

ANNUAL REPORT

2025-2026

CanmetENERGY in Varennes

*A Government of Canada
clean energy research centre*



Natural Resources
Canada

Ressources naturelles
Canada

Canada



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Message from the **Director General**



As Canada's energy outlook continues to evolve in a context shaped by rapid scientific advances, changing societal expectations, and increasing environmental and economic complexity, CanmetENERGY in Varennes remains committed to developing world-class, science-based solutions that support Canada's energy resilience, competitiveness, affordability, and long-term prosperity.

Strengthening energy security, improving productivity, and accelerating the transition to cleaner and more efficient energy systems are closely interconnected priorities. As the Government of Canada's clean energy research centre, CanmetENERGY in Varennes contributes to the development of knowledge, tools, and technologies that help governments, industry, communities, and Canadians make informed decisions in a constantly changing environment.

This year, our teams continued to strengthen scientific excellence, expand strategic partnerships, and advance applied research initiatives that position the Centre at the forefront of energy innovation. Despite a demanding operating environment, our employees continued to deliver work aligned with the Government of Canada's priorities in energy efficiency, clean growth, grid modernization, industrial competitiveness, and energy security.

Through collaboration with industry, utilities, educational institutions, Indigenous partners, communities, and governments, CanmetENERGY helps shape a cleaner, more resilient, and more competitive energy future for Canada.

Over the past year, the Centre's research activities have advanced solutions for smart, energy-efficient buildings, the decarbonization of industrial systems, the integration of more flexible and resilient electricity grids, and support for northern and remote communities. We have also strengthened tools that support the planning and evaluation of projects related to energy efficiency, renewable energy, and cogeneration. In addition, our work on carbon capture, utilization, and storage (CCUS), as well as on clean fuels, is helping to reduce emissions in sectors that are among the most difficult to decarbonize.

Beyond technology development, we contribute to strengthening Canada's innovation ecosystem by training highly qualified personnel, generating scientific knowledge, transferring technologies to industry, and supporting the development of policies, programs, codes, and standards.

The growing integration of digital technologies, data-driven approaches, and artificial intelligence is also enhancing our ability to address complex energy challenges and support the modernization of Canada's energy systems.

These achievements reflect the expertise, dedication, and professionalism of our employees and collaborators across Canada. I would also like to recognize the leadership of Jocelyn Millette, who served as Director General over the past seven years, including during the period covered by this annual report, and who helped guide the Centre's sustained efforts under Canada's clean energy innovation agenda. I am proud to build on this strong foundation, working together with our teams and partners to further advance the Centre's mission.

Looking ahead, CanmetENERGY will continue to support the Government of Canada's priorities through research, collaboration, and technology development to generate tangible benefits for Canadians and help build a more sustainable, resilient, affordable, and prosperous energy future for Canada.

Alexandre Prieur
Director General

Looking Forward to a **Green** Future

Although our scientific plan extends to 2028, we adapt our activities to evolving Canadian priorities and circumstances. In addition to the 13 projects funded through the Program of Energy Research and Development (PERD) and the Energy Innovation Program (EIP), we are continuing our work on CCUS, hydrogen, and clean fuels. We are also advancing projects in collaboration with the forest sector, the Treasury Board of Canada Secretariat (Greening Government Operations), and the Department of National Defence. These initiatives are coordinated under a shared vision and mission, supported by highly skilled and interconnected teams, to help Canada become “an energy superpower in both clean and conventional energies.”¹

Over the coming years, we will:

- › continue to develop technologies and knowledge, while studying and refining transfer mechanisms to deliver results throughout our five-year plan. This will enable the users of our research to accelerate “no-regrets” decision-making while minimizing the risk of stranded assets;
- › enhance our testing and development infrastructure by upgrading our electrical and thermal microgrid to approximately 250kWe, expanding our high-performance computing capacity to support artificial intelligence (AI) applications, and improving our air-to-air, air-to-water, ground-source, and cold-climate heat pump facilities;
- › leverage our energy system modelling capabilities to support GHG emissions reductions while strengthening energy security and prosperity at the community, provincial, and national levels;
- › continue collaborating with other federal departments, particularly the Department of National Defence, by providing expertise and knowledge to enhance energy self-sufficiency and security while reducing greenhouse gas emissions;
- › ensure internal and external scientific training and succession in strategic areas to support our mandate. This innovation plan, spanning 5, 10, and 15 years, will be informed by foresight exercises and consultations with the scientific community to anticipate changes in the social, economic, and geopolitical landscapes in the years to come.

We recognize the extent of the task at hand and welcome collaboration with organizations that share our mission.

¹ [Mandate Letter | Prime Minister of Canada](#)

Who We Are

Clean Energy | Research | Innovation | Leadership

The **CanmetENERGY in Varennes (CEV) research centre**, located on Montreal's south shore, is part of Natural Resources Canada's Energy Technology Sector (ETS).

With over 180 researchers, engineers, technologists, managers and support staff, we lead research and development (R&D) activities and deliver programs aimed at developing clean and efficient science and technology for a low-carbon future.

We collaborate with partners from non-governmental organizations, academia, industry, and all levels of government.

We strive to put science at the service of all Canadians.



Our Values

At the core of our decisions and actions lie the excellence and scope of our work, the accountability of public funds and resources, great and efficient teamwork, as well as the well-being, development and motivation of our employees. We value diversity within our team for a healthy, respectful, inclusive and creative work environment.

Our Impact and Scientific Productivity

We use several means to communicate and disseminate our science. The results of our R&D activities are namely:

- › Presented in international conferences
- › Published in reports and scientific journals
- › Integrated in several codes and standards
- › Included in new patented technologies
- › Taught in university courses, workshops and training sessions
- › Highlighted in posters, videos, brochures and other promotional material
- › Deployed in our software tools, federal government facilities, and remote communities not connected to the power grid
- › Shared in television reports, radio interviews, articles published on the Natural Resources Canada website, and posts on our social media platforms

Our work is focused on a successful energy transition and the achievement of GHG emissions reduction targets. Our science and conclusive data enable us to:

- › Support government policy decision-making
- › Develop national strategies and guidelines
- › Provide technical expertise to public deployment programs
- › Foster technological innovation in Canada's various sectors

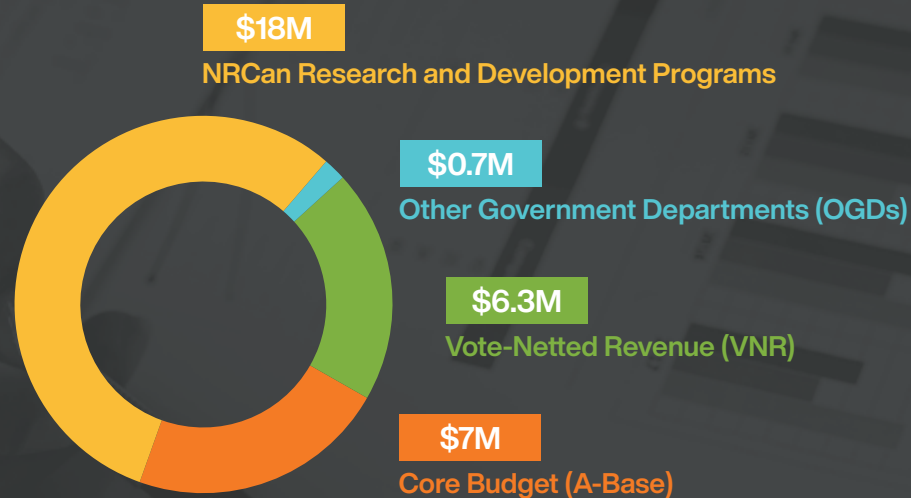
Our Areas of Activity

Our facilities are equipped to develop, test and demonstrate clean energy solutions in real-world conditions to enhance their market uptake. Our activities and expertise in various sectors include:

