



## 2020 Training Seminar Agenda

Portland, Oregon

March 17 – 19, 2020

### Monday, March 16, 2020

**12:00 PM – 6:00 PM**      **Registration desk open**  
Hilton Downtown Portland, OR

### Tuesday, March 17, 2020

**6:30 AM – 6:00 PM**      **Registration desk open**  
Hilton Downtown Portland, OR

**6:30 AM – 8:00 AM**      **Breakfast (Provided)**  
Hilton Downtown Portland, OR

**8:00 AM – 8:15 AM**      **Introduction and Welcoming remarks**  
Lee Morgan

**8:15 AM – 9:00 AM**      **History of Power Circuit Breakers (PCB)** – a brief history of high voltage PCB and development of different arc interruption techniques. (Jozef Levi-Doble)

**9:00 AM – 10:00 AM**      **OA-4 troubleshooting** – Very basic hydraulics theory. Hydraulic schematic symbols. Hydraulic prints and operations. OA-4 hydraulic and mechanical operating principles. Troubleshooting trip-free and pressure dumping. Rebuilding of valves and latches and addressing lubrication issues. (Lee Morgan)

**10:00 AM – 10:15 AM**      **Break**  
Hilton Downtown Portland, OR

**10:15 AM – 11:00 AM**      **Basic HV Circuit Breaker Timing** – (Volney Naranjo - Megger)  
Hilton downtown Portland, OR



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- 11:00AM – 12:00 PM**     **HV Circuit Breaker Timing** – (Volney Naranjo - Megger)  
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- 12:00 PM – 1:00 PM**     **Lunch** (Provided)  
Hilton Downtown Portland, OR
- 1:00 PM – 2:00 PM**     **SF<sub>6</sub> – The Alternative Gas** – With the ever-growing challenges of federal & local reporting and SF<sub>6</sub> emission reduction, a number of alternatives have been presented to the industry in replacement of SF<sub>6</sub> gas. As the industry continues to review and consider alternatives, we should not limit our solutions. SF<sub>6</sub> continues to be the best alternative for medium and high voltage electrical insulation and arc quenching in GIE. Turning to the existing stockpile of SF<sub>6</sub> gas offers an environmentally friendly alternative solution to importing virgin SF<sub>6</sub> gas from overseas. The implementation of reconditioned SF<sub>6</sub>, which has been properly treated to meet or surpass IEEE, IEC and CIGRE standards, helps to reduce the carbon footprint and eliminates SF<sub>6</sub> emissions that are the direct result of the manufacturing process. Awareness and preventative measures will allow our industry to continue using this insulating medium safely, provided the benefits of reuse are shared and understood.  
(Billy Lao-Dilo)
- 2:00 PM – 3:00 PM**     **Measuring breaker motion and transducer adapters** –  
Explanations why motion traces during timing are important. Adapters to fit motion transducers on older and newer PCB and Limitations of transducer and using the correct transducer. (Lee Morgan)
- 3:00 PM – 3:15 PM**     **Break**  
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- 3:15 PM – 4:00 PM**      **ABB's FSA-2 Mechanism Lubrication issues** – Basic FSA-2 mechanism operating principles. Poor lubrication effects on breaker's operation identified by timing. Removal, dis-assembly, cleaning, re-lubing and re-installing of latches, gears and sleeves. (Steve Hood-BPA)
- 4:00 PM – 5:00 PM**      **BPA 550 PM inspection program** - Purpose. Inspection. Interrupter change out work procedures. Shipping and storage. Rebuilding and upgrading ABB's double SP interrupters. (Shawn Syhlman-BPA)
- 5:00 PM – 6:00 PM**      **Reception/Networking Hour**  
Hilton downtown Portland, OR
- 6:00 PM – 8:30 PM**      **Dinner (Provided)**  
Hilton downtown Portland, OR

### Wednesday, March 18, 2020

- 6:30 AM – 8:00 AM**      **Breakfast (Provided)**  
Hilton downtown Portland, OR
- 8:00 AM – 9:00 AM**      **Leaking SF6 on bushing** – This topic addresses how to detect, repair and prevent SF6 bushing leaks due to aging. Porcelain bushing on PCBs are affixed to the metal flange by way of Portland cement which tends to develop leaks as temperature changes and ageing. Composite bushings are now also developing leaks due to age and types of adhesive used to attached fiberglass to the meatal flange. **Impact of moisture on HV equipment** (Lee Morgan)
- 9:00 AM – 10:00 AM**      **TRV Capacitors– The Whys, where's and how's**  
History, purpose, identification and how TRV capacitors works, how to properly grounding and testing TRV capacitors on HV circuit breakers. (Ken Edwards-First Energy Corp.)
- 10:00 AM – 10:15 AM**      **Break**



