

**The Canadian
Fuel Cell and Hydrogen Industry:
A Capabilities Guide**

September 2003



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Preface

The global fuel cell and hydrogen industry is poised to provide major improvements in efficiency, greenhouse gas emissions, urban pollution and quality of life. For Canada specifically, the chance to exploit the global leadership position of our companies in making these changes is significant, as Canadian companies are the acknowledged world leaders in the development and commercialization of fuel cell, hydrogen and related technologies. This leadership covers most fuel cell types, components and systems supply, systems integration, fueling systems, and fuel production, storage and delivery, as well as engineering and financial services.

At Fuel Cells Canada we believe that Canada is in the best possible position to exploit and benefit from the development for the broadest interests of all citizens. Whether the results take the form of new high value added jobs, or reduction of pollution and the rate of global warming, Canada because of its early national commitment to support these technologies, stands to be amongst the leaders of tomorrow.

As of October 2001, an estimated 1,800 people were directly employed by the Canadian fuel cell industry with many more people employed in support sectors. The largest concentration of fuel cell expertise is located in British Columbia, with growing clusters located in Alberta, Manitoba, Ontario, and Quebec also playing an integral role in development and commercialization activities.

This Capabilities Guide provides critical information on many of the key companies and organizations active in the Canadian fuel cell industry. Inclusion in the Guide is voluntary. The information contained in this guide has been provided to Fuel Cells Canada by participating corporations and organizations.

Publication of this Capabilities Guide has been made possible in part through funding from the Government of Canada, specifically the following departments: Industry Canada, the National Research Council of Canada, and Natural Resources Canada.

Fuel Cells Canada thanks the Governments of Canada and British Columbia for their continuing support to the Canadian fuel cell industry. We would especially like to acknowledge Western Economic Diversification Canada and the BC Ministry of Competition, Science and Enterprise for supporting our association.



Fuel Cells Canada™

Advancing Canada's World-Leading Fuel Cell Industry

What is Fuel Cells Canada?

Fuel Cells Canada is a not for profit, national industry association with the mission of accelerating Canada's world-leading fuel cell and hydrogen industry. We are the prime source of services and support to corporations, educational institutions and business alliances developing and promoting fuel cell technologies, products and services.

Fuel Cells Canada's Mandate Include:

- Promoting the Canadian fuel cell industry in the global market;
- Enhancing the industry's profile with Canadian governments to encourage a national strategic approach to fuel cell industry development;
- Facilitating demonstration projects that allow fuel cell companies to test and perfect their pre-commercial fuel cell technologies;
- Promoting fuel cell, hydrogen and related technology and its economic and environmental benefits;
- Advancing communications, information sharing and networking between member companies;
- Facilitating the development of regulations, standards and codes that support the safe and widespread application of fuel cell and new fuel products and applications;
- Providing direction on skills development and course curricula at Canadian educational institutions.

Our Management Team:

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Fuel Cells Canada™

Advancing Canada's World-Leading Fuel Cell Industry

Membership Benefits:

Fuel Cells Canada is a member-focused organization. The following are just some of the numerous benefits and opportunities offered through membership.

- Maximize marketing efforts through coordinated events and international conference attendance by FCC for member companies
- Gain access to FCC organized industry networking opportunities
- Benefit from proactive media relations for fuel cell and hydrogen industry
- Improve competitiveness by staying informed through Members Only reports, website access and newsletter
- Benefit from industry wide government communications efforts
- Participate actively in industry development through FCC Member Committees
 - Codes and Standards
 - Communications
 - Environmental Strategy,
 - Government Policy
 - Training and Skills Development

Levels of Membership:

Sponsoring Member (with additional benefits, leadership)

Executive Member (over 100 employees)

Member (25 to 100 employees)

Associate Member (25 employees, Universities)

For more information, please visit our website:

www.fuelcellscanada.ca

Research Facility Opportunities

Fuel Cells Canada is located at the National Research Council's Institute for Fuel Cell Innovation in Vancouver, British Columbia. This close proximity further strengthens the partnership between Fuel Cells Canada and the Government of Canada.

NRC-IFCI Facility Information

- International showcase for Canadian fuel cell technologies
- Platform for collaborative research
- Private Sector 'Hydrogen-Ready' Incubator Lab-space totaling 3500 sq. feet
- Interface between industry, government, and university researchers
- Skills development and training opportunities for young researchers and technicians



The NRC Institute for Fuel Cell Innovation currently at 3250 East Mall (UBC), Vancouver BC will be relocating in two years to a new site on Westbrook and Southwest Marine Drive close to TRIUMF.

The new facility will be purpose built to support fuel cell and hydrogen research. Provisions in the design are being made to accommodate industry demonstration projects and to continue to provide active research and development space for start-up companies.

NRC invites interested companies to contact either of the following individuals for more information:

| | | |
|-------------------------|---------------------------|--------------|
| David Semczyszyn | National Research Council | 604-221-3013 |
| David Shepherd | Fuel Cells Canada | 604-822-9189 |

Hydrogen-Ready Labs at NRC Institute for Fuel Cell Innovation's Technology Accelerator

Designed to assist early-stage start-up companies through prototyping and into early commercialization there are nine fuel cell and hydrogen laboratories ranging in size from 380 square feet to 510 feet. Facility rents are designed to recover costs but still an affordable environment for early-stage companies.

Design Features

- H2, Propane and CO sensors in all labs
- Flame detectors
- Card Access security 24 hours, 7 days
- 1 hour fire separation between labs
- Eyewash and shower stations provided
- Fire Alarm connected to City of Vancouver Fire Department
- Voice and data ports in all labs

Piping Runs Deliver the following gases

- Nitrogen
- Oxygen
- Carbon Dioxide
- Hydrogen
- Methanol
- Natural Gas
- Dry Compressed Air
- Natural Gas Reformate

Electrical Supply

- 110, 220, 600 Volt services available
- Class 1, Division 2 intrinsically safe fixtures installed throughout



Access to the NRC/FCC hydrogen ready labs has played an important role in accelerating the commercialization of QuestAir's gas purification technology. Working out of the Institute for Fuel Cell Innovation provides us with a secure research facility, world-class test facilities and great partnership opportunities.

Peter Tyszewicz
Vice President Manufacturing and Product
Development, QuestAir Technologies Inc.




Having access to the hydrogen-ready labs at the National Research Council Institute for Fuel Cell Innovation is critical to the success of our new technology. We have a researcher located there on a full-time basis who is working collaboratively with NRC researchers to test, evaluate and optimize a new design. Our work requires 24/7 access to the facilities, and NRC has always accommodated our schedule and security requirements.

David Leger, President/CEO
PowerDisc Development Corporation Ltd.

Hydrogen-Ready Environmental Chamber

A hydrogen-ready environmental chamber is being installed at the National Research Council of Canada Institute for Fuel Cell Innovation on the University of British Columbia campus in Vancouver, BC. It will allow companies and researchers to test and evaluate fuel cell vehicles and products in conditions that simulate the ambient conditions in the Northern Territories, Winnipeg and Mexico City – all from one location.

The facility will simulate extreme temperature, humidity, and altitude conditions for testing various fuel cell and clean energy technologies. The lab is large enough to hold a complete vehicle such as the Ford F150 pick-up truck and is equipped with a dynamometer. Single stacks, balance of plant and fuel storage systems will also be evaluated to determine performance and, ultimately, potential for product launch. It will serve as an invaluable way to minimize real-world testing, which can require transporting equipment and personnel to extremely remote regions of the world.



Vancouver's low elevation and mild year-round climate is inviting to such a facility in that it reduces associated costs, both capital and operating. Furthermore, the location allows easy access to utilities, communication and transportation/shipping.

Capabilities:

- Temperature: -60C to 85C
- Humidity: 5-95% RH
- Altitude: 0-10,000 ft
- Dynamometer: 250HP, 100kph
- A vibration system is planned for the future

The environmental chamber was implemented through a partnership between government and industry. Funding was provided by the National Research Council Canada, Western Economic Diversification Canada and Fuel Cells Canada.

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The Canadian Fuel Cell Industry – A Profile

from “Canadian Fuel Cell Commercialization Roadmap”

Interest in fuel cells is growing rapidly as more businesses, investors and countries recognize the opportunities and benefits. This is accelerating the rate at which the fuel cell industry will commercialize globally. It is also creating a far more competitive environment.

Canada is recognized as a fuel cell industry leader, along with the US, Germany and Japan. However, many more countries are beginning to make strategic investments to create domestic fuel cell industries.

The Canadian Industry

Canada’s leadership in the development and commercialization of fuel cell and related technologies covers most fuel cell types, components and systems supply, systems integration, fueling systems, and fuel storage, along with engineering and financial services.

Employment

As of October 2001, an estimated 1,800 people were directly employed by the Canadian fuel cell industry (companies whose core business is focused on fuel cell and hydrogen activities), with additional jobs supported in sectors that supply and service the industry.⁴ Of the 2001 total, 76 percent were employed in Western Canada (the area west of Ontario). Employment numbers have remained relatively constant in 2002–03, reflecting a trend toward consolidation in the industry.

The Canadian workforce in the fuel cell and hydrogen sector is well educated: 78 percent of the 2001 workforce had a post-secondary education. Of that total, 55 percent held a university degree and 22 percent held a community college education.⁵

Revenues

Revenues reached \$96.9 million in 2001. Eighty-two percent of these revenues were based on exports, with sales of equipment (77 percent) being the mainstay of the growing industry. Western Canada was responsible for 70 percent of all revenues.⁶

Research and Development

Continued research and development is critical to the development and commercialization of fuel cell and hydrogen products and systems. In 2001 research and development expenditures were significantly higher than revenues reaching \$179 million, and representing almost \$100,000 per employee. Key sources for capital research activities have come from development alliance partners. The sector is a significant player in the Canadian innovation scene. In 2001, research and development expenditures in the fuel cell and hydrogen sector were similar to that in the Canadian auto industry despite the latter’s \$92 billion in sales and

132,000 employees. Western Canada was responsible for 87 percent of research and development expenditures in 2001.⁷

Traditionally, much of the research and development has been carried out at the corporate level, often with support from the federal or provincial governments. Ongoing institutional research activities have been carried out at CANMET (Natural Resources Canada), the Canadian Hydrogen Institute in Trois-Rivières and more recently at the National Research Council's Institute for Fuel Cell Innovation in Vancouver. Over the years, a small number of Canadian universities have carried out research projects in fuel cell and hydrogen related topics. This activity is expected to increase over the next few years.

Industry Structure

Worldwide, the fuel cell and hydrogen industry is at the nascent stage. The structure of the industry reflects this early stage of development, as does the lack of statistical information and analyses of this new industry. The Sypher Mueller/NRCan study found that the major activities of respondent firms could be divided into the following areas:

- Engineering services – 36 percent
- Hydrogen production equipment – 29 percent
- Testing equipment – 25 percent
- Fuel cell stacks – 25 percent
- Electrical components – 21 percent⁸

In Canada and elsewhere, the industry is characterized by a relatively low number of small (mostly under 500 employees) companies engaged exclusively (over 50 percent of revenues derived from the fuel cell and hydrogen related activities) in the sector, with a much larger range of companies involved to a much smaller degree in the supply of parts, systems and services.

This profile builds on the analysis developed by PricewaterhouseCoopers.⁹

The several interrelated layers in the Canadian fuel cell industry can be described as follows:

- Companies, whose primary focus or goal is fuel cell production and/or system integration, many of which have formed strategic international alliances or are pursuing such alliances
- Major suppliers to the fuel cell producers, a number of which are selling to both foreign and Canadian companies
- Companies that are focused on fueling infrastructure
- Providers of services to the fuel cell industry

There is a symbiotic relationship among the various players and layers of the industry. The number and intensity of the inter-relationships are growing as the industry grows in scope and scale. Of significant interest is the increasing number of large domestic and international corporations that are beginning to participate in the

sector. The entry of these stakeholders confirms the long-term growth potential for the sector, and provides the manufacturing, marketing and management experience needed for the industry to successfully mature.

It has already been noted that most Canadian fuel cell industry revenues are derived from export sales. While this reflects the realities of the large overseas markets and their support for new technology adoption, it is important to note that foreign market opportunities are directly related to targeted government support for the introduction and early purchase of these new technologies. In recent years, the same degree of support has not been available in Canada.

Fuel Cell Producers and Systems Integrators

There are 17 companies in Canada whose primary market focus or goal is fuel cell production and/or system integration.

Figure 3. Fuel Cell Producers and Systems Integrators

| Company | City | Province | Applications | | |
|------------------------|---------------------|----------|--------------|----------|--------|
| | | | Stationary | Portable | Mobile |
| Aluminum Power | Toronto | ON | | | • |
| Angstrom Power | North Vancouver | BC | | • | |
| Astris Energi | Mississauga | ON | | | • |
| Ballard Power Systems | Burnaby | BC | • | • | • |
| Cellex Power Products | Richmond | BC | • | | |
| DuPont Canada | Kingston | ON | • | • | • |
| Energy Visions | Mississauga/Calgary | ON/AB | • | • | • |
| Fuel Cell Technologies | Kingston | ON | • | | |
| Global Thermoelectric | Calgary | AB | • | | • |
| GreenVOLT Power | Orillia | ON | • | | |
| Hydrogenics | Mississauga | ON | • | • | • |
| Kinectrics | Toronto | ON | • | | |
| MagPower Systems | Delta | BC | • | • | |
| Palcan Fuel Cells | Burnaby | BC | | • | • |
| PEM Technologies | Vancouver | BC | | • | • |
| PowerDisc Development | Chilliwack | BC | | | • |
| Siemens Canada | Mississauga | ON | • | • | |

Reflecting the current situation throughout the world, most of these companies are relatively small, falling into the Canadian definition of small and medium sized enterprises as having under 500 employees. The larger companies usually have fewer than 500 employees engaged in fuel cell and related activities. The exception to this situation is Ballard Power Systems. Most of its approximately 1,100 employees are directly employed in activities related to fuel cells and/or systems development and integration.

Many of these producers have formed domestic and international strategic alliances with companies in other industries that will be users of fuel cell technology. These

alliances and partnerships provide actual (or potential) access to the financial resources, and the technical, manufacturing and marketing skills required as the industry moves into the commercialization of products and systems.

Parts and Systems Suppliers

Advanced Measurement Systems
Agile Systems
Azure Dynamics
Cimtex Industries
FuelMaker
Greenlight Power Technologies
Kinectrics
NORAM
Northgate Energy Technologies Ltd.
Pathway Design & Manufacturing
Pivotal Power
PrecisionH2
QuestAir Technologies
SatCon Power Systems Canada
SMC Pneumatics (Canada)
SRE Controls
Technologies M4
TeleflexGFI Control Systems
Teleflex (Canada)
Transformix Engineering
Tyco Electronics
Universal Dynamics
Weststaim Ambeon
Xantrex Technology
Zetacon

Fueling Infrastructure

BC Hydro
BOC Gases
Chevron Texaco
Clean Energy Ltd.
Duke Energy
Dynetek Industries
Enbridge Gas Distribution
Fueling Technologies Inc.
General Hydrogen
HERA Hydrogen Storage Systems
Kraus Group
Membrane Reactor Technologies Ltd.
Methanex
Ontario Power
Praxair
Stuart Energy Systems
Vandenborre Hydrogen Systems

* Some companies are involved in more than one area.

Fuel Cell Service Providers

Alberta Research Council
Auto21 Networks of Centres of Excellence (NCE)
Automotive Parts Manufacturers' Association
BC Ministry of Competition, Science & Enterprise
Business Development Bank of Canada
Canadian Hydrogen Association
Centre for Automotive Materials and Manufacturing (CAMM)
Chrysalix Energy Management
Colliers International
Conduit Ventures Ltd.
Deloitte & Touche LLP
Environment Canada
Fuel Cells Canada
Gowling Lafleur Henderson LLP
Greater Vancouver Regional District
GrowthWorks
Heating, Refrigeration and Air Conditioning Institute of Canada
Heliocentris Energy Systems
HSBC Bank Canada
Human Resource Development Canada
Hydrogen Research Institute
Hydro-Québec CapiTech
Industry Canada (Energy & Marine Branch)
Institute for Integrated Energy Systems
Ipsos-Reid (North American Energy Division)
James Hoggan and Associates
Keen Engineering
Korn/Ferry International
KPMG
Marsh Canada
McCarthy Tétrault
National Bank Financial
National Defence
National Research Council Canada
Natural Resources Canada; TEAM and CANMET Energy Technology Centre
Ontario Ministry of Enterprise, Opportunity & Innovation
Ontario Power Generation
PEM Engineers inc.
PricewaterhouseCoopers
Public Works & Government Services Canada
TD Securities
Technology Partnerships Canada
TISEC
Transport Canada
University College of the Fraser Valley
Ventures West Management
Western Economic Diversification

Suppliers, Service Providers and Fueling Infrastructure

Many more firms and organizations in Canada besides fuel cell producers are involved in the fuel cell industry. This includes a number of companies focused on developing the fueling infrastructure.

