



Due to COVID-19 precautions, all attendees must wear masks to all classes & events (except when eating and drinking), even if they have been vaccinated. Hand sanitizer stations will be set up in various places. Please refrain from hand shaking and observe social distancing as much as possible. Thank you for your understanding & commitment to safety, a hallmark value of the NC Electric Meter School & Grid Technology Conference for generations.

## **89th Annual NC Electric Meter School and Grid Technology Conference**

Embassy Suites  
Kingston Plantation  
Myrtle Beach, South Carolina  
June 13-17, 2021

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



*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** 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. Other states may approve these courses. It is the responsibility of the attendees to check with their respective certifying agencies to see if they will accept this training.**

# General Information

## About the 89th Conference

The 89th Annual North Carolina Electric Meter School and Grid Technology Conference is coordinated by the Office of Professional Development and will take place June 13-17, 2021. 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 5-7 p.m. on Sunday, June 13; from 8 a.m. to 4 p.m. on Monday and Tuesday, June 14 and 15, and 8 a.m. to noon on Wednesday, June 16

**Early bird registration fee: \$495 through May 28**

**After May 28 and walk-in fee: \$595**

The registration fee includes the welcome reception on Sunday evening, networking socials and lunches Monday-Wednesday, breaks and continental breakfasts Monday-Thursday.

**Single Day:** A single day registration fee is available at \$345 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](http://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](mailto: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 May 28. **No reimbursement will be made for cancellations made after May 28 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 **Winchester** 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.

## Accommodations

Headquarters for the 2021 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](http://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 for lodging at Embassy Suites, Hilton, Royal Palms or code ELE Kingston Plantation to receive special NC Electric Meter School rates. The room block will be released on May 11 unless it fills prior to the release date.

## Banquet

Due to COVID-19 precautions we will not have a banquet this year. Thank you for your understanding.

## COVID-19 Precautions

Due to COVID-19 precautions, all attendees must wear masks to all classes and events (except when eating and drinking), even if they have been vaccinated. Hand sanitizer stations will be set up in various places. Please refrain from hand shaking & observe social distancing as much as possible. Thank you for your understanding & commitment to safety, a hallmark value of the NC Electric Meter School & Grid Technology Conference for generations.

# 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:** Chad Cooper  
**Vice Chairperson:** Greg Johnson  
**Secretary/Treasurer:** Connie McElroy-Bacon

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<b>COMMITTEES</b>	<b>CHAIRPERSON</b>	<b>VICE CHAIRPERSON(S)</b>
Single Phase	Clare Bargerstock	
Polyphase	Chad Cooper	Jimmy Grubbs
Advanced	Rusty Mutschink	Tony Horton
Management	Kenneth McCraw	Jimmy Green
Substation and Distribution (Basic)	Curtis Craig	Bob Wilcox
Substation and Distribution (Advanced)	John Maclaga	Bob Wilcox
Emerging Technologies	Tony Horton	Garey Edwards Angela Hare
Facilities	Tony Horton	Connie McElroy-Bacon Jimmy Green
Hall of Fame	Tony Horton	
Mfrs./Hospitality	Craig Shoaf	Randy Riley Jeff Lewis
Banquet/Entertainment	Connie McElroy-Bacon	
Members at Large	Sean Dempsey Dean Williams Tim Overbee Greg Johnson Rodney Brown	



# 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 13, 2021

- 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 14, 2021

### General Session

- Presiding:            Chad Cooper, Dominion Energy, SC
- 9:00 a.m.            **Welcome to the School**  
Chad Cooper , Dominion Energy, SC
- Presentation of Colors**
- Opening Comments**  
Connie McElroy-Bacon, Conference Manager,  
NC State University
- 9:30 a.m.            **Welcome from NC State University Continuing Education**  
Chip Futrell, Director, Continuing & Professional Education,  
NC State University
- 9:45 a.m.            **TESCO – The Eastern Specialty Company**
- 10:45 a.m.            **Break**
- 11:00 a.m.            **Past, Present & Emerging Technologies**  
Ed Kobeszka, Power Engineering
- 12:00 p.m.            **Lunch**
- Presiding:            Chad Cooper, Dominion Energy, SC
- 1:00 p.m.            **AMI / Internet of Things (IoT) Convergence**  
Ty Roberts, Itron
- 2:30 p.m.            **Break**
- 2:45 p.m.            **Single Phase, Polyphase, Advanced, Basic Substation & Dis-  
tribution, Advanced Substation & Distribution , and Emerging  
Technologies Sessions Begin**
- 2:45 p.m.            **Visit Vendors, Management Track Participants**
- 4:15 p.m.            **Networking Social in the Exhibit Area**

