



Technology/Service:	Biogas Upgrading	
Information by: (14.a)	Adam Sandstrom	Date: 8/2/22

COMPANY INFORMATION

Company:	Clarke Energy		
Phone:	2624901796	Web Site:	https://www.clarke-energy.com/us/usa/
Address:	2100 Pewaukee Rd	City:	Waukesha
State:	WI	Zip Code:	53188

TECHNICAL CONTACT (14.a)

DEMONSTRATION SITE CONTACT (15.a)

Name:	Alan Howard	Site Name:	
Phone:	2625655020	Contact:	
Email:	Alan.howard@clarke-energy.com	Title:	
Address:	2100 Pewaukee Rd	Phone:	
City:	Waukesha	Email:	
State:	WI	Address:	
Zip Code:	53188	City:	
		State:	
		Zip Code:	

INITIAL TECHNOLOGY OVERVIEW

This information is to guide in the development of a more specific and detailed Technology Information Request. Please answer the following questions for each Technology or Service Provided.

What is the name of the technology or service you provide?

Biogas Upgrading facilities

Please provide a brief (1-2 sentence) description and a full description of this technology.

Attach pages or separate document if necessary.

Summary: (1.a) Biogas Upgrading

Full description: (1.b) Biogas upgrading is the process of the separation of methane from the carbon dioxide and other gases from biogas. The concentrated biogas – close to 100% methane is called ‘renewable natural gas’ (RNG) or ‘biomethane’. This gas can be used as a vehicle fuel or injected into the gas distribution network. Biogas upgrading technology can be applied to anaerobic digesters, wastewater treatment facilities and landfill sites. Biogas upgrading can be used as a substitute technology to gas engines or can be used in parallel where power and heat are required on site.

Please explain how this technology will improve water quality and/or air quality by one or more of the following: (2.a)

- i. Reducing the nutrient content, organic strength, and/or pathogen levels of manure and agricultural waste.
- ii. Reducing odors and gaseous emissions
- iii. Facilitating desirable waste handling and storage
- iv. Producing value added byproducts that facilitate manure and waste utilization.

Reducing carbon emissions through the use of renewable natural gas fuel.

Do you have a preferred region or area for the location of projects?

Anywhere

Location of farm(s)?

Anywhere

What's the smallest and largest farm using this system?

n/a

Input and output of this unit/system – do you have a mass balance analysis? (3.a)

If a mass balance is available, please include below or attach as a separate document.

n/a

Input material description and characteristics: (4.a)

For example: raw manure, digestate, screened digestate, suitable non-farm feedstocks, other.

Biogas from anaerobic digesters

Please provide the expected performance of this technology related to the following: (5.a)

- i. Changes in form or handling characteristics
- ii. Nutrient fate or end use projections
- iii. Macro-nutrient reductions or transformations
- iv. Pathogen reductions or elimination
- v. Air emissions (including gaseous ammonia, hydrogen sulfide, and volatile organic compounds)

Cleaned Biomethane for fuel use in CHP engines.

Do you consider this a mature system or ongoing farm development?

n/a

Any weather constraints? Yes No *If so, please describe.*

No

Any bedding constraints? Yes No *If so, please describe.*

No

Output material description and characteristics:

Please include the % of the total stream for each material, i.e. 10% fiber and 90% screened liquid by weight.

Cleaned/upgraded biomethane 99%

Do the outputs of the process have a resale market identified? Yes No

If so, under what brand name or who is the contract with?

Can be reintroduced to the natural gas distribution network.

Please provide any alternative uses for the byproducts produced by this technology. (11.a)

CHP engine fuel or carbon reduction credits.

Is this process scalable and to what extent (top and bottom limits)? Yes No *If so, please describe.*

Does this technology require any air input? Yes No

What is the preferred air connection? *For example: psi, fitting size, air quality.*

If not distributed by the system, please list each connected device.

