TEXAS COMMISSION ON ENVIRONMENTAL QUALITY

EXAMPLE A

**NOTICE OF APPLICATION AND PRELIMINARY DECISION
FOR AN AIR QUALITY PERMIT**

PROPOSED AIR QUALITY PERMIT GHGPSDTX112

APPLICATION AND PRELIMINARY DECISION. Colorado Bend II Power, LLC, has applied to the Texas Commission on Environmental Quality (TCEQ) for issuance of proposed Greenhouse Gas (GHG) Prevention of Significant Deterioration (PSD) Air Quality Permit GHGPSDTX112, which would authorize construction of additional electric generating units at the Colorado Bend Energy Center located at 3863 South State Highway 60, near Wharton, Wharton County, Texas 77488. This application is being processed in an expedited manner, as allowed by the commission's rules in 30 Texas Administrative Code, Chapter 101, Subchapter J. This application was submitted to the TCEQ on November 14, 2014. The proposed facility will emit greenhouse gases.

The executive director has determined that the emissions of air contaminants from the proposed facility which are subject to PSD review will not violate any state or federal air quality regulations and will not have any significant adverse impact on soils, vegetation, or visibility. All air contaminants have been evaluated, and best available control technology will be used for the control of these contaminants.

The executive director has completed the technical review of the application and prepared a draft permit which, if approved, would establish the conditions under which the facility must operate. The permit application, executive director's preliminary decision, draft permit, and the executive director's preliminary determination summary will be available for viewing and copying at the TCEQ central office, the TCEQ Houston regional office, and at the Wharton County Library, 1920 North Fulton, Wharton, Wharton County, Texas, beginning the first day of publication of this notice. The facility's compliance file, if any exists, is available for public review at the TCEQ Houston Regional Office, 5425 Polk Street, Suite H, Houston, Texas.

INFORMATION AVAILABLE ONLINE. The following documents are accessible through the Commission's Web site at www.tceq.texas.gov/goto/cid: the executive director's preliminary decision which includes the draft permit, the executive director's preliminary determination summary, and, once available, the executive director's response to comments and the final decision on this application. You may access the Commissioners' Integrated Database (CID) by using the above link and entering the permit number for this application. The Wharton County Library provides public access to the internet. The following link to an electronic map of the site or facility's general location is provided as a public courtesy and is not part of the application or notice: http://www.tceq.texas.gov/assets/public/hb610/index.html?lat=29.286666&lng=-96.065555&zoom=13&type=r. For the exact site location, refer to the permit application.

PUBLIC COMMENT/PUBLIC MEETING. You may submit public comments or request a public meeting about this application. The purpose of a public meeting is to provide the opportunity to submit comment or to ask questions about the application. The TCEQ will hold a public meeting if the executive director determines that there is a significant degree of public interest in the application, if requested by an interested person, or if requested by a local legislator. A public meeting is not a contested case hearing. There is no opportunity to request a contested case hearing for this application. **You may submit additional written public comments within 30 days of the date of newspaper publication of this notice in the manner set forth in the AGENCY CONTACTS AND INFORMATION paragraph below.**

After the deadline for public comment, the executive director will consider the comments and prepare a response to all public comment. **The response to comments, along with the executive director's decision on the application will be mailed to everyone who submitted public comments or is on a mailing list for this application.**

EXECUTIVE DIRECTOR ACTION. The executive director may issue final approval of the application. The response to comments, along with the executive director's decision on the application will be mailed to everyone who submitted public comments or is on a mailing list for this application, and will be posted electronically to the CID.

MAILING LIST. In addition to submitting public comments, you may ask to be placed on a mailing list to obtain additional information on this application by sending a request to the Office of the Chief Clerk at the address below.

AGENCY CONTACTS AND INFORMATION. Public comments and requests must be submitted either electronically at www.tceq.texas.gov/about/comments.html, or in writing to the Texas Commission on Environmental Quality, Office of the Chief Clerk, MC-105, P.O. Box 13087, Austin, Texas 78711-3087. If you communicate with the TCEQ electronically, please be aware that your email address, like your physical mailing address, will become part of the agency's public record. For more information about this permit application or the permitting process, please call the Public Education Program toll free at 1-800-687-4040. Si desea información en Español, puede llamar al 1-800-687-4040.

Further information may also be obtained from Colorado Bend II Power LLC, 325 North Saint Paul Street, Suite 2650, Dallas Texas 75201-3920 or by calling Mr. Albert M. Hatton III, Senior Environmental Project Manager, at (610) 765-5316.

Notice Issuance Date: February 24, 2015

February 20, 2015 Draft

Emission Sources - Maximum Allowable Emission Rates

Permit Number GHGPSDTX112

This table lists the maximum allowable emission rates of greenhouse gas (GHG) emissions, as defined in Title 30 Texas Administrative Code § 101.1, for all sources of GHG air contaminants on the applicant's property that are authorized by this permit. The emission rates shown are those derived from information submitted as part of the application for permit and are the maximum rates allowed for these facilities, sources, and related activities. Any proposed increase in emission rates may require an application for a modification of the facilities authorized by this permit.

Air Contaminants Data

Emission Point No. (1)	Source Name (2)	Air Contaminant Name (3)	Emission Rates
			TPY (4)
CTDB3-A	GE Model 7HA.02 Combustion Turbine (CT) and 770 MMBtu/hr Duct Burner	CO_2	1,975,187
		CH_4	37
		N_2O	3.7
		CO_2e	1,977,194
CTDB3-B	GE Model 7HA.02 CT and 770 MMBtu/hr Duct Burner	CO_2	1,975,187
		CH_4	37
		N_2O	3.7
		CO_2e	1,977,194
FWP2	Fire Water Pump 250 Horsepower Diesel Engine	CO_2	16.4
		CH_4	<0.1
		N_2O	<0.1
		CO_2e	16.5
EG3	2.0 MW Emergency Generator Diesel Engine	CO_2	155.3
		CH_4	<0.1
		N_2O	<0.1
		CO_2e	156
AUX3	Auxiliary Boiler 40 MMBtu/hr	CO_2	20,494
		CH_4	0.4
		N_2O	<0.1
		CO_2e	20,515
SF6-FUG	SF_6 Insulated Equipment (5)	SF_6	0.003
		CO_2e	66
NG-FUG	Natural Gas Piping Fugitives (5)	CH_4	19
		CO_2	1.7
		CO_2e	476.3

Emission Sources - Maximum Allowable Emission Rates

Emission Point No. (1)	**Source Name (2)**	**Air Contaminant Name (3)**	**Emission Rates**
			TPY (4)
MSS FUG	Natural Gas Venting from CT Shutdown and CT, Small Equipment, and Component Maintenance (5)	CH_4	0.1
		CO_2	<0.1
		CO_2e	2.5
Total Sitewide GHG Emissions (6)		CO_2	3,971,041
		CH_4	92.7
		N_2O	7.4
		SF_6	0.003
		CO_2e	3,975,621

(1) Emission point identification - either specific equipment designation or emission point number from plot plan.
(2) Specific point source name. For fugitive sources, use area name or fugitive source name.
(3) CO_2 - carbon dioxide
N_2O - nitrous oxide
CH_4 - methane
SF_6 - sulfur hexafluoride
CO_2e - carbon dioxide equivalents, based on the following Global Warming Potentials from 40 CFR Part 98, subpart A, Table A-1, effective January 1, 2015: CO_2 (1), CH_4 (25), N_2O (298), and SF_6 (22,800)
(4) Compliance with annual emission limits (tons per year) is based on a 12-month rolling period. Annual emission limits include both normal and maintenance, startup, and shutdown (MSS) emissions.
(5) Fugitive emission rates are estimates and are enforceable through compliance with the applicable special conditions and permit application representations.
(6) Total emissions include the potential to emit for all listed sources. Totals are given for informational purposes only and do not constitute emission limits.

