



Southeastern Distribution Apparatus School and Conference

August 19th - 22nd, 2024

The Hotel at Auburn University
and Dixon Conference Center
Auburn, Alabama

Utility Technology Association is a 501c(6) non-profit organization dedicated to the delivery of high quality, practical and comprehensive training designed to meet the needs and challenges of today's electric utility industry.

Southeastern Distribution Apparatus School & Conference

Module 100	Module 200	Module 300	Module 400	Module 500
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Monday

10:00 - 4:00	Registration			
1:00 - 1:30	General Session - Auditorium			
1:30 - 2:30	Digitizing the Physical Environment for Distribution Use Case			
2:30 - 3:00	Networking Refreshment Break			
3:00 - 4:30	Electrical Fundamentals	Protective Grounding	Technology Roadmap	Eaton - Transitioning to Next Generation Reclosers and Control
4:30 - 6:00	Exhibit Hall Opens / Hospitality			

Tuesday

8:30 - 10:00	Power Theory	Capacitor Installations & Operation	Power System SCADA and Smart Grids	Emerging Transformer Technology	ABB - Eagle Single Phase Recloser with Long Range Communications and Use Cases
				Monitoring at the Distribution Transformer	
10:00 - 10:30	Networking Refreshment Break in Exhibit Hall				
10:30 - 12:00	Distribution Devices & Equipment Overview	Application of Voltage Regulators	Power System SCADA and Smart Grids - Continued	Lessons Learned - Energy Storage Operations at Duke Energy	Beckwith Electric - Regulator & Capacitor Controls
12:00 - 1:00	Lunch				
1:00 - 2:30	Substation Devices & Equipment Overview	Distribution Feeder Protection	Creating the Digital Twin	Residential Demand Billing	SEL - Advanced Applications with the SEL-351 Relay
				Rate Strategies for Next Generation Distribution System	
2:30 - 3:00	Networking Refreshment Break in Exhibit Hall				
3:00 - 4:00	Substation Breakers	Apparatus Equipment Maintenance & Testing	Connecting IED's to SCADA & ADMS	Asset Traceability	Southern States - Gold Eagle Single Phase Recloser
4:00 - 5:30	Exhibit Hall / Hospitality				

Knowledge is Power

Southeastern Distribution Apparatus School & Conference

		Module 100	Module 200	Module 300	Module 400	Module 500
Wednesday	8:30 - 10:00	Voltage Regulators	Applications of 600A Underground Connectors	Data Analytics & Generative AI	Simplifying Coordination in High Density Recloser Installations Engineering Access & Data Analytics for Distribution Line Relays	Hubbell - Recloser Control
	10:00 - 10:30	Networking Refreshment Break in Exhibit Hall				
	10:30 - 12:00	Lightning Impact in Distribution Systems	Underground Switchgear	Beware of Bad Actors - AI-Powered Threat Intel to Keep Systems Safe and Available	How Distribution Connected Renewables are Stealing Vars from the Grid	SEL - Troubleshooting a SEL-651R Lock Out
	12:00 - 1:00	Lunch				
	1:00 - 2:00	Distribution Transformer Connections	System Protection: Theory & Applications Series	Fiber Optic Theory & Hands-On Applications	Microgrid Case Study	GE Multilin Agile - Substation Breaker Relay
	2:00 - 2:15	Networking Refreshment Break				
	2:15 - 3:15	Infrared Inspections	System Protection: Theory & Applications Series - Continued	Improving Distribution Grid Reliability Through Intelligent Line Sensors	Witness Testing - DER Interconnections	S&C Electric - TripSaver II Application and System Deployment Strategies
	3:15 - 3:30	Networking Refreshment Break				
	3:30 - 4:30	Underground Cable & Cable Accessories	System Protection: Theory & Applications Series- Continued	Cybersecurity Challenges	Comprehensive Area Planning & N-1 Contingency Studies	S&C Electric - Vacufuse II and EdgeRestore System Application
	5:00 - 6:00	Annual Dinner - Grand Ballroom				
6:00 - 9:00	Casino Royale - Grand Ballroom					
Thursday	8:30 - 9:45	Reliability and Risk: The Challenges of Managing Expectations				
	9:45 - 10:00	Networking Refreshment Break				
	10:00 - 11:15	Reliability and Risk: The Challenges of Managing Expectations -Continued				
	11:15	Closing Session				

