



**A comprehensive study to scan and
analyze approaches to sharing the cost of
blending renewable natural gas (RNG)**

PUBLIC VERSION
December 2022



CONNECTING THE BIOGAS INDUSTRY

DISCLAIMER NOTICE

This report has been prepared for and funded by Natural Resources Canada (NRCan).

The content of this report is based on information gathered in good faith from both primary and secondary sources and is believed to be correct. BiogasWorld has taken all reasonable care to ensure that the information presented in this report is fair and accurate. Considering that this report is based on the information provided by different industry stakeholders, BiogasWorld cannot guarantee its accuracy. Any decisions made based upon any information contained in this document are the sole responsibility of the reader.

SUGGESTED CITATION

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- Heritage Gas, NS, Canada
- IBBK, Germany
- Michigan Public Service Commission
- NW Natural, USA
- Oregon Public Utilities Commission
- Pacific Northern Gas, BC, Canada
- Public Utilities Board, Manitoba
- Puget Sound Energy, USA
- RNG Coalition, USA
- Vermont Gas, VT, USA

EXECUTIVE SUMMARY

The present RNG study initiated by Natural Resources Canada aims to analyze Canadian and international regulations and approaches on RNG pricing and cost sharing and to identify the opportunities to minimize the cost impacts of blending RNG on consumers.

Using the information collected via interviews with industry stakeholders and documentation analysis, BiogasWorld can draw the following conclusions:

1. The major drivers of RNG use in North America and Europe are binding or voluntary targets set up by the governments to increase the renewable content or reduce GHG emissions.
2. Talking specifically about existing RNG programs in North America, it is possible to distinguish between two main cost recovery approaches: Canada regulates the purchase price of RNG and has a stricter approach to what costs can be distributed to end-consumers, while certain US utilities are allowed to socialize the costs to all end-users.
3. Several utilities in the US offer the offset programs, without buying RNG: users can have carbon neutral natural gas usage by purchasing the carbon credits.
4. Currently, the end users who opt in to purchase RNG pay more than those who choose to consume less expensive natural gas. The main incentive to subscribe by corporate users, for example, is the internal corporate clean energy or GHG emissions targets.
5. The majority of study participants highlighted the importance of addressing the opportunities that environmental attributes can present, either for monetization by end users directly or by trading the attributes by utilities and reducing the costs for end-users. In Europe and US environmental attributes are traded while in Canada this market is yet to be developed.

TABLE OF CONTENTS

DISCLAIMER NOTICE.....	2
SUGGESTED CITATION.....	2
ACKNOWLEDGEMENTS.....	3
EXECUTIVE SUMMARY	4
TABLE OF CONTENTS	5
ABBREVIATIONS	7
EXCHANGE RATE	7
CURRENT STUDY IN CONTEXT	8
Current Information Gaps.....	8
Project Execution.....	8
Issues of Scope	8
Report Organization	8
RNG PRICING AND COST SHARING IN CANADA.....	9
Canadian Biogas and RNG Market.....	9
RNG Pricing and Cost Sharing in British Columbia.....	9
Legislative drivers in British Columbia.....	9
Major players and RNG Programs.....	10
RNG Pricing and Cost Sharing in Ontario	13
Legislative drivers in Ontario	13
Major players and RNG Programs.....	13
RNG Pricing and Cost Sharing in Quebec	14
Legislative drivers in Quebec	14
Major players and RNG Programs.....	14
RNG Pricing and Cost Sharing in other Canadian provinces.....	18
RNG PRICING AND COST SHARING IN THE USA	19
RNG Pricing and Cost Sharing in California	19
RNG Pricing and Cost Sharing in Oregon	20
Legislative drivers in Oregon.....	20
RNG Program of NW Natural	20
RNG Pricing and Cost Sharing in Michigan	22
RNG Pricing and Cost Sharing in Vermont.....	23

Legislative drivers in Vermont	23
RNG Program of Vermont Gas Systems	23
RNG Pricing and Cost Sharing in Washington.....	25
Legislative drivers in Washington.....	25
RNG Program of Puget Sound Energy	25
RNG Pricing and Cost Sharing in other US states	27
RNG PRICING AND COST SHARING IN EUROPE.....	28
RNG Market – European Particularities	29
CONCLUSIONS	30
Summary of existing approaches.....	30
Conclusions.....	33
SELECTED REFERENCES.....	34

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ABBREVIATIONS

AD	Anaerobic digestion
CAPEX	Capital expenditures
CI	Carbon intensity
FOG	Fats, oil, grease
GJ	Gigajoule
PJ	Petajoule
RNG	Renewable natural gas

EXCHANGE RATE

The report uses the Bank of Canada exchange rate for November 2022:

1 USD = 1.3449 CAD

1 Euro = 1.3719 CAD

CURRENT STUDY IN CONTEXT

Current Information Gaps

Although the biogas and RNG industry in Canada has seen a steady development in recent years, growing from 180 to almost 280 biogas installations within the last decade, the potential for the industry is far from being used. RNG plays an important role in the development of clean fuel industry all over the world and NRCan aims to benefit from this valuable resource to grow the clean fuel industry. However, while RNG can be blended into the natural gas grid without any impact on end-users, the cost of its production is higher than conventional natural gas. To understand the cost impact on the end-users, NRCan aims to explore the current regulations on RNG pricing and cost sharing.

This initiative aligns closely with the main mission of Natural Resources Canada's Clean Fuels Branch.

Project Execution

Over the period of four months, BiogasWorld conducted interviews, data collection and analysis of data and documentation to ensure that the information presented in the current document is correct and relevant to the goals of the study.

Overall, BiogasWorld reached out to more than 50 RNG industry stakeholders from Canada and abroad, including gas utilities and industrial associations.

As of the end of December 2023, BiogasWorld conducted 24 interviews.

Issues of Scope

It is important to mention the following issues of scope:

- Due to the current energy situation in the European Union, the current RNG market is rapidly changing as new support schemes are being introduced. The current report provides the most recent information that can potentially change in the very near future.

Report Organization

The current document consists of four sections that are organized as follows:

Section 1 concentrates on Canadian RNG market and provides the information on regulatory drivers, existing RNG programs offered by natural gas utilities and their particularities. Additionally, the section contains information on major developments and suggested changes currently under consideration.

Section 2 presents the information on the current situation with RNG programs in the USA.

Section 3 describes the approach taken in Europe and presents several countries and their particularities.

Section 4 concentrates on the analysis of collected information.

RNG PRICING AND COST SHARING IN CANADA

Canadian Biogas and RNG Market

Current developments of RNG market are tightly connected to RNG injection into the gas grid as such projects are the only ones that may benefit from a long-term RNG purchase agreement with some Canadian utilities. There are only two Canadian provinces, British Columbia and Quebec, that have RNG programs run via natural gas utility. Ontario has a pilot project and applied for RNG program at the end of October 2022. This section presents the major RNG program particularities and developments.

