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Canada

Canadian Capabilities in Offshore Clean Technologies

Guide and Company Directory for the Oil and Gas Sector

March, 2024

TRADE COMMISSIONER SERVICE (TCS)

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This document has been prepared by Petroleum Technology Alliance Canada (PTAC) for the Trade Commissioner Service, Global Affairs Canada.

Introduction

Inter-governmental cooperation, with respect to clean technology innovation initiatives, has increased in recent years due in part to the growing appreciation for the impacts of resource development on the natural environment in offshore areas, including a large variety of marine life and fish stocks. Canada has the longest marine shoreline in the world at over 70,000 kilometers of mainland coast. In fact, if offshore islands are included, Canada has over 240,000 kilometers of marine coastland. There are more than 2,000 kilometers of international border over water through the Great Lakes, which contain approximately 21% of the world's fresh water. Canada has internationally recognized control of over 5 million square kilometers of marine internal coastal waters, territorial seas, and its Exclusive Economic Zone (EEZ)[1].

In comparison to the Gulf of Mexico or the North Sea, Canada is not a major player in offshore oil and gas development, however, Canadian offshore operations can be found in some of the most challenging and environmentally sensitive areas of the world. Developments in Canada, as a result, are highly regulated by both the Federal government and the affected provinces and territories.

Most of Canada's offshore regions have some potential for oil and gas development, even though only the Atlantic facing east coast and Lake Ontario have seen active oil and gas production. The main area with significant existing production is offshore Newfoundland and Labrador. Oil production in this region includes Hibernia, Terra Nova, White Rose, and Hebron oil production installations, with other projects such as Equinor's Bay Du Nord in the planning stages. Offshore Nova Scotia and Lake Erie have seen mainly gas development, however, the majority of these facilities have been either drilled from onshore locations or have been decommissioned, such as the Sable Offshore Energy Project and Cohasset/Panuke. As of year-end 2022 Offshore Oil Production was approximately 15 million cubic meters per year[2] (or 95 million barrels per year), which encompasses 22% of Canadian conventional oil production.

The harsh North Atlantic operational environment experienced in offshore Newfoundland is incredibly unique. This is especially true in winter where powerful storms, ice build up on structures, and the presence of icebergs preventing pipelines to shore, pose significant operational challenges, and require all production to be transferred to tankers for transfer to markets. To account for these unique challenges, some operators developed fixed structures designed to resist ice impacts (Hibernia and Hebron), while others utilize Floating Production Storage and Offloading (FPSO) facilities (White Rose and Terra Nova). Additionally, the operating oil fields within the North Atlantic are located near the Grand Banks, a major fishing grounds accessed by fishing fleets from North America and much of Europe. This creates unique conditions and regulations, requiring the application of some novel technologies for servicing, manning, and operating these offshore facilities.

The objective of this guide and company directory is to share Canada's experience and expertise in offshore oil and gas operations. The guide highlights Canadian capabilities with the purpose of assisting both Canadian producers and other oil and gas producing countries in reducing impacts of offshore developments.

[1] Department of Fisheries and Ocean Brochure https://waves-vagues.dfo-mpo.gc.ca/library-bibliotheque/40622952.pdf
[2] Canadian Association of Petroleum Producers Statistics handbook for 2021

Offshore Clean Technology Development in Canada

Canada, as the country with responsibility and control over the largest expanse of ocean area in the world, has the most diverse range of offshore territory and ecosystems to study, monitor, maintain and protect for a wide range of interests. Eight of Canada's ten provinces and all three of its territories contain marine or Great Lakes areas which have potential for offshore oil and gas development. With marine regions on all three coasts and freshwater lake systems that are open to seagoing vessels and technologies, Canada's ecosystems include Arctic water under permanent ice cover, marine areas that are only ice-free for 3 to 4 months of the year, and freshwater lakes that are frozen over for 3 to 4 months of the year. The freshwater Great Lakes serve as a water supply for a large proportion of Eastern Canada and the northern United States. With this wide range of ecosystems, Canada also has a vast array of biota to protect, from cod fisheries to salmon runs, including shellfish, whales, seals, sea lions, walruses and polar bears. As a result, offshore technology is a key focus for Canada and there are ongoing pressures to develop more sustainable methods for all industries and municipalities impacting those regions, including existing and future oil and gas developments.

