NEW YORK (MainStreet) — Utilities have implemented many measures to ensure there are fewer disruptions to the power grid this summer.

Newer technologies have allowed electricity companies to minimize strains to the grid during extreme weather and to restore power quickly in the event of a heat wave, blackout, brownout or a storm.

Many utilities have adopted smart meter technology and have begun installing smart meter grids for its residential customers to help mitigate outages and help consumers spend less money for electricity.

Commonwealth Edison Co., the Chicago utility company, is installing 4 million GE smart meters, which is part of the city's plan to modernize its grid, manage its energy usage and plan and respond to outages more quickly. In 2009, Florida Power and Light installed 4.5 GE million smart meters which allowed customers to track and report outages and maintenance in their neighborhoods simply by looking at an online map.

Utilities are now adopting methods and strategies to implement distributed intelligence, isolate the issue to prevent it from cascading and "closing the loop on software," said John McDonald, director of technical strategy and policy development at GE's Digital business. When customers incorporate tweets about outages or take photos of downed trees, GE's software can incorporate the data into its management system directly to assess the situation quicker, he said.

"The integration of all the components is really where the value is to the utility," McDonald said.

Con Edison of New York was able to de-energize some of its sub-stations before Hurricane Sandy hit, because they were in low areas, preventing salty flood water from damaging the facility. The utility used tools to shut off the substations and prevent the short circuits that would have damaged the power grid. By shutting the substations, it helped keep the grid operating, he said.

"You try to minimize your damage," McDonald said. "In the future, the main thing is to invest and integrate the components and embrace new ways of doing this such as empowering customers with social media to have more effective communication. We're at the tip of the iceberg."

The massive heat wave crossing the U.S. last week could have created a critical situation where many power outages would have been triggered. With increased demand and usage, utilities are not always aware of where damages occur.

Smart Grid technologies could lower the cost of power disruptions by 75% by 2020, the Electric Power Research Institute estimates.
Using smart technology helps operators understand the loads on the existing power lines, where to have more efficient design or when to use alternative energy sources such as solar, wind or hydro to prevent power surges or blackouts, said Ahmad Haidari, global industry director for ANSYS, an engineering simulation software company.

Utilities are not "doing enough right now" to upgrade their infrastructure, said Tom Leyden, CEO of Solar Grid Storage, a Philadelphia startup that sells battery storage systems for commercial solar projects.

"New investments are needed to make the grid more capable of handling extreme weather and peak demand," he said. "Solar and other renewables help, but their power is intermittent and less predictable than power generated by central gas or coal-fired plants. Storage in the grid provides a buffer for intermittency. Every project we install creates more resilience by reducing strain on the grid, particularly during peak demand times."

The company is currently working on installing solar backup power for a New Jersey school that did not have power for 14 days after Hurricane Sandy.

Utilities are now finding solutions to cope with increased peak demand, said Jeremy Eaton, a vice president and general manager in Minneapolis, Minn. for Smart Grid Solutions at Honeywell, a technology and manufacturing company.

More utilities are working to manage and integrate renewable power into the grid, especially wind power, which has seen massive growth, he said. Honeywell is working with the Hawaiian Electric companies to incorporate more wind since their goal is to establish 70% clean energy by 2030, with at least 40% of electricity coming from renewable sources and 30% from energy efficiency. The challenge is to accommodate rapid changes in renewable generation including solar and wind to ensure reliable and economic operation of its grid.

"Utilities need more resources to manage the volatility on the grid," said Eaton. "Our system is automated and can help them reduce their load."

Utilities are in a mode of major expansion with upgrades to distribution, transmission and other communication updates since the infrastructure has aged and caused deteriorating service, said Chris Ellinghaus, a utility equity analyst at Williams Capital.

"Capital expenditures are close to an all-time high," he said. "The equipment has more predictive capabilities now and can speed up the process of recovery. There is much more information to the utility today and it is getting more widespread. The enormous technology change taking place will result in better service."

Disruptions and blackouts could occur from older coal and nuclear plants being retired such as the shutdown of the San Onofre Nuclear Generating Station by Southern California Edison. Natural gas plants are not as reliable as coal plants and there is greater volatility in gas prices, he said.

Utilities that are equipped with a distribution management system have a process that allows them to identify the fault so that restoring power can happen more quickly, said Mingguo Hong, associate professor of electrical engineering and computer science at Case Western Reserve University.

"The demand for power can be very high during hot summer days and the grid could be highly stressed because the transmission lines could be operating at their limits," he said. "This could trigger cascading outages that leads to blackouts. In order to prevent that from occurring, the operator needs to plan for high power demand very carefully."

--Written by Ellen Chang for MainStreet