Some of these firms are closely aligned with one or two of the producers, but most are involved with many of the industry's players. Many of these companies also provide parts, systems and/or services to foreign as well as domestic stakeholders.

Industry Clusters

Michael Porter, a leading authority on industry cluster theory, has described clusters as "critical masses in one location with unusual competitive success in specific fields."¹⁰ Successful clusters usually include a wide range of organizations and agencies, and include, among other characteristics:

- The presence of at least one anchor tenant or player
- Linkages among firms and their supporting technological infrastructure
- Proximity to supportive educational, financial, business and institutional resources
- Self-sufficiency in key inputs, including skilled employees, components and systems, engineering, marketing and financial resources
- Access to government institutions and resources

Fuel cell and hydrogen industry clusters are at an early stage (mature industry clusters are often considered to have at least 15,000 employees). However, it is clear that such clusters are indeed growing in Canada, and that these clusters provide a core capability that can, with aggressive policy and program support from government and accelerated participation by industry, continue to ensure Canada's leading role in this developing industry.

Clusters of fuel cell companies, suppliers, infrastructure developers and service providers exist in the Vancouver area, and are growing in the Calgary, Toronto, Kingston and Montreal areas. All have localized fuel cell and infrastructure developments with considerable growth potential.

Vancouver

BC, specifically the lower mainland around Vancouver, is home to the earliest corporate fuel cell development activities in Canada. With more than 1,200 workers directly employed in the fuel cell and hydrogen industries, the area has arguably the largest concentration of fuel cell expertise in the world. It is also an excellent example of the dynamics of cluster building, whereby the existence of core capabilities can enhance growth in a new industry.

The Vancouver cluster developed from the early activities of Ballard Power Systems. Founded in 1982, the company now has approximately 1,100 employees, 300 of which are located outside the province. Ballard has established relationships with a variety of local suppliers and customers, who themselves have established

relationships with others in the region. Some employees from Ballard Power Systems have moved on to found new corporations, while others now work for other companies and organizations in the area.

Ballard Power Systems, and the region, remain largely focussed on PEMFC technology, however other complementary core competencies are focussed increasingly important. These include: parts and systems development, systems integration, fueling infrastructure systems development, engineering, consulting and financial services.

Demonstration projects allowed significant progress to be made in data collection, knowledge of product performance, and in testing the robustness of products as they were prepared for commercial production.

Government support was critical to the early success of the Vancouver cluster. Recognizing the long-term benefits of fuel cell technology, both the federal and provincial governments provided early financial support to the industry. Critically, support was extended not just for research and technology development, but also for demonstration projects. These demonstration projects allowed significant progress to be made in data collection, knowledge of product performance, and in testing the robustness of products as they were prepared for commercial production. Although the region continues to benefit from some limited support for demonstration activities, this support ends in 2003 and there is no currently agreed replacement or continuation.

As the industry has grown, it has attracted services to the region. Local venture capital companies have increased their interest and commitment to the industry and specialized financial institutions have been established. Given the size of the industry in the Vancouver region, it was an appropriate site for the headquarters of Fuel Cells Canada, as well as the headquarters of the National Research Council's Institute for Fuel Cell Innovation. As national institutions, both of these organizations provide services and support industry stakeholders across the country.

University activity has been a part of the cluster development in the region. For many years, the major activities occurred at the Institute for Integrated Energy Systems (IESVic) at the University of Victoria, which has a graduate program in fuel cell technology and core research facilities. Research activities are also carried out at Simon Fraser University in Burnaby. Recently, the University of British Columbia has joined the industry, establishing a small facility and hiring staff recently graduated from the University of Victoria.

Critical activities in BC include:¹¹

- Focus on PEMFC technology
- Core technology developers/integrators: Ballard Power Systems, Palcan Fuel Cell Company, Cellex Power Products, Angstrom Power, PEM Fuel Cells
- Suppliers of specialized products and systems: QuestAir Technology, Pathway Design and Manufacturing, Greenlight Power Technologies, Cimtex Industries, Xantrex Technology, Azure Dynamics

- Fueling infrastructure and storage: General Hydrogen, Methanex, BC Hydro (Powertech), Clean Energy Canada, Praxair, BOC Gasses
- Government institutions: Western Economic Diversification, Industry Canada, National Research Council, BC Ministry of Competition, Science & Enterprise
- Universities: University of Victoria (IESVic), University of British Columbia, Simon Fraser University, University College of the Fraser Valley
- Specialized services: NORAM Engineering and Constructors, Keen Engineering, Fuel Cells Canada, Chrysalix Energy Management, Ventures West Management, GrowthWorks
- Testing facilities: BC Hydro (Powertech), National Research Council's Institute for Fuel Cell Innovation
- Research and development organizations: National Research Council's Institute for Fuel Cell Innovation, British Columbia Research Inc. (BCRI)

Many of these companies and institutions also have significant relationships with other domestic and international stakeholders.

Calgary


The Calgary area also has the potential to build a fuel cell cluster. Anchor capabilities include Global Thermoelectric, a leading developer of small (5 kW) solid oxide fuel cells, and Dynetek Industries, a leading supplier of cylinders for compressed hydrogen. In addition, Advanced Measurement Systems supplies testing units for Global Thermoelectric. The University of Calgary has respected capabilities in research, as does the Alberta Research Council, where Energy Visions is developing its direct methanol fuel cells.

Toronto

Core fuel cell technology and commercialization capabilities in the Toronto area include Hydrogenics (PEMFC) and Kinectrics (fuel cell integration). The area is also home to Stuart Energy Systems, a major developer and supplier of hydrogen infrastructure systems. As important is the huge potential in the supply industry, both present suppliers (Agile Systems, FuelMaker, SatCon Power Systems Canada, SRE Controls, TeleflexGFI Control Systems, Zetacon), and the many volume manufacturers of parts and components to allied industry sectors, such as automotive, aerospace and defence, white goods, electrical supply and information technology. Local universities have excellent research capabilities. The University of Toronto, McMaster University and others have small but long-standing programs related to fuel cells and hydrogen supply development. Enbridge Gas Distribution has extensive experience in HVAC systems and is able to provide recommendations in product integration.

Kingston

Kingston is the home of Fuel Cell Technologies, a leading integrator of small scale (5 kW) SOFC systems. The company has also developed proprietary aluminium air fuel cell technology. Kingston is the centre of DuPont Canada's fuel cell development.



DuPont has a global mandate to develop flowfield plates and membrane electrode assemblies for PEMFC and direct methanol fuel cells. Transformix Engineering develops and supplies power electronics for fuel cells. The city also has long-standing research and testing capabilities at the Royal Military College and is developing research capabilities at the Centre for Automotive Materials Manufacturing (CAMM) which is connected to Queen's University. It provides university-level automotive engineering education as well as considerable investment in automotive research and development, including fuel cells and hydrogen technology. Industry stakeholders have recently organized and incorporated an alternative energy industry organization to foster growth of a fuel cell industry cluster in the area.

Montreal

Montreal has significant activities related to hydrogen fueling and storage. This developing capability originated in the 1980s with the interest of Hydro-Québec in the huge potential for supplying Europe with hydrogen. While Hydro-Québec remains interested in the industry, companies such as HERA Hydrogen Storage Systems, Vandendorpe Hydrogen Systems and Hydro-Québec CapiTech now carry the flag for the hydrogen supply industry. Nearby, the Canadian Hydrogen Institute at the Université du Québec à Trois-Rivières provides world-renowned research facilities and capabilities for the industry. The region has benefited from support by the provincial and the federal governments – especially for research in hydrogen storage technologies.

The Importance of Clusters

Clusters provide the critical mass needed to sustain the fuel cell industry in Canada. As other countries and regions try to lure producers and suppliers to their jurisdictions, clusters will become even more important as the "glue" that keeps the Canadian industry together. Clusters will also accelerate technology and commercialization development due to their potential to pool skills and talents and to focus efforts. In Canada, many stakeholders integral to the various clusters have considerable relationships with one or more industry players in the other regions, as well as relationships with alliance partners and suppliers in other parts of the world. Considerable scope exists within the larger Canadian fuel cell and hydrogen industry for the kind of dynamic relationships that will support industry acceleration across the country. The early evidence from demonstration programs in BC indicates that these inter-regional relationships may be an integral part of the developing industry across the country.

Clusters of Fuel Cell Companies



International Competitors

Other jurisdictions are challenging Canada's leadership position in fuel cell development and commercialization. Recognizing the substantial benefits to be gained from success, government and industry stakeholders in other countries have developed policies and programs that aggressively support fuel cell development and market access for their own companies and institutions.

United States

The US government proposes spending \$2.7 billion over the next five years for hydrogen and fuel cell research and development and advanced automotive technologies.

- Freedom Fuel Initiative will develop technologies for hydrogen production and the distribution infrastructure needed to power fuel cell vehicles and stationary fuel cell power sources.
- FreedomCAR Initiative is a partnership with automakers to develop technologies needed for mass production of safe and affordable hydrogen-powered fuel cell vehicles.

In addition, individual states have established their own incentive programs to promote alternate energy sources:

- California: Incentives, emission targets and demonstration activities
- Michigan: NextEnergy program will provide funding of \$79 million over next three years, plus a 700-acre tax-free research zone
- Ohio: Fuel cell initiatives totalling \$162 million over three years
- Connecticut: Clean Energy Fund provided approximately \$15 million in 2002

Japan

The government provided over \$275 million in 2002 to support fuel cell research, development and commercialization. This spending is expected to exceed \$380 million per year beginning in 2003.

European Community

EC will spend \$3.3 billion from 2003–2006 on renewable energy, mostly hydrogen and fuel cells. This is a significant increase from the 1999–2002 period, when the average annual spending on fuel cell research, development and demonstration was \$140 million.

The European Economic Union's 6th Framework Program (2002–2006) identifies the following research, technological development and demonstration activities pertaining to sustainable development:

- Estimated \$2.5 billion will be dedicated to fuel cells and hydrogen initiatives
- Target of five percent of EC road transport to be hydrogen-powered by 2020
- Targets for fuel cell cost reductions in stationary power of less than \$1,650/kW
- Focus on identifying actions necessary for vibrant fuel cell industry and sustainable hydrogen economy, with ability to target additional expenditures of up to \$4.3 billion

Germany

Current annual funding for fuel cell and hydrogen initiatives totals approximately \$58 million. Germany's Investing into the Future Program (ZIP) has committed \$99 million during the next three years to help fund 44 R&D projects involving fuel cells for stationary and mobile applications.

Singapore

The government has established the Singapore Initiative in Energy Technology Program (SINERGY), which aims to make Singapore a leading player in the development of alternative energy technology. SINERGY is part of the government's effort to promote more clean energy R&D and test-bedding activities for automotive and stationary power applications.

4. PricewaterhouseCoopers and Sypher Mueller. The information compiled in this "Profile" has been obtained from three sources:

1. The PricewaterhouseCoopers Study, Fuel Cells – The Opportunity for Canada, June 2002.
2. The Sypher Mueller/NRCan Survey and Report, Economic Impact of Industrial Hydrogen Activity in Canada, June 2002.
3. Information collected by Fuel Cells Canada. Information for Sypher Mueller and for PricewaterhouseCoopers was collected in 2001 and reflects the state of the industry at that time. It is important to note that there is limited statistical information available on the Canadian fuel cell industry, and virtually none on similar activities outside of the country.
5. Sypher Mueller/NRCan p. 14
6. Sypher Mueller/NRCan pp. 7–11
7. Ibid., p. 12
8. Ibid., p. 6
9. PricewaterhouseCoopers pp.25–29
10. Porter, Michael. Clusters and the New Economics of Competition, Harvard Business Review (Nov–Dec 1998) p. 80.
11. For a list of some critical cluster activities see: Vancouver's Key Private Sector Industries for Clustering, Vancouver Economic Development Commission, July 2002. p13.

Canadian Fuel Cell Industry: Selected Capabilities*

*Note: Please contact individual companies for specific capabilities.

☛ Members of Fuel Cells Canada.

Bold - Sponsoring level members

| | Fuel Cells | Test/Sensor Equipment | Control Systems | Fuel/Fuel Systems | Integration | Components | Services | Fuel Storage |
|---|------------|-----------------------|-----------------|-------------------|-------------|------------|----------|--------------|
| ☛ Advanced Measurement Systems Inc. | | X | | | | | | |
| Agile Systems Inc. | | | X | | | | | |
| Alberta Research Council | X | | | X | X | | X | X |
| Aluminum-Power Inc. | X | | | | | | | |
| Analytic Systems | | | | | X | X | | |
| ☛ Angstrom Power Inc. | X | | | | X | | | |
| Armstrong Monitoring Corporation | | X | | | | X | | |
| ☛ Astris Energi Inc. | X | X | | | X | | | |
| ☛ Azure Dynamics Corp. | | | X | | X | | | |
| ☛ Ballard Power Systems Inc. | X | | X | | X | X | | |
| ☛ BC Hydro | | X | | X | | | X | X |
| ☛ BOC Gases | | | | X | X | | | X |
| ☛ Business Development Bank of Canada | | | | | | | X | |
| ☛ Canadian Hydrogen Association | | | | X | | | X | X |
| CANMET Energy Technology Centre, NRCan | X | | | X | X | | X | X |
| ☛ Cellex Power Products Inc. | | | X | | X | X | | |
| ☛ Centre for Automotive Materials & Manufacturing | | | | | | | X | |
| ☛ Chevron Texaco Technology Ventures | | | | X | X | | X | X |
| ☛ Chrysalix Energy Limited Partnership | | | | | | | X | |
| Cimtex Industries Ltd. | | | | | | X | | |
| ☛ Clean Energy Canada | | | | X | | | | |
| Colliers International | | | | | | | X | |
| ☛ Conduit Ventures Ltd. | | | | | | | X | |
| Dana Canada Corporation | | | X | | | X | | |
| ☛ Deloitte & Touche LLP | | | | | | | X | |
| Delta-Q Technologies Corp. | | | X | | | X | | |
| ☛ DuPont Canada Inc. | X | | X | | X | X | | |
| ☛ Dynetek Industries Ltd. | | | | | | | | X |
| ☛ Enbridge Consumers Gas | | | | X | X | | X | |
| Energy and Marine Branch, Industry Canada | | | | | | | X | |
| Energy Visions Inc. | X | | | | X | | | |
| ESTCO Battery Management Inc. | | | | | | X | X | |
| Ford Motor Company | X | | | X | X | | | |
| ☛ Fuel Cell Technologies Ltd. | X | | X | | X | | | |
| ☛ Fuel Cells Canada | | | | | | | X | |
| ☛ Fueling Technologies Inc. | | | | X | | | X | |
| FuelMaker Corporation | | | | X | | | | X |
| ☛ General Hydrogen Corporation | | | | | X | X | X | X |

Canadian Fuel Cell Industry: Selected Capabilities*

*Note: Please contact individual companies for specific capabilities.

☛ Members of Fuel Cells Canada.