BUILDINGS	INDUSTRIAL SYSTEMS OPTIMIZATION	RENEWABLE ENERGY INTEGRATION	RETScreen
 Renewable heating and cooling systems	 Industrial decarbonization	 Transition to high renewable integration on the grid	 RETScreen Expert
 Intelligent buildings operation	 Clean fuels, bioeconomy and hydrogen	 Smart grid and microgrid control for resilient power systems	 RETScreen Innovation Lab
 Energy systems for northern and remote infrastructures	 Industrial decarbonization powered by artificial intelligence (AI)	 Smart cities and communities	 RETScreen Data Onboarding
 Greening Government services and expertise	 Carbon capture, utilization and storage (CCUS)	 Distributed energy resource assessment and technology	 RETScreen Capacity Building

Structure & Annual Budget

SOURCE OF FUNDS



DISTRIBUTION OF FUNDS

R&D PROGRAMS	STRATEGIC & OPERATIONAL	DEPLOYMENT
Buildings 23 employees \$6.2M	Science Impact Unit 4 employees \$0.8M	RETScreen 25 employees \$2.3M
Industry 38 employees \$4.7M	Scientific Outreach 6 employees \$0.5M	Greening Government Operations (Buildings division) 12 employees \$1.7M
Renewable Energy Integration 40 employees \$4.6M	Operations 18 employees \$3.5M	Energy Systems for Northern & Remote Infrastructures (Buildings division) 13 employees \$5M
Test Benches 7 employees \$0.8M		

In millions of dollars, including salaries, benefits, operations, and maintenance.
Excludes student salaries of \$1.9M. Full-time equivalent (FTE).





Overview of our science and technology activities carried out during the 2025-2026 fiscal year

BUILDINGS



Our Buildings division carries out R&D activities and deploys energy efficiency, renewable energy integration and smart electrification solutions and technologies for the decarbonization of buildings. Our activities aim to support Canada in achieving its GHG emissions reduction targets to achieve net-zero emissions by 2050.



Renewable Heating and Cooling

Accelerating heat pump adoption

Heat pumps play a vital role in building electrification and heating decarbonization. **Techno-economic simulation studies on cold-climate air-source heat pumps** in the Canadian residential sector were conducted to identify adoption barriers, quantify regional benefits and develop strategies to increase their uptake. We collaborate with the Office of Energy Efficiency (OEE) on initiatives to promote the adoption of air-source and ground-source heat pumps in commercial and institutional buildings. We have developed recommendations for sizing cold-climate heat pumps in the residential sector across all Canadian regions.

KEY OUTCOMES

The **techno-economic simulation studies** informed the **requirements of the Canadian Greener Homes Initiative and a heat pump sizing guide**. The studies also enhanced understanding of the increase in electricity demand, addressing questions about other aspects of decarbonization. A two-year project with the OEE is underway to increase heat pump penetration in commercial and institutional buildings, evaluating the technical and economic potential of cold-climate air-to-air heat pumps in rooftop units and updating design guides and training materials for ground-source heat pumps.

CO₂ heat pump with ejector

Transcritical CO₂ heat pumps are **increasingly used in a variety of heating and cooling applications in buildings**. Integrating a two-phase ejector as an expander improves the performance of a heat pump, especially at low-source temperatures. The ejector is a simple device with no moving parts, which allows high pressure to entrain and compress a lower pressure stream.

KEY OUTCOMES

Ongoing experimental work has quantified ejector benefits for multiple heating applications requiring different temperatures, such as space heating with radiant floor systems (25°C to 37°C), low-temperature hydronic loops (37°C to 50°C) and domestic hot water production (50°C to 60°C). Measured benefits include performance increases (up to 18%) and capacity increases (up to 20%). Operational and control knowledge has been developed to **maximize gains**. Our team of experts **assists Canadian CO₂ system manufacturers in enhancing competitiveness** by offering more efficient CO₂ systems.

CO₂ thermal network

The CO₂ Thermal Network developed by CEV is **expected to greatly improve the way thermal energy is used, recovered and distributed** in commercial and institutional buildings. This innovative technology comprises a single pipe that circulates two-phase (liquid-vapor) CO₂ as a heat carrier fluid. Heat pumps connected to the CO₂ loop provide heating or cooling to the different zones of a building or building cluster.



KEY OUTCOMES

Ongoing experimental work **has developed and tested control sequences crucial** for achieving targeted performances. Discussions are underway with Canadian companies interested in commercializing the technology, which is patented in Canada and the United States.



Highlights

- › Our team, in collaboration with other federal entities, successfully implemented a high-temperature heat pump in a forestry building in Quebec City. This is the first project of its kind in a federal building. The project serves as a technology showcase with significant reproducibility potential.

New research activity

- › A new project aimed at **improving the energy efficiency of federal urban energy systems** will be funded starting in 2025 by the Greening Government Fund—an initiative that supports the greening of federal operations. Control strategies to optimize steam pressure in systems equipped with natural gas boilers, thereby reducing fuel consumption and GHG emissions, will be developed under this project.

CO₂ vertical thermosiphon to extract ground heat

This passive technology is particularly interesting for **improving building heating efficiency and maintaining permafrost under buildings in northern remote communities.**

KEY OUTCOMES

A feasibility analysis was conducted on the implementation of geothermal thermosiphons with heat recovery and reuse to improve space heating at Université Laval's new research station in northern Quebec. This technology will be assessed as a measure to preserve permafrost stability and improve the resilience of Department of National Defence (DND) buildings in the Arctic.

High temperature heat pump for building retrofit

Many buildings in Canada's building inventory use a high-temperature (80-90 °C) hydronic heating system. Existing, new, and emerging heat pump technologies that make it possible to achieve these temperatures in a cascade system or by using waste heat offer a **solution for the electrification of these buildings.**

KEY OUTCOMES

Preliminary analysis of recorded data indicates that the implementation of a high-temperature heat pump at the Laurentian Forestry Centre (a NRCan building) resulted in a reduction in steam consumption for space heating by 24%. The project is part of a **technology showcase** and will **support the market entry of Canadian equipment manufacturers.**

Heat pumps combined with thermal storage

Integrated heat pump and thermal storage solutions for buildings enable **storing excess thermal energy provided by the heat pump** during low building load periods, and **then using the stored energy to supplement or entirely replace heat pump operation** during peak periods. Benefits include increased building flexibility to reduce electricity consumption during peak periods, reduction (and in some cases, elimination) of auxiliary heating systems using fossil fuels or less efficient electric baseboards, and, lastly, reduction of investment required for upgrading building electrical infrastructure.

KEY OUTCOMES

Work in this new research area has made it possible to **evaluate, through modelling and simulation, heat pump solutions** using phase change materials as thermal storage units. Test benches are under development to test these solutions.

Data-Driven Building Operation for Increased Energy Efficiency, Flexibility, and Resiliency

Software tools to increase the energy efficiency of heating and cooling plants and the decarbonization of their operation

Multi-chiller systems are commonly used in medium and large commercial and institutional buildings to provide cooling through chilled water systems. A software tool, Can OptiCool, has been developed to determine the optimal chiller sequencing strategy, determining which combination of individual chillers to operate to satisfy a given building cooling load while minimizing the energy consumption of the whole cooling plant. Through collaboration with a private firm, implementations in large office buildings in Montréal have demonstrated significant electricity savings.

