Appendix 11-1

New Jersey Reasonably Available Control Technology (RACT) Analysis

The following discussion provides technical details associated with the RACT analysis for the following sources:

1. Boilers serving electric generating units
2. Stationary combustion turbines
3. Industrial/commercial/institutional (ICI) boilers and other indirect heat exchangers
4. Stationary reciprocating engines
5. Asphalt pavement production plants
6. Glass manufacturing furnaces
7. Municipal solid waste (MSW) incinerators
8. Sewage sludge incinerators

Boilers serving Electric Generating Units (EGUs)

New Jersey RACT rule defines electric generating unit (EGU) as 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 (N.J.A.C. 7:27-19.1). Boilers serving electric generating units or EGUs produce electricity by turning a generator. Generators are turned by steam produced from a boiler. Boilers typically use coal, oil, or gas as fuel.

On April 20, 2009, New Jersey adopted amendments to 7:27-19.4, which set output-based performance standards for oxides of nitrogen (NO_x) emissions from boilers serving EGUs. New Jersey presumptive reasonably available control technology (RACT) limits for NOx emissions from boilers serving EGUs are provided in Table-3 of N.J.A.C. 7:27-19.4(a). The table sets maximum allowable emission rate of 1.50 pounds per megawatt-hour (Lb/MWH) for coal combustion. This output-based emission rate is based on a heat rate of 10,000 British thermal unit per kilowatt hour (BTU/KWH) and input based emission limit of 0.15 pound per million (Lb/MMBTU) for coal. The averaging period for the NOx limit is each calendar day between May 1 and September 30 and 30-day period ending on each such day from October 1 through April 30, if continuous emission monitor is used pursuant to N.J.A.C. 7:27-19.15(a).

NJDEP performed state to state RACT analysis and compared presumptive NOx RACT rule limits for coal boilers serving EGU in Ozone Transport Region (OTR). The presumptive NOx emission limits for existing coal fired boilers in OTR states are provided in Table-1 below:

Table-1
Comparison of Presumptive NOx Emission limit for existing boilers serving EGUs

SR. No.	OTR STATE	NOx RACT limit	Averaging Period	Effective Date	Rule Citation
1	CT	0.12 Lb/MMBTU	Daily Block	6/1/2023	22a-174-22e(d)(2)(C)
2	DC	0.43 Lb/MMBTU	Calendar Day	4/16/2004	20 DCMR 805.5(c)(1)
3	DE	0.125 Lb/MMBTU	24 Hour Rolling	1/1/2012	Section 4.3 of 1146
4	MA	0.12 Lb/MMBTU	Daily	3/9/2020	310 CMR 7.19(4)(b)1
5	MD	0.13 Lb/MMBTU	24-Hr Block	6/1/2020	COMAR 26.11.38
6	ME	0.15 Lb/MMBTU	90-day Rolling	1/1/2005	Ch 145, Section 3.B.2(b)
7	NH	0.22 Lb/MMBTU	24-Hr Calendar Day	8/15/2018	Env-A 1306.06(b)
8	NJ	0.15 Lb/MMBTU	Daily	5/1/2015	N.J.A.C. 7:27-19.4(a), Table-3
10	NY	0.12 Lb/MMBTU	24-Hr Daily	7/1/2014	6 CRR-NY 227-2.4(a)
11	PA	0.12 Lb/MMBTU	30 day	4/23/2016	25-129.97(g)(1)(viii)
12	VA	0.38 Lb/MMBTU	Daily	12/15/2006	9VAC5-40-7430.B, Table 4-51G
13	VT	0.70 Lb/MMBTU	N/A	8/31/2018	Subchapter II, 5-251(1)(c)

The above table shows that New Jersey presumptive NOx RACT limit is more stringent than presumptive NOx RACT limits of other states in OTR as shown below:

- NJ (1.50 Lb/MWH or 0.15 Lb/MMBTU, Calendar Day)
- DC (0.43 Lb/MMBTU, Calendar Day)
- ME (0.15 Lb/MMBTU, 90-Day Rolling)

- NH (0.22 Lb/MMBTU, Calendar Day)
- PA (0.12 Lb/MMBTU, 30-Day)
- VA (0.38 Lb/MMBTU, Daily)
- VT (0.70 Lb/MMBTU).

New Jersey was the first state in the region to establish the more stringent RACT limit for boilers serving EGU on April 20, 2009. Four other states (CT, MA, MD and NY) adopted RACT limits after New Jersey that are marginally more stringent than New Jersey limit as shown below:

- CT (0.12 Lb/MMBTU, Daily Block, effective 6/1/2023)
- MA (0.12 Lb/MMBTU, Daily, effective 3/9/2020)
- MD (0.13 Lb/MMBTU, 24-hour Block, effective 3/9/2020)
- NY (0.12 Lb/MMBTU, 24-hour Daily, effective 7/1/2014)
- DE (0.125 Lb/MMBTU, 24-hour Rolling, effective 1/1/2012)

After the adoption of NOx RACT limits in 2009, seven coal fired units in New Jersey were shutdown, which has resulted into a significant reduction in NOx emissions. Details of the seven shutdown units are provided in Table-2 below:

Table-2
Shutdown of Seven Coal Boilers in New Jersey

Sr No	Facility	Generating Station	Location	Unit	Capacity	Heat Input
1	Conectiv	B.L. England Generating Station	Upper Township Cape May County	Unit-1	130 MW	1300 MMBTU/Hr
2	Conectiv	B.L. England Generating Station	Upper Township Cape May County	Unit-2	160 MW	1600 MMBTU/Hr
3	Conectiv	Deepwater Generating Station	Pennsville Salem County	Unit 8	82 MW	820 MMBTU/Hr
4	PSE&G	Hudson Generating Station	Jersey City Hudson County	Unit-2	640 MW	6600 MMBTU/Hr
5	PSE&G	Mercer Generating Station	Hamilton Township Mercer County	Unit-1	341 MW	3350 MMBTU/Hr
6	PSE&G	Mercer Generating Station	Hamilton Township Mercer County	Unit-2	341 MW	3350 MMBTU/Hr
7	City of Vineland	Vineland Municipal Electric Utility	City of Vineland, Cumberland County	Unit-10	23 MW	357 MMBTU/Hr

Currently, New Jersey has only three coal-fired units that supply both steam and electricity. New Jersey does not have any existing EGU firing oil or gas as fuel. Details of the three units are provided in Table-3 below:

Table-3
Exiting Coal Boilers in New Jersey

Sr No	Facility	Generating Station	Location	PI	Capacity	Heat Input	NOx Control	Stack Tested NOx	Actual NOx (*)
1	US Generating	Logan Unit-1	76 Route 130, Swedesboro, New Jersey	55834	230 MW	2116 MMBTU/Hr	SCR	0.122 Lb/MMBTU	424 TPY
2	US Generating	Carney Unit-1	500 Shell Road and Route 130 Salem County	65498	112 MW	1389 MMBTU/Hr	SCR	0.122 Lb/MMTU	286 TPY
3	US Generating	Carney Unit-2	500 Shell Road and Route 130 Salem County	65498	112 MW	1389 MMBTU/Hr	SCR	0.122 Lb/MMBTU	302 TPY
TOTAL					454 MW				1012 TPY

(*) 2018 Emission Statement

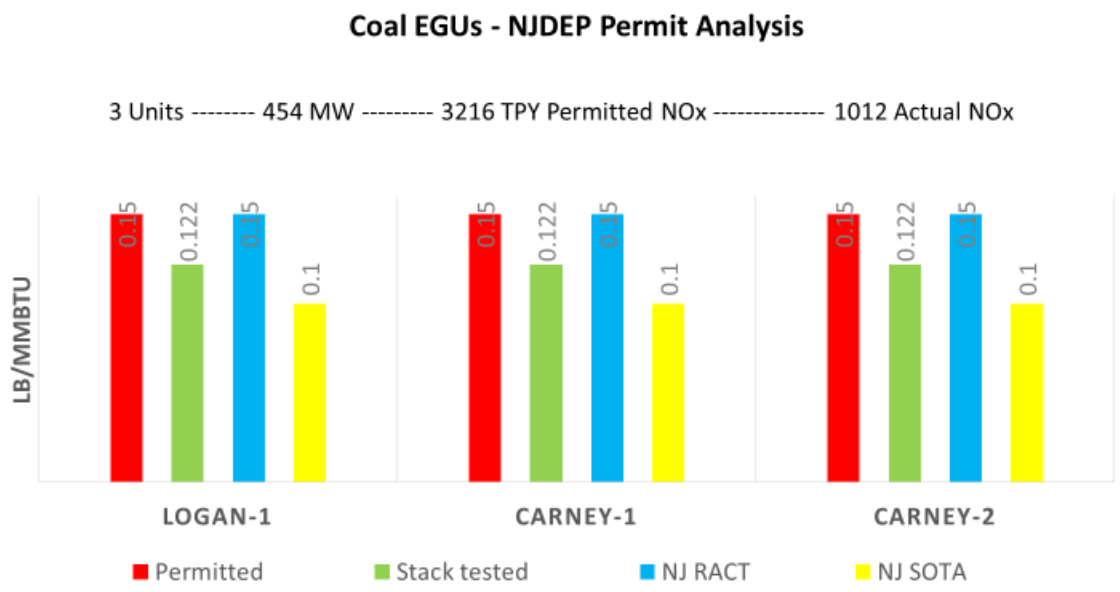
The three coal units are permitted at New Jersey NOx RACT level (1.5 Lb/MWH or 0.15 Lb/MMBTU) and are operating selective catalytic reduction (SCR) to reduce NOx emissions.

NJDEP has established the current RACT level of 0.15 Lb/MMBTU based on optimization study of NOx controls. NJDEP reviewed stack test results of NOx emissions from all three boilers. The stack test results of all three boilers demonstrated compliance with the New Jersey RACT limit. These boilers are operating below the RACT level. NJDEP also found that the stack tested NOx emissions are close to 0.12 Lb/MMBTU.

NJDEP also reviewed emission statement data to calculate actual NOx emissions from the three coal boilers. The 2018 emission statement showed that total actual NOx emissions are one third of the permitted NOx emissions. NJDEP permits limit NO_x emissions based on hourly or daily averaging times, which are monitored by continuous emissions monitors (CEMs) and stack testing. These shorter averaging times promote the lowering of NO_x emissions on a daily basis during the summertime (when they are needed to control outdoor ozone levels), rather than allowing facilities to emit at high levels of NOx during a given summer day while still meeting an annual or ozone season cap.

NJDEP review of permitted NOx emissions, stack tested NOx emissions, actual NOx emissions as well as comparison of these emissions with New Jersey RACT limits and state of the art (SOTA)

limits are provided in the following chart:



In order to seek additional NOx reductions from these three coal boilers, NJDEP performed technological and economic feasibility. NJDEP analysis showed additional NOx controls are not cost effective and not economically feasible. The cost of additional NOx control would be approximately $237,069 per ton of NOx removed based on assumptions of 15 million capital cost of constructing for new SCR system, 20 percent additional NOx reduction and 50 percent capacity factor.

Overall, electricity generation in New Jersey is shifting from coal to natural gas and renewable energy. Currently, NJDEP is developing rules as part of the “New Jersey Protecting Against Climate Threats (NJPACT)” initiative that will address fuel and efficiency standards for boilers and carbon dioxide (CO_2) emissions with the co-benefit of reducing NOx and VOC emissions.

Based on these factors, NJDEP determined that the current NOx RACT limit of 0.15 Lb/MMBTU (0.15 Lb/MWh) is reasonable and should remain unchanged.

NJDEP is recertifying the NOx RACT requirements specified in N.J.A.C. 7:27-19.4 to comply with the 70-ppb ozone standard.

Stationary Combustion Turbines

NOx emissions from existing stationary combustion turbines are regulated under N.J.A.C. 7:27-19.5. “Stationary combustion turbine” is defined in N.J.A.C. 7:27-19.1 as any simple cycle combustion turbine, regenerative cycle combustion turbine, or combustion turbine portion of a combined cycle steam/electric generating system that is not self-propelled but may be mounted on a vehicle for portability; or is self-propelled on tracks at a facility, but does not in the course of its normal operation leave the facility.

Pursuant to N.J.A.C. 7:27-19.5(g), the owner or operator of a stationary combustion turbine that is a high electric demand day **(**HEDD) unit or a stationary combustion turbine that is capable of generating 15 megawatts (MW) or more and that commenced operation on or after May 1, 2005 shall cause it to emit NO_X at a rate no greater than the applicable maximum allowable NO_X emission rate. HEDD unit means an electrical generating unit, capable of generating 15 MW or more, that commenced operation prior to May 1, 2005, and that operated less than or equal to an average of 50 percent of the time during the ozone seasons of 2005 through 2007. 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 (N.J.A.C. 7:27-19.1). In addition, pursuant to N.J.A.C. 7:27-19.5(e), the owner or operator of any stationary combustion turbine that has a maximum gross heat input rate of at least 25 million BTU per hour shall adjust the turbine's combustion process in accordance with the procedure set forth at N.J.A.C. 7:27-19.16. The purpose of the combustion process adjustment is to ensure that the combustion process is operating as close *to* optimally as is practicable, thereby improving fuel economy and minimizing NOx emissions. NOx emissions from New Jersey’s existing simple cycle, combined cycle and compressor turbines are discussed below:

A. Simple cycle turbines:

Maximum allowable NO_X emission rates for the existing gas and oil-fired simple cycle turbines in pounds of NOx per megawatt hour (Lb/MWh) are provided in Table-1 below:

Table-1
Maximum Allowable NO_X Emission Rates

Type of Turbine	Type of Fuel	
	Gas	Oil
Simple cycle combustion turbine	1.0 Lb/MWh(a)	1.60 Lb/MWh(a)

Note:

(a) N.J.A.C. 7:27-19.5(g), Table 7 sets forth NOx emission limits of 1.0 Lb/MWh for gas fired units and 1.60 Lb/MWh for oil fired units. These output-based emission limits are based on an input-based emission rate of 25 ppm (0.100 Lb/MMBTU) for natural gas and 42 ppm (0.160 Lb/MMBTU for fuel oil combustion and 35 percent efficiency for simple cycle turbines.

Compliance with the above limits is required based on each calendar day between May 1 and September 30 with the use of continuous emission monitoring (CEM) system. If no CEM system has been installed on the equipment or source operation, compliance with the limits is based upon the

average of three one-hour tests, each performed over a consecutive 60-minute period pursuant to N.J.A.C. 7:27-19.15(a)1 and 2.

NJDEP compared NJ RACT limits for simple cycle turbines with the RACT limits of ozone transport region (OTR) states. A comparison is provided in Table-2 below:

Table-2
Presumptive NOx Emission Limits for Simple Cycle Turbines in OTR

Sr No	OTR State	Presumptive NOx Limit in ppmvd@15%O2		Averaging Period	Rule Citation
		Gas	Oil		
1	CT	40	50	Daily Block	22a-174-22e(d)(4)(C)
2	DC	25	42	Calendar Day	20-805.4
3	DE	42	88	Daily	1148-4.0, Table 4-1
4	MA	40	50	Calendar Day	310 CMR 7.19(7)(b)(2)
5	MD	42	65	One hour	26.11.09.08G(2)
6	ME	(c)	(c)	(c)	Chapter 138, section H
7	NH(a)	25	c	Hourly	Env-A 1306.02
8	NJ	25	42	Calendar Day	N.J.A.C. 7:27-19.5(g), Table 7
9	NY(b)	25	42	Daily	6 CRR NY 227-3
10	PA	42	96	30-day rolling	129.97(g)(2)((iv)& 129.100(a)(1)
11	RI	(c)	(c)	(c)	27.8.4.A
12	VA	42	65	Daily	9VAC5-40-7430.B.b, Table4-51H
13	VT	(c)	(c)	(c)	5-1010

Notes:

(a) Env-A 1306.02 states "gas-fired turbine constructed after May 27, 1999 shall not exceed an hourly average NOx RACT emission limit of 25 parts per million by volume dry basis (ppmvd), corrected to 15%O2, equivalent to 0.092 lb per million Btu, when operating on gas."

(b) On 12/31/2019, NY adopted ozone season NOx limits in two phases. Phase-1 is effective May 1 2023 with NOx limit of 100 ppm for all turbines. Phase-2 is effective May 1, 2025 and NOx limits are 25 ppm (gas) and 42 ppm (oil).

(c) Case-by-case

Table-2 shows that the NJ RACT limit of 1.0 Lb/MWh (25 ppmvd@15%O2) during gas fire operations is more stringent than the presumptive NOx limits of CT, DE, MA, MD, PA and VA RACT rules and consistent with DC, NH, and NY RACT rules. New York adopted RACT limit almost a decade after New Jersey's adoption. The NY NOx limit of 25 ppmvd@15%O2 during gas firing operations is not effective until May 1, 2025 while the same NOx limit in New Jersey has been effective since May 1, 2015. NJDEP also reviewed averaging periods. NH has an hourly average. However, NHDES staff expressed difficulties in compliance with the hourly average and recommended daily average with CEM system, similar to New Jersey. (Email communication with Gary Millbury of NH Air Permits 4/23/20).

Table-2 also shows that the NJ RACT limit of 1.6 Lb/MWh (42 ppmvd@15%O2) during oil fire operations is more stringent than the presumptive NOx limits of CT, DE, MA, MD, PA and VA RACT rules and consistent with DC, and NY RACT rules.

NJDEP reviewed air pollution control permits for the existing 46 simple cycle turbines. A list of existing simple cycle turbines operating in New Jersey is provided in Attachment-1. Of the 46 units, 10 units fire gas only and the other 36 can fire both gas and oil. All 46 units have NOx controls where 26 units representing 57% of the fleet are equipped with selective catalytic reduction (SCR), 6 units are equipped with Dry Low NOx (DLN) technology, 6 units are equipped with water injection (WI) and 8 units are equipped with both WI and DLN to control NOx emissions. All units comply with the NJ RACT limits.

