



87th Annual NC Electric Meter School and Grid Technology Conference

Embassy Suites
Kingston Plantation
Myrtle Beach, South Carolina
June 24-28, 2018

go.ncsu.edu/ncems

Offered by the Office of Professional Development
North Carolina State University, Raleigh, North Carolina

Our New Name, Logo and Focus



To celebrate our 87th year, and our commitment to the future, we have updated our logo, our name, and we have added new topics and products related to electric metering and the electrical grid.

Electricity metering has been in existence for over 100 years. Metering has continued to evolve in functionality and complexity over this period. The NC Meter School has long served the purpose of providing a place where the metering discipline, skills, changes, products, and practices are learned and discussed. The industry has progressed with today's technology, and metering interfaces have become varied and often directly related to other grid technologies. The NC Electric Meter School and Grid Technology Conference will continue to be current and proactive.

The North Carolina Electric Meter School and Grid Technology Conference has now expanded and includes topics and products related to electric metering and the electrical grid as follows:

Electricity Metering

All aspects of metering to include installation, removal, testing, maintenance, and management practices. Examples may include any metering quantity measurement for revenue or other operational purposes.

Revenue

Tariffs, rate practices, and other aspects associated with the accurate measurement of electricity. Examples may include any method or equipment to read, record, and/or verify accurate metering.

Communications

Remote communications, including many forms and technology options, related to metering and/or other electrical equipment operations. Examples may include metering and other electrical grid hardware that requires communications between devices or from field to host. May also include modems, fiber, cellular, local, or other means of communications media or methods; tools or equipment.

IT/Computer/Programmable Devices

Metering and other grid operational/support systems or equipment. Examples may include metering devices and associated equipment to upload/download programs/configurations; diagnostic equipment; and associated tools and methods.

Security

Physical, cyber, and data protection options to safeguard the revenue and operational integrity of the electrical system. Examples may include pre- and post-energy tampering security methods and systems.

Renewable/Alternative Energy

Metering interfaces to measure power at these different types of facilities. Examples may include solar, wind or other alternative means of generation.

Generation, Transmission, and Distribution

Equipment and practices associated with any aspect of the electric grid, including but not limited to AMI (advanced metering infrastructure). Examples may include relay; substation; metered data from generation, transmission, and other distribution/grid management systems.

Customer Service

Services or equipment to provide enhanced customer service options for the customer that may be from within the meter or associated metering data, or other services past the meter. Examples may include metering data or pre-pay.

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General Information

Purpose and Mission

The North Carolina Electric Meter School and Grid Technology Conference provides you with an excellent opportunity to learn all aspects of metering in a school environment. The basic principles are provided for metering personnel with interest in single phase or polyphase equipment.

You will gain valuable exposure to metering applications and the processing of information gathered from metering, presented in advanced and management levels of instruction. Advanced and management level attendees will take away knowledge of problems, resources, and solutions helping to meet the changing environment of the electric industry.

Metering and utility personnel can increase their knowledge of substations and distribution equipment through two tracks. Information will be presented from utility experience as well as vendor perspectives.

Annually, the North Carolina Electric Meter School and Grid Technology Conference brings together meter personnel from the electric utility industry to present important information on common problems, standard practices, procedures, and new technologies. The school is open to any and all persons interested in this opportunity.

Attention: Professional Engineers

The North Carolina Electric Meter School and Grid Technology Conference is an approved sponsor of continuing professional competency activities for qualifying North Carolina Professional Engineers and Registered Land Surveyors. Upon course completion, each participant may receive 18 Professional Development Hours (PDHs). **Note: These PDHs are only for participants with a North Carolina Professional Engineering license.**

General Information

About the 87th Conference

The 87th Annual North Carolina Electric Meter School and Grid Technology Conference is coordinated by the Office of Professional Development and will take place June 24-28, 2018. All events will be held at the Embassy Suites at Kingston Plantation, Myrtle Beach, SC.

The program committee attempts each year to design the advanced and management tracks so that individuals find it worthwhile and profitable to attend. The conference includes discussions and presentations on metering practices, new equipment, and new developments.

The single phase and polyphase tracks require a calculator with scientific functions. Individuals planning to attend the single phase or polyphase track are also encouraged to bring a copy of the *Handbook for Electricity Metering* to the school. For information on this publication contact EEI, **202.508.5000**.

Registration & Fees

Registration for the School & Conference will be held in the lobby of the Embassy Suites, Myrtle Beach, SC, from 5:00 – 7:00 p.m. on Sunday, June 24; from 8:00 a.m. – 4:00 p.m. on Monday and Tuesday, June 25 and 26, and 8:00 a.m. – 12:00 p.m. on Wednesday, June 27.

Early bird registration fee: \$445 through May 31
After May 31 and walk-in fee: \$545

The registration fee includes the welcome reception on Sunday evening, networking socials and lunches Monday-Wednesday, breaks Monday-Thursday, and the banquet on Wednesday evening. Additional banquet tickets are available at \$55 each. For youth, ages 15-18, tickets are available at \$25 each. Children under the age of 14 are welcome at no charge.

Single Day: A single day registration fee is available at \$325 per person per day (includes lunch on that day, except Thursday).

More Information: For more information or to register online, visit the conference website at go.ncsu.edu/ncems

If you are a person with a disability and desire any assistive devices, services, or other accommodations to participate in this course, please contact the Office of Professional Development at **919.515.2261** or email **ContinuingEducation@ncsu.edu** to discuss your needs at least 2 weeks in advance of the program.

Cancellation & Substitution

If your plans should change, you may designate a substitute to attend in your place at any time. In the event that you need to cancel your registration, you may do so with a full refund if you inform us by email by June 12. **No reimbursement will be made for cancellations made after June 12 or if you fail to attend.** Non-paid no shows who registered by phone, fax, internet, or mail will be billed.

Reference Standard Calibration Check

An added benefit is being offered to you during the conference at no additional charge. After registering, and while attending the conference, please stop by the **Harrow** room reserved by Radian Research/WECO to have your reference standard(s) tested against a Radian NIST traceable 0.01% reference standard. You will receive a printed and/or electronic "Report of Calibration" which provides the accuracy of your standard at all common loading conditions.

