

46th Annual **MINNESOTA POWER SYSTEMS CONFERENCE**

November 2-4, 2010

**Earle Brown Heritage Center
6155 Earle Brown Drive
Brooklyn Center, MN 55430**

Sponsored by:
College of Continuing Education, University of Minnesota

Cosponsored by:
IEEE, Power and Energy Society, Twin Cities Chapter

www.cce.umn.edu/mnpowersystems

COLLEGE OF CONTINUING EDUCATION

UNIVERSITY OF MINNESOTA



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. The conference also serves as a forum for power engineers to meet with their colleagues from other utilities to discuss mutual concerns. Concurrent sessions include substations, utility industry futures, distribution automation/communications, power generation, delivery systems, project management, relaying, and two tutorials.

Earn 15 Professional Development Hours for attending this program.

2010 MIPSYCON Planning Committee

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Cannon Technologies--
Cooper Power Systems
Plymouth, Minnesota

Larry Brusseau

MAPPCOR
Roseville, Minnesota

Kristi Fischer

University of Minnesota
St. Paul, Minnesota

Catherine Flannery

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Nathan Germolus

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Ramsey, Minnesota

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Dan Nordell

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Mike Steckelberg

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Dave VanHouse

Minnesota Power
Duluth, Minnesota

Jon Wahlgren

Connexus Energy
Ramsey, Minnesota

Greg Woodworth

Ulteig Engineers, Inc.
Minneapolis, Minnesota

* Planning Committee Chair

Program Schedule

Tuesday, November 2, 2010

GENERAL SESSION

8:15 a.m.-12:00 noon

Moderator: Michael Jensen

Co-Moderators: Mark Gutzmann, Gerry Steffens, Larry Brusseau

7:15	Check-in	10:00	Break
	Continental Breakfast	10:30	Commercial Nuclear Power 101 <i>Hernando Madronero, General Electric</i>
8:15	Welcome <i>Mike Jensen, Xcel Energy and IEEE Power and Energy Society Chair</i>	11:15	Cyber Security Threats -- What You Need to Know <i>Craig Sorum, FBI-Minneapolis Division</i>
8:30	Climate Change Policy: What's Next? <i>Michael Robertson, Michael Robertson & Associates</i>	12:00	Lunch
9:15	Transmission for Wind Generation: What Will We Need to Build? <i>Mike Steckelberg, Great River Energy</i>		

CONCURRENT SESSIONS

1:00 – 4:15 p.m.

SUBSTATION

Moderator: Chuck Healy
Co-Moderators: Steve Mohs, Denny Branca

1:00	Fundamental Principles of Transformer Thermal Loading and Protection <i>Joe Perez, ERLPhase Power Technologies</i>
1:45	Surge Arrester Use to Improve Grid Reliability <i>Steve Brewer, Hubbell Power Systems, Inc.</i>
2:30	Break
2:45	GIS- Benefits and Considerations Over Traditional AIS Solutions <i>Rick Graf, Siemens Energy, Inc.</i>
3:30	Reactor Switching and Reactor Switching Devices <i>Thomas Speas, Southern States, LLC</i>
4:15	Adjourn

UTILITY INDUSTRY FUTURES

Moderator: Dave VanHouse
Co-Moderators: Tom Guttormson, Gerry Steffens

1:00	SmartGridCity™ - Lessons Learned in the Field <i>Randy Huston, Xcel Energy</i>
1:45	BESS Impact on Integration of PV and Wind Onto the AC Grid <i>Pat Hayes, ABB Inc.</i>
2:30	Break
2:45	Congestion Severity Index at American Transmission Co. (ATC) <i>Thomas Dagenais, AMEC Earth & Environmental, Inc.</i>
3:30	Offshore Wind Development in the Great Lakes <i>Michael Murphy, HDR Engineering, Inc.</i>
4:15	Adjourn

CONCURRENT SESSIONS *continued on next page*

CONCURRENT SESSIONS *continued*

1:00 – 4:15 p.m.

