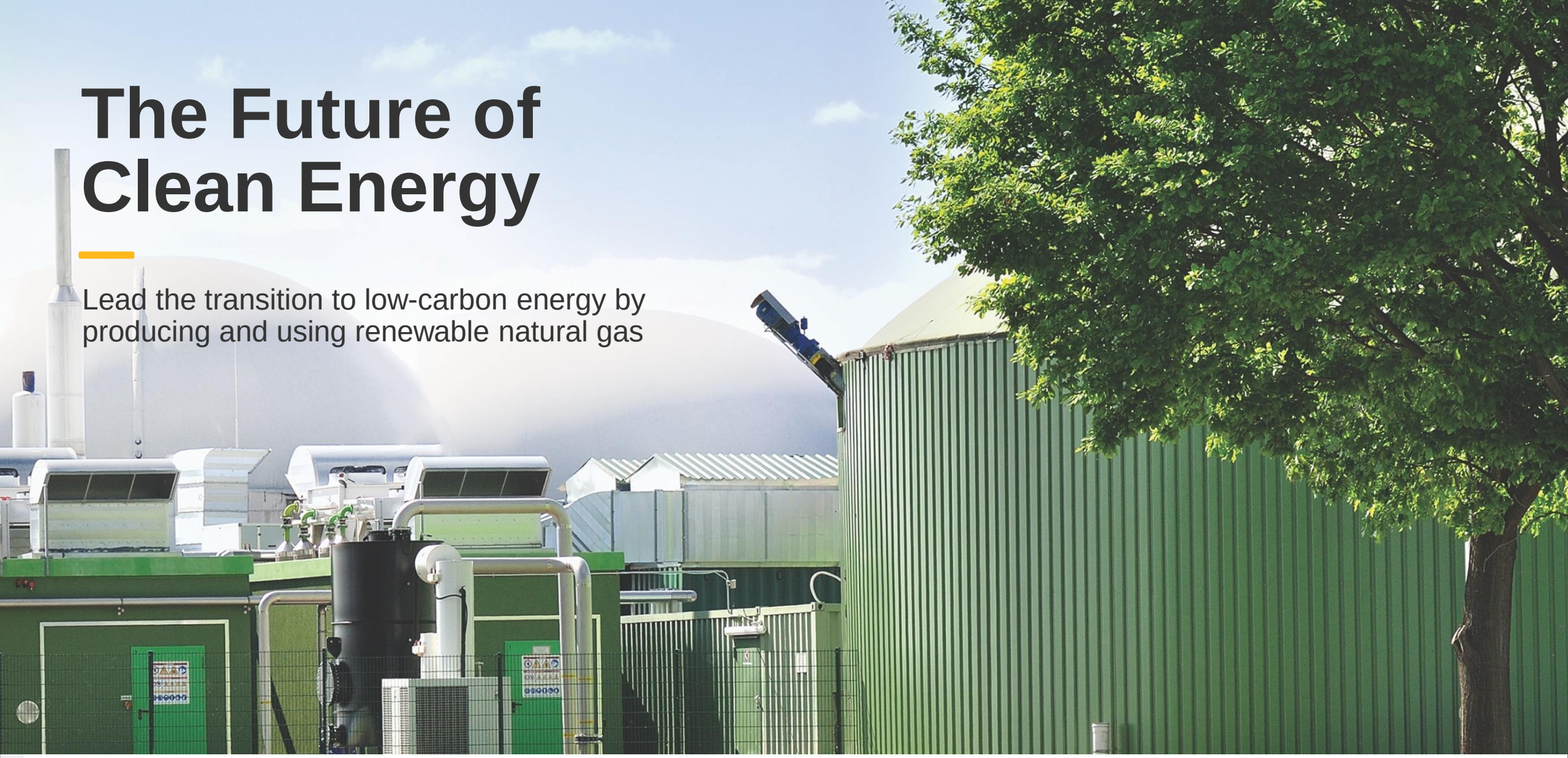
The Future of Clean Energy

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



