Technology Supporting the Challenges of Utility Vegetation Management at FirstEnergy

Energy Association of Pennsylvania

October 18, 2022

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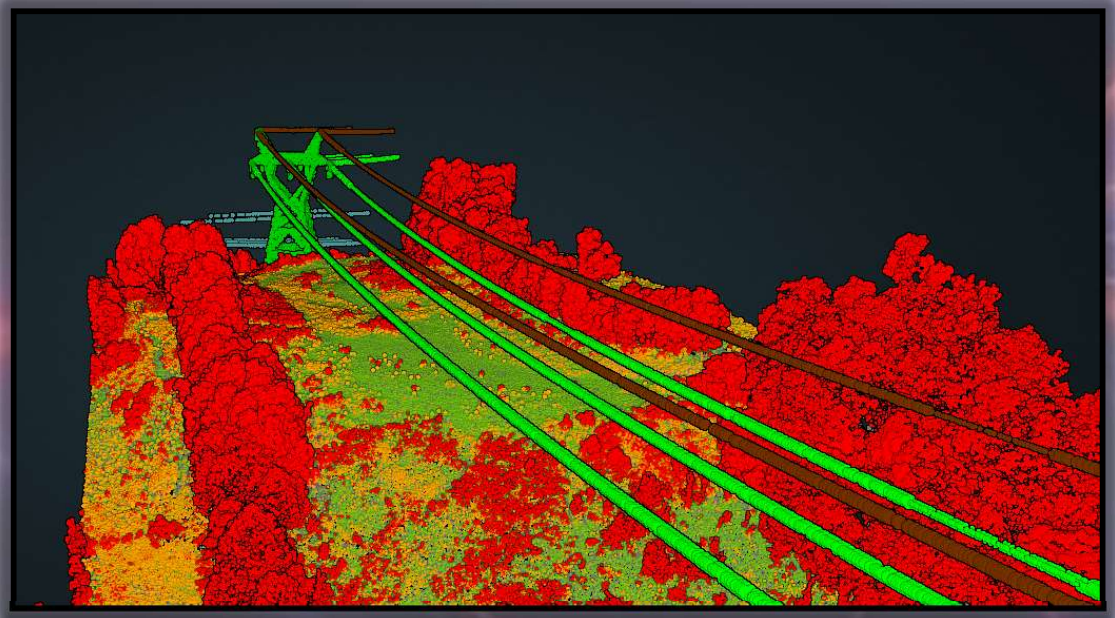
Utility Vegetation Management Program "Challenges"

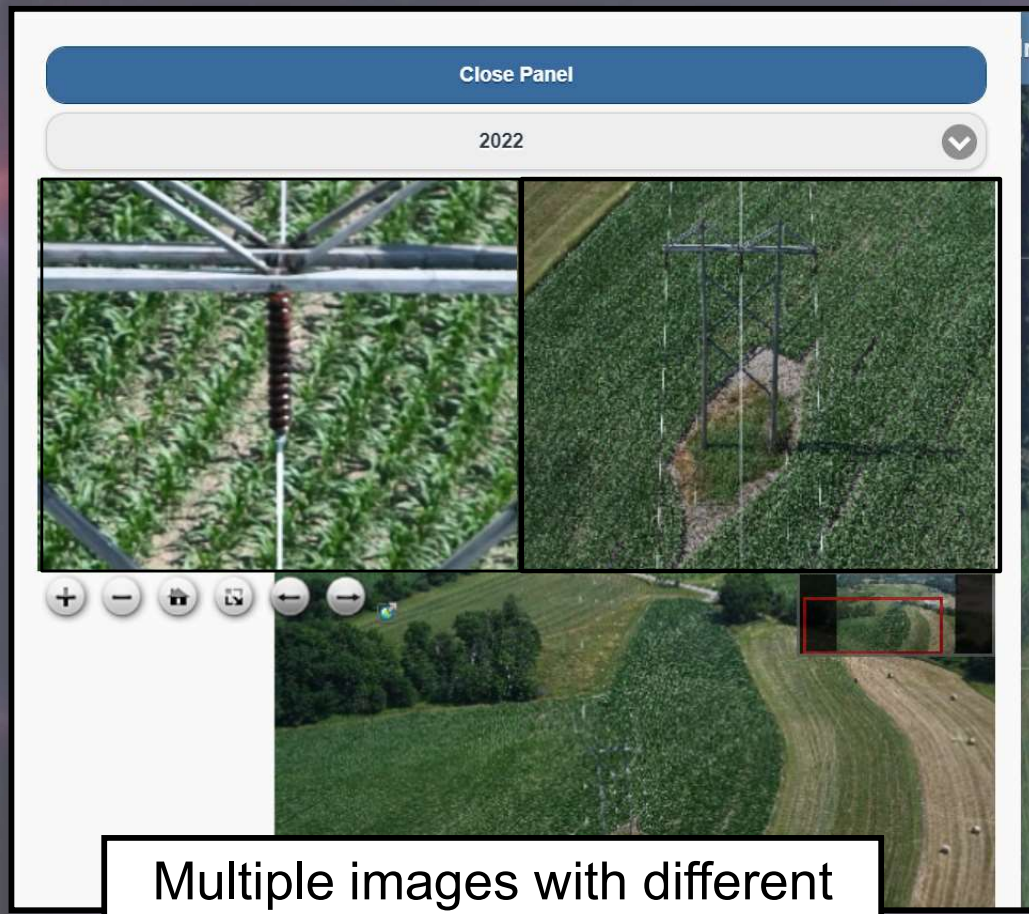
- Increased Safety through Decreased Exposure
- Vegetation Management Program Efficiencies
- Vegetation Management Program Efficacy
- Increased Reliability to Customers
- Understanding System Condition
- Supporting New and Unexpected Variables

