Appendix 8.1-4

Best Available Control Technology Analysis

BEST AVAILABLE CONTROL TECHNOLOGY ANALYSIS

1.0 Introduction

Through its Best Available Control Technology (BACT) Policy and its Rule 2201, the San Joaquin Valley Air Pollution Control District (SJVAPCD) requires the application of BACT to all emissions units, which are subject to its New Source Review (NSR) rule and result in a potential to emit greater than the applicable BACT threshold levels. For the Kings River Conservation District Community Power Plant (KRCD CPP), the applicable BACT threshold levels are:

- Nitrogen oxides (NOx) – 2 pounds per day (lbs/day)
- Carbon Monoxide (CO) – 200,000 pounds per year (lbs/yr)
- Volatile Organic Compounds (VOCs) – 2 lbs/day
- Particulate Matter less than 10 microns in diameter (PM10) – 2 lbs/day
- Sulfur Dioxide (SO2) – 2 lbs/day

For those pollutants for which BACT is triggered, a BACT analysis is performed to ensure that the appropriate level of emissions control is applied to the source. The SJVAPCD defines this appropriate level of emissions control (i.e., BACT) as the most stringent limitation or control technique of the following:

- Achieved in practice for such emissions unit and class of source; or
- Contained in any State Implementation Plan (SIP) approved by the United States Environmental Protection Agency (USEPA) for such emissions unit category and class of source. A specific limitation or control technique shall not apply if the owner or operator of the proposed emissions unit demonstrates to the satisfaction of the Air Pollution Control Officer (APCO) that such limitation or control technique is not presently achievable; or
- Contained in an applicable federal New Source Performance Standard; or
- Any other emission limitation or control technique, including process and equipment changes of basic or control equipment, found by the APCO to be cost effective and technologically feasible for such class or category of sources or for a specific source.

The general method for performing a BACT analysis is based on the USEPA's top-down approach, which is described in the USEPA's *New Source Review Workshop Manual*

(October 1990). This approach requires identification of the most stringent control available. This control level/technology is selected as BACT unless the applicant can show that it is not available, not achievable or not cost effective.

Identification of possible control technology options is generally accomplished through a review of the USEPA's Reasonably Available Control Technology (RACT)/BACT/ Lowest Achievable Emission Rate (LAER) Clearinghouse (or RBLC) and/or other BACT Clearinghouses, in this case, the SJVAPCD's BACT Guidelines and the California Air Resources Board (CARB) BACT Clearinghouse. CARB's "Guidance for Power Plant Siting and Best Available Control Technology" document (July 1999) was also reviewed. For natural gas-fired combustion turbines (CTs) such as those being used as the prime movers for the KRCD CPP, the control technologies involved are well established, although the control levels applied to different projects vary. Therefore, the BACT analysis for the CTs focuses on a review, via the clearinghouses and guidelines, of the recent control level determinations.

2.0 BACT Analysis for Combustion Turbines

Given the BACT threshold levels listed in Section 1.0 above as well as the size and anticipated operations of KRCD CPP (i.e., nominal 565 megawatt (MW) output, baseload/year-round operation), the CTs will trigger BACT for NOx, CO, VOCs, PM10 and SO2.

2.1 Nitrous Oxide

In reviewing the USEPA & CARB Clearinghouse data for NOx (see Tables 1 & 2), the NOx BACT levels ranged from 2 to 3.5 parts per million (ppm) (USEPA) and 2 to 2.5 ppm (CARB). The most stringent control level was found to be 2.0 ppm, based on the use of low NOx combustors (e.g., Dry Low NOx (DLN) combustors) in combination with Selective Catalytic Reduction (SCR). This BACT is in keeping with CARB's Guidance document as well as SJVAPCD BACT Guideline 3.4.2. The former notes 2.0 ppm with a 3-hour averaging period as BACT for NOx emissions from combined cycle CTs fueled by natural gas, and the latter notes 2.0 ppm averaged over 1-hour as technologically feasible, although it is not classified as having been achieved in practice or contained within a State Implementation Plan (SIP).

