From: Christopher Anglin
To: EGLE-ROP
Cc: Rodney Taylor; Brian Leahy; Emma L. Wright
Subject: Red Leaf RNG, LLC ROP Application Permit No.89-22
Date: Tuesday, July 2, 2024 9:16:11 AM
Attachments: Red Leaf Full ROP Application_Signed.pdf

CAUTION: This is an External email. Please send suspicious emails to abuse@michigan.gov

Thank you for the call this morning and giving us the opportunity to submit electronically. Attached is the Red Leaf RNG, LLC Renewable Operating Permit (ROP) application that we mailed on 6/27/24.

If you need any additional information please contact us.

Regards,

Chris Anglin, CHST, CSP
Director of Safety & Environmental
Email: c.anglin@novillarng.com
Mobile: 734-915-2384
435 Joe Hall Dr.
Ypsilanti, MI 48197
www.novillarng.com

Michigan Department of Environment, Great Lakes, and Energy - Air Quality Division

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RENEWABLE OPERATING PERMIT INITIAL APPLICATION
ASC-001 APPLICATION SUBMITTAL AND CERTIFICATION

This information is required by Article II, Chapter 1, Part 55 (Air Pollution Control) of P.A. 451 of 1994, as amended, and the Federal Clean Air Act of 1990. Failure to obtain a permit required by Part 55 may result in penalties and/or imprisonment. Refer to "Renewable Operating Permit Initial Application Instructions" for additional information to complete the application.

Source Name: Red Leaf RNG, LLC	SRN: ~~89-22~~ P1268	Section Number (if applicable):

Identify the items that are included as part of your administratively complete application in the checklist below. For your application to be complete, it must include information necessary to evaluate the source and to determine all applicable requirements. Answer the compliance statements as they pertain to all the applicable requirements to which the source is subject. A Responsible Official must sign and date this form.

Listing of ROP Application Contents. See the initial application instructions for guidance regarding which forms and attachments are required for your source. Check the box for the items included with your application.

☒	Completed ROP Initial Application Forms (required)	☐	Copies of all Consent Orders/Consent Judgments
☐	MAERS Forms (to report emissions not previously submitted)	☐	Compliance Plan/Schedule of Compliance
☒	HAP/Criteria Pollutant Potential to Emit Calculations	☐	Acid Rain Initial Permit Application
☒	Stack information	☐	Cross-State Air Pollution Rule (CSAPR) Information
☒	Copies of all active Permit(s) to Install (required)	☒	Additional Information (AI-001) Forms
☐	Compliance Assurance Monitoring (CAM) Plan	☒	Paper copy of all documentation provided (required)
☒	Other Plans (e.g., Malfunction Abatement, Fugitive Dust, Operation and Maintenance, etc.)	☒	Electronic documents provided (optional)
☐	Confidential Information	☐	Other, explain:

Compliance Statement

This source is in compliance with **all** of its applicable requirements, including those contained in Permits to Install, this application and other applicable requirements that the source is subject to. ☒ Yes ☐ No

This source will continue to be in compliance with all of its applicable requirements, including those contained in Permits to Install, this application and other applicable requirements that the source is subject to. ☒ Yes ☐ No

This source will meet, in a timely manner, applicable requirements that become effective during the permit term. ☒ Yes ☐ No

The method(s) used to determine compliance for each applicable requirement is/are the method(s) specified in the existing Permits to Install, this application and all other applicable requirements that the source is subject to.

If any of the above are checked No, identify the emission unit(s) or flexible group(s) affected and the applicable requirement for which the source is or will be out of compliance at the time of issuance of the ROP on an AI-001 Form. Provide a compliance plan and schedule of compliance on an AI-001 Form.

Name and Title of the Responsible Official (Print or Type)

Rodney Taylor

As a Responsible Official, I certify that, based on information and belief formed after reasonable inquiry, the statements and information in this application are true, accurate, and complete.

Rodney Taylor — **Signature of Responsible Official**

6-28-2024 — **Date**

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RENEWABLE OPERATING PERMIT INITIAL APPLICATION
SI-001 SECTION INFORMATION

This information is required by Article II, Chapter 1, Part 55 (Air Pollution Control) of P.A. 451 of 1994, as amended, and the Federal Clean Air Act of 1990. Failure to obtain a permit required by Part 55 may result in penalties and/or imprisonment. Refer to "Renewable Operating Permit Initial Application Instructions" for additional information to complete the application.

SRN: P1268	Section Number (if applicable):

SECTION INFORMATION	
Section Name N/A	
Section Description (Including address if different from Source address identified on the S-001 Form)	
Emission Units Included In This Section	
EU-	**EU-**
EU-	**EU-**
EU-	**EU-**
EU-	**EU-**
EU-	**EU-**
EU-	**EU-**
EU-	**EU-**
EU-	**EU-**
EU-	**EU-**
EU-	**EU-**
EU-	**EU-**
EU-	**EU-**
EU-	**EU-**
EU-	**EU-**
EU-	**EU-**
EU-	**EU-**
EU-	**EU-**
EU-	**EU-**

☐ Check if an AI-001 Form is attached to provide more information for SI-001. Enter AI-001 Form ID: **AI-**

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RENEWABLE OPERATING PERMIT INITIAL APPLICATION
S-001 STATIONARY SOURCE INFORMATION

This information is required by Article II, Chapter 1, Part 55 (Air Pollution Control) of P.A. 451 of 1994, as amended, and the Federal Clean Air Act of 1990. Failure to obtain a permit required by Part 55 may result in penalties and/or imprisonment. Refer to "Renewable Operating Permit Initial Application Instructions" for additional information to complete the application.

SRN: P1268	Section Number (if applicable):

SOURCE INFORMATION

SIC Code	NAICS Code
	221210

Source Name
Red Leaf RNG, LLC

Street Address
113 N. Lee Road (Maple Row Dairy)

City	State	ZIP Code	County
Saranac	MI	48881	Ionia

Section/Town/Range (if street address not available)

Source Description
Environmentally beneficial biomethane recovery and pipeline quality renewable natural gas (RNG) plant on land leased from the Maple Row Dairy farm in Saranac, Michigan.

OWNER INFORMATION

Owner Name
Red Leaf RNG, LLC

Mailing address (☐ check if same as source address)
435 Joe Hall Dr.

City	State	ZIP Code	County	Country
Ypsilanti	MI	48197	Washtenaw	USA

☐ Check if an AI-001 Form is attached to provide more information for S-001. Enter AI-001 Form ID: **AI-**

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RENEWABLE OPERATING PERMIT INITIAL APPLICATION FORM
S-002 CONTACT AND RESPONSIBLE OFFICIAL INFORMATION

This information is required by Article II, Chapter 1, Part 55 (Air Pollution Control) of P.A. 451 of 1994, as amended, and the Federal Clean Air Act of 1990. Failure to obtain a permit required by Part 55 may result in penalties and/or imprisonment. Refer to "Renewable Operating Permit Initial Application Instructions" for additional information to complete the application.

SRN: P1268	Section Number (if applicable):

At least one contact and one Responsible Official must be identified. Additional contacts and Responsible Officials may be included if necessary.

CONTACT INFORMATION

Contact 1 Name			Title	
Christopher Anglin			Director of Environmental and Safety	
Company Name & Mailing address (☐ check if same as source address)				
Novilla RNG 435 Joe Hall Drive				
City	State	ZIP Code	County	Country
Ypsilanti	MI	48197	Washtenaw	USA
Phone number		E-mail address		
734-915-2384		c.anglin@novillarng.com		

Contact 2 Name (optional)			Title	
Company Name & Mailing address (☐ check if same as source address)				
City	State	ZIP Code	County	Country
Phone number		E-mail address		

RESPONSIBLE OFFICIAL INFORMATION

Responsible Official 1 Name			Title	
Rodney Taylor			VP of Operations	
Company Name & Mailing address (☐ check if same as source address)				
Novilla RNG 435 Joe Hall Drive				
City	State	ZIP Code	County	Country
Ypsilanti	MI	48197	Washtenaw	USA
Phone number		E-mail address		
405-320-0969		r.taylor@novillarng.com		

Responsible Official 2 Name (optional)			Title	
Company Name & Mailing address (☐ check if same as source address)				
City	State	ZIP Code	County	Country
Phone number		E-mail address		

☐ Check if an AI-001 Form is attached to provide more information for S-002. Enter AI-001 Form ID: **AI-**

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RENEWABLE OPERATING PERMIT INITIAL APPLICATION
S-003 SOURCE REQUIREMENT INFORMATION

This information is required by Article II, Chapter 1, Part 55 (Air Pollution Control) of P.A. 451 of 1994, as amended, and the Federal Clean Air Act of 1990. Failure to obtain a permit required by Part 55 may result in penalties and/or imprisonment. Refer to "Renewable Operating Permit Initial Application Instructions" for additional information to complete the application.

SRN: P1268	Section Number (if applicable):

SOURCE REQUIREMENT INFORMATION

Answer the questions below for specific requirements or programs to which the source may be subject. Refer to the ROP Initial Application Instructions for additional information.

1.	Actual emissions and associated data from **all** emission units with applicable requirements are required to be reported in MAERS. Are there any emissions and associated data that have not been reported in MAERS for the most recent emissions reporting year? If Yes, identify the emission unit(s) that was/were not reported in MAERS on an AI-001 Form. Applicable MAERS form(s) for unreported emission units must be included with this application.	☐ Yes ☒ No
2.	Is this source subject to the federal regulations on ozone-depleting substances? (40 CFR Part 82)	☐ Yes ☒ No
3.	a. Is this source subject to the federal Chemical Accident Prevention Provisions? (Section 112(r) of the Clean Air Act Amendments, 40 CFR Part 68) If Yes, a Risk Management Plan (RMP) and periodic updates must be submitted to the USEPA. b. Has an updated RMP been submitted to the USEPA?	☐ Yes ☒ No ☐ Yes ☐ No
4.	Does the source belong to one of the source categories that require quantification of fugitive emissions? If Yes, identify the category on an AI-001 Form and include the fugitive emissions in the PTE calculations for the source. *See ROP Initial Application instructions.*	☐ Yes ☒ No
5.	Does this stationary source have the potential to emit (PTE) of 100 tons per year or more of any criteria pollutant (PM-10, PM 2.5, VOC, NOx, SO_2, CO, lead)? If Yes, include potential emission calculations for each identified pollutant on an AI-001 Form.	☒ Yes ☐ No
6.	Does this stationary source emit any hazardous air pollutants (HAPs) regulated by the federal Clean Air Act, Section 112? If Yes, include potential and actual emission calculations for HAPs, **including fugitive emissions** on an AI-001 Form.	☒ Yes ☐ No
7.	a. Are any emission units subject to Compliance Assurance Monitoring (CAM)? If Yes, identify the specific emission unit(s) and pollutant(s) subject to CAM on an AI-001 Form. b. Is a CAM plan included with this application on an AI-001 Form?	☐ Yes ☒ No ☐ Yes ☐ No
8.	Does the source have any active Consent Orders/Consent Judgments (CO/CJ)? If Yes, attach a copy of each CO/CJ on an AI-001 Form.	☐ Yes ☒ No
9.	Are any emission units subject to the federal Cross State Air Pollution Rule (CSAPR)? If Yes, identify the specific emission unit(s) subject to CSAPR on an AI-001 Form.	☐ Yes ☒ No
10.	a. Are any emission units subject to the federal Acid Rain Program? If Yes, identify the specific emission unit(s) subject to the Federal Acid Rain Program on an AI-001 Form. b. Is an Acid Rain Permit Application included with this application?	☐ Yes ☒ No ☐ Yes ☒ No
11.	Does the source have any required plans such as a malfunction abatement plan, fugitive dust plan, operation/maintenance plan, startup/shutdown plans or any other monitoring plan? If Yes, then the plan(s) must be submitted with this application on an AI-001 Form.	☒ Yes ☐ No
12.	Are there any specific requirements that the source proposes to be identified in the ROP as non-applicable? If Yes, then the requirement and justification must be submitted on an AI-001 Form.	☐ Yes ☒ No

☒ Check if an AI-001 Form is attached to provide more information for S-003. Enter AI-001 Form ID: **AI-**002, 005, 006

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RENEWABLE OPERATING PERMIT INITIAL APPLICATION
EU-001 PERMIT TO INSTALL (PTI) EXEMPT EMISSION UNITS

This information is required by Article II, Chapter 1, Part 55 (Air Pollution Control) of P.A. 451 of 1994, as amended, and the Federal Clean Air Act of 1990. Failure to obtain a permit required by Part 55 may result in penalties and/or imprisonment. Refer to "Renewable Operating Permit Initial Application Instructions" for additional information to complete the application.

SRN: P1268	Section Number (if applicable):

Review all emission units at the source and answer the question below.

1. Does the source have any emission units that are required to be listed in the ROP application under R 336.1212(4) (Rule 212(4)) of the Michigan Air Pollution Control Rules, not including Rules 281(2)(h), 287(2)(c), and 290?

☒ Yes ☐ No

If Yes, identify the emission units in the table below. If No, go to the EU-002 Form.

Note: Emission units that are subject to process specific emission limitations or standards, even if identified in Rule 212, must be captured in either an EU-002 or EU-004 Form. Identical emission units may be grouped (e.g. PTI exempt Storage Tanks).

Emission Unit ID	**Emission Unit Description**	**PTI Exemption Rule Citation** [e.g. Rule 282(2)(b)(i)]	**Rule 212(4) Citation** [e.g. Rule 212(4)(c)]
EU-GENERATOR	60kW Emergency Generator	285(2)(g)	
EU-			
EU-			
EU-			
EU-			
EU-			
EU-			
EU-			
EU-			

Comments:

☒ Check if an AI-001 Form is attached to provide more information for EU-001. Enter AI-001 Form ID: **AI-**004

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RENEWABLE OPERATING PERMIT INITIAL APPLICATION
EU-002 EMISSION UNITS MEETING THE CRITERIA OF RULES 281(2)(h), 285(2)(r)(iv), 287(2)(c), OR 290

This information is required by Article II, Chapter 1, Part 55 (Air Pollution Control) of P.A. 451 of 1994, as amended, and the Federal Clean Air Act of 1990. Failure to obtain a permit required by Part 55 may result in penalties and/or imprisonment. Refer to "Renewable Operating Permit Initial Application Instructions" for additional information to complete the application.

SRN: P1268	Section Number (if applicable):

Review all emission units and applicable requirements at the source and provide the following information.

1. Does the source have any emission units which meet the criteria of Rules 281(2)(h), 285(2)(r)(iv), 287(2)(c), or 290. ☐ Yes ☒ No

   If Yes, identify the emission units in the table below. If No, go to the EU-003 Form.

Note: If several emission units were installed under the same rule above, provide a description of each and an installation date for each.

Origin of Applicable Requirements	**Emission Unit Description – *Provide Emission Unit ID and a description of Process Equipment, Control Devices and Monitoring Devices***	**Date Emission Unit was Installed/ Modified/ Reconstructed**
☐ Rule 281(2)(h) or 285(2)(r)(iv) cleaning operation		
☐ Rule 287(2)(c) surface coating line		
☐ Rule 290 process with limited emissions		

Comments:

☐ Check if an AI-001 Form is attached to provide more information for EU-002. Enter AI-001 Form ID: **AI-**

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RENEWABLE OPERATING PERMIT INITIAL APPLICATION
EU-003 EMISSION UNITS WITH PERMITS TO INSTALL

This information is required by Article II, Chapter 1, Part 55 (Air Pollution Control) of P.A. 451 of 1994, as amended, and the Federal Clean Air Act of 1990. Failure to obtain a permit required by Part 55 may result in penalties and/or imprisonment. Refer to "Renewable Operating Permit Initial Application Instructions" for additional information to complete the application.

SRN: P1268	Section Number (if applicable):

Review all emission units at the source and fill in the information in the following table for **all** emission units with Permits to Install (PTI). Any PTI(s) identified below must be attached to the application.

Permit to Install Number	Emission Unit ID	Description (*Include Process Equipment, Control Devices and Monitoring Devices*)	Date Emission Unit was Installed/ Modified/ Reconstructed
89-22	**EU-**BOILER	A 5.5 MMBtu/hr natural gas or propane-fired boiler for heating the digester	8/15/2023
89-22	**EU-**GCU	Gas Cleaning and Upgrading Unit including a multistage membrane system	9/30/2023
89-22	**EU-**FLARE	One digester gas flare used as backup for the EUGCU	8/3/2023
	EU-		
	EU-		
	EU-		
	EU-		
	EU-		
	EU-		

1. Are you proposing changes to any emission unit names, descriptions or control devices in the PTIs listed above? If Yes, describe the proposed changes on an AI-001 Form. ☐ Yes ☒ No

2. Are you proposing additions or clarifications to any permit conditions? If Yes, describe the proposed changes on an AI-001 Form. ☐ Yes ☒ No

3. Are you proposing monitoring, testing, recordkeeping and/or reporting necessary to demonstrate compliance with any applicable requirements? If Yes, describe the proposed conditions on an AI-001 Form. ☐ Yes ☒ No

☐ Check if an AI-001 Form is attached to provide more information for EU-003. Enter AI-001 Form ID: **AI-**

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RENEWABLE OPERATING PERMIT INITIAL APPLICATION
EU-004 OTHER EMISSION UNITS

This information is required by Article II, Chapter 1, Part 55 (Air Pollution Control) of P.A. 451 of 1994, as amended, and the Federal Clean Air Act of 1990. Failure to obtain a permit required by Part 55 may result in penalties and/or imprisonment. Refer to "Renewable Operating Permit Initial Application Instructions" for additional information to complete the application.

SRN: P1268	Section Number (if applicable):

Complete an EU-004 Form for **all** emission units with applicable requirements that have **not** been addressed on an EU-001, EU-002 or EU-003 Form. This would include grandfathered emission units or PTI exempt emission units subject to applicable requirements in the AQD Rules, and emission units subject to a MACT, NESHAP, NSPS, or other federal requirement.

1. Does the source have emission units with applicable requirements that have not been addressed on the EU-001, EU-002 and/or EU-003 Forms? ☐ Yes ☒ No

   If Yes, provide the required information below. Complete the AR-001 and/or AR-002 Form(s) to identify all applicable requirements and all monitoring, testing, recordkeeping and/or reporting to demonstrate compliance with the applicable requirements.

Emission Unit ID **EU-**	Installation Date (MM/DD/YYYY)	Modification/Reconstruction Date(s) (MM/DD/YYYY)	SIC Code – *If different from S-001 Form*
Emission Unit Description – *Include process equipment, control devices, monitoring devices, and all stacks/vents associated with this emission unit that have applicable requirements. Indicate which forms are used to describe/include the applicable requirements for this emission unit (AR-001 and/or AR-002 Forms).*			

Emission Unit ID **EU-**	Installation Date (MM/DD/YYYY)	Modification/Reconstruction Date(s) (MM/DD/YYYY)	SIC Code – *If different from S-001 Form*
Emission Unit Description – *Include process equipment, control devices, monitoring devices, and all stacks/vents associated with this emission unit that have applicable requirements. Indicate which forms are used to describe/include the applicable requirements for this emission unit (AR-001 and/or AR-002 Forms).*			

Emission Unit ID **EU-**	Installation Date (MM/DD/YYYY)	Modification/Reconstruction Date(s) (MM/DD/YYYY)	SIC Code – *If different from S-001 Form*
Emission Unit Description – *Include process equipment, control devices, monitoring devices, and all stacks/vents associated with this emission unit that have applicable requirements. Indicate which forms are used to describe/include the applicable requirements for this emission unit (AR-001 and/or AR-002 Forms).*			

☐ Check if an AI-001 Form is attached to provide more information for EU-004. Enter AI-001 Form ID: **AI-**

RENEWABLE OPERATING PERMIT INITIAL APPLICATION
FG-001: FLEXIBLE GROUPS

This information is required by Article II, Chapter 1, Part 55 (Air Pollution Control) of P.A. 451 of 1994, as amended, and the Federal Clean Air Act of 1990. Failure to obtain a permit required by Part 55 may result in penalties and/or imprisonment. Refer to "Renewable Operating Permit Initial Application Instructions" for additional information to complete the application.

SRN: P1268	Section Number (if applicable):

Complete the FG-001 Form for all Emission Units (EUs) that you want to combine into a Flexible Group (FG). Create a descriptive ID for the FG and description, and list the IDs for the EUs to be included in the FG. See instructions for FG examples.

