

Notice Inviting Written Public Comment

Notice is hereby given that the Executive Officer/Air Pollution Control Officer (EO/APCO) of the Bay Area Air Quality Management District has issued an amended Preliminary Determination of Compliance (PDOC) and a proposed PSD permit under application number 15487 for a proposed new power plant. The proposed **Russell City Energy Center (RCEC)** would be located at 3806 Depot Road in the City of Hayward, Alameda County, in an area zoned for industrial uses. The project was previously certified by the California Energy Commission on September, 2002. An amendment is required because the site is relocated approximately 1,500 feet to the north from the original location. The proposed facility would be a nominal 600-MW, natural-gas fired, combined-cycle merchant power plant consisting of two natural gas fired combustion turbine generators, one steam turbine generator and associated equipment, two fired heat recovery steam generators, a 9-cell wet cooling tower, and a 300 hp diesel fired pump engine. The PDOC documents the Air Pollution Control Officer's preliminary decision to issue an Authority to Construct for the proposed RCEC.

The proposed power plant would be permitted to emit the following maximum quantities of regulated air pollutants:

Nitrogen Oxides	134.6 tons per year
Carbon Monoxide	389.3 tons per year
Particulate Matter (PM ₁₀)	86.8 tons per year
Precursor Organic Compounds	28.5 tons per year
Sulfur Dioxide	12.2 tons per year

The emissions of nitrogen oxides (as NO₂), carbon monoxide, particulate matter (PM₁₀), and precursor organic compounds associated with this project will meet the Best Available Control Technology (BACT) requirement of District Regulation 2-2-301.1. The emission increases of nitrogen oxides and precursor organic compounds associated with this project will comply with the emission offset requirements of District Regulation 2-2-302.

Pursuant to District Regulation 2-2-405, the Air Pollution Control Officer invites written public comment on the Preliminary Determination of Compliance and its intended action.

The Preliminary Determination of Compliance is available for public inspection at the Outreach and Incentives Division Office located on the 5th floor of District headquarters at 939 Ellis Street, San Francisco CA, 94109. The PDOC may also be viewed on the District website at www.baaqmd.gov. Written comments should be directed to Weyman Lee of the District Engineering Division by May 12, 2007.

Dated at San Francisco, the 2nd day of April, 2007.

Signed by Brian Bunger for Jack P. Broadbent
Jack P. Broadbent
Executive Officer/APCO
Bay Area Air Quality Management District

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**Amended
Preliminary
Determination of Compliance**

Russell City Energy Center

**Bay Area Air Quality Management District
Application 15487**

March 27, 2007

Weyman Lee, P.E.
Air Quality Engineer

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I Background

This is the amended Preliminary Determination of Compliance (PDOC) for the Russell City Energy Center (RCEC), a 600-MW, natural-gas fired, combined-cycle merchant power plant proposed by Calpine Corporation (Calpine). The project was originally certified by the California Energy Commission in September, 2002. However, the site has been relocated approximately 1,500 feet to the north from the original location (1.24 miles east of Johnson Landing on the southeastern shore of the San Francisco Bay in the City of Hayward). Hence an amendment to the Authority to Construct is required.

The RCEC will consist of two natural gas fired Westinghouse 501F combustion turbine generators (CTGs), one steam turbine generator (STG) and associated equipment, two supplementally fired heat recovery steam generators (HRSGs), a 9-cell wet cooling tower, and a 300 hp diesel fire pump engine.

Pursuant to BAAQMD Regulation 2, Rule 3, Section 405, this document serves as the Preliminary Determination of Compliance (PDOC) document for the RCED. It will also serve as the evaluation report for the BAAQMD Authority to Construct application number 15487.

The PDOC describes how the proposed RCEC will comply with applicable federal, state, and BAAQMD regulations, including the Best Available Control Technology and emission offset requirements of the District New Source Review regulation. Permit conditions necessary to insure compliance with applicable rules and regulations and air pollutant emission calculations are also included. This document includes a health risk assessment that estimates the impact of the project emissions on public health and a PSD air quality impact analysis, which shows that the project will not interfere with the attainment or maintenance of applicable ambient air quality standards.

In accordance with BAAQMD Regulation 2, Rule 3, Section 404, this PDOC is subject to the public notice, public inspection, and 30-day public comment period requirements of District Regulation 2, Rule 2, Sections 406 and 407. Because the PDOC documents the preliminary decision of the APCO to issue a PSD permit, it is subject to the public notice requirements of Regulation 2-2-405.

II Project Description

1. Permitted Equipment

Calpine is proposing a combined-cycle combustion turbine power generation facility with a nominal electrical output of 600 MW. As proposed, each natural gas fired combustion turbine generator (CTG) will have a nominal electrical output of 200 MW and the steam produced by the heat recovery steam generators (HRSGs) will feed to a steam turbine generator with a rated electrical output of 235 MW.

The RCEC will consist of the following permitted equipment:

- S-1 Combustion Turbine Generator (CTG) #1, Westinghouse 501F, 2,038.6 MMBtu/hr maximum rated capacity, natural gas fired only; abated by A-1 Selective Catalytic Reduction System (SCR) and A-2 Oxidation Catalyst
- S-2 Heat Recovery Steam Generator (HRSG) #1, with Duct Burner Supplemental Firing System, 200 MMBtu/hr maximum rated capacity; Abated by A-1 Selective Catalytic Reduction (SCR) System and A-2 Oxidation Catalyst
- S-3 Combustion Turbine Generator (CTG) #2, Westinghouse 501F, 2,038.6 MMBtu/hr maximum rated capacity, natural gas fired only; abated by A-3 Selective Catalytic Reduction System (SCR) and A-4 Oxidation Catalyst
- S-4 Heat Recovery Steam Generator (HRSG) #2, with Duct Burner Supplemental Firing System, 200 MMBtu/hr maximum rated capacity; Abated by A-3 Selective Catalytic Reduction (SCR) System and A-4 Oxidation Catalyst
- S-5 Cooling Tower, 9-Cell, 141,352 gallons per minute, with efficiency drift eliminators, make and model to be determined.
- S-6 Fire Pump Diesel Engine, Clarke JW6H-UF40, 300 hp, 2.02 MMBtu/hr rated heat input.

2. Equipment Operating Scenarios

Turbines and Heat Recovery Steam Generators

Because RCEC will be a merchant power plant, the exact operation of the new gas turbine/HRSG power trains will be dictated by market circumstances and demand. However, the following general operating modes are expected to occur at the RCEC:

Base Load: Maximum continuous output with duct firing

Load Following: Facility would be operated to meet contractual load and spot sale demand, with a total output less than the base load scenario

Partial Shutdown: Based upon contractual load and spot sale demand, it may be economically favorable to shutdown one or more turbine/HRSG power trains; this would occur during periods of low overall demand such as late evening and early morning hours

Full Shutdown: May be caused by equipment malfunction, fuel supply interruption, or transmission line disconnect or if market price of electricity falls below cost of generation

The chart below outlines the maximum operating annual air pollutant emissions for this project. The carbon monoxide emissions have decreased from 584.2 tons/year to 389.3 tons/year and the PM₁₀ emissions have increased slightly from 86.4 tons/year to 86.8 tons/year. All other emission rates are unchanged from previous application #2896.

NO ₂ (ton/yr)	CO (ton/yr)	POC (ton/yr)	PM ₁₀ (ton/yr)	SO ₂ (ton/yr)
134.6	389.3	28.5	86.8	12.2

3. Air Pollution Control Strategies and Equipment

The proposed RCEC includes sources that trigger the Best Available Control Technology (BACT) requirement of New Source Review (District Regulation 2, Rule 2, NSR) for emissions of nitrogen oxides (NO_x), carbon monoxide (CO), precursor organic compounds (POCs), sulfur dioxide (SO₂), and particulate matter of less than 10 microns in diameter (PM₁₀).

a. Selective Catalytic Reduction with Ammonia Injection for the Control of NO_x

The gas turbines and HRSG duct burners each trigger BACT for NO_x emissions. The gas turbines will be equipped with dry low-NO_x (DLN) combustors, which minimize NO_x emissions by lowering peak flame temperature by premixing combustion air with a lean fuel mixture. The HRSGs will be equipped with low-NO_x duct burners, which are designed to minimize NO_x emissions. In addition, the combined NO_x emissions from the gas turbines and HRSGs will be further reduced through the use of selective catalytic reduction (SCR) systems with ammonia injection. The gas turbine and HRSG duct burner combined exhaust will achieve a BACT level NO_x emission limit of 2 ppmvd @ 15% O₂ (one hour average).

b. Oxidation Catalyst, Dry Low-NO_x (DLN) Combustors and Good Combustion Practices to control and minimize CO Emissions

The gas turbines and HRSG duct burners each trigger BACT for CO emissions. The gas turbines will be equipped with dry low-NO_x combustors, which operate on a lean fuel mixture that minimizes incomplete combustion and CO emissions. The HRSGs will be equipped with low-NO_x duct burners which are also designed to minimize CO emissions. Furthermore, the gas turbines and HRSGs will be abated by oxidation catalysts which will oxidize the CO emissions to produce CO₂ and water. The gas turbine and HRSG duct burner combined exhaust will achieve a CO emission limit of 4 ppmvd @ 15% O₂ (three hour average).

c. Oxidation Catalyst, Dry Low-NO_x (DLN) Combustors and Good Combustion Practices to control and minimize POC Emissions

The Gas Turbines and HRSGs each trigger BACT for POC emissions. The gas turbines will utilize dry low-NO_x combustors which are designed to minimize incomplete combustion and therefore minimize POC emissions. The HRSGs will be equipped with low-NO_x burners, which are designed to minimize incomplete combustion and therefore minimize POC emissions. Furthermore, the turbines and HRSGs will be abated by oxidation catalysts which will also

reduce POC emissions. The gas turbine and HRSG duct burner combined exhaust will achieve a POC emission limit of 1 ppmvd @ 15% O₂ (one hour average).

d. Exclusive Use of Clean-burning Natural gas to Minimize SO₂ and PM₁₀ Emissions

The gas turbines and HRSG duct burners will burn exclusively PUC-regulated natural gas to minimize SO₂ and PM₁₀ emissions. Because the SO₂ emission rate is proportional to the sulfur content of the fuel burned and is not dependent upon the burner type or other combustion characteristics, the use of "low sulfur content" natural gas will result in the lowest possible emission of SO₂. PM₁₀ emissions are minimized through the use of best combustion practices and "clean burning" natural gas.

