Department of Environmental Conservation

Source Specific
State Implementation Plan Revision

CASTLETON ENERGY CENTER
PERMIT ID: 4-3844-00008/00006

FEBRUARY 2024

DIVISION OF AIR RESOURCES
BUREAU OF AIR QUALITY PLANNING
ALBANY, NEW YORK 12233-3251
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Acronyms and Abbreviations

CAA	Federal Clean Air Act
DAR	DEC Division of Air Resources
DEC	New York State Department of Environmental Conservation
EPA	United State Environmental Protection Agency
NAAQS	National Ambient Air Quality Standards
NO_X	Oxides of Nitrogen
NYCRR	New York Codes, Rules, and Regulations
RACT	Reasonably Available Control Technology
SIP	State Implementation Plan
SSSR	Source Specific SIP Revision
VOCs	Volatile Organic Compounds

Introduction

The United States Environmental Protection Agency (EPA) defines Reasonably Available Control Technology (RACT) as the lowest emission limitation that a particular source is capable of meeting by the application of control technology that is reasonably available considering technological and economic feasibility.

Title 6 of the New York Codes, Rules, and Regulations (NYCRR) contains several regulations that define Reasonably Available Control Technology (RACT) for certain categories of stationary sources in New York. These regulations seek emissions reductions of nitrogen oxides (NO_x) and/or volatile organic compounds (VOCs) to help attain and/or maintain the 8-hour ozone National Ambient Air Quality Standards (NAAQS).

Depending upon the relevant RACT regulation, a source that is required to implement RACT must meet a presumptive RACT limit, meet an alternate limit determined from an approved technical analysis if reaching a presumptive RACT limit is technically or economically infeasible, or meet an approved case-by-case RACT limit for sources which do not have a presumptive RACT limit established in regulation. Individual source specific RACT determinations that are included in a facility's operating permit must be submitted to EPA as a revision to the New York State Implementation Plan (SIP) to satisfy the NO_x and/or VOC RACT requirements under sections 182 and 184 of the Clean Air Act (CAA).

The New York State Department of Environmental Conservation's (DEC's) DAR-20 guidance, titled "Economic and Technical Analysis for Reasonably Available Control Technology (RACT)," provides procedures for the economic and technical feasibility analysis that needs to be used to evaluate source-specific RACT determinations and to determine appropriate RACT emission limits. This analysis must also be completed at each renewal of the emission source owner's permit. The re-evaluation must contain the latest control technologies and strategies available for review and allow for an inflation-adjusted economic threshold.

Source-specific RACT Determination and RACT Analysis

The Air Title V Facility Permit for Castleton Energy Center issued on March 21, 2023, contains conditions to regulate the emission of oxides of nitrogen (NOx). The 65 MW combined-cycle electricity generating facility consists of a 489.2 MMBtu/hr GE Frame 6, natural gas-fired combustion turbine generator (CTG); a heat recovery steam generator (HRSG) with a 125 MMBtu/hr supplemental duct burner; and a steam turbine generator (STG). The facility also operates an auxiliary boiler, which was de-rated from an original nameplate rate of 95 MMBtu/hr to a new rate of 24.4 MMBtu/hr. Although the CTG is primarily fired with natural gas, #2 fuel oil is also used as a backup fuel. The duct burner fires on natural gas only.

Nitrogen oxide (NOx) emissions from the CTG are controlled by water injection. The auxiliary boiler is fired on natural gas only and is equipped with a low NOx burner.

The permit for this facility contains an overall limit on NOx of 157 tons/year. In addition, the combustion turbines and duct burners in this permit are subject to Lowest Achievable Emission Rate (LAER) requirements for NOx which are more stringent than the applicable NOx RACT requirements. The LAER conditions currently in the permit require the facility to install, maintain, and operate NOx CEMS in accordance with 40 CFR Part 75. Accordingly, the Department has streamlined this permit to include only the the more stringent LAER conditions for NOx emissions. By complying with these requirements the facility is also complying with the applicable provisions of NOx RACT.

The technical analyses used by DEC to determine the case-by-case RACT limits is included in this Source Specific SIP Revision (SSSR) as Appendix A.

Air Title V Facility Permit and Permit Review Report

The RACT case-by-case permit conditions are included in Appendix B. The complete Air Title V Permit issued on March 21, 2023 for the Castleton Energy Center is available at:
PERMIT

The Permit Review Report for this facility is available at:
PRR

Appendix A: Technical Analyses

Castleton Power, LLC
1902 River Road
Castleton-on-Hudson, NY 12033
518-732-4400

VIA EMAIL

August 10, 2022

New York State Department of Environmental Conservation
NYSDEC Regional Permit Administrator
Region 4 Headquarters
Division of Environmental Permits
1130 North Westcott Rd.
Schenectady, NY 12306-2014

Re:

Castleton Energy Center
NOx RACT Cost Re-Evaluation
Permit ID: 4-3844-00008/00006

Facility DEC ID: 4384400008

Dear Sir or Madam:

Please find enclosed a NOx Reasonably Available Control Technology (RACT) cost re-evaluation. Castleton Energy Center (CEC) generated the enclosed evaluation to respond to a request by the New York State Department of Environmental Conservation (NYSDEC) and the U.S. Environmental Protection Agency (EPA). Castleton was advised that the prior analysis, based on the RACT requirements triggered by the 2008 Ozone National Ambient Air Quality Standard (NAAQS), required a cost update for the 2015 Ozone NAAQS. We were further advised that the technology evaluation of selective catalytic reduction (SCR) was still sufficient an only the costs needed to be escalated to the current date.

The original analysis determined that the cost to control one NOx ton was $17,757. Per our discussion, the analysis would use the 2011 analysis values and update the values using available cost indexes. CEC's re-evaluation utilized two cost indexes to escalate the costs for 2022, the Engineering News Record (ENR) index and the Consumer Price Index (CPI). Multiple ENR indexes are available and the building and construction index for New York City was used for that option as it should represent construction costs more closely than the CPI. The calculated cost to control one NOx ton was determined to be $27,337 and $22,834, respectively.

The 2011 NOx RACT analysis stated that the RACT cost-effectiveness threshold was $4,500 and the $17,757 value far exceeded the threshold at the time. The cost-effectiveness threshold is escalated as well and if the 2011 value is escalated at the same rates as the CEC analysis, then the current value would be approximately $7,000, significantly lower than the CEC RACT analysis value. NOx control costs remain above the RACT threshold and the source is compliant with the RACT requirements.

Sincerely,

Steve Konisky
Plant Manager

cc: John Tissue - NAES Corporation

enclosures

Castleton Power, LLC
1902 River Road
Castleton-on-Hudson, NY 12033
518-732-4400

March 15, 2022

Mr. Edward Pellegrini
Professional Engineer 1
Division of Air Resources, Region 4
New York State Department of Environmental Conservation
1130 N. Westcott Rd.
Schenectady, NY 12306

Re: NOx RACT Analysis for the Castleton Energy Center Combustion Turbine (Emission Unit 1-0GTDB)

Dear Mr. Pellegrini:

In response to your email dated March 1, 2022, Castleton Energy Center (CEC) has reviewed the 6 NYSCRR Part 227-2 Reasonably Available Control Technology (RACT) analysis for oxides of nitrogen (NOx) submitted in 2012 for CEC's 65 megawatt (MW) combined-cycle electricity generating facility, consisting of a 489.2 MMBtu/hr GE Frame 6, natural gas-fired combustion turbine generator (CTG); a heat recovery steam generator (HRSG) with a 125 MMBtu/hr supplemental duct burner; and a steam turbine generator (STG).