Flexible Group ID **FG-**Flare			
Flexible Group Description One gas cleaning and upgrading unit and one flare.			
Emission Unit IDs			
EU-Flare	**EU-**	**EU-**	**EU-**
EU-GCU	**EU-**	**EU-**	**EU-**
EU-	**EU-**	**EU-**	**EU-**
EU-	**EU-**	**EU-**	**EU-**
EU-	**EU-**	**EU-**	**EU-**
EU-	**EU-**	**EU-**	**EU-**
EU-	**EU-**	**EU-**	**EU-**
Flexible Group ID **FG-**			
Flexible Group Description			
Emission Unit IDs			
EU-	**EU-**	**EU-**	**EU-**
EU-	**EU-**	**EU-**	**EU-**
EU-	**EU-**	**EU-**	**EU-**
EU-	**EU-**	**EU-**	**EU-**
EU-	**EU-**	**EU-**	**EU-**
EU-	**EU-**	**EU-**	**EU-**
EU-	**EU-**	**EU-**	**EU-**
☐ Check if an AI-001 Form is attached to provide more information for FG-001. Enter AI-001 Form ID: **AI-**			

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RENEWABLE OPERATING PERMIT INITIAL APPLICATION
AR-001 APPLICABLE REQUIREMENTS FROM MACT, NESHAP OR NSPS

This information is required by Article II, Chapter 1, Part 55 (Air Pollution Control) of P.A. 451 of 1994, as amended, and the Federal Clean Air Act of 1990. Failure to obtain a permit required by Part 55 may result in penalties and/or imprisonment. Refer to "Renewable Operating Permit Initial Application Instructions" for additional information to complete the application.

SRN: P1268	Proposed Section Number (if applicable):

Answer the question below for emission units subject to a MACT, NESHAP or NSPS regulation and provide either an existing Permit to Install, an existing template table*, or a newly created table** that contains the applicable requirements for each subject emission unit with the application, including associated monitoring, testing, recordkeeping and reporting necessary to demonstrate compliance.

1. Is any emission unit subject to a Maximum Achievable Control Technology (MACT) standard in 40 CFR Part 63, National Emission Standard for Hazardous Air Pollutants (NESHAP) in 40 CFR Part 61, or New Source Performance Standard (NSPS) in 40 CFR Part 60? ☒ Yes ☐ No

   If yes, identify the emission units and applicable MACT, NESHAP or NSPS in the table below.

Note: If several emission units are subject to the same regulation, list all of the emission unit IDs together. Attach the applicable requirements (PTI, template table or newly created table) in the selected format to the application using an AI-001 Form.

MACT NESHAP or NSPS Subpart and Name	**Emission Unit ID –** *Provide the Emission Unit ID you created on the EU-003 or EU-004 Form*	**Applicable Requirements Attached in Which Format?**
NSPS Subpart JJJJ (area HAP source)	EU-GENERATOR	☐ PTI No. ☐ Template Table* ☒ Newly Created Table**
		☐ PTI No. ☐ Template Table* ☐ Newly Created Table**
		☐ PTI No. ☐ Template Table* ☐ Newly Created Table**
		☐ PTI No. ☐ Template Table* ☐ Newly Created Table**
		☐ PTI No. ☐ Template Table* ☐ Newly Created Table**

STREAMLINED REQUIREMENTS

2. Are you proposing to streamline any requirements? ☐ Yes ☒ No

   If yes, identify the streamlined and subsumed requirements and provide the EU ID and a justification for streamlining the applicable requirement on an AI-001 Form.

*MACT and NSPS template tables (available at the link below)

**Blank EU or FG template tables (available at the link below)

http://michigan.gov/air (select the Permits Tab, "Renewable Operating Permits(ROP)/Title V", then "ROP Forms & Templates")

☒ Check if an AI-001 Form is attached to provide more information for AR-001. Enter AI-001 Form ID: **AI-**004

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RENEWABLE OPERATING PERMIT INITIAL APPLICATION
AR-002 OTHER APPLICABLE REQUIREMENTS

This information is required by Article II, Chapter 1, Part 55 (Air Pollution Control) of P.A. 451 of 1994, as amended, and the Federal Clean Air Act of 1990. Failure to obtain a permit required by Part 55 may result in penalties and/or imprisonment. Refer to "Renewable Operating Permit Initial Application Instructions" for additional information to complete the application.

SRN: P1268	Section Number (if applicable):

APPLICABLE REQUIREMENTS NOT INCLUDED IN A PTI, MACT, NESHAPS, NSPS, OR PERMIT EXEMPTION

Answer the questions below and create an EU table to identify terms and conditions for each emission unit identified on an EU-004 Form (other than MACT, NESHAP, or NSPS requirements). This would include emission units that are grandfathered or exempt from PTI requirements but subject to state rules, federal rules or consent orders/consent judgments. Blank EU template tables are available on the EGLE Internet at: http://michigan.gov/air (select the Permits Tab, "Renewable Operating Permits (ROP)/Title V", then "ROP Forms & Templates")

1. Is there an emission unit identified on an EU-004 Form that is subject to **emission limit(s)**? If Yes, fill out an EU table to identify the emission limit(s), and provide the EU ID and the source of the applicable requirement below. Do not include requirements identified on an AR-001 Form.	☐ Yes ☒ No
2. Is there an emission unit identified on an EU-004 Form that is subject to **material limit(s)**? If Yes, fill out an EU table to identify the material limit(s), and provide the EU ID and the source of the applicable requirement below. Do not include requirements identified on an AR-001 Form.	☐ Yes ☒ No
3. Is there an emission unit identified on an EU-004 Form that is subject to **process/operational restriction(s)**? If Yes, fill out an EU table to identify the process/operational restriction(s), and provide the EU ID and the source of the applicable requirement below. Do not include requirements identified on an AR-001 Form.	☐ Yes ☒ No
4. Is there an emission unit identified on an EU-004 Form that is subject to **design/equipment parameter(s)**? If Yes, fill out an EU table to identify the design/equipment parameter(s), and provide the EU ID and the source of the applicable requirement below. Do not include requirements identified on an AR-001 Form.	☐ Yes ☒ No

5. Is there an emission unit identified on an EU-004 Form that is subject to **testing/sampling requirement(s)**? If Yes, fill out an EU table to identify the testing/sampling requirement(s), and provide the EU ID and the source of the applicable requirement below. Do not include requirements identified on an AR-001 Form.	☐ Yes ☒ No
6. Is there an emission unit identified on an EU-004 Form that is subject to **monitoring/recordkeeping requirement(s)**? If Yes, fill out an EU table to identify the monitoring/recordkeeping requirement(s), and provide the EU ID and the source of the applicable requirement below. Do not include requirements identified on an AR-001 Form.	☐ Yes ☒ No
7. Is there an emission unit identified on an EU-004 Form that is subject to **reporting requirement(s)**? If Yes, fill out an EU table to identify reporting requirement(s), and provide the EU ID and the source of the applicable requirement below. Do not include requirements identified on an AR-001 Form.	☐ Yes ☒ No
8. Is there an emission unit identified on an EU-004 Form that is subject to **stack/vent restriction(s)**? If Yes, fill out an EU table to identify stack/vent restriction(s), and provide the EU ID and the source of the applicable requirement below. Do not include requirements identified on an AR-001 Form.	☐ Yes ☒ No
9. Are there any other requirements that you would like to **add** for an emission unit identified on an EU-004 Form? If Yes, fill out an EU table to identify the requirements, and provide the EU ID and a justification for the applicable requirement below. Do not include requirements identified on an AR-001 Form.	☐ Yes ☒ No
10. Are you proposing to streamline any requirements? If Yes, identify the streamlined and subsumed requirements and the EU ID, and provide a justification for streamlining the applicable requirement below. Do not include requirements identified on an AR-001 Form.	☐ Yes ☒ No
☐ Check if an AI-001 Form is attached to provide more information for AR-002. Enter AI-001 Form ID: **AI-**	

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RENEWABLE OPERATING PERMIT INITIAL APPLICATION
AR-003 SOURCE-WIDE APPLICABLE REQUIREMENTS

This information is required by Article II, Chapter 1, Part 55 (Air Pollution Control) of P.A. 451 of 1994, as amended, and the Federal Clean Air Act of 1990. Failure to obtain a permit required by Part 55 may result in penalties and/or imprisonment. Refer to "Renewable Operating Permit Initial Application Instructions" for additional information to complete the application.

SRN: P1268	Section Number (if applicable):

Complete a Source-wide table for any conditions that apply to the entire source. A blank Source-wide template table is available on the EGLE Internet at:
http://michigan.gov/air (select the Permits Tab, "Renewable Operating Permits (ROP)/Title V", then "ROP Forms & Templates")

1. Are there any applicable requirements that apply to the entire source? If Yes, identify the conditions by utilizing a Source-wide template table and include all of the appropriate applicable requirements, including associated monitoring, testing, recordkeeping and reporting necessary to demonstrate compliance. Provide information regarding the applicable requirements in the comment field below.	☐ Yes ☒ No
Comments	

☐ Check if an AI-001 Form is attached to provide more information for AR-003. Enter AI-001 Form ID: **AI-**

Red Leaf RNG Active PTI

Form AI-001

June 2024 ROP Application

MICHIGAN DEPARTMENT OF ENVIRONMENT, GREAT LAKES, AND ENERGY
AIR QUALITY DIVISION

July 5, 2022

PERMIT TO INSTALL
89-22

ISSUED TO
Red Leaf RNG, LLC

LOCATED AT
113 North Lee Road
Saranac, Michigan 48881

IN THE COUNTY OF
Ionia

STATE REGISTRATION NUMBER
P1268

The Air Quality Division has approved this Permit to Install, pursuant to the delegation of authority from the Michigan Department of Environment, Great Lakes, and Energy. This permit is hereby issued in accordance with and subject to Section 5505(1) of Article II, Chapter I, Part 55, Air Pollution Control, of the Natural Resources and Environmental Protection Act, 1994 PA 451, as amended. Pursuant to Air Pollution Control Rule 336.1201(1), this permit constitutes the permittee's authority to install the identified emission unit(s) in accordance with all administrative rules of the Department and the attached conditions. Operation of the emission unit(s) identified in this Permit to Install is allowed pursuant to Rule 336.1201(6).

DATE OF RECEIPT OF ALL INFORMATION REQUIRED BY RULE 203: **June 27, 2022**	
DATE PERMIT TO INSTALL APPROVED: **July 5, 2022**	SIGNATURE:
DATE PERMIT VOIDED:	SIGNATURE:
DATE PERMIT REVOKED:	SIGNATURE:

PERMIT TO INSTALL

Table of Contents

COMMON ACRONYMS

AQD	Air Quality Division
BACT	Best Available Control Technology
CAA	Clean Air Act
CAM	Compliance Assurance Monitoring
CEMS	Continuous Emission Monitoring System
CFR	Code of Federal Regulations
COMS	Continuous Opacity Monitoring System
Department/department/EGLE	Michigan Department of Environment, Great Lakes, and Energy
EU	Emission Unit
FG	Flexible Group
GACS	Gallons of Applied Coating Solids
GC	General Condition
GHGs	Greenhouse Gases
HVLP	High Volume Low Pressure*
ID	Identification
IRSL	Initial Risk Screening Level
ITSL	Initial Threshold Screening Level
LAER	Lowest Achievable Emission Rate
MACT	Maximum Achievable Control Technology
MAERS	Michigan Air Emissions Reporting System
MAP	Malfunction Abatement Plan
MSDS	Material Safety Data Sheet
NA	Not Applicable
NAAQS	National Ambient Air Quality Standards
NESHAP	National Emission Standard for Hazardous Air Pollutants
NSPS	New Source Performance Standards
NSR	New Source Review
PS	Performance Specification
PSD	Prevention of Significant Deterioration
PTE	Permanent Total Enclosure
PTI	Permit to Install
RACT	Reasonable Available Control Technology
ROP	Renewable Operating Permit
SC	Special Condition
SCR	Selective Catalytic Reduction
SNCR	Selective Non-Catalytic Reduction
SRN	State Registration Number
TBD	To Be Determined
TEQ	Toxicity Equivalence Quotient
USEPA/EPA	United States Environmental Protection Agency
VE	Visible Emissions

*For HVLP applicators, the pressure measured at the gun air cap shall not exceed 10 psig.

POLLUTANT / MEASUREMENT ABBREVIATIONS

acfm	Actual cubic feet per minute
BTU	British Thermal Unit
°C	Degrees Celsius
CO	Carbon Monoxide
CO_2e	Carbon Dioxide Equivalent
dscf	Dry standard cubic foot
dscm	Dry standard cubic meter
°F	Degrees Fahrenheit
gr	Grains
HAP	Hazardous Air Pollutant
Hg	Mercury
hr	Hour
HP	Horsepower
H_2S	Hydrogen Sulfide
kW	Kilowatt
lb	Pound
m	Meter
mg	Milligram
mm	Millimeter
MM	Million
MW	Megawatts
NMOC	Non-Methane Organic Compounds
NO_x	Oxides of Nitrogen
ng	Nanogram
PM	Particulate Matter
PM10	Particulate Matter equal to or less than 10 microns in diameter
PM2.5	Particulate Matter equal to or less than 2.5 microns in diameter
pph	Pounds per hour
ppm	Parts per million
ppmv	Parts per million by volume
ppmw	Parts per million by weight
psia	Pounds per square inch absolute
psig	Pounds per square inch gauge
scf	Standard cubic feet
sec	Seconds
SO_2	Sulfur Dioxide
TAC	Toxic Air Contaminant
Temp	Temperature
THC	Total Hydrocarbons
tpy	Tons per year
µg	Microgram
µm	Micrometer or Micron
VOC	Volatile Organic Compounds
yr	Year

GENERAL CONDITIONS

1. The process or process equipment covered by this permit shall not be reconstructed, relocated, or modified, unless a Permit to Install authorizing such action is issued by the Department, except to the extent such action is exempt from the Permit to Install requirements by any applicable rule. **(R 336.1201(1))**

2. If the installation, construction, reconstruction, relocation, or modification of the equipment for which this permit has been approved has not commenced within 18 months, or has been interrupted for 18 months, this permit shall become void unless otherwise authorized by the Department. Furthermore, the permittee or the designated authorized agent shall notify the Department via the Supervisor, Permit Section, Air Quality Division, Michigan Department of Environment, Great Lakes, and Energy, P.O. Box 30260, Lansing, Michigan 48909-7760, if it is decided not to pursue the installation, construction, reconstruction, relocation, or modification of the equipment allowed by this Permit to Install. **(R 336.1201(4))**

3. If this Permit to Install is issued for a process or process equipment located at a stationary source that is not subject to the Renewable Operating Permit program requirements pursuant to Rule 210 (R 336.1210), operation of the process or process equipment is allowed by this permit if the equipment performs in accordance with the terms and conditions of this Permit to Install. **(R 336.1201(6)(b))**

4. The Department may, after notice and opportunity for a hearing, revoke this Permit to Install if evidence indicates the process or process equipment is not performing in accordance with the terms and conditions of this permit or is violating the Department's rules or the Clean Air Act. **(R 336.1201(8), Section 5510 of Act 451, PA 1994)**

5. The terms and conditions of this Permit to Install shall apply to any person or legal entity that now or hereafter owns or operates the process or process equipment at the location authorized by this Permit to Install. If the new owner or operator submits a written request to the Department pursuant to Rule 219 and the Department approves the request, this permit will be amended to reflect the change of ownership or operational control. The request must include all of the information required by subrules (1)(a), (b), and (c) of Rule 219 and shall be sent to the District Supervisor, Air Quality Division, Michigan Department of Environment, Great Lakes, and Energy. **(R 336.1219)**

6. Operation of this equipment shall not result in the emission of an air contaminant which causes injurious effects to human health or safety, animal life, plant life of significant economic value, or property, or which causes unreasonable interference with the comfortable enjoyment of life and property. **(R 336.1901)**

7. The permittee shall provide notice of an abnormal condition, start-up, shutdown, or malfunction that results in emissions of a hazardous or toxic air pollutant which continue for more than one hour in excess of any applicable standard or limitation, or emissions of any air contaminant continuing for more than two hours in excess of an applicable standard or limitation, as required in Rule 912, to the Department. The notice shall be provided not later than two business days after start-up, shutdown, or discovery of the abnormal condition or malfunction. Written reports, if required, must be filed with the Department within 10 days after the start-up or shutdown occurred, within 10 days after the abnormal condition or malfunction has been corrected, or within 30 days of discovery of the abnormal condition or malfunction, whichever is first. The written reports shall include all of the information required in Rule 912(5). **(R 336.1912)**

8. Approval of this permit does not exempt the permittee from complying with any future applicable requirements which may be promulgated under Part 55 of 1994 PA 451, as amended or the Federal Clean Air Act.

9. Approval of this permit does not obviate the necessity of obtaining such permits or approvals from other units of government as required by law.

10. Operation of this equipment may be subject to other requirements of Part 55 of 1994 PA 451, as amended and the rules promulgated thereunder.

11. Except as provided in subrules (2) and (3) or unless the special conditions of the Permit to Install include an alternate opacity limit established pursuant to subrule (4) of Rule 301, the permittee shall not cause or permit to be discharged into the outer air from a process or process equipment a visible emission of density greater than the most stringent of the following. The grading of visible emissions shall be determined in accordance with Rule 303 (R 336.1303). **(R 336.1301)**
    a) A six-minute average of 20 percent opacity, except for one six-minute average per hour of not more than 27 percent opacity.
    b) A visible emission limit specified by an applicable federal new source performance standard.
    c) A visible emission limit specified as a condition of this Permit to Install.

12. Collected air contaminants shall be removed as necessary to maintain the equipment at the required operating efficiency. The collection and disposal of air contaminants shall be performed in a manner so as to minimize the introduction of contaminants to the outer air. Transport of collected air contaminants in Priority I and II areas requires the use of material handling methods specified in Rule 370(2). **(R 336.1370)**

13. The Department may require the permittee to conduct acceptable performance tests, at the permittee's expense, in accordance with Rule 1001 and Rule 1003, under any of the conditions listed in Rule 1001. **(R 336.2001)**

EMISSION UNIT SPECIAL CONDITIONS

EMISSION UNIT SUMMARY TABLE

The descriptions provided below are for informational purposes and do not constitute enforceable conditions.

Emission Unit ID	Emission Unit Description (Including Process Equipment & Control Device(s))	Flexible Group ID
EUBOILER	A 5.5 MMBtu/hr natural gas or propane-fired boiler for heating the digester	NA
EUGCU	Gas Cleaning and Upgrading Unit including a multistage membrane system. The GCU is used to upgrade the raw anaerobic digester gas to meet pipeline specifications. Controlled with a Thermal Oxidizer	FGFLARE
EUFLARE	One digester gas flare used as backup for the EUGCU. The flare is capable of burning up to 571 scfm, giving a heat input capacity of 21.5 MMBtu/hr when using the estimated higher heating value of the digester gas of 1012 Btu/scf	FGFLARE

Changes to the equipment described in this table are subject to the requirements of R 336.1201, except as allowed by R 336.1278 to R 336.1291.