If you think you are up to the challenge, test your meter calibration knowledge by taking a fun quiz. In addition, receive a packet explaining the importance of regular calibration of your equipment.

Banquet

An 87th anniversary banquet for conference participants and their guests will be held on Wednesday evening, June 27, at the Embassy Suites. The banquet is included in the registration fee. Guest tickets are available at \$55 each. Youth tickets for those ages 15-18 are available for \$25 each. Tickets for children **up to age 14** are available at no fee. Dress is casual. A social will begin at 6:00 p.m. followed by the banquet at 7:00 p.m.

Accommodations

Headquarters for the 2018 North Carolina Electric Meter School and Grid Technology Conference will be:

Embassy Suites Hotel at Kingston Plantation

9800 Queensway Blvd.
Myrtle Beach, SC 29572

Kingston Plantation offers a variety of accommodations. (Lodging is NOT included in the registration fee.) To review the various types of accommodations and to make reservations online, please visit go.ncsu.edu/ncems and click on the Accommodations tab.

After reviewing the options online, if you prefer, you may call 800.876.0010 and mention code NCE to receive special NC Electric Meter School rates. The room block will be released on May 25 unless it fills prior to the release date.

General Information

Steering Committee Mission Statement

To represent the planning committee as a working group with a mission to guide the School, its programs, and its activities in a way deemed appropriate by the planning committee and in the best interest of the North Carolina Electric Meter School and Grid Technology Conference.

Steering Committee

Chairperson: Rusty Mutschink
Vice Chairperson: Craig Shoaf
Secretary/Treasurer: Connie McElroy-Bacon

COMMITTEES	CHAIRPERSON	VICE CHAIRPERSON(S)
Single Phase	Clare Bargerstock	Mike Byrd
Polyphase	Chad Cooper	Jimmy Grubbs Jeff Plesur
Advanced	Rusty Mutschink	Tony Horton
Management	Kenneth McCraw	Jimmy Green
Substations (Basic)	Curtis Craig	Bob Wilcox
Substations (Advanced)	John Maclaga	Bob Wilcox
Emerging Technologies	Tony Horton	Garey Edwards Angela Hare
Facilities	Tony Horton	Connie McElroy-Bacon Jimmy Green
Hall of Fame	Bob Kelly	Tony Horton
Mfrs./Hospitality	Craig Shoaf	Bob Kelly Randy Riley Jeff Lewis
Banquet/Entertainment	Connie McElroy-Bacon	James Williamson
Members at Large	Sean Dempsey Dean Williams	

Conference Tracks

SINGLE PHASE

The single phase track is designed for the entry-level person. Classes are designed to provide a basis for understanding metering principles, power and to complement the participant's metering skills gained on the job. Sessions offered cover overviews of a power system, basic math, AC and DC theory, meter testing safety and all areas related to single phase meters. The classes are designed to prepare participants for the next level of classes relating to polyphase meters.

POLYPHASE

The polyphase track is designed for the purpose of providing participants with an overview of the basic information needed to understand polyphase metering. This session covers selection, installation, and maintaining polyphase meters. The session provides training on programming polyphase meters. Participants also will receive training in the selection, use, and maintenance of current and voltage transformers.

ADVANCED

The advanced track includes topics on complex metering theory and concepts, high-end metering applications, power quality, remote metering communication methods and other advanced metering applications, tools and equipment. Individuals that have previous metering experience or education should attend this session.

MANAGEMENT

The management track provides information about the newest technologies, current industry trends, day to day operational issues, as well as updates on new technology implementation projects. This track is ideal for professionals and managers who want to learn more about the metering industry, where it is headed and current challenges.

BASIC SUBSTATION & DISTRIBUTION PRINCIPLES

This track is designed to provide entry-level knowledge of substations and distribution systems. It is ideal for substation personnel with less than two years' experience or meter technicians who work occasionally in substations. Classes cover the fundamentals of substation construction, proper grounding, electrical layout, and the purpose for typical equipment in a substation. Examples include safety, station power transformers, batteries, circuit breakers, capacitors, switches, voltage regulators, basic communications, metering, and other miscellaneous components found in most substations. Classes are also offered to cover distribution system operation and the various types of equipment used.

Conference Tracks (continued)

ADVANCED SUBSTATION & DISTRIBUTION CONCEPTS

This track is geared towards experienced substation and meter technicians as well as supervisors and managers who maintain, repair, and/or oversee the daily operation of substations. Classes cover advanced calibration, maintenance and repair of station equipment as well as troubleshooting techniques of station components. Included are classes on remote communication controls, SCADA, grounding, oil testing, welding, relays, voltage reduction, security protocols, lightning protection, IEEE and OSHA requirements, AMI equipment, infrared, and high frequency testing. Classes are also offered to cover various distribution system operation methods and techniques, and various types of equipment used.

EMERGING TECHNOLOGIES

The Emerging Technologies Track provides an opportunity to explore how electric metering and the overall electric grid are working together in a variety of ways. New technologies, methods, tools, equipment, and challenges will be discussed. In addition to revenue metering as part of the overall electric grid this session will include a forum for Security, Renewables/Alternative Energy, Communications, IT/Computer/Programmable Devices, and Customer Service issues.

Conference Schedule

Sunday, June 24, 2018

- 2:00 p.m. Begin Vendor Set-up – Embassy Suites, Kensington Ballroom
- 5:00–7:00 p.m. Registration – Embassy Suites Lobby
- 6:00–7:00 p.m. Welcome Reception – Kensington Ballroom

Monday, June 25, 2018

General Session

- Presiding: Rusty Mutschink, Central Electric Power
- 9:00 a.m. **Welcome to the School**
Rusty Mutschink, Central Electric Power
- Presentation of Colors**
Carolina Forest High School ROTC
- Opening Comments**
Connie McElroy-Bacon, Conference Manager,
NC State University
- 9:30 a.m. **Welcome from NC State University Continuing Education**
Alice Warren, Vice Provost for Continuing Education,
NC State University
- 9:45 a.m. **Grid Security**
Slade Griffin, Contextual Security
- 10:45 a.m. **Break**
- 11:00 a.m. **Post AMI, What's Next?**
Jim Weikert, Power Systems Engineering
- 12:00 a.m. **Lunch**
- Presiding: Rusty Mutschink, Central Electric Power
- 1:00 p.m. **Internet of Things**
Steven Collier, Milsoft
- 2:30 p.m. **Break**
- 2:45 p.m. **Single Phase, Polyphase, Advanced, Basic Substation
& Distribution, and Advanced Substation & Distribution
Sessions Begin**
- 2:45 p.m. **Management, Visit Vendors**
- 4:15 p.m. **Networking Social in the Exhibit Area**