Table 1 Summary of Control Strategies and Emission Limitations for Gas Turbines and HRSG Duct Burners

Source	Control Strategy and Emission Limit ^a				
	NO _x	CO	POC	PM ₁₀	SO ₂
Gas Turbine & HRSG Power Trains	DLN Combustors/SCR	DLN Combustors/Oxidation Catalyst	DLN Combustors/Oxidation Catalyst	PUC-Regulated Natural Gas	PUC-Regulated Natural Gas
	2 ppmv	4 ppmv	2 ppmv	12 lb/hr	2 lb/hr

^a ppmv concentrations dry at 15% O₂

III Facility Emissions

The facility regulated air pollutant emissions and toxic air contaminant emissions are presented in the following tables. Detailed emission calculations, including the derivations of emission factors are presented in the appendices.

Table 2 is a summary of the daily maximum regulated air pollutant emissions for the permitted sources at RCEC. These emission rates are used to determine if the Best Available Control Technology (BACT) requirement of the District New Source Review Regulation (NSR; Regulation 2, Rule 2) is triggered on a pollutant-specific basis. Pursuant to Regulation 2-2-301.1, any new source that has the potential to emit 10 pounds or more per highest day of POC, NPOC, NO_x, SO₂, PM₁₀, or CO are subject to the BACT requirement for that pollutant.

Table 2 Maximum Daily Regulated Air Pollutant Emissions for Proposed Sources (lb/day)

Source	Pollutant (lb/day)				
	Nitrogen Oxides (as NO ₂)	Carbon Monoxide	Precursor Organic Compounds	Particulate Matter (PM ₁₀)	Sulfur Dioxide
S-1 Gas Turbine & S-2 HRSG ^a	776	5387	148	279	37
S-3 Gas Turbine & S-4 HRSG ^a	776	5387	148	279	37
S-5 Cooling Tower ^b				68	
S-6 Fire Pump Diesel Engine ^c	2.82	0.22	0.21	0.079	0.0033

^a NOx, CO, and POC emission rates are based upon one 360 minute cold start-up and 18 hours of Gas Turbine /HRSG full load operation at maximum combined firing rate of 2,238.6 MM BTU/hr in one day; PM₁₀ and SO₂ emission rates are based upon 24 hours of Gas Turbine/HRSG baseload operation at maximum combined firing rate of 2,238.6 MM BTU/hr in one day

^b emission rates based upon 24 hr/day operation at maximum emission rates

^c emission rates based upon 1 hr/day operation at maximum emission rates

Table 3 is a summary of the maximum facility toxic air contaminant (TAC) emissions from new sources. These emissions are used as input data for air pollutant dispersion models used to assess the increased health risk to the public resulting from the project. The ammonia emissions shown are based upon a worst-case ammonia emission concentration of 5 ppmvd @ 15% O₂ due to ammonia slip from the A-1 and A-3 SCR Systems. The chronic and acute screening trigger levels shown are per Table 2-5.1 of Regulation 2, Rule 5.

Table 3 Maximum Facility Toxic Air Contaminant (TAC) Emissions

Toxic Air Contaminant	Total Project Emissions (lb/yr)	Chronic Trigger Level (lb/yr-project)	Total Project Emissions (lb/hr)	Acute (1 hour max.) Trigger Level (lb/hr)
Turbines/HRSGs				
Acetaldehyde	2.33E+03	6.4E+01		
Acrolein	3.21E+02	2.3E+00	4.03E-02	4.2E-04
Ammonia	1.21E+05	7.7E+03	1.52E+01	7.1E+00
Benzene	2.26E+02	6.4E+00	2.84E-02	2.9E+00
1,3-Butadiene	2.16E+00	1.1E+00		
Ethylbenzene	3.04E+02	7.7E+04		
Formaldehyde	1.56E+04	3.0E+01	1.96E+00	2.1E-01
Hexane	4.40E+03	2.7E+05		
Naphthalene	2.82E+01	1.1E-02		
Total PAHs	1.80E+00	1.1E-02		
Propylene	1.31E+04	1.2E-02		
Propylene Oxide	8.13E+02	4.9E+01	1.02E-01	6.8E+00
Toluene	1.21E+03	1.2E+01	1.51E-01	8.2E+01

Toxic Air Contaminant	Total Project Emissions (lb/yr)	Chronic Trigger Level (lb/yr-project)	Total Project Emissions (lb/hr)	Acute (1 hour max.) Trigger Level (lb/hr)
Xylenes	4.08E+02	2.7E+04		
Cooling Tower				
Ammonia	1.86E+02	7.7E+03	2.12E-02	7.1E+00
Arsenic	1.55E-01	1.2E-02	1.77E-05	4.2E-04
Cadmium	2.48E-01	4.5E-02		
Hexavalent chromium	1.27E+00	1.3E-03		
Copper	1.88E+00	9.3E+01		
Lead	5.88E-01	5.4E+00	6.71E-05	2.2E-01
Manganese	2.58E+00	7.7E+00		
Mercury	1.86E-03	5.6E-01		
Nickel	1.45E+00	7.3E-01	1.66E-04	1.3E-02
Selenium	2.16E-01	7.7E+02		
Zinc	5.94E+00	1.4E+03		
Firepump Engine				
Diesel Exhaust Particulate	4.0E+00	5.8E-01		

Table 4 is a summary of the maximum annual regulated air pollutant emissions for the facility from proposed permitted sources. Pursuant to the Prevention of Significant Deterioration (PSD) requirements of New Source Review (Regulation 2-2-304.1 and 2-2-305.1), a new major facility with maximum annual pollutant emissions in excess of any of the trigger levels shown must perform modeling to assess the net air quality impact of the proposed facility.

**Table 4
Maximum Annual Facility Regulated Air Pollutant Emissions**

Pollutant	Permitted Source Emissions ^{a,b} (tons/year)	PSD Trigger ^c (tons/year)
Nitrogen Oxides (as NO ₂)	134.6	100
Carbon Monoxide	389.3	100
Precursor Organic Compounds	28.5	N/A ^d
Particulate Matter (PM ₁₀)	86.8	100
Sulfur Dioxide	12.2	100

- ^a emission increases from proposed gas turbines and heat recovery steam generators, cooling tower and fire pump diesel engine; specified as permit condition limit
- ^b includes start-up and shutdown emissions for gas turbines
- ^c for a new major facility
- ^d there is no PSD requirement for POC since the BAAQMD is designated as nonattainment for the federal 1-hour ambient air quality standard for ozone

The sulfuric acid mist (H₂SO₄) emissions will be conditioned to be less than the PSD threshold of 7 tons per year. The applicant has accepted an enforceable permit condition (Number 25) limiting sulfuric acid mist from the new combustion units to a level below the PSD trigger level. Compliance will be determined by use of emission factors (using fuel gas rate and sulfur content as input parameters) derived from quarterly compliance source tests. The quarterly source test will be conducted, as indicated in Condition number 34, to measure SO₂, SO₃, H₂SO₄ and ammonium sulfates. This approach is necessary because the conversion in turbines of fuel sulfur to SO₃, and then to H₂SO₄ is not well established.

IV Statement of Compliance

The following section summarizes the applicable District Rules and Regulations and describes how the proposed Russell City Energy Center will comply with those requirements.

A. Regulation 2, Rule 2; New Source Review

The primary requirements of New Source Review that apply to the proposed RCEC facility are Section 2-2-301; "Best Available Control Technology Requirement", Section 2-2-302; "Offset Requirements, Precursor Organic Compounds and Nitrogen Oxides, NSR", and Section 2-2-404, "PSD Air Quality Analysis".

1. Best Available Control Technology (BACT) Determinations

Pursuant to Regulation 2-2-206, BACT is defined as the more stringent of:

- (a) "The most effective control device or technique which has been successfully utilized for the type of equipment comprising such a source; or
- (b) The most stringent emission limitation achieved by an emission control device or technique for the type of equipment comprising such a source: or
- (c) Any emission control device or technique determined to be technologically feasible and cost-effective by the APCO, or
- (d) The most effective emission control limitation for the type of equipment comprising such a source which the EPA states, prior to or during the public comment period, is contained in an approved implementation plan of any state, unless the applicant demonstrates to the satisfaction of the APCO that such limitations are not achievable. Under no circumstances shall the emission control required be less stringent than the emission control required by any applicable provision of federal, state or District laws, rules or regulations."

