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DOCKET
07-AFC-3C
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June 6, 2011

Dale Rundquist
Compliance Project Manager
California Energy Commission
Energy Facilities Siting Division
1516 Ninth Street, MS 2000
Sacramento, CA 95814-5504

RE: CPV Sentinel Energy Project (07-AFC-3C)
General Arrangement Refinement

Dear Mr. Rundquist:

Please find the attached General Arrangement Refinement for the CPV Sentinel Energy Project (07-AFC-3C). Also enclosed is a DVD that is that contains the air modeling results for the General Arrangement Refinement.

We would like to request your comments and/or approval of the proposed General Arrangement Refinement by **July 1, 2011**.

If you have any questions or concerns, please do not hesitate to call me at 714-648-2759.

Sincerely,

Maggie Fitzgerald
Site Compliance Manager

CC: Mark Turner, CPV Sentinel, LLC
Mark McDaniels, CPV Sentinel, LLC
John Murphy, CPV Sentinel, LLC
Charles Collins, Gemma Power Systems
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General Arrangement Refinements

CPV Sentinel Energy Project
Riverside County, California
07-AFC-3C

June 2011

Prepared for:

CPV
Competitive Power Ventures
SENTINEL
ENERGY PROJECT

Prepared by:

URS

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APPENDICES

TABLES

FIGURE

ACRONYMS

AAQS	Ambient Air Quality Standard
AERMOD	American Meteorological Society/Environmental Protection Agency Regulatory Model
AFC	Application for Certification
BACT	Best Available Control Technologies
CAAQS	California Ambient Air Quality Standard
CCR	California Code of Regulations
CEC	California Energy Commission
CO	carbon monoxide
CPVS	CPV Sentinel Energy Project
CTG	combustion turbine generator
dBA	A-weighted decibel
KOP	key observation point
L_{dn}	day-night average sound level
L_{eq}	equivalent sound level
L_{90}	noise level equaled or exceeded during 90 percent of the measured time interval
$\mu g/m^3$	micrograms per cubic meter
NAAQS	National Ambient Air Quality Standard
NO_2	nitrogen dioxide
PM_{10}	particulate matter less than 10 microns in diameter
$PM_{2.5}$	particulate matter less than 2.5 microns in diameter
ppm	parts per million
PSD	Prevention of Significant Deterioration
PTC	Permit to Construct
PTO	Permit to Operate
SCAQMD	South Coast Air Quality Management District
SCR	selective catalytic reduction
SO_2	sulfur dioxide
3 sigma	3σ
U.S. EPA	U.S. Environmental Protection Agency
VBV	Variable Bleed Valve
ZLD	zero liquid discharge

1.0 INTRODUCTION

In June 2007, CPV Sentinel, LLC filed an Application for Certification (AFC) with the California Energy Commission (CEC), seeking approval to construct and operate the CPV Sentinel Energy Project (CPVS or project). In November 2008, CPV Sentinel identified modifications to the project's General Arrangement in the report submitted to the CEC entitled *Project Design Refinements.* Additional minor refinements (height changes to the fire pump and cooling towers) were proposed in the *Permit to Construct/Permit to Operate* (PTC/PTO) *Application Amendment* submitted to the South Coast Air Quality District (SCAQMD) in November 2009 and copied to the CEC.

In December 2010, the CEC approved the project and issued the Commission Decision (Docket 07-AFC-3C).

CPV Sentinel recently identified additional refinements to the General Arrangement during detail project design. These refinements are all within the 37-acre project site, and do not result in any additional disturbed areas beyond the site not previously evaluated. This submittal describes the project design refinements and analyzes whether they result in any environmental consequences not previously analyzed. As set forth below, the project design refinements do not materially change the environmental consequences of the CPVS, and all impacts are expected to remain less than significant.

This document is submitted in accordance with Title 20 California Code of Regulations (CCR), Section 1769, governing post certification amendments and changes. Section 1769 requires that after the final decision on a project is effective, the applicant must file with the CEC a petition for any modifications it proposes to the project design, operation, or performance requirements. It also specifies that the following information be included in any such petition:

(A) *A complete description of the proposed modifications, including new language for any conditions that will be affected.*

Section 2.0 below provides a complete description of the project design refinements. None of the adopted Conditions of Certification are affected by the project design refinements.

(B) *A discussion of the necessity for the proposed modifications.*

The project design refinements are based on additional design work that typically occurs after a project has been approved and is nearing commencement of construction. They are necessary to ensure the most effective and efficient construction and operation of the project.

(C) *If the modification is based on information that was known by the petitioner during the certification proceeding, an explanation why the issue was not raised at that time.*

The project design refinements are based on additional design work that has occurred since the final decision on the project.

(D) *If the modification is based on new information that changes or undermines the assumptions, rationale, findings, or other bases of the final decision, an explanation of why the change should be permitted.*

As explained in Sections 2.1 through 2.16 below, the project design refinements do not materially change or undermine the assumptions, rationale, findings, or other bases of the final decision.

(E) An analysis of the impacts the modification may have on the environment and proposed measures to mitigate any significant adverse impacts.

As explained in Sections 2.1 through 2.16 below, the project design refinements will not have any adverse impacts on the environment, and no measures in addition to the existing Conditions of Certification are required to address any such impacts.

(F) A discussion of the impact of the modifications on the facility's ability to comply with applicable laws, ordinances, regulations, and standards.

As explained in Sections 2.1 through 2.16 below, the project design refinements will not affect the project's ability to comply with applicable laws, ordinances, regulations, and standards.

(G) A discussion of how the modification affects the public.

As explained in Sections 2.1 through 2.16 below, the project design refinements will not have any material effect on the public.

(H) A list of property owners potentially affected by the modification.

As explained in Sections 2.1 through 2.16, the project design refinements will not materially affect any property owners.

(I) A discussion of the potential effect on nearby property owners, the public and the parties in the application proceedings.

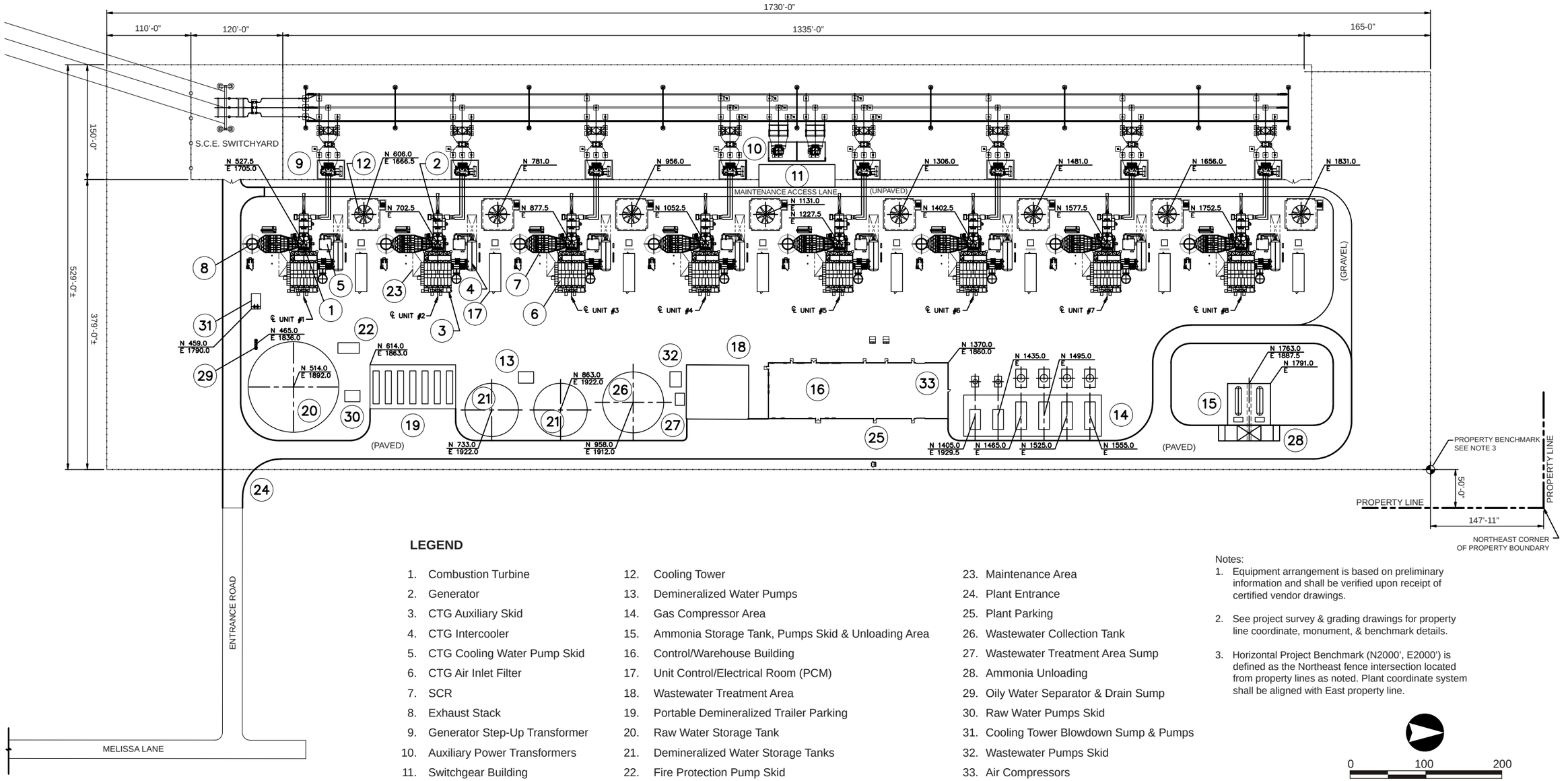
As explained in Sections 2.1 through 2.16 below, the project design refinements will not materially affect nearby property owners, the public or the parties to the application proceedings.

Based on the information provided in this submission, we believe that staff can determine that there is no possibility that the project design refinements may have a significant effect on the environment, will not necessitate a change or deletion of a condition imposed by the CEC in the final decisions, and will not make changes that would cause the project not to comply with any applicable laws, ordinances, regulations, or standards. Therefore, pursuant to 20 CCR Section 1769(a)(2), no Commission approval of the project design refinements is required.

2.0 PROJECT DESIGN REFINEMENTS

Refinements to the General Arrangement are listed below. Figure 2-1 shows the current General Arrangement for the project. Tables 2-1 and 2-2 identify the changes to the heights of tanks and structures from those previously presented in the 2008 *Project Design Refinements* and 2009 PTC Amendment.

- The air inlet structures are slightly larger and taller, and turbine housing are shorter for all eight units.
- The warehouse building that was previously located south of Unit 1 has been relocated and is now attached to the operations building (called the control/warehouse building). The height of the control/warehouse building has been reduced.