Conference Schedule

Monday (continued)

Track Sessions Begin

SINGLE PHASE

- Presiding: Clare Bargerstock, Northern Virginia Electric Cooperative
- 2:45 p.m. **Overview of a Power System**
Clare Bargerstock, Northern Virginia Electric Cooperative
- 4:15 p.m. **Networking Social in Exhibit Area**

POLYPHASE

- Presiding: Chad Cooper, SCE&G;
Jeff Plesur, Rappahannock Electric Cooperative
- 2:45 p.m. **History of Electric Metering**
Tom Lawton, TESCO
- 4:15 p.m. **Networking Social in the Exhibit Area**

ADVANCED

- Presiding: Rusty Mutschink, Central Electric Power Cooperative
- 2:45 p.m. **AMI Fundamentals: Grid to Customer**
Chris Prince, Aclara
- 4:15 p.m. **Networking Social in the Exhibit Area**

MANAGEMENT

- 2:45 p.m. **Visit Vendors**
- 4:15 p.m. **Networking Social in the Exhibit Area**

SUBSTATION & DISTRIBUTION BASIC

- Presiding: Curtis Craig, Shenandoah Valley Electric Cooperative
- 2:45 p.m. **Substation Site Selection**
Chris Jones, Booth & Associates
- 4:15 p.m. **Networking Social in the Exhibit Area**

SUBSTATION & DISTRIBUTION ADVANCED

- Presiding: John Maclaga, City of Statesville
- 2:45 p.m. **Lightning Round**
Various speakers, 5 minutes or less per speaker
- 4:15 p.m. **Networking Social in the Exhibit Area**

EMERGING TECHNOLOGIES

- 2:45 p.m. **Visit Vendors**
- 4:15 p.m. **Networking Social in the Exhibit Area**

Tuesday, June 26, 2018

SINGLE PHASE

- Presiding: Mike Byrd, ElectriCities,
(Retired)
- 8:00 a.m. **Basic Meter Math**
John Jones, Powermetrix
- 9:00 a.m. **Basic AC Electricity**
Carl Chermak, Aclara
- 10:00 a.m. **Break**
- 10:15 a.m. **DC Theory**
Randy Riley, Landis + Gyr
- 12:00 p.m. **Lunch**
- Presiding: Brady Hidell, WESCO
- 1:00 p.m. **Meter Testing 101**
Tom Lawton, TESCO
- 2:00 p.m. **Watt-hour Meter Principles
and Components**
Tom Van Valkenburgh,
Radian
- 3:00 p.m. **Break**
- 3:15 p.m. **Introduction to Watt-hour
Meter Testing**
John Jones, Powermetrix
- 4:15 p.m. **Adjourn/Networking
Social in the Exhibit Area**

POLYPHASE

- Presiding: Jeff Plesur, Rappahannock
Electric Cooperative
- 8:00 a.m. **Introduction to Polyphase
Metering**
Carl Chermak, Aclara
- 9:00 a.m. **Metering Terms**
Joe Ostrowsky, AMETEK
- 10:00 a.m. **Break**
- 10:15 a.m. **AC Theory**
Steve Hudson, Powermetrix
- 11:00 a.m. **Principles and Applications
of Polyphase Metering**
Mike Corbin, Honeywell
Elster
- 12:00 p.m. **Lunch**
- Presiding: Mike Gaston, WESCO
- 1:00 p.m. **Visit Vendors**
- 2:15 p.m. **Design Basics and
Understanding the
Accuracy of Instrument
Transformers**
Roger Lapay, ABB
- 3:30 p.m. **Break**
- 3:45 p.m. **Introduction to Power
Quality**
Steve Hudson, Powermetrix
- 4:15 p.m. **Adjourn/Networking
Social in the Exhibit Area**

Conference Schedule

Tuesday (continued)

ADVANCED

- Presiding: Trey Brown, Anixter
- 8:00 a.m. **Troubleshooting with Phasors**
Chris Prince, Aclara
- 8:45 a.m. **Multi-functioning Metering**
Randy Riley, Landis+Gyr
- 9:30 a.m. **Integrated Site Test**
John Jones, Powermetrix
- 10:15 a.m. **Break**
- 10:30 a.m. **Accurate Energy Measurement in the Presence of Real World Distorted Waveforms**
Pete Dack, Radian
- 11:15 a.m. **Demand Response Real Life Benefits**
Michael Logue, Sensus
- 12:00 p.m. **Lunch**
- Presiding: Mike King, Brooks Utility
- 1:00 p.m. **4 Quadrant Metering**
Michael Bearden, Landis+Gyr
- 1:45 p.m. **21st Century Power Measurement**
Bill Hardy, TESCO
- 2:30 p.m. **Break**
- 2:45 p.m. **Benefits of a Smart Meter**
Tina Pampanelli, Itron
- 3:30 p.m. **Visit Vendors**
- 4:15 p.m. **Adjourn/Networking Social in the Exhibit Area**

MANAGEMENT

- Presiding: Kenneth McCraw, Duke Energy
- 8:00 a.m. **Post AMI - Meter Audits / Site Surveys**
Randy Watson, Bellwether Management Solutions
- 8:45 a.m. **AMI Meter Certification Before, During, and After Deployment**
Tom Lawton, TESCO
- 9:30 a.m. **Beyond the Hype: Getting More Value from Your AMI Data**
Sean Dempsey, WESCO
- 10:15 a.m. **Break**
- 10:30 a.m. **Mitigating Customer RF Concerns—How to Deal with Customers that do not want an RF Meter—Round Table Discussion**
Clare Bargerstock, Northern Virginia Electric Cooperative; Tim Overbee, Duke Energy; Tina Pampanelli, Itron; Jimmy Green, Brunswick Electric
- 12:00 p.m. **Lunch**
- Presiding: Sean Dempsey, WESCO
- 1:00 p.m. **Consideration of Adding AMI to Distribution Transformers**
John Kretzchmar, SAMSCO
- 1:45 p.m. **Benefits of a Disconnect Switch**
Tina Pampanelli, Itron
- 2:30 p.m. **Break**

Tuesday (continued)

MANAGEMENT (continued)

2:45 p.m. **How Has Next Generation AMI Changed Your Business Model—Round Table Discussion**

Angela Hare, Central Electric Membership Corp; Rusty Mutschink, Central Electric Power; Clare Bargerstock, Northern Virginia Electric Cooperative; Brad Kusant, Itron; Bob Wilcox, Rappahannock Electric Cooperative (Retired)

4:15 p.m. **Adjourn/Networking Social in the Exhibit Area**

SUBSTATION & DISTRIBUTION BASIC

Presiding: Ron Culp, Chapman Co.