Opening Session

Digitizing the Physical Environment for Distribution Use Case

Dexter Lewis, *EPRI*

Technology advancements have exploded in machine autonomy, data collection, spatial analytics, visualization, computer vision, and artificial intelligence! It's amazing frankly. It is important as researchers keep up. Most importantly, researchers must try to understand the value, capabilities, and limitations of these new technologies. With these new innovations come marketed promises of unprecedented value. Only through objective testing can performance metrics be derived. During this session, learn about research experiences into next-gen digital approaches to managing the distribution system.

Module 100: Fundamentals of Distribution System Apparatus

Electrical Fundamentals

Instructor: Mike Chirico, *Covington Electric Cooperative*

Session on AC and DC circuit theory including ohms law and associated math, circuit components, and current and voltage laws. Included are discussion of the relationship between current, voltage, resistance, impedance, power and energy.

Power Theory

Instructor: Mike Chirico, *Covington Electric Cooperative*

An expansion of the basic electricity review class – with an elaboration on volts, amps, power factor, etc. Definition and applications of KW, KVA, the power triangle, and calculating power factor.

Distribution Devices & Equipment Overview

Instructor: Keith Hardt, *Pungo Engineering*

This session will cover generation, transmission, distribution and utilization of an electric grid. Topics include the equipment on the distribution system with discussion on design and function.

Substation Devices & Equipment Overview

Instructor: Keith Hardt, *Pungo Engineering*

This session will cover generation, transmission, distribution and utilization of an electric grid. Topics include the equipment used in the substation with discussion on design and function.

Substation Breakers

Instructor: Chad Cassity, *Georgia Power*

Session will include common functions, types, how breakers work and why the equipment is used. Learn about protection schemes, protective relays and how to bypass breakers. Learn about the different interruption mediums such as oil, SF6 or vacuum. Discusses testing, inspection & sampling practices. Students will learn about the components of dissolved gas analysis testing.

Voltage Regulators

Instructor: Jimmy Smith, *Howard Industries*

Session will center on how a regulator works and the internal components. Covers how they are used in distribution systems along with basic operation & functions. Covers safety issues such as by-passing & deenergizing regulators. Basic inspection procedures.

Lightning Impact in Distribution Systems

Instructor: Joe Hall, *CREASTA*

Covers how arresters work and their use in the distribution system. It introduces the student to how lightning and other causes create overvoltage on the system. We also introduce the student to the concepts of BIL (Basic Insulation Level) ratings of equipment / hardware. We discuss the importance of properly grounding the system to make arresters operate properly.

Distribution Transformer Connections

Instructor: Jason Waters, *Georgia Power*

Discussion in this class will include components and internal workings of a transformer. Covers how a transformer works and how it is used on the distribution system. Learn the meaning of transformer polarity and how to easily hook up transformer banks using the Arrow System.

Infrared Inspections

Instructor: Chad Smith, *Coweta-Fayette EMC*

Infrared inspection is a proactive approach to identifying issues in electrical systems before they cause a serious or costly outage. This session will cover the tools used and various findings from inspections.

Underground Cable & Cable Accessories

Instructor: Oscar Dominguez, *Hubbell Power Systems*

Session will begin with a discussion on the differences between underground and overhead cables with an emphasis on the types of underground cable. Topics included in this class will be 200A accessories, cable stress, terminations and underground arresters.

Module 200: Principles & Applications of Distribution System Apparatus

Protective Grounding

Instructor: Keith Hardt, *Pungo Engineering Services*

Session gives a comprehensive understanding of the theory and practice of safe electrical grounding principles as it relates to the individual. There will be discussion on the OSHA requirements, understanding ground potential rise, touch and step potential, and vehicle safety along with applications, principles and procedures related to grounding.