# Conference Schedule

## Monday (continued)

### Track Sessions Begin

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#### SINGLE PHASE

Presiding: Combined Session with Polyphase (See Below)

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#### POLYPHASE / SINGLE PHASE COMBINED SESSION

Presiding: Jimmy Grubbs, SCE&G (Retired)

2:45 p.m. **History of Electric Metering**  
Tom Lawton, TESCO – The Eastern Specialty Company

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

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#### ADVANCED

Presiding: Rusty Mutschink, Central Electric Power Cooperative

2:45 p.m. **Safety in Field Metering Equipment**  
Steve Hudson, Powermetrix

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

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#### MANAGEMENT

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

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

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#### SUBSTATION & DISTRIBUTION BASIC

Presiding: Curtis Craig, Shenandoah Valley Electric Cooperative (Retired)

2:45 p.m. **Introduction to Substations I: Equipment**  
Court H. Weathers, PE, Booth & Associates LLC

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

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#### SUBSTATION & DISTRIBUTION ADVANCED

Presiding: John Maclaga, City of Statesville

2:45 p.m. **Lightning Round**  
John Maclaga, City of Statesville

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

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#### EMERGING TECHNOLOGIES

Presiding: Joe Costner, Chapman Co.

2:45 p.m. **Smart Cities Technology**  
Jess Fosson, Anixter

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

## Tuesday, June 15, 2021

### SINGLE PHASE

- Presiding: Jimmy Grubbs, SCE&G (Retired)
- 8:00 a.m. **Basic Meter Math**  
Michael Corbin, Honeywell
- 9:00 a.m. **DC Electricity Class**  
Randy Riley, Landis + Gyr
- 10:00 a.m. **Break**
- 10:15 a.m. **Basic AC Electricity**  
Carl Chermak / Will Elliott, Aclara
- 12:00 p.m. **Lunch**
- Presiding: Adam Hart, Anixter
- 1:00 p.m. **Wathour Meter Principals**  
Tom VanValkenburg, Radian Research
- 2:00 p.m. **Wathour Meter Configurations**  
Carl Chermak / Will Elliott, Aclara
- 3:00 p.m. **Break**
- 3:15 p.m. **Introduction to Wathour Meter Testing**  
John Jones, Powermetrix
- 4:15 p.m. **Adjourn/Networking Social in the Exhibit Area**

### POLYPHASE

- Presiding: Chad Cooper, Dominion Energy SC
- 8:00 a.m. **Metering Terms**  
Steve Bleier, AMETEK
- 9:00 a.m. **Polyphase Meter Applications**  
Michael Corbin, Honeywell
- 10:00 a.m. **Break**
- 10:15 a.m. **Introduction to Vector Diagrams**  
Phil Fischbach, Powermetrix
- 11:00 a.m. **AC Theory**  
Phil Fischbach, Powermetrix
- 12:00 p.m. **Lunch**
- Presiding: WESCO
- 1:00 p.m. **Visit Vendors**
- 2:15 p.m. **Instrument Transformer Basics**  
Jeon Rennie, Peak Demand, Inc.
- 3:30 p.m. **Break**
- 3:45 p.m. **CT Testing: Theory and Practice**  
Bill Hardy, Power Measurements
- 4:15 p.m. **Adjourn/Networking Social in the Exhibit Area**

