APPENDIX K
AIR QUALITY DATA AND MODELING PROTOCOL

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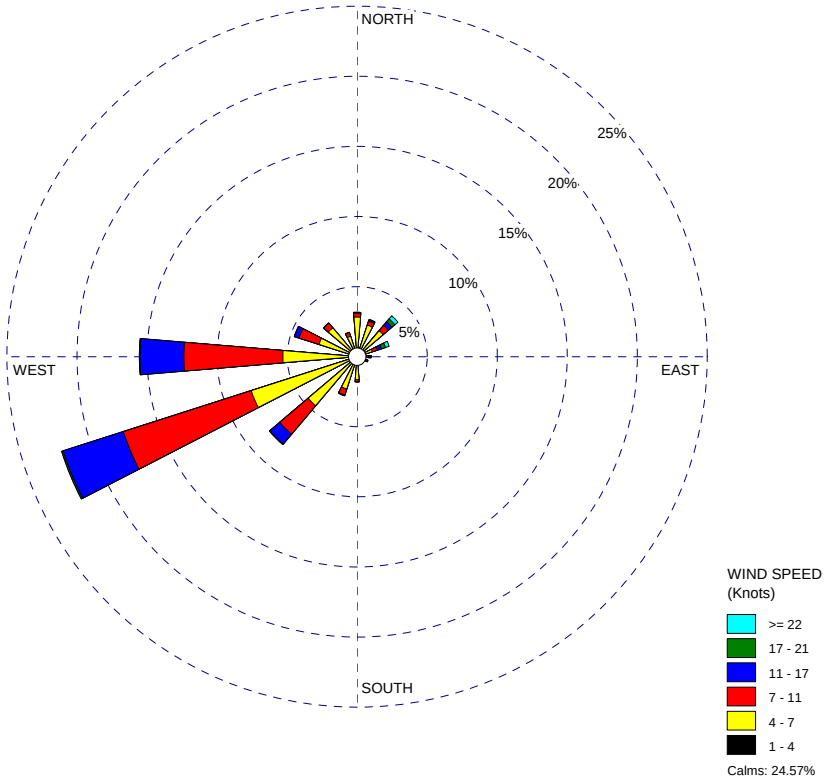
Appendix K-1
Seasonal Wind Roses

WIND ROSE PLOT:

Ontario International Airport

DISPLAY:

Wind Speed
Direction (blowing from)



COMMENTS:	DATA PERIOD:	COMPANY NAME:	
	1994 1995 1997 1998 1999 **Jan 1 - Dec 31** **00:00 - 23:00**	MODELER:	
	CALM WINDS: **24.57%**	TOTAL COUNT: **43800 hrs.**	
	AVG. WIND SPEED: **5.50 Knots**	DATE: **1/18/2007**	PROJECT NO.:

WRPLOT View - Lakes Environmental Software

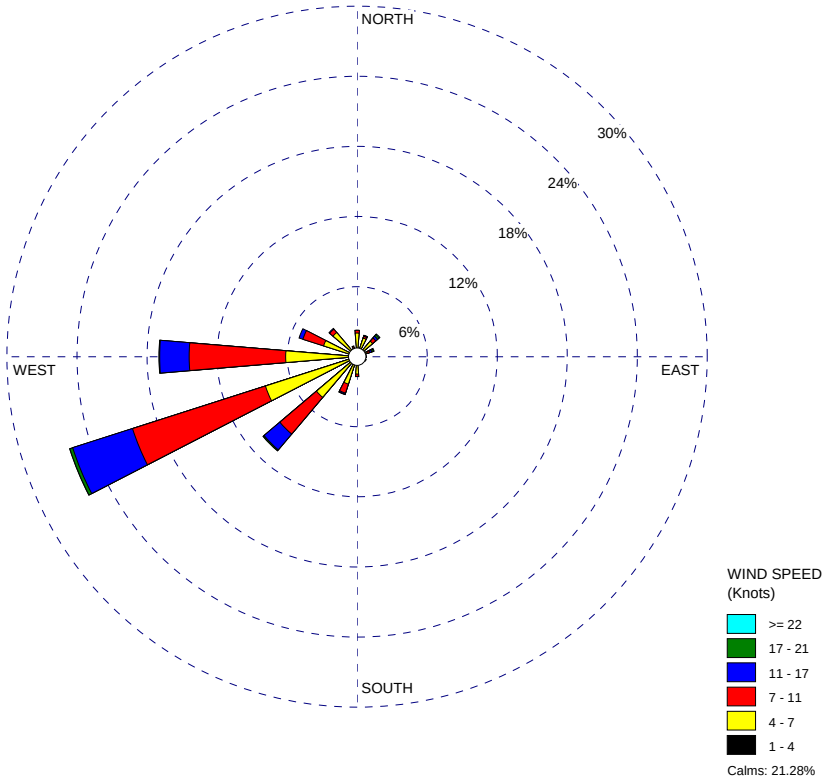
Annual Season Windrose for Ontario International Airport based on Surface Data for 1994, 1995, 1997, 1998 and 1999

WIND ROSE PLOT:

Ontario International Airport
1994-1999 Spring (Mar, Apr, May)

DISPLAY:

Wind Speed
Direction (blowing from)



COMMENTS:	DATA PERIOD:	COMPANY NAME:	
	1994 1995 1997 1998 1999 **Mar 1 - May 31** **00:00 - 23:00**	MODELER:	
	CALM WINDS: **21.28%**	TOTAL COUNT: **11040 hrs.**	
	AVG. WIND SPEED: **5.82 Knots**	DATE: **1/18/2007**	PROJECT NO.:

WRPLOT View - Lakes Environmental Software

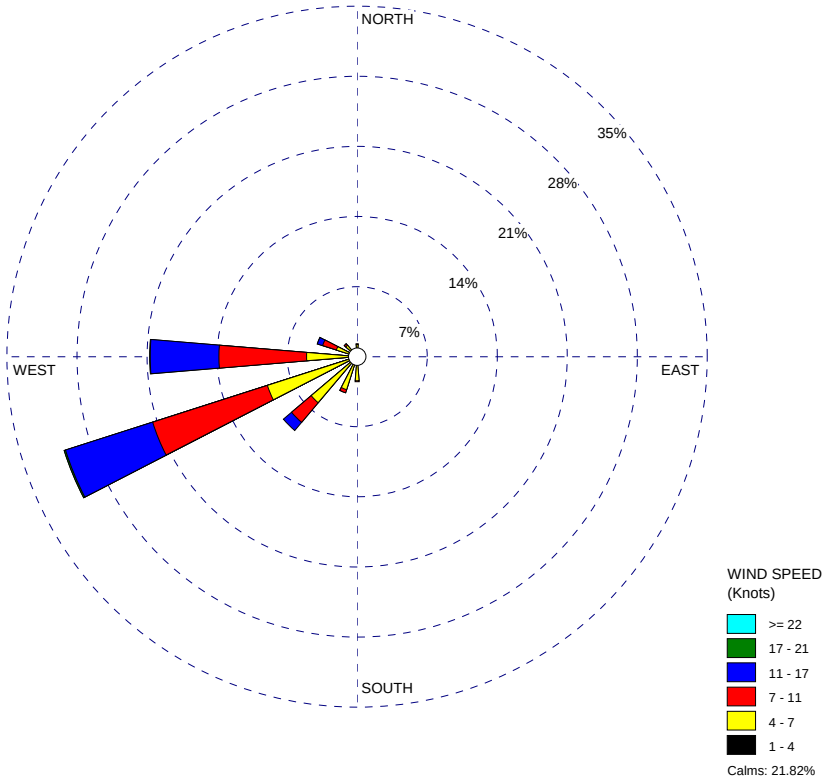
Spring Season Windrose for Ontario International Airport based on Surface Data for 1994, 1995, 1997, 1998 and 1999

WIND ROSE PLOT:

Ontario International Airport
1994-1999 Summer (Jun, Jul, Aug)

DISPLAY:

Wind Speed
Direction (blowing from)



COMMENTS:	DATA PERIOD:	COMPANY NAME:	
	1994 1995 1997 1998 1999 **Jun 1 - Aug 31** **00:00 - 23:00**	MODELER:	
	CALM WINDS: **21.82%**	TOTAL COUNT: **11040 hrs.**	
	AVG. WIND SPEED: **6.08 Knots**	DATE: **1/18/2007**	PROJECT NO.:

WRPLOT View - Lakes Environmental Software

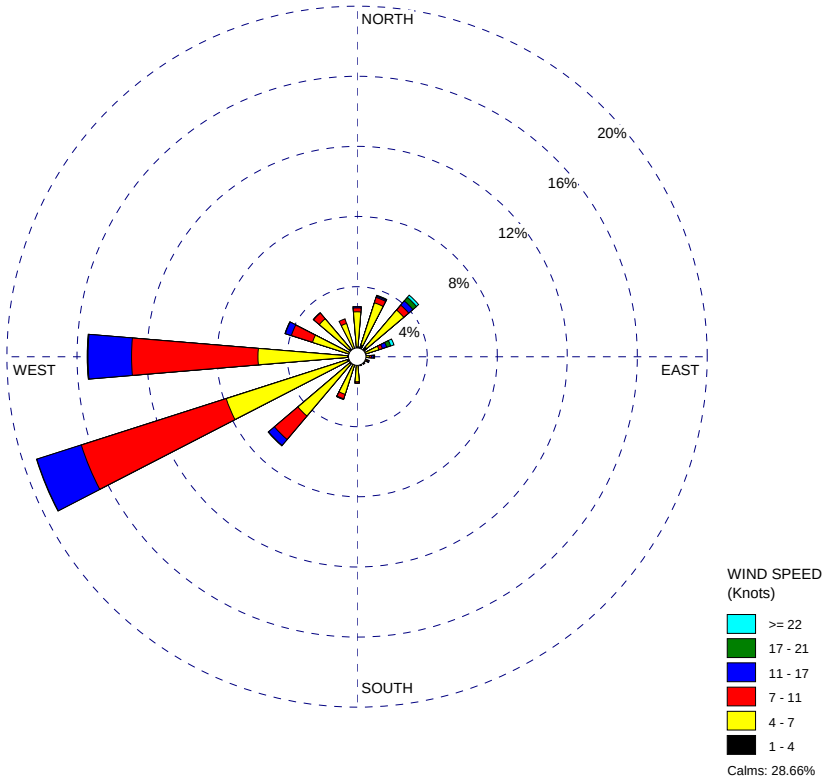
Summer Season Windrose for Ontario International Airport based on Surface Data for 1994, 1995, 1997, 1998 and 1999

WIND ROSE PLOT:

Ontario International Airport
1994-1999 Fall (Sep, Oct, Nov)

DISPLAY:

Wind Speed
Direction (blowing from)



COMMENTS:	DATA PERIOD:	COMPANY NAME:	
	1994 1995 1997 1998 1999 **Sep 1 - Nov 30** **00:00 - 23:00**	MODELER:	
	CALM WINDS: **28.66%**	TOTAL COUNT: **10920 hrs.**	
	AVG. WIND SPEED: **4.84 Knots**	DATE: **1/18/2007**	PROJECT NO.:

WRPLOT View - Lakes Environmental Software

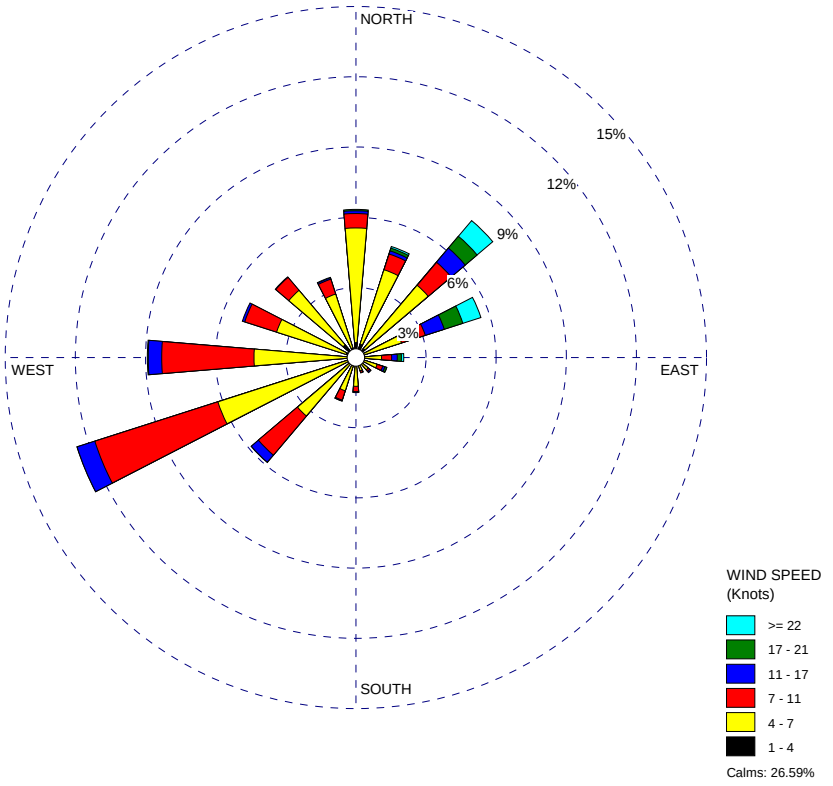
Fall Season Windrose for Ontario International Airport based on Surface Data for 1994, 1995, 1997, 1998 and 1999

WIND ROSE PLOT:

Ontario International Airport
1994-1999 Winter (Jan, Feb, and Dec)

DISPLAY:

Wind Speed
Direction (blowing from)



COMMENTS:	DATA PERIOD:	COMPANY NAME:	
	1994 1995 1997 1998 1999 **Check Date Range Report** **00:00 - 23:00**	MODELER:	
	CALM WINDS: **26.59%**	TOTAL COUNT: **10800 hrs.**	
	AVG. WIND SPEED: **5.23 Knots**	DATE: **1/18/2007**	PROJECT NO.:

WRPLOT View - Lakes Environmental Software

Winter Season Windrose for Ontario International Airport based on Surface Data for 1994, 1995, 1997, 1998 and 1999

Appendix K-2
Construction Emissions

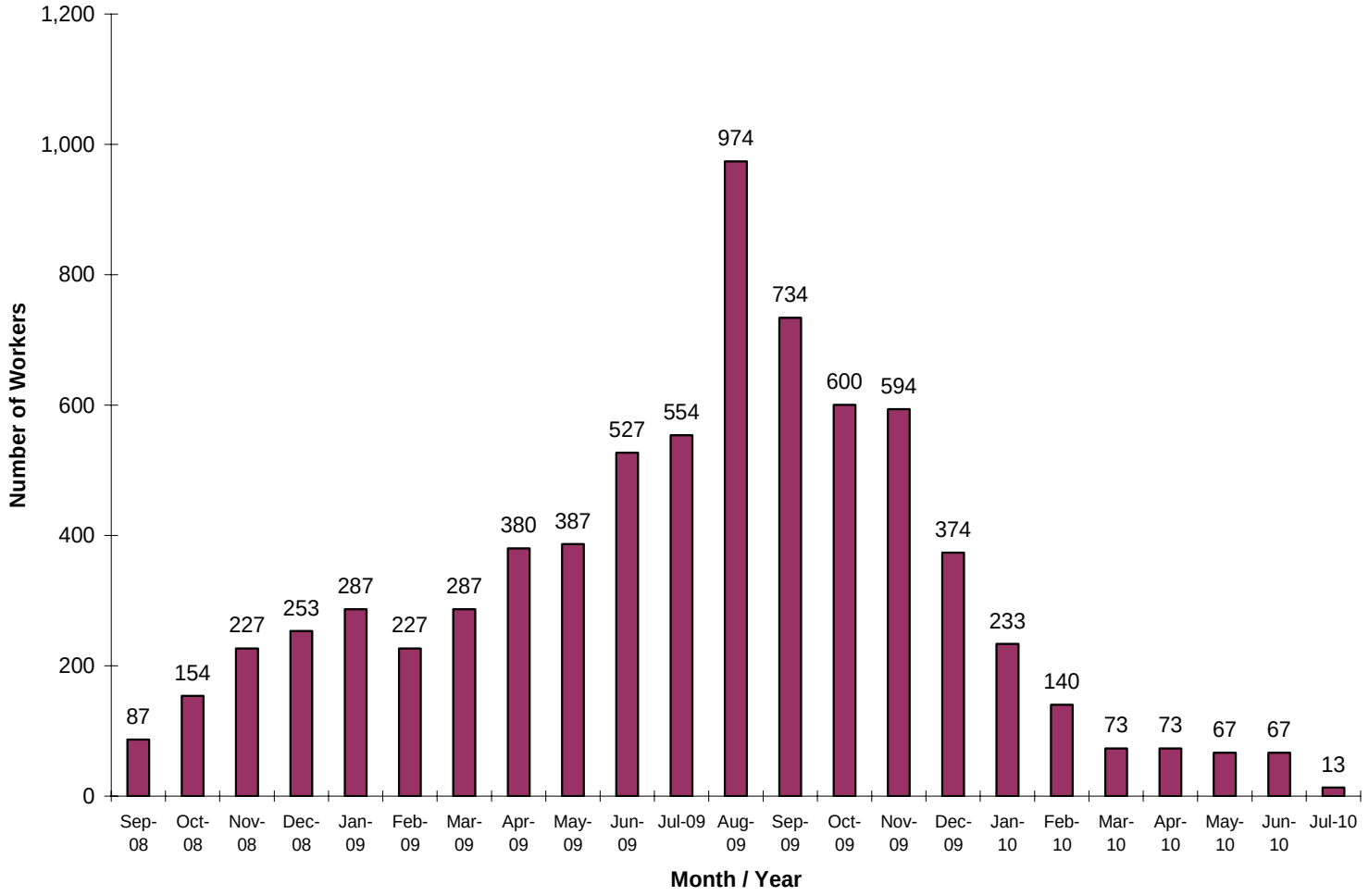
Daily Maximum Construction Emissions of Criteria Pollutants (lbs/day)						
Activity	**PM_{10}**	**$PM_{2.5}$**	**CO**	**ROC**	**NO_x**	**SO_x**
Onsite Combustion Emissions						
Diesel Construction Equipment	18.67	17.18	150.32	45.53	333.46	0.30
Dump trucks, pickup trucks and worker vehicles	0.10	0.08	1.84	0.23	1.06	0.002
Construction Combustion Subtotal (lbs)	***18.7***	***17.2***	***150.3***	***45.5***	***333.5***	***0.3***
Onsite Fugitive Dust Emissions						
Vehicle Travel on Unpaved Roads and Parking Lot	12.36	2.62				
Earth clearing/Bulldozing	9.24	1.92				
Earth Loading/Storage	0.47	0.10				
Subtotal of Offsite Emissions (lbs)	***22.1***	***4.6***				
Offsite On-Highway Emissions						
Worker Passenger Vehicle – Combustion Emissions	0.03	0.02	4.17	0.43	0.44	0.004
Worker Passenger Vehicle – Paved Road Dust	2.53	0.43				
Subtotal of Offsite Emissions (lbs)	***2.53***	***0.43***	***4.17***	***0.43***	***0.44***	***0.004***
Total Max. Daily Emissions (lbs)	**43.3**	**22.2**	**154.5**	**46.0**	**333.9**	**0.3**

Notes:
PM_{10} = particulate matter less than 10 micrometers in diameter
$PM_{2.5}$ = particulate matter less than 2.5 micrometers in diameter
ROC = reactive organic compounds
CO = carbon monoxide
NO_x = nitrogen oxide(s)
SO_x = sulfur oxide(s)

Maximum Annual Construction Emissions of Criteria Pollutants (ton/year)						
Activity	**PM_{10}**	**$PM_{2.5}$**	**CO**	**ROC**	**NO_x**	**SO_x**
Onsite Combustion Emissions						
Diesel Construction Equipment	1.46	1.35	11.71	3.62	24.88	0.02
Dump trucks, pickup trucks and worker vehicles	0.01	0.01	0.05	0.01	0.07	0.0001
Construction Combustion Subtotal (lbs)	***1.5***	***1.3***	***11.7***	***3.6***	***24.9***	***0.0***
Onsite Fugitive Dust Emissions						
Vehicle Travel on Unpaved Roads and Parking Lot	1.05	0.22				
Earth clearing/Bulldozing	4.80	1.00				
Earth Loading/Storage	0.05	0.01				
Subtotal of Offsite Emissions (lbs)	***5.9***	***1.2***				
Offsite On-Highway Emissions						
Worker Passenger Vehicle – Combustion Emissions	0.00	0.00	0.55	0.06	0.06	0.001
Worker Passenger Vehicle – Paved Road Dust	0.33	0.06				
Subtotal of Offsite Emissions (lbs)	***0.33***	***0.06***	***0.55***	***0.06***	***0.06***	***0.001***
Total Max. Daily Emissions (lbs)	**7.7**	**2.6**	**12.3**	**3.7**	**24.9**	**0.0**

Notes:
PM_{10} = particulate matter less than 10 micrometers in diameter
$PM_{2.5}$ = particulate matter less than 2.5 micrometers in diameter
ROC = reactive organic compounds
CO = carbon monoxide
NO_x = nitrogen oxide(s)
SO_x = sulfur oxide(s)

Construction Staff by Month



Number of Workers by Month																						TOTAL ALL MONTHS	TOTAL MONTHS 1-12
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22		
87	154	227	253	287	227	287	380	387	527	554	974	734	600	594	374	233	140	73	73	67	67	7299	4344

Worker Commuting Emissions

Combustion EMISSION FACTOR FOR ONROAD VEHICLES

Onroad Vehicle	Fuel Type	Total Vehicle Count/ Year	Vehicle Count/ Constr Project	Weight (lbs)	Vehicle Type	EF (lbs/mile)					
						PM_{10}	$PM_{2.5}$	CO	VOC	NOx	SO_2
Passenger Vehicles	G/D	3475	5839	1000	LDA	8.51E-05	5.29E-05	1.05E-02	1.08E-03	1.10E-03	1.07E-05

EMISSION CALCULATION FOR ONROAD VEHICLES

	Total Days / Year	Total Days / Constr. Project	Daily VMT / Vehicle	Annual VMT	Constr Project Total VMT	Daily Emissions (lbs/day)					
						PM_{10}	$PM_{2.5}$	CO	VOC	NOx	SO_2
Highway Vehicles											
Passenger Vehicles	264	484	30	104256	175176	0.03	0.02	4.17	0.43	0.44	0.00

Annual Emission Rate (tons/year)						Total Project Emission Rate (tons)					
PM_{10}	$PM_{2.5}$	CO	VOC	NOx	SO_2	PM_{10}	$PM_{2.5}$	CO	VOC	NOx	SO_2
0.004	0.003	0.550	0.056	0.057	0.001	0.007	0.005	0.924	0.095	0.097	0.001

Emission Factors from
SCAQMD Prepared - Highest (Most Conservative) Emfac 2007 (version 2.3)
Emission Factors for On-Road Passenger Vehicles
Scenario Year: 2008
All model years in the range 1965 to 2008

Passenger vehicle travel on paved roads

0.0064 PM10 lb/VMT (from Table A9-9-B-1 for major streets/highways)

Equipment	Daily PM10 Emissions (lb/day)	Annual PM10 Emissions (tons/yr)	Constr Project PM10 Emissions (tons)	Daily PM2.5 Emissions (lb/day)	Annual PM2.5 Emissions (tons/yr)	Constr Project PM2.5 Emissions (tons)
Employee Vehicles	2.53	0.33	0.56	0.43	0.06	0.09

Assumed average distance travelled off site for all employees commuting will be 15 miles
times 2 for return trip 30 miles
Each worker on makes 1 return trip per day
7299 = Total number employees on site for entire 22 month construction period
4344 = Total number employees on site for months 1-12
based on AFC Table 3.6-1 - Construction Staff by Trade
Assumed 1.25 employees per vehicle
22 Maximum number of days per month of construction

Estimated Pieces of Construction Equipment and Schedules

	CONSTRUCTION EQUIPMENT	AVERAGE HOURS PER DAY	AVERAGE UNITS ON SITE PER MONTH																						TOTAL ALL MONTHS	TOTAL MONTHS 1-12
			1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22		
1	TRACKHOE EXCAVATOR	8		4	6	8	8	6	2																34	34
2	BACKHOE	8	1	3	3	3	3	3	3	1	1	1	1	1	1	1	1	1	1	1					30	24
3	BULLDOZER	6		4	6	8	8	6	4																40	36
4	FRONT END LOADER	8	4	4	4	4	4	4	4																28	28
5	BOBCAT	7	3	3	3	3	3	3	3																21	21
6	ROLLER COMPACTOR	6	2	2	4	4	6	6	6									1	1	1					33	30
7	PLATE COMPACTOR	6	4	4	4	4	6	6	6																34	34
8	CAISSON DRILLING RIG	8		1																					1	1
10	PAVING MACHINE	8															1	1	1						3	0
11	CONCRETE PUMP (DAILY RENTAL)	8		1	1	1	1	1	1	1	1	1	1												10	10
12	GROUT MIXER	3						1	1	1	1	1	1	1	1	1	1	1	1						12	7
13	ROUGH TERRAIN CRANE – 30 TON	8			1	1	1	1	2	2	2	2	2	1	1	1	1	1	1	1					21	15
14	ROUGH TERRAIN CRANE – 50 TON	8								1	1	1	1	1	1	1	1								8	5
15	TRUCK CRANE – 150 TON (DAILY RENTAL)	8						1	1	1	1	1	1	1	1	1	1	1	1						12	7
16	TRUCK CRANE – 350 TON (DAILY RENTAL)	8							1	2	1				1	1									6	4
17	CRAWLER CRANE – 150 TON	8		1	1																				2	2
18	TURBINE GANTRY	4								1	2	2	2	1	1										9	8
19	ROUGH TERRAIN FORKLIFT	6	1	1	1	1	1	2	2	2	2	2	2	2	2	2	1	1	1	1	1				28	19
20	HEAVY DUTY FORKLIFT	6						1	1	1	1	1	1	1											7	7
21	MANLIFTS – 40’	8						2	2	3	3	3	3	2	2	2	2	2	1						27	18
22	MANLIFTS – 60’	8						1	1	1	2	3	3	2	2	1	1	1							18	13
23	MANLIFTS – 80’	8						1	1	1	2	3	3	2	2	1	1	1							18	13
24	AIR COMPRESSORS	8		1	1	1	1	2	2	3	3	3	3	3	2	1	1	1	1	1					30	23
25	WELDING MACHINES	8			2	2	2	4	8	12	12	12	12	6	4	4	4	2	2	2					90	72
26	WATER TRUCK	4	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1						17	12
9	DUMP TRUCK	6	4	5	5	5	5	5	4																33	33
27	PICK-UP TRUCKS	3	11	11	11	11	15	15	15	15	15	13	13	13	11	9	9	9	9	9					214	158
	Equipment per Month		31	46	54	57	65	72	71	49	51	50	50	38	33	27	26	24	21	16	1	0	0	0		

Annual Combustion Emissions

Maximum annual construction equipment activity occurs in months 1 - 12.

Diesel Fired Offroad Equipment

					Emission factors (lb/hr)					Annual Emissions (ton/yr)					
Equipment	**Quantity/ year**	**Hours /Day**	**Horsepo wer**	**Days/ month**	**PM10**	**CO**	**ROC**	**NOx**	**SOx**	**PM10**	**PM2.5**	**CO**	**VOC**	**NOx**	**SOx**
Excavator	34	8	175	22	0.0748	0.6735	0.1674	1.2913	0.0013	0.2	0.2	2.0	0.5	3.9	0.0
Backhoe	24	8	120	22	0.0595	0.3703	0.1083	0.6510	0.0006	0.1	0.1	0.8	0.2	1.4	0.0
Tracked Dozer	36	6	375	22	0.1179	0.8463	0.3011	2.6790	0.0021	0.3	0.3	2.0	0.7	6.4	0.0
Wheeled Loader	28	8	175	22	0.0733	0.6383	0.1659	1.3029	0.0012	0.2	0.2	1.6	0.4	3.2	0.0
Bobcat	21	7	50	22	0.0259	0.2724	0.1007	0.2552	0.0003	0.0	0.0	0.4	0.2	0.4	0.0
Roller Compactor	30	6	175	22	0.0717	0.6345	0.1653	1.3433	0.0012	0.1	0.1	1.3	0.3	2.7	0.0
Plate Compactor	34	6	15	22	0.0021	0.0263	0.0052	0.0328	0.0001	0.0	0.0	0.1	0.0	0.1	0.0
Drill Rig	1	8	175	22	0.0585	0.7541	0.1203	1.1469	0.0016	0.0	0.0	0.1	0.0	0.1	0.0
Paving Machine	0	8	150	22	0.0924	0.5356	0.1823	1.0659	0.0008	0.0	0.0	0.0	0.0	0.0	0.0
Concrete Pump	10	8	25	22	0.0146	0.1221	0.0485	0.1954	0.0002	0.0	0.0	0.1	0.0	0.2	0.0
Grout Mixer	7	3	25	22	0.0125	0.1038	0.0402	0.1722	0.0002	0.0	0.0	0.0	0.0	0.0	0.0
Crane	15	8	75	22	0.0320	0.3359	0.1466	0.2624	0.0003	0.0	0.0	0.4	0.2	0.3	0.0
Crane	5	8	100	22	0.0664	0.3807	0.1261	0.7275	0.0006	0.0	0.0	0.2	0.1	0.3	0.0
Crane	7	8	250	22	0.0535	0.3881	0.1392	1.3867	0.0013	0.0	0.0	0.2	0.1	0.9	0.0
Crane	4	8	500	22	0.0771	0.7762	0.2012	1.9878	0.0018	0.0	0.0	0.3	0.1	0.7	0.0
Crane	2	8	250	22	0.0535	0.3881	0.1392	1.3867	0.0013	0.0	0.0	0.1	0.0	0.2	0.0
Crane - turbine gant	8	4	120	22	0.0664	0.3807	0.1261	0.7275	0.0006	0.0	0.0	0.1	0.0	0.3	0.0
Rough Terrain Fork	19	6	120	22	0.0757	0.4543	0.1404	0.8292	0.0007	0.1	0.1	0.6	0.2	1.0	0.0
Heavy Duty Forklift	7	6	120	22	0.0757	0.4543	0.1404	0.8292	0.0007	0.0	0.0	0.2	0.1	0.4	0.0
Aerial Lift	18	8	15	22	0.0048	0.0534	0.0113	0.0736	0.0001	0.0	0.0	0.1	0.0	0.1	0.0
Aerial Lift	13	8	25	22	0.0077	0.0644	0.0249	0.1073	0.0001	0.0	0.0	0.1	0.0	0.1	0.0
Aerial Lift	13	8	50	22	0.0203	0.2011	0.0833	0.2037	0.0003	0.0	0.0	0.2	0.1	0.2	0.0
Air Compressor	23	8	25	22	0.0108	0.0905	0.0359	0.1448	0.0002	0.0	0.0	0.2	0.1	0.3	0.0
Welder	72	8	25	22	0.0085	0.0707	0.0281	0.1131	0.0001	0.1	0.0	0.4	0.2	0.7	0.0
Water Truck	12	4	250	22	0.0659	0.4799	0.1822	1.8617	0.0019	0.0	0.0	0.3	0.1	1.0	0.0
	443								**Total**	**1.5**	**1.3**	**11.7**	**3.6**	**24.9**	**0.0**

Notes:

Emission factors from SCAQMD composite off-road emission factors from CARB's Off-Road Model for year 2008.

Equipment list, quantity, horsepower, and hours of operation from client.

PM2.5 emission factors from updated CEIDARS List with PM2.5 fractions. PM2.5 numbers obtained by multiplying the PM10 values by fraction in CEIDARS list for onroad or offroad diesel vehicles.

Combustion Exhaust from Travel on Unpaved Roads

Vehicle Type	Quantity/ year[1]	Round Trips /Day/ Unit	Round Trip Distance (mile)	Daily VMT per Unit	Annual VMT for all Units	Emission factor (lb/mile) PM10	PM2.5	CO	VOC	NOx	SOx	Emission factor vehicle type	Annual Emissions (ton/yr) PM10	PM2.5	CO	VOC	NOx	SOx
Dump trucks	33	4	1	4	2904	0.0042	0.0038	0.0136	0.0035	0.0446	4.14E-05	HHD truck	0.006	0.005	0.020	0.005	0.065	6.01E-05
Trucks - Pickup 3/4 ton	158	1	1	1	3476	8.51E-05	5.29E-05	0.0105	0.0011	0.0011	1.07E-05	passenger	0.000	0.000	0.018	0.002	0.002	1.87E-05
Worker's Vehicles in Parking lot	3475	1	0.75	0.75	2606	8.51E-05	5.29E-05	0.0105	0.0011	0.0011	1.07E-05	passenger	0.000	0.000	0.014	0.001	0.001	1.4E-05
												Total Unpaved Road	**0.006**	**0.006**	**0.052**	**0.008**	**0.068**	**9.27E-05**

Notes:

SCAQMD Prepared - Highest (Most Conservative) Emfac 2007 (version 2.3)

Emission Factors for On-Road Passenger Vehicles & Delivery Trucks & Heavy Heavy Duty Diesel Trucks

Scenario Year: 2008

All model years in the range 1965 to 2008

1. Truck quantity based on monthly maximums, worker vehicle quantity based on total vehicles per day per month

22 Maximum number of days per month of construction

Emission location	Activity	number of sources	MODEL EMISSION RATE per Source (lb/hr) NOx Annual	PM10 Annual	SO2 Annual	PM2.5 Annual	MODEL EMISSION RATE per Source (g/s) NOx Annual	PM10 Annual	SO2 Annual	PM2.5 Annual
Various	excavation	46	0.1235	0.0073	1.15E-04	0.0067	1.56E-02	9.16E-04	1.44E-05	8.43E-04
Roads	truck & worker travel	9	0.0017	0.00016	2.353E-06	0.00014	2.18E-04	2.02E-05	2.97E-07	1.79E-05

18 sources in main construction area
10 sources in laydown area B
5 sources in laydown area 1
5 sources in laydown area 9
8 sources in pipe excavation area

Annual Fugitive Dust Emissions

Maximum annual construction equipment activity occurs in months 1 - 12.

Bulldozing/Earth clearing

$E = 0.45 * G^{1.5} / H^{1.4} * 2.2046$ PM10 Emissions from bulldozing (lb/hr) from SCAQMD Table A9-9-F

7.5 G = Silt content (%) (from Table A9-9-F-1 for overburden)

15 H = Moisture content of surface material (%) (from Table A9-9-F-2 for moist dirt)

0.46 lb/hr of PM10

Equipment	Quantity/ year	Hours/ Day	Hours/ year/ Unit	Watering Control Efficiency	PM10 Emissions (tons/yr)	PM2.5 Emissions (tons/yr)
Excavator	34	8	1232	85%	1.44	0.30
Backhoe	24	8	1232	85%	1.02	0.21
Tracked Dozer	36	6	924	85%	1.15	0.24
Wheeled Loader	28	8	1232	85%	1.19	0.25
				Total	**4.80**	**1.00**

7 Total months of soil movement

22 construction days per month

Water efficiency from CEQA Table 11-4 watering 3 times daily or using chemical suppressants

Dirt Piling or Material Handling

$E = 0.00112 * (G/5)^{1.3} / (H/2)^{1.4}$ PM10 Emissions from Dirt Piling or Material Handling (lb/hr) from SCAQMD Table A9-9-G

12 G = Mean Wind speed (mph) default

15 H = Moisture content of surface material (%) (from Table A9-9-G-1 for moist dirt)

0.00021 lb/ton of PM10

annual fugitive dust

Equipment	Quantity/ year	Hours/ Day	Annual Material Handled (ton)	Watering Control Efficiency	PM10 Emissions (tons/yr)	PM2.5 Emissions (tons/yr)
Wheeled Loader	28	8	39,978	85%	0.0006	0.0001
Dump Trucks	33	6	39,978	85%	0.0006	0.0001
				Total	**0.0012**	**0.0003**

Water efficiency from CEQA Table 11-4 watering 3 times daily or using chemical suppressants

220 yd3/day 260 ton/day
33,880 yd3 39,978 tons 2360 density of soil (lb/yd3)
(USDA NRCS Physical Soil Properties from San Bernardino County
Western Part for Tujunga Sandy Loam soil)
14 acres = 33,880 cubic yds, assume depth of 0.5 yd (1.5 ft) of soils moved

Cover Storage Pile
SCAQMD Table A9-9-E
E = 1.7 * G/1.5 * (365-H)/235 * I/15 * J
PM10 Emission factor from wind erosion of storage piles per day per acre
7.5 G = Silt content (%) (from Table A9-9-E-1 for overburden)
34 H = Mean number of days per year with at least 0.01 inches of precipitation (from Western Regional Climate Center for Riverside Fire Station)
1.7 I = Percentage of time that the unobstructed wind speed exceeds 12 mph at mean pile height
0.5 J = Fraction of TSP that is PM10 = 0.5
0.678 lb/acre/day

wind speed percentage based on 1994-99 (5 yrs) of wind speed data (actual hours > 10 knots) as recorded at Ontario station

Source	Quantity	Size of Pile (acre)	Days / year	Watering Control Efficiency	PM10 Emissions (tons/yr)	PM2.5 Emissions (tons/yr)
Cover Storage Pile	3	1.5	210	85%	0.05	0.010

Water efficiency from CEQA Table 11-4 watering 3 times daily or using chemical suppressants
pile size assumed
Days per year accounts for weekend days also, not just work days

annual fugitive dust

Travel on unpaved road

$F = 2.1 * G/12 * H/30 * (J/3)^{0.7} * (I/4)^{0.5} * (365-K)/365$ SCAQMD Table A9-9-D

Emission factor for vehicle travel on unpaved roads (lb/VMT)

12.5 G = Surface silt loading (%) (average value for Tujunga Loamy sand at site)

5 H = Mean vehicle speed (mph)

value listed in table I = Mean number of wheels on vehicle

value listed in table J = Mean vehicle weight (ton)

34 K = Mean number of days per year with at least 0.01 inches of precipitation (from Western Regional Climate Center for Riverside Fire Station)

Vehicle Type	Quantity/ year[1]	Round Trips /Day/ Unit	Round Trip Distance (mile)	Daily VMT per Unit	Annual VMT for all Units	Mean Vehicle Weight (tons)	Number of Wheels on Vehicle	PM10 EF (lbs/VMT)	Watering Control Efficiency	PM10 Emissions (tons/yr)	PM2.5 Emissions (tons/yr)
Bobcat	21	4	0.25	1	462	3	4	0.33	85%	0.011	0.002
Roller Compactor	30	4	0.25	1	660	11	4	0.82	85%	0.041	0.009
Plate Compactor	34	0	0	0	0	NA	NA	NA	85%	0.000	0.000
Drill Rig	1	0	0	0	0	NA	NA	NA	85%	0.000	0.000
Paving Machine	0	8	0.25	2	0	NA	NA	NA	85%	0.000	0.000
Concrete Pump	10	1	0.25	0.25	55	0.5	2	0.07	85%	0.000	0.000
Grout Mixer	7	0	0	0	0	NA	NA	NA	85%	0.000	0.000
Crane	15	1	0.25	0.25	82.5	15	6	1.25	85%	0.008	0.002
Crane	5	0	0	0	0	NA	NA	NA	85%	0.000	0.000
Crane	7	1	0.25	0.25	38.5	40	12	3.51	85%	0.010	0.002
Crane	4	0	0	0	0	NA	NA	NA	85%	0.000	0.000
Crane	2	0	0	0	0	NA	NA	NA	85%	0.000	0.000
Crane - turbine gantr	8	0	0	0	0	NA	NA	NA	85%	0.000	0.000
Rough Terrain Forklif	19	4	0.25	1	418	7	4	0.60	85%	0.019	0.004
Heavy Duty Forklift	7	4	0.25	1	154	7	4	0.60	85%	0.007	0.001
Aerial Lift	18	0	0	0	0	NA	NA	NA	85%	0.000	0.000
Aerial Lift	13	0	0	0	0	NA	NA	NA	85%	0.000	0.000
Aerial Lift	13	1	0.25	0.25	71.5	7	4	0.60	85%	0.003	0.001
Air Compressor	23	0	0	0	0	0.5	2	0.07	85%	0.000	0.000
Welder	72	0	0	0	0	0.5	2	0.07	85%	0.000	0.000
Water Truck	12	10	2	20	5280	13	10	1.46	85%	0.578	0.122
Dump Truck	33	4	1	4	2904	13	10	1.46	85%	0.318	0.067
Trucks - Pickup 3/4 ton	158	1	1	1	3476	1	4	0.15	85%	0.040	0.008
Worker's Vehicles in Parking lot	3475	1	0.75	0.75	2606	0.5	4	0.09	85%	0.018	0.004
									Total	**1.053**	**0.223**

annual fugitive dust

Assumed maximum travel speed is 5 mph
Equipment weight from SCAQMD Table A9-9-D-3
Water efficiency from CEQA Table 11-4 watering 3 times daily or using chemical suppressants
PM2.5 emission factors from updated CEIDARS List with PM2.5 fractions.
PM2.5 numbers obtained by multiplying the PM10 values by fraction in CEIDARS list for appropriate fugitive dust sources.
Round trips/day uses 1 trip per hour for dump trucks. Water trucks operate 2 times per hour. Service trucks use 1 trips per day.
Distances measured from plot plan from highway along access road to center of construction area and parking lot.
1. Truck quantity based on monthly maximums, worker vehicle quantity based on total vehicles per day per month

22 Maximum number of days per month of construction

		Total MODEL EMISSION RATE (lb/hr)	
		PM10	PM2.5
Emission location	**Activity**	**Annual**	**Annual**
Various	excavation	0.0113	0.0023
Roads	truck & worker travel	0.2404	0.0510

18 sources in main construction area B
10 sources in laydown area B
5 sources in laydown area 1
5 sources in laydown area 9
8 sources in pipe excavation area

					MODEL EMISSION RATE per Source (g/s-m2)	
					PM10	PM2.5
Location	**X (m)**	**Y (m)**	**AREA (m2)**	**percent of total area**	**Annual**	**Annual**
MAINDUST	325	174	56550	0.397	9.98E-09	2.08E-09
LAYDN1	255	95	24225	0.170	9.98E-09	2.08E-09
LAYDN9	100	35	3500	0.025	9.98E-09	2.08E-09
PIPEA	100	10	1000	0.007	9.98E-09	2.08E-09
PIPEB	100	10	1000	0.007	9.98E-09	2.08E-09
PIPEC	100	10	1000	0.007	9.98E-09	2.08E-09
PIPED	30	10	300	0.002	9.98E-09	2.08E-09
PIPEE	10	100	1000	0.007	9.98E-09	2.08E-09
PIPEF	10	30	300	0.002	9.98E-09	2.08E-09
PIPEG	100	10	1000	0.007	9.98E-09	2.08E-09
PIPEH	42	10	420	0.003	9.98E-09	2.08E-09
ALTB			52050	0.366	9.98E-09	2.08E-09

					annual fugitive dust	
Total Construction Area			142345			
Note 3 smaller areas make up AltB						
ALTB1	290	115	33350			
ALTB2	95	125	11875			
ALTB3	195	35	6825			
ROAD1	12	120	1440	0.118	1.16E-07	2.41E-08
ROAD2	12	120	1440	0.118	1.16E-07	2.41E-08
ROAD3	12	120	1440	0.118	1.16E-07	2.41E-08
ROAD4	12	120	1440	0.118	1.16E-07	2.41E-08
ROAD5	12	120	1440	0.118	1.16E-07	2.41E-08
ROAD6	12	60	720	0.059	1.16E-07	2.41E-08
ROAD7	120	12	1440	0.118	1.16E-07	2.41E-08
ROAD8	120	12	1440	0.118	1.16E-07	2.41E-08
ROAD9	120	12	1440	0.118	1.16E-07	2.41E-08
Total Road Area			12240			

Excavations and Foundations - Combustion Emissions

Maximum construction activity occurs in month 6.

Diesel Fired Offroad Equipment

Equipment	Quantity	Hours /Day	Horsepower	Emission factors (lb/hr) PM10	CO	ROC	NOx	SOx	Hourly Emissions (lb/hr) PM10	PM2.5	CO	VOC	NOx	SOx	Daily Emissions (lb/day) PM10	PM2.5	CO	VOC	NOx	SOx
Wheeled Loader	4	8	175	0.0733	0.6383	0.1659	1.3029	0.0012	0.29	0.27	2.55	0.66	5.21	0.00	2.35	2.16	20.43	5.31	41.69	0.04
Tracked Dozer	6	6	375	0.1179	0.8463	0.3011	2.6790	0.0021	0.71	0.65	5.08	1.81	16.07	0.01	4.24	3.90	30.47	10.84	96.44	0.07
Water Truck	1	6	250	0.0659	0.4799	0.1822	1.8617	0.0019	0.07	0.06	0.48	0.18	1.86	0.00	0.40	0.36	2.88	1.09	11.17	0.01
Roller Compactor	6	6	175	0.0717	0.6345	0.1653	1.3433	0.0012	0.43	0.40	3.81	0.99	8.06	0.01	2.58	2.37	22.84	5.95	48.36	0.04
Plate Compactor	6	6	15	0.0021	0.0263	0.0052	0.0328	0.0001	0.01	0.01	0.16	0.03	0.20	0.00	0.07	0.07	0.95	0.19	1.18	0.00
Bobcat	3	7	50	0.0259	0.2724	0.1007	0.2552	0.0003	0.08	0.07	0.82	0.30	0.77	0.00	0.54	0.50	5.72	2.12	5.36	0.01
Rough Terrain Forkl	3	6	120	0.0757	0.4543	0.1404	0.8292	0.0007	0.23	0.21	1.36	0.42	2.49	0.00	1.36	1.25	8.18	2.53	14.93	0.01
Air Compressor	2	8	25	0.0108	0.0905	0.0359	0.1448	0.0002	0.02	0.02	0.18	0.07	0.29	0.00	0.17	0.16	1.45	0.57	2.32	0.00
Welder	4	8	25	0.0085	0.0707	0.0281	0.1131	0.0001	0.03	0.03	0.28	0.11	0.45	0.00	0.27	0.25	2.26	0.90	3.62	0.00
Crane	2	8	250	0.0535	0.3881	0.1392	1.3867	0.0013	0.11	0.10	0.78	0.28	2.77	0.00	0.86	0.79	6.21	2.23	22.19	0.02
Concrete Pump	1	8	25	0.0146	0.1221	0.0485	0.1954	0.0002	0.01	0.01	0.12	0.05	0.20	0.00	0.12	0.11	0.98	0.39	1.56	0.00
Excavator	6	8	175	0.0748	0.6735	0.1674	1.2913	0.0013	0.45	0.41	4.04	1.00	7.75	0.01	3.59	3.30	32.33	8.03	61.98	0.06
Aerial Lift	4	8	50	0.0203	0.2011	0.0833	0.2037	0.0003	0.08	0.07	0.80	0.33	0.81	0.00	0.65	0.60	6.44	2.67	6.52	0.01
Grout Mixer	1	3	25	0.0125	0.1038	0.0402	0.1722	0.0002	0.01	0.01	0.10	0.04	0.17	0.00	0.04	0.03	0.31	0.12	0.52	0.00
Backhoe	3	8	120	0.0595	0.3703	0.1083	0.6510	0.0006	0.18	0.16	1.11	0.32	1.95	0.00	1.43	1.31	8.89	2.60	15.62	0.01
	52							**Total**	**2.71**	**2.50**	**21.68**	**6.61**	**49.06**	**0.044**	**18.67**	**17.18**	**150.32**	**45.53**	**333.46**	**0.30**

Notes:
Emission factors from SCAQMD composite off-road emission factors from CARB's Off-Road Model for year 2008.
Equipment list, quantity, horsepower, and hours of operation from client.
PM2.5 emission factors from updated CEIDARS List with PM2.5 fractions. PM2.5 numbers obtained by multiplying the PM10 values by fraction in CEIDARS list for onroad or offroad diesel vehicles.
Construction day is assumed to be 10 hours long with a 1 hour lunch (7 am to 6 pm).

Combustion Exhaust from Travel on Unpaved Road

Vehicle Type	No. Of Unit	Round Trips /Day/ Unit[3]	Round Trip Distance (mile)	Daily VMT (all units)	Emission factor (lb/mile) PM10	PM2.5	CO	VOC	NOx	SOx	Emission factor vehicle type	Hourly Emissions (lb/hr) PM10	PM2.5	CO	VOC	NOx	SOx	Daily Emissions (lb/day) PM10	PM2.5	CO	VOC	NOx	SOx
Dump trucks	5	4	1	20	0.0041693	0.0038	0.0136	0.0035	0.0446	4E-05	HHD truc	0.0075806	0.006824	0.0248	0.0064	0.081054861	7.52E-05	0.083386	0.075059	0.272274	0.070316	0.891603	0.000827
Trucks - Pickup 3/4 ton	15	1	1	15	8.505E-05	5E-05	0.0105	0.0011	0.0011	1E-05	passeng	0.000116	7.22E-05	0.0144	0.0015	0.001503932	1.47E-05	0.001276	0.000794	0.158227	0.016188	0.016543	0.000161
Worker's Vehicles in Parking lot	178	1	0.75	133	8.505E-05	5E-05	0.0105	0.0011	0.0011	1E-05	passeng	0.0010299	0.000641	0.1277	0.0131	0.013354918	0.00013	0.011329	0.00705	1.405052	0.143749	0.146904	0.001432
											Total Unpaved Road	**0.0087265**	**0.007537**	**0.1669**	**0.0209**	**0.095913711**	**0.00022**	**0.095991**	**0.082903**	**1.835552**	**0.230252**	**1.055051**	**0.00242**

Notes:

SCAQMD Prepared - Highest (Most Conservative) Emfac 2007 (version 2.3)

Emission Factors for On-Road Passenger Vehicles & Delivery Trucks & Heavy Heavy Duty Diesel Trucks

Scenario Year: 2008

All model years in the range 1965 to 2008

Number of workers in month 6/1.25 people per car

Construction day is assumed to be 10 hours long with a 1 hour lunch (7 am to 6 pm).

11 Maximum number of construction work hours per day

Emission location	Activity	number of sources	MODEL EMISSION RATE per Source (lb/hr) NOx 1-hr	NOx Annual	CO 1 & 8 hr	PM10 24hr	PM10 Annual	SO2 1 & 3 hr	SO2 24hr	SO2 Annual	PM2.5 24hr	PM2.5 Annual	MODEL EMISSION RATE per Source (g/s) NOx 1-hr	NOx Annual	CO 1 & 8 hr	PM10 24hr	PM10 Annual	SO2 1 & 3 hr	SO2 24hr	SO2 Annual	PM2.5 24hr	PM2.5 Annual
Various	excavation	46	1.066	0.000	0.471	0.037		0.001	0.001		0.034		######		5.94E-02	4.65E-03		1.21E-04	7.57E-05		4.28E-03	0.00E+00
Roads	truck & worker travel	9	0.010657	0	0.0185	0.001		2E-05	2E-05		0.000837		######		2.34E-03	1.22E-04		3.08E-06	3.08E-06		1.06E-04	0.00E+00

18 sources in main construction area
10 sources in laydown area B
5 sources in laydown area 1
5 sources in laydown area 9
8 sources in pipe excavation area

Excavations and Foundations - Fugitive Dust Emissions

Maximum construction activity occurs in month 6.

Bulldozing/Earth clearing

$E = 0.45 * G^{1.5} / H^{1.4} * 2.2046$ PM10 Emissions from bulldozing (lb/hr) from SCAQMD Table A9-9-F

7.5 G = Silt content (%) (from Table A9-9-F-1 for overburden)

15 H = Moisture content of surface material (%) (from Table A9-9-F-2 for moist dirt)

0.46 lb/hr of PM10

Equipment	Quantity	Hours/Day	Watering Control Efficiency	PM10 Emissions (lb/hr)	PM10 Emissions (lb/day)	PM2.5 Emissions (lb/hr)	PM2.5 Emissions (lb/day)
Wheeled Loader	4	8	85%	0.28	2.21	0.06	0.46
Tracked Dozer	6	6	85%	0.41	2.48	0.09	0.52
Backhoe	3	6	85%	0.21	1.24	0.04	0.26
Excavator	6	8	85%	0.41	3.31	0.09	0.69
			Total	**1.31**	**9.24**	**0.27**	**1.92**

22 construction days per month

7 Total months of soil movement

Water efficiency from CEQA Table 11-4 watering 3 times daily or using chemical suppressants

Dirt Piling or Material Handling

$E = 0.00112 * (G/5)^{1.3} / (H/2)^{1.4}$ PM10 Emissions from Dirt Piling or Material Handling (lb/hr) from SCAQMD Table A9-9-G

12 G = Mean Wind speed (mph) default

15 H = Moisture content of surface material (%) (from Table A9-9-G-1 for moist dirt)

0.00021 lb/ton of PM10

Equipment	Quantity	Hours/Day	Material Handled (ton/day)	Material Handled (ton)	Watering Control Efficiency	PM10 Emissions (lb/hr)	PM10 Emissions (lb/day)	PM2.5 Emissions (lb/hr)	PM2.5 Emissions (lb/day)
Wheeled Loader	4	8	260	39,978	85%	0.0010	0.0081	0.0002	0.0017
Dump Trucks	5	6	260	39,978	85%	0.0014	0.0081	0.0003	0.0017
					Total	**0.0024**	**0.0162**	**0.0005**	**0.0034**

Water efficiency from CEQA Table 11-4 watering 3 times daily or using chemical suppressants

220 yd3/day 260 ton/day
33,880 yd3 39,978 tons 2360 density of soil (lb/yd3)
(USDA NRCS Physical Soil Properties from San Bernardino County
Western Part for Tujunga Sandy Loam soil)
14 acres = 33,880 cubic yds, assume depth of 0.5 yd (1.5 ft) of soils moved

Cover Storage Pile
SCAQMD Table A9-9-E
E = 1.7 * G/1.5 * (365-H)/235 * I/15 * J
PM10 Emission factor from wind erosion of storage piles per day per acre
7.5 G = Silt content (%) (from Table A9-9-E-1 for overburden)
34 H = Mean number of days per year with at least 0.01 inches of precipitation (from Western Regional Climate Center for Riverside Fire Station)
1.7 I = Percentage of time that the unobstructed wind speed exceeds 12 mph at mean pile height
0.5 J = Fraction of TSP that is PM10 = 0.5
0.678 lb/acre/day

wind speed percentage based on 1994-99 (5 yrs) of wind speed data (actual hours > 10 knots) as recorded at Ontario station

Source	Quantity	Size of Pile (acre)	Hours/Day	Watering Control Efficiency	PM10 Emissions (lb/hr)	PM10 Emissions (lb/day)	PM2.5 Emissions (lb/hr)	PM2.5 Emissions (lb/day)
Cover Storage Pile	3	1.5	24	85%	0.02	0.46	0.004	0.095

Water efficiency from CEQA Table 11-4 watering 3 times daily or using chemical suppressants
pile size assumed

Travel on unpaved road
F = 2.1 * G/12 * H/30 * $(J/3)^{0.7}$ * $(I/4)^{0.5}$ * (365-K)/365 SCAQMD Table A9-9-D
Emission factor for vehicle travel on unpaved roads (lb/VMT)
12.5 G = Surface silt loading (%) (average value for Tujunga Loamy sand at site)
5 H = Mean vehicle speed (mph)
value listed in table I = Mean number of wheels on vehicle
value listed in table J = Mean vehicle weight (ton)
34 K = Mean number of days per year with at least 0.01 inches of precipitation (from Western Regional Climate Center for Riverside Fire Station)

Vehicle Type	No. Of Unit	Round Trips /Day/ Unit	Round Trip Distance (mile)	Daily VMT (all units)	Mean Vehicle Weight (tons)	Number of Wheels on Vehicle	PM10 EF (lbs/VMT)	Watering Control Efficiency	PM10 Emissions (lb/hr)	PM10 Emissions (lb/day)	PM2.5 Emissions (lb/hr)	PM2.5 Emissions (lb/day)
Roller Compactor	6	4	0.25	6	11	4	0.82	85%	0.07	0.74	0.01	0.16
Bobcat	3	4	0.25	3	3	4	0.33	85%	0.01	0.15	0.00	0.03
Rough Terrain Forkli	3	4	0.25	3	7	4	0.60	85%	0.02	0.27	0.01	0.06
Air Compressor	2	1	0	0	0.5	2	0.07	85%	0.00	0.00	0.00	0.00
Welder	4	1	0	0	0.5	2	0.07	85%	0.00	0.00	0.00	0.00
Crane	1	1	0	0	40	12	3.51	85%	0.00	0.00	0.00	0.00
Crane	1	1	0.25	0.25	40	12	3.51	85%	0.01	0.13	0.00	0.03
Concrete Pump	1	1	0.25	0.25	0.5	2	0.07	85%	0.00	0.00	0.00	0.00
Aerial Lift	4	1	0.25	1	7	4	0.60	85%	0.01	0.09	0.00	0.02
Grout Mixer	1	1	0	0	0.5	2	0.07	85%	0.00	0.00	0.00	0.00
Dump Truck	5	4	1	20	13	10	1.46	85%	0.40	4.38	0.08	0.93
Trucks - Pickup 3/4 ton	15	1	1	15	1	4	0.15	85%	0.03	0.34	0.01	0.07
Water Truck	1	10	2	20	13	10	1.46	85%	0.40	4.38	0.08	0.93
Worker's Vehicles in Parking lot	178	1	0.75	133	0.5	4	0.09	85%	0.17	1.88	0.04	0.40
								Total	**1.12**	**12.36**	**0.24**	**2.62**

Assumed maximum travel speed is 5 mph
Equipment weight from SCAQMD Table A9-9-D-3
Water efficiency from CEQA Table 11-4 watering 3 times daily or using chemical suppressants
PM2.5 emission factors from updated CEIDARS List with PM2.5 fractions.
PM2.5 numbers obtained by multiplying the PM10 values by fraction in CEIDARS list for appropriate fugitive dust sources.
Round trips/day uses 1 trip per hour for dump trucks. Water trucks operate 2 times per hour. Service trucks use 1 trips per day.
Distances measured from plot plan from highway along access road to center of construction area and parking lot.
11 Maximum number of construction work hours per day

Emission location	Activity
Various	excavation
Roads	truck & worker travel

Total MODEL EMISSION RATE (lb/hr)			
PM10 24hr	PM10 Annual	PM2.5 24hr	PM2.5 Annual
0.883		0.1837	
1.124		0.2383	

18 sources in main construction area B
10 sources in laydown area B
5 sources in laydown area 1
5 sources in laydown area 9
8 sources in pipe excavation area

Location	X (m)	Y (m)	AREA (m2)	percent of total area
MAINDUST	325	174	56550	0.397
LAYDN1	255	95	24225	0.170
LAYDN9	100	35	3500	0.025
PIPEA	100	10	1000	0.007
PIPEB	100	10	1000	0.007
PIPEC	100	10	1000	0.007
PIPED	30	10	300	0.002
PIPEE	10	100	1000	0.007
PIPEF	10	30	300	0.002
PIPEG	100	10	1000	0.007
PIPEH	42	10	420	0.003
ALTB			52050	0.366

MODEL EMISSION RATE per Source (g/s-m2)			
PM10 24hr	PM10 Annual	PM2.5 24hr	PM2.5 Annual
7.83E-07		1.63E-07	
7.83E-07		1.63E-07	
7.83E-07		1.63E-07	
7.83E-07		1.63E-07	
7.83E-07		1.63E-07	
7.83E-07		1.63E-07	
7.83E-07		1.63E-07	
7.83E-07		1.63E-07	
7.83E-07		1.63E-07	
7.83E-07		1.63E-07	
7.83E-07		1.63E-07	
7.83E-07		1.63E-07	
7.83E-07		1.63E-07	

Total Construction Area			142345			
Note 3 smaller areas make up AltB						
ALTB1	290	115	33350			
ALTB2	95	125	11875			
ALTB3	195	35	6825			
ROAD1	12	120	1440	0.118	9.10E-06	1.89E-06
ROAD2	12	120	1440	0.118	9.10E-06	1.89E-06
ROAD3	12	120	1440	0.118	9.10E-06	1.89E-06
ROAD4	12	120	1440	0.118	9.10E-06	1.89E-06
ROAD5	12	120	1440	0.118	9.10E-06	1.89E-06
ROAD6	12	60	720	0.059	9.10E-06	1.89E-06
ROAD7	120	12	1440	0.118	9.10E-06	1.89E-06
ROAD8	120	12	1440	0.118	9.10E-06	1.89E-06
ROAD9	120	12	1440	0.118	9.10E-06	1.89E-06
Total Road Area			12240			

Appendix K-3
Operating Emissions

Annual Operating Conditions

Operating Conditions	**Annual**
Number of Starts	260
Hot Starts	200
Warm Starts	50
Cold Starts	10
Startup/Shutdown Time (hours)	345
Turbine Operation no duct burners (hours)	3,446
Duct Burner Operation (hours)	4,000
Total CTG Normal Operating Hours	7,446

Criteria Pollutant Emission Rates for the San Gabriel Generating Station Turbines and SCR with Ammonia Injection During Normal Operation (pounds per hour for both turbines)

		Ambient Temperature		
Load	Pollutant	25 ^{o}F	63 ^{o}F	105 ^{o}F
100% Unfired	VOC	2.1	1.9	1.9
	Ammonia Slip	26.4	24.6	23.5
	CO	6.9	6.5	6.2
	NO_X	28.5	26.6	25.4
	SO_2	2.2	2.1	2.0
	PM_{10}	7.2	7.2	7.2
80% Unfired	VOC	3.3	3.1	2.7
	Ammonia Slip	21.9	20.2	18.0
	CO	5.8	5.3	4.7
	NO_X	23.6	21.9	19.7
	SO_2	1.8	1.7	1.5
	PM_{10}	7.2	7.2	7.2
60% Unfired	VOC	5.9	5.5	4.9
	Ammonia Slip	17.9	16.6	15.0
	CO	11.8	11.0	9.8
	NO_X	19.4	18.0	16.2
	SO_2	1.5	1.4	1.3
	PM_{10}	7.2	7.2	7.2
100% With Duct Burners	VOC	2.7	2.6	2.5
	Ammonia Slip	34.6	33.1	31.9
	CO	19.9	19.8	19.6
	NO_X	37.4	35.7	34.5
	SO_2	2.9	2.8	2.7
	PM_{10}	7.7	7.7	7.7

Criteria Pollutant Emission Rates During Startup and Shutdown (for both turbines)

	Cold Startup 150 minutes		Warm Startup 120 minutes		Hot Startup 40 minutes		Shutdown 20 minutes	
Pollutant	Max	Total	Max	Total	Max	Total	Max	Total
	lb/hr	lb/ event	lb/hr	lb/ event	lb/hr	lb/ event	lb/hr	lb/ event
NO_X	116	216	116	167	65	48	62	44
CO	1,557	2,605	1,605	2,000	554	551	916	911
VOC	153	270	154	207	57	55	57	55
SO_2	2.00	1.93	2.03	1.51	2.03	0.39	2.03	0.23
PM_{10}	9	15	8	11	8	3	8	3

Note: Startup/shutdown duration defined as operation of CTG below 60% load when gaseous emission rates (lb/hr basis) exceed those defined as normal operation.

