CHFCA

Clean. Efficient. Energy.

2020 CHFCA MEMBER CAPABILITIES GUIDE

ACKNOWLEDGEMENTS

The 2020 Canadian Hydrogen and Fuel Cell Association Member Capabilities Guide provides critical information on many of the key companies and organizations active in Canada's hydrogen and fuel cell sector.

The Canadian Hydrogen and Fuel Cell Association thanks the provincial and federal governments for their continuing support to the Canadian hydrogen and fuel cell industry. We would especially like to acknowledge Innovation, Science, and Economic Development Canada, Global Affairs Canada, Natural Resources Canada, The National Research Council of Canada, Western Economic Diversification Canada, and the Province of British Columbia for partnering with our organization.

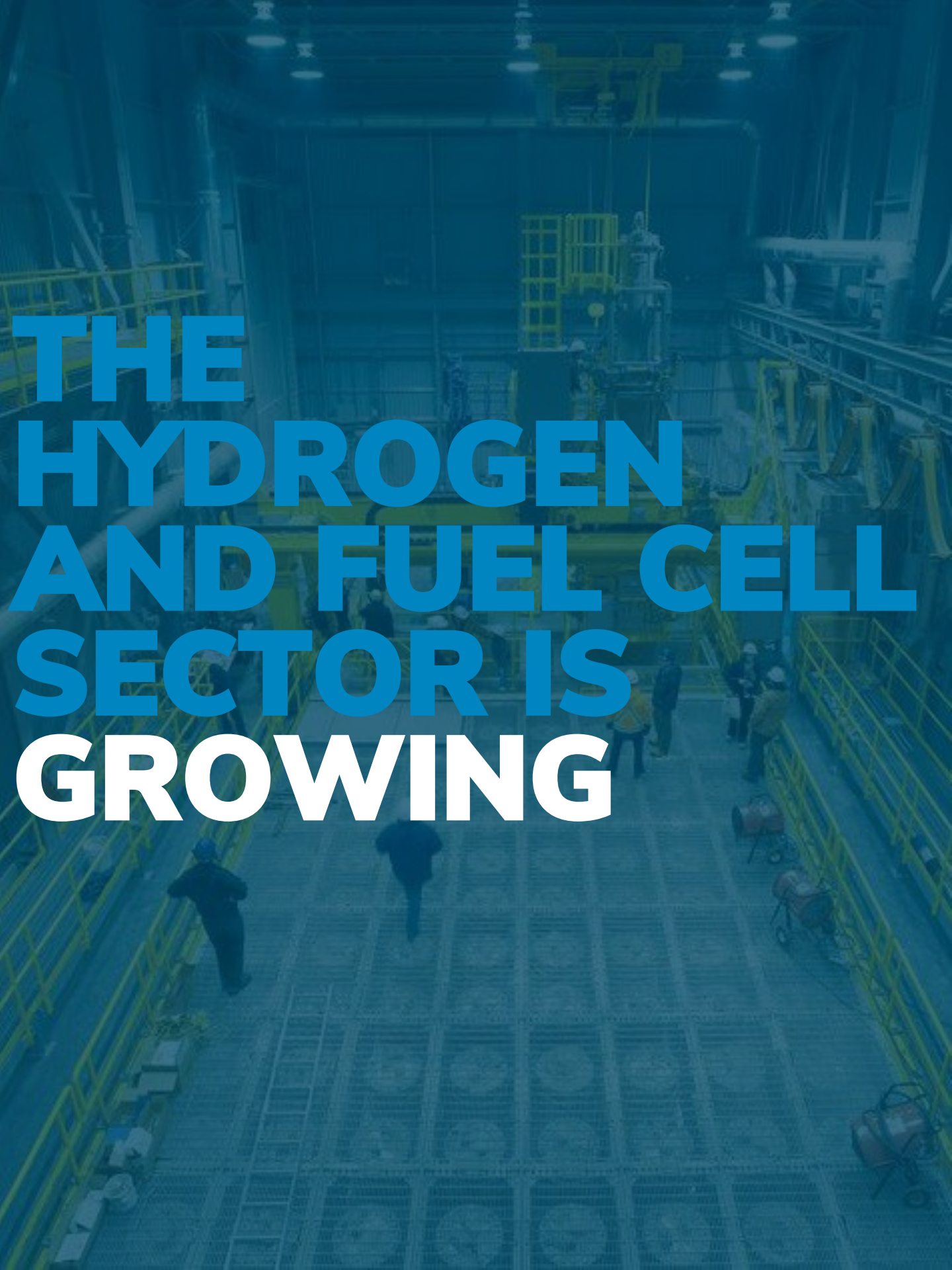
9 THINGS YOU NEED TO KNOW ABOUT CANADA'S HYDROGEN AND FUEL CELL SECTOR

Hydrogen and fuel cells improve the air we breathe, reduce greenhouse gas emissions and provide innovation-based jobs in a sunrise sector.

This important technology works with both fossil fuels and renewable energy sources. It reduces the carbon impact of fossil fuels by turning them into clean, low-impact electricity. It helps intermittent, renewable sources of energy by storing that energy for when it can be used most effectively.

Here are **10 key things** you need to know about Canada's hydrogen and fuel cell sector.



THE HYDROGEN AND FUEL CELL SECTOR IS GROWING

The Canadian hydrogen and fuel cell sector is growing, generating jobs, and attracting investment.

Recent investments and those underway are estimated at over $750 million. In BC, sector jobs increased 38% to 2,177 between 2015 and 2018. With increasing global interest and demand for low-carbon hydrogen energy systems and fuel cell solutions, this level of activity is likely to increase.

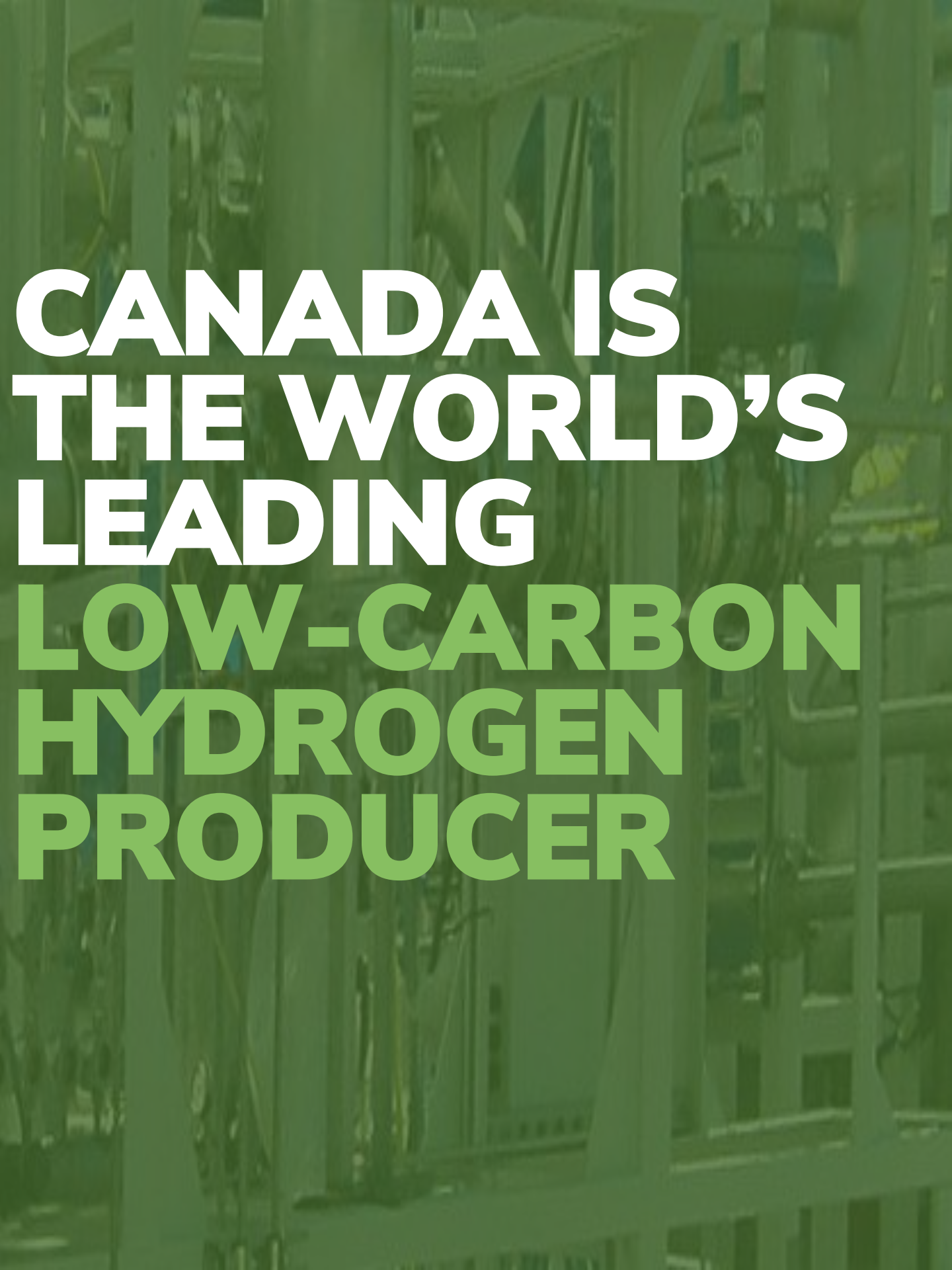
Recent examples include major expansions of low-carbon hydrogen production in Quebec & Alberta, including for export to Europe (as low-carbon methanol) and to the USA (as liquid); substantial foreign investment in leading sector companies; job growth and expansion in sector companies providing products and services for local and export markets; and investment in fueling infrastructure in BC and Quebec.

