UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION 10
1200 6TH AVENUE
SEATTLE, WASHINGTON 98101

DATE:	See date of Section Chief signature
SUBJECT:	CLEAN AIR ACT INSPECTION REPORT Bio Energy Washington, Maple Valley, WA
FROM:	Daniel Heins, Environmental Scientist Air Toxics Enforcement Section, EPA Region 10
THRU:	Derrick Terada, Acting Section Chief Air Toxics Enforcement Section, EPA Region 10
TO:	File

BASIC INFORMATION

Facility Name: Bio Energy Washington
Facility Location: 16650 228th Ave SE, Maple Valley, WA 98038

Date of Inspection: On-Site Inspection: May 23, 2022
Virtual Conference: June 1, 2022

EPA Inspector(s):

1. Daniel Heins, Environmental Scientist [a,b]
2. Brendan Whyte, Air and TRI Compliance Officer [a,b]
3. Katrina (Katie) Bradshaw, Multi Media Inspector [b]

Other Attendees:

1. Kevin Singer, Plant Manager – Bio Energy Washington [a,b]
2. Dan Thompson, Plant Operations/Technician – Bio Energy Washington [b]

[a] Attended virtual conference
[b] Attended on-site inspection

Contact Email Address: ksinger@bioenergy-wa.com

Purpose of Inspection: Evaluate Clean Air Act compliance

Facility Type: Renewable natural gas plant associated with (separate) municipal solid waste (MSW) landfill

On Site (5/23) Arrival Time: 14:15
On Site (5/23) Departure Time: 16:00
Virtual Conference (6/1) Start Time: 13:30
Virtual Conference (6/1) End Time: 15:00

Inspection Type:
☒ Unannounced Inspection
☐ Announced Inspection

SITE OVERVIEW

Unless otherwise stated, the following information was obtained verbally from BioEnergy Washington representatives during the virtual conference and on-site inspection.

Company Ownership:
BioEnergy Washington is an LLC owned by INGENCO Holdings and has been since initial site development.

Operations Overview:
BioEnergy Washington owns and operates the renewable natural gas plant (the Facility) associated with the King County Cedar Hills Landfill. The Facility operates 24/7, processing landfill gas from Cedar Hills into pipeline grade natural gas and generating electricity. For the purpose of this overview, "product gas" shall refer to the gas under various stages of treatment progressing to the next step towards eventual pipeline injection.

Raw landfill gas is first routed through a series of condensate knockouts, coolers, and compressors. Removed condensate is routed back to the Cedar Hills leachate system.

Next the gas goes through hydrogen sulfide removal. Sulfur is removed with Darco BGI lignite coal-based media in two vessels that operate in series, with the second vessel positioned to control eventual breakthrough from the first vessel and allowing for media removal while continuing operations through just one vessel. This arrangement is commonly described as a "lag/lead" system. Media is changed out every 6-12 months. Spend media is trucked off for disposal off site as non-hazardous waste.

After sulfur removal, the gas is routed to the volatile organic compounds (VOCs) and carbon dioxide (CO_2) removal system. This stage also removes siloxanes from the gas. First the gas goes through a filter that removes more water, again routed back to the Cedar Hills leachate system. CO_2 and VOCs are removed in a pressure swing adsorption (PSA) system with two beds operating on 10-minute cycles. The PSA uses a multi-layer bed of various materials, replaced on a two-year disposal cycle. The gas from the initial depressurization of the PSA system ("blowdown gas") is routed back to the raw landfill gas intake to be re-processed. Next in the regeneration cycle, waste gas pulled out from the media (primarily CO_2 with some methane and a small percent of VOCs) is routed to the thermal oxidizer (TO) for VOC destruction in a discontinuous cycle. The TO is fueled by waste gas from the subsequent nitrogen removal step. After the PSA system, the product gas goes through a pair of activated carbon beds to remove

any remaining VOCs. These also operated on a lag/lead system. Spent media is regenerated off site for use by other facilities. Product gas then goes through a first stage membrane, where rejected gas is used to regenerate the PSA units. Product gas then goes to a second stage membrane, where rejected gas is re-cycled into the start of the treatment system.

