



INTERNATIONAL PARTNERSHIP FOR HYDROGEN AND FUEL CELLS IN THE ECONOMY

IPHE Country Update November 2018: Canada

Name	Eric Barker
Contact information	eric.barker@canada.ca ; +1 604 666-1426
Covered Period	June – November 2018

1. New Policy Initiatives on Hydrogen and Fuel Cells

Over the past six months, all levels of government have collaborated to encourage the development and adoption of hydrogen and fuel cells (HFC) technologies along with clean technologies in general. Developments include:

Federal Government

- On November 21, 2018 the Government of Canada released its [Fall Economic Statement](#) which introduced a number of initiatives which could potentially benefit the hydrogen and fuel cell industry. Related initiatives include:
 - The full cost of specified clean energy equipment will be eligible for immediate expensing through an accelerated Capital Cost Allowance.
 - An additional **\$50M** to increase venture capital available to clean technology firms, under the Venture Capital Catalyst Initiative and beyond the **\$400M** announced in Budget 2017;
 - Modernization of federal regulations where new frameworks are required to deal with emerging technologies;
 - The **\$1.26B Strategic Innovation Fund** (SIF) will receive an additional **\$800M** to spur innovative R&D and expansion of businesses in Canada.
- Natural Resources Canada (NRCan) continues to provide support to the development of Hydrogen Refueling Station (HRSS) infrastructure through the [Electric Vehicle and Alternative Fuel Infrastructure Deployment Initiative](#). Three stations were approved under Phase I (Ontario, Quebec, British Columbia) and 4 additional ones have been approved under Phase II (Quebec and British Columbia). Others to follow.
- Canada's national Zero Emission Vehicle (ZEV) Strategy is to be released early 2019. Similar strategies are under development regarding low carbon fuels and carbon taxes.
- The "kick-off" workshop for Mission Innovation's Renewable and Clean Hydrogen Innovation Challenge (MI – IC8) was held at the Canadian Embassy in Berlin, October 17-18, 2018.

Provincial: British Columbia (BC)

- On November 20, 2018 the BC government [announced](#) their intention to introduce legislation next spring to phase in targets for the sale of Zero Emission Vehicles (ZEVs).



INTERNATIONAL PARTNERSHIP FOR HYDROGEN AND FUEL CELLS IN THE ECONOMY

This legislation will set targets of 10% ZEV sales by 2025, 30% by 2030 and 100% by 2040.

- In September 2018, the BC Ministry of Energy, Mines and Petroleum Resources launched the [Advanced Research and Commercialization \(ARC\) Program](#) which will provide BC-based companies operating in the Clean Energy Vehicle (CEV) sector with up to **\$1.35M** of funding over the next three years. The ARC Program will provide support to BC companies to invest in product development and commercialization activities through to long-term demonstration projects.
- In July, the BC government confirmed they are working on a [clean growth strategy](#) to be released in December, 2018. Aim is to integrate the province's goals for climate action, clean energy and sustainable economic growth. Topics to be addressed include: light and heavy duty ZEVs; clean fuels; requirement for building energy labelling; low carbon buildings; development of stronger codes and standards; training and certification; and, financial incentives.
 - The strategy is to include an analysis of the hydrogen opportunity specific to BC, given the province's abundant renewable energy and natural resource profile.
- The construction of HTEC (Hydrogen Energy Technology Corporation) and Shell Canada's 2nd Hydrogen Refueling Station (HRS) in Burnaby has begun and expected to be operational Q1 2019.
- Carbon taxes are now \$35/tonne and will continue to increase by \$5/tonne/year until rates reach \$50/tonne in April 2021.
- BC's **\$40M** [Clean Energy Vehicle Program](#) continues to provide support for ZEV purchase incentives along with the development of HRSs.
- **\$1M** has been committed to help incent the deployment of FCEV fleets in BC. Availability of FCEVs to be determined.

