

Overhead Line Design Issues & Wind and Ice Storm Mitigation Interest Group

Overhead Transmission Lines (OHL) often face extreme events such as severe ice or wind loads which 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 extreme wind or ice storms exceed the design criteria. Moreover, utilities should not ignore the anticipated effects of global warming and ongoing climate change.

There are many approaches to limiting the impact of ice and wind loads on overhead lines. One may focus on a better knowledge of climatic events and their impacts on OHL, advancements in design, mitigation techniques or mutual assistance efforts. These include:

- Climatic stations for recording ice or wind parameters and modeling for a better forecast of maximum loads
- Careful selection of the design approach minimizes the risk of failures, while simultaneously reducing the potential consequences of such events.
- Mitigation techniques deal with the reduction of the consequences of exceeding the design loads or to avoid failure of installations by reducing ice accretion or by using de-icing techniques.
- Mutual assistance efforts focus on the sharing of resources, such as workers, logistics, equipment and components, in the event of serious damage.

Experiences with the 1998 ice storm in northeastern Canada and the U.S., several smaller ice storms, hurricanes and High Intensity Winds (HIW) recently occurring in many countries have demonstrated the devastation severe weather causes to transmission systems. These problems may best be addressed by improving knowledge and technologies, and by sharing the needed efforts on research and studies. The coalition of information on most recent design and technological innovations, collaboration on R&D projects and amalgamation of logistics and spare materials to face crisis situations will benefit all participants in this Interest Group.

Topics & Issues

- Design and Technology Innovations
- Prediction and Simulation of Extreme Events
- Failure Containment and Load Control Devices
- Best Practices for Crisis Management
- Real time Monitoring for Maximum Utilization of OHL
- Design for High Intensity Winds
- Conductor Vibration: Mitigation and Control
- Ice Mitigation and De-Icing Techniques
- Best Practices for Transmission Line Design
- Cost Impact of Overhead Line Failures
- OHL Protection against Lightning
- Component Safety, Reliability and End of Life Predictions
- Environmental and Sustainability Issues



Technology Coordinator



Dr. Anand Goel leads the Overhead Line Design Issues & Wind and Ice Storm Mitigation Interest Group (WISMIG). He is a professional engineer with over 40 years of professional experience, spending 24 years in the Engineering Division of Ontario Hydro/Hydro One and serving as Manager in Lines Engineering for 18 years, leading a team of professionals for power line engineering services. A highlight of his career was leading the diagnostic engineering teams and participating in restoration efforts after the 1998 Ice Storm. He obtained his B.E. (Honours) from IIT Roorkee, India and his Ph.D. from the University of Toronto, Canada. Dr. Goel has been active in CEA and CEATI R&D activities for the past 20 years and was a leading WISMIG participant prior to his retirement from Hydro One. He is a member of technical committees in CSA, CIGRE, and IEEE and is a Senior Member of IEEE. Dr. Goel has authored and co-authored over 20 technical papers and has made numerous presentations at technical conferences around the world. He has also contributed to the book, 'Atmospheric Icing of Power Networks' published by Springer.



Projects

for a complete project listing, please visit: www.ceati.com/wismig

- Application Guide for Wind Speed-Up Factors
- Guide for Design, Installation and Repair of ACSR Conductor Splices
- Monitoring Package for Extreme Events
- Corrosion Assessment for Tubular Steel Poles
- Guide for Determining Deflection Criteria
- Rime Icing Model Validation Using WRF and Full Scale Field Icing Data
- Estimation of Safe Design Tension for Compact ACSR Conductors to Safeguard against Aeolian Vibrations
- Determination of Drag Coefficients for Ice Covered Conductors
- New Material for Replacing Copper for Grounding in the Transmission System
- Emergency Restoration Methods under Extreme Events - Best Practices
- Robotic Maintenance and Its Implications for Design
- Transmission Line LiDAR Surveys and Development of Guide Specifications
- Methodology to Determine Transmission Life Cycle Costs
- Technology Watch on New Conductors for Transmission Lines
- End of Life for Wood Structures
- New Structural Materials for Transmission Lines
- Guide on Reconductoring and Uprating of Transmission Lines
- Methodology for Conducting Extreme Event Model Simulations
- Development of a Vision Based Real-Time Ice Detection System
- Conductor Fatigue Work for AGS Suspension Clamps
- Simulation of the Cascade Process of Towers
- Guide to Identify and Rank Critical Facilities
- Technology Watch for Gaps in Knowledge about Conductor Fatigue
- Technology Watch: Methodology for Transmission Line Failure Investigations
- High Intensity Wind Case Study
- Guide to Best Practices for the Design of 138-230 kV Overhead Transmission Lines
- Workshop on Wireless Smart Sensors for Real-Time Monitoring of Conductors and Shield Wires
- Evaluation of the Real Costs of Transmission Line Failures
- Modeling and Forecasting Icing Events Using Regular Weather Models
- Calculated vs. Measured High-Temperature Sags and Enhanced Stress-Strain Tests
- State of the Art Review of Geophysical Techniques to Determine Geotechnical Parameters of Subsoil Conditions
- Benchmark Study for a Line Modeled in ADINA with Various Anti-Cascading Structures
- Safety Measures During Emergency Restoration
- Strength of Steel Angles Subjected to Short Duration Axial Load Comparison Between Unbalanced Ice Loads and Security Loads and Assessment of their Impact on Line/Structure Designs
- Evaluation of Live Line Conductor Vibration Recorders and Evaluation of SEFAG VIBREC 400 Vibration Recorder on AGS Clamps
- Design Criteria for Substation Insulation Taking into Account Pollution and Icing
- Updating the Wind and Ice Loads Design Information Used for Reliability Based Design
- Modeling and Prediction of Failure of Transmission Lines due to High Intensity Winds - Phase II
- Design Guide to Control Galloping of Transmission Line Conductors
- Galloping Phenomena, Occurring Problems and Solutions
- Options Available to Prevent Cascading Type Failures and Assess Their Cost Effectiveness
- Cost Benefit Analysis for Overhead Lines Comparing Overhead Ground Wires to Surge Arresters
- Guidelines for Installation of Surge Arresters on Sub-Transmission and Transmission Lines using Different Structure Designs at Voltages from 69 kV to 345kV
- Inspection Techniques for Detecting Latent Damage to Existing Overhead Transmission Lines from Previous Ice and Wind Storms
- Investigation of the Differences in the Application of the Canadian and US Methodology for Estimates of Ice Loads for a 50-Year Return Period
- De-Icing Techniques Before, During, and Following Ice Storms
- Assessing Design Approaches for Overhead Transmission Lines Under Climatic Loads for New Projects as well as for Verification of Lines to be Upgraded



Annual Activities

2 Meetings

5-7 Conference Calls

Technology Watch Workshop

Weekly Information Exchange

Networking between Participants

Participation is open to:

Utilities

Government Agencies

Universities

Project Reports

Over the years more than 1500 projects have been completed and published in the fields of:

Generation; Transmission Distribution; Utilization

For a complete listing, please consult our website.

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