

45th Annual MINNESOTA POWER SYSTEMS CONFERENCE

November 3-5, 2009

*** NEW LOCATION ***

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

Sponsored by:
College of Continuing Education, University of Minnesota

Cosponsored by:
IEEE, Twin Cities Section

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, delivery systems, project management, and relaying.

Earn 15 Professional Development Hours for attending this program.

2009 MIPSYCON Planning Committee

Denny Branca

Cannon Technologies--
Cooper Power Systems
Plymouth, Minnesota

Larry Brusseau

MAPPCOR
Roseville, Minnesota

Kristi Fischer

University of Minnesota
St. Paul, Minnesota

Catherine Flannery

University of Minnesota
St. Paul, Minnesota

Nathan Germolus

Sebesta Blomberg
Fargo, North Dakota

Tom Guttormson

Connexus Energy
Ramsey, Minnesota

Mark Gutzmann

Xcel Energy
Minneapolis, Minnesota

Al Haman

STAR Energy Services
Alexandria, Minnesota

Jim Hanson

Consulting Engineers Group
Farmington, Minnesota

Mark Harvey

ABB Inc.
Anoka, Minnesota

Pat Hayes

ABB Inc.
Brooklyn Park, Minnesota

Chuck Healy

Electro Tech
Minneapolis, Minnesota

David Hoops

GE Energy
Huron, South Dakota

Paul Imbertson

University of Minnesota
Minneapolis, Minnesota

Michael Jensen

Xcel Energy
Minneapolis, Minnesota

Michael Marz

American Transmission
Company
Waukesha, Wisconsin

Steve Mohs

Ulteig Engineers, Inc.
Minneapolis, Minnesota

Dan Nordell

Xcel Energy
Minneapolis, Minnesota

Dave Peterson

Dairyland Power Co-op
LaCrosse, Wisconsin

Roger Simundson

Minnkota Power
Grand Forks, North Dakota

Philip Spaulding

Xcel Energy
Maple Grove, Minnesota

*** Mike Steckelberg**

Great River Energy
Maple Grove, Minnesota

Gerry Steffens

Rochester Public Utilities
Rochester, Minnesota

Jeff Schoenecker

Dakota Electric
Association
Farmington, Minnesota

Dave VanHouse

Minnesota Power
Duluth, Minnesota

Jon Wahlgren

Otter Tail Power Company
Fergus Falls, Minnesota

* Planning Committee Chair

Program Schedule

Tuesday, November 3, 2009

GENERAL SESSION

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

Moderator: Mike Steckelberg

Co-Moderators: Jeff Schoenecker, Michael Jensen, Roger Simundson

7:15	Check-in Continental Breakfast	10:00	Break
8:15	Welcome <i>Mike Steckelberg</i> , Great River Energy	10:30	Smart Grids and Micro Grids - What Are They Really? <i>Bruce Mork</i> and <i>Wayne Weaver</i> , Michigan Technological University
8:30	Regulatory Perspective on Regional Transmission Expansion <i>David Boyd</i> , Minnesota Public Utilities Commission	11:15	Energy: Bridging Developing Nations and Inner-City Youth <i>Paul Imbertson</i> , University of Minnesota
9:15	Advanced Technology Enabling a Smarter Grid <i>Larry Sollecito</i> , GE Digital Energy	12:00	Lunch

CONCURRENT SESSIONS

1:00 – 4:15 p.m.

SUBSTATION

Moderator: Chuck Healy

Co-Moderators: Steve Mohs, Al Haman

1:00	Capacitor Switching and Capacitor Switching Devices <i>Tom Speas</i> , Southern States, LLC
1:45	Effect of Current Limiting Reactors on Capacitor Breaker Switching Capability <i>Pratap Mysore</i> , Xcel Energy and <i>Himanshu Bahirat</i> , Michigan Technological University
2:30	Break
2:45	Transformer Winding Design: Discussion of the Design and Performance of Circular Disk and Helical Construction Versus Layered Windings for Power Transformer Applications <i>David Harris</i> , Waukesha Electric Systems
3:30	Green Transformation: Technology Advances and Applications for Natural Ester Fluids <i>David Bingenheimer</i> , Cooper Power Systems
4:15	Adjourn

UTILITY INDUSTRY FUTURES

Moderator: Michael Jensen

Co-Moderators: Dave VanHouse, Gerry Steffens

1:00	Wind Energy Costs – Past, Present, and Future <i>Jeffrey Anthony</i> , American Wind Energy Association
1:45	Nuclear Plant Fuel Handling <i>Mario Coviello</i> , Westinghouse Electric
2:30	Break
2:45	Energy Sense 2009 <i>Thomas Butz</i> , Power System Engineering
3:30	Modular Energy Storage Systems for Power System Application <i>Ned Mohan</i> , University of Minnesota
4:15	Adjourn

EXHIBITOR RECEPTION

4:15-6:00 p.m.

