Renewable Natural Gas

The RNG Opportunity for Natural Gas Utilities

As customers increasingly demand renewable energy sources, natural gas local distribution companies (LDCs) are evaluating the opportunity to integrate renewable natural gas (RNG) resources into their fuel supply. Increased use of RNG would enable LDCs to lower the carbon intensity of their fuel supply while diverting waste streams, encouraging local economic development, and adding additional sources of supply. In addition, when compared to flaring or generating electricity on-site, integrating RNG into LDC pipelines can result in local air quality benefits. When properly treated, RNG can be used interchangeably with traditional natural gas, providing fossil fuel displacement benefits across a range of industries and end uses. While RNG has been produced and used in the U.S. for decades, utilities and policymakers are increasingly exploring an expanded role for RNG.

The opportunity for expanded use of RNG is significant, with a recent study estimating the technical potential of RNG from existing sources in the U.S. could satisfy ten percent of the natural gas distributed nationally. However, due to the high costs associated with upgrading RNG and bringing it to market, the majority of potential supplies of RNG have not been developed. While a number of policies are helping promote RNG resource development for use in the transportation and power generation sectors, to date, these policies have not been directed at increasing the use of RNG in the natural gas distribution segment for delivery to customers for heating and appliances.

Renewable natural gas from a range of existing sources has the potential to meet ten percent of natural gas demand.

Most RNG produced today originates from diverted waste streams such as landfills, animal manure, and waste water treatment plants. It can also be produced from plant materials such as forest and agriculture waste. Estimates of the amount of RNG that could be produced in the U.S. vary, but show that meaningful amounts of customer demand for natural gas could be met with RNG. The high end of a range of potential RNG volumes from an American Gas Foundation study is equal to ten percent of the natural gas delivered to U.S. customers in 2015.[1] RNG potential varies regionally, and areas with large RNG feedstock resources have the potential to achieve higher percentages of RNG. A

Total RNG potential in the U.S has been estimated to be as high as 2.4 trillion cubic feet. This amount of RNG could replace significant volumes of traditional natural gas each year, and is equal to 10% of U.S. natural gas deliveries in 2015

American Gas Foundation RNG Potential Estimates as a Percentage of 2015 U.S. Natural Gas Deliveries, by Customer Type

Customer Type	Natural Gas Delivered (Mscf)	RNG Potential as % of 2015 Deliveries
Residential	4,609,669,883	52%
Commercial	3,198,797,217	75%
Industrial	7,534,589,246	32%
Electricity Generation	9,689,827,433	25%
Vehicle Fuel	39,348,210	6119%
Total	25,072,231,989	10%

[1] American Gas Foundation. The Potential for Renewable Gas: Biogas Derived from Biomass Feedstocks and Upgraded to Pipeline Quality". September 2011. Available at: http://www.eesi.org/files/agf-renewable-gas-assessment-report-110901.pdf

study by the University of California Davis shows that California resources could provide enough RNG to fuel current natural gas demand from the state's transportation sector four times over.[2] The development of emerging technologies, such as power-to-gas, that break down water to create RNG could expand the RNG resource base in the future, allowing RNG to supplant even greater volumes of traditional natural gas.

The existing natural gas distribution network can be used to deliver renewable fuel.

Natural gas customers – from individual home owners to major corporations – are increasingly interested in reducing their environmental impact. RNG allows natural gas users to reduce the impact of their gas consumption and allows utilities to complement existing renewable electricity offerings with a renewable gas product. Incorporating RNG into natural gas supply provides an opportunity to reduce greenhouse gas (GHG) emissions while utilizing the existing natural gas distribution system. Replacing traditional natural gas with RNG in many cases provides a greater climate benefit than electrification of end-uses. Additionally, RNG can be substituted for traditional natural gas in any application, whereas electrification is not possible or even beneficial on a lifecycle basis for all current natural gas applications. Beyond interest in strategies to reduce the carbon intensity of natural gas, RNG development can add new sources of supply and provide an economic benefit to regional economies.

Policies to reduce the carbon intensity of electricity and transportation fuels are the primary drivers for RNG today, but RNG can also be used to heat homes and businesses.

The primary existing drivers of RNG development are policies and incentives to decarbonize the transportation and power generation sectors. Federal and state programs, such as the Renewable Fuel Standard (RFS) and California's Low Carbon Fuel Standard (LCFS), provide a monetary credit to RNG that is used as a transportation fuel. Similarly, many state electric renewable portfolio standard (RPS) programs allow RNG to generate renewable energy credits (RECs) when it is used to produce electricity. However, there are very few programs that allow RNG to generate credits when it is used to

