



October 24, 2012

Mr. Ross Bell
Air Division Manager
Shasta County Dept Resource Management
Shasta Air Quality Management District
1855 Placer Street, Suite 101
Redding, CA 96001

RECEIVED
OCT 25 2012
SHASTA COUNTY AQMD

RE: Increase Unit 6 Startup Time Limitation Title V Application

Dear Mr. Bell,

On October 16, 2012, Redding Electric Utility (REU) submitted an application to modify District Permit 06-PO-42a to modify the startup time for Unit 6 at the Redding Power Plant from two hours to four hours. Enclosed with this letter is the corresponding application for a Title V operating permit modification.

In the enclosed application, REU suggests the following changes, in redline/strikeout format, to Condition D8 of Title V Operating Permit 03-TV-02:

The emission limits in Condition D7 shall not apply during any startup (which is not to exceed ~~2.4~~ hours in duration) or shutdown (which is not to exceed 1.0 hours in duration). The EMx™ SCONOx system and good combustion practices shall be used whenever the combustion turbine is operating and to the fullest extent practical during startup and shutdown conditions to minimize pollutant emissions. Startup shall be defined as the period beginning with ignition and lasting until equipment has reached stable operating mode and has achieved operating permit limits. Shutdown shall be defined as the period beginning with the lowering of equipment from stable operating load with the intention of full shutdown and lasting until fuel flow is completely off and combustion has ceased. Emissions from the gas turbine and associated HRSG shall meet all of the emissions limitations listed below for each startup or shutdown.

Pollutant	Startup	Shutdown	Verification
NOx as NO ₂	8087 lbs/24 hrs	40 lb/hr	Verified by CEMS

The operator must maintain the stationary combustion turbine, air pollution control equipment, and monitoring equipment in a manner consistent with good air pollution control practices for minimizing emissions at all times, including startup, shutdown, and malfunction.

[District Permit 06-PO-42, Condition ~~3228~~][40 CFR 60.4333]

If you have any questions, please call me at (530) 245-7017.

Sincerely,

P. P. Greg Deedon
Electric Manager – Power Production

Enclosure

STATIONARY SOURCE SUMMARY (FORM 5-A2)

DISTRICT: Shasta County Air Quality Management District	< DISTRICT USE ONLY =
	DISTRICT ID:
COMPANY NAME: City of Redding	FACILITY NAME: Redding Power Plant

II. TYPE OF PERMIT ACTION

	CURRENT PERMIT (permit number)	EXPIRATION (date)
<input type="checkbox"/> Initial Title V Application		
<input type="checkbox"/> Permit Renewal		
<input type="checkbox"/> Significant Permit Modification	03-TV-02	January 3, 2015
<input type="checkbox"/> Minor Permit Modification		
<input type="checkbox"/> Administrative Amendment		

III. DESCRIPTION OF PERMIT ACTION

1. Does the permit action requested involve: a:
- | | |
|--|--|
| <input type="checkbox"/> Portable Source | <input type="checkbox"/> Voluntary Emissions Caps |
| <input checked="" type="checkbox"/> Acid Rain Source | <input type="checkbox"/> Alternative Operating Scenarios |
| <input type="checkbox"/> Source Subject to MACT Requirements [Section 112] | |
- b: None of the options in I.a. are applicable
2. Is source operating under Compliance Schedule? Yes No

3. For permit modifications, provide a general description of the proposed permit modification:

On November 2, 2006, Redding Electric Utility (REU) submitted, to the Shasta County Air Quality Management District (AQMD), a permit application for a new combined-cycle gas turbine (Unit 6) at the Redding Power Plant located in Redding, California. The Unit 6 gas turbine is virtually identical to the pre-existing Unit 5 gas turbine and incorporates the same emissions control technology (referred to as SCNOx for Unit 5 and EMx™ [by Emerachem] for Unit 6; and referred to collectively as "EMx" in this application) to minimize the emissions of nitrogen oxides (NOx) and carbon monoxide (CO). In January 2007, the AQMD issued, for public and United States Environmental Protection Agency (USEPA) review/comment, the Permit Evaluation and draft Authority to Construct (ATC) for Unit 6. On February 16, 2007, the AQMD issued the ATC Permit (#06-PO-42) for the new Unit 6. Although the Permit Application specified a 4-hour startup period, comparable to that for Unit 5, and the AQMD's Permit Evaluation included the 4-hour startup, the ATC was issued with only a 2-hour startup limit for Unit 6. This permit application presents REU's request to change the current 2-hour startup limit on Unit 6 to four hours.

