

# 53rd Annual MINNESOTA POWER SYSTEMS CONFERENCE

November 7–9, 2017

**Saint Paul RiverCentre  
175 W Kellogg Boulevard  
Saint Paul, Minnesota**

Sponsored by:  
College of Continuing Education, University of Minnesota

In Cooperation with:  
IEEE, Power and Energy Society, Twin Cities Chapter

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**COLLEGE OF CONTINUING EDUCATION**  

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**UNIVERSITY OF MINNESOTA**

# Program At A Glance

## TUESDAY, NOVEMBER 7, 2017

7:00 a.m.	Registration and Continental Breakfast		
	<b>General Session</b>		
8:00	Welcome and Opening Remarks		
8:15	Electricity in Transition: A Regulatory Perspective		
9:00	100MW North Star Solar Project		
9:45	Break		
10:15	The Evolution of the Grid in the Midcontinent Independent System Operator (MISO) Region		
11:00	Influence of Corporate Culture and Ethics in Infamous Scams		
Noon	Lunch		
	<b>Substation</b>	<b>Safety and Security</b>	<b>Delivery Systems I</b>
1:00 p.m.	Air Core Reactors: Magnetic Clearances, Electrical Connection, and Grounding of Their Supports	Secure Business Transformation through Mobile Device Management (MDM)	Basin Electric NERC CIP Program  Protection of Distribution Feeders that Contain Distributed PV Generation
1:45	Operational Experiences of an HV Transformer Neutral Blocking Device	CIP-003-6—Low-Impact CIP Implementation	Solutions to Common Distribution Protection Challenges  System Studies for American Transmission Co.'s Benson Lake SVC Project
2:30	Break		
3:00	Evaluating Transformer Heating Due to GMD	Securing IEDs Against Cyber Threats in Critical Substation Automation and Industrial Control Systems	Demystifying IROL—Does Exceeding IROL Always Imply Loss of Reliable Operation?  Commission Testing Methods for Protection Systems

3:45	Bus Duct Inspection & Maintenance Best Practices	Is the Cloud Safe for Utility Use?	Distribution System Optimization Using Simulation Tools	End-to-End Testing
4:30	<b>Exhibitor Reception</b>			
7:00	Adjourn			
<b>WEDNESDAY, NOVEMBER 8, 2017</b>				
7:30 a.m.	Registration and Continental Breakfast			
	<b>Distribution Automation/Communications</b>		<b>Utility Industry Futures</b>	
8:30	Needed Communications for DA Applications—Panel Session	Process/Project Management—Xcel Energy MN Solar*Rewards Community Program	The Growing Connectedness of the Electric and Natural Gas Systems	Operational Flexibility at Coal Creek Station
9:15	Needed Communications for DA Applications—Panel Session (Continued)	Q-28 Van Loon Wildlife and Black River Transmission Line Project	DER Hosting Capacity Analysis	Simulating Success at Antelope Valley Station
10:00	Break			
10:30	Apply a Wireless Line Sensor System to Enhance Distribution Protection Schemes	Great Northern 500 kV Transmission Line: Behind the (Electrical) Design	Energy Storage: Xcel Energy Project Updates and Industry Landscape	Resource Planning for a Reciprocating Internal Combustion Engine (RICE) Project
11:15	Implementing Volt/VAR Optimization with DER Penetration	Building an SVC Substation on Rock	Enabling Advanced Capabilities for DER—Takeaways from the Interconnection Standard IEEE 1547 Full Revision	When Engineering and Environmental Departments Meet
Noon	Lunch			