8:00 a.m. **Key Elements of Distribution Design (NESC)**
Bill Jordan, Booth & Associates

8:45 a.m. **Substation - What is it?**
Don Seay, KCI

9:30 a.m. **Properly Sizing Distribution Transformers & Services**
Bill Jordan, Booth & Associates

10:15 a.m. **Break**

10:30 a.m. **Basics of Distribution and Power Transformers**
Don Seay, KCI

11:15 a.m. **Voltage Regulators and Controls**
Roger Munay, Eaton Cooper Power Systems

12:00 p.m. **Lunch**

Presiding: Joe Driscoll, Brooks Utilities

1:00 p.m. **Basic Substation Transformer Protection**

Brett Cockerham, Schweitzer Engineering Labs

1:45 p.m. **How to Correctly do Transformer Oil Sampling**

Bob Wilcox, Rappahannock Electric Cooperative (Retired)

2:30 p.m. **Break**

2:45 p.m. **Basics of Differential Protection and its Application in Distribution System**

Vijay Shanmugasundaram, Megger

3:30 p.m. **Introduction to Transformer Testing**

Will Knappek, OMICRON

4:15 p.m. **Adjourn/Networking Social in the Exhibit Area**

SUBSTATION & DISTRIBUTION ADVANCED

Presiding: Joel Valley, Fayetteville PWC

8:00 a.m. **Flatten Voltage Profile and Minimize VAR Flow to Improve Bottom Line**
Phil Smith, Eaton

8:45 a.m. **Securing Substation Communications**
Phil Smith, Eaton

9:30 a.m. **Substation Security Design, Trends & Technology**
Bob Wilcox, Rappahannock Electric Cooperative (Retired); Ashley Rose, ANIXTER

Conference Schedule

Tuesday (continued)

SUBSTATION & DISTRIBUTION ADVANCED (continued)

10:15 a.m. **Break**

10:30 a.m. **High-Voltage Instrument Transformers**
Scott Flowers, Ritz
Instrument Transformers

11:15 a.m. **Power Transformer Protection**
Paul Smith, GE

12:00 p.m. **Lunch**

Presiding: Jeff Lewis, PowerTech

1:00 p.m. **Comprehensive Transformer Condition Assessment**
Don Seay, KCI

1:45 p.m. **Transformer Monitoring**
Jonathan Scott, PrimeStone
Technology

2:30 p.m. **Break**

2:45 a.m. **Visit Vendors**

3:30 p.m. **Beyond Smart Metering... Intelligent Metering**
Scott Laster, Schneider
Electric

4:15 p.m. **Adjourn/Networking Social in the Exhibit Area**

EMERGING TECHNOLOGIES

Presiding: Tony Horton, Duke Energy
(Retired)

8:00 a.m. **Introduction to Smart Grid**
Sean Dempsey, WESCO

8:45 a.m. **The Active Grid**
Bryan Seal, Itron

9:30 a.m. **Grid Modernization**
Jim Musilek, NCEMC

10:15 a.m. **Break**

10:30 a.m. **Distribution Intelligence**
Kent Hedrick, Landis+Gyr

11:15 a.m. **Distribution Automation/AMI Convergence**
Drue Merkle, Honeywell
Elster

12:00 p.m. **Lunch—Lakeside Pavilion**

Presiding: Eric Layman, DC Technology

1:00 p.m. **AMI's Evolution to IoT Platform**
Kent Hedrick, Landis+Gyr

1:45 p.m. **Distribution Power Quality/Unconventional Metering**
Juan Diaz, Satec

2:30 p.m. **Break**

2:45 p.m. **How Utilities Benefit from the Implementation of a Centralized Secure IED Management System**
Phil Smith, Eaton

3:30 p.m. **Field Results from Active Control at the Distribution Transformer, Enabling Opportunities for New Rates, Services, Customers, and Revenue.**
Chad Eckhardt (and a NC/SC Co-op) where we have field installs, ERMCO-GridBridge

4:15 p.m. **Adjourn/Networking Social in the Exhibit Area**

Wednesday, June 27, 2018

SINGLE PHASE

- Presiding: Shane Hilton, Anixter
- 8:00 a.m. **Introduction To Meter Sockets**
Greg Tyre, Nick Candler,
The Durham Company
- 9:00 a.m. **Understanding the Basics of Instrument Transformers**
Roger Lapay, ABB
- 10:00 a.m. **Break**
- 10:15 a.m. **Visit Vendors**
- 11:00 a.m. **Programming Workshop for Single Phase Meters**
Scott Finley, National
Transformer Sales
- 12:00 p.m. **Lunch**
- Presiding: Scott Owens, GE
- 1:00 p.m. **Programming Workshop for Single Phase Meters**
(continued)
Steve Wright, Itron
- 2:00 p.m. **Break**
- 2:15 p.m. **Programming Workshop for Single Phase Meters**
(continued)
Chris Prince, Aclara
- 3:15 p.m. **Programming Workshop for Single Phase Meters**
(continued)
Dan Riddle, Honeywell
Elster
- 4:15 p.m. **Adjourn**
- 6:00 p.m. **Networking Social**
- 7:00 p.m. **Banquet**

