

Summer Has Long Stressed Electric Grids. Now Winter Does, Too.

Electric utilities, which designed their system to meet peak demand in sizzling weather, are straining to keep up during the cold.



By Ivan Penn

Ivan Penn, who covers the energy industry, reported from Houston and Los Angeles.

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For decades, managers of electric grids feared that surging energy demand on hot summer days would force blackouts. Increasingly, they now have similar concerns about the coldest days of winter.

Largely because of growing demand from homes and businesses, and supply constraints thanks to aging utility equipment, many grids are under greater strain in winter. By 2033, the growth in electricity demand during winter, compared with the current level, is expected to exceed the growth in demand in summer, according to the North American Electric Reliability Corporation, a nonprofit organization that develops and enforces standards for the utility industry.

Just 10 years ago, winter electricity use ran about 11 percent less than in summer, according to the group. By 2033, that gap is expected to shrink to about 8 percent. And by 2050, winter demand could surpass electricity use in the summer.

“We’re seeing both summer and winter peaks growing, but we’re seeing winter peaks growing faster,” said Jim Robb, chief executive of the reliability corporation. “The demand curve just shoots up very, very quickly.”

For years after the 2008 financial crisis, annual electricity demand was essentially flat. The Obama administration promoted energy efficiency as a way to address climate change, and consumers used less electricity to save money.

But that trend has reversed in recent years as businesses have built hundreds of large data centers, each of which can use as much power as a small city, and as individuals have bought more electric cars and appliances. A major contributor in the winter is the increasing use of electricity to power heaters at homes and businesses that previously used oil or gas furnaces.

While they are very efficient overall, electric heat pumps become less efficient when the temperature outside is below 30 degrees Fahrenheit, Mr. Robb said. As a result, electric utilities have to work harder when it's very cold and during winter storms.

On Jan. 17, as bitter cold swept across many of the seven states it serves, the Tennessee Valley Authority hit its highest peak electricity demand ever. The public power system, which has more than 10 million customers, was able to handle it because of upgrades it had made to handle higher winter demand. The previous record was set on Aug. 16, 2007.

"We are already, in our region, seeing higher winter peaks and more challenges than with summer peaks," said Aaron Melda, a senior vice president for transmission and power supply at the authority.

PJM, which is the nation's largest grid and serves 65 million people in 13 states, also exceeded its projected demand on Jan. 17 as snow, sleet and freezing rain blanketed the Mid-Atlantic. The system met that demand and supplied energy to neighboring grids. A year earlier, PJM needed help from its neighbors during a major winter storm.

U.S. grids are also struggling because they are importing less power during the winter from Canada. Demand for electricity in that country is growing strongly, and a decline in rain and snow has reduced supply from its hydroelectric power plants, said Robert McCullough of McCullough Research, an energy consulting firm based in Portland, Ore.

Aging and poorly maintained U.S. power lines and utility equipment are another major problem, he said. The electric grid serving much of Texas collapsed during a 2021 winter storm in part because natural gas pipelines and power plant equipment froze or malfunctioned. Nearly 250 people died because of the storm and power outage, state officials said.



The electric grid serving much of Texas collapsed during a winter storm in 2021 after power equipment and pipelines froze or malfunctioned. Tamir Kalifa for The New York Times

“It’s pretty clear we’re entering a period where we don’t know what’s going to happen next,” Mr. McCullough said. “Electrification is clearly going to change it and make it worse.”

Like many Americans, Michael Pittman had grown used to strains on the electric grid from summer heat waves or storms. He lives just outside of Houston, where he works as the general manager of Star Pizza, a restaurant that has two locations in the city.

The 50-year-old restaurant’s original store — where the dough and sauce for both shops are made — lost power in the 2021 storm.

“There was a very helpless feeling,” said Mr. Pittman, who has worked at the restaurant since 1994 and previously experienced power outages during hot summer days and hurricanes. “Now it gives everyone that shock feeling when you hear a freeze is coming. The news immediately goes to the grid.”

The restaurant considered getting generators for backup power, but Mr. Pittman said doing so would cost too much. Instead, he braces for the worst when freezing temperatures come and hopes to keep operating from his second location, in an area that tends to lose power less often during bad weather.

“There are certain things you take for granted,” Mr. Pittman said. “The electric grid is one of them.”

The grid faces many challenges as the country moves to reduce greenhouse gas emissions. And growing electricity demand in the winter makes many of them more difficult.

In much of the country, electric grids were designed to handle high demand in the summer when people crank up air-conditioners. As a result, utilities typically shut some power plants and other parts of the grid for maintenance and upgrades during the rest of the year.

High demand in multiple seasons, energy experts said, could make it more difficult to repair and improve stressed and aging systems.

The North American Electric Reliability Corporation believes that winter electricity use could surpass summer demand in New York and other Northeastern states within six years. That would also mean higher electric bills, which have been rising steadily in recent years. In November, the average U.S. homeowner paid \$162 for the typical 1,000 kilowatt-hours of use, up from \$156 a year earlier, according to the Energy Information Administration.



Star Pizza considered getting generators for backup power, but the expense was too great. Danielle Villasana for The New York Times

“As more and more jurisdictions transition to all-electric, you’re going to see that peak change,” said Calvin Butler, chief executive of Exelon, which owns regulated utilities in New Jersey, Maryland, Delaware, Pennsylvania and Illinois. “We are going to start seeing more of a winter peaking seasons.”

Mr. Butler said he believed that growing demand for electricity would require upgrades and additions to the grid to keep the lights on, including continued use of some fossil fuels.

Renewable sources of energy like solar panels and wind turbines produce less electricity during the winter, in part because there are fewer hours of sunshine and because wind and weather conditions are more variable. That's why Mr. Butler contends that the United States will need to keep using natural gas power plants, which supply about 40 percent of its electricity.

"It just reinforces the need to have natural gas within the system," Mr. Butler said. "You're going to need gas for the foreseeable future."

Continuing to burn a lot of natural gas to produce electricity will, of course, undermine efforts to lower emissions of carbon dioxide and methane — two major greenhouse gases. But replacing gas is difficult because batteries and other energy storage technologies cannot provide enough energy for days at a time at a reasonable cost right now, though some experts believe that will change in the future.

Utilities could also build more transmission lines to carry renewable energy from places where it is abundant to where it is needed, say from large solar farms in the Southwest to the Midwest in winter. But approval for such projects can take many years.

"This is a lot of energy that we're talking about trying to transition away from," Mr. Robb of the grid reliability corporation said. "We need a technology that is available at scale and can provide the same sort of balancing services that we get out of gas."

Mr. McCullough, the consultant, said the focus on more natural gas was shortsighted in part because gas plants had also been unreliable in winter. He argues that grid managers and utilities need to consider more distributed resources like rooftop solar and better plan for the growing winter demand in ways that allow the country to address climate change.

"The bottom line is," he said, "we're getting both summer and winter peaks, and we're not predicting them."

Ivan Penn is a reporter based in Los Angeles and covers the energy industry. His work has included reporting on clean energy, failures in the electric grid and the economics of utility services. More about Ivan Penn