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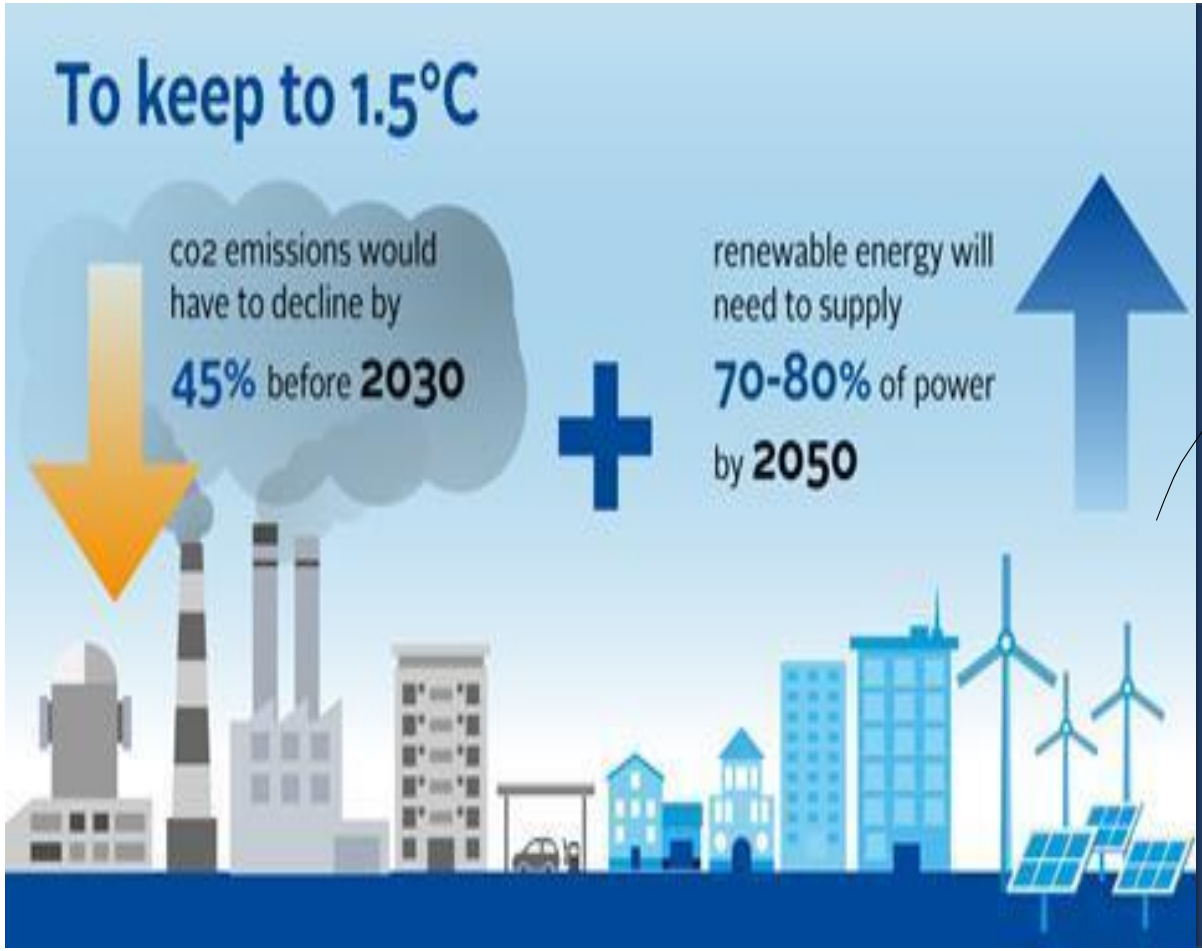
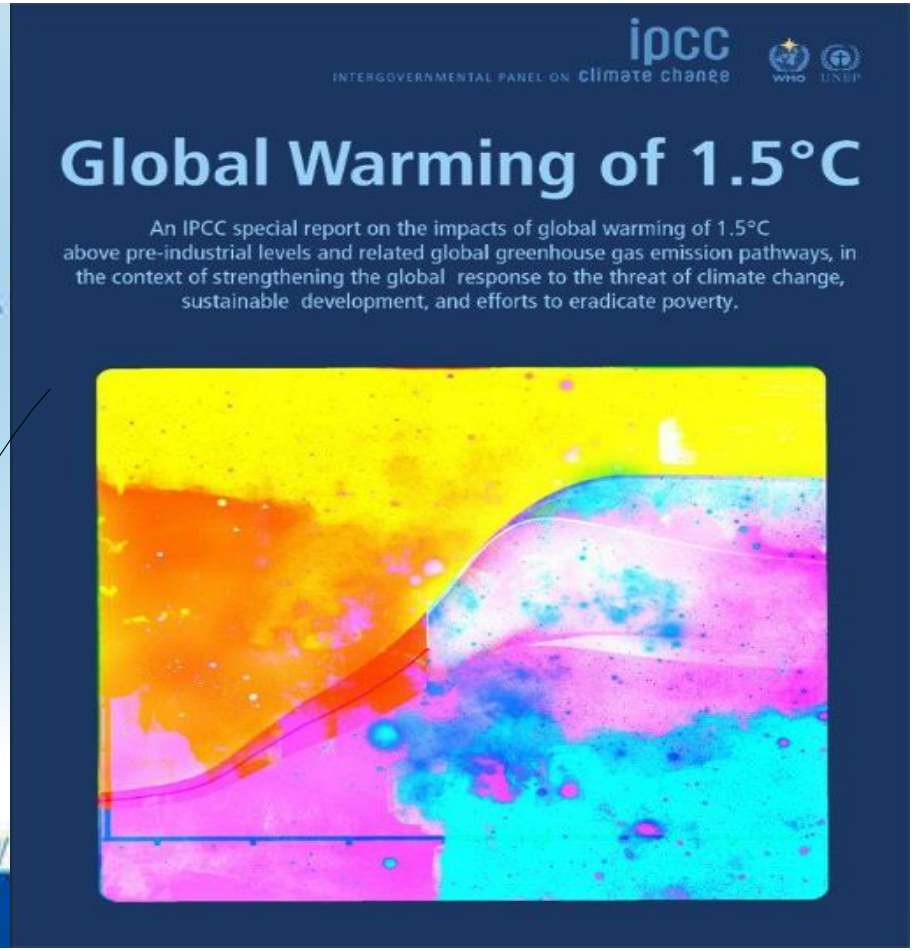
What We'll Cover