LEGEND

1. Combustion Turbine
2. Generator
3. CTG Auxiliary Skid
4. CTG Intercooler
5. CTG Cooling Water Pump Skid
6. CTG Air Inlet Filter
7. SCR
8. Exhaust Stack
9. Generator Step-Up Transformer
10. Auxiliary Power Transformers
11. Switchgear Building
12. Cooling Tower
13. Demineralized Water Pumps
14. Gas Compressor Area
15. Ammonia Storage Tank, Pumps Skid & Unloading Area
16. Control/Warehouse Building
17. Unit Control/Electrical Room (PCM)
18. Wastewater Treatment Area
19. Portable Demineralized Trailer Parking
20. Raw Water Storage Tank
21. Demineralized Water Storage Tanks
22. Fire Protection Pump Skid
23. Maintenance Area
24. Plant Entrance
25. Plant Parking
26. Wastewater Collection Tank
27. Wastewater Treatment Area Sump
28. Ammonia Unloading
29. Oily Water Separator & Drain Sump
30. Raw Water Pumps Skid
31. Cooling Tower Blowdown Sump & Pumps
32. Wastewater Pumps Skid
33. Air Compressors

Notes:

1. Equipment arrangement is based on preliminary information and shall be verified upon receipt of certified vendor drawings.
2. See project survey & grading drawings for property line coordinate, monument, & benchmark details.
3. Horizontal Project Benchmark (N2000', E2000') is defined as the Northeast fence intersection located from property lines as noted. Plant coordinate system shall be aligned with East property line.

0 100 200
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Source:
Mott MacDonald; CPV Sentinel Energy Project,
General Arrangement Plan & Legend, Dwg. No. 289497-G-101,
Rev. C, 4/28/11.

PLOT PLAN

CPV Sentinel Energy Project
June 2011 — CPV Sentinel, LLC
28067907 — Riverside County, California

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FIGURE 2-1

5/24/11 vsa ..T:\CPV Sentinel 2011\Amendment_Jun11\Fig2-1_PlotPlan.ai

Table 2-1
Heights of Structures at CPVS Project Site

General Arrangement	Height (feet)		
	2008[1]	2009[2]	Current General Arrangement (2011)
Building/Structure			
Cooling tower	35	35	32
Turbine housing	40	40	20
SCR	40	40	40
Switchyard structure	24	24	12
Fire pump skid	3	3	11
Warehouse	24	24	22
Operations	20	20	22
Gas compressor	26	26	9
Control rooms	12	12	12
Air inlet structure	40	40	49.75
Stacks			
Turbine	90	90	90
Fire pump	15	50	50
Cooling tower	43	41	41

Notes:

1. 2008 = General Arrangement associated with November 2008 Project Design Refinements
2. 2009 = General Arrangement associated with November 2009 PTC Amendment
3. Warehouse and operations building are combined in 2011

SCR selective catalytic reduction
ZLD zero liquid discharge

Table 2-2
Heights and Diameters of Tanks at CPVS

General Arrangement Version	2008[1]		2009[2]		Current General Arrangement (2011)	
Tank/Structure	**Height (feet)**	**Diameter (feet)**	**Height (feet)**	**Diameter (feet)**	**Height (feet)**	**Diameter (feet)**
Raw water	46	100	46	100	43	118.5
Treated (or demineralized) water 1	36	70	36	70	42	70
Treated (or demineralized) water 2	36	70	36	70	42	70
Wastewater Collection (new)	NA	NA	NA	NA	49	80
Variable Bleed Valve (Silencer/ Stack)	55	11	55	11	55	11

Notes:

1. 2008 = General Arrangement associated with November 2008 Project Design Refinements
2. 2009 = General Arrangement associated with November 2009 PTC Amendment

NA = Not Applicable (tank not present in 2008/2009 General Arrangements)

- The gas compressor area was shifted east on the CPVS project site, and the height of the building has been reduced.

- Each respective unit control/electrical room for each combustion turbine unit has been relocated. Previously, the control/electrical rooms were located immediately north of each unit's air inlet structure and were orientated north-south. The control/electrical rooms for each unit are now orientated east-west and located immediately east of each unit's cooling tower and north of each unit's combustion turbine generator (CTG) intercooler.

- The fire protection pump skid was reoriented from an east-west configuration to north-south. Additionally, the fire pump stack was moved to the south end of the fire protection pump skid.

- A wastewater collection tank was added north of the water storage tanks and immediately south of the wastewater treatment area. The new tank is for collection of wastewater during operations and to act as a collector for cooling tower blowdown for the zero liquid discharge (ZLD) system during off-normal operations and/or system maintenance. The ZLD will be operated in "batch" mode, and the additional tank allows water to accumulate for a longer duration before discharge and processing by the ZLD system.

- The raw water storage tank has moved further southeast to make room for the new wastewater collection tank.

- The demineralized water storage tanks have been relocated north due to the relocation of the portable demineralized trailer parking area.

- The two 40-foot-tall ZLD evaporator towers within the wastewater treatment area have been replaced with one ZLD evaporator tower, which is taller.

As explained further below, these refinements to the General Arrangement do not result in any changes to the environmental consequences of the CPVS. Furthermore, all impacts are expected to remain less than significant with implementation of Conditions of Certification set forth in the December 2010 Commission Decision.

2.1 AIR QUALITY

2.1.1 Construction Emissions

Potential environmental impacts from project construction are presented in AFC Table 7.1-22. The modifications to the CPVS will not result in an increase in the area of disturbance or alter the expected number, duration, or location of construction equipment operations proposed for the construction of the CPVS presented in the AFC. Therefore, the construction emissions calculated and modeled in AFC Section 7.1.2, analyzed by CEC Staff in Section 4.1 of the Final Staff Assessment, and reviewed and approved by the Commission in Section V, B of the Commission Decision accurately characterize the potential air quality impacts during construction for the modified project. All construction Conditions of Certification identified in the Commission Decision remain valid and will be implemented during project construction.

2.1.2 Operational Emissions

Minor refinement of the facility's General Arrangement results in no change to project emissions. Operational emissions remain the same as those presented in the *PTC/PTO Application Amendment* submitted to the SCAQMD in November 2009, with the exception of a reduction in carbon monoxide

(CO) emissions. The emission estimates supporting the PTC/PTO Amendment used CO emission rates equivalent to a 6-part-per-million (ppm) exhaust concentration during normal operations. The SCAQMD determined that the best available control (BACT) level for CO emissions is 4 ppm, which is a condition of the PTC/PTO. Operational emission estimates and calculations are included as Appendix A. Turbine commissioning emissions are presented in Appendix B, and remain the same as those presented in the commissioning memo provided to SCAQMD in March 2008, which is provided in Appendix C.

2.1.3 Dispersion Modeling

Ambient air quality standard (AAQS) dispersion modeling was conducted to ensure that the changes in the locations of project emissions sources and changes to the dimensions and locations of the buildings and structures on the site would not cause stack plume downwash conditions that would lead to more significant offsite pollutant concentrations than were previously presented. The air dispersion model was updated to incorporate the General Arrangement changes listed above (i.e., use appropriate building and equipment coordinates and heights).

Air quality modeling to show compliance with the state and federal AAQS was conducted according to the methodology described in Section 3.1.3 of the 2008 *Project Design Refinements,* and using the revised source and structure locations described above with AERMOD version 09292. Model input data such as meteorological and ozone data were the same as used in previous analyses.

For the normal operations and startup scenarios, the emissions from each source and the stack parameters used in this analysis remained the same as those presented in the November 2009 PTC/PTO Amendment, with the exception of CO. As mentioned above, the PTC/PTO Amendment included CO emission rates equivalent to a 6-ppm exhaust concentration during normal operations. Because the BACT level for CO emissions was revised to 4 ppm, the 2011 air dispersion model runs used a CO emission rate of 4 ppm to represent this exhaust concentration.

The commissioning scenarios were remodeled using the commissioning emissions presented in a memorandum provided to SCAQMD on March 4, 2008, which is included as Appendix C. Two scenarios were examined: 1) two turbines in commissioning mode and six turbines operating in normal startup mode; and 2) three turbines in commissioning mode and three turbines operating in normal startup mode.

AFC Section 7.1 presented additional modeling to evaluate impacts of CPVS emissions due to plume fumigation conditions. That analysis has not been repeated because maximum short-term emissions for the sources of the amended project are expected to be no higher than the levels presented in the AFC. The same is true of the analysis conducted to determine potential impacts of CPVS emission plumes on visibility in the nearest Class I areas.

Input and output electronic files for the new dispersion modeling analyses are included on the DVD that is being submitted under separate cover.

2.1.4 Dispersion Modeling Results

The results of the air dispersion model analysis that reflects the project refinements presented in the revised General Arrangement are similar to the results of previous modeling efforts. Table 2-3 summarizes the maximum predicted criteria pollutant concentrations due to all emission sources of the operational CPVS.

SCAQMD rules require that information be provided on the modeled impacts of individual project sources. These results are provided in Tables 2-4a, 2-4b, and 2-4c. Individual sources of non-attainment

Table 2-3
Operational Model Results
AERMOD Refined Modeling Results for the Operational Project (All Sources)

Pollutant	Averaging Period	Maximum Predicted Impact (µg/m^3)	PSD Class II Significance Level (µg/m^3)	SCAQMD Significant Change (µg/m^3)	Background Concentration (µg/m^3) [1]	Total Concentration (µg/m^3)	NAAQS (µg/m^3)	CAAQS (µg/m^3)
NO_2	1-hour Normal[2]	42.11	NA	20	174.8	216.9	NA[5]	339
	1-hour Startup[2]	110.85	NA	20	174.8	285.6	NA[5]	339
	Annual[2]	0.46	1	1	24.5	31.3	100	57
SO_2	1-hour	6.80	NA	NA	62.9	69.7	NA	655
	3-hour	5.95	25	NA	41.6	47.5	1300	NA
	24-hour	2.53	5	NA	39.4	41.9	365	105
	Annual	0.33	1	NA	10.7	11.0	80	NA
CO	1-hour Normal	21.29	2,000	1,100	2,645	2,666	40,000	23,000
	1-hour Startup	155.66	2,000	1,100	2,645	2,801	40,000	23,000
	8-hour Normal	11.08	500	500	944.4	955.5	10,000	10,000
PM_{10}	24-hour[3,4]	8.89	5	2.5	161	169.9	150	50
	Annual[3,4]	0.35	1	1	54.9	55.3	NA	20
$PM_{2.5}$	24-hour[3,4]	8.89	NA	NA	44.3	53.2	35	NA
	Annual[3,4]	0.35	NA	NA	10.8	11.2	15	12

Notes:
1 Background represents the maximum values measured at the monitoring stations identified in original AFC application.
2 Results for NO_2 during operations used ozone limiting method with ambient ozone data collected at the Palm Spring Fire Station monitoring station for the years 1988 through 1991.
3 PM_{10} background levels exceed ambient standards.
4 All PM_{10} emissions from project sources were also considered to be $PM_{2.5}$.
5 See CEC Final Decision at page 5.

