DEPARTMENT OF NATURAL RESOURCES AND ENVIRONMENTAL CONTROL

DIVISION OF AIR AND WASTE MANAGEMENT

Statutory Authority: 7 Delaware Code, Chapter 60 (7 **Del.C.,** Ch. 60)
7 **DE Admin. Code** 1148

FINAL

1148 Control of Stationary Combustion Turbine Electric Generating Unit Emissions

Secretary's Order No. 2007-A-0023

Date of Issuance: June 19, 2007
Effective Date: July 11, 2007

Under the authority vested in the Secretary of the Department of Natural Resources and Environmental Control ("Department" or "DNREC") under 29 **Del.C.** §§8001 et seq., 29 **Del.C.** §§10111 et seq. and 7 **Del.C.** §6010(a), the following findings, reasons and conclusions are entered as an Order of the Secretary in the above-referenced rulemaking proceeding.

On October 6, 2005, the Department opened a proposed rulemaking proceeding in Start Action Notice ("SAN") 2005-10, which was to develop a proposed regulation for the purpose of regulating and reducing the air emission of nitrogen oxides ("NOx") from certain larger stationary combustion turbines ("CT") used for electric generation. The Department identified the following six CTs as sources of air pollution emission of NOx as the subject of this regulation: units 11 and 14 at Conectiv Delmarva Generation's ("Conectiv") Christiana Generating Station in Wilmington, New Castle County, unit 10 at NRG's Indian River Generating Station near Millsboro, Sussex County, unit 10 at Conectiv's Delaware City Generation Station near Delaware City, New Castle County, unit 10 at Conectiv's Edgemoor Generating Station in Edge Moor, New Castle County, and unit 10 at Conectiv's West Substation Generating Station in Wilmington, New Castle County.

The Department's experts with the Division of Air and Waste Management, Air Quality Management Section ("AQMS") identified these CTs as sources of air pollution, and that these sources could have significant reductions to their emission of NOx through the installation and use of emission controls, for example, water injection pollution control equipment. Moreover, the installation could occur reasonably economically and without any undue disruption to the electric system's reliability. These CTs operate to provide electricity only during periods when there is a high demand for electricity, which often coincides with hot, humid weather that also creates conditions suitable for the formation of ozone. Thus, reducing NOx emissions from the CTs is important because NOx is a harmful air pollutant and a precursor to the formation of ground-level ozone and fine particular matter. Ozone is a major cause of adverse human health consequences, particularly for the young, the elderly and anyone with impaired breathing ability. Ozone also adversely impacts agriculture.

The Department's regulatory action is taken in part to comply with federal air quality requirements, notably, the Environmental Protection Agency's ("EPA") 8 Hour Ozone National Ambient Air Quality Standard ("NAAQS"). Delaware is within the EPA's Philadelphia-Wilmington-Atlantic City ozone non-attainment area, which means that Delaware must take regulatory actions to improve air quality to meet the NAAQS by 2010. The Department published the proposed regulation on April 1, 2007 in the *Delaware Register of Regulations*, and held a public hearing on April 26, 2007 before the Department's hearing officer, Robert P. Haynes, who issued a report dated June 15, 2007 recommending approval of the proposed regulation as a final regulation. This report includes the Department's response to the public comments, as prepared by Mark Prettyman in the Division of Air and Waste Management, Air Quality Management Section ("AQMS"). Based upon the record developed by the Department, including all the public comments, I adopt the report and incorporate it into this order.

This Order and its approval of the proposed regulation as a final regulation will allow the Department and Delaware to fulfill certain federal regulatory responsibilities under the federal Clean Air Act, amended, and EPA's CAA regulations. The regulation is part of the Department's ozone State Implementation Plan ("SIP"), which is periodically revised and updated, to plan Delaware's regulatory steps and to demonstrate to the EPA that Delaware's regulatory actions will result in Delaware attaining the NAAQS by 2010. The Department supports the

attainment of NAAQS as it will bring cleaner air and better health to Delaware's citizens and visitors. The regulation approved by this Order will result in significantly lower air emissions of harmful pollutants based upon the estimated 2.21 tons per day of NOx emitted from the CTs currently when they operate, which will be reduced by the installation of water injection technology by about 40% to approximately 1.33 tons per day. Thus, on the worst ozone days the Department projects that CTs will be operating and that when the CTs comply with this regulation they will emit significantly less of ozone causing air pollution NOx than they currently emit.

