



EMISSIONS
REDUCTION
ALBERTA

Edmonton
Global



ALEXANDER FIRST NATION
1847 TREATY 6

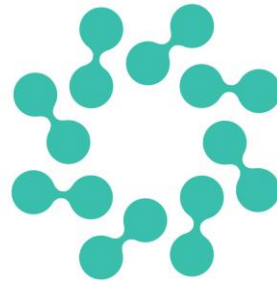
Canada



Alberta

The Transition
Accelerator

Sturgeon
COUNTY



EDMONTON REGION Hydrogen HUB

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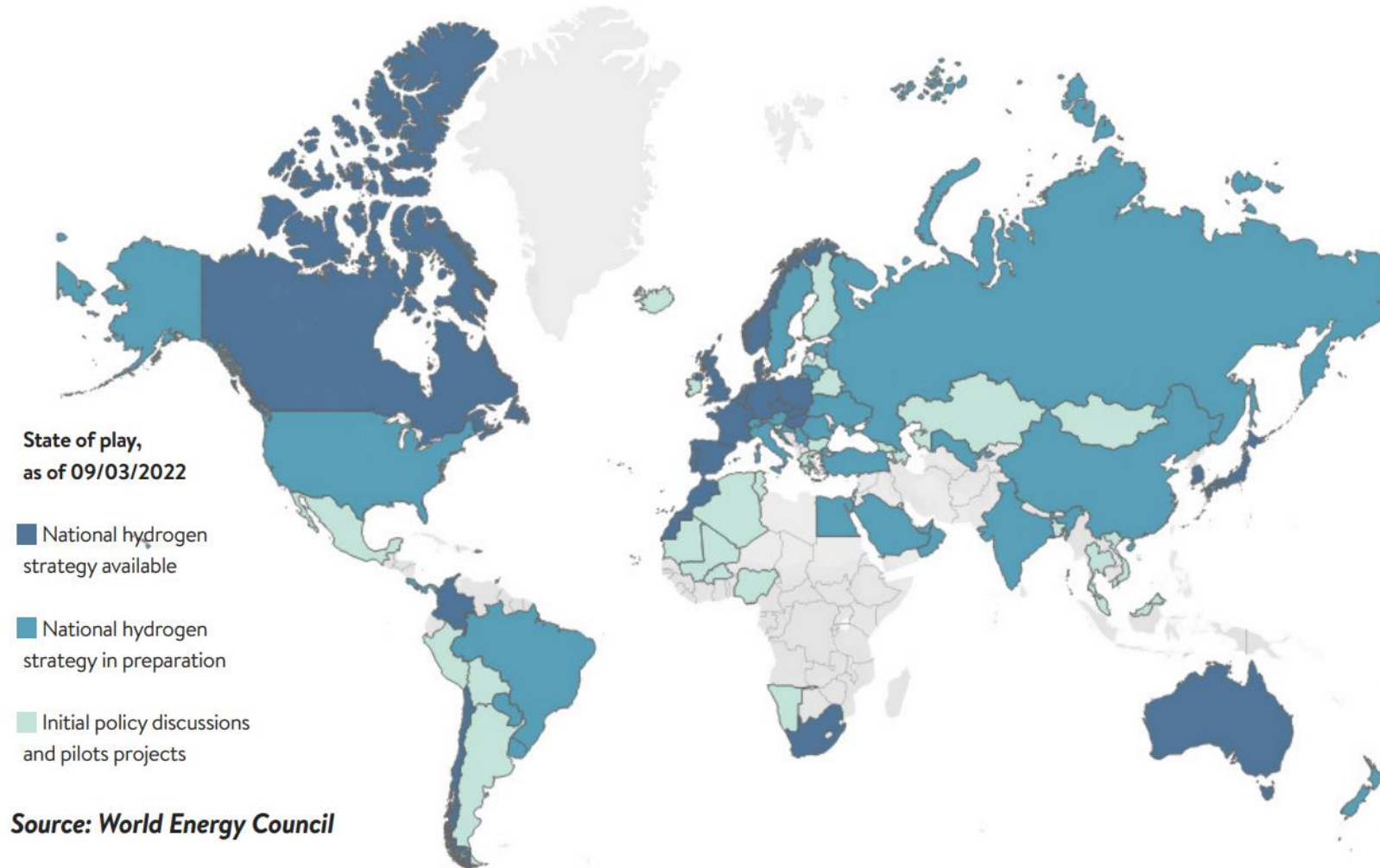
STRATHCONA
COUNTY

CITY OF
FORT SASKATCHEWAN
ALBERTA

Lamont County

www.erh2.ca

How Real is Hydrogen?