For the 2012 RACT analysis a single vendor quote for dry low NOx (DLN) combustors was obtained, as were two vendor quotes for selective catalytic reduction (SCR) systems. The analysis demonstrated that retrofitting the existing plant with DLN combustors, a SCR system, or a combination of DLN and SCR would not yield cost-effective NOx reductions when applied to CEC's historic actual emissions. Therefore, a limit of 157.49 TPY NOx was proposed for the combined annual emissions from the turbine and duct burner and was codified in the facility's Title V Permit ID: 4-3844-00008/00006.

A review of the most recent determinations in Environmental Protection Agency's (EPA) Clean Air Technology Center - RACT/BACT/LAER Clearinghouse (RBLC) continues to identify SCR and or DLN burners as the Best Available Control Technology (BACT) for control of NOx from combined-cycle turbines. The RBLC did not identify any new control technologies that would necessitate an update of those considered in the RACT analysis as submitted. Since both BACT technologies were included in the 2012 RACT analysis and those costs have increased when updated for the 2022 price index, the costs for SCR and DLN are less cost effective now than then, and the 2012 determination continues to demonstrate compliance with 6 NYSCRR Part 227-2 RACT requirements. Therefore, CEC proposes the limit of 157.49 TPY NOx limit and related permit conditions be maintained.

Steve Konisky
Plant Manager

Table 1 Economic Analysis - Air Emissions Control Equipment				
No.	**Item**	**2011 Cost Analysis**	**2022 ENR Cost Analysis Update[c]**	**2022 CPI Cost Analysis Update[d]**
	Index Increase		56.40%	29.90%
1	Cost of Emission Control Equipment, Including Installation	$ 11,743,718	$ 18,367,175	$ 15,255,090
2	Calculated Capital Recovery Factor[a]	$ 0.1627	$ 0.1627	$ 0.1627
3	Calculated Annual Equipment Cost (Multiply Line 1 by Line 2)	$ 1,910,703	$ 2,988,339	$ 2,482,003
Annual Operating Costs				
4A	Electricity[b]	$ 148,240	$ 148,240	$ 148,240
4B	Natural Gas[b]	$ -		
4C	Catalyst Replacement	$ 1,217,997	$ 1,904,947	$ 1,582,178
4D	Reagent Cost	$ 7,048	$ 11,023	$ 9,155
4E	Maintenance	$ 176,156	$ 275,508	$ 228,827
5	Total Annual Costs (Add Items 3 - 4E)	$ 3,460,677	$ 5,328,058	$ 4,450,403
Annual NOx Tonnage Reduced				
6A	NOx Actual Annual Emissions (tons)	243.6	243.6	243.6
6B	Percent Capture and Control (or % Reduction) achieved	80%	80%	80%
6C	Tons Reduced (Multiply Item 6A by Item 6B)	195	195	195
Total Cost of Controls per Ton Reduced (Divide Item 5 by Item 6C)		$ 17,757	$ 27,337.39	$ 22,834.29
Notes:				
a. The Capital Recovery Factor (CRF) = $I(1+I)^n/(1+I)^n-1$, where I = annual interest rate (10%) and n = equipment life in years (n=10)				
b. Energy costs are the added costs of operating the control equipment minus any costs that are no longer incurred as a result of the installation and operation of the control device, not the total cost of operating the process unit being controlled.				
c. Cost increase calculated using the ENR. January 2011 to July 2022 = 56.4% increase				
d. Cost increase calculated using the CPI. January 2011 to June 2022 = 29.9% increase				

2020 Electric Prices

2020 Average Monthly Bill- Industrial

(Data from forms EIA-861- schedules 4A-D, EIA-861S and EIA-861U)

State	Number of Customers	Average Monthly Consumption (kWh)	Average Price (cents/kWh)	Average Monthly Bill (Dollar and cents)
New England	**22,812**	**56,927**	**12.89**	**7,335.01**
Connecticut	4,130	57,714	13.07	7,543.10
Maine	2,681	81,618	8.86	7,235.17
Massachusetts	10,877	47,657	14.51	6,913.25
New Hampshire	3,180	49,094	13.11	6,437.41
Rhode Island	1,692	31,259	15.76	4,925.79
Vermont	252	452,619	11.20	50,693.68
Middle Atlantic	**34,626**	**173,167**	**6.38**	**11,045.04**
New Jersey	11,629	48,266	10.01	4,830.17
New York	7,535	183,703	5.54	10,185.34
Pennsylvania	15,462	261,972	6.16	16,138.20
East North Central	**55,891**	**264,305**	**6.78**	**17,907.84**
Illinois	5,561	604,840	6.70	40,506.14
Indiana	19,383	181,701	6.98	12,681.72
Michigan	5,580	383,125	7.24	27,749.91
Ohio	19,746	197,607	6.16	12,171.57
Wisconsin	5,621	328,595	7.29	23,952.68
West North Central	**128,394**	**60,061**	**7.11**	**4,267.76**
Iowa	9,507	214,462	6.43	13,782.98
Kansas	23,979	38,395	7.30	2,802.10
Minnesota	9,042	180,379	7.67	13,839.05
Missouri	10,108	105,723	6.84	7,233.56
Nebraska	62,716	15,369	7.38	1,134.40
North Dakota	8,933	94,511	7.26	6,863.97
South Dakota	4,109	59,409	7.79	4,628.24
South Atlantic	**84,927**	**133,082**	**6.25**	**8,314.99**
Delaware	878	195,085	6.70	13,077.43
District of Columbia	1	15,528,667	7.99	1,240,100.00
Florida	22,587	61,145	7.15	4,374.67
Georgia	23,822	107,771	5.77	6,217.60
Maryland	8,966	31,433	7.81	2,454.74
North Carolina	9,822	219,136	6.31	13,830.81
South Carolina	3,714	562,664	5.98	33,639.92
Virginia	3,693	394,310	6.28	24,748.35
West Virginia	11,444	103,717	6.09	6,320.22
East South Central	**24,580**	**319,710**	**5.55**	**17,750.91**

Alabama	7,240	354,015	5.87	20,793.33
Kentucky	5,982	387,328	5.31	20,577.37
Mississippi	10,343	123,288	5.63	6,946.74
Tennessee	1,015	1,678,061	5.33	89,487.29
West South Central	**339,848**	**48,677**	**5.06**	**2,461.48**
Arkansas	35,978	38,820	5.89	2,287.13
Louisiana	19,276	156,829	4.88	7,653.93
Oklahoma	20,468	82,926	4.61	3,822.84
Texas	264,126	39,472	5.07	2,000.78
Mountain	**98,064**	**70,569**	**6.25**	**4,412.00**
Arizona	7,595	154,851	6.07	9,399.21
Colorado	15,209	84,552	7.48	6,327.92
Idaho	28,759	26,602	6.23	1,657.27
Montana	11,414	32,868	5.18	1,701.02
Nevada	3,316	299,673	5.61	16,819.78
New Mexico	9,436	80,262	5.58	4,477.92
Utah	11,001	73,267	5.90	4,325.29
Wyoming	11,334	67,139	6.88	4,618.14
Pacific Contiguous	**201,224**	**35,487**	**10.30**	**3,655.55**
California	148,130	26,796	14.27	3,823.90
Oregon	26,353	49,383	5.70	2,812.97
Washington	26,741	69,937	5.08	3,553.35
Pacific Noncontiguous	**1,945**	**195,705**	**22.01**	**43,065.36**
Alaska	1,129	96,281	15.88	15,294.18
Hawaii	816	333,267	24.45	81,488.97
U.S. Total	**992,311**	**80,543**	**6.67**	**5,370.93**