B. Combined cycle turbines:

Maximum allowable NO_X emission rates for the existing gas and oil-fired combined cycle turbines in Lb/MWh are provided in Table-3 below:

Table-3
Maximum Allowable NO_X Emission Rates

Type of Turbine	Type of Fuel	
	Gas	Oil
Combined cycle combustion turbine	0.75 Lb/MWh(a)	1.20 Lb/MWh(a)

Note:

(a) N.J.A.C. 7:27-19.5(g), Table 7 sets forth NOx emission limits of 0.75 Lb/MWh for gas fired units and 1.20 Lb/MWh for oil fired units. These output-based emission limits are based on an input-based emission rate of 25 ppm (0.100 Lb/MMBTU) for natural gas and 42 ppm (0.160 Lb/MMBTU for fuel oil combustion and 46 percent efficiency for combined cycle turbines.

Compliance with the above limits is required based on each calendar day between May 1 and Sep 30 with the use of continuous emission monitoring (CEM) system. If no CEM system has been installed on the equipment or source operation, compliance with the limits is based upon the average of three one-hour tests, each performed over a consecutive 60-minute period pursuant to N.J.A.C. 7:27-19.15(a)1 and 2.

NJDEP compared NJ RACT limits for simple cycle turbines with the RACT limits of OTR states. A comparison is provided in Table-4 below:

Table-4

Presumptive NOx Emission Limits for Combined Cycle Turbines in OTR

	OTR State	Presumptive NOx Limit in ppmvd@15%O2		Averaging Period	Rule Citation
		Gas	Oil		
1	CT	25	42	Daily Block	22a-174-22e(d)(5)(C)
2	DC	25	42	Calendar Day	20-805.4
3	DE	42	88	One hour	1148-4.1, Table 4-1 & 4.5
4	MA	25	42	Calendar Day	310 CMR 7.19(7)(b)(1)
5	MD	42	65	One hour	26.11.09.08G(2)
6	ME	(c)	(c)	(c)	Chapter 138, section H
7	NH(a)	25	c	Hourly	Env-A 1306.02
8	NJ	25	42	Calendar Day	N.J.A.C. 7:27-19.5(g), Table 7
9	NY(b)	(c)	(c)	(c)	6 CRR NY 227-2.4(e)(2)
10	PA	42	96	30-day rolling	129.97(g)(2)((i)& 129.100(a)(1)

11	RI	(c)	(c)	(c)	27.8.4.A
12	VA	42	65	Daily	9VAC5-40-7430.B.b, Table4-51H
13	VT	(c)	(c)	(c)	5-251 & 5-1010

Notes:

(a) *Env-A 1306.02 states "gas-fired turbine constructed after May 27, 1999 shall not exceed an hourly average NOx RACT emission limit of 25 parts per million by volume dry basis (ppmvd), corrected to 15%O2, equivalent to 0.092 lb per million Btu, when operating on gas." For turbines constructed before May 27, 1999, the hourly NOx limits are 42 ppm (gas) and 65 ppm (oil).*

(b) *Effective 12/7/2019, NY removed outdated references & limits (42 ppm (gas) and 65 ppm(oil) for combined cycle units and replaced with case-by-case provision. Please see https://govt.westlaw.com/nycrr/Document/I4e978e48cd1711dda432a117e6e0f345?viewType=FullText&originationContext=documenttoc&transitionType=CategoryPageItem&contextData=(sc.Default)*

(c) *Case-by-case*

Table-4 shows that the NJ RACT limit of 0.75 Lb/MWh (25 ppmvd@15%O2) during gas fire operations is more stringent than the presumptive NOx limits of DE, MD, PA and VA RACT rules and consistent with CT, DC, MA and NH RACT rules. NJDEP also reviewed averaging periods. NH is the only state that has a RACT limit similar to NJ but is compliance based on an hourly average. However, midsize units equipped with a CEM system operating in NH have difficulties in complying with the hourly average and showed periodic hourly exceedances. NHDES staff recommended a daily average with CEM system, similar to New Jersey and other states in the OTR. (Email communication with Gary Millbury of NH Air Permits 4/23/20).

Table-4 also shows that the NJ RACT limit of 1.2 Lb/MWh (42 ppmvd@15%O2) during oil fire operations is more stringent than the presumptive NOx limits of DE, MD, PA and VA RACT rules and is consistent with CT, DC, and MA RACT rules.

NJDEP reviewed air pollution control permits for the existing 41 combined cycle turbines. A list of existing combined cycle turbines operating in New Jersey is provided in Attachment-2. Of the total 41 units, 10 units fire gas only and the other 21 can fire both gas and oil. All 41 units have NOx controls – 25 units representing 61% of the fleet are equipped with SCR, 9 units are equipped with DLN technology, 3 units are equipped with WI and 4 units are equipped with both WI and DLN to control NOx emissions. All units comply with the NJ RACT limits.

C. Compressor turbines:

Simple cycle combustion turbines combusting natural gas and compressing gaseous fuel at major NOx facilities (compressor turbines) are a source category for NOx emission control strategies. Compressor turbines drive mechanical devices (compressors) designed to increase the pressure of the gaseous fuels being transported through a pipeline. In New Jersey, three natural gas pipeline companies (Transcontinental Gas Pipeline, Tennessee Gas Pipeline, and Texas Eastern/Spectra Energy Transmission) operate compressor turbines and compressor engines. Natural gas transmission pipeline systems use compressors at gas compressor stations to maintain system flow and overcome pressure losses due to the movement of the natural gas, and to facilitate the movement of the natural gas through a pipeline. The compressor turbines do not generate electricity.

Operation of these equipment tends to increase during periods of high natural gas demand, such as during winter, when there is a high heating fuel demand, or on high electric demand days in the summer when natural gas-fired electric generating units consume a significant amount of natural gas.

The compressor turbines are significant sources of NO_X emissions and are permitted to operate continuously. In the years since these units were installed, NO_X control technologies have advanced to the point where installing such technologies would allow these older units to meet current RACT standards.

NJDEP committed to establishing NO_X emissions limits for these sources in New Jersey's 2015 RACT SIP revision (available at www.nj.gov/dep/baqp/sip/siprevs.htm). On November 6, 2017 (49 N.J.R. 3518), NJDEP adopted amendments to its rules for stationary gas turbines and engines. The newly adopted NOx limits are based on the 2014 OTC Model Rule for Control of NO_X Emissions from Natural Gas Pipeline Compressor Fuel-Fired Prime Movers and other states in OTR. At N.J.A.C. 7:27-19.5(l), NJDEP adopted the following new standard for NO_x emissions for compressor turbines:

> *"Beginning November 6, 2019, any simple cycle combustion turbine combusting natural gas and compressing gaseous fuel at a major NO_X facility shall not emit more than 42 parts per million by volume, dry basis, (ppmvd) of NO_X, corrected to 15 percent oxygen."*

The new rules were effective November 2019 and estimated a NO_X reduction from 57 tons per year to 128 tons per year (49 N.J.R. 25, January 3, 2017). The new rule required Spectra Energy Lambertville (PI 80337) to modify air permits for two existing turbines, 5800 hp each with permitted NOx emission concentration of 172.5 pppmvd@15 %O2. A NOx reduction of 116.79 tons per year has been realized effective 2020 ozone season.

Based on these factors, NJDEP determined that the current NOx RACT limits specified in N.J.A.C. 7:27-19.5 are reasonable and should remain unchanged. NJDEP is recertifying the NOx RACT requirements specified in N.J.A.C. 7:27-19.5 to comply with the 70-ppb ozone standard.

Industrial/Commercial/Institutional (ICI) Boilers and other indirect heat exchangers

Existing Industrial/Commercial/Institutional (ICI) boilers and other indirect heat exchangers operating in New Jersey are regulated under New Jersey RACT rule N.J.A.C. 7:27-19.7. These equipment combust commercial fuel, such as natural gas and/or No. 2 fuel oil, to produce heat or process steam. They are widely used in chemical, metal, paper, petroleum, food production and other industries. The ICI boilers are non-utility boilers and smaller than electric generating units (EGU) in size. They are field erected or package boilers. Installation of add-on air pollution controls to these boilers may be difficult and technologically not feasible because of space limitations.

New Jersey adopted NOx RACT requirements for ICI boilers on December 20, 1993 (25 N.J.R. 5957) based on Northeast States for Coordinated Air Use Management (NESCAUM) Stationary Source Committee recommendations. Subsequently, New Jersey expanded the RACT requirements for ICI boilers. In October 17, 2005 rule adoption (37 N.J.R. 3976), New Jersey required an annual combustion process adjustment for ICI boilers with maximum gross heat input rate to 5 million BTUs per hour (MMBTU/Hr) from 25 MMBTU/Hr. In April 20, 2009 rule adoption (41 N.J.R. 1752), New Jersey revised presumptive NOx limits based on Ozone Transport Commission (OTC) Technical Support Document.

NJDEP is developing rules as part of the “New Jersey Protecting Against Climate Threats (NJPACT)” initiative that will address fuel and efficiency standards for boilers and carbon dioxide (CO2) emissions with the co-benefit of reducing NOx and VOC emissions.

N.J.A.C. 7:27-19.7 specifies presumptive NOx RACT limits depending on the maximum gross heat input rate in MMBTU/Hr to the boiler and type of fuel used. A summary of New Jersey presumptive NOx RACT limits is provided in Table-1 below:

Table-1
New Jersey Presumptive NOx Emission limits (in Lb/MMBTU) for Existing ICI Boilers(a)

Maximum Gross Heat Input (MMBTU/Hr)	Type of Fuel		
	Natural Gas	No. 2 Oil	Dual Fuel (b)
At least 25 but less than 100	0.05	0.08	0.12
100 or greater	0.10	0.10	0.20 (c)
250 or greater	Install and operate CEM (N.J.A.C. 7:27-19.7(d)		
At least 5	Combustion process adjustment (N.J.A.C. 7:27-19.7(g))		

Notes:

(a) N.J.A.C. 7:27-19.7(i), Table-9

(b) N.J.A.C. 7:27-19.1 defines “dual fuel” as a type of burner capable of combusting more than one type of commercial fuel.

(c) Also, for all boilers firing other liquid or other gaseous fuel

Compliance with the presumptive RACT limits is based upon the average of three one-hour tests, each performed over a consecutive 60-minute period, if no continuous emissions monitoring (CEM) system has been installed on the equipment or source operation pursuant to N.J.A.C. 7:27-19.15(a). If a CEM system has been installed, the compliance with the NOx limit is based upon each calendar day average between May 1 and September 30.

NJDEP conducted a detailed review of existing ICI boilers operating in New Jersey to comply with the 70-ppb ozone RACT mandates. NJDEP reviewed presumptive NOx RACT rule limits of states within the Ozone Transport Region (OTR), New Jersey air pollution control permit data, as well as New Jersey emission statements, for the following seven categories of ICI boilers:

- 5 to 25 MMBTU/Hr ICI boilers
- 25 to 100 MMBTU/Hr ICI boilers firing natural gas
- 100 MMBTU/Hr ICI boilers or greater firing natural gas
- 25 to 100 MMBTU/Hr ICI boilers firing oil:
- 100 MMBTU/Hr or greater firing oil
- 25 to 100 MMBTU/Hr firing dual fuel
- 100 MMBTU/Hr or greater firing dual fuel

Based on the review, NJDEP determined that New Jersey's current NOx RACT limits specified in N.J.A.C. 7:27-19.7 are reasonable and should remain unchanged as discussed below.

1. 5 to 25 MMBTU/Hr ICI Boilers

Pursuant to N.J.A.C. 7:27-19.7(g), the owner or operator of an ICI boiler or other indirect heat exchanger with a maximum gross heat input rate of at least 5 MMBTU/Hr, whether or not located at a major NO_X facility, is required to "adjust the combustion process" in the same quarter of each calendar year in accordance with the procedure set forth at N.J.A.C. 7:27-19.16. The purpose of the combustion process adjustment is to ensure that the combustion process is operating as close *to* optimally as is practicable, thereby improving fuel economy and minimizing NOx emissions. NJDEP has determined that no NOx control measures represent RACT for boilers smaller than 25 MMBTU/Hr. The amount of NOx reductions, which such boilers can achieve, is small compared to the reductions available from larger boilers. In addition, the personnel operating such boilers generally would not be expected to have the expertise needed for proper operation, maintenance and monitoring of the requisite control measures. In addition, the cost per ton of NOx removed by a given control measure would be higher for these small boilers. Therefore, NJDEP will continue to require combustion process adjustment for this size category.

2. 25 to 100 MMBTU/Hr ICI Boilers Firing Natural Gas:

New Jersey presumptive NOx emission RACT limit is 0.05 Lb/MMBTU for existing ICI boilers of size 25 to 100 MMBTU/Hr firing natural gas (N.J.A.C. 7:27-19.7, Table-9). NJDEP performed state to state RACT analysis and compared New Jersey RACT limit with the presumptive NOx RACT rule limits of states within OTR. A comparison of the presumptive NOx emission limits is provided in Table-2 below:

Table-2
Comparison of Presumptive NOx Emission Limit for Existing ICI Boilers
(25 to 100 MMBTU/Hr, Gas Fired)

OTR State	Presumptive NOx RACT Rule Limit	
	Size 25-50 MMBTU/Hr	Size 50-100 MMBTU/Hr
CT	0.05 Lb/MMBTU	0.05 Lb/MMBTU
DC	Annual Tune up	Annual Tune up
DE	Annual Tune up	LNB or FGR
MA	Annual Tune up	0.10 Lb/MMBTU
MD	Annual Tune up	Annual Tune up
ME	Annual Tune up	0.30 Lb/MMBTU
NH	0.20 Lb/MMBTU	0.10 Lb/MMBTU
NJ	**0.05 Lb/MMBTU**	**0.05 Lb/MMBTU**
NY	0.05 Lb/MMBTU	0.05 Lb/MMBTU
PA	Annual Tune up	0.10 Lb/MMBTU
RI	--	0.10 Lb/MMBTU
VA	0.20 Lb/MMBTU	0.20 Lb/MMBTU

Note: VT RACT rule provisions 5-2511(1)(a) and 5-1010 do not specify presumptive NOx limits.

Table-2 shows that New Jersey presumptive NOx RACT limit is more stringent than RACT limits of other OTR states (MA, ME, NH, PA, RI and VA). New Jersey RACT limits is consistent with the RACT limits of CT and NY.

Delaware NOx RACT rule 1112, Section 3 specifies Low NOx Burner (LNB) or Flue Gas Recirculation (FGR) technology for NOx controls instead of presumptive NOx limits. The New Jersey NOx limit is more flexible than requiring specific controls as RACT requirements. New Jersey allows flexibility in choosing the control technology for NOx reductions, establishes a baseline for use in an averaging plan under N.J.A.C. 7:27-19.6, and/or provides a basis from which emission credits can be generated for use as offsets under N.J.A.C. 7:27-18.

3. 100 MMBTU/Hr ICI Boilers or Greater Firing Natural Gas:

The New Jersey presumptive NOx emission RACT limit is 0.10 Lb/MMBTU for existing ICI boilers of size 100 MMBTU/Hr or greater firing natural gas (N.J.A.C. 7:27-19.7, Table-9). Installation and operation of CEM system is required if the boiler size is 250 MMBTU/hr or more (N.J.A.C. 7:27-19.7(d)). Compliance with the limit is based on each calendar day between May 1 and September 30, if CEM is used (N.J.A.C. 7:27-19.15(a1)). If no CEM has been or is required to be installed, compliance with the limit is based upon the average of three one-hour tests, each performed over a consecutive 60-minute period (N.J.A.C. 7:27-19.15(a)2). NJDEP performed state to state RACT analysis and compared presumptive NOx RACT rule limits for this category in OTR. A comparison of the presumptive NOx emission limits is provided in Table-3 below:

Table-3
Comparison of Presumptive NOx Emission Limit for Existing ICI Boilers
(100 MMBTU/Hr or Greater, Gas Fired)

OTR State	Presumptive NOx RACT Rule Limit	
	Size 100-250 MMBTU/Hr	Size 250 MMBTU/Hr or Greater
CT	0.10 Lb/MMBTU	0.10 Lb/MMBTU
DC	0.20 Lb/MMBTU	0.20 Lb/MMBTU
DE	0.10 Lb/MMBTU	0.10 Lb/MMBTU

MA	0.06 Lb/MMBTU	0.08 Lb/MMBTU
MD	0.20 Lb/MMBTU	(a)
ME	0.30 Lb/MMBTU	0.30 Lb/MMBTU
NH	0.10 Lb/MMBTU	(a)
NJ	0.10 Lb/MMBTU	0.10 Lb/MMBTU
NY	0.06 Lb/MMBTU	0.08 Lb/MMBTU
PA	0.10 Lb/MMBTU	0.10 Lb/MMBTU
RI	0.10 Lb/MMBTU	0.10 Lb/MMBTU
VA	0.20 Lb/MMBTU	0.20 Lb/MMBTU
VT	(a)	0.20 Lb/MMBTU

Note: (a) The RACT rules do not specify presumptive NOx limit.

The above table shows that New Jersey presumptive NOx RACT limit is more stringent than RACT limits of other OTR states (DC, MD, and ME) and consistent with CT, DE, NH, PA and RI.

MA adopted RACT limits of 0.06 Lb/MMBTU for 100 to 250 MMBTU/Hr boilers and 0.08 Lb/MMBTU for 250 MMBTU/hr or more, which are effective March 9, 2020. NY adopted similar limits effective July 1, 2014. Both MA and NY adopted the RACT limits after New Jersey adopted the RACT limits on April 20, 2009 (41 N.J.R. 1752). NY and MA RACT limits are marginally more stringent than New Jersey limits. New York rule 227-2.4 is available at https://govt.westlaw.com/nycrr/Document/I4e978e48cd1711dda432a117e6e0f345?viewType=FullText&originationContext=documenttoc&transitionType=CategoryPageItem&contextData=(sc.Default)). MA rule 7.19-(4)(b).3 is available at https://www.mass.gov/doc/310-cmr-700-air-pollution-control-regulations.

