A guide to producing and using RNG

The Future of Clean Energy

Lead the transition to low-carbon energy by producing and using renewable natural gas

- Organic waste
- Agriculture
- Wastewater treatment
- Landfills
- Food and beverage processing

Inside:
The RNG advantage
How is RNG produced and used?
RNG vs. electrification
Expert help to get started
Get expert help planning and developing your RNG projects

This booklet will guide you through everything you need to know to produce and use renewable natural gas (RNG) with Enbridge Gas. We'll help you leverage RNG as an effective solution to achieve climate action goals and create a sustainable future for your company and community.
From organic waste to renewable energy, RNG will play an important role in Ontario's clean energy future.

What is RNG?
A sustainable alternative to fossil fuels.

Why produce and use RNG?
There are benefits for many sectors.

How is RNG made and used?
Transforming organic waste into a low-carbon fuel.

RNG vs. electrification
A reliable approach to manage costs and take climate change action.

Municipal Transit Program
Reduce fuel costs with compressed natural gas (CNG).

Success stories
See how others are benefiting.

Help and expertise with RNG projects
Steps to get your RNG project started.

See our service areas
Use our map to check your service territory.

The RNG potential in Canada is 36% of its 2017 natural gas consumption.

RNG is produced from organic waste, landfill gas, agricultural sources (such as manure) and wastewater treatment.

RNG has the potential to power various sectors of our economy, such as fuelling transit fleets, powering industry and heating homes.

RNG: a smart strategy

A circular economy approach
RNG turns organic waste into renewable energy that can be used in business, industrial, residential and transportation applications.

A cost-effective solution
RNG is an effective way to reduce CO2 emissions and manage costs.

A sustainable energy source
Low-carbon energy is created by capturing and cleaning landfill gas or biogas. The digestate (byproduct of anaerobic digestion) can be converted into fertilizer, returning valuable nutrients back into the soil.

An effective way to create energy resilience
As the RNG supply is distributed by underground pipes, it is reliable and resilient against extreme weather conditions.

A path to net zero
RNG can help reduce GHG emissions by capturing methane that would otherwise be released into the atmosphere.

A clean energy network
RNG is delivered through the existing natural gas infrastructure where it can be used to heat homes and businesses.

Benefits of RNG
- Fuel the future
  - Utilities across Canada have ambitious RNG targets, aiming to have a five percent blend of RNG in all natural gas streams by 2025 and 10 percent by 2030. This would result in a 14 metric tonne reduction in greenhouse gas (GHG) emissions by 2030—equivalent to taking ~3.1 million cars off the road.

How you can benefit from RNG

Waste management companies can take advantage of a new revenue opportunity by producing and selling RNG.

• Repurpose organic waste by turning it into clean, renewable RNG.
• Instead of flaring, capture methane to produce RNG and create a new revenue stream.
• Reduce emissions by fuelling fleets with compressed RNG.
• Meet sustainability and environmental goals.


Waste management companies can benefit from RNG production and use.

RNG can be created from your agricultural waste, resulting in a new revenue stream.

• Earn new revenue from the production of RNG.
• Reduce your GHG emissions.
• Gain an effective waste management solution.
• Be part of a growing biogas sector forecasted to grow up to 50 percent in the next five years.
• Return soil nutrients by using the RNG byproduct as fertilizer.

Agribusinesses can benefit from RNG production.

Municipalities can benefit from RNG production and use.

• Meet climate change and sustainability goals.
• Reduce emissions by using RNG.
• Achieve energy independence and sustain reliable sources.
• Strengthen your local economy and infrastructure.
• Fuel transit and waste truck fleets with compressed RNG or blended CNG. Heat buildings with blended RNG.
• Use the existing natural gas infrastructure to distribute RNG.
• Manage costs and reduce CO2 emissions, compared to electrification.

With oversight on landfills, water waste, energy infrastructure and transit, municipalities are ideally positioned to produce RNG and also use it as a sustainable energy source.

Food and beverage processors can benefit from RNG production and use.

• Reduce carbon emissions by using natural gas blended with RNG to fuel buildings and processes, or use compressed RNG or blended CNG to fuel fleets.
• Leverage existing natural gas infrastructure to inject and distribute RNG.
• Achieve corporate sustainability goals by reducing your carbon footprint.
• Get better energy value with the most affordable renewable energy.
• Avoid downtime with more resilient, reliable service compared to electricity.

