NEETRAC
National Electric Energy Testing, Research, and Applications Center

# NEETRAC NEWS

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## In This Issue...



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## Ongoing Baseline Projects

Happy New Year! As 2025 begins, there are currently 18 open, ongoing Baseline projects. This issue will provide a brief summary of each. If you would like to serve as a Technical Advisor on any of these projects, please email suzanne,.schmidle@neetrac.gatech.edu with the project number and your contact information.

### Maintenance of NEETRAC Baseline Knowledge

***Baseline Project Number 16-050***
***PI: J.C. Hernandez-Mejia***

Substantial Member resources are dedicated to the conduct of NEETRAC Baseline (collaborative) projects and a significant body of important knowledge resides in the project deliverables. Members find these project results useful and frequently contact NEETRAC about them. Once a Baseline project is complete, however, there is no mechanism and hence, no incentive, to maintain or update the developed knowledge. Members often continue to provide information related to a completed project or NEETRAC observes correlations / opportunities for knowledge growth with other work, but currently there is no way to incorporate or use it. This project will develop a framework for updating key Baseline project findings and provide a mechanism for disseminating the new information to Members.

### Substation Bus Ampacity Support Activities

***Baseline Project Number 19-080***
***PI: Joe Goldenburg***

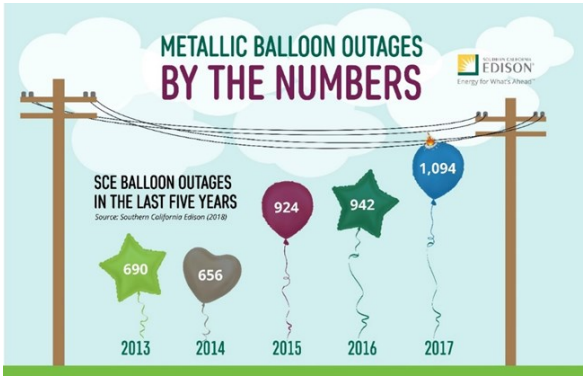
In project #12-202, a new, more accurate method for determining the ampacity of substation bus was developed and included rectangular, universal angle, and web bus designs. The new method led to a major revision of IEEE 605's bus ampacity calculation sections, and was incorporated into NEETRAC's substation bus ampacity software tool (BUSAMP), available to eligible NEETRAC Members. This new project 1) provided support to the IEEE PES Substation Committee to revise IEEE 605. Additionally, FERC 881 requires all US based electric utilities rate their lines, substations, and related equipment. As most US utilities use IEEE 605 for substation ratings, this project also supports NEETRAC's members as they work through their line ratings process with a focus in using BUSAMP.

## Dielectric Performance of Celebratory Balloons

***Baseline Project Number 20-038***

***PI: Anil Poda***

In 2018, several utilities expressed concern about increasing numbers of metallic balloon caused outages in their distribution systems. The common "foil" or "celebratory" balloon is metallized and, therefore, is conductive. When these celebratory balloons come into contact with energized distribution power lines, a system fault occurs. New, alternative celebratory balloon designs have been created that have non-continuous metalized designs or are without metallization, but their effectiveness for reducing power outages is unknown. This issue was brought to the IEEE PES Distribution Reliability Working Group and, after some scoping surveys on this topic, PAR2845 was approved for a Task Group to write a *Trial Use Standard for Testing and Evaluating the Dielectric Performance of Celebratory Balloons in Contact with Overhead Power Distribution Lines Rated up to 38 kV System Voltage.*




https://energized.edison.com/stories/metallic-balloon-problem-worsens-sometimes-dangerously

NEETRAC will lead the efforts of the Task Force that will work to develop a method to evaluate the effectiveness of these alternative designs. The activities will include efforts to determine the prevalence of the problem, level of concern, risk perception, current regulation, and efforts to minimize issues. Information gained / developed during the project will be shared with appropriate interested parties (NEETRAC Members and IEEE).

## IEEE Entity Standards Monitoring II

***Baseline Project Number 22-148***

***PI: Joe Goldenburg***

This project continues to explore IEEE's relatively new entity standards development process. The IEEE Standards Association describes their Entity membership as a way for "companies to engage and influence technology development to ensure their business interests are heard and represented". In BL #20-156, NEETRAC found several issues with some existing entity standards, including conflicts with requirements in North America for the construction, maintenance, and operations of overhead lines. NEETRAC developed a presentation that details the concerns that Management Board representatives and Technical Advisors have with the entity standards development process. The presentation includes information on how to tell whether a standard was developed using the Entity or Individual process. It has been delivered at several industry forums and two NEETRAC Members standards engineering groups. To obtain a copy, please contact Joe Goldenburg at 404.675.1858. This project will continue to monitor the process.

