

COMMONWEALTH OF VIRGINIA
STATE AIR POLLUTION CONTROL BOARD MEETING
June 21, 2019

SUBJECT: Prevention of Significant Deterioration (PSD) Permit for Balico LLC/ –
Chickahominy Power, Registration No. 52610 - Public Participation Report and
Request for Board Action

SPEAKER: Michael G. Dowd
Director, Air Division
Department of Environmental Quality

INTRODUCTION

Balico LLC / Chickahominy Power (BCP) has proposed to construct and operate a new natural gas-fired combined-cycle electric power generating facility in Charles City County (the “Chickahominy Power Station” (CPS)) with a nominal generating capacity of 1650 megawatts (MW) at ISO (International Organization for Standardization) conditions. Prevention of Significant Deterioration (PSD) permitting is triggered because, as a fossil fuel-fired steam electric plant of more than 250 million British thermal units (MMBtu) per hour heat input capacity, the proposed facility is a major stationary source under 9 VAC 5 Chapter 80, Article 8. The proposed site is an area of Charles City County about 10 miles southeast of the Richmond International Airport.

BCP submitted its initial air permit application on February 22, 2017. The application was deemed complete on January 10, 2019 when an updated application was submitted.

The applicant held the required informational briefing on May 17, 2017. DEQ’s public hearing for the proposed permit was held March 5, 2019. The public comment period was opened January 31, 2019 and ended March 20, 2019.

Staff analysis has shown that BCP has met the requirements of the PSD permitting regulations at 9 VAC 5 Chapter 80, Part II, Article 8, and that the proposed facility, operating in accordance with the conditions of the proposed permit (Attachment A), will not cause or significantly contribute to an exceedance of ambient air quality standards or PSD increments.

PERMIT APPLICATION REVIEW

BCP has applied for a permit to construct and operate a natural gas-fired combined cycle electric power generating facility with a nominal generating capacity of 1650 megawatts (MW). The proposed facility is comprised of three combustion turbine (CT) generators, each having a heat recovery steam generator (HRSG) driving a steam turbine (ST) for additional electricity generation. The CT-HRSG arrangement is commonly called combined cycle. The proposed facility also includes two auxiliary boilers, an emergency diesel firewater pump, an emergency

diesel generator, three fuel gas heaters, circuit breakers (total capacity of 22,800 pounds of sulfur hexafluoride), and two distillate oil storage tanks.

The pollutants of concern from the combined-cycle units are nitrogen oxides (NO_x), carbon monoxide (CO), volatile organic compounds (VOC), greenhouse gases (GHG), sulfur dioxide (SO₂), sulfuric acid mist (H₂SO₄), particulate matter (PM), particulate matter having an aerodynamic diameter equal to or less than ten microns (PM₁₀), and particulate matter having an aerodynamic diameter equal to or less than 2.5 microns (PM_{2.5}). NO_x from the units will be controlled using dry low-NO_x combustion and selective catalytic reduction (SCR). CO and VOC will be controlled by oxidation catalyst. The total emissions from the proposed project are shown in Table 1.

Table 1. Total emissions from proposed CPS

Pollutant	Emissions (tons/yr)
NO _x	407
CO	323
SO ₂	62
VOC	211
PM	169
PM ₁₀	169
PM _{2.5}	169
Sulfuric acid mist	65
GHG	6,479,692
Formaldehyde	9.86
Acrolein	0.23
Cadmium	0.059
Chromium	0.075
Beryllium	0.00064
Nickel	0.12
Mercury	0.014
Lead	0.027

Note: Emissions of regulated toxic pollutants other than those listed above are below permitting exemption thresholds and were therefore not included in Table 1

The proposed site for the CPS is a 185-acre parcel ESE of the intersection of State Route 106 (Roxbury Rd.) and State Route 685 (Chambers Rd.) and adjacent to the Dominion Energy Chickahominy Substation. There are no Class I areas (areas such as national parks or wildlife sanctuaries) within 100 km of the proposed facility. The Federal Land Managers were notified of the project but none requested that a Class I Air Quality Related Values modeling analysis be included as part of the permit review.

