



*GREATER DUBUQUE
DEVELOPMENT*

Growing Sustainable Communities

October 2, 2018



Environmental Strategy

- Eliminate fugitive emissions via capturing and flaring.
- Create early beneficial use opportunities through reuse of “brown gas” for electricity/heat.
- Convert excess biogas to value-added environmental and economic products.
- Maximize those values through local utilization as renewal energy and fuels.

Economic Strategy

- Must create additional positive environmental outcome.
- Must generate revenue or demonstrable cost reductions.
- Must create opportunity for additional economic development and growth in the region.
- Must not require additional direct investment or risk from the City.



Renewable Natural Gas:

Waste-to-Energy Opportunities

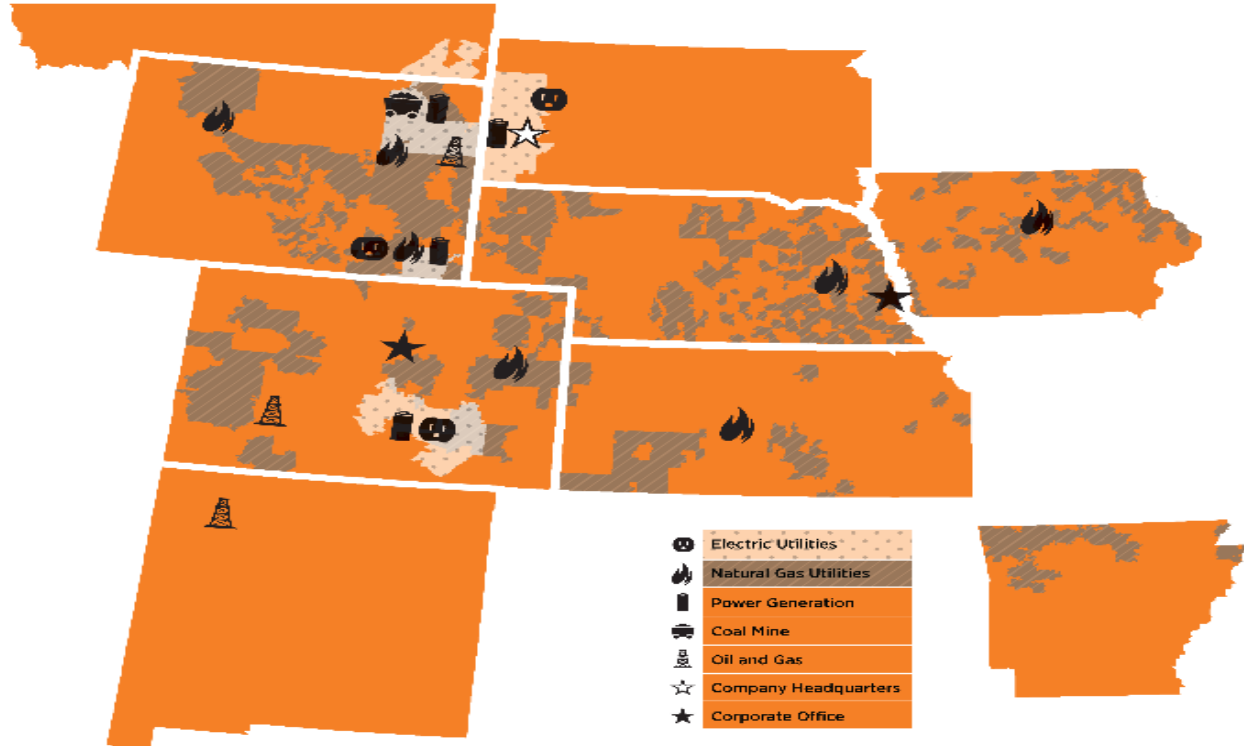


Black Hills Corporation

Based in Rapid City, SD, we serve more than 1.2 million electric and natural gas utility customers in Arkansas, Colorado, Iowa, Kansas, Montana, Nebraska, South Dakota and Wyoming.

The company also generates wholesale electricity and produces natural gas, crude oil and coal.

Our employees partner to produce results that are *“improving life with energy”*.



What is Biogas/Landfill Gas?

Mixture of different gases produced by an **anaerobic process** (breakdown of organic matter in the absence of oxygen)

Organic materials are the “feedstock” and include animal manure, food scraps, agricultural residues, sewage, or solid (landfill) waste

Produced by either:

1. Anaerobic **digestion** with anaerobic bacteria in a closed system, or
2. Breakdown of wet, biodegradable waste inside a **landfill** due to chemical reactions and/or microbes (cover mechanically compresses waste and prevents exposure to oxygen)

Primarily **methane** (40-60%) and **carbon dioxide** (40-50%), with small amounts of oxygen, nitrogen, hydrogen sulfide, and non-methane organic compounds

Renewable energy source for direct use, generating electricity, alternative vehicle fuel or injection into natural gas pipelines

Renewable Natural Gas (RNG)

Raw biogas or landfill gas is processed or purified to **remove contaminants** (primarily carbon dioxide and hydrogen sulfide)

Following purification, RNG contains > **90% methane** and **~950 Btu**

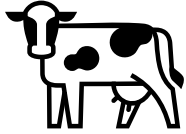
RNG is **comparable** to traditional natural gas

- Stringent specifications and testing insure **quality**

Why is RNG important?