- Overview of RNG
- Enbridge RNG programs
- RNG Opportunities for Businesses
- Questions

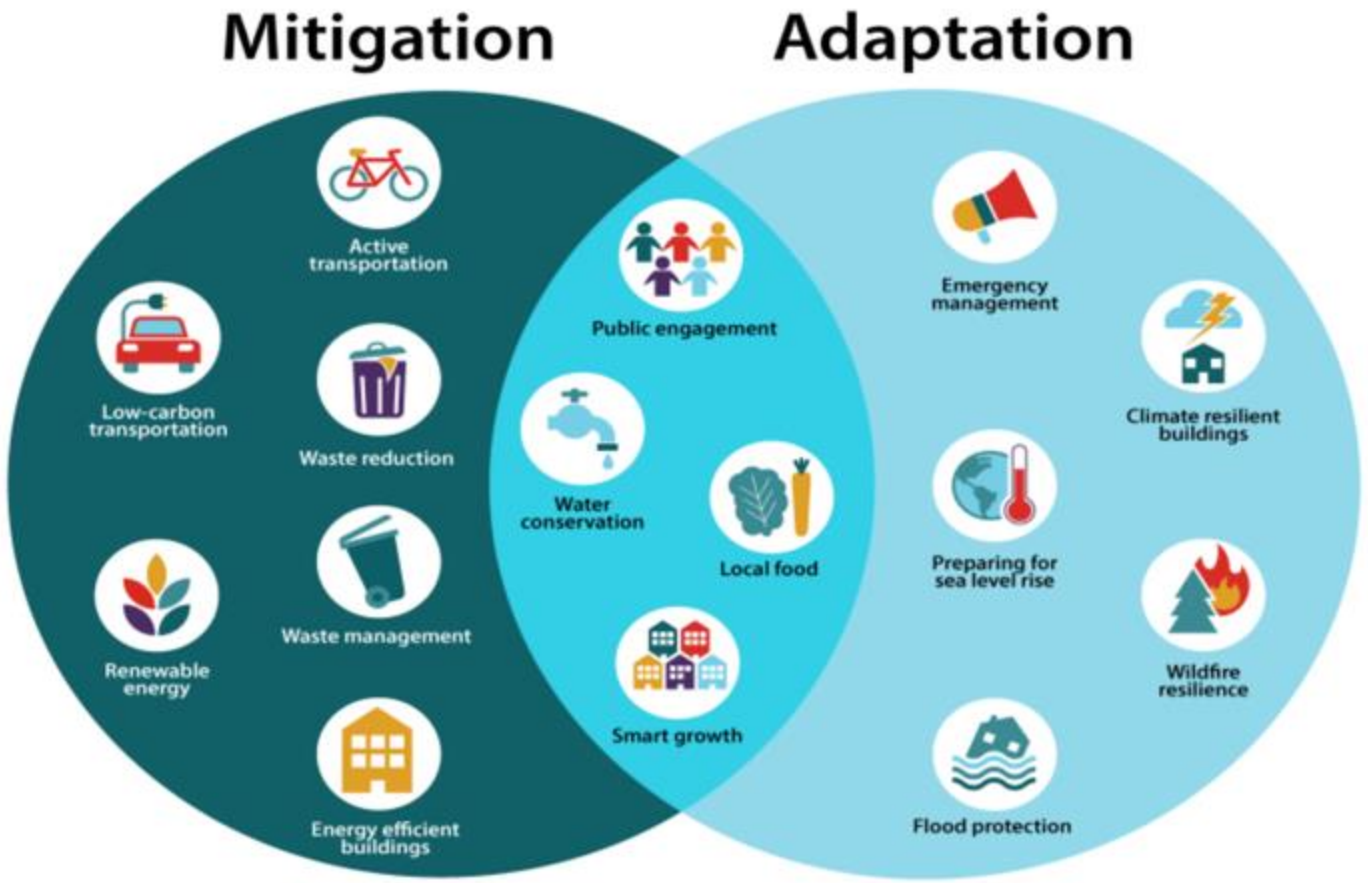
THE DRIVER – TODAY'S CLIMATE LANDSCAPE





Source: unpri.org

Doing what is Right…



- Source: Climate Adaptation - District of Squamish - Hardwired for Adventure

Low-Carbon Growth - RNG

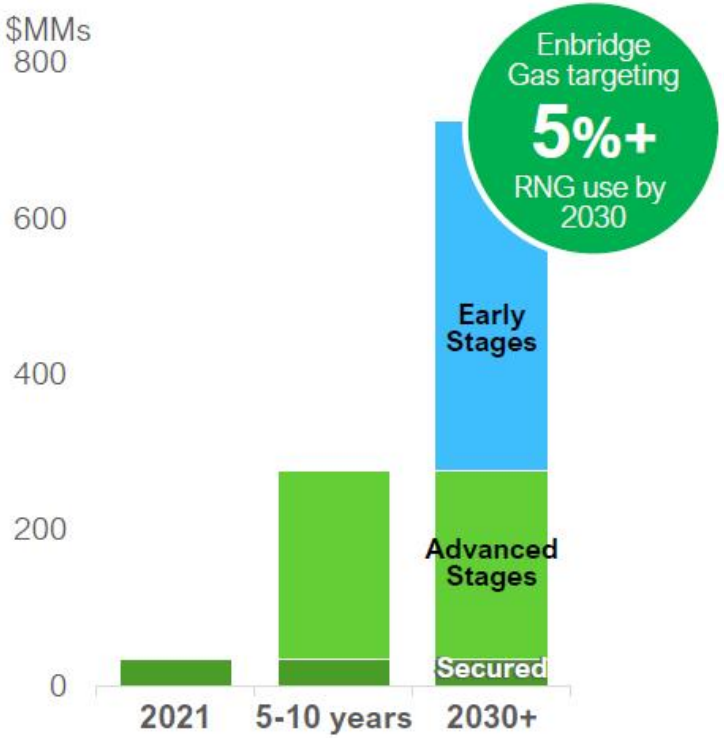
