NEW YORK STATE DEPARTMENT OF ENVIRONMENTAL CONSERVATION

Division of Air Resources
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FEB 23 2024

Ms. Lisa F. Garcia
Regional Administrator
U.S. Environmental Protection Agency, Region 2
290 Broadway, 26th Floor
New York, NY 10007-1866

Dear Administrator Garcia:

On behalf of the Governor of the State of New York, I am submitting for approval by the U.S. Environmental Protection Agency (EPA) a Source-Specific State Implementation Plan Revision (SSSR) for Indeck Energy Center in Corinth, New York.

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. The Air Title V Permit for Indeck - Corinth Energy Center that was issued on January 1, 2024, includes conditions that establish RACT for NOx process emissions.

A public notice specifying that process specific RACT determinations would be submitted to EPA as a SSSR was published in the Environmental Notice Bulletin (ENB) on September 20, 2023. A public comment period occurred from September 20, 2023 to October 20, 2023. No comments were received.

Several documents, including those that were used by the New York State Department of Environmental Conservation to evaluate and approve the RACT emission limits, are included in this proposed SSSR.

If you have any questions or concerns, please contact Daniel Goss, Assistant Engineer, Division of Air Resources, Bureau of Air Quality Planning, SIP Planning Section at (518) 402-8396.

Sincerely,

Christopher M. LaLone, P.E.
Director, Division of Air Resources

NEW YORK STATE | Department of Environmental Conservation

Enclosures

c: R. Ruvo, EPA Region 2
R. Bielawa

NEW YORK STATE | Department of Environmental Conservation

Source Specific State Implementation Plan Revision

INDECK – CORINTH ENERGY CENTER

PERMIT ID: 5-4126-00028

MARCH 2024

DIVISION OF AIR RESOURCES
BUREAU OF AIR QUALITY PLANNING
ALBANY, NEW YORK 12233-3251
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Table of Contents

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.

Facility Description

Corinth Energy Center is a combined-cycle cogeneration plant utilizing a GE Frame 7 gas turbine with evaporative cooling, a heat-recovery steam generator (HRSG) with duct burner, selective catalytic reduction (SCR) for NOx control and a GE steam turbine. This is a co-generation plant furnishing steam to the adjacent water production plant and electricity to Consolidated Edison. The plant is operated from a centralized control room through a Foxboro Distributed Control System (DCS). Circulating water is cooled through a 4-cell wet cooling tower. Natural gas is the primary fuel. A 375,000 gal #2 fuel oil tank provides backup fuel. The facility operates between 80% and 100% load. Oil firing on the gas turbine is limited to 17.3 million gallons per 365-day rolling average. The duct burner fires only natural gas. Operating hours on the gas turbine and duct burner are not limited. The gas turbine is operated with dry low-NOx equipment and the duct burners has low-NOx burners. SCR controls facility NOx to 9/18 ppm for gas/oil firing, respectively.

Air Title V Facility Permit

The case-by-case RACT determination has been incorporated into the facility's Title V Permit. The relevant permit conditions are included in this document in Appendix B. The full Title V permit is available at:

PERMIT

The Permit Review Report is available at:

PRR

Appendix A: Technical Analyses

INDECK CORINTH LIMITED PARTNERSHIP • 24 WHITE STREET • CORINTH, NEW YORK 12822
518/654-7895 • FAX: 518/654-6864

September 26, 2023

Sent via: email
NYSDEC Region 5
Division of Air Resources
232 Golf Course Road
Warrensburg, NY 12885-0220

RE: RACT Analysis Dates
Indeck-Corinth Energy Center
ORIS Code 050458

Attn: Mr. Timothy Abrams

Dear Mr. Abrams:

Per your request, Indeck Corinth submits the following information with regards to the RACT analysis portion of our Title V Air Permit Renewal 5 application.

- The RACT analysis, as a process, was performed by Indeck's Environmental Specialist over a period from early February 2023 through early April 2023, with the final Draft version being completed on April 4th 2023.
- The Draft version was reviewed by several individuals in May 2023, and considered Final on approximately June 29th, 2023.
- The Final RACT analysis was then submitted along with the rest of the Renewal 5 application on June 30th, 2023.

Please feel free to contact me at (518) 654-7895 or by email at mminnolera@indeckenergy.com should you have any questions regarding this matter.

Sincerely,

INDECK-CORINTH LIMITED PARTNERSHIP
By: Indeck Energy Services of Corinth, Inc.
Its General Partner

Michael E. Minnolera
Alternate Account Representative

MEM

cc: T. Krysiak (Indeck) (electronic)
Plant File

\\correspondence\2023 dec correspondence\2023 RACT analysis dates.doc

Introduction

The Indeck Corinth Energy Center is an existing 128-megawatt cogeneration facility located in Corinth, NY. With commercial operations commencing in mid-1995, the energy center originally provided thermal energy to the nearby International Paper (IP) facility and electrical energy onto the local electric grid. The plant is located in on the northeast side of the village and adjacent to the Hudson River. Access to the plant is off White Street (see general location map).

Indeck Corinth was a combined cycle cogeneration facility, with the main cycle consisting of a combustion gas turbine generator (GT), a heat recovery steam generator (HRSG) with duct burner (DB) and a condensing steam turbine. No auxiliary boiler was, or is, part of the facility. Indeck Corinth no longer supplies any thermal energy to IP, as that plant has now permanently shut down. A distilled water plant replaced IP as the steam host until 2015 but has also been permanently shut down and dismantled. Thus, the Indeck Corinth facility now operates as a merchant combined cycle plant.