Criteria Pollutant Annual Emissions for both Turbines

Pollutant	Annual Emissions
	Tons
NO_X	133.1
CO	287.4
VOC	27.7
SO_2	9.2
PM_{10}	28.8

Notes:

1) Includes emissions from two combustion turbine/duct burners

2) Emissions include 10 cold starts, 50 warm starts, 200 hot starts, and 260 shutdowns and 4,000 hours at 100% duct burner capacity and 3,446 hours operating at 100% CT load at 63 ^{o}F.

Worst-Case Short-Term Emission Estimates (both turbines)

1-Hr Emissions (lb/hr)	
NO_X	116
CO	1,605
VOC	154
SO_2	2.9
PM_{10}	9

3-Hr Emissions (lb/hr)	
SO_2	2.9

8-Hr Emissions (lb/hr)	
CO	385

24-Hr Emissions (lb/day)	
NO_X	1,075
CO	4,475
VOC	436
SO_2	70
PM_{10}	185

Notes:

1) The 1-hr NO_X, CO, VOC, and PM10 are based on the worst case start-up/shutdown condition

2) The 1-hr, 3-hr and 24-hr SO_2 emission rate is based on maximum fuel consumption, 25°F ambient will full duct firin

3) The 8-hr CO emission rate is based on 1 cold-start, **1 hot-start** and balance of time operating at 25°Fambient with fu

4) The 24-hr NO_X, CO, and VOC emission rates are based on 1 cold-start, **1-hot-start,** 1 shutdown and balance of time operating at 25°F ambient with full duct firing.

5) The 24-hr PM_{10} emission rate is based on an ambient temperature of 25°F with full duct firing

Estimated Criteria Pollutant Emissions from Gas Turbine Commissioning

	Worst-Case Hourly Commissioning Emissions per turbine	Total Commissioning Period Emissions (both turbines)
	lb/hr/ct	tons
NO_X	130	19
CO	3,520	611
VOC	83	10
SO_2	1.4	0.4
PM_{10}	5	2

Notes

1. Emissions during individual Unit 1 and Unit 2 operation are uncontrolled
2. Emissions during combined Unit 1 and Unit 2 steam blows are uncontrolled.
3. Oxidation catalyst and SCR catalyst are installed after combined steam blows.

Auxiliary Boiler Emissions

Pollutant	Emission Factor (lb/MMBtu LHV)	Emissions	
		lb/hr	ton/yr
NOX	0.0137	0.69	1.39
CO	0.0471	2.38	4.75
VOC	0.0051	0.26	0.51
SO2	0.0008	0.04	0.08
PM10	0.0064	0.32	0.64

Notes:
1) NOX emissions based on 9 ppm @ 3% O2 dry.
2) Annual emissions based on 4,000 hours of operation
3) Auxiliary Boiler Heat Input 56 mmBTU/Hr (HHV)

Fire Pump Engine Emissions

Not Applicable - Fire Water Supplied from Existing Plant Fire Pumps

Annual Emissions

with Auxiliary Boiler

Pollutant		Emissions
		ton/yr
NOX		134.5
CO		292.1
VOC		28.3
SO2		9.3
PM10		29.5

Notes:
1) Includes emissions from two turbines, duct burners & auxiliary boiler
2) Emissions include 10 cold starts, 50 warm starts, 200 hot starts and 260 shutdowns and 4,000 hours at 100% duct burner capacity and 3,446 hours operating at 100% CT load at 63 ^{o}F.

Emissions During Facility Comissioning

	NO_X	CO	VOC	SO_2	PM_{10}
lb total	38,343	1,222,769	20,105	812	4,298
ton total	19.2	611.4	10.1	0.4	2.1
ton/CTG	9.6	305.7	5.0	0.2	1.1

UNIT 1

Activity	Emissions	Duration (hours)	CT Load (%)	NO_X lb/hr	CO lb/hr	VOC lb/hr	SO_2 lb/hr	PM_{10} lb/hr	NO_X lb	CO lb	VOC lb	SO_2 lb	PM_{10} lb
First fire to FSNL	Uncontrolled	12	0%	43	3,520	44	0.2	5	520	42,235	529	3	60
Green rotor run-in	Uncontrolled	12	0%	43	3,520	44	0.2	5	520	42,235	529	3	60
Manual Trips/Mechanical Overspeed trip test	Uncontrolled	8	0%	43	3,520	44	0.2	5	347	28,157	353	2	40
GT FSNL Lean-Lean Mode	Uncontrolled	8	0%	43	3,520	44	0.2	5	347	28,157	353	2	40
Electronic Overspeed Tests	Uncontrolled	8	0%	43	3,520	44	0.2	5	347	28,157	353	2	40
Unanticipated problems	Uncontrolled	8	0%	43	3,520	44	0.2	5	347	28,157	353	2	40
Initial Synchronization	Uncontrolled	4	4%	63	3,455	51	0.3	5	252	13,822	203	1	20
On-line excitation checks	Uncontrolled	16	4%	63	3,455	51	0.3	5	1,009	55,287	814	4	80
DLN Tuning/Load Testing - 0%	Uncontrolled	12	0%	43	3,520	44	0.2	5	520	42,235	529	3	60
DLN Tuning/Load Testing - 25%	Uncontrolled	12	25%	119	3,132	83	0.4	5	1,424	37,588	1,001	5	60
DLN Tuning/Load Testing - 50%	Uncontrolled	12	50%	59	361	24	0.6	5	711	4,331	289	7	60
DLN Tuning/Load Testing - 75%	Uncontrolled	12	75%	47	13	2	0.8	4	565	153	20	10	43
DLN Tuning/Load Testing - 100%	Uncontrolled	12	100%	109	66	1	1.4	4	1,304	789	11	16	46
Loss of CT Processor Testing	Uncontrolled	8	100%	109	66	1	1.4	4	869	526	7	11	31
CTG 1 steam blow 1	Uncontrolled	12	4%	63	3,455	51	0.3	5	757	41,466	610	3	60
CTG 1 steam blow 2	Uncontrolled	12	4%	63	3,455	51	0.3	5	757	41,466	610	3	60
CTG 1 steam blow 3	Uncontrolled	12	4%	63	3,455	51	0.3	5	757	41,466	610	3	60
CTG 1 steam blow 4	Uncontrolled	12	4%	63	3,455	51	0.3	5	757	41,466	610	3	60

UNIT 2

Activity	Emissions	Duration (hours)	CT Load (%)	NO_X lb/hr	CO lb/hr	VOC lb/hr	SO_2 lb/hr	PM_{10} lb/hr	NO_X lb	CO lb	VOC lb	SO_2 lb	PM_{10} lb
First fire to FSNL	Uncontrolled	12	0%	43	3,520	44	0.2	5	520	42,235	529	3	60
Green rotor run-in	Uncontrolled	12	0%	43	3,520	44	0.2	5	520	42,235	529	3	60
Manual Trips/Mechanical Overspeed trip test	Uncontrolled	8	0%	43	3,520	44	0.2	5	347	28,157	353	2	40
GT FSNL Lean-Lean Mode	Uncontrolled	8	0%	43	3,520	44	0.2	5	347	28,157	353	2	40
Electronic Overspeed Tests	Uncontrolled	8	0%	43	3,520	44	0.2	5	347	28,157	353	2	40
Unanticipated problems	Uncontrolled	8	0%	43	3,520	44	0.2	5	347	28,157	353	2	40
Initial Synchronization	Uncontrolled	4	4%	63	3,455	51	0.3	5	252	13,822	203	1	20
On-line excitation checks	Uncontrolled	16	4%	63	3,455	51	0.3	5	1,009	55,287	814	4	80
DLN Tuning/Load Testing - 0%	Uncontrolled	12	0%	43	3,520	44	0.2	5	520	42,235	529	3	60
DLN Tuning/Load Testing - 25%	Uncontrolled	12	25%	119	3,132	83	0.4	5	1,424	37,588	1,001	5	60
DLN Tuning/Load Testing - 50%	Uncontrolled	12	50%	59	361	24	0.6	5	711	4,331	289	7	60
DLN Tuning/Load Testing - 75%	Uncontrolled	12	75%	47	13	2	0.8	4	565	153	20	10	43
DLN Tuning/Load Testing - 100%	Uncontrolled	12	100%	109	66	1	1.4	4	1,304	789	11	16	46
Loss of CT Processor Testing	Uncontrolled	8	100%	109	66	1	1.4	4	869	526	7	11	31
CTG 2 steam blow 1	Uncontrolled	12	4%	63	3,455	51	0.3	5	757	41,466	610	3	60
CTG 2 steam blow 2	Uncontrolled	12	4%	63	3,455	51	0.3	5	757	41,466	610	3	60
CTG 2 steam blow 3	Uncontrolled	12	4%	63	3,455	51	0.3	5	757	41,466	610	3	60

CTG 2 steam blow 4	Uncontrolled	12	4%	63	3,455	51	0.3	5	757	41,466	610	3	60

UNITS 1 & 2 COMBINED

Activity	Emissions	Duration (hours)	CT Load (%)	NO_X lb/hr	CO lb/hr	VOC lb/hr	SO_2 lb/hr	PM_{10} lb/hr	NO_X lb	CO lb	VOC lb	SO_2 lb	PM_{10} lb
Combined Steam Blow 1	Uncontrolled	12	4%	63	3,455	51	0.3	5	1,513	82,931	1,220	6	120
Combined Steam Blow 1	Uncontrolled	12	4%	63	3,455	51	0.3	5	1,513	82,931	1,220	6	120
Load oxidation & SCR catalyst													
Fire for STG prep	Controlled	12	30%	130	794	63	0.5	5	3,128	19,047	1,515	11	120
Unit base load	Controlled	24	100%	13	3	1	1.0	3.6	628	153	46	49	173
Unit base load	Controlled	24	100%	13	3	1	1.0	3.6	628	153	46	49	173
Fire for STG testing	Controlled	24	100%	13	3	1	1.0	3.6	628	153	46	49	173
Fire for STG testing	Controlled	24	100%	13	3	1	1.0	3.6	628	153	46	49	173
Fire for STG testing	Controlled	24	100%	13	3	1	1.0	3.6	628	153	46	49	173
Fire for STG base load	Controlled	24	100%	13	3	1	1.0	3.6	628	153	46	49	173
Fire for STG base load	Controlled	24	100%	13	3	1	1.0	3.6	628	153	46	49	173
Fire for STG base load	Controlled	24	100%	13	3	1	1.0	3.6	628	153	46	49	173
Fire for STG base load	Controlled	24	100%	13	3	1	1.0	3.6	628	153	46	49	173
Duct Burner Testing	Controlled	24	110%	18	10	1	1.4	3.9	846	473	61	66	185
Duct Burner Testing	Controlled	24	110%	18	10	1	1.4	3.9	846	473	61	66	185
SCR Testing	Controlled	12	100%	13	3	1	1.0	3.6	314	76	23	24	86
Stack Testing (RATA)	Controlled	12	100%	13	3	1	1.0	3.6	314	76	23	24	86

Notes 1. Emissions during individual Unit 1 and Unit 2 operation is uncontrolled, i.e., oxidation catalyst and SCR catalyst have not been installed.
2. Emissions during combined Unit 1 and Unit 2 steam Blows are uncontrolled.
3. Oxidation catalyst and SCR catalyst are installed after combined steam blows.

R1 Changed steam blow from 24 to 12 hrs
Reduced steam blows from 15 to 10 total
Assumed catalyst loaded after combined steam blows

R2 Changed initial sync, online excitation checks, and steam blows from 20% load to 4% load

Normalized Natural Gas Composition

ATOMIC WEIGHTS

Hydrogen	H	lb/lbatom	1.008
Carbon	C	lb/lbatom	12.011
Nitrogen	N	lb/lbatom	14.007
Oxygen	O	lb/lbatom	15.999
Argon	Ar	lb/lbatom	39.948
Sulfur	S	lb/lbatom	32.066

NATURAL GAS ANALYSIS

Pressure = 14.696 lb_f/in^2

Temperature = 60 °F

Component		MW [lb/lbmol]	Reported mole %	Normalized mole %	Normalized weight %	Specific Volume [ft^3/lb]	Higher Heating Value (1) Btu/lbm	Higher Heating Value (1) Btu/ft^3	Lower Heating Value (1) Btu/lbm	Lower Heating Value (1) Btu/ft^3
Nitrogen	N_2	28.01	0.320	0.320	0.534	13.55	0	0	0	0
Carbon Dioxide	CO_2	44.01	1.500	1.502	3.930	8.63	0	0	0	0
Carbon Monoxide	CO	28.01	0.000	0.000	0.000	13.55	4,342.0	320.5	4,342.0	320.5
Hydrogen	H_2	2.02	0.000	0.000	0.000	188.32	61,022.0	324.2	51,566.0	273.9
Methane	CH_4	16.04	96.310	96.416	91.977	23.66	23,891.0	1,010.0	21,511.0	909.4
Ethane	C_2H_6	30.07	1.420	1.422	2.542	12.63	22,333.0	1,769.7	20,429.0	1,618.7
Propane	C_3H_8	44.10	0.230	0.230	0.604	8.61	21,653.0	2,516.1	19,922.0	2,314.9
Iso-Butane	C_4H_{10}	58.12	0.040	0.040	0.138	6.53	21,232.0	3,251.9	19,590.0	3,000.4
n-Butane	C_4H_{10}	58.12	0.040	0.040	0.138	6.53	21,300.0	3,262.3	19,658.0	3,010.8
Iso-Pentane	C_5H_{12}	72.15	0.010	0.010	0.043	5.26	21,043.0	4,000.9	19,456.0	3,699.0
n-Pentane	C_5H_{12}	72.15	0.010	0.010	0.043	5.26	21,085.0	4,008.9	19,481.0	3,703.9
n-Hexane	C_6H_{14}	86.18	0.010	0.010	0.051	4.41	20,943.0	4,755.9	19,393.0	4,403.9
n-Heptane	C_7H_{16}	100.20	0.000	0.000	0.000	3.79	20,839.0	5,502.5	19,315.0	5,100.3
Ethylene	C_2H_4	28.05	0.000	0.000	0.000	13.53	21,640.0	1,600.0	20,278.0	1,499.0
Propylene	C_3H_6	42.08	0.000	0.000	0.000	9.02	21,039.0	2,333.0	19,678.0	2,182.0
neo-Pentane	C_5H_{12}	72.15	0.000	0.000	0.000	5.26	20,958.0	3,985.0	19,371.0	3,683.0
Oxygen	O_2	32.00	0.000	0.000	0.000	11.86	0	0	0	0
Water	H_2O	18.02	0.000	0.000	0.000	21.07	1,059.8	50.3	0	0
Total			**99.89**	**100.00**	**100.00**		**22,760**	**1,008.6**	**20,506**	**908.7**

Molecular Weight [lb/lbmol] 16.80 16.82

HHV/LHV Ratio 1.110 1.110

Sulfur Content 0.200 grains/ 100 ft^3
0.000645 wt %

grains/ 100 ft^3 Contract Limit

Notes
(1) Ideal Calorific Values from ASTM D3588 - 98

SIEMENS

San Gabriel Generating Station

Estimated SGT6-5000F Gas Turbine Performance
Gas Turbine in Combined Cycle / Dry Low NOx Combustor
AeroPac II 2-102x196 / 0.85 Power Factor

Based on CTT-2586 Rev.3
Wednesday, December 13, 2006

SITE CONDITIONS:	**CASE 1**	**CASE 2**	**CASE 3**	**CASE 4**	**CASE 5**	**CASE 6**	**CASE 7**	**CASE 8**	**CASE 9**	**CASE 10**	**CASE 11**	**CASE 12**
FUEL TYPE	Natural Gas	Natural Gas	Natural Gas	Natural Gas	Natural Gas	Natural Gas	Natural Gas	Natural Gas	Natural Gas	Natural Gas	Natural Gas	Natural Gas
LOAD LEVEL	BASE	90%	80%	70%	60%	50%	40%	30%	20%	10%	4%	FSNL
NET FUEL HEATING VALUE, Btu/lbm (LHV)	20,797	20,797	20,797	20,797	20,797	20,797	20,797	20,797	20,797	20,797	20,797	20,797
GROSS FUEL HEATING VALUE, Btu/lbm (HHV)	23,073	23,073	23,073	23,073	23,073	23,073	23,073	23,073	23,073	23,073	23,073	23,073
EVAPORATIVE COOLER STATUS/EFFECTIVENESS	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF
AMBIENT DRY BULB TEMPERATURE, °F	63.0	63.0	63.0	63.0	63.0	63.0	63.0	63.0	63.0	63.0	63.0	63.0
AMBIENT WET BULB TEMPERATURE, °F	55.9	55.9	55.9	55.9	55.9	55.9	55.9	55.9	55.9	55.9	55.9	55.9
AMBIENT RELATIVE HUMIDITY, %	65%	65%	65%	65%	65%	65%	65%	65%	65%	65%	65%	65%
BAROMETRIC PRESSURE, psia	14.117	14.117	14.117	14.117	14.117	14.117	14.117	14.117	14.117	14.117	14.117	14.117
COMPRESSOR INLET TEMPERATURE, °F	63.0	63.0	63.0	63.0	63.0	63.0	63.0	63.0	63.0	63.0	63.0	63.0
INLET PRESSURE LOSS, inches of water (Total)	3.9	3.4	2.9	2.3	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.1
EXHAUST PRESSURE LOSS, inches of water (Total)	23.8	20.9	17.7	14.9	13.0	12.1	11.3	10.5	9.8	9.1	8.7	8.5
EXHAUST PRESSURE LOSS, inches of water (Static)	20.8	18.3	15.5	13.0	11.4	10.6	9.9	9.2	8.6	8.0	7.6	7.4
GAS TURBINE PERFORMANCE:												
GROSS POWER OUTPUT, kW	168,980	151,900	134,810	117,710	100,600	83,470	66,340	49,200	32,060	14,910	4,610	0
GROSS HEAT RATE, Btu/kWh (LHV)	9,580	9,750	10,035	10,510	11,075	11,785	12,975	15,060	19,485	33,080	90,655	****
GROSS HEAT RATE, Btu/kWh (HHV)	10,625	10,820	11,135	11,660	12,285	13,075	14,390	16,710	21,615	36,700	100,575	****
FUEL FLOW, lbm/hr	77,800	71,210	65,040	59,470	53,560	47,300	41,380	35,630	30,030	23,720	20,130	18,530
HEAT INPUT, mmBtu/hr (LHV)	1,618	1,481	1,353	1,237	1,114	984	861	741	625	493	419	385
HEAT INPUT, mmBtu/hr (HHV)	1,795	1,643	1,501	1,372	1,236	1,091	955	822	693	547	465	428
EXHAUST TEMPERATURE, °F	1,104	1,079	1,094	1,128	1,113	1,020	930	839	748	660	608	585
EXHAUST FLOW, lbm/hr	3,678,870	3,461,948	3,160,611	2,855,275	2,681,958	2,675,519	2,669,254	2,663,056	2,656,931	2,650,968	2,647,468	2,645,917
EXHAUST GAS COMPOSITION (BY % VOL):												
OXYGEN	12.67	12.88	12.88	12.79	13.11	13.99	14.86	15.72	16.58	17.43	17.92	18.15
CARBON DIOXIDE	3.71	3.61	3.62	3.66	3.51	3.10	2.71	2.31	1.91	1.52	1.30	1.19
WATER	8.45	8.26	8.26	8.34	8.06	7.27	6.50	5.73	4.96	4.21	3.77	3.57
NITROGEN	74.28	74.36	74.35	74.32	74.43	74.74	75.04	75.34	75.64	75.93	76.10	76.18
ARGON	0.89	0.89	0.89	0.89	0.89	0.89	0.90	0.90	0.90	0.91	0.91	0.91
MOLECULAR WEIGHT	28.37	28.39	28.39	28.38	28.40	28.45	28.50	28.54	28.59	28.64	28.67	28.68
NET EMISSIONS: Based on USEPA test methods												
NOx, ppmvd @ 15% O2	9	9	9	9	9	15	45	45	45	50	40	30
NOx, lbm/hr as NO2	61	55	51	46	42	61	159	134	110	96	65	45
CO, ppmvd @ 15% O2	10	10	10	10	10	150	700	1,500	2,500	3,000	3,600	4,000
CO, lbm/hr	41	38	34	31	28	372	1,501	2,724	3,726	3,522	3,558	3,624
VOC, ppmvd @ 15% O2 as CH4	1.2	1.2	2.3	10	10	70	120	250	500	400	370	350
VOC, lbm/hr as CH4	2.8	2.6	4.5	18	16	99	147	259	426	268	209	181
PARTICULATES, lbm/hr	10	10	10	10	10	13	13	13	13	13	13	13

NOTES:

- Performance is based on new and clean condition.
- All data is estimated and not guaranteed.
- Gross power output is at the generator terminals.
- Estimated GT Performance values are dependent upon receiving test tolerances equal to measurement uncertainty calculated in accordance with ASME PTC 19.1-1998.
- VOC's consist of total hydrocarbons excluding methane and ethane and is expressed in terms of methane.
- Gas fuel composition is 95.608% CH4, 2.378% C2H6, 0.492% C3H8, 0.083% iC4H10, 0.078% nC4H10, 0.025% iC5H12, 0.017% nC5H12, 0.016% nC6H14, 0.483% N2, 0.821% CO2, and 0.2 grains of sulfur per 100 SCF.
- Gas fuel must be in compliance with the Siemens Fuel Specification.
- Particulates are per US EPA Method 5/202 (front and back half).
- Average temperature of the gas fuel is 280 °F. Sensible heat of the fuel is not included in the fuel heating values, heat input, or heat rate.
- Please be advised that the information contained in this transmittal has been prepared and is being transmitted per customer request specifically for information purposes only. Such information is not intended to be used for evaluation of plant design and/or performance relative to contractual commitments. Data included in any permit application or Environmental Impact Statement are strictly the customer's responsibility.

SIEMENS

San Gabriel Generating Station

Estimated SGT6-5000F Gas Turbine Performance — **Based on CTT-2586 Rev.2**

Gas Turbine in Combined Cycle / Dry Low NOx Combustor — **Wednesday, December 13, 2006**

AeroPac II 2-102x196 / 0.85 Power Factor

SITE CONDITIONS:	**CASE 1**	**CASE 2**	**CASE 3**	**CASE 4**	**CASE 5**	**CASE 6**	**CASE 7**	**CASE 8**	**CASE 9**	**CASE 10**	**CASE 11**	**CASE 12**	**CASE 13**	**CASE 14**	**CASE 15**	**CASE 16**	**CASE 17**	**CASE 18**
FUEL TYPE	Natural Gas	Natural Gas	Natural Gas	Natural Gas	Natural Gas	Natural Gas	Natural Gas	Natural Gas	Natural Gas	Natural Gas	Natural Gas	Natural Gas	Natural Gas	Natural Gas	Natural Gas	Natural Gas	Natural Gas	Natural Gas
LOAD LEVEL	BASE	BASE	80%	60%	BASE	BASE	80%	60%	BASE	BASE	80%	60%	BASE	80%	60%	BASE	80%	60%
NET FUEL HEATING VALUE, Btu/lbm (LHV)	20,797	20,797	20,797	20,797	20,797	20,797	20,797	20,797	20,797	20,797	20,797	20,797	20,797	20,797	20,797	20,797	20,797	20,797
GROSS FUEL HEATING VALUE, Btu/lbm (HHV)	23,073	23,073	23,073	23,073	23,073	23,073	23,073	23,073	23,073	23,073	23,073	23,073	23,073	23,073	23,073	23,073	23,073	23,073
EVAPORATIVE COOLER STATUS/EFFECTIVENESS	85%	OFF	OFF	OFF	85%	OFF	OFF	OFF	85%	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF
AMBIENT DRY BULB TEMPERATURE, °F	105.0	105.0	105.0	105.0	95.0	95.0	95.0	95.0	63.0	63.0	63.0	63.0	40.0	40.0	40.0	25.0	25.0	25.0
AMBIENT WET BULB TEMPERATURE, °F	68.7	68.7	68.7	68.7	70.4	70.4	70.4	70.4	55.9	55.9	55.9	55.9	34.8	34.8	34.8	21.7	21.7	21.7
AMBIENT RELATIVE HUMIDITY, %	15%	15%	15%	15%	30%	30%	30%	30%	65%	65%	65%	65%	60%	60%	60%	60%	60%	60%
BAROMETRIC PRESSURE, psia	14.117	14.117	14.117	14.117	14.117	14.117	14.117	14.117	14.117	14.117	14.117	14.117	14.117	14.117	14.117	14.117	14.117	14.117
COMPRESSOR INLET TEMPERATURE, °F	74.2	105.0	105.0	105.0	74.1	95.0	95.0	95.0	57.0	63.0	63.0	63.0	40.0	40.0	40.0	25.0	25.0	25.0
INLET PRESSURE LOSS, inches of water (Total)	3.7	3.4	2.6	2.0	3.7	3.5	2.7	2.0	3.9	3.9	2.9	2.1	4.1	3.0	2.1	4.2	3.0	2.1
EXHAUST PRESSURE LOSS, inches of water (Total)	22.7	19.8	15.3	11.5	22.7	20.7	15.8	11.8	24.4	23.8	17.7	13.0	25.9	19.1	13.9	26.8	19.7	14.4
EXHAUST PRESSURE LOSS, inches of water (Static)	19.9	17.3	13.3	10.1	19.9	18.1	13.8	10.3	21.3	20.8	15.5	11.4	22.7	16.8	12.2	23.5	17.3	12.6
GAS TURBINE PERFORMANCE:																		
GROSS POWER OUTPUT, kW	161,960	142,200	113,360	84,490	162,040	148,430	118,350	88,240	172,760	168,980	134,810	100,600	181,320	144,700	108,020	187,880	149,960	111,970
GROSS HEAT RATE, Btu/kWh (LHV)	9,690	10,000	10,605	11,840	9,695	9,895	10,455	11,640	9,540	9,580	10,035	11,075	9,440	9,845	10,815	9,390	9,760	10,710
GROSS HEAT RATE, Btu/kWh (HHV)	10,750	11,095	11,765	13,135	10,755	10,980	11,600	12,915	10,580	10,625	11,135	12,285	10,470	10,920	12,000	10,420	10,830	11,885
FUEL FLOW, lbm/hr	75,450	68,380	57,790	48,100	75,510	70,620	59,490	49,380	79,210	77,800	65,040	53,560	82,270	68,480	56,160	84,820	70,360	57,660
HEAT INPUT, mmBtu/hr (LHV)	1,569	1,422	1,202	1,000	1,570	1,469	1,237	1,027	1,647	1,618	1,353	1,114	1,711	1,424	1,168	1,764	1,463	1,199
HEAT INPUT, mmBtu/hr (HHV)	1,741	1,578	1,333	1,110	1,742	1,629	1,373	1,139	1,828	1,795	1,501	1,236	1,898	1,580	1,296	1,957	1,623	1,330
EXHAUST TEMPERATURE, °F	1,114	1,133	1,118	1,135	1,115	1,127	1,111	1,128	1,101	1,104	1,094	1,113	1,089	1,080	1,100	1,082	1,067	1,091
EXHAUST FLOW, lbm/hr	3,565,123	3,321,026	2,916,700	2,506,912	3,561,987	3,393,761	2,968,985	2,544,429	3,725,922	3,678,870	3,160,611	2,681,958	3,862,661	3,298,392	2,779,319	3,958,407	3,383,797	2,836,748
EXHAUST GAS COMPOSITION (BY % VOL):																		
OXYGEN	12.50	12.90	13.19	13.42	12.45	12.72	13.00	13.24	12.59	12.67	12.88	13.11	12.75	12.95	13.16	12.74	12.98	13.16
CARBON DIOXIDE	3.70	3.62	3.49	3.38	3.71	3.65	3.52	3.41	3.73	3.71	3.62	3.51	3.75	3.66	3.56	3.77	3.67	3.58
WATER	9.36	8.13	7.88	7.67	9.57	8.74	8.48	8.27	8.69	8.45	8.26	8.06	7.75	7.57	7.38	7.56	7.35	7.19
NITROGEN	73.57	74.46	74.56	74.64	73.40	74.01	74.11	74.19	74.11	74.28	74.35	74.43	74.85	74.92	75.00	75.02	75.10	75.17
ARGON	0.88	0.89	0.89	0.89	0.88	0.88	0.89	0.89	0.89	0.89	0.89	0.89	0.90	0.90	0.90	0.90	0.90	0.90
MOLECULAR WEIGHT	28.27	28.40	28.42	28.43	28.25	28.34	28.35	28.37	28.35	28.37	28.39	28.40	28.45	28.46	28.48	28.48	28.49	28.50
NET EMISSIONS: Based on USEPA test methods																		
NOx, ppmvd @ 15% O2	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9
NOx, lbm/hr as NO2	59	53	45	37	59	55	46	38	62	61	51	42	64	53	44	66	55	45
CO, ppmvd @ 15% O2	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10
CO, lbm/hr	40	36	30	25	40	37	31	26	42	41	34	28	43	36	30	45	37	30
VOC, ppmvd @ 15% O2 as CH4	1.2	1.2	2.3	10.0	1.2	1.2	2.3	10.0	1.2	1.2	2.3	10.0	1.2	2.3	10.0	1.2	2.3	10.0
VOC, lbm/hr as CH4	2.7	2.5	4.0	14.5	2.7	2.6	4.1	14.9	2.9	2.8	4.5	16.1	3.0	4.7	16.9	3.1	4.9	17.3
PARTICULATES, lbm/hr	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10

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- 0.025% iC5H12, 0.017% nC5H12, 0.016% nC6H14, 0.483% N2, 0.821% CO2, and 0.2 grains of sulfur per 100 SCF.
- Gas fuel must be in compliance with the Siemens Fuel Specification.
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Emissions Summary Normal Operations
Siemens W501F (2 x 2 x 1) Combined Cycle
Natural Gas Operation

CASE		CASE 1A	CASE 1B	CASE 1C	CASE 1D	CASE 2A	CASE 2B	CASE 2C	CASE 2D	CASE 3A	CASE 3B	CASE 3C	CASE 3D
SWPC Case		CASE 1	CASE 2	CASE 3	CASE 4	CASE 9	CASE 9	CASE 11	CASE 12	CASE 16	CASE 16	CASE 17	CASE 18
Ambient Conditions		105°F -15% RH	105°F -15% RH	105°F -15% RH	105°F -15% RH	63°F -65% RH	63°F -65% RH	63°F -65% RH	63°F -65% RH	25°F -60% RH	25°F -60% RH	25°F -60% RH	25°F -60% RH
CT Load		Base	Base	80%	60%	Base	Base	80%	60%	Base	Base	80%	60%
Duct Burner		Fired	Unfired	Unfired	Unfired	Fired	Unfired	Unfired	Unfired	Fired	Unfired	Unfired	Unfired
Evap Cooler		ON	ON	OFF	OFF	ON	ON	OFF	OFF	OFF	OFF	OFF	OFF
SITE CONDITIONS													
Ambient Temperature	°F	105	105	105	105	63	63	63	63	25	25	25	25
Relative Humidity	%	15%	15%	15%	15%	65%	65%	65%	65%	60%	60%	60%	60%
Site Elevation	feet												
Atmospheric Pressure	psia	14.12	14.12	14.12	14.12	14.12	14.12	14.12	14.12	14.12	14.12	14.12	14.12
FACILITY CONDITIONS													
CT Fuel Type		Natural Gas	Natural Gas	Natural Gas	Natural Gas	Natural Gas	Natural Gas	Natural Gas	Natural Gas	Natural Gas	Natural Gas	Natural Gas	Natural Gas
CT Model		W501F	W501F	W501F	W501F	W501F	W501F	W501F	W501F	W501F	W501F	W501F	W501F
CT Load	%	BASE	BASE	80%	60%	BASE	BASE	80%	60%	BASE	BASE	80%	60%
CT Evap Coolers	ON/OFF	85%	85%	OFF	OFF	85%	85%	OFF	OFF	OFF	OFF	OFF	OFF
CT Power Output	kW	161,960	161,960	113,360	84,490	172,760	172,760	134,810	100,600	187,880	187,880	149,960	111,970
CT Heat Consumption (LHV)	MBtu/hr	1,569.2	1,569.2	1,201.9	1,000.4	1,647.4	1,647.4	1,352.7	1,113.9	1,764.0	1,764.0	1,463.4	1,199.1
CT Heat Consumption (HHV)	MBtu/hr	1,741.7	1,741.7	1,334.0	1,110.4	1,828.6	1,828.6	1,501.4	1,236.4	1,957.9	1,957.9	1,624.3	1,330.9
CT Fuel Flow Rate	lb/hr	76,524	76,524	58,612	48,786	80,340	80,340	65,966	54,321	86,024	86,024	71,364	58,476
CT Fuel Flow Rate	MSCF/hr	1.73	1.73	1.32	1.10	1.81	1.81	1.49	1.23	1.94	1.94	1.61	1.32
CT Exhaust Gas Flow Rate	lb/hr	3,565,123	3,565,123	2,916,700	2,506,912	3,725,922	3,725,922	3,160,611	2,681,958	3,958,407	3,958,407	3,383,797	2,836,748
CT Exhaust Gas Temperature	°F	1,114	1,114	1,118	1,135	1,101	1,101	1,094	1,113	1,082	1,082	1,067	1,091
DB Heat Consumption (LHV)	MBtu/hr	561.0	0.0	0.0	0.0	561.0	0.0	0.0	0.0	550.0	0.0	0.0	0.0
DB Heat Consumption (HHV)	MBtu/hr	622.7	0.0	0.0	0.0	622.7	0.0	0.0	0.0	610.5	0.0	0.0	0.0
DB Fuel Flow Rate	lb/hr	27,358	0	0	0	27,358	0	0	0	26,822	0	0	0
DB Fuel Flow Rate	MSCF/hr	0.62	0.00	0.00	0.00	0.62	0.00	0.00	0.00	0.61	0.00	0.00	0.00
Atomic Weights	lb/lbatom												
Hydrogen	1.008												
Carbon	12.011												
Nitrogen	14.007												
Oxygen	15.999												
Argon	39.948												
Sulfur	32.066												
NATURAL GAS ANALYSIS													
Name		SoCalGas	SoCalGas	SoCalGas	SoCalGas	SoCalGas	SoCalGas	SoCalGas	SoCalGas	SoCalGas	SoCalGas	SoCalGas	SoCalGas
	MW	mol %	mol %	mol %	mol %	mol %	mol %	mol %	mol %	mol %	mol %	mol %	mol %
Nitrogen, N_2	28.01	0.320	0.320	0.320	0.320	0.320	0.320	0.320	0.320	0.320	0.320	0.320	0.320
Carbon Dioxide, CO_2	44.01	1.500	1.500	1.500	1.500	1.500	1.500	1.500	1.500	1.500	1.500	1.500	1.500
Carbon Monoxide, CO	28.01	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Hydrogen, H_2	2.02	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Methane, CH_4	16.04	96.310	96.310	96.310	96.310	96.310	96.310	96.310	96.310	96.310	96.310	96.310	96.310
Ethane, C_2H_6	30.07	1.420	1.420	1.420	1.420	1.420	1.420	1.420	1.420	1.420	1.420	1.420	1.420
Propane, C_3H_8	44.10	0.230	0.230	0.230	0.230	0.230	0.230	0.230	0.230	0.230	0.230	0.230	0.230
Iso-Butane, C_4H_{10}	58.12	0.040	0.040	0.040	0.040	0.040	0.040	0.040	0.040	0.040	0.040	0.040	0.040
n-Butane, C_4H_{10}	58.12	0.040	0.040	0.040	0.040	0.040	0.040	0.040	0.040	0.040	0.040	0.040	0.040
Iso-Pentane, C_5H_{12}	72.15	0.010	0.010	0.010	0.010	0.010	0.010	0.010	0.010	0.010	0.010	0.010	0.010
n-Pentane, C_5H_{12}	72.15	0.010	0.010	0.010	0.010	0.010	0.010	0.010	0.010	0.010	0.010	0.010	0.010
n-Hexane, C_6H_{14}	86.18	0.010	0.010	0.010	0.010	0.010	0.010	0.010	0.010	0.010	0.010	0.010	0.010
n-Heptane, C_7H_{16}	100.20	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Ethylene, C_2H_4	28.05	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Propylene, C_3H_6	42.08	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
neo-Pentane, C_5H_{12}	72.15	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Oxygen, O_2	32.00	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Water, H_2O	18.02	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Total		*99.89*	*99.89*	*99.89*	*99.89*	*99.89*	*99.89*	*99.89*	*99.89*	*99.89*	*99.89*	*99.89*	*99.89*
	MW	wt %	wt %	wt %	wt %	wt %	wt %	wt %	wt %	wt %	wt %	wt %	wt %
Nitrogen, N_2	28.01	0.534	0.534	0.534	0.534	0.534	0.534	0.534	0.534	0.534	0.534	0.534	0.534
Carbon Dioxide, CO_2	44.01	3.930	3.930	3.930	3.930	3.930	3.930	3.930	3.930	3.930	3.930	3.930	3.930
Carbon Monoxide, CO	28.01	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Hydrogen, H_2	2.02	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Methane, CH_4	16.04	91.977	91.977	91.977	91.977	91.977	91.977	91.977	91.977	91.977	91.977	91.977	91.977
Ethane, C_2H_6	30.07	2.542	2.542	2.542	2.542	2.542	2.542	2.542	2.542	2.542	2.542	2.542	2.542
Propane, C_3H_8	44.10	0.604	0.604	0.604	0.604	0.604	0.604	0.604	0.604	0.604	0.604	0.604	0.604
Iso-Butane, C_4H_{10}	58.12	0.138	0.138	0.138	0.138	0.138	0.138	0.138	0.138	0.138	0.138	0.138	0.138
n-Butane, C_4H_{10}	58.12	0.138	0.138	0.138	0.138	0.138	0.138	0.138	0.138	0.138	0.138	0.138	0.138
Iso-Pentane, C_5H_{12}	72.15	0.043	0.043	0.043	0.043	0.043	0.043	0.043	0.043	0.043	0.043	0.043	0.043
n-Pentane, C_5H_{12}	72.15	0.043	0.043	0.043	0.043	0.043	0.043	0.043	0.043	0.043	0.043	0.043	0.043
n-Hexane, C_6H_{14}	86.18	0.051	0.051	0.051	0.051	0.051	0.051	0.051	0.051	0.051	0.051	0.051	0.051
n-Heptane, C_7H_{16}	100.20	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Ethylene, C_2H_4	28.05	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Propylene, C_3H_6	42.08	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
neo-Pentane, C_5H_{12}	72.15	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Oxygen, O_2	32.00	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Water, H_2O	18.02	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Total		*100.00*	*100.00*	*100.00*	*100.00*	*100.00*	*100.00*	*100.00*	*100.00*	*100.00*	*100.00*	*100.00*	*100.00*
Fuel LHV	Btu/lb	20,506	20,506	20,506	20,506	20,506	20,506	20,506	20,506	20,506	20,506	20,506	20,506
Fuel HHV	Btu/lb	22,760	22,760	22,760	22,760	22,760	22,760	22,760	22,760	22,760	22,760	22,760	22,760
Fuel LHV	Btu/ft^3	908.7	908.7	908.7	908.7	908.7	908.7	908.7	908.7	908.7	908.7	908.7	908.7
Fuel HHV	Btu/ft^3	1,008.6	1,008.6	1,008.6	1,008.6	1,008.6	1,008.6	1,008.6	1,008.6	1,008.6	1,008.6	1,008.6	1,008.6

Emissions Summary Normal Operations
Siemens W501F (2 x 2 x 1) Combined Cycle
Natural Gas Operation

CASE		CASE 1A	CASE 1B	CASE 1C	CASE 1D	CASE 2A	CASE 2B	CASE 2C	CASE 2D	CASE 3A	CASE 3B	CASE 3C	CASE 3D
SWPC Case		CASE 1	CASE 2	CASE 3	CASE 4	CASE 9	CASE 9	CASE 11	CASE 12	CASE 16	CASE 16	CASE 17	CASE 18
Ambient Conditions		105°F -15% RH	105°F -15% RH	105°F -15% RH	105°F -15% RH	63°F -65% RH	63°F -65% RH	63°F -65% RH	63°F -65% RH	25°F -60% RH	25°F -60% RH	25°F -60% RH	25°F -60% RH
CT Load		Base	Base	80%	60%	Base	Base	80%	60%	Base	Base	80%	60%
Duct Burner		Fired	Unfired	Unfired	Unfired	Fired	Unfired	Unfired	Unfired	Fired	Unfired	Unfired	Unfired
Evap Cooler		ON	ON	OFF	OFF	ON	ON	OFF	OFF	OFF	OFF	OFF	OFF
HHV/LHV Ratio		1.110	1.110	1.110	1.110	1.110	1.110	1.110	1.110	1.110	1.110	1.110	1.110
Total Sulfur, S	grains/100 ft^3	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20
COMBUSTION TURBINE EXHAUST ANALYSIS													
Argon, Ar	% vol	0.88	0.88	0.89	0.89	0.89	0.89	0.89	0.89	0.90	0.90	0.90	0.90
Nitrogen, N_2	% vol	73.57	73.57	74.56	74.64	74.11	74.11	74.35	74.43	75.02	75.02	75.10	75.17
Oxygen, O_2	% vol	12.50	12.50	13.19	13.42	12.59	12.59	12.88	13.11	12.74	12.74	12.98	13.16
Carbon Dioxide, CO_2	% vol	3.70	3.70	3.49	3.38	3.73	3.73	3.62	3.51	3.77	3.77	3.67	3.58
Water, H_2O	% vol	9.36	9.36	7.88	7.67	8.69	8.69	8.26	8.06	7.56	7.56	7.35	7.19
Total		*100.0*	*100.0*	*100.0*	*100.0*	*100.0*	*100.0*	*100.0*	*100.0*	*100.0*	*100.0*	*100.0*	*100.0*
Molecular weight	lb/lbmol	28.27	28.27	28.42	28.43	28.35	28.35	28.39	28.40	28.48	28.48	28.49	28.50
Argon, Ar	% vol, dry	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97
Nitrogen, N_2	% vol, dry	81.16	81.16	80.93	80.84	81.16	81.16	81.05	80.96	81.16	81.16	81.06	80.99
Oxygen, O_2	% vol, dry	13.79	13.79	14.31	14.54	13.79	13.79	14.04	14.26	13.79	13.79	14.01	14.18
Carbon Dioxide, CO_2	% vol, dry	4.08	4.08	3.79	3.66	4.08	4.08	3.94	3.82	4.08	4.08	3.96	3.86
Water, H_2O	% vol, dry	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Total		*100.00*	*100.00*	*100.00*	*100.00*	*100.00*	*100.00*	*100.00*	*100.00*	*100.00*	*100.00*	*100.00*	*100.00*
Molecular weight (dry)	lb/lbmol	29.33	29.33	29.30	29.29	29.33	29.33	29.32	29.31	29.33	29.33	29.32	29.31
	lb/lbmol	wt %	wt %	wt %	wt %	wt %	wt %	wt %	wt %	wt %	wt %	wt %	wt %
Argon, Ar	39.95	1.24	1.24	1.25	1.25	1.25	1.25	1.25	1.25	1.26	1.26	1.26	1.26
Nitrogen, N_2	28.01	72.89	72.89	73.50	73.55	73.23	73.23	73.38	73.43	73.80	73.80	73.85	73.88
Oxygen, O_2	32.00	14.14	14.14	14.85	15.11	14.21	14.21	14.52	14.77	14.32	14.32	14.58	14.78
Carbon Dioxide, CO_2	44.01	5.76	5.76	5.40	5.23	5.79	5.79	5.61	5.44	5.83	5.83	5.66	5.53
Water, H_2O	18.02	5.96	5.96	4.99	4.86	5.52	5.52	5.24	5.11	4.79	4.79	4.65	4.55
Total		*100.00*	*100.00*	*100.00*	*100.00*	*100.00*	*100.00*	*100.00*	*100.00*	*100.00*	*100.00*	*100.00*	*100.00*
Argon, Ar	wt %, dry	1.32	1.32	1.32	1.32	1.32	1.32	1.32	1.32	1.32	1.32	1.32	1.32
Nitrogen, N_2	wt %, dry	77.51	77.51	77.37	77.30	77.51	77.51	77.44	77.38	77.51	77.51	77.45	77.40
Oxygen, O_2	wt %, dry	15.04	15.04	15.63	15.88	15.04	15.04	15.32	15.57	15.04	15.04	15.29	15.48
Carbon Dioxide, CO_2	wt %, dry	6.13	6.13	5.68	5.50	6.13	6.13	5.92	5.73	6.13	6.13	5.94	5.80
Water, H_2O	wt %, dry	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Total		*100.00*	*100.00*	*100.00*	*100.00*	*100.00*	*100.00*	*100.00*	*100.00*	*100.00*	*100.00*	*100.00*	*100.00*
Argon, Ar	lb/hr	44,308	44,308	36,556	31,440	46,524	46,524	39,548	33,578	49,811	49,811	42,608	35,739
Nitrogen, N_2	lb/hr	2,598,616	2,598,616	2,143,836	1,843,811	2,728,505	2,728,505	2,319,280	1,969,266	2,921,378	2,921,378	2,498,875	2,095,904
Oxygen, O_2	lb/hr	504,192	504,192	433,095	378,788	529,455	529,455	458,832	396,152	566,903	566,903	493,290	419,140
Carbon Dioxide, CO_2	lb/hr	205,441	205,441	157,530	131,088	215,669	215,669	177,193	145,876	230,902	230,902	191,668	156,992
Water, H_2O	lb/hr	212,566	212,566	145,683	121,785	205,769	205,769	165,757	137,087	189,414	189,414	157,356	128,974
Total		*3,565,123*	*3,565,123*	*2,916,700*	*2,506,912*	*3,725,922*	*3,725,922*	*3,160,611*	*2,681,958*	*3,958,407*	*3,958,407*	*3,383,797*	*2,836,748*
Argon, Ar	moles/hr	1,109	1,109	915	787	1,165	1,165	990	841	1,247	1,247	1,067	895
Nitrogen, N_2	moles/hr	92,763	92,763	76,529	65,819	97,400	97,400	82,792	70,297	104,285	104,285	89,203	74,818
Oxygen, O_2	moles/hr	15,757	15,757	13,535	11,838	16,546	16,546	14,339	12,380	17,716	17,716	15,416	13,099
Carbon Dioxide, CO_2	moles/hr	4,668	4,668	3,579	2,979	4,900	4,900	4,026	3,315	5,247	5,247	4,355	3,567
Water, H_2O	moles/hr	11,799	11,799	8,087	6,760	11,422	11,422	9,201	7,609	10,514	10,514	8,735	7,159
Total		*126,096*	*126,096*	*102,645*	*88,182*	*131,433*	*131,433*	*111,348*	*94,442*	*139,009*	*139,009*	*118,775*	*99,537*
Argon, Ar	moles/hr, dry	1,109	1,109	915	787	1,165	1,165	990	841	1,247	1,247	1,067	895
Nitrogen, N_2	moles/hr, dry	92,763	92,763	76,529	65,819	97,400	97,400	82,792	70,297	104,285	104,285	89,203	74,818
Oxygen, O_2	moles/hr, dry	15,757	15,757	13,535	11,838	16,546	16,546	14,339	12,380	17,716	17,716	15,416	13,099
Carbon Dioxide, CO_2	moles/hr, dry	4,668	4,668	3,579	2,979	4,900	4,900	4,026	3,315	5,247	5,247	4,355	3,567
Water, H_2O	moles/hr, dry	0	0	0	0	0	0	0	0	0	0	0	0
Total		*114,297*	*114,297*	*94,558*	*81,422*	*120,011*	*120,011*	*102,147*	*86,832*	*128,495*	*128,495*	*110,040*	*92,378*
COMBUSTION TURBINE EMISSIONS (per CT)													
NO_X	ppmvd @ 15% O_2	9.0	9.0	9.0	9.0	9.0	9.0	9.0	9.0	9.0	9.0	9.0	9.0
NO_X	ppmvd	10.9	10.9	10.0	9.7	10.9	10.9	10.5	10.1	10.8	10.8	10.5	10.3
NO_X as NO_2 S&L Calculated	lb/hr	57.1	57.1	43.7	36.3	59.9	59.9	49.2	40.5	64.1	64.1	53.2	43.6
NO_X as NO_2 METHOD 19 F Factor	lb/hr	57.7	57.7	44.2	36.8	60.6	60.6	49.8	41.0	64.9	64.9	53.9	44.1
NO_X as NO_2 SWPC Perfomance Runs	lb/hr	58.8	58.8	45.0	37.4	61.7	61.7	50.7	41.7	66.1	66.1	54.8	44.9
CO	ppmvd @ 15% O_2	4.0	4.0	4.0	10.0	4.0	4.0	4.0	10.0	4.0	4.0	4.0	10.0
CO	ppmvd	4.8	4.8	4.5	10.8	4.8	4.8	4.7	11.3	4.8	4.8	4.7	11.4
CO	lb/hr	15.4	15.4	11.8	24.6	16.2	16.2	13.3	27.4	17.4	17.4	14.4	29.5
CO SWPC Perfomance Runs	lb/hr	40.0	40.0	30.0	25.0	42.0	42.0	34.0	28.0	45.0	45.0	37.0	30.0
VOC	ppmvd @ 15% O_2	0.6	0.6	1.2	2.5	0.6	0.6	1.2	2.5	0.6	0.6	1.2	2.5
VOC	ppmvd	0.7	0.7	1.3	2.7	0.7	0.7	1.3	2.8	0.7	0.7	1.3	2.8
VOC	lb/hr	1.3	1.3	1.9	3.5	1.4	1.4	2.2	3.9	1.5	1.5	2.4	4.2
VOC SWPC Perfomance Runs	lb/hr	1.4	1.4	2.0	7.2	1.4	1.4	2.3	8.1	1.5	1.5	2.4	8.7
SO_2	ppmvd @ 15% O_2	0.11	0.11	0.11	0.11	0.11	0.11	0.11	0.11	0.11	0.11	0.11	0.11
SO_2	ppmvd	0.13	0.13	0.12	0.12	0.13	0.13	0.13	0.13	0.13	0.13	0.13	0.13
SO_2	lb/hr	0.99	0.99	0.76	0.63	1.04	1.04	0.85	0.70	1.11	1.11	0.92	0.75
SO_3 Oxidation	%	0	0	0	0	0	0	0	0	0	0	0	0
SO_3	ppmvd @ 15% O_2	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
SO_3	ppmvd	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
SO_3	lb/hr	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
PM10													
Front Half	lb/hr												

Emissions Summary Normal Operations
Siemens W501F (2 x 2 x 1) Combined Cycle
Natural Gas Operation

