

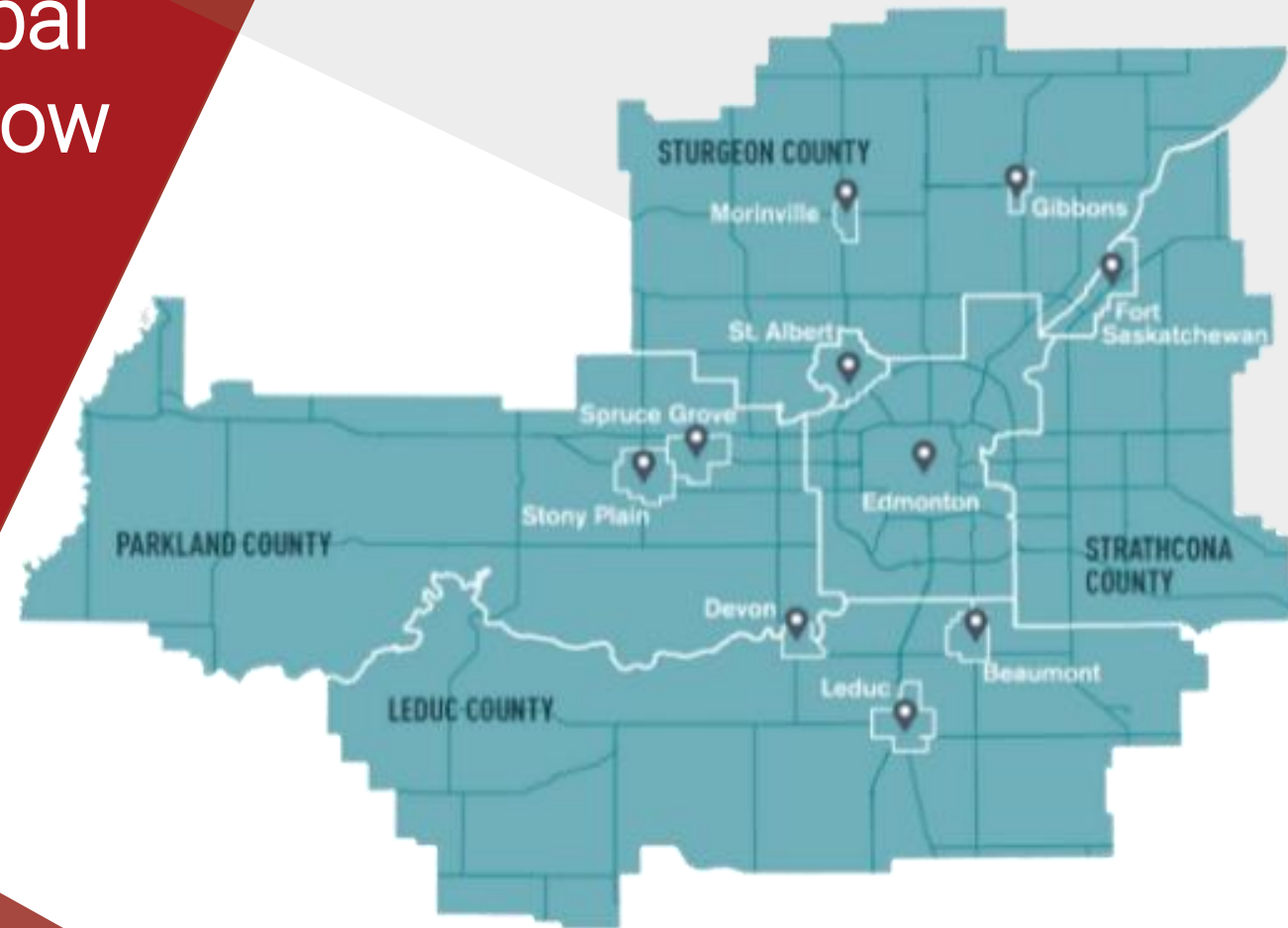
# Policy and Politics: Creating Federal-Provincial Alignment through a Hub-Based Approach for the Hydrogen Economy

Presentation to Economics Society of Northern Alberta  
December 8, 2022

Brent Lakeman  
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Edmonton Global

