

# Power to Synthetic Gas

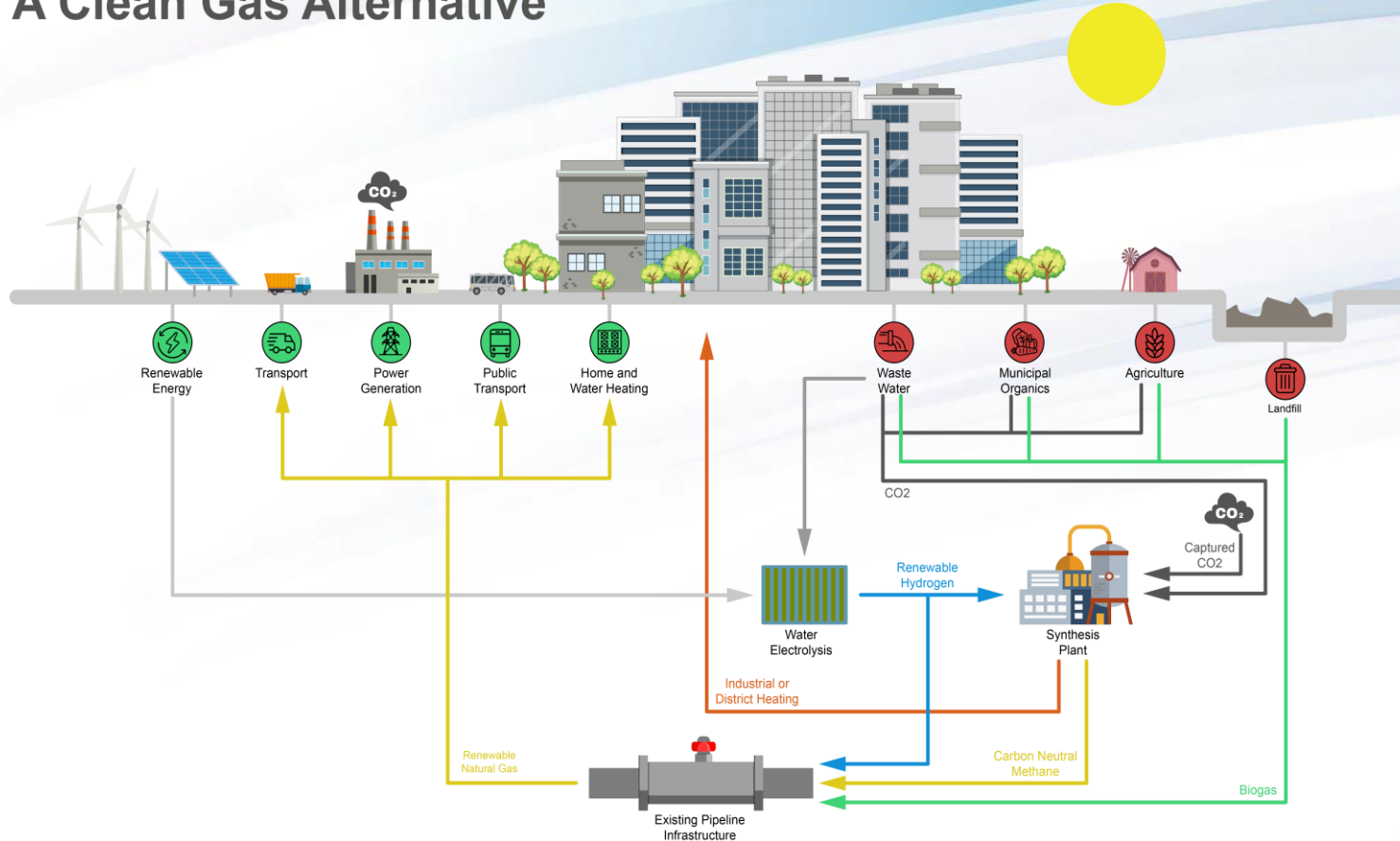
Demonstration Plant located in Alberta

