



Government of Canada

Trade Commissioner Service

Gouvernement du Canada

Service des délégués commerciaux

Canada

CANADA'S LEADERSHIP ADVANTAGE: HYDROGEN AND FUEL CELLS



Canadian Fuel cell technologies are being used to enhance the performance of clean energy systems by balancing fluctuations in energy loads; helping to grow the renewable energy sector around the world. The sector is an important contributor to the development of clean, efficient and reliable energy alternatives.

The Canadian hydrogen and fuel cell sector is a global leader recognized for pioneering new technologies and industry expertise. Canada is home to a significant concentration of global hydrogen and fuel cell expertise including all elements within the supply chain.

Canadian companies have established a competitive global position resulting from years of research, supply chain development and demonstration activities. The largest cluster of hydrogen and fuel cell companies in Canada is located in British Columbia.

AREAS OF CANADIAN HYDROGEN AND FUEL CELL STRENGTHS



HYDROGEN PRODUCTION
Local Resource Production



RENEWABLE ENERGY
Making Hydrogen and Storing for Future Use



BACK-UP POWER
Fast Start-up for Critical Power Support



HYDROGEN INFRASTRUCTURE
Economically Viable Fueling



CARS BUSES TRAINS AND HEAVY DUTY VEHICLES
Full Performance with Zero Emissions



STATIONARY POWER
Stable and Predictable Electricity



RESEARCH AND ENGINEERING
Turn-Key Solutions



TEST STATIONS AND EQUIPMENT
Full Range of Support



HYDROGEN AND FUEL CELLS

EXPORTING

Canadian companies are well positioned to supply strong international commercial demand for fuel cell powered buses, trains and heavy duty vehicles, material handling equipment, back-up & stationary power, hydrogen production, distribution and storage. Canadian technologies play a significant role in renewable energy systems across the world, integrating with wind and solar technologies to balance electrical loads. A Canadian supply chain has emerged that provides parts, components, testing equipment, and engineering and financial services to global hydrogen and fuel cell technology developers.

FUEL CELL FORKLIFT FLEET

Ballard Power Systems > www.ballard.com

Fuel cells are powering the material handling equipment in Walmart's 400,000 sq. ft. Alberta distribution centre. The fuel cell powered fork lifts and pallet trucks use green hydrogen produced by Air Liquide (Quebec) from hydroelectric power, and Plug Power GenDrive units powered by Ballard's fuel cells - delivering significant operating cost savings and a reduction in greenhouse gas emissions.



Benefits include:

- > Operating cost savings of \$2 million dollars projected over a 7-year period
- > Greenhouse Gas Emission savings: 530 tonnes of CO₂ per year
- > Eliminated battery-charging area creating more valuable warehouse space
- > Longer operation, no battery swapping, less than 3 minute refueling
- > Constant full power output throughout shift as low as -29 °C condition



POWER TO GAS

Hydrogen can be the critical link to firm intermittent renewable energy sources.

Hydrogenics > hydrogenics.com

Canada is a world-leader in developing and deploying hydrogen energy systems to improve the use of renewable energy sources, including wind, solar and hydro-electric power.

Hydrogenics Corp. in partnership with Canada's Tugliq Energy (Quebec), has demonstrated the feasibility of a Wind Turbine Power-to-Gas system at the Raglan Mine in Nunavik, Canada. Hydrogenics' HySTAT60 electrolyser and HyPM R200 PEM fuel cell harvests surplus wind energy from a 3MW wind turbine and produces 200kW of back up energy for up to 20 hours. This system has replaced the use of more than 5 million liters of diesel and reduced greenhouse gases by 13,300 tonnes.

CANADIAN FUEL CELL LEADERSHIP

The Canadian market is leading on commercial deployment of hydrogen and fuel cell technologies by large corporate and institutional entities. Walmart and Canadian Tire Corporation are switching their material handling equipment fleets to fuel cell powered. Enbridge Gas Distribution in partnership with Hydrogenics is using fuel cell technology to provide regulation services to the Independent Electricity System Operator (IESO) of Ontario. Wind Mobile is using fuel cells for telecom backup power. Canadian leadership in the sector is attracting significant investment in Canada.

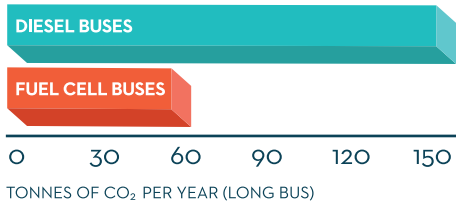
FUEL CELL BUSES

New Flyer > newflyer.com

New Flyer a leading North America transit bus manufacturer, successfully demonstrated their XHE60 Fuel Cell transit bus during a 22-month test period in California. The XHE60 is powered by Ballard Power Systems's seventh generation FCveloCity hydrogen fuel cell propulsion system.

First commercial delivery of two XHE60 buses to the Champaign Urbana Mass Transit Districts is scheduled for early 2019.