REU's Requested Changes

Since a gas turbine equipped with an EMx system cannot reasonably be expected to meet its permit limits within a 2-hour startup window, REU accordingly requests that the AQMD change the 2-hour startup limit for Unit 6 to four hours, consistent with REU's permit application, the AQMD's permit evaluation, and the operating limit for the identical Unit 5. Although REU is requesting that the length of the startup period be increased from two to four hours, the total NOx emissions will not change. The modified permit would include 87 pounds for each startup, which includes the original 80 pound limit from the permit for a two hour startup, with 7 pounds of base load operation for the additional 2 hours of startup. This change represents no net increase in emissions for the unit. Note also that Permit 03-TV-02 incorrectly references Condition 32 of District Permit 06-PO-42 rather than Condition 28. Therefore, REU suggests the following changes, in redline/strikeout format, to Condition D8 of the Title V PTO:

The emission limits in Condition D7 shall not apply during any startup (which is not to exceed ~~2~~ hours in duration) or shutdown (which is not to exceed 1.0 hours in duration). The EMxTM SCONOx system and good combustion practices shall be used whenever the combustion turbine is operating and to the fullest extent practical during startup and shutdown conditions to minimize pollutant emissions. Startup shall be defined as the period beginning with ignition and lasting until equipment has reached stable operating mode and has achieved operating permit limits. Shutdown shall be defined as the period beginning with the lowering of equipment from stable operating load with the intention of full shutdown and lasting until fuel flow is completely off and combustion has ceased. Emissions from the gas turbine and associated HRSG shall meet all of the emissions limitations listed below for each startup or shutdown.

<i>Pollutant</i>	<i>Startup</i>	<i>Shutdown</i>	<i>Verification</i>
<i>NOx as NO₂</i>	<i>8087 lbs/24 hrs</i>	<i>40 lb/hr</i>	<i>Verified by CEMS</i>

The operator must maintain the stationary combustion turbine, air pollution control equipment, and monitoring equipment in a manner consistent with good air pollution control practices for minimizing emissions at all times, including startup, shutdown, and malfunction.

[District Permit 06-PO-42, Condition ~~32~~28][40 CFR 60.4333]

Background

A 2-hour startup window may be manageable for some combined cycle turbines with water-injection or dry low-NOx (DLN) combustors and SCR for NOx control. However, Units 5 and 6 at the Redding Power Plant are equipped with identical emissions control technology, which use catalytic oxidation to control emissions of both CO and NOx. Unlike SCR technology, EMx does not require ammonia injection for its oxidation-reduction reaction that removes NOx from the exhaust gas. Rather, the EMx reactor catalytically converts NOx to nitrogen gas and sequentially regenerates the parallel reactors for a high level of emissions control.

In California, REU is one of the few operators of gas turbines equipped with EMx technology. As such, a review of typical startup limits for 50 MW gas-fired gas turbines will not yield many, if any, examples of turbines equipped with EMx technology. Therefore, startup limits applicable to most 50 MW gas turbines in California are not necessarily indicative of the startup capabilities of a gas turbine equipped with EMx.

Process Description

The duration of the startup process for a typical combined cycle gas turbine is regulated by the allowable rate of temperature increase that the steam generator and steam turbine can accommodate. However the duration of the startup process for a combined cycle gas turbine equipped with an EMx system is further regulated by the temperature of the auxiliary steam used to regenerate the EMx catalyst. Auxiliary steam temperature (which feeds the EMx) is the most critical parameter in the EMx catalyst regeneration process. The EMx catalyst regeneration system, without which the EMx system cannot sustain operation, requires a gradual ramping during startup until the EMx controls can be shifted from "warm-up" mode to "operate." The manufacturer specifies the temperature (measured at the steam outlet from the EMx) at which the shift from "warm-up" to "operate" can be made.