The World

- 21 Countries have H₂ strategies
- 27 more are drafting strategies
- \$2 Trillion/yr Global market
- \$23 Billion/yr Japanese market
- \$12 Billion/yr Korean market

Alberta

- \$10-20 Billion/yr Alberta
- \$6 Billion/yr in investments

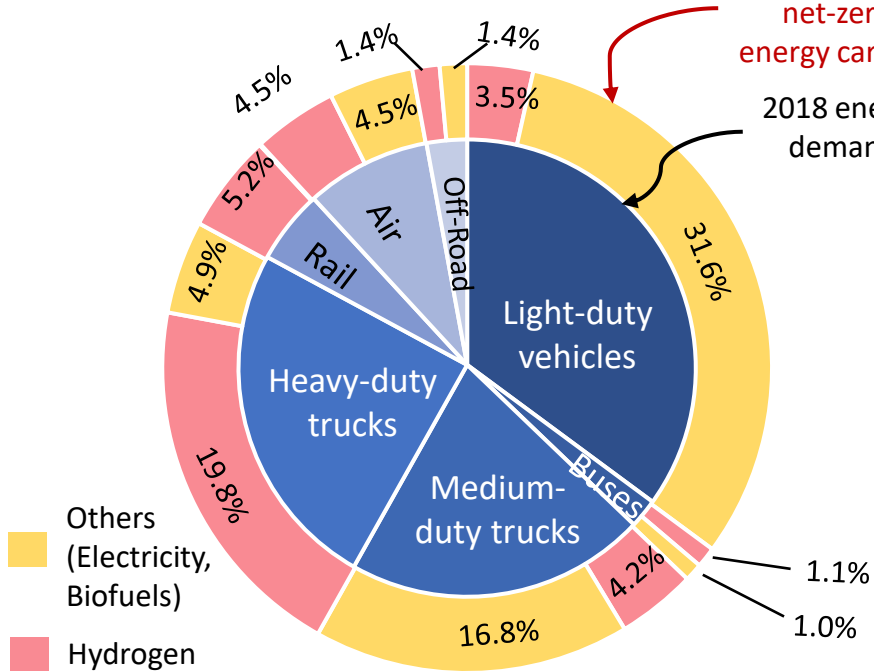
Comparison to current oil markets

- \$10-15 Billion/yr AB market
- \$8-10 Billion/yr oilsands investments in Alberta
- ~\$65 Billion/yr AB exports
- ~\$2 Trillion/yr Global market

Scale of the Opportunity in Alberta

Transportation

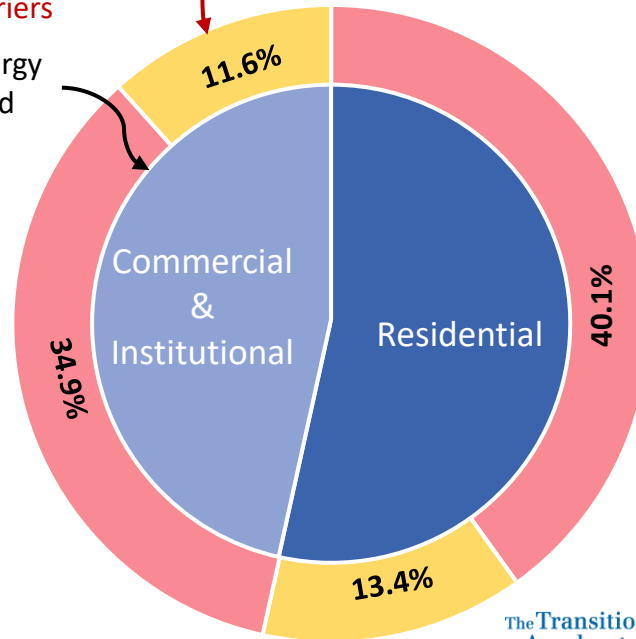
462 PJ_{h_hv}/yr (2018)



Buildings (from Nat'l Gas)