DEPARTMENT ANALYSIS

Criteria Pollutants

Applicability of PSD review is evaluated on a pollutant-specific basis. A new stationary source that has the potential to emit (PTE) major quantities of a pollutant (i.e., a fossil fuel-fired steam electric plant over 250 MMBtus per hour heat input having the PTE to emit over 100 tons per

year of a pollutant) is subject to PSD review for any regulated NSR pollutant with the PTE over the PSD significant rate in 9 VAC 5-80-1615 C. Pollutants exceeding PSD major or PSD significance levels for the proposed BCP project are NO_x, CO, VOC, GHG, PM, PM₁₀, PM_{2.5}, SO₂ and sulfuric acid mist. GHG emissions (CO₂ equivalents or CO_{2e}) exceeded the PSD threshold established by EPA’s PSD and Title V Greenhouse Gas Tailoring Rule, adopted in 9 VAC 5-85-50 (75,000 tons per year) and so, too, are subject to PSD review.

Emissions of pollutants subject to PSD review are required to undergo a top-down Best Available Control Technology (BACT) analysis and air quality analyses.

BACT

Pollutants subject to a PSD review from a proposed facility must undergo a rigorous “top-down” BACT analysis. The “top-down” method provides that all available control technologies be ranked in descending order of control effectiveness. The applicant first examines the most stringent or “top” alternative. The top alternative is established as BACT unless the applicant demonstrates that technical considerations or energy, environmental, or economic impacts justify that the most stringent technology is not feasible. For the proposed BCP project, the pollutants subject to BACT are NO_x, CO, VOC, PM, PM₁₀, PM_{2.5}, CO_{2e}, SO₂ and sulfuric acid mist.

A summary of the BACT analysis is presented in Table 2.

Table 2 – BACT Summary

Pollutant	Equipment and Primary BACT	Control	Compliance								
CO _{2e}	Turbines Initial emission limit for CO _{2e} : 812 lb/MWh annual average Initial heat rate limit: 6,452 Btu/kWh net HHV at full load, ISO conditions	Energy efficient combustion practices and low GHG fuels	Fuel monitoring Power output monitoring Initial heat rate evaluation ASME Performance Test Code on Overall Plant Performance (PTC 46)								
CO _{2e}	Auxiliary boilers and fuel gas heaters	Good combustion practices (GCPs), clean fuel (NG), and efficient design.	Manufacturer specifications and maintenance.								
CO _{2e}	Emergency Generators	High efficiency operation and limit on annual hours of operation	Fuel usage monitoring								
CO _{2e}	Electrical Circuit breakers 0.5% leakage rate	Enclosed-pressure type breaker and leak detection	Audible alarm with decreased pressure.								
CO _{2e}	Fugitive leaks from natural gas piping components	AVO monitoring and leak repair	recordkeeping								
NO _x	Turbines This limit applies at all times except SU/SD and tuning events: 2.0 ppmvd @ 15% O ₂ (1-hour avg.) Limits during SU/SD for each event: <table border="1" style="margin-left: 20px;"> <tr> <td>Cold start</td> <td>60 lb/turbine</td> </tr> <tr> <td>Warm start</td> <td>54 lb/turbine</td> </tr> <tr> <td>Hot start</td> <td>42 lb/turbine</td> </tr> <tr> <td>shutdown</td> <td>20 lb/turbine</td> </tr> </table> Limits during tuning: 703 lb/turbine/calendar day	Cold start	60 lb/turbine	Warm start	54 lb/turbine	Hot start	42 lb/turbine	shutdown	20 lb/turbine	Dry Low NO _x burners SCR	Annual fuel throughput and NO _x CEMS Stack test Annual limit for tuning events
Cold start	60 lb/turbine										
Warm start	54 lb/turbine										
Hot start	42 lb/turbine										
shutdown	20 lb/turbine										
NO _x	Auxiliary Boilers (each) 0.6 lb/hr (0.011 lbs/MMBtu) Fuel gas heaters	Natural gas combustion with dry low NO _x burners	Annual fuel throughput and NO _x CEMS Stack test								