POLYPHASE

- Presiding: Jack Pyburn, Honeywell
Elster
- 8:00 a.m. **CT Testing - Theory & Practice**
Bill Hardy, TESCO
- 9:00 a.m. **ANSI Meter Forms**
Carl Chermak, Aclara
- 9:45 a.m. **Break**
- 10:00 a.m. **Programming Polyphase Meters-Session 1**
Vendor Rooms —
Itron, Aclara, Honeywell
Elster, Landis+Gyr
- 11:00 a.m. **Programming Polyphase Meters-Session 2 -**
Vendor Rooms —
Itron, Aclara, Honeywell
Elster, Landis+Gyr
- 12:00 p.m. **Lunch**
- Presiding: Bob Whitmore, Radian
Research
- 1:00 p.m. **Introduction to Vector Diagrams**
John Jones, Powermetrix
- 2:00 p.m. **Demand and TOU Metering**
Jack Pyburn, Honeywell
Elster
- 3:00 p.m. **Break**
- 3:15 p.m. **Reference Standards & Traceability**
Raeann Miller, Radian
Research

Conference Schedule

Wednesday (continued)

POLYPHASE (continued)

- 4:15 p.m. **Adjourn**
- 6:00 p.m. **Networking Social**
- 7:00 p.m. **Banquet**

ADVANCED

- Presiding: Rick Wathern, WESCO
- 8:00 a.m. **Measuring and Proving Test Accuracy**
Tom Van Valkenburg, Radian
- 8:45 a.m. **KYZ Pulse Metering, Ke Values and Isolation Relays**
Bill Brayden, Brayden Automation Corp/Solid State Instruments
- 9:30 a.m. **Harmonics in Metering**
Steve Hudson, Powermetrix
- 10:15 a.m. **Break**
- 10:30 a.m. **Ratio, Burden, and Admittance**
Tom Lawton, TESCO
- 11:15 a.m. **Meter Communications**
Steve Wright, Itron
- 12:00 p.m. **Lunch**
- Presiding: Mike King, Brooks Utility
- 1:00 p.m. **Metering Best Practices**
Kevin Hawk, Reliable Meter Service

- 1:45 p.m. **Sizing Instrument Transformers for Most Accurate Metering Performance**
Frank Lopez, GE

- 2:30 p.m. **Break**

- 2:45 p.m. **Power Transformer Losses**
Michael Bearden, Landis+Gyr

- 3:30 p.m. **Basics of Grounding**
Chris Prince, Aclara

- 4:15 p.m. **Adjourn**

- 6:00 p.m. **Networking Social**

- 7:00 p.m. **Banquet**

MANAGEMENT

- Presiding: Brian Jehle, Inner-tite
- 8:00 a.m. **Economics for Meter Site Testing**
Steve Hudson, Powermetrix
- 8:45 a.m. **Street Light Meter Testing**
Pete Dack, Radian
- 9:30 a.m. **How to Hire and Train the Right Employee for Meters and Metering Technologies**
Tom Lawton, TESCO
- 10:15 a.m. **Break**
- 10:30 a.m. **Residential and Commercial Customer Peak Demand Control**
Bill Brayden, Brayden Automation Corp/Solid State Instruments

Wednesday (continued)

MANAGEMENT (continued)

- 11:15 a.m. **Cellular Communications for Utilities**
John Kretzchmar, SAMSCO
- 12:00 p.m. **Lunch**
Presiding: Tim Overbee, Duke Energy
- 1:00 p.m. **Meter Asset Management 101**
TBD, Radian
- 1:45 p.m. **21st Century Power Measurement**
Bill Hardy, TESCO
- 2:30 p.m. **Break**
- 2:45 p.m. **LoRa Alliance Low Power WAN for IoT and Metering Applications**
Bill Smith, Vision Metering
- 3:30 p.m. **Troubleshooting with AMI Data**
Jeff Dargen, Duke Energy
- 4:15 p.m. **Adjourn**
- 6:00 p.m. **Networking Social**
- 7:00 p.m. **Banquet**

SUBSTATION & DISTRIBUTION BASIC

- Presiding: Jerry Aubin, Chapman Co
- 8:00 a.m. **Reclosers & Fuses**
Roger Munay, Eaton Cooper Power Systems
- 8:45 a.m. **Understanding the Basics of Recloser Protection**
Vijay Shanmugasundaram, Meggar
- 9:30 a.m. **Basics of Protective Relay Testing**

Michael Kleman, Manta Test Systems

- 10:15 a.m. **Break**
- 10:30 a.m. **Relaying Zones of Protection**
Paul Smith, GE
- 11:15 a.m. **Dielectric Frequency Response Testing**
Wes Schrom, Carolina Dielectric
- 12:00 p.m. **Lunch—Lakeside Pavilion**
Presiding: Craig Shoaf, National Transformer
- 1:00 p.m. **Capacitors and Capacitor Controls**
Roger Munay, Eaton Cooper Power Systems
- 1:45 p.m. **Basics of Surge Arresters**
Don Seay, KCI
- 2:30 p.m. **Break**
- 2:45 p.m. **Wildlife Mitigation**
Todd Kerr, Power Line Sentry
- 3:30 p.m. **Circuit Breaker Testing Basics**
Will Knappek, OMICRON
- 4:15 p.m. **Adjourn**
- 6:00 p.m. **Networking Social**
- 7:00 p.m. **Banquet**

Conference Schedule

Wednesday (continued)

SUBSTATION & DISTRIBUTION ADVANCED

Presiding: Perry Godwin, Chapman Co

8:00 a.m. **Relay Testing of
Microprocessor Relays**
Will Knapek, OMICRON

8:45 a.m. **Applying Faulted Circuit
Transmitters for Faster
Distribution Protection**
Brett Cockerham ,
Schweitzer Engineering Labs

9:30 a.m. **Protection and
Coordination
Considerations For Solar
Sites on the Distribution
Power System**
John Town, Schweitzer
Engineer Labs

10:15 a.m. **Break**

10:30 a.m. **Online Monitoring
Signatures of High Voltage
Equipment Failures**
Mark Tostrud, Dynamic
Ratings

11:15 a.m. **Secure Direct Transfer Trip
(DTT) Case Study Using
Cellular Communication**
Andre Smit, Siemens

12:00 p.m. **Lunch—Lakeside Pavilion**

Presiding: Dee Byrd, WR Daniel

1:00 p.m. **Report 6 Years of New
Diff Prot on Distribution
Feeders**
Andre Smit, Siemens

