



Osmose Helps Revitalize an Aging Electrical Transmission System without Total Replacement

Digital analysis with Power Line Systems™ applications determined the true health of assets and how they could be rehabilitated

A vital but weathered system

Developed nations rely on stable electrical systems for both commerce and comfort. Unfortunately, these systems can degrade over time, requiring maintenance, repairs, and—as a last resort—replacement. A New England utility recently determined that their electrical transmission system needed an overhaul. “The transmission structures, built decades ago, had endured years of exposure to environmental elements and were increasingly vulnerable due to the growing frequency and severity of extreme weather events,” said Mark Pitre, senior manager engineering: steel structure services at Osmose.

To secure the transmission system for reliable service in the decades to come, the utility partnered with Osmose, which has provided inspection, maintenance, and reinforcement of critical utility infrastructure for over 90 years. The first step was to assess the system and determine the extent of work needed. However, the utility lacked the original documentation for the transmission assets, making it difficult to determine the original design intent, structural capacity, or historical modifications. As a result of this information gap, Osmose could not easily assess the current condition and performance of the system by using traditional methods.

Determining performance through data

Recognizing the high costs and long timelines associated with full structure replacements, the utility and Osmose sought a more strategic, data-driven approach. Deeper knowledge of asset conditions and performance could help them identify how to extend the service life of towers through effective but relatively inexpensive maintenance and repairs. Ideally, only individual assets would be replaced as needed, rather than undertaking a full replacement of the entire system.

“The objective was to perform a top-to-bottom assessment of several remote transmission lines, which included a variety of structure types and materials, such as steel monopoles, lattice towers, wood H-frames, and guyed structures,” explained Pitre. In addition to traditional inspections of foundations using assessors on the ground, the company chose to conduct overhead inspections using drones, as well as lidar scanning. With those advanced methods, they could capture data from angles not visible from the ground and create accurate 3D models. However, they needed applications that could bring more value to the gathered data and help the utility understand the true status of the transmission system.

Project summary

Organization

Osmose

Solution

Transmission and distribution

Location

New England, United States

Project playbook

PLS-CADD®, PLS-POLE®, TOWER

Project objectives

- A utility needed to improve its aging transmission network while reusing or rehabilitating as many existing assets as possible.
- Osmose used PLS applications to create a full, accurate 3D model of the transmission network.
- Detailed finite element and wind analysis helped Osmose determine the current state of assets and how they could be rehabilitated.

Analysis within a digital environment

Osmose determined they could transform their gathered data into actionable insights by using applications from Power Line Systems (PLS), a Bentley company. They imported the lidar data into PLS-CADD to create 3D models of the transmission system. Detailed structure models were created in the PLS-POLE and TOWER applications and incorporated into the 3D PLS-CADD model to simulate structural performance under current code requirements and extreme weather scenarios. The software enabled Osmose to analyze bent members, corrosion, missing bolts, and other defects, as well as to simulate the behavior of conductors under various loading and temperature conditions using finite element analysis.

Using PLS-CADD, Osmose evaluated the impact of replacing existing, aging conductors and shield wires with new conductors and optical ground wires. This analysis helped the utility understand how these enhancements would affect structural loading and performance. They also created a structure wind rating report, which incrementally increases wind loads on digital models of structures to determine their failure thresholds. This analysis created a realistic simulation of extreme wind events without the need to manually create numerous load cases.

Timely, cost-effective upgrades

With the help of PLS applications, Osmose created and placed 3D models of the entire transmission system, no matter the type of structure, within a single environment. This system produced models of all assets that matched their conditions in the field, from telecommunication array antennas to older wood H-frame structures with steel crossarms. As a result, they could undertake detailed finite element analysis throughout and produce a structure wind rating report with a high level of accuracy.

"By using PLS software, Osmose was able to provide the utility a comprehensive, full structure assessment with a clear understanding of its structures' health and a pathway to informed, data-driven decisions for the future resilience and reliability of its structures," said Pitre. The company used their detailed knowledge of the transmission system and its current condition to provide the utility recommendations for efficient and cost-effective upgrades. The utility can now improve service to their customers, bring their assets up to code, and ensure reliable transmission without having to replace their entire system at great expense.

"Through the use of PLS software, Osmose provided the utility with a clear, data-backed roadmap for improving the resilience and reliability of its transmission network. This proactive approach enabled the utility to better serve its customers by reducing the risk of outages and avoiding costly infrastructure failures."

-Mark Pitre, Senior Manager Engineering:
Steel Structure Services, Osmose.



Detailed finite element and wind analysis helped Osmose determine the current state of assets and how they could be rehabilitated.

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