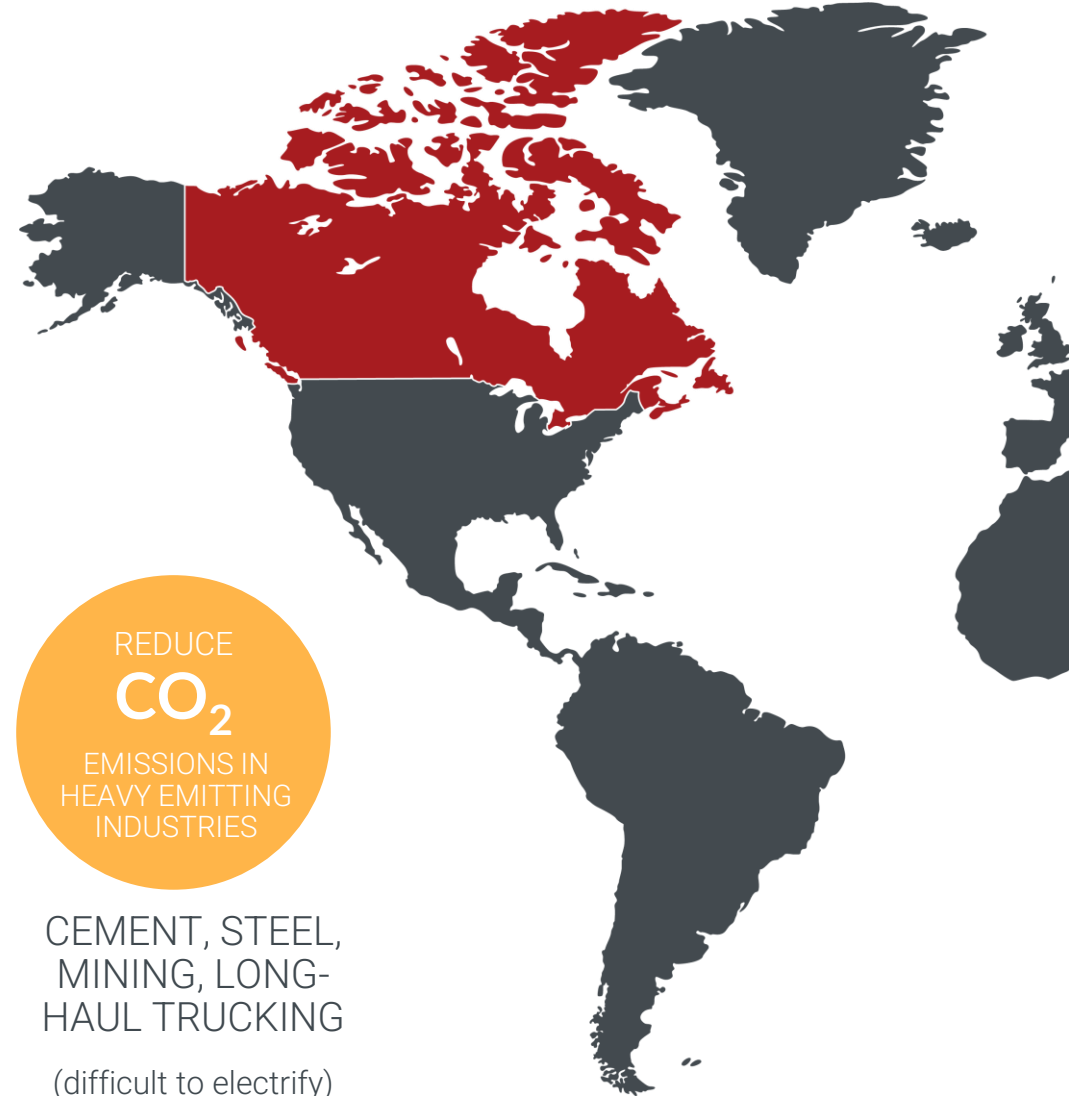


The purpose of Edmonton Global is to radically transform and grow the economy of the Edmonton Metropolitan Region



# The Hydrogen Opportunity for Canada

- Abundant Feedstocks
- A Clean Energy Innovation Leader
- Strong Energy Sector
- International Collaboration
- Access to Export Markets
- Experienced World-Leading Deployment



**350,000**

HYDROGEN  
SECTOR JOBS

**\$50  
Billion**

DOMESTIC  
REVENUE

PART OF A  
**\$2.5  
Trillion**

GLOBAL MARKET

HYDROGEN  
COULD  
REPRESENT  
**30%**

OF CANADA'S  
ENERGY MIX BY  
2050

(190 Mt CO<sub>2</sub>e  
reduction)

REDUCE  
**CO<sub>2</sub>**  
EMISSIONS IN  
HEAVY EMITTING  
INDUSTRIES

CEMENT, STEEL,  
MINING, LONG-  
HAUL TRUCKING

(difficult to electrify)