CANADA HAS LEADING COMPANIES AND TECHNOLOGY

Canada holds a global leadership position in fuel cell technology and hydrogen energy systems. Ballard Power Systems, Hydrogenics and Greenlight Innovation are recognized global leaders, while many other companies offer leading technology and products.

Canadian companies secure 82% of the global market for heavy-duty transportation engines or component parts.

In addition, companies such as HTEC, Powertech Labs and others offer leading hydrogen supply technology solutions.


CANADA IS
THE WORLD'S
LEADING
LOW-CARBON
HYDROGEN
PRODUCER

Blessed with substantial low-carbon intensity power capacity (wind, hydro, nuclear), Canada's production of low-cost electrolytic hydrogen can expand significantly for domestic use and export.

In addition, Canada has ample fossil fuel reserves that can be converted to low-cost, low-carbon hydrogen through reformation and carbon capture and storage, (CCS).

Alberta's Quest CCS project and CO2 Trunk Line are among the leading technologies that will allow Canada to use hydrogen domestically and export our energy reserves as hydrogen, while leaving the carbon in the ground.

GLOBAL DEMAND FOR CANADIAN PRODUCTS IS GROWING

Sector activity in China, Japan, Korea, Europe and California is high and continues to ramp up, while other countries such as Australia and India are becoming increasingly active.

This activity, growth and emergence of new international players have led to Increasing demand for Canadian clean energy products and solutions worldwide, generating opportunities and investments in a broad range of applications.

This includes passenger vehicles, buses, trucks, trains/trams, ships and planes, stationary and back-up power, and material handling.

COMMERCIAL HYDROGEN AND FUEL CELL SOLUTIONS ARE AVAILABLE

The most commercial hydrogen solution is the forklift with over 30,000 deployed globally, followed by more than 12,000 fuel cell cars and 2,500 fuel cell buses and trucks. Vehicles such as the Hyundai NEXO, Toyota Mirai, Honda Clarity, Mercedes GLC/FC and New-Flyer Xcelsior transit buses are commercially available, and sales are ramping up. The products available today offer great performance, high efficiency and reliability.

With the help of Canadian fuel cell products and expertise, OEMs are successfully integrating fuel cell and hydrogen technology into their products and services.

In the near future, commercial heavy-duty trucks, marine vessels, trains, off-road vehicles and even aviation products that offer excellent performance will be available. These products will be built with Canadian expertise and as volumes increase, they will be available at low cost.


HYDROGEN
CAN
DECARBONIZE
CHALLENGING
SECTORS

Electrification and batteries are an essential part of the solution, but they cannot solve the hard-to-abate sectors.

With the help of commercial fuel cell products and low-cost, low-carbon hydrogen, diverse industries can substantially reduce or eliminate GHG emissions and criteria pollutants with greater efficiency and lower cost.

Starting with heavy duty transportation (buses, trucks, trains, marine) and moving into industrial processing (steel, chemical, refining) and even into personal transportation, aviation and home heating, hydrogen can help Canada's manufacturing and resource extraction industries to efficiently transform cities, ports and shipping processes to continue clean growth. Moreover, Canadians will continue to enjoy the lifestyle and choices which they are already accustomed to.

ECONOMIC BENEFITS WILL FLOW TO OTHER SECTORS

Integrating hydrogen energy into the Canadian economy will engage industries from coast to coast. In addition to Canada's leading low-carbon hydrogen and fuel cell and industrial gas companies, other sectors will profit from the transition:

- Oil and gas companies will dedicate their massive resources and talents to transforming our abundant fossil fuel resources into the transportation and heating fuel of the future: low-cost, low-carbon hydrogen. They provide the scale to ramp up the supply of the vast quantities of fuel that will be needed in Canada and abroad.
- Power companies will manufacture and store low-cost hydrogen from low-carbon power, providing grid stability and additional revenue from assets.
- Pipeline companies will move the low-cost hydrogen from production facilities to major industrial users and will ultimately help to heat Canadian homes

CANADA CAN LEAD IN DEMONSTRATION AND DEPLOYMENT

Globally, there is a pressing need for proven commercial fuel cell products and for proven applications of low-carbon hydrogen in heating and processing.

Over the coming decade, dozens of OEMs and manufacturers will need to integrate, demonstrate and deploy hydrogen and fuel cells into their products and services.

While Canada may not be the largest market for these products, we can be the first market. Canada has the right mix of skills, existing assets and experience to effectively manage demonstrations and early commercial deployment.

Due to our technical leadership, Canadian companies have participated in dozens of demonstrations within Canada and globally. With appropriate incentives, we can entice companies to Canada to gain that vital experience, while simultaneously building our expertise, developing exportable technology and reducing carbon emissions.

CANADA CAN LEAD IN THE DEPLOYMENT OF HYDROGEN INFRASTRUCTURE

Deployment and demonstration of hydrogen and fuel cell products and applications must be supported with widely available low-cost, low-carbon hydrogen. Canada has a unique advantage as the largest producer of low-carbon hydrogen, but more must be done to build on this infrastructure. This will involve increasing capacity and making it widely available to support demonstrations and deployment from coast to coast to coast. Specific examples include:

- Expanding low-carbon hydrogen production from both low-carbon power & electrolysis; fossil fuel reformation & CO2 sequestration.
- By expanding the hydrogen distribution network, including liquid trucking; gaseous pipeline; mixed hydrogen & natural gas pipeline; shipment as ammonia, methanol or in liquid organic hydrogen carriers
- Increasing fueling infrastructure for all modes of transportation.
- Ensuring load is available through deployment of hydrogen energy applications

CANADIAN HYDROGEN AND FUEL CELL ASSOCIATION

MEMBER PROFILES

CANADIAN NUCLEAR LABORATORIES

www.cnl.ca

As Canada's premier nuclear science and technology organization, Canadian Nuclear Laboratories (CNL(is a world leader in developing innovative applications from nuclear technology through its expertise in physics, metallurgy, chemistry, biology and engineering and delivers a range of services ranging from research and development, design and engineering to specialized technology, waste management and decommissioning. Under its Clean, Safe Energy program, CNL and collaborators develop, assess and facilitate the commercialization of technologies to allow for increased energy generation, enhanced safety and efficiencies, and reduced dependence on fossil fuels. Included is its hydrogen technologies which utilizes CNL's expertise in heavy water and hydrogen technology, including its patented wet-proofed catalyst technology for applications to electrolysis (electrolytic cells) and fuel cells. It also provides the foundation for the production and application of hydrogen as an energy source.