The gas turbine is initially fired at 5 MW while the boiler feed water is heated, high pressure steam is first generated, and then superheated auxiliary (high pressure) steam is first fed to the EMx catalyst regeneration system reformer. Initially, the EMx system will briefly control emissions until the catalyst is saturated; however, soon after the gas turbine is fired, exhaust from the turbine will rapidly poison the catalyst, and further reduction in emissions cannot occur until the catalyst is

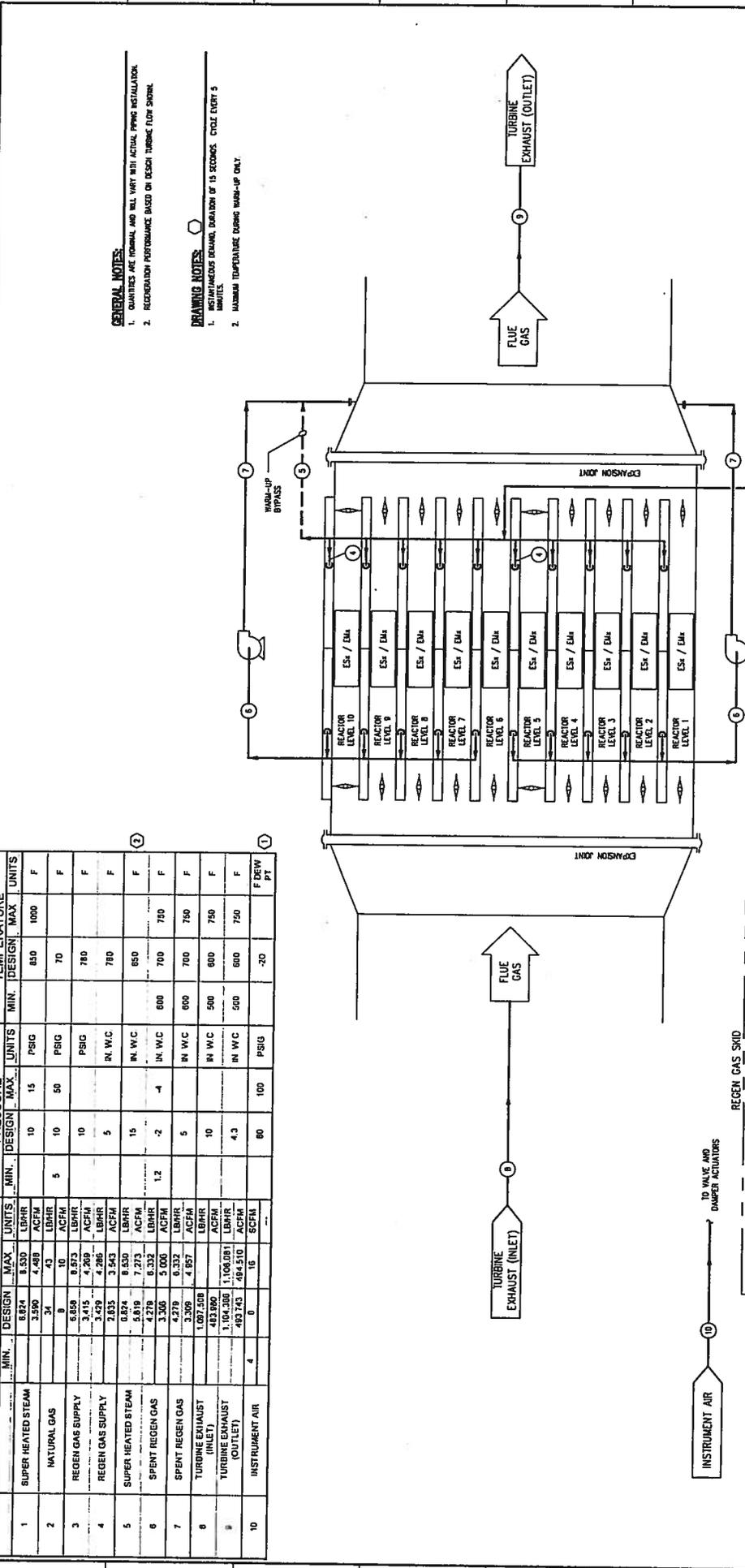
regenerated by the EMx. The gas turbine is then ramped to 10 MW while the high pressure steam pressure increases, and while the auxiliary steam temperature and reformer outlet temperature continue to increase. The gas turbine is further ramped to 24 MW once the high pressure steam reaches its design operating level of about 600 psi.