CO = carbon monoxide
CAAQS = California Ambient Air Quality Standards
m = meters
µg/m^3 = micrograms per cubic meter
NA = not applicable
NO_2 = nitrogen dioxide
PM_{10} = particulate matter less than 10 microns in diameter
$PM_{2.5}$ = particulate matter less than 2.5 microns in diameter
PSD = Prevention of Significant Deterioration
NAAQS = National Ambient Air Quality Standards
SO_2 = sulfur dioxide
U.S. EPA = U.S. Environmental Protection Agency

Table 2-4a
CO and NO_2 Modeling Results for Individual Project Emission Sources for Maximum Normal Operations Emission Rates
(All values in µg/m^3)

Pollutant	CO		NO_2	
Averaging Time	**1-Hour**	**8-Hour**	**1-Hour**	**Annual**
Unit 1	4.28	2.56	4.39	0.07
Unit 2	4.24	2.06	4.36	0.07
Unit 3	4.27	2.65	4.38	0.07
Unit 4	4.27	2.44	4.38	0.07
Unit 5	4.47	2.93	4.58	0.08
Unit 6	4.49	2.92	4.61	0.08
Unit 7	4.51	2.87	4.63	0.08
Unit 8	4.50	2.91	4.62	0.07
Fire Pump	9.97	4.50	42.06	0.02
All Eight Turbines Only	21.14	11.08	21.70	0.46
All Project Sources	21.29	11.08	42.11	0.46

Notes:
CO = carbon monoxide
µg/m^3 = micrograms per cubic meter
NO_2 – nitrogen dioxide

Table 2-4b
CO and NO_2 Modeling Results for Individual Project Emission Sources for Worst-Case Startup Emission Rates
(All values in µg/m³)

Pollutant	CO		NO_2
Averaging Time	**1-Hour**	**8-Hour**	**1-Hour**
Unit 1	29.29	6.88	20.85
Unit 2	28.58	7.09	20.35
Unit 3	28.73	7.33	20.46
Unit 4	28.74	7.43	20.47
Unit 5	31.03	7.54	22.10
Unit 6	31.00	7.61	22.08
Unit 7	31.24	7.16	22.25
Unit 8	31.24	7.99	22.25
Fire Pump	9.97	4.50	42.06
All Eight Turbines Only	155.66	36.98	110.85
All Project Sources	155.66	36.98	110.85

Notes:
CO = carbon monoxide
µg/m³ = micrograms per cubic meter
NO_2 – nitrogen dioxide

Table 2-4c
PM_{10} and SO_2 Modeling Results for Individual Project Emission Sources for Worst-Case Normal Operations Emission Rates
(All values in µg/m³)

Pollutant	PM_{10}		SO_2			
Averaging Time	**24-Hour**	**Annual**	**1-Hour**	**3-Hour**	**24-Hour**	**Annual**
Unit 1	1.21	0.05	1.38	1.00	0.32	0.05
Unit 2	1.13	0.05	1.37	0.94	0.33	0.05
Unit 3	1.26	0.05	1.37	1.07	0.34	0.05
Unit 4	1.14	0.06	1.37	0.99	0.35	0.05
Unit 5	1.32	0.06	1.44	1.18	0.36	0.06
Unit 6	1.34	0.06	1.45	1.18	0.37	0.06
Unit 7	1.34	0.06	1.45	1.15	0.38	0.06
Unit 8	1.36	0.06	1.45	1.16	0.38	0.05
Fire Pump	0.01	0.00	0.08	0.05	0.02	0.01
All Eight Turbines	8.87	0.34	6.80	5.95	2.53	0.33
Cooling Tower 1	0.13	0.01	–	–	–	–
Cooling Tower 2	0.18	0.01	–	–	–	–
Cooling Tower 3	0.20	0.02	–	–	–	–
Cooling Tower 4	0.22	0.02	–	–	–	–
Cooling Tower 5	0.24	0.02	–	–	–	–
Cooling Tower 6	0.24	0.02	–	–	–	–
Cooling Tower 7	0.31	0.02	–	–	–	–
Cooling Tower 8	0.41	0.01	–	–	–	–
All 8 Cooling Towers	0.64	0.03	–	–	–	–
All Project Sources	8.89	0.35	6.80	5.95	2.53	0.33

Notes:
µg/m³ = micrograms per cubic meter
PM_{10} = particulate matter less than 10 microns in diameter
SO_2 = sulfur dioxide

pollutants must not cause incremental pollutant concentrations above specified limits. For 24-hour and annual particulate matter less than 10 microns in diameter (PM_{10}), the SCAQMD permissible impact levels per permit unit are 2.5 micrograms per cubic meter ($\mu g/m^3$) and 1 $\mu g/m^3$, respectively. For attainment pollutants (nitrogen dioxide, CO, and sulfur dioxide), it is only necessary to show that facility impacts plus background will not cause an exceedance of an applicable ambient standard.

Modeling results in Table 2-4c indicate that the highest 24-hour offsite concentration of PM_{10} due to any of the eight CTGs range from a low of 1.14 $\mu g/m^3$ (Unit 4) to a high of 1.36 $\mu g/m^3$ (Unit 8). These values are all below the SCAQMD 24-hour PM_{10} limit of 2.5 $\mu g/m^3$. The maximum annual PM_{10} value for any of the eight CTGs is also below the SCAQMD annual PM_{10} limit of 1 $\mu g/m^3$.

Table 2-5 presents the results for commissioning scenarios. The impacts predicted are similar to previous modeling and remain less than significant.

The air quality impacts predicted from the CPVS due to project refinements remain less than significant compared to the ambient air quality standards deemed applicable in the Commission Decision.

2.1.5 Conclusion

Reanalysis of the project's impacts to air quality was conducted to ensure that the modified geometry between CPVS emission sources and project buildings would not result in increased pollutant concentrations compared with those presented in the AFC and the Commission Decision. The results of the revised analysis demonstrate that air quality impacts associated with CPVS operation and commissioning will remain less than significant with the implementation of the Conditions of Certification.

2.2 BIOLOGICAL RESOURCES

As described in AFC Section 7.2 and the Commission Decision, no threatened or endangered plant or wildlife species have been observed during biological resource field surveys of the project site. The refinements to the General Arrangement are within the 37-acre project site and would not result in any additional disturbed areas beyond the site. Therefore, the refinements to the General Arrangement would not change the analysis of potential impacts to biological resources previously described in AFC Section 7.2, analyzed by CEC Staff in Section 4.2 of the Final Staff Assessment, and reviewed and approved by the Commission in Section VI, A of the Commission Decision. Impacts to biological resources are expected to be less than significant with implementation of Conditions of Certification.

2.3 CULTURAL RESOURCES

The refinements to the General Arrangement are within the 37-acre project site and would not result in any additional disturbed areas beyond the site. As discussed in AFC Section 7.3 and set forth in the Commission Decision, no significant archaeological or historic and architectural (built environmental) resources were identified within the project site or vicinity. Therefore, this refinement of the General Arrangement would not change the analysis of potential impacts to cultural resources described in AFC Section 7.3, analyzed by CEC Staff in Section 4.3 of the Final Staff Assessment, and reviewed and approved by the Commission in Section VI, C of the Commission Decision. Impacts to cultural resources are expected to be less than significant with implementation of Conditions of Certification.

2.4 LAND USE

The refinements to the General Arrangement are within the 37-acre project site and do not alter the analysis of potential impacts to land use resources presented in AFC Section 7.4 and set forth in the Commission

Table 2-5
Commissioning Model Results
AERMOD Refined Modeling Results for Commissioning (All Sources)

Operating Mode	Pollutant	Averaging Period	Maximum Predicted Impact (µg/m^3)	PSD Class II Significance Level (µg/m^3)	SCAQMD Significant Change (µg/m^3)	Background Concentration (µg/m^3) [1]	Total Concentration (µg/m^3)	NAAQS (µg/m^3)	CAAQS (µg/m^3)
Three turbines in startup mode and three turbines commissioning	NO_2	1-hour	143.06	NA	20	174.8	317.9	NA [2]	339
	CO	1-hour	324.32	2,000	1,100	2,645	2,969	40,000	23,000
		8-hour	162.72	500	500	944.4	1,107.1	10,000	10,000
Six turbines in startup mode and two turbines commissioning	NO_2	1-hour	125.27	NA	20	174.8	300.1	NA [2]	339
	CO	1-hour	259.08	2,000	1,100	2,645	2,904	40,000	23,000
		8-hour	139.13	500	500	944.4	1,083.5	10,000	10,000

Notes:

[1] Background represents the maximum values measured at the monitoring stations identified in original AFC application.
[2] See CEC Final Decision at page 5.

CO = carbon monoxide
CAAQS = California Ambient Air Quality Standards
µg/m^3 = micrograms per cubic meter
NA = not applicable
NAAQS = National Ambient Air Quality Standards
NO_2 = nitrogen dioxide
PSD = Prevention of Significant Deterioration
SCAQMD = South Coast Air Quality Management District

Decision. These analyses found that the CPVS would not disrupt or divide an established community; would not conflict with the established uses of the area; would be consistent with existing zoning and applicable land use plans, policies, and regulations; and would not affect farmlands. Therefore, the refinements to the General Arrangement would not change the analysis of potential impacts to land use described in AFC Section 7.3, analyzed by CEC Staff in Section 4.5 of the Final Staff Assessment, and reviewed and approved by the Commission in Section VII, A of the Commission Decision. Impacts to land use are expected to be less than significant with implementation of Conditions of Certification.

2.5 NOISE

2.5.1 Construction

The modifications to CPVS would not result in significant changes to the potential noise emissions during construction that were modeled and presented in AFC Section 7.5.3.7, analyzed by CEC Staff in Section 4.6 of the Final Staff Assessment, and reviewed and approved by the Commission in Section VII, D of the Commission Decision. Construction noise impacts are expected to be less than significant with implementation of the Noise Conditions of Certification outlined in the Commission Decision.

2.5.2 Operations

To assess operational noise impacts from the project design modifications, the detailed noise model previously developed for the project, as described in the AFC Section 7.5.3.2, was revised to incorporate the recent modifications to CPVS and to assess potential changes in noise exposure. Several of the project modifications described in Section 2.0 Project Design Refinements may affect noise exposure, including the addition of a wastewater collection tank, rearrangement and relocation of specific structures, and changes in heights of certain structures.

Noise exposure from the revised project design was then compared to the noise exposure presented in the December 2010 Commission Decision. Results of the modeling are presented below.

Receptor location LT-1 (Residence C) is the nearest residence to the site and the critical design receptor for purposes of evaluating noise exposure. LT-1 is shown on AFC Figure 7.5-1. No new potentially noise sensitive uses have been identified in the project area. Table 2-6 presents the anticipated steady-state noise level of the project under full load at receptor location LT-1 in terms of the noise level during 90 percent of the measured time interval (L_{90}) and equivalent sound level (L_{eq}). As shown in Table 2-6, noise levels at LT-1, based on the revised noise modeling, are identical to the noise levels presented in the 2010 Commission Decision.

Table 2-6
Predicted Project Noise Level (dBA L_{90}, L_{eq})

Location	Approximate Distance to Project (feet)	Project Noise Level (dBA L_{90}, L_{eq})
LT-1	1,007	54, 56

Notes:
dBA = A-weighted decibels
L_{90} = noise level equaled or exceeded during 90 percent of the measured time interval
L_{eq} = equivalent sound level

Table 2-7 presents the cumulative noise levels based on the available monitoring and modeled project noise level data. When compared to existing noise levels without the project, the current project design increases existing noise levels by 6 A-weighted decibels (dBA) L_{90} at receptor location LT-1 for the quietest 4 hours of the night, and increases L_{eq} by 4 dBA.