Capabilities: Research, Hydrogen Production, Fuel Cells Modules and Systems

Market focus: Mobile, stationary

CONTACT INFORMATION

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HYDROGENICS

www.hydrogenics.com

Hydrogenics, a Cummins Inc. company, is a global innovation leader in designing, developing and manufacturing commercial hydrogen generation, energy storage and fuel cell products. With 70 years of experience, Hydrogenics is helping to accelerate a global shift to cleaner energy by delivering technologies for onsite hydrogen generation, fuel cell power modules for transportation including commuter bus and train fleets, stationary fuel cell back-up power and MW-scale power plants, and Power-to-Gas utility scale energy storage to provide grid services and renewable fuel.

Our solutions are based on two main platforms, fuel cells for power and electrolysers for hydrogen generation and energy storage. Our systems have the longest life compared to those in the marketplace, the greatest range of power levels and offer the most varied solutions.

Hydrogenics is based in Mississauga, Ontario, Canada with operations across North America, Europe and Asia.

Capabilities: Energy Storage, Hydrogen Production, Fuel Cells Modules and Systems, Hydrogen Fuelling Infrastructure

Market focus: Mobile, stationary

CONTACT INFORMATION

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NATIONAL RESEARCH COUNCIL CANADA

National Research Council Canada | Conseil national de recherches Canada

www.nrc.canada.ca

The National Research Council of Canada (NRC) is Canada's largest federal research and development organization. The NRC partners with Canadian industry to take research impacts from the lab to the marketplace, where people can experience the benefits. This market-driven focus delivers innovation faster, enhances people's lives and addresses some of the world's most pressing problems.

Within its various R&D programs and activities the advances support Canadian hydrogen and fuel cell leadership by addressing industry-defined technology development, testing and validation priorities. NRC supports industrialization to the cost of Proton Exchange Membrane Fuel Cells through R&D on quality control for components, knowledge development on manufacturing processes and system-level analysis, including hydrogen safety, codes and standards and data analytics.

Capabilities: Research, energy storage, hydrogen fuelling Infrastructure, fuel cell modules, hydrogen production, materials and components

Market focus: Mobile, stationary, portable

CONTACT INFORMATION

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BALLARD POWER SYSTEMS

www.ballard.com

Ballard is a leading global provider of innovative clean energy solutions, delivering fuel cell products and engineering services which have the Power to Change the World®.

Over its 40-year history, Ballard has invested more than $1 billion in research and development to advance fuel cell technology and has produced over 560 megawatts of PEM fuel cell products.

Today Ballard's 700+ employees design, manufacture, and sell fuel cell products that contribute to CO2 emission reductions in various applications ranging from heavy-duty mobility, critical infrastructure, and unmanned aerial vehicles (UAVs). Ballard also enables customers to solve their technical and business challenges and accelerate their fuel cell programs by delivering customized, high value, bundled technology solutions.

Capabilities: Fuel cell development, components, systems integration, services

Market focus: Mobile, stationary, aerospace

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HYDRO-QUÈBEC

www.hydroquebec.com

Hydro-Québec's mission is to provide customers with a high-quality power supply while contributing significantly to Québec's collective wealth. Our hydroelectric facilities play a central role in the emergence of a low-carbon economy. As recognized leaders in hydropower and large transmission systems, we export clean, renewable power and commercialize our expertise and innovations on world markets. We operate some 60 hydroelectric generating station, making us one of the largest hydroelectricity producers in the world. Close to 100% of our electricity is generated using water, Québec hydropower is a generating option with very low greenhouse gas (GHG) emissions and no toxic waste. This clean energy is delivered to customers across Québec and our export markets. Hydro-Québec's transmission system is the most extensive in North America. We harness our know-how and expertise to optimize for today and build for tomorrow. We also fine-tune technological innovations that set the benchmark for electricity providers worldwide: safe battery materials, energy storage systems, electrical powertrain systems, network maintenance robots and more.

Capabilities: Hydrogen production

Market focus: Mobile, stationary

CONTACT INFORMATION

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POWERTECH LABS

www.powertechlabs.com

Powertech Labs is recognized worldwide as the leading authority for the testing and certification of high-pressure hydrogen fuel storage components and systems. A wholly owned subsidiary of BC Hydro, Powertech Labs is made up of 200 scientists, technicians, engineers and specialists who are pioneers in the development of high-pressure hydrogen technology for both vehicles and refueling infrastructure.

Since 2001, Powertech has designed and constructed 12 turnkey, compressed hydrogen fueling stations which are installed across North America. Powertech offers a one-stop-shop approach for businesses that require technical engineering expertise, standards and code testing, as well as quality testing and failure analysis services. We provide specialized testing and investigation services to support electrical utilities' capital assets: generation, transmission and distribution, OEMs, automotive manufacturers, government and research organizations.

Capabilities: Hydrogen fuelling infrastructure, energy storage, hydrogen production, engineering

Market focus: Mobile, stationary

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TOYOTA CANADA

www.toyota.ca

Toyota Canada Inc. has been building its presence and activity in Canada for over 50 years. It is the exclusive Canadian distributor of Toyota and Lexus vehicles. Toyota has sold over eight million vehicles in Canada through a national network of 287 Toyota and Lexus dealerships. Toyota is dedicated to bringing safety, quality, dependability and reliability to the vehicles Canadians drive and the service they receive.

Toyota is developing environmental technologies including energy-saving technologies with the aim of improving fuel efficiency and reducing emissions, and responding to the diversification of fuels in order to promote the use of alternative fuels. Toyota has also long maintained that hydrogen fuel cell technology could be a zero-emission solution across a broad spectrum of vehicle types. The Mirai hydrogen fuel cell electric vehicle, first introduced in Japan in 2014, began sales in Canada in 2019.

Capabilities: Vehicle manufacturing

Market focus: Mobile, stationary, portable

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AIR LIQUIDE

www.airliquide.ca

Created in 1911, Air Liquide Canada is present in all of the country's key industrial regions from coast to coast.

Air Liquide offers innovative solutions – gas, equipment and services – in a wide variety of sectors, from oil and gas, mining, healthcare, automotive, aeronautics, to chemical and agri-food industries.

Air Liquide is also actively involved in the Energy transition with the supply of hydrogen and related solutions. Air Liquide Canada is the number one Canadian producer and distributor of gases derived from air.

Air Liquide is working on developing innovative technologies and solutions for reducing carbon emissions during the hydrogen production process. Although hydrogen is mainly used today for industrial purposes in chemistry and refinery, it is increasingly used in other sectors, such as clean transportation.

Capabilities: Hydrogen production, engineering

Market focus: Mobile, stationary, portable

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GHD LIMITED

www.ghd.com

GHD provides comprehensive, tailored consulting and engineering services for alternative and renewable energy projects that range from site investigations and facility siting, environmental assessments (EA's), feasibility and economic assessments, detailed engineering design, construction management, and plant commissioning into turnkey design-build-operate projects. We have a broad customer base that has seen GHD at the forefront of development of wind, natural gas, renewable natural gas (RNG), and hydrogen.

GHD is involved in some of the largest hydrogen projects around the world. Our global project experience covers electrolyzers, steam reformation, power-to-gas and power-to-ammonia, development of hydrogen supply chains, and hydrogen mobility.

GHD is currently involved in research and development projects that generate hydrogen from organic waste and landfill gas as well as brown, blue, and green hydrogen technologies. We are involved in industrial hydrogen and fertilizer production, hydrogen land and water transport modes and renewable energy operation.

Capabilities: Engineering

Market focus: Mobile, stationary

CONTACT INFORMATION

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GREENLIGHT INNOVATION

www.greenlightinnovation.com

Greenlight Innovation is a global supplier of the world's most sophisticated electro-chemical testing and assembly equipment for fuel cells, electrolysers and batteries.

For over 25 years, Greenlight Innovation's equipment has set the industry standard for quality and reliability. With a range of power up to 500kW, Greenlight solutions have been used by the leading automotive companies, fuel cell and battery pack developers, systems integrators and research organizations.