Does this technology require any water input? Yes No *If so, please describe.*

What is the preferred water connection? *For example: psi, fitting size, water quality, gpm.*

If not distributed by the system, please list each connected device.

Does this technology require any electrical input? Yes No *If so, please describe.*

What is the preferred electrical connection? *For example: phase #, voltage, full load amps.*

If not distributed by the system, please list each connected device.

Does this technology require any mechanical input? Yes No *If so, please describe.*

What is the preferred mechanical connection? *For example: horsepower, connection, rpms.*

If not distributed by the system, please list each connected device.

Does this system require any special plumbing? Yes No *If so, please describe what is required.*

Does this system require any special foundations or pads? Yes No *If so, please describe.*

Do you consider this technology part of a larger system that you provide? Yes No *If so, please describe.*

Does this system require any other components that you do not provide or are not included in this proposal? Yes No
If so, please describe.

How is the system delivered to the site? *For example: skid mounted, assembled on site, constructed on site.*

Assembled on site

Is this system portable or configured in such a way that it could be easily transported for use in several locations?

Yes No *If so, please describe.*

Does this technology negatively impact another critical area or have other regulated characteristics (i.e. emissions, sound, odor)?
If so, what are these impacts and what mitigation measures have been if required by state or local agencies?
If so, please describe the recommended means of mitigating these impacts.

no

What spare parts and redundant components are included with the system?

All spare parts and maintenance included

What equipment, time and resources are required for monitoring this technology and what equipment is included for monitoring this technology? (6.a)

All equipment included.

What equipment, time and resources are required to control this technology and what equipment is included for controlling this technology? (6.b)

All equipment included.

What is the usable life of the system?

Unlimited

What is the salvage value at the end of the usable life?

n/a

What is the educational and technical level of competence for the operation of the system?

minimal

What level of maintenance is required for the system? (7.a)

Please indicate if rebuilds or major components must be replaced and what the frequency is for these components.

All maintenance included

Are consumables used in the process? Yes No

Please provide the nature and purchase relationship for these consumables. For example: proprietary, special contract, generally available.

Which of these NRCS codes would this technology be classified under? Check all that apply. Add if necessary.

CODE	NRCS DESCRIPTION	CHECK ALL THAT APPLY
472	Access Control	<input type="checkbox"/>
560	Access Road	<input type="checkbox"/>
309	Agrichemical Handling	<input type="checkbox"/>
371	Air Filtration and Scrubbing	<input type="checkbox"/>
591	Amendments for the Treatment of Agricultural Waste	<input type="checkbox"/>
366	Anaerobic Digester	<input checked="" type="checkbox"/>
672	Building Envelope Improvement	<input type="checkbox"/>
372	Combustion System Improvement	<input type="checkbox"/>
317	Composting Facility	<input type="checkbox"/>
554	Drainage Water Management	<input type="checkbox"/>
375	Dust Control from Animal Activity on Open Lot Surfaces	<input type="checkbox"/>
373	Dust Control on Unpaved Roads and Surfaces	<input type="checkbox"/>
374	Farmstead Energy Improvement	<input type="checkbox"/>
512	Forage and Biomass Planting	<input type="checkbox"/>
561	Heavy Use Area Protection	<input type="checkbox"/>
516	Livestock Pipeline	<input type="checkbox"/>
590	Nutrient Management	<input type="checkbox"/>
521A	Pond Sealing or Lining, Flexible Membrane	<input type="checkbox"/>
533	Pumping Plant	<input type="checkbox"/>
588	Roof Runoff Structure	<input type="checkbox"/>
367	Roofs and Covers	<input type="checkbox"/>
318	Short-Term Storage of Animal Waste and By-Products	<input type="checkbox"/>
570	Stormwater Runoff Control	<input type="checkbox"/>
606	Subsurface Drain	<input type="checkbox"/>
635	Vegetated Treatment Area	<input type="checkbox"/>
601	Vegetative Barrier	<input type="checkbox"/>
360	Waste Facility Closure	<input type="checkbox"/>
632	Waste Separation Facility	<input checked="" type="checkbox"/>
313	Waste Storage Facility	<input checked="" type="checkbox"/>
634	Waste Transfer	<input type="checkbox"/>
629	Waste Treatment	<input type="checkbox"/>
359	Waste Treatment Lagoon	<input type="checkbox"/>
		<input type="checkbox"/>
		<input type="checkbox"/>