**WEDNESDAY, NOVEMBER 8, 2017 (continued)**

	<b>Civil-Structural</b>		<b>Delivery Systems II</b>		<b>Relaying II</b>		<b>Metering</b>
1:00	Great River Energy Transmission Line Tower Repairs	Delayed-Current Zero Crossing Phenomena During Switching of Shunt-Compensated Lines	Panel: Implementing GMD Standard TPL-007	Redundant Bus Protection Using High-Impedance Differential Relays	AMI Trials and Testings		
1:45	Challenging Transmission Structure Designs: Case Studies			Beyond the Nameplate—Selecting Transformer Compensation Settings for Secure Differential Protection	AMI Performance Requirements and Testing		
2:30	Break						
3:00	What Structural Engineers Should Know About Substation Rigid Bus Design	Case Study on Aggregate Load Modeling in Transient Stability Studies		What's New in C37.113-2015, IEEE Guide for Protective Relay Applications to Transmission Lines	Metering Communications Interoperability: Are We There Yet?		
3:45	Red Rock Hydroelectric Project—New Hydro at an Existing Flood Control Dam	Voltage Changes Caused by Distributed Energy Resources and Their Impact on Hosting Capacities		Considerations for Implementing a Zone-Selective Interlocking Scheme on Medium and Low Voltage Systems	Local Balancing Authority Metering in MISO: An Engineering Perspective		
4:30	Adjourn						

**THURSDAY, NOVEMBER 9, 2017**

7:30 a.m.	Registration and Continental Breakfast						
	<b>Tutorial I</b>		<b>Tutorial II</b>		<b>Tutorial III</b>		<b>Tutorial IV</b>
8:30	Transmission System Performance for Geomagnetic Disturbance Events	Ethernet Fundamentals	Ethernet Fundamentals	Substation Grounding Tutorial	Substation Grounding Tutorial	Transmission Design 201—Advanced Elements	Transmission Design 201—Advanced Elements
10:00	Break						
10:30	Transmission System Performance for Geomagnetic Disturbance Events	Ethernet Fundamentals	Ethernet Fundamentals	Substation Grounding Tutorial	Substation Grounding Tutorial	Transmission Design 201—Advanced Elements	Transmission Design 201—Advanced Elements
Noon	Adjourn						

# Program Schedule

Saint Paul RiverCentre  
175 West Kellogg Boulevard  
Saint Paul, Minnesota

Tuesday, November 7, 2017

## GENERAL SESSION

8:00 a.m.–noon

Moderator: *Scott Hoberg*

Co-Moderators: *Dave Bisel, Al Haman, Michael Marz*

### Welcome and Opening Remarks

*Scott Hoberg, Minnesota Power*

### Electricity in Transition: A Regulatory Perspective

*Matthew Schuerger, Minnesota Public Utilities Commission*

Minnesota's grid is undergoing significant changes as aging infrastructure retires, consumer demands evolve, and new technology costs fall. This presentation will highlight the opportunities and challenges the Minnesota Public Utilities Commission faces in the changing electric utility landscape. – Fundamental

### 100MW North Star Solar Project

*Chase Whitney, Community Energy Solar, LLC*

The recently completed North Star Solar project is the largest single solar facility in the Midwest and one of the largest in the country with more than 440,000 solar panels spanning 1,000 acres. This presentation will provide an overview of the project from start to finish. – Intermediate

### The Evolution of the Grid in the Midcontinent Independent System Operator (MISO) Region

*Jordan Bakke, David Duebner, Durgesh Manjure, Laura Rauch, Midcontinent Independent System Operator*

This panel will discuss viewpoints on the evolution of the grid in the MISO region. The electrical system continues to undergo significant changes driven by changing economics, environmental regulation, and aging infrastructure. – Advanced

### Influence of Corporate Culture and Ethics in Infamous Scams

*Chris Anderson, ALLETE*

Well-known companies continue to make headlines for committing fraud, despite financial penalties and damage to reputation. This presentation will focus on how decisions by employees at all levels of the organization can be impacted by, and affect, a company's ethical culture. – Fundamental

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## CONCURRENT SESSIONS

1:00–4:30 p.m.

