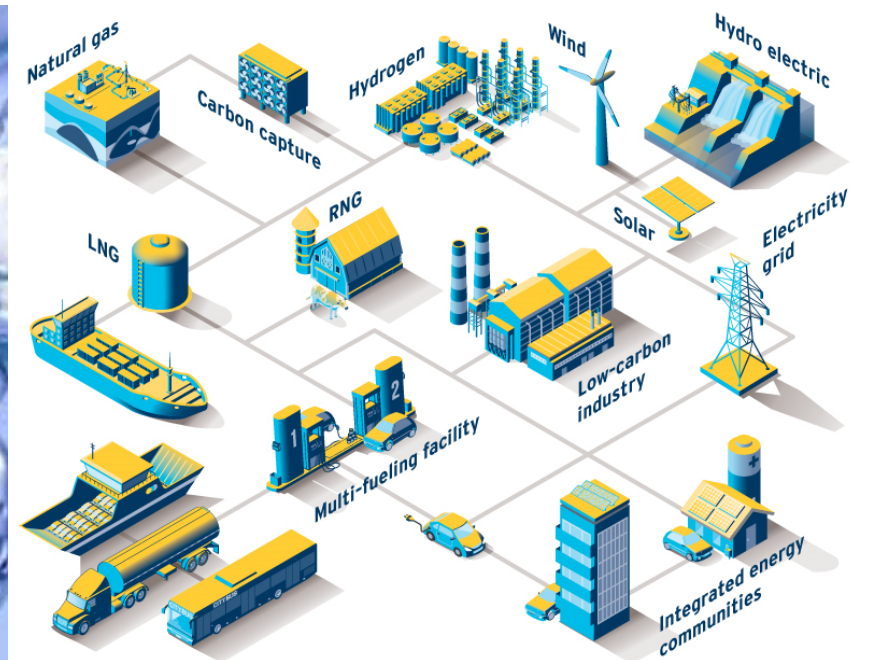


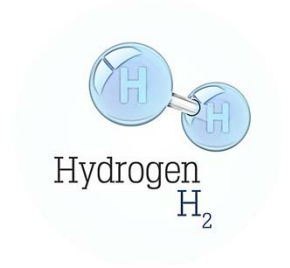
# Renewable Gas – Exploring Renewable Hydrogen Production Pathways