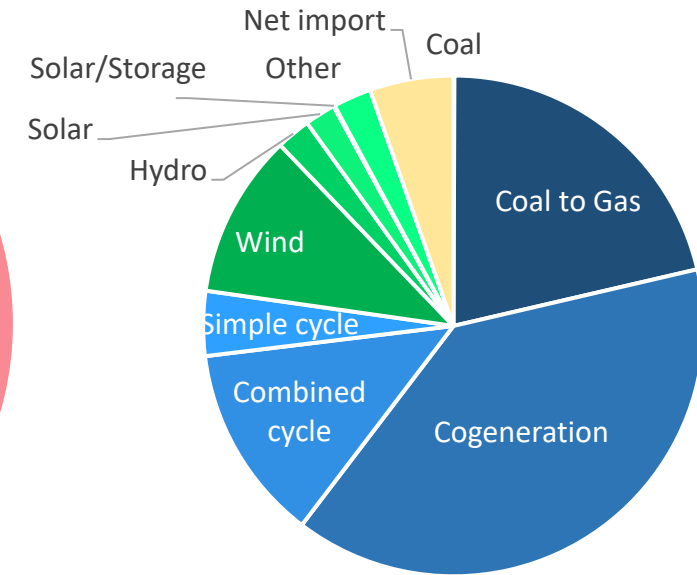
330 PJ_{h_hv}/yr (2018)

Projection to net-zero energy carriers



Electricity Generation

310 PJ/yr or 86,158 GWh/yr (2021)



The Transition Accelerator

- Backup for renewables (10% of Ann Gen)
- Industrial Cogeneration (20% of Ann Gen)

t H₂/d

2,800

(~14Mt CO₂/yr reduction from HD Trucks)

5,100

(~10Mt CO₂ /yr Reduction)

5,400

(~12Mt CO₂ /yr)

Total: 13,000 tH₂/day. About 2.4X current production. At \$2.1/kg = **\$10B/year**

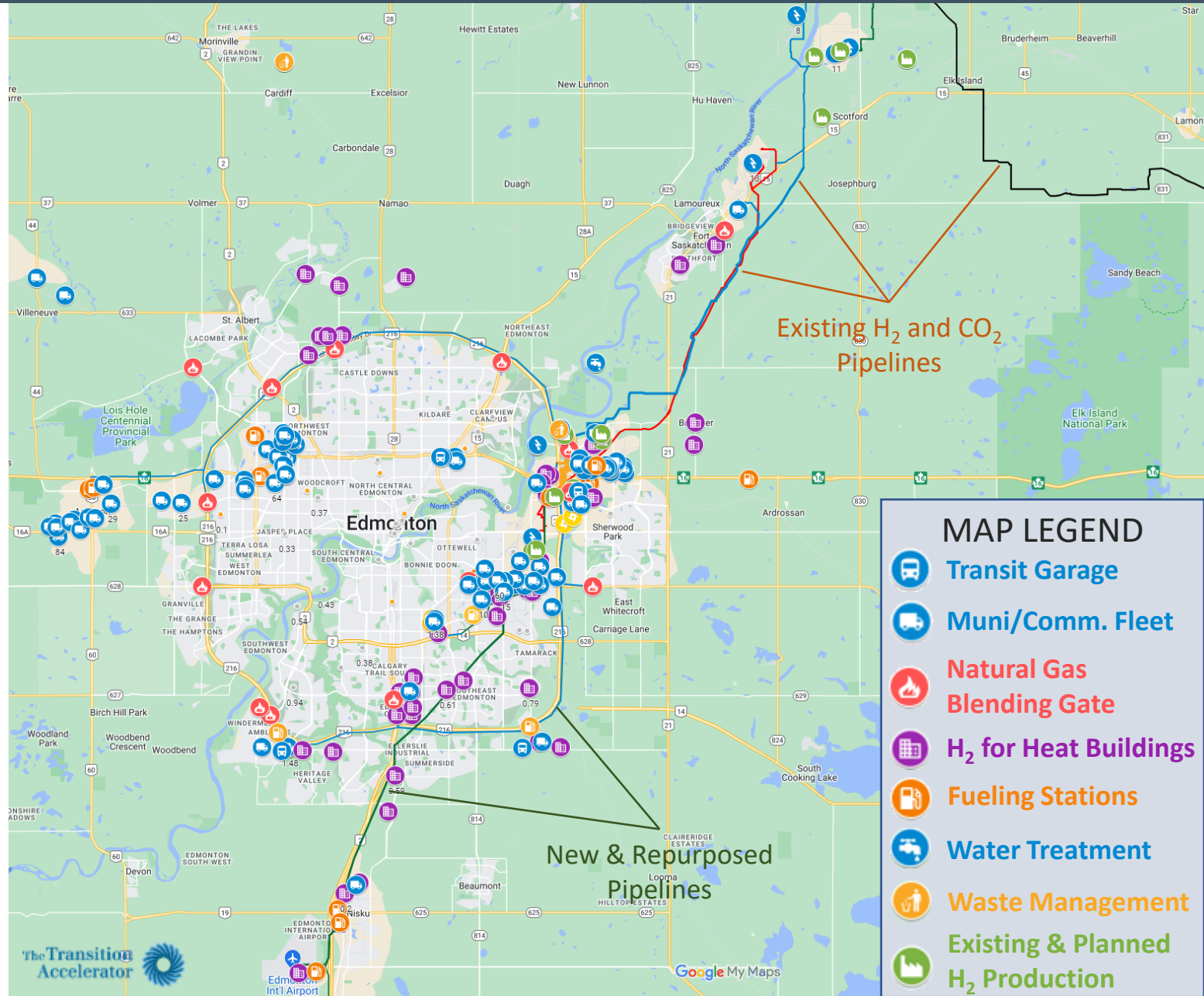
(20-30% of non-O&G emissions)