EUBOILER
EMISSION UNIT CONDITIONS

DESCRIPTION

A 5.5 MMBtu/hr natural gas or propane-fired boiler for heating the digester

Flexible Group ID: NA

POLLUTION CONTROL EQUIPMENT

NA

I. EMISSION LIMIT(S)

NA

II. MATERIAL LIMITS

1. The permittee shall burn only pipeline quality natural gas or propane in EUBOILER. **(R 336.1205, R 336.1224, R 336.1225, R 336.1331, R 336.1702(a), 40 CFR 52.21(c) & (d))**

III. PROCESS/OPERATIONAL RESTRICTIONS

NA

IV. DESIGN/EQUIPMENT PARAMETERS

1. The combined maximum design heat input capacity for EUBOILER shall not exceed 5.5 MMBtu per hour on a fuel heat input basis. **(R 336.1205, 40 CFR 52.21(c) & (d))**

V. TESTING/SAMPLING

NA

VI. MONITORING/RECORDKEEPING

Records shall be maintained on file for a period of five years. **(R 336.1201(3))**

NA

VII. REPORTING

1. Within 30 days after completion of the installation, construction, reconstruction, relocation, or modification authorized by this Permit to Install, the permittee or the authorized agent pursuant to Rule 204, shall notify the AQD District Supervisor, in writing, of the completion of the activity. Completion of the installation, construction, reconstruction, relocation, or modification is considered to occur not later than commencement of trial operation of each boiler within EUBOILER. **(R 336.1201(7)(a))**

VIII. STACK/VENT RESTRICTIONS

The exhaust gases from the stacks listed in the table below shall be discharged unobstructed vertically upwards to the ambient air unless otherwise noted:

Stack & Vent ID	Maximum Exhaust Diameter/Dimensions (inches)	Minimum Height Above Ground (feet)	Underlying Applicable Requirements
1. SVBOILER	18	24	40 CFR 52.21(c)&(d)

IX. OTHER REQUIREMENTS

NA

EUGCU
EMISSION UNIT CONDITIONS

DESCRIPTION

Gas Cleaning and Upgrading Unit including a multistage membrane system. The GCU is used to upgrade the raw anaerobic digester gas to meet pipeline specifications. Controlled with a Thermal Oxidizer

Flexible Group ID: FGFLARE

POLLUTION CONTROL EQUIPMENT

Thermal oxidizer

I. EMISSION LIMIT(S)

Pollutant	Limit	Time Period / Operating Scenario	Equipment	Monitoring / Testing Method	Underlying Applicable Requirements
1. SO_2	49.79 pph	Hourly	EUGCU	SC V.1	R 336.1205, 40 CFR 52.21(c) & (d)

II. MATERIAL LIMIT(S)

Material	Limit	Time Period / Operating Scenario	Equipment	Monitoring / Testing Method	Underlying Applicable Requirements
1. Biogas	146.16 MMscf/yr	12-month rolling time period as determined at the end of each calendar month	Thermal Oxidizer of EUGCU	SC VI.3	R 336.1224, R 336.1225, R 336.1702, 40 CFR 52.21(c) & (d)
2. H_2S concentration of the biogas	18,000 ppmv	Hourly	Thermal oxidizer of EUGCU	SC VI.2	R 336.1205, 40 CFR 52.21(c) & (d)

3. The volumetric feed rate for the thermal oxidizer of EUGCU shall not exceed a maximum of 278 scfm. **(R 336.1205, R 336.1224, R 336.1225, R 336.1702, 40 CFR 52.21(c) & (d))**

4. Other than the natural gas and propane used as assist gas, the permittee shall burn only gas produced by the anaerobic digester (digester biogas) in the thermal oxidizer. **(R 336.1205, R 336.1225, 40 CFR 52.21(c) & (d))**

III. PROCESS/OPERATIONAL RESTRICTION(S)

1. No later than 90 days after the completion of installation of the equipment, the permittee shall submit to the AQD District Supervisor, for review and approval, a preventative maintenance/malfunction abatement plan (PM/MAP) for EUGCU. After approval of the PM/MAP by the AQD District Supervisor, the permittee shall not operate EUGCU unless the PM/MAP, or an alternate plan approved by the AQD District Supervisor, is implemented, and maintained. The plan shall incorporate procedures recommended by the equipment manufacturer as well as incorporating standard industry practices. At a minimum, the plan shall include:
   a) Identification of the equipment and, if applicable, air-cleaning device and the supervisory personnel responsible for overseeing the inspection, maintenance, and repair.
   b) Description of the items or conditions to be inspected and frequency of the inspections or repairs.
   c) Identification of the equipment and, if applicable, air-cleaning device, operating parameters that shall be monitored to detect a malfunction or failure, the normal operating range of these parameters and a description of the method of monitoring or surveillance procedures.
   d) Identification of the major replacement parts that shall be maintained in inventory for quick replacement.
   e) A description of the corrective procedures or operational changes that shall be taken in the event of a malfunction or failure to achieve compliance with the applicable emission limits.

   If at any time the PM/MAP fails to address or inadequately addresses an event that meets the characteristics of a malfunction, the permittee shall amend the PM/MAP within 45 days after such an event occurs. The permittee shall also amend the PM/MAP within 45 days if new equipment is installed or upon request from the AQD District Supervisor. The permittee shall submit the PM/MAP and any amendments to the PM/MAP to the AQD District Supervisor for review and approval. If the AQD does not notify the permittee within 90 days of submittal, the PM/MAP or amended PM/MAP shall be considered approved. Until an amended plan is approved, the permittee shall implement corrective procedures or operational changes to achieve compliance with all applicable emission limits. **(R 336.1224, R 336.1225, R 336.1910, R 336.1911, R 336.1912)**

2. No later than 90 days after permit issuance, the permittee shall submit, implement, and maintain a nuisance minimization plan for odors as described in Appendix A, for EUGCU. If at any time the plan fails to address or inadequately addresses odor management, the permittee shall amend the plan within 45 days after such an event occurs. The permittee shall also amend the plan within 45 days if new equipment is installed or upon request from the District Supervisor. The permittee shall submit the plan and any amendments to the plan to the AQD District Supervisor for review and approval. If the AQD does not notify the permittee within 90 days of submittal, the plan or amended plan shall be considered approved. Until an amended plan is approved, the permittee shall implement corrective procedures or operational changes to minimize odors.[1] **(R 336.1901)**

IV. DESIGN/EQUIPMENT PARAMETER(S)

1. The permittee shall install, calibrate, maintain, and operate in a satisfactory manner, a device to monitor and record the volumetric flow rate of vent gas into the thermal oxidizer, on a continuous basis. Continuous shall be defined in this permit as at least one reading every 15 minutes. **(R 336.1224, R 336.1225, R 336.1901, 40 CFR 52.21(c) & (d))**

2. The permittee shall install, calibrate, maintain and operate in a satisfactory manner, acceptable to the AQD District Supervisor, a device to monitor and record the H_2S concentration of the vent gas into the thermal oxidizer of EUGCU. The permittee shall monitor and record the concentrations at this location on a continuous basis during the operation of EUGCU. Continuous shall be defined in this permit as at least one reading every 15 minutes. **(R 336.1205, R 336.1224, R 336.1225, R 336.1901, 40 CFR 52.21(c) & (d))**

3. The permittee shall not operate EUGCU unless the thermal oxidizer is installed, maintained, and operated in a satisfactory manner, acceptable the AQD District Supervisor. Satisfactory manner includes maintaining a minimum combustion chamber temperature of 1400°F and operating and maintaining the equipment in accordance with the MAP required in SC III.1. **(R 336.1205, R 336.1224, R 336.1225, R 336.1910, 40 CFR 52.21(c) & (d))**

4. The permittee shall install, calibrate, maintain and operate in a satisfactory manner, acceptable to the AQD District Supervisor, a temperature monitoring device in the combustion chamber of the thermal oxidizer to

monitor and record the temperature, on a continuous basis, during operation of EUGCU. Temperature data recording shall consist of measurements made at equally spaced intervals, not to exceed 15 minutes per interval. **(R 336.1205, R 336.1224, R 336.1225, 40 CFR 52.21(c) & (d))**

V. TESTING/SAMPLING

Records shall be maintained on file for a period of five years. **(R 336.1201(3))**

1. Within 180 days after commencement of initial startup, the permittee shall verify SO_2 emission rates from EUGCU by testing at owner's expense, in accordance with Department requirements. Testing shall be performed using an approved EPA Method listed in:

Pollutant	Test Method Reference
SO_2	40 CFR Part 60, Appendix A

An alternate method, or a modification to the approved EPA Method, may be specified in an AQD approved Test Protocol and must meet the requirements of the federal Clean Air Act, all applicable state and federal rules and regulations, and be within the authority of the AQD to make the change. No less than 60 days prior to testing, the permittee shall submit a complete test plan to the AQD Technical Programs Unit and District Office. The AQD must approve the final plan prior to testing, including any modifications to the method in the test protocol that are proposed after initial submittal. The permittee must submit a complete report of the test results to the AQD Technical Programs Unit and District Office within 60 days following the last date of the test. **(R 336.1205, R 336.1224, R 336.1225, R 336.1702, R 336.1902, R 336.2001, R 336.2003, R 336.2004, 40 CFR 52.21(c) & (d))**

VI. MONITORING/RECORDKEEPING

Records shall be maintained on file for a period of five years. **(R 336.1201(3))**

1. The permittee shall keep, in a satisfactory manner, all records related to, or as required by, the PM/MAP. **(R 336.1224, R 336.1225, R 336.1910, R 336.1911, R 336.1912)**

2. The permittee shall keep, in a satisfactory manner, continuous records of the H_2S concentration into the thermal oxidizer. The permittee shall keep all records on file and make them available to the Department upon request. Continuous shall be defined in this permit as at least one reading every 15 minutes. **(R 336.1224, R 336.1225, R 336.1901, 40 CFR 52.21(c) & (d))**

3. The permittee shall keep, in a satisfactory manner, continuous records of the volumetric flow rate of vent gas into the thermal oxidizer. The permittee shall keep all records on file and make them available to the Department upon request. Continuous shall be defined in this permit as at least one reading every 15 minutes. **(R 336.1224, R 336.1225, R 336.1901, 40 CFR 52.21(c) & (d))**

4. The permittee shall monitor and record, in a satisfactory manner acceptable to the AQD District Supervisor, the temperature in the combustion chamber of the thermal oxidizer, on a continuous basis, during operation of EUGCU. Temperature data recording shall consist of measurements made at equally spaced intervals, not to exceed 15 minutes per interval. **(R 336.1205, R 336.1224, R 336.1225, 40 CFR 52.21(c) & (d))**

VII. REPORTING

1. Within 30 days after completion of the installation, construction, reconstruction, relocation, or modification authorized by this Permit to Install, the permittee or the authorized agent pursuant to Rule 204, shall notify the AQD District Supervisor, in writing, of the completion of the activity. Completion of the installation, construction, reconstruction, relocation, or modification is considered to occur not later than commencement of trial operation of EUGCU. **(R 336.1201(7)(a))**

VIII. STACK/VENT RESTRICTION(S)

The exhaust gases from the stacks listed in the table below shall be discharged unobstructed vertically upwards to the ambient air unless otherwise noted:

Stack & Vent ID	Maximum Exhaust Diameter / Dimensions (inches)	Minimum Height Above Ground (feet)	Underlying Applicable Requirements
1. SVGCU	12	69	40 CFR 52.21(c) & (d)

IX. OTHER REQUIREMENT(S)

NA

Footnotes:
[1] This condition is state only enforceable and was established pursuant to Rule 201(1)(b).

EUFLARE
EMISSION UNIT CONDITIONS

DESCRIPTION

One digester gas flare used as backup for the EUGCU. The flare is capable of burning up to 571 scfm, giving a heat input capacity of 21.5 MMBtu/hr when using the estimated higher heating value of the digester gas of 1012 Btu/scf.

Flexible Group ID: FGFLARE

POLLUTION CONTROL EQUIPMENT

NA

I. EMISSION LIMIT(S)

Pollutant	Limit	Time Period / Operating Scenario	Equipment	Monitoring / Testing Method	Underlying Applicable Requirements
1. SO_2	39.72 pph	Hourly when the EUGCU is not operating	EUFLARE	SC V.1 VI.3	R 336.1205, 40 CFR 52.21(c) & (d)
2. SO_2	0.29 pph	Hourly when the EUGCU is operating	EUFLARE	SC V.1 VI.3	R 336.1205, 40 CFR 52.21(c) & (d)

II. MATERIAL LIMIT(S)

Material	Limit	Time Period / Operating Scenario	Equipment	Testing / Monitoring Method	Underlying Applicable Requirements
1. Biogas[A]	300 MMscf/yr	12-month rolling time period as determined at the end of each calendar month	EUFLARE	SC VI.5	R 336.1224, R 336.1225, R 336.1702, 40 CFR 52.21(c) & (d)
2. H_2S concentration of the biogas	7,000 ppmv	At all times when the EUGCU is not operating	EUFLARE	SC VI.3	R 336.1224, R 336.1225, 40 CFR 52.21(c) & (d)
3. H_2S concentration of the biogas	100 ppmv	At all times when the EUGCU is operating	EUFLARE	SC VI.3	R 336.1224, R 336.1225, 40 CFR 52.21(c) & (d)

[A] "Biogas" is defined as gas sent to the flare from either the digester or from EUGCU

4. The permittee shall burn only biogas and natural gas in EUFLARE. **(R 336.1119, R 336.1225, 40 CFR 52.21(c) & (d))**

5. The volumetric flow rate for EUFLARE shall not exceed a maximum of 571 scfm when the EUCU is not operating. **(R 336.1224, R 336.1225, R 336.1702, 40 CFR 52.21)**

6. The volumetric flow rate for EUFLARE shall not exceed a maximum of 293 scfm when the EUGCU is operating. **(R 336.1224, R 336.1225, R 336.1702, 40 CFR 52.21)**

III. PROCESS/OPERATIONAL RESTRICTION(S)

1. No later than 90 days after the completion of installation of the equipment, the permittee shall submit to the AQD District Supervisor, for review and approval, a preventative maintenance / malfunction abatement plan (PM / MAP) for EUFLARE. After approval of the PM / MAP by the AQD District Supervisor, the permittee shall not operate EUFLARE unless the PM / MAP, or an alternate plan approved by the AQD District Supervisor, is implemented, and maintained. The plan shall incorporate procedures recommended by the equipment manufacturer as well as incorporating standard industry practices. At a minimum, the plan shall include:
   a) Identification of the equipment and, if applicable, air-cleaning device and the supervisory personnel responsible for overseeing the inspection, maintenance, and repair.
   b) Description of the items or conditions to be inspected and frequency of the inspections or repairs.
   c) Identification of the equipment and, if applicable, air-cleaning device, operating parameters that shall be monitored to detect a malfunction or failure, the normal operating range of these parameters and a description of the method of monitoring or surveillance procedures.
   d) Identification of the major replacement parts that shall be maintained in inventory for quick replacement.
   e) A description of the corrective procedures or operational changes that shall be taken in the event of a malfunction or failure to achieve compliance with the applicable emission limits.

   If at any time the PM/MAP fails to address or inadequately addresses an event that meets the characteristics of a malfunction, the permittee shall amend the PM/MAP within 45 days after such an event occurs. The permittee shall also amend the PM/MAP within 45 days if new equipment is installed or upon request from the AQD District Supervisor. The permittee shall submit the PM / MAP and any amendments to the PM/MAP to the AQD District Supervisor for review and approval. If the AQD does not notify the permittee within 90 days of submittal, the PM/MAP or amended PM/MAP shall be considered approved. Until an amended plan is approved, the permittee shall implement corrective procedures or operational changes to achieve compliance with all applicable emission limits. **(R 336.1224, R 336.1225, R 336.1910, R 336.1911, R 336.1912)**

2. No later than 90 days after permit issuance, the permittee shall submit, implement, and maintain a nuisance minimization plan for odors as described in Appendix A, for EUFLARE. If at any time the plan fails to address or inadequately addresses odor management, the permittee shall amend the plan within 45 days after such an event occurs. The permittee shall also amend the plan within 45 days if new equipment is installed or upon request from the District Supervisor. The permittee shall submit the plan and any amendments to the plan to the AQD District Supervisor for review and approval. If the AQD does not notify the permittee within 90 days of submittal, the plan or amended plan shall be considered approved. Until an amended plan is approved, the permittee shall implement corrective procedures or operational changes to minimize odors. [1] **(R 336.1901)**

IV. DESIGN/EQUIPMENT PARAMETER(S)

1. The permittee shall install, calibrate, maintain, and operate in a satisfactory manner, a device to monitor and record the volumetric flow rate of biogas burned in EUFLARE, on a continuous basis. Continuous shall be defined in this permit as at least one reading every 15 minutes. **(R 336.1224, R 336.1225, R 336.1901, 40 CFR 52.21(c) & (d))**

2. The permittee shall install, calibrate, maintain and operate in a satisfactory manner, a device to monitor and record the H_2S content of biogas sent to EUFLARE, continuously. Satisfactory manner includes operating and maintaining EUFLARE in accordance with an approved PM / MAP for EUFLARE, as required in SC III.1. Continuous shall be defined in this permit as at least one reading every 15 minutes. **(R 336.1224, R 336.1225, R 336.1901, 40 CFR 52.21(c) & (d))**

V. TESTING/SAMPLING

1. Upon the request of the AQD District Supervisor, the permittee shall verify SO_2 emission rates from EUFLARE by testing at owner's expense, in accordance with Department requirements. Testing shall be performed using an approved EPA Method listed in:

Pollutant	Test Method Reference
SO_2	40 CFR Part 60, Appendix A

An alternate method, or a modification to the approved EPA Method, may be specified in an AQD approved Test Protocol and must meet the requirements of the federal Clean Air Act, all applicable state and federal rules and regulations, and be within the authority of the AQD to make the change. No less than 60 days prior to testing, the permittee shall submit a complete test plan to the AQD Technical Programs Unit and District Office. The AQD must approve the final plan prior to testing, including any modifications to the method in the test protocol that are proposed after initial submittal. The permittee must submit a complete report of the test results to the AQD Technical Programs Unit and District Office within 60 days following the last date of the test. **(R 336.1205, R 336.1224, R 336.1225, R 336.1702, R 336.1902, R 336.2001, R 336.2003, R 336.2004, 40 CFR 52.21(c) & (d))**

VI. MONITORING/RECORDKEEPING

Records shall be maintained on file for a period of five years. **(R 336.1201(3))**

1. The permittee shall complete all required calculations in a format acceptable to the AQD District Supervisor by the 30th day of the calendar month, for the previous calendar month, unless otherwise specified in any monitoring/recordkeeping special condition. The permittee shall keep all records on file at the facility and make them available to the Department upon request. **(R 336.1224, R 336.1225, R 336.1702, 40 CFR 52.21(c) & (d))**

2. The permittee shall keep, in a satisfactory manner, all records related to, or as required by, the PM/MAP. **(R 336.1224, R 336.1225, R 336.1702(a), R 336.1910, R 336.1911, R 336.1912, 40 CFR 52.21(c) & (d))**

3. The permittee shall keep, in a satisfactory manner, continuous records of the H_2S content of the biogas routed to EUFLARE, for each day that the flare is operated. Continuous shall be defined in this permit as at least one reading every 15 minutes. **(R 336.1224, R 336.1225, 40 CFR 52.21(c) & (d))**

4. The permittee shall keep, in a satisfactory manner, continuous records of the volumetric flow rate of biogas routed to EUFLARE. The records shall include the operational status of the thermal oxidizer within EUGCU. Continuous shall be defined in this permit as at least one reading every 15 minutes. **(R 336.1224, R 336.1225, R 336.1901, 40 CFR 52.21(c) & (d))**

5. The permittee shall keep, in a satisfactory manner, records of the total volume (MMscf) biogas burned in EUFLARE on a monthly and 12-month rolling time period. **(R 336.1224, R 336.1225, R 336.1702, 40 CFR 52.21(c) & (d))**

VII. REPORTING

1. Within 30 days after completion of the installation, construction, reconstruction, relocation, or modification authorized by this Permit to Install, the permittee or the authorized agent pursuant to Rule 204, shall notify the AQD District Supervisor, in writing, of the completion of the activity. Completion of the installation, construction, reconstruction, relocation, or modification is considered to occur not later than commencement of trial operation of EUFLARE. **(R 336.1201(7)(a))**

VIII. STACK/VENT RESTRICTION(S)

The exhaust gases from the stacks listed in the table below shall be discharged unobstructed vertically upwards to the ambient air unless otherwise noted:

Stack & Vent ID	Maximum Exhaust Diameter / Dimensions (inches)	Minimum Height Above Ground (feet)	Underlying Applicable Requirements
1. SVFLARE	NA	40	R 336.1225, 40 CFR 52.21(c) & (d)

IX. OTHER REQUIREMENT(S)

NA

Footnotes:
[1] This condition is state only enforceable and was established pursuant to Rule 201(1)(b).

FLEXIBLE GROUP SPECIAL CONDITIONS

FLEXIBLE GROUP SUMMARY TABLE

The descriptions provided below are for informational purposes and do not constitute enforceable conditions.

Flexible Group ID	Flexible Group Description	Associated Emission Unit IDs
FGFLARE	One gas cleaning and upgrading unit and one flare combined are capable of burning up to 571 scfm	EUGCU, EUFLARE

FGFLARE
FLEXIBLE GROUP CONDITIONS

DESCRIPTION

One gas cleaning and upgrading unit and one flare combined are capable of burning up to 571 scfm.