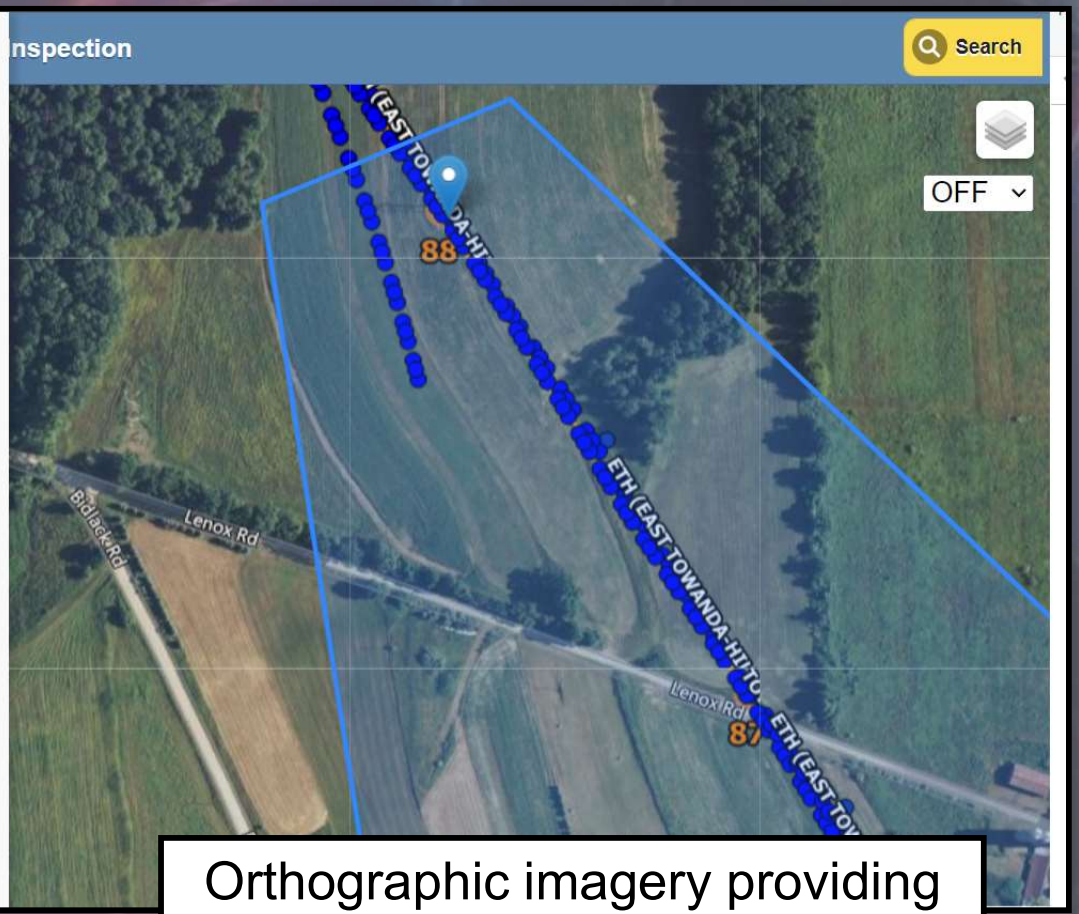
LiDAR



- ~15,000 flight miles of data acquired in 2022 (69kV – 500kV)
- Data Processed to provide vegetation clearance information
- High resolution imagery also acquired
- Technology used to increase safety, efficiency, validate and verify compliance