Date: ______________________

Special Conditions

Permit Number GHGPSDTX112

Emission Rates and Permit Representations

1. This permit authorizes greenhouse gas (GHG) emissions only from those emission points listed in the attached table entitled "Emission Sources - Maximum Allowable Emission Rates" (MAERT), and the facilities covered by this permit are authorized to emit subject to the emission rate limits on that table and other operating conditions specified in this permit. Also, this permit authorizes the GHG emissions from planned maintenance, startup, and shutdown (MSS).

2. Emission limits are based on representations in the permit application dated November 12, 2014, as subsequently updated.

3. The combustion turbines (CTs) and duct burners, identified as emission point numbers (EPNs) CTDB3-A and CTDB3-B, shall comply with applicable requirements of the U.S. Environmental Protection Agency (EPA) regulations in Title 40 Code of Federal Regulations (40 CFR) Part 60, Standards of Performance for Greenhouse Gas Emissions, Subpart KKKK or TTTT, as adopted for GHGs.

4. This permit authorizes two natural gas-fired CTs to operate in combined cycle with heat recovery steam generators (HRSGs) and a steam turbine. Each CT shaft drives an electric generator and each HRSG supplies steam to a single steam turbine which drives a third electric generator. The CTs may employ evaporative cooling for power enhancement. Each HRSG is equipped with natural gas-fired duct burners. The duct burners in each HRSG are limited to a maximum heat input of 770 million British thermal units (Btu) per hour (MMBtu/hr), based on the high heating value (HHV) of the fuel. Exhaust emissions are controlled using selective catalytic reduction (SCR) and oxidation catalysts located in the HRSGs.

    A. This permit authorizes construction and operation of two General Electric model 7HA.02 CTs.

    B. The CTs are authorized to operate in normal operation, defined as operation anywhere between and including 45 percent (%) and 100% of full load and the SCR has been placed into operation.

    C. The CTs are authorized to operate at reduced load, defined as operation below 45% of full load that is not MSS operation.

    D. The CTs are authorized for MSS operation as defined in TCEQ NSR Air Permit No. 119365, Special Condition No. 21 and Attachments A and B.

Emissions Standards, Fuel Specifications, and Operating Specifications

5. During non-MSS operation, each CT/HRSG must comply with the following performance specifications, on a 12-month rolling average:

   A. emissions of carbon dioxide (CO_2) must not exceed 879 pounds per megawatt-hour (lbs/MWh) based on generator gross output; and

   B. the gross heat rate must not exceed 7,395 Btu (HHV)/kWh.

6. During MSS operation, CO_2 emissions from each CT/HRSG must:

   A. not exceed 186 tons/hr; and

   B. be minimized in accordance with the MSS requirements of TCEQ NSR Air Permit No. 119365, Special Condition Nos. 20 and 21.

7. The auxiliary boiler must comply with the following requirements.

   A. Emissions of CO_2 must not exceed 0.06 ton CO_2 per million Btu (HHV), on a 12-month rolling average.

   B. The boiler must be operated using good combustion practices.

   C. The fuel-to-steam efficiency must be at least 77%.

8. Fuel usage of the permitted facilities is subject to the following.

   A. The CTs, duct burners, and auxiliary boiler must use pipeline-quality natural gas containing no more than 2.0 grain (gr) on an hourly basis and 0.5 gr on an annual basis of total sulfur per 100 dry standard cubic feet.

   B. The emergency engines must use diesel fuel containing no more than 0.0015 percent sulfur by weight.

   C. Firing of any other fuel will require prior authorization from the Texas Commission on Environmental Quality (TCEQ) Air Permits Division.

   D. Upon request by the Executive Director of the TCEQ or any local air pollution control program having jurisdiction, the holder of this permit shall provide a sample and/or an analysis of the fuel fired in the CTs, duct burners, auxiliary boiler, or engines, or shall allow an air pollution control agency representative to obtain a sample for analysis.

9. The 2,937-horsepower (hp) emergency generator engine (EPN EG3) and the 250-hp fire water pump engine (EPN FWP2) are subject to the following:

   A. Non-emergency operation is limited to 100 hours, each engine, per year, on a rolling 12-month basis.

   B. Heat input is limited to:

      (1) 19 MMBtu/hr, for EPN EG3; and

(2) 2.0 MMBtu/hr, for EPN FWP2.

C. The applicable requirements of 40 CFR 60, Subpart IIII, including the use of a non-resettable elapsed time meter on each engine.

10. The permit holder shall minimize emissions from pressurized components and equipment containing GHG as follows:

A. Piping and valves in natural gas service within the operating area must be checked daily for leaks using audio, visual, and olfactory (AVO) sensing for natural gas leaks.

B. The sulfur hexafluoride (SF_6)-enclosed circuit breakers used to prevent damage in the event of a power surge must be designed to meet the latest American National Standards Institute (ANSI) C37.013 standard for high-voltage circuit breakers. The circuit breakers must be guaranteed to achieve a SF_6 leak rate of 0.5% by weight or less annually. The circuit breakers must be in a totally enclosed, pressurized compartment equipped with an alarm that signals the plant control room in the event that any circuit breaker loses pressure to the extent that 10% of the SF_6 has leaked.

C. As soon as practicable following the detection of a leak, plant personnel shall take one or more of the following actions:

(1) Locate and isolate the leak, if necessary.

(2) Commence repair or replacement of the leaking component.

(3) Use a leak collection or containment system to control the leak until repair or replacement can be made if immediate repair is not possible.

Maintenance, Startup, and Shutdown

11. The permit holder shall minimize uncontrolled venting of natural gas during MSS according to good engineering practices.

Shakedown Period

12. The performance specifications of Special Condition No. 5 do not apply during combustion shakedown. Shakedown is defined as the period beginning with initial startup and ending no later than initial performance testing, during which the permit holder conducts operational and contractual testing and tuning to ensure the safe, efficient and reliable operation of the plant. The shakedown period shall not exceed the time period for performance testing as specified in 40 CFR § 60.8. The permit holder shall operate the facility in a manner consistent with good air pollution practice for minimizing emissions at all times, including during MSS and shakedown.

Initial Demonstration of Compliance

13. The holder of this permit shall perform initial stack sampling or other testing as required to establish the actual pattern and quantities of CO_2 being emitted into the atmosphere from the CT/HRSGs in relation to the electric output of the generators, to forecast initial compliance with the output-specific CO_2 emission limit of Special Condition No. 5.A. and the emission limits of the MAERT. The holder of this permit is responsible for providing sampling and testing facilities and conducting the sampling and testing operations at the holder's expense. The TCEQ Executive Director or his designated representative shall be afforded the opportunity to observe all such sampling or testing.

   A. The CO_2 emissions must be sampled from each CT/HRSG stack using EPA Test Method 3a or 3b in 40 CFR 60, Appendix A for the concentration of CO_2. Exhaust flow rate may be measured or calculated from fuel flow. Generator gross electrical output in MWh must be measured concurrently with CO_2 concentration. Testing should consist of three, one-hour runs.

   B. Each CT must be tested with duct burners as close to maximum firing rate as possible while the turbine is operating as close to base load as possible.