## Scoping Study of Cable Minimum Bending Radius - Performance and Flexibility

***Baseline Project Number 23-055***

***PI: Diana Ramirez-Wong***

Underground power cables can be installed exceeding static bending limits, yet little is reported about the impact of overbending on the cable life. At the same time, the flexibility of power cables is a function of the entire cable design and not only one material. This project aims to gain insight into power cable static bending practices and cable flexibility. Two separate, but related, issues will be investigated: 1) the issues associated with tight cable bending radii on cable performance and recommendation of a test protocol to verify static bending limits; and 2) the need for a flexibility test procedure specifically designed for power cables. The final outcome will be two separate comprehensive reports on the findings, and suggested testing protocols for (1) cable performance due to tight bending, and (2) cable flexibility. NEETRAC will lead the efforts of the Task Force that will work to develop a method to evaluate the effectiveness of these alternative designs. The activities will include efforts to determine the prevalence of the problem, level of concern, risk perception, current regulation, and efforts to minimize issues. Information gained / developed during the project will be shared with appropriate interested parties (NEETRAC Members and IEEE).

## Evolution of Diagnostic Technologies Deployed for Power Cable Systems

***Baseline Project Number 22-099***

***PI: J.C. Hernandez-Mejia***


The underground cable system infrastructure is complex and aging. As the system ages, failures become more and more frequent, generally following a bath-tub curve model. This brings concerns with electric reliability and, if not addressed, the old infrastructure will not support a reliable system operation. To address this issue, utility engineers need tools to address the failures before they happen as part of a predictive condition assessment cable testing and replacement program. These tools already exist; in fact, in 2015, NEETRAC concluded a major project (i.e., Cable Diagnostic Focused Initiative) that looked at all available power cable diagnostic technologies at the time. This project was supported by the Members, the U.S. Department of Energy, and other interested parties. Since 2015, Members continue to request information on diagnostic tools and seek advice on the diagnostic technologies. Additionally, power cable systems, as well as the technologies, continue to evolve. New alternative cable system restoration options are being considered, considerable amounts of diagnostic data have been generated, and applicable standards are being updated. Therefore, this project looks at the evolution of cable diagnostic technologies in several aspects and gathers and analyzes cable diagnostic data in order to provide NEETRAC Members with the most recent information on the applicable alternatives, practices, performance, and diagnostic tools.

NEETRAC will lead the efforts of the Task Force that will work to develop a method to evaluate the effectiveness of these alternative designs. The activities will include efforts to determine the prevalence of the problem, level of concern, risk perception, current regulation, and efforts to minimize issues. Information gained / developed during the project will be shared with appropriate interested parties (NEETRAC Members and IEEE).

## Flooding Impact on Single-Phase Padmount Transformers - Initial Study

***Baseline Project Number 24-070***

***PI: Qasim Khan***

Utilities are focusing on improving grid reliability and resiliency. This includes planning for severe weather events such as flooding, which can critically impact underground distribution and transmission power systems. Both existing and new underground distribution systems utilize above grade single phase pad-mount transformers. These units are not rated for submersion, but may be submersed during a flooding event. Utilities are asking suppliers what risks occur if exposed units are returned to service. This project aims to review existing research, survey members about present-day restoration practices and recommendations, and implement a limited test program to investigate the immediate effects of submersion.

## Challenges Surrounding Energy Storage Systems (ESS) Inside Substations

***Baseline Project Number 24-069***

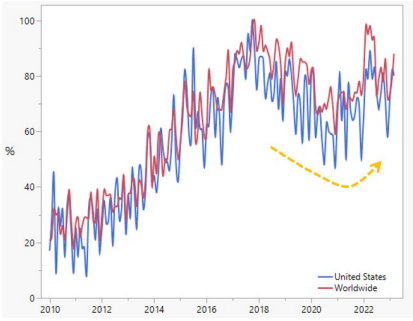
***PI: Anil Poda***

Energy storage systems are an essential component of electrical infrastructure. These systems serve as backup power sources when DER supply fluctuates, provide emergency power during outages, and can supply auxiliary power in substations. The increasing grid integration of renewable generation significantly changes the operation of the distribution system. Safety measures around substation energy storage systems are of utmost importance due to the potential risks associated with their operation and maintenance. There are multiple safety guidelines / regulations published by states and in standards (NFPA, NESC, and OSHA) when installing the ESS inside a substation. This project will focus on studying the safety challenges while installing large ESS inside substations. In addition, it will report the current status of standards and guidelines that address the safety challenges of the energy storage systems