Please provide an estimated installed capital cost for this technology and indicate the model, cow number or volume that this cost applies to. (8.a)

Please include all components and designate if provided by you or others.

Wide range

Please provide an estimated annual operation cost for this technology and indicate the model, cow number or volume that this cost applies to. (8.b)

Please include all costs and designate if provided by you or others.

Wide range

Is there financing available for this system? Yes No *If so, what are the conditions for this financing?*

Is the system available for lease? Yes No *If so, please describe.*

What sort of warranty or guarantee do you provide with this technology? (9.a)

Do you provide any performance guarantees or strictly defects in parts and materials?

We guarantee and maintain all our equipment.

Explain how this system is unique or transformative and how does it improve upon or go beyond other technologies that are currently available.

Currently the most advance biogas upgrading technology on the market.

Please provide the recommended record keeping procedures for end users of this technology. (10.a)

n/a

NRCS considers it the responsibility of the technology provider to furnish information from a university or other independent research entity to document the effectiveness of the technology to achieve its intended purpose in order to be funded through its programs. This information must provide independent, verifiable data demonstrating results of the use of the facility, technology or process in other similar situations and locations and, if available, document the effectiveness of the technology under different climatic factors. Documentation from peer reviewed journals is preferable. Where use of a waste treatment facility or process to improve one resource concern negatively impacts another, impacts and mitigation measures, if required by state or local agencies, are to be documented.

Can you provide independent, verifiable data demonstrating results for the use of this technology in other similar situations and locations? Would you be willing to provide this data in order to qualify for NRCS funding? (12.a)

Yes

If information is provided related to the previous question, please provide the credentials of the individual collecting the data and analyzing the results along with disclosure of potential conflicts of interest. (13.a)

Newtrient has developed a third-party evaluation protocol that can be used in conjunction with a local university or state extension agency to evaluate technologies in a way that will meet the NRCS requirements. Please contact mstoerm@newtrient.com if you are interested in contracting for this service.

TECHNOLOGY REFERENCES

Please provide customers with whom we can discuss this technology and its performance. (15.a)

Include a company name, location, contact name and contact information.

Reference 1

Company Name:	Clarke Energy
Company Location:	Global
Contact Name:	Adam Sandstrom
Contact Information:	Adam.sandstrom@clarke-energy.com

Reference 2

Company Name:	
Company Location:	
Contact Name:	
Contact Information:	

Reference 3

Company Name:	
Company Location:	
Contact Name:	
Contact Information:	

Reference 4

Company Name:	
Company Location:	
Contact Name:	
Contact Information:	

Are there any other facts about this technology that you feel should be included in this document?

The questions above have been adapted to attempt to glean as much information as possible in order to help Newtrient develop technology documentation that will meet the standards of what is required in a review package for technology to be approved under NRCS Practice Standard 629 (CPS 629 - Waste Treatment) **Note the definition of Waste Treatment is “The use of unique or innovative mechanical, chemical or biological technologies that change the characteristics of manure and agricultural waste”.**

NRCS documentation specifies that the review package shall contain the following 15 items (in black) and from these Newtrient has developed the questions in this document (in red):