   C. In accordance with 40 CFR Part 75, Appendix D and 40 CFR Part 60, the permit holder shall ensure that all required fuel flow meters are installed, a periodic schedule for HHV fuel sampling is initiated, and all certification tests are completed on or before the earlier of 90 unit operating days or 180 calendar days after the date the unit commences commercial operation, as defined in 40 CFR Part 75, Appendices D and G.

   D. The performance test must be conducted within 60 days after achieving the maximum production rate at which the affected facility will be operated, but not later than 180 days after initial startup of the facility. Additional sampling may be required by the TCEQ or EPA.

   E. The permit holder must submit a written report of the performance testing results to the TCEQ. The tested output-specific CO_2 emission rate in units of lb CO_2/MWh for each unit should be reported with the stack test report required for criteria air pollutant initial compliance under TCEQ NSR Air Permit No. 119365, Special Condition No. 14.

   F. If the tested output-specific CO_2 emission rate is not consistent with projected compliance with the 12-month rolling emission limit of Special Condition No. 5.A., the stack test report must document the potential to exceed the limit and explain how the facility will achieve compliance with the limit within the initial 12-month rolling time period.

Continuous Demonstration of Compliance

14. The permit holder shall install, calibrate, maintain, and operate a continuous monitoring system to monitor and record the natural gas consumption in the CTs, duct burners, and auxiliary boiler, and the gross electric output of the CT and steam turbine generators. The monitoring system data shall be used to demonstrate continuous compliance with the performance specifications of Special Condition Nos. 5, 6, and 7.A., and the emission limits of the attached MAERT. The data must be converted into units of the applicable standards in accordance with this special condition, as follows.

    A. Use the data to calculate for each CT/HRSG, the hourly:

        (1) Heat input. Calculate the heat input in million Btus, using the measured fuel flow and the HHV of the natural gas fuel. Calculate the hourly heat input consistent with Equation F-20 and the procedures for determining the HHV, in Section 5.5.2 of 40 CFR Part 75, Appendix F. In this section, the HHV is referred to as the gross calorific value of gaseous fuel, GCV_g, and is expressed in Btu/100 scf. The fuel supply must be sampled and analyzed for HHV at least monthly.

        (2) CO_2 emission rate. Calculate the CO_2 emission rate in short tons per hour, during all periods of operation, in accordance with 40 CFR Part 75, Appendix G, section 2.3, Equation G-4, using:

            (a) the default emission factor of 118.9 lb CO_2/MMBtu; or

            (b) a custom emission factor determined in accordance with 40 CFR Part 75, Appendix F, section 3.3.6, Equation 7-b.

        (3) Gross electric output. Calculate the gross electric output of each CT/HRSG in MWh on an hourly basis. The hourly gross electric output of the steam turbine generator is apportioned to each CT/HRSG based on the hourly proportion of each HRSG's thermal output to the steam turbine.

        (4) Heat rate. Calculate the heat rate in Btu/kWh, using the heat input and the gross electric generator output. Heat rate does not need to be calculated during periods of MSS.

        (5) Output-specific CO_2 emission rate. Calculate the output-specific CO_2 emission rate in lb CO_2/MWh by dividing the hourly CO_2 emission rate by the corresponding hourly gross output in MWh of the CT/HRSG. Output-specific CO_2 emissions do not need to be calculated during periods of MSS.

(6) Methane (CH_4) and nitrous oxide (N_2O) emissions. Calculate the CH_4 and N_2O emission rates in short tons per hour during all periods of operation, using the:

(a) measured hourly heat input;

(b) default emission factors of $1.0(10^{-3})$ kg CH_4/MMBtu and $1.0(10^{-4})$ kg N_2O/MMBtu, from Table C-2 of 40 CFR Part 98, Subpart A; and

(c) conversion factors of 0.45359 kg/lb and 2,000 lb/ton.

(7) Emission rate of carbon dioxide equivalent (CO_2e). Calculate the CO_2e emission rate, in short tons per hour, as the sum of the CO_2 emissions and the CO_2e-converted emissions of CH_4 and N_2O. The CH_4 and N_2O emission rates are converted to CO_2e emissions using the Global Warming Potentials of 25 for CH_4 and 298 for N_2O, from Table A-1 of 40 CFR Part 98, Subpart A, version effective January 1, 2015.

B. Hourly to 12-month rolling data. Calculate for each CT/HRSG, 12-month rolling:

(1) Average heat rate and output-specific CO_2 emissions to show compliance with the limits of Special Condition No. 5.

(a) Monthly heat rate is the sum of the hourly heat input for the month, excluding periods of MSS, divided by the sum of the hourly gross output for the same hourly periods. At the end of each calendar month, add the monthly heat input to the monthly heat input for the preceding 11 operating months and divide the resulting sum by the gross output in kWh for the same period.

(b) Monthly output-specific CO_2 emissions are the sum of the hourly CO_2 emissions for the month, excluding periods of MSS, divided by the sum of the hourly gross output for the same hourly periods. At the end of each calendar month, add the monthly CO_2 emissions to the monthly CO_2 emissions for the preceding 11 operating months and divide the resulting sum by the gross output in MWh for the same period.

(c) An operating month is any calendar month in which the CT/HRSG operated in normal operation for any time.

(2) Emissions of CO_2, CH_4, N_2O, and CO_2e in tons per year to show compliance with the limits of the MAERT. Monthly emissions are the sum of the hourly emissions for that month and include all periods of operation. At the end of each calendar month, add the monthly emissions to the monthly emissions for the previous 11 calendar months.

C. Auxiliary boiler calculations. Calculate hourly and 12-month rolling GHG emissions from the auxiliary boiler using the measured fuel flow and the equations (converting metric tons to short tons) in 40 CFR Part 98 as follows:

(1) Equation C-1, for CO_2; and

(2) Equation C-8, for CH_4 and N_2O.

15. Fuel meter accuracy and quality assurance. The CT and duct burner fuel flow meters must meet the applicable requirements, including specifications and certification testing, of 40 CFR Part 75, Appendix D and 40 CFR Part 60. The fuel flow meters shall be accurate to ±2.0 percent of the units' maximum flow. The fuel flow meter data shall be automatically recorded with a data acquisition and handling system.

16. Alternative monitoring of CO_2. The permit holder may, as an alternative to monitoring CO_2 emissions in accordance with Special Condition No. 13, install and operate a CO_2 CEMS, a volumetric stack gas flow monitor, and an automated data acquisition and handling system in accordance with the CO_2 CEMS system requirements in 40 CFR § 75.10(a)(3) and (a)(5) for measuring and recording the CO_2 emissions to the atmosphere from EPNs CTDB3-A and CTDB3-B.

17. Auxiliary boiler efficiency monitoring. The permit holder must measure the fuel-to-steam efficiency of the auxiliary boiler upon initial startup of the facilities and annually thereafter. Either the input-output or the heat loss method of the American Society of Mechanical Engineers' Power Test Code, PTC 4.1, may be used to calculate the overall boiler efficiency.

Recordkeeping Requirements

18. The following records shall be kept at the plant for the life of the permit and made available at the request of personnel from the TCEQ, EPA, or any air pollution control agency with jurisdiction.

A. A copy of this permit.

B. The permit application dated September 2014 and subsequent representations submitted to the TCEQ.

19. The following information shall be maintained by the permit holder in a form suitable for inspection for a period of five years after collection and shall be made immediately available upon request to representatives of the TCEQ, EPA, or any local air pollution control program having jurisdiction:

A. Records necessary to demonstrate compliance with the NSPS for GHGs identified in Special Condition No. 3, following the effective date of the NSPS, if applicable.