In regions powered by low-carbon electric grids, buildings serviced by heating plants equipped with both electric and natural gas boilers can substantially lower their greenhouse gas (GHG) emissions by increasing the contribution of electric boilers to meet heating demand. Two software tools, Can Duo-Therm and Can-OptiWatt, have been developed to identify inefficiencies in the operation of electric boilers and identify the optimal building peak power demand limit that balances cost efficiency with environmental impact.

KEY OUTCOMES

- › Implementation of Can OptiCool in a large commercial building in Montréal led to a reduction of 10% in the cooling system's electricity consumption.
- › Factsheets describing the application of these tools and results from case studies are now available on NRCan's Existing Building Commissioning (EBCx) Tools and Resources web page.

Deployment and dissemination of knowledge

Members of the Intelligent Buildings team presented work related to the energy flexibility of Canadian commercial and institutional buildings at an expert meeting of the International Energy Agency's (IEA) Annex 96 - Grid Integrated Control of Buildings.

The advancements of AI and its applications in buildings were presented during a training session of the "Association québécoise des cadres scolaires."

The major areas of research on buildings required to address climate change and achieve carbon neutrality were discussed during a symposium organized by Réseau Énergie et Bâtiments.

ADVANCED THERMAL MODELLING FRAMEWORK

A methodology has been developed to enable the rapid development, evaluation, and comparison of models representing the thermal behaviour of buildings. These models will support the development of optimal control sequences to reduce energy consumption, peak electric power demand, and GHG emissions. Artificial Intelligence (AI) and data-driven methods (black-box) as well as methods combining theoretical knowledge and data-driven methods (grey-box) are used for model development. The software code to automate this methodology is under development.

Reducing Diesel Dependence of Remote Infrastructures

Operational energy efficiency – NATO Science for Peace and Security Project

The benefits of reducing diesel dependence in military camps extend beyond GHG emission reductions. They include enhanced resilience, reduced fuel convoy requirements and, potentially, faster mission execution.

A project funded under NATO's Science for Peace and Security Program has been initiated to **develop tools and demonstrate their energy efficiency in deployed camp scenarios**. This three-year project also assists Ukraine in developing optimization tools to rebuild and enhance the resilience of its national electricity grid. It is a collaborative effort involving Canada, Belgium, Denmark, France, Lithuania, the Netherlands, Slovenia, Ukraine, the United Kingdom and the United States.

KEY OUTCOMES

The project will explore opportunities to improve interoperability among allies by demonstrating methods to **reduce emissions associated with diesel in deployment operations**. The project began in February 2025 and is funded for three years.

Low power energy solutions for remote surveillance

This project demonstrated that a **direct methanol fuel cell** with solar photovoltaics, a battery energy storage, and a wind system had the **capability of operating autonomously** through the polar night in the Arctic.

KEY OUTCOMES

The results **advanced scientific efforts in the field of power generation and sustainment in the Arctic**. Operating autonomously through the polar night was never successfully demonstrated before using this type of system, which now provides a new option for an alternative power on remote systems.



Energy efficiency assessments for the Royal Canadian Navy

Several studies were conducted to **improve the operational effectiveness of the Royal Canadian Navy platforms**. The project is conducted in collaboration with Defence Research and Development Canada (DRDC) – Atlantic and the National Research Council Canada (NRC).

KEY OUTCOMES

An energy audit was performed on the Halifax-class combat ship of the Royal Canadian Navy and, for the first time, a detailed dataset on the destination of major electrical flows was collected. Data analysis led to the **development of an energy model** to formulate energy efficiency recommendations aimed at **reducing fuel consumption and improving decision-making**. Various ships have also been selected for evaluating electrification potential.

Greening Government Operations

CanmetENERGY in Varennes (CEV) is mandated by the Centre for Greening Government (CGG) of the Treasury Board of Canada Secretariat (TBS) to **provide support to federal organizations in achieving the GHG emissions reduction targets** set by the Greening Government Strategy (GGS). These support services are provided as part of the Greening Government Operations (GGO) program. In 2025-2026, our centre contributed to this initiative in several ways, namely by:

- › **supporting 10 federal organizations in their decarbonization process**, including through existing building commissioning (EBCx) projects, energy efficiency, and GHG emission reduction assessments, assistance with measurement, and verification of performance (M&V), as well as document review and advisory services;
- › transferring knowledge through five sessions of GGO's Community of Practice, 195 person-days of training, development of EBCx training content, and multiple conferences and presentations;

- › reducing the risk associated with innovative technology adoption by collaborating on a high-temperature heat pump demonstration project at NRCan's Laurentian Forestry Centre (LFC) and completing a 3-year Greening Government Fund (GGF) project on the implementation of ongoing commissioning (OCx) in federal buildings;
- › contributing to GGO's toolbox, in collaboration with OEE and multiple departments, through the development of two guides on GHG emissions reduction, one guide on OCx, and 10 case studies on different EBCx approaches, as well as initiating the development of the Electrification Readiness Assessment Tool (ERA Tool), which will help federal organizations identify the best candidates for electrification within their real property portfolio.



Highlights

- › Identifying the best candidates for smart building technology implementation in AAFC building portfolio using a pre-screening tool developed through GGO
- › Publishing new guides to assist building managers with GHG emissions reduction and OCx implementation through:
 - GHG Emissions Reduction Audit: A Checklist for Building Owners and Managers
 - Framework for GHG Emissions Reduction Planning: Building Portfolios
 - A Practical Guide to Monitoring-Based Commissioning (MBCx)
- › Creating interest at the 2025 RPIC Summit on high-temperature heat pumps for building decarbonization and commissioning as a strategy for optimizing building performance
- › As part of the GGO Community of Practice, organizing a visit to Ādisōke, the new Ottawa Central Public Library and Library and Archives Canada joint facility

INDUSTRIAL SYSTEMS OPTIMIZATION (ISO)



Our division offers a broad range of expertise and is uniquely positioned to tackle complex problems related to large-scale energy systems optimization. We provide Canada's energy-intensive industrial sectors with decarbonization solutions, system design tools, and knowledge to improve their global efficiency, thereby increasing their competitiveness and reducing their environmental footprint.



Carbon capture, utilization, and storage (CCUS)

National CCUS Assessment Framework

Developed in collaboration with CanmetENERGY in Ottawa and various Canadian stakeholders, this decision-support platform **enables governments and industry to enhance the planning of CCUS projects at both provincial and national scales**. The platform integrates cost and technological performance across the entire CO₂ value chain—including capture, transportation, and storage—while also accounting for the impacts of policy decisions.

KEY OUTCOMES

Our **cutting-edge CCUS value chain optimization model** has been further advanced, with refined economic models and enhanced emissions and storage databases. These improvements enable more precise identification of cost-effective strategies to connect CO₂ emitters with storage sites using pipelines, ships, trains, and trucks. This multimodal model has supported preliminary **assessments of CCS networks in British Columbia and Alberta** and **provided illustrative examples for the *Eastern Canada Geological Storage Atlas***, highlighting the benefits of shared regional infrastructure.

Advanced CCUS technologies and systems

The large-scale deployment of CCUS requires high-performance carbon capture technologies that minimize energy use and costs. Advanced process designs that integrate efficient solvents with innovative equipment and configurations are being investigated to **enhance energy efficiency and mass transfer while reducing overall system costs**.

