Transmission system sails smoothly through wild windstorms

June 12, 2009

While sudden thunderstorms played havoc with Portland's evening commute on Thursday, June 4, BPA employees at the agency's transmission dispatch center watched the storms' raging winds throw wild swings into the power flowing from the Northwest's wind farms.

Wind generation first shot up more than 1,000 megawatts — close to 50 percent of the total capacity of the wind fleet on BPA's system — in scarcely an hour. Then the output quickly dropped nearly as much, then surged and dropped and surged and dropped again. One thousand megawatts is equivalent to the Columbia Generating Station, a nuclear plant, so it was as if a major power plant were riding a roller coaster.

"This is the first time I've seen it move this much, this fast," said Bart McManus, technical lead for wind integration in Transmission Services. "This type of movement is very rare in our wind fleet."

Dispatch operators must ensure the total amount of power flowing into the grid managed by BPA remains stable and that it matches the amount flowing out. This means rapidly cutting back on other incoming power when wind suddenly ramps up and rapidly adding other power when wind drops off.

One of dispatch's key tools is automatic generation control, a computer-driven system that ties together many of the major federal hydroelectric dams. This system acts quickly to adjust the amount of water flowing through dam turbines — and the power they generate — so it offsets shifts in wind generation. That allowed BPA to absorb the rapid swings in wind power without a flicker in the region's lights.

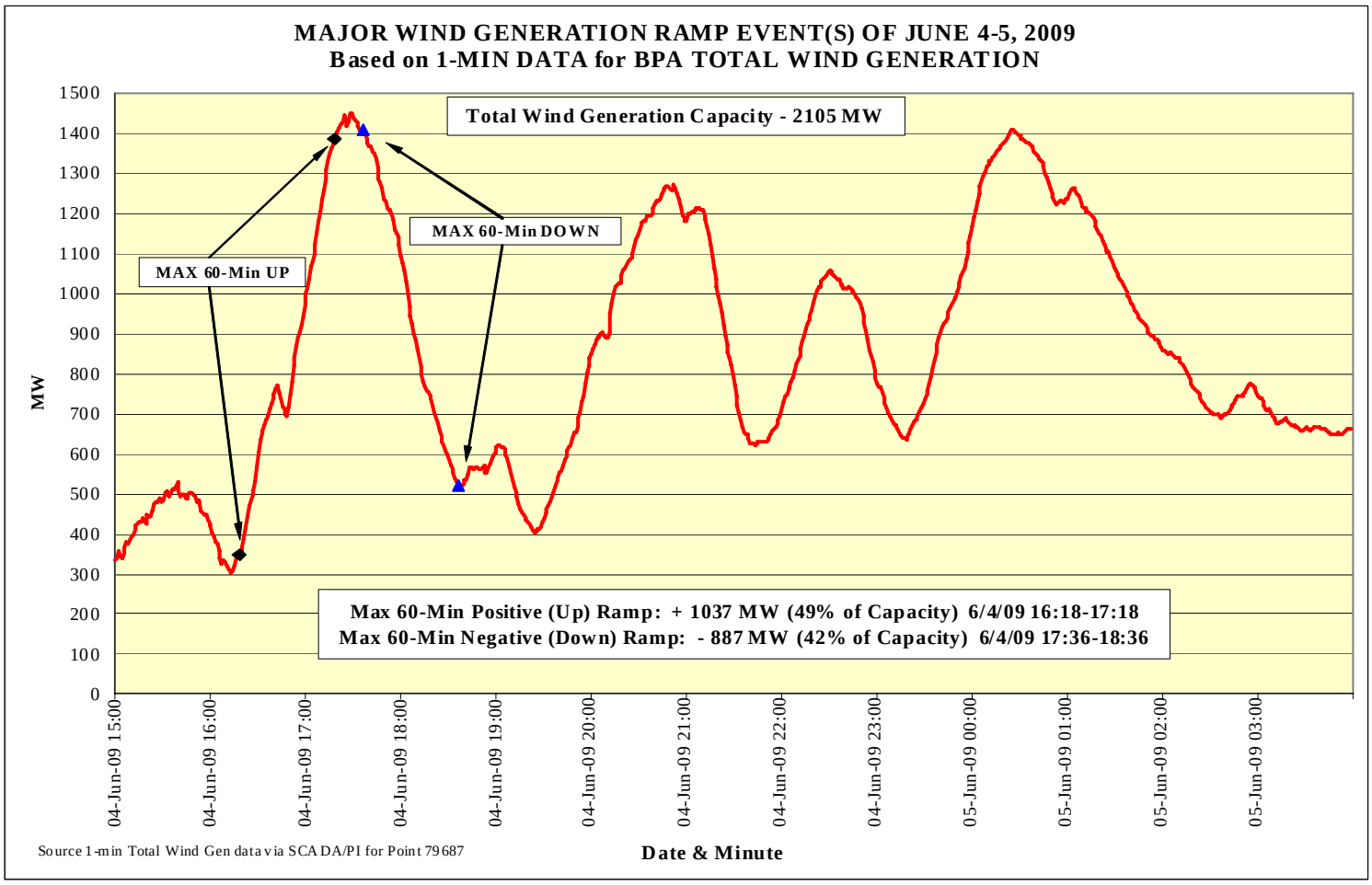
Grand Coulee and Chief Joseph dams provided most of the response to the wind generation changes, since they are large and very flexible, McManus said.

The events underscored the role of the hydro system in backing up wind power and how effectively BPA has integrated the fast-growing wind fleet into its grid. BPA's work to expand transmission for wind power and other renewable resources has made the agency a national leader in wind integration.

As the storms picked up into the evening and power demand dropped, BPA issued an alert notifying wind power producers that they might have to curtail their generation. That would be necessary if BPA could not reduce the energy output of the hydro system far enough to absorb sudden climbs in wind power, without exceeding total power demands at the time.

However, that wasn't necessary, McManus said. "It came close to the limits of the hydro system, but then the wind turned around and backed off," he said.

The dramatic swings in wind generation last week are a function of having so many of the region's wind power projects concentrated around the Columbia River Gorge, where they're all subject to the same blustery weather at the same time. However, BPA is taking steps to improve forecasting and other actions to better accommodate swings in wind energy.



Date: June 12, 2009