Policy and Regulation

Offshore areas of Canada are the primary responsibility of Department of Fisheries and Oceans (DFO) Canada, and is supported by the Canadian Coast Guard, which is a special operating agency within the DFO. Offshore oil and gas development is a joint responsibility of the Federal and Provincial governments for the operating areas affected. The main regulating body for active offshore oil developments is the Canada Newfoundland & Labrador Offshore Petroleum Board. In areas further south, The Canada-Nova Scotia Offshore Petroleum Board has responsibility in the previously developed offshore areas which have now been decommissioned. Natural gas development in Lake Erie is the responsibility of the Province of Ontario, which has jurisdiction over about 50% of the lake's area and would also have responsibility for any future oil and gas developments that may occur in the other Great Lakes. Offshore oil and gas resources within the Province of British Columbia are regulated by the B.C. Energy Regulator, however, B.C. and the Federal Government are currently enforcing a moratorium on offshore oil and gas development[3] in the province. As a result, there has been little activity in the area and many of the larger lease holders have allowed their leases to revert to the province. A similar moratorium is in place in the Arctic where environmental impacts are assessed by Federal Departments.

Access to Financing and Financial Incentives

The Newfoundland and Labrador Government is interested in new developments and initiatives to improve the sustainability of existing offshore oil and gas operations. Incentives for development are tied to environmental compliance and job creation in the province. Grants to organizations developing technology can come through a number of Federal and Provincial departments and funding programs. The main incentives from the province of Newfoundland and Labrador come in the form of royalty negotiations with the province.

[3] Offshore Oil and Gas in B.C. - History of https://cmscontent.nrs.gov.bc.ca/geoscience/MapPlace1/Offshore/ChronologyOfActivity.pdf

Investment in Research and Development

There is a wide range of funding sources for studies on the impacts of offshore operation and clean technologies to help mitigate environmental impacts. Many of these funds may be fully within the control of government departments, such as the DFO, while other funds are channeled through Industry Collaborations like those described below.

Industry Collaboration

The main offshore industry collaboration is Canada's Ocean Supercluster, which has broad membership from multiple industries and supports research, development, and applications for a range of technologies that can support clean technology applications in the offshore oil and gas industry. The Supercluster is funded through industry partnerships and up to C$278 million from the Federal Government. The organizational focus is on "digital sensors and monitoring, autonomous marine vehicles, energy generation, automation, marine biotechnology and marine engineering technologies". The Ocean Supercluster is also a leader of the Ocean Technology Alliance Canada group which hosts a directory of services. Most industry oil and gas producers in the offshore are either large multi-national companies such as ExxonMobil, Chevron, Murphy Oil, or Equinox; major Canadian companies like Cenovus and Suncor; or crown corporations including Nalcor Energy (Government of Newfoundland and Labrador) and Canada Hibernia Holding Corp (Government of Canada through the Canada Development Holding Corporation (CDEV)). Generally, shared ownership in projects leads to cooperation in supporting clean technology development for the offshore operations.

Environmental, Social, and Corporate Governance

As offshore development is a Federal and Provincially regulated enterprise, it is held to a high standard with respect to responsible development and a commitment to continual improvement. A high priority is placed on excellent operational performance with minimal environmental impacts, responding quickly to any issues, ensuring safe and secure operations, and involving a high local labour content. Many of the companies involved in Canada's offshore oil and gas development also bring knowledge and learnings from offshore operations around the world. The example of the abandonment and decommissioning of the Sable Offshore Energy Project (substantially completed in 2020), Deep Panuke (2020) and Cohasset (2006) are examples of responsible clean up post-production with follow-up monitoring to confirm no outstanding issues. The Equinor Bay Du Nord project when it proceeds would be the first offshore project in the world beyond the 200 nautical mile limit[4].