### SUBSTATION

Moderator: *Neil Stiller*

Co-Moderators: *Steven Mohs, Brianna Swenson*

### Air Core Reactors: Magnetic Clearances, Electrical Connection, and Grounding of Their Supports

*David Caverly, Trench Limited*

This paper explains the concepts of reactor magnetic clearances and provides guidance as to proper arrangement of their electrical connection, methods of handling concrete reinforcement and fencing, and the "Do's and Don'ts" of reactor support grounding. – Intermediate

## **Operational Experiences of an HV Transformer Neutral Blocking Device**

*Fred Faxvog, Emprimus; David Wojtczak, American Transmission Company*

In February 2015 a Neutral Current Blocking System was installed on a 345/138 kV transformer in Wisconsin to increase resiliency to GMD. The device, installation, and operating experience will be discussed. – Intermediate

## **Evaluating Transformer Heating Due to GMD**

*Brian Penny, American Transmission Company*

NERC Standard TPL-007 requires assessment of the thermal impact of GMD on BES transformers by January 1, 2021. This presentation discusses what this means for the owners of these transformers. – Intermediate

## **Bus Duct Inspection & Maintenance Best Practices**

*Gary Whitehead, Electrical Builders Inc.*

This presentation will cover non-seg, cable, and isophase bus systems, the critical roles they play, and subsequently, the importance of properly inspecting and maintaining them on a regular basis. – Intermediate

## **SAFETY AND SECURITY**

*Moderator: Larry Brusseau*

*Co-Moderators: Mike Crane, Jesse Tomford*

### **Secure Business Transformation through Mobile Device Management (MDM)**

*Heidi Konyonenbelt, Mike Wetterling, Otter Tail Power Company*

Demand for information in “the palm of our hands” requires a secure extension of the enterprise network and creates efficiency opportunities in operations. By implementing a robust MDM, companies can securely leverage company data in the field. – Fundamental

### **CIP-003-6—Low-Impact CIP Implementation**

*Michael Brytowski, Great River Energy*

This presentation describes some methods and issues implementing the new NERC CIP-003-6 Reliability Standard, requiring minimum levels of cyber and physical security for Low Impact Bulk-Electric System facilities (BES) (transmission and generation). – Fundamental

### **Securing IEDs Against Cyber Threats in Critical Substation Automation and Industrial Control Systems**

*Mark Adamiak, GE Grid Automation*

Cyber-attacks have become real! This paper examines the cyber threats being faced by utilities today and the utility-related standardized remedies developed by industry standards groups. – Intermediate

### **Is the Cloud Safe for Utility Use?**

*Kenneth Elkinson, Doble Engineering Co.*

How has increased security surrounding digital data and regulatory standards such as NERC CIP affected digital compliance within your company? Is it safe for utilities to use the cloud to transport data? What types of data? And... what types of the cloud are acceptable? – Intermediate

## **DELIVERY SYSTEMS I**

*Moderator: Al Haman*

*Co-Moderators: Greg Owen, Mike Steckelberg*

### **Basin Electric NERC CIP Program**

*Mike Kraft, Basin Electric Power Cooperative*

This presentation will discuss how to identify and implement cyber security best practices in a risk-based manner while maintaining CIP compliance. It will feature specific highlights and lessons learned. – Intermediate

## **System Studies for American Transmission Co.'s Benson Lake SVC Project**

*Adam Manty, American Transmission Company*

ATC's Benson Lake SVC project will be introduced with a review of the need drivers and the system studies completed to tune the SVC and deliver maximum system benefits. – Intermediate

## **Demystifying IROL (Interconnection Reliability Operating Limit)—Does Exceeding IROL Always Imply Loss of Reliable Operation?**

*Hari Singh, Xcel Energy*

IROL utilization varies widely due to a lack of clear guidelines. Conceptual differences between instability, cascading and uncontrolled separation will be explained with examples to help differentiate SOL from IROL. – Intermediate

## **Distribution System Optimization Using Simulation Tools**

*Daniel Desrosiers, Cyme International*

As Distributed Energy Resources (DER) become more prevalent in the distribution grid, simulation tools help optimize the performance of the network. They can help personnel manage the complexities of the network and greatly support development of solid business cases when considering implementation of new technical solutions. – Intermediate

## **RELAYING I**

*Moderator: Michael Ebert*

*Co-Moderators: Dave Bisel, Tom Guttormson*

## **Protection of Distribution Feeders that Contain Distributed PV Generation**

*Scott Elling, HDR*

Several megawatts of community solar gardens are being interconnected to the Minnesota distribution grid. This presentation highlights some of the protection challenges encountered on the distributed energy resource projects. – Fundamental

