RNG Interconnect Guideline for New York

A Process for “Getting to Yes”

Presented by Dan Dessanti/Bob Wilson
NGA Fall Operations Conference
October 18, 2019
About NGA

- Non-profit trade association
- Local gas utilities (LDCs) serving New England, New York, New Jersey and Pennsylvania
- Several interstate pipeline companies
- LNG importers and LNG trucking companies
- Over 380 “associate member” companies, from industry suppliers and contractors to electric grid operators
- www.northeastgas.org
NGA Function Areas

Education & Training

RD&D

Advocacy
RNG Guide Sponsors and Participants

- **Sponsors**
  - Central Hudson
  - Con Edison
  - National Fuel
  - National Grid
  - NYSEG/RGE
  - Orange and Rockland

- **Project Manager**
  - NGA

- **Consultant**
  - GTI
Can We *Reasonably & Rationally* Meet The Challenges of The Second “Great Conversion”

- Supply Mix Is Changing........
- Renewable Gas is a *reality and an important part of the nations supply future*
- Clean-up Technology has evolved
Guideline Development Process

- Kickoff Discussion – 09/29/2016
- Draft Guide Review – NYS Utilities 04/10/2017
- Final Guide Review & Revision – 09/22/2017
- Discussion with NYSDPS, NYSERDA – 01/24/2018
- Peer Review with RNC & ABC – 06/2018 - 6/2019
- Final Document – September 16, 2019
RNG is already accepted and used in New York and in the US.

For example, introduction of RNG directly into a gas distribution system has been successfully practiced for over 30 years from the Staten Island, NY landfill 4–7 MMSCF/Day recovered and processed followed by direct injection into the local distribution system.

Project developers are in discussion with gas distributors throughout NE and the northeast but the processes, requirements, and agreements are not uniform, resulting in commercial and technical uncertainty for both parties.

A consistent approach will bring certainty for all parties involved in negotiations with regard to safety, reliability, continuity, and interchangeability.
What, Why How Approach

- What are LDC concerns?
- Why are LDC’s concerned?
- How can we address these concerns?
The What?

- HHV/SG
- Total Inerts
- Moisture
- Oxygen
- Sulfur Compounds / Total Sulfur
- Trace Constituents
- Supply Reliability
The Why?

- **HHV/SG** – Interchangeability, Therm Billing
- **Total Inerts** – Interchangeability, Integrity
- **Moisture** – System Integrity
- **Oxygen** – System Integrity, Interchangeability
- **Sulfur Compounds** – System Integrity, Safety
- **Trace Constituents** – End Use, Safety
- **Supply Reliability** – gas system supply balancing
Constituents of Concern Summary

- Potential COCs that may be found in raw gas from specific feedstocks for RNG production – focus analysis on reasonable COC’s

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Landfill</th>
<th>Agricultural and Clean Organics</th>
<th>WWTP</th>
<th>Source / Facility Separated Organics</th>
<th>Gasifier Syngas</th>
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<tbody>
<tr>
<td>Water Content</td>
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<td>Sulfur, including Hydrogen Sulfide</td>
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<td>Hydrogen</td>
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<td>Carbon dioxide</td>
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<td>Nitrogen</td>
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<td>Oxygen</td>
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<td>Ammonia</td>
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<td>Biologicals</td>
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<td>Mercury</td>
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<td>Volatile metals</td>
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<td>Siloxanes</td>
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<td>Volatile Organic Compounds</td>
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<tr>
<td>Semi-volatile Organic Compounds</td>
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<tr>
<td>Halocarbons</td>
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<td>Aldehydes and Ketones</td>
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<tr>
<td>Polychlorinated biphenyls (PCBs)(1)</td>
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<tr>
<td>Pesticides (1)</td>
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</tbody>
</table>