# Conference Schedule

## Tuesday (continued)

### ADVANCED

- Presiding: Bob Whitmore, Radian Research
- 8:00 a.m. **Multifunction Meter Class**  
Randy Riley, Landis + Gyr
- 8:45 a.m. **Troubleshooting with Phasors**  
Carl Chermak, Aclara
- 9:30 a.m. **Theory of AC and DC Meter Testing**  
Bill Hardy, Power Measurements
- 10:15 a.m. **Break**
- 10:30 a.m. **Harmonics in Metering**  
Steve Hudson, Powermetrix
- 11:15 a.m. **Instrument Transformer Testing & Maintenance**  
Chris Zaphiris, Ritz Instrument Transformers
- 12:00 p.m. **Lunch**
- Presiding: Brian Jehle, Inner-tite
- 1:00 p.m. **Integrated Site Test**  
John Jones, Powermetrix
- 1:45 p.m. **High End Intertie Metering**  
Joe Ostrowsky, AMETEK
- 2:30 p.m. **Break**
- 2:45 p.m. **Power Transformer Losses & Live Demo**  
Landis+Gyr
- 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. **System Wide Demand/TOU Rate**  
Lee Ayers, Mid-Carolina Electric Cooperative
- 8:45 a.m. **Using AMI End Point Data for Voltage Management**  
Mitch Mossman and utility user representative, Sensus
- 9:30 a.m. **Planning & Managing a Mass Meter Deployment**  
Phil Dudley, Texas Meter
- 10:15 a.m. **Break**
- 10:30 a.m. **Panel – How Has Next Gen AMI Changed Our Business Model**  
Jason Kelly, Duke Energy
- 12:00 p.m. **Lunch**
- Presiding: Phil Dudley, TMD
- 1:00 p.m. **Outage Management During Hurricane Florence Using Real Time AMI Data**  
Drue Merkle, Sensus
- 1:45 p.m. **The Value of a Meter Data Management System**  
Honeywell Smart Energy
- 2:30 p.m. **Break**

## Tuesday (continued)

2:45 p.m. **Mitigating Customer RF Concerns – Panel**  
Jimmy Green, Brunswick Electric; Tina Pampanelli, Itron

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

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### SUBSTATION & DISTRIBUTION BASIC

Presiding: Adam Hart, Anixter

8:00 a.m. **What is a Substation?**  
Don Seay, Consultant

8:45 a.m. **Tap Changer Fundamentals**  
Carlos Bittner, Reinhausen Mfg. Inc.

9:30 a.m. **Voltage Regulator and Controls**  
Roger Munay, Eaton Cooper Power Systems

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

10:30 a.m. **Bushing CT (BCT) – What I Should Know?**  
Frank Lopez, GE Instrument Transformers

11:15 a.m. **Reclosers**  
Roger Munay, Eaton Cooper Power Systems

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

Presiding: Rick Anderson, Fayetteville PWC

1:00 p.m. **DNP3 Basics**  
Andy Gould, Schweitzer Engineering Laboratories

1:45 p.m. **Relaying Zones of Protection**  
Paul Smith, GE

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

2:45 p.m. **Introduction to Substations II: Protection**  
Court Weathers, PE, Booth & Associates LLC

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

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### SUBSTATION & DISTRIBUTION ADVANCED

Presiding: Preston Fry, RW Chapman

8:00 a.m. **Fuses**  
Roger Munay, Eaton Cooper Power Systems

8:45 a.m. **Voltage Optimization & the Effects of DERs on the Grid**  
Ed Kobeszka, Power Engineering

9:30 a.m. **Visit Vendors**

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

10:30 a.m. **From Transformer Nameplate to Differential Protection**  
Luke Booth, Schweitzer Engineering Laboratories

11:15 a.m. **Loop Restoration & Additional Segmentation**  
Caleb Harrison, S&C Electric Company

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

Presiding: Joel Valley, Fayetteville PWC

1:00 p.m. **Properly Sizing Distribution Transformers and Services**  
Bill Jordan, PE, Booth and Associates LLC

# Conference Schedule

## Tuesday (continued)

1:45 p.m. **CCVT Design and Applications for use in Relaying and Revenue Metering**  
Chris Zaphiris, Ritz, Inc.

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

2:45 p.m. **Comprehensive Transformer Condition Assessment**  
Don Seay, Consultant

3:30 p.m. **Transformer Online Monitoring**  
Steve Averitt, PE,  
Reinhausen Mfg. Inc.