2011 Electric Prices

Table 5C. Industrial average monthly bill by Census Division, and State 2011

Census Division	Number of	Average Monthly	Average Retail Price	Average Monthly Bill
State	Consumers	Consumption (kWh)	(Cents per Kilowatthour)	(Dollar and cents)
New England	34,271	67,907	12.55	$8,520.25
Connecticut	4,757	64,260	13.24	$8,508.16
Maine	2,823	89,023	8.88	$7,908.07
Massachusetts	21,021	67,288	13.38	$9,000.45
New Hampshire	3,491	46,224	12.27	$5,669.84
Rhode Island	1,958	38,979	11.27	$4,394.53
Vermont	221	534,353	9.83	$52,503.39
Middle Atlantic	45,984	128,738	8.17	$10,516.40
New Jersey	12,715	52,649	11.43	$6,015.64

New York	8,222	136,019	7.83	$10,656.82
Pennsylvania	25,047	164,975	7.73	$12,755.10
East North Central	60,934	275,657	6.53	$17,988.14
Illinois	5,843	639,570	6.42	$41,060.29
Indiana	17,891	222,524	6.17	$13,720.82
Michigan	12,961	203,329	7.32	$14,884.65
Ohio	19,712	227,921	6.12	$13,943.61
Wisconsin	4,527	430,872	7.33	$31,570.22
West North Central	108,713	67,832	6.08	$4,123.75
Iowa	7,378	217,315	5.21	$11,326.86
Kansas	23,986	37,548	6.71	$2,519.88
Minnesota	10,673	184,412	6.47	$11,926.73
Missouri	8,759	164,875	5.85	$9,639.49
Nebraska	51,373	17,178	6.43	$1,104.70
North Dakota	3,639	98,895	6.24	$6,171.01
South Dakota	2,905	74,193	6.20	$4,598.82
South Atlantic	75,311	154,701	6.66	$10,309.37
Delaware	1,238	174,432	8.91	$15,543.66
District of Columbia	1	18,020,333	6.89	$1,240,750.00
Florida	17,335	81,173	8.55	$6,941.28
Georgia	16,241	161,736	6.60	$10,672.96
Maryland	8,900	46,886	8.76	$4,108.44
North Carolina	10,609	208,586	6.01	$12,546.21
South Carolina	4,459	525,043	5.94	$31,188.26
Virginia	4,082	351,503	6.49	$22,824.33
West Virginia	12,446	78,475	6.18	$4,849.24
East South Central	22,865	445,574	6.19	$27,574.14
Alabama	6,491	433,105	6.25	$27,052.90
Kentucky	7,426	489,490	5.33	$26,103.98
Mississippi	6,931	195,537	6.53	$12,772.17
Tennessee	2,017	1,183,212	7.23	$85,528.09
West South Central	168,126	81,779	6.00	$4,906.49
Arkansas	32,761	43,227	5.63	$2,434.40
Louisiana	18,090	138,467	5.69	$7,880.02
Oklahoma	18,242	72,218	5.46	$3,943.34
Texas	99,033	85,938	6.24	$5,358.52
Mountain	85,326	78,536	6.08	$4,777.91
Arizona	7,212	142,728	6.55	$9,355.42
Colorado	16,425	77,330	7.06	$5,458.56
Idaho	26,258	28,285	5.10	$1,443.12
Montana	5,877	56,473	5.27	$2,978.58
Nevada	3,506	318,976	6.65	$21,201.53
New Mexico	7,603	75,741	6.06	$4,591.04
Utah	9,378	82,933	5.10	$4,228.60
Wyoming	9,067	94,316	5.41	$5,101.91
Pacific Contiguous	124,442	60,156	7.62	$4,582.07

California	73,297	56,773	10.11	$5,737.46
Oregon	23,300	42,787	5.47	$2,338.89
Washington	27,845	83,596	4.09	$3,417.73
Pacific Noncontiguous	1,948	213,702	25.02	$53,466.56
Alaska	1,250	88,714	15.71	$13,935.58
Hawaii	698	437,533	28.40	$124,259.87
U.S. Total	727,920	113,487	6.82	$7,739.60

Table 1 Explanation			
Economic Analysis - Air Emissions Control Equipment			
No.	**Item**	**2011 Cost Analysis**	**2022 Cost Analysis Update Discussion[c]**
1	Cost of Emission Control Equipment, Including Installation	$ 11,743,718	ENR and CPI cost increase applied.
2	Calculated Capital Recovery Factor[a]	$ 0.1627	No cost increase applied. Prior value was used for consistency.
3	Calculated Annual Equipment Cost (Multiply Line 1 by Line 2)	$ 1,910,703	Product of costs and the Capital Recovery Factor.
Annual Operating Costs			
4A	Electricity[b]	$ 148,240	Current electrical costs were applied.
4B	Natural Gas[b]	$ -	N/A
4C	Catalyst Replacement	$ 1,217,997	ENR and CPI cost increase applied.
4D	Reagent Cost	$ 7,048	CPI cost increase applied. Currently, reagent cost increases are higher and exceed the standard price increase.
4E	Maintenance	$ 176,156	ENR and CPI cost increase applied.
5	Total Annual Costs (Add Items 3 - 4E)	$ 3,460,677	N/A
Annual NOx Tonnage Reduced			
6A	NOx Actual Annual Emissions (tons)	243.6	No cost increase applied. Prior value was used for consistency.
6B	Percent Capture and Control (or % Reduction) achieved	80%	N/A
6C	Tons Reduced (Multiple Item 6A by Item 6B)	$ 195	No cost increase applied. Prior value was used for consistency.
Total Cost of Controls per Ton Reduced (Divide Item 5 by Item 6C)		$ 17,757	Addition of increased costs.

Notes:

a. The Capital Recovery Factor (CRF) = $I(1+I)^n/(1+I)^n-1$, where I = annual interest rate (10%) and n = equipment life in years (n=10)

b. Energy costs are the added costs of operating the control equipment minus any costs that are no longer incurred as a result of the installation and operation of the control device, not the total cost of operating the process unit being controlled.

c. Cost increase calculated using the ENR. January 2011 to July 2022 = 56.4% increase

d. Cost increase calculated using the CPI. January 2011 to June 2022 = 29.9% increase

ENR - Engineering News	
January 2011	6994.68
July 2022	10941.1
Difference	3946.42
Percent	56.4

Engineering News-Record

City Cost Index - New York - As of July 2022

The building and construction cost indexes for ENR's individual cities use the same components and weighting as those for the 20-city national indexes. The city indexes use local prices for portland cement and 2 X 4 lumber and the national average price for structural steel. The city's BCI uses local union wages, plus fringes, for carpenters, bricklayers and iron workers. The city's CCI uses the same union wages for laborers.

To find more recent cost index data, go to this webpage (link below) and click on the link for the year you need, and then navigate to the week you need. Keep in mind that the city cost index figures are always published in the second weekly issue of the month.

http://www.enr.com/economics/current_costs

Go back to view all City Indexes.

