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

NEETRAC NEWS

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In This Issue...

IEEE PES T&D Conference & Exposition

Several engineers and employees from NEETRAC will be attending the IEEE PES T&D Expo this May! Please come see us at booth #3174 and get the latest updates on NEETRAC projects! We look forward to seeing you in Denver, April 17 - 19!

IEEE PES Power & Energy Society®

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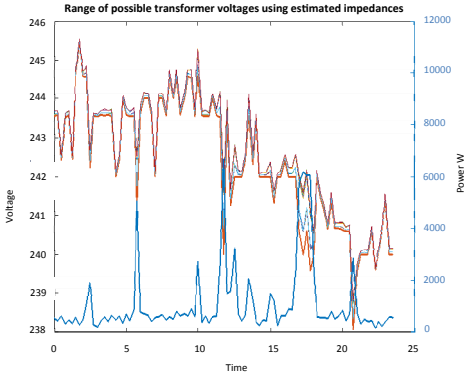
Baseline Projects Recently Completed

The following Baseline Closeouts were presented at the February 2018 Management Board Meeting. The reports will be finalized and distributed in the coming months.

Assessment of Voltage Volatility at the Grid Edge

System Analysis

Baseline Project Number 16-091



Unexpectedly high voltage volatility is being observed at the grid edge, both in AMI data as well as uncorrelated data from grid edge sensors. This project performed a prevalence study to understand the extent and severity of the problem. A sensitivity analysis was also performed to understand the effects of different components in the system (transformers, capacitor banks, voltage regulators, etc.) and identify the components that have greater impact in creating voltage variation problems. It was found that there is voltage sensitivity to various parameters such as cable impedance and length, load power factor, and transformer impedance. Most existing distribution models stop at the medium voltage side of the transformer. ANSI performance, however, is based on voltage at the customer, which is separated by a voltage drop across the transformer and cable impedances. By analyzing AMI data with sufficient fidelity, it was possible to establish secondary network connectivity and determine primary and secondary transformer voltages, load power factor, incidents of theft, etc.

Baseline Projects Recently Completed - Cont'd

Hot Dipped & Thermal Diffusion Galvanizing Comparison Testing

Hardware/Equipment Testing

Baseline Project Number 13-256

This project compared the corrosion resistance, mechanical strength, and torque characteristics of thermal diffusion coatings and hot dip galvanized coatings. It was found that manufacturer's processes for thermal diffusion galvanizing (TDG) are different and not standardized like hot dipped galvanizing (HDG). This can have considerable influence on performance. NEETRAC, therefore, recommends that users request evaluation data when purchasing parts that are galvanized using a TDG process.

Specification Test Validation of Fiberglass Crossarms

Hardware/Equipment Testing

Baseline Project Number 14-068

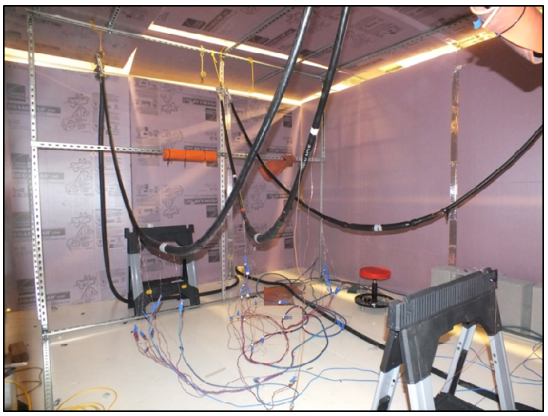
Baseline Project number 06-225, Fiberglass Deadend Crossarm Specification, developed a purchasing specification for fiberglass deadend crossarms. The current project verified that the testing procedure developed in #06-225 could be effectively executed and the results could serve as an adequate benchmark for crossarm performance. It was found that the test methods outlined on 06-225 were generally sound, but many need small modifications to either update them to the current technology or clarify the procedure. Pass/fail limits were not established so utilities are encouraged to use the specification to benchmark fiberglass crossarm technologies rather than as a "qualification" test procedure.

Detailed Thermal Profile of MV Underground Joints

Reliability

Baseline Project Number 14-143

NEETRAC has developed significant data on the performance of connectors used in MV joints; however, very little information is available on the temperature profile of connectors and conductors inside joint bodies. The goal of this project was to develop thermal profiles inside a variety of medium voltage joints. It was found that for a given reference conductor temperature, temperatures inside joints (and connector/conductor resistance) vary based on conductor size, joint type, and the age of the conductor. The temperature drop between the connector and the outside joint housing also varied significantly depending on the joint design, so it was concluded that joint surface IR temperature measurements can be used only as a rough indication that the joint connector is overheating.

