Biogas & Renewable Natural Gas (RNG)

Alex Kirschling
Natural Gas Engineering Supervisor
Public Service Commission of Wisconsin
Biogas vs. RNG

Biogas – a renewable energy source produced from the breakdown of organic matter such as food or animal waste (45-65% methane)

Renewable Natural Gas (RNG) – Biogas that has been upgraded to “pipeline quality” natural gas (>95% methane)
Biogas/RNG Process

Waste Types Used to Make RNG

- Municipal Solid Waste
- Sewage Sludge
- Yard and Crop Wastes
- Food and Food Processing Wastes
- Manure

Biogas made from organic sources through anaerobic processes contains 45–65% methane.

Biogas is treated to remove moisture, particulates, contaminants and other gases (CO₂, O₂, N₂, and VOCs); this increases the methane content to 90% or greater—typically 96–98% for pipeline injection.

The resulting product is renewable natural gas (RNG).

https://www.epa.gov/lmop/renewable-natural-gas
Biogas/RNG Process

Landfill Gas Treatment Stages

**PRIMARY TREATMENT**
- Knockout Pot
- Filter
- Blower
- Flare

**SECONDARY TREATMENT**
- Moisture Removal
- Siloxane/Sulfur Removal
- Compressor

**ADVANCED TREATMENT**
- Flare/Thermal Oxidizer for Waste/Tail Gas
- Removal of CO₂, O₂, N₂, and VOCs

End Uses

**Biogas**
- Heating
- Electricity

**RNG**
- Other Industrial Uses

Anaerobic Digestion Products, Biogas Treatment, and End Uses

**Biogas**
- Moisture Removal
- Siloxane/Sulfur Removal

**RNG**
- Fertilizer
- Soil Amendment
- Animal Bedding
- Other Innovative Uses

Other Industrial Uses

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Biogas/RNG Process

RNG Delivery Options

- Local Use
- Pipeline Injection

RNG End Uses

- Vehicle Fuel
- Electricity
- Thermal Applications

https://www.epa.gov/lmop/renewable-natural-gas
Digesters

https://www.orix.co.jp/grp/en/orix_in_action/entry/2022/08/08/153000
Landfills
“Virtual” pipelines
RNG in Wisconsin

- **1980s, 90s, & 00s** – Biogas pipelines from landfills to nearby end users for electric/heat generation
- **2010s** – RNG injection into interstate pipelines
  - Federal Renewable Fuel Standard (RFS)
  - California Low Carbon Fuel Standard (LCFS)
- **2020s** – RNG injection into distribution pipelines
  - Four distribution companies in Wisconsin have modified tariff to allow RNG into pipelines
How does Biogas/RNG affect my state?

- Siting
- Gas quality
- Pipeline safety
Biogas/RNG - Siting

- Most biogas/RNG pipelines are intrastate, meaning that siting falls with the states.
- Siting requirements vary by state.
  - In Wisconsin, the PSC only has siting authority over “public utilities”.
  - Most RNG pipeline operators do not meet “public utility” definition.
  - Utilities in Wisconsin require tariff change to accept RNG into distribution system.
- Many still subject to pipeline safety regulations during construction & operation (more in a few slides).
Biogas/RNG – Gas quality

- Quality requirements differ by state/operator
- Certain constituents in gas need continuous monitoring (O2, H2S, CO2)
- Other important constituents to monitor such as Siloxanes
- 950-990 BTU
  - May vary from traditional natural gas supplies (commonly 1050 BTU and have seen as high as 1100 in recent years)
- Consider some redundancy for quality monitoring
Biogas/RNG – Pipeline safety

- Most biogas/RNG pipelines are GATHERING pipelines, with a couple exceptions
- What does this mean?
  - Limited jurisdiction
    - Some pipelines do not have to follow pipeline safety regulations at all
  - Less safety requirements apply to some pipelines
    - Odorization not required
    - Emergency procedures not required
    - Operator qualification not required
    - Integrity management program not required
RNG gathering pipeline
Biogas/RNG pipeline issues

- Often discover pipelines after/during construction
- Issues with wrong pipe/inadequate construction
  - Added state rule in WI requiring construction standards filed with PSC
- Some have not been members of the state one-call
Other resources

General Information and Reports

- Introducing Renewable Biogas into the Natural Gas Delivery Infrastructure
- Renewable Natural Gas (RNG)
- An Overview of Renewable Natural Gas From Biogas

RNG Project Lists and Maps

- RNG Project Map
- Renewable Natural Gas Database | Argonne National Laboratory (anl.gov)
- Livestock Anaerobic Digester Database
- RNG Facilities in North America

Gas Quality

- Guidance Document for the Introduction of LandfillDerived Renewable Gas into Natural Gas Pipelines
- Guidance Document for Introduction of Dairy Waste Biomethane
- Major Transmission Pipeline Tariffs
- Renewable Natural Gas Quality Specifications in North America
- Interconnect Guide for Renewable Natural Gas (RNG) in New York State
- Assessing Heating Value and Maximum Siloxane Specifications
Questions?