NJDEP reviewed NOx emissions from 12 existing ICI boilers operating in New Jersey that are greater than 100 MMBTU/Hr and firing natural gas. The boiler size, air pollution controls, permitted NOx emissions and stack tested NOx emissions are provided in Table-4 below:

Table-4
New Jersey's Existing ICI Boilers Greater Than 100 MMBTU/Hr Firing Natural Gas
(Permitted and Stack tested NOx Emissions in Lb/MMBTU)

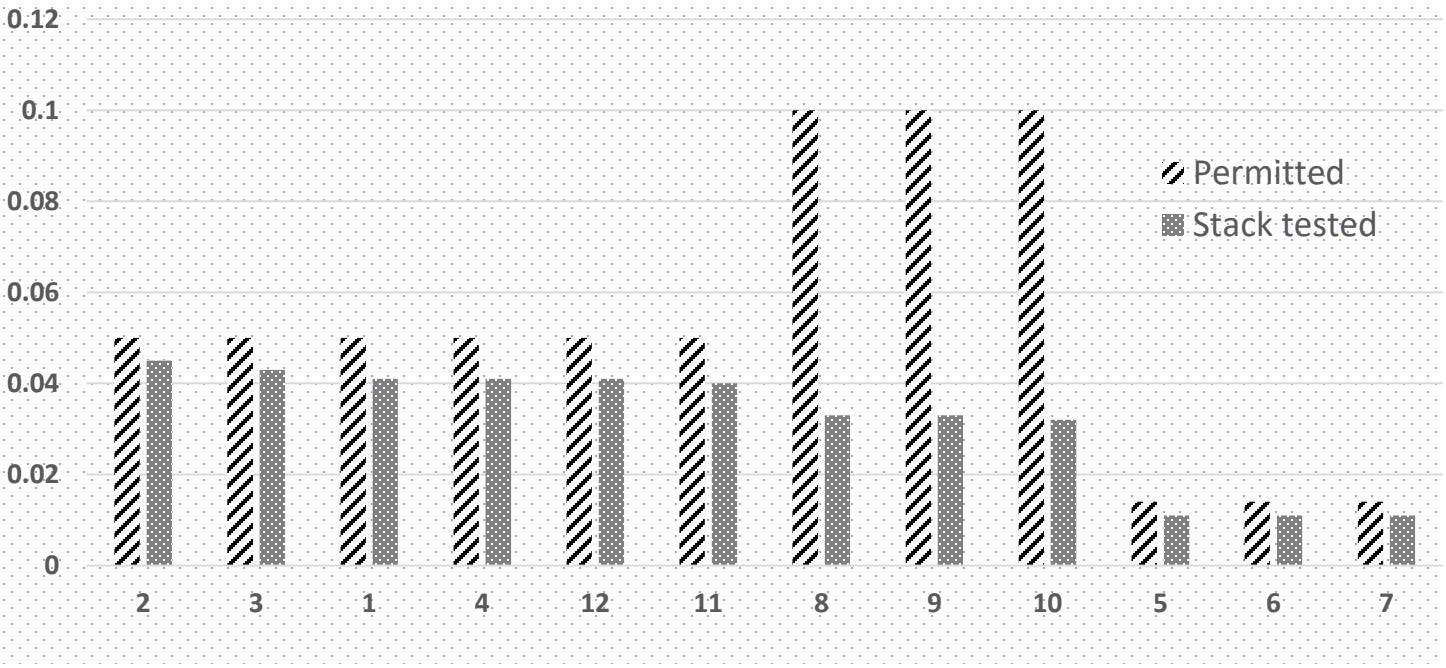
Sr No	Facility	ID	Size (MMBTU/Hr)	Air Pollution Controls	Permitted NOx	Stack Tested NOx
1	Bristol Myers Squib	BOP180001, E4603	114	LNBs, FGR	0.05	0.041
2	Bristol Myers Squib	BOP180001, E4604	114	LNBs, FGR	0.05	0.045
3	Nestle USA	BOP190003, E29	123	LNB, FGR(20%)	0.05	0.0430
4	Nestle USA	BOP190003, E30	120	FGR	0.05	0.0405
5	Merck Rahway	BOP190003, E750010	249	OC, SCR	0.014	0.0114
6	Merck Rahway	BOP190003, E750011	249	OC, SCR	0.014	0.0105
7	Merck Rahway	BOP190003, E750012	249	OC, SCR	0.014	0.011
8	Paulsboro Refining	BOP190003, E36	484	LNB, FGR	0.1	0.0325
9	Paulsboro Refining	BOP190003, E37	485	LNB, FGR	0.1	0.0330
10	Paulsboro Refining	BOP190003, E38	484	LNB, FGR	0.1	0.0320
11	Princeton University	BOP120001, E23	189	LNB, FGR (17%)	0.05	0.040
12	Princeton University	BOP120001, E24	189	LNB, FGR (17%)	0.05	0.041

Notes:
LNB: Low NOx Burner
FGR: Flue Gas Recirculation
OC: Oxidation Catalyst

SCR: Selective Catalytic Reduction

The stack tested NOx emissions in Lb/MMBTU from these ICI boilers are ranked in the order of highest to lowest in Chart-1 below:

Chart-1
New Jersey's 12 Existing ICI boilers Greater Than 100 MMBTU/Hr Firing Natural Gas
Stack Tested NOx (Ranked)



Notes:
1, 2 - Bristol Myers Squib *(LNB + FGR), 114 MMBTU/Hr each*
3 - Nestle (LNB + FGR), 123 MMBTU/Hr
4 - Nestle (FGR), 120 MMBTU/Hr
5,6,7- Merck (Oxidation Catalyst + SCR), 249 MMBTU/Hr each
8,9,10 – Paulsboro Refining (LNB + FGR), 484 MMBTU/Hr each
11,12 - Princeton University (LNB+ FGR), 189 MMBTU/Hr each

The above chart shows that the actual stack tested NOx emissions from all 12 boilers are below 0.06 Lb/MMBTU and are in compliance with the NY and MA RACT limit of 0.06 Lb/MMBTU.

4. 25 to 100 MMBTU/Hr ICI Boilers Firing Oil:

The New Jersey presumptive NOx emission RACT limit is 0.08 Lb/MMBTU for existing ICI boilers of size 25 to 100 MMBTU/Hr firing No. 2 oil (N.J.A.C. 7:27-19.7, Table-9). NJDEP performed a state to state RACT analysis and compared presumptive NOx RACT rule limits for this category in OTR. A comparison of the presumptive NOx emission limits is provided in Table-5 below:

Table-5
Comparison of Presumptive NOx Emission Limit for Existing ICI Boilers
(25 to 100 MMBTU/Hr, Oil Fired)

OTR State	Presumptive NOx RACT Rule Limit	
	Size 25-50 MMBTU/Hr	Size 50-100 MMBTU/Hr
CT	0.10 Lb/MMBTU	0.10 Lb/MMBTU
DC	Annual Tune up	0.30 Lb/MMBTU
DE	Annual Tune up	LNB or FGR
MA	Annual Tune up	0.12 Lb/MMBTU
MD	Annual Tune up	Annual Tune up
ME	Annual Tune up	0.30 Lb/MMBTU
NH	0.20 Lb/MMBTU	0.12 Lb/MMBTU
NJ	0.08 Lb/MMBTU	0.08 Lb/MMBTU
NY	0.08 Lb/MMBTU	0.08 Lb/MMBTU
PA	Annual Tune up	0.12 Lb/MMBTU
RI	Tune up every 2 years	0.12 Lb/MMBTU
VA	0.25 Lb/MMBTU	0.25 Lb/MMBTU

The Table-5 shows that New Jersey presumptive NOx RACT limit of 0.08 Lb/MMBTU for oil-fired ICI boiler size 25 to 100 MMBTU/Hr is more stringent than several OTR states (CT, DC, MA,MD, ME, NH, PA, RI and VT). Also, the New Jersey RACT limit is consistent with the New York RACT limit for this boiler size and fuel category.

5. 100 MMBTU/Hr or Greater Firing Oil:

The New Jersey presumptive NOx emission RACT limit is 0.10 Lb/MMBTU for existing ICI boilers size greater than 100 MMBTU/Hr firing oil (N.J.A.C. 7:27-19.7, Table-9). Compliance with the NOx limit is based upon the average of three one-hour tests each performed over a consecutive 60-minute period, if no CEM system has been or is required to be installed (N.J.A.C. 7:27-19.15(a)2). For boiler size 250 MMBTU/hr of more, an installation and operation of continuous emission monitoring (CEM) is required pursuant to N.J.A.C. 7:27-19.7(d). The averaging period is each calendar day between May 1 and September 30 if CEM is used (N.J.A.C. 7:27-19.15(a1)).

NJDEP performed a state to state RACT analysis and compared presumptive NOx RACT rule limits for this category in OTR. A comparison of the presumptive NOx emission limits is provided in Table-6 below:

Table-6
Comparison of Presumptive NOx Emission Limit for Existing ICI Boilers
(100 MMBTU/Hr or Greater, Oil Fired)

OTR State	Presumptive NOx RACT Rule Limit	
	100-250 MMBTU/Hr	250 MMBTU/Hr or Greater
CT	0.15 Lb/MMBTU	0.15 Lb/MMBTU
DC	0.25 Lb/MMBTU	0.25 Lb/MMBTU
DE	0.25 Lb/MMBTU	0.25 Lb/MMBTU
MA	0.15 Lb/MMBTU	0.15 Lb/MMBTU
MD	0.25 Lb/MMBTU	0.30 Lb/MMBTU
ME	0.30 Lb/MMBTU	0.30 Lb/MMBTU
NH	0.30 Lb/MMBTU	0.30 Lb/MMBTU
NJ	0.10 Lb/MMBTU	0.10 Lb/MMBTU

NY	0.15 Lb/MMBTU	0.15 Lb/MMBTU
PA	0.20 Lb/MMBTU	0.17 Lb/MMBTU
RI	0.12 Lb/MMBTU	0.12 Lb/MMBTU
VA	0.25 Lb/MMBTU	0.25 Lb/MMBTU
VT	---	0.30 Lb/MMBTU

Table-6 shows that, for boiler size 100 to 250 MMBTU/Hr, the New Jersey presumptive NOx RACT limit is more stringent than the RACT limits of other OTR states. RI has a RACT limit of 0.12 Lb/MMBTU based on a one-hour average. The NJ RACT limit of 0.10 Lb/MMBTU is essentially an hourly average. New Jersey RACT rule compliance is based on the average of three one-hour test, which is an hourly average when CEM system is not installed. Installation and operation of CEM system is required for larger boilers (boiler size 250 MMBTU/hr or more). New Jersey does not have any boilers of size 250 MMBTU/Hr or greater and firing only oil.

6. 25 to 100 MMBTU/Hr Firing Dual Fuel:

The New Jersey presumptive NOx emission RACT limit is 0.12 Lb/MMBTU for existing ICI boilers of size 25 to 100 MMBTU/Hr firing dual fuel using fuel oil and/or natural gas (N.J.A.C. 7:27-19.7, Table-9). “Dual fuel” is defined in N.J.A.C. 7:27-19.1 as a type of burner capable of combusting more than one type of commercial fuel. New Jersey RACT limit of 0.12 Lb/MMBTU during dual fuel firing is higher than the NJ RACT limit of 0.08 Lb/MMBTU during oil firing for ICI boiler size 25 to 100 MMBTU/Hr as shown in Table-1, since dual fuel burner emits more pollutants than a single nozzle burner used to burn either natural gas or No. 2 fuel oil.

NJDEP performed state to state RACT analysis and compared presumptive NOx RACT rule limits for this category in OTR. A comparison of the presumptive NOx emission limits is provided in Table-7 below:

Table-7
Comparison of Presumptive NOx Emission Limit for Existing ICI boilers
(25 to 100 MMBTU/Hr, Dual Fuel Fired)

OTR State	Presumptive NOx RACT Rule Limit	
	25-50 MMBTU/Hr	50-100 MMBTU/Hr
CT	By calculation	By calculation
DC	Annual Tune up	Case-by-case
DE	Annual Tune up	LNB or FGR
MA	Annual Tune up	0.12 Lb/MMBTU
MD	Annual Tune up	Annual Tune up
ME	Annual Tune up	Case-by-case
NH	0.20 Lb/MMBTU	0.12 Lb/MMBTU
NJ	0.12 Lb/MMBTU	0.12 Lb/MMBTU
NY	0.08 Lb/MMBTU	0.08 Lb/MMBTU
PA	Annual Tune up	Case-by-case
RI	Annual Tune up	Case-by-case
VA	0.25 Lb/MMBTU	0.25 Lb/MMBTU

Note: CT RACT Rule 22a-174-22e(d)(10) does not specify presumptive NOx limit but requires calculation for the NOx emission limit. VT RACT rule 5-251(2) and 5-1010 does not specify presumptive NOx limit.

Table-7 shows that New Jersey RACT limit is more stringent than NH and VA RACT limits and consistent with MA RACT limit.

New York RACT rule limit of 0.08 Lb/MMBTU is marginally more stringent than the New Jersey RACT limit of 0.12 Lb/MMBTU for NOx during dual fuel firing. However, New York RACT rule 227-2.4 was effective July 1, 2014 five years after New Jersey RACT rule adoption on April 20, 2009 (41 N.J.R. 1752(a)). The New York RACT rule is available at https://govt.westlaw.com/nycrr/Document/I4e978e48cd1711dda432a117e6e0f345?viewType=FullText&originationContext=documenttoc&transitionType=CategoryPageItem&contextData=(sc.Default)

NJDEP reviewed NOx emissions from existing 33 ICI boilers operating in New Jersey of size 25 to 100 MMBTU/Hr and firing dual fuel. The permitted and stack tested NOx emissions are provided in Table-8 below:

Table-8
New Jersey's Existing 33 ICI Boilers 25 to 100 MMBTU/Hr Firing Dual Fuel
(Permitted and Stack Tested NOx Emissions in Lb/MMBTU)

SR	Facility	Size (MMBTU/Hr)	Air Pollution Control	Permitted NOx (Lb/MMBTU)	Stack Tested NOx (Lb/MMBTU)	Permitted NOX (TPY)	Actual NOx (TPY) (2018ES)
1	Rutgers U PI#17958 E7(a)	49.5	None	0.12	0.083	105	33.6
2	Rutgers U PI#17958 E8 (a)	99	None	0.12	0.074		
3	Rutgers U PI#17958 E9 (a)	99	None	0.1	0.069		
4	COE Bridgewater PI#35832 E23	72	LNB, FGR	0.03 gas 0.10 oil	0.023 gas 0.092 oil	100.35	1.6
5	PB Nutcliff (formerly Hoffmann LaRoche) ID 07167 E1022 (b)	89.8	None	0.12	0.10	77.3	4.7
6	PB Nutcliff (formerly Hoffmann LaRoche) ID 07167 E1023 (b)	96.8	None	0.12	0.09		
7	Bayonne Holdings PI#12174 E9	96.75	None	Gas 0.05 Oil 0.10	0.07	235.6	17.6
8	Bayonne Holdings PI#12174	96.75	None	Gas 0.05 Oil 0.10	0.064		

	E10						
9	Bayonne Holdings PI#12174 E11	96.75	None	Gas 0.05 Oil 0.10	0.072		
10	Bayonne Holdings PI#12174 E12	96.75	None	Gas 0.05 Oil 0.10	0.06		
11	Hackensack Medical Center PI # 02876 E901	71.6	None	0.02 gas Oil emergency use only	N/A	79.68	6.0
12	Hackensack Medical Center PI # 02876 E902	71.6	None	0.02 gas Oil emergency use only	N/A		
13	Hackensack Medical Center PI # 02876 E903	71.6	None	0.02 gas Oil emergency use only	N/A		
14	Ashland Parlin/Hercules PI#15017, E700	33.5	None	0.035 gas 0.098 oil	0.022 gas 0.08 oil	19.52	0
15	Ashland Parlin/Hercules PI#15017, E701	33.5	None	0.352 gas 0.098 oil	0.022 gas 0.087 oil	19.52	0
16	Montclair State University PI # 07524, E200	49	None	0.02 gas 0.08 oil	N/A	47.2	0.27
17	Montclair State University PI # 07524, E201	49	None	0.02 gas 0.08 oil	N/A	47.2	
18	1000 Boardwalk PI# 70502	28.3	LNB, FGR	0.12 gas Oil emergency use only	0.096	30.4	5.07
19	1000 Boardwalk PI# 70502	28.3	LNB, FGR	0.12 gas Oil emergency use only	0. 107		
20	1000 Boardwalk PI# 70502	28.3	LNB, FGR	0.12 gas Oil emergency use only	0.086		
21	1000 Boardwalk PI# 70502	28.3	LNB, FGR	0.12 gas Oil emergency use only	0.098		
22	1000 Boardwalk PI# 70502	28.3	LNB, FGR	0.12 gas Oil emergency use only	0.108		

23	1000 Boardwalk PI# 70502	28.3	LNB, FGR	0.12 gas Oil emergency use only	0.103		
24	1000 Boardwalk PI# 70502	28.3	LNB, FGR	0.12 gas Oil emergency use only	0.083		
25	1000 Boardwalk PI# 70502	28.3	LNB, FGR	0.12 gas Oil emergency use only	0.090		
26	Rutgers U, Newark PI# 08242, E72261	38	None	0.08	0.065	115.93	5.26
27	Rutgers U, Newark PI# 08242, E72262	38	None	0.08	0.070		
28	Rutgers U, Newark PI# 08242, E72263	64	None	0.08	0.077		
29	Merck Sharp PI# 41712 E75003	99.5	SCR	0.015	0.008	22.66	3.33
30	Merck Sharp PI# 41712 E75005	99.5	LNB, FGR	0.015	0.009		
31	Merck Sharp PI# 41712 E75009	99.5	SCR	0.015	0.010		
32	Novartis (c) PI# 26173, E12101	60	None	0.10	0.065	31.59	1.52
33	Schweitzer Mauduit PI #17880 (c) U4, E306	98.4	None	0.035	0.033	10.27	2.75

Notes:

(a) Rutgers U E7 installed in 1989, E8 and E9 installed in 1966
(b) PB Nutcliff E1022 and E1023 installed in 1955, Modified in 1995
(c) The boiler is equipped with two separate burners for gas and oil
LNB: Low NOx Burner
FGR: Flue Gas Recirculation
SCR: Selective Catalytic Reduction

Table-8 shows that stack tested NOx emissions from 15 boilers of 33 (45%, highlighted in yellow) shows compliance with the NY RACT rule limit of 0.08 Lb/MMBTU.

