



Government of Canada

Trade Commissioner Service

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Service des délégués commerciaux

Canada

CANADIAN CLEAN TECHNOLOGY AND RENEWABLE ENERGY FOR MINES LEADING THE MINING SECTOR'S TRANSITION TO COST-EFFICIENT, LOW-CARBON ENERGY SOLUTIONS



Canada's clean technology industry is playing a critical role in the mining sector's energy transformation delivering affordable, customized, and proven technologies and services.

Delivering effective and reliable solutions, Canadian companies are helping mines reduce carbon emissions and diesel consumption in major mining centres around the world.

The world's mining companies are looking to Canadian clean technology solutions to control costs, secure power reliability, reduce carbon emissions and build social license to operate. Commodity price recoveries have placed mines in a better financial position to address these strategic concerns.

KEY AREAS OF STRENGTH IN CLEAN TECHNOLOGY AND RENEWABLES FOR MINES



RENEWABLE ENERGY PROJECT DEVELOPMENT



ENERGY STORAGE



ENERGY EFFICIENCY



ELECTRIFICATION OF TRANSPORTATION FLEETS & EQUIPMENT



MINING AUTOMATION & BIG DATA SOLUTIONS



CONSULTING & ENGINEERING



MINING MICROGRIDS



CARBON EMISSIONS REDUCTION



WATER CONSERVATION, TREATMENT & REUSE



GREEN / SUSTAINABLE CAMPS COLLABORATION

EXPERIENCE, EXPERTISE AND COLLABORATION

Canadian clean technology firms have: international experience, expertise working in remote locations, access to funding and testing facilities, and the ability to offer customized and scalable solutions.

Collaboration with indigenous partners and surrounding communities is a core strength of Canadian companies. Clean energy projects that include a direct benefit to local communities can facilitate project finance by attracting development and multilateral banks.

Canadian companies like Hatch, Pace Technologies and WSP, have led landmark renewable energy and storage projects for global mines. Canadian companies are also global leaders in energy efficiency and carbon reduction products and services for mines.



CLEAN TECH MINING

LEADING MINING'S ENERGY TRANSITION

Canada's clean technology sector has a long history of working with mining companies and is globally recognized for its innovative and collaborative approach. Canadian renewable energy procurements have resulted in a strong domestic renewable energy sector which is exporting this expertise.

CANADA'S WATER EXPERTISE FOR THE MINING SECTOR

Water and waste water treatment is a Canada's clean technology industry core strength with innovative water applications and technologies that deliver significant energy and cost savings for mines. These include water conservation and reuse systems and technologies that recover value, such as metals from wastewater streams. These companies are helping mines save money through efficiency and compliance, and protect the safety of water supplies.

CANADIAN COMPANIES SPECIALIZING IN RENEWABLES AND CLEAN TECHNOLOGIES WITH MINING APPLICATIONS

RENEWABLE ENERGY PROJECT DEVELOPMENT

- > **3G Energy**
Renewable energy project developer
- > **BluEarth Renewables**
Wind, hydro and solar independent power producer
- > **Canadian Solar**
Solar developer and panel manufacturer
- > **CarbonFree Technology**
Solar development and financing
- > **Carmanah Technologies Corp.**
Solar lighting and power systems
- > **Grasshopper Solar**
Solar developer and panel supplier
- > **Golder Associates**
Engineering and consulting services
- > **Hatch**
Engineering, procurement and consultation for hybrid systems
- > **Heron Canada**
Developer and supplier of remote microgrids
- > **H.H. Angus & Associates Ltd.**
Engineering and consulting services
- > **Isla Power**
Renewable energy developer
- > **Innergex**
Hydro, wind and solar energy developer
- > **JCM Power**
Private equity for clean power projects
- > **Knight Piesold**
Engineering and consulting services
- > **L&A Energy Consulting Ltd**
Engineering and consulting services
- > **Phoventus**
Engineering and consulting services
- > **Potentia Renewables**
Renewable energy developer
- > **Northland Power**
Thermal and renewable energy independent power producer
- > **S2E Technologies**
Renewable energy design and implementation advisory services
- > **TUGLIQ Energy**
Developer specializing in remote power systems
- > **Windiga Energy**
Renewable energy developer