Capacitor Installation & Operations

Instructor: Bob McFetridge, *Beckwith Electric*

Discussion on why capacitors are used in the distribution system and how they work. Defines terms such as working power, non-working power and power factor.

Application of Voltage Regulators

Instructor: Roger Munay, *Eaton*

Explanation of why voltage regulators are needed and how they work. Topics include the placement of regulators, settings, and effects on the distribution system. Class will cover safety considerations of voltage regulators.

Fundamentals of Distribution Feeder Protection

Instructor: Craig Wester, *GE Grid Solutions*

Session provides a basic understanding of the principles of relaying and protection of the electric distribution feeder. Topics included in this class are why relays are used, how relays protect the feeder, applications of various types of relays, and relay coordination.

Apparatus Equipment Maintenance & Testing Services

Instructor: Curtis Boyer, *Sunbelt Solomon*

Keeping transformers and other electrical equipment running smoothly is essential to the success of every utility. This session will cover maintenance and repair procedures along with associated testing requirements.

Applications of 600A Underground Connectors: Junctions, Switchgear, and Transformer

Instructor: David Swafford, *Southcon*

Learn about the design, installation, and application of 600A dead front separable connectors for UG distribution systems.

Underground Switchgear

Instructor: Robert Reepe, *Georgia Power*

Pad mounted switchgear provides simplicity and complexity to distribution systems in today's environment. This switchgear discussion covers the design and application of load serving devices in the distribution system. Simple switching systems, simple protection with fuses to complex communication enabled switching and vacuum interruption will be covered as well as design considerations and applications for each category of device. The future of implementing advanced technologies will be included. We will limit the coverage to Medium Voltage Utility Grade outdoor switchgear.

System Protection: Theory & Applications Series

Instructors: Bill Baker, *Georgia Power*; Brad Schafer, *GRESKO Utility Supply*

This series of classes will be built on system protection theory and applications. Covered in this series will be station protection, feeder protection and some distribution automation schemes.

The first session presents fundamentals in protection theory, protection practices and presents fundamentals in the Time Current Coordination

relationships of devices. Also, the coordination between devices with isolation and restoration techniques.

The second session builds on the foundation on theory and demonstrates the integration of the theory and the devices performing the system protection. Covered in this session will be single and three phase reclosers. Also, will cover how reclosers operate, how they are applied on the distribution system, and how they interact with other devices such as station relays and fuses.

The third session demonstrates the coordination between devices with isolation and restoration techniques. Also, will cover the key differences between electronic reclosers and hydraulic reclosers, and the pros and cons of both options.

Module 300: SCADA, Communications & Cybersecurity

Power System SCADA and Smart Grids

Instructor: John McDonald, JDM Associates
Session begins with a brief history of electrical power utility SCADA as well as its use in other industries. All the basic system building blocks are then presented starting with intelligent electronic devices (IEDs), data concentrators, communication links, and master stations. The class includes considerations when building a SCADA system such as budgeting, cost justification, user expectations, staffing, test and commissioning, training, and maintainability. Diving deeper into the system, the fundamentals of SCADA communication will be discussed including protocols, channel types, and cloud services. System design aspects will be described including alarm management, HMI design, integration with our smart grid applications, and time synchronization. Finally, the class will touch on important security considerations. Throughout the talk, the presenter will interject industry best practices and examples from project implementations. Questions and sharing of past experiences are highly encouraged by all attendees.

Creating the Digital Twin

Instructor: Clifton Black, Southern Company Research & Development

Today, we are hearing more and more about the application of digital twins and the potential they hold. But what exactly is a digital twin and how does it differ from other technologies. This session will explore the concept of digital twins in the Power Delivery environment. Current and potential use cases that leverage the technology will be discussed along with their associated benefits, as well as how they are developed and maintained.