# Hydrogen Value Chain Opportunities within the Edmonton Region



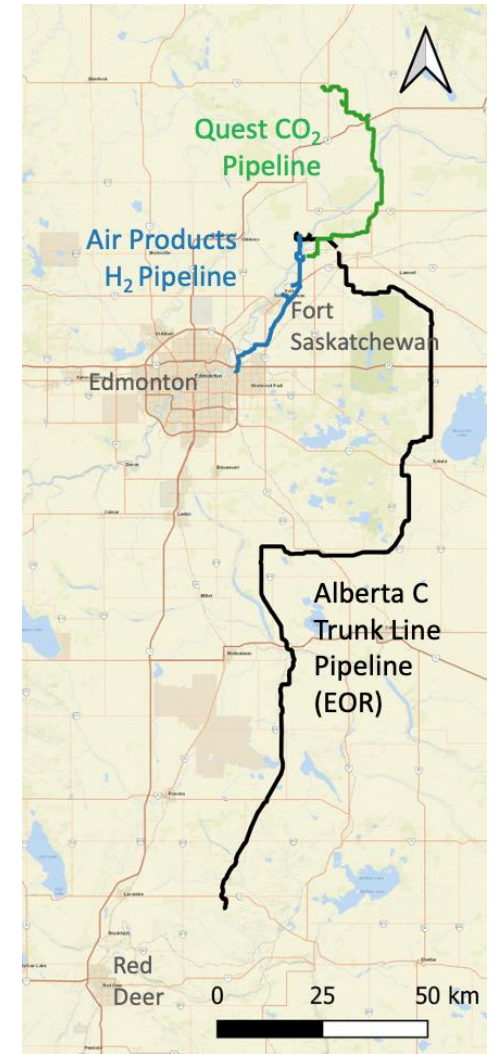
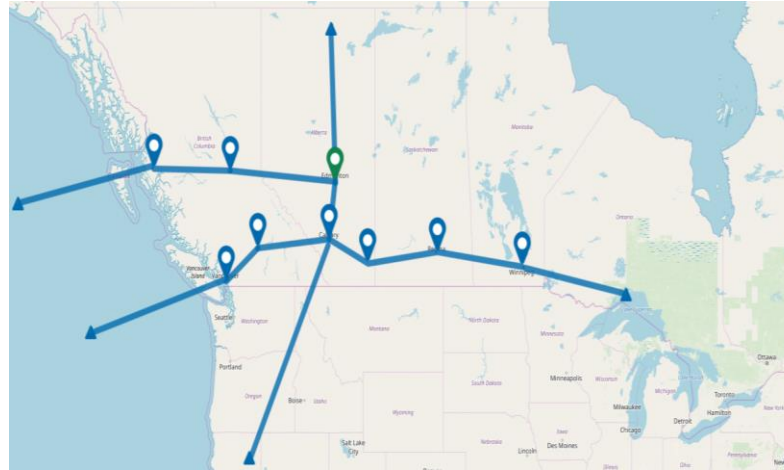
The Edmonton Metropolitan Region is located on Treaty 6 and MNA District 4

- |  |   |   |   |
|--|---|---|---|
|  Power Generation |  Maintenance |  Aviation                  |  H2 Blending |
|  CCUS             |  Bus Fleets  |  Solar (Green H2)          |   |
|  Trucking         |  Research    |  Hydrogen Fueling Stations |   |

# Why the Edmonton Region?

The ingredients are here.....

- Enabling policy framework
- World's lowest cost, lowest carbon H<sub>2</sub>
- Expertise and experience from oil and gas sector
- World-class CCUS capabilities
- Strategically located with access to two western ports
- Centrally located along transportation corridors
- Diversified industry base





# BUILDING A TRANSITION PATHWAY TO A VIBRANT HYDROGEN ECONOMY IN THE ALBERTA INDUSTRIAL HEARTLAND

David B. Layzell, PhD, FRSC  
Jessica Lof, MSc  
Cameron Young, MSc, PEng  
Jonathan Leary



# Natural Gas Vision and Strategy



ALBERTA'S  
INDUSTRIAL  
HEARTLAND  
HYDROGEN  
TASK FORCE

ALBERTA'S  
NATURAL GAS  
STRATEGY &  
VISION

CANADA'S  
HYDROGEN  
STRATEGY

ALBERTA  
HYDROGEN  
ROAD MAP

# Alberta Hydrogen Roadmap





# Policy Alignment Resulting in World Leading Investments



## Federal and Provincial Policy and Program Alignment Resulting in \$1.6 Billion investment for region

- World's largest Net Zero Hydrogen Complex
- SIF funding - \$300 million
- APIP funding - \$161 million

# Latest policy and incentives within Canada and Alberta

## Federal Government

- Net Zero Accelerator / Strategic Innovation Fund (flexible supports for strategic projects) (ISED)
- Clean Fuel Fund (NRCan)
- Accelerated Capital Cost Allowance (accelerated depreciation for favourable tax treatment)
- Federal CCUS tax credits up to 60% for investments into equipment for CO<sub>2</sub> capture.
- Zero Emission Vehicle Infrastructure Program (NRCan)
- iZEV - Incentives for Zero Emissions Vehicles (Transport Canada)
- Canadian Infrastructure Bank (CIB) \$500-million zero-emission vehicle (ZEV) Charging and Hydrogen Refueling Infrastructure Initiative (CHRI)
- ***Just Announced: Investment Tax Credit for Clean Hydrogen (to be developed)***

## Provincial Government

- Alberta Petrochemical Incentive Program (12% of eligible capital costs returned to projects through cash grants upon completion)
- Emissions Reduction Alberta (ERA) – existing investments in leading H<sub>2</sub> pilot projects
- Alberta Clean Hydrogen Centre of Excellence - \$50 million

