

Basin Electric's all-of-the-above resource portfolio works together with the Southwest Power Pool market to serve members during energy emergency

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Val Weigel, Basin Electric director of asset management and commodity strategy, said from a marketing perspective, each fuel type in Basin Electric's generation resource portfolio played a role.

The energy emergency across the entire midsection of the United States Feb. 14-20 will be discussed and investigated for months if not years, according to Barbara Sugg, CEO of [Southwest Power Pool](#) (SPP). "We understand there will be an investigation by [FERC](#) ([Federal Energy Regulatory Commission](#)) and we welcome that. We are always looking to be better," Sugg said during a phone conference on Feb. 18. "Our system is running 1,000 contingencies every four minutes. ... The transmission grid is the single most complex piece of technology ever built by mankind. Let that sink in."

Basin Electric's diverse generation portfolio accounts for about 6% of the entire SPP system; the cooperative received its first notice that the regional transmission organization issued a "resource alert" on Feb. 8. SPP then issued a conservative operations message on Feb. 9.

"At that time, we communicated with our plant sites to make sure we had enough fuel to run our sites, make sure our offers are up-to-date for the coming days, because once we're in conservative operations, SPP has the ability to commit resources early to make sure they're going to have enough resources online for the event," Val Weigel, Basin Electric director of asset management and commodity strategy, said.

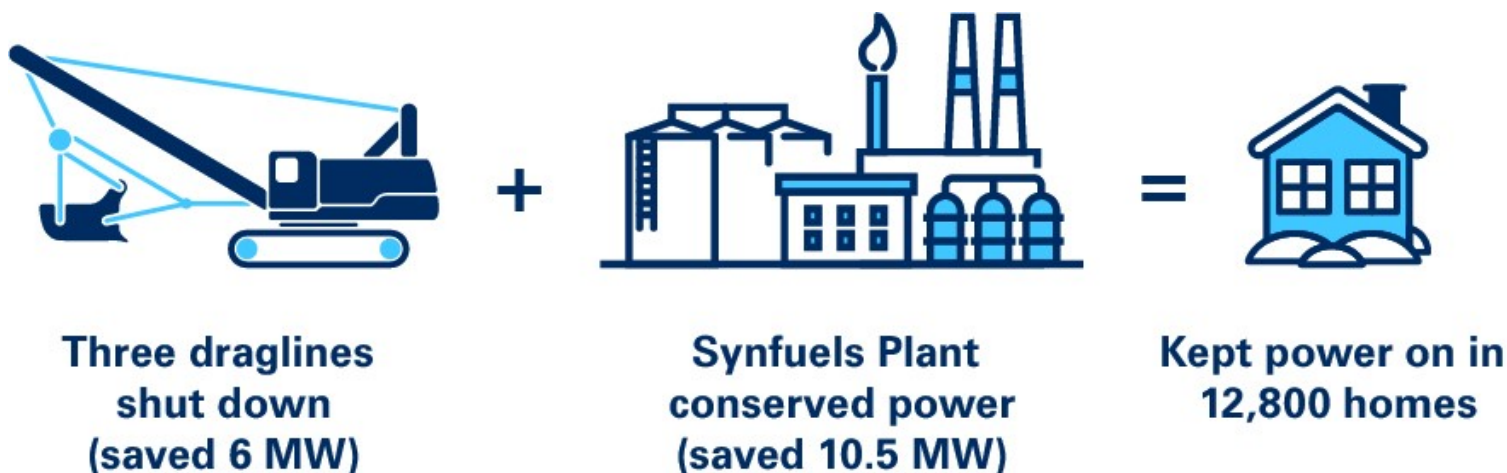
The SPP balancing authority monitors its own load forecast for the whole footprint. SPP knows how much generation is available to serve the load, and they know the associated transmission constraints. Once SPP starts to see that the resources and transmission available will not be able to serve all of the load while maintaining appropriate reserve levels, they reach out to the reliability coordinator who then starts to issue progressive Energy Emergency Alerts (EEA) to stakeholders.