B. Continuous monitoring data for CT/HRSG fuel flow, heat rate, output-specific CO_2, and emissions of CO_2, CH_4, N_2O, and CO_2e, to demonstrate compliance with the performance specifications of Special Condition No. 5 and the hourly and annual emission rates listed in the MAERT.

  (1) Records must be kept for all hourly, daily, monthly, and 12-month rolling periods.

  (2) Data retention at intervals less than one hour is not required for normal operation. Periods of MSS should be identified to the nearest minute.

  (3) Records of heat rate and output-specific CO_2 should identify the times when emissions data have been excluded from the calculation because of MSS or monitoring system malfunction.

  (4) Records of emission rates should identify the times when emission data has been excluded from the calculation because of monitoring system malfunction.

  (5) Records should identify numerical factors used in calculations that are used to demonstrate compliance with emission limits and performance standards.

C. Records of monthly samples of natural gas HHV.

D. Auxiliary boiler operating records, to demonstrate compliance with Special Condition Nos. 7, including:

  (1) hours of operation, identifying startup and shutdown periods;

  (2) hourly and 12-month rolling fuel usage and GHG emission rates; and

  (3) results of annual efficiency tests.

E. Fuel purchase records, copies of gas supply contracts, test results, or other information to demonstrate compliance with the CT/HRSG, auxiliary boiler, and emergency engine fuel sulfur limits of Special Condition No. 8.

F. Records of the monthly hours of operation of the emergency engines in emergency and non-emergency operation, and records of engine maintenance, to demonstrate compliance with Special Condition No. 9.

G. Records of AVO checks for natural gas (CH_4) leaks and maintenance performed to any piping and valves in natural gas service to show compliance with Special Condition No. 10.

H. Records of maintenance or leak repair performed on SF_6-containing circuit breakers.

I. If applicable, files of all CO_2 CEMS quality assurance measures, calibration checks, adjustments and maintenance performed on these systems to demonstrate compliance with Special Condition No. 16.

Reporting

20. The holder of this permit shall submit to the TCEQ Houston Regional Office reports as described in 40 CFR § 60.7 in accordance with NSPS requirements. Such reports are required for each emission unit which is required to be continuously monitored pursuant to this permit. In addition to the information specified in 40 CFR § 60.7(c), each report shall contain:

    A. the hours of operation of the CTs; and

    B. a report summary of the periods of non-complying emissions and continuous monitoring system downtime by cause.

TEXAS COMMISSION ON ENVIRONMENTAL QUALITY
AIR QUALITY PERMIT

A Permit Is Hereby Issued To
Colorado Bend II Power, LLC
Authorizing the Construction and Operation of the
Colorado Bend II Power Project
Located near **Wharton, Wharton County, Texas** *at*
Latitude 29° 17′ 12″ Longitude –96° 3′ 56″

Permit Number: GHGPSDTX112

Draft Date : February 20, 2015 ______________________________

For the Commission

1. **Facilities** covered by this permit shall be constructed and operated as specified in the application for the permit. All representations regarding construction plans and operation procedures contained in the permit application shall be conditions upon which the permit is issued. Variations from these representations shall be unlawful unless the permit holder first makes application to the Texas Commission on Environmental Quality (commission) Executive Director to amend this permit in that regard and such amendment is approved. [Title 30 Texas Administrative Code 116.116 (30 TAC 116.116)]
2. **Voiding of Permit**. A permit or permit amendment is automatically void if the holder fails to begin construction within 18 months of the date of issuance, discontinues construction for more than 18 months prior to completion, or fails to complete construction within a reasonable time. Upon request, the executive director may grant an 18-month extension. Before the extension is granted the permit may be subject to revision based on best available control technology, lowest achievable emission rate, and netting or offsets as applicable. One additional extension of up to 18 months may be granted if the permit holder demonstrates that emissions from the facility will comply with all rules and regulations of the commission, the intent of the Texas Clean Air Act (TCAA), including protection of the public's health and physical property; and (b)(1)the permit holder is a party to litigation not of the permit holder's initiation regarding the issuance of the permit; or (b)(2) the permit holder has spent, or committed to spend, at least 10 percent of the estimated total cost of the project up to a maximum of $5 million. A permit holder granted an extension under subsection (b)(1) of this section may receive one subsequent extension if the permit holder meets the conditions of subsection (b)(2) of this section. [30 TAC 116.120(a), (b) and (c)]
3. **Construction Progress**. Start of construction, construction interruptions exceeding 45 days, and completion of construction shall be reported to the appropriate regional office of the commission not later than 15 working days after occurrence of the event. [30 TAC 116.115(b)(2)(A)]
4. **Start-up Notification**. The appropriate air program regional office shall be notified prior to the commencement of operations of the facilities authorized by the permit in such a manner that a representative of the commission may be present. The permit holder shall provide a separate notification for the commencement of operations for each unit of phased construction, which may involve a series of units commencing operations at different times. Prior to operation of the facilities authorized by the permit, the permit holder shall identify the source or sources of allowances to be utilized for compliance with Chapter 101, Subchapter H, Division 3 of this title (relating to Mass Emissions Cap and Trade Program). [30 TAC 116.115(b)(2)(B)(iii)]
5. **Sampling Requirements**. If sampling is required, the permit holder shall contact the commission's Office of Compliance and Enforcement prior to sampling to obtain the proper data forms and procedures. All sampling and testing procedures must be approved by the executive director and coordinated with the regional representatives of the commission. The permit holder is also responsible for providing sampling facilities and conducting the sampling operations or contracting with an independent sampling consultant. [30 TAC 116.115(b)(2)(C)]

6. **Equivalency of Methods.** The permit holder must demonstrate or otherwise justify the equivalency of emission control methods, sampling or other emission testing methods, and monitoring methods proposed as alternatives to methods indicated in the conditions of the permit. Alternative methods shall be applied for in writing and must be reviewed and approved by the executive director prior to their use in fulfilling any requirements of the permit. [30 TAC 116.115(b)(2)(D)]
7. **Recordkeeping.** The permit holder shall maintain a copy of the permit along with records containing the information and data sufficient to demonstrate compliance with the permit, including production records and operating hours; keep all required records in a file at the plant site. If, however, the facility normally operates unattended, records shall be maintained at the nearest staffed location within Texas specified in the application; make the records available at the request of personnel from the commission or any air pollution control program having jurisdiction; comply with any additional recordkeeping requirements specified in special conditions attached to the permit; and retain information in the file for at least two years following the date that the information or data is obtained. [30 TAC 116.115(b)(2)(E)]
8. **Maximum Allowable Emission Rates**. The total emissions of air contaminants from any of the sources of emissions must not exceed the values stated on the table attached to the permit entitled "Emission Sources--Maximum Allowable Emission Rates." [30 TAC 116.115(b)(2)(F)]
9. **Maintenance of Emission Control**. The permitted facilities shall not be operated unless all air pollution emission capture and abatement equipment is maintained in good working order and operating properly during normal facility operations. The permit holder shall provide notification for upsets and maintenance in accordance with 30 TAC 101.201, 101.211, and 101.221 of this title (relating to Emissions Event Reporting and Recordkeeping Requirements; Scheduled Maintenance, Startup, and Shutdown Reporting and Recordkeeping Requirements; and Operational Requirements). [30 TAC 116.115(b)(2)(G)]
10. **Compliance with Rules**. Acceptance of a permit by an applicant constitutes an acknowledgment and agreement that the permit holder will comply with all rules, regulations, and orders of the commission issued in conformity with the TCAA and the conditions precedent to the granting of the permit. If more than one state or federal rule or regulation or permit condition is applicable, the most stringent limit or condition shall govern and be the standard by which compliance shall be demonstrated. Acceptance includes consent to the entrance of commission employees and agents into the permitted premises at reasonable times to investigate conditions relating to the emission or concentration of air contaminants, including compliance with the permit. [30 TAC 116.115(b)(2)(H)]
11. **This** permit may not be transferred, assigned, or conveyed by the holder except as provided by rule. [30 TAC 116.110(e)]
12. **There** may be additional special conditions attached to a permit upon issuance or modification of the permit. Such conditions in a permit may be more restrictive than the requirements of Title 30 of the Texas Administrative Code. [30 TAC 116.115(c)]
13. **Emissions** from this facility must not cause or contribute to a condition of "air pollution" as defined in Texas Health and Safety Code (THSC) 382.003(3) or violate THSC 382.085. If the executive director determines that such a condition or violation occurs, the holder shall implement additional abatement measures as necessary to control or prevent the condition or violation.
14. **The** permit holder shall comply with all the requirements of this permit. Emissions that exceed the limits of this permit are not authorized and are violations of this permit.

