

Advancing Energy Technology and Innovation: Enhanced Strategic Collaboration between Federal, Provincial, and Territorial Governments

Energy Technology Working Group



Energy and Mines Ministers' Conference

Iqaluit, Nunavut

August 2018

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Context

The Energy and Mines Ministers' Conference (EMMC) is an annual gathering of federal, provincial and territorial (FPT) ministers responsible for energy and mining portfolios to discuss how to support a responsible and competitive industry that contributes to the sustainable development of local communities and Canada as a whole. At these meetings, ministers discuss shared priorities for collaborative action to advance energy and mining development across the country.

Collaboration on research, development, and demonstrations (RD&D) in energy technologies plays a significant role in advancing innovation in Canada's energy sector. Energy technology innovation in Canada is advanced by data-driven innovation, technology demonstration, as well as international and intergovernmental cooperation. Collaboration on energy technology innovation is needed to accelerate the transition to a lower-carbon economy and to enhance the competitiveness of Canada's energy sector.

The Pan-Canadian Framework on Clean Growth and Climate Change (PCF) further strengthens the shared interest among governments in working together to transition to a sustainable, low-carbon economy. The PCF is a collective plan developed by the Government of Canada and most provinces and territories that outlines the ways in which FPT governments will collaborate to support clean growth and address climate change, including in the area of energy technology and innovation. Building on the Paris Agreement from COP21, the PCF is both a commitment to the world that Canada will do its part on climate change and a plan to meet the needs of Canadians.

The EMMC's Energy Technology Working Group (ETWG) supports the advancement of energy technology and innovation through collaboration on energy technology RD&D. In previous EMMC's, the ETWG developed reports for energy and mining ministers on FPT collaboration, including challenges to collaboration and best practices and lessons-learned to advance collaboration among jurisdictions.

Federal, Provincial and Territorial Governments have developed strategic collaboration initiatives on energy technology and innovation inspired by these best practices and lessons-learned. Many of these initiatives have been pursued with co-funding from Natural Resources Canada (NRCan), which provides notable support for energy technology and innovation.

This report will profile some of the ongoing strategic FPT collaborations in co-funding data-driven innovation and technology demonstration, as well as intergovernmental and international partnerships promoting energy technology. It is intended to showcase new and ongoing forms of collaboration in innovation to inspire further collaborative activities involving FPT governments and other stakeholders going forward.

Collaborative Initiatives

The following initiatives are examples of recent energy technology and innovation collaborations between Natural Resources Canada (NRCan), provincial and territorial governments, and in some instances, other federal departments and partners across jurisdictions. These examples provide insight into effective mechanisms for collaboration that FPT governments can pursue going forward.



Data-Driven Innovations



Data informs innovation in the Natural Resources sector. The ways data are being collected, channelled and applied are profoundly affecting how everyone, from individuals to governments and businesses, gets information and use it.

FPT governments have developed strategic collaboration initiatives on data-centred projects. A number of collaborative initiatives between governments focus on using data to inform innovative solutions and improve energy technology.

Data and information sharing promotes FPT collaboration for advancing energy RD&D activities. Although many jurisdictions are engaged in energy RD&D, collaboration opportunities may be limited due to a lack of knowledge on the capabilities and technology interest of potential partners. Collaborative data-driven innovation provides an avenue for sharing information for better outcomes and to reduce duplication of efforts or resources.

Data-driven innovation will also affect the energy industry through transformative changes such as its application to automation and artificial intelligence, advancing energy transition, and offering new ways to approach the energy landscape. Federal, Provincial, and Territorial Governments will need to leverage collaboration to foster data-driven innovation in the energy technology industry.

Environmental Monitoring of Tidal Energy Technology

Project Description	Partners
<p>Location: Halifax, Nova Scotia</p> <p>Co-Funding: \$4.1M total (\$1M from NRCan’s Energy Innovation Program; \$1M from ACOA & leverage funding)</p>	<p>Natural Resources Canada (NRCan); Nova Scotia Department of Energy; Offshore Energy Association of Nova Scotia (OERA); Atlantic Canada Opportunities Agency (ACOA).</p>

This initiative aims to solicit research responses to a number of knowledge and technology gaps associated with the current state of tidal energy in Canada. The overarching research objective is to address critical issues common to different tidal energy conversion technologies. This will reduce uncertainty and investment risk and will lower the cost of tidal electricity in Canada.

Critical research themes include but are not limited to, environmental effects monitoring (turbine effects on fish, marine mammals, seabirds, lobster, ambient noise), cost reduction technologies and innovation (common challenges to foundations, moorings, materials and methods), specialized marine operational capacity (innovations in vessel deployment, positioning, research, equipment recovery).

