2023-2025 WMP
Joint IOU Covered Conductor Working Group

Testing Workstream

Topics:
Aging Susceptibility Discussion

AGENDA

- **Background (20 min)**
  - **SCE Benchmarking/Research (2018)**
  - **Phase 1 Report**
- **Recent Aging Susceptibility Testing (40 min)**
  - **SDG&E**
  - **PG&E**
- **Break (10 min)**
- **Discussion / Opportunities for Lessons Learned, Best Practices, and/or Benchmarking (40 min)**
- **Next Steps (10 min)**

Background

SCE Benchmarking / Research (2018)

- Identified that severe UV exposure is one factor that could reduce the estimated 45-year service life of CC
- To mitigate this potential, SCE's CC program includes the following:
  - Requires conformance to ICEA S-121-733-2016 Sunlight Resistance (UV) Testing
    - Testing ensures the strength of the covering is at least 80% of the original strength before accelerated UV exposure
  - SCE-specified material uses cross-linked high-density polyethylene with little carbon black / Titanium Dioxide also used as a UV inhibitor
    - Early CC designs that suffer from tracking issues are crosslinked polyethylene with high carbon content for UV inhibiting purposes
  - SCE CC design specifies 150 mils of insulation
    - Early CC designs specified thin layers of insulation (less than 100 mils)

Phase 1 Testing Report

- UV degradation (embrittlement and/or cracking of CC) was one of 58 failure mode / hazard scenario combinations identified through the failure mode workshop (and one that only affects CC)
- Exponent concluded that while UV exposure may accelerate CC sheath aging by causing embrittlement and/or cracking, UV inhibitors are commonly used to prolong polymer lifetime (Hendrix 2010, Ariffin 2012)
- Concluded that move investigation is not recommended

Recent Aging Susceptibility Testing

SDG&E Testing

- Contracted with Exponent to provide a framework within which the effectiveness of CC risk mitigation can be quantified
- Two specific technical aspects were identified: the risk of adjacent conductors clashing in high winds and the rate of degradation of insulating jackets due to prolonged exposure
  - Regarding the latter, Exponent performed experimental accelerated aging tests
- Tests determined that the tensile strength of the CCs did not change as a function of exposure to UV and temperature
- However, the results did demonstrate that the cover thickness was susceptible to material loss due to UV exposure

PG&E Testing

- PG&E conducted UV weathering test per ANSI / ICEA S-121-733 standards
- Samples exposed for periods of 250, 500, 750 and 1,000 hours to determine deterioration trends of the materials under test
- Tested materials showed significant degradation in mechanical properties after UV exposure
- The CCs' insulation materials became more brittle and had reduced toughness after the UV weathering test
- Recommended establishing plans for enhanced visual inspection of CC at high UV exposed areas

Discussion

- Is additional aging susceptibility testing warranted?
- Mitigation to prevent UV degradation over time
  - Material composition
  - Material thickness
  - Supplier testing
  - Other
- Changes/Additions to Inspection Practices
  - What about lab testing portions of a CC over time, e.g., at 5-year, 10-year, etc. intervals?
- Should consideration be given to effectiveness of CC over time (if UV will degrade the covering over time)?
- Should consideration be given to PSPS thresholds over time (if UV will degrade the covering over time)?
- Would it be beneficial to document questions for future benchmarking surveys?

Next Steps

- Meeting minutes
- Action items
- Follow-up meetings