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

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

10:30 a.m. **Asset Insights Through Analytics**  
TESCO – The Eastern Specialty Company

11:15 a.m. **Leveraging AMI for Grid Modernization**  
Steve Kenny, Landis+Gyr

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

Presiding: Sean Dempsey, WESCO Distribution

1:00 p.m. **Anatomy of a Hack: How Your Utility Can Better Defend Against Cyberattacks**  
Steve Lindsay, XTEC

### EMERGING TECHNOLOGIES

Presiding: Garey Edwards, City of High Point

8:00 a.m. **Introduction to Emerging Grid Technologies**  
Sean Dempsey, WESCO Distribution; Adam Seaborn, Middle Tennessee Electric Membership Cooperative

8:45 a.m. **Solutions for Protecting Distribution Systems with Solar Farm Installations**  
Luke Booth, Schweitzer Engineering Laboratories

9:30 a.m. **The Impact of Grid Modernization on the Performance of Metering Current Transformers**  
Jon Rennie, Peak Demand Inc.

1:45 p.m. **Improving Asset Management through Online Monitoring**  
Mark Tostrud, Dynamic Ratings

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

2:45 p.m. **Voltage Optimization & the Effects of DERS on the Grid**  
Edward Kobeszka, Power Engineering

3:30 p.m. **Unlicensed Radio Applications**  
Andy Gould, Schweitzer Engineering Laboratories

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



## Wednesday, June 16, 2021

### SINGLE PHASE

- Presiding: Steve Wright, Itron
- 8:00 a.m. **Meter Testing 101**  
Tom Lawton, TESCO – The Eastern Specialty Company
- 9:00 a.m. **Demand/TOU Metering**  
Randy Riley, Landis + Gyr
- 10:00 a.m. **Break**
- 10:15 a.m. **Visit Vendors**
- 11:00 a.m. **Programming Workshop for Single Phase Meters**  
Dan Riddle, Honeywell
- 12:00 p.m. **Lunch**
- Presiding: Paul Keadle, NTS
- 1:00 p.m. **Programming Workshop for Single Phase Meters (continued)**  
Scott Finley, NTS
- 2:00 p.m. **Break**
- 2:15 p.m. **Programming Workshop for Single Phase Meters (continued)**  
Carl Chermak / Will Elliott, Aclara
- 3:15 p.m. **Instrument Transformer Theory & Testing**  
Phil Fischbach, PowerMatrix
- 4:15 p.m. **Adjourn / Networking Social in the Exhibit Area**

### POLYPHASE

- Presiding: Jimmy Grubbs, SCE&G (Retired)
- 8:00 a.m. **3 Phase Theory**  
Phil Fischbach, Powermetrix
- 9:00 a.m. **Instrument Transformer Theory & Testing**  
Phil Fischbach, PowerMatrix
- 9:45 a.m. **Break**
- 10:00 a.m. **Programming Polyphase Meters-Session 1**  
Vendor Rooms — Itron, Aclara, Honeywell, Landis+Gyr
- 11:00 a.m. **Programming Polyphase Meters-Session 2**  
Vendor Rooms — Itron, Aclara, Honeywell, Landis+Gyr
- 12:00 p.m. **Lunch**
- Presiding: WESCO
- 1:00 p.m. **Modern ANSI Meter Forms**  
Carl Chermak, Aclara
- 2:00 p.m. **Instrument Transformers – Understanding Nameplate Basics**  
Frank Lopez, GE Instrument Transformers
- 3:00 p.m. **Break**
- 3:15 p.m. **Demand/TOU Metering**  
Randy Riley, Landis + Gyr

# Conference Schedule

## Wednesday (continued)

### POLYPHASE (continued)

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

### ADVANCED

Presiding: Honeywell

8:00 a.m. **Basics of Grounding**  
Carl Chermak / Will Elliott,  
Aclara

8:45 a.m. **Sizing Instrument  
Transformers for Most  
Accurate Metering  
Performance**  
Frank Lopez, GE Instrument  
Transformers

9:30 a.m. **Ratio, Burden, and  
Admittance**  
Tom Lawton, TESCO – The  
Eastern Specialty Company

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

10:30 a.m. **TBA**

11:15 a.m. **TBA**

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

Presiding: Brian Homer, Central Electric  
Power Cooperative

1:00 p.m. **Advanced Functional Meter  
Testing**  
Pete Dack, Radian Research

1:45 p.m. **Four Quadrant Metering**  
Steve Hudson, Powermetrix

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

2:45 p.m. **CT Testing: Theory and  
Practice**  
Tom Lawton, TESCO – The  
Eastern Specialty Company

3:30 p.m. **The Benefits of High  
Accuracy, Extended Range  
Current Transformers**  
Jon Rennie, Peak Demand Inc.