Emission Unit: EUGCU, EUFLARE

POLLUTION CONTROL EQUIPMENT

Thermal oxidizer for EUGCU

I. EMISSION LIMIT(S)

Pollutant	Limit	Time Period / Operating Scenario	Equipment	Monitoring / Testing Method	Underlying Applicable Requirements
1. SO_2	219.35 tpy*	12-month rolling time period as determined at the end of each calendar month	FGFLARE	SC VI.2	R 336.1205, 40 CFR 52.21(c) & (d)
*Emissions are restricted by the annual flowrates and H_2S concentrations for EUFLARE and EUGCU.					

II. MATERIAL LIMIT(S)

NA

III. PROCESS/OPERATIONAL RESTRICTION(S)

NA

IV. DESIGN/EQUIPMENT PARAMETER(S)

NA

V. TESTING/SAMPLING

Records shall be maintained on file for a period of five years. **(R 336.1201(3))**

NA

VI. MONITORING/RECORDKEEPING

Records shall be maintained on file for a period of five years. **(R 336.1201(3))**

1. The permittee shall complete all required calculations in a format acceptable to the AQD District Supervisor by the 30th day of the calendar month, for the previous calendar month, unless otherwise specified in any monitoring/recordkeeping special condition. **(R 336.1205, R 336.1224, R 336.1225, R 336.1702, 40 CFR 52.21(c) & (d))**

2. The permittee shall calculate and keep, in a satisfactory manner, acceptable to the AQD District Supervisor, records of monthly and 12-month rolling total SO_2 mass emissions for FGFLARE. Calculations shall be performed using Appendix B. The permittee shall keep all records on file and make them available to the Department upon request. **(R 336.1205, 40 CFR 52.21(c) & (d))**

VII. REPORTING

NA

VIII. STACK/VENT RESTRICTION(S)

NA

IX. OTHER REQUIREMENT(S)

NA

Footnotes:
[1] This condition is state only enforceable and was established pursuant to Rule 201(1)(b).

APPENDIX A
Nuisance Minimization Plan: Odors

I. Introduction

Purpose, description of each potential source of odors, permit number, background information, etc.

II. Potential Sources of Odorous Emissions and Related Equipment

Listing of equipment at source that could generate potential odors. Identify process and/or equipment, control equipment (if applicable), and any other information necessary to aid in addressing a complaint if received.

III. Maintenance Schedule

Description of maintenance schedule for equipment, procedures, etc.

IV. Best Management Practices/Housekeeping Measures

Identify best management practices and housekeeping measures the source will use to aid in the minimization of odorous emissions. Explain how odors will be minimized during all startups, shutdowns, and malfunctions. The plan shall incorporate procedures recommended by the equipment manufacturer(s), as well as incorporating standard industry practices.

V. Odor Incident Notification/Investigation/Response

Describe procedures that shall be taken to address odor complaints. Identify the individual(s) at the facility who will be responsible for initiating the response procedures upon the receipt of an odor complaint notification from the AQD, a neighbor, or other source. The response should include taking records that include the date and time of the complaint, meteorological data for the timeframe specified in the complaint, identification of the equipment/process that is most likely to be the source of the complaint, steps taken to identify any maintenance or corrective action necessary for the equipment involved, and other measures utilized by the permittee to address the complaint.

APPENDIX B
Procedures for Calculating Emissions

The permittee shall demonstrate compliance with the emission limits in this permit by monitoring digester biogas flow rates and digester biogas H_2S concentration.

Calculation for Monthly SO_2 Emissions using digester biogas H_2S Monitoring:

The following calculation for SO_2 emissions shall utilize the continuous H_2S concentration measurements and continuous flow rate measurements.

$$SO_2\ Monthly\ \left(\frac{ton\ SO_2}{month}\right) = \left(\left(\sum A\ ppm * B\frac{MMscf\ Biogas}{min}\right) * \frac{1.1733\ mol\ SO_2}{ft^3} * \frac{64.06\ grams}{mol\ SO_2} * \frac{1\ lb}{453.59\ grams} * \frac{1440\ min}{day} * \frac{days}{month} * \frac{ton}{2{,}000\ lb}\right) + \left(\left(\sum C\ ppm * D\frac{MMscf\ Biogas}{min}\right) * \frac{1.1733\ mol\ SO_2}{ft^3} * \frac{64.06\ grams}{mol\ SO_2} * \frac{1\ lb}{453.59\ grams} * \frac{1440\ min}{day} * \frac{days}{month} * \frac{ton}{2{,}000\ lb}\right) + \left(\frac{1.6\ lb}{10^3\ gallons} * \frac{E\ gallons}{hr} * \frac{1}{10^3} * \frac{1440\ min}{day} * \frac{days}{month} * \frac{ton}{2{,}000\ lb}\right)$$

Where:
A = ppm sulfur content, as H2S
B = flow rate digester biogas burned in EUFLARE
C= ppm sulfur content into thermal oxidizer, as H2S
D= flow rate digester gas into thermal oxidizer of EUGCU
E= Assist gas flow rate

Red Leaf RNG Potential to Emit Calculations

Form AI-002

June 2024 ROP Application

Table B-1
Summary of Potential Emissions
Red Leaf RNG, LLC

Operating Scenario 1 - All digester raw biogas bypasses the membrane separation plant and is controlled with the backup flare. The membrane separation plant and tail gas thermal oxidizer are not operating.

	Emissions (ton/yr)								Greenhouse Gas (ton/yr)	Hazardous Air Pollutants[1] (ton/yr)	
Emission Unit Description	NO_x	SO_2	CO	VOC	PM	PM_{10}	$PM_{2.5}$	Hydrogen Sulfide	CO_2e	Highest Single HAP Emissions	Total HAP Emissions
Backup Flare[2]	6.40	174.00	69.75	62.12	1.58	1.58	1.58	1.85	18,107	0.27	0.28
Tail Gas Thermal Oxidizer[3]	-	-	-	-	-	-	-	-	-	-	-
Boiler[4]	3.39	0.42	1.98	0.26	0.18	0.18	0.18	-	3,329	0.04	0.04
Total Emissions	9.79	174.42	71.73	62.38	1.76	1.76	1.76	1.85	21,436	0.31	0.33

Scenario 2 - Tail gas from the membrane separation plant operation is controlled with the thermal oxidizer using propane as the assist gas. Membrane separation plant tail gas is controlled during startups and shutdowns with the backup flare.

	Emissions (ton/yr)								Greenhouse Gas (ton/yr)	Hazardous Air Pollutants[1] (ton/yr)	
Emission Unit Description	NO_x	SO_2	CO	VOC	PM	PM_{10}	$PM_{2.5}$	Hydrogen Sulfide	CO_2e	Highest Single HAP Emissions	Total HAP Emissions
Backup Flare[5]	4.87	1.27	53.07	47.27	1.20	1.20	1.20	0.01	9,285	0.14	0.15
Tail Gas Thermal Oxidizer[6]	1.20	218.09	4.85	3.97	0.14	0.14	0.14	1.16	7,976	0.02	0.02
Boiler[4]	3.39	0.42	1.98	0.26	0.18	0.18	0.18	-	3,329	0.04	0.04
Total Emissions	9.45	219.78	59.90	51.49	1.53	1.53	1.53	1.17	20,590	0.20	0.21

Notes:

1. Refer to Tables 4 through 9 for HAP emission calculation information.
2. Refer to Table 4 for the supporting emission calculations details for the backup flare.
3. The tail gas thermal oxidizer is not operating during this operating scenario.
4. The boiler can be fired with either propane or natural gas. Emissions represent the worst case emissions for operation fired with either propane or natural gas, refer to Tables 8 and 9 for the supporting emission calculations details for the boiler.
5. Refer to Table 5 for the supporting emission calculations details for the backup flare.
6. The waste gas thermal oxidizer can be operated with either propane or natural gas as the assist gas. Emissions represent the worst case emissions for operation with either propane or natural gas as the assist gas, refer to Tables 8 and 9 for the supporting emission calculations details for the thermal oxidizer.

Table B - 2
Facility-Specific Operating Parameters
Red Leaf RNG, LLC

	Operating Scenarios			
Scenario Name	Scenario 1 - Backup Flare Controlling Digester Biogas Operations		Scenario 2 - Membrane Separation Plant Normal Operation, Flare Controlling Startup and Shutdown Emissions	
Scenario Description	All digester biogas bypasses the membrane separation plant and is controlled with the backup flare. The membrane separation plant and tail gas thermal oxidizer are not operating.		Tail gas from the membrane separation plant operation is controlled with the thermal oxidizer using propane as the assist gas. Membrane separation plant tail gas is controlled during startups and shutdowns with the backup flare.	
Emission Unit	Tail Gas Thermal Oxidizer	Backup Flare	Tail Gas Thermal Oxidizer - Propane Assist Gas	Backup Flare
Gas Flow Rate (scfm)	Not Operating - NA	570.78	278.08	292.69
Methane Content (%)	Not Operating - NA	62.00	8.00	92.00
CO_2 Content (%)	Not Operating - NA	38.00	92.00	8.00
Heat Input From Main Gas Stream (MMBtu/hr)	Not Operating - NA	21.49	1.35	16.35
Heat Input From Supplemental Gas Stream (MMBtu/hr)	Not Operating - NA	NA	1.28	NA
Sulfur Concentration (ppmv as H_2S)	Not Operating - NA	7,000	18,000	100

Table B-3
Sulfur Dioxide Emission Rate Calculations
Red Leaf RNG, LLC

Gas Flow Data

Operating Scenario	Control Device	Gas Available for Combustion (scf/min)	Gas Available for Combustion (MMscf/yr)
Scenario 1 - Backup Flare Controlling Digester Biogas Operations	Tail Gas Thermal Oxidizer	Not Operating - NA	
	Backup Flare	570.78	300.00
Scenario 2 - Membrane Separation Plant Normal Operation, Flare Controlling Startup and Shutdown Emissions	Tail Gas Thermal Oxidizer	278.08	146.16
	Backup Flare	292.69	153.84

Gas Concentration and Emission Unit Data

Pollutant	Molecular Weight (gm/mole)	Operating Scenario	Control Device	H_2S Gas Concentration (ppmv)	H_2S Gas Concentration (mg/m3)	H_2S Gas Concentration (lb/MMscf)	Destruction Efficiency %
H_2S	34.081	Scenario 1	Tail Gas Thermal Oxidizer	Not Operating - NA			
			Backup Flare	7,000	9,757	609.12	98
		Scenario 2	Tail Gas Thermal Oxidizer	18,000	25,090	1,566.30	99
			Backup Flare	100	139	8.70	98
SO_2	64.066						

Source ID	SO_2 Emission Rate Annualized (ton/yr)	SO_2 Emission Rate Annualized (g/s)	SO_2 Emission Rate Short-term (lb/hr)	SO_2 Emission Rate Short-term (g/s)	H_2S Emission Rate Annualized (ton/yr)	H_2S Emission Rate Annualized (g/s)	H_2S Emission Rate Short-term to Flare (lb/hr)	H_2S Emission Rate Short-term to Flare (g/s)
Scenario 1 - Backup Flare Controlling Digester Biogas Operations								
Tail Gas Thermal Oxidizer	Not Operating - NA				Not Operating - NA			
Backup Flare[(2)]	174.00	5.01	39.73	5.01	1.85	0.05	0.42	0.05
Scenario 1 Total	174.00	5.01			1.85			
Scenario 2 - Membrane Separation Plant Normal Operation, Flare Controlling Startup and Shutdown Emissions								
Tail Gas Thermal Oxidizer	218.09	6.27	49.79	6.27	1.16	0.03	0.26	0.03
Backup Flare[(2)]	1.27	0.04	0.29	0.04	0.01	3.90E-04	3.10E-03	3.90E-04
Scenario 2 Total	219.36	6.31			1.17			

Notes:
1. The H_2S emission rate from the backup flare assumes 98% of all H_2S is converted to SO_2.

Table B-4
Scenario 1 - Backup Flare Potential Emission Calculations
Red Leaf RNG, LLC

Discussion: The backup flare is used as a control device to combust all digester raw biogas when the Membrane Separation Plant and tail gas thermal oxidizer are not operating.
The total emissions from the flare include waste gas vapors and pilot light emissions.

Waste Gas Emissions

Biogas Flow Rate to Flare	570.78	scf/min	
Biogas Flow Rate to Flare	34,247	scf/hr	
Biogas Methane Content	62.0	Percent	
Heat Content of Biogas	21.49	MMBtu/hr	
Heat Content of Assist Gas	-	MMBtu/hr	No assist gas is required
Total Heat Content	21.49	MMBtu/hr	

Pollutant	Emission Factor	Emission Factor Units	Emission Factor Note	Pollutant Type	Emissions (lb/hr)	Emissions (ton/yr)
Criteria Pollutants						
Biogas Combustion						
NOx	0.068	lb/MMBtu	[1]	NOx	1.46	6.40
SO_2	1.85	lb/MMBtu	[2]	SO_2	39.73	174.00
CO	750	lb/10^6 scf methane	[3]	CO	15.92	69.75
VOC	0.66	lb/MMBtu	[4]	VOC	14.18	62.12
PM	17	lb/10^6 scf methane	[3]	PM	0.36	1.58
PM_{10}	17	lb/10^6 scf methane	[3]	PM	0.36	1.58
$PM_{2.5}$	17	lb/10^6 scf methane	[3]	PM	0.36	1.58
CO_2	120,000	lb/10^6 scf	[5]	GHG	4,109.59	18,000.00
Methane	2.3	lb/10^6 scf	[5]	GHG	0.08	0.35
N_2O (Uncontrolled)	2.2	lb/10^6 scf	[5]	GHG	0.08	0.33
CO_2e			[6]	GHG	4,134.01	18,106.97
Anaerobic Digester Off-gas						
$CO_2 = CO_2e$			[7]	GHG	1,481.84	6,490.48
Total CO_2e				GHG	5,615.85	24,597.44
HAPs and TACs						
2-Methylnaphthalene	2.40E-05	lb/10^6 scf	[8]	HAP	8.22E-07	3.60E-06
3-Methylchloranthrene	1.80E-06	lb/10^6 scf	[8]	HAP	6.16E-08	2.70E-07
7,12-Dimethylbenz(a)anthracene	1.60E-05	lb/10^6 scf	[8]	HAP	5.48E-07	2.40E-06
Acenaphthene	1.80E-06	lb/10^6 scf	[8]	HAP	6.16E-08	2.70E-07
Acenaphthylene	1.80E-06	lb/10^6 scf	[8]	HAP	6.16E-08	2.70E-07
Anthracene	2.40E-06	lb/10^6 scf	[8]	HAP	8.22E-08	3.60E-07
Benz(a)anthracene	1.80E-06	lb/10^6 scf	[8]	HAP	6.16E-08	2.70E-07
Benzene	2.10E-03	lb/10^6 scf	[8]	HAP	7.19E-05	3.15E-04
Benzo(a)pyrene	1.20E-06	lb/10^6 scf	[8]	HAP	4.11E-08	1.80E-07
Benzo(b)fluoranthene	1.80E-06	lb/10^6 scf	[8]	HAP	6.16E-08	2.70E-07
Benzo(g,h,i)perylene	1.20E-06	lb/10^6 scf	[8]	HAP	4.11E-08	1.80E-07
Benzo(k)fluoranthene	1.80E-06	lb/10^6 scf	[8]	HAP	6.16E-08	2.70E-07
Butane	2.10E+00	lb/10^6 scf	[8]	TAC	7.19E-02	3.15E-01
Chrysene	1.80E-06	lb/10^6 scf	[8]	HAP	6.16E-08	2.70E-07
Dibenzo(a,h)anthracene	1.20E-06	lb/10^6 scf	[8]	HAP	4.11E-08	1.80E-07
Dichlorobenzene	1.20E-03	lb/10^6 scf	[8]	HAP	4.11E-05	1.80E-04
Ethane	3.10E+00	lb/10^6 scf	[8]	TAC	1.06E-01	4.65E-01
Fluoranthene	3.00E-06	lb/10^6 scf	[8]	HAP	1.03E-07	4.50E-07
Fluorene	2.80E-06	lb/10^6 scf	[8]	HAP	9.59E-08	4.20E-07
Formaldehyde	7.50E-02	lb/10^6 scf	[8]	HAP	2.57E-03	1.13E-02
Hexane	1.80E+00	lb/10^6 scf	[8]	HAP	6.16E-02	2.70E-01
Indeno(1,2,3-cd)pyrene	1.80E-06	lb/10^6 scf	[8]	HAP	6.16E-08	2.70E-07
Naphthalene	6.10E-04	lb/10^6 scf	[8]	HAP	2.09E-05	9.15E-05
Phenanthrene	1.70E-05	lb/10^6 scf	[8]	HAP	5.82E-07	2.55E-06
Propane	1.60E+00	lb/10^6 scf	[8]	TAC	5.48E-02	2.40E-01
Pyrene	5.00E-06	lb/10^6 scf	[8]	HAP	1.71E-07	7.50E-07
Toluene	3.40E-03	lb/10^6 scf	[8]	HAP	1.16E-04	5.10E-04
Arsenic	2.0E-04	lb/10^6 scf	[9]	HAP	6.85E-06	3.00E-05
Barium	4.4E-03	lb/10^6 scf	[9]	TAC	1.51E-04	6.60E-04
Beryllium	1.2E-05	lb/10^6 scf	[9]	HAP	4.11E-07	1.80E-06
Cadmium	1.1E-03	lb/10^6 scf	[9]	HAP	3.77E-05	1.65E-04
Chromium	1.4E-03	lb/10^6 scf	[9]	HAP	4.79E-05	2.10E-04
Cobalt	8.4E-05	lb/10^6 scf	[9]	HAP	2.88E-06	1.26E-05
Copper	8.5E-04	lb/10^6 scf	[9]	TAC	2.91E-05	1.28E-04
Manganese	3.8E-04	lb/10^6 scf	[9]	HAP	1.30E-05	5.70E-05
Mercury	2.6E-04	lb/10^6 scf	[9]	HAP	8.90E-06	3.90E-05
Molybdenum	1.1E-03	lb/10^6 scf	[9]	TAC	3.77E-05	1.65E-04
Nickel	2.1E-03	lb/10^6 scf	[9]	HAP	7.19E-05	3.15E-04
Selenium	2.4E-05	lb/10^6 scf	[9]	HAP	8.22E-07	3.60E-06
Vanadium	2.3E-03	lb/10^6 scf	[9]	TAC	7.88E-05	3.45E-04
Zinc	2.9E-02	lb/10^6 scf	[9]	TAC	9.93E-04	4.35E-03
Total HAP Emissions					6.47E-02	2.83E-01
Highest Single HAP Emissions			[10]		6.16E-02	2.70E-01

Notes:

1. Emission factors from AP-42, Chapter 13.5 Industrial Flares, February 2018, Table 13.5-1, THC, NOx and Soot Emissions Factors for Flare Operations for Certain Chemical Manufacturing Processes.

2. Sulfur dioxide emissions are based on the H_2S content (ppm) of the biogas and assumes a 100% conversion of the biogas fuel sulfur content SO_2. Refer to Table 3 for the sulfur dioxide emission rate calculations.

3. Emission factors from AP-42, Chapter 2.4 Municipal Solid Waste Landfills, November 1998,Table 2.4-5. Emission Rates for Secondary Compounds Exiting Control Devices. Calculated based on the percent of methane in the biogas combusted in the flare.

4. Emission factors from AP-42, Chapter 13.5 Industrial Flares, February 2018,Table 13.5-2, VOC and CO Emissions Factors for Elevated Flare Operations for Certain Refinery and Chemical Manufacturing Processes.

5. Emission factors from AP-42, Chapter 1.4, Natural Gas Combustion, July 1998, Table 1.4-2. Emission Factors for Criteria Pollutants and Greenhous Gases from Natural Gas Combustion.

6. CO_2e calculated by equation A-1 of 40 CFR 98.2, which states the total CO_2e is equal to the GWP factor for CH_4 multiplied by the potential CH_4 emissions. The global warming potential for CO_2 is 1, CH_4 is 25, and nitrous oxide is 298.