PROJECT MANAGEMENT

Moderator: **Jim Hanson**

Co-Moderators: **Michael Jensen, Larry Brusseau**

1:00	Xcel Energy's Buffalo Ridge Incremental Generation Outlet Project (BRIGO) <i>Mike Dunham, Xcel Energy</i>	2:45	University of Minnesota SCADA Implementation - Can It Be Done in a Non-traditional Utility Setting? <i>Mike Grimstad, University of Minnesota</i>
1:45	Eau Claire 16kV Conversion Project Coordination <i>Joe Gravelle and Brad Nelson, Xcel Energy</i>	3:30	500kV TSR Facility Study <i>Bill Barnhart, HDR and Doni Murphy, Natural Resource Group</i>
2:30	Break	4:15	Adjourn

EXHIBITOR RECEPTION

4:15-6:00 p.m.



Wednesday, November 3, 2010

CONCURRENT SESSIONS

8:30 a.m.-12:00 noon

**DISTRIBUTION AUTOMATION/
COMMUNICATIONS**

Moderator: Tom Guttormson

Co-Moderators: Dave Hoops,

Jim Hanson

- 7:30 Continental Breakfast
- 8:30 NERC CIP Standards –
Past, Present, and Future
Ray Sefchik, Midwest Reliability
Organization
- 9:15 Smart Grid Communication
Network Requirements
Byron Flynn, General Electric
- 10:00 Break
- 10:30 The NIST Smart Grid
Interoperability Panel (SGIP)
Process and Results
Dan Nordell, Xcel Energy
- 11:15 New Wireless Alternatives for
Distribution Automation (DA)
and Fixed Wireless AMI
Rick Schmidt, Power Systems
Engineering
- 12:00 Lunch

DELIVERY SYSTEMS I

Moderator: Michael Marz

**Co-Moderators: Dave Peterson,
Dave VanHouse**

- 7:30 Continental Breakfast
- 8:30 D-VAR STATCOM System Helps
Large Canadian Wind Farm Meet
the “Grid Code”
Manisha Ghorai, American
Superconductor Corporation
- 9:15 CU Project: An Introduction to
High Voltage Direct Current
Transmission
Jack Christofersen and *Karl
Mortensen*, GRE-retired
- 10:00 Break
- 10:30 EPRI’s Research on HTLS
Advanced Conductors
John Chan, Electric Power
Research Institute
- 11:15 PEVs and the Electric Grid --
Challenges and Opportunities
Rana Mukerji, New York
Independent System Operator
- 12:00 Lunch

RELAYING I

Moderator: Mark Gutzmann

Co-Moderators: Pat Hayes, Mark Harvey

- 7:30 Continental Breakfast
- 8:30 Smart Grid Substation: Case
Study of the Substation of the
Future
Andrew Beckel and *John Grimm*,
Xcel Energy
- 9:15 Performance Issues with
Directional Comparison Blocking
Schemes
Bogdan Kasztenny, Schweitzer
Engineering Laboratories
- 10:00 Break
- 10:30 Fundamentals of Transformer
Inrush
Suhag Patel, GE Digital Energy -
Multilin
- 11:15 NERC Standards for Generator-
Transmission System
Coordination
Charles Mozina, Beckwith
Electric
- 12:00 Lunch

Wednesday, November 3, 2010

CONCURRENT SESSIONS

1:00-4:15 p.m.

POWER GENERATION

Moderator: Jeff Schoenecker

**Co-Moderators: Steven Mohs,
Michael Marz**

- 1:00 Wind Energy and the Power System: Wind Power Myths Debunked
Matthew Schuerger, Energy Systems Consulting Services, LLC
- 1:45 University of Minnesota Research Facility on Wind Turbines
Ned Mohan, University of Minnesota
- 2:30 Break
- 2:45 Implementing PV Renewable Energy Technology and A Case Study of Minnesota's Largest PV Solar System
Mario Monesterio, Westwood Renewables LLC
- 3:30 Lessons Learned from Generation Event Reports
Rogério Scharlach, Schweitzer Engineering Laboratories
- 4:15 Adjourn

DELIVERY SYSTEMS II

Moderator: Mike Steckelberg

**Co-Moderators: Philip Spaulding,
Chuck Healy**

- 1:00 Distribution Generation Interconnection Panel Session
Al Haman, STAR Energy Services, *Craig Turner*, Dakota Electric, *Shawn Bagley*, Xcel Energy and *Mike Steckelberg*, Great River Energy
- 1:45 State Estimator Software Application with Minimal Real-Time Measurements and Use for Training Exercises.
Bob Endahl and *Gabe Kainz*, Otter Tail Power Company
- 2:30 Break
- 2:45 GIS – Substation and Transmission Lifecycle Management with Smallworld, ESRI, and ProjectWise
Craig Tobias, Xcel Energy
- 3:30 Measurement, Calculation, and Prediction of T&D Losses: Technical / Economic Methods and Ramifications
Richard Gonzalez, Excel Engineering, Inc.
- 4:15 Adjourn

