CEC No. 02-AFC-02
Salton Sea Geothermal Unit 6 Power Plant Project

Responses To:
California Energy Commission Data Requests, Set Two (Nos. 99 - 106)

Application for Certification (02-AFC-02) for Salton Sea Geothermal Unit 6 Power Plant Project

Submitted by:
CE Obsidian Energy LLC

Submitted to:
California Energy Commission
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BACKGROUND

Commissioning Emissions Estimate

Plant commissioning emissions are presented in AFC Table 5.1-22, Page 5.1-75, based on Appendix G, Table G-5. Using the information presented in Table G-5, staff was unable to verify the total (tons/period) estimated commissioning emissions for the criteria pollutants. Below is an example calculation using the values provided in Table G-5 and the estimated hours per activity.

For Ammonia:

Total (tons/period) = [PTU (lbs/period) + LP Vent Tank (lbs/hr) * 159 hrs + SP Vent Tank (lbs/hr) * 159 hrs + HP Vent Tank (lbs/hr) * 87 hrs + DWHs (lbs/hr) *167 hrs + Cooling Tower (lbs/hr) * 114 hrs + Steamblow (lbs/period)] / 2000 lbs/ton

Total NH_3 = [11470 + 17.2*159 + 68.8*159 + 700*87 + 16.5*167 + 712*114 + 5942] / 2000 = 87.95 tons/period

Table G-5 shows that the total ammonia equals 113.2 tons/period.

DATA REQUEST

99. Please provide detailed calculations to verify the total (tons/period) estimated commissioning emissions.

RESPONSE

There is a typographical error in Table G-5. It should have read 159 hours for HP Vent Tank.

The calculations are as follows:

For Ammonia:

Total (tons/period) = [PTU (lbs/period) + LP Vent Tank (lbs/hr) * 159 hrs + SP Vent Tank (lbs/hr) * 159 hrs + HP Vent Tank (lbs/hr) * 159 hrs + DWHs (lbs/hr) *167 hrs + Cooling Tower (lbs/hr) * 114 hrs + Steamblow (lbs/period)] / 2000 lbs/ton

Total NH_3 = [11470 + 17.2*159 + 68.8*159 + 700*159 + 16.5*167 + 712*114 + 5942] / 2000 = 113.2 tons/period

Emissions presented in AFC Table 5.1-22, Page 5.1-75 are correct. Table G-5 has been revised and is attached.

BACKGROUND

Well Flow Run Emissions Estimate

Well Flow Run emissions are presented in AFC Table 5.1-33, Page 5.1-81, Appendix G, Table G-14, and the basis for emissions calculations are described in Section 5.1.2.4.2 on page 5.1-19 of the AFC. Section 5.1.2.4.2 explains that re-drilling or coiled tubing cleanout of one production well and three injection wells is anticipated each year. These actions occur within the existing well bore, and are for purposes of cleaning out obstructions such as siltation or mineral deposition that restricts the well flow. Using this information, Staff was unable to verify the total (tons/year) estimated well flow run emissions for the criteria pollutants. Below is an example calculation using the values provided in Table G-14 and the estimated hours per activity.

For PM_{10}:

Total (tons/year) = [Production Single Well (lbs/hr) * 232 hrs/year + Injection Single Well (lbs/hr) * 54 hours/year * 3 wells/year] / 2000 lbs/ton

Total PM_{10} = [97*232 + 56*54*3] / 2000 = 15.79 tons/year

Table G-14 shows that the total PM_{10} equals 18.0 tons/year.

DATA REQUEST

100. Please provide detailed calculations to verify the annual emissions basis (tons/year) used for estimating well flow run emissions.

RESPONSE

There is an error in Table G-14. The total annual hours for the injection wells are 54 hours (3*18).

The calculations are as follows:

For PM_{10}:

Total (tons/year) = [Production Single Well (lbs/hr) * 232 hrs/year + Injection Wells (lbs/hr) * 54 hours/year] / 2000 lbs/ton

Total PM_{10} = [97*232 + 56*54] / 2000 = 12.7 tons/year

Well Flow Run emissions presented in AFC Table 5.1-34, Page 5.1-81, and in Appendix G, Table G-14, have been revised and are attached.

