

Utility companies must take a proactive approach to life-cycle management regarding utility distribution systems and addressing the vulnerabilities within utility pole networks. A data-driven approach to operations can play a critical role in mitigating risk and creating positive outcomes.

In the Eye of the Storm: Building Distribution Grid Reliability Through Proactive Asset Life-Cycle Management

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The Need for Grid Hardening and Investing in Asset Life-Cycle Management

The increased frequency of extreme weather events has accelerated the investment in utility distribution infrastructure. Scientists at Colorado State University are predicting another above-average hurricane season for the Atlantic coast in 2022, forecasting at least 19 major storms and 9 hurricanes, 4 of which will be major hurricanes (i.e., Category 3 or higher). An average Atlantic hurricane season normally has 14 named storms, approximately 7 hurricanes, and 3 major hurricanes. These storms have the ability to damage communities up and down the U.S. coastline and across many Caribbean islands.



Source: Getty Images

AT A GLANCE

WHAT'S IMPORTANT

- » A coordinated data-driven approach to properly maintaining and operating utility distribution systems has become a priority for many utilities.
- » An enterprise platform that taps into core utility operational systems can mitigate risk, ensure regulatory compliance, and optimize capex and opex investments in utility pole systems.
- » A digital approach to asset life-cycle management for utility pole systems can streamline workflows, eliminate paperwork and manual tasks, and create efficiencies and gains in accuracy by integrating data, teams, and processes. Integration of this data can produce actionable intelligence before, during, and after extreme weather events that results in significant time and cost savings.

Natural disasters such as wildfires, winter storms, and hurricanes are becoming more frequent and severe and have become main drivers for utility investment in protecting and effectively managing utility infrastructure. Once the most neglected part of the utility value chain, the distribution system that supports the safe and reliable delivery of power has now become one of the highest priorities for utilities. Companies are gearing up efforts to maintain optimal asset health and implement an asset life-cycle management strategy.

Across the core components of the utility value chain (generation, transmission, distribution), the distribution system in the past several years has seen the most disruption because of the energy transition (i.e., the migration away from concentrated fossil fuel generation and toward distributed resources such as solar power, energy storage from wind, and electric vehicles). An upgraded distribution system will enable electric utility customers to consume, produce and, in some cases, sell energy back to the wholesale market.

The current power utility distribution system infrastructure is made up of aging assets, such as utility poles that are nearing or past their 30- to 40-year expected life span. Utility pole networks are in desperate need of a more sophisticated approach to asset management as opposed to the historical and reactive (break/fix) approach that utilities companies typically take. The typical business process for maintenance on utility poles is a manual inspection that occurs every 8 to 12 years, which is an exercise to replace poles on an as-needed basis. Most poles are replaced only after they have been damaged. Utility executives are realizing there must be a safer, more reliable, and more economic approach to maintaining their pole networks.



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Utilities need to consider and invest in digital technologies that can help them properly maintain and manage their critical energy infrastructure and assist in the planning and prioritizing of asset maintenance before, during, and after extreme weather-related events. The collection and analysis of timely and accurate information can be leveraged by utilities to make better-informed decisions more quickly when managing critical assets. For storm preparation, utilities can rely on digital tools to assess the vulnerability of utility distribution assets.

Furthermore, in addition to storm planning, long-term and capital planning can benefit from continuous structural analysis combined with the strategic management of asset life-cycle data, which can provide utilities the best way to design for, build, maintain, and strengthen reliability in the power grid.

Benefits of a Data-Driven Approach When Designing for, Analyzing, and Managing the Asset Health of Utility Distribution System Critical Infrastructure

A strategic approach to asset life-cycle management on overhead distribution poles and lines can provide utilities with a reliable, safe, and cost-effective way to design, operate, and manage their distribution system assets. A vulnerability assessment of overhead distribution poles can be the starting point of a proactive approach to asset management.

Operational data can be used to perform a thorough structural analysis to determine pole integrity, which can provide utilities with actionable intelligence to better plan, design, maintain, and operate their power grids. A data-driven approach to operations, taking preventive and proactive measures, can assist utilities in planning and making the right investment decisions before the next extreme weather event arrives and can provide utilities with the system reliability needed and an effective way to manage and maintain a robust power grid safely and confidently.

Access to accurate and up-to-date critical asset data can ensure that utilities are following the increasingly stringent regulatory oversight within their operations. A centralized operational platform populated with a plethora of asset and critical operations related data can be utilized by all key stakeholders who are responsible for maintaining and operating a structurally sound network of overhead distribution assets. Organized and up-to-date operational data, design plans, and documentation of new standards can provide utilities with a wealth of insight and assist utility crews before, during, and after extreme weather events, creating a tactical and disciplined approach to asset life-cycle management.

