

51st Annual **MINNESOTA POWER SYSTEMS CONFERENCE**

November 10–12, 2015

• **We've Moved to a New Location** •

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

Sponsored by:
College of Continuing Education, University of Minnesota

Co-sponsored by:
IEEE, Power and Energy Society, Twin Cities Chapter

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COLLEGE OF CONTINUING EDUCATION

UNIVERSITY OF MINNESOTA

Program At A Glance

TUESDAY, NOVEMBER 10, 2015

7:00 a.m.	Registration and Continental Breakfast			
	General Session			
8:00	Welcome and Opening Remarks			
8:15	Leadership in the Ever-Changing Energy Landscape			
9:00	Construction of the Minnesota Multipurpose Stadium			
9:45	Break			
10:15	Delivering Electric Power to the Bakken			
11:00	Business Ethics: Lessons from an \$8.5 Million Fraud			
Noon	Lunch			
	Substation	Utility Industry Futures I	Delivery Systems I	Relaying I
1:00 p.m.	3-D Coming to a Substation Near You	Performance Analysis of 258 kW AC Solar Demonstration Project	Xcel Energy Field Area Network	Life Lessons from the Power System
1:45	Evaluating Dielectric Condition in SF6 Gas Breakers	Hometown BioEnergy: On Peak Power Generation from Waste	Meeting the Challenges in Regional Transmission Planning and Development	A Practical Guide to Performing Wide-Area Coordination Analysis
2:30	Break			
2:45	Experiences with Mobile Substation Installations	Distributed Generation and Electric Rates	Distribution Grid Resiliency Structure Testing, Results, and Learnings	Transmission Line Automated Relay Coordination Checking

3:30	System Upgrades for Phase Angle Regulating Transformers	Drones Promise Faster, Easier Inspection	Robots for Energized Transmission Line Work	Improving Reliability and Security of System Protection
4:15	Exhibitor Reception (4:15-6:30)			
6:30	Adjourn			
WEDNESDAY, NOVEMBER 11, 2015				
7:30 a.m.	Registration and Continental Breakfast			
	Distribution Automation/ Communications	Project Management	Utility Industry Futures II	Power Generation
8:30	Antenna Systems–The Weak Link in High Data Throughput Wireless Data Communications Systems	Storm Restoration of a 500 kV Line–Challenges & Successes	Lessons Learned in Implementing Battery Systems Controls in Low-Inertia Systems	Traditional and Emerging Emissions Control for Baseload Generation Stations
9:15	Hacking SCADA Networks–Awareness and Prevention	Birch Lake Dam Rebuild	Risk of Unintentional Islanding in the Presence of Multiple Inverters or Mixed Generation Types	Low SCR Wind Generation Instability Identification and Mitigation
10:00	Break			
10:30	What Protection Engineers Need to Know About Networking	Leveraging the Power of GIS Technology for Asset Management–Pole Replacement Tracking Tool	Integrating Solar Energy	Spiritwood Station’s Unique Design Features
11:15	Securing Communications for SCADA and Critical Industrial Systems	Challenges of Urban Construction–Minneapolis-Hiawatha Corridor Project	MISO Dynamic Stability Limited Interface Limit Calculation	Minnesota Power Laskin Energy Center Gas Conversion
Noon	Lunch			

WEDNESDAY, NOVEMBER 11, 2015 (continued)