Basin Electric's transmission operator is [Western Area Power Administration](#) (WAPA). In fact, WAPA is the transmission operator for all of Basin Electric's members who have transmission in SPP with the exception of [Class A members Tri-State G&T](#) and [Corn Belt Power Cooperative](#), who are their own transmission operators. "Each transmission operator has the responsibility and authority on grid operations," Pius Fischer, Basin Electric vice president of [transmission](#), said. "They have the steering wheel for operating equipment, dispatching maintenance, and an understanding of how the grid is operating at any moment in time."

SPP announced the first Energy Emergency Alert (EEA Level 1) on the morning of Feb. 15. As the EEAs moved through Level 2 and Level 3, SPP contacted transmission operators like WAPA, Tri-State G&T, and Corn Belt Power Cooperative, with the direction to shed load. "We know that SPP makes their selection to each of the TOPs (transmission operators) based on a pro rata share of the overage of the load that needs to come down with all the entities in SPP, but each TOP has their own methodologies for how to shed load. They perform studies for instances like this," Fischer said. "Our members are asking questions for how these decisions are made, and there will be discussions with all parties involved and 'lessons learned' reports to help answer those questions."

In addition to load being shed quickly by members, some large load was voluntarily shed within Basin Electric operations. At the [Freedom Mine](#), all three Bucyrus Erie 2570 draglines were shut down from Feb. 15-19, which saved a little more than 6 megawatts in the [Roughrider Electric Cooperative](#) system. Roughrider Electric is a [Class C member](#) of Basin Electric. At [Dakota Gasification](#)

Company's Great Plains Synfuels Plant, power use was reduced by about 10.5 megawatts in the urea production facility and other areas, which was accomplished without reducing natural gas production.



Troy Tweeten, Basin Electric senior vice president of Operations, said availability of the cooperative's baseload and peaking generation ranged from 74%-97% throughout the event. Several units in the fleet were offline for different reasons: Leland Olds Station Unit 2 in Stanton, North Dakota, tripped due to an issue in the switchyard, and several of the gas units were offline due to maintenance, and in some cases, were waiting on replacement parts that had been delayed due to the COVID-19 global pandemic. Dry Fork Station in Gillette, Wyoming, had issues due to buildup on the bottom ash conveyor, but was able to remain in service throughout the event. Laramie River Station in Wheatland, Wyoming, had to bring down two units on Feb. 18 due to boiler tube leaks.

Tweeten said wind turbines shut off at about 22 degrees below zero to protect their structure. He said because they contain heaters to keep their gearboxes from freezing up in the cold, they do consume a bit of electricity while down, about 1 megawatt of power for an entire wind project. Other power plants also consume electricity for ancillary services to keep equipment above freezing.

Spirit Mound Station, a diesel-fueled peaking plant in Vermillion, South Dakota, that runs about one day per unit per year on average temporarily ran out of fuel on site during this event. Between both units, the plant has run seven days year-to-date. "Those units hardly ever get scheduled in the day-ahead market, and both were getting picked up in that market," Tweeten said. The units were restarted immediately once the fuel supply was replenished.

Transmission system maintenance crews were on site at Leland Olds Station's switchyard on Feb. 14 at 2 a.m. until that night at midnight to get Unit 2 hooked back into the grid. "Because of the cold temperatures, we had a piece of equipment go into alarm and then lockout. This failed breaker is scheduled to be replaced, as it uses compressed air rather than newer SF6 gas technology," Derik Johnson, Basin Electric manager of transmission system maintenance, said. "We really appreciate the efforts from our field crews. They dress for the extreme cold, and take breaks when they need to warm up." The temperature reached down to 36 degrees below zero on Feb. 14 in Stanton, North Dakota, where Leland Olds is located.

Leland Olds was back online prior to SPP announcing the EEA Level 1 the morning of Feb. 15.

"Everything we had that was not on outage was committed in the day-ahead market. When conservative operations come into play, we notify the plants that we are in conservative operations, so that event precludes any planned outages," Weigel said. "The units also have the ability to be dispatched at emergency maxes once we get into the EEAs."