Summary

Canada has a well established offshore oil and gas industry in Eastern Canada and continues to work on research to support continual improvement efforts aimed at enhancing sustainability and developing new clean technologies. Considering current moratoriums, any future oil and gas development off the coast of British Columbia or in the Arctic will require the development of new technologies and monitoring methods to ensure that impacts on the environment and Indigenous populations are minimized. Successful performance of the offshore oil and gas industry off of the East Coast has exemplified the viability of more sustainable oil and gas development and operations in harsh environments.

[4] https://www.cer-rec.gc.ca/en/data-analysis/energy-markets/provincial-territorial-energy-profiles/provincial-territorial-energy-profiles-newfoundland-labrador.html?=undefined&wbdisable=true

Important Clean Technology Areas Related to Offshore Operations

The following technology areas have been identified as those where Canadian companies have developed or deployed clean technology solutions in Canada's offshore oil and gas operations.

Category	Description
Products and Services	
Digital Sensors and Monitoring	Including hydrographic and bathymetric surveying and monitoring, weather monitoring, and other subsea sensors.
Autonomous Marine Vehicles	Vehicles capable of surveying, monitoring, and repairing undersea components of wells, pipelines, mooring systems, and platforms. Systems could be manned or unmanned with a range of depth capabilities and enhanced ability to operate in rough seas.
Power Generation and Gas Compression	Technologies to convert offshore power generation from natural gas to hybrid or fully renewable wind, wave, or other source. Technologies to capture flue gas emissions from power generation and compression equipment for subsurface injection or absorption, including electrical power storage.
Automation and Platform/Rig Stabilization	Enhanced systems to ensure offshore drilling rig, platform, floating production storage and offloading (FPSO), and support vessel stability in high seas to prevent failures, capsizing, losses during transfers or spills.
Navigation Systems Satellite Warning & Response Systems	Satellite and/or aerial based systems to improve navigation, detect potential hazards to facilities (such as icebergs or unauthorized vessels) in the operating region. Including methods for coordination of responses to mitigate risks to oil and gas facilities and possible consequences of facility damage.
Marine Engineering, Construction and Decommissioning	Improved methods for designing and construction gravity-based and other structures or vessels intended for offshore use to minimize materials and negative impacts during construction, transport, and decommissioning of units. Designs to resist ice pressure and impacts of ice on the operating structures.
Design of Oil Transfer Systems	Improvements to design of production facility to tanker oil transfer systems to avoid or significantly reduce potential leakage or spills in all weather conditions.
Crew Change, Resupply and Safety Technologies	Technologies to enhance the safety and security of crew transfers and production facility resupply under adverse weather conditions including emergency evacuation in extreme situations to protect life.
Marine Life Research	Technologies to improve monitoring of marine life in the area of offshore facilities which is less intrusive and costly compared to current systems. Can potentially operate on a continuous basis in all weather and sea state conditions. Monitoring both fish, microscopic sea life, ecosystem state, and marine mammals.

Case Studies

These selected case studies are based on input obtained from websites of technology suppliers and illustrate how their products improve the sustainability of operating in the harsh and demanding environments encountered by offshore oil and gas operations in Canada.

