

Integration of Emerging Fuels RNG Gas Quality & Interchangeability

*NARUC Task Force on Natural Gas Resource Planning
RNG Expert Learning Session*

August 28, 2024

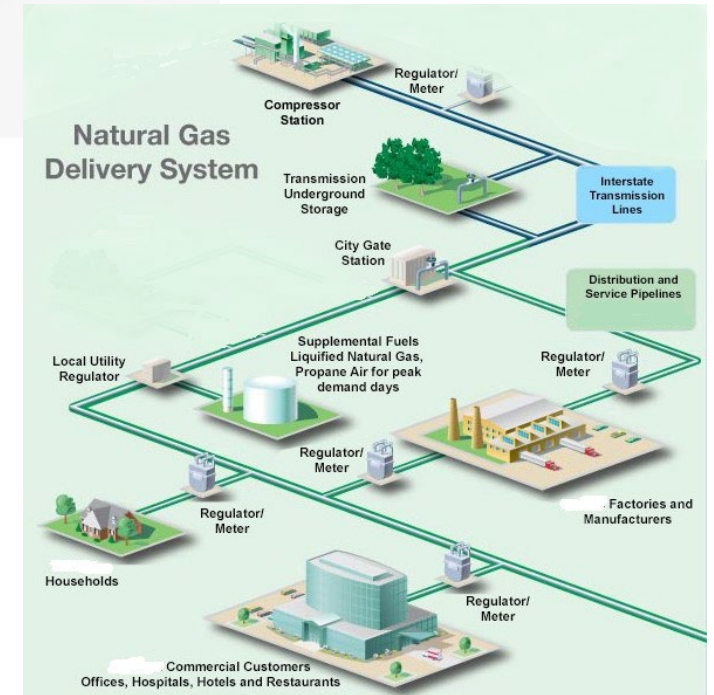
*Bob Wilson,
Northeast Gas Association*



NGA

Regional Trade Association Representing

- Local Distribution Companies
- Transmission Companies
- LNG Importers
- 250+ Associate Members
- +13 Million Customers



Overview

- Emerging Fuels as an Infrastructure Utilization Solution; *Our Second Great Conversion ?*
- Practical Aspects of Gas Quality & Interchangeability; The “What”, “Why” & “How”.
- The Process for *Getting Connected & Staying Connected*