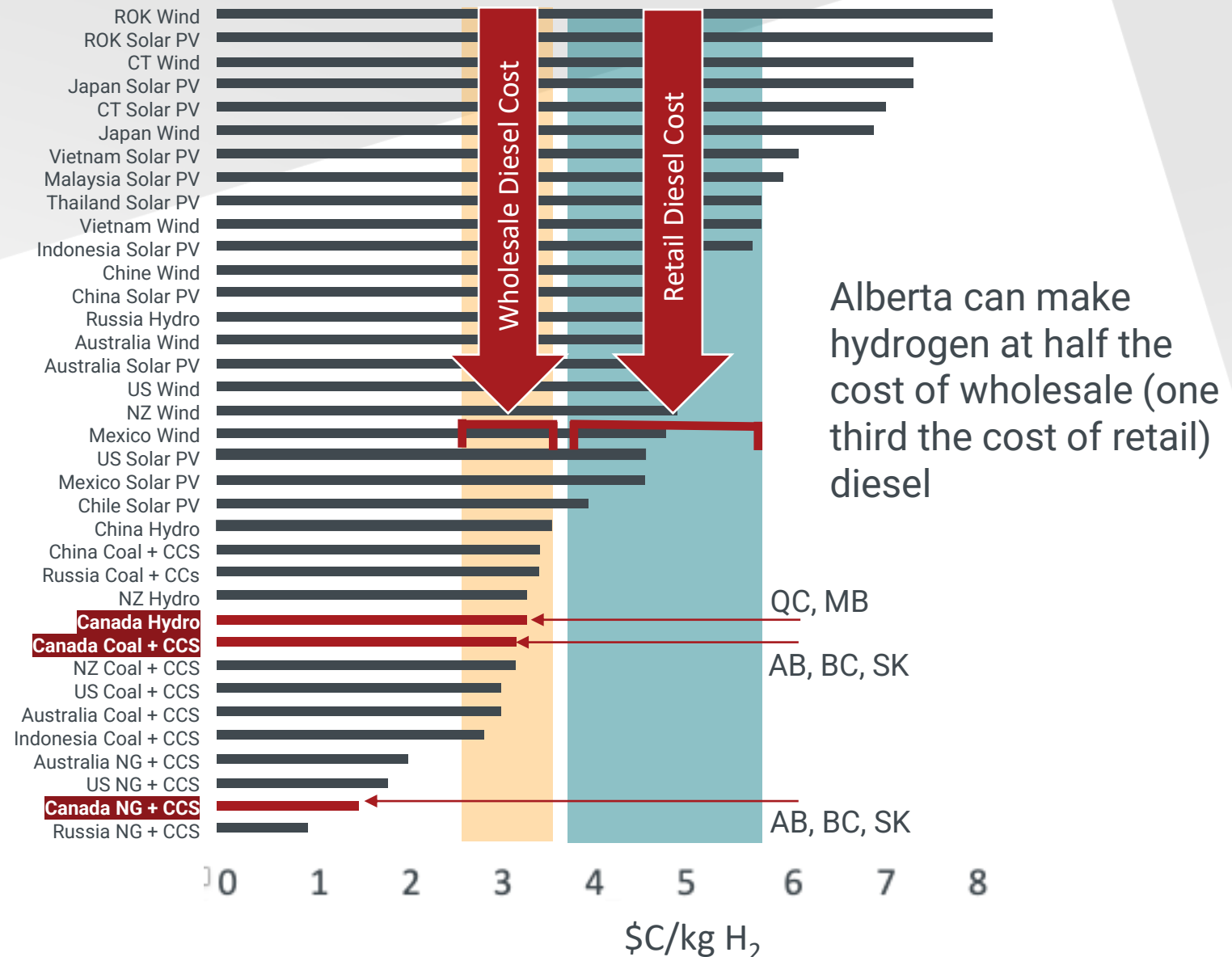
## Municipal Government

- Edmonton Region Hydrogen Hub
- Heartland Incentive Program (2 - 2.5% of project capital cost returned through property tax abatement and infrastructure supports)