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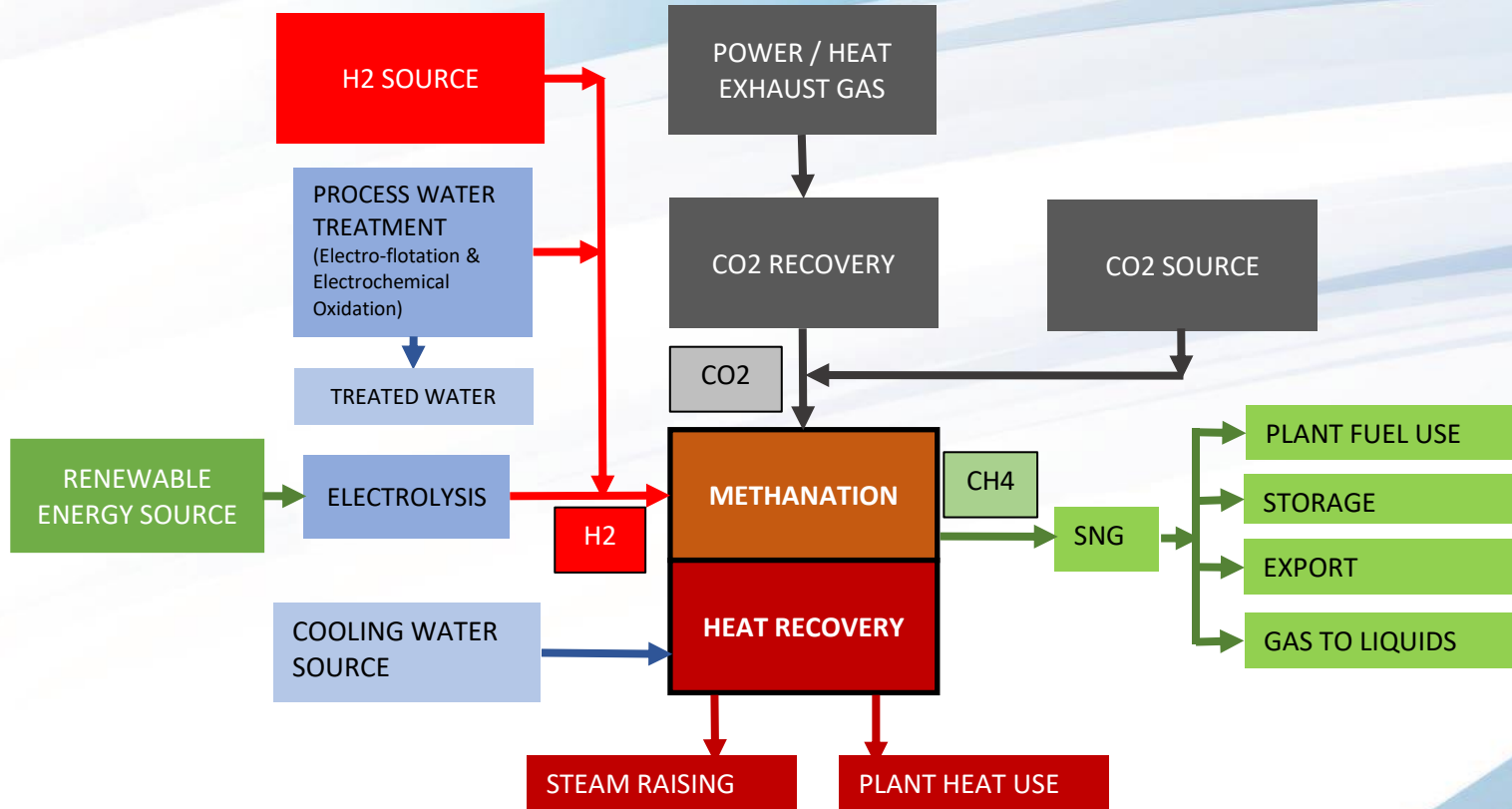
# Shaping a Low Carbon World through Power to Gas