Connecting IED's to SCADA & ADMS: Exploring Cellular, Fiber and Radio Solutions Instructors: Robbie Young, *Snapping Shoals EMC*; Jarrod Kilgore, *Carroll EMC*

Join us for an engaging question-and-answer style panel discussion with representatives from utilities. This session will focus on the integration of Intelligent Electronic Devices (IEDs) with Supervisory Control and Data Acquisition (SCADA) and Advanced Distribution Management Systems (ADMS). Our panelists will share their experiences and insights on various communication technologies, including cellular, fiber optics, and radio. Attendees will have the opportunity to ask questions and learn about the practical challenges and benefits of different connection methods, gaining valuable knowledge to enhance the efficiency and reliability of their own power distribution systems.

Data Analytics and Generative AI

Instructor: Michael Fourman, Georgia Transmission Corporation

This session will cover the basics of data analytics and generative artificial intelligence and will provide examples of how each is being used in the utility industry. Basics include, at a high level, component, skills, and tools.

Beware of Bad Actors - AI-Powered Threat Intel to Keep Systems Safe and Available

Instructor: Kunle Adetoro, Fortinet

During this session, there will be discussion on three practical ways to leverage the insights provided by advanced threat intelligence to secure your operational networks.

- Principle 1: Segmentation | Leveraging segmentation to reduce cyber risk when protecting operational systems, including Advanced Distribution Management Systems, SCADA Systems, Smart Meters, and Substations.

- Principle 2: Detection | Designing detection and response systems to reduce the impact of an attack yet supporting both modern and legacy equipment without impacting the safety and uptime goals of the business.

- Principle 3: Orchestration | Collect and correlate data so threats or vulnerabilities can be identified and coordinate a response before the bad actor completes their mission. Automated tracking and reporting reducing the burden on security operations and informs regulatory compliance as a part of a business risk reduction.

Learning objectives of this session includes advocating for improved engineering to support resiliency and governance by applying a security-first mind set to any and every initiative, understanding the need to rethink regulations, treating them as a business risk initiative and not just compliance, and simplifying the complexities of cybersecurity by leveraging a mesh or fabric architecture.

Fiber Optics Communication Theory & Hands-On Applications

Instructor: Randy Gritters, Connected Fibers

Learn how electric utilities take advantage of the broadband capabilities of fiber optic communications to benefit electrical operation. Topics in this session will include the history of fiber optics, waveguides, types of fiber, cables, safety, splicing, designing fiber systems, testing and troubleshooting fiber. Learn how to splice and terminate fiber optic connections. This class will provide instruction on the proper techniques and tools used while allowing the students hands on experience in splicing and terminating fiber optics.

Improving Distribution Grid Reliability Through Intelligent Line Sensors

Instructor: Adrian Bailey, Megger Grid Analytics

Intelligent Grid Line Sensors are an emerging technology to improve grid reliability by accurately identifying and classifying faults and reducing time to locate faults. In addition, the ability to locate transient faults, including self-extinguishing arcs, provides valuable information in advance before they evolve to permanent faults. The introduction of Distributed Energy Resources and Electrical Vehicle Charging Stations has changed the basic, one-direction of power flow convention. The ability to continuously monitor multiple points along the network provides visibility into overloads, reverse power flow and harmonic content. The "Bird-on-a-Wire" form factor sensor has evolved from basic fault indicators to the Intelligent Grid Line Sensors we have today to provide the information we need to reduce the duration and frequency of outages. The data from these sensors are used by server-based applications to provide the information needed, from energy trending to transient events and fault information.

Cybersecurity Challenges

Instructor: Steven Dyer, Central Service Assn

Learn about protecting your utility from cyber threats. Discussion on identifying vulnerabilities, developing security protocols and implementing solutions to safeguard your utility.

Module 400: Smart Grid, Engineering & Emerging Technology

Technology Roadmap

Instructor: Doug Houseman, 1898 & Co.

This session will look at three factors to the utility technology roadmap: 1) increasing load impacts, 2) new and retiring technology impacts, 3) what to think about when building your technology roadmap. Specific technology areas to be covered will be metering and sensing, protection and segmentation, poles and undergrounding, conductors, and substations. The use of various OT systems (ADMS, DRMS, DERMS, etc.) will be discussed and how they impact the roadmap.