Additionally, a centralized and accessible data repository of accurate and critical asset information can be the foundation of a digital twin or a virtual replica of a utility distribution system, allowing for stress testing, simulations, and scenario planning to ensure proper grid hardening is in place and can endure the worst possible damage of extreme weather-related events.

Data-driven management of critical distribution assets can also support grid modernization efforts as well as other communication infrastructure such as broadband and 5G, which can mitigate risk not only for utilities but also for internet, phone, and communication providers that also rely on the structural integrity of utility distribution system poles. Overall, a data-driven approach to operations and effective utility pole asset management can bring many benefits to utilities and their customers as well as other entities that rely on a utility's network structural integrity.

Ultimately, a sophisticated digital strategy in operations can support utilities in maintaining a robust power grid, which can result in significant cost and time savings while improving the safety, efficiency, and reliability of a utility distribution system.

Considering Bentley Systems When Building a Robust Power Grid

Bentley Systems' SPIDA software enables utilities to design, analyze, and manage utility power pole systems. The following are key capabilities and elements that utilities can leverage in their distribution system operations when building better, stronger, and more resilient grid infrastructure:

- » Provides utilities with critical asset data and intelligence to support timely operational decisions
- » Provides a data-driven, condition-based, and proactive approach to asset life-cycle management
- » Streamlines the engineering design process and ensures safety code compliance requirements are met
- » Taps into core asset applications and systems of record, which provide all key stakeholders with access to data and insights for clarity, coordination, and accuracy in operational decision making
- » Analyzes existing critical grid infrastructure to identify, assess, and replace vulnerable utility poles, minimizing risk before extreme weather events happen
- » Assists in capital planning strategies for long-term management of critical distribution assets
- » Integrates with existing core utility applications such as asset management, geospatial information systems, graphic work design, and mobile workforce management, providing a holistic view on the health of the distribution system within a utility's footprint
- » Equips utilities with defined preparation procedures for upcoming weather events, assisting utilities before, during, and after events such as hurricanes, winter storms, and wildfires, which can improve restoration times as well as grid stability and reliability during natural disasters and extreme weather-related emergencies
- » Provides a strategic approach to asset life-cycle management leveraging data and analysis that support regulatory compliance and risk management and improve cost optimization in relation to asset health
- » Creates an asset data repository that can be the foundation for building a digital twin of a utility's distribution network, which can enable stress testing and scenario planning
- » Enables coordination between utilities, contractors, and third parties, supporting a robust structural analysis and enabling automated construction coordination and effective project management and accurate cost capture while providing seamless interaction between all key stakeholders in grid operations

Challenges

Utilities traditionally have been reactive when it comes to asset management and weather-related asset damage or outage restoration. A change of mindset is needed to move to a proactive data-driven approach. Creating a digital strategy for asset life-cycle management will require many utilities to shift from a time-based, scheduled, or reactive manual approach to a condition-based approach.

Integration with core utility systems such as enterprise asset management, asset performance management, and mobile workforce management will be key in taking full advantage of an effective asset life-cycle management platform. Ensuring integration and interoperability of existing systems in addition to creating and maintaining clean and accurate data sets will be a requirement for maximizing overall cost optimization, asset performance, and health within a utility distribution system.

Conclusion

As a result of the rise in the frequency and intensity of weather-related events in recent years, reliability and overall risk assessments have become priorities for utility distribution systems. Additionally, increased regulatory pressure, liability, and risk are mounting in the utility sector, forcing utilities to examine the need to better manage the grid and increase the reliability of their critical assets and operations.

A strategic approach to asset life-cycle management that can provide an operational platform that can detect, predict, and prevent asset failure can ensure that system reliability is strengthened in a time-sensitive and cost-effective manner. Furthermore, structural management of utility pole systems can assist utilities in meeting regulatory compliance standards in addition to providing cost optimization in efforts to maintain optimal asset health while reducing overall risk as it relates to natural disasters and extreme weather events, safeguarding asset integrity.

IDC believes the utility sector will continue to face major challenges in effectively managing its distribution systems. To the extent that Bentley Systems can address the challenges described in this document and help utilities improve asset life-cycle management strategies for utility pole networks, the company has a significant opportunity for success.

About the Analyst



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John Villali is a Research Director for IDC Energy Insights, primarily responsible for thought leadership in the area of utility digital transformation.

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