Digital Sensors and Monitoring

Ocean Floor Geophysics

Provides multiple services to support the offshore oil and gas industry in Canada. Based on the west coast (Burnaby B.C.) it can provide services covering all the stages of oil and gas asset operations. Services include:

- **Exploration** – Using towed Controlled Source Electro-Magnetic (CSEM) systems to survey the seafloor for natural gas hydrate and shallow gas deposits, combined with seismic to define sub-surface structures and characteristics.
- **Development** – Automated Underwater Vehicles (AUVs) equipped with advance sonar technologies, magnetometers, geochemical sensors, laser scanners and high resolution cameras. Including digital 3D models to allow producers and regulators to extract information and quantify Risk.
- **Production/Inspection** – Inspection of subsea pipelines to detect issues before they become problems.
- **Decommissioning** – High resolution mapping of infrastructure and geohazards by AUV and characterization of sediment, fluid properties and contamination.

Marine Engineering

Orange Force Marine

Provides specialized services throughout the Great Lakes and with international clients supplying a wide range of vessels, crews, and sensor equipment. As part of its services, it manages a “Crowd Sourced Bathymetry” (CSB) system to contribute data for mapping the 77% of the world’s oceans and 85% of the Great Lakes which have not yet been mapped with modern technologies and current standards. OFM’s “Mussel” kits are industry proven and via a robust, non-intrusive, seamless hardware installation, data is transferred to the cloud without operator intervention. Other services include support to government agencies, marine scientific research and ocean technology, undersea vehicles, and environmental response.

Alloy Concepts Inc.

Based in Dartmouth, Nova Scotia and utilizes computerized machining equipment to manufacture high-quality products locally to allow rapid replacement or specialized equipment for the aerospace, ocean technology, renewable energy, medical, military and oil and gas industries.

Environmental Impacts

Edgewise Environmental Ltd.

Out of St. John's Newfoundland and Labrador, provides a wide range of environmental services to protect the marine fauna from seabirds to whales. They provide services as required from project management, environmental assessments and spill response assistance, and research into migratory patterns.

Whale Seeker Inc.

A not-for-profit corporation based in Montréal, Quebec focused on automating marine mammal detection and monitoring to protect whales by avoiding encounters with ships interference from human activity. Artificial Intelligence makes the detection from aerial and satellite images more reliable and time effective. The four tools developed by the company are Mobius, Mobius Observer, Cetus, and Arc.

Offshore Power Generation

A number of companies are offering alternative power generation in the offshore environment from hybrid power systems to gravity base wind generators.

Canadian Company Directory

The Canadian companies listed here have identified a primary product/service category, and each company is listed under its respective primary category. Each company has also identified additional products and services that it offers. Click on a company name to skip to its listing. Listing includes companies who have submitted summaries specific to this **Directory (in Bold)** as well as companies listed in the Canadian Energy Export Guide (*) and a sampling of companies from the Oceans Advance Directory for companies active in the Oil and Gas Sector in Newfoundland and Labrador https://oceansadvance.net/members/?cmcats=all&cmcustomtax=all&cmtags=all&query_search=Oil+and+gas&page_business=20 (**).

		Product Categories							Service Categories				
Company	Page Number	General Offshore	Subsea Sensors	Underwater Vehicles	Specialty Equipment	Power Systems			Marine Engineering	Hydrography/Bathymetric	Spill Response	Marine Research	Marine Life Tracking
Directory													
Alloy Concepts		■			■				■				
Edgewise Environmental		■											
Ocean Floor Geophysics		■	■	■									
Orange Force Marine		■							■	■	■	■	
Whale Seeker					■								
Energy Export Guide													
Aspin Kemp & Associates*						■			■				
Global Power Technologies*						■							
National Compressed Air Canada*		■				■							
Sedna Wind Technologies*						■							
Oceans Advance Directory													
C-CORE **		■										■	
e-Sonar**			■		■							■	
GRI Simulations **			■	■						■			

Memorial University **														
Navsim Technology **														

Canadian Offshore Ocean Technology Products and Services

Alloy Concepts Inc.