John Quinn – Senior Manager, Renewable Gas Supply

September 9th, 2020



# Agenda

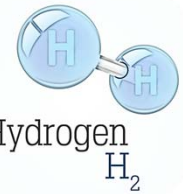


## 1. Overview

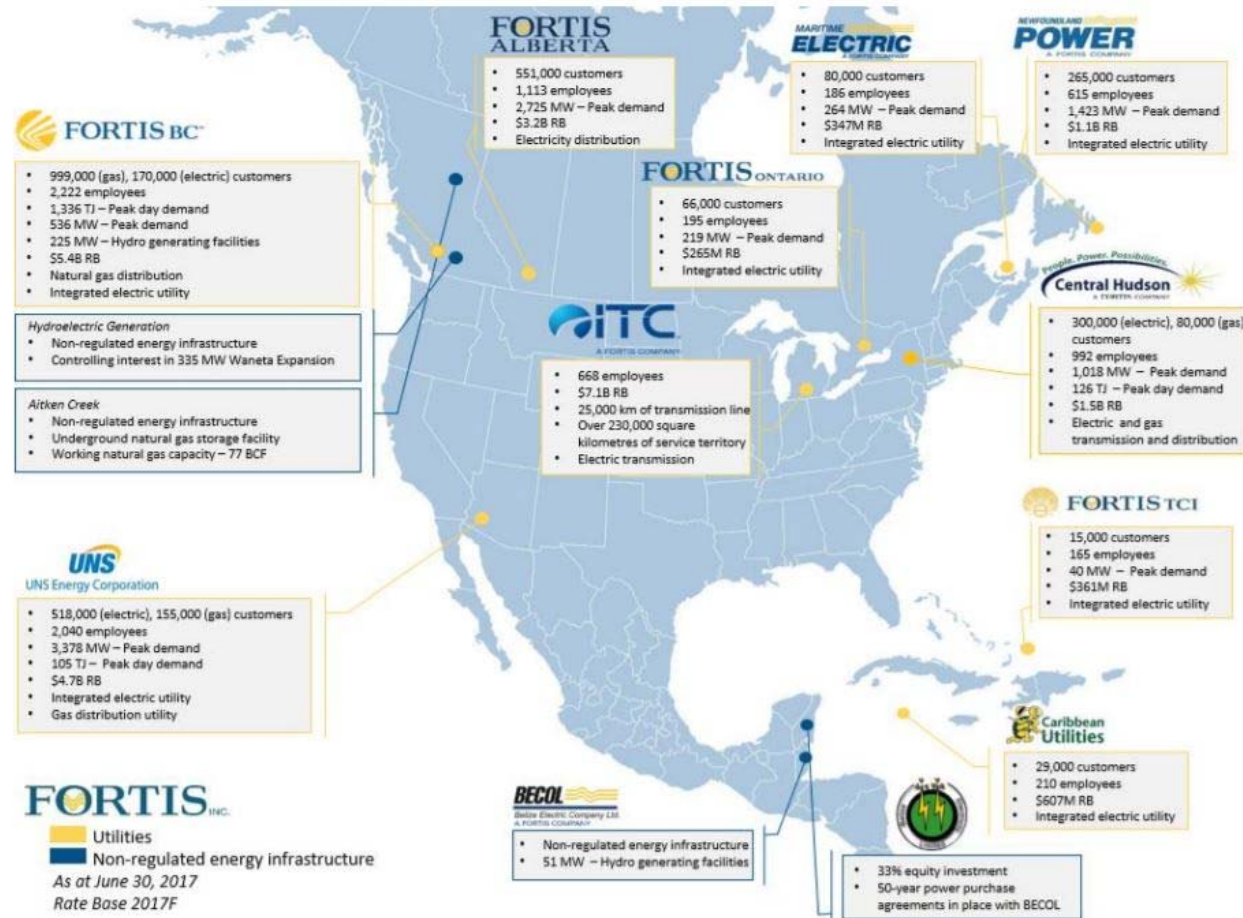
- Fortis Inc.
- About FortisBC
- FortisBC Clean growth Pathway to 2050

## 2. FortisBC Renewable Gas Supply - Hydrogen

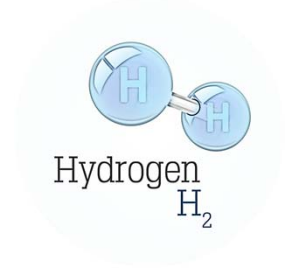
- Production Pathways
- Supply Potential
- Energy Decarbonization Potential
- Utility Enabling Measures
- Business Prioritizing Activities
- Investment is Required in First Mover & Strategic Demonstration Projects



# Fortis Inc. - North American Operations



# About FortisBC



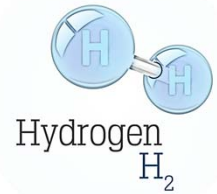
FortisBC area of operations

- Serving **1.2 million customers** in **135 communities**
- Investing over **\$590 million annually** in B.C.'s energy assets
  - 50,000 km of pipelines
  - 7,200 km of electric lines
  - 2 LNG facilities
  - 4 hydroelectric generating plants
  - Underground gas storage
- Delivering **21% of B.C.'s energy needs**
  - Electricity
  - Natural gas
  - Renewable natural gas (enabled under BC Greenhouse Gas reduction Regulation (GGRR))
  - Compressed & liquefied natural gas
  - Alternative energy solutions
- 2020 Nat. Gas Res/Comm/Ind/Trans: **200 PJ/yr**
- 2020 RNG supply: **0.3 PJ/yr**
- Approved/prospective RNG supply: **20 PJ/yr**