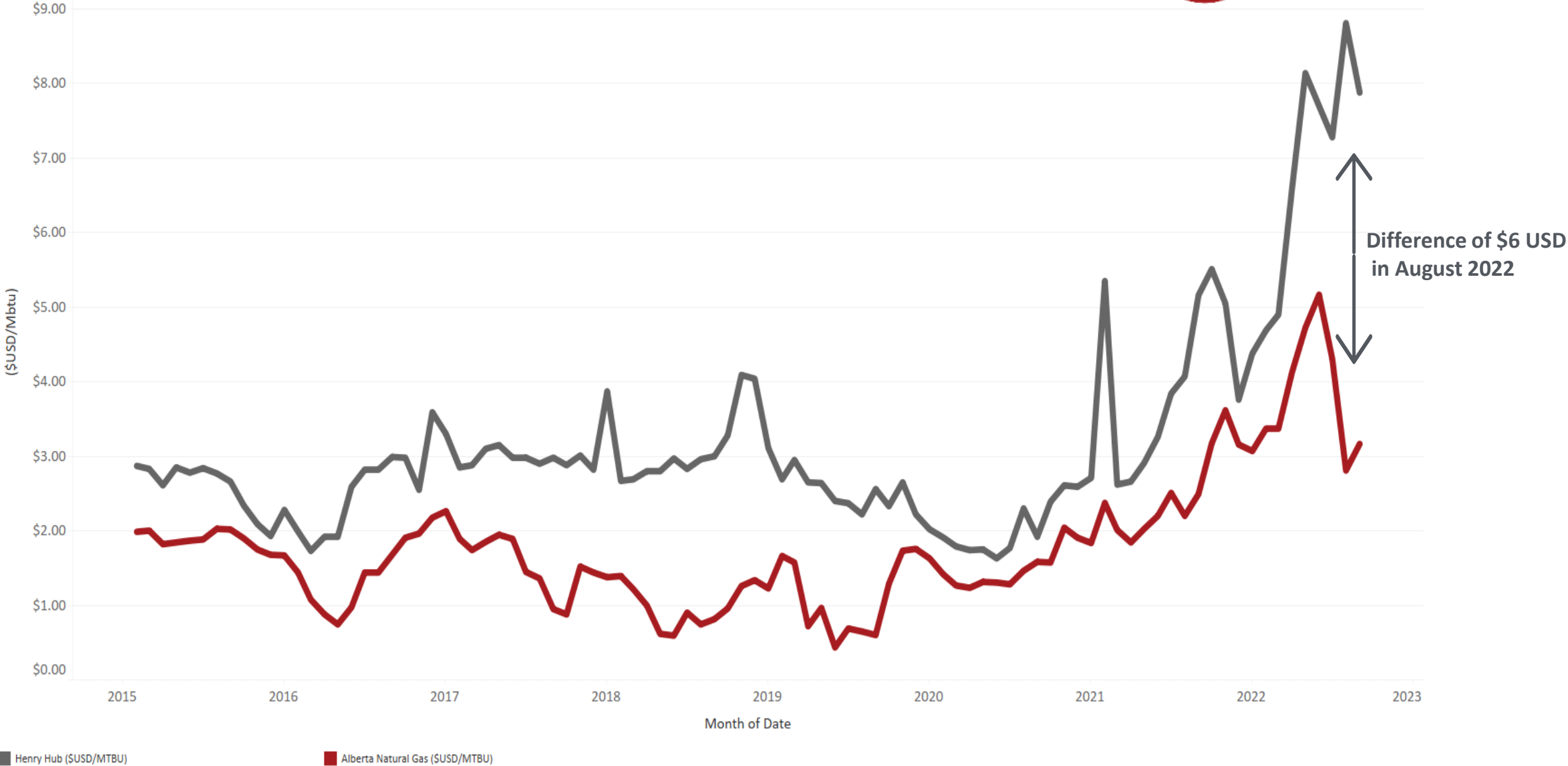
# Leveraging Our Cost Advantage

Canada is among  
the world's  
lowest cost  
producers of  
hydrogen



Adapted from Asia Pacific Energy  
Research Centre. 2018  
Perspectives on H<sub>2</sub> in the APEC  
region  
Source: Transition Accelerator

Cost Comparison of Natural Gas Price-  
*Henry Hub vs Alberta Natural Gas*





# Existing and Planned Infrastructure

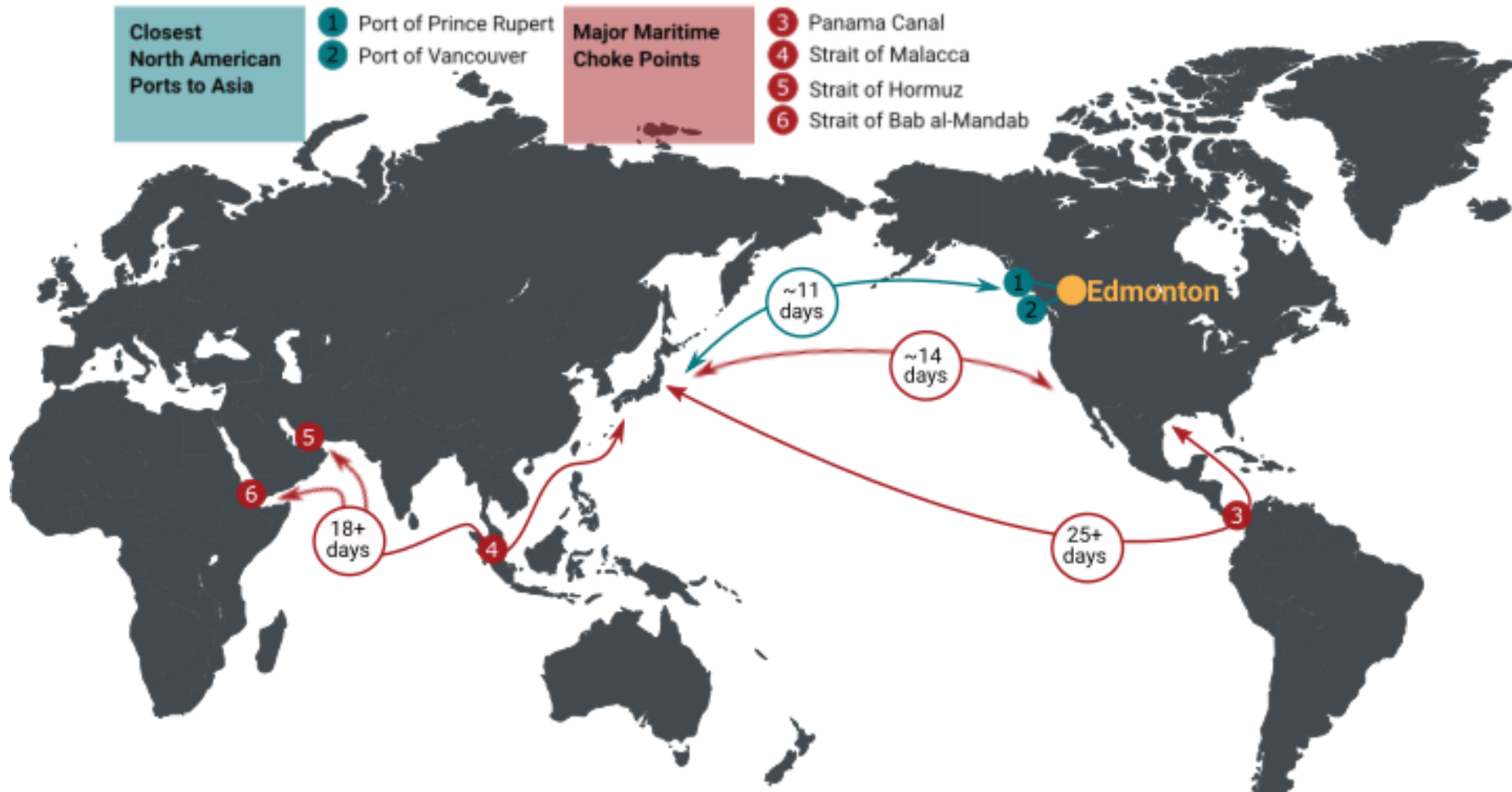
- Home of facilities that have made Canada one of top ten global producers of hydrogen today
- Existing Hydrogen Heartland Pipeline (Air Products)– Over 50 Km
- Home to the largest clean hydrogen production facilities in the world
- Existing large-scale CO<sub>2</sub> pipeline infrastructure (Alberta Carbon Trunk Line, Quest)
- World's largest net zero hydrogen production facility (Air Products) – planned for 2024
  - Providing hydrogen for Imperial renewable diesel facility
- Over \$30 Billion in new hydrogen projects being proposed for Edmonton Region, including:
  - Dow's net zero ethylene and derivatives complex
  - ATCO/Suncor clean hydrogen production aiming >300,000 tonnes per year
  - Exploring clean ammonia for export to Asia
    - Mitsubishi/Shell - first phase aims to produce ~165,000 tons per annum
    - Itochu/Petronas/Inter Pipeline
    - Hydrogen Canada - convert natural gas into 100,000 MT/y of hydrogen, an ammonia equivalent of 620,000 MT/y



