Impact of Winter Storm Uri on Texas' Petrochemical Industry

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During Feb. 14–18, 2021, much of Texas was slammed by Winter Storm Uri, which led to the general failure of electricity and natural gas systems. Texas' independent electric grid managed by ERCOT was four and a half minutes away from complete collapse *(1)*, which could have crippled the state for several weeks, perhaps many months. This winter storm and the failure of the energy system caused at least 210 deaths and cost tens of billions of dollars.

This disaster was substantially a repeat of history from previous winter storms in 2011 and 1989. It was worsened by the duration and the geographical extent of the cold snap, the absence of preparation such as winterization of the hydrocarbon production and electricity-generation facilities, as well as the lack of planning to account for the interdependencies of the electricity and natural gas systems. Electricity prices spiked to a capped price of $9,000/MWh for over 72 hr in response to a loss of 40% of the grid's nameplate capacity. Natural gas prices spiked to $400 per million BTU in the Houston Ship Channel, over 100-fold higher than normal. This failure of the energy system had rolling impacts on transportation, drinking water, food supply, and the chemicals industry. Over 4.8 million homes and businesses were without electricity for days and 4 million people lost access to drinking water for several days.

Not all of Texas was hit so badly. El Paso, which is not part of the ERCOT grid and is part of the Western Interconnect, had winterized its energy infrastructure and experienced minimal impact to its energy system.

The impact of Uri on the Texas Gulf Coast petrochemical industry was comparable to those from the worst natural disasters experienced by the area. Natural gas supplies to industries were curtailed by more than 50%, and crude oil supply chains were curtailed by more than 20%. These reductions, combined with the earlier-than-predicted arrival of the coldest weather, resulted in many of the petrochemical facilities shutting down more abruptly than optimal. Most refineries and petrochemical installations along the Texas Gulf Coast were impacted and were forced to operate at reduced capacity or completely shut down. The curtailments impacted all petrochemicals, but most severely affected were the production of ethylene, propylene, butadiene, BTX, methanol, and almost all polymer manufacturing. After the disruptions, it took several weeks for the supply chain to return to normalcy, and in some cases months.

During the power outages caused by the winter storm, and because of the early arrival of the cold weather that caused emergency shutdowns, petrochemical facilities released 3.5 million pounds of additional pollution into the air, according to the Environmental Defense Fund and Air Alliance Houston. These emissions were comparable to the releases during Hurricane Laura in the summer of 2020, a Category 4 hurricane that was among the most powerful storms ever to strike the Beaumont and Port Arthur petrochemical complexes.

Nevertheless, several of the petrochemical complexes that had reduced their electricity consumption as part of their demand response function were able to supply much-needed electricity to the grid from their cogeneration facilities. Collaboration between petrochemical operators and electricity distributors has been a template that has helped Texas avoid previous challenges with summer peak load. This capability remained somewhat intact during Uri.

The Texas Legislature has responded to the failure by requiring power plants and some natural gas suppliers to weatherize their infrastructure, by restructuring the governance of ERCOT and the oversight of the Public Utility Commission of Texas, and by mandating a statewide emergency alert system to ensure effective communication within the energy system. The state also provided financial relief for financially strained natural gas utilities and electric cooperatives by passing on the costs back to the consumers through ratepayer-backed bonds with maturities of 20 to 30 years. Subsequently, ERCOT has released a 60-point plan to address grid resilience; its implementation will prove crucial over the coming years.

The energy markets have been a focus for much of the critique of the Texas energy system, and much-needed systemic changes require careful consideration. The downstream petrochemical industry must play a significant role, promoting resilience and environmental controls while maintaining the balances and safety that cogeneration and demand response can provide. CEP

1. Largey, M., "Texas' Power Grid Was 4 Minutes And 37 Seconds Away From Collapsing. Here's How It Happened," *Texas Standard,* www.texasstandard.org/stories/texas-power-grid-was-4-minutes-and-37-seconds-away-from-collapsing-heres-how-it-happened (Mar. 1, 2021).

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