GAS INSULATED SUBSTATIONS

January 29-30, 2018
Pepco Offices
701 9th St NW
Washington, DC

Featuring a Waterfront Substation Site Visit
TUESDAY, JANUARY 30, 2018

PRE-CONFERENCE WORKSHOP
GIS 101: An Introduction
Best Practices and Considerations
MONDAY, JANUARY 29, 2018

POST-CONFERENCE WORKSHOP
GIS Commissioning:
Best Practices and Considerations
WEDNESDAY, JANUARY 31, 2018

HOST UTILITY

Pepco Holdings, Inc

SPONSORS
OVERVIEW

Faced with increasing demands for reliability, improved aesthetics and security, the adoption of gas insulated substations (GIS) by North American utilities is rapidly increasing. Companies elect to use GIS because of the increased load and limited space present in the urban areas. Often, building new substations or increasing capacity is difficult because land is either not available or is prohibitively expensive.

This conference will address regulatory, technical and business considerations for GIS. It will review GIS technology and detail current design trends and maintenance solutions for gas insulated substations. Utilizing both technical presentations and case studies from leading utilities, attendees will be provided with a sound understanding of GIS capability as well as real-world examples involved in selecting and constructing GIS substations.

In addition, experts will cover technical and commercial capabilities, review greenhouse gas issues, illustrate how to replace aging infrastructure with GIS, and review considerations for selecting GIS. They will discuss various special challenges involved in GIS, including SF6 leak detection, GIS commissioning, constraints, and challenges from an engineering perspective.

This event will conclude with a tour of Pepco’s brand-new Waterfront substation.

LEARNING OUTCOMES

- Discuss Dominion Energy’s operating and maintenance experience with GIS, as well as their future GIS projects
- Explain critical components of GIS commissioning
- Describe GIS safety practices and considerations
- Participate in a Q&A with expert GIS vendors
- Describe how to arrange display and controls to enhance safety
- Discuss SF6 regulations and alternatives to SF6
- Review important design, operations and maintenance considerations for a Seattle City Lights’ GIS installation
- Explain Pepco’s Capital Grid projects, including their use of Bentley 3D for concept development
- Provide tips for writing a comprehensive GIS specification
- Discuss IEE Switchgear Committee- ADSCM alternative insulating gases to SF6 Task Force Update
- Discuss the design, construction, and commissioning process for Pepco’s Waterfront substation
- Participate in a site visit to Pepco’s Waterfront substation

WHO SHOULD ATTEND

- Distribution executives and managers
- Substation and distribution engineers
- Project managers involved in substation design, modification, and installation
- Utility asset managers
- Construction firms involved in GIS projects
- Transmission and distribution planners
- Utility environmental managers

“Our company is looking at adopting this technology. The conference was very timely and the information. Very effective at answering my questions.”

Sr. Manager, ATCO
## AGENDA

### MONDAY, JANUARY 29, 2018

<table>
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<tr>
<th>Time</th>
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<tr>
<td>12:30 – 1:00 pm</td>
<td>Registration</td>
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| 1:00 – 1:15 pm | Welcoming Remarks<br>
* Sandra Fisher, VP of Transmission and Substations, Pepco |
| 1:15 – 2:00 pm | Dominion Energy & Gas Insulated Substations<br>
* Why Dominion Energy considers GIS<br>
* GIS history at Dominion Energy<br>
* Operating and maintenance experience with GIS<br>
* Future GIS projects<br>
* Dave Mitchell, Consultant, Dominion |
| 2:00 – 2:45 pm | GIS Commissioning<br>
* Brief overview of GIS components<br>
* Typical commissioning tasks and sequence of events<br>
* Field AC over potential withstand (HiPot) and assessment of various methods<br>
* Field Partial Discharge (PD) measurement techniques<br>
* Sean Parsi, Electrical Engineer, Kinectrics |
| 2:45 – 3:00 pm | Afternoon Break                                                        |
| 3:00 – 3:45 pm | GIS Safety Considerations<br>
* Designing for end user and manufacturer safety<br>
* Operator safety for switch position monitoring and gas filling<br>
* Responding safely to compartment and/or area SF6 alarms during operation<br>
* Maximizing safety and substation availability<br>
* Safety features for O&M access and ease of maintenance<br>
* Carl Kilcrease, Business Development Manager, ABB<br>
* Pat Ervin, Business Development Manager, ABB |
| 3:45 – 5:15 pm | GIS Hot Topics Q&A Panel<br>
* This panel presents an opportunity to pose your GIS questions to industry experts. Panelists include:<br>
* Moderator: George Becker, Senior Substation Engineer, POWER Engineers<br>
* Jaclyn Cantler, Director of Transmission and Substation Engineering, Pepco<br>
* David Gianamore, Assistant General Manager-Substation Division, Mitsubishi Electric Power Products, Inc.<br>
* Thomas Schulz, Manager- North American Gas Insulated Substations, ABB<br>
* Ed Grilli, Business Development, Hawkeye/Elecnor & President, EJG Strategic Partners<br>
* Jim Hackett, Manager, The Colt Group |
| 5:15 – 6:30 pm | Networking Reception                                                   |
TUESDAY, JANUARY 30, 2018

8:00 – 8:30 am  Continental Breakfast

8:30 – 9:15 am  GIS Local Control Cabinets
• Arrangement of display and controls to enhance safety
• How diagnostics and communication improve availability
• Dimensions and placement choices for indoor substations
• Outdoor configuration considerations
• Equipment state awareness
  David Gianamore, Assistant General Manager-Substation Division, Mitsubishi Electric Power Products, Inc.

