

48th Annual **MINNESOTA POWER SYSTEMS CONFERENCE**

November 6-8, 2012

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

MILP SY CON

Tuesday, November 6, 2012

GENERAL SESSION

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

Moderator: Denny Branca

Co-Moderators: Gerry Steffens, Larry Brusseau, Greg Woodworth

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|------|---|-------|---|
| 7:15 | Check-in
Continental Breakfast | 10:15 | Natural Gas: Past, Present, and Future
<i>Dawn Constantin</i> , BP – North American Gas & Power |
| 8:15 | Welcome
<i>Denny Branca</i> , Cooper Power Systems | 11:00 | Ethics in Professional Engineering
<i>Doreen Frost</i> , Minnesota Board of AELSLAGID; <i>Michael Marz</i> , American Transmission Company; and <i>Denny Branca</i> , Cooper Power Systems |
| 8:30 | The University of Minnesota: Engineering the Future
<i>Dr. Eric Kaler</i> , President, University of Minnesota | 12:00 | Lunch |
| 9:00 | Building a Workforce That Can Transition the Power Industry
<i>Wanda Reder</i> , S&C Electric Company | | |
| 9:45 | Break | | |

CONCURRENT SESSIONS

1:00 - 4:15 p.m.

SUBSTATION

Moderator: Mythili Chaganti
Co-Moderators: Steven Mohs,
Mark Harvey

- 1:00 Current Practices on Power Transformer Monitoring and Controls for Smart Grid Applications
H. Jin Sim, Waukesha Electric Systems
- 1:45 Mobile Substation Design
Brad Bozich and Vitor Vieira, Efacec Group
- 2:30 Break
- 2:45 High Definition Laser Scanning of Substations
Peter Gitzen, Xcel Energy
- 3:30 Substation Design - Sustainable Solutions
Jim Hogan and Marshall Bird, Burns & McDonnell
- 4:15 Adjourn

UTILITY INDUSTRY FUTURES

Moderator: Jeff Schoenecker
Co-Moderators: Gerry Steffens,
Michael Ebert

- 1:00 Power Electron Tubes as an Enabling Technology for the Grid
John Kappenman, Storm Analysis Consultants
- 1:45 The Direct Conversion of Heat to Electricity Using Multiferroic Alloys
Richard James, University of Minnesota
- 2:30 Break
- 2:45 Emerging Home Automation Programs - Opportunities and Challenges
Rick Schmidt, Power System Engineering; Kevin Doe and Ryan Brager, Cooper Power Systems
- 3:30 Minnesota's Deep Geothermal Energy Potential
Donald Fosnacht, University of Minnesota, Duluth
- 4:15 Adjourn

PROJECT MANAGEMENT

Moderator: Jim Hanson
Co-Moderators: Mike Steckelberg,
Scott Hoberg

- 1:00 100 Miles in 100 Days: 2011 Buffalo Ridge 115kV and 34.5kV Wind Feeder Storm Restoration Project
Eugene Kotz, Xcel Energy
- 1:45 Manitoba Hydro's System Development Plans
Ronald Mazur, Manitoba Hydro
- 2:30 Break
- 2:45 Chisago – Apple River 115/161kV Line Conversion
Andrew Beckel, Xcel Energy
- 3:30 Project Permitting and Construction Challenges
Al Koeckeritz, Otter Tail Power
- 4:15 Adjourn

METERING

Moderator: Dave Hoops
Co-Moderators: Tom Guttormson,
Chuck Healy

- 1:00 KWH Metering Fundamentals
Dan Nordell, Xcel Energy
- 1:45 AMI Architectures
Todd Blom, Ecologic Analytics, LLC
- 2:30 Break
- 2:45 Metering Best Practices – Generation and Transmission Metering
Daniel Gunderson, ALLETE-Minnesota Power
- 3:30 Applied Meter Data Analytic
Rick Brakken, DataRaker, Inc.
- 4:15 Adjourn

EXHIBITOR RECEPTION

4:15-6:00 p.m.