Emerging Distribution Transformer Technology

Instructor: Jason Anderson, EPRI

Over the last century, the electric distribution grid has been characterized by one-way power flow from centralized generation sources to end-users. The distribution grid is amid a profound transformation to become more flexible, resilient, and intelligent, enabling bi-directional power flow and potentially delivering both AC and DC electricity. New power electronic based solid-state transformers (SSTs) are emerging as a potential technology that could transform the way the distribution grid is designed and operated.

These new power electronic based transformer technologies may prove essential to enable electrification, more readily integrate distributed energy resources (DERs), and increase grid reliability and resilience. Session will provide an overview of SSTs and other emerging distribution transformer technologies discussing SST designs, potential capabilities, applications, and challenges.

Lessons Learned - Energy Storage Operations

Instructor: Jason Handley, Duke Energy

Duke Energy will share its experiences and lessons learned on operations and maintenance of battery energy storage systems and microgrids. The grid is quickly adapting to the addition of many types of distributed energy resources. The majority of this new equipment joining the grid is microprocessor, power electronic, and inverter based which has a completely different maintenance and life cycle than traditional grid hardware. This session will highlight these changes and some of the complexities in operating and maintaining this equipment can have through a variety of lessons learned.

Residential Demand Billing

Instructor: Jason Thrash, Wiregrass Electric Cooperative

Learn about the purpose and implementation of a Residential Demand Billing rate.

Rate Strategies for Next Generation Distribution System

Instructor: Michael Watson, Empiric

Electric utilities face a confluence of societal shifts driven by technology and politics. Technology is introducing new loads and resources behind the meter. Politics is introducing incentives that may not reflect the true value of the loads or resources, resulting in accelerated adoption. Add to this mix, utilities are investing billions of dollars in advanced meter infrastructure and load control technology. These factors combine to create an environment ripe for change but held back by fear and inertia. New analytics tools allow utilities to explore rate options at the individual consumer level. This session demonstrates the impact of various rate strategies on different segments of the residential rate class.

Asset Traceability

Instructor: Kevin Gorham, EPRI

Utilities manage extensive distribution networks spanning thousands of miles. These networks consist of various asset types, such as conductors,

transformers, substations, etc. Keeping track of the network assets is challenging due to the sheer volume and complexity, maintenance history, and other relevant data. Utilities commonly use enterprise asset management systems to manage their assets. However, these systems lack complete traceability regarding an asset's history and available data. Multiple utility management systems may house different types of asset attributes. For instance, one system might track maintenance schedules while another records asset specifications. Cross-referencing these systems can be difficult.

EPRI has proposed a solution: a simplified asset traceability method that integrates records from disparate systems via a common identifier. By linking asset data across various systems, utilities can improve traceability and enhance decision-making.

Simplifying Coordination in High Density Recloser Installations

Instructor: Kiran Ravikumar, SEL

Increased density of protective devices on distribution networks can help improve reliability metrics by reducing the number of customers within any isolation zone. However, traditional relaying coordination methods become increasingly difficult to implement as the total number of devices increases. To maintain security and selectivity, traditional protection requires additional time delays for each sequential protective device, thus increasing the time that fault current is present on the system. Session focuses on how an advanced coordination scheme, not limited by traditional coordination considerations, was developed using high-speed communications infrastructure.

Engineering Access & Data Analytics for Distribution Line Relays

Instructor: Chris Boos, Alabama Power

Discuss how Alabama Power is using remote engineering access connections to help manage their fleet of distribution line relays. The focus of the discussion will be around automated data collection, automated data analysis, and issue reporting for condition-based maintenance and human performance improvements. Traditional uses of engineering access, including event captures, settings updates, and remote troubleshooting will also be briefly covered.

How Distribution Connected Renewables are Stealing VARs from the Grid

Instructor: Bob McFetridge, Beckwith Electric

This session will discuss the connection of 1-10 MW solar farms and batteries to the distribution grid. When inverter-based generation is attached to the distribution grid the injection of power creates voltage rises. If the voltage rise is too great the generation is either curtailed or trips off-line. The smart inverters can regulate the voltage back down by absorbing inductive VARs like motors so the voltage remains stable, and the inverters can inject additional real power. While this sounds like the solution to the problem, capacitive VARs needed to be added back into the grid without causing a voltage rise. The inverters can steal VARs from the

grid even when operating at unity power factor. The voltage rise caused by the real power injection can force voltage controller capacitor banks to open, thus reducing the reactive VARs on the grid. Utilities will be required to add additional capacitor banks to the grid and re-evaluate the switching schemes and placement of the capacitor banks.

