ENGINEERING EVALUATION
Calpine Gilroy Cogen; Plant #11180
Application #445

BACKGROUND

Calpine Gilroy submitted an application for a minor modification to the Title V permit for their turbine in Gilroy, California. The purpose of the modification is to replace worn components in the turbine. Since the replacement will increase the maximum capacity of the turbine by 4.3%, an application is necessary. The applicant has stated that the emissions of NOx and CO will not increase, and that PM10 and HC will not increase above 10 lb/day, the District BACT trigger.

EMISSION CALCULATIONS

NOx:
Prior to the application, the turbine had the following NOx limits:

- 21.6 ppm @ 15% O2, dry, three-hr average (9-9-305 w/efficiency adjustment)
- 25 ppm @ 15% O2, dry, three-hr average (BACT, PSD)
- 95 ppm @ 15% O2, dry (NSPS, Subpart GG)

There were no hourly, daily, or annual mass emission limits.

The facility's original application--#30331--in 1985 had a BACT limit of 25 ppm NOx @ 15% O2. The emission calculations were based on 8585 hours of operation per year. The calculated emissions were 384 tons NOx per year. These emissions were fully offset at the time by Utility Offset Credits.

According to Regulation 2-2-604.2, an annual emissions increase is calculated from the "annual emission rate for which offsets have been provided." This rate is 384 tons NOx per year. The "annual emissions rate" is subject to a RACT reduction due to the adoption of Regulation 9, Rule 9, which requires an emission limit of 18 ppm @ 15% O2, adjusted for efficiency. The resulting concentration limit is 21.6 ppm @ 15% O2. The RACT reduction is therefore 15.7%, or 60.4 tons per year, resulting in an annual limit of 323.6 tons NOx per year.

The facility will be required to determine efficiency pursuant to Regulation 9-9-401 to ensure that the facility is entitled to the efficiency adjustment after the modification.

To ensure that the source does not trigger BACT due to an increase of more than 10 lb NOx/day, the source will be subject to a concentration limit reduction that is proportional to the 4.3% increase in heat input. A new daily concentration limit will be added that is 4.3% lower than the Regulation 9, Rule 9 limit. This limit will be

20.6 ppm @ 15 O2, dry, averaged over every calendar day. The lowered concentration limit will ensure that emissions of NOx do not increase by more than 10 lb/day.

A daily limit equivalent to the highest day since the effective date of the RACT rule will also be added to the permit. This limit is 1876 lb NOx per any calendar day.

CO:
The permit has a concentration limit, an annual emissions limit, and various other CO limits for special contingencies. The permit conditions for CO are adequate to ensure no increases over 10 lb/day.

PM and POC:
The permit has existing facility-wide permit conditions for these pollutants. The PM limit is 25 tons per year and the POC limit is 40 tons per year. Emissions of these pollutants have never been measured at the turbine. To ensure that emissions of these pollutants do not increase more than 10 lb per day, the facility will be required to perform a source test before and after the installation of the new components at the same fuel input to show that the increase at the turbine will be less than 10 lb per day.

Based on an increase of 35.7 mcf/hr or 857 mcf/day, and using the factors in the draft AP-42 chapter for stationary gas turbines, the expected increases are:

Total particulate:
857 mscf/day x 7.8 lb/10E6 scf = 6.68 lb/day
= 1.20 tpy

Total POC:
857 mscf /day x 2.8 lb/10E6 scf = 2.4 lb/day
= 0.43 tpy

Gilroy has stated that the increases of particulate and POC will not increase more than 10 lb/day. This statement will be verified by source testing. If the increases are below 10 lb/day, the increases are not subject to BACT. The cumulative increase will be determined after the source tests.

SO2:
The emission increase of SO2 is directly proportional to the increase in natural gas throughput. The additional throughput, assuming a heat content of 1050 btu/scf of natural gas is 35.7 mcf of natural gas per hour or 857 mcf per day.

Using the standard emission factor of 0.0006 lb SO2/mcf, the increase is 0.51 lb/day. This increase is not subject to BACT.