For facilities where natural gas usage can account for a significant portion of energy use, RNG can help manage waste and energy costs while reducing CO2 emissions.

Enbridge Gas Renewable Natural Gas Producer Guide
How is RNG made and used?

RNG is created by capturing methane emissions from organic waste, landfills and wastewater treatment plants. A renewable source of energy, it can be injected into our natural gas network and used for residential and commercial energy needs as well as transportation fuel.

Anaerobic digestion

The biodigester breaks down the organic waste, creating biogas. The byproduct of anaerobic digestion, digestate, can be converted into fertilizers that return nutrients back to the soil.

Upgrading

- The biogas is cleaned to meet gas quality specifications.
- Landfill gas is captured and sent to the gas digester to the resulting RNG is added to the existing natural gas infrastructure to be sold and distributed to customers—either directly into the pipeline or to fuel the producer’s own needs.

Waste recovery

Organic waste, such as wastewater treatment sludge, food waste or manure is delivered to a biodigester.

Unlike fossil fuels, RNG can be used to fuel fleets, fertilize soil and power homes.

If we harness only 10% of Canada’s potential, RNG can help heat up to one million homes for one year.

*Source, 2019 Canadian Gas Association Press Release titled: Renewable natural gas start-up company completes key milestone converting Alberta forest residues into pipeline-quality gas
Why RNG is more effective than electrification

Electrification is not the only way to meet climate change goals—RNG is a more cost-effective, reliable and low-carbon alternative to electricity.

1. With net zero emissions, RNG is a more cost-effective way to meet climate change goals.
2. RNG leverages the existing natural gas infrastructure and vehicles rather than requiring investment in new electrical infrastructure.
3. RNG doesn't contribute to peak electricity demand, which can lead to higher costs to generate, transmit and distribute electricity.
4. By repurposing organic waste, RNG reduces GHG emissions.
5. Natural gas has fewer service interruptions than electricity, and is resilient against extreme weather, flooding and other natural disasters.

5 reasons to choose RNG over electrification

1. RNG costs $24/GJ — equivalent to $0.09/kWh.
2. Electricity in Ontario is priced at $0.128/kWh.
3. Enbridge Gas can design, build and maintain the municipality's RNG upgrading and injection infrastructure for approximately $0.05 – $0.10/m³ in addition to its natural gas commodity cost.
4. Enbridge can reduce CO2 emissions by 9,381 tonnes annually.
5. It can produce 5 million m³ of RNG — about third of its annual natural gas consumption.

Let Enbridge Gas help you get up and running

Contact our RNG experts to create a custom plan for your community.

— enbridgegas.com/rng

Consumes 50 million m³ of natural gas.
Processes 75,000 tonnes of organic waste.
It can produce 5 million m³ of RNG — about third of its annual natural gas consumption.

An illustrative example of how RNG is a smart, economical solution to achieve climate change goals.

In this example:

- RNG costs $24/GJ — equivalent to $0.09/kWh.
- Electricity in Ontario is priced at $0.128/kWh.
- Enbridge Gas can design, build and maintain the municipality's RNG upgrading and injection infrastructure for approximately $0.05 – $0.10/m³ in addition to its natural gas commodity cost.
- Enbridge can reduce CO2 emissions by 9,381 tonnes annually.
- It can produce 5 million m³ of RNG — about third of its annual natural gas consumption.

Sources:
- oeb.ca/rates-and-your-bill/electricity-rates
Success stories

Toronto to transform about 35% of organic waste into RNG

The City of Toronto will soon harness the biogas emitted from processing its Green Bin organic waste. The resulting RNG will be added to the existing natural gas system and used to fuel the city’s waste collection fleet.

It’s a smart, circular solution that will help the city achieve ambitious climate change goals while diverting waste from landfill.

By the numbers
Processes 55,000 tonnes of organic waste.
Contributed to producing approximately 3.3 million m³ of RNG from the cleanup and conditioning of about 6 million m³ of biogas.
Eliminates 9,000 + tonnes of CO₂ emissions.
Projected to be operational by early 2021.