Pollutant	Equipment and Primary BACT	Control	Compliance								
	0.011 lb/MMBtu (9 ppmvd @ 3% O ₂)										
NO _x	Emergency Generators EG-1 4.8 g/bhp-hr FWP-1 2.6 g/bhp-hr	GCPs	Annual hours of operation								
CO	Turbines This limit applies at all times except SU/SD and tuning events: 1.0 ppmvd @ 15% O ₂ (3-hour avg) Limits during SU/SD for each event: <table border="1" style="margin-left: 20px;"> <tr><td>Cold start</td><td>444 lb/turbine</td></tr> <tr><td>Warm start</td><td>396 lb/turbine</td></tr> <tr><td>Hot start</td><td>252 lb/turbine</td></tr> <tr><td>shutdown</td><td>156 lb/turbine</td></tr> </table> Limits during tuning: 214 lb/turbine/calendar day	Cold start	444 lb/turbine	Warm start	396 lb/turbine	Hot start	252 lb/turbine	shutdown	156 lb/turbine	Oxidation catalyst GCPs	CO CEMS Annual limit for tuning events
Cold start	444 lb/turbine										
Warm start	396 lb/turbine										
Hot start	252 lb/turbine										
shutdown	156 lb/turbine										
CO	Auxiliary Boilers (each) 3.2 lb/hr (0.037 lbs/MMBtu) Fuel gas heaters 0.5 lb/hr (0.037 lb/MMBtu)	Clean fuel and GCPs	Stack test								
CO	Emergency generators 2.6 g/hp-hr	Proper operation and maintenance, clean fuel	Annual hours of operation								
VOC	Turbines This limit applies at all times except SU/SD and tuning events: 0.7 ppmvd @ 15% O ₂ (3-hour avg) Limits during SU/SD for each event: <table border="1" style="margin-left: 20px;"> <tr><td>Cold start</td><td>216 lb/turbine</td></tr> <tr><td>Warm start</td><td>216 lb/turbine</td></tr> <tr><td>Hot start</td><td>168 lb/turbine</td></tr> <tr><td>shutdown</td><td>216 lb/turbine</td></tr> </table> Tuning events are limited to no more than 18 consecutive hours and 96 hours per year.	Cold start	216 lb/turbine	Warm start	216 lb/turbine	Hot start	168 lb/turbine	shutdown	216 lb/turbine	Oxidation catalyst GCPs	Stack test and CO CEMS correlation Tracking duration of SU/SD and maintenance events. Annual limit for tuning events
Cold start	216 lb/turbine										
Warm start	216 lb/turbine										
Hot start	168 lb/turbine										
shutdown	216 lb/turbine										
VOC	Auxiliary boilers and fuel gas heaters 0.005 lb/MMBtu	GCPs	Annual fuel throughput								
VOC	Emergency generators FWP-1 0.11 g/hp-hr EG-1 1.0 g/hp-hr	GCPs	Annual hours of operation								
H ₂ SO ₄	Turbines These limits apply at all times 0.0012 lb/MMBtu	Low sulfur fuel with a sulfur content of no more than 0.4 gr/100 scf on an annual average.	Fuel monitoring								
H ₂ SO ₄	Auxiliary boilers and fuel gas heaters	Pipeline quality natural gas with a sulfur content of no more than 0.4 gr/100 scf on an annual average.	Fuel monitoring								
H ₂ SO ₄	Emergency generators 0.000118 lb/MMBtu	ULSD fuel with 15 ppm S	Fuel monitoring								
SO ₂	Turbines This limit applies at all times 0.00114 lb/MMBtu	Low sulfur fuel	Fuel monitoring, stack test								
SO ₂	Auxiliary boilers 0.00114 lb/MMBtu	Pipeline quality NG with a sulfur content of no more than 0.4 gr/100 scf on an annual basis.	Fuel monitoring								
SO ₂	Emergency generators 0.00154 lb/MMBtu	ULSD fuel with 15 ppm S	Fuel certification and annual hours of operation								
PM	Turbines These limits apply at all times except during tuning events: 0.0052 lb/MMBtu	Low sulfur/ash fuel (pipeline quality NG with no more than 0.4 gr/100scf on an annual average) and GCPs	Stack test Annual limit for tuning events								

