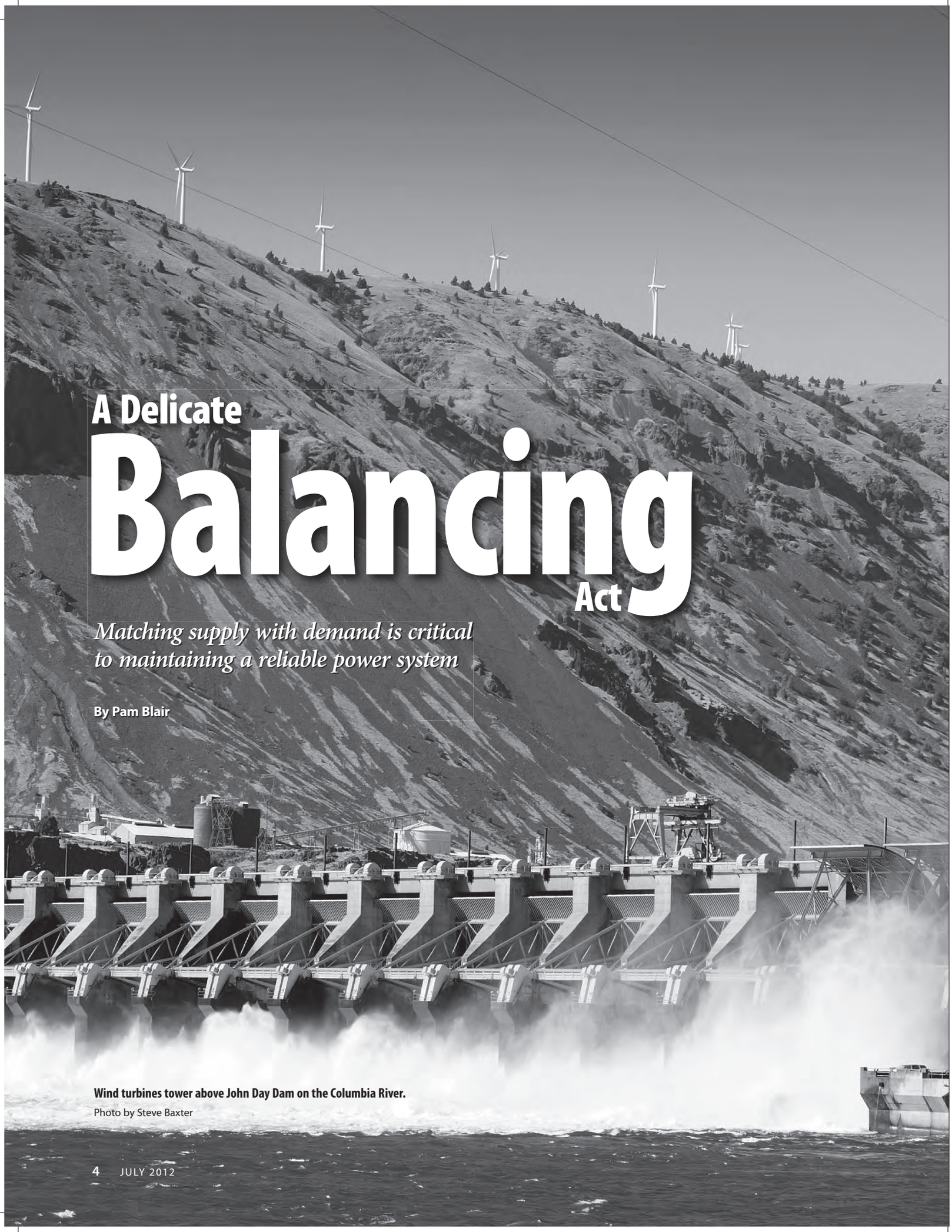

A Delicate Balancing Act

Matching supply with demand is critical to maintaining a reliable power system

By Pam Blair

Wind turbines tower above John Day Dam on the Columbia River.
Photo by Steve Baxter

Call it too much of a good thing. In 2011, the Pacific Northwest produced about 97,500 more megawatt-hours of electricity than it needed or could sell.