Wednesday, November 7, 2012

CONCURRENT SESSIONS

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

**DISTRIBUTION AUTOMATION/
COMMUNICATIONS**

Moderator: Rick Johnson

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

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|-------|--|
| 7:30 | Continental Breakfast |
| 8:30 | Merging Sonet and Ethernet Communications for Power System Applications
<i>Paul Robertson</i> , Schweitzer Engineering Laboratories |
| 9:15 | Communications for Distribution Automation and Fixed Wireless AMI
<i>Rick Schmidt</i> , Power System Engineering |
| 10:00 | Break |
| 10:30 | Machine-to-Machine Communications
<i>Amy Rainwater</i> , Verizon Business |
| 11:15 | Deploying a Distribution Management System in a Pilot Project
<i>Megan Lyons</i> , Burns & McDonnell |
| 12:00 | Lunch |

DELIVERY SYSTEMS I

Moderator: Tom Guttormson

**Co-Moderators: Dave Peterson,
Philip Spaulding**

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|-------|--|
| 7:30 | Continental Breakfast |
| 8:30 | American Electric Power's Conservation Voltage Reduction (CVR) Pilot Project
<i>Michael Campbell</i> , American Electric Power Company; <i>Dan Arden</i> and <i>Dean Hotvet</i> , Cooper Power Systems |
| 9:15 | Event Analysis of the May 10, 2011, Upper Peninsula (Michigan) Blackout
<i>Paul Walter</i> , American Transmission Company |
| 10:00 | Break |
| 10:30 | Mackinac VSC HVDC Flow Control Project Design
<i>Michael Marz</i> , American Transmission Company |
| 11:15 | Determination of Spare and Mobile Transformer Requirements: Application of the Binomial Probability Distribution Function to Achieving Target Levels of Transformer Availability and Service Reliability
<i>Richard (Rick) Gonzalez</i> , Excel Engineering, Inc. |
| 12:00 | Lunch |

RELAYING I

Moderator: Mark Gutzmann

Co-Moderators: Greg Woodworth, Michael Ebert

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|-------|--|-------|--|
| 7:30 | Continental Breakfast | 10:30 | Simplifying Protection System Design for Distribution Systems
<i>Rich Hunt</i> , General Electric |
| 8:30 | Implementing NERC Guidelines for Coordinating Generator and Transmission Protection
<i>Charles Mozina</i> , Beckwith Electric Company | 11:15 | Understanding Differences in Harmonic Restraint and Harmonic Blocking in Transformer Differential Protection
<i>John Wang</i> , Xcel Energy |
| 9:15 | Testing Considerations for Line Current Differential Schemes
<i>Bogdan Kasztenny</i> , Schweitzer Engineering Laboratories, Inc. | 12:00 | Lunch |
| 10:00 | Break | | |

Wednesday, November 7, 2012

CONCURRENT SESSIONS

1:00-4:15 p.m.

POWER GENERATION

Moderator: Mike Steckelberg

**Co-Moderators: Jeff Schoenecker,
Al Haman**

- 1:00 MISO Market Explained
Sidney Jackson, MISO Energy
- 1:45 Minnesota Power's Base Load
Diversification Study Report to
the Minnesota Public Utilities
Commission
Julie Pierce, Minnesota Power
- 2:30 Break
- 2:45 The Future Role of Passive
Methods for Detecting
Unintentional Island Formation
Michael Ropp, Northern Plains
Power Technologies
- 3:30 Wind Farm Volt/VAR Control
Using a Real-Time Automation
Controller
Tony Martini, Schweitzer
Engineering Laboratories
- 4:15 Adjourn

DELIVERY SYSTEMS II

Moderator: Chuck Healy

**Co-Moderators: Michael Marz,
Mythili Chaganti**

- 1:00 Regional Issues Facing
Transmission-Line Installation
Michelle Bissonnette, HDR and
Tom Bailey, Briggs and Morgan
- 1:45 The Bakken Oil Field Development
Kirk Dewey, HDR Engineering, Inc
- 2:30 Break
- 2:45 The Selection of Insulator
Technology for HV- Transmission
Lines
Ezio Del Bello, Seves USA
- 3:30 NERC Facility Rating Alert
Andrew Lucero, Lucero
Consulting LLC, an MRO
contractor
- 4:15 Adjourn

RELAYING II

Moderator: Greg Woodworth

Co-Moderators: Dave Hoops, Mark Harvey

- 1:00 Comprehensive Testing of
Generator Protection Systems
Tom Ernst, GE Energy Digital
Energy
- 1:45 Stray Flux Effects on Current
Transformers
Roger Hedding, ABB Inc.
- 2:30 Break
- 2:45 Calculating the Loadability of
Distance Relays
René Midence, ERL Phase
Power Technologies
- 3:30 100% Stator Ground Fault
Detection Implementation at
Hibbard Renewable Energy
Center
Steve Schoenherr, Minnesota
Power and *Roger Hedding*, ABB
Inc.
- 4:15 Adjourn