High Resolution Imagery

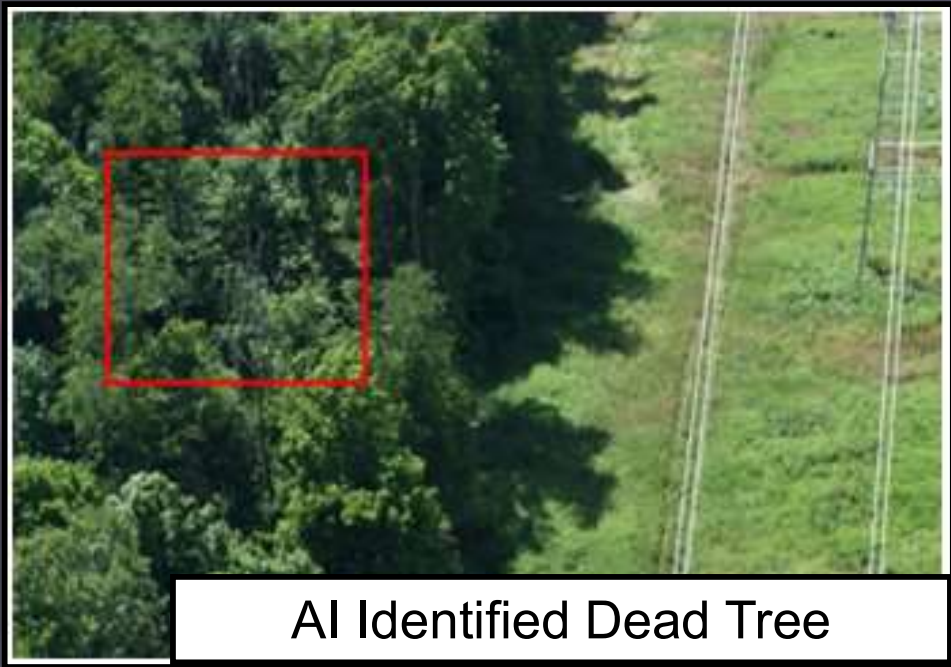




Multiple images with different "perspectives" in the same location viewable through imagery viewer software

Orthographic imagery providing "top-down view" of location depicted through oblique imagery on left of screen

Artificial Intelligence



AI Identified Dead Tree

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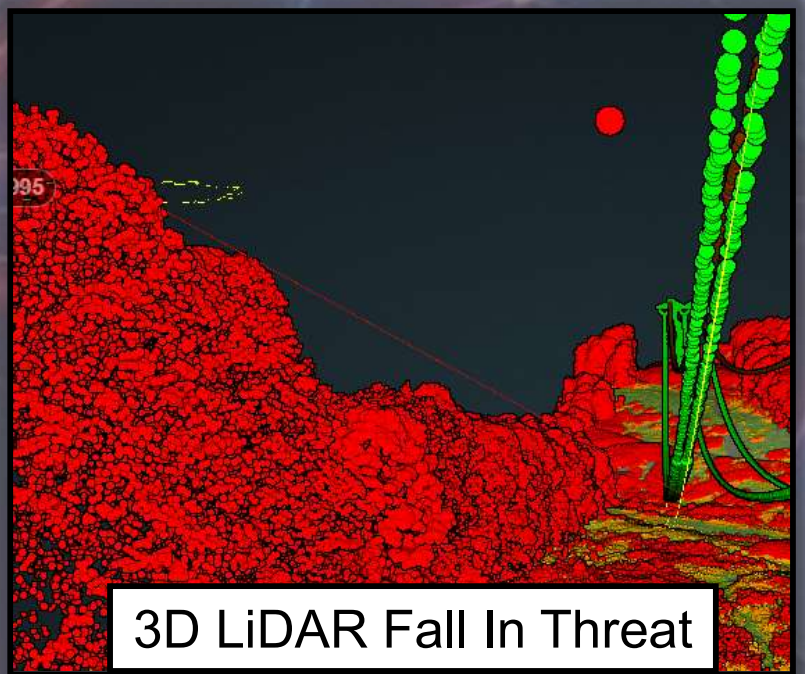

3D LiDAR Fall In Threat

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AI and LiDAR Identified Dead Tree Threat

Thank You!

