Government of Canada | Gouvernement du Canada

DRAFT V.2

Canada Member Statement

International Partnership for the Hydrogen Economy (IPHE)

4th Steering Committee Meeting

September 2005
Kyoto, Japan

Canada

Outline

- Canadian Research and Development Activity Update
- Canadian Technology Demonstrations Update
- Canadian Industry Accomplishments
- Domestic/International Hydrogen Conferences, Workshops, and Other Events and Activities
- Canadian Industry Issues

Government Supported R&D Initiatives

National Research Council of Canada (NRC)

- $15 million Cdn. R&D program involving over 100 researchers
- Hydrogen Technology Environmental Chamber in Vancouver - one of the only public facilities of its kind in North America fully operational
- Over 60 papers published in refereed journals - two publications rated among Elsevier Science's "Top 25 Hottest Research Publications"
- NRC's SOFC research led to a breakthrough in operational flexibility and performance
- Research on novel catalysts for fuel cell and hydrolysis resulted in significant improvement in efficiency (patent application filed)

Technology Partnerships Canada (TPC)

- $18.5 million investment in two projects by the Government of Canada

$9.5M to Cellex Power Products Inc. to develop hydrogen fuel cell power units for industrial lift trucks

$9M to General Hydrogen (Canada) Corporation to develop self-contained fuel cell power packs for industrial vehicles, and associated fuel cell process control and fluid management modules

Canada

Government Supported R&D Initiatives

Natural Resources Canada - Hydrogen and Fuel Cell R&D Program

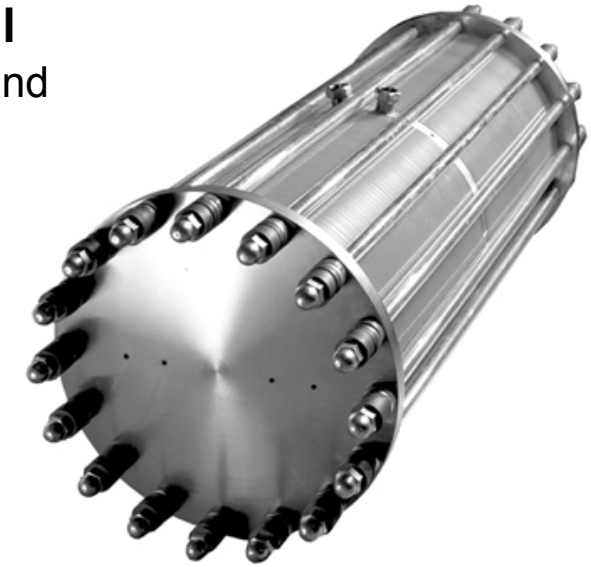
- Program has four elements: hydrogen production; hydrogen storage; utilization; and codes, standards, safety and outreach
- $3M RFP to industry for R&D projects to develop cost competitive technologies in the area of hydrogen, fuel cells, and hybrid electric vehicles (HEVs)

Environment Canada

- Investigating production of methane and hydrogen from bio-solids at waste water treatment facilities
- Promoting the need for ultra-clean hydrogen to reduce the environmental footprint

Social Sciences and Humanities Research Council

- Efforts underway to examine market, economic, social and cultural aspects to building a hydrogen economy
- Strong private sector, government, NGO and academic interest



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Hydrogen Highway™ Update

- National Research Council demonstrating hydrogen production from photovoltaic panels at their facility in Vancouver