The company provide sales and service throughout North America, Asia and Europe.

Capabilities: Testing and manufacturing equipment

Market focus: Mobile, stationary, portable

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HYDROGEN OPTIMIZED

www.h-optimized.com

Hydrogen Optimized is a Canadian Hydrogen Technology company. We develop and complete green hydrogen production projects for our clients and partners using our innovative hydrogen Technologies. Our vision is that by 2030, the adoption of clean hydrogen processes for energy and industrial purposes will have improved the quality of life for all individuals worldwide.

Our pedigree dates to 1905, when Alexander T. Stuart, Canada's hydrogen pioneer, concluded that hydrogen and oxygen were the key building blocks to a sustainable clean and diverse energy and industrial world. His Son Alexander K. (Sandy) Stuart expanded upon his father's work on a global basis. Hydrogen Optimized was founded in 2017 by Andrew T.B. Stuart, grandson of Alexander T. Stuart. Over 1000 hydrogen project utilizing Stuart hydrogen production technology, in over 100 countries, have been undertaken by Stuart's or companies that had Stuart's at their leadership at the time.

With the world's premier hydrogen heritage, we develop, design, and build large scale green hydrogen systems.

Capabilities: Hydrogen production, engineering

Market focus: Mobile, stationary

CONTACT INFORMATION

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HYUNDAI AUTO CANADA

www.hyundaicanada.com

Hyundai Auto Canada, established in 1983 and headquartered in Markham, Ontario, is a subsidiary of Hyundai Motor Company of Korea. Hyundai vehicles are distributed throughout Canada by Hyundai Auto Canada and are sold and serviced through more than 210 dealerships nationwide. As the first automaker in Canada to offer its zero-emissions fuel cell electric vehicle in 2015, four years later Hyundai Auto Canada announced the national launch of its second-generation fuel cell vehicle, the NEXO, Canada's only fuel cell-powered SUV and the first vehicle of its kind to be made easily accessible to consumers.

In Vancouver, Hyundai has collaborated with car-share company Modo, providing Vancouverites with unparalleled access to fuel cell vehicles, allowing more drivers and riders to learn about and experience this technology firsthand. Hyundai began its fuel cell research and development in the 1990s with the aim of protecting the global environment and leading the industry with environmental technology.

Capabilities: Vehicle manufacturing, services

Market focus: Mobile

CONTACT INFORMATION

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INTERTEK

www.intertek.com/canada

Intertek is a trusted provider of quality and safety services for many of the world's leading brands and companies.

Today, Intertek has more than 600 people working in 25 laboratories and offices across Canada, providing expert technical services to a wide range of industries and markets.

Intertek has developed certification and classification protocols to provide clear safety solutions for alternative fuel components and systems for natural gas, hydrogen gas, and fuel cells. We assist clients in reducing risk and optimizing productivity by working with top-tier alternative fuel industry innovators, partnering with authorities having jurisdiction (AHJs), and being involved in the development of codes and standards.

Partnering with Intertek helps ensure compliance with the latest regulatory standards and puts clients at the forefront of the alternative fuel industry.

Capabilities: Testing, certification and safety

Market focus: Mobile, stationary, portable

CONTACT INFORMATION

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ITM POWER

www.itm-power.com

ITM Power specializes in the manufacture of integrated hydrogen energy solutions for grid balancing, energy storage and the production of green hydrogen for transport, renewable heat and chemicals. Founded in June 2001, the company is based in Sheffield, UK with additional offices in Australia, Germany, France, the USA and Canada.

In 2015, the company signed a siting agreement with Shell for hydrogen refuelling stations which was expanded in 2019 to include buses, trucks, trains and ships, and subsequently to deploy a 10MW electrolyser at Shell's Rhineland refinery.

The Company also signed a strategic partnership agreement with Sumitomo Corporation in 2018 for the development of multi-megawatt projects in Japan. Additional customers and partners include Ørsted, National Grid, Cadent, Northern Gas Networks, Gasunie, RWE, Engie, BOC Linde, Toyota, Honda, Hyundai, and Anglo American, among others.

Capabilities: Hydrogen fuelling infrastructure, energy storage, hydrogen production

Market focus: Mobile, stationary, portable

CONTACT INFORMATION

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MERCEDES-BENZ CANADA

www.mercedes-benz.ca

Located in Burnaby, British Columbia, the Mercedes-Benz Canada Fuel Cell Division (MBFC) opened in 2012 and has subsequently played an instrumental role in the global commercialization of fuel cell technology.

Since its inception, MBFC has been manufacturing Fuel Cell Stacks samples (prototypes) and was the first automated automotive facility dedicated to the production of fuel stacks and sub-assemblies, as well as to the advancement of fuel stack production technology.

Within MBFC, the Common Fuel Cell Program (CFCP) is focused on further refining its manufacturing processes with the goal of reducing production costs. It is also playing a key role in the implementation of the next Fuel Cell Car Series by Daimler.

Capabilities: Vehicle manufacturing

Market focus: Mobile

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UNILIA FUEL CELLS CANADA

www.overdrivefce.ca

Unilia (Canada) Fuel Cells Inc. is a Vancouver-based international hydrogen fuel cell stack engineering and manufacturing company at the forefront of the vehicle electrification movement.

The company's core competencies in electrochemical engineering, stack design, and at-scale production are led by a team of domain experts all of whom are industry veterans.

With R&D and production facilities also in China, Unilia was built from the ground to offer unparalleled competitive advantage through technological edge, manufacturing prowess, and, importantly, market access.

The result is a synergy of East and West embodying the agility and passion of a start-up with the resources and capabilities of a seasoned industry contributor.

Capabilities: Engineering, Fuel Cells Modules and Systems

Market focus: Mobile, stationary

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SACRÈ-DAVEY ENGINEERING

www.sacre-davey.com

Sacré-Davey is an engineering, technology, and systems integration firm offering a range of operations engineering support services, project development, management and delivery, as well as complete system design and construction supervision, and delivery of turnkey systems.

With offices in North Vancouver, Calgary, Toronto, Seattle, Portland and the United Kingdom, and a staff in excess of 150 people, we have developed and integrated technologies that add value for clients for over 30 years using the latest modular design techniques, codes and standards, 3D CAD and Stress Analysis software.

The company's hydrogen systems and solutions are compact, flexible, and cost effective and include purification systems, compression & processing systems, reforming and electrolysis systems, high pressure storage & fueling systems, fuel cell and ICE integration, as well as combined heat and power systems.

Capabilities: Engineering, energy storage, hydrogen fuelling infrastructure

Market focus: Mobile, stationary

CONTACT INFORMATION

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BLUE-O TECHNOLOGY

www.blue-otechnology.com

Blue-O Technology Inc. is a fuel cell components company located in Burnaby, British Columbia that has a worldwide patent on a plate-shaped catalyst for PEM applications. Blue-O Technology Inc. incorporates its patented plate-shaped catalyst to produce a high-power density MEA. Blue-O Technology Inc. is in the pilot production stage optimizing its MEA and catalyst products. Blue-O is exploring the performance and durability of different platinum-group metals (PMG) with its chemical process. Blue-O offers a reduction in the precious metal content of the catalyst by 30-50%. The industry convention for fuel cell catalyst is a spherical shaped catalyst that is composed of carbon and platinum however platinum particles become deposited beneath the surface of the sphere and consequently, do not interact with hydrogen. This results in a significant amount of platinum that goes unutilized. This technological advantage will offer any customer enormous savings at both low and high-scale production. Blue-O Technology Inc. is currently looking to partner and/or collaborate with stack companies, bi-polar plates manufacturers, and membrane companies for further optimization and to begin production.

Capabilities: Materials and components, fuel cells modules and systems

Market focus: Mobile, stationary

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DPOINT HUMIDIFIERS

www.dpoint.ca

In 2005, dPoint Technologies began its journey into the world of heat and humidity exchangers when its Founder and CEO, James Dean, saw an opportunity to license a superior membrane humidifier technology from leading fuel cell manufacturer, Ballard Power Systems. After a comprehensive market and technology assessment, dPoint expanded its vision and product line to develop and apply this unique technology to manufacture Energy Recovery Ventilator (ERV) Cores for the HVAC industry.