1:45 p.m. **SCADA Implementation**
Richard Auerweck, Survalent

2:30 p.m. **Break**

2:45 p.m. **Introduction to Partial
Discharge Testing**
Tim Erwin, EA Technology,
LLC

3:30 p.m. **Substation Design
Options**
Mike Taylor, Power Services

4:15 p.m. **Adjourn**

6:00 p.m. **Networking Social**

7:00 p.m. **Banquet**

EMERGING TECHNOLOGIES

Presiding: Tony Horton, Duke Energy
(Retired)

8:00 a.m. **Ocracoke NC Micro Grid-
Learn How It Worked
During a Main Tie Line Cut
in Summer 2017**
Jim Musilek, NCEMC

8:45 a.m. **Lessons Learned From
Implementation of
Microgrid on 15kV Feeder
at Duke Energy**
Aleksandar Vukojevic, Duke
Energy

9:30 a.m. **Designing Smart Grid
Communication Networks
for Economics and
Performance**
Emma Ritch, ABB Wireless

10:15 a.m. **Break**

Wednesday (continued)

EMERGING TECHNOLOGIES (continued)

10:30 a.m. **Protection Considerations for Solar Farm Connections**
Don Seay, KCI

11:15 a.m. **PV Solar Plant Studies: A Utility Perspective**
Court Weathers, Booth & Associates

12:00 p.m. **Lunch**

Presiding: Jon Scott, Primestone

1:00 p.m. **Solar Farm Inverter Response During Distribution System Disturbances**
John Town, Schweitzer Engineering Labs

1:45 p.m. **The Use of Smart Glasses in Electric Utility O&M Activities**
Aleksandar Vukojevic , Duke Energy

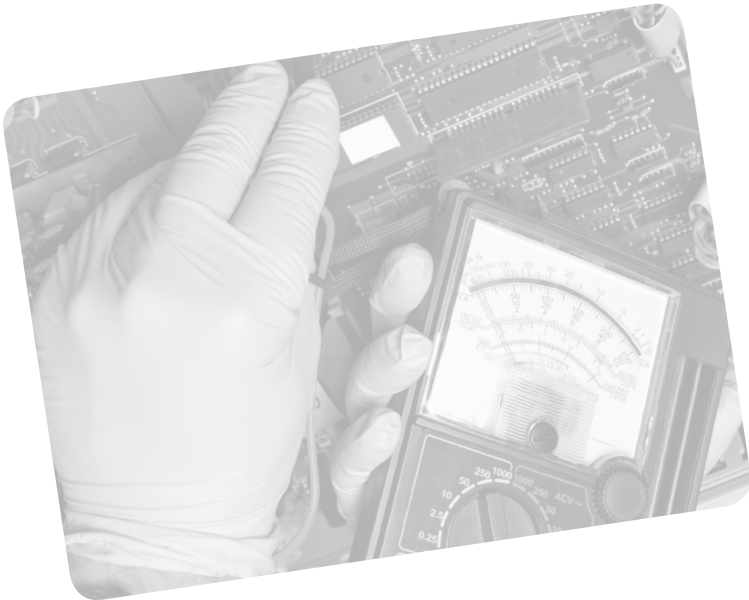
2:30 p.m. **Break**

2:45 p.m. **Street Lights - A New Metering Frontier**
Tom Lawton, TESCO

3:30 p.m. **Visually Presenting AMI Data-Learn How to Use Your GIS System to Visually Display AMI Data**
Paul Reavis, Reavis Code

6:00 p.m. **Networking Social**

7:00 p.m. **Banquet**



Conference Schedule

Thursday, June 28, 2018

SINGLE PHASE

Presiding: Tim Overbee, Duke Energy

8:00 a.m. **Instrument Transformers Basics**
Roger Jerez, Artech USA

9:00 a.m. **Current Metering Safety Topics**
Tom Lawton, TESCO

10:00 a.m. **Potential Career Paths in Electric Metering**
Jeff Lewis, PowerTech

10:45 a.m. **Break**

11:15 a.m. **All Sessions Combine into General Session**

POLYPHASE

Presiding: Matt Fisher, WESCO

8:00 a.m. **Understanding Transformer Banking**
Clare Bargerstock, Northern Virginia Electric Cooperative

9:00 a.m. **AMI Meter Sensor Data and Applications**
Mike Osterhout, Landis+Gyr

10:00 a.m. **Break**

10:15 a.m. **KYZ Pulse Metering**
Bill Brayden, Brayden Automation Corp/Solid State Instruments

11:15 a.m. **All Sessions Combine into General Session**

ADVANCED

Combined Session
(See Advanced/Management/Emerging Technologies Sessions Agenda)

ADVANCED/MANAGEMENT/ EMERGING TECHNOLOGIES COMBINED SESSION

Presiding: Keith McAteer, GE Energy Connections

8:00 a.m. **Electric Vehicle Chargers: An Exploding Energy Market**
Bill Hardy, TESCO

8:45 a.m. **ANSI C12 Standards Update**
Steve Hudson, Powermetrix

9:30 a.m. **Why Use Extended Range CTs**
Frank Lopez, GE

10:15 a.m. **Challenges for Meter Shop Operations of the Future**
Tom Lawton, TESCO

11:00 a.m. **Break**

11:15 a.m. **All Sessions Combine into General Session**

SUBSTATION & DISTRIBUTION BASIC

Presiding: Curtis Craig, Shenandoah Valley Electric Cooperative

8:00 a.m. **Substation Battery Testing**
Wes Schrom, Carolina Dielectric

8:45 a.m. **Substation Inspections**
Don Seay, KCI

9:30 a.m. **Feeder Automation Basics**
Phil Smith, Eaton

10:15 a.m. **Metering Applications in Distribution Systems**
John Town, Schweitzer Engineering Labs

Thursday (continued)

SUBSTATION & DISTRIBUTION

BASIC (continued)

- 11:00 a.m. **Break**
- 11:15 a.m. **All Sessions Combine into General Session**

SUBSTATION & DISTRIBUTION ADVANCED

- Presiding: John Maclaga, City of Stateville
- 8:00 a.m. **Substation Intelligence: Beyond the RTU**
Court Weathers, Booth & Associates
- 8:45 a.m. **Vacuum and SF6 Breaker Maintenance**
Tony Conte, ABB HV Service Group

- 9:15 a.m. **Substation Switches**
Lon Hamilton, Southern States
- 9:45 a.m. **Substation Switch Design and Standards**
Rob Ross, Cleaveland Price
- 10:30 a.m. **Innovative Approach to Environmental Conditions**
Randy Zacharias, MindCore
- 11:00 a.m. **Break**
- 11:15 a.m. **All Sessions Combine into General Session**

EMERGING TECHNOLOGIES

Combined Session
(See Advanced/Management/Emerging Technologies Sessions Agenda on page 22 after ADVANCED.)