The project was issued its initial permit-to-construct by the New York Department of Environmental Conservation (DEC) in May 1992. The initial Title V Operating Permit for the facility was issued by the NYSDEC on November 2, 1998. The facility is now operating under its fourth Title V (mod. 1) renewal. The project is classified as a major source under PSD rules and regulations. As such, a past review of air emissions from the facility established that Best Available Control Technology (BACT) requirements were applicable. In accordance with that review, Indeck Corinth employs dry low-NOx (DLN) combustion with selective catalytic reduction (SCR) for control of nitrogen oxides. Applicable limits on the main cycle are 9 ppm for gas firing and 18 ppm for oil firing.

Indeck Corinth submitted its original RACT assessment (Reasonably Available Control Technology) on December 27, 2011. That document was authored in accordance with 227-2.3(b), which required applicable facilities to prepare and submit by January 1, 2012, a “RACT analysis that explains why the control technology the facility currently employs should still be considered RACT…”.

This NOX RACT Analysis is being submitted to comply with the NYSDEC Program Policy, DAR-20, which requires that an existing source specific NOX RACT determination be re-evaluated as part of the renewal conditions of the emission source owner’s permit.

To facilitate the NYSDEC review of this document, individuals familiar with both the facility and the preparation of this material are identified below. The DEC should contact these individuals if additional information or clarification is required during the review process.

Project Owner	Indeck Energy Services of Corinth, Inc.
Project Site	Indeck Corinth Energy Center 24 White Street Corinth, NY 12882
Project Owner Contact	Mr. Thomas Krysiak Indeck Energy Services, Inc. Environmental, Health & Safety Manager 600 N. Buffalo Grove Road Buffalo Grove, Illinois 60089 Phone: 716-225-6478 Email: tkrysiak@indeckenergy.com
Plant Contact	Mr. Michael Minnolera Plant Manager INDECK-Corinth Energy Center 24 White Street Corinth, NY 12822 Phone: 518.654.7895 Fax: 518.654.6864 Email: mminnolera@indeckenergy.com

Project Description

The Indeck-Corinth Energy Center is a combined cycle merchant facility consisting of a combustion gas turbine generator with heat recovery steam generator (CGTG/HRSG). The specific equipment train is made up of one General Electric Frame 7EA gas turbine-generator (CGTG) set, a Nooter/Erikson heat recovery steam generator (HRSG) with a Coen duct burner, a General Electric condensing steam turbine generator, an electrical distribution system, and instrumentation and controls. The combustion gas turbine generator is rated at 83,600 KW. The exhaust gas from the CGTG is directed to the HRSG where energy is recovered from the exhaust gas to generate steam at both 1450 psig, 980°F and 165 psig, 420°F.

Steam from the HRSG is routed to the steam turbine generator. With the shutdown of the IP mill and distilled water plant, extraction steam is no longer being utilized outside of the facility. By employing a DLN combustion system, extraction steam is not required for NOx reduction in the GT. Exhaust steam from the steam turbine is condensed in a surface condenser. Boiler feedwater is pumped from the condenser hot well to the HRSG. Condenser cooling water is cooled by an induced draft, counterflow, cooling tower, and recirculated from a concrete cooling tower basin back to the condenser.

Electricity generated by the gas and steam turbine-generators at 13.8KV is used to operate the plant. Plant power internal electrical distribution is a combination of 4160v and 480V. The plant is controlled through the Foxboro DCS (digital control system) and local mounted instrumentation. Currently there are no annual hourly operating restrictions on the main cycle; however, there is an annual rolling limitation of 17.3 million gallons of distillate allowed to be combusted as a back-up fuel.

Regulatory Status

The Indeck Corinth Energy Center is currently operating under the authority of its Title V operating permit, ID 5-4126-00028/00009 Renewal 4 Mod 1. This current Title V permit term is effective until December 31, 2023. A renewal application is required six months prior to permit expiration.

From an air emissions regulatory perspective, Indeck Corinth is subject to various federal and state regulations, including, but not limited to 40CFR50 and 51, 40CFR60, 40CFR70, 72 and 75 and various parts of NYSDEC Chapter III – Air Resources. Indeck Corinth is classified as a “major” source of air emissions per Prevention of Significant Deterioration (PSD) rules and regulations, as it has a potential-to-emit of greater than 100 tons per year. The facility is also regulated under Subpart GG – Standards of Performance for Stationary Gas Turbines. During its initial regulatory review phase, Indeck Corinth was required to conduct a Best Available Control Technology (BACT) assessment. For emissions of nitrogen oxides (NOx), the BACT determination resulted in NOX control to 9 ppm when firing natural gas, 18 ppm when firing distillate oil. Control to this emission level was to be achieved, and has subsequently been

demonstrated, with DLN followed by SCR on natural gas, and water injection with SCR on distillate. The applicability and regulatory acceptance of these control levels are formalized in various specific conditions within the facility's Title V permit. The NOx levels were also enumerated as BACT in the original permit-to-construct for the facility.