CASE		CASE 1A	CASE 1B	CASE 1C	CASE 1D	CASE 2A	CASE 2B	CASE 2C	CASE 2D	CASE 3A	CASE 3B	CASE 3C	CASE 3D
SWPC Case		CASE 1	CASE 2	CASE 3	CASE 4	CASE 9	CASE 9	CASE 11	CASE 12	CASE 16	CASE 16	CASE 17	CASE 18
Ambient Conditions		105°F -15% RH	105°F -15% RH	105°F -15% RH	105°F -15% RH	63°F -65% RH	63°F -65% RH	63°F -65% RH	63°F -65% RH	25°F -60% RH	25°F -60% RH	25°F -60% RH	25°F -60% RH
CT Load		Base	Base	80%	60%	Base	Base	80%	60%	Base	Base	80%	60%
Duct Burner		Fired	Unfired	Unfired	Unfired	Fired	Unfired	Unfired	Unfired	Fired	Unfired	Unfired	Unfired
Evap Cooler		ON	ON	OFF	OFF	ON	ON	OFF	OFF	OFF	OFF	OFF	OFF
Back Half	lb/hr												
Total	lb/hr	3.60	3.60	3.60	3.60	3.60	3.60	3.60	3.60	3.60	3.60	3.60	3.60
DUCT BURNER EMISSIONS (per CT/HRSG)													
Argon, Ar	lb/hr	0	0	0	0	0	0	0	0	0	0	0	0
Nitrogen, N_2	lb/hr	146	0	0	0	146	0	0	0	143	0	0	0
Oxygen, O_2	lb/hr	-103,974	0	0	0	-103,974	0	0	0	-101,936	0	0	0
Carbon Dioxide, CO_2	lb/hr	72,979	0	0	0	72,979	0	0	0	71,548	0	0	0
Water, H_2O	lb/hr	58,207	0	0	0	58,207	0	0	0	57,066	0	0	0
Total		*27,358*	*0*	*0*	*0*	*27,358*	*0*	*0*	*0*	*26,822*	*0*	*0*	*0*
DB Heat Consumption (HHV)	MBtu/hr	622.7	0.0	0.0	0.0	622.7	0.0	0.0	0.0	610.5	0.0	0.0	0.0
NO_X	lb/MBtu, HHV	0.080	0.080	0.080	0.080	0.080	0.080	0.080	0.080	0.080	0.080	0.080	0.080
NO_X	lb/hr	49.8	0.0	0.0	0.0	49.8	0.0	0.0	0.0	48.8	0.0	0.0	0.0
CO	lb/MBtu, HHV	0.080	0.080	0.080	0.080	0.080	0.080	0.080	0.080	0.080	0.080	0.080	0.080
CO	lb/hr	49.8	0.0	0.0	0.0	49.8	0.0	0.0	0.0	48.8	0.0	0.0	0.0
VOC	lb/MBtu, HHV	0.0007	0.0007	0.0007	0.0007	0.0007	0.0007	0.0007	0.0007	0.0007	0.0007	0.0007	0.0007
VOC	lb/hr	0.4	0.0	0.0	0.0	0.4	0.0	0.0	0.0	0.4	0.0	0.0	0.0
SO_2	lb/hr	0.35	0.00	0.00	0.00	0.35	0.00	0.00	0.00	0.35	0.00	0.00	0.00
SO_3 Oxidation	%	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
SO_3	lb/hr	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
PM10													
Front Half	lb/MBtu, HHV												
Front Half	lb/hr												
Back Half	lb/hr												
Total	lb/hr	0.25	0.00	0.00	0.00	0.25	0.00	0.00	0.00	0.25	0.00	0.00	0.00
POST DUCT BURNER EXHAUST COMPOSTION (per CT/HRSG)													
Argon, Ar	lb/hr	44,308	44,308	36,556	31,440	46,524	46,524	39,548	33,578	49,811	49,811	42,608	35,739
Nitrogen, N_2	lb/hr	2,598,762	2,598,616	2,143,836	1,843,811	2,728,651	2,728,505	2,319,280	1,969,266	2,921,521	2,921,378	2,498,875	2,095,904
Oxygen, O_2	lb/hr	400,218	504,192	433,095	378,788	425,480	529,455	458,832	396,152	464,967	566,903	493,290	419,140
Carbon Dioxide, CO_2	lb/hr	278,421	205,441	157,530	131,088	288,648	215,669	177,193	145,876	302,450	230,902	191,668	156,992
Water, H_2O	lb/hr	270,773	212,566	145,683	121,785	263,976	205,769	165,757	137,087	246,480	189,414	157,356	128,974
Total		*3,592,482*	*3,565,123*	*2,916,700*	*2,506,912*	*3,753,280*	*3,725,922*	*3,160,611*	*2,681,958*	*3,985,229*	*3,958,407*	*3,383,797*	*2,836,748*
Argon, Ar	wt %	1.23	1.24	1.25	1.25	1.24	1.25	1.25	1.25	1.25	1.26	1.26	1.26
Nitrogen, N_2	wt %	72.34	72.89	73.50	73.55	72.70	73.23	73.38	73.43	73.31	73.80	73.85	73.88
Oxygen, O_2	wt %	11.14	14.14	14.85	15.11	11.34	14.21	14.52	14.77	11.67	14.32	14.58	14.78
Carbon Dioxide, CO_2	wt %	7.75	5.76	5.40	5.23	7.69	5.79	5.61	5.44	7.59	5.83	5.66	5.53
Water, H_2O	wt %	7.54	5.96	4.99	4.86	7.03	5.52	5.24	5.11	6.18	4.79	4.65	4.55
Total		*100*	*100*	*100*	*100*	*100*	*100*	*100*	*100*	*100*	*100*	*100*	*100*
Argon, Ar	moles/hr	1,109	1,109	915	787	1,165	1,165	990	841	1,247	1,247	1,067	895
Nitrogen, N_2	moles/hr	92,768	92,763	76,529	65,819	97,405	97,400	82,792	70,297	104,290	104,285	89,203	74,818
Oxygen, O_2	moles/hr	12,507	15,757	13,535	11,838	13,297	16,546	14,339	12,380	14,531	17,716	15,416	13,099
Carbon Dioxide, CO_2	moles/hr	6,326	4,668	3,579	2,979	6,559	4,900	4,026	3,315	6,872	5,247	4,355	3,567
Water, H_2O	moles/hr	15,030	11,799	8,087	6,760	14,653	11,422	9,201	7,609	13,682	10,514	8,735	7,159
Total		*127,741*	*126,096*	*102,645*	*88,182*	*133,078*	*131,433*	*111,348*	*94,442*	*140,622*	*139,009*	*118,775*	*99,537*
Argon, Ar	moles/hr, dry	1,109	1,109	915	787	1,165	1,165	990	841	1,247	1,247	1,067	895
Nitrogen, N_2	moles/hr, dry	92,768	92,763	76,529	65,819	97,405	97,400	82,792	70,297	104,290	104,285	89,203	74,818
Oxygen, O_2	moles/hr, dry	12,507	15,757	13,535	11,838	13,297	16,546	14,339	12,380	14,531	17,716	15,416	13,099
Carbon Dioxide, CO_2	moles/hr, dry	6,326	4,668	3,579	2,979	6,559	4,900	4,026	3,315	6,872	5,247	4,355	3,567
Water, H_2O	moles/hr, dry	0	0	0	0	0	0	0	0	0	0	0	0
Total		*112,711*	*114,297*	*94,558*	*81,422*	*118,425*	*120,011*	*102,147*	*86,832*	*126,940*	*128,495*	*110,040*	*92,378*
Argon, Ar	vol %	0.87	0.88	0.89	0.89	0.88	0.89	0.89	0.89	0.89	0.90	0.90	0.90
Nitrogen, N_2	vol %	72.62	73.57	74.56	74.64	73.19	74.11	74.35	74.43	74.16	75.02	75.10	75.17
Oxygen, O_2	vol %	9.79	12.50	13.19	13.42	9.99	12.59	12.88	13.11	10.33	12.74	12.98	13.16
Carbon Dioxide, CO_2	vol %	4.95	3.70	3.49	3.38	4.93	3.73	3.62	3.51	4.89	3.77	3.67	3.58
Water, H_2O	vol %	11.77	9.36	7.88	7.67	11.01	8.69	8.26	8.06	9.73	7.56	7.35	7.19
Total		*100*	*100*	*100*	*100*	*100*	*100*	*100*	*100*	*100*	*100*	*100*	*100*
Molecular weight	lb/lbmol	28.12	28.27	28.42	28.43	28.20	28.35	28.39	28.40	28.34	28.48	28.49	28.50
Argon, Ar	vol %, dry	0.98	0.97	0.97	0.97	0.98	0.97	0.97	0.97	0.98	0.97	0.97	0.97
Nitrogen, N_2	vol %, dry	82.31	81.16	80.93	80.84	82.25	81.16	81.05	80.96	82.16	81.16	81.06	80.99
Oxygen, O_2	vol %, dry	11.10	13.79	14.31	14.54	11.23	13.79	14.04	14.26	11.45	13.79	14.01	14.18
Carbon Dioxide, CO_2	vol %, dry	5.61	4.08	3.79	3.66	5.54	4.08	3.94	3.82	5.41	4.08	3.96	3.86
Water, H_2O	vol %, dry	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Total		*100*	*100*	*100*	*100*	*100*	*100*	*100*	*100*	*100*	*100*	*100*	*100*
Molecular weight (dry)	lb/lbmol	29.47	29.33	29.30	29.29	29.46	29.33	29.32	29.31	29.45	29.33	29.32	29.31
POST DUCT BURNER EMISSIONS (per CT/HRSG)													
NO_X	ppmvd @ 15% O_2	12.4	9.0	9.0	9.0	12.3	9.0	9.0	9.0	12.1	9.0	9.0	9.0
NO_X	ppmvd	20.6	10.9	10.0	9.7	20.1	10.9	10.5	10.1	19.3	10.8	10.5	10.3
NO_X as NO_2 S&L Calculated	lb/hr	106.9	57.1	43.7	36.3	109.7	59.9	49.2	40.5	113.0	64.1	53.2	43.6
NO_X as NO_2 METHOD 19 F Factor	lb/hr	108.1	57.7	44.2	36.8	110.9	60.6	49.8	41.0	114.2	64.9	53.9	44.1
CO	ppmvd @ 15% O_2	12.4	4.0	4.0	10.0	12.1	4.0	4.0	10.0	11.6	4.0	4.0	10.0

Emissions Summary Normal Operations
Siemens W501F (2 x 2 x 1) Combined Cycle
Natural Gas Operation

CASE		CASE 1A	CASE 1B	CASE 1C	CASE 1D	CASE 2A	CASE 2B	CASE 2C	CASE 2D	CASE 3A	CASE 3B	CASE 3C	CASE 3D
SWPC Case		CASE 1	CASE 2	CASE 3	CASE 4	CASE 9	CASE 9	CASE 11	CASE 12	CASE 16	CASE 16	CASE 17	CASE 18
Ambient Conditions		105°F -15% RH	105°F -15% RH	105°F -15% RH	105°F -15% RH	63°F -65% RH	63°F -65% RH	63°F -65% RH	63°F -65% RH	25°F -60% RH	25°F -60% RH	25°F -60% RH	25°F -60% RH
CT Load		Base	Base	80%	60%	Base	Base	80%	60%	Base	Base	80%	60%
Duct Burner		Fired	Unfired	Unfired	Unfired	Fired	Unfired	Unfired	Unfired	Fired	Unfired	Unfired	Unfired
Evap Cooler		ON	ON	OFF	OFF	ON	ON	OFF	OFF	OFF	OFF	OFF	OFF
CO	ppmvd	20.7	4.8	4.5	10.8	19.9	4.8	4.7	11.3	18.6	4.8	4.7	11.4
CO	lb/hr	65.3	15.4	11.8	24.6	66.0	16.2	13.3	27.4	66.2	17.4	14.4	29.5
VOC	ppmvd @ 15% O_2	0.6	0.6	1.2	2.5	0.6	0.6	1.2	2.5	0.6	0.6	1.2	2.5
VOC	ppmvd	1.0	0.7	1.3	2.7	1.0	0.7	1.3	2.8	0.9	0.7	1.3	2.8
VOC	ppmvw	0.9	0.7	1.2	2.5	0.9	0.7	1.2	2.6	0.9	0.7	1.2	2.6
VOC	lb/hr	1.8	1.3	1.9	3.5	1.8	1.4	2.2	3.9	1.9	1.5	2.4	4.2
SO_2	ppmvd @ 15% O_2	0.11	0.11	0.11	0.11	0.11	0.11	0.11	0.11	0.11	0.11	0.11	0.11
SO_2	ppmvd	0.19	0.13	0.12	0.12	0.18	0.13	0.13	0.13	0.18	0.13	0.13	0.13
SO_2	lb/hr	1.34	0.99	0.76	0.63	1.39	1.04	0.85	0.70	1.46	1.11	0.92	0.75
SO_3	ppmvd @ 15% O_2	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
SO_3	ppmvd	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
SO_3	lb/hr	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
PM10													
Front Half	lb/hr	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Back Half	lb/hr	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
OXIDATION CATALYST (per CT/HRSG)													
CO Reduction	% decrease	85	80	80	80	85	80	80	80	85	80	80	80
CO	ppmvd @ 15% O_2	1.9	0.8	0.8	2.0	1.8	0.8	0.8	2.0	1.7	0.8	0.8	2.0
CO	ppmvd	3.1	1.0	0.9	2.2	3.0	1.0	0.9	2.3	2.8	1.0	0.9	2.3
CO	lb/hr	9.8	3.1	2.4	4.9	9.9	3.2	2.7	5.5	9.9	3.5	2.9	5.9
VOC Reduction	% decrease	30	30	30	30	30	30	30	30	30	30	30	30
VOC (non-methane, non-ethane)	ppmvd @ 15% O_2	0.4	0.4	0.8	1.8	0.4	0.4	0.8	1.8	0.4	0.4	0.8	1.8
VOC (non-methane, non-ethane)	ppmvd	0.7	0.5	0.9	1.9	0.7	0.5	0.9	2.0	0.7	0.5	0.9	2.0
VOC as CH_4	lb/hr	1.2	0.9	1.4	2.5	1.3	1.0	1.5	2.7	1.3	1.0	1.7	3.0
SO_3 Oxidation	% increase	0	0	0	0	0	0	0	0	0	0	0	0
Δ SO_3	ppmvd @ 15% O_2	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Δ SO_3	ppmvd	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Δ SO_3	lb/hr	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
POST SCR EMISSIONS (per CT/HRSG)													
NO_X	ppmvd @ 15% O_2	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0
NO_X Removal Efficiency	% decrease	83.9	77.8	77.8	77.8	83.7	77.8	77.8	77.8	83.4	77.8	77.8	77.8
NO_X	ppmvd	3.3	2.4	2.2	2.2	3.3	2.4	2.3	2.3	3.2	2.4	2.3	2.3
NO_X S&L Calculated	lb/hr	17.2	12.7	9.7	8.1	17.9	13.3	10.9	9.0	18.7	14.3	11.8	9.7
NO_X as NO_2 METHOD 19 F Factor	lb/hr	17.4	12.8	9.8	8.2	18.1	13.5	11.1	9.1	18.9	14.4	12.0	9.8
NH_3	ppmvd @ 15% O_2	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
NH_3	ppmvd	8.31	6.03	5.58	5.39	8.20	6.03	5.82	5.63	8.01	6.03	5.84	5.70
NH_3	lb/hr	15.9	11.7	9.0	7.5	16.5	12.3	10.1	8.3	17.3	13.2	10.9	9.0
NH_3	lbmol/hr	0.9	0.7	0.5	0.4	1.0	0.7	0.6	0.5	1.0	0.8	0.6	0.5
CO	ppmvd @ 15% O_2	1.9	0.8	0.8	2.0	1.8	0.8	0.8	2.0	1.7	0.8	0.8	2.0
CO	ppmvd	3.1	1.0	0.9	2.2	3.0	1.0	0.9	2.3	2.8	1.0	0.9	2.3
CO	lb/hr	9.8	3.1	2.4	4.9	9.9	3.2	2.7	5.5	9.9	3.5	2.9	5.9
VOC	ppmvd @ 15% O_2	0.4	0.4	0.8	1.8	0.4	0.4	0.8	1.8	0.4	0.4	0.8	1.8
VOC	ppmvd	0.7	0.5	0.9	1.9	0.7	0.5	0.9	2.0	0.7	0.5	0.9	2.0
VOC	lb/hr	1.2	0.9	1.4	2.5	1.3	1.0	1.5	2.7	1.3	1.0	1.7	3.0
SO_2	ppmvd @ 15% O_2	0.11	0.11	0.11	0.11	0.11	0.11	0.11	0.11	0.11	0.11	0.11	0.11
SO_2	ppmvd	0.19	0.13	0.12	0.12	0.18	0.13	0.13	0.13	0.18	0.13	0.13	0.13
SO_2	lb/hr	1.34	0.99	0.76	0.63	1.39	1.04	0.85	0.70	1.46	1.11	0.92	0.75
SO_3 Oxidation across SCR	% increase	0	0	0	0	0	0	0	0	0	0	0	0
SO_3 Oxidation across SCR	lb/hr	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
SO_3	ppmvd @ 15% O_2	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
SO_3	ppmvd	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
SO_3	lb/hr	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
SO_3	lbmol/hr	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
$(NH_4)_2SO_4$, Ammonium Sulfate	lb/hr	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
PM10													
Front Half	lb/hr	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Front Half	lb/MBtu (HHV)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Front Half	grains/scf	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Front Half	grains/dscf	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Back Half	lb/hr	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Total PM10	lb/hr	3.85	3.60	3.60	3.60	3.85	3.60	3.60	3.60	3.85	3.60	3.60	3.60
Total PM10	grains/scf	0.0005	0.0005	0.0006	0.0007	0.0005	0.0005	0.0006	0.0007	0.0005	0.0005	0.0006	0.0007
Total PM10	grains/dscf	0.0006	0.0006	0.0007	0.0008	0.0006	0.0005	0.0006	0.0008	0.0006	0.0005	0.0006	0.0007
Aqueous Ammonia (per CT/HRSG)													
Purity	%	29.4	29.4	29.4	29.4	29.4	29.4	29.4	29.4	29.4	29.4	29.4	29.4
Consumption	lb/hr	167.1	95.8	73.4	61.0	171.9	100.6	82.6	68.0	177.6	107.7	89.3	73.1

Emissions Summary Normal Operations
Siemens W501F (2 x 2 x 1) Combined Cycle
Natural Gas Operation

CASE		CASE 1A	CASE 1B	CASE 1C	CASE 1D	CASE 2A	CASE 2B	CASE 2C	CASE 2D	CASE 3A	CASE 3B	CASE 3C	CASE 3D
SWPC Case		CASE 1	CASE 2	CASE 3	CASE 4	CASE 9	CASE 9	CASE 11	CASE 12	CASE 16	CASE 16	CASE 17	CASE 18
Ambient Conditions		105°F -15% RH	105°F -15% RH	105°F -15% RH	105°F -15% RH	63°F -65% RH	63°F -65% RH	63°F -65% RH	63°F -65% RH	25°F -60% RH	25°F -60% RH	25°F -60% RH	25°F -60% RH
CT Load		Base	Base	80%	60%	Base	Base	80%	60%	Base	Base	80%	60%
Duct Burner		Fired	Unfired	Unfired	Unfired	Fired	Unfired	Unfired	Unfired	Fired	Unfired	Unfired	Unfired
Evap Cooler		ON	ON	OFF	OFF	ON	ON	OFF	OFF	OFF	OFF	OFF	OFF
Stack Conditions (per CT/HRSG)													
Internal Diameter	ft	19.0	19.0	19.0	19.0	19.0	19.0	19.0	19.0	19.0	19.0	19.0	19.0
Flow	lb/hr	3,592,649	3,565,219	2,916,774	2,506,973	3,753,452	3,726,022	3,160,694	2,682,026	3,985,407	3,958,515	3,383,886	2,836,821
Exit Velocity	ft/s	63.2	63.8	50.9	43.2	64.2	65.4	54.6	45.7	67.4	69.5	58.6	48.4
Temperature	°F	204.6	220.0	206.5	197.3	188.1	208.6	198.7	190.2	183.9	211.3	202.8	192.9
Flow	acfm	1,075,432	1,086,159	866,600	734,219	1,092,545	1,113,149	929,077	777,847	1,146,994	1,182,066	997,217	823,218
Flow	scfm	820,508	809,925	659,293	566,398	854,786	844,203	715,194	606,607	903,239	892,863	762,899	639,335
Flow	dscfm	723,966	734,137	607,352	522,978	760,667	770,839	656,096	557,731	815,358	825,331	706,796	593,351

Notes:

MBtu = 10^6 Btu

Emissions Summary Startup/Shutdown
Siemens W501F (2 x 2 x 1) Combined Cycle
Natural Gas Operation

SWPC Case		CASE 1	CASE 1	CASE 2	CASE 3	CASE 4	CASE 5	CASE 6	CASE 7	CASE 8	CASE 9	CASE 10	CASE 11	CASE 12
Ambient Conditions		63°F -65% RH	63°F -65% RH	63°F -65% RH	63°F -65% RH	63°F -65% RH	63°F -65% RH	63°F -65% RH	63°F -65% RH	63°F -65% RH	63°F -65% RH	63°F -65% RH	63°F -65% RH	63°F -65% RH
CT Load		BASE	BASE	0.90	0.80	0.70	0.60	0.50	0.40	0.30	0.20	0.10	0.04	FSNL
Duct Burner		FIRED	UNFIRED	UNFIRED	UNFIRED	UNFIRED	UNFIRED	UNFIRED	UNFIRED	UNFIRED	UNFIRED	UNFIRED	UNFIRED	UNFIRED
Evap Cooler		OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF
SITE CONDITIONS														
Ambient Temperature	°F	63	63	63	63	63	63	63	63	63	63	63	63	63
Relative Humidity	%	65%	65%	65%	65%	65%	65%	65%	65%	65%	65%	65%	65%	65%
Site Elevation	feet													
Atmospheric Pressure	psia	14.12	14.12	14.12	14.12	14.12	14.12	14.12	14.12	14.12	14.12	14.12	14.12	14.12
FACILITY CONDITIONS														
CT Fuel Type		Natural Gas	Natural Gas	Natural Gas	Natural Gas	Natural Gas	Natural Gas	Natural Gas	Natural Gas	Natural Gas	Natural Gas	Natural Gas	Natural Gas	Natural Gas
CT Model		W501F	W501F	W501F	W501F	W501F	W501F	W501F	W501F	W501F	W501F	W501F	W501F	W501F
CT Load	%	BASE	BASE	0.90	0.80	0.70	0.60	0.50	0.40	0.30	0.20	0.10	0.04	FSNL
CT Evap Coolers	ON/OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF
CT Power Output	kW	168,980	168,980	151,900	134,810	117,710	100,600	83,470	66,340	49,200	32,060	14,910	4,610	0
CT Heat Consumption (LHV)	MBtu/hr	1,618.1	1,618.1	1,481.0	1,352.7	1,236.9	1,113.9	983.7	860.5	741.1	624.6	493.2	418.7	385.4
CT Heat Consumption (HHV)	MBtu/hr	1,796.0	1,796.0	1,643.9	1,501.4	1,372.9	1,236.4	1,091.9	955.2	822.5	693.3	547.5	464.8	427.8
CT Fuel Flow Rate	lb/hr	78,909	78,909	72,226	65,966	60,319	54,321	47,974	41,966	36,139	30,461	24,054	20,421	18,794
CT Fuel Flow Rate	MSCF/hr	1.78	1.78	1.63	1.49	1.36	1.23	1.08	0.95	0.82	0.69	0.54	0.46	0.42
CT Exhaust Gas Flow Rate	lb/hr	3,678,870	3,678,870	3,461,948	3,160,611	2,855,275	2,681,958	2,675,519	2,669,254	2,663,056	2,656,931	2,650,968	2,647,468	2,645,917
CT Exhaust Gas Temperature	°F	1,104	1,104	1,079	1,094	1,128	1,113	1,020	930	839	748	660	608	585
DB Heat Consumption (LHV)	MBtu/hr	561.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
DB Heat Consumption (HHV)	MBtu/hr	622.7	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
DB Fuel Flow Rate	lb/hr	27,358	0	0	0	0	0	0	0	0	0	0	0	0
DB Fuel Flow Rate	MSCF/hr	0.62	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
NATURAL GAS ANALYSIS														
Name		SoCalGas	SoCalGas	SoCalGas	SoCalGas	SoCalGas	SoCalGas	SoCalGas	SoCalGas	SoCalGas	SoCalGas	SoCalGas	SoCalGas	SoCalGas
Fuel LHV	Btu/lb	20,506	20,506	20,506	20,506	20,506	20,506	20,506	20,506	20,506	20,506	20,506	20,506	20,506
Fuel HHV	Btu/lb	22,760	22,760	22,760	22,760	22,760	22,760	22,760	22,760	22,760	22,760	22,760	22,760	22,760
Fuel LHV	Btu/ft^3	908.7	908.7	908.7	908.7	908.7	908.7	908.7	908.7	908.7	908.7	908.7	908.7	908.7
Fuel HHV	Btu/ft^3	1,008.6	1,008.6	1,008.6	1,008.6	1,008.6	1,008.6	1,008.6	1,008.6	1,008.6	1,008.6	1,008.6	1,008.6	1,008.6
HHV/LHV Ratio		1.110	1.110	1.110	1.110	1.110	1.110	1.110	1.110	1.110	1.110	1.110	1.110	1.110
Total Sulfur, S	grains/100 ft^3	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20
COMBUSTION TURBINE EXHAUST ANALYSIS (SEE NOTE 3)														
Argon, Ar	% vol	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.90	0.90	0.90	0.91	0.91	0.91
Nitrogen, N_2	% vol	74.28	74.28	74.36	74.35	74.32	74.43	74.74	75.04	75.34	75.64	75.93	76.10	76.18
Oxygen, O_2	% vol	12.67	12.67	12.88	12.88	12.79	13.11	13.99	14.86	15.72	16.58	17.43	17.92	18.15
Carbon Dioxide, CO_2	% vol	3.71	3.71	3.61	3.62	3.66	3.51	3.10	2.71	2.31	1.91	1.52	1.30	1.19
Water, H_2O	% vol	8.45	8.45	8.26	8.26	8.34	8.06	7.27	6.50	5.73	4.96	4.21	3.77	3.57
Total		*100.0*	*100.0*	*100.0*	*100.0*	*100.0*	*100.0*	*100.0*	*100.0*	*100.0*	*100.0*	*100.0*	*100.0*	*100.0*
Molecular weight	lb/lbmol	28.37	28.37	28.39	28.39	28.38	28.40	28.45	28.50	28.54	28.59	28.64	28.67	28.68
Argon, Ar	% vol, dry	0.97	0.97	0.97	0.97	0.97	0.97	0.96	0.96	0.96	0.95	0.95	0.95	0.94
Nitrogen, N_2	% vol, dry	81.14	81.14	81.05	81.05	81.09	80.96	80.60	80.26	79.92	79.59	79.27	79.08	79.00
Oxygen, O_2	% vol, dry	13.84	13.84	14.04	14.04	13.95	14.26	15.09	15.89	16.68	17.45	18.19	18.63	18.82
Carbon Dioxide, CO_2	% vol, dry	4.06	4.06	3.94	3.94	3.99	3.82	3.35	2.89	2.45	2.01	1.59	1.35	1.24
Water, H_2O	% vol, dry	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Total		*100.00*	*100.00*	*100.00*	*100.00*	*100.00*	*100.00*	*100.00*	*100.00*	*100.00*	*100.00*	*100.00*	*100.00*	*100.00*
Molecular weight (dry)	lb/lbmol	29.33	29.33	29.32	29.32	29.32	29.31	29.27	29.22	29.18	29.14	29.11	29.08	29.07
	lb/lbmol	wt %	wt %	wt %	wt %	wt %	wt %	wt %	wt %	wt %	wt %	wt %	wt %	wt %
Argon, Ar	39.95	1.25	1.25	1.25	1.25	1.25	1.25	1.26	1.26	1.26	1.26	1.27	1.27	1.27
Nitrogen, N_2	28.01	73.34	73.34	73.38	73.38	73.36	73.43	73.60	73.77	73.94	74.11	74.27	74.37	74.41
Oxygen, O_2	32.00	14.29	14.29	14.52	14.52	14.42	14.77	15.74	16.68	17.62	18.56	19.47	20.01	20.25
Carbon Dioxide, CO_2	44.01	5.76	5.76	5.60	5.61	5.67	5.44	4.80	4.18	3.56	2.94	2.34	1.99	1.83
Water, H_2O	18.02	5.37	5.37	5.24	5.24	5.29	5.11	4.60	4.11	3.62	3.13	2.65	2.37	2.24
Total		*100.00*	*100.00*	*100.00*	*100.00*	*100.00*	*100.00*	*100.00*	*100.00*	*100.00*	*100.00*	*100.00*	*100.00*	*100.00*
Argon, Ar	wt %, dry	1.32	1.32	1.32	1.32	1.32	1.32	1.32	1.31	1.31	1.30	1.30	1.30	1.30
Nitrogen, N_2	wt %, dry	77.50	77.50	77.44	77.44	77.47	77.38	77.15	76.93	76.71	76.50	76.29	76.17	76.12
Oxygen, O_2	wt %, dry	15.10	15.10	15.33	15.32	15.23	15.57	16.50	17.40	18.28	19.16	20.00	20.49	20.71
Carbon Dioxide, CO_2	wt %, dry	6.08	6.08	5.91	5.92	5.99	5.73	5.03	4.36	3.69	3.04	2.41	2.04	1.87
Water, H_2O	wt %, dry	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Total		*100.00*	*100.00*	*100.00*	*100.00*	*100.00*	*100.00*	*100.00*	*100.00*	*100.00*	*100.00*	*100.00*	*100.00*	*100.00*
Argon, Ar	lb/hr	46,006	46,006	43,318	39,548	35,718	33,578	33,578	33,577	33,577	33,577	33,579	33,576	33,579
Nitrogen, N_2	lb/hr	2,698,053	2,698,053	2,540,434	2,319,280	2,094,725	1,969,266	1,969,200	1,969,131	1,969,068	1,969,003	1,968,937	1,968,902	1,968,883
Oxygen, O_2	lb/hr	525,576	525,576	502,753	458,832	411,754	396,152	421,078	445,335	469,328	493,045	516,126	529,673	535,675
Carbon Dioxide, CO_2	lb/hr	211,846	211,846	193,973	177,193	161,892	145,876	128,473	111,542	94,790	78,235	62,120	52,662	48,471
Water, H_2O	lb/hr	197,389	197,389	181,471	165,757	151,187	137,087	123,191	109,669	96,293	83,073	70,206	62,655	59,309
Total		*3,678,870*	*3,678,870*	*3,461,948*	*3,160,611*	*2,855,275*	*2,681,958*	*2,675,519*	*2,669,254*	*2,663,056*	*2,656,931*	*2,650,968*	*2,647,468*	*2,645,917*
Argon, Ar	moles/hr	1,152	1,152	1,084	990	894	841	841	841	841	841	841	840	841
Nitrogen, N_2	moles/hr	96,313	96,313	90,686	82,792	74,776	70,297	70,295	70,292	70,290	70,288	70,285	70,284	70,283
Oxygen, O_2	moles/hr	16,425	16,425	15,712	14,339	12,868	12,380	13,159	13,917	14,667	15,408	16,130	16,553	16,740
Carbon Dioxide, CO_2	moles/hr	4,814	4,814	4,407	4,026	3,679	3,315	2,919	2,534	2,154	1,778	1,412	1,197	1,101
Water, H_2O	moles/hr	10,957	10,957	10,073	9,201	8,392	7,609	6,838	6,088	5,345	4,611	3,897	3,478	3,292
Total		*129,660*	*129,660*	*121,963*	*111,348*	*100,608*	*94,442*	*94,052*	*93,672*	*93,297*	*92,925*	*92,564*	*92,352*	*92,258*
Argon, Ar	moles/hr, dry	1,152	1,152	1,084	990	894	841	841	841	841	841	841	840	841
Nitrogen, N_2	moles/hr, dry	96,313	96,313	90,686	82,792	74,776	70,297	70,295	70,292	70,290	70,288	70,285	70,284	70,283
Oxygen, O_2	moles/hr, dry	16,425	16,425	15,712	14,339	12,868	12,380	13,159	13,917	14,667	15,408	16,130	16,553	16,740
Carbon Dioxide, CO_2	moles/hr, dry	4,814	4,814	4,407	4,026	3,679	3,315	2,919	2,534	2,154	1,778	1,412	1,197	1,101
Water, H_2O	moles/hr, dry	0	0	0	0	0	0	0	0	0	0	0	0	0
Total		*118,703*	*118,703*	*111,890*	*102,147*	*92,216*	*86,832*	*87,214*	*87,585*	*87,951*	*88,314*	*88,667*	*88,874*	*88,966*
COMBUSTION TURBINE EMISSIONS (per CT)														
NO_X	ppmvd @ 15% O_2	9.0	9.0	9.0	9.0	9.0	9.0	15.0	45.0	45.0	45.0	50.0	40.0	30.0

Emissions Summary Startup/Shutdown
Siemens W501F (2 x 2 x 1) Combined Cycle
Natural Gas Operation

SWPC Case			CASE 1	CASE 1	CASE 2	CASE 3	CASE 4	CASE 5	CASE 6	CASE 7	CASE 8	CASE 9	CASE 10	CASE 11	CASE 12
Ambient Conditions			63°F -65% RH	63°F -65% RH	63°F -65% RH	63°F -65% RH	63°F -65% RH	63°F -65% RH	63°F -65% RH	63°F -65% RH	63°F -65% RH	63°F -65% RH	63°F -65% RH	63°F -65% RH	63°F -65% RH
CT Load			BASE	BASE	0.90	0.80	0.70	0.60	0.50	0.40	0.30	0.20	0.10	0.04	FSNL
Duct Burner			FIRED	UNFIRED	UNFIRED	UNFIRED	UNFIRED	UNFIRED	UNFIRED	UNFIRED	UNFIRED	UNFIRED	UNFIRED	UNFIRED	UNFIRED
Evap Cooler			OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF
NO_x		ppmvd	10.8	10.8	10.5	10.5	10.6	10.1	14.8	38.2	32.2	26.3	23.0	15.4	10.6
NO_x as NO_2		lb/hr	58.8	58.8	53.8	49.2	45.0	40.5	59.3	154.0	130.3	107.0	93.6	63.1	43.4
NO_x as NO_2	METHOD 19 F Factor	lb/hr	59.5	59.5	54.5	49.8	45.5	41.0	60.3	158.3	136.4	114.9	100.8	68.5	47.3
NO_x as NO_2	SWPC Perfomance Runs	lb/hr	60.6	60.6	55.5	50.7	46.3	41.7	61.1	158.6	134.2	110.2	96.4	64.9	44.7
CO		ppmvd @ 15% O_2	4.0	4.0	4.0	4.0	4.0	10.0	150.0	700.0	1,500.0	2,500.0	3,000.0	3,600.0	4,000.0
CO		ppmvd	4.8	4.8	4.6	4.7	4.7	11.3	147.8	594.4	1,073.8	1,463.1	1,377.4	1,388.1	1,412.4
CO		lb/hr	15.9	15.9	14.6	13.3	12.2	27.4	360.9	1,458.2	2,645.4	3,619.3	3,420.9	3,455.5	3,519.6
CO	SWPC Perfomance Runs	lb/hr	41.0	41.0	38.0	34.0	31.0	28.0	372.0	1,501.0	2,724.0	3,726.0	3,522.0	3,558.0	3,624.0
VOC		ppmvd @ 15% O_2	0.6	0.6	0.6	1.2	2.5	2.5	35.0	60.0	125.0	250.0	200.0	185.0	175.0
VOC		ppmvd	0.7	0.7	0.7	1.3	2.9	2.8	34.5	50.9	89.5	146.3	91.8	71.3	61.8
VOC		lb/hr	1.4	1.4	1.3	2.2	4.4	3.9	48.2	71.6	126.3	207.3	130.6	101.7	88.2
VOC	SWPC Perfomance Runs	lb/hr	1.4	1.4	1.3	2.3	8.9	8.1	49.6	73.5	129.7	212.9	134.2	104.5	90.6
SO_2		ppmvd @ 15% O_2	0.11	0.11	0.11	0.11	0.11	0.11	0.11	0.11	0.12	0.12	0.12	0.12	0.12
SO_2		ppmvd	0.13	0.13	0.13	0.13	0.13	0.13	0.11	0.10	0.08	0.07	0.05	0.05	0.04
SO_2		lb/hr	1.02	1.02	0.93	0.85	0.78	0.70	0.62	0.54	0.47	0.39	0.31	0.26	0.24
SO_3 Oxidation		%	0	0	0	0	0	0	0	0	0	0	0	0	0
SO_3		ppmvd @ 15% O_2	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
SO_3		ppmvd	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
SO_3		lb/hr	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
PM10															
Front Half		lb/hr													
Back Half		lb/hr													
Total		lb/hr	3.6	3.6	3.6	3.6	3.6	3.6	5.0	5.0	5.0	5.0	5.0	5.0	5.0
DUCT BURNER EMISSIONS (per CT/HRSG)															
Argon, Ar		lb/hr	0	0	0	0	0	0	0	0	0	0	0	0	0
Nitrogen, N_2		lb/hr	146	0	0	0	0	0	0	0	0	0	0	0	0
Oxygen, O_2		lb/hr	-103,974	0	0	0	0	0	0	0	0	0	0	0	0
Carbon Dioxide, CO_2		lb/hr	72,979	0	0	0	0	0	0	0	0	0	0	0	0
Water, H_2O		lb/hr	58,207	0	0	0	0	0	0	0	0	0	0	0	0
Total			*27,358*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*
DB Heat Consumption (HHV)		MBtu/hr	622.7	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
NO_x		lb/MBtu, HHV	0.080	0.080	0.080	0.080	0.080	0.080	0.080	0.080	0.080	0.080	0.080	0.080	0.080
NO_x		lb/hr	49.8	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
CO		lb/MBtu, HHV	0.080	0.080	0.080	0.080	0.080	0.080	0.080	0.080	0.080	0.080	0.080	0.080	0.080
CO		lb/hr	49.8	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
VOC		lb/MBtu, HHV	0.0007	0.0007	0.0007	0.0007	0.0007	0.0007	0.0007	0.0007	0.0007	0.0007	0.0007	0.0007	0.0007
VOC		lb/hr	0.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
SO_2		lb/hr	0.35	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
SO_3 Oxidation		%	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
SO_3		lb/hr	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
PM10															
Front Half		lb/MBtu, HHV													
Front Half		lb/hr													
Back Half		lb/hr													
Total		lb/hr	0.25	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
POST DUCT BURNER EXHAUST COMPOSTION (per CT/HRSG)															
Argon, Ar		lb/hr	46,006	46,006	43,318	39,548	35,718	33,578	33,578	33,577	33,577	33,577	33,579	33,576	33,579
Nitrogen, N_2		lb/hr	2,698,199	2,698,053	2,540,434	2,319,280	2,094,725	1,969,266	1,969,200	1,969,131	1,969,068	1,969,003	1,968,937	1,968,902	1,968,883
Oxygen, O_2		lb/hr	421,602	525,576	502,753	458,832	411,754	396,152	421,078	445,335	469,328	493,045	516,126	529,673	535,675
Carbon Dioxide, CO_2		lb/hr	284,825	211,846	193,973	177,193	161,892	145,876	128,473	111,542	94,790	78,235	62,120	52,662	48,471
Water, H_2O		lb/hr	255,596	197,389	181,471	165,757	151,187	137,087	123,191	109,669	96,293	83,073	70,206	62,655	59,309
Total			*3,706,228*	*3,678,870*	*3,461,948*	*3,160,611*	*2,855,275*	*2,681,958*	*2,675,519*	*2,669,254*	*2,663,056*	*2,656,931*	*2,650,968*	*2,647,468*	*2,645,917*
Argon, Ar		wt %	1.24	1.25	1.25	1.25	1.25	1.25	1.26	1.26	1.26	1.26	1.27	1.27	1.27
Nitrogen, N_2		wt %	72.80	73.34	73.38	73.38	73.36	73.43	73.60	73.77	73.94	74.11	74.27	74.37	74.41
Oxygen, O_2		wt %	11.38	14.29	14.52	14.52	14.42	14.77	15.74	16.68	17.62	18.56	19.47	20.01	20.25
Carbon Dioxide, CO_2		wt %	7.69	5.76	5.60	5.61	5.67	5.44	4.80	4.18	3.56	2.94	2.34	1.99	1.83
Water, H_2O		wt %	6.90	5.37	5.24	5.24	5.29	5.11	4.60	4.11	3.62	3.13	2.65	2.37	2.24
Total			*100*	*100*	*100*	*100*	*100*	*100*	*100*	*100*	*100*	*100*	*100*	*100*	*100*
Argon, Ar		moles/hr	1,152	1,152	1,084	990	894	841	841	841	841	841	841	840	841
Nitrogen, N_2		moles/hr	96,318	96,313	90,686	82,792	74,776	70,297	70,295	70,292	70,290	70,288	70,285	70,284	70,283
Oxygen, O_2		moles/hr	13,176	16,425	15,712	14,339	12,868	12,380	13,159	13,917	14,667	15,408	16,130	16,553	16,740
Carbon Dioxide, CO_2		moles/hr	6,472	4,814	4,407	4,026	3,679	3,315	2,919	2,534	2,154	1,778	1,412	1,197	1,101
Water, H_2O		moles/hr	14,188	10,957	10,073	9,201	8,392	7,609	6,838	6,088	5,345	4,611	3,897	3,478	3,292
Total			*131,305*	*129,660*	*121,963*	*111,348*	*100,608*	*94,442*	*94,052*	*93,672*	*93,297*	*92,925*	*92,564*	*92,352*	*92,258*
Argon, Ar		moles/hr, dry	1,152	1,152	1,084	990	894	841	841	841	841	841	841	840	841
Nitrogen, N_2		moles/hr, dry	96,318	96,313	90,686	82,792	74,776	70,297	70,295	70,292	70,290	70,288	70,285	70,284	70,283
Oxygen, O_2		moles/hr, dry	13,176	16,425	15,712	14,339	12,868	12,380	13,159	13,917	14,667	15,408	16,130	16,553	16,740
Carbon Dioxide, CO_2		moles/hr, dry	6,472	4,814	4,407	4,026	3,679	3,315	2,919	2,534	2,154	1,778	1,412	1,197	1,101
Water, H_2O		moles/hr, dry	0	0	0	0	0	0	0	0	0	0	0	0	0
Total			*117,117*	*118,703*	*111,890*	*102,147*	*92,216*	*86,832*	*87,214*	*87,585*	*87,951*	*88,314*	*88,667*	*88,874*	*88,966*
Argon, Ar		vol %	0.88	0.89	0.89	0.89	0.89	0.89	0.89	0.90	0.90	0.90	0.91	0.91	0.91
Nitrogen, N_2		vol %	73.35	74.28	74.36	74.35	74.32	74.43	74.74	75.04	75.34	75.64	75.93	76.10	76.18
Oxygen, O_2		vol %	10.03	12.67	12.88	12.88	12.79	13.11	13.99	14.86	15.72	16.58	17.43	17.92	18.15
Carbon Dioxide, CO_2		vol %	4.93	3.71	3.61	3.62	3.66	3.51	3.10	2.71	2.31	1.91	1.52	1.30	1.19
Water, H_2O		vol %	10.81	8.45	8.26	8.26	8.34	8.06	7.27	6.50	5.73	4.96	4.21	3.77	3.57
Total			*100*	*100*	*100*	*100*	*100*	*100*	*100*	*100*	*100*	*100*	*100*	*100*	*100*

Emissions Summary Startup/Shutdown
Siemens W501F (2 x 2 x 1) Combined Cycle
Natural Gas Operation

SWPC Case		CASE 1	CASE 1	CASE 2	CASE 3	CASE 4	CASE 5	CASE 6	CASE 7	CASE 8	CASE 9	CASE 10	CASE 11	CASE 12
Ambient Conditions		63°F -65% RH	63°F -65% RH	63°F -65% RH	63°F -65% RH	63°F -65% RH	63°F -65% RH	63°F -65% RH	63°F -65% RH	63°F -65% RH	63°F -65% RH	63°F -65% RH	63°F -65% RH	63°F -65% RH
CT Load		BASE	BASE	0.90	0.80	0.70	0.60	0.50	0.40	0.30	0.20	0.10	0.04	FSNL
Duct Burner		FIRED	UNFIRED	UNFIRED	UNFIRED	UNFIRED	UNFIRED	UNFIRED	UNFIRED	UNFIRED	UNFIRED	UNFIRED	UNFIRED	UNFIRED
Evap Cooler		OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF
Molecular weight	lb/lbmol	28.23	28.37	28.39	28.39	28.38	28.40	28.45	28.50	28.54	28.59	28.64	28.67	28.68
Argon, Ar	vol %, dry	0.98	0.97	0.97	0.97	0.97	0.97	0.96	0.96	0.96	0.95	0.95	0.95	0.94
Nitrogen, N_2	vol %, dry	82.24	81.14	81.05	81.05	81.09	80.96	80.60	80.26	79.92	79.59	79.27	79.08	79.00
Oxygen, O_2	vol %, dry	11.25	13.84	14.04	14.04	13.95	14.26	15.09	15.89	16.68	17.45	18.19	18.63	18.82
Carbon Dioxide, CO_2	vol %, dry	5.53	4.06	3.94	3.94	3.99	3.82	3.35	2.89	2.45	2.01	1.59	1.35	1.24
Water, H_2O	vol %, dry	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Total		*100*	*100*	*100*	*100*	*100*	*100*	*100*	*100*	*100*	*100*	*100*	*100*	*100*
Molecular weight (dry)	lb/lbmol	29.46	29.33	29.32	29.32	29.32	29.31	29.27	29.22	29.18	29.14	29.11	29.08	29.07
POST DUCT BURNER EMISSIONS (per CT/HRSG)														
NO_X	ppmvd @ 15% O_2	12.3	9.0	9.0	9.0	9.0	9.0	15.0	45.0	45.0	45.0	50.0	40.0	30.0
NO_X	ppmvd	20.2	10.8	10.5	10.5	10.6	10.1	14.8	38.2	32.2	26.3	23.0	15.4	10.6
NO_X as NO_2	lb/hr	108.7	58.8	53.8	49.2	45.0	40.5	59.3	154.0	130.3	107.0	93.6	63.1	43.4
NO_X as NO_2 METHOD 19 F Factor	lb/hr	109.9	59.5	54.5	49.8	45.5	41.0	60.3	158.3	136.4	114.9	100.8	68.5	47.3
CO	ppmvd @ 15% O_2	12.3	4.0	4.0	4.0	4.0	10.0	150.0	700.0	1500.0	2500.0	3000.0	3600.0	4000.0
CO	ppmvd	20.0	4.8	4.6	4.7	4.7	11.3	147.8	594.4	1073.8	1463.1	1377.4	1388.1	1412.4
CO	lb/hr	65.7	15.9	14.6	13.3	12.2	27.4	360.9	1,458.2	2,645.4	3,619.3	3,420.9	3,455.5	3,519.6
VOC	ppmvd @ 15% O_2	0.6	0.6	0.6	1.2	2.5	2.5	35.0	60.0	125.0	250.0	200.0	185.0	175.0
VOC	ppmvd	1.0	0.7	0.7	1.3	2.9	2.8	34.5	50.9	89.5	146.3	91.8	71.3	61.8
VOC	ppmvw	0.9	0.7	0.6	1.2	2.7	2.6	32.0	47.6	84.4	139.0	88.0	68.6	59.6
VOC	lb/hr	1.8	1.4	1.3	2.2	4.4	3.9	48.2	71.6	126.3	207.3	130.6	101.7	88.2
SO_2	ppmvd @ 15% O_2	0.11	0.11	0.11	0.11	0.11	0.11	0.11	0.11	0.12	0.12	0.12	0.12	0.12
SO_2	ppmvd	0.18	0.13	0.13	0.13	0.13	0.13	0.11	0.10	0.08	0.07	0.05	0.05	0.04
SO_2	lb/hr	1.37	1.02	0.93	0.85	0.78	0.70	0.62	0.54	0.47	0.39	0.31	0.26	0.24
SO_3	ppmvd @ 15% O_2	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
SO_3	ppmvd	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
SO_3	lb/hr	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
PM10														
Front Half	lb/hr	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Back Half	lb/hr	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Total	lb/hr	3.9	3.6	3.6	3.6	3.6	3.6	5.0	5.0	5.0	5.0	5.0	5.0	5.0
OXIDATION CATALYST (per CT/HRSG)														
CO Reduction	% decrease	85	80	80	80	80	80	80	75	70	65	60	50	0
CO	ppmvd @ 15% O_2	1.8	0.8	0.8	0.8	0.8	2.0	30.0	175.0	450.0	875.0	1,200.0	1,800.0	4,000.0
CO	ppmvd	3.0	1.0	0.9	0.9	0.9	2.3	29.6	148.6	322.1	512.1	551.0	694.0	1,412.4
CO	lb/hr	9.9	3.2	2.9	2.7	2.4	5.5	72.2	364.6	793.6	1,266.8	1,368.3	1,727.7	3,519.6
VOC Reduction	% decrease	30	30	30	30	30	30	20	10	0	0	0	0	0
VOC (non-methane, non-ethane)	ppmvd @ 15% O_2	0.4	0.4	0.4	0.8	1.8	1.8	28.0	54.0	125.0	250.0	200.0	185.0	175.0
VOC (non-methane, non-ethane)	ppmvd	0.7	0.5	0.5	0.9	2.1	2.0	27.6	45.9	89.5	146.3	91.8	71.3	61.8
VOC as CH_4	lb/hr	1.3	1.0	0.9	1.5	3.0	2.7	38.6	64.4	126.3	207.3	130.6	101.7	88.2
SO_3 Oxidation	% increase	0	0	0	0	0	0	0	0	0	0	0	0	0
Δ SO_3	ppmvd @ 15% O_2	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Δ SO_3	ppmvd	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Δ SO_3	lb/hr	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
POST SCR EMISSIONS (per CT/HRSG)														
NO_X	ppmvd @ 15% O_2	2.0	2.0	2.0	2.0	2.0	2.0	15.0	45.0	45.0	45.0	50.0	40.0	30.0
NO_X Removal Efficiency	% decrease	83.8	77.8	77.8	77.8	77.8	77.8	0.0	0.0	0.0	0.0	0.0	0.0	0.0
NO_X	ppmvd	3.3	2.4	2.3	2.3	2.4	2.3	14.8	38.2	32.2	26.3	23.0	15.4	10.6
NO_X	lb/hr	17.6	13.1	12.0	10.9	10.0	9.0	59.3	154.0	130.3	107.0	93.6	63.1	43.4
NO_X as NO_2 METHOD 19 F Factor	lb/hr	17.8	13.2	12.1	11.1	10.1	9.1	60.3	158.3	136.4	114.9	100.8	68.5	47.3
NH_3	ppmvd @ 15% O_2	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
NH_3	ppmvd	8.18	5.99	5.81	5.82	5.89	5.63	4.93	4.25	3.58	2.93	2.30	1.93	1.77
NH_3	lb/hr	16.3	12.1	11.1	10.1	9.2	8.3	7.3	6.3	5.4	4.4	3.5	2.9	2.7
NH_3	lbmol/hr	1.0	0.7	0.7	0.6	0.5	0.5	0.4	0.4	0.3	0.3	0.2	0.2	0.2
CO	ppmvd @ 15% O_2	1.8	0.8	0.8	0.8	0.8	2.0	30.0	175.0	450.0	875.0	1200.0	1800.0	4000.0
CO	ppmvd	3.0	1.0	0.9	0.9	0.9	2.3	29.6	148.6	322.1	512.1	551.0	694.0	1412.4
CO	lb/hr	9.9	3.2	2.9	2.7	2.4	5.5	72.2	364.6	793.6	1266.8	1368.3	1727.7	3519.6
VOC	ppmvd @ 15% O_2	0.4	0.4	0.4	0.8	1.8	1.8	28.0	54.0	125.0	250.0	200.0	185.0	175.0
VOC	ppmvd	0.7	0.5	0.5	0.9	2.1	2.0	27.6	45.9	89.5	146.3	91.8	71.3	61.8
VOC	lb/hr	1.3	1.0	0.9	1.5	3.0	2.7	38.6	64.4	126.3	207.3	130.6	101.7	88.2
SO_2	ppmvd @ 15% O_2	0.11	0.11	0.11	0.11	0.11	0.11	0.11	0.11	0.12	0.12	0.12	0.12	0.12
SO_2	ppmvd	0.18	0.13	0.13	0.13	0.13	0.13	0.11	0.10	0.08	0.07	0.05	0.05	0.04
SO_2	lb/hr	1.37	1.02	0.93	0.85	0.78	0.70	0.62	0.54	0.47	0.39	0.31	0.26	0.24
SO_3 Oxidation across SCR	% increase	0	0	0	0	0	0	0	0	0	0	0	0	0
SO_3 Oxidation across SCR	lb/hr	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
SO_3	ppmvd @ 15% O_2	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
SO_3	ppmvd	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
SO_3	lb/hr	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
SO_3	lbmol/hr	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
$(NH_4)_2SO_4$, Ammonium Sulfate	lb/hr	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
PM10														
Front Half	lb/hr	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

Emissions Summary Startup/Shutdown
Siemens W501F (2 x 2 x 1) Combined Cycle
Natural Gas Operation

SWPC Case		CASE 1	CASE 1	CASE 2	CASE 3	CASE 4	CASE 5	CASE 6	CASE 7	CASE 8	CASE 9	CASE 10	CASE 11	CASE 12
Ambient Conditions		63°F -65% RH	63°F -65% RH	63°F -65% RH	63°F -65% RH	63°F -65% RH	63°F -65% RH	63°F -65% RH	63°F -65% RH	63°F -65% RH	63°F -65% RH	63°F -65% RH	63°F -65% RH	63°F -65% RH
CT Load		BASE	BASE	0.90	0.80	0.70	0.60	0.50	0.40	0.30	0.20	0.10	0.04	FSNL
Duct Burner		FIRED	UNFIRED	UNFIRED	UNFIRED	UNFIRED	UNFIRED	UNFIRED	UNFIRED	UNFIRED	UNFIRED	UNFIRED	UNFIRED	UNFIRED
Evap Cooler		OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF
Front Half	lb/MBtu (HHV)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Front Half	grains/scf	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Front Half	grains/dscf	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Back Half	lb/hr	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Total PM10	lb/hr	3.85	3.60	3.60	3.60	3.60	3.60	5.00	5.00	5.00	5.00	5.00	5.00	5.00
Total PM10	grains/scf	0.0005	0.0005	0.0005	0.0006	0.0006	0.0007	0.0010	0.0010	0.0010	0.0010	0.0010	0.0010	0.0010
Total PM10	grains/dscf	0.0006	0.0006	0.0006	0.0006	0.0007	0.0008	0.0010	0.0010	0.0010	0.0010	0.0010	0.0010	0.0010
Aqueous Ammonia (per CT/HRSG)														
Purity	%	29.4	29.4	29.4	29.4	29.4	29.4	29.4	29.4	29.4	29.4	29.4	29.4	29.4
Consumption	lb/hr	170.1	98.8	90.4	82.6	75.5	68.0	24.9	21.5	18.2	15.0	11.8	9.9	9.1
Stack Conditions (per CT/HRSG)														
Internal Diameter	ft	19.0	19.0	19.0	19.0	19.0	19.0	19.0	19.0	19.0	19.0	19.0	19.0	19.0
Flow	lb/hr	3,706,398	3,678,968	3,462,039	3,160,694	2,855,351	2,682,026	2,675,544	2,669,276	2,663,075	2,656,946	2,650,980	2,647,478	2,645,926
Exit Velocity	ft/s	65.4	64.6	59.8	53.9	34.5	45.3	47.0	46.2	45.4	31.8	31.7	31.6	31.6
Temperature	°F	208.6	208.6	198.7	190.2	0.0	183.9	211.3	202.8	192.9	0.0	0.0	0.0	0.0
Flow	acfm	1,112,085	1,098,130	1,017,648	917,088	586,238	770,310	799,759	786,443	771,590	541,459	539,353	538,117	537,569
Flow	scfm	843,396	832,813	783,375	715,194	646,214	606,607	604,091	601,651	599,238	596,854	594,532	593,170	592,566
Flow	dscfm	752,265	762,437	718,675	656,096	592,310	557,731	560,170	562,551	564,907	567,236	569,502	570,832	571,421

Notes:

MBtu = 10^6 Btu

COLD START
EMISSION CALCULATION

COLD START

Time	LEAD CTG - INSTANTANEOUS							LAG CTG - INSTANTANEOUS							LEAD CTG 1-HR AVERAGE						LAG CTG 1-HR AVERAGE						2 CTGs - 1 HR AVERAGE				
	CT Load		NO_X	CO	VOC	SO_2	PM_{10}	CT Load		NO_X	CO	VOC	SO_2	PM_{10}	NO_X	CO	VOC	SO_2	PM_{10}	NO_X	CO	VOC	SO_2	PM_{10}	NO_X	CO	VOC	SO_2	PM_{10}
			lb/hr	lb/hr	lb/hr	lb/hr	lb/hr			lb/hr	lb/hr	lb/hr	lb/hr	lb/hr	lb/hr	lb/hr	lb/hr	lb/hr	lb/hr	lb/hr	lb/hr	lb/hr	lb/hr	lb/hr	lb/hr	lb/hr	lb/hr	lb/hr	lb/hr
0:00	Purge	0%	0	0	0	0	0								0	0	0	0.0	0	0	0	0	0.0	0	0	0	0	0.0	0
0:01	Purge	0%	0	0	0	0	0								0	0	0	0.0	0	0	0	0	0.0	0	0	0	0	0.0	0
0:02	Purge	0%	0	0	0	0	0								0	0	0	0.0	0	0	0	0	0.0	0	0	0	0	0.0	0
0:03	Purge	0%	0	0	0	0	0								0	0	0	0.0	0	0	0	0	0.0	0	0	0	0	0.0	0
0:04	Purge	0%	0	0	0	0	0								0	0	0	0.0	0	0	0	0	0.0	0	0	0	0	0.0	0
0:05	Purge	0%	0	0	0	0	0								0	0	0	0.0	0	0	0	0	0.0	0	0	0	0	0.0	0
0:06	Purge	0%	0	0	0	0	0								0	0	0	0.0	0	0	0	0	0.0	0	0	0	0	0.0	0
0:07	Light Off	0%	2	32	4	0.2	1								0	4	1	0.0	0	0	0	0	0.0	0	0	4	1	0.0	0
0:08	ramp to FSNL	0%	2	32	4	0.2	1								0	7	1	0.1	0	0	0	0	0.0	0	0	7	1	0.1	0
0:09	ramp to FSNL	0%	2	32	4	0.2	1								1	10	1	0.1	0	0	0	0	0.0	0	1	10	1	0.1	0
0:10	ramp to FSNL	0%	2	32	4	0.2	1								1	12	2	0.1	0	0	0	0	0.0	0	1	12	2	0.1	0
0:11	ramp to FSNL	0%	2	32	4	0.2	1								1	13	2	0.1	0	0	0	0	0.0	0	1	13	2	0.1	0
0:12	ramp to FSNL	0%	2	32	4	0.2	1								1	15	2	0.1	0	0	0	0	0.0	0	1	15	2	0.1	0
0:13	ramp to FSNL	0%	2	32	4	0.2	1								1	16	2	0.1	0	0	0	0	0.0	0	1	16	2	0.1	0
0:14	ramp to FSNL	0%	2	32	4	0.2	1								1	17	2	0.1	0	0	0	0	0.0	0	1	17	2	0.1	0
0:15	ramp to FSNL	0%	2	32	4	0.2	1								1	18	2	0.1	0	0	0	0	0.0	0	1	18	2	0.1	0
0:16	ramp to FSNL	0%	2	32	4	0.2	1								1	19	2	0.1	0	0	0	0	0.0	0	1	19	2	0.1	0
0:17	ramp to FSNL	0%	2	32	4	0.2	1								1	20	3	0.1	1	0	0	0	0.0	0	1	20	3	0.1	1
0:18	ramp to FSNL	0%	2	32	4	0.2	1								1	20	3	0.2	1	0	0	0	0.0	0	1	20	3	0.2	1
0:19	ramp to FSNL	0%	2	32	4	0.2	1								1	21	3	0.2	1	0	0	0	0.0	0	1	21	3	0.2	1
0:20	ramp to FSNL	0%	2	32	4	0.2	1								1	21	3	0.2	1	0	0	0	0.0	0	1	21	3	0.2	1
0:21	ramp to FSNL	0%	2	32	4	0.2	1								1	22	3	0.2	1	0	0	0	0.0	0	1	22	3	0.2	1
0:22	ramp to FSNL	0%	2	32	4	0.2	1								1	22	3	0.2	1	0	0	0	0.0	0	1	22	3	0.2	1
0:23	ramp to FSNL	0%	2	32	4	0.2	1								1	23	3	0.2	1	0	0	0	0.0	0	1	23	3	0.2	1
0:24	FSNL	0%	43	3,520	88	0.2	5								3	163	6	0.2	1	0	0	0	0.0	0	3	163	6	0.2	1
0:25	5 MW	3%	53	3,089	97	0.3	5								5	275	10	0.2	1	0	0	0	0.0	0	5	275	10	0.2	1
0:26	10 MW	6%	68	2,444	109	0.3	5								7	356	14	0.2	1	0	0	0	0.0	0	7	356	14	0.2	1
0:27	15 MW	9%	84	1,799	122	0.3	5								10	407	17	0.2	1	0	0	0	0.0	0	10	407	17	0.2	1
0:28	20 MW	12%	95	1,358	138	0.3	5								13	440	22	0.2	1	0	0	0	0.0	0	13	440	22	0.2	1
0:29	20 MW	12%	95	1,358	138	0.3	5								16	471	25	0.2	1	0	0	0	0.0	0	16	471	25	0.2	1
0:30	20 MW	12%	95	1,358	138	0.3	5								18	499	29	0.2	2	0	0	0	0.0	0	18	499	29	0.2	2
0:31	20 MW	12%	95	1,358	138	0.3	5								21	526	33	0.2	2	0	0	0	0.0	0	21	526	33	0.2	2
0:32	20 MW	12%	95	1,358	138	0.3	5								23	551	36	0.2	2	0	0	0	0.0	0	23	551	36	0.2	2
0:33	20 MW	12%	95	1,358	138	0.3	5								25	575	39	0.2	2	0	0	0	0.0	0	25	575	39	0.2	2
0:34	20 MW	12%	95	1,358	138	0.3	5								27	597	42	0.2	2	0	0	0	0.0	0	27	597	42	0.2	2
0:35	20 MW	12%	95	1,358	138	0.3	5								29	618	44	0.2	2	0	0	0	0.0	0	29	618	44	0.2	2
0:36	20 MW	12%	95	1,358	138	0.3	5								31	638	47	0.2	2	0	0	0	0.0	0	31	638	47	0.2	2
0:37	20 MW	12%	95	1,358	138	0.3	5								32	657	49	0.2	2	0	0	0	0.0	0	32	657	49	0.2	2
0:38	20 MW	12%	95	1,358	138	0.3	5								34	675	52	0.2	2	0	0	0	0.0	0	34	675	52	0.2	2
0:39	20 MW	12%	95	1,358	138	0.3	5								35	692	54	0.2	2	0	0	0	0.0	0	35	692	54	0.2	2
0:40	20 MW	12%	95	1,358	138	0.3	5								37	709	56	0.2	2	0	0	0	0.0	0	37	709	56	0.2	2
0:41	20 MW	12%	95	1,358	138	0.3	5								38	724	58	0.2	2	0	0	0	0.0	0	38	724	58	0.2	2
0:42	20 MW	12%	95	1,358	138	0.3	5								40	739	60	0.2	3	0	0	0	0.0	0	40	739	60	0.2	3
0:43	20 MW	12%	95	1,358	138	0.3	5								41	753	61	0.2	3	0	0	0	0.0	0	41	753	61	0.2	3
0:44	20 MW	12%	95	1,358	138	0.3	5								42	766	63	0.2	3	0	0	0	0.0	0	42	766	63	0.2	3
0:45	20 MW	12%	95	1,358	138	0.3	5								43	779	65	0.2	3	0	0	0	0.0	0	43	779	65	0.2	3
0:46	20 MW	12%	95	1,358	138	0.3	5								44	792	66	0.2	3	0	0	0	0.0	0	44	792	66	0.2	3
0:47	20 MW	12%	95	1,358	138	0.3	5								45	803	68	0.2	3	0	0	0	0.0	0	45	803	68	0.2	3
0:48	20 MW	12%	95	1,358	138	0.3	5								46	815	69	0.2	3	0	0	0	0.0	0	46	815	69	0.2	3
0:49	20 MW	12%	95	1,358	138	0.3	5								47	826	71	0.2	3	0	0	0	0.0	0	47	826	71	0.2	3
0:50	20 MW	12%	95	1,358	138	0.3	5								48	836	72	0.2	3	0	0	0	0.0	0	48	836	72	0.2	3
0:51	20 MW	12%	95	1,358	138	0.3	5								49	846	73	0.2	3	0	0	0	0.0	0	49	846	73	0.2	3
0:52	20 MW	12%	95	1,358	138	0.3	5								50	856	74	0.2	3	0	0	0	0.0	0	50	856	74	0.2	3
0:53	20 MW	12%	95	1,358	138	0.3	5								51	865	76	0.2	3	0	0	0	0.0	0	51	865	76	0.2	3
0:54	20 MW	12%	95	1,358	138	0.3	5								52	874	77	0.3	3	0	0	0	0.0	0	52	874	77	0.3	3
0:55	20 MW	12%	95	1,358	138	0.3	5								52	883	78	0.3	3	0	0	0	0.0	0	52	883	78	0.3	3
0:56	20 MW	12%	95	1,358	138	0.3	5								53	891	79	0.3	3	0	0	0	0.0	0	53	891	79	0.3	3
0:57	20 MW	12%	95	1,358	138	0.3	5								54	899	80	0.3	3	0	0	0	0.0	0	54	899	80	0.3	3
0:58	20 MW	12%	95	1,358	138	0.3	5								55	907	81	0.3	3	0	0	0	0.0	0	55	907	81	0.3	3
0:59	20 MW	12%	95	1,358	138	0.3	5								55	914	82	0.3	3	0	0	0	0.0	0	55	914	82	0.3	3
1:00	20 MW	12%	95	1,358	138	0.3	5	Purge	0%	0	0	0	0	0	56	922	83	0.3	3	0	0	0	0.0	0	56	922	83	0.3	3
1:01	20 MW	12%	95	1,358	138	0.3	5	Purge	0%	0	0	0	0	0	58	944	85	0.3	3	0	0	0	0.0	0	58	944	85	0.3	3
1:02	20 MW	12%	95	1,358	138	0.3	5	Purge	0%	0	0	0	0	0	59	966	87	0.3	3	0	0	0	0.0	0	59	966	87	0.3	3
1:03	20 MW	12%	95	1,358	138	0.3	5	Purge	0%	0	0	0	0	0	61	988	90	0.3	4	0	0	0	0.0	0	61	988	90	0.3	4
1:04	20 MW	12%	95	1,358	138	0.3	5	Purge	0%	0	0	0	0	0	62	1,011	92	0.3	4	0	0	0	0.0	0	62	1,011	92	0.3	4
1:05	20 MW	12%	95	1,358	138	0.3	5	Purge	0%	0	0	0	0	0	64	1,033	94	0.3	4	0	0	0	0.0	0	64	1,033	94	0.3	4
1:06	20 MW	12%	95	1,358	138	0.3	5	Purge	0%	0	0	0	0	0	65	1,055	96	0.3	4	0	0	0	0.0	0	65	1,055	96	0.3	4
1:07	20 MW	12%	95	1,358	138	0.3	5	Light Off	0%	2	32	4	0.2	1	67	1,077	99	0.3	4	0	4	1	0.0	0	67	1,082	99	0.3	4
1:08	24 MW	14%	99	1,328	161	0.3	5	ramp to FSNL	0%	2	32	4	0.2	1	68	1,099	101	0.3	4	0	7	1	0.1	0	69	1,106	102	0.3	4
1:09	28 MW	16%	102	1,307	177	0.4	5	ramp to FSNL	0%	2	32	4	0.2	1	70	1,120	104	0.3	4	1	10	1	0.1	0	71	1,129	105	0.4	4
1:10	32 MW	19%	104	1,287	192	0.4	5	ramp to FSNL	0%	2	32	4	0.2	1	72	1,140	107	0.3	4	1	12	2	0.1	0	72	1,152	109	0.4	4
1:11	36 MW	21%	109	1,219	199	0.4	5	ramp to FSNL	0%	2	32	4	0.2	1	74	1,160	110	0.3	4	1	13	2	0.1	0	74	1,173	112	0.4	4
1:12	40 MW	24%	114	1,125	183	0.4	5	ramp to FSNL	0%	2	32	4	0.2	1	75	1,178	113	0.3	4	1	15	2	0.1	0	76	1,192	115	0.4	5
1:13	44 MW	26%	107	1,267	207	0.4	5	ramp to FSNL	0%	2	32	4	0.2	1	77	1,198	117	0.3	4	1	16	2	0.1	0	78	1,214	119	0.4	5
1:14	48 MW	28%	126	888	142	0.5	5	ramp to FSNL	0%	2	32	4	0.2	1	79	1,212	119	0.3	4	1	17	2	0.1	0	80	1,229	121	0.4	5
1:15	52 MW	31%	130	794	126	0.5	5	ramp to FSNL	0%	2	32	4	0.2	1	81	1,224	121	0.3	4	1	18	2	0.1	0	82	1,242	123	0.5	5
1:16	56 MW	33%	135	708	114	0.5	5	ramp to FSNL	0%	2	32	4	0.2	1	83	1,235	123	0.3	4	1	19	2	0.1	0	84	1,254	125	0.5	5

COLD START
EMISSION CALCULATION

COLD START

Time	LEAD CTG - INSTANTANEOUS							LAG CTG - INSTANTANEOUS							LEAD CTG 1-HR AVERAGE					LAG CTG 1-HR AVERAGE					2 CTGs - 1 HR AVERAGE				
	CT Load		NO_X	CO	VOC	SO_2	PM_{10}	CT Load		NO_X	CO	VOC	SO_2	PM_{10}	NO_X	CO	VOC	SO_2	PM_{10}	NO_X	CO	VOC	SO_2	PM_{10}	NO_X	CO	VOC	SO_2	PM_{10}
			lb/hr	lb/hr	lb/hr	lb/hr	lb/hr			lb/hr	lb/hr	lb/hr	lb/hr	lb/hr	lb/hr	lb/hr	lb/hr	lb/hr	lb/hr	lb/hr	lb/hr	lb/hr	lb/hr	lb/hr	lb/hr	lb/hr	lb/hr	lb/hr	lb/hr
1:17	60 MW	35%	142	579	95	0.5	5	ramp to FSNL	0%	2	32	4	0.2	1	86	1,244	124	0.3	5	1	20	3	0.1	1	87	1,264	127	0.5	5
1:18	64 MW	38%	147	493	83	0.5	5	ramp to FSNL	0%	2	32	4	0.2	1	88	1,252	125	0.3	5	1	20	3	0.2	1	89	1,272	128	0.5	5
1:19	68 MW	40%	154	365	64	0.5	5	ramp to FSNL	0%	2	32	4	0.2	1	91	1,257	126	0.3	5	1	21	3	0.2	1	92	1,278	129	0.5	5
1:20	72 MW	42%	135	306	59	0.6	5	ramp to FSNL	0%	2	32	4	0.2	1	93	1,262	127	0.3	5	1	21	3	0.2	1	94	1,283	130	0.5	5
1:21	76 MW	45%	116	248	54	0.6	5	ramp to FSNL	0%	2	32	4	0.2	1	95	1,265	128	0.3	5	1	22	3	0.2	1	96	1,287	131	0.5	5
1:22	80 MW	47%	88	160	46	0.6	5	ramp to FSNL	0%	2	32	4	0.2	1	96	1,267	129	0.3	5	1	22	3	0.2	1	97	1,290	132	0.5	5
1:23	84 MW	49%	69	101	41	0.6	5	ramp to FSNL	0%	2	32	4	0.2	1	97	1,269	129	0.4	5	1	23	3	0.2	1	98	1,291	132	0.5	6
1:24	88 MW	52%	54	66	35	0.6	5	FSNL	0%	43	3,520	88	0.2	5	98	1,269	130	0.4	5	3	163	6	0.2	1	101	1,432	136	0.5	6
1:25	92 MW	54%	39	46	24	0.7	4	5 MW	3%	53	3,089	97	0.3	5	98	1,212	129	0.4	5	5	275	10	0.2	1	103	1,487	139	0.5	6
1:26	96 MW	56%	29	32	17	0.7	4	10 MW	6%	68	2,444	109	0.3	5	98	1,162	128	0.4	5	7	356	14	0.2	1	105	1,518	141	0.6	6
1:27	100 MW	59%	19	19	10	0.7	4	15 MW	9%	84	1,799	122	0.3	5	97	1,122	126	0.4	5	10	407	17	0.2	1	107	1,529	143	0.6	6
1:28	104 MW	61%	9	5	3	0.7	4	20 MW	12%	95	1,358	138	0.3	5	96	1,093	124	0.4	5	13	440	22	0.2	1	108	1,533	146	0.6	6
1:29	108 MW	64%	9	5	3	0.7	4	20 MW	12%	95	1,358	138	0.3	5	94	1,071	122	0.4	5	16	471	25	0.2	1	110	1,541	147	0.6	6
1:30	112 MW	66%	9	4	3	0.7	4	20 MW	12%	95	1,358	138	0.3	5	93	1,049	120	0.4	5	18	499	29	0.2	2	111	1,548	149	0.6	6
1:31	116 MW	68%	10	3	3	0.8	4	20 MW	12%	95	1,358	138	0.3	5	91	1,026	117	0.4	5	21	526	33	0.2	2	112	1,552	150	0.6	7
1:32	120 MW	71%	10	2	3	0.8	4	20 MW	12%	95	1,358	138	0.3	5	90	1,004	115	0.4	5	23	551	36	0.2	2	113	1,555	151	0.6	7
1:33	124 MW	73%	10	2	3	0.8	4	20 MW	12%	95	1,358	138	0.3	5	89	982	113	0.4	5	25	575	39	0.2	2	114	1,557	152	0.6	7
1:34	128 MW	75%	10	2	3	0.8	4	20 MW	12%	95	1,358	138	0.3	5	87	960	111	0.4	5	27	597	42	0.2	2	114	1,557	152	0.6	7
1:35	132 MW	78%	10	2	3	0.8	4	20 MW	12%	95	1,358	138	0.3	5	86	937	109	0.4	5	29	618	44	0.2	2	115	1,556	153	0.7	7
1:36	136 MW	80%	11	3	2	0.9	4	20 MW	12%	95	1,358	138	0.3	5	84	915	106	0.4	5	31	638	47	0.2	2	115	1,554	153	0.7	7
1:37	140 MW	82%	11	3	2	0.9	4	20 MW	12%	95	1,358	138	0.3	5	83	893	104	0.5	5	32	657	49	0.2	2	115	1,550	153	0.7	7
1:38	144 MW	85%	11	3	2	0.9	4	20 MW	12%	95	1,358	138	0.3	5	82	871	102	0.5	5	34	675	52	0.2	2	116	1,546	153	0.7	7
1:39	148 MW	87%	11	3	2	0.9	4	20 MW	12%	95	1,358	138	0.3	5	80	849	100	0.5	5	35	692	54	0.2	2	116	1,541	153	0.7	7
1:40	152 MW	89%	11	3	2	0.9	4	20 MW	12%	95	1,358	138	0.3	5	79	826	97	0.5	5	37	709	56	0.2	2	116	1,535	153	0.7	7
1:41	156 MW	92%	12	3	1	0.9	4	20 MW	12%	95	1,358	138	0.3	5	77	804	95	0.5	5	38	724	58	0.2	2	116	1,528	153	0.7	7
1:42	160 MW	94%	12	3	1	0.9	4	20 MW	12%	95	1,358	138	0.3	5	76	782	93	0.5	5	40	739	60	0.2	3	116	1,521	152	0.7	7
1:43	164 MW	96%	12	3	1	0.9	4	20 MW	12%	95	1,358	138	0.3	5	75	760	91	0.5	5	41	753	61	0.2	3	116	1,513	152	0.7	7
1:44	168 MW	99%	12	3	1	0.9	4	20 MW	12%	95	1,358	138	0.3	5	73	737	88	0.5	5	42	766	63	0.2	3	115	1,504	151	0.8	7
1:45	170 MW	100%	13	3	1	1.0	4	20 MW	12%	95	1,358	138	0.3	5	72	715	86	0.5	5	43	779	65	0.2	3	115	1,495	151	0.8	7
1:46	170 MW	100%	13	3	1	1.0	4	20 MW	12%	95	1,358	138	0.3	5	71	693	84	0.5	5	44	792	66	0.2	3	115	1,485	150	0.8	7
1:47	170 MW	100%	13	3	1	1.0	4	20 MW	12%	95	1,358	138	0.3	5	69	671	82	0.6	4	45	803	68	0.2	3	115	1,474	149	0.8	7
1:48	170 MW	100%	13	3	1	1.0	4	20 MW	12%	95	1,358	138	0.3	5	68	649	79	0.6	4	46	815	69	0.2	3	114	1,463	149	0.8	7
1:49	170 MW	100%	13	3	1	1.0	4	20 MW	12%	95	1,358	138	0.3	5	67	626	77	0.6	4	47	826	71	0.2	3	114	1,452	148	0.8	7
1:50	170 MW	100%	13	3	1	1.0	4	20 MW	12%	95	1,358	138	0.3	5	65	604	75	0.6	4	48	836	72	0.2	3	114	1,440	147	0.8	7
1:51	170 MW	100%	13	3	1	1.0	4	20 MW	12%	95	1,358	138	0.3	5	64	582	73	0.6	4	49	846	73	0.2	3	113	1,428	146	0.8	7
1:52	170 MW	100%	13	3	1	1.0	4	20 MW	12%	95	1,358	138	0.3	5	63	560	70	0.6	4	50	856	74	0.2	3	113	1,415	145	0.9	7
1:53	170 MW	100%	13	3	1	1.0	4	20 MW	12%	95	1,358	138	0.3	5	61	538	68	0.6	4	51	865	76	0.2	3	112	1,403	144	0.9	7
1:54	170 MW	100%	13	3	1	1.0	4	20 MW	12%	95	1,358	138	0.3	5	60	515	66	0.6	4	52	874	77	0.3	3	112	1,389	143	0.9	7
1:55	170 MW	100%	13	3	1	1.0	4	20 MW	12%	95	1,358	138	0.3	5	59	493	64	0.6	4	52	883	78	0.3	3	111	1,376	141	0.9	7
1:56	170 MW	100%	13	3	1	1.0	4	20 MW	12%	95	1,358	138	0.3	5	57	471	61	0.7	4	53	891	79	0.3	3	111	1,362	140	0.9	7
1:57	170 MW	100%	13	3	1	1.0	4	20 MW	12%	95	1,358	138	0.3	5	56	449	59	0.7	4	54	899	80	0.3	3	110	1,348	139	0.9	7
1:58	170 MW	100%	13	3	1	1.0	4	20 MW	12%	95	1,358	138	0.3	5	55	426	57	0.7	4	55	907	81	0.3	3	109	1,333	138	0.9	7
1:59	170 MW	100%	13	3	1	1.0	4	20 MW	12%	95	1,358	138	0.3	5	53	404	55	0.7	4	55	914	82	0.3	3	109	1,319	136	1.0	7
2:00	170 MW	100%	13	3	1	1.0	4	20 MW	12%	95	1,358	138	0.3	5	52	382	52	0.7	4	57	937	84	0.3	3	109	1,319	136	1.0	8
2:01	170 MW	100%	13	3	1	1.0	4	20 MW	12%	95	1,358	138	0.3	5	51	360	50	0.7	4	58	960	86	0.3	3	109	1,319	137	1.0	8
2:02	170 MW	100%	13	3	1	1.0	4	20 MW	12%	95	1,358	138	0.3	5	49	338	48	0.7	4	60	982	89	0.3	3	109	1,320	137	1.0	8
2:03	170 MW	100%	13	3	1	1.0	4	20 MW	12%	95	1,358	138	0.3	5	48	315	46	0.7	4	62	1005	91	0.3	4	110	1,320	137	1.0	8
2:04	170 MW	100%	13	3	1	1.0	4	20 MW	12%	95	1,358	138	0.3	5	47	293	43	0.8	4	63	1028	93	0.3	4	110	1,321	137	1.0	8
2:05	170 MW	100%	13	3	1	1.0	4	20 MW	12%	95	1,358	138	0.3	5	45	271	41	0.8	4	65	1050	96	0.3	4	110	1,321	137	1.1	8
2:06	170 MW	100%	13	3	1	1.0	4	20 MW	12%	95	1,358	138	0.3	5	44	249	39	0.8	4	66	1073	98	0.3	4	110	1,322	137	1.1	8
2:07	170 MW	100%	13	3	1	1.0	4	20 MW	12%	95	1,358	138	0.3	5	43	227	37	0.8	4	68	1095	100	0.3	4	110	1,321	137	1.1	8
2:08	170 MW	100%	13	3	1	1.0	4	24 MW	14%	99	1,328	161	0.3	5	41	204	34	0.8	4	70	1117	103	0.3	4	111	1,321	137	1.1	8
2:09	170 MW	100%	13	3	1	1.0	4	28 MW	16%	102	1,307	177	0.4	5	40	183	32	0.8	4	71	1138	106	0.3	4	111	1,320	137	1.1	8
2:10	170 MW	100%	13	3	1	1.0	4	32 MW	19%	104	1,287	192	0.4	5	38	161	29	0.8	4	73	1159	109	0.3	4	111	1,320	138	1.1	8
2:11	170 MW	100%	13	3	1	1.0	4	36 MW	21%	109	1,219	199	0.4	5	37	140	26	0.8	4	75	1178	112	0.3	4	112	1,319	138	1.1	8
2:12	170 MW	100%	13	3	1	1.0	4	40 MW	24%	114	1,125	183	0.4	5	35	120	22	0.8	4	77	1197	115	0.3	4	112	1,317	137	1.1	8
2:13	170 MW	100%	13	3	1	1.0	4	44 MW	26%	107	1,267	207	0.4	5	34	102	19	0.8	4	78	1217	118	0.3	4	112	1,319	138	1.2	8
2:14	170 MW	100%	13	3	1	1.0	4	48 MW	28%	126	888	142	0.5	5	32	81	16	0.9	4	80	1232	121	0.3	4	112	1,313	137	1.2	8
2:15	170 MW	100%	13	3	1	1.0	4	52 MW	31%	130	794	126	0.5	5	30	67	14	0.9	4	83	1244	123	0.3	4	113	1,311	137	1.2	8
2:16	170 MW	100%	13	3	1	1.0	4	56 MW	33%	135	708	114	0.5	5	28	54	12	0.9	4	85	1255	125	0.3	5	113	1,309	136	1.2	8
2:17	170 MW	100%	13	3	1	1.0	4	60 MW	35%	142	579	95	0.5	5	26	42	10	0.9	4	87	1265	126	0.3	5	113	1,307	136	1.2	8
2:18	170 MW	100%	13	3	1	1.0	4	64 MW	38%	147	493	83	0.5	5	24	33	8	0.9	4	90	1272	127	0.3	5	114	1,305	136	1.2	8
2:19	170 MW	100%	13	3	1	1.0	4	68 MW	40%	154	365	64	0.5	5	22	25	7	0.9	4	92	1278	128	0.3	5	114	1,302	135	1.2	8
2:20	170 MW	100%	13	3	1	1.0	4	72 MW	42%	135	306	59	0.6	5	20	19	6	0.9	4	94	1282	129	0.3	5	114	1,301	135	1.3	9
2:21	170 MW	100%	13	3	1	1.0	4	76 MW	45%	116	248	54	0.6	5	18	14	5	0.9	4	96	1286	130	0.3	5	114	1,300	135	1.3	9
2:22	170 MW	100%	13	3	1	1.0	4	80 MW	47%	88	160	46	0.6	5	16	10	4	0.9	4	98	1288	131	0.4	5	114	1,298	135	1.3	9
2:23	170 MW	100%	13	3	1	1.0	4	84 MW	49%	69	101	41	0.6	5	15	7	3	0.9	4	99	1289	132	0.4	5	114	1,296	135	1.3	9
2:24	170 MW	100%	13	3	1	1.0	4	88 MW	52%	54	66	35	0.6	5	14	6	3	0.9	4	99	1232	131	0.4	5	113	1,237	133	1.3	9
2:25	170 MW	100%	13	3	1	1.0	4	92 MW	54%	39	46	24	0.7	4	13	5	2	0.9	4	99	1181	129	0.4	5	112	1,185	132	1.3	9
2:26	170 MW	100%	13	3	1	1.0	4	96 MW	56%	29	32	17	0.7	4	13	4	2	1.0	4	98	1141	128	0.4	5	111	1,145	130	1.3	9
2:27	170 MW	100%	13	3	1	1.0	4	100 MW	59%	19	19	10	0.7	4	12	3	1	1.0	4	97	1111	126	0.4	5	109	1,114	127	1.3	9
2:28	170 MW	100%	13	3	1	1.0	4	104 MW	61%	9	5	3	0.7	4	12	3	1	1.0	4	96	1089	124	0.4	5	108	1,092	125	1.4	9
2:29	170 MW	100%	13	3	1	1.0	4	108 MW	64%	9	5	3	0.7	4	12	3	1	1.0	4	94	1066	122	0.4	5	107	1,069	123	1.4	9
2:30	170 MW	100%	13	3	1	1.0	4	112 MW	66%	9	4	3	0.7	4	13	3	1	1.0	4	93	1043	119	0.4	5	105	1,046	120	1.4	8
2:31	170 MW	100%	13	3	1	1.0	4	116 MW	68%	10	3	3	0.8	4	13	3	1	1.0	4	91	1021	117	0.4	5	104	1,024	118	1.4	8
2:32	170 MW	100%	13	3	1	1.0	4	120 MW	71%	10	2	3	0.8	4	13	3	1	1.0	4	90	998	115	0.4	5	102	1,001	116	1.4	8
2:33	170 MW	100%	13	3	1	1.0	4	124 MW	73%	10	2	3	0.8	4	13	3	1	1.0	4	88	976	113	0.4	5	101	979	114	1.4	8

COLD START
EMISSION CALCULATION

COLD START

Time	LEAD CTG - INSTANTANEOUS							LAG CTG - INSTANTANEOUS							LEAD CTG 1-HR AVERAGE						LAG CTG 1-HR AVERAGE						2 CTGs - 1 HR AVERAGE				
	CT Load		NO_X	CO	VOC	SO_2	PM_{10}	CT Load		NO_X	CO	VOC	SO_2	PM_{10}	NO_X	CO	VOC	SO_2	PM_{10}	NO_X	CO	VOC	SO_2	PM_{10}	NO_X	CO	VOC	SO_2	PM_{10}
			lb/hr	lb/hr	lb/hr	lb/hr	lb/hr			lb/hr	lb/hr	lb/hr	lb/hr	lb/hr	lb/hr	lb/hr	lb/hr	lb/hr	lb/hr	lb/hr	lb/hr	lb/hr	lb/hr	lb/hr	lb/hr	lb/hr	lb/hr	lb/hr	lb/hr
2:34	170 MW	100%	13	3	1	1.0	4	128 MW	75%	10	2	3	0.8	4	13	3	1	1.0	4	87	953	110	0.4	5	100	956	111	1.4	8
2:35	170 MW	100%	13	3	1	1.0	4	132 MW	78%	10	2	3	0.8	4	13	3	1	1.0	4	86	930	108	0.4	5	98	934	109	1.4	8
2:36	170 MW	100%	13	3	1	1.0	4	136 MW	80%	11	3	2	0.9	4	13	3	1	1.0	4	84	908	106	0.4	5	97	911	107	1.4	8
2:37	170 MW	100%	13	3	1	1.0	4	140 MW	82%	11	3	2	0.9	4	13	3	1	1.0	4	83	885	103	0.5	5	96	888	104	1.5	8
2:38	170 MW	100%	13	3	1	1.0	4	144 MW	85%	11	3	2	0.9	4	13	3	1	1.0	4	81	863	101	0.5	5	94	866	102	1.5	8
2:39	170 MW	100%	13	3	1	1.0	4	148 MW	87%	11	3	2	0.9	4	13	3	1	1.0	4	80	840	99	0.5	5	93	843	100	1.5	8
2:40	170 MW	100%	13	3	1	1.0	4	152 MW	89%	11	3	2	0.9	4	13	3	1	1.0	4	79	817	97	0.5	5	92	821	98	1.5	8
2:41	170 MW	100%	13	3	1	1.0	4	156 MW	92%	12	3	1	0.9	4	13	3	1	1.0	4	77	795	94	0.5	5	90	798	95	1.5	8
2:42	170 MW	100%	13	3	1	1.0	4	160 MW	94%	12	3	1	0.9	4	13	3	1	1.0	4	76	772	92	0.5	5	89	775	93	1.5	8
2:43	170 MW	100%	13	3	1	1.0	4	164 MW	96%	12	3	1	0.9	4	13	3	1	1.0	4	74	750	90	0.5	5	87	753	91	1.5	8
2:44	170 MW	100%	13	3	1	1.0	4	168 MW	99%	12	3	1	0.9	4	13	3	1	1.0	4	73	727	87	0.5	5	86	730	88	1.5	8
2:45	170 MW	100%	13	3	1	1.0	4	170 MW	100%	13	3	1	1.0	4	13	3	1	1.0	4	72	705	85	0.5	5	85	708	86	1.6	8
2:46	170 MW	100%	13	3	1	1.0	4	170 MW	100%	13	3	1	1.0	4	13	3	1	1.0	4	70	682	83	0.5	5	83	685	84	1.6	8
2:47	170 MW	100%	13	3	1	1.0	4	170 MW	100%	13	3	1	1.0	4	13	3	1	1.0	4	69	659	81	0.6	4	82	663	82	1.6	8
2:48	170 MW	100%	13	3	1	1.0	4	170 MW	100%	13	3	1	1.0	4	13	3	1	1.0	4	68	637	78	0.6	4	81	640	79	1.6	8
2:49	170 MW	100%	13	3	1	1.0	4	170 MW	100%	13	3	1	1.0	4	13	3	1	1.0	4	66	614	76	0.6	4	79	617	77	1.6	8
2:50	170 MW	100%	13	3	1	1.0	4	170 MW	100%	13	3	1	1.0	4	13	3	1	1.0	4	65	592	74	0.6	4	78	595	75	1.6	8
2:51	170 MW	100%	13	3	1	1.0	4	170 MW	100%	13	3	1	1.0	4	13	3	1	1.0	4	63	569	71	0.6	4	77	572	72	1.6	8
2:52	170 MW	100%	13	3	1	1.0	4	170 MW	100%	13	3	1	1.0	4	13	3	1	1.0	4	62	546	69	0.6	4	75	550	70	1.6	8
2:53	170 MW	100%	13	3	1	1.0	4	170 MW	100%	13	3	1	1.0	4	13	3	1	1.0	4	61	524	67	0.6	4	74	527	68	1.6	8
2:54	170 MW	100%	13	3	1	1.0	4	170 MW	100%	13	3	1	1.0	4	13	3	1	1.0	4	59	501	65	0.6	4	72	504	66	1.7	8
2:55	170 MW	100%	13	3	1	1.0	4	170 MW	100%	13	3	1	1.0	4	13	3	1	1.0	4	58	479	62	0.7	4	71	482	63	1.7	8
2:56	170 MW	100%	13	3	1	1.0	4	170 MW	100%	13	3	1	1.0	4	13	3	1	1.0	4	57	456	60	0.7	4	70	459	61	1.7	8
2:57	170 MW	100%	13	3	1	1.0	4	170 MW	100%	13	3	1	1.0	4	13	3	1	1.0	4	55	434	58	0.7	4	68	437	59	1.7	8
2:58	170 MW	100%	13	3	1	1.0	4	170 MW	100%	13	3	1	1.0	4	13	3	1	1.0	4	54	411	55	0.7	4	67	414	56	1.7	8
2:59	170 MW	100%	13	3	1	1.0	4	170 MW	100%	13	3	1	1.0	4	13	3	1	1.0	4	53	388	53	0.7	4	66	392	54	1.7	8
3:00	170 MW	100%	13	3	1	1.0	4	170 MW	100%	13	3	1	1.0	4	13	3	1	1.0	4	51	366	51	0.7	4	64	369	52	1.7	8
3:01	170 MW	100%	13	3	1	1.0	4	170 MW	100%	13	3	1	1.0	4	13	3	1	1.0	4	50	343	49	0.7	4	63	346	50	1.7	8
3:02	170 MW	100%	13	3	1	1.0	4	170 MW	100%	13	3	1	1.0	4	13	3	1	1.0	4	48	321	46	0.7	4	62	324	47	1.8	8
3:03	170 MW	100%	13	3	1	1.0	4	170 MW	100%	13	3	1	1.0	4	13	3	1	1.0	4	47	298	44	0.7	4	60	301	45	1.8	8
3:04	170 MW	100%	13	3	1	1.0	4	170 MW	100%	13	3	1	1.0	4	13	3	1	1.0	4	46	275	42	0.8	4	59	279	43	1.8	8
3:05	170 MW	100%	13	3	1	1.0	4	170 MW	100%	13	3	1	1.0	4	13	3	1	1.0	4	44	253	39	0.8	4	57	256	40	1.8	8
3:06	170 MW	100%	13	3	1	1.0	4	170 MW	100%	13	3	1	1.0	4	13	3	1	1.0	4	43	230	37	0.8	4	56	233	38	1.8	8
3:07	170 MW	100%	13	3	1	1.0	4	170 MW	100%	13	3	1	1.0	4	13	3	1	1.0	4	42	208	35	0.8	4	55	211	36	1.8	8
3:08	170 MW	100%	13	3	1	1.0	4	170 MW	100%	13	3	1	1.0	4	13	3	1	1.0	4	40	186	32	0.8	4	53	189	33	1.8	8
3:09	170 MW	100%	13	3	1	1.0	4	170 MW	100%	13	3	1	1.0	4	13	3	1	1.0	4	39	164	29	0.8	4	52	167	30	1.8	8
3:10	170 MW	100%	13	3	1	1.0	4	170 MW	100%	13	3	1	1.0	4	13	3	1	1.0	4	37	142	26	0.8	4	50	146	27	1.8	8
3:11	170 MW	100%	13	3	1	1.0	4	170 MW	100%	13	3	1	1.0	4	13	3	1	1.0	4	36	122	23	0.8	4	49	125	24	1.9	8
3:12	170 MW	100%	13	3	1	1.0	4	170 MW	100%	13	3	1	1.0	4	13	3	1	1.0	4	34	104	20	0.8	4	47	107	21	1.9	8
3:13	170 MW	100%	13	3	1	1.0	4	170 MW	100%	13	3	1	1.0	4	13	3	1	1.0	4	32	82	16	0.9	4	45	86	17	1.9	7
3:14	170 MW	100%	13	3	1	1.0	4	170 MW	100%	13	3	1	1.0	4	13	3	1	1.0	4	30	68	14	0.9	4	44	71	15	1.9	7
3:15	170 MW	100%	13	3	1	1.0	4	170 MW	100%	13	3	1	1.0	4	13	3	1	1.0	4	29	55	12	0.9	4	42	58	13	1.9	7
3:16	170 MW	100%	13	3	1	1.0	4	170 MW	100%	13	3	1	1.0	4	13	3	1	1.0	4	27	43	10	0.9	4	40	46	11	1.9	7
3:17	170 MW	100%	13	3	1	1.0	4	170 MW	100%	13	3	1	1.0	4	13	3	1	1.0	4	24	33	8	0.9	4	37	36	9	1.9	7
3:18	170 MW	100%	13	3	1	1.0	4	170 MW	100%	13	3	1	1.0	4	13	3	1	1.0	4	22	25	7	0.9	4	35	28	8	1.9	7
3:19	170 MW	100%	13	3	1	1.0	4	170 MW	100%	13	3	1	1.0	4	13	3	1	1.0	4	20	19	6	0.9	4	33	22	7	1.9	7
3:20	170 MW	100%	13	3	1	1.0	4	170 MW	100%	13	3	1	1.0	4	13	3	1	1.0	4	18	14	5	0.9	4	31	17	6	1.9	7
3:21	170 MW	100%	13	3	1	1.0	4	170 MW	100%	13	3	1	1.0	4	13	3	1	1.0	4	16	10	4	0.9	4	29	13	5	1.9	7
3:22	170 MW	100%	13	3	1	1.0	4	170 MW	100%	13	3	1	1.0	4	13	3	1	1.0	4	15	7	3	0.9	4	28	10	4	1.9	7
3:23	170 MW	100%	13	3	1	1.0	4	170 MW	100%	13	3	1	1.0	4	13	3	1	1.0	4	14	6	3	0.9	4	27	9	4	2.0	7
3:24	170 MW	100%	13	3	1	1.0	4	170 MW	100%	13	3	1	1.0	4	13	3	1	1.0	4	13	5	2	0.9	4	26	8	3	2.0	7
3:25	170 MW	100%	13	3	1	1.0	4	170 MW	100%	13	3	1	1.0	4	13	3	1	1.0	4	13	4	2	1.0	4	26	7	3	2.0	7
3:26	170 MW	100%	13	3	1	1.0	4	170 MW	100%	13	3	1	1.0	4	13	3	1	1.0	4	12	3	1	1.0	4	26	7	2	2.0	7
3:27	170 MW	100%	13	3	1	1.0	4	170 MW	100%	13	3	1	1.0	4	13	3	1	1.0	4	12	3	1	1.0	4	25	6	2	2.0	7
3:28	170 MW	100%	13	3	1	1.0	4	170 MW	100%	13	3	1	1.0	4	13	3	1	1.0	4	12	3	1	1.0	4	26	6	2	2.0	7
3:29	170 MW	100%	13	3	1	1.0	4	170 MW	100%	13	3	1	1.0	4	13	3	1	1.0	4	13	3	1	1.0	4	26	6	2	2.0	7
3:30	170 MW	100%	13	3	1	1.0	4	170 MW	100%	13	3	1	1.0	4	13	3	1	1.0	4	13	3	1	1.0	4	26	6	2	2.0	7

		NO_X	CO	VOC	SO_2	PM_{10}		NO_X	CO	VOC	SO_2	PM_{10}		NO_X	CO	VOC	SO_2	PM_{10}
LEAD	lb	114	1,304	135	1	9	**LAG**	102	1,301	134	0.5	6	**MAX**	116	1,557	153	2.0	9
TOTAL	lb	216	2,605	270	1.9	15												
	ton	0.1	1.3	0.1	0.0	0.0												

Notes
1) Emissions during 150 minunte cold start-up highlighted in gray
2) Cold-start duration defined as the time needed for both CTGs to ramp to a load > 60%
3) Emissions during normal operation (> 60% CTG load) shown for purposes of evaluating worst case 1-hr emission rates

WARM START
EMISSION CALCULATION

WARM START

Time	LEAD CTG - INSTANTANEOUS							LAG CTG - INSTANTANEOUS						LEAD CTG 1-HR AVERAGE					LAG CTG 1-HR AVERAGE					2 CTGs - 1 HR AVERAGE				
	CT Load		NO_X	CO	VOC	SO_2	PM_{10}	CT Load	NO_X	CO	VOC	SO_2	PM_{10}	NO_X	CO	VOC	SO_2	PM_{10}	NO_X	CO	VOC	SO_2	PM_{10}	NO_X	CO	VOC	SO_2	PM_{10}
			lb/hr	lb/hr	lb/hr	lb/hr	lb/hr		lb/hr	lb/hr	lb/hr	lb/hr	lb/hr	lb/hr	lb/hr	lb/hr	lb/hr	lb/hr	lb/hr	lb/hr	lb/hr	lb/hr	lb/hr	lb/hr	lb/hr	lb/hr	lb/hr	lb/hr
0:00	Purge	0%	0	0	0	0	0							0	0	0	0.0	0	0	0	0	0.0	0	0	0	0	0.0	0
0:01	Purge	0%	0	0	0	0	0							0	0	0	0.0	0	0	0	0	0.0	0	0	0	0	0.0	0
0:02	Purge	0%	0	0	0	0	0							0	0	0	0.0	0	0	0	0	0.0	0	0	0	0	0.0	0
0:03	Purge	0%	0	0	0	0	0							0	0	0	0.0	0	0	0	0	0.0	0	0	0	0	0.0	0
0:04	Purge	0%	0	0	0	0	0							0	0	0	0.0	0	0	0	0	0.0	0	0	0	0	0.0	0
0:05	Purge	0%	0	0	0	0	0							0	0	0	0.0	0	0	0	0	0.0	0	0	0	0	0.0	0
0:06	Purge	0%	0	0	0	0	0							0	0	0	0.0	0	0	0	0	0.0	0	0	0	0	0.0	0
0:07	Light Off	0%	2	32	4	0.2	1							0	4	1	0.0	0	0	0	0	0.0	0	0	4	1	0.0	0
0:08	ramp to FSNL	0%	2	32	4	0.2	1							0	7	1	0.1	0	0	0	0	0.0	0	0	7	1	0.1	0
0:09	ramp to FSNL	0%	2	32	4	0.2	1							1	10	1	0.1	0	0	0	0	0.0	0	1	10	1	0.1	0
0:10	ramp to FSNL	0%	2	32	4	0.2	1							1	12	2	0.1	0	0	0	0	0.0	0	1	12	2	0.1	0
0:11	ramp to FSNL	0%	2	32	4	0.2	1							1	13	2	0.1	0	0	0	0	0.0	0	1	13	2	0.1	0
0:12	ramp to FSNL	0%	2	32	4	0.2	1							1	15	2	0.1	0	0	0	0	0.0	0	1	15	2	0.1	0
0:13	ramp to FSNL	0%	2	32	4	0.2	1							1	16	2	0.1	0	0	0	0	0.0	0	1	16	2	0.1	0
0:14	ramp to FSNL	0%	2	32	4	0.2	1							1	17	2	0.1	0	0	0	0	0.0	0	1	17	2	0.1	0
0:15	ramp to FSNL	0%	2	32	4	0.2	1							1	18	2	0.1	0	0	0	0	0.0	0	1	18	2	0.1	0
0:16	ramp to FSNL	0%	2	32	4	0.2	1							1	19	2	0.1	0	0	0	0	0.0	0	1	19	2	0.1	0
0:17	ramp to FSNL	0%	2	32	4	0.2	1							1	20	3	0.1	1	0	0	0	0.0	0	1	20	3	0.1	1
0:18	ramp to FSNL	0%	2	32	4	0.2	1							1	20	3	0.2	1	0	0	0	0.0	0	1	20	3	0.2	1
0:19	ramp to FSNL	0%	2	32	4	0.2	1							1	21	3	0.2	1	0	0	0	0.0	0	1	21	3	0.2	1
0:20	ramp to FSNL	0%	2	32	4	0.2	1							1	21	3	0.2	1	0	0	0	0.0	0	1	21	3	0.2	1
0:21	ramp to FSNL	0%	2	32	4	0.2	1							1	22	3	0.2	1	0	0	0	0.0	0	1	22	3	0.2	1
0:22	ramp to FSNL	0%	2	32	4	0.2	1							1	22	3	0.2	1	0	0	0	0.0	0	1	22	3	0.2	1
0:23	ramp to FSNL	0%	2	32	4	0.2	1							1	23	3	0.2	1	0	0	0	0.0	0	1	23	3	0.2	1
0:24	FSNL	0%	43	3,520	88	0.2	5							3	163	6	0.2	1	0	0	0	0.0	0	3	163	6	0.2	1
0:25	5 MW	3%	53	3,089	97	0.3	5							5	275	10	0.2	1	0	0	0	0.0	0	5	275	10	0.2	1
0:26	10 MW	6%	68	2,444	109	0.3	5							7	356	14	0.2	1	0	0	0	0.0	0	7	356	14	0.2	1
0:27	15 MW	9%	84	1,799	122	0.3	5							10	407	17	0.2	1	0	0	0	0.0	0	10	407	17	0.2	1
0:28	20 MW	12%	95	1,358	138	0.3	5							13	440	22	0.2	1	0	0	0	0.0	0	13	440	22	0.2	1
0:29	20 MW	12%	95	1,358	138	0.3	5							16	471	25	0.2	1	0	0	0	0.0	0	16	471	25	0.2	1
0:30	20 MW	12%	95	1,358	138	0.3	5							18	499	29	0.2	2	0	0	0	0.0	0	18	499	29	0.2	2
0:31	20 MW	12%	95	1,358	138	0.3	5							21	526	33	0.2	2	0	0	0	0.0	0	21	526	33	0.2	2
0:32	20 MW	12%	95	1,358	138	0.3	5							23	551	36	0.2	2	0	0	0	0.0	0	23	551	36	0.2	2
0:33	20 MW	12%	95	1,358	138	0.3	5							25	575	39	0.2	2	0	0	0	0.0	0	25	575	39	0.2	2
0:34	20 MW	12%	95	1,358	138	0.3	5							27	597	42	0.2	2	0	0	0	0.0	0	27	597	42	0.2	2
0:35	20 MW	12%	95	1,358	138	0.3	5							29	618	44	0.2	2	0	0	0	0.0	0	29	618	44	0.2	2
0:36	20 MW	12%	95	1,358	138	0.3	5							31	638	47	0.2	2	0	0	0	0.0	0	31	638	47	0.2	2
0:37	20 MW	12%	95	1,358	138	0.3	5							32	657	49	0.2	2	0	0	0	0.0	0	32	657	49	0.2	2
0:38	20 MW	12%	95	1,358	138	0.3	5							34	675	52	0.2	2	0	0	0	0.0	0	34	675	52	0.2	2
0:39	20 MW	12%	95	1,358	138	0.3	5							35	692	54	0.2	2	0	0	0	0.0	0	35	692	54	0.2	2
0:40	20 MW	12%	95	1,358	138	0.3	5							37	709	56	0.2	2	0	0	0	0.0	0	37	709	56	0.2	2
0:41	20 MW	12%	95	1,358	138	0.3	5							38	724	58	0.2	2	0	0	0	0.0	0	38	724	58	0.2	2
0:42	20 MW	12%	95	1,358	138	0.3	5							40	739	60	0.2	3	0	0	0	0.0	0	40	739	60	0.2	3
0:43	20 MW	12%	95	1,358	138	0.3	5							41	753	61	0.2	3	0	0	0	0.0	0	41	753	61	0.2	3
0:44	20 MW	12%	95	1,358	138	0.3	5							42	766	63	0.2	3	0	0	0	0.0	0	42	766	63	0.2	3
0:45	20 MW	12%	95	1,358	138	0.3	5	Purge	0%	0	0	0	0	0	43	779	65	0.2	3	0	0	0	0.0	0	43	779	65	0.2	3
0:46	20 MW	12%	95	1,358	138	0.3	5	Purge	0%	0	0	0	0	0	44	792	66	0.2	3	0	0	0	0.0	0	44	792	66	0.2	3
0:47	20 MW	12%	95	1,358	138	0.3	5	Purge	0%	0	0	0	0	0	45	803	68	0.2	3	0	0	0	0.0	0	45	803	68	0.2	3
0:48	20 MW	12%	95	1,358	138	0.3	5	Purge	0%	0	0	0	0	0	46	815	69	0.2	3	0	0	0	0.0	0	46	815	69	0.2	3
0:49	20 MW	12%	95	1,358	138	0.3	5	Purge	0%	0	0	0	0	0	47	826	71	0.2	3	0	0	0	0.0	0	47	826	71	0.2	3
0:50	20 MW	12%	95	1,358	138	0.3	5	Purge	0%	0	0	0	0	0	48	836	72	0.2	3	0	0	0	0.0	0	48	836	72	0.2	3
0:51	20 MW	12%	95	1,358	138	0.3	5	Purge	0%	0	0	0	0	0	49	846	73	0.2	3	0	0	0	0.0	0	49	846	73	0.2	3
0:52	20 MW	12%	95	1,358	138	0.3	5	Light Off	0%	2	32	4	0.2	1	50	856	74	0.2	3	0	4	1	0.0	0	50	860	75	0.3	3
0:53	20 MW	12%	95	1,358	138	0.3	5	ramp to FSNL	0%	2	32	4	0.2	1	51	865	76	0.2	3	0	7	1	0.1	0	51	872	77	0.3	3
0:54	20 MW	12%	95	1,358	138	0.3	5	ramp to FSNL	0%	2	32	4	0.2	1	52	874	77	0.3	3	1	10	1	0.1	0	52	884	78	0.3	3
0:55	20 MW	12%	95	1,358	138	0.3	5	ramp to FSNL	0%	2	32	4	0.2	1	52	883	78	0.3	3	1	12	2	0.1	0	53	894	79	0.3	3
0:56	20 MW	12%	95	1,358	138	0.3	5	ramp to FSNL	0%	2	32	4	0.2	1	53	891	79	0.3	3	1	13	2	0.1	0	54	904	81	0.4	3
0:57	20 MW	12%	95	1,358	138	0.3	5	ramp to FSNL	0%	2	32	4	0.2	1	54	899	80	0.3	3	1	15	2	0.1	0	55	914	82	0.4	4
0:58	25 MW	15%	99	1,328	161	0.3	5	ramp to FSNL	0%	2	32	4	0.2	1	55	906	81	0.3	3	1	16	2	0.1	0	56	922	83	0.4	4
0:59	30 MW	18%	103	1,297	184	0.4	5	ramp to FSNL	0%	2	32	4	0.2	1	56	913	83	0.3	3	1	17	2	0.1	0	56	930	85	0.4	4
1:00	35 MW	21%	107	1,267	207	0.4	5	ramp to FSNL	0%	2	32	4	0.2	1	57	934	86	0.3	3	1	18	2	0.1	0	58	952	89	0.4	4
1:01	40 MW	24%	114	1,125	183	0.4	5	ramp to FSNL	0%	2	32	4	0.2	1	59	953	90	0.3	3	1	19	2	0.1	0	60	972	92	0.4	4
1:02	45 MW	26%	121	983	159	0.4	5	ramp to FSNL	0%	2	32	4	0.2	1	61	969	92	0.3	3	1	20	3	0.1	1	62	989	95	0.4	4
1:03	50 MW	29%	128	841	134	0.5	5	ramp to FSNL	0%	2	32	4	0.2	1	63	983	94	0.3	4	1	20	3	0.2	1	64	1,003	97	0.4	4
1:04	55 MW	32%	135	708	114	0.5	5	ramp to FSNL	0%	2	32	4	0.2	1	66	995	96	0.3	4	1	21	3	0.2	1	67	1,016	99	0.5	4
1:05	60 MW	35%	142	579	95	0.5	5	ramp to FSNL	0%	2	32	4	0.2	1	68	1005	98	0.3	4	1	21	3	0.2	1	69	1,026	101	0.5	4
1:06	65 MW	38%	149	450	77	0.5	5	ramp to FSNL	0%	2	32	4	0.2	1	70	1012	99	0.3	4	1	22	3	0.2	1	72	1,034	102	0.5	4
1:07	70 MW	41%	144	335	62	0.5	5	ramp to FSNL	0%	2	32	4	0.2	1	73	1017	100	0.3	4	1	22	3	0.2	1	74	1,040	103	0.5	4
1:08	75 MW	44%	116	248	54	0.6	5	ramp to FSNL	0%	2	32	4	0.2	1	75	1021	101	0.3	4	1	23	3	0.2	1	76	1,044	104	0.5	5
1:09	80 MW	47%	88	160	46	0.6	5	FSNL	0%	32	32	4	0.2	1	76	1023	102	0.3	4	2	23	3	0.2	1	79	1,046	105	0.5	5
1:10	85 MW	50%	59	72	39	0.6	5	5 MW	3%	53	3,089	97	0.3	5	77	1023	102	0.3	4	4	141	7	0.2	1	82	1,165	109	0.5	5
1:11	90 MW	53%	49	59	31	0.6	5	10 MW	6%	68	2,444	109	0.3	5	78	1024	103	0.3	4	7	226	10	0.2	1	85	1,250	113	0.5	5
1:12	95 MW	56%	34	39	21	0.7	4	15 MW	9%	84	1,799	122	0.3	5	78	1024	103	0.3	4	10	283	14	0.2	1	88	1,307	117	0.5	5
1:13	100 MW	59%	19	19	10	0.7	4	20 MW	12%	95	1,358	138	0.3	5	79	1024	103	0.4	4	13	320	19	0.2	1	91	1,343	122	0.5	5
1:14	105 MW	62%	9	5	3	0.7	4	20 MW	12%	95	1,358	138	0.3	5	79	1023	103	0.4	4	15	354	23	0.2	1	94	1,378	126	0.6	6
1:15	110 MW	65%	9	4	3	0.7	4	20 MW	12%	95	1,358	138	0.3	5	79	1023	103	0.4	4	18	387	26	0.2	1	97	1,410	129	0.6	6
1:16	115 MW	68%	10	3	3	0.8	4	20 MW	12%	95	1,358	138	0.3	5	79	1022	103	0.4	4	20	417	30	0.2	2	99	1,439	133	0.6	6