RNG Pricing and Cost Sharing in British Columbia

Legislative drivers in British Columbia

The main regulations that drive the current RNG programs in BC are presented in the table below.

Table 1. RNG drivers in British Columbia

Legislation	Details
BC Clean Energy Act	<ul style="list-style-type: none"> Provides that the Lieutenant Governor in Council (LGIC) can prescribe undertakings to encourage public utilities to pursue certain greenhouse gas (GHG) reducing initiatives, Such initiatives may include projects, programs, contacts, or expenditures that aim the reduction of GHG emissions in BC.
Greenhouse Gas Reduction (Clean Energy) Regulation (GGRR)	<ul style="list-style-type: none"> Specifies that the prescribed undertakings are funded by public utilities and paid for by their customers, Allows the public utilities to acquire RNG by purchasing it (up to 31\$ per GJ for the fiscal year 2021/2022 and increasing the price cap annually by inflation), Allows the public utilities to acquire RNG by producing it (the levelized cost of production is set up as maximum amount), Limits the renewable natural gas content to 15 % of the total amount, in GJ, of natural gas provided by the public utility to its non-bypass customers, Allows the purchase of green and waste hydrogen, synthesis gas and lignin.
Clean BC plan and CleanBC Roadmap to 2030	<ul style="list-style-type: none"> Set out ambitious targets for reducing GHG emissions, including the sectorial emissions targets that range from 33 to 38 % for oil and gas sector.
Carbon Tax Act and BC Carbon Tax Regulation	<ul style="list-style-type: none"> RNG supply blended with natural gas deliveries is exempt from the carbon tax.

Current developments

British Columbia Utilities Commission BCUC is currently in [Phase 2 of its inquiry into the acquisition of RNG](#) by public utilities in BC. This inquiry focuses on environmental attributes and the possibility to deliver physical unit of natural gas along with environmental attributes associated with the production of a unit of physical biomethane which are contractually acquired by the BC public utility. Additionally, the inquiry investigates carbon intensity, fugitive methane emissions and the use of environmental attributes from other clean or renewable resources.

Major players and RNG Programs

In British Columbia, there are two public utilities that purchase RNG. Cost recovery mechanisms from end-users are specific for each utility. Below are the details for each program.

FortisBC Energy Inc.

The Renewable Natural Gas Program of FortisBC Energy Inc. (FEI) has been initially approved in 2010 for a pilot project and in 2013 on a permanent basis. The figure below summarizes the main elements of the program as of 2022.

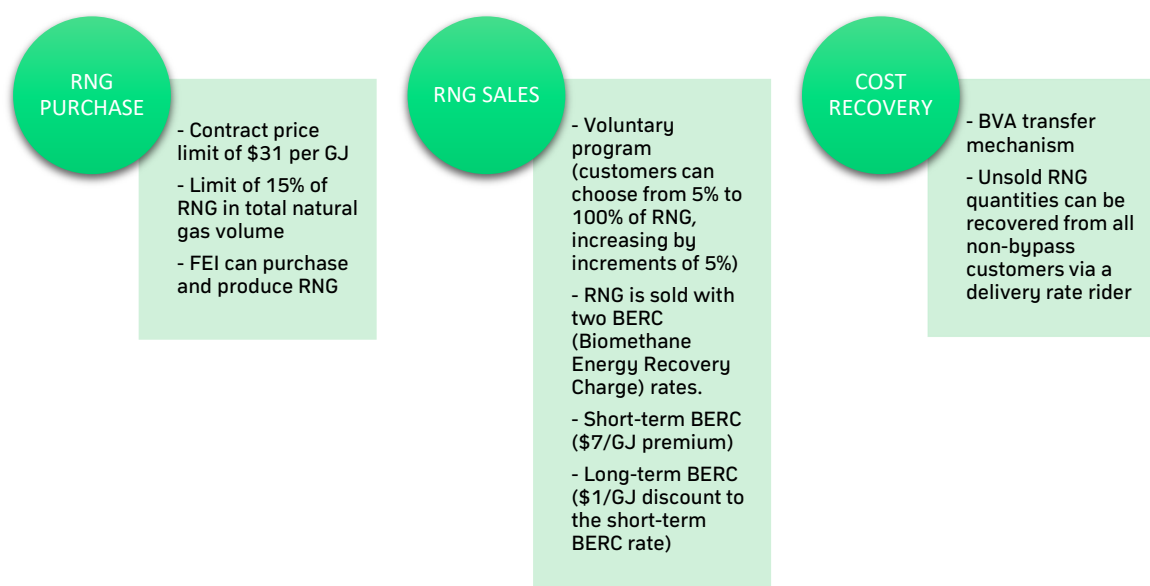


Figure 1. RNG Program of FEI, British Columbia

FEI is allowed to acquire RNG by purchasing it or by producing it. Currently, BCUC is also investigating the possibility of acquiring environmental attributes separately.

The price limit on RNG Purchase Contracts is \$31 per GJ for 2021-2022 with the future increase by the inflation rate. FEI can acquire up to 15% of the RNG in total natural gas volume.

The current RNG program offers a voluntary option of buying RNG for end-users with two rates:

1. Short-term BERC rate
2. Long-term BERC rate

The approved premium for short-term BERC rate is \$7 / GJ and the RNG price is set up on an annual basis. As of October 2022, the final RNG price using [the short-term BERC rate](#) for residential users and small commercial business equals \$13.808 /GJ.

According to provincial [Carbon Tax Regulation](#), the purchasers of RNG get the credit in the amount of carbon tax payable on the specified volume of percentage of RNG.

The existing FEI's cost recovery mechanism is called BVA (Biomethane Variance Account) transfer mechanism. Biomethane Variance Account (BVA) records all interconnection and biomethane program overhead costs and cost of biomethane supply. If biomethane is not sold within 18 months and/or 250 000 GJ, it is transferred to Midstream Cost Reconciliation Account (MCRA) at Commodity Cost Recovery Charge (CCRA) rate on January 1. As a result of this transaction, some costs still remain in BVA. These costs are to be amortized through delivery rates of all end-users (called non-bypass customers by FEI) on January 1 next year.

Currently, there are ongoing BCUC proceedings regarding FEI's Comprehensive RNG Program Review. All documents of the review can be access via [BCUC website](#).

Pacific Northern Gas Ltd.

The application for the approval of a Low Carbon Energy (LCE) Cost Recovery Mechanism by Pacific Northern Gas Ltd. (PNG) has been approved at the end of November 2023. The summary of the program is available in the figure below.