## A Clean Gas Alternative

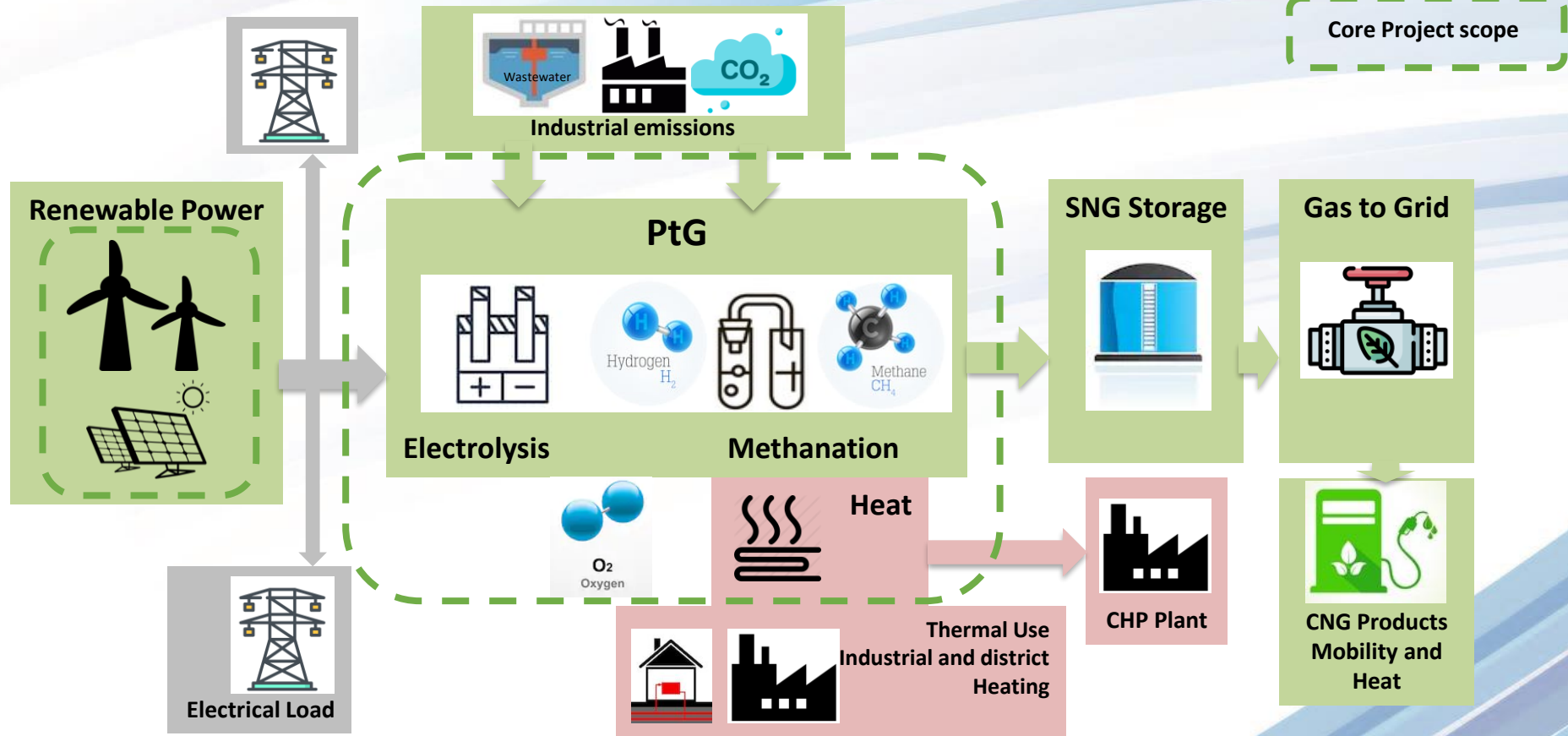


- A low carbon cycle and economy
- Renewable power generation
- Producing PtH<sub>2</sub> (Power to Hydrogen) and PtSNG (Power to Synthetic Natural Gas)
- Capturing and utilizing CO<sub>2</sub> emissions (generating RECs)
- Storing and transporting the renewable gas to where it is needed
- Electrical power demand and grid balancing management by turning PtG on and off

