

Future of Heat

Renewable Natural Gas

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LMOP Special Session 1: What's Next for RNG?
February 27, 2019

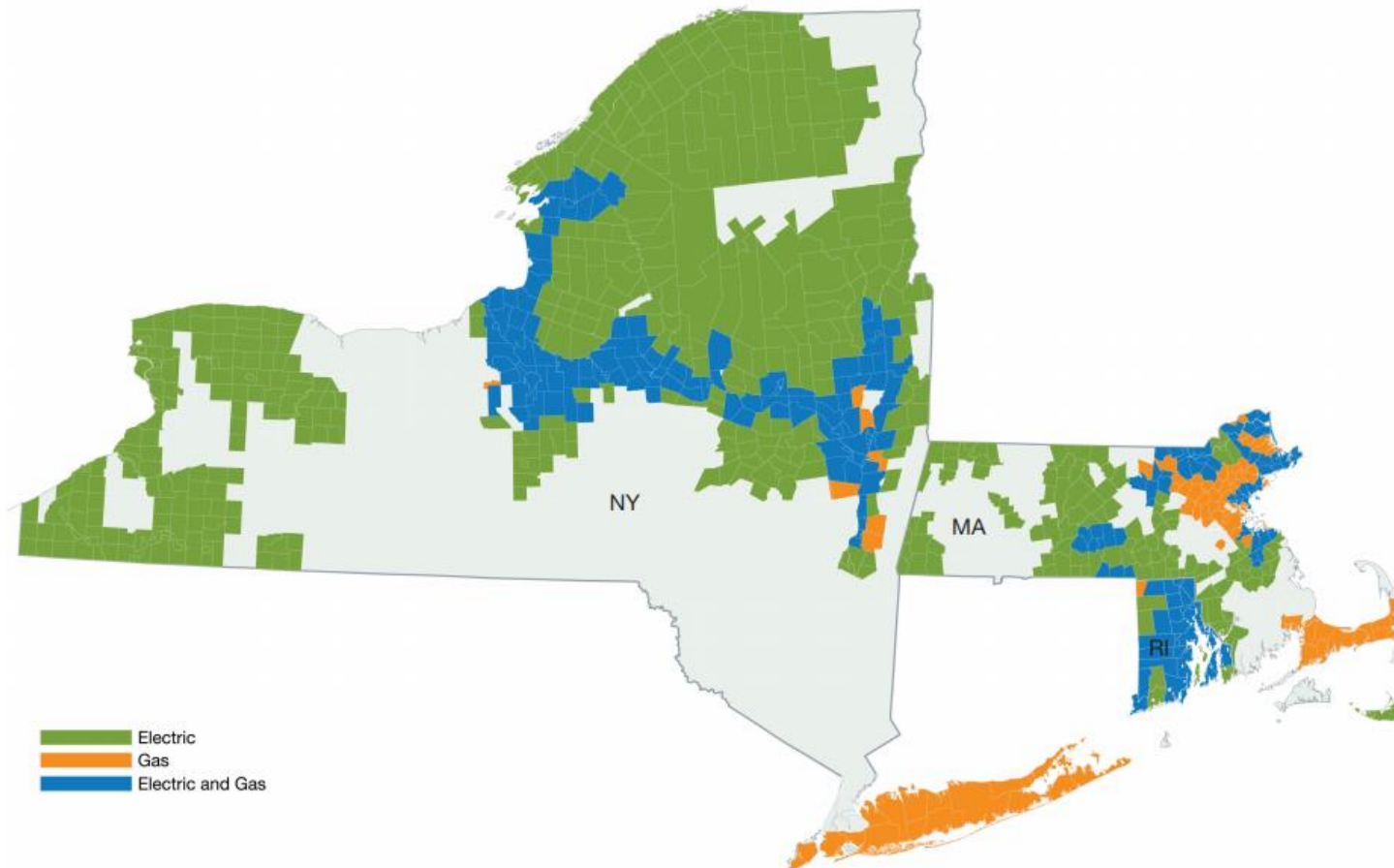
nationalgrid



Who We Serve

Gas and electric distribution company providing energy to 20 million customers in NY, MA, and RI.

We deliver **safe, affordable, reliable** and **sustainable** energy.



Key Takeaways From Our 80x50 Pathway Modeling

Our 80x50 Pathway is ambitious and comprehensive, with implications for customers, communities, utilities, automakers, and policymakers.