Canadian Transportation Fuel Cell Alliance

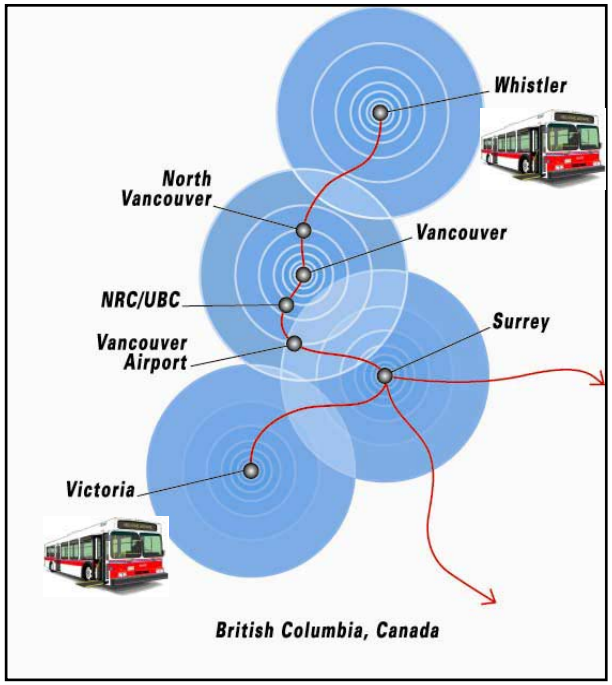
- Three Operational Hydrogen Fuelling Stations:

  Powertech Labs, Surrey - 350 and 700 bar hydrogen produced by electrolyser fed with green certified electricity

  Pacific Spirit Station, NRC-IFCI/UBC campus - 350 bar

  BC Transit Fuelling Station, Victoria - 350 bar

- BC Transit Business Plan for 20 Fuel Cell buses to be used for the 2010 Olympic Games under development



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Hydrogen Village Update

- General Motors of Canada Limited and Hydrogenics Corporation demonstrated two hydrogen fuel cell powered forklifts in regular service supported by an on-site Hydrogenics HyLYZER hydrogen refueling station. Dynetek Industries and FTI International are also supplying technology to the project
- Installation of 4 SOFC units at the U of T Mississauga Campus
- Demonstration of 4 John Deere “Gator” utility vehicles at Exhibition place in Toronto

- Supply of a hydrogen fuel cell powered courier delivery vehicle and a gaseous hydrogen refueling station for Purolator’s West Toronto location
- A wind turbine refuelling station is up and running
- Grid connected energy system using on-site hydrogen generation from a natural gas feedstock

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Vancouver Fuel Cell Vehicle Program Update

March 31, 2005 - Five vehicles officially delivered to the vehicle users: BC Hydro, BC Transit, Ballard Power Systems, City of Vancouver, Fuel Cells Canada / Natural Resources Canada / National Research Council Canada / Province of BC.

Canadian Transportation Fuel Cell Alliance

Ford Focus Fuel Cell Vehicle is a third-generation hybrid-electric vehicle that uses the Ballard Mark 902 series fuel-cell engine and Dynetek 5,000 psi compressed-hydrogen storage.

Hydrogen fuelling station located at the National Research Council Canada facilities in Vancouver

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Prince Edward Island Wind - Hydrogen Village Demonstration Project

Use of wind energy as the main energy source for the production of hydrogen to provide backup and primary electricity for industrial, farm and household applications, as well as for fuel for a mix of transportation and other requirements.

Hydrogen Early Adopters Program (h2EA)

- $10.3M project with 50% Government of Canada contribution
- Project involves 15 organizations, led by Hydrogenics of Toronto
- Natural Resources Canada also contributing $115000, through the Canadian Transportation and Fuel Cell Alliance, toward an engineering study for the hydrogen fuelling stations component of this project.

Canada

Portable Power Demonstrations

Angstrom Power Incorporated - Demonstrating and testing hydrogen fuel cell-powered portable electronic devices, including lights and chargers, in remote field operations without access to the electricity grid.