Projects

OERA is supporting five collaborative research project to address knowledge gaps and challenges associated with tidal energy development in Canada:

- Acadia University in Wolfville, NS in collaboration with VEMCO Nova Scotia.
- The Fundy Ocean Research Center for Energy (FORCE), Halifax, NS in collaboration with Acadia University, Kongsberg Marine, University of Maine, and ASL Environmental.
- Dynamic Systems Analysis (DSA), Halifax, NS in collaboration with FORCE, Dalhousie University, Acadia University, Scotrenewables Tidal Power Ltd. and Tocado Tidal Turbines.

- Nova Scotia Community College (NSCC), Dartmouth, NS in collaboration with DSA, Dominion Diving and AML Oceanographic.
- Acadia University in Wolfville, NS in collaboration with University of New Brunswick, Dalhousie University and Luna Ocean Consulting.
- The Fundy Ocean Research Center for Energy (FORCE), Halifax, NS in collaboration with Dalhousie University, Cape Sharp Tidal, Minas Tidal, Operational Excellence, Lengkeek Vessel, DSA, Dalhousie University, Acadia University, Memorial University, UNB, and NORTEK Scientific.
- Luna Ocean Consulting Ltd., Shad Bay NS in collaboration with Memorial University and Dalhousie University.

Anticipated Results

- Allow the Nova Scotia tidal industry to expanding, while helping build the associated national supply and service sectors;
- Allow economic development of up to 200 additional sites in Canada suitable for in-stream tidal turbine technology, including northern and remote locations;
- Reduce greenhouse gas emissions by addressing concerns delaying the development of further renewable marine energy resources;
- Allow Canada to maintain and improve its position in the emerging global tidal energy market.

Enhanced Charging Infrastructure via Vehicle-Side Data

Project Description	Partners
<p>Location: Across Canada</p> <p>Co-Funding: \$6.87M total (up to \$3.25M from NRCan’s Energy Innovation Program)</p>	<p>Alectra Utilities; CrossChasm Technologies Inc. (operating as “FleetCarma”); BC Hydro; Oakville Hydro; Burlington Hydro; Waterloo North Hydro; Nova Scotia Power; Bruce Power; University of Waterloo; Toronto Hydro; Hydro-Québec; New Brunswick Power.</p>
<p>This project addresses concerns by utilities regarding potential grid overload due to electric vehicle (EV) charging, supports optimal EV charging deployment, and addresses barriers to widespread adoption of EV infrastructure in workplaces and multi-unit residences.</p> <p>The project seeks to improve the operation and deployment of charging infrastructure for EVs by demonstrating charging based on the innovative and intelligent use of real world, vehicle-side data, such as battery state and all charge events. The data obtained will provide Canadian utilities and governments with a large-scale view of how EVs are driven and charged in Canada, as well as support ideal deployment of new charging stations and help identify potential grid upgrades. The project also includes demonstrations of “smart-charging” in the workplace and an innovative low-cost charge reimbursement solution for multi-unit dwellings.</p> <p>This demonstration project is divided into three sections, which all utilize the capabilities of FleetCarma’s vehicle data logger combined with centralized data collection and control:</p> <p>Large-Scale EV Grid Integration Impact Analysis Up to 1000 EVs across Canada will be monitored, capturing data on driving and charging habits.</p> <p>Workplace Smart-Charging This section of the project is led by Alectra Utilities and will use FleetCarma’s paired smart-charging</p>	<p>control system, which incorporates data loggers clipped into the vehicle, to minimize EV and grid integration issues.</p> <p>Charge Reimbursements in Multi-Unit Residential Buildings A charge reimbursement system for multi-unit dwellings that is less onerous, lower cost and provides more value to the EV and building owners than installing sub-meters will be demonstrated.</p> <p>Anticipated Results The project’s large-scale EV grid integration impact section will result in information on how EVs are used in Canada. This data will be made widely available to Canadian utilities and policy makers. It will allow for a data-driven approach to identify where grid overloading will and won’t occur, as well as where grid and charging infrastructure upgrades are required.</p> <p>The workplace smart-charging and the multi-unit residential reimbursement sections will improve the ability to intelligently deploy EV charging infrastructure at workplaces and multi-unit residential buildings. It will result in reduced greenhouse gases and increase EV adoption for multi-unit residential buildings, due to providing a lower cost option where simply charge reimbursement is required.</p>

Greenhouse Gas Inventory System for the Upstream Oil and Gas Industry

Project Description	Partners
<p>Location: Calgary, Alberta</p> <p>Co-Funding: \$1.2M total (\$730,000 from NRCan's Energy Innovation Program)</p>	Natural Resources Canada (NRCan); Alberta Energy Regulator (AER); Clearstone Engineering Ltd.; GreenPath Energy Ltd.; Carleton University.

The primary objective of this project is to develop a standardized upstream oil and gas (UOG) emission inventory solution for Alberta. The solution is intended to facilitate integration and harmonization across jurisdictions and demonstrate achievement of provincially and federally stated methane reduction targets.

