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Microgrid in Canada 2017

Alexandre Prieur, *Smart Grid Project Leader*

International Symposium on Microgrid
Newcastle, November 2017

CanmetENERGY
Leadership in ecoInnovation

Canada

SMART GRID DEPLOYMENT IN CANADA 2016

79%	> 29 270	4215
OF METERS ARE SMART METERS	ELECTRIC VEHICLES	CHARGING STATIONS

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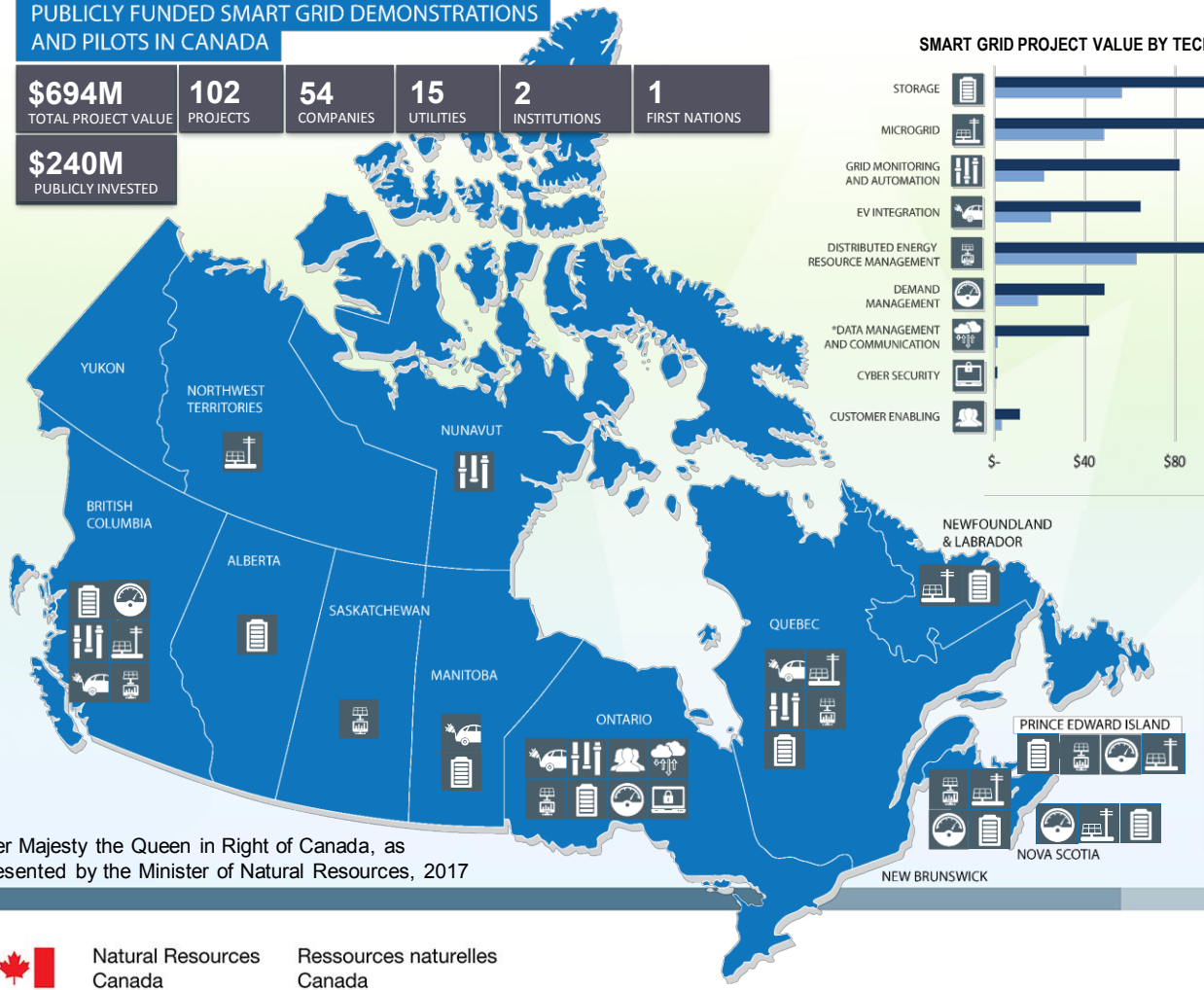
PUBLICLY FUNDED SMART GRID DEMONSTRATIONS AND PILOTS IN CANADA