BACKGROUND

<u>Plant Startup Emissions Estimate</u>

Plant Startup emissions are presented in AFC Table 5.1-36, page 5.1-83, and Appendix G, Table G-16. Using this information, Staff was unable to verify the total (tons/period) estimated plant startup emissions for the criteria pollutants. Below is an example calculation using the values provided in Table G-16 and the estimated hours per activity as provided in the notes section of Table G-16.

For PM_{10}:

Total (tons/year) = [PTU (lbs/hr) * 45 hrs/year + 100% LP Vent Tank (lbs/hr) * 5 hrs/year * (7% of full flow) + SP Vent Tank (lbs/hr) * 5 hrs/year * (7% of full flow) + 100% of Cooling Tower (lbs/hr) * 40 hrs * (7% to 63% of full flow) + DWHs (lbs/hr) * 40 hrs * (7% to 63% of full flow)] / 2000 lbs/ton

Total NH_3 = [70.8*45 + 17.2*5*0.07 + 68.8*5*0.07 + 546*40*0.63 (assumed) + 16.54*40*(0.63 assumed)] / 2000 = 8.70 tons/period

Table G-16 shows that the total PM_{10} equals 5.15 tons/year.

The notes provided with Table G-16 state that emissions from the Cooling Towers and Dilution Water Heaters (DWH) range from 7% to 63% of the full flow. The actual percentages used in the calculation are not provided.

DATA REQUEST

101. Please provide detailed calculations to verify the annual emissions basis (tons/period) used for estimating plant startup emissions.

RESPONSE

The calculations are as follows:

For Ammonia:
Total (tons/year) = [PTU (lbs/hr) * 45 hrs/year + 100% LP Vent Tank (lbs/hr) * 5 hrs/year * (7% of full flow) + SP Vent Tank (lbs/hr) * 5 hrs/year * (7% of full flow) + 100% of Cooling Tower (lbs/hr) * 5 hrs * (2.52 times full flow) + DWHs (lbs/hr) * 5 hrs * (2.52 times full flow)] / 2000 lbs/ton

Total NH_3 = [70.8*45 + 17.2*5*0.07 + 68.8*5*0.07 + 546*5*2.52 + 16.54*5*2.52] / 2000 = 5.15 tons/period

For PM_{10}:
Total (tons/year) = [PTU (lbs/hr) * 45 hrs/year + 100% LP Vent Tank (lbs/hr) * 5 hrs/year * (7% of full flow) + SP Vent Tank (lbs/hr) * 5 hrs/year * (7% of full flow) + 100% of Cooling

Tower (lbs/hr) * 5 hrs * (2.52 times full flow) + DWHs (lbs/hr) * 5 hrs * (2.52 times full flow)] / 2000 lbs/ton

Total PM_{10} = [96.8*45 + 1.59*5*0.07 + 1.28*5*0.07 + 3.46*5*2.52 + 0.134*5*2.52] / 2000 = 2.20 tons/period

The percentages follow the facility startup schedule presented in Appendix G, Table G-5.1, the equivalent emission factor was calculated as presented below:

Well 1	5 Hours	.07 flow
Wells 1-2	5 Hours	.14 flow
Wells 1-3	5 Hours	.21 flow
Wells 1-4	5 Hours	.28 flow
Wells 1-5	5 Hours	.35 flow
Wells 1-6	5 Hours	.42 flow
Wells 1-7	5 Hours	.49 flow
Wells 1-8	5 Hours	.56 flow
Sum	5 Hours	2.52 flow

Plant startup emissions in AFC Table 5.1-36, page 5.1-83, and Appendix G, Table G-16 as presented are correct, no changes are proposed.

BACKGROUND

Air Dispersion Modeling Analyses

Staff's review of the air dispersion modeling analyses has found some inconsistencies between the modeling inputs and emission estimates. Staff also needs additional description regarding the assumptions used in the modeling analyses. For example, it appears that Cell "A", the first cell in the tower, may account for higher emissions of hydrogen sulfide than the other cells in the array. This needs clarification and explanation.

