RULE 425 **Stationary Gas Turbines (Oxides of Nitrogen)** - Adopted 8/16/93, Amended 1/11/18

I. Purpose

The purpose of this Rule is to limit oxides of nitrogen (NOx) emissions from stationary gas turbines.

II. Applicability

The provisions of this Rule shall apply to any stationary gas turbine with a rating equal to or greater than 0.88 megawatts (MW) operating in the Eastern Kern Air Pollution Control District (District).

III. Definitions

A. Combined Cycle: Any stationary gas turbine operated both for the production of electrical energy from shaft work and the useful energy produced from heat recovered from its exhaust gases.

B. Dry Low-NOx Combustor: Any gas turbine engine combustor using staging, air/fuel premixing or other design features to reduce NOx emissions.

C. Gaseous Fuel: Any fuel existing as gas at standard conditions.

D. Liquid Fuel: Any fuel, including distillate and residual oil, existing as liquid at standard conditions.

E. Oxides of Nitrogen (NOx): Total nitrogen oxides (expressed as NO_2).

F. 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.

G. Rating: Manufacturer's continuous electrical output megawatt (MW) specification for a gas turbine system.

H. Simple Cycle: Any stationary gas turbine in which all electric generators are driven by shaft work from fuel combustion.

I. Selective Catalytic Reduction (SCR): A post-combustion control technology that utilizes a reducing agent, such as ammonia, injected into the exhaust gas stream where it converts NOx to molecular nitrogen in the presence of a catalyst.

J. Stationary Gas Turbine: Any gas turbine system, with or without power augmentation, which is permanently attached to a foundation, or is not a portable gas turbine. The gas turbine is not self-propelled nor intended to be propelled while performing its function, although it may be mounted onto a foundation. Two or more gas turbines powering a common shaft shall be treated as one gas turbine.

K. Standard Conditions: As defined in Rule 102, Subsection RR.

L. Shut-Down Period: The time necessary to cease operation of a gas turbine from operating under load conditions. The time shall not exceed one (1) hour.

M. Start-Up Period: The time necessary to bring operation of a gas turbine up to the designed rating. The time shall not exceed six (6) hours for combined cycle gas turbine power plants or two (2) hours for simple cycle gas turbine power plants.

IV. Exemptions

The provision of this Rule shall not apply to the operation of stationary gas turbines under the following conditions:

A. Emergency standby units demonstrated to operate less than 200 hours per year.
B. Units less than 4 MW that operate less than 877 hours per year.
C. Laboratory units used in research and testing for the advancement of gas turbine technology.
D. Units operated exclusively for firefighting and/or flood control.
E. Turbines used in test cells and test stands.
F. Portable equipment registered in accordance with ARB regulations under 13 CCR 2450-2465, Portable Equipment Registration Program (PERP) or 13 CCR 2420 Off-road Compression-ignition Engines and Equipment. Portable turbines used by the Department of Defense or National Guard exclusively used for military tactical support or other federal emergency purposes.

V. Requirements

A. Emission Limits

The owner or operator of any stationary gas turbine unit shall not operate such unit under load conditions, excluding the start-up or shut-down period which results in the measured NOx emissions concentration exceeding the compliance limit listed below, averaged over one (1) hour based on four consecutive 15-minute averages:

Unit Size Megawatt Rating (MW)	**Compliance Limit NOx, ppmv at 15% O_2**	
	Gaseous Fuel	**Liquid Fuel**
Units Rated 0.88 to Less Than 2.9 MW OR Units Greater Than or Equal to 4 MW That Operate Less Than 877 Hour/Year	42	65
2.9 MW to Less Than 10 MW	25	65
10.0 MW and Greater	9	25

B. The owner or operator of Westinghouse W251B10 with Authority to Construct issued before January 1, 1983 using dry low-NOx combustors shall have the following NOx emission limits:

1. 25 ppmv at 15% O_2 when fired with gaseous fuel or,

2. 65 ppmv at 15% O_2 when fired with liquid fuel.

C. Start-up/Shut-down Combined Cycle Units

The NOx emissions shall meet at least one of the following averaged over the duration of the start-up or shut-down period:

1. 70 ppmv at 15% O_2 for turbines fired with gaseous fuel or,

2. 226 ppmv at 15% O_2 for turbines fired with liquid fuel.