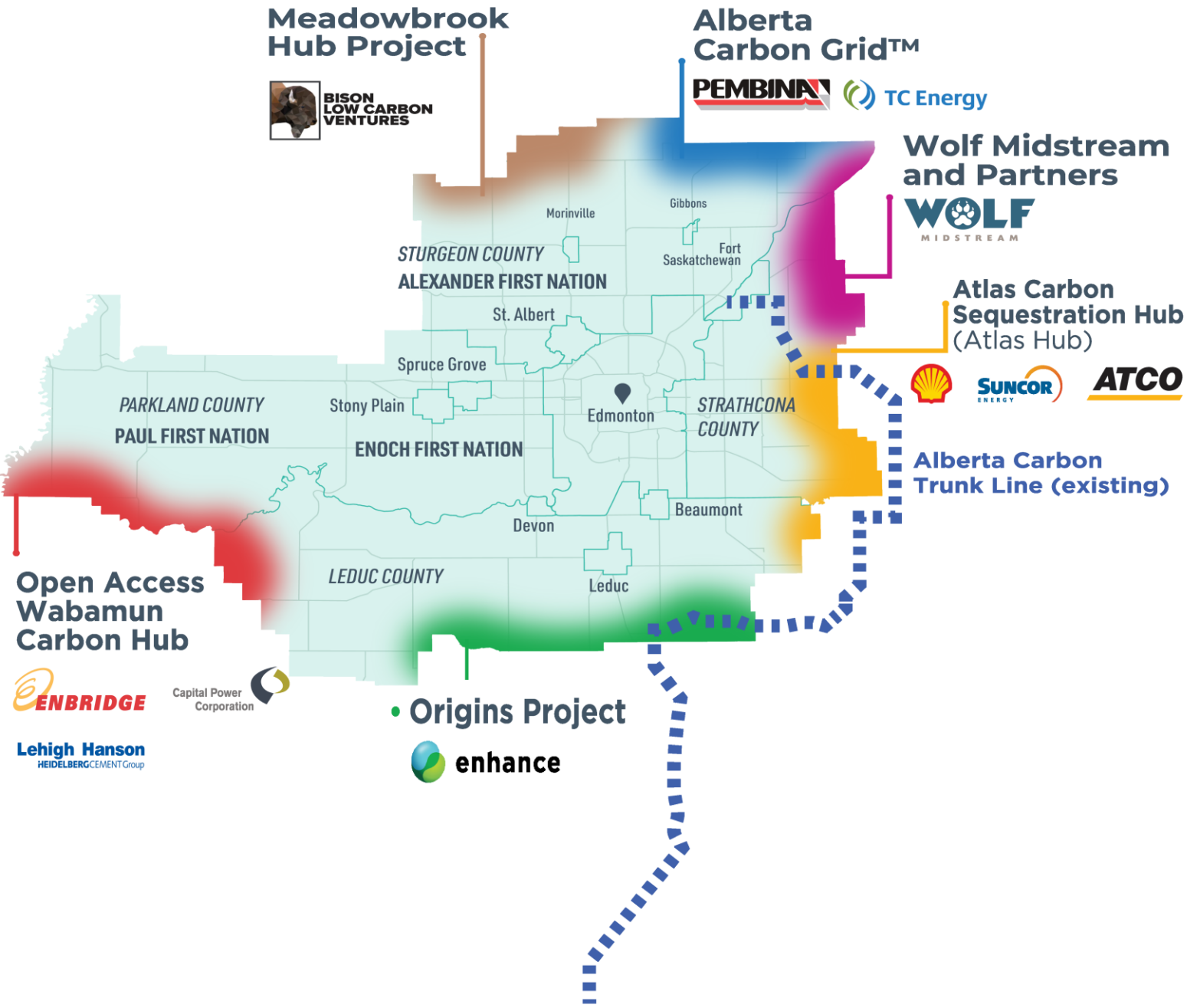
# The Hydrogen Export Opportunity

- \$50 billion opportunity for Canada

- Key Markets:  
Japan, South Korea, California, China
- Collaborative approach to establish critical enabling infrastructure







