

Research case study > energy storage

Large-scale energy storage integration

Version 1 (updated May 31, 2017)

Context: Growing demand, aging infrastructure and system constraints, as well as increasing renewable energy integration, have amplified the need for utilities to find new ways to manage their system. Battery Energy Storage Systems (BESS) can play a key role in this



Problem: The major challenges in integrating the BESS with the existing power system network is to determine the type of battery, high efficiency power converters, the power and energy capacity of BESS and advanced control methods.

Solution: The BESS is feasible for energy reservation service and peak load shaving. Distribution system loss can also be reduced by 10% and a 25% reduction in buses violating the voltage profile. Li-ion batteries are preferred due to its fast response, low self-discharge and long cycle and calendar life.

Impact: The most significant economic value to the Hydro One network is the loss reduction in the distribution system with intermittent renewable energy systems. This project also confirms the ability of BESS to regulate the voltage profile of the system.

CUE's role: Researchers developed three key technologies during this project: 1) an ESS detailed model with power converters; 2) Optimization of ESS for distribution with renewable energy and 3) battery testing and economic modelling for energy conservation.

 Completed**Sponsors:**

Hydro One, Ontario Research Fund

Timeline:

January 2011-July 2014

Research Team:

David Xu, Srinivas Karanki

Key stats

- 3** New technologies developed
- 10%** Reduction in system losses
- 25%** Reduction in bus voltage violations
- 15%** Electricity demand growth in Ontario