

Draft Model Rule

Control of Natural Gas and Oil Fired HEDD Turbine NO_x Emissions

1.0 Purpose

The purpose of this regulation is to control the emissions of nitrogen oxides (NO_x) from stationary natural gas, No. 1 and No. 2 fuel oil fired combustion turbines that operate primarily on high electric demand days (HEDD) and thereby reduce the impact on public health, safety, and welfare, and aid in the Ozone Transport Region's (OTR) attainment of the State and National Ambient Air Quality Standard (NAAQS) for ground level ozone.

2.0 Applicability

This regulation is applicable to any natural gas, No. 1 or No. 2 fuel oil fired turbine that is an HEDD unit capable of generating 5 - 15 MW or greater (depending on distribution of generating units in individual states).

3.0 Definitions *Note: The definitions used in this section are provided as examples for state adoption as needed.*

The following words, abbreviations and terms, when used in this regulation, shall have the following meanings:

Administrator means the Administrator of the United States Environmental Protection Agency or the Administrator's duly authorized representative.

Capacity factor means either:

(1) the ratio of a unit's actual annual electric output (expressed in MWh) to the unit's nameplate capacity times 8760 hours, or

(2) the ratio of a unit's annual heat input (in million British thermal units or equivalent units of measure) to the unit's maximum design heat input (in million British thermal units per hour or equivalent units of measure) times 8,760 hours.

Combined cycle combustion turbine means a combustion turbine that recovers heat from the turbine exhaust gases to heat water or generate steam.

Combustion turbine means an internal combustion engine fueled by natural gas, No. 1 or No. 2 fuel oil, in which blades are driven by combustion gases to generate mechanical energy in the form of a rotating shaft that drives an electric generator or other industrial equipment.

Electric generating unit or “EGU” means a combustion or steam generating source used for generating electricity that delivers all or part of its power to the electric power distribution grid for commercial sale.

Existing means a stationary combustion turbine that is a HEDD unit and that commenced operation on or before May 1, 200[7].

Natural gas fired means a device capable of combusting only natural gas as a fuel.

High electric demand day or “HEDD” means the day following a day in which the next day forecast load is estimated to have a peak value of [52,000 megawatts or higher as predicted by the PJM Interconnection 0815 update to its Mid Atlantic Region Hour Ending Integrated Forecast Load, available from PJM Interconnection at <http://oasis.pjm.com/doc/projload.txt>].

High electric demand day unit or “HEDD unit” means an EGU, capable of generating [5 - 15] megawatts or more, that commenced operation prior to [May 1, 2007], and that operated less than or equal to an average of [50] percent of the time during the ozone seasons of 200[7] through 200[9].

MW means megawatt.

MWh means megawatt-hour.

Natural gas means a naturally occurring fluid mixture of hydrocarbons (e.g., methane, ethane, or propane) produced in geological formations beneath the Earth’s surface that maintains a gaseous state at standard atmospheric temperature and pressure under ordinary conditions. Additionally, natural gas must either be composed of at least 70 percent methane by volume or have a gross calorific value between 950 and 1,100 British thermal units (Btu) per standard cubic foot. Natural gas does not include the following gaseous fuels: landfill gas, digester gas, refinery gas, sour gas, blast furnace gas, coal-derived gas, producer gas, coke oven gas, or any gaseous fuel produced in a process which might result in highly variable sulfur content or heating value.

Oil means No. 1 or No. 2 fuel oil.

Oil fired means an HEDD unit combusting any amount of oil as a main or secondary fuel (other than burner pilots) during any previous or current year, and the HEDD unit maintains the ability to store and fire oil as a main or secondary fuel (other than burner pilots).

Operator means any person who operates, controls, or supervises a turbine subject to this regulation and shall include, but not be limited to, any holding company, utility system, or plant manager of such turbine.

Owner means any holder of any portion of the legal or equitable title in a turbine subject to this regulation.

Peaking unit means:

(1) A unit that has: (i) An average capacity factor of no more than 10.0 percent during the previous three calendar years and (ii) A capacity factor of no more than 20.0 percent in each of those calendar years.