The regulation is supported by the considerable scientific evidence developed by the Department's experts and in a collaborative manner with interested participants. AQMS drafted the proposed regulation based upon reasonably available control technology. At the hearing Conectiv Delmarva Generation submitted comments and the Department has adopted certain changes that the hearing officer determined not to be substantive as they allow the Department's regulations to be consistent with federal regulations. The Department's approval of the final regulation is made based upon careful consideration of all the comments, and the expert opinion that the proposed regulation provides a reasonable and well-supported basis to improve air quality and allow Delaware to attain cleaner air in order to meet the NAAQS by 2010. The Department compliments all the participants in the regulatory development process for their participation and cooperation, even if a regulation could not satisfy all the interests.

I find that the record developed during the public hearing process, including the Department's response, provides ample support for the Department to adopt this final regulation. The justification is that it will result in cleaner air quality though reasonably available air pollution controls. The regulation approved by this Order will result in the reduction of NOx from significant sources of such emissions, which have not installed emission controls under other air quality regulations.

In conclusion, the following findings and conclusions are entered:

The Department, acting through this Order of the Secretary and 29 **Del.C.** §10118(d), hereby approved the final regulation in Appendix A to the Report,

The Department shall have this Order published in the *Delaware Register of Regulations* and in newspapers in the same manner as the notice of the proposed regulation;

The Department shall provide notice to the persons affected by the Order, as determined by the Department, including all those who submitted comments to the Department, who otherwise participated in the public hearing, and who requested to receive notice of all actions on proposed regulations.

John A. Hughes, Secretary

1148 Control of Stationary Combustion Turbine Electric Generating Unit Emissions

[~~xx/xx/2007~~ 07/11/2007]

1.0 Purpose.

The purpose of this regulation is to control the emissions of nitrogen oxides (NOx) from stationary combustion turbine electric generating units in the State of Delaware to reduce the impact on public health, safety, and welfare. This regulation will also reduce NOx emissions in the State of Delaware from the subject units during high electric demand days (HEDD). This will meet Delaware's obligation to support the regional HEDD NOx reduction initiative for the units subject to this regulation.

[~~xx/xx/2007~~ 07/11/2007]

2.0 Applicability.

2.1 This regulation applies to existing, stationary combustion turbine electric generating units located in Delaware with a base-load nameplate capacity of 1 MW or greater.

2.2 This regulation is not applicable to existing stationary combustion turbine electric generating units that are subject to Regulation No. 12, "Control of Nitrogen Oxides Emissions," and meet the NOx emissions limitations identified in Table II **[of paragraph 3.5]** of Regulation No. 12, and are not otherwise exempt from the NOx emissions limitations of Table II of Regulation No. 12.

[2.3 This regulation is not applicable to *existing stationary combustion turbine electric generating units* that have undergone New Source Review in accordance with Regulation No. 1125 "Requirements for Preconstruction Review," and are covered by a permit which imposes NOx emissions limitations established to meet Best Available Control Technology and/or Lowest Achievable Emission

Rate technology standards.]

[~~xx/xx/2007~~ 07/11/2007]

3.0 Definitions.

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

"**Annual capacity factor**" means the ratio of the megawatt-hours produced in a calendar year by a stationary combustion turbine electric generating unit to the maximum possible annual electric generation determined on the base-load nameplate capacity of the stationary combustion turbine electric generating unit.

"**Base-load nameplate capacity"** means, starting from the initial installation of a combustion turbine electric generating unit, the maximum electrical generating output (in MWe) that the combustion turbine electric generating unit is capable of producing on a steady basis during continuous operation at rated ambient temperature and atmospheric pressure as specified by the manufacturer of the combustion turbine electric generating unit or, starting from the completion of a physical change in the combustion turbine electric generating unit resulting in an increase in the maximum electrical generating output (in MWe) that the combustion turbine electric generating unit is capable of producing on a steady state basis and during continuous operation, such increased maximum output as specified by the person conducting the physical change.

"**Combustion turbine**" means a combustion engine consisting of a compressor, combustor(s) and power turbine used to provide rotary motion to an output shaft. The combustion turbine may be fueled by gaseous and/or liquid fuels.