The type of BACT described in definitions (a) and (b) must have been demonstrated in practice and approved by a local Air Pollution Control District, CARB, or the EPA and is referred to as "BACT 2". This type of BACT is termed "achieved in practice". The BACT category described

in definition (c) is referred to as "technologically feasible/cost-effective" and it must be commercially available, demonstrated to be effective and reliable on a full-scale unit, and shown to be cost-effective on the basis of dollars per ton of pollutant abated. This is referred to as "BACT 1". BACT specifications (for both the "achieved in practice" and "technologically feasible/cost-effective" categories) for various source categories have been compiled in the BAAQMD BACT Guideline.

Gas Turbines and HRSGs

The following section includes BACT determinations by pollutant for the gas turbines and HRSG duct burners of the proposed RCEC Project. Because each Gas Turbine and its associated HRSG will exhaust through a common stack and be subject to combined emission limitations, the BACT determinations will, in practice, apply to each Gas Turbine/HRSG power train as a combined unit.

Nitrogen Oxides (NO_x)

- **Combustion Gas Turbines**

District BACT Guideline 89.1.6 specifies BACT 1 (technologically feasible/cost-effective) for NO_x for a combined cycle gas turbine with a rated output ≥ 40 MW as 2.0 ppmvd @ 15% O₂ averaged over one hour, typically achieved through the use of Selective Catalytic Reduction (SCR) with ammonia injection in conjunction with dry low-NO_x combustors. The EPA has accepted this BACT determination as Federal LAER. This BACT determination has been imposed on recent BAAQMD permits issued for : East Altamont Energy Center (Application #2589), and Pico Power Project (Application #6481). In addition, Palomar Energy Project located in San Diego County, a 546 MW combined cycle power plant, recently started up (4/1/06) with a NO_x emission requirement of 2.0 ppmvd, @ 15% O₂, averaged over one hour.

A NO_x emission concentration of 2.0 ppmvd, @ 15% O₂, averaged over one hour, has been established as "achieved-in-practice" BACT for NO_x based upon our review of CEM data for the ANP Blackstone power plant, a nominal 550-MW combined cycle facility. The ANP Blackstone power plant is located in Blackstone, Massachusetts and consists of two ABB GT-4 Gas Turbines rated at 180-MW each with unfired heat recovery steam generators. We reviewed CEM data for approximately 2,313 firing hours for unit 1 and 2,737 firing hours for unit 2 which occurred from April 2001 to April 2002. With the exception of start-up and shutdown periods, the NO_x concentrations were below the 2.0 ppmvd limit by a sufficient margin to demonstrate consistent, continuous compliance.

In accordance with design criteria specified by the applicant, each combustion gas turbine is designed to meet a NO_x emission concentration limit of 2.0 ppmvd NO_x @ 15% O₂, averaged over one hour during all operating modes except gas turbine start-ups and shutdowns. This meets the current District BACT 1 determination and meets or exceeds the current EPA and ARB BACT determinations for NO_x. Compliance with this emission limitation will be achieved through the use of dry low-NO_x combustors which utilize "lean-premixed"

combustion technology to reduce the formation of NO_x and CO. The NO_x emissions from the turbine and HRSG will be abated through the use of a selective catalytic reduction (SCR) system with ammonia injection. The NO_x emission concentration will be verified by a CEM (continuous emissions monitor) located at the common stack for each gas turbine/HRSG power train.

- Heat Recovery Steam Generators (HRSGs)

Supplemental heat will be supplied to the HRSGs with low-NO_x duct burners, which are designed to minimize NO_x emissions. The duct burner exhaust gases will also be abated by the SCR system with ammonia injection and when combined with the gas turbine exhaust, will achieve NO_x emission concentrations of less than or equal to 2.0 ppmvd @ 15% O₂, averaged over one hour.

Top-Down BACT Analysis

The following “top-down” BACT analysis for NO_x has been prepared in accordance with EPA’s 1990 Draft New Source Review Workshop Manual. A “top-down” BACT analysis takes into account energy, environmental, economic, and other costs associated with each alternative technology, and the benefit of reduced emissions that the technology would bring. Although this analysis is based upon a controlled NO_x emission concentration of 2.5 ppmv instead of the applicable NO_x emission rate of 2.0 ppmv, the District has determined that the conclusions of the analysis are applicable to this project.

Available Control Options and Technical Feasibility

In a March 24, 2000 letter sent to local air pollution control districts, EPA Region 9 stated that the SCONO_x Catalytic Adsorption System should be included in any BACT/LAER analysis for combined cycle gas turbine power plant projects since it can achieve the BACT/LAER emission specification for NO_x of 2.5 ppmvd @ 15% O₂, averaged over one hour or 2.0 ppmvd @ 15% O₂, averaged over three hours. In this letter, EPA stated that ABB Alstom Power, the exclusive licensee for SCONO_x applications, has conducted “full-scale damper testing” that demonstrates that SCONO_x is technically feasible for gas turbines of the size proposed for the RCEC Project. Stone & Webster Management Consultants, Inc. of Denver, Colorado was subsequently hired by ABB to conduct an independent technical review of the SCONO_x technology as well as the full-scale damper testing program. According to the report by Stone & Webster, modifications to the actuators, fiberglass seals, and louver shaft-seal interface are being incorporated to resolve unacceptable reliability and leakage problems. However, no subsequent testing of the redesigned components has occurred to determine if the problems have been solved. Because the feasibility of the “scale-up” of the SCONO_x system for large turbines has not been demonstrated and because the selected control technology, SCR, has been demonstrated in practice to achieve NO_x emission concentrations of less than 2 ppmv, averaged over one hour, we do not consider SCONO_x to be a viable control alternative for NO_x.

Although we do not consider SCONO_x to be a technically feasible control alternative for this project, we have analyzed the collateral impacts of both SCR and SCONO_x. We are providing

the following analysis for informational purposes only. The analysis shown in Table 5 applies to a single GE Frame 7FA Gas Turbine equipped with DLN combustors and a NO_x emission rate of 25 ppmvd @ 15% O₂.

Table 5 Top-Down BACT Analysis Summary for NO_x

Control Alternative	Emissions ^a (ton/yr)	Emission Reduction ^b (ton/yr)	Total Annualized Cost ^c (\$/yr)	Average Cost-Effectiveness (\$/ton)	Incremental Cost-Effectiveness (\$/ton)	Toxic Impacts	Adverse Environmental Impacts	Incremental Energy Impact (MM BTU/yr)
SCONO _x	788	709	4,122,889	5,815	N/A ^d	No	No	122,000 ^e
SCR	788	709	1,557,125	2,196	-	Yes	No	67,900 ^e

^a based upon uncontrolled NO_x emission rate of 25 ppmvd @ 15% O₂, and annual firing rate of 17,436,780 MM BTU/yr

^b based upon NO_x emission rate after abatement of 2.5 ppmvd @ 15% O₂, and annual firing rate of 17,436,780 MM BTU/yr

^c "Cost Analysis for NO_x Control Alternatives for Stationary Gas Turbines", ONSITE SYCOM Energy Corporation, October 15, 1999

^d does not apply since there is no difference in emission reduction quantity between alternatives

^e "Towantic Energy Project Revised BACT Analysis", RW Beck, February 18, 2000; based upon increased fuel use to overcome catalyst bed back pressure

Energy Impacts

As shown in Table 5, the use of SCR does not result in any significant or unusual energy penalties or benefits when compared to SCONO_x. Although the operation and maintenance of SCONO_x does result in a greater energy penalty when compared to that of SCR, this is not considered significant enough to eliminate SCONO_x as a control alternative.

Economic Impacts

According to EPA's 1990 Draft New Source Review Workshop Manual, "Average and incremental cost effectiveness are the two economic criteria that are considered in the BACT analysis."

As shown in Table 5, the average cost-effectiveness of both SCR and SCONO_x meet the current District cost-effectiveness guideline of \$17,500 per ton of NO_x abated. However, the average cost-effectiveness of SCR is approximately 38% of the average cost-effectiveness of SCONO_x. These figures are based upon total annualized cost figures from a cost analysis conducted by ONSITE SYCOM Energy Corporation. Although SCONO_x will result in greater economic impact as quantified by average cost-effectiveness, this impact is not considered adverse enough to eliminate SCONO_x as a control alternative. See Appendix F for ONSITE SYCOM cost-effectiveness calculations.

Incremental cost-effectiveness does not apply since SCR and SCNO_x both achieve the current BACT/LAER standard for NO_x of 2.5 ppmvd @ 15% O₂, averaged over one hour and therefore achieve the same NO_x emission reduction in tons per year.

Environmental Impacts

The use of SCR will result in ammonia emissions due to an allowable ammonia slip limit of 5 ppmvd @ 15% O₂. A health risk assessment using air dispersion modeling showed an acute hazard index of 0.024 and a chronic hazard index of 0.007 resulting from the emission of all non-carcinogenic compounds, including ammonia, from the gas turbines. In accordance with the District Regulation 2, Rule 5 and currently accepted practice, a hazard index of 1.0 or above is considered significant. Therefore, the toxic impact of the ammonia slip resulting from the use of SCR is deemed to be not significant and is not a sufficient reason to eliminate SCR as a control alternative.