(2) A unit may initially qualify as a peaking unit if the designated representative demonstrates to the satisfaction of the Administrator that the requirements of paragraph (1) of this definition are met, or will in the future be met, through one of the following submissions: (i) For a unit for which a monitoring plan has not been submitted under 40 CFR 75.62, the designated representative submits either: (A) Capacity factor data for the unit for the three calendar years immediately preceding the date of initial submission of the monitoring plan for the unit under 75.62; or (B) If a unit does not have capacity factor data for one or more of the three calendar years immediately preceding the date of initial submission of the monitoring plan for the unit under 75.62, all available capacity factor data, beginning with the date on which the unit commenced commercial operation; and projected capacity factor data. (ii) For a unit for which a monitoring plan has already been submitted under 75.62, that has not qualified as a peaking unit under paragraph (2)(i) of this definition, and where capacity factor changes, the designated representative submits either: (A) Three calendar years of data following the change in the unit's capacity factor showing an average capacity factor of no more than 10.0 percent during the three previous calendar years and a capacity factor of no more than 20.0 percent in each of those calendar years; or (B) One calendar year of data following the change in the unit's capacity factor showing a capacity factor of no more than 10.0 percent and a statement that this changed pattern of operation resulting in a capacity factor less than 10.0 percent is considered permanent and is projected to continue for the foreseeable future.

(3) A unit that initially qualifies as a peaking unit must meet the criteria in paragraph (1) of this definition each year in order to continue to qualify as a peaking unit. If such a unit fails to meet such criteria for a given year, the unit no longer qualifies as a peaking unit starting January 1 of the year after the year for which the criteria are not met. If a unit failing to meet the criteria in paragraph (1) of this definition initially qualified as a peaking unit under paragraph (2) of this definition, the unit may qualify as a peaking unit for a subsequent year only if the designated representative submits the data specified in paragraph (2)(ii)(A) of this definition.

(4) A unit may qualify as a peaking unit on an ozone season basis rather than an annual basis, if the owner or operator reports NO_x mass emissions and heat input data only during the ozone season.

Reasonably available control technology (RACT) means the lowest emission limit for NO_x that a particular source is capable of meeting by the application of NO_x emissions control technology that is reasonably available considering technological and economic feasibility.

Regenerative cycle combustion turbine means a combustion turbine that recovers heat from its exhaust gases and uses that heat to preheat the inlet combustion air which is fed into the combustion turbine.

Shutdown means the period of time beginning when generation of electricity ceases and ending when combustion of fuel in the turbine ceases. The duration of shutdown shall not exceed 10 minutes, unless manufacturer of the turbine or the control recommends a longer shutdown period.

Simple cycle combustion turbine means a combustion turbine that does not recover heat from its exhaust gases.

Startup means the period of time beginning when combustion of fuel in the turbine commences and ending when generation of electricity begins. The duration of startup shall not exceed 10 minutes, unless manufacturer of the turbine or the control recommends a longer startup period.

Stationary combustion turbine means any simple cycle combustion turbine, regenerative cycle combustion turbine, or combustion turbine portion of a combined cycle steam/electric generating system that:

1. Is not self-propelled, but may be mounted on a vehicle for portability; or
2. Is self-propelled on tracks at a facility, but does not in the course of its normal operation leave the facility.

4.0 NO_x Emissions Limitations

4.1 After May 1, 2015, no owner or operator of a HEDD turbine subject to this regulation shall cause to be emitted into the atmosphere any NO_x emissions in excess of the following presumptive NO_x RACT emission rate limits:

Type of Turbine	Type of Fuel	NO _x Emission Limits ¹		
		lb/MWh ²	lb/MMBtu	ppm @15% O ₂
Combined Cycle or Regenerative Cycle	Natural Gas	0.75	0.100	25
	No.1 or No. 2 Fuel Oil	1.20	0.160	42
Simple cycle	Natural Gas	1.00	0.100	25
	No.1 or No. 2 Fuel Oil	1.60	0.160	42

¹ Or as specified in a permit if a more stringent emission limit is imposed due to SOTA or PSD.

² lb/MWh emission rates calculated using an efficiency of 35% for simple cycle CTs and 46% for combined cycle CTs [lb/MWh = lb/MMBtu * 3.413 / efficiency]

4.1.1 For turbines that combust natural gas, No. 1 or No. 2 fuel oil by themselves, the above emission limits shall apply

- 4.1.2 For turbines that combust a mixture of natural gas and No. 1 or No. 2 fuel oil, the applicable emission limit shall be determined by calculating a weighted average of the above emission limits based on the amount of each fuel that is combusted.

4.2 Compliance with the emission rate requirements of paragraph 4.1 of this regulation shall be demonstrated based on the average of emissions:

- 4.2.1 Between May 1 and September 30, over each calendar day <or a 24-hour rolling average>; and

- 4.2.2 From October 1 through April 30 of the following year, over the 30-day period ending on each such day.