	Civil-Structural	Delivery Systems II	Relaying II	Metering
1:00	Conductor Dynamics: Practical Information for Design Engineers	Transition from SPS to RAS—What Will Really Change?	Methods for Testing Transformer Differential Relays Applied to Delta-Grounded Wye Transformers Using Single-Phase Test Currents	Advantages of Two-Way AMI/ Demand Response Systems
1:45	Foundation Design and Construction Challenges with Shallow Bedrock	Downtown East Distribution System	Transmission Line Setting Calculations—Beyond the Cookbook	Minnesota Power's Smart Grid Investment Grant Impacts: Past, Present, and Future
2:30	Break			
2:45	Lessons Learned from Failures	Transmission Planning for Physical Security of Critical Electricity Infrastructure	Paralleling CTs for Line Current Differential Applications: Problems and Solutions	Achieving Interoperability in a World of Standards Compliance
3:30	Study of Galloping Mitigation	Meeting Minnesota Energy Efficiency Requirements with Utility Projects	CT Saturation Tolerance for 87L Applications	What To Do with All That 2-Way End-Device Data
4:15	Adjourn			

THURSDAY, NOVEMBER 12, 2015

7:30 a.m.	Registration and Continental Breakfast			
	Tutorial I	Tutorial II	Tutorial II	
8:30	Methods to Reduce Arc-Flash Hazards	Project and Construction Management Techniques	Shunt Capacitor Banks—Specifications, Applications, and Best Practices for Protection and Switching	
10:00	Break			
10:30	Methods to Reduce Arc-Flash Hazards (continued)	Project/Construction Management Techniques (continued)	Shunt Capacitor Banks (continued)	
Noon	Adjourn			

Program Schedule

• New Location •

Saint Paul RiverCentre
175 West Kellogg Boulevard
Saint Paul, Minnesota

TUESDAY, NOVEMBER 10, 2015

GENERAL SESSION

8:00 a.m.–noon

Moderator: Michael Marz

Co-Moderators: Michael Ebert, Larry Brusseau, Al Haman

Welcome and Opening Remarks

Michael Marz, American Transmission Company

Leadership in the Ever-Changing Energy Landscape

Timothy Rogelstad, Otter Tail Power Company

Change in the electrical energy landscape continues to accelerate. Utility leadership is needed to navigate this change, and this presentation will discuss how we lead the way to the future.

Construction of the Minnesota Multipurpose Stadium

Kevin Dalager, M.A. Mortenson; Larry Heinsch, Gephart Electric - Build 23;

Scott Smith, Parsons Electric - Build 23

The construction of the Minnesota Multipurpose Stadium is underway on the eastern edge of downtown Minneapolis. This presentation will provide an overview of the construction, special challenges on site, expectations from stakeholders, and unique electrical installations implemented.

Delivering Electric Power to the Bakken

Matthew Stoltz, Basin Electric Power Cooperative

This presentation will describe how development of the Bakken oil field impacts the area transmission system. Transmission operational optimization and facility additions will be described in detail.

Business Ethics: Lessons from an \$8.5 Million Fraud

Nathan Mueller, Consultant

Mr. Mueller will present the ethical lessons learned professionally and personally from embezzling \$8.5 million and being sentenced to 97 months in federal prison.

CONCURRENT SESSIONS

1:00–4:15 p.m.

SUBSTATION

Moderator: Chuck Healy

Co-Moderators: Steve Mohs, Rick Johnson

3D Coming to a Substation Near You

John Scott, Burns & McDonnell

This presentation will be an in-depth analysis of the benefits and challenges of migrating your existing design processes to a 3D design process. We will demonstrate migration from 2D CAD and Raster Image work flows to 3D and Intelligent 3D.

Evaluating Dielectric Condition in SF6 Gas Breakers

Linda Nowak, Doble Engineering

The object of this presentation is to review test techniques which have been developed for SF6 gas circuit breakers for evaluating their dielectric condition.

Experiences with Mobile Substation Installations

Bill Hansen, Xcel Energy

This presentation will provide an overview of mobile substations and how they are installed, including considerations for sizing, settings, and siting. It will also highlight some lessons learned: what has worked well and not so well.

System Upgrades for Phase Angle Regulating Transformers

Benjamin Fameree, Kenneth Sletten, Minnesota Power

This presentation examines the replacement of all eight motor drives for two-phase angle regulating transformers operating in series, including an upgrade of the equipment controls for remote monitoring and diagnostic analysis. The audience will be provided with an understanding of the planning, implementation, and commissioning of both projects taking place in International Falls, MN.