RELAYING II

Moderator: Nathan Germolus

Co-Moderators: Jon Wahlgren, Mark Gutzmann

- 1:00 Protecting Transmission Lines Terminated Into Transformers
Roger Hedding, ABB, Inc.
- 1:45 Highlights of the IEEE C37.234 Guide for Protective Relay Application to Power System Buses
Working Group K14 of the IEEE PES Power System Relaying Committee (Pratap Mysore, Xcel Energy)
- 2:30 Break
- 2:45 Broken Rotor Bar Detection . . . Past, Present, and Future
Dan Swigost, Basin Electric Power Cooperative
- 3:30 Fault Locator Based Line Current Differential Relay Synchronized Measurements
Ilija Voloh, GE Digital Energy - Multilin
- 4:15 Adjourn

Thursday, November 4, 2010

CONCURRENT SESSIONS

8:30 a.m.-12:00 noon

TUTORIAL I

Moderator: Al Haman

**Co-Moderators: Jon Wahlgren,
Nathan Germolus**

- 7:30 Continental Breakfast
8:30 Relaying 102
Tom Ernst, Minnesota Power
10:00 Break
10:30 Relaying 102 (continued)
12:00 Adjourn

TUTORIAL II

Moderator: Tom Guttormson

**Co-Moderators: Mike Steckelberg,
Larry Brusseau**

- 7:30 Continental Breakfast
8:30 Distribution Planning for the
"Smart" Utility
*David Farmer, UC Synergetic,
Inc.*
10:00 Break
10:30 Distribution Planning for the
"Smart" Utility (continued)
12:00 Adjourn

Topic Descriptions

GENERAL SESSION

Climate Change Policy: What's Next?

Michael Robertson, Michael Robertson & Associates

An assessment of the current state, regional, and federal prospects for legislation on climate change.

Transmission for Wind Generation: What Will We Need to Build?

Mike Steckelberg, Great River Energy

Several entities are conducting electrical transmission planning studies to determine a design for a high-voltage electric network to provide for wind power transfers. This presentation will provide an update of the current studies including the estimated costs for the proposed networks.

Commercial Nuclear Power 101

Hernando Madronero, General Electric

Nuclear energy plays a major role in meeting the world's energy needs. At the end of 2005, there were 443 nuclear power plants operating in 32 countries. These plants account for 17 percent of the world's electricity. The industry remains dynamic, as evidenced by the fact that several new plants enter commercial operation every year and there are, typically, 30 or more in various stages of construction at any given time.

Cyber Security Threats -- What You Need to Know

Craig Sorum, FBI-Minneapolis Division

FBI SSA Craig Sorum, head of the Minnesota Cyber Crime Task Force (MCCTF), a jointly sponsored task force by the FBI and U.S. Secret Service, will present "Cyber Security Threats – What You Need to Know." Topics will include an overview and mission of the MCCTF and threats and current trends to include computer intrusions, malicious codes, social engineering, identity theft, and internet threats against children.

SUBSTATION

Fundamental Principles of Transformer Thermal Loading and Protection

Joe Perez, ERLPhase Power Technologies

The IEEE Guide C57.91-1995 allows users to calculate dynamics ratings for power transformers, which are used in planning/operations cases to alleviate load constraints and to set new microprocessor thermal relays.

Surge Arrester Use to Improve Grid Reliability

Steve Brewer, Hubbell Power Systems, Inc.

We will first tackle the replacement of existing Silicon Carbide arresters on the system. Second, we will cover the use of line arresters to eliminate lightning caused breaker operations.

GIS -- Benefits and Considerations Over Traditional AIS Solutions

Rick Graf, Siemens Energy, Inc.

A brief overview of GIS technology and how it might be beneficial for consideration in today's substation design. Examples will be shown that describe the characteristics of GIS versus AIS technology. When should one consider the use of GIS for their new or upgraded substation?

Reactor Switching and Reactor Switching Devices

Thomas Speas, Southern States, LLC

Switching reactive loads produces voltage transients, chops currents, and stresses equipment. The switching device used for shunt reactors can significantly impact on these factors. This paper presents an overview of reactor switching options showing the benefits of using the different types of switching devices available on the market today.