Hamilton Water Treatment Plant

RNG curbs emissions at Hamilton’s water treatment plant

To reduce emissions created from its water treatment process, Hamilton’s Woodward Avenue water treatment plant now captures raw biogas to produce heat and power through a cogeneration unit. The surplus gas is purified and used to create RNG.

By the numbers
Processes up to 10,000 m³ of RNG per day.
Offsets more than 1,100 tonnes of CO₂ annually.

Hamilton Street Railway

How Hamilton fuels fleets for less

After realizing the cost of diesel was on the rise, the City of Hamilton expanded its fleet with more than 100 new CNG buses and received funding for a new CNG station.

Proven results

Highest capacity
Now the highest capacity station in Ontario.

Fast fuelling times
Comparable to diesel pumps.

95% fewer emissions
Fewer tailpipe emissions helps improve air quality and answers climate change goals.

*Source: biogasassociation.ca/index.php/featured-member/member/the_city_of_hamilton
†Source: hamilton.ca/government-information/news-centre/news-releases/green-energy-doors-open-see-how-hamilton-generates
Support to produce RNG

Whether you’re planning for RNG facilities or ready to start selling, Enbridge Gas is here to help you with expertise, support and financing.

Feasibility

Determine your opportunity
Get a free assessment to determine whether your facility is suited to produce RNG.

Production

You plan, build and maintain the anaerobic digester to turn organic waste into biogas.

Upgrade your biogas to RNG
Once you start creating biogas, we offer a turnkey solution to help you upgrade it to pipeline-quality RNG. This includes:

- Capital support to design, build and manage a new biogas upgrading system and injection station.
- Access to industry experts in engineering and construction.
- Complete engineering and design studies of all equipment, with full documentation.

Interconnection

Capacity Study
This study verifies that your facility:

- Is at market capacity to receive the gas and complies with Enbridge Gas’ distribution network system pressure standards.
- Meets safety requirements.
- Is designed within Enbridge Gas’ peak demand considerations.

Your Enbridge Gas Business Development Specialist may need additional preliminary information such as the proposed location, volume of raw biogas or RNG and the station/pipeline requirements. This study takes approximately 4 – 6 weeks.

Detailed Engineering Study
Once we confirm that the proposed project meets the requirements, we’ll continue to the final step, which includes:

- A detailed description of all construction costs.
- Complete engineering construction drawings.
- All construction and environmental permit applications and right-of-way acquisition requirements.
- A service contract is required, and a backstop agreement or indemnification letter may also be needed.

This study takes approximately 6 – 8 weeks.

Preliminary Engineering Study
If we determine that the proposed project requirements can be met, we’ll help develop cost estimates for the project. Estimates may include construction, land acquisition, site development and regulatory and environmental permits. This study takes approximately 3 – 4 weeks.

The value of RNG is clear:
Equivalent to approximately $0.09/kWh.*
Low-carbon.
Reduces CO2 emissions.
Can be blended into natural gas applications.

*See further details on p. 11.
Selling and using your RNG

Inject your RNG into the pipeline

With pipeline-ready RNG, you can inject it into the Enbridge Gas system. Our experts will handle everything to get your RNG connected to the pipeline, including adding safety odourants and all metering.

With many municipalities declaring climate emergencies, local governments must find innovative ways to deal with competing budgets and urgent priorities. Enbridge Gas can help transition transit fleets to compressed natural gas (CNG), a proven way for municipalities to meet ambitious climate change targets.

Get your RNG into market

After you inject your RNG into the Enbridge Gas system, the natural gas will need to be transported to its end market. We provide:

• Access to an established network of brokers that can help distribute and sell your RNG through the natural gas system.

• Help to transport and store your RNG supply.

Your opportunity to use RNG

For even greater environmental impact, we can help you get to net-zero emissions by using the RNG you produce to heat buildings or to fuel fleets.

Cleanup and injection rates

The cost for each service would be specific to the location of the project and based on fully allocated costs. For both rates, a consistent monthly service fee over the term of the contract ensures cost certainty for RNG producers, an important factor to help enable and facilitate RNG production in Ontario.

Reduce fuel costs up to 40% with CNG

According to the U.S. Department of Energy, CNG can cut the fuel cost of municipal transit fleets by up to 40%. The program covers:

1. The incremental cost of buses
2. Design and construction of a CNG fuelling station
3. Maintenance facility upgrades
4. Training and change management

The cost for each service would be specific to the location of the project and based on fully allocated costs. For both rates, a consistent monthly service fee over the term of the contract ensures cost certainty for RNG producers, an important factor to help enable and facilitate RNG production in Ontario.

