

# Renewable Natural Gas: Affordable Renewable Fuel for Canada



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## EXECUTIVE SUMMARY

As governments – both provincial and federal – discuss lower GHG emissions pathways, renewable natural gas (RNG or biomethane) presents a significant and largely untapped opportunity for GHG emission-free energy for our country. Using RNG means putting renewable energy directly in an existing pipeline: showing how pipes can deliver the benefits of renewables as efficiently (and often more cost-effectively) than electric wires.

Canada has an RNG resource base of approximately 1,210 billion cubic feet (Bcf) per year, which is nearly 50 per cent of Canada's 2014 natural gas consumption. As a starting point, gas utilities are looking at measures to support a target of up to 10 per cent RNG into natural gas pipeline distribution systems by 2030. Nationally, this amount of RNG would be equal to approximately 267 billion cubic feet of natural gas per year. This volume of RNG could fuel 3.1 million homes with renewable fuel annually and would result in 14 megatonnes (MT) per year of GHG emission reductions per year, equivalent to removing 3 million passenger cars from the road.

Currently, in the provinces of British Columbia, Ontario and Quebec, natural gas distribution utilities are putting RNG into the pipeline distribution system. By the end of 2016, utilities will have brought online eleven RNG projects producing enough renewable fuel for 51,000 homes or equivalent to approximately 132 million litres of renewable fuel for transportation markets.

RNG, while more costly than geologic natural gas supplies, is a cost-effective source of renewable energy for Canada. RNG can be produced, cleaned and put into the natural gas distribution system at a cost of between \$10-25 per gigajoule (GJ), or equivalent to between 4-9 cents per kilowatt hour (kWh). For comparison, current renewable electricity contracts for utility scale solar in Ontario have been signed for approximately \$19 and

\$44/GJ or 7-16 cents/kWh.

With the right policy measures in place, natural gas utilities can support lower GHG emission energy delivery to Canadians through the introduction of RNG into their distribution pipeline systems across the country. To this end, the Canadian Gas Association, in its 2016 pre-budget submission to the House of Commons Finance Committee, has requested \$50 million in federal support from the Canadian Green Infrastructure Fund to advance RNG projects in Canada. Further, CGA will be hosting a workshop on May 25<sup>th</sup> 2016 in Toronto with industry and government stakeholders to discuss the RNG potential for Canada and the various policy measures that could support a robust RNG market across the country.



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## OVERVIEW



This publication outlines the potential for RNG in Canada including its role in the reduction of GHG emissions, its value as an affordable renewable energy option for natural gas markets, and the role natural gas utilities can play in delivering this clean renewable product to Canadians.

RNG is a 100 per cent renewable energy source. RNG can be produced in two ways. The first is anaerobic digestion whereby waste (from landfills, farms or waste water treatment plants) is converted into methane and carbon dioxide in a digester or holding tank. The gas produced is then cleaned or purified to meet utility pipeline specifications. The digesters can be located at waste water treatment plants, landfills, at green bin waste facilities, or on farms. The second way to produce RNG is through gasification of forest or agricultural waste. Gasification uses high temperatures to thermally breakdown biomass into synthesis gas, a mixture of very simple gaseous compounds. This syngas is then reformed into

methane to produce RNG.

After RNG has been captured, cleaned and injected in pipelines, it can be used in the same way as conventional natural gas by homes, businesses, institutions, and industry. RNG can also be used, like conventional natural gas, as a transportation fuel in the form of compressed natural gas (CNG) or liquefied natural gas (LNG).

An added benefit is that the end user requires no equipment upgrades or modifications, thus avoiding costly upgrades to the end use customer. Further, unlike solar or wind, RNG is produced year round without intermittency and it can be stored underground in natural gas storage facilities.



## CANADA'S RNG OPPORTUNITY

In 2014, the total natural gas demand in Canada, was 2670 Bcf. As shown in Table 1, the ultimate potential for RNG in Canada is estimated to be 1210 Bcf per year<sup>1</sup>- equal to nearly half of Canada's 2014 natural gas consumption. The RNG potential is greatest in British Columbia (300 Bcf) followed by Quebec (282 Bcf). Of the total RNG potential in Canada, 85 per cent can be sourced from forest and agricultural waste while the remaining opportunity is from landfills, green bin waste, waste water treatment plants and farm-based digesters. It is important to note that in order for the RNG potential from biomass to be realized, there are

technological improvements required to the biomass to RNG conversion process. Further, the biomass needed to generate RNG will have to be purchased in the open market and will compete with alternative uses of biomass resources including pellet plants and biomass use by industry for heating and/or power needs. Up until 2025, the majority of RNG potential exists in landfills, waste water treatment plants, and farm-based digesters. Post 2025, gasification of biomass and agricultural waste would begin to come on stream with appropriate technology in place.