Expanding Utility Portfolio

- Focused on In-franchise investments
- Current projects reduce 93,000 tCO_2e emissions annually
- **~55 in-franchise projects in development**

Strategic Partnership

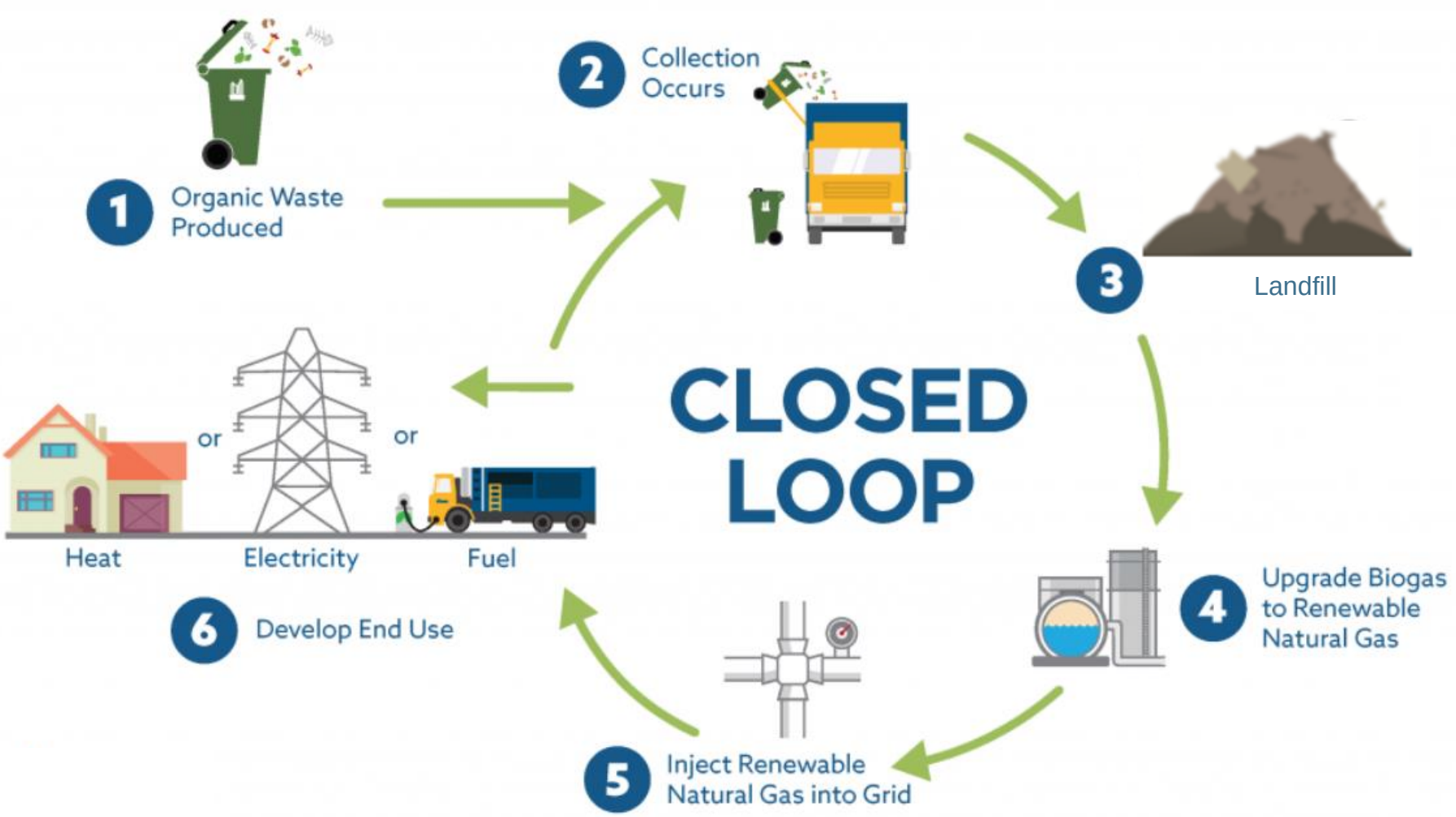
- Partnered with Walker Industries & Comcor Technologies
- Cross-Canada wellfield to injection facilities serving landfills

