EMAILED
3/30/2022

STATE OF DELAWARE
DEPARTMENT OF NATURAL RESOURCES AND ENVIRONMENTAL CONTROL
DIVISION OF AIR QUALITY
STATE STREET COMMONS
100 W. WATER STREET, SUITE 6A
DOVER, DELAWARE 19904

ENGINEERING & COMPLIANCE

PHONE
(302) 739-9402

March 30, 2022

BioEnergy Devco
28338 Enviro Way
Seaford, Delaware, 19973

ATTENTION: Peter Ettinger
Chief Development Officer

SUBJECT: **Request for Additional Information**

Dear Mr. Ettinger:

This letter is to inform you that a review of the permit application submitted for the proposed construction of an anaerobic digestion system and associated biogas upgrade and air pollution control equipment is ongoing, but that additional information is necessary before it can be completed. The following outline summarizes the information being requested:

1. The Engineering Report included in the application cites "equipment malfunction" and "excessive gas production" as reasons for flare operation. Aside from that description, the Department is not clear on the circumstances during which the flare will operate.
   a. To the extent possible, please specify the equipment malfunctions that would trigger operation of flare.
   b. Please provide a description of the instances in which "excessive gas production" would trigger operation of flare.
   c. If applicable, please specify and explain any other instances in which operation of the flare would occur.

2. The application suggests that the proposed VOC/siloxane and H_2S removal vessels are 100% efficient at removing these pollutants from the gas stream.
   a. Please provide documentation from the manufacturer in which it clearly quantifies the estimated removal efficiency of the pollutants by the proposed equipment.
   b. This may include technical specifications or a formal written response from the manufacturer certifying the estimated removal efficiency of the equipment.

3. The Department is seeking clarification on the variations of biogas flow through process and control equipment. Please provide a narrative describing the potential pathways through which biogas may travel, beginning with generation in the anaerobic digesters and concluding with the final RTO and flare emission points. Additionally, please clarify whether simultaneous operation of the RTO and flare is possible.

4. Based on the information provided in the application, the Department believes that the VOC/siloxane removal vessels located directly upstream of the RTO and flare should be considered air pollution control equipment. For the following reasons, an amendment to the potential to emit (PTE) calculation shall be submitted based on the uncontrolled emissions immediately downstream of the PSA system which would result if the VOC/siloxane removal vessels, RTO, and flare air pollution control equipment were not installed. The PTE calculation shall be based on the composition and flowrate of the gas at this point in the process.
    a. A November 27, 1995 memorandum published by EPA focused on the "Criteria for Determining Whether Equipment is Air Pollution Control Equipment or Process Equipment" was consulted.
    b. In that memorandum, it suggests considering three (3) questions when making judgement on whether equipment should be treated as pollution control or an inherent part of the process. Those questions, and the Department's determination for each, is outlined below:
        i. Is the primary purpose of the equipment to control air pollution?
            1. Based on its location in the process, VOCs and siloxanes from the biogas stream have already been isolated from the gas intended for use in the natural gas pipeline system. As such, the primary purpose of the equipment appears to be controlling air pollution through the reduction of the concentration of certain pollutants in the gas stream prior to combustion in the RTO or flare.
        ii. Where the equipment is recovering product, how do the cost savings from the product recovery compare to the cost of the equipment?
            1. The Department found no evidence of product recovery being achieved through the operation of the VOC/siloxane removal vessels. This question was deemed inapplicable.
        iii. Would the equipment be installed if no air quality regulations are in place?
            1. The Department found no evidence that this equipment serves any purpose other than reducing contaminants prior to combustion in the RTO or flare.

5. Information in the application suggests that the point at which breakthrough occurs in the H_2S and VOC/siloxane removal vessels is approximately 6 months. The application indicates that the determination of breakthrough may be determined through monitoring of pressure drop across media or sampling of gas between in-series vessels.
    a. Which method is proposed for use in monitoring the equipment for breakthrough?
    b. If pressure drop reading is preferred method, please provide information from the equipment manufacturer stating the recommended pressure drop ranges indicative of effective operation for purposes of verifying the information submitted in the application.