General Session

- Presiding: Rusty Mutschink, Central Electric Power
- 11:15 a.m. **Traffic Safety**
Eric Mellott,
NC Highway Patrol
- 12:00 p.m. **Participant Feedback on the School**
Closing Comments
Adjourn

Conference Schedule

Manufacturer Programming Sessions

TUESDAY, JUNE 26

8:00 a.m.	_____	Eton
	_____	Oxford
	_____	Pembroke
	_____	Winchester
	Radian/WECO: Calibration Check _____	Harrow
10:00 a.m.	Schneider _____	Eton
	Probewell _____	Oxford
	TESCO _____	Pembroke
	Aclara _____	Winchester
	Radian/WECO: Calibration Check _____	Harrow
12:00 p.m.	Lunch	
1:00 p.m.	SMC _____	Eton
	_____	Oxford
	TESCO _____	Pembroke
	_____	Winchester
	Radian/WECO: Calibration Check _____	Harrow
3:00 p.m.	_____	Eton
	_____	Oxford
	TESCO _____	Pembroke
	_____	Winchester
	Radian/WECO: Calibration Check _____	Harrow
5:00 p.m.	Adjourn	

WEDNESDAY, JUNE 27

8:00 a.m.	_____	Eton
	_____	Oxford
	TESCO _____	Pembroke
	_____	Winchester
	Radian/WECO: Calibration Check _____	Harrow
10:00 a.m.	Programming Session: Itron _____	Eton
	Programming Session: Aclara _____	Oxford
	Programming Session: Honeywell Elster _____	Kensington A
	Programming Session: Landis+Gyr _____	Winchester
	Radian/WECO: Calibration Check _____	Harrow
	_____	Pembroke
12:00 p.m.	Lunch	
1:00 p.m.	_____	Eton
	_____	Oxford
	TESCO _____	Pembroke
	Schweitzer Engineering Labs, Inc. _____	Winchester
	Radian/WECO: Calibration Check _____	Harrow
3:00 p.m.	_____	Eton
	_____	Oxford
	TESCO _____	Pembroke
	Schweitzer Engineering Labs, Inc. _____	Winchester
	Radian/WECO: Calibration Check _____	Harrow
5:00 p.m.	Adjourn	

Conference Support

2018 Program Committee

Amiss, Jim	Ensales, Inc., Beulaville, NC	McElroy-Bacon, Connie	NC State University, Raleigh, NC
Bargerstock, Clare	Northern Virginia Electric Cooperative, Manassas, VA	Murray, Fred	Ensales, Beulaville, NC
Byrd, Mike	Electricities (Retired), Raleigh, NC	Mutschink, Rusty	Central Electric Power Cooperative, Columbia, SC
Candler, Nick	The Durham Company, Lebanon, MO	Overbee, Tim	Duke Energy, Pine Level, NC
Chermak, Carl	Aclara, Syracuse, NY	Plesur, Jeff	Rappahannock Electric Cooperative, Fredericksburg, VA
Cooper, Chad	SCE&G, West Columbia, SC	Plexico, Ben	Harvey Plexico Inc., Columbia, SC
Craig, Curtis	Shenandoah Valley Electric, Mt. Crawford, VA	Prince, Christopher	Aclara, Atlanta, GA
Culp, Ronald	Chapman Company, Charlotte, NC	Purcell, William	Meter Treater, Lake Park, FL
Dempsey, Sean	WESCO Distribution, Raleigh, NC	Pyburn, Jack	Honeywell, New Bern, NC
Diaz, Juan	Satec, Union, NJ	Riley, Randy	Landis+Gyr, Gastonia, NC
Diebold, Garry	USAT, Chapel Hill, NC	Scott, Jon	PrimeStone, Alpharetta, GA
Driscoll, Joe	Brooks UPG, Novi, MI	Shoaf, Craig	NTS, Raleigh, NC
Edwards, Garey	City of High Point, High Point, NC	Steinberger, John	Verizon, Charlotte, NC
Farmer, Kyle	Marwell Inc., Radford, VA	Stevens, Mike	DeWalch, Houston, TX
Green, Jimmy	Brunswick EMC, Shallotte, NC	Tarver, James	American Meter Program Services, Joanna, SC
Grubbs, Jimmy	SCE&G (Retired), Columbia, SC	Tarver, Toby	American Meter Program Services, Joanna, SC
Hardy, Bill	TESCO, Knoxville, TN	Tollison, Tony	Laurens Electric Coop, Laurens, SC
Hidell, Brady	WESCO Distributing, Clayton, NC	Town, John C	Schweitzer Engineering Labs, Inc., Charlotte, NC
Hilton, Shane	Anixter, Wake Forest, NC	Trye, Greg	The Durham Company, Lebanon, MO
Horton, Tony	Duke Energy (Retired), Wendell, NC	Valley, Joel	Fayetteville PWC, Fayetteville, NC
Hudson, Steve	Powermetrix, Knoxville, TN	Waters, Larry	GE Energy Connections (Retired), Johns Creek, GA
Jehle, Brian	Inner-Tite Corp., Holden, MA	White, Vernon	TESCO-The Eastern Specialty Co., Bristol, PA
Jones, Barry	Ensales, Beulaville, NC	Whitmore, Bob	Radian Research, Inc., Lafayette, IN
Kelly, Bob E.	RW Chapman (Retired), Raleigh, NC	Wilcox, Bob	Rappahannock Electric Cooperative, (Retired), Fredericksburg, VA
King, Mike	Brooks UPG, Gainesville, GA	Williams, Dean	Duke Energy (Retired), Myrtle Beach, SC
Kretzschmar, John	SAMSCO, Boiling Springs, SC	Wilson, Benja	Mid Carolina Electric Cooperative, Lexington, SC
Lawton, Tom	TESCO, Bristol, PA	Wilson, Robert	Ensales, Inc., Unicoi, TN
Lewis, Jeff	PowerTech LLC, Waxhaw, NC	Wright, Steve	Itron, West Union, SC
Lopez, Frank	GE Energy Connections, Odessa, FL		
Maclaga, John	City of Statesville, Statesville, NC		
McCraw, Kenneth	Duke Energy, Charlotte, NC		