Preliminary Determination Summary

Colorado Bend II Power, LLC
Permit Number GHGPSDTX112

I. Applicant

Colorado Bend II Power, LLC (Exelon)
325 North Saint Paul Street, Suite 2650
Dallas, Texas 75201-3920

II. Project Location

The proposed Colorado Bend II Power Project (CB II) is located at the existing Colorado Bend Energy Center (CBEC), 3863 South State Highway 60, near Wharton, Wharton County, Texas 77488.

III. Project Description

The CBEC is an existing, natural gas-fired combined cycle gas turbine (CCGT) power plant. Exelon proposes to add additional natural gas-fired CCGT power generation at the CBEC. The proposed project's major equipment comprises two General Electric model Frame 7 HA.02 combustion turbines (CTs) connected to electric generators (CTGs), two supplemental-fired heat recovery steam generators (HRSGs), and one steam turbine electric generator (STG). Each HRSG will use duct burners rated at 770 million Btu per hour of heat input to boost the CT exhaust energy when needed.

Each CTG is site-rated at 328 MW gross electric output at 70°F ambient temperature. At this condition, two HRSGs with full duct burner firing produce enough steam to generate an additional 501 MW, for a total of 1,157 MW gross, or with about 5% losses, about 1,100 MW net electric output.

Natural gas-fired CCGTs are low-emitting and energy-efficient. Natural gas is the cleanest fossil fuel. The combustion of natural gas produces more water and less carbon dioxide (CO_2), the principal GHG of fossil fuel power plants, than heavier fossil fuels. CCGT achieves energy efficiency by combining two thermal cycles. In the Brayton thermal cycle, the CT expands hot, compressed gas over turbine blades which power the CTG. In the Rankine thermal cycle, the exhaust gases from the CT flow through the HRSG, generating pressurized steam; this steam is expanded in the steam turbine, powering the STG.

In addition to the major equipment, an electric generating facility requires support equipment. The support equipment includes three fossil-fuel fired sources that are sources of GHG: an auxiliary steam boiler, a 2,000 kW emergency diesel engine generator, and a 250 horsepower emergency diesel engine fire water pump. Natural gas emissions from pipe fittings and other components in natural gas service and fuel line purges of natural gas during maintenance, startup, and shutdown (MSS) activities account for a very small amount of additional GHG emissions. Finally, to maintain safety and reliability, the main generator circuit breakers are sealed in an enclosure filled with a few hundred pounds of sulfur hexafluoride (SF_6) gas, a potent GHG. Over long periods of time, a few pounds of SF_6 may escape the seals and be emitted to the atmosphere.

IV. Emissions

The proposed CB II's maximum annual emissions of federally regulated GHG pollutants subject to review by the Texas Commission on Environmental Quality (TCEQ), in tons per year (tpy), are shown in Table IV-1. These emissions include carbon dioxide (CO_2), methane (CH_4), nitrous oxide (N_2O), and SF_6.

Table IV-1: Project Total GHG pollutants, tpy

CO_2	CH_4	N_2O	SF_6	Total GHG	Total CO_2e
3,971,041	92.7	7.4	0.003	3,971,141	3,975,621

In Table IV-1, "Total GHG" is the sum of the project's proposed CO_2, CH_4, N_2O, and SF_6 emissions. The "Total CO_2e" is the sum of these emissions expressed in equivalents, each compound weighted to reflect the heat-trapping potential of different GHG gases relative to CO_2. The "CO_2 equivalent" emissions of different GHG gases have been set by the U.S. EPA in Title 40, Code of Federal Regulations (40 CFR) Part 98, Subpart A, Appendix Table A-1. The weightings are: CO_2 - (1); CH_4 - (25); N_2O - (298); and SF_6 - (22,800).

Table IV-2 shows the project GHG emissions by type of source. The specific GHG emissions, total CO_2e emissions, and the source type's relative contribution to the project total CO_2e are shown.

Table IV-2: Project GHGs by Type of Source, tpy

Source	CO_2	CH_4	N_2O	SF_6	Total CO_2e	Total - %
CT/HRSGs (normal)	3,866,248	71.6	7.2	--	3,870,177	99.47%
CT/HRSGs (MSS)	84,126	1.6	0.2	--	84,211	2.12%
Aux. Boiler	20,494	0.4	<0.1	--	20,515	0.52%
Fugitives	2	19.1	--	0.003	545	0.01%
Engines	172	<0.1	<0.1	--	172	0.00%
Total	3,971,041	92.7	7.4	0.003	3,971,141	100.00%

The majority of the project's proposed GHG and CO_2e emissions, about 99.5% of both totals, result from the combustion of natural gas in the CT/HRSGs. The support equipment and non-CT/HRSG MSS activities account for the remaining 0.5% of the emissions. Of the GHG and CO_2e from the CT/HRSGs, about 98% is projected to be emitted during the production of electricity and 2% is expected to be emitted during CT/HRSG MSS activities, primarily CT/HRSG startups.

During MSS activities, the hourly firing rates and resulting GHG emissions from the combustion equipment may range from zero to the maximum allowed normal rates. Because the MSS rates of GHG emissions are lower than normal operation GHG emission rates, no separate hourly emission rates are established in the Maximum Allowable Emission Rate Table (MAERT) for the CT/HRSGs, engines, or auxiliary boiler. The annual GHG emission rates in the MAERT are based on full-year, normal operation at average ambient conditions for the CT/HRSGs, full-year operation of the auxiliary boiler, and 500 hours per year of operation for the two emergency engines.

V. Federal Applicability

The proposed project triggers PSD review for non-GHG NSR regulated pollutants. Under current law, PSD review for GHG is triggered whenever PSD review is triggered for non-GHG PSD pollutants and the project increase of CO_2e exceeds 75,000 tpy. As shown in Table V-1, because the project increase is more than 75,000 tpy of CO_2e, PSD review is triggered for GHG emissions.

Table V-1: GHG Permit Review Applicability

Pollutant	Project Emissions (tpy)	PSD Major Modification (tpy)	PSD Triggered? Y/N
CO_{2e}	3,975,621	75,000	Y

On November 10, 2014, the U.S. EPA granted the TCEQ the authority to review and issue GHG permits. Although this permit application was submitted to the EPA in September 2014, it was transferred on November 14, 2014 to the TCEQ for review before the U.S. EPA Region 6 had initiated formal review of the application. Substantively, whether reviewed by the U.S. EPA or the TCEQ, the GHG emissions are reviewed under the same federal PSD rules.