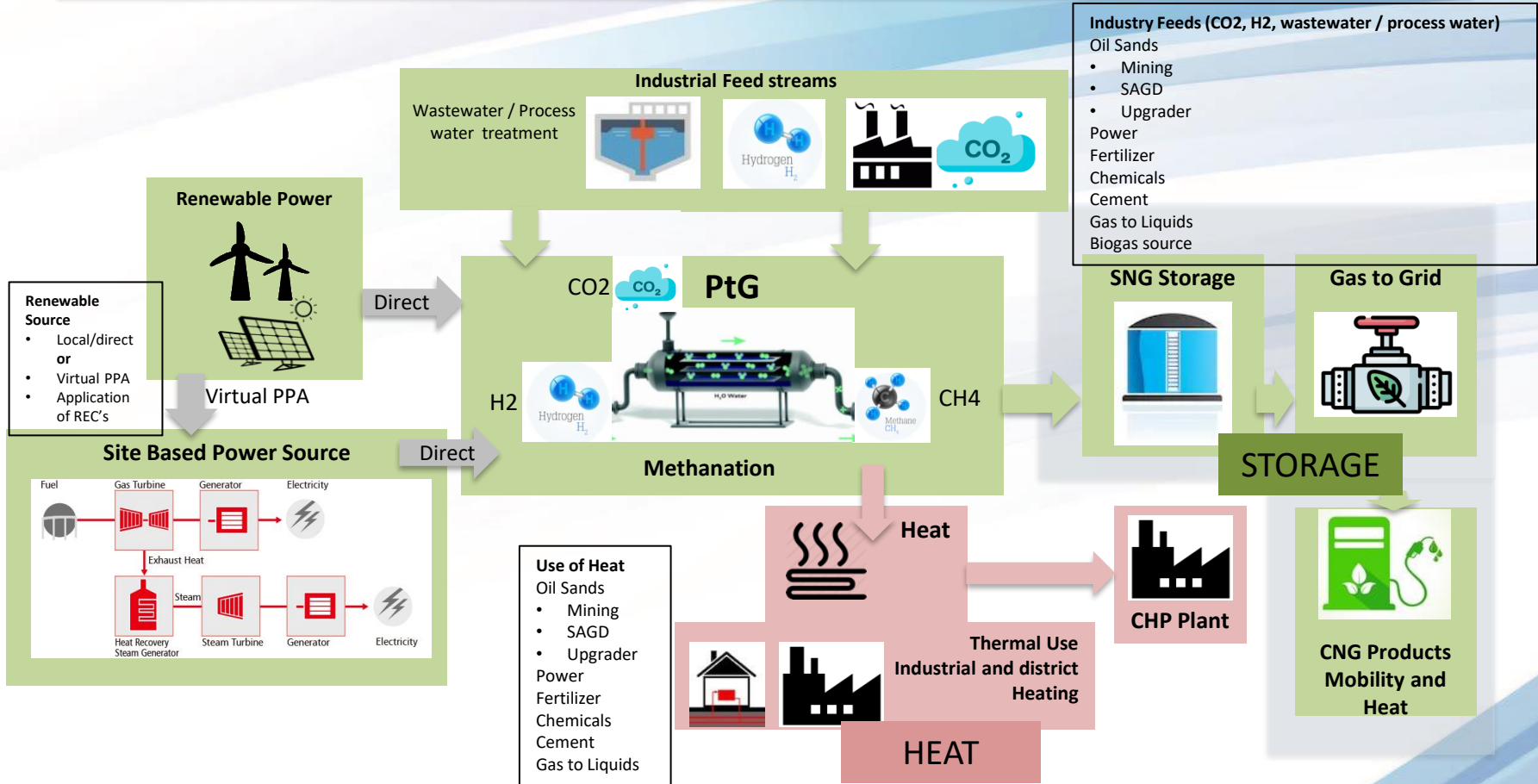
# PtG Simplified Process Block Flow Diagram (Industrial Application)