KEY OUTCOMES

Rotating Packed Bed (RPB) technology was assessed as a replacement for conventional packed columns in amine-based CO₂ capture, demonstrating enhanced heat and mass transfer, reduced equipment size and energy demand, and capture cost reductions of up to 30%. The integration of **high-temperature heat pumps (HTHP)** and **mechanical vapor compression (MVR)** for steam generation through waste heat recovery was successfully applied to a Canadian cement plant, eliminating the need for an external steam boiler and ensuring high performance and strong industrial relevance.

Carbon Capture Modelling and Costing Tool

Our team is developing CCAT, an Excel-based decision-support tool designed to rapidly and accurately estimate the sizing, resource requirements, and cost of various carbon capture technologies across a broad range of capture rates and flue gas conditions representative of most industrial and power generation applications.

KEY OUTCOMES

The **CCAT tool** was enhanced with new machine learning (ML) models, expanding its capability across a broader range of flue gas conditions. It supports **multiple capture pathways**—including conditioning, CO₂ separation, and compression—for amine-based, enzymatic, cryogenic, and membrane systems. Grounded in process engineering and cost modelling, this user-friendly tool enables rapid, consistent assessments, linking ML predictions to CAPEX, OPEX, and utility evaluations. CCAT was applied to estimate capture costs for all industrial facilities emitting over 50,000 tonnes of CO₂ annually across multiple sectors in Eastern Canada as part of a **large interprovincial CCUS assessment**.

Industrial Decarbonization Powered by Artificial Intelligence (AI)

AI-based carbon capture process design acceleration and optimization

An AI-assisted approach using causal incremental reinforcement learning (CIRL) has been developed to **optimize chemical process design**. This method integrates an intelligent agent with process simulators to guide and accelerate multi-objective design optimization.

KEY OUTCOMES

The approach was successfully tested on a representative MEA absorption-based carbon capture process, achieving 8% cost reduction compared to standard design methods. It also enhances the scalability of decarbonization technologies, **supporting broader adoption for climate change mitigation**.

Enhanced predictive modeling of materials and products for decarbonization applications

A novel modeling methodology using an ensemble of ML techniques and available datasets was developed to **predict novel material and product properties**.

KEY OUTCOMES

The developed ensemble model **outperformed the best-performing individual ML model by 10%**, achieving 99% accuracy in predicting the Hansen Solubility Parameters (HSP) of lignin using SMILES codes. This methodology can be applied to various chemical analytics beyond HSP prediction.

Intelligent Energy Management and Information System (iEMIS)

With funding from OEE, an iEMIS prototype was developed and implemented in a pulp mill in the province of New Brunswick.

KEY OUTCOMES

The developed iEMIS was successfully tested on several pieces of equipment in a pulp mill. Substantial savings have been achieved so far. A demonstration program is under way for a large adoption of the technology in industry.

Improved forest biomass inventory estimation tool

An advanced deep neural network-based tool was developed to better **estimate forest biomass attributes**. The tool is currently used in two Canadian provinces (ON and NB) and the Yukon.

KEY OUTCOMES

The tool allowed a 22% improvement in tree biomass estimation and enhanced tree species identification by 38% (accuracy increased from 45% to 62%) compared to most popular tools. This tool will enable **more accurate forest value chain planning**.

Digital decision support tool for log transportation optimization

A digital tool enabling real-time log truck routing and scheduling to reduce fuel consumption and travel distance was developed and tested with two major Canadian forest companies.

KEY OUTCOMES

The tool was successfully applied to a large Canadian forest company's transportation network, **demonstrating a 35% reduction potential in fuel savings and GHG emissions**.

Clean Fuels

Integrated Biorefineries Mission Innovation: bio-SAF production

A collaborative project between Canada and Brazil established a methodology for harmonizing the techno-economic assessment and calculation of carbon intensity to produce bio-based sustainable aviation fuels (bio-SAFs). The project considers regional specificities relating to the type of biomass, supply and distribution logistics, and country-specific operating costs.

KEY OUTCOMES

A daily production of 2,000 barrels of bio-SAF was set for benchmarking performance indicators. Five harmonized indicators were defined: thermal efficiency, return on energy investment, minimum selling price, carbon intensity and the GHG emissions abatement cost. The regions with abundant and diversified biomass sources and low-carbon electricity are better positioned to produce bio-SAF.

Hybrid production of sustainable aviation fuels (SAFs): an innovative approach

This approach, validated for a case study in Quebec, combines biomass gasification (490,000 dry tonnes/year), water-gas shift reactions and Fischer-Tropsch synthesis to produce bio-SAF and downstream upgrading with CO₂ recovery to produce e-SAFs. It addresses the challenges of limited biomass availability and the need for low-carbon, scalable and flexible SAF production.

KEY OUTCOMES

The biomass gasification produced 2,176 barrels of bio-SAF per day, as well as 913 barrels of renewable naphtha and additional electricity. Flue gases contain 1,136 tonnes of biogenic CO₂ per day. Hybrid bio-SAF and e-SAF production, with a CO₂ capture rate of 95%, enabled an additional 2,000 barrels of e-SAF daily, which represents a 92% increase in production over the bio-SAF pathway alone. This process also produced an additional 717 barrels of naphtha per day.



Awards, Agreements and **Knowledge Dissemination**

- › Obtained a two-year CIFAR AI Catalyst Grant in partnership with AMII (Alberta Machine Intelligence Institute) to work on accelerating the design of catalytic materials and CO₂ conversion processes.
- › Active member in the Quantum-Sustainability Working Group and at the AI for Climate Change Working Group.
- › Participation and representation at the IEA IETS, IEA Bioenergy and Hydrogen Technology Collaboration Programs Tasks (IEA-IETS Tasks XI, XVIII, XVII and XXI, and IEA-Bioenergy Tasks 39, 42 and 43).

Hydrogen

Techno-economic assessment of hydrogen production

In collaboration with CanmetENERGY in Devon, four hydrogen production pathways were analyzed: methane pyrolysis, steam methane reforming (SMR) with and without CO₂ capture and storage, alkaline electrolysis and solid oxide electrolysis. The study examined the GHG abatement cost and hydrogen selling price in Alberta, Quebec and Ontario.

KEY OUTCOMES

SMR, a technologically mature process, has the lowest capital cost at \$6.3/kg H₂, compared to \$9.5/kg H₂ for methane pyrolysis and \$11.3/kg H₂ for electrolysis. The viability of **electrolysis technologies** depends on investments and electricity prices, which account for 70-82% of operating costs. In Alberta, production costs range from \$9.9/kg to \$12.3/kg H₂. In Quebec, it ranges from \$4.9/kg to \$6.4/kg H₂. Despite its lower cost, SMR remains the least environmentally sustainable option.

Harmonized life cycle assessment (LCA) for hydrogen carbon intensity

The methodology developed through a collaboration with the National Research Council (NRC) and CanmetENERGY in Devon ensures consistency in scope, inventory criteria and data quality. Six hydrogen production pathways were compared against the Clean Hydrogen Investment Tax Credit thresholds.

KEY OUTCOMES

The carbon intensities of alkaline electrolysis (1.2 kg CO_{2eq}/kg H₂) and PEM electrolysis (1.3 kg CO_{2eq}/kg H₂) in Quebec meet the threshold of 0.75-2 kg CO_{2eq}/kg H₂, qualifying for a 25% tax credit. In Alberta, autothermal reforming (4.4 kg CO_{2eq}/kg H₂) and steam methane reforming (10.1 kg CO_{2eq}/kg H₂, or 4.9 with capture) exceed this threshold. Biomass gasification with carbon capture (0.3 kg CO_{2eq}/kg H₂) could qualify for up to a 40% tax credit.