(1) Unless reasonably suspected
<table>
<thead>
<tr>
<th>Parameter</th>
<th>AGA 4A Reported Range</th>
<th>Range Found in Upgraded Landfill-Derived RNG</th>
<th>Range Found in Upgraded Dairy-Derived RNG</th>
<th>Range Found in Upgraded WWTP-Derived RNG</th>
<th>Range Found in Natural Gas Samples</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Total Sulfur</strong> gr. per 100 SCF</td>
<td>max 0.5 to 20</td>
<td>BDL (0.003) to 0.32</td>
<td>BDL (0.003) to 0.31</td>
<td>BDL (0.003) to 0.01</td>
<td>BDL (0.003) to 1.1</td>
</tr>
<tr>
<td><strong>Hydrogen Sulfide</strong> gr per 100</td>
<td>maxi 0.25 to 1</td>
<td>BDL (0.003) to 0.03</td>
<td>BDL (0.003)</td>
<td>BDL (0.003) to 0.01</td>
<td>BDL (0.003) to 0.36</td>
</tr>
<tr>
<td><strong>Hydrogen (vol%)</strong></td>
<td>max. 0.04 to 0.1</td>
<td>BDL (0.1) to 1.0</td>
<td>BDL (0.1)</td>
<td>BDL (0.1)</td>
<td>BDL (0.1) to 0.3</td>
</tr>
<tr>
<td><strong>Carbon dioxide (vol%)</strong></td>
<td>maximum 1 to 3</td>
<td>BDL (0.03) to 2.2</td>
<td>0.06 to 0.95</td>
<td>0.49 to 0.66</td>
<td>BDL (0.03) to 2.6</td>
</tr>
<tr>
<td><strong>Nitrogen (vol%)</strong></td>
<td>maximum 0.001 to 4</td>
<td>0.5 to 9.5</td>
<td>0.20 to 7.81</td>
<td>BDL (0.03)</td>
<td>BDL (0.03) to 12.7</td>
</tr>
<tr>
<td><strong>Oxygen (vol%)</strong></td>
<td>max. 0.04 to 1 ; most 0.1-0.2</td>
<td>BDL (0.03) to 1.3</td>
<td>BDL (0.03) to 1.99</td>
<td>BDL (0.03) vol%</td>
<td>BDL (0.03) to 1.2 vol%</td>
</tr>
<tr>
<td><strong>Diluents + Inerts (vol%)</strong></td>
<td>max 3 to 6</td>
<td>0.6 to 10.0</td>
<td>0.37 to 10.65</td>
<td>0.49 to 0.66</td>
<td>0.3 to 12.7</td>
</tr>
<tr>
<td><strong>Ammonia</strong></td>
<td>none</td>
<td>BDL (10 ppmv)</td>
<td>BDL (10 ppmv)</td>
<td>BDL (10 ppmv)</td>
<td>BDL (10 ppmv)</td>
</tr>
<tr>
<td><strong>Total Bacteria</strong> # per 100SCF</td>
<td>none</td>
<td>2.46x10^4 - 3.29x10^8</td>
<td>3.28x10^3 - 1.02x10^7</td>
<td>9.85x10^5 to 2.14x10^6</td>
<td>3.47x10^4 to 6.39x10^7</td>
</tr>
<tr>
<td><strong>Mercury</strong> µg/m^3</td>
<td>none</td>
<td>BDL (0.01) to 0.3</td>
<td>BDL (0.01)</td>
<td>BDL (0.01)</td>
<td>BDL (0.01) to 0.06</td>
</tr>
<tr>
<td><strong>Other Volatile Metals</strong> µg/m^3</td>
<td>none</td>
<td>BDL (30) to 250 (Cr, Cu, Mn, Pb, Sb, Zn)</td>
<td>BDL</td>
<td>BDL to 229 (Zn)</td>
<td>BDL (30) to 213 (As, Cu, Pb, Zn)</td>
</tr>
<tr>
<td><strong>Siloxanes (D4) mg Si/m^3</strong></td>
<td>none</td>
<td>BDL^1 to 6.0</td>
<td>BDL(0.5-1.0 mg/m^3)</td>
<td>BDL (0.5-1.0 mg/m^3)</td>
<td>BDL^1</td>
</tr>
<tr>
<td><strong>Non-Halogenated Semi-Volatile and Volatile Compounds (ppmv)</strong></td>
<td>none</td>
<td>BDL^2 to 1.4 (BTEx, phthahlates)</td>
<td>BDL^2 to 0.1 (BTEx,N-nitrosodi-n-propylamine, benzyl alcohol)</td>
<td>BDL^2 to 6 ppbv (phthahlate)</td>
<td>BDL^2 to 471 (1,3-butadiene, acrylonitrile, BTEX)</td>
</tr>
<tr>
<td><strong>Halocarbons(ppmv)</strong></td>
<td>none</td>
<td>BDL (0.1) to 3.6 Freons, chloroethane, vinyl chloride</td>
<td>BDL (0.1)</td>
<td>BDL (0.1)</td>
<td>BDL (0.1)</td>
</tr>
<tr>
<td><strong>Aldehyde/Ketones</strong> ppbv</td>
<td>none</td>
<td>BDL(10 to 522)</td>
<td>not tested</td>
<td>BDL (10)</td>
<td>BDL (10) to 103</td>
</tr>
<tr>
<td><strong>PCBs (ppbv)</strong></td>
<td>none</td>
<td>BDL (0.01 ppbv)</td>
<td>BDL (0.01 ppbv)</td>
<td>BDL (0.01 ppbv)</td>
<td>BDL (0.01 ppbv)</td>
</tr>
<tr>
<td><strong>Pesticides (ppbv)</strong></td>
<td>none</td>
<td>BDL (0.0006 to 0.003) (4,4’-DDT)</td>
<td>BDL (0.0004 to 0.5) (gamma-chlordane)</td>
<td>BDL (0.0006) to 0.006 (4,4’-DDT)</td>
<td>BDL (0.0006)</td>
</tr>
</tbody>
</table>
The How

