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Request from: Public Utilities Regulatory Authority

Question:

(PLANT ADDITIONS) Application, Ex. CLP-ADDITIONS-1, p. 63. Provide the following regarded the "Direct Buried Replacement" projects:

a. Documentation supporting the statement: "on an industry-wide basis that much of the original XLP and HMP-insulated primary cable installed in the DB system had not achieved its engineered life expectancy."
b. An exhibit showing the engineered life expectancy by type (e.g., XLP, HMP-insulated) and vintage of direct-buried (DB) assets on the Company's system;
c. An exhibit showing the actual service life of all the Company's DB plant at the time of replacement for the years 2017 through 2026 (to-date).
d. An unlocked spreadsheet showing the number and duration of premature DB cable failures by year and their contribution to blue-sky SAIDI and SAIFI performance.

Response:

a. The statement that much of the original XLPE and HMP-insulated primary cable installed in the distribution system had not yet achieved its engineered life expectancy is supported by industry research, utility operating experience, and cable-aging studies conducted by EPRI, NEETRAC, cable manufacturers, and other industry researchers. Studies of distribution cable performance have generally identified expected service lives in the range of 30 to 40 years for early-generation XLPE and HMP cable designs under normal operating conditions, while recognizing that actual service life is highly dependent on installation type, operating environment, loading, exposure to moisture, and cable construction.

   Industry experience has demonstrated that cable age alone is not a reliable indicator of end of life. Premature failures in some early cable installations were often associated with factors such as water-treeing, contamination, manufacturing deficiencies, shield defects, or moisture ingress rather than the intrinsic exhaustion of the insulation system. Soil type and installation, i.e. direct buried versus cable in conduit, are significant to the overall life expectancy of a underground cable. As a result, many XLPE and HMP cable circuits have remained electrically serviceable beyond their original design expectations.

EPRI asset demographic information indicates that significant populations of XLPE and HMP cable remain in service at ages exceeding 35 years and, in many cases, beyond 50 years. In addition, recent evaluations of approximately 40-year-old service-aged cable have found that many cable systems continue to exhibit acceptable electrical and material performance.

Accordingly, while replacement of direct-buried cable may be warranted based on reliability performance, failure history, condition assessment results, operational risk, or broader asset management considerations.

The type of failures and overall service age of direct buried cable is supportive of some of the following industry documentation such as the following:

EPRI Research – EPRI's work implicitly recognizes that cable age alone is not equivalent to end-of-life and that remaining-life assessment is both possible and necessary because many assets survive beyond their nominal design life.

1. EPRI Distribution Cable Research

EPRI's *Distribution Cable Research Digest* has long cited approximately **40 years** as the expected service life of modern underground medium-voltage cable systems.

EPRI has also sponsored extensive work on remaining-life estimation for XLPE cables, including *Estimation of Remaining Life of XLPE-Insulated Cables* and related aging-model studies designed specifically to assess service life beyond original installation dates.

2. EPRI Asset Demographics Data

EPRI's current distribution asset demographic database shows that 25% of HMWPE assets are older than 57 years and 25% of XLPE assets are older than 46 years, which demonstrates that large populates of these cable types remain in service well beyond what many utilities historically considered their normal 30-40 year design life. Please refer to RSR-059, Attachment 1.

NEETRAC Research – NEETRAC projects support the argument that replacement programs often targeted cables because of specific condition concerns and failure risk rather than because the insulation had necessarily consumed its full engineering life.

1. NEETRAC Historical Assessment of XLPE Life

NEETRAC's paper *Long-Life XLPE Insulated Power Cable* notes that when medium-voltage XLPE cable was first introduced, utilities expected:

"20 or even 30 years" of reliable service. Please refer to RSR-059, Attachment 2.

The paper further explains that many early failures were caused by water-treeing mechanisms, manufacturing deficiencies, contamination, and moisture-related degradation rather than fundamental exhaustion of the polyethylene insulation system. Please refer to RSR-059, Attachment 2.

NEETRAC states that improvements in materials and manufacturing greatly improved long-term performance and reliability. Please refer to RSR-059, Attachment 2.

2. Recent NEETRAC / Alabama Power 40-Year Field Evaluation

One of the most valuable recent studies examined TR-XLPE cable removed after approximately **40 years of continuous service** from Alabama Power's Galleria Mall system:

- Installed in 1985
- Evaluated after ~40 years in service
- Included electrical and material performance testing
- Specifically designed to assess cable condition near the historically expected service-life threshold, please refer to RSR-059, Attachment 3.

The study's purpose was to determine whether cable approaching or exceeding the traditional 40-year design-life expectation remained fit for service.

b. The Company does not maintain the information necessary to produce the requested exhibit. Installation vintage information is unavailable for a significant portion of the Company's direct-buried cable assets, and insulation type information is incomplete for many assets. As a result, the Company is unable to reliably classify all direct-buried assets by both vintage and insulation type and therefore cannot produce the requested exhibit.

c. As it relates to the Company's Direct Buried Replacement Program, the Company's plant assets replaced and retired are accounted for under the mass-distribution property method. Under such a method, the Company's plant accounting system utilizes the group method of depreciation and retirement, rather than a direct one-for-one matching principle of individual asset additions and retirements for each utility property. Please refer to OCC-793[i] for further discussion on the Broad Group Procedure that the Company utilizes to depreciate and retire its utility property. Therefore, because the specific vintage year of each retired unit is not identifiable, the Company is unable to provide the actual service life of all the Company's Direct Buried utility property when these individual units are removed and retired during the years 2017 through 2026.

d. Please refer to RSR-059, Attachment 4. The Company note that, given (b) above, the Company is not able to delineate "premature" DB events and therefore RSR-059, Attachment 4, lists all DB events from 2017-2025.

Prior Referenced Response:

[i] OCC-793 Question:

Refer to Exhibit CLP-ADDITIONS-1, p. 45. Approximately $4.3 billion of capital additions has been placed in service since January 1, 2017. Identify all such additions retired, abandoned or written off before the end of their depreciable life, with the in-service and retirement dates, the original cost, the amount remaining in rate base, and the reason.

OCC-793 Response:

Please refer to OCC-793, Attachment 1, for all additions of specific property since January 1, 2017, that were retired before the end of their depreciable life including in-service and retirement dates, original cost, amounts remaining in rate base and the reason for retirement.

Retirements of specific property are generally recorded at the full value of the individual asset, whereas mass property retirements are accounted for using the applicable mass property retirement methodology. In some cases, specific property asset retirements are partial, or trended. This occurs when the original asset record includes units of property not separately unitized at the time of installation. When the original cost of the retired asset cannot be specifically identified, the Company utilizes the Handy-Whitman index to trend the replacement cost back to the original installation year to estimate its historical cost. The estimated amount is then retired from the existing asset and charged to the accumulated depreciation account. This process ensures that the cost of the replacement is removed from utility plant while the remaining portion of the original asset continues to be reflected in plant in service.

CL&P predominantly utilizes the Broad Group Procedure to depreciate utility property. Under the Broad Group Procedure, homogenous assets are grouped together and depreciated under a single average service life. When an asset within the group is retired, the asset is considered fully accrued, regardless of the asset's actual service life, and accumulated depreciation is debited for the full book cost of the asset. If an asset is retired prior to the average service life, any impact to depreciation expense will be recovered over time by assets that exceed the average service life of the group. The asset retirement dispersion is analyzed in future depreciation studies when creating an updated, proposed average service life and accompanying accrual rate.