DATA REQUEST

102. Staff calculations show that the hydrogen sulfide modeling input files for operation use an emission rate that is equivalent to 7.20 tons/yr, while the AFC indicates that the annual operating hydrogen sulfide emissions are 10.75 tons/yr. Please confirm the model emission inputs and remodel the hydrogen sulfide emissions, if necessary.

RESPONSE

The modeling that was conducted for hydrogen sulfide was based on 22 emission point sources. The grams per second emission numbers used in the modeling were calculated as follows:

Total noncondensible gas H2S emissions are 0.766 lbs/hr which converts to 0.0966 grams/sec (0.766/60/60*454) or 3.36 tons per year (0.766*8760/2000). There are 18 cells ("B through "J" and "L" through "S") which emit the noncondensible gases. Each cell emits

0.00537 grams per sec (0.0966/18). This was the value used in the modeling for 18 point sources.

Total offgassing H2S emissions are 1.687 lbs/hr which converts to 0.21 grams/sec (1.687/60/60*454) or 7.4 tons per year (1.687*8760/2000). There are two cells (“A” and “K”) which emit the offgassing H2S emissions. Each cell emits 0.105 grams per sec (0.21/2). This was the value used in the modeling for 2 point sources.

Total dilution water heater H2S emissions are 0.678 lbs/hr which converts to 0.0855 grams/sec (0.678/60/60*454) or 2.97 tons per year (0.678*8760/2000). There are two dilution water heaters (“1” and “2”) which emit H2S emissions. Each dilution water heater emits 0.0428 grams per sec (0.0855/2). This was the value used in the modeling for 2 point sources.

Total operating H2S emissions modeled are 13.7 tons per year (3.36+7.4+2.97).

No changes to the modeling results are necessary. Note that modeling was based on the hourly emission files for hydrogen sulfide, refer to OH2S95.Txt, OH2S96.Txt, OH2S97.Txt, OH2S98.Txt, OH2S99.Txt.

103. The modeling files indicate that Cell “A” of the cooling towers will emit significantly more hydrogen sulfide than the other 19 cells of the cooling towers. Please provide an explanation of the hydrogen sulfide emissions partitioning within in the cooling tower.

RESPONSE

The noncondensible gases to be generated at the project are routed to the cooling towers’ 18 cells. The total hydrogen sulfide emitted from this source is 0.766 lbs/hour (0.0966 grams/sec). Hydrogen sulfide emitted from this source on a per cell basis is 0.00537 grams/sec (0.0966/18). This is the hydrogen sulfide rate used for 18 cells. At the other two cells (Cells “A” and “K”, the most northern cells), there is a different source of hydrogen sulfide that is derived from the offgassing emissions. These offgassing emissions are generated from the use of condensate in the cooling tower. The condensate is routed to the oxidixizer boxes located in Cells “A” and “K”. The condensate contains hydrogen sulfide and ammonia which can offgas at these two cells. The oxidizer boxes are essentially biofilters that control hydrogen sulfide emissions by 95 percent. A total of 1.687 lbs/hour (0.21 grams per sec) is emitted from this operation at the two cells. Thus Cells “A” and “K” each emit 0.105 grams/sec (0.21/2). The cooling tower emits on an annual basis 10.7 tons per year.

104. The applicant’s modeling analysis indicates that the construction emissions have the potential to cause exceedances of the 1-hour NO_2 standard. Please identify if the NOx-OLM modeling analysis used hourly ozone and concurrent hourly background NO_2 data, and if not please remodel with hourly ozone and concurrent hourly background NO_2 data.