UTILITY INDUSTRY FUTURES I

Moderator: Mike Steckelberg

Co-Moderators: Larry Brusseau, Philip Spaulding

Performance Analysis of 258 kW AC Solar Demonstration Project

John Aiton, Andy Bergrud, Great River Energy

Detailed performance comparisons of three equipment manufacturers and production data will be presented. Lessons learned regarding design, procurement, and construction will also be discussed.

Hometown BioEnergy: On Peak Power Generation from Waste

Benjamin Simmons, Avant Energy

Hometown BioEnergy generates sustainable energy on peak power from food and agricultural processing wastes. The project supports Minnesota Municipal Power Agency's compliance with MN Renewable Energy Standard. Operational in 2013, the 8 MW distributed generation facility was designed with on-site gas storage, enabling "dispatch flexibility" to maximize revenue generation.

Distributed Generation and Electric Rates

Tom Nigon, STAR Energy Services LLC

Electric cooperatives are reviewing their rates because of the growth in solar distributed generation. Topics covered are strategies to reduce cost shifting including the development of a residential demand rate.

Drones Promise Faster, Easier Inspection

Jon Cavote, United Dynamics Advanced Technologies Corporation

"United Aerobotics" process patented aerial drone inspections provide pathway to high-quality evaluation at reduced costs. Case studies present working proof of inspection performance and accuracy.

DELIVERY SYSTEMS I

Moderator: Al Haman

Co-Moderators: Will Lovelace, Scott Hoberg

Xcel Energy Field Area Network

Kyle Grossmann, Dan Nordell, Xcel Energy

Xcel Energy is demonstrating a Field Area Network (FAN) architecture which is intended to

extend the corporate data network using two additional standards-based and interoperable tiers (WiMAX and Wi-SUN) beyond the substation to support communication to a variety of field devices including Electric Distribution Automation (SCADA), Fault Locators, High-Speed Distribution Switching (Relaying), Gas Transmission and Distribution, Street Lighting, and both Electric and Gas Advanced Meter Infrastructure (AMI). A proof-of-concept project is being fielded in the Denver Metro area which will be a blueprint for future Xcel Energy field communications.

Meeting the Challenges in Regional Transmission Planning and Development

Douglas Brown, Siemens

FERC Order 1000 reformed electric transmission planning and cost allocation requirements for transmission providers. This presentation provides an overview of Order 1000 and looks at examples of developing and evaluating transmission plans to meet regional reliability, economic, and public policy needs.

Distribution Grid Resiliency Structure Testing, Results, and Learnings

David Flaten, Xcel Energy

Xcel Energy and EPRI simulated trees falling on a three-mile, out-of-service 1950s-era line. Results of structure and conductor failures are discussed along with potential mitigation measures.

Robots for Energized Transmission Line Work

Bryan Rushing, Quanta Technology

This presentation will explore past experience with ground-based robots and the current types of robots available in the industry. We will look at the basics of robots suspended from transmission lines and the basics of unmanned aerial vehicles. Additionally, we will explore methods to estimate benefits of energized work and the future of transmission line robotics.

RELAYING I

Moderator: Neil Stiller

Co-Moderators: Dave Bisel, Greg Owen

Life Lessons from the Power System

R. Benjamin Kazimier, Basler Electric Company

Life Lessons from the Power System explores the basic principles of relay protection design and relay protection commissioning, while reflecting upon lessons learned.

A Practical Guide to Performing Wide-Area Coordination Analysis

Bipasha Barman, Power Engineers Inc.

The presentation will cover the analysis methodology and selecting an approach to performing a wide-area coordination study. Topics such as (i) subset boundaries, (ii) calculation spreadsheets, and (iii) looped system and multiterminal line examples will be presented to show the challenges, considerations, and choices the protection engineer may be faced with in this type of study.