# Power to Synthetic Gas Concept



# PtG Industrial Application Opportunities



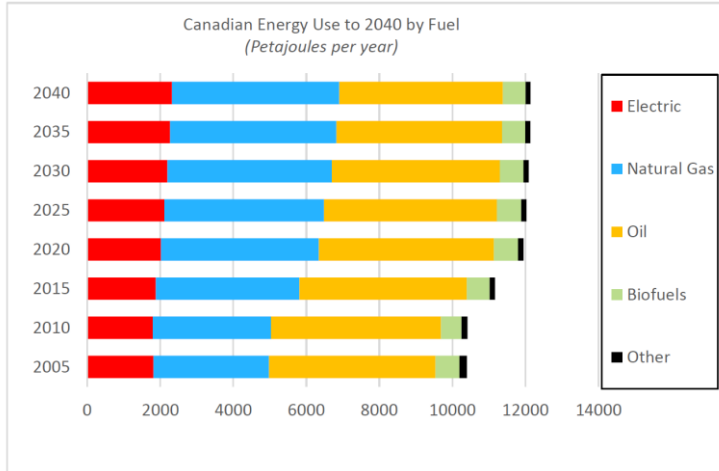
# Markets

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- A key element of the 'Green Gas Concept' is to seize upon the opportunity of the future market for renewable fuel. The Canadian Gas Association (CGA) has proposed policy<sup>1</sup> for a fully developed Renewable Natural Gas (RNG) marketplace by 2020, with Renewable gas targets
  - 5% by 2025
  - 10% by 2030
- The market is immature and presents an early opportunity to promote industrial attraction to develop a growth industry for RNG and become the 'Clean Gas Pioneer', utilising existing gas infrastructure
- Optional wastewater treatment markets through ECO technology, for municipal utility and industrial plant applications
- The plant would be the **first PtSNG in Canada** and only the second renewable gas project in Alberta
- As more renewable energy is added to the Transmission system, the need to convert renewable energy to storage solutions will become a market opportunity
  - The demonstration plant will provide valuable learnings for plant controls and management under variable and intermittent renewable energy supply