Capital Outlook



Utilize existing infrastructure to lower emissions and maintain affordable energy supply

What is a Circular Economy?



RNG Overview

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Unlike fossil fuels, RNG is created from:

Food processing organic waste

Agricultural waste, such as leftover crops and animal manure

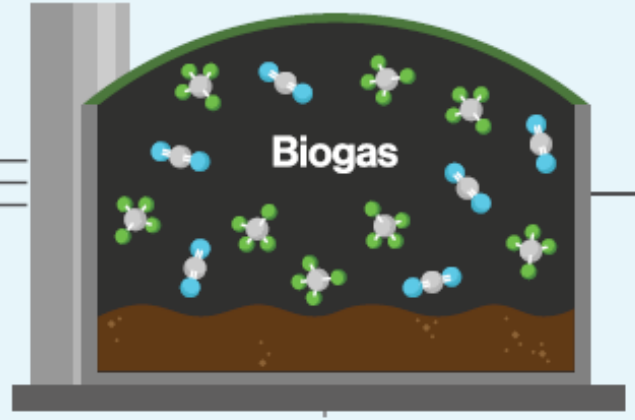
Bio-solids from wastewater treatment plants

1 Waste recovery

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

2 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.



3 Upgrading

- The biogas is cleaned to meet gas quality specifications.
- Landfill gas is captured and sent directly for upgrading.

4 Added to system

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.