Table 2-7
Summary of Cumulative Noise Levels (dBA L_{90}, L_{eq})

Location	Ambient Background Level (dBA L_{90}, L_{eq})	Project Noise Level (dBA L_{90}, L_{eq})	Cumulative Noise Level (dBA L_{90}, L_{eq})	Predicted Change (dBA L_{90}, L_{eq})
LT-1	49, 55	54, 56	55, 59	+6, +4

Notes:
dBA = A-weighted decibels
L_{90} = noise level equaled or exceeded during 90 percent of the measured time interval
L_{eq} = equivalent sound level

When compared to the results of the project design noise levels that were analyzed by CEC Staff in Section 4.6 of the Final Staff Assessment, and reviewed and approved by the Commission in Section VII D of the Commission Decision, the proposed modifications to CPVS will not change noise exposure at LT-1. The projected project noise level, based on 3 sigma (3σ) modeling, at receptor location LT-1 remains at 56 dBA L_{eq} and 54 dBA L_{90}. CEC Staff notes in the Final Staff Assessment that, "The inherent conservativeness in projections based on 3σ data results in figures that overstate actual power plant noise by 7 dBA or more. Staff has noticed this conservativeness in project noise modeling; only twice in the past 16 years has staff dealt with power plants that proved to be noisier than expected. Typically, noise monitoring performed after the plant has begun operation shows it to be markedly quieter than was projected." This assessment is also applicable to the modeling results presented in Table 2-7.

The CPVS modifications outlined in Section 2.0 will not significantly change the noise levels generated by CPVS at LT-1. Table 2-8 lists changes to existing sound levels with operation of the CPVS. The ambient noise level at LT-1 during the critical nighttime hours is 56 dBA. The changes in sound levels at LT-1 are shown in this revised table and are equal to sound levels presented in the Commission Decision. Given the high ambient noise level conditions near the CPVS project site, the calculated project plus existing L_{dn} values remain unchanged from the Commission Decision at all nearby noise-sensitive receivers. Therefore, noise impacts from facility operations with the identified modifications remain less than significant with implementation of the Noise Conditions of Certification outlined in the Commission Decision.

Table 2-8
Change in Existing Sound Level with CPVS

Receptor	Distance from Source to Receptor (feet)	Existing Sound Level (L_{dn}) [1,2]	Calculated Project Sound Level (L_{dn},L_{eq},L_{90})	Calculated Project Plus Existing (L_{dn})	Change in Sound Level (L_{dn})
LT-1	1,007	60 dBA	62, 56, 54 dBA	64 dBA	+4 dBA
ST-1	1,007	60 dBA	62, 56, 54 dBA	64 dBA	+4 dBA
ST-2	2,450	60 dBA	54, 48, 46 dBA	61 dBA	+1 dBA
ST-3	1,332	60 dBA	60, 54, 52 dBA	63 dBA	+3 dBA

Notes:
[1] Measured Hourly L_{90} at LT-1 was the basis for L_{dn} used at all locations.
[2] Refer to AFC Table 7.5-2 for the existing measured hourly sound levels.
dBA ≡ decibels measured on the A-Weighted scale
L_{90} ≡ noise levels equaled or exceeded during 90 percent of the measured time interval
L_{dn} ≡ day-night average sound level
L_{eq} ≡ equivalent sound level

2.6 PUBLIC HEALTH

The refinements to the General Arrangement do not alter the expected numbers, durations, or locations of construction equipment operations associated with project construction. Therefore, as described in AFC Section 7.6, the relatively short duration of the CPVS construction is not expected to result in significant long-term public health effects.

The refinements to the General Arrangement do not increase operational emissions of toxic air contaminants. The health risk assessment was not revised to include the General Arrangement refinements, because the ambient air quality analysis conducted with the project refinements showed little change in the predicted criteria pollutant impacts, and the same would be expected for the health risk impacts. Therefore, as set forth in Section V, C of the Commission Decision, it is anticipated that the construction and operation of the CPVS will pose a less-than-significant health risk to nearby populations with implementation of Conditions of Certification.

2.7 WORKER SAFETY AND HEALTH

The refinements to the General Arrangement are within the 37-acre project site and would not change the anticipated workplace hazards or require changes to the safety programs presented in AFC Section 7.7, analyzed by CEC Staff in Section 4.14 of the Final Staff Assessment, and reviewed and approved by the Commission in Section V, D of the Commission Decision. Potential impacts to worker safety and health are expected to be less than significant with implementation of Conditions of Certification.

2.8 SOCIOECONOMICS

The refinements to the General Arrangement are within the 37-acre project site and would not alter the analysis of potential socioeconomic impacts presented in AFC Section 7.8, analyzed by CEC Staff in Section 4.8 of the Final Staff Assessment, and reviewed and approved by the Commission in Section VII, C of the Commission Decision. The analysis concluded the CPVS would not induce substantial growth or concentration of population; induce substantial increases in demand for public service and utilities; displace a large number of people; disrupt or divide an established community; or result in disproportionate adverse effects on minority or low-income populations. Potential socioeconomics impacts are expected to be less than significant with implementation of Conditions of Certification.

2.9 SOILS

The refinements to the General Arrangement are within the 37-acre project site, would not result in increased soil erosion or loss of topsoil, and would not alter the analysis of potential impacts to soils described in AFC Section 7.9, analyzed by CEC Staff in Section 4.9 of the Final Staff Assessment, and reviewed and approved by the Commission in Section VI, B of the Commission Decision. The project design measures that will be implemented during construction and operation of the CPVS would reduce soil impacts. Therefore, potential impacts to soil resources are expected to be less than significant with implementation of Conditions of Certification.

2.10 TRAFFIC AND TRANSPORTATION

The refinements to the General Arrangement are within the 37-acre project site and would not alter the analysis of potential traffic and transportation impacts presented in AFC Section 7.10, analyzed by CEC Staff in Section 4.10 of the Final Staff Assessment, and reviewed and approved by the Commission in Section VII, B of the Commission Decision, including roadway and intersection levels of service during project construction and operation, and potential impacts to transportation networks. Therefore, potential traffic and transportation impacts are expected to be less than significant with implementation of Conditions of Certification.

2.11 VISUAL RESOURCES

The majority of the refinements to the General Arrangement would not be visible from any of the five Key Observation Points (KOPs). The size modifications to the air inlet structures and turbine housings will only have a minimal visual modification on each KOP from what was simulated. The warehouse location modification, the tank relocations, and the added water tank would only be slightly noticeable from views at KOPs 2 and 3, and would not be noticeable to viewers at KOPs 1, 4, or 5 due to screening by terrain and existing industrial structures. Because the majority of the changes to the General Arrangement would not be visible from the five KOPs, and none of the project changes would result in any newly identified KOPs, revisions to the visual simulations was not deemed warranted.

Furthermore, the relocation of the warehouse building moves it further from the viewers at KOPs 2 and 3, to the center of the site where it would be screened from view. The raw water storage tank was not moved; this tank would remain as simulated and would screen the other tank relocations and the new wastewater collection tank from view.

Therefore, potential visual impacts at all five KOPs are expected to remain less than significant with implementation of Conditions of Certification.

2.12 HAZARDOUS MATERIALS

The refinements to the General Arrangement are within the 37-acre project site and would not result in changes to the hazardous materials that would be used during construction or operation of the CPVS. Therefore, as described in AFC Section 7.12, analyzed by CEC Staff in Section 4.4 of the Final Staff Assessment, and reviewed and approved by the Commission in Section V, E of the Commission Decision, potential hazardous materials handling impacts are expected to be less than significant with implementation of Conditions of Certification.

2.13 WASTE MANAGEMENT

The refinements to the General Arrangement are within the 37-acre project site and would not increase nonhazardous or hazardous wastes associated with construction or operation of the CPVS. AFC Section 7.13, CEC Staff Final Staff Assessment Section 4.13, and Section V, F of the Commission Decision include best management practices that will be implemented during construction and operation of the CPVS to manage and minimize the amount of waste generated. Therefore, potential waste management impacts are expected to be less than significant with implementation of Conditions of Certification.

2.14 WATER RESOURCES

The refinements to the General Arrangement are within the 37-acre project site and include the addition of a new wastewater collection tank for storage and to act as a collector for cooling tower blowdown for the ZLD system during maintenance and/or system upsets. The additional tank allows water to accumulate for a longer duration and then discharge to the ZLD (which can be run as needed)). The refinements to the General Arrangement would not result in changes to the analysis of water resources, water quality, or flood hazards described in AFC Section 7.14, analyzed by CEC Staff in Section 4.9 of the Final Staff Assessment, and reviewed and approved by the Commission in Section VI, B of the Commission Decision. Impacts to water resources are expected to be less than significant with implementation of the Conditions of Certification.

2.15 GEOLOGIC HAZARDS AND RESOURCES

The refinements to the General Arrangement are within the 37-acre project site and would not result in changes to the analysis of geologic hazards or result in significant adverse impacts to the geologic environment. Therefore, as described in AFC Section 7.15, analyzed by CEC Staff in Section 5.2 of the

Final Staff Assessment, and reviewed and approved by the Commission in Section VI, D of the Commission Decision, impacts to geologic hazards and resources are expected to be less than significant with implementation of the Conditions of Certification.

2.16 PALEONTOLOGICAL RESOURCES

AFC Section 7.16 identified potential impacts on paleontological resources that could occur as a result of project construction. The refinements to the General Arrangement are within the 37-acre project site and do not result in any additional disturbed areas beyond the site. Therefore, these refinements would not change the analysis of impacts to paleontological resources described in AFC Section 7.16, analyzed by CEC Staff in Section 5.2 of the Final Staff Assessment, and reviewed and approved by the Commission in Section VI, D of the Commission Decision. Impacts to paleontological resources are expected to be less than significant with implementation of Conditions of Certification.

3.0 REFERENCES

URS (URS Corporation), 2007. Application for Certification. CPV Sentinel Energy Project. June.

URS (URS Corporation), 2008. Project Design Refinements, CPV Sentinel Energy Project. November.

CEC (California Energy Commission), 2010. Commission Decision, CPV Sentinel Energy Project. December.