40% x 2030

80% x 2050

Power

- Ramp up renewable electricity deployment to achieve 67% zero-carbon electricity supply vs. 45% today

- Zero carbon electricity system
- Increase large-scale renewables
- Inter-seasonal energy storage
- New clean electricity options (gas + CCS, modular nuclear)

Transport

- Reach more than 10 million light-duty electric vehicles on Northeast roads (50% of all light-duty vehicles) vs. < 75,000 today

- More than 20 million light-duty vehicles (100% of the fleet)
- Low-carbon heavy duty, rail, and off-road transportation
- Reductions in vehicle miles traveled

Heat

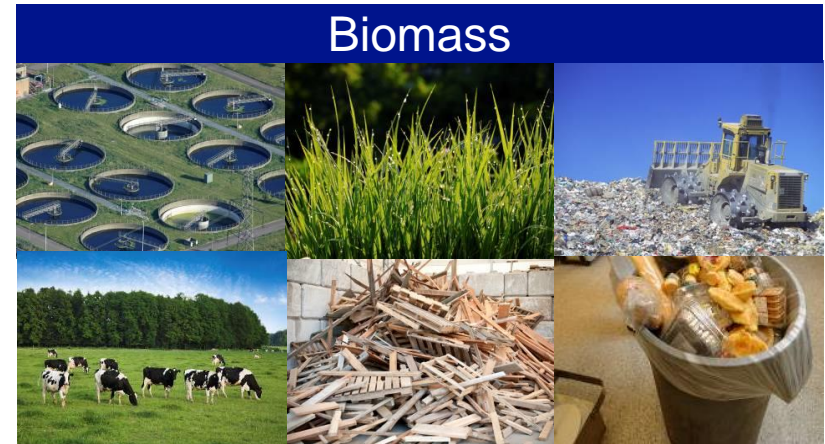
- Double the rate of EE retrofits
- Triple the rate of oil-to-gas heating conversions
- Transform the oil-to-electric conversion market (10X scale up)

- Sustain thermal efficiency investment
- Decarbonize natural gas supply for heating
- Hybrid gas/electric heating

Renewable Natural Gas (RNG)

Current definition

- Pipeline-quality gas produced from biomass



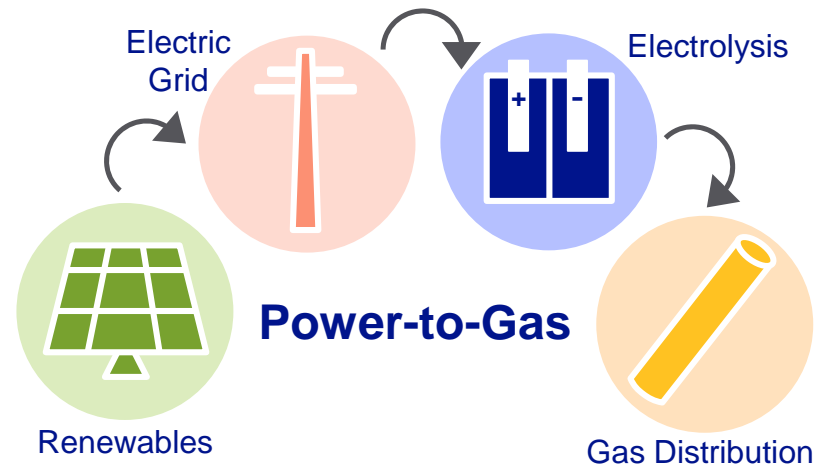
Biomass

Emerging / evolving definition

- Pipeline compatible gas derived from biomass or other renewable sources that has lower lifecycle CO₂e emissions than geologic natural gas.
- e.g. – Power-to-Gas, Methane Reforming

+

2nd Generation RNG



National Grid's RNG Journey

1982 Staten Island Landfill – oldest operating RNG facility in the U.S.

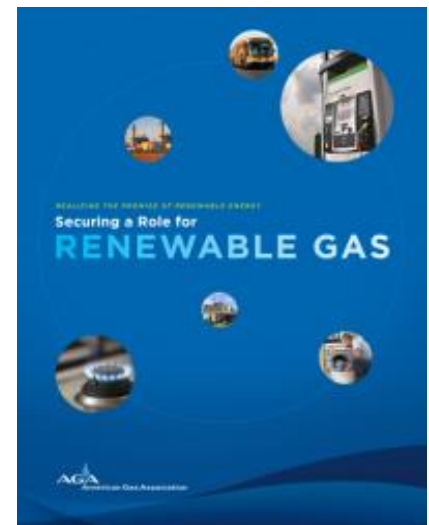
2009 Newtown Creek Demonstration Project