Bold - Sponsoring level members

| | Fuel Cells | Test/Sensor Equipment | Control Systems | Fuel/Fuel Systems | Integration | Components | Services | Fuel Storage |
|---|------------|-----------------------|-----------------|-------------------|-------------|------------|----------|--------------|
| Global Hydrofuel Technologies | X | | | X | X | | | |
| ☛ Global Thermoelectric Inc. | X | | | | X | | | |
| ☛ Gowling Lafleur Henderson LLP | | | | | | | X | |
| ☛ Greater Vancouver Regional District | | | | | | | X | |
| ☛ Greenlight Power Technologies Inc. | | X | X | | X | | X | |
| ☛ GrowthWorks Ltd. | | | | | | | X | |
| ☛ Heliocentris Energy Systems Inc., North America | | | | | | | X | |
| ☛ HERA Hydrogen Storage Systems Inc. | | | | | | | | |
| ☛ HSBC Bank Canada | | | | | | | X | |
| Hydro-Québec CapiTech | | | | | | | X | |
| Hydrogen Research Institute | X | | | X | | | X | X |
| ☛ Hydrogenics Corporation | X | X | | | X | X | | |
| ☛ Institute for Integrated Energy Systems (IESVic) | | | | | | | X | |
| ☛ James Hoggan and Associates Inc. | | | | | | | X | |
| ☛ Keen Engineering | | | | | | | X | |
| ☛ Kinectrics Inc. | | | | | X | | X | |
| ☛ KPMG LLP | | | | | | | X | |
| Kraus Group Inc. | | | | X | X | | | X |
| LeapTran Technologies International Inc. | | | | | | X | | |
| MagPower Systems Inc. | X | | | | | | | |
| ☛ Marsh Canada Limited | | | | | | | X | |
| ☛ McCarthy Tétrault LLP | | | | | | | X | |
| ☛ Membrane Reactor Technologies Ltd. | | | X | | | X | X | |
| ☛ Methanex Corporation | | | | X | X | X | X | X |
| ☛ Ministry of Enterprise, Opportunity and Innovation, Province of Ontario | | | | | | | X | |
| ☛ National Bank Financial | | | | | | | X | |
| ☛ National Research Council Canada | X | X | X | X | X | X | X | X |
| Neodym Technologies | | X | | | | X | | |
| Nepal Management Ltd. | | | | | | | X | |
| ☛ NORAM Engineering and Constructors Ltd. | | | | X | X | | X | X |
| ☛ Northgate Energy Technologies Ltd. | | | | X | | X | | |
| ☛ Ontario Power Generation | | | | X | X | X | X | |
| ☛ Palcan Fuel Cell Co. Ltd. | X | | | | X | X | | X |
| ☛ Pathway Design & Manufacturing Inc. | | | | | | X | | |
| ☛ PEM Engineers Inc. | X | | | | | | X | |
| PEM Technologies | X | | | | | | | |
| Pivotal Power Inc. | | | | | | X | | |
| PowerDisc Development Corporation Ltd. | X | | | X | | | | |

Canadian Fuel Cell Industry: Selected Capabilities*

*Note: Please contact individual companies for specific capabilities.

☛ Members of Fuel Cells Canada.

Bold - Sponsoring level members

| | Fuel Cells | Test/Sensor Equipment | Control Systems | Fuel/Fuel Systems | Integration | Components | Services | Fuel Storage |
|---|------------|--------------------------|--------------------|----------------------|-------------|------------|----------|--------------|
| Praxair, Inc. | | | | X | | X | | X |
| PrecisionH2 Inc. | | | | X | X | | | X |
| ☛ PricewaterhouseCoopers LLP | | | | | | | X | |
| ☛ QuestAir Technologies Inc. | | | | X | | X | | |
| Royal Military College of Canada | X | | X | | | X | X | |
| SatCon Power Systems Canada Ltd. | | | X | | X | | | |
| Siemens Canada Ltd. | X | | | X | | | X | |
| ☛ SMC Pneumatics (Canada) Ltd. | | X | | | | X | | |
| SRE Controls Inc. | | | X | | | | | |
| ☛ Staubli Corporation | | | | X | | X | | |
| ☛ Stuart Energy Systems Corporation | | | | X | | | | |
| ☛ TD Securities Inc. | | | | | | | | |
| Technologies M4 Inc. | | | | | X | X | | |
| Technology Early Action Measures, NRCan | | | | | | | X | |
| ☛ Teleflex Canada | | | X | X | X | X | X | |
| TeleflexGFI Control Systems Inc. | | | X | X | X | X | | X |
| TISEC Inc. | | | | | | | X | |
| Tyco Electronics Canada Ltd. | | | X | | | X | X | |
| Universal Dynamics Limited | | | | | | | X | |
| ☛ University College of the Fraser Valley | | | | | | | X | |
| University of Calgary | X | | | | | X | X | |
| University of Regina | | | X | | | | | |
| ☛ Ventures West Management Inc. | | | | | | X | X | |
| ☛ Westaim Ambeon | | | | | | X | | |
| Xantrex Technology Inc. | | | X | | | X | | |
| ☛ Zetacon Corporation | | | X | | | | | |

Advanced Measurement Systems Inc.



6205-10th Street SE
Calgary, AB T2H 2Z9

Website: www.advmeas.com

Products: Fuel Cell Test Stations, Automated Test Stations

Description: Specializing in fuel cell testing, Advanced Measurements manufactures customized test systems to meet each customer's individual requirements. The test system measures fuel-cell characteristics such as voltages, current, humidity, temperature and gas flows into a fuel cell. The system also controls all aspects of the test environment. Designing fuel cells that meet the unique power demands of automobiles and other applications requires a flexible test system that fuel cell developers can use to reduce their development cycle and shorten time to market. These being the two most critical factors for fuel cell developers, Advanced Measurements can offer a solution to its customers to assist them to commercialize their product.

Contact: Len Johnson
President

Phone: (403) 571-7273 Ext. 240

Fax: (403) 571-7279

e-mail: len.j@advmeas.com



Agile Systems Inc.

575 Kumpf Drive
Waterloo, ON N2V 1K3

Website: www.agile-systems.com

Products: Power Inverter for Alternative Energy

Description: Agile has applied its digital power expertise to the fuel cell market place integrating control and power management to produce the most advanced inverter technology. Digital processing, unlike analogue, allows our technology to be software rather than hardware driven. The result is a power management solution that is small, smart, connected and versatile.

Agile's firmware-driven design, industry experience and integrated manufacturing approach sets us apart.

Agile's industry experience includes:

- Advanced motor control
- Inter-module network communications
- Sine wave inverter designs from 100W to over 30 kW
- DC-DC conversion
- Advanced battery management
- Configurable display including state of charge
- Accessory DC power

Contact: Marc Mitges
Chief Operating Officer
Phone: (519) 886-2000
Fax: (519) 886-2075
e-mail: mmitges@agile-systems.com



Alberta Research Council Inc.

250 Karl Clark Road
Edmonton, AB T6N 1E4

Website: www.arc.ab.ca

Products: Power Generation, Transmission and Distribution

Description: The Alberta Research Council (ARC) develops and commercializes technologies to give customers a competitive advantage. A Canadian leader in innovation, ARC provides solutions globally to the energy, life sciences, agriculture, environment, forestry and manufacturing sectors. ARC works with more than 800 clients each year.

Applied expertise: ARC's Advanced Materials business unit develops and commercializes new materials, products, and processing technologies in ceramics, metals, and polymers and composites. Our key technologies include polymer nanocomposites, polymer membranes, thermoplastic pultrusion, ceramic and ceramic composites for structural and functional application, hollow ceramic membranes, composite ceramic coatings, micro-solid oxide fuel cells, and solar energy systems.

Fuel Cell R&D: The unit is developing the design and manufacturing process for a high surface area micro solid-oxide tubular fuel cell (μ SOFC). ARC has six patent applications related to μ SOFC fabrication, current collection, stack design and other design elements. These patent applications characterize a design with low thermal mass and high thermal shock resistance.

Staff, Facilities & Services: Twenty-five highly trained staff, including 13 scientists; extensive lab and engineering space to conduct materials processing, testing, and evaluation as well as thermal analysis; membrane characterization facilities, chemical processes lab, a ceramics lab, a gas membrane lab, an ambient room, a metallography room and environmental control chambers; access to venture management expertise including patent and intellectual property administration; and market intelligence.

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Venture Manager
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(780) 450-5334
richardson@arc.ab.ca



Aluminum-Power Inc.

907 Alness Street
Toronto, ON M3G 2N2

Website: www.aluminum-power.com

Products: Aluminum air fuel cell

Description: Aluminum-Power Inc has developed an aluminum air fuel cell that has the potential to revolutionize the mobile electronics and automotive industries. A breakthrough technology that offers high, sustained power over extended periods.

Contact: Rafael Ferry
VP Marketing

Phone: (416) 661-6614 ext 224

Fax: (416) 661-7340

e-mail: rferry@aluminum-power.com



Analytic Systems (1993) LTD.

Suite 207 - 12448 - 82nd Avenue
Surrey, B.C. V3W 3E9

Website: www.analyticsystem.com

Products: High quality power conversion products such as DC/DC converters, AC/DC power supplies and DC/AC inverters, AC-DC Battery Chargers, OEM custom solutions.

Description: Analytic Systems is the power conversion solution provider for the fuel cell industry. Pure Sine and Q'Sine Inverters and full range of Dc to DC voltage converters. Develops OEM opportunities with customers such as Teleflex Canada, Telus, Soltek Solar, Kobelt Manufacturing, Solar Turbines, and Prime Mover Controls. Markets: Alternate Energy, Military, Industrial, RV, Marine, Telecommunications, Heavy Equipment, Solar Energy, Fleet Utility, RV and Auto/Motorsports.

Contact: Bill Walker
Business Development Manager
Phone: 1-800-668-3884
Fax: 1-604-543-7354
e-mail: billw@analyticsystem.com



Angstrom Power Inc.



Suite 106, 980 W 1st Street
North Vancouver, B.C. V7P 3N4

Website: www.angstrompower.com

Description: Angstrom Power Inc., is a Vancouver-based developer of micro-structured fuel cells targeting a variety of applications. Angstrom is applying micro-fabrication technology to create a fuel cell system using novel architecture and manufacturing techniques. Initial target applications include battery replacement and portable power.

Contact: Denis Connor
President and CEO

Phone: (604) 980-9936

Fax: (604) 980-9937

e-mail: dconnor@angstrompower.com

 **ANGSTROM®**

Armstrong Monitoring Corporation

215 Colonnade Road South
Ottawa, ON K2E 7K3

Website: www.armstrongmonitoring.com

Products: Hazardous gas monitoring equipment including devices to detect CO, H₂, CH₄, NO₂, SO₂, Propane

Description: The Armstrong Monitoring Corporation, an Ottawa based, ISO-9001 Registered manufacturer of high quality gas sensing apparatus, prides itself in meeting the needs of the fuel cell and hydrogen industries.

In the twenty years since its inception, Armstrong has been involved in research, design and commercialization of innovative new technologies and products for a wide range of industries and applications. Armstrong's diverse product line features hazardous gas monitoring equipment ranging from simple, building block sensor elements and transmitters, to complete, integrated, turnkey systems.

Working in concert with Canada's leading research organizations, Armstrong brings together the science, technology and marketing, required in today's knowledge based economy, at home and around the world.

Contact: Robert Kealey
Sales and Marketing Manager
Phone: (613) 225-9531 or (800) 465-5777
Fax: (613) 225-6965
e-mail: Rkealey@armstrongmonitoring.com

The *armstrong*
MONITORING CORPORATION



Hazardous Gas Sensing and Detection Specialists

Astris Energi Inc.



2175-6 Dunwin Drive
Mississauga, ON L5L 1X2

Website: www.astrisfuelcell.com; www.astris.ca

Products: Standard Products: POWERSTACK MC250, LABELL and QUICKCELL fuel cells, TL4 Test Load and TESTMASTER Fuel Cell Test Software.

Advanced

Products: Alkaline Fuel Cell (AFC) generators and systems up to 10 kW for transportation (golf car), portable power generators and co-generators.

Description: Astris Energi Inc. is a global leader in alkaline fuel cells and fuel cell systems. The company was founded in 1983, and has been a pioneer in the development of alkaline fuel cells. Astris' proprietary low-cost fuel cell technology targets specialized small engine applications up to 10 kilowatts. These applications include portable and stationary generators, golf cars, neighbourhood electric vehicles, forklifts and boats. Management experience includes sophisticated laboratory and prototype development, assembly facilities, and over 20 years of applied research and commercial product development.

Contact: Anthony Durkacz
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Fax: (905) 608-8222
e-mail: anthony@astrisfuelcell.com



Azure Dynamics Corp.



3650 Westbrook Mall
Vancouver, BC V6S 2L2

350 Bay Street, Suite 400
Toronto, ON M5H 2S6

Website: www.azuredynamics.com

Products: Electric and hybrid electric vehicle powertrains including fuel cell compatible systems and controls.

Description: Azure Dynamics Corporation is an innovative company that has developed proprietary hybrid electric vehicle technology for retrofit and new vehicle powertrains in the light and medium duty commercial vehicle category. Azure's intellectual property combined with interchangeable, off-the-shelf components provides an affordable and effective solution for fleet managers in applications such as postal and courier delivery fleets as well as utility vehicles, shuttle buses and taxis. Azure's proprietary adaptive control systems achieve optimal efficiency and vehicle performance while also making significant reductions in emissions and energy consumption.

Contact: Steven Glaser
Vice President Corporate Affairs

Phone: (416) 367-0220 ext.105

Fax: (416) 367-9591

e-mail: sglaser@azuredynamics.com



Ballard Power Systems Inc.



4343 North Fraser Way
Burnaby, BC V5J 5J9

Website: www.ballard.com

Products: Ballard is commercializing fuel cell engines for transportation applications and fuel cell systems for portable and stationary products.

Description: Ballard Power Systems is recognized as the world leader in developing, manufacturing and marketing zero-emission proton exchange membrane (PEM) fuel cells. Ballard's proprietary technology is enabling automobile, bus, electrical equipment, portable power and stationary product manufacturers to develop environmentally clean products for sale. Ballard is partnering with strong, world-leading companies, including DaimlerChrysler, Ford, EBARA, ALSTOM and FirstEnergy, to commercialize Ballard® fuel cells. Ballard has supplied fuel cells to Honda, Nissan, Volkswagen, Yamaha, Cinergy and Coleman Powermate, among others.

Contact: Stephen L. Kukucha
Senior Advisor, External Affairs
Phone: (604) 453-3633
Fax: (604) 412-3100
e-mail: stephen.kukucha@ballard.com

BALLARD®

BC Hydro



18th floor - 333 Dunsmuir Street (D18)
Vancouver, BC V6B 5R3

Website: www.bchydro.com

Products: Sale of electricity and hydrogen; research and development services.

Description: In support of its corporate sustainability objectives, BC Hydro will use renewable electricity and its extensive distribution network to produce hydrogen for industrial, transportation and portable power markets. Hydrogen is part of a diversification strategy to move the company into a sustainable energy market that holds significant potential. BC Hydro and its research subsidiary, Powertech Labs Inc., are major contributors to the emerging hydrogen economy of British Columbia, through the development and demonstration of hydrogen infrastructure technologies.

Contact: Bruce Sampson
Vice-President, Sustainability
Phone: (604) 624-4242
Fax: (604) 624-4155
e-mail: bruce.sampson@bchydro.com

BC hydro

BOC Gases



575 Mountain Avenue
Murray Hill, New Jersey 07974 USA

Website: www.boc.com

Products: BOC is a leading supplier of industrial gases and related products and services throughout the world.

Description: BOC has experience supplying hydrogen via every available mode of distribution, including as liquid via tankers and as a gas via pipelines, tube trailers, and cylinders. BOC has experience with the application and/or development of various hydrogen production technologies, including large-scale steam/methane reforming, partial oxidation, methanol reforming, by-product hydrogen production, and small-scale electrolysis.

BOC serves a wide range of industries in the hydrogen market, covering such diverse markets as power generation, float glass, food, petrochemicals, refining, and steel. BOC is also a Sustaining Member of the National Hydrogen Association.

BOC is a leader in the safe handling, production, and distribution of high-pressure hydrogen. Our proven designs and experience demonstrate our commitment to safe and reliable delivery systems, as does the craftsmanship exhibited during construction. The stringent and exacting specifications BOC has used to install facilities like these in locations such as nuclear power plants, chemical plants, and steel mills are translated to supplying infrastructure to the growing hydrogen refuelling market.

Contact: Michael MacGowan
Marketing Manager, Hydrogen Energy
Phone: (908) 771-1086
Fax: (908) 771-1903
e-mail: Michael.mcgowan@coc.com



Business Development Bank of Canada



5 Place Ville Marie, Suite 400
Montreal, QC H3B 5E7

Website: www.bdc.ca

Products: Equity and quasi-equity

Description: As the preferred partner for companies in the emerging sectors, BDC Investment Group meets the special needs of businesses at every stage of their development. BDC Investment Group provides flexible, innovative financial instruments designed for companies whose assets are primarily intangible. Venture capital and subordinated financing are the main strategic tools BDC offers businesses with solid growth potential.

