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Too much of a good thing: Growth in wind power makes life difficult for grid managers

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Benjamin Brink/The Oregonian
The fast-growing number of wind farms in the Northwest, such as the Biglow Canyon Wind Farm near Rufus, has created new challenges for those who manage the power grid.

On the afternoon of May 19, in a single chaotic hour, more than a thousand wind turbines in the Columbia River Gorge went from spinning lazily in the breeze to full throttle as a storm rolled east out of Hood River.

Suddenly, almost two nuclear plants worth of extra power was sizzling down the lines -- the largest hourly spike in wind power the Northwest has ever experienced.

At the **Bonneville Power Administration**'s control room in Vancouver, it was too much of a good thing. More electricity than its customers needed. More than the available power lines could export from the region. And more than the grid could readily absorb by ramping down generation at the region's network of federal dams.

So the edict went out: Feather your turbine blades; slash output.

It was an unwelcome instruction for wind farm owners, whose economics depend on generating electricity whenever possible. Yet it's one likely to go out with increasing frequency.

During the last three years, the building boom spawned by green energy mandates in Oregon, Washington and California doubled the generation capacity of wind farms in the region. By 2013, it's expected to double again.

That seems like great news. Plenty of carbon-free energy with no fuel costs. Jobs. Property taxes.

In the real world, however, the pace and geographic concentration of wind development, coupled with wild swings in its output, are overwhelming the region's electrical grid and outstripping its ability to use the power or send it elsewhere.

In theory, better coordination of the balkanized grid operations around the west could help solve the problem, reducing costs, eliminating bottlenecks and solving scheduling conflicts that plague the system today.

In practice, however, those efforts have often stalled at the planning stage -- the victim of risk-averse engineers, utility managers or public utility customers worried about seeing their rates increase.

It's not a new problem. But the renewables explosion, and pressure to reduce carbon emissions, is forcing the transmission issue to center stage now.

"There's a sweet spot to talk about these issues, and everyone's attention is on this at the moment," said Rachel Shimshak, executive director of the **Renewables Northwest Project**. "Maybe the benefits didn't look so obvious before, but now we have a lot more people with skin in the game."

The most significant player in that crowd is California, which already buys much of the Northwest's wind energy, but has trouble getting it delivered over clogged interstate power lines. The state has just increased its already aggressive renewable energy standards, increasing its appetite for green power.

Ultimately, the solution to the problem is to beef up or build new power lines, said Randy Hardy, a Seattle-based energy consultant. But that's a five to ten year proposition, involving even more coordination on what to build, where to put it and who pays.

"We have a next-year problem," Hardy said, "or maybe a this-year problem."

Only 15 percent of the electricity generated by wind farms in the Northwest goes to the public utilities that buy power directly from BPA, which sells power from federal dams in the Columbia Basin. But the federal power marketing agency manages three quarters of the region's high voltage transmission system, including the sections serving most of the region's wind farms.

That makes it BPA's job to balance their up-and-down output, blending it with other sources of power so total generation at any given time matches total demand -- a requirement to maintain grid reliability.

The dams are great for the job -- operators can adjust water flows through the turbines to help offset variable wind output.

But only within limits.

As the region's wind fleet grows, an ever bigger slice of the hydro pie is being reserved to fill in when the wind doesn't blow as scheduled. That means foregone sales of surplus power, a source of revenue that reduces BPA's rates for public utility customers.

When the wind blows harder than forecast, particularly during periods of high spring runoff at the dams, operators face the opposite problem. They can't bypass the dam turbines to lower hydro generation, because dumping too much water over the spillways harms fish.

So the other option is to cut generation at the wind farms.

Too many curtailments, however, undermines the economics of wind, not only because turbines generate less power to sell but because valuable tax and renewable energy credits are only generated when their blades are spinning.

"We are committed to trying to find ways to get as much wind into the system as possible, but we're going to be real sticklers about reliability, and we think its it's not fair to have a cost shift," said Elliott Mainzer, BPA's director of strategic planning

BPA does charge wind farms to offset the additional costs they bring to the system. But those charges have been highly contentious.

Last year, when the agency proposed quadrupling its “integration” rate, Oregon’s congressional delegation took up the wind developers’ fight, accusing the agency of dragging its feet on renewables and focusing solely on maintaining low rates for its public utility customers. Sen. Ron Wyden was highly critical of the agency’s attitude problem, and Rep. Earl Blumenauer even suggested it might be time for new leadership at the agency.

BPA ultimately backed away from the big rate increase. But it is coming up again this year as the agency kicks off a new rate-setting process.

Meanwhile, it has pushed ahead with a variety of efforts to accommodate more variable resources, from better wind forecasting to more flexible scheduling of transmission.

In extreme situations, however, the agency continues to dump wind.

At the current rate of wind development, says the BPA's Mainzer, the region's system of dams and power lines will start running into consistent operational problems around 2013, when wind in the agency's territory reaches total capacity of some 6,000 megawatts.

Above and beyond that, he said, will require major structural changes.

"If it's done right, he said, "it's a huge opportunity for the Northwest."

The solution, most experts believe, lies in better coordination of power plants across the west, more efficient use of existing power lines and some expansion of the grid.

"We believe there's more space on the lines if we get smarter about how we use them," said John Audley, deputy director at the Renewables Northwest Project. "But there isn't anyone out there who feels we have enough transmission in place to get what we need done."

Building new transmission, though, is an uphill battle. New lines often require new rights of way through sensitive habitat and private property. And they are phenomenally expensive, raising the show-stopping question of who pays.

BPA has had some success convincing wind developers and other transmission customers to commit to helping fund new power lines and upgrades within the region.

"The piece that is not doing well is planning for moving wind out of the region," said Brian Silverstein, senior vice president of transmission services for BPA. Ultimately, he said, "we can plan all we want. The challenge is getting people to commit to the investment."

There's a broad-based effort to get more out of the existing lines, too.

The capacity of power lines linking Oregon and California, for instance, is completely booked long term. But on a day-to-day basis, utilization can be lower than 50 percent.

Part of the problem is that utilities buy more capacity than they need, and hoard it for emergencies. If that capacity can be freed up, BPA estimates the lines could transfer 10 to 15 percent more power.

Another issue is that utilities are required to reserve line capacity an hour ahead of time. By allowing them to adjust their orders more frequently, utilities could accommodate unanticipated ebbs and flows in wind generation and maybe free up another 25 to 30 percent of capacity on the power lines.

But none of those changes come quickly, easily or cheaply. Utility managers, renewable developers, customer advocates and environmentalists met last week in Portland for a day-long seminar on expanding and modernizing the grid to accommodate renewables.

There was a definite sense of urgency in the air. But also determination.

"We can't pay for everything at once, and we don't want to pay for everything on the table," said Jeff Bissonnette, a lobbyist for the **Citizen's Utility Board of Oregon**. "We have to figure out what makes sense to pay for first, second and third, and what makes sense for consumers and the environment."

-- **Ted Sickinger**