"**Combustion turbine electric generating unit**" means a combustion turbine used to drive an electric generator.

"**Department"** means the State of Delaware Department of Natural Resources and Environmental Control as defined in 29 **Del.C.**, Chapter 80, as amended.

"**Electric generator**" means a device that utilizes rotary motion from an input shaft to create electrical energy.

"**Existing"** means the unit has been synchronized to the grid before **[~~insert the effective date of this regulation~~ July 11, 2007]**.

"**Gaseous fuel**" means any non-solid or non-liquid fuel, including natural gas, digester gas, landfill gas, process gas, or any gas stored as a liquid at high pressure such as liquefied petroleum gas.

"**Liquid fuel**" means any non-solid or non-gaseous fuel, including kerosene, jet fuel, distillate fuel oil, bio-fuels, and methanol.

"**Ozone season**" means the months of **[~~April through October~~ May through September]**.

"**Ozone season capacity factor**" means the ratio of the megawatt-hours produced during the ozone season, as defined within this regulation, by a stationary combustion turbine electric generating unit to the maximum possible ozone season electric generation determined on the base-load nameplate capacity of the stationary combustion turbine electric generating unit

"**Peak-load nameplate capacity**" means, starting from the initial installation of a combustion turbine electric generating unit, the maximum electrical generating output (in MWe) that the combustion turbine electric generating unit is capable of producing for limited durations at rated ambient temperature and atmospheric pressure as specified by the manufacturer of the combustion turbine electric generating unit or, starting from the completion of a physical change in the combustion turbine electric generating unit resulting in an increase in the maximum electrical generating output (in MWe) that the combustion turbine electric generating unit is capable of producing for limited durations, such increased maximum output as specified by the person conducting the physical change.

"**PPMV**" means gaseous concentration in parts per million by volume, corrected to 15 percent O_2 dry basis.

"**Shutdown**" means the period of time between a combustion turbine generating unit being brought from an operating condition to fuel shut off. This period of time may be begun at either opening the generator breaker or disconnecting the combustion turbine from the electric generator, and is concluded when the fuel is completely shut off to the combustion turbine.

"**Simple cycle**" means a combustion turbine electric generating unit which does not recover heat from the combustion turbine electric generating unit exhaust gases to preheat the inlet combustion air to the combustion turbine electric generating unit, to heat water, or to generate steam.

"**Start-up**" means the period during which a combustion turbine generating unit is brought from a shutdown status to rated speed and generator breaker closure.

"**Stationary**" means a unit that is not self-propelled or intended to be propelled while performing its design function.

[~~xx/xx/2007~~ 07/11/2007]

4.0 NOx Emissions Limitations.

4.1 Beginning **[~~April~~ May]** 1, 2009, no existing stationary combustion turbine electric generating unit subject to this regulation shall exceed the NOx emissions limitations shown in Table I of this regulation during the ozone season, inclusive of any year:

Table I

Fuel Type	NOx Emissions Limit (ppmv)
Gaseous Fuel	**42**
Liquid Fuel	**88**

4.2 The owner or operator of an existing stationary combustion turbine electric generating unit shall, no later than **[~~April~~ May]** 1, 2009, either demonstrate to the satisfaction of the Department, through source testing approved by the Department, that the existing stationary combustion turbine generating unit meets the NOx emissions limitations of Table I of this regulation or install NOx emission controls designed to meet the NOx emissions limitation of Table I of this regulation in accordance with the requirements of paragraph 4.3 of this regulation.

4.3 The owner or operator of an existing stationary combustion turbine electric generating unit installing NOx emissions reduction controls in accordance with the requirements of paragraph 4.2 of this regulation shall install the NOx emissions reduction controls and implement operating procedures with the goal of achieving the NOx emissions limits of Table I of this regulation, and shall be designed and operated to control NOx emissions across the anticipated operating load range of the combustion turbine electric generating unit, including**[, if technically feasible,]** periods of *startup*, *shutdown*, and reduced load operation **[~~insofar as technically feasible~~]**.