## Evolution of Utility Microgrid Experience

***Baseline Project Number 23-128***

***PI: Diana Ramirez-Wong***




This work will update the utility industry perspective on microgrids, building upon the findings from NEETRAC BL PRJ No. 18-178, which explored trends and commonalities of utility microgrids in early 2020. The primary goal is to trace the evolution of driving forces, developments, challenges, and potential risks within existing and planned utility microgrids in the dynamic landscape of modern power systems. This research will provide valuable information to the utility industry and anyone interested in the energy transition. Microgrids have the potential to enhance power system reliability and resilience, enable the integration of renewable energy sources at a local level, and support demand response and energy storage technologies. Understanding the current state of utility microgrids will aid in the development of effective strategies for future microgrid deployments, and further facilitate the transition to a more sustainable and resilient energy system.

## Correlation of Laboratory Corrosion Tests to Outdoor Exposure Mechanisms

***Baseline Project Number 23-131***

***PI: Tristan Cline***

The concerns surrounding the use of corrosion test procedure GMW 15288 in IEEE enclosure integrity standards are related to its repeatability and relevance in qualifying coating systems. The findings from project 21-064 have indicated that the use of this test should be questioned due to its lack of repeatability and correlation to real world results.

To address these concerns and investigate the correlation between laboratory corrosion tests and field corrosion tests, a research project has been initiated. The project's primary objective is to compare the results of laboratory corrosion tests to those obtained from field tests conducted in various environments, including Arizona (AZ), Florida (FL), Georgia (GA), and Ohio (OH), with an exposure period of five years.

Through this investigation, the project aims to provide understanding on which corrosion test procedures provide higher degrees of correlation to field results and which test may be used for a diverse set of materials. Additionally, the project results may contribute to more robust IEEE enclosure integrity standards.

## Impact of Neutral Corrosion on Service Reliability of Jacketed Cable Systems - Part II

***Baseline Project Number 23-138***

***PI: Anil Poda***

Forensic evaluations of extruded dielectric cables at NEETRAC often show substantial corrosion of the cable metallic shield (neutral) even though the cable may be jacketed. The corrosion appears to be the result of moisture migration between the jacket and the cable core insulation shield. The purpose of this project is to better understand the fault performance of LCT and reduced round wire (RW) neutral designs without water blocking material and the full round wire neutral with water blocking material. A root cause analysis will be performed on the flat strap (FS) neutral design to understand the reasons for the difference in the performance of the corroded FS neutral design observed in BL #16-190.

## Understanding Human Factors for Operating Separable Connectors

***Baseline Project Number 20-045***

***PI: Anil Poda***

Load break separable connectors are expected to survive when switched into a fault. However, there are a number of issues that can affect the survival, including human switching capability. Additionally, how line tools and modern PPE impact a lineman's ability to switch is unknown. In this project, NEETRAC will collect information on common PPE requirements when switching and develop an instrumented live line tool for data gathering. Data will be collected and presented on the switching performance data.

## Investigation of Mechanical Cycling as a Connector Qualification Parameter

***Baseline Project Number 23-171***

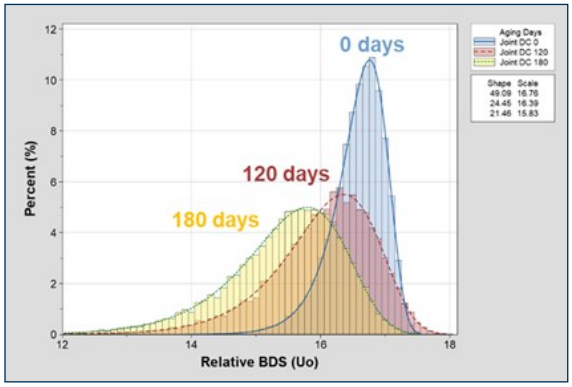
***PI: Joe Goldenburg***

Overhead connector testing has primarily focused on thermal cycle test methods (CCT). Within roughly the last 12 years, standards bodies have been evaluating whether to incorporate tension to CCTs. It was seen from the test results of project 16-123 that tension has an effect; however, the magnitude of the effect is unknown. It is believed that no one has evaluated the effects of mechanical cycling by itself. The purpose of this test project is to further understand mechanical cycling's effect on connectors and to investigate the feasibility of mechanical cycling as a sole test parameter for connector qualification testing.