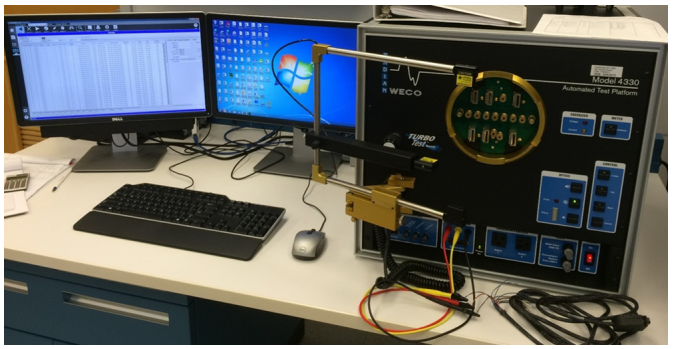


Baseline Projects Recently Completed - Cont'd

Harmonic Effects on kVARh and kVAh Measurements in Large Commercial / Industrial Electronic Meters

System Analysis

Baseline Project Number 15-051



The purpose of this project was to investigate the concern that harmonic energy generated within a customer's load may affect kVARh and kWh values measured / calculated by electronic revenue meters. The degree to which the accuracy of these calculations was affected depended upon the algorithms programmed into the meter. Variances in accuracy could result in questionable power factor (PF) adjustments to customer bills. The Georgia Power Meter Lab agreed to work with NEETRAC to investigate the effect harmonics may have on the accuracy of kVARh and kWh measurements and on the calculation of PF. Testing results showed that electric utilities employing the tested models of meters in commercial and industrial settings could have confidence that kWh readings are within ANSI required accuracy for kilowatt-hours in the presence of widely varying harmonic content as presented in the newest edition of ANSI C12.20. Additionally, electric utilities who employ kVARh readings in revenue billing should review their use of these meters for such purposes because of the possibility of over-billing and/or under-billing customers when harmonics are present.

Arc Proofing Tapes for Cable - Test Program

System Analysis

Baseline Project Number 15-052

Baseline Project #12-107 found that most utilities use arc proofing tapes on at least a portion of their cable circuits. There is, however, very limited data available on the need for arc proofing tapes to protect cables from adjacent cable faults. There is also very little data on arc tape effectiveness. This project sought to create a better understanding and appreciation of the performance characteristics of arc proofing tapes by performing high power arc flash tests at the NEETRAC NJC Laboratory in Chicago. Testing was conducted at a 2-inch and a 10-inch separation distance between the arc source and the cable jacket surface. The test results clearly show that arc damage is a function of the number of arc proofing tape layers, the separation distance, and the cable jacket type.

Transformer Teardown - Dissemination of Results from Project #10-167 to Manufacturers

Hardware/Equipment Testing

Baseline Project Number 16-065

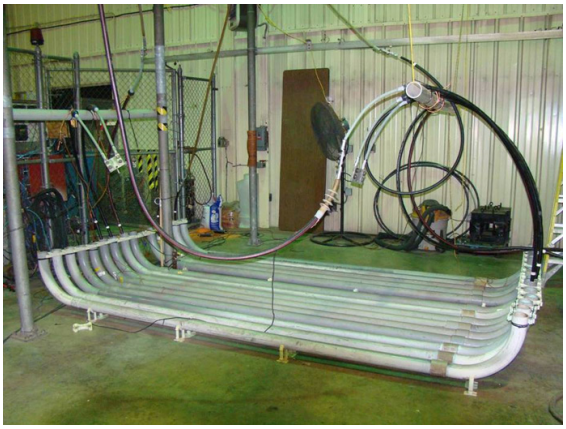
In project 10-167, a comprehensive report was prepared that outlines quality observations made on overhead and padmount single phase distribution transformers. After that report was issued, NEETRAC Members approved a subsequent project, #16-065, to summarize the results for each transformer manufacturer and hold discussions with each manufacturer. These meetings were held with a very positive exchange of information between each manufacturer and NEETRAC. The Members also asked NEETRAC to present a general overview of the project findings to the IEEE Transformer Committee. That presentation was made at the March 2018 meeting.

NEETRAC Baseline Project Flashbacks - 5 Years Ago

NEETRAC has completed many interesting Baseline projects over its 20-year history. Here is a look at just a few of NEETRAC's past projects that are still useful today. If you are interested in any of these project reports, please contact your Management Board representative (see page 5).

DISTRIBUTION

Project #06-138: Investigation of Anomalous Cable Behavior at Elevated Temperatures



There is a test for qualifying cables at an emergency temperature of 140 °C (Class III). Recently, cable manufacturers have discovered that when some TRXLPE insulated cables are tested at this temperature, the dielectric losses increase to levels far beyond the normal level for these cables. This phenomenon is not fully understood, but could have an adverse impact on cable performance in the field. In this project, a test was conducted that established whether or not this phenomenon occurs only at the unusually high temperature level of 140 °C . As seen in this project, the consequences are noticeable variations in measured dielectric loss and in the resistance of the conductor and insulation shields. Therefore, it is important to note these phenomena and to carefully assess the consequences when operating cables at these very elevated temperatures. If the phenomenon occurs at lower temperatures, additional testing may be required to see how the phenomenon impacts cable life.