PLANT CUMULATIVE INCREASE

CO	None
NOx	None
Particulate	To be determined
SO2	0.09 tons
VOC	To be determined

STATEMENT OF COMPLIANCE

The facility is not subject to the requirement for Best Available Control Technology (BACT) because it does not trigger BACT on a daily or annual basis. If the facility is not able to comply with the new limits after the modification, it will be required to install BACT for the pollutants for which the triggers are exceeded.

The modification is not subject to CEQA pursuant to 2-1-312.11 because the modification satisfies the “No Net Emission Increase" provisions of District Regulation 2, Rule 2, and because 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.

TITLE V IMPACTS

This application is considered to be a minor modification of the Title V permit, therefore minor modification procedures will be used, and there will be no public notice. There will be a 45-day EPA review period.

PERMIT CONDITIONS

Following are the permit conditions as amended. The proposed Title V permit shows the conditions in strikeout/underline format:

Calpine Gilroy Cogen, L. P.
Facility #B1180
PERMIT CONDITION #2780 (amended August 29, 1987, June 27, 1989, September 13, 1990 [APPLICATION NO. 5140], May, 1998 [Application #25841], December, 1998 [Application #18872], and January, 2000 [Application #455])

1a. Except as provided in condition 7, the oxides of nitrogen (NOx) concentration in the gas turbine exhaust shall not exceed 25 ppmdv at 15% oxygen averaged over any three-hour period whether firing natural gas or fuel oil. (BACT, PSD)

1b. The limit in part 1a shall not apply during cold start-up, which is not to exceed four hours, or shut-down procedure, which is not to exceed two hours. However, for daily start-ups after a shut-down of twelve (12) hours or less, the start-up period shall be limited to one (1) hour. (BACT)

1c. During any mode of operation, the owner or operator shall inject steam for NOx control at the turbine when steam of specified pressure and temperature is available. (BACT, PSD)

1d. The oxides of nitrogen (NOx) concentration in the gas turbine exhaust shall not exceed 21.6 ppmdv at 15% oxygen averaged over any three-hour period whether firing natural gas or fuel oil, excluding periods of startup or shutdown pursuant to Regulation 9-9-114 or periods of inspection and maintenance pursuant to Regulation 9-9-113. (9-9-113, 9-9-114, 9-9-305, 9-9-401)

1e. Effective after startup of the modification proposed in Application #445, the oxides of nitrogen (NOx) concentration in the gas turbine exhaust shall not exceed 20.6 ppmdv at 15% oxygen averaged over any calendar day whether firing natural gas or fuel oil, excluding periods of startup or shutdown pursuant to Regulation 9-9-114 or periods of inspection and maintenance pursuant to Regulation 9-9-113. (2-2-604, 9-9-113, 9-9-114, 9-9-305, 9-9-401)

1f. Mass emissions of NOx at S1, Gas Turbine, shall not exceed 323.7 tons per any consecutive twelve months. The permit holder shall install current Best Available Control Technology if this limit is exceeded or if the permit holder applies for a limit exceeding this limit. (BACT, 9-9-301.2, 2-2-604)

1g. Mass emissions of NOx at S1, Gas Turbine, shall not exceed 1876 lb in any calendar day. (Regulation 2-2-301)

2. (deleted BAAQMD Title V application #25841)

3a. An oxidizing catalyst (A100) shall reduce CO emissions from the gas turbine (S100). The catalyst shall operate during all periods of turbine operation except during start-up, which shall not exceed one hour for warm start, or four hour for a cold start. (9/98 BACT)

3b. Annual CO emissions shall not exceed 100 tons in any consecutive twelve months for the entire facility. Sampling ports for testing for compliance with this condition shall be maintained as approved by the District's Source Test Section. (6/27/89) (BACT)

3c. CO emissions in the gas turbine exhaust shall not exceed 10 ppmdv at 15% oxygen over any three-hour period whether firing natural gas or fuel oil. (9/98 BACT)

3d. The limit in paragraph 3c shall not apply during startup and shutdown periods. Emissions during startup and shutdown periods shall be limited to 14670 lbs per any consecutive twelve months. (6/27/89 BACT)

3e. The limit in paragraph 3c shall not apply during operation at less than 80 percent load, which is not to exceed 750 hours in any consecutive twelve months. The emissions during operation at less than 80 percent load shall not exceed 14.8 tons per any consecutive twelve months. (9/98 BACT)

