Texas grapples with gas, grid failures behind winter blackout

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Texas utilities' urgent actions to halt the frozen electric grid's slide toward statewide collapse Feb. 15 were undermined by a critical gap in information — they did not know whether they were inadvertently switching off gas systems supplying vital generating plants, according to utility officials.

The gaping hole in the statewide emergency operating strategy was a focus of a July 26 work session by the state Public Utility Commission (PUC) probing the causes of the Feb. 14-19 grid crisis, which is blamed for causing $100 billion or more in economic loss to Texas. The official death toll in Texas from the winter storm stands at 210 people.

Officials from three of Texas' largest power utilities disclosed last week that the number of "critical" gas facilities on their systems — meant to be protected in a grid emergency, if possible — was much higher than they knew about going into the February blackouts.

Pinpointing the most strategic gas facilities is essential to carrying out power shut-offs to keep electricity supply and demand in balance during an extreme grid emergency, said Liz Jones, vice president for regulatory affairs at Oncor Electric Delivery Co., in testimony to the PUC.

"If we can't keep every gas well on, [which ones] provide the most production to support the system, and how can we figure out what that is?" Jones asked. If utilities know which gas pipelines and compressors are delivering fuel to crucial electric plants, they may be prioritized for protection, she added.

Oncor, which had previously reported a large upward revision in the critical gas facilities on its system after the February outage, revealed a much larger number last week.

The Dallas-based utility said it was aware of only 35 critical natural gas facilities that were on a list of exempt customers before the February deep freeze.

The actual number turned out to be 795, said Collin Martin, Oncor's senior director for transmission grid operations.

AEP Texas, a subsidiary of American Electric Power Co., had a similar story. "We went from 11 to 171," said Richard Ross, AEP's regional director of transmission policy, comparing the figures before and after the emergency.

Texas-New Mexico Power's number of critical gas facilities billowed from two before the February outage to 177.

Explanations for the undercount by officials of the two industries last week, summed up, were:

Electricity side: "You didn't tell us."

Gas side: "You didn't ask."

An investigative report by the University of Texas, Austin, commenting on a rise in Oncor figures, said the initial missing data on critical plants "presumably indicates that some delivery of natural gas may have been interrupted due to power outages because the operators of the critical natural gas infrastructure failed to alert the transmission and/or distribution providers that they were critical loads."

The report team was unable to dig more deeply into the issue or evaluate its causes, the investigators wrote, because it couldn't get access to data about critical customers, even though its inquiry was supported by the Electric Reliability Council of Texas, the grid operator for most of the state. The team received confidential generation data from ERCOT and the PUC.

Jones said Oncor's operators were in the dark as they punched buttons to cut off customers on Feb. 15 because gas companies hadn't listed themselves on official reports as having all of those critical facilities supply gas generators.

“Up to now, the electric companies and the gas companies haven’t communicated as well as they should have, obviously,” Jones said.

“Not everybody [in the gas sector] fills that report out completely,” she added. “There’s simply no compulsion for them” to do that.

The communication issue was not remedied by ERCOT or spotlighted by federal grid watchdogs, said Portland, Ore.-based analyst Robert McCullough. "[E]xtensive evidence from the February outages indicate that [grid regulatory] policies are poorly understood and are implemented in an ad hoc fashion," his firm, McCullough Research, said in a June report. "It is not clear if there exists a comprehensive operable list of critical infrastructure facilities that must not have their power shut off," the report added.

“That’s where we need ERCOT, utilities, the [utility] commission, the railroad commission, you all really working together to identify what truly is critical,” said Jeff Stracener, AEP Texas’ vice president for distribution region operations, at last week's work session. ERCOT regulates utilities on its system, but gas companies are overseen by the Texas Railroad Commission.

Todd Staples, president of the Texas Oil and Gas Association, told E&E News the blame was not on his industry’s part.

“Communication from ERCOT about the critical load form prior to the storm was severely inadequate, and the form stated explicitly, ‘It is not intended to apply to field services,'" he said in a statement.

Recently adopted legislation aimed at clearing up the process and mapping which facilities are directly linked to generation sites "should mitigate communications that led to a significant amount of power outages,” he added.

Jones, the Oncor executive, said the fixes should be mandated.

“What we have hoped for, for quite some time, is to actually have some … rules,” Jones said.

But it wasn’t a topic Stracener took up in his testimony last week. Commissioner Lori Cobos of the PUC asked him whether there was a possible regulatory requirement that could mandate close teamwork on emergency preparations.