Contact: Jacques Dénoimée
Director, Investment / Advanced Industrial Technologies (Alternative Energy)

Phone: (514) 496-9321
Fax: (514) 283-5455
e-mail: jacques.denommee@bdc.ca



Canadian Hydrogen Association



5 King's College Road, Suite 116
Toronto, ON M5S 3G8

Website: www.h2.ca

Description: The Canadian Hydrogen Association is a nonprofit membership association composed of universities, research organizations, industry and small business.

Our objective is to promote the use and development of hydrogen energy, hydrogen energy systems and technologies and to develop the role of hydrogen energy for the purpose of improving the environment.

Contact: Dr. Tapan Bose
President

Contact: Barbara Parkinson
Administrator

Phone: (416) 978-2551

Fax: (416) 978-2551

e-mail: info@h2.ca



CANMET Energy Technology Centre, Natural Resources Canada

580 Booth Street, 13th Floor
Ottawa, ON K1A 0E4

Website: www.nrcan.gc.ca/es/technologies_e.htm

Description: The CANMET Energy Technology Centre (CETC) is Canada's leading federal S&T organization that is developing and deploying energy efficient, alternative energy and advanced technologies. CETC's Transportation Energy Technologies program partners with industry and other federal and provincial agencies to develop and deploy new transportation technologies, such as: alternative fuels and advanced propulsion systems; advanced energy storage systems; emissions control technologies; vehicle transportation system efficiency; and fuelling infrastructure technologies. The program supports R&D through cost-shared agreements, standards development, and technology transfer, both domestically and internationally.

In June 2001, Natural Resources Canada established the Canadian Transportation Fuel Cell Alliance (CTFCA), a \$23 million, 5-year, demonstration program for hydrogen infrastructure. The CTFCA is partnering with the private sector and provinces to demonstrate and evaluate different hydrogen fuelling systems for fuel cell vehicles, establish safety standards and develop training and certification programs for the personnel who will maintain these systems. The CTFCA will enable Canada to focus and showcase its world-leading fuel cell and fuel supply technologies.

Contact: Nick Beck
Chief, Transportation Energy Technologies
CANMET Energy Technology Centre - Ottawa

Phone: (613) 996-6022
Fax: (613) 996-9416
e-mail: nbeck@nrcan.gc.ca



**Natural Resources
Canada**

**Ressources naturelles
Canada**

Cellex Power Products Inc.



13155 Delf Place
Richmond, BC V6V 2A2

Website: www.cellexpower.com

Products: Fuel Cell Power Units

Description: Cellex Power Products, Inc. is a Canadian company based in Vancouver, B.C. focused on the development and commercialization of fuel cell power product solutions for Industrial Vehicles. Cellex's strategy is to develop proprietary system and component technology required to integrate fuel cell stacks, hydrogen systems and other components into commercial products.

Contact: Blair Lill
Marketing Manager
Phone: (604) 248-3552
Fax: (604) 270-4304
e-mail: blill@cellexpower.com



Centre for Automotive Materials and Manufacturing



945 Princess Street
Kingston, Ontario K7L 5L9

Website: www.cammauto.com

Description: The Centre for Automotive Materials and Manufacturing (CAMM) is Ontario's industry, university, and government partnership dedicated to providing leadership and a framework to transform university research and education into opportunities for the automotive sector.

Fuel cells are a major area of CAMM's research and development program, with applications including transportation, portable, and stationary systems. Our current university partners for fuel cell projects are Queen's University, the Royal Military College, and the University of Waterloo. The focus of our industry driven and supported R&D program is to reduce the cost of manufacturing while increasing the durability and reliability of both PEM and solid oxide fuel cell components and systems. Capabilities include facilities for testing and evaluation of materials, components, and systems; CFD, reaction kinetics, finite element, and failure modeling; and product cost modeling and dynamic simulation of manufacturing systems.

Contact: Dr. Floyd R. Tuler
Executive Director
Phone: (613) 547-6459 or (613) 547-6700
Fax: (613) 547-8125
e-mail: floyd.tuler@mail.cammauto.com

CAMM Centre for Automotive
Materials and Manufacturing

ChevronTexaco Technology Energy Ventures



3901 Briarpark Drive
Houston, TX 77042, USA

Website: www.chevrontexaco.com/technologyventures.com

Products: Fuel processing, hydrogen storage, advanced batteries.

Description: ChevronTexaco Technology Ventures, a unit of ChevronTexaco, is involved with identifying, developing and commercializing new and emerging technologies and new energy systems that promise to play an increasingly important role in the world's energy mix and environmental stewardship. Such activities include fuel cells, fuel processing, hydrogen storage, and advanced batteries. ChevronTexaco Technology Ventures is actively engaged in developing and commercializing several key enabling technologies through internal development, joint ventures and equity investments to create new market opportunities for the next generation of clean, efficient energy systems.

Contact: Liz Darsky
Marketing Specialist
Phone: (713) 954-6803
Fax: (713) 954-6016
e-mail: darskyes@chevrontexaco.com

ChevronTexaco

Chrysalix Energy



1682 West 7th Ave, Suite 200
Vancouver, BC V6J 4S6

Website: www.chrysalix.com

Products: Chrysalix provides early-stage funding to new companies as well as management assistance, technological know-how, organized networking with industry players and experience in the management of intellectual property.

Description: Chrysalix Energy Limited Partnership is an early-stage private venture capital firm focusing on fuel cell & hydrogen economy companies and is a private equity joint venture between Ballard Power Systems, BASF Venture Capital, The BOC Group, Duke Energy, the Mitsubishi Corporation and Shell Hydrogen. Operating independently, Chrysalix offers a unique value proposition to its start-up clients throughout the business planning, start-up and operations phases of development.

Contact: Christine Bergeron
Investment Manager

Phone: (604) 659-5475

Fax: (604) 659-5479

e-mail: cbergeron@chrysalix.com



Cimtex Industries Ltd.

**1 - 32912 Mission Way
Mission, BC V2V 5X9**

Website: www.cimtexindustries.com

Products: Machined and fabricated metal and plastic components

Description: Cimtex Industries is a full service ISO registered manufacturer of machined components and fabricated assemblies for the Aerospace, Telecommunications, Scientific and High Tech industries. These services include prototype design and development, machining, fabrication, assembly and testing of the final product in accordance with customer requirements.

Contact: Cory Padula
President

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e-mail: cory@cimtexindustries.com



Clean Energy Canada



3020 Old Ranch Parkway, Suite 200
Seal Beach, CA 90740 USA

Website: www.cleanenergyfuels.com

Products: Hydrogen and Natural Gas Fueling Stations and Fleet Services.

Contact: Atul Deshmane
Director of Technology Advancement

Phone: 562-493-2804

Fax: 562-493-4352

e-mail: adeshmane@cleanenergyfuels.com

Colliers International

200 Granville Street, 16th Floor
Vancouver, BC V6C 2R6

Website: www.colliersmn.com

Products: Real Estate Services

Description: The fuel cell industry requires technically advanced real estate facilities. Colliers International has developed industry specific technical expertise for the fuel cell industry to ensure our clients receive appropriate and cost effective real estate solutions.

Offering first class commercial real estate services in 14 cities across Canada, Colliers International also has more than 250 offices in 51 countries on 6 continents worldwide. Connected through our global database system and web site, we provide you with instant access to our local market experts anywhere your business takes you.

Contact: Kevin Nelson
Technical Facility Specialist
Phone: (604) 681-4111
Fax: (604) 661-0849
e-mail: kevin.nelson@colliers.com



Conduit Ventures Limited



20 - 21 Tooks Court, Cursitor Street
London, United Kingdom EC4A 1LB

Website: www.conduit-ventures.com

Products: CVL currently has capital available for investment provided by its founding investors (which include Shell Hydrogen, Mitsubishi Corporation and Johnson Matthey plc and Danfoss A/S). CVL is managed by a team headed by John Butt, a former Director of Global Mergers and Acquisitions at Schroder Salomon Smith Barney. CVL's ambition is to become a leading independent global provider of venture capital to different fuel cell and related hydrogen technologies. The Fund is expected to be established with resources of up to US \$100 million.

Description: Conduit Ventures Limited (CVL) is the first European- based venture capital fund to focus purely upon fuel cells and related hydrogen technologies.

Contact: Mr. John Butt
CEO

Phone: +44 20 7242 9595

Fax: +44 20 7405 2863

e-mail: jb@conduit-ventures.com

CONDUIT VENTURES LIMITED

**Dana Canada Corporation
Long Manufacturing Thermal Products Division
Oakville Fuel Cell Support Centre**

656 Kerr St., Oakville, Ontario
Canada L6K 3E4

Website: www.dana.com

Products: Fuel Cell balance of plant components and subsystems, especially heat exchangers and thermal management. Also, components and subsystems for hydrogen fuel processors.

Description: Dana Corporation produces automotive components and systems, and has committed 4 global Fuel Cell Support Centres to develop component products for the emerging fuel cell industry. The Long Manufacturing Thermal Products Division in Oakville is leveraging its automotive heat exchanger design and manufacturing capabilities to produce new products for fuel cell applications with particular competency in thermal design, system modeling, prototyping and high volume manufacturing. Products include aluminum and stainless steel heat exchangers, variable speed pumps and fans for low parasitic energy loss PEM balance of plant system operation. Welding and brazing technologies are used for high temperature fuel processor and SOFC components.

Contact: Brian Cheadle
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Nick Kalman
Fuel Cell Account Manager
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(905) 845-0685
nick_kalman@longmfg.com



Deloitte & Touche LLP



2800 - 1055 Dunsmuir Street
Vancouver, BC V7X 1P4

Website: www.deloitte.ca

Products: Deloitte & Touche provides a full range of accounting services including: Assurance and advisory, Taxation, Financial Advisory and Consulting.

Description: Deloitte & Touche is one of Canada's leading professional services firms, providing a full range of assurance and advisory, financial advisory, tax and consulting services through more than 6,600 people in more than 46 locations across the country.

Contact: Paul Fletcher
Partner

Phone: (604) 640-3189

e-mail: pfletcher@deloitte.ca

**Deloitte
& Touche**

Delta-Q Technologies Corp.

Unit 3, 5250 Grimmer Street
Burnaby, BC V5H 2H2

Website: www.delta-q.com

Products: High efficiency AC-DC power supplies and battery chargers. QuiQ™ HF/PFC Battery Chargers are currently being sold in volumes to leading OEMs in the recreational and industrial electric drive vehicle industry. Advanced power conversion and power management products currently under development include motor controllers and DC-DC converters. Proprietary battery charging algorithms have been developed for fuel cell/battery hybrid systems.

Description: Delta-Q Technologies is a leading advanced power conversion company using power electronics design and digital control to deliver high efficiency solutions with exceptional price/performance metrics. Delta-Q will become a leader in the conversion, control and monitoring of power in today's high volume electric drive vehicle industry and will then leverage this leadership position to exploit emerging opportunities for power electronics in automotive fuel cell vehicles, 42V vehicle systems, grid-tied hydrogen infrastructure solutions and other markets where advanced power electronics are required.

Contact: Ken Fielding
President & CEO
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e-mail: kfielding@delta-q.com



DuPont Canada Inc.



P.O. Box 2200, Streetsville
Mississauga, ON L5M 2H3

Website: www.dupont.ca

Products: Fuel Cell Flow Field Plates, Nafion® Membranes and Solutions, Membrane Electrode Assemblies for PEM Fuel Cells, Membrane Electrode Assemblies for Direct Methanol Fuel Cells.

Description: With a history of success that dates back to the 1800s, DuPont Canada has become an innovative, science-based company with well defined strengths and a solid, blue chip reputation. Today, in our drive to deliver rapid, sustainable growth in stakeholder value, we continue to build on the strength of our core values, people, technology, market positions, and close ties with the global DuPont company.

DuPont Canada is a global supplier of flow field plates for fuel cells. Technology research and development activities are conducted at our Research and Business Development Centre at Kingston, Ontario.

Nafion® membranes and solutions, as well as membrane electrode assemblies for PEM fuel cells and direct methanol fuel cells, are available through E.I. duPont de Nemours and Company Ltd.

DuPont Fuel Cells technologies. Powering the future of energy today.

Contact: Nevil Whitty
Flow Field Plates Product Manager

Phone: (613) 548-5299

e-mail: Nevil.J.Whitty@can.dupont.com



Dynetek Industries Ltd.



4410 - 46 Avenue SE
Calgary, AB T2B 3N7

Website: www.dynetek.com

Products: Advanced Lightweight Fuel Storage Systems™.

Description: Dynetek Industries Ltd. designs, produces and markets one of the lightest and most advanced fuel storage and refueling systems for many compressed gases. Dynetek has extensive knowledge in composite cylinder and systems design and is recognized around the world as the solution-of-choice to the alternative fuel vehicle sector. Dynetek also serves the industrial gas and energy sectors in the bulk transport and storage of compressed gases. Dynetek works with its customers to provide the most practical and innovative solutions.

Contact: Robb Thompson
President & CEO
Phone: (403) 720-0262
Fax: (403) 720-0263



Dynetek Industries Ltd.

Enbridge Gas Distribution



500 Consumers Road
North York, ON M2J 1P8

Website: www.cgc.enbridge.com

Products: Natural Gas Distributor

Description: Enbridge Gas Distribution is Canada's largest natural gas distributor and one of the fastest growing natural gas companies in North America, serving 1.5 million residential, commercial, and industrial customers.

For more than 150 years Enbridge Gas Distribution has been involved in natural gas storage and distribution - providing its customers with safe, economical and reliable products to make their homes and businesses comfortable.

Enbridge Gas Distribution is part of the Enbridge family of companies, which has business segments in Energy Transportation, Energy Distribution, and Energy Services and is owned by Enbridge Inc.

Enbridge inc. common shares trade on the Toronto stock Exchange in Canada under the symbol "ENB" and on the NASDAQ National Market in the U.S. under the symbol "ENBR".

Contact: Jeff Sim
Business Manager, Distributed Energy

Phone: (416) 495-5281

Fax: (416) 495-6163

e-mail: jeff.sim@enbridge.com



Energy & Marine Branch, Industry Canada

2000 - 300 West Georgia Street
Vancouver, BC V6B 6E1

Website: <http://strategis.ic.gc.ca/electrical>

Description: The Industry Canada Portfolio is presently engaged in a number of activities related to the development of many alternative energy technologies - including fuel cells and hydrogen. These activities include: demonstrating pilot and large-scale technology projects; increasing access to investment capital for emerging energy start-ups; addressing technical barriers to distributed generation; and, facilitating the industry-led, Fuel Cell Commercialization Roadmap - a report that outlines the key commercialization challenges faced by the Canadian industry, and the subsequent recommendations and actions necessary to overcome these challenges and capitalize on Canada's leadership position.

The Energy and Marine Branch of Industry Canada is developing policies and programs to enhance the economic climate for the growth of the industry, linking industry opportunities with established industries, and working in collaboration with NRCan, National Research Council, Natural Sciences and Engineering Research Council of Canada, Transport Canada, National Defence and Environment Canada to develop a coordinated approach to fuel cell sector development. The government's Innovation Strategy Industry Engagement process will further assist the Canadian fuel cell industry to identify measures that can both facilitate the adoption of these new innovative technologies and increase its ability to compete globally.

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**Industry
Canada**

**Industrie
Canada**

Energy Visions Inc.

43 Fairmeadow Avenue
Toronto, Ontario, M2P 1W8

Website: www.energyvi.com

Products: Direct Methanol Fuel Cells,
Nickel-Zinc batteries,
Hybrid battery/Fuel Cell Systems

Description: Energy Vision's mission is to develop and commercialize innovative, cost-effective, environmentally friendly portable power systems. EVI's DMFC technology is based on using a flowing electrolyte technology that has shown up to a 30% efficiency and voltage improvement over PEM DMFC systems. EVI is a developer of rechargeable batteries, notably the Nickel-Zinc battery, which offers a 50% voltage advantage over Ni-Cad batteries with no memory effect. EVI's philosophy is that hybrid battery/fuel cell power systems are the most cost-effective method of circumventing performance limitations of existing fuel cell technology and the economic realities of the marketplace. EVI is developing All-Electric Hybrid battery/fuel cell devices for a variety of applications.

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ESTCO Battery Management Inc.

19 Grenfell Crescent, Suite 100
Ottawa, Ontario K2G 0G3
Canada

Website: www.estco.com

Products: Fuel cell and battery management systems in two product lines: the Fuel Cell Health Manager™(FCHM™) and the Battery Health Manager™(BHM™).

