

How to harness the wind

January 30 2015, by Dana Yates



Bhanu Opathella, pictured in the CUE lab, published a recent study exploring how to optimize Ontario's wind farms. Credit: Christopher Manson

With the abundance of wind in the Great North, one might think that harnessing it would be a breeze. But that isn't the case. Fortunately, a Ryerson researcher has found a way to address the major challenges related to wind power.

Bhanu Opathella, Electrical Engineering (PhD) '13, is a postdoctoral fellow in Ryerson's Centre for Urban Energy (CUE), a research and technology demonstration centre that's devoted to the discovery and commercialization of innovative, practical solutions to urban energy issues.

Opathella led a 2012 study that explored how to optimize Ontario's [wind farms](#). Also involving Bala Venkatesh, academic director of the CUE, the study was published in the Institute of Electrical and Electronics Engineers' Transactions on Power Systems journal.

Wind power is associated with three difficult problems: wind is unpredictable, inconsistent and the energy it produces cannot be dispatched on demand. So how can the Ontario electricity system enhance the efficacy of the province's dozens of wind farms? By getting them to work together, says Opathella.

While regulation changes are needed to facilitate that collaboration, Opathella says the results will be worth it. That is, when farms work in partnership, an area experiencing a great deal of wind can then offset an area experiencing very little wind.

"Since each generator has a different output, a turbine on one farm can work at full capacity while a turbine on another farm can operate at just 10 per cent capacity," says Opathella.

Using economic models, the researchers did a case study on a hypothetical, first-of-its-kind Wind Generators Co-operative that involved 10 wind farms in Ontario. The study showed that the uncertainty and variability of wind energy can be minimized when the wind farms work together and store their resulting energy in a common hydroelectric facility.

Due to daily fluctuations in the demand for electricity and the changing availability of wind, which blows intermittently and is stronger at night, backup power is needed to make this renewable resource a viable source of [energy](#). The co-ordinated operation of wind farms, however, reduces the need for backup power in the electricity system.

What's more, using a pump storage hydro power plant eliminates the problem of too little or too much supply. And since these facilities are too expensive to build to serve a single wind farm, a co-operative of wind farms improves the overall efficiency and cost-effectiveness of pump hydro [power](#) plants.

"For all these reasons, a Wind Generators Cooperative is a pragmatic solution to integrate large quantities of [wind energy](#) into the Ontario electricity system," says Opathella. "Also, the strategy can be applied across Canada and around the world."

Provided by Ryerson University

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