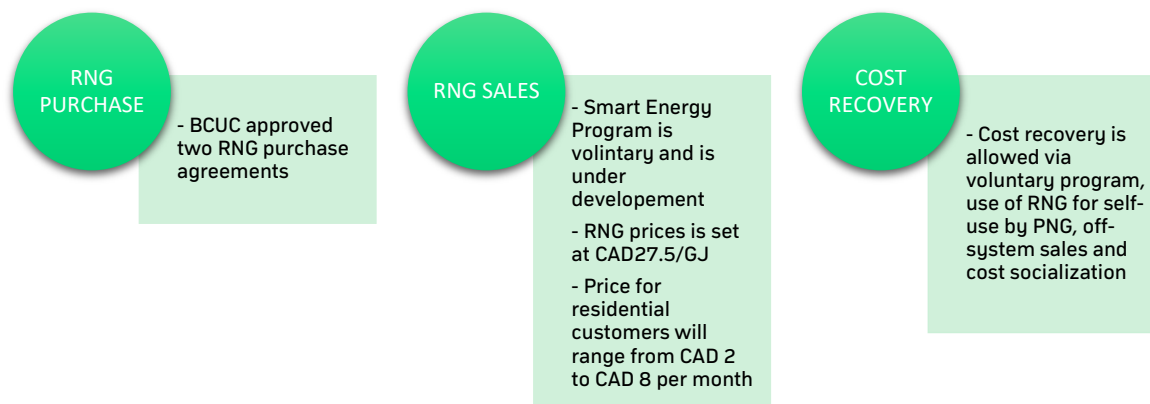


Figure 2. Low Carbon Program of PNG, British Columbia

According to the BCUC's current definition, low carbon energy includes both biomethane and conventional natural gas combined with separately acquired environmental attributes that arise from the production of biomethane.

BCUC accepted two purchase agreements for biomethane acquisition (ATCO and Tidal) by PNG. PNG did not identify any opportunities for ownership of RNG production facilities.

The Low Carbon Commodity Charge of CAD 27.50 per GJ has been approved. This cost aims to recover to the maximum the costs associated with RNG purchase without the necessity to socialize the remaining costs to all PNG users. The voluntary users will receive credit for the associated emissions reduction and biomethane credit under Carbon Tax Regulation.

Under the voluntary program, residential customers will be able to choose from 2 up to 100% RNG in their natural gas mix. As the program is under development, PNG plans that price for residential customers will range from CAD 2 to CAD 8 per month.

The cost recovery mechanism includes the establishment of a non-rate base deferral account and low carbon energy cost variance account that will capture the costs and recoveries associated with the program.

Cost recovery can be done using the following approaches:

- Voluntary Low Carbon Energy program
- Transfer of low carbon energy to RNG for its own use
- Off-system sales
- Recovery of remaining costs through cost recovery rider

PNG expects that the majority of RNG will be used for the company's own needs and does not expect high demand coming from its end-users.

RNG Pricing and Cost Sharing in Ontario

Legislative drivers in Ontario

The major driver of RNG industry development in Ontario is the Made-in-Ontario Environment Plan which identifies the actions that the government intends to take to achieve GHG emissions reduction goals. Additionally, the Plan indicates the intent to require natural gas utilities to implement a voluntary RNG program.

Major players and RNG Programs

Enbridge Gas Inc.

The current RNG Pilot Program was developed by Enbridge as an answer to Clean Fuel Standard when the Federal government was planning to include renewable content obligations for natural gas utilities. The final version of CFS does not have gaseous fuel obligations.

Ontario Energy Board (OEB) approved the Voluntary Renewable Natural Gas Program of Enbridge Gas Inc. (Enbridge) in September 2020. It is a pilot project known as "OptUp Program" that allows residential and small business customers to purchase RNG. The current pilot project has no cost recovery mechanism. The fixed monthly \$2 charge of participation in RNG program is used to fund the RNG purchase by Enbridge.

At the end of October 2023, Enbridge submitted the application to OEB to establish a Low-Carbon Voluntary Program for large volume sales service customers. The program plans to acquire up to one percent of its planned gas supply community portfolio as low-carbon energy in 2025 (four percent in 2028).

The cost recovery mechanism is based on a voluntary program; however, the proposal includes the ability to socialize the costs not recovered via this program. The residential charge is capped at CAD 2 per month for 2025 and can go up to CAD 8 per month in 2028 (the charge is linked to the target low carbon procurement amounts for 2025-2028).

RNG Pricing and Cost Sharing in Quebec

Legislative drivers in Quebec

The major regulatory drivers of RNG development in Quebec are presented in the following Table.

Table 2. RNG Drivers in Quebec

Legislation	Details
Energy Policy 2030 (Politique énergétique 2030)	<ul style="list-style-type: none"> • Sets the goal of <ul style="list-style-type: none"> ○ favoring the low carbon economy ○ increase of renewable energy production by 25% ○ Increase of bioenergy production by 50%
Green Economy Plan 2030 (Plan pour une économie verte 2030)	<ul style="list-style-type: none"> • Roadmap for the next 10 years • Goal of reduction of GHG emissions by 37.5% by 2030 • Use of RNG to green the natural gas grid • Use of RNG for heating
Act respecting the Régie de l'énergie (Loi sur la Régie de l'énergie)	<ul style="list-style-type: none"> • Regulates the responsibility of the Energy Commission (Régie de l'énergie) to approve the supply plans of RNG • Specifies that the government may make the regulations determining the quantity of RNG to be delivered by a natural gas distributor and the terms and conditions of such delivery
Regulation respecting the quantity of renewable natural gas to be delivered by a distributor (Règlement concernant la quantité de gaz naturel renouvelable devant être livrée par un distributeur)	<ul style="list-style-type: none"> • Sets the legally binding RNG injection targets based on natural gas volume: <ul style="list-style-type: none"> ○ 1% of RNG in natural gas grid in 2020-2021 ○ 2% in 2023 ○ 5% in 2025 ○ 7% in 2028 ○ 10% in 2030

Major players and RNG Programs

In Quebec, there are two public utilities, Energir and Gazifère, that purchase RNG; the cost recovery mechanisms from end-users are specific for each utility.

Energir

The first injection of RNG to Energir natural gas grid was done in 2017. The details of current RNG Program offered by Energir are presented in the Figure below.

