

PROPOSED AMENDED RULE 1134. EMISSIONS OF OXIDES OF NITROGEN FROM STATIONARY GAS TURBINES

(a) Purpose

The purpose of this rule is to reduce emissions of oxides of nitrogen (NOx) from stationary gas turbine units.

(b) Applicability

The provisions of this rule shall apply to all existing stationary gas turbines, 0.3 megawatt (MW) and larger, as of August 4, 1989. The rule does not apply to stationary gas turbines subject to Rule 1135 – Emissions of Nitrogen from Electricity Generating Facilities or Rule 1109.1 – Refinery Equipment.

(c) Definitions

(1) ANNUAL CAPACITY FACTOR is the ratio between the measured heat input (in MMBTU) from fuel consumption to a stationary gas turbine unit during a calendar year and the potential heat input (in MMBTU) to the stationary gas turbine unit had it been operated for 8,760 hours during a calendar year at the permitted rating, expressed as a percent.

~~CHEMICAL PROCESSING GAS TURBINE UNIT is a gas turbine unit that vents its exhaust gases into the operating stream of a chemical process.~~

(2) COGENERATION CYCLE GAS TURBINE UNIT is a any gas turbine unit that operates both for the simultaneous production of shaft work and for the recovery of useful thermal energy from the exhaust gases or waste steam as defined by Section 25134 of the California Public Resources Code which is designed to generate electricity and useful heat energy at the same time (combined heat and power).

(3) COMBINED CYCLE GAS TURBINE UNIT is a gas turbine unit that operates both for the production of electrical energy from shaft work and the useful energy produced from heat recovered from its exhaust gases recovers heat from the gas turbine exhaust gases for use in a heat recovery steam generator to generate additional electricity.

- (4) DUCT BURNER is a device located in the heat recovery steam generator of a gas turbine unit that combusts fuel and adds heat energy to the turbine exhaust to increase the output of the heat recovery steam generator.
- (45) EMERGENCY STANDBY GAS TURBINE UNIT is a gas turbine unit that operates only as a ~~mechanical or electrical~~ power source for a facility when the primary power source has been rendered inoperable, except due to power interruption pursuant to an interruptible power supply agreement. ~~This does not include utility company electrical power plant units.~~
- (5) EMISSION CONTROL PLAN is a plan that shall contain at a minimum ~~District permit or identification number; name of gas turbine manufacturer; model designation; rated brake horsepower; heat rate (BTU/KW-HR); corrected to the HHV for each type of fueling (liquid/gas); type of liquid fuel and/or type of gaseous fuel; hours of operation in the previous one-year period; fuel consumption (cubic feet of gas or gallons of liquid) for the previous one-year period; and a list of all gas turbine units required to be controlled identifying the type of emission control to be applied to such gas turbine units along with documentation showing existing emissions of NO_x and CO.~~
- (6) EXHAUST AFTER-TREATMENT ~~means~~ is a control method for the post-combustion reduction of NO_x emissions, such as selective catalytic reduction (SCR).
- (7) EXISTING GAS TURBINE UNIT is a stationary gas turbine unit that was not a participant in the Regional Clean Air Incentives Market (RECLAIM) program and met the following criteria prior to August 4, 1989:
- (A) Had been issued a valid permit to construct or operate by the ~~District~~SCAQMD, or
- (B) Was in operation pursuant to the provisions of ~~District~~SCAQMD Rule 219(b)(1).~~;~~ and.
- (8) HHV ~~HIGHER HEATING VALUE OF FUEL~~ is the higher heating value of fuel.
- (9) LHV ~~LOWER HEATING VALUE OF FUEL~~ is the lower heating value of fuel.
- (10) PEAKING GAS TURBINE UNIT is a gas turbine unit that is used ~~intermittently to produce energy on a demand basis.~~
- (10) LANDFILL GAS is any untreated, raw gas derived through a natural process from the decomposition of organic waste deposited in a landfill

from the evolution of volatile species in the waste, or from chemical reactions of substances in the waste.