Multicriteria analysis tool for green hydrogen

A multicriteria analysis tool was developed to prioritize the use of green hydrogen in the industrial sector. The key criteria considered include greenhouse gas (GHG) reduction per unit of energy input, energy penalty, the availability of alternative solutions to hydrogen and technical and economic factors.

KEY OUTCOMES

The replacement of grey hydrogen in refineries, diesel in heavy trucks, and reforming gas in steel plants was among the applications studied. While green hydrogen can support decarbonization in these sectors, only a limited number of applications achieve GHG reductions comparable to direct electrification. Given the constrained availability of renewable electricity, electrification should generally be prioritized, as it delivers higher emission reductions in low-carbon grids compared to green hydrogen pathways.



A Partnership for **Improved Decarbonization**

Collaboration agreement with the Quebec provincial government

We have maintained a fruitful collaboration on energy transition and decarbonization with the Quebec government for over a decade. A new partnership agreement has been signed for the 2024-2028 period, allowing us to continue developing tools and knowledge to facilitate the achievement of Quebec's decarbonization goals.

KEY OUTCOMES

This partnership supports the development of detailed energy inventories for the province's major industrial sectors, enabling a clearer understanding of energy consumption patterns. It will also facilitate the establishment of decarbonization scenarios, the estimation of the potential for electrification and bioenergy uses in the industrial sector as well as the assessment of opportunities for green hydrogen utilization to further advance the province's energy transition efforts.



Industrial Decarbonization

Pulp and paper sector

KraftSIM, launched in 2024, is a publicly available modelling tool created to support the pulp and paper industry in adopting process improvements, transitioning to carbon neutral/negative operation, and exploring forest product diversification. The platform models various decarbonization and production diversification pathways.

KEY OUTCOMES

Ten new technologies were integrated into a representative Canadian Kraft mill, allowing the industry to assess energy and emission reductions in its own operations. In the last year, KraftSIM was upgraded with a condensing turbine, improved white liquor chemistry control, black liquor and biomass gasification for NH_3 production, and calcium looping for CO_2 capture. Upcoming additions for 2026-2027 for public release include amine-based carbon capture, methanol production from gasified black liquor and biomass, and methanol from contaminated condensates. KraftSIM is currently in use by several Canadian mills and research centres.

Electrification of industrial processes

The **electrification opportunities were analyzed and characterized by their technological maturity** in the sectors of pulp and paper, refineries, steel plants, aluminum smelters, alumina production, cement, whitewash, iron ore extraction and pelletizing, as well as gold and silver mining. These sectors generate 99 megatonnes (MT) of GHG emissions annually, from their use of electricity, biomass, fossil fuels and industrial processes.

KEY OUTCOMES

These opportunities could reduce annual fossil fuel consumption by approximately 685 PJ and greenhouse gas (GHG) emissions by 46 Mt CO_2 . Achieving these reductions would require an additional 181 TWh of electricity per year. Based on current energy prices, the associated net change in energy costs is estimated at approximately CAD 12 billion.

When considering only mature technologies, the potential reduction decreases to 367 PJ/year in fossil fuel use and 23.0 Mt CO_2 /year in emissions. This scenario would require an additional 74 TWh of electricity annually and result in an estimated energy cost change of approximately CAD 4 billion.

Iron and steel sector

Traditional and emerging steel production pathways have been modeled to assess their energy demand and GHG emissions. A techno-economic viability analysis has helped **identify optimal strategies for achieving carbon neutrality in the Canadian steel sector**.

KEY OUTCOMES

This work has determined the electricity, biomass, hydrogen and carbon capture and storage (CCS) requirements for **achieving carbon neutrality across different production pathways**. It has also estimated the potential carbon customs tariffs on Canadian steel exports to Europe based on electricity grid carbon intensity, production processes, product type and carbon footprint.

In collaboration with CanmetENERGY in Ottawa, Corem and the Thermochemical Computation Centre (CRCT) at Polytechnique Montreal, decarbonization solutions tailored to Canadian steel plants are being studied. Corem is providing experimental validation by exploring the integration of greener fuels, such as hydrogen, in iron oxide reduction.

KEY OUTCOMES

Industrial unit modeling and simulation using globally recognized thermodynamic databases for metallurgical processes. The replacement of natural gas with hydrogen, alongside process optimization efforts, can significantly reduce GHG emissions in steel production, while avoiding major process modifications. An analysis of biomass integration is planned for 2025.

Decision Support Tools and Methodologies

Role of biorefineries in industrial decarbonization

Biorefineries transform biomass into biofuels, bioproducts and bioenergy. They reduce fossil fuel reliance, cut GHG emissions and support a circular economy by valorizing residues. The I-BIOREF software now integrates CO₂ capture, storage and valorization, by specifying the biogenic and non-biogenic emissions.

KEY OUTCOMES

Three case studies analyzed renewable diesel and SAF production, incorporating low-carbon H₂ production technologies and CO₂ valorization. The calculation of their carbon intensity and other findings were presented at the Integrated Biorefineries Mission Innovation and the BBEST & IEA Bioenergy international conference (Brazil, October 2024).

Arbitrage of limited renewable resources – system-level modeling

The limited availability of renewable resources forces us to prioritize their use where they offer maximum benefits and where there are no better alternatives. **System-level modeling techniques and multicriteria decision-making tools** are needed to develop robust decarbonization pathways, policies and programs.

KEY OUTCOMES

Improved technology models were incorporated into report “Pathways for a net-zero Canada”, by the Trottier Energy Institute (IET). The third edition of the IET Energy Outlook predicts an increase in biomass utilization for biochar and biocarbon production, generating negative emissions. These models have been adapted to assess electrification potential and identify the most promising hydrogen application in industry.

Software Solutions Developed by Our Team



EXPLORE

Multivariate data analysis for process optimization



I-BIOREF

Assessment of the techno-economic, environmental and socio-economic performance of the sustainability and circularity of industrial biorefineries



INTEGRATION

Heat recovery optimization in industrial processes



COGEN

Modeling to improve the profitability of cogeneration systems



KraftSIM

CADSIM simulation for the assessment of new technologies in kraft processes

Free download online



RENEWABLE ENERGY INTEGRATION (REI)



Our R&D activities aim to improve access to renewable and clean electricity for Canadians while recognizing sustainability, reliability, safety, and affordability objectives. Our mandate is well aligned with the Government of Canada's national priorities to achieve net-zero emissions by 2050, enhance energy security, and support a resilient and sustainable electricity system.



Renewable Energy and **Smart Grid Resources and Devices**

Our team assesses the performance of distributed energy resources (DER) and related standards to address issues related to the impact on electric grids of variable renewable energy and the increasing demand for electricity. Through our work, we evaluate and model the performance of both existing and novel solar photovoltaic (PV)-related technologies and power conversion equipment (inverters). In addition to this work, design guidelines and gaps in performance and safety are also addressed.

Standards related to PV/BIPV technologies and to inverters

This project focuses on the adoption and maintenance of standards related to PV and building-integrated photovoltaics (BIPV) technologies and to inverters through various standard committees, such as the CSA Group's standard committees. Our involvement contributes to the coordinated development of **DER products and system standards, guides and codes** in Canada.

KEY OUTCOMES

Following the publication of CSA C61215 Ed. 2 in April 2025, dealing with PV module quality, CanmetENERGY initiated the adoption process for IEC 61730-1 & -2, which address PV module safety. In addition, CanmetENERGY contributed to the revision of the TS-900 guideline, which provides best practices for the installation of rooftop solar PV systems. It also continued its involvement in power converter safety standards through participation in the revision of CSA C22.2 No. 107.1 on power conversion equipment safety.

