Engineering Evaluation
Pacific Gas and Electric Company
Application #22504
Plant #24

BACKGROUND

Pacific Gas and Electric Company (PG&E) has submitted an application to bank Interchangeable Emission Reduction Credits (IERCs) at the Hunters Point Power Plant in San Francisco pursuant to Regulation 2, Rule 9 (Interchangeable Emission Reduction Credits), adopted on April 7, 1999.

This facility has five boilers (S-3, 4, 5, 6, 7) subject to the Advanced Technology Alternative Emission Control Plan (ATAECP "system-wide emissions bubble") of Regulation 9-11, Section 309. Under the ATAECP, the individual boilers are not required to comply with a specific emission limit, but their emissions and fuel use contribute to a system-wide average. The current system-wide average NO_x limit (2000) is 0.105 lb/MMBtu; this limit will ratchet down over the years to 0.057 (2002), 0.037 (2004) and 0.018 (2005) lb/MMBtu. There are a total of 15 utility boilers at four facilities subject to Regulation 9-11. Three facilities were sold and transferred to the Southern Energy Delta on April 16, 1999. PG&E retained ownership of this Hunters Point facility. Hence, the five boilers at this facility together constitute a generating system subject to the Regulation 9-11 ATAECP. PG&E proposes to retire the Hunters Point boilers by 2004 after replacement power for these boilers goes on-line.

The applicant has applied to bank IERCs from the following sources:

S-3 Boiler No. 3 Electric Generation, Babcock and Wilcox, gas and oil fired, 670 MMBTU/hr heat input.

S-4 Boiler No. 4 Electric Generation, Babcock and Wilcox, gas and oil fired, 670 MMBTU/hr heat input.

S-5 Boiler No. 5 Electric Generation, Babcock and Wilcox, gas and oil fired, 670 MMBTU/hr heat input.

S-6 Boiler No. 6 Electric Generation, Babcock and Wilcox, gas and oil fired, 670 MMBTU/hr heat input.

S-7 Boiler No. 7 Electric Generation, Combustion Engineering, gas and oil fired, 1,720 MMBTU/hr heat input.

The reductions in NO_x emissions are due to the addition of new controls and the innovative use of lower emitting combustion practices. These include:

1. Modification of the gas burner rings for staged combustion. This technique creates an increase in the combustion gas residence time in fuel rich zones, reducing the formation of NO_x.

2. Biased firing of burners to achieve fuel-rich and air-rich zones. Therefore primary combustion can occur at a lower flame temperature (fuel-rich zone) and the secondary combustion can occur at lower bulk gas temperature (air-rich zone) to minimize NO_x formation.

3. Routing flue gas to the forced draft inlets for better flue gas-combustion air mixing.

4. Installation of an oxygen trim system for optimal excess air operation.

5. Improved operating procedures and training of Operations and Maintenance personnel.

EMISSIONS CALCULATIONS

I. Baseline and Initial Generation Periods

The initial IERC generation period proposed starts on January 1, 1997 and ends on December 31, 1999. Per Regulation 2-9-602, the baseline period is the five-year period immediately preceding the initial credit generation period. Therefore the baseline period for this application is January 1, 1992 through December 31, 1996. Furthermore the initial credit generation period shall not be more than 30 months prior to the submittal of the first complete IERC banking application (Regulation 2-9-204). This IERC banking application was deemed complete on June 7, 1999. Thus, the initial IERC generation period chosen by PG&E complies with this requirement.

IERC generation period: January 1, 1997 through December 31, 1999
IERC baseline period: January 1, 1992 through December 31, 1996

II. Baseline Throughput

As per Regulation 2-9-602.2, the baseline throughput is the lesser of actual throughput or permitted throughput during the baseline period. Since there was no permit condition limiting the throughput of fuel during this period, the actual throughput of fuel reported by PG&E is used as the baseline throughput. The fuel throughput for all five boilers during the baseline period is summarized as follows:

Calendar Year	*Natural Gas Input*	*Oil Input*	*Total Input*
1992	16,875,397 MMBtu/yr	7,188 MMBtu/yr	16,882,585 MMBtu/yr
1993	10,100,090	33,725	10,133,815
1994	12,749,488	1,770,975	14,520,463
1995	10,941,086	0	10,941,086
1996	11,612,312	0	11,612,312
Total	**62,278,373**	**1,811,888**	**64,090,261**

The gas and oil throughput data for the Hunters Point Power Plant above are summarized from EPA datagroups of the CEM (Continuous Emission Monitor) computers, which use hourly averages based on 15 minute averages. The raw CEM data can be accessed at the EPA website. See Appendix A for data summaries. The CEMs are regularly source tested to verify compliance with District Regulation 1-522.6 that requires accuracy within 5% of CEM full scale or 10% of applicable emission standard (see Appendix B). The average fuel throughput for the baseline period is calculated to be **12,818,052 MMBtu/yr**.

