




**SUBJECT:** Addendum to Application Review Memo  
Plan Approval 18-00033B  
Renovo Energy Center, LLC  
Renovo Generation Station  
Renovo Borough, Clinton County

**TO:** Muhammad Q. Zaman   
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**THROUGH:** David M. Shimmel, P.E.   
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**FROM:** Paul R. Waldman   
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On October 14, 2020, the Department submitted a proposed plan approval (18-00033B) to Renovo Energy Center, LLC (REC) for the construction of a dual fuel-fired combined-cycle power plant consisting of two (2) identical 1 x 1 powerblocks where each powerblock consists of a combustion turbine (CT), a steam turbine (ST) with heat recovery steam generators (HRSG) and duct burners (DB). Ancillary equipment for the facility also being proposed by REC includes: one (1) diesel-fired emergency generator engine, one (1) diesel-fired fire pump engine, two (2) natural gas-fired auxiliary boilers, three (3) natural gas-fired water bath heaters, one (1) natural gas-fired dew point gas heater, one (1) ultra-low sulfur diesel fuel (ULSD) storage tank, two (2) lube oil storage tanks, and two (2) aqueous ammonia storage tanks at the proposed Renovo Generation Plant located in Renovo Borough, Clinton County. Please see the application review memo dated October 2, 2020, for the technical review of the application. The Department received comments from Power Engineers, Inc., engineering firm for REC, on October 28, 2020. The comments are addressed in this memo.

The Department published an Intent to Issue Plan Approval in the *Pennsylvania Bulletin* on October 17, 2020. REC published an Intent to Issue in the Lock Haven Express for three (3) consecutive days which ended on October 21, 2020. During the 30-day comment period for each publication, several comments were received by the Department from the public. The Department eventually extended the comment period to December 7, 2020. The Department's response to all public comments including the Clean Air Council (CAC) were addressed in a Comment-Response document dated April 29, 2021.

The Department submitted a proposed plan approval to the United States Environmental Protection Agency (EPA) on October 14, 2020, for review. Comments were received by the Department from EPA on November 13, 2020. The comments are addressed in this memo.

## **Department Re-evaluations based on Public Comments**

### ***Sources P101 and P102 – Ammonia Slip Limitation***

The Department determined that similar GE model 7HA.02 combustion turbines (CTs) were in service at the CPV Towantic Energy Center in Connecticut and so requested testing information from Connecticut's Department of Energy and Environmental Protection (DEEP). In an email dated January 19, 2021, from Mr. James Grillo Air Pollution Control Engineer from Connecticut's DEEP, he indicated that the testing was performed on May 10 and 11, 2018, on a 2,700 million Btu per hour (MMBtu/hr) GE model 7HA.02. The ammonia slip was recorded at an average 1.57 parts per million, dry volume (ppmdv) @ 15% oxygen while firing on natural gas, which is less than the 2 ppmdv @ 15% oxygen limitation per the permit for the Towantic unit. Mr. Grillo also indicated that the facility has been able to maintain compliance with the ammonia slip limitation of 2.0 ppmdv @ 15% oxygen since testing.

REC was advised of the CPV Towantic Energy Center requirement to comply with an ammonia emission limitation of 2.0 ppmdv @ 15% oxygen while firing on natural gas and consequently in an email dated February 4, 2021, they proposed a revised ammonia slip limitation of 2.0 ppmdv @ 15% oxygen. The ammonia slip emissions based on 2.0 ppmdv @ 15% oxygen equates to 12.68 pounds per hour and 59.86 tons per year. Since it has been proven in testing on similar model combustion turbines, I believe that the proposed combustion turbines will be able to comply with an ammonia slip limitation of 2.0 ppmdv @ 15% oxygen. Therefore, I recommend that the ammonia slip limitation be revised to 2.0 ppmdv @ 15% oxygen, 12.68 pounds per hour for natural gas-firing and 11.59 pounds per hour for ULSD firing and 59.86 tons per year for each Source P101 and P102 in the plan approval.

### ***Source P101 and P102 – Startup and Shutdown Durations***

The Clean air Council commented that there should be no simultaneous cold startups for the CTs per their December 11, 2020, comments to the Department's Modeling Section. REC's modeling did not include simultaneous cold starts for the CTs. REC has agreed to not start each CT simultaneously. Therefore, a condition has been added to both Sources P101 and P102, "The permittee shall not cold start each combustion turbine within one hour of the other."