## **Solutions to Common Distribution Protection Challenges**

*Jeremy Blair, Schweitzer Engineering Laboratories, Inc.*

This paper presents common challenges in distribution protection and demonstrates solutions using the multiple protection elements and custom logic available in modern distribution feeder relays and recloser controls. – Intermediate

## **Commission Testing Methods for Protection Systems**

*Thomas Ernst, GE Grid Solutions*

This paper looks at the requirements of commission testing as contrasted against maintenance testing requirements. The steps of commission testing for each of the NERC PRC-005-2 protection system components are discussed along with thoughts on record keeping. – Intermediate

## **End-to-End Testing**

*Scott Cooper, Omicron*

This presentation describes traditional end-to-end testing history, philosophy, methods, procedures, and results analysis. Testing new time domain schemes will also be discussed. – Intermediate

## **EXHIBITOR RECEPTION**

4:30–7:00 p.m.

## CONCURRENT SESSIONS

8:30 a.m.–noon

### DISTRIBUTION AUTOMATION/COMMUNICATIONS

Moderator: *Dan Nordell*

Co-Moderators: *Michael Ebert, Jay Morris*

#### **Needed Communications for DA Applications—Panel Session**

*Mark Adamiak, GE Grid Automation; Tom Ernst, GE Grid Solutions; Dan Lysaker, Xcel Energy*

This is a double-session panel discussion reviewing fundamentals of power system protection applied to distribution circuits, the resulting communication requirements for a Field Area Network, and practical applications from the utility world. – Intermediate

#### **Apply a Wireless Line Sensor System to Enhance Distribution Protection Schemes**

*Jakob Fowler, Schweitzer Engineering Laboratories, Inc.*

This paper studies methods of improving distribution feeder protection schemes through the use of wireless fault transmitters, allowing a recloser control to optimize protection decisions in real time. – Intermediate

#### **Implementing Volt/VAR Optimization with DER Penetration**

*Wayne Hartmann, Beckwith Electric Company, Inc.*

This paper explores the impact of DER on distribution Volt/VAR optimization. Included is a novel method of coordinating on-load tapchanger elements to line capacitor banks and active VAR regulating DERs. – Intermediate

### PROJECT MANAGEMENT

Moderator: *Denny Branca*

Co-Moderators: *Michael Marz, Bethlyn Cummings*

#### **Process/Project Management—Xcel Energy MN Solar\*Rewards Community Program**

*Tom Santori, Xcel Energy*

In December 2014 Xcel Energy launched the MN Solar\*Rewards Community program, which has become one of the nation's largest community solar garden programs in the nation. This session will focus on the utility's experience managing a large community solar garden program, while highlighting overall process and portfolio management strategies. – Fundamental

#### **Q-28 Van Loon Wildlife and Black River Transmission Line Project**

*Heather Dell, HDR Engineering; Jim Bertelsen, Dairyland Power Cooperative*

A portion of Dairyland Power Cooperative's existing Q-1 transmission line corridor runs through the Van Loon Wildlife Area and Black River Floodplain wetland complex in Wisconsin. Age and necessity required the existing Q-1 to be rebuilt, instituting the new 161kV Q-28 Project. Specialized design considerations and construction methods were necessary to minimize environmental impacts along the existing alignment. – Fundamental

#### **Great Northern 500 kV Transmission Line: Behind the (Electrical) Design**

*Christian Winter, Minnesota Power*

An overview of Minnesota Power's Great Northern Transmission Line followed by design considerations and challenges of a series capacitor protection system, circuit breaker transient recovery voltage, and transmission line switching overvoltage. Minnesota Power will discuss its approach to these design challenges to facilitate safe live-line working clearances on the new line. – Fundamental



## **Building an SVC Substation on Rock**

*Ken Jauquet, Derek Parker, American Transmission Company*

Building an SVC station on a large outcrop of rock presented challenges that required unique construction techniques. This presentation explains how ATC made the best of a rocky situation. – Fundamental

## **UTILITY INDUSTRY FUTURES**

*Moderator: Mike Steckelberg*

*Co-Moderators: Will Lovelace, Brianna Swenson*

### **The Growing Connectedness of the Electric and Natural Gas Systems**

*Mike Nygaard, Midcontinent Independent System Operator*

The US share of electrical energy from gas-fired power plants increases each year. This growing dependence requires analysis of how generators get gas, and how the industries affect each other. – Intermediate