Table 1: Provincial Gas Demand and RNG Potential for Canada

Province	Gas Demand (Bcf/year)	Residential Demand (Bcf/year)	Potential RNG Resource Base (Bcf/year)	Potential 2030 RNG Production (Bcf/year)	Percentage of Gas Demand	Number of Homes Gas Demand
BC*	210	70	300	10	5%	122,960
AB	1075	161	169	68	6%	792,464
SK	171	33	137	14	8%	160,603
MB	74	21	69	3	5%	40,444
ON	861	352	157	138	16%	1,615,272
QC	250	23	282	31	13%	366,640
NB	18	1	64	2	10%	22,508
NS	6	0.2	32	1	10%	7,503
<b>Total</b>	<b>2665</b>	<b>662</b>	<b>1,210</b>	<b>267</b>	<b>10%</b>	<b>3,128,392</b>

Sources: Statistics Canada, Table 128-0016. Alberta Innovates, 2010 and 2011, CGA notes. Note: \*BC's Biomass is largely being contracted for and use in pellet plants. Therefore, at this time, much of BC's potential for RNG comes from landfills and digesters.

In addition to the production potential of RNG, there is a significant GHG emission reduction opportunity. Table 2 provides data and information on the 2014 GHG emissions from natural gas consumption in each province and the RNG emission reduction potential for each province by the year 2030, based on market conditions and available RNG supplies. Assuming 10 per cent of Canada's natural gas consumption is from RNG production, there exist significant GHG emission reductions opportunities for all provinces. Nationally,

the GHG reduction potential is 14 megatonnes, equivalent to taking 3 million cars off the road. The greatest emission reduction opportunities are in provinces where the largest available RNG volumes exist. Along with this emission reduction opportunity there is a cost saving for RNG wherever CO2 emissions are priced - saving the consumer the carbon cost for the volume of RNG they use.

<sup>1</sup> RNG production potential is continually replaced as new waste is constantly produced from the various sources.



Table 2: Provincial Emissions and GHG Reduction Potential

Province	Natural Gas GHG Emissions (Megatonnes - 2014)	2030 Annual GHG Emissions Reductions from RNG (Megatonnes)	Number of Passenger Cars Equivalent
BC	11	0.6	116,197
AB	61	3.6	748,878
SK	7	0.7	151,770
MB	4	0.2	38,219
ON	41	7.3	1,526,432
QC	12	1.6	346,474
NB	0.2	0.1	21,270
NS	0.3	0.0	7,090
<b>Total</b>	<b>136</b>	<b>14</b>	<b>2,956,331</b>

Source: <http://www.epa.gov/energy/greenhouse-gas-equivalencies-calculator>

## RNG PROJECTS IN CANADA

The map on page 5 illustrates operating and planned RNG production projects in Canada. The three provinces where RNG is currently being blended into the Canadian distribution system are British Columbia, Ontario and Quebec. By the end of 2016, the total quantity of RNG being produced in Canada will be equal to the annual natural gas demand of approximately 51,000 homes or 132 million liters of renewable transportation fuel.

In British Columbia, FortisBC offers a **voluntary RNG program** where RNG is purchased by ratepayers at a cost of ~\$15/GJ. Participants can choose to blend between 5 per cent and 100 per cent RNG into their gas supply stream. There are at current, approximately 7,000 customers in British Columbia taking advantage of this program. In Ontario, there is a single RNG project **in Hamilton** from the municipal waste water treatment facility. The Region of Peel and the City of Toronto have expressed great interest in producing RNG from source separated organic waste that they collect. In Quebec, there are two landfills producing RNG and **an aerobic digester project** with the City of St Hyacinthe.

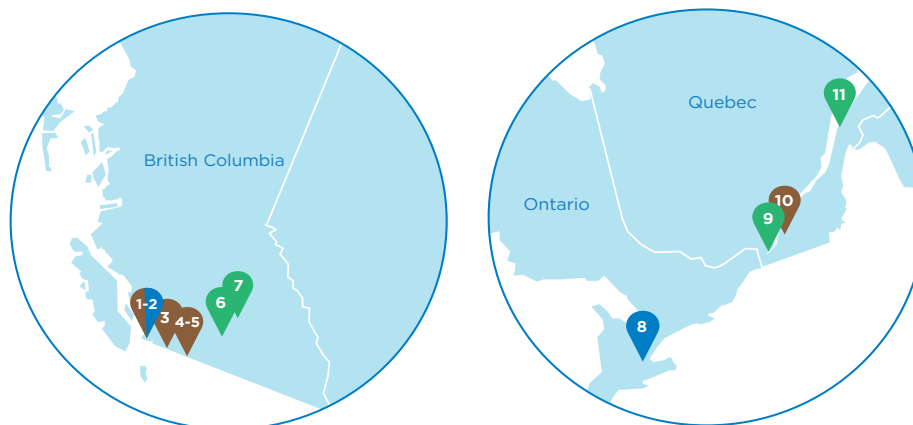
In addition municipalities across Canada are working with gas utilities to learn more about RNG and the role it can play in helping to reduce their GHG profile, optimize their waste diversion strategy, and help to meet their energy needs.