The ammonia emissions resulting from the use of SCR may have another environmental impact through its potential to form secondary particulate matter such as ammonium nitrate. Because of the complex nature of the chemical reactions and dynamics involved in the formation of secondary particulates, it is difficult to estimate the amount of secondary particulate matter that will be formed from the emission of a given amount of ammonia. However, it is the opinion of the Research and Modeling section of the BAAQMD Planning Division that the formation of ammonium nitrate in the Bay Area air basin is limited by the formation of nitric acid and not driven by the amount of ammonia in the atmosphere. Therefore, ammonia emissions from the proposed SCR system are not expected to contribute significantly to the formation of secondary particulate matter within the BAAQMD. The potential impact on the formation of secondary particulate matter in the SJVAPCD is not known. This potential environmental impact is not considered adverse enough to justify the elimination of SCR as a control alternative.

A second potential environmental impact that may result from the use of SCR involves the storage and transport of ammonia. Although ammonia is toxic if swallowed or inhaled and can irritate or burn the skin, eyes, nose, or throat, it is a commonly used material that is typically handled safely and without incident. The RCEC will utilize aqueous ammonia in a 19% (by weight) solution. Consequently, the RCEC will be required to maintain a Risk Management Plan (RMP) and implement a Risk Management Program to prevent accidental releases of ammonia. The RMP provides information on the hazards of the substance handled at the facility and the programs in place to prevent and respond to accidental releases. The accident prevention and emergency response requirements reflect existing safety regulations and sound industry safety codes and standards. In addition, the CEC has modeled the health impacts arising from a catastrophic release of aqueous ammonia due to spontaneous storage tank failure at the proposed RCEC facility and found that the impact would not be significant. Therefore, the potential environmental impact due to aqueous ammonia storage at the RCEC does not justify the elimination of SCR as a control alternative.

The use of SCNO_x will require approximately 360,000 gallons of water per year for catalyst cleaning. This environmental impact does not justify the elimination of SCNO_x as a control alternative.

Conclusion

Both SCR and SCONO_x can achieve the current accepted BACT/LAER specification for NO_x without causing significant energy, economic, or environmental impacts. Thus, neither can be eliminated as a viable control alternative. The only aspect of this analysis affected by the current NO_x BACT standard of 2.0 ppmvd @ 15% O₂, averaged over one hour is the cost of compliance. The increased cost of control for each technology is not expected to affect the conclusion of this analysis. Therefore, the applicant's proposed use of SCR to meet the NO_x BACT/LAER specification is acceptable.

Carbon Monoxide (CO)

BACT for CO will be analyzed within the context of two distinct operating modes for each gas turbine/HRSG power train. The first mode is firing of the gas turbine only over its entire operating range from minimum to maximum load. The second mode includes gas turbine firing at maximum load with HRSG duct burner firing.

- Combustion Gas Turbines and Heat Recovery Steam Generators (HRSGs)

District BACT Guideline 89.1.6 specifies BACT 2 (achieved in practice) for CO for combined cycle gas turbines with a rated output of ≥ 50 MW as a CO emission concentration of ≤ 4.0 ppmvd @ 15% O₂. This BACT specification is based upon the Sacramento Power Authority (Campbell Soup facility) located in Sacramento County, California. BACT 1 (technologically feasible/cost-effective) is currently not specified. This emission rate limit applies to all operating modes except gas turbine start-up and shutdown.

The applicant has agreed to a CO emission limit of 4.0 ppmvd @ 15% O₂, averaged over any rolling 3-hour period. This satisfies the current BACT 2 limitation as discussed above. Compliance with this emission limitation will be achieved through the use of dry low-NO_x combustors which utilize "lean-premixed" combustion technology to reduce the formation of NO_x and CO. CO emissions from the turbine and HRSG will be abated through the use of an oxidation catalyst. The CO emission concentration will be verified by a CEM located at the common stack for each gas turbine/HRSG power train.

Precursor Organic Compounds (POCs)

- Combustion Gas Turbines

There currently is no BACT 1 (technologically feasible/cost-effective) specification for POC for this source category. Currently, District BACT Guideline 89.1.6 specifies BACT 2 (achieved in practice) for POC for combined cycle gas turbines with an output rating ≥ 50 MW as 2 ppmv, dry @ 15% O₂, which is typically achieved through the use of dry-low NO_x combustors and/or an oxidation catalyst. This is based upon the Delta Energy Center and Metcalf Energy Center, which were recently permitted at a POC emission limit of 2 ppmvd @ 15% O₂.

The applicant has proposed to not exceed a POC stack concentration of 1 ppmvd @ 15% O₂ with the use of dry-low NO_x combustors and/or an oxidation catalyst. Thus the RCEC satisfies the BACT requirement for POC emissions.

- Heat Recovery Steam Generators (HRSGs)

The HRSG duct burners will be of low-NO_x design, which minimizes incomplete combustion and therefore the POC emission rate. Each gas turbine/HRSG pair will achieve this emission limitation through the use of dry low-NO_x burners, good combustion practices and an oxidation catalyst.

Sulfur Dioxide (SO₂)

- Combustion Gas Turbines

District BACT Guideline 89.1.6 specifies BACT 2 (achieved in practice) for SO₂ for combined cycle gas turbines with an output rating of ≥ 50 MW as the exclusive use of clean-burning natural gas with a sulfur content of ≤ 1.0 grains per 100 scf. The proposed turbines will burn exclusively PUC-regulated natural gas with an expected average sulfur content of 0.25 grains per 100 scf, which will result in minimal SO₂ emissions. This corresponds to an SO₂ emission factor of 0.0007 lb/MM BTU. This meets the current BACT 2 specification for SO₂.

- Heat Recovery Steam Generators (HRSGs)

As is the case of the Gas Turbines, BACT for SO₂ for the HRSG duct burners is deemed to be the exclusive use of clean-burning natural gas with a sulfur content of ≤ 1.0 grains per 100 scf. The HRSGs will burn exclusively PUC-regulated natural gas with an average natural gas sulfur content of 0.25 grains per 100 scf. This corresponds to an SO₂ emission factor of 0.0007 lb/MM BTU. This meets the current BACT 2 specification for SO₂.

Particulate Matter (PM₁₀)

- Combustion Gas Turbines

District BACT Guideline 89.1.6 specifies BACT for PM₁₀ for combined cycle gas turbines with rated output of ≥ 50 MW as the exclusive use of clean-burning natural gas with a maximum sulfur content of ≤ 1.0 grains per 100 scf. The proposed turbines will utilize exclusively PUC-regulated natural gas with an average sulfur content of 0.25 gr/100 scf, which will result in minimal direct PM₁₀ emissions and minimal formation of secondary PM₁₀ such as ammonium sulfate.

- Heat Recovery Steam Generators (HRSGs)

BACT for PM₁₀ for the HRSG duct burners is deemed to be the exclusive use of clean-burning natural gas with a maximum sulfur content of ≤ 1.0 grains per 100 scf. The HRSGs will burn exclusively PUC-regulated natural gas with an average natural gas sulfur content of 0.25 grains per 100 scf which will result in minimal direct PM₁₀ emissions and minimal formation of secondary PM₁₀ such as ammonium sulfate.

- **Cooling Towers**

The BAAQMD BACT/TBACT workbook does not specify BACT for PM₁₀ for wet cooling towers. However, the ARB BACT Clearinghouse cites a BACT specification for PM₁₀ for the proposed La Paloma power plant cooling tower as the use of drift eliminators with a maximum drift rate of 0.0006%. The cooling towers for the Los Medanos Energy Center, Delta Energy Center, and Metcalf Energy Center are equipped with drift eliminators with a guaranteed drift rate of 0.0005%.

The proposed Cooling Towers will also be equipped with drift eliminators with a drift rate of 0.0005%. This meets BACT for PM₁₀.

Fire Pump Diesel Engine

Based upon 24 hour per day operation under emergency conditions, the proposed fire pump diesel engine triggers BACT for NO_x, POC, and CO, since its potential to emit for each of those pollutants exceeds 10 pounds per day. The current District BACT limits and the specifications for the proposed engine are summarized in Table 6. The applicant will be required by permit conditions to select and install an engine that satisfies BACT for all pollutants listed.

Table 6 District BACT Limits and Proposed Fire Pump Diesel Engine Specifications

Pollutant	District BACT Specifications^a (g/bhp-hr)	S-6 Engine^b Specifications (g/bhp-hr)
NO _x (as NO ₂)	6.9	4.27
CO	2.75	0.33
POC	1.5	0.32
SO ₂	Ultra-Low Sulfur Oil	0.005 ^c
PM ₁₀	Ultra-Low Sulfur Oil	0.12 ^c

^a BACT 2 (“achieved in practice”) per District BACT Guideline 96.1.2, “IC Engine – Compression Ignition ≥ 175 hp output rating”

^b emission rates specified by applicant

^c permit conditions will require the use of ultra-low sulfur oil (15 ppm by weight) at S-6 engine

2. Emission Offsets

General Requirements

Pursuant to Regulation 2-2-302, federally enforceable emission offsets are required for POC and NO_x (as NO₂) emission increases from permitted sources at facilities which will emit 15 tons per year or more on a pollutant-specific basis. For facilities that will emit more than 35 tons per year of NO_x (as NO₂), offsets must be provided by the applicant at a ratio of 1.15 to 1.0. Pursuant to Regulation 2-2-302.2, POC offsets may be used to offset emission increases of NO_x.