# Market Potential

## Growth in Gas as a fuel



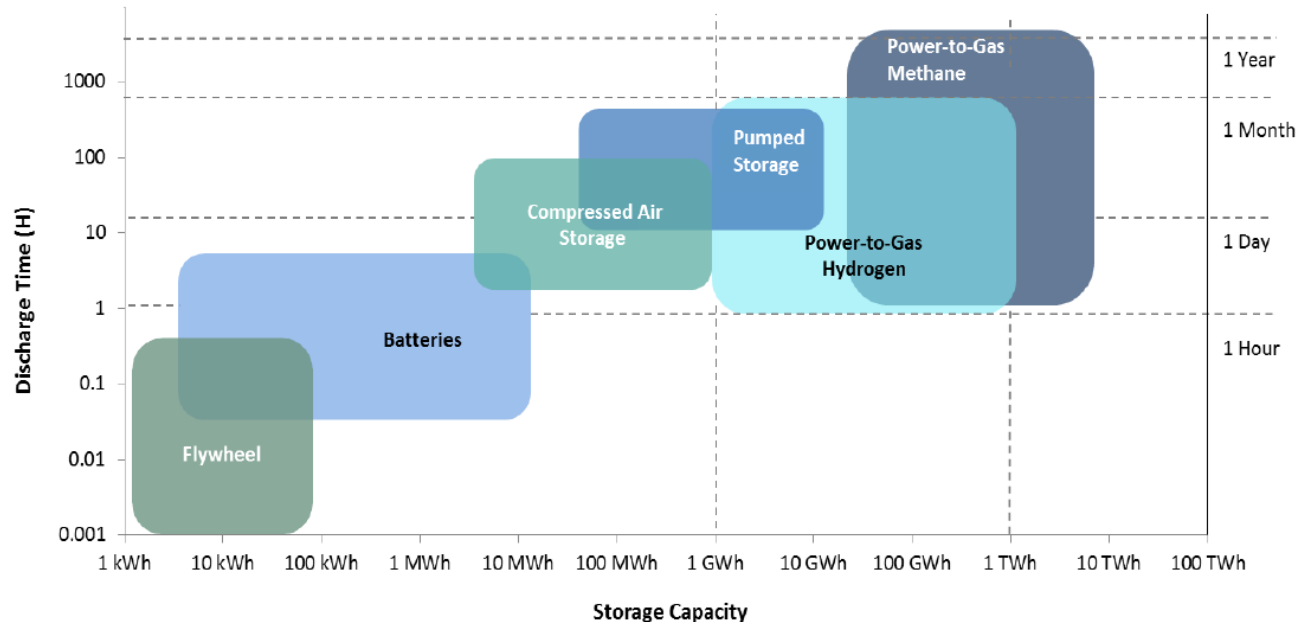
## Emissions Reduction from RNG

Provincial Emissions and GHG Reduction Potential			
Province	Natural Gas End Use GHG Emissions (Megatonnes)	Annual GHG Emission Reductions from RNG (Megatonnes)	Number of Passenger Cars Equivalent
BC	11	0.7	147,000
AB	61	4.3	903,000
SK	7	0.6	126,000
MB	4	0.2	38,219
ON	41	8.0	1,680,000
QC	12	0.5	105,000
NB	0.2	0.1	21,270
NS	0.3	0.1	21,000
<b>Total</b>	<b>136</b>	<b>14</b>	<b>3,041,489</b>

Source: ICF International, Statistics Canada, CGA RNG Data

Alberta is Canada's largest Provincial emitter by some margin. Focus on production of RNG in Alberta demonstrates commitment to reduce emissions and leadership in pioneering PtG solutions.

# PtG offers huge storage capacity for Renewables Projects



Source: Storage and Power / Energy Characteristics (Fraunhofer ISE 2015)

- The addition of significant Renewable Energy sources to the Transmission system presents the potential for periods of oversupply of renewable power. Storage solutions are required to optimise renewable power operations and useful supply.
- PtSNG offers immediate response grid balancing.
- Gas transmission infrastructure is available within Alberta to allow simple low cost addition of RNG into the system.



# Financial / Investment

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- Capital Cost Estimate (5 MW rated capacity)
  - \$15-20m dependent upon extent of scope
- As a demonstration plant, the project objectives include proving commercial scale plant economics
- An investment consortium of local industry, gas producer(s) and support from grant funding, is proposed
- Investment could be recovered through a PPA and sale of RECs

# Key Benefits of the PtG Concept

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- Application of an optimum Renewable Energy Power to Storage concept
- Application (internal or trading) and value of Project Renewable Energy Credits (REC's)
- Methanation is an exothermic reaction, generating significant usable heat (with significant steam raising capability)
- Generation of a renewable green synthetic gas which can be used within the plant fuel gas processes or within existing pipeline infrastructure
- Opportunity to add Gas to Liquids process from the SNG
- Alignment with potential future Clean Gas Regulations
- Engagement in an innovative green technology project (first of its kind in Canada)
- Carbon Neutral / Negative process
- Easily integrated within existing process plant
  - Including Oil Sands operations and SAGD water treatment streams
- Simple water treatment technology (potentially eliminating large capital and operating cost components of industrial water treatment and processing)
- Wide industrial application
- Use of CO<sub>2</sub> Stream delivering emissions reduction
- Use of Renewable Energy
  - Direct or
  - Virtual PPA (fixed long term power cost)
- Application of modular plant design

# Why build a Demonstration Plant in Alberta?

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- Industrial Centres with large emitters
- Sites exist in close proximity to large emitters
- Opportunity to engage Colleges and Universities
- Address challenges experienced in some areas of Alberta of declining natural gas production through a renewable gas development program
- Delivery of economic growth through industrial attraction in areas in need of revitalisation
- Operating as a socially and environmentally responsible power producer
- Embrace within a Renewable Energy Program (utilising RE sources)
- Opportunity to be a centre for RNG excellence



# Contact

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For more information on the investment opportunity,  
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