Today, dPoint is a recognized global leader in R&D and manufacturing of membranes and heat and humidity exchangers for energy recovery in buildings. The company has an innovative team of material scientists, mechanical engineers and manufacturing experts who come from respected high-tech firms. Together they develop and supply the world with superior membrane materials and energy recovery products to improve lives and conserve energy.

Capabilities: Fuel Cells Modules and Systems

Market focus: Stationary, portable

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DANA HOLDING CORPORATION

www.global.dana.com

Dana Holding Corporation is a multi- national automotive parts manufacturer of components for tomorrow's power sources, including hydrogen fuel-cell engines.

Drawing on its global production facilities and Technology Centers, Dana engineers and manufactures product solutions to meet the exacting requirements of OEM customers, including fuel-cell stack bipolar plates, and balance of plant and hydrogen reformer components.

Dana supports fuel cell component development at four global technical centres including Canada's Oakville Development Centre and other centres located in Germany, Japan and the US

Capabilities: Fuel cells modules and systems, vehicle manufacturing

Market focus: Mobile, stationary, portable

CONTACT INFORMATION

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EMCARA GAS DEVELOPMENT

www.emcara.com

Established in 2010, Emcara Gas Development Inc. is in the business of safety technology for alternative fuel systems. Emcara specializes in the only long trigger thermally activated pressure relief devices available on the market today, as well as related products for compressed natural gas, hydrogen fuelling systems, and bulk haul systems. Emcara's products enhance safety, performance, reliability and system flexibility.

In addition to safety products, Emcara provides consulting engineering services for systems and component design, predictive calculations, physical testing, and systems trouble-shooting. Industries served include heavy vehicle, on-road haul transport, rail, and ground storage.

Emcara continually has a robust pipeline of new products in development that will assist in the growth and development of the alternative fuel industry. While Emcara continues to develop solutions that increase safety and performance, Emcara is paving the way in the future of alternative fuel systems.

Capabilities: Fuel cells modules and systems, engineering, testing

Market focus: Mobile, stationary

CONTACT INFORMATION

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HTEC – HYDROGEN TECHNOLOGY AND ENERGY CORPORATION

www.htec.ca

HTEC is a leading developer and provider of hydrogen supply solutions. Under its Hydrogen Infrastructure platform, HTEC builds, owns, and operates hydrogen production facilities, distribution systems and fueling stations. In British Columbia, HTEC opened Canada's first retail hydrogen station in 2019 and is building a central electrolysis production facility. This infrastructure, along with the company's PowerCube hydrogen distribution operations, will enable the deployment of more than 1,000 FCEVs in British Columbia, Canada. Under its Hydrogen Technology Solutions banner, the company provides deep industry experience and technologies to provide customized hydrogen production, processing, distribution and vehicle fueling solutions for its infrastructure platform and other clients. The company's technical services include design and development services; equipment for hydrogen purification compression and processing; safety training; risk analysis; and market development support.

Capabilities: Hydrogen fuelling infrastructure, energy storage, hydrogen production

Market focus: Mobile, stationary

CONTACT INFORMATION

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HYDROGEN IN MOTION (H2M)

www.hydrogeninmotion.com

Hydrogen In Motion (H2M) develops and manufactures mobile, uncompressed hydrogen storage tanks and delivers off-board refueling solutions to owners of hydrogen fuel cell vehicles.

The company's hydrogen energy solutions offer both economic and environmental impacts, while providing an infinite source of constant energy with no emissions, low cost commitment and versatility with compact storage.

H2M's hydrogen fuel technology is unsurpassed in cost, safety, convenience and portability.

The company's current product offerings include hydrogen storage, H2U – hydrogen delivery, hydrogen generation and capital financing.

Capabilities: Energy storage

Market focus: Mobile, stationary, portable

CONTACT INFORMATION

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INNOVATIVE HYDROGEN SOLUTIONS

www.innovativehydrogen.com

Innovative Hydrogen Solutions Inc. (IHS) was formed in 2004 to develop and commercialize breakthrough hydrogen-based technologies. The company has developed a patent-pending aftermarket product for combustion engines, which has been initially marketed to the long-haul diesel engine truck market. This product increases fuel efficiency of diesel engines by at least 5% (30%+ fuel efficiency was proven in a third party independent testing on long haul applications), thereby offering very attractive ROI and payback while significantly reducing exhaust pollution. The product, known as the Innovative-Partial Hydrogen Injection System (i-Phi) also produces noticeable increases in horsepower and torque. The technology has the added benefit of producing significant reductions in emissions, with an almost 90% reduction in Particulate Matter (PM) which prolongs engine life and decreases maintenance intervals and GHG emissions. In addition, the i-Phi technology has undergone a GreenPrint Assessment confirming compliance to the GHG Emission Reduction protocols (for both Regulated and Voluntary markets) meaning GHG reductions can be quantified and verified for credit/offset generation.

Capabilities: Engineering, vehicle manufacturing

Market focus: Mobile

CONTACT INFORMATION

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IRDI SYSTEM

www.irdisystem.com

IRDI System Inc. was founded in August of 2010 to manufacture infrared communication equipment in hydrogen enriched environment. Since then, the company has remained focus in this area but has expanded its product lines to better serve the fuel cell industry.

Our equipment serves the fuel cell industry and meets the gas filling requirement per the Society of Automobile Engineering SAE J2799/J2601standard.

IRDI System Inc. has key personnel in the areas of electrical, software and mechanical engineering. In addition, IRDI System Inc. possesses certification expertise regarding many regions of the world including North America, Europe Japan and Korea.

We are deeply committed to providing our customers with quality products. In 2011, we established a separate Quality Assurance department to maintain and further these high standards.

Capabilities: Materials and Components

Market focus: Mobile, stationary

CONTACT INFORMATION

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LOOP ENERGY

www.loopenergy.com

Loop Energy is a rapidly growing developer, manufacturer and supplier of hydrogen fuel cell solutions that deliver commercial impact.

Based in Burnaby, British Columbia – the cradle of fuel cell innovation – Loop provides enviable zero-emission products for leading vehicle manufacturers who want to thrive in a zero-emission economy.

Through our comprehensive product development and manufacturing, partners and customers gain better performance, lower operating costs, and reduced environmental impact.

Loop Energy is working with globally recognized vehicle manufacturers to design and deliver carbon-free motive solutions using both electric and hydrogen fuel cell technologies that deliver superior performance to conventional diesel engines at a competitive cost of ownership, without subsidies.

Capabilities: Fuel cells modules and systems

Market focus: Mobile, stationary

CONTACT INFORMATION

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NEXT HYDROGEN CORPORATION

www.nexthydrogen.com

Next Hydrogen's innovative water electrolysis technology is designed to integrate intermittent renewable electric power sources and clean hydrogen production on an infrastructure scale.

Next Hydrogen's patented cell architecture, which enables modules up to 2.8 MW; gives operational flexibility rivalling PEM electrolysers while delivering the lifecycle economics of market proven alkaline systems.

Because it can run at a higher current density than conventional electrolysers, its operating range is larger, and because gas-liquid separators and gas coolers are built inside the module, multi-MW hydrogen generation plants can be pre-assembled in shipping containers, reducing plant erection costs.

Capabilities: Hydrogen production

Market focus: Mobile, stationary

CONTACT INFORMATION

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NORAM ENGINEERING AND CONSTRUCTORS

www.noram-eng.com

The NORAM Group is a vertically integrated portfolio of businesses developing, engineering, and commercializing technologies for the process and resource industries. Since 1988, the company has built a global reputation for innovation and excellence in the supply of proprietary engineering and equipment packages to the chemical, pulp and paper, minerals processing, wastewater and electrochemical sectors, with capital projects in operation on five continents. Recognized as a leader in the fields of nitration, sulfuric acid and electrochemistry, in addition to carrying out large assignments for major multi-national clients and municipalities, NORAM also works with early-stage technology companies providing R&D and engineering expertise throughout the design and fabrication of pilot scale to full commercial industrial demonstration plants. NORAM supplies proprietary engineering and equipment packages worldwide through its Vancouver office and local fabrication subsidiary. NORAM Engineering and Constructors is also BC Research's parent company.