4.3.1 The owner or operator of an existing stationary combustion turbine electric generating unit installing NOx emissions reduction controls in accordance with paragraph 4.3 of this regulation, shall submit to the Department for approval an emissions 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 of this regulation and the emissions control limitations of Table I of this regulation. The plan shall contain, as a minimum, the following information:

4.3.1.1 Facility and unit identification

4.3.1.2 Combustion turbine electric generating unit manufacturer and manufacturer's model number.

4.3.1.3 Combustion turbine electric generating unit manufacturer's base and peak (when applicable) load nameplate ratings and rating conditions (atmospheric temperature and pressure, fuel type, etc.).

4.3.1.4 Primary and secondary (where applicable) fuel type(s) **[~~and typical fuel(s) analysis~~]**.

4.3.1.5 Hours of operation and electrical output for the previous five years.

4.3.1.6 **[~~Results of any previous NOx emissions testing conducted in the five calendar years prior to insert the effective date of this regulation.~~ Documentation of the *combustion turbine electric generating unit's* NOx emissions rate, without NOx emissions controls installed in compliance with this regulation. The documents may include:**

4.3.1.6.1 Results of any previous NOx emissions testing conducted in the five calendar years prior to July 11, 2007; or

4.3.1.6.2 A plan to conduct NOx emissions testing, as part of the initial compliance testing conducted in accordance with paragraph 4.3.3 of this regulation, with the NOx emissions controls (installed in compliance with this regulation) turned off.]

4.3.1.7 **[~~Anticipated future operating schedule (capacity factor), annual and seasonal.~~[Reserved]**

4.3.1.8 Technical description of proposed emissions control technology and equipment designed to minimize NOx emissions across the entire operating range of the existing stationary combustion

turbine electric generating unit (**[~~insofar as technically feasible~~ including, if technically feasible, periods of *start-up*, *shutdown*, and reduced load operation]**), predicted NOx emissions levels following controls installation, and supporting documentation. **[~~The proposed operating range of the control technology may be utilized by the Department in establishing permit limitations for startup and shutdown for the subject unit.~~]**

4.3.1.9 Compliance schedule including compliance emissions testing conducted representative of anticipated normal load range, including base load and peak load (if applicable), and anticipated monitoring plan submittal.

4.3.1.10 Any other information requested by the Department.

4.3.2 The owner or operator of an existing stationary combustion turbine electric generating unit submitting an emissions control plan in accordance with paragraph 4.3.1 of this regulation shall submit the plan to the Department for approval no later than **[~~insert nine months from the effective date of this regulation~~ April 11, 2008]**.

4.3.3 Following completion of the approved NOx emissions control installation described in paragraphs 4.3.1 and 4.3.2 of this regulation, emissions testing approved by the Department shall be conducted to determine compliance with the NOx emissions requirements of paragraph 4.1 and the Table I of this regulation. Testing results shall be submitted to the Department no later than 60 days following the completion of the testing.

4.3.4 If actual achievable NOx emissions levels following completion of the approved emissions reduction plan are greater than those of Table I of this regulation, the owner or operator of the stationary combustion turbine electric generating unit may petition the Department for alternative NOx emissions limitations no greater than the actual achievable NOx emissions levels determined in the post-emissions control installation testing.

4.4 The NOx emissions limitations of paragraph 4.1 and Table I of this regulation, or alternate NOx emissions limitations approved by the Department in accordance with paragraph 4.3.4 of this regulation, are applicable to existing stationary combustion turbine electric generating units subject to this regulation whenever combusting fuel during the ozone season, inclusive of any year**[~~, except during periods of *start-up* or *shutdown*~~.:**

4.4.1 except during periods of *start-up* or *shutdown*, if the control of NOx emissions during these periods is shown not to be technically feasible in the emissions control plan submitted in accordance with paragraph 4.3.1 of this regulation; or

4.4.2 including periods of *start-up* and *shutdown*, if the control of NOx emissions during these periods is shown to be technically feasible in the emissions control plan submitted in accordance with paragraph 4.3.1 of this regulation.]

4.5 Compliance with the NOx emissions limitations of paragraph 4.1 and Table I of this regulation, or alternate NOx emissions limitations approved by the Department in accordance with paragraph 4.3.4 of this regulation, are based on one hour averaging periods.