7. CO_2 emissions generated in the anaerobic digester that pass through the flare.

8. Emission factors from AP-42, Chapter 1.4, Natural Gas Combustion, July 1998, Table 1.4-3. Emission Factors for Speciated Organic Compounds from Natural Gas Combustion.

9. Emission factors from AP-42, Chapter 1.4, Natural Gas Combustion, July 1998, Table 1.4-4. Emission Factors for Metals from Natural Gas Combustion.

10. The HAP with the highest facility-wide potential emissions is hexane.

Table B-5
Scenario 2 - Backup Flare Potential Emission Calculations
Red Leaf RNG, LLC

Discussion: The backup flare is used as a control device to combust offgas during startup, shutdown and malfunction events. Membrane Separation Plant tail gas is controlled during startups and shutdowns with the Backup Flare.
The total emissions from the flare include waste gas vapors and pilot light emissions.

Waste Gas Emissions

Biogas Flow Rate to Flare	292.69	scf/min	
Biogas Flow Rate to Flare	17,562	scf/hr	
Biogas Methane Content	92.0	Percent	
Heat Content of Biogas	16.35	MMBtu/hr	
Heat Content of Assist Gas	-	MMBtu/hr	No assist gas is required
Total Heat Content	16.35	MMBtu/hr	

Pollutant	Emission Factor	Emission Factor Units	Emission Factor Note	Pollutant Type	Emissions (lb/hr)	Emissions (ton/yr)
Criteria Pollutants						
Biogas Combustion						
NOx	0.068	lb/MMBtu	[1]	NOx	1.11	4.87
SO_2	0.02	lb/MMBtu	[2]	SO_2	0.29	1.27
CO	750	lb/10^6 scf methane	[3]	CO	12.12	53.07
VOC	0.66	lb/MMBtu	[4]	VOC	10.79	47.27
PM	17	lb/10^6 scf methane	[3]	PM	0.27	1.20
PM_{10}	17	lb/10^6 scf methane	[3]	PM	0.27	1.20
$PM_{2.5}$	17	lb/10^6 scf methane	[3]	PM	0.27	1.20
CO_2	120,000	lb/10^6 scf	[5]	GHG	2,107.40	9,230.40
Methane	2.3	lb/10^6 scf	[5]	GHG	0.04	0.18
N_2O (Uncontrolled)	2.2	lb/10^6 scf	[5]	GHG	0.04	0.17
CO_2e			[6]	GHG	2,119.92	9,285.25
Anaerobic Digester Off-gas						
$CO_2 = CO_2e$			[7]	GHG	1,481.84	6,490.48
Total CO_2e				GHG	3,601.76	15,775.73
HAPs and TACs						
2-Methylnaphthalene	2.40E-05	lb/10^6 scf	[8]	HAP	4.21E-07	1.85E-06
3-Methylchloranthrene	1.80E-06	lb/10^6 scf	[8]	HAP	3.16E-08	1.38E-07
7,12-Dimethylbenz(a)anthracene	1.60E-05	lb/10^6 scf	[8]	HAP	2.81E-07	1.23E-06
Acenaphthene	1.80E-06	lb/10^6 scf	[8]	HAP	3.16E-08	1.38E-07
Acenaphthylene	1.80E-06	lb/10^6 scf	[8]	HAP	3.16E-08	1.38E-07
Anthracene	2.40E-06	lb/10^6 scf	[8]	HAP	4.21E-08	1.85E-07
Benz(a)anthracene	1.80E-06	lb/10^6 scf	[8]	HAP	3.16E-08	1.38E-07
Benzene	2.10E-03	lb/10^6 scf	[8]	HAP	3.69E-05	1.62E-04
Benzo(a)pyrene	1.20E-06	lb/10^6 scf	[8]	HAP	2.11E-08	9.23E-08
Benzo(b)fluoranthene	1.80E-06	lb/10^6 scf	[8]	HAP	3.16E-08	1.38E-07
Benzo(g,h,i)perylene	1.20E-06	lb/10^6 scf	[8]	HAP	2.11E-08	9.23E-08
Benzo(k)fluoranthene	1.80E-06	lb/10^6 scf	[8]	HAP	3.16E-08	1.38E-07
Butane	2.10E+00	lb/10^6 scf	[8]	TAC	3.69E-02	1.62E-01
Chrysene	1.80E-06	lb/10^6 scf	[8]	HAP	3.16E-08	1.38E-07
Dibenzo(a,h)anthracene	1.20E-06	lb/10^6 scf	[8]	HAP	2.11E-08	9.23E-08
Dichlorobenzene	1.20E-03	lb/10^6 scf	[8]	HAP	2.11E-05	9.23E-05
Ethane	3.10E+00	lb/10^6 scf	[8]	TAC	5.44E-02	2.38E-01
Fluoranthene	3.00E-06	lb/10^6 scf	[8]	HAP	5.27E-08	2.31E-07
Fluorene	2.80E-06	lb/10^6 scf	[8]	HAP	4.92E-08	2.15E-07
Formaldehyde	7.50E-02	lb/10^6 scf	[8]	HAP	1.32E-03	5.77E-03
Hexane	1.80E+00	lb/10^6 scf	[8]	HAP	3.16E-02	1.38E-01
Indeno(1,2,3-cd)pyrene	1.80E-06	lb/10^6 scf	[8]	HAP	3.16E-08	1.38E-07
Naphthalene	6.10E-04	lb/10^6 scf	[8]	HAP	1.07E-05	4.69E-05
Phenanthrene	1.70E-05	lb/10^6 scf	[8]	HAP	2.99E-07	1.31E-06
Propane	1.60E+00	lb/10^6 scf	[8]	TAC	2.81E-02	1.23E-01
Pyrene	5.00E-06	lb/10^6 scf	[8]	HAP	8.78E-08	3.85E-07
Toluene	3.40E-03	lb/10^6 scf	[8]	HAP	5.97E-05	2.62E-04
Arsenic	2.0E-04	lb/10^6 scf	[9]	HAP	3.51E-06	1.54E-05
Barium	4.4E-03	lb/10^6 scf	[9]	TAC	7.73E-05	3.38E-04
Beryllium	1.2E-05	lb/10^6 scf	[9]	HAP	2.11E-07	9.23E-07
Cadmium	1.1E-03	lb/10^6 scf	[9]	HAP	1.93E-05	8.46E-05
Chromium	1.4E-03	lb/10^6 scf	[9]	HAP	2.46E-05	1.08E-04
Cobalt	8.4E-05	lb/10^6 scf	[9]	HAP	1.48E-06	6.46E-06
Copper	8.5E-04	lb/10^6 scf	[9]	TAC	1.49E-05	6.54E-05
Manganese	3.8E-04	lb/10^6 scf	[9]	HAP	6.67E-06	2.92E-05
Mercury	2.6E-04	lb/10^6 scf	[9]	HAP	4.57E-06	2.00E-05
Molybdenum	1.1E-03	lb/10^6 scf	[9]	TAC	1.93E-05	8.46E-05
Nickel	2.1E-03	lb/10^6 scf	[9]	HAP	3.69E-05	1.62E-04
Selenium	2.4E-05	lb/10^6 scf	[9]	HAP	4.21E-07	1.85E-06
Vanadium	2.3E-03	lb/10^6 scf	[9]	TAC	4.04E-05	1.77E-04
Zinc	2.9E-02	lb/10^6 scf	[9]	TAC	5.09E-04	2.23E-03
Total HAP Emissions					3.32E-02	1.45E-01
Highest Single HAP Emissions			[10]		3.16E-02	1.38E-01

Notes:

1. Emission factors from AP-42, Chapter 13.5 Industrial Flares, February 2018, Table 13.5-1, THC, NOx and Soot Emissions Factors for Flare Operations for Certain Chemical Manufacturing Processes.

2. Sulfur dioxide emissions are based on the H_2S content (ppm) of the biogas and assumes a 100% conversion of the biogas fuel sulfur content SO_2. Refer to Table 3 for the sulfur dioxide emission rate calculations.

3. Emission factors from AP-42, Chapter 2.4 Municipal Solid Waste Landfills, November 1998,Table 2.4-5. Emission Rates for Secondary Compounds Exiting Control Devices. Calculated based on the percent of methane in the biogas combusted in the flare.

4. Emission factors from AP-42, Chapter 13.5 Industrial Flares, February 2018,Table 13.5-2, VOC and CO Emissions Factors for Elevated Flare Operations for Certain Refinery and Chemical Manufacturing Processes.

5. Emission factors from AP-42, Chapter 1.4, Natural Gas Combustion, July 1998, Table 1.4-2. Emission Factors for Criteria Pollutants and Greenhous Gases from Natural Gas Combustion.

6. CO_2e calculated by equation A-1 of 40 CFR 98.2, which states the total CO_2e is equal to the GWP factor for CH_4 multiplied by the potential CH_4 emissions. The global warming potential for CO_2 is 1, CH_4 is 25, and nitrous oxide is 298.

7. CO_2 emissions generated in the anaerobic digester that pass through the flare.

8. Emission factors from AP-42, Chapter 1.4, Natural Gas Combustion, July 1998, Table 1.4-3. Emission Factors for Speciated Organic Compounds from Natural Gas Combustion.

9. Emission factors from AP-42, Chapter 1.4, Natural Gas Combustion, July 1998, Table 1.4-4. Emission Factors for Metals from Natural Gas Combustion.

10. The HAP with the highest facility-wide potential emissions is hexane.

Table B-6
Waste Gas Thermal Oxidizer Potential Emission Calculations with Propane as Assist Gas
Red Leaf RNG, LLC

Discussion: The thermal oxidizer (TO) is used as a control device to combust tail gas from the Membrane Separation Plant. The total emissions from the thermal oxidizer include tail gas vapors, assist gas and pilot light emissions.

Waste Gas Emissions

Waste Gas Flow Rate to TO	278.08	scf/min
Waste Gas Flow Rate to TO	16,684.93	scf/hr
Waste Gas Methane Content	8.00	Percent methane
Methane Heat Content	1,012	Btu/scf
Heat Content of Waste Gas	1.35	MMBtu/hr
Heat Content of Assist Gas	1.28	MMBtu/hr
Total Heat Content	2.63	MMBtu/hr
Propane Heat Content	91.5	MMBtu/1000 gallons
Propane Assist Gas Flow Rate	13.94	gallons/hr
Propane Assist Gas Flow Rate	122,077	gallons/yr

Pollutant	Emission Factor	Emission Factor Units	Emission Factor Note	Pollutant Type	Emissions (lb/hr)	Emissions (ton/yr)
Criteria Pollutants						
Waste Gas Combustion						
Waste Gas - NOx	0.068	lb/MMBtu	[1]	NOx	0.09	0.40
Assist Gas - NOx	13	lb/10^3 gal	[2]	NOx	0.18	0.79
Total NOx				NOx	0.27	1.20
Waste Gas - SO_2	36.84	lb/MMBtu	[3]	SO_2	49.77	217.99
Assist Gas - SO_2	1.6	lb/10^3 gal	[4]	SO_2	0.02	9.76E-02
Total SO_2				SO_2	49.79	218.09
Waste Gas - CO	750	lb/10^6 dscf Methane	[5]	CO	1.00	4.38
Assist Gas - CO	7.5	lb/10^3 gal	[2]	CO	0.10	0.46
Total CO				CO	1.11	4.84
Waste Gas - VOC	0.66	lb/MMBtu	[6]	VOC	0.89	3.90
Assist Gas - VOC	1.0	lb/10^3 gal	[2]	VOC	0.01	0.06
Total VOC				VOC	0.91	3.97
Waste Gas - PM = PM_{10} = $PM_{2.5}$	17	lb/10^6 scf methane	[5]	PM	0.02	0.10
Assist Gas - PM = PM_{10} = $PM_{2.5}$	0.7	lb/10^3 gal	[2]	PM	0.01	0.04
Total PM = PM_{10} = $PM_{2.5}$				PM	0.03	0.14
Waste Gas - CO_2	120,000	lb/10^6 scf	[7]	GHG	160.18	701.57
Waste Gas- Methane	2.3	lb/10^6 scf	[7]	GHG	3.07E-03	0.01
Waste Gas - N_2O (Uncontrolled)	2.2	lb/10^6 scf	[7]	GHG	2.94E-03	0.01
Waste Gas - CO_2e			[8]	GHG	161.13	705.74
Assist Gas - CO_2	12,500	lb/10^3 gal	[2]	GHG	174.20	762.98
Assist Gas - Methane	0.2	lb/10^3 gal	[2]	GHG	2.79E-03	0.01
Assist Gas - N_2O (Uncontrolled)	0.9	lb/10^3 gal	[2]	GHG	0.01	0.05
Assist Gas - CO_2e			[8]	GHG	178.00	779.66
Anaerobic Digester Off-gas						
CO_2 = CO_2e			[9]	GHG	1,481.84	6,490.48
Total CO_2e				GHG	1,820.98	7,975.87

HAPs and TACs

Pollutant	Waste Gas Emission Factor (lb/10^6 scf)	Propane Assist Gas Emission Factor (lb/10^3 gal)	Emission Factor Note	Pollutant Type	Emissions (lb/hr)	Emissions (ton/yr)
2-Methylnaphthalene	2.40E-05	2.17E-06	[10]	HAP	6.23E-08	2.73E-07
3-Methylchloranthrene	1.80E-06	1.63E-07	[10]	HAP	4.67E-09	2.05E-08
7,12-Dimethylbenz(a)anthracene	1.60E-05	1.45E-06	[10]	HAP	4.15E-08	1.82E-07
Acenaphthene	1.80E-06	1.63E-07	[10]	HAP	4.67E-09	2.05E-08
Acenaphthylene	1.80E-06	1.63E-07	[10]	HAP	4.67E-09	2.05E-08
Anthracene	2.40E-06	2.17E-07	[10]	HAP	6.23E-09	2.73E-08
Benz(a)anthracene	1.80E-06	1.63E-07	[10]	HAP	4.67E-09	2.05E-08
Benzene	2.10E-03	1.90E-04	[10]	HAP	5.45E-06	2.39E-05
Benzo(a)pyrene	1.20E-06	1.08E-07	[10]	HAP	3.11E-09	1.36E-08
Benzo(b)fluoranthene	1.80E-06	1.63E-07	[10]	HAP	4.67E-09	2.05E-08
Benzo(g,h,i)perylene	1.20E-06	1.08E-07	[10]	HAP	3.11E-09	1.36E-08
Benzo(k)fluoranthene	1.80E-06	1.63E-07	[10]	HAP	4.67E-09	2.05E-08
Butane	2.10E+00	1.90E-01	[10]	TAC	5.45E-03	2.39E-02
Chrysene	1.80E-06	1.63E-07	[10]	HAP	4.67E-09	2.05E-08
Dibenzo(a,h)anthracene	1.20E-06	1.08E-07	[10]	HAP	3.11E-09	1.36E-08
Dichlorobenzene	1.20E-03	1.08E-04	[10]	HAP	3.11E-06	1.36E-05
Ethane	3.10E+00	2.80E-01	[10]	TAC	8.04E-03	3.52E-02
Fluoranthene	3.00E-06	2.71E-07	[10]	HAP	7.78E-09	3.41E-08
Fluorene	2.80E-06	2.53E-07	[10]	HAP	7.27E-09	3.18E-08
Formaldehyde	7.50E-02	6.78E-03	[10]	HAP	1.95E-04	8.52E-04
Hexane	1.80E+00	1.63E-01	[10]	HAP	4.67E-03	2.05E-02
Indeno(1,2,3-cd)pyrene	1.80E-06	1.63E-07	[10]	HAP	4.67E-09	2.05E-08
Naphthalene	6.10E-04	5.52E-05	[10]	HAP	1.58E-06	6.93E-06
Phenanthrene	1.70E-05	1.54E-06	[10]	HAP	4.41E-08	1.93E-07
Propane	1.60E+00	1.45E-01	[10]	TAC	4.15E-03	1.82E-02
Pyrene	5.00E-06	4.52E-07	[10]	HAP	1.30E-08	5.68E-08
Toluene	3.40E-03	3.07E-04	[10]	HAP	8.82E-06	3.86E-05
Arsenic	2.0E-04	1.81E-05	[11]	HAP	5.19E-07	2.27E-06
Barium	4.4E-03	3.98E-04	[11]	TAC	1.14E-05	5.00E-05
Beryllium	1.2E-05	1.08E-06	[11]	HAP	3.11E-08	1.36E-07
Cadmium	1.1E-03	9.95E-05	[11]	HAP	2.85E-06	1.25E-05
Chromium	1.4E-03	1.27E-04	[11]	HAP	3.63E-06	1.59E-05
Cobalt	8.4E-05	7.59E-06	[11]	HAP	2.18E-07	9.55E-07
Copper	8.5E-04	7.69E-05	[11]	TAC	2.21E-06	9.66E-06
Manganese	3.8E-04	3.44E-05	[11]	HAP	9.86E-07	4.32E-06
Mercury	2.6E-04	2.35E-05	[11]	HAP	6.75E-07	2.95E-06
Molybdenum	1.1E-03	9.95E-05	[11]	TAC	2.85E-06	1.25E-05
Nickel	2.1E-03	1.90E-04	[11]	HAP	5.45E-06	2.39E-05
Selenium	2.4E-05	2.17E-06	[11]	HAP	6.23E-08	2.73E-07
Vanadium	2.3E-03	2.08E-04	[11]	TAC	5.97E-06	2.61E-05
Zinc	2.9E-02	2.62E-03	[11]	TAC	7.52E-05	3.30E-04
Total HAP Emissions					4.90E-03	2.15E-02
Highest Single HAP Emissions			[12]		4.67E-03	2.05E-02

Notes:

1. Emission factors from AP-42, Chapter 13.5 Industrial Flares, February 2018, Table 13.5-1, THC, NOx and Soot Emissions Factors for Flare Operations for Certain Chemical Manufacturing Processes.

2. Emission factors from AP-42, Chapter 1.5 Liquefied Petroleum Gas Combustion, July 2008, Table 1.5-1. Emission Factors for LPG Combustion for a commercial boiler (0.3 to 10 MMBtu/hr).

3. Sulfur dioxide emissions are based on the H_2S content (ppm) of the biogas and assumes a 100% conversion of the tail gas and biogas assist gas sulfur content to SO_2. Refer to Table 3 Scenario 2 for the sulfur dioxide emission rate calculations.

4. Emission factors from AP-42, Chapter 1.5 Liquefied Petroleum Gas Combustion, July 2008, Table 1.5-1. Emission Factors for LPG Combustion for a commercial boiler (0.3 to 10 MMBtu/hr). Sulfur content assumed to be 16 gr/100 ft^3 gas vapor. Maximum sulfur concentration in propane of 200 mg/kg (ppmw)from typical propane specification: 200 mg/kg / 10^6 mg/kg * 1 (lb/lb)/(kg/kg) * 7000 grains/lb * 44 lb C_3H_8/mole / 385.3 (ft^3/mole) * 100 (ft^3/100 ft^3) = 16.0 gr/100 ft^3.

5. Emission factors from AP-42, Chapter 2.4 Municipal Solid Waste Landfills, November 1998,Table 2.4-5. Emission Rates for Secondary Compounds Exiting Control Devices.

6. Emission factors from AP-42, Chapter 13.5 Industrial Flares, February 2018,Table 13.5-2, VOC and CO Emissions Factors for Elevated Flare Operations for Certain Refinery and Chemical Manufacturing Processes.

7. Emission factors from AP-42, Chapter 1.4, Natural Gas Combustion, July 1998, Table 1.4-2. Emission Factors for Criteria Pollutants and Greenhous Gases from Natural Gas Combustion.

8. CO_2e calculated by equation A-1 of 40 CFR 98.2, which states the total CO_2e is equal to the GWP factor for CH_4 multiplied by the potential CH_4 emissions. The global warming potential for CO_2 is 1, CH_4 is 25, and nitrous oxide is 298.

9. CO_2 emissions generated in the anaerobic digester that pass through the thermal oxidizer.

10. Emission factors from AP-42, Chapter 1.4, Natural Gas Combustion, July 1998, Table 1.4-3. Emission Factors from Speciated Organic Compounds for Natural Gas Combustion. Converted to propane emission factor per Note "a" in Table 1.4-3: Methane's emissions factors to propane's emissions factors is as follows: lb pollutant/10^3 gallons of propane = (lb pollutant /10^6 ft^3 methane) * (91.5 x 10^6 Btu/10^3 gallons of propane) / (1020 x 10^6 Btu/10^6 scf of methane) using 1020 x 10^6 Btu/10^6 scf for the methane heat content.