Thursday, November 8, 2012

CONCURRENT SESSIONS

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

TUTORIAL I

Moderator: Michael Marz
Co-Moderators: Jim Hanson,
Dan Nordell

7:30 Continental Breakfast
8:30 Relaying 103
Tom Ernst, GE Energy Digital
Energy
10:00 Break
10:30 Relaying 103 (continued)
12:00 Adjourn

TUTORIAL II

Moderator: Tom Guttormson
Co-Moderators: Larry Brusseau,
Rick Johnson

7:30 Continental Breakfast
8:30 Transmission Design 101
Duane Phillips, Stanley
Engineering
10:00 Break
10:30 Transmission Design 101
(continued)
12:00 Adjourn

Presentation Descriptions

GENERAL SESSION

**The University of Minnesota:
Engineering the Future**

*Dr. Eric Kaler, President, University of
Minnesota*

University of Minnesota President Dr. Eric W. Kaler is our featured keynote speaker for the 2012 Minnesota Power System Conference. Dr. Kaler became the 16th president of the University of Minnesota on July 1, 2011. He is only the second alumnus to rise to the University's presidency. He received his Ph.D. from the University's Department of Chemical Engineering and Materials Science in 1982. We're excited to have such a distinguished engineer present to us. His presentation will, among other topics, detail the role of Minnesota's only comprehensive research university in preparing world-class science, technology, engineering, and math graduates for the 21st century workforce, and discuss the U's partnerships to drive innovation and discoveries.

**Building a Workforce That Can
Transition the Power Industry**

Wanda Reder, S&C Electric Company

The power and energy industry is going through a major transition while a perfect

storm builds. More than 50 percent of the existing technical workforce in the U.S. power industry will leave in the next five to ten years. Meanwhile, the workload is increasing and skills sets are shifting to modernize and upgrade aging infrastructure, integrate intermittent renewable generation, and meaningfully engage consumers. This presentation will reflect upon the workforce changes that have occurred since this topic was last discussed at MIPSYCON in 2005. Strategies that can and should be pursued to prepare a workforce today to address the business needs of tomorrow will also be discussed.

Natural Gas: Past, Present, and Future
*Dawn Constantin, BP – North American
Gas & Power*

The paradigm shift in North American natural gas supply over the past few years has had a dramatic impact on supply/demand balances and prices. What does this mean for the future? This session will highlight current dynamics as well as signposts to watch for that will influence future supply and demand trends.

Ethics in Professional Engineering

Doreen Frost, Minnesota Board of AELSLAGID; Michael Marz, American Transmission Company; and Denny Branca, Cooper Power Systems

More states are including engineering ethics in their P.E. continuing education requirements. Doreen Frost, Minnesota Board of AELSLAGID Executive Director, will discuss engineering ethics, before brief illustrative scenarios are presented.

SUBSTATION

Current Practices on Power Transformer Monitoring and Controls for Smart Grid Applications

H. Jin Sim, Waukesha Electric Systems

Current practices on utilization of modern measurement and diagnostic systems and controls to support ever-increasing needs of system reliability and economical utilization of various sources of generation will be presented.

Mobile Substation Design

Brad Bozich and Vitor Vieira, Efacec Group

Engineering concepts related to designing mobile substations with focus on:

- mobile power transformer;
- trailer configuration (weight distribution, steering features toward reduced turning radius);
- equipment transit vs. service layout.

High Definition Laser Scanning of Substations

Peter Gitzen, Xcel Energy

This presentation will give an overview of the use of high-definition laser scanning of electrical substations to as-built existing conditions. Some of the topics covered will be: field collection cost, accuracy, processing of the data, and outputs to design software.

Substation Design - Sustainable Solutions

Jim Hogan and Marshall Bird, Burns & McDonnell

Society emphasizes the use of sustainable practices in building designs. These same sustainable concepts can be applied to

electrical substations. The conceptual design of a substation was performed using sustainable initiatives and will be presented.