ENR COST INDEXES IN NEW YORK (1978-2022)

YEAR	MONTH	BCI	%CHG	CCI	%CHG
2022	July	10941.10	+8.6	21634.54	+4.1
2022	June	10937.73	+8.9	21631.17	+4.2
2022	May	10787.65	+8.5	21481.10	+4.0
2022	April	10752.15	+8.7	21445.60	+4.1
2022	March	10676.75	+8.2	21370.17	+3.9
2012	Feb	7245.73	3.1	13810.78	2.9
2012	Jan	7245.73	3.6	13810.78	3.1
2011	Dec	7242.73	3.5	13807.78	3.0

YEAR	MONTH	BCI	%CHG	CCI	%CHG
2011	Nov	7242.23	3.4	13807.28	3.0
2011	Oct	7237.23	3.5	13802.28	3.0
2011	Sep	7230.73	3.6	13795.78	3.1
2011	Aug	7229.48	3.2	13794.53	2.9
2011	Jul	7216.73	3.0	13781.78	2.8
2011	Jun	7205.23	2.9	13770.28	2.7
2011	May	7039.93	0.8	13441.53	0.4
2011	Apr	7038.93	3.2	13440.53	3.8
2011	Mar	7029.43	3	13431.03	3.7
2011	Feb	7026.43	3.1	13428.03	3.7
2011	Jan	6994.68	2.7	13396.28	3.5

CPI for All Urban Consumers (CPI-U)
Original Data Value

Bureau of Labor Statistics: https://data.bls.gov/pdq/SurveyOutputServlet

Series CUUR0100SA0,CUUS0100SA0
Not Seasonally Adjusted
Series Title: All items in Northeast urban, all urban consumers, not seasonally adjusted
Area: Northeast
Item: All items
Base 1982-84=100
Years: 2011 to 2022

Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual	HALF1	HALF2
2011	235.969	237.110	239.074	240.267	241.566	241.690	242.282	243.033	243.323	243.014	242.652	241.987	240.997	239.279	242.715
2012	242.879	243.850	245.125	245.850	245.709	245.201	244.984	246.252	247.409	247.564	247.097	246.456	245.698	244.769	246.627
2013	247.277	248.665	248.719	248.464	248.584	248.851	249.411	249.858	250.231	249.320	249.503	249.567	249.038	248.427	249.648
2014	251.045	251.233	252.413	252.506	253.598	253.555	253.833	253.185	253.154	252.730	251.781	250.519	252.463	252.392	252.534
2015	250.016	250.619	251.451	251.760	252.770	253.626	253.405	252.903	252.922	252.504	252.573	251.670	252.185	251.707	252.663
2016	251.739	252.250	252.854	254.270	255.023	255.471	255.386	255.545	256.085	256.605	256.541	256.427	254.850	253.601	256.098
2017	258.073	258.768	258.510	259.165	259.386	259.335	258.833	259.508	260.875	260.580	260.630	260.791	259.538	258.873	260.203
2018	262.188	263.260	263.556	264.669	265.840	265.950	265.830	266.425	266.709	266.464	265.487	265.286	265.139	264.244	266.034
2019	266.109	266.706	268.025	269.070	269.744	270.133	270.381	270.548	270.563	270.348	270.643	270.429	269.392	268.298	270.485
2020	272.316	273.080	272.531	271.325	271.345	272.283	273.347	273.597	273.925	273.374	273.543	274.225	272.908	272.147	273.669
2021	275.427	276.473	278.197	280.234	281.858	284.741	285.220	285.630	286.423	288.236	289.835	290.405	283.557	279.488	287.625
2022	292.644	294.605	298.403	300.325	302.939	306.453								299.228	

Jun-22	306.453
Jan-11	235.969
Difference	70.484
% Difference	29.9

January 18, 2013

RECEIVED
JAN 22 2013
REGIO... ...ADQUARTERS
SCHENECTADY, NY 12306

Mr. Frank Riedy
New York State Department of Environmental Conservation
1150 N. Westcott Rd.
Schenectady, NY 12306-2014

Re: NOx RACT Analysis for the Castleton Energy Center Combustion Turbine (Emission Unit 1-0GTDB)

Dear Mr. Riedy:

In response to your letter dated October 16, 2012, Castleton Energy Center (CEC) has revised and is resubmitting the Reasonably Available Control Technology (RACT) analysis for oxides of nitrogen (NOx) required by 6 NYSCRR Part 227-2. The revised analysis pertains to CEC's 65 MW combined-cycle electricity generating facility consisting of a 489.2 MMBtu/hr GE Frame 6, natural gas-fired combustion turbine generator (CTG); a heat recovery steam generator (HRSG) with a 125 MMBtu/hr supplemental duct burner; and a steam turbine generator (STG).

A single vendor quote for dry low NOx (DLN) combustors was obtained, as were two vendor quotes for selective catalytic reduction (SCR) systems. These quotes are described in further detail within this letter, and are included as Attachments B–D. The RACT analysis was revised based on these cost data. The revised analysis shows that retrofitting the existing plant with DLN combustors, a SCR system, or a combination of DLN and SCR would not yield cost-effective NOx reductions when applied to CEC's historic actual emissions.

However, when the lower of the two SCR quotes was applied to the plant's full annual potential to emit (PTE) when operating on natural gas (based on 25 ppmvd NOx @ 15% O_2, 614.2 MMBtu per hour, and 8,760 hours per year), cost-effective NOx reductions would theoretically be possible. However, as actual operation of CEC is not expected to approach this level, CEC is requesting an annual cap on the combined NOx emissions of the turbine and duct burner at the NYDEC cost-effectiveness threshold of $4,500/ton. Therefore, a NYDEC Air Permit Application to limit the combined annual NOx emissions from the turbine and duct burner to 157.49 TPY is included as Attachment A. The derivation of this emission limit is described in further detail within this letter. We believe that this application satisfies the requirements of 6 NYSCRR Part 227-2, and is consistent with the approach outlined in your October 16, 2012 letter.

Summary of Vendor Quotes

Dry Low NOx Combustors – Power Systems Mfg., LLC – An email quote was received from Power Systems Mfg., LLC (PSM) for installation of DLN combustors (see Attachment B). PSM proposed to install its PSM LEC III system, capable of reducing NOx emissions to 5 ppmvd @ 15% O_2. The original quote amount was $5 million ± 15%, but that amount was subsequently reduced to $4.8 million ± 5%, which is the value that will be used for this analysis. Additionally, PSM estimates that installation of its system would reduce the maximum output of the plant by 3-5 MW due to the removal of the existing steam injection system. The PSM quote was all-inclusive in that it included all parts, labor, and commissioning for the system. Although CEC requested that PSM formalize the quote on its letterhead, this was not provided.

This capital cost was annualized based on a 10-year project life and a 4% interest rate (capital recovery factor of 0.1233), yielding a cost of **$591,797/year**.

Selective Catalytic Reduction – Hamon Deltak, Inc. – An email quote was received from Hamon Deltak, Inc. (Hamon) for the installation of an SCR system (see Attachment C). Hamon provided cost data for two potential systems: the first would reduce NOx to 9 ppmvd @ 15% O_2 and cost $1.98 million; the second would reduce NOx to 3 ppmvd @ 15% O_2 and cost $2.11 million. For the purposes of this analysis, only the second system will be considered as it provides much better emissions performance for only a small incremental cost increase. Although CEC requested that Hamon formalize the quote on its letterhead, this was not provided.

It was noted from the quote that several key items are not included in the scope of the quote, including civil design/installation of a foundation and catch basin for the ammonia storage tank; catalyst lifting/handling equipment (i.e., monorail and electric hoist); electrical engineering, wiring, installation, and testing. Budgetary allowances for these additional costs were independently estimated. The full cost of this quote is summarized in Table 1.

The total capital cost listed in Table 1 was annualized (in the same manner as previous) yielding a cost of **$336,584/year**. Additional pertinent data in the Hamon quote include a catalyst guarantee period of 36 months from the date of initial operation, a catalyst replacement cost of $185,000, and a 19% aqueous ammonia dosing rate of 169 pounds per hour. These data affect the annual operating cost of the SCR system, which is discussed later in this analysis.