Since commencement of operations in July 1995, Indeck Corinth has consistently demonstrated compliance with its various approvals. In particular, the plant's continuous emissions monitoring system (CEMS) has shown the effectiveness of DNL with SCR (or water injection and SCR on distillate) to control NOx emissions from the gas turbine and duct burner to the facility's BACT level of 9/18 ppm. While the plant was constructed in accordance with the original BACT determination and has repeatedly demonstrated compliance with BACT, Indeck Corinth is now required to demonstrate compliance with NYSDEC Subpart 227-2 Reasonably Available Control Technology (RACT) for Major Facilities of Oxides of Nitrogen. For Indeck Corinth, Subpart 227-2 identifies one emissions source at the facility subject to this subpart. The combined cycle GE Frame 7EA combustion gas turbine/duct burner is identified under *227 – 2.4 (e) Combustion Turbines.*

RACT Analysis for the GE Frame 7EA Combined Cycle Gas Turbine

General discussion

The Indeck Corinth Energy Center is a combined cycle facility designed to supply electric power to the local grid. The plant's primary emissions source is the combined cycle gas turbine, which is a GE Frame 7EA. A HRSG with a duct burner recovers the energy from the GT exhaust and provides steam to a GE steam turbine.

The initial NOx BACT determination for Indeck Corinth selected DLN with SCR as the control alternative. DLN combustors are a historically widely accepted method with regards to NOx control in combined cycle GT's, such as the GE Frame 7EA. The emission level for this technology at the time of permit issuance was around 42 ppm NOx with the GT firing natural gas, 65 ppm for oil firing. This represented an emission reduction of nearly 70% from the uncontrolled case, which on ppm basis for gas was 148 ppm to 32 ppm. A similar reduction in the oil firing case was also realized with steam injection, 267 ppm to 54 ppm. GE datasheets are provided in Appendix B showing this control scenario. The 42/65 ppm NOx level complies with the NOx RACT limits specified in Subpart 227-2.4(e)(2), which applies to combined cycle combustion turbines. This level is applicable "prior to July 1, 2014." For Indeck Corinth, the original BACT analysis selected SCR as an add-on back end. DLN was selected as the method of combustion control. Stack emissions of NOx for this technology selection were set at 9/18 ppm for gas/oil firing. This concentration level included the contribution from the duct burner. Overall, the total control of NOx from the combination of DLN followed by SCR reaches almost 95%, 148 ppm uncontrolled to 9 ppm at the stack.

By achieving the BACT level of 9/18 ppm, the Indeck Corinth current permit limits are well below the presumptive RACT limits of 227-2.4(e)(2) specified for the time period to July 1, 2014. In accordance with the requirements under 227-2.4(e)(3), the following discussion evaluates RACT for GT operations after July 1, 2014. Discussed are available NOx control technologies, their effectives and costs of installation and operation.

Control Technologies

At the time of initial permit issuance, steam injection was the overwhelming selection for BACT determinations relative to gas turbines in combined cycle. It was normally projected to achieve +80% reductions in NOx emissions, with limited adverse consequences on cycle performance and/or equipment maintenance. At the time of construction permit issuance for Corinth, steam injection was the favored control option on the Frame 7EA. However, this GT control mechanism was being supplanted by technologies that are more effective. With emissions targets being set below those achieved by steam injection, DLN and SCR were the primary alternatives, particularly in combined cycle applications where temperature profiles were favorable. Currently, the three most common and applicable NOx control options for GT combined cycle are steam/water injection, dry low NOx combustion (DLN), and selective catalytic reduction (SCR). Of these options, steam injection and DLN are combustion control technologies, while SCR is post-combustion technology. These options are discussed as follows.

Steam Injection

NOX emissions correlate with combustion zone flame temperature. By injecting water or steam into the combustor, flame temperature can be reduced and therefore, NOx emissions are lowered. For a gas turbine, the steam injection at the combustion chamber is achieved through passages in the fuel nozzle assembly. A penalty in overall efficiency must be paid for additional fuel required to heat the water to combustor temperature. However, gas turbine output is enhanced because of the additional mass flow through the turbine. The injected water must be of boiler feed water quality to prevent deposits and corrosion in the hot turbine gas path area downstream of the combustor.

Some side effects from water/steam injection are: (1) impact on dynamic pressure activity within the combustor, (2) increase of CO emissions, (3) reduction on combustion stability, and (4) flame blow out when increasing water/steam injection. Currently, the achievable NOx emissions by water/steam injection are about 25ppm to 42ppm @ 15% O_2. The achievable NOX level is different for the type of unit and the type of fuel fired.

Dry Low-NOX (DLN)

DLN technology achieves low NOx emissions by staging fuel in a lean, premixed combustion mode at designed flame temperatures. A DLN combustor usually consists of four major components: fuel injection system, liner, venturi and cap/center body assembly. The components form two stages in the combustor. In the premixed mode, the first stage thoroughly mixes the fuel and air and delivers a uniform, lean, unburned fuel-air mixture to the second stage. The technology is based on the principal of a premixed combustion configuration to achieve uniform mixing of fuel and air, thus producing a reduced heating value gas. This will then burn at lower flame temperatures.

The achievable NOx emissions by DLN range from about 9ppm to 65ppm @ 15% O_2. The achievable NOX level is different for the type of unit and the type of fuel fired.