RESPONSE

The 1-hour NO_2 construction modeling assessment used the ISC3OLM dispersion model with concurrent hourly ozone data. The maximum 1-hour impact was then added to the maximum monitored 1-hour background NO_2 concentration to determine the total impact. The use of hourly ozone data with concurrent meteorology follows U.S. EPA modeling guidance. While the maximum background 1-hour NO_2 concentration was added to the worst-case modeled impact to produce a total impact, it is not probable that the two concentrations would occur at the same time. Impacts from construction activities, in and of themselves, are not expected to exceed the California 1-hour standard. Combined with a conservative estimate of the background value, the California 1-hour standard is exceeded by 6.6 percent. This calculated exceedance is more of an artifact of the conservative background levels (NO_2 and ozone) used in the analysis. The station used to derived the NO_2 background level is located near the Calexico -East Port of Entry, which had an estimated 2.4 million vehicle crossings in 1999 including trucks. Gentry Road located half a mile from the project location, has an annual average daily traffic of 1350 vehicles or about 493,000 vehicles per year. McKendry has an annual average daily traffic of 53 vehicles.

Thus, the modeling assessment overestimates the total impact. To comply with your request, a FORTRAN program was written to read the hourly binary concentration files and add the hourly NO_2 concentrations. Table 1 shows maximum modeled impacts with the concurrent hourly background level. Table 2 shows the maximum combined impact. Under this review, construction emissions show impacts below the California 1 hour standard.

Table 1
MAXIMUM MODELED IMPACTS WITH CONCURRENT BACKGROUND (ug/m^3)

NOXCONST Run (Hour Ending)	**ALL Sources** 98081716	**Mobile Sources** 99101710	**Wellhead Sources** 97070403
Receptor UTMs(km)	628.483, 3670.346	627.91, 3670.24	627.10, 3670.90
Modeled Impact	268.02	209.67	243.66
Background	5.64	3.76	11.29
Total Impact	273.66	213.44	254.95

Table 2
MAXIMUM COMBINED IMPACTS WITH CONCURRENT BACKGROUND (ug/m^3)

NOXCONST Run (Hour Ending)	**ALL Sources** 99102809	**Mobile Sources** 99102809	**Wellhead Sources** 99102809
Receptor UTMs(km)	629.25, 3667.25	628.75, 3669.00	629.00, 3667.75
Modeled Impact	150.44	79.94	120.97
Background	206.91	206.91	206.91
Total Impact	357.35	286.85	327.88

Technical Area: Transmission System Engineering
CEC Author: Sudath Arachchige and Demy Bucaneg P.E.
SSU6 Author: Eddie Lutz, David Barajas, Juan-Carlos Sandoval

BACKGROUND

Staff needs a complete and coordinated interconnection study. This study should analyze the reliability impacts including the feasibility of selected mitigation measures necessary to support interconnection of the 185 MW Salton Sea Unit 6 Project (SSU6) to the Imperial Irrigation District (IID) transmission system. By considering the latest IID system configuration and utilizing the 2005 Base Case with or without Blythe Energy Project Phase II, new and fully coordinated studies are necessary to assess the system reliability impacts at the interconnection and downstream facilities due to the addition of the Salton Sea Energy Project. The System Impact Study (SIS) should be coordinated with adjacent transmission owners. The SSU6 interconnection should comply with the Utility Reliability and Planning Criteria, North American Electric Reliability Council (NERC) Planning Standards, NERC/Western Systems Coordinating Council (WSCC) Planning Standards, and California Independent System Operator (Cal-ISO) Planning Standards.

DATA REQUESTS

105. Please submit a SIS Report considering the 185 MW net output of SSU6. Include all system impacts and mitigation alternatives considered and then selected for 2005 summer peak and for 2005 off-peak.

    a. For the Western Area Power Authority (Western), IID, San Diego Gas & Electric (SDG&E) and Southern California Edison (SCE) systems, identify and list in a table format major assumptions in the base cases. Include system load, major path (East of the Colorado River, West of the Colorado River, Path 42) and line flows, imports or exports, and the amount of queue and system generation in each system.

    b. Identify the planning criteria utilized in the SIS to determine the reliability criteria violations for overload, over-voltage, system instability, and for excessive fault currents.

    c. Analyze the Western, IID, SDG&E and SCE systems for power flow impacts with and without the SSU6 under N-0 (normal condition), N-1 (single contingencies & Cal-ISO Category B contingencies) and N-2 (double contingencies & Cal-ISO Category C contingencies) conditions. In all studies consider established normal and emergency transmission line ratings according to seasons. Submit the following along with a summary of the study results:

        (1) one-line diagrams showing the study areas of Western, IID, SDG&E and SCE systems including the new switchyard and interconnection facilities for the SSU6.