Transmission Line Automated Relay Coordination Checking

Garret Sarkinen, Xcel Energy

This presentation is a follow-up to the previous year's presentation which focused on the automation mechanics of evaluating the sensitivity and selectivity of transmission line protective relay settings. Now the focus is on some of the key findings of that automated relay coordination study.

Improving Reliability and Security of System Protection

Steve Turner, Beckwith Electric Company

Citing a NERC report on the dramatic rise in misoperations due to complex programming and testing of numerical protection relays, this paper provides examples of actual misoperations and illustrates results.

EXHIBITOR RECEPTION

4:15–6:30 p.m.

WEDNESDAY, NOVEMBER 11, 2015

CONCURRENT SESSIONS

8:30 a.m.–noon

DISTRIBUTION AUTOMATION/COMMUNICATIONS

Moderator: Jay Morris

Co-Moderators: Tom Guttormson, Dan Nordell

Antenna Systems – The Weak Link in High Data Throughput Wireless Data Communications Systems

Mike Larson, Larson Data Communications, Inc.

A growing number of utilities are experiencing poor radio link performance issues when fielding new generation radio systems, which are operating at ever-increasing over-the-air data throughput rates, made possible by ever-increasingly complex modulation schemes. The issue may be under-performing radio equipment, but often, the issues are the result of less-than-optimal antenna selection and mounting location.

Hacking SCADA Networks – Awareness and Prevention

Matthew Cowell, Phoenix Contact

This presentation will offer discussion on the threats facing industrial controls and SCADA systems with suggestions on how to prevent future incidents (including brief live demonstration).

What Protection Engineers Need to Know About Networking

Mark Adamiak, GE Grid Automation

This presentation explores the network architecture of the modern protection and control systems including protective relays. Lessons learned from real projects will also be presented.

Securing Communications for SCADA and Critical Industrial Systems

Kevin Carson, Schweitzer Engineering Laboratories, Inc.

This presentation details the threats that SCADA and industrial control systems face, how to detect and counter those threats, and how to apply countermeasures, new technologies, and safe practices to these systems.

PROJECT MANAGEMENT

Moderator: Denny Branca

Co-Moderators: Greg Woodworth, Jake Bernhagen

Storm Restoration of a 500 kV Line – Challenges & Successes

William Pim, Xcel Energy

Overview of the development of a dedicated restoration plan for a remote 500 kV transmission line and subsequent successful execution of the plan to rapidly replace a downed tower.

Birch Lake Dam Rebuild

Kyle Maher, Minnesota Power

This project discusses the challenges of rebuilding a dam such as the Birch Lake Dam, a timber crib storage reservoir dam, within the compressed construction season in Northern Minnesota.

Leveraging the Power of GIS Technology for Asset Management – Pole Replacement Tracking Tool

Scott Hafner, Xcel Energy; Dan Haglund, Ulteig, Inc.

This presentation focuses on real-time Web and mobile mapping application for pole replacement tracking. This application is used by designers, project managers, and construction crews from multiple internal and external work groups to manage 3,000 annual pole replacements.

Challenges of Urban Construction – Minneapolis-Hiawatha Corridor Project

Joseph Samuel, Nathan Steward, Xcel Energy

This presentation will highlight challenges Xcel Energy overcame in permitting and constructing two new substations and installing 1.5 miles of double-circuit 115 kV underground transmission line in an urban area of Minneapolis, MN.

UTILITY INDUSTRY FUTURES II

Moderator: Michael Marz

Co-Moderators: Mike Steckelberg, Chuck Healy

Lessons Learned in Implementing Battery Systems Controls in Low-Inertia Systems

Michael Ropp, Dustin Schutz, Northern Plains Power Technologies

This presentation will discuss two case studies in which battery-inverter systems are used in low-inertia power systems, including issues encountered and mitigation strategies. One case study is a whole-feeder microgrid; the other is a diesel-based system with heavy photovoltaic penetration.