GHC SAVINGS USING FUEL CELL BUSES

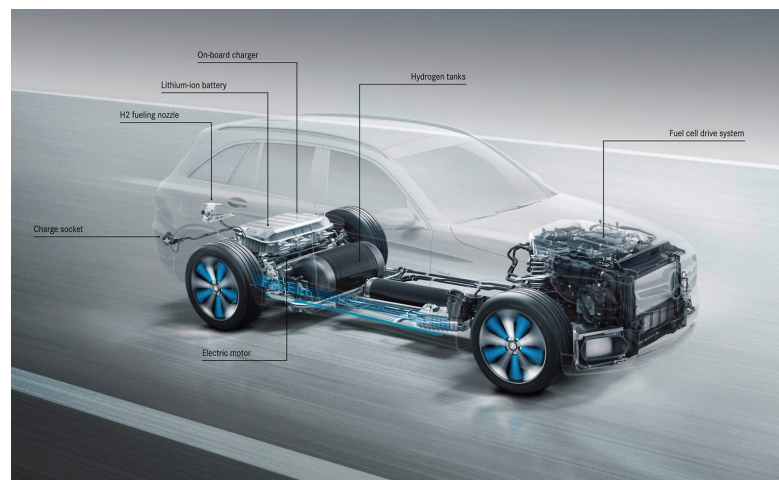


FUEL CELL MANUFACTURING IN CANADA

Daimler > www.daimler.com

Canada is a pioneer in the development of automotive fuel cell technologies. British Columbia's Automotive Fuel Cell Cooperation (AFCC) was a fuel cell stack developer and joint venture between Daimler, Ford, Nissan and Ballard Power System. The AFCC was the world's first next generation automotive research and development center.

This led to Daimler locating the world's first standardized automotive fuel cell stack production facility, Mercedes-Benz Fuel Cell, in Vancouver. This facility showcases how Canadian research and development leads to a production facility and will continue to be integral to achieving the technical and commercial targets for the market introduction of hydrogen and fuel cell vehicles.



ADDITIONAL FIRMS WITH HYDROGEN AND FUEL CELL EXPERTISE

BUSES, TRAINS, AND HEAVY VEHICLES

Ballard Power Systems
> ballard.com

Dana Canada
> www.dana.com

Hydra Energy Corp
> hydraenergy.com

Hydrogenics
> hydrogenics.com

Hydrogen In Motion Inc. (H2M)
> www.hydrogeninmotion.com

Loop Energy
> www.loopenergy.com

OverDrive Fuel Cell Engineering Inc
> www.overdrivefce.ca

Palcan Energy Corp
> www.palcan.com

Zen Clean Energy Solutions Inc
> www.zenenergysolutions.com

HYDROGEN FUELING INFRASTRUCTURE

Advanced Flow Systems
> www.advancedflowsystems.com

Associated Plastics & Supply Corp
> www.associatedplastics.com

Aurora Scientific Corp
> www.aurorascicorp.com

Change Energy Services Inc
> www.changeenergy.ca

HTEC | Hydrogen Technology and Energy Corporation
> www.htec.ca

Hydra Energy Corp
> hydraenergy.com

Hydrogenics
> hydrogenics.com

Hydrogen In Motion Inc. (H2M)
> www.hydrogeninmotion.com

IRDI System
> www.irdisystem.com

Kraus Global Ltd. | Dispensing Solutions
> krausglobal.com

Newflyer
> www.newflyer.com

Nu:ionic Technologies
> www.nuionic.com

HYDROGEN PRODUCTION

Air Products Canada
> www.airproducts.ca

Advanced Flow Systems
> www.advancedflowsystems.com

Enbridge Gas Distribution
> www.enbridgegas.com

Hydrogenics
> hydrogenics.com

Luxfer Canada Ltd
> www.luxfer.com

Next Hydrogen
> www.nexthydrogen.com

Nu:ionic Technologies
> www.nuionic.com

Quadrogen Power Systems
> www.quadrogen.com

Xebec Adsorption Inc
> www.xebecinc.com

RESEARCH AND ENGINEERING

Ballard Power Systems
> www.ballard.com

Blue-O Technology Inc
> www.blue-otechnology.com

CCS Global Group Inc.
> www.ccsglobalgroup.com

Cellula Robotics Ltd.
> www.cellula.com

Change Energy Services Inc
> www.changeenergy.ca

Hydrogenics
> hydrogenics.com

NORAM Engineering and Constructors
> www.noram-eng.com

NSERC Hydrogen Canada: H₂CAN
> www.h2can.ca

OverDrive Fuel Cell Engineering Inc
> www.overdrivefce.ca

Pathway Industries
> www.pathwayindustries.com

Sacré-Davey Engineering
> www.sacre-davey.com

Simulent Consulting Inc
> www.simulent.com

Terrella Energy Systems Ltd
> www.terrellaenergy.com

Zen Clean Energy Solutions Inc
> www.zenenergysolutions.com

STATIONARY AND BACK-UP POWER

Ballard Power Systems
> www.ballard.com

Hydrogen In Motion Inc. (H2M)
> www.hydrogeninmotion.com

Hydrogenics
> hydrogenics.com

Next Hydrogen
> www.nexthydrogen.com

Palcan Energy Corp
> www.palcan.com

Sacré-Davey Engineering
> www.sacre-davey.com

TESTING AND CERTIFICATION

CCS Global Group Inc.
> www.ccsglobalgroup.com

CSA Group
> www.csagroup.org

Greenlight Innovation
> www.greenlightinnovation.com

Intertek Canada
> www.intertek.com/canada

Powertech Labs
> www.powertechlabs.com

Simulent Consulting Inc
> www.simulent.com

Tandem Technologies Ltd.
> www.tandemtech.ca

Zen Clean Energy Solutions Inc
> www.zenenergysolutions.com

THE CANADIAN HYDROGEN AND FUEL CELL ASSOCIATION:

For more information about innovative Canadian hydrogen and fuel cells companies please visit > www.chfca.ca



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