

BACKGROUND

R&D and Pilots Projects Proposed for Immediate Investment by the Smart Grid Opportunities Fund

1. Adaptive Intelligent Energy Control System for Residential, Industrial, Commercial and Agriculture Consumers
 2. Integrating large scale solar farms for reliable generation and grid support
 3. Micro-grid optimization for integration and optimal dispatch of renewable generation and storage
 4. Plug and Drive Partnership R&D Targets
 5. Utility Scale Electricity Storage Demonstration Using New and Re-purposed Lithium Ion Automotive Batteries
 6. Automatic Fault Detection and System Restoration in Smart Distribution Systems
 7. Double the Capacity of the Transmission Lines
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1 Adaptive Intelligent Energy Control System for Residential, Industrial, Commercial and Agriculture Consumers: [Energent, Hydro One, Milton Hydro, OPA, University of Waterloo]

CUSTOMER CONTROL

This project focuses on 50 residential pilots of in-home displays in Hydro One and Milton Hydro service territories Along with 15 other pilots in industrial, commercial, and agricultural settings. These in-home displays are coupled with novel predictive algorithms that automatically account for electricity market conditions, weather forecasts, and user preferences (such as desired energy cost per month). OCE investment in this project is \$1M and partner investment is \$2.8M.

2 Integrating large scale solar farms for reliable generation and grid support: [First Solar, Bluewater Power, Hydro One, London Hydro, OPA, University of Western Ontario, University of Waterloo]

UTILITY FLEXIBILITY

This project addresses the connection of MW-scale solar PV panels into Hydro One transmission and distribution networks. The FIT program has more demand for renewable power than it can currently handle. This project will help Hydro One connect projects faster and more cost effectively. We see it as a mission-critical activity for the province to meet the goals of the Green Energy Act. OCE investment is \$3 million and partner investment is \$3.3 million.

3 Micro-grid optimization for integration and optimal dispatch of renewable generation and storage [Hydro One, Wenvor Technologies, GE Digital Energy, Virelec, Hydrogenics, Kasabonika Lake First Nation, University of Waterloo]

UTILITY FLEXIBILITY

Substituting diesel dependency with reliable renewable generation in remote communities and industrial sites requires a sophisticated intelligent micro-grid system capable of optimal dispatch and management of intermittent renewable sources and storage solutions. The export potential for this technology is high considering the markets in India and China and other areas where electricity is currently not available. OCE's investment is \$3M and partner investment is about \$13M. This is an important smart grid niche opportunity for Ontario.

4 Plug and Drive Partnership R&D Targets

ADAPTIVE INFRASTRUCTURE

The Plug and Drive Partnership is extensive and includes: OCE, OPA, OPG, IESO, Hydro One, EDA, GM, Toyota, City of Hamilton, City of Toronto, Toronto Hydro, Veridian, CEATI, TAF, Pollution Probe, MEI, MEDT, MTO, MOE, Environment Canada, Ryerson University and the University of Waterloo. The group has released an interim report on PHEV/EV infrastructure needs of Ontario. The final report will come out in mid-March and will offer more details on RD&D needs. In order to secure new EV's from GM and others, the Province needs to act quickly on these recommendations. OCE can put these actions into play quickly. It should be noted that this initiative aligns well with a proposal being prepared with the DSEA, GM, UOIT, Veridian and others.

5 Utility Scale Electricity Storage Demonstration Using New and Re-purposed Lithium Ion Automotive Batteries

UTILITY FLEXIBILITY

OCE supported the \$4 million Clean Energy Fund (NRCan) proposal for electrical storage in the urban setting of Toronto. This proposal has been supported by NRCan, the list of Ontario partners is extensive (includes CEATI, Ryerson University, Hydro One, Toronto Hydro, Electrovaya, OPA and OCE).

6 Automatic Fault Detection and System Restoration in Smart Distribution Systems

UTILITY FLEXIBILITY

LDCs and partner companies have identified eight critical R&D topics, such as Automatic Fault Detection and System Restoration in Smart Distribution Systems, to enable increased deployment of distributed generation. The total proposed value of this project is expected to be around \$4 million with OCE being asked to contribute about \$2 million. Toronto, Kingston, Ottawa, London Hydro, and Waterloo North Hydro companies together with Virelec Ltd, Moloney Electric, and S&C Lavalin are supporting the project.

7 Double the Capacity of the Transmission Lines

ADAPTIVE INFRASTRUCTURE

Upgrading the transmission system is a prerequisite to ensuring long-term energy security in southern Ontario. The situation is critical and urgent in order to meet the goals of the GEA and FIT program. The proposed research by the University of Waterloo and the University of Western Ontario will identify geographic locations where strategic placement of high power electronics devices (FACTS) would allow the capacity of the grid to be increased and strengthened. The cost saving of increasing the capacity of the existing grid versus building a new line is approximately \$1M per kilometre. Hydro One, OPA, IESO and others have committed approximately \$4M to this initiative; OCE is being asked to invest \$1.0 to 2.0M.