Description: ESTCO is a privately owned technology development company who's business focus is the development and marketing of "smart" electronic management solutions to ensure that rechargeable batteries and fuel cells provide the maximum service life and performance at the lowest cost in applications as varied as stand-by power systems for telecommunications to micro-power for portable electronic devices. With 28 patents awarded, pending and filed, ESTCO, with two platform technologies now entering commercialization, is strongly positioned to achieve and sustain a dominant industry position within its target sectors. ESTCO is seeking commercial partnerships and offers licensing opportunities in the power and energy technologies so necessary to ensure the viability and security of our critical telecommunication and energy infrastructure.

Contact: Dr. Bill Adams
President and CEO
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613 851 0829 (cell)
Fax: 613 228 3483
e-mail: bill@estco.com

ESTCO Battery Management Inc.

Ford Motor Company

#1043, MC 40
15050 Commerce Drive North,
Dearborn, Michigan 48120 USA

Website: www.ford.com

Products: Fuel Cell Vehicles

Description: At Ford Motor Company, we care about preserving the environment for future generations and are dedicated to environmental solutions. Sustainable Mobility Technologies, the research and development arm; concentrates on fuel cell and other advanced electric power trains. Ford's fuel cell engine is powered by hydrogen, which produces zero emissions. Adding absolutely nothing but water vapor to the atmosphere.

Contact: Philip Chizek
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Fax: (313) 594-4901
e-mail: pchizek@ford.com



Fuel Cell Technologies Ltd.



20 Binnington Court
Kingston, ON K7M 8S3

Website: www.fct.ca

Products:

- Solid oxide fuel cell (SOFC) power systems in the 1-50 kilowatt (kW) range for residential, industrial, small commercial, and remote area applications;
- Aluminum-oxygen (Al/O₂) power systems for unmanned underwater vehicles, diver heating systems, and both prime and backup power for remote locations.

Description: FCT is a leading developer of fuel cell power systems. The company's core business is production of SOFC products in the 1 to 50 kW range to provide electricity and heat both for stationary applications such as homes, small commercial enterprises, and remote locations, and for industrial applications. The capacity to co-generate electricity and heat at high temperatures results in system efficiency of approximately 90%. FCT's 5 kW unit is scheduled for field demonstrations in 2003. FCT is working toward having its 5 kW unit available in commercial production volumes in 2005. Since its incorporation in 1994, FCT's research and production facilities have been located in Kingston, Ontario. Fuel Cell Technologies Ltd. is a wholly owned subsidiary of the publicly-traded Fuel Cell Technologies Corporation.

Contact: Gary Allen
Director of Sales

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Fax: (613) 541-6114
e-mail: gallen@fct.ca



Fuel Cells Canada

3250 East Mall
Vancouver, BC V6T 1W5

Website: www.fuelcellscanada.ca

Description: Fuel Cells Canada is a non-profit, national industry association. Our mission is to accelerate the development of Canada's world-leading fuel cell and hydrogen industry. We are the prime source of services and support to Canadian corporations, educational institutions and business alliances promoting, developing, demonstrating, and deploying fuel cell and related products and services in Canada.

Fuel Cells Canada's mandate includes:

- Promoting the Canadian fuel cell and hydrogen industry globally;
- Enhancing the industry's profile with Canadian governments to encourage a national strategic approach to fuel cell and hydrogen industry development;
- Facilitating demonstration projects that allow fuel cell companies to test and perfect their pre-commercial fuel cell technologies;
- Promoting fuel cell technology and its economic and environmental benefits;
- Advancing communications, information sharing and networking between member companies;
- Facilitating the development of regulations, standards and codes that support the safe and widespread application of fuel cell and hydrogen products;
- Providing direction on skills development and course curricula at Canadian educational institutions.

Contact: Chris Curtis
Vice-President
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e-mail: ccurtis@fuelcellscanada.ca



Fuel Cells Canada™

Advancing Canada's World-Leading Fuel Cell Industry

Fueling Technologies Inc.



23 - 131 Citation Drive
Concord, ON L4K 2R3

Website: www.fuelingtech.com

Products: Hydrogen fuel dispensing systems

Description: Fueling Technologies Inc. (FTI) is a world leader in hydrogen dispensing system design and manufacture. FTI's capabilities include:

- An ISO 9001 certified company;
- CE certified hydrogen dispensers;
- 20+ years of experience in alternative fuel dispensing systems, to private and public sector customers around the world;
- filling 350 bar vehicles (up to 440 bar pressures);
- proprietary electronics that provide fast fill, and highly accurate hydrogen/natural gas blending.

Example hydrogen fueling projects:

USA/Canada: SunLine Transit, Arizona Public Service,
PowerTech/BC Hydro, and the California Fuel Cell
Partnership

Japan: Japan's first mobile fueling stations, used by Toyota
and Nissan

Europe: The City of Malmo, Sweden

| | | |
|-----------------|--|--|
| Contact: | Ian Patterson President | Joel T. Kissack Business Development |
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| Fax: | (905) 669-7561 | (905) 669-7561 |
| e-mail: | ian@fuelingtech.com | joel@fuelingtech.com |



FuelMaker Corporation

70 Worcester Road
Toronto, ON M9W 5X2

Website: www.fuelmaker.com

Products: Hydrogen drying, purification, and compression to 5000 psi. Complete fueling systems for fleets of up to 50 vehicles. Natural gas compression for reformer feed.

Description: FuelMaker has over 15 years experience in high pressure gaseous fueling systems around the world. It custom engineers the following hydrogen systems:

- Fast-fill or time-fill fleet fueling systems for electrolytic hydrogen (examples include Honda demonstration station in Los Angeles and Stuart Energy PFAs).
- Fast-fill or time-fill fleet fueling systems for reformer based hydrogen (systems under development with GTI).
- High pressure hydrogen compression and storage for stationary power/fuel cell applications.
- Natural gas compression systems for pressurized reformer feed.
- Natural gas high pressure storage systems for reformer back-up in stationary power/fuel cell applications.

Contact: Ralph Rackham
VP - Engineering & Research

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Fax: (416) 674-3042

e-mail: info@fuelmaker.com



General Hydrogen Corporation



13120 Vanier Place
Richmond, BC V6V 2J2

Website: www.generalhydrogen.com

Description: General Hydrogen's business is to develop, integrate and deploy, together with its strategic partners, hydrogen-based solutions for industrial, commercial and consumer applications and markets.

General Hydrogen focuses on applications and markets that create the best possible pathway to the establishment of a global energy delivery infrastructure for hydrogen fuel cell powered vehicles and distributed electrical generation systems. GH foresees such infrastructure as being a vital prerequisite and driver for the emergence of the hydrogen age.

For the industrial market, the company is developing end-to-end systems to replace forklift batteries with fuel cell Hydricity™ Packs to achieve significant increases in forklift productivity within major distribution centers.

| | | |
|-----------------|--|--|
| Contact: | John Graham Vice President Design & Marketing | Lisa Coltart Investor Relations |
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| Fax: | (604) 231-0400 | (604) 231-0400 |
| e-mail: | jgrahamgeneralhydrogen.com | lcoltart@generalhydrogen.com |



General Hydrogen

Global Hydrofuel Technologies

#1105 - 13700 Mayfield Place
Richmond, British Columbia
V6V 2E4

Website: www.globalhydrofuel.com

Description: Global Hydrofuel Technologies has developed a method for producing hydrogen-on-demand from aluminum-assisted water split reaction, hydrogen suitable for any application and without the need for hydrogen storage or distribution. Its patented technology uses readily available, safe and recyclable reactants, produces no pollutants and is suitable for any application that uses hydrogen fuel. These key aspects greatly reduce infrastructure requirements and should allow for early adoption and rapid expansion of products based on this technology. GHTI believes that its proprietary technology offers significant advantages over competing processes. In addition to continuing independent research, GHTI is developing technology prototypes for marketing to potential and strategic partners.

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e-mail: ricky@gujralgroup.com



Global Thermoelectric Inc.



4908 - 52nd Street SE
Calgary, AB T2B 3R2

Website: www.globalte.com

Products: Generators; Solid Oxide Fuel Cells (SOFC).

Description: Global Thermoelectric Inc. is a world leader in the commercialization of solid oxide fuel cell (SOFC) technology with a focus on residential cogeneration, auxiliary power for automotive applications and small scale industrial uses.

Global is also the world's leading manufacturer & distributor of thermoelectric generators for remote power applications.

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e-mail: jbarker@globalte.com



Gowling Lafleur Henderson LLP



2300 - 1055 Dunsmuir Street
P.O. Box 49122
Vancouver, B.C. V7X 1J1

Website: www.gowlings.com

Description: For more than 100 years, we have provided clients with a broad range of legal and intellectual property agency services. Today, as one of Canada's largest national law firms, Gowlings has offices across Canada - Vancouver, Montreal, Ottawa, Toronto, Hamilton, Waterloo Region, and Calgary - and abroad in Moscow.

Gowlings has an internationally recognized high-tech practice group that comprises both intellectual property and business law professionals. This group is very active serving clients in the fuel cell industry, and provides a wide range of legal services, from the protection and exploitation of technology by patents and licensing, to corporate finance, international trade, and corporate/commercial law.

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Greater Vancouver Regional District



4300 Kingsway
Burnaby, B.C. V5H 4G8

Website: www.gvrd.bc.ca

Description: The GVRD is a federation of 21 municipalities and one unincorporated area that provides regional services to the Vancouver urban region.

Contact: Ken Cameron
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Greater
Vancouver
Regional
District

Greenlight Power Technologies Inc.



Unit C, 4242 Phillips Ave.
Burnaby, BC V5A 2X2

Website: www.greenlightpower.com

Products: Automated industrial grade test stations for fuel cell stacks, fuel cell components, fuel reformers, electrolyzers and fuel cell systems. Fuel cell diagnostic equipment. Fuel cell testing services.

Description: Greenlight Power Technologies, a division of Hydrogenics Corporation, is a leading global supplier of testing and diagnostic equipment and testing services to the fuel cell industry. The FCATS product line of test stations is a recognized industry standard for testing PEM stacks ranging from 0-120 kW. Greenlight has also developed test stations for solid oxide and molten carbonate fuel cells. The Company has supplied over 350 test stations to nearly every major fuel cell program in Asia, Europe and North America including leading fuel cell stack developers, component developers, system integrators and research organizations. Greenlight has satellite customer support offices in Germany and Japan.

Contact: David Chapman
Chief Executive Officer

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e-mail: info@greenlightpower.com



GrowthWorks Ltd.



2600 - 1055 West Georgia Street
Vancouver, BC V6E 3R5

Website: www.growthworks.ca

Products: GrowthWorks has five funds under management:

- 1) Working Opportunity Fund
- 2) Working Ventures Canadian Fund
- 3) Working Ventures Opportunity Fund
- 4) GrowthWorks Access Fund
- 5) Pacific Venture Fund

Description: GrowthWorks (www.growthworks.ca) is a recognized leader in venture capital fund management with proven expertise in raising and investing capital. Managing several funds, including the Working Opportunity Fund and Working Ventures Funds, with a combined \$700 million in assets under management across Canada, GrowthWorks has substantial capital resources and expertise. GrowthWorks has a team of skilled and knowledgeable investment professionals with a combined 200 years of experience. The Investment Team has a proven track record of identifying, structuring and making investments in the fastest growing sectors of the economy, primarily in information technology, life sciences, advanced manufacturing and early stage investing.

Contact: Rolf Dekleer
Investment Manager

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GROWTHWORKS

Heliocentris Inc.



3652 West 5th Ave
Vancouver, BC V6R 1S2

Website: www.heliocentris.com

Products: Fuel cells and hydrogen technology equipment for education, ranging in power from 1-watt single fuel cells through to a 300-watt cogeneration system.

Description: Heliocentris Energy Systems is a world leader in providing fuel cell and hydrogen technology systems for education, outreach and demonstration. The parent company, Heliocentris GmbH is located in Berlin, Germany. In November 2002, Heliocentris Energy Systems Inc. was established in Vancouver, Canada. This company has been set-up to develop fuel cell course material, provide fuel cell education and training, and promote Heliocentris fuel cell products throughout North America.

Heliocentris products are presently sold in Canada through Northwest Scientific and Boreal Laboratory Supplies.

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e-mail: bcook@heliocentris.com



HERA Hydrogen Storage Systems Inc.



577 Le Breton
Longueuil, QC J4G 1R9

Website: www.herahydrogen.com

Products: Hydrogen storage products using metal hydrides.

Description: HERA develops hydrogen storage products based on metal hydrides for use in fuel cell, internal combustion engine and other hydrogen applications.

Hydrides store hydrogen in a solid form enabling improved safety and compactness for the provisioning of hydrogen energy in portable, stationary, mobile, military and other power applications.

HERA is a world leader in the development of hydrogen storage materials. With a wide portfolio of hydride technologies and its technical knowledge and engineering expertise, HERA is a strong partner for original equipment suppliers that develop and manufacture hydrogen based power products and applications.

Contact: Marc Hubert
Director, Business Development

Phone: (450) 651-1200 ext 208

Fax: (450) 651-1209

e-mail: mh@herahydrogen.com

HERA™
Hydrogen Storage Systems

HSBC Bank Canada



885 West Georgia Street
Vancouver, BC V6C 3G1

Website: www.hsbc.ca

Products: Full range of Commercial Financial Services including; deposit services, treasury, cash management, electronic banking, asset management, term and operating credits, import and export financing, equipment leasing and investment capital financing. Full range of Personal Financial Services including deposit services, personal lending including mortgages, private banking, mutual funds, Internet and telephone banking, full service and self-directed brokerage, trust services, property and casualty insurance services.

Description: HSBC Bank Canada is an indirectly-held, wholly-owned subsidiary of HSBC Holdings plc, which is headquartered in London, England. It is the largest international bank and seventh largest bank overall in Canada with 160 offices. HSBC Bank Canada is a principal member of the HSBC Group, which has more than 6,500 offices in 78 countries and territories and is one of the world's largest banking and financial services organizations.

Contact: Greg Sherman
Assistant Vice President
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YOUR WORLD OF FINANCIAL SERVICES

Hydro-Québec CapiTech Inc.

75 René-Lévesque Blvd. West 22nd Floor
Montréal, QC H2Z 1A4

Website: www.hqcapitech.com

Products: Hydro-Québec CapiTech is the wholly owned venture capital arm of Hydro-Québec. CapiTech invests with strategic intent in companies offering energy-related products and services that can create demand for, and increase the performance of Hydro-Québec's business units. The delivery of superior financial returns are an important part of our investment criteria.

Description: CapiTech has already invested directly and indirectly in more than 5 fuel cell companies and related enabling technologies. CapiTech is always on the lookout for investment opportunities in that sector.

Contact: Richard Morrison
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Hydrogen Research Institute

Université du Québec à Trois-Rivières
3351 des Forges, P.O. Box 500
Trois-Rivières, QC G9A 5H7

Website: www.irh.uqtr.ca

Products: R&D

Description: The Hydrogen Research Institute (HRI) is an R&D unit of the Université du Québec à Trois-Rivières, Quebec, Canada. The research interests of the HRI are diverse and extend from the fundamental to the applied. Collaboration with industry and the training of graduate students and qualified personnel is a constant preoccupation. The R&D activities of the HRI are essentially focused on the following domains: storage, safety, transportation, production and uses of hydrogen, mainly fuel cells and internal combustion engine. The HRI has developed lasting partnerships with governmental agencies and the industries. The HRI responds to the diverse interests and goals of its partners in identifying and solving problems, as well as providing the expertise and facilities to evaluate new technologies.

Contact: Dr. Tapan Bose
Director

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e-mail: tapan_bose@uqtr.ca



Hydrogenics Corporation



5985 McLaughlin Road
Mississauga, ON L5R 1B8

Website: www.hydrogenics.com

Products: PEM fuel cell power modules for transportation, stationary, and portable applications; PEM electrolyzer modules; Seal-in-Place stack sealing technology; fuel cell test systems and services (see Greenlight Power).

Description: Hydrogenics is a leader in the design and manufacture of fuel cell power systems and power modules ranging from 2 kW to 60 kW. Greenlight Power Technologies, a wholly-owned subsidiary of Hydrogenics, is dedicated to fuel cell test products and services. The Company has chosen a commercialization path that first develops premium power products for early technology adopters. Through the implementation of a sustainable business plan based on an integrated technology portfolio, Hydrogenics is working with key partners and clients including General Motors, John Deere, NRCan, and the Canadian and U.S. militaries. The Company also has operations in Japan, Germany and the U.S.