### Canadian Renewable Natural Gas (RNG) Projects

Operating & In Development as of 2017



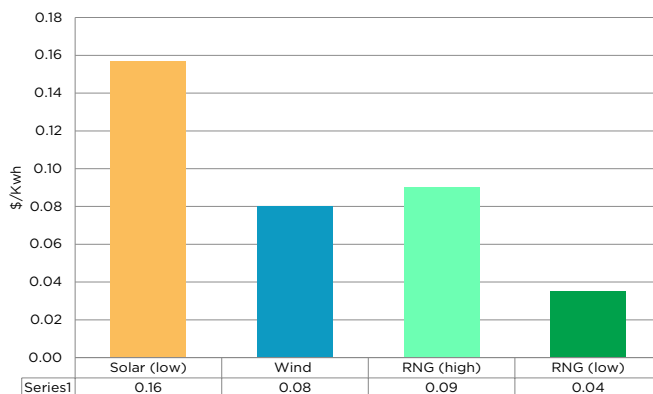
Project Number	Location	Start date	RNG Production	Status
1	Delta, BC	2014	1,348 homes/year	Operating
2	Richmond, BC	2016	505 homes/year	In development
3	Surrey, BC	2017	1,100 homes/year	In development
4	Chilliwack, BC	2015	1,348 homes/year	Operating
5	Abbotsford, BC	2010	2,527 homes/year	Operating
6	Kelowna, BC	2014	3,032 homes/year	Operating
7	Salmon Arm, BC	2013	1,011 homes/year	Operating
8	Hamilton, ON	2011	2,695 homes/year	Operating
9	Terrebonne, QC	2014	28,000 homes/year	Operating
10	St. Hyacinthe, QC	2017	5,054 homes/year	In development
11	Rivière du loup, QC	2016	1,350 homes/year	In development

### RNG – AFFORDABLE AND VERSATILE

On affordability, Figure 1 provides information on renewable energy costs for wind, solar and RNG (both a high and low cost).

As illustrated, RNG is extremely competitive with modern renewable electricity generation sources and in all cases is more affordable than Canadian utility scale solar power. As was witnessed with wind and solar, the cost of RNG will decline significantly as it gains a larger share of the market and economies of scale are built into manufacturing of RNG clean up technologies and processes. These costs are important considerations as jurisdictions across Canada look to lower the GHG emission footprint of their energy system while at the same time keeping energy affordable.

Figure 1: Comparing Canadian Renewable Energy Costs



Source: <http://fit.powerauthority.on.ca/fit-program/fit-program-pricing/fit-price-schedule>, CGA member companies and RNG project data.



RNG costs vary between \$10-25/GJ depending on the source, with landfill gas being the most affordable production method and RNG from forest and agricultural waste at the higher end of the RNG cost spectrum. In terms of electricity equivalent pricing, RNG costs between 4 – 9 cents/kWh. For comparison, current renewable electricity contracts for utility scale solar in Ontario have been signed for approximately \$19 and \$44/GJ or 7-16 cents/kWh.

On versatility, RNG is the same methane molecule as any other natural gas. It can therefore be used in any energy application that uses natural gas. From

furnaces and water heaters to transportation fuel or power generation, RNG can meet the energy needs of consumers. The use of existing pipeline infrastructure to deliver RNG to consumers is a significant benefit to Canada as it enables a high utilization of extensive distribution pipeline assets – lowering energy costs to customers and operating costs to utilities – all while significantly reducing emissions, fostering innovation and creating new economic activity.

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## POLICY DRIVERS FOR RNG IN CANADA

In the United States 35 out of 50 state legislatures provide support for RNG as part of their renewable portfolio standards for electricity production. Federally, the U.S. Environmental Protection Agency provides an RNG incentive through its Renewable Fuel Standard. In 2015 alone, 500 million litres of renewable fuel were produced from RNG for use in U.S. transportation markets<sup>2</sup>. Additionally in California, there is a further incentive being offered to RNG producers. As a result of these policies, some RNG project operators in Quebec are selling their RNG volumes into the California market where they can receive a renewable energy incentive.

In Canada, various policy measures could help realize the true potential of RNG for the country's energy future. Investment tax credits for RNG projects, direct program support to offset higher RNG costs and the introduction of gas utility renewable portfolio standard (RPS) programs for RNG are three possible measures. At this time, various policy scenarios are being

explored across Canada. More consultation between governments, industry and communities is required to determine the best approach to provincial and federal policies that can support a RNG industry.

In a 2016 pre-budget submission to the House of Commons Finance Committee, CGA requested \$50 million in federal support from the Canadian Green Infrastructure Fund to advance RNG projects in Canada by providing grants to projects to support efforts to reduce cost and risk. CGA is also seeking pilot demonstration funding to further advance biomass gasification technology. As a first step in the dialogue on RNG, CGA is convening a RNG Workshop on May 25<sup>th</sup> in Toronto that will include industry and government stakeholders. The workshop will explore the RNG potential for Canada and the opportunities for various policy measures that could support RNG supplies across the country.



<sup>2</sup> <http://www.epa.gov/fuels-registration-reporting-and-compliance-help/2015-renewable-fuel-standard-data>



## CONCLUSION

Our commitment, as Canada's natural gas industry, is to work to constantly ensure the provision of safe and reliable energy services to Canadians with clean and affordable natural gas. RNG is one more product offering we can make to ensure this, and we want to work with stakeholders to make it available across the country.

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