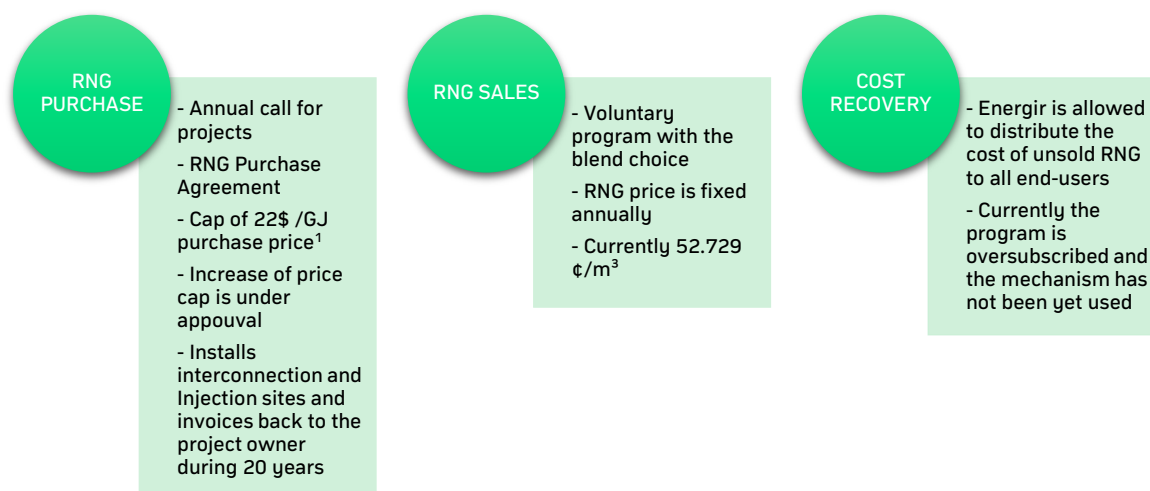


Figure 3. RNG Program of Energir, Quebec¹

Energir is using several different tactics to acquire RNG:

1. RNG acquisition via RFP. Once a year, Energir issues the Call for Interest and Call for Proposals to procure RNG. The first call for proposals was published at the end of 2021. This year, Energir published its Request for Information on October 31, 2022 to procure between 70 and 100 Mm³/year (2.6-3.8 PJ) of RNG by October 2024.
2. RNG Projects development. Energir develops business opportunities with RNG project developers and negotiates the contracts on an individual basis.
3. Energir may as well purchase RNG on spot market.

As part of project developments, Energir is responsible for interconnection and injection sites. In this case, all capital expenses connected to interconnection and injection are invoiced back to the project owner for 20 years.

Currently, Energir has a purchase price cap of 22\$/GJ and each RNG procurement contract should be approved by the Energy Commission (Regie de l'Énergie). However, the application to increase the cap is under consideration with Regie de l'Énergie. It is suggested that the price can go up to 45\$/GJ¹.

To sell acquired RNG, Energir is offering a voluntary program where end-users can choose the blend they need. The current RNG tariff starting 1 October 2022 is 52,729 ¢/m³ (\$13.98/GJ). Although the RNG tariff is

¹ The approved purchase price changed after the final report for this project has been prepared. The price approved for 2023 can go up to \$45/GJ under certain conditions.

established every year, to protect the end-users, Energir signs RNG contracts for 20 years, thus allowing the establishment of a stable tariff.

Additionally, the end-users that buy RNG are not charged Carbon tax under the current Quebec's [SPEDE](#) (Quebec's Cap-and-Trade System, Système de plafonnement et d'échange de droits d'émission) .

The existing mechanism of cost recovery allows Energir to invoice all the end-users to cover the unsold RNG, however, as of today, the demand for RNG from end-users is higher than supply.

Gazifère

The specifics of Gazifère's RNG program are presented in Figure 3.

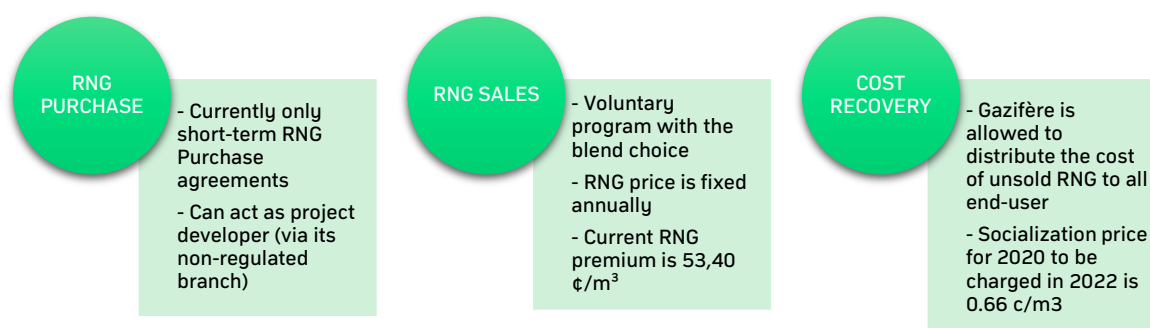


Figure 4. RNG Program of Gazifère, Quebec

As of now Gazifère has only short-term RNG procurement contracts. However, they plan to sign long-term RNG procurement contracts in the near future.

Additionally, acting via its non-regulated subsidiary, Gazifère has the ability to act as project developer participating in the project's development and construction. The capital and operational expenditures of such projects, where Gazifère acts as developer will be covered under RNG purchase contract signed for RNG procurement that should be approved by the Energy Commission (Regie de l'Énergie).

The interconnection costs will be covered by tariffs charged to the end-users.

Gazifère offers voluntary program for end-users where they can choose to buy from 1 up to 100% of RNG. The tariff is updated each year. The current tariff is as follows:

- RNG rate depending on the service:
 - 1) Sales Service: 53.40 ¢/m³ (CAD 14.16/GJ)
 - 2) Western T-Service: 80.37 ¢/m³ (CAD 21.31/GJ)
 - 3) Dawn T-Service: 84.52 ¢/m³ (CAD 22,41/GJ)
 - 4) Ontario T-Service: 85.47 ¢/m³ (CAD 22,66/GJ)
- The carbon tax (SPEDE) is not charged to the end-users for the portion of RNG if it meets the required minimum threshold set by the government (2% in 2023, 5% in 2025, 7% in 2028 and 10% in 2030)

Gazifère has the right to socialize the costs related to upsold renewable natural gas to all customers that did not voluntarily opt for RNG rate or did not meet the required minimum threshold of maintenance.

The charge is based on the difference between the costs related to the RNG purchase and the revenues from the voluntary sale of RNG.

For 2020, the socialization of unsold RNG is 0.66 ¢/m³ (CAD 0.17/GJ) and will apply in 2022 for all natural gas volumes delivered to the end-use customers.

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RNG Pricing and Cost Sharing in other Canadian provinces

As it has been specified in the previous sections, only the provinces of British Columbia, Ontario and Quebec have approved RNG programs that are able to actively purchase RNG from different sources and sell it to end users, either residential clients or businesses. For all other provinces, RNG is treated on the same pricing and regulatory basis as conventional natural gas.