Carbon Management  
within the Edmonton  
Region

The Home to 6 CO<sub>2</sub>  
Hubs

# Scaling Hydrogen Production – A Comparison



- Location: Alberta Industrial Heartland, Canada
- H<sub>2</sub> production capacity: **547,000 tonnes per year**
- Year of completion: 2024
- Production method: ATR + CCUS

Comparing Air Product's announced Hydrogen Production plant in Edmonton Metropolitan Region with some of the world's largest green hydrogen production projects to be built in Europe and Asia



- Location: Rotterdam, Netherlands
- H<sub>2</sub> production capacity: **22,000 tonnes per year**
- Year of completion: 2025
- Production method: electrolyzers powered by offshore wind farm

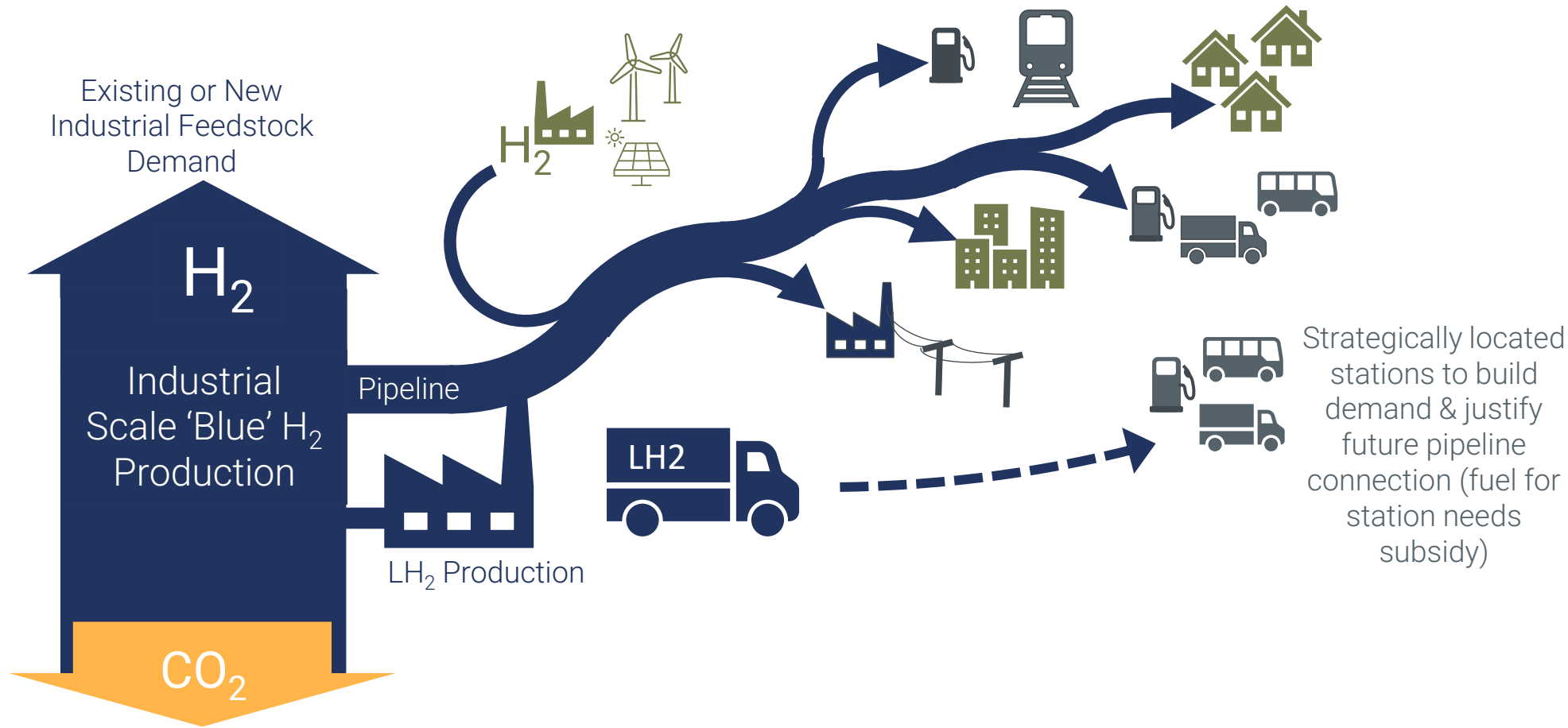


**SINOPEC**

- Location: Xinjiang, China
- H<sub>2</sub> production capacity: **20,000 tonnes per year**
- Year of completion: 2023
- Production method: electrolyzers powered by photovoltaic plant



# Leveraging our Assets to Create a Hydrogen Cluster



1. 'Piggy-back' on low-cost, low carbon industrial H<sub>2</sub> prod.

