3 ways utilities use data to improve storm response before, during, and after a storm

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Severe storms can cause statewide outages, making emergency preparedness a challenge utilities can't ignore. As these events become more common, utilities must improve their preparation and response methods to maintain reliability, effectively manage resources, and build a more resilient grid. To do this, many utilities are turning to data analytics to answer questions like:

- How will this storm impact our system and customers?
- How quickly can power be restored?
- How can we prepare to tackle deviations from our forecasts?

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Using data analytics to quantify storm impacts based on a range of variables—from weather forecasts to infrastructure conditions—can help utilities create more effective preparation and response plans. While most utilities recognize the need for such evidence-based strategies, many still struggle to integrate data into their planning.

A shift in perspective can help. The key is to have a clear vision of what you're looking to achieve with data analytics. Like any technology, data science is only as strong as the clarity of the user's vision and execution.

Here are three ways we recommend using data to strengthen storm response efforts before, during, and after severe weather events.

Before a storm: Predictive modeling

In the days leading up to storms, utilities have several questions:

- How severe will the damage be?
- Which areas will be hit hardest?
- How should resources be distributed to speed up restoration?

Predictive modeling offers the answers by combining third-party and utility data to create a comprehensive picture of potential storm impacts. This detailed view helps pinpoint when, where, and how many outages are most likely to occur. This allows utilities to pre-position crews, stage equipment, and improve customer communication.

Use comprehensive data for accurate predictions

A complete picture built using various data sources, as detailed in the table below, strengthens the accuracy and effectiveness of predictive modeling. This allows utilities to better prepare for and respond to outages by not just visualizing data points but quantifying the relationships between key mechanisms and outage events.

Mechanism	Data source
Current weather conditions	Real-time weather forecasts; observational data
Past outages and storm events	Utility outage records
Meteoroligical severe weather threats	Storm prediction center convection threats
Historical weather conditions	Recent observational measurements and forecast data
Vegetation conditions	E Source tree canopy and outage analytics

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Mechanism	Data source
Infrastructure exposure	Conductor and asset locational and attribute data
Accessibility	Land use, slope, and other geospatial attributes
Major system upgrades	Dropout reclosers, spacer cables, feeders/segments moved underground
System at risk	Preceding permanent and momentary outages

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Predictive modeling helps utilities:

- Identify patterns and measure factors that influence outage risk.
- Understand how different conditions affect storm impacts, improving our model accuracy.
- Create probabilistic forecasts to address uncertainty beyond a best guess.

To see predictive modeling in action, watch Smarter storm preparation: Predictive insights with Alabama Power. The utility shared how advanced forecasting techniques is transforming its storm response efforts.

During a storm: Scenario planning

Severe storms often evolve quickly, making accurate forecasting a challenge. To stage crews and resources effectively, utilities must adapt their plans using real-time data. Without the flexibility to make quick adjustments, they risk restoration delays.

Scenario planning can help in unpredictable situations. Utilities can use it to forecast resource needs and modify plans as the storm progresses by combining probabilistic outage forecasts with live tools like real-time restoration monitoring, ensuring they're prepared for every outcome.

With scenario planning, utilities can:

- Monitor multiple variables to address uncertainties in weather forecasting.
- Dynamically adjust resource allocations across service territories.
- Accurately estimate what's needed to meet restoration targets.

Scenario planning allows utilities to simultaneously plan for best, worst, and most likely impact scenarios. Some utilities intentionally plan for the worst potential damage to make sure they're ready for the worst possible outcome. By using this approach to predict a range of storm impacts, utilities can provide more

reliable estimated times of restoration and timely customer communication.

After a storm: Visualize and update restoration plans

Forecasting is one way predictive analytics can help. Restoration is the other. After a storm front passes, outdated or incomplete information about damage and restoration progress can cause inefficiencies, resulting in ineffective resource management and unreliable power restoration times. Restoration analytics allows utilities to track restoration progress, enabling them to visualize damage as it happens and adjust resource allocation based on actualized impact.

For example, after Hurricane Francine hit the southern US this year, an E Source client experienced almost 3,000 outages—approximately 200,000 customers were without power. This level of impact falls into their most severe category for storm response.

Real-time data insights from E Source's GridInform Storm Insight allowed the utility to view outages as they occurred and track restoration progress. By combining damage assessments with current forecasts, the client:

- Accounted for evolving outages.
- Managed field resources more effectively.
- Adjusted restoration plans as needed.

In fact, with live updates of response plans, utilities can predict up to 95% of power restoration within 24 hours of the storm.

A data-driven future

With AI-powered storm insights, utilities can forecast outages days to hours before a storm, use scenario planning for optimal restoration, and monitor conditions in real time to adjust plans. These intelligent tools also offer the benefit of continuous improvement, constantly enhancing reliability, resiliency, and customer satisfaction.

E Source GridInform Storm Insight is purpose-built for utilities, using AI-powered insights to predict, plan, and respond to storms. Integrating a wide range of temporal and spatial data sources with the utility system's data provides actionable insights to improve preparation and resource allocation. This solution is proven to reduce spending by 25%, resulting in better planning, quicker response times, and reduced customer impact. Visit the E Source GridInform Storm Insight page to learn how your utility can improve its storm outage prediction accuracy.

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