Table 1 **Hamon Deltak, Inc. -- Capital Costs for a 3 ppm SCR System**	
Item	Budgetary Cost
Vendor Supplied Line-Items Listed in the Proposal Under the Following Headings:	
• Ammonia Storage and Forwarding System Consisting of the Following: o 19% Aqueous Ammonia Storage o Delivery Truck Offloading Station o Ammonia Forwarding Piping (to Dilution Skid) o Ammonia Forwarding Pump o Ammonia Tank Fogging (Leak Protection) Equipment o Local Safety Eyewash/Shower Station o All Carbon Steel Materials • Ammonia Dilution & Injection System o Electrically heated vaporization/dilution skid o Ammonia flow balancing header o Ammonia piping to HRSG, and Injection grid feeders o Ammonia Injection Grid o Static Mixer element (assure ammonia mixing prior to the SCR catalyst) • Catalyst Frame and Associated Baffling • Ducting Modifications o Removable Roof Hatch o Duct Structural Reinforcement as Necessary to Carry Catalyst Weight • Initial SCR Catalyst • Support Installation • Field Installation Labor and Equipment	$2,110,000
Out-of-Scope or Buyer Supplied Items:	
• Civil Design of Ammonia Storage Foundation and Catch Basin	$10,000
• Installation of Ammonia Storage Foundation and Catch Basin	$10,000
• Catalyst Lifting/Handling Equipment (i.e., Monorail and Electric Hoist)	$60,000
• Electrical Engineering, Wiring, Installation, and Testing	$10,000
• Analyzer/CEM System	$150,000
• Freight	$30,000
• Project Contingency[a]	$350,000
Total Capital Costs:	**$2,730,000**
Notes [a]Project contingency is 15% of the capital cost; from EPA Air Pollution Cost Control Manual, Sixth Edition, Table 2.5	

Selective Catalytic Reduction – Peerless Mfg. Co. – A quote was received from Peerless Mfg. Co (Peerless) for the installation of an SCR system (see Attachment D). Peerless provided data for an SCR system that would reduce NOx to 2.5 ppmvd @ 15% O_2 at a base cost $1.45 million, with additional costs listed for add-on items.

As was the case with the Hamon SCR quote, many key items were not included in the scope of the Peerless quote. The proposal contains elements that are designated as either "optional," "buyer," or "out of scope" items. Additional exclusions are listed in the proposal. Budgetary costs for these items were estimated separately, and are listed in Table 2. The estimate includes the three optional items (a PLC Local Control Panel, electric hoist and monorail, and Professional Engineer's stamp), as these are recommended by the vendor to ensure optimum design, operation, and maintenance of the system. Budgetary allowances for these additional costs were independently estimated. The full cost of this quote is summarized in Table 2.

Table 2
Peerless Mfg Co. -- Capital Cost for a 2.5 ppm SCR System

Item	Budgetary Cost
Vendor Supplied Line-Items Listed in the Proposal Under the Following Headings:	
• Basic Engineering and Design • Ammonia System • PLC Control Panel • Ammonia Injection Manifold • Ammonia Injection Grid • Initial Catalyst	$1,454,600
Out-of-Scope or Buyer Supplied Items:	
Basic Engineering and Design • Design and Supply Anchor Bolts • Supply and Installation of Insulation • Professional Engineer Stamp • Design, supply, and installation of heat tracing or instrument protection	$10,000
Ammonia System • Power Wiring for Fan Motors • Motor Starters • Foundation/Support for Ammonia Flow Control Unit	$10,000
PLC Control Panel	$52,000
Manifold • Isolation Valve at each Branch Take-Off • Insulation • Supports for Manifold	$5,000
Interconnecting Piping: • Insulation • Support of Interconnecting Piping	$5,000
Ductwork and Structure: • Expansion Joint at Boiler Exhaust • Flow Distribution Correction	$200,000

Table 2 Peerless Mfg Co. -- Capital Cost for a 2.5 ppm SCR System	
• Inlet Transition Ducting to Reactor Housing • Expansion Join at Reactor Housing Inlet • Reactor Housing • Reactor Housing Structural Support Steel • Test Ports for Catalyst • Ductwork Platforms and Ladder Access • Stack • CEMS test Ports • Stack Platform and Ladders • Silencer	
Hoist and Monorail	$60,000
Aqueous Ammonia Pump Skid • Support of Ammonia Pump Skid • Motor Starters	$5,000
Analyzer/CEM System • NOx Analyzer at Inlet • NOx Analyzer at Outlet • CO Analyzer at Outlet • O_2 Analyzer • CEM System PLC • CEM Data Acquisition and Handling System • CEM Analyzer Certification • CEM Probe with Filter and Sample Line • Calibration Kit with Regulators • Sample Conditioner • Analyzer/CEM Shelter	$150,000
Site Work[a] • Field Service/Supervision • Interconnecting Wiring, Ground Frames, and Conduits • Electrical Supply and Controls for Pumps, Fans • Final Field and Touch-Up Painting • Unloading and Storage at Job Site • Civil/Foundation Design and Work • Labor, Equipment, Consumables, and Materials for Erection of the Equipment at the Job Site	$390,000
Freight	$30,000
Project Contingency[b]	$270,000
Total Capital Costs:	**$2,641,600**

Notes
[a]Installation costs are 20% of the direct capital costs; from EPA Air Pollution Cost Control Manual, Sixth Edition, Table 2.5
[b]Project contingency is 15% of the capital cost; from EPA Air Pollution Cost Control Manual, Sixth Edition, Table 2.5

The total capital cost listed in Table 2 was annualized (in the same manner as previous) yielding a cost of **$325,685/year**. Additional pertinent data in the Peerless quote include a catalyst guarantee period of 36 months from the date of initial operation; a catalyst replacement cost of $300,000; and a 29% aqueous ammonia dosing rate of 102 pounds per hour. These data affect the annual operating cost of the SCR system, which is discussed later in this analysis.

RACT Analysis Based on Historic Actual Emissions

NYDEC's October 16, 2012 letter states "... NOx reduction and cost of controls should be calculated and based on actual emissions." Therefore, the NOx removal cost-effectiveness for the three control systems for which vendor quotes were received was determined based on CEC's historic emissions, averaged over the three-year period of 2010-2012.

Historic Operation and Emissions – Historic generation and NOx emissions are summarized in Table 3. NOx mass emissions (tons per year) are from CEC's 2010-2012 annual CEMS reports, submitted to USEPA's Emissions Collection and Monitoring Plan System (ECMPS).

Table 3
CEC Historic Generation and NOx Emissions

Year	Net Generation (MWh)	NOx Emissions (ppmvd @ 15% O_2)	Annual Emissions (tons per year)[a]	Equivalent Full Load Hours
2010	136,681	22.0	51.0	2,102
2011	86,330	21.0	33.1	1,328
2012	143,327	16.5	47.1	2,205
Average	**122,113**	**19.8**	**43.7**	**1,878**

Note:
a. Based on plant heat rate of 9,449 Btu/kWh, calculated from the plant maximum heat input of 614.2 MMBtu/hr (489.2 turbine = MMBtu/h, duct burner = 125 MMBtu/h), and maximum output of 65 MW.

Table 3 also lists the equivalent full load hours of operation (i.e., at 65 MW of output), which is necessary for calculating several of the annual operating costs, such as reagent usage. Historic actual hours of operation exceeded this theoretical value; however, estimating annual costs based on maximum load minimizes annual costs, and hence is a conservative assumption.

Direct Annual Operating Costs – To complete the RACT analysis, the direct annual operating costs of each control option must be calculated. These costs include electricity, reagent, catalyst replacement, and maintenance. These costs are estimated in Table 4 for each system. Electricity and reagent costs are based on 1,878 equivalent full load hours as shown in Table 3.

