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Canada's Member Statement

International Partnership for the Hydrogen Economy (IPHE)

6th Steering Committee Meeting

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Canada

Outline

- Canadian Industry Highlights
- Canadian Industry Overview and Issues
- Demonstration Program Update
- Research & Development Activity Update
- Planning, Studies, Conferences/Tradeshows
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Canadian Industry Highlights

Fuel Cells Canada

- Canada's National industry association changed its name to *Hydrogen & Fuel Cells Canada*, more accurately reflecting the interests of its membership

Hydrogen & Fuel Cells Canada

Ballard Power

- Delivered the first prototypes of its next generation fuel cell, the Mark 1030 V3, for the residential cogeneration market to EBARA BALLARD Corporation. Prototypes are for integration and testing in 1 kW residential cogeneration systems and feature increased reliability and lifetime, with significantly less weight and volume
- MOU and fuel cell supply agreement with Shanghai Fuel Cell Vehicle Powertrain Co. to cooperate on the development of fuel cell vehicles for demonstration and field trial programs planned in China in 2006 and 2007. Ballard will supply up to 20 fuel cells
- Successful completion of alpha trials and plans for accelerated beta trials and managed commercial rollout of its air-cooled fuel cell, the Mark 1020 ACS, a product primarily focused on the backup power market, providing 1-5 kilowatts

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Canadian Industry Highlights

Hydrogenics

- In partnership with General Motors of Canada and NACCO Materials Handling Group, received federal funding for a demonstration project involving H_2 technologies for commercial lift trucks and other industrial vehicles
- Orders to supply electrolysis-based H_2 generator plants to two of China's largest energy companies and a major North American oil and gas refinery
- Orders for three 12kW Fuel Cell Power Modules for DC backup power application at leading mobile telecom company in Asia; a Fuel Cell Hybrid MidiBus for a public transit authority in Germany, and three fuel cell test stations for a leading Korean energy company
- Manufacturing and supply agreement with American Power Conversion (APC) for network-critical physical infrastructure (NCPI). Hydrogenics to deliver up to 500 12 kW Fuel Cell Power Modules for integration into APC's architecture

QuestAir

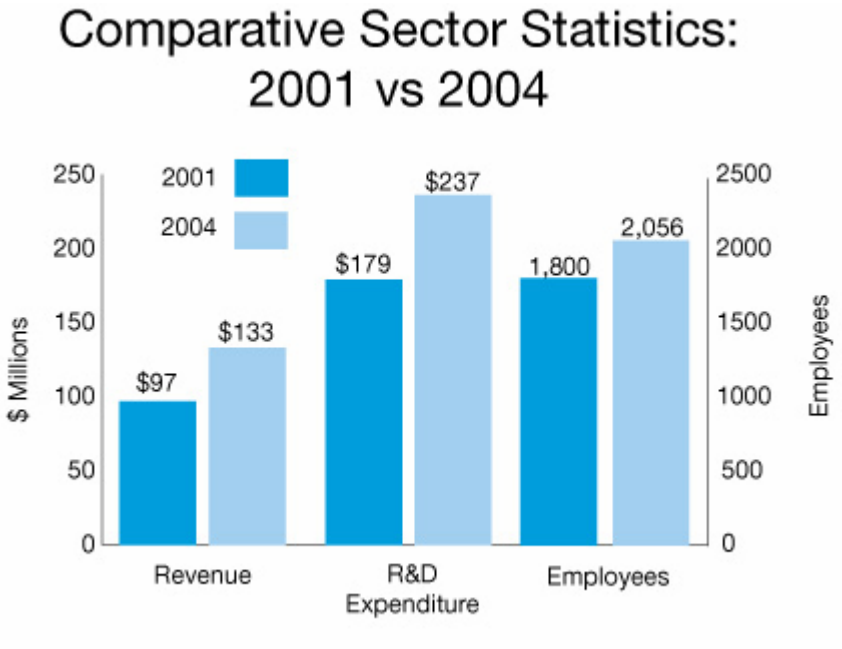
- Supply agreement for H_2 purification systems to Nuvera Fuel Cells
- Sales of H_2 purification systems to an ExxonMobil refinery, a synthetic fuels plant in Denver, Colorado, a H2 fueling station at Sunline Transit Agency, and Hydro-Chem, a supplier of industrial H2 plants

