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Device redesign could prevent lost wind energy

Eric McCarthy/Journal Pioneer

Andre Begin-Drolet, a mechanical engineering PhD student from Laval University, is doing research at the Wind Energy Institute of Canada (WEICan) facility at North Cape.

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NORTH CAPE – An ice storm put the turbines at the North Cape wind farm offline for seven and a half days last winter.

The ice didn't actually stay on the turbine blades that long, explained Scott Harper, general manager at the Wind Energy Institute of Canada (WEICan); it's just that the ice had damaged the nacelles' anemometers - tiny instruments that measure wind speed. Because the data from the damaged anemometers was faulty, the wind turbines sat idle until technicians were able to replace the instruments.

Idle turbines mean lost revenue. In that case, about $60,000.

That is why Harper and WEICan are so enthusiastic about the research Laval University mechanical engineering PhD student Andre Begin-Drolet is doing. He is about to put the third generation of the ice-free anemometer he designed through its paces in North Cape's natural environment.

"Ice will change the geometry of the instrument and, since the calibration of the instrument is very dependent on the geometry, then you will read something, but it will be the wrong thing," Begin-Drolet explained.

Sometimes the force of the wind causes iced-up anemometers to break.

"You've got to buy new ones and pay people to go up there and replace them," Harper said.

In the wind industry, Begin-Drolet explained, the power generated is directly related to the wind speed.

"So, you need to have higher accuracy of wind speed in the wind industry than you would need in airplanes and bridges," he said.

"There are some other heated instruments out there, but they don't give as good data, as good measurements, as we hope this one will do."

It has already been tested in Laval's wind tunnel and icing climatic simulation chamber.

"The rubber hit's the road the first time freezing rain hits, to see how it compares and what it's doing versus what others are doing," said Harper.

Begin-Drolet will have access to the wind farm's data so that he will be able to compare the accuracy of his instrument to others used there.

The third generation prototype has heating elements embedded in all fixed and rotating parts. The heating elements could be programmed to turn on at a lower temperature, but for the first winter of testing it will switch on when the temperature drops below 6 degrees Celsius. Maximum power to the instrument is 150 watts. It is black in colour to draw heat from the sun. Sensors and communication capabilities are built into the design.

Anemometers used at the wind farm typically cost between $1,000 and $2,000.

Although optimistic this third generation prototype is up for the challenge, Begin-Drolet anticipates there will be a fourth generation device, with a mounting bracket redesign, and steps to cut production costs.