Contact: Jane Dalziel
Director of Communications and Government Liaison

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e-mail: jdalziel@hydrogenics.com



Institute for Integrated Energy Systems (IESVic)



University of Victoria
P.O. Box 3055 STNCSC
Victoria, BC V8W 3P6

Website: www.iesvic.uvic.ca

Description: The Institute for Integrated Energy Systems at the University of Victoria (IESVic) promotes feasible paths to sustainable energy systems by developing new technologies and perspectives to overcome barriers to the widespread adoption of sustainable energy. Founded in 1989, IESVic conducts original research to develop key technologies for energy systems and actively promotes the development of sensible, clean energy alternatives.

All energy systems require technologies that link end-user services back to energy sources. These linked technologies create pathways that harness, store and convert energy in its various forms to deliver services on demand. Most of today's energy systems require technological pathways based on non-renewable or greenhouse gas emitting energy sources, such as hydrocarbons. Because these dominant energy resources are both unsustainable and harmful, IESVic is committed to promoting and developing creative alternatives. Our specific areas of expertise are fuel cells, cryofuels and hydrogen storage, biohydrogen, computational modelling, energy systems analysis and energy policy development.

Contact: Dr. Ned Djilali
Executive Director IESVic and Professor of Mechanical Engineering
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IESVic
integrated energy systems

James Hoggan and Associates Inc.



Suite 1500 - 1900 West Georgia Street
Vancouver BC V6G 2Z6

Website: www.hoggan.com

Products: A full range of public and investor relations services including media relations, public relations and investor relations strategy development, crisis communications, IPOs, annual and quarterly reports, investor presentations, audience perception research and media and presentation coaching.

Description: One of Canada's leading public and investor relations firms with specific expertise in the hydrogen and fuel cell sector. Clients include Ballard Power Systems, Stuart Energy Systems, QuestAir Technologies Inc. and Fuel Cells Canada. JHA has the industry experience necessary to develop and implement successful communications programs for long-term public and investor relations initiatives and short-term issues facing clients. JHA has affiliations with independent public relations firms in 60 locations worldwide.

Contact: Madelaine Duke
Senior Account Manager

Phone: (604) 739-7500

Fax: (604) 736-9902

e-mail: mduke@hoggan.com



JAMES HOGGAN + ASSOCIATES INC.

Keen Engineering Co. Ltd.



116 - 930 West First Street
North Vancouver, BC V7P 3N4

Website: www.keeneng.com

Description: Keen Engineering is an international professional consulting engineering firm staffed with over 200 dedicated design professionals.

Fuel Cell Group

The growth of fuel cell applications and the proper facilities for R & D and manufacturing are new and challenging tasks. Keen has assembled a team to respond to the needs of the Fuel Cell industries.

Our Fuel Cell Team's lead electrical and mechanical engineers have one of the largest portfolios of fuel cell support facilities in Canada.

Our experience in the design of the following:

- electrical systems
- communication systems
- life safety systems such as gas detection and flame detection systems
- fuel cells connection to the grids
- distribution of different gases including hydrogen, methane, propane, co, co2, N2 at specific pressure
- tank farms for storing different gases

The Fuel Cell Group members have done over 150 small to large projects for the fuel cell support facilities. The experience that they contribute to their team is unparalleled in the world.

As well, our Sustainable Building Services Group have invested much time in modelling the energy consumption of buildings and alternative options for reducing energy use. Together the Fuel Cell and Sustainable Building Groups provide leading edge experience in the design of the support facilities for fuel cell technology.

Contact: Bezhad Mehrabadi, P.Eng. RCDD
Associate
LEED Accredited Professional

Phone: (604) 986-5336

Fax: (604) 980-3747

e-mail: bezhad.mehrabadi@keen.ca

keen
ENGINEERING

Kinectrics Inc.



800 Kipling Avenue
Toronto, ON M8Z 6C4

Website: www.kinectrics.com

Products: Kinectrics provides engineering services and facilities to develop, engineer, test, assembly and commercialize fuel cell technologies including balance of plants systems.

Description: Kinectrics provides innovative technical services to clients worldwide in the design, development and commercialization of fuel cell systems, with a special focus on plant balance for stationary and residential applications.

Kinectrics offers complete testing facilities for solid oxide fuel cell components and stacks. At its Toronto facility and in partnership with Siemens Westinghouse, Kinectrics is currently providing services for the engineering, development, construction and operation of a pre commercial 250kWe SOFC combined heat and power plant. In addition, the company has successfully teamed with Ballard, Fuel Cell Technologies Inc. and other key players in the fuel cell industry.

A broad-based engineering firm, Kinectrics also offers comprehensive fuel cell related technical and consulting services in the areas of hydrogen, distributed generation, and other energy efficient technologies.

Contact: Young A. Ngo
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e-mail: young.ngo@kinectrics.com



KPMG LLP



777 Dunsmuir Street
P.O. Box 10426
Vancouver, BC V7Y 1K3

Website: www.kpmg.ca

Products: KPMG provides assurance, tax, and financial advisory services.

Description: KPMG's Fuel Cell practice includes a multidisciplinary team of professionals who work exclusively with clients in this industry. Our services are designed to help Fuel Cell companies meet their business challenges.

KPMG is the global network of professional services firms whose aim is to turn understanding of information, industries, and business trends into value. With nearly 100,000 people worldwide, KPMG member firms provide assurance, tax, and financial advisory services from more than 750 cities in 150 countries.

Contact: James Topham
Partner, Fuel Cell Sector
Phone: (604) 691-3049
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e-mail: jtopham@kpmg.ca



Kraus Global Inc.

25 Paquin Road
Winnipeg, MB R2J 3V9

Website: www.krausglobal.com

Products: Kraus Global Inc. is a designer and manufacturer of transportation refueling systems for the alternative fuels industry, providing integrated refueling station solutions for compressed natural gas (CNG), propane (LPG) and compressed hydrogen fuels.

Description: As fuel cells lead the new wave of change in the transportation industry, Kraus Global is leading the way in the development of the required refueling technologies. Kraus Global has now introduced the world's first line of contemporary "retail-style" compressed hydrogen dispensers for fuel cell vehicle fueling applications. These "second generation" dispensers feature a 350 bar (5,000 psi) filling pressure and high flow rates, packaged in an attractive forecourt-style cabinet. Based on technologies used in hundreds of Kraus CNG dispensers successfully operating around the world, these dispensers are designed to look, feel and operate like conventional gasoline dispensers, paving the way for the acceptance of hydrogen as the fuel of the future.

Contact: Mr. Jim Kohut
Business Development Manager
Phone: (204) 663-3601
Fax: (204) 663-7112
e-mail: inquiries@krausglobal.com



LeapTran Technologies International Inc.

#808-6707 Elbow Dr. SW
Calgary, AB T2V 0E5

Products: Fuel cell testing components and materials, high temperature fuel cell manufacture equipments, business and product development consulting service.

Description: Providing cost effective, high quality components, materials, and manufacture equipments made in China. LeapTran's expertise includes:

- DC-DC converter (100W-10kW, efficiency > 95%)
- DC-AC converter
- Mass flow controller/meter
- Solenoid control valve
- Furnaces (sintering, heat treatment, tunnel, environmental controlled, batch type, lab type, up to 1700°C)
- Tape casting machines (lab type, pilot type, manufacture type)
- Screen printing (lab type, pilot type)
- Ball mills and attrition mills
- ZrO₂, Al₂O₃

Contact: Jeff Xu
Manager, Business Development

Phone: (403) 640-1880 (Canada) 86-13917962582 (China)

Fax:

e-mail: jeffxu@shaw.ca; jeffqxu@hotmail.com

MagPower Systems Inc.

Suite 340 - 6165 Highway 17
Delta, BC V4K 5B8

Website: www.magpowersystems.com

Products: The Magnesium-Air Fuel Cell (MAPC) is a primary, secondary, emergency, standby and alternative power source. MagPower has commenced manufacturing of the cells that will be used in its portable system and systems that have currently been licensed worldwide.

Description: MagPower Systems Inc. has developed a powerful, reliable and environmentally friendly non-toxic alternative power source that generates electricity through a combination of magnesium, oxygen and a saltwater electrolyte in conjunction with MagPower's Hydrogen Inhibitors. The MAPC technology has never reached the commercial stage due to its limiting power output caused by hydrogen generation. MagPower has solved this problem and has patents pending on its Intellectual Property; the Hydrogen Inhibitors. The MAPC's advanced cell design includes being environmentally benign, infinite shelf life, does not consume fossil fuels and can be scaled to produce large primary and secondary power systems. The MAPC is encased in a lightweight injected mould polymer manufactured and distributed through licensing agreements worldwide.

Contact: Shawn A. McGroarty
CEO
Phone: (604) 940-3232
Fax: (604) 940-3233
e-mail: ceo@magpowersystems.com

Mag
POWER Systems Inc.

Marsh Canada Limited



510 Burrard Street, Suite 1300
Vancouver, BC V6C 3J2

Website: www.marsh.com

Products: Marsh is proud to have been appointed the general insurance broker for Fuel Cells Canada. We look forward to providing general insurance and employee benefit services to the fuel cells industry.

Description: Marsh is the world's leading risk and insurance services firm. Our one overriding mission is to create and deliver risk solutions and services that make our clients more successful. More than 35,000 colleagues serve clients in over 100 countries from more than 400 owned-and-operated offices.

Marsh Canada Ltd. is a subsidiary of Marsh & McLennan Companies, Inc. (MMC), a global professional services firm with annual revenues exceeding \$10 billion. In addition to Marsh, MMC is the parent company of Putnam Investments, one of the largest investment management companies in the United States; Mercer Consulting Group, a major global provider of consulting services; and MMC Capital, a global private-equity firm.

Contact: Denis J. Marston
Vice-President
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MARSH

McCarthy Tétrault LLP



Suite 1300, Pacific Centre
777 Dunsmuir Street
Vancouver, BC V7Y 1K2

Website: www.mccarthy.ca

Products: Legal Services.

Description: With offices in every major Canadian financial and business centre, McCarthy Tétrault LLP is Canada's largest law firm. We have the business-oriented approach to service that our clients require and boast the largest national technology practice in Canada. Since 2000, the Canadian Legal Expert Directory, Canada's qualitative legal directory, has ranked McCarthy Tétrault as the strongest technology practice in Canada. Our lawyers and patent agents provide our fuel cell clients with expert advice in a full range of legal areas, including intellectual property, patents, licensing, joint ventures, strategic alliances, corporate finance, mergers and acquisitions, employment, litigation, finance and taxation. Our experience in the fuel cells industry is broad, having provided legal services to companies, venture capitalists and investment banks involved in fostering the hydrogen economy. We are also proud of the role we played in the creation of Fuel Cells Canada and of our continued strong support of the organization as a member and provider of legal services.

Our lawyers are based in Vancouver, Calgary, London, Toronto, Ottawa, Montréal and Québec. We also have an international presence with offices in New York and London. Recognized by Chambers Global as the only Canadian firm in its list of "Top 10 North American Law Firms" and named "Best Canadian Business Law Firm of the Year", McCarthy Tétrault has earned its reputation as Canada's premier law firm.

Contact: Michael G. Urbani,
Lawyer
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McCarthy
Tétrault
mccarthy.ca

Membrane Reactor Technologies Ltd.



400 - 200 Granville Street
Vancouver, BC V6C 1S4

Website: www.membranereactor.com

Products: Hydrogen Production Units using steam methane reforming in a proprietary membrane reactor.

Description: Membrane Reactor Technologies Ltd. is a privately owned, Vancouver based technology firm with activities focused on the development and commercialization of membrane reactor systems. With application of its patented Fluidized Bed Membrane Reactor (FBMR) technology to steam methane reforming, the company is poised to become a competitive supplier of small to medium scale, pure hydrogen production units for the industrial hydrogen market and the emerging hydrogen economy.

Contact: Michael Rushton
President and CEO
Phone: (604) 822-4343
Fax: (604) 822-1659
e-mail: mrushton@membranereactor.com



Methanex Corporation



1800 Waterfront Centre
200 Burrard Street
Vancouver, BC V6C 3M1

Website: www.methanex.com

Products: Methanol

Description: Methanex is the world's leading methanol producer and marketer, and is excited about the potential for methanol to contribute to energy diversity and environmental considerations included in a hydrogen economy, such as fuel cell vehicles. Globally, Methanex already produces approximately one million tonnes of hydrogen per year, which is consumed to manufacture methanol. Easily delivered into the market place as a liquid, methanol is readily reformed to liberate its hydrogen, with methanol having a greater hydrogen density than even liquid hydrogen.

Methanex notes especially the ability for methanol to overcome aspects of the economic, delivery and storage challenges associated with hydrogen. While fuel cell developments are proceeding, it is also important to ensure that the fuel supply expectations can be met. Methanex intends to not only deliver fuel, but to do so in the context of a fuel service package including hardware, monitoring and trading. For fuel cells in general, Methanex already supplies many fuel cell demonstrations, both direct methanol fuel cells and for on-board reforming to hydrogen. And in fuel cell vehicles in particular, Methanex led the installation of a methanol refuelling station at the California Fuel Cell Partnership in Sacramento, and supplied all the methanol refueling needs for DaimlerChrysler's historic trans-continental Nectar-5 journey in the summer of 2002.

Contact: Michael Macdonald
Senior Vice President, Technology & Emerging Markets
Phone: (604) 661-2650
Fax: (604) 895-5335
e-mail: mmacdonald@methanex.com



Ministry of Enterprise, Opportunity and Innovation, Province of Ontario



8th Floor, Hearst Block
900 Bay Street
Toronto, ON M7A 2E1

Website: www.2ontario.com

Description: The goal of the Ministry of Enterprise, Opportunity and Innovation is to promote economic growth in Ontario. Faced with an increasingly competitive global marketplace, we aim to accomplish this by creating a culture of innovation, promoting investment and expanding exports to world markets.

We lead the competitive efforts of the provincial government by:

- building and expanding sector competitive capabilities;
- leading economic development initiatives;
- eliminating and preventing unnecessary "red tape".

We act as a catalyst for innovation through:

- Research and Development funding partnerships;
- advisory services to help small and medium-sized enterprises grow;
- programs to encourage young people to explore careers in science or start their own business.

We promote investment in the province by:

- marketing Ontario to the world as a preferred business location;
- helping our regional economies plan and invest for strategic growth;
- investing in our greatest resource - our people - through strategic skills development partnerships.

We encourage trade development by:

- helping Ontario exporters increase their international market opportunities;
- providing export education, counseling and market intelligence;
- showcasing Ontario's products and services abroad.

Contact: Robert Tmej
Senior Advisor, Sector Competitiveness Branch
Phone: (416) 325-6871
Fax: (416) 325 6885
e-mail: robert.tmej@eoi.gov.on.ca



Ministry of
Enterprise,
Opportunity &
Innovation

National Bank Financial



130 King Street West, Suite 3200
Toronto, ON M5H 3T9

666 Burrard Street, Suite 3300
Vancouver, BC V6C 2X8

Website: www.nbfinancial.com

Description: National Bank Financial (NBF) is a full-service, fully-integrated investment dealer with approximately 3,000 employees. Our investment banking and institutional sales offices are located in Canada, U.S., Britain, and Switzerland.

NBF's Energy Technology team is comprised of scientific, engineering and financial experts who have a specialized understanding of the sector. This understanding serves as a critical bridge between our industry clients and investor contacts.

Our services to industry participants include private placements of equity, initial public offerings, follow-on offerings, credit and debt products, and mergers and acquisitions advisory services.

| | | |
|-----------------|--|--|
| Contact: | Marc Murnaghan Director, Energy Technology | Charles Addison Managing Director |
| Phone: | (416) 869-6781 | (604) 443-4017 |
| Fax: | (416) 869-6411 | (604) 623-6777 |
| e-mail: | marc.murnaghan@nbfinancial.com | charles.Addison@nbfinancial.com |



National Research Council Canada



3250 East Mall
Vancouver, BC V6T 1W5

Website: <http://ifci-ipc.nrc-cnrc.gc.ca>

Description: The National Research Council's Institute for Fuel Cell Innovation is working in partnership with industry, university and government stakeholders to build fuel cell technology clusters across Canada and to support the innovation needs of Canadian fuel cell companies through:

- Research and Development - strategic research aimed at advancing fuel cell science and technology and facilitating the commercialization of fuel cells
- People - a multidisciplinary team of over 60 researchers, all focused on fuel cell research, provide advice and expertise to stakeholders
- State-of-the-art facilities - hydrogen-ready labs and environmental chamber, MEA characterization and fabrication facility, fuel cell test stations and specialized equipment to support the NRC research program as well as the needs of Canadian fuel cell companies
- Partnership - research collaboration, people exchange and large-scale strategic initiatives and demonstration projects
- Technology Acceleration - lab and office space to support emerging fuel cell companies
- NRC Fuel Cell Program - headquarters of a horizontal program designed to leverage NRC expertise and facilities across Canada

Research is focused on five strategic areas of critical importance to Canada's fuel cell industry:

- Polymer Electrolyte Membrane Fuel Cells (PEMFC)
- Solid Oxide Fuel Cells (SOFC)
- Systems Integration, Testing and Evaluation (SITE)
- Microtechnology and Sensing
- Modelling

The Institute is also home to the Mining Wear Resistant Materials Consortium, an international group of industry giants in the mining and energy sector that work with NRC to discover ways to lower costs associated with wear and tear of machinery and equipment.

