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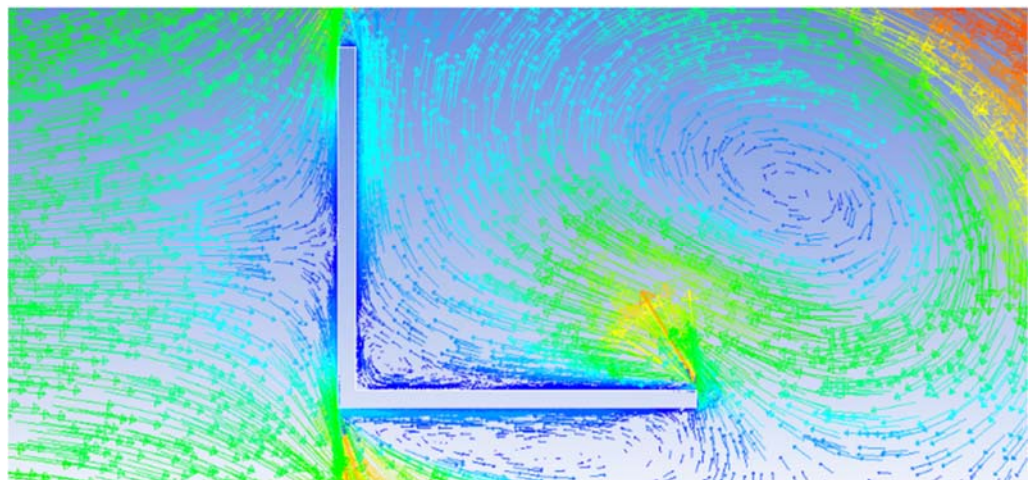
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## Significant Substation Bus Ampacity Changes Expected in 2022

NEETRAC Baseline Projects #11-002 and #12-202 have resulted in significant revision to the IEEE 605 Standard, *Guide for Bus Design in Air Insulated Substations*, which should be implemented by the end of 2022.

Power losses ( $I^2R$ ) in substation bus raises bus temperature. Utilities limit bus temperatures to prevent strength loss from annealing, ensure adequate fault current capacity, and maintain connected equipment temperature limits. Inaccurate ampacity ratings can result in over temperature excursions. Therefore, an accurate calculation method is essential.

Since 1977, bus ampacity ratings have used a “flat plane” calculation method for all geometries except round. At that time, heat transfer from a horizontal plate was well understood and provided the basis for ampacity calculation of complex geometries. Buses such as integral web were mathematically deconstructed into a series of flat horizontal plates. The heat loss per plate was summed and used to calculate ampacity. While practical, this method ignores the effects of bus orientation and geometry. Wind tunnel tests performed at NEETRAC have shown these effects are significant. A new calculation method was developed to more accurately predict ampacity rating accuracy. The IEEE committee accepted the method and will implement it in the next revision of the IEEE 605 standard.



Computational Fluid Dynamics (CFD) Simulation of Air Flow over Universal Angle Bus

For more information about the project or the upcoming conference call, contact Mechanical Section Lead, Joseph Goldenburg at 404-675-1858 or [joe.goldenburg@neetrac.gatech.edu](mailto:joe.goldenburg@neetrac.gatech.edu).

## Baseline Projects Recently Launched

NEETRAC is launching the following Baseline project proposals presented during the January 2019 Management Board Meeting based on input from the Management Board.

### Support for Maintenance of IEEE 1656

#### **Baseline Project Number 19-033**

IEEE 1656, *IEEE Guide for Testing the Electrical, Mechanical, and Durability Performance of Wildlife Protectives Devices on Overhead Power Distribution Systems Rated up to 38 kV*, was established in 2010 with input from NEETRAC. The original motivation for the guide was confusion in the industry about wildlife deterrent requirements and poor performance of some existing products. This standard will go inactive in 2020, which could result in users installing products that degrade and manufacturers being required to perform inconsistent testing. Through this project, NEETRAC will participate in the IEEE 1656 Wildlife Task Force with the goal of maintaining the guide as an active document.



### Maintaining Worker Safety in Energized Utility Vaults

#### **Baseline Project Number 19-034**

Electrical vaults are designed to provide periodic access for qualified personnel to install, maintain, or inspect equipment, cable, or cable accessories. The devices located in vaults are often energized when personnel enter or work in the vault. Monitoring of the devices before entry and during the work period can reduce the exposure to risk. This project will research / identify: (1) inspection methods used by utilities; (2) existing technology that can be used to mitigate risks associated with general hazardous environments of electrical vaults; (3) inspection methods that are used to evaluate electrical and thermal related risks; and (4) all equipment or component types that are typically found in electrical vaults.



