



Natural Resources
Canada

Ressources naturelles
Canada

October
2020



SMART GRID

PROGRAM
OVERVIEW

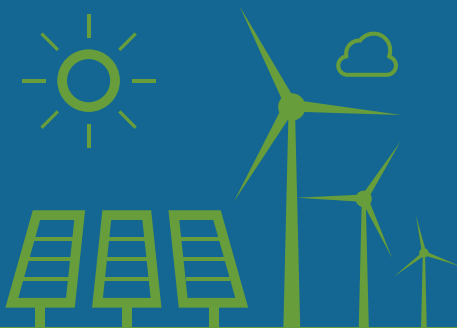
Canada

OVERVIEW

The program funds \$100M over four years on demonstration and deployment projects.



The Smart Grid Program (“the Program”) is one of Natural Resources Canada’s (NRCan’s) targeted national programs addressing key infrastructure required to advance the goals of the Pan Canadian Framework on Clean Growth and Climate Change.



The objective of the Program is to accelerate the development of smart grids to reduce GHG emissions and generate economic and social benefits (e.g. create new jobs). The program funds \$100M over four years on demonstration and deployment projects.

The projects listed in this document are funded by the Program. Once implemented, the projects will reduce greenhouse house gas emissions, and have an impact in reducing the long-term economical impact to the customer.

© Her Majesty the Queen in Right of Canada, as represented by the Minister of Natural Resources, 2020

For information regarding reproduction rights, contact Natural Resources Canada at nrcan.copyright.droitdauteur@nrcan-rncan.canada.ca.

Cat. No. M154-137/2020E-PDF (Online)
ISBN 978-0-660-36332-5

RECIPIENT (PROVINCE/TERRITORY)	PROJECT TITLE
1 Yukon Energy (YK)	Residential Demand Response Program (RDRP)
2 EPCOR (AB)	EPCOR Smart Grid System (ESGS)
3 EQUS REA (AB)	Canada's 1st Member-Owned Rural Smart Grid Project
4 ENMAX Power (AB)	Integrating Distributed Generation into Secondary Networks in Large Urban Centres
5 SaskPower (SK)	SaskPower Distribution Modernization Program
6 SSM PUC (ON)	Sault Smart Grid
7 Bracebridge Generation (ON)	Smart, Proactive, Enabled, Energy Distribution; Intelligently, Efficiently, Responsive (SPEEDIER) Project
8 London Hydro (ON)	West 5 Smart Grid Project
9 Alectra Utilities (ON)	Power.House Hybrid: Minimizing GHGs and Maximizing Grid Benefits
10 Alectra Utilities (ON)	GridExchange
11 Independent Electricity System Operator (IESO) (ON)	York Region Non-Wires Alternatives Demonstration Project
12 Lakefront Utilities (ON)	Digital Utility Platform
13 Hydro-Québec (QC)	Smart Grid Deployment Off-grid Networks
14 Hydro-Québec (QC)	Lac-Mégantic Microgrid
15 Saint John Energy (NB)	Integrated Dispatchable Resource Network for Local Electric Distribution Utility
16 NB Power & NS Power (NB & NS)	Collaborative Grid Innovation for Atlantic Smart Energy Communities
17 PEI Energy Corporation (PEI)	Slemon Park Microgrid Project



1

RESIDENTIAL DEMAND RESPONSE PROGRAM

YUKON ENERGY

- 3 year project spanning from 2018-2021
- Project total value \$1,225,000
- Receiving total contributions worth \$650,000 from NRCan
- Yukon Energy is focused on reducing Yukon's current and future dependence on new thermal (natural gas and diesel) generation to meet increasing peak demands on its electrical grid through demand response technology focused on residential electric heating and hot water end-use loads. The demonstration will involve approximately 400 customers fitted with demand response devices, controllable from Yukon Energy's (YEC) system control centre. This would enable YEC to shift participating customer's load off critical peak electricity demand periods. Objectives also include the reduction of fuel costs, which would help to minimize electrical rate increases and reduce GHG emissions from thermal-based peaking generation.



2

EPCOR SMART GRID SYSTEM

EPCOR

- 4 year project spanning from 2018-2022
- Project total value \$47,253,162
- Receiving total contributions worth \$10,677,000 from NRCan
- EPCOR Utilities will deploy a solar PV facility with integrated battery energy storage system and an intelligent Distributed Energy Management System (DERMS) software that together, will reduce peak load demand at the E. L. Smith Water Treatment Plant and enable effective use of the grid-connected system to address capacity shortfalls in power system wires infrastructure.