Defining the Future

Strategic Vision 2032

Edmonton Region Hub		07-Jul-22	
		2023	2032
Class 8 Trucks	Fuel Cell	5	5,700
	Dual Fuel	2	9,500
Fueling stations		1	40+
H ₂ Pipelines in place (km)		0	100's
tH ₂ demand/day	Transportation*	0.1	340
	Heat and Power	0.1	120

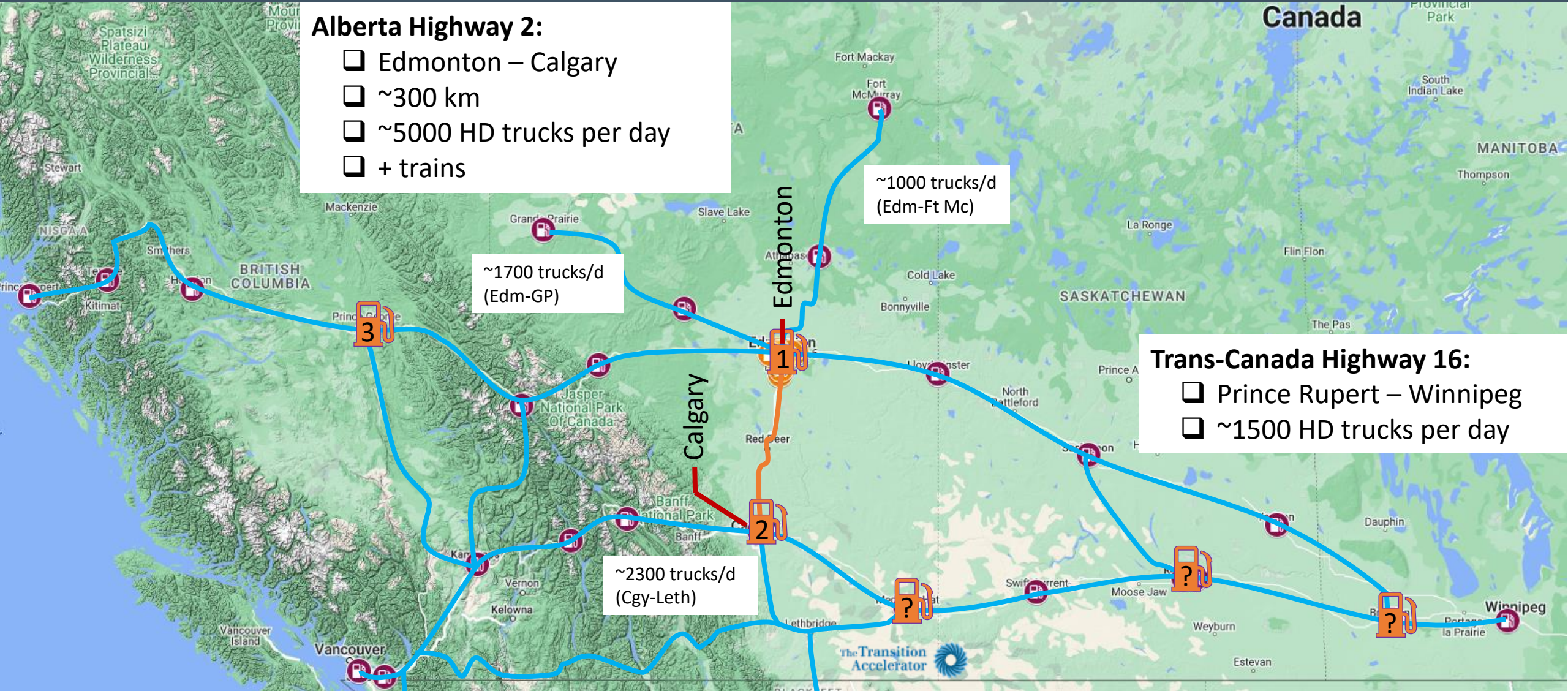
- **Transportation**—trucks, buses, trains
- **Heat & Power**—commercial, institutional, industrial
- **Utility Blending**—commercial, residential
- **\$10's billions** of investment and construction
- **\$400+ million/yr** of H₂ commodity sales
- **1500+ tCO₂/yr** emissions reduction