CanmetENERGY has started the development of a tracking platform for smart-grid standards. The platform will feature a database and user interface designed to collect, organize, summarize, evaluate, and prioritize standards related to the energy transition. The platform will integrate an automated prioritization methodology to help identify the most relevant smart grid standards, guidelines, and reports, based on a modified Hay method.

Assessment of the photovoltaics potential of the Canadian building stock

This project focuses on assessing the potential of photovoltaics on rooftops in Canada. Using a new statistical method developed by our researchers, a detailed analysis of 11 Canadian municipalities was conducted, leveraging high-quality LiDAR and building footprint data. The method was applied to the stock of residential, commercial and institutional buildings in Canada and can be used, for example, in net-zero pathway studies.

KEY OUTCOMES

Since CanmetENERGY published the report entitled "**Assessing the photovoltaic potential of the Canadian building stock**" in January 2024, key achievements include the open-source release of the code to evaluate the technical and market potential of PV systems on roofs. A commercial license was also granted to the Centre de recherche en informatique de Montréal (CRIM) (now Luqia Technologies) to perform the study on the PV potential of roofs for the city of Montréal, now available on Montréal's open data website.



Conferences & Events

- › Organized a joint IEA PVPS Task 1 (Strategic PV Analysis & Outreach) and Task 15 (Enabling Framework for the Development of Building-Integrated Photovoltaics) meeting, held in collaboration with Concordia University in Montréal in June 2025. The event included a public session and discussions between international PV experts and Canadian stakeholders from industry, utilities, and provincial and municipal governments.
- › Co-organized the 2025 IEEE Electric Power and Energy Conference (EPEC) in Waterloo, ON, as co-chair in the Technical Program Committee. Responsible for the technical program of the three-day conference, consisting of tutorials, workshops, industry and group panel sessions, and paper sessions. Led the paper process, including intake, reviews, acceptances, assignments, and publishing. There was a record turnout of over 200 attendees, from academia, industry, and utilities.

Improving Technology-Grid Interface and Interoperability to Support Grid Modernization

This project focuses on bridging the gaps in terms of integration and connections between grid-edge technologies (e.g., flexible loads) and the grid itself. It focuses on three main R&D areas: facilitation of connections between inverters and the grid, development of methods for DER control and aggregation as well as mapping and advancement of grid integration standards.

Facilitating inverter-grid interfaces

This activity focuses on the evaluation of distributed energy resources (DERs) for electrical performance and their interoperability with latest grid codes or standards. These assessments are conducted on both commercial inverters and R&D prototypes using the state-of-the-art inverter testing facility at CanmetENERGY in Varennes. The findings support the refinement and advancement of DER certification standards.

KEY OUTCOMES

The team has been using the OpenSVP software platform to automate the evaluation of distributed energy resources (DERs) against North American grid code requirements. As part of this effort, the project team developed Python-based test scripts aligned with the latest revision of the IEEE 1547.1 standard for the certification of distribution-connected solar and wind inverters. These scripts were validated using the OpenSVP software through automated testing on a solar inverter simulation model.

Advanced flexibility solutions for electricity grids with variable renewable energy

This activity focuses on advancing the knowledge, tools, and partnerships needed to integrate residential electric space heating into electricity grids with growing variable renewable energy. It focuses on innovative control approaches, analytical frameworks and collaboration with Canadian utilities to support residential demand response programs.

KEY OUTCOMES

This activity advanced residential space-heating flexibility through smart thermostats and advanced control of electric baseboard heaters. It was supported by a co-simulation framework to evaluate performance across building types and grid objectives. It also initiated a collaboration with a Canadian utility to evaluate a residential demand response pilot, including analysis of data from over 450 households.

Variable Renewable Energy (VRE) Resources and Electrified Grid-Active Neighbourhoods, Communities and Cities

This project focuses on strategies to allow operation of distribution grids with a large penetration of VRE. It is based on these main areas of R&D: the amount of VRE that a distribution grid can accommodate (i.e., hosting capacity); the management, control and protection for the distribution grid and microgrids; and the pathways for both net-zero remote communities and distribution grid modernization.

Distribution grid hosting capacity

This project focuses on hosting capacity, defined as the additional amount of DERs and loads that a distribution system can accommodate without requiring infrastructure upgrades. It investigates the assessment methods and their standardization as well as short term approaches to **increase the hosting capacity through resource and load management**.

KEY OUTCOMES

Published in 2025, the new edition of the IEEE 1729 Recommended Practice for Electric Power Distribution System Analysis includes a new chapter on hosting capacity calculation developed under the leadership of CanmetENERGY following three years of collaboration with a team of experts and industry stakeholders. This chapter establishes a harmonized method to calculate and determine the amount of distributed energy resources, such as renewable energy, that can be integrated in a distribution system. Application of the guideline through partnerships with utilities such as Toronto Hydro, provides real-world insights to continuously refine and strengthen the approach. To support its implementation, CanmetENERGY is developing a grid analysis toolbox to facilitate impact studies, including the integration of new power conversion equipment that can provide grid-support functions and increase renewable energy hosting capacity.

Varennnes Interactive Grid (VARIG)

The Varennnes Interactive Grid (VARIG) project aims to develop a modular and reusable interactive grid platform composed of interoperable components that can be combined to support a wide range of research questions and test cases, with the Varennnes grid serving as one key component. These test cases include, for example, demonstrating how DERs can be operated to actively support grid operations under scenarios of high renewable penetration or electrification.

KEY OUTCOMES

Significant R&D progress was achieved this year through the development of a scalable co-simulation framework supporting interoperable and distributed simulations. For the building-modelling component, a methodology for the automated generation of EnergyPlus models for all residential buildings in Varennnes is currently being evaluated. In parallel, reusable distribution grid analysis tools are being developed to assess the impacts of electrification, DER integration, and hosting capacity across VARIG and related projects. The custom-developed PyPSU tool was also significantly enhanced to support the conversion, modification, and validation of distribution network models from power system simulation tools and GIS platforms. The tool was successfully applied to validate the Varennnes medium-voltage network, enabling the efficient identification of connectivity issues and strengthening the overall network analysis workflow.

Low-Carbon Regional and National Electric Grids and Energy Systems

This project fosters the **development of zero-carbon systems** at the provincial, territorial and national levels. It has three main areas: bulk system stability while integrating large numbers of DERs and inverter-based resources; planning and operation to support electrification and DER opportunities in a new grid paradigm; and Canadian pathways for grid modernization.

This work aims to develop methods and models for improving regional stability, strategies for system operation and planning to support electrification and flexibility while weighing new cooperative roles for transmission and distribution system operators and grid modernization pathways and scenarios.

Pathways to net-zero through electric grid modernization

Under this objective, CanmetENERGY is building capacity expansion and production cost models for Canada's national and regional grids, using open-source resources. These models support analysis to explore pathways for Canada's future electric grid and roles for new resources and technologies while meeting net-zero transition needs. The objective also leverages CanmetENERGY's multisectoral expertise, integrating electricity, industry and buildings perspectives to address complex research and policy challenges related to decarbonization.

KEY OUTCOMES

CanmetENERGY continued advancing electricity grid planning and operational methods, and to strengthen bulk power system modelling through the development of PyPSA-Canada, using the open-source tool Python for Power System Analysis (PyPSA) framework. A national model representing Canada's 10 provinces was developed and is scheduled for open-source release in FY 2026–27.