Table 1
Recent Nitrous Oxide Limits for Combined-Cycle Gas Turbine Projects (USEPA RBLC)[1]
KRCD CPP

Emission Limit[2]	**Control Technology**	**RBLC ID #/Permit Issuance Date**	**Company Name and Location**	**Equipment**
3 ppm	Low NOx Burners With SCR	CO-0056 5/06	Rocky Mountain Energy Center, Colorado	300 MW CT
2.5 ppm, 24-hour	DLN with SCR	NC-0101 9/05	Forsyth Energy Projects, North Carolina	1844.3 MMBtu/hr CT
2 ppm, 3-hour rolling	SCR	NV-0035 8/05	Tracey Substation Expansion Project, Nevada	306 MW CT
2 ppm, 3-hour	DLN & SCR	OR-0041 8/05	Wanapa Energy Center, Oregon	2384.1 MMBtu/hr Fuel Input
2.5 ppm on natural gas, 10 ppm on oil	SCR	FL-0265 6/05	Hines Power Block 4, Florida	530 MW Output
3 ppm, annual average	Low NOx Burners with SCR	LA-0192 6/05	Cresent City Power, Louisiana	2006 MMBtu/hr Fuel Input
2.5 ppm	DLN & SCR	MI-0366 4/05	Berrien Energy, Michigan	1584 MMBtu/hr Fuel Input
2 ppm	DLN & SCR	FL-0263 2/05	FPL Turkey Point Power Plant, Florida	170 MW Output
2.5 ppm, 3-hour	DLN & SCR	WA-0328 1/05	BP Cherry Point Cogeneration Project	GE 7FA
3 ppm, 3-hour	DLN & SCR	OH-0252 12/04	Duke Energy Hanging Rock Energy Facility, Ohio	GE 7 FA
2 ppm, 3-hour	Low NOx Burners & SCR	AZ-0047 12/04	Wellton Mohawk Generating Station, Arizona	GE 7FA
3.5 ppm, 3-hour	SCR	MS-0073 11/04	Reliant Energy Choctaw County, Mississippi	230 MW Output
3.5 ppm	Low NOx Burners & SCR	NV-0033 8/04	El Dorado Energy, Nevada	475 MW Output

Notes:

1. Emissions limits are in parts per million & referenced at 15% O2, unless noted otherwise.

Acronyms:
MMBtu/HHV - million British thermal units per hour higher heating value.
CT – combustion turbine
GE General Electric

Table 2 Recent NOx Limits for Combined-Cycle Gas Turbine Projects - CARB BACT Clearinghouse KRCD CPP				
Emission Limit[1]	**Control Technology**	**Permit Issuance Date**	**Company Name and Location**	**Equipment**
2.5 ppm, 1-hour average	SCR	3/03	Elk Hills Power Project, SJVAPCD	GE 7FA
2 ppm, 1-hour	SCR	12/03	Western Midway Sunset Power Project, SJVAPCD	GE 7FA or Westinghouse 501F
2 ppm, 3-hour	SCR	5/03	Magnolia Power Project, SCAQMD	GE 7FA
2.5 ppm, 1-hour	SCR	10/03	Three Mountain Power, Shasta County AQMD	GE 7FA or Westinghouse 501F
Notes: 1. Emissions limits are in parts per million & referenced at 15% oxygen, unless noted otherwise.				

DLN combustors reduce NOx formation in the combustion zone by pre-mixing fuel and air to avoid the development of hot spots within the combustion area. The SCR process injects ammonia into the exhaust stream in the presence of a catalyst to further reduce NOx emissions. While there other technologies, e.g., SCONOx, Xonon, that can be applied to CTs for the reduction of NOx emission, none of these other approaches can provide a lower emissions limit than that achieved through the use of DLN combustion in combination with SCR and more importantly, none of these other technologies has been applied to the size or class of CTs to be used for the KRCD CPP.

These conclusions regarding other NOx control methods are mirrored in the other recent AFC applications for various similar projects, e.g., South Bay Replacement Project, San Joaquin Energy Center, as well as in the CARB's May 2004 Report to the Legislature on Gas-Fired Power Plant NOx Emissions Controls and Related Environmental Impacts. As noted in CARB's report, neither SCONOx nor Xonon have been applied to F Class CTs. Applications of SCONOx have been limited to smaller units (40-50 MW). Similarly, Xonon, which appears capable of achieving 3 rather than 2 ppm NOx, has only been applied to small CTs (e.g., less than 20 MW).