The project will:

1. Confirm inventory organizational and operational boundaries for the Alberta UOG industry.
2. Feature field data collection to improve confidence in UOG equipment inventories and provincial fugitive and pneumatic emission estimates.
3. Document 'business rules' in Requirements and Design Documents for implementing a data management system and emission calculation modules.
4. Develop an inventory database application for monthly determination of emissions from UOG facilities and wells.



Anticipated Results

The intended result of this project is to minimize or eliminate the use of emission factors and replace with operator reported values for hydrocarbon storage tanks, pneumatic devices, well surface casing vent flows and gas migration (SCVF/GM), dehydrators and equipment leaks. These sources contributed 62% of methane emissions and, 85% of methane uncertainty in the 2011 UOG national inventory (ECCC, 2014). The project will provide a detailed inventory of monthly GHG emissions and uncertainty from the Alberta UOG industry and improve confidence in the identification of methane emission reduction opportunities.

The project is a component of Alberta's commitment to reduce methane emissions in the oil and gas industry by 2025 and the AERs mandate to implement and enforce regulatory requirements, including a system that can intake and manage large data sets from operators for the purpose of monitoring progress toward reduction targets.

Harmonized Methane Emission Platform

Project Description	Partners
Location: Calgary, Alberta Co-Funding: \$9.75M total (\$1.27M from NRCan's Energy Innovation Program; \$2.03M from AER over two fiscal years)	Natural Resources Canada (NRCan); Government of Alberta; Alberta Energy Regulator (AER); Clearstone Engineering.

The objective is to demonstrate a new, more efficient and effective methane emissions reporting platform for the upstream oil and gas (UOG) industry that can collect, manage and share information in a standardized way across multiple provinces. The AER is working to implement a 45% methane emissions reduction in the UOG industry. The AER hopes to accomplish this by developing and administrating various regulatory instruments such as this reporting platform.

The vision for this platform is to facilitate methane emissions reductions through efficient, effective and transparent data management. Objectives are to develop a system that aligns activity and product definitions, facility and asset delineation, reporting standards and formats, accessibility to data and storage standards, architecture, and equipment inventories.

Anticipated Results

The AER has recently implemented modern, service-oriented architecture called "One Stop" for managing regulatory lifecycle processes. The first implementation of the platform included the data collection, management and sharing of information related to reclamation and pipeline construction.

The project was very successful and was awarded an Elite Award for Business Process Innovation by OpenText Corporation in 2016. The OneStop Platform enables easier and transparent sharing of public information. The platform is scalable and is being expanded to include, well operations reports, integrated inspections, and water authorizations within the AER. In addition, Onestop is being adopted by other ministries within the province of Alberta.

The intention for this project is to apply these same technologies within the methane reporting tool to leverage the advantages of data collection, and managing and sharing information in a standardized and collaborative way that encourages further harmonization for methane emission reporting. This will enable deeper and accelerated emission reductions.

Technology Demonstrations



Collaboration plays a significant role in demonstrating advanced energy technology. FPT governments have a shared interest in collaborating on energy technology research, development and demonstrations (RD&D) to reduce risks and help commercialize energy innovations.

Projects that demonstrate new energy technology prove that energy solutions can work. Governments can play a role by working together to attract investment in innovative energy technology, scale up the technology to be viable energy solution, and apply new technology to industry.

Through several initiatives, FPT governments have collaborated to help successfully demonstrate new technology, reduce barriers to introducing new energy innovation, and bring projects from the demonstration stage to the commercialization stage. Collaboration through *co-funding* leverages each resources and expertise between partners to address energy technology priorities.

High Voltage Utility Connected Level 2 Electric Vehicle Charging Demonstration

Project Description	Partners
<p>Location: Vancouver, British Columbia</p> <p>Co-Funding: \$2.4M total (\$1.2M from NRCan's Energy Innovation Program)</p>	<p>Province of British Columbia; BC Hydro; City of Vancouver; Township of Langley; City of Abbotsford; City of Maple Ridge; District of Kent; Fraser Valley Regional District; SPMC Technologies Inc.; Itron Inc.; Zeco Systems Inc (Greenlots); Intertec Testing Services NA Ltd.</p>
<p>The objective of this project is to develop and demonstrate a Level 2 (L2) Electric Vehicle (EV) charger that addresses barriers to EV infrastructure deployment in Multi-Unit Residential Buildings (MURBs), as well as large commercial and municipal buildings. This new charger design will increase the efficiency, reduce installation costs and be directly connected to the utility's smart meter network allowing for individual EV payment resolution and remote monitoring.</p>	<p>wiring, improve the EV charger system's performance and reliability, while also reducing costs. The space savings would be especially beneficial for charger installations in older buildings. A smart utility meter will be integrated into the charger to allow for individual metering and billing, as well as remote monitoring.</p>
<p>Current L2 EV chargers use low AC voltage (240 VAC) as an input. In commercial buildings and MURBs, installation of EV chargers typically require a designated transformer to convert facility voltage (480-600 VAC) to the required L2 charger voltage. In this project, the transformer would be integrated into the charger, which will eliminate the need for the designated transformer reducing space requirements in the meter room, reduce the number of conduits and</p>	<p>Anticipated Results</p> <p>This project aims to reduce barriers to EV uptake by Canadians living in MURBs, as well as aid EV charger installations in commercial and municipal buildings. The demonstrated technology would be replicable in other Canadian and international jurisdictions.</p>



