RULE 250 STATIONARY GAS TURBINES

Adopted 10-17-94

CONTENTS

This Page Intentionally Left Blank

100 GENERAL

101 PURPOSE: The purpose of this rule is to limit NOx emissions from stationary gas turbines in conformance with BARCT determinations approved by the California Air Resources Board to meet the requirements of the California Clean Air Act.

102 APPLICABILITY: Except as provided in Sections 110 and 111, this rule shall apply to all stationary gas turbines, 0.3 megawatt (MW) and larger.

110 EXEMPTION - LABORATORY, FIREFIGHTING/FLOOD CONTROL, AND PIPELINE UNITS: The provisions of this rule with the exception of Section 402.3 shall not apply to the operation of stationary gas turbines used under the following conditions:

110.1 Laboratory units used in research and testing for the advancement of gas turbine technology.

110.2 Units operated exclusively for firefighting and/or flood control.

110.3 Pipeline gas turbines provided that the owner/operator demonstrates to the satisfaction of the Air Pollution Control Officer that water or steam injection, selective catalytic reduction, or any other emission control technology is not technologically feasible, cost effective or creates adverse environmental impacts such as those associated with the use, transport, or disposal of supplies such as water and ammonia.

110.4 Chemical processing gas turbine units.

111 EXEMPTION - EMERGENCY STANDBY AND SMALL UNITS: The provisions of this rule with the exception of Sections 402.3, 403, and 502.5 shall not apply to the operation of stationary gas turbines used under the following conditions:

111.1 Emergency standby units demonstrated to operate less than 200 hours per calendar year.

111.2 Units of less than 4 MW operating less than 877 hours per calendar year.

200 DEFINITIONS

201 BARCT: "Best Available Retrofit Control Technology" as defined in Section 40406 of the California Health and Safety Code as an "emission limitation that is based on the maximum degree of reduction achievable, taking into account environmental, energy, and economic impacts by each class or category of source".

202 CHEMICAL PROCESSING GAS TURBINE UNIT: A stationary gas turbine that vents its exhaust gases into the operating stream of a chemical process.

203 COMPLIANCE LIMIT: Allowable NOx emissions expressed in parts per million by volume (ppmv).

204 CONTROL SYSTEM OPERATING PARAMETERS: Operating parameters that the Air Pollution Control Officer deems necessary to analyze when determining compliance, such as ammonia and exhaust flow rates and exhaust gas temperature for SCR; of humidity, water injection rate, exhaust gas flow rate, and temperature for water injection.

205 EMERGENCY STANDBY UNIT: A stationary gas turbine that operates only as a mechanical or electrical power source for a facility when the primary power source has been rendered inoperable due to a failure beyond the reasonable control of the operator, except due to power interruption pursuant to a voluntary interruptible power supply agreement. Electricity generated by such a unit cannot be sold.

206 **HHV:** The higher heating value of a fuel.

207 **LHV:** The lower heating value of the fuel.

208 **MEASURED NOx EMISSIONS CONCENTRATION:** The concentration of NOx emissions corrected to International Standards Organization (ISO) standard conditions:

$$NOx = (NOx_{obs})(P_{ref}/P_{obs})^{0.5}(288^{o}/T_{amb})^{1.53}[e^{19(Hobs-0.00633)}]$$

Where:

Nox	=	Emissions of NOx at 15 percent oxygen and ISO standard conditions on a dry basis, ppm.
Nox_{obs}	=	Measured NOx emissions corrected to 15 percent oxygen on a dry basis, ppm.
P_{ref}	=	Standard reference pressure, 14.696 psia.
P_{obs}	=	Measured site ambient absolute pressure, psia.
H_{obs}	=	Measured humidity of ambient air, pounds water per pound dry air.
e	=	Transcendental constant (2.718).
T_{amb}	=	Measured temperature of ambient air, degrees K.

or an alternate correlation that corrects to ISO standard conditions and is approved by the Air Pollution Control Officer.

209 **NOx EMISSIONS (Nox):** The sum of nitric oxides and nitrogen dioxide in the exhaust gas stream.

210 **PIPELINE GAS TURBINES:** A stationary gas turbine used to transport gases or liquids in a pipeline.

211 **POWER AUGMENTATION:** An increase in the gas turbine shaft output and/or the decrease in gas turbine fuel consumption by the addition of energy recovered from exhaust heat.