WARM START
EMISSION CALCULATION

WARM START

Time	LEAD CTG - INSTANTANEOUS							LAG CTG - INSTANTANEOUS							LEAD CTG 1-HR AVERAGE					LAG CTG 1-HR AVERAGE					2 CTGs - 1 HR AVERAGE				
	CT Load		NO_X	CO	VOC	SO_2	PM_{10}	CT Load		NO_X	CO	VOC	SO_2	PM_{10}	NO_X	CO	VOC	SO_2	PM_{10}	NO_X	CO	VOC	SO_2	PM_{10}	NO_X	CO	VOC	SO_2	PM_{10}
			lb/hr	lb/hr	lb/hr	lb/hr	lb/hr			lb/hr	lb/hr	lb/hr	lb/hr	lb/hr	lb/hr	lb/hr	lb/hr	lb/hr	lb/hr	lb/hr	lb/hr	lb/hr	lb/hr	lb/hr	lb/hr	lb/hr	lb/hr	lb/hr	lb/hr
1:17	120 MW	71%	10	2	3	0.8	4	20 MW	12%	95	1,358	138	0.3	5	79	1022	103	0.4	4	23	446	33	0.2	2	102	1,467	136	0.6	6
1:18	125 MW	74%	10	2	3	0.8	4	20 MW	12%	95	1,358	138	0.3	5	79	1021	103	0.4	5	25	472	36	0.2	2	104	1,494	139	0.6	6
1:19	130 MW	76%	10	2	3	0.8	4	20 MW	12%	95	1,358	138	0.3	5	80	1021	103	0.4	5	27	498	39	0.2	2	106	1,519	142	0.6	6
1:20	135 MW	79%	10	2	3	0.8	4	20 MW	12%	95	1,358	138	0.3	5	80	1020	103	0.4	5	29	522	42	0.2	2	108	1,542	145	0.6	7
1:21	140 MW	82%	11	3	2	0.9	4	20 MW	12%	95	1,358	138	0.3	5	80	1020	103	0.4	5	30	544	45	0.2	2	110	1,564	147	0.6	7
1:22	145 MW	85%	11	3	2	0.9	4	20 MW	12%	95	1,358	138	0.3	5	80	1019	103	0.4	5	32	566	47	0.2	2	112	1,585	150	0.7	7
1:23	150 MW	88%	11	3	2	0.9	4	20 MW	12%	95	1,358	138	0.3	5	80	1019	103	0.4	5	34	586	49	0.2	2	114	1,605	152	0.7	7
1:24	155 MW	91%	12	3	1	0.9	4	20 MW	12%	95	1,358	138	0.3	5	80	960	101	0.5	5	35	605	52	0.2	2	115	1,566	153	0.7	7
1:25	160 MW	94%	12	3	1	0.9	4	20 MW	12%	95	1,358	138	0.3	5	79	909	100	0.5	5	37	624	54	0.2	2	116	1,533	153	0.7	7
1:26	165 MW	97%	12	3	1	0.9	4	20 MW	12%	95	1,358	138	0.3	5	78	868	98	0.5	5	38	641	56	0.2	2	116	1,509	154	0.7	7
1:27	170 MW	100%	13	3	1	1.0	4	20 MW	12%	95	1,358	138	0.3	5	77	838	96	0.5	5	39	658	58	0.2	2	116	1,496	154	0.7	7
1:28	170 MW	100%	13	3	1	1.0	4	20 MW	12%	95	1,358	138	0.3	5	75	816	94	0.5	5	41	674	59	0.2	3	116	1,489	153	0.7	7
1:29	170 MW	100%	13	3	1	1.0	4	20 MW	12%	95	1,358	138	0.3	5	74	793	91	0.5	5	42	689	61	0.2	3	116	1,482	153	0.7	7
1:30	170 MW	100%	13	3	1	1.0	4	20 MW	12%	95	1,358	138	0.3	5	73	771	89	0.5	5	43	703	63	0.2	3	116	1,474	152	0.8	7
1:31	170 MW	100%	13	3	1	1.0	4	20 MW	12%	95	1,358	138	0.3	5	71	748	87	0.5	5	44	717	65	0.2	3	115	1,465	151	0.8	7
1:32	170 MW	100%	13	3	1	1.0	4	20 MW	12%	95	1,358	138	0.3	5	70	725	84	0.5	5	45	731	66	0.2	3	115	1,456	151	0.8	7
1:33	170 MW	100%	13	3	1	1.0	4	20 MW	12%	95	1,358	138	0.3	5	69	703	82	0.6	4	46	744	68	0.2	3	115	1,446	150	0.8	7
1:34	170 MW	100%	13	3	1	1.0	4	20 MW	12%	95	1,358	138	0.3	5	67	680	80	0.6	4	47	756	69	0.2	3	114	1,436	149	0.8	7
1:35	170 MW	100%	13	3	1	1.0	4	20 MW	12%	95	1,358	138	0.3	5	66	658	78	0.6	4	48	768	70	0.2	3	114	1,425	148	0.8	7
1:36	170 MW	100%	13	3	1	1.0	4	20 MW	12%	95	1,358	138	0.3	5	65	635	75	0.6	4	49	779	72	0.2	3	113	1,414	147	0.8	7
1:37	170 MW	100%	13	3	1	1.0	4	20 MW	12%	95	1,358	138	0.3	5	63	612	73	0.6	4	50	790	73	0.2	3	113	1,402	146	0.9	7
1:38	170 MW	100%	13	3	1	1.0	4	20 MW	12%	95	1,358	138	0.3	5	62	590	71	0.6	4	51	800	74	0.2	3	112	1,390	145	0.9	7
1:39	170 MW	100%	13	3	1	1.0	4	20 MW	12%	95	1,358	138	0.3	5	60	567	68	0.6	4	51	811	75	0.3	3	112	1,378	144	0.9	7
1:40	170 MW	100%	13	3	1	1.0	4	20 MW	12%	95	1,358	138	0.3	5	59	545	66	0.6	4	52	820	76	0.3	3	111	1,365	143	0.9	7
1:41	170 MW	100%	13	3	1	1.0	4	20 MW	12%	95	1,358	138	0.3	5	58	522	64	0.7	4	53	830	77	0.3	3	111	1,352	141	0.9	7
1:42	170 MW	100%	13	3	1	1.0	4	20 MW	12%	95	1,358	138	0.3	5	56	500	62	0.7	4	54	839	78	0.3	3	110	1,338	140	0.9	7
1:43	170 MW	100%	13	3	1	1.0	4	25 MW	15%	99	1,328	161	0.3	5	55	477	59	0.7	4	55	847	80	0.3	3	109	1,324	139	0.9	7
1:44	170 MW	100%	13	3	1	1.0	4	30 MW	18%	103	1,297	184	0.4	5	54	454	57	0.7	4	55	855	82	0.3	3	109	1,309	139	0.9	7
1:45	170 MW	100%	13	3	1	1.0	4	35 MW	21%	107	1,267	207	0.4	5	52	432	55	0.7	4	57	876	85	0.3	3	109	1,308	140	1.0	7
1:46	170 MW	100%	13	3	1	1.0	4	40 MW	24%	114	1,125	183	0.4	5	51	409	52	0.7	4	59	895	88	0.3	3	110	1,304	141	1.0	8
1:47	170 MW	100%	13	3	1	1.0	4	45 MW	26%	121	983	159	0.4	5	49	387	50	0.7	4	61	911	91	0.3	3	111	1,298	141	1.0	8
1:48	170 MW	100%	13	3	1	1.0	4	50 MW	29%	128	841	134	0.5	5	48	364	48	0.7	4	63	925	93	0.3	4	111	1,289	141	1.0	8
1:49	170 MW	100%	13	3	1	1.0	4	55 MW	32%	135	708	114	0.5	5	47	341	46	0.7	4	65	937	95	0.3	4	112	1,278	140	1.0	8
1:50	170 MW	100%	13	3	1	1.0	4	60 MW	35%	142	579	95	0.5	5	45	319	43	0.8	4	68	946	97	0.3	4	113	1,265	140	1.1	8
1:51	170 MW	100%	13	3	1	1.0	4	65 MW	38%	149	450	77	0.5	5	44	296	41	0.8	4	70	954	98	0.3	4	114	1,250	139	1.1	8
1:52	170 MW	100%	13	3	1	1.0	4	70 MW	41%	144	335	62	0.5	5	43	274	39	0.8	4	73	959	99	0.3	4	115	1,233	137	1.1	8
1:53	170 MW	100%	13	3	1	1.0	4	75 MW	44%	116	248	54	0.6	5	41	251	36	0.8	4	75	963	100	0.3	4	116	1,214	136	1.1	8
1:54	170 MW	100%	13	3	1	1.0	4	80 MW	47%	88	160	46	0.6	5	40	229	34	0.8	4	76	965	100	0.3	4	116	1,193	134	1.1	8
1:55	170 MW	100%	13	3	1	1.0	4	85 MW	50%	59	72	39	0.6	5	39	206	32	0.8	4	77	965	101	0.3	4	116	1,171	133	1.2	8
1:56	170 MW	100%	13	3	1	1.0	4	90 MW	53%	49	59	31	0.6	5	37	183	30	0.8	4	78	966	101	0.3	4	115	1,149	131	1.2	8
1:57	170 MW	100%	13	3	1	1.0	4	95 MW	56%	34	39	21	0.7	4	36	161	27	0.8	4	78	966	102	0.3	4	114	1,127	129	1.2	8
1:58	170 MW	100%	13	3	1	1.0	4	100 MW	59%	19	19	10	0.7	4	34	139	25	0.9	4	79	966	102	0.4	4	113	1,104	126	1.2	8
1:59	170 MW	100%	13	3	1	1.0	4	105 MW	62%	9	5	3	0.7	4	33	117	22	0.9	4	79	965	102	0.4	4	112	1,082	123	1.2	8
2:00	170 MW	100%	13	3	1	1.0	4	110 MW	65%	9	4	3	0.7	4	31	96	18	0.9	4	79	965	102	0.4	4	110	1,061	120	1.2	8
2:01	170 MW	100%	13	3	1	1.0	4	115 MW	68%	10	3	3	0.8	4	30	77	15	0.9	4	79	964	102	0.4	4	109	1,042	117	1.3	8
2:02	170 MW	100%	13	3	1	1.0	4	119 MW	70%	10	2	3	0.8	4	28	61	12	0.9	4	79	964	102	0.4	4	107	1,025	114	1.3	8
2:03	170 MW	100%	13	3	1	1.0	4	123 MW	72%	10	2	3	0.8	4	26	47	10	0.9	4	79	963	102	0.4	4	105	1,010	112	1.3	8
2:04	170 MW	100%	13	3	1	1.0	4	127 MW	75%	10	2	3	0.8	4	24	35	8	0.9	4	79	963	102	0.4	4	103	998	110	1.3	8
2:05	170 MW	100%	13	3	1	1.0	4	131 MW	77%	10	2	3	0.8	4	22	26	7	0.9	4	79	962	102	0.4	5	101	988	108	1.3	8
2:06	170 MW	100%	13	3	1	1.0	4	135 MW	79%	10	2	3	0.8	4	19	18	5	0.9	4	80	962	102	0.4	5	99	980	107	1.4	8
2:07	170 MW	100%	13	3	1	1.0	4	139 MW	82%	11	3	2	0.9	4	17	13	4	0.9	4	80	961	101	0.4	5	97	974	106	1.4	8
2:08	170 MW	100%	13	3	1	1.0	4	143 MW	84%	11	3	2	0.9	4	16	9	4	0.9	4	80	961	101	0.4	5	96	970	105	1.4	8
2:09	170 MW	100%	13	3	1	1.0	4	147 MW	86%	11	3	2	0.9	4	14	6	3	0.9	4	80	960	101	0.5	5	94	966	104	1.4	8
2:10	170 MW	100%	13	3	1	1.0	4	151 MW	89%	11	3	2	0.9	4	14	5	2	1.0	4	79	909	100	0.5	5	92	914	102	1.4	8
2:11	170 MW	100%	13	3	1	1.0	4	155 MW	91%	12	3	1	0.9	4	13	4	2	1.0	4	78	868	98	0.5	5	91	872	100	1.4	8
2:12	170 MW	100%	13	3	1	1.0	4	159 MW	94%	12	3	1	0.9	4	13	3	1	1.0	4	77	838	96	0.5	5	89	842	97	1.5	8
2:13	170 MW	100%	13	3	1	1.0	4	163 MW	96%	12	3	1	0.9	4	13	3	1	1.0	4	75	816	94	0.5	5	88	819	95	1.5	8
2:14	170 MW	100%	13	3	1	1.0	4	167 MW	98%	12	3	1	0.9	4	13	3	1	1.0	4	74	793	91	0.5	5	87	796	93	1.5	8
2:15	170 MW	100%	13	3	1	1.0	4	170 MW	100%	13	3	1	1.0	4	13	3	1	1.0	4	73	771	89	0.5	5	85	774	90	1.5	8
2:16	170 MW	100%	13	3	1	1.0	4	170 MW	100%	13	3	1	1.0	4	13	3	1	1.0	4	71	748	87	0.5	5	84	751	88	1.5	8
2:17	170 MW	100%	13	3	1	1.0	4	170 MW	100%	13	3	1	1.0	4	13	3	1	1.0	4	70	725	85	0.5	5	83	728	86	1.5	8
2:18	170 MW	100%	13	3	1	1.0	4	170 MW	100%	13	3	1	1.0	4	13	3	1	1.0	4	68	703	82	0.6	4	81	706	83	1.5	8
2:19	170 MW	100%	13	3	1	1.0	4	170 MW	100%	13	3	1	1.0	4	13	3	1	1.0	4	67	680	80	0.6	4	80	683	81	1.6	8
2:20	170 MW	100%	13	3	1	1.0	4	170 MW	100%	13	3	1	1.0	4	13	3	1	1.0	4	66	658	78	0.6	4	79	661	79	1.6	8
2:21	170 MW	100%	13	3	1	1.0	4	170 MW	100%	13	3	1	1.0	4	13	3	1	1.0	4	64	635	75	0.6	4	77	638	76	1.6	8
2:22	170 MW	100%	13	3	1	1.0	4	170 MW	100%	13	3	1	1.0	4	13	3	1	1.0	4	63	612	73	0.6	4	76	616	74	1.6	8
2:23	170 MW	100%	13	3	1	1.0	4	170 MW	100%	13	3	1	1.0	4	13	3	1	1.0	4	62	590	71	0.6	4	75	593	72	1.6	8
2:24	170 MW	100%	13	3	1	1.0	4	170 MW	100%	13	3	1	1.0	4	13	3	1	1.0	4	60	567	68	0.6	4	73	570	69	1.6	8
2:25	170 MW	100%	13	3	1	1.0	4	170 MW	100%	13	3	1	1.0	4	13	3	1	1.0	4	59	545	66	0.6	4	72	548	67	1.7	8
2:26	170 MW	100%	13	3	1	1.0	4	170 MW	100%	13	3	1	1.0	4	13	3	1	1.0	4	58	522	64	0.6	4	71	525	65	1.7	8
2:27	170 MW	100%	13	3	1	1.0	4	170 MW	100%	13	3	1	1.0	4	13	3	1	1.0	4	56	500	62	0.7	4	69	503	63	1.7	8
2:28	170 MW	100%	13	3	1	1.0	4	170 MW	100%	13	3	1	1.0	4	13	3	1	1.0	4	55	477	59	0.7	4	68	480	60	1.7	8
2:29	170 MW	100%	13	3	1	1.0	4	170 MW	100%	13	3	1	1.0	4	13	3	1	1.0	4	53	454	57	0.7	4	67	458	58	1.7	8
2:30	170 MW	100%	13	3	1	1.0	4	170 MW	100%	13	3	1	1.0	4	13	3	1	1.0	4	52	432	55	0.7	4	65	435	56	1.7	8
2:31	170 MW	100%	13	3	1	1.0	4	170 MW	100%	13	3	1	1.0	4	13	3	1	1.0	4	51	409	52	0.7	4	64	412	53	1.7	8
2:32	170 MW	100%	13	3	1	1.0	4	170 MW	100%	13	3	1	1.0	4	13	3	1	1.0	4	49	387	50	0.7	4	62	390	51	1.7	8
2:33	170 MW	100%	13	3	1	1.0	4	170 MW	100%	13	3	1	1.0	4	13	3	1	1.0	4	48	364	48	0.7	4	61	367	49	1.7	8

WARM START
EMISSION CALCULATION

WARM START

Time	LEAD CTG - INSTANTANEOUS							LAG CTG - INSTANTANEOUS							LEAD CTG 1-HR AVERAGE						LAG CTG 1-HR AVERAGE						2 CTGs - 1 HR AVERAGE				
	CT Load		NO_X	CO	VOC	SO_2	PM_{10}	CT Load		NO_X	CO	VOC	SO_2	PM_{10}	NO_X	CO	VOC	SO_2	PM_{10}	NO_X	CO	VOC	SO_2	PM_{10}	NO_X	CO	VOC	SO_2	PM_{10}
			lb/hr	lb/hr	lb/hr	lb/hr	lb/hr			lb/hr	lb/hr	lb/hr	lb/hr	lb/hr	lb/hr	lb/hr	lb/hr	lb/hr	lb/hr	lb/hr	lb/hr	lb/hr	lb/hr	lb/hr	lb/hr	lb/hr	lb/hr	lb/hr	lb/hr
2:34	170 MW	100%	13	3	1	1.0	4	170 MW	100%	13	3	1	1.0	4	13	3	1	1.0	4	47	341	46	0.7	4	60	345	47	1.8	8
2:35	170 MW	100%	13	3	1	1.0	4	170 MW	100%	13	3	1	1.0	4	13	3	1	1.0	4	45	319	43	0.8	4	58	322	44	1.8	8
2:36	170 MW	100%	13	3	1	1.0	4	170 MW	100%	13	3	1	1.0	4	13	3	1	1.0	4	44	296	41	0.8	4	57	299	42	1.8	8
2:37	170 MW	100%	13	3	1	1.0	4	170 MW	100%	13	3	1	1.0	4	13	3	1	1.0	4	43	274	39	0.8	4	56	277	40	1.8	8
2:38	170 MW	100%	13	3	1	1.0	4	170 MW	100%	13	3	1	1.0	4	13	3	1	1.0	4	41	251	36	0.8	4	54	254	37	1.8	8
2:39	170 MW	100%	13	3	1	1.0	4	170 MW	100%	13	3	1	1.0	4	13	3	1	1.0	4	40	229	34	0.8	4	53	232	35	1.8	8
2:40	170 MW	100%	13	3	1	1.0	4	170 MW	100%	13	3	1	1.0	4	13	3	1	1.0	4	38	206	32	0.8	4	52	209	33	1.8	8
2:41	170 MW	100%	13	3	1	1.0	4	170 MW	100%	13	3	1	1.0	4	13	3	1	1.0	4	37	183	30	0.8	4	50	187	31	1.8	8
2:42	170 MW	100%	13	3	1	1.0	4	170 MW	100%	13	3	1	1.0	4	13	3	1	1.0	4	36	161	27	0.8	4	49	164	28	1.8	8
2:43	170 MW	100%	13	3	1	1.0	4	170 MW	100%	13	3	1	1.0	4	13	3	1	1.0	4	34	139	25	0.8	4	47	142	26	1.9	8
2:44	170 MW	100%	13	3	1	1.0	4	170 MW	100%	13	3	1	1.0	4	13	3	1	1.0	4	33	117	22	0.9	4	46	120	23	1.9	7
2:45	170 MW	100%	13	3	1	1.0	4	170 MW	100%	13	3	1	1.0	4	13	3	1	1.0	4	31	96	18	0.9	4	44	99	19	1.9	7
2:46	170 MW	100%	13	3	1	1.0	4	170 MW	100%	13	3	1	1.0	4	13	3	1	1.0	4	30	77	15	0.9	4	43	81	16	1.9	7
2:47	170 MW	100%	13	3	1	1.0	4	170 MW	100%	13	3	1	1.0	4	13	3	1	1.0	4	28	61	12	0.9	4	41	64	13	1.9	7
2:48	170 MW	100%	13	3	1	1.0	4	170 MW	100%	13	3	1	1.0	4	13	3	1	1.0	4	26	47	10	0.9	4	39	50	11	1.9	7
2:49	170 MW	100%	13	3	1	1.0	4	170 MW	100%	13	3	1	1.0	4	13	3	1	1.0	4	24	35	8	0.9	4	37	39	9	1.9	7
2:50	170 MW	100%	13	3	1	1.0	4	170 MW	100%	13	3	1	1.0	4	13	3	1	1.0	4	22	26	7	0.9	4	35	29	8	1.9	7
2:51	170 MW	100%	13	3	1	1.0	4	170 MW	100%	13	3	1	1.0	4	13	3	1	1.0	4	19	18	6	0.9	4	32	21	6	1.9	7
2:52	170 MW	100%	13	3	1	1.0	4	170 MW	100%	13	3	1	1.0	4	13	3	1	1.0	4	17	13	5	0.9	4	30	16	5	1.9	7
2:53	170 MW	100%	13	3	1	1.0	4	170 MW	100%	13	3	1	1.0	4	13	3	1	1.0	4	15	9	4	0.9	4	29	12	5	2.0	7
2:54	170 MW	100%	13	3	1	1.0	4	170 MW	100%	13	3	1	1.0	4	13	3	1	1.0	4	14	6	3	0.9	4	27	9	4	2.0	7
2:55	170 MW	100%	13	3	1	1.0	4	170 MW	100%	13	3	1	1.0	4	13	3	1	1.0	4	13	5	2	0.9	4	27	8	3	2.0	7
2:56	170 MW	100%	13	3	1	1.0	4	170 MW	100%	13	3	1	1.0	4	13	3	1	1.0	4	13	4	2	1.0	4	26	7	3	2.0	7
2:57	170 MW	100%	13	3	1	1.0	4	170 MW	100%	13	3	1	1.0	4	13	3	1	1.0	4	13	3	1	1.0	4	26	7	2	2.0	7
2:58	170 MW	100%	13	3	1	1.0	4	170 MW	100%	13	3	1	1.0	4	13	3	1	1.0	4	12	3	1	1.0	4	25	6	2	2.0	7
2:59	170 MW	100%	13	3	1	1.0	4	170 MW	100%	13	3	1	1.0	4	13	3	1	1.0	4	12	3	1	1.0	4	26	6	2	2.0	7
3:00	170 MW	100%	13	3	1	1.0	4	170 MW	100%	13	3	1	1.0	4	13	3	1	1.0	4	13	3	1	1.0	4	26	6	2	2.0	7
3:01	170 MW	100%	13	3	1	1.0	4	170 MW	100%	13	3	1	1.0	4	13	3	1	1.0	4	13	3	1	1.0	4	26	6	2	2.0	7
3:02	170 MW	100%	13	3	1	1.0	4	170 MW	100%	13	3	1	1.0	4	13	3	1	1.0	4	13	3	1	1.0	4	26	6	2	2.0	7
3:03	170 MW	100%	13	3	1	1.0	4	170 MW	100%	13	3	1	1.0	4	13	3	1	1.0	4	13	3	1	1.0	4	26	6	2	2.0	7
3:04	170 MW	100%	13	3	1	1.0	4	170 MW	100%	13	3	1	1.0	4	13	3	1	1.0	4	13	3	1	1.0	4	26	6	2	2.0	7
3:05	170 MW	100%	13	3	1	1.0	4	170 MW	100%	13	3	1	1.0	4	13	3	1	1.0	4	13	3	1	1.0	4	26	6	2	2.0	7
3:06	170 MW	100%	13	3	1	1.0	4	170 MW	100%	13	3	1	1.0	4	13	3	1	1.0	4	13	3	1	1.0	4	26	6	2	2.0	7
3:07	170 MW	100%	13	3	1	1.0	4	170 MW	100%	13	3	1	1.0	4	13	3	1	1.0	4	13	3	1	1.0	4	26	6	2	2.0	7
3:08	170 MW	100%	13	3	1	1.0	4	170 MW	100%	13	3	1	1.0	4	13	3	1	1.0	4	13	3	1	1.0	4	26	6	2	2.0	7
3:09	170 MW	100%	13	3	1	1.0	4	170 MW	100%	13	3	1	1.0	4	13	3	1	1.0	4	13	3	1	1.0	4	26	6	2	2.0	7
3:10	170 MW	100%	13	3	1	1.0	4	170 MW	100%	13	3	1	1.0	4	13	3	1	1.0	4	13	3	1	1.0	4	26	6	2	2.0	7
3:11	170 MW	100%	13	3	1	1.0	4	170 MW	100%	13	3	1	1.0	4	13	3	1	1.0	4	13	3	1	1.0	4	26	6	2	2.0	7
3:12	170 MW	100%	13	3	1	1.0	4	170 MW	100%	13	3	1	1.0	4	13	3	1	1.0	4	13	3	1	1.0	4	26	6	2	2.0	7
3:13	170 MW	100%	13	3	1	1.0	4	170 MW	100%	13	3	1	1.0	4	13	3	1	1.0	4	13	3	1	1.0	4	26	6	2	2.0	7
3:14	170 MW	100%	13	3	1	1.0	4	170 MW	100%	13	3	1	1.0	4	13	3	1	1.0	4	13	3	1	1.0	4	26	6	2	2.0	7
3:15	170 MW	100%	13	3	1	1.0	4	170 MW	100%	13	3	1	1.0	4	13	3	1	1.0	4	13	3	1	1.0	4	26	6	2	2.0	7
3:16	170 MW	100%	13	3	1	1.0	4	170 MW	100%	13	3	1	1.0	4	13	3	1	1.0	4	13	3	1	1.0	4	26	6	2	2.0	7
3:17	170 MW	100%	13	3	1	1.0	4	170 MW	100%	13	3	1	1.0	4	13	3	1	1.0	4	13	3	1	1.0	4	26	6	2	2.0	7
3:18	170 MW	100%	13	3	1	1.0	4	170 MW	100%	13	3	1	1.0	4	13	3	1	1.0	4	13	3	1	1.0	4	26	6	2	2.0	7
3:19	170 MW	100%	13	3	1	1.0	4	170 MW	100%	13	3	1	1.0	4	13	3	1	1.0	4	13	3	1	1.0	4	26	6	2	2.0	7
3:20	170 MW	100%	13	3	1	1.0	4	170 MW	100%	13	3	1	1.0	4	13	3	1	1.0	4	13	3	1	1.0	4	26	6	2	2.0	7
3:21	170 MW	100%	13	3	1	1.0	4	170 MW	100%	13	3	1	1.0	4	13	3	1	1.0	4	13	3	1	1.0	4	26	6	2	2.0	7
3:22	170 MW	100%	13	3	1	1.0	4	170 MW	100%	13	3	1	1.0	4	13	3	1	1.0	4	13	3	1	1.0	4	26	6	2	2.0	7
3:23	170 MW	100%	13	3	1	1.0	4	170 MW	100%	13	3	1	1.0	4	13	3	1	1.0	4	13	3	1	1.0	4	26	6	2	2.0	7
3:24	170 MW	100%	13	3	1	1.0	4	170 MW	100%	13	3	1	1.0	4	13	3	1	1.0	4	13	3	1	1.0	4	26	6	2	2.0	7
3:25	170 MW	100%	13	3	1	1.0	4	170 MW	100%	13	3	1	1.0	4	13	3	1	1.0	4	13	3	1	1.0	4	26	6	2	2.0	7
3:26	170 MW	100%	13	3	1	1.0	4	170 MW	100%	13	3	1	1.0	4	13	3	1	1.0	4	13	3	1	1.0	4	26	6	2	2.0	7
3:27	170 MW	100%	13	3	1	1.0	4	170 MW	100%	13	3	1	1.0	4	13	3	1	1.0	4	13	3	1	1.0	4	26	6	2	2.0	7
3:28	170 MW	100%	13	3	1	1.0	4	170 MW	100%	13	3	1	1.0	4	13	3	1	1.0	4	13	3	1	1.0	4	26	6	2	2.0	7
3:29	170 MW	100%	13	3	1	1.0	4	170 MW	100%	13	3	1	1.0	4	13	3	1	1.0	4	13	3	1	1.0	4	26	6	2	2.0	7
3:30	170 MW	100%	13	3	1	1.0	4	170 MW	100%	13	3	1	1.0	4	13	3	1	1.0	4	13	3	1	1.0	4	26	6	2	2.0	7

		NO_X	CO	VOC	SO_2	PM_{10}		NO_X	CO	VOC	SO_2	PM_{10}		NO_X	CO	VOC	SO_2	PM_{10}
LEAD	lb	88	1,030	105	1	7	**LAG**	79	970	102	0	4	**MAX**	116	1,605	154	2.0	8
TOTAL	lb	167	2,000	207	2	11												
	ton	0.1	1.0	0.1	0.0	0.0												

Notes
1) Emissions during 120 minute warm start-up highlighted in gray
2) Warm-start duration defined as the time needed for both CTGs to ramp to a load > 60%
3) Emissions during normal operation (> 60% CTG load) shown for purposes of evaluating worst case 1-hr emission rates

HOT START
EMISSION CALCULATION

HOT

Time	LEAD CTG - INSTANTANEOUS							LAG CTG - INSTANTANEOUS							LEAD CTG 1-HR AVERAGE					LAG CTG 1-HR AVERAGE					2 CTGs - 1 HR AVERAGE				
	CT Load		NO_X	CO	VOC	SO_2	PM_{10}	CT Load		NO_X	CO	VOC	SO_2	PM_{10}	NO_X	CO	VOC	SO_2	PM_{10}	NO_X	CO	VOC	SO_2	PM_{10}	NO_X	CO	VOC	SO_2	PM_{10}
			lb/hr	lb/hr	lb/hr	lb/hr	lb/hr			lb/hr	lb/hr	lb/hr	lb/hr	lb/hr	lb/hr	lb/hr	lb/hr	lb/hr	lb/hr	lb/hr	lb/hr	lb/hr	lb/hr	lb/hr	lb/hr	lb/hr	lb/hr	lb/hr	lb/hr
0:00	Purge	0%	0	0	0	0	0	Purge	0%	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0	0
0:01	Purge	0%	0	0	0	0	0	Purge	0%	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0	0
0:02	Purge	0%	0	0	0	0	0	Purge	0%	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0	0
0:03	Purge	0%	0	0	0	0	0	Purge	0%	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0	0
0:04	Purge	0%	0	0	0	0	0	Purge	0%	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0	0
0:05	Purge	0%	0	0	0	0	0	Purge	0%	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0	0
0:06	Purge	0%	0	0	0	0	0	Purge	0%	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0	0
0:07	Light Off	0%	2	32	4	0.2	1	Light Off	0%	2	32	4	0.2	1	0	4	1	0	0	0	4	1	0	0	0	8	1	0.1	0
0:08	ramp to FSNL	0%	2	32	4	0.2	1	ramp to FSNL	0%	2	32	4	0.2	1	0	7	1	0	0	0	7	1	0	0	1	14	2	0.1	0
0:09	ramp to FSNL	0%	2	32	4	0.2	1	ramp to FSNL	0%	2	32	4	0.2	1	1	10	1	0	0	1	10	1	0	0	1	19	3	0.1	1
0:10	ramp to FSNL	0%	2	32	4	0.2	1	ramp to FSNL	0%	2	32	4	0.2	1	1	12	2	0	0	1	12	2	0	0	1	23	3	0.2	1
0:11	ramp to FSNL	0%	2	32	4	0.2	1	ramp to FSNL	0%	2	32	4	0.2	1	1	13	2	0	0	1	13	2	0	0	1	27	4	0.2	1
0:12	ramp to FSNL	0%	2	32	4	0.2	1	ramp to FSNL	0%	2	32	4	0.2	1	1	15	2	0	0	1	15	2	0	0	2	30	4	0.2	1
0:13	ramp to FSNL	0%	2	32	4	0.2	1	ramp to FSNL	0%	2	32	4	0.2	1	1	16	2	0	0	1	16	2	0	0	2	32	4	0.2	1
0:14	ramp to FSNL	0%	2	32	4	0.2	1	ramp to FSNL	0%	2	32	4	0.2	1	1	17	2	0	0	1	17	2	0	0	2	34	5	0.3	1
0:15	ramp to FSNL	0%	2	32	4	0.2	1	ramp to FSNL	0%	2	32	4	0.2	1	1	18	2	0	0	1	18	2	0	0	2	36	5	0.3	1
0:16	ramp to FSNL	0%	2	32	4	0.2	1	ramp to FSNL	0%	2	32	4	0.2	1	1	19	2	0	0	1	19	2	0	0	2	38	5	0.3	1
0:17	ramp to FSNL	0%	2	32	4	0.2	1	ramp to FSNL	0%	2	32	4	0.2	1	1	20	3	0	1	1	20	3	0	1	2	39	5	0.3	1
0:18	ramp to FSNL	0%	2	32	4	0.2	1	ramp to FSNL	0%	2	32	4	0.2	1	1	20	3	0	1	1	20	3	0	1	2	41	5	0.3	1
0:19	ramp to FSNL	0%	2	32	4	0.2	1	ramp to FSNL	0%	2	32	4	0.2	1	1	21	3	0	1	1	21	3	0	1	2	42	5	0.3	1
0:20	ramp to FSNL	0%	2	32	4	0.2	1	ramp to FSNL	0%	2	32	4	0.2	1	1	21	3	0	1	1	21	3	0	1	2	43	6	0.3	1
0:21	ramp to FSNL	0%	2	32	4	0.2	1	ramp to FSNL	0%	2	32	4	0.2	1	1	22	3	0	1	1	22	3	0	1	2	44	6	0.3	1
0:22	ramp to FSNL	0%	2	32	4	0.2	1	ramp to FSNL	0%	2	32	4	0.2	1	1	22	3	0	1	1	22	3	0	1	2	45	6	0.3	1
0:23	ramp to FSNL	0%	2	32	4	0.2	1	ramp to FSNL	0%	2	32	4	0.2	1	1	23	3	0	1	1	23	3	0	1	3	46	6	0.3	1
0:24	FSNL	0%	43	3,520	88	0.2	5	FSNL	0%	43	3,520	88	0.2	5	3	163	6	0	1	3	163	6	0	1	6	325	13	0.3	2
0:25	7 MW	4%	63	2,659	105	0.3	5	7 MW	4%	63	2,659	105	0.3	5	5	259	10	0	1	5	259	10	0	1	11	517	20	0.4	2
0:26	14 MW	8%	84	1,799	122	0.3	5	14 MW	8%	84	1,799	122	0.3	5	8	316	14	0	1	8	316	14	0	1	16	631	29	0.4	2
0:27	21 MW	12%	96	1,348	146	0.3	5	21 MW	12%	96	1,348	146	0.3	5	11	353	19	0	1	11	353	19	0	1	23	705	38	0.4	2
0:28	28 MW	16%	102	1,307	177	0.4	5	28 MW	16%	102	1,307	177	0.4	5	14	386	24	0	1	14	386	24	0	1	29	771	49	0.4	3
0:29	35 MW	21%	107	1,267	207	0.4	5	35 MW	21%	107	1,267	207	0.4	5	18	415	31	0	1	18	415	31	0	1	35	830	61	0.4	3
0:30	42 MW	25%	107	1,267	207	0.4	5	42 MW	25%	107	1,267	207	0.4	5	20	442	36	0	2	20	442	36	0	2	41	885	73	0.4	3
0:31	49 MW	29%	126	888	142	0.5	5	49 MW	29%	126	888	142	0.5	5	24	456	40	0	2	24	456	40	0	2	47	913	79	0.4	3
0:32	56 MW	33%	135	708	114	0.5	5	56 MW	33%	135	708	114	0.5	5	27	464	42	0	2	27	464	42	0	2	54	928	84	0.4	4
0:33	63 MW	37%	147	493	83	0.5	5	63 MW	37%	147	493	83	0.5	5	31	465	43	0	2	31	465	43	0	2	61	930	86	0.5	4
0:34	70 MW	41%	144	335	62	0.5	5	70 MW	41%	144	335	62	0.5	5	34	461	44	0	2	34	461	44	0	2	68	922	87	0.5	4
0:35	77 MW	45%	107	218	52	0.6	5	77 MW	45%	107	218	52	0.6	5	36	454	44	0	2	36	454	44	0	2	72	909	88	0.5	4
0:36	84 MW	49%	69	101	41	0.6	5	84 MW	49%	69	101	41	0.6	5	37	445	44	0	2	37	445	44	0	2	74	890	87	0.5	4
0:37	91 MW	54%	44	52	28	0.6	5	91 MW	54%	44	52	28	0.6	5	37	434	43	0	2	37	434	43	0	2	74	869	87	0.5	4
0:38	98 MW	58%	24	25	13	0.7	4.0	98 MW	58%	24	25	13	0.7	4.0	37	424	43	0	2	37	424	43	0	2	73	848	85	0.6	5
0:39	105 MW	62%	9	5	3	0.7	3.6	105 MW	62%	9	5	3	0.7	3.6	36	414	42	0	2	36	414	42	0	2	72	827	83	0.6	5
0:40	112 MW	66%	9	4	3	0.7	3.6	112 MW	66%	9	4	3	0.7	3.6	35	404	41	0	2	35	404	41	0	2	71	807	81	0.6	5
0:41	119 MW	70%	10	2	3	0.8	3.6	119 MW	70%	10	2	3	0.8	3.6	35	394	40	0	2	35	394	40	0	2	69	788	79	0.6	5
0:42	126 MW	74%	10	2	3	0.8	3.6	126 MW	74%	10	2	3	0.8	3.6	34	385	39	0	2	34	385	39	0	2	68	770	78	0.6	5
0:43	133 MW	78%	10	2	3	0.8	3.6	133 MW	78%	10	2	3	0.8	3.6	34	376	38	0	2	34	376	38	0	2	67	752	76	0.7	5
0:44	140 MW	82%	11	3	2	0.9	3.6	140 MW	82%	11	3	2	0.9	3.6	33	368	37	0	2	33	368	37	0	2	66	736	74	0.7	5
0:45	147 MW	86%	11	3	2	0.9	3.6	147 MW	86%	11	3	2	0.9	3.6	33	360	36	0	2	33	360	36	0	2	65	720	73	0.7	5
0:46	154 MW	91%	12	3	1	0.9	3.6	154 MW	91%	12	3	1	0.9	3.6	32	352	36	0	2	32	352	36	0	2	64	705	71	0.7	5
0:47	161 MW	95%	12	3	1	0.9	3.6	161 MW	95%	12	3	1	0.9	3.6	32	345	35	0	3	32	345	35	0	3	63	690	70	0.8	5
0:48	168 MW	99%	12	3	1	0.9	3.6	168 MW	99%	12	3	1	0.9	3.6	31	338	34	0	3	31	338	34	0	3	63	676	69	0.8	5
0:49	170 MW	100%	13	3	1	1.0	3.6	170 MW	100%	13	3	1	1.0	3.6	31	331	34	0	3	31	331	34	0	3	62	663	67	0.8	5
0:50	170 MW	100%	13	3	1	1.0	3.6	170 MW	100%	13	3	1	1.0	3.6	31	325	33	0	3	31	325	33	0	3	61	650	66	0.8	5
0:51	170 MW	100%	13	3	1	1.0	3.6	170 MW	100%	13	3	1	1.0	3.6	30	319	32	0	3	30	319	32	0	3	61	638	65	0.9	5
0:52	170 MW	100%	13	3	1	1.0	3.6	170 MW	100%	13	3	1	1.0	3.6	30	313	32	0	3	30	313	32	0	3	60	626	64	0.9	5
0:53	170 MW	100%	13	3	1	1.0	3.6	170 MW	100%	13	3	1	1.0	3.6	30	307	31	0	3	30	307	31	0	3	59	614	62	0.9	5
0:54	170 MW	100%	13	3	1	1.0	3.6	170 MW	100%	13	3	1	1.0	3.6	29	302	31	0	3	29	302	31	0	3	59	603	61	0.9	5
0:55	170 MW	100%	13	3	1	1.0	3.6	170 MW	100%	13	3	1	1.0	3.6	29	296	30	0	3	29	296	30	0	3	58	592	60	0.9	5
0:56	170 MW	100%	13	3	1	1.0	3.6	170 MW	100%	13	3	1	1.0	3.6	29	291	30	0	3	29	291	30	0	3	58	582	59	1.0	5
0:57	170 MW	100%	13	3	1	1.0	3.6	170 MW	100%	13	3	1	1.0	3.6	28	286	29	0	3	28	286	29	0	3	57	572	58	1.0	5
0:58	170 MW	100%	13	3	1	1.0	3.6	170 MW	100%	13	3	1	1.0	3.6	28	281	29	0	3	28	281	29	0	3	56	563	57	1.0	5
0:59	170 MW	100%	13	3	1	1.0	3.6	170 MW	100%	13	3	1	1.0	3.6	28	277	28	1	3	28	277	28	1	3	56	553	56	1.0	5
1:00	170 MW	100%	13	3	1	1.0	3.6	170 MW	100%	13	3	1	1.0	3.6	28	277	28	1	3	28	277	28	1	3	56	553	56	1.0	6
1:01	170 MW	100%	13	3	1	1.0	3.6	170 MW	100%	13	3	1	1.0	3.6	28	277	28	1	3	28	277	28	1	3	57	554	56	1.1	6
1:02	170 MW	100%	13	3	1	1.0	3.6	170 MW	100%	13	3	1	1.0	3.6	29	277	28	1	3	29	277	28	1	3	57	554	56	1.1	6
1:03	170 MW	100%	13	3	1	1.0	3.6	170 MW	100%	13	3	1	1.0	3.6	29	277	28	1	3	29	277	28	1	3	58	554	56	1.1	6
1:04	170 MW	100%	13	3	1	1.0	3.6	170 MW	100%	13	3	1	1.0	3.6	29	277	28	1	3	29	277	28	1	3	58	554	57	1.2	6
1:05	170 MW	100%	13	3	1	1.0	3.6	170 MW	100%	13	3	1	1.0	3.6	29	277	28	1	3	29	277	28	1	3	59	554	57	1.2	6
1:06	170 MW	100%	13	3	1	1.0	3.6	170 MW	100%	13	3	1	1.0	3.6	30	277	28	1	3	30	277	28	1	3	59	554	57	1.2	6
1:07	170 MW	100%	13	3	1	1.0	3.6	170 MW	100%	13	3	1	1.0	3.6	30	277	28	1	3	30	277	28	1	3	59	553	56	1.3	6
1:08	170 MW	100%	13	3	1	1.0	3.6	170 MW	100%	13	3	1	1.0	3.6	30	276	28	1	3	30	276	28	1	3	60	552	56	1.3	6
1:09	170 MW	100%	13	3	1	1.0	3.6	170 MW	100%	13	3	1	1.0	3.6	30	276	28	1	3	30	276	28	1	3	60	551	56	1.3	7
1:10	170 MW	100%	13	3	1	1.0	3.6	170 MW	100%	13	3	1	1.0	3.6	30	275	28	1	3	30	275	28	1	3	61	550	56	1.4	7
1:11	170 MW	100%	13	3	1	1.0	3.6	170 MW	100%	13	3	1	1.0	3.6	30	275	28	1	3	30	275	28	1	3	61	549	56	1.4	7
1:12	170 MW	100%	13	3	1	1.0	3.6	170 MW	100%	13	3	1	1.0	3.6	31	274	28	1	3	31	274	28	1	3	61	548	56	1.4	7
1:13	170 MW	100%	13	3	1	1.0	3.6	170 MW	100%	13	3	1	1.0	3.6	31	274	28	1	3	31	274	28	1	3	62	547	56	1.4	7
1:14	170 MW	100%	13	3	1	1.0	3.6	170 MW	100%	13	3	1	1.0	3.6	31	273	28	1	4	31	273	28	1	4	62	546	56	1.5	7
1:15	170 MW	100%	13	3	1	1.0	3.6	170 MW	100%	13	3	1	1.0	3.6	31	273	28	1	4	31	273	28	1	4	62	545	56	1.5	7
1:16	170 MW	100%	13	3	1	1.0	3.6	170 MW	100%	13	3	1	1.0	3.6	31	272	28	1	4	31	272	28	1	4	63	544	55	1.5	7

HOT START
EMISSION CALCULATION

HOT

Time	LEAD CTG - INSTANTANEOUS							LAG CTG - INSTANTANEOUS							LEAD CTG 1-HR AVERAGE					LAG CTG 1-HR AVERAGE					2 CTGs - 1 HR AVERAGE				
	CT Load		NO_X	CO	VOC	SO_2	PM_{10}	CT Load		NO_X	CO	VOC	SO_2	PM_{10}	NO_X	CO	VOC	SO_2	PM_{10}	NO_X	CO	VOC	SO_2	PM_{10}	NO_X	CO	VOC	SO_2	PM_{10}
			lb/hr	lb/hr	lb/hr	lb/hr	lb/hr			lb/hr	lb/hr	lb/hr	lb/hr	lb/hr	lb/hr	lb/hr	lb/hr	lb/hr	lb/hr	lb/hr	lb/hr	lb/hr	lb/hr	lb/hr	lb/hr	lb/hr	lb/hr	lb/hr	lb/hr
1:17	170 MW	100%	13	3	1	1.0	3.6	170 MW	100%	13	3	1	1.0	3.6	32	272	28	1	4	32	272	28	1	4	63	543	55	1.5	7
1:18	170 MW	100%	13	3	1	1.0	3.6	170 MW	100%	13	3	1	1.0	3.6	32	271	28	1	4	32	271	28	1	4	64	543	55	1.6	7
1:19	170 MW	100%	13	3	1	1.0	3.6	170 MW	100%	13	3	1	1.0	3.6	32	271	28	1	4	32	271	28	1	4	64	542	55	1.6	7
1:20	170 MW	100%	13	3	1	1.0	3.6	170 MW	100%	13	3	1	1.0	3.6	32	270	28	1	4	32	270	28	1	4	64	541	55	1.6	8
1:21	170 MW	100%	13	3	1	1.0	3.6	170 MW	100%	13	3	1	1.0	3.6	32	270	27	1	4	32	270	27	1	4	65	540	55	1.6	8
1:22	170 MW	100%	13	3	1	1.0	3.6	170 MW	100%	13	3	1	1.0	3.6	33	269	27	1	4	33	269	27	1	4	65	539	55	1.7	8
1:23	170 MW	100%	13	3	1	1.0	3.6	170 MW	100%	13	3	1	1.0	3.6	33	269	27	1	4	33	269	27	1	4	65	538	55	1.7	8
1:24	170 MW	100%	13	3	1	1.0	3.6	170 MW	100%	13	3	1	1.0	3.6	32	210	26	1	4	32	210	26	1	4	64	420	52	1.7	8
1:25	170 MW	100%	13	3	1	1.0	3.6	170 MW	100%	13	3	1	1.0	3.6	31	166	24	1	4	31	166	24	1	4	63	332	48	1.7	8
1:26	170 MW	100%	13	3	1	1.0	3.6	170 MW	100%	13	3	1	1.0	3.6	30	136	22	1	4	30	136	22	1	4	60	272	44	1.8	8
1:27	170 MW	100%	13	3	1	1.0	3.6	170 MW	100%	13	3	1	1.0	3.6	29	114	20	1	4	29	114	20	1	4	58	227	39	1.8	8
1:28	170 MW	100%	13	3	1	1.0	3.6	170 MW	100%	13	3	1	1.0	3.6	27	92	17	1	4	27	92	17	1	4	55	184	34	1.8	8
1:29	170 MW	100%	13	3	1	1.0	3.6	170 MW	100%	13	3	1	1.0	3.6	26	71	13	1	4	26	71	13	1	4	52	142	27	1.8	8
1:30	170 MW	100%	13	3	1	1.0	3.6	170 MW	100%	13	3	1	1.0	3.6	24	50	10	1	4	24	50	10	1	4	48	100	20	1.9	8
1:31	170 MW	100%	13	3	1	1.0	3.6	170 MW	100%	13	3	1	1.0	3.6	22	35	8	1	4	22	35	8	1	4	45	70	15	1.9	7
1:32	170 MW	100%	13	3	1	1.0	3.6	170 MW	100%	13	3	1	1.0	3.6	20	23	6	1	4	20	23	6	1	4	41	47	11	1.9	7
1:33	170 MW	100%	13	3	1	1.0	3.6	170 MW	100%	13	3	1	1.0	3.6	18	15	4	1	4	18	15	4	1	4	36	30	9	1.9	7
1:34	170 MW	100%	13	3	1	1.0	3.6	170 MW	100%	13	3	1	1.0	3.6	16	10	3	1	4	16	10	3	1	4	32	19	7	1.9	7
1:35	170 MW	100%	13	3	1	1.0	3.6	170 MW	100%	13	3	1	1.0	3.6	14	6	2	1	4	14	6	2	1	4	29	12	5	1.9	7
1:36	170 MW	100%	13	3	1	1.0	3.6	170 MW	100%	13	3	1	1.0	3.6	13	4	2	1	4	13	4	2	1	4	27	9	4	1.9	7
1:37	170 MW	100%	13	3	1	1.0	3.6	170 MW	100%	13	3	1	1.0	3.6	13	4	1	1	4	13	4	1	1	4	26	7	3	2.0	7
1:38	170 MW	100%	13	3	1	1.0	3.6	170 MW	100%	13	3	1	1.0	3.6	13	3	1	1	4	13	3	1	1	4	25	6	2	2.0	7
1:39	170 MW	100%	13	3	1	1.0	3.6	170 MW	100%	13	3	1	1.0	3.6	13	3	1	1	4	13	3	1	1	4	25	6	2	2.0	7
1:40	170 MW	100%	13	3	1	1.0	3.6	170 MW	100%	13	3	1	1.0	3.6	13	3	1	1	4	13	3	1	1	4	26	6	2	2.0	7
1:41	170 MW	100%	13	3	1	1.0	3.6	170 MW	100%	13	3	1	1.0	3.6	13	3	1	1	4	13	3	1	1	4	26	6	2	2.0	7
1:42	170 MW	100%	13	3	1	1.0	3.6	170 MW	100%	13	3	1	1.0	3.6	13	3	1	1	4	13	3	1	1	4	26	6	2	2.0	7
1:43	170 MW	100%	13	3	1	1.0	3.6	170 MW	100%	13	3	1	1.0	3.6	13	3	1	1	4	13	3	1	1	4	26	6	2	2.0	7
1:44	170 MW	100%	13	3	1	1.0	3.6	170 MW	100%	13	3	1	1.0	3.6	13	3	1	1	4	13	3	1	1	4	26	6	2	2.0	7
1:45	170 MW	100%	13	3	1	1.0	3.6	170 MW	100%	13	3	1	1.0	3.6	13	3	1	1	4	13	3	1	1	4	26	6	2	2.0	7
1:46	170 MW	100%	13	3	1	1.0	3.6	170 MW	100%	13	3	1	1.0	3.6	13	3	1	1	4	13	3	1	1	4	26	6	2	2.0	7
1:47	170 MW	100%	13	3	1	1.0	3.6	170 MW	100%	13	3	1	1.0	3.6	13	3	1	1	4	13	3	1	1	4	26	6	2	2.0	7
1:48	170 MW	100%	13	3	1	1.0	3.6	170 MW	100%	13	3	1	1.0	3.6	13	3	1	1	4	13	3	1	1	4	26	6	2	2.0	7
1:49	170 MW	100%	13	3	1	1.0	3.6	170 MW	100%	13	3	1	1.0	3.6	13	3	1	1	4	13	3	1	1	4	26	6	2	2.0	7
1:50	170 MW	100%	13	3	1	1.0	3.6	170 MW	100%	13	3	1	1.0	3.6	13	3	1	1	4	13	3	1	1	4	26	6	2	2.0	7
1:51	170 MW	100%	13	3	1	1.0	3.6	170 MW	100%	13	3	1	1.0	3.6	13	3	1	1	4	13	3	1	1	4	26	6	2	2.0	7
1:52	170 MW	100%	13	3	1	1.0	3.6	170 MW	100%	13	3	1	1.0	3.6	13	3	1	1	4	13	3	1	1	4	26	6	2	2.0	7
1:53	170 MW	100%	13	3	1	1.0	3.6	170 MW	100%	13	3	1	1.0	3.6	13	3	1	1	4	13	3	1	1	4	26	6	2	2.0	7
1:54	170 MW	100%	13	3	1	1.0	3.6	170 MW	100%	13	3	1	1.0	3.6	13	3	1	1	4	13	3	1	1	4	26	6	2	2.0	7
1:55	170 MW	100%	13	3	1	1.0	3.6	170 MW	100%	13	3	1	1.0	3.6	13	3	1	1	4	13	3	1	1	4	26	6	2	2.0	7
1:56	170 MW	100%	13	3	1	1.0	3.6	170 MW	100%	13	3	1	1.0	3.6	13	3	1	1	4	13	3	1	1	4	26	6	2	2.0	7
1:57	170 MW	100%	13	3	1	1.0	3.6	170 MW	100%	13	3	1	1.0	3.6	13	3	1	1	4	13	3	1	1	4	26	6	2	2.0	7
1:58	170 MW	100%	13	3	1	1.0	3.6	170 MW	100%	13	3	1	1.0	3.6	13	3	1	1	4	13	3	1	1	4	26	6	2	2.0	7
1:59	170 MW	100%	13	3	1	1.0	3.6	170 MW	100%	13	3	1	1.0	3.6	13	3	1	1	4	13	3	1	1	4	26	6	2	2.0	7
2:00	170 MW	100%	13	3	1	1.0	3.6	170 MW	100%	13	3	1	1.0	3.6	13	3	1	1	4	13	3	1	1	4	26	6	2	2.0	7
2:01	170 MW	100%	13	3	1	1.0	3.6	170 MW	100%	13	3	1	1.0	3.6	13	3	1	1	4	13	3	1	1	4	26	6	2	2.0	7
2:02	170 MW	100%	13	3	1	1.0	3.6	170 MW	100%	13	3	1	1.0	3.6	13	3	1	1	4	13	3	1	1	4	26	6	2	2.0	7
2:03	170 MW	100%	13	3	1	1.0	3.6	170 MW	100%	13	3	1	1.0	3.6	13	3	1	1	4	13	3	1	1	4	26	6	2	2.0	7
2:04	170 MW	100%	13	3	1	1.0	3.6	170 MW	100%	13	3	1	1.0	3.6	13	3	1	1	4	13	3	1	1	4	26	6	2	2.0	7
2:05	170 MW	100%	13	3	1	1.0	3.6	170 MW	100%	13	3	1	1.0	3.6	13	3	1	1	4	13	3	1	1	4	26	6	2	2.0	7
2:06	170 MW	100%	13	3	1	1.0	3.6	170 MW	100%	13	3	1	1.0	3.6	13	3	1	1	4	13	3	1	1	4	26	6	2	2.0	7
2:07	170 MW	100%	13	3	1	1.0	3.6	170 MW	100%	13	3	1	1.0	3.6	13	3	1	1	4	13	3	1	1	4	26	6	2	2.0	7
2:08	170 MW	100%	13	3	1	1.0	3.6	170 MW	100%	13	3	1	1.0	3.6	13	3	1	1	4	13	3	1	1	4	26	6	2	2.0	7
2:09	170 MW	100%	13	3	1	1.0	3.6	170 MW	100%	13	3	1	1.0	3.6	13	3	1	1	4	13	3	1	1	4	26	6	2	2.0	7
2:10	170 MW	100%	13	3	1	1.0	3.6	170 MW	100%	13	3	1	1.0	3.6	13	3	1	1	4	13	3	1	1	4	26	6	2	2.0	7
2:11	170 MW	100%	13	3	1	1.0	3.6	170 MW	100%	13	3	1	1.0	3.6	13	3	1	1	4	13	3	1	1	4	26	6	2	2.0	7
2:12	170 MW	100%	13	3	1	1.0	3.6	170 MW	100%	13	3	1	1.0	3.6	13	3	1	1	4	13	3	1	1	4	26	6	2	2.0	7
2:13	170 MW	100%	13	3	1	1.0	3.6	170 MW	100%	13	3	1	1.0	3.6	13	3	1	1	4	13	3	1	1	4	26	6	2	2.0	7
2:14	170 MW	100%	13	3	1	1.0	3.6	170 MW	100%	13	3	1	1.0	3.6	13	3	1	1	4	13	3	1	1	4	26	6	2	2.0	7
2:15	170 MW	100%	13	3	1	1.0	3.6	170 MW	100%	13	3	1	1.0	3.6	13	3	1	1	4	13	3	1	1	4	26	6	2	2.0	7
2:16	170 MW	100%	13	3	1	1.0	3.6	170 MW	100%	13	3	1	1.0	3.6	13	3	1	1	4	13	3	1	1	4	26	6	2	2.0	7
2:17	170 MW	100%	13	3	1	1.0	3.6	170 MW	100%	13	3	1	1.0	3.6	13	3	1	1	4	13	3	1	1	4	26	6	2	2.0	7
2:18	170 MW	100%	13	3	1	1.0	3.6	170 MW	100%	13	3	1	1.0	3.6	13	3	1	1	4	13	3	1	1	4	26	6	2	2.0	7
2:19	170 MW	100%	13	3	1	1.0	3.6	170 MW	100%	13	3	1	1.0	3.6	13	3	1	1	4	13	3	1	1	4	26	6	2	2.0	7
2:20	170 MW	100%	13	3	1	1.0	3.6	170 MW	100%	13	3	1	1.0	3.6	13	3	1	1	4	13	3	1	1	4	26	6	2	2.0	7
2:21	170 MW	100%	13	3	1	1.0	3.6	170 MW	100%	13	3	1	1.0	3.6	13	3	1	1	4	13	3	1	1	4	26	6	2	2.0	7
2:22	170 MW	100%	13	3	1	1.0	3.6	170 MW	100%	13	3	1	1.0	3.6	13	3	1	1	4	13	3	1	1	4	26	6	2	2.0	7
2:23	170 MW	100%	13	3	1	1.0	3.6	170 MW	100%	13	3	1	1.0	3.6	13	3	1	1	4	13	3	1	1	4	26	6	2	2.0	7
2:24	170 MW	100%	13	3	1	1.0	3.6	170 MW	100%	13	3	1	1.0	3.6	13	3	1	1	4	13	3	1	1	4	26	6	2	2.0	7
2:25	170 MW	100%	13	3	1	1.0	3.6	170 MW	100%	13	3	1	1.0	3.6	13	3	1	1	4	13	3	1	1	4	26	6	2	2.0	7
2:26	170 MW	100%	13	3	1	1.0	3.6	170 MW	100%	13	3	1	1.0	3.6	13	3	1	1	4	13	3	1	1	4	26	6	2	2.0	7
2:27	170 MW	100%	13	3	1	1.0	3.6	170 MW	100%	13	3	1	1.0	3.6	13	3	1	1	4	13	3	1	1	4	26	6	2	2.0	7
2:28	170 MW	100%	13	3	1	1.0	3.6	170 MW	100%	13	3	1	1.0	3.6	13	3	1	1	4	13	3	1	1	4	26	6	2	2.0	7
2:29	170 MW	100%	13	3	1	1.0	3.6	170 MW	100%	13	3	1	1.0	3.6	13	3	1	1	4	13	3	1	1	4	26	6	2	2.0	7
2:30	170 MW	100%	13	3	1	1.0	3.6	170 MW	100%	13	3	1	1.0	3.6	13	3	1	1	4	13	3	1	1	4	26	6	2	2.0	7
2:31	170 MW	100%	13	3	1	1.0	3.6	170 MW	100%	13	3	1	1.0	3.6	13	3	1	1	4	13	3	1	1	4	26	6	2	2.0	7
2:32	170 MW	100%	13	3	1	1.0	3.6	170 MW	100%	13	3	1	1.0	3.6	13	3	1	1	4	13	3	1	1	4	26	6	2	2.0	7
2:33	170 MW	100%	13	3	1	1.0	3.6	170 MW	100%	13	3	1	1.0	3.6	13	3	1	1	4	13	3	1	1	4	26	6	2	2.0	7