UTILITY INDUSTRY FUTURES

Power Electron Tubes as an Enabling Technology for the Grid

John Kappenman, Storm Analysis Consultants

A new generation of electron tubes has been developed from military applications, which can handle the voltages and currents required for current and next generation HVDC and FACTS systems.

The Direct Conversion of Heat to Electricity Using Multiferroic Alloys

Richard James, University of Minnesota

This presentation will be describing a procedure for making alloys with reversible phase transformations between phases having diverse magneto electric properties. The alloys can be used for the direct conversion of heat to electricity.

Emerging Home Automation Programs - Opportunities and Challenges

Rick Schmidt, Power System Engineering; Kevin Doe and Ryan Brager, Cooper Power Systems

This session will provide a fresh overview of the state of the industry for home automation programs and utility-driven energy savings and demand response programs. The communication networks common to these programs and related challenges will be explored. Topics include: latest product capabilities by leading vendors, value proposition, review of lessons learned from early deployments, and future trends for home automation.

Minnesota's Deep Geothermal Energy Potential

Donald Fosnacht, University of Minnesota, Duluth

A new geothermal energy map has been developed for Minnesota based on water and mining drill hole thermal profiling and through the collection of various mineral samples across the state that indicate the

effects of radioactive heating. The data indicate that Minnesota's potential for enhanced geothermal energy is significantly better than that previously indicated in past DOE studies and more similar to other states in the region.

PROJECT MANAGEMENT

100 Miles in 100 Days: 2011 Buffalo Ridge 115kV and 34.5kV Wind Feeder Storm Restoration Project *Eugene Kotz, Xcel Energy*

In July 2011, a large wind storm and tornado destroyed 100+ miles of 115kV transmission and 34.5kV wind feeders sourced via the Buffalo Ridge substation in Lake Benton. This presentation chronicles the emergency response, restoration, financial planning, material and procurement effort, and commissioning of the new lines which are operating today.

Manitoba Hydro's System Development Plans

Ronald Mazur, Manitoba Hydro

The presentation will describe the existing Manitoba Hydro power system, and identify future hydro generation potential along with associated transmission required to deliver this generation to Manitoba load and export customers.

Chisago – Apple River 115/161kV Line Conversion

Andrew Beckel, Xcel Energy

This presentation will review the recent Chisago-Apple River 115/161kV line conversion project completed by Xcel Energy and Dairyland Power. The project was a conversion of an aged 69kV system to both 115 and 161kV. Two new substations were built and six substations were upgraded. Approximately 45 miles of transmission line were upgraded, including three miles of new underground 115kV line. The presentation will include discussion about permitting efforts, unique design challenges, and construction coordination between the two utilities.

Project Permitting and Construction Challenges

Al Koeckeritz, Otter Tail Power

The Bemidji to Grand Rapids 230kV line is 70

miles long and crosses the Chippewa National Forest, the Leech Lake Indian Reservation, and several Minnesota Department of Natural Resource properties. This presentation will cover the permitting and construction challenges faced to complete the project.

METERING

KWH Metering Fundamentals *Dan Nordell, Xcel Energy*

Electricity metering is a specialized and important niche of the electric utility industry's transmission and distribution operation, and is used to measure the quantity and quality of product delivered to the utility's internal, wholesale, and retail customers. This presentation will discuss fundamental concepts of kilowatt (power) and kilowatt-hour (energy) metering with an emphasis on application to transmission and distribution systems and the role electricity metering plays in the smart grid.

AMI Architectures

Todd Blom, Ecologic Analytics, LLC

Collection and management of data from and about each of the millions of electricity meters used by the utility industry has unique challenges. Not only must individual meter configuration data be kept, but also the information produced by each meter must be communicated and maintained in historical records to resolutions sometimes as granular as one minute. This presentation will discuss the systems used by electric utilities to achieve this task.

Metering Best Practices – Generation and Transmission Metering

Daniel Gunderson, ALLETE-Minnesota Power

In recent years, manufacturers of high-end watt-hour meters have allowed utilities to be creative in their utilization of both communication media and protocols to achieve their Energy Management System (EMS) goals. In most investor-owned utilities with transmission and generation assets, the metering interfaces with an eclectic mix of technology. This presentation will review best practices around these areas of utilities and provide an overview of some of the forward-looking concepts in this changing area of the business.

Applied Meter Data Analytics

Rick Brakken, DataRaker, Inc.

