

**BAY AREA AIR QUALITY MANAGEMENT DISTRICT**

*ENGINEERING DIVISION*

**Permit Evaluation and Emission Calculations**

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PROCESSING ENGINEER DENNIS T. JANG	

**Delta Energy Center, LLC; Plant #12095  
1200 Arcy Lane, Pittsburg CA 94565**

**BACKGROUND**

The Delta Energy Center, LLC (DEC) is applying for a change of permit conditions governing the sulfur content of natural gas combusted at the facility. Condition #17154, part 14 currently reads as follows:

- 14. The Gas Turbines (S-1, S-3, and S-5) and HRSG Duct Burners (S-2, S-4, and S-6) shall be fired exclusively on natural gas with a maximum sulfur content of 0.25 grain per 100 standard cubic feet. (BACT for SO<sub>2</sub> and PM<sub>10</sub>)**

This sulfur content limit is the basis of hourly, daily, and annual SO<sub>2</sub> mass emission calculations for the facility and corresponds to the annual limit of 18.42 tons per year of SO<sub>2</sub>. In addition, the sulfur limit was deemed to be BACT for SO<sub>2</sub> and PM<sub>10</sub> in the Final Determination of Compliance (FDOC) issued prior to the construction and operation of the facility. However, the sulfur content limit was not imposed as a permit condition in the FDOC that was issued on October 21, 1999. Rather, the limit was established during the initial Title V permitting process for the purpose of compliance monitoring for SO<sub>2</sub> emissions. A monthly fuel sampling and testing requirement was also established in the initial Title V operating permit.

Subsequent operation of the facility has shown that the sulfur content of the natural gas fired at the facility (supplied by PG&E and Calpine) has a total sulfur content that may occasionally exceed 0.25 gr/100 scf but is always less than 1.0 gr/100 scf. Pursuant to CPUC regulations (General Order 58, Title 7, part b), PG&E is only required to supply gas with a sulfur content of less than 5 gr/100 scf. DEC is requesting that the sulfur content limit specified in part 14 be increased to 1.0 gr/100 scf with annual SO<sub>2</sub> mass emission calculations based upon annual source test results and records of natural gas usage. DEC utilizes a blend of PG&E gas and Calpine gas. In order to capture the variations in the sulfur content of the natural gas, DEC will calculate SO<sub>2</sub> mass emissions using the current monthly sulfur content test results and gas usage records for that period. The annual SO<sub>2</sub> mass emissions will be based upon the cumulative total for the previous 12 months.

DEC is currently operating under a compliance agreement with the District that allows the facility to exceed the sulfur content limit of 0.25 gr/100 scf. Weekly sampling and testing of the natural gas combusted at the facility as required by the agreement shows that the fuel sulfur content has exceeded 0.25 gr/100 scf on six occasions (out of 36 tests) with results ranging from 0.26 to 0.45 gr/100 scf. See attached summary of fuel gas test results for further detail.

The following procedures will be implemented to address the issues outlined above.

- DEC will be required to continue monthly sampling and testing of the natural gas combusted at the facility to determine the total sulfur content of the fuel.
- Monthly SO<sub>2</sub> mass emission calculations will be based upon the most recent fuel sulfur content test results, natural gas usage records, and the assumption that 100% of the sulfur in the fuel is converted to SO<sub>2</sub>. Annual SO<sub>2</sub> mass emissions will be based upon the cumulative total of the emissions for each of the previous 12 months.