3

EQUS REA: CANADA'S 1ST MEMBER-OWNED RURAL SMART GRID PROJECT

EQUS REA

- 3 year project spanning from 2018-2021
- Project total value \$9,045,653
- Receiving total contributions worth \$2,261,363 from NRCan
- EQUS REA addresses challenges associated with serving rural customers such as terrain, distance, accessibility and communications. By deploying a next generation ultra-rural radio frequency mesh network, the project increases renewable energy sources and EV charging stations and installs battery storage. EQUS REA will improve its utility and consumer interface, increase customer engagement and awareness while improving response times and repairs to outages for farms, residential, commercial and industrial sites in rural areas.



4

INTEGRATING DISTRIBUTED GENERATION INTO SECONDARY NETWORKS IN LARGE URBAN CENTRES

ENMAX POWER

- 4 year project spanning from 2018-2022
- Project total value \$2,852,000
- Receiving total contributions worth \$1,426,000 from NRCan
- The objective of ENMAX's project is to develop and demonstrate a new solution to accommodate bi-directional power flows on urban electrical grids. This can ultimately help unlock the untapped potential for urban centers, such as the city of Calgary, to allow generation from renewable and distributed energy. This project will consider Solar Photovoltaics (PV), but can be expanded to include other types of generation and resources. The success of this project could lead to significant reductions of GHGs and result in many other benefits. Using a combination of advanced monitoring and controls as well as protective relay configuration changes that allow for export, the proposed project will demonstrate how solar PV, and ultimately other forms of distributed generation and energy resources, can be safely integrated into secondary and spot networks.



5

SASKPOWER DISTRIBUTION MODERNIZATION PROGRAM

SASKPOWER

- 4 year project spanning from 2018-2022
- Project total value \$21,091,840
- Receiving total contributions worth \$5,272,960 from NRCan
- SaskPower will modernize and upgrade SaskPower's electrical grid by investing in central monitoring and control from the newly established Provincial Distribution Control Centre. By upgrading existing substation and feeder sensors, deploying telecommunication and integrating information from Advanced Metering Infrastructure (AMI), the project will improve SaskPower's workforce efficiency and enable future integration of distributed energy resources and energy storage.



6

SAULT SMART GRID

PUC DISTRIBUTION

- 3 year project spanning from 2018-2021
- Project total value \$47,914,000
- Receiving total contributions worth \$11,807,000 from NRCan
- PUC will deploy a community-scale smart grid in Sault Ste. Marie, covering 100% of the PUC service area. The project improves PUC's system efficiency, resiliency and reliability by integrating a number of complimentary smart grid technologies, including distributed automation, Voltage/VAR management, and the enhancement of existing Advanced Metering Infrastructure (AMI). In addition, the project provides an enabling platform for renewable energy and expands customer opportunities to take advantage of enhanced energy services and solutions.



7

SMART, PROACTIVE, ENABLED, ENERGY DISTRIBUTION; INTELLIGENTLY, EFFICIENTLY, RESPONSIVE (SPEEDIER) PROJECT

BRACEBRIDGE GENERATION

- 4 year project spanning from 2018-2022
- Project total value \$9,485,000
- Receiving total contributions worth \$2,900,000 from NRCan
- Bracebridge Generation will modernize the Town of Parry Sound's electricity grid to facilitate the shift towards a net-zero (carbon-neutral) smart community by using Distributed Energy Resource Management (DERMS) for increasing visibility and control of loads and variable renewable generation. The project will deploy solar, energy storage system and automation technologies to reduce loading on the transmission station and reduce dependencies on far away energy resource, facilitate increase electric vehicle (EV) adoption, and develop smart residential demand management systems via controllable Hot Water Tanks (HWTs), EV chargers and battery storage.



8

WEST 5 SMART GRID PROJECT

LONDON HYDRO

- 4 year project spanning from 2018-2022
- Project total value \$10,988,817
- Receiving total contributions worth \$5,084,000 from NRCan
- This project will enable the development of the West 5 Net-Zero Energy (NZE) community and microgrid in London, Ontario, creating a showcase for sustainable communities which incur minimal negative impacts on the environment, and providing an example of Canadian leadership in the field of integrated smart energy system technologies. This project will involve the following innovations: (1) microgeneration; (2) renewable sources of energy; (3) tighter building envelopes; (4) smarter heating and cooling systems; (5) direct current (DC) generation, distribution, and energy storage; (6) system monitoring; (7) vehicle-to-grid storage; and, (8) improved Electric Vehicle (EV) charging infrastructure. The overarching objective of the project is to successfully construct Canada's first large-scale, fully integrated, net-zero energy community, to demonstrate net-zero energy's feasibility, deploy it at the community level, and to inspire and inform widespread change across Canada's construction industry towards net-zero energy.