Contact: Erica Branda
Communications Officer
Phone: (604) 221-3099
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National Research
Council Canada

Conseil national
de recherches Canada

Neodym Technologies

711 - 675 W. Hastings Street
Vancouver, BC V6B 1N2

Website: www.neosafe.com

Products: Janus™
PowerKnowz™
KnowzNet™
AutoKnowz™

Single and multiple combustible gas detection devices for hydrogen, methane, propane, and methanol.

Description: Neodym specializes in developing low cost integrated solutions for OEM's detecting both hazardous and combustible gases.

Contact: Bill McDonald
Market Development
Phone: (604) 685-1185
Fax: (604) 685-3764
e-mail: wjm@neodymsystems.com





Nepal Management Ltd.

1808 - 193 Aquarius Mews
Vancouver, BC V6Z 2Z2

Products: Consulting services to early stage companies in the fuel cell/hydrogen space.

Description: Principal is interested to build early-stage companies in fuel cells.

Contact: Michael J. Brown
President
Phone: (604) 682-5845
Fax: (604) 682-5846
e-mail: michaeljbrown@shaw.ca

NORAM Engineering and Constructors Ltd.



200 Granville Street, Suite 400
Vancouver, BC V6C 1S4

Website: www.noram-eng.com

Products: Systems integration for industrial and utility scale power projects; design of chemical and electrical systems; supply of prototype and pilot plant systems; supply of specialized balance-of-plant components including hydrogen generation and delivery systems.

Description: NORAM specializes in the development, commercialization and supply of electrochemical processes. The privately owned company is known for its vision, innovation, and quick response. It is a major shareholder of BC Research, a technology incubator, located at the University of British Columbia.

NORAM is a multi-disciplined firm experienced in the design and operation of electrochemical plants with loads between 5 and 200 MW.

Expertise includes plant modeling, handling of hazardous chemicals, materials of construction, storage and pumping systems, material and heat balance, heat exchangers, flow batteries, shunt currents and grounding of electrolytes, power rectifiers, inverters, power quality and grid-connection.

NORAM is focused on stationary power applications for fuel cells.

The firm is evaluating opportunities where hydrogen is produced as a byproduct in existing electrochemical processes. NORAM also contributed to the development of a Fluidized Bed Membrane Reactor (FBMR) technology, which converts natural gas into high-purity hydrogen, on demand.

Contact: George A. E. Cook, P.Eng.
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Malcolm Cameron
Principal Electrical Engineer
(604) 681-2030
(604) 683-9164
mcameron@noram-eng.com

NORAM
Engineering and Constructors Ltd

Northgate Energy Technologies Ltd



9912 Lougheed Highway
Burnaby, BC
V3J 1N3

Website: www.northgateenergy.com

Products: Advanced Materials for Energy Products & Direct Formic Acid Micro Fuel Cells.

Description: Advanced Hydrogen storage materials.
20 milliwatt to 5 watt micro fuel cells using Formic Acid as the fuel.

Contact: David McLoed
Vice President, Marketing & Business Development

Phone: 604-420-2905

Fax: 604-420-9559

e-mail: dmcloed@northgateenergy.com

Northgate
Northgate Energy Technologies Inc.

Ontario Power Generation



700 University Avenue
Toronto, ON M5G 1X6

Website: www.opg.com (See News Release - March 4, 2003)

Products: OPG is committed to fostering sustainable technologies and works in alliances with others to advance the commercialization of emerging market technologies. OPG is participating with Siemens Westinghouse, the government of Canada, Kinectrics Inc. and the US Department of Energy in the development of the 250 kW Solid Oxide Fuel Cell (SOFC) design. The pre-commercial unit is currently in the commissioning stages in Ontario.

Description: Ontario Power Generation ("OPG") is one of the largest generators of electricity in North America with a balanced portfolio of nuclear, hydro electric, fossil and renewable generation assets. OPG sells the electricity that it generates into the markets administered by the Independent Electricity Market Operator (the "IMO"). Wholesale customers acquire its electricity output for use or sale within Ontario or into interconnected markets. OPG's stations offer dispatch flexibility of base load, intermediate and peak capacity and are diversified by fuel type and technology. OPG is a low-cost generator in its regional market area.

Contact: Mark Tinkler
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ONTARIOPOWER
GENERATION

Palcan Fuel Cells Ltd.



8658 Commerce Court
Burnaby, BC V5A 4N6

Website: www.palcan.com

Products: Polymer Exchange Membrane Fuel Cell stacks; Membrane Electrode Assemblies; metal hydride canisters; and the Palpac' Power Systems.

Description: Palcan Fuel Cells Co. Ltd. is a publicly listed company trading on the TSX Venture Exchange under the symbol 'PC'. The head office is located in Burnaby, British Columbia, Canada.

The Company has developed the technologies for prototyping, manufacturing and testing Proton Exchange Membrane (PEM) fuel cell stacks and systems ranging from 100W to 5 kW. Palcan is also developing and manufacturing unique rare earth metal hydride hydrogen storage products. A three-way fusion of these products with electronics will produce an integrated power system series of products branded under the name Palpac' Power Systems.

Contact: Daniel Gallagher
Director Corporate Communications
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Fax: (604) 422-8869
e-mail: Daniel@palcan.com



Pathway Design & Manufacturing Inc.



7400 MacPherson Avenue, Suite 111
Burnaby, BC V5J 5B6

Website: www.pathway-design.com

Products: Custom design, engineering and tooling services, prototyping, research and development, and volume manufacturing.

Description: Pathway is an ISO-certified custom supplier of design and manufacturing services to the alternative energy industry. Pathway's professional staff of engineers and industrial designers has extensive experience in working collaboratively with the engineering departments of alternative energy companies, and offers particular expertise in design modifications to enhance manufacturability and reduce per part costs.

With a full service machine shop in-house, Pathway also offers tooling, prototyping and production machining services. For R&D and volume manufacturing, Pathway offers injection molding, fabrication and assembly services, together with an extensive quality control department certified to the ISO 9000-2000 standard.

Pathway's designers and process engineers have a thorough knowledge of plastics materials and processing, from utility grade plastics through to advanced engineering materials, including glass-filled resins.

For more information on Pathway's capabilities and services please visit our website.

Contact: Lee-Ann McGuire
Chief Financial Officer
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e-mail: leeann@pathway-design.com



PEM Engineers Inc.



6216 Mackenzie Street
Vancouver, BC, V6N 1H5

Website:

Products: PEM Engineers Inc. provides engineering consulting services to industry and government in support of PEM fuel cell systems and stacks development.

Description: David Watkins and Clarence Chow, former long-term directors of Ballard's Advanced Systems and Transportation Programs, have joined forces to form the consulting company. Their combined experience totals more than 31 years in PEM fuel cell stacks and systems for transportation and stationary applications. PEM Engineers Inc. provides consulting services, including conducting studies for government and industry; proposal review for government and industry; due diligence for investors and developers; assisting start-ups in planning and initiating development programs; and prototype trouble-shooting for developers.

| | | |
|-----------------|-------------------------|-----------------------|
| Contact: | Clarence Chow | David Watkins |
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| Fax: | (604) 648-8791 | (604) 648-8791 |
| e-mail: | clarence.chow@telus.net | DavidSWatkins@aol.com |

PEM Engineers Inc.

PEM Technologies Inc.

110 - 13700 Mayfield Place,
Richmond, BC
V6V 2E4

Website: www.pem.ca

Products: High efficiency H₂/O₂ Proton Exchange Membrane Fuel Cells in the 100W to 5kW power output range for selective portable, stationary, and low speed vehicle applications.

Description: We are a private Canadian company specializing in H₂/O₂ proprietary fuel cell stacks and systems and non-fluoro based polymer membrane research and development. We have world class competencies in polymer chemistry and the development of non-fluoro based ion exchange polymer, membranes and MEAs.

Contact: Douglas F. Good
Chief Financial Officer
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Fax: (604) 233-1116
e-mail: dfgood@pem.ca



Pivotal Power Inc.

150 Bluewater Road
Bedford, NS B4B 1G9

Website: www.pivotalpower.com

Products: Power electronics engineering: uninterruptible power supplies, inverters, converters, battery management systems, static frequency chargers, embedded power supplies.

Description: Pivotal Power has an objective to be the power electronics supplier of choice to the fuel cell industry with inverter and converter products in the range of 100W to 30kW. Pivotal Power's 20 year history, reputation for customer support and capabilities with design, development and manufacturing make it an excellent partner to fuel cell companies seeking custom solutions to their power electronics need.

Contact: Carlo Shimoon
President & CEO
Phone: (902) 835-7268
Fax: (902) 835-6026
e-mail: c.shimoon@pivotalpower.com



PowerDisc Development Corporation Ltd.

Unit 5 - 45770 Railway Avenue
Chilliwack, BC V2P 1L3

Website: www.powerdisc.ca

Products: PowerDisc's product line will consist of a variety of PowerDisc engines ranging from 1-100+ kW, PEM fuel cell stacks and hybrid propulsion systems.

Description: PowerDisc is a research and development company focused on the development and commercialization of PowerDisc engines, proprietary PEM fuel cell stacks and hybrid propulsion systems utilizing the PowerDisc engine. The company is working closely with the National Research Council of Canada under the National Fuel Cell Program and several complimenting companies to develop its products.

Contact: David Leger
CEO

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Fax: (604) 792-0910

e-mail: info@powerdisc.ca

Praxair, Inc.

1 City Center Drive, Suite 1200
Mississauga, ON L5B 1M2

Website: www.praxair.com

Products: Praxair, Inc. ("Praxair") is a leading supplier of hydrogen and hydrogen supply systems in North America.

Description: Praxair offers an unmatched combination of commitment and capability to hydrogen users. Praxair's complete range of supply options including cylinders, high-pressure bulk gas delivery, liquid hydrogen delivery, on site production and pipeline supply are designed to provide you the most economical, flexible, reliable, and safe supply available.

Contact: Wolfgang Laser
Product Manager - Atmospheric

Phone: (905) 803-1796

Fax: (905) 803-1698

e-mail: wolfgang_laser@Praxair.com



PrecisionH2 Inc.

4141 Sherbrooke Ouest, Suite 550
Montréal, QC H3Z 1B9

Website: www.precisionh2.com

Products: CarbonSaver - Distributed Energy Systems

Description: PH2 is developing non-thermal fuel processor technology for on-site hydrogen production in distributed Natural Gas applications. During the decomposition of methane in the CarbonSaver, the carbon in the methane is captured in a solid form for later use. Low operating temperature and rapid start, load following features when integrated with fuel cell installations, make the PrecisionH2 technology a leading approach to the distributed supply of hydrogen. In a new R&D collaboration, PH2 will begin developing larger units for roadside hydrogen fueling systems from a Natural Gas feed. In this process carbon black will also be captured for use instead of released as CO₂ or other GHG's.

Contact: Dan Fletcher
VP Development
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Fax: (514) 842-0162
e-mail: danfletcher@precisionh2.com



PricewaterhouseCoopers LLP



250 Howe Street, Suite 700
Vancouver, BC V6C 3S7

Website: www.pwcglobal.com

Products: Professional services to assist growing and mature companies build value, manage risk and improve performance.


Description: PricewaterhouseCoopers understands and supports the fuel cell industry in Canada and around the world. Our Alternative Energy ne work of professional staff, drawn from 125,000 people in 142 countries, has a firm grasp of the issues facing companies in the industry as it evolves towards commercialization. We are continually expanding our knowledge and client base with the goal of being the pre-eminent advisor to the industry in local, national and global markets.

Relevant Publications:

"Fuel Cells - The Opportunity for Canada",
June 2002 with Fuel Cells Canada

"Canadian Fuel Cell Commercialization Roadmap",
April 2003 with Industry Canada and Fuel Cells Canada

| | | |
|-----------------|--|--|
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| Phone: | (604) 806-7575 | (604) 806-7726 |
| Fax: | (604) 806-7806 | (604) 806-7806 |
| e-mail: | john.delucchi@ca.pwcglobal.com | john.webster@ca.pwcglobal.com |

PRICEWATERHOUSECOOPERS 

QuestAir Technologies Inc.



6961 Russell Avenue
Burnaby, BC V5J 4R8

Website: www.questairinc.com

Products:

- Hydrogen purification technology for stationary and automotive PEM fuel cell systems, and for reformer-based hydrogen fueling systems.
- Industrial system's for the purification of hydrogen, helium and methane.

Description: QuestAir Technologies, Inc. has developed proprietary gas purification technology that is being applied to several large existing and emerging world markets, including industrial hydrogen production and stationary and automotive fuel cells.

QuestAir's proprietary fast-cycle pressure swing adsorption ("PSA") technology allows the developers of fuel cell systems to increase the efficiency of their products, and offers a compact, cost effective gas purification solution to QuestAir's industrial customers and developers of hydrogen fueling infrastructure. QuestAir's strategic partners include Shell Hydrogen, Ballard Power Systems and The BOC Group.

Contact: Mr. Mark Kirby
Director, Business Development

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Fax: (604) 454-1137

e-mail: Kirby@questairinc.com

QuestAir

Royal Military College of Canada

Department of Chemistry & Chemical Engineering
PO Box 17000, Stn Forces,
Kingston, ON, K7K7B4

Products: We are a research group consisting of 15 scientists, engineers and technicians. We offer our services to industry and government organizations with whom we presently have several contracts.

Description: RMC played an important role in much of the early fuel cell work in Canada, in that we provided the scientific expertise and liaison with Ballard for the Department of Defense (the sole supporter of Ballard in their first few years of fuel cell work). Today the group has expertise in all areas of fuel cell systems and is carrying out research and development on the following, membrane reformers, reforming catalysts, polymer electrolyte membranes, MEA's, DMFC's, fuel cell component testing and modeling of all components that make up a fuel cell power system.

Contact: Dr J.C. Amphlett
Director Electrochemical Group

Phone: 613 541 6000 x 6272

Fax: 613 542 9489

e-mail: amphlett-j@rmc.ca

SatCon Power Systems Canada

835 Harrington Court
Burlington, ON L7N 3P3

Website: www.satcon.com

Products: DC/AC & DC/DC power converters for Fuel Cell applications

Description: Three-phase Power Conditioning Systems available as grid connected, standalone or both. Incorporates optional integration of energy storage and other energy sources, static disconnect switches, for un-interruptible power to critical loads for total system integration and power quality. Inverters certified to UL1741 from 25kW to multi MW.

Contact: Vince Scaini
Product Line Manager

Phone: (905) 631-4403

Fax: (905) 639-0961

e-mail: vince.scaini@satcon.com



Siemens Canada Limited

2185 Derry Road West
Mississauga, ON L5N 7A6

Website: www.pgd.siemens.ca

Products: Power Generation, Transmission and Distribution

Description: Siemens and Westinghouse belong to the pioneers of fuel cell technology. Activities in the Siemens corporate research labs started back in 1962. In 1984, a 100kW alkaline fuel cell developed by Siemens was successfully tested in a submarine. Today, Siemens continues to be one of the leading companies in fuel cell research, development and manufacturing of our SOFC technology. With SOFC demonstration projects well under way in Canada and elsewhere in the world, Siemens Solid Oxide Fuel Cell technology holds a leading position.

Contact: Peter J. Schürmann
VP, Executive Account Management

Phone: (905) 819-5763

Fax: (905) 819-5806

e-mail: peter.schurmann@siemens.com

SIEMENS

SMC Pneumatics (Canada) Ltd.