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- The hourly and daily SO<sub>2</sub> mass emission limits specified in condition #17154, parts 22(g) and 36(e), respectively, will be deleted. These limits were imposed as surrogates for the BACT standard for SO<sub>2</sub> and PM<sub>10</sub> based upon fuel sulfur content. Because the fuel sulfur content is directly monitored through monthly fuel testing, these mass emission limits are no longer required. Furthermore, the maximum annual facility SO<sub>2</sub> emissions will remain less than 40 tons per year, and thus PSD is not triggered for SO<sub>2</sub>. Therefore, short term (hourly and/or daily) mass SO<sub>2</sub> emission limits are not necessary to prevent interference with the attainment or maintenance of any applicable ambient air quality standard for SO<sub>2</sub>.
- Part 40 will be modified to reflect the deletion of the hourly and daily mass SO<sub>2</sub> emission limits and to explicitly prescribe the method for calculating facility annual mass SO<sub>2</sub> emissions and the daily mass POC and PM<sub>10</sub> emissions. Part 40 will read as follows:
  40. **To demonstrate compliance with parts 22(f), 22(g), 22(h), 36(c) through 36(d)36(e), and 37(c) through 37(e), the owner/operator shall calculate and record on a daily basis, the Precursor Organic Compound (POC) mass emissions, Fine Particulate Matter (PM<sub>10</sub>) mass emissions (including condensable particulate matter), and Sulfur Dioxide (SO<sub>2</sub>) mass emissions from each power train. The owner/operator shall use the actual Heat Input Rates calculated pursuant to part 39, actual Gas Turbine Start-up Times, actual Gas Turbine Shutdown Times, actual steam turbine cold start-up times, actual gas turbine combustor tuning times, and CEC and District-approved emission factors to calculate these emissions. For the purpose of part 37(e), the owner/operator shall calculate the annual mass SO<sub>2</sub> emissions for each power train using the results of the fuel sulfur content testing performed pursuant to part 57 of this condition and records of natural gas usage. This calculation shall assume that all of the sulfur in the fuel is converted to SO<sub>2</sub>. For the purposes of parts 36(c) and 36(d), the owner/operator shall use the results of the annual source testing performed pursuant to part 43 to calculate daily mass POC, and PM<sub>10</sub>, emissions. For the purposes of parts 22(f) and 22(h), the owner operator shall use the results of the annual source testing performed pursuant to part 43 to demonstrate compliance with the hourly mass POC and PM<sub>10</sub> emission limits. The calculated emissions shall be presented as follows:
    - (a) For each calendar day, POC, PM<sub>10</sub>, and SO<sub>2</sub> emissions shall be summarized for: each power train (Gas Turbine and its respective HRSG combined) and all six sources (S-1, S-2, S-3, S-4, S-5, and S-6) combined.
    - (b) on a daily basis, the cumulative total POC, PM<sub>10</sub>, and SO<sub>2</sub> mass emissions, for each year for all six sources (S-1, S-2, S-3, S-4, S-5, and S-6) combined.  
(Offsets, PSD, Cumulative Increase)**
- Per the applicant's request, the sulfur content limit will be increased to 1.0 gr/100 scf. Accordingly, part 14 will be modified as shown:
  14. **The Gas Turbines (S-1, S-3, and S-5) and HRSG Duct Burners (S-2, S-4, and S-6) shall be fired exclusively on natural gas with a maximum sulfur content of ~~0.25~~ 1.0 grain per 100 standard cubic feet. (BACT for SO<sub>2</sub> and PM<sub>10</sub>)**

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Although the maximum fuel sulfur content limit will increase, the maximum annual facility SO<sub>2</sub> emissions will remain below the existing the limit of 18.42 tons per year since the actual fuel sulfur content will rarely exceed 0.25 gr/100 scf.

- The original BACT determination of 0.25 grains total sulfur per 100 scf of fuel gas has been reconsidered in light of actual facility operating experience and revised to 1.0 gr/100 scf.

The following changes will also be made to the permit conditions:

- The commissioning conditions (parts 1 through 12) will be deleted since the commissioning of the facility has been completed. The corresponding entries in the part IV (Source Specific Applicable Requirements) tables and part VII (Applicable Limits and Compliance Monitoring Requirements) tables will be deleted.

#### Title V Permit Considerations:

Because the proposed permit condition changes involve a change to a BACT determination for SO<sub>2</sub> and PM<sub>10</sub>, they are considered a significant permit revision pursuant to Regulation 2-6-226.5 and therefore trigger the public notice and comment requirements of Regulation 2-6-412. A change to a BACT determination is considered to be a change to a case-by-case determination of an emission standard.

#### Monitoring Analysis:

The monitoring for annual SO<sub>2</sub> emissions will be based upon monthly fuel sulfur content testing, actual natural gas usage, and the conservative assumption that 100% of sulfur in the fuel is converted to SO<sub>2</sub>. This will adequately enforce the facility cumulative increase for SO<sub>2</sub> mass emissions. Monitoring for hourly and daily mass SO<sub>2</sub> emissions will not be required since those limits will be deleted from the permit conditions.

#### CRITERIA-POLLUTANT EMISSION SUMMARY

There will no increase in criteria pollutant emissions as a result of the proposed permit condition changes.