Capabilities: Engineering, hydrogen production

Market focus: Stationary

CONTACT INFORMATION

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PROTON TECHNOLOGIES

www.proton.energy

Proton Technologies helps oil producers make low-cost, high profit, zero emissions hydrogen from existing oil fields.

The company has developed a two-step, patented process to produce the lowest-cost pure hydrogen from existing oil reservoirs with absolutely no emissions. The process combines two proven technologies, In-Situ gasification industry and hydrogen selectivity techniques to produce hydrogen in mature oil fields.

Proton's mission is to transform the deep earth into a continuing source of green energy and help usher in a new era for cities and industry worldwide.

The idea for Calgary-based Proton Technologies began as a conversation between leading academic researchers at the University of Calgary and a young Canadian oil and gas company seeking to redefine the energy sector through the application of game-changing technologies.

Capabilities: Hydrogen production

Market focus: Stationary

CONTACT INFORMATION

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QUADROGEN POWER SYSTEMS

www.quadrogen.com

Quadrogen is a Canadian clean technology company that builds customized biogas clean-up systems that allow waste-water treatment plants, landfills, agricultural digesters and power generation facilities to turn waste biogas into clean energy.

The company also helps oil and gas producers convert shale and associated gas into hydrogen and natural gas, while offering world-class engineering & design services for feasibility studies, custom manufacturing, and development programs.

The company's unique C3P process cleans biogas and other gases and makes them usable as heat/electricity, biomethane, CO2 for greenhouses/hydroponics, and/or hydrogen. Quadrogen has active stations running in North America and is poised to launch the world's first quad-generation project.

Capabilities: Hydrogen production, engineering

Market focus: Stationary

CONTACT INFORMATION

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SBI BIOENERGY INC.

www.sbibioenergy.com

SBI BioEnergy (SBI) is an Alberta-based company incorporated in 2007 to produce unique environmentally friendly drop-In renewable fuels using a continuous catalytic process that converts fat, oil, or grease. The company has recently proven the efficacy of producing renewable diesel, gasoline, and jet fuel.

SBI's fuels are called Drop-In as they are chemically indistinguishable from and perform similarly to petroleum fuels. Unlike biodiesel, SBI's renewable fuels do not require blending with petroleum fuels and do not require any modifications to engines or infrastructure. In addition to renewable fuels, SBI can also produce high quality colourless biodiesel as an intermediate product as well as pure glycerin co-product.

SBI has lower capital and operating costs than its competitors since it does not need to purchase hydrogen, incorporate expensive hydrogen safety features, consume water or chemicals, or build a large physical plant. Furthermore, SBI will produce pure glycerin that can be sold to food, pharmaceutical, and personal care industries. SBI expects that the sales of pure glycerin will offset much of the cost to produce its fuels.

Capabilities: Hydrogen production

Market focus: Mobile, stationary

CONTACT INFORMATION

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TANDEM TECHNOLOGIES LIMITED

www.tandemtech.ca

Tandem Technologies has been providing high quality fuel cell hardware for the past fifteen years to research institutes, educational facilities and commercial R&D, and is dedicated to the continued development of hydrogen fuel cells and their applications.

With a focus on research tools, Tandem provides hardware, test equipment and services are designed to accelerate development programs and increase productivity. In addition to its in-house machining and molding capabilities, Tandem also provides custom hardware, custom gaskets, graphite flow-field plates and MEA's.

The TP series cells are designed primarily for researchers who are providing their own membrane electrode assemblies (MEAs) but they can also be provided with MEAs.

Capabilities: Components and materials, fuel cell modules and systems, testing and manufacturing equipment

Market focus: Mobile, stationary

CONTACT INFORMATION

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TERRELLA ENERGY SYSTEMS

Terrella Energy Systems is a developer of lightweight, corrosion resistant, and thermally efficient graphite structures for use in fuel cells, thermal products, and a variety of eco-friendly heat generating energy systems.

Terrella's forming methods for graphite allows unique shapes and features while taking full advantage of graphite's superior properties that can out-perform metals with properties such as conductivity and corrosion resistance.

Terrella offers innovative solutions through their graphite structures that can meet current thermal challenges. Their forming process goes beyond simple graphite sheets, or "heat spreaders", and extends into three dimensional graphite structures that offer increased conductivity, more efficient performance, lighter weight, and corrosion resistant properties, when compared to today's metals such as titanium, stainless steel, aluminum, or copper.

Capabilities: Components and materials

Market focus: Mobile, stationary

CONTACT INFORMATION

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TESTNET CANADA INC.

www.h2-test.net/en/

TesTneT Canada Inc. is a subsidiary of TesTneT Engineering GmbH of Munich, Germany, one of the largest high-pressure testing labs in the world. TesTneT is an ISO 17025: 2017 registered organization, performing the high-pressure testing of components used in hydrogen fuel systems.

TesTneT can conduct various tests involving hydrogen gas pressure cycling, hydraulic pressure cycling, and destructive tests (fire testing, gunfire penetration) on all elements of hydrogen fuel systems, including fuel containers, pressure regulators, valves, fittings, hoses, etc.

With TesTneT Engineering's state of the art extreme climate chambers, gas storage tanks and systems can be simultaneously exposed to multiple stress factors including pressure cycles, extreme temperature and corrosion.

Capabilities: Testing, certification and safety

Market focus: Mobile, stationary

CONTACT INFORMATION

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TUGLIQ ENERGY

www.tugliq.com

TUGLIQ Energy Co. is a Canadian specialist Independent Power Producer (IPP) focused on remote and complex energy diversification. TUGLIQ is committing resources and know-how to enable reliable, cost-effective, innovative, predictable industrial-scale renewable energy, tailored specifically to mining operations, islanded and remote communities.

TUGLIQ financed, designed, deployed, commissioned, owns and operates Canada's flagship mining Renewable Energy deployment, involving 6MW of Wind coupled to three-tiered energy storage of 3.2MW of Li-Ion batteries, 200kW of flywheels, and 200kW of Renewable Hydrogen loop. Since 2014, the award-winning Project has abated more than 12 million liters of diesel at the Glencore RAGLAN Mine, achieving 97.2% availability. The Wind farm was commissioned on time and on budget, a proud and significant achievement for the Arctic.

Capabilities: Energy storage

Market focus: Stationary

CONTACT INFORMATION

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XEBEC ADSORPTION

www.xebecinc.com

Xebec provides gas purification, generation and filtration solutions for the natural gas, field gas, biogas/renewable natural gas, helium, hydrogen markets. The company designs, engineers and manufactures innovative products that transform raw gases into marketable sources of clean energy.

Xebec's H2X Solutions efficiently upgrades hydrogen-containing reformate, petrochemical process gas streams and refinery off-gas streams to pure and ultra-pure hydrogen. Xebec provides the most compact, economical and reliable PSA systems available today.

Headquartered in Blainville Quebec, Xebec operates two manufacturing facilities – in Blainville and in Shanghai, China, and maintains a sales and distribution presence throughout North America, Europe and Asia.

Capabilities: Hydrogen production

Market focus: Mobile, stationary

CONTACT INFORMATION

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AVL FUEL CELL CANADA

www.avl.com

AVL is the world's largest independent company for the development, simulation and testing of powertrain systems (hybrid, combustion engine, transmission, electric drive, batteries, fuel cell and control technology). AVL employs more than 8,600 staff worldwide.

In 2018, AVL opened a research development facility in Vancouver, Canada to extend the company's leadership in delivering next-generation battery and fuel cell powertrain engineering solutions and to complement its work in Graz, Austria.

AVL Fuel Cell Canada Inc. performs cutting edge fuel cell research and development for automotive applications. The company's core competencies center around fuel cell modelling and simulation, MEA development, unit cell and stack design, stack system interface development, control system design and implementation, design verification and life cycle testing, and failure analysis

Capabilities: Testing and manufacturing equipment, engineering, systems integration

Market focus: Mobile

CONTACT INFORMATION

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DIMATEC INC.

www.dimatec.com

Dimatec is a registered ISO-9000 manufacturer of innovative, high-quality metal bond diamond products, drilling equipment components, and precision machined parts for the mineral exploration, mining, geotechnical and energy sectors.