HOT START
EMISSION CALCULATION

HOT

Time	LEAD CTG - INSTANTANEOUS							LAG CTG - INSTANTANEOUS							LEAD CTG 1-HR AVERAGE					LAG CTG 1-HR AVERAGE					2 CTGs - 1 HR AVERAGE				
	CT Load		NO_X	CO	VOC	SO_2	PM_{10}	CT Load		NO_X	CO	VOC	SO_2	PM_{10}	NO_X	CO	VOC	SO_2	PM_{10}	NO_X	CO	VOC	SO_2	PM_{10}	NO_X	CO	VOC	SO_2	PM_{10}
			lb/hr	lb/hr	lb/hr	lb/hr	lb/hr			lb/hr	lb/hr	lb/hr	lb/hr	lb/hr	lb/hr	lb/hr	lb/hr	lb/hr	lb/hr	lb/hr	lb/hr	lb/hr	lb/hr	lb/hr	lb/hr	lb/hr	lb/hr	lb/hr	lb/hr
2:34	170 MW	100%	13	3	1	1.0	3.6	170 MW	100%	13	3	1	1.0	3.6	13	3	1	1	4	13	3	1	1	4	26	6	2	2.0	7
2:35	170 MW	100%	13	3	1	1.0	3.6	170 MW	100%	13	3	1	1.0	3.6	13	3	1	1	4	13	3	1	1	4	26	6	2	2.0	7
2:36	170 MW	100%	13	3	1	1.0	3.6	170 MW	100%	13	3	1	1.0	3.6	13	3	1	1	4	13	3	1	1	4	26	6	2	2.0	7
2:37	170 MW	100%	13	3	1	1.0	3.6	170 MW	100%	13	3	1	1.0	3.6	13	3	1	1	4	13	3	1	1	4	26	6	2	2.0	7
2:38	170 MW	100%	13	3	1	1.0	3.6	170 MW	100%	13	3	1	1.0	3.6	13	3	1	1	4	13	3	1	1	4	26	6	2	2.0	7
2:39	170 MW	100%	13	3	1	1.0	3.6	170 MW	100%	13	3	1	1.0	3.6	13	3	1	1	4	13	3	1	1	4	26	6	2	2.0	7
2:40	170 MW	100%	13	3	1	1.0	3.6	170 MW	100%	13	3	1	1.0	3.6	13	3	1	1	4	13	3	1	1	4	26	6	2	2.0	7
2:41	170 MW	100%	13	3	1	1.0	3.6	170 MW	100%	13	3	1	1.0	3.6	13	3	1	1	4	13	3	1	1	4	26	6	2	2.0	7
2:42	170 MW	100%	13	3	1	1.0	3.6	170 MW	100%	13	3	1	1.0	3.6	13	3	1	1	4	13	3	1	1	4	26	6	2	2.0	7
2:43	170 MW	100%	13	3	1	1.0	3.6	170 MW	100%	13	3	1	1.0	3.6	13	3	1	1	4	13	3	1	1	4	26	6	2	2.0	7
2:44	170 MW	100%	13	3	1	1.0	3.6	170 MW	100%	13	3	1	1.0	3.6	13	3	1	1	4	13	3	1	1	4	26	6	2	2.0	7
2:45	170 MW	100%	13	3	1	1.0	3.6	170 MW	100%	13	3	1	1.0	3.6	13	3	1	1	4	13	3	1	1	4	26	6	2	2.0	7
2:46	170 MW	100%	13	3	1	1.0	3.6	170 MW	100%	13	3	1	1.0	3.6	13	3	1	1	4	13	3	1	1	4	26	6	2	2.0	7
2:47	170 MW	100%	13	3	1	1.0	3.6	170 MW	100%	13	3	1	1.0	3.6	13	3	1	1	4	13	3	1	1	4	26	6	2	2.0	7
2:48	170 MW	100%	13	3	1	1.0	3.6	170 MW	100%	13	3	1	1.0	3.6	13	3	1	1	4	13	3	1	1	4	26	6	2	2.0	7
2:49	170 MW	100%	13	3	1	1.0	3.6	170 MW	100%	13	3	1	1.0	3.6	13	3	1	1	4	13	3	1	1	4	26	6	2	2.0	7
2:50	170 MW	100%	13	3	1	1.0	3.6	170 MW	100%	13	3	1	1.0	3.6	13	3	1	1	4	13	3	1	1	4	26	6	2	2.0	7
2:51	170 MW	100%	13	3	1	1.0	3.6	170 MW	100%	13	3	1	1.0	3.6	13	3	1	1	4	13	3	1	1	4	26	6	2	2.0	7
2:52	170 MW	100%	13	3	1	1.0	3.6	170 MW	100%	13	3	1	1.0	3.6	13	3	1	1	4	13	3	1	1	4	26	6	2	2.0	7
2:53	170 MW	100%	13	3	1	1.0	3.6	170 MW	100%	13	3	1	1.0	3.6	13	3	1	1	4	13	3	1	1	4	26	6	2	2.0	7
2:54	170 MW	100%	13	3	1	1.0	3.6	170 MW	100%	13	3	1	1.0	3.6	13	3	1	1	4	13	3	1	1	4	26	6	2	2.0	7
2:55	170 MW	100%	13	3	1	1.0	3.6	170 MW	100%	13	3	1	1.0	3.6	13	3	1	1	4	13	3	1	1	4	26	6	2	2.0	7
2:56	170 MW	100%	13	3	1	1.0	3.6	170 MW	100%	13	3	1	1.0	3.6	13	3	1	1	4	13	3	1	1	4	26	6	2	2.0	7
2:57	170 MW	100%	13	3	1	1.0	3.6	170 MW	100%	13	3	1	1.0	3.6	13	3	1	1	4	13	3	1	1	4	26	6	2	2.0	7
2:58	170 MW	100%	13	3	1	1.0	3.6	170 MW	100%	13	3	1	1.0	3.6	13	3	1	1	4	13	3	1	1	4	26	6	2	2.0	7
2:59	170 MW	100%	13	3	1	1.0	3.6	170 MW	100%	13	3	1	1.0	3.6	13	3	1	1	4	13	3	1	1	4	26	6	2	2.0	7
3:00	170 MW	100%	13	3	1	1.0	3.6	170 MW	100%	13	3	1	1.0	3.6	13	3	1	1	4	13	3	1	1	4	26	6	2	2.0	7
3:01	170 MW	100%	13	3	1	1.0	3.6	170 MW	100%	13	3	1	1.0	3.6	13	3	1	1	4	13	3	1	1	4	26	6	2	2.0	7
3:02	170 MW	100%	13	3	1	1.0	3.6	170 MW	100%	13	3	1	1.0	3.6	13	3	1	1	4	13	3	1	1	4	26	6	2	2.0	7
3:03	170 MW	100%	13	3	1	1.0	3.6	170 MW	100%	13	3	1	1.0	3.6	13	3	1	1	4	13	3	1	1	4	26	6	2	2.0	7
3:04	170 MW	100%	13	3	1	1.0	3.6	170 MW	100%	13	3	1	1.0	3.6	13	3	1	1	4	13	3	1	1	4	26	6	2	2.0	7
3:05	170 MW	100%	13	3	1	1.0	3.6	170 MW	100%	13	3	1	1.0	3.6	13	3	1	1	4	13	3	1	1	4	26	6	2	2.0	7
3:06	170 MW	100%	13	3	1	1.0	3.6	170 MW	100%	13	3	1	1.0	3.6	13	3	1	1	4	13	3	1	1	4	26	6	2	2.0	7
3:07	170 MW	100%	13	3	1	1.0	3.6	170 MW	100%	13	3	1	1.0	3.6	13	3	1	1	4	13	3	1	1	4	26	6	2	2.0	7
3:08	170 MW	100%	13	3	1	1.0	3.6	170 MW	100%	13	3	1	1.0	3.6	13	3	1	1	4	13	3	1	1	4	26	6	2	2.0	7
3:09	170 MW	100%	13	3	1	1.0	3.6	170 MW	100%	13	3	1	1.0	3.6	13	3	1	1	4	13	3	1	1	4	26	6	2	2.0	7
3:10	170 MW	100%	13	3	1	1.0	3.6	170 MW	100%	13	3	1	1.0	3.6	13	3	1	1	4	13	3	1	1	4	26	6	2	2.0	7
3:11	170 MW	100%	13	3	1	1.0	3.6	170 MW	100%	13	3	1	1.0	3.6	13	3	1	1	4	13	3	1	1	4	26	6	2	2.0	7
3:12	170 MW	100%	13	3	1	1.0	3.6	170 MW	100%	13	3	1	1.0	3.6	13	3	1	1	4	13	3	1	1	4	26	6	2	2.0	7
3:13	170 MW	100%	13	3	1	1.0	3.6	170 MW	100%	13	3	1	1.0	3.6	13	3	1	1	4	13	3	1	1	4	26	6	2	2.0	7
3:14	170 MW	100%	13	3	1	1.0	3.6	170 MW	100%	13	3	1	1.0	3.6	13	3	1	1	4	13	3	1	1	4	26	6	2	2.0	7
3:15	170 MW	100%	13	3	1	1.0	3.6	170 MW	100%	13	3	1	1.0	3.6	13	3	1	1	4	13	3	1	1	4	26	6	2	2.0	7
3:16	170 MW	100%	13	3	1	1.0	3.6	170 MW	100%	13	3	1	1.0	3.6	13	3	1	1	4	13	3	1	1	4	26	6	2	2.0	7
3:17	170 MW	100%	13	3	1	1.0	3.6	170 MW	100%	13	3	1	1.0	3.6	13	3	1	1	4	13	3	1	1	4	26	6	2	2.0	7
3:18	170 MW	100%	13	3	1	1.0	3.6	170 MW	100%	13	3	1	1.0	3.6	13	3	1	1	4	13	3	1	1	4	26	6	2	2.0	7
3:19	170 MW	100%	13	3	1	1.0	3.6	170 MW	100%	13	3	1	1.0	3.6	13	3	1	1	4	13	3	1	1	4	26	6	2	2.0	7
3:20	170 MW	100%	13	3	1	1.0	3.6	170 MW	100%	13	3	1	1.0	3.6	13	3	1	1	4	13	3	1	1	4	26	6	2	2.0	7
3:21	170 MW	100%	13	3	1	1.0	3.6	170 MW	100%	13	3	1	1.0	3.6	13	3	1	1	4	13	3	1	1	4	26	6	2	2.0	7
3:22	170 MW	100%	13	3	1	1.0	3.6	170 MW	100%	13	3	1	1.0	3.6	13	3	1	1	4	13	3	1	1	4	26	6	2	2.0	7
3:23	170 MW	100%	13	3	1	1.0	3.6	170 MW	100%	13	3	1	1.0	3.6	13	3	1	1	4	13	3	1	1	4	26	6	2	2.0	7
3:24	170 MW	100%	13	3	1	1.0	3.6	170 MW	100%	13	3	1	1.0	3.6	13	3	1	1	4	13	3	1	1	4	26	6	2	2.0	7
3:25	170 MW	100%	13	3	1	1.0	3.6	170 MW	100%	13	3	1	1.0	3.6	13	3	1	1	4	13	3	1	1	4	26	6	2	2.0	7
3:26	170 MW	100%	13	3	1	1.0	3.6	170 MW	100%	13	3	1	1.0	3.6	13	3	1	1	4	13	3	1	1	4	26	6	2	2.0	7
3:27	170 MW	100%	13	3	1	1.0	3.6	170 MW	100%	13	3	1	1.0	3.6	13	3	1	1	4	13	3	1	1	4	26	6	2	2.0	7
3:28	170 MW	100%	13	3	1	1.0	3.6	170 MW	100%	13	3	1	1.0	3.6	13	3	1	1	4	13	3	1	1	4	26	6	2	2.0	7
3:29	170 MW	100%	13	3	1	1.0	3.6	170 MW	100%	13	3	1	1.0	3.6	13	3	1	1	4	13	3	1	1	4	26	6	2	2.0	7
3:30	170 MW	100%	13	3	1	1.0	3.6	170 MW	100%	13	3	1	1.0	3.6	13	3	1	1	4	13	3	1	1	4	26	6	2	2.0	7

		NO_X	CO	VOC	SO_2	PM_{10}		NO_X	CO	VOC	SO_2	PM_{10}		NO_X	CO	VOC	SO_2	PM_{10}
LEAD	lb	24	276	28	0.2	1.5	**LAG**	24	276	28	0.2	1.5	**MAX**	65	554	57	2.0	8
TOTAL	lb	48	551	55	0	3												
	ton	0.0	0.3	0.0	0.0	0.0												

Notes
1) Emissions during 40-minute hot start-up highlighted in gray
2) Emissions during normal operation (> 60% CTG load) shown for purposes of evaluating worst case 1-hr emission rates

SHUTDOWN
EMISSION CALCULATION

SHUTDOWN

Time	LEAD CTG - INSTANTANEOUS							LAG CTG - INSTANTANEOUS							LEAD CTG 1-HR AVERAGE					LAG CTG 1-HR AVERAGE					2 CTGs - 1 HR AVERAGE				
	CT Load		NO_X	CO	VOC	SO_2	PM_{10}	CT Load		NO_X	CO	VOC	SO_2	PM_{10}	NO_X	CO	VOC	SO_2	PM_{10}	NO_X	CO	VOC	SO_2	PM_{10}	NO_X	CO	VOC	SO_2	PM_{10}
			lb/hr	lb/hr	lb/hr	lb/hr	lb/hr			lb/hr	lb/hr	lb/hr	lb/hr	lb/hr	lb/hr	lb/hr	lb/hr	lb/hr	lb/hr	lb/hr	lb/hr	lb/hr	lb/hr	lb/hr	lb/hr	lb/hr	lb/hr	lb/hr	lb/hr
0:00	170 MW	100%	13	3	1	1.0	4	170 MW	100%	13	3	1	1.0	4	13	3	1	1	4	13	3	1	1	4	26	6	2	2.0	7
0:01	170 MW	100%	13	3	1	1.0	4	170 MW	100%	13	3	1	1.0	4	13	3	1	1	4	13	3	1	1	4	26	6	2	2.0	7
0:02	170 MW	100%	13	3	1	1.0	4	170 MW	100%	13	3	1	1.0	4	13	3	1	1	4	13	3	1	1	4	26	6	2	2.0	7
0:03	170 MW	100%	13	3	1	1.0	4	170 MW	100%	13	3	1	1.0	4	13	3	1	1	4	13	3	1	1	4	26	6	2	2.0	7
0:04	170 MW	100%	13	3	1	1.0	4	170 MW	100%	13	3	1	1.0	4	13	3	1	1	4	13	3	1	1	4	26	6	2	2.0	7
0:05	170 MW	100%	13	3	1	1.0	4	170 MW	100%	13	3	1	1.0	4	13	3	1	1	4	13	3	1	1	4	26	6	2	2.0	7
0:06	170 MW	100%	13	3	1	1.0	4	170 MW	100%	13	3	1	1.0	4	13	3	1	1	4	13	3	1	1	4	26	6	2	2.0	7
0:07	170 MW	100%	13	3	1	1.0	4	170 MW	100%	13	3	1	1.0	4	13	3	1	1	4	13	3	1	1	4	26	6	2	2.0	7
0:08	170 MW	100%	13	3	1	1.0	4	170 MW	100%	13	3	1	1.0	4	13	3	1	1	4	13	3	1	1	4	26	6	2	2.0	7
0:09	170 MW	100%	13	3	1	1.0	4	170 MW	100%	13	3	1	1.0	4	13	3	1	1	4	13	3	1	1	4	26	6	2	2.0	7
0:10	170 MW	100%	13	3	1	1.0	4	170 MW	100%	13	3	1	1.0	4	13	3	1	1	4	13	3	1	1	4	26	6	2	2.0	7
0:11	170 MW	100%	13	3	1	1.0	4	170 MW	100%	13	3	1	1.0	4	13	3	1	1	4	13	3	1	1	4	26	6	2	2.0	7
0:12	170 MW	100%	13	3	1	1.0	4	170 MW	100%	13	3	1	1.0	4	13	3	1	1	4	13	3	1	1	4	26	6	2	2.0	7
0:13	170 MW	100%	13	3	1	1.0	4	170 MW	100%	13	3	1	1.0	4	13	3	1	1	4	13	3	1	1	4	26	6	2	2.0	7
0:14	170 MW	100%	13	3	1	1.0	4	170 MW	100%	13	3	1	1.0	4	13	3	1	1	4	13	3	1	1	4	26	6	2	2.0	7
0:15	170 MW	100%	13	3	1	1.0	4	170 MW	100%	13	3	1	1.0	4	13	3	1	1	4	13	3	1	1	4	26	6	2	2.0	7
0:16	170 MW	100%	13	3	1	1.0	4	170 MW	100%	13	3	1	1.0	4	13	3	1	1	4	13	3	1	1	4	26	6	2	2.0	7
0:17	170 MW	100%	13	3	1	1.0	4	170 MW	100%	13	3	1	1.0	4	13	3	1	1	4	13	3	1	1	4	26	6	2	2.0	7
0:18	170 MW	100%	13	3	1	1.0	4	170 MW	100%	13	3	1	1.0	4	13	3	1	1	4	13	3	1	1	4	26	6	2	2.0	7
0:19	170 MW	100%	13	3	1	1.0	4	170 MW	100%	13	3	1	1.0	4	13	3	1	1	4	13	3	1	1	4	26	6	2	2.0	7
0:20	170 MW	100%	13	3	1	1.0	4	170 MW	100%	13	3	1	1.0	4	13	3	1	1	4	13	3	1	1	4	26	6	2	2.0	7
0:21	170 MW	100%	13	3	1	1.0	4	170 MW	100%	13	3	1	1.0	4	13	3	1	1	4	13	3	1	1	4	26	6	2	2.0	7
0:22	170 MW	100%	13	3	1	1.0	4	170 MW	100%	13	3	1	1.0	4	13	3	1	1	4	13	3	1	1	4	26	6	2	2.0	7
0:23	170 MW	100%	13	3	1	1.0	4	170 MW	100%	13	3	1	1.0	4	13	3	1	1	4	13	3	1	1	4	26	6	2	2.0	7
0:24	170 MW	100%	13	3	1	1.0	4	170 MW	100%	13	3	1	1.0	4	13	3	1	1	4	13	3	1	1	4	26	6	2	2.0	7
0:25	170 MW	100%	13	3	1	1.0	4	170 MW	100%	13	3	1	1.0	4	13	3	1	1	4	13	3	1	1	4	26	6	2	2.0	7
0:26	170 MW	100%	13	3	1	1.0	4	170 MW	100%	13	3	1	1.0	4	13	3	1	1	4	13	3	1	1	4	26	6	2	2.0	7
0:27	170 MW	100%	13	3	1	1.0	4	170 MW	100%	13	3	1	1.0	4	13	3	1	1	4	13	3	1	1	4	26	6	2	2.0	7
0:28	170 MW	100%	13	3	1	1.0	4	170 MW	100%	13	3	1	1.0	4	13	3	1	1	4	13	3	1	1	4	26	6	2	2.0	7
0:29	170 MW	100%	13	3	1	1.0	4	170 MW	100%	13	3	1	1.0	4	13	3	1	1	4	13	3	1	1	4	26	6	2	2.0	7
0:30	170 MW	100%	13	3	1	1.0	4	170 MW	100%	13	3	1	1.0	4	13	3	1	1	4	13	3	1	1	4	26	6	2	2.0	7
0:31	170 MW	100%	13	3	1	1.0	4	170 MW	100%	13	3	1	1.0	4	13	3	1	1	4	13	3	1	1	4	26	6	2	2.0	7
0:32	170 MW	100%	13	3	1	1.0	4	170 MW	100%	13	3	1	1.0	4	13	3	1	1	4	13	3	1	1	4	26	6	2	2.0	7
0:33	170 MW	100%	13	3	1	1.0	4	170 MW	100%	13	3	1	1.0	4	13	3	1	1	4	13	3	1	1	4	26	6	2	2.0	7
0:34	170 MW	100%	13	3	1	1.0	4	170 MW	100%	13	3	1	1.0	4	13	3	1	1	4	13	3	1	1	4	26	6	2	2.0	7
0:35	170 MW	100%	13	3	1	1.0	4	170 MW	100%	13	3	1	1.0	4	13	3	1	1	4	13	3	1	1	4	26	6	2	2.0	7
0:36	170 MW	100%	13	3	1	1.0	4	170 MW	100%	13	3	1	1.0	4	13	3	1	1	4	13	3	1	1	4	26	6	2	2.0	7
0:37	170 MW	100%	13	3	1	1.0	4	170 MW	100%	13	3	1	1.0	4	13	3	1	1	4	13	3	1	1	4	26	6	2	2.0	7
0:38	170 MW	100%	13	3	1	1.0	4	170 MW	100%	13	3	1	1.0	4	13	3	1	1	4	13	3	1	1	4	26	6	2	2.0	7
0:39	170 MW	100%	13	3	1	1.0	4	170 MW	100%	13	3	1	1.0	4	13	3	1	1	4	13	3	1	1	4	26	6	2	2.0	7
0:40	170 MW	100%	13	3	1	1.0	4	170 MW	100%	13	3	1	1.0	4	13	3	1	1	4	13	3	1	1	4	26	6	2	2.0	7
0:41	170 MW	100%	13	3	1	1.0	4	170 MW	100%	13	3	1	1.0	4	13	3	1	1	4	13	3	1	1	4	26	6	2	2.0	7
0:42	170 MW	100%	13	3	1	1.0	4	170 MW	100%	13	3	1	1.0	4	13	3	1	1	4	13	3	1	1	4	26	6	2	2.0	7
0:43	170 MW	100%	13	3	1	1.0	4	170 MW	100%	13	3	1	1.0	4	13	3	1	1	4	13	3	1	1	4	26	6	2	2.0	7
0:44	170 MW	100%	13	3	1	1.0	4	170 MW	100%	13	3	1	1.0	4	13	3	1	1	4	13	3	1	1	4	26	6	2	2.0	7
0:45	170 MW	100%	13	3	1	1.0	4	170 MW	100%	13	3	1	1.0	4	13	3	1	1	4	13	3	1	1	4	26	6	2	2.0	7
0:46	170 MW	100%	13	3	1	1.0	4	170 MW	100%	13	3	1	1.0	4	13	3	1	1	4	13	3	1	1	4	26	6	2	2.0	7
0:47	170 MW	100%	13	3	1	1.0	4	170 MW	100%	13	3	1	1.0	4	13	3	1	1	4	13	3	1	1	4	26	6	2	2.0	7
0:48	170 MW	100%	13	3	1	1.0	4	170 MW	100%	13	3	1	1.0	4	13	3	1	1	4	13	3	1	1	4	26	6	2	2.0	7
0:49	170 MW	100%	13	3	1	1.0	4	170 MW	100%	13	3	1	1.0	4	13	3	1	1	4	13	3	1	1	4	26	6	2	2.0	7
0:50	170 MW	100%	13	3	1	1.0	4	170 MW	100%	13	3	1	1.0	4	13	3	1	1	4	13	3	1	1	4	26	6	2	2.0	7
0:51	170 MW	100%	13	3	1	1.0	4	170 MW	100%	13	3	1	1.0	4	13	3	1	1	4	13	3	1	1	4	26	6	2	2.0	7
0:52	170 MW	100%	13	3	1	1.0	4	170 MW	100%	13	3	1	1.0	4	13	3	1	1	4	13	3	1	1	4	26	6	2	2.0	7
0:53	170 MW	100%	13	3	1	1.0	4	170 MW	100%	13	3	1	1.0	4	13	3	1	1	4	13	3	1	1	4	26	6	2	2.0	7
0:54	170 MW	100%	13	3	1	1.0	4	170 MW	100%	13	3	1	1.0	4	13	3	1	1	4	13	3	1	1	4	26	6	2	2.0	7
0:55	170 MW	100%	13	3	1	1.0	4	170 MW	100%	13	3	1	1.0	4	13	3	1	1	4	13	3	1	1	4	26	6	2	2.0	7
0:56	170 MW	100%	13	3	1	1.0	4	170 MW	100%	13	3	1	1.0	4	13	3	1	1	4	13	3	1	1	4	26	6	2	2.0	7
0:57	170 MW	100%	13	3	1	1.0	4	170 MW	100%	13	3	1	1.0	4	13	3	1	1	4	13	3	1	1	4	26	6	2	2.0	7
0:58	170 MW	100%	13	3	1	1.0	4	170 MW	100%	13	3	1	1.0	4	13	3	1	1	4	13	3	1	1	4	26	6	2	2.0	7
0:59	170 MW	100%	13	3	1	1.0	4	170 MW	100%	13	3	1	1.0	4	13	3	1	1	4	13	3	1	1	4	26	6	2	2.0	7
1:00	162 MW	95%	12	3	1	0.9	4	162 MW	95%	12	3	1	0.9	4	13	3	1	1	4	13	3	1	1	4	26	6	2	2.0	7
1:01	153 MW	90%	12	3	1	0.9	4	153 MW	90%	12	3	1	0.9	4	13	3	1	1	4	13	3	1	1	4	26	6	2	2.0	7
1:02	145 MW	85%	11	3	2	0.9	4	145 MW	85%	11	3	2	0.9	4	13	3	1	1	4	13	3	1	1	4	26	6	2	2.0	7
1:03	136 MW	80%	11	3	2	0.9	4	136 MW	80%	11	3	2	0.9	4	13	3	1	1	4	13	3	1	1	4	26	6	2	2.0	7
1:04	128 MW	75%	10	2	3	0.8	4	128 MW	75%	10	2	3	0.8	4	13	3	1	1	4	13	3	1	1	4	26	6	2	2.0	7
1:05	119 MW	70%	10	2	3	0.8	4	119 MW	70%	10	2	3	0.8	4	13	3	1	1	4	13	3	1	1	4	26	6	2	2.0	7
1:06	111 MW	65%	9	4	3	0.7	4	111 MW	65%	9	4	3	0.7	4	13	3	1	1	4	13	3	1	1	4	26	6	2	2.0	7
1:07	102 MW	60%	9	5	3	0.7	4	102 MW	60%	9	5	3	0.7	4	13	3	1	1	4	13	3	1	1	4	25	6	2	2.0	7
1:08	94 MW	55%	34	39	21	0.7	4	94 MW	55%	34	39	21	0.7	4	13	4	1	1	4	13	4	1	1	4	26	8	3	2.0	7
1:09	85 MW	50%	59	72	39	0.6	5	85 MW	50%	59	72	39	0.6	5	14	5	2	1	4	14	5	2	1	4	28	10	4	2.0	7
1:10	77 MW	45%	107	218	52	0.6	5	77 MW	45%	107	218	52	0.6	5	15	9	3	1	4	15	9	3	1	4	31	17	6	1.9	7
1:11	68 MW	40%	154	365	64	0.5	5	68 MW	40%	154	365	64	0.5	5	18	15	4	1	4	18	15	4	1	4	36	29	8	1.9	7
1:12	60 MW	35%	142	579	95	0.5	5	60 MW	35%	142	579	95	0.5	5	20	24	6	1	4	20	24	6	1	4	40	48	11	1.9	7
1:13	51 MW	30%	130	794	126	0.5	5	51 MW	30%	130	794	126	0.5	5	22	37	8	1	4	22	37	8	1	4	44	75	15	1.9	7
1:14	43 MW	25%	107	1,267	207	0.4	5	43 MW	25%	107	1,267	207	0.4	5	23	58	11	1	4	23	58	11	1	4	47	117	22	1.9	8
1:15	34 MW	20%	107	1,267	207	0.4	5	34 MW	20%	107	1,267	207	0.4	5	25	79	15	1	4	25	79	15	1	4	50	159	29	1.8	8
1:16	26 MW	15%	100	1,318	169	0.4	5	26 MW	15%	100	1,318	169	0.4	5	26	101	17	1	4	26	101	17	1	4	53	203	35	1.8	8

SHUTDOWN
EMISSION CALCULATION

SHUTDOWN

Time	LEAD CTG - INSTANTANEOUS							LAG CTG - INSTANTANEOUS							LEAD CTG 1-HR AVERAGE					LAG CTG 1-HR AVERAGE					2 CTGs - 1 HR AVERAGE				
	CT Load		NO_X	CO	VOC	SO_2	PM_{10}	CT Load		NO_X	CO	VOC	SO_2	PM_{10}	NO_X	CO	VOC	SO_2	PM_{10}	NO_X	CO	VOC	SO_2	PM_{10}	NO_X	CO	VOC	SO_2	PM_{10}
			lb/hr	lb/hr	lb/hr	lb/hr	lb/hr			lb/hr	lb/hr	lb/hr	lb/hr	lb/hr	lb/hr	lb/hr	lb/hr	lb/hr	lb/hr	lb/hr	lb/hr	lb/hr	lb/hr	lb/hr	lb/hr	lb/hr	lb/hr	lb/hr	lb/hr
1:17	17 MW	10%	94	1,368	131	0.3	5	17 MW	10%	94	1,368	131	0.3	5	28	124	19	1	4	28	124	19	1	4	56	248	39	1.8	8
1:18	9 MW	5%	68	2,444	109	0.3	5	9 MW	5%	68	2,444	109	0.3	5	29	165	21	1	4	29	165	21	1	4	57	330	43	1.8	8
1:19	0 MW	0%	43	3,520	88	0.2	5	0 MW	0%	43	3,520	88	0.2	5	29	223	23	1	4	29	223	23	1	4	58	447	45	1.8	8
1:20	0 MW	0%	43	3,520	88	0.2	5	0 MW	0%	43	3,520	88	0.2	5	30	282	24	1	4	30	282	24	1	4	59	564	48	1.7	8
1:21	0 MW	0%	43	3,520	88	0.2	5	0 MW	0%	43	3,520	88	0.2	5	30	341	26	1	4	30	341	26	1	4	60	681	51	1.7	8
1:22	0 MW	0%	43	3,520	88	0.2	5	0 MW	0%	43	3,520	88	0.2	5	31	399	27	1	4	31	399	27	1	4	61	798	54	1.7	8
1:23	0 MW	0%	43	3,520	88	0.2	5	0 MW	0%	43	3,520	88	0.2	5	31	458	29	1	4	31	458	29	1	4	62	916	57	1.6	8
1:24			0	0	0	0.0	0			0	0	0	0.0	0	31	458	29	1	4	31	458	29	1	4	62	915	57	1.6	8
1:25			0	0	0	0.0	0			0	0	0	0.0	0	31	458	29	1	4	31	458	29	1	4	62	915	57	1.6	8
1:26			0	0	0	0.0	0			0	0	0	0.0	0	31	458	28	1	4	31	458	28	1	4	61	915	57	1.5	8
1:27			0	0	0	0.0	0			0	0	0	0.0	0	30	458	28	1	4	30	458	28	1	4	61	915	57	1.5	7
1:28			0	0	0	0.0	0			0	0	0	0.0	0	30	458	28	1	4	30	458	28	1	4	60	915	57	1.5	7
1:29			0	0	0	0.0	0			0	0	0	0.0	0	30	457	28	1	4	30	457	28	1	4	60	915	57	1.4	7
1:30			0	0	0	0.0	0			0	0	0	0.0	0	30	457	28	1	4	30	457	28	1	4	59	915	57	1.4	7
1:31			0	0	0	0.0	0			0	0	0	0.0	0	30	457	28	1	3	30	457	28	1	3	59	915	57	1.4	7
1:32			0	0	0	0.0	0			0	0	0	0.0	0	29	457	28	1	3	29	457	28	1	3	59	915	57	1.3	7
1:33			0	0	0	0.0	0			0	0	0	0.0	0	29	457	28	1	3	29	457	28	1	3	58	915	57	1.3	7
1:34			0	0	0	0.0	0			0	0	0	0.0	0	29	457	28	1	3	29	457	28	1	3	58	914	57	1.3	7
1:35			0	0	0	0.0	0			0	0	0	0.0	0	29	457	28	1	3	29	457	28	1	3	57	914	57	1.2	6
1:36			0	0	0	0.0	0			0	0	0	0.0	0	28	457	28	1	3	28	457	28	1	3	57	914	57	1.2	6
1:37			0	0	0	0.0	0			0	0	0	0.0	0	28	457	28	1	3	28	457	28	1	3	56	914	57	1.2	6
1:38			0	0	0	0.0	0			0	0	0	0.0	0	28	457	28	1	3	28	457	28	1	3	56	914	57	1.1	6
1:39			0	0	0	0.0	0			0	0	0	0.0	0	28	457	28	1	3	28	457	28	1	3	56	914	57	1.1	6
1:40			0	0	0	0.0	0			0	0	0	0.0	0	28	457	28	1	3	28	457	28	1	3	55	914	57	1.1	6
1:41			0	0	0	0.0	0			0	0	0	0.0	0	27	457	28	1	3	27	457	28	1	3	55	914	57	1.0	6
1:42			0	0	0	0.0	0			0	0	0	0.0	0	27	457	28	1	3	27	457	28	1	3	54	914	56	1.0	6
1:43			0	0	0	0.0	0			0	0	0	0.0	0	27	457	28	0	3	27	457	28	0	3	54	913	56	1.0	6
1:44			0	0	0	0.0	0			0	0	0	0.0	0	27	457	28	0	3	27	457	28	0	3	53	913	56	0.9	5
1:45			0	0	0	0.0	0			0	0	0	0.0	0	26	457	28	0	3	26	457	28	0	3	53	913	56	0.9	5
1:46			0	0	0	0.0	0			0	0	0	0.0	0	26	457	28	0	3	26	457	28	0	3	52	913	56	0.9	5
1:47			0	0	0	0.0	0			0	0	0	0.0	0	26	457	28	0	3	26	457	28	0	3	52	913	56	0.8	5
1:48			0	0	0	0.0	0			0	0	0	0.0	0	26	456	28	0	2	26	456	28	0	2	52	913	56	0.8	5
1:49			0	0	0	0.0	0			0	0	0	0.0	0	26	456	28	0	2	26	456	28	0	2	51	913	56	0.8	5
1:50			0	0	0	0.0	0			0	0	0	0.0	0	25	456	28	0	2	25	456	28	0	2	51	913	56	0.7	5
1:51			0	0	0	0.0	0			0	0	0	0.0	0	25	456	28	0	2	25	456	28	0	2	50	913	56	0.7	5
1:52			0	0	0	0.0	0			0	0	0	0.0	0	25	456	28	0	2	25	456	28	0	2	50	913	56	0.7	4
1:53			0	0	0	0.0	0			0	0	0	0.0	0	25	456	28	0	2	25	456	28	0	2	49	912	56	0.6	4
1:54			0	0	0	0.0	0			0	0	0	0.0	0	24	456	28	0	2	24	456	28	0	2	49	912	56	0.6	4
1:55			0	0	0	0.0	0			0	0	0	0.0	0	24	456	28	0	2	24	456	28	0	2	49	912	56	0.6	4
1:56			0	0	0	0.0	0			0	0	0	0.0	0	24	456	28	0	2	24	456	28	0	2	48	912	56	0.5	4
1:57			0	0	0	0.0	0			0	0	0	0.0	0	24	456	28	0	2	24	456	28	0	2	48	912	56	0.5	4
1:58			0	0	0	0.0	0			0	0	0	0.0	0	24	456	28	0	2	24	456	28	0	2	47	912	56	0.5	4
1:59			0	0	0	0.0	0			0	0	0	0.0	0	23	456	28	0	2	23	456	28	0	2	47	912	56	0.4	4
2:00			0	0	0	0.0	0			0	0	0	0.0	0	23	456	28	0	2	23	456	28	0	2	46	912	56	0.4	3
2:01			0	0	0	0.0	0			0	0	0	0.0	0	23	456	28	0	2	23	456	28	0	2	46	912	56	0.4	3
2:02			0	0	0	0.0	0			0	0	0	0.0	0	23	456	28	0	2	23	456	28	0	2	46	912	56	0.3	3
2:03			0	0	0	0.0	0			0	0	0	0.0	0	23	456	28	0	2	23	456	28	0	2	45	911	56	0.3	3
2:04			0	0	0	0.0	0			0	0	0	0.0	0	22	456	28	0	2	22	456	28	0	2	45	911	56	0.3	3
2:05			0	0	0	0.0	0			0	0	0	0.0	0	22	456	28	0	1	22	456	28	0	1	45	911	56	0.3	3
2:06			0	0	0	0.0	0			0	0	0	0.0	0	22	456	28	0	1	22	456	28	0	1	44	911	55	0.2	3
2:07			0	0	0	0.0	0			0	0	0	0.0	0	22	455	28	0	1	22	455	28	0	1	44	911	55	0.2	3
2:08			0	0	0	0.0	0			0	0	0	0.0	0	21	455	27	0	1	21	455	27	0	1	43	910	55	0.2	3
2:09			0	0	0	0.0	0			0	0	0	0.0	0	20	454	27	0	1	20	454	27	0	1	41	907	53	0.2	2
2:10			0	0	0	0.0	0			0	0	0	0.0	0	19	450	26	0	1	19	450	26	0	1	37	900	52	0.1	2
2:11			0	0	0	0.0	0			0	0	0	0.0	0	16	444	25	0	1	16	444	25	0	1	32	888	50	0.1	2
2:12			0	0	0	0.0	0			0	0	0	0.0	0	14	434	23	0	1	14	434	23	0	1	27	869	46	0.1	2
2:13			0	0	0	0.0	0			0	0	0	0.0	0	12	421	21	0	1	12	421	21	0	1	23	842	42	0.1	2
2:14			0	0	0	0.0	0			0	0	0	0.0	0	10	400	18	0	1	10	400	18	0	1	20	800	35	0.1	2
2:15			0	0	0	0.0	0			0	0	0	0.0	0	8	379	14	0	1	8	379	14	0	1	16	758	28	0.1	1
2:16			0	0	0	0.0	0			0	0	0	0.0	0	6	357	11	0	1	6	357	11	0	1	13	714	23	0.1	1
2:17			0	0	0	0.0	0			0	0	0	0.0	0	5	334	9	0	1	5	334	9	0	1	10	668	18	0.0	1
2:18			0	0	0	0.0	0			0	0	0	0.0	0	4	293	7	0	0	4	293	7	0	0	7	587	15	0.0	1
2:19			0	0	0	0.0	0			0	0	0	0.0	0	3	235	6	0	0	3	235	6	0	0	6	469	12	0.0	1
2:20			0	0	0	0.0	0			0	0	0	0.0	0	2	176	4	0	0	2	176	4	0	0	4	352	9	0.0	1
2:21			0	0	0	0.0	0			0	0	0	0.0	0	1	117	3	0	0	1	117	3	0	0	3	235	6	0.0	0
2:22			0	0	0	0.0	0			0	0	0	0.0	0	1	59	1	0	0	1	59	1	0	0	1	117	3	0.0	0
2:23			0	0	0	0.0	0			0	0	0	0.0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0	0
2:24			0	0	0	0.0	0			0	0	0	0.0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0	0
2:25			0	0	0	0.0	0			0	0	0	0.0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0	0
2:26			0	0	0	0.0	0			0	0	0	0.0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0	0
2:27			0	0	0	0.0	0			0	0	0	0.0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0	0
2:28			0	0	0	0.0	0			0	0	0	0.0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0	0
2:29			0	0	0	0.0	0			0	0	0	0.0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0	0
2:30			0	0	0	0.0	0			0	0	0	0.0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0	0
2:31			0	0	0	0.0	0			0	0	0	0.0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0	0
2:32			0	0	0	0.0	0			0	0	0	0.0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0	0
2:33			0	0	0	0.0	0			0	0	0	0.0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0	0

SHUTDOWN
EMISSION CALCULATION

SHUTDOWN

Time	LEAD CTG - INSTANTANEOUS						LAG CTG - INSTANTANEOUS						LEAD CTG 1-HR AVERAGE						LAG CTG 1-HR AVERAGE						2 CTGs - 1 HR AVERAGE				
	CT Load	NO_X	CO	VOC	SO_2	PM_{10}	CT Load	NO_X	CO	VOC	SO_2	PM_{10}	NO_X	CO	VOC	SO_2	PM_{10}	NO_X	CO	VOC	SO_2	PM_{10}	NO_X	CO	VOC	SO_2	PM_{10}
		lb/hr	lb/hr	lb/hr	lb/hr	lb/hr		lb/hr	lb/hr	lb/hr	lb/hr	lb/hr	lb/hr	lb/hr	lb/hr	lb/hr	lb/hr	lb/hr	lb/hr	lb/hr	lb/hr	lb/hr	lb/hr	lb/hr	lb/hr	lb/hr	lb/hr
2:34		0	0	0	0.0	0		0	0	0	0.0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0	0
2:35		0	0	0	0.0	0		0	0	0	0.0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0	0
2:36		0	0	0	0.0	0		0	0	0	0.0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0	0
2:37		0	0	0	0.0	0		0	0	0	0.0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0	0
2:38		0	0	0	0.0	0		0	0	0	0.0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0	0
2:39		0	0	0	0.0	0		0	0	0	0.0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0	0
2:40		0	0	0	0.0	0		0	0	0	0.0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0	0
2:41		0	0	0	0.0	0		0	0	0	0.0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0	0
2:42		0	0	0	0.0	0		0	0	0	0.0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0	0
2:43		0	0	0	0.0	0		0	0	0	0.0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0	0
2:44		0	0	0	0.0	0		0	0	0	0.0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0	0
2:45		0	0	0	0.0	0		0	0	0	0.0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0	0
2:46		0	0	0	0.0	0		0	0	0	0.0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0	0
2:47		0	0	0	0.0	0		0	0	0	0.0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0	0
2:48		0	0	0	0.0	0		0	0	0	0.0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0	0
2:49		0	0	0	0.0	0		0	0	0	0.0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0	0
2:50		0	0	0	0.0	0		0	0	0	0.0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0	0
2:51		0	0	0	0.0	0		0	0	0	0.0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0	0
2:52		0	0	0	0.0	0		0	0	0	0.0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0	0
2:53		0	0	0	0.0	0		0	0	0	0.0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0	0
2:54		0	0	0	0.0	0		0	0	0	0.0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0	0
2:55		0	0	0	0.0	0		0	0	0	0.0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0	0
2:56		0	0	0	0.0	0		0	0	0	0.0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0	0
2:57		0	0	0	0.0	0		0	0	0	0.0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0	0
2:58		0	0	0	0.0	0		0	0	0	0.0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0	0
2:59		0	0	0	0.0	0		0	0	0	0.0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0	0
3:00		0	0	0	0.0	0		0	0	0	0.0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0	0
3:01		0	0	0	0.0	0		0	0	0	0.0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0	0
3:02		0	0	0	0.0	0		0	0	0	0.0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0	0
3:03		0	0	0	0.0	0		0	0	0	0.0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0	0
3:04		0	0	0	0.0	0		0	0	0	0.0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0	0
3:05		0	0	0	0.0	0		0	0	0	0.0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0	0
3:06		0	0	0	0.0	0		0	0	0	0.0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0	0
3:07		0	0	0	0.0	0		0	0	0	0.0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0	0
3:08		0	0	0	0.0	0		0	0	0	0.0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0	0
3:09		0	0	0	0.0	0		0	0	0	0.0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0	0
3:10		0	0	0	0.0	0		0	0	0	0.0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0	0
3:11		0	0	0	0.0	0		0	0	0	0.0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0	0
3:12		0	0	0	0.0	0		0	0	0	0.0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0	0
3:13		0	0	0	0.0	0		0	0	0	0.0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0	0
3:14		0	0	0	0.0	0		0	0	0	0.0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0	0
3:15		0	0	0	0.0	0		0	0	0	0.0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0	0
3:16		0	0	0	0.0	0		0	0	0	0.0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0	0
3:17		0	0	0	0.0	0		0	0	0	0.0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0	0
3:18		0	0	0	0.0	0		0	0	0	0.0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0	0
3:19		0	0	0	0.0	0		0	0	0	0.0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0	0
3:20		0	0	0	0.0	0		0	0	0	0.0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0	0
3:21		0	0	0	0.0	0		0	0	0	0.0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0	0
3:22		0	0	0	0.0	0		0	0	0	0.0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0	0
3:23		0	0	0	0.0	0		0	0	0	0.0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0	0
3:24		0	0	0	0.0	0		0	0	0	0.0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0	0
3:25		0	0	0	0.0	0		0	0	0	0.0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0	0
3:26		0	0	0	0.0	0		0	0	0	0.0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0	0
3:27		0	0	0	0.0	0		0	0	0	0.0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0	0
3:28		0	0	0	0.0	0		0	0	0	0.0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0	0
3:29		0	0	0	0.0	0		0	0	0	0.0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0	0
3:30		0	0	0	0.0	0		0	0	0	0.0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0	0

		NO_X	CO	VOC	SO_2	PM_{10}		NO_X	CO	VOC	SO_2	PM_{10}		NO_X	CO	VOC	SO_2	PM_{10}
LEAD	lb	22	456	28	0	1	**LAG**	22	456	28	0	1	**MAX**	62	916	57	2.0	8
TOTAL	lb	44	911	55	0	3												
	ton	0.0	0.5	0.0	0.0	0.0												

Notes
1) Emissions during shutdown highlighted in gray
2) Emissions during normal operation (> 60% CTG load) shown for purposes of evaluating worst case 1-hr emission rates

Appendix K-4
Greenhouse Emissions

Step 1. identify all types of fuel directly combusted.

Natural Gas

Step 2. Determine annual consumption of the fuel

	Max Fuel Flow HHV	Hours of Operation	Fuel Consumed	Total Fuel Consumed
1 Turbine (no duct burner)	1957.5 MMBtu/hr	3791 hr/yr	7,420,882.5 MMBtu	2 Turbines 35,388,965 MMBtu
1 Turbine (with duct burner)	2568.4 MMBtu/hr	4000 hr/yr	10,273,600 MMBtu	
Boiler	56 MMBtu/hr	4000 hr/yr	224,000 MMBtu	224,000 MMBtu
Total				35,612,965 MMBtu

Step 3. Select the appropriate emission factors for each fuel from Tables5.1 and 5.3.
Find the emission factors for natural gas (boiler and large gas fired turbines > 3MW)

Step 4. Calculate fuel's carbon dioxide emissions

Total Emissions (metric tons) = Adjusted Emission Factor (kg CO_2/MMBtu) x Fuel Consumed (MMBtu) x 0.001 metric tons/kg
= 53.05 kg CO_2/MMBtu x 35,612,965 MMBtu x 0.001 metric tons/kg = **1,889,267.793 metric tons CO_2**

Step 5a . Calculate fuel's methane emissions.

1) Boiler

Total Emissions (metric tons) = Adjusted Emission Factor (kg CH_4/MMBtu) x Fuel Consumed (MMBtu) x 0.001 metric tons/kg
= 0.001021 kg CH_4/MMBtu x 224,000 MMBtu x 0.001 metric tons/kg = 0.228704 metric tons CH_4

2) Turbines

Total Emissions (metric tons) = Adjusted Emission Factor (kg CH_4/MMBtu) x Fuel Consumed (MMBtu) x 0.001 metric tons/kg
= 0.003901 kg CH_4/MMBtu x 35,388,965 MMBtu x 0.001 metric tons/kg = 138.05235 metric tons CH_4

Total CH4 Emissions = 138.28105 metric tons CH_4

Step 5b. Calculate fuel's nitrous oxide emissions.

1) Boiler

Total Emissions (metric tons) = Adjusted Emission Factor (kg N_2O/MMBtu) x Fuel Consumed (MMBtu) x 0.001 metric tons/kg
= 0.000980 kg N_2O /MMBtu x 224,000 MMBtu x 0.001 metric tons/kg = 0.21952 metric tons N_2O

2) Turbines

Total Emissions (metric tons) = Adjusted Emission Factor (kg N_2O /MMBtu) x Fuel Consumed (MMBtu) x 0.001 metric tons/kg
= 0.001361 kg N_2O /MMBtu x 35,388,965 MMBtu x 0.001 metric tons/kg = 48.16438 metric tons N_2O

Total N_2O Emissions = 48.38390 metric tons N_2O

Step 6. Convert CH_4 and NO Emissions to CO_2e and sum the subtotals.

Metric Tons of CO_2 = 1,889,267.793 metric tons CO_2
CH_4 Tons of CO_2e = metric tons CH_4 x 21 = 138.28105 x 21 = 2,903.902 metric tons
N_2O Tons of CO_2e = metric tons N_2O x 310 = 48.3839 x 310 = 14,999.009 metric tons

Total = 1,907,170.704 metric tons of CO_2e

Appendix K-5
Modeling Protocol

AIR QUALITY MODELING PROTOCOL FOR THE ETIWANDA POWER PROJECT SAN BERNARDINO COUNTY, CALIFORNIA

PREPARED FOR:

- **SOUTH COAST AIR QUALITY MANAGEMENT DISTRICT**
- **CALIFORNIA ENERGY COMMISSION**
- **U.S. ENVIRONMENTAL PROTECTION AGENCY REGION IX**

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MARCH 20, 2007

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$\mu g/m^3$	Micrograms per cubic meter
AAQS	Ambient Air Quality Standards
ACC	Air-cooled condenser
AERMOD	American Meteorological Society/Environmental Protection Agency Regulatory Model
AFC	Application for certification
AQRV	Air quality related values
ARB	Air Resources Board
ARM	Ambient Ratio Method
ATC	Authority to construct
BACT	Best available control technology
BPIP	Building profile input program
BPIP-Prime	Building Parameter Input Program – Prime
CAAQS	California Ambient Air Quality Standards
CARB	California Air Resources Board
CEC	California Energy Commission
CO	Carbon monoxide
CTG	Combustion turbine generator
°C	degrees Celsius
DCS	Distributed Control System
DLN	Dry, low-NO_x
DOC	Determination of compliance
EC	Element carbon
EGS	Etiwanda Generating Station
EPP	Etiwanda Power Project
ERC	Emission reduction credit
FLM	Federal Land Manager
GEP	Good engineering practice
g/s	Gram per second
HARP	Hotspots analysis and reporting program
HHV	Higher heating value
HRA	Health risk assessment
HRSG	Heat recovery steam generator
ISCST3	Industrial Source Complex Short Term 3rd version
IWAQM	Interagency Workgroup on Air Quality Modeling
km	Kilometers
LCC	Lambert Conformal Conic
LORS	Laws, ordinances, regulations, and standards
MEI	Maximally exposed individual
mm	Millimeter
MW	Megawatt
NAAQS	National Ambient Air Quality Standards
NNSR	Non-attainment New Source Review
NO_2	Nitrogen dioxide
NO_x	Nitrogen oxides

NPS	National Park Service
NSR	New source review
O_3	Ozone
OEHHA	Office of Environmental Health Hazard Assessment
OLM	Ozone limiting method
Pb	Lead
$PM_{2.5}$	Particulate matter less than 2.5 μm in diameter
PM_{10}	Particulate matter less than 10 μm in diameter
ppb	Parts per billion
ppm	Parts per million
PMS	Particulate Matter Speciation
PSD	Prevention of significant deterioration
ROC	Reactive organic compound
SCAQMD	South Coast Air Quality Management District
SCR	Selective catalytic reduction
SIL	Significant impact level
SO_2	Sulfur dioxide
SOA	Secondary organic aerosol
STG	Steam turbine generator
TAC	Toxic air contaminants
T-BACT	Best available control technology for toxics
tpy	Tons per year
USEPA	United States Environmental Protection Agency
USFS	United States Forest Service
USGS	United States Geological Survey
UTM	Universal Transverse Mercator
ZOI	Zone of impact

SECTION 1 INTRODUCTION

1.1 BACKGROUND

The Etiwanda Power Project (EPP) will be a nominal 615 -megawatt (MW) combined cycle power plant to be constructed almost entirely within the existing Reliant Energy Etiwanda Generating Station (EGS) property in Rancho Cucamonga, San Bernardino County, California. The EPP will consist of a 2 x 1 configuration, consisting of two combustion turbine generators (CTG), two supplementally-fired heat recovery steam generators (HRSGs), one steam turbine generator (STG) and ancillary equipment. The EGS site area is approximately 60 fenced acres located about 1 mile east of Interstate 15 (I-15) and approximately 1.5 miles north of Interstate 10 (I-10). Please refer to Figure 1.

The project is subject to the site licensing requirements of the California Energy Commission (CEC). The CEC will coordinate its independent air quality evaluations with the South Coast Air Quality Management District (SCAQMD) through the Determination of Compliance (DOC) process. As noted above the EPP will occur at an existing power generating station. The annual emission increases of several criteria pollutants resulting from this expansion will potentially be above the emission level thresholds for a Major Modification, as this term is defined in the United States Environmental Protection Agency's (USEPA) Prevention of Significant Deterioration (PSD) regulations. Specifically, the EPP will have a potential to emit greater than 100 tons per year (tpy) of carbon monoxide (CO), greater than 40 tons per year of nitrogen oxides (NO_x), and greater than 15 tons per year of particulate matter with diameter less than 10 microns (PM_{10}). The Reactive Organic Compounds (ROC) and Sulfur Oxides (SO_x) emissions are expected to be less than 40 tons per year. These annual emissions estimates are based on the following annual operating assumptions:

- 10 cold starts, 50 warm starts, 200 hot starts, and 260 shutdowns per year,
- 4,000 hours/year at 100% duct burner capacity and
- 3,446 hours/year operating at 100% combustion turbine load at 63 ºF.

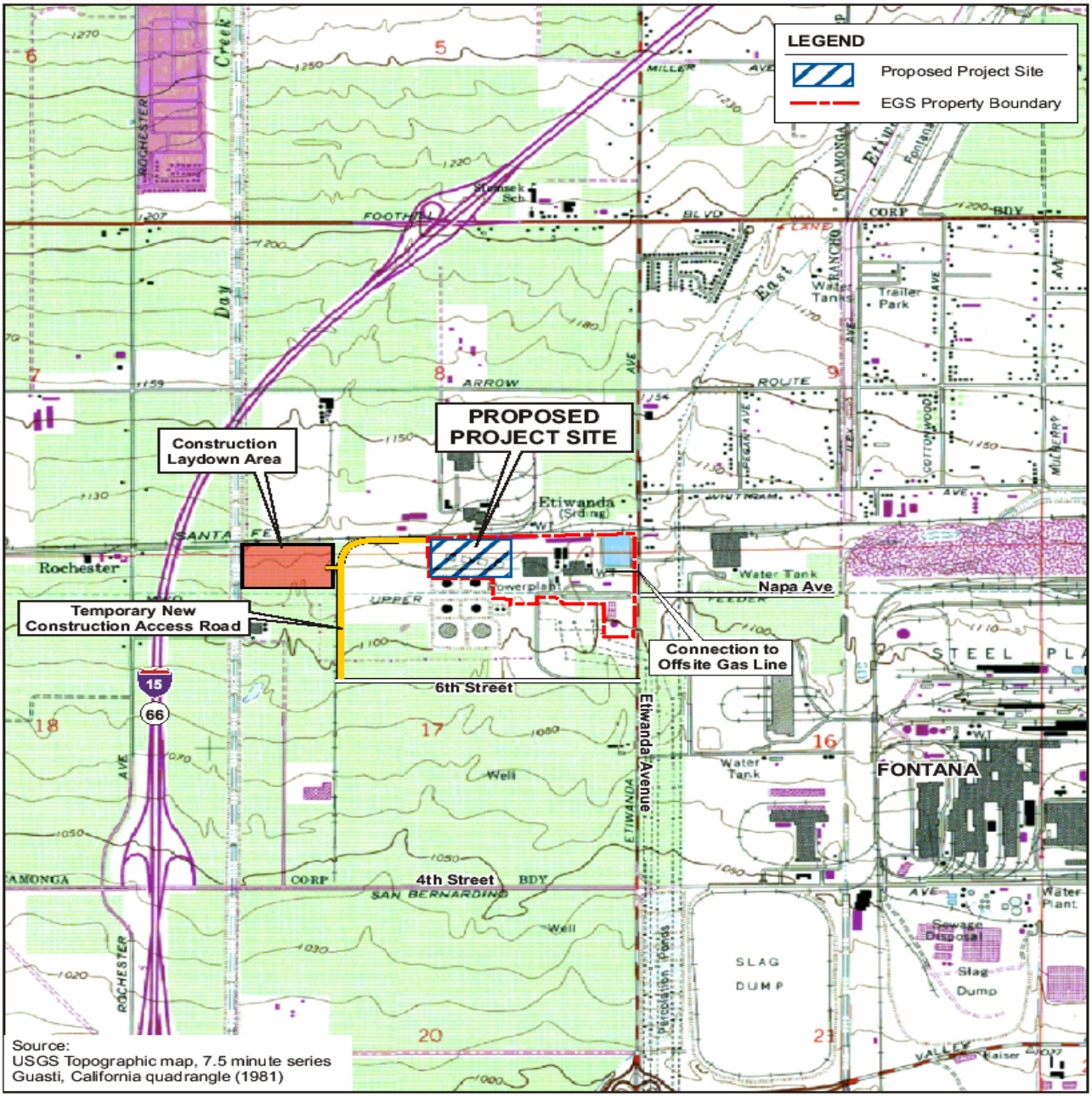
Since the project triggers PSD review, the air dispersion modeling for this project will be conducted in conformance with PSD requirements. For example, worst-case predicted impacts will be compared with the applicable monitoring exemption limits to demonstrate that the project will be exempt from the requirements relating to pre-construction ambient air quality monitoring. The PSD regulations apply only to those pollutants for which the project area is in attainment of the National Ambient Air Quality Standards (NAAQS). State and local new source review (NSR) and non-attainment NSR (NNSR) regulations potentially apply to all criteria pollutants, depending on the quantity of pollutants emitted. The area around the EPP is classified as attainment with respect to the NAAQS for nitrogen dioxide (NO_2), CO, and SO_2, and non-attainment for ozone (O_3), particulate matter less than 2.5 and 10 micrometers in diameter ($PM_{2.5}$ and PM_{10} respectively). With respect to the California Ambient Air Quality Standards (CAAQS), the area around the EPP is classified as attainment for NO_2, CO, sulfates, lead (Pb), hydrogen sulfide, and SO_2, and non-attainment for O_3, PM_{10}, and $PM_{2.5}$. NO_2 and SO_2 are regulated as PM_{10} precursors, and NO_2 and ROC as O_3 precursors. Project emissions of non-attainment pollutants and their precursors will be offset to satisfy state and local NNSR regulations.

1.2 PURPOSE

The CEC and SCAQMD both require the use of atmospheric dispersion modeling to demonstrate that a new power generation facility or modification to an existing facility will comply with applicable air quality standards and to determine the potential impacts on human health from the toxic air contaminants that will be emitted by such projects. In addition, CEC power plant siting regulations require that the cumulative impacts of the proposed project and reasonably foreseeable projects within 10 km of the project site be assessed via modeling.

This document summarizes the procedures that are proposed for the air dispersion modeling for project certification and permitting. Modeling of both operation and construction emissions due to the proposed power plant will be performed in accordance with CEC guidance (CEC, 1997) and the proposed guidance (CEC, 2006). This protocol is being submitted to the CEC and SCAQMD for their review and comment prior to completion of the applicable permit applications. In addition, the protocol will also be provided to US Environmental Protection Agency Region IX, because of the need to obtain a PSD permit for the proposed project. The proposed model selection and modeling approach is based on review of applicable regulations and agency guidance documents, and discussions with agency staff.