## Performance Assessment of Medium Voltage Joints by Wet Accelerated Aging

***Baseline Project Number 23-179***

***PI: Thomas Parker***




The standards governing the qualification test for underground distribution cables insulated with EPR or TRXLPE stipulate a one-year accelerated aging test. However, the standard overseeing the qualification of underground cable joints mandates only a 30-day accelerated aging test. In NEETRAC's Baseline projects 16-061 and 19-081, aging tests on underground cable joints were conducted, mirroring the cable aging test. A methodology was devised to leverage the collected data for assessing the relative performance of field circuits comprising both cable and joints. This project by NEETRAC aims to delve into specific technical concerns identified towards the end of project 19-081. These include gathering data on an additional pre-molded joint, exploring the use of different connectors within the same joint body, and investigating the potential correlation between initial connector temperatures and joint performance.

## Correlation between Distribution Transformer Aging Models and Condition Assessment Techniques

***Baseline Project Number 23-181***

***PI: J.C. Hernandez-Mejia***

Distribution transformers have become more important assets due to induced shortages from supply chain issues that still remain after COVID-19 and consequential higher costs. There is also an increased interest on thermal modelling as means to estimate the loss of life. This is due to the availability of loading data from the AMI and sensors that can be used to enhance asset management strategies. However, limited amounts of information (if any) are available on the use of condition assessment techniques for aged distribution transformers when they are deployed in the field and thus correlations between distribution transformer life and condition assessment techniques are not widely available. This project seeks to study such correlations on transformers that are accelerated aged in a lab environment.

## NEETRAC SDO Engineering Support

***Baseline Project Number 24-110***

***PI: Thomas Parker***

During the COVID-19 pandemic, the world shifted to a virtual workplace to be effective. Since returning to the office, virtual meetings and work efforts continue to be an additional way to successfully maintain project schedules and reduce travel costs. SDOs are using this workplace shift to facilitate the development of standards between in-person technical committee meetings. NEETRAC engineers participate in standards development efforts in over twelve ANSI, ASTM, CSA and IEEE technical committees (see table below). This project will support efforts at virtual meetings and assigned supplemental tasks for working group and leadership roles occurring between in-person technical committee attendance.

| SDO | Committee |
|---|---|
| ASTM | B01 Electrical Conductors, E11 Quality & Statistics, E28 Mechanical Testing, F18 Electrical Protective Equipment For Workers |
| ANSI | C119 Overhead Conductors |
| CSA | Communication and Power Line Hardware |
| IEEE | Transmission & Distribution, Switchgear, Transformers, Insulated Conductors, Power System Instrumentation Measurements, Substations |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### Management Board Meetings

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

**May 7 - 8, 2025**

**September 24 - 25, 2025**

**February 4 - 5, 2026**

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

## 2024/2025 NEETRAC Member Management Board Representatives

1. Aluma-Form…….. Pete Landsgaard
2. BC Hydro…….Hudson Giesbrecht
3. Borealis Compounds, Inc.……..Joe Schilens
4. Conductores Monterrey…… Raul Garcia
5. Consolidated Edison…… Frank Doherty
6. Dominion Energy…….. Liz Sullivan
7. Dow ……..…….. Tim Person
8. DTE Energy……Abdalla Sadoon
9. Duke Energy……...Chris Fletcher
10. Eaton…….. Alan Yerges
11. Exelon…….. Aaron Babu
12. FirstEnergy……..Chris Slattery
13. Gresco Utility Supply……..Brad Schafer
14. Hubbell Power Systems……Jeff Butler
15. LS Cable & System……Tim West
16. Nova Scotia Power……Katelin Spence
17. NRECA……David Farmer
18. Okonite……...Bill Crawford
19. Pacific Gas & Electric…….. Connie Taylor
20. PPL Corporation……..……April Markley
21. Prolec GE…….. Carlos Gaytan
22. Prysmian Group……Jared Weitzel
23. Public Service Electric & Gas……..Ed Gray
24. Rauckman Utility Products……Jim Rauckman
25. San Diego Gas & Electric……..…. Kevin Galloway
26. Slacan Industries……..Ian Pollock
27. Smart Wires…….. Jesse Tucker
28. Southern California Edison…….Bryan Pham
29. Southern Company…….. Susan White
30. Southern States, LLC…….. Steve Fan
31. Southwire Company……... Yuhsin Hawig
32. Tacoma Power……..Joe Rempe
33. TE Connectivity……Brian Ayres
34. WEC Energy Group…….. Michael Smalley