4.3 Compliance with the emission rate requirements of paragraph 4.1 of this regulation shall be demonstrated as follows: *Note: this section is inserted as an example of an existing rule that deals with this issue.*

- 4.3.1 For all simple cycle HEDD turbines that combust natural gas, No. 1 or No. 2 fuel oil and qualify as "Peaking Units", periodic emission monitoring (using such instrument as a portable monitor) in accordance with <insert state technical manual> must be conducted for NO_x and CO every year. Periodic testing is not required if NO_x and CO are continuously monitored by a CEMS that meets the requirements at 40 CFR 75. Periodic testing for NO_x and CO shall be performed while combusting one fuel, if the turbine is permitted to combust natural gas and fuel oil, testing is not required on both fuels.

- 4.3.2 For all simple cycle HEDD turbines that do not combust natural gas, No. 1 or No. 2 fuel oil and qualify as "Peaking Units", stack testing must be conducted for NO_x and CO once every 5 years. Stack testing must be performed while combusting each fuel that the turbine is permitted to combust.

- 4.3.3 For all combined cycle HEDD turbines that do not qualify for the exemption at 4 below, stack testing must be conducted for NO_x and CO once every 5 years. Stack testing must be performed while combusting each fuel that the turbine is permitted to combust.

- 4.3.4 For all combined cycle HEDD turbines that combust ultra low sulfur distillate (ULSD) oil only for less than 100 hours per year, initial stack testing for NO_x and CO shall be required, however, subsequent stack testing, while combusting ULSD, shall not be required as long as the turbine does not combust ULSD for more than 100 hours in any given calendar year.

4.4 The NO_x emission rate limits of paragraph 4.1 of this regulation are applicable during all periods of fuel combustion, except startup and shutdown, unless otherwise specified in the subject unit's operating permit.

4.5 The owner or operator of a turbine subject to this regulation shall adjust the turbine's combustion process in accordance with the manufacturer's recommended maintenance guide and schedule.

4.6 No later than May 1, XXXX (the next May 1st after rule adoption), the owner or operator of a turbine subject to this regulation shall submit to the <state regulatory agency> a compliance plan documenting either existing compliance with the requirements of paragraph 4.1 through paragraph 4.4 of this regulation, or a NOx emission control plan detailing all actions, including a schedule of increments of progress, which will be taken to comply with the requirements of paragraph 4.1 through 4.4 of this regulation. The submittal shall contain, as a minimum, the following information:

4.6.1 Information sufficient to identify the turbine, including a brief description, its location, its permit number, the company stack designation, and any other identifying numbers, and any other information necessary to distinguish it from other equipment owned or operated by the owner or operator

4.6.2 Notation of all fuel types, primary and secondary, and approximate historic annual heat input percentages.

4.6.3 Documentation of NOx emission rates at current control levels and operating practices.

4.6.4 Where applicable, technical description of proposed emission control technology, equipment design, or process changes to be implemented to achieve compliance with the requirements of paragraph 4.1 through 4.4 of this regulation.

4.6.5 An explanation of what the expected emission control efficiency will be and what emission rate will be achievable with the proposed emission control technology, equipment design, or process changes

4.6.6 A proposed compliance schedule.

4.6.7 An explanation of any obstacles that may prevent the owner or operator from implementing its proposed plan to control the emissions from the turbine according to the proposed schedule.

4.6.8 Any other information requested by the <state regulatory agency>.

4.7 The owner or operator of a turbine subject to this regulation shall prepare and submit to the <state regulatory agency> an update to this compliance plan by January 30th of the year following any calendar year in which any of the owner or operator's turbines that are subject to this regulation have not yet demonstrated compliance with the requirements of paragraph 4.1 through paragraph 4.4 of this regulation. Each annual update shall include, at a minimum:

4.7.1 Information sufficient to identify the turbine, including a brief description, its location, its permit number, the company stack designation, and any other identifying numbers, and any

other information necessary to distinguish it from other equipment owned or operated by the owner or operator

4.7.2 The progress made toward achieving compliance with the requirements of paragraph 4.1 through 4.4 of this regulation and a statement of whether the turbine is maintaining the proposed schedule to obtain compliance with this regulation.

4.7.3 An explanation of any obstacles that have been encountered or are anticipated and how they will be overcome.

4.7.4 An explanation of any revisions that must be made to the compliance plan or proposed compliance schedule for the turbine.