The primary purpose of electricity metering is to measure for revenue purposes the product produced and delivered by electric utilities. This presentation will discuss opportunities for advanced analytical methods to be used not only to ensure the integrity of each of thousands or millions of electric meters in a utility's system but also to improve the efficiency and performance of the utility's transmission and distribution systems by providing both real-time and after-the-fact feedback to utility operations.

DISTRIBUTION AUTOMATION/ COMMUNICATIONS

Merging Sonet and Ethernet Communications for Power System Applications

*Paul Robertson, Schweitzer Engineering
Laboratories*

Power system communications systems have different communications requirements that may be addressed with TDM- or Ethernet-based systems. This presentation describes the benefits and shortcomings of each technology and provides objective performance comparisons of current solutions.

Communications for Distribution Automation and Fixed Wireless AMI

Rick Schmidt, Power System Engineering

This session will provide an update of the emerging communications infrastructure architectures and technologies being used for utility automation such as for the backhaul of AMI, DA, and substations. Utility application level requirements will be reviewed, as well as bandwidth sizing tactics by application.

Machine-to-Machine Communications

Amy Rainwater, Verizon Business

For years, M2M (machine-to-machine) has been providing businesses the capability to monitor, control, or manage the operation of remote equipment. With expansive fixed and mobile broadband networks that can transmit information from almost any device, the great potential for M2M communications in the energy sector is being realized. M2M

is fueling innovation in the enterprise as utilities are realizing that smart machines and smart applications can take information from a system or environment to create new revenue streams, control costs, and improve products and services.

Deploying a Distribution Management System in a Pilot Project

Megan Lyons, Burns & McDonnell

This session will describe Kansas City Power and Light's experiences with the design and installation of a Distribution Management System for their DOE pilot project. Key functionalities include fault location, network reconfiguration, centralized Volt/Var control, and integration with a demand response system.

DELIVERY SYSTEMS I

American Electric Power's Conservation Voltage Reduction (CVR) Pilot Project

*Michael Campbell, American Electric Power
Company; Dan Arden and Dean Hotvet,
Cooper Power Systems*

American Electric Power (AEP) commissioned a pilot project to investigate the benefits of a CVR program utilizing Cooper Power Systems Yukon Energy Automation Software with Integrated-Volt-Var-Control (IVVC). This CVR pilot was commissioned on June 2012, in Owasso, Oklahoma, a major metropolitan area just outside of Tulsa, Oklahoma. The latest results from the project along with a project overview will be presented.

Event Analysis of the May 10, 2011, Upper Peninsula (Michigan) Blackout

*Paul Walter, American Transmission
Company*

On May 10, 2011, the Upper Peninsula of Michigan experienced a total blackout. Paul Walter, Manager of ATC Planning, will describe that blackout event and how Phasor Measurement Units (PMUs) greatly aided in the analysis of the event.

Mackinac VSC HVDC Flow Control Project Design

*Michael Marz, American Transmission
Company*

This presentation describes how ATC evaluated available technologies, system

characteristics, and performance requirements to design a VSC HVDC installation to control power flow between Michigan's upper and lower peninsulas.

Determination of Spare and Mobile Transformer Requirements: Application of the Binomial Probability Distribution Function to Achieving Target Levels of Transformer Availability and Service Reliability

Richard (Rick) Gonzalez, Excel Engineering, Inc.

The Binomial Probability Distribution Function is a useful tool for the utility engineer in determining the optimal inventory of spare and mobile transformers required to ensure power system reliability.

RELAYING I

Implementing NERC Guidelines for Coordinating Generator and Transmission Protection

Charles Mozina, Beckwith Electric Company

The presentation will provide practical guidance in implementing NERC guidelines (as outlined in the NERC white paper) for setting generator protection to coordinate with transmission protection.

Testing Considerations for Line Current Differential Schemes

Bogdan Kasztenny, Schweitzer Engineering Laboratories, Inc.

This presentation will cover field testing of 87L schemes, including relay hardware, firmware and settings, channel, and time sources. It also describes features of 87L relays and multiplexers to aid testing.

Simplifying Protection System Design for Distribution Systems

Rich Hunt, General Electric

This session describes the design decisions made by Orion while developing their next generation protective relaying system, using process bus communications and multi-zone protective relays to standardize wiring design and simplify installation.

