TRANSFORM

Energy Systems through Game-changing Technology

BUILDINGS | CARBON CAPTURE AND STORAGE | FUEL CELLS | NUCLEAR | POLICY | PLANNING
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HELLO, SUNSHINE! INTEGRATING SOLAR FARMS WITH ONTARIO'S GRID

Magdy Salama, Claudio Cañizares, K. Bhattacharya, Ehab El-Saadany, Mehrdad Kazerani, Siva Sivoththaman, A. Yazdani

Harvesting energy from the sun is an attractive proposition. But when you convert solar energy into electricity on a large scale, as so-called "solar farms" aim to do, you run into a number of problems. These range from land use issues to the technical headaches of incorporating new electricity sources into our current grid. Investigators at UW, the University of Western Ontario, Hydro One and OptiSolar are finding solutions, thanks to an ambitious $4.5 million research collaboration.

Among the issues they're tackling is the fact that decentralized sources of electricity such as solar farms can create frequency and voltage problems when they're connected to the grid. Six professors from UW's electrical engineering department - Kankar Bhattacharya, Claudio Cañizares, Ehab El-Saadany, Mehrdad Kazerani, Magdy Salama and Siva Sivoththaman - are working to determine just how much photovoltaic (PV) electricity our current system can accommodate without damaging upstream transistors.

Kazerani and Salama are developing new technology to increase the solar farm efficiency by reducing the impact of the shading on the solar panel. Kazerani is also developing cost-effective technologies to convert the DC power produced by PV systems into the three-phase AC power required by the grid, while Salama is enhancing solar farm performance by developing a new technology to reduce the impact of harmonics generated from the power electronics devices connected to solar panels.

Meanwhile, Cañizares and El-Saadany are combining real-time weather models and meteorological data with PV models to predict how much solar power will be transmitted to the grid. The result will be powerful tools to help grid managers take full advantage of solar energy while still ensuring a reliable supply of energy.

Finally, fellow UW electrical engineer Siva Sivoththaman is developing novel technology to maximize the power output of PV cells using textured conductive oxide coatings and optically active coatings.

Together, these researchers are working to make large-scale PV generation a reality in Ontario, successfully integrating solar farms with our current transmission and distributions systems.

Partners: Hydro One Inc., OptiSolar Farms Canada, First Solar, London Hydro, Bluepower, and University of Western Ontario.

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