Ten (10) boilers of 33 burn natural gas and they are permitted for oil firing only during emergency use. Pursuant to N.J.A.C. 7:27-19.25. During an emergency, if a combustion source temporarily combusts fuel oil or other liquid fuel in place of natural gas, the owner or operator is not required to have the combustion source comply with the applicable NO_X emission limits.

NJDEP will continue to explore NOx reductions from the existing dual fuel fired ICI boilers during air permit modifications but not as a RACT SIP requirement.

7. 100 MMBTU/Hr or Greater Firing Dual Fuel:

New Jersey presumptive NOx emission RACT limit is 0.20 Lb/MMBTU for existing ICI boilers of size 100 MMBTU/Hr or greater firing dual fuel. This limit is also applicable to boilers firing other liquid or other gaseous fuel (N.J.A.C. 7:27-19.7, Table-9). Installation and operation of CEM system is required for large size ICI boilers (250 MMBTU/hr or more) pursuant to N.J.A.C. 7:27-19.7(d). The averaging period is each calendar day between May 1 and September 30 if CEM is used (N.J.A.C. 7:27-19.15(a1)). If no CEM has been or is required to be installed, compliance with the limit shall be based upon the average of three one-hour tests, each performed over a consecutive 60-minute period (N.J.A.C. 7:27-19.15(a)2).

The NJDEP performed state to state RACT analysis and compared presumptive NOx RACT rule limits for this category in OTR. A comparison of the presumptive NOx emission limits is provided in Table-9 below:

Table-9
Comparison of Presumptive NOx Emission limit for existing ICI boilers
(100 MMBTU/Hr or Greater, Dual Fuel Fired)

OTR State	Presumptive NOx RACT Rule Limit	
	100-250 MMBTU/Hr	250 MMBTU/Hr or Greater
CT	By calculation	By calculation
DC	0.25 Lb/MMBTU	0.25 Lb/MMBTU
DE	0.25 Lb/MMBTU	0.25 Lb/MMBTU
MA	0.15 Lb/MMBTU	0.15 Lb/MMBTU
MD	0.25 Lb/MMBTU	0.30 Lb/MMBTU
ME	Case-by-case	Case-by-case
NH	0.25 Lb/MMBTU	0.25 Lb/MMBTU
NJ	0.20 Lb/MMBTU	0.20 Lb/MMBTU
NY	0.15 Lb/MMBTU	0.15 Lb/MMBTU
PA	Case-by-case	Case-by-case
RI	Case-by-case	Case-by-case
VA	0.25 Lb/MMBTU	0.25 Lb/MMBTU

Note: CT RACT Rule 22a-174-22e(d)(10) does not specify presumptive NOx limit but requires calculation for the NOx emission limit. VT RACT rule 5-251(2) and 5-1010 does not specify presumptive NOx limit

Table-9 shows that the New Jersey RACT limit is more stringent than DC, DE, MD, NH and VA RACT limits. NY and MA RACT rules have a NOx limit of 0.15 Lb/MMBTU, which is marginally more stringent than New Jersey RACT limit of 0.20 Lb/MMBTU during dual fuel firing.

New York RACT rule 227-2.4 was adopted after New Jersey RACT rule adoption on April 20, 2009 (41 N.J.R. 1752(a)). New York RACT rule 227-2.4 is available at https://govt.westlaw.com/nycrr/Document/I4e978e48cd1711dda432a117e6e0f345?viewType=FullText&originationContext=documenttoc&transitionType=CategoryPageItem&contextData=(sc.Default) and MA rule is available at available at https://www.mass.gov/doc/310-cmr-700-air-pollution-control-regulations.

NJDEP reviewed NOx emissions from existing nine (9) ICI boilers of size greater than 100 MMBTU/Hr operating in New Jersey and firing dual fuel. The permitted and stack tested NOx emissions are provided in Table-10 below:

Table-10
New Jersey's Existing ICI Boilers Greater Than 100 MMBTU/Hr Firing Dual Fuel
(Permitted and Stack tested NOx Emissions in Lb/MMBTU)

SR	Facility	Size (MMBTU/Hr)	Air Pollution Control	Permitted NOx (Lb/MMBTU)	Stack Tested NOx (Lb/MMBTU)	Permitted NOX (TPY)	Actual NOx (TPY) (2018ES)
1	Anheuser - Busch PI#07551 U3003-E3003(a)	147	None	0.20	0.19	147	15
2	Anheuser - Busch PI#07551 U3003-E3004(a)	134	None	0.20	0.18	134	16
3	Marcal PI# 02102 E102 (b)	114	None	0.20	0.114	157	48.75
4	Marcal PI# 02102 E103 (b)	147	None	0.20	0.17		
5	Merck Sharp PI# 41712 U75001, E75010	249.5	SCR	0.014 gas 0.026 oil	---	85.1	6.78
6	Merck Sharp PI# 41712 U75001, E75011	249.5	SCR	0.014 gas 0.026 oil	0.0107 gas 0.021 oil		
7	Merck Sharp PI# 41712 U75001, E75012	249.5	SCR	0.014 gas 0.026 oil	0.012 gas 0.023 oil		
8	Trustees of Princeton PI # 61014 E23	189	LNB. FGR	0.10	0.075	239.58	5.96
9	Trustees of Princeton PI # 61014 E24	189	LNB, FGR	0.10	0.074		

Notes:

(a) Anheuser-Busch E3003 and E3004 installed in 1967

(b) Marcal E102 and E103 installed on or before 1995
LNB: Low NOx Burner
FGR: Flue Gas Recirculation
SCR: Selective Catalytic Reduction

Table-10 shows that stack tested NOx emissions from 5 boilers (highlighted in yellow), out of 9, shows compliance with the NY and MA RACT rule limit of 0.15 Lb/MMBTU. Three boilers are equipped with SCR and two with LNB and FGR.

NJDEP will continue to explore NOx reductions from the existing dual fuel fired ICI boilers during air permit modifications but not as a RACT SIP requirement.

Based on these factors, NJDEP determined that the current NOx RACT limits for the existing ICI boilers and heat exchangers satisfy RACT requirements. Therefore, NJDEP is re-certifying N.J.A.C. 7:27-19.7 for the 70-ppb ozone standard.

Stationary Reciprocating Engines

NOx emissions from the existing stationary reciprocating engines operating in New Jersey are regulated under N.J.A.C. 7:27-19.8. The potential to emit NOx from this source category is 25 tons per year or more.

Engines are used in industrial, institutional and commercial facilities. This category includes those engines that are used to generate electricity outside of that supplied by utilities. “Stationary reciprocating engine” is defined in N.J.A.C. 7:27-19.1. It is an engine that remains for more than 30 days at a single site (for example, any building, structure, facility, or installation), but does not include a mobile electric generator being used by the military, a locomotive engine or a construction engine. A stationary reciprocating engine is not self-propelled but may be mounted on a vehicle for portability; or is self-propelled on rails at a facility but does not in the course of its normal operation leave the facility.

The New Jersey RACT rule at N.J.A.C. 7:27-19.8 establishes different emissions limits based upon whether the engine generates electricity, whether the engine uses liquid or gaseous fuel, and whether it is a rich-burn engine or lean-burn engine. The distinction between rich-burn and lean-burn engines is the ratio of air to fuel combusted in each type of engine; less air is combusted with a given amount of fuel in a rich-burn engine. NOx emissions from engines are formed due to the operating temperature and pressure in the engine. The thermal NOx is predominant, while fuel NOx is minimal. Different control measures are appropriate for each type of engine. Gaseous-fueled lean-burn engines can control NOx with clean-burn combustion technology; this approach uses more air in combusting a given amount of fuel. The excess air lowers combustion temperatures, thereby reducing NOx formation. Gaseous-fueled rich-burn engines can employ nonselective catalytic reduction; in this approach, a catalyst causes NOx to react with CO and unburned hydrocarbons to produce nitrogen, carbon dioxide and water. In a liquid-fueled lean-burn engine, retarded ignition timing reduces NOx formation through lowered combustion temperatures and pressures. In this type of engine, it may also be necessary to install separate circuit aftercooling to meet the emissions limits.

N.J.A.C. 7:27-19.8 establishes NOx emission limits for engines generating electricity, non-electric engines and engines used at compressor stations to transport gases fuels through the pipelines, as discussed below.

A. Engines Generating Electricity:

New Jersey adopted NOx emission requirements on October 17, 2005 (37 N.J.R. 3976) for Engines Generating Electricity and Emergency Generators based on OTC Model Rule for Additional NOx Control Measures and OTC March 6, 2001 Distributed Generation (DG) Initiative. These RACT limits became effective on March 7, 2007. A summary of New Jersey presumptive NOx emission limits is provided in Table-1 below:

Table-1
Summary of New Jersey Presumptive NOx Emission Limits for Engines Generating Electricity

Type of Engine	Applicability	NOx Limit (Grams/BHP-Hr)(a)	New Jersey RACT Rule
Rich Burn (b)	148 KW (200 BHP) or greater (Gaseous or Liquid Fuel)	1.5	N.J.A.C. 7:27-19.8(e)1 Table-10
	37 KW (50 BHP) or greater (New or Modified after 3/7/2007)	0.9	N.J.A.C. 7-27:19.8(e)2&3
Lean Burn (b)	148 KW (200 BHP) or greater (Gas)	1.5 or 80% reduction	N.J.A.C. 7:27-19.8(e)1 Table-10
	148 KW (200 BHP) or greater (Liquid Fuel or Dual(Gas and Liquid))	2.3	N.J.A.C. 7:27-19.8(e)1 Table-10

	37 KW (50 BHP) or greater (New or Modified after 3/7/2007)	0.9	N.J.A.C. 7:27-19.8(e)2&3

Notes:
(a): Grams per brake horse power hour
(b) N.J.A.C. 7:27-19.1 defines "Gas" or "gaseous fuel" means any gaseous substance that can be used to create useful heat and/or mechanical energy, "Lean-burn engine" means a stationary reciprocating engine that operates at an air-to- fuel ratio that is fuel-lean of stoichiometric and that cannot operate with an exhaust oxygen concentration of less than one percent and "Rich-burn engine" means a stationary reciprocating engine that is not a lean-burn engine.

The owner or operator of any stationary reciprocating engine that has a maximum rated power output of at least 37 KW or greater used for generating electricity and whether or not it is located at a major NOx facility, are also required to adjust the engine's combustion process pursuant to N.J.A.C. 7:27-19.8(f).

Requirements for Emergency Generators (EG) are also specified in New Jersey RACT rule. N.J.A.C. 7:27-19.1 defines an EG as one that is located at a facility and produces mechanical or thermal energy, or electrical power exclusively for use at the facility; and is the source of mechanical or thermal energy, or electrical power when the primary source of energy is unavailable as a result of (1) A power disruption that results from construction, repair, or maintenance activity at the facility (operation of the combustion source under this subparagraph is limited to 30 days in any calendar year, not including operation); (2) A power outage or failure of the primary source of mechanical or thermal energy because of an emergency; or (3) A voltage reduction issued by PJM and posted on the PJM internet website (www.pjm.com) under the "emergency procedures" menu. N.J.A.C. 7:27-19.11 requires that the owner or operator of an EG with a maximum power output of 37 KW or greater shall maintain records of operations for a period no less than five years.

NJDEP compared presumptive NOx emission limits for engines generating electricity in the ozone transport region (OTR). A summary of presumptive NOx limits of OTR states is provided in Table-2 below:

Table-2
Presumptive NOx limits of OTR states for Engines Generating Electricity

OTR State	NOx RACT Limit in LB/MWH	RACT Rule
NJ	2.80 Lb/MWH (0.9 Grams/BHP-Hr)(a) (New installed or modified after 3/7/2007	N.J.A.C. 7:27-19.8(e)2
CT	4.0 Lb/MWH (Installed before 1/1/2005) 0.60 Lb/MWH (installed on and after 1/1/2005) 0.30 Lb/MWH (Installed on and after 5/1/2008) 0.15 Lb/MWH (Installed on and after 1/1/2012)	22a-174-42(d) Table 42-2
DE	0.60 Lb/MWH (Effective 1/11/2006)	T7, 1144, 3.2.2
MA	0.60 Lb/MWH (installed on and after 3/23/2006) 0.30 Lb/MWH (Installed on and after 1/1/2008) 0.15 Lb/MWH (Installed on and after 1/1/2012)	310 CMR 7.26 Table-1
MD	0.88 Lb/MWH (Effective 2/12/2018)	T26, Sub-11, Ch-36
ME	4.0 Lb/MWH (Effective 1/1/2005) 1.5 Lb/MWH (Effective 1/1/2009)	Chapter 148, Section 5.B
NY(b)	4.67 Lb/MWH (1.5 Grams/BHP-Hr (Effective 11/1/2016) 2.96 Lb/MWH (Effective 5/1/2021) 3.11 Lb/MWH (1.0 Grams/BHP-Hr) (Effective 5/1/2025 for SI -Gas) 0.93 Lb/MWH (0.30 Grams/BHP-Hr for CI <750 BHP-Oil) (Effective 5/1/2025) 1.55 (0.50 Grams/BHP-Hr for CI >750 BHP-Oil) Effective 5/1/2025	6 NYCRR, 222.4

PA	6.23 Lb/MWH (Surrender CAIR NOx allowances & CAIR ozone allowances) (Effective 4/23/2016)	129.97, 203, 204 &145
RI	0.15 Lb/MWH (Effective 1/13/2019)	05/P43/Sec 43.8.2.A
VA	1.56 lb/MWH (Effective 8/17/2011)	9VAC5-530-180
VT	0.88 Lb/MWH (Effective 12/13/2018)	5-271

Notes:
(a): A multiplier of 3.11 is used to convert NOx emission from Grams/BHP-Hr to Lb/MWH pursuant to EPA Final Report on Output Based Regulations: Handbook of Air Regulators, August 2014
(b): NY RACT rule (March 11, 2020 New York Register)

The above table shows that New Jersey presumptive NOx limit for engines generating electricity is similar to the New York limit for engines generating electricity. However, there is a significant difference in adoption timing and applicability threshold. New Jersey adopted RACT limits for electric engines on October 17, 2005. New York adopted 6 NYCRR, Part 222, almost fifteen year later, on March 11, 2020. New York rule is to control NOx emissions from DGs located in New York City, Long Island, Westchester and Rockland Counties of New York. New Jersey rule is applicable to entire state. New Jersey applicability threshold is 50 BHP (37 KW) while New York applicability threshold is 200 BHP.

Several states including CT, MA and RI developed presumptive NOx limits based on the Regulatory Assistance Project (RAP) model rule. The RAP model rule for small electric generation sources was developed under a contract with the National Renewable Energy Laboratory (NREL). The model rule limits are technology forcing standards for smaller-scale electric generation technologies and regulate five air pollutants: NOx, PM, CO, SO_2, and CO_2. The emission standards specified in the RAP rule are output-based (Lb/MWH) standards. For non-emergency engines, the model rule calls for the standards for each pollutant to be phased in three steps over a ten-year period: 0.6 Lb/MWH, 0.3 Lb/MWH and 0.15 Lb/MWH.

NJDEP reviewed presumptive NOx emission limits as well as compliance with those limits of OTR states that followed the RAP model rule. NJDEP found that the limits adopted by OTR states based on RAP model rule were intended to be technology-forcing. Very few units operated under the provisions and the NOx limits are not achievable. Based on research, there are no commercially available units that comply with the limits.

NJDEP reviewed air pollution control permits of existing engines generating electricity in New Jersey. NJDEP permit database showed 45 engines operating at 20 facilities. Of the 45 engines, 18 engines are generating both steam and electricity (cogeneration units) and 27 engines are generating electricity only. Additionally, 17 of the 45 engines are well controlled and equipped with selective catalytic reduction (SCR). The total permitted NOx emissions from the 45 engines are 269 tons per year while actual NOx emissions based on 2018 emission statement is 71 tons per year.

NJDEP estimated NOx emissions during the 2020 ozone season to be approximately 35 tons (458 Lb/Day). NJDEP also evaluated additional rule making. The environmental benefit of ozone season NOx reduction would be insignificant based on an assumption of 70 percent reduction through additional rulemaking.

A list of New Jersey facilities operating engines generating electricity is provided in Table-3 below.