3f. The limit in paragraph 3c shall not apply when ambient temperature is less than 35 degrees F. The CO limit when ambient temperature is less than 35 degrees F shall be 15 ppmdv, averaged over one hour. Operation at this alternate limit shall be limited to 100 hours in any consecutive twelve-month period. Emissions of CO while operating under this condition shall be limited to 3120 lbs in any consecutive twelve-month period. (9/98 BACT)

3g. The limit in paragraph 3c shall not apply during periods of natural gas curtailment and for short testing periods using non-gaseous fuel. However, the operator shall shut down the facility and apply for an increase in the CO limit if operating with non-gaseous fuel causes the facility to exceed the annual CO limit in paragraph 3b.

4. Nitrogen oxide (NOx) emissions from each auxiliary boiler (S-101, S-102) shall not exceed 40 ppmdv at 3% oxygen averaged over any three-hour period. (PSD, BACT)

5. Any fuel oil fired (except as provided in condition #7) shall not exceed a maximum sulfur content of 0.12% (by weight). The owner or operator shall maintain records on the duration of fuel oil firing, the sulfur content, and in which operating sources fuel oil firing took place. All fuel receipts must be certified to 0.12% weight sulfur or less. (PSD, BACT)

6. Total emissions from the gas turbine (S-100) and auxiliary boilers (S-101, S-102) shall not exceed 25 ton/year TSP or 40 ton/yr NMHC. (Cumulative increase)

6a. As long as natural gas is burned exclusively at the turbine and boilers, particulate emissions shall not be monitored. Within 2 weeks of fuel oil use at S100, Turbine, or S101-S102, Boilers, the permit holder shall have source tests performed to measure TSP from the source or sources burning fuel oil. As a contingency measure, the permit holder shall submit a proposed test protocol to the Source Test group at the

District within 3 months of issuance of this permit for approval. The permit holder shall notify the Source Test group at least one week prior to performing the test or tests. The test or tests shall form the basis for the emission factor or factors to be used when burning fuel oil. (basis: Regulation 2-6-501)

6b. After fuel oil firing has commenced, the permit holder shall keep records of fuel oil firing to determine whether the 25 tpy limit for TSP has been violated. The permit holder shall use these records to determine the TSP emissions on a rolling twelve month basis. In this case, the emission factors used for natural gas burning shall be:
Turbine: 2.5 lb/hr
Boilers: 5 lb/mmscf natural gas
(basis: Regulation 2-6-501)

6c. After the source test required by part 17 is performed, the permit holder shall use the source test to develop an emission factor for particulate for the turbine and shall use the emission factor to determine the particulate emissions from the turbine on a rolling twelve month basis for compliance with part 6 of this condition.

7a. During periods of natural gas curtailment, the maximum sulfur content of the fuel oil burned shall not exceed 0.25% (by weight), provided that the gas turbine was being fired on natural gas prior to the curtailment.

7b. During such periods, the NOx emission limit in condition #1a shall not apply.

NOx will be controlled via steam injection at no less than the rate determined by the steam/fuel ratio specified for natural gas firing and no greater than the lesser of the rate determined by the manufacturers recommended maximum steam/fuel ratio or 83,000 lb/hr (at 59 F). (PSD, BACT)

8. The steam injection to control NOx emissions from the turbine shall be operated during all periods when injection steam is available at the specified pressure and temperature. (BACT)

9. Pursuant to the PSD permit, the owner or operator shall install and operate a continuous monitoring system to monitor and record the fuel consumption and the ratio of steam injected to fuel fired in the turbine. (PSD, 2-1-403)

10a. The emissions of sulfur dioxide (SO2) shall not exceed 3087 lb/day from the entire facility, except under natural gas curtailment as stated in condition #7. (BACT)

10b. The daily SO2 limit shall not be monitored when the facility burns natural gas exclusively. When the facility burns fuel oil, and is not

operating under natural gas curtailment, the SO2 limit shall be monitored by calculating the SO2 emitted using the following equation:

lb SO2 emitted/day =
(fuel oil burned) x (density fuel oil) x (%S by weight) x
(2.0 lb SO2/lb S)