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

### MANAGEMENT

Presiding: Michael Corbin, Honeywell  
Smart Energy

8:00 a.m. **TBA**

8:45 a.m. **Economics for Meter Site  
Testing**  
Steve Hudson, Powermetrix

9:30 a.m. **Distributed Energy Resources**  
Ed Kobeszka, Power Engineering, Inc.

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

10:30 a.m. **Improving Meter Shop  
Efficiency**  
Pete Dack, Radian Research

11:15 a.m. **Asset and Inventory  
Management in the IoT  
Utility 2.0 World**  
TESCO – The Eastern Specialty  
Company

## Wednesday (continued)

### MANAGEMENT (continued)

- 12:00 p.m. **Lunch**  
Presiding: Brian Jehle, Inner-tite
- 1:00 p.m. **Revenue Assurance**  
Jason Parker, Duke Energy
- 1:45 p.m. **Current Metering Safety Topics**  
Tom Lawton, TESCO – The Eastern Specialty Company
- 2:30 p.m. **Break**
- 2:45 p.m. **Panel on Training and Meter Tech of Future**  
Rusty Mutschink, Central Electric Power Cooperative;
- 4:15 p.m. **Adjourn / Networking Social in the Exhibit Area**

### SUBSTATION & DISTRIBUTION BASIC

- Presiding: Dee Byrd, W. R Daniel
- 8:00 a.m. **Microprocessor Based Relay Testing Principles**  
Luke Booth, Schweitzer Engineering Laboratories
- 8:45 a.m. **Capacitors and Capacitor Controls**  
Roger Munay, Eaton Cooper Power Systems
- 9:30 a.m. **Substation Mathematics**  
Luke Booth, Schweitzer Engineering Laboratories
- 10:15 a.m. **Break**

- 10:30 a.m. **Basics of Distribution and Power Transformers**  
Don Seay, Consultant
- 11:15 a.m. **Asset Management of Transformers**  
Michael Ryan, Camlin Power
- 12:00 p.m. **Lunch**  
Presiding: John Hellman, RW Chapman
- 1:00 p.m. **Substation Outage – “What do I do next?”**  
Paul Smith, GE
- 1:45 p.m. **Introduction to Distribution Reclosing**  
Luke Booth, Schweitzer Engineering Laboratories
- 2:30 p.m. **Break**
- 2:45 p.m. **Basics of Power Circuit Breakers**  
Don Seay, Consultant
- 3:30 p.m. **Fundamentals of Ethernet Communications**  
Andy Gould, Schweitzer Engineering Laboratories
- 4:15 p.m. **Adjourn / Networking Social in the Exhibit Area**

### SUBSTATION & DISTRIBUTION ADVANCED

- Presiding: Ron Culp, RW Chapman

# Conference Schedule

## Wednesday (continued)

### SUBSTATION & DISTRIBUTION ADVANCED (continued)

- 8:00 a.m. **Understanding the Transformer Thermal Model as Referenced by IEEE C57.91**  
Andy Gould, Schweitzer Engineering Laboratories
- 9:30 a.m. **Application of Capacitor Banks for Power Factor Improvement and Voltage Control**  
Don Seay, Consultant
- 10:15 a.m. **Break**
- 10:30 a.m. **Power Quality: Capacitor and System Configuration**  
Alexandre Naves, ABB
- 11:15 a.m. **Surge Arrester Application for Equipment and Line Protection**  
Don Seay, Consultant
- 12:00 p.m. **Lunch**  
Presiding: Thom Froehlich, WR Daniel
- 1:00 p.m. **Advanced Distribution Grid Monitoring for Today's Evolving Distribution System**  
Bryan Gehringer, NovaTech LLC
- 1:45 p.m. **Distribution Substation Centralized Protection & Control Architectures**  
Craig Wester, GE Grid Automation
- 2:30 p.m. **Break**
- 2:45 p.m. **Troubleshooting SCADA Communications**  
Andy Gould, Schweitzer Engineering Laboratories

- 3:30 p.m. **Improving Substation Safety through Online Monitoring**  
Mark Tostrud, Dynamic Ratings
- 4:15 p.m. **Adjourn/Networking Social in the Exhibit Area**