Revolutionizing the approach to vegetation management

Utilizing a risk model for vegetation management

PPL Electric Utilities

Executive Summary

Trees are a leading cause of outages for every utility. Within the PPL Electric Utilities (PPL) service territory, we estimate that about 34% of distribution outages over the past five years were caused by trees.

But how do you prevent those tree-caused outages from occurring?

Identifying trees likely to cause outages is like looking for a needle in a haystack, which is why utilities traditionally complete vegetation maintenance on entire circuits every few years. But tree trimming and tree removal often upset customers, and that work can be very costly to utilities.

That is why our team worked to develop an industry-leading approach to vegetation maintenance. Instead of tracking work using paper maps and spreadsheets, we have revolutionized our approach with data analytics and new technologies.

That approach, implemented in 2020, led to efficiencies in scope selection, planning and execution of work. Despite experiencing more severe weather in 2020 than the previous year, we improved vegetation reliability (SAIFI) by 14% by following a risk-based vegetation program including a focus on strategic hazard tree identification and removals. This reliability improvement was achieved without increasing overall vegetation maintenance costs.

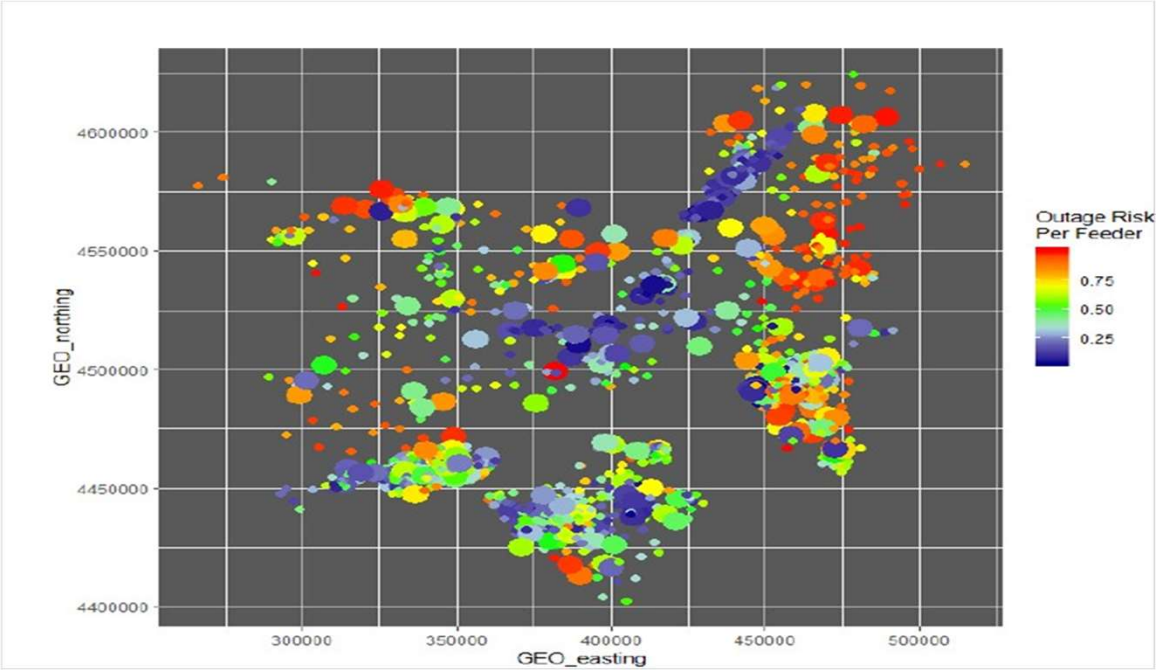
PPL Electric Utilities

Our Innovation

Step 1 - Developed a preliminary risk model to quantify vegetation risks across our system. To move from a cyclical approach to a targeted approach, we needed to create a risk model to identify where risks exist on our system. This was no easy undertaking when considering there are more than 300 key variables that can be modeled when measuring the performance of a feeder or grid!
Ultimately, we needed to develop a unique risk modeling approach.

We used a concept called residual analysis that allowed us to take shared characteristics from our feeders and grid to model expected performance of various components. This provided an understanding of how many outages would occur on one feeder or grid based on its characteristics.