Differently from other provinces, in Alberta, there are competitive retailers aggregating gas supply from gas suppliers of their choice and making the supply available on behalf of the customers they acquire. The aggregated supply from retailers could potentially include some component of RNG and can be marketed as renewable content in the natural gas supply. However, there is no subsidy mechanism for RNG pricing in Alberta.

Additionally, Alberta Utilities Commission has approved renewable natural gas distribution system transportation rates for ATCO Gas and Pipelines setting up the gas quality and specifications to help ensure compatibility with the pipeline system gas quality.

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RNG PRICING AND COST SHARING IN THE USA

RNG Pricing and Cost Sharing in California

According to California Public Utilities Commission, public utilities in California do not currently procure RNG on behalf of their core customers (residential users and small businesses). CPUC has adopted [decision D.22-02-025](#) to implement [Senate Bill 1440](#) that requires CPUC to consider adoption biomethane procurement targets or goals for each investor-owned utility (IOU) providing gas service in California. The decision establishes a biomethane procurement program and several short-term and medium-term procurement goals, including procurement of 17.6 billion cubic feet of RNG (18.6 PJ) by 2025 targeting organic waste directed from landfills. Medium-term target is the procurement of 72.8 billion cubic feet of RNG (76,9 PJ) per year (dairy biomethane is limited to 4% of procurement).

This decision aims to assist the state in meeting short-lived climate pollutants (SLCP) emissions reduction goals established by SB 1383 and requires the utilities to develop the methodology for RNG procurement in a cost-effective manner. RNG procurement contracts are to be approved and the utilities are required to prepare the biomethane procurement plan.

Additionally, SoCalGas offers [Biogas Conditioning and Upgrading services](#) for RNG projects. All conditioning and upgrading facilities are designed, constructed and owned by SoCalGas.

RNG Pricing and Cost Sharing in Oregon

Legislative drivers in Oregon

The main driver of RNG injection into the natural gas grid is the [State Bill 98](#) that came into effect in 2019. This bill allows the utilities to make qualified investments and procure RNG from third parties to meet the following requirements:

- 2020-2024 – 5% of RNG in natural gas grid
- 2025-2029 – 10%
- 2050 – 30%

The law allows up to 5% of the utility revenue requirement to be used to cover RNG costs.

The [Rule 860-150-0050](#) of Oregon Public Utility Commission on Environmental Attributes and Renewable Thermal Certificates (RTCs) requires the use of RTCs to track the chain of custody of the environmental attributes of RNG produced or purchased for the utility's retail natural gas customers in Oregon via M-RETS renewable energy certificate system.

RNG Program of NW Natural

The summary of NW Natural's program is available in the following Figure.

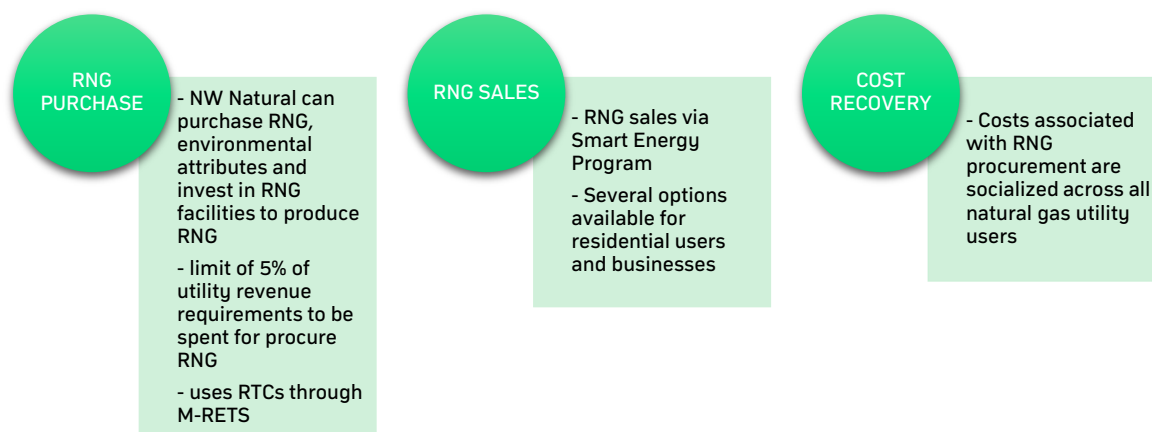


Figure 5. RNG Program of NW Natural, Oregon, USA

NW Natural acquires RNG by buying environmental attributes, or Renewable Thermal Certificates (RTCs) through RNG marketers, through project developments like [Tyson Foods project](#) and by purchasing the RNG from RNG facilities and injecting it into the natural gas grid.

NW Natural is obligated to build interconnection and injection stations as soon as the project satisfies the interconnection requirements. All associated costs are paid by the project.

NW Natural has the limit of 5% of utility revenue requirements that it can spend to procure RNG.

Additionally, NW Natural offers [interconnection services](#) to RNG projects.

M-RETS (Midwest Renewable Energy Tracking System) is used to create, track and retire RTCs (Renewable Thermal Certificates) associated with renewable energy production. Created RTCs are transferred to the utility at the time of RNG purchase and the utility retires them on behalf of customers.

End users and businesses can opt in to buy RNG using the following prices:

- Residential users' premium:
 - Average home option: fixed rate of US\$5.50 (CAD 7.4) each month that allows to offset the emissions of 630 therms (66 GJ) per year (US 1/GJ, CAD1,36/GJ),
 - Climate neutral option: around 10.5 US cents per therm (US\$0.99/GJ, CAD1.33/GJ) to offset 100% of carbon emissions
- Businesses
 - Fixed monthly rate (to offset carbon emissions, % of emissions to reduce can be selected)
 - Smart Energy Circle to offset 100% of carbon emissions

70% of payment received under the Smart Energy Program is used to support individual carbon-offset projects with the remaining 30% used for customers education and program administration.

The costs associated with RNG procurement are socialized across all natural gas utility users.

RNG Pricing and Cost Sharing in Michigan

In Michigan, [Public Act 87](#) of 2021 directed the Michigan Public Service Commission to conduct a study into the potential for RNG development. Thus, as of today there are no utilities purchasing RNG as part of the retail customer supply.

DTE Energy offers a pilot voluntary program called CleanVision Natural Gas Balance that allows the end users to offset their natural gas emissions by paying monthly premiums. The following premiums are established for 2022:

- 25% offset - US\$4 (CAD 5.38) monthly
- 50% offset - US\$8 (CAD 10.76) monthly
- 75% offset - US\$12 (CAD 16.14) monthly
- 100% offset - US\$16 (CAD 21.52) monthly

The above estimations are based on the average Michigan household consumption.