Understanding Differences in Harmonic Restraint and Harmonic Blocking in Transformer Differential Protection

John Wang, Xcel Energy

The difference between harmonic restraint and harmonic blocking is explained. Field events will be used to compare the security and dependability of the two methods in transformer protection.

POWER GENERATION

MISO Market Explained

Sidney Jackson, MISO Energy

This presentation will focus on the overall scope and operations of the MISO wholesale electric energy markets, including the critical role of assuring grid reliability across the region.

Minnesota Power's Base Load Diversification Study Report to the Minnesota Public Utilities Commission

Julie Pierce, Minnesota Power

Minnesota Power provided its Base Load Diversification Study to the Minnesota Public Utilities Commission in February 2012. The report was a first-of-its-kind, long-term resource planning analysis that outlined the pressures and uncertainty facing coal-fired generation in the current economic and environmental regulation environments. The presentation will review the process that Minnesota Power went through to develop the report, highlights of the findings, and the key stakeholder participation that occurred.

The Future Role of Passive Methods for Detecting Unintentional Island Formation

Michael Ropp, Northern Plains Power Technologies

This presentation will briefly explain the fundamentals of the island formation problem. Then, it will discuss why grid support may spell the end for active anti-islanding, because of a fundamental incompatibility between the two, and finally it will lay out the options for passive and communications-based island detection, with a brief strengths and weaknesses comparison for both categories, and delve into the challenges, strengths, and opportunities in passive island detection that will arise as grid support becomes increasingly important.

Wind Farm Volt/VAR Control Using a Real-Time Automation Controller

Tony Martini, Schweitzer Engineering Laboratories

This presentation discusses a reactive power control system that utilizes a central automation controller to regulate both power factor and voltage at the point of utility interconnection.

DELIVERY SYSTEMS II

Regional Issues Facing Transmission-Line Installation

Michelle Bissonnette, HDR and Tom Bailey, Briggs and Morgan

Getting transmission projects built has become increasingly more complex because of the active participation of the public and various state and federal agencies in the transmission review and approval process. One of the critical changes is the demand for ever greater detail about the project and its alternatives in determining whether the project is needed and its environmental impacts are properly mitigated. This presentation addresses the need and environmental issues that arise in the Minnesota and federal review processes for proposed transmission lines, and the implications for transmission planners.

The Bakken Oil Field Development

Kirk Dewey, HDR Engineering, Inc

When a region experiences a boom in oil and gas development, the need for electrical and other infrastructure increases rapidly to support the development and the surrounding communities. This presentation will discuss the overall oil and gas development within the Bakken Shale play in western North Dakota and how it has affected electrical service and reliability in the area.

The Selection of Insulator Technology for HV- Transmission Lines

Ezio Del Bello, Seves USA

This presentation will review the pros and cons of the three main technologies available for insulating HV Lines: porcelain, toughened glass, and polymers. Included will be an overview of current industry trends in the United States.

NERC Facility Rating Alert

Andrew Lucero, Lucero Consulting LLC, an MRO contractor

This presentation will discuss the NERC Alert in its recommendation to industry on the consideration of actual field conditions in determination of transmission facility ratings with the MRO specifics.

RELAYING II

Comprehensive Testing of Generator Protection Systems

Tom Ernst, GE Energy Digital Energy

This paper focuses on different types of generator protection testing as suggested in the IEEE C37.233-2009 guide on protection system testing and NERC PRC-005. Performance testing to verify the behavior of the generator in various system conditions, commission and maintenance testing, and post-fault analysis are discussed.

Stray Flux Effects on Current Transformers

Roger Hedding, ABB Inc.

Current transformer secondary currents accurately represent the primary current when the primary conductor is straight and infinitely long. However, this is usually not the case. Nearby conductors can have a major influence on the secondary current. This presentation examines the influence of external conductors on current transformer operation and subsequent relay performance.

Calculating the Loadability of Distance Relays

René Midence, ERL Phase Power Technologies

This technical presentation focuses on concepts, definitions, and calculations for how to determine the maximum loadability limit of a transmission line protected by a distance relay with mho and lens characteristics.

100% Stator Ground Fault Detection Implementation at Hibbard Renewable Energy Center

Steve Schoenherr, Minnesota Power and Roger Hedding, ABB Inc.