VI. Best Available Control Technology (BACT) Review

Each of the GHG-emitting sources within the proposed project is subject to the PSD requirement to apply BACT to the GHG emissions. Exelon's application evaluated BACT using the top-down review process. The TCEQ independently evaluated Exelon's BACT analysis. Both Exelon and the TCEQ searched the EPA's RACT/BACT/LAER Clearinghouse (RBLC), and considered recent permits issued by EPA Region 6 for CCGT electric generating units (EGUs). In addition, the TCEQ sought information related to potentially applicable control technologies, on-going GHG permitting in Texas, and emissions control developments, both in and outside of Texas.

A. CTs/HRSGs

Normal Operations

Exelon followed the 5-step, top-down BACT evaluation method. Carbon capture and storage (CCS) and energy efficiency processes, practices, and designs for the CTs/HRSGs were identified as the two available GHG pollutant control options. Exelon concluded that CCS is economically unreasonable and that BACT for the CT/HRSGs is energy efficiency processes, practices, and designs.

Exelon's BACT analysis is supported by recent BACT evaluations conducted by the U.S. EPA Region 6 for CCGT EGUs. Exelon's BACT evaluation in all major respects was identical to the ten BACT analyses detailed in the statements of basis (SOB) for the GHG permits CCGTs issued by the EPA Region 6 listed in the first column of Table VI-1. In every case, the EPA concluded that CCS is economically unreasonable and that BACT for the CT/HRSGs is energy efficiency processes, practices, and designs.

Table VI-1 identifies the GHG PSD permits for ten CCGT EGUs reviewed and issued by the EPA Region 6, from the beginning of GHG permitting in 2011 to the present. The principal purpose of these ten CCGT plants is to generate electricity for sale on the electric grid. The table does not include issued permits for two plants identified by the EPA Region 6 as CCGTs because the primary purpose of those plants, Formosa Plastics and M&G Resins, is to provide on-site support for manufacturing facilities.

Table VI-1: U.S. EPA Region 6 Issued Permits for CCGT EGUs[1]

Permit No. (PSDTX..GHG)	Issue Date	Company	County	CT Model	Permit Btu/kWh[A]	Permit lbs CO_2/MWh[B]
1350	1/23/15	Tenaska	Cameron	MHI 501GAC	7,500	922
1380	10/28/14	Lon C. Hill LP	Nueces	GE 7FA.04 GE 7FA.05 S SCC6-5000F, or S ST6-5000	7,720	920
1348	10/08/14	Victoria WLE LP	Victoria	GE 7FA.04	no limit	940
1012M2	9/29/14	Austin Energy	Travis	GE 7FA.04	7,943	930
1298	7/31/14	Pinecrest EC LLC	Angelina	GE 7FA.05 or S GT6-5000F4 or S GT6-5000F5	7,925 7,649 7,679	942 909.2 912.7
1364	4/28/14	FGE Pwr, LLC	Mitchell	Alstom GT24	7,625	889
1288	11/6/13	La Paloma EC	Cameron	GE 7FA.04 or S SGT6-5000F4 or S SGT-5000F5	7,861 7,649 7,639	934.5 909.2 912.7
955M1	11/29/12	Calpine Ch. EC	Harris	S 501F	7,730	920
979M2	11/29/12	Calpine DP EC	Harris	S 501F	7,730	920
1244	11/10/11	LCRA	Llano	GE 7FA	7,720	918

[A] Heat rate, in units of Btu/kWh, is the ratio of fuel energy input to electrical energy output, and is the industry standard measure of fossil fuel-fired generation efficiency. All permit limits in this table are based on the high heating value (HHV) of the natural gas fuel. Limits for permits issued after 2012 are based on the gross electric output of the generators; limits for permits in 2011 and 2012 are based on the generator net electric output. Limits include MSS operations for: Austin Energy, Calpine Channel and Deer Park, and LCRA. Inclusion or exclusion of MSS operations in limit is not addressed in Tenaska, Lon Hill, Victoria WLE, Pinecrest, and La Paloma. MSS operations are excluded from limit in FGE. The limit is silent on applicability to non-duct burner firing in Pinecrest and La Paloma. The limit does not apply to duct burner firing in Calpine Channel and Deer Park. Averaging period is 12-month rolling for all, except: 365-day rolling for Austin Energy and LCRA; 30-day rolling for Calpine Channel and Deer Park.

[B] The output-specific limit, in units of lbs of CO2/MWh (lbs shown here may be converted from short tons), is based on the gross output of the generators for the permits issued after 2012, and the net output for the permits issued in 2011 and 2012. Limits include MSS operations for: Austin Energy, Calpine Channel and Deer Park, and LCRA. Inclusion or exclusion of MSS operations in limit is not addressed in Lon Hill. MSS operations are excluded from limit in Tenaska and FGE, and appear excluded in Victoria WLE. Startup operations are excluded from the limits in Pinecrest and La Paloma. The limits are silent on applicability to non-duct burner firing in Pinecrest and La Paloma. The limits do not apply to duct burner firing in Calpine Channel and Deer Park. Averaging period is 12-month rolling for all, except: 365-day rolling for Austin Energy and LCRA; 30-day rolling for Calpine Channel and Deer Park.

[1] Data downloaded from permits on the U.S EPA Region 6 website at http://yosemite.epa.gov/r6/Apermit.nsf/AirP on February 19, 2015.

CCS

Exelon's cost evaluation of CCS is based on the U.S. Department of Energy's (DOE) *Cost and Performance Baseline for Fossil Energy Plants, Volume 1: Bituminous Coal and Natural Gas to Electricity*, Revision 2a, September 2013. According to this report, the cost of electricity for a natural gas-fired 2x1 CCGT EGU increases 68% with CCS compared to the plant without CCS. Exelon and the TCEQ find that these added costs are not economically reasonable.

The EPA provided detailed, critical analyses of the CCS analyses presented in the permit applications of the ten EPA-issued permits and EPA's conclusions with regard to the economic unreasonableness of CCS for those CCGT EGUs are consistent with Exelon's finding for CBII.

The EPA Region 6 also relied on the DOE's cost estimates in finding that CCS for the projects on Table VI-1 would be economically unreasonable. Seven of the ten cost analyses EPA Region 6 reviewed and accepted had CCS costs double the capital cost of CCGT without CCS; the other three had capital cost at least 50% higher with CCS. In each case, Region 6 found that the energy requirements for CCS were a significant negative impact. The TCEQ agrees with the EPA that the costs and energy impacts of CCS are economically unreasonable as BACT for natural gas-fired CCGT EGUs, including the CBII project.

Energy efficiency processes, practices, and designs

Exelon proposes BACT consisting of energy efficiency applied to processes, practices, and design of their CCGT EGUs as follows.

Efficiency measures applied to the CTs include: a modern, high efficiency industrial frame CT; evaporative cooling to improve turbine efficiency during hot outdoor temperatures; periodic burner tuning to maintain optimal thermal efficiency and performance; reduction in heat loss with insulation blankets on the CT casing; and modern instrumentation and controls, including distributed digital system controls that automate processes for optimal operation.