The utility acquired both RNG and environmental attributes for this program.

Under the existing [MPSC decision](#), DTE Gas is prohibited from recovering the costs of voluntary program through non-participating customers.

RNG Pricing and Cost Sharing in Vermont

Legislative drivers in Vermont

The main legislation that drives the interest of utilities to acquire RNG is the Global Warming Solutions Act (Act 153 as Enacted) that created legally binding emissions reduction targets for the state. The Act requires the reduction of GHG emissions of 26% below 2005 levels by 2025 with an end target of 80% below 1990 levels by 2050.

However, there are no further regulations that further specify the process of how these targets reductions will be achieved. According to Vermont Gas, the Clean Heat Standard that was not accepted this year will be proposed again next year. The main provision in the proposed standard that may affect the current RNG program is the requirement to physically procure the RNG amounts (as opposed to acquisition of environmental attributes).

RNG Program of Vermont Gas Systems

In the absence of legally binding utilities targets in current Vermont legislation, VGS follows its own climate plan unveiled in 2019. VGS is striving to get to NetZero by 2050 with the immediate goal of reducing GHG emissions for their customers by 30% in the next 10 years.

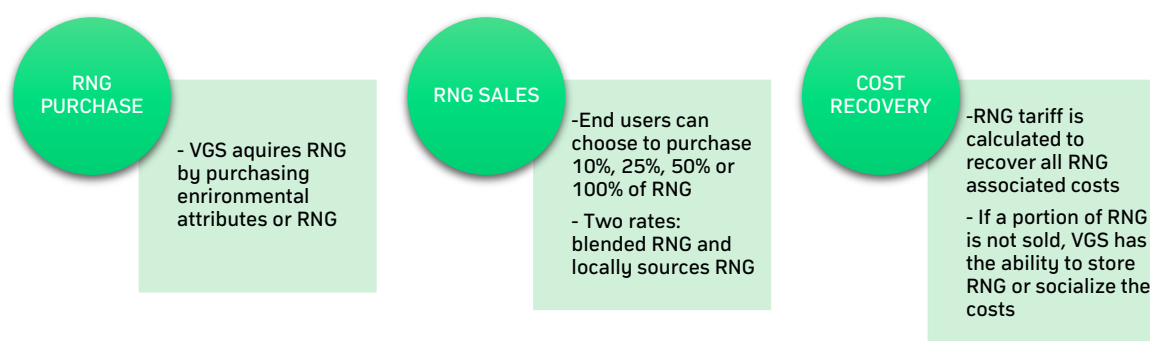


Figure 6. RNG Program of Vermont Gas Systems, Vermont, USA

Currently, VGS is mainly acquiring either environmental attributes via third party marketers or offtakes already produced RNG. VGS has the ability to participate in construction of plants in future.

The current regulations oblige VGS to receive the approval of Public Utilities Commission (PUC) for any RNG acquisition coming from outside the state, however, the RNG purchase within the state does not require PUC approval, if the contract is proposed for the period of less than 5 years or does not exceed 10% of the total RNG supply.

While VGS is not obliged to connect RNG projects to its system, VGS works with projects to make their system accessible. All expenses for interconnection and injection are paid back by the project either up-front as a lump sum or over time as a component of a facilities development agreement. Typically, the term ranges from 5 to 10 years.

The RNG voluntary program is available starting 2017 for all end users where they can choose to purchase 10%, 25%, 50% and 100% RNG.

Vermont Gas users have two choices when it comes to the origin of RNG. They can choose:

1. Blended RNG (S-RNG) that supports the supply from all of VGS's RNG sources
2. Locally sourced RNG that supports local supplies of RNG by acquiring the renewable attributes from Vermont projects

The price adder changes four times a year when VGS updates all its prices. It is established by subtracting the average commodity cost of natural gas from the average RNG community cost. As of October 2022, the RNG adder is as follows:

- Blended S-RNG Adder per Ccf: \$1.0298 (US 0.77/GJ, CAD 1.04/GJ)
- Locally Sourced S-RNG Adder per Ccf: \$1.3754 (US 1.033/GJ, CAD 1.39/GJ)

As natural gas and RNG prices are updated four times a year, the established RNG price is calculated to recover all RNG associated costs. However, during the period VGS has unsold RNG, it can either store the unsold RNG in its storage facilities or has the ability to distribute the cost to all end-users. In this case, VGS is allowed to socialize up to 2% of the cost of the total RNG supply.

RNG Pricing and Cost Sharing in Washington

Legislative drivers in Washington

In Washington, [House bill 1257](#) requires gas utilities to offer voluntary RNG program to its users limiting the maximum customer charge to 5% of the amount charged to retail customers for natural gas, thus allowing the socialization of RNG procurement costs to all end-users.

In January 2023, the Cap-and-Trade program starts. This program will require utilities to reduce their carbon footprint using renewable energy from Washington state.

RNG Program of Puget Sound Energy

The summary of Puget Sound Energy's (PSE) program is available in the following Figure.

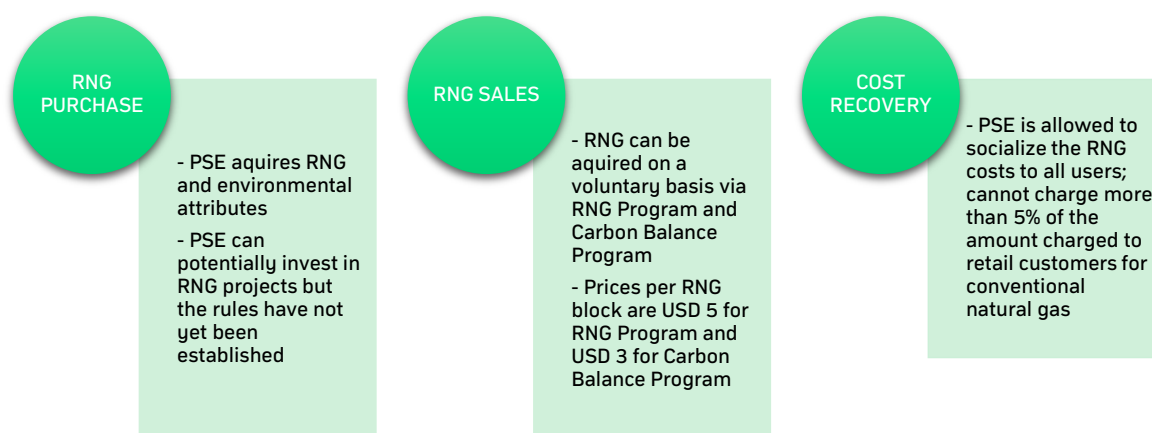


Figure 7. RNG Program of PSE, Washington, USA

The current PSE's RNG program is voluntary and allows the end-users to buy blocks of RNG to achieve 100% carbon neutral natural gas usage. Each block of RNG (2.7 therms of conventional natural gas, i.e., 0.28 GJ) costs USD 5 (CAD 6.72) per month, meaning that the price for GJ is USD 17.86 (CAD 24.02)

Additionally, PSE offers the program called Carbon Balance that allows the acquisition of carbon offsets. The price starts at USD 3 (CAD 4.03).