11. Emission factors from AP-42, Chapter 1.4, Natural Gas Combustion, July 1998, Table 1.4-4. Emission Factors for Metals from Natural Gas Combustion. Converted to propane emission factor per Note "a" in Table 1.4-3: Methane's emissions factors to propane's emissions factors is as follows: lb pollutant/103 gallons of propane = (lb pollutant /106 ft3 methane) * (91.5 x 106 Btu/103 gallons of propane) / (1020 x 106 Btu/106 scf of methane) using 1020 x 106 Btu/106 scf for the methane heat content.

12. The HAP with the highest potential emissions is hexane.

Table 7
Waste Gas Thermal Oxidizer Potential Emission Calculations with Natural Gas as Assist Gas
Red Leaf RNG, LLC

Discussion: The thermal oxidizer (TO) is used as a control device to combust tail gas from the Membrane Separation Plant. The total emissions from the thermal oxidizer include tail gas vapors, assist gas and pilot light emissions.

Waste Gas Emissions

Waste Gas Flow Rate to TO	278.08	scf/min
Waste Gas Flow Rate to TO	16,684.93	scf/hr
Waste Gas Methane Content	8.00	Percent methane
Heat Content of Waste Gas	1.35	MMBtu/hr
Heat Content of Assist Gas	1.28	MMBtu/hr
Total Heat Content	2.63	MMBtu/hr
Methane Heat Content	1,012	Btu/scf
Assist Gas Flow Rate to TO	21.00	scf/min
Assist Gas Flow Rate to TO	1,260.00	scf/hr
Assist Gas Methane Content	100	Percent methane
Total Flow Rate to TO	17,944.93	scf/hr
Total Flow Rate to TO	299.08	scf/min

Pollutant	Emission Factor	Emission Factor Units	Emission Factor Note	Pollutant Type	Emissions (lb/hr)	Emissions (ton/yr)
Criteria Pollutants						
Waste Gas Combustion						
Waste Gas - NOx	0.068	lb/MMBtu	[1]	NOx	0.09	0.40
Assist Gas - NOx	100.00	lb/10^6 scf	[2]	NOx	0.13	0.55
Total NOx				NOx	0.22	0.95
Waste Gas - SO_2	36.86	lb/MMBtu	[3]	SO_2	49.79	218.08
Assist Gas - SO_2	0.6	lb/10^6 scf	[4]	SO_2	7.56E-04	3.31E-03
Total SO_2				SO_2	49.79	218.09
Waste Gas - CO	750	lb/10^6 dscf Methane	[5]	CO	1.00	4.38
Assist Gas - CO	84	lb/10^6 scf	[4]	CO	0.11	0.46
Total CO				CO	1.11	4.85
Waste Gas - VOC	0.66	lb/MMBtu	[6]	VOC	0.89	3.90
Assist Gas - VOC	5.5	lb/10^6 scf	[4]	VOC	6.93E-03	0.03
Total VOC				VOC	0.90	3.94
Waste Gas - PM = PM_{10} = $PM_{2.5}$	17	lb/10^6 dscf methane	[5]	PM	0.02	0.10
Assist Gas - PM = PM_{10} = $PM_{2.5}$	7.6	lb/10^6 scf	[4]	PM	0.01	0.04
Total PM = PM_{10} = $PM_{2.5}$				PM	0.03	0.14
Waste Gas - CO_2	120,000	lb/10^6 scf	[4]	GHG	160.18	701.57
Waste Gas- Methane	2.3	lb/10^6 scf	[4]	GHG	3.07E-03	0.01
Waste Gas - N_2O (Uncontrolled)	2.2	lb/10^6 scf	[4]	GHG	2.94E-03	0.01
Waste Gas - CO_2e			[7]	GHG	161.13	705.74
Assist Gas - CO_2	120,000	lb/10^6 scf	[4]	GHG	151.20	662.26
Assist Gas - Methane	2.3	lb/10^6 scf	[4]	GHG	2.90E-03	0.01
Assist Gas - N_2O (Uncontrolled)	2.2	lb/10^6 scf	[4]	GHG	2.77E-03	0.01
Assist Gas - CO_2e			[7]	GHG	152.10	666.19
Anaerobic Digester Off-gas						
CO_2 = CO_2e			[8]	GHG	1,481.84	6,490.48
Total CO_2e				GHG	1,795.07	7,862.41
HAPs and TACs						
Pollutant	**Waste Gas and Assist Gas Emission Factor**	**Emission Factor Units**	**Emission Factor Note**	**Pollutant Type**	**Emissions (lb/hr)**	**Emissions (ton/yr)**
2-Methylnaphthalene	2.40E-05	lb/10^6 scf	[9]	HAP	6.23E-08	2.73E-07
3-Methylchloranthrene	1.80E-06	lb/10^6 scf	[9]	HAP	4.67E-09	2.05E-08
7,12-Dimethylbenz(a)anthracene	1.60E-05	lb/10^6 scf	[9]	HAP	4.15E-08	1.82E-07
Acenaphthene	1.80E-06	lb/10^6 scf	[9]	HAP	4.67E-09	2.05E-08
Acenaphthylene	1.80E-06	lb/10^6 scf	[9]	HAP	4.67E-09	2.05E-08
Anthracene	2.40E-06	lb/10^6 scf	[9]	HAP	6.23E-09	2.73E-08
Benz(a)anthracene	1.80E-06	lb/10^6 scf	[9]	HAP	4.67E-09	2.05E-08
Benzene	2.10E-03	lb/10^6 scf	[9]	HAP	5.45E-06	2.39E-05
Benzo(a)pyrene	1.20E-06	lb/10^6 scf	[9]	HAP	3.11E-09	1.36E-08
Benzo(b)fluoranthene	1.80E-06	lb/10^6 scf	[9]	HAP	4.67E-09	2.05E-08
Benzo(g,h,i)perylene	1.20E-06	lb/10^6 scf	[9]	HAP	3.11E-09	1.36E-08
Benzo(k)fluoranthene	1.80E-06	lb/10^6 scf	[9]	HAP	4.67E-09	2.05E-08
Butane	2.10E+00	lb/10^6 scf	[9]	TAC	5.45E-03	2.39E-02
Chrysene	1.80E-06	lb/10^6 scf	[9]	HAP	4.67E-09	2.05E-08
Dibenzo(a,h)anthracene	1.20E-06	lb/10^6 scf	[9]	HAP	3.11E-09	1.36E-08
Dichlorobenzene	1.20E-03	lb/10^6 scf	[9]	HAP	3.11E-06	1.36E-05
Ethane	3.10E+00	lb/10^6 scf	[9]	TAC	8.04E-03	3.52E-02
Fluoranthene	3.00E-06	lb/10^6 scf	[9]	HAP	7.78E-09	3.41E-08
Fluorene	2.80E-06	lb/10^6 scf	[9]	HAP	7.27E-09	3.18E-08
Formaldehyde	7.50E-02	lb/10^6 scf	[9]	HAP	1.95E-04	8.52E-04
Hexane	1.80E+00	lb/10^6 scf	[9]	HAP	4.67E-03	2.05E-02
Indeno(1,2,3-cd)pyrene	1.80E-06	lb/10^6 scf	[9]	HAP	4.67E-09	2.05E-08
Naphthalene	6.10E-04	lb/10^6 scf	[9]	HAP	1.58E-06	6.93E-06
Phenanthrene	1.70E-05	lb/10^6 scf	[9]	HAP	4.41E-08	1.93E-07
Propane	1.60E+00	lb/10^6 scf	[9]	TAC	4.15E-03	1.82E-02
Pyrene	5.00E-06	lb/10^6 scf	[9]	HAP	1.30E-08	5.68E-08
Toluene	3.40E-03	lb/10^6 scf	[9]	HAP	8.82E-06	3.86E-05
Arsenic	2.0E-04	lb/10^6 scf	[10]	HAP	5.19E-07	2.27E-06
Barium	4.4E-03	lb/10^6 scf	[10]	TAC	1.14E-05	5.00E-05
Beryllium	1.2E-05	lb/10^6 scf	[10]	HAP	3.11E-08	1.36E-07
Cadmium	1.1E-03	lb/10^6 scf	[10]	HAP	2.85E-06	1.25E-05
Chromium	1.4E-03	lb/10^6 scf	[10]	HAP	3.63E-06	1.59E-05
Cobalt	8.4E-05	lb/10^6 scf	[10]	HAP	2.18E-07	9.55E-07
Copper	8.5E-04	lb/10^6 scf	[10]	TAC	2.21E-06	9.66E-06
Manganese	3.8E-04	lb/10^6 scf	[10]	HAP	9.86E-07	4.32E-06
Mercury	2.6E-04	lb/10^6 scf	[10]	HAP	6.75E-07	2.95E-06
Molybdenum	1.1E-03	lb/10^6 scf	[10]	TAC	2.85E-06	1.25E-05
Nickel	2.1E-03	lb/10^6 scf	[10]	HAP	5.45E-06	2.39E-05
Selenium	2.4E-05	lb/10^6 scf	[10]	HAP	6.23E-08	2.73E-07
Vanadium	2.3E-03	lb/10^6 scf	[10]	TAC	5.97E-06	2.61E-05
Zinc	2.9E-02	lb/10^6 scf	[10]	TAC	7.52E-05	3.30E-04
Total HAP Emissions					4.90E-03	2.15E-02
Highest Single HAP Emissions			[11]		4.67E-03	2.05E-02

Notes:

1. Emission factors from AP-42, Chapter 13.5 Industrial Flares, February 2018, Table 13.5-1, THC, NOx and Soot Emissions Factors for Flare Operations for Certain Chemical Manufacturing Processes.

2. Emission factors from AP-42, Chapter 1.4, Natural Gas Combustion, July 1998, Table 1.4-1. Emission Factors for Nitrogen Oxides (NOx) and Carbon Monoxide (CO) from Natural Gas Combustion.

3. Sulfur dioxide emissions are based on the H_2S content (ppm) of the biogas and assumes a 100% conversion of the waste gas sulfur content to SO_2. Refer to Table 3 Scenario 2 for the sulfur dioxide emission rate calculations.

4. Emission factors from AP-42, Chapter 1.4, Natural Gas Combustion, July 1998, Table 1.4-2. Emission Factors for Criteria Pollutants and Greenhous Gases from Natural Gas Combustion.

5. Emission factors from AP-42, Chapter 2.4 Municipal Solid Waste Landfills, November 1998,Table 2.4-5. Emission Rates for Secondary Compounds Exiting Control Devices.

6. Emission factors from AP-42, Chapter 13.5 Industrial Flares, February 2018,Table 13.5-2, VOC and CO Emissions Factors for Elevated Flare Operations for Certain Refinery and Chemical Manufacturing Processes.

7. CO_2e calculated by equation A-1 of 40 CFR 98.2, which states the total CO_2e is equal to the GWP factor for CH_4 multiplied by the potential CH_4 emissions. The global warming potential for CO_2 is 1, CH_4 is 25, and nitrous oxide is 298.

8. CO_2 emissions generated in the anaerobic digester that pass through the thermal oxidizer.

9. Emission factors from AP-42, Chapter 1.4, Natural Gas Combustion, July 1998, Table 1.4-3. Emission Factors for Speciated Organic Compounds from Natural Gas Combustion.

10. Emission factors from AP-42, Chapter 1.4, Natural Gas Combustion, July 1998, Table 1.4-4. Emission Factors for Metals from Natural Gas Combustion.

11. The HAP with the highest potential emissions is hexane.

Table B-8
Propane Fired Boiler Potential Emission Calculations
Red Leaf RNG, LLC

Discussion:

Propane will be used as a back-up fuel to fire the boiler used to heat water to maintain the operating temperature of the anaerobic digester.
The boiler will have a maximum heat input rating of 5.44 MMBtu/hr.

Boiler Emissions

Boiler Heat Input Rating	5.44	MMBtu/hr
Propane Flow Rate to the Boiler	59.50	gallons/hr
Propane Flow Rate to the Boiler	521,227	gallons/yr
Propane Heat Content	91.5	MMBtu/1000 gallons

Pollutant	Emission Factor	Emission Factor Units	Emission Factor Note	Pollutant Type	Boiler Emissions (lb/hr)	Boiler Emissions (ton/yr)
Criteria Pollutants						
NOx	13	lb/10^3 gal	[1]	NOx	0.77	3.39
SO_2	1.6	lb/10^3 gal	[2]	SO_2	0.10	0.42
CO	7.5	lb/10^3 gal	[1]	CO	0.45	1.95
VOC	1.0	lb/10^3 gal	[1]	VOC	0.06	0.26
Total PM = PM_{10} = $PM_{2.5}$	0.7	lb/10^3 gal	[1]	PM	0.04	0.18
CO_2	12,500	lb/10^3 gal	[1]	GHG	743.76	3,257.67
Methane	0.2	lb/10^3 gal	[1]	GHG	0.01	0.05
N_2O (Uncontrolled)	0.9	lb/10^3 gal	[1]	GHG	0.05	0.23
Total CO_2e			[3]	GHG	760.02	3,328.87
HAPs and TACs						
2-Methylnaphthalene	2.17E-06	lb/10^3 gal	[4]	HAP	1.29E-07	5.66E-07
3-Methylchloranthrene	1.63E-07	lb/10^3 gal	[4]	HAP	9.68E-09	4.24E-08
7,12-Dimethylbenz(a)anthracene	1.45E-06	lb/10^3 gal	[4]	HAP	8.61E-08	3.77E-07
Acenaphthene	1.63E-07	lb/10^3 gal	[4]	HAP	9.68E-09	4.24E-08
Acenaphthylene	1.63E-07	lb/10^3 gal	[4]	HAP	9.68E-09	4.24E-08
Anthracene	2.17E-07	lb/10^3 gal	[4]	HAP	1.29E-08	5.66E-08
Benz(a)anthracene	1.63E-07	lb/10^3 gal	[4]	HAP	9.68E-09	4.24E-08
Benzene	1.90E-04	lb/10^3 gal	[4]	HAP	1.13E-05	4.95E-05
Benzo(a)pyrene	1.08E-07	lb/10^3 gal	[4]	HAP	6.46E-09	2.83E-08
Benzo(b)fluoranthene	1.63E-07	lb/10^3 gal	[4]	HAP	9.68E-09	4.24E-08
Benzo(g,h,i)perylene	1.08E-07	lb/10^3 gal	[4]	HAP	6.46E-09	2.83E-08
Benzo(k)fluoranthene	1.63E-07	lb/10^3 gal	[4]	HAP	9.68E-09	4.24E-08
Butane	1.90E-01	lb/10^3 gal	[4]	TAC	1.13E-02	4.95E-02
Chrysene	1.63E-07	lb/10^3 gal	[4]	HAP	9.68E-09	4.24E-08
Dibenzo(a,h)anthracene	1.08E-07	lb/10^3 gal	[4]	HAP	6.46E-09	2.83E-08
Dichlorobenzene	1.08E-04	lb/10^3 gal	[4]	HAP	6.46E-06	2.83E-05
Ethane	2.80E-01	lb/10^3 gal	[4]	TAC	1.67E-02	7.30E-02
Fluoranthene	2.71E-07	lb/10^3 gal	[4]	HAP	1.61E-08	7.07E-08
Fluorene	2.53E-07	lb/10^3 gal	[4]	HAP	1.51E-08	6.60E-08
Formaldehyde	6.78E-03	lb/10^3 gal	[4]	HAP	4.03E-04	1.77E-03
Hexane	1.63E-01	lb/10^3 gal	[4]	HAP	9.68E-03	4.24E-02
Indeno(1,2,3-cd)pyrene	1.63E-07	lb/10^3 gal	[4]	HAP	9.68E-09	4.24E-08
Naphthalene	5.52E-05	lb/10^3 gal	[4]	HAP	3.28E-06	1.44E-05
Phenanthrene	1.54E-06	lb/10^3 gal	[4]	HAP	9.15E-08	4.01E-07
Propane	1.45E-01	lb/10^3 gal	[4]	TAC	8.61E-03	3.77E-02
Pyrene	4.52E-07	lb/10^3 gal	[4]	HAP	2.69E-08	1.18E-07
Toluene	3.07E-04	lb/10^3 gal	[4]	HAP	1.83E-05	8.01E-05
Arsenic	1.81E-05	lb/10^3 gal	[5]	HAP	1.08E-06	4.71E-06
Barium	3.98E-04	lb/10^3 gal	[5]	TAC	2.37E-05	1.04E-04
Beryllium	1.08E-06	lb/10^3 gal	[5]	HAP	6.46E-08	2.83E-07
Cadmium	9.95E-05	lb/10^3 gal	[5]	HAP	5.92E-06	2.59E-05
Chromium	1.27E-04	lb/10^3 gal	[5]	HAP	7.53E-06	3.30E-05
Cobalt	7.59E-06	lb/10^3 gal	[5]	HAP	4.52E-07	1.98E-06
Copper	7.69E-05	lb/10^3 gal	[5]	TAC	4.57E-06	2.00E-05
Manganese	3.44E-05	lb/10^3 gal	[5]	HAP	2.04E-06	8.95E-06
Mercury	2.35E-05	lb/10^3 gal	[5]	HAP	1.40E-06	6.13E-06
Molybdenum	9.95E-05	lb/10^3 gal	[5]	TAC	5.92E-06	2.59E-05
Nickel	1.90E-04	lb/10^3 gal	[5]	HAP	1.13E-05	4.95E-05
Selenium	2.17E-06	lb/10^3 gal	[5]	HAP	1.29E-07	5.66E-07
Vanadium	2.08E-04	lb/10^3 gal	[5]	TAC	1.24E-05	5.42E-05
Zinc	2.62E-03	lb/10^3 gal	[5]	TAC	1.56E-04	6.83E-04
Total HAP Emissions					1.02E-02	4.45E-02
Highest Single HAP Emissions			[6]		9.68E-03	4.24E-02

Notes:

1. Emission factors from AP-42, Chapter 1.5 Liquefied Petroleum Gas Combustion, July 2008, Table 1.5-1. Emission Factors for LPG Combustion for a commercial boiler (0.3 to 10 MMBtu/hr).

2. Emission factors from AP-42, Chapter 1.5 Liquefied Petroleum Gas Combustion, July 2008, Table 1.5-1. Emission Factors for LPG Combustion for a commercial boiler (0.3 to 10 MMBtu/hr). Sulfur content assumed to be 16 gr/100 ft^3 gas vapor. Maximum sulfur concentration in propane of 200 mg/kg (ppmw)from typical propane specification: 200 mg/kg / 10^6 mg/kg * 1 (lb/lb)/(kg/kg) * 7000 grains/lb * 44 lb C_3H_8/mole / 385.3 (ft^3/mole) * 100 (ft^3/100 ft^3) = 16.0 gr/100 ft^3.

3. CO_2e calculated by equation A-1 of 40 CFR 98.2, which states the total CO_2e is equal to the GWP factor for CH_4 multiplied by the potential CH_4 emissions. The global warming potential for CO_2 is 1, CH_4 is 25, and nitrous oxide is 298.

4. Emission factors from AP-42, Chapter 1.4, Natural Gas Combustion, July 1998, Table 1.4-3. Emission Factors from Speciated Organic Compounds for Natural Gas Combustion. Converted to propane emission factor per Note "a" in Table 1.4-3: Methane's emissions factors to propane's emissions factors is as follows: lb pollutant/10^3 gallons of propane = (lb pollutant /10^6 ft^3 methane) * (91.5 x 10^6 Btu/10^3 gallons of propane) / (1020 x 10^6 Btu/10^6 scf of methane) using 1020 x 10^6 Btu/10^6 scf for the methane heat content.

5. Emission factors from AP-42, Chapter 1.4, Natural Gas Combustion, July 1998, Table 1.4-4. Emission Factors for Metals from Natural Gas Combustion. Converted to propane emission factor per Note "a" in Table 1.4-3: Methane's emissions factors to propane's emissions factors is as follows: lb pollutant/103 gallons of propane = (lb pollutant /106 ft3 methane) * (91.5 x 106 Btu/103 gallons of propane) / (1020 x 106 Btu/106 scf of methane) using 1020 x 106 Btu/106 scf for the methane heat content.