# FortisBC's Clean Growth Pathway to 2050



Diversified approach to reduce GHGs and support climate action goals



Energy Efficiency



Renewable Gas



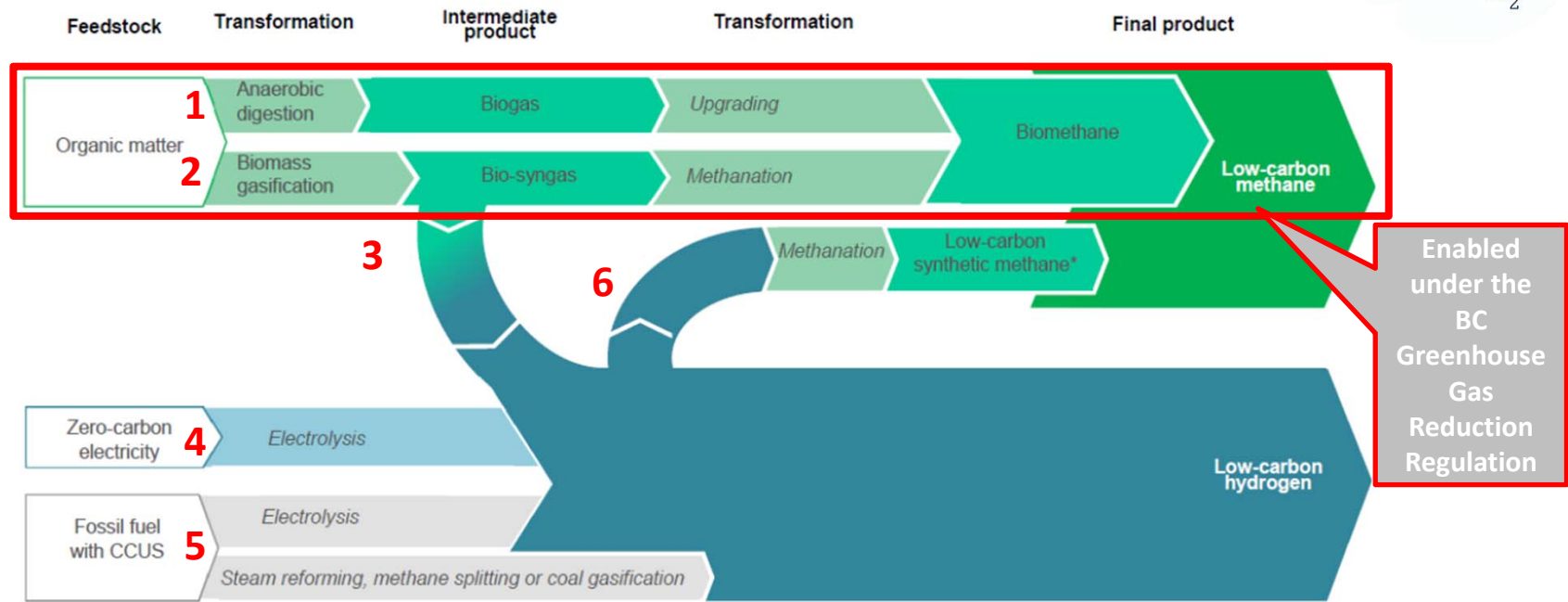
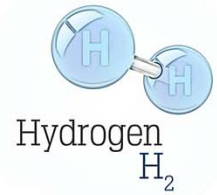
Zero and Low Carbon Transportation