Pilot Facility for Scale Up and Testing Carbon Capture and Conversion Technologies

Project Description	Partners
<p>Location: Richmond, British Columbia</p> <p>Co-Funding: \$2.16M total (\$950,000 from NRCan's Energy Innovation Program)</p>	<p>Natural Resources Canada (NRCan); CMC Research Institutes; BC Research Inc.; University of British Columbia</p>

This project has established a multi-purpose technology development and scale up facility to validate and test carbon capture and conversion technologies at a small scale (up to 1 tonne/day), and prepare them for scale-up, for testing in the field or at the commercialization centre in Alberta or elsewhere.

This facility enables researchers and technology developers from government, academia and industry to accelerate the development, validation and prototyping of novel carbon capture and conversion technologies. The facility is unique in its synergistic and system engineering approach in developing the most efficient solutions for GHG emissions from a broad range of industrial processes.

This project enables multi-sector partnerships to reduce bottlenecks in the innovation chain associated with scaling up activities, and provides critical training opportunities for students and young professionals.

Anticipated Results

The facility's holistic view on carbon and conversion processes should have a significant technical impact, through process intensification and cost reduction. Potential synergies achieved through this approach would most likely have direct impact on both environmental and economic aspects of any projects.

Some of the economic and social impacts will include economic diversification, clean tech development and improved access of Western Canadian oil and potentially liquefied natural gas products to global markets.

New carbon capture and conversion technologies that are going to be developed and scaled up at the facility will accelerate GHG emissions reductions from the most carbon intensive industries in Canada. Other benefits could include international exports, increased competitiveness for Canadian clean tech, and the growth of a knowledge based economy in Canada.

Enhanced Modified VAPour EXtraction R&D Operation

Project Description	Partners
<p>Location: Conklin, Alberta</p> <p>Co-Funding: \$56.9M total (\$9.9M from NRCan’s Oil and Gas Clean Tech Program; \$2.3M from AI)</p>	<p>Natural Resources Canada (NRCan); Alberta Innovates (AI); Western Research Institute (WRI); MEG Energy Corp.</p>

The main objectives of the enhanced Modified VAPour Extraction (eMVAPEX) technology are to efficiently grow MEG’s bitumen production rate, achieve sustainable cost savings and minimize environmental impacts to land, air and water. It is anticipated that by employing eMVAPEX, a steam/solvent hybrid process, the bitumen production rate and overall bitumen recovery will increase relative to the SAGD process while requiring significantly less steam injection.

As eMVAPEX requires less steam per barrel of oil, MEG is projecting an approximately 43% reduction in GHG emissions relative to the industry average as well as a significant reduction in water usage.



The efficiency gain in steam deployment will allow MEG to redeploy existing steam generation capacity to new patterns, further increasing bitumen production and reducing the overall per barrel footprint and cost of bitumen production.

Anticipated Results

MEG targets annual production of 80,000-82,000 barrels per day. Steam generation is the main contributor to GHG emissions and the operating cost of bitumen production. eMVAPEX involves injection of a light hydrocarbon instead of steam after initial SAGD operation when bitumen recovery reaches between 20-30%.

It is anticipated that by employing eMVAPEX, overall plant bitumen production could be increased by up to 70% with the same steam assets employed for SAGD bitumen production. The overall GHG emission intensity is expected to be reduced by as much as 43% for industry standard assets at 3.0 SOR, as well as improving the overall recovery from the reservoir.

Combined Direct Contact Steam Generation and Non-Aqueous Extraction Demonstration Project

Project Description	Partners
<p>Location: Alberta</p> <p>Co-Funding: \$24.7M total (\$7.8M from NRCan’s Oil and Gas Clean Tech Program; \$2.2M from AI)</p>	<p>Natural Resources Canada (NRCan); Alberta Innovates (AI); Suncor Energy Oil Sands Limited Partnership.</p>

The project, composed of Direct Contact Steam Generation (DCSG) (Project A) and Non-Aqueous Extraction (NAE) Demonstration (Project B) supports the federal government’s objectives to reduce greenhouse gas (GHG) emissions and improve environmental performance of the oil sands operations in Alberta and the broader Canadian oil sector.