It should be noted that in the case of POC and NO_x offsets, District regulations do not require consideration of the location of the source of the emission reduction credits relative to the location of the proposed emission increases that will be offset.

Timing for Provision of Offsets

Pursuant to District Regulation 2-2-311, the applicant surrendered the required valid emission reduction credits to mitigate the emission increases for the facility prior to the issuance of the Authority to Construct on May 14, 2003. Pursuant to District Regulation 2, Rule 3, "Power Plants," the Authority to Construct was issued after the California Energy Commission issued the Certificate for the proposed power plant.

Offset Requirements by Pollutant

The applicable offset ratios and the quantity of offsets required are summarized in Appendix C, Table C-1.

POC Offsets

Because the RCEC will emit less than 35 tons of POC per year, the POC emissions were offset at a ratio of 1.0 to 1.0 pursuant to District Regulation 2-2-302.

NO_x Offsets

Because the RCEC will emit greater than 35 tons per year of Nitrogen Oxides (NO_x) from permitted sources, the applicant provided emission reduction credits (ERCs) of NO_x at a ratio of 1.15 to 1.0 pursuant to District Regulation 2-2-302. Pursuant to District Regulation, 2-2-302.2, the applicant provided POC ERCs to offset the proposed NO_x emission increases at a ratio of 1.15 to 1.0.

PM₁₀ Offsets

Because the total PM₁₀ emissions from permitted sources will not exceed 100 tons per year, the RCEC does not trigger the PM₁₀ offset requirement of District Regulation 2-2-303.

SO₂ Offsets

Pursuant to Regulation 2-2-303, emission reduction credits are not required for the proposed SO₂ emission increases associated with this project since the facility SO₂ emissions will not exceed 100 tons per year. Regulation 2-2-303 allows for the voluntary offsetting of SO₂ emission

increases of less than 100 tons per year. The applicant has opted not to provide such emission offsets.

Offset Package

Table 7 summarizes the offset obligation of the RCEC. The emission reduction credits presented in Table 8 exist as federally-enforceable, banked emission reduction credits that have been reviewed for compliance with District Regulation 2, Rule 4, “Emissions Banking”, and were subsequently issued as banking certificates by the BAAQMD under the applications cited in the table footnotes. If the quantity of offsets issued under any certificate exceeded 35 tons per year for any pollutant, the application was required to fulfill the public notice and public comment requirements of District Regulation 2-4-405. Accordingly, such applications were reviewed by the California Air Resources Board, U.S. EPA, and adjacent air pollution control districts to insure that all applicable federal, state, and local regulations were satisfied.

As indicated below, Calpine has surrendered valid emission reduction credits to offset the emission increases from the permitted sources proposed for the RCEC project.

Table 7 Emission Reduction Credits Surrendered for RCEC (ton/yr)

Valid Emission Reduction Credits	POC	NO _x
Banking Certificate #, Owner ^a		
855, Calpine		53.11
815, Calpine	80.325	49.864
Total ERC's Identified	80.325	102.974
Permitted Source Emission Limits	28.5	134.6
Offsets Required per BAAQMD Regulations	28.5	154.80
Outstanding Offset Balance	+51.825^b	-51.825^b

^a These Banking Certificates originated from the following locations:

Certificate	Company	Location	Original Issue Date	Original Cert.
#855	PG&E	San Francisco	9/30/85	#14 [*]
#815	Pacific Refining	Hercules	1/19/01	#558 ^{**}

^{*} Certificate #14 (#671) was generated by the shutdown of Potrero Units 1&2 (Boilers S-3, S-4, S-5; B&W 500,000 pounds per hour) at the Potrero Power Plant facility.

^{**} Certificate #558 (#728) was generated by the closure of the Pacific Refining Company in Hercules. The credits resulted from the shutdown of process heaters (S-3,4,5,6,8,9,10,12,13) and a safety flare (S-76).

^b surplus POC credits used to offset NO_x emission increases per District Regulation 2-2-302.2

3. PSD Air Quality Impact Analysis

Pursuant to BAAQMD Regulation 2-2-414.1, the applicant has submitted a modeling analysis that adequately estimates the air quality impacts of the RCEC project. The applicant’s analysis

was based on EPA-approved models and was performed in accordance with District Regulation 2-2-414.

Pursuant to Regulation 2-2-414.2, the District has found that the modeling analysis has demonstrated that the allowable emission increases from the RCEC facility, in conjunction with all other applicable emissions, will not cause or contribute to a violation of applicable ambient air quality standards for NO₂, CO, and PM₁₀ or an exceedance of any applicable PSD increment.

Pursuant to Regulation 2-2-417, the applicant has submitted an analysis of the impact of the proposed source and source-related growth on visibility, soils, and vegetation. The entire PSD air quality impact analysis is contained in Appendix E.

Pursuant to Regulation 2-2-306, a non-criteria pollutant PSD analysis is required for sulfuric acid mist emissions if the proposed facility will emit H₂SO₄ at rates in excess of 38 lb/day and 7 tons per year. However, RCEC has agreed to permit conditions limiting total facility H₂SO₄ emissions to 7 tons per year and requiring annual source testing to determine SO₂, SO₃, and H₂SO₄ emissions. If the total facility emissions ever exceed 7 tons per year, then the applicant must utilize air dispersion modeling to determine the impact (in µg/m³) of the sulfuric acid mist emissions.

Table 8 Maximum Predicted Ambient Impacts of Proposed RCEC (µg/m³)
[maximums are in bold type]

Pollutant	Averaging Time	Commissioning Maximum Impact	Start-up	Inversion Break-up Fumigation Impact	Shoreline Fumigation Impact	ISCST3 Modeled Impact	Significant Air Quality Impact Level
NO ₂	1-hour	119.2	77	9.5	62.4	226.8	19
	annual	—	—	—	—	0.14	1.0
CO	1-hour	1977	1069	6.5	36.5	134.7	2000
	8-hour	348	178	—	—	5.7	500
PM ₁₀	24-hour	—	—	2.9	3.2	2.94	5
	annual	—	—	—	—	0.15	1

Because the maximum modeled project impacts for annual average NO₂, 1-hour & 8-hour average CO, and 24-hour & annual average PM₁₀ did not exceed their corresponding significance levels for air quality impacts per Regulation 2-2-233, further analysis to determine if the corresponding ambient air quality standards will be exceeded per District regulation 2-2-414 is not required. Table 9 summarizes the applicable ambient air quality standards, the maximum background concentrations, and the contribution from the proposed RCEC for the NO₂ 1-hour impact that exceeds the significance level. As shown in Table 9, the worst-case NO_x emissions from RCEC will not cause or contribute to an exceedance of the California ambient air quality standard for 1-hour NO₂.

Table 9
Applicable California and National Ambient Air Quality Standards (AAQS)
and
Ambient Air Quality Levels from the Proposed RCEC (µg/m³)

Pollutant	Averaging Time	Maximum Background	Maximum Project Impact	Maximum Project impact plus maximum background	California Standards	National Standards
NO ₂	1-hour	143	227	370	470	---

B. Health Risk Assessment

Pursuant to the BAAQMD Risk Management Policy, a health risk screening must be conducted to determine the potential impact on public health resulting from the worst-case emissions of toxic air contaminants (TACs) from the RCEC project. The potential TAC emissions (both carcinogenic and non-carcinogenic) from the RCEC are summarized in Table 2. In accordance with the requirements of the BAAQMD Regulation 2-5 and CAPCOA guidelines, the impact on public health due to the emission of these compounds was assessed utilizing approved air pollutant dispersion models.

Table 10 Health Risk Assessment Results

Receptor	Cancer Risk (risk in one million)	Chronic Non-Cancer Hazard Index (risk in one million)	Acute Non-Cancer Hazard Index (risk in one million)
Maximally Exposed Individual	0.7	0.007	0.024
Resident	≤ 0.7	≤ 0.007	≤ 0.024
Worker	≤ 0.7	≤ 0.007	≤ 0.024

The health risk assessment performed by the applicant has been reviewed by the District Toxics Evaluation Section and found to be in accordance with guidelines adopted by Cal/EPA's Office of Environmental Health Hazard Assessment (OEHHA), the California Air Resources Board (CARB), and the California Air Pollution Control Officers Association (CAPCOA). Pursuant to BAAQMD Regulation 2-5, the increased carcinogenic risk attributed to this project is considered to be not significant since it is less than 1.0 in one million. The chronic hazard index and the acute hazard index attributed to the emission of non-carcinogenic air contaminants is each considered to be not significant since each is less than 1.0. Therefore, the RCEC facility is deemed to be in compliance with BAAQMD Regulation 2-5. Please see Appendix D for further discussion.