Pollutant	Equipment and Primary BACT	Control	Compliance
	Tuning events are limited to no more than 18 consecutive hours and 96 hours per year.		
PM	Auxiliary boilers and fuel gas heaters 0.007 lbs/MMBtu Auxiliary boilers 0.6 lbs/hr	Low sulfur/carbon fuel and GCPs	Annual fuel throughput
PM	Emergency generators EG-1 0.15 g/hp-hr FWP-1 0.15 g/hp-hr	Low sulfur fuel and GCPs	Annual hours of operation
PM ₁₀	Turbines These limits apply at all times except during tuning events: 12.3 lbs/hr (0.0052 lb/MMBtu) average of three test runs Tuning events are limited to no more than 18 consecutive hours and 96 hours per year.	Low sulfur/ash fuel (pipeline quality NG with no more than 0.4 gr/100scf on an annual average) and GCPs Minimizing duration of maintenance events.	Stack test Annual limit for tuning events
PM ₁₀	Auxiliary boilers and fuel gas heaters 0.007 lbs/MMBtu Auxiliary boilers 0.6 lbs/hr	Low sulfur/carbon fuel and GCPs	Annual fuel throughput
PM ₁₀	Emergency generators EG-1 0.15 g/hp-hr FWP-1 0.15 g/hp-hr	Low sulfur fuel and GCPs	Annual hours of operation
PM _{2.5}	Turbines These limits apply at all times except during tuning events: 12.3 lbs/hr (0.0052 lb/MMBtu) average of three test runs Tuning events are limited to no more than 18 consecutive hours and 96 hours per year.	Low sulfur/ash fuel (pipeline quality NG with no more than 0.4 gr/100scf on an annual average) and GCPs Minimizing duration of maintenance events.	Stack test Annual limit for tuning events
PM _{2.5}	Auxiliary boilers and fuel gas heaters 0.007 lbs/MMBtu Auxiliary boilers 0.6 lbs/hr	Low sulfur/carbon fuel and GCPs	Annual fuel throughput
PM _{2.5}	Emergency generators EG-1 0.15 g/hp-hr FWP-1 0.15 g/hp-hr	Low sulfur fuel and GCPs	Annual hours of operation

Toxic Pollutants/Hazardous Air Pollutants (HAPs)

40 CFR 63 Subpart YYYYY, National Emissions Standards for HAPs from Stationary Combustion Turbines, applies to CTs located at major HAP sources. The HAP emissions from the proposed CPS do not exceed major source thresholds for HAPs (i.e., 10 tons per year of a single HAP or 25 tons per year of all HAPs combined). Accordingly, the proposed facility is not subject to the MACT standard.

Since the facility is not subject to the MACT standard, the emissions of toxic pollutants were examined for applicability to the toxic pollutant standards in 9 VAC 5-60-300. As a result, BCP conducted an evaluation of toxic pollutants and compared proposed emission rates to the emission standards in 9 VAC 5-60-300. This evaluation includes a modeling analysis for eight pollutants for which permitted emissions were above the exemption levels in 9 VAC 5-60-300 (acrolein, beryllium, lead compounds, formaldehyde, cadmium, chromium, mercury, and nickel). The modeling analysis indicates that the impacts of the eight pollutants are well below their applicable Significant Ambient Air Concentrations (SAACs).

Testing

The permit requires initial stack tests for NO_x, SO₂, CO, PM, PM₁₀, PM_{2.5}, and VOC from the combined-cycle units. Periodic stack tests will continue for PM₁₀, PM_{2.5}, VOC (every five years), and SO₂ (annually). Initial stack tests for NO_x and CO from the auxiliary boiler and fuel gas heaters is also required. Additional stack tests can be requested by DEQ.

BCP must conduct an initial power block heat rate test to determine compliance with the heat rate in the permit to demonstrate efficient operation of the turbines and associated HRSG. Periodic (every six years) power block heat rate tests are also required.

Visible emissions evaluations (VEEs), concurrent with the initial CT, auxiliary boiler, and fuel gas heaters stack tests, are required by the permit.

The permit allows the permittee to use the fuel quality characteristics in a current, valid purchase contract, tariff sheet, or transportation contract for the fuel to verify that the sulfur content of the natural gas is 0.4 grains or less of total sulfur per 100 standard cubic feet. Alternatively, per 40 CFR 60.4370, the permit allows BCP to determine the sulfur content of the natural gas by testing using two custom monitoring schedules or an EPA-approved schedule. The permit also requires the permittee to obtain fuel supplier certification for each shipment of distillate oil used in the emergency diesel generator and fire water pump.

Monitoring

The permit requires that the CT stacks be equipped with Continuous Emission Monitoring Systems (CEMS) meeting the requirements of 40 CFR Part 75 (Acid Rain Program) for NO_x and SO₂ (unless an alternative method of determining SO₂ emissions has been approved for that purpose) and meeting the requirements of 40 CFR Part 60 for CO. In addition to the CEMS, the permit requires BCP to conduct extensive, continuous monitoring of key operational parameters on the control devices to assure proper operation and performance.

Recordkeeping

The permit requires BCP to keep records of all CEMS results; control device parametric monitoring results; results of fugitive leak inspections; monthly fuel throughput for the turbines, auxiliary boiler and fuel gas heaters; net electrical energy output of the plant; calculations of CO₂ monthly emissions; and the frequency and duration of any SU/SD or tuning events. BCP is further required by the permit to keep records of all fuel certifications and testing results, and monthly operating hours for the emergency generator and fire water pump.