Risk of Unintentional Islanding in the Presence of Multiple Inverters or Mixed Generation Types

Chris Mouw, Scott Perlenfein, Northern Plains Power Technologies

Based on extensive experience, two key situations have been identified in which unintentional islanding of distributed energy resources can still occur. This presentation discusses modern anti-islanding, these two cases and potential mitigation strategies, and the use of modeling in solving this problem.

Integrating Solar Energy

Mark Ahlstrom, WindLogics/NextEra Energy

Solar generation is growing rapidly. This presentation discusses the latest solar integration issues and NERC activities on essential reliability services for solar and other renewables.

MISO Dynamic Stability Limited Interface Limit Calculation

Raja Thappetaobula, Midcontinent Independent System Operator (MISO)

MISO has implemented real-time dynamic limit calculation on Stability Limited Interfaces. Limits are being calculated in the near real time using the current system conditions. By taking advantage of the capabilities of the Real-Time Stability Limit Calculation Tool we can reliably maximize system use.

POWER GENERATION

Moderator: Scott Hoberg

Co-Moderators: Dave Bisel, Greg Owen

Traditional and Emerging Emissions Control for Baseload Generation Stations

Greg Owen, Basin Electric Power Cooperative

This presentation provides an overview of present and future emissions control methods utilized at baseload generation stations, including an engineering perspective of associated materials, power consumption, control, and cost.

Low SCR Wind Generation Instability Identification and Mitigation

Will Lovelace, Minnkota Power Cooperative, Inc.; Jerry Martinez, General Electric

Instability may result from high penetration of power electronic-based generation such as wind into a relatively weak system. This presentation describes historical events resulting from a low SCR (Short Circuit Ratio) and some low-cost control changes employed as mitigation.

Spiritwood Station's Unique Design Features

William Gallagher, Great River Energy

North Dakota's newest coal-fired, combined heat- and power-generating station was presented with fuel, ash, steam, and water challenges. This session discusses how those challenges were met.

Minnesota Power Laskin Energy Center Gas Conversion

Jodi Piekarski, Kristopher Spenningsby, Minnesota Power

Minnesota Power has recently converted its Laskin Energy Center from coal to natural gas. This presentation will cover the project from origination through start-up focusing on scope development, design, permitting, and construction.

CONCURRENT SESSIONS

1:00–4:15 p.m.

CIVIL-STRUCTURAL

Moderator: Rick Johnson

Co-Moderators: Chuck Healy, Steve Mohs

Conductor Dynamics: Practical Information for Design Engineers

Paul Springer, Southwire

While vibration theory can be daunting, the practical rules are not. This presentation is designed to help the transmission engineer know whether they need dampers, and if so, what the right questions are to get fair value for the investment in vibration protection.

Foundation Design and Construction Challenges with Shallow Bedrock

Nathaniel Roth, Sargent & Lundy

Foundation design and construction can be extremely challenging with shallow bedrock. This presentation will explore viable foundation types, as well as the potential challenges faced during construction.

Lessons Learned from Failures

Peter Catchpole, Power Engineers, Inc.

By using examples, we will explore the various types of failures and the value of studying them. Additionally, we will discuss how to study and learn from the lessons of failures.

Study of Galloping Mitigation

Jay Quint, Burns & McDonnell

Galloping is large amplitude oscillations which impact the operation of a transmission line. This discussion will review the available devices used to control galloping.

DELIVERY SYSTEMS II

Moderator: Greg Woodworth

Co-Moderators: Dave Peterson, Philip Spaulding

Transition from SPS to RAS – What Will Really Change?

Hari Singh, Xcel Energy

Apparent versus actual changes in NERC's new Remedial Action Scheme (RAS) definition are delineated. Rationales for explicitly excluding certain corrective actions from the RAS "umbrella" are discussed.