- > **WSP**
Engineering and consulting services

ENERGY STORAGE & OFF-GRID SYSTEMS

- > **Aspin Kemp and Associates**
Systems integrator focusing on energy efficiency in diesel and microgrid power
- > **Clear Blue Technologies**
Smart hybrid controllers for off-grid systems
- > **Electrovaya**
Portable lithium-ion battery power solutions
- > **eCAMION**
Battery and storage systems designed for extreme conditions
- > **Eguana Technologies**
Intelligent power electronics for microgrid applications
- > **Hydrogenics**
Hydrogen generation and fuel cell products
- > **Hydrostor**
Advanced Compressed Air Energy Storage (A-CAES) technology
- > **NRStor**
Energy storage project developer
- > **Novacab Inc.**
Thermal energy storage specialists
- > **Peak Power**
Energy storage software and project solutions
- > **Salient Energy**
Zinc-ion battery supplier
- > **Sigma Energy Storage**
Hybrid Thermal-Compressed Air Energy Storage (HT-CAES) technology

ENERGY EFFICIENCY & EMISSIONS REDUCTION

- > **BBA**
Engineering, automation, and environmental monitoring services
- > **Clean Energy Compression**
Compressed Natural Gas (CNG) fueling systems
- > **EELO Solutions**
Energy and carbon management consultation
- > **Industrial Fabrication**
Mobile equipment solutions

- > **First Pac West**
Green/sustainable mining camps - energy efficient & modular
- > **FVT Research**
Drop-in electric drives for commercial, industrial and off-road vehicles
- > **Maclean Engineering**
Mobile equipment solutions
- > **Prairie Machine and Parts**
Mining equipment and battery-operated electric vehicle supplier
- > **Rail-Veyor Technologies Global Inc**
Energy efficient material haulage solutions
- > **SysEne Consulting**
Carbon, energy and water management consultation
- > **TM4 Inc.**
Electric and hybrid powertrain systems
- > **Thermal Energy**
Energy efficiency technologies and consultation

WATER CONSERVATION, TREATMENT & REUSE

- > **Altech Environmental Consulting Ltd.**
Water and wastewater services
- > **APG Neuros Inc.**
Technologies for wastewater treatment applications
- > **Aquatic Informatics Inc.**
Water data management software
- > **ASDR**
Water, wastewater and sewage treatment
- > **Aslan Technologies Inc**
Green/sustainable mining camps - energy efficient & modular
- > **Bionest**
Wastewater treatment solutions
- > **Bishop Water Technologies**
Wastewater treatment solutions
- > **BQE Water**
Mine water treatment
- > **Current Water Technologies Inc**
Electrochemical water technologies
- > **Dundee Sustainable Technologies Inc.**
Technologies for the treatment of materials in the mining industry
- > **EcoTec Environmental Consultants**
Equipment for industrial wastewater treatment

- > **FilterBoxx Water and Environmental Corp.**
Packaged and modular water and wastewater solutions
- > **H2Flow Equipment Inc.**
Equipment for water and wastewater treatment
- > **Island Water Technologies**
Renewable wastewater treatment
- > **Kontek Process Water Management**
Wastewater recovery, treatment, and raw water purification systems
- > **Mabarex**
Water management efficiency/ optimization at remote mining camps
- > **Newterra**
Water treatment solutions
- > **Terragon Environmental**
Wastewater Solutions
- > **Renix**
Purifying and de-contamination technologies
- > **Xogen Technologies Inc.**
Innovative wastewater treatment solutions

MINING AUTOMATION AND BIG DATA SOLUTIONS

- > **Bestech**
Engineering, automation, and environmental monitoring services
- > **Canvass.io**
Artificial intelligence for industry
- > **Element.ai**
Artificial intelligence products and thought leadership
- > **Ionic Engineering**
Automation systems design
- > **Hard-Line Solutions**
Mining Automation and Mining Remote Controls
- > **Maestro Digital Mine**
Mine ventilation and automation
- > **MineSense**
Smart mining solutions
- > **Motion Metrics**
Advanced monitoring solutions
- > **RoweBots Research Inc.**
Data monitoring for mining vehicles
- > **Symbioticware Inc.**
Data monitoring

CANADIAN COMPANIES LEADING LANDMARK PROJECTS

Canadian firms are behind some of the first and most innovative clean technology projects for the mining sector.



CANADA'S FIRST BATTERY-POWERED ELECTRIC MINE

Canadian Solar is one of the world's largest and foremost solar power companies. A leading manufacturer of solar photovoltaic modules and provider of solar energy solutions, Canadian Solar also has a geographically diversified pipeline of utility-scale power projects. Canadian Solar has successfully delivered over 26 GW of premium quality modules to over 100 countries and specializes in customized microgrid solutions for remote applications. Canadian Solar is one of the most bankable companies in the solar industry, publicly listed on NASDAQ since 2006.