Table 4 Direct Annual Operating Costs			
Control System (NOx emissions, ppmvd @ 15% O_2)	PSM (5 ppm)	Hamon-Deltak (3 ppm)	Peerless (2.5 ppm)
Electricity[a]	$1,343,243 [b]	$18,028[c]	$18,028[c]
Catalyst Replacement[d]	0	$85,007	$134,731
Reagent Cost[e]	0	$44,433	$26,817
Maintenance[f]	$72,000	$40,950	$39,624
Total Direct Annual Operating Costs	$1,415,243	$188,418	$219, 201

Notes:
a. Based on $0.048/kWh, the 2012 weighted average wholesale electricity price at the NEPPOOL Mass Hub (New England); from the U.S. Energy Information, available at *http://www.eia.gov/electricity/wholesale/index.cfm*.
b. The DLN system does not consume electricity; however, it will reduce the plant's output by 3-5 MW due to the loss of steam injection (per the PSM quote). This loss is calculated in terms of the "spark spread" of the plant, which is estimated to be $11/MWh.
c. SCR power usage estimated at 200 kW.
d. Based on the vendor catalyst replacement cost plus 35% for installation, freight, and project contingency, three-year replacement period, 4% interest rate.
e. Based on an estimated reagent cost of $0.14/lb, based on a vendor quote of $0.1311 per pound for 29% aqueous ammonia solution plus a fuel surcharge (See Attachment B).
f. Estimated to be 1.5% of total capital investment, from USEPA Air Pollution Cost Control Manual, Sixth Edition, Table 2.5.

Control Option Cost-Effectiveness Determination -- The cost-effectiveness of NOx reductions from each of the vendor-quoted control systems, compared to historic actual emissions, was calculated in accordance with NYSDEC's *Air Guide 20 – Economic and Technical Analysis for Reasonable Available Control Technology determinations.*[1] Table 4 of the Guidance document (reproduced below in Table 5) contains the information required by NYSDEC for a complete economic analysis for emission control equipment.

[1] Available at *http://www.dec.ny.gov/regulations/25210.html#table1.*

Table 5
Cost-Effectiveness Determination

	Control System (NOx emissions, ppmvd @ 15% O_2)	PSM (5 ppm)	Hamon-Deltak (3 ppm)	Peerless (2.5 ppm)
1	Cost of Emission Control Equipment, Including Installation	$4,800,000	$2,730,000	$2,641,600
2	Calculated Capital Recovery Factor[a]	0.1233	0.1233	0.1233
3	Calculated Annual Equipment Cost (Multiply Line 1 by Line 2)	$591,797	$336,584	$325,685
Annual Operating Costs				
4A	Electricity[b]	$1,343,243	$18,028	$18,028
4B	Natural Gas[b]	0	0	0
4C	Catalyst Replacement	0	$85,007	$134,731
4D	Reagent Cost	0	$44,433	$26,817
4E	Maintenance	$72,000	$40,950	$39,624
5	Total Annual Costs (Add Items 3 - 4E)	$2,007,040	$525,002	$545,185
Annual NOx Tonnage Reduced				
6A	NOx Actual Annual Emissions (tons)	43.7	43.7	43.7
6B	Percent Capture and Control (or % Reduction) achieved	74.7%	84.8%	87.4%
6C	Tons Reduced (Multiple Item 6A by Item 6B)	32.64	37.06	38.19
Total Cost of Controls per Ton Reduced (Divide Item 5 by Item 6C)		$61,490	$14,166	$14,276

Notes:
a. The Capital Recovery Factor (CRF) = $I(1+I)^n/(1+I)^n-1$, where I = annual interest rate (4%) and n = equipment life in years (n=10)
b. Energy costs are the added costs of operating the control equipment minus any costs that are no longer incurred as a result of the installation and operation of the control device, not the total cost of operating the process unit being controlled.

Table 5 shows that the NOx reductions achieved by the three vendor quoted systems would be cost-ineffective at CEC's three-year average (2009-2011) historic actual operating conditions. This is based on the NYDEC NOx RACT cost-effectiveness threshold of $3,000/ton (1994 dollars), or approximately $4,500/ton in current dollars.[2]

<u>Control Option Cost-Effectiveness Determination</u> – NYDEC's October 16, 2012 letter also requested that the option of installing both DLN and SCR be evaluated. Because the SCR-alone achievable level of control is near the Best Available Control Technology (BACT) level, only very small incremental reductions could be expected (on the order of

[2] The 1994 RACT cost-effectiveness threshold of $3,000 per ton is listed in the NYSDEC document *Air Guide 20 – Economic and Technical Analysis for Reasonably Available Control Technology.* The NYSDEC's current RACT cost-effectiveness threshold of $4,500 per ton was obtained during a phone conversation between Steve Konisky (CEC plant manager) and Frank Riedy (NYSDEC) on December 15, 2011.

1-2 ppm) by combining both controls. These incremental reductions would be highly cost-ineffective based on the data shown in Table 5. Therefore, the combined SCR and DLN control option was not further considered.

RACT Analysis Based on CEC's Potential to Emit

Subpart 227-2, Section 2.5(c) of the NYSDEC Regulations specifies that an owner can request an emission source specific emission limit based on the economic feasibility of the control option. Additional guidance in NYDEC's October 16, 2012 letter states:

> *If the cost of a NOx control exceeds the RACT upper limit based on actual historical emissions, but does not exceed it based on the NOx PTE, then the facility should determine the NOx PTE (tons/year) at which the cost of the control would equal the RACT upper limit. The unit emissions would need to be capped at that level if the facility did not implement the NOx control.*

The calculation below demonstrates that installation of the SCR system would be cost-effective at the turbine/HRSG's PTE; therefore, a lower NOx PTE is being requested such that SCR would not be cost-effective. Based on the cost effectiveness of the DLN combustors shown in Table 5, this control option would not be cost effective at any level of operation. Therefore, this control option is not further evaluated.

Calculation of Potential to Emit of Turbine and Duct Burner – The PTE of the gas turbine and duct burner while operating on natural gas was calculated in the same manner as shown in Table 3, except that it was presumed that the unit could potentially operate 8,760 full load hours per year at 25 ppmvd NOx @ 15% O_2 (as limited by Condition #40 of CEC's Title V permit). At this level of operation, the plant would burn 5,380,392 MMBtu/year of natural gas, and emit 243.6 TPY of NOx.[3]

The control option with the lowest NOx cost-effectiveness is the Hamon-Deltak SCR system, as shown in Table 5. If this system were installed on the turbine/duct burner, the potential emissions would be reduced by 88% (i.e., from 25 to 3 ppmvd @ 3% O_2), producing 213.98 TPY of NOx reductions. Based on the total annual costs of this SCR system shown on line 5 of Table 6, this level of reduction is presumed to be cost-effective relative to a $4,500/ton threshold. It is noted that the annual operating costs of this system would be significantly higher than shown in Table 6 for 8,760 hours/year of full load operation. Annual costs were not calculated for this scenario since the calculation

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[3] NOx PTE = (489.2 MMBtu/h + 125 MMBtu/h) * (8,760 h/year) * (8,710 dscf/MMBtu) * (25 dscf NOx/1,000,000 dscf exhaust) * (28.32 L/cf) * (mol/24.47 L) * (46.01 g NOx/mol) * (lb/453.6 g) * (ton/2,000 lb) * [20.9/(20.9-15.0)] = 243.55 TPY. Where: 489.2 MMBtu/h = Turbine max firing rate, 125 MMBtu/h = Duct burner firing rate, 8,710 dscf/MMBtu = F-factor for natural gas @ 0% O_2 and 20° C (from EPA Method 19, Table 19-2), Mol/24.47 L = Standard molar volume @ 25 degrees C, 46.01 g/mol = Molecular weight of nitrogen dioxide, NO_2 [20.9/(20.9-15.0)] = Correction factor to account for the 25 ppm being normalized to 15% exhaust oxygen.

under the following heading demonstrates the exact level of operation, and corresponding annual operating costs, that exceed the NYDEC NOx cost-effectiveness threshold.