Global LNG

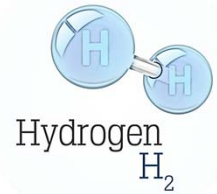


# Renewable Gas Production Pathways



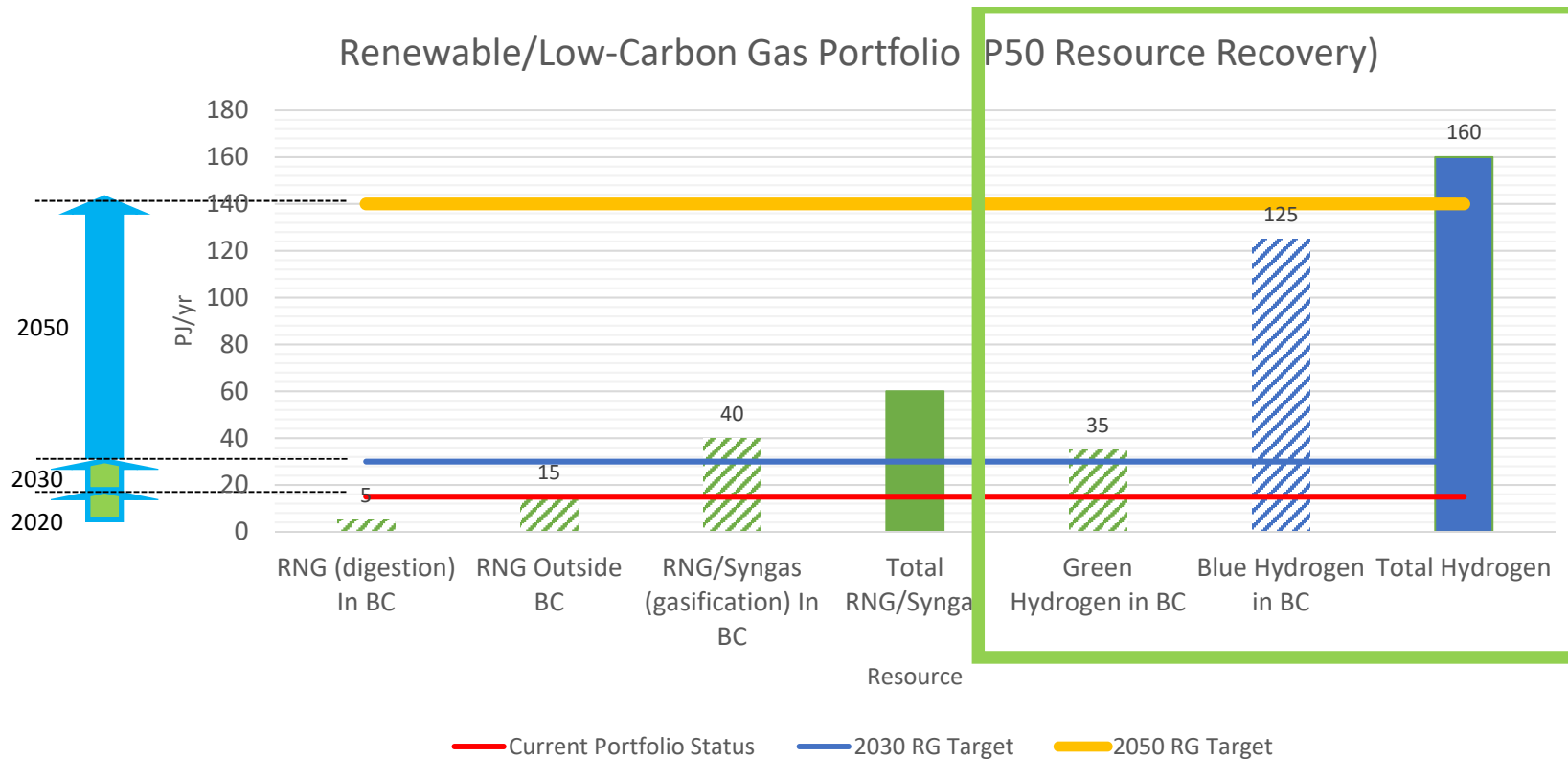
1. **RNG Biomethane** upgraded biogas produced from farm or municipal organic biomass.
2. **RNG Biomethane** upgraded synthesis gas (syngas) produced from wood biomass at mills.
3. **Syngas** onsite fuel to displace industrial natural gas; can also be upgraded to green hydrogen.
4. **Green Hydrogen** produced via water electrolysis using renewable electricity feedstock.
5. **Blue Hydrogen** reformed from hydrocarbon feedstock with upto 90% carbon sequestered.
6. **Synthetic Methane** processed from green hydrogen (when opportune).