6. The "Untreated biogas Characteristics" section of the "Filter Operations" page indicates that data from existing biogas plants was used in modeling of the project and estimating biogas quantity and characteristics. Please elaborate on the process that was used in estimating the quantity and composition of biogas expected to be generated in the proposed AD system as it relates to the type and quantity of feedstock proposed for use.

7. The Engineering Report attached to the application discusses odor control at the site, with particular focus on the solid feedstock receiving area, but also makes mention of the feedtank separators prior to the solid separation of digestate downstream of the digesters.
    a. For the solid feedstock receiving area, it is the Department's understanding that it is the intention to maintain the area at a negative air pressure, but that this negative pressure will be achieved through the operation of a dilution exhaust fan which will vent the air through the roof/exterior of the building to the environment. The Department understands that quantification of emissions from this process may be difficult due to the nature of the activity, but requests submission of the following information:

i. The sequence of events involved in the unloading and transfer of solid feedstock and an estimated residence time of material in the area prior to transfer into the pre-tanks.
ii. A plan of action in the event that equipment malfunction, for example, prevents the unloading and transfer of solid feedstock from occurring in the manner in which it was designed.

b. For the feedtank separators portion of the process, it is the Department's understanding that filters will be implemented to control odors. Please quantify and submit the pre- and post-control emissions anticipated to be generated in this area along with the specifications of the filters proposed for use.

8. In reviewing the emissions generated from the combustion of biogas in the RTO and flare, it was observed that no emissions of NO_X, CO, or PM were estimated, aside from those generated from the combustion of natural gas. Because these pollutants will be modeled in the application process, limited by the permit, and tested upon startup of the proposed equipment, the Department is requesting verification that additional emissions of these pollutants are not expected in the process of combusting the biogas.

9. The distance from the flare to the property line was not specified in the application. Please submit this information.

10. The application proposed limits on flare operation based on volume of biogas combusted. Please specify whether there will be systems in place to monitor and record the volume of natural gas and biogas combusted by the RTO and flare?

11. The Engineering Report attached to the application indicates that the separated solid digestate "will be conveyed and discharged into a storage bunker and either marketed as a soil amendment product or transported to the adjacent compost facility for further processing."

    a. Will this storage bunker be vented to the atmosphere?
    b. And if so, have potential emissions from the storage of solid digestate been quantified?

12. The Department anticipates testing of emissions from the RTO will be necessary to demonstrate compliance with emission limitations established by permit. Testing is typically required to be completed within ninety (90) days of achieving the maximum production rate at which the proposed equipment will be operated, but not later than 180 days after initial startup. In the case of the proposed anaerobic digestion system, the Department is interested in understanding the emissions generated while the anaerobic digestion system is operating at its maximum production rate. Please provide an estimate of when maximum gas generation will be achieved relative to startup of the proposed equipment.

13. The AQM-4.2 forms submitted for the H_2S and VOC/siloxane carbon adsorption systems indicate that temperature excursions are expected during the startup period when gas is introduced. Please elaborate on these excursions.

    a. What causes the excursions?
    b. Is the temperature of the H_2S and VOC/siloxane adsorption beds continuously monitored and recorded?
    c. How long are the excursions expected to last?
    d. What is the expected impact of the excursion on the composition of the gas stream that is eventually emitted to the atmosphere?

e. Are there any other expected instances where excursions are expected to occur?

Requested information may be sent to me electronically as it becomes available, but a single response to include all requested information shall be sent to the following address when all information has been compiled.

Division of Air Quality
State Street Commons
100 W. Water Street, Suite 6A
Dover, DE 19904

Please contact me at (302) 739-9402 if you have any questions or concerns.