Fuel oil shall be measured in gal/day. Density shall be measured in lb/gal. The owner or operator may measure the density or use a default value of 7.20 lb/gal. The sulfur content shall be as certified by the supplier. The owner or operator shall calculate the SO2 emitted on a daily basis when the facility burns fuel oil, unless the facility is under natural gas curtailment. In addition to the records required by Condition 6b, the following records shall be kept:

sulfur content of the fuel by weight
density of the fuel
SO2 emitted

(Regulation 2-6-501)

11. The owner or operator shall install, calibrate and operate District approved continuous in-stack emission monitors for nitrogen oxides, carbon monoxide, and either oxygen or carbon dioxide at the turbine and the boilers. (PSD, BACT, 2-1-403)

12. (deleted BAAQMD Title V application #25841)

13a. The exhaust stack from the gas turbine (P-100) shall be constructed to a height of at least 80 feet. (PSD)

13b. Sampling ports for testing for compliance with these conditions shall be maintained as approved by the District's Source Test Division. (BAAQMD 1-501)

14. All records associated with the above conditions shall be retained by the owner or operator, for at least five years, for review by the District and shall be supplied to the District upon request. The recording format of conditions #5, #9, and #17 shall be subject to the approval of the APCO. (PSD, BACT)

15. Prior to burning fuel oil as the primary fuel in the gas turbine, the owner or operator shall demonstrate to the satisfaction of the APCO, during an approved test period, that the "quiet combustor" is capable of meeting the emission requirements for condition #1. If within six months of initial start-up of fuel oil as a discretionary fuel, the applicant is unable to achieve the concentration limitation of 25 ppm, the applicant shall take action to install a selective catalytic reduction

system, or another APCO approved equivalent control system capable of satisfying the emission limit in condition #1. (BACT)

16. (deleted BAAQMD Title V application #25841)

17. In order to assure that the offset trigger levels for NMHC (40 TPY) and the PSD modeling trigger level for TSP (25 TPY) are not exceeded, total fuel oil usage in the gas turbine (S-100) shall not exceed 0.55 million barrels/year, except as provided below: "If the owner or operator can demonstrate, through the use of District approved source test methods, that the mass emissions of NMHC exiting the catalytic converter are less than those used to establish the above barrel limitation, then that limit may be renegotiated." (Cumulative increase)

18. The auxiliary boilers (S-101, S-102) shall not operate simultaneously with the gas turbine more than a combined total of 28 boiler hours/day or 3950 boiler hours/year. The auxiliary boilers may operate any time during period of gas turbine outage. (9/13/90) (Cumulative increase)

Conditions for implementation of Application 445 (to be deleted after completion via an administrative permit amendment):

19. Emissions of particulate and POC shall be determined by a District-approved source test before and within 60 days after the modification to ensure that emissions of particulate and POC do not increase more than 10 lb/day. Both tests shall be performed in accordance with the District's Manual of Procedures and shall be performed at the same fuel input rate. The permit holder shall notify the Manager of the District's Source Test Section at least seven (7) days prior to each test, to provide the District staff the option of observing the testing. Within 45 days of test completion, a comprehensive report of the test results shall be submitted to the Manager of the District's Source Test Section for review and disposition.
(basis: Regulation 2-1-403)

20. The permit holder shall perform an efficiency test pursuant to Regulation 9-9-401 within 60 days of the modification to ensure that the concentration limits in parts 1d and 1e are appropriate. The concentration limits in part 1d and 1e shall be raised or lowered in accordance with the procedure and calculation provided in Regulation 9-9-401 using an administrative permit amendment. (basis: Regulation 9-9-305, 9-9-401)

21. Part 1e of this condition shall not take effect until 90 days after turbine startup following installation of the modification to allow adjustments

and tuning of the turbine and plant to obtain optimum emissions performance. In addition, the permit holder shall be allowed to add additional CO catalyst material as necessary or desired to obtain and maintain compliance with all new or current permit conditions.

RECOMMENDATION

Issue an Authority to Construct for S100, Gas Turbine, 1085 mmbtu/hr (HHV @ 35^{o} F) to:

Replace turbine components
Increase efficiency
Increase the capacity of the turbine to 1085 mmbtu/hr (HHV @ 35^{o} F)

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Brenda Cabral, Date
Air Quality Engineer

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