Selective Catalytic Reduction (SCR)

SCR technology converts NO and NO_2 in the gas turbine exhaust stream to molecular nitrogen and oxygen by reacting the NOX with ammonia in the presence of catalyst. Conventional SCR technology requires that the temperature of the exhaust stream remain in a narrow range (550^0F to 750^0F or 288^0C to 399^0C). This limits the utilization of SCR to applications where heat recovery systems are installed in the exhaust from the GT. New high-temperature SCR technology is being developed that may allow SCRs in the future to be used for applications without recovery boilers.

SCR systems are sensitive to fuels containing more than 1000ppm of sulfur, since sulfur poisons the catalyst being used in SCRs and react with ammonia to form ammonium bisulfate. This is extremely corrosive, particularly near the discharge of a heat recovery boiler. Another byproduct from the SCR systems is the ammonia slip. Ammonia slip may increase when the catalyst bed is plugged forming non-uniform distribution of the ammonia flow. Slip is also increased as NOx reduction is pushed to higher levels.

Emissions

The NOX emissions from the Indeck Corinth combined cycle GT are currently permitted at 9 ppm on gas, 18 ppm on oil. These limits are inclusive of the duct burner contribution. Regarding potential-to-emit (PTE), the main cycle has no annual operating limit. Thus, the main cycle has an annual NOx PTE of 185.6 tons. Calculations are provided in Appendix A. It is relevant to note that this PTE level assumes 8760 hours of annual operation with maximum annual

distillate operations included. The maximum allowable distillate usage is 17,300,000 gallons per year (rolling 365-day basis). Also, the technology currently in use at Corinth, DLN with SCR, is the most effective NOx emission control technology option available. DLN can achieve lower NOX emissions from the combustor than can steam injection. Furthermore, SCR as a post combustion option achieves additional reduction of NOx and is the most effective post combustion option. The Indeck Corinth main cycle run times over the previous five years are shown in Attachment A. The historic utilization levels from 2018 through 2022 are roughly about 4500 annual hours. This equates to a capacity factor of approximately 50%. As such, the PTE value is an over-estimate and it is anticipated that the future years will see the same relative level of main cycle operations at Indeck Corinth.

Cost Analysis

As discussed previously, there are three potential control options normally employed at combustion turbines: steam injection, DLN and SCR. Subpart 227-2.4(e)(3) requires a cost analysis of the various options, which is presented in Appendix C&D. Assuming a base level of 42/65 ppm via steam injection, SCR and DLN are evaluated generically in the Indeck Corinth case. However, since SCR is already employed by the project, this analysis is somewhat perfunctory. The analysis presented herein merely confirms what has already been employed. Concerning DLN, this option does not present any further reduction, as it is only a more advanced combustion control technique than steam injection. Since it is already employed with SCR, DLN on its own does not achieve a final emission rate more stringent than the existing DLN/SCR configuration. This existing plant configuration meets BACT and RACT.

<u>Post Combustion Control</u>

Control of NOX with post combustion SCR technology would be the most stringent emission control option available for Indeck Corinth. As SCR is currently employed into the cycle, the cost presented would be to replace the current SCR with a newer SCR with catalyst to reduce NOX emissions lower. The re-design effort would be significant, as the HRSG would require re-construction to accommodate the catalyst bed and the current ammonia system would need to be upgraded as well. This is all associated with the capital cost portion of the installation. Ongoing operating impacts include increased equipment maintenance, additional personnel and the regularly scheduled replacement of catalyst material, which is a significant expense. A spreadsheet detailing the cost of a new SCR at Indeck Corinth and estimated cost of parts and installation provided by various contractor during previous submitted analysis for other Indeck facilities are included in Attachment C. The cost per ton of NOX removed is calculated at $11,813. This assumes 50-56% removal of the PTE of 185.6 annual tons. While this cost and PTE are used here in accordance with air guide practice, Indeck herein points out that the facility has not exceeded 75 annual

tons within the previous five years, with the average over the past 5 years being approximately 61 tons. It is also not expected to exceed these levels in the future under any reasonable scenario. At 75 tons per year annual emission level, the cost per ton removed using a new upgraded SCR exceeds $25,000. No effort has been made to verify that the assumptions of this current evaluation are in agreement with those made at the time of original BACT review. However, it is believed to accurately reflect the overall cost of this control option upgrade and the cost per ton removed using maximum current PTE.

Combustion Control

DLN is a combustion control option that is capable of achieving lower NOx emission levels in comparison to steam injection. DLN is very specific to each particular GT, and Indeck Corinth is well aware of its applicability to the GE Frame 7EA. For a GT equipped with steam injection, the switch to DLN requires significant and costly upgrades required at the GT. Information relative to its application on a GE Frame 6 or 7 (generally applicable for Indeck Corinth) has been provided by DLN suppliers and is shown in Appendix D. The particular document attached is from PSM and details the DLN alternative from their perspective which was used in the initial NOX RACT analysis. For this analysis, it is assumed that the Indeck Corinth GT would be equipped with DLN at the indicated cost and would lower emissions from a steam injected control level of 42 ppm to 15 ppm while firing natural gas. DLN is not effective with oil firing, and those operating hours would remain at 65 ppm with steam injection for NOx control. There is now new DLN technology available, which would result in lowering the NOX emissions leaving the gas turbine down to 6 ppm while firing natural gas. Since the DLN option has already been installed and teamed with SCR, the entire cost exercise is presented merely for information purposes. This analysis is based on reducing NOX emissions leaving the gas turbine from 15 ppm to 6 ppm. This presentation is provided to fulfill the requirements of subpart 227-2 and is performed in accordance with Air Guide 20. The cost to perform an upgrade to the next version of DLN technology is the same as the proposed cost of installing it on the gas turbine originally. The only difference would be the cost associated with additional downtime, increased inspections and maintenance would remain the same as with the current DLN setup so those factors have been removed from the maintenance cost determination. Assuming its maximum PTE, the cost of control comes to about $25,652 per ton. DLN upgrade capital cost is in excess of $5,000,000 dollars for a GE GT. In any case, the DLN option is installed at Corinth and teamed with SCR to provide the equipment configuration that achieves maximum NOx control from a technology selection standpoint. No other equipment selection is available to further reduce NOx emissions.