### **DER Hosting Capacity Analysis**

*Chris Punt, Xcel Energy*

Xcel conducted a Hosting Capacity Analysis for all of its distribution feeders in Minnesota to identify DER feasibility. The presentation will highlight this process and potential impacts that may occur. – Intermediate

### **Energy Storage: Xcel Energy Project Updates and Industry Landscape**

*Beth Chacon, Xcel Energy*

Xcel Energy will provide an overview of two battery demonstration projects that integrate solar energy, provide backup power, manage voltage, and provide other grid services. – Intermediate

### **Enabling Advanced Capabilities for Distributed Energy Resources (DER)—Takeaways from the Interconnection Standard IEEE 1547 Full Revision**

*Patrick Dalton, Xcel Energy*

Advanced DER capabilities of ride-through, interoperability, and new control functions will be available in equipment across the nation upon completion of standards revisions. This presentation will describe how the advanced features will change DER integration. – Intermediate

## **POWER GENERATION**

*Moderator: Scott Hoberg*

*Co-Moderators: Douglas Brown, Kojo Sefah*

### **Operational Flexibility at Coal Creek Station**

*Kyle Leier, Great River Energy*

This presentation discusses the impacts of unit cycling on base-load, coal-fired power plant operations, maintenance, and marketing due to the addition of variable renewal generation on the electric system. – Intermediate

### **Simulating Success at Antelope Valley Station**

*Greg Owen, Basin Electric Power Cooperative; Jason Lee, Cassper Simulation Solutions*

How can Operations stay ahead of employee turnover due to an aging workforce? This paper reviews lessons learned from a recent training simulator project at the Antelope Valley Station. – Fundamental

## **Resource Planning for a Reciprocating Internal Combustion Engine (RICE) Project**

*Jeremy Sutton, Rochester Public Utilities*

This presentation will look at the process to identify resource needs and the ultimate selection of a 46 MW RICE facility. Topics covered will be EPA and economic factors forcing the retirement of a facility, EPC open-book process, MISO interconnection, community involvement, air permitting, and lessons learned. – Fundamental

## **When Engineering and Environmental Departments Meet**

*Jeff Hansen, Basin Electric Power Cooperative*

Engineers often wait too long for environmental reviews of their projects. This presentation describes how early involvement of environmental review can save you time and money, and lead to a more successful final project. – Intermediate

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## **CONCURRENT SESSIONS**

1:00–4:30 p.m.

### **CIVIL-STRUCTURAL**

Moderator: *Bethlyn Cummings*

Co-Moderators: *Dave Peterson, Kojo Sefah*

#### **Great River Energy Transmission Line Tower Repairs**

*Jim McGuire, Kerby Nester, Great River Energy*

Great River Energy has recently experienced several unexpected transmission line tower issues. This session will address rime ice, drone utilization, and damage caused by a tractor on autopilot. – Intermediate

#### **Challenging Transmission Structure Designs: Case Studies**

*Marlon Vogt, Josh Potts, Ulteig*

This presentation will discuss case studies of various structures that had difficult design constraints, associated design and construction challenges, and the resulting solutions. – Intermediate

#### **What Structural Engineers Should Know About Substation Rigid Bus Design**

*Paul Somboonyanon, Burns & McDonnell*

The presentation will provide a structural design aspect of substation rigid bus design utilizing 1) a simplified design approach based on IEEE 605 and 2) a static analysis in finite-element software. Design limitations and design considerations on both approaches will be discussed. – Fundamental

#### **Red Rock Hydroelectric Project—New Hydro at an Existing Flood Control Dam**

*Brent Moeller, Missouri River Energy Services*

A hydroelectric project is currently under construction at the existing Red Rock Dam on the Des Moines River. Construction necessitated large excavations into the upstream and downstream sides of the existing embankment dam while maintaining the integrity of the dam throughout construction. – Fundamental

