



Research case study > renewables

Impacts on grid: solar panels

Version 1 (updated May 9, 2017)

Context: With more and more consumers installing solar panels (SP) it is important to understand how this might impact the grid system. Though renewable energies are vital for sustainability they may have adverse effects on grid infrastructure.

Problem: When SP are operating at or close to nominal power, active power can cross the distribution transformer backward to the transmission system. Voltage harmonics produced by the inverters used with SP can also be injected into the transformer, reducing their operational life.

Solution: Assess amount of PV panels and inverters that can be connected to a transformer and quantify the reduction in asset life of transformers. Such a study shall inform utilities of effect of PV panels on transformer life.

Impact: This research allows for better asset planning and maintenance to preserve the lifetime of these valuable grid components. It also provides better understanding of renewable integration which will further their propagation.

CUE's role: Our researchers created simulation models built in MATLAB/Simulink for a solar farm and a residential rooftop system on the basis of Canadian Utility data. Experimental work in a laboratory setup then followed the simulation models.



Sponsors:

Hydro One, Ontario Research Fund

Timeline:

January 2011–April 2014

Research team:

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Key stats

1,947MW
1,214

Ontario's installed capacity
Hydro One transformers