UTILITY INDUSTRY FUTURES

SmartGridCity™ - Lessons Learned in the Field

Randy Huston, Xcel Energy

SmartGridCity™ provides an opportunity to better understand how smart technologies will impact the electric utility industry, our states, our nation, and most importantly, our customers. While still a work in progress, important lessons are becoming evident and this presentation discusses some of those related to operations through the use of actual examples.

BESS Impact on Integration of PV and Wind Onto the AC Grid

Pat Hayes, ABB, Inc

This paper will discuss the electrical, thermal, and environmental effects of PV and Wind on an AC grid system. It will address the areas where the renewable solutions are heavily saturated and how the grid code's low voltage ride through criteria are used or not used. It also will discuss the sizing of BESS systems, batteries, inverters, and transformers to minimize the power fluctuations and improve the grid performance.

Congestion Severity Index at American Transmission Co. (ATC)

Thomas Dagenais, AMEC Earth & Environmental, Inc.

ATC uses a Congestion Severity Index, combines the financial impact of constraints with the frequency of constraints, for use as a screening indicator to determine areas of the system where potential upgrades may be cost-effective.

Offshore Wind Development in the Great Lakes

Michael Murphy, HDR Engineering, Inc.

Mr. Murphy will present an overview of the status of offshore wind development on the Great Lakes. The challenges and issues that are associated with offshore wind development for siting, permitting, and construction of such projects will be discussed.

PROJECT MANAGEMENT

Xcel Energy's Buffalo Ridge Incremental Generation Outlet Project (BRIGO)

Mike Dunham, Xcel Energy

This presentation will be about Xcel Energy's \$64 million Buffalo Ridge Incremental Generation Outlet (BRIGO) project from the project management perspective. Content will cover project management activities, stakeholders, challenges, and lessons learned.

Eau Claire 16kV Conversion Project Coordination

Joe Gravelle and Brad Nelson, Xcel Energy

The presentation will provide an overview of Xcel Energy's project management as implemented on the Eau Claire – Chippewa Falls, Wisconsin 69kV to 161kV conversion, a multiyear (2009-2011) \$33-million series of projects. An emphasis will be placed on the coordination efforts used to plan and schedule the project's transmission system outages years in advance, with respect to construction staging and system operational requirements.

University of Minnesota SCADA Implementation - Can It Be Done in a Non-traditional Utility Setting?

Mike Grimstad, University of Minnesota

The what, why, and how of trying to integrate a new SCADA system into the University of Minnesota primary distribution system and what the future may bring.

500kV TSR Facility Study

Bill Barnhart, HDR and Doni Murphy, Natural Resource Group

We will present the development of a multi-utility, regional system, 500kV transmission line and network interconnection facility study. The project consisted of preparing a Midwest ISO (MISO) facility study for a proposed 1100 MW, 500kV transmission line from Canada to southwest Minnesota.

DISTRIBUTION AUTOMATION/ COMMUNICATIONS

NERC CIP Standards – Past, Present, and Future

Ray Sefchik, Midwest Reliability Organization

A chronological review of the evolution of the NERC Critical Infrastructure Protection Reliability Standards.

Smart Grid Communication Network Requirements

Byron Flynn, General Electric

This paper will present several Smart Grid use cases and review the minimum and typical communications bandwidth and latency performance requirements at various points along the system driven by the data and applications in case.

The NIST Smart Grid Interoperability Panel (SGIP) Process and Results

Dan Nordell, Xcel Energy EMC

The Energy Policy Act of 2007 charged the National Institute of Standards and Technology (NIST) with the task of coordinating standards development for the Smart Grid. This presentation provides a roadmap to the resulting process and anticipated results.

New Wireless Alternatives for Distribution Automation (DA) and Fixed Wireless AMI

Rick Schmidt, Power Systems Engineering

This presentation will provide an overview of the existing and emerging communications media alternatives for Distribution Automation (DA) and Fixed Wireless AMI backhaul. Technologies discussed will include: 900 ISM Spread Spectrum, 900 ISM WiMax, 3.65 GHz WiMax, licensed 700 MHz and 220 MHz, and new software-defined radio licensed WiMax technology. Mr. Schmidt will provide an overview of the common communications requirements for both DA and AMI, insights into the vendor solutions, and advice on how to properly size the bandwidth for an extensive multi-application utility automation infrastructure.