$694M	102	54	15	2	1
TOTAL PROJECT VALUE	PROJECTS	COMPANIES	UTILITIES	INSTITUTIONS	FIRST NATIONS

$240M
PUBLICLY INVESTED



SMART GRID PROJECT VALUE BY TECHNOLOGY AREA 2003-2017

5	New **microgrid** demo projects since 2015
$17 M	Invested since 2015, representing
$56 M	In project value

19	New projects announced in the last 2 years, with more currently in contract negotiations
$32 M	Invested in the last 2 years, representing
$99 M	In project value

Mission Innovation Challenges - Microgrid

Innovation Challenges are global calls to action aimed at accelerating research, development, and demonstration (RD&D) in technology areas where MI members believe increased international attention would make a significant impact in our shared fight against climate change. *The Innovation Challenges cover the entire spectrum of RD&D; from early stage research needs assessments to technology demonstration projects.*

1. **Smart Grid Innovation Challenge -** *to enable future grids that are powered by affordable, reliable, decentralised for everyone renewable electricity systems.*
2. **Off-Grid Access to electricity Innovation Challenge -** to develop systems that enable off-grid households and communities to access affordable and reliable renewable electricity.
3. **Carbon Capture Innovation Challenge -** to enable near-zero CO_2 emissions from power plants and carbon intensive industries.
4. **Sustainable Biofuels Innovation Challenge** - to develop ways to produce, at scale, widely affordable, advanced biofuels for transportation and industrial applications.
5. **Converting Sunlight Innovation Challenge** - to discover affordable ways to convert sunlight into storable solar fuels.
6. **Clean Energy Materials Innovation Challenge** - to accelerate the exploration, discovery, and use of new high-performance, low-cost clean energy materials.
7. **Affordable Heating and Cooling of Buildings Innovation Challenge** - to make low-carbon heating and cooling affordable.

Green Infrastructure Phase II

- Promoting Clean Energy for Remote Communities
  - Innovative demonstrations to reduce diesel use in off-grid, remote and Northern communities;
  - Deployment of renewable energy technologies to reduce reliance on diesel in off-grid, remote and Northern communities; and
  - Bioheating program to reduce fossil fuel use to reduce reliance on fossil fuels in rural and remote communities.

- Smart Grid Demonstrations and Deployment
  - Supporting demonstrations and deployments of smart grid integrated systems to enable emission reductions.
  - Up to $100M will be invested over four years from April 1, 2018 to March 31, 2022

Call for project concept done

Request for proposal (RFP) to come

Recent Canadian Smart Grid Projects*

Demand Management

- Residential HVAC Energy Conservation and Peak Load Control of Energy Network
- Energy Management System for Cell Towers
- Energy Management for Buildings

Distributed Energy Resource Management

- SmartESS Inverter
- Smart Storage Demonstration
- Intelligent Smart Grid Photovoltaic Module
- Local Achievable Potential Studies Allocation

EV Integration

- Enhanced Charging Infrastructure Via Vehicle-Side Data
- EV Fast Charging Network Across Trans-Canada Highway
- EV Pilot Project Deploying Level 2 & 3 Charging Stations
- Regional Electric Car-Sharing System Pilot Project

Microgrid

- Solar Power and Energy Storage in Building Controlled by Smart Software and Internet Communications
- New Generation Integrated Smart Infrastructures for Charging EV Demonstration
- North Bay Community Energy Park
- Community Renewable Energy Microgrid Demonstration Project
- Mobile Microgrid with Generation and Storage