(2) Where modification of switchyards, substations or switching stations are proposed or under consideration, before and after plan and profile sketches.

(3) Electronic copies of GE PSLF Power Flow base cases (*sav, *drw files) and EPCL or Autocon contingency (for N-1 & N-2) and comparison files. Also provide a hard copy of the list of contingencies evaluated.

(4) Power flow diagrams (in MVA, percentage loading and P. U. voltage) with and without SSU6 for base case normal conditions and for all overload criteria violations under N-1 and N-2 contingency conditions.

(5) Lists of all overload criteria violations in a table format showing the contingency, overloaded element, rating of the overloaded element in MVA or amperes, and the loadings of the overloaded element in MVA or amperes & percentage before and after adding SSU6 generation and their differences (incremental and decremental loading) in percentage side by side. Include all pre-project overload criteria violations.

(6) Discuss candidate mitigation measures considered to eliminate each overload criteria violation and select a mitigation measure for each criteria violation in consultation with the transmission owner and, where applicable, the Cal-ISO. Provide a letter or state in a report from the respective transmission owner and, where applicable, the Cal-ISO verifying the rationale and feasibility of the mitigation measure and implementation of the mitigation measure prior to the on-line date of the new plant.

d. Analyze the Western, IID, SDG&E and SCE systems for Transient Stability (20 second dynamic simulation required) with SSU6. Analysis should be conducted for three-phase and single line to ground faults with delayed clearing at strategic buses under critical N-1 & N-2 contingency conditions. In addition, consider a three phase five-cycle fault at the SSU6 switchyard 161(230) kV bus followed by full load rejection of the plant. Submit the following along with a summary of the study results:

(1) Hard copies of the switching files and dynamic plots.

(2) Electronic copies of the *dyd & *swt files and dynamic plots.

(3) The results in table format showing the bus name with kV faulted, type of fault (3-phase or line to ground), duration (cycles) for clearing, lines tripped, reference diagram and comments (stable, unstable or marginally stable).

(4) For stability criteria violations, discuss candidate mitigation measures and select one for each violation in consultation with the affected transmission owner and Cal-ISO if applicable. Provide revised dynamic plots and switching file showing stable condition with the selected mitigation measure. Provide a letter or state in the report from the respective transmission owner or the Cal-ISO where applicable verifying the rationale and feasibility of the mitigation measure and implementation of the selected mitigation measure prior to the on-line date of SSU6.

e. Analyze Western, IID, SDG&E and SCE systems for Short Circuit currents with and without the SSU6 at strategic buses for three-phase and single line to ground faults. Submit the following along with a summary of the results:

(1) Results in table format showing the bus name with kV faulted, type of fault (three-phase/line to ground), existing breaker size and interrupting rating (kA), fault currents (kA) before and after addition of the SSU6 and their differences (incremental fault currents) side by side.

(2) Identify the substation breakers, which would be considered overstressed for incremental fault currents due to the addition of SSU6 and would need replacement with higher capacity or other mitigation to eliminate overstressing. Provide proposed ratings of the breakers to be replaced in the table. Provide a letter or state in the report from the respective transmission owner or the Cal-ISO where applicable verifying the rationale and feasibility of implementing the selected mitigation measure before the on-line date of SSU6.

RESPONSE

Responses to transmission Data Requests are being finalized and will be forwarded shortly.

106. For any mitigation measure selected per Item 105 above that would include new interconnection facilities or new downstream facilities, or downstream facilities requiring modifications, reconductoring or any other change, provide a full description of the project with one-line diagrams, plans and profiles showing pre-project and post-project facilities. Where new or modified linear facilities are proposed outside a substation fence line, provide in consultation with the transmission owner the routes, construction methods, environmental setting, environmental impacts and recommended mitigation measures to offset any adverse environmental impacts.

RESPONSE

Responses to transmission Data Requests are being finalized and will be forwarded shortly.