- “**Greens**” the natural gas grid (decarbonization)
- Furthers environmental initiatives and mandates – methane is **21x** more powerful as **greenhouse gas** than carbon dioxide
- Enables continued natural gas usage (and petroleum displacement) in **transportation**

Sources of organics to produce RNG



Agricultural Waste

8,000

large farms and dairies



Food Waste

66.5 million

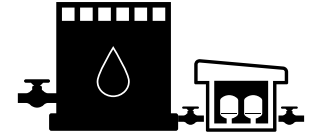
tons per year



Landfill Gas

1,750

landfills



Waste Water

17,000

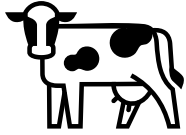
facilities

Why is RNG valuable?

- **Renewable Fuel Standard (RFS)** requires blending of renewable fuels with nation's motor vehicle fuel supply
 - **Renewable Identification Numbers (RINs)** are “proof of compliance” for Obligated Parties
 - RINs are the **economic driver** of most biogas projects
 - RINs can be **much more valuable** than the gas commodity itself
- EPA views all North American gas pipelines as “**one**” **big pipeline** (mass balance)
- California Low Carbon Fuel Standards (LCFS) have created an **additional market**

Imagine....

For the next 15 minutes you are all producers of biogas



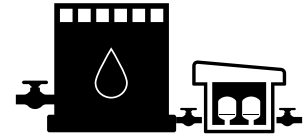
Dairy owner/operator



Landfill diverted food/green waste project developer



Landfill owner/operator



Wastewater Treatment Plant owner/operator



These producers all have one thing in common: They want to produce RNG and inject it into a common carrier pipeline



Opportunities

There are 645 landfills nationally with operational waste to energy projects but < 40 currently produce RNG

Increasing amount of organic waste:

- Americans dump 450 million tons of municipal solid waste into landfills every year
- ~50% U.S. food production is uneaten each year

Potential state & local bans of organic waste from landfills

Potential state renewable gas standards

RINs & LCFS

- Value to refiners and importers on secondary market

Environmental initiatives and mandates

Good community partner

- Utilizing a “waste” sourced energy

Challenges / Lessons Learned

Displaces natural gas load

Connecting to existing gas distribution systems

- Costs
- LP or HP
- Line pack

Gas quality concerns & responsibilities – LDC and customers

Credit security – RIN & LCFS markets dependent upon:

- Renewable Fuel Standards (RFS)
- CNG/LNG being dispensed into the transportation sector

Allowing for future growth

Will happen whether you're involved or not

- Utility often the “missing link”

Slow to develop

Public concern

- Odors

Dubuque Iowa WRRC Project

City of Dubuque's Water Resource Recovery Center (WRRC)

Partnership between:

- **City of Dubuque**
owns WRRC and will receive revenue from sale of biogas
- **BioResources Development**
will process raw biogas and create ~200 Mcf/day of pipeline quality RNG
- **Black Hills Energy**
will quality test, then inject the RNG into our distribution system
- **N1 Energy**
will market RINs

In-service as of February 28, 2018

Dubuque Iowa WRRC Project



Dubuque, IA WRRC Project





Dubuque Metropolitan Area
DMA SWA
Solid Waste Agency



Improving life with energy

- 1. There will likely be two “models” to choose from:
 - *Horizontal (plug and play, lower risk lower return)*
 - *Vertical (multiple collaborative efforts to enhance local outcomes, higher risk higher return)*
- 2. Cost reduction opportunities will be available, but will look different.
- 3. Unless landfill/agency owns its vehicle fleet, it will normally have less “self-use” capacity than water treatment plants. Pursuing higher levels of “local utilization” will require different partners..

Key RNG questions for BHE

Location:

- Is the project within our service territory or a state where we operate a gas utility?
- How far from our gas distribution system?
- Any interstate pipelines in the area?
- Is there three phase power available at your site?

Production:

- What is your estimated volume of RNG today? In the future?
 - Does BHE have capacity to handle this volume?
- Do you want BHE to purchase the entire “green gas” package, just the “brown gas” molecules, or will it all be handled by your marketer/third party?

Timeframe:

- Where are you in your process?
- What is your in-service target date?

Financial:

- Who are your partners?
- Will you be able to provide credit security (i.e. Letter of Credit, etc.)?

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**“WE DON'T INHERIT
THE EARTH FROM
OUR ANCESTORS,
WE BORROW IT FROM
OUR CHILDREN.”**

- NATIVE AMERICAN PROVERB

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Thank you!

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