Https://alloyconcepts.com

LOCATION
59 Guildford Avenue
Dartmouth, Nova Scotia, B3B 0H5

PRIMARY CATEGORY
Offshore

CONTACT INFORMATION
Perry MacIsaac
Sales and Customer Relationships Manager
pmacisaac@alloyconcepts.com
(902) 481-6903
Patricia Vargas
Quality Assurance Manager
pvargas@alloyconcepts.com
(902) 446-6903

SECONDARY CATEGORY
Offshore field services, equipment and supplies

COMPANY DESCRIPTION

Alloy Concepts Inc. is a computerized machining facility established in the industrial hub of Nova Scotia. It uses the most advanced technology to manufacture high-quality products that pass rigorous testing for aerospace, ocean technology, renewable energy, medical, military & defence, and oil and gas industries.

At Alloy Concepts Inc., we're focused on providing reliable service, continual improvement, and a desire to exceed our customers' expectations. As a result, we confidently offer precise machining and manufacturing, with secondary services like, but not limited to, protective coatings, fabrication, electronic assembly, and testing.

COUNTRIES EXPORTED TO
United States

INTERNATIONAL APPLICATIONS AND EXPERIENCE
Produce parts for a wide variety of worldwide industries, companies, and organizations.

TECHNICAL CAPABILITIES

- Reliable: Alloy Concepts is ISO 9001:2015
- Versatile: We work with a wide variety of materials, from titanium to plastics.
- Advanced: Our CNC machines are equipped with the latest technology and the most recent software.
- Earth-friendly: We recycle all scrap materials and fluids.

EDGEWISE Environmental Ltd.

www.edgewiseenvironmental.com

LOCATION
St. John's, Newfoundland and Labrador

PRIMARY CATEGORY
Offshore

CONTACT INFORMATION
Ashley Noseworthy
President & CEO
info@edgewiseenvironmental.com
(709) 770- 0492

SECONDARY CATEGORY
Other – Environmental

COMPANY DESCRIPTION
EDGEWISE Environmental is a certified women-owned marine environmental consultancy based in Newfoundland and Labrador, Canada. We focus on marine mammal and seabird observation, mitigation, and anthropogenic noise solutions; providing tailored consulting services and bespoke training programs across all marine industries. We have a growing Research & Development program and are always open to collaboration. At Edgewise we strive to tackle environmental issues with our clients through our training programs and consulting efforts to make a positive environmental impact on all marine ecosystems.

COUNTRIES EXPORTED TO
Germany, United Kingdom, Greece, Barbados, Trinidad and Tobago, Suriname, Guyana

INTERNATIONAL APPLICATIONS AND EXPERIENCE
Edgewise Environmental has current partnerships with companies across Europe with ongoing international projects. We have signed MOU's with Black Bawks Data Science (UK), and MSeis (UK). Edgewise has completed work for clients in the Mediterranean focused in environmental management within the oil and gas industry. We have an active export strategy to the Caribbean.

TECHNICAL CAPABILITIES
Our services are rooted in innovation and inclusivity, reflecting our dedication to comprehensive and sustainable marine solutions. Our services include oiled wildlife response coordination and management, environmental impact assessment, wildlife database management and quality assessment, environmental project management, abandoned vessel assessments, research and report writing, environmental personnel provision, and provision of seabird handling equipment.
We developed Canada's first formal marine mammal observation, seabird observation and passive acoustic monitoring (PAM) programs, taught to Canadian regulation and legislation. Since our launch in 2018, our certification has been accepted across industries, including oil and gas, renewable energy, telecommunications, academia, indigenous governments, and fellow environmental consultancies. We have delivered training across Canada, from coast to coast including Newfoundland and Labrador, Nova Scotia, New Brunswick, Quebec and British Columbia.