Provincial: Alberta

- In July 2018, Emissions Reduction Alberta (ERA) [announced](#) that it is making **\$70M** available in a new competitive funding opportunity. The BEST Challenge targets technologies that demonstrate the potential to reduce greenhouse gas (GHG) emissions in Alberta. Eligible sectors include sustainable transportation, electricity generation, and biotechnology.

Provincial: Ontario

- Following the release of Metrolinx's hydrogen rail (**Hydrail**) [Feasibility Study](#), shortlisted solution providers have begun the analysis and engineering required to complete final proposals.
- The new provincial government in Ontario has stopped providing ZEV product purchase incentives.



INTERNATIONAL PARTNERSHIP FOR HYDROGEN AND FUEL CELLS IN THE ECONOMY

Provincial: Quebec

- Following the introduction of Quebec's [ZEV Standard](#) (January 11, 2018). Toyota has committed to shipping a fleet of 50 Toyota Mirai fuel cell vehicles to the Quebec government for testing and demonstration.
- A HRS is being constructed in Quebec City to fuel the Mirai's. The station, which will produce 200 KGs of hydrogen through on site electrolysis, is expected to be operational in the spring, 2019. A mobile HRS is being shipped to Quebec in the meantime, to support the deployment of initial FCEVs.
- Other HRSs in the province are under development.

2. Hydrogen and Fuel Cell R&D Updates

- Progress continues on the development of the University of British Columbia's next generation multi-fuel station to be built on campus. The retail station, which will include on-site renewable hydrogen production/dispensing, electric vehicles (EV) fast charging along with diesel and natural gas dispensing will also be used for research, development, demonstration and educational purposes.

3. Demonstration and Deployment Updates

- The Canadian FCEV Coalition of automakers, made up of Honda, Hyundai, Kia, BMW, Mercedes-Benz and Toyota continue to promote the development of hydrogen refueling infrastructure to enable the adoption of FCEVs in Canada.
- [AVL Powertrain Engineering](#)
 - The world's largest independent company for the development of powertrain systems with internal combustion engines as well as instrumentation established a global fuel cell engineering centre ([AVL Fuel Cell Canada](#)) in Burnaby, British Columbia. The location was chosen due to the availability of qualified personnel and established supply chains.
- [Ballard Power Systems](#)
 - On November 13, 2018, [announced](#) a **\$183.8M** strategic collaboration with Weichai Power, a leading automotive equipment manufacturer specializing in the production of powertrains, automobiles, intelligent logistics, automotive parts and components;
 - Ballard fuel cell modules are to power four fuel cell electric [UPS delivery trucks](#) and two yard trucks at the [Port of Los Angeles](#);
 - In October, [closed](#) a transaction to divest itself of non-core (military) Power Manager business;
 - On September 18th [unveiled](#) its next generation fuel cell stack for the heavy duty motive market;
 - [Signed](#) an MOU with ABB for the development of fuel cell systems to power marine applications; and,