Microgrid Case Study

Instructor: Steven Schultz, ABB

The ABB Electrification site in Senatobia, Mississippi is the company's first U.S. facility to integrate technology that will achieve carbon-neutral manufacturing. The investment in operational advancements is in line with ABB's 2030 Sustainability targets and its Mission to Zero program that enables the company to leverage its own products and services to meet Scope 1 and Scope 2 emissions targets. By increasing the use of renewables and optimizing energy storage, ABB will reduce energy consumption and CO2 emissions, and increase cost savings. The ABB site is equipped with a solar microgrid that uses renewables as a distributed energy resource in combination with an Energy Storage System (ESS). This allows backup power and sustainable energy usage from PV Solar and battery during peak utility demand. The Microgrid is monitored and controlled using systems integrated by the ABB Digital Systems Center.

Witness Testing - DER Interconnections

Instructor: Keith Hardt, Pungo Engineering

With distributed energy resource (DER) penetration growing increasingly in certain regions of the United States, utilities need to incorporate special considerations and solutions that encompass all aspects of the interconnection procedure. The interconnection of any energy resource to the electrical grid requires careful attention to its impact on the surrounding system and consumers. This is true whether the source is landfill gas to energy generation, peaking power plants, community PV, battery storage, or any other type of DER. Different strategies are used by utilities depending on the local characteristics of the distribution system. Learn more about the equipment needed for utility system protection and the means and methods for performing witness testing to be in compliance with IEEE 1547 Standard for Interconnecting Distributed Resources with Electric Power Systems and other industry standards for interconnected DER's.

Comprehensive Area Planning & N-1 Contingency Studies

Instructor: Andrew Monroe, QUES

Session will cover the processes involved in a large-scale area planning project with the goal of improving feeder performance and reliability metrics including SAIDI, SAIFI, and CAIDI. Topics include data collection, model validation, and load forecasting; feeder normalization using planning criteria and mitigation strategies to eliminate violations; reliability analysis; and capacity analysis for feeder and substation N-1 contingency plans. Actual studies will be referenced.

Module 500: Control Training Lab

These sessions will be discussion and demonstrations of apparatus equipment internal and external controls. Learn about programming and functionality of regulator, recloser and capacitor controls from the manufacturer. Also sessions on relays.

Eaton - Transitioning to Next Generation Reclosers and Control

Instructor: David Swafford, *Southcon*

As recloser apparatus and control technology continues to advance, how can utilities take advantage of the available improvements? This session presents Eaton new products, the innovative ways utilities are utilizing them, and how they can support their personnel through the transition to a more modern grid.

ABB - Eagle Single Phase Recloser with Long Range Communications and Use Cases

Instructor: Andrew Peterson, *ABB*

This session will discuss the latest advancements with the ABB Eagle self-powered single phase recloser which includes the capability for long range communications (LRC). This feature allows users to monitor, configure, and operate the Eagle remotely and provides the means for DNP 3.0 communication. Also explore use cases from current users of the Eagle.

Beckwith - Regulator & Capacitor Controls

Instructor: Miguel Bengla, *Beckwith Electric*

This session will cover regulator and capacitor control basic functions and programming. Also included will be the presentation of more advanced applications to manage Distributed Automation and Distributed Energy Resources along with how to set up the controls.

SEL - Advanced Applications with the SEL-351 Relay

Instructor: Jai Subbarayan, *SEL*

The SEL-351 Relay is commonly applied in distribution feeder overcurrent protection. In this session, students will learn several advanced applications of the SEL-351 relay beyond traditional overcurrent protection, such as harmonic blocking, automatic source transfer, directional element settings and breaker failure protection.