**London
Hydro**

NRCAN SMART GRID PROGRAM

LEGEND

Project by Program Stream:

- ▲ Demonstration Projects
- Deployment Projects
- Hybrid Projects

1. Whitehorse, Yukon Energy

2. Edmonton, EPCOR

3. Red Deer, EQUS REA

4. Calgary, ENMAX Power

5. Regina, SaskPower

6. Sault Ste. Marie, PUC Distribution

7. Parry Sound, Bracebridge Generation

8. London, London Hydro

13. Nunavik, Hydro-Québec

17. Slemon Park, PEI Energy Corporation

16. Amherst, NS Power and Shediac, NB Power

15. Saint John, Saint John Energy

14. Lac Megantic, Hydro-Québec

12. Cobourg, Lakefront Utilities

11. Toronto, Independent Electricity System Operator

9. 10. Markham, Alectra Utilities

9

POWER.HOUSE HYBRID: MINIMIZING GHGS AND MAXIMIZING GRID BENEFITS

ALECTRA UTILITIES

- 4 year project spanning from 2018-2022
- Project total value \$10,294,000
- Receiving total contributions worth \$1,160,000 from NRCan
- Alectra will demonstrate how a full complement of controllable electrical and thermal energy technologies installed in 10 Markham homes, with integrated controls and real-time grid GHG signals can achieve significant reductions in total household GHGs, while still providing energy for space and water heating, transportation, and appliances.



10

GRIDEXCHANGE

ALECTRA UTILITIES

- 3 year project spanning from 2018-2021
- Project total value \$4,012,408
- Receiving total contributions worth \$1,850,000 from NRCan
- Alectra will demonstrate the ability of blockchain software technology to provide real-time transparency, tracking, and management of Distributed Energy Resources (DER) participation in providing energy services. Alectra will leverage its existing 20 Power.House customers to participate in an energy marketplace powered by the Linux Foundation's Hyperledger Fabric. Through a blockchain software platform, Alectra will issue requests for the Power.House systems to provide hypothetical market services. All aspects of market participation will be transacted through and recorded using this blockchain platform. Customers will receive compensation through a virtual currency that will be created to support participation. The currency may be exchanged for goods and services at participating merchants or for other forms of value in a marketplace.



11

YORK REGION NON-WIRES ALTERNATIVES DEMONSTRATION PROJECT.

INDEPENDENT ELECTRICITY SYSTEMS OPERATOR (IESO)

- 4 year project spanning from 2018-2022
- Project total value \$11,000,000
- Receiving total contributions worth \$5,000,000 from NRCan
- The IESO will investigate newly proposed, advanced, whole-system operation and market models for a smart grid, high-distributed energy resource (DER) future, with a focus on the division of grid functions among entities (new and/or existing) and interoperability at the transmission-distribution interface. The project will focus on development of an interoperability framework, assessing division of grid functions, transmission-distribution coordination requirements, and the value of DERs for both local- and wholesale-level needs to defer investments in traditional infrastructure. This will result in/involve: 1) Design of a Non-Wires Alternatives (NWA) market for third-party service providers that is interoperable with participation in the IESO's wholesale markets on a demonstration basis. 2) Development of communication and dispatch protocols for the IESO, local distribution companies, DERs and aggregators, and deployment of information and communication technology infrastructure needed for demonstration purposes. 3) Demonstration of new distribution-level functions and coordination with wholesale-level functions.



12

DIGITAL UTILITY PLATFORM

LAKEFRONT UTILITIES

- 4 year project spanning from 2018-2022
- Project total value \$656,612
- Receiving total contributions worth \$164,153 from NRCan
- The project deploys Utilismart's Digital Utility Platform allowing increases in distributed energy resources and EV charging station penetration, replaces overloaded transformers and feeders through load flow, feeder and short-circuit analysis, develop a more reliable and resilient grid through 24/7 monitoring and support customers in their conservation efforts by providing historical data, conservation tips and detailed billing.