Dimatec is also actively investigating applications for its expertise with metal, metal powders and metal hydrides for the hydrogen storage sector.

Since the company's formation in 1988, Dimatec has strived to develop new and innovative products to meet the changing needs of the drilling industry.

Capabilities: Materials and components

Market focus: Mobile, stationary

CONTACT INFORMATION

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EKONA POWER

https://www.ekonapower.com

Ekona Power is creating a new solution to producing industrial scale hydrogen that is both low-cost and clean by converting natural gas into hydrogen, clean power, and pure CO2 that can be easily stored or used.

Ekona Power's solution will assist industrial hydrogen consumers including refineries, ammonia plants or chemical plants who are seeking new solutions that can deliver large-scale, green hydrogen at costs on par or better than incumbents.

In addition, Ekona's solution will also assist gas transmission & distribution companies that seek to decarbonize their natural gas (NG) pipeline networks by injecting low-cost green hydrogen, at costs similar to pipeline natural gas, to reduce downstream greenhouse gas (GHG) emissions.

Capabilities: Hydrogen production

Market focus: Mobile, stationary

CONTACT INFORMATION

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GEMA SCIENCES CORP.

GEMA Sciences is a research-based start-up who has made a major break-through in the development of on-demand hydrogen technology that can effectively produce pure hydrogen using simple input components available in industrial quantities around the world.

After 6 years of research & development testing and $2.5 million in R & D, the cost for the same membrane was reduced to approximately $28USD per 4" x 6" membrane. The discovery, which GEMA refers to as the Laurisa-Adrianne effect, uses no electricity or heat, but is exothermic and is defined as a "Chemical Galvanic Charged Effect" that increases efficiency by a factor of 2195% over standard chemical conversion of the same anode alloy. The yet undefined physical and chemical anomaly produces free hydrogen.

GEMA is now in the process of commercializing the discovery along with raising funds to assimilate the discovery into a demonstration project to realize it's potential.

Capabilities: Fuel cells modules and systems, hydrogen production, materials and components

Market focus: Mobile, stationary

CONTACT INFORMATION

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HY2GEN CANADA

www.hy2gen.ca

Founded in 2018 in Montreal, Canada Hy2Gen Canada is 100% owned by Hy2gen AG, Germany. Its business purpose is developing and operating companies (>650 MW) producing green hydrogen and hydrogen-based feedstock such as oxygen, bio-methanol and bio-methane. Green hydrogen is produced by Hy2gen AG by means of Alkaline electrolysis or polymer electrolyte membrane (PEM).

Hy2gen Canada Inc. aims to play the leading role in the newly established North American market of green hydrogen. During the first phase of production, Hy2gen Canada will gradually increase its capacity of green hydrogen and reach 1,500 tons per month at its maturity.

Hy2gen Canada has developed a customer network which guarantees a significant purchasing capacity, in addition to additional new demands for its product. In response to the demand, Hy2gen Canada will develop additional projects in several regions to ensure an effective geographical distribution.

Capabilities: Hydrogen production

Market focus: Mobile, stationary

CONTACT INFORMATION

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HYDRA ENERGY CORPORATION

www.hydraenergy.com

Hydra Energy Corporation (Hydra) was founded in BC in 2012, with a vision of a clean energy future and accelerating the shift to clean combustion in transportation.

Hydra pairs unprecedented innovation in hydrogen engine technology with the supply of low carbon intensity hydrogen recovered from waste to achieve improved environmental and economic outcomes.

Hydra's "Hydrogen as a Service" business model removes barriers for hydrogen adoption in transportation by retrofitting existing vehicle fleets at no cost to the fleet operator in exchange for a long-term exclusive hydrogen supply agreement, benefitting fleets with lower operating costs and reduced emissions.

Capabilities: Engineering, systems integration

Market focus: Mobile

CONTACT INFORMATION

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ILLUMING POWER INC.

www.illumingpower.com

Illuming Power is a Vancouver-based engineering firm specializing in hydrogen fuel cell, stack and BOP design, prototyping and scale up.

The firm provides design, equipment supply, procurement and services for its strategic partners.

Illuming Power have assembled a highly experienced team of fuel cell engineers and scientists with expertise in fuel cell stack development as well as component design and prototyping.

Illuming's mission is to provide technologies that provide step change improvements in performance and manufactured cost to clients.

Capabilities: Fuel cell modules and systems, materials and components

Market focus: Mobile, stationary

CONTACT INFORMATION

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IONOMR INNOVATIONS

www.ionomr.com

Ionomr designs and manufactures ion exchange membranes and coatings for energy storage, and clean energy generation applications including fuel cells, batteries, and electrolysis for hydrogen production.

The company's core technology is the most alkaline-stable and versatile anion-exchange membrane on the market providing both cost and performance advantages.

Ionomr is in the late stages of development of highly conductive, recyclable and environmentally benign, cation-exchange membranes for use in fuel cells, electrolyzers and other electrochemical technologies.

Ionomr also offers cost-effective membranes for water treatment and purification, grid energy storage using advanced battery designs, synthetic fuel production, and chemical recovery and generation from waste streams.

Capabilities: Materials and components, fuel cell modules and systems, hydrogen production

Market focus: Mobile, stationary

CONTACT INFORMATION

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NU:IONIC TECHNOLOGIES

www.nuionic.com

Nu:ionic Technologies converts renewable biogas or natural gas and electricity into high purity hydrogen for use as zero emission fuel or industrial gas at high efficiency, resulting in the lowest cost hydrogen fuel.

The Nu:ionic on-site hydrogen generation unit utilizes innovative microwave technology resulting in higher efficiency and lower cost than delivered hydrogen or competing on-site production technologies, and eliminates the emissions associated with liquefaction, distribution and storage of hydrogen.

The company is applying its microwave gas conversion technology in a variety of areas, including hydrogen by-product production from refinery waste streams and renewable energy storage.

Capabilities: Hydrogen production

Market focus: Mobile, stationary

CONTACT INFORMATION

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PLANETARY HYDROGEN

www.planetaryhydrogen.com

Planetary Hydrogen's novel electrochemical cells empower energy companies to profitably fight climate change by creating hydrogen while taking CO2 out of the air.

The patented Planetary Hydrogen technology uses renewable electricity to produce hydrogen via conventional electrolysis of water. By adding ground alkaline rock, the electrolysis cell also creates an atmosphere-scrubbing compound called mineral hydroxide. That hydroxide actively binds with carbon dioxide, producing an "ocean antacid" very similar to baking soda.

The net effect is the direct air capture and storage of CO2 while producing valuable pure hydrogen. The system can consume as much as 40kg of CO2 and permanently stores it for every 1kg of hydrogen it produces, accelerating "The Earth's Natural Thermostat" which is the geological process that removes excess CO2 from the atmosphere via rock weathering that is otherwise very slow and inefficient.

Capabilities: Hydrogen production

Market focus: Mobile, stationary

CONTACT INFORMATION

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RENEWABLE HYDROGEN CANADA CORPORATION

www.renewableh2canada.ca

Renewable Hydrogen Canada (RH2C), based near Victoria, British Columbia, is producing renewable hydrogen (RH2) through water electrolysis powered by renewables (primarily wind, augmented by hydro).

The company's first project is a joint venture with a major Canadian utility that will feature a world-scale RH2 plant.

Given northeastern BC's vast untapped reserves of renewable energy (particularly wind), and the legal requirements of Vancouver and BC to decarbonize, Renewable Hydrogen Canada is focused on producing RH2 in the northeast; blending it with natural gas in the region; and distributing the blended fuel to Vancouver via the province's largest natural gas pipeline. In addition, Renewable Hydrogen Canada is pursuing emerging opportunities to make RH2 a major export commodity.