Sincerely,

Jordan Matthews, P.E.
Environmental Engineer
Engineering & Compliance Section

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pc: Dover File

MEMORANDUM

TO: Amy S. Mann, P.E. ASM

THROUGH: Joanna L. French, P.E. JLF

FROM: Jordan G. Matthews, P.E. JGM

SUBJECT: BioEnergy Development Group, LLC
Request for Additional Information

DATE: March 29, 2022

BACKGROUND

On January 13, 2022, the Department received an air permit application from Verdantas LLC on behalf of BioEnergy Devco requesting permission to construct an anaerobic digestion (AD) process at the BioEnergy Innovation Center (BIC) in Seaford. The process would be equipped with a flare, regenerative thermal oxidizer (RTO), and other filtration equipment, which would be used to upgrade and control the biogas generated from the AD's operation.

During my review of the application, I determined that more information was required to complete the review process. The following outline summarizes the information being requested:

1. The Engineering Report included in the application cited "equipment malfunction" and "excessive gas production" as reasons for flare operation. Aside from that description, it is unclear to me the circumstances during which the flare will operate. I have asked that a response be provided specifying and explaining the scenarios in which "equipment malfunctions" or "excessive gas production" would trigger use of the flare. Additionally, if any other instances would trigger use of the flare, I have asked that they specify and describe those as well.

2. The application suggests that the proposed VOC/siloxane and H_2S removal vessels are 100% efficient at removing their associated pollutants from the gas stream. I have asked that they provide documentation from the manufacturer clearly quantifying the estimated removal efficiency of the pollutants by the proposed equipment. I specified that this documentation may include technical specifications or a formal written response from the manufacturer certifying the estimated removal efficiency of the equipment.

3. The application provided a process flow diagram for the process but did not include a narrative of the possible variations of biogas flow through process and control equipment. I have asked that they provide a narrative describing the potential pathways through which biogas may travel, beginning with generation in the anaerobic digesters and concluding with the final RTO and flare emission points. Additionally, I have asked that they clarify whether simultaneous operation of the RTO and flare is possible.

4. Based on the information provided in the application, I believe that the VOC/siloxane removal vessels located directly upstream of the RTO and flare should be considered air pollution control equipment. In making this determination, I consulted a November 27, 1995 memorandum published by EPA focused on the "Criteria for Determining Whether Equipment is Air Pollution Control Equipment or Process Equipment".

   In that memorandum, it suggests considering three (3) questions when making judgement on whether equipment should be treated as pollution control or an inherent part of the process.

Those questions, and my determination for each with respect to the VOC/siloxane removal vessels, is outlined below:

1. *Is the primary purpose of the equipment to control air pollution?*

   Based on the location of the VOC/siloxane removal vessels, VOCs and siloxanes from the biogas stream have already been isolated from the gas intended for use in the natural gas pipeline system. As such, the equipment does not appear to offer any benefit to the process, and I believe its primary purpose is controlling air pollution through the reduction of the concentration of VOCs and siloxanes in the gas stream prior to combustion in the RTO or flare.

2. *Where the equipment is recovering product, how do the cost savings from the product recovery compare to the cost of the equipment?*

   I found no evidence of product recovery being achieved through the operation of the VOC/siloxane removal vessels. This question was deemed inapplicable.

3. *Would the equipment be installed if no air quality regulations are in place?*

   I found no evidence that this equipment serves any purpose other than reducing contaminants prior to combustion in the RTO or flare. Furthermore, the combustion of siloxanes was previously identified as a potential obstacle in passing the Department's modeling criteria. Removal of these pollutants prior to combustion eliminates that obstacle, but also supports the determination that the equipment is proposed for installation as a result of air quality regulations.

Based on the determination outlined above, I am asking that an amendment to the potential to emit (PTE) calculation be submitted based on the uncontrolled emissions immediately downstream of the PSA system which would result if the VOC/siloxane removal vessels, RTO, and flare air pollution control equipment were not installed. The PTE calculation shall be based on the composition and flowrate of the gas at this point in the process.

5. Information in the application suggests that the point at which breakthrough occurs in the H_2S and VOC/siloxane removal vessels is approximately 6 months. The application indicates that the determination of breakthrough may be determined through monitoring of pressure drop across media or sampling of gas between in-series vessels. Based on the wording in the application, it is unclear which method is proposed for use, and I am asking that the preferred method of monitoring the equipment be specified.