APPENDIX A
REVISED OPERATIONAL EMISSION ESTIMATES AND CALCULATIONS (WITH SEPARATELY SUBMITTED DVD)

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

GE Energy

Performance By: **Daniele Marcucci**
Project Info: **CPV Sentinel Project**

Engine: **LMS100 PA**
Deck Info: **G0179C - 87o.scp**
Generator: **BDAX 82-445ER 60Hz, 13.8kV, 0.9PF (35404)**
Fuel: **Site Gas Fuel#900-1837, 20600 Btu/lb,LHV**

Date: **05/15/2008**
Time: **1:39:06 PM**
Version: **3.7.0**

Case #	**100**	**101**	**102**	**103**	**104**	**105**	**106**	**107**	**108**	**109**	**110**
Ambient Conditions											
Dry Bulb, °F	17.0	17.0	17.0	72.0	72.0	72.0	72.0	107.0	107.0	107.0	107.0
Wet Bulb, °F	15.8	15.8	15.8	57.1	57.1	57.1	57.1	72.2	72.2	72.2	72.2
RH, %	80.0	80.0	80.0	40.0	40.0	40.0	40.0	18.4	18.4	18.4	18.4
Altitude, ft	1080.0	1080.0	1080.0	1080.0	1080.0	1080.0	1080.0	1080.0	1080.0	1080.0	1080.0
Ambient Pressure, psia	14.132	14.131	14.131	14.132	14.132	14.131	14.131	14.132	14.132	14.131	14.131
Engine Inlet											
Comp Inlet Temp, °F	16.0	17.0	17.0	59.3	72.0	72.0	72.0	77.4	107.0	107.0	107.0
RH, %	96.9	80.0	80.0	87.8	40.0	40.0	40.0	78.3	18.4	18.4	18.4
Conditioning	NONE	NONE	NONE	EVAP	NONE	NONE	NONE	EVAP	NONE	NONE	NONE
Tons or kBtu/hr	0	0	0	0	0	0	0	0	0	0	0
Pressure Losses											
Inlet Loss, inH20	4.50	4.50	4.50	4.50	4.50	4.50	4.50	4.50	4.50	4.50	4.50
Exhaust Loss, inH20	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00
Partload %	**100**	**75**	**50**	**EVAP-100**	**100**	**75**	**50**	**EVAP-100**	**100**	**75**	**50**
kW, Gen Terms	**102548**	**76927**	**51295**	**101279**	**98109**	**73597**	**49080**	**94674**	**88141**	**66119**	**44098**
Est. Btu/kW-hr, LHV	**7806**	**8213**	**9043**	**7939**	**8015**	**8375**	**9232**	**8066**	**8236**	**8638**	**9569**
Guar. Btu/kW-hr, LHV	**8006**	**8424**	**9275**	**8143**	**8221**	**8590**	**9469**	**8273**	**8447**	**8859**	**9814**
Fuel Flow											
MMBtu/hr, LHV	800.5	631.8	463.8	804.1	786.4	616.4	453.1	763.6	725.9	571.1	422.0
lb/hr	38859	30671	22517	39034	38174	29922	21996	37070	35239	27724	20483
NOx Control	**Water**	**Water**	**Water**	**Water**	**Water**	**Water**	**Water**	**Water**	**Water**	**Water**	**Water**
Water Injection											
lb/hr	30395	21745	13881	28181	28551	19663	12359	25338	24790	16970	10602
Temperature, °F	68.0	68.0	68.0	68.0	68.0	68.0	68.0	68.0	68.0	68.0	68.0
Intercooler	**Water-Air**	**Water-Air**	**Water-Air**	**Water-Air**	**Water-Air**	**Water-Air**	**Water-Air**	**Water-Air**	**Water-Air**	**Water-Air**	**Water-Air**
Humidification	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF
IC Heat Extraction, btu/s	24794	18075	11097	30778	31642	24981	16657	33611	33375	26831	18472
KOD Water Extraction, lb/s	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.7	0.0	0.0	0.0
Control Parameters											
HP Speed, RPM	9245	9095	8925	9354	9350	9142	8959	9358	9352	9136	8952
LP Speed, RPM	5061	4726	4507	5321	5293	4942	4715	5274	5295	5027	4801
PT Speed, RPM	3600	3600	3600	3600	3600	3600	3600	3600	3600	3600	3600
PS3 - CDP, psia	567.0	468.9	362.9	554.7	542.2	452.0	350.7	527.9	501.9	419.9	327.4
T23 - Intcrl Inlet Temp, °F	284.6	258.9	222.8	336.1	348.9	327.9	290.6	350.5	382.4	362.3	325.4
P23 - Intcrl Inlet Pressure, psia	57.2	50.8	42.8	54.1	52.8	48.3	41.0	51.6	49.1	45.2	38.6
W23 - Intcrl Inlet Flow, lb/s	455.8	401.5	351.7	438.8	428.8	369.9	323.3	419.5	397.1	344.0	301.4
T25 - HPC Inlet Temp, °F	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
T3CRF - CDT, °F	713	687	658	724	724	688	659	721	720	685	657
T48IN, °R	1984	1924	1856	2031	2031	1943	1875	2031	2031	1942	1874
T48IN, °F	1524	1464	1397	1571	1571	1483	1416	1572	1571	1482	1414

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

GE Energy

Performance By: **Daniele Marcucci**
Project Info: **CPV Sentinel Project**

Engine: **LMS100 PA**
Deck Info: **G0179C - 87o.scp**
Generator: **BDAX 82-445ER 60Hz, 13.8kV, 0.9PF (35404)**
Fuel: **Site Gas Fuel#900-1837, 20600 Btu/lb,LHV**
Date: **05/15/2008**
Time: **1:39:06 PM**
Version: **3.7.0**

Case #	**100**	**101**	**102**	**103**	**104**	**105**	**106**	**107**	**108**	**109**	**110**
Exhaust Parameters											
Temperature, °F	742.6	743.7	761.6	785.1	791.0	770.2	785.6	798.9	812.6	790.8	804.9
lb/sec	473.5	399.6	316.2	455.9	445.9	382.3	303.6	433.6	412.4	355.0	283.4
lb/hr	1704762	1438475	1138319	1641406	1605189	1376241	1092909	1561119	1484727	1278007	1020221
Energy, Btu/s- Ref 0 °R	146365	123005	98361	147293	144535	120934	96786	141887	136292	114421	91952
Cp, Btu/lb-R	0.2729	0.2714	0.2703	0.2767	0.2764	0.2735	0.2724	0.2775	0.2775	0.2746	0.2734
Emissions (NOT FOR USE IN ENVIRONMENTAL PERMITS)											
NOx ppmvd Ref 15% O2	25	25	25	25	25	25	25	25	25	25	25
NOx as NO2, lb/hr	79	63	46	80	78	61	45	76	72	57	42
CO ppmvd Ref 15% O2	155	155	137	126	133	132	113	117	122	118	99
CO, lb/hr	299.01	236.60	153.30	245.34	252.72	195.64	123.76	215.76	213.45	162.83	100.47
CO2, lb/hr	102637.70	81056.25	59580.86	103154.90	100862.70	79119.49	58235.85	97992.56	93140.53	73338.89	54256.38
HC ppmvd Ref 15% O2	8	8	6	6	6	6	5	5	5	5	4
HC, lb/hr	8.49	6.73	4.06	6.17	6.58	5.05	2.85	5.12	5.22	3.89	2.02
SOX as SO2, lb/hr	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Maximum Emissions											
NOx ppmvd Ref 15% O2	**25.00**	**25.00**	**25.00**	**25.00**	**25.00**	**25.00**	**25.00**	**25.00**	**25.00**	**25.00**	**25.00**
NOx as NO2, lb/hr	**79.270**	**62.54**	**45.89**	**79.68**	**77.92**	**61.03**	**44.85**	**75.69**	**71.93**	**56.56**	**41.77**
CO ppmvd Ref 15% O2	**110.60**	**110.60**	**110.60**	**92.40**	**77.70**	**77.70**	**77.70**	**73.30**	**68.30**	**68.30**	**68.30**
CO, lb/hr	**213.45**	**168.39**	**123.57**	**179.23**	**147.39**	**115.45**	**84.83**	**135.04**	**119.61**	**94.04**	**69.45**
HC ppmvd Ref 15% O2	**23.20**	**23.30**	**19.20**	**16.80**	**18.30**	**17.90**	**13.80**	**14.60**	**15.70**	**14.90**	**10.50**
HC, lb/hr	**25.57**	**20.26**	**12.24**	**18.58**	**19.82**	**15.22**	**8.59**	**15.41**	**15.73**	**11.72**	**6.09**
VOC ppmvd Ref 15% O2	**4.60**	**4.70**	**3.80**	**3.40**	**3.70**	**3.60**	**2.80**	**2.90**	**3.10**	**3.00**	**2.10**
VOC, lb/hr	**5.11**	**4.05**	**2.45**	**3.72**	**3.96**	**3.04**	**1.72**	**3.08**	**3.15**	**2.34**	**1.22**
PM10, lb/hr	**5.00**	**5.00**	**5.00**	**5.00**	**5.00**	**5.00**	**5.00**	**5.00**	**5.00**	**5.00**	**5.00**
Exh Wght % Wet (NOT FOR USE IN ENVIRONMENTAL PERMITS)											
AR	1.2309	1.2368	1.2430	1.2207	1.2233	1.2310	1.2374	1.2191	1.2217	1.2292	1.2355
N2	72.1947	72.5352	72.8988	71.5984	71.7512	72.1985	72.5704	71.5046	71.6562	72.0954	72.4585
O2	13.5620	14.2193	14.9082	13.0063	13.0533	13.9566	14.6761	12.9900	13.0411	13.9423	14.6590
CO2	6.0206	5.6349	5.2341	6.2845	6.2835	5.7490	5.3285	6.2771	6.2732	5.7385	5.3181
H20	6.9705	6.3539	5.6993	7.8714	7.6691	6.8473	6.1733	7.9917	7.7897	6.9784	6.3160
SO2	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
CO	0.0175	0.0164	0.0135	0.0149	0.0157	0.0142	0.0113	0.0138	0.0144	0.0127	0.0098
HC	0.0005	0.0005	0.0004	0.0004	0.0004	0.0004	0.0003	0.0003	0.0004	0.0003	0.0002
NOX	0.0032	0.0030	0.0028	0.0033	0.0033	0.0030	0.0028	0.0033	0.0033	0.0030	0.0028
Exh Mole % Dry (NOT FOR USE IN ENVIRONMENTAL PERMITS)											
AR	0.9722	0.9695	0.9667	0.9743	0.9742	0.9704	0.9674	0.9743	0.9742	0.9704	0.9674
N2	81.3140	81.0828	80.8452	81.4911	81.4832	81.1604	80.9097	81.4912	81.4816	81.1587	80.9080
O2	13.3732	13.9158	14.4748	12.9602	12.9782	13.7357	14.3253	12.9610	12.9829	13.7409	14.3304
CO2	4.3165	4.0096	3.6950	4.5532	4.5423	4.1138	3.7817	4.5537	4.5408	4.1121	3.7800
H20	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
SO2	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
CO	0.0198	0.0184	0.0149	0.0170	0.0179	0.0160	0.0126	0.0158	0.0164	0.0143	0.0110
HC	0.0010	0.0009	0.0007	0.0008	0.0008	0.0007	0.0005	0.0007	0.0007	0.0006	0.0004
NOX	0.0032	0.0030	0.0027	0.0034	0.0034	0.0030	0.0028	0.0034	0.0034	0.0030	0.0028

