Government of Canada | Gouvernement du Canada

Canada
Member Statement

International Partnership for the Hydrogen Economy (IPHE)

5th Steering Committee Meeting

March 2006
Vancouver, Canada

Canada

Outline

- Canadian Research and Development Activity Update
- Canadian Demonstration Activity Update
- Other Events and Activities
- Canadian Industry Overview and Issue

Government Supported R&D Initiatives

Natural Resources Canada

Hydrogen

- Hydrogen production and purification
- Hydrogen storage: solid, gaseous and liquid
- Hydrogen safety

PEM Fuel Cells

- Microstructured fuel cells (~1W)
- 10kW for commercial power; backup; off-road
- 65kW units for buses
- High temperature membranes to increase fuel cell operating temperature

Solid Oxide Fuel Cells

- Lower temperature electrolytes
- Direct oxidation of hydrocarbon fuels
- Lower cost materials

Government Supported R&D Initiatives

Defence R&D Canada

Defence R&D Canada has cost shared contracts with industry totalling $2.7M in 2005-2006

1. Integrated Soldier System Project
   Handheld Fuel Cell Power Source - Angstrom Power Inc. Development of 'Micro Hydrogen' technologies for portable power applications

2. Auxiliary Power Units for Light Armoured Vehicles Project

   Light Armored Vehicle Fuel Cell APU - Hydrogenics Corp. Development of regenerative fuel cell APU consisting of three major subsystems: fuel cell power module (7KW); electrolyser module; and metal hydride hydrogen storage system

Government Supported R&D Initiatives

Environment Canada

1. Emission measurements of light duty vehicles
   The Environmental Technology Centre (ETC) is planning to conduct emission measurements of light duty vehicles operating on hydrogen (pilot ignited diesel/hydrogen system) to support a hydrogen technology development project lead by the Saskatchewan Research Council.
2. Hydrogen production from municipal wastewater sludge
3. Hydrogen from the co-digestion of municipal sludge with municipal organic wastes
4. Hydrogen production from potato wastes

National Research Council of Canada (NRC)

- Value of collaborative projects approaching $5 million in 2004/05:
  - 19 industrial partners, 14 university partners, 15 collaborative contracts; 8 international projects; 12 Industrial Partnership Facility clients located at NRC-Institute for Fuel Cell Innovation (NRC–IFCI)
  - A collaborative research client, MagPower Systems, recently signed a $22M deal to manufacture and distribute its portable magnesium fuel cells in China via a Hong Kong company

- Significant advances made in electrocatalysis, membrane electrode assembly (MEA) optimization and low temperature ceramics

- $300,000 from Japan's New Energy and Industrial Technology Development Organization (NEDO) and the Institute of Applied Energy (IAE) for low temperature conducting ceramics for SOFC's

Government Supported R&D Initiatives

IPHE Collaborative Research

- 35 Canadian researchers from university and government labs interested in the 10 approved IPHE projects and are in discussion with the project leaders about joining the project

- One university researcher and one NRC researcher have officially signed onto a project

- Canada co-leading the development of a proposed IPHE project on Diagnostic Tools for Fuel Cells

Hydrogen Highway™ Update

Three Operational Hydrogen Fuelling Stations

Several Methods of Hydrogen Production

- Waste Hydrogen capture
- Solar hydrogen production
- Electrolysis using Green certified electricity
- Traditional tube trailer delivery

Variety of applications:

- Vehicles - including BC Transit business plan for 20 Fuel Cell Buses, airport ground support equipment
- Micro - bike lights, flashlights, portable power through Angstrom
- Stationary applications

HYDROGEN HIGHWAY CANADA

Canadian Transportation Fuel Cell Alliance

SUSTAINABLE DEVELOPMENT TECHNOLOGY CANADA™

Hydrogen Early Adopters Program (h2EA)