Therefore, the proposed BACT for NOx emissions from the KRCD CPP's's two natural gas-fired combined cycle CTs is the use of dry low NOx combustion in combination with SCR to limit NOx to 2 parts per million by volume dry (ppmdv) @ 15% oxygen (O2). The averaging time proposed in 3 hours.

2.2 Carbon Monoxide

A review of the USEPA & CARB Clearinghouse data for CO (refer to Tables 3 & 4), indicated CO BACT levels, which ranged from 2 to 18 ppm (EPA) and 2 to 4 ppm (CARB). The most stringent control level was found to be 2 ppm, based on the use of an oxidation catalyst. This level is within the limits of CARB's BACT guidance, which notes 6 ppm. The SJVAPCD's BACT Guideline 3.4.2 shows 6 ppm, as achieved in practice or contained within a SIP, and 4 ppm, as technologically feasible.

Table 3
Recent CO Limits for Combined-Cycle Gas Turbine Projects- USEPA RBLC
KRCD CPP

Emission Limit[1]	Control Technology	RBLC ID #/ Permit Issuance Date	Company Name and Location	Equipment
3 ppm	Oxidation Catalyst	CO-0056 5/06	Rocky Mountain Energy Center, Colorado	300 MW Output
11.6 ppm, 3-hour	Good Combustion Practices	NC-0101 9/05	Forsyth Energy Projects, N. Carolina	1844.3 MMBtu/hr Fuel Input
3.5 ppm, 3-hour rolling	Oxidation Catalyst	NV-0035 8/05	Tracey Substation Expansion Project, Nevada	306 MW Output
2 ppm, 3-hour	Oxidation Catalyst	OR-0041 8/05	Wanapa Energy Center, Oregon	2384.1 MMBtu/hr Fuel Input
8 ppm on natural gas, 12 ppm on oil	Good Combustion Practices	FL-0265 6/05	Hines Power Block 4, Florida	530 MW Output
4 ppm, annual average	Good Combustion Practices	LA-0192 6/05	Cresent City Power, Louisiana	2006 MMBtu/hr Fuel Input
2 ppm, 3-hour	Oxidation Catalyst	MI-0366 4/05	Berrien Energy, Michigan	1584 MMBtu/hr Fuel Input
8 ppm	Good Combustion Practices	FL-0263 2/05	FPL Turkey Point Power Plant, Florida	170 MW Output
2 ppm, 3-hour	Oxidation Catalyst	WA-0328 1/05	BP Cherry Point Cogeneration Project	GE 7FA
6 ppm, 24-hour average	Good Combustion Practices	OH-0252 12/04	Duke Energy Hanging Rock Energy Facility, Ohio	GE 7 FA
3 ppm, 3-hour	Oxidation Catalyst	AZ-0047 12/04	Wellton Mohawk Generating Station, Arizona	GE 7FA

18.36 ppm, 3-hour	Good Combustion Practices	MS-0073 11/04	Reliant Energy Choctaw County, Mississippi	230 MW Output
2.6 ppm	Oxidation Catalyst	NV-0033 8/04	El Dorado Energy, Nevada	475 MW Output
Notes: 1. Emissions limits are in parts per million-dry volume & referenced at 15% O2, unless noted otherwise.				

Table 4
Recent CO Limits for Combined-Cycle Gas Turbine Projects- CARB BACT Clearinghouse
KRCD CPP

Emission Limit[1]	Control Technology	Permit Issuance Date	Company Name and Location	Equipment
4 ppm, 3-hour	Oxidation Catalyst	3/03	Elk Hills Power Project, SJVAPCD	GE 7FA
4 ppm, 3-hour	Oxidation Catalyst	12/03	Western Midway Sunset Power Project, SJVAPCD	GE 7FA or Westinghouse 501F
2 ppm, 1-hour	Oxidation Catalyst	5/03	Magnolia Power Project, SCAQMD	GE 7FA
4 ppm, 3-hour	Oxidation Catalyst	10/03	Three Mountain Power, Shasta County AQMD	GE 7FA or Westinghouse 501F
Notes: 1. Emissions limits are in parts per million-dry volume & referenced at 15% O2, unless noted otherwise.				