CNG's proven benefits:

 Costs

<table>
<thead>
<tr>
<th>Item</th>
<th>Cost</th>
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<tbody>
<tr>
<td>The program cover</td>
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</tr>
<tr>
<td>The incremental capital required</td>
<td>$6M</td>
</tr>
<tr>
<td>The program cost</td>
<td>$6M</td>
</tr>
<tr>
<td>The incremental capital</td>
<td>$6M</td>
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</tbody>
</table>

CNG benefits:

- Reduce fuel costs up to 40%.
- Quieter than diesel engines.
- 90% fewer tailpipe emissions.
- 40% lower fuel costs.
- 90% quieter than diesel engines.
- 40% lower fuel costs.
Enbridge Gas

Renewable Natural Gas Producer Guide

1. Introduction

In this document, continuous monitoring means real-time or near-real time. Periodic monitoring could be seasonal, semi-annually or annually. Final monitoring frequency will be defined for each RNG facility.

2. Article II: Gas quality

In the event that the quality of the gas does not conform or if Enbridge Gas, acting reasonably, suspects the quality of the gas may deviate from the quality standards set out herein, Enbridge Gas may refuse to accept delivery of gas at the Receipt Points hereunder until such deficiency has been remedied by Shipper. Each such refusal shall be promptly communicated to Shipper.

3. Non-conforming gas

If Shipper's gas fails at any time to conform to the requirements of this Article II, Enbridge Gas, in addition to its other remedies, may refuse to accept delivery of gas at the Receipt Points hereunder until such deficiency has been remedied by Shipper. Each such refusal shall be promptly communicated to Shipper.

4. Consequences of non-compliance

In summary, in order to be injected into the Enbridge Gas distribution system, RNG must:

- Have a Wobbe Index during normal operation no lower than 47.2 MJ/m³.
- Not contain any contaminants, particles, or other impurities at a level that will affect or impair the safe and reliable operation of gas appliances through which it flows.
- Not contain more than 4% by volume of total inerts.
- Not contain more than 0.4% by volume of oxygen.
- Not contain more than 2% by volume of carbon dioxide.
- Have an energy content no lower than 36.0 MJ/m³.
- Not contain more than 10 mg/m³ of ammonia.
- Not contain more than 6 mg/m³ of hydrogen sulfide.
- Not contain more than 23 mg/m³ of organochlorinated compounds.
- Not contain more than 38 mg/m³ of total inerts.
- Not exceed the maximum levels specified in Table 1.

Understanding gas quality requirements

<table>
<thead>
<tr>
<th>Specification</th>
<th>Value</th>
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<tbody>
<tr>
<td>Oxygen (% vol)</td>
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</tr>
<tr>
<td>Carbon dioxide (% vol)</td>
<td>≤ 2</td>
</tr>
<tr>
<td>Energy content (MJ/m³)</td>
<td>≥ 36.0</td>
</tr>
<tr>
<td>Hydrogen sulfide (mg/m³)</td>
<td>≤ 6</td>
</tr>
<tr>
<td>Ammonia (mg/m³)</td>
<td>≤ 10</td>
</tr>
</tbody>
</table>

Table 1: Renewable natural gas — pipeline gas quality specifications
About Enbridge Gas

Enbridge Gas Inc., formed on Jan. 1, 2019 from the amalgamation of Union Gas and Enbridge Gas Distribution, is Canada’s largest natural gas storage, transmission and distribution company based in Ontario with a more than 170-year history of providing safe and reliable service to customers. The distribution business serves about 3.8 million customers, heating over 75 percent of Ontario homes. The storage and transmission business offers a variety of storage and transportation services to customers at the Dawn Hub, the largest integrated underground storage facility in Canada and one of the largest in North America. Enbridge Gas Inc. is owned by Enbridge Inc., a Canadian-based leader in energy transportation and distribution.
Ready to get started?
Partner with our RNG experts

Our dedicated team of energy experts are ready to provide you with the technical expertise and information to produce and use RNG.

Connect with an expert
rng@enbridge.com
enbridgegas.com/rng

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