### **DELIVERY SYSTEMS II**

Moderator: *Will Lovelace*

Co-Moderators: *Douglas Brown, Al Haman*

#### **Delayed-Current Zero Crossing Phenomena During Switching of Shunt-Compensated Lines**

*Paul Nyombi, Xcel Energy, Dave Olson, Xcel Energy (retired); Pratap Mysore, Pratap Consulting Services*

Presentation focuses on the basic concepts of why we get delayed-current zeros during switching of shunt compensated lines and how these can be mitigated. – Fundamental

### **Panel: Implementing GMD Standard TPL-007**

*Michael Marz, American Transmission Company; Justin Michlig, Midcontinent Independent System Operator; Mike Steckelberg, Great River Energy*

TPL-007 establishes system performance requirements during geomagnetic disturbance (GMD) events. This panel will discuss standard development and implementation, including the challenges of gathering the data required to model GMD impacts. – Fundamental

### **Case Study on Aggregate Load Modeling in Transient Stability Studies**

*Bernardo Fernandes, Siemens Power Technologies International*

This paper presents a practical application of detailed load models in stability analyses to better represent important load dynamics. It includes the study methodology, modeling approach, and a parametric analysis. – Intermediate

### **Voltage Changes Caused by Distributed Energy Resources and Their Impact on Hosting Capacities**

*Michael Ropp, Northern Plains Power Technologies*

This presentation will focus on the impacts of distributed energy resources on distribution circuit voltages, identify which impacts are concerns, and discuss present and future mitigation strategies. – Intermediate

## **RELAYING II**

*Moderator: Dave Bisel*

*Co-Moderators: Mike Crane, Greg Owen*

### **Redundant Bus Protection Using High-Impedance Differential Relays**

*Josh LaBlanc, Minnesota Power*

This presentation delves into Minnesota Power's investigation of options to implement dual bus protection systems to improve system redundancy. The presentation examines bus protection in general and application of dual high-impedance bus differential relays in depth. – Intermediate

### **Beyond the Nameplate—Selecting Transformer Compensation Settings for Secure Differential Protection**

*Ariana Hargrave, Schweitzer Engineering Laboratories, Inc.*

This paper presents simple rules for the correct selection of transformer differential relay compensation settings and shows how not following these rules can result in relay misoperations. – Intermediate

### **What's New in C37.113-2015, IEEE Guide for Protective Relay Applications to Transmission Lines**

*Nestor Casilla, Doble Engineering Company*

This paper provides a summary of the changes that were made to IEEE Standard C37.113-1999, IEEE Guide for Protective Relay Applications to Transmission Lines, in its revised version of 2015. – Intermediate

### **Considerations for Implementing a Zone-Selective Interlocking Scheme on Medium and Low Voltage Systems**

*Matt Proctor, GE Grid Solutions; Marcelo Valdes, GE Industrial Solutions,*

Presentation covers different methods to accomplish inter-IED signaling, some common application challenges, and considerations to determine precise timing of devices used in a ZSI scheme. – Intermediate

## METERING

Moderator: *Dan Nordell*

Co-Moderators: *Tom Guttormson, Jay Morris*

### AMI Trials and Testings

*Daniel Nordell, Xcel Energy*

Discussion of Xcel Energy's technical requirements for and testing of Field Area Networking technologies designed to serve converged applications including but not restricted to Distribution Automation, Advanced Metering, Outage Management, and Fault Isolation. – Intermediate

### AMI Performance Requirements and Testing

*Tom Guttormson, Connexus Energy*

This session will include presentation and discussion of establishing performance requirements for an AMI deployment, with field testing to validate delivered performance. Session will include facilitated audience participation. – Intermediate

### Metering Communications Interoperability: Are We There Yet?

*Edward Beraset, Electric Power Research Institute (EPRI)*

Modern AMI meters all have communications capabilities and many manufacturers now claim to adhere to communications standards. This talk will describe the current state of interoperability and demonstrate a new EPRI tool to help diagnose RF mesh networks. – Intermediate

### Local Balancing Authority Metering in MISO: An Engineering Perspective

*Brianna Swenson, Alliant Energy*

This presentation will cover the who, why, where, and how of Local Balancing Authority metering in the MISO territory. Themes include topic overview, engineering examples, and project challenges. – Intermediate