### ***Source P101 and P102 – Stack Heights***

Based on the modeling performed by REC, the stack height was proposed to be at 262'-0" above grade to ensure proper dispersion of the exhaust gas from each CT. The Department's Modeling Section concurred that the proposed height of each stack as proposed by REC would ensure proper dispersion of the exhaust gas from each CT. Therefore, a condition has been incorporated into Sources P101 and P102 that each stack height shall not be less than 262'-0" above grade.

### ***Sources P103 and P104 – Emergency Generator and Fire Pump Engines***

In an email dated February 12, 2021, REC has agreed to limit the emissions from Sources P103 and P104 to comply with the more stringent Tier 4 limits as specified in 40 CFR Part 1039.101 as compared to the previous Tier 2 and Tier 3 limits. The Department has replaced the emission

limitations initially proposed with a more stringent condition that states, “The permittee shall operate and maintain Sources P103 and P104 to achieve the emission standards specified in 40 CFR Section 1039.101 over the entire life of the engine. Any testing used to verify compliance with this work practice restriction shall be performed in accordance with 40 CFR Part 60 Subpart III, including 40 CFR Section 60.4212, and Department-approved test methods and procedures.” These limitations satisfy the requirement of BACT, LAER and BAT.

### **Comments from Renovo Energy Center**

#### **Comment #1**

REC noted typographical errors in the plan approval which the Department has revised.

#### **Comment #2**

REC is requesting that additional language be added to Condition #009 of Section C – Site Level Requirements. Condition #009 is a monitoring requirement for the circuit breakers at the facility and to take corrective action once the alarms are trigger for the release to atmosphere of sulfur hexafluoride (SF<sub>6</sub>). The condition requires REC to take immediate action once the alarm sound and REC would like it to be revised to “The permittee shall take corrective action as soon as practicable and fix...”. The Department agrees that REC will take action and correct the situation as practicable as possible. Therefore, the condition has been revised in the plan approval.

#### **Comment #3**

REC commented that Emission Reduction Credits (ERC) for nitrogen oxide (NO<sub>x</sub>) pursuant to Condition #018 in Section C of Plan Approval 18-00033B was miscalculated based on a facility-wide emissions. The facility-wide NO<sub>x</sub> emissions equate to 356.92 tons in any 12 consecutive month period. Pursuant to 25 Pa. Code Section 127.210, the offset ratio for both NO<sub>x</sub> and VOC emissions is 1.15:1 because the region is designated as a Transport Region. Based on the 1.15 offset ratio REC will be required to obtain 410.46 tons of NO<sub>x</sub> ERCs prior to commencement of operation of any source at the facility. However, the proposed plan approval had the incorrect total of NO<sub>x</sub> ERCs at 418.10 tons instead of the required 410.46 tons based on the facility-wide NO<sub>x</sub> ERC. Therefore, the condition has been revised so that REC will be required to obtain 410.46 tons of NO<sub>x</sub> ERC.

#### **Comment #4**

REC commented that the record keeping requirement of recording the daily fuel usage as specified in Condition #004 of Source 031 should be on a monthly basis pursuant to 40 CFR Part 60 Subpart Dc Section 60.48c(g)(2). Section 60.48(g)(2) allows a permittee to use an alternate to meeting the requirements of daily records provided that the source combusts natural gas. Since these boilers only combust natural gas as proposed by REC, the condition has been revised to record and maintain records of the amount of fuel combusted in each calendar month.

#### **Comment #5**

REC commented that the NO<sub>x</sub> emission rate of 0.033 lb/MMBtu for the 3.0 MMBtu/hr dew point heater (Source 033) was too restrictive and that the proposed source is not subject to the Lowest Achievable Emission Rate (LAER) and Best Available Control Technology (BACT). Since the proposed source is part of the project, all air contaminant source must comply with the

requirements of LAER and BACT. The NO<sub>x</sub> emission rate 0.033 lb/MMBtu satisfies these requirements and the rate is achieved with low-NO<sub>x</sub> burners. Therefore, the NO<sub>x</sub> emission rate of 0.033 lb/MMBtu will remain in the plan approval.

#### **Comments #6 and 10**

REC commented that the sulfur oxide (SO<sub>x</sub>) emission rate of 5.94 pounds per hour (lb/hr) for each combustion turbine with duct burners (Sources P101 and P102) was not the emission rate of 6.10 lb/hr proposed by REC. An email dated September 2, 2020, from Mr. Tim Donnelly from Power Engineers, Inc., consultant for REC, stated the SO<sub>x</sub> emission rate of 0.001336 lb/MMBtu can be used for the CT and DB. The potential SO<sub>2</sub> emission rate as proposed by REC will be 0.001336 lb/MMBtu and conservatively assuming that all of the sulfur will convert to SO<sub>2</sub>. This would equate to 5.94 lb/hr based on the 4,448 MMBtu/hr rated heat input for both the CT and DB. Therefore, the SO<sub>x</sub> emission rate of 5.94 lb/hr while firing natural gas will be included in the plan approval.