TRANSMISSION

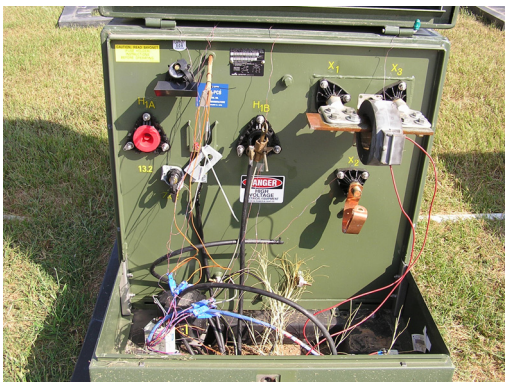
Project #06-215: Transmission Line Ampacity Based on Distributed Temperature Sensing

Safety, reliability, and economic considerations provide ample incentive for utilities to understand the behavior and operating limits of the transmission system. Fiber-optic transmission conductor (FOTC) was developed to measure in-service conductor temperature with one food resolution—not previously possible. Uncertainties in the thermal performance of transmission lines require safety margins that could unnecessarily limit power flow. This project improved understanding of transmission line behavior by comparing a model to the live data. Qualification of the uncertainties of line behavior permits safe increase of power flow where capacity is available. Project benefits include the ability to improve operating strategies, quantify risks, and provide a basis for compliance with reliability mandates.

NEETRAC Baseline Project Flashbacks - 10 Years Ago

DISTRIBUTION

Project #04-089: Padmounted Transformer Tank Temperatures



Maximum transformer temperatures were measured under a variety of loading and weather conditions to validate a thermal model of a padmounted transformer developed by Cooper Power Systems. Utilities can use this model to predict the maximum tank temperature of a padmounted transformer under different loading levels, weather conditions, solar insolation levels, and installation latitudes. Artificial rocks placed over the transformers were investigated and found to greatly increase the operating temperature of the transformer, degrading its loading capacity and seriously decreasing transformer life expectancy.

Where to Find NEETRAC

NEETRAC staff members regularly attend and participate in industry conferences and meeting around the world. Here are a few upcoming events where you will find NEETRAC representation.

- **ASTM B01** - April 2018 (Attended by Joe Goldenburg)
- **ANSI C119** - April 2018 (Attended by Joe Goldenburg)
- **IEEE PES Switchgear Committee** - April 2018 (Attended by Caryn Riley and Frank Lambert)
- **IEEE PES T&D Conference**, Denver, CO - April 2018 (Attended by Rick Hartlein, Frank Lambert, Caryn Riley, Dylan Summer, Tony Pribble, Thomas Lancaster, Jason Clute, and Suzanne Schmidle)
- **IEEE Insulated Conductors Committee** - May 2018 (Attended by Thomas Parker, Josh Perkel, Tom Champion, and Nigel Hampton)
- **IEEE Surge Protective Devices Committee** - May 2018 (Attended by Ray Hill and Essay Wen Shu)
- **IEEE PES Substation Committee** - May 2018 (Attended by Anil Poda, Joe Goldenburg, and Tony Pribble)
- **IEEE PES General Meeting Overhead Lines Committee** - August 2018 (Attended by Joe Goldenburg)

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Management Board Meetings

The next three NEETRAC Management Board meetings have been scheduled. Please plan to join us on the Georgia Tech campus on the following dates:

May 16 - 17, 2018
September 26 - 27, 2018
January 30 - 31, 2019

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

2017/2018 NEETRAC Member Management Board Representatives

1. 3M..... Mark Hoisington
2. ABB..... Gary Haynes
3. Alumaform..... Pete Landsgaard
4. Ameren..... Greg Ringkamp
5. American Electric Power..... John Tucker
6. American Transmission Company.....David Wojtczak
7. BC Hydro.....Cosmo Picassi
8. Borealis Compounds, Inc.....Susan Song
9. Consolidated Edison.....Frank Doherty
10. Dominion Virginia Power.....John Bruce
11. Dow Chemical Company.....Brent Richardson
12. DTE Energy.....Diego Libreros
13. Duke Energy.....Chris Fletcher
14. Eaton..... Alan Yerges
15. Exelon.....Lisa Perrone
16. FirstEnergy.....Timothy Croushore
17. Gresco Utility Supply..... Chad Capps
18. Hubbell Power Systems..... Jerry Goolsby
19. MacLean Power.....Matt Gaertner
20. NRECA..... Reed Cooper
21. Pacific Gas & Electric..... Rudy Movafagh
22. PacifiCorp ..... Douglas Marx
23. PPL Corporation..... ..... Nicole Lacouve
24. Prolec GE..... Carlos Gaytan
25. Prysmian Cables & Systems..... Patrick Coplen
26. Public Service Electric & Gas ..... Ed Gray
27. S&C Electric..... Salvador Palafox
28. San Diego Gas & Electric..... Christian Henderson
29. Smart Wires.....Haroon Inam
30. South Carolina Electric & Gas..... Doug Spires
31. Southern California Edison..... Robert Tucker
32. Southern Company.....Michael Pearman
33. Southern States, LLC..... Joe Rostron
34. Southwire Company.....Yuhsin Hawig
35. TVA..... David Smith
36. Viakable..... Raul Garcia
37. We Energies..... Michael Smalley