Table-3
New Jersey Facilities Operating Engines Generating Electricity

SR #	Facility	PI#	SR NO	Equip ID	Output Type	Class	Rated Output	Fuel	Control Device	RACT Limit	Currently Permitted				Most recent Stack Test Data				2018 Emission Statement
							Bhp			g/bhp-hr	g/bhp-hr	lb/hr	hr/yr	Tons/yr	Year	g/bhp-hr	ppmvd	lb/hr	Tons/yr
1	RB R&D Development center	01508	1	E906	CoGen	Lean Burn	126	NG	Oxidation catalyst	0.9	0.15	0.0417	8,760	0.18	2010	0.00	0.05	0.00	N/Av
2	PPL Energy Services Holdings, LLC	02863	2	E1	Electric	Lean Burn	2889	NG	Oxidation catalyst	2.5	0.50	3.18	8,760	13.93	2005	0.26	45.77	1.66	1.48
			3	E2	Electric	Lean Burn	2889	NG	Oxidation catalyst	2.5	0.50	3.18	8,760	13.93	2005	0.27	46.37	1.68	1.62
			4	E3	Electric	Lean Burn	2889	NG	Oxidation catalyst	2.5	0.50	3.18	8,760	13.93	2005	0.23	40.90	1.42	1.44
			5	E4	Electric	Lean Burn	2889	NG	Oxidation catalyst	2.5	0.50	3.18	8,760	13.93	2005	0.28	50.40	1.78	1.71
3	Shoprite - Oakland	03679	6	E1	CoGen	Lean Burn	629	NG	Dry Selective Catalyst	2.5	0.61	0.850	8,760	3.70	2017	0.67	121	0.86	N/Av
			7	E2	CoGen	Lean Burn	558	NG	NSCR	2.5	0.9	1.11	4,100	2.27	2017	0.54	109.33	0.70	N/Av
4	Essex County Correctional Facility	07909	8	E7	Electric	Lean Burn	4267	NG	Selective Catalytic Reduction (SCR)	2.5	0.07	0.66	8,760	2.88	2018	0.08	10.17	0.72	N/Av
5	Automatic Rolls of NJ	16202		E100	Electric	Lean Burn	2941	Diesel	SCR and Oxidation Catalyst	8	0.63	4.06	1,537	3.14	2015	N/Av	17.43	0.38	N/Av
																N/Av	66.33	1.48	N/Av
			9													0.317	42.07	1.86	N/Av
6	Barnes & Noble Inc.	18540	10	E3	Electric	Lean Burn	2889	NG	SCR and Oxidation Catalyst	2.5	0.15	0.96	8,760	4.18	2018	0.101	14.00	0.61	N/Av
7	Jersey Shore University Medical Center	21324	11	E2301	CoGen	Lean Burn	2671	NG	SCR and Oxidation Catalyst	2.5	0.15	0.88	8,752	3.87	2018	0.035	5.37	N/Av	1.93
			12	E2401	CoGen	Lean Burn	2671	NG	SCR and Oxidation Catalyst	2.5	0.15	0.88	8,752	3.87	2018	0.025	3.73	N/Av	2.65
8	Verizon Corporate Services Group	35442	13	E3001	Electric	Lean Burn	3296	Diesel	SCR	8.0	0.6	4.81	1,400	3.05	2015	0.547	74.33	4.05	N/Av
			14	E3002	Electric	Lean Burn	3353	Diesel	SCR	8.0	0.6	4.81	1,400	3.10	2016	0.417	55.33	3.03	N/Av
			15	E3003	Electric	Lean Burn	3402	Diesel	SCR	8.0	0.6	4.81	1,400	3.15	2015	0.410	55.67	3.02	N/Av
			16	E3004	Electric	Lean Burn	3346	Diesel	SCR	8.0	0.6	4.81	1,400	3.10	2015	0.337	47.00	2.48	N/Av
9	Raritan Valley Community College	35482	17	E6	CoGen	Other	1966	NG	SCR and Oxidation Catalyst	2.5	0.15	0.650	8,760	2.85	2013	0.043	6.93	0.18	N/Av
10	Morgan Stanley Data Center	36207		E7	Electric	Lean Burn	3000	No. 2 Fuel Oil	SCR and Oxidation Catalyst	8.0	0.65	4.23	500	1.07	2014	0.173	43.53	1.11	N/Av
						Lean Burn										0.250	71.30	1.59	N/Av
			18			Lean Burn										0.420	N/Av	2.70	N/Av
				E8	Electric	Lean Burn	3000	No. 2 Fuel Oil	SCR and Oxidation Catalyst	8.0	0.65	4.23	500	1.07	2014	0.360	101.43	2.32	N/Av
						Lean Burn										0.053	15.65	0.34	N/Av
			19			Lean Burn										0.410	N/Av	2.65	N/Av
11	Overlook Hospital	40668	20	E10	CoGen	Lean Burn	1382	NG	SCR and Oxidation Catalyst	2.5	0.37	1.12	8,760	4.94	2018	0.187	26.97	0.51	1.08
			21	E11	CoGen	Lean Burn	1382	NG	SCR and Oxidation Catalyst	2.5	0.37	1.12	8,760	4.94	2018	0.217	31.87	0.53	2.14
12	Rahway Valley Sewerage Authority	41702	22	E240003	CoGen	Lean Burn	2131	NG	Oxidation catalyst	2.5	0.7	3.29	8,760	14.40	2014	0.617	74.60	2.71	4.58
13	Joint Meeting of Essex and Union Counties	41813	23	E4301	CoGen	N/Av	1185	NG	Catalytic Oxidizer	2.5	0.7	1.83	8,760	8.01	2018	0.317	42.80	0.77	1.93
			24	E4302	CoGen	N/Av	1185	NG	Catalytic Oxidizer	2.5	0.7	1.83	8,760	8.01	2018	0.290	37.20	0.68	2.74
			25	E4303	CoGen	N/Av	1185	NG	Catalytic Oxidizer	2.5	0.7	1.83	8,760	8.01	2018	0.347	43.97	0.84	1.32
			26	E4304	CoGen	N/Av	1185	NG	Catalytic Oxidizer	2.5	0.7	1.83	8,760	8.01	2018	0.353	50.23	0.87	1.88
14	Burlington County Resource Recovery Complex	45949	27	E31	EGU	Lean Burn	N/Av	LFG	None	1.5	0.6	2.66	8300	11.24	2017	0.588	89	2.45	7.05
			28	E32	EGU	Lean Burn	N/Av	LFG	None	1.5	0.6	2.66	8300	11.24	2017	0.440	66.70	1.85	7.12
			29	E33	EGU	Lean Burn	N/Av	LFG	None	1.5	0.6	2.66	8300	11.24	2017	0.493	80.50	2.13	8.01
			30	E34	EGU	Lean Burn	N/Av	LFG	None	1.5	0.6	2.66	8300	11.24	2017	0.469	69.60	1.96	7.67
			31	E35	EGU	Lean Burn	N/Av	LFG	None	1.5	0.6	2.66	8300	11.24	2017	0.457	70.60	1.97	9.53
			32	E36	EGU	Rich Burn	N/Av	FO	None	N/Av	N/Av	3.46	500	0.87	N/Av	N/Av	N/Av	N/Av	0.08
			33	E400	EGU	Lean Burn	1050	FO	None	8	2.6	6.02	1000	3.01	N/Av	N/Av	N/Av	N/Av	N/Av
15	Clayton Sand Company	46102	34	E16	EGU	Lean Burn	3090	Diesel	SCR and Oxidation Catalyst	0.9	0.9	6.15	8,760	9.78	2019	0.437	52.33	2.67	N/Av
16	Ener-G Rudox	46563	35	E10	CoGen	Rich Burn	351	NG	NSCR	0.9	0.8	0.62	8,760	2.72	2016	0.037	11.73	0.03	N/Av
			36	E11	CoGen	Rich Burn	351	NG	NSCR	0.9	0.8	0.62	8,760	2.72	2016	0.007	2.00	0.01	N/Av
17	Shoprite Burlington	46572	37	E2	EG/PS	Rich Burn	605	NG	NSCR	0.9	0.85	1.13	4,100	2.32	2017	0.567	100.23	0.73	N/Av
			38	E1	15	Lean Burn	629	NG	Dry Selective Catalyst	0.9	0.61	0.85	8,760	3.70	2017	0.597	100.20	0.75	N/Av
18	Shoprite Hainesport	46573	39	E1	CoGen	Lean Burn	629	NG	Dry Selective Catalyst	0.9	0.61	0.85	8,760	3.70	2017	0.653	97.10	0.91	N/Av
			40	E2	EG/PS	Lean Burn	558	NG	Dry Selective Catalyst	0.9	0.9	1.11	4,100	2.27	2017	0.737	121.67	0.91	N/Av
19	Camden County Municipal	50163	41	E3802	CHP	Lean Burn	2649	DG/NG	SCR	0.9	0.15	0.88	8,300	3.65	2019	0.100	N/Av	0.59	N/Av
			42	E3803	CHP	Lean Burn	2649	DG/NG	SCR	0.9	0.15	0.88	8,300	3.65	2019	0.110	N/Av	0.66	N/Av
20	Ocean County Municipal Utility	78909	43	E109	EGU	Lean Burn	471	DG	None	1.5	1.5	1.56	8,760	6.83	2008	0.341	42.63	0.35	1.30
			44	E110	EGU	Lean Burn	471	DG	None	1.5	1.5	1.56	8,760	6.83	2008	0.297	31.10	0.30	1.13
			45	E111	EGU	Lean Burn	471	DG	None	1.5	1.5	1.56	8,760	6.83	2008	0.607	69.77	0.62	2.90
	TOTAL		45		Cogen-18									**268.62**					**71.29**
	N/Av = Not Available				EGU-27									**PERMITTED**					**Actual**
	N/A = Not Applicable													**TPY**					**TPY**
	SR No. 37 - Burlington RR Complex Engine- BHP, Permitted Grams/BHP-hr, Stack Tested NOx not available																		

B. Non-Electric Engines:

New Jersey adopted NOx emission requirements for stationary internal combustion engines on December 20, 1993 (25 N.J.R. 5957). NJ.A.C. 7:27-19.8 established emission limits for the existing stationary internal combustion engines. The emission limits are consistent with those recommended by the Northeast States for Coordinated Air Use Management (NESCAUM) Stationary Source Committee. A summary of New Jersey presumptive NOx limits for non-electric engines is provided in Table-1 below:

Table-1
Summary of New Jersey Presumptive NOx Emission Limits for Non-electric Engines

Type of Engine	Applicability Threshold	Fuel	NOx Emission Limit (Grams/BHP-Hr)	New Jersey RACT Rule
Rich Burn (a)	500 BHP or greater	Gaseous Fuel	1.5	N.J.A.C. 7:27-19.8(a)
Lean Burn (a)	500 BHP or greater	Gaseous Fuel	2.5	N.J.A.C. 7:27-19.8(b)
	500 BHP or greater	Liquid Fuel	8.0	N.J.A.C. 7:27-19.8(c)

Note: (a) N.J.A.C. 7:27-19.1 defines "Gas" or "gaseous fuel" means any gaseous substance that can be used to create useful heat and/or mechanical energy, "Lean-burn engine" means a stationary reciprocating engine that operates at an air-to- fuel ratio that is fuel-lean of stoichiometric and that cannot operate with an exhaust oxygen concentration of less than one percent and "Rich-burn engine" means a stationary reciprocating engine that is not a lean-burn engine.

NJDEP compared presumptive NOx emission limits for engines generating electricity in ozone transport region (OTR). A summary of presumptive NOx limits of OTR states is provided in Table-2 below:

Table-2
Presumptive NOx limits of OTR states for Engines

OTR State	NOx RACT Limit in Grams/BHP-Hr				RACT Rule
	Gas (500 BHP or greater)		Oil (500 BHP or greater)		
	Lean Burn	Rich Burn	Lean Burn	Rich Burn	
NJ	2.5	1.5	8.0	--	N.J.A.C. 7:27-19.8
CT(a)	1.5	1.5	2.3	1.5	22a-174-22e(d)(6)(8)
MA	1.5	1.5	2.3	2.3	310 CMR 7.19(8)(d)
NH	2.5	1.5	4.77	4.77	1307.02(a)
NY	1.5	1.5	2.3	2.3	227-2.4(f)(1)
PA	3.0	2.0	8.0	2.0	129.97(g)(3) & 129.100(a)
RI	2.5	1.5	9.0	1.5	27.8.3 & 27.9.D
VT	4.8	4.8	4.8	4.8	5-271(a) & (c)

Note: (a) CT Phase 2 limits beginning June 1, 2023 and continuing thereafter. DC, DE, MD, ME and VA rules do not have presumptive NOx limits.

The above table shows:

a. New Jersey presumptive NOx limit for lean burn engines (gas) is more stringent than PA and VT and consistent with NH and RI.
b. New Jersey presumptive NOx limit for rich burn engines (gas) is more stringent than PA and VT and consistent with CT, MA, NH, NY and RI.

c. New Jersey presumptive NOx limit for lean burn engines (oil) is more stringent than RI and consistent with PA.

After New Jersey's adoption of NOx RACT requirements for engines, several states adopted presumptive NOx limits that are marginally more stringent than New Jersey presumptive RACT limits as discussed below.

Connecticut adopted presumptive NOx limits for engines in two phases. Phase 1 means the first implementation phase, beginning June 1, 2018 and ending May 31, 2023. Phase 2 means the second implementation phase, beginning June 1, 2023 and continuing thereafter. (see https://eregulations.ct.gov/eRegsPortal/Browse/RCSA/Title_22aSubtitle_22a-174Section_22a-174-22e/). Connecticut presumptive NOx limits are as follows:

a. Phase 1 (June 2018 – May 2023): 2.5 Grams/BHP-hr (gas) and 8.0 Grams/BHP-Hr (oil)
b. Phase 2 (beginning June 2023): 1.5 Grams/BHP-Hr (gas) and 2.3 Grams/BHP-Hr (oil, lean burn).

Massachusetts adopted NOx limits for engines at 310 CMR 7.19(8)(d), which states that the owner/operator of an engine that has operated 1000 hours or more during any consecutive 12-month period since March 9, 2018 shall have until two years after the 12-month consecutive period that exceeded the 1000 hours of operation to comply with the applicable NO_X emission standards below:

a. For rich burn, gas-fired reciprocating internal combustion engines, 1.5 grams per BHP-hr
b. For lean burn, gas-fired reciprocating internal combustion engines, 1.5 grams per BHP-hr and
c. For lean burn, oil-fired or dual fuel reciprocating internal combustion engines, 2.3 grams per BHP-hr.

Massachusetts RACT rule is available at https://www.mass.gov/doc/310-cmr-700-air-pollution-control-regulations.

New York RACT rule 6 CRR-NY 227-2.4 requires that a stationary internal combustion engine either having a maximum mechanical output rating equal to or greater than 200 brake horsepower in a severe ozone nonattainment area or having a maximum mechanical output rating equal to or greater than 400 brake horsepower outside a severe ozone nonattainment area must comply with the following NOx emission limits:

a. Internal combustion engines fired solely with natural gas: 1.5 grams per brake horsepower-hour; and
b. Internal combustion engine fired with distillate oil (solely or in combination with other fuels): 2.3 grams per brake horsepower-hour.

The emergency power generating stationary internal combustion engines, and engine test cells at engine manufacturing facilities that are used for either research and development purposes, reliability testing, or quality assurance performance testing are exempt from these requirements.

The New York RACT rule is available at https://govt.westlaw.com/nycrr/Document/I4e978e48cd1711dda432a117e6e0f345?viewType=FullText&originationContext=documenttoc&transitionType=CategoryPageItem&contextData=(sc.Default)

Delaware RACT rule section 1112-3.4 (available at https://regulations.delaware.gov/AdminCode/title7/1000/1100/1112.pdf) specifies technology rather than specific NOx limit. It requires that the NOx emission rate shall not exceed those achieved using pre-ignition chamber combustion or clean burn technology for gas fired engines.

NJDEP reviewed air pollution control permits of existing non-electric engines operating in New Jersey. NJDEP permit database showed 10 engines operating at 4 facilities. All 10 engines are lean burn, of which 8 engines

fire natural gas and 2 engines fire fuel oil. Three engines are equipped with a catalytic oxidizer and one engine is equipped with selective catalytic reduction (SCR) and oxidation catalyst. The permitted NOx emissions from the 10 non-electric engines are 206 tons per year while actual NOx emissions based on 2018 emission statement is 63.4 tons per year.

NJDEP estimated NOx emissions during ozone season to be approximately 32 tons (418 Lb/Day). NJDEP also evaluated additional rule making. The environmental benefit of ozone season NOx reduction would be insignificant based on an assumption of 70 percent reduction through additional rulemaking.

A list of New Jersey facilities operating non-electric engines is provided in Table-4 below.

Table-4
New Jersey Facilities Operating Non-Electric Engines

SL #	Facility	PI#	SR NO	Equip ID	Class	Rated Output	Fuel	Control Device	Currently Permitted				Most recent Stack Test Data				2018 Emission Statement
						Bhp			g/bhp-hr	lb/hr	hr/yr	Tons/yr	Year	g/bhp-hr	ppmvd	lb/hr	Tons/yr
1	New Jersey American Water Co	35862	1	E201	Lean Burn	1303	NG	Catalytic Oxidizer	0.7	2.01	8,760	8.81	2018	0.273	52.30	0.78	3.75
			2	E202	Lean Burn	1303	NG	Catalytic Oxidizer	0.7	2.01	8,760	8.81	2018	0.293	53.63	0.84	2.46
			3	E203	Lean Burn	1303	NG	Catalytic Oxidizer	0.7	2.01	8,760	8.81	2018	0.323	62.97	0.92	3.41
			4	E204	Lean Burn	1303	NG	Catalytic Oxidizer	0.7	2.01	8,760	8.81	2018	0.267	46.27	0.76	3.65
2	Linden Compressor Station	41722	5	E1	Lean Burn	2153	NG	None	2.5	11.9	8,760	51.97	2018	1.60	126.33	7.67	13.58
			6	E2	Lean Burn	2153	NG	None	2.5	11.9	8,760	51.97	2018	1.57	114.67	7.47	17.47
			7	E3	Lean Burn	2153	NG	None	2.5	11.9	8,760	51.97	2018	1.30	104.60	5.94	13.32
3	Buckeye Pipeline Co	41780	8	E4371	Lean Burn	3130	NG	SCR and Oxidation Catalyst	0.27	1.89	8760	8.16035714	2014	0.263	29.00	1.74	2.42
4	Burlington County Resource	45949	9	E39	Lean Burn	173	FO	None	4.61	1.76	2,080	1.83	N/Av	N/Av	N/Av	N/Av	1.44
			10	E600	Lean Burn	1200	FO	None	3.33	8.73	1,125	4.91	2018	1.79	8.31	4.72	1.9
	TOTAL											**206.05**					**63.40**
	N/Av = Not Available											**PERMITTED**					**ACTUAL**
	N/A = Not Applicable											**TPY**					**TPY**

NJDEP permit program is following up with a possible NOx reduction through permit modifications with the following two facilities:

1. Linden Compressor Station (PI 41722): Operating existing three lean burn engines firing gas, each 2,153 BHP. These engines have no control for NOx emissions.
2. Burlington Resource Recovery Complex (PI 45949) : Operating one lean burn engine, firing oil, 1,200 BHP. This engine has no control for NOx emissions.
   During the 12/16/20 Microsoft Teams Conference Call, a discussion was held on the nitrogen oxide emissions. It was mentioned that the Engine has a USEPA Tier 4 designation. The Nitrogen Oxide Tier 4 level for non-road diesel engines with a 1200 BHP rating is 2.6 g/BHP-hr. As stated in Table-2 above, NY. CT and MA rules have 2.3 Grams/BHP-Hr limit.