Based on this information, the proposed BACT for CO emissions from the KRCD CPP two natural gas-fired combined cycle CTs is the use of an oxidation catalyst to limit CO to 2 ppmdv @ 15% O2. The averaging time proposed in 3 hours.

2.3 Volatile Organic Carbons

In reviewing the clearinghouse data for VOCs (see Tables 5 & 6), the EPA's RBLC data ranged from 1.1 ppm (based on annual averaging) to 4 ppm (3-hour averaging). Alternatively, some of the BACT determinations for VOCs in the USEPA database were expressed as mass emissions rates rather than concentrations. In these instances the VOC limit ranged from 3 to 6 lbs/hr. The concentrations, which appear to be lower than the mass emissions rates, rely on the use of an oxidation catalyst. CARB's BACT data for VOCs ranged from 0.7 to 2 ppm. The most stringent control level was based on the use of an oxidation catalyst. CARB's BACT guidelines indicate 2 ppm averaged over one hour except for the Western Midway Sunset project, which shows 1.4 ppm over 3 hours. The SJVAPCD's BACT Guideline 3.4.2 notes 2 ppm as achieved in practice or contained within a SIP, and 1.5 ppm, as technologically feasible.

Based on discussions with SJVAPCD personnel, this 1.5 ppm VOC limit was proposed for the Midway Sunset project. However, this facility was never constructed and therefore, the 1.5 ppm level has not been achieved in practice. For longer averaging times, e.g., an annual basis, VOC concentrations of less than 2 ppm are achievable. However, for shorter periods, such as 3 hours, 2 ppm appears to be the lowest VOC emissions concentration attained.

Table 5
Recent VOC Limits for Combined-Cycle Gas Turbine Projects - USEPA RBLC
KRCD CPP

Emission Limit[1]	**Control Technology**	**Permit Issuance Date**	**Company Name and Location**	**Equipment**
0.0029 lbs/MMBtu	Oxidation Catalyst	CO-0056 5/06	Rocky Mountain Energy Center, Colorado	300 MW CT
4 ppm, 3-hour rolling	Oxidation Catalyst	NV-0035 8/05	Tracey Substation Expansion Project, Nevada	306 MW CT
No Limit Specified	Oxidation Catalyst	OR-0041 8/05	Wanapa Energy Center, Oregon	2384.1 MMBtu/hr Fuel Input
1.1 ppm, annual average	Oxidation Catalyst	LA-0192 6/05	Cresent City Power, Louisiana	2006 MMBtu/hr Fuel Input
3.2 lbs/hr	Oxidation Catalyst	MI-0366 4/05	Berrien Energy, Michigan	1584 MMBtu/hr Fuel Input
1.3 ppm	Good Combustion Practices	FL-0263 2/05	FPL Turkey Point Power Plant, Florida	170 MW Output
No Limit Specified	Oxidation Catalyst	WA-0328 1/05	BP Cherry Point Cogeneration Project	GE 7FA
3.2 lbs/hr	Good Combustion Practices	OH-0252 12/04	Duke Energy Hanging Rock Energy Facility, Ohio	GE 7 FA
3 ppm, 3-hour	Oxidation Catalyst	AZ-0047 12/04	Wellton Mohawk Generating Station, Arizona	GE 7FA
3.64 ppm, 3-hour	Good Combustion Practices	MS-0073 11/04	Reliant Energy Choctaw County, Mississippi	230 MW Output
5.2 lbs/hr	Good Combustion Practices	NV-0033 8/04	El Dorado Energy, Nevada	475 MW Output

Notes:
1. Emissions limits are in parts per million & referenced at 15% O2, unless noted otherwise.

Table 6 Recent VOC Limits for Combined-Cycle Gas Turbine Projects- CARB BACT Clearinghouse KRCD CPP				
Emission Limit[1]	**Control Technology**	**Permit Issuance Date**	**Company Name and Location**	**Equipment**
2 ppm, 3-hour average	Oxidation Catalyst	3/03	Elk Hills Power Project, SJVAPCD	GE 7FA
1.4 ppm, 3-hour	Oxidation Catalyst	12/03	Western Midway Sunset Power Project, SJVAPCD	GE 7FA or Westinghouse 501F
2 ppm, 1-hour	Oxidation Catalyst	5/03	Magnolia Power Project, SCAQMD	GE 7FA
2 ppm, 1-hour	Oxidation Catalyst	10/03	Three Mountain Power, Shasta County AQMD	GE 7FA or Westinghouse 501F
Notes: 1. Emissions limits are in parts per million & referenced at 15% O2, unless noted otherwise.				