Wednesday, November 4, 2009

CONCURRENT SESSIONS

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

**DISTRIBUTION AUTOMATION/
COMMUNICATIONS**

Moderator: Dan Nordell

**Co-Moderators: Roger Simundson,
Jeff Schoenecker**

- 7:30 Continental Breakfast
- 8:30 Enterprise – Wide IP Network for Automation
Jim Goodin and Kathy Nelson, Great River Energy
- 9:15 Communications for the Smart Grid
Mark Adamiak, GE Digital Energy - Multilin
- 10:00 Break
- 10:30 Wired and Wireless Communications Strategies for Supporting Smart Distribution Grid
David Mayne, Digi International
- 11:15 How to Evaluate and Deploy the Latest Advancements in Communication Networks
Dan Paladino, FreeWave Technologies
- 12:00 Lunch

DELIVERY SYSTEMS I

Moderator: Dave VanHouse

**Co-Moderators: Dave Peterson,
Tom Guttormson**

- 7:30 Continental Breakfast
- 8:30 Bison on the Wires –Utilizing the Square Butte HVDC Line for Wind Energy Delivery
Frank Frederickson and George Sweezy, Minnesota Power
- 9:15 Integrating Renewable Energy in the Midwest: ITC's Green Power Express 765 kV Network
David Grover, ITC
- 10:00 Break
- 10:30 Experiences with Voltage Drop During Large Transformer Energization: Arrowhead Phase Shifting Transformer and Beyond
Michael Marz, American Transmission Company
- 11:15 Severe Space Weather Events – Understanding Societal and Economic Impacts and Preparing U.S. Power Grids for the Extreme Space Weather/Geomagnetic Superstorm Events
John Kappenman, Storm Analysis Consultants
- 12:00 Lunch

Wednesday, November 4, 2009

CONCURRENT SESSIONS

1:00-4:15 p.m.

DELIVERY SYSTEMS II

Moderator: Al Haman

**Co-Moderators: Michael Marz,
Philip Spaulding**

- 1:00 Wind Plants: An Overview
Ronald Brzezinski, GE Energy
- 1:45 South Minneapolis, Planning for
a Mature Community as the City
Evolves
Scott Zima, Xcel Energy
- 2:30 Break
- 2:45 Contamination and Condition
Wireless Monitoring of
Insulators and Arresters
Arnie Vitols, ABB Inc.
- 3:30 Secondary Network Distribution
Systems Background, Planning,
and Operation
James Nash, Xcel Energy
- 4:15 Adjourn

RELAYING

Moderator: Mark Gutzmann

**Co-Moderators: David Hoops,
Mark Harvey**

- 1:00 Line Current Differential Relay
Operation Under Severe Current
Transformer Saturation
Roger Hedding, ABB Inc.
- 1:45 Considerations for Transmission
Reclosing Practices in the MRO
Area
Len Yee, SaskPower
- 2:30 Break
- 2:45 Then Versus Now: A Comparison
of Total Scheme Complexity
*Roy Moxley, Schweitzer
Engineering Laboratories, Inc.*
- 3:30 Isolation of Angular Instability
Using Power Swing Relays
*Nick Giffin, American
Transmission Company*
- 4:15 Adjourn

PROJECT MANAGEMENT

Moderator: Denny Branca

**Co-Moderators: Pat Hayes,
Larry Brusseau**

- 1:00 Project Management Approach
to a Multi-Year, Multi-Owner,
Major Transmission Project
*Gerald Chezik and Brian
Westerhaus, Xcel Energy, Inc.*
- 1:45 Successfully Engaging the
Public on Need for Transmission
Projects
Tim Carlsgaard, Xcel Energy
- 2:30 Break
- 2:45 Substation Construction Project
Resourcing
*Lloyd Willenbring and Dave
Johnson, Xcel Energy*
- 3:30 Wind Industry Future from a
Turbine Blade Manufacture's
Perspective
Bill Burga, LM Glasfiber
- 4:15 Adjourn