Next, the product gas is routed to the nitrogen removal stage. This operates under a similar process to the PSA, but uses vacuum to pull off the waste gas. The tail gas from this stage is approximately half nitrogen and half methane. This gas ("fuel gas") is routed to the on-site fuel gas tank to eventually fuel the TO and the generator sets.

After nitrogen removal, the product gas is routed to oxygen removal. This stage begins with a backup sulfur scavenger that protects the catalyst from any potential upsets in prior sulfur removal steps. The product gas is heated and run through a precious metal catalyst, where oxygen is removed via combustion with the methane in the gas, yielding CO_2 and water. The product gas is routed through an economizer to transfer heat to the incoming gas, then routed to a cooler. Condensate is removed and discharged to the Cedar Hills leachate system. The acid scrubber located here is not in service and dates to pre-retrofit.

Next, the product gas goes through final water removal. This is a temperature swing adsorption (TSA) system using alumina media to pull out water. Heated fuel gas (from the nitrogen removal stage) is used to regenerate the media. This media is replaced on a three-year cycle.

Final product gas goes to the sales gas tank and then is compressed and metered as it is sent to Puget Sound Energy (PSE). PSE is responsible for addition of mercaptan (an odorant added for safety).

Waste gas produced during startup and shutdown is routed to the open flare on site. Control valves are designed to open above pressure setpoints and with power failure and route the gas to the flare. The site does not vent any untreated gas. If the pilot light for the open flare goes out, the facility shuts down.

The nitrogen removal tail gas, also referred to as the fuel gas, is primarily routed to the generator sets after regenerating the TSA. The fuel gas is also used to fuel the TO and can be routed to an open flare as needed. The Facility has 18 engines total, divided into groups of six ("A", "B", and "C"), with one exhaust stack per group. The engines are Detroit Diesel Series 60 engines, modified prior to 2008 from previous usage in trucks. The engines can run on diesel fuel as well as fuel gas, and they help supply electricity to the Facility. The engines are compression ignition and operate on a blend of over 90% fuel gas and under 10% diesel (percentages on an energy basis). The engines use custom programming to allow for operation on this fuel blend. The engines are rated to 305 kilowatts (kW), but in practice operate with a maximum of 270 kW. The exhaust from each engine group goes through selective catalytic reduction (SCR) with urea injection and copper zeolite to control nitrogen oxides (NOx). Exhaust is then routed through an oxidative catalyst to remove carbon monoxide and other products of incomplete combustion.

SITE TOUR — MAY 2, 2022

☒ Presented Credentials
☒ Stated authority and purpose of inspection
☐ Provided Small Business Resource Information Sheet
☒ Small Business Resource Information Sheet not provided. Reason: Not a small business
☒ Provided CBI warning to facility

Data Collected and Observations:
Dan Thompson led EPA on a tour of the Facility. EPA looked at the control screens for the process, then walked through the site from the beginning to the end of the gas treatment system, and finished by looking at the engine room. EPA made observations with a FLIR GF360 Optical Gas Imaging camera and monitored with a ThermoFisher Toxic Vapor Analyzer 2020 (TVA2020) flame ionization device. EPA identified a leak from a sample line with the FLIR and confirmed it with the TVA2020. The Facility capped the leak the next day and provided EPA a picture of the corrective action.

Photos and/or Videos: were taken during the inspection. See Appendix A.
Field Measurements: were taken during this inspection. See above.

INSPECTION CONFERENCE — JUNE 1, 2022

☒ Provided U.S. EPA point of contact to the facility
☒ Provided CBI warning to facility

Staff Interview:
The Facility was constructed in 2008, began operations in 2009, and had a retrofit modifying operations in 2012. No major changes to operations have occurred since 2012.

The Facility receives around 6,300 scfm of raw landfill gas from Cedar Hills, down from a historical peak of 9,800 scfm.

The Facility is an area source for air permitting, and thus operates under PSCAA Notice of Construction Permits, not a Title V permit.

In addition to the control valves routing to the open flare, the Facility has mechanical pressure relief valves (PRVs) that are inspected annually to ensure no leakage. The PRVs are inspected either by Washington State or by the Facility's insurance provider.