INTERNATIONAL PARTNERSHIP FOR HYDROGEN AND FUEL CELLS IN THE ECONOMY

- [Announced](#) a 3.5 year extension to their professional engineering services contract with Audi.
- [Enbridge Gas Distribution and Hydrogenics Corp](#)
 - In June, 2018 officially opened North America's first major Power-to-Gas (PtG) [energy storage facility](#).
- [Hydrogenics Corp](#)
 - On October 15th [announced](#) they had been selected to supply a large-scale electrolysis system capable of producing over 400KGs of Hydrogen per day at a hydrogen refueling station in Germany;
 - On October 8th ([International HFC Day](#)) of its newest North American facility in Carlsbad, California;
 - Is supplying six heavy duty fuel cell power modules for Class 8 drayage trucks in [California](#);
 - In September, the Canadian Hydrogen and Fuel Cell Association ([CHFCA](#)) [reported](#) that Alstom's 1st hydrogen fuel cell electric train that uses Hydrogenics systems is now in commercial service;
 - Hydrogenics, along with partners in Europe, to deliver a 2.5MW electrolyser based energy storage system to be directly connected to a 45MW wind farm in [Norway](#); and,
 - In June [announced](#) it will be providing fuel cells to Golden Gate Zero Emission Marine for the 1st high speed, hydrogen powered fuel cell marine vessel in the US.
- [Hydrogen Technology and Energy Corporation \(HTEC\)](#)
 - On June 15, 2018 HTEC and Shell Canada opened the 1st retail Hydrogen Refueling Station in [Vancouver, BC](#) and construction has begun on a 2nd. These stations will be part of a six-station network under development in Victoria and through the Lower Mainland of BC.
- [Loop Energy](#)
 - In August, [announced](#) that their heavy duty fuel cell range extender will power two zero emissions, hybrid electric Class 8 drayage trucks.
- [Xebec Adsorption](#)
 - The Blainville, Quebec based gas purification technology developer, [announced](#) a strategic co-operation agreement with Zhangjiagang Furui Hydrogen Power Equipment co, a Chinese company engaged in hydrogen generation and distribution, to expand their business within the renewable hydrogen supply chain.



INTERNATIONAL PARTNERSHIP FOR HYDROGEN AND FUEL CELLS IN THE ECONOMY

4. Events and Solicitations

- The [Canadian Hydrogen and Fuel Cell Association](#) along with F-Cell (of Germany) will be hosting the 2019 International HFC Summit and Trade Show in Vancouver, May 23 – 24th, 2019.
- 10th Clean Energy Ministerial and 4th Mission Innovation Ministerial meetings will also be hosted in Vancouver, May 26-28th, 2019. ([Press Release](#)).

5. Investments: Government and Collaborative Hydrogen and Fuel Cell Funding

- The **\$230K** “hydrogen @ scale” techno-economic feasibility study [announced](#) by the British Columbia is progressing. Results to be released early 2019. Project participants include: ITM Power, BC Hydro, Chiyoda Corporation and Mitsui.
- The Government of Canada, along with the CHFCA, continue to support industry participation in priority industry events.

6. Regulations, Codes, and Standards Updates

- Various federal departments have initiated dialogue to review codes & standards for H2 metering to enable accurate retail sales. Future discussions will engage industry, academia along with other [IPHE members](#).



Summary Country Update November 2018: Canada

Transportation	Target Number	Current Status	Partnerships, Strategic Approach	Policy Support
Fuel Cell Vehicles ¹	N/A	17	Vehicle roll-out for next 2 years likely to focus on 3 urban centres: Greater Vancouver and the Greater Toronto region and Quebec.	Provincial product purchase incentives (e.g. in BC \$6,000 for FCEVs & \$5,000 for EVs. Federal infrastructure incentives. ZEV Mandate (Quebec)
FC Bus	N/A	1 (Ballard)	Chinese Joint Venture	Chinese government incentives
Fuel Cell Trucks ²	N/A	2 (under development)	Private Public Partnerships	Federal programs
Forklifts	N/A	Over 400	Industry partnerships.	Commercial sales
H ₂ Refueling Stations	Target Number		Partnerships, Strategic Approach	Policy Support
70 MPa On-Site Production	N/A	2 (1 under development)	Public, private & academic partnership	Provincial program support
70 MPa Delivered	8	1	Private public partnerships	Federal and provincial (e.g., in BC, \$500K per HRS) program support
35 MPa On-Site Production	N/A	1	Academic research	Provincial Policy Support

¹ Includes Fuel Cell Electric Vehicles with Range Extenders

² As above



INTERNATIONAL PARTNERSHIP FOR HYDROGEN AND FUEL CELLS IN THE ECONOMY

35 MPa Delivered	N/A	5	Commercial sales	
Stationary	Target³	Current Status	Partnerships, Strategic Approach	Policy Support
Small ⁴	N/A			
Medium ⁵	N/A			
Large ⁶	1	Under development	Private public partnership	Ontario government program support
District Grid ⁷	N/A			
Regional Grid ⁸	N/A			
Telecom backup	N/A			
H₂ Production	Target⁹	Current Status	Partnerships, Strategic Approach	Policy Support
Fossil Fuels ¹⁰	N/A	Approximately 3 million metric tonnes per year		
Water Electrolysis ¹¹	N/A	TBD		