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

GE Energy

Performance By: **Daniele Marcucci**
Project Info: **CPV Sentinel Project**

Engine: **LMS100 PA**
Deck Info: **G0179C - 87o.scp**
Generator: **BDAX 82-445ER 60Hz, 13.8kV, 0.9PF (35404)**
Fuel: **Site Gas Fuel#900-1837, 20600 Btu/lb,LHV**

Date: **05/15/2008**
Time: **1:39:06 PM**
Version: **3.7.0**

Case #	**100**	**101**	**102**	**103**	**104**	**105**	**106**	**107**	**108**	**109**	**110**
Exh Mole % Wet (NOT FOR USE IN ENVIRONMENTAL PERMITS)											
AR	0.8665	0.8731	0.8802	0.8552	0.8580	0.8667	0.8739	0.8535	0.8563	0.8648	0.8718
N2	72.4669	73.0180	73.6103	71.5264	71.7640	72.4844	73.0873	71.3814	71.6170	72.3237	72.9118
O2	11.9182	12.5317	13.1794	11.3755	11.4301	12.2673	12.9403	11.3530	11.4112	12.2450	12.9141
CO2	3.8469	3.6108	3.3643	3.9964	4.0005	3.6740	3.4160	3.9888	3.9911	3.6644	3.4064
H20	10.8802	9.9464	8.9491	12.2279	11.9279	10.6899	9.6680	12.4060	12.1066	10.8861	9.8831
SO2	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
CO	0.0176	0.0166	0.0136	0.0149	0.0157	0.0143	0.0114	0.0138	0.0144	0.0128	0.0099
HC	0.0009	0.0008	0.0006	0.0007	0.0007	0.0006	0.0005	0.0006	0.0006	0.0005	0.0004
NOX	0.0028	0.0027	0.0025	0.0030	0.0030	0.0027	0.0025	0.0029	0.0029	0.0027	0.0025
O2 Correction Factor	0.7853	0.8459	0.9189	0.7447	0.7464	0.8248	0.8982	0.7448	0.7468	0.8253	0.8988
Exhaust Molecular Weight	28.120	28.201	28.288	27.986	28.019	28.125	28.214	27.966	27.999	28.103	28.189
Stack Emissions (after SCR/oxcat)											
NOx ppmvd Ref 15% O2	**2.5**	**2.5**	**2.5**	**2.5**	**2.5**	**2.5**	**2.5**	**2.5**	**2.5**	**2.5**	**2.5**
CO ppmvd Ref 15% O2	**4.0**	**4.0**	**4.0**	**4.0**	**4.0**	**4.0**	**4.0**	**4.0**	**4.0**	**4.0**	**4.0**
VOC ppmvd Ref 15% O2	**2.0**	**2.0**	**2.0**	**2.0**	**2.0**	**2.0**	**2.0**	**2.0**	**2.0**	**2.0**	**2.0**
NH3 ppmvd Ref 15% O2	**5.0**	**5.0**	**5.0**	**5.0**	**5.0**	**5.0**	**5.0**	**5.0**	**5.0**	**5.0**	**5.0**
NOx as NO2, lb/hr	**7.913**	**6.246**	**4.586**	**7.951**	**7.775**	**6.094**	**4.481**	**7.551**	**7.178**	**5.647**	**4.173**
CO, lb/hr	**7.709**	**6.084**	**4.468**	**7.745**	**7.574**	**5.937**	**4.365**	**7.356**	**6.992**	**5.501**	**4.065**
VOC, lb/hr	**2.208**	**1.742**	**1.279**	**2.218**	**2.169**	**1.700**	**1.250**	**2.107**	**2.002**	**1.575**	**1.164**
NH3, lb/hr	**5.858**	**4.624**	**3.395**	**5.886**	**5.756**	**4.512**	**3.317**	**5.590**	**5.314**	**4.181**	**3.090**
SOX, lb/hr (based on 0.25 gr/SCF)	**0.623**	**0.492**	**0.361**	**0.626**	**0.612**	**0.480**	**0.353**	**0.594**	**0.565**	**0.444**	**0.328**
PM10, lb/hr	**5.000**	**5.000**	**5.000**	**5.000**	**5.000**	**5.000**	**5.000**	**5.000**	**5.000**	**5.000**	**5.000**

Aero Energy Fuel Number	**900-1837 (CPV Sentinel 150)**	
	Volume %	**Weight %**
Hydrogen	0.0000	0.0000
Methane	95.9992	91.2962
Ethane	1.7359	3.0943
Ethylene	0.0000	0.0000
Propane	0.3325	0.8692
Propylene	0.0000	0.0000
Butane	0.1224	0.4217
Butylene	0.0000	0.0000
Butadiene	0.0000	0.0000
Pentane	0.0343	0.1467
Cyclopentane	0.0000	0.0000
Hexane	0.0258	0.1318
Heptane	0.0000	0.0000
Carbon Monoxide	0.0000	0.0000
Carbon Dioxide	1.1961	3.1207
Nitrogen	0.5537	0.9195
Water Vapor	0.0000	0.0000
Oxygen	0.0000	0.0000
Hydrogen Sulfide	0.0000	0.0000
Ammonia	0.0000	0.0000

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

GE Energy

Performance By: **Daniele Marcucci**
Project Info: **CPV Sentinel Project**

Engine: **LMS100 PA**
Deck Info: **G0179C - 87o.scp**
Generator: **BDAX 82-445ER 60Hz, 13.8kV, 0.9PF (35404)**
Fuel: **Site Gas Fuel#900-1837, 20600 Btu/lb,LHV**

Date: **05/15/2008**
Time: **1:39:06 PM**
Version: **3.7.0**

Case #	**100**	**101**	**102**	**103**	**104**	**105**	**106**	**107**	**108**	**109**	**110**
Btu/lb, LHV	20600										
Btu/scf, LHV	918										
Btu/scf, HHV	1018										
Btu/lb, HHV	22838										
Fuel Temp, °F	150.0										
NOx Scalar	1.010										
Specific Gravity	0.58										
Engine Exhaust											
Exhaust Avg. Mol. Wt., Wet Basis	28.1	28.2	28.3	28.0	28.0	28.1	28.2	28.0	28.0	28.1	28.2
Exhaust Flow, ACFM	894504	753259	603127	895913	879274	738571	591977	862163	827947	697845	561667
Exhaust Flow, SCFM	367501	309207	243935	355534	347278	296624	234817	338387	321449	275669	219389
Exhaust Flow, Btu/lb	309	308	311	323	324	316	319	327	330	322	324
Exhaust Flow, Calories/s	36884055	30997382	24786986	37117903	36422789	30475394	24390035	35755485	34345549	28834163	23171811
Inlet Flow Wet, pps	456.1	401.7	351.9	439.0	429.0	370.1	323.4	419.7	397.3	344.1	301.6
Inlet Flow Dry, pps	455.2	401.1	351.4	434.7	426.0	367.6	321.2	412.8	393.5	340.8	298.7
Shaft HP	139415	104838	70313	137704	133421	100351	67325	128789	119974	90274	60621

Transient Emissions Summary

LMS100 PA Estimated Startup / Shutdown Emissions at Package Exit

T2 (°F / °C)		CO (lb)*	NOx (lb)*	VOC (lb)*	PM10 (lb)*
-30 / -34.4	Start	15	5	3	11
	Shutdown	59	6	3	11
59 / 15	Start	13	5	3	11
	Shutdown	35	6	3	11
78 / 25.5	Start	13	5	3	11
	Shutdown	29	6	3	11
90 / 32.2	Start	13	5	3	11
	Shutdown	29	6	3	11

* Margined average engine emissions - NOT A GUARANTEE

Assumptions: Natural gas, sea level, 4"/6" losses, water injection to 25 PPM NOx @ 15% O2

May 22, 2006

Notes: The table shown above was provided by GE (and confirmed on 4/27/07).
Based on the table, the cold start CO used is 14 lb.
All other startup values at all other ambients are a constant.
PM10 emissions are limited to 5 pounds per hour, not 11 as presented in the table.

Complete Start (Ignition to full compliance)		CO lb	NOx lb	VOC lb	PM10 lb	Fuel MMBtu	SO2** lb
Cold Day(17°F)	Initial 10 minutes	14.0	5.0	3.0	0.8	26.0	0.02
	Final 15 minutes *	2.9	19.8	1.3	1.3	197.5	0.15
	Total	16.9	24.8	4.3	2.1	223.5	0.17
Avg Day(72°F)	Initial 10 minutes	13.0	5.0	3.0	0.8	26.0	0.02
	Final 15 minutes *	2.9	19.9	1.0	1.3	197.4	0.15
	Total	15.9	24.9	4.0	2.1	223.4	0.17
Hot Day(107°F)	Initial 10 minutes	13.0	5.0	3.0	0.8	26.0	0.02
	Final 15 minutes *	2.7	18.9	0.8	1.3	187.5	0.15
	Total	15.7	23.9	3.8	2.1	213.5	0.17

Notes: * Oxidation catalyst expected to be fully effective at end of GE 10 minute start interval.
Other emissions during start-up and all emissions during transient assumed to be unabated.

Turbine Operating Scenarios

Case	100	101	102	103	104	105	106	107	108	109	110
Ambient Temperature (°F)	17	17	17	72	72	72	72	107	107	107	107
Stack Diameter (ft)	13.5	14.5	15.5	16.5	17.5	18.5	19.5	20.5	21.5	22.5	23.5
Exhaust Flow (lb/hr)	1704762	1438475	1138319	1641406	1605189	1376241	1092909	1561119	1484727	1278007	1020221
CTG Load Level	**100**	**75**	**50**	**EVAP-100**	**100**	**75**	**50**	**EVAP-100**	**100**	**75**	**50**
Evap. Cooler	NONE	NONE	NONE	EVAP	NONE	NONE	NONE	EVAP	NONE	NONE	NONE

Data from Vendor Area = 143.14 ft^2

Expected Operation of Each Gas Turbine - Normal Operation

(Reference: CPV Sentinel Project 5/15/08 GE LMS100 PA Turbine/Site Specific (1080.0 ft elev) Information)

Heat Consumed (MMBTU/hr) - LHV	800.5	631.8	463.8	804.1	786.4	616.4	453.1	763.6	725.9	571.1	422.0
Turbine Outlet Temperature (°F)	742.6	743.7	761.6	785.1	791.0	770.2	785.6	798.9	812.6	790.8	804.9
Turbine Outlet Temperature (°K)	667.9	668.5	678.5	691.5	694.8	683.3	691.8	699.2	706.8	694.7	702.5
Exhaust Flow (acfm)	862625	728547	585102	859926	844938	712377	572801	826931	795027	672609	542992
Stack Exit Velocity, ft/m	6026.5	5089.8	4087.7	6007.6	5902.9	4976.8	4001.7	5777.1	5554.2	4699.0	3793.5
Stack Exit Velocity, m/s	30.61	25.86	20.77	30.52	29.99	25.28	20.33	29.35	28.22	23.87	19.27
Nitrogen, % Vol	72.47	73.02	73.61	71.53	71.76	72.48	73.09	71.38	71.62	72.32	72.91
Oxygen, % Vol	11.92	12.53	13.18	11.38	11.43	12.27	12.94	11.35	11.41	12.25	12.91
Carbon Dioxide, % Vol	3.85	3.61	3.36	4.00	4.00	3.67	3.42	3.99	3.99	3.66	3.41
Argon, % Vol	0.87	0.87	0.88	0.86	0.86	0.87	0.87	0.85	0.86	0.86	0.87
Water Vapor, % Vol	10.88	9.95	8.95	12.23	11.93	10.69	9.67	12.41	12.11	10.89	9.88
Molecular Weight	28.12	28.20	28.29	27.99	28.02	28.13	28.21	27.97	28.00	28.10	28.19