   Additionally, if monitoring the pressure drop across the media is the preferred method, I am asking that they provide information from the equipment manufacturer stating the recommended pressure drop ranges indicative of effective operation for the purpose of verifying the information submitted in the application.

6. The "Untreated biogas Characteristics" section of the "Filter Operations" page in the application indicates that data from existing biogas plants was used in modeling of the project and estimating biogas quantity and characteristics. I am asking that they elaborate further on the process of estimating the quantity and composition of biogas expected to be generated in the proposed AD system as it relates to the type and quantity of feedstock proposed for use.

7. The Engineering Report attached to the application discusses odor control at the site, with particular focus on the solid feedstock receiving area, but also makes mention of the feedtank separators prior to the solid separation of digestate downstream of the digesters.

   For the solid feedstock receiving area, it is my understanding that the intention is to maintain the area at a negative air pressure, but that this negative pressure will be achieved through the operation of a dilution exhaust fan which will vent the air through the roof/exterior of the building to the environment. Due to the nature of a process involving consistent material unloading and transfer, I understand that quantification of emissions may be difficult. I am asking that the following information be submitted:

   - The sequence of events involved in the unloading and transfer of solid feedstock and an estimated residence time of material in the area prior to transfer into the pre-tanks.
   - A plan of action in the event that equipment malfunction, for example, prevents the unloading and transfer of solid feedstock from occurring in the manner in which it was designed.

   For the feedtank separators, it is my understanding that filters will be implemented to control odors. I am asking that the pre- and post-control emissions in this area be quantified and submitted along with the specifications of the filters proposed for use.

8. In reviewing the emissions generated from the combustion of biogas in the RTO and flare, it was observed that no emissions of NO_X, CO, or PM were estimated, aside from those generated from the combustion of natural gas. Because these pollutants will be modeled in the application process, limited by the permit, and tested upon startup of the proposed equipment, I am asking for verification that additional emissions of these pollutants are not expected in the process of combusting the biogas.

9. The distance from the flare to the property line was not specified in the application. I have asked that they submit this information.

10. The application proposed limits on flare operation based on volume of biogas combusted. Since there will be a need to quantify the volume of natural gas and biogas combusted by the RTO and flare control equipment, I have asked whether there will be systems in place to measure and record the flowrate of each type of gas.

11. The Engineering Report attached to the application indicated that the separated solid digestate "will be conveyed and discharged into a storage bunker and either marketed as a soil amendment product or transported to the adjacent compost facility for further processing." The following questions were asked about the proposed storage of this material:

    - Will this storage bunker be vented to the atmosphere?
    - And if so, have potential emissions from the storage of solid digestate been quantified?

12. I anticipate that the permit will include requirements to complete testing of emissions from the RTO in order to demonstrate compliance with emission limitations established by permit. Testing is typically required to be completed within ninety (90) days of achieving the maximum production rate at which the proposed equipment will be operated, but not later than 180 days after initial startup. In the case of the proposed anaerobic digestion system, I am curious as to whether the

anaerobic digestion system will be capable of operating at its maximum production rate within this schedule. I have asked that provide an estimate of when maximum gas generation will be achieved relative to startup of the proposed equipment.

13. The AQM-4.2 forms submitted for the H_2S and VOC/siloxane carbon adsorption systems indicate that temperature excursions are expected during the startup period when gas is introduced. I have asked the following questions related to these anticipated excursions:

    - What causes the excursions?
    - Is the temperature of the adsorption beds continuously monitored and recorded?
    - How long are the excursions expected to last?
    - What is the expected impact of the excursion on the composition of the gas stream that is eventually emitted to the atmosphere?
    - Are there any other expected instances where excursions are expected to occur?

Representatives of BioEnergy Devco and Verdantas, LLC were briefed about the majority of these items during a conference call on March 23, 2022. The final three (3) questions were added to the request letter thereafter.

RECOMMENDATIONS

I recommend that the attached letter outlining the additional information required in order to complete the review of the application be sent to the Company.

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