Ocean Floor Geophysics Inc.

www.oceanfloorgeophysics.com

LOCATION
Burnaby, B.C., Canada

PRIMARY CATEGORY
Offshore

CONTACT INFORMATION
Matthew Kowalczyk, CEO
matthew.kowalczyk@oceanfloorgeophysics.com
+1-778-862-9480

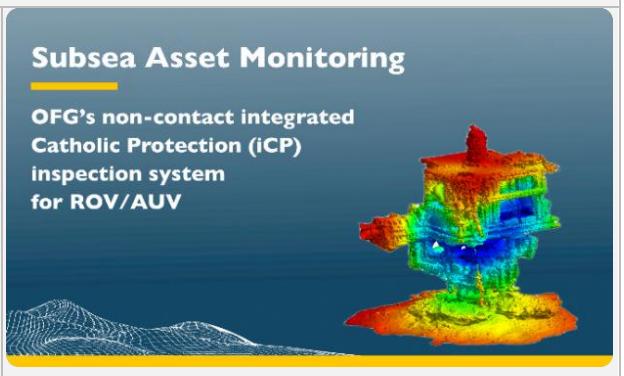
SECONDARY CATEGORY
Other – Subsea Sensors

COMPANY DESCRIPTION
OFG provides solutions to address our clients' subsea surveying challenges across a range of markets including the renewables, oil and gas, defence and minerals sectors. We bring together expert teams of engineers and geoscientists to design, integrate and operationalize complex sensor systems deployed from AUV, ROV, ROTV, USV, towfish and surface vessels. We collect rich multiphysics datasets and interpret these to meet and exceed survey objectives efficiently and safely, with minimal environmental impact.

COUNTRIES EXPORTED TO
Globally, excepting countries excluded by the Canadian Export Control List.

INTERNATIONAL APPLICATIONS AND EXPERIENCE
OFG has operated globally since 2007 in subsea site investigation and infrastructure inspection off the shores of every continent, including Antarctica and in deep international waters of the Pacific, Atlantic, and Indian Oceans.

TECHNICAL CAPABILITIES
OFG is a globally recognized leader in the operation of autonomous underwater vehicles, and the integration and deployment of specialised magnetic and electric field sensors on subsea vehicles for site investigations and infrastructure inspection. Our non-contact Cathodic Protection inspection (iCP) system is used and accepted by global energy companies for the efficient subsea inspection and monitoring of pipelines and structures. The OFG Self-Compensating Magnetometer (SCM) is the industry standard for autonomous underwater vehicles. The OFG Hypermag is the next generation of the SCM with applications in UXO, cable and pipeline depth of burial, archaeology and geology.



Orange Force Marine Ltd.

www.orangeforcemarine.com

LOCATION
Port Stanley, Ontario, Canada

PRIMARY CATEGORY
Offshore

CONTACT INFORMATION
Derek Niles
President
dniles@orangeforcemarine.com
+1 (226)376-0494

SECONDARY CATEGORY
Other – Hydrographic/Bathymetric Surveying and Monitoring
Marine Research
Underwater Vehicles

COMPANY DESCRIPTION
Orange Force Marine Ltd. is a specialized marine services company providing safe, professional, cost effective & efficient commercial vessel services, maritime operational expertise, consulting, products and multi-discipline sea-going support to various industrial, academic and government clients throughout the Great Lakes (Canada & US).

With flexible and effective vessels, experienced crews and capable sensor equipment (multi-beam echo sounders, side scan sonar, magnetometers, ROVs, sub-bottom profiling, GIS software), Orange Force Marine is able to deliver ocean-tech research and development, hydrographic / bathymetric survey activities, underwater operations, environmental response and specialized marine technical support.

COUNTRIES EXPORTED TO
Canada, United States, and Global (consulting or specialized bathymetry services)

INTERNATIONAL APPLICATIONS AND EXPERIENCE

Since 2021, Orange Force Marine Ltd has provided automated bathymetry and remote monitoring services and equipment to commercial industry, academia and government organizations globally as part of our bathymetric collection projects. This includes work with universities, hydrographic offices, non-profit citizen science organizations and international regulatory institutions.