Potential to Emit Cap at which SCR is Not Cost-Effective – A revised PTE of the gas turbine/duct burner, while operating on natural gas, was calculated at the level at which the installation of the lowest-cost SCR system (i.e., the Hamon-Deltak system) would not result in cost-effective NOx reductions. This PTE is the limit requested by CEC, while operating on natural gas to satisfy the requirements of Subpart 227-2. The result of this iterative calculation demonstrates that this PTE occurs when the turbine/duct burner operate at 25 ppmvd @ 15% O_2, at full load (614.2 MMBtu/h), for 5,663 hours/year. The corresponding PTE of the unit is 157.49 TPY of NOx, as shown in Table 6.

Table 6
Cost-Effectiveness Determination

	Control System (NOx emissions, ppmvd @ 15% O_2)	Hamon-Deltak (3 ppm)
1	Cost of Emission Control Equipment, Including Installation	$2,730,000
2	Calculated Capital Recovery Factor[a]	0.1233
3	Calculated Annual Equipment Cost (Multiply Line 1 by Line 2)	$336,584
Annual Operating Costs		
4A	Electricity[b]	$27,862
4B	Natural Gas[b]	0
4C	Catalyst Replacement	$85,007
4D	Reagent Cost	$133,987
4E	Maintenance	$40,950
5	Total Annual Costs (Add Items 3 - 4E)	$623,710
Annual NOx Tonnage Reduced		
6A	NOx Actual Annual Emissions (tons)	157.49
6B	Percent Capture and Control (or % Reduction) achieved	88.0%
6C	Tons Reduced (Multiple Item 6A by Item 6B)	138.59
Total Cost of Controls per Ton Reduced (Divide Item 5 by Item 6C)		$4,500.36

Notes:
a. The Capital Recovery Factor (CRF) = $I(1+I)^n/(1+I)^n-1$, where I = annual interest rate (4%) and n = equipment life in years (n=10)
b. Energy costs are the added costs of operating the control equipment minus any costs that are no longer incurred as a result of the installation and operation of the control device, not the total cost of operating the process unit being controlled.

It is noted that any number of other operating scenarios are possible that result in uncontrolled NOx emissions of 157.49 TPY, such as operation at lower loads or lower NOx concentrations for greater hours. However, each of these scenarios is expected to entail higher annual operating costs. Therefore, 157.49 TPY is the lowest PTE at which installation of the Hamon-Deltak 3 ppm SCR system would remain cost-ineffective, and is the turbine/duct burner natural gas burning PTE limit requested by CEC in the attached Air Permit Application (See Attachment A) to satisfy the requirements of Subpart 227-2. Please contact me at (707) 794-9740 if you have any questions regarding this application.

Sincerely,

John Walsh
Asset Manager

cc: Steve Konisky, Castleton Energy Center
Courtney Graham, Sierra Research

Attachment A: NYDEC Air Permit Application
Attachment B: Power Systems Mfg., LLC – Dry Low NOx Combustors Quote
Attachment C: Hamon-Deltak, Inc. – Selective Catalytic Reduction Quote
Attachment D: Peerless Mfg. Co. – Selective Catalytic Reduction Quote

Appendix B: Case-by-case Permit Conditions

[redacted]

Condition 30: Compliance Certification
Effective between the dates of 03/21/2023 and 03/20/2028

Applicable Federal Requirement:6 NYCRR 201-6.4 (a)

Item 30.1:
The Compliance Certification activity will be performed for the facility:
The Compliance Certification applies to:

Emission Unit: 1-0GTDB Emission Point: 00001
Process: OIL

Regulated Contaminant(s):
CAS No: 0NY210-00-0 OXIDES OF NITROGEN

Item 30.2:
Compliance Certification shall include the following monitoring:

Monitoring Type: CONTINUOUS EMISSION MONITORING (CEM)
Monitoring Description:
Compliance with the oxides of nitrogen emission limit stated herein shall, when firing fuel oil be demonstrated using CEMS.

Manufacturer Name/Model Number: Teledyne T802
Parameter Monitored: OXIDES OF NITROGEN
Upper Permit Limit: 42 parts per million by volume (dry, corrected to 15% O2)
Reference Test Method: RM 7
Monitoring Frequency: AS REQUIRED - SEE PERMIT MONITORING DESCRIPTION
Averaging Method: AVERAGING METHOD AS PER REFERENCE TEST METHOD INDICATED
Reporting Requirements: SEMI-ANNUALLY (CALENDAR)
Reports due 30 days after the reporting period.
The initial report is due 7/30/2023.
Subsequent reports are due every 6 calendar month(s).

Condition 31: Compliance Certification

Effective between the dates of 03/21/2023 and 03/20/2028

Applicable Federal Requirement:6 NYCRR 201-6.4 (a)

Item 31.1:
The Compliance Certification activity will be performed for the facility:
The Compliance Certification applies to:

Emission Unit: 1-0GTDB Emission Point: 00001
Process: NG2

Regulated Contaminant(s):
CAS No: 0NY210-00-0 OXIDES OF NITROGEN

Item 31.2:
Compliance Certification shall include the following monitoring:

Monitoring Type: CONTINUOUS EMISSION MONITORING (CEM)
Monitoring Description:
Compliance with the duct burner, oxides of nitrogen emission limit stated herein shall, when firing gas, be demonstrated using the difference in CEMS data from the duct burners firing in combination with the combustion turbine and CEMS data from the combustion turbine firing alone.

Manufacturer Name/Model Number: Teledyne T802
Parameter Monitored: OXIDES OF NITROGEN
Upper Permit Limit: 15.5 pounds per hour
Reference Test Method: RM 7
Monitoring Frequency: AS REQUIRED - SEE PERMIT MONITORING DESCRIPTION
Averaging Method: AVERAGING METHOD - SEE MONITORING DESCRIPTION
Reporting Requirements: SEMI-ANNUALLY (CALENDAR)
Reports due 30 days after the reporting period.
The initial report is due 7/30/2023.
Subsequent reports are due every 6 calendar month(s).

Condition 32: Compliance Certification
Effective between the dates of 03/21/2023 and 03/20/2028

Applicable Federal Requirement:6 NYCRR 201-6.4 (a)

Item 32.1:
The Compliance Certification activity will be performed for the facility:
The Compliance Certification applies to:

Emission Unit: 1-0GTDB Emission Point: 00001
Process: NG2

Regulated Contaminant(s):

CAS No: 0NY210-00-0 OXIDES OF NITROGEN

Item 32.2:
Compliance Certification shall include the following monitoring:

Monitoring Type: CONTINUOUS EMISSION MONITORING (CEM)
Monitoring Description:

Compliance with the duct burner, oxides of nitrogen emission limit stated herein shall, when firing gas be demonstrated using the difference in CEMS data from the duct burners firing in combination with the combustion turbine and CEMS data from the combustion turbine firing alone.

