Student makes strides in wind forecasting

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Meeting the demand for power in the future will depend on a well-balanced mix of generation resources. How will wind power fit into that mix? That's a question the Bonneville Power Administration is pursuing on many fronts.

Ben Kujala, a graduate student in statistics at Portland State University, just completed a project to help find the answer. He was hired by BPA as a summer intern.

Better predictions about the way wind will affect the power system could lead to better planning and help integrate more wind energy. The concern with current methods is that they do not completely capture the relationship between regional temperatures and wind power generation. But, Kujala has created a synthetic record of historical wind power generation to help understand this relationship.

"During extreme temperatures, there is often a stagnant weather system in the Northwest. If we have really high or really low temperatures across the region, we will likely see less output from the wind fleet," he explains. "This is important because extreme temperatures translate into higher demand for electricity."

"My goal is to relate the output we have seen from the wind fleet during these extreme temperatures to similar weather patterns that occurred in the past," says Kujala. This required a unique methodology – to his knowledge, historical weather data has not been used this way before.

Kujala examined hourly temperature data dating back to 1973. Using this information, he created a synthetic wind record that is tied to the observed temperatures. BPA only has actual wind observations that date back to 2002, so the synthetic record is important.

The result of Kujala's work is a model to help predict whether BPA will have ample resources to support the future peak demand for power. "If all of our power came from wind, we couldn't guarantee that there would always be generation available. So the question is what proportion of wind can be integrated into the system that would still allow us to meet peak loads?"

The model works similar to the way forecasters predict long-term stream flow, which is basically based on educated guesses.

"With one guess, our ability to predict wind's impact on the Northwest power system isn't very precise. But with a thousand guesses, we can be much more accurate," says Kujala. "We now have a better idea about how wind power contributes to the regional power mix."

Kujala is currently in one of the agency's student employment programs. Once he graduates this semester, he hopes to continue working for BPA.