The possible permit modifications will be permit actions and not RACT requirements.

C. Compressor Engines:

The stationary reciprocating engines combusting natural gas and compressing gaseous fuel at major NO_X facilities (compressor engines) is a source category for NO_X emission control strategies.

Compressor engines drive mechanical devices (compressors) designed to increase the pressure of the gaseous fuels being transported through a pipeline. In New Jersey, three natural gas pipeline companies (Transcontinental Gas Pipeline, Tennessee Gas Pipeline, and Texas Eastern/Spectra Energy Transmission) operate compressor turbines and compressor engines. Natural gas transmission pipeline systems use compressors at gas compressor stations to maintain system flow and overcome pressure losses due to the movement of the natural gas, and to facilitate the movement of the natural gas through a pipeline. These engines do not generate electricity.

Compressor engines include two-stroke lean-burn, four-stroke lean-burn, and four-stroke rich-burn engines. Operation of this equipment tends to increase during periods of high natural gas demand, such as during winter, when there is a high heating fuel demand, or on high electric demand days in the summer when natural gas fired electric generating units consume a significant amount of natural gas.

The compressor engines are significant sources of NO_X emissions and are permitted to operate continuously. In the years since these units were installed, NO_X control technologies have advanced to the point where installing such technologies would allow these older units to meet current RACT standards.

NJDEP committed to establishing NO_X emissions limits for these sources in New Jersey's 2015 RACT SIP revision (available at www.nj.gov/dep/baqp/sip/siprevs.htm). On November 6, 2017 (49 N.J.R. 3518), NJDEP adopted amendments to its rules for stationary gas turbines and engines. The newly adopted NOx limits are based on 2014 OTC Model Rule for Control of NO_X Emissions from Natural Gas Pipeline Compressor Fuel-Fired Prime Movers. At N.J.A.C. 7:27-19.8, NJDEP adopted the following new standards for NO_x emissions for compressor engines:

a. Beginning November 6, 2019, the owner or operator of a two-stroke lean-burn engine capable of producing an output of 200 BHP or more but less than 500 BHP, combusting natural gas, and compressing gaseous fuel at a major NOx facility shall cause it to emit no more than 3.0 grams of NOx per BHP-hr; and

b. Beginning November 6, 2019, the owner or operator of a four-stroke lean-burn engine or four-stroke rich-burn engine capable of producing an output of 200 BHP or more but less than 500 BHP, combusting natural gas, and compressing gaseous fuel at a major NOx facility shall cause it to emit no more than 2.0 grams of NOx per BHP-hr.

The estimated NO_X reductions from the adoption of new rules that could be realized beginning 2020 by using NO_X control technologies range from 84 tons per year to 126 tons per year (49 N.J.R. 25, January 3, 2017). The new rule required Transcontinental LNG station 240 (PI 02626) to modify air permits for three existing lean burn engines, 440 BHP each with permitted NOx emissions of 11.0 grams/BHP-Hr. A NOx reduction of 161 tons per year has been realized effective 2019.

Based on these factors, NJDEP determined that the current NOx RACT limits specified in N.J.A.C. 7:27-19.8 are reasonable and should remain unchanged. NJDEP is recertifying the NOx RACT requirements specified in N.J.A.C. 7:27-19.8 to comply with the 70-ppb ozone standard.

Asphalt Pavement Production Plants

New Jersey RACT rules control VOC and NOx emissions from the use and production of asphalt. Asphalt used for paving roads, parking lots, driveways, and airport runways emit VOC emissions, which are regulated under N.J.A.C. 7:27-16.9. Asphalt pavement production plants emit NOx emissions, which are regulated under N.J.A.C. 7:27-19.9.

The existing asphalt pavement production plants have a potential to emit more than 25 TPY NOx. N.J.A.C. 7:27-19.1 defines "asphalt" as "a solid, semisolid, or liquid material, produced by mixing bituminous substances together with gravel, crushed rock or similar materials, and used commonly as a coating or paving". The provision also defines "asphalt pavement production plant" as "a batch type asphalt plant or drum mix asphalt plant operated to manufacture asphalt pavement". Pursuant to N.J.A.C. 7:27-19.9, the owner or operator of an existing asphalt pavement production plant operating in New Jersey is required to comply with the applicable maximum allowable NO_X emission concentrations specified in Table-1 below:

Table-1
Maximum Allowable NO_X Emission Concentrations for Asphalt Pavement Production Plants

Fuel Type	NOx Emission Concentration
Natural gas	75 ppmvd@7%O2 (a)
2 fuel oil	100 ppmvd@7%O2 (a)
No. 4 fuel oil, heavier fuel oils or on-specification used oil or any mixture of these three oils	125 ppmvd@7%O2 (a)

Note: (a) Parts per million dry volume at seven percent oxygen

New Jersey adopted the above limits on April 20, 2009 (41 N.J.R. 1752) based on the Ozone Transport Commission (OTC) recommendation of 35 percent emission reduction from these plants. The OTC recommended NO_X emission limits based on fuel type and dryer type, or by installing low NO_X burners and implementing best management practices (BMP). New Jersey lowered the NOx limit in Table 1 from 200 ppmvd@7%O2 for all plants regardless of fuel type or dryer type and did not propose installation of a specific control technology. The required reductions could be achieved by low NO_X burners, fluid gas recirculation, water injection, BMP and/or other NO_X reduction measures. Pursuant to New Jersey RACT rule N.J.A.C. 7:27-19.9(e), the owner or operator of an asphalt pavement production plant is required to perform the following BMP:

1. Reduce aggregate moisture content by covering the aggregate stockpile to prevent high water content due to rain; or designing and operating stockpiles for water drainage and removing sand and aggregate from piles at a sufficient height above the base to avoid charging wet mix to the dryer;
2. Conduct monthly inspections of the flights in the dryer when the dryer is in use to determine the degree of wear and the need for replacement. If necessary, replace or modify a flight with an appropriate flight for the applicable combustion zone; and
3. Annually inspect the air system and repair air system leaks to minimize excess air.

New Jersey rule also requires owner or operator of a facility to record and maintain onsite logs of the implementation of BMP. In addition, adjustments to the combustion process of the aggregate dryer are required in accordance with N.J.A.C. 7:27-19.9(b).

NJDEP reviewed presumptive NOx RACT rule limits for the existing asphalt plants in the Ozone Transport Region (OTR). New Jersey RACT limits are compared with OTR states in Table-2 below:

Table-2
Presumptive NOx RACT rule limits for Existing Asphalt Plants in OTR

Sr No.	OTR State	Fuel Type			Averaging Period	Rule Citation
		Natural Gas	No.2 Oil	No. 4/Used Oil		
1	NJ	75 ppmvd@7%O2	100 ppmvd@7%O2	125 ppmvd@7%O2	One hour	N.J.A.C. 7:27-19.9, Table 11
2	CT	180 ppmvd@12%CO2	180 ppmvd@12%CO2	180 ppmvd@12%CO2	Daily Block	22a-174-22(d)(8)
3	DC	150 ppmvd@7%O2	150 ppmvd@7%O2	150 ppmvd@7%O2	n/a	20 DMCR 805.6(b)
4	NH	0.429 Lb/MMBTU OR 0.12 Lb/Ton	0.429 Lb/MMBTU OR 0.12 Lb/Ton	0.429 Lb/MMBTU OR 0.12 Lb/Ton	One hour	Env A-1308.03

Note:

1. *RACT rules of DE, MA, MD, ME, NY, PA, RI, VA and VT do not specify presumptive NOx limits*
2. *NY RACT Rule 241.5 Asphalt Based Surface Coating rule which addresses VOC emissions but not NOx emissions.*
3. *VT RACT rule 5-253.15-Cutback and Emulsified Asphalt addresses VOC emissions, but not NOx emissions.*
4. *MD RACT rule requires burning only gas (when available) during ozone season and maintain good operating practices. Please see 26.22.08.J at http://www.dsd.state.md.us/COMAR/subtitle_chapters/26_Chapters.aspx#Subtitle11.*

Table-2 shows that New Jersey presumptive NOx RACT limits for all fuels are more stringent than CT and DC. The New Hampshire RACT hourly NOx limit is 0.12 Lb per Ton of asphalt produced, which is equivalent to 0.429 Lb/MMBTU. New Hampshire chose the output-based limit to encourage plant efficiency and to be consistent with EPA AP-42 emission factor. New Jersey adopted emission concentration limits in ppmvd@7%O2 in order to be consistent with the practice of requiring concentration limits for this industry, and also for ease of testing and enforcement. Table-3 below shows a comparison of New Jersey's permitted NOx concentrations with the New Hampshire output-based limits.

Table-3
A comparison of NJ' Permitted NOx concentration limit with the NH output-based limit

Sr No	Rule/Permit	Citation	NOx Limit (Natural Gas)			NOx Limit (Fuel Oil)		
			Lb/ Ton	Lb/ MMBTU	ppmvd@ 7%O2	Lb/ Ton	Lb/ MMBTU	ppmvd@ 7%O2
1	NJ RACT	N.J.A.C. 7:27-19.9, Table 11	--	--	75	--	--	100
2	NH RACT	Env A-1308.03	0.12	0.429	--	0.12	0.429	--
3	NJ- Newark Asphalt	PI 05095 PCP 190001	0.054	0.119	75	0.076	0.167	75
4	NJ-Trap Rock	PI 15121 PCP 180002	0.032	0.119	75	0.045	0.167	---
5	NJ Brane	PI 8300 PCP 190001	0.032	0.119	75	---	---	---

Table-3 shows that New Jersey presumptive NOx limits are more stringent than New Hampshire.

NJDEP reviewed air pollution control permits of existing 8 plants. The permitted and stack tested NOx emissions for these plants are provided in Table-4 below:

Table-4
Permitted and Stack Tested NOx emissions (in ppmdv@7%O2) from NJ Asphalt Plants

Sr No.	Facility	Plant ID	Capacity (Tons/Hour)	NOx Emissions Natural Gas(a)		NOx Emissions Fuel Oil(b)	
				Permitted	Stack Tested	Permitted	Stack Tested
1	Weldon Quarry	35012	400	75	45	---	---
2	Trap Rock	45031	250	75	50	---	---
3	Trap Rock-Keasbey	15121	400	75	56.3	---	---
4	Walter	78010	500	75	67	---	---
5	Stavola	80010	--	75	63.5	---	---
6	Newark Asphalt	5095	220	---	---	150 (c)	53.9
7	Stavola Old Bridge	15049	400	---	---	150 (c)	128
8	Morris Asphalt	83471	160	---	---	200 (d)	153

Notes:

(a) NJ RACT Limit during natural gas firing is 75 ppmdv@7%O2
(b) NJ RACT Limit during oil firing is 100 ppmdv@7%O2
(c) N.J.A.C. 7:27-19.25 exempts emergency use of fuel oil
(d) Morris Asphalt, PI 83471 PCP 070001, was approved prior to adoption of the NJ RACT limit

Based on these factors, NJDEP determined that the current NOx RACT limits for the existing Asphalt Pavement Production Plants satisfy RACT requirements. Therefore, NJDEP is re-certifying N.J.A.C. 7:27-19.9 for the 70-ppb ozone standard.

Glass Manufacturing Furnaces

NOx emissions from glass manufacturing furnaces are regulated under N.J.A.C. 7:27-19.10. Existing glass manufacturing furnaces have a potential to emit more than 25 TPY NOx. The glass manufacturing furnace uses heat for the production of glass. N.J.A.C. 7:27-19.1 defines "glass" as a hard, amorphous inorganic substance made by fusing silicates, and sometimes borates and phosphates, with certain basic oxides.

On April 20, 2009 (41 N.J.R. 1752), New Jersey adopted RACT limits of 4.0 pounds NO_X per ton of glass removed (Lb/Ton) for specialty glass manufacturing furnaces and 9.2 Lb/Ton for flat glass manufacturing furnaces based on the Ozone Transport Commission (OTC) recommendations. New Jersey RACT rules distinguish among various types of glass manufacturing furnaces because each type requires different energy inputs to fuse the raw materials into glass. As a result, the emissions from similar furnaces producing different types of glass can vary significantly. NOx emissions from glass manufacturing plants may be controlled using combustion modifications (low NO_X burners, oxy-firing, oxygen-enriched air staging), process modifications (fuel switching, batch preheat, electric boost), and post-combustion modifications (fuel reburn, selective non-catalytic reduction, selective catalytic reduction). The New Jersey RACT rule specifies the maximum allowable NO_X emission rates and applicability thresholds. A summary of New Jersey presumptive NOx emission rates and applicability thresholds for various type of existing glass furnaces is provided in Table-1 below:

Table-1
Summary of NO_X Emission Rate for Existing Glass Manufacturing Furnaces
(Pounds of NO_X per Ton of Glass Removed from the Furnace)(a)

Type of Furnaces	NJ Applicability Thresholds	NJ Presumptive NOx Emission Rate
Commercial container glass manufacturing furnace (b) (c)	Maximum potential production rate of at least 14 Tons of glass removed from the furnace per day and having the potential to emit (PTE) more than 10 tons of NO_X per year (TPY)	4.0 Lb/Ton (a) (N.J.A.C. 7:27-19.10(a))
Specialty container glass manufacturing furnace (c)	Maximum potential production rate of at least 7 Tons of glass removed from the furnace per day and having PTE more than 10 TPY	
Borosilicate recipe glass manufacturing furnace (c)	Maximum potential production rate of at least 5 Tons of glass removed from the furnace per day, and having PTE more than 10 TPY	
Pressed glass manufacturing furnace, blown glass manufacturing furnace or fiberglass manufacturing furnace (c)	PTE more than 10 TPY	
Flat glass manufacturing furnace (d)	PTE more than 10 TPY	9.2 Lb/Ton (N.J.A.C. 7:27-19.10(b))

Notes:

(a) Glass removed means the amount of glass coming out of a glass melting furnace, expressed in short tons per day (N.J.A.C. 7:27-19.1).
(b) Commercial container glass means clear or colored glass made of soda-lime recipe, which is formed into bottles, jars, ampoules or other containers, but does not include specialty container glass (N.J.A.C. 7:27-19.1).
(c) Borosilicate recipe means 60 to 80 percent silicon dioxide, five to 35 percent boric oxides, and four to 23 percent other oxides. The commercial container glass furnaces, specialty container glass furnaces

and borosilicate recipe glass furnaces and pressed glass furnaces are listed in N.J.A.C. 7:27-19.2(b)6, 7, 8 and 9, respectively.

(d) *Flat glass means glass produced by the float, sheet, rolled or plate glass process and formed into windows, windshields, table tops or similar products (N.J.A.C. 7:27-19.1).*

Compliance with the above limits is based upon the average of three one-hour tests, each performed over a consecutive 60-minute period pursuant to N.J.A.C. 7:27-19.15(a)2. If a continuous emissions monitoring system has been installed on the equipment or source operation, the compliance with the limit is over each calendar day between May 1 and September 30 pursuant to N.J.A.C. 7:27-19.15(a)1.

The owner or operator of a glass manufacturing furnace subject to the RACT requirements are required to adjust the combustion process of the furnace in accordance with N.J.A.C. 7:27-19.16 before May 1 of each calendar year pursuant to N.J.A.C. 7:27-19.10(e).

The New Jersey RACT rule allows alternative methods for compliance with RACT requirements. Pursuant to N.J.A.C. 7:27-19.19(f), the owner or operator of a glass manufacturing furnace is allowed to comply with one of the following methods in lieu of complying with a NOx emission limits of Table-1 above:

1. An emission averaging plan pursuant to N.J.A.C. 7:27-19.6 and 19.14;
2. An alternative maximum allowable emission rate for the furnace pursuant to N.J.A.C. 7:27-19.13; or
3. A seasonal fuel switching plan for the furnace pursuant to N.J.A.C. 7:27-19.14 and 19.20.

NJDEP reviewed NOx RACT rule emission limits of states within Ozone Transport Region (OTR). New Jersey RACT limits are compared with OTR states in Table-2 below:

Table-2
Presumptive NOx RACT rule limits for Existing Glass manufacturing Furnaces in OTR
(NOx Emissions in Lb of NOx per Ton of Glass Removed)

Sr No.	OTR State(a)	Type of Furnace		Rule Citation
		Flat Glass	Specialty Glass	
1	MD	Daily Optimization of Combustion	Daily Optimization of Combustion	26.11.09.08.I
2	MA	n/a	5.3 Lb/Ton	310 CMR 7.19(11)&(12)
3	NJ	9.2 Lb/Ton	4.0 Lb/Ton	N.J.A.C. 7:27-19.10 and 19.2(b)
4	PA	7.0 Lb/Ton	4.0 Lb/Ton	129.304(a), 129.308 &129.309(d)

Notes:

(a) *RACT rules of CT, DE, DC, ME, MD, NH, NY, RI, VA and VT do not specify presumptive NOx limits*

(b) *MD RACT rule* 26.11.09.08.I *requires owner or operator to optimize combustion by performing daily oxygen tests and maintain excess oxygen at 4.5% or less. Please see* http://www.dsd.state.md.us/comar/comarhtml/26/26.11.09.08.htm

(c) *PA RACT rule* 129.304(a), 129.308 &129.309(d) *limits are based on 30-day rolling. PA NOx RACT limits are 7.0 Lb/ton for flat glass furnaces, 4.0 Lb/ton for container and fiber glass furnaces, and 6 Lb/ton for all other furnaces. See 129.304(a)(1) through (5). Please see*

http://www.pacodeandbulletin.gov/Display/pacode?file=/secure/pacode/data/025/chapter129/s129.304.html&searchunitkeywords=129.304&origQuery=129.304&operator=OR&title=null

Table-2 shows that the NJ presumptive NOx RACT limit of 9.2 Lb/Ton (daily) for flat glass furnaces is more stringent than the PA RACT limit of 7.0 Lb/Ton (30-day rolling). The NJ RACT rule limit is based on a daily average with continuous emission monitoring (CEM) and the average of three one-hour tests without CEM while the PA RACT limit is based on 30-day rolling average. Currently, New Jersey does not have any flat glass manufacturing furnaces in operation within the state.