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### EMERGING TECHNOLOGIES

- Presiding: Garey Edwards, City of High Point
- 8:00 a.m. **How to Transition to a Passwordless IT/OT Environment**  
Steve Lindsay, XTEC, Inc.
- 8:45 a.m. **Certifying DC Electric Vehicle Fast Chargers and AC Level Two Chargers**  
Bill Hardy, Power Measurements
- 9:30 a.m. **Next Generation Power Quality Compensation**  
Christopher Lee, Mitsubishi
- 10:15 a.m. **Break**
- 10:30 a.m. **Very-Fast-Transients Resistant Instrument Transformers: A Modern IT for Smart Grid Applications**  
David Raschka, ABB Inc.
- 11:15 a.m. **Software-Defined Networking**  
Andy Gould, Schweitzer Engineering Laboratories

## Wednesday (continued)

### EMERGING TECHNOLOGIES (continued)

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

Presiding: Ron Culp, Chapman Co.

1:00 p.m. **Regulation of Distribution Transformers**

Steve Averitt, Reinhausen

1:45 p.m. **AMI & DA Convergence**

Steve Kenny, Landis+Gyr

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

2:45 p.m. **Grid Edge Device Analytics**

Rob Hartway, Honeywell  
Smart Energy

3:30 p.m. **Intelligent Sensors - More Than a Blinking FCI Device**  
Tim Figura, Sentient Energy

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



# Conference Schedule

## Thursday, June 17, 2021

### SINGLE PHASE

Presiding: Jeane Kretzschmar,  
SAMSCO

8:00 a.m. **Meter Safety**  
Tom Lawton, TESCO – The  
Eastern Specialty Company

9:00 a.m. **Potential Career Paths in  
Electric Metering**  
Jeff Lewis, Powertech LLC

10:00 a.m. **Instrument Transformers –  
Understanding Nameplate  
Basics**  
Frank Lopez, GE Instrument  
Transformers

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

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

### POLYPHASE

Presiding: Steve Wright, Itron

8:00 a.m. **Detecting False Energy  
Metering During a Black  
Start Condition**  
Victor Love, Schweitzer  
Engineering Laboratories

9:00 a.m. **Practical Use of Phasors in  
Metering**  
Carl Chermak, Aclara

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

10:15 a.m. **Field Testing Primary  
Distribution Sites**  
Rusty Mutschink, Central  
Electric Power Cooperative

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

### ADVANCED/MANAGEMENT/ EMERGING TECHNOLOGIES COMBINED SESSION

Presiding: Tina Pampanelli, Itron

8:00 a.m. **Capacitor Bank Challenges  
and How Grid Monitoring  
and Your AMI Network Can  
Enhance Your Cap Bank DA  
Experience.**  
Scott Jochimsen, Aclara

8:45 a.m. **Use of Drones in Utilities**  
Kenneth McCraw, Duke  
Energy

9:30 a.m. **21st Century Power  
Measurements**  
Bill Hardy, Power  
Measurements

10:15 a.m. **Using Analytics to Understand  
the Evolving Electric Grid**  
Rich Hunt, Quanta Technology

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

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

## Thursday (continued)

### **SUBSTATION & DISTRIBUTION BASIC**

- Presiding: Dee Byrd, WR Daniel
- 8:00 a.m. **Surge Arrestors**  
Don Seay, Consultant
- 8:45 a.m. **Substation Switch 101**  
Lon Hamilton, Southern States
- 9:30 a.m. **Substation Inspections**  
Don Seay, Consultant
- 10:15 a.m. **Insulation, Asset and Wildlife Protection**  
Mike Anderson, TE Connectivity
- 11:00 a.m. **Break**
- 11:15 a.m. **All Sessions Combine into General Session**

### **SUBSTATION & DISTRIBUTION ADVANCED**

- Presiding: Bob Whitmore, Radian
- 8:00 a.m. **Wildlife Asset Protection in the Substation**  
Mike Anderson, TE Connectivity
- 8:45 a.m. **Power Quality: Harmonics Overview**  
Alexandre Naves, ABB, Inc.
- 9:30 a.m. **Online Monitoring for Condition-based Maintenance**  
Joel Valley, Fayetteville PWC
- 10:15 a.m. **Tuning of Voltage Regulator Controls in Distribution Systems with High Renewable**  
Roger Munay, Eaton
- 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: Chad Cooper, Dominion Energy, SC

