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CASE STUDY / **UTILITY STORM HARDENING**

Making a strong case for utility infrastructure hardening

As required by a new Florida statute, Tampa Electric Company (TECO) needed to provide a 10-year storm protection plan. A list of projects and their calculated benefits was developed in alignment with the statute using an innovative analysis tool to establish overall budget levels and prioritize projects to provide the maximum benefit to customers.

Modeling the impact to TECO's system for nearly 100 storms for more than 20,000 projects provides a comprehensive and justifiable business case assessment for effectively reducing restoration times and costs following storm events in Florida.

Project stats

Client
Tampa Electric Company

Location
Tampa, Florida

Projected Completion
October 2020

$1.5B
10-year plan developed

20K
hardening project options assessed

budget optimized from
$250M to $2.5B
over 10 years

Challenge

Faced with ongoing extreme weather events and related outages, Florida is looking to implement more grid resilience throughout the state. A recently passed statute requires each utility to develop a 10-year plan to mitigate the impact of major events on customers through infrastructure storm-hardening. The plan requires development of hardening projects, estimating restoration cost and outage time benefits, prioritizing projects, and justifying the overall investment level.

While the statute requirements are more than reasonable and seem straightforward, producing the results is a major challenge. First, the benefits of hardening investment are dependent on the frequency and impact to TECO's system. Thus, the model needs to factor in the range of potential storm events over the life span of the infrastructure improvements — 50 years in most cases.

Second, the main driver of asset failures is vegetation blown into power lines, resulting in interruptions and pole failures. The model also needs to consider the vegetation around hundreds of thousands of assets, the condition of those assets and expected variance in wind speeds throughout a region.

Next, groups of assets serving customers require the model to consider the linkage between assets and customers. Further, the scope of the project needs to be comprehensive to avoid leaving a "weak link," but not so encompassing as to harden parts of the system that provide minimal value to customers.

Solution

Our team was engaged by TECO to employ a resilience-based planning approach to identify hardening projects and prioritize investment in the transmission and distribution system. Utilizing a data-driven decision-making methodology through our Storm Resilience Model, we employed robust and sophisticated algorithms to calculate the resilience benefit of hardening projects in terms of reduced restoration costs and Customer Minutes Interrupted (CMI).

The model is designed to evaluate the impact on TECO's system for nearly 100 storm scenarios against 20,000 potential hardening projects, each developed at the protection

device level for laterals or circuit level for feeders and transmission circuits. This allows the model to associate assets with customers, and thus inform development of projects that are customer centric.

The model also leverages geospatial analytics to evaluate vegetation density, span by span, across the entire system as well right-of-way access. Additionally, we leveraged wood pole asset health algorithms and sophisticated storm surge modeling within the model to understand the likelihood of asset failure during a storm and the impact that failure will have on customers.

Monte Carlo analysis simulated storm events over the next 50 years, creating 1,000 storm futures. Each subsystem section was evaluated before and after hardening for each of these storm futures to generate a range in customer benefits from a restoration cost and CMI reduction perspective.

Finally, the model performed a budget optimization to identify the point of diminishing returns, where additional hardening investment offers minimal value to customers.

Project results

The results of the assessment and model produced a 10-year, $1.5 billion Storm Protection Plan across five different storm hardening programs, from undergrounding laterals to transmission pole replacements and more. The results show a decrease in storm restoration costs of approximately 32% to 37% and a 32% decrease in storm CMI over the next 50 years.

The budget optimization analysis showed that the overall $1.5 billion investment level was right before the point of diminishing returns. This provides confidence that the plan will not overinvest in hardening activities, providing customers with the most benefit from infrastructure improvements.

Fundamentally this allows TECO to provide the Florida Public Service Commission and their stakeholders with a robust and justifiable business case wholly focused on customer benefits rooted in how storms impact the system.

The plan was submitted to the commission on April 10, with a decision anticipated in October 2020. Our technical report is included in TECO's filing to the commission and we are providing expert witness testimony throughout the regulatory process.

The model and supporting assessment provide TECO with the tools necessary to not only build impactful resilience into the grid but also justify those storm hardening investments to both internal and external stakeholders, making more effective use of large capital investments over the next 10 years.

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