Stracener paused just a moment. “Not that comes to top of mind,” he said. The commissioners did not pursue the topic at the July 26 work session.

Critical weakness

The missing information about critical gas facilities helped doom the utilities’ rotating outage plans for grid emergencies, according to a report issued last month by five former PUC commissioners and the Cynthia and George Mitchell Foundation.

When control room operators at ERCOT saw its system becoming unbalanced, with power supplies unable to meet customers’ power demands, they directed transmission and distribution utilities like Oncor to make proportional cuts in their services areas.

The utilities’ plans are designed to shut down circuits or clusters of customers on the same feeder line. The cluster outages are to be rotated to limit impacts on customers. As power is restored to a circuit, another is shut down. “Our target … is to rotate load with 15 to 30 minutes,” Oncor's Martin said. “That’s our objective.”

ERCOT reached a crisis point in an eight-minute period before 2 a.m. on Feb. 15. With generation plants dropping offline at an increasingly dangerous rate, the frequency level in ERCOT ‘s network began to sag, warning operators that they were headed to a potentially catastrophic systemwide shut down.

Frequency — the rate at which alternating current cycles up and down — must be maintained within narrow bounds to prevent burning out grid equipment. Under ERCOT’s rules, if frequency drops from a standard 60 cycles per second to as low as 59.4 for a few minutes, generators and other equipment begin automatically shutting down, threatening an

uncontrolled, chain-reaction blackout. Experts have said ERCOT was fortunate to have avoided that outcome in February, given the frequency drop it saw.

With just minutes to spare, ERCOT operators ordered three outages totaling 7,500 megawatts of power, roughly equal to 10 percent of customers' power needs then.

The emergency procedure worked, bringing the system out of its nosedive, but the rotation strategy couldn't and didn't perform as designed in many areas of the state, leading to several days of power outages.

A greater disaster

Officials confirm that Texas had come closer than any other part of the U.S. grid ever has to a far greater disaster — a systemwide blackout that would have required operators to restore power in a delicate, laborious process in which mistakes can take power plants down again.

The challenge of bringing back a region as large ERCOT's in that situation is not well understood, said John Moura, director of reliability assessment and system analysis for the North American Electric Reliability Corp. ERCOT has only very limited connections to other power regions that could help jump-start generators, and relies instead on emergency backup units, some of which would have been affected by the freezing weather.

"There are things that happen [to the system] we don't know about, that are very hard to see, when the system collapses to that level," he said. The multi-day event "could have been much longer," he told E&E News.

The Texas grid's lurch toward potential collapse was the result of deficiencies in the utilities' outage rotation, said the report by the five former PUC chairs.

That was only one of many contributing factors to the crisis, said Alison Silverstein, an Austin-area energy consultant and author of the former PUC chairs' report.

But far too many circuits were fundamentally flawed in design, she added.

The clusters were too large to permit a smooth rotation, given the rapid loss of power plant generation. In too many cases, the circuits included protected customers such as hospitals and emergency responders, which meant that the entire circuit with its many customers could not be included in the outage rotation.

Without the ability to create a "soft landing" with rotating outages among smaller circuits, ERCOT had to resort to large-scale power cut-off orders to utilities, the report said.

"Texas' electric utilities had to cut service to millions of customers because the critical facilities (those they knew of) are located on large circuits serving large numbers of customers and high electric loads on every circuit," said the former officials, Pat Wood III, Robert Gee, Judy Walsh, Brett Perlman and Becky Klein.

"Once those circuits were protected, there was no electricity left to serve the remaining circuits that don't serve critical facilities, so all the remaining circuits were cut," said the report, titled "Never Again: How to Prevent Another Major Texas Electricity Failure."

That left many customers without power for days.

"The lack of outage rotation in February was the most customer-impacting part of this disaster — many homes reached freezing temperatures during multi-day outages, causing many deaths from hypothermia and carbon monoxide poisoning, and millions of frozen pipes and damaged property and possessions," the report concluded.

In an interview, Silverstein said the group's inquiry also saw examples of gas companies voluntarily listing critical installations on lists of customers that can be cut in power shortage circumstances, thus qualifying for lower rates.

"That is grossly duplicitous and irresponsible. It should be banned," she said.

“This outage management process must be overhauled,” the "Never Again" report said. "It is easier to manage outages and rotate outages fairly if circuits containing critical facilities are smaller and require less power, and if non-critical circuits are smaller so that outage burdens can be shared."