## THURSDAY, NOVEMBER 9, 2017

### CONCURRENT SESSIONS

8:30 a.m.–noon

### TUTORIAL I

Moderator: *Michael Marz*

Co-Moderators: *Will Lovelace, Mike Steckelberg*

#### Transmission System Performance for Geomagnetic Disturbance Events

*Jyothi Chittyreddy, Siemens PTI*

This tutorial will look at the causes and effects of geomagnetic disturbances, provide an overview of the NERC TPL-007 Standard and an understanding of the GMD Vulnerability Assessment and Transformer Thermal Impact Assessment required by the standard, and introduce other types of GMD-related studies. – Intermediate

### TUTORIAL II

Moderator: *Dave Bisel*

Co-Moderators: *Michael Ebert, Greg Owen*

#### Ethernet Fundamentals

*Steel McCreery, Schweitzer Engineering Laboratories, Inc.*

Ethernet has become the de facto LAN technology used within the modern electrical substation to accomplish substation automation. This tutorial's focus is the practical aspects of implementing Ethernet-based substation LANs. – Fundamental

## TUTORIAL III

Moderator: *Brianna Swenson*

Co-Moderators: *Bethlyn Cummings, Steven Mohs*

### Substation Grounding Tutorial

*Joe Gravelle, Eduardo Ramirez-Bettoni, Xcel Energy*

This tutorial will cover substation ground grid design from the initial planning stages to the final design package. The presenters will discuss considerations for dealing with the design variables.  
– Intermediate

## TUTORIAL IV

Moderator: *Larry Brusseau*

Co-Moderators: *Kojo Sefah, Jesse Tomford*

### Transmission Design 201—Advanced Elements

*Duane Phillips, Stanley Consultants, Inc.*

Transmission Design 201 builds on previous tutorials and takes the class to the next level of transmission design. We'll take an in-depth look at electrical studies and their impact on design, as well as understanding the challenging aspects of route selection and material selection and testing. – Intermediate

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# General Information

## ABOUT THE CONFERENCE

This conference provides electric utility engineers and consultants the opportunity to stay abreast of today's power system technology. The conference emphasizes the unique challenges faced by electric utilities in the Midwest and serves as a forum for power engineers to meet with their colleagues from other utilities to discuss mutual concerns.

## LOCATION AND ACCOMMODATIONS

The conference will be held at the Saint Paul RiverCentre, 175 W Kellogg Boulevard, Saint Paul, Minnesota. Parking is available for a fee in the RiverCentre parking ramp, which is located on Kellogg Boulevard across the street from RiverCentre.

A block of rooms has been reserved at the Intercontinental Saint Paul Riverfront, 651-292-1900 and the Holiday Inn Saint Paul Downtown, 651-225-1515.

To receive the special conference rate of \$165 for the Intercontinental Saint Paul Riverfront and \$134 for the Holiday Inn Saint Paul Downtown, identify yourself as a participant of the Minnesota Power Systems Conference. The room block deadline is **October 20, 2017**.

## REGISTRATION AND FEES

The fee for the conference is \$375 if received by October 18; if received after October 18 the fee is \$425. The conference fee includes all sessions, continental breakfasts, luncheons, refreshments breaks, and the exhibitor reception. If you cancel your registration by October 31 a refund, minus \$30, will be issued. If you cancel after this date you will not be eligible for a refund.

## EXHIBITOR RECEPTION

The exhibitor reception will be held on Tuesday, November 7, from 4:30–7:00 p.m. Conference attendees are invited to attend this reception to view the exhibits, meet the exhibitors, and enjoy some hors d'oeuvres and cash bar.

## CONTINUING EDUCATION UNITS (CEUs)

Participants who attend the entire conference will receive 1.5 University of Minnesota, College of Continuing Education CEUs. Participants who attend only Tuesday and Wednesday will receive 1.2 CEUs. One CEU is defined as 10 contact hours of participation in an organized continuing education experience. A CEU certificate will be sent to each participant after the conference. A permanent record of CEUs earned will be maintained by the University of Minnesota Office of Admissions and Record Transcript Unit.