Table-2 also shows that the NJ presumptive NOx RACT limit of 4 Lb/Ton for specialty glass furnaces is more stringent than the MA RACT limit of 5.3 Lb/Ton. The NJ presumptive NOx RACT limit is also more stringent than the PA RACT limit, which is based on a 30-day rolling average. Both MA and PA RACT rules have applicability thresholds of 50 TPY while the NJ RACT rule applicability threshold is 10 TPY.

NJDEP reviewed air permit data of the existing glass manufacturing plants operating in New Jersey. New Jersey has 14 specialty glass manufacturing furnaces operating at 4 facilities. New Jersey does not have any flat glass manufacturing furnaces. The capacity, air pollution controls, permitted NOx emissions, stack tested NOx emissions and actual NOx emissions from these 14 furnaces are provided in Table-3 below:

Table-3
Existing 14 Specialty Glass Manufacturing Furnaces in New Jersey

Sr. No.	Facility PI No. and Glass Type	Furnace ID	Capacity Tons of Glass per day	Air Pollution Controls	RACT Rule limit Lb of NOx/Ton Glass Removed	Permitted NOx			Stack Tested NOx	Actual NOx (a)
						Lb/Ton Glass Removed	Tons per Day	Tons per Year	Lb/Ton Glass Removed	Tons/Year
1	Ardagh Specialty Glass PI 75506 Specialty-Container glass bottles and jars	1	219	None	4.0	3.89	0.58	233 For both	1.59	51.2
		2	354	None	4.0	1.50	0.30		1.13	60.2
2	Durand Glass PI 75475 Specialty-Tableware. Pressed and blown glass	1	146	SCR(b)	4.0	4.0 1.2 1.0	0.29	26.7	1.18	13.8
		2	146	SCR(b)	4.0	4.0 1.2 1.0	0.29	25.3	0.97	6.72
		3	265	SCR(b)	4.0	4.0 1.2 1.0	0.53	45.9	1.01	26.5
3	Corning Pharma Glass PI 75503 Specialty-	S	25.1	Oxyfuel (c)	4.0	4.0	0.053	19.3	0.98	4.12
		T	57.5	Oxyfuel (c)	4.0	3.89	0.112	40.9	1.95	19.7

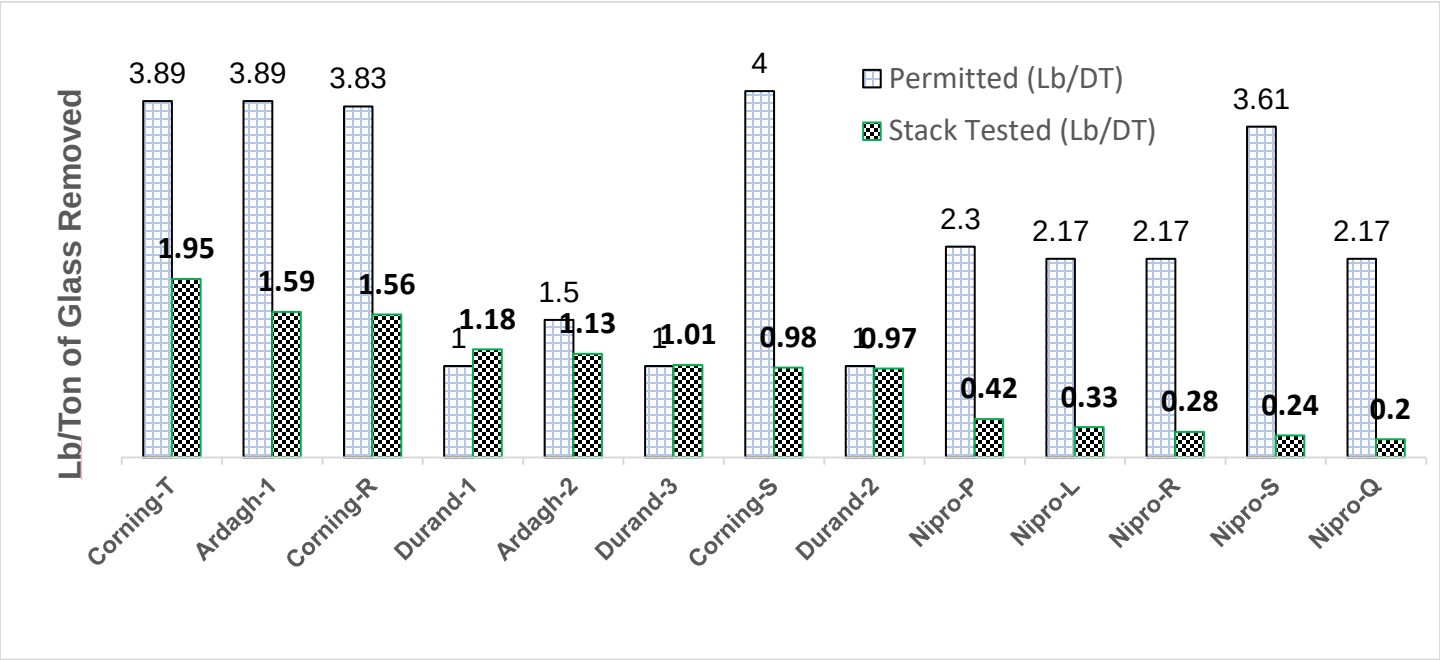
	Borosilicate glass products (sampling tubes medical)									
		R	92.0	Oxyfuel (c)	4.0	3.83	0.176	64.4	1.56	24.8
4	Nipro Pharma Packaging PI 75505 Specialty-Specialty glass - soda lime and borosilicate	X(d)	1.8	Electric Furnaces with Natural Gas Boost	4.0	15	0.013	4.95	0.44	0.01
		L	25		4.0	2.17	0.027	10.5	0.33	0.90
		P	25		4.0	2.3	0.029	11.1	0.42	1.37
		Q	25		4.0	2.17	0.027	10.5	0.20	1.06
		R	25		4.0	2.17	0.027	10.5	0.28	1.81
		S	34		4.0	3.61	0.061	22.9	0.24	2.01

Notes:

(a) *Actual NOx emissions are based on 2018 Emission Statement*
(b) *SCR: Selective Catalytic Reduction*
(c) *Oxyfuel firing process uses pure oxygen for combustion instead of ambient air. Ambient air contains a significant amount of nitrogen. By using nearly pure oxygen, the oxy firing process reduces the presence of nitrogen, which reduces NO_X emission.*
(d) *Nipro Pharma Packaging Furnace X has a pull rate of 5 tons per day which is less New Jersey RACT applicability of 7 tons per day for the specialty container glass manufacturing furnace.*
(e) *Johns Manville (PI # 51613) has three electric melting furnaces. Each of these electric furnaces are exempted from NOx RACT requirements pursuant to N.J.A.C. 7:27-19.2(b) because potential to emit NOx from each furnace is less than the applicability threshold of 10 tons per year.*

NJDEP reviewed the permitted and stack tested NOx emissions from the existing units. The stack tested NOx emissions are ranked from highest to lowest in Chart-1 below:

Chart-1
Stack Tested NOx emissions from New Jersey Specialty Glass Manufacturing Furnaces



The above chart shows that all Glass Manufacturing Furnaces operating in New Jersey are in compliance with the NJ RACT limits by a wide margin.

Based on these factors, NJDEP determined that the current NOx RACT limits for the existing glass manufacturing furnaces are stringent and satisfy RACT requirements for the 70-ppb ozone standard. Therefore, NJDEP is re-certifying N.J.A.C. 7:27-19.10 for the 70-ppb ozone standard.

Municipal solid waste (MSW) incinerators

Municipal solid waste (MSW) incinerator facility is a major NOx facility that has the potential to emit 25 or more tons of NOx per year. New Jersey RACT rule defines "incinerator" as any device, apparatus, equipment, or structure using combustion or pyrolysis for destroying, reducing or salvaging any material or substance, but does not include thermal or catalytic oxidizers used as control apparatus on manufacturing equipment. This term includes any thermal destruction facility which is a resource recovery facility, as such terms are defined in N.J.A.C. 7:26-1.4. (N.J.A.C. 7:27-19.1).

New Jersey took a lead and adopted NOx RACT requirements on April 20, 2009 for the existing MSW incinerators, which are specified in N.J.A.C. 7:27-19.12. The code establishes a maximum allowable NOx emission concentration of 150 parts per million dry volume at seven percent oxygen (ppmvd@7%O2) based on each calendar day average. In addition, installation and operation of a continuous emissions monitoring system (CEM) for NOx emissions are required to demonstrate compliance with the presumptive NOx limit.

In lieu of complying with the maximum allowable emissions concentration limit of 150 ppmvd@7%O2, the owner or operator of a MSW incinerator may obtain an alternative maximum allowable NO_X emission limit approved by the Department pursuant to N.J.A.C. 7:27-19.13. New Jersey MSW facilities have not used this provision.

All existing MSW incinerators in New Jersey are equipped with selective non-catalytic reduction (SNCR). It is a non-combustion technology that reduces NOx emissions without a catalyst by injecting a reducing agent (such as ammonia, urea or cyanuric acid) into the flue gas, downstream of the combustion zone; the injection of the reducing agent converts NOx to molecular nitrogen, water, and (if the reducing agent is urea or cyanuric acid) carbon dioxide (CO2). The term is defined in N.J.A.C. 7:27-19.1.

NJDEP reviewed presumptive NOx RACT limits for the existing MSW incinerators in ozone transport region (OTR). Table-1 below provides a comparison of the presumptive NOx RACT limits of OTR states:

Table 1
Comparison of presumptive NOx RACT Limits for MSW Incinerators in OTR

SR	OTR State	Presumptive NOx Limits ppmvd@7% O_2)	Averaging Period	Rule Citation
1	CT	146 ppmvd@7%O2	24-hour daily	22a-174-38(c) (8), Table 38-2A
2	DC	case-by-case	case-by-case	20 DMCR 805.3(e) and 805.7(b)
3	DE	case-by-case	case-by-case	1112 section 3.8
4	MA	146 ppmvd@7%O2	24-hour	310 CMR 7.08(2)(f)3 Table-3
5	MD	140 ppmvd@7%O2	24-hour block	26.22.08.10.B
6	ME	180 ppmvd@7%O2	24-hour daily block	138, Section 3.F
7	NH	150 ppmvd@7%O2	24-hour calendar day	Env A-1309.03(b)(1)
8	NJ	150 ppmvd@7%O2	Calendar day	N.J.A.C. 7:27-19.12(a)
9	NY	150 ppmvd@7%O2	24-hour average	219-10.2, Table 1
10	PA	180 ppmvd@7%O2	Daily	129.97(f) and 129.100(a)(3)
11	RI	case-by-case	case-by-case	27.8 4.B
12	VA	170 ppmvd@7%O2	24-hour daily block	VA 9VAC5-40-6620
13	VT	case-by-case	case-by-case	5-1010(b)

The above table shows that New Jersey presumptive NOx limit is more stringent than ME, PA and VA. The table also shows that New Jersey presumptive NOx limit is consistent with NH and NY.

After New Jersey's adoption of NOx RACT requirements for MSW incinerators, few states recently adopted presumptive NOx limits.

Connecticut adopted presumptive NOx limit of 146 ppmvd@7%O2 effective 12/22/2016 in its RACT Rule 22a-174-38(c) (8), Table 38-2A. This limit is for the processed waste, defined as a type of municipal solid waste produced by sorting by size and/or altering the size through mechanical means.

Maryland adopted presumptive NOx limit of 140 ppmvd@7%O2, 24-hour block average, effective 5/1/2019 in its RACT Rule RACT rule COMAR 26.22.08.10.B.

Massachusetts adopted presumptive NOx limit of 146 ppmvd@7%O2 effective 3/10/2020 in its RACT Rule 310 CMR 7.08(2)(f)3 Table-3. This limit is for refused derived fuel stoker defined a steam generating unit that combusts refused derived fuel in a suspension firing mode using air-fed distributors. For mass burn water wall units, the limit is 150 ppmvd@7%O2.

New York adopted presumptive NOx limit of 150 ppmvd@7%O2 effective 3/14/2020 in its RACT Rule 219-10.2, Table 1 effective 3/14/2020. The 150 ppm, 24-hour average, is for mass burn water wall units. For the rotary combustors, New York RACT limits is 170 ppm, 24-hour average.

In order to seek additional reduction from this source category, NJDEP reviewed air pollution control permits of existing MSW incinerators operating in New Jersey. A summary of the permits and NOx emissions are provided in Table-2 below:

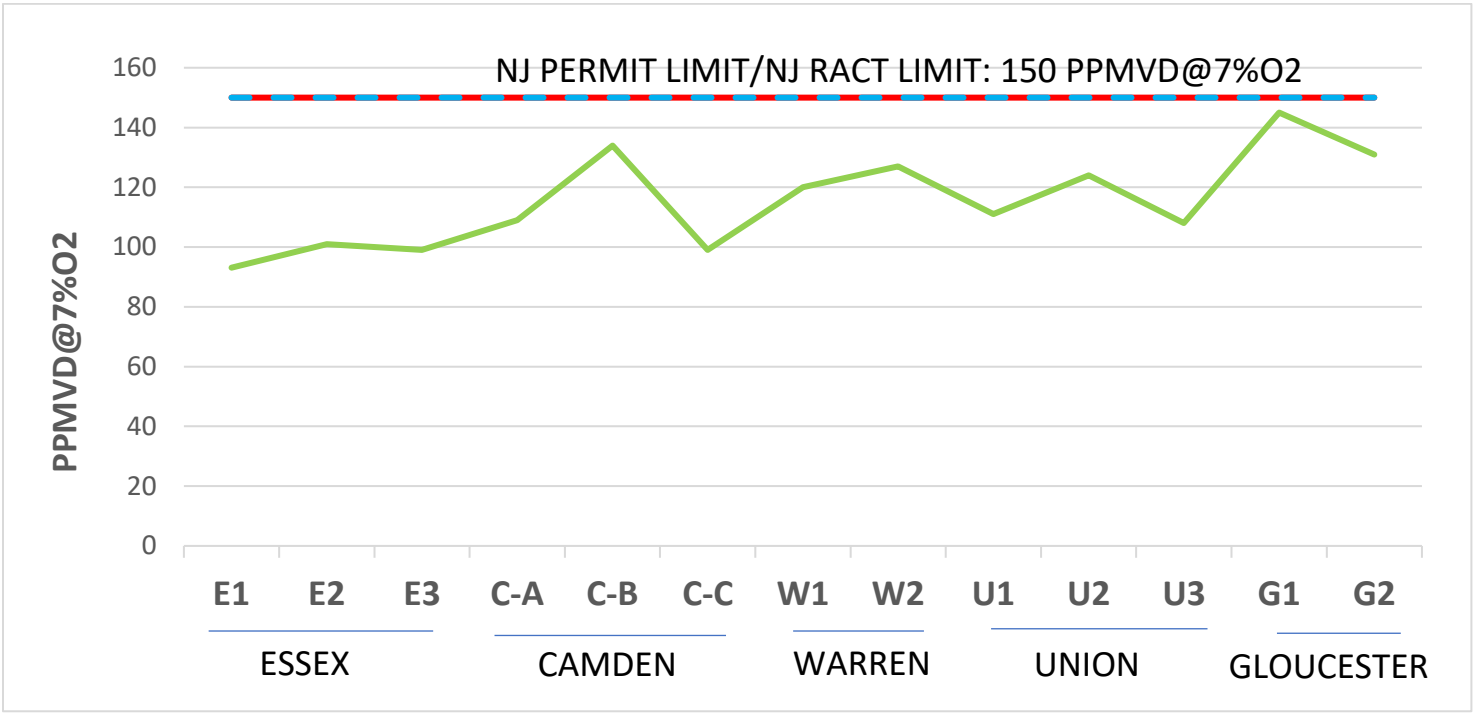
Table-2
New Jersey's Existing MSW Incinerators

Sr. No	Facility and Location	No. of Combustors	Heat Input (MMBTU per Hour)	Capacity (Tons per Day)	NOx Controls	NJ RACT Rule limit in ppmvd 7%O_2	Currently Permitted NOx		Stack Tested NOx Average ppmvd@ 7%O_2	Actual NOx (2018 Emission Statement (Tons per Year)
							ppmvd@ 7%O_2	Tons per Year		
1	Covanta Essex Co., Newark (PI 07736)	3	3 x 423	3 x 2700	SNCR (Reagent-ammonium hydroxide) + CNLT(a)	150	150	1248	97.6	789.41
2	Covanta Camden County Energy Recovery Camden (PI51614)	3	3 x 154.6	3 x 388	SNCR (Reagent-Urea)	150	150	459	114	390.84
3	Covanta Warren	2 (b)	2 x 89	2 x 274	SNCR (Reagent-Urea)	150	150	298	124	156.1

	Energy Resource Oxford (PI 85455)									
4	Covanta Union, Rahway (PI 41814)	3	3 x 93.5	3 x 480	SNCR (Reagent-Ammonia) + CLNT(a)	150	150	1050	114	636.3
5	Wheelabrator Gloucester Company LP, Westville (PI55793)	2	2 x 108.3	2 x 288	SNCR (Reagent-Urea)	150	150	470	143	230.84
TOTAL		13	2408 MMBTU/hr	11828 Ton/day	--	---	---	3525 TPY	---	2203 TPY

Notes:
(a): CLNT- Covanta Low NOx Technology on all units
(b): Two units were removed

The permitted and stack tested NOx emissions from New Jersey's existing MSW incinerators are shown in a chart below:



In addition to the review of air permits, NJDEP also reviewed technological and economic feasibility of the "Covanta Low NOx Technology" (CLNT). This technology involves modifications to the combustion air system to substantially reduce NOx formation. With the CLNT, a portion of the combustion air is diverted to a new (tertiary) series of nozzles. The distribution of the air between the different streams is controlled to yield the optimal gas composition and temperature to minimize NOx production.