[~~xx/xx/2007~~ 07/11/2007]

5.0 Monitoring and Reporting.

5.1 For *existing stationary combustion turbine electric generating unit*s with an *ozone season capacity factor* of 10% or less for each of the five calendar years preceding **[insert the effective date of this regulation July 11, 2007],** compliance emissions testing acceptable to the *Department* shall be conducted by the owner or operator in the calendar **[~~year before each calendar year for which the operating permit expires~~ years representing successive 5-year intervals from the calendar year in which the initial compliance test was conducted in accordance with paragraph 4.3.3 of this regulation]**.

5.2 For *existing combustion turbine electric generating unit*s with an *ozone season capacity factor* greater than 10% for any of the five calendar years preceding **[~~insert the effective date of this regulation, compliance emissions testing acceptable to the *Department* shall be conducted by the owner or operator every two years, starting in the second calendar year after insert the effective date of this regulation.~~ July 11, 2007:**

5.2.1 Compliance emissions testing acceptable to the Department shall be conducted by the owner or operator every two years following the calendar year in which the initial compliance test was conducted in accordance with paragraph 4.3.3 of this regulation.

5.2.2 If an *existing combustion turbine electric generating unit's ozone season capacity factor* drops below 10% for 5 consecutive years, the owner or operator may petition the Department to

reduce the compliance testing frequency to 5 years.]

5.3 For *existing combustion turbine electric generating unit*s in compliance with paragraph 5.1 of this regulation but which have an *ozone season capacity factor* of greater than 10% for any year subsequent to **[~~insert the effective date of this regulation~~ July 11, 2007]**, compliance emissions testing acceptable to the *Department* shall be conducted by the owner or operator every two years, starting in the calendar year after the year that the 10% *ozone season capacity factor* was exceeded.

5.4 The owner or operator of an *existing combustion turbine electric generating unit* shall submit to the *Department*, for approval, a monitoring plan containing monitoring information correlating control system parameters or other operating characteristic indications with NOx emissions output.

5.4.1 The correlations may be developed using actual emissions test data and parameters and characteristics recommended by the *combustion turbine electric generating unit* manufacturer, emission control equipment supplier, or other operating experience. The correlations shall address the entire anticipated operating load range of the *combustion turbine electric generating unit*.

5.4.2 This information may be used by the *Department* to monitor compliance with this regulation.

5.4.3 Representative data shall be continuously collected and recorded **[~~for any period that~~ while]** the *combustion turbine electric generating unit* combusts any fuel **[during the *ozone season*]**.

5.4.4 The approved monitoring information shall be annually submitted to the *Department* no later than February 1 of the year following the calendar year for which the data is collected, and shall also include detailed explanations for any periods **[during the *ozone season*]** where the monitored operating parameters were outside acceptable margins and include descriptions of corrective actions taken.

5.5 The provisions of paragraphs 5.1, 5.2, 5.3 and 5.4 of this regulation are not applicable to *existing stationary combustion turbine electric generating unit*s which are otherwise required to install, test, operate, and maintain NOx continuous emissions monitoring system in accordance with *Department* or EPA requirements for continuous emissions monitoring systems meeting all applicable requirements of 40 CFR Part 60 or 40 CFR Part 75 (July 1, 2006 edition).

5.6 The owner or operator of an *existing stationary combustion turbine electric generating unit* shall maintain an operating log **[during the *ozone season*]** that includes, on a daily basis, actual start-up and shutdown times, total hours of operation, gross electrical megawatt-hours generated, fuel consumption, type of fuel(s), identification of any periods operating outside the monitoring parameters identified in paragraph 5.4 of this regulation (where applicable), identification of any periods of non-compliance with the requirements of this regulation, cumulative-to-date hours of operation and gross electrical megawatt-hours generated, and any other information requested by the *Department*. This data shall be submitted annually to the *Department* no later than February 1 of the year following the calendar year for which the data is collected.

[~~xx/xx/2007~~ 07/11/2007]

6.0 Recordkeeping. The owner or operator of a *stationary combustion turbine electric generating unit* subject to this regulation shall maintain, for a period of at least five years, copies of all measurements, tests, reports, operating logs, and other information required by this regulation. This information shall be provided to the *Department* upon request at any time.

[~~xx/xx/2007~~ 07/11/2007]

7.0 Penalties. The *Department* may enforce all of the provisions of this regulation under 7 **Del. C.**, Chapter 60.