Thursday, November 5, 2009

CONCURRENT SESSIONS

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

**TUTORIAL I
MOTORS 101**

Moderator: Jim Hanson

**Co-Moderators: Mike Steckelberg,
Michael Marz**

- 7:30 Continental Breakfast
- 8:30 Motors 101
Paul Imbertson, University of Minnesota
- 10:00 Break
- 10:30 Motors 101 (continued)
- 12:00 Adjourn

**TUTORIAL II
COMMUNICATIONS 101**

Moderator: Nathan Germolus

**Co-Moderators: David Hoops,
Jon Wahlgren**

- 7:30 Continental Breakfast
- 8:30 Communications 101
*Dan Nordell, Xcel Energy and
Mark Adamiak, GE Digital Energy
– Multilin*
- 10:00 Break
- 10:30 Communications 101 (continued)
- 12:00 Adjourn



Topic Descriptions

GENERAL SESSION

Regulatory Perspective on Regional Transmission Expansion

David Boyd, Minnesota Public Utilities Commission

The continuing trend in significant expansion of the electric transmission grid has led state regulators, along with policy makers, to approach grid planning and oversight in new and challenging ways. The demands that are being placed on our transmission infrastructure and the evolving state and federal policies governing electricity generation and delivery have led state regulators to adopt new and broader roles in the planning process. Just as utility power engineers are coordinating utility planning and development in a multi-state grid context, state regulators have similarly begun to coordinate their efforts as they respond to the regional issues associated with grid expansion.

Advanced Technology Enabling a Smarter Grid

Larry Sollecito, GE Digital Energy

The path to the Smart Grid is unfolding and advanced technologies are helping address increasing electrical demand, the need to reduce CO₂ emissions, and the need for more economical, viable, and reliable green power. This presentation addresses the technologies enabling a smarter grid today and technologies in development that will make the system predictive, self-healing, and secure.

Smart Grids and Micro Grids - What Are They Really?

Bruce Mork and Wayne Weaver, Michigan Technological University

This presentation explores what an engineer can do with these technologies when used in a coordinated fashion. Included will be PMUs and synchrophasors, high-speed data sharing, wide area monitoring and protection, emergency control, load shedding, and system

separation. Also covered will be the use of microgrids on the customer side of the meter to optimally integrate and control renewable generation, electric vehicles, energy storage, and the utility interconnection.

Energy: Bridging Developing Nations and Inner-City Youth

Paul Imbertson, University of Minnesota

The University of Minnesota Branch of the National Society of Black Engineers (NSBE) has developed an outreach and social development program to enhance the lives of inner-city youth and members of communities in developing nations. This unique program engages students at North Community High School in Minneapolis to develop renewable energy systems built from readily available material and constructed in a remote region of Nicaragua. This presentation will cover the philosophy and activities of this program which has included hundreds of student contact hours, numerous trips to Nicaragua, and excursions to Lamberton, Minnesota, and the White Earth Indian reservation.

SUBSTATION

Capacitor Switching and Capacitor Switching Devices

Tom Speas, Southern States, LLC

Capacitors represent an effective and low-cost alternative for improving the power flow of transmission and distribution systems. Switching capacitor banks can produce transients resulting in damaged equipment or nuisance outages. This paper presents an overview of capacitor switching options showing the expected transient currents in single-bank and back-to-back switching.

Effect of Current Limiting Reactors on Capacitor Breaker Switching Capability

Pratap Mysore, Xcel Energy and Himanshu Bahirat, Michigan Technological University

Current limiting reactors have been used with capacitor banks to limit the in-rush and out-rush current magnitude and frequency to industry-specified levels. Several capacitor bank failures reported in the industry prompted North American Electric Reliability Council (NERC) to issue an advisory to review the rate of recovery voltage capabilities of these breakers clearing faults in between the reactor and the capacitor bank. This presentation presents detailed analysis of the problem and suggests solutions. EMTP analysis and results also are presented.