Downtown East Distribution System

Andy Dammel, Xcel Energy

Xcel Energy redesigned its distribution system in downtown Minneapolis to provide cost-effective and reliable service to the Vikings Stadium and surrounding developments. This presentation explains how that was accomplished.

Transmission Planning for Physical Security of Critical Electricity Infrastructure

Frank McElvain, Siemens PTI

An effective CIP-014-2 grid criticality study adds key insight to assure reliability. Presentation will provide unique perspectives on reliability coordination, planning, and the military to maximize insights from a CIP-014-2 criticality evaluation.

Meeting Minnesota Energy Efficiency Requirements with Utility Projects

Aaron Vander Vorst, Minnkota Power Cooperative, Inc.

This presentation introduces use of utility-scale projects to meet MN Conservation Improvement Program energy efficiency requirements. It will also cover the introduction to CIP, lessons learned, and creative identification of projects during system planning and design.

RELAYING II

Moderator: Dave Bisel

Co-Moderators: Michael Ebert, Jake Bernhagen

Methods for Testing Transformer Differential Relays Applied to Delta-Grounded Wye Transformers Using Single-Phase Test Currents

Thomas Ernst, GE Digital Energy; Craig Talbot, Minnesota Power

A method is discussed for testing transformer differentials applied to D/GWye transformers using one-phase currents based on three-line and nameplate diagrams. This confirms correct settings by simulating SLG Y-side loading.

Transmission Line Setting Calculations – Beyond the Cookbook

Dan Heidfeld, Schweitzer Engineering Laboratories

This paper looks at various commonly used transmission line protective elements and points out characteristics to look for where deviations from cookbook guidelines are required.

Paralleling CTs for Line Current Differential Applications: Problems and Solutions

Jason Young, Schweitzer Engineering Laboratories

This presentation discusses complications that can arise from paralleling CTs and relay design improvements that add security to these applications. Event reports are shown to illustrate problems and solutions.

CT Saturation Tolerance for 87L Applications

Terrence Smith, GE Digital Energy

This paper explores requirements for the line current differential function (87L) with regard to the tolerance to current transformer (CT) saturation. Typically, requirements provided by manufacturers or standards are to eliminate CT saturation completely by proper sizing of CTs, which is not always practical.

METERING

Moderator: Tom Guttormson

Co-Moderators: Jay Morris, Dan Nordell

Advantages of Two-Way AMI/Demand Response Systems

Danielle Thompson, Eaton Corporation; Brad Lingen, Missouri River Energy Services

This presentation will explain the implementation of the MRES hosted multimunicipal member DR and AMI programs across four states using Eaton's DR/AMI solution.

Minnesota Power's Smart Grid Investment Grant Impacts: Past, Present, and Future

Daniel Gunderson, Tina Koecher, Minnesota Power

This presentation will focus on Minnesota Power's Smart Grid Investment Grant Award, including how the Advanced Metering Infrastructure (AMI) deployment and Distribution Automation investment shaped the vision for a better customer experience. An overview of the project execution, lessons learned, and how those lessons are shaping the future strategic direction for Minnesota Power will be discussed.

Achieving Interoperability in a World of Standards Compliance

Dan Nordell, Xcel Energy

The buzzword of the day for vendors is to declare that their systems are "standards based". What utilities need and want is "interoperability". Standards compliance is a necessary but not sufficient component in achieving interoperability. This talk will examine what is needed to achieve true interoperability and help the audience become more discerning as they discuss this important issue with their vendors.

What to Do with All That 2-Way End-Device Data

Joe Childs, Eaton Corporation

This session reviews the value assessment of utilizing two-way data, and addresses some of the challenges of managing the abundance of data available. Discussion will occur about optimizing the data received through AMI, load management, and volt-var control applications.