**Lakefront
Utilities
Inc.**

13

SMART GRID DEPLOYMENT OFF-GRID NETWORKS

HYDRO-QUÉBEC

- 4 year project spanning from 2018-2022
- Project total value \$46,235,398
- Receiving total contributions worth \$11,000,000 from NRCan
- Hydro-Québec will deploy a microgrid control system and Battery Energy Storage System throughout 13 remote Indigenous communities. By using a higher order of automation, Hydro-Québec will improve the performance of its thermal generating assets and allow for the future integration of renewable energy. The project will be supported by research work that has been underway for more than 10 years at the Institut de recherche d'Hydro-Québec (IREQ).



14

LAC-MÉGANTIC MICROGRID

HYDRO-QUÉBEC

- 3 year project spanning from 2018-2021
- Project total value \$8,460,000
- Receiving total contributions worth \$3,384,000 from NRCan
- Hydro-Québec will demonstrate and deploy Distributed Energy Resource (DER) technologies in an innovative micro-grid and increase the adoption of decentralized renewable energy generation. The project will test control of DER technologies such as batteries, solar panels, vehicle charging stations, and home automation equipment in an intelligent micro-grid to help support the grid and reduce environmental impacts.



15

INTEGRATED DISPATCHABLE RESOURCE NETWORK FOR LOCAL ELECTRIC DISTRIBUTION UTILITY

SAINT JOHN ENERGY

- 4 year project spanning from 2018-2022
- Project total value \$13,989,284
- Receiving total contributions worth \$1,127,000 from NRCan
- Saint John Energy (SJE) will integrate a variety of Distributed Energy Resources (DERs) into the local electricity grid and develop machine-learned algorithms to optimize the dispatch of the DERs. The DERs consist of smart water heaters, thermal energy storage devices, battery technologies, dispatchable generation and other smart control elements. The infrastructure will allow SJE to manage its peak demands and reduce its carbon footprint.



16

COLLABORATIVE GRID INNOVATION FOR ATLANTIC SMART ENERGY COMMUNITIES

NOVA SCOTIA POWER & NEW BRUNSWICK POWER

- 4 year project spanning from 2018-2022
- Project total value \$37,400,000
- Receiving total contributions worth \$5,000,000 from NRCan
- This project will develop, deploy and pilot new distributed energy resource (DER) solutions as it seeks to find solutions to reduce carbon emissions from power generation and build customer and community engagement around energy consumption and use of smart energy technologies. This demonstration and deployment project will advance smart energy technologies, explore new rate designs and operational and market models. Primary components include deployment and operation of two community-scale solar installations, up to 250 distributed battery storage units, six commercial/ industrial buildings with varying DER configurations, 500-home research study exploring load control, distributed generation and storage, EV smart chargers for personal and fleet electric vehicles, and cyber-security approaches to secure these DERs.



PEI ENERGY CORPORATION

- 3 year project spanning from 2019-2022
- Project total value \$24,600,500
- Receiving total contributions worth \$4,373,250 from NRCan
- The project combines the installation of a 10MW PV solar array and a large grid connected battery array for flexible storage with remote control to provide clean energy and peak load management in a combined residential, industrial and commercial self-contained park. The resulting microgrid will be configured so that it can be connected to the grid or, when the grid is not available, disconnected to function as a fully operational, independent system.



PROGRAM OVERVIEW

Definitions:

DERMS — Distributed energy resource management system
Demonstration projects involve a combination of technologies or operational procedures typically implemented for the purposes of proving pre-commercial innovative technologies. Technologies considered as demonstration are expected to be in the Technology Readiness Level range of 5-8.

Deployment projects consist of proven technologies with the intent of modernizing grid operations by providing new functionality and addressing market gaps.
Hybrid projects involve demonstration and deployment phases. This occurs as either: 1) phased approach, where a project moves from a demonstration to a deployment; or, 2) project simultaneously launching demonstration and deployment components that may or may not be related