This modelling capacity is being used to identify pathways toward a sustainable energy future. Through a collaborative project between the industry and the renewable energy integration groups, industrial flexibility and electrification options were integrated into PyPSA-Canada. Work also progressed modelling dynamic smart charging of electric vehicles, providing insight into its potential impacts and future electricity system requirements.

National and International Partnerships

CanmetENERGY is an active member of various national and international organizations, often serving in leadership roles. These partnerships enable the exchange of expertise and knowledge across Canada and abroad, while strengthening internal capabilities and technical know-how. They also provide opportunities to leverage the work and experience of other members, reducing duplication of work and benefitting from shared best practices and lessons learned.

KEY OUTCOMES

Canada, through CanmetENERGY, participates as national experts to several International Smart Grid Action Network (ISGAN) working groups. CanmetENERGY also contributes to the Electricity Modelling Hub (EMH) through its Technical Advisory Committee and task forces. PyPSA-Canada modellers actively contribute by sharing input and models, participating in events, and engaging in the multi-model comparison forum.

Smart Renewables

Electrification Systems (SRES)

This project aims to assess the capacity of various technologies to provide grid services and their impact on the grid infrastructure. By assessing the performance as well as the flexibility potential of technologies and identifying knowledge gaps on the effective integration of these technologies into grid systems, SRES provides guidance to policymakers on **effective grid modernization pathways to achieve net-zero targets**.

Technology assessment for grid modernization

Information and data analysis focuses on analyzing the information gathered through literature reviews and data acquisition to study the system's performance and operation and then determine what information gaps still exist per technology. This work aims to determine the impact, performance, and long-term viability of any grid services that were provided and, if no grid services were provided, to study the potential for the system to provide grid services. It also provides strategic guidance to policymakers, utilities, and system operators to enable informed decisions on programs, policies, and investments.

KEY OUTCOMES

Through literature review, our project **assessed distributed grid-connected PV technology and isolated microgrid research needs and key policy considerations for grid support**. This work addresses challenges that must be overcome to modernize Canada's electricity systems and ensure clean, resilient, reliable, and affordable power for Canadians. This is done through timely, actionable insights, increased transfer of federal research results to accelerate uptake across the sector and the industry, evidence based guidance to inform policy and program design, and technology assessments to clarify the role of established and emerging energy resources. Grid modernization solutions (e.g., software/hardware retrofits, grid monitoring and automation, demand side management, EV integration, microgrids) are also identified.



The Feedback of various GoC branches and divisions on Our Work:

The Smart Grid and Microgrid Research Facility being built at CanmetENERGY is a great project that will support the development of secure, reliable, and resilient electricity and thermal energy systems, enabling innovative smart grid and microgrid applications across Canada.

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RETScreen



Our RETScreen division develops and deploys the world-leading **RETScreen Clean Energy Management Software** platform, which enables low-cost energy planning, implementation, monitoring and reporting for buildings, factories, fleets and power plants around the world.



The division undertakes **several workstreams to advance NRCan's corporate mandate** to ensure Canada's abundant natural resources are developed sustainably, competitively and inclusively. These workstreams include:

- › the **RETScreen Innovation Lab**, which collaborates with government and multilateral organizations to co-fund and develop advanced versions of the RETScreen software;
- › the **RETScreen Data Onboarding service**, which delivers onboarding services on a cost-recovery basis, helping large public enterprise customers with their facility-level and portfolio-wide deployment of the platform;
- › the **RETScreen Capacity Building program**, which helps improve the knowledge, skills and capabilities of the 900,000+ energy, facility and sustainability professionals located around the world who use the RETScreen software.

RETScreen Innovation Lab

Versions 9.3, 9.4 and 10.0 of the RETScreen Software were released. These updated versions include the following new features:

Portfolio Analysis and All Modules

- › Integration of an automatic scenario analysis feature within the portfolio-wide *Net Zero Planning Tool*, which now also produces a new *Net Zero Transition Plan*
- › Creation of new Geographic Information System (GIS) portfolio analysis capabilities via *Azure Maps*
- › Upgraded user manual in HTML format with increased functionality, including browser-based translation into more than 100 languages
- › Comprehensive energy planning, implementation, monitoring, and reporting framework structured around three main use types, at both the individual facility level and portfolio-wide

Feasibility Analysis Module

- › Series of power generation and deep retrofit archetypes added to *Virtual Energy Analyzer*
- › Updates to integrated databases, including benchmark, climate, electricity & fuel prices, products, costs, refrigerants, and GHG emissions data
- › New HVAC system templates tool to help user rapidly generate energy modelling components for different system types

Performance Analysis Module

- › Enhanced Ongoing Commissioning (OCx) capabilities, including a new Notification manager tool used for automated anomaly and fault detection
- › Automated weather data services expanded beyond our existing collaboration with NASA to now provide live streaming of hourly and daily data from *Copernicus – European Centre for Medium-Range Weather Forecasts* (global coverage) and *Environment and Climate Change Canada* (ground weather stations across Canada)



RETScreen team starts new project with the **Canadian Forces Housing Agency (CFHA)**

The RETScreen Division was commissioned by the Department of National Defence (DND) to onboard the 11,700+ residential housing units across Canada that the CFHA owns and operates into the RETScreen Clean Energy Management Software platform.

RETScreen **Data Onboarding**

The annual Government of Canada's Green-house Gas Emissions Inventory, prepared by the Treasury Board of Canada Secretariat (TBS) with the support of the RETScreen Team in Varennes, uses the RETScreen Software to **report on GHG emissions from federal facilities and conventional fleet operations** (Scope 1 & 2 emissions) and from air travel (Scope 3). This reporting now also includes water consumption, waste production and refrigerant tracking on a pilot basis.

Provided ongoing cost-recovery support to the DND to implement and maintain a RETScreen portfolio, with **8,000+ military facilities**. This work includes the completion and dissemination of the extensive portfolio-wide feasibility analysis for DND: **2050 Carbon Neutral Portfolio Plan: Canada's Department of National Defence (DND)**.

Supported other cost-recovery enterprise customers in implementing and maintaining RETScreen portfolios:

- › Global Affairs Canada (GAC) – **113 facilities (e.g., embassies and consulates)** at foreign missions
- › Natural Resources Canada (NRCan) – **28 facilities**
- › Canadian Space Agency (CSA) – **17 facilities**

Provided ongoing technical support to numerous energy, facility and sustainability managers at public sector enterprises who use RETScreen for **portfolio-wide energy and GHG management for thousands of facilities** located across Canada and around the world.



RETScreen Capacity Building

Undertook **outreach activity efforts with various key stakeholders** to encourage a continued software download rate at 40,000+/ year and to further build the capacity of the 950,000+ RETScreen users across Canada and around the world.

Coordinated **activities with the RETScreen trainers' network**, including the delivery of multiple training webinars in Canada and around the world, focused on various customer segments for the RETScreen software (e.g., municipalities, universities / colleges, schools, hospitals, commercial buildings, mines, factories, clean power, etc.).

Provided in-depth technical support to subscribing customers and engaged high value potential customers on an ongoing basis to ensure **continuous capacity building of key users**.

Supported Housing, Infrastructure and Communities Canada's (HICC) \$2B Green and Inclusive Community Buildings (GICB) Program in **reviewing numerous funding applications** submitted to GICB via the RETScreen Software.

Targeted outreach activities, including sending **regular email bulletins** to 150,000+ newsletter subscribers and producing **many new training videos in Spanish**.

