SEPTEMBER 7, 2018

Labor Day was no holiday for New England's power grid: Weather and resource outages led to capacity shortage conditions

ISO New England provides these newsletter updates on power system conditions when data and other information become available and can be released on a preliminary basis.

Labor Day was expected to be hot, but not as hot as it got. Between the hotter-than-forecasted weather and a string of unplanned generator outages, power system operating reserves ran short in New England on Monday, September 3, 2018. ISO New England system operators implemented several steps of a well-established operating procedure to address the reserve shortage and recover the required level of operating reserves.

Temps were hotter than weather forecast, so consumer demand was higher than load forecast

Monday was a holiday, and demand is typically lower on holidays than on regular weekdays. However, consumer demand for power soared as people cranked up their air conditioning to deal with the swampy air around the region. As a result, the peak demand on Monday was the highest ever recorded on a Labor Day in New England.

Weather is the biggest factor in day-to-day load variations, and Labor Day illustrated that linkage. The weather forecast for Boston called for a high temperature of 89° Fahrenheit (F) and a dew point of 70°, but the actual high temperature was 94° and the dew point was 73°. Similarly, for Hartford, the forecasted temperature and dew point were 90° and 71°, but the actual temperature and dew point came in at 94° and 74°, respectively.

Dew point levels—a measure of humidity—in the mid-60s or greater make hot temperatures feel more uncomfortable and contribute to increased demand for air conditioning, which raises demand for power. In fact, when the dew point is above 70, every one-degree increase can cause load to rise by about 500 megawatts. Similar effects on load are caused by rising temperatures.

Demand for electricity peaked at about 22,956 MW during the hour from 5 to 6 p.m., about 2,400 MW higher than expected when the day began, based on forecasted weather conditions for the day. Breaking down the hourly integrated peak to the more granular five-minute intervals, the system saw a five-minute peak of about 23,106 MW at 5:50 p.m. As an indicator of more typical holiday-weekend-sized loads, the peak on Sunday, the day before, was just 16,752 MW. (Figures are preliminary.)

Unplanned generator outages cut into reserves

Several power plants also went offline unexpectedly throughout the day. In all, about 1,600 MW of forced generation outages occurred on Monday.

To make up for the generation outages, some resources that had been providing reserves began generating electricity, and as a result the power system dropped below the required operating reserve requirements.

Between 3:30 p.m. and 4 p.m., the ISO implemented 5 of the 11 actions available in Operating Procedure 4 Action During a Capacity Deficiency, to address the capacity deficiency. These actions enabled the ISO to purchase emergency energy from New York and New Brunswick and to ask market participants to reduce energy consumption at their own facilities. The actions also include alerts to notify market participants of stressed system conditions.

One of the actions declares a Power Watch to signal the seriousness of system conditions. While the ISO didn't issue a request for voluntary conservation Monday, that was an option if conditions had deteriorated. However, conditions improved steadily as offline generators were able to come online to restore operating reserves and demand began to decline throughout late afternoon.

Wholesale power prices spiked when energy was short

When system conditions require the use of operating reserves, wholesale electricity prices will go up to reflect the value of the reserve power that is needed during these shortage conditions. Monday, prices rose as high as about $2,454/MWh during the hour from 5 to 6 p.m. That compares to a price of about $68/MWh during the hour from 9 to 10 p.m., after the operating reserve shortage had been addressed. For the entire day, the average hourly price was about $262/MWh. (Figures are preliminary and subject to reconciliation.)

While these price spikes can be eye-catching, the real-time market price applies to a small proportion of the total load. Utilities and other power suppliers buy most of the power they'll need the next day in the day-ahead energy market, and that's the price they pay for the power they committed to buy. If they use more than they purchased in the day-ahead market, they pay the real-time price for the difference. For Monday, the day-ahead energy price was about $60.85/MWh for the hour from 5 to 6 p.m.

Pay-for-Performance Shortage Event

The power system remained in Operating Procedure No. 4 from about 3:30 to 8 p.m., and the region was in a Capacity Scarcity Condition for about two hours and 40 minutes. Under the Pay-for-Performance market design implemented June 1, 2018, an operating reserve scarcity constitutes a capacity scarcity condition.

When that occurs, resources that did not perform according to their capacity supply obligation will be required to compensate the resources that made up for those resources' shortfall by performing above their capacity supply obligation. Charges for underperformance are paid by the underperforming resources, not electricity ratepayers.

Underperforming resources will be penalized at a rate of $2,000/MWh for failing to meet their obligation during energy shortfalls, while resources that over-perform (including resources with no obligation) will receive $2,000/MWh of additional revenue. The performance payment rate is scheduled to increase to $5,455/MWh over the next six years.

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