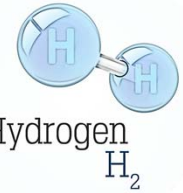
# H<sub>2</sub> – Supply Potential Vs RG Targets

Taking into account certain realities, such as potential feedstock unavailability, less than 100% capacity production at plants, or technology underperforms



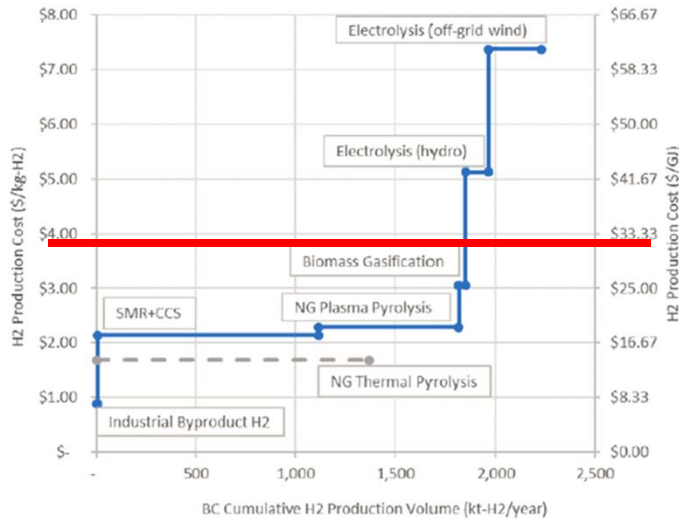
1. Hallbar report: B.C. Hydro's forestry feedstock estimation; RNG production potential is estimated to be 51.3 PJ/year. If NRCan's forestry feedstock estimations are used, RNG production potential is estimated to be 93.6 PJ/year. 2 RNG (organics) In BC max supply potential no tech advancement Hallbar Consulting Report, 3. Syngas (wood) max supply potential with technology advancement Hallbar report, 4 Hydrogen supply potential from BC Hydrogen Study





# H<sub>2</sub> - Energy Decarbonization Potential

Year	2050	
	Conservative	Aggressive
Scenario		
Renewable Content – Hydrogen from BC Hydro Grid	> 33%	> 33%
Hydrogen Blend in Natural Gas used in Province (by volume)	20%	45%
Transport	1 million FCEV's + 1,000 stations	
Industry – renewable/low-carbon hydrogen in refining and synthetic fuel production	75% low carbon fuel from H2 pathway	
Hydrogen (Million Tonnes/yr)	0.506	1.445
Hydrogen (PJ/yr)	71	202
% Available Theoretical Supply	22%	63%
GHG Reduction (Million tonnes CO2e/yr)	7.2	15.6
Provincial GHG Reduction Goal (Mt CO2e/yr)	51	
% Provincial GHG Reduction Goal	14%	31%

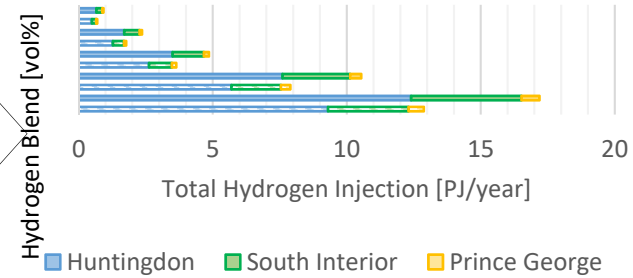


**Hydrogen Blending in The Gas Grid**

**Hydrogen Distribution in Dedicated Micro Grids**

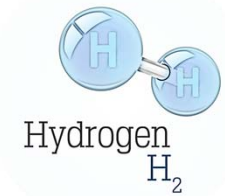
**Hydrogen for MD/HD in Multi-Fuel Re-fueling Hubs**

Hydrogen Blending Potential



Energy at work FORTIS BC™





# H<sub>2</sub> – Utility Enabling Measures

Regional focus - locally enabled to meet customer and stakeholder expectations

## Safety

**Manage the safety of hydrogen as an energy carrier and fuel.**

- Identify, research and test hydrogen knowledge gaps.
- Analysis to inform the safety, efficacy, and viability of applications.
- Develop evidence base to support industry Codes-Standards-Regulations.