1. A description of the technology. If lengthy, this may be placed in an appendix.
 - a. Please provide a brief (1-2 sentence) description of this technology.
 - b. Please provide a full description of this technology. (Attach pages if necessary)
2. An explanation of how this technology will accomplish one or more of the purposes of the standard.
 - a. Please explain how this technology will improve water quality and/or air quality by one or more of the following:
 - i. Reducing the nutrient content, organic strength, and/or pathogen levels of manure and agricultural waste.
 - ii. Reducing odors and gaseous emissions
 - iii. Facilitating desirable waste handling and storage
 - iv. Producing value added byproducts that facilitate manure and waste utilization.
3. The range of volumetric and mass flow rate capacities and hydraulic retention times of the waste streams including the influent, effluent, and recycle streams.
 - a. Please provide a detailed mass balance that demonstrates the range of volumetric and mass flow rate capacities and hydraulic retention times of the waste streams including the influent, effluent, and recycle streams for this technology by model number or as related to a specific flow or number of animals (i.e. 1,000 cows per day or 100,000 gallons per day).
4. The characteristics of the influent waste stream important to the waste treatment or process.
 - a. Are there any characteristics of the influent waste stream important to the proper operation of this technology?
5. Expected system performance related to changes in form, nutrient fate projections, macro-nutrient reductions, pathogen reductions and air emissions including gaseous ammonia, hydrogen sulfide, and volatile organic compounds.
 - a. Please provide the expected performance of this technology related to the following:
 - i. Changes in form or handling characteristics
 - ii. Nutrient fate or end use projections
 - iii. Macro-nutrient reductions or transformations
 - iv. Pathogen reductions or elimination
 - v. Air emissions (including gaseous ammonia, hydrogen sulfide, and volatile organic compounds)
6. Process monitoring and control system requirements.
 - a. What equipment, time and resources are required for monitoring this technology and what equipment is included for monitoring this technology?
 - b. What equipment, time and resources are required to control this technology and what equipment is included for controlling this technology?
7. A typical operation and maintenance plan that includes performance monitoring requirements and a replacement schedule for components that do not have a minimum life span of ten or more years.
 - a. Please provide a typical operation and maintenance plan that includes performance monitoring requirements and a replacement schedule for components that do not have a minimum life span of ten or more years.
8. Estimated installation and annual operation cost.
 - a. Please provide an estimated installed capital cost for this technology and indicate the model, cow number or volume that this cost applies to.
 - b. Please provide an estimated annual operation cost for this technology and indicate the model, cow number or volume that this cost applies to.
9. An example of a warranty on all construction or applied processes not covered by other NRCS Conservation Practice Standards.

- a. Please provide an example of a warranty on all construction or applied processes included with this technology.
- 10. Recommended record keeping procedures for end users.
 - a. Please provide the recommended record keeping procedures for end users of this technology.
- 11. Alternatives for the use of the byproducts produced by the system.
 - a. Please provide the alternative uses for the byproducts produced by this technology.

It is the responsibility of the technology provider to furnish information from a university or other independent research entity to document the effectiveness of the technology to achieve its intended purpose. Provide independent, verifiable data demonstrating results of the use of the facility or process in other similar situations and locations. If available document the effectiveness of the technology under different climatic factors. Documentation from peer reviewed journals is preferable. Where use of a waste treatment facility or process to improve one resource concern negatively impacts another, impacts and mitigation measures, if required by state or local agencies, are to be documented.

- 12. Independent, verifiable data demonstrating results for the use of the facility or process in other similar situations and locations.
 - a. Can you provide independent, verifiable data demonstrating results for the use of this technology in other similar situations and locations? Would you be willing to provide this data in order to qualify for NRCS funding?
- 13. The credentials of the individual collecting the data and analyzing the results along with disclosure of potential conflicts of interest.
 - a. If information is provided related to the previous question, please provide the credentials of the individual collecting the data and analyzing the results along with disclosure of potential conflicts of interest.
- 14. Contact information for the technology provider.
 - a. Please provide a technical contact and a business contact to answer questions regarding the information provided for this technology.
- 15. Contact information for individuals that have implemented this technology at the farm scale.
 - a. Please provide contact information for individuals that have implemented this technology at the farm scale.