212 **PUBLIC SERVICE UNIT:** A gas turbine used to generate electricity for sale or for use in serving the public.

213 **RATING:** The continuous megawatt (MW) rating or mechanical equivalent by a manufacturer for gas turbine(s) without power augmentation.

214 **SELECTIVE CATALYTIC REDUCTION (SCR):** A post combustion control technology that utilizes ammonia injected into the exhaust gas stream where it reduces NOx to molecular nitrogen in the presence of a catalyst.

215 **STATIONARY GAS TURBINE:** Any gas turbine system that is gas and/or liquid fueled with or without power augmentation. This unit is either attached to a foundation at a facility or is portable equipment operated at a specific facility for more than 90 days in any 12-month period. Two or more gas turbines powering one shaft shall be treated as one unit.

216 **THERMAL STABILIZATION PERIOD:** The two hour start-up time necessary to bring the heat recovery steam generator to the proper temperature, not to exceed two (2) hours.

300 STANDARDS

301 **LIMITATIONS:** The owner or operator of any stationary gas turbine unit shall not operate such unit under load conditions, excluding the thermal stabilization period which results in the measured NOx emissions concentration exceeding the compliance limit listed below, averaged over 15 minutes:

Unit Size Megawatt Rating (MW)	Compliance limit NO_x, ppm @ 15% O_2	
	Gas[A]	Oil[B]
0.3 to Less Than 2.9 MW and Units Greater Than or Equal to 4 MW That Operate Less Than 877 Hour/Year	42	65
2.9 to Less Than 10 MW	25 x **EFF**/25	65
10.0 MW and Over with SCR	9 x **EFF**/25	25 x **EFF**/25
10.0 MW and Over Without SCR	15 x **EFF**/25	42 x **EFF**/25

A. GAS INCLUDES NATURAL, DIGESTER, AND LANDFILL GASES.
B. OIL INCLUDES KEROSINE, JET, AND DISTILLATE. THE SULFUR CONTENT OF THE OIL SHALL BE LESS THAN 0.05%.

Where: **EFF**(efficiency) is the higher of the following:

301.1 **EFF** $= \frac{3412 \times 100\%}{AHR}$

[where: AHR = Actual Heat Rate at HHV of Fuel (BTU/KW-HR)], which is the demonstrated percent efficiency of the gas turbine only as calculated without consideration of any downstream energy recovery from the actual heat rate, (BTU/KW-HR) or 1.34 (BTU/HP-HR); corrected to the HHV (higher heating value) of the fuel and ISO conditions, as measured at peak load for that facility, or

301.2 **EFF** $= \frac{MRE \times LHV}{HHV}$

[where: MRE = Manufacturer's Rated Efficiency with Air Pollution Equipment at LHV.], which is the manufacturer's continuous rated percent efficiency of the gas turbine with air pollution equipment after correction from LHV to HHV of the fuel at peak load for that facility.

400 ADMINISTRATIVE REQUIREMENTS

401 COMPLIANCE SCHEDULE: Owners or operators of all gas turbines existing on the date of adoption and subject to the provisions of this rule shall comply with the applicable provisions of Section 301 in accordance with the following schedule:

401.1 No later than May 31, 1995, demonstrate final compliance.

402 EMISSION CONTROL PLAN: The owner or operator of any existing stationary gas turbine shall submit to the Air Pollution Control Officer for approval an Emissions Control Plan of all actions, including a schedule of increments of progress, which will be taken to meet or exceed requirements of the applicable emissions limitations in Section 301 and compliance schedule in Section 401.

402.1 The Emission Control Plan shall contain, as a minimum, a list that provides the following for each gas turbine subject to the provisions of this rule:

a. Permit or identification number;

b. Name of gas turbine manufacturer;

c. Model designation;

d. Rated shaft power output (MW);

e. Type of liquid fuel and/or type of gaseous fuel;

f. Fuel consumption (cubic feet of gas or gallons of liquid) for the previous one-year period;

g. Hours of operation in the previous one-year period;

h. Heat rate (BTU/KW-HR), corrected to the HHV for each type of fuel (liquid/gas), and

I. HHV for each fuel.

402.2 A listing of all gas turbines required to be controlled, identifying the type of emission control to be applied to each gas turbine along with documentation showing existing emissions of oxides of nitrogen.