Hydrogen Village Update

- Hydrogenics Corporation demonstrated two hydrogen fuel cell powered forklifts in regular service at both General Motors of Canada Limited (Oshawa) and at FedEx (Toronto Pearson Airport). GM has a permanent refueling facility, FedEx used a transportable hydrogen generation and refueling system
- Fuel Cell Technologies installing four 5kW SOFC units at the University of Toronto to provide heat and power for student residences
- Two fuel cell powered John Deere “Gator” utility vehicles in service at the Cdn. National Exhibition
  - Two additional units will be delivered this year
- Purolator operating a fuel cell powered courier delivery vehicle in routine service in downtown Toronto
- Two backup power units are currently being installed
- Three refuelling stations:
  - Exhibition Place - Publicly accessible wind turbine fed electrolytic hydrogen (350 Bar)
  - GM Oshawa - Forklift refueling station on the plant site (350 Bar)
  - Purolator – Refueling station at the West Toronto Terminal (350 Bar)

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SUSTAINABLE DEVELOPMENT TECHNOLOGY CANADA™

hydrogen village

Hydrogen Early Adopters Program (h2EA)

Vancouver Fuel Cell Vehicle Program Update

Since delivery of 5 Ford Focus fuel cell vehicles to user organizations, vehicles have performed to expectations, accumulating 30,000 km combined. Drivers have rated vehicle performance and driving experience to be very good.

4 vehicles are operated in Vancouver and 1 in Victoria. Fueling stations are located at NRC-IFCI in Vancouver, Powertech Labs in Surrey and BC Transit in Victoria. Vehicle maintenance is performed at NRC-IFCI and BC Transit by vehicle technicians trained by Ford.

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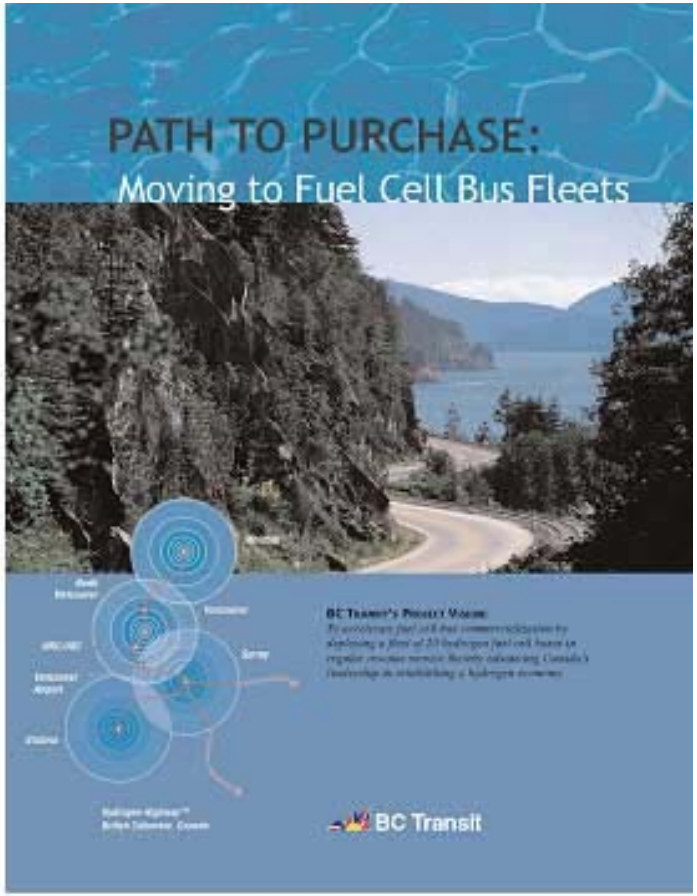
Technology Early Action Measures (TEAM)

BC Transit Fuel Cell Bus Proposal

- $89M proposal to introduce 20 fuel cell buses into BC Transit's fleet by 2010.

- Part of the Victoria and Whistler nodes of the Hydrogen Highway™

- Objectives: response to climate change, accelerate fuel cell system cost reductions for applications in buses and cars, enable technology to be commercially competitive and facilitate hydrogen infrastructure.