PSE is allowed to acquire RNG and environmental attributes. The utility can potentially invest in new facilities, but the rules of such participations have not yet been established. The same concerns the interconnection and injection costs.

Starting January 2023, the state of Washington will have an active Cap-and-Trade program. The program requires PSE to use RNG that is produced in the state and in close vicinity. As currently, it uses the majority of RNG produced in Washington state, the obligations and exemptions under this new program are not yet

clear, but if the utility will have to pay carbon pricing, it will be charged to end-users, thus the end-users that acquire RNG via voluntary program should be exempt.

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RNG Pricing and Cost Sharing in other US states

Several other states offer voluntary programs (for example, NW Natural in Washington) or work with Utilities commissions to establish the RNG programs.

In Minnesota, CenterPoint Energy has been denied the Voluntary Green Tariff by the Minnesota Public Utility Commission. Currently, the major driver that allows the use of renewables in the grid is the Natural Gas Innovation Act that offers voluntary participation. This Act encourages the utilities to prepare the plan of grid decarbonization to reduce the emissions for all customers. The plan should be approved by the Minnesota Public Utilities Commission.

In Kansas and Nebraska, the pilot RNG Voluntary Programs offered by Black Hills Energy have been approved by the local Utilities Commission. Both programs acquire only environmental attributes and offsets via third party, 3Degrees. The programs are self-funded, so no cost socialization is allowed. The energy is sold by blocks or 20.5 therms (2.16 GJ) for USD 5 (CAD 6.72). Thus, the price for GJ is USD 2.31 (CAD 3.10).

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RNG PRICING AND COST SHARING IN EUROPE

Unlike the majority of Canada, natural gas market in Europe is deregulated and the prices are determined by supply and demand. The switch from natural gas pricing based on oil-indexation system following the oil price trends occurred in 2000 when EU moved to “gas-on-gas” competition where prices reflect multiple sellers and buyers on spot market.

In the absence of biomethane trading index in Europe, the price of RNG is subject to negotiation between the producer and buyer. The certificates of origin generated by the RNG producers are traded separately to allow for additional revenue.

Major regulatory documents that drive RNG industry in Europe are presented in the table below.

Table 3. RNG Drivers in Europe

Legislation	Details
European Green Deal	<ul style="list-style-type: none"> • Full decarbonization - no net emissions of GHG by 2050 • Increasing the EU's climate ambition
Renewable Energy Directive II	<ul style="list-style-type: none"> • Currently under revision • Binding target of renewables in energy mix to 32% by 2030 (proposal of 40%) • Advanced biofuels and biomethane produced from a specific feedstock to transport
FitFor55 package	<ul style="list-style-type: none"> • Set of proposals to achieve 55% emissions by 2030
REPowerEU Plan	<ul style="list-style-type: none"> • Proposal to increase RES target of 45% (from 40% in RED II) • Boosting RNG production to 35 billion m3/yr by 2030
Biomethane Action Plan	<ul style="list-style-type: none"> • Double the EU biomethane production to 35 billion m3/yr by 2030

In the absence of regulatory caps for natural gas prices in Europe, the prices that end-users pay for natural gas with or without RNG are set up via supply-demand mechanism and thus can fluctuate substantially. In the majority of European countries the RNG is injected in the natural gas distribution grid as natural gas and 15 EU countries impose the obligation on the natural gas operators to provide a connection point for RNG injection ([Acer, 2020](#)).

The analysis of several European countries shows that in the majority of cases, RNG supply and demand within each country is balanced. The exception will be Sweden and Denmark where Sweden imports Danish RNG. Additionally, Germany sells some RNG to countries like the Netherlands and Switzerland.

Certificates of origin issued for produced RNG are traded to bring additional revenue. While the majority of countries have some type of registry for the certificates of origin, their trade across the borders is still in development due to the lack of homogeneous registry system. The [REGATRACE project](#) scheduled to finish at the end of 2022 aims to create an efficient trade system based on issuing and trading biomethane/renewable gases Guarantees of Origin (GO) with exclusion of double sale.

RNG Market – European Particularities

While the supply and consumption of RNG are similar in European countries, some particularities still exist. Below are some examples.

Denmark

- Denmark is producing more biomethane than it consumes, exporting it to Sweden, where the incentives support the consumption side (tax exemption) allowing for this RNG to be subsidized on production side in Denmark and consumption side in Sweden.
- RNG producers inject the RNG into the local gas distribution system or the transmission system. Gas grid operators have the obligation to connect RNG projects upon request, but the injected RNG does not differ from natural gas and does not have any preferential use.
- The RNG producers sell the RNG on the same terms as conventional natural gas. At the same time the producer receives the “green” biomethane certificates that are accepted by EU Emissions Trading System (EU ETS) and can be traded commercially.
- Certificates price is considered as steady and trades at around 10-20 Euro/MWh (CAD 13.72-27.44/MWh)

France

- France offers the RNG support with Feed-in-Tariff for 15 years that consists of Reference tariff (between 64 Euro and 95 Euro, CAD 87.8 – 130.33) and Premium for feedstock (varies between 5 Euro and 39 Euro, CAD 6-53.5)
- End-users in France can choose to buy different blends of RNG in their natural gas supply
- RNG purchasers do not pay Domestic Natural Gas Consumption Tax ([TICGN](#))

Germany

- Germany exports small portion of its RNG to the Netherlands and Switzerland
- The use of RNG for electricity generation is supported by existing schemes
- RNG producers have preferential access to gas grid connection and injection of the RNG as compared with domestic natural gas production and import.

Netherlands

- Netherlands has its own national renewable gas registry operated by Vertogas. It is mandatory to register and certify via Vertogas.
- Production of RNG and its injection is supported via SDE++ scheme

Sweden

- Unlike other European countries, Sweden offers RNG support on consumption side, meaning that the users of RNG do not pay taxes when they consume RNG
- This approach makes the Danish RNG exported to Sweden double subsidized (RNG gets subsidy on production side in Denmark and on consumption side in Sweden)

UK

- The main use of RNG in UK is heating and cooling.
- Until 2021, the RNG injected into the gas grid was offered a feed-in-tariff under Renewable Heat Incentive.