Project A will demonstrate the technical capability of the DCSG technology through continuous operation at the field scale. DCSG is considered a viable alternative to the Once-Through Steam Generator technology currently used to make steam for the in-situ steam-assisted gravity drainage (SAGD) bitumen extraction. Given there are no boiler tubes in the proposed DCSG technology to generate steam, scaling and fouling are minimized. This will also allow water treatment to be reduced drastically altering the footprint, complexity, and cost structure of a SAGD production facility. Carbon sequestration opportunities will also be explored in this project.

Project B will develop a non-aqueous extraction process (i.e. use of solvent rather than water) as an alternative technology for recovering bitumen from mined oil sands ore. The NAE technology could potentially replace the current hot water process used in the oil sands industry.

The project will validate the environmental and cost benefits for the development of the commercial demonstration plant. It will be used for processing high fines ore that is currently being stockpiled from mining operations and for future deployment on new oil sands leases.

Anticipated Results

The anticipated benefits to Canada from Project A (DCSG) include less GHG emissions by industry, improved thermal efficiency, lower steam-to-oil ratio, and the ability for carbon capture and management. For Project B (NAE), the benefits include bitumen production using less water, producing less tailings as well as reduced GHG emissions. Both projects will accelerate technology development particularly for the oil sands operations which will advance Canada’s environmental goals and economic competitiveness.



Hydrogen-Donor Diluent Reduction (HDR)

Project Description	Partners
<p>Location: Fort McMurray, Alberta</p> <p>Co-Funding: \$24.8M total (\$9.4M from NRCan’s NRCan’s Oil and Gas Clean Tech Program; \$2.2M from AI)</p>	<p>Natural Resources Canada (NRCan); Alberta Innovates (AI); Alberta Sulphur Research Limited (ASRL); BP Canada Energy; Husky Oil Operations Limited.</p>

The purpose of this demonstration project is to scale-up Hydrogen-Donor Diluent Reduction (HDR) technology to validate the continuous achievement of product quality, diluent reduction and GHG reduction performance objectives.

This 500 barrel per day demonstration project, located at the 60,000 Barrel per day in-situ Sunrise Oil Sands Limited Partnership Energy Facility operated by Husky Oil Operations Limited situated north-east of Fort McMurray Alberta, will demonstrate HDR diluent reduction technology around the clock over a 6 month period. Real-time conventional dilbit (diluted bitumen) from Sunrise will feed the demonstration. The diluent will be recycled back into the in-situ facility, and HDR product will be generated.

HDR accomplishes GHG reductions by changing the bitumen molecule to facilitate reducing and replacing the amount and type of diluent required for the transportation of bitumen to refineries by pipeline and by eliminating the need to vaporize undesirable light fractions contained in the diluent out of the diluted bitumen at the refinery.

HDR has the potential to reduce 4.75 million tonnes per year of carbon dioxide emissions for every 1 million barrels per day of bitumen processed.

Anticipated Results

HDR has implications for the entire oil sands industry, currently facing a bottleneck of pipeline export capacity. If HDR becomes standard practice, reduced diluent volumes would allow for more Canadian product market access with improved product value. The technology is designed to dovetail with existing in-situ facilities, and it is anticipated that new in-situ facilities would apply this technology.

Subject to a successful pilot, Husky would consider HDR for commercial installation along with any expansions of its Sunrise project and any associated long term and expensive pipeline expansions. Assuming HDR is validated through this demonstration, project participants are expected to adopt the technology which would facilitate wide scale acceptance and deployment.

Cenovus Hot Solvent Process

Project Description	Partners
<p>Location: Foster Creek, Alberta</p> <p>Co-Funding: \$9.5M total (\$7.5M co-funded by NRCan; \$2M co-funded by Alberta Innovates)</p>	Cenovus FCCL, ConocoPhillips Canada; Alberta Innovates (AI); Natural Resources Canada (NRCan).

This solvent technology project will demonstrate an enhanced bitumen recovery process involving the co-injection of steam and solvent in an in-situ steam-assisted gravity drainage (SAGD) production at the Foster Creek project.

It will test the efficiency of the steam and solvent co-injection in terms of the amount of oil recovered, the water and steam requirements, and its impact on the cumulative steam-to-oil ratio (SOR) during bitumen production, and on water treatment costs associated with steam generation.



Anticipated Results

Outcomes may include increased market competitiveness and environmental performance resulting from the more efficient bitumen production and lower energy costs while lowering water use and greenhouse gas emissions (GHG) in the Canadian oil sands industry.

Specifically, if the demonstration project is successful and later deployed, the SOR and the related GHG emission intensity of existing in-situ oil sands operations could be reduced significantly and make new in-situ projects emit lesser GHG and more economical due to lower capital requirements associated with reduction in water treatment and steam generation costs.

Intergovernmental and International Partnerships



Advancing energy technology in Canada requires strong partnerships between federal, provincial, and territorial governments. FPT governments can work together through several forms of strategic collaboration such as co-funding projects, joint calls, and trusted partnerships.