Reporting

BCP must provide quarterly reports to DEQ of CEMS results, including whether or not excess emissions have occurred, and emissions associated with alternative operating scenarios. BCP is required by the permit to notify DEQ of commencement of construction, facility start-up, and to provide 30-day prior notice for each performance test conducted, and the results of performance tests.

Air Quality Analyses

In addition to the BACT review, PSD regulations require an air quality analysis be performed that demonstrates the projected air emissions from the proposed facility will neither cause or significantly contribute to a violation of any applicable National Ambient Air Quality Standard (NAAQS) or PSD increment. In addition, PSD regulations require that an additional impact analysis consisting of a soil and vegetation analysis, a growth analysis, and a visibility impairment analysis be conducted.

Prior to conducting the analyses, BCP submitted a protocol outlining the intended methodology and input data for both areas. DEQ staff reviewed and approved the protocol. Based on DEQ's review of the NAAQS and PSD increment analyses, the proposed project does not cause or significantly contribute to a predicted violation of any applicable NAAQS or Class I and Class II area PSD increment.

The DEQ's review of the required air quality analyses for the CPS for both Class I and Class II PSD areas is attached to this document (Attachment C). This document also includes DEQ's review of an additional impact analysis consisting of a soil and vegetation analysis, a growth analysis, and a visibility impairment analysis.

PUBLIC PARTICIPATION ACTIVITIES

Applicant Informational Briefing

In accordance with 9 VAC 5-80-1775 C of the Regulations, the applicant held an informational briefing on May 17, 2017 at the Charles City County Government Building in Charles City, Virginia.

Public Hearing

In accordance with 9 VAC 5-80-1775 F, a public hearing announcement was published in the *New Kent-Charles City Chronicle* newspaper on January 31, 2019. The public hearing was held on March 5, 2019. At least 10 (there were roughly 5 attendees that did not fill out the sign-in sheet) non-DEQ staff persons attended the hearing. Three of the attendees offered testimony and one written comment was received and entered into the record by the Department. Of the three oral comments provided at the hearing, one was in support of the proposed facility, one requested changes to the draft permit and one opposed the construction of the facility.

Public Comment Period

The comment period for the draft permit ran from January 31, 2019 through March 20, 2019. During the public comment period, 103 written comments and 3 oral comments (two participants provided both written and oral comments) were received. The written comments included one from the U.S. EPA, one from the Chickahominy Indian Tribe, one from BCP, three from environmental advocacy groups, one from the regional planning commission and 96 from citizens. The majority of the comments requested that the State Air Pollution Control Board make the final permit determination rather than DEQ.

Copies of DEQ's Summary of and Response to Comments (Attachment D) and DEQ's Changes to the Draft Permit (Attachment E) are also attached.

Changes to the Draft Permit

1. Remove the General Electric turbine option and associated conditions
2. Remove the conditions providing for on-line (turbines in operation) water washing events
3. Add a condition (Condition #23) establishing a 96 hour per year operating limitation for turbine tuning events
4. Further clarify that the annual emission limits (Condition #36) encompass all periods of operation including startups, shutdowns and tuning events
5. Clarify the excess emission reporting requirements for startups, shutdowns and tuning events and add advance notification provisions for tuning events (Conditions #9, #10 and #51).
6. Lower the British thermal unit per kilowatt-hour (Btu/KWh) heat rate limits (Condition #8) and the pound of CO_{2e} per megawatt-hour (lb/MWh) greenhouse gas emission limits (Condition #35).

SUPPORTING DOCUMENTATION

Immediately following this agenda memo are the following documents:

- A. Draft Final Permit (with track changes)
- B. Draft Final Permit (clean copy)
- C. Permit Engineering Analysis
- D. Summary of and Response to Public Comments
- E. Summary of DEQ Changes to the Draft Permit

RECOMMENDATION

The Board approve the proposed permit with the changes discussed above.

ATTACHMENT A
Draft Final Permit (with track changes)

ATTACHMENT B
Draft Final Permit (clean copy)

ATTACHMENT C
Permit Engineering Analysis (including the Air Quality Analyses Review)

ATTACHMENT D
Summary of and Response to Public Comments

ATTACHMENT E
Summary of DEQ Changes to the Draft Permit