- (11) NATURAL GAS is a mixture of gaseous hydrocarbons, with at least 80 percent methane (by volume), and of pipeline quality, such as the gas sold or distributed by any utility company regulated by the California Public Utilities Commission.
- (~~5~~12) OXIDES OF NITROGEN (NO_x) EMISSIONS is the sum of nitric oxides and nitrogen dioxides emitted, collectively expressed as nitrogen dioxide emissions.
- (13) OUTER CONTINENTAL SHELF is as defined in 40 CFR, Part 55 – Outer Continental Shelf Air Regulations.
- (~~14~~14) PIPELINE GAS TURBINE UNIT is a stationary gas turbine unit used to transport gases or liquids in a pipeline.
- (~~15~~15) POWER AUGMENTATION is the 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.
- (16) PRODUCED GAS is organic compounds that are both gaseous at standard temperature and pressure and are associated with the production, gathering, separation, or processing of crude oil.
- (~~17~~17) RATING OF A GAS TURBINE UNIT is the continuous MW (megawatt) rating or mechanical equivalent by a manufacturer for gas turbine unit(s) without power augmentation.
- (18) RECLAIM NO_x SOURCE for the purpose of this rule is stationary gas turbine unit located at a facility that is currently in the Regional Clean Air Incentives Market (RECLAIM), as established in Regulation XX.
- (~~19~~19) SEWAGE DIGESTER GAS is any gas derived from anaerobic decomposition of organic sewage.
- (20) SHUTDOWN is the time period during which a stationary gas turbine unit reduces load ending in a period of zero fuel flow or as otherwise defined in the SCAQMD permit.
- (~~21~~21) SIMPLE CYCLE GAS TURBINE is any stationary combustion turbine that does not recover heat from the combustion turbine exhaust gases to heat water or generate steam
- (22) START-UP is the time period during which a stationary gas turbine unit begins combusting fuel after a period of zero fuel flow or as otherwise defined in the SCAQMD permit.

~~(15)~~ ~~SOUTHEAST DESERT AIR BASIN (SEDAB) means the portion of the air basin containing specific desert portions of Los Angeles, Riverside and San Bernardino counties, as defined in Title 17, California Code of Regulations, Section 60109, within the jurisdiction of the District.~~

~~(16)~~23 STATIONARY GAS TURBINE UNIT is any gas turbine unit that is gas and/or liquid fueled with or without power augmentation. This gas turbine 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 units powering one shaft shall be treated as one gas turbine unit.

~~(17)~~24 THERMAL STABILIZATION PERIOD is the two-hour start up time necessary for NOx control purposes in cogeneration cycle, combined cycle, or any other applicable stationary gas turbine units.

(25) TUNING is adjusting, optimizing, rebalancing, or other similar operations to a stationary gas turbine unit or an associated control device or otherwise as defined in the SCAQMD permit. Tuning does not include operations of an electric power generating unit and the associated control device during load transitions.

(ed) Emissions Limitations

(1) Until December 31, 2023 or until the existing gas turbine operates in compliance with subparagraph (d)(3), ~~The~~ ~~the~~ operator of any existing stationary gas turbine unit shall not operate such unit under load conditions, excluding the thermal stabilization period or other time period specified in the Permit to Construct or the Permit to Operate issued prior to August 4, 1989, which result in the discharge of oxides of nitrogen (NOx) emissions, directly or indirectly, into the atmosphere at concentrations in excess of the following as measured pursuant to subdivision (e):

$$Compliance\ Limit = Reference\ Limit \times \frac{EFF}{25\%}$$

Where:

Compliance Limit = allowable NOx emissions (ppm by volume).

Reference Limit = the NOx emission limit (ppm by volume) is corrected to 15 percent oxygen on a dry basis, and averaged

over 15 consecutive minutes. These limits for various megawatt ratings (continuous rating by the manufacturer without power augmentation) are as follows:

REFERENCE NO_x LIMITS, PPM

Unit Size Megawatt (MW) Rating	Effective 12-31-95
0.3 to Less Than 2.9 MW	25
2.9 to Less Than 10.0 MW	9
2.9 to Less Than 10.0 MW No SCR	15
10.0 MW and Over	9
10.0 MW and Over No SCR	12
60 MW and Over Combined Cycle No SCR	15
60 MW and Over Combined Cycle	9
	Effective 4/11/97
2.9 to Less Than 10.0 MW Utilizing Fuel Containing a Minimum of 60% Sewage Digester Gas by Volume on a Daily Average	25

And,

$$EFF = \frac{3413 \times 100\%}{\text{Actual Heat Rate at HHV of Fuel (BTU/KW-HR)}}$$

or,

$$EFF = (\text{Manufacturer's Rated Efficiency at LHV}) \times \frac{LHV}{HHV}$$

or

EFF = the demonstrated percent efficiency of the gas turbine unit only as calculated without consideration of any downstream energy recovery from the actual heat rate, (BTU/KW HR) or 1.34 BTU/HP; corrected to the HHV (higher heating value)

of the fuel, as measured at peak load for that facility; or the manufacturer's continuous rated percent efficiency (manufacturer's rated efficiency) of the gas turbine unit after correction from LHV (lower heating value) to the HHV of the fuel, whichever efficiency is higher. The value of EFF shall not be less than 25 percent. Gas turbine units with lower efficiencies will be assigned a 25 percent efficiency for this calculation.