RACT Determination for the Gas Turbine Combined Cycle

Indeck Corinth historically operated as a cogeneration facility, supplying electric power to the local grid. With the termination of steam supply to International Paper and then the distilled water plant, the facility now operates as an independent merchant power station. The current state of the electric power market has relegated the main cycle at Corinth to less than full utilization. In the attached data, it can be seen that the previous five operating years has shown a utilization factor of approximately 50% for the Corinth main cycle. As such, opportunities for further investment in the main cycle are limited. With NOx currently controlled to very low levels with DLN and SCR, annual NOx emissions from the main cycle have been below 75 tons per year for the preceding five-year period. This compares to the facility's PTE of 185.6 tons. Any calculation of effective cost of control will look arbitrarily high if the PTE value is used. In addition, the current configuration using DLN with SCR conforms with past and current BACT analyses. The SCR cost analysis presented herein merely verifies the current installation. The analysis of DLN likewise merely provides a control scenario that provides maximum benefit versus alternative combustion control alternatives, such as steam injection.

Relative to combustion turbines, Subpart 227-2 specifies the following presumptive limits prior to July 1, 2014:

> *(2) For combined cycle combustion turbines:*
>
> *(i) prior to July 1, 2014, 42 ppmvd, corrected to 15 percent oxygen, when firing gas; and*
>
> *(ii) prior to July 1, 2014, 65 ppmvd, corrected to 15 percent oxygen, when firing oil.*

For installations after July 1, 2014, the following is specified:

> *(3) For combustion turbines fired primarily with fuels not listed in paragraph (2) of this subdivision that operate prior to July 1, 2014, and for all combustion turbines that operate after July 1, 2014, the owner or operator must submit a proposal for RACT to be implemented that includes descriptions of:*
>
> *(i) the available NO_x control technologies, the projected effectiveness of the technologies considered, and the costs for installation and operation for each of the technologies; and*
>
> *(ii) the technology and the appropriate emission limit selected as RACT considering the costs for installation and operation of the technology*.

Indeck Corinth's current NOx limits easily comply with the presumptive limit applicable until 2014. Thus, continued operations under the current limit of 9/18 ppm NOx complies with RACT for the period ending mid-2014. For post-2014, this report has examined the applicable technologies relative to NOx control. The technologies discussed herein include steam injection, DLN and SCR. Indeck Corinth currently employs DLN with SCR, generally regarded as the most effective NOx control configuration. Thus, a current evaluation of RACT for Indeck Corinth shows the current DLN/SCR technology choice satisfies the requirements of Subpart 227-2 for GT installations after July 1, 2014.

Conclusions

Indeck Corinth Energy Center is subject to Subpart 227-2 RACT for Major Facilities of Oxides of Nitrogen. In particular, the combined cycle gas turbine is the emission unit at Corinth subject to this RACT regulation. For the CCGT, 227-2 sets a presumptive NOx emission limit governing operations until July1, 2014. In this case, Indeck Corinth will meet the presumptive limit of 42/65 ppm NOx for gas/oil firing by continued compliance with its existing Title V permit limits of 9/18 ppm.

The RACT review required by 227-2 has examined applicable control technologies and confirmed the current plant configuration as the appropriate method of NOx control for the GT after July 2014. Indeck Corinth will continue its evaluation of the GT relative to NOx control and will continue its commitment to reasonably improve its performance in relation to environmental compliance with the state and federal NOx control programs.

Attachments

A. Indeck Corinth NOX Potential-to-Emit / Historical Emissions Data

B. GE Spec Sheets for Steam Injection

C. SCR Cost Analysis

D. DLN Cost Analysis

Appendix A

Potential-to Emit

Historical Data

NOX RACT Analysis- Attachment A
Potential-to Emit Calculation
Indeck Corinth Energy Center
GT Combined Cycle

Process: 102	ES/C: C00GT
17300000	gal/yr #2 oil

2 oil
btu/gal
138110

0.722079189	Limit fraction on NG/yr
0.277920811	Limit fraction on oil/yr

				981.4 mmBTU/hr				1125.7 mmBTU/hr		Maximum PTE
	Proc 101	6207761	mmbtu/yr	Proc 102	2389303	mmbtu/yr	Proc 104			Process 101+102
	N.G. - lb/hr	lb/mmBTU	N.G. - tpy	#2 oil - lb/hr	lb/mmBTU	#2 oil - tpy	lb/hr	lb/mmBTU	N.G. - tpy	tpy
NOx	32		101.207	69.3		84.358	36.8		161.184	185.57

