INTERNATIONAL PARTNERSHIP FOR
HYDROGEN AND FUEL CELLS IN THE ECONOMY

# IPHE Country Update November 2016: Canada

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| **Covered Period** | June 2016 - November 2016 |

## 1. New Policy Initiatives on Clean Technologies and Clean Energy

**Federal government:** A number of items in the March 2016 Canadian federal budget reinforced the government`s position that a competitive economy and environmental protection are linked. Priorities include: clean infrastructure development ($5B); the reduction of greenhouse gas (GHG) emissions ($2B); sustainable natural resource development ($1B); clean technology research, development & demonstrations ($230M); clean energy vehicle infrastructure development ($62.5M to date); air pollution ($345M); energy efficiency ($129M); sustainable municipalities ($125); along with other policy developments.

Over the past six months, the following action items have been taken:

- $800M commitment towards the development of innovative clusters expected to have broad economic and environmental impacts;
- Extensive consultations with leading innovators from industry, academia and other levels of government have taken place, nationally;
- A number of federal, provincial and municipal governments are reengaging with the HFC industry and related initiatives;
- The Government of Canada (GoC) has committed to the development of a national HFC Roadmap (2016/2017);
- An Economic Analysis and Modelling of Retail Hydrogen Fuelling Infrastructure project has been launched;
- The 2016 "Canadian Hydrogen & Fuel Cell Sector Profile" was completed.
- 3 new federally supported retail Hydrogen Refuelling Stations (HRS) are to be built - locations to be announced;
- The GoC is committed to supporting the development of additional HRSs, assuming FCEVs are available (2018 – 2026);
- Transport Canada recently acquired two Toyota FCEVs to support environmental and safety testing. Test results will inform the development of codes, standards, and regulations required to support the commercialization of FCEVs.
- The Ministers of Transportation, Environment and Climate Change Canada and Natural Resources Canada had an opportunity to drive a Toyota Mirai on Parliament Hill as did other senior government officials.
- On October 3rd, 2016, Prime Minister Trudeau announced that provincial governments have until 2018 to adopt a carbon pricing scheme, or the federal government will impose a price for them – a minimum of $10 per tonne by 2018 and $50 a tonne by 2022.

**Provincial governments**

In August, 2016 **British Columbia** (BC) released a $120K "Clean Energy Vehicle (CEV) Economic Analysis" report which was produced in partnership with the GoC, industry, and academia. Despite certain challenges to be overcome, analysts concluded that the province has a number of competitive advantages, which are enabling BC based suppliers to pursue opportunities in the CEV sector. BC's established HFC industry, academic institutions, and supply chains being the largest drivers. The results of the study are

being used to inform the development of a new provincial program designed to address the challenges and opportunities associated with the development of the region's CEV industry along with the infrastructure to support it. For additional information: See Clean Energy Vehicle (CEV) Economic Analysis.

The **Government of BC** continues to support the introduction of CEVs in the Pacific region through product purchase and infrastructure development incentives. FCEVs are eligible for a $6,000 rebate and EVs $5000. The BC CEV program is also providing support towards the development of a new retail HRS in the Vancouver area and potentially in Victoria, the capital of BC.

In August 2016, BC released its Climate Leadership Plan. The plan highlights the first set of actions being taken to help meet the province's 2050 emissions reduction target of 80% below 2007 levels. BC has broad based carbon tax of $30/tonne; its low carbon fuel standard is driving the development of HRSs in the province; in 2015 97.6% of BC's electricity supply came from renewable energy; and, BC was the 1st jurisdiction in North America to achieve a carbon-neutral public sector.

On May 24, 2016, the **Province of Alberta** introduced Bill 20: the Climate Leadership Implementation Act**,** which implements the carbon levy on Albertans and Alberta businesses that the government announced under its Climate Change Leadership Plan. Beginning in January 2017, Albertans will be subject to economy-wide carbon tax of $20 per tonne which will increased to $30 per tonne by January 2018. The province expects the tax will generate revenues of over $3B per year by 2018. These funds are to be used to support: green transportation infrastructure development; energy efficiency programs; renewable energy research, development and investments; and, an adjustment fund to help lower-income Albertans offset the cost increases of carbon pricing.

In May, 2016 the **Province of Ontario** finalized the rules for its new cap and trade program and passed the Climate Change Mitigation and Low-Carbon Economy Act which ensures that proceeds from the province's cap and trade program are invested in a transparent and accountable way back into green projects that will help households and businesses reduce greenhouse gas pollution and save on energy costs. Ontario expects to generate up to $1.9B per year in proceeds from its cap and trade program. This revenue will be deposited into a new Greenhouse Gas Reduction Account and reinvested into: clean transportation; energy efficiency programs; renewable energy; and, renewable off-grid electrification.

Ontario's objective is to cut greenhouse gas pollution to 15% below 1990 levels by 2020, 37 % by 2030 and 80% by 2050. For additional information on the tools and incentives available to help achieve their goals, please consult Ontario's June 2016, Climate Change Action Plan.