Based on this information, the proposed BACT for VOCs from the KRCD CPP's's two natural gas-fired combined cycle CTs is the use of an oxidation catalyst to limit VOCs to 2 ppm averaged over 3 hours.

2.4 Particulate Matter 10 Micrograms Diameter and Smaller

In reviewing the BACT Guideline and Clearinghouse data for PM10, the most stringent control level was found to be the use of California Public Utility Commission (CPUC) regulated natural gas. CARB's BACT Guidelines note the use of natural gas with a sulfur content of no more than 1.0 grains/100 standard cubic feet (scf) as BACT for PM10. The use of natural gas as BACT for PM10 appears in the SJVAPCD's BACT Guidelines (Guideline 3.4.2) as having been achieved in practice or contained in a SIP. In addition, the SJVAPCD also defines PM10 BACT for this class of emissions source as including an air inlet cooler/filter and a lube oil vent coalescer.

Therefore, CPUC regulated natural gas in combination with an air inlet cooler/filter and a lube oil vent coalescer is considered as the most effective BACT for PM10 emissions from the KRCD CPP two CTs. This BACT will limit stack emissions of PM10 from each CT to approximately 10.0 lbs/hr (Siemens) or 9.0 lbs/hr (GE).

2.5 Sulfur Dioxide

In reviewing the BACT Guideline and Clearinghouse data for SO2, the most stringent control level was found to be the use of CPUC regulated natural gas. CARB's BACT Guidelines also note the use of natural gas with a sulfur content of no more than 1.0

grains/100 scf as BACT for PM10. The use of CPUC regulated natural gas (or alternatively, natural gas with a sulfur content of no more than 0.75 grains/100/scf) as BACT for SO2 appears in the SJVAPCD's BACT Guideline 3.4.2 as having been achieved in practice or contained in a SIP.

Therefore, CPUC regulated natural gas is considered as the most effective BACT for SO2 emissions and will be used as the fuel for the KRCD CPP two CTs. Information from the natural gas supplier indicates that, while the average sulfur content of the fuel is on the order of 0.1 grains/100 scf, the maximum sulfur content reaches approximately 0.3 grains/100scf. This latter sulfur content will limit stack emissions of SO2 from each CT to approximately 1.7 lbs/hr (Siemens) or 1.5 lbs/hr (GE).

3.0 Best Available Control Technology for Ancillary and Standby Equipment

In addition to the KRCD CPP two CTs, other air emissions sources will include an auxiliary boiler, a natural-fired emergency generator, a diesel driven fire pump and an evaporative cooling tower. BACT for each of these equipment pieces is discussed below.

3.1 Auxiliary Boiler

A relatively small package boiler will be used to maintain necessary steam loads during periods of CT startup & shutdown or non-operation. The auxiliary boiler, which will capable of generating approximately 45,000 lbs/hr of 160 pounds per square inch gauge (psig) saturated steam, is anticipated to operate at full load for more than **24 consecutive hours and up to 2,315 hours annually**. Given its relatively small size, the auxiliary boiler will fire at full load when operating.

Given this operating profile, the auxiliary boiler will trigger BACT for NOx, VOCs, and PM10 , but not CO or SO2.

Given the operational profile of the auxiliary boiler, the SJVAPCD's BACT Guidelines were used to make a BACT determination. Guideline 1.1.2, which relates to natural gas-fired boilers of greater than 20 MMBtu/hr fuel input (base loaded or with small load swings), notes the following as achieved in practice of contained in the SIP: NOx – an emissions concentration of no more than 9 ppmdv @3% O2 (ultra low-NOx main burner system); VOCs & PM10 – use of natural gas fuel.

Based on this information, the following are proposed as BACT for the auxiliary boiler:

- NOx – Combustion system (e.g., ultra-low NOx main burners) that achieves 9 ppmdv @ 3% O2 for NOx.;

- VOCs & PM10 – use of natural gas fuel.