** PTE data determined and provided to the facility by Mr. Mike Sundberg, NYSDEC.

Historical Indeck Corinth Operations- Previous 5 Years

	2018	2019	2020	2021	2022
Total Operating Hours	5462.25	4519.25	3041.5	4459	4900.25
Annual NOX Emissions (tons)	74.5	62	42.2	62.1	65.7

** Operational hours & emissions data provided from end of year EDR submitted to USEPA.

Appendix B

GE Spec Sheets for Steam Injection

ESTIMATED PERFORMANCE - PG6541(B)

LOAD CONDITION			BASE	BASE	BASE
AMBIENT TEMP.		- Deg F.	59	59	59
OUTPUT		- kW	38000.	38700.	40310.
HEAT RATE (LHV)		- Btu/kWh	10960.	10860.	10640.
HEAT CONS. (LHV)	X10-6	- Btu/h	416.5	420.3	428.9
EXHAUST FLOW	X10-3	- lb/h	1104.0	1111.0	1127.0
EXHAUST TEMP		- Deg F.	1006.	1004.	998.
EXHAUST HEAT	X10-6	- Btu/h	271.9	274.5	280.4
STEAM FLOW		- lb/h	0.	6950.	23130.

TURBINE EXHAUST EMISSIONS

NOX	- ppmvd @ 15% O2	148.	~80 NSPS(1)	42.(2)
NOX AS NO2	- lb/h	247.	158.	72.
CO	- ppmvd	10.	10.	10.
CO	- lb/h	10.	10.	10.
UHC	- ppmvw	7.	7.	7.
UHC	- lb/h	4.	4.	4.
PART	- lb/h	2.5	2.5	2.5

EXHAUST ANALYSIS % VOL.

ARGON	0.90	0.90	0.87
NITROGEN	74.89	74.13	72.42
OXYGEN	13.88	13.68	13.23
CARBON DIOXIDE	3.14	3.13	3.13
WATER	7.20	8.17	10.35

SITE CONDITIONS

ELEVATION	- ft.	0
SITE PRESSURE	- psia	14.7
INLET LOSS	- in. Water	4
EXHAUST LOSS	- in. Water	10
RELATIVE HUMIDITY	- %	60
FUEL TYPE	-	METHANE
FUEL LHV	- Btu/lb	21515
APPLICATION	-	AIR COOLED GENERATOR

NOTES:

(1) NSPS - NEW SOURCE PERFORMANCE STANDARD. NOx EMISSION IS CORRECTED TO 15% O_2 WITH HEAT RATE CORRECTION.

(2) EMISSION INFORMATION BASED ON GE RECOMMENDED MEASUREMENT METHODS. NOx EMISSION IS CORRECTED TO 15% O_2 WITHOUT HEAT RATE CORRECTION AND IS NOT CORRECTED TO ISO REFERENCE CONDITIONS PER 40CFR 60.335(a)(1)(i).

(3) ESTIMATED PERFORMANCE, NOT GUARANTEED. TO BE USED FOR STUDY PURPOSES ONLY.

ESTIMATED PERFORMANCE - PG6541(B)

LOAD CONDITION			BASE	BASE	BASE
AMBIENT TEMP.		- Deg F.	59	59	59
OUTPUT		- kW	37180.	39170.	39920.
HEAT RATE (LHV)		- Btu/kWh	11070.	10790.	10690.
HEAT CONS. (LHV)	X10-6	- Btu/h	411.6	422.6	426.7
EXHAUST FLOW	X10-3	- lb/h	1107.0	1127.0	1134.0
EXHAUST TEMP		- Deg F.	1007.	1000.	998.
EXHAUST HEAT	X10-6	- Btu/h	269.9	277.6	280.5
STEAM FLOW		- lb/h	0.	19970.	27630.

TURBINE EXHAUST EMISSIONS

NOX	- ppmvd @ 15% O2	267.	NSPS(1)	65.(2)
NOX AS NO2	- lb/h	461.	160.	117.
CO	- ppmvd	10.	10.	10.
CO	- lb/h	10.	10.	10.
UHC	- ppmvw	7.	7.	7.
UHC	- lb/h	4.	4.	4.
PART	- lb/h	17.0	17.0	17.0

EXHAUST ANALYSIS % VOL.

ARGON	0.90	0.88	0.86
NITROGEN	75.59	73.42	72.63
OXYGEN	14.01	13.44	13.23
CARBON DIOXIDE	4.10	4.09	4.09
WATER	5.40	8.17	9.19

SITE CONDITIONS

ELEVATION	- ft.	0
SITE PRESSURE	- psia	14.7
INLET LOSS	- in. Water	4
EXHAUST LOSS	- in. Water	10
RELATIVE HUMIDITY	- %	60
FUEL TYPE	-	DIST.
FUEL LHV	- Btu/lb	18550
APPLICATION	-	AIR COOLED GENERATOR

NOTES:

(1) NSPS - NEW SOURCE PERFORMANCE STANDARD. NOx EMISSION IS CORRECTED TO 15% O_2 WITH HEAT RATE CORRECTION.