730 Eaton Way, Unit 2
Delta, BC V3M 6J9

Website: www.smc Pneumatics.ca

Products: Solenoid Valves, Flow Control, Fittings, Tubing, Pumps, Teflon Products, Electro-Pneumatic Regulators, Switches, Pneumatic Cylinders, Sensors, Automation Solutions, Engineering Support

Description: SMC is an industry leader that has committed itself to aiding and participating in the development of fuel cell applications. Our cutting edge products and extensive R&D structure allow SMC to continually provide collaborative solutions designed to improve fuel cell systems, fuel cell manufacturing automation systems and related test equipment.

With branch offices established in 39 countries and 230 cities, SMC is poised to service a global market both efficiently and effectively.

SMC is continually expanding its product line in order to meet the requests of our customers as we strive to provide outstanding products coupled with unsurpassed service.

Contact: Brian Davis
Regional Manager, Western Canada

Phone: (604) 517-1646
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e-mail: bdavis@smcusa.com



SRE Controls Inc.

440 Phillip Street
Waterloo, ON N2L 5R9

Website: www.srecontrols.com

Products: Power Electronics, microprocessor based control systems, controllers, converters, inverters and chargers.

Description: SRE Controls is a 10 year old Company in the business of supplying Power Electronic controllers and associated devices to Industry. The Company is a major supplier of controllers for Industrial Electric Vehicles (IEV's). Our major served market is throughout North America with limited sales elsewhere.

SRE designs, manufactures, and markets sells power electronic motor controllers for traction motor control, lift and pump motor control and steering control. We serve the IEV market which encompasses Forklift Trucks, AGV's, Ground Support Equipment, Scissors and Booms, Personnel and Burden Carriers, Tractors and Lawn and Garden Equipment. All these market areas benefit from the environmental pressure to reduce emissions from the use of hydrocarbon fuels. They grow with economy plus an additional growth factor due to the swing from Internal Combustion (IC) engines to electric.

The Company is active in designs, prototyping and early stage manufacturing for on-road EV's and Fuel Cell applications, where we design for engine control as well as for vehicle traction and auxiliaries.

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Business Manager,
Generation Plant Technologies

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Fax: (519) 725-1645

e-mail: hdickout@srecontrols.com



Staubli Corporation



201 Parkway West
Duncan, South Carolina
29334

Website: www.staubli.com

Products: Mono and Multi Coupling Systems for Hydride Bottle Connections, Cooling Circuits and other Fluid / Gas Hydrogen Applications.

Description: Staubli is a Global Manufacturer of high quality, high precision quick disconnects and multi coupling products. With over 100 years of product manufacturing, we have the capability of producing product that is specific to customer needs, incorporating a large R&D department that is dedicated to customer application solutions. This dedication can provide new product development or modification of existing product for use in the H2 industry, thus providing a custom solution to meet the customer specific needs.

Contact: Kevin Wilcox
Regional Manager - Canada

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e-mail: k.wilcox@staubli.com

STÄUBLI

Stuart Energy Systems Corporation



5101 Orbitor Drive
Mississauga, ON L4W 4V1

Website: www.stuartenergy.com

Products: Stuart Energy's Hydrogen Energy Station is an electrolytic hydrogen infrastructure solution designed to meet the hydrogen needs of a variety of markets and applications. The Hydrogen Energy Station is, uniquely, a single system able to supply hydrogen for industrial processes, transportation fuel for vehicles, power for buildings and communities, or any combination of these applications using clean hydrogen.

Description: Stuart Energy is the leader in hydrogen infrastructure solutions and has over fifty years experience in electrolytic hydrogen generation with an unparalleled safety and reliability record.

Stuart Energy has a world-leading technology portfolio that includes all electrolytic technologies: alkaline electrolysis, both atmospheric and pressurized, as well as access to Proton Exchange Membrane (PEM) electrolysis.

Stuart Energy has important partnerships or projects with other global leaders such as Cheung Kong Infrastructure Holdings Ltd, Ford Motor Company, Toyota Motor USA, and Hamilton-Sundstrand.

Stuart Energy is also the title-holder of over a 100 patents, including the most recent patent giving Stuart Energy exclusive rights to develop and market "smart" on-site on-demand Hydrogen Energy Stations.

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TD Securities Inc.



700 West Georgia Street, Suite 660
Vancouver, BC V7Y 1B6

Website: www.tdsecurities.com

Products: TD Securities provides a wide range of capital market products and services to corporate, government and institutional clients in five key business areas of finance: Investment Banking, Private Equity, Institutional Equities, Debt Capital Markets and Foreign Exchange.

Description: Our Investment Banking group provides financial advisory services in Equity and Debt Financing, Mergers & Acquisitions, Divestitures and Risk Management. Our capital-raising services include placements of common equity, preferred shares, private equity and private debt securities, and bank debt including syndications and bridge financings.

Our Energy Technology Group consists of 8 investment banking and equity research professionals based in Vancouver, Calgary, Toronto and New York and has been involved in raising over \$590 million in private and public equity for Energy Technology companies in the past 24 months.

Contact: Bruce Black
Vice President, Energy Technology Group
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Technologies M4 Inc.

575 Rue le Breton
Longueuil, QC J4G 1R9

Website: www.tech-m4.com

Description: TM4 delivers solutions for highly integrated power electronics, controls and electric generator units offering superior power density, efficiency, controllability and reliability to meet power quality needs, as well as for distributed and mobile power generation applications. In the short term, they are aimed at markets such as UPS, electric vehicle (EV) range extenders, series hybrid-electric vehicles (HEV) and auxiliary power units as well as the distributed energy resources (DER) industry, which requires power solutions that meet the highest standards of quality, functionality and efficiency.

Contact: Michel Lemaire
Director, Business Development

Phone: (450) 674-2030 ext. 259

Fax: (450) 674-1932

e-mail: michel.lemaire@tech-m4.com



Technologies M4 Inc.

Technology Early Action Measures, Natural Resources Canada

580 Booth St., 13th Floor
Ottawa, ON K1A 0E4

Website: www.team.gc.ca

Products: The Government of Canada's Climate Change Action Fund supports the demonstration and deployment of innovative technologies that reduce greenhouse gas emissions, while sustaining economic and social development in Canada and internationally.

Description: TEAM funds projects through existing Canadian governmental technology programs and builds on existing long-term, sustained government investments in technology research and development. Through the resulting investment partnerships, the federal government, private sector and other collaborators are contributing to early action on greenhouse gas reductions with significant environmental co-benefits and economic growth. Since 1998, TEAM has provided \$16 million to 13 hydrogen and fuel cell related projects.

Contact: Wayne Richardson
Director, TEAM Operations Office
Phone: (613) 996-5419
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e-mail: wrichar@nrcan.gc.ca



Teleflex Canada



3831 No. 6 Road
Richmond, BC V6V 1P6

Website: www.teleflexcanada.com, www.teleflex.com

Products: Teleflex Canada seeks to be a leader in balance of plant component design and manufacturing for the fuel cell industry. We are currently looking to partner with fuel cell development companies to help them meet their balance of plant requirements.

Description: Teleflex Canada's core competencies have evolved over the last 27 years in BC to the point where we are one of the few Western Canadian manufacturing companies that can produce engineered, high volume, precision machined products that meet the strictest quality demands. With the goal of being the fuel cell industry's leader in supplying balance of plant components, we feel we are perfectly positioned to achieve this goal. Our team of expert engineers, manufacturing capacity and experience, established relationships with major OEM's (including automotive), and the financial backing of our large and successful parent corporation (Teleflex Inc., \$2b/yr) puts us in a position of strength for the fuel cell market.

Contact: Mengo McCall
Business Development
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Fax: (604) 270-6896
e-mail: mmccall@teleflex.bc.ca



TeleflexGFI

100 Hollinger Crescent
Kitchener, ON N2K 2Z3

Website: www.teleflexgfi.com

Products: TeleflexGFI's hydrogen product offerings include in-tank solenoid valves, pressure regulators, pressure relief devices, and isolation valves.

Description: TeleflexGFI is the premier full system service supplier of alternative fuel systems and components for hydrogen, natural gas and propane applications.

As part of an ongoing commitment to the development of next generation technologies, TeleflexGFI provides high-pressure hydrogen components to Original Equipment Manufacturers (OEM) customers involved in compressed hydrogen storage for fuel cell vehicular and stationary storage.

TeleflexGFI is ISO 9001 and QS 9000 certified.

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TISEC Inc.

2113 St. Regis, Suite 250
Dollard des Ormeaux, QC H9B 2M9

Website: www.tisec.com

Products: Sourcebook for Hydrogen Applications, Safety and Reliability Studies, Code Compliance

Description: TISEC Inc. supports the hydrogen industry by providing reference material and engineering services to ensure the safe implementation and deployment of hydrogen systems. It's SourceBook for Hydrogen Applications has become an essential reference on safety aspects of hydrogen systems. TISEC also publishes other reference materials on hydrogen. TISEC engineers provide engineering consultation on designs of systems, facilities and products involving hydrogen to ensure compliance with local, national and international codes and standards.

Contact: Robert Hay
President

Phone: (514) 684-9096

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e-mail: sourcebook@tisec.com



Tyco Electronics Canada Ltd.

20 Esna Park Drive,
Markham, ON L3R 1E1

Website: www.tycoelectronics.com

Products: Tyco Electronics manufactures and designs Electrical and Electronic Interconnection Systems, Relays, Sensors, Switches, Custom Electronic Modules and Enclosures. Through both internal development, and acquisitions of new companies and technology, we continue to expand our product offering and customer based solutions.

Description: Tyco Electronics Ltd was formed in 1999 when Tyco International Ltd merged the acquired companies AMP, Elcon and Raychem into a newly formed business unit. Since that time Tyco Electronics has grown to be the world's largest passive component supplier merging over 55 industry leading companies. With brand names like AMP, Raychem, Elcon, Agastat, P&B, Schrack, Hartman, CII Technologies, and Dulmison, our expertise in material science, product design and process engineering allows us to develop, manufacture and sell high performance, first-to-market products. In Canada, Tyco Electronics Canada not only provides sales and support for the great breadth of Tyco Electronics products, but also designs and manufactures an assortment of products for the global automotive and utility industries.

Contact: Sam Alesio
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tyco

Electronics

Universal Dynamics Limited

100 - 13700 International Place
Richmond, BC V6V 2X8

Website: www.udgroup.com

Products: Quality and productivity improvement solutions to support fuel cell related companies through engineered packages, control and production management software, hardware and technical support.

Description: Universal Dynamics' diversified team reduces "time to market" with cost effective outsourced engineering and software development services to fuel cell related companies. Universal Dynamics' proven record of success extends from plant facility power and hydrogen distribution infrastructure through testing and data acquisition/analysis software systems to custom development of automated manufacturing machinery. Our support role accelerates development by allowing key staff to concentrate on growing their core expertise as companies evolve from R&D through prototyping to manufacturing. Our hands on approach allows customers to focus on their high priority development activities and be confident that essential background services and support functions are addressed.

Contact: Ken McCance
VP, Business Process Integration

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University College of the Fraser Valley



33844 King Rd
Abbotsford, BC V2S 8A7

Website: www.ucfv.bc.ca

Products: Applied research in alternative energy solutions, commercialization of technology, customized training in trades & technology, new technology promotion.

Description: The University College of the Fraser Valley is the major adult educational resource for the communities of the Fraser Valley. UCFV is a comprehensive educational institution, offering bachelor's and associate degree programs, academic and applied diplomas and certificates, trades training and continuing education.

Fuel Cell technology is an important focus for our applied research in alternative energy solutions. We offer a wide array of applied research expertise in partnership with government and the business community.

Our on-site Industrial Technology advisor with the NRC IRAP program is available to assist companies in undertaking research and appraising new or existing technologies. In addition the ITA plays a key role in fostering extensive interaction between our academic and business communities.

Contact: Duncan Jeffries
Director, Industry Liaison

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e-mail: jeffries@ucfv.bc.ca



University of Calgary

Dept. of Chemistry, 2500 University Dr NW
Calgary, AB T2N 1N4

Website: <http://www.chem.ucalgary.ca/groups/birss/research.html>

Products: Development of new catalysts for fuel cell applications and overcoming degradation of fuel cell performance.

Description: The fuel cell research in the Birss Group at the University of Calgary focuses on several different areas. In one branch, we are working on novel sol-gel derived methods to form thin films composed of nanometer sized metallic particles to serve as catalysts for hydrogen or methanol fuel oxidation in proton exchange membrane (PEM) fuel cells. Another project, partly funded by Ballard Power Systems, involves the development of new low cost cathode materials, again using sol-gel processing techniques, for the reduction of oxygen in PEM fuel cells.

Research is also directed towards high temperature solid oxide fuel cells (SOFCs) and is funded by NSERC, NRC, AERI and Global Thermoelectric Inc. Reliable electrochemical methods are being developed using 3-electrode techniques in order to establish the kinetics and mechanisms of the fuel oxidation and oxygen reduction reactions. As well, a deeper understanding of the causes of the degradation of performance of SOFCs is being obtained, with emphasis on anode and cathode poisoning and thermal cycling effects, and methods are being sought to minimize these problems. Further, in situ FTIR spectroscopy is being employed, in collaboration with Dr. Ron Kydd's group, to establish the mechanism and identify surface intermediates during the oxidation of fuels under SOFC conditions.

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University of Regina

Faculty of Engineering
3737 Wascana Parkway
Regina, SK, Canada

Website: www.uregina.ca

Products: Research on hydrogen production from fossil fuels

Description: We are aiming to develop a cost effective and reliable hydrogen fuel delivery system. This will involve the design of a low-cost prototype to produce hydrogen from natural gas.

Contact: Dr. Raphael Idem, P.Eng.
Associate Professor
Faculty of Engineering

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e-mail: Raphael.idem@uregina.ca



Ventures West Management Inc.



Suite 280 - 1285 West Pender Street
Vancouver, BC V6E 4B1

Website: www.ventureswest.com

Products: Ventures West provides equity capital for early stage technology companies.

Description: Ventures West has a distinguished track record of funding some of Canada's leading technology companies. In the fuel cell sector, Ventures West's was a lead investor in Ballard Power, Polyfuel, Angstrom Power, QuestAir, Cellex, Statpower (sold to Xantrex), Inverpower (sold to Satcon), and Greenlight Power (sold to Hydrogenics). Ventures West today has over \$400 million under management with offices in Vancouver, Toronto and Ottawa. We continue to actively pursue early stage investments in the fuel cell sector.

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Westaim Ambeon
(a division of Westaim Corporation)



10102 114th Street
Fort Saskatchewan, AB T8L 3W4

Website: www.westaimambeon.com

Products: Thermal spray powders for abradable seals and wear resistance; conductive filler materials for EMI shielding applications; engineered honeycomb parts for abradable seals and structural components.

Description: Westaim Ambeon is a leader in composite material technologies for advanced power generation and electronic applications. A new catalyst materials group within the division is aiming to apply its capabilities in composite materials to assist in achieving the required material breakthroughs for the fuel cell industry in components like fuel reformers, membrane electrode assemblies and SOFC anodes.

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e-mail: gcool@westaim.com



Xantrex Technology Inc.

8999 Nelson Way
Burnaby, BC V5A 4B5

Website: www.xantrex.com

Products: Advanced power electronic equipment including DC to AC inverters and Fuel Cell control systems. Power levels from below 1 kilowatt to over 1 megawatt for grid-connected and stand-alone applications.

Description: Xantrex develops, manufactures, markets, and supports leading advanced power electronic and control products for the Distributed Power, Mobile Power, and Programmable Power markets. Xantrex has extensive product and project development experience in the area of power conversion and system control for Fuel Cell applications. We work with Fuel Cell OEM customers in partnership to achieve optimal system solutions for their specific applications.

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xantrex
Smart Choice for Power

Zetacon Corporation



10-7050 Telford Way
Mississauga, ON L5S 1V7

Website: www.zetacon.com

Products: The Z2000 generic power platform enables engineering teams to quickly meet their specific power system requirements in areas such as AC inverters, battery chargers, electrolysis power supplies, etc.

Description: The high energy density Z2000 power platform, combined with the expertise of our applications engineering staff, can be configured to become a power converter, inverter, generator, sensor-less motor controller, etc. With rapid prototyping and quick ramp-up to volume production, the Z2000 allows our customers to take advantage of advanced high performance power technology in their end products without a large investment in in-house power electronics infrastructure while maintaining full implementation and control of any proprietary algorithms. The Z2000 can be fully configured, using only the hardware and software actually required for each application. This allows our customers to best balance cost and functionality for success in their end products.

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