Angstrom Power

- Angstrom Power closes $18 Million round of financing

Canadian Industry Overview & Issues

- **Industry invested well over $1 billion in R&D since 2000**
- **Includes over 100 companies/organizations employing 2,000 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**
- **Industry hoping for program funding and fiscal support to match or lead investment by industry**

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Demonstration Program Update

HydrogenHighway

- Angstrom Power Inc. H_2 fuel cell flashlights and battery chargers to be used by museum staff at the Royal BC Museum

- General Hydrogen's fuel-cell power packs in ground support vehicles at the Vancouver International airport

hydrogen village

- Canada's first multiple solid oxide fuel cell facility at the University of Toronto. The facility will supply clean and environmentally friendly heat and power for 12 student townhouse units via four 5kW systems from Fuel Cell Technologies Ltd.

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Federally Supported R&D: Activity Update

Natural Resources Canada

- Development of micro-structured fuel cell with over 2500 hours operating time at 1 watt
- Progress made to uncover the critical factors leading to performance degradation under real life automotive drive cycle conditions
- Reproducible processes for the synthesis of carbon nanotubes have been developed; chemical and heat treatments applied to the Single Walled Nanotubes (SWNT) to improve their H_2 adsorption capacities have yielded significant results

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Federally Supported R&D: Activity Update

National Research Council of Canada (NRC)

- New materials innovation and novel processes employed to raise PEM operating temperature to over 100° C
  - eliminating water management and related carbon monoxide issues and improving PEM thermal management
- Designed, commissioned and utilized a PEM and SOFC MEA fabrication and testing facility; characterization equipment such as high temperature x-ray defraction, thermogravity and thermomechanical analysis, surface area analysis, and specialized spray equipment
- Developed novel SOFC architecture using stainless steel as low-cost structural material- improving system's operational flexibility and performance
  - produced outcomes that exceed initial target of 500 mW/cm2 at 600 °C
- Patented HyPod (Hydrogen Production on Demand) Technology
- Initiated study of codes and standards related to Hydrogen Highway™ Refuelling Station; commissioned customization of a garage facility at NRC-IFCI
- Built and occupied new $19M LEED-certified NRC-IFCI facility - one of Canada's "greenest" government facilities

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Planning, Studies, Conferences/Tradeshows

- **Development of a National Hydrogen and Fuel Cell Strategy**
  - **A long term vision for Canada's participation in the H2 economy**
  - **Initial focus on short-term actions to support the H2 and fuel cell sector to commercialize the technology**

- **2006 Canadian H_2 and Fuel Cell Sector Profile**

- **Defence R&D Canada is completing a new future technology readiness document on power sources**
  - **Hydrogen and fuel cells is one area of interest. Unclassified document should be completed in December 2006**

- **2007 Canadian H_2 and Fuel Cell Conference and Trade Show**
  - **Vancouver Convention & Exhibition Centre, April 29 to May 2, 2007**
  - **Organized by Hydrogen & Fuel Cells Canada**
  - **www.hfc2007.com**

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Overview, Wrap-up

- **Canada continues to take a holistic approach to the development of hydrogen and fuel cell technologies, and continues to make progress in R&D and demonstrations:**
  - **Industry is leading R&D advancements**
  - **Demonstration projects are supporting mobile, portable and stationary applications and supporting infrastructure**
  - **Niche applications are leading the path to commercialization**

- **We view partnerships with IPHE countries as critical to the success of the global transition to the hydrogen economy**
  - **Advocate working with IPHE colleagues on strengthening its focus and activities as umbrella for international collaboration**

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