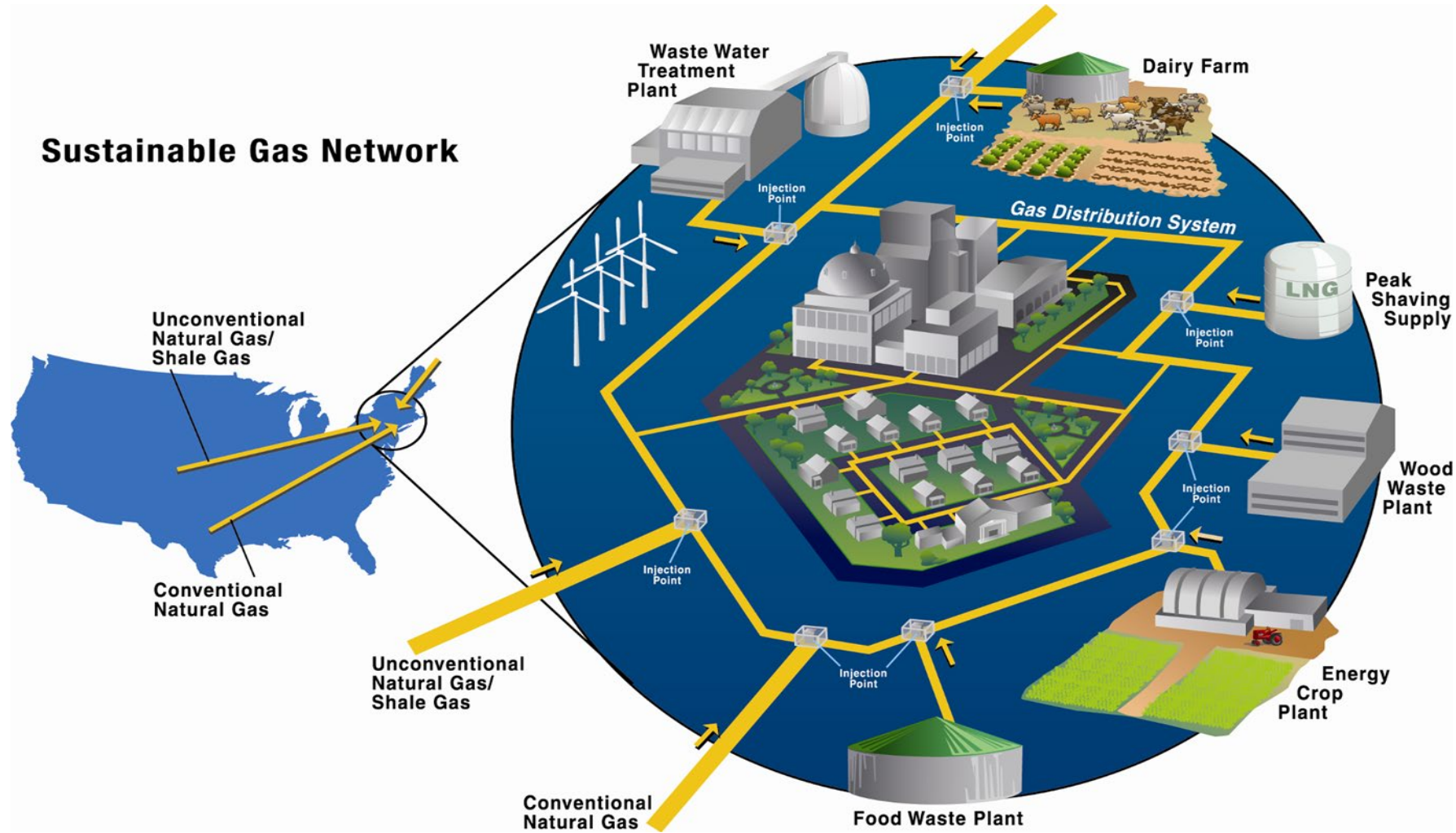
Can We Reasonably & Rationally Meet the Challenges of *The Second Great Conversion* ?



A purge burner igniting manufactured gas being replaced in a main by natural gas during the 'great conversion' in 1952

- Emerging fuels including Renewable Gas are one potential component of meeting our parallel sustainability and carbon reduction goals utilizing existing energy delivery infrastructure.
- RNG Clean-up Technology has evolved significantly, resulting in greater reliability and supply opportunities.
- Production facilities have grown significantly from just 30 in 2011 to over 300 in 2023.
- Recent research suggests that existing organic waste streams are sufficient to eventually produce enough RNG to displace up to 7% of natural gas consumed in the U.S.

Vision for a Sustainable Gas Network



Practical Aspects of RNG Gas Quality & Interchangeability

The “What”, “Why”, “How” Approach to Assessing Emerging Fuels

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

Tariffs, Contracts & Interconnect Agreements

- ◆ Only natural gas quality specifications contained in a FERC approved tariff can be enforced
- ◆ Pipeline tariff provisions on gas quality *need to be flexible*
- ◆ Pipelines & customers should develop gas quality specifications based on sound technical engineering and scientific considerations
- ◆ Pipelines & customers STRONGLY ENCOURAGED to use the NGC+ White Paper & Interim Guidelines as a common scientific reference point
- ◆ Unresolved disputes brought before FERC will be resolved on a case-by-case basis with significant weight given to the NGC+ white paper.



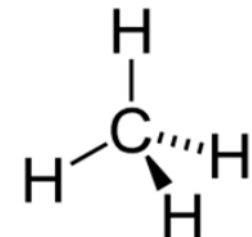
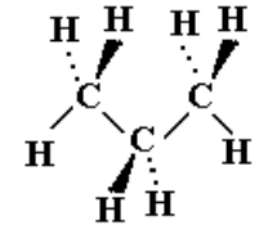
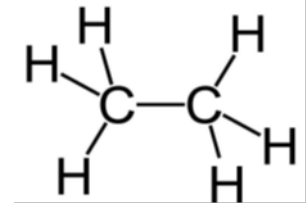
What Are We Concerned About *Regardless of Source* ?