Homes and businesses

Fuel fleets

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

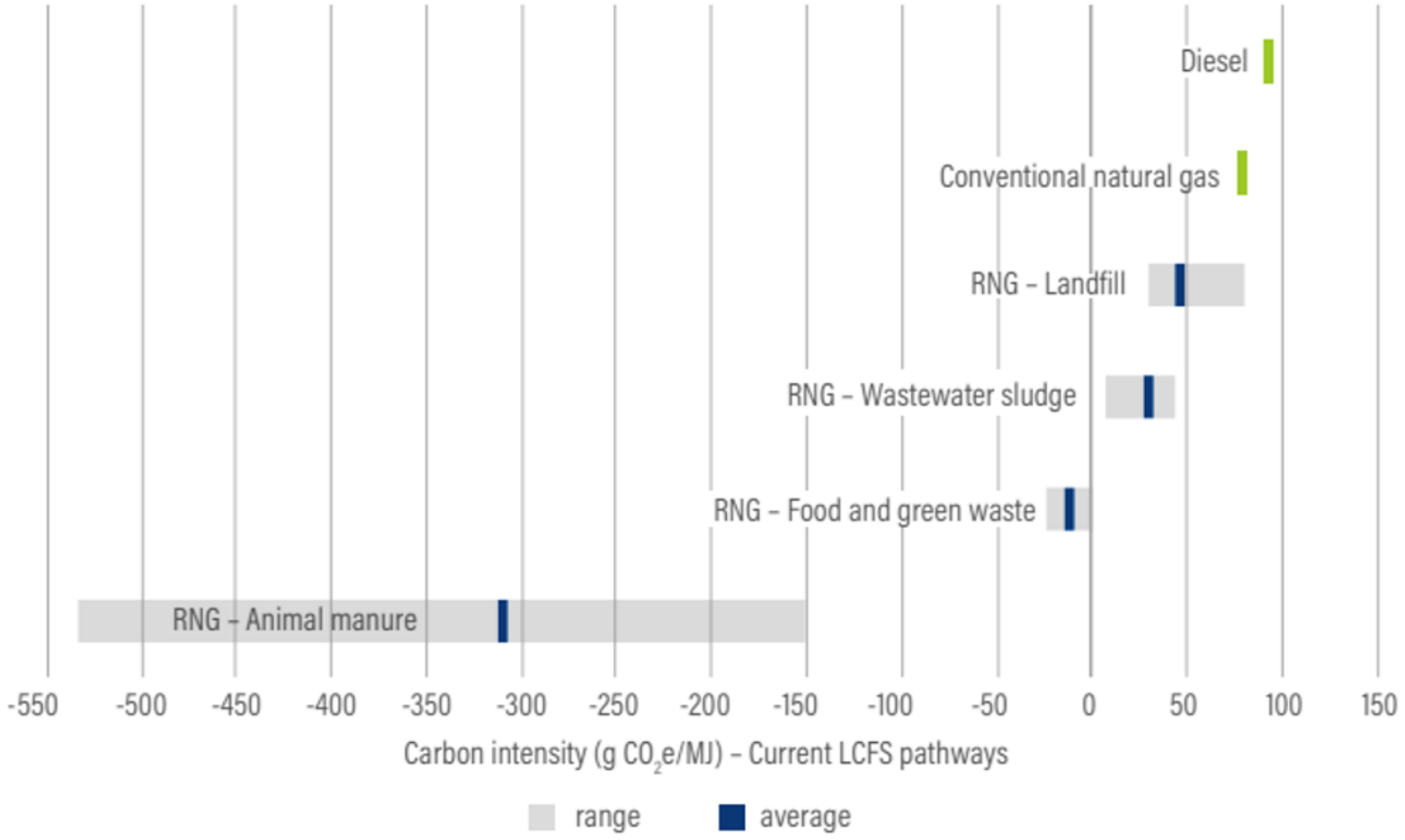
Landfills

Landfill gas is captured

Byproduct / digestate

Fertilize soil

RNG: Carbon Intensity



Illustrative example

California Air Resources Board (CARB, 2020)

- **Canada's Clean Fuel Regulation (Dec 2021) will include RNG carbon intensity methodology**

RNG Advantages

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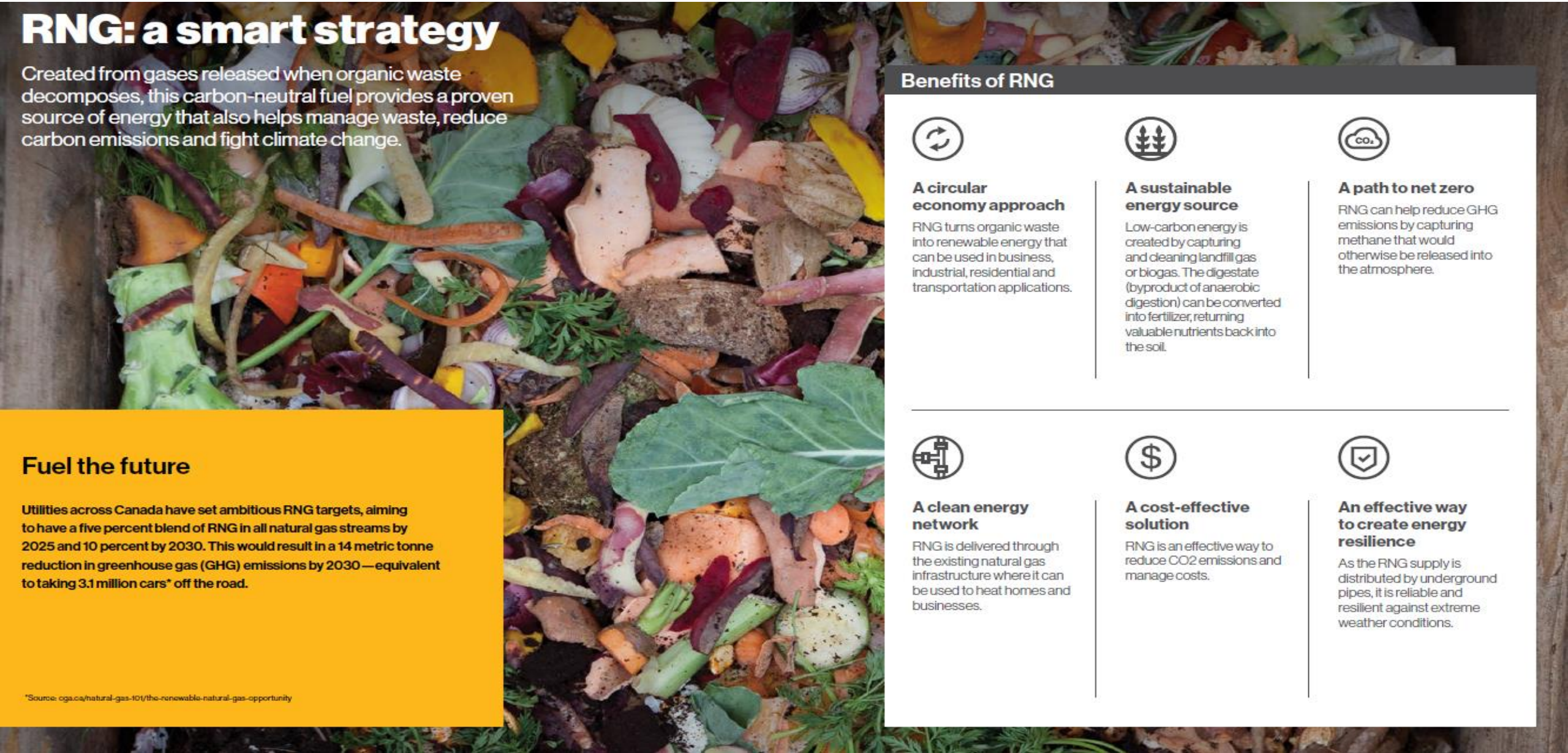


