

## **BPA: Forecasting the Wind**

### **Local News**

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Sitting in a dark room, enfolded by screens of twinkling data, Adam Caccavano mediates a powerful dance between Northwest wind and water.

As BPA duty schedulers like Caccavano coordinate the flows of water and hydroelectric power generation at the 31 federal dams, a new tool called the Super Forecast is helping them better anticipate the action of the wind across the turbines of BPA customers around the Columbia River Basin.

“It’s definitely one of the most valuable things that’s been done in the last few years to help us perform our jobs,” says Caccavano, a University of Oregon physicist by training who joined BPA in 2009. “It’s something you can guarantee I’ll have available on my screen all the time.”

The Super Forecast methodology, a software program created by a small team of analysts led by Scott Winner in Power Generation Support, is another step in BPA’s efforts to ensure the safe and reliable integration of variable resources, such as wind power.

“This is a great example of the type of innovation and creativity that has made BPA a world leader in renewable energy integration,” says Elliot Mainzer, BPA acting deputy administrator. “Hats off to Scott and the team.”

In the Northwest, the system of federal dams represents the hidden factor undergirding the essential stability of the transmission grid in the renewable energy era.

The invisible hand that coordinates them belongs to hydro operators such as Caccavano. During their 12-hour work shifts, they compensate for changes in wind generation like a skillful dance partner mirroring the moves in reverse. If wind revs up, hydro generation backs down; if wind drops off, hydro steps forward to fill the void. Working together, they cut a clean figure that keeps the flow of energy perfectly smooth and in balance.

To accomplish this feat of synchronization, federal hydro managers hold water and generation capacity in reserve. These balancing reserves, like any reserve, represent a critical form of insurance that often goes untapped. Meanwhile, the system stretches and flexes to provide navigation, flood control, irrigation and protection for migrating fish.

As wind has set record after record — most recently, on Feb. 22, wind produced an average of 4,464 megawatts for an hour, accounting for 34 percent of the generation in BPA’s balancing area — the agency and the region are seeking opportunities to use the finite resources of the Columbia system more efficiently.

“Forecasting is only going to become more important in the future, not less important,” says Winner, project manager of BPA’s Centralized Wind Power Forecasting Initiative.

“You cannot put a price tag on what improved forecasting could help us do.”

To apply 21st century technology to the longstanding riddle of wind forecasting, the agency collaborated with wind customers for four years to arrange to collect the additional data that feeds the wind forecasting efforts. BPA is now able to monitor wind speed at the turbine level across 31 wind plants integrated by the agency. “Everything starts with good data,” Winner says.

The Super Forecast, launched in March, benefits the agency and customers in three ways. First, this

site-specific wind data is provided to BPA's two private wind-power forecasting vendors, strengthening their predictions. Each company's forecast varies based on proprietary factors, including which data it chooses to emphasize.

"Some forecasts are better in certain time frames than others — like short-term or long-term forecasting, or they tend to be more accurate for some sites than others," says analyst Nathan Henshaw. "That reflects the variety of different terrain in our balancing area and the complexity of the Gorge."

Second, the Super Forecast enables BPA to analyze and blend the vendor forecasts into a hybrid that can perform better than either parent, especially for a particular site.

The BPA-developed software operates like a mini-Kentucky Derby, pitting vendor forecasts against each other every hour around the clock. The ingenious algorithm evaluates their accuracy against the actual behavior of the wind and declares which one hit the winner's circle most often over the past seven days — at each wind site. Instead of a bag of oats and a garland of roses, the winner earns the privilege of becoming the official BPA forecast for the upcoming hour at that site. The methodology also provides reliability: If a vendor's forecast fails to arrive, the Super Forecast defaults to the second vendor. "We lost connectivity with one vendor, and our hydro schedulers didn't even notice," says Winner, whose Super Forecast team included Henshaw, John Yen, Kasi Beale, Jeff Gaskin and Brendon Schloe.

To aid in transmission scheduling, BPA is making the project-specific forecasts available to wind generation owners and their scheduling agents at no charge (costs are recovered through rates). By getting the most out of vendor forecasts, the Super Forecast also helps BPA fulfill the Department of Energy's top recommendations to balancing authorities on the integration of wind: to have a wind forecasting program and to use multiple forecasting vendors.

So far, BPA's new tool is finding an eager audience, inside and out. "Lots of wind generators really wanted to be first on the list for getting the new forecast," Winner says. "They understand it, and they're on board with it."