2. Pipeline H<sub>2</sub> to new fuel markets

3. Rapidly grow H<sub>2</sub> demand

4. Attract H<sub>2</sub>-using industries & OEMs

# The Edmonton Region Hydrogen Hub

Our futures are linked together and we're working cooperatively to take advantage of this opportunity to develop a low-carbon hydrogen economy and position the Edmonton Region for long-term economic success in the clean energy future.



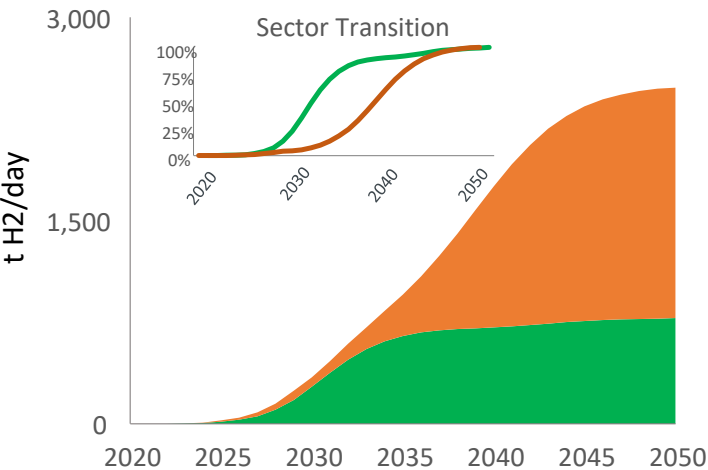
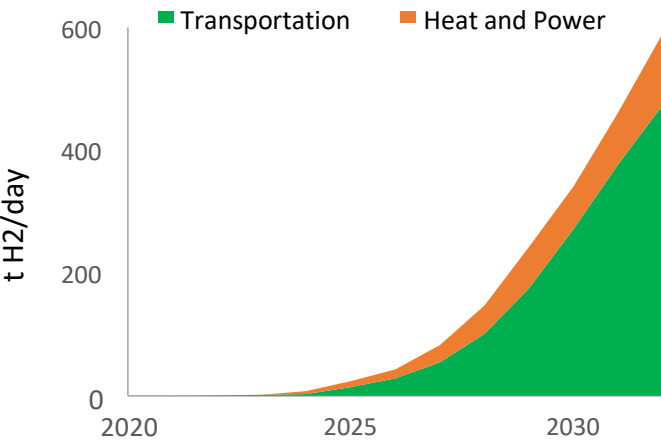
# Growing Demand for Hydrogen within the Edmonton Region

## Edmonton Region Hub Planned Infrastructure and Demand Projection

		2025	2032
Class 8 Trucks	HFCE	90	5,700
	Dual Fuel	290	9,500
Fueling stations		5	40+
H <sub>2</sub> Pipelines in place (km)		5	300+
CHP Sites		6	40+
H <sub>2</sub> demand (tonnes/ day)	Transportation*	8	340
	Heat and Power	4	120



Edmonton Region Demand



\*incl. trains, agriculture, medium-duty trucks, mining trucks





The Home to  
Leading Pilot  
Projects

# Building Demand from Pilot Projects within the Edmonton Region

## TRUCKS

Alberta Zero-Emissions Truck Electrification Collaboration (AZETEC)

Dual Fuel Commercialization Program

H<sub>2</sub> Truck Demonstration Road Show

Electric Vehicle Infrastructure Demo (EVID)



## BUSES

Fuel Cell Electric Bus Demonstrations (AZEHT)



## AIR

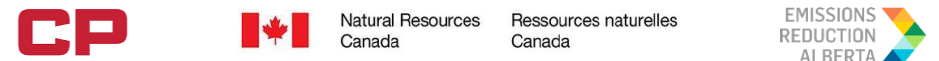
Edmonton International Airport Zero-emission Fleets

Edmonton International Airport Zero-emission Aviation Fuel and Aircrafts



## RAIL

CP Rail Hydrogen Locomotive Pilot



## HEAT & POWER

Fort Saskatchewan Hydrogen Blending Pilot





# Next Steps

- Implementation of Canadian Hydrogen Strategy
  - Federal program implementation
  - Approach for measuring Carbon Intensity
- Alberta Hydrogen Roadmap
  - Policy decisions around treatment of hydrogen within natural gas utility framework
  - Alberta Hydrogen Centre of Excellence
  - Advance export opportunity, in partnership with other governments
- Edmonton Region Hydrogen Hub
  - Implementation of Strategic Vision for the region
  - Scale hydrogen demand in region
  - Identify and strengthen regional supply chain
  - Ongoing engagement of industry







**Learn More About Hydrogen at:**

Contact Us

**Edmonton Region Hydrogen Hub** [www.erh2.ca](http://www.erh2.ca)

<https://edmontonglobal.ca/hydrogen-economy/>

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**Come Join us in Edmonton at the 2<sup>nd</sup> Canadian  
Hydrogen Convention, April 25-27, 2023**



Canadian Hydrogen Convention

[www.hydrogenexpo.com](http://www.hydrogenexpo.com)