Joint calls allow partners to leverage each other's resources and expertise to address common priorities by supporting multiple projects. Initiatives such as the *Clean Growth Program* aim to spark RD&D innovation through FPT partnerships on clean technology projects.

Trusted partnerships lay the foundation for strong collaboration. Intergovernmental agreements such as the *Alberta-Canada Collaboratory on Clean Energy Research and Technology* specify shared priorities between governments and the collaborative efforts needed to reach clean technology goals. They are also an efficient mechanism for facilitating project co-funding, joint calls, and information sharing.

To advance energy technology, Canada also needs to engage with partners at the international-level. Collaboration between FPT governments is needed to bring Canadian energy technology innovation to the world stage and to learn from other nations' innovations to implement them at home.

Alberta-Canada Collaboratory on Clean Energy Research and Technology

Description



Signed by NRCan's Minister of Natural Resources, Jim Carr, and Alberta's Economic Development and Trade Minister, Deron Bilous in 2017, the Memorandum of Understanding (MOU) between the Government of Canada and the Government of Alberta enhances FPT collaboration on more sustainable oil sands development, as well as clean energy technology and research addressing climate change and pollution for a clean growth economy.

This MOU builds on a previous one between the Governments of Canada and Alberta signed in 2012 that supported the development of new and improved oil sands technologies. This MOU expands the scope to include clean technologies outside of the oil sands sector, focusing on the following 4 areas:

- Cleaner natural resources;
- Bio-industrial;
- Energy efficiency and environmental performance; and,
- Transforming the energy mix.

Partners

Government of Canada (Natural Resources Canada); Government of Alberta.

Partnership Objectives

- Enable strategic planning and funding discussions on clean energy;
- Align collaboratory efforts with Alberta and Canada's energy strategies, innovation, and R&D to support energy and climate change policies and priorities;
- Ensure the full research and technology development capacity of Alberta and NRCan's CanmetENERGY laboratories is harnessed; and
- Strengthen the ability to collaborate on transformative research, scale-up and demonstration projects in targeted areas.

Specifically, in the short term, the MOU supports collaborative funding of up to 4 projects by the Governments of Canada and Alberta. In the long term, the agreement supports the transition of Alberta towards a low carbon, circular economy. It helps to capitalize on opportunities to develop new technology products and services for global opportunities. NRCan and the Government of Alberta are already working closely together on related projects, including the [Carbon Conversion Technology Centre](#).

Alberta Carbon Conversion Technology Centre

Project Description	Partners
<p>Location: Calgary, Alberta</p> <p>Co-Funding: \$20M total (\$10M co-funded by NRCan; 10M co-funded by Alberta Innovates)</p>	<p>Government of Canada (Natural Resources Canada); Government of Alberta.</p>

The Alberta Carbon Conversion Technology Centre (ACCTC) fills a gap in large-scale infrastructure in the innovation chain that allows for potential CO₂ utilization and conversion technologies to be tested at near commercial scale. At the ACCTC, a facility with five outdoor test bays, innovators have the chance to see how their technologies work in a “real-life” environment that provides flue gas from natural gas combustion.

Following the ACCTC Grand Opening ceremony on May 25, 2018, the facility will be available to the five finalists in the natural gas track of the NRG COSIA Carbon XPRIZE to demonstrate their technologies, including three Canadian and two US technology developers. After the Carbon XPRIZE is awarded in 2020, the ACCTC will be available for use by other global innovators interested in proving out new technologies.

Innovations tested at the ACCTC are expected to contribute to economic diversification and job creation.

The ACCTC is a tangible demonstration of Canada’s and Alberta’s resolve to reduce greenhouse gas emissions. The ACCTC will help accelerate the development of carbon conversion and utilization technologies from CO₂ generated by natural gas combustion. Innovations commercialized at the ACCTC can be applied across multiple industries.

Anticipated Results

- Creating a vital strategic public asset for accelerating carbon dioxide capture and utilization.
- Demonstrating Alberta’s and Canada’s leadership in supporting technology demonstration infrastructure to advance world-class carbon capture and utilization technologies.
- Developing an internationally recognized cluster of expertise and activity around carbon utilization and creation of value-added products.
- Filling an infrastructure gap by creating a facility capable of de-risking large-scale industrial technology development.

Collaboration

The ACCTC will be located adjacent to the Shepard Energy Centre in Calgary and will be unique in the world by enabling innovative CO₂ capture, conversion and utilization technologies to be tested and refined at a near-commercial scale using real-life flue gas from natural gas combustion.