Once the auxiliary steam temperature at the reformer outlet reaches 700°F (the manufacturer's design specification), the EMx controls are shifted from "warm-up" mode to "operate" and the EMx system begins to sequentially regenerate pairs of catalyst beds. Each regeneration cycle takes about 10 minutes. As each pair of catalyst beds is regenerated, NOx concentrations in the gas turbine exhaust will be incrementally reduced. Once four pairs of catalyst beds are regenerated, the EMx system will consistently meet the emission limits. A process flow diagram of the EMx catalyst regeneration system is included in Figure 1.

Figure 2 contains a figure showing a startup event from March 14, 2011, with the EMx catalyst regeneration system being triggered at a reformer outlet temperature of 700°F (this temperature is shown by the black line in Figure 2). For this startup, fuel ignition (the yellow line) commenced at 9:38 am. At about 11:20 am, the auxiliary steam temperature at the reformer outlet reached 700°F (1 hour and 42 minutes after fuel ignition). After the operator verified that the auxiliary steam temperature at the reformer outlet had met the manufacturer-specified temperature of 700°F, the EMx system was shifted to "operate" mode (11:25 am; 1 hour and 47 minutes after fuel ignition). At this point in the operation, methane began to be added to the steam reformer and catalyst regeneration commenced. At 12:22 pm, the catalyst beds were sufficiently regenerated to sustain NOx concentrations (the red line) consistently below 2 ppm @ 15% O₂ (about 2 hours and 43 minutes after fuel ignition). This startup event represents a nearly ideal startup with fresh catalyst and no operating problems or equipment malfunctions.

A 50 MW combined cycle gas turbine equipped with an SCR system can typically achieve the design SCR operating temperature of about 450°F, which reflects the exhaust gas temperature, in 2 hours or less. During the March 14, 2011, startup, the gas-side high pressure evaporator outlet temperature (the green line), which approximates the inlet temperature of a theoretical SCR catalyst on this turbine, reached 450°F at about 10:40 am (about 1 hour after startup). It takes much longer to heat auxiliary steam to yield a reformer outlet temperature of 700°F (1 hour and 42 minutes) than it takes to merely heat the gas turbine exhaust to 450°F (about 1 hour). It takes longer still to completely regenerate the EMx catalyst (2 hours and 43 minutes). This longer startup process was the basis for REU's original proposal of a 4-hour gas turbine startup. Completing the startup of an EMx system within 2 hours is not a realistic expectation given the design constraints. Even under ideal conditions such as those experienced on March 14, 2011, REU cannot achieve EMx system startup within the 2-hour window.

LINE NO.	COMPONENT	FLOW			PRESSURE			TEMPERATURE					
		MIN.	DESIGN	MAX.	UNITS	MIN.	DESIGN	MAX.	UNITS	MIN.	DESIGN	MAX.	UNITS
1	SUPER HEATED STEAM	6.874	8.530	LBHR	10	15	PSIG	850	1000	F			
2	NATURAL GAS	3.590	4.488	ACFM	5	10	PSIG	70		F			
3	REGEN GAS SUPPLY	6.854	8.573	LBHR	10	10	PSIG	780		F			
4	REGEN GAS SUPPLY	3.415	4.269	ACFM	5	5	IN. W.C.	780		F			
5	SUPER HEATED STEAM	3.429	4.285	LBHR	15	15	IN. W.C.	850		F			
6	SPENT REGEN GAS	0.874	8.530	LBHR	1.2	-4	IN. W.C.	700	750	F			
7	SPENT REGEN GAS	4.279	5.332	LBHR	5	5	IN. W.C.	700	750	F			
8	TURBINE EXHAUST (INLET)	1.097,508	4.957	ACFM	10	10	IN. W.C.	500	500	F			
9	TURBINE EXHAUST (OUTLET)	483,980	1,068,091	LBHR	4.3	4.3	IN. W.C.	500	500	F			
10	INSTRUMENT AIR	483,743	484,510	ACFM	80	100	PSIG	-20		F DEW PT			



GENERAL NOTES:

1. DIMENSIONS ARE NOMINAL AND WILL VARY WITH ACTUAL PIPING INSTALLATION.
2. RECOVERY PERFORMANCE BASED ON DESIGN TURBINE FLOW SHEET.