Data from Vendor

Average Emission Rates from Each Gas Turbine (lbs/hr) - Normal Operations

NO_X at 25 ppmvd pre-BACT level	79.27	62.54	45.89	79.68	77.92	61.03	44.85	75.69	71.93	56.56	41.77
NO_X at 2.5 ppmvd BACT level	7.913	6.246	4.586	7.951	7.775	6.094	4.481	7.551	7.178	5.647	4.173
CO at pre BACT level	213.45	168.39	123.57	179.23	147.39	115.45	84.83	135.04	119.61	94.04	69.45
CO at 4.0 ppmvd BACT level	7.71	6.08	4.47	7.75	7.57	5.94	4.37	7.36	6.99	5.50	4.07
UHC at pre-BACT level	25.57	20.26	12.24	18.58	19.82	15.22	8.59	15.41	15.73	11.72	6.09
VOC at 2.0 ppmvd BACT level	2.21	1.74	1.28	2.22	2.17	1.70	1.25	2.11	2.00	1.58	1.16
SO_2 short-term rate	2.481	1.958	1.437	2.492	2.437	1.910	1.404	2.366	2.249	1.770	1.308
SO_2 long-term rate	0.620	0.489	0.359	0.623	0.609	0.478	0.351	0.592	0.562	0.442	0.327
PM_{10}	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00
NH_3 at 5 ppmvd BACT level	5.86	4.62	3.40	5.89	5.76	4.51	3.32	5.59	5.31	4.18	3.09

Sulfur content in fuel basis for above: 1 grain total S/100 scf short-term
0.25 grain total S/100 scf long-term

Data from Vendor Higher sulfur content of 1 gr/100 dscf should be used for averaging times of 1 to 24 hours

Startup / Shutdown Emissions from Turbine

Startup

duration in minutes	10	15	25	35		
	Startup	SCR Warmup	Total Startup	Normal	1 hour With Start up and Normal Operation	Emissions if starting up for an entire hour
	Emissions	Emissions	Emissions	Emissions		
	lb/event	**lb/event**	**lb/event**	lb/hour	lb/hour	lb/hour
NO_X	5.00	19.86	24.86	7.95	29.49	59.65
CO	14.00	2.89	16.89	7.75	21.41	40.55
VOC	3.00	1.26	4.26	2.22	5.55	10.21
SO_2	0.02	0.15	0.17	2.49	1.63	0.42
PM_{10}	0.83	1.25	2.08	5.00	5.00	5.00

Assumptions:

Startup Emissions for CO, NO_2, PM_{10}, and VOC integrated from data provided by GE.

Startup emissions are highest of three temperatures, all for cold day 17 degrees F.

SO_2 emissions assume complete conversion of all sulfur to SO_2.

Normal emissions are highest of five operating cases listed above (case 103).

Shutdown

duration in minutes	10.3	49.7		1 hour of
	Shutdown	Normal	Total Shutdown	Shutdown
	Emissions	Emissions	Emissions	Emissions
	lb/event	lb/hour	lb/hr	lb/hour
NO_X	6.00	7.95	12.59	34.95
CO	35.00	7.75	41.42	203.88
VOC	3.00	2.22	4.84	17.48
SO_2	0.02	2.49	2.08	0.12
PM_{10}	0.86	5.00	5.00	5.00

Assumptions:

Shutdown Emissions for CO, NO_2, PM_{10}, and VOC integrated from data provided by GE.

SO_2 emissions assume complete conversion of all sulfur to SO_2.

Normal emissions are highest of five operating cases listed above (case 103).

Worst-Case 1-Hour Normal Operations Emissions per Turbine

Worst-Case (non-commissioning) 1-Hour Emissions are the maximum of an hour with 1 startup & normal operations; an hour with 1 shutdown and normal operations; or normal operations.

Comparison of normal, startup and shutdown emissions presented below.

Emissions per turbine	Worst-case Total	Startup /Warmup	Shutdown	Normal Operations	Total	Startup /Warmup	Shutdown	Normal Operations	Worst-case Total
	lb/hr				Total lbs				g/s
NO_2	29.49	29.49	12.59	7.95	7.95			7.95	3.72
CO	41.42	21.41	41.42	7.75	7.75			7.75	5.22
VOC	5.55	5.55	4.84	2.22	2.22			2.22	0.70
SO_2	2.49	1.63	2.08	2.49	2.49			2.49	0.31
PM_{10}	5.00	5.00	5.00	5.00	5.00			5.00	0.63

Worst-Case 3 Hour Emission Rate per Turbine

Only SO_2 is considered for an average 3-hour Ambient Air Quality Standard.

Worst-case 3-Hour Scenario are equal to 3 hours at normal rate.

Emissions per turbine	Worst-case Total	Startup /Warmup	Shutdown	Normal Operations	Total	Startup /Warmup	Shutdown	Normal Operations	Worst-case Total
	lb/hr				Total lbs				g/s
Total Hours of Operation	3			3				3	
SO_2	2.49			2.49	7.48			7.48	0.31

Worst-Case 8-Hour Normal Operations Emission Rates

Only CO is considered for an average 8-hour Ambient Air Quality Standard.

8-Hour Normal Operations Scenario includes 1 Startups, 1 Shutdown, and remaining time at Normal rate.

Emissions per turbine	Worst-case Total	Startup /Warmup	Shutdown	Normal Operations	Worst-case Total	Startup /Warmup	Shutdown	Commissioning	Normal Operations	Worst-case Total
	lb/hr				Total lbs					g/s
Total Hours of Operation	8	0.42	0.172	7.41		0.42	0.17		7.41	
CO	13.66	40.55	203.88	7.75	109.30	16.89	35.00		57.40	1.72

Worst-Case 24 Hour Emission Rate

Only SO_2 and PM_{10} are considered for an average 24-hour Ambient Air Quality Standard.

Worst-case 24-hour scenario for SO_2 amd PM10 uses normal operations.

Emissions per turbine	Worst-case Total	Startup /Warmup	Shutdown	Normal Operations	Total	Startup /Warmup	Shutdown	Normal Operations	Worst-case Total
	lb/hr				Total lbs				g/s
Total Hours of Operation	24	0.83	0.34	22.82		0.83	0.34	22.82	
NO_X	10.13	59.65	34.95	7.95	243.17	49.71	12.00	181.46	1.28
CO	11.69	40.55	203.88	7.75	280.56	33.79	70.00	176.77	1.47
VOC	2.71	10.21	17.48	2.22	65.13	8.51	6.00	50.62	0.34
SO_2	2.49			2.49	59.80			59.80	0.31
PM_{10}	5.00			5.00	120.00			120.00	0.63

Average Annual Emissions

Average Operation lb/hr Emission Rates presented below for normal operations are based on normal operation scenario (max emissions) for 2,628 total operating hours, plus 300 startup/warmup events and 300 shutdown events.

Emissions per turbine	Worst-case Total	Startup /Warmup	Shutdown	Normal Operations	Total	Startup /Warmup	Shutdown	Normal Operations	Worst-case Total
	lb/hr				Total lbs				g/s
Total Hours of Operation	2805	125.00	51.50	2628	2804.50				
Number per Scenario		300	300						
Duration of Event (min)		25	10.3	60					
NO_X	3.44	59.65	34.95	7.95	30150.70	7456.5	1800.0	20894.2	0.43
CO	4.10	40.55	203.88	7.75	35922.84	5068.5	10500.0	20354.4	0.52
VOC	0.91	10.21	17.48	2.22	8005.48	1276.5	900.0	5829.0	0.12
SO_2	0.19	0.42	0.12	0.62	1695.32	52.1	6.1	1637.1	0.02
PM_{10}	1.60	5.00	5.00	5.00	14022.50	625.0	257.5	13140.0	0.20

Note: Worst-case lb/hr is the total emissions (lbs) over 8,760 hours/year

1-Hour Normal Emission Scenario (no startups or shutdowns) for Sentinel

Only NO_2, CO and SO_2 are considered for the 1-hour Ambient Air Quality Standard.

Normal 1-Hour Scenario for NO_2 and CO includes turbines operating at highest normal operating rate.

Fire Pump operates 1 hour per week.

Emissions per turbine	lb/hr	g/s
NO_2	7.95	1.00
CO	7.75	0.98
SO_2	2.49	0.31
Emissions from Fire Pump		
NO_2	1.35	0.17
CO	0.32	0.04
SO_2	0.002	3.09E-04

1-Hour Emission Scenario (including startups and/or shutdowns) for Sentinel

Only NO_2, CO and SO_2 are considered for the 1-hour Ambient Air Quality Standard.

1-Hour Scenario for NO_2 , CO uses turbines operating with 1 startup or shutdown and remaining time at highest normal operating rate.

Fire Pump operates 1 hour per week.

Emissions per turbine	lb/hr	g/s
NO_2	29.49	3.72
CO	41.42	5.22
SO_2	2.49	0.31
Emissions from Fire Pump		
NO_2	1.35	0.17
CO	0.32	0.04
SO_2	0.002	3.09E-04

3 Hour Emissions Scenarios for Sentinel

Only SO_2 is considered for an average 3-hour Ambient Air Quality Standard.

The worst-case 3-hour emission rate is the max SO_2 rate for 100% load, normal operating case (72°F; with Evap. Cooler On).

Fire Pump operates 1 hour per week.

Emissions per turbine	lb/hr	g/s
SO_2	2.49	0.31
Emissions from Fire Pump		
SO_2	0.002	3.09E-04

8-Hour Normal Emissions Scenarios for Sentinel

Only CO is considered for an average 8-hour Ambient Air Quality Standard.

Worst-case 8-Hour Normal Scenario includes 1 Startups, 1 Shutdowns, and remaining time at normal rate.

Fire Pump operates 1 hour per week.

Emissions per turbine	lb/hr	g/s
CO	13.66	1.72
Emissions from Fire Pump		
CO	0.32	3.98E-02

24-Hour Emissions Scenarios for Sentinel

Only SO_2 and PM_{10} are considered for an average 24-hour Ambient Air Quality Standard.
Worst-case 24-hour scenario for SO_2 amd PM10 uses normal operations.
Fire Pump operates 50 hours per year.