- 11:15 a.m. **Safety – Changes in Society and effects on job**  
Major Taylor, Lexington County Sheriff
- 12:00 p.m. **Participant Feedback on the School**  
**Closing Comments/Door Prizes**  
**Adjourn**

# Conference Schedule

## Manufacturer Programming Sessions

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### TUESDAY, JUNE 15

8:00 a.m.	Powermetrix _____ Eton
	S&C Electric Company _____ Oxford
	TESCO – The Eastern Specialty Company _____ Pembroke
	Radian/WECO: Calibration Check _____ Winchester
10:00 a.m.	Powermetrix _____ Eton
	Probewell _____ Oxford
	TESCO – The Eastern Specialty Company _____ Pembroke
	Radian/WECO: Calibration Check _____ Winchester
12:00 p.m.	Lunch
1:00 p.m.	Powermetrix _____ Eton
	Schweitzer _____ Oxford
	TESCO – The Eastern Specialty Company _____ Pembroke
	Radian/WECO: Calibration Check _____ Winchester
3:00 p.m.	Powermetrix _____ Eton
	Schweitzer _____ Oxford
	TESCO – The Eastern Specialty Company _____ Pembroke
	Radian/WECO: Calibration Check _____ Winchester
5:00 p.m.	Adjourn

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### WEDNESDAY, JUNE 16

8:00 a.m.	Powermetrix _____ Eton
	_____ Oxford
	TESCO-The Eastern Specialty Company _____ Pembroke
	Radian/WECO: Calibration Check _____ Winchester
10:00 a.m.	Programming Session: Itron _____ Eton
	Programming Session: Aclara _____ Oxford
	Programming Session: Honeywell _____ Kensington A
	Programming Session: Landis+Gyr _____ Pembroke
	Radian/WECO: Calibration Check _____ Winchester
12:00 p.m.	Lunch
1:00 p.m.	Powermetrix _____ Eton
	S&C Electric Company _____ Oxford
	TESCO-The Eastern Specialty Company _____ Pembroke
	Radian/WECO: Calibration Check _____ Winchester
3:00 p.m.	Powermetrix _____ Eton
	_____ Oxford
	TESCO-The Eastern Specialty Company _____ Pembroke
	Radian/WECO: Calibration Check _____ Winchester
5:00 p.m.	Adjourn