C. Other Applicable District Rules and Regulations

Regulation 1, Section 301: Public Nuisance

None of the project's proposed sources of air contaminants are expected to cause injury, detriment, nuisance, or annoyance to any considerable number of persons or the public with respect to any impacts resulting from the emission of air contaminants regulated by the District. In part, the PSD air quality impact analysis insures that the proposed facility will comply with this Regulation by concluding that the Russell City Energy Center will not interfere with the attainment or maintenance of applicable federal or state health-based ambient air quality standards for NO₂, CO and PM₁₀.

Regulation 2, Rule 1, Sections 301 and 302: Authority to Construct and Permit to Operate

Pursuant to Regulation 2-1-301 and 2-1-302, the RCEC has submitted an application to the District to obtain an Authority to Construct and Permit to Operate for the proposed S-1 & S-3 Gas Turbines, S-2 & S-4 Heat Recovery Steam Generators, S-5 Cooling Tower and S-6 Fire Pump Diesel Engine.

Regulation 2, Rule 1, Sections 426: CEQA-Related Information Requirements

As the lead agency under CEQA for the proposed RCEC Project, the California Energy Commission (CEC) will satisfy the CEQA requirements of Regulation 2-1-426.2.1 by producing their Final Certification which serves as an EIR-equivalent pursuant to the CEC's CEQA-certified regulatory program in accordance with CEQA Guidelines Section 15253(b) and Public Resource Code Sections 21080.5 and 25523.

Regulation 2, Rule 3: Power Plants

Pursuant to Regulation 2-3-405, this Preliminary Determination of Compliance (PDOC) serves as the APCO's Preliminary determination that the proposed power plant will meet the requirements of all applicable BAAQMD, state, and federal regulations. The PDOC contains proposed permit conditions to ensure compliance with those regulations. Pursuant to Regulation 2-3-404, this PDOC is subject to the public notice, public comment, and public inspection requirements contained in Regulation 2-2-406 and 407. The Authority to Construct, when issued by the District, will be the PSD permit for the RCEC.

Regulation 2, Rule 5: New Source Review of Toxic Air Contaminants

A risk screening analysis was performed to estimate the health risk resulting from the toxic air contaminant (TAC) emissions from the RCEC. Results from this analysis indicate that the maximally exposed individual cancer risk is estimated at 0.7 in a million, the chronic non-cancer hazard index at 0.007 in a million, and acute non-cancer hazard index at 0.024 in million. Therefore the RCEC will be in compliance the requirements of Regulation 2-5-301. Furthermore, the proposed controls are considered to be toxic best available control technology (TBACT).

Regulation 2, Rule 6: Major Facility Review

Pursuant to Regulation 2, Rule 6, section 404.1, the owner/operator of the RCEC shall submit an application to the BAAQMD for a major facility review permit within 12 months after the facility becomes subject to Regulation 2, Rule 6. Pursuant to Regulation 2-6-212.1 and 2-6-218,

the RCEC will become subject to Regulation 2, Rule 6 upon completion of construction as demonstrated by first firing of the gas turbines.

Regulation 2, Rule 7: Acid Rain

The RCEC gas turbine units and heat recovery steam generators will be subject to the requirements of Title IV of the federal Clean Air Act. The requirements of the Acid Rain Program are outlined in 40 CFR Part 72. The specifications for the type and operation of continuous emission monitors (CEMs) for pollutants that contribute to the formation of acid rain are given in 40 CFR Part 75. District Regulation 2, Rule 7 incorporates by reference the provisions of 40 CFR Part 72. Pursuant to 40 CFR Part 72.30(b)(2)(ii), RCEC must submit an Acid Rain Permit Application to the District at least 24 months prior to the date on which each unit commences operation. Pursuant to 40 CFR Part 72.2, "commence operation" includes the start-up of the unit's combustion chamber.

Regulation 6: Particulate Matter and Visible Emissions

Through the use of dry low-NO_x burner technology and proper combustion practices, the combustion of natural gas at the proposed gas turbines, HRSG duct burners, auxiliary boiler, and emergency generator set is not expected to result in visible emissions. Specifically, the facility's combustion sources are expected to comply with Regulation 6, including sections 301 (Ringelmann No. 1 Limitation), 302 (Opacity Limitation) with visible emissions not to exceed 20% opacity, and 310 (Particulate Weight Limitation) with particulate matter emissions of less than 0.15 grains per dry standard cubic foot of exhaust gas volume. As calculated in accordance with Regulation 6-310.3, the grain loading resulting from the simultaneous operation of each power train (Gas Turbine and HRSG Duct Burners) is 0.0032 gr/dscf @ 6% O₂. See Appendix A for CTG/HRSG grain loading calculations.

With a maximum total dissolved solids content of 8,000 mg/l and corresponding maximum PM₁₀ emission rate of 2.83 lb/hr, the proposed 9-cell cooling tower is expected to comply with the requirements of Regulation 6.

Particulate matter emissions associated with the construction of the facility are exempt from District permit requirements but are subject to Regulation 6. It is expected that the conditions of certification imposed by the California Energy Commission will include requirements for construction activities that will require the use of water and/or chemical dust suppressants to minimize PM₁₀ emissions and prevent visible particulate emissions.

Regulation 7: Odorous Substances

Regulation 7-302 prohibits the discharge of odorous substances which remain odorous beyond the facility property line after dilution with four parts odor-free air. Regulation 7-302 limits ammonia emissions to 5000 ppm. Because the ammonia slip emissions from the proposed

CTG/HRSG power trains will each be limited by permit condition to 5 ppmvd @ 15% O₂, the facility is expected to comply with the requirements of Regulation 7.

Regulation 8: Organic Compounds

The gas turbines and HRSG duct burners are exempt from Regulation 8, Rule 2, "Miscellaneous Operations" per 8-2-110 since natural gas will be fired exclusively at those sources. The fire pump diesel engine will comply with Regulation 8-2-301 since its emissions will contain a total carbon concentration of less than 300 ppmv, dry.

The use of solvents for cleaning and maintenance at the RCEC is expected to comply with Regulation 8, Rule 4, "General Solvent and Surface Coating Operations" section 302.1 by emitting less than 5 tons per year of volatile organic compounds.

Regulation 9: Inorganic Gaseous Pollutants

Regulation 9, Rule 1, Sulfur Dioxide

This regulation establishes emission limits for sulfur dioxide from all sources and applies to the combustion sources at this facility. Section 301 (Limitations on Ground Level Concentrations) prohibits emissions which would result in ground level SO₂ concentrations in excess of 0.5 ppm continuously for 3 consecutive minutes, 0.25 ppm averaged over 60 consecutive minutes, or 0.05 ppm averaged over 24 hours. Section 302 (General Emission Limitation) prohibits SO₂ emissions in excess of 300 ppmv (dry). With maximum projected SO₂ emissions of < 1 ppmv, the gas turbines, HRSG duct burners, and firepimp engine are not expected to cause ground level SO₂ concentrations in excess of the limits specified in Regulation 9-1-301 and should easily comply with section 302.

Regulation 9, Rule 3, Nitrogen Oxides from Heat Transfer Operations

The proposed combustion gas turbines (each rated at 2038.6 MM BTU/hr, HHV) and HRSG duct burners (each rated at 200 MM BTU/hr, HHV) shall comply with the Regulation 9-3-303 NO_x limit of 125 ppm by complying with a permit condition nitrogen oxide emission limit of 2.0 ppmvd @ 15% O₂. The proposed fire pump diesel engine is not subject to this regulation since it has a maximum heat input rating of approximately 2.02 MM BTU/hr, based upon a maximum rated output of 300 bhp.

Regulation 9, Rule 7, Nitrogen Oxides and Carbon Monoxide from Industrial, Institutional, and Commercial Boilers, Steam Generators, and Process Heaters

The proposed S-2 & S-4 HRSGs are subject to the emission concentration limits of Regulation 9, Rule 7, section 301 which limits NO_x emissions to 30 ppmv, dry @ 3% O₂ and CO emissions to 400 ppmv, dry @ 3% O₂. To determine if the HRSG duct burners comply with these NO_x emission limits, it would be necessary to install a NO_x CEM upstream of the HRSG duct burners since the HRSGs and turbines exhaust through a common stack. Because the combined exhaust from the turbines and HRSGs are subject to a much more stringent BACT limit of 2.0 ppmvd @ 15% O₂, it is reasonable to conclude that the HRSG duct burners comply with the emission limits of Regulation 9, Rule 7. As a practical matter, the HRSG duct burners are therefore subject to Regulation 9, Rule 9.

Regulation 9, Rule 8, Nitrogen Oxides and Carbon Monoxide from Stationary Internal Combustion Engines

The proposed 300 hp fire pump diesel engine is exempt from Sections 301, 302 and 502 of Regulation 9, Rule 8 per Regulation 9-8-110.2, since it will be fired exclusively on diesel fuel. The proposed emergency generator will comply with Regulation 9-8-330 which allows emergency use for unlimited hours, and limits non-emergency use to 50 hours per year.

Regulation 9, Rule 9, Nitrogen Oxides from Stationary Gas Turbines

Because each of the proposed combustion gas turbines will be limited by permit condition to NO_x emissions of 2.0 ppmvd @ 15% O₂, they will comply with the Regulation 9-9-301.3 NO_x limitation of 9 ppmvd @ 15% O₂.