◆ Constituents Considered:

- ◆ Non-Methane Hydrocarbons
- ◆ Water Vapor
- ◆ Hydrogen Sulfide
- ◆ Mercaptans
- ◆ Total Sulfur
- ◆ Carbon Dioxide
- ◆ Nitrogen
- ◆ Total Inerts
- ◆ Oxygen
- ◆ **Other Trace Constituents ?**

Parameters & Other Considerations:

- ◆ Heating Value
- ◆ Specific Gravity
- ◆ Temperature
- ◆ Hydrocarbon Dew Point
- ◆ Interchangeability / Wobbe Number
- ◆ Measurement & Analysis (mass, volume, energy)



Why are These Constituents & Parameters Important to Operators

- Nitrogen – liquefaction, fuel cells, pipeline efficiency
- CO₂ – liquefaction, system integrity
- Moisture – system integrity, synergistic effects with other constituents
- Interchangeability / Wobbe / HHV – combustion applications
- Sulfur Compounds– system integrity, emissions, odorization
- Oxygen – liquefaction, odorization, system integrity
- Trace Constituents of Concern - system integrity, odorization, feedstock impacts including liquefaction, combustion applications,



How – Understanding Stakeholder Concerns & Needs....

- ✓ Establish trace constituent pipeline/RNG equivalency
- ✓ Consider the NGC+ Interchangeability Operating Envelope
- ✓ 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



How -Emerging Fuels Interconnect Guideline

A user-friendly technical framework for introducing emerging fuels is provided to help *reduce overall operational risk for the developer and pipeline operator*, thereby minimizing potential impacts to end-use consumers.

—
Interconnect Guide
for Emerging Fuels
into Energy Delivery
Networks
*Introduction of RNG
and HENG*



RNG / Geological Supply COC Summary Comparison

Constituents found in RNG	Comparison to tariff or specification concentration values when one is stated	Comparison to natural gas
Hydrogen sulfide	✓ Significantly below typical tariff/spec range	✓ RNG has narrower range
Total sulfur	✓ Significantly below typical tariff/spec range	✓ RNG has narrower range
Siloxane	Falls within typical tariff/spec range	RNG slightly higher range
Mercury	Aligns with minimum of typical tariff/spec range	RNG nearly identical range
Vinyl chloride	✓ Below typical tariff/spec range	RNG nearly identical range
1,4-dichlorobenzene	✓ Significantly below typical tariff/spec range	✓ Not found in either gas
N-nitroso-di-n-propylamine	✓ Significantly below typical tariff/spec range	✓ Only found in one RNG site, did not replicate
Methacrolein	✓ Significantly below typical tariff/spec range	RNG nearly identical range
Copper	✓ Significantly below typical tariff/spec range	RNG nearly identical range
Arsenic	Aligns with minimum typical tariff/spec range	RNG nearly identical range
Iron-Oxidizing Bacteria	✓ Below typical tariff/spec value	Both RNG and NG have large ranges similar in volume
Acid-Producing Bacteria	✓ Below typical tariff/spec value	Both RNG and NG have large ranges; RNG range broader than NG range
Sulfate-Reducing Bacteria	✓ Below typical tariff/spec value	RNG nearly identical range

Practical Guidelines To Embrace Renewable Gas

- ▶ Understand trace constituents of concern
- ▶ Model and determine aggregation compositions based on “bookend” flows and assumed end state cleanup criteria
- ▶ Evaluate possibility of gas system operations to minimize impacts of anomalies (redirecting flows etc..)
- ▶ Optimize design and cleanup strategy based on above
- ▶ Establish remote monitoring and shutdown capability
- ▶ Ensure you meet all local regulatory requirements for accepting this gas..... May vary by state.





Wrap-Up Questions Discussions