

CEATI Participants
Only!

Resiliency Issues in a High-Voltage Transmission Grid: Impacts on Power Systems & Line Design

In conjunction with the Transmission Overhead Design & Extreme Event Mitigation (TODEM) and Power System Planning & Operations (PSPO) Interest Group Meetings

October 16-20, 2017 • Portland, OR

From **October 16 - 20th, 2017**, CEATI's Transmission Overhead Design & Extreme Event Mitigation (TODEM) Interest Group will convene in Portland, OR, along with the Power System Planning & Operations (PSPO) Interest Group. Participants from both groups will be holding their own separate utility-only meetings and will convene at a Workshop in the middle of the week to discuss the common issue of resiliency. The workshop will be Co-Chaired by TODEM & PSPO Technical Advisors, Asim Haldar & John Sabiston.

Overhead Line Design & Extreme Event Mitigation (TODEM) Meeting

October 16-17, 2017

Workshop: Resiliency Issues in a High-Voltage Transmission Grid

October 18, 2017

This internal workshop will provide attendees with a better understanding of where the "National Resilience" effort is heading and its impact on the electric power industry.

The workshop will identify key issues and challenges, as well as opportunities in the area of grid resiliency. It will also help establish recovery goals for powerline systems and mitigation techniques. Particular reference will be made to planning and design criteria, in addition to the identification of knowledge gaps in the comprehension of grid resiliency.

Power System Planning & Operations (PSPO) Meeting

October 19-20, 2017

TODEM at a Glance

Focus Areas:

- Extreme Events
- Maximizing Availability/Utilization of Existing Transmission Lines
- Investigation of New Technologies
- Development of New Transmission Lines Constraints (Environmental, Visual, Structural, etc.)
- Understanding Resiliency Issues from a National Perspective and its Impact on Line Design

PSPO at a Glance

Focus Areas:

- Advances in Power System Modelling and Analysis
- The Use of New Technologies and Tools in the Power System
- Expanding the Role of HVDC Transmission
- Integrating Renewable Generation Sources and Storage Technologies

Resiliency Issues in a High-Voltage Transmission Grid

Impacts on Power Systems & Line Design

7:30 - 8:00 Continental Breakfast

8:00 - 8:10 Opening Remarks & Welcome Address

*Asim Haldar & John Sabiston,
Conference Co-Chairs*

8:10 - 9:00 Key Note Address: NIST Lifeline Resiliency Project

*Jay Raskin, Architect, Past Chair NIST
Community Resilience Project*

The National Institute of Standards and Technology (NIST) leads a Community Resilience effort as part of a broader national resilience effort to provide guidance and tools to help communities improve the resilience their buildings and infrastructure systems. NIST created the Community Resilience Planning Guide to provide a practical and flexible approach to help communities improve their resilience to natural, technological, and human-caused hazards. In order to provide continuity for the resilience effort, NIST has created Community Resilience Center of Excellence to support resilience research, as well as the Community Resilience Panel that has gathered experts from social, economic, and infrastructure disciplines to recommend improvements to standards, guidelines, best practices and other tools. The Panel's mission is to reduce barriers to achieving community resilience in an open, transparent process.

9:00 - 9:30 Key Note Address: Tower Systems Resiliency to Disaster *Ted Brekken, Oregon State University*

The Pacific Northwest is regularly hit with large subduction zone earthquakes, and much of the infrastructure is unprepared, including the electrical grid. This presentation will cover the basics of how seismic activity impacts the electrical grid and its components, some historical base cases, and electrical system metrics and analysis methods.

9:30 - 9:45 Question & Answer Period

9:45 - 10:15 Morning Refreshment Break

10:15 - 10:45 Beyond N-1, A More Resilient Electric Power Transmission Grid

Leon Kempner, Bonneville Power Administration

It is important for Utilities to consider resiliency of the electrical power grid beyond reliability performance, N-1. Utilities are proficient in responding to N-1 situations that affect their electrical grid on a regular basis. Experience to N-1 events and additional design considerations can help improve grid resiliency. This presentation will discuss key resiliency components that utilities are currently applying and could do to improve performance, beyond N-1.