5.0 Alternative RACT Determination *Note: this section is inserted as an example of an existing rule that deals with this issue.*

5.1 If the owner or operator of an existing turbine subject to this regulation is unable to comply with the presumptive NO_x RACT emissions rate limitations of paragraph 4.1 of this regulation, the owner or operator may seek an alternative NO_x RACT emission limitation by submitting a NO_x RACT determination to the <state regulatory agency> in accordance with Section 5.0 of this regulation.

5.2 Alternative NO_x RACT determinations made pursuant to paragraph 5.1 of this regulation shall be submitted to <state regulatory agency> no later than XXXX (120 days after rule adoption) for review and approval.

5.3 An alternative NO_x RACT determination submitted in accordance with paragraph 5.1 of this regulation shall include, as a minimum, the following information for each turbine for which an alternative emission limit is sought:

5.3.1 Information sufficient to identify the turbine, including a brief description, its location, its permit number, the company stack designation, and any other identifying numbers, and any other information necessary to distinguish it from other equipment owned or operated by the owner or operator

5.3.2 The turbine's potential to emit, based on the applicable emission limit(s) included at 4.1 of this regulation, expressed in lb/MMBtu and TPY.

5.3.3 The turbine's potential to emit, based on the emission limit(s) included in the facilities air pollution control permit, expressed in lb/MMBtu and TPY.

5.3.4 The actual amount of NO_x emitted per unit of heat input, expressed in MMBtus, or other unit acceptable to the State of <xxxx>, for each day during the <last full calendar year of operating data> calendar year. This shall be established with approved CEMS, stack test, or other method approved by the <state regulatory agency>.

5.3.5 A listing of all available NO_x control options. This list shall include, but not be limited to, the following:

5.3.5.1 Water Injection (WI)

5.3.5.2 Dry Low NO_x Combustors (DLN)

5.3.5.3 Selective Catalytic Reduction (SCR)

5.3.5.4 Use of Alternative Fuels

5.3.6 An evaluation of the technical and economic feasibility of each available NO_x control option. The economic feasibility should be based on operating the turbine the maximum amount that is allowed by the air pollution control permit.

5.3.7 A listing of all available means of modifying the turbine or turbine operation so that the unit becomes a lower emitter of NO_x.

5.3.8 An evaluation of the technical and economic feasibility of each available means of modifying the turbine or turbine operation so that the turbine becomes a lower emitter of NO_x. The economic feasibility should be based on operating the turbine the maximum amount that is allowed by the air pollution control permit.

5.3.9 A demonstration that no control options or means of modifying the turbine or turbine operation listed in parts 5.4.5 and 5.4.7, or any combination thereof, that are technically and economically feasible, are capable of lowering the NO_x emissions from the turbine sufficiently to enable it to comply with the applicable emission limits at 4.1.

5.3.10 Identification of any NO_x control options or means of modifying the turbine or turbine operation listed in parts 5.4.5 and 5.4.7 that are technically and economically feasible.

5.3.11 Expected NO_x emission rate(s) for the range of normal operation of the turbine that will be achieved once the NO_x control options or means of modifying the turbine or turbine operation listed in 5.4.10 are implemented.

5.3.12 The proposed methods of measuring initial compliance and ongoing continued compliance with the alternative NO_x emission limit(s) proposed at 5.4.11.

5.3.13 The proposed applicable record keeping and reporting procedures that would be used once the NO_x control options or means of modifying the turbine or turbine operation, listed at 5.4.10 are implemented.

5.3.14 Proposed schedule for implementing the NO_x control options or means of modifying the turbine or turbine operation, listed at 5.4.10.

5.3.15 A comparison of the turbines potential to emit under the proposed alternative emission limit(s) with its potential to emit under the applicable emission limit(s) at 4.1.

5.3.16 Any other information requested by the <state regulatory agency>.

5.4 The State of <xxxx> shall not approve an alternative NOx emission limit unless it is satisfied that:

- 5.4.1 The turbine cannot comply with the applicable emission limit set forth at 4.1 utilizing any technologically and economically feasible control option or means of modifying the turbine or turbine operation.
- 5.4.2 The alternative NOx emission limit proposed by the owner or operator is the most stringent emission limit that the emission unit can obtain, given the available control options and means of modifying the turbine and turbine operation.

5.5 The <state regulatory agency> will submit each approved alternative RACT determination made under Section 5.0 of this regulation to the Administrator for approval as a revision to the State Implementation Plan (SIP).

6.0 Recordkeeping

The owner or operator of a turbine subject to this regulation shall maintain, for a period of at least five years, copies of all measurements, tests, reports, logs, required to demonstrate compliance with this regulation. This information shall be provided to the <state regulatory agency> upon request at any time.