Georgia Tech NEETRAC
National Electric Energy Testing, Research and Applications Center

NEETRAC NEWS

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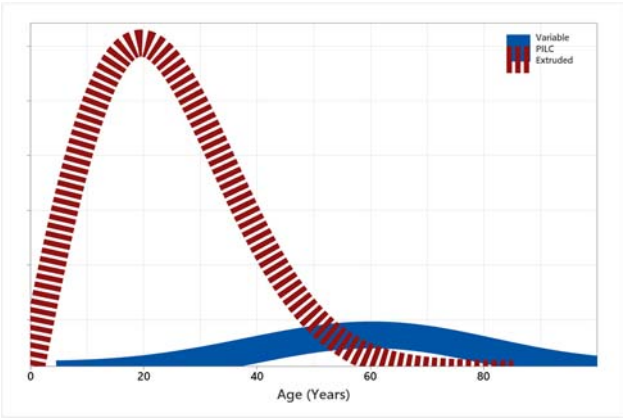
Maintenance of NEETRAC Baseline Knowledge: 16-050

Since its inception in 1996, NEETRAC has amassed a substantial body of useful knowledge that resides in in the form of Baseline project deliverables. Members frequently review these deliverables when the need arises and contact NEETRAC staff to ask questions about the project results. In 1996, Baseline project 16-050 was initiated to review and refresh the information / data contained in some of the more frequently referenced projects. This project also provides a mechanism for updating and supporting the dissemination of knowledge after a Baseline project is complete. Two projects that were recently "refreshed" include:

14-214: Power Cable System Design Evolution
PI: Essay Wen Shu
In 2014, NEETRAC conducted benchmarking on extruded cable and accessory specifications, usage, and maintenance practices at utilities.

08-167: Preserving Operational Practices for Paper Insulated Cables (PILC & Pipe Type)
PI: Yamille del Valle
Project 08-167 focused on PILC and Pipe Type cables with a goal to preserve existing knowledge of the age of these cable systems.

Both of these projects included assessments of the age (not life) of |medium voltage power cables using input from many different electric utilities. The work in both projects was recently updated and the combined findings from these projects is shown to the right. More details can be found in the 16-050 project poster.



Extruded	PILC	Combined
Estimated Mean Age (Years)		
25	64	30

Baseline Projects Recently Completed

The following Baseline projects closeout were presented at the virtual September 2021 Management Board Meeting. The reports will be finalized and distributed to eligible Members in the coming months.

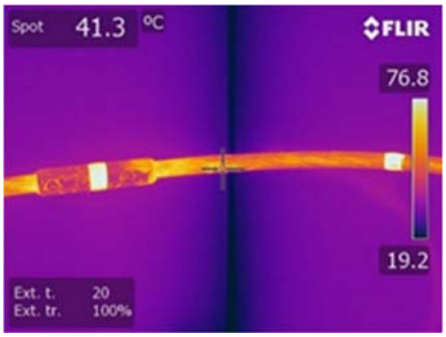
Understanding Online Condition Assessment of Overhead Transmission Connectors

Baseline Project Number 17-134

PI: Thomas Parker, thomas.parker@neetrac.gatech.edu

Some utilities routinely inspect overhead transmission lines with a focus on the many different connectors used on these lines (splices, dead ends, etc.). The inspection techniques deployed include thermal imaging, resistance measurements, and others. Obtaining data on the effectiveness of these techniques is difficult because poorly performing connectors are usually immediately shunted or replaced when a problem is detected. To better understand online condition assessment of transmission line connectors, industry research in this area was reviewed along with Member experiences and available Member test data.

NEETRAC conducted an initial survey of its membership on this topic in 2018 and has made IR (thermal |imaging), resistance, and direct temperature measurements both in the lab and in the field in an effort to better understand the efficacy of these connector assessment techniques.



IR imaging assessments can be complicated because the measurement requires an understanding of many factors including the emissivity of the object being inspected, the instantaneous field of view (what a single detector pixel in the camera sees via the attached lens at a given distance to the object of interest), reflections from other objects, and the need for sufficient line current at the time of measurement for any thermal issues (overheating) to be observed. Overall, it is difficult to make accurate absolute temperature measurements with IR imaging in the field so these should be avoided. A more effective approach is to make relative comparisons between similar devices operating under similar conditions.

Direct temperature measurements are easier and more reliable than IR for assessing the absolute temperature of a connector. Sufficient current is needed at the time of measurement just as for IR imaging. This hotstick-based technique must be in contact with the line for several seconds to obtain an accurate temperature measurement.

Resistance measurement techniques are promoted as a better method of evaluating the condition of a connection than a temperature measurement as it is less likely to depend on line current. But measurement accuracy does decline with lower currents. Resistance measurements appear to be more sensitive than temperature measurements so caution should be exercised when establishing the criteria used to determine when to repair or replace connectors.

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Understanding Online Condition Assessment of Overhead Transmission Connectors - Cont'd

The minimum temperature or resistance ratio value, or the minimum absolute temperature that indicates a connector should be replaced or shunted, are not well defined values. Consideration must be given to the magnitude of the value and the change in value over time to assess when action should be taken.