40,000+

Continued software download rate,
per year

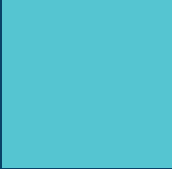
150,000+

Email newsletter subscribers

950,000+

RETScreen users across Canada
and around the world





Our support teams offer a
wide range of expertise
and are of valuable service
to our divisions tasked with
implementing R&D programs

Operations

Our Operations team supports the delivery of interdependent and national programs by our Centre and its S&T partners. This team is comprised of the following three subgroups:

Engineering & Technical Services | Infrastructure Management | Business Office



Areas of Expertise

- › Design and construction of test benches and prototypes for applied science
- › Design, construction and delivery of external projects with partners
- › Maintenance of test benches and scientific R&D facilities in our pilot plants
- › Calibration of scientific measuring instruments
- › Technical support for researchers and engineers
- › Building maintenance, upkeep and improvement
- › Physical security of the premises
- › Information technology and management
- › Shipping and receiving of goods
- › Human resources
- › Contracts and finance
- › Risk and emergency management



Highlights

- › Elaborated the final specifications of the microgrid test facility project and prepared for RFP process and construction
- › Upgraded pilot plants to accommodate future projects
- › Reorganized workspaces to accommodate new mechanical and electrical workshops
- › Constructed new mezzanine platforms to allocate more space for new test bench projects in pilot plant 1
- › Delivered and commissioned hybrid power containers in the Arctic in collaboration with interdepartmental and external partners
- › Delivered new geothermal and CO₂ heat pump and thermosiphon projects
- › Provided technical support for our scientific projects and prototypes at end sites across Canada
- › Developed advanced test control for CO₂ test benches
- › Provided technical support for our scientific projects and prototypes at end sites across Canada
- › Managed building condition report initiated by Real Property
- › Delivered a new genset and microgrid test bench in collaboration with interdepartmental partners (DND)
- › Integrated new technologies into the operations of the building as proof of concept or as pilot projects for further study/application
- › Designed and constructed new heat pump and thermal storage test benches
- › Supported R&D groups for data migration to MS365
- › Migrated multiple servers to a newer version of Windows Server
- › Developed a tool for archiving valuable documents
- › Verified the compliance of building equipment and protection systems

Science Impact Unit

Within the Director General's office is the Science Impact Unit (SIU), a multidisciplinary team of experts in science, policy, commerce, and engineering that provides scientific and corporate support to research groups in their strategic planning to maximize the impact of research results. The SIU fulfills this role by conducting strategic foresight and developing value propositions for our S&T activities. It also provides advice, coordination, and administrative oversight for NRCan agreements developed by our researchers, including R&D collaborations with academia and the private sector, as well as revenue generation activities.



Highlights

- › Developed bilingual Science Plan (2023–2028) placemats to strengthen internal alignment and enhance external engagement through clear, accessible communication of strategic priorities
- › Led the establishment and implementation of a cross-functional Strategic Innovation Planning Working Group focused on technology foresight and priority setting toward the 2035 horizon. This initiative supports the Centre's ability to advance transformative S&T initiatives and align future funding with evolving national and industry priorities
- › Played a key role in designing a pilot project with the Office of the Chief Scientist to identify disruptive scientific and technological trends through strategic foresight, including the analysis of AI as a horizontal enabler shaping future S&T priorities, cross-sector innovation, and long-term strategic planning
- › Engaged in ongoing Circle of Nations presentations and Elder-led knowledge sessions to strengthen the Centre's cultural competency and understanding of Indigenous histories and traditional teachings, helping to foster more respectful and informed collaboration with Indigenous communities in the context of technology transfer and knowledge dissemination
- › In collaboration with the Scientific Outreach team, supported the development of a strategic outreach plan for the Industrial Systems Optimization division and the Buildings division, to serve as a practical framework for outreach and communication efforts
- › Laid the groundwork for an impact strategy for the Centre by reviewing research impact assessment processes and indicators, and establishing an interdisciplinary working group to guide the co-development of the strategy with research divisions
- › Strengthened departmental strategic foresight capacity through active engagement with the Foresight Community of Practice, advancing foresight methodologies and exploring opportunities to assess foresight activities within the Science Policy Integration Sector to improve alignment with Policy Horizons Canada and NRCan
- › Explored the development of a strategic living laboratory framework to position the Centre as a hub for collaborative, real-world experimentation and innovation, enabling researchers, industry, and stakeholders to co-develop, validate, and scale emerging S&T solutions in operational environments

Scientific Outreach

Our Scientific Outreach team provides strategic communication advisory services and puts in place actions towards promoting CEV's science and research. The team helps our scientific divisions maximize the impact of their R&D activities, while offering assistance with knowledge and technology transfer.



Areas of Expertise

- › Advice on strategic communications for CEV's different divisions
- › Development of communication products
- › Management of social network platforms
- › Dissemination of science and technology
- › Arrangements for activities related to media relations
- › Translation and revision
- › Graphic design, photography and videography
- › Document formatting
- › Coordination of visits and corporate events



Highlights

- › Review, translation, and layout of the EBCx, MBCx, and Building Portfolio Planning guides to ensure their quality, accessibility, and effective dissemination to target audiences
- › Development of a dissemination strategy for the EBCx tools
- › Development of content showcasing scientific projects, organizational achievements, site visits, and funding announcements, particularly on LinkedIn
- › Development of communications and impact plans tailored to the needs of the Industrial Process Optimization and Buildings groups
- › Development and implementation of an internal communications plan and a wellness plan to foster employee engagement and well-being
- › Development of corporate materials (brochures, videos, and PowerPoint presentations) to support outreach, promotion, and partnership development activities
- › Creation of a series of employee profile videos showcasing the employer brand
- › Photography and videography support at internal, external, and international events
- › Production of visual content to support collaboration between the Buildings Group and the Department of National Defence (DND)
- › Development of a virtual learning course for DND

80+

documents translated
and reviewed

550+

postings to our social
networking sites

30+

projects (guides, brochures,
leaflets, documents, reports)
achieved

12+

interviews secured through
the implementation of media
relations initiatives



How to Collaborate

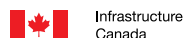
CanmetENERGY is open to collaborate with external partners so long as these arrangements provide a win-win outcomes to both parties and helps CEV advance its research mandates. Collaborations with the private sector are specifically designed to share the costs, risks and benefits of joint initiatives, while at the same time increasing the involvement of the clients being served and enhancing the general level of goodwill with all parties. There are different types of arrangements under which universities, industry and companies could collaborate with CanmetENERGY. They include:

- › **Formal agreements** or revenue generation contracts, such as Memorandums of Understanding, Task-Shared Agreements, R&D Umbrella Agreements, Non-Disclosure Agreements, and other arrangements that clearly define the roles, responsibilities and timelines and ensure a clear understanding of the scope of the collaboration.
- › **Informal partnerships** that can be more flexible and less formal, such as access and use of CEV's testing facilities, co-supervision of post-graduate level students for practical training and appointment of our researchers to adjunct professorship positions at selected universities.
- › **Service arrangements** to procure required services to effectively deliver on scientific and corporate mandates and to communicate research results to the public.

We welcome your requests to explore potential collaborations with us.

Some of Our Collaborators

Federal & Provincial Governments | Crown Corporations



Infrastructure
Canada



National
Defence

Défense
nationale



Global Affairs
Canada

Affaires mondiales
Canada



Canadian Forest
Service

Service canadien
des forêts



Canadian Space
Agency

Agence spatiale
canadienne



Treasury Board of Canada
Secrétariat

Secrétariat du Conseil du Trésor
du Canada

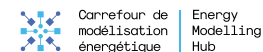
Universities



Private Companies



Agencies | Associations | Organizations



Clean Energy | Research | Innovation | Leadership

Science at the service of all Canadians