ELECTRIC ORE TRANSPORTATION TECHNOLOGY

The Goldex Mine in Val-d'Or Quebec is installing Rail-Veyor Technologies' electric powered ore transporting technology to save on energy, ventilation, mine design and infrastructure costs.

GLENCORE RAGLAN MINE WIND-STORAGE HYBRID

This award-winning project set a new landmark in renewable energy penetration of diesel autonomous grids by coupling leading-edge storage technologies and an advanced controller to a wind turbine at a remote Canadian Arctic mine. Led by TUGLIQ Energy using cutting-edge services and technologies

from leading Canadian companies - Electrovaya, Hatch and Hydrogenics - the project combines an Arctic-rated 3 MW wind turbine with three forms of energy storage. The system has achieved 97.6% availability, displacing 8.5 million litres of diesel and 23 700 kT tons of greenhouse gases and will continue to save Glencore 2.3 million litres of fuel per year. TUGLIQ Energy is currently leading the expansion of this project adding a 3 MW wind turbine coupled with a 3MW-1MWh Battery Energy Storage System to drive further carbon and diesel savings.

PARTNERING WITH FIRST NATIONS ON RENEWABLE ENERGY FOR MINES

Partnering with indigenous or local communities on renewable energy is a solution to two of the biggest challenges faced by miners in remote locations: power generation and inclusion of local indigenous people. Canadian gold-miner AurCrest has created the subsidiary company Wiigwaasaatig Energy Inc. (WEI) to develop renewable energy infrastructure in partnership with neighbouring aboriginal communities, for the use or sale to resource companies. AurCrest and WEI will finance and develop a 40-megawatt renewable energy business and are working with Maple Energy & Mining as technical advisors for project development.

CANADA IS A WORLD LEADER IN SUPPORTING CLEAN TECHNOLOGY APPLICATIONS FOR MINES

Canada will be the first major mining jurisdiction to implement a carbon pricing system with a federal framework set to be in place by 2019. The Government of Canada has programs in place to assist with the development, commercialization and use of clean technologies for mines. These programs are driving new and world-leading examples of low-carbon and renewable energy solutions for mines to address mining's global energy challenges.

MINING AUTOMATION, BIG DATA AND ANALYTICS

Alongside energy and climate initiatives, the application of digital technologies to automate operations, drive efficiencies and improve quality and safety are transforming the mining sector. Canadian companies are delivering solutions to global mining operators, playing a key role in developing the "mine of the future". These services include artificial intelligence platforms, software solutions and mining automation products and services.

REASONS TO DO BUSINESS WITH CANADIAN COMPANIES



> REAL-WORLD PROJECT EXPERIENCE

Canadian companies are world leaders in project feasibility, development, implementation and renewable energy system operation for mines and large industrial energy users around the globe. World-leading projects have been led by Canadian firms who continue to export their expertise to mines around the world.

> OFF-GRID EXPERTISE

With over 300 off-grid communities looking to reduce reliance on diesel, Canada has a thriving domestic market for off-grid clean energy solutions. Thanks to a robust research and development framework, and a supportive financing environment, Canadian clean power companies are exporting scalable and reliable off-grid renewable technologies to the mining industry.

> REMOTE LOCATIONS AND HARSH-CLIMATE APPLICATIONS

Government support for cutting-edge technologies and projects in the remote north have led Canada to become a knowledge-centre for operating renewable energy and clean technology solutions in remote locations and harsh climates. Canadian firms are deploying this expertise in remote locations around the world.

> CUSTOMIZED SOLUTIONS

Each mine site requires a customized energy solution to meet its particular power requirements, life-of-mine length and approval process. Canadian firms are well-placed to work with technology providers and strategic partners to deliver flexible, and customized solutions for mines.

> MULTILINGUALISM

With both English and French as official languages, Canadian firms have an advantage when exporting products and services to French-speaking countries. While not an official language, many Canadian firms also have Spanish-speaking capabilities.

EXPORT DEVELOPMENT CANADA (EDC)

Export Development Canada (EDC) is Canada's export credit agency, and can provide loans to foreign buyers with procurement needs that match Canadian expertise. EDC also provides insurance and financial services, bonding products and small business solutions to Canadian exporters and investors and their international buyers. EDC supports Canadian direct investment abroad and investment into Canada. Much of its business is done in partnership with other financial institutions and through collaboration with the Government of Canada. > www.edc.ca



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