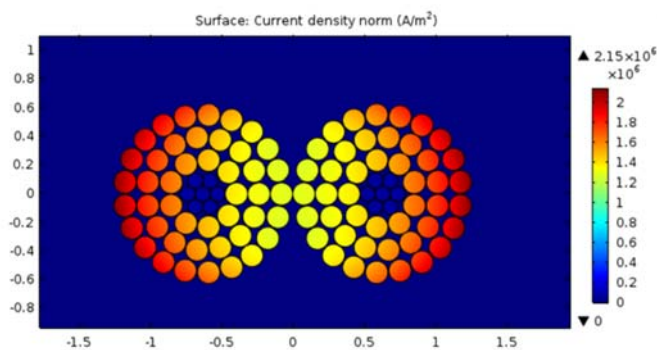
## Baseline Projects Recently Completed

The following Baseline project closeout was presented at the January 2019 Management Board Meeting. The report will be finalized and distributed in the coming months.

### Estimation of the AC Resistance for Large Overhead Conductors

#### **Baseline Project Number 16-118**

The ampacity rating of large, bare overhead and insulated underground conductors is critically dependent on the conductor AC resistance. Mathematical equations were developed many years ago to calculate the resistance of large conductors, but the resulting values have always been in question. Conductor designs, such as Milliken conductors in underground cables and twisted pair overhead conductors, present special complexities that make the calculation of AC resistance even more complex and uncertain. In this project, an electrical method was implemented and used to measure the AC resistance of large overhead conductors, including twisted pair designs. Resistance values were measured at different current levels and the resulting data was used to develop models of the current / resistance / temperature relationship. The results were also validated against book values, thermal data, and finite element analysis.

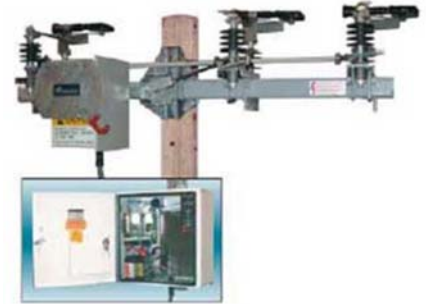


## Baseline Projects Recently Completed - Cont'd

### Battery Systems for Field T&D Equipment

#### Baseline Project Number 17-038

Batteries are increasingly used in T&D equipment due to the increased use of sophisticated control systems in equipment such as switchgear, reclosers, capacitors, and regulators. This expansion puts a greater emphasis on the need for reliable, long lasting batteries and battery systems that must perform 24/7 under extreme temperatures, withstand transient over-voltages, and frequent equipment operations. In this project, a literature review, equipment manufacturer survey, utility experience survey, and life analysis on field batteries were conducted to understand the current state of battery usage and its performance when installed in utility equipment. Based on the results of this work, an understanding of critical failure rates, optimum maintenance schedules, and battery selection parameters were developed. With this information, utilities can work with manufacturers to maximize battery life and performance and reduce maintenance costs.



## Current Baseline Projects

NEETRAC is currently conducting the baseline projects listed below. If you would like to become a Technical Advisor for one of these projects, please email [suzanne.schmidle@neetrac.gatech.edu](mailto:suzanne.schmidle@neetrac.gatech.edu) with your name, email address, and the project(s) for which you would like to volunteer. To learn more about being a Technical Advisor, visit our website at <http://neetrac.gatech.edu/technical.html>.