402.3 Support documentation for any units exempt under the provisions of Sections 110 and 111.

403 EXEMPT UNITS AND EMERGENCY STANDBY UNITS: Exempt units and emergency standby units shall comply with the following:

403.1 The owner or operator of any unit listed below shall notify the Air Pollution Control Officer in writing within seven days if the hour-per-year limit is exceeded. A public service unit operating during a state of emergency, when such emergency is declared by proclamation of the Governor of the State of California and when the unit is located in the specific geographical location identified in the proclamation, shall be excluded from the hour-per-year limit. If the hour-per-year limit is exceeded, the exemption shall be permanently withdrawn. Within 30 days after the exceedance, the owner or operator shall submit a application for Authority to Construct that details a plan to meet the applicable limits specified in Section 301 of this rule within two years. Included in this application, the owner or operator shall submit an emission control plan that includes a schedule of increments of progress for the installation of the required control equipment. This schedule shall be subject to the review and approval of the Air Pollution Control Officer.

a. Any unit smaller than 4 MW or emergency standby unit exempt under Sections 110 and 111.

b. Any unit equal to or greater than 4 MW.

500 MONITORING AND RECORDKEEPING

501 MONITORING: The owner or operator of any stationary gas turbine subject to the provisions of this rule shall perform the following actions:

501.1 Install, operate and maintain in calibration equipment, as approved by the Air Pollution Control Officer, that continuously measures and records the following:

a. Control system operating parameters;

b. Elapsed time of operation; and

c. For units of 10 MW or greater that operated more than 4000 hours per year over the last three years prior to July 13, 1994, the exhaust gas NOx concentrations corrected to ISO conditions at 15 percent oxygen on a dry basis. The NOx monitoring system shall meet EPA requirements as specified

in 40 CFR Part 60, App. B, Spec.2 or other systems that are acceptable to the EPA.

502 RECORDKEEPING:

502.1 All records shall be available for inspection at anytime for a period of two years.

502.2 Submit to the Air Pollution Control Officer information demonstrating that the system has data gathering and retrieval capability.

502.3 Submit to the Air Pollution Control Officer, prior to issuance of a Permit to Operate, information correlating the control system operating parameters to the associated NOx output. This information may be used by the Air Pollution Control Officer to determine compliance when there is no continuous emission monitoring system for NOx available or when the continuous emission monitoring system is not operating properly.

502.4 Provide source test information annually regarding the exhaust gas NOx concentration at ISO conditions corrected to 15 percent oxygen on a dry basis, and the demonstrated percent efficiency (EFF) of the turbine unit.

502.5 Maintain a gas turbine operating log that includes, on a daily basis, the actual Pacific Standard Time start-up and stop time, total hours of operation, type and quantity of fuel used (liquid/gas). This information shall be available for inspection at any time from the date of entry.

502.6 Maintain a gas turbine operating log for units exempt under Section 111 that includes, on a daily basis, the actual Pacific Standard Time start-up and stop time, total hours of operation, and cumulative hours of operation to date for the calendar year. This information shall be available for inspection at any time for two years from the date of entry and submitted to the Air Pollution Control Officer at the end of each calendar year in a manner and form approved by the Air Pollution Control Officer.

503 TEST METHODS:

503.1 **Oxides of Nitrogen (NO_x):** Oxides of Nitrogen (NO_x) emissions shall be determined in accordance with EPA Method 20.

503.2 **Oxygen (O_2):** Oxygen (O_2) concentrations shall be determined in accordance with EPA Method 3A.

503.3 **HHV and LHV:** HHV and LHV shall be determined in accordance with ASTM D-240-87, Standard Test Method for Heat of Combustion of Liquid Hydrocarbon Fuels by Bomb Calorimeter, or D-2382-88, Standard Test Method for Heat of Combustion of Hydrocarbon Fuels by Bomb Calorimeter (High-precision Method), for distillate fuels, and ASTM D-3588-91, Standard Practice for Calculating Heat Value, Compressibility Factor, and Relative Density (Specific Gravity) of Gaseous Fuels, ASTM D-1826-88, Standard Test Method for Calorific (Heating) Value of Gases in Natural Gas Range by Continuous Recording Calorimeter, or ASTM D-1945-81, Standard Method for Analysis of Natural Gas by Gas Chromatography, for gaseous fuels.

This Page Intentionally Left Blank