COMMONWEALTH OF PENNSYLVANIA
Department of Environmental Protection
Southwest Regional Office

MEMO

RE Comment and Response Document
Hill Top Energy Center, LLC
Natural Gas-Fired Combined Cycle Power Plant
Cumberland Township, Greene County
Permit Decision: Approved
Public Comment Period: September 30, 2017 – November 12, 2017
Public Meeting and Hearing: November 2, 2017
APS 936200 Auth 1174569 PF 805163

DATE November 27, 2017

TO Air Quality Permit File PA-30-00233B

FROM Alexander Sandy AS
Air Quality Engineering Specialist
Air Quality Program

THROUGH Alan A. Binder, P.E. AAB
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Background

On March 13, 2017, the Department received a plan approval application from Environmental Consulting & Technology, Inc. (ECT) on behalf of Hill Top Energy Center, LLC (HTEC) to construct a 620 MW natural gas-fired combined cycle power plant near the town of Nemacolin in Cumberland Township, Greene County. Review of the submitted application has been completed by the Department and the public comment period has expired. This memo documents activity that has taken place since the Department's review memo was finalized.

In accordance with 25 Pa. Code § 127.44(c), notice of intent to issue the plan approval was sent to the applicant on September 28, 2017, and to the EPA and the states within 50 miles of the proposed facility (WV DEP, OH EPA, and MD DOE) on October 5, 2017. Notice of intent to issue the plan approval (and to hold a public hearing) was published in the *Pennsylvania Bulletin* on September 30, 2017, and the applicant fulfilled the requirements of 25 Pa. Code § 127.44(c) by publishing the notice in the *Observer-Reporter* on September 30 through October 2, 2017. Proof of publication was provided to the Department on October 16, 2017.

On October 5, 2017, a copy of the draft plan approval, review memorandum, and notice of intent to issue the plan approval was sent to the Department's Operations Staff (Rick Gurney and Elizabeth Speicher), the Department's Modeling Section (Andrew Fleck and John LaRosa), the applicant, U.S. EPA, National Park Service, U.S. Forest Service, and NJ DEP (upon request).

The public comment period was extended to November 12, 2017, 10 days after the public hearing was held on November 2, 2017. There was no testimony at the public hearing. Comments from the applicant were received on November 1, 2017, and from EPA on November 8, 2017. No comments from the public were received. Comments received and the Department's responses are identified below.

List of Commentators

1. Marcos Aquino
   Acting Associate Director, Office of Permits and State Programs (3AP10), U.S. EPA

2. William Campbell III, P.E., on behalf of Hill Top Energy, LLC
   Project Manager, Environmental Consulting & Technology, Inc.

Comments and Responses

EPA

Comments on the Technical Review Memo (TRM) and the proposed plan approval:

1. **Comment:** Well explained and detailed TRM. This is a good example of a TRM that also addresses in detail the project alternatives' analysis and environmental justice related concerns required for New Source Review (NSR) permitting.

   Response: The Department acknowledges this comment.

2. **Comment:** Discussion on the selection of nitrogen oxides (NOx) and volatile organic compounds (VOC) lowest achievable emission rate (LAER):

   a. On page 21-22 of the TRM and on page 34-35 of the proposed plan approval, the NOx LAER limit is stated as 2.00 parts per million dry volume (ppmvd) corrected at 15% oxygen with a 3-hour averaging period initially. However, the Pennsylvania Department of Environmental Protection (PADEP) has determined and described in the TRM that LAER is 2.00 ppmvd on a 1-hour averaging basis. Please explain how the initial compliance test will correlate with initial and ongoing compliance of the LAER limit on a 1-hour basis.

   Response: On page 21 of the review memo, the Department indicates that the applicant has proposed an emission limit of 2.0 ppmvd (not 2.00 ppmvd) corrected to 15% O_2 on a 3-hour averaging period (for initial and continuous compliance), similar to the averaging time required for NOx emissions from turbines specified in NSPS Subpart KKKK. However, the review memo goes on to say on page 22 that upon review of the RBLC including LAER determinations for Virginia Electric and Power Company Warren County Power Plant and Virginia Electric and Power Company Brunswick County Power Plant, and recent comments from EPA on CPV Fairview, LLC, the Department determined that a more stringent, 1-hour averaging period constitutes LAER for this source for *continuous compliance*. Initial compliance with the NOx emission limit will be demonstrated based on the average of three 1-hour test runs as prescribed in the applicable EPA Reference Method 7E. Continuous compliance will based on at least one sample every 15 minutes from the CEMS averaged over each 1-hour block.