3.2 Emergency Generator (Natural Gas-Fired)

The KRCD CPP requires a natural gas-fired internal combustion (IC) engine as an emergency generator. Although Rich Burn IC engines were reviewed, a Lean Burn IC engine will be used due to the size (1,800 – 2,000 horsepower) required. The emergency generator is not anticipated to run for more than **30 minutes in a 24-hour period (no more than 26 hours annually)** and then only for maintenance purposes. However, the SJVAPCD criterion for determining BACT applicability for emergency or standby equipment is to assume up to 24 hours of continuous operation. Based on this assumption, a BACT evaluation for the emergency generator is triggered for NOx, VOCs and PM10, but not CO or SO2.

Given the limited operational profile of the emergency generator, the SJVAPCD's BACT Guidelines were used to make a BACT determination. Guideline 3.1.8, which applies to Lean Burn natural gas-fired emergency IC engines of more than 250 horsepower, notes the following as achieved in practice of contained in the SIP: NOx & VOCs – no more than 1.0 grams per break horsepower hour (g/bhp-hr); PM10 - use of natural gas fuel. For VOCs Guideline 3.1.8 also notes a 90% effective oxidation catalyst as technically feasible. This guideline further notes the following as alternative basic equipment: NOx – Rich Burn engine with 90% effective non-selective catalytic reduction (NSCR); VOCs - Rich Burn engine with 50% effective NSCR.

Based on this information, the following are proposed as BACT for the natural gas-fired emergency generator:

- NOx & VOCs – no more than 1.0 g/bhp-hr;
- PM10 – use of natural gas fuel.

Cursory calculations, based on simple capital cost, indicate that the addition of a 90% effective oxidation catalyst for additional VOC control is not cost effective. On an annual basis the emergency generator will emit less than 0.04 tons per year of VOCs. Using the SJVAPCD's VOC cost effectiveness thresholds of $5,000 per ton and their default factors for determining an annualized capital cost, e.g., interest rate of 10%, 10 year catalyst life, in order for this application to be cost effective the actual capital cost must be less than approximately $1,105.

Similar cursory calculations indicate that the use of a Rich Burn engine with a) 90% effective NOx control and b) 50% effective VOC control, both via NSCR, in lieu of a

Lean Burn engine would not be cost effective. On an annual basis the (Lean Burn) emergency generator will emit less than 0.06 & 0.04 tons per year of NOx and VOCs, respectively. Assuming a Rich Burn engine with NSCR could reduce these annual emissions rates by 90% and 50%, respectively and using the SJVAPCD's NOx and VOC cost effectiveness thresholds of $9,700 and $5,000/ton as well as their default factors for determining an annualized capital cost, e.g., interest rate of 10%, 10 year catalyst life, in order for the NSCR application to be cost effective the actual capital cost must be less than approximately $3,827 (based on the use of a Multi-Pollutant Cost Effectiveness Threshold (MCET) approach.

In each instance the capital cost would exceed the amounts noted above and application would not be cost effective.

3.3 Fire Pump (Diesel-Fired)

The fire pump is not anticipated to run for more than **30 minutes in a 24-hour period (no more than 26 hours annually)** and then only for maintenance purposes. However, the SJVAPCD criterion for determining BACT applicability for emergency or standby equipment is to assume up to 24 hours of continuous operation. Based on this assumption, a BACT evaluation is triggered for the diesel fire pump for NOx, VOCs. PM10 and SO2, but not CO.

Given the limited operational profile of the diesel fire pump, the SJVAPCD's BACT Guidelines were used to make a BACT determination. Guideline 3.1.4, which applies to emergency diesel internal combustion engines driving fire pumps, notes the following as achieved in practice of contained in the SIP: NOx – an emissions rate of no more than 6.9 g/bhp-hr; VOCs – positive crankcase ventilation (unless this voids the Underwriters Laboratories (UL) certification); PM10 – 0.1 g/bhp-hr (if Toxics BACT (TBACT) is applicable) or 0.4 g/bhp-hr (if TBACT is not applicable); SO2 – low sulfur diesel fuel (500 ppmw sulfur or less) or very low sulfur diesel fuel (15 ppmw sulfur or less), if available. Guideline 3.1.4 also notes catalytic oxidation as technically feasible for control of VOCs.