Clean Growth Hub

Description	Partners
<p>The Clean Growth Hub is a whole-of-government focal point for clean technology focused on supporting companies and projects, coordinating programs and tracking results. The Hub also advances the Clean Technology and Innovation pillar of the Pan-Canadian Framework on Clean Growth and Climate Change, and is part of the Innovation and Skills Plan.</p> <p>The Clean Growth Hub is a new service model that provides access to representatives of a number of federal departments and agencies with policies or programs that support clean technology. They are co-located together in Ottawa but serve all of Canada. This model leverages existing knowledge, expertise and working relationships while providing an easy, single point of contact for clean technology users and producers.</p> <p>The Clean Growth Hub helps stakeholders access over \$2.3 billion from Budget 2017 funding dedicated to clean technology, as well as other existing Government of Canada funding.</p>	<p>Government of Canada (various GoC Departments)</p> <p>Participating departments and agencies include:</p> <ul style="list-style-type: none"> • Innovation, Science and Economic Development Canada (Co-Chair) • Natural Resources Canada (Co-Chair) • Agriculture and Agri-Food Canada • Business Development Bank of Canada • Canadian Commercial Corporation • Environment and Climate Change Canada • Export Development Canada • Fisheries and Oceans Canada • Global Affairs Canada (Trade Commissioner Service) • National Research Council Canada • Sustainable Development Technology Canada • Transport Canada • Treasury Board of Canada Secretariat (Centre for Greening Government) <p>Opportunity for Collaboration</p> <p>While the Clean Growth Hub services will initially focus on connecting proponents to federal investments, it will gradually expand its network to connect proponents to relevant provincial, territorial, municipal, private sector and international networks and resources, whenever possible.</p>



Clean Growth in the Natural Resources Program

Description	Partners
<p>The Clean Growth Program (CGP) which launched on November 20, 2017, provides \$155M/4 years for the co-funding of clean technology RD&D projects with provinces and territories, in Canada’s energy, mining and forestry sectors. Overall, the program aims to advance clean technologies so that natural resource operations can better reduce their environmental impacts on air, land, and water.</p> <p>The CGP provides an opportunity to further enhance the leveraging of funds to support clean tech projects. This objective is being met through the establishment of trusted partnerships with key provincial/territorial partners and funding associations.</p> <p>Trusted partnerships are established through the signing of Memorandums Of Understanding and Non-Disclosure Agreements, trusted partnerships enable efficient collaboration via the sharing of information, leveraging of respective funding processes and the possible establishment of parallel calls for proposals.</p> <p>Trusted Partnerships are an effective means to lessen the burden of co-funding projects by reducing barriers and streamlining the proposal review processes at both levels of government, facilitating the sharing of information, and expertise, and can be used to leverage respective calls for proposals</p> <p>Any project vetted, and approved, by either NRCan’s or trusted partners’ application processes could be easily co-funded by the other party.</p>	<p>Government of Canada (Natural Resources Canada); Alberta Innovates; BC Innovation Council; Emission Reductions Alberta; Innovation Saskatchewan; Natural Gas Innovation Fund; Offshore Energy Research Association; Ontario Centre of Excellence.</p> <p>Trusted Partnerships are not tied to specific programs and can be leveraged by other NRCan programs as mutually beneficial opportunities arise with PT partners.</p> <h3>Moving Forward</h3> <p>As of March 21, 2018 NRCan – Innovation & Energy Technology Sector has established seven partnerships (see above). Additional trusted partnerships with provincial partners are currently under development. An agreement with the <i>BC ICE Fund</i> is in its final stages</p> <p>Given the efficiency and certainty the framework provides, it is an ideal tool for future provincial and territorial collaboration even beyond this program, and these partnerships will facilitate efficient federal/provincial collaboration for years to come.</p> <p>The program expects to fund approximately 40 projects, a subset of which will be co-funded through the trusted partners. Streamlined projects funded through the trusted partnerships will be announced in 2018.</p> 

Cleantech Impact

Description

Federal Budget 2017 committed \$75 million over 4 years to create the cleantech stream of the Impact Canada Initiative, launched under the name Cleantech Impact in May 2018. The Initiative takes a challenge-based approach to accelerate breakthrough cleantech solutions to tough problems, such as reducing reliance on diesel in remote and northern communities.

For more information, please visit:

impact.canada.ca

Lead

Government of Canada (Natural Resources Canada)

FPT Engagement

Engagement with PTs occurs throughout challenge development to inform challenge design. Webinars and in-person meetings across Canada took place between April – July 2018 specifically to shape a possible challenge focused on reducing reliance on diesel in northern/remote communities.

CLEAN TECH IMPACT



International Collaboration through Mission Innovation

Project Description



Mission Innovation (MI), a global initiative of 22 countries and the European Commission, works to increase the availability of advanced technologies that will define a future global energy mix that is clean, affordable, and reliable.

MI governments are seeking to double their spending on clean energy technology RD&D to increase the rate at which new clean energy solutions are ready to be taken up by the private sector.

Here in Canada, we have pledged to double annual federal investments in clean energy innovation from a baseline of C\$387 million in 2014/15 to C\$775 million by 2020.

Collaboration

MI Ministers gather every year to take stock of the progress and to plan ahead. On May 23-24, 2018, the European Commission, together with Nordic countries, co-hosted the 3rd Mission Innovation Ministerial in Malmö, Sweden.

