Data-driven storm response for a reliable and resilient grid

Fireside chat with PPL Electric Utilities and the Institute for Electric Innovation
By Sara Patnaude
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Earlier this year, we joined the Institute for Electric Innovation's Thought Leaders Speak Out 2023: Engaging Customers with Technology series. This event gathered customer-focused utility executives to explore strategies for effectively engaging customers and to share their experiences and insights.

E Source's Tom Martin had the privilege of speaking alongside Sal Salet, vice president of distribution for PPL Electric Utilities, to share how utilities should integrate AI and data-driven decision-making into storm response and grid investments. We'll highlight a few key moments from the session in this blog post and serve up some insights into the role of technology in enhancing customer engagement and improving operational efficiency in the utility industry.

Enable AI and machine learning to optimize grid investments and storm response decision-making

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How PPL used AI and machine learning to optimize grid investments and storm response decision-making

PPL's digital grid journey—which began a decade ago—has yielded notable benefits. By adopting a data-driven approach to grid investments, PPL reduced spending on vegetation management by 30% while increasing its ROI by over 200%.

Facing a surge in storms in recent years (costing 30% to 40% of the utility's operations and maintenance [O&M] budget with vegetation management accounting for 60% to 70% of this cost), PPL has started relying on better data to enhance its storm response. This approach has allowed for more precise and cost-effective responses, improving grid reliability while reducing operational costs.

E Source Data Science has been happy to support PPL's efforts. When it comes to the way utilities typically handle storms, Martin noted, "If you're basing your storm response off of predictions, but you're running your analytics based on what actually happened in hindsight—looking backward—there's going to be a disconnect there."

Leveraging AI and machine learning to optimize grid investment and storm response decision-making

Martin and the E Source data scientists worked with PPL to build "a lighthouse of stability"—a digital replica of the grid system that integrates various datasets like weather, geography, outage, and asset data. This system provides PPL with highly accurate predictions and actionable insights for storm response.

With the support of AI analytics, PPL has achieved a 25% reduction in storm response costs and surpassed its goal of restoring 95% of customers within 24 hours after a storm. The AI model continually improves its accuracy with new data, enhancing decision-making capabilities.

Because of AI and machine learning, PPL can predict outages and downtime, optimize crew dispatch, and improve worker safety. The AI model's ability to predict storm impacts five days in advance allows for efficient resource allocation, minimizing idle time for crews and ensuring adequate rest, which fosters better relationships with response teams.

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Utilities can build data capabilities to accelerate and expand predictive AI applications

When it comes to AI applications for utilities, there are specific key beneficial use cases—what Martin calls "the big five." These include:

- Vegetation management
- Wildfire mitigation
- Storm management
- Capital optimization
- O&M reduction

Martin predicts that the next top use case for AI will be assessing the grid impact of behind-the-meter assets, especially with the increasing integration of distributed energy resources.

As the session wrapped up, he emphasized the need for the industry to shift toward managing the grid based on customer impact, such as accommodating residential customers charging EVs overnight, highlighting the critical role of customer impact in grid management. According to Martin:

> We design and run our transformers assuming that they get to cool down at night. But if those transformers are supporting a bunch of EVs charging at night and they don't actually

> get to cool down at night, all of a sudden we're running transformers at 120% over capacity, and that's going to create significant risk.

Looking ahead, PPL is focusing on enhancing safety and reliability while reducing operational costs in its digital grid journey. This involves building asset data for condition-based maintenance, implementing sensor- and satellite image–based vegetation management to minimize errors, and developing AI models to predict injuries and assess high-risk tasks for improved worker safety.

Building data capabilities to accelerate and expand predictive AI applications

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