Storage

- Underwater Compressed Air Energy Storage Demonstration
- Distributed Grid-Scale Energy Storage
- Active Battery-Management System for Lithium-ion Batteries
- Home Thermal Energy Storage System
- Improved Energy Storage Capacity of Batteries

*with public funding

CANADIAN RENEWABLE ENERGY LABORATORY – MICROGRIDS

CanadianSolar

System Software Simulation Services

Energy Planning	System Sizing	Dynamic Modeling	Analysis
Economic Consideration	Renewables sizing	Equipment modeling	Energy analysis
Real/historical Load data	Energy storage sizing	System validation	Static analysis
Load modeling	Energy analysis	Power sizing	Dynamic analysis
Renewable energy penetration feasibility	Cost analysis		Cost analysis

System Hardware Simulation Services

System Analysis and Design Services

Can-REL TECHNOLOGY

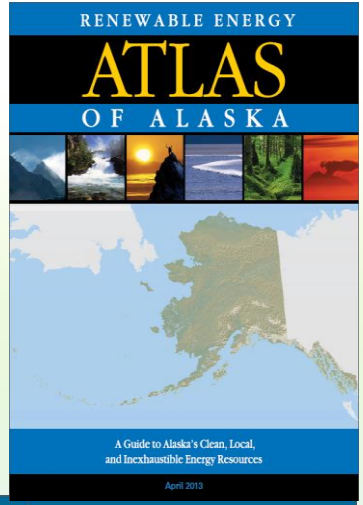
Canadian Solar has designed Can-REL to accommodate the most common and complex microgrid designs. The following technologies are part of our design:

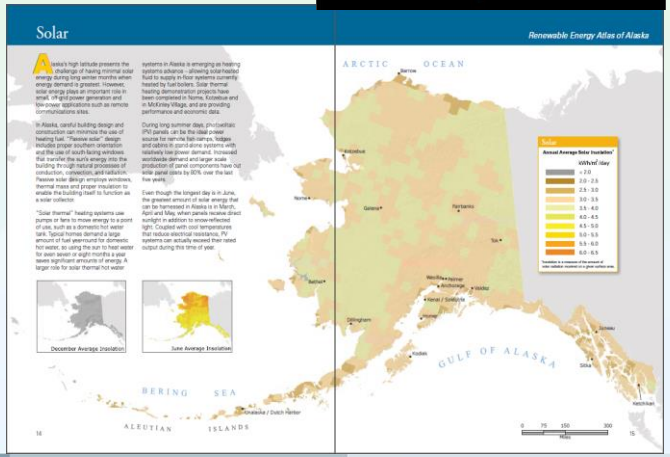
- Capacitor bank (30kVAR)
- Diesel generator (100kVA)
- Empty test bays
- EV charging station (2 X Level 2
- Li-ion battery energy storage (200kW/200kWh)
- Physical PV array (10kW)
- Physical wind turbine (3kW)
- Programmable grid simulator (270kVA)
- Programmable load banks (2 X 100kVA)
- PV simulator (90kW)
- Remotely accessible
- Wind simulator (100kW)

Renewable Energy Atlas & Microgrid Field Testing in the Arctic (REMFTA)

- The Arctic Renewable Energy Atlas (AREA) is a comprehensive online tool which will include maps of renewable energy resources and case studies of renewable energy projects in the Arctic (similar to the Alaska Atlas above).

- CanmetENERGY is collaborating with **NREL** within the **Arctic Council Sustainable Development Working Group** to develop AREA
- Microgrid Field Test in the arctic (Cambridge Bay, Nunavut)





For More Information

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Canada Microgrid Publications 2017

- **Peer Review Journal Papers (73)**
- **Conference Publications (22)**
- **Magazine Articles (2)**
- **Book Contributions (3)**