Southern States - Gold Eagle Single Phase Recloser

Instructor: Alex Bradfish, *Southern States LLC*

Discussion on the present benefits, unique features and use cases of Southern States Single Phase Reclosers. The session will cover two products: 1) Single Phase Gold Eagle Recloser with SEL 351RS (Kestrel) Control Cabinet and 2) Single Phase Cutout Mounted Gold Eagle Recloser.

Hubbell - Recloser & Beckwith Control

Instructors: Javier Bonilla, Matt Garver,

Hubbell Utility Solutions

This session will first focus on the new Hubbell Liberty family of three phase reclosers and single phase recloser options. This session will also help users interpret data logging in VersaTech reclosers to identify various scenarios that may impact system reliability and provide tips on how to maximize the VersaTech recloser capabilities when combining it with different protective assets on the network.

The session then transitions to the Beckwith advanced recloser control to cover programming and complex scenarios. Included will be a review of pre-built functions for setting up an application:

- Sectionalizer Module
- Decentralized FLISR Module (aka FLISR without communications)
- Recloser Module
- Downed Conductor Functionality
- Graphical Real Time Function Monitoring Screens for Testing and Troubleshooting
- Drag and Drop DNP Map Configuration
- Email Support Hot Button

SEL - Troubleshooting a SEL-651R Lock Out

Instructor: Jai Subbarayan, *SEL*

The SEL-651R is commonly applied as recloser control in distribution system protection and control. In this session, students will learn the fundamentals of the reclosing function in the SEL-651R and learn some common causes of unexpected lockouts in recloser relays. There will also be a demonstration of an event analysis to identify the cause of an unexpected lockout.

GE Multilin Agile - Substation Breaker Relay

Instructor: Craig Wester, *GE Vernova*

This session will review the GE Multilin Agile which provides powerful, compact, and economical feeder protection and bay control for utility substation breakers. The session will highlight the key functionality and key features of the GE Multilin Agile, such as compact draw-out design, complete feeder protection, feeder reclosing, advanced monitoring and recording, sag and swell, flexible and advanced SCADA communications, configurable front HMI and control pushbuttons, simple model number selection, easy configuration, advanced built-in cyber security, and current/voltage simulation mode for testing.

S&C Electric - TripSaver II Application and System Deployment Strategies

Instructor: Ryan McAndrews, *S&C Electric*

This session will discuss the programming of an S&C TripSaver II for several common lateral recloser applications. A S&C TripSaver II will be used to demonstrate the behavior changes behind settings along with a placement demonstration. The session will highlight the specific settings and programming necessary for each application.

S&C Electric - Vacufuse II and EdgeRestore System Application

Instructor: Ryan McAndrews, *S&C Electric*

This session will introduce and discuss applications of S&C's Vacufuse II Self-Resetting Interrupter and S&C's EdgeRestore Underground Distribution Restoration System. Units will be demonstrated in the classroom. Also discuss application strategies for these devices and how they are best utilized alongside the S&C TripSaver II Cutout Mounted Recloser. The session will highlight the specific settings and programming necessary for each application.

Closing Session

Reliability and Risk: The Challenges of Managing Expectations

Instructor: Kevin Mara, *Hi-Line Engineering*

Customers are working more from home and have a higher reliance on electronic equipment and a desire for a higher level of reliability and resiliency. This is coupled with the electric utility risk around resiliency and protection of the public and the environment. The discussion will consider risk from major events such as hurricanes, wind sheer events, major thunderstorms, and ice storms. What steps are utilities using to harden systems or system components. These steps include enhanced vegetation management and self-healing systems. Fire mitigation is another risk that poses a potential liability for utilities and risk for the public. Undergrounding is an option for risk management and how utilities are financing and prioritizing the undergrounding projects. Flooding impacts to substations and some areas with padmounted equipment. Advance issues such as battery storage both behind the meter and utility will be discussed. New tools for resiliency now include micro grids. The discussion will include case studies from utilities. Justification tool for resiliency projects is the DOE's Interruption Cost Estimator (ICE). This will be reviewed to provide a means for cost-benefit analysis of projects.