Regulation 10: Standards of Performance for New Stationary Sources

Regulation 10 incorporates by reference the provisions of Title 40 CFR Part 60. The applicable subparts of 40 CFR Part 60 include Subpart A, “General Provisions”, Subpart Da, “Standards of Performance for Electric Utility Steam Generating Units for which Construction is Commenced after September 18, 1978”, Subpart GG “Standards of Performance for Stationary Gas Turbines” and Subpart IIII “Standards of Performance for Stationary Compression Ignition Internal Combustion Engines. The proposed gas turbines and heat recovery steam generators comply with all applicable standards and limits proscribed by these regulations. The applicable emission limitations are summarized below:

Source	Requirement	Emission Limitation	Compliance Verification
Gas Turbines and HRSGs	Subpart Da		
	40 CFR 60.44a(a)(1)	0.2 lb NO _x /MM BTU, except during start-up, shutdown, or malfunction	Sources limited by permit condition to 0.0074 lb/NO _x /MM BTU
	40 CFR 60.44a(a)(2)	25% reduction of potential NO _x emission concentration	SCR Systems will comply with this reduction requirement
	40 CFR 60.44a(d)(1)	1.6 lb NO _x /MW-hr	0.055 lb NO _x /MW-hr at nominal plant rating of 600 MW
	Subpart GG		
	40 CFR 60.332(a)(1)	100 ppmv NO _x , @ 15% O ₂ , dry	Sources limited by permit condition to 2.0 ppmv NO _x @ 15% O ₂ , dry
Firepump Diesel Engine	Subpart IIII		
	40 CFR 60	7.8 nmhc+NO _x , 2.6 CO, 0.40 PM ₁₀ (g/HP-hr) for 2008 and earlier engines	S-6 Firepump Engine will comply with required emission limits. See Table 6.

State Requirements

RCEC is subject to the Air Toxic “Hot Spots” Program contained in the California Health and Safety Code Section 44300 et seq. The facility will prepare inventory plans and reports as required.

The S-6 Firepump Engine is subject to and will be in compliance with the Airborne Toxic Control Measure (ATCM) for Stationary Compression Ignition Engines contained in Title 17 of the California Code of Regulations Section 93115. The allowable operating hours and recordkeeping requirements contained in the ATCM will be included in the Permit Conditions.

V Permit Conditions

The following permit conditions will be imposed to ensure that the proposed project complies with all applicable District, State, and Federal Regulations. The conditions limit operational parameters such as fuel use, stack gas emission concentrations, and mass emission rates. Permit conditions will also specify abatement device operation and performance levels. To aid enforcement efforts, conditions specifying emission monitoring, source testing, and record keeping requirements are included. Furthermore, pollutant mass emission limits (in units of lb/hr and lb/MM BTU of natural gas fired) will insure that daily and annual emission rate limitations are not exceeded.

To provide maximum operational flexibility, no limitations will be imposed on the type, or quantity of gas turbine start-ups or shutdowns. Instead, the facility must comply with daily and annual (consecutive twelve-month) mass emission limits at all times. Compliance with CO and NO_x limitations will be verified by continuous emission monitors (CEMs) that will be in operation during all turbine operating modes, including start-up, shutdown and combustor tuning. If the CO and NO_x CEMs are not capable of accurately assessing gas turbine start-up and shutdown mass emission rates due to variable O₂ content and the differing response times of the O₂ and NO_x monitors, then start-up and shutdown mass emission rates will be based upon annual source test results. Compliance with POC, SO₂, and PM₁₀ mass emission limits will be verified by annual source testing.

In addition to permit conditions that apply to steady-state operation of each CTG/HRSG power train, conditions will be imposed that govern equipment operation during the initial commissioning period when the CTG/HRSG power trains will operate without their SCR systems and/or oxidation catalysts in place. Commissioning activities include, but are not limited to the testing of the gas turbines, adjustment of control systems, and the cleaning of the HRSG steam tubes. Permit conditions 1 through 12 apply to this commissioning period and are intended to minimize emissions during the commissioning period and insure that those emissions will not contribute to the exceedance of any applicable short-term ambient air quality standard.

Russell City Energy Center Permit Conditions

(A) Definitions:

Clock Hour:	Any continuous 60-minute period beginning on the hour
Calendar Day:	Any continuous 24-hour period beginning at 12:00 AM or 0000 hours
Year:	Any consecutive twelve-month period of time

Heat Input:	All heat inputs refer to the heat input at the higher heating value (HHV) of the fuel, in BTU/scf
Rolling 3-hour period:	Any consecutive three-hour period, not including start-up or shutdown periods
Firing Hours:	Period of time during which fuel is flowing to a unit, measured in minutes
MM BTU:	million british thermal units
Gas Turbine Warm and Hot Start-up Mode:	The lesser of the first 180 minutes of continuous fuel flow to the Gas Turbine after fuel flow is initiated or the period of time from Gas Turbine fuel flow initiation until the Gas Turbine achieves two consecutive CEM data points in compliance with the emission concentration limits of conditions 20(b) and 20(d)
Gas Turbine Cold Start-up Mode:	The lesser of the first 360 minutes of continuous fuel flow to the Gas Turbine after fuel flow is initiated or the period of time from Gas Turbine fuel flow initiation until the Gas Turbine achieves two consecutive CEM data points in compliance with the emission concentration limits of conditions 20(b) and 20(d)
Gas Turbine Shutdown Mode:	The lesser of the 30 minute period immediately prior to the termination of fuel flow to the Gas Turbine or the period of time from non-compliance with any requirement listed in Conditions 20(b) through 20(d) until termination of fuel flow to the Gas Turbine
Gas Turbine Combustor: Tuning Mode	The period of time, not to exceed 360 minutes, in which testing, adjustment, tuning, and calibration operations are performed, as recommended by the gas turbine manufacturer, to insure safe and reliable steady-state operation, and to minimize NO _x and CO emissions. The SCR and oxidation catalyst are not operating during the tuning operation.
Gas Turbine Cold Start-up:	A gas turbine start-up that occurs more than 48 hours after a gas turbine shutdown
Gas Turbine Hot Start-up:	A gas turbine start-up that occurs within 8 hours of a gas turbine shutdown
Gas Turbine Warm Start-up:	A gas turbine start-up that occurs between 8 hours and 48 hours of a gas turbine shutdown
Specified PAHs:	The polycyclic aromatic hydrocarbons listed below shall be considered to be Specified PAHs for these permit conditions. Any emission limits for Specified PAHs refer to the sum of the emissions for all six of the following compounds Benzo[a]anthracene Benzo[b]fluoranthene Benzo[k]fluoranthene Benzo[a]pyrene Dibenzo[a,h]anthracene

Indeno[1,2,3-cd]pyrene

- Corrected Concentration: The concentration of any pollutant (generally NO_x, CO, or NH₃) corrected to a standard stack gas oxygen concentration. For emission points P-1 (combined exhaust of S-1 Gas Turbine and S-3 HRSG duct burners), P-2 (combined exhaust of S-2 Gas Turbine and S-4 HRSG duct burners), the standard stack gas oxygen concentration is 15% O₂ by volume on a dry basis
- Commissioning Activities: All testing, adjustment, tuning, and calibration activities recommended by the equipment manufacturers and the RCEC construction contractor to insure safe and reliable steady state operation of the gas turbines, heat recovery steam generators, steam turbine, and associated electrical delivery systems during the commissioning period
- Commissioning Period: The Period shall commence when all mechanical, electrical, and control systems are installed and individual system start-up has been completed, or when a gas turbine is first fired, whichever occurs first. The period shall terminate when the plant has completed performance testing, is available for commercial operation, and has initiated sales to the power exchange.
- Precursor Organic Compounds (POCs): Any compound of carbon, excluding methane, ethane, carbon monoxide, carbon dioxide, carbonic acid, metallic carbides or carbonates, and ammonium carbonate
- CEC CPM: California Energy Commission Compliance Program Manager
- RCEC: Russell City Energy Center

(B) Applicability:

Conditions 1 through 12 shall only apply during the commissioning period as defined above. Unless otherwise indicated, Conditions 13 through 50 shall apply after the commissioning period has ended.

Conditions for the Commissioning Period

1. The owner/operator of the RCEC shall minimize emissions of carbon monoxide and nitrogen oxides from S-1 & S-3 Gas Turbines and S-2 & S-4 Heat Recovery Steam Generators (HRSGs) to the maximum extent possible during the commissioning period.
2. At the earliest feasible opportunity in accordance with the recommendations of the equipment manufacturers and the construction contractor, the owner/operator shall tune the S-1 & S-3 Gas Turbines combustors and S-2 & S-4 Heat Recovery Steam Generators duct burners to minimize the emissions of carbon monoxide and nitrogen oxides.
3. At the earliest feasible opportunity in accordance with the recommendations of the equipment manufacturers and the construction contractor, owner/operator shall install, adjust, and operate the A-2 & A-4 Oxidation Catalysts and A-1 & A-3 SCR Systems to minimize the emissions of

carbon monoxide and nitrogen oxides from S-1 & S-3 Gas Turbines and S-2 & S-4 Heat Recovery Steam Generators.