SUSTAINABLE DEVELOPMENT TECHNOLOGY CANADA™

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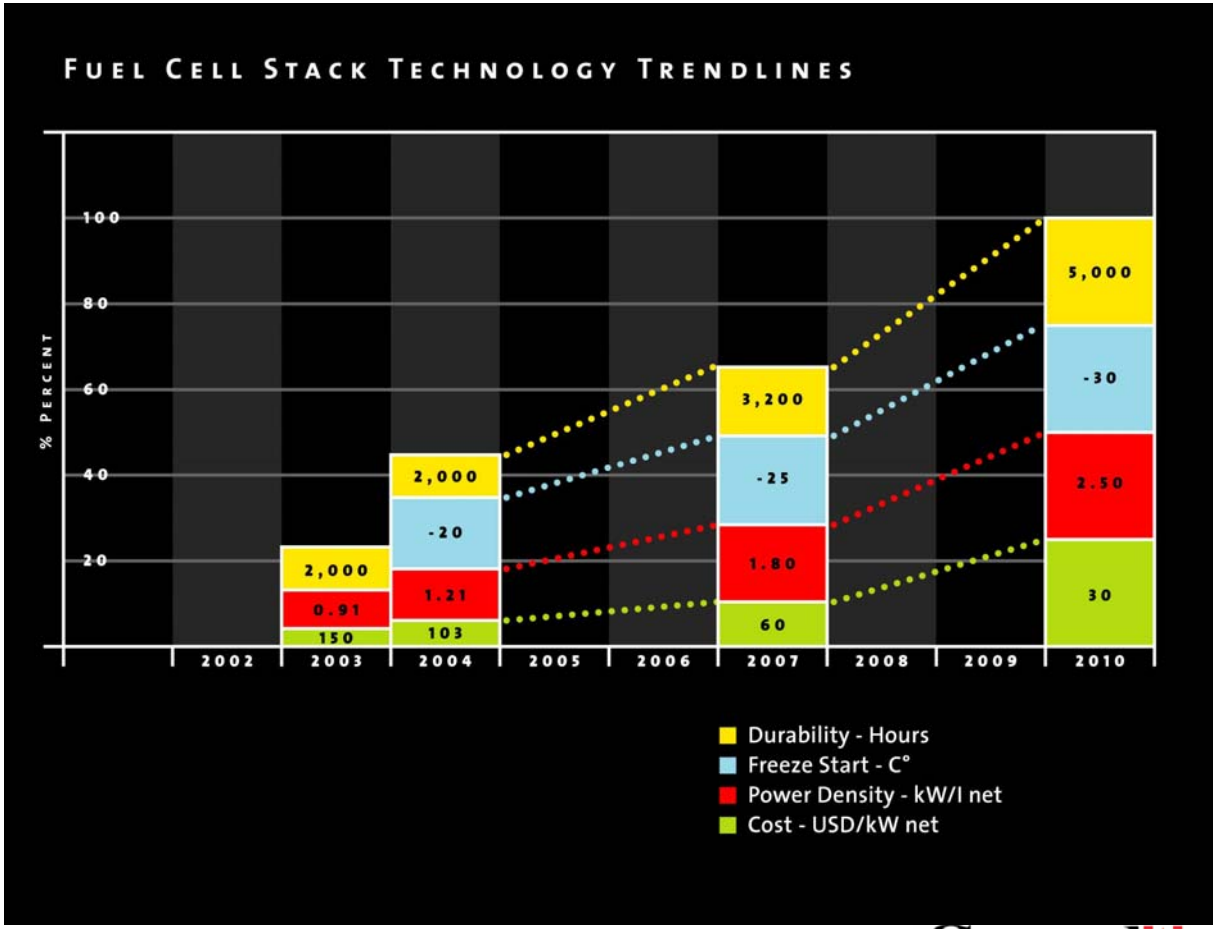
PEM Stack Performance and Future Targets

Ballard Power Systems demonstrated, in a single stack design, significant progress in three areas most critical to advancing fuel cells along the path to commercialization:

✓ Freeze start: 50 consecutive starts from -20 degrees Celsius

✓ Durability: more than 2,200 hours of operation, employing a drive cycle testing protocol that simulated real world driving

✓ Cost: the stack design incorporated a 30% reduction in platinum catalyst loading with no reduction in performance



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SOFC Continuous Operation

Fuel Cell Technologies has announced that its second generation 5 kW Solid Oxide Fuel Cell system, (SOFC) has accumulated over 1500 hours of operation and in its latest test has generated over 5 kW of energy per hour for over 300 hours.