Transformer Winding Design: Discussion of the Design and Performance of Circular Disk and Helical Construction Versus Layered Windings for Power Transformer Applications

David Harris, Waukesha Electric Systems

Power transformer circular winding can be designed with disc and helical or layer windings. Currently, all three windings types are used for power transformers up to voltages of 115 kV and 20 MVA. The discussion will present a review of the issues related to short circuit withstand (mechanical strength), thermal performance and overloading (winding cooling) when deciding which winding configuration is most appropriate for the transformer service specified.

Green Transformation: Technology Advances and Applications for Natural Ester Fluids

David Bingenheimer, Cooper Power System

Natural ester dielectric fluids: environmentally preferable leading-edge technology. These natural ester fluids provide an interesting value proposition, providing a long-term cost advantage, while improving your environmental stewardship.

UTILITY INDUSTRY FUTURES

Wind Energy Costs – Past, Present, and Future

Jeffrey Anthony, American Wind Energy Association

Utilities are increasingly looking to renewable energy, and wind energy in particular, to provide clean energy to their customers -- and reaping the hedge value benefits of a resource where the price of electricity is known for 20 or more years in the future. Learn how utilities are managing this resource in their portfolio of generation resources and the cost aspects relative to other sources of new generation.

Nuclear Plant Fuel Handling

Mario Coviello, Westinghouse Electric

This presentation will highlight the nuclear fuel handling process and equipment used during an outage to maintain safe and reliable energy production. Aspects of fuel handling discussed in the presentation include operator safety, fuel safety, and environmental protection for both boiling water and pressurized water reactors. Also, the presentation will attempt to show the benefits of machine reliability vs. machine speed in reducing outage refuel time.

Energy Sense 2009

Thomas Butz, Power System Engineering

Energy issues continue to take center stage in 2009. Prices have decreased dramatically from 2008, mostly driven by the economic downturn. There is increasing likelihood for a carbon reduction policy (may have passed by the time of this printing), and the continued goal of reducing foreign oil imports. Energy Sense 2009 will provide an update on the issues and frame up an energy plan showing the impact of current initiatives.

Modular Energy Storage Systems for Power System Application

Ned Mohan, University of Minnesota

In this presentation, the research work being carried out on modular energy storage systems at the University of Minnesota will be described. One of the applications is in the distribution grid, near residential loads, to store wind-generated energy at night to meet the morning peak demand, and then to store PV-generated energy to meet the evening peak demand that may include charging of PHEVs. The availability of economically feasible storage will enhance the capability of the smart-grid concept.

DISTRIBUTION AUTOMATION/ COMMUNICATIONS

Enterprise – Wide IP Network for Automation

Jim Goodin and Kathy Nelson, Great River Energy

This presentation is a case study of the business drivers, economic issues, and technology challenges that GRE faced in developing an IP network to over 500 substations. The system deployed consists of an OC 48 Sonet network for backhaul and 700 Mhz radio spectrum for the last mile connection to the substations

Communications for the Smart Grid

Mark Adamiak, GE Digital Energy - Multilin

The Smart Grid has become a force to be addressed not only in the utility industry, but also in the halls of Congress. Billions of stimulus dollars have been allocated to drive the “intelligence” of grid from where it is today to where it needs to be tomorrow. A key element in “linking” the functions of the Smart Grid is communications. This presentation will address the process of identifying functional requirements for a Smart-Grid application and the process of distilling them into communication requirements. A review of the presently selected NIST Smart Grid protocols will be presented.

Wired and Wireless Communications Strategies for Supporting Smart Distribution Grid

David Mayne, Digi International

There is a lot of policy, discussion, and news about the Smart Grid. In this session, Digi will define the “Smart Grid” and highlight specific examples of how electric utilities and energy management companies are benefiting from using wireless networks – both public and private – to improve the reliability, security, and efficiency of the electricity distribution grid.

How to Evaluate and Deploy the Latest Advancements in Communication Networks

Dan Paladino, FreeWave Technologies

Building the ideal communication network. The purpose of this presentation will be to inform participants on what needs to be considered when designing a communication network. A basic review of communication options will be presented as well as what to look for in performance and services when choosing vendor/suppliers. The goal of this presentation is to provide participants with a more current and informed position for developing the ideal communication network.