For effective use of this technology, modification of combustion air system, SNCR and furnace water wall may be necessary. The CLNT can be combined with an SNCR system, although changes to the location of the ammonia/urea injectors will likely be required. If ammonia is the reagent, the unreacted ammonia (ammonia slip) that exits the furnace is reduced. In addition to modifying the SNCR system, the furnace waterwalls may require upgraded protection due to temperature increases. For the Low NOx system, estimated temperatures in the furnace ranged between 2200°F and 2300°F during a short-term test at the Covanta Bristol facility. Optimal temperatures for SNCR are typically between 1600 and 2000°F. (Source: New Process for Achieving Very Low NOx: By Mark White (Covanta Energy), Steve Goff (Covanta Energy), Steve Deduck (Covanta Energy), Oliver Gohlke (Martin GmbH), 2009).

New Jersey's Covanta Essex, Newark and Covanta Union, Rahway facilities have installed and operating CLNT. Although the CLNT or "Covanta Low NOx Technology" may be technologically feasible at New Jersey's remaining facilities, it is "not commercially available". The developer refused licensing.

Selective Catalytic Reduction (SCR) is technologically feasible but not cost effective. The cost of installation of SCR may exceed $30 Million. The estimated cost effectiveness for the SCR system based on Covanta Palm Beach #2 in Florida is $15,885 per ton of NOx removed.

Optimization of existing SNCR systems can often result in additional emission reductions at relatively low capital cost. Optimization may include the application of computational fluid dynamic modeling to determine better distribution of reagent, addition of reagent injection ports and/or upgrading from ammonia based SNCR to urea based SNCR.

NJDEP already required SNCR optimization. The current Air Pollution Control permit of the Wheelabrator Gloucester Facility (PI # 55793, BOP180001, Ref # 61) requires that for each SNCR, the permittee shall conduct optimization tests (once initially) to determine both the performance of the SNCR system and the optimized urea injection rate versus NOx removal efficiency.

For the other MSW permits, NJDEP may require periodic NOx optimization of the existing SNCR for additional NOx emission reduction during New Jersey permitting process, either at the time of Title V permit renewal or next significant modification, whichever one occurs sooner. However, this is not a RACT obligation.

Based on these factors, NJDEP determined that the current NOx RACT limit of 150 ppmvd@7%O2 is reasonable and should remain unchanged. NJDEP is recertifying the NOx RACT requirements specified in N.J.A.C. 7:27-19.12 to comply with the 70-ppb ozone standard.

Sewage Sludge Incinerators

NOx emissions from Sewage Sludge Incinerators are regulated under N.J.A.C. 7:27-19.28. New Jersey RACT rule defines “incinerator” as any device, apparatus, equipment, or structure using combustion or pyrolysis for destroying, reducing or salvaging any material or substance, but does not include thermal or catalytic oxidizers used as control apparatus on manufacturing equipment. For the purposes of this subchapter, this term includes (without limitation) any thermal destruction facility which is a resource recovery facility, as such terms are defined in N.J.A.C. 7:26-1.4 (N.J.A.C. 7:27-19.1). Emissions of air toxics are more concerns than emissions of NOx from the sewage sludge incinerators.

The maximum allowable NOx emission rates for the existing sewage sludge incinerators are established in New Jersey’s RACT rules. New Jersey owner or operator of a sewage sludge incinerator is required to comply with the applicable maximum allowable NO_X emission rate specified in Table-1 below:

Table-1
New Jersey NO_X RACT Rule Limits for Existing Sewage Sludge Incinerators

Type of Sludge Incinerator	NOx Emission Rate (a) (in pounds of NO_X per ton of dry sewage sludge)
Multiple Hearth Incinerator	7.0
Fluidized Bed Incinerator	2.5

Note: (a) N.J.A.C 7:27-19.28(a), Table-13

Compliance demonstration with the above limits is required based on the average of three one-hour tests, each performed over a consecutive 60-minute period in accordance with N.J.A.C. 7:27-19.15(a)2.

N.J.A.C 7:27-19.28(b) allows alternative methods for compliance with the RACT limits. In lieu of complying with the maximum allowable NO_X emissions rate specified in Table-1 above, the owner or operator of an existing sewage sludge incinerator may comply with the RACT requirements using one of the following alternative methods:

1. An emission averaging plan pursuant to N.J.A.C. 7:27-19.6 and 19.14;
2. An alternative maximum allowable emission rate pursuant to N.J.A.C. 7:27-19.13;
3. A seasonal fuel switching plan pursuant to N.J.A.C. 7:27-19.14 and 19.20; or
4. A plan for phased compliance pursuant to N.J.A.C. 7:27-19.14 and N.J.A.C. 7:27-19.21 or 19.23.

New Jersey adopted the NOx RACT requirements on April 20, 2009 (41 N.J.R. 1752). At the time, NO_X emissions from sewage sludge incinerators were regulated via facility-specific emission rates. However, the NJDEP determined that the presumptive NOx emission rates were reasonable for the facilities to meet without any modifications based on actual stack test results from the existing sewage sludge incinerators. Therefore, the owner or operator of an existing sludge incinerator is not mandated to submit new facility-specific NO_X control plans to the NOx RACT limit.

After New Jersey adopted the NOx emission rates for sewage sludge incinerators in 2009, EPA adopted New Source Performance Standards (NSPS) subpart LLL on April 29, 2016. The EPA rule prohibited the use of a bypass stack and required the owner or operator to comply with additional requirements, such as an annual

performance testing at a minimum 85% feed rate, control requirements for heavy Metals (Hg, Cd, CO, Pb), acid gases (HCl, SO2), toxics (dioxins/furans) and fugitive emissions from ash, site specific monitoring plan, etc. New Jersey facilities experienced difficulties in meeting the 85% feed rate requirements, restrictions for use of by-pass stack and additional costs of upgrades. As a result, the owner or operators opted to transfer sludge materials to landfills or nearby facilities based upon cost effectiveness. For example, the Parsippany Troy Hill facility now sends its sludge waste to the Stony Brook facility for disposal. However, the Bayshore facility Unit-2 (Dorr Oliver) opted to retrofit with Hg control. A list of New Jersey sludge incinerators that shutdown is provided in Table-2 below:

Table-2
New Jersey Sewage Sludge Incinerators Shutdown

Sr No	Facility	Plant ID	Shutdown Date
1	Parsippany Troy Hills	26209	3/16/16
2	Gloucester County Utilities Authority	55102	1/17/19
3	Pequannock Lincoln Park	25076	6/26/2014
4	Township of Wayne	30436	1/27/2014
5	Camden County MUA	50299	5/9/2014

NJDEP reviewed presumptive NOx RACT rule limits of states in the Ozone Transport Region (OTR) for the existing sewage sludge incinerators. New Jersey's presumptive RACT limits are compared with RACT limits of OTR states in Table-3 below:

Table-3
Presumptive NOx RACT Rule Limits for Existing Sludge Incinerators in OTR

Sr No	OTR State	Type of Sludge Incinerator		Rule Citation
		Multiple Hearth	Fluidized Bed	
1	CT	(a)	(a)	22a-174-22(c)(2)
2	DC	(b)	(b)	20 DMCR 805.3(e) and 805.7(b)
3	DE	(b)	(b)	1112 section 3.8
4	MA	(b)	(b)	310 CMR 7.19 (12)
5	MD	(b)(c)	(b)(c)	26.22.08.J
6	ME	(b)	(b)	138, Section 3.H
7	NH	(b)	(b)	Env A-1313.01
8	NJ	7 Lb/DT	2.5 Lb/DT	N.J.A.C. 7:27-19.28, Table 13
9	NY	220 ppmdv@7%O2(d)	150 ppmdv@7%O2 (d)	6 CRR-NY-219-9
10	PA	(b)	(b)	129.99(a)
11	RI	(b)	(b)	27.8 4.B
12	VA	(b)	(b)	9VAC5-40-7420.D
13	VT	(b)	(b)	5-1010(b) and 5-251(2)

Notes:

(a): CT RACT rule exempts sludge incinerators. CT RACT rule 22a-174-22(c)(2) states "The requirements of this section shall not apply to an emissions unit that is a type of incinerator for which an emissions guideline has been issued…" CT RACT rule is available at https://eregulations.ct.gov/eRegsPortal/Browse/RCSA/Title_22aSubtitle_22a-174Section_22a-174-22e/

(b): The RACT rules do not specify presumptive NOx limits. Case by case limit applies when applicable.

(c) MD RACT rule 26.22.08.J requires to maintain good operating practices as recommended by the equipment vendor to minimize NOx emissions.

(d) New York RACT rule incorporated by reference the federal requirements of 40 CFR Part 60, Subpart MMMM in Part 200 that apply to sewage sludge incineration. 40 CFR Part 60, Subpart MMMM, Table 3 specifies 220 ppmdv @7% oxygen for multiple hearth units. 40 CFR Part 60, Subpart MMMM, Table 2 specifies 150 ppmdv @7% oxygen for fluidized bed units. See 219.91 Applicability at

https://govt.westlaw.com/nycrr/Browse/Home/NewYork/NewYorkCodesRulesandRegulations?guid=I6190b300c47b11e1b0790000845b8d3e&originationContext=documenttoc&transitionType=Default&contextData=(sc.Default)

Table-3 shows that NJ is the only state in OTR that established presumptive NOx limits. CT and NY rely on Federal limits, while 11 OTR states have case-by-case review provisions.

NJDEP compared NJ's permitted and stack tested NOx emission rates with the New York RACT rule concentration limits. A comparison of NJ and NY limits is provided in Table-4 below:

Table-4
A comparison of NJ and NY limits RACT rule limits for Existing Sludge Incinerators in OTR

Sr No	OTR State	Multiple Hearth	Fluidized Bed	Rule Citation
1	NJ	7 Lb/DT	2.5 Lb/DT	N.J.A.C. 7:27-19.28, Table 13
2	NJ	142 ppmdv@7%O2 (a)	85 ppmdv@7%O2 (b)	Please see notes (a) and (b)
3	NY	220 ppmdv@7%O2(c)	150 ppmdv@7%O2 (c)	6 CRR-NY-219-9

Notes:

(a) 7 Lb/DT is approximately 142 ppmdv@7% O2, based on calculations using test data at ACUA Multiple Hearth Unit-B. 142 ppmdv@7%O2 is also highest calculated in all MH Units.

(b) 2.5 Lb/DT is approximately 85 ppmdv@7% O2, based on calculations using test data at Bayshore Dorr Oliver Unit-2. 85 ppmdv@7%O2 is also highest in all FB units.

(c) New York RACT rule incorporated by reference the federal requirements of 40 CFR Part 60, Subpart MMMM in Part 200 that apply to sewage sludge incineration. 40 CFR Part 60, Subpart MMMM, Table 3 specifies 220 ppmdv @7% oxygen for multiple hearth units. 40 CFR Part 60, Subpart MMMM, Table 2 specifies 150 ppmdv @7% oxygen for fluidized bed units. See 219.91 Applicability at
https://govt.westlaw.com/nycrr/Browse/Home/NewYork/NewYorkCodesRulesandRegulations?guid=I6190b300c47b11e1b0790000845b8d3e&originationContext=documenttoc&transitionType=Default&contextData=(sc.Default)

Table-4 shows that NJ RACT emission rates are more stringent than Federal limits. New Jersey sludge incinerators are in compliance with the Federal limits.

NJDEP reviewed air pollution control permits of existing sludge incinerators operating in New Jersey. The permitted capacity, heat input, allowable annual NOx emissions and actual annual NOx emissions from 9 sewage sludge incinerators currently operating in New Jersey are provided in Table-5 below:

Table-5
New Jersey's Existing Sewage Sludge Incinerators

Type of Incinerator	Total Units	Capacity (DryTon/Day)	Heat Input (MMBTU/Hr)	Permitted NOx (Tons/Year)	Actual NOx (Tons/Year)(*)
Multiple Heath	4	137	102	159	21

Fluidized Bed	5	135	102	41	4
Total	9	272	204	200	25

(*) New Jersey 2018 Emission Statements

Table-5 shows that total actual annual NOx emissions from sewage sludge incinerators are only 13 percent of the permitted annual NOx emissions. The total actual annual NOx emissions are very low compared to other source categories such as turbines and boilers.

The permitted and stack tested NOx emissions from New Jersey's existing sludge incinerator are provided in Table-6 below:

Table-6
New Jersey's Existing Sewage Sludge Incinerators
Permitted and Stack Tested NOx Emissions

Sr. No	Facility and Type of Incinerator	Unit ID	Heat Input	Capacity	Air Pollution Controls	NOx RACT Rule limit	Currently Permitted NOx			Most recent Stack tested NOx		Actual NOx (2018 ES)
			MMBTU /Hr	Dry Ton per Day		Lb/Dry Ton of Sludge	Lb/Dry Ton of sludge	ppmvd @ 7%O_2	in TPY	Lb/Dry Ton of Sludge	ppmvd @ 7%O_2	in TPY
1	Atlantic County Utilities Authority PI # 70508 Two Multiple Hearth Units (a)	A	19	29.4	Venturi Scrubber Afterburner	7 (b)	7 (b)	220 (c)	72.1 (d)	2.21 (e)	51.6 (e)	6.7 (f)
		B	38.5	69.6	Venturi Scrubber Afterburner	7 (b)	7 (b)	220 (c)		1.47 (e)	30.3 (e)	
2	Stony Brook Regional Sewerage Authority PI # 61036 Two Multiple Hearth Units (g)	1	32	37.5 (h)	Venturi Scrubber Wet Scrubber Afterburner	7 (b)	7 (b)	220 (c)	61.3	2.78 (i)	35.8 (i)	10.81 (j)
		2	32	37.5 (h)	Venturi Scrubber Wet Scrubber Afterburner	7 (b)	7 (b)	220 (c)	61.3	3.35 (i)	55.8 (i)	3.06 (j)
3	Somerset Raritan Valley Sewerage Authority PI # 35857	2	19.3	30 (k)	Venturi Scrubber Wet ESP Particulate Filter HEPA Carbon Adsorber	2.5 (l)	2.5 (l)	150 (m)	13.8	0.53 (o)	15 (o)	0.72 (p)

	One Fluidized Bed											
4	Northwest Bergen County Utilities Authority Wastewater Treatment Plant PI # 03601 Two Fluidized Bed Units (a)	1	15.6	24 (q)	Venturi Scrubber Wet Scrubber Wet ESP Particulate Pre-Filter Carbon Adsorber	2.5 (l)	2.5 (l)	150 (m)	12.22	0.758 (r)	17.9 (r)	0.19 (r)
		2	17.5	27 (q)	Venturi Scrubber Wet Scrubber Wet ESP Particulate Pre-Filter Carbon Adsorber	2.5 (l)	2.5 (l)	150 (m)		0.95 (r)	23.1 (r)	2.56 (r)
5	Bayshore Regional Sewerage Authority PI # 21753 Two Fluidized Bed Units (a)	1 (Niro)	25	27 (t)	Venturi Scrubber Wet Scrubber Wet ESP Particulate Filter HEPA Carbon Adsorber	2.5 (l)	2.5 (l)	150 (m)	14.5	3.79 (u)	119 (u)	N/A (v)
		2 (Dorr-Oliver) (s)	25 (Incin. #2) (BOP180003 mod pending)	27 (t)	Venturi Scrubber Wet Scrubber Sorbent Polymer Composite (SPC) Adsorber	2.5 (l)	2.5 (l)	150 (m)		1.5 (n)	41 (n)	N/A (v)

Notes:

a. *The two units cannot burn sludge simultaneously.*
b. *7 lb/ton dry sludge input., N.J.A.C. 7:27-19.28(a)*
c. *40 CFR 62.15955*
d. *Permitted NOx emissions are 8.56 lb/hr for Incinerator A and 20.29 lb/hr Incinerator B.*
e. *Average, see TST190001 and TST190002*
f. *ES 2018 not submitted. EST180001 – 2017.*
g. *Permit allows simultaneous operation of both incinerators*
h. *3,594 lb/hr (one hour block average), 3,125 lb/hr of dry sludge based on a 24 hour block average which equates to 37.5 dry tons per day, each Incinerator*
i. *Average, TST170001 and TST170002*
j. *From EST190001 Incinerator total is from the RTO and afterburner scenarios*
k. *2,500 (dry lb/hr)*

l. *NOx (Total) <= 2.5 lb/ton dry sludge input [N.J.A.C. 7:27-19.28(a)*
m. *40 CFR 62.15955*
n. *TST060001*
o. *TST180001*
p. *Incinerator #2 EST190001, U1 OS4*
q. *2,000 (dry lb/hr) for Incinerator #1 and 2,250 (dry lb/hr) for Incinerator.#2.*
r. *TST-170001 for Incinerator 1 and TST-180001 Incinerator 2 and EST-190001*
s. *Modification BOP180003 under review to include controls to meet Subpart LLL requirements*
t. *2,250 (dry lb/hr) for Niro Incinerator #1 and 2,250 (dry lb/hr) for Incinerator #2 (BOP180003)*
u. *From TST180002 and TST180001*
v. *No Emission Statement Reported since 1998, not required to report per emission statement applicability.*

Table-5 shows New Jersey's existing sewage sludge incinerators are in compliance with NJ RACT emission rates. The permitted NOx emission rates provide a margin of safety for compliance and variability in feed rates.

Based on these factors, NJDEP determined that the current NOx RACT limits for the existing sewage sludge incinerators are sufficiently stringent to satisfy the RACT requirements for the 70-ppb ozone standard. Therefore, NJDEP is re-certifying N.J.A.C. 7:27-19.28 for the 70-ppb ozone standard.