Not only is MI focused on collaboration between members, it also encourages work with private industry.

Five MI governments, including Canada, recently announced a partnership with the Breakthrough Energy Coalition (BEC), an independent and parallel initiative led by Bill Gates that includes over 30 influential investors from around the world.

Partners

Government of Canada (Natural Resources Canada); MI Member Governments; Breakthrough Energy Coalition

Through collaboration with the BEC, who has committed to providing more patient, early-stage capital to accelerate energy technology innovation, we aim to help Canadian researchers and companies overcome early stage financial challenges. As a first step in this collaboration, BEC plans to commission a scoping study on Canada that will provide valuable insights on the Canadian energy innovation system from an investor’s perspective.

Opportunity

Canada plays a leadership role in the international MI effort and will host the 4th Mission Innovation Ministerial in Vancouver in May 2019. This event will be a key opportunity to highlight Canada’s advancements in clean energy innovation.

NRCan, Canada’s lead on MI, has engaged with Provinces and Territories through the EMMC Energy Technology Working Group to identify opportunities for involvement in MI. Connections will continue to be established as interest is expressed. FPT governments working together in international fora, such as MI, is key to enhancing the partnerships and collaborations that can help open new markets and position Canada as a global energy leader.



TEQ and SDTC Collaborative Funding for Innovation Projects

Description	Partners
<p>Sustainable Development Technology Canada (SDTC) and <i>Transition énergétique Québec</i> (TEQ), through the province’s <i>Technoclimat</i> program, are working together to support innovation in energy and reduction of greenhouse gas emissions (GHG).</p> <p>For the purpose of allowing applicants to maximize their sources of funding to carry out their project, TEQ and SDTC partnered to simplify approaches to file an application in the context of these two programs in innovation. Since January 2018, it is now possible to file a joint application with TEQ and SDTC to submit a project in innovation.</p> <p>This collaboration also allows applicants and projects to benefit from the expertise of both organizations, particularly in the context of the evaluation of the innovation projects in energy and GHG emissions reduction.</p> <p>(Note: opportunities for collaboration between SDTC and other provinces/territories are also available.)</p>	<p>Sustainable Development Technology Canada (SDTC); Transition énergétique Québec (TEQ)</p> <p>SDTC funds projects to develop clean technologies and support businesses in commercialization that promote innovative pre-commercial technologies and can demonstrate significant economic benefits and advantages in one or more areas including climate change, air pollution, with clean water and soils.</p> <p>TEQ's Technoclimat program aims to encourage the development of technological innovations in Québec in the areas of energy efficiency, renewable energies, bioenergy, and greenhouse gas emissions reduction by providing support to project developers who wish to demonstrate the potential of a technological innovation. The program can also support projects aimed at testing in technologies in Québec that are not available on the Québec market or that are found to be only marginally available.</p>



Key Observations

In Canada, co-funding collaboration on advancing energy technology is centred on data-driven innovations and technology demonstrations. Ongoing collaborative initiatives in RD&D are strengthening Canada's energy technology sector. Investment in data-driven innovations are helping to improve clean technologies while investment in technology demonstrations help to scale-up clean energy solutions, bring new tech to the commercial stage, and apply to industry to reduce emissions.

Strategic collaboration for advancing energy technology in Canada is already driving our innovation in this sector, but there is an appetite for stronger partnerships. Trends towards more intergovernmental agreements and the ongoing collaboration behind the Pan-Canadian Framework on Clean Growth and Climate Change indicate a desire for enhanced strategic collaboration between FPT governments to meet Canada's climate change commitments and supporting clean growth.

Strategic collaboration initiatives are an effective approach to advancing shared interests. Collaboration through joint calls and co-funding initiatives allow for FPT governments, as well as industry partners, to leverage each other's resources and expertise to address common priorities in climate change and clean growth. Shared initiatives can be identified more specifically and collaboration can be strengthened through trusted partnership agreements between governments.

Stronger FPT collaboration strengthens Canada's economic advantage in energy technology. FPT collaboration accelerates Canada's energy technology innovation. As the world seeks technology solutions to reduce emissions and achieve economic growth, Canada is seen as a leader in energy technology on the world stage and a place for investment in further RD&D and commercialization of innovation developed at home. Stronger FPT collaboration on RD&D can make Canada a leading exporter of energy technology.

FPT governments are encouraged to seek opportunities to collaborate on energy technology and innovation. It is important to note that strategic collaborations extend beyond formal mechanisms such as trusted partnerships and co-funding, and that other forms of strategic collaboration for advancing energy technology RD&D are encouraged such as information sharing, joint research, and improving market access to new technology to accelerate development. The examples of mechanisms for strategic collaboration in this report aims to spur interest and lead to increased collaboration initiatives between federal, provincial and territorial governments going forward.