Capabilities: Hydrogen production

Market focus: Mobile, stationary

CONTACT INFORMATION

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SAUER COMPRESSORS

www.sauercompressors.com

Sauer Compressors is a medium-sized German group of companies with twelve international subsidiaries. The company was founded more than 130 years ago and has over 80 years' experience in compressed air technology.

Today, Sauer Compressors focuses on the development, production and sale of medium and high-pressure compressors for applications in hydrogen, commercial shipping, industries, the petroleum industry and the defence sector.

Sauer compressors have excellent conditions for many hydrogen applications thanks to their oil-free, dry-running and gas-tight design.

Compressors are technically sealed, in operation or when stopped and are flexible regarding variable suction and discharge pressure.

Capabilities: Components, services

Market focus: Mobile, stationary

CONTACT INFORMATION

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SYLAS CONSULTING GROUP

www.sylasconsulting.com

Sylas Consulting Group is a boutique management consulting firm with diverse professional expertise specializing in high-tech industries.

Sylas' services are broadly categorized as follows: 1) Strategic Supply Management – supply base development, strategic sourcing, collaboration, Intellectual Property (IP) licensing strategy and negotiation, and commercialization strategy; 2) Strategic Partnerships – joint development, research collaboration and partnership strategy development, implementation, and relationships management; 3) Management of Technology – technology roadmap, technologies harvesting, innovation management, strategic marketing, and test engineering strategy; 4) Project Management – strategic project development & management, and portfolio management; 5) Transfer Pricing – functional analysis, transfer pricing liaison with Big 4 consulting firms, IP planning and restructuring, and CRA audit preparation, and 6) Corporate Governance – strategic legal liaison with law firms, and brings diversity to the boardroom.

Capabilities: Services

Market focus: Mobile, stationary

CONTACT INFORMATION

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RED RIVER COLLEGE

www.rrc.ca

Red River College is Manitoba's largest institute of applied learning and research. Since inception in 2004, AR&C has attracted significant capital investment which has helped support over 50 research partnerships. These investments in research facilities and equipment effectively serve the applied research needs of the region and its industry.

Red River College's Research Partnerships & Innovation office has been an active player in hydrogen and fuel cell transportation, having hosted the first meeting to plan a pan-Canadian hydrogen fuel cell bus demonstration and integration trial.

In 2006, RRC operated the bus and refueling station as part of the demonstration and testing of the 40-foot, zero pollution emitting New Flyer Industries vehicle that was outfitted with three HyPM 65 fuel-cell power modules and ultra-capacitors (to recapture energy from the bus's brakes).

Capabilities: Academia, research, hydrogen fuelling infrastructure, energy storage, hydrogen production, engineering

Market focus: Mobile, stationary

CONTACT INFORMATION

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SIMON FRASER UNIVERSITY

www.sfu.ca

In the area of fuel cell and hydrogen research, Simon Fraser University (SFU) is a leader in materials science, electrochemistry, modeling, and engineering. SFU developed its capacity and reputation through a symbiotic partnership with NRC Institute for Fuel Cell Innovation (NRC IFCI). This partnership fostered academic leadership and growth of the industry sector in the Vancouver region to become the premier global center of excellence for fuel cell research.

SFU brings together research strengths within research clusters in materials science and engineering, electrochemical materials and energy science, technology management, and resources and environmental management to establish a prospective technology platform for sustainable fuel cell systems. Research in fuel cell materials, electrochemistry, and technology at SFU is carried out in the Departments of Chemistry, Physics, MSE, Engineering Science (ENSC), as well as the Beedie School of Business and the School of Resource and Environmental Management (REM).

Capabilities: Academia, fuel cell modules and systems, research, engineering

Market focus: Mobile, stationary

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UNIVERSITÉ DU QUÉBEC À TROIS-RIVIÈRES (UQTR) – HYDROGEN RESEARCH INSTITUTE

www.uqtr.ca

The Hydrogen Research Institute (HRI) of the Université du Québec à Trois-Rivières (UQTR) was established in 1994 and is one of Canada's leading institutes dedication to hydrogen. Its goal is to contribute to the development of hydrogen technologies through research activities related to the storage, produce and safe use of hydrogen. The Hydrogen Research Institute is a multidisciplinary team of over 50 people having at its disposal state of the art equipment and laboratories. The research and development activities carried out at HRI extend from material science to system development and technology demonstration. The Institute is particularly interested in the development of advanced materials to address the technical gaps needed for commercially competitive hydrogen energy systems, in performing fluid dynamics simulations of hydrogen releases for safety, as well as the safety and lifetime analysis of new materials and hydrogen energy systems.

Capabilities: Academia, research, hydrogen production, energy storage, testing, certification and safety

Market focus: Mobile, stationary, portable

CONTACT INFORMATION

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UNIVERSITY OF BRITISH COLUMBIA – CLEAN ENERGY RESEARCH CENTRE

www.cerc.ubc.ca

The Clean Energy Research Centre (CERC) at the University of British Columbia hosts world-leading researchers who see this challenge as an opportunity to help future generations inherit a better world.

CERC's interdisciplinary program brings together innovators from many departments, including the Faculty of Applied Science, the Faculty of Science, and the Sauder School of Business.

Researchers at CERC have been involved in different research projects with industry partners, from contracts and agreements to combined research grants. The university invests $500 M annually on research, which can be used to leverage industrial support through several programs and mechanisms. CERC also actively seeks local and global collaboration with industry, academia and all levels of government.

Capabilities: Academia, fuel cell modules and systems, research, engineering, hydrogen fuelling infrastructure

Market focus: Mobile, stationary

CONTACT INFORMATION

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UNIVERSITY OF TORONTO

www.mie.utoronto.ca

The Solid Oxide Fuel Cell facility at the University of Toronto officially opened on April 19, 2006. It is the first installation of solid oxide fuel cells in a student residence in Canada, and the world's first multi-unit installation. It has been garnering international attention.

The system includes four, 5 kW solid oxide fuel cells. The units are connected to form a "mini-grid" that provides environmentally-friendly electricity, hot water, and space heating for twelve student townhouse residences. The system is also connected to the Ontario power grid, but can operate if the grid goes down, which is beneficial in case of blackouts.

The solid oxide fuel cell project is sponsored by the Government of Canada's Hydrogen Early Adopters Program, UTM, Fuel Cell Technologies Ltd., and Air Liquide Canada.

Capabilities: Academia, research, fuel cell development

Market focus: Mobile, stationary, portable

CONTACT INFORMATION

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G&S BUDD CONSULTING

G&S Budd Consulting Ltd., established in April 2014, provides business development, project and program management services to the renewable energy sector.

The company's Principal, Geoff Budd, has broad and deep experience in the business development of fuel cell and electrolyser products spanning more than 20 years, including work with Ballard Power Systems in North America and Europe as well as leading the North American business development activities for ITM-Power.

Capabilities: Consulting

Market focus: Mobile, stationary

CONTACT INFORMATION

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TRUCKENBRODT CLEAN ENERGY CONSULTING

Truckenbrodt Clean Energy Consulting is a BC-based company that provides advisory services to the global renewable energy and transportation sectors.

Following over 20 years in the automotive and aeroengine sectors with leading OEMs Daimler, BMW and Daewoo, Dr. Truckenbrodt was the former Chief Executive Officer for the Automotive Fuel Cell Cooperation (AFCC), a joint venture of Daimler AG and Ford Motor Company, based in Vancouver Canada as well as the President and CEO of the Canadian Hydrogen & Fuel Cell Association.

Capabilities: Consulting

Market focus: Mobile, stationary

CONTACT INFORMATION

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ZEN CLEAN ENERGY SOLUTIONS

www.zenenergysolutions.com/

Zen Clean Energy Solutions is a Boutique consulting firm with more than 50 years of combined experience in the clean energy sector.

With a mission to commercially advance and deploy clean energy solutions and technologies that promote sustainability by working with organizations and developing projects, Zen is uniquely positioned to guide complex projects from inception to implementation given the team's range of backgrounds including government relations, business and corporate development, and engineering and technology development, complemented with a strong backbone in project management.

Capabilities: Consulting

Market focus: Mobile, stationary

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