³ Targets can be units installed and/or total installed capacity in the size range indicated

⁴ <5 kW (e.g., Residential Use)

⁵ 5kW – 400 kW (e.g., Distributed Residential Use)

⁶ 0.3MW – 10 MW (e.g., Industrial Use)

⁷ 1MW – 30 MW (e.g., Grid Stability, Ancillary Services)

⁸ 30MW plus (e.g., Grid Storage and Systems Management)

⁹ Target can be by quantity (Nm³, kg, t) and by percentage of total production; also, reference to efficiency capabilities can be a target

¹⁰ Hydrogen produced by reforming processes

¹¹ Please indicate if targets relate to a specific technology (PEM, Alkaline, SOEC)



INTERNATIONAL PARTNERSHIP FOR HYDROGEN AND FUEL CELLS IN THE ECONOMY

(PEM, Alkaline, SOEC)				
By-product H ₂		TBD		
Energy Storage from Renewables	Target¹²	Current Status	Partnership, Strategic Approach	Policy Support
Power to Power ¹³ Capacity				
Power to Gas ¹⁴ Capacity	2	200 kW PtG system with 300 kg of H ₂ (Raglan Mine, Quebec) 5 MW PtG under development (Enbridge/Hydrogenics)	Private, public, partnerships	Federal and provincial policy support.

¹² Can be expressed in MW of Installed Capacity to use the electricity from renewable energy generation, and Annual MWh of stored energy capacity

¹³ Operator has an obligation to return the electricity stored through the use of hydrogen back to electricity

¹⁴ Operator has the opportunity to provide the stored energy in the form of hydrogen back to the energy system through multiple channels (e.g., merchant product, enriched natural gas, synthetic methane for transportation, heating, electricity)



INTERNATIONAL PARTNERSHIP FOR HYDROGEN AND FUEL CELLS IN THE ECONOMY

Hydrogen Refueling Stations	Capacity	Dispensing Pressure	Production Method
South Granville, Vancouver, British Columbia (HTEC – Opening June 15, 2018)	120kg/day	70 MPa	Electrolysis
Burnaby, British Columbia (HTEC – Design and permitting in progress)	120kg/day	70 MPa	Electrolysis
Greater Vancouver (To be announced)	100kg	70MPa	Electrolysis
Surrey, British Columbia (Powertech Labs)	Storage at 45MPa: 60kg Storage at 85MPa: 60kg	35/70 MPa	On-site Electrolysis (24kg/d)
Burnaby, British Columbia (Ballard)	Storage at 25MPa: 4700 kg Storage at 25MPa: 2400 kg	35 MPa	Methane/Natural Gas
Greater Toronto Area (GTA), Ontario (Location to be announced)	100kg	70MPa	Electrolysis
Mississauga, Ontario (Under development)	60kg	70MPa	Electrolysis
Brampton , Ontario (Canadian Tire – 74 FC forklifts)	TBD	35 MPa	On-site Electrolysis
Bolton, Ontario (Canadian Tire – forklifts TBD)	TBD	TBD	On-site Electrolysis
Cornwall, Ontario (Walmart – 240 FC forklifts)	TBD	35 MPa	Electrolysis
Balzac (Calgary), Alberta (Walmart – 230 FC forklifts)	TBD	35 MPa	Electrolysis
Mississauga, Ontario (Hydrogenics)	Storage at 20MPa	35 MPa	Electrolysis
Trois Rivières, Québec (WEH Gas Technologies)	TBD	70 MPa	On-site Electrolysis