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Underground Mining Demonstration Program (NRCan – CANMET)

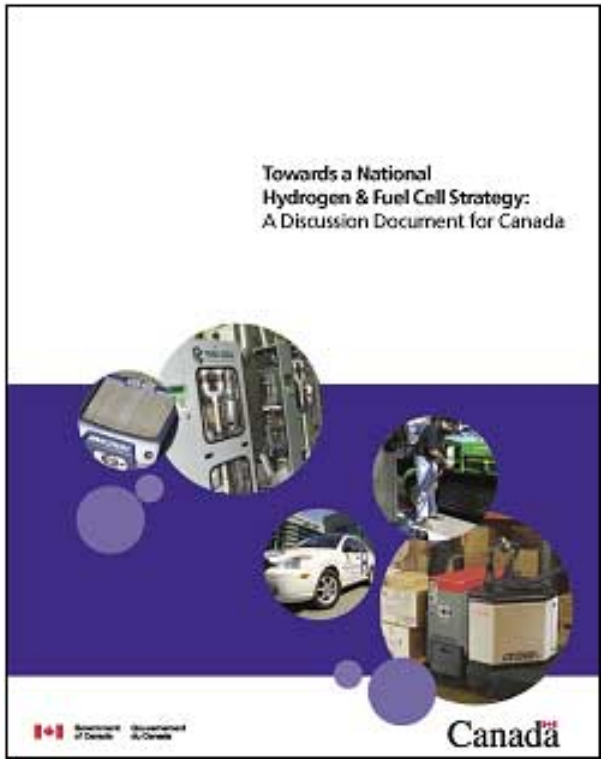
- Opportunities: reduce green house gas emissions, eliminate underground diesel emissions, lower operating costs
- Objectives: Full underground utilization of fuel cells
  - Test fuel cell suitability
  - Build representative mining vehicles, test in mine production
  - Develop supporting information: cost-benefit; mine standards; hydrogen production, delivery and storage; technology training; establish research underground hydrogen mine
  - Involve Canadian technology developers

- Multiple international partners:
  - Mining companies, equipment manufacturers, technology developers, research centers, regulatory agencies
- Latest progress: cost-benefit, hydrogen production and delivery studies; successful production testing of 1 mine vehicle, 2 others ready to test

Development of a National Strategy

Towards a National H2 and Fuel Cell Strategy for Canada

- A long term vision for Canada's participation in the H2 economy together with a phased action plan. Initial focus on short-term actions to support the H2 and fuel cell sector to commercialize the technology.



- Discussion Document and stakeholder consultations completed

- Strategy to be finalized in 2006

Canadian Solid Oxide Fuel Cell Network

Vision: Enhance co-ordination and ensure sustainable funding of research, development, and commercialization of solid oxide fuel cells and related technologies in Canada to create products that serve the world.

The Network will endeavour to:

- Establish national priorities for research, development, design, demonstration, and commercialization of SOFC and related technologies
- Develop strategy to produce commercial products within 5 years
- Co-ordinate activities as one integrated, Canada-wide initiative
- Facilitate access to funding
- Provide integrating and interdisciplinary function to maximize collective knowledge, expertise, and capacity of partners
- Maintain strategic relevance within an ever changing global context by providing high-quality intelligence

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Other Activities

Transport Canada seeking to expand its Advanced Technology Vehicles Program (ATVP) to include hydrogen/fuel cell component and continuing to participate in United Nations WP. 29 and related Working Party on Pollution and Energy (GRPE) and Working Party on Passive Safety (GRSP)

Canadian Hydrogen Installation Code

- 4th Draft, Public enquiry underway

Windsor Workshop 2006: Transportation, Technologies and Fuels Forum

- Toronto, Canada, June 5 – June 7, 2006
- www.windsorworkshop.ca

2007 Canadian H2 and Fuel Cell Conference and Trade Show

- Vancouver Convention & Exhibition Centre, April 29 to May 2, 2007
- Organized by Fuel Cells Canada

World H2 Energy Conference 2006

- Canadian delegation and National Pavilion

Canadian Industry Overview and Issues

- Since 2000 industry invested well over $ 1 billion in R&D
- Includes over 80 companies/organizations employing 2200 people across supply chain
- Innovation intensive - $ 100,000 per employee per year on R&D and over 200 demonstration projects on-going
- Canadian stakeholders are meeting cost reduction/performance enhancement timelines
- National Strategy and government partnership required for:
  - Maintaining R&D expenditures
  - Demonstration of infrastructure and applications (buses)
  - Government procurement and effective program delivery
- Program funding and fiscal support to match or lead investment by industry


Canada