Efficiency measures applied to the HRSGs include: heat exchanger shell-and-tube design that maximizes the contact surface between the turbine exhaust gas and the feed water; insulation that reduces heat loss; minimization of internal heat exchange surface fouling by careful water quality control; minimization of external heat exchange surface fouling by inlet air filtration, management of ammonia slip and periodic tube cleaning; and minimization of vented steam and repair of steam leaks to maximize steam retention for power generation.

Efficiency measures applied to the steam turbine include: use of reheat cycles; use of an exhaust steam condenser to lower the exhaust steam to the saturation point, creating a vacuum which maximizes steam turbine pressure drop; efficient blading design; and effective steam turbine seals.

Efficiency measures applied to the steam turbine generator include generator cooling.

The EPA's selection of energy efficiency for the ten CCGT EGUs in Table VI-1 is consistent with and provides support for the acceptance of Exelon's same choice of BACT. However, the specific heat rate (heat rate is the inverse of efficiency) and output-specific CO_2 emission limits are all slightly different because they were determined case-by-case, based on differing small characteristics of each project.

Exelon's proposed CT is the GE F7HA.02. The proposed GE F7 HA.02 CT is a new model, advertised as the "world's largest, most efficient gas turbine in its class" by GE.[2] The proposed CBII CTs would be serial numbers 1 and 2 of this 60 Hz version; GE's press release on the proposed CBII project says the CTs are expected to be shipped in 2016. Although a new CT model, the emission-generating combustors will be GE's existing DLN 2.6+ design. A review of the CCGT ratings in Gas Turbine World (GTW), "2014 Performance Specs"[3] confirms that the GE F7 HA.02 is the largest CT in the 60 Hz market, although Siemens (S) SCC5-8000H in the 50 Hz market is larger at 400 MW. As shown in Table VI-2, this project's 2x1 CCGT plant efficiency, based on net electric output and natural gas lower heating value, is virtually identical to the advertised higher, and next lower offerings for large, 60Hz, 2x1 CCGTs from other CT manufacturers.

Table VI-2: GTW 2014 Performance Specs for 2x1 CCGTs[3]

CT Mfr	Model No.	Output (net MW)		Efficiency (net, LHV)
		per CT	plant	
Mitsubishi (M)	MPCP2(M501J)	322	943	61.7%
General Electric (GE)	2 x 7HA.02	328	976	61.2%
Siemens (S)	SCC6-8000H 2x1	274	818	>60.0%
Alstom (A)	KA24-2	231	664	58.4%

Table VI-3 provides a broader comparison of 2x1 CCGT plant efficiency and its inverse, heat rate, using the vendor-supplied model plant efficiency and heat rate data from the GTW 2014 Performance Specs. The trend shows the newest J and H class models with incrementally better performance than the F class models. Exelon's proposed heat rate for CBII and the heat rates of the issued permits in Table VI-1 show consistency with regard to ranking when compared to the GTW data. However, the proposed CBII heat rate in Table VI-4 and the permitted heat rates in Table VI-1 are higher than the corresponding heat rates in the last column of Table VI-3. Reasons for the differences include case-specific factors such as: the potential annual operations may have been modeled at the permitting stage to evaluate project economics and the modeled dispatch over time will result in a range of ambient conditions that affect long-term efficiency; site elevation differences; differences in internal plant loads due to factors such as use of wet

[2] Brochure GEA31098 (03/2014), downloaded February 20, 2015 from: http://efficiency.gepower.com/.
[3] Gas Turbine World, January-February Vol. 44 No. 1, Pequot Publishing, Fairfield CT.

cooling towers or air-cooled condensers; and higher system pressure drops due to inlet or stack exit design, and internal resistance to flow from duct burners and emission control catalysts that were not included in the GTW model plants.

Table VI-3: Heating Value, Plant Load, and Degradation Effects on Heat Rate and Efficiency[A]

Mfr/Model	GTW Eff. net, LHV	GTW Eff. net, HHV	Aged Eff. gross, HHV	GTW Btu/kWh (net, LHV)	Aged Btu/ kWh (gross, HHV)
M MPCP2 (J)	61.7%	55.5%	50.5%	5,531	6,761
GE 7HA.02	61.2%	55.1%	50.1%	5,570	6,809
S SCC6-8000H	60.0%	54.0%	49.1%	5,687	6,952
GE 7F.05	59.5%	53.6%	48.7%	5,740	7,017
GE 7F.04	59.0%	53.1%	48.3%	5,790	7,078
A KA24-2	58.4%	52.6%	47.8%	5,843	7,143
S SCC6-5000F	58.0%	52.2%	47.4%	5,882	7,190

[A]Assumptions: CH_4 HHV/LHV – 1.11; Plant load – 2% of gross output; degradation due to aging – 12.3%.

Exelon's proposed annual heat rate and output-specific CO_2 emission limits are shown in Table VI-4. Exelon provided a natural gas analysis for CBII with an HHV-to-LHV ratio of 1.11. Plant auxiliary power is about 3% of full load output. The proposed factor for equipment aging over the life of the plant (and permit) was 12.3%, consistent with most other GHG permits for CCGT EGUs. Exelon says the plant is expected to operate largely at base load, rather than with daily starts.

Table VI-4: Exelon's Proposed BACT Limits for CT/HRSGs

CT Model	Permit Btu/kWh[A]	Permit lbs CO_2/MWh[A]
GE F7HA.02 (2x1)	7,395	879

[A] Based on natural gas HHV, gross generator output, exclusion of MSS, monthly rolling 12-month rate.

The proposed BACT limits compare well with those of previously issued GHG permits. Searches of the EPA's RACT-BACT-LAER (RBLC) Clearinghouse for gas-fired CCGTs were conducted by the applicant and the TCEQ permit reviewer. The applicant also provided summary information for several projects not yet in the RBLC. Exelon's proposed emission limits were comparable to several issued permits outside Texas, including the Arcadis-U.S. Clean Energy Center in Ohio and the Salem Harbor repowering project in Massachusetts. Exelon's proposed limits appear to reflect BACT for GHG emissions from the CT/HRSGs.

Maintenance, Startup and Shutdown (MSS) Emissions

Startup and shutdown of the CTs is a necessary operation. The CT/HRSG firing rates are reduced during startup and shutdown. Duct burner firing is not used during startup or shutdown. The CT firing rates are transitioning from zero to normal rates during a startup, and from normal rates to zero during a shutdown. Because emissions of GHG are directly proportional to the amount of natural gas burned, the lower firing rates result in lower-than-normal GHG emissions during startup and shutdown. The emission limits in the MAERT remain applicable during MSS. It is not effective to specify a reduced firing rate during these activities. From the owner's perspective, startup and shutdown should be as efficient as possible while maintaining the integrity of the equipment and ensuring safe operation. Efficiency, as measured by ratio of the electricity energy output to the natural energy input, is poor or nonexistent during startup and shutdown; delaying efficient operation is detrimental to the purpose of the project. Nonetheless, the PSD rules do not exempt MSS from the BACT requirement. The permit BACT requirement is to minimize startup and shutdown emissions from the CTs by minimizing the duration of startups and shutdowns, in accordance with Special Condition No. 21 of Permit No. 119365.

Maintenance of the CTs includes a number of optimization activities that must be conducted while the CTs operate, sometimes under transient or reduced load. To the extent that plant efficiency is impaired while conducting on-line maintenance, there is a similar incentive for the owner to minimize the duration of the activity. Emissions from CT maintenance are also subject to the emission limits of the MAERT and BACT is achieved by compliance with those limits.