Commercial Vehicle Corridor Adoption

Alberta Highway 2:

- Edmonton – Calgary
- ~300 km
- ~5000 HD trucks per day
- + trains



Trans-Canada Highway 16:

- Prince Rupert – Winnipeg
- ~1500 HD trucks per day

Trans-Canada Highway 1:

- Vancouver – Winnipeg
- ~2000 HD trucks per day

Lessons Learned

Creating Demand is *THE* issue

The technology (generally) exists

- Need new system configurations (infra, regs, safety, price signals)

Scale needed for cost effectiveness

- Fuel costs differ across sectors

New value chains unlikely to emerge without taking an active role

- Strategic, systemic consortium approach—private industry, govts, munis
- Leadership from Province and Feds needed

What's Needed?

Future of HUB

- Current mandate expires 2023
- Recapitalizing, reshaping

Province is key

- HUBs need spokes—connectivity to other regions
- Budget surplus, energy transition vision, election

Awareness & Support

- Industry & Public
- Energy transition, safety, jobs, etc

Enabling Policy

- Empower utility companies
- Safety regulatory innovation

Infrastructure at Scale

- Fueling Stations
- Pipelines

Pilot & Demonstration Projects

- Still a need to “show me”
- 5000 Vehicle Challenge, Millennium Place, Bremner, etc

Who's responsibility is it?
What is the role of munis?

HUB Projects

Alberta Zero Emissions Truck Electrification Collaboration (AZETEC)

- >\$20 million
April 2023–Aug 2024

*launch pre-dates HUB, but we have ongoing involvement



EVID Demonstration Fueling Station

Dec 2022–2027



Alberta Zero Emissions Hydrogen Transit (AZEHT)

- \$9.9 million
Jan 2023–Jan 2025



H2 Truck Demonstration Road Show

Dec 2022–Sep 2024



H₂-Diesel Dual Fuel (co-combustion)

- Multiple Projects
(\$10+ million, 10+ Companies)
- Pilots, technology development, emissions study, demonstrations



Recently Funded Projects

The Hydrogen Innovation Accelerator

- \$744 k

The Hydrogen
Innovation Accelerator



Prairies Economic
Development Canada

Développement économique
Canada pour les Prairies



Bremner Community

- \$2 million+
- Feasibility of pure H₂ Community



HELPING BUILD
BETTER CITIES™



Aurora Hydrogen

- \$2 million+
- Hydrogen Pyrolysis



Ampclad Coatings

- \$600 k+
- Pipeline Coatings



Air Products Portable Fueler

- \$2,000,000



Emerging Initiatives

Fleets

- 5000 Vehicle Challenge
 - On-road fleets (trucks, buses, etc.)
 - Off-road fleets (tractors, graders, etc.)
- Municipal Fueling Stations
 - Edmonton
 - Strathcona

H₂ for Heat (& Power)

- Millennium Place CHP (Strathcona)
- Pure H₂ communities
- H₂ Blending

Waste to Resource Initiative

- 10 municipalities & one First Nation

Distributed Energy Systems

- Ammonia as an Energy Carrier
- H₂ Pyrolysis