CONCLUSIONS

Summary of existing approaches

The analysis of the information obtained for this project allows us to say that there is a difference between the RNG industry's approaches in North America and Europe. In North America, the utilities are regulated and are expected to obtain permissions to purchase and sell RNG to their clients. Overall, RNG is perceived as a specific commodity. In Europe, RNG in most cases is treated as natural gas with associated certificates of origin that can be traded separately to obtain additional project revenue.

Table 4 summarizes different approaches in North America.

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Table 4. Particularities of RNG programs in North America

Details	FortisBC, BC, Canada	Pacific Northern Gas, BC, Canada	Enbridge, ON, Canada	Energir, QC, Canada	Gazifère, QC, Canada	NW Natural, OR, USA	Vermont Gas, VT, USA	Puget Sound Energy, WA, USA	Black Hills Energy, KS, NE, USA
Type of Program	Regular, approved	Regular, approved	Proposed	Regular, approved	Regular, approved	Regular, approved	Regular, approved	Regular, approved	Pilot, Approved
RNG Price or Premium for RNG	Premium: CAD 6-7/GJ) RNG price: CAD13.81/GJ	RNG price: CAD27.50/GJ Residential: CAD 2-8 (under development)	To be determined	RNG price: CAD13.98/GJ	RNG price: CAD 14.16-22.66/GJ	RNG premium: CAD 1.36/GJ	RNG premium: CAD 1.04-1.39/GJ	RNG price: CAD 24.02/GJ	Offsets: CAD 3.10/GJ
RNG procurement specifics	Contract price limit of CAD 31/GJ	Approved purchase contracts	To be determined	Contract price limit of CAD 22/GJ – Application to increase is under consideration	Only short-term procurement now	Allowed to purchase RNG, environmental attributes and develop projects	Allowed to purchase RNG, environmental attributes	Allowed to purchase RNG, environmental attributes	Acquires environmental attributes only via 3Deegrees
Possibility of purchasing environmental attributes	Currently under investigation with BCUC	Yes	To be determined	Not available	Not available	Yes	Yes	Yes	Yes
Cost recovery mechanisms	Via voluntary program Unsold RNG can be socialized through delivery rates to all end-users	Via voluntary program Transfer for self-use Off-system sales Socialization of costs	Via voluntary program to large volume customers Unsold RNG cost recovery via socialization	Via voluntary program Cost of unsold RNG can be socialized to all end-users	Via voluntary program Cost of unsold RNG can be distributed to all end-users; Socialization price is identified in tariff	Costs associated with RNG procurement are socialized across all natural gas utility users	Costs recovered via RNG tariff that is updated four times a year Not sold portion can be stored or socialized	Costs associated with RNG procurement are socialized across all natural gas utility users; Cap exists	Pilot is self-funded, no socialization is allowed

Details	FortisBC, BC, Canada	Pacific Northern Gas, BC, Canada	Enbridge, ON, Canada	Energir, QC, Canada	Gazifère, QC, Canada	NW Natural, OR, USA	Vermont Gas, VT, USA	Puget Sound Energy, WA, USA	Black Hills Energy, KS, NE, USA
Relief from carbon pricing	End-users purchasing RNG get the credit equal to carbon tax	End-users purchasing RNG get the credit equal to carbon tax	To be determined	End-users do not pay carbon tax under SPEDE	End-users do not pay carbon tax under SPEDE	No carbon pricing in state	No carbon pricing in state	Cap-and-trade comes into effect in January 2023. Exemptions are not yet clear	No
Possibility of utilities producing RNG	Yes	PNG did not identify any opportunities	To be determined	Yes, via its non-regulated subsidiary	Yes, via its non-regulated subsidiary	Yes	Yes	Utility can potentially invest in projects, but the rules are not yet established	Not applicable
Injection and interconnection cost (CAPEX) handling approaches	Information not available	Information not available	To be determined	All CAPEX connected to injection and interconnection are invoiced back to the project (20 years)	Information not available	All CAPEX is paid by the project	All expenses are paid back by the project either up-front as a lump sum or over time	The rules are not yet established	Not applicable

The report analyzed eight RNG programs offered by the utilities in Canada and the USA and one proposed program by Enbridge. This program in Canada is at the application level. One of analyzed programs by Black Hills Energy in Kansas and Nebraska is a pilot project.

Most utilities in Canada that have RNG programs can procure RNG but not environmental attributes. In the US, the utilities can acquire environmental attributes and offsets along with RNG.

Apart from the pilot project by Black Hills Energy, the cost recovery mechanisms are based on voluntary programs participation. In the US, several utilities are socializing RNG costs across all natural gas utility users in Oregon and Washington, while most Canadian utilities may socialize only the RNG portion unsold via voluntary program. A new approach is offered by Enbridge in their recent application for Low-Carbon Program that aims to offer voluntary program only to large volume buyers while all costs to be distributed among all the end-users. However, it is important to note that this program has not yet been approved.

There is as well a difference between the carbon pricing relief for customers in two countries. As Canada has active carbon pricing legislation, the end-users who opt in to purchase RNG via voluntary program do not pay carbon tax. As in most US states, there is no carbon tax and this relief is not applicable.

Apart from pilot projects in Kansas and Nebraska, utilities can participate in the production of RNG, either directly or via its non-regulated subsidiary. The injection and interconnection for RNG projects should be done by utilities but all the costs are either charged back to the project as a lump sum or via a long-term agreement.

Conclusions

Based on the analysis of RNG programs in North America and Europe, the following conclusions can be made:

1. The major drivers of RNG use in North America and Europe are binding or voluntary targets set up by the governments to increase the renewable content or reduce emissions. Several stakeholders that participated in this study suggested that the Canadian standard requiring mandatory RNG blend will increase the development of the industry.
2. Talking specifically about existing RNG programs in North America, it is possible to distinguish between two main approaches: Canada regulates the purchase price of RNG and has a stricter approach to what costs can be distributed to end-consumers, while certain US utilities are allowed to socialize the costs to all end-users.
3. Several utilities in the US offer the offset programs, for example, Puget Sound Energy and Black Hills Energy that offer carbon neutral natural gas usage by purchasing the carbon credits.
4. Currently, the end users who opt in to purchase RNG pay more than those who choose to consume less expensive natural gas. The main incentive to subscribe by corporate users, for example, is the internal corporate clean energy or GHG emissions targets.
5. Most study participants highlighted the importance of addressing the opportunities that environmental attributes can present, either for monetization by end users directly or by trading the attributes by utilities and reducing the costs for end-users. In Europe and US environmental attributes are traded while in Canada this market is yet to be developed to allow the monetization of such attributes.

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