Project #	Project Title	PI
13-044	Automatic Splice Reliability - Phase 2	Yamille del Valle
15-100	Support for New Standard Development – Distribution & Transmission Accessories	Thomas Parker
15-126	Refreshing and Expanding the NEETRAC Training Portfolio	Essay Wen Shu
16-043	Enhancing the AWTT for Special Applications	Thomas Lancaster
16-048	Cable System Rejuvenation Forum	Nigel Hampton
16-050	Maintenance of NEETRAC Baseline Knowledge	Nigel Hampton
16-123	High Temperature Connector Committee Testing Support – Phase II	Joe Goldenburg
16-124	Overhead Conductor Testing Database	Dylan Summer
16-190	Impact of Neutral Corrosion on Service Reliability of Jacketed Cable Systems	Anil Poda
16-194	Organization of NEETRAC Baseline Projects	Yamille del Valle
17-040	Temperature Impact on Conductor Performance	Joe Goldenburg
17-048	Prognosis Methods for Standard Reliability Indices	Yamille del Valle
17-050	Impact of Crosslinking Byproducts on Void Discharge - Dielectric Strength and Diffusion	Nigel Hampton
17-132	Wood Pole Inspection Technique Phase II	Essay Wen Shu
17-134	Understanding Online Condition Assessment of OH Transmission Connectors	Thomas Parker
17-135	Power Equipment Oil Analysis: Lab Performance / Sampling Techniques Study	Josh Perkel
17-136	Impact of Current and Voltage Surges on Cable System Life - Scoping Study	Josh Perkel
17-205	Dielectric Performance of Personal Protective Equipment	Anil Poda
17-208	Lightning Risk Environment for Distribution Equipment	Ray Hill
18-057	Assessing the Loss of Performance in Mature Field Aged Cables	Thomas Lancaster
18-060	Coating Evaluation Program	Tony Pribble
18-102	Cable Drying Assessment and Decision Criteria	Essay Wen Shu
18-103	Endurance of Outdoor Insulation Multifactor Aging	JC Hernandez
18-177	Voltage Withstand Requirements for DER Isolation Devices	JC Hernandez
18-178	Utility Microgrid Experience Study	JC Hernandez
18-179	Non-Wood Utility Poles Data Mining / Verification	Essay Wen Shu
18-183	Pests in Enclosures	Joe Goldenburg
18-184	Impact of Die Choice on Mechanical Performance of Compression Connectors - Phase II	Tony Pribble
19-033	Support for Maintenance of IEEE 1656	Yamille del Valle
19-034	Maintaining Worker Safety in Energized Utility Vaults	Essay Wen Shu

## New NEETRAC Members

NEETRAC welcomes the following new Members for the 2019 / 2020 membership year!



Tacoma Power is an innovative, citizen-owned electric utility that generates, transmits, and distributes electricity and provides energy and telecommunication services in an increasingly competitive marketplace. They are committed to providing high-value, competitively priced products and services to their customers through the quality of their employees and the responsiveness that results from local ownership.



After a year as a trial Member, LS Cable & System now joins NEETRAC as a full Member. LS Cable & System designs, manufactures, and distributes an array of cable products for the rapidly growing energy sector, including low and medium voltage products that service the commercial, industrial, renewable energy, and utility markets.

After a year as a trial Member, LS Cable & System now joins NEETRAC as a full Member. LS



After a year away, TE Connectivity has rejoined NEETRAC. TE Connectivity offers a wide range of reliable and cost-effective products for the electrical power industry. For over 60 years, they have worked closely with their customers around the globe to develop innovative solutions to ever-changing challenges.



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### Management Board Meetings

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

**May 15 - 16, 2019**

**September 18 - 19, 2019**

**January 21 - 22, 2020**

For details, please visit the Member Section of the NEETRAC website at [www.neetrac.gatech.edu](http://www.neetrac.gatech.edu).

## 2019/2020 NEETRAC Member Management Board Representatives

1. 3M.....	Mark Hoisington	20. NRECA.....	Reed Cooper
2. ABB.....	Gary Haynes	21. Pacific Gas & Electric.....	Rudy Movafagh
3. Alumaform.....	Pete Landsgaard	22. PacifiCorp.....	Douglas Marx
4. Ameren.....	James Huss	23. PPL Corporation.....	Nicole Lacouve
5. American Electric Power.....	John Tucker	24. Prolec GE.....	Carlos Gaytan
6. BC Hydro.....	Fred Dennert	25. Public Service Electric & Gas.....	Ed Gray
7. Borealis Compounds, Inc.....	Susan Song	26. S&C Electric.....	Salvador Palafox
8. Consolidated Edison.....	Frank Doherty	27. San Diego Gas & Electric.....	Christian Henderson
9. Dominion Energy.....	Bobby Moorhead	28. Smart Wires.....	Haroon Inam
10. Dow Chemical Company.....	Brent Richardson	29. South Carolina Electric & Gas.....	Mike Cook
11. DTE Energy.....	Najwa Abouhassan	30. Southern California Edison.....	Herbert Martinez
12. Duke Energy.....	Chris Fletcher	31. Southern Company.....	Michael Pearman
13. Eaton.....	Alan Yerges	32. Southern States, LLC.....	Joe Rostron
14. Exelon.....	Lisa Perrone	33. Southwire Company.....	Sherif Kamel
15. FirstEnergy.....	Randy Coleman	34. Tacoma Power.....	Joe Rempé
16. General Cable.....	Bill Temple	35. TE Connectivity.....	Brian Ayres
17. Gresco Utility Supply.....	Brad Schafer	36. TVA.....	David Smith
18. Hubbell Power Systems.....	Jerry Goolsby	37. Viakable.....	Raul Garcia
19. LS Cable & System.....	Tim West	38. We Energies.....	Michael Smalley