It should be noted that correlating thermal and resistance data is quite difficult. In field tests conducted during this project, most connectors tested **bad** by temperature ratio and/or resistance ratio. In lab tests, most connectors tested **good** by temperature ratio and/or resistance ratio. In field tests, many connectors also tested bad by temperature ratio, but good by resistance ratio. In lab tests, many connectors also tested good by temperature ratio, but bad by resistance ratio.

There are advantages and disadvantages to each connector evaluation method. NEETRAC Members interested in learning more about the final results can contact the project PI, Thomas Parker at thomas.parker@neetrac.gatech.edu.

Testing of Fire Proofing Materials / Techniques Used in Cable System Vaults - Part 1

Baseline Project Number 19-150

PI: Ray Hill, ray.hill@neetrac.gatech.edu

A test protocol specifically designed to evaluate the effectiveness of fire proofing materials / techniques applied to cable systems within the confines of electric utility cable vaults, manholes, and tunnels was developed in NEETRAC Baseline project #18-032. This project has evaluated those new test protocols by conducting both the direct flame impingement (shown left) and indirect flame (furnace) tests on available fire proofing materials as suggested by the project Technical Advisors.

Initial feedback on the test protocol's procedures provided by the test laboratory resulted in adjustments to the size of the ribbon burner and upper temperature limits for the direct flame impingement test. These modifications were in place for all testing. During the indirect flame or furnace testing, instability in the furnace temperature caused by ignition of a test sample indicated that sample types should not be mixed during this test type. Multiple fire-proofing materials were evaluated and the lab results presented to the NEETRAC membership. Part II of the project closeout will be presented in January 2022 at the NEETRAC Management Board meeting where the revised version of the test protocol and any recommended follow-up work will be reviewed.

NEETRAC Moving Forward

As some of you may know, NEETRAC's Director, Salvador Palafox, resigned, effective the end of October. As a result, the Georgia Tech Dean of the College of Engineering, Raheem Beyah, asked me to return as Interim Director. I will coordinate / lead NEETRAC into our next phase of being a productive, well-respected leader in collaborative electric energy R&D.

Over the last few months, several engineers left NEETRAC, some to retirement and others to career advancement opportunities elsewhere. Even with this staff attrition, NEETRAC still has tremendous capabilities, including medium and high voltage testing, high power testing, mechanical testing, environmental testing, diagnostics, and many others. We also maintain strong analytical expertise. There is a tremendous amount of work we can do and are doing. There may be some project delays and we may have to truncate or potentially cancel some baseline projects, but the work conducted will continue to be strong and designed to meet your needs.

The current staff at NEETRAC is motivated and dedicated to providing our Members with the quality research and testing services that you expect from NEETRAC. The Georgia Tech Dean and Provost also indicated they will support us any way they can. The NEETRAC model of collaboration among electric utilities, manufacturers, and Georgia Tech continues to provide a highly effective, unique problem solving resource for the electric energy industry. The future plan for NEETRAC will consist of a number of elements including staff recruitment, Member retention, staff cross training, workflow enhancements, staff progression, project prioritization, and many others. We will work to gather a broad range of input as we move forward.

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NEETRAC Interim Director

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Management Board Meetings

The next three Management Board meetings have been scheduled for the following dates:

January 19 - 20, 2022

May 18 - 19, 2022

September 21 - 22, 2022

For details, please visit the Member Section of the NEETRAC website at www.neetrach.gatech.edu.

2021/2022 NEETRAC Member Management Board Representatives

1. Aluma-Form…….. Pete Landsgaard
2. Ameren…… James Huss
3. American Electric Power…….. Jim Salerno
4. BC Hydro……Fred Dennert
5. Borealis Compounds, Inc.……..Susan Song
6. Consolidated Edison…… Frank Doherty
7. Dominion Energy…….. Liz Sullivan
8. Dow Chemical Company……..Paul Caronia
9. DTE Energy……Naera Haghnazarian
10. Duke Energy……...Chris Fletcher
11. Eaton…….. Alan Yerges
12. Exelon…….. Lisa Perrone
13. FirstEnergy……..Randy Coleman
14. Gresco Utility Supply……..Brad Schafer
15. Hubbell Power Systems……Charles Worthington
16. LS Cable & System……Tim West
17. Nova Scotia Power……Jim McFadgen
18. NRECA……Reed Cooper
19. Okonite……...Bill Crawford
20. Pacific Gas & Electric…….. Jim Gill
21. PPL Corporation……..……Chris Fatzinger
22. Prolec GE…….. Carlos Gaytan
23. Prysmian Group……Bill Temple
24. Public Service Electric & Gas..…... Ed Gray
25. Rauckman Utility Products……Jim Rauckman
26. S&C Electric……..Marshall Mauney
27. San Diego Gas & Electric……..…. Christian Henderson
28. Smart Wires…….…… Haroon Inam
29. Southern California Edison……Alan Kasanow
30. Southern Company……..Michael Pearman
31. Southern States, LLC…….. Joe Rostron
32. Southwire Company……... Yuhsin Hawig
33. Tacoma Power……..Joe Rempe
34. TE Connectivity……Brian Ayres
35. TVA…… Steven Coley
36. Viakable…… Raul Garcia
37. WEC Energy Group…….. Michael Smalley