III. Baseline Emissions and Emission Rate

A. Emission Rate

The NO_x emissions from boilers S-3, 4, 5, 6, and 7 were measured by a CEM. As mentioned above, raw CEM data can be accessed at the EPA website. The average annual emission rates calculated from EPA datagroups are summarized below. Emissions and fuel data can be found in Appendix A.

Calendar Year	Gas Emissions	Gas Emission Factor	Oil Emissions	Oil Emission Factor
1992	1761.61 ton/yr	0.2088 lb/MMBtu	2.05	0.5704 lb/MMBtu
1993	997.98	0.1976	2.44	0.1447
1994	1130.45	0.1773	452.17	0.5106
1995	693	0.1267	0	NA
1996	736.80	0.1269	0	NA
Totals	5319.84		456.66	

The emission rate for the baseline period is calculated as follows:

ER = [(5319.84 + 456.66 ton) * (2000 lb/ton)] / (64,090,261 MMBtu) = 0.1803 lb/MMBtu

However, under the ATAECP, oil firing is not allowed (Regulation 9-11-309). Hence the emissions from oil firing must be adjusted to the levels that would have occurred if gas had been fired instead of oil by using the applicable gas emission factor:

1992:	0.2088 lb/MMBtu X 7,188 MMBtu	= 1,500 lb	=	0.75 ton
1993:	0.1976 lb/MMBtu X 33,725 MMBtu	= 6,664 lb	=	3.32 ton
1994:	0.1267 lb/MMBtu X 1,770,975 MMBtu	= 224,383 lb	=	112.19 ton
				116.26 ton

ER = [(5319.84 + 116.26 ton) * (2000 lb/ton)] / (64,090,261 MMBtu) = **0.170 lb/MMBtu**

B. Baseline Adjusted Emission Rate

The baseline emission rate is required to be adjusted to Reasonably Available Control Technology (RACT) or Best Available Retrofit Technology (BARCT) in effect for the boilers during the credit generation periods as per District Regulation 2-9-603.1.1. Regulation 9-11-309.1 ATAECP requires all boilers in the electric power generating system to comply with the following system-wide NO_x emission rate limits during the respective credit generation periods: (1) 1997: 0.188 lb/MMBtu; (2) 1998: 0.160 lb/MMBtu, and (3) 1999: 0.115 lb/MMBtu. Therefore, except for the 1997 period (because the actual baseline emission rate is lower), baseline emission rates will be adjusted downward to these BARCT emissions rates. Baseline adjusted emission rates are thus:

CGP_1 = 0.170 lb/MMBtu
CGP_2 = 0.160 lb/MMBtu
CGP_3 = 0.115 lb/MMBtu

C. Baseline Adjusted Emissions

Baseline adjusted emissions are calculated by multiplying the Baseline Adjusted Rate by the average fuel throughput for the baseline period pursuant to Regulation 2-9-603.1.2.

A_1 = (0.170 lb/MMBtu)(12,818,052 MMBtu)(1ton /2000lb) = **1,089.5 tons**
A_2 = (0.160 lb/MMBtu)(12,818,052 MMBtu)(1ton /2000lb) = **1,025.4 tons**
A_3 = (0.115 lb/MMBtu)(12,818,052 MMBtu)(1ton /2000lb) = **737.0 tons**

D. ATAECP Compliance During Credit Generation Period

The five boilers (S-3, 4, 5, 6, 7) at the Hunters Point facility along with the boilers at the Potrero, Contra Costa and Pittsburg Power Plants were subject to the ATAECP for the years 1997, 1998 and until April 16, 1999. After the transfer of the Potrero, Contra Costa and Pittsburg plants to Southern Energy Delta on April 16, 1999, the five boilers at Hunters Point constitute its own generating system subject to the ATAECP. The table below indicates PG&E was in compliance with the ATAECP with or without the Hunters Point boilers during the credit generation period.

Year	ATAECP Requirement	System-Wide (SW) Emissions	SW Emissions w/o HP Units
1997	0.188 lb/MMBtu	0.093 lb/MMBtu	0.090 lb/MMBtu
1998	0.160	0.087	0.087
1999*	0.115	0.067	0.066
1999**	0.115	0.074	N/A

** Through 4/16/99*
** *HP units only, Entire Year*

IV. Credit Generation Period (CGP) Actual Emissions

The CGP emissions are calculated with the same methodology as for baseline emissions using CEM data. There are three CGP periods consisting of (1) 1997 calendar year, (2) 1998 calendar year and (3) 1999 calendar year.

