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Witness: John P. Dipaola-Tromba, Sean D. Redding and Jenna M. Turner
Request from: Office of Consumer Counsel

Question:

(Vegetation Management) Please provide any evidence that the use of LiDAR, as opposed to arborist field assessments, has resulted or is expected to result in improved electric-system reliability, reduced vegetation-related outages, or more efficient vegetation management.

Response:

Please refer to the Company's response to OCC-104[i], that provides an overview of LiDAR in comparison to LiDAR alternatives (i.e. Arborist field assessments).

Arborist field assessments are effective but are time- and labor-intensive, qualitative, and limited in the ability to identify risk across the electric distribution system. LiDAR supplements Arborist field assessments by providing a quantitative inventory of vegetation risk across the entire system. The LiDAR dataset provides the Company with a granular three-dimensional representation of conductor location, vegetation height and crown dimensions, horizontal and vertical clearance distances, and potential fall-in trees inside and outside of the Utility Protection zone. Once analyzed, the LiDAR dataset enables utilities to prioritize and direct valuable field resources to locations that pose the greatest threat to reliability, resulting in more efficient vegetation management and reducing the likelihood of vegetation-related outages.

There is a growing body of research and industry implementation demonstrating that LiDAR-based vegetation management improves risk identification and prioritization, which can translate into fewer vegetation-related outages and more efficient allocation of vegetation management resources.

Please refer to OCC-973, Attachment 1, for a Utility Arboriculture Association white paper on "The Use of LiDAR in Distribution and Transmission Vegetation Management." The white paper is a summary of the experience gathered from "*45 utility vegetation managers from throughout North America. The managers that participated had over 700 years of combined experience in the electric utility industry. They represented 31 companies and together manage the vegetation on over 1,000,000 miles of distribution lines and transmission corridors that provide electricity to over 53,000,000 customers.*"

The white paper discusses benefits of LiDAR on page 1, including, "*The volume and accuracy of the data resulting from the survey cannot be obtained from other inventory methodologies… The*

data obtained permitted better assessment of clearances in areas such as canyon crossings where ground and aerial patrols provided less definitive results… LiDAR provided exact identification and location of high risk off-ROW trees increasing efficiencies in the field… Users identified other benefits experienced as being the ability to limit work to very specific sites where it is needed; added precision and valuable data to work specification; better definition and reclamation of the ROW edge; the ability to share data with other entities (e.g., municipal utilities, parks, etc.) and improved communications with landowners."

Please refer to OCC-973, Attachment 2, for "A Study of [Utility Vegetation Management] Planning and Implementation with a LiDAR Information Matrix". The study found that LiDAR can lead to improved work planning and scheduling, more efficient field inspections, and better prioritization of vegetation risks. On pages 4-5, the author found that short- and long-term vegetation management work planning and scheduling can be improved by transforming LiDAR datasets into actionable field information. This is reiterated on page 7, "*The results of the study indicated that only the most salient and discrete xyz coordinate points of vegetation captured in a LIDAR scan are needed by a ground inspector to adequately schedule and plan work. The filtering criteria for feature coded LIDAR data determine what ground inspectors target during inspections… The inspector is essential to the process in that he/she is able to assess the condition of the vegetation and can prioritize the work with the added knowledge obtained from the ground.*"

The author continues that, "*LIDAR measurements are vital to a field forester's understanding of distances from trees to conductors and the geometric possibilities of trees that may place energized conductors within the target areas of tree failure… Other measurements, such as crown size, canopy size, and risk tree identifiers, and the measurements gained from technologies such as LIDAR, will soon become as important as DBH. The abilities of the inspector are limited by some paradigms of visual assessment. The future of ROW inspection will most likely transform the process to a more measurements-based activity. The precision and accuracy of LIDAR and similar technologies will be a driver of this change. LIDAR data management and electronic communication of complex data in the field will continue to provide many opportunities to improve transmission vegetation management… This deliverable package outlined above will facilitate efficient identification of tree locations, while providing a database that can be used in long term planning... The ground inspection process proved to be a critical component of LIDAR supported vegetation management, because professional foresters could successfully apply LIDAR measurements to locate and code-tag target trees to aid LIDAR information transfer to line clearance crews. Additionally, inspection foresters could provide a thorough understanding of site characteristics and tree inventory in terms of species, structure, health, maturity, environmental impact, tree failure risk, and prioritized prescription.*"

Please refer to OCC-973, Attachment 3, on page 7, where the University of Connecticut found that integrating LiDAR-derived tree exposure data improved outage-prediction model performance up to 5-13% compared with simpler models. The authors further note that LiDAR (ProxPix) data has