Emissions per turbine	**lb/hr**	**g/s**
NO_2	10.13	1.28
CO	11.69	1.47
VOC	2.71	0.34
SO_2	2.49	0.31
PM_{10}	5.00	0.63
Emissions from Cooling Tower per Cell (8)	**lb/hr**	**g/s**
PM_{10}	0.065	0.008
Emissions from Fire Pump		
SO_2	1.02E-04	1.29E-05
PM_{10}	1.74E-03	2.19E-04

Average Annual Emissions for Sentinel

Average Operation Emission Rates are based on the annual operation scenarios for 2,628 hours plus 300 startup/warmup events and 300 shutdown events.
Fire Pump operates 50 hours per year. Cooling tower operates 2,628 hours per year.
Annual SO_2 assumes 0.25 grains S/scf of natural gas.

Emissions per turbine	**lb/hr**	**g/s**
NO_X	3.44	0.43
CO	4.10	0.52
VOC	0.91	0.12
SO_2	0.19	0.02
PM_{10}	1.60	0.202
Emissions from Cooling Tower per Cell		
PM_{10}	0.021	2.63E-03
Emissions from Fire Pump		
NO_2	7.73E-03	9.74E-04
CO	1.80E-03	2.27E-04
VOC	2.02E-04	2.55E-05
SO_2	1.40E-05	1.76E-06
PM_{10}	2.39E-04	3.01E-05

Note: Worst-case annual lb/hr is the total emissions (lbs) over 8,760 hours/year

Cooling Tower Drift Calculation

8 1-cell towers

Cooling Tower

design circulating water rate		55,200	gallons/min	(total flow for all towers)	
cycles of concentration		6.8			
TDS		555	mg/liter	(555 ppm)	
		4.63	lb/1000 gallons		
Drift Eliminator Control		0.000005		BACT=0.0005%	
Operating hours per year		2805			
Number of cooling towers/cells		8			
Drift PM emissions	total	0.52	lb/hr	0.065 lb/hr	per cell
		1462.6	lb/yr	182.820 lb/yr	per cell
		0.73	**tpy**		

Emissions from Emergency Diesel Firewater Pump

Rated Horsepower	**240**	**BHP**	
Testing duration	**60**	**min/week**	
Yearly testing	**52**	**week/year**	
Expected non-emergency usage	**50**	**hr/yr**	
Diesel Fired	Emission Factor	Emission Rate per Testing	Yearly Emission Rate
	g/HP/Hr	lb/hr	lb/yr
NO_X[1]	2.56	1.35	67.73
CO	0.597	0.32	15.79
VOC (Total Hydrocarbons)[1]	0.07	0.04	1.77
SO_X		0.002	0.12
PM_{10}	0.079	0.042	2.09

Note: SO_2 emission factor based on 15 ppm sulfur in the diesel

Engine parameters

Exhaust Flow Rate (acfm)	991	
Exhaust Temp (degrees F)	723	
Stack Diameter (feet)	0.373	
Stack height (feet)	50	(12 ft building + 38 ft stack)
fuel usage (gph)	11.5	
diesel density (lb/gal)	7.1	

Sulfur content 15 ppm in fuel

Data from Vendor for a Clarke model JU6H-UFADTO Tier 3 engine

APPENDIX B
REVISED COMMISSIONING EMISSIONS

Sentinel Commissioning Emissions

Description	Power Level	Operating Hours	Estimated Fuel Rate	Total Estimated Emission per Event)					Exhaust Temperature	Exhaust Temperature	Exhaust Flow	Exhaust Flow
				NOX	CO	VOC	PM10	SOX				
			(MMBtu/hr)	(lbs)	(lbs)	(lbs)	(lbs)	(lbs)	(deg F)	(deg K)	(lb/sec)	(lb/hr)
* First fire the unit & then shutdown to check for leaks, etc.												
	Core/Sync Idle	23.1	73.5	256.7	1048.6	26.7	138.5	1.2	859	732.6	82	295,200
* Synch & Check E-stop												
	Sync Idle	17.3	73.5	191.8	786.1	20.0	103.8	0.9	859	732.6	82	295,200
* Additional AVR Commissioning												
	0.05	17.3	92.8	362.0	523.6	12.5	103.8	1.1	864	735.4	113	406,800
* Break-in Run												
	0.05	11.5	92.8	240.9	349.0	8.4	69.2	0.7	864	735.4	113	406,800
* Dynamic Commissioning of AVR & Commission Water												
Load Step 1	0.1	5.77	166	96.3	399.5	30.3	34.6	0.7	868	737.6	144	518,400
Load Step 2	0.2	5.77	246	142.2	261.1	15.0	34.6	1.0	827	714.8	195	702,000
Load Step 3	0.3	5.77	319	184.6	261.1	15.3	34.6	1.3	806	703.2	238	856,800
Load Step 4	0.4	5.77	389	225.0	230.8	15.4	34.6	1.6	785	691.5	278	1,000,800
Load Step 5	0.5	5.77	457	265.4	190.4	16.3	34.6	1.8	770	683.2	316	1,137,600
Load Step 6	0.6	5.77	525	304.3	259.6	19.5	34.6	2.1	760	677.6	351	1,263,600
Load Step 7	0.7	5.77	591	341.8	356.3	23.5	34.6	2.4	752	673.2	385	1,386,000
Load Step 8	0.8	5.77	659	382.2	503.4	29.9	34.6	2.7	752	673.2	415	1,494,000
Load Step 9	0.9	5.77	728	421.2	744.2	42.5	34.6	2.9	758	676.5	443	1,594,800
Load Step 10	1	5.77	798	463.0	1138.0	69.1	34.6	3.2	767	681.5	470	1,692,000
Subtotal		57.7		2826.1	4344.2	276.8	346.2	19.7				
* Base load AVR Commissioning												
	1	23.1	798	1850.5	4550.5	275.5	138.5	12.9	767	681.5	470	1,692,000
COMPLETE - TOTAL ESTIMATED FIRED HOURS												
		150		5728.8	11603.4	620.2	900.0	36.6				

Commissioning Emissions per Turbine per phase

Mode	hrs	NOx lb/hr	CO lb/hr	VOC lb/hr	PM10 lb/hr	SOx lb/hr
First fire	40.4	11.11	45.43	1.16	6.00	0.05
controlled break in	28.8	20.90	30.25	0.73	6.00	0.06
Dynamic AVR	57.7	48.99	75.30	4.80	6.00	0.34
Base load AVR	23.1	80.19	197.19	11.94	6.00	0.56

APPENDIX C
SCAQMD COMMISSIONING MEMORANDUM

URS Memorandum – CPV Sentinel Project

Date:	March 4, 2008
To:	Roy Olivares and Robert Wu (SCAQMD)
From:	John Lague (URS)
Information:	Mark Turner (CPV), Mike Carroll (Latham & Watkins) Julie Mitchell (URS), Dale Shileikis (URS), Kathy Rushmore (URS), John Seidler (Spectrum Energy)
Subject:	Supplemental Dispersion Modeling of New Turbine Commissioning Scenarios

Recently, Roy and I have been discussing the new emissions data for LMS100 commissioning that we received from GE after the submittal of our application. As a result of these discussions, we understood that the previous AERMOD dispersion modeling for commissioning needed to be revised to reflect the new emissions data. This memo is intended to meet that requirement. In addition, several other issues related to potential impacts during turbine commissioning have arisen in the last few weeks as a result of communications we have had from the District during its review of our application. These include:

(1) Increasing the allowable hours of commissioning for each turbine from 104 to 150 hours per year, to allow for any difficulties that may be encountered in tuning one or more of these units; and
(2) Probable compression of the construction/commissioning schedule due to delays in licensing that may make it necessary to commission more than one turbine at a time and/or to simultaneously commission some units while other previously-commissioned units are operated normally.

URS recognizes that the modeling of short-term commissioning impacts that was conducted for the PTC application did not include scenarios with one or more turbines being commissioned while one or more turbines operate normally, and that additional modeling would be necessary to determine the extent to which these concurrent activities could occur without causing exceedance of any ambient air quality standards. Accordingly, we conducted modeling for a number of different combinations. These simulations showed the following:

- Any number from one to six turbines could be operated at maximum load with two turbines simultaneously commissioning.
- Up to three turbines could be operated at maximum load with three turbines simultaneously commissioning.

The zipped file e-mailed with this memo includes input and output files for the NO_x and CO simulations corresponding to these two scenarios. Files for the scenarios that were shown not to comply with the federal and state ambient standards under all conditions

represented in the four-year meteorological input data record are not provided. Similarly, modeling for scenarios with fewer turbines operating while two or three turbines undergo commissioning are not shown, since they led to lower impacts than those shown in this memo.

In all cases, the new California one-hour NO_2 standard (338 $\mu g/m^3$ was found to be the limiting standard, i.e., scenarios that comply with this standard also comply with all other standards. As in the original application, separate modeling results are not provided for SO_2 and PM_{10} because commissioning emissions for these pollutants are lower than for normal full-load operations. Also, VOC emissions are not modeled as there are no ambient standards for this pollutant. The AERMOD option to use the ozone limiting method was used with hourly ozone monitoring data recorded at the SCAQMD Palm Springs-Fire Station monitoring station for the same 4 years as the meteorological input data.

The revised emissions and stack parameters for commissioning used in these added simulations were provided in a previous email that was sent to Roy, but are included as an Excel file accompanying this memo. In all our simulations, the commissioning turbines were assumed to be engaged in the portion of the commissioning regimen that produces the highest NO_x and CO emissions, i.e., the Base-Load AVR testing. Another convention is that the northernmost turbine (Turbine 1) will be commissioned first, then the adjacent turbine to the south (Turbine 2), then Turbine 3, and so on until the southernmost turbine is reached (Turbine 8). Thus in the modeling scenarios for combined operating and commissioning turbines, the operating turbines are always the northernmost units included in the simulations, with the commissioning units immediately to the south. Thus, the two specific scenarios for which modeling results are provided with this memo are:

- Turbines 1 through 6 operating at maximum load with Turbines 7 and 8 commissioning.
- Turbines 1 through 3 operating at maximum load with Turbines 4 and 5 commissioning.

The following table summarizes the modeling results for these scenarios. As in the modeling presented in the original permit application, we have added the highest NO_2 concentration predicted by AERMOD to the maximum background NO_2 concentration recorded during the three most recent years of available monitoring data for the Palm Springs Fire Station monitoring location. Even with these conservative assumptions, the modeling results show that no exceedances of the short-term standards would be caused by the selected scenarios for turbine commissioning.

Revised AERMOD Results for Scenarios with Multiple Turbine Commissioning/Operating									
Scenario	**Number of units in commisioning**	**Number of units Operating Normally**	**Pollutant**	**Averaging Time**	**Max Modeled Concentration (µg/m3)**	**Max Background Concentration (µg/m3)**	**Max Total Concentration (ug/m3)**	**Most Stringent Standard (ug/m3)**	**Comply?**
1	2	6	NO_2	1-hour	154.5	174.8	329.3	338	Yes
			CO	1-hour	310.9	2,645	2955.9	23,000	Yes
				8-hour	217.5	944.4	1161.9	10,000	Yes
2	3	3	NO_2	1-hour	149.5	174.8	324.3	338	Yes
			CO	1-hour	354.1	2,645	2999.1	23,000	Yes
				8-hour	249.5	944.4	1193.9	10,000	Yes