**Quebec's** primary tool for fighting climate change is their 2013 – 2020 Climate Change Action Plan. Priorities include: the electrification of transportation; the development of public transit; energy efficiency; renewable energy; clean technology R&D. The estimated $3.3B required to fund related activities come from the auctions associated with the provinces cap and trade system established in 2013. Although FCEVs are not currently eligible for the provinces $8K EV product purchase incentive the expectation is that this will change as in March, 2016 the Quebec Government revised its policies to include hydrogen as a source of energy and, the Université du Quebec a Trois-Rivières (UQTR) recently took possession of a FCEV. UQTR has hydrogen production & dispensing on sight.

## 2. Hydrogen and Fuel Cell R&D Update

The Simon Fraser University led Catalysis Research for Electrolyte Fuel Cells Network (Carpe-FC) is in its 5th and final year of operation. Carpe-FC is a pan-Canadian academic network with active participation from 8 universities, 4 SMEs, an industry association, and three government departments. It comprises of a multi-disciplinary team of over 100 researchers from universities and government laboratories across Canada, who work closely with participating industry partners. Thanks in part to their active involved in the Carpe-FC network, participating firms have been able to reduce the amount of platinum loading by close to 70%, while effectively managing durability and performance.

**3. Demonstration and Deployments Update**

The 1st commercial FCEV was delivered to the province of Quebec (Université du Quebec a Trois-Rivières) and, two additional FCEVs were delivered to customers in British Columbia (HTEC, Powertech Labs).

In October, Ballard Power Systems announced the commissioning and deployment of its 22nd of 330 FC buses (FCB) in the city of Foshan, China. Alstrom unveiled the 1st of 1000 Hydrogenics Corporation powered fuel cell passenger train completely powered by hydrogen at Berlin InnoTrans trade show in September 2016.

**4. Events and Solicitations**

***Globe Capital 2017***: April 4 – 5, 2017, Toronto, Ontario. Globe Capital is a new summit for leaders to discuss how to mobilize and accelerate the capital necessary to transform our economies.

***Hydrogen & Fuel Cells 2017 Summit - HFC2017***: June 5 – 6, 2017, Vancouver, BC. A biennial conference, hosted by the Canadian Hydrogen and Fuel Cell Association (CHFCA) to increase awareness of the economic, environmental and social benefits of hydrogen and fuel cells.

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

The Government of Canada will co-invest in the deployment of three additional public HRSs over the next 1.5 years. Locations to be announced with additional HRS investments to follow, assuming automotive OEMs commit to bringing FCEVs to the market.

The BC government (BCG) has committed to investing in a public hydrogen refuelling station (HRS) in partnership with industry. Location to be announced. The BCG is also in discussions with the Capital Regional District of Victoria, given their interest in FCEV fleets.

Transport Canada purchased and took possession of two FCEVs for evaluation, testing and to further the advancement of related codes and standards.

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# Summary Country Update October 2016: Canada

| Transportation | Target Number | Current Status | Partnerships, Strategic Approach | Policy Support |
|---|---|---|---|---|
| Fuel Cell Vehicles[1] | N/A | 15 | Vehicle roll-out for next 2 years to focus on 2 urban centres: Greater Vancouver and the Greater Toronto region | Provincial product purchase incentives. Federal infrastructure incentives. |
| 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 | Approximately 400 | Industry partnerships. | Commercial sales |
| **$H_2$ Refueling Stations** | **Target Number** | | **Partnerships, Strategic Approach** | **Policy Support** |
| 70 MPa On-Site Production | N/A | | | |
| 70 MPa Delivered | 5 | 1 | Private public partnerships | Federal and provincial (BC) program support |
| 35 MPa On-Site Production | N/A | 1 | Academic research | Provincial Policy Support |
| 35 MPa Delivered | N/A | 5 | Commercial sales | |
| **Stationary** | **Target Number[3]** | **Current Status** | **Partnerships, Strategic Approach** | **Policy Support** |

[1] Includes Fuel Cell Electric Vehicles with Range Extenders
[2] As above

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|---|---|---|---|---|
| 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 | | | |
| **$H_2$ Production** | **Target[9]** | **Current Status** | **Partnerships, Strategic Approach** | **Policy Support** |
| Fossil Fuels[10] | N/A | Approximately 3 million tonnes per year | | |
| Water Electrolysis[11] (PEM, Alkaline, SOEC) | 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 ($Nm^3$, 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, Alkiline, SOEC)

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| By-product $H_2$ | | TBD | | |
| **Energy Storage from Renewables** | **Target[12]** | **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 H2 (Raglan Mine, Quebec)<br><br>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)

## Hydrogen Filling Stations (Nationwide)

**Total of 11 hydrogen filling stations**

| Station | Capacity | Dispensing Pressure | Production Method |
|---|---|---|---|
| Vancouver, British Columbia (HTEC – public station under development and location TBD) | TBD | 70 MPa | Electrolysis |
| Greater Vancouver (Public station 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 25 MPa: 4700 kg Storage at 25 MPa: 2400 kg | 35 MPa | Methane/Natural Gas |
| Greater Toronto Area (GTA), Ontario (Location to be announced) | 100kg | 70MPa | Electrolysis |
| GTA, Ontario (Location to be announced) | 60kg | 70MPa | Electrolysis |
| GTA, Ontario (Canadian Tire – 74 FC forklifts) | TBD | 35 MPa | 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 Riviere, Quebec (WEH Gas Technology) | TBD | 70 MPa | On-site Electrolysis |