Ryerson University

Centre for Urban Energy

Research case study > energy storage

Impacts on grid: flywheel energy storage

Version 1 (updated May 31, 2017)

Context: The growing capacity of renewable energy systems has a need for flexible storage devices to combat intermittency and unpredictability. For this a flywheel energy storage system (FESS), which consists of a rotating mass, machine and power converters, can be used.

Problem: There is a potential risk of harmonic problems due to both inherent intermittence of solar-photovoltaic/wind systems and nonlinear characteristics of power converters. These can degrade power quality and can result in system instability.

Solution: A sensorless online monitoring method can significantly improve system reliability while grid side converters in the FESS can be adapted as an active power filter to mitigate harmonic currents injected by nonlinear loads.

Impact: The project found that FESS can significantly reduce system loss and improve the voltage profile in the distribution system providing significant economic value to the Hydro One network while improving system reliability.

CUE's role: During this project CUE researchers developed three key technologies for voltage: (1) regulation using flywheel in the distribution grid; (2) sensorless online monitoring of flywheel and (3) harmonic mitigation using flywheel grid connected converters.

✓ *Completed*

Sponsors:
Hydro One, OCE

Timeline:
January 2011–July 2015

Research Team:
David Xu, Rongqiang Liu, Kamran Masteri, Tharmini Thavaratnam, Shibiao Zhao, M. Alouddin Chowdhury, Xiaoqiang Guo

Key stats

2MW	Hydro One flywheel
15-20 years	Lifespan
90,000	Cycles with no degradation