6. The HAP with the highest facility-wide potential emissions is hexane.

Table B-9
Natural Gas Fired Boiler Potential Emission Calculations
Red Leaf RNG, LLC

Discussion: Natural gas will be used as a back-up fuel to fire the boiler used to heat water to maintain the operating temperature of the anaerobic digester.
The boiler will have a maximum heat input rating of 5.44 MMBtu/hr.

Boiler Emissions

Boiler Heat Input Rating	5.44	MMBtu/hr
Natural Gas Flow Rate to the Boiler	5,380	scf/hr
Total Natural Gas Flow Rate	47,126,786	scf/yr
Natural Gas Methane Content	100.00	Percent methane
Methane Heat Content	1,012	Btu/scf

Pollutant	Emission Factor	Emission Factor Units	Emission Factor Note	Pollutant Type	Boiler Emissions (lb/hr)	Boiler Emissions (ton/yr)
Criteria Pollutants						
NOx	100	lb/10^6 scf	[1]	NOx	0.54	2.36
SO_2	0.6	lb/10^6 scf	[2]	SO_2	3.23E-03	1.41E-02
CO	84	lb/10^6 scf	[1]	CO	4.52E-01	1.98E+00
VOC	5.5	lb/10^6 scf	[2]	VOC	2.96E-02	1.30E-01
Total PM = PM_{10} = $PM_{2.5}$	7.6	lb/10^6 scf	[2]	PM	4.09E-02	1.79E-01
Lead	5.00E-04	lb/10^6 scf	[2]	Lead	2.69E-06	1.18E-05
CO_2	120,000	lb/10^6 scf	[2]	GHG	645.57	2,827.61
Methane	2.3	lb/10^6 scf	[2]	GHG	1.24E-02	5.42E-02
N_2O (Uncontrolled)	2.2	lb/10^6 scf	[2]	GHG	1.18E-02	5.18E-02
Total CO_2e			[3]	GHG	649.41	2,844.41
HAPs and TACs						
2-Methylnaphthalene	2.40E-05	lb/10^6 scf	[4]	HAP	1.29E-07	5.66E-07
3-Methylchloranthrene	1.80E-06	lb/10^6 scf	[4]	HAP	9.68E-09	4.24E-08
7,12-Dimethylbenz(a)anthracene	1.60E-05	lb/10^6 scf	[4]	HAP	8.61E-08	3.77E-07
Acenaphthene	1.80E-06	lb/10^6 scf	[4]	HAP	9.68E-09	4.24E-08
Acenaphthylene	1.80E-06	lb/10^6 scf	[4]	HAP	9.68E-09	4.24E-08
Anthracene	2.40E-06	lb/10^6 scf	[4]	HAP	1.29E-08	5.66E-08
Benz(a)anthracene	1.80E-06	lb/10^6 scf	[4]	HAP	9.68E-09	4.24E-08
Benzene	2.10E-03	lb/10^6 scf	[4]	HAP	1.13E-05	4.95E-05
Benzo(a)pyrene	1.20E-06	lb/10^6 scf	[4]	HAP	6.46E-09	2.83E-08
Benzo(b)fluoranthene	1.80E-06	lb/10^6 scf	[4]	HAP	9.68E-09	4.24E-08
Benzo(g,h,i)perylene	1.20E-06	lb/10^6 scf	[4]	HAP	6.46E-09	2.83E-08
Benzo(k)fluoranthene	1.80E-06	lb/10^6 scf	[4]	HAP	9.68E-09	4.24E-08
Butane	2.10E+00	lb/10^6 scf	[4]	TAC	1.13E-02	4.95E-02
Chrysene	1.80E-06	lb/10^6 scf	[4]	HAP	9.68E-09	4.24E-08
Dibenzo(a,h)anthracene	1.20E-06	lb/10^6 scf	[4]	HAP	6.46E-09	2.83E-08
Dichlorobenzene	1.20E-03	lb/10^6 scf	[4]	HAP	6.46E-06	2.83E-05
Ethane	3.10E+00	lb/10^6 scf	[4]	TAC	1.67E-02	7.30E-02
Fluoranthene	3.00E-06	lb/10^6 scf	[4]	HAP	1.61E-08	7.07E-08
Fluorene	2.80E-06	lb/10^6 scf	[4]	HAP	1.51E-08	6.60E-08
Formaldehyde	7.50E-02	lb/10^6 scf	[4]	HAP	4.03E-04	1.77E-03
Hexane	1.80E+00	lb/10^6 scf	[4]	HAP	9.68E-03	4.24E-02
Indeno(1,2,3-cd)pyrene	1.80E-06	lb/10^6 scf	[4]	HAP	9.68E-09	4.24E-08
Naphthalene	6.10E-04	lb/10^6 scf	[4]	HAP	3.28E-06	1.44E-05
Phenanthrene	1.70E-05	lb/10^6 scf	[4]	HAP	9.15E-08	4.01E-07
Propane	1.60E+00	lb/10^6 scf	[4]	TAC	8.61E-03	3.77E-02
Pyrene	5.00E-06	lb/10^6 scf	[4]	HAP	2.69E-08	1.18E-07
Toluene	3.40E-03	lb/10^6 scf	[4]	HAP	1.83E-05	8.01E-05
Arsenic	2.0E-04	lb/10^6 scf	[5]	HAP	1.08E-06	4.71E-06
Barium	4.4E-03	lb/10^6 scf	[5]	TAC	2.37E-05	1.04E-04
Beryllium	1.2E-05	lb/10^6 scf	[5]	HAP	6.46E-08	2.83E-07
Cadmium	1.1E-03	lb/10^6 scf	[5]	HAP	5.92E-06	2.59E-05
Chromium	1.4E-03	lb/10^6 scf	[5]	HAP	7.53E-06	3.30E-05
Cobalt	8.4E-05	lb/10^6 scf	[5]	HAP	4.52E-07	1.98E-06
Copper	8.5E-04	lb/10^6 scf	[5]	TAC	4.57E-06	2.00E-05
Manganese	3.8E-04	lb/10^6 scf	[5]	HAP	2.04E-06	8.95E-06
Mercury	2.6E-04	lb/10^6 scf	[5]	HAP	1.40E-06	6.13E-06
Molybdenum	1.1E-03	lb/10^6 scf	[5]	TAC	5.92E-06	2.59E-05
Nickel	2.1E-03	lb/10^6 scf	[5]	HAP	1.13E-05	4.95E-05
Selenium	2.4E-05	lb/10^6 scf	[5]	HAP	1.29E-07	5.66E-07
Vanadium	2.3E-03	lb/10^6 scf	[5]	TAC	1.24E-05	5.42E-05
Zinc	2.9E-02	lb/10^6 scf	[5]	TAC	1.56E-04	6.83E-04
Total HAP Emissions					1.02E-02	4.45E-02
Highest Single HAP Emissions			[6]		9.68E-03	4.24E-02

Notes:

1. Emission factors from AP-42, Chapter 1.4, Natural Gas Combustion, July 1998, Table 1.4-1. Emission Factors for Nitrogen Oxides (NOx) and Carbon Monoxide (CO) from Natural Gas Combustion.

2. Emission factors from AP-42, Chapter 1.4, Natural Gas Combustion, July 1998, Table 1.4-2. Emission Factors for Criteria Pollutants and Greenhous Gases from Natural Gas Combustion.

3. CO_2e calculated by equation A-1 of 40 CFR 98.2, which states the total CO_2e is equal to the GWP factor for CH_4 multiplied by the potential CH_4 emissions. The global warming potential for CO_2 is 1, CH_4 is 25, and nitrous oxide is 298.

4. Emission factors from AP-42, Chapter 1.4, Natural Gas Combustion, July 1998, Table 1.4-3. Emission Factors from Speciated Organic Compounds for Natural Gas Combustion.

5. Emission factors from AP-42, Chapter 1.4, Natural Gas Combustion, July 1998, Table 1.4-4. Emission Factors for Metals from Natural Gas Combustion.

6. The HAP with the highest facility-wide potential emissions is hexane.

TOXIC AIR CONTAMINANTS
Allowable Emission Rate Methodology - Rule 227(1)(a)

Table B-10
Rule 227(1)(a) Air Toxics Evaluation
Red Leaf RNG, LLC

Facility Name:								Facility Address:												Hours of operation per year:				8,760	
		Screening Level						Allowable Emission Rate (AER)						Proposed Emission Rate (ER)							Is Proposed Emission Rate less than AER?					
								1st ITSL		2nd ITSL		IRSL / SRSL														
Chemical Name	CAS No.	1st ITSL µg/m³	1st ITSL Avg Time	2nd ITSL µg/m³	2nd ITSL Avg Time	IRSL / SRSL µg/m³ (annual Avg)	AQD Footnote(s)	Max lbs per hour	lbs per month, 24-hr, 8-hr or 1-hr	Max lbs per hour	lbs per month, 24-hr, 8-hr or 1-hr	Max lbs per hour	lbs per month	Max Hourly ER lbs/hour	Rate (1st ITSL)	1st ITSL Rate Units	Rate (2nd ITSL)	2nd ITSL Rate Units	Rate (IRSL)	IRSL / SRSL Rate Units	1st ITSL Max Hourly Rate	1st ITSL ER	2nd ITSL Max Hourly Rate	2nd ITSL ER	IRSL Max Hourly Rate	IRSL ER
2-methylnaphthalene	91-57-6	10	annual					5.4	400					9.51E-07	0.0006943	lbs/month					yes	yes				
3-methylcholanthrene	56-49-5						5							7.133E-08												
7,12-dimethylbenz(a)anthracene	57-97-6						5							6.34E-07												
hydrogen sulfide	7783-06-4	10	annual	100	24 hr			5.4	400	5	12			0.4226611	308.54259	lbs/month	10.143866	lbs/24-hr			yes	yes	yes	yes		
acenaphthene	83-32-9	210	annual					113.4	8400					7.133E-08	5.207E-05	lbs/month					yes	yes				
acenaphthylene	208-96-8	35	annual					18.9	1400					7.133E-08	5.207E-05	lbs/month					yes	yes				
anthracene	120-12-7	1000	annual					540	40000					9.51E-08	6.943E-05	lbs/month					yes	yes				
benz(a)anthracene	56-55-3						5							7.133E-08												
benzene	71-43-2	30	annual	30	24 hr	0.1		16.2	1200	1.5	3.6	0.054	4	8.322E-05	0.0607472	lbs/month	0.0019972	lbs/24-hr	0.060747188	lbs/month	yes	yes	yes	yes	yes	yes
benzo(a)pyrene	50-32-8	0.002	24 hr			0.001	5	0.0001	0.00024			0.00054	0.04	4.755E-08	1.141E-06	lbs/24-hr			3.47127E-05	lbs/month	yes	yes			yes	yes
Benzo(b)fluoranthene	205-99-2						5							7.133E-08												
benzo(g,h,i)perylene	191-24-2	13	annual					7.02	520					4.755E-08	3.471E-05	lbs/month					yes	yes				
Benzo(k)fluoranthene	207-08-9						5							7.133E-08												
butane	106-97-8	23800	8 hr				22	476	476					0.0832153	0.6657226	lbs/8-hr					yes	yes				
chrysene	218-01-9						5							7.133E-08												
dibenz(a,h)anthracene	53-70-3						5							4.755E-08												
1,4-dichlorobenzene	106-46-7	800	annual			0.25		432	32000			0.135	10	4.755E-05	0.0347127	lbs/month			0.034712679	lbs/month	yes	yes			yes	yes
fluoranthene	206-44-0	140	annual					75.6	5600					1.189E-07	8.678E-05	lbs/month					yes	yes				
fluorene	86-73-7	140	annual					75.6	5600					1.11E-07	8.1E-05	lbs/month					yes	yes				
formaldehyde	50-00-0	30	24 hr			0.08		1.5	3.6			0.0432	3.2	0.002972	0.0713274	lbs/24-hr			2.169542414	lbs/month	yes	yes			yes	yes
n-hexane	110-54-3	700	annual					378	28000					0.0713274	52.069018	lbs/month					yes	yes				
Indeno(1,2,3-cd)pyrene	193-39-5						5							7.133E-08												
naphthalene	91-20-3	3	annual	520	8 hr	0.08		1.62	120	10.4	10.4	0.0432	3.2	2.417E-05	0.0176456	lbs/month	0.0001934	lbs/8-hr	0.017645612	lbs/month	yes	yes	yes	yes	yes	yes
phenanthrene	85-01-8	0.1	annual					0.054	4					6.736E-07	0.0004918	lbs/month					yes	yes				
pyrene	129-00-0	100	annual					54	4000					1.981E-07	0.0001446	lbs/month					yes	yes				
toluene	108-88-3	5000	24 hr					250	600					0.0001347	0.0032335	lbs/24-hr					yes	yes				
arsenic	7440-38-2					0.0002						0.00011	0.008	7.925E-06					0.005785446	lbs/month					yes	yes
barium and soluble barium compounds	7440-39-3	5	8 hr				35	0.1	0.1					0.0001744	0.0013948	lbs/8-hr					yes	yes				
cadmium	7440-43-9					0.0006						0.00032	0.024	4.755E-07					0.000347127	lbs/month					yes	yes
cadmium	7440-43-9					0.0006						0.00032	0.024	4.755E-07					0.000347127	lbs/month					yes	yes
chromium	7440-47-3						17							5.548E-05												
cobalt and cobalt compounds that releas	7440-48-4	0.2	8 hr			0.00013	42	0.004	0.004			7E-05	0.0052	3.329E-06	2.663E-05	lbs/8-hr			0.002429888	lbs/month	yes	yes			yes	yes
copper	7440-50-8	2	8 hr					0.04	0.04					3.368E-05	0.0002695	lbs/8-hr					yes	yes				
manganese and manganese compounds	7439-96-5	0.3	annual				29	0.162	12					1.506E-05	0.0109923	lbs/month					yes	yes				
mercury and mercury compounds	7439-97-6	0.3	annual	1	24 hr		7	0.162	12	0.05	0.12			1.03E-05	0.0075211	lbs/month	0.0002473	lbs/24-hr			yes	yes	yes	yes		
molybdenum	7439-98-7	30	8 hr					0.6	0.6					0	0	lbs/8-hr					yes	yes				
nickel	7440-02-0					0.006						0.00324	0.24	8.322E-05					0.060747188	lbs/month					yes	yes
selenium and inorganic selenium compou	7782-49-2	2	8 hr				34	0.04	0.04					9.51E-07	7.608E-06	lbs/8-hr					yes	yes				
vanadium pentoxide	1314-62-1	0.5	1 hr					0.0005	0.0005					9.114E-05	9.114E-05	lbs/hr					yes	yes				
zinc oxide [1]	1314-13-2	20	8 hr					0.4	0.4					0.0011492	0.0091933	lbs/8-hr					yes	yes				
PAH as benzo(a)pyrene [2]		0.002	24 hr			0.001	5	0.0001	0.00024			0.00054	0.04	4.175E-05	0.0010019	lbs/24-hr			0.03047536	lbs/month					yes	yes

% of AER					
Turn values red if they are greater than:				100%	
1st ITSL Max Hourly Rate	1st ITSL ER	2nd ITSL Max Hourly Rate	2nd ITSL ER	IRSL Max Hourly Rate	IRSL ER
0.0%	0.0%				
7.8%	77.1%	8.5%	84.5%		
0.0%	0.0%				
0.0%	0.0%				
0.0%	0.0%				
0.0%	0.0%	0.0%	0.1%	0.2%	1.5%
0.0%	0.5%			0.0%	0.1%
0.0%	0.0%				
0.0%	0.1%				
0.0%	0.0%			0.0%	0.3%
0.0%	0.0%				
0.0%	0.0%				
0.2%	2.0%			6.9%	67.8%
0.0%	0.2%				
0.0%	0.0%	0.0%	0.0%	0.1%	0.6%
0.0%	0.0%				
0.0%	0.0%				
0.0%	0.0%				
				7.3%	72.3%
0.2%	1.4%				
				0.1%	1.4%
				0.1%	1.4%
0.1%	0.7%			4.7%	46.7%
0.1%	0.7%				
0.0%	0.1%				
0.0%	0.1%	0.0%	0.2%		
0.0%	0.0%				
				2.6%	25.3%
0.0%	0.0%				
18.2%	18.2%				
0.3%	2.3%				
				7.7%	76.2%

Table B-11
PAE Emission Evaluation
Red Leaf RNG, LLC

Potency Factors for TACs with AQD Footnote 5.

Procedure for the Carcinogenic PAHs of Footnote No. 5

Table 1. PAH Potency Equivalency Factors (PEFs)

CHEMICAL NAME	CAS NO.	PEF	Emission Rate (lb/hr)	Emission Rate (ton/yr)
Dibenz(a,h)anthracene	53-70-3	1.1	4.76E-08	2.08E-07
3-Methylcholanthrene	56-49-5	5.7	7.13E-08	3.12E-07
7,12-Dimethylbenz(a)anthracene	57-97-6	65	6.34E-07	2.78E-06
Chrysene	218-01-9	0.01	7.13E-08	3.12E-07
Indeno(1,2,3-cd)pyrene	193-39-5	0.1	7.13E-08	3.12E-07
Benzo(a)anthracene	56-55-3	0.1	7.13E-08	3.12E-07
Benzo(b)fluoranthene	205-99-2	0.1	7.13E-08	3.12E-07
Benzo(k)fluoranthene	207-08-9	0.1	7.13E-08	3.12E-07
Benzo(j)fluoranthene	205-82-3	0.1		
5-Methylchrysene	3697-24-3	1		
Benzo(a)pyrene	50-32-8	1	4.76E-08	2.08E-07
Dibenzo(a,e)pyrene	192-65-4	1		
Dibenzo(a,h)pyrene	189-64-0	10		
Dibenzo(a,i)pyrene	189-55-9	10		
Dibenzo(a,l)pyrene	191-30-0	10		
Equivalent Emission Rate of benzo(a)pyrene (lb/hr)			4.17E-05	1.83E-04

yellow columns = must enter information

Instructions: In the table for Rule 227(1)(a) enter in CAS Numbers and emission rates for each PAH that is emitted. The table above will calculate the "equivalent emission rate of benzo(a)pyrene." Next, you need to compare this to the IRSL (or SRSL) for benzo(a)pyrene.