DRAWING NOTES:

1. INSTANTANEOUS SOUND, DURATION OF 15 SECONDS, CYCLE EVERY 5 MINUTES.
2. MAXIMUM TEMPERATURE DURING WASH-UP ONLY.

DATE		04-11-08	DATE	04-11-08
DESIGNED BY	PAF	DATE	04-11-08	DATE
CHECKED BY	MGH	DATE	04-11-08	DATE
APPROVED BY	DA	DATE		DATE
CLIENT APPROVED		DATE		DATE

THIS DRAWING CONTAINS PROPRIETARY INFORMATION AND MAY BE REPRODUCED OR DISCLOSED TO ANY OTHER PARTY WITHOUT THE WRITTEN CONSENT OF AN OFFICER OF EMERACHEM, L.L.C.

EMERACHEM, L.L.C.

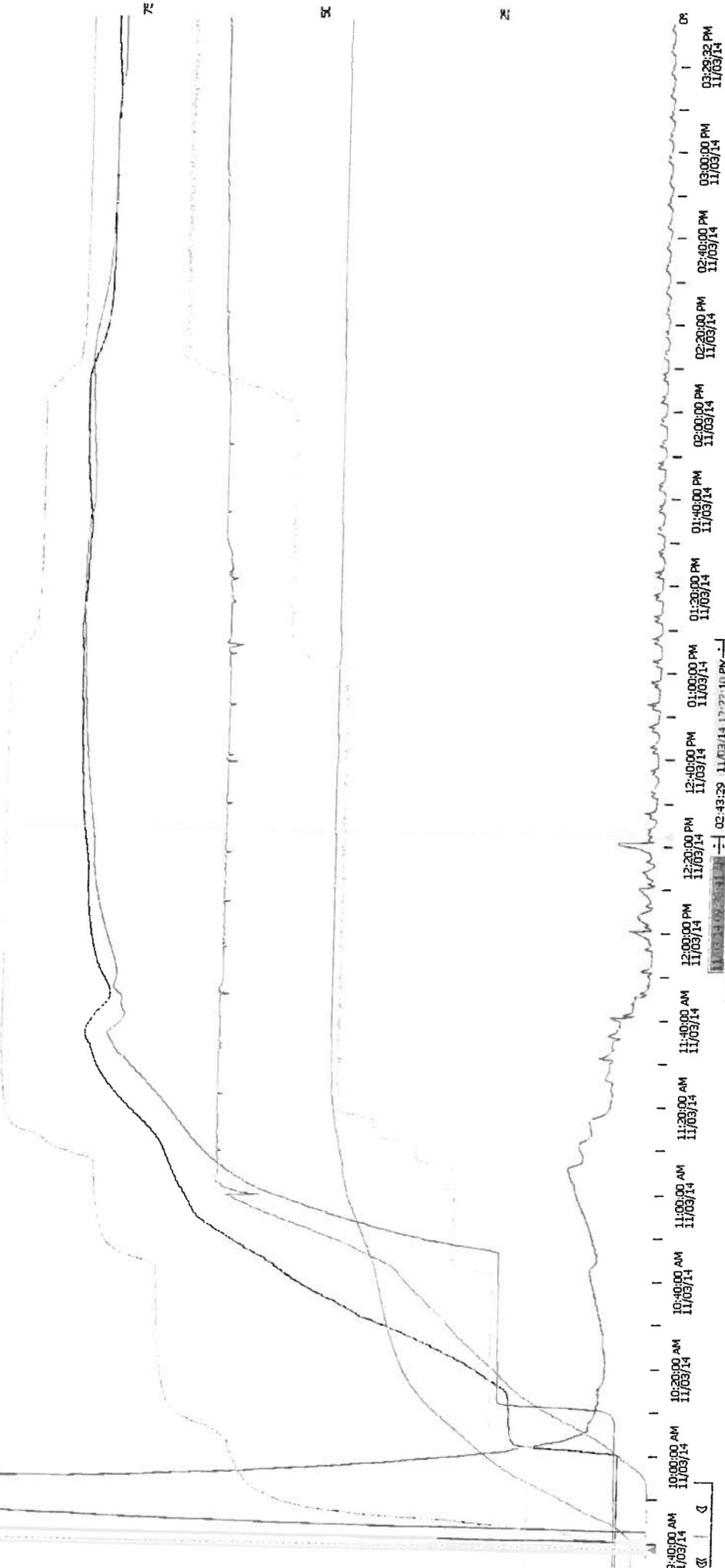
PROCESS FLOW DIAGRAM AND MASS BALANCE

REDDING POWER PLANT UNIT #6

EMR CONTROL SYSTEM

SCALE: NO SCALE

SHEET 1 OF 1



TIME	DATE	SIGNAL TAG	RANGE LOW	RANGE HI	CUPSOR 1	CUPSOR 2	UNIT	LAST
03:00 AM	11/03/14	3HFC4E1B12Q011OUT	0.0000	100.0000	-0.7016	1.0107	HPm	0.988
03:00 AM	11/03/14	6HSP15011: Q01	0.0000	1000	0.1085	606.8431	psi	628.6166
03:00 AM	11/03/14	6ASST100611: Q01	0.0000	1100	47.5441	889.1349	°F	885.2238
03:00 AM	11/03/14	6HFGT150011: Q01	0.0000	1200	61.8252	1103	°F	991.7301
03:00 AM	11/03/14	6HFGT150411: Q01	0.0000	1300	56.1000	565.0661	°F	570.4728
03:00 AM	11/03/14	6RGST150311: Q01	0.0000	1000	45.7899	795.5367	°F	775.1371
03:00 AM	11/03/14	6FSSFI01511: Q01	0.0000	540.0000	530.7780	13023	1.50cf/h	2009
03:00 AM	11/03/14	6CF1AUCEN111: E/1	-14.9070	74.8250	-0.0326	25.1175	MV	46.0731

Output Value: HP STEAM OUTLET PRESS

HP STEAM OUTLET PRESS

ALL STEAM TEMP

GAS SIDE TURB E H TEMP

GAS SIDE HP EVAP OUTLET TEMP

STEAM REFORMER OUTLET TEMPERATURE

GTG FUEL GAS SIFFL / FLOW

Generator A:trig Power Measurement

HP STEAM DRUM

Date: 06/12/03

Drawn By: _____

Checked By: _____

Page 1

CERTIFICATION STATEMENT (FORM 5-M)

DISTRICT: Shasta County	< DISTRICT USE ONLY =
COMPANY NAME: City of Redding	DISTRICT ID:
	FACILITY NAME: Redding Power Plant

Identify, by checking off below, the forms and attachments that are part of your application. If the application contains forms or attachments that are not identified below, please identify these attachments in the blank space provided below. Review the instructions if you are unsure of the forms and attachments that need to be included in a complete application.

Forms included with application

- Stationary Source Summary Form
- Total Stationary Source Emission Form
- Compliance Plan Form
- Compliance Plan Certification Form
- Exempt Equipment Form
- Certification Statement Form

List other forms or attachments

check here if additional forms listed on back

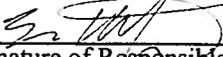
Attachments included with applications

- Description of Operating Scenarios
- Sample emission calculations
- Fugitive emission estimates
- List of Applicable requirements
- Discussion of units out of compliance with applicable federal requirements and, if required, submit a schedule of Compliance
- Facility schematic showing emission points
- NSR Permit
- PSD Permit
- Enhanced monitoring protocols
- Risk management verification per 112(r)

List Other Forms or Attachments (cont.)

I certify under penalty of law, based on information and belief formed after reasonable inquiry, that the information contained in this application, composed of the forms and attachments identified above, are true, accurate, and complete.

I certify that I am the responsible official, as defined in Rule 5.

 10/24/12
Signature of Responsible Official Date

p.p. Greg Deedon
Print Name of Responsible Official

Electric Manager - Power Production
Title of Responsible Official and Company Name