Ryerson's Centre for Urban Energy develops system to harness and control wind power

The collaborative project with Toronto Hydro, Hydro One and Temporal Power could change energy storage in Canada

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Masters of Applied Science student Kamran Masteri Farahani is lead researcher on the Centre for Urban Energy's Energy on Time project.

Canada is gathering more of its energy supply from green and renewable energy sources, including wind. While wind energy is sustainable and easily captured, the intermittent nature of this power source creates a number of challenges for storing and controlling it. New research at Ryerson University is examining the capabilities and uses of flywheel technology to harness and control wind power's intermittency.

Energy on Time is a collaborative project headquartered at Ryerson's Centre for Urban Energy (CUE). In 2010, emerging technology company Temporal Power founded by Ryerson alumni Jeffrey Veltri, Toronto Hydro and Hydro One, approached the research team at CUE to investigate the capabilities of a flywheel Veltri had built to store power generated by wind energy. Given the increasing need for energy storage, the CUE team was also tasked with developing control systems to integrate wind energy storage with the Ontario electricity grid.

Kamran Masteri Farahani, a Masters of Applied Science student in electrical engineering at Ryerson, spent the last year and half leading this research.

"A flywheel stores energy like a battery, but in kinetic form. Whenever you need it, it's right there in a matter of milliseconds," says Masteri. "The efficiency and capacity of this new flywheel is incomparable. This will change energy storage completely."

A flywheel, a rotating mechanical device used to store rotational energy, has numerous advantages over other types of energy storage such as batteries and capacitor banks. Flywheels can provide continuous energy even when the energy source is discontinuous, as is the case with wind energy.

Flywheels are also less expensive to create and require less maintenance than traditional energy storage units such as batteries. Flywheels can also be connected in series, creating flexibility to meet a variety of energy storage and usage requirements. The use of flywheels for wind power storage and voltage regulation is a new advancement, and could be ready for testing within Ontario by this summer.

Masteri has tested the flywheel with various algorithms in simulation tests at CUE at Ryerson. He believes the system is close to full implementation. The next step is for Masteri to test the

flywheel at Temporal Power in Mississauga. If all goes as planned, Hydro One may begin testing energy storage flywheels at its wind farms in Ontario.

"Energy on Time is the first project to come out of CUE, and we are very excited to see it commercialized," says Bala Venkatesh. CUE's Academic Director. "Because flywheels have the capability to store off-peak power, this technology will benefit the Ontario electricity system as a whole by making it more efficient and flexible."

Toronto Hydro, which has also helped fund the research, is investigating ways to implement the flywheel system for solar energy applications.

Masteri has recently published his Master’s thesis on the Energy on Time project. You can also learn more about the Energy on Time project at the CUE's website.