RNG: a smart strategy

Created from gases released when organic waste decomposes, this carbon-neutral fuel provides a proven source of energy that also helps manage waste, reduce carbon emissions and fight climate change.

Fuel the future

Utilities across Canada have set 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.

*Source: oga.ca/natural-gas-101/the-renewable-natural-gas-opportunity

Benefits of RNG

A circular economy approach

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

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.

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.

A cost-effective solution

RNG is an effective way to reduce CO_2 emissions and manage costs.

An effective way to create energy resilience

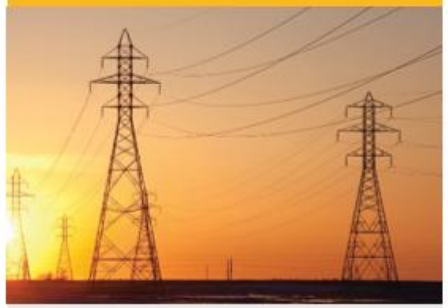
As the RNG supply is distributed by underground pipes, it is reliable and resilient against extreme weather conditions.

Why RNG is complementary to Decarbonization

With **net-zero emissions**, it's a cost-effective way to meet climate change goals

Fewer service interruptions than electricity and is resilient against extreme weather

Leverages the existing natural gas infrastructure and vehicles

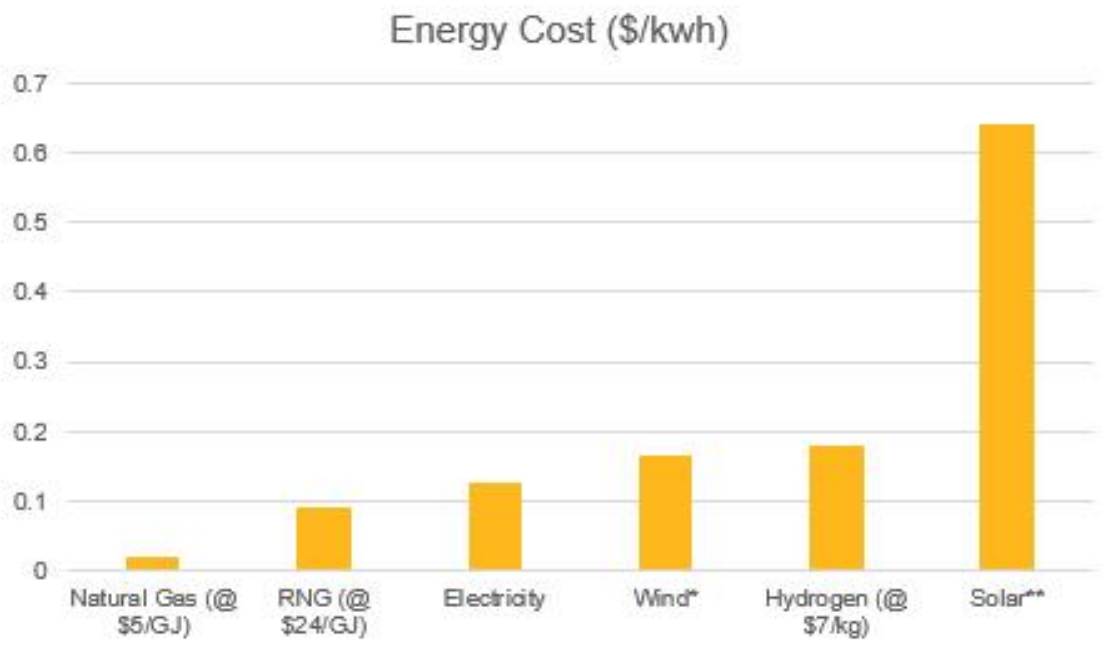


Doesn't contribute to **peak electricity demand**.