The findings from our preliminary risk model were surprising. Some circuits that we had once deemed "worst performing'" were performing better than expected. Other circuits that we thought were acceptable turned out to be a big reliability risk.

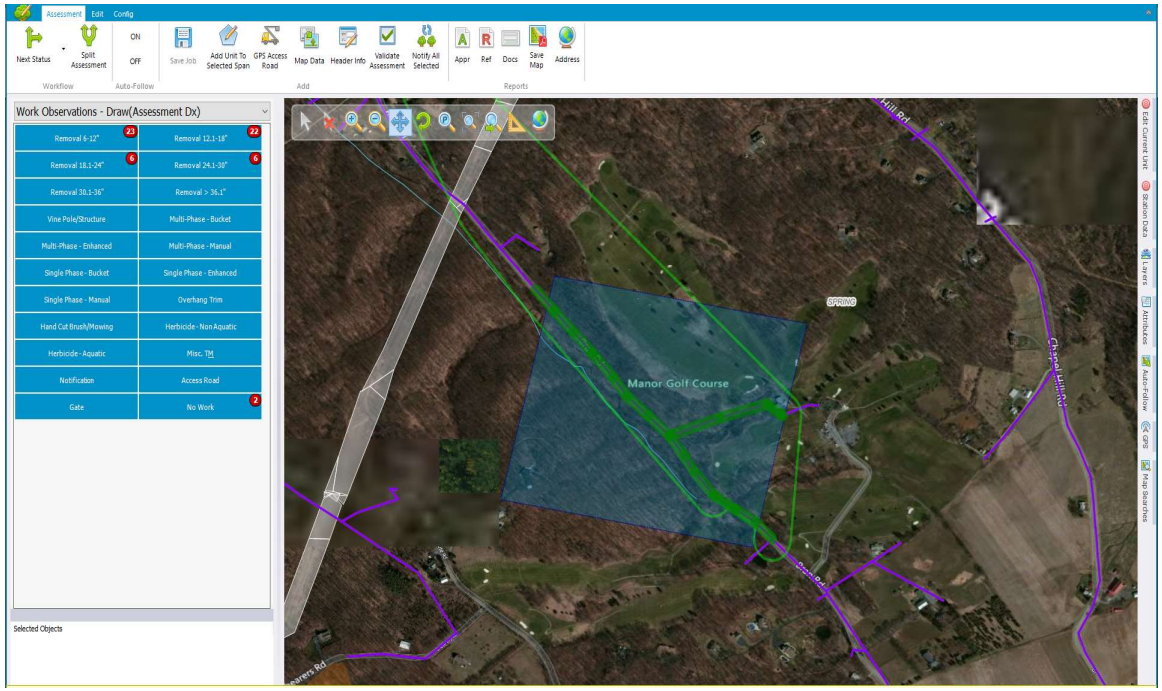


PPL Electric Utilities

Our Innovation

Step 2 - Test the efficacy of the preliminary risk model before the summer storm season.

With our risk model established, we had one simple question - will this work when we operationalize it? Using the new risk model, we identified 187 separate 500m x 500m grids from 36 different circuits that had a very high probability of experiencing a vegetation-related outage. The vegetation management team performed maintenance on these specific parts of the grid prior to the summer storm season. While these areas utilized our new approach, we continued to use the traditional, cyclical based maintenance on our other feeders. The results were overwhelmingly positive, and the targeted approach produced significant reliability improvements.



PPL Electric Utilities

Our Innovation

Step 3 - Standardize the risk model so it could be scalable. It was important that our contractors and others could easily implement our new approach in a standard way. Therefore, based on the
risk model, each segment within the feeder was assigned a risk level: high (pink), moderate (orange), low (yellow), keep safe (translucent).

We continue to maintain our standard trimming specifications across all risk levels, but we now vary the intensity of hazard tree removals based on the predicted risk. For instance, "keep safe" or "low risk" grids have fewer trees removed while "moderate" or "high-risk" grids have higher targets.

PPL Electric Utilities

Real-world Results

In 2020, the vegetation risk model allowed our team to improve reliability while maintaining vegetation costs despite more severe weather and a similar number of event days as 2019. In fact, we improved our vegetation SAIFI by 14% compared to 2019.

Not only are our customers benefiting from improved reliability and managed costs, but we are now utilizing an industry-leading approach to vegetation management.

Improved vegetation SAIFI by 14%.

PPL Electric Utilities