Figure 1
General Vicinity – Etiwanda Power Plant Project



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Scale in Feet
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N

PROJECT LOCATION MAP

March 2007
28067169

Etiwanda Expansion Project
Reliant Energy
San Bernardino County, California

URS

FIGURE 2.2-1

3/06/07 vsa ..\Reliant Etiwanda\Graphics\2.0 Facility Description\2.2-1_plm.cdr

SECTION 2 PROJECT DESCRIPTION

2.1 PROJECT LOCATION

The location of the proposed project is shown on Figure 1, which also illustrates the project site, and nearby roads and other features. The EPP will be almost entirely within the existing Reliant Energy Etiwanda Generating Station (EGS) property in Rancho Cucamonga, San Bernardino County, California. The EGS site is bordered by Etiwanda Avenue to the East, an existing SCE switchyard and vacant SCE-owned land to the South, undeveloped SCE owned land to the West, a parcel to the southwest owned by Inland Empire Utilities District containing two water tanks, and Burlington Northern Santa Fe Railroad tracks to the North. The EGS site is approximately 60 acres in size. Primary access to the site areas during construction will be from the south via 6th Street. The EGS Plant permanent access will remain on Etiwanda Avenue.

The EPP project will be constructed in the area previously occupied by the Units 1 and 2 cooling towers. Construction of the combined cycle plant will be generally within the footprint of the plant area to the west of Units 3 and 4, both of which will be unaffected by the addition of the new units. Units 1, 2 and 5 were retired in 2004 Net station power output will increase by approximately 615 MW over the existing plant capacity of 640MW with the addition of the combined cycle plant.

2.2 DESCRIPTION OF THE PROPOSED SOURCES

The proposed power generation facility (power block) consists of two CTGs (new units designated as Units 61 and 62,) equipped with dry low NO_X combustors and inlet air evaporative coolers; two HRSGs equipped with duct burners; one STG (new unit designated as Unit 60) and an air cooled condenser; and associated auxiliary systems and equipment. The exclusive fuel for the CTGs and duct burners will be pipeline-quality natural gas.

Units 61 and 62 will be Siemens Model 5000F CTGs, each with an ISO baseload gross output of approximately 180 MW. Each CTG will be designed and constructed to burn a single fuel (i.e., natural gas) with an evaporative cooling system installed on the inlet air for use when the ambient temperatures exceed 59°F. The maximum fuel flow rate for each turbine will be 1,960 MMBtu/hr (higher heating value, HHV). A combined cycle configuration will be established with the addition of HRSGs to the exhaust outlets of Units 61 and 62 and the addition of the Unit 60 STG.

A dry, low NO_X (DLN) combustor system will be used to control the nitrogen oxide (NO_X) emissions from each CTG. An additional post-combustion NO_X control system, a selective catalytic reduction (SCR) system will be provided in each HRSG to further reduce the NO_X emissions to the atmosphere. The SCR system for each HRSG will inject an aqueous ammonia solution into the exhaust gas stream upstream of a catalyst bed to reduce NO_X to inert nitrogen and water. An oxidation catalyst system will also be incorporated into the air quality control system to control emissions of CO and ROC.

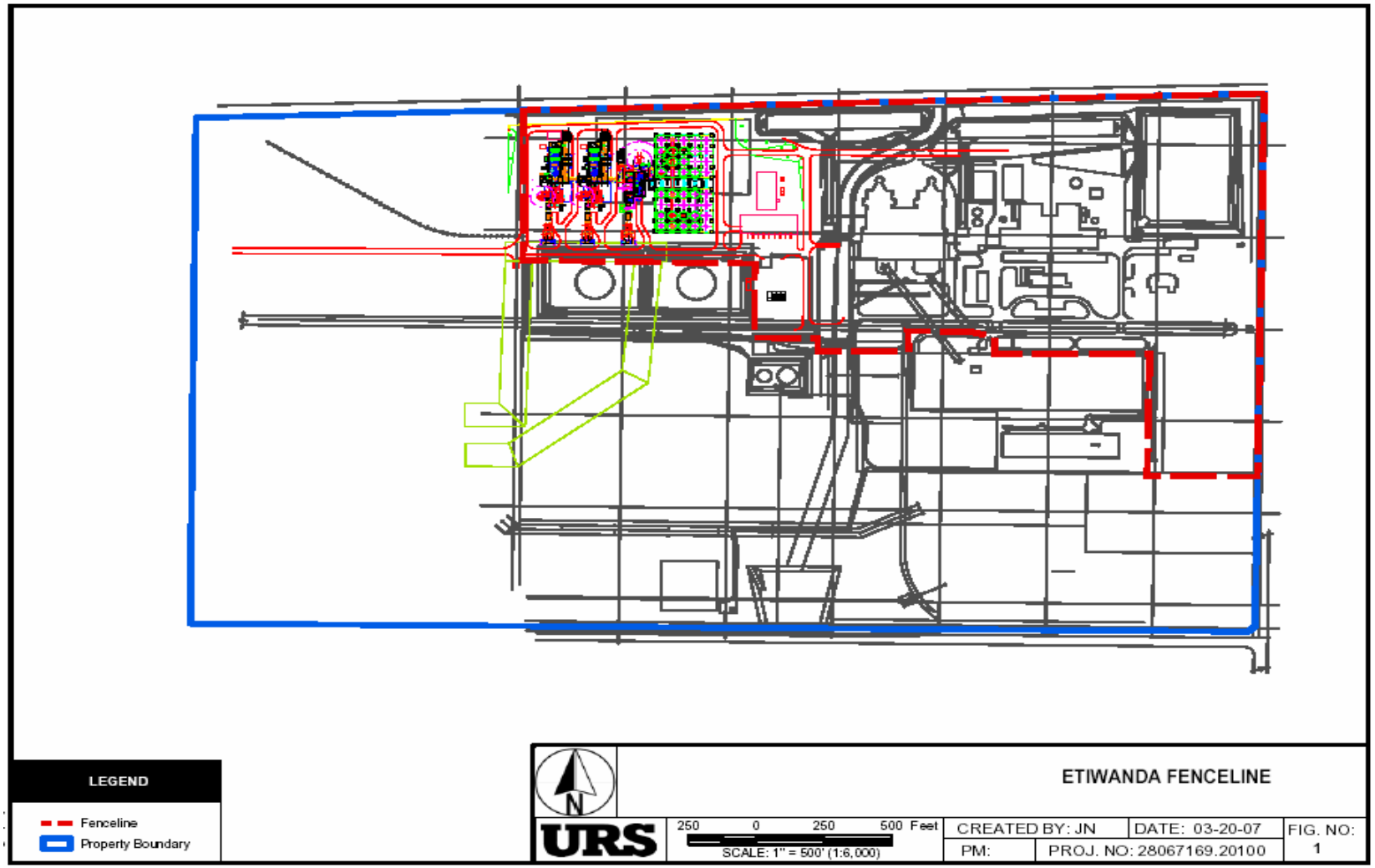
A water treatment system will be installed to create demineralized water for the combustion and steam processes. The system will be located in a new water treatment building on the EPP site. Demineralized and evaporative cooling water tanks and associated pumps will be located adjacent to the water treatment

building. Water treatment chemicals will be contained in totes and stored in curbed areas to prevent the spread of any potential spills. Spilled chemicals will drain to a sump for removal off site. A multi-celled dry cooling tower will be constructed to perform the required cooling for the CTGs, STG and associated equipment.

Natural gas compressors will be required to compress the natural gas to the pressures required by the CTGs. A natural gas fired auxiliary boiler will be provided to enhance start up of the EPP. A control building will be erected to house the Distributed Control System (DCS) controlling the plant as well as house associated plant electrical equipment, warehouse and shop.

Figure 2 shows the proposed locations of the proposed new generating units relative to the existing facility and the red dashed line indicates the fenceline of the property. [why is there a drawing of what looks like 8 simple cycle turbines on Figure 2?]

Figure 2
Facility Plot Plan and Fenceline



SECTION 3 REGULATORY SETTING

3.1 CALIFORNIA ENERGY COMMISSION REQUIREMENTS

For projects with electrical power generation capacity greater than 50 MW, CEC requires that applicants prepare a comprehensive Application for Certification (AFC) document addressing the proposed project's environmental and engineering features. An AFC must include the following air quality information (CEC, 1997):

- A description of the project, including project emissions of air pollutants and greenhouse gases, fuel type(s), control technologies and stack characteristics;
- The basis for all emission estimates and/or calculations;
- An analysis of Best Available Control Technology (BACT) according to South Coast Air Quality Management District (SCAQMD) Rules;
- Existing baseline air quality data for all regulated pollutants;
- Existing meteorological data, including temperature, wind speed and direction and mixing height;
- A listing of applicable laws, ordinances, regulations and standards (LORS) and a determination of compliance with all applicable LORS;
- An emissions offset strategy;
- An air quality impact assessment (i.e., national and state ambient air quality standards [AAQS] and PSD review) and protocol for the assessment of cumulative impacts of the proposed project along with permitted and under construction projects within a 10 km radius; and
- An analysis of human exposure to air toxics (i.e., health risk assessment [HRA]).

For the EPP, the air quality impact assessment, the cumulative impacts assessment, and the HRA will be performed using dispersion models.

3.2 SOUTH COAST AIR QUALITY MANAGEMENT DISTRICT REQUIREMENTS

The SCAQMD has promulgated requirements under Rule 1303. In general, all equipment with the potential to emit air pollutants is subject to the requirements of this rule, which has the following major requirements that potentially apply to new sources such as the EPP:

- Installation of BACT,
- Ambient air quality impact modeling to demonstrate compliance with NAAQS and CAAQS and to evaluate impacts to plume visibility in Class I areas near the proposed source(s),
- Emission offsets,
- Statewide compliance for all applicant-owned or operated facilities in California,

- Projection of visibility in Class I areas.

Rule 1401 (New Source Review of Toxic Air Contaminants or TACs) establishes allowable risks for new or modified sources of TAC emissions. This rule specifies limits for maximum individual cancer risk (MICR), cancer burden, and non-carcinogenic acute and chronic hazard indices (HIs) for new or modified sources of TAC emissions. The health risks resulting from project emissions, as demonstrated with a risk assessment, must not exceed established threshold values. While Rule 1401 does not specifically require the application of best available control technology for toxics (T-BACT) to any new or modified source that emits carcinogenic TACs, the rule relaxes the MICR risk threshold when T-BACT is applied.

3.3 U.S. ENVIRONMENTAL PROTECTION AGENCY REQUIREMENTS

USEPA has promulgated PSD regulations applicable to Major Sources and Major Modifications in San Bernardino County. The EPP will be a Major Modification Source because of the annual CO and NO_x emission rates. Many of the PSD requirements are the same as the AFC and Rule 1303 requirements described above (e.g., project description, BACT, ambient air quality standards analysis). However, PSD requires the following additional analyses:

- A PSD analysis of the potential impacts from the new emissions from the EPP;
- An analysis of air quality related values (AQRV) to ensure the protection of visibility in federal Class I National Parks and National Wilderness Areas within 100 km of the proposed project;
- An evaluation of potential impacts on soils and vegetation of commercial and recreational value; and
- An evaluation of potential growth-inducing impacts.

SECTION 4 CRITERIA POLLUTANT AIR QUALITY IMPACT ANALYSIS FOR NON-CLASS I AREAS

This section describes the dispersion models and modeling techniques to be used in performing the near-field criteria pollutant impact analysis for the EPP. The objectives of the modeling are to demonstrate that air emissions from the EPP will not cause incremental impacts that exceed the Class II PSD Significant Impact Levels (SILs) nor contribute to exceedances of state and federal ambient air quality standards

In November 2005, the USEPA officially recognized the American Meteorological Society/ Environmental Protection Agency Regulatory Model (AERMOD) as the preferred dispersion model for regulatory applications, replacing the Industrial Source Complex Short Term 3 (ISCST3) model. When contacted prior to preparation of this protocol, SCAQMD staff stated that use of ISCST3 would still be acceptable until complete meteorological input data sets suitable for use with AERMOD have been prepared by SCAQMD staff for areas throughout the District's jurisdiction . However, USEPA officially promulgated requirements to use AERMOD as a near-field dispersion model after a one-year grace period commencing November 9, 2005 and Region IX staff informed us that they would probably not approve any further use of ISCST3 for regulatory applications. Accordingly, the AERMOD will be used for the licensing/permitting analyses associated with the EPP.

4.1 SCREENING MODELING

Screening AERMOD modeling analysis (Version 04300) will be conducted using gridded receptors surrounding the Etiwanda plant facility. Modeling will be conducted with emission parameters corresponding to normal operating emissions of the proposed new turbine/HRSGs for different load conditions and ambient temperatures in order to determine the stack parameters and operating loads that correspond to maximum ground-level impacts from the most important project sources, i.e., the CTGs/HRSGs. The stack parameters that align with the highest offsite impact from these sources for each pollutant and averaging time period will be used for subsequent the refined modeling simulations.

4.2 REFINED MODELING

The purpose of the refined modeling analysis is to demonstrate that air emissions from the EPP will not cause or contribute to an ambient air quality violation. The AERMOD model (version 04300) will be used for the refined modeling of criteria pollutants. The regulatory default option will be selected. Specific modeling techniques for PSD, AAQS, and HRA analyses are discussed below.

Analysis of land use adjacent to the EPP was conducted in accordance with Section 8.2.8 of the Guideline on Air Quality Models (EPA-450/2-78-027R and Auer [1978]), EPA AERMOD implementation guide (2004), and its addendum (2006).

Based on the Auer land use procedure, more than 50 percent of the area within a 3-km radius of the Etiwanda power plant is appropriately classified as urban. Since the Auer classification scheme requires more than 50 percent of the area within the 3-km radius around a proposed new source to be non-rural for an urban classification, the urban mode will be used in the AERMOD modeling analyses. In addition,

land use characteristics for the entire 360 degrees out to a distance of 3 kilometers surrounding both the Ontario Airport and the Etiwanda site is entirely urban. According to the EPA AERMOD implementation guide (2005), AERMOD's urban option will be selected. The following land-use parameter values are proposed to be used with the Ontario meteorological data.

Table 4-1
Etiwanda Land Use Characteristics

Land Use Characteristic	Spring	Summer	Autumn	Winter
Albedo	0.14	0.16	0.14	0.14
Bowen Ratio	2.0	4.0	4.0	2.0
Surface Roughness (m)	1.0	1.0	1.0	1.0

The regulatory default options will be used, including building and stack tip downwash, default wind speed profiles, exclusion of deposition and gravitational settling, consideration of buoyant plume rise and complex terrain. In addition, the model will be instructed to exclude periods of missing meteorological data.

4.2.1 PSD Modeling Analyses

As the proposed project will trigger PSD as a Major Modification, modeling will be required to determine whether its incremental impacts on ambient levels of attainment pollutants (NO_2, SO_2 and CO) will not exceed Class II significant impact levels, or SILs. If these SILs were predicted to be exceeded, then an analysis of increment consumption since the local PSD baseline date would be required. However, it is anticipated that the increased emissions of these pollutants due to the EPP will not cause incremental effects above the federal SILs.

4.2.2 Ambient Air Quality Standards Analysis

In accordance with SCAQMD Rule 1303(b)(1), the proposed EPP will be required to demonstrate compliance with one of the following requirements:

- The project impact plus background must not exceed the most stringent applicable ambient air quality standard for each attainment pollutant (NO2, SO2, CO)
- The incremental effect of each permit unit of the EPP may not exceed the Significant Change in Air Quality Concentration standards (listed in Table 4-2 as SCAQMD Significance Levels) for non-attainment pollutants (PM10)

Compliance with these modeling requirements for attainment pollutants will be demonstrated by determining the maximum impact of the proposed Project at any receptor and adding a conservative background concentration based on recent data from the SCAQMD air quality monitoring station determined to be most representative of pre-project conditions in the project area. Because the EPP will be an addition to an existing operational power plant, separate model simulations will be conducted for the proposed new emission units alone and with the additional emissions contributions of the existing

Etiwanda Units 3 and 4, as well as a new simple cycle turbine peaking unit operated by SCE on adjacent property. The EPP will not be considered to cause or contribute to a near-field ambient air quality violation unless impacts from these sources combined with the background concentration exceed the most stringent ambient air quality standard.

Initially, the modeling will assume full conversion of NO_x to NO_2. Should it be required, 75% of NO_x to NO_2 conversion Ambient Ratio Method (ARM) will be applied. Furthermore, should it be required, NO_2 estimates will be reduced using the USEPA ozone limiting method (OLM) (for either hourly or annual impacts). If 1-hour and annual concentrations do not exceed the applicable ambient air quality standard, then compliance is demonstrated and no further modeling is necessary for NO_2.

For PM_{10}, which is a non-attainment pollutant, the maximum contributions of individual emission units of the proposed EPP will be compared directly with the corresponding Significant Change in Air Quality Concentration standard. If these values are below the significant change thresholds, no further demonstration of compliance for this pollutant is required. Note that emissions reduction credits will be provided by the applicant to provide at least a one-to-one offsetting of all Project emissions increases of NO_x, ROC, PM_{10} and SO_2.

4.2.3 Health Risk Assessment Analysis

The CEC and SCAQMD require a health risk assessment to evaluate TAC emissions from the operation of the project. Contaminants emitted by the project with potential carcinogenic effects or chronic and/or acute non-carcinogenic effects will be considered. This health risk assessment will be performed following the SCAQMD Risk Assessment Procedures for Rules 1401 and 212 (SCAQMD, 2005), Supplemental Guidelines for Preparing Risk Assessments for the Toxics “Hot Spots” Information and Assessment Act (AB2588) (SCAQMD, 2005) and Office of Environmental Health Hazard Assessment (OEHHA), Air Toxics Hot Spots Program Risk Assessment Guidelines (OEHHA, 2003). As recommended by the SCAQMD guideline, the California Air Resources Board (CARB) Hotspots Analysis and Reporting Program (HARP) (CARB, 2005) will be used to perform a refined SCAQMD Tier 4 and OEHHA Tier 1 health risk assessment for the project. HARP includes two modules: a dispersion module and a risk module. The HARP dispersion module incorporates the USEPA ISCST3 air dispersion model, and the HARP risk module implements the latest Risk Assessment Guidelines developed by OEHHA.

First, ground-level concentrations from the EPP emissions will be estimated using the ISCST3 dispersion model within HARP. The HARP modeling analysis will be consistent with, and use similar appropriate parameters, as the modeling approach discussed above for the AAQS analyses using AERMOD, except incorporating the SCAQMD required ISC control parameter NOCALMS. The same 5 year Ontario meteorological data set was processed for input into ISC, and will be used in this HRA. Based on the impacts determined by the ISCST3 model, the HARP model will be used to estimate the corresponding health risks. The ISCST3 results obtained for the year(s) of meteorological data resulting in the highest 1-hour and annual impacts will be used and receptors will be placed at 25-meter spacing around the facility fenceline and 100-meter spacing outside the fence out to 10 km. All receptors that HARP creates that are inside the fenceline will be excluded. The HARP simulations will also include the census

receptors out to 10 km, and additional receptors will be placed at all sensitive locations (e.g., schools, hospitals, etc.) out to a distance of 3 miles.

Per SCAQMD guidelines, cancer risk will be determined using the "Derived (Adjusted)" calculation method. Chronic non-cancer risks will be calculated with the "Derived (OEHHA)" method. Since EPP is surrounded by urban development, the dairy milk and local meat ingestion and drinking water consumption pathways will not be included in this analysis.

The HRA performed by means of the HARP model will follow the following steps:

- Define the location of the MEI for residents and commercial/industrial (i.e., the location where the highest carcinogenic risk may occur);
- Define the locations of the maximum chronic non-carcinogenic adverse health effects and the maximum acute adverse health effects;
- Calculate concentrations and adverse health effects at locations of maximum impact for each pollutant;
- Calculate cancer burden if cancer risk is predicted to be greater than one in a million;
- Determine the zone of impact for cancer risk if the cancer risk is predicted to be greater than or equal to one in a million; and
- Determine the zone of impact for acute and chronic health risks if the acute or chronic health index is predicted to be greater than or equal to 0.5.

Table 4-2
Relevant Ambient Air Quality Standards and Significance Level

Pollutant	Averaging Time	CAAQS (a,b)	NAAQS (b,c)	PSD Class II Significance Impact Levels (μg/m3)/ (SCAQMD Significance Levels)	PSD Significant Emission Rates (tpy)	PSD Increments (μg/m3)	
						Class I	Class II
CO	8-hour	9.0 ppm (10,000 μg/m^3)	9.0 ppm (10,000 μg/m^3)	500	100		
	1-hour	20 ppm (23,000 μg/m^3)	35 ppm (40,000 μg/m^3)	2,000 / (1,100)			
NO_2[d]	Annual		0.053 ppm (100 μg/m^3)	1	40	2.5	25
	1-hour	0.25 ppm (470 μg/m^3)		(20)[h]			

Pollutant	Averaging Time	CAAQS (a,b)	NAAQS (b,c)	PSD Class II Significance Impact Levels (μg/m3)/ (SCAQMD Significance Levels)	PSD Significant Emission Rates (tpy)	PSD Increments (μg/m3)	
						Class I	Class II
SO_2	Annual		0.03 ppm (80 μg/m^3)	1	40	2	20
	24-hour	0.04 ppm[e] (105 μg/m^3)	0.14 ppm (365 μg/m^3)	5		5	91
	3-hour		0.5 ppm (1,300 μg/m^3)	25		25	512
	1-hour	0.25 ppm (655 μg/m^3)					
PM_{10}	Annual	20 μg/m^3	50 μg/m^3	1	15	4	17
	24-hour	50 μg/m^3	150 μg/m^3	5 / (2.5)		8	30
$PM_{2.5}$	Annual	12 μg/m^3	15 μg/m^3				
	24-hour		65 μg/m^3				
O_3	8-hour	0.07 ppm (137 μg/m^3)	0.08 ppm (157 μg/m^3)	See footnote[f]			
	1-hour	0.09 ppm (180 μg/m^3)	See footnote[g]				

Notes:

a. California standards for ozone (as volatile organic compound), carbon monoxide, sulfur dioxide (1-hour), nitrogen dioxide, and PM10, are values that are not to be exceeded. The visibility standard is not to be equaled or exceeded.

b. Concentrations are expressed first in units in which they were promulgated. Equivalent units are given in parentheses and based on a reference temperature of 25°C and a reference pressure of 760 mm of mercury. All measurements of air quality area to be corrected to a reference temperature of 25°C and a reference pressure of 760 mm of mercury (1,013.2 millibar).

c. National standards, other than those for ozone and based on annual averages, are not to be exceeded more than once a year. The ozone standard is attained when the expected number of days per calendar year with maximum hourly average concentrations above the standard is equal to or less than 1.

d. NO2 is the compound regulated as a criteria pollutant; however, emissions are usually based on the sum of all NOx.

e. At locations where the state standards for ozone and/or PM10 are violated. National standards apply elsewhere.

f. Modeling is required for any net increase of 100 tons per year or more of ROCs subject to PSD.

g. New federal 8-hour ozone and fine particulate matter (PM2.5) standards were promulgated by USEPA on July 18, 1997. The federal 1-hour ozone standard was revoked by USEPA on June 15, 2005.

h. Previous SCAQMD 1-hour NO2 Significant Impact Level in Rule 1303 rescinded for NO2 attainment areas on April 20, 2001.

Blanks = Not applicable

ºC = degrees Centigrade

CAAQS = California Ambient Air Quality Standard

mm = millimeters

NAAQS = National Ambient Air Quality Standard

ppm = parts per million by volume, or micromoles of pollutant per mole of gas

TPY = ton per year

μg/m3 = micrograms per cubic meter

4.3 MODELING EMISSIONS INVENTORY

4.3.1 Operational Project Sources

Operational emissions from the project will be dominated by the CTGs with HRSGs Table 4-3 summarizes preliminary worst case short-term emission estimates from the two proposed turbine/HRSG trains during normal operation, startup/shutdown, and commissioning tests. Conceptual plant design includes SCR for NO_x and oxidation catalysts for CO that will comply with recent BACT determinations for similar projects in California and elsewhere. Emissions of SO_2 and PM_{10} will be maintained at low, levels, owing to the exclusive use of interstate pipeline quality natural gas as fuel for the gas turbines. Table 4-4 summarizes the estimated annual emissions from all project sources for each criteria pollutant.

Table 4-3
Worst-Case Short-Term Emission Estimates (For Both Turbines/HRSGs) – Normal Operation, Startup/Shutdown, and Commissioning

	Startup Emissions			Shutdown Emissions		Normal Operations Emissions	Commissioning Emissions
Pollutant	Maximum Emission Rate (lb/hr/2CTs)	Duration (min) [type of startup]	Total Startup Emissions (lb/startup /2CTs)	Maximum Rate (lb/hr/2CT)	Total Shutdown Emissions (lb/shutdown /2CTs) – 20 min duration	Maximum Rate from Normal Operation- 100% load with duct burner at 25°F (lb/hr/2CTs)	Commissioning (lb/hr/1CT)
NO_x	116	150 [Cold]	216	62	44	37.4	130
CO	1605	120 [Warm]	2000	916	911	19.9	3520
	1557	150 [Cold]	2605				
SO_2	2.0	150 [Cold]	2	2	0	2.9	1.4
PM_{10}	9	150 [Cold]	15	8	3	7.7	5

Table 4-4
Approximate Annual Project Emissions Increases for Both Turbines/HRSGs and one Auxiliary Boiler

Pollutant	Annual Emissions (tpy)	
	2 Turbines	Auxiliary Boiler
NOx	133	1.39
CO	287	4.75
SO2	9	0.08
PM10	29	0.64
VOC	28	0.51

4.3.2 Project Construction Sources

Temporary construction emissions will result from heavy equipment exhaust (primarily NO_x emissions and diesel particulate emissions) and fugitive dust (PM_{10}) from earthmoving activities and vehicle traffic on paved and unpaved surfaces. A detailed Excel Workbook will be created to estimate criteria pollutant emissions for the different non-overlapping phases of Project construction, based on information from the Project design engineers on the equipment use by month during the construction schedule and the area extent of ground disturbance that will occur during different construction phases. Depending on the magnitude of emissions for different pollutants and the proximity of construction activities to the property boundary for each phase, one or more emission scenarios representing reasonable worst-case activity and ground disturbance for each averaging time will be selected for subsequent dispersion modeling to estimate the maximum off-site air quality impacts of these temporary activities. The emissions estimates for these scenarios will be modeled using AERMOD with same near-field receptor grids and the same meteorological input data used for the modeling of the Project's operational emissions. The construction site, parking area, and lay-down area will be modeled as area or volume sources. Ultra-low sulfur diesel fuel (15 ppm by weight or less) will be utilized on any emission calculations for construction equipment used at the EPP site.

4.3.3 Toxic Air Contaminants

TACs will also be emitted from the operational EPP project due to combustion of natural gas. However, only small quantities of TACs will be emitted from these sources, primarily benzene, formaldehyde, and polycyclic aromatic hydrocarbons, because only natural gas will be used as fuel for the CTG/HRSG trains and the auxiliary boiler. No new diesel equipment is proposed as part of the project. Emission estimates for TACs from these sources will be based on emission factors available from SCAQMD, CARB and/or vendor data, if available.

4.3.4 Cumulative Impact Analysis Including Off-Property Sources

A cumulative modeling analyses will be performed using AERMOD to evaluate the combined impacts of the EPP Project emissions increases with those of the existing Etiwanda Power Plant Units 3 and 4 and a new peaking turbine proposed by SCE on the adjacent SCE property, as well as any other new sources within 6 miles from the EPP that are currently either under construction, undergoing permitting or expected to be permitted in the near future. Requests will be made to the SCAQMD and to the City of Rancho Cucamonga and adjacent cities within 6 miles of the Project site asking for lists of all such new or planned sources. When received, these lists will be forwarded to CEC for review. Based on this information, and the CEC response, additional sources may be included in the cumulative source modeling analysis.

4.4 BUILDING WAKE EFFECTS

The effect of building wakes (i.e., downwash) upon the stack plumes of emission sources at the facility will be evaluated in accordance with USEPA guidance (USEPA, 1985). Direction-specific building data will be generated for stacks below good engineering practice (GEP) stack height using the most recent version of USEPA Building Parameter Input Program – Prime (BPIP-Prime). Appropriate information

will be provided in the AFC and other permit applications that describe the input assumptions and output results from the BPIP-Prime model. The AERMOD model considers the PRIME downwash algorithm.

4.5 RECEPTOR GRID

The receptor grids that will be used in the AERMOD modeling analyses described in this protocol for operational sources will be as follows:

- 25-meter spacing along the fenceline and extending from the fenceline out to 100 meters beyond the property line;
- 100-meter spacing from 100 m to 1 km beyond the property line;
- 500-meter spacing within 1 to 5 km of project sources; and
- 1,000-meter spacing within 5 to 10 km of project sources.

During the refined modeling analysis for operational Project emissions, if a maximum predicted concentration for a particular pollutant and averaging time is located within the portion of the receptor grid with spacing greater than 25 meters, a supplemental dense receptor grid will be placed around the original maximum concentration point and the model will be rerun. The dense grid will use 25-meter spacing and will extend to the next grid point in all directions from the original point of maximum concentration. The fenceline is shown in Figure 2 as a dashed red line.

Due to the large computation time required to run AERMOD, this receptor grid, with the additional dense nested grid points, was determined to best balance the need to predict maximum pollutant concentrations and allow the all operational modeling runs to be completed in less than one week.

Because construction emission sources release pollutants to the atmosphere from small stacks or from soil disturbances at ground level, maximum predicted construction impacts for all pollutants and averaging times will occur within the first kilometer from the EPP site boundary. Accordingly, only the portion of the above grid with 25 meter spacing out to a distance of 1 km will be used for the construction modeling.

For the HRA modeling, receptors will be placed around the fenceline with 25-meter spacing, and 100-meter spacing will be used outside of the fenceline out to 10 km. All receptors that HARP creates that are inside the fence will be excluded. HARP will also include the census receptors out to 10 km. These census receptors will include the populated areas near the proposed EPP facility location. Discrete receptors will also be placed at all sensitive locations (e.g., schools, hospitals, etc.) out to 3 miles.

A detailed project map and a 7 ½- minute U.S Geological Survey (USGS) map will be provided in the AFC. Actual Universal Transverse Mercator (UTM) coordinates will be used. The CAAQS and NAAQS apply to all locations outside of the applicant's facility, i.e. where public access is not under the control of the applicant, and the south part of the property, to which the public begins to have access. Therefore, the fenceline will be placed inside of the facility's property boundary, and the receptors will be placed on and outside of the fenceline.

4.6 METEOROLOGICAL AND AIR QUALITY DATA

4.6.1 Meteorological Data

Meteorological data suitable for direct input to AERMOD were purchased from Trinity Consulting. Hourly surface data in CD 144 format for calendar years 1994, 1995, 1997, 1998, and 1999 were obtained from the SCAQMD for the Ontario International Airport meteorological station which is located, in the City of Ontario approximately 3.7 miles southwest of the EPP site. The data from this station for 1996 did not meet the 90% data capture rate that is normally required for regulatory permitting in California, and was thus replaced by 1994 data. Concurrent upper air sounding data collected at Edwards Air Force Base, California were used with the Ontario surface data to run the AERMET preprocessor program in order to generate an AERMOD-ready meteorological input file for the selected five year period.

The meteorological data recorded at Ontario International Airport are acceptable for use at EPP facility for two reasons, proximity and terrain similarity. The terrain immediately surrounding the Project site can be categorized as a flat, or gradually sloping urban area. The terrain around the Ontario International Airport is also relatively flat, or gradually sloping urban area. Thus the land use and the location with respect to near-field terrain features are similar. Additionally, there are no significant terrain features separating the Ontario Airport from the EPP facility site that would cause differences in wind or temperature conditions between these respective areas. Therefore the five years of meteorological data selected from the Ontario International Airport were determined to be representative for purposes of evaluating the Project's air quality impacts. The Ontario International Airport is the closest full-time meteorological recording station to the EPP facility site, and thus meteorological conditions at the sites will be very similar.

The Edwards Air Force Base upper air data monitoring station is located approximately 60 miles northwest of EPP facility site. This is the closest upper air station and was determined the most representative data available for use in this modeling analysis.

Seasonal and annual wind roses based on the five years of Ontario Airport surface meteorological data are provided as Appendix A to this protocol document. Winds for all seasons and all years blow predominantly from the west and southwest directions, although the directional pattern is more variable during the winter season.

4.6.2 Air Quality Monitoring Data

Air quality monitoring data from 2002 through 2006 for the Project area was obtained from the USEPA AirData (2006) and the CARB-California Air Quality Data website (2006). The most recent five years of data (2002-2006) from Fontana-Arrow, Upland, Riverside-Rubidoux, and San Bernardino-4th Street monitoring stations were collected to determine the most representative baseline concentrations for each air pollutant and averaging period addressed in the California and National ambient air quality standards. The maximum concentration recorded at these monitoring stations over the five-year period will be used as a conservative representation of existing air quality condition at the proposed Project site.

The Fontana monitoring station is located approximately 4 km to the east of EPP facility site. The Fontana station is the closest station that monitors all the criteria pollutants, except CO. The Upland

station is the next closest station that monitors ambient CO. The Upland station is located approximately 9 km to the west of EPP facility site.

The selected maximum baseline concentrations for all pollutants are summarized in Table 4-5. These data will be added to the modeled maximum impacts from the facility for each pollutant and averaging time, and the totals will then be compared with the applicable AAQS. This is a conservative approach because it assumes that the highest recorded value and the modeled maximum impact both occur at the same time and at the same location. However, since the background concentrations of PM_{10} currently exceed the CAAQS, the PM_{10} and $PM_{2.5}$ impacts are compared to the PM_{10} and $PM_{2.5}$ SILs and the SILs of the SCAQMD.

Table 4-5
Highest Monitored Concentrations Near Etiwanda Area (2002 – 2006)

Pollutant	Averaging Time	Highest Monitoring Concentration	Monitoring Station Address	Year
CO	8-hour	4.5 ppm (5145 μg/m³)	San Bernardino	2003
	1-hour	5.1 ppm (5830 μg/m³)	San Bernardino	2003
NO_2	Annual	0.036 ppm (67.59 μg/m³)	Upland	2002
	1-hour	0.122 ppm (229.09 μg/m³)	Upland	2002
SO_2	Annual	0.004 ppm (10.46 μg/m³)	Rubidoux	2004
	24-hour	0.015 ppm (39.22 μg/m³)	Rubidoux	2004
	3-hour	0.016 ppm (41.83 μg/m³)	Rubidoux	2004
	1-hour	0.024 ppm (62.75 μg/m³)	Rubidoux	2005
PM_{10} (Non-attainment area)	Annual	63.3 μg/m³	Rubidoux	2004
	24-hour	164 μg/m³	Rubidoux	2003
$PM_{2.5}$	Annual	27.4 μg/m³	Rubidoux	2002
(Non-attainment area)	24-hour	104.3 μg/m³	Rubidoux	2003

4.7 FUMIGATION

Fumigation occurs when a stable layer of air lies a short distance above the release point of a plume and unstable air lies below. Especially on sunny mornings with light winds, the heating of the earth's surface causes a layer of turbulence which grows in depth over time and may intersect an elevated exhaust plume, rapidly drawing it down to ground level and creating relatively high pollutant concentrations for a short period. Typically, fumigation analysis is conducted using SCREEN3 when the project site is rural and the stack height is greater than 10 meter. However, since the Etiwanda project site is urban, the SCREEN3 fumigation analysis is not considered to be valid.

SECTION 5 CLASS I AREAS AIR QUALITY IMPACT ANALYSIS

An evaluation of impacts in Class I areas within 100 km of the Etiwanda site will be conducted because the potential emissions increases from the project are sufficient to trigger the federal PSD program. A major modification to an existing PSD source with emissions exceeding the PSD Significant Emissions Increase thresholds must evaluate impacts to visibility and other air quality related values at all Class I areas that are located within a 100-km radius of the facility in order to satisfy the federal PSD program requirements, which are incorporated within SCAQMD Rule 1703 – PSD Analysis. In addition, SCAQMD Rule 1303 requires plume visibility impact analyses for new emission sources proposing to locate within prescribed distances of several specific Class I areas. This section describes the dispersion models and modeling techniques that will be used in performing the Class I area air quality analyses for the EPP. The objectives of the modeling are to demonstrate that air emissions from the EPP will not cause or contribute to a PSD increment exceedance or cause a significant impact on visibility, regional haze or sulfur or nitrogen deposition in any Class I area.

For the plume visibility analysis required by SCAQMD Rule 1303 and the federal PSD program, VISCREEN (Tier 1 and 2) and PLUVUE II (Tier 3) will be used for the Class I areas, which are located within 50 kilometers (km) of the EPP facility. The CALPUFF-Lite (screening model) and CALMET/CALPUFF (full-CALPUFF) model will be used for the Class I areas (or portions thereof) that are outside a 50-km perimeter from the facility. For the PSD analysis, AERMOD will be used for the Class I areas (and portions thereof) that are located within 50 km of the facility, and CALPUFF-Lite or CALPUFF will be used for the Class I areas located more than 50 km from the facility. CALPUFF-Lite will be used for the analyses of the Project's impacts to sulfur and nitrogen deposition in all Class I areas. These planned modeling analyses are summarized in Table 5-1.

Table 5-1
Proposed Model Selection and Receptor Description for Class I Area Analyses

Distance from the Etiwanda Project	Class I Areas	Class I area Air Quality Impact Analysis	Model to be Used	Receptors
Within 50 km	- Cucamonga Wilderness Area - San Gabriel Wilderness Area	PSD Analysis	AERMOD	Discrete receptors in Class I areas
		Deposition	CALPUFF-Lite	Discrete receptors in Class I areas
		Visibility	VISCREEN / PLUVUE	Discrete observer/vista points
Beyond 50 km	- San Gorgonio Wilderness Area - San Jacinto Wilderness Area - Agua Tibia Wilderness Area - Joshua Tree National Park	PSD Analysis	CALPUFF-Lite / CALPUFF	Three rings of receptors for CALPUFF-Lite; Discrete receptors in Class I areas for CALPUFF
		Visibility	CALPUFF-Lite / CALPUFF	
		Deposition	CALPUFF-Lite	

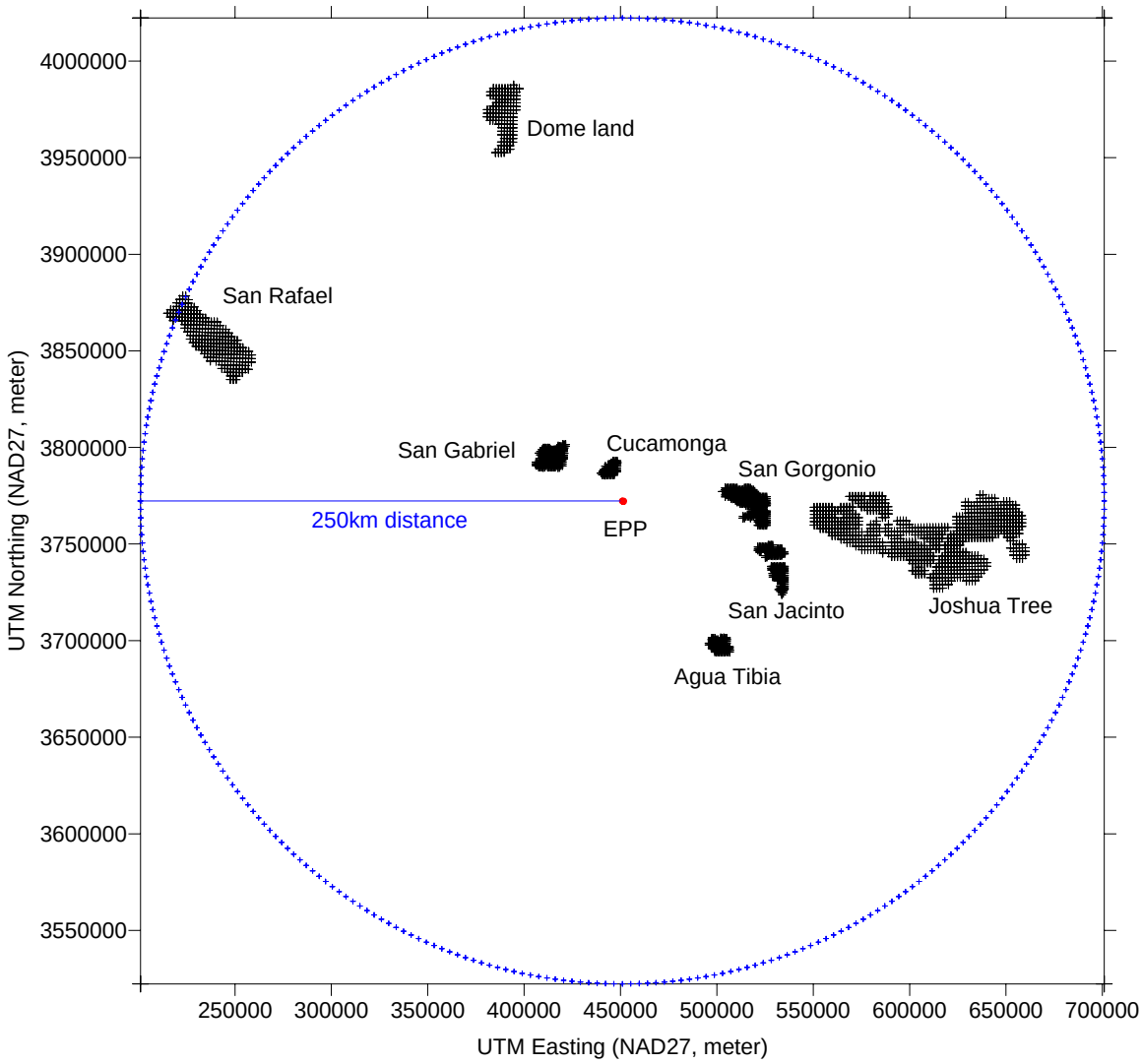
Figure 3 shows the locations of these Class I areas relative to the proposed site location for the EPP and Table 5.2 lists the distances from EPP to the closest and farthest points in each Class I area. The federal authority in charge of the five wilderness areas identified above is the United States Forest Service (USFS) and the National Park Service is in charge of Joshua Tree National Park. The visibility analyses for these six areas will be conducted in a manner consistent with guidance from the NPS and USFS following the procedures set forth in the Federal Land Managers' Air Quality Related Values Workgroup (FLAG) Phase I Report (USFS, 2000).

Table 5-2
Class I Areas Within 100-km Radius of the Facility

Class I areas	Distance from the EPP (km)	
Cucamonga Wilderness Area	Closest	14
	Farthest	21
San Gabriel Wilderness Area	Closest	36
	Farthest	49
San Gorgonio Wilderness Area	Closest	52
	Farthest	76
San Jacinto Wilderness Area	Closest	74
	Farthest	96
Agua Tibia Wilderness Area	Closest	84
	Farthest	96
Joshua Tree National Park	Closest	99
	Farthest	210

The Cucamonga Wilderness Area and San Gabriel Wilderness Area are located within 50 km. The San Gorgonio Wilderness Area, San Jacinto Wilderness Area, Agua Tibia Wilderness Area, and Joshua Tree National Park are located beyond 50 km and within 100 km from the proposed facility. The CALPUFF modeling domain will extend 50 km past the farthest edge in all directions from any of the six Class I areas being analyzed in order to reduce the probability that mass will be lost due to possible wind recirculation. San Rafael Wilderness Area and Dome Land Wilderness Area are located within 250 km of the EPP, but will not be included in the modeling analysis since they lie downwind of Cucamonga and San Gabriel Wilderness Areas. Thus the CALPUFF modeling domain will extend from EPP 100 km to the west, 100 km to the north, 260 km to the east, and 150 km to the south.

Figure 3
Radius of 250 km Surrounding the EPP Showing Class I Area Receptors



5.1 NEAR-FIELD CLASS I AREAS AIR QUALITY IMPACT ANALYSIS (WITHIN 50KM)

5.1.1 Near-Field Class I Areas Visibility and Regional Haze Analysis: Tier I, Tier II and Tier III Visibility Modeling

SCAQMD Rule 1303(b)(5) (C)(i) requires a plume visibility analysis if the net emissions increase from a new source will exceed 15 tpy of PM_{10} or 40 tpy of NO_x, provided that the source is located within specified distances from the nearest boundary of a Federal Class I area. The proposed EPP site is within the distance specified in Rule 1303 for one Class I area, the Cucamonga Wilderness Area. In addition, the Project emissions are expected to exceed the threshold values for both NO_x and PM_{10}. Accordingly, a

plume visibility analysis in Cucamonga Wilderness will be conducted in the manner that meets the requirements of Rule 1303 Appendix B, along with the PSD requirements described below.

As shown in Table 5-2, two Class I areas lie entirely within the near-field, i.e., within 50 km from the proposed facility: Cucamonga and San Gabriel Wilderness Areas. For these two Class I areas a screening-level VISCREEN modeling analysis will be performed to address the proposed project's impacts in terms of plume contrast and color difference index. This analysis is required under SCAQMD Rule 1303, as well as the federal PSD program, which is incorporated in SCAQMD regulations under rule 1703.

Initially, a series of Tier I visibility screening analyses will be conducted to obtain a conservative evaluation of the proposed project's potential to adversely affect visibility in two Class I areas: Cucamonga Wilderness Area and San Gabriel Wilderness Area. The level of analysis entails use of the EPA VISCREEN model with simple, worst-case default input assumptions (i.e., extremely stable [Class F]) atmospheric turbulence conditions and a very low wind speed [1.0 meter per second] persisting for 12 consecutive hours in a direction) that would transport the proposed turbine plumes toward a hypothetical observer at each Class I area. The only inputs required to execute the Tier I analysis with the default parameter settings are: (1) projected short-term maximum turbine emission rates of fine particulate, and nitrogen oxides; per EPA Plume Visual Impact Screening Workbook (EPA, 1988 and 1992) (2) the distances between the project stacks and a hypothetical observer at the nearest and farthest Park boundaries; and (3) representative background visual range for the region(s) of concern.

The VISCREEN output for a Class I analysis provides the results of the following plume impact tests:

- Plume perceptibility based on color differences between the plume and a sky or terrain background (dE).
- Plume contrast relative to a sky or terrain background (C).

The VISCREEN model calculates the color difference index (dE) and the contrast (C) for four different lines of sight corresponding to two types of background (sky and terrain), and two assumed worst-case sun angles (10 degrees and 140 degrees). As part of the standard output, the four lines of sites will be calculated for both the observer's view inside the Class I area and the view outside the area. However, it should be noted that both the NPS and the USFS identify only the view inside the Class I area as the criteria for significance in this analysis.

Based upon the FLAG workbook, the significance criteria for the dE is less than 2 and 0.05 for C. As recommended by the FLAG document, a Tier II screening procedure should be conducted when the potential for impacts greater than the screening criteria is indicated by the results of the Tier I analysis, as described in the Plume Visual Impact Screening Workbook (EPA, 1988 and 1992).

The Tier II procedure is similar to the Tier I analysis, but allows more site-specific input data to be used in place of the extremely conservative default assumptions Specifically, the frequency of occurrence of the different dispersion conditions in the project vicinity will be established and ranked in terms of increasing values of the dispersion parameter '$\sigma_z u$' (i.e., the product of the wind speed (u) and the plume vertical spread parameter (σ_z) for the appropriate stability class) and the source-receptor distance. The

VISCREEN model will be then run for the most restrictive combination of wind speed, wind direction and atmospheric stability that corresponds to a cumulative frequency, with all the other parameter combinations of lesser dispersion parameter values, of 1%. In addition, a background ozone concentration of 0.065 ppm will be incorporated to represent the worst-case 24-hour ozone concentration in the region.

The Tier II procedure consists of analyzing the available meteorological data to incorporate information on the frequency of conditions that may lead to adverse plume impacts in the Class I areas. The required meteorological statistics used for this refinement will be derived from the five-year Ontario International Airport hourly meteorological data set with an upper air data from the Edwards Air force Base, which also will be used for the AERMOD analysis. The hourly meteorological data were measured very near the proposed location and are considered representative of the wind conditions at the site.

This data set will be first analyzed to determine the frequency of various combinations of wind speed and stability in the approximately 30 degree wind direction sectors that would carry the EPP facility plume toward each of the Class I areas located less than 50 km from the EPP site. The frequency distributions will be developed separately for four diurnal time periods (midnight-6:00 am, 6:00 am-noon, noon-6:00 pm, and 6:00 pm-midnight). For each time period, five wind speed categories corresponding to 0-1 meters per second (m/s), 1-2 m/s, 2-3 m/s, 3-4 m/s, and 4-5 m/s will be analyzed for each of six stability classes (Class A-most unstable through Class F-most stable, Class G is considered as Class F) and wind direction compass sector toward the Class I area from the project site. For each time of day and the approximately 30 degree wind direction sector that could transport project emissions toward a Class I area, 14 wind speed/stability combinations will be ranked in order of increasing values of the dispersion parameter, $\sigma_z u$ as described above. The combinations will include F stability for wind speed classes 1 through 4, E stability with wind speed classes 1 through 5, and D stability with wind speed classes 1 through 5, as per the Tier II guidance. Note that the lowest values of this parameter correspond to the most restrictive dispersion conditions. Finally, a table will be constructed showing the percent frequency of occurrence for each combination of stability and wind speed or, alternatively for each value of $\sigma_z u$. These data are tabulated in terms of the frequency of each combination, as well as the cumulative frequency of all combinations with lower values of $\sigma_z u$.

The meteorological condition for each Class I area with a cumulative frequency of 1 or greater, and with a wind speed fast enough to transport the plume to the given park within 12 hours will be selected. The EPP and Cucamonga and San Gabriel Wilderness Areas lie in complex terrain. The elevation gain from the EPP to Cucamonga is greater than 500 meters and there is terrain with an elevation gain of greater than 500 meters between EPP and the front edge of San Gabriel. Per the Plume Visual Impact Screening Workbook (EPA, 1988 and 1992), the worst-case stability class selected may be shifted one category less stable. Thus the VISCREEN model will be run for one stability class less stable and the wind speed determined by the techniques described above for the corresponding Class I areas to determine whether impacts above the model's screening criteria would be predicted. Actual background visual range measurements have been conducted in San Gabriel Wilderness Area. The average measured background visible range value for 2001 – 2003 from the best 20% visibility days at San Gabriel Wilderness Area of 213 km will be used in the simulation for both Cucamonga Wilderness Area and San Gabriel Wilderness Area.

If the plume parameters predicted by VISCREEN are above the screening criteria for locations inside the Class I areas, an analysis using the EPA PLUVUE II plume visibility model will be required to determine whether a less conservative screening approach would result in predicted significant impacts within the two near-field Class I areas. This analysis will involve collaboration with air quality staff of the National Forest Service to identify appropriate observer/vista locations to be analyzed in the PLUVUE II study. According to the FLAG guidance, the significant impact levels for the Tier III analysis are more stringent than those for the Tier 1 and Tier II modeling approach. Thus the delta E and contrast numbers used as significance criteria in the PLUVUE II simulations will be 1.0 and 0.02, respectively.

For Tier I and II visibility modeling, the maximum 24-hour averaged emission rates of NO_2 and PM_{10} from two turbines and one auxiliary boiler will be used, per the Plume Visual Impact Screening Workbook (EPA, 1988 and 1992). For Tier III visibility modeling, the maximum 24-hour averaged emission rates of NO_2, SO_2 and PM_{10} from two turbines and one auxiliary boiler will be used.

Full details of the VISCREEN and PLUVUE simulations and meteorological analyses used in developing realistic worst-case impact scenarios will be provided with model input and output files for the PLUVUE simulations.

5.1.2 Near-Field Class I Areas PSD Analysis: AERMOD

A PSD analysis for Class I areas will be required because the EPP will be a major modification as defined in the PSD regulations. Therefore, the maximum predicted incremental criteria pollutant concentrations from the EPP sources will be compared with the proposed PSD significant impact level for Class I areas (see Table 5-3) for each pollutant as a reference point.

For the Class I areas within 50 km distance of the facility, the PSD analysis will be conducted using the AERMOD model. Receptors for each Class I area will be obtained from the *NPS Convert Class One Areas* database. No modifications to the receptor locations or heights, as provided in the database, will be made. Latitude/longitude of the Class I receptor coordinate will be converted to UTM coordinate based on NAD27 zone 11.

The 3-hour average impact of SO_2, the 24-hour average impacts of SO_2 and PM_{10}, and the annual average impacts of SO_2, PM_{10}, and NO_x will be predicted using corresponding averaging emission rates. The five-year meteorological data used for the Class II area (Section 4.6) will be used for Class I area. The modeled maximum impacts from the proposed EPP site will be compared with the corresponding proposed PSD Class I significant impact levels.

Table 5-3 Proposed Class I Significance Impact Levels

Parameter	Modeled Scenario					
Concentration	NO_x	PM_{10}		SO_2		
	Annual	24-hour	Annual	3-hour	24-hour	Annual
Threshold	0.1	0.3	0.2	1	0.2	0.1

5.2 FAR-FIELD CLASS I AREA AIR QUALITY IMPACT ANALYSIS: CALPUFF MODELING

To analyze visibility and incremental impacts for the Class I areas beyond 50 km from the proposed project site, and deposition and soil and vegetation impacts for the Class I areas within 50 km from the proposed project site, the CALPUFF-Lite model, the screening mode of CALPUFF, will be used. If significant impacts are predicted the refined CALPUFF model will be used in conjunction with the CALMET diagnostic meteorological model. CALPUFF is a transport and dispersion model that simulates the advection and dispersion of "puffs" of material emitted from modeled sources. CALPUFF can incorporate three-dimensionally varying wind fields, wet and dry deposition, and atmospheric gas and particle phase chemistry. When run in the screening mode, CALPUFF-Lite uses data from a single meteorological station. The CALMET model is used to prepare the necessary gridded wind fields for use in the refined CALPUFF model. CALMET can accept as input; mesoscale meteorological data (MM5 data), surface station, upper air, precipitation, cloud cover, and over-water meteorological data (all in a variety of input formats). These data are merged and the effects of terrain and land cover types are estimated. This process results in the generation of gridded 3-D wind field that accounts for the effects of slope flows, terrain blocking effects, flow channelization, and spatially varying land use types.

The EPA-approved regulatory air quality dispersion model CALPUFF (version 5.711a) will be used as per the recommendations in the following regulatory guidance documents. In addition, all supporting Version 5 editions of the pre- and post-processors will be used.

- Federal Land Managers' Air Quality Related Values Workgroup (FLAG) Phase I Report , and
- Interagency Workgroup on Air Quality Modeling (IWAQM) Phase 2 Summary Report and Recommendations for Modeling Long Range Transport Impacts.

The IWAQM report recommends CALPUFF for use in long-range transportation and dispersion analyses involving one or more emission sources. Key inputs and model options will be discussed in the air quality impacts analysis section of the permit application. Discussions with the FLMs from the USFS and NPS will help define the appropriate model inputs.

The IWAQM document's recommendations regarding modeling of Class I area impacts include the following paragraph:

> 'Basically, IWAQM's recommendation for a screening analysis is an approach using a simplified set of meteorology with CALPUFF. To encourage the results to be higher than would be estimated using a fully developed CALPUFF and CALMET analysis, rings of receptors are used. The maximum concentration value found anywhere on the receptor rings are used (rather than restricting the analysis to receptors only located within the Class I area(s) of interest)."

The simplified approach described in this passage is the CALPUFF Lite analysis, which is clearly identified by IWAQM as a methodology designed to ensure that peak impacts to air quality in Class I areas will err on the side of conservatism (overprediction). Thus, if air quality and deposition impacts are

shown by CALPUFF Lite modeling to be below the applicable levels of significance for Class I areas, no further analysis should be required.

Copies of all executable files used in the preparation of this modeling analysis will be provided with the final application.

5.2.1 CALPUFF/CALMET Description

5.2.1.1 Location and Land-Use

The CALPUFF models incorporate assumptions regarding land-use classification, leaf-area index, and surface roughness length to estimate deposition during transport. For the CALPUFF-Lite analysis the urban land use and dispersion coefficients will be selected.

For the refined CALPUFF modeling, U.S. Geological Survey (USGS) 1:250,000 scale digital elevation models (DEMs) and Land Use Land Cover (LULC) classification files will be used to develop the geophysical input files required by the CALMET model. Terrain pre-processor (TERREL) and land use pre-processor (CTGPROC) output will be combined in the geo-physical preprocessor (MAKEGEO) to prepare the CALMET geo-physical input file. The CALMET model will incorporate the necessary parameters in the CALMET output files for use in the CALPUFF model.

In the refined CALPUFF modeling the domain will extend from EPP 100 km to the west, 100 km to the north, 260 km to the east, and 150 km to the south. The grid-cells will be 3 kilometers wide. The modeling domain will be specified using the Lambert Conformal Conic (LCC) Project system.

5.2.1.2 Meteorological Data

The screening mode of CALPUFF utilizes enhanced ISC meteorological data. Hourly meteorological data input files will be prepared for use with the CALPUFF air quality dispersion model. Hourly surface data obtained at the Ontario International Airport (WABAN 722861) for the years 1994 through 1999 (except 1996) were combined with twice daily upper-air soundings from Edwards Air Force Base (WABAN 03197) to create the required data set. The input files were prepared by Trinity Consulting using CPRAMMET (Version, 99169) according to EPA approved protocols (EPA 1999) for use with wet/dry deposition models. All missing wind speed, direction, and friction velocity observations were filled using linear interpolation between adjacent hourly observations, and wind speed and friction velocity observation data at some hours were zeroed-out when delta t showed a negative number at the hours.

If refined CALPUFF modeling is required, pursuant to FLM guidance, a three-year meteorological data set will be developed using a combination of surface, upper-air, and mesoscale meteorological (MM5) data for 2001-2003. Surface, upper-air, and MM5 data points will be combined and used in the CALMET model. Hourly surface data from numerous different meteorological stations and precipitation stations for 2001-2003 will be obtained from NCDC and used in CALMET. Three years of MM5 data, 2001-2003 will also be used for CALMET.

CALMET wind fields will be generated using a combination of the MM5 data sets augmented with the surface and upper air data from the National Weather Service (NWS) described above. Per IWAQM guidance, the MM5 data will be interpolated to the CALMET fine-scale grid to create the initial-guess wind fields (IPROG = 14 for MM5).