2017 Exhibitors

Exhibitor

Aclara
American Meter Program Services
Ametek Power Instruments
Anixter Inc.
ARTECHE
AZZ Enclosure Systems
Bellwether Management Solutions
Brooks UPG
Burndy
Chapman Co.
DC Technology Inc.
DeWalch
Eaton Power Systems
Electro Industries/GaugeTech
Ensales
EUS
FLIR Systems
GE Grid Automation
GE Grid Solutions
Harvey Plexico Inc.
Highfield Manufacturing
Honeywell Elster
Hubbell/SWI
ICMI, Member Reinhausen Group
IFD Corporation
Inner-Tite Corp
Irby Utilities
ITEC
Itron
Jake Rudisill Associates, Inc.
KCI Associates
Landis+Gyr
Marwell
Megger
Milbank Manufacturing Co
NaturChem, Inc.
NTS
Peak Demand Inc.

Exhibitor

Power Line Sentry, LLC
POWER SALES & SERVICE
Powermetrix
PowerSolve
PowerTech
PrimeStone Technologies, Inc.
Probewell Lab Inc.
Radian Research
Reliable Meter Service
Ritz Instrument Transformers, Inc.
Safearth
SAMSCO
SATEC
Schneider Electric
Schweitzer Engineering Laboratories
Sensus
Service Electric Co.
Shealy Electrical-A Division of Border States
Silver Spring Networks
SMC
Solid State Instruments/Brayden
Automation
Southwest Electric Co.
Spinlab Utility Instrumentation Inc.
SUSI Adapters
Synergy Systems, Inc
TESCO - The Eastern Specialty Company
Terratal
Texas Meter + Device
The Durham Company
TransData, Inc
Transformer Maintenance and Service, Inc.
Utility Lines
Utility Solutions Inc.
Vision Metering, LLC
WESCO
WRDA, Inc.
Zepolla Innovations LLC / UtiliShelf

Hall of Fame

The Hall of Fame award is given for outstanding contributions and dedicated services, which ensure the continued success of the North Carolina Meter School.

1981

Ed Ruggles, NC State University (Deceased)
Bert W. Blake, CP&L (Deceased)
Edwin W. Winkler, NC State University, (Deceased)
William A. Keller, Duncan Electric (Deceased)
George B. Hoadley, NC State University (Deceased)

1982

William J. Perry, CP&L (Deceased)
Donald Eggleston, Duke Power (Retired)

1983

Herbert B. Adams, VEPCO (Deceased)
Walter Hodde, Sangamo Weston (Retired)
Norman R. Bell, NC State University (Deceased)

1984

Brian C. Fetner, SCE&G (Deceased)
D.K. Woodard, General Electric (Retired)

1985

Vernon E. Bobo, Duke Power (Retired)
Edward Kennedy, Santee Cooper (Retired)
C.L. McKenzie, CP&L (Retired)

1986

No Inductees

1987

Rick Anderson, P.E., Fayetteville Public Works
David B. Stansel, NC State University (Deceased)

1988

Richard P. Dorton, VEPCO (Retired)
Lee Monroe, Duke Power (Retired)

1989

Robert W. Cox, General Electric (Deceased)
Lloyd Jordan, General Electric (Deceased)

1990

Bob Kelly, R.W. Chapman (Retired)
Ed Manning, NC State University (Deceased)

1991

Earl Garthright, VA/NC Power (Deceased)
J.J. Perry, Jr., J.J. Perry Company (Deceased)
Connie McElroy-Bacon, NC State University

1992

No Inductees

1993

John Sutton, P.E., NC State University (Retired)
Ralph West, Duke Power (Retired)

1994

Jack Tanner, Tanner & Tanner, Inc. (Deceased)

1995

No Inductees

1996

Luther Herman, NC State University (Deceased)
Donald Stanley, City of Wilson (Deceased)

1997

David A. Springs, P.E., Central Electric Power Cooperative
Joyce Tanner, Tanner & Tanner, Inc. (Retired)

1998

No Inductees

1999

Jimmy Grubbs, SCE&G (Retired)
Gene Schickedanz, Durham Co. (Retired)

2000

Randy Riley, Landis+Gyr
Larry Waters, General Electric (Retired)

2001

John Carr, UTEC (Retired)
Dean Williams, Duke Energy (Retired)

2002

Clare Bargerstock, NOVEC
Del Weers, ITEC (Retired)

2003

Tony Horton, Progress Energy Carolinas (Retired)

2004

Brooks Kirby, City of Morganton

2005

Cindy S. Allen, NC State University (Retired)

2006

Tom Van Valkenburgh, Watthour Engineering

2007

Jeff Lewis, PowerTech, LLC
Bob Wilcox, Rappahannock Electric Cooperative (Retired)

2008

Craig Shoaf, National Transformer Sales

2009

Greg Tyre, The Durham Company

2010

Scott Mossbrooks, N-Dimension Solutions

2011

Brian Giusani, Audio Visual Services Coastal
Kenneth McCraw, Duke Energy

2012

John Cochran, ITEC
James Green, Brunswick EMC

2013

No Inductees

2014

No Inductees

2015

Mike Byrd, ElectriCities of NC
Bill Hardy, Power Measurements
Chuck Robertson, SCE&G (Retired)

2016

Curtis Craig, Shenandoah Valley Electric Cooperative

2017

Rusty Mutschink, Central Electric Power Coop
Tim Overbee, Duke Energy

NC STATE UNIVERSITY

Office of Professional Development
Box 7401
Raleigh, NC 27695-7401



**87th Annual NC
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