Additionally, REC commented that the formaldehyde emission rate of 0.58 lb/hr for Sources P101 and P102 was not the emission rate of 0.59 lb/hr proposed by REC. Vendor data from GE stated that the formaldehyde emission rate equates to 0.58 lb/hr. Therefore, the formaldehyde rate of 0.58 lb/hr will remain the same in the plan approval.

#### **Comments #7 and 11**

REC commented that the carbon dioxide (CO<sub>2</sub>) emission rate of 894 pounds per Megawatt-hour of electricity produced (lb/MW-hr) for Sources P101 and P102 was not the emission rate of 964 lb/MW-hr proposed by REC. Vendor data from GE shows that the emission rate for CT-DB firing of each Source P101 and P102 equates to 894 lb/hr. Therefore, the CO<sub>2</sub> emission rate of 894 lb/MW-hr from Sources P101 and P102 will remain in the plan approval.

#### **Comments #8 and 13**

REC commented that the proposed 720 hours limitation while firing on ultra-low diesel fuel (ULSD) for Sources P101 and P102 does not include the hours of startup and shutdown and requests additional language in each condition to clarify. This limitation is for steady-state operation of each CT and does not include the hours for startup and shutdown. The hour limitation for startup and shutdown are included in Condition #006 of Sources P101 and Condition #007 of Source P102. To clarify, the Department is adding the language to each condition as "...shall only be fired on ULSD fuel not more than 720 hours of steady state, not including startup and shutdown hours, in any 12 consecutive month period." Each condition has been revised in the plan approval.

#### **Comments #9 and 12**

REC commented that the emission limitations for the SUSD for Sources P101 and P102 in the plan approval did not include margins due to deterioration of the CT over time which could violate the emission rates. The limits as proposed in the plan approval were determined from the manufacturer vendor emission rates per each SUSD event for both natural gas and ULSD. In addition, REC utilized the emissions from the manufacturer vendor emission rates for the modeling analysis. It is the permittee's responsibility to maintain air contaminant sources to comply with emission limitations as established in the plan approval. Since REC has not

performed the modeling analysis with the higher emission rates for SUSD and these rates were determined to satisfy LAER and BACT requirements, the condition will remain the same in the plan approval.

**Comments #14**

REC commented that Condition #002 of Source P104 was not needed because it was covered in Source P103. Condition #002 of Source P104 included both Source P103 and P104 which should only include Source P104. The condition has been revised to only include Source P104.

**Comments #15**

REC commented that Condition #008 of Source P104 was not needed because it was covered in Source P103. Condition #008 of Source P104 included both Source P103 and P104 but should only include Source P104. The condition has been revised to only include Source P104.

**Comment #16**

REC requests that the fire pump engine rated horsepower be approved at 250 brake-horsepower to have some flexibility in ordering the proper engine. Currently, REC has agreed to install a Tier 4 engine. Because Tier 4 has lower emission rates, the Department has agreed to allow the installation of up to 250 brake horsepower to provide operational flexibility for this emergency fire pump engine.

**Comment #17**

REC commented that Condition #003 of Source P105 had the incorrect description of the storage tanks. The condition had two (2) 20,000-gallon aqueous ammonia storage tanks and two (2) lube oil storage tanks... The condition has been revised to the correct description of the tanks, "...two (2) 26,000-gallon aqueous ammonia storage tanks and two (2) 20,000-gallon lube oil storage tanks..." in the plan approval.

**Comment #18**

REC commented that the opacity limitation of Sources P103 and P104 be increased to that of 25 Pa. Code Section 123.41. The opacity limitation as specified in Sources P103 and P104 have been determined to satisfy the Prevention of Significant Deterioration (PSD) requirements of 40 CFR Part 52.21 and 25 Pa. Code Section 127.83 and Best Available Technology requirements of 25 Pa. Code Sections 127.1 and 127.12. Therefore, the conditions will remain the same in the plan approval.