Based on this information, the following are proposed as BACT for the diesel fire pump:

- NOx – no more than 6.9 g/bhp-hr;
- VOCs – positive crankcase ventilation, provided this does not void an UL certification (Note that a cursory calculation, based on simple capital cost, indicates that the addition of catalytic oxidation is not cost effective. On an annual basis the diesel fire pump will emit 0.002 tons per year of VOCs. Using the

SJVAPCD's VOC cost effectiveness threshold of $5,000/ton and their default factors for determining an annualized capital cost, e.g., interest rate of 10%, 10 year catalyst life, the actual capital cost must be less than approximately $62.00 for the installation of catalytic oxidation to be cost effective. The capital cost for catalytic oxidation equipment would certainly be greater than this amount.)

- PM10 – 0.4 g/bhp-hr (note the KRCD CPP will not be a Major Air Toxics Source, as defined in SJVAPCD Rule 2520; therefore, Toxic BACT does not apply);
- SO2 - very low sulfur diesel fuel if available, alternatively low sulfur diesel fuel.

The Diesel Fire Pump will be specified as a Tier III engine, if available in the size required, or alternatively, as a Tier II engine.

3.4 Cooling Tower

In addition to PM10 emissions from the CTs, the KRCD CPP evaporative cooling tower will emit relatively minor amounts of PM10 through the cooling tower drift, which entrains PM10. The cooling tower will have a circulating water flow rate of up to approximately **125,200 gallons per minute** (gpm), which is greater than 10,000 gpm permitting and BACT exemption level for cooling towers, as provided in SJVAPCD Rule 2020 (Permit) Exemptions, Part 6.2. Therefore, the KRCD CPP's cooling tower is subject to BACT for its PM10 emissions.

SJVAPCD BACT Guideline 8.3.10 (Cooling Tower – Induced Draft, Evaporative Cooling) lists cellular type drift eliminators as technologically feasible, although not achieved in practice or contained in a SIP. The intent of this guideline is to minimize cooling tower drift, as reduced PM10 emissions from cooling towers are achieved through minimization of drift. The KRCD CPP's cooling tower will be designed to include drift eliminators that reduce drift to no more than 0.0005% of the circulating water flow. This is the proposed BACT for PM10 emissions from the cooling tower.

4.0 Summary of Best Available Control Technology

Tables 7 and 8 summarize the proposed BACT and associated emissions limits for the KRCD CPP.

Table 7 Summary of Proposed BACT - CTs KRCD CPP			
	Proposed BACT	**Proposed Emission Limitation[1]**	
		GE	**Siemens**
NOx	DLN with SCR	2.0 ppm averaged over 3 hrs[2]	2.0 ppm averaged over 3 hrs[2]
CO	Oxidation Catalyst	2.0 ppm averaged over 3 hrs[2]	2.0 ppm averaged over 3 hrs2
VOCs	Oxidation Catalyst	2.0 ppm averaged over 3 hrs[2]	2.0 ppm averaged over 3 hrs[2]
PM10	Use of Natural Gas Fuel	9.0 lbs/hr	10.0 lbs/hr
SO2	Use of Natural Gas Fuel	1.5 lbs/hr[3]	1.7 lbs/hr[3]

Notes:
1. Not to apply during periods of startup and shutdown.
2. ppmdv @ 15% O2; ammonia slip is limited to no more than 5 ppm.
3. Based on a fuel sulfur content of 0.30 grains/100 scf.

Table 8 Summary of Proposed BACT- Ancillary Equipment KRCD CPP				
Proposed BACT/ Emissions Limitation				
	Auxiliary Boiler	**Emergency Generator**	**Diesel Fire Pump**	**Cooling Tower**
NOx	9 ppm[1]	1.0 g/bhp-hr	6.9 g/bhp-hr	NA
CO	NA	NA	NA	NA
VOCs	Natural Gas Fuel	1.0 g/bhp-hr	Positive Crankcase Ventilation[2]	NA
PM10	Natural Gas Fuel	Natural Gas Fuel	0.4 g/bhp-hr[3]	0.0005% Cooling Tower Drift
SO2	NA	NA	Low sulfur fuel[4]	NA

Notes:
1. 9 ppmdv @ 3% O2.
2. Provided this does not void a UL certification.
3. Assumes that Toxic BACT is not triggered.
4. If available very low sulfur fuel will be used.