DELIVERY SYSTEMS I

D-VAR STATCOM System Helps Large Canadian Wind Farm Meet the “Grid Code”

Manisha Ghorai, American Superconductor Corporation

How a hybrid dynamic reactive compensation system is configured to assist wind farms in meeting AESO’s wind interconnection requirements including power factor, voltage control, and LVRT requirements.

CU Project: An Introduction to High Voltage Direct Current Transmission

Jack Christofersen and Karl Mortensen, GRE-retired

The North Dakota – Minnesota, Cooperative Power Association and United Power Association (CU) Project will be described to provide an introduction to High Voltage Direct Current Transmission (HVDC). The intent is to supplement the University of Minnesota’s leadership in the National Science Foundation Program to Reform the Electrical Energy Systems Curriculum.

EPRI’s Research on HTLS Advanced Conductors

John Chan, Electric Power Research Institute

A number of advanced conductors using a composite core have been developed in recent years to increase the transfer capacity of transmission lines. EPRI is conducting numerous tests to evaluate and predict the performance of these conductors.

PEVs and the Electric Grid -- Challenges and Opportunities

Rana Mukerji, New York Independent System Operator

This paper describes the impact of increasing levels of plug-in electric vehicles on the nation’s electricity grid. It outlines the effect of different charging schemes on the electric system loadings and suggests several mechanisms to integrate increasing volumes of plug-in electric vehicles. The tie-in with renewable resources is also explored.

RELAYING I

Smart Grid Substation: Case Study of the Substation of the Future

Andrew Beckel and John Grimm, Xcel Energy

This presentation will describe the recent efforts at the Xcel Energy Merriam Park Substation to implement a complete control system using the IEC61850 automation standard. It also will describe the efforts to integrate various substation monitoring systems such as battery monitors, transformer oil monitors, and cameras.

Performance Issues with Directional Comparison Blocking Schemes

Bogdan Kasztenny, Schweitzer Engineering Laboratories

This presentation reviews a number of field cases of DCB scheme misoperations. A case is made for switching from blocking to permissive schemes when digital relays and channels are used.

Fundamentals of Transformer Inrush

Suhag Patel, GE Digital Energy - Multilin

This paper will present an overview of the transformer inrush phenomenon and its impact on differential relays. Prevention of misoperation on transformer and generator differential relays will also be discussed.

NERC Standards for Generator-Transmission System Coordination

Charles Mozina, Beckwith Electric

The paper outlines current NERC standards that address coordination of generator and transmission line protection. It discusses setting guidelines for generator protective elements, which misoperated during the 2003 blackout.

POWER GENERATION

Wind Energy and the Power System: Wind Power Myths Debunked

Matthew Schuerger, Energy Systems Consulting Services, LLC

The presentation will address a number of popular misconceptions about wind power and power systems, including output variability, capacity value, backup capacity, and energy storage.

University of Minnesota Research Facility on Wind Turbines

Ned Mohan, University of Minnesota

This presentation will describe the cutting-edge research planned at the University of Minnesota, through a funding of nearly \$8 million from the Department of Energy (DOE). As a part of this project, a utility-scale wind turbine will be installed at the University of Minnesota's UMore Park property that will allow faculty from various disciplines to work towards the DOE's nationwide goal of achieving 20 percent wind power by 2030.

Implementing PV Renewable Energy Technology and A Case Study of Minnesota's Largest PV Solar System

Mario Monesterio, Westwood Renewables LLC

Minnesota's solar resource potential is not very well understood and much less the process and challenges for implementation. This presentation will provide an overview of general requirements and processes associated with the financial and construction aspects to complete a successful project. Included are discussions on preliminary analysis, finance, design and permitting, installation, O&M and monitoring. The presentation will be rounded off with a case-study of the largest PV tracking system in the midwest.

Lessons Learned from Generation Event Reports

Rogério Scharlach, Schweitzer Engineering Laboratories

This paper analyzes real-world event report data in the interest of uncovering valuable lessons for setting and commissioning generator relays.

DELIVERY SYSTEMS II

Distribution Generation Interconnection Panel Session

Al Haman, STAR Energy Services, Craig Turner, Dakota Electric, Shawn Bagley, Xcel Energy and Mike Steckelberg, Great River Energy

This panel session will present the various aspects of connecting generation to distribution system circuits, both business practices and technical issues. The panelists will describe their practical experiences associated with these interconnections.