4. Coincident with the steady-state operation of A-1 & A-3 SCR Systems and A-2 & A-4 Oxidation Catalysts pursuant to conditions 3, 9, 10 (except for S-6), and 11, the owner/operator shall operate the Gas Turbines (S-1 & S-3) and the HRSGs (S-3 & S-4) in such a manner as to comply with the NO_x and CO emission limitations specified in conditions 20(a) through 20(d).
5. The owner/operator of the RCEC shall submit a plan to the District Engineering Division and the CEC CPM at least four weeks prior to first firing of S-1 & S-3 Gas Turbines describing the procedures to be followed during the commissioning of the gas turbines, HRSGs, and steam turbines. The plan shall include a description of each commissioning activity, the anticipated duration of each activity in hours, and the purpose of the activity. The activities described shall include, but not be limited to, the tuning of the Dry-Low-NO_x combustors, the installation and operation of the required emission control systems, the installation, calibration, and testing of the CO and NO_x continuous emission monitors, and any activities requiring the firing of the Gas Turbines (S-1 & S-3) and HRSGs (S-2 & S-4) without abatement by their respective oxidation catalysts and/or SCR Systems. The owner/operator shall not fire any of the Gas Turbines (S-1 or S-3) sooner than 28 days after the District receives the commissioning plan.
6. During the commissioning period, the owner/operator of the RCEC shall demonstrate compliance with conditions 8, 9, 10, and 11 through the use of properly operated and maintained continuous emission monitors and data recorders for the following parameters:
 - firing hours
 - fuel flow rates
 - stack gas nitrogen oxide emission concentrations,
 - stack gas carbon monoxide emission concentrations
 - stack gas oxygen concentrations.

The monitored parameters shall be recorded at least once every 15 minutes (excluding normal calibration periods or when the monitored source is not in operation) for the Gas Turbines (S-1 & S-3), HRSGs (S-2 & S-4). The owner/operator shall use District-approved methods to calculate heat input rates, nitrogen dioxide mass emission rates, carbon monoxide mass emission rates, and NO_x and CO emission concentrations, summarized for each clock hour and each calendar day. The owner/operator shall retain records on site for at least 5 years from the date of entry and make such records available to District personnel upon request.

7. The owner/operator shall install, calibrate, and operate the District-approved continuous monitors specified in condition 6 prior to first firing of the Gas Turbines (S-1 & S-3) and Heat Recovery Steam Generators (S-2 & S-4). After first firing of the turbines, the owner/operator shall adjust the detection range of these continuous emission monitors as necessary to accurately measure the resulting range of CO and NO_x emission concentrations. The type, specifications, and location of these monitors shall be subject to District review and approval.
8. The owner/operator shall not fire the S-1 Gas Turbine and S-2 Heat Recovery Steam Generator without abatement of nitrogen oxide emissions by A-1 SCR System and/or abatement of carbon monoxide emissions by A-2 Oxidation Catalyst for more than 300 hours during the commissioning period. Such operation of S-1 Gas Turbine and S-2 HRSG without abatement shall be limited to discrete commissioning activities that can only be properly executed without the SCR system and/or oxidation catalyst in place. Upon completion of these activities, the owner/operator shall provide written notice to the District Engineering and

Enforcement Divisions and the unused balance of the 300 firing hours without abatement shall expire.

9. The owner/operator shall not fire the S-3 Gas Turbine and S-4 Heat Recovery Steam Generator without abatement of nitrogen oxide emissions by A-3 SCR System and/or abatement of carbon monoxide emissions by A-4 Oxidation Catalyst for more than 300 hours during the commissioning period. Such operation of S-3 Gas Turbine and S-4 HRSG without abatement shall be limited to discrete commissioning activities that can only be properly executed without the SCR system and/or oxidation catalyst in place. Upon completion of these activities, the owner/operator shall provide written notice to the District Engineering and Enforcement Divisions and the unused balance of the 300 firing hours without abatement shall expire.
10. The total mass emissions of nitrogen oxides, carbon monoxide, precursor organic compounds, PM₁₀, and sulfur dioxide that are emitted by the Gas Turbines (S-1 & S-3), Heat Recovery Steam Generators (S-2 & S-4) and S-6 Fire Pump Diesel Engine during the commissioning period shall accrue towards the consecutive twelve-month emission limitations specified in condition 24.
11. The owner/operator shall not operate the Gas Turbines (S-1 & S-3) and Heat Recovery Steam Generators (S-2 & S-4) in a manner such that the combined pollutant emissions from these sources will exceed the following limits during the commissioning period. These emission limits shall include emissions resulting from the start-up and shutdown of the Gas Turbines (S-1 & S-3).

NO _x (as NO ₂)	4,805 pounds per calendar day	400 pounds per hour
CO	20,000 pounds per calendar day	5,000 pounds per hour
POC (as CH ₄)	495 pounds per calendar day	
PM ₁₀	432 pounds per calendar day	
SO ₂	298 pounds per calendar day	
12. No less than 45 days prior to the end of the Commissioning Period, the Owner/Operator shall conduct District and CEC approved source tests using certified continuous emission monitors to determine compliance with the emission limitations specified in condition 20. The source tests shall determine NO_x, CO, and POC emissions during start-up and shutdown of the gas turbines. The POC emissions shall be analyzed for methane and ethane to account for the presence of unburned natural gas. The source test shall include a minimum of three start-up and three shutdown periods and shall include at least one cold start, one warm start, and one hot start. Twenty working days before the execution of the source tests, the Owner/Operator shall submit to the District and the CEC Compliance Program Manager (CPM) a detailed source test plan designed to satisfy the requirements of this condition. The District and the CEC CPM will notify the Owner/Operator of any necessary modifications to the plan within 20 working days of receipt of the plan; otherwise, the plan shall be deemed approved. The Owner/Operator shall incorporate the District and CEC CPM comments into the test plan. The Owner/Operator shall notify the District and the CEC CPM within seven (7) working days prior to the planned source testing date. The owner/operator shall submit the source test results to the District and the CEC CPM within 30 days of the source testing date.

Conditions for the Gas Turbines (S-1 & S-3) and the Heat Recovery Steam Generators (HRSGs; S-2 & S-4)

13. The owner/operator shall fire the Gas Turbines (S-1 & S-3) and HRSG Duct Burners (S-2 & S-4) exclusively on PUC-regulated natural gas with a maximum sulfur content of 1 grain per 100 standard cubic feet. To demonstrate compliance with this limit, the operator of S-1 through S-4 shall sample and analyze the gas from each supply source at least once every 30 consecutive days to determine the sulfur content of the gas. PG&E monthly sulfur data may be used provided that such data can be demonstrated to be representative of the gas delivered to the RCEC. (BACT for SO₂ and PM₁₀)
14. The owner/operator shall not operate the units such that the combined heat input rate to each power train consisting of a Gas Turbine and its associated HRSG (S-1 & S-2 and S-3 & S-4) exceeds 2,238.6 MM BTU (HHV) per hour. (PSD for NO_x)
15. The owner/operator shall not operate the units such that the combined heat input rate to each power train consisting of a Gas Turbine and its associated HRSG (S-1 & S-2 and S-3 & S-4) exceeds 53,726 MM BTU (HHV) per day. (PSD for PM₁₀)
16. The owner/operator shall not operate the units such that the combined cumulative heat input rate for the Gas Turbines (S-1 & S-3) and the HRSGs (S-2 & S-4) exceeds 35,708,858 MM BTU (HHV) per year. (Offsets)
17. The owner/operator shall not fire the HRSG duct burners (S-2 & S-4) unless its associated Gas Turbine (S-1 & S-3, respectively) is in operation. (BACT for NO_x)
18. The owner/operator shall ensure that the S-1 Gas Turbine and S-2 HRSG are abated by the properly operated and properly maintained A-1 Selective Catalytic Reduction (SCR) System and A-2 Oxidation Catalyst System whenever fuel is combusted at those sources and the A-1 SCR catalyst bed has reached minimum operating temperature. (BACT for NO_x, POC and CO)
19. The owner/operator shall ensure that the S-3 Gas Turbine and S-4 HRSG are abated by the properly operated and properly maintained A-3 Selective Catalytic Reduction (SCR) System and A-4 Oxidation Catalyst System whenever fuel is combusted at those sources and the A-3 SCR catalyst bed has reached minimum operating temperature. (BACT for NO_x, POC and CO)
20. The owner/operator shall ensure that the Gas Turbines (S-1 & S-3) and HRSGs (S-2 & S-4) comply with requirements (a) through (h) under all operating scenarios, including duct burner firing mode. Requirements (a) through (h) do not apply during a gas turbine start-up, combustor tuning operation or shutdown. (BACT, PSD, and Regulation 2, Rule 5)
 - (a) Nitrogen oxide mass emissions (calculated as NO₂) at P-1 (the combined exhaust point for S-1 Gas Turbine and S-2 HRSG after abatement by A-1 SCR System) shall not exceed 16.5 pounds per hour or 0.00735 lb/MM BTU (HHV) of natural gas fired. Nitrogen oxide mass emissions (calculated as NO₂) at P-2 (the combined exhaust point for S-3 Gas Turbine and S-4 HRSG after abatement by A-3 SCR System) shall not exceed 16.5 pounds per hour or 0.00735 lb/MM BTU (HHV) of natural gas fired.
 - (b) The nitrogen oxide emission concentration at emission points P-1 and P-2 each shall not exceed 2.0 ppmv, on a dry basis, corrected to 15% O₂, averaged over any 1-hour period. (BACT for NO_x)