   Comment 2.b.: The NOx LAER limit is set at 2.00 ppmvd with and without duct firing (page 3) in the Heat Recovery Steam Generator (HRSG). HRSG duct burner operations would normally lead to additional natural gas combustion and therefore additional generation of thermal and fuel-bound NOx. If the LAER limit is 2.00 ppmvd with duct firing, it should be a lower concentration when there is no duct firing. Please explain why setting two emission limits as LAER for the two operational scenarios is not required to set a NOx LAER limit, or alternatively, establish a NOx LAER limit without duct firing in addition to the limit during duct firing.

   Response: The duct firing will be using NOx-containing combustion air from the turbine. This has the benefit of some NOx reduction by introducing the turbine exhaust into a fuel rich zone with a residence time sufficient for a reburning process to occur converting a portion of the turbine NOx to N_2 and O_2.

As a result, operation with duct firing potentially has a net reduction in NOx emissions[1]. Furthermore, according to section 13.1 of the Response to Public Comments on Proposed Standards of Performance for Stationary Combustion Turbines (February 2006) found under Additional Resources[2], "The data that EPA has to date on duct burners shows that the duct burner has little to no effect on NO_x emissions at high loads." Additionally, after review of the RACT/BACT/LAER Clearinghouse and other plan approvals for combined cycle power plants, the Department is not aware of any examples of a similar source having separate NOx limits, with and without duct firing. As such, the final plan approval will maintain a single NOx limit, consistent with other similar sources and the requirements of NSPS Subpart KKKK – Standards of Performance for Stationary Combustion Turbines.

Comment 2.c.: The draft plan approval does not have an annual hours-of-operation restriction on HRSG duct firing, although it does require HTEC to record duct burner hours of operation on a 12-month rolling basis (page 37 of the plan approval); thus, it appears to permit unlimited hours of operation which would lead to additional NOx emissions. Please explain the lack of a restriction on hours of operation, or alternatively, establish an operational limit consistent with federal and state NSR requirements.

Response: The plan and purpose of the proposed facility is a merchant plant (e.g. it will be funded by investors and sell electricity in the competitive wholesale power market). As such, the plant will need to be available 8,760 hours per year in all operational scenarios. The plan approval includes short term emission limits consistent with BACT and LAER and the facility-wide potential to emit (PTE) accounts for operation of the duct burners at 8,760 hours per year, consistent with federal and state NSR requirements. Note that although actual operation is expected to be less, calculating PTE at 8,760 hours per year requires the applicant to secure more emission reduction credits (ERCs).

Comment 2.d.: VOC LAER is set for the two main operational scenarios: combustion turbine (CT) with HRSG duct firing and CT without duct firing. The TRM explains that VOC emissions increase during turbine partial load conditions when combustion temperatures are lower, which leads to incomplete combustion and poor fuel/air mixing. The VOC LAER is set at 2.00 ppmvd with duct burners and 1.00 ppmvd without HRSG duct firing. Please explain why separate VOC LAER is set with and without duct firing, but not for NOx LAER when NOx emissions formation is also dependent upon combustion temperatures which are lower at partial loads.

Response: The duct burner will increase the emissions of VOC when it is operating due to the additional combustion. A portion of the VOC from the turbine will not be reduced by duct burner combustion as in the case with NOx, so there will be additional VOC created by the duct burner, requiring a higher emission limit. Furthermore, after review of the RACT/BACT/LAER Clearinghouse and other plan approvals for combined cycle power plants, this is consistent with other similar sources.

Comment 2.e.: On page 23 of the TRM, PADEP notes that lower VOC limits have been set elsewhere as found in the RACT BACT LAER Clearinghouse (RBLC), but PADEP states those limits have not been demonstrated in practice. Please identify in the TRM what these lower limits are and explain why they are not yet "demonstrated in practice."

[1] https://www3.epa.gov/ttncatc1/dir1/gasturb.pdf
[2] https://www.epa.gov/stationary-sources-air-pollution/stationary-gas-and-combustion-turbines-new-source-performance

Response: A few examples of issued plan approvals for natural gas-fired combined cycle combustion turbines with VOC limits lower than proposed in this plan approval include Robinson Power (1.0 ppmvd @ 15% O2 without duct firing, 1.3 ppmvd @ 15% O2 with duct firing), CPV Fairview (1.0 ppmvd @ 15% O2 without duct firing, 1.9 ppmvd @ 15% O2 with duct firing), and Panda Liberty (1.0 ppmvd @ 15% O2 without duct firing, 1.5 ppmvd @ 15% O2 with duct firing); however, these plants have either not commenced construction, are currently under construction, or have not performed/received approved stack test results. Therefore, these values are not considered demonstrated in practice on an initial basis, let alone an ongoing basis.