State Estimator Software Application with Minimal Real-Time Measurements and Use for Training Exercises

Bob Endahl and Gabe Kainz, Otter Tail Power Company

The large amount of unmeasured system presented a specific challenge for state estimation. Through vendor cooperation, OTP was able to acquire a tool that greatly aids operator visibility and training.

GIS – Substation and Transmission Lifecycle Management with Smallworld, ESRI, and ProjectWise

Craig Tobias, Xcel Energy

This will be an overview of spatial data management and document management related to the entire lifecycle of a facility from its conception through design to maintenance.

Measurement, Calculation, and Prediction of T&D Losses: Technical / Economic Methods and Ramifications

Richard Gonzalez, Excel Engineering, Inc.

This paper describes the considerations involved, and the methods which are applicable to performing economic evaluations of T & D system losses. Recent changes in electric energy market structure are addressed with respect to how these affect the correct valuation of capacity and energy components of the loss evaluation.

RELAYING II

Protecting Transmission Lines Terminated Into Transformers

Roger Hedding, ABB, Inc.

Transmission lines that are terminated into transformers are applications where the line and transformer cannot be separated by a circuit breaker and are therefore in the same zone of protection. These applications may be addressed with either current differential or line distance protection. In either case the implementation of separate transformer differential protection isolating the protection zone is recommended. The line protection application needs to consider the instrument transformer locations and transformer winding connections at the transformer end. This paper will discuss the application considerations for both line differential and distance schemes for lines terminated into transformers and provide setting examples.

Highlights of the IEEE C37.234 Guide for Protective Relay Application to Power System Buses

*Working Group K14 of the IEEE PES Power System Relaying Committee
Pratap Mysore, Xcel Energy*

The presentation highlights bus protection concepts discussed in the IEEE guide, C37.234-2009. Selection and application of protection schemes influenced by the availability and location of breakers, current transformers, and disconnect as well as bus switching scenarios also will be presented.

Broken Rotor Bar Detection . . . Past, Present, and Future

Dan Swigost, Basin Electric Power Cooperative

A microprocessor relay has been used for the last decade to find or confirm broken rotor bars in squirrel cage induction motors. A look at how it has been used and what additional relay enhancements would make broken rotor bar detection effective.

Fault Locator Based Line Current Differential Relay Synchronized Measurements

Iliia Voloh, GE Digital Energy - Multilin

This paper presents a new patent pending multi-ended fault locator, integrated within line current differential relays protection relays and working in real time. It takes advantage of synchronized measurements transmitted between line terminals and is achieving great accuracy at no additional cost.

TUTORIAL I

Relaying 102

Tom Ernst, Minnesota Power

This tutorial series is aimed at the engineer who is new to protective relaying or is looking for a refresher. It will be interactive with the audience and will cover the application principles of protective relaying including communication systems, advanced line protection methods, shunt capacitor bank protection and rotating machine protection. Real-life examples will be provided.

TUTORIAL II

Distribution Planning for the "Smart" Utility

David Farmer, UC Synergetic, Inc.

As smart grid technologies evolve from the substation to the end user, the amount of information available will increase exponentially presenting distribution engineers with unique challenges previously unseen in the industry. Integrating distributed generation and renewable energy sources will present planners with new technical challenges, as well. This presentation will review essential distribution planning concepts with a focus on new techniques and mindsets that will be necessary as these technologies penetrate the system.

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. The conference also serves as a forum for power engineers to meet with their colleagues from other utilities to discuss mutual concerns. Concurrent sessions include substations, utility industry futures, distribution automation/communications, power generation, delivery systems, project management, relaying, and two tutorials.