10:45 - 11:15 Dynamic Reference Matrix for Management of High Impact Low Frequency Risks & Basis for Tech. Transfer

Ian Grant, Tennessee Valley Authority

TVA is the largest public power system in the US that generates and transmits power that is then sold to 155 distribution companies. In response to the increasing expectations of reliability and resilience, TVA has developed a matrix tool that enables coordination across a wide range of high impact low frequency risks, provides a dynamic reference for managing all aspects of those risks, and serves as a basis for technology transfer. The presentation describes the tool and a number of actions that TVA takes to enhance resilience.

Workshop Agenda

October 18, 2017

11:15 - 11:45 **Discussion on the Implementation of a Resiliency Program for Overhead Lines** *Brian Townsend, Altalink*

As critical infrastructure organizations engage in resiliency planning, it falls into the hands of the utility engineers to understand and implement these philosophies, with integration, when possible, into each organizations existing design and restoration practices. In these early stages of resiliency planning, this presentation will offer questions for consideration and discussion on topics such as mitigation versus restoration planning, changes to line importance and the need to retrofit existing facilities.

11:45 - 12:00 **Question & Answer Period**

12:00 - 1:00 Lunch

1:00 - 1:30 **Station Hardening: Con Edison's Response to Hurricane Sandy & Related Long-Term Improvements** *Kevin Davis, Con Edison*

In response to the impacts caused by Super Storm Sandy, which struck the New York City area on October 29, 2012, Con Edison initiated a four year, \$1 billion company-wide program, to fortify its energy delivery systems against future storms. The storm resulted in the loss of 5 transmission substations and 4,000 megawatts of generation. The combination of Sandy and the November 7th Nor'easter interrupted service to approximately 1,115,000 customers. This *Storm Hardening* program aimed at protecting critical infrastructure to mitigate the effects of future coastal flooding and severe winds by establishing a design basis that accounts for anticipated climate change and sea level rise. The Company pursued an array of resiliency measures, from reinforced perimeter flood walls and deployable flood gates, to new fiber optic based relay protection and automation systems. As result, Con Edison is now protected against a return of Sandy as well as more severe future storms.

1:30 - 2:00 **Understanding Resilience Issues from a Line Engineer's Perspective** *Asim Haldar, CEATI International*

Resilience and Reliability are often used interchangeably in assessing the risk of exposure of a power grid to extreme events. The presentation focuses on the various terms that are used and an understanding of these terms in relation to electrical and mechanical system performances. How resilience can affect the conventional design of overhead lines is also discussed. A simple concept is presented to show how the traditional line reliability can be integrated with security to provide an optimum return period of an extreme event. Resilience plays an important role in the planning and design processes to ensure that the recovery of the system is quick once it has failed.

2:00 - 2:30 **EMP Mitigation: Systems and Components** *Alberto Ramirez Orquin, Resilient Grids*

EMP, in its three basic forms, as well as shock waves from solar storms, are phenomena which have come to the forefront of interest for the utility industry and for society at large. That has also been reflected in recent legislation addressing this serious security risk to critical electricity infrastructures. This work discerns the liability concerns associated to each disturbance, postulating plausible strategies to cope with it. The protection of major power equipment is fully discussed, in particular as it applies to transformer GIC neutral-blocking concepts. In any case, an examination of some characteristic hardware with attending sensing/relaying ancillaries is carried out.

2:30 - 2:45 **Question & Answer Period**

2:45 - 3:15 Afternoon Refreshment Break

3:15 - 4:30 **Panel Session**

4:30 - 4:45 **Closing Remarks**

*Asim Haldar & John Sabiston,
Workshop Co-Chairs*

agenda is subject to change



The Workshop has been organized with the help of:



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A room-block has been reserved at the Crowne Plaza Portland Downtown Convention Center. Attendees are eligible to reserve their rooms at the rate of \$169 per night or the equivalent to the government per diem. Reservations should be made directly on their website (please contact aleksm@ceati.com for the link) or by calling the reservations desk and mentioning "CEATI International".



Please note that all three of these events are closed-door, CEATI Participant-only sessions, providing participant organizations with extensive opportunities for networking and knowledge sharing with leading transmission utilities from a variety of service environments.

For more information on CEATI's Transmission Program, please contact T&D Senior Program Manager
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