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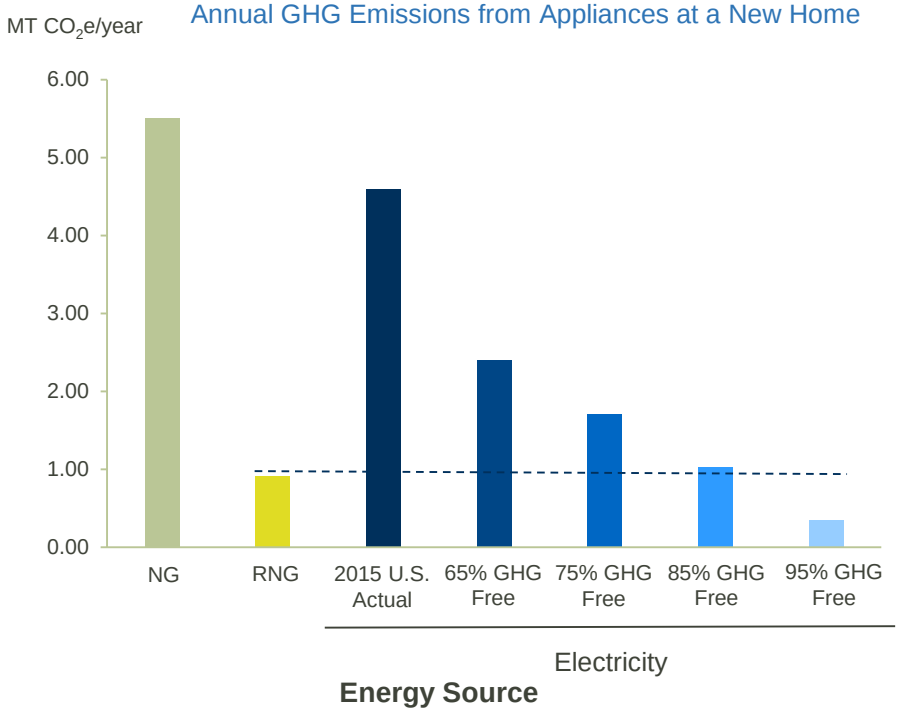
Using RNG in the existing natural gas distribution network can provide significant climate benefits. If a homeowner were to use 100% RNG to heat their home and fuel their appliances, they would generate fewer GHGs compared to electricity even if the grid were 75% decarbonized



[2] Myers Jaffe, Amy. "The Feasibility of Renewable Natural Gas as a Large-Scale, Low-Carbon Substitute". University of California Davis. June 2016. Available at: https://www.arb.ca.gov/research/apr/past/13-307.pdf

heat homes and fuel household appliances. As such, most RNG produced in the U.S. is used in the transportation and power generation sectors. With new incentives, RNG use in the natural gas distribution sector, where end-use combustion is often more efficient compared to the transportation and electric sectors, would likely increase.

Financial and regulatory barriers currently limit RNG use in the distribution segment

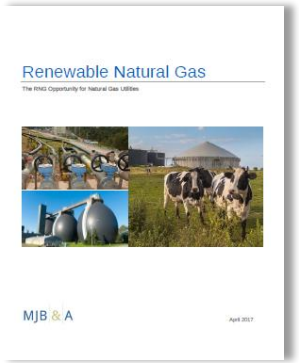
Despite RNG's large potential resource base, a range of barriers currently limit RNG production and use in natural gas distribution systems. The primary barrier is economic. After RNG is produced, it must be processed to meet specific standards, designed to protect health and infrastructure, before it can be introduced to the distribution network. RNG production facilities must also be physically connected to the distribution system via pipeline. The costs associated with these efforts are usually too great to be borne by RNG producers, and cannot be covered by utilities subject to least-cost requirements. Regulatory requirements related to the quality of RNG represent another challenge. Currently, RNG quality is handled on a project-by-project basis without an established standard. Aside from recently established rules in California, the lack of clear and consistent regulations governing RNG quality standards creates uncertainty for project developers.

Policymakers can provide certainty to project developers and reduce barriers to RNG projects.

Natural gas utilities, policymakers, and regulators have several options to increase the utilization of RNG and realize some of its potential environmental and economic benefits. As a first step, RNG gas quality standards could be established to provide LDCs and RNG producers with regulatory certainty. This would assure LDCs that the RNG they receive is fully interchangeable with the traditional natural gas on their systems and make clear to producers how to treat their RNG. Utilities can also encourage RNG production by purchasing RNG from producers, investing in RNG infrastructure, or offering voluntary RNG programs to customers. To enable this investment, regulators could consider taking factors beyond cost into consideration. For example, regulators could consider the ability of RNG to contribute toward GHG reductions and the local or regional economic benefits of RNG investments. When these factors are considered, as is currently allowed in California and British Columbia, regulators are more likely to approve investment in RNG projects. Finally, policymakers could consider options that assign a value to the environmental attributes of RNG consumed by end users outside of the transportation and power generation sectors. This would incentivize using RNG in the natural gas distribution segment and recognize the environmental benefits of RNG supplied by LDCs to all customers rather than for only specific end uses.

For MJB&A's full report, "Renewable Natural Gas: The RNG Opportunity for Natural Gas Utilities," click here.

For questions and comments, please contact:



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