5.2.1.3 Other Model Options

Size parameters for dry deposition of nitrate, sulfate, and PM_{10} particles will be based on default CALPUFF model options. Chemical parameters for gaseous dry deposition and wet scavenging coefficients will be based on default values presented in the CALPUFF User's Guide. Calculation of total nitrogen deposition will include the contribution of nitrogen resulting from the ammonium ion of the ammonium sulfate compound. For the CALPUFF runs that incorporate deposition and chemical transformation rates (i.e. deposition and visibility), the full chemistry option of CALPUFF will be turned on (MCHEM = 1). The nighttime loss for SO_2, NO_x and nitric acid (HNO_3) will be set at 0.2 percent per hour, 2 percent per hour and 2 percent per hour, respectively. CALPUFF will also be configured to allow predictions of SO_2, sulfate (SO_4), NO_x, HNO_3, nitrate (NO_3) and PM_{10} using the MESOPUFF II chemical transformation module.

The background ammonia level is set to 5.5 ppb, which is averaged value from desert shrub and grass land. The IWAQM report specified the background ammonia concentration of 1 ppb for desert scrub and 10 ppb for grass land. Ozone concentration of 65 ppb for every month will be entered into the CALPUFF-Lite model. Hourly ozone concentration files will be obtained from the California Air Resources Board. Data for the years of 2001- 2003 from Fontana will be used in the refined CALPUFF modeling.

5.2.1.4 Receptors

CALPUFF-Lite will be run in the screening mode to assess the potential for significant visibility degradation due to project emissions. In CALPUFF-Lite, the terrain is represented in each of the Class I Areas as circular rings of receptors spaced at 1 degree intervals at the closest, middle and farthest distances into the Class I area from the modeled source. The elevation assigned to each receptor on a given ring is the highest point on the portion of the ring that lies within the Class I area. The distance between ring receptors and the project location and the elevation and location of the ring receptors are shown in Table 5-4. The use of these model receptor grids is extremely conservative, since it ensures that at least some potential degradation of the visibility will be predicted for any plume reaching the distance of the rings, regardless of the actual wind direction.

Table 5-4
CAPUFF-Lite Ring Receptor Distances and Elevations

Class I areas	Distance from the EPP (km)		Ring Receptor Elevation (m)
San Gorgonio Wilderness Area	Closest	52	2357
	Middle	64	3340
	Farthest	76	1488
San Jacinto Wilderness Area	Closest	74	1261
	Middle	85	2798
	Farthest	96	2017
Agua Tibia Wilderness Area	Closest	84	745
	Middle	90	1358
	Farthest	96	1466
Joshua Tree National Park	Closest	100	1180
	Middle	155	1219

Receptors for all refined CALPUFF modeling of each Class I area will be obtained from the National Park Service's *NPS Convert Class One Areas* database (provided by the NPS). No modifications to the receptor locations or heights, as provided in the database, will be made. Latitude/Longitude of the Class I receptor coordinate will be converted to Lambert Conformal Conic (LCC) coordinate based on domain setup shown in CALMET options. These receptors are shown in Figure 3.

The discrete NPS receptors in Cucamonga Wilderness Area and San Gabriel Wilderness Area will be used in the CALPUFF-Lite modeling for Deposition and Soil and Vegetation Analyses.

5.2.2 Far-Field Class I Areas Visibility and Regional Haze Analysis

For the analysis of visibility effects, CALPUFF requires project emission rate inputs for six pollutant species, i.e., directly emitted PM_{10}, NO_x, and SO_2, and secondary SO_4, HNO_3, and NO_3. Emission rates for PM_{10}, NO_x and SO_2 will be calculated for the 2 turbine/HRSGs of the proposed project operating under maximum load emission conditions and an auxiliary boiler. The maximum 24-hour averaged emission rates will be used for the visibility analysis and the total turbine/HRSG SO_2 emissions will be speciated to SO_2 and SO_4 as indicated in NPS's Particulate Matter Speciation (PMS) guidelines for natural gas turbines (NPS, 2006). The total turbine/HRSG PM_{10} emissions will be speciated to elemental carbon and organic carbon (emitted as Secondary Organic Aerosol (SOA)) per the PMS. For CALPUFF-Lite, the natural gas auxiliary boiler directly emit Fine PM (PMF), NO_x, and SO_2, no speciation will be applied to these emissions. For refined CALPUFF modeling, the natural gas auxiliary boiler emissions will be speciated in a similar manner as the turbine/HRSG emissions per USFS guidance. Direct

emissions of the remaining species, HNO_3 and NO_3, are assumed to be zero for the natural gas burning sources of the EPP.

Modeled impacts will be converted to visibility impacts using the CALPOST post processor. CALPOST will be used to post-process estimated 24-hour averaged ammonium nitrate, ammonium sulfate, EC, and SOA concentrations into each extinction coefficient value for each day at each modeled receptor.

CALPUFF also requires a background light extinction reference level. The analysis will be run using the FLAG recommended background extinction values for each Class I area. The background extinction coefficient is composed of hygroscopic scattering components, where the addition of water enhances particle light-scattering efficiencies, non-hygroscopic scattering components and Rayleigh scattering. Ammonium sulfate and ammonium nitrate compose the hygroscopic scattering components, while organic aerosols, soil, coarse particles, particle absorption primarily from elemental carbon and absorption from gases primarily from nitrogen dioxide compose the non-hygroscopic scattering components.

In accordance with the FLAG guideline the total background extinction coefficient is calculated for each Class I area using the following equation:

$$b_{ext} = b_{hygro} \cdot f(RH) + b_{non\text{-}hygro} + b_{Ray}$$

where:

b_{hygro} = the hygroscopic scattering component (Mm^{-1})
$= 3[(NH_4)_2SO_4 + NH_4NO_3]$
$b_{non\text{-}hygro}$ = the non-hygroscopic scattering component (Mm^{-1})
$= b_{OC} + b_{Soil} + b_{Course} + b_{ap} + b_{ag}$
b_{Ray} = the Rayleigh scattering component (Mm^{-1}) = 10 Mm^{-1} (FLAG)
f(RH) = relative humidity adjustment factor

In the CALPOST post-processor program, the monthly background concentration of ammonium sulfate is set to one third of the hygroscopic scattering component, and the monthly background concentration of soil is set to the non-hygroscopic scattering component, as recommended in the FLAG report. The background soil concentration will be set to the FLAG recommended non-hygroscopic value. The scattering coefficients that will be used in CALPUFF for all four Class I areas beyond 50 km are presented in Table 5-5.

The FLAG RH adjustment factors (MVISBK=2) and the RHMAX = 95 % will be used as suggested by the NPS FLM.

The extinction coefficient percent change (background extinction coefficient vs. modeled extinction coefficient), predicted by CALPUFF will be compared to the level of acceptable change (LAC) of 5 percent.

Table 5-5
Scattering Coefficients used in CALPUFF for Class I Areas

Class I Area	Total Background Extinction (Mm^{-1})	Hygroscopic Scattering Component (Mm^{-1}) = BKSO4	Non-hygroscopic Scattering Component (Mm^{-1}) = BKSOIL	Rayleigh Scattering (Mm^{-1})
San Gorgonio Wilderness Area	15.8	0.2	4.5	10.0
San Jacinto Wilderness Area	15.9	0.2	4.5	10.0
Agua Tibia Wilderness Area	16.0	0.2	4.5	10.0
Joshua Tree National Park	15.7	0.2	4.5	10.0

The FLAG guidance states that:

> "The FLMs are concerned about situations where change in extinction from new source growth is greater than 5%, as compared against natural conditions".

Thus, if predicted impacts obtained by means of a conservative CALPUFF Lite analysis demonstrate that no extinction change greater than 5% will occur in a Class I area, then no further evaluation of regional haze impacts in such Class I areas will be performed

5.2.3 PSD Class I Significance Analysis

A PSD analysis for Class I areas will be required because the EPP will be a major modification as defined in the PSD regulations. Therefore, the maximum predicted incremental criteria pollutant concentrations from the EPP sources will be compared with the Proposed PSD significant impact level for Class I areas (see Table 5-3) for each pollutant as a reference point.

CALPUFF will be used to model ambient air concentrations of NO_2, PM_{10}, and SO_2 in Class I Areas beyond 50 km from the proposed EPP sources to compare against the proposed PSD Class I significant impact level. All NO_2 and PM_{10}, sources will be modeled at full potential-to-emit (PTE) for the CALPUFF PSD modeling. The facility SO_2 emission rate will be portioned into SO_2 and SO_4 emissions according to National Park Service (NPS)'s Particulate Matter Speciation (PMS) guidance for natural gas combustion turbines. The full chemistry option of CALPUFF will be turned on (MCHEM =1, MESOPUFF II scheme), and deposition options will be turned on (MWET = 1 and MDRY = 1).

5.3 DEPOSITION ANALYSIS

For all six Class I areas within and beyond 50 km from the facility, CALPUFF will be used to evaluate the potential for Nitrogen and Sulfur deposition due to EPP Project emissions. Total deposition rates for each pollutant will be obtained by summing the modeled wet and/or dry deposition rates. The annual average emission rates for Project sources will be used since annual deposition rates are to be estimated.

For Sulfur deposition, the wet and dry fluxes of sulfur dioxide (SO_2) and sulfate (SO4) are calculated, normalized by the molecular weight of Sulfur, and expressed as total S. Total Nitrogen deposition is the sum of Nitrogen contributed by wet and dry fluxes of nitric acid (HNO_3), nitrate (NO_3^-), ammonium nitrate (NH_4NO_3) and the dry flux of NO_x.

The total modeled nitrogen and sulfur deposition rates will be compared to the USNPS/USFWS DATs for western states. The DAT for nitrogen and sulfur are each 0.005 kilogram per hectare per year (kg/ha-yr), which is 1.59E-11 $g/m^2/s$. If the maximum predicted values determined by a CALPUFF Lite analysis are below these DATs, no further analysis using CALPUFF will be performed.

5.4 SOILS AND VEGETATION

The designated Wilderness Areas contain vegetative ecosystems as identified by the Federal Land Manager (FLM) (USFS, 1992). For each ecosystem, sensitive species or groups of species will be designated to represent potential impacts to each vegetation species in the ecosystem. These species are impacted primarily by ozone but are also impacted by nitrogen and sulfur compounds. Acidity in rain, snow, cloudwater, and dry deposition can affect soil fertility and nutrient cycling processes in watersheds and can result in acidification of lakes and streams with low buffering capacity. Therefore, the soil and vegetation analysis will be analyzed using the CALPUFF model to predict total sulfur and nitrogen deposition results and monitored ozone concentration. In order to protect sensitive species, the USFS (1992) recommends that short-term maximum SO_2 levels should not exceed 40 to 50 parts per billion (ppb), annual average SO_2 concentrations should not exceed 8 to 12 ppb, and annual average NO_2 concentration should not exceed 15 ppb.

SECTION 6 PRESENTATION OF MODELING RESULTS

6.1 PSD, NAAQS AND CAAQS ANALYSES

The results of the PSD and AAQS analyses to evaluate the construction and operational impacts of the EPP facility will be presented in summary tables. A figure indicating the locations of the maximum predicted pollutant concentrations for each applicable pollutant and averaging time will be provided. The maximum modeled values of NO_2, SO_2 and CO will be compared with SILs. If the model impact exceeds the SILs, the background concentrations (see Section 4.6.2) will be added to the maximum modeled values from the Etiwanda sources to yield total concentrations, which will be compared with the NAAQS and CAAQS. The cumulative impact values from combination of project sources and existing sources in EPP and new sources within 6 miles will be added to the background concentration and will be compared with NAAQS and CAAQS. Maximum modeled PM_{10} concentrations per emission source will be compared with the SCAQMD significance levels.

6.2 HEALTH RISK ASSESSMENT ANALYSIS

Maps at a scale of 1:24,000 will depict the following data:

- Elevated terrain within a 10-km radius of the project;
- Distribution of population within a 10-km radius of the project and sensitive receptors, including schools, pre-schools, etc., within a 3-mile radius of the project;
- Table listing all sensitive receptors within a 3-mile radius of the project;
- Current and future residential land uses;
- Isopleths for any areas where predicted exposures to air toxics result in estimated chronic non-cancer impacts and acute impacts equal to or exceeding a hazard index of 0.5; and
- Isopleths for any areas where exposures to air toxics lead to an estimated carcinogenic risk equal to or exceeding one in one million.

Health risk assessment modeling results will be summarized to include maximum annual (chronic, carcinogenic, and non-carcinogenic) and hourly (acute) adverse health effects from toxic air contaminant emissions. Cancer burden will be presented if the cancer risk is predicted to be greater than one in a million. Health risk values will be calculated and presented in the summary table for the points of maximum impact and the sensitive receptors with the maximum risk values.

6.3 CLASS I ANALYSIS

The results of the visibility, PSD and deposition analyses to evaluate the operational impacts of the EPP facility will be presented in summary tables and compared with all relevant significance thresholds.

6.4 DATA SUBMITTAL

Electronic copies of the modeling input and output files will be provided to SCAQMD and the CEC.

SECTION 7 REFERENCES

American Meteorological Society. Journal of Applied Meteorology, 17(5): 636-643. "Correlation of Land Use and Cover with Meteorological Anomalies", August Auer Jr., May 1978.

ARB 2003. HARP User Guide – Software for Emission Inventory Database Management, Air Dispersion Modeling Analyses, and Health Risk Assessment version 1.3, Air Resources, Board, California Environmental Protection Agency. December 2003.

CEC, 1997. "Regulations Pertaining to the Rules of Practice and Procedure and Plant Site Certification". Title 20, California Code of Regulations. Chapter 1, 2, 5.

CEC, 2006. Rules of Practice and Procedure & Power Plant Site Certification Regulations Revisions, 04-SIT-2, December 14, 2006.

National Park Service, 2007. Particulate Matter Speciation: http://www2.nature.nps.gov/air/permits/ect/index.cfm

Office of Environmental Health Hazard Assessment (OEHHA), 2003. Air Toxics Hot Spots Program Risk Assessment Guidelines, August 2003.

South Coast Air Quality Management District, 2005. Risk Assessment Procedure for Rules 1401 and 212, Version 7, July 2005.

South Coast Air Quality Management District, 2005. Supplemental Guidelines for Preparing Risk Assessments for the Toxics "Hot Spots" Information and Assessment Act (AB2588), July 2005.

United States Environmental Protection Agency, 1988. Workbook for Plume Visual Impact Screening and Analysis, U.S. Environmental Protection Agency, Research Triangle Park, NC. September 1988.

United States Environmental Protection Agency, 1990. New Source Review Workshop Manual Prevention of Significant Deterioration and Nonattainment Area Permitting (Draft), Office of Air Quality Planning and Standards, U.S. Environmental Protection Agency, Research Triangle Park, NC 27711. October 1990.

United States Environmental Protection Agency, 1992. Addendum to Workbook for Plume Visual Impact Screening and Analysis, U.S. Environmental Protection Agency, Research Triangle Park, NC. October 1992.

United States Environmental Protection Agency, 1998. Interagency Workgroup on Air Quality Modeling (IWAQM), Phase 2 Summary Report and Recommendations for Modeling Long Range Transport Impacts. EPA-454/R-98-019. December 1998.

United States Environmental Protection Agency, 2004. User's Guide for the AMS/EPA Regulatory Model-AERMOD. September 2004.

United States Environmental Protection Agency, 2005. AERMOD Implementation Guide. September 2005.

United States Environmental Protection Agency, 2006. Addendum to User's Guide for the AMS/EPA Regulatory Model-AERMOD. December 2006.

United States Environmental Protection Agency, 2006. USEPA AirData

United States Forest Service et al. 2000. Federal Land Managers Air Quality Related Values Workgroup (FLAG) Phase 1 Report. Prepared by U.S. Forest Service Air Quality Program, National Park Service Air Resources Division, U.S. Fish and Wildlife Service Air Quality Branch. December 2000.

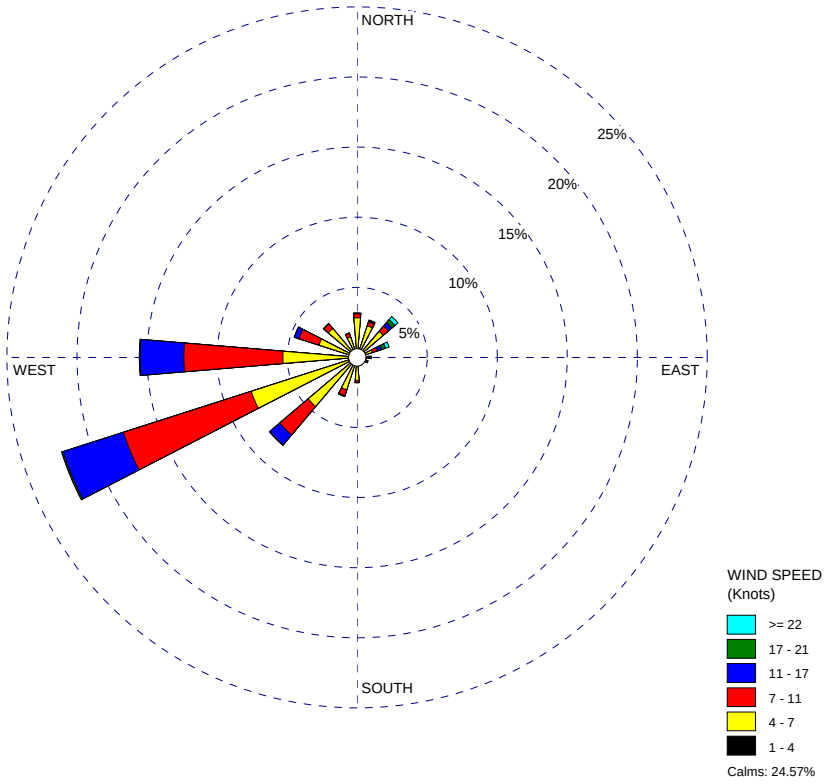
USDA Forest Service and National Park Service, 2005. CALPUFF Reviewer's Guide (DRAFT) prepared by Howard Gebhart. September 2005

APPENDIX A

Annual and Seasonal Windroses for the Ontario International Airport (1994, 95, 97, 98, and 99)

WIND ROSE PLOT:
Ontario International Airport

DISPLAY:
Wind Speed
Direction (blowing from)



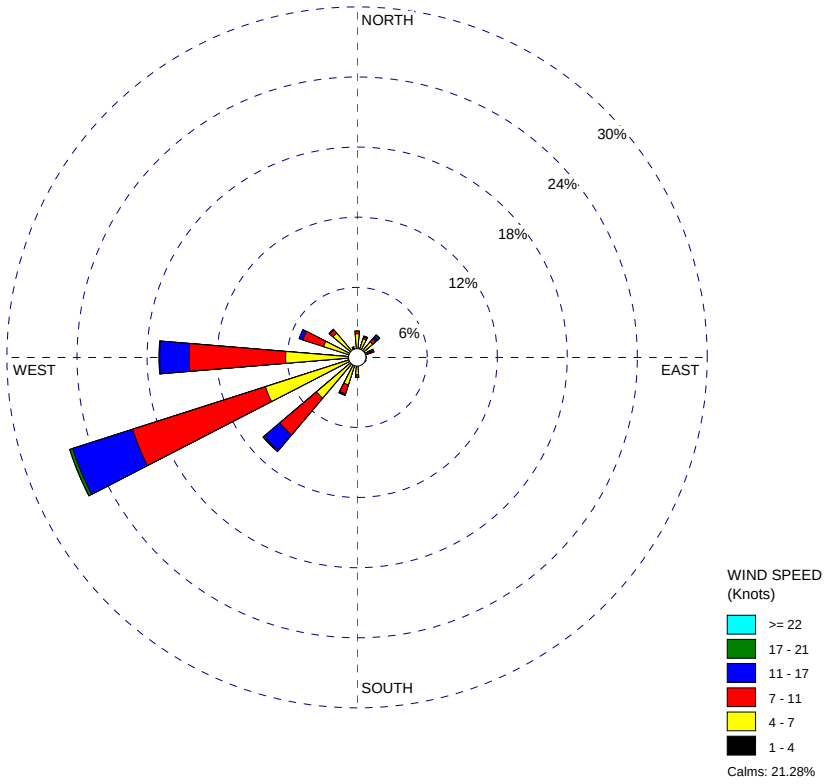
COMMENTS:	DATA PERIOD:	COMPANY NAME:	
	1994 1995 1997 1998 1999 **Jan 1 - Dec 31** **00:00 - 23:00**	MODELER:	
	CALM WINDS: **24.57%**	TOTAL COUNT: **43800 hrs.**	
	AVG. WIND SPEED: **5.50 Knots**	DATE: **1/18/2007**	PROJECT NO.:

WRPLOT View - Lakes Environmental Software

Annual Season Windrose for Ontario International Airport based on Surface Data for 1994, 1995, 1997, 1998 and 1999

WIND ROSE PLOT:
Ontario International Airport
1994-1999 Spring (Mar, Apr, May)

DISPLAY:
Wind Speed
Direction (blowing from)



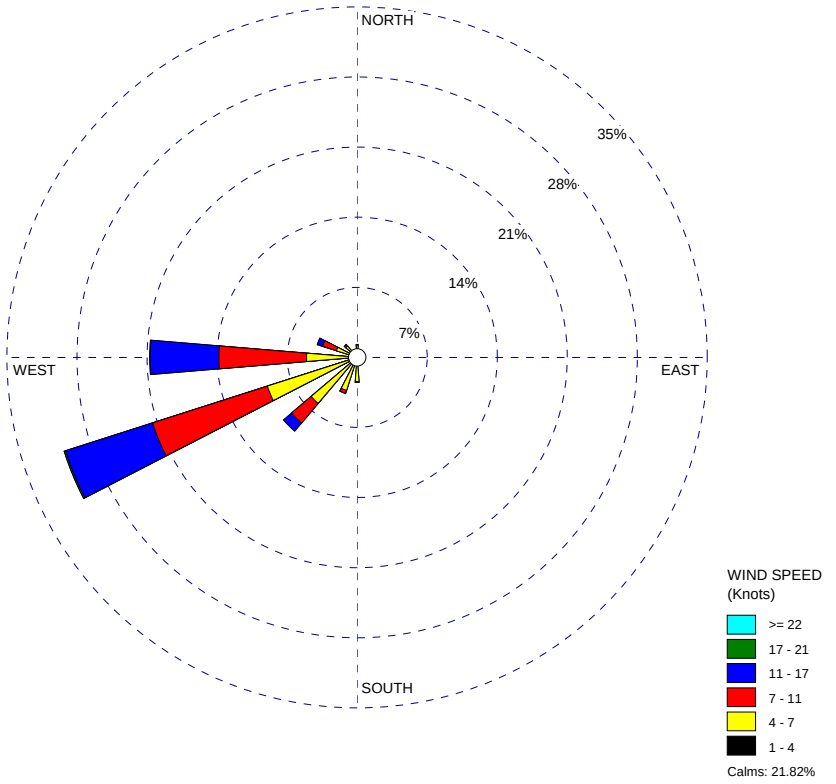
COMMENTS:	DATA PERIOD:	COMPANY NAME:	
	1994 1995 1997 1998 1999 **Mar 1 - May 31** **00:00 - 23:00**	MODELER:	
	CALM WINDS: **21.28%**	TOTAL COUNT: **11040 hrs.**	
	AVG. WIND SPEED: **5.82 Knots**	DATE: **1/18/2007**	PROJECT NO.:

WRPLOT View - Lakes Environmental Software

Spring Season Windrose for Ontario International Airport based on Surface Data for 1994, 1995, 1997, 1998 and 1999

WIND ROSE PLOT:
Ontario International Airport
1994-1999 Summer (Jun, Jul, Aug)

DISPLAY:
Wind Speed
Direction (blowing from)



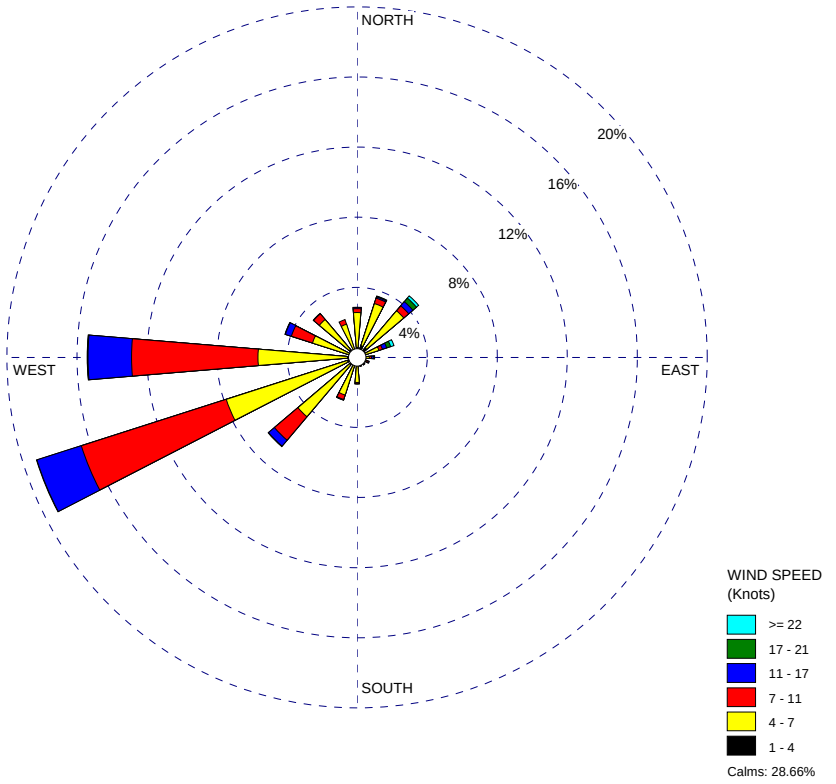
COMMENTS:	DATA PERIOD:	COMPANY NAME:	
	1994 1995 1997 1998 1999 **Jun 1 - Aug 31** **00:00 - 23:00**	MODELER:	
	CALM WINDS: **21.82%**	TOTAL COUNT: **11040 hrs.**	
	AVG. WIND SPEED: **6.08 Knots**	DATE: **1/18/2007**	PROJECT NO.:

WRPLOT View - Lakes Environmental Software

Summer Season Windrose for Ontario International Airport based on Surface Data for 1994, 1995, 1997, 1998 and 1999

WIND ROSE PLOT:
Ontario International Airport
1994-1999 Fall (Sep, Oct, Nov)

DISPLAY:
Wind Speed
Direction (blowing from)



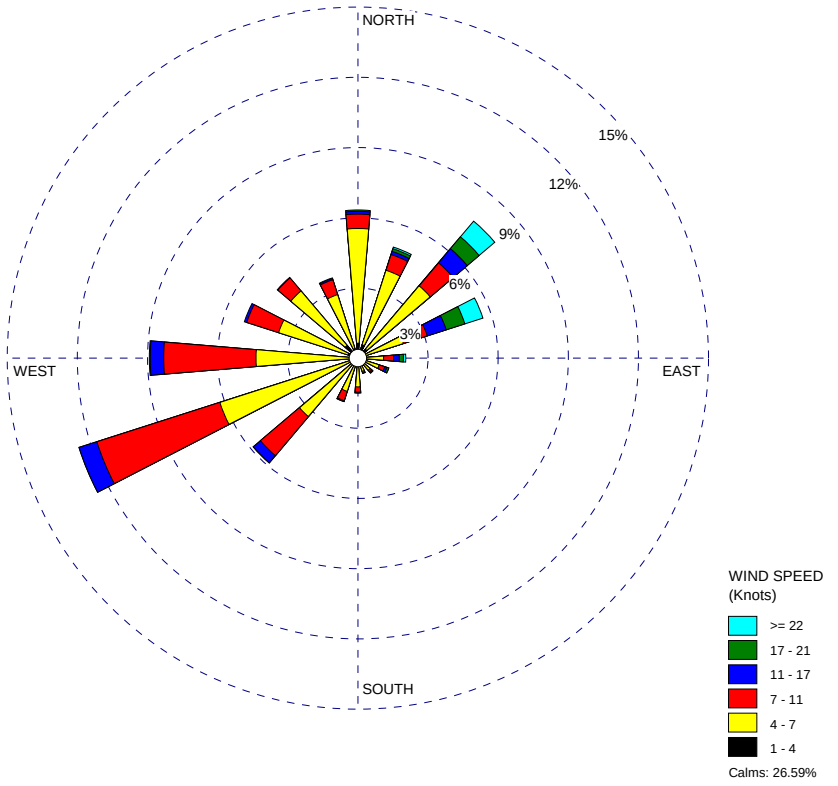
COMMENTS:	DATA PERIOD:	COMPANY NAME:	
	1994 1995 1997 1998 1999 **Sep 1 - Nov 30** **00:00 - 23:00**	MODELER:	
	CALM WINDS: **28.66%**	TOTAL COUNT: **10920 hrs.**	
	AVG. WIND SPEED: **4.84 Knots**	DATE: **1/18/2007**	PROJECT NO.:

WRPLOT View - Lakes Environmental Software

Fall Season Windrose for Ontario International Airport based on Surface Data for 1994, 1995, 1997, 1998 and 1999

WIND ROSE PLOT:
Ontario International Airport
1994-1999 Winter (Jan, Feb, and Dec)

DISPLAY:
Wind Speed
Direction (blowing from)



COMMENTS:	DATA PERIOD:	COMPANY NAME:	
	1994 1995 1997 1998 1999 **Check Date Range Report** **00:00 - 23:00**	MODELER:	
	CALM WINDS: **26.59%**	TOTAL COUNT: **10800 hrs.**	
	AVG. WIND SPEED: **5.23 Knots**	DATE: **1/18/2007**	PROJECT NO.:

WRPLOT View - Lakes Environmental Software

Winter Season Windrose for Ontario International Airport based on Surface Data for 1994, 1995, 1997, 1998 and 1999

Appendix K-6
VISCREEN Modeling Input

San Gabriel Generating Station Project Level II Visibility Modeling

VISCREEN LEVEL II MODELING INPUT SUMMARY

Background Visible Range:171 km for Cuca, 175 for Saga
Ozone: 0.065 ppm
Primary Particulates Density= 1.5
Primary Particulates diameter = 3

Class I Area	Wind Direction	Met Data	Worst Met Condition	Distance to Class I Area Closest (km)	Farthest (km) *	Met Condition w/ Cumulative Frequency >1.0 (Stability Class and Wind Speed (m/s)) Hr 1-6	Hr 7-12	Hr 13-18	Hr 19-24
Cucamonga	NNW	1994-1999	**D 1**	14	21	E 0.5	D 2.5	--	--
	Since the elevation rise is greater than 500m from top of the stack to the peak of the mountain, we can shift the wind stability from E to one category less stable D.								
San Gabriel	WNW, NW	1994-1999	**D 3**	36	49	E 2.5	D 4.5	--	--
	1m/sec of wind speed will not reach to San Gabriel WA within 12 hours. The puff will be dissipated over 12hours. Therefore, the next worst wind scenario will be used. Since the elevation rise is greater than 500m from top of the stack to the peak of the mountain, we can shift the wind stability from E to one category less stable D.								

*Note: If farthest distance is greater than 50 km, 50 km is used.

Process Description:

1 The values (stability class and wind speed) corresponding to the first occurrence for a met condition with a cumulative frequency >1.0 are shown for each Class I area.
2 The highlighted value for each Class I area correspond to the first occurrence in the table (Class I sheet)
3 The highlighted values are used in the Level II Visibility analysis.
4 This worksheet displays the results of the VISCREEN Level II analysis.
5 The number in the met condition column is the value used in the model. All other inputs in the model use default values.
6 The file name is displayed in column 4. The .xxx refers to .sum or .out extensions.
7 Values that exceed the limites of Delta E and Contrast are highlighted.

San Gabriel Generating Station Project Level II Visibility Modeling
Class I Areas
Cucamonga Wilderness Area

Formulas:

σ_y (meters) =465.11628(x)tan(TH)

TH =0.017453293[c-d ln(x)]

σ_z (meters) =ax^b

Shaded areas below represent wind speed/stability conditions not needed for this analysis.
(see page 45 in "Workbook for Plume Visual Impact Screening and Analysis, EPA-450/4-88-019; updated 10-92)

x= 14.0 distance to class I area (km)

	Stability Class	a (meters)	b	c[8]	d[8]	TH	σ_y	σ_z	$\sigma_y\sigma_z u$ for various wind speeds (meters/second) 1	2	3	4	5	6	7	8
1	A	** [1]	** [1]	24.167	2.5334	0.305104718	2050.761204	5000	1.03E+07	2.05E+07	3.08E+07	4.10E+07	5.13E+07	6.15E+07	7.18E+07	8.20E+07
2	B	109.300 [2]	1.09710 [2]	18.333	1.8096	0.236620609	1570.200142	1977.139123	3.10E+06	6.21E+06	9.31E+06	1.24E+07	1.55E+07	1.86E+07	2.17E+07	2.48E+07
3	C	61.141 [3]	0.91465 [3]	12.5	1.0857	0.168158559	1105.425143	683.3426782	7.55E+05	1.51E+06	2.27E+06	3.02E+06	3.78E+06	4.53E+06	5.29E+06	6.04E+06
4	D	44.053 [4]	0.51179 [4]	8.333	0.72382	0.112098967	733.019758	170.0404934	1.25E+05	2.49E+05	3.74E+05	4.99E+05	6.23E+05	7.48E+05	8.73E+05	9.97E+05
5	E	35.420 [5]	0.37615 [5]	6.25	0.54287	0.084078358	548.7807368	95.57946989	5.25E+04	1.05E+05	1.57E+05	2.10E+05	2.62E+05	3.15E+05	3.67E+05	4.20E+05
6	F	27.074 [6]	0.27436 [6]	4.1667	0.36191	0.056052974	365.3788576	55.84754831	2.04E+04	4.08E+04	6.12E+04	8.16E+04	1.02E+05	1.22E+05	1.43E+05	1.63E+05
								Travel Time (hours)[7]	7.8	2.6	1.6	1.1	0.9	0.7	0.6	0.5

[1] If x is >3.11 km, thenσz = 5,000 meters
[2] for "x" > 0.4 kilometers.
[3] all distances
[4] for "x" > 30.00 kilometers.
[5] for "x" 20.01 - 40.00 kilometers.
[6] for "x" 30.01 - 60.00 kilometers.
[7] wind speed used to calculate travel time are the average ws within a ws category. (1-2 uses 1.5 m/s; ws category of 3-4 uses 3.5 m/s)
[8] Table 1-1 in ISC2 Volume II Users Guide

Sector of Interest **NNW, NW**

Condition No.	5 year Meteorological Data Stability Class	Wind Speed	Flag	$\sigma_y\sigma_z u$	Travel Time (hours)	Frequency of Occurance Hour of day 1-6 f	1-6 cf	7-12 f	7-12 cf	13-18 f	13-18 cf	19-24 f	19-24 cf	max f	max cf
1	F	0 - 1	1	2.0406E+04	7.8	0.730%	0.730%	0.000%	0.000%	0.009%	0.009%	0.292%	0.292%	0.730%	0.730%
2	F	1 - 2	2	4.0811E+04	2.6	0.237%	0.967%	0.000%	0.000%	0.009%	0.018%	0.174%	0.466%	0.237%	0.967%
3	E[9]	0 - 1	1	5.2452E+04	7.8	0.100%	1.067%	0.037%	0.037%	0.009%	0.027%	0.000%	0.466%	0.100%	1.067%
4	F	2 - 3	3	6.1217E+04	1.6	0.192%	1.259%	0.000%	0.037%	0.009%	0.037%	0.174%	0.639%	0.192%	1.259%
5	E	1 - 2	2	1.0490E+05	2.6	0.037%	1.296%	0.018%	0.055%	0.018%	0.055%	0.027%	0.667%	0.037%	1.296%
6	D	0 - 1	1	1.2464E+05	7.8	0.219%	1.515%	0.301%	0.356%	0.027%	0.082%	0.000%	0.667%	0.301%	1.597%
7	E	2 - 3	3	1.5736E+05	1.6	0.137%	1.652%	0.037%	0.393%	0.018%	0.100%	0.137%	0.804%	0.137%	1.734%
8	E	3 - 4	4	2.0981E+05	1.1	0.000%	1.652%	0.000%	0.393%	0.037%	0.137%	0.018%	0.822%	0.037%	1.771%
9	E	4 - 5	5	2.6226E+05	0.9	0.000%	1.652%	0.000%	0.393%	0.018%	0.155%	0.000%	0.822%	0.018%	1.789%
10	D	1 - 2	2	2.4929E+05	2.6	0.027%	1.679%	0.146%	0.539%	0.009%	0.164%	0.000%	0.822%	0.146%	1.935%
11	D	2 - 3	3	3.7393E+05	1.6	0.137%	1.816%	0.612%	1.151%	0.110%	0.274%	0.073%	0.895%	0.612%	2.547%
12	D	3 - 4	4	4.9857E+05	1.1	0.018%	1.835%	0.137%	1.288%	0.055%	0.329%	0.009%	0.904%	0.137%	2.684%
13	D	4 - 5	5	6.2322E+05	0.9	0.009%	1.844%	0.000%	1.288%	0.027%	0.356%	0.000%	0.904%	0.027%	2.711%
14	D	5 - 6	6	7.4786E+05	1.1	0.000%	1.844%	0.027%	1.315%	0.018%	0.374%	0.000%	0.904%	0.027%	2.739%
15	D	6 - 7	7	8.7250E+05	0.6	0.000%	1.844%	0.009%	1.324%	0.018%	0.393%	0.009%	0.913%	0.018%	2.757%
16	D	7 - 8	8	9.9714E+05	0.5	0.000%	1.844%	0.009%	1.333%	0.009%	0.402%	0.000%	0.913%	0.009%	2.766%

[9] Since the elevation rise is greater than 500m from top of the stack to the peak of the mountain, we can degrade the wind stability from E to D.

San Gabriel Generating Station Project Level II Visibility Modeling
Class I Areas
San Gabriel Wilderness Area

Formulas:

σ_y (meters) =465.11628(x)tan(TH)

TH =0.017453293[c-d ln(x)]

σ_z (meters) =ax^b

x= 36.0 distance to class I area (km)

Shaded areas below represent wind speed/stability conditions not needed for this analysis.
(see page 45 in "Workbook for Plume Visual Impact Screening and Analysis, EPA-450/4-88-019; updated 10-92)

Stability Class	a (meters)	b	c[8]	d[8]	TH	σ_y	σ_z	$\sigma_y\sigma_z u$ for various wind speeds (meters/second) 1	2	3	4	5	6	7	8
A	** [1]	** [1]	24.167	2.5334	0.26334424	4514.32713	5000	2.26E+07	4.51E+07	6.77E+07	9.03E+07	1.13E+08	1.35E+08	1.58E+08	1.81E+08
B	109.300 [2]	1.09710 [2]	18.333	1.8096	0.206791225	3512.765766	5000	1.76E+07	3.51E+07	5.27E+07	7.03E+07	8.78E+07	1.05E+08	1.23E+08	1.41E+08
C	61.141 [3]	0.91465 [3]	12.5	1.0857	0.150261918	2535.122172	1621.080643	4.11E+06	8.22E+06	1.23E+07	1.64E+07	2.05E+07	2.47E+07	2.88E+07	3.29E+07
D	36.650 [4]	0.56589 [4]	8.333	0.72382	0.100167543	1682.856087	278.4646052	4.69E+05	9.37E+05	1.41E+06	1.87E+06	2.34E+06	2.81E+06	3.28E+06	3.75E+06
E	26.970 [5]	0.46713 [5]	6.25	0.54287	0.075129708	1260.358058	143.8389598	1.81E+05	3.63E+05	5.44E+05	7.25E+05	9.06E+05	1.09E+06	1.27E+06	1.45E+06
F	17.836 [6]	0.41507 [6]	4.1667	0.36191	0.050087262	839.3724791	78.93542337	6.63E+04	1.33E+05	1.99E+05	2.65E+05	3.31E+05	3.98E+05	4.64E+05	5.30E+05
							Travel Time (hours)[7]	20.0	6.7	4.0	2.9	2.2	1.8	1.5	1.3

[1] If x is >3.11 km, thenσz = 5,000 meters
[2] for "x" > 0.4 kilometers.
[3] all distances
[4] for "x" 10.01 - 30.00 kilometers.
[5] for "x" 10.01 - 20.00 kilometers.
[6] for "x" 7.01 - 15.00 kilometers.
[7] wind speed used to calculate travel time are the average ws within a ws category. (1-2 uses 1.5 m/s; ws category of 3-4 uses 3.5 m/s)
[8] Table 1-1 in ISC2 Volume II Users Guide

Sector of Interest **NW, WNW**

Condition No.	5 year Meteorological Data Stability Class	Wind Speed	Flag	$\sigma_y\sigma_z u$	Travel Time (hours)	Frequency of Occurance Hour of day 1-6 f	1-6 cf	7-12 f	7-12 cf	13-18 f	13-18 cf	19-24 f	19-24 cf	max f	max cf
1	F	0 - 1	1	6.6256E+04	20.0	0.502%	0.502%	0.009%	0.009%	0.000%	0.000%	0.128%	0.128%	0.502%	0.502%
2	F	1 - 2	2	1.3251E+05	6.7	0.137%	0.639%	0.000%	0.009%	0.000%	0.000%	0.055%	0.183%	0.137%	0.639%
3	E	0 - 1	1	1.8129E+05	20.0	0.055%	0.694%	0.055%	0.064%	0.000%	0.000%	0.027%	0.210%	0.055%	0.694%
4	F	2 - 3	3	1.9877E+05	4.0	0.128%	0.822%	0.000%	0.064%	0.018%	0.018%	0.219%	0.429%	0.219%	0.913%
5	E	1 - 2	2	3.6258E+05	6.7	0.009%	0.831%	0.027%	0.091%	0.000%	0.018%	0.000%	0.429%	0.027%	0.941%
6	D[9]	0 - 1	1	4.6862E+05	20.0	0.073%	0.904%	0.137%	0.228%	0.009%	0.027%	0.009%	0.438%	0.137%	1.078%
7	E[10]	2 - 3	3	5.4387E+05	4.0	0.155%	1.059%	0.037%	0.265%	0.018%	0.046%	0.119%	0.557%	0.155%	1.233%
8	E	3 - 4	4	7.2515E+05	2.9	0.000%	1.059%	0.000%	0.265%	0.000%	0.046%	0.027%	0.584%	0.027%	1.260%
9	D	1 - 2	2	9.3723E+05	6.7	0.046%	1.105%	0.082%	0.347%	0.009%	0.055%	0.000%	0.584%	0.082%	1.342%
10	E	4 - 5	5	9.0644E+05	2.2	0.009%	1.114%	0.000%	0.347%	0.000%	0.055%	0.009%	0.594%	0.009%	1.352%
11	D	2 - 3	3	1.4058E+06	4.0	0.046%	1.160%	0.475%	0.822%	0.091%	0.146%	0.046%	0.639%	0.475%	1.826%
12	D	3 - 4	4	1.8745E+06	2.9	0.046%	1.205%	0.155%	0.977%	0.027%	0.174%	0.027%	0.667%	0.155%	1.982%
13	D	4 - 5	5	2.3431E+06	2.2	0.009%	1.215%	0.055%	1.032%	0.037%	0.210%	0.009%	0.676%	0.055%	2.037%
14	D	5 - 6	6	2.8117E+06	2.9	0.000%	1.215%	0.018%	1.050%	0.055%	0.265%	0.027%	0.703%	0.055%	2.091%
15	D	6 - 7	7	3.2803E+06	1.5	0.000%	1.215%	0.009%	1.059%	0.009%	0.274%	0.000%	0.703%	0.009%	2.100%
16	D	7 - 8	8	3.7489E+06	1.3	0.000%	1.215%	0.009%	1.068%	0.037%	0.311%	0.009%	0.712%	0.037%	2.137%

[9] 1m/sec of wind speed will not reach to San Gabriel WA within 12 hours. The puff will be dissipated over 12hours. Therefore, the next worst wind scenario will be used.
[10] Since the elevation rise is greater than 500m from top of the stack to the peak of the mountain, we can degrade the wind stability from E to D.

Appendix K-7
BACT Analysis

The BACT assessment conducted for the Project considered all emission control technologies currently proposed or in use on natural-gas-fired combustion turbines (>50 MMBtu/hour heat input) in combined cycle configurations, as well as gas-fired boilers. To identify feasible emission limits, several information sources were consulted, including the following:

- U.S. EPA BACT/Lowest Achievable Emission Rate Clearinghouse (U.S. EPA 1985) and updates
- CARB BACT Clearinghouse database and CARB BACT Guidelines for Power Plants (Adopted 7/22/99)
- Recent California Energy Commission (CEC) Applications for Certification
- Research conducted by SGGS design engineers

Table 1 lists selected recent NO_x BACT determinations for natural-gas-fired **c**ombined cycle power projects in California using advanced technology combustion turbines. BACT for the most recent projects that have come on line in the state has been determined to be either 2.0 or 2.5 ppm NO_x by volume (ppmvd) (at 15 percent oxygen [O_2]), to be achieved by means of SCR with ammonia injection. The most recent projects to be approved by CEC committed to a NO_x BACT level of 2.0 ppmvd at 15% O_2. The CTG in this Project will achieve the BACT concentration of 2.0 ppmvd at 15 percent O_2 using dry low-NOx combustor technology (rather than steam or water injection, as a means of water conservation), and SCR.

Similarly, the most recent combined cycle turbine projects have been approved with a CO emissions limit between 3 and 6 ppmvd and a ROC emissions limit at or near 2 ppmvd (both at 15 percent O_2), based on the use of an oxidation catalyst. The CTG in this Project will employ the same control technology to achieve comparable CO and ROC stack exhaust levels. Exclusive use of natural gas fuel has been determined to be BACT for SO_x and PM_{10} in all other comparable projects for several years.

1 COMBINED CYCLE GAS TURBINE CONTROL TECHNOLOGIES

1.1 ASSESSMENT OF NO_x CONTROL TECHNOLOGIES

Based on a review of materials described above, the following NO_x control technologies were evaluated to determine whether they are able to achieve BACT NO_x levels in practice:

- Dry low-NOx burners (DLN) and Goal Line SCONOx™
- DLN and SCR with ammonia injection

SCONOx™

SCONOx™ is a NO_x reduction system produced by Goal Line Environmental Technologies (now distributed by EmeraChem) for gas turbine applications. This system uses a coated catalyst to oxidize both NO_x and CO, thereby reducing plant emissions of these pollutants. CO emissions are reduced in SCONOx™ by the oxidation of CO to CO_2. A two-step process reduces the NO_x emissions. First, NO_x emissions are oxidized to NO_2 and then adsorbed onto the catalyst. In the second step, a proprietary regenerative gas is passed through the catalyst periodically. This gas

de-sorbs the NO_2 from the catalyst and reduces it to N_2. The system does not use ammonia as a reagent; rather, it uses natural gas as the basis for a proprietary catalyst regeneration process.

TABLE 1
SUMMARY OF RECENT NO_X BACT DETERMINATIONS
FOR COMBUSTION TURBINE GENERATORS IN COMBINED CYCLE CONFIGURATIONS

Name	Location	Emission Limit[1]			Control(s)	On-Line Date
		NOx	CO	ROC		
Projects Recently Coming On-Line						
PICO	CA	2.0 ppm	4.0 ppm	2 ppm	SCR with ammonia CO Catalyst	March 05
Metcalf	CA	2.5 ppm	6.0 ppm	2 ppm	SCR with ammonia CO Catalyst	May 05
Pastoria – Phase 1	CA	2.5 ppm	3.0 ppm	6 ppm	SCR with ammonia CO Catalyst	July 05
Magnolia	CA	2.0 ppm	2.0 ppm	2 ppm	SCR with ammonia CO Catalyst	September 05
Malburg	CA	2.0 ppm	2.0 ppm	2 ppm	SCR with ammonia CO Catalyst	October 05

Name	Location	NOx	CO	ROC	Control(s)	Date Permitted
Projects Recently Permitted by CEC						
East Altamont	CA	2.0 ppm	6.0 ppm	2.0 ppm	SCR with ammonia CO Catalyst	
SMUD Consumnes	CA	2.0 ppm	4.0 ppm	1.4 ppm	SCR with ammonia CO Catalyst	
Inland Empire	CA	2.0 ppm	3.0 ppm	2.0 ppm	SCR with ammonia CO Catalyst	
San Joaquin	CA	2.0 ppm	4.0 ppm	2.0 ppm	SCR with ammonia CO Catalyst	
Roseville	CA	2.0 ppm	4.0 ppm	2.0 ppm	SCR with ammonia CO Catalyst	

[1] All emission limits are in ppm by volume referenced to 15% O_2

SCR = selective catalytic reduction

As demonstrated by an initial installation on several gas turbines where energy is recovered from the exhaust gas to produce steam, SCONOx™ is capable of achieving NO_x emission concentrations of 2 ppm based on a maximum inlet concentration of 25 ppm, and 90 percent CO reduction based on a maximum inlet concentration of 50 ppm. However, the effectiveness of the SCONOx™ technology has not been demonstrated on turbines as large as the Siemens 5000F turbines proposed for the SGGS Project.

Vendors of the SCONOx™ technology have stated that it is commercially ready for any size turbine. However, the largest turbine that SCONOx™ has actually been applied to thus far is a GE LM2500, approximately 25 MW in capacity, or about 10% the capacity of the proposed project. The Otay Mesa Power Project (which would have used Frame 7F turbines in a combined cycle configuration) was permitted with a commitment to use the SCONOx™ technology as the primary NO_x and CO control method if possible, but construction of that project has been postponed for several years. The AFC filed in 2000 for the Nueva Azalea Project also proposed to use the SCONOx™ technology, but this project was ultimately never built.
SCONOx™ would not require an oxidizing catalyst or the use of ammonia reagent to control CO and NO_x emissions. The SCONOx™ technology employs a reactive catalyst that must be regenerated on a regular basis. The catalyst reacts with CO and NO to form CO_2, which is emitted, and NO_2, which is absorbed on the surface of the catalyst until it is saturated. Prior to saturation, the catalyst is regenerated. This is accomplished by sealing off the catalyst from the exhaust stream by means of a pair of mechanical louver doors and subjecting it to a mixture of natural gas and steam that forms hydrogen to produce elemental nitrogen and CO_2, which are emitted through the stack.

The manufacturer of SCONOx™ recommends that the catalyst in each module be removed and put through a regenerative bathing process once a year. An on-line catalyst washing system design has not yet been fully developed. There is some concern that the bathing process may result in an additional hazardous waste stream. The time required for this process is not clearly known, but it is likely to be approximately 1-2 weeks. Also, there may be a requirement that liquefied natural gas be stored on-site for use during the regular regeneration process of the catalyst throughout the year.

For large gas turbines, an assembly of multiple SCONOx™ modules would be required to control NO_x and CO to 2 ppm each. For example, proposals for installation of the technology on Frame 7F turbine have specified up to 15 such modules, with a capital cost of $26 million (Three Mountain Power Plant, 99-AFC-2). Testing has not yet been conducted to demonstrate the successful operation of the louver doors used by each module under realistic flow and emissions conditions that would be found in large turbines. Also, control algorithms have not yet been developed nor tested for controlling large numbers of SCONOx™ modules. Due to the lack of appropriate testing and information, some HRSG manufacturers have expressed reluctance to issue guarantees for their equipment if SCONOx™ is installed (Beck, 2000).

Although the SCONOx™ technology has been demonstrated to be an effective NO_x and CO emission abatement system on a few small combined cycle turbine installations and does not require the use of ammonia reagent, an SCR system has virtually the same NO_x emissions

guarantee as the SCONOx™ at a much lower price, and has been successfully demonstrated extensively on large Frame-type turbines.

Potential advantages of the SCONOx™ process include:

- **No ammonia.** The SCONOx™ process does not use ammonia. This eliminates the ammonia storage and transportation safety issues entirely and the potential for ammonia slip or ammonia-based particulate formation.
- **Carbon monoxide reduction.** SCONOx™ will reduce CO emissions as well as NO_x emissions.

Potential disadvantages of the SCONOx™ process include:

- **Unproven for large gas turbines.** While demonstrated to be effective on smaller turbines, several aspects of the technology have not been demonstrated for a system configured for a larger turbine.
- **Catalyst "washing."** A proprietary catalyst washing system must be used and an on-line catalyst washing system design has not yet been fully developed. If an on-line catalyst washing system is not used, then the facility must be shut down for cleaning.
- **High capital and operating cost.** SCONOx™ is significantly more expensive than SCR with ammonia injection, primarily due to the higher cost of initial and replacement catalyst. The SCONOx™ catalyst is a precious metal catalyst, which is very expensive.

Because the performance of SCONOx™ has not been sufficiently demonstrated as "achieved in practice" on large combined cycle turbines, as discussed above, SCONOx™ does not represent BACT for the SGGS Project at this time.

SCR with Ammonia Injection

SCR with ammonia injection systems for reduction of NO_x emissions have been widely used in combined cycle gas turbine applications for many years and are considered a proven technology. In fact, all combined cycle projects utilizing frame-size gas turbines that have been permitted and constructed in California in the last ten years have utilized SCR in combination with either water injection or dry low-NO_x burners.

SCR systems are commercially available from several vendors, unlike SCONOx™, which is available from a single vendor. The SCR process involves the injection of ammonia into the flue gas stream via an ammonia injection grid upstream of a catalyst. The ammonia reacts with the NO_x gases in the presence of the catalyst. The catalyst is not regenerated and requires periodic replacement. SCR vendors typically offer a 3-year guarantee on catalyst life. SCR with ammonia injection systems have been used in numerous larger combined cycle applications including Siemens 5000F Class units.

The Project will use dry low-NOx burners (DLN) and SCR with ammonia injection designed to achieve a NO_x emission limit of 2.0 ppm (at 15 percent O_2) on a 3-hour average. As noted in Table 1, this level of NO_x control is consistent with other recent similar projects, and is considered to be BACT for the SGGS Project. It has also been approved by the SCAQMD on other similar projects.

OTHER TECHNOLOGIES

Technologies that cannot achieve a NO_x emissions limit of 2.0 ppmvd (at 15 percent O_2) in practice were not considered as potential BACT candidates. These technologies include SCR without DLN and DLN without SCR.

1.2 ASSESSMENT OF CO CONTROL TECHNOLOGIES

The SGGS CTG is guaranteed to achieve 2 ppm (at 15 percent O_2) over a 3-hour average with natural gas fuel and use of a CO oxidation catalyst (except during unit startup and shutdown). The use of a CO oxidation catalyst will result in emissions of CO that will conform to current SCAQMD BACT requirements.

The following CO control technologies are evaluated:

- Combustion design/control
- Oxidizing catalyst

Combustion Design/Control

Gas turbine combustion technology has significantly improved over recent years with respect to lowering CO emissions. This turbine design that will be used for the SGGS Project has been guaranteed by the manufacturer to achieve a CO rate of 2.0 ppm (at 15 percent O_2) with post-combustion control technologies under a wide range of operating conditions (60 percent to 100 percent load) and ambient conditions (15°F to 115°F).

Oxidizing Catalyst

CO oxidizing catalysts have been used with natural-gas-fired turbines for over a decade when uncontrolled CO emission levels are considered unacceptably high. CO catalysts operate at elevated temperatures within the exhaust stream and are considered technically feasible, having been successfully demonstrated in numerous combined cycle Frame turbine applications. Thus, installation of a CO oxidizing catalyst on the Project turbines is considered to be BACT for CO in the case of the SGGS application.

1.3 ASSESSMENT OF ROC CONTROL TECHNOLOGIES

The proposed BACT level of 2 ppmvd (at 15 percent O_2) for ROC control achieved by an oxidation catalyst is consistent with the most stringent level that has been demonstrated in practice by the latest combined cycle units to come on line in California and is therefore considered to be BACT for the SGGS Project.

1.4 ASSESSMENT OF SO_2 AND PM_{10} CONTROL TECHNOLOGIES

Sulfur dioxide and PM_{10} emissions will be controlled through the exclusive use of clean-burning pipeline quality natural gas. This control technology has been widely and uniformly implemented for control of SO_2 and PM_{10} emissions from combustion turbines in California and throughout the United States, and is considered to be BACT for the SGGS Project.

1.5 ASSESSMENT OF AMMONIA SLIP CONTROL TECHNOLOGIES

The proposed BACT level of 5 ppmvd NH_3 (at 15 percent O_2) is the most rigorous control requirement that has been imposed to date on any gas turbine power plant project in California, and is thus considered to represent an appropriate BACT level for the SGGS Project.

2 AUXILIARY BOILER CONTROL TECHNOLOGIES

The Project will include a 56 MMBTU auxiliary boiler. Several recent BACT determinations for similar boilers are presented on the SCAQMD website. In reviewing these determinations, the NOx emission limit for recent boilers under 100 MMBTUvaries from 7 to 12 ppm @ 3% O2. The table below presents the BACT determination from several recent applications in the SCAQMD. Low NOx burners will be used for emission control on the auxiliary boiler to control NOx emissions to 9 ppm @ 3% O2. CO will be controlled to 50 ppm @ 3% 02. BACT was not specified for VOC, SO_x, and PM_{10} for natural gas boilers of similar size, but good combustion control and use of natural gas is commonly accepted as BACT for a unit of this size and type.

Location	Application Date	Boiler Rating (MM BTU/Hr)	Control Technology	Emission Limit (ppm) VOC	CO	NOx
Los Angeles, CA	5/19/04	39	Ultra low NOx burners with FGR	3	100	9
Fullerton, CA	7/11/03	10	Ultra low NOx burners with forced internal recirculation (FIR)		50	12
City of Industry, CA	4/15/03	21	SCR		50	7
Chatsworth, CA	11/22/02	21.5	Ultra low NOx burners		100	9
Fremont, CA	6/8/01	28.8	Low NOx burners		50	9

Emissions corrected to 3% O2