TRANSFORM
Energy Systems through Game-changing Technology

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TAKING THE GUESSWORK OUT OF WIND POWER PREDICTIONS

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When it comes to forecasting the weather, Waterloo's Dr. Fue-Sang Lien believes that two crystal balls (or three or four or five) are better than one. By linking a number of systems, Dr. Lien and his team of researchers have pioneered a new way to more accurately anticipate wind speeds and power.

It's a welcome improvement for the energy sector. While hydroelectric and nuclear power offer a predictable source of electricity, wind speeds vary from hour to hour. That makes it difficult for utilities to know how much electricity wind turbines will add to the grid on any given day — and therefore how to manage their power supply efficiently. It also complicates energy trading between jurisdictions.

So what's the solution? Historical data and physics-based modelling systems can provide rough wind speed predictions. Feeding that information into artificial neural networks that learn and adapt makes those forecasts more reliable. Still, Dr. Lien knew there was room for improvement.

On a wind farm in Northern China, he and his colleagues developed a better model, feeding the best statistical and meteorological data into an interconnected framework of artificial neural networks to forecast wind speed and turbine power.

The result is more accurate 72-hour forecasts (plus a clearer sense of how much confidence utilities can place in those predictions). In Ontario, where wind power supplies a growing percentage of the province's energy mix, the new approach is sure to be a breath of fresh air.

Partners: Natural Sciences and Engineering Research Council of Canada (NSERC), Waterloo CFD Engineering Consulting Inc., Defence Research and Development Canada, Taiwan Power Research Institute, North China Electric Power University, York University, Shared Hierarchical Academic Research Computing Network (SHARCNET)