DELIVERY SYSTEMS I

Bison on the Wires –Utilizing the Square Butte HVDC Line for Wind Energy Delivery

Frank Frederickson and George Sweezy, Minnesota Power

In order to meet their Minnesota state renewable portfolio standards, Minnesota Power is planning to develop several hundred megawatts of wind generation in the center North Dakota area and deliver it to Minnesota over the Square Butte High Voltage Direct Current (HVDC) transmission line. This paper and presentation provide a historical perspective of the original Square Butte project, the prospects of wind development in North Dakota, and the future role of the HVDC line.

Integrating Renewable Energy in the Midwest: ITC's Green Power Express 765 kV Network

David Grover, ITC

ITC Holdings, the first and only fully independent transmission company in the United States announced the Green Power Express in February 2009. The proposed Green Power Express is a 3000-mile network of 765 kV transmission lines stretching from North and South Dakota, across Minnesota and Iowa, into Wisconsin, Illinois, and Indiana. When complete, the Green Power Express will facilitate movement of approximately 12,000 MW of power from wind-rich areas to major load centers in the Midwest ISO and PJM regions.

Experiences with Voltage Drop During Large Transformer Energization: Arrowhead Phase Shifting Transformer and Beyond

Michael Marz, American Transmission Company

The adverse effects of the voltage drop associated with transformer energization are increasing as transformers become larger and loads become more sensitive. Recent experiences in Wisconsin and Minnesota have shown the importance of analyzing the magnitude and duration of the voltage drop associated with energizing a large transformer before the transformer is put into service. The various analysis methods and mitigation techniques used to energize several new large transformer installations without adversely affecting loads are presented.

Severe Space Weather Events – Understanding Societal and Economic Impacts and Preparing U.S. Power Grids for the Extreme Space Weather/Geomagnetic Superstorm Events

John Kappenman, Storm Analysis Consultants

Severe geomagnetic storms (Space Weather) pose operational threats to the North American electric power grid and pose the risk of long-term outages to major portions of the North American grid. Although a severe storm is a relatively

infrequent event, it has the potential for long-term societal and financial impacts to the power grid. Recent analysis undertaken for the US EMP Commission and for FEMA under Executive Order 13407 indicates that severe geomagnetic storms that occur at a 1 in 30-year to 1 in 100-year frequency may be one of the most important hazards and is certainly the least understood threat to the reliable operation of the power networks.

DELIVERY SYSTEMS II

Wind Plants: An Overview

Ronald Brzezinski, GE Energy

An overview on the fundamentals of wind energy as well as an overview of GE wind turbine technology. The presentation will also cover GE Grid-Friendly technology which facilitates grid interconnection and enables power plant performance similar to traditional generation.

South Minneapolis, Planning for a Mature Community as the City Evolves

Scott Zima, Xcel Energy

Northern States Power Company, a Minnesota corporation; (“Xcel Energy”) has been monitoring the growing customer electrical demand in the south Minneapolis area for more than 50 years. In the last 10 years, electrical system planners, operators, and construction crews have responded to an overloaded electric distribution system with increasingly intensified customer demand. Typical mitigation strategies, such as extending feeder circuits, reconfiguring feeder circuits, and adding new feeder circuits, are exhausted. Existing adjacent distribution substations do not have the available capacity to alleviate the overload conditions. How will the solution unfold?

Contamination and Condition Wireless Monitoring of Insulators and Arresters

Arnie Vitols, ABB Inc.

Condition monitoring of high voltage equipment provides the system management with critical information to become grid smart and operate the system at the most efficient level and reduce the risk of insulation failure to an economically and functionally acceptable level. The switching and lightning events impacting the system are time stamped to be compared to breaker operations and lightning strikes recorded on other independent measuring devices for analysis. The benefits of monitoring of field contaminated insulators will be discussed.

Secondary Network Distribution Systems Background, Planning, and Operation

James Nash, Xcel Energy

Electric utilities have an obligation to serve their customers. But, there are many ways to engineer a solution to the question of how to serve a customer. Each answer chosen will impact installation and ownership costs and the expected reliability. This paper will focus on secondary network distribution systems in general and, specifically, Xcel Energy's secondary network distribution systems. The discussion will address different distribution system configurations, their operation, and reliability, culminating with the secondary network distribution system and its history, planning, operation, and maintenance.