Whale Seeker, Inc.

www.whaleseeker.com

LOCATION
Montreal, QC

PRIMARY CATEGORY
Offshore

CONTACT INFORMATION
Christine Fürthaller
Head of Growth
christine@whaleseeker.com
438-863-2268

SECONDARY CATEGORY
Offshore Technologies
Marine Life Research

COMPANY DESCRIPTION
Whale Seeker, Inc. is a for-profit corporation based in Québec, Canada. Whale Seeker ethically uses AI to automate marine mammal detection, delivering better, simpler, and faster marine mammal detection data when and where it matters most. Whale Seeker helps scale marine mammal detection for many clients ranging from governments, private industry, and NGOs. Founded in 2018, the company collaborates with maritime industry partners, academic institutions, and governments to create solutions to promote healthy marine mammals and oceans. As the first Certified B Corp company using AI in service of wildlife, Whale Seeker cares about the ethics surrounding the development of their AI as well as the use of their solutions. Möbius was named one of the top 10 AI solutions in the world to reach SDG goals by The International Research Institute on AI under the auspices of UNESCO (IRCAI) and was also awareded the Solar Impulse Foundation Efficient Solution Label.

COUNTRIES EXPORTED TO
Whale Seeker products can be used worldwide.

INTERNATIONAL APPLICATIONS AND EXPERIENCE
Whale Seeker has worked internationally in Antarctica, the Arctic, and northern Baffin Island.

TECHNICAL CAPABILITIES
Whale Seeker's marine mammal detection products include:

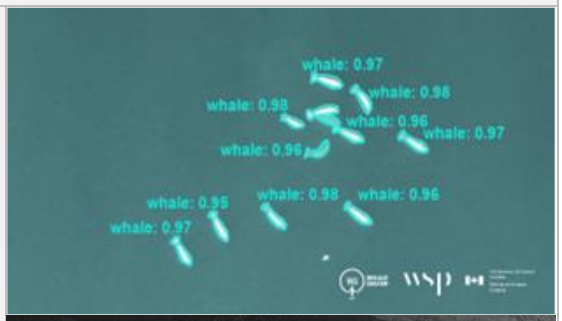
Möbius: https://www.whaleseeker.com/mobius

Möbius Observer: https://www.whaleseeker.com/mobius-observer

Cetus: https://www.whaleseeker.com/cetus

Arc: https://www.whaleseeker.com/arc

These allow for a wide range of detection capabilities, ranging from aerial to satellite imagery analysis to real-time detection via drone imagery to infrared analysis.



Canadian Energy Export Guide

The Canadian Energy Export Guide is a searchable database that represents more than 1,000 Canadian companies that export products and services in the area of oil & gas and related clean technologies, from grass roots exploration, pipeline construction and operation, to end of production decommissioning, reclamation, and remediation. The Canadian Energy Export Guide uses 12 primary categories and 60 sub-categories to identify Canadian companies that are exporting to international markets. The companies listed in this Canadian Capabilities in Offshore Clean Technology Guide and Directory can also be found online in the Canadian Energy Export Guide under the category of Clean Technology and Environmental Management/Offshore.

Industry Partners

The following Canadian associations and organizations have members and/or are working in the area of offshore technology management and operations.

Canadian Association of Petroleum Producers (CAPP) is an industry association that advocates for economic competitiveness and safe, environmentally, and socially responsible performance from its members.

Clean Resource Innovation Network (CRIN) was created to contribute to a future in which Canada is a global leader in producing clean hydrocarbon energy from source to end use.

Enserva is the national trade association representing the service, supply, and manufacturing sectors within the upstream petroleum industry. They also maintain the Canadian Energy Export Guide noted above.

Petroleum Technology Alliance Canada (PTAC) is an industry association with production, academia, government, regulator and technology vendor members. It leads the technology development of methane emission reduction devices, and research into many environmental areas. Of note is PTAC's Canadian Emission Reduction Innovation Consortium including 16 producers and 16 research organizations.