2010 National Grid RNG Whitepaper

2011 AGA Nationwide RNG Whitepaper

2017 Standard Interconnection Guideline for all NY LDCs

2018 Facilitating interconnection for RNG producers, developing RNG offerings, R&D for new sources



Newtown Creek Demonstration Project

Partnership with NYC DEP to convert city's largest wastewater treatment plant into a source of clean energy

- Processes 250 million gallons/day of wastewater
- Operational October 2019
- Inject enough RNG to heat 2,500 homes, reduce CO₂ emissions by ~16,000 metric tons
- Significant potential to increase RNG production if NYC food waste pilot project becomes permanent



Source: New York City Department of Environmental Protection

Purpose of the Standard Interconnection Guideline

Current Challenges

- ❑ No uniform processes, requirements, or agreements
- ❑ Commercial and technical uncertainty for both parties

Document Objectives

- ✓ Provide consistent approach to assess commercial and technical viability of each project without compromising safety or reliability of grid
- ✓ Define requirements to keep gas flowing and avoid service interruption
- ✓ Provide standardized framework to reduce uncertainty and optimize biogas processing facility design
- ✓ Outline structured approach for use by all parties (both project developer and pipeline operator) of the RNG process
- ✓ Lay out roles and responsibilities for each party and what each needs to accomplish

PRELIMINARY EVALUATION

Developer contacts pipeline operator & provides preliminary project scope description

- Location
- Anticipated interconnect pressure
- Temperature
- Pipe size
- Heating value and specific gravity
- Amount of gas
- Flow
- Variability in gas delivery
- Biogas source and cleanup technology
- Other key process variables

Preliminary Review Meeting

- Review of ESA and GSA Requirements
- Developer/operator specific needs
- Local, state, and/or federal regulator requirements (includes NYS code 16 NYCRR Part 229 Gas Quality Standards for Pipeline Injection)

ENGINEERING FEASIBILITY ANALYSIS

Developer provides detailed technical proposal to pipeline operator (typically under NDA)

- Description of chosen cleanup gas technology
- Data proving cleanup technology is compatible with upgraded gas feedstock
- Detailed analysis of raw biogas (can be from another project with same feedstock)

Address impact issues on pipeline system and customers

- Examine pipeline capacity during varying load periods
- Zone of influence of trace constituent impact
- Impact on therm billing monitoring

Reimbursement to pipeline operator for full technical and economic feasibility of the project

*Making contact with a pipeline operator and executing an ESA does **NOT** guarantee acceptance of the project*

GSA OR INTERCONNECTION AGREEMENT

Commercial aspects of accepting gas negotiated

- Commodity compensation
- Delivery obligations (volume, energy content, pressure, temperature, flow rate etc.)
- Gas pairing agreements (blending)
- Gas measurement requirements (schedule and periodicity, equipment, sharing of monitoring information and electronic signals etc.)
- Operation and maintenance requirements (monitoring and measurement equipment maintenance, odorization and metering equipment maintenance etc.)
- Facility access
- Gas quality monitoring requirements
- Conditions that impact acceptance of upgraded gas and facility isolation
- Billing and payment terms
- Tariff or a special contract for transporting the gas enabling the pipeline operator to facilitate the desired transaction for the Developer if the RNG will be sold to a third party
- Begin discussion of pre-construction questions

CONSTRUCTION/ COMMISSIONING

Pipeline operator must be kept informed on progress of construction and specifications

- Suggested interim meetings at 30%, 60%, 90% project completion points at minimum

Address pre-construction questions

- Facility start-up procedures
- Discussion of odorization
- Final gas quality tariff specifications
- On-line instrumentation needs
- Schedule for monitoring of gas quality
- Identification of sampling points
- Identification of target COCs for periodic monitoring
- Initial sampling requirements
- Follow-up sampling requirements
- Steady state sampling requirements
- Trigger levels for specific COCs
- Response actions for out-of-compliance supply
- Emergency plans and procedures
- Facility O&M procedures

Draft Interconnect Process Visual

Challenges to RNG Development

1. POLICY & REGULATORY SUPPORT

Regulators can work on valuing RNG used for heating

2. INTERCONNECTION

Utilities and regulators can collaborate on guidelines

3. EDUCATION

Utilities, regulators & developers can work together to raise awareness

Where Are We Going Next?

1. Develop new products – e.g. Green Gas Tariff
2. Connect customer driven biomass based projects – e.g. Interconnection Incentives
3. Grow RNG potential through demonstration projects



Renewable Natural Gas



Power to Gas



Hydrogen Blending

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