3. **Comment:** Discussion on the selection of carbon monoxide (CO) best available control technology (BACT):

   a. On page 22 of the TRM, PADEP sets CO BACT in a similar fashion to NOx LAER at 2.00 ppmvd corrected at 15% oxygen, on a 1-hour average basis. Additionally, the TRM states that HTEC intends to perform routine inspections of the CO catalyst bed to ensure it operates "as recommended by the manufacturer". the proposed plan approval does not contain such a requirement. When the plan approval and/or the subsequent Title V operating permit does include such a requirement to perform routine inspections, it should require inspections on a definite, specified basis such as weekly or monthly and should provide sufficient clarity on what "as recommended by the manufacturer" means, otherwise this is an unenforceable permit condition.

Response: The oxidation catalyst manufacturer has not yet been selected, therefore the manufacturer recommended maintenance schedule is not known at this time. Once the manufacturer is selected, this information will be submitted to the Department and the plan approval can be modified to include a specific schedule. Section C, Condition #018 *does* require HTEC to construct, operate and maintain all air contamination sources and air cleaning devices (including the oxidation catalyst) authorized under this plan approval in accordance with the manufacturer's specifications and recommended maintenance schedules.

4. **Comment:** Discussion on the selection of particulate matter (PM), course PM and fine PM BACT:

   a. PADEP has provided a good explanation on why PM BACT limits are not comparable across various natural gas-fired combined cycle emission generating units (EGUs), particularly in the discussion relating to the condensable portion of PM.

Response: The Department acknowledges this comment.

Comment 4.b.: Because BACT is set as total PM, inclusive of PM2.5, PADEP should clearly state in the plan approval and TRM that the PM BACT limit with duct firing and without duct firing includes the condensable portion of PM. Please explain how the two BACT limits (with and without duct firing) will be monitored for compliance assurance (0.0071 lb/MMBTU without duct firing and 0.0072 lb/MMBTU with duct firing).

Response: Section E Combined Cycle Turbine Conditions #002(d), (e), and (f) have been modified in the final plan approval to specify that total particulate matter includes filterable and condensable, for

clarification. Note that the specified compliance method is EPA Reference Methods 201/201A or equivalent *and* Method 202, which is for condensable particulate matter.

Compliance with the emission limits with and without duct burners will be demonstrated by three 1-hour stack tests, with and without duct burners, using the above referenced test methods. Furthermore, the short term (lb/MMBtu) and long term (tpy) particulate matter emission limits in the plan approval have been developed based upon the maximum and average annual sulfur content of the gas. Compliance assurance can be demonstrated using these emission factors and the natural gas supplier's guaranteed sulfur content required to be maintained by Section C, Condition #012(h).

5. **Comment:** Auxiliary boiler operations:

   a. The TRM states that the auxiliary boiler is meant to operate only after "extended" shutdowns and to " potentially" provide fuel gas heating, although it is expected to have overlapping operating hours during startups and shutdowns. EPA has not identified any clear limits on operation of the auxiliary boiler in the proposed plan approval. It is not clear in the TRM nor in the proposed permit whether the auxiliary boiler has an hours-of- operation limit. If the facility intends to operate this boiler only on an as-needed basis, PADEP should include an annual operating hours limit or explain why such a limit is not required to address federal and state NSR requirements.

   Response: See response to Comment 2.c. The plan approval includes short term emission limits consistent with BACT and LAER and the facility-wide PTE accounts for operation of the auxiliary boiler at 8,760 hours per year, consistent with federal and state NSR requirements.

6. **Comment:** PADEP proposes to set the GHG BACT for the CT/HRSG at 879 pounds per megawatt hour (lb/MWhr) carbon dioxide equivalent (C02e) with duct firing. Please explain why there is no GHG BACT limit set for the operating scenario without duct firing. The TRM notes (page 3) that duct burners are typically designed to operate only when the CT is at or above 90% load.

   Response: See response to Comment 2.c. The plan approval includes emission limits consistent with BACT on a lb/MWh basis and the facility-wide PTE accounts for operation of the duct burners at 8,760 hours per year. This is also consistent with NSPS Subpart TTTT – Standards of Performance for Greenhouse Gas Emissions for Electric Utility Generating Units.

7. **Comment:** On page 28 of the proposed plan approval, Condition #001 in Monitoring Requirements sets a leak detection and repair (LDAR) program to find and fix methane leaks for all components in natural gas service. EPA recommends that PADEP consider requiring the use of optical gas imaging (OGI) infrared (IR) camera technology for such LDAR inspections, since such OGI cameras have been found to be adept especially at finding methane leaks. EPA has recognized that OGI has proven to be an effective alternative to EPA Test Method 21, and has even required OGI in place of Method 21 in the 2016 Oil and Gas Rule (81 FR 35824). OGI may be particularly useful at HTEC because of the extensive number and length of pipes, valves, and flanges there and OGI is well suited to detect high concentrations of methane, which would be expected should this equipment leak. EPA is happy to share additional information and resources regarding OGI with PADEP.