# Conference Support

## 2021 Program Committee

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Amiss, Jim .....	Ensales, Beulaville, NC	Jones, Barry .....	Ensales, Beulaville, NC
Anderson, Rick .....	Fayetteville PWC, Fayetteville, NC	Kelly, Bob .....	RW Chapman (retired), Raleigh, NC
Ashby, Shane.....	TE Connectivity, Mayodan, NC	Kretzschmar, Jeane.....	SAMSCO, Boiling Springs, SC
Bargerstock, Clare.....	Northern Virginia Electric Cooperative, Manassas, VA	Lawton, Tom.....	TESCO, Bristol, PA
Barlow, Jeff.....	Honeywell Smart Energy, Raleigh, NC	Lewis, Bo .....	PowerTech LLC, Waxhaw, NC
Booth, Luke.....	Schweitzer Engineering Laboratories, Charlotte, NC	Lewis, Jeff.....	PowerTech LLC, Lexington, NC
Brown, Rodney.....	Dominion Energy Richmond, VA	Maclaga, John .....	City of Statesville, Statesville, NC
Burn, Tyler.....	Ensales, Beulaville, NC	McCraw, Kenneth.....	Duke Energy, Charlotte, NC
Byrd, Dee .....	WR Daniel & Associates, Mooresville, NC	McElroy-Bacon, Connie....	NC State University, Raleigh, NC
Candler, Nick .....	The Durham Company, Lebanon, MO	Murray, Fred.....	Ensales, Beulaville, NC
Cooley, Jerome .....	Honeywell Smart Energy, Clearwater, FL	Mutschink, Rusty.....	Central Electric Power Coop, Columbia, SC
Cooper, Chad .....	Dominion Energy, West Columbia, SC	Overbee, Tim.....	Duke Energy, Pine Level, NC
Craig, Curtis.....	Shenandoah Valley Electric Coop, Mt. Crawford, VA	Parker, Jason.....	Duke Energy, Garner, NC
Dempsey, Sean .....	Wesco Distribution, Raleigh, NC	Plexico, Ben .....	Harvey Plexico, Inc., Columbia, SC
Dudley, Phil.....	Texas Meter, Oak Island, NC	Pyburn, Jack.....	Honeywell Smart Energy, New Bern, NC
Edwards, Garey.....	City of High Point, High Point, NC	Riley, Randy .....	Landys+Gyr, Gastonia, NC
Farmer, Kyle.....	Marwell, Radford, VA	Shoaf, Craig.....	NTS, Raleigh, NC
Finley, Scott.....	NTS, Raleigh, NC	Valley, Joel .....	Fayetteville PWC, Fayetteville, NC
Froelich, Thom.....	WR Daniel & Associates, Lake Wylie, SC	Waters, Larry .....	Sensus, Johns Creek, GA
Green, Jimmy .....	Brunswick Electric, Shallotte, NC	White, Vernon .....	TESCO, Bristol, PA
Grubbs, Jimmy .....	SCE&G (Retired), Gilbert, SC	Whitmore, Bob.....	Radian, Lafayette, IN
Hardy, Bill.....	TESCO, Bristol, PA	Wilcox, Bob .....	Rappahannock Electric Cooperative (Retired), Fredericksburg, VA
Hiddell, Brady.....	Wesco Distributing, Clayton, NC	Williams, Dean.....	Duke Energy (Retired), Myrtle Beach, SC
Horton, Tony.....	Duke Energy (retired), Wendell, NC	Wilson, Robert.....	Ensales, Unicoi, TN
Johnson, Greg.....	Alabama Power Co., Montgomery, AL	Wright, Steve.....	Itron, West Union, SC
		Yingling, Kurt.....	Ensales, Beulaville, NC

# 2021 Exhibitors

## Exhibitor

Aclara

Allegiant Utility Services, Inc.

American Casting & Mfg. Corp

Anixter Inc

Arteche USA Inc

Atlantic Power Sales, LLC

Bellwether Management Solutions

Black Rock Branding

Booth & Associates, LLC

Brooks Utility Products

Chapman Co.

DeWalch

Eaton

Electrical Consulting Engineers, Inc.

Enerco Energy Services Inc.

Ensales

Franklin Grid Solutions

GE Grid Automation

GE Instrument Transformers

Harvey Plexico Inc.

Honeywell

Inner-Tite Corp.

IPKeys Power Partners

Irby

ITEC

Itron

Jake Rudisill Associates, Inc.

Landis+Gyr

Marwell Corporation

Megger

MinMax Technologies

Nighthawk

NovaTech

NTS

Peak Demand Inc

Power Sales & Service

Powermetrix

PowerTech

Probewell Lab Inc.

Radian Research

Ritz Instrument Transformers, Inc.

SAMSCO

Satec Inc.

Schweitzer Engineering Laboratories

SensorLink Corporation

Solid State Instruments/Brayden Automation

Tantalus Systems

TE Connectivity

TESCO - The Eastern Specialty Company

Texas Meter + Device

TransData, Inc

Transformer Maintenance & Service, Inc.

Trantech Radiator Products, Inc.

TSTM INC

Utility Lines, LLC

Utility Solutions Inc.

Vision Metering

W.R. Daniel & Associates, Inc.

# 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 (Deceased)

## 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 (Deceased)  
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 (Retired)  
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, Northern Virginia Electric Cooperative  
Del Weers, ITEC (Retired)

## 2003

Tony Horton, Duke Energy (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 (Retired)

## 2010

Scott Mossbrooks, N-Dimension Solutions

## 2011

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

## 2012

John Cochran, ITEC (Retired)  
James Green, Brunswick EMC

## 2013

No Inductees

## 2014

No Inductees

## 2015

Mike Byrd, Electricities of NC (Retired)  
Bill Hardy, TESCO – The Eastern Specialty Company  
Chuck Robertson, SCE&G (Retired)

## 2016

Curtis Craig, Shenandoah Valley Electric Cooperative

## 2017

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

## 2018

Vernon White, TESCO – The Eastern Specialty Company

## 2019

Sean Dempsey, WESCO Distribution

## 2020

Canceled due to COVID-19