B. Auxiliary Boiler

The proposed natural gas-fired auxiliary boiler, with a heat input rating of 40 MMBtu/hr, will be used to minimize the duration of CT/HRSG startup periods. The auxiliary boiler is expected to be used to maintain vacuum on steam seals while the HRSGs are not operating, which reduces the steam turbine startup time. Based on unrestricted annual hours of operation, the proposed auxiliary boiler emissions account for about 0.5% of the project CO_2e emissions.

Exelon identified four potentially applicable control technologies: CCS, low-carbon fuel, good operating and maintenance practices, and energy efficient design. Exelon rejected CCS and chose each of the other methods. The TCEQ's review of other GHG permits requirements for auxiliary boilers supports Exelon's proposed BACT for the auxiliary boiler.

Exelon identified intermittent operation and low CO_2 concentration in the flue gas as reasons that CCS is not economically reasonable for controlling the CO_2 emissions. While these are probably valid reasons in practice, the proposed potential emissions reflect continuous, rather than intermittent operation, and full load, instead of reduced load. A natural gas-fired boiler with a typical full load exhaust oxygen level of 3% dry volume produces CO_2 of about 10% dry volume, about twice the concentration of the CTs. However, even assuming continuous operation and full load, CCS is not economically reasonable for the auxiliary boiler. The costs of building a CO_2 capture system and pipeline would far exceed the economic benefit of reduced startup times, and the applicant would have to forego the auxiliary boiler. Therefore, CCS is not BACT for the auxiliary boiler.

Emissions of CO_2, CH_4, and N_2O will be minimized though the use of efficient natural gas, a low-carbon fuel, good combustion and maintenance practices, and energy-efficient design. Special Condition No. 17 of the draft permit requires the boiler efficiency to be tested on an annual basis. These techniques meet BACT.

C. Fugitive Emission Sources

Natural Gas Emissions from Piping and Components in Natural Gas Service

Although the natural gas supply to the CTs, duct burners, and auxiliary boiler is conveyed in pipes, flanges, compressor seals, and other components that are sealed to prevent leaks, connectors and seals are not 100% leak-proof at all times. The applicant estimated the annual potential for natural gas emissions from approximately 3,000 components in natural gas service at 19 tpy of CH_4 and about 2 tpy of CO_2. The emissions are a negligible portion of the project total, at about 0.01% of the project CO_2e. Nonetheless, various leak detection and repair programs are applicable and available. Hand-held analyzers, remote sensing and audio, visual, and olfactory (AVO) detection methods are among the possible control methods. Based on the very small amount of emissions, the least costly of these methods, AVO programs, have been required in recent GHG permits. Proposed Special Condition No. 10 of the draft permit requires that a program of daily AVO detection be implemented and if a leak is detected, it be located, isolated, and repaired as soon as practicable. Compliance with the permit conditions constitutes BACT for these sources.

SF_6-containing Circuit Breakers

The generator circuit breakers associated with the proposed units will be insulated with SF_6. SF_6 is a colorless, odorless, non-flammable, and non-toxic synthetic gas. It is a fluorinated compound that has an extremely stable molecular structure. The unique chemical properties of SF_6 make it an efficient electrical insulator. The gas is used for electrical insulation, arc quenching, and current interruption in high-voltage electrical equipment. SF_6 is only used in sealed and safe systems, which under normal circumstances do not leak gas at conventionally measurable rates. Over long periods of time the SF_6 requires replenishment. The capacity of the circuit breakers associated with the proposed plant is currently estimated to be 1,160 lbs of SF_6. The proposed circuit breaker at the generator output will have a low pressure alarm and a low pressure lockout. The alarm will alert personnel of any leakage in the system, and the lockout prevents any operation of the breaker due to lack of “quenching and cooling” of SF_6 gas.

Proposed Special Condition No. 10 of the draft permit requires that if a leak is detected, it be located, isolated, and repaired as soon as practicable. Circuit breaker design and compliance with the permit conditions constitutes BACT for this potential source of GHG.

Natural Gas Emissions from Turbine Shutdowns and Small Equipment/Fugitive Component Repair or Replacement

After the CTs are shut down, a short length of fuel piping may be purged for safety reasons. Potential emissions are calculated at 0.1 tpy of CH_4, or 2.5 tpy of CO_2e. These emissions are negligible and no control is considered BACT.

D. Emergency Engines

The proposed project includes two new diesel-fired emergency engines: a 2.0 MW electric generator engine and a 250 horsepower, fire water pump engine. Exelon analyzed BACT for the engines using the top-down review method. TCEQ reviewed Exelon's analysis and concurs with it. Potential alternative power sources to drive the engines, either natural gas or electricity, do not meet the technical feasibility requirement to be available under the range of emergencies considered; a liquid fuel supply is more likely to be available. Both gasoline and diesel fuel have similar GHG emissions; diesel is preferred for its longevity under storage. The BACT measures selected, use of good operating and maintenance practices, and low annual capacity factor, are consistent with the BACT measures in similar permits. Each emergency engine is limited to 100 hours per year of non-emergency operation, for periodic maintenance activities and readiness testing.

VII. Air Quality Analysis

The air quality analysis is a key element of the PSD permit review for the criteria air pollutants, those for which the U.S. EPA has established NAAQS. For the proposed CBII power project, the air quality analysis for the criteria and other individual air pollutant emissions is summarized in the Preliminary Determination Summary (PDS) for Permit No. PSDTX1410. In contrast to the criteria pollutant PSD permit, for the reasons explained below, there is no benefit to an air quality analysis for GHG pollutant PSD permits, and none is required by the EPA or TCEQ.

Criteria and other individual air pollutants may have localized, direct health or welfare impacts; air dispersion modeling is required to demonstrate that a proposed source will not have adverse impacts of this nature. In contrast, the GHG pollutants are virtually certain not to have such impacts. The CO_2 and CH_4 emissions under review in this permit application are chemically stable, trace components of the natural atmosphere that are classified by the TCEQ Toxicology Division as simple asphyxiants. An asphyxiant gas is a nontoxic or minimally toxic gas which reduces or displaces the normal oxygen concentration in breathing air. The ground level increases in CO_2 or CH_4 concentrations from the CBII's exhaust stacks would be far below the level at which the normal oxygen concentrations in the atmosphere are affected. The compound N_2O is a combustion byproduct emitted in miniscule concentrations and is also a trace component of the natural atmosphere. The compound SF_6 is a manmade chemical whose emissions from the sealed circuit breakers are too small to measure. As a consequence of their toxicological characteristics or low emission rates, none of the GHG emissions from power plant emissions require air dispersion modeling or other case-by-case evaluation of their ambient impacts.

The GHG permit review does not involve an air quality analysis of global impacts, although the purpose of the GHG PSD permit program is to address potential effects from large GHG sources on the global atmosphere and climate. The existing climate models evaluate cumulative, global-scale GHG emissions; individual facility impacts are too small for meaningful analysis. In their guidance on PSD permitting for GHG sources, the EPA has said, "Quantifying…exact impacts attributable to the specific GHG source obtaining a permit in specific places is not currently possible with climate change modeling."[4]

VIII. Conclusion

Exelon proposes emission limits and equipment specifications that represent BACT for the GHG emissions from the proposed electric generating facility. The applicant has demonstrated the project meets all applicable rules, regulations and requirements of the Texas and Federal Clean Air Acts. The executive director's preliminary decision is to issue Permit No. GHGPSDTX112.

[4] "PSD and Title V Permitting Guidance for Greenhouse Gases," p. 48. Office of Air Quality Planning and Standards, U.S. EPA, March 2011.