Response: The Department appreciates the recommendation, and may consider it in the future, however, has determined not to limit the permittee to a single technology/methodology, consistent with EPA Method 21, and to allow the potential for newer technologies to be considered.

8. **Comment:** On page 13, page 19, page 36 of the proposed plan approval, PADEP monitoring and control of opacity. EPA suggests that PADEP use its authority under Pa. Code 123.43 to consider the use of a Digital Camera Opacity System (DOCS) to enhance HTEC's ability to adequately monitor and record opacity. While it is considered an alternative to the EPA Test Method 9, this approach has been accepted by EPA for wide use in industries that need frequent opacity readings. Use of DOCS at this facility may be even more beneficial if the industrial processes on site dictate nighttime emissions, since the DOCS has been approved for use at night as well. For further information on DOCS, please contact me or refer to: http://www.virtuallc.com/files/ASTM_D7520_Summary.pdf.

   Response: The Department appreciates the recommendation, and may consider it in the future, however, has determined to allow the measurement of visible emissions by either an approved device or trained observers, consistent with the Department's visible emission measuring technique in 25 Pa. Code § 123.43. Furthermore, the auxiliary boiler and combustion turbine will combust natural gas only and visible emissions are not expected.

9. **Comment:** On page 9 of the TRM, PADEP notes that requirements of 40 CFR Part 68 (Risk Management Plans- RMP) are not applicable to this facility because HTEC intends to use 19% aqueous ammonia and RMP applies to ammonia storage facilities that store concentrations of aqueous ammonia greater than 20%. EPA did not find any enforceable conditions in the proposed plan approval for HTEC to monitor, test and record the concentration of aqueous ammonia. Please add such a condition in the plan approval or explain why it is not required.

   Response: The final plan approval includes conditions limiting the ammonia concentration to less than 20% and recordkeeping of the ammonia concentration.

   Applicant

10. **Comment:** Page 5, Section A: HTEC would like clarification that the capacities/throughputs listed in Section A are for informational use only and should not be used as enforceable limitations.

    Response: The capacities/throughputs listed in Section A are for informational purposes and are not enforceable limitations.

11. **Comment:** Page 17, Section C, IV, Condition #25: For clarity, the first bullet should read; "One (1) 3509 MMBtu/hr *HHV* General Electric…"

    Response: HHV has been added to the specified condition in the final plan approval for clarification.

12. **Comment:** Page 19, Section D, I (Auxiliary Boiler), Condition #1 (a) and (b): For clarity, please add HHV after the units of lb/MMBtu for both NOx and CO.

    Response: HHV has been added to the specified condition in the final plan approval for clarification.

13. **Comment:** Page 21, Section D, I (Fuel Gas Heater), Condition #1 (a) and (b): For clarity, please add HHV after the units of lb/MMBtu for both NOx and CO.

    Response: HHV has been added to the specified condition in the final plan approval for clarification.

14. **Comment:** Page 34, Section E, I (Combined Cycle Turbine), Condition #2(c): Please add clarification here or in Section H that the VOC is measured as methane (CH4).

    Response: VOC (as methane), as indicated in the application, has been added in the final plan approval for clarification.

15. **Comment:** Page 35, Section E, I (Combined Cycle Turbine), Conditions #2 (d, e, f, g and h): As in the other conditions in this section, please add the clarification that the US EPA Reference Method is an "Initial" test, and add that the "Continuous" measurement is based on a 12-month rolling.

    Response: Sections d, e, f, g, and h of Condition #002 have been updated in the final plan approval as suggested for clarification.

16. **Comment:** Page 35, Section E, I (Combined Cycle Turbine), Conditions #2(k): the units for greenhouse gases should be CO2*e*/MWh (gross).

    Response: The greenhouse gas emission limit has been changed in the final plan approval to CO2*e*/MWh (gross), as requested, and as indicated in the application. This limit is more stringent than the limit proposed by the Department as it includes other contributors to greenhouse gas emissions such as methane and nitrous oxide.

    Department Initiated

    The final plan approval includes the following correction to the combined cycle combustion turbine ammonia slip limit in Section E (Combined Cycle Turbine), Condition #002(j):

    (j) Ammonia Slip (NH3): 5.0 ppmvd @ 15% O2 on a 3-hour average.

    Compliance Method/Averaging Period
    Initial: U.S. EPA Conditional Test Method CTM-027
    Continuous: ~~12-month rolling~~ **3-hour block**