✓ Establish trace constituent product equivalency
✓ Explore opportunities & common ground
✓ Willingness to understand each others concerns & work towards solutions
✓ Finding ways to say “yes” rather than imposing overly restrictive requirements based on operational uncertainty
RNG Interchangeability Implementation Process

1. Understand Historical Supply
   - Work with Pipelines to establish system adjustment gas

2. Understand “Zone of Influence”
   - Work with pipeline to determine optimum injection point
   - Establish reasonable supply compositions
   - Pipeline to model influence on system including therm zones

3. Identify “Potential Sensitive Receptors”
   - LDC’s catalog potential sensitive customer equipment

4. Assessment
   - Assess sensitive equipment
   - Establish extent of retrofits
   - Negotiate fixes

5. Supply Agreement
   - Establish interchangeability GSA parameters
   - Establish most economical & balanced retrofit strategy if necessary
How to Achieve Success........

✓ Don’t rely on published tariff values alone, gas within distribution systems may be historically different than broad ranges in pipeline tariffs.

✓ Work with Utilities to understand chemical properties of gas in the area of anticipated injection (adjustment gas).

✓ Work with Utilities to balance processing requirements and potential opportunities for contractual blending to meet HHV requirements.

✓ Share as much information as possible to provide operational certainty that the processed gas stream is similar to pipeline gas flowing in the area of injection.
How to Achieve Success

- Optimize start-up and operational monitoring protocols.
- Develop “surrogate” monitoring parameters as process indicators that drive the need for more exotic testing if necessary.
- Leverage application of similar processes in similar situations – don’t reinvent the wheel!
- Establish mutually agreeable testing and monitoring parameters, limits, test methods and procedures to deal with anomalies.
The Guideline Combines

*Good Science & Common Sense*......