RECIPIENT (PROVINCE/ TERRITORY)	PROJECT TITLE	ENERGY MARKET AND RATE INNOVATION			ADVANCED INVERTER FUNCTIONS		LOAD MANAGEMENT	EV INTEGRATION	ARTIFICIAL INTELLIGENCE	PROJECT TYPE	SYSTEM CATEGORY
		SOLAR	WIND			STORAGE					
Yukon Energy (YK)	Residential Demand Response Program (RDRP)									Demonstration	DERMS
EPCOR (AB)	EPCOR Smart Grid System (ESGS)									Deployment	DERMS, Microgrid, Distributed energy storage
EQUUS REA (AB)	Canada's 1st Member-Owned Rural Smart Grid Project									Deployment	DERMS
ENMAX Power (AB)	Integrating Distributed Generation into Secondary Networks in Large Urban Centres									Demonstration	Grid monitoring and automation
SaskPower (SK)	SaskPower Distribution Modernization Program									Deployment	Grid monitoring and automation
SSM PUC (ON)	Sault Smart Grid									Deployment	Grid monitoring and automation
Bracebridge Generation (ON)	Smart, Proactive, Enabled, Energy Distribution; Intelligent, Efficiently, Responsive (SPEEDIER) Project									Hybrid	DERMS
London Hydro (ON)	West 5 Smart Grid Project									Hybrid	DERMS
Alectra Utilities (ON)	Power.House Hybrid: Minimizing GHGs and Maximizing Grid Benefits									Demonstration	DERMS
Alectra Utilities (ON)	GridExchange									Demonstration	DERMS
Independent Electricity System Operator (IESO) (ON)	York Region Non-Wires Alternatives Demonstration Project									Demonstration	New markets & rate options (NRO)
Lakefront Utilities (ON)	Digital Utility Platform									Deployment	Grid monitoring and automation
Hydro-Québec (QC)	Smart Grid Deployment of Off-Grid Networks									Deployment	Microgrid off-grid, grid monitoring, automation and storage off-grid
Hydro-Québec (QC)	Lac-Mégantic Microgrid									Hybrid	Microgrid-connected
Saint John Energy (NB)	Integrated Dispatchable Resource Network for Local Electric Distribution Utility									Hybrid	DERMS
New Brunswick Power & Nova Scotia Power (NB & NS)	Collaborative Grid Innovation for Atlantic Smart Energy Communities									Hybrid	DERMS
PEI Energy Corporation (PEI)	Slemon Park Microgrid Project									Deployment	Microgrid, DERMS

RELATED NRCAN PROGRAMS

ELECTRIC VEHICLE INFRASTRUCTURE AND DEMONSTRATIONS

To support innovative EV charging and hydrogen (H2) refuelling infrastructure demonstration projects that will address barriers to the installation, operation and management of charging and refuelling technologies.

ELECTRIC VEHICLE AND ALTERNATIVE FUEL INFRASTRUCTURE DEPLOYMENT INITIATIVE

Supports the deployment of electric vehicle fast-chargers, natural gas and hydrogen refuelling stations.

ENERGY EFFICIENT BUILDINGS RESEARCH DEVELOPMENT AND DEMONSTRATION

Support RD&D projects to lower the cost of highly energy efficient building construction and to inform the development and adoption of new building codes for both the alteration of existing buildings and the construction of new net-zero energy ready buildings across Canada.

CLEAN ENERGY FOR RURAL AND REMOTE COMMUNITIES

Supports rural and remote communities' transition away from diesel to more sustainable clean energy through 2 program streams:

- Bio Heat, demonstration & development projects
- Capacity building projects

CLEAN GROWTH IN THE NATURAL SECTORS PROGRAM

Supports emerging clean technologies (RD&D) that can reduce environmental impacts (air, land and water) and enhance the competitiveness of Canada's energy, mining, and forestry sectors.

BREAKTHROUGH ENERGY SOLUTIONS CANADA

Accelerating clean energy solutions in electricity, transportation, buildings and manufacturing with potential to substantially reduce greenhouse gas emissions globally. Partnership with the Breakthrough Energy Coalition (up to \$10M) and the Business Development Bank of Canada (up to \$10M).

IMPACT CANADA

A Prize Challenge Program that speeds up cleantech solutions to some of Canada's biggest challenges. Some of our electricity-related cleantech challenges are:

- Power Forward – Pairing Canada and UK Innovators to design the power grid of 2030
- Indigenous Off-Diesel Initiative – Enabling 15 remote Indigenous communities lead the transition away from reliance on diesel
- Charging the Future – Accelerating the best made-in-Canada battery innovation towards the market

Visit NRCan's current investments page for information on projects funded under these programs: <http://nrcan.gc.ca/current-investments>

For more information on major federal clean technology programs and services, visit the Clean Growth Hub website: Canada.ca/clean-growth