#### EMISSION CALCULATIONS

There will no increase in the annual facility SO<sub>2</sub> emissions since they will be calculated using the monthly sulfur content test results, actual natural gas usage records, and the conservative assumption that all sulfur in the fuel is converted to SO<sub>2</sub>. Because the fuel sulfur content will remain below 0.25 gr/100 scf for the majority of the time, the annual calculated SO<sub>2</sub> mass emissions will not exceed the annual limit of 18.42 tons per year that is based upon an average sulfur content of 0.25 gr/100 scf.

#### FACILITY CUMULATIVE INCREASE

(since April 5, 1991)

This requirement does not apply since there will be no increase in annual facility SO<sub>2</sub> or PM<sub>10</sub> emissions resulting from the proposed permit condition changes.

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### TOXIC RISK SCREENING ANALYSIS

This requirement does not apply since the proposed permit condition changes will not result in any increase in toxic air contaminant emissions.

### BACT ANALYSIS

In the original FDOC for the DEC that was issued on October 21, 1999, BACT 1 (technologically feasible/cost-effective) for SO<sub>2</sub> and PM<sub>10</sub> was determined to be the exclusive use of natural gas with a maximum total sulfur content of 0.25 gr/100 scf. This determination was based upon the assumption that the sulfur content of the natural gas supplied to Calpine by PG&E would never exceed 0.25 gr/100 scf based upon a survey of the historical sulfur content of PG&E natural gas. Subsequent operation of the DEC and fuel testing has shown that the sulfur content has exceeded 0.25 on several occasions. Because it is likely that the sulfur content will exceed 0.25 gr/100 scf in the future and because Calpine cannot control the sulfur content of the gas supplied by PG&E, it is reasonable to revise the BACT determination for SO<sub>2</sub> to 1.0 gr total sulfur per 100 scf of natural gas.

### OFFSET ANALYSIS

Because the proposed permit condition changes will not result in any increase in annual emissions, the offset provision of NSR does not apply.

### FEE SUMMARY

Source	Fee Schedule	Filing Fee	Initial Fee	Late Fee	Permit to Operate Fee	Source Sub-Total
DEC Facility	B	\$254.00	\$0.00	\$0.00	\$0.00	\$254.00
<b>Grand Total</b>						<b>\$254.00</b>
<b>Amount Paid</b>						<b>\$254.00</b>
<b>Log Number</b>						<b>J659F</b>

### STATEMENT OF COMPLIANCE

The Delta Energy Center is expected to comply with all applicable permit conditions and regulations, including the proposed permit condition changes.

This project is **categorically exempt** from District CEQA Regulation 2-1-311 pursuant to Regulation 2-1-312.11 (Permit applications for a new/modified source(s) or for process changes which will satisfy the "No Net Emission Increase" provisions of Regulation 2, Rule 2, and for which there is no possibility that the project may have any significant environmental effect in connection with any environmental media or resources other than air quality) and therefore is not subject to CEQA review.

The DEC facility is **not** located within 1000 feet of the outer boundary of a K-12 school and is therefore not subject to the public notification requirements of Regulation 2-1-412.

A Toxics Risk Screening Analysis is not required since the proposed permit condition changes will not result in the increased emission of any toxic air contaminants. TBACT does not apply to this project.

Offsets, PSD, NSPS, and NESHAPS do not apply to this project.

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PERMIT CONDITIONS

As discussed earlier, permit condition #17154 will be modified as shown:  
(for the purpose of clarity, only modified parts are shown)

- 14. The Gas Turbines (S-1, S-3, and S-5) and HRSG Duct Burners (S-2, S-4, and S-6) shall be fired exclusively on natural gas with a maximum sulfur content of ~~0.25~~ 1.0 grain per 100 standard cubic feet. (BACT for SO<sub>2</sub> and PM<sub>10</sub>)
  
- 22. The Gas Turbines (S-1, S-3, & S-5) and HRSGs (S-2, S-4, & S-6) shall comply with requirements (a) through (h) under all operating scenarios, including duct burner firing mode and steam injection power augmentation mode. Requirements (a) through (f) do not apply during a gas turbine start-up or shutdown, a steam turbine cold start-up, or a gas turbine combustor tuning period. (BACT, PSD, and Toxic Risk Management Policy)
  - (g) ~~Deleted Sulfur dioxide (SO<sub>2</sub>) mass emissions at P-1, P-2, and P-3 each shall not exceed 1.49 pounds per hour or 0.0007 lb/MM BTU of natural gas fired. (BACT)~~
  