**February 3, 2021, Comment**

In an email dated February 3, 2021, REC requested that the length of each startup and shutdown (SUSD) scenario for each CT as proposed in the proposed plan approval be revised as follows: (1) revise cold start duration to not be in excess of 60 minutes; (2) revise warm start duration to not be in excess of 55 minutes; (3) revise hot start duration to not be in excess of 35 minutes; and (4) revise shutdown duration to be no more than 27 minutes when firing natural gas and 23 minutes when firing ULSD. REC requested that the total combined SUSD not exceed 460 hours while firing on natural gas and 40 hours while firing on ULSD. Because the total combined SUSD hours will not exceed the proposed hours of 460 hours firing on natural gas and 40 hours firing on ULSD, the emissions for each pollutant will not increase because the number of events

will decrease. Therefore, I recommend that the SUSD durations in the plan approval should be revised to (1) cold start duration to not be more than 60 minutes; (2) warm start duration to not be more than 27 minutes when firing natural gas and 23 minutes when firing ULSD for each Sources P101 and P102.

The pounds per event for each pollutant will be increased because of the duration being increased. REC requested the increase in an email dated October 28, 2020, for example, that cold start for NO<sub>x</sub> emissions while firing on natural gas would increase from 123 pounds per event to 163 pounds per event. However, the annual emissions will not increase. Therefore, the emissions per event in the plan approval of the SUSD for each combustion turbine has been revised proportionally to the increase in duration.

### **Unites States Environmental Protection Agency (EPA) Comment**

#### **Comment #1**

EPA commented that the review memo did not discuss the Best Available Control Technology (BACT) requirements pursuant to 40 CFR Part 52 Section 52.21 for greenhouse gas (CO<sub>2e</sub>) emissions for the proposed facility.

REC provided an analysis on the BACT for CO<sub>2e</sub> emissions for sources at the facility which included Carbon Capture and Storage (CCS), energy efficiency and type of fuels as part of the control for CO<sub>2e</sub> emissions.

CCS is a process where the CO<sub>2</sub> emissions are captured in the exhaust stream gas utilizing a scrubber, adsorption process or cryogenic separation. In a document titled "Report of the Interagency Task Force on Carbon Capture and Storage" in August 2010, several factors potentially make this technology unavailable at the present time. The report concluded that coal-fired power plant emissions would be the best potential for CO<sub>2</sub> emission control. Other factors included regulatory uncertainty, lack of storage space for the air contaminant and lack of financial incentives for new technologies. REC stated that CCS is not commercially available in the United States and that there is no known application of this technology at the time of the submittal of the application. Therefore, the technology is technically infeasible.

REC stated that energy efficiency and good operating practices can be utilized to control CO<sub>2e</sub> emissions from the sources at the facility, and that REC will utilize this method. Reducing the amount of fuel to produce the same amount of electric power will result in lower CO<sub>2e</sub> emissions. As stated in the application review memo dated October 2, 2020, REC is utilizing high efficiency combustion turbines. Each combustion turbine will include a monitoring system that will ensure maximum combustion efficiency. REC is proposing to utilize natural gas as the primary fuel with ultra-low sulfur diesel (ULSD) fuel as backup for each CT which in combination with utilizing high efficiency CTs will satisfy the requirements of BACT.

In addition, REC stated that each combustion source (boilers, engines, heaters and turbine engines) will be designed utilizing good combustion practices which will include proper air/fuel mixture, adequate residence time in the combustion zone and proper maintenance and operation of the burners in each source. Also, the type of fuel with a lower carbon content will reduce CO<sub>2e</sub> emissions. As stated above, REC is proposing to utilize natural gas as the primary fuel for

all sources at the facility with the exception of ULSD as back up for each combustion turbine and emergency generator. Natural gas does have a lower carbon content than either coal or ULSD. I believe that energy efficiency, good operating practices along with the type of fuel used satisfies the requirements of BACT for each source at the facility.

Additionally, CO<sub>2</sub> emissions from electric utility generating units are regulated by 40 CFR Part 60 Subpart TTTT. Please see the application review memo dated October 2, 2020, for further detail on the applicability of Subpart TTTT. REC is proposing a CO<sub>2</sub> emission rate from each combustion turbine of 894 pounds of CO<sub>2</sub> per Megawatt-hour which complies with Subpart TTTT.

**Responses related to EPA comments regarding the Air Quality modeling analysis:**

Please see the enclosed comment response document for the Department's responses related to the comments regarding the air quality modeling analysis.

**Conclusion**

All revisions as stated in this memo have been incorporated in the plan approval. Therefore, I recommend issuance of Plan Approval 18-00033B to Renovo Energy Center, LLC for the dual-fuel fired combined-cycle power plant located in Renovo Borough, Clinton County. Please see the application review memo dated October 2, 2020, for further information on the technical review of this plan approval.

File: Renovo Energy Center, FAC, FAC OP, 18-00033  
Cc: Central Office – Air Quality Permits  
US EPA Region III