If final gas is off specification, the Facility checks with PSE. Some level of off-spec gas is allowed under their contract, but if the Facility needs to cease delivery, they route the gas to the open flare and if they cannot resolve the issue shut down the Facility. No gas is ever routed back to Cedar Hills.

The Facility conducts monthly monitoring for carbon monoxide, NOx, and oxygen at the engine exhausts. The Facility calculates rolling 12-month emissions for compliance, using the monthly monitoring data and emission factors for particulate matter, sulfur dioxide, and formaldehyde. The Facility recently was seeing approximately 0.1 tons of formaldehyde emissions per year.

The Facility has applied to modify their permit to remove the option running the engines on pure diesel, aiming to only operate under the diesel-fuel gas mixture.

EPA and the Facility discussed whether or not the engines were considered "new" for the various EPA Stationary Engines Rules and which requirements may be applicable. This was flagged as a topic that would need further research.

Requested documents:
The following documents were requested during the virtual conference and confirmed via follow up email:

- Digital version of the facility process diagram
- Any active air permits from PSCAA
- For the TO and open flare:
    - Most recent TO performance test
    - Specifications/capacity for the open flare
    - Past 12 months of monitoring data for both the TO and the flare
- For the engines:
    - A narrative explaining the production/modification of the engines from their original forms, including modifications of the ECM.
    - A narrative explanation of the pollution controls on the engines, including a description of the catalytic and SCR systems.
    - Original construction date and modification date for each engine.
    - Details for each engine, including
    - Number of cylinders
    - Displacement
    - And Power output (HP or KW).
    - Stack test data for engines for the last calendar year.
    - Any initial tests demonstrating compliance with EPA requirements.

DIGITAL SIGNATURES

Heins, Daniel Digitally signed by Heins, Daniel Date: 2022.06.03 11:40:40 -07'00'

Daniel Heins, Report Author

DERRICK TERADA Digitally signed by DERRICK TERADA Date: 2022.06.03 14:10:40 -07'00'

Derrick Terada, Acting Section Chief

APPENDICES AND ATTACHMENTS

Appendix A: Digital Image Log

APPENDIX A: DIGITAL IMAGE LOG

Inspector Name: Brendan Whyte (photos); Daniel Heins (FLIR video)
Archival Record Location: US EPA SharePoint

2022-05-22 Images/Videos

File Name	Time (PDT)	Description
P5230149.JPG	14:42	"HMI" control station
P5230150.JPG	14:44	TO monitor
P5230151.JPG	14:47	Flare monitor
P5230152.JPG	14:50	PSA monitor
P5230153.JPG	15:00	Compressors (electric)
P5230154.JPG	15:03	compressor ID plate
P5230155.JPG	15:05	Gas line from landfill [Cedar Hills]
P5230156.JPG	15:07	Inlet gas chromatograph
P5230157.JPG	15:09	Flare (small) and TO (large)
P5230158.JPG	15:11	Nitrogen tank
P5230159.JPG	15:12	TO
P5230160.JPG	15:12	Flare
P5230161.JPG	15:21	"MEDAL" system
MOV_0659.mp4	15:21	[FLIR Video] FID hit from gas sample line by "V-6270." TVA reading: 6,800 ppm / flame out
P5230162.JPG	15:22	Location of FID hit
P5230163.JPG	15:23	Nitrogen removal process
P5230164.JPG	15:25	Waste oil from CPI separator (goes to Clean Harbors)
P5230165.JPG	15:26	CPI
P5230166.JPG	15:28	Fluid from cooling heat exchanger
P5230167.JPG	15:31	Glycol system
P5230168.JPG	15:37	SCR and catalyst box for Engine Group B
P5230169.JPG	15:41	Engine "B6" oil filters
P5230170.JPG	15:42	Engine "B6" fuel filters
P5230171.JPG	15:43	B6 series plate
P5230172.JPG	15:44	B6 generator plate
P5230173.JPG	15:45	B5 oil filters
P5230174.JPG	15:47	A1 fuel filter
P5230175.JPG	15:47	A1 oil filters
P5230176.JPG	15:48	A1 (no block ID)
P5230177.JPG	15:48	A1 generator plate
P5230178.JPG	15:49	A1 engine
P5230179.JPG	15:49	A1 engine