## Infrastructure

**Leverage reach of existing gas infrastructure and use system assets.**

- Injecting and blending at low levels and cluster development.
- Upgrade/repurpose existing infrastructure.
- Design new build infrastructure to be hydrogen compatible.

## Use Cases

**Policy to support H<sub>2</sub> market development across multiple sectors.**

- Strategic demonstrations to establish use cases.
- Promote demand and investment to build sustainable supply chains.
- Requires long-term policy commitments.

## Carbon Abatement

**Scale production and delivery of affordable low CI hydrogen supply**

- Scaled production of blue hydrogen relies on scaled carbon capture (CCS).
- CCS at scale will transition natural gas producers to hydrogen production.
- Facilitate all emissions from natural gas to be captured in bulk.




# H<sub>2</sub> – Business Prioritizing Activities

Sustainable business through reduction of GHG emissions from natural gas

- Need clarity over legislation and regulation supporting 15% renewable content

Policy




- Need the GRR definition to include hydrogen and synthesis gas (Syngas) along with price and volume increases

Legislation



- Need access to lower cost electricity for grid-connected projects (electricity is approximately 75% of operating cost)

Provincial Grid

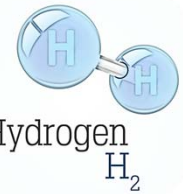


- Need clarity over technical approval pathways

Regulations



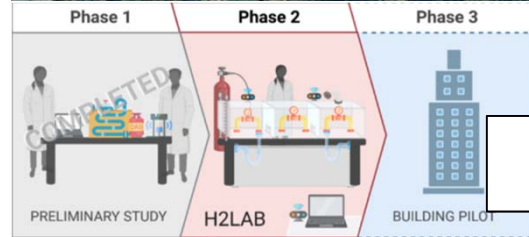
- Innovate: across the gas industry to set rules and regulations and begin implementing a number of technologies that barely exist today.
- Evolve: equipment, processes and methods of converting water, wood and other forms of carbon-rich waste into clean fuels and hydrogen.
- Develop: new hybrid multi product supply chains and flex fuel end use applications, appliances, devices and processes.
- Partner: to deploy significant capital and leverage opportunities to develop and construct production, supply and end use infrastructure.



# H<sub>2</sub> – Investment is Required

Blending, Dedicated Micro-Grids & Network Hubs, Transportation Projects

- **Strategic Demonstrations:**
- *Demonstration projects in various sectors will inform necessary knowledge gaps to move from the requirement to survey, test and trial all parts of the gas distribution network prior to hydrogen injection, to the ability to inject into an untested network.*
- *A key objective will be to support the development of CSR such that FEI, or a third party supplier of hydrogen, will be able to inject hydrogen into FEI's network, just as RNG (biomethane) producers can today.*
- *A successful demonstration project has the potential to unlock growth of renewable gas through introduction and growth of new hydrogen markets.*



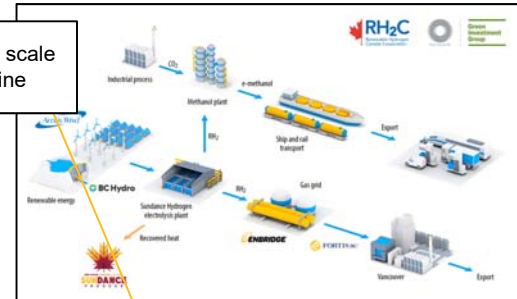
Potential large scale PtG + pipeline injection

Potential hydrogen micro grid

UBC-O H2ILab

UBC-V Campus Energy Center with H2

Potential PtG, blending, large scale hydrogen hub





Questions?

*Energy at work*  **FORTIS BC™**