In the table for Rule 227(1)(a), (b), or (c), enter the CAS No. for benzo(a)pyrene (50-32-8) into Column B, **and change the Chemical Name in Column A from "benzo(a)pyrene" to "*PAHs as benzo(a)pyrene*."** Changing the name will prevent the table above from double-counting the benzo(a)pyrene emissions. Then enter

Red Leaf RNG Stack Parameters

Form AI-003

June 2024 ROP Application

Stack Exhaust Parameters
Red Leaf RNG, LLC

Source ID	Stack Coordinate (UTM)		Stack Height		Stack Diameter		Exit Gas Temperature		Exhaust Flow Rate (acfm)	Exit Velocity (m/s)
	Easting	Northing	(ft)	(m)	(in)	(m)	(F)	(K)		
Scenario 1										
RNG Plant Flare	644565.3	4760799.9	23	7.01	---	0.813	---	1273.0	---	20.0
Boiler	644451.2	4760785.2	24	7.32	18	0.457	300	422.0	3,180	9.14
Scenario 2										
RNG Plant Thermal Oxidizer	644547.3	4760799.3	61	18.59	18	0.457	1,000	810.9	6,305	18.12
RNG Plant Flare	644565.3	4760799.9	23	7.01	---	0.813	---	1273.0	---	20.0
Boiler	644451.2	4760785.2	24	7.32	18	0.457	300	422.0	3,180	9.14

Red Leaf RNG EUGENERATOR NSPS JJJJ Table

Form AI-004

June 2024 ROP Application

EUGENERATOR
EMISSION UNIT CONDITIONS

DESCRIPTION

60 kW Emergency Generator

Flexible Group ID: NA

POLLUTION CONTROL EQUIPMENT

NA

I. EMISSION LIMIT(S)

Pollutant	Limit	Time Period/Operating Scenario	Equipment	Monitoring/ Testing Method	Underlying Applicable Requirements
1. NOx	10 grams	Horsepower-hour	EUGENERATOR		**40 CFR 60 Subpart JJJJ Table 1**
2. CO	387 grams	Horsepower-hour	EUGENERATOR		**40 CFR 60 Subpart JJJJ Table 1**

II. MATERIAL LIMIT(S)

NA

III. PROCESS/OPERATIONAL RESTRICTION(S)

1. Any operation other than emergency operation, maintenance and testing, and operation in non-emergency situations for 50 hours per year. (40 CFR 60.4243(d))
2. Emergency stationary ICE may be operated for maintenance checks and readiness testing up to 100 hours per calendar year. (40 CFR 60.4243(d)(2))

IV. DESIGN/EQUIPMENT PARAMETER(S)

1. The owner or operator of emergency stationary SI internal combustion engines that are less than 130 HP, built on or after July 1, 2008, and do not meet the standards applicable to non-emergency engines, must install a non-resettable hour meter upon startup of the emergency engine. (40 CFR 60.4237(c))

V. TESTING/SAMPLING

NA

VI. MONITORING/RECORDKEEPING

Records shall be maintained on file for a period of five years. **(R 336.1213(3)(b)(ii))**

1. Maintain documentation from the manufacturer that engine is certified to meet emission standards. (40 CFR 60.4245(a)(3))
2. Maintenance conducted on the engine. (40 CFR 60.4245(a)(2))

VII. REPORTING

NA

VIII. STACK/VENT RESTRICTION(S)

NA

IX. OTHER REQUIREMENT(S)

NA

Red Leaf RNG Malfunction Abatement Plan

Form AI-005

June 2024 ROP Application

Preventative Maintenance/Malfunction Abatement Plan

Red Leaf RNG, LLC (P1268)

113 North Lee Road
Saranac, MI 48881

This Preventative Maintenance/Malfunction Abatement Plan (PM/MAP) has been developed as required under Special Conditions III.1, EUGCU and III.1, EUFLARE of Permit to Install No. 89-22 (PTI), and Rule 336.1911 of Michigan's Administrative Rules for Air Pollution Control. The purpose of the PM/MAP is to describe the standard operating procedures that will be used to prevent, detect, and correct malfunctions of the biogas flare control device (EUFLARE),the gas cleaning and upgrading unit and associated thermal oxidizer control device (EUGCU) and the boiler used to heat the manure in the digester (EUBOILER) at the Red Leaf RNG, LLC (Red Leaf) biomethane recovery and pipeline quality renewable natural gas facility in Saranac, Michigan (the RNG facility).

1 Introduction

On July 5, 2022, the Michigan Department of Environment, Great Lakes and Energy, Air Quality Division (AQD) issued the PTI to Red Leaf RNG, LLC (Red Leaf RNG) covering the installation and operation of a new RNG facility on property leased from the Maple Row dairy farm. Under its operational design, cow manure is transferred from the dairy farm to an anaerobic digester, where it is broken down in an oxygen-free environment. The generated biogas is a mixture of methane, carbon dioxide (CO_2), and small amounts of other gases including hydrogen sulfide (H_2S). A gas upgrading plant processes the raw biogas generated in the anaerobic digester to create pipeline quality renewable natural gas (RNG). The RNG is then compressed and injected into a natural gas pipeline.

Tail gases from the gas upgrading plant is controlled with a thermal oxidizer as the primary control device. A backup flare combusts off-specification gas during start-up, shutdown, and malfunction events. The backup flare also serves to combust raw biogas when the gas upgrading plant is not in operation.

This PM/MAP consists of two parts: 1) the preventive maintenance program; and 2) the malfunction abatement and equipment monitoring program. The Plant Manager is responsible for implementing the PM/MAP, and overseeing the inspection, maintenance, and repair of the control equipment.

2 Preventative Maintenance Program

This preventative maintenance program is designed to minimize the potential for equipment malfunctions by establishing an inspection and monitoring schedule for equipment and accessories associated with EUFLARE, EUGCU, and EUBOILER. The preventative maintenance program includes the following elements:

- Identification of the covered equipment;
- Identification of supervisory personnel responsible for overseeing the inspection, maintenance, and repair of the control equipment;
- Description of the items or conditions that will be inspected;
- The frequency of inspection or repairs;
- Identification of the major replacement parts that will be maintained on-site.

These elements are provided in **Table 1**. As specified by the Plant Manager, Red Leaf RNG will maintain a record of equipment inspection and monitoring activities conducted in accordance with this preventative maintenance program. The records, which will be maintained for five years, will be provided to the AQD upon request.

3 Malfunction Abatement Program

This malfunction abatement and equipment monitoring program is intended to detect any abnormal conditions or malfunctions and will be utilized to initiate corrective actions to achieve continued operation in a timely manner. The malfunction abatement and equipment monitoring program includes the following elements:

- Control equipment operating variables that will be monitored to detect any malfunction or failure;
- Normal operating range of these variables;
- Description of the method of monitoring;
- Personnel responsible for monitoring;
- Frequency of monitoring;
- Description of the corrective procedures or operational changes that will be taken in the event of a malfunction.

Equipment for which a malfunction could cause a possible interruption in the operation of the control equipment is listed in **Table 2**. The table also lists the operating variables to be monitored: the normal operating range, the method of monitoring, the frequency of monitoring, the person monitoring the equipment, and the corrective actions to be taken during a malfunction or failure of the equipment.

4 Malfunction Notification and Reporting

Notification/reporting requirements associated with a malfunction of EUFLARE or EUGCU are specified under Rule 336.1912. Pursuant to the rule, Red Leaf must provide notice of an abnormal condition or malfunction that results in:

1. Emissions of a hazardous air pollutant (HAP) or toxic air contaminant (TAC) which continues for more than one hour in excess of any applicable standard or limitation; or

2. Emissions of any air contaminant continuing for more than two hours in excess of an applicable standard or limitation.

The notices required under Rule 336.1912 must be provided to the AQD as soon as reasonably possible, but not later than 2 business days after the discovery of the abnormal conditions or malfunction. Notice may be provided by any reasonable means, including electronic, telephonic, or oral communication.

Red Leaf must submit to the AQD a written report of an abnormal condition or malfunction that results in emissions of any air contaminant continuing for more than 2 hours in excess of a standard or limitation established by any applicable requirement. The written report shall be submitted within 10 days after the abnormal conditions or malfunction has been corrected, or within 30 days of discovery of the abnormal conditions or malfunction, whichever is first. The written reports shall include all of the following information:

1. The time and date, the probable causes or reasons for, and the duration of the abnormal condition or malfunction.
2. An identification of the source, process, or process equipment that experienced abnormal conditions or which malfunctioned and all other affected process or process equipment that have emissions in excess of an applicable requirement, including a description of the type and, where known or where it is reasonably possible to estimate, the quantity or magnitude of emissions in excess of applicable requirements.
3. Information describing the measures taken and air pollution control practices followed to minimize emissions.
4. The report shall also include a summary of the actions taken to correct and to prevent a reoccurrence of the abnormal conditions or malfunction and the time taken to correct the malfunction.

The truth, accuracy, and completeness of the written reports required under this rule for a stationary source subject to the requirements of R 336.1210 shall be certified by the Responsible Official.

If a reportable abnormal condition or malfunction were to occur, the facility manager will immediately report it to the Red Leaf Director of Safety and Environmental Permitting:

Mr. Christopher Anglin
Director of Safety and Environmental Permitting
canglin@novillarng.com
(734) 915-2384

Mr. Anglin (or his designated agent) will be responsible for investigating and reporting the abnormal condition or malfunction.

TABLE 1
PREVENTATIVE MAINTENANCE PROGRAM
Red Leaf RNG, LLC

Covered Equipment				Preventative Maintenance Activity - Frequency of Inspection							
Emissions Unit	Description	Control/Monitoring Equipment	Manufacturer / Model	Daily	Weekly	Monthly	Quarterly or greater	Annual or greater	Responsibility	Recordkeeping	Replacement Parts
EUFLARE	Digester Gas Flare	Flare	Perennial	no recommended daily PM items	no recommended weekly PM items	1) Test/exercise blower, verify flare pilot is lit, and shutdown valve if the device has not been in service during the month.	Quarterly: 1) Inspect blower bearings & grease per manufacturers requirements 2) Record all set points for reference. Compare to the approved set point values, resolve any deviations.	Annually: 1) Calibrate pressure transmitters per manufacturers recommendations 2) Replace UPS battery 3) Test & document all safety functions. This is listed in the SAFETY ALARM & SHUTDOWN TEST REPORT. Contact PEI if safety functions are not working. 4) Thermally scan all control & junction panels while running under load for a minimum of 3 hours. Remediate hot connections. 5) With power off, check tightness on all electrical connections & terminal blocks. 6) Check gas & air lines for leaks using your standard corporate methodologies & procedures, remediate any leaks. 7) Check blower alignment, remediate as required. 8) Replace ignition cables Inspect ignition system, replace as needed.	operations personnel	on site	Refer to operation manual for proper replacement parts.
		Flow Meter	Kurz					Every 6 years: Follow Kurz flow meter maintenace procedure			
		H2S Monitor	Hobre				Quaterly: Calibrate H2S monitor 6 months: Replace condensate trap filter on Hobre				
		Thermocouple	ThermX or equilvant manufacturer					Annually: Field calibrate or replace Thermocouple's			
EUGCU	Thermal Oxidizer used to destroy tailgas off the Gas Cleaning and Upgrading Unit	Thermal Oxidizer	Perennial	no recommended daily PM items	no recommended weekly PM items	no recommeded Monthly PM items	Quarterly: 1) Visually inspect exterior of TOU while operational & at temperature and remediate as necessary i) Burned or scorched areas that indicate a hot spot through the insulation. ii) Warped or damaged louvers that will not sufficiently close during operation. iii) Thermally scan the exterior of the flare from all four sides, note any hot spots that warrant additional internal investigation. Save these photos to a file for future reference, note the date, time, exterior temperature, precipitation & firing rates 2) Record all set points for reference. Compare to the approved set point values, resolve any deviations.	Annually: 1) Visually Inspect Interior of TOU. A) Power down and cool off. Following your corporate protocols, lock out/tag out the control panels, the airlines, the natural gas line & the tail gas lines. open the manway &inspect thefollowing, remediate damaged items as indicated: i) Burner tip. Ensure that it is intact & undamaged. Photograph for record. Compare current state to past. Contact Power Flame service shop if replacement is required. ii) Injection ports. Ensure they are intact & undamaged. Photograph for record. Compare current state to past. Contact PEI if replacement is required. iii) Insulation & pins. Ensure that it is intact & securely affixed to the TOU. Pay particular attention to any hot spots identified in step 1) above. Photograph for record. Compare current state to past. Remediate any damaged insulation. iv) Manway door insulation. Ensure that it is intact & in good shape. Photograph for record. Compare current state to past. Remediate any damage. B) Remove any SiO2 or other debris in combustion chamber. Use appropriate PPE per your corporate policy. 2) Calibrate pressure transmitters per manufacturer recommendations 3) Replace UPS battery 4) Test & document all safety functions. This is listed in the SAFETY ALARM & SHUTDOWN TEST REPORT. Contact PEI if safety functions are not working. 5) Thermally scan all control & junction panels while running under load for a minimum of 3 hours. Remediate hot connections. 6) With power off, check tightness on all electrical connections & terminal blocks. 7) Check gas & air lines for leaks using your standard corporate methodologies & procedures, remediate any leaks.	operations personnel	on site	Refer to operation manual for proper replacement parts.
		Flow Meter	Kurz				Quaterly: Calibrate H2S Monitor 6 months: Replace condensate trap filter on Hobre	Every 6 years: Follow Kurz flow meter maintenace procedure			
		H2S Meter	Hobre								
		Thermocouple	ThermX or equilvant manufacturer					Annually: Field calibrate or replace Thermocouple's			
EUBOILER	A 5.5 MMBtu/hr natural gas or propane-fired boiler for heating the digester	Boiler	Bryan Boilers	Visual inspection of guages,monitors, and indicatorsand record readings in boiler log. Visual check on instr. and equip. settings against factory recommended specs.	1) On units equipped with firing rate control, verify it is functioning correctly by ajusting control and observing if input changes accordingly. 2) Make visual inspection of pilot flame. Check flame signal strength and main flame operation as specified in burner manual. 3) Check pilot and main fuel valves for correct operation. Open limimt switch-make audible and visual check- Check valve position indicators and check fuel meters, if supplied. 4) Confirm boiler area is free of combustable materials and that there is nothing obstructing air openings, relief openings, etc. 5) Check combustion safety controls for flalme failure and flame sifn=gnal strength as specified in manufacturer's instructions in the burner maual. 6) Check all limit ontrols as specified in section 2.4 of the burner manual. 7)Check float low water cutoff as described above.	1) Make visual inspection of linkage and proper operation of flue, vent, stack, or outlet dampers. Check draft as specified in Section 2 of the boiler manual. 2) Check float low water cutoff as described above. 3) Check low draft, fan,air pressure and damper position interlocks as specified in burner manual. 4) Check high and low gas pressure interlocks. Refer to manufacturer's instructions for correct procedure. 5) Chek high and low oil pressure interlocks. Refer to manufacturer's instructions for correct procedure.	no recommended quarterly PM items	Annually: 1) Perform leakage on pilot and main gas valves as specified in manufacturer's instructions. 2) Check operating control, high limit, low fire start control, and low water cutoff as specified in manufacturer's instruction. 3) check air atomizing interlock, fule valveintelock switch, purge switch, burner positioninterlock, and fule changeover control, as specified in burner manual.	operations personnel	on site	Refer to operation manual for proper replacement parts.

TABLE 2
MALFUNCTION ABATEMENT AND EQUIPMENT MONITORING PROGRAM
Red Leaf RNG, LLC

Emission Unit	Control Equipment	Operating Variables Monitored	Normal Operating Range	Method of Monitoring	Frequency of Monitoring	Personnel Responsible	Corrective Procedure or Operational Change in the Event of Equipment Malfunction or Failure
EUFLARE	Flare (includes flow and termperature) Hobre Gas Analyser	Flow Rate Temperature Hydrogen Sulfide	0> and ≤571 SCFM Presence of a pilot light ≤7,000 ppm H2S	Human Machine Interface and visual monitoring	Daily	Operators	Flare: Reference Perennial Flare Troublshooting and Alarm Shutdown Procedure Hobre: Reference Hobre manufacturer guidance if equipment malfuncitons, take daily H2S readings manually until repaired. Step 2) If a Malufunction occurs that isn't listed in the above manual's then the operator will evaluate the malufuncation and contact the manufacturer to help identify the corrective action.
EUGCU	Thermal Oxidizer (includes flow and termperature) Hobre Gas Analyser	Flow Rate Temperature Hydrogen Sulfide	0> and ≤278 SCFM ≥1400 F Combusion Chamber ≤18,000 ppm H2S	Human Machine Interface and visual monitoring	Daily	Operators	TOX: Reference Perennial Thermal Oxidizer Troublshooting and Alarm Shutdown Procedure Hobre: Reference Hobre manufacturer guidance if equipment malfuncitons, take daily H2S readings manually until repaired. Step 2: If a Malufunction occurs that isn't listed in the above manual's then the operator will evaluate the malufuncation and contact the manufacturer to help identify the corrective action.
EUBOILER	A 5.5 MMBtu/hr natural gas or propane-fired boiler for heating the digester	Temperature Flow	98 F≥ and ≤140 F 430 gpm≥ and ≤440gpm	Human Machine Interface and visual monitoring	Daily	Operators	Step 1: Reference Section 5.7 (Trouble Shooting) of Bryan Boilers Operation Manual Step 2: If a Malufunction occurs that isn't listed in the above manual's then the operator will evaluate the malufuncation and contact the manufacturer to help identify the corrective action.

Red Leaf RNG Nuisance Minimization Plan

Form AI-006

June 2024 ROP Application

Nuisance Minimization Plan

Red Leaf RNG, LLC (P1268)

113 North Lee Road
Saranac, MI 48881

This Nuisance Minimization Plan (NMP) has been developed as required under Special Conditions III.2, EUGCU and III.2, EUFLARE of Permit to Install No. 89-22 (PTI), and in accordance with the plan contents specified in Appendix A of the PTI.

1 Introduction

On July 5, 2022, the Michigan Department of Environment, Great Lakes and Energy, Air Quality Division (AQD) issued the PTI to Red Leaf RNG, LLC (Red Leaf RNG) covering the installation and operation of a new biomethane recovery and pipeline quality renewable natural gas facility in Saranac, Michigan. The facility, which is currently under construction, is located on land leased from the Maple Row Dairy.

Once operation commences, cow manure will be transferred from the dairy farm to an anaerobic digester, where it will be broken down in an oxygen-free environment. The generated biogas will be a mixture of methane, carbon dioxide (CO_2), and small amounts of other gases including hydrogen sulfide (H_2S). A gas upgrading plant will process the raw biogas generated in the anaerobic digesters to create pipeline quality renewable natural gas (RNG). The RNG is then compressed and injected into a natural gas pipeline.

Tail gases from the gas upgrading plant will be controlled with a thermal oxidizer as the primary control device. A backup flare will combust off-specification gas during start-up, shutdown, and malfunction events. The backup flare will also serve to combust raw biogas when the gas upgrading plant is not in operation.

The RNG facility is located in a rural portion of Ionia County. There are only a few residences (and no commercial establishments) within one mile and no residences within 1,000 feet of the RNG facility.

2 Potential Sources of Odorous Emissions and Related Equipment

There are a limited number of points along the process where potential odor-containing emissions may be released to the ambient air. These potential sources of odor can be broken into the following categories:

1. **Anaerobic Digester** – The anaerobic digester is designed to not emit to the ambient air during normal operating conditions. The digester is equipped with pressure relief valves (PRVs) designed to protect the integrity of the digester and to minimize emissions during an overpressure condition. Hydrogen sulfide levels in the digester may range from 2,000 to 7,000 ppm. If the gas upgrading plant is off-line, as well as during start-up, shutdown, and malfunction events, the backup flare is designed to achieve at least 98 percent control of the methane in the

biogas stream and will convert nearly 100 percent of the H_2S in the biogas stream to sulfur dioxide (SO_2).

2. **Gas Upgrading Plant** – Tail gases generated in the gas upgrading plant will be vented to the thermal oxidizer that is designed to achieve at least 99 percent control of the methane in the tail gas stream and will convert nearly 100 percent of the H_2S in the tail gas stream to SO_2. Odor potential from the gas upgrading plant is limited to fugitive emissions due to leaking components.
3. **Pipeline Injection** – Odor potential from the transfer of RNG from the gas upgrading plant to the on-site pipeline injection point is limited to fugitive emissions due to leaking components.

3 Maintenance Schedule

Preventative maintenance of potential odor-generating equipment will be conducted in accordance with a Preventative Maintenance/Malfunction Abatement Plan (PM/MAP) that will be submitted to the AQD within 90 days of the completion of installation of the RNG facility. The PM/MAP will include key personnel, a schedule for inspections and maintenances, corrective actions should a malfunction occur.

4 Best Management Practices/Housekeeping Measures

Red Leaf RNG will implement best management practices and housekeeping measures designed to minimize odor potential or duration at the RNG facility. Because the RNG upgrading operation has already been designed to minimize odor potential, and redundant H_2S control (flare to back up the thermal oxidizer), these best management practices focus on preventative maintenance and operator training to minimize the potential for odors. Operators will perform regular inspections and perform preventative maintenance on the systems. Operator training for the digester, flare, and thermal oxidizer will follow procedures recommended by the equipment manufacturers.

Odor potential during the startup or shutdown of the gas upgrading plant is minimized because the biogas will always be vented to a control device. Startup of the digester is expected to occur no more than once every five years. Any biogas generated during startup of the digester will be controlled by the flare until a sufficient quantity of biogas is generated to operate the gas upgrading plant.

5 Odor Incident Notification/Investigation/Response

If an odor complaint is received at the RNG facility, the facility manager will immediately report it to the Red Leaf RNG environmental manager:

Mr. Christopher Anglin
Director of Safety and Environmental Permitting
canglin@novillarng.com
(734) 915-2384

Mr. Anglin (or his designated agent) will be responsible for investigating the complaint and for implementing any necessary corrective actions. The following information will be recorded and maintained for two years from the date of the complaint:

- Date/time of the complaint.

- Location that the odor was detected.
- Duration of the odor.
- Weather conditions (e.g., wind direction/speed, precipitation) during the complaint period.
- Plant operations during the complaint period, including whether any equipment malfunctions occurred.
- Corrective actions implemented (if the complaint is due to on-site operations).