

Hydrogen Regional Opportunity & Sector Development

Strathcona County

Economic Development & Tourism



December 2020



The Hydrogen Opportunity

By 2050, the global hydrogen sector could generate US\$2.5 trillion per year and create 30 million jobs.

Hydrogen as a fuel source produces only water with no carbon emissions.





Why Hydrogen?



Critical component to industrial refining processes

Some sectors require chemical energy carriers

Hydrogen complements low-carbon electricity generation

Hydrogen complements production of biobased diesel, fuel, etc.



Hydrogen in Alberta

Hydrogen can be produced through stream reforming, gasification, or electrolysis. In Alberta and most of the world, hydrogen is produced by processing natural gas.

Hydrogen in Alberta is primarily used by industry to crack bitumen, which is then further processed to create synthetic crude, gasoline, diesel, jet fuel, plastics and fertilizers.

Alberta has the potential to be one of the lowest cost hydrogen producers on the planet.





Canadian Production

Production cost comparison:

Alberta blue hydrogen: Canada green hydrogen: Wholesale diesel: Retail diesel:



Enclosure 1



Alberta's Natural Gas Vision & Strategy

Enclosure 1



Hydrogen (H₂) Goals:

- 1. Large-scale hydrogen production with CCUS by 2030.
- 2. Exports of hydrogen and hydrogen products are in place by 2040.



Hydrogen Classifications

The Transition Accelerator

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A. Hydrogen Today (8.2 kt/d) **B. Hydrogen in a New, Net-Zero Energy System GRAY H₂ Some Chemical Plants BYPRODUCT H₂** CO_2 (a GHG) **GREEN H**₂ **BLUE H₂** H_{2} **Fossil Fuels Renewables** Fossil H_2 Fuels $0_{2} H_{2}O$ CO_2 2 **Biomass Nuclear** Sequestered Export $\mathbf{+}$ Industrial Feedstocks Industrial Feedstock H₂ Fuel Fertilizer for Fuels for Materials & Fertilizer for Fuels for Materials & **Buildings Transport** Industry Power Agriculture Transportation Chemicals Agriculture Transportation Chemicals



Liquid Hydrogen Market





Transition Accelerator Key Findings

Enclosure 1

Market: Significant domestic market opportunity in Canada, and a larger export market to countries that are exploring hydrogen use, such as: United States, Japan, South Korea and Germany.

Cost: Canada is among the world's lowest cost producers of hydrogen, by producing it from upgrading natural gas, with the carbon captured and sequestered.

Jobs: The opportunity presents thousands of construction jobs and hundreds of permanent high paying jobs



Enclosure 1

Transition Accelerator Recommendation

Recommendation:

Focus public/private investment towards establishing hydrogen nodes.

Criteria for potential hydrogen node locations:

- Low-cost, low-carbon source of blue hydrogen
- Substantial nearby markets
- Ability to cost-effectively connect supply to demand
- Scale of supply and demand that is economical
- Engaged industry, governments and academics





What's Next



Immediate Future

Establish a "Hydrogen Hub":

- Blue hydrogen production
- Liquefaction infrastructure

Long-Term Opportunity

Develop value chain for liquid hydrogen:

- Expansion of market; fueling stations and vehicles
- Launch industry-led consortia with PPP



Existing Hydrogen Assets in Strathcona County Enclosure 1

Edmonton I Hydrogen Facility

- Commissioned 2006
- 71 MMSCFD Capacity



Scotford Hydrogen Facility

- Commissioned 2016
- 154 MMSCFD Capacity



Edmonton II Hydrogen Facility

- Commissioned 2008
- 105 MMSCFD Capacity



Heartland Hydrogen Pipeline

- Commercialized in 2010
- ~55km in length
- 1 BSCFD capacity, bidirectional
- 12"/16" pipeline







Air Products' Heartland H₂ Pipeline

Enclosure 1





Alberta Carbon Trunk Line (ACTL)

Enclosure 1







Example: Blue Hydrogen Production Facility Enclosure 1

A greenfield blue hydrogen production facility that includes liquefaction and CO₂ capture capabilities.

Impacts:

- Estimated capital cost: \$750 million to \$1 billion
- Estimated jobs: +2,000 construction jobs and +20 permanent jobs, plus many indirect jobs
- Estimated CO2 capture potential: ~1,000,000 million tonnes/year





Alberta Hydrogen System Vision

Safe, reliable low-carbon supply enabling decarbonization across sectors





Hydrogen Fuel Cell Vehicle Pilot

Enclosure 1

In Alberta, a pilot project to operate two long-range hydrogen-powered trucks between Edmonton and Calgary received \$7.3-million from Emissions Reduction Alberta (ERA).

The project demonstrates how hydrogen could be applied to improve fuel efficiency and reduce greenhouse-gas emissions to zero in the long-haul trucking industry.





Recommendations for Strathcona County Enclosure 1

Short-term actions:

- Transportation feasibility study
- Explore infrastructure/fleet partnership opportunities
- Letters of support for projects
- Collaboration

Long-term actions:

- Infrastructure investment
- Fleet conversion
- Municipal leader