- (2) The operator of any existing gas turbine unit subject to this rule shall also be subject to Regulation XIII if carbon monoxide (CO) emissions increase as a result of the application of NOx controls.
- (3) Notwithstanding the exemptions contained in Rule 2001 (j) and its accompanying Table I, effective January 1, 2024, the owner or operator of any stationary gas turbine unit shall not operate such unit under load conditions, excluding start-up, shutdown, and tuning periods, which result in the discharge of oxides of nitrogen (NOx) emissions, directly or indirectly, into the atmosphere at concentrations in excess of the following emission limits listed in Table I.

Table I: Emissions Limits for Stationary Gas Turbines

<u>Fuel Type</u>	<u>NOx (ppmv)</u>	<u>Ammonia (NH3) (ppmv)</u>	<u>Oxygen Correction (%, dry)</u>
<u>Landfill Gas</u>	<u>12.5</u>	<u>5.0</u>	<u>15</u>
<u>Liquid – Outer Continental Shelf</u>	<u>25.0</u>	<u>5.0</u>	<u>15</u>
<u>Natural Gas – Combined Cycle</u>	<u>2.0</u>	<u>5.0</u>	<u>15</u>
<u>Natural Gas – Pipeline Gas Turbine</u>	<u>5.0</u>	<u>5.0</u>	<u>15</u>
<u>Natural Gas – Simple Cycle</u>	<u>2.5</u>	<u>5.0</u>	<u>15</u>
<u>Produced Gas</u>	<u>5.0</u>	<u>5.0</u>	<u>15</u>
<u>Produced Gas – Outer Continental Shelf</u>	<u>9.0</u>	<u>5.0</u>	<u>15</u>
<u>Sewage Digester</u>	<u>18.8</u>	<u>5.0</u>	<u>15</u>
<u>Other</u>	<u>12.5</u>	<u>5.0</u>	<u>15</u>

(4) Start-Up, Shutdown, and Tuning

Requirements for start-up, shutdown, and tuning for each stationary gas turbine unit shall be included in the SCAQMD permit. The SCAQMD permit shall include limits for duration, mass emissions, and number of start-ups, shutdowns, and, if applicable, tunings.

(5) Averaging Time

(i) Stationary gas turbine units installed prior to [Date of Adoption] shall comply with the averaging time requirements specified on the SCAQMD permit as of [Date of Adoption].

(ii) Stationary gas turbine units installed after [Date of Adoption] shall average the NOx, ammonia, and oxygen emissions limits in Table I over a 60 minute rolling average.

(6) Prohibition of Liquid Fuel

An owner or operator of a stationary gas turbine shall not burn liquid fuel in a stationary gas turbine except for Outer Continental Shelf turbine units.

Outer Continental Shelf turbine units burning 10 percent or less by volume liquid fuel shall be subject to the Produced Gas – Outer Continental Shelf limit.

(de) Monitoring and Source Testing

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

- (1) For ~~co-generation and combined cycle~~ existing gas turbine units 2.9 MW and larger (continuous rating by the manufacturer without power augmentation), install, operate, and maintain in calibration a continuous in-stack NO_x and oxygen monitoring system which meets the requirements of SCAQMD Rule 218 – Continuous Emission Monitoring~~40 CFR Part 60, Appendix B, Spec. 2, for NO_x, Spec. 3 for oxygen (except the alternative RA procedures for Spec. 2 shall not apply), the 2 and 24-hour calibration spec. of Rule 218, and 40 CFR Part 60, Appendix F to demonstrate compliance with the emission limits of this rule. The continuous emissions monitoring system shall have data gathering and retrieval capability which meets the reporting requirements of 40 CFR part 60.7(e), 60.7(d), and 60.13.~~ This system shall include equipment that measures and records the following:
 - (A) Flow rate of liquids or gases and the ratio of water or steam to fuel added to the combustion chamber or to the exhaust for the reduction of NO_x emissions, as applicable.
 - (B) Elapsed time of operation.
- (2) Source Testing
 - (A) On or before December 31, 2023, the operator of any existing gas turbine unit not operating with a continuous emission monitoring system, Provide provide source test information regarding the gas turbine unit's exhaust gas NO_x and ammonia concentration, and the demonstrated percent efficiency (EFF), or the manufacturer's rated EFF, if the Executive Officer determines that it is representative of the unit's EFF, and the carbon monoxide concentration as specified pursuant to paragraph (e)(1). NO_x and carbon monoxide concentrations shall be in ppm by volume, corrected to 15 percent oxygen on a dry basis.
 - (B) Source Test Frequency