D. Start-up/Shut-down Simple Cycle Units

The NOx emission shall be kept to a minimum by use of the following:

1. Manufacturer’s recommendation for operation during start-up and shut-down.

2. Injection of water as soon as reasonably possible.

3. Maintaining proper air to fuel ratios.

VI. Administrative Requirements

A. Emission Control Plan

The owner or operator of any existing stationary gas turbine subject to this Rule shall submit to the APCO for approval an emissions control plan, including a schedule of increments of progress to be taken to meet or exceed requirements of Section V to comply with the compliance schedule prescribed by Section VIII.

An emissions control plan shall be submitted for each stationary gas turbine subject to this Rule, including:

1. District permit number,
2. Gas turbine manufacturer's name and model number,
3. Rated electrical energy output (MW) and rated heat recovery (Btu/hr),
4. Type of fuel (gas and/or liquid),
5. Last year's fuel consumption (cubic feet of gas or gallons of liquid),
6. Last year's hours of operation,
7. Type of emissions control to be applied to engine, and
8. Documentation showing current NOx emissions concentration.

B. Monitoring and Recordkeeping

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

1. Install, operate, and maintain in calibration equipment capable of continuously measuring and recording the following:

    a. Control system operating parameters:

        i. Periodic NOx emission concentrations,
        ii. Turbine exhaust oxygen concentration,
        iii. Air-to-fuel ratio,
        iv. Flow rate of reducing agents added to turbine exhaust,
        v. Catalyst inlet and exhaust temperature,
        vi. Catalyst inlet and exhaust oxygen concentration,
        vii. Other operational characteristics.

    b. Elapsed time of operation measured by an hourly meter.

2. For units with 10 MW or greater, the owner or operator shall monitor the exhaust gas NOx concentrations. The NOx monitoring system shall meet EPA requirements as specified in 40 CFR Part 60, Appendix B, Specification 2, or other systems approved by EPA. The owner or operator shall submit to the Air Pollution Control Officer the information demonstrating that emission monitoring system has data gathering and retrieval capability.

3. Submit to the Air Pollution Control Officer, prior to issuance of 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.

4. Provide source test information regarding the exhaust gas NOx concentration at ISO conditions corrected to 15 percent oxygen on a dry basis.

5. Maintain a stationary gas turbine engine operating log, including, on a daily basis, actual start-up and stop times, total hours of operation, and type and quantity of fuel used (liquid/gas).

6. Maintain and make all records available for District inspection at any time for a period of five (5) years.

C. Compliance Testing

The owner or operator of any stationary gas turbine subject to provisions of this rule shall conduct annual testing using the methods specified in Section VI.D below.

D. Test Methods

1. Oxides of nitrogen (NOx) emissions shall be determined using EPA Method 7E or EPA Method 20 or ARB Method 100.

2. Exhaust gas Oxygen (O_2) concentration content shall be determined using EPA Method 3A or ARB Method 100.

E. Exempt Units

Exempt units shall comply with the following:

1. The owner or operator of any unit exempt under Section IV shall submit support documentation to the Air Pollution Control Officer within seven days if the hour-per-year limit is exceeded. 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 an application for Authority to Construct that details a plan to meet the applicable limits specified in Section V of this Rule. Included in the application, the owner or operator shall submit a schedule of increments of progress for the installation of the required control equipment. This schedule shall not exceed four years from the date of the receipt of Authority to Construct application.

2. 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.

VII. Calculations

NOx emissions concentrations shall be calculated using the following equation:

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

where:

NOx	=	NOx emissions concentration (ppmv) corrected to 15 percent oxygen and ISO standard conditions on a dry basis.
NOx_{obs}	=	Measured stack gas NOx emissions concentration (ppmv) corrected to 15 percent oxygen on a dry basis.
P_{ref}	=	standard atmospheric pressure (14.7 psia).
P_{obs}	=	atmospheric pressure measured at site during testing, psia.
H_{obs}	=	absolute ambient humidity measured at site during testing, pounds water per pound dry air.
e	=	transcendental constant (2.718).
T_{amb}	=	ambient air temperature in K and measured at site during testing.

VIII. Compliance Schedule

An owner or operator of a stationary gas turbine subject to Section V and not currently achieving such limits shall comply with requirements of Section V in accordance with the following schedule:

A. By (18 months after rule adoption date), submit to the Control Officer a compliance plan, and a complete application for Authority to Construct for all necessary equipment modifications subject to Rule 201.

B. By January 1, 2021, demonstrate full compliance.

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