Technology Innovation Project *Project Brief*

TIP 424: CEATI – Transmission Overhead Line Design and Extreme Event Mitigation (TODEM)

Context

Overhead transmission lines are subjected to extreme events that may damage line sections and affect power supply to customers. Even when the best design criteria are met, there continues to be a risk of extensive damage to overhead lines when structural loads exceed the design criteria. Experiences with several devastating events such as the ice storm in Canada and the north eastern U.S. in 1998, the major wind storm event in France in 1999 and the major icing event in China in 2008, along with hurricanes and high intensity winds (HIW) recently occurring in many countries, have demonstrated the significant devastation that severe weather causes to transmission systems. These problems may best be addressed by a better understanding of these issues through gaining knowledge in the subject areas, improving current transmission line design methods, conditional assessment, and vulnerability evaluation technologies and by TODEM membership benchmarking and sharing needed research efforts as well as closing the existing "knowledge gaps" in the industry.

Focus Areas

- The TODEM Strategic Plan describes 5 focus areas aimed at delivering value to TODEM members. These include: Extreme Events
- Maximizing Availability/ Utilization of Existing Transmission Lines
- Investigation of New Technologies
- Development of New Transmission Lines – Constraints: Environmental, Visual, Structural
- Understanding Resiliency Issues and its Impact on Line Design

Annual Activities

- 2 Face-to-Face Meetings (Virtual during COVID)
- Workshops/Conferences (Virtual during COVID)
- Conference Calls
- On-Demand Information Exchange
- Collaborative Project Development

Why It Matters

Through membership in this program, BPA's Transmission Line Engineers can increase their knowledge of the latest design criteria and mitigation methods to manage the effects of extreme events on overhead transmission lines. CEATI project reports are available to all BPA employees.

The program accomplishes its goals by benchmarking, sharing knowledge through collaborative projects, information exchanges, training webinars, workshops, conferences, and access to a global network of subject matter experts.

Goals and Objectives

The objective of this interest group is to develop and share strategies to deal with overhead transmission line design issues and to mitigate the impact of extreme events, develop benchmarks for increased utilization of existing lines as well as the design of new lines, address corrosion of transmission components, develop containment strategy against line cascade and develop technologies to reduce life cycle costs.

About CEATI

The Centre for Energy Advancement through Technological Innovation (CEATI) is a user-driven organization committed to providing technology solutions to its electrical utility participants, who are brought together to collaborate and act jointly to advance the industry through the sharing and developing of practical and applicable knowledge.

As of today, over one hundred and thirty (130) utilities from all six (6) of the world's continents are represented in CEATI's twenty (20) Programs. CEATI now boasts a library of over two thousand (2,000) published reports and is currently managing over one hundred and fifty (150) on-going projects in all areas related to the power grid. A significant amount of these reports have been adopted as national and international standards and numerous guides have been recognized as points of reference for practical information.

CEATI INTERNATIONAL | Transmission Overhead Line Design and Extreme Event Mitigation

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Membership: Continuing

Links

www.ceati.com/TODEM

Leverage

BPA's contributions are leveraged at a ratio of 44:1

This annual membership provides BPA access to reports and results of TODEM projects.

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Some of the Current Projects are:

TODEM 33/132 Mitigation of Line Deterioration

TODEM 33/131 Development of Fragility Models for Key Line Components

TODEM 33/130 Life Cycle Cost Evaluation of Transmission Lines

TODEM 3398B Section 4 - Line/Structure Configuration - Its Impact on Line Design

TODEM 4105 A Comparison of Phodar vs. LiDAR - Advantages and Disadvantages of Each

TODEM 33/129 Self-Damping Measurement of HTLS Conductor

TODEM 33/128 A General Framework for GIS based Vulnerability Assessment of Overhead Lines under Extreme Events

TODEM 33/127 Transmission Line Structures Under Downbursts and Tornadoes

TODEM 33/126 Selection Criteria of Backfill Materials and its Impact on Assessing Foundation Capacity

TODEM 33/125 Vibration of Tower Structures

TODEM 3398B Section 3 - The Challenge in Route Selection, Siting Process & Environmental Issues

TODEM 33/123 Calibration of Overhead Lines Based on Reliability Based Design Philosophy

TODEM 33/122 Comparative Evaluations of Direct Embedment, Drilled Shafts and Steel Caisson Foundations for Tubular Steel Pole Structures

TODEM 33/121 Operating Limit for Conductor Temperature and its Impact on Splices

TODEM 33/120 Galloping Mitigation – Performance Evaluation of Various Anti-Galloping Control Devices

TODEM 3398B Best Practices Guide for EHV AC Transmission Lines (230 kV - 765 kV)

TODEM 3256B Additional Example Problems for Tubular Pole Corrosion

TODEM 33/117 Understanding Ground Anchoring Systems for Overhead Line Foundations

TODEM 33/110 Residual Life Estimation of NCI Insulators

TODEM 33/124 Guidelines for Appropriate Sampling Techniques in Inspection of Line Components for Risk Assessment

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