By repurposing organic waste, RNG reduces GHG emissions

RNG @ $24/GJ = ¢ 8.6/kWh is a competitive renewable fuel

Energy Price Comparison



Did you know…if RNG is valued at $24/GJ:

- This is equivalent to $0.09/kWh
- As of May 2021, electricity in Ontario is valued at $0.113/kWh

*https://parkergallantenergyperspectivesblog.wordpress.com/2016/12/08/how-much-is-wind-power-really-costing-ontario/
**http://www.solarelectricityhandbook.com/canada-feed-in-tariff.html

RNG: cost considerations

- Supply costs
  - Price competitive with electricity
- Avoided Carbon Charge
  - $50/tCO2e (2022) → $170/tCO2e (2030)
  - RNG supply avoids federal carbon charges on your utility bill
  - **If $22/GJ on long term contract**, this avoided charge can be 12-17% of your RNG supply cost

Did you know…if RNG costs $22/GJ to produce/procure:

- This is equivalent to $0.08/kWh
- Off-peak electricity Ontario is priced at $0.082/kWh

Electricity rates and prices (June 28, 2022)[1]

Off-peak	Mid-peak	On-peak
8.2¢/kWh	11.3¢/kWh	17.0¢/kWh

RNG supply can be a cost-competitive pathway to realize GHG emissions reductions

1 https://www.oeb.ca/rates-and-your-bill/electricity-rates

RNG Value Chain

Enbridge Services

Biogas Gas Generation

Anerobic Digestion

- Waste water treatment plants
- Municipal and merchant digesters
- Farms
- Public and private large landfills

Thermo-Chemical Gasification of biomass and organics

LFG Collection

Wells are drilled at the landfill for landfill gas collection and are put under vacuum for central collection

Biogas Clean Up

LFG or Biogas is cleaned and conditioned to pipeline specifications

- Engineering and Design
- Equipment suppliers and manufacturers
- Construction and Operations

Distribution and Transmission

An injection station and service is required from the connecting pipeline or gas distributor

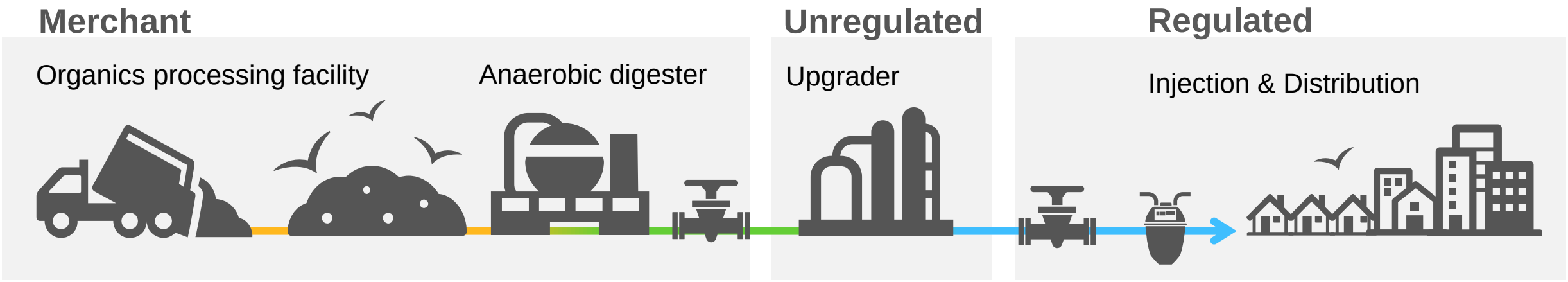
Service fees and tariffs

Rate-based utility assets

Sales and Marketing

Tidal arranges for transport and buy/sell agreements for the RNG and its associated Environmental attributes.

RNG System



15 or 20-year contract: Enbridge will assume design, construction, ownership, operation, maintenance of the Upgrader, Injection Station, (and the Distribution Pipe if necessary)

Note: The costs illustrated are estimates based on prior Enbridge Gas projects.

RNG: production costs

Municipality example (Quest)[1]	Production cost
Raw biogas source (A)	$8.0/GJ
Biogas upgrading (B)	$7.5/GJ
Utility connection (C)	$5.0/GJ
Contingency (D)	$4.0/GJ
Supportive funding (E)	- $2.5/GJ
TOTAL	**$22.0/GJ**

If RNG costs $22/GJ to produce:

- This is equivalent to 7.8¢/kWh
- This is equivalent to $0.89/diesel litre equivalent (dLe)

Electricity rates and prices[2]

Off-peak	Mid-peak	On-peak
8.2¢/kWh	11.3¢/kWh	17.0¢/kWh

Diesel prices[3]

$2.25/litre

RNG self-consumption is competitive with grid distributed electricity and diesel fuel

1 - Example costs from: questcanada.org/national-renewable-natural-gas-handbook/
2 - oeb.ca/rates-and-your-bill/electricity-rates
3 - https://www.ontario.ca/page/motor-fuel-prices

Success Stories

Toronto

AD
315k GJ

Niagara

Landfill
800k GJ

London

AD
120k GJ

Hamilton

WWTP
100k GJ

Valued partnerships

Q&A

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