- 10:15 AM – 11:00 AM**    **MEPPI PCB Print** – Detailed look at a schematic print from an MEPPI circuit breaker using the control scheme, schematic symbols, aux switches and device numbers from basic print reading topic. (Jim Altenhof-MEPPI)
- 11:00 AM – 12:00 PM**    **Basic SF6 Gas** - Terminology and definitions. Basic SF6 gas properties. How it's made and purified. Pressures & vacuum. Unit of measure for pressure. Gauge types and readings. Impurities and its effects. Vacuum dry-out theory. Sample of easy operating direction for Dilo carts (Dilo for Dummies). (Lee Morgan)
- 12:00 PM – 1:00 PM**    **Lunch** (Provided)  
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- 1:00 PM – 2:00 PM**    **g<sup>3</sup> – Alternative to SF<sub>6</sub> gas for High Voltage Equipment.** This presentation will detail GE's SF<sub>6</sub> alternative, g<sup>3</sup>, and its comparison to SF<sub>6</sub> for use in high voltage circuit breakers including design, performance and maintenance. (Todd Irwin-GE)
- 2:00 PM – 3:00 PM**    **Testing and assessing the release coils of switchgear**– The performance of the switchgear is dependant upon many system's components, presentation will show how to test and assess the release coils of the switchgear. (Guy Wasfy-KoCos)
- 3:00 PM – 3:15 PM**    **Break**  
Hilton downtown Portland, OR
- 3:15 PM – 4:00 PM**    **Decommissioning of HV breakers** – Safety issues dealing with breakers that has been permanently removed from service. Dealing with transportation and dis-assembling of charged mechanism and interrupters with pressurized tanks. (Steve Cabeza-Alabama Power)



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**4:00 PM – 5:00 PM**      **HV substation thermal scans** - Terminology and definitions. Purpose of scans. Effects due to environment and system condition. Safety. Proper camera settings. Scanning technique. EPRI guides. Thermo limits of HV substation equipment and accessories. (Lee Morgan)

**5:00 PM – 6:00 PM**      **Reception/Networking Hour**  
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**6:00 PM – 8:30 PM**      **Dinner (Provided)**  
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### Thursday, March 19, 2020

**6:30 AM – 8:00 AM**      **Breakfast (Provided)**  
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**8:00 AM – 9:00 AM**      **Current Transformer (CT) safety** – Identification of high voltage CT's. Purpose and use of CT's. Hazards of dealing with CT secondary circuits. CT secondary circuit schematics and prints. Identification and labeling of CT's secondary circuits. Safe work practices and procedures. Proper tools, equipment and components. (Lee Morgan)

**9:00 AM – 10:00 AM**      **Radiography** - This course will offer an overview of the internal inspection of high voltage circuit breakers using radiography. Attendees will gain a basic understanding of the technology, and the benefits over traditional internal inspections with the risks associated in performing these tasks. Actual radiographed results will be shown, along with a sample of parts radiography inspection discovered as damaged. (Jeff Pindro-ABB)

**10:00 AM – 10:15 AM**      **Break**  
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- 10:15 AM – 11:00 AM**    **Awareness of and Best Practices of Catastrophic SF6 equipment failure** – Discussion on what to do from the beginning to end of a failed SF6 Gas insulated equipment. Recognition form equipment status. Protecting the employees. Controlling and maintain the site. Isolating the field equipment. Safely Disposing of the equipment and dealing with the site. (Neil Hutchins -Southern Company)
- 11:00 AM – 12:00 PM**    **New grounding horn design** – Grounding horns are installed for ease of attaching portable protective grounds (PPG) on equipment, when the bus connection needs to be undone for testing or repairs, the PPG needs to be re-attached to a different location. This new design will allow the bus connection to be separated without detaching PPG. (Shawn Syhlman-BPA)
- 12:00 AM – 1:00 PM**    **Lunch (Provided)**  
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- 1:00 PM – 2:00 PM**    **Understanding timing and troubleshooting** – Terminology and definitions. IEEE standards. How to read grafts/plots. How to calculate limits of various PCB manufactures. Test leads Installation, Safety, Comparing results. Common errors and Troubleshooting. (Lee Morgan)
- 2:00 PM – 3:00 PM**    **Battery testing and maintenance** - Terminology and definitions. Battery types. Safety. Visual inspections. Impedance testing. Capacity testing. (Volney Naranjo - Megger)
- 3:00 PM – 3:15 PM**    **Break**  
Hilton downtown Portland, OR
- 3:15 PM – 4:15 PM**    **SF6 Quality testing** – (Justin Palmer)  
Hilton downtown Portland, OR

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| <b>4:15 PM – 5:00 PM</b> | <b>Open Discussion</b> – Questions/answers, comments, suggestions. |
| <b>5:00 PM – 6:00 PM</b> | <b>Reception/Networking Hour</b><br>Hilton downtown Portland, OR   |
| <b>6:00 PM – 8:30 PM</b> | <b>Dinner (Provided)</b><br>Hilton downtown Portland, OR           |

Agenda is tentative. Topics and timeline may be adjusted to better serve the attendees.