That prompted the Bonneville Power Administration—which not only manages federal hydropower resources, but owns 75 percent of the region's high-voltage transmission facilities—to shout "stop."

"To maintain system reliability, we must make sure generation equals demand," said Mike Hansen, a BPA spokesman.

Generation in excess of load creates an imbalance that can jeopardize the system and lead to instability, electrical disturbances and even blackouts.

Surplus Northwest power typically is sold to utilities in the Southwest, but sometimes it is not needed. An analysis by the Northwest Power and Conservation Council predicts that every four years the Northwest could exceed Southwest market demand between April and June by 300,000 to 1.2 million MWHs.

"Oversupply is not a new issue in the Northwest, but it has become problematic as more wind power is added to the power supply," said Joan Dukes, council chairwoman.

Wind turbines in the BPA transmission grid generated more than 4,000 MW for the first time on March 11. Nearly 1,000 MW of that has been added in the past year. BPA expects to have 5,000 MW connected to its system by 2013.

Last year, 35 percent of new electric capacity in the United States was from wind farms, the Global Wind Energy Council reports.

Managing the Oversupply

The problem is not entirely due to wind power, although its variable nature does pose a challenge for schedulers.

Rapid spring runoff causes high flows in the Columbia River. Water that cannot be stored either must be diverted past turbines and released over spillways, or run through generators.

Operators must run the system to comply with environmental regulations to protect fish. Too much spill can subject migrating salmon to harmful levels of dissolved gases in the churning water.

Faced with state and federal requirements specifying allowable gas limits, BPA established a policy last year known as environmental redispatch.

During high water levels and hours of low power demand—at night and the early morning—BPA maximized hydro generation and minimized dissolved gas levels by cutting off transmission access to other power generators. BPA started with fossil fuel plants and, as necessary, ended with wind farms.

BPA substituted free hydropower to satisfy generators' scheduled deliveries.

"We're only talking about a few hours of the day, then we need all of these resources to meet the load," Hansen said.

Between May 18 and early July 2011, BPA replaced most power from fossil fuels and about 6 percent of scheduled wind energy. The wind reduction amounted to 1 percent to 2 percent of the wind generators' annual production, according to BPA.

Coal and natural gas plants typically shut down and save fuel costs. However, wind economics are different. Their revenue from production tax credits, renewable energy credits and contracts depends on feeding generation onto the grid.

Wind project owners cried foul in a June 2011 complaint with the Federal Energy Regulatory Commission. In December, FERC directed BPA to provide wind generators comparable, nondiscriminatory transmission service.

Crafting a New Plan

BPA responded with an Oversupply Management Protocol, to remain in place through March 2013. As with the environmental redispatch plan, BPA can displace generators—including wind producers—after all other reasonable actions are taken. Again, it offers low-cost or free hydropower to replace the output.

The primary difference in the new plan is BPA will compensate generators for lost revenues, including renewable energy credits, production tax credits and purchase power agreements signed before March 6—the date the new plan was filed.

BPA proposes splitting costs 50/50 between users of the federal base power system—its public power customers—and wind project owners/purchasers.

Paying wind generators to shut down in 2012 is projected to cost about $12 million, but could exceed $50 million in extreme conditions, according to BPA. It says reductions likely will be unnecessary in one of every three years.

The new protocol already has been used. At the end of April, so much water passed through dams that transmission for wind power was cut off six hours and five hours on consecutive mornings. ■

Powering the Future

Renewable energy sources do not always generate power when it is needed. If it can be stored and used later, intermittent energy sources such as wind could more easily be integrated into a utility's power mix.

That is why Kotzebue Electric Association is working to deploy an energy storage system—essentially, a series of rechargeable batteries. It would reduce the Alaska electric cooperative's use of high-priced diesel.

During lower energy use, generators would be run at peak efficiency, with unused power stored. At peak energy use, the battery would supply power, reducing the need to bring additional diesel generators online.

That capability is critical for KEA, which has 2.95 megawatts of wind power on its system. But finding a system that meets the co-op's needs has been a challenge.

"Improvements are on the horizon," says KEA General Manager Brad Reeve. "Everything we are working on is to decrease the amount of fuel we use. We can do that by making wind more firm capacity through storage."