(2) EMISSION INFORMATION BASED ON GE RECOMMENDED MEASUREMENT METHODS. NOx EMISSION IS CORRECTED TO 15% O_2 WITHOUT HEAT RATE CORRECTION AND IS NOT CORRECTED TO ISO REFERENCE CONDITIONS PER 40CFR 60.335(a)(1)(i).

(3) DISTILLATE FUEL IS ASSUMED TO HAVE 0.015% FUEL BOUND NITROGEN, OR LESS. FUEL BOUND NITROGEN AMOUNTS GREATER THAN 0.015% WILL ADD TO THE REPORTED NOx VALUE.

(4) ESTIMATED PERFORMANCE, NOT GUARANTEED. TO BE USED FOR STUDY PURPOSES ONLY.

TMJ 112189-1-V5

Appendix C

SCR Cost Analysis

Indeck Corinth Energy Center
SCR Cost Analysis
GE Frame 7 Combined Cycle

Emission Parameter

	Annual hours	lbs/hr of NOX	PTE in annual tons GT + DB
Gas Firing	Refer to PTE in Attachment A		101.2
Oil Firing	Refer to PTE in Attachment A		84.4
			185.6

Cost methodology per Air Guide 20 (see Appendix B)

Emission Reduction Scenario: SCR to 4 ppm gas (56% removal - 9 ppm to 4 ppm Nox)
SCR to 9 ppm oil (50% removal- 18 ppm to 9 ppm Nox)

Capital Cost		$	8,000,000
Capital Recovery Factor	0.146 yrs= 10		7.5 %
Calculated Annual Equipment Cost		$	1,168,000
Annual Operating Costs			
Electricity			
Fuel		$	-
Maintenance		$	-
Catalyst Replacement		$	-
Expenses		$	-
Total Annual Costs		$	1,168,000
Annual NOX Reduction			
NOX PTE			185.6
Percent Removal	9 to 4 ppmvd (gas)		56
	18 to 9 ppmvd (oil)		50
Tons Reduced			98.9
Cost per ton for control strategy		$	11,813

Indeck Corinth Energy Center
SCR Cost Analysis
GE Frame 7 Combined Cycle

Supporting Information

Capital Recovery Factors

% Interest	0.075	Business Rate per Indeck finance dept
Years	10	
Factor (calculated)	0.146	per DAR-20 Table T-1

Capital Cost

Cost Breakdowns		Source
Engineering	$ 8,000,000	Attached email chain from Environex (includes Engineering, SCR system and components, HRGS redesign and reconstruction)
SCR System		
Ammonia System		
HRSG Work		
Re-design		
Re-construction		

Replacement Catalst
Consistant with current operations

Operating expenses/Power/Maintenance
Consistant with current operations

Appendix D

DLN Cost Analysis

Indeck Corinth Energy Center
Dry Low-NOx Cost Analysis
GE Frame 7EA Combined Cycle

arameter

	Annual hours	lbs/hr of NOX	PTE in annual tons GT + DB
Gas Firing	Refer to PTE in Attachment A		101.2
Oiling Firing	Refer to PTE in Attachment A		84.4
			185.6

odology per Air Guide 20 (see Appendix B)

eduction Scenario	DLN to 15 ppm to 6 ppm (60% removal - 15 to 6 ppm Nox on gas firing - oil remains at 65 ppm		
Capital Cost		$	9,250,000
Capital Recovery Factor	yrs= 10		7.5 %
Calculated Annual Equipment Cost		$	1,347,595
Annual Operating Costs			
Electricity		$	-
Fuel		$	-
Maintenance		$	210,000
Catalyst Replacement		$	-
Expenses		$	-
Total Annual Costs		$	1,557,595
Annual NOX Reduction			
NOX PTE			101.2
Percent Removal	15 to 6 ppm		60
Tons Reduced	oil firing remains at 65 ppm		60.7
Cost per ton for control strategy		$	25,652

Indeck Corinth Energy Center
Dry Low-NOx Cost Analysis
GE Frame 7EA Combined Cycle

Supporting Information

Capital Recovery Factors

% Interest	0.075
Years	10
Factor (calculated)	0.146

Cost Breakdowns			**Source**
Engineering	$	100,000	
DLN System	$	5,200,000	Attached quote
Spare hardware		2100000	na
Bleed system		750000	
Misc. Work			
Demolition			
Intallation, Commissioning	$	350,000	
Misc.	$	750,000	
Operating expenses			
Ammonia		na	
Replacement catalyst		na	
Power		na	
CEMS		na	
annual RATA		na	
parts		na	
labor		na	
Maintenence			
added downtime hours			2 days per year
increased GT inpsection			@$55/hr of lost revenue
inspection/maintenance			@$500/hr of lost revenue
hardware	$	210,000	@$2.1 mil over 10 years

Appendix B: Case-by-case Permit Conditions

[redacted]

Condition 60: Compliance Certification
Effective between the dates of 01/01/2024 and 12/31/2028

Applicable Federal Requirement:40CFR 52.21(j), Subpart A

Item 60.1:
The Compliance Certification activity will be performed for:

Emission Unit: U-00001 Emission Point: 00001
Process: 102

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

Item 60.2:
Compliance Certification shall include the following monitoring:

Monitoring Type: CONTINUOUS EMISSION MONITORING (CEM)
Monitoring Description:
NOx emissions are limited to 18 parts per million. This limit applies at all times except during periods of startup, fuel switching, or shutdown.