This session will describe: the decision to

change from Minnesota Powers standard relay package to protect steam driven generators an in effort to achieve 100% stator ground fault detection on smaller generators; the description of available methods to achieve 100% stator ground fault detection and some of the pros and cons of each method; and the retrofitting of 100% stator ground fault protection to a power plant.

TUTORIAL I

Relaying 103

Tom Ernst, GE Energy Digital Energy

This is the last session in a tutorial series aimed at the engineer who is new to protective relaying or is looking for a refresher. It will be interactive and will cover the application principles of protective relaying, including an overview of

IEC 61850 and rotating machine protection. Real-life examples will be provided.

TUTORIAL II

Transmission Design 101

Duane Phillips, Stanley Engineering

This tutorial will walk through a detailed process flow of what it takes, and what design considerations there are, for detailed transmission line design. Major steps include: design criteria; load flow and system studies; interconnection studies; structure configuration; conductor selection; insulation selection; materials and hardware selection; foundation design; electrical studies; structure spotting; permitting support; and construction support.

2012 MIPSYCON Planning Committee

* Denny Branca

Cooper Power Systems
Plymouth, Minnesota

Larry Brusseau

MAPPCOR
Roseville, Minnesota

Mythili Chaganti

IEEE PES Twin Cities
Chapter Chair
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Michael Ebert

Ulteig Engineers, Inc.
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Kristi Fischer

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Catherine Flannery

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Tom Guttormson

Connexus Energy
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Mark Gutzmann

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ABB Inc.
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Dave Hoops

GE Energy
Huron, South Dakota

Rick Johnson

Otter Tail Power Company
Fergus Falls, Minnesota

Michael Marz

American Transmission
Company
Waukesha, Wisconsin

Steve Mohs

Burns & McDonnell
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Dan Nordell

Xcel Energy
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Dave Peterson

Dairyland Power
Cooperative
LaCrosse, Wisconsin

Jeff Schoenecker

Dakota Electric
Association
Farmington, Minnesota

Philip Spaulding

Xcel Energy
Maple Grove, Minnesota

Mike Steckelberg

Great River Energy
Maple Grove, Minnesota

Gerry Steffens

Consultant
Rochester, Minnesota

Dave VanHouse

Minnesota Power
Duluth, Minnesota

Bruce Wollenberg

University of Minnesota
Minneapolis, Minnesota

Greg Woodworth

Siemens Energy
Minnetonka, Minnesota

*Planning Committee Chair

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, metering, relaying, and two tutorials.

LOCATION AND ACCOMMODATIONS

The conference will be held at the **Earle Brown Heritage Center, 6155 Earle Brown Drive, Brooklyn Center, MN, 55430**. For directions, please visit their website – www.earlebrown.com. The Earle Brown Heritage Center is located near the intersection of I-94/694 and Shingle Creek Parkway (just north of the former Brookdale Shopping Center) There is ample free parking surrounding the facility.

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 19, 2012**. 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 22; if received after October 22 the fee is \$325. The conference fee includes all sessions, continental breakfasts, luncheons, refreshments breaks, and the exhibitor reception. You are encouraged to register early to take advantage of the lower fee. If you cancel your registration by October 29 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.

CONFERENCE PAPERS AND POWER POINT PRESENTATIONS

Conference presentation papers, from speakers who have submitted papers, can be found on the conference website, www.cce.umn.edu/mnpowersystems

Presentation PowerPoints, from speakers who are willing to have their PowerPoints posted, will be available for a limited time after the conference on the conference website, www.cce.umn.edu/mnpowersystems

EXHIBITOR RECEPTION

The exhibitor reception will be held on Tuesday, November 6, from 4:15-6:00 p.m. 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 directions, 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.

PROGRAM INFORMATION

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REGISTRATION INFORMATION

612-625-2900
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CALL FOR PAPERS FOR 2013 CONFERENCE

Deadline for abstract submission for MIPSYCON 2013 is February 4, 2013. Notification of acceptance will be sent by June 2013. If you would like to be considered for the 2013 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 6, 2012, and you would like more information and registration materials go to www.cce.umn.edu/mnpowersystems left-hand link, Exhibitor Information.

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48th Annual Minnesota Power Systems Conference

186338 kf

November 6-8, 2012

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- Enclosed is \$275 in full payment of the conference registration fee (received by October 22).
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Method of Payment

- Enclosed is a check or money order payable to the University of Minnesota.
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