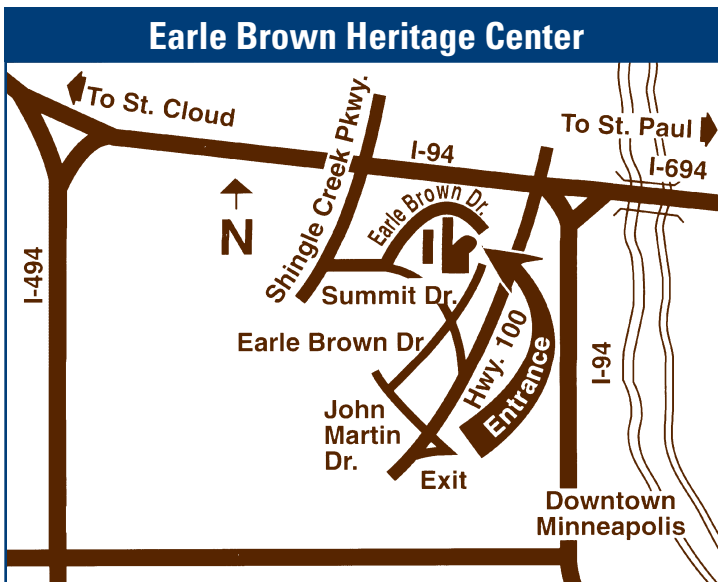
LOCATION AND ACCOMMODATIONS

The conference will be held at the **Earle Brown Heritage Center, 6155 Earle Brown Drive, Brooklyn Center, Minnesota**. For directions, please visit their Web site – www.earlebrown.com. The Earle Brown Heritage Center is located near the intersection of I-94/694 and Shingle Creek Parkway (just north of Brookdale Shopping Center). There is ample free parking surrounding the facility. Please see map for details.

Convenient lodging for out-of-town participants is available at the Embassy Suites Minneapolis – Brooklyn Center Hotel, 6300 Earle Brown Drive, Brooklyn Center, MN 55430. The rate is \$109, plus tax, for a 1 King Suite or 2 Queen Suite. Participants are responsible for making their own lodging reservations. To make a reservation, call 763-560-2700 or 1-800-362-2779. To receive the special conference rate, please identify yourself as a participant of the Minnesota Power Systems Conference. Reservations must be made by October 8, 2010. After this date reservations will be accepted on a space and rate available basis. The hotel is next to the Earle Brown Heritage Center and parking is free.

REGISTRATION AND FEES

The fee for the conference is \$275 if received by October 18; if received after October 18, the fee is \$325. The conference fee includes all sessions, two luncheons, refreshments breaks, the exhibitor reception, and the conference proceedings CD. You are encouraged to register early to take advantage of the lower fee. If you cancel your registration by October 25 a refund, minus \$30, will be issued. If you cancel after this date you will not be eligible for a refund. A full refund will be issued if the conference is cancelled by the University of Minnesota.



EXHIBITOR RECEPTION

The exhibitor reception will be held on Tuesday, November 2, from 4:15-6:00 p.m. at the Earle Brown Heritage Center (the same location as the conference sessions). Exhibitors will display brochures and small equipment. All conference attendees are invited to attend this reception to view the exhibits, meet the exhibitors, and enjoy some hors d'oeuvres and beverages.

CONTINUING EDUCATION UNITS (CEUs)

Participants who attend the entire conference will receive 1.5 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 under responsible sponsorship, capable direction, and qualified instruction. 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's Transcript Unit.

FOR PROGRAM INFORMATION

Emily Strong
College of Continuing Education
University of Minnesota
Phone: 612-624-3492
Fax: 612-624-6225
E-mail: cceconf4@umn.edu

FOR REGISTRATION INFORMATION

612-625-2900
cceinfo@umn.edu

CALL FOR PAPERS FOR 2011 CONFERENCE

Deadline for abstract submission for MIPSYCON 2011 is January 14, 2011. Notification of acceptance will be mailed by June 2011. If you would like to be considered for the 2011 program, please submit an abstract of approximately 300 words online at www.cce.umn.edu/mn-powersystems.

EXHIBITOR INFORMATION AND REGISTRATION

If you are interested in having a display at the exhibitor reception on November 2, 2010, and you would like more information and registration materials go to www.cce.umn.edu/mnpowersystems lefthand link, Exhibitor Information.

Disability accommodations will be provided upon request. This publication is available in alternative formats upon request. Call 612-624-3708.

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.

Registration

46th Annual Minnesota Power Systems Conference

ENGR 0316
184327 kf

November 2-4, 2010

Please print or type

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

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

E-mail Fax

Company/Institution Title/Position

Daytime Telephone Home Telephone

I do not want to be listed on the participant list.

Conference Fee

- Enclosed is \$275 in full payment of the conference registration fee (received by October 18).
- Enclosed is \$325 in full payment of the conference registration fee (received after October 18).

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).
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Register Online:

www.cce.umn.edu/mnpowersystems
The most secure form of registration

Mail to (with credit card information):

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St. Paul, MN 55108-6069

Fax to (with credit card information):

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