ALL OF THE ABOVE ENERGY STRATEGY



Weigel said from a marketing perspective, each fuel type in Basin Electric's generation resource portfolio played a role. "If you look at our fuel mix from Feb. 8 on, you'll see we had a pretty diversified fuel mix. I don't think there was one fuel type that was perfect. We dealt with pros and cons to each of the fuel types during that timeframe and Basin Electric's all-of-the-above energy strategy served us well," Weigel said.

"You can include everyone from operations, TSM (transmission system maintenance), procurement, marketing, engineering, Headquarters, everybody helping out when there was a problem, trying to get the units back up and running, everybody worked together," Tweeten said. "All the employees worked together to figure out where we were with our generation, and when we did have issues, what we could do to get it back on."

The Synfuels Plant in Beulah, North Dakota, was producing natural gas that was desperately needed. Cold weather shut in many gas producers, but not the Synfuels Plant. Dan Gallagher, Basin Electric manager of commodity sales and trading, said because the Synfuels Plant produces gas and has firm capacity on the Northern Border Pipeline, it made procuring the gas to transport to the cooperative's gas-fueled units more efficient. "More efficient because we are both producing and transporting natural gas, and consuming natural gas, so as traders we are able to manage that situation more cost-effectively than if we were only buying a lot of natural gas," Gallagher said. "We can serve some of our own generation using our own production, so looking at it from a physical standpoint the portfolio provides more options to manage the position effectively and efficiently."

Weigel said for natural gas purchases, there were other ways to capture some value. "In SPP, we have physically purchased natural gas for the North Dakota units that we have available that was financially hedged. So, we had purchases for the northern gas units that were significantly lower than spot market prices," she said.

The highest fixed price natural gas purchases in the Ventura market was around \$500/mmbtu, when normally prices are around \$2-\$3/mmbtu. Weigel said in Oklahoma, there were daily gas prices as high as \$1,200/mmbtu due to the trouble cold weather caused in the southern United States.

On the power side, average day-ahead prices from Feb. 13-20 were \$1,600 per megawatt-hour. (Because SPP is recalculating a few day-ahead and real-time events during this period, that is a preliminary number.) The highest hourly prices exceeded \$3,500 per megawatt-hour at Basin Electric's load zone in the SPP market. To put that in perspective, Weigel said, average day-ahead prices during the same period of 2020 were \$18.60 per megawatt-hour. Real-time prices can be even more volatile.

In market conditions where all resources aren't committed in the day-ahead market, Basin Electric resources can take advantage of volatile real-time prices. "For example, if the market wind doesn't show up like it's planned in the day-ahead market, and prices

increase in the real-time market to offset this, the way we would take advantage of real-time prices is we would likely have a gas unit that wasn't already committed in the day-ahead market and it would be ready for real-time commitment and dispatch and be able to capture those higher, real-time prices," she said.

While the cold didn't penetrate the [Midcontinent ISO \(MISO\)](#) market as much as the west-side and SPP markets, Basin Electric also experienced prices in the \$300-\$400 per megawatt-hour range in the MISO market. "We had a significant on-peak position hedged in the market, which helped to mitigate against the full exposure to the day-ahead market," Weigel said. "This was a strategy we had implemented to mitigate that exact price risk."

Weigel said this unprecedented event highlights the value of Basin Electric being a member in regional transmission organization markets. The SPP market provides a mix of more than 800 generators that can supply energy to the market in many varying conditions.

"There are times when this generation is a benefit to Basin in that the [mix of resources](#) allows us to back our resources down and purchase energy from the market at a lower price to serve our member load obligations; in addition, the SPP market allows us generation to lean on when we don't have all of our resources available. There are also times when Basin Electric provides our excess resource mix to the market to assist in other market participants serving their load," Weigel said. "That is the benefit of the market. If we can't show up with all of our resources, somebody else is able to backfill for us. If we hadn't been part of SPP it would have been more difficult to secure the 400 megawatts to backfill for Leland Olds when it was taken offline for issues in the switchyard."

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