The company has recently installed its first residential system in Canada at the Canadian Centre for Housing Technology in Ottawa.

Three additional systems were shipped in Q2 of 2005

Power Module Market Versatility

Hydrogenics Corporation applies a market-based roadmap by focusing its durability, cost reductions and product optimization for early adopting target markets.

The company's HyPM 10 kW power module has achieved technology milestones for two early adopting markets – critical backup power (partnering with American Power Conversion) and fuel cell hybrids as battery-replacements for forklift trucks (partnering with NACCO and GM)

HyPM XR10

Canada

Other Canadian Industry Announcements

Advanced Measurements has won a $3 million contract to supply SOFC test stands to a major international fuel cell developer

Azure Dynamics is providing new motor technology for use at John Lennon Airport in Liverpool, England

Ballard Power Systems in partnership with its Japanese joint venture, Ebara Ballard Corporation announced the delivery of the world's first commercial fuel cell generator system at the Japanese Prime Minister's new official residence

Dynetek Industries has delivered a certified 700 bar (10,000 psi) hydrogen storage system to Nissan Motor Company Ltd., along with 5000 psi systems for the fuel cell powered forklifts being trial tested at General Motors of Canada plant in Oshawa (with General Hydrogen) and 5000 psi storage systems for Ford's new hydrogen powered E-450 shuttle bus

Hydrogenics Corporation announced development alliances with international partners including Hitachi Zosen (Japan), Reva Electric Car Company (India), and Belgium-based American Power Conversion to provide fuel cell power modules for their newly launched InfraStruXure data center backup power for extended run applications

QuestAir Technologies Inc. is installing its H-3200 hydrogen purifier at the Chevron Hydrogen Energy Station in Chino, California

HERA Hydrogen Storage Systems Inc. (HERA) and **Membrane Reactor Technologies (MRT)** are partnering with the BOC Group and to develop and demonstrate, with US DOE funding, advanced hydrogen generation and delivery systems that integrate MRT's membrane reactor and HERA's thermal hydride compression into a single package.

Source: Fuel Cells Canada

Other Developments

- Announcement of the British Columbia Hydrogen and Fuel Cell Strategy - $2 million grant from the Province of British Columbia to begin implementation
- BC Transit announced study called *Transforming the Future: Moving towards Fuel Cell Powered Fleets in Canadian Urban Transit Systems*
- Province of Ontario announced new $3M Ontario Fuel Cell Innovation Program (OFCIP) to support demonstrations of hydrogen and fuel cell technologies
- Alberta government and research organizations collaborating on high temperature fuel cell initiative that will include networking and joint projects
- Canadian Technology/Partnering Mission to Stuttgart and NRW-KNBW, Germany September 25-30, 2005
- Canadian Participation / Pavilion at 9th Grove Fuel Cell Symposium, UK, October 4-6, 2005
- Canadian Organization of Metallurgists (COM 2005) – Fuel Cell and Hydrogen Symposium, 21-24 August 2005 in Alberta, Canada.

Other Developments

- Electric Drive Transportation Association Conference, Vancouver, December 6-8 2005
- Transport Canada seeking to expand its Advance Technology Vehicles Program (ATVP) to include hydrogen/fuel cell component
- Continuing efforts to develop a Eastern Canadian Hydrogen Corridor
- Participation in WP.29 and related Working Party on Pollution and Energy (GRPE) through Transport Canada
- Canadian Hydrogen Installation Code
- “Hydrogen Systems: A Canadian Strategy for Greenhouse Gas Reduction and Economic Growth” published
- Canadian National Hydrogen and Fuel Cell Strategy development

Canadian Industry Issues

- H2 Infrastructure
- Capital/Financing
- Mobilization of Government Procurement
  - Encourage early adoption and reduce risk through actual purchases


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