CGP	Total Heat Input	Emission Factor	NOx Emissions
1 (B_1)	12,438,188 MMBtu/yr	0.106 lb/MMBtu	659.6 ton/yr
2 (B_2)	13,060,754	0.087	570.1
3 (B_3)	8,362,275	0.074	309.4

V. Comparison of CEM and District Databank Emissions Data

The table below compares emissions and emission rates from CEM data and the District's Databank (DB):

Year	CEM Gas Factor (lb/MMBtu)	DB Gas Factor (lb/MMBtu)	CEM Oil Factor (lb/MMBtu)	DB Oil Factor (lb/MMBtu)	CEM NOx emissions (ton/yr)	DB NOx emissions (ton/yr)
1992	0.209	0.179	0.570	0.720	1763.66	1462.92
1993	0.198	0.181	0.145	0.727	1000.42	1037.07
1994	0.177	0.179	0.511	0.728	1582.62	1759.74
1995	0.127	0.179			693.00	944.69
1996	0.127	0.131			736.80	734.31
1997	0.106	0.132			659.60	793.13
1998	0.087	0.130			570.10	826.31
1999	0.074	0.139			309.40	560.38

Note that the District Databank emission factors for natural gas combustion at the five boilers have been modified only twice: (1) in or prior to 1992, and (2) in 1996. While the average DB factors compare favorably with the average CEM factors from 1992 through 1994, the DB factors have not been changed frequently enough to reflect the low NO_x modifications (see Background Section) performed on the boilers beginning in 1995. See Appendix C for data and calculations from which the results above are derived. Thus, the CEM data are deemed more reliable and accurate and therefore used in the calculation of the available IERC's at this facility.

VI. Credit Generation Period Non-Curtailment Emissions

The CGP non-curtailment emissions are derived by multiplying the average baseline throughput by the actual emissions rate (Regulation 2-9-603.1.4).

C_1 = (12,818,052 MMBtu/yr)(0.106 lb/MMBtu)(1 ton/2000 lb) = **680.0 ton/yr**
C_2 = (12,818,052 MMBtu/yr)(0.087 lb/MMBtu)(1 ton/2000 lb) = **559.5 ton/yr**
C_3 = (12,818,052 MMBtu/yr)(0.074 lb/MMBtu)(1 ton/2000 lb) = **474.3 ton/yr**

VII. IERC

The Interchangeable Emission Reduction Credits (IERC) are calculated by subtracting the greater of B (CGP actual emissions) and C (CGP non-curtailment emissions) from A (baseline emissions) in accordance with Regulation 2-9-603.1.5.

Period 1 (1997): C is greater than B; thus the IERCs for this period are:

$IERC_1$ = 1,089.5 – 680.0 = **409.5 tons**

Period 2 (1998): B is greater than C; thus the IERCs for this period are:

$IERC_2$ = 1,025.4 – 570.1 = **455.3 tons**

Period 3 (1999): C is greater than B; thus the IERCs for this period are:

$IERC_3$ = 737.0 – 474.3 = **262.7 tons**

TOXICS RISK SCREENING ANALYSIS

There is no net increase in emissions of toxic compounds that will result from this IERC banking application. Therefore, a Toxics Risk Screening Analysis is not required.

STATEMENT OF COMPLIANCE

This application for IERCs is in compliance with Regulation 2, Rule 9, Interchangeable Emissions Reduction Credits. Emissions reductions at Sources S-3, 4, 5, 6, and 7 complies with the criteria in Regulation 2-9-301.1.1 as (1) these boilers are stationary sources in the District Emission Inventory; (2) emission reductions are real, permanent, quantifiable, enforceable, surplus and are calculated from actual data and records. Emission reductions are achieved by implementation of low NO_x techniques and installation of low NO_x devices as described in the Background section of this evaluation. The NO_x emissions are monitored by CEMs that are checked regularly by the District Source Test Section; (3) boilers are still operating and fully functional.

The initial IERC generation period, January 1, 1997 through December 31, 1999, is not more than 30 months prior to the submittal of the first complete banking application (deemed complete on June 7, 1999) and is therefore in compliance Regulation 2-9-204.

The baseline period, January 1, 1992 through December 31, 1996, is the five-year period immediately preceding the initial credit generation period. Therefore the baseline period for this application is in compliance with Regulation 2-9-602,

Regulation 2-9-603.1.1 requires the baseline emission rate to be adjusted to comply with the most stringent of (BARCT) Best Available Retrofit Control Technology and (RACT) Reasonably Available Control Technology. The BARCT/RACT determination for this application is the system average emission rates required by Advanced Technology Alternative Emission Control Plan of Regulation 9-11.

Regulation 2-1-312.10 categorically exempts from CEQA review applications to bank emission reductions pursuant to Regulation 2, Rule 4 and Regulation 2, Rule 9 because such applications have no potential for causing a significant environmental impact.

RECOMMENDATIONS

It is recommended that the following IERC Certificates be issued to Pacific Gas and Electric Company:

Location: Hunters Point Power Plant
1000 Evans Avenue
San Francisco, CA 94124

Baseline Period: January 1, 1992 through December 31, 1996

Certificate #1: effective date: January 1, 1998, expiration date: December 31, 2002

Credit Generation Period January 1, 1997 to December 31, 1997
$IERC_1$ = 409.5 tons NO_x

Certificate #2: effective date: January 1, 1999, expiration date: December 31, 2003

Credit Generation Period January 1, 1998 to December 31, 1998
$IERC_2$ = 455.3 tons NO_x

Certificate #3: effective date: January 1, 2000, expiration date: December 31, 2004

Credit Generation Period January 1, 1999 to December 31, 1999
$IERC_3$ = 262.7 tons NO_x

by: _____ Date: _____
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