- (i) Stationary gas turbine units not operating with a continuous emission monitor and Units-emitting 25 tons or more of NO_x per calendar year shall be source tested, at least once every 12 months.
 - (ii) ~~All other Stationary gas turbine units not operating with a continuous emission monitor and emitting less than 25 tons existing units~~ shall be source tested ~~within 90 days after every 8,400 hours of operation~~ every three years.
- (3) In lieu of complying with paragraphs (e)(1), a RECLAIM NO_x source subject to Rule 1134 shall conduct monitoring and recordkeeping pursuant to SCAQMD Rule 2012 – Requirements for Monitoring, Reporting, and Recordkeeping for Oxides of Nitrogen (NO_x) Emissions, excluding the following:
- (A) Rule 2012 paragraphs (c)(3) through (c)(8), reporting and Super Compliant facilities;
 - (B) Rule 2012 subparagraphs (d)(2)(B) through (d)(2)(E), reporting and emission factors;
 - (C) Rule 2012 subdivisions (e) and (f), NO_x Process Units and Permit Conditions for Large Sources and Process Units;
 - (D) Rule 2012 paragraphs (g)(5) through (g)(8), reporting;
 - (E) Rule 2012 paragraphs (h)(1), (h)(2), and (h)(4) through (h)(6), reporting and mass emissions;
 - (F) Rule 2012 subdivisions (j) through (l), Source Testing, Exemptions, Appeals; and
 - (G) Rule 2012 Reported Data and Transmitting/Reporting Frequency requirements from Appendix A – “Protocol for Monitoring, Reporting and Recordkeeping for Oxides of Nitrogen (NO_x) Emissions.”
- (ef) Test Methods
- The following may be used by the Executive Officer to verify the concentrations of NO_x, NH₃, CO₂ and oxygen subject to the provisions of this rule. Emissions determined to exceed any limits established by this rule through either of the following shall constitute a violation of this rule.

- (1) ~~District SCAQMD~~ Test Methods 3.1, 7.1, 10.1 ~~and 100.1, and 207.1~~, and EPA Test Method 10 or any method deemed to be equivalent by the Executive Officer and approved by CARB and EPA.
- (2) Data obtained from a continuous emissions monitoring system, which is installed and properly operated according to paragraph ~~(d)~~(1) of this rule and as approved by the Executive Officer.

(fg) Recordkeeping

The ~~facility owner or operator of a stationary gas turbine~~ shall comply with the following provisions effective [90 days after Date of Adoption]:

- (1) All records shall be maintained at the facility for a period of two years and made available to ~~District SCAQMD~~ staff upon request.
- (2) Maintain a gas turbine operating log that includes, on a daily basis, the actual ~~Pacific Standard Time~~ start-up and stop time~~s~~; total hours of operation; type and quantity of fuel used (liquid/gas)~~s~~; cumulative hours of operation to date for the calendar year; and if applicable the cumulative hours of operation since the last source test required by subparagraph ~~(d)~~(2)(A).
- (3) ~~A monthly summary of emissions pursuant to paragraph (d)(1) shall be submitted to the District on or before the last day of the following calendar month.~~ Install, operate, and maintain a data acquisition system (DAS) to demonstrate compliance with the provisions subdivisions (d) and (h) of this rule.
- (4) The results of source tests shall be submitted to the ~~District SCAQMD~~ in a form and manner as specified by the Executive Officer within 30 days after source testing is completed.
- (5) Any person using an emission control system as a means of complying with this rule shall maintain daily records of system operation and maintenance which will demonstrate continuous operation and compliance of the emission control device during periods of emission producing activities.

(gh) Exemptions

The owner or operator ~~Any person~~ seeking to qualify for any one of the following exemptions has the burden of proving their its existing stationary gas turbine unit meets the applicable specified criteria.