Manufacturer Name/Model Number: Teledyne T802
Parameter Monitored: OXIDES OF NITROGEN
Upper Permit Limit: 0.10 pounds per million Btus
Reference Test Method: RM 7
Monitoring Frequency: AS REQUIRED - SEE PERMIT MONITORING DESCRIPTION
Averaging Method: AVERAGING METHOD - SEE MONITORING DESCRIPTION
Reporting Requirements: SEMI-ANNUALLY (CALENDAR)
Reports due 30 days after the reporting period.
The initial report is due 7/30/2023.
Subsequent reports are due every 6 calendar month(s).

[redacted]

[redacted]

[redacted]

[redacted] [redacted]

[redacted] [redacted]

[redacted]

[redacted]

Permit ID: 4-3844-00008/00006 **Facility DEC ID: 4384400008**

[redacted]

Condition 35: Compliance Certification
Effective between the dates of 03/21/2023 and 03/20/2028

Applicable Federal Requirement:6 NYCRR 201-6.4 (a)

Item 35.1:
The Compliance Certification activity will be performed for the facility:
The Compliance Certification applies to:

Emission Unit: 1-0GTDB Emission Point: 00001
Process: NG3

Regulated Contaminant(s):
CAS No: 0NY210-00-0 OXIDES OF NITROGEN

Item 35.2:
Compliance Certification shall include the following monitoring:

Monitoring Type: CONTINUOUS EMISSION MONITORING (CEM)
Monitoring Description:
Compliance with the oxides of nitrogen emission limit stated herein shall, when firing gas in the turbine, shall be demonstrated using CEMS.

Manufacturer Name/Model Number: Teledyne T802
Parameter Monitored: OXIDES OF NITROGEN
Upper Permit Limit: 25 parts per million by volume (dry, corrected to 15% O2)
Reference Test Method: RM 7
Monitoring Frequency: AS REQUIRED - SEE PERMIT MONITORING DESCRIPTION
Averaging Method: AVERAGING METHOD AS PER REFERENCE TEST METHOD INDICATED
Reporting Requirements: SEMI-ANNUALLY (CALENDAR)
Reports due 30 days after the reporting period.
The initial report is due 7/30/2023.
Subsequent reports are due every 6 calendar month(s).

[redacted]

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[redacted]

[redacted]

Condition 49: Compliance Certification
Effective between the dates of 03/21/2023 and 03/20/2028

Applicable Federal Requirement:6 NYCRR 227-2.5 (c)

Item 49.1:
The Compliance Certification activity will be performed for the facility:
The Compliance Certification applies to:

Emission Unit: 1-0GTDB

Regulated Contaminant(s):
CAS No: 0NY210-00-0 OXIDES OF NITROGEN

Item 49.2:
Compliance Certification shall include the following monitoring:

Monitoring Type: CONTINUOUS EMISSION MONITORING (CEM)
Monitoring Description:
Castleton Energy will limit annual NOx 157.49 tons/yr from the combustion turbine and duct burner. This limit will satisfy the 6 NYCRR Part 277 Reasonably Available Control Technology (RACT) requirements.

Manufacturer Name/Model Number: TELEDYNE/T200M
Upper Permit Limit: 157 tons per year
Reference Test Method: RM-20
Monitoring Frequency: MONTHLY
Averaging Method: ANNUAL TOTAL ROLLED MONTHLY
Reporting Requirements: SEMI-ANNUALLY (CALENDAR)
Reports due 30 days after the reporting period.
The initial report is due 7/30/2023.
Subsequent reports are due every 6 calendar month(s).

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Appendix C: Public Notice Documents

Statewide - Source-Specific State Implementation Plan Revision for Reasonably Available Control Technology for Castleton Energy Center; Permit ID: 4-1922-00055/00005 in Castleton, New York

This Page Covers

Public Notice

Source-Specific State Implementation Plan Revision for Reasonably Available Control Technology for Castleton Energy Center; Permit ID: 4-1922-00055/00005 in Castleton, New York

Notice is hereby given that the New York State Department of Environmental Conservation (NYS DEC) plans to submit a Source-Specific State Implementation Plan Revision (SSSR) for Reasonably Available Control Technology (RACT) for Castleton Energy Center to the United States Environmental Protection Agency (US EPA) for approval.

Title 6 of the New York Codes, Rules, and Regulations (NYCRR) contains several regulations that define RACT for certain categories of stationary sources. These regulations seek emissions reductions of nitrogen oxides (NO_x) and/or volatile organic compounds (VOCs) to help attain and/or maintain the 8-hour ozone National Ambient Air Quality Standards (NAAQS). Depending upon the relevant RACT regulation, a source that is required to implement RACT must meet a presumptive RACT limit, meet an alternate limit determined from an approved technical analysis if reaching a presumptive RACT limit is technically or economically infeasible, or meet an approved case-by-case RACT limit for sources which do not have a presumptive RACT limit established in regulation.

The Air Title V Facility Permit for Castleton Energy Center issued on March 21, 2023, contains conditions to regulate the emission of oxides of nitrogen (NO_x).

The 65 MW combined-cycle electricity generating facility consists of a 489.2 MMBtu/hr GE Frame 6, natural gas-fired combustion turbine generator (CTG); a heat recovery steam generator (HRSG) with a 125 MMBtu/hr supplemental duct burner; and a steam turbine generator (STG). The facility also operates an auxiliary boiler, which was de-rated from an original nameplate rate of 95 MMBtu/hr to a new rate of 24.4 MMBtu/hr. Although the CTG is primarily fired with natural gas, #2 fuel oil is also used as a backup fuel. The duct burner fires on natural gas only.

Nitrogen oxide (NO_x) emissions from the CTG are controlled by water injection. The auxiliary boiler is fired on natural gas only and is equipped with a low NO_x burner.

The permit for this facility contains an overall limit on NO_x of 157 tons/year. In addition,
the combustion turbines and duct burners in this permit are subject to Lowest Achievable Emission Rate (LAER) requirements for NO_x which are more stringent than the applicable NO_x RACT requirements. The LAER conditions currently in the permit require the facility to install, maintain, and operate NO_x CEMS in accordance with 40 CFR Part 75. Accordingly, NYS DEC has streamlined this permit to include only the more stringent LAER conditions for NO_x emissions. By complying with these requirements the facility is also complying with the applicable provisions of NO_x RACT.

The Source-Specific State Implementation Plan Revision <https://www.dec.ny.gov/chemical/8403.htm> for Castleton Energy Center that DEC plans to submit to EPA for approval is available at: https://www.dec.ny.gov/chemical/8403.html <https://www.dec.ny.gov/chemical/8403.html>.

The Air Title V Facility Permit <https://www.dec.ny.gov/dardata/boss/afs/permits/438440000800006_r3.pdf> that contains the permit conditions is available at: https://www.dec.ny.gov/dardata/boss/afs/permits/438440000800006_r3.pdf <https://www.dec.ny.gov/dardata/boss/afs/permits/438440000800006_r3.pdf>.

The Permit Review Report <https://www.dec.ny.gov/dardata/boss/afs/permits/prr_438440000800006_r3.pdf> for this facility is available at: https://www.dec.ny.gov/dardata/boss/afs/permits/prr_438440000800006_r3.pdf. <https://www.dec.ny.gov/dardata/boss/afs/permits/prr_438440000800006_r3.pdf.>

Source-specific RACT determinations that are included in this permit action will be submitted to the US EPA for approval as a SSSR. The NYS DEC is providing a 30 day period to comment on the proposed SSSR or to request a hearing. **Written comments should be submitted by March 8, 2024 to contact listed below.**

Primary Contact

Daniel Goss
NYS DEC - Division of Air Resources
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Albany, NY 12233-3251

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airsips@dec.ny.gov

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