## PROGRAM INFORMATION

612-624-4972    cceconf4@umn.edu

## REGISTRATION INFORMATION

612-625-2900    ccereg@umn.edu

## ADDITIONAL INFORMATION

Visit the conference website – [cce.umn.edu/mnpowersystems](http://cce.umn.edu/mnpowersystems) for additional information on:

- Exhibitor information and registration
- 2018 call for presentations
- Conference papers and PowerPoints

Disability accommodations will be provided upon request. This publication is available in alternative formats upon request.  
Call 612-624-4972.

The University of Minnesota shall provide equal access to and opportunity in its programs, facilities, and employment without regard to race, color, creed, religion, national origin, gender, age, marital status, disability, public assistance status, veteran status, sexual orientation, gender identity, or gender expression.

# 2017 MIPSYCON Planning Committee

**Dave Bisel**

Schweitzer Engineering  
Laboratories

**Denny Branca**

Electro Tech

**Douglas Brown**

Siemens Power Technologies  
International

**Larry Brusseau**

Corn Belt Power Cooperative

**Mike Crane**

Electro Tech

**Bethlyn Cummings**

Ulteig Engineers

**Michael Ebert**

Mortenson

**Kristi Fischer**

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**Tom Guttormson**

Connexus Energy

**Al Haman**

STAR Energy Services

**\*Scott Hoberg**

Minnesota Power

**Will Lovelace**

Minnkota Power Cooperative

**Michael Marz**

American Transmission  
Company

**Steve Mohs**

Burns & McDonnell

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**Greg Owen**

Basin Electric Power  
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Dairyland Power Cooperative

**Kojo Sefah**

IEEE Power and Energy Society  
Twin Cities Chapter Chair

**Philip Spaulding**

Xcel Energy

**Mike Steckelberg**

Great River Energy

**Neil Stiller**

Rochester Public Utilities

**Brianna Swenson**

Alliant Energy

**Jesse Tomford**

Otter Tail Power Company

**Marie Villano**

University of Minnesota

**Helen Weber**

University of Minnesota

**Bruce Wollenberg**

University of Minnesota

\* Planning Committee Chair

# Registration

CF0749 HW  
Please print or type

**53rd Annual Minnesota Power Systems Conference**

**November 7–9, 2017**

Name (Last) (First) (M.I.)

Business Address (Street/P.O. Box) City State ZIP

Email

Company/Institution Title/Position

Daytime Telephone

## Conference Fee

- \$375, Conference Participant Early Fee (received by October 18)
- \$425, Conference Participant Fee (received after October 18)
- \$200, Speaker Fee (if attending entire conference)

## Meal Options

- I am requesting vegetarian lunches.
- I am requesting gluten-free lunches.
- I am requesting vegan lunches.

## Tutorial Options

- I plan to attend the Transmission System Performance for Geomagnetic Disturbance Events.
- I plan to attend the Ethernet Fundamentals.
- I plan to attend the Substation Grounding Tutorial.
- I plan to attend the Transmission Design 201—Advanced Elements.
- I don't plan to attend the Tutorials.

## Method of Payment

- Enclosed is a check or money order payable to the University of Minnesota.
- The fee will be paid by my employer. Enclosed is a purchase order.
- Payment should be charged to my credit card (check one).
  - Visa
  - MasterCard
  - Discover
  - American Express

Credit card number Expiration date

Name as printed on card (please print)

Signature of cardholder

## How to Register

### Register online:

[cce.umn.edu/mnpowersystems](http://cce.umn.edu/mnpowersystems)  
The most secure form of registration.

### Fax to (with credit card information):

612-624-5359  
This fax will be received in a secure location.

### Mail to (with payment information):

CCE Registration  
University of Minnesota  
College of Continuing Education  
352 Ruttan Hall  
1994 Buford Avenue  
Saint Paul, MN 55108

If your check is returned because of insufficient funds or closed account, or because you have made a stop payment request, you will be charged a check handling fee of \$20.

The information on this form is private data, used to identify and locate you, obtain payment, and enable instructors to better know their audience. Name, address, and payment method are mandatory. Information on this form may be shared with instructors and program cosponsors.