THURSDAY, NOVEMBER 12, 2015

CONCURRENT SESSIONS

8:30 a.m.–noon

TUTORIAL I

Moderator: Tom Guttormson

Co-Moderators: Greg Owen, Will Lovelace

Methods to Reduce Arc-Flash Hazards

David Bisel, Mike Merow, Schweitzer Engineering Laboratories

This tutorial discusses protective relaying methods used to reduce arc-flash hazards in switchgear, MCCs, and overhead distribution lines. Methods discussed include maintenance mode activation of instantaneous overcurrent settings, bus differential relaying, and high-speed light detection with optical sensors. Background information on arc flash and the

standards driving calculations will be covered. Application and installation examples are shown, along with an exercise on implementing instantaneous settings for maintenance mode.

TUTORIAL II

Moderator: Larry Brusseau

Co-Moderators: Michael Marz, Greg Woodworth

Project and Construction Management Techniques

Duane Phillips, Stanley Consultants, Inc.

Travel through a typical power delivery project work scope to introduce and develop project and construction processes and skills. Included will be industry best-practice techniques and considerations for specifically developing project and construction plans.

TUTORIAL III

Moderator: Denny Branca

Co-Moderators: Steve Mohs, Chuck Healy

Shunt Capacitor Banks – Specifications, Applications, and Best Practices for Protection and Switching

Pratap Mysore, HDR Inc.

The tutorial provides insight into basics of shunt capacitor bank specifications, applications, and protection. Issues associated with switching transients and use of current limiting reactors with latest industry information are also covered.

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 • New Location •

Due to overwhelming popularity the conference has moved to a **NEW LOCATION WITH A LARGER VENUE**, 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 Crowne Plaza Saint Paul-Riverfront, 651-292-1900 and the Holiday Inn Saint Paul Downtown, 651-225-1515.

To receive the special conference rate of \$155 for the Crowne Plaza Saint Paul-Riverfront and \$125 for the Holiday Inn Saint Paul Downtown, identify yourself as a participant of the Minnesota Power Systems Conference. The room block deadline is October 8, 2015.

REGISTRATION AND FEES

The fee for the conference is \$375 if received by October 26; if received after October 26 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 November 2 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 10, from 4:15–6:30 p.m. Conference attendees are invited to attend this reception to view the exhibits, meet the exhibitors, and enjoy some hors d'oeuvres and a 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

612-624-4754 cceconf2@umn.edu

REGISTRATION INFORMATION

612-625-2900 cceinfo@umn.edu

ADDITIONAL INFORMATION

Visit the conference website – www.cce.umn.edu/mnpowersystems – for additional information on:

- Exhibitor information and registration
- 2016 call for presentations
- Conference papers and PowerPoint presentations

Disability accommodations will be provided upon request. This publication is available in alternative formats upon request. Call 612-624-3492.

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IEEE Power and Energy
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Schweitzer Engineering
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* **Michael Marz**

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Basin Electric Power
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Mike Steckelberg

Great River Energy

Neil Stiller

Rochester Public Utilities

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Siemens Energy

* Planning Committee Chair

Registration

189320 kf

Please print or type

• New Location •

51st Annual Minnesota Power Systems Conference

November 10–12, 2015

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

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

E-mail

Company/Institution Title/Position

Daytime Telephone Home Telephone

Conference Fee

- \$375, Conference Participant Early Fee (received by October 26).
 \$425, Conference Participant Fee (received after October 26).
 \$200, Speaker Fee (if attending entire conference).

Meal Options

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

Tutorial Options

- I plan to attend the "Methods to Reduce Arc-Flash Hazards" Tutorial
 I plan to attend the "Project and Construction Management Techniques" Tutorial
 I plan to attend the "Shunt Capacitor Banks – Specifications, Applications, and Best Practices for Protection and Switching" Tutorial
 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.
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How to Register

Register Online:

www.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 credit card information):

University of Minnesota
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201 Coffey Hall
1420 Eckles Ave
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