RELAYING

Line Current Differential Relay Operation Under Severe Current Transformer Saturation

Roger Hedding, ABB Inc.

Relays rely on the current transformer to produce a secondary current that faithfully reflects the primary current for proper operation. In some instances this isn't the case. This paper will look at cases where severe ct saturation can be

a problem, review the real-time digital simulator inputs to the relay, and look at what mechanisms in modern line current differential relays are used to mitigate the problem.

Considerations for Transmission Reclosing Practices in the MRO Area

Len Yee, SaskPower

This presentation deals with the various types of reclosure and the various factors that will determine what type of reclosing to use. It is based on considerations with respect to system stability, system security, rotor torsional stresses, and reclosing onto faulted non-restorative primary devices. It was created for consideration in the MRO area; however, these considerations are applicable on any system. The presentation will also address breaker duty cycles, line dead times, radial lines and impact of clearing times of transformers connected to grid stations, power transfer, and even fuses that some utilities may use on some transmission connected transformers.

Then Versus Now: A Comparison of Total Scheme Complexity

Roy Moxley, Schweitzer Engineering Laboratories, Inc.

Microprocessor relays offer input, output, and configuration options that can improve the reliability of protection and control schemes. Different connections can increase or decrease scheme complexity and therefore reliability. This paper describes different scheme connections and provides a methodology to compare and evaluate their reliability.

Isolation of Angular Instability Using Power Swing Relays

Nick Giffin, American Transmission Company

This presentation discusses the evaluation of power swing relays used to isolate angular instability. The relays predict a loss of synchronism event at a remote generating station and island the region to maintain angular stability of the bulk power system.

PROJECT MANAGEMENT

Project Management Approach to a Multi-Year, Multi-Owner, Major Transmission Project

Gerald Chezik and Brian Westerhaus, Xcel Energy, Inc.

This presentation is an examination of the CapX 2020 Project Management approach to constructing 700 miles of high voltage transmission lines, including 20 substations, across four states, with a group of 11 owners in order to support additional wind generation outlet, load serving capacity, and improved reliability. This discussion will introduce the progress made to date and some of the challenges and lessons learned so far.

Successfully Engaging the Public on Need for Transmission Projects

Tim Carlsgaard, Xcel Energy

Despite transmission's prominence in national energy policy, public opposition can lead to costly delays and higher project costs. You don't need high-priced consultants to engage the public – the CapX2020 utilities have been successful by using the latest GIS tools, developing understandable informational materials, and deploying plain-talking engineers who know the importance of listening.

Substation Construction Project Resourcing

Lloyd Willenbring and Dave Johnson, Xcel Energy

This presentation reviews the challenges associated with resourcing projects that fall outside of normal planned workload. It reviews the impacts of different resourcing options when augmenting normal construction crews. It also reviews one company's approach to maintaining high standards of quality in workmanship in spite of the challenges surrounding fluctuating workloads.

Wind Industry Future from a Turbine Blade Manufacturer's Perspective

Bill Burga, LM Glasfiber

The wind industry is presently undergoing several concurrent events which have a direct impact on the industry. Financial crises, recession, transmission access and assessments, Federal Stimulus package, and proposed Cap and Trade legislation impact the future of wind energy. This paper will discuss the current and future state of wind energy in North Dakota, the U.S., and around the world from the perspective of a company, LM Glasfiber, and its plans to meet the challenges in the turbulent world of the wind industry.

TUTORIALS

Motors 101

Paul Imbertson, University of Minnesota

This tutorial covers electric motor theory, construction, application, and operation. We start from basic principles but move on to specific design and utilization issues, so this presentation is suitable for engineers who have little direct experience with electric motors as well as those who are interested in a review of motor concepts. Specifically, we will cover motor design, motor selection for specific applications, adjustable speed drives, and motor integration and interaction with power systems.

Communications 101

Dan Nordell, Xcel Energy and Mark Adamiak, GE Digital Energy – Multilin

Modern power systems depend on a wide variety of communication technologies to ensure safe and reliable operation. This tutorial will present concepts including fundamental communication theory, traditional utility RTU protocols, modern network communication concepts and practice, and the application of the latest international standards for utility communication systems.