- (1) All provisions of this rule shall not apply to the following:

- (A) Laboratory gas turbine units used in research and testing.
- (B) Gas turbine units operated exclusively for fire fighting and/or flood control.
- ~~(C) Chemical processing gas turbine units.~~
- ~~(D) All existing pipeline gas turbine units located in the Southeast Desert Air Basin (SEDAB).~~

(2) Emergency Standby Gas Turbine Units

(A) The owner or operator of an emergency standby gas turbine shall not be subject to The provisions of subdivisions (ed) and (de), and paragraphs (fg)(3), (fg)(4) and (fg)(5) for that unit, provided that the emergency standby gas turbine units shall not apply to the following:

- (i) ~~(A)~~Install and maintain in proper operation a non-resettable engine hour meter; and
- (ii) ~~Emergency standby and peaking gas turbine units Demonstrated to operate less than 200 hours per calendar year of operation; which have installed and maintained in proper operation a non-resettable engine hour meter.~~

~~(B) All existing gas turbine units located in the Southeast Desert Air Basin (SEDAB) which are rated below 4 MW and operate less than 877 hours per year.~~

~~(C) All existing gas turbine units located on San Clemente Island which are rated below 4 MW and operate less than 877 hours per year.~~

(B) However, if the hour-per-year limit is exceeded, the exemption shall be automatically and permanently withdrawn. The operator of any stationary gas turbine unit exempt under this subparagraph ~~(h)(2)(A) must shall:~~

(i) ~~n~~Notify the Executive Officer within seven days if the hour-per-year limit is exceeded;

(ii) Within 30 days after the date the hour-per-year limit is exceeded, the operator must submit a permit application for modification to equipment to meet the applicable compliance limit within 24 months of the date the hour-per-year limit is exceeded. Included with this permit application, the operator must submit an emission control plan including a schedule of increments of progress for the installation of the required control equipment. This plan and

schedule shall be subject to the review and approval of the Executive Officer.

(3) Low-Use

(A) The owner or operator of a stationary gas turbine installed prior to [Date of Adoption] shall not be subject to subdivision (d) for that stationary gas turbine, provided that:

- (i) The stationary gas turbine has an annual capacity factor of less than twenty-five percent in one calendar year;
- (ii) The stationary gas turbine has an annual capacity factor of less than ten percent averaged over three calendar years;
- (iii) The stationary gas turbine retains the NO_x and NH₃ limits, averaging times, and start-up, shutdown, and tuning requirements specified on the SCAQMD permit as of [Date of Adoption]; and
- (iv) This exemption is a condition of the SCAQMD permit.

(B) Initial Requirement for Low-Use Exemption

The owner or operator of a stationary gas turbine unit that elects the low-use exemption pursuant to paragraph (h)(3)(A) shall:

- (i) Demonstrate compliance with subparagraph (g)(3)(A) using data from calendar years 2017, 2018, and 2019; and
- (ii) Submit SCAQMD permit applications for each stationary gas turbine unit requesting the change of SCAQMD permit conditions to incorporate the low-use exemption by July 1, 2020.

(C) If stationary gas turbine unit with a low-use exemption pursuant to subparagraph (h)(3)(A) exceeds the annual or three year average annual capacity factor limit, the owner or operator of that stationary gas turbine unit shall:

- (i) Submit complete SCAQMD permit applications to repower, retrofit, or retire that stationary gas turbine unit within nine months from the date of reported exceedance of subparagraph (h)(3)(A);
- (ii) Submit a CEMS Plan within six months from the date of complete SCAQMD permit application submittal pursuant to clause (h)(3)(B)(i); and
- (iii) Not operate that stationary gas turbine unit in a manner that exceeds the emissions limits listed in Table I after three years from the date of the reported exceedance of subparagraph (g)(3)(A).

- (D) Eligibility of the low-use exemption shall be determined annually for each stationary gas turbine and reported to the Executive Officer no later than July 1 following each reporting year.
- (4) The Landfill Gas NOx limits in Table 1 shall not apply during low-load periods when the landfill gas turbine is operating below ten percent of the rating of the gas turbine unit up to 250 hours per year. Records shall be maintained pursuant to paragraph (g)(3) with demonstrating low-load condition and the hours operated under this condition annually.
- (5) The Landfill Gas NOx limits in Table 1 shall not apply to a turbine for up to 100 hours per year when the turbine operates within ten percent of the daily permitted SOx mass emission limit. Records shall be maintained pursuant to paragraph (g)(3) indicating the SOx mass emissions, ratio of daily turbine SOx mass emissions to daily permitted SOx mass emissions, and the hours operated under this condition annually.