Manufacturer Name/Model Number: California Analytical Instruments 700 CLD
Parameter Monitored: OXIDES OF NITROGEN
Upper Permit Limit: 18.0 parts per million by volume
(dry, corrected to 15% O2)
Reference Test Method: Method 7E
Monitoring Frequency: CONTINUOUS
Averaging Method: 1-HOUR AVERAGE
Reporting Requirements: QUARTERLY (CALENDAR)
Reports due 30 days after the reporting period.
The initial report is due 4/30/2024.
Subsequent reports are due every 3 calendar month(s).

[redacted]

Applicable Federal Requirement:40CFR 52.21(j), Subpart A

Item 67.1:
The Compliance Certification activity will be performed for:

Emission Unit: U-00001 Emission Point: 00001
Process: 104

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

Item 67.2:
Compliance Certification shall include the following monitoring:

Monitoring Type: CONTINUOUS EMISSION MONITORING (CEM)
Monitoring Description:
NOx emissions are limited to 9 parts per million. This limit applies at all times except during periods of startup, fuel switching, or shutdown.

Manufacturer Name/Model Number: California Analytical Instruments 700 CLD
Parameter Monitored: OXIDES OF NITROGEN
Upper Permit Limit: 9 parts per million by volume (dry, corrected to 15% O2)
Reference Test Method: method 7E
Monitoring Frequency: CONTINUOUS
Averaging Method: 1-HOUR AVERAGE
Reporting Requirements: QUARTERLY (CALENDAR)
Reports due 30 days after the reporting period.
The initial report is due 4/30/2024.
Subsequent reports are due every 3 calendar month(s).

Appendix C: Public Notice Documents

ENB Region 5 Completed Applications 09/20/2023

Region 5 SEQR and Other Notices
Region 5 SPDES Renewals

Saratoga County

Applicant:

Indeck-Corinth Limited Partnership
600 N Buffalo Grove Rd Ste 300
Buffalo Grove, IL 60089 -2432

Facility:

Indeck-Corinth Energy Center
24 White St
Corinth, NY 12822

Application ID:

5-4126-00028/00009

Permit(s) Applied for:

Article 19 Air Title V Facility
Article 19 Title IV (Phase II Acid Rain)

Project is Located:

Corinth, Saratoga County

Project Description:

The Department has prepared a draft permit and made a tentative determination, subject to public comment or other information, to issue a renewal of the Title IV and Title V permits for the Indeck Corinth Energy Center. Pursuant to the requirements of Section 7(2) of the Climate Leadership and Community Protection Act (CLCPA), the Department has requested and received information regarding the project's consistency with the CLCPA.

The facility is a potentially major source of emissions of Nitrogen Oxides, Carbon Monoxide, Particulates and Volatile Organic Compounds (VOCs) and has emission rate limits based on Reasonably Available Control Technology (RACT). Nitrogen Oxides, Carbon Monoxide, and Ammonia emissions are monitored continuously. Particulate and VOC emissions are measured by stack testing at the Department's discretion. The NOx RACT variance will be submitted to USEPA for approval as a source specific revision to the New York State Implementation Plan (SIP). This renewal does not change these caps or make any other substantive changes to the current permit.

In accordance with 6NYCRR Parts 621.7(b)(9) and 201-6.3(c), the Administrator of the United States Environmental Protection Agency (USEPA) has the authority to bar issuance of any Title V Facility Permit if it is determined not to be in compliance with applicable requirements of the Clean Air Act or 6NYCRR Part 201.

Persons wishing to inspect the subject Title V files, including the application with all relevant supporting materials, the draft permit, and all other materials available to the DEC (the "permitting authority") that are relevant to this permitting decision should contact the DEC representative listed below. The Draft Permit and Permit Review Report may be viewed and printed from the Department web site at: https://www.dec.ny.gov/chemical/8569.html.

DEC will evaluate the application and the comments received on it to determine whether to hold a public hearing. Comments and requests for a public hearing should be in writing and addressed to the Department representative listed below. A copy of the Department's permit hearing procedures is available upon request or on the Department web site at: https://www.dec.ny.gov/permits/6234.html.

Availability of Application Documents:

Filed application documents, and Department draft permits where applicable, are available for inspection during normal business hours at the address of the contact person. To ensure timely service at the time of inspection, it is recommended that an appointment be made with the contact person.

State Environmental Quality Review (SEQR) Determination:

Project is not subject to SEQR because it is a Type II action.

SEQR Lead Agency: None Designated

State Historic Preservation Act (SHPA) Determination:

The proposed activity is not subject to review in accordance with SHPA. The application type is exempt and/or the project involves the continuation of an existing operational activity.

Coastal Management:

This project is not located in a Coastal Management area and is not subject to the Waterfront Revitalization and Coastal Resources Act.

DEC Commissioner Policy 29, Environmental Justice and Permitting (CP-29)

It has been determined that the proposed action is not subject to CP-29.

Opportunity for Public Comment:

Comments on this project must be submitted in writing to the Contact Person no later than *Oct 20, 2023*.

Contact:

Beth A Magee
NYSDEC Region 5 Warrensburg Sub-Office
232 Golf Course Rd
Warrensburg, NY 12885
(518)623-1281
DEP.R5@dec.ny.gov

Region 5 SEQR and Other Notices
Region 5 SPDES Renewals