"*application to other research topics such as prioritizing areas for vegetation management near utilities and providing data on potential tree threats to roads, railways, or other infrastructure networks.*"

The Company expects LiDAR to improve efficiency of vegetation management and reduce vegetation-related outages when combined with other programs of the VMP. Please refer to Exhibit CLP-VMP-1, on pages 34-36, at lines 14-5, for ways that the Company proposes to utilize LiDAR data, specifically "*the Company plans to use LiDAR for vegetation management to evaluate branch encroachments across the upcoming year's scheduled maintenance circuits. The processing and classification of the LiDAR data is translated to segment level encroachment risk based on a composite evaluation of encroachment based on our specifications along the segment. The segment level risk can then be evaluated by zone, isolating device to isolating device, and the customer and outage impact so work can be prioritized and sequenced to optimize trimming for reliability. Additionally, the LiDAR processed data can be ingested into work management software to assist with planning, scheduling and issuing work out contractor tree crews. There is also potential for the LiDAR to be used for contracting scheduled maintenance, providing data to contactors to identify specifically where work is needed and volumetric measures of vegetation to be trimmed.*"

The processed LiDAR data will enable the Company to prioritize and optimize the annual roadside scheduled maintenance circuits based on the vegetation encroachment risk across the electrical distribution system without regional biases in tree density and overhang. LiDAR will also enable the Company to optimize and prioritize high-risk encroachment zones for the renewed Midcycle program where a specification clearance limitation was imposed during scheduled maintenance, whether by a property owner, tree owner, or the tree warden with respect to getting the specification clearance.

Prior Referenced Response:

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[i] OCC-104 Question:

(VMP/LiDAR). The company is proposing to institute LiDAR, presented as a new program component, which will cost $950,000 (Exhibit CLP-VMP-2 page 25 of 29). What is the alternative to LiDAR and the cost? Provide analysis on the pros and cons of using LiDAR.

OCC-104 Response:

Please refer to pages 13-14, of Exhibit CLP-VMP-2, summarizing a ground-based LiDAR pilot performed by the Company in 2025 at a cost of $153 per mile. LiDAR is an effective and accurate method of assessing vegetation conditions along heavily forested electric distribution systems. As discussed on pages 33-34, of Exhibit CMP-VMP-1, the processing and classification of the LiDAR data is translated to segment level encroachment risk based on a composite evaluation of encroachment based on the VMP specifications along the segment. The segment level risk

can then be evaluated by zone, isolating device to isolating device, and the customer and outage impact, so work can be prioritized and sequenced to optimize trimming for reliability.

Additionally, the LiDAR processed data can be ingested into work management software to assist with planning, scheduling, and issuing work out to contractor tree crews. There is also potential for the LiDAR to be used for contracting scheduled maintenance, providing data to contactors to identify specifically where work is needed and volumetric measures of vegetation to be trimmed. This could also assist with pricing and line-of-sight decisions on what needs to be trimmed. One aspect of LiDAR that could be perceived as a "con" is that risk tree evaluation may be limited by obstructions (e.g., trees closer to the terrestrial pulsed-laser scan); however, this will be mitigated separately through the VMP's Risk Tree Removal ("RTR") program.

The alternatives to LiDAR include (1) satellite remote sensing, (2) Arborist field assessment, and (3) no encroachment assessment.

1. Satellite remote sensing: The Company performed a satellite remote sensing pilot at a cost of $376 per mile. The encroachment assessment was not accurate (<60%) and is limited by GIS and canopy overhang. The tree health risk was also not accurate (<50%) and included false positives and negatives in the data.

2. Arborist field assessment: The Company utilized the Vegetation Management team of CT licensed Arborists to perform encroachment assessments in 2025 at a cost of $117 per mile. The cost to perform this manual assessment was similar to LiDAR but with less granularity available in the assessment data. While field assessment data can be utilized for point-in-time decision making, the lack of granularity does not allow the Company to quantify the associated volumetric workload that may assist with more precise VMP budgeting and generate more competitive pricing from contractors. Unlike LiDAR point cloud data, the manual field assessment data is not digestible by work management software and does not allow the Company to prioritize and sequence work precisely to optimize trimming for electric system reliability. Less granularity also does not allow the Company to hold maintenance contractors accountable to the vegetation conditions prior to maintenance trimming that can be compared post-maintenance trimming cycle.

3. No encroachment assessment: The Company recognizes that there is also the option to not perform any assessment at a cost of $0 per mile; however, the true cost of not assessing the vegetation conditions on the system is the potential impact to reliability that may occur by not assessing encroachment and fall in risks to the electric system.