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. Newly created and redesigned concurrent sessions include substations, utility industry futures, distribution automation/communications, delivery systems, project management, and relaying.

Location and Accommodations

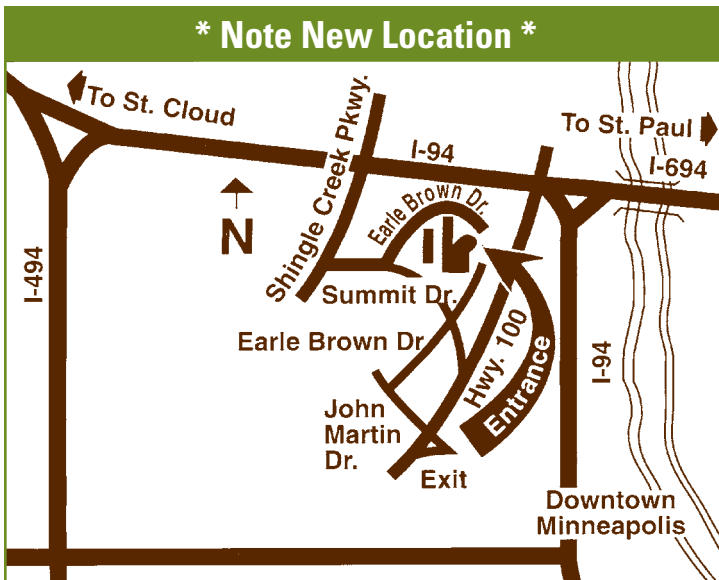
The conference will be held at the **Earle Brown Heritage Center, 6155 Earle Brown Drive, Brooklyn Center, Minnesota**. For directions, please visit their Web site – www.earlebrown.com. The Earle Brown Heritage Center is located near the intersection of I-94/694 and Shingle Creek Parkway (just north 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 1, 2009. After this date reservations will be accepted on a space and rate available basis. The hotel is directly connected to the Earle Brown Heritage Center by a walkway, and parking is free.

Registration and Fees

The fee for the conference is \$275 if received by October 19; if received after October 19, the fee is \$325. The conference fee includes all sessions, two luncheons, refreshments breaks, the exhibitor reception, and the conference proceedings book and CD. You are encouraged to register early to take advantage of the lower fee. If you cancel your registration by October 26, 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 3, 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 Transcript Unit.

For Program Information

Kristi Fischer
College of Continuing Education
University of Minnesota
Phone: 612-625-4265
E-mail: cceconf4@umn.edu

For Registration Information

612-625-2900
cceinfo@umn.edu

Call for Papers For 2010 Conference

Deadline for abstract submission for MIPSYCON 2010 is January 15, 2010. Notification of acceptance will be mailed by June 2010. If you would like to be considered for the 2010 program, please submit an abstract of approximately 300 words to: Kristi Fischer, College of Continuing Education, University of Minnesota, 352 Classroom Office Building, 1994 Buford Avenue, St. Paul, MN 55108, E-mail: cceconf4@umn.edu

Disability accommodations will be provided upon request. This publication is available in alternative formats upon request. Call 612-625-4265. The University of Minnesota is committed to the policy that all persons shall have equal access to its programs, facilities, and employment without regard to race, color, creed, religion, national origin, sex, age, marital status, disability, public assistance status, veteran status, or sexual orientation.

Registration

45th Annual Minnesota Power Systems Conference

ENGR 0276
183244 kf

November 3-5, 2009

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 phone 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 19).
- Enclosed is \$325 in full payment of the conference registration fee (received after October 19).

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/Novus American Express

Credit Card Number Expiration Date

Name as printed on card (please print)

Signature of cardholder

How to Register

Register Online:

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

Mail to (with credit card information):

Information Center 183244
University of Minnesota
20 Coffey Hall
1420 Eckles Avenue
St. Paul, MN 55108-6069

Fax to (with credit card information):

612-624-5359

This fax will be received in a secure location.

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 co-sponsors.

Continuing Professional Education
University of Minnesota
352 Classroom Office Building
1994 Buford Avenue
St. Paul, MN 55108

Nonprofit Org.
U.S. Postage
PAID
Minneapolis, MN
Permit No. 811



45th Annual
**MINNESOTA POWER
SYSTEMS CONFERENCE**

November 3-5, 2009