- 36. Total combined emissions from the Gas Turbines, and HRSGs (S-1, S-2, S-3, S-4, S-5, and S-6) including emissions generated during Gas Turbine start-ups and shutdowns, steam turbine cold start-ups, and combustor tuning activities shall not exceed the following limits during any calendar day:
  - (a) 1,990.8 pounds of NO<sub>x</sub> (as NO<sub>2</sub>) per day (CEQA)
  - (b) 12,756.4 pounds of CO per day (PSD)
  - (c) 478.2 pounds of POC (as CH<sub>4</sub>) per day (CEQA)
  - (d) 648 pounds of PM<sub>10</sub> per day (PSD)
  - (e) ~~deleted 96.6 pounds of SO<sub>2</sub> per day (BACT)~~
  
- 40. To demonstrate compliance with parts 22(f), ~~22(g), 22(h), 36(c) through 36(d)~~~~36(e)~~, and 37(c) through 37(e), the owner/operator shall calculate and record on a daily basis, the Precursor Organic Compound (POC) mass emissions, Fine Particulate Matter (PM<sub>10</sub>) mass emissions (including condensable particulate matter), and Sulfur Dioxide (SO<sub>2</sub>) mass emissions from each power train. The owner/operator shall use the actual Heat Input Rates calculated pursuant to part 39, actual Gas Turbine Start-up Times, actual Gas Turbine Shutdown Times, actual steam turbine cold start-up times, actual gas turbine combustor tuning times, and CEC and District-approved emission factors to calculate these emissions. For the purpose of part 37(e), the owner/operator shall calculate the annual mass SO<sub>2</sub> emissions for each power train using the results of the fuel sulfur content testing performed pursuant to part 57 of this condition and records of natural gas usage. This calculation shall assume that all of the sulfur in the fuel is converted to SO<sub>2</sub>. For the purposes of parts 36(c) and 36(d), the owner/operator shall use the results of the annual source testing performed pursuant to part 43 to calculate daily mass POC and PM<sub>10</sub> emissions. For the purposes of parts 22(f) and 22(h), the owner operator shall use the

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**results of the annual source testing performed pursuant to part 43 to demonstrate compliance with the hourly mass POC and PM<sub>10</sub> emission limits.** The calculated emissions shall be presented as follows:

- (a) For each calendar day, POC, PM<sub>10</sub>, and SO<sub>2</sub> emissions shall be summarized for: each power train (Gas Turbine and its respective HRSG combined) and all six sources (S-1, S-2, S-3, S-4, S-5, and S-6) combined.
- (b) on a daily basis, the cumulative total POC, PM<sub>10</sub>, and SO<sub>2</sub> mass emissions, for each year for all six sources (S-1, S-2, S-3, S-4, S-5, and S-6) combined.  
(Offsets, PSD, Cumulative Increase)

**RECOMMENDATION**

Issue a **Change of Conditions Letter** for the following sources:

- S-1 Combustion Gas Turbine #1, Westinghouse 501FD; 2,003 MM BTU per hour, equipped with dry low-NO<sub>x</sub> Combustors, abated by A-1 Selective Catalytic Reduction System**
- S-2 Heat Recovery Steam Generator #1, equipped with dry low-NO<sub>x</sub> Duct Burners, 200 MM BTU per hour, abated by A-1 Selective Catalytic Reduction System**
- S-3 Combustion Gas Turbine #2, Westinghouse 501FD; 2,003 MM BTU per hour, equipped with dry low-NO<sub>x</sub> Combustors, abated by A-2 Selective Catalytic Reduction System**
- S-4 Heat Recovery Steam Generator #2, equipped with dry low-NO<sub>x</sub> Duct Burners, 200 MM BTU per hour, abated by A-2 Selective Catalytic Reduction System**
- S-5 Combustion Gas Turbine #3, Westinghouse 501FD; 2,003 MM BTU per hour, equipped with dry low-NO<sub>x</sub> Combustors, abated by A-3 Selective Catalytic Reduction System**
- S-6 Heat Recovery Steam Generator #3, equipped with dry low-NO<sub>x</sub> Duct Burners, 200 MM BTU per hour, abated by A-3 Selective Catalytic Reduction System**

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**Air Quality Engineer II**

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**Date**