9:15 – 10:00 am  SF6 Regulations and Alternatives to SF6
• Sulfur Hexafluoride (SF6) basics and regulations
• Alternatives SF6
• What are the current, practical alternatives?
• Why are companies looking at them?
• What are some of the industry needs?
• Next steps and predictions
  Keven Berent, Senior Program Manager, EPRI

10:00 – 10:30 am  Networking Break

10:30 – 11:15 am  115kV GIS – Extremely Compact Installation in an Urban Substation- Seattle City Light
This session will discuss design considerations as well as subsequent operations and maintenance challenges at Seattle City Light's Union GIS substation. Topics will include:
• 115kV GIS specification
• Meeting space constraints – still with GIS
• Cable termination issues – HPFF cable termination challenges on to GIS
• Test and commissioning challenges
• Future test and diagnostic provisions
• Gas pressure monitoring, instrumentation, CTs, VTs, etc.
• Spare parts
  Rajinder Rai, Principal Substation Engineer, Seattle City Light

11:15 am – 12:00 pm  Pepco’s Bentley Substation
This case study will include:
• Use of Bentley Substation 3D design suite to develop designs for indoor GIS substations
• Advantages and disadvantages of 3D modeling for concept development
• How Bentley substation was implemented
• Features not used
• Future plans for Bentley substation development
  Gary Klein, Principal, Substation Engineering Company (SECo)
  Heather Anderson, Electrical Engineer, Substation Engineering Company (SECo)

12:00 – 1:00 pm  Group Luncheon
1:00 – 2:00 pm  Tips for Writing a Comprehensive GIS Specification & IEE Switchgear Committee- ADSCM Alternative Insulating Gases to SF6 Task Force Update
   • Tips for Writing a Comprehensive GIS Specification
     o Technical scope of supply and service conditions
     o System performance and required rating structure
     o General and detailed component requirements
     o Codes and standards
     o Review application, related costs, operational and maintenance practices
     o Design and factory testing requirements
     o Address new industry standards
   • IEEE Switchgear Committee – ADSCOM Alternative Insulating Gases to SF6 Task Force Update
     o Report on status of existing alternative gases
     o Impacts on IEEE Switchgear and Substation standards
     o Coordination work with other organizations (CIGRE, IEC, NEMA, etc…)
     o Status of report to IEEE Switchgear and Substation Standards Committees

George Becker, Senior Substation Engineer, POWER Engineers

2:00 – 2:45 pm  GIS & Circuit Breakers
   • Overview of EPRI’s circuit breaker and gas insulated substation/lines research
   • Interesting results from current research
   • Examples of how GIS/GIL research is being used in the field

Bhavin Desai, Senior Program Manager, EPRI

2:45 – 3:00 pm  Afternoon Break

3:00 – 3:30 pm  Pepco Waterfront Substation
   This session will cover the timeline and challenges unique to Pepco’s Waterfront substation, from decision-making through construction, commissioning, and operation. Pepco will provide an overview of the substation so that attendees can maximize the effectiveness of their visit.

Stephen Anthony, Manager- Substation Engineering, Pepco
Vandana Gyandhar, Project Manager, Pepco

3:30 – 5:00 pm  Waterfront Substation Site Visit

5:00 pm  Conference Adjourns

“Very good technical content.”
Instrument and Control Supervisor, New York Power Authority

“Great speakers with good information.”
Sr. Structural Engineer, Burns & McDonnell
OVERVIEW

This workshop will provide an overview of gas insulated substations (GIS). It will begin with a description of the fundamental characteristics of GIS, including a comparison of AIS vs. GIS, details of GIS designs, and a review of the business case for GIS. The speakers will discuss reliability and system planning implications for gas insulated substations. They will compare substation safety and security using AIS vs. GIS. Attendees will learn GIS maintenance basics and review SF6 gas management strategies and techniques. They will leave the workshop with an understanding of potential services for maximizing GIS life and learn how to monitor GIS conditions. The workshop will also describe medium voltage GIS and review the differences between medium voltage GIS and high voltage GIS. We will conclude with a Q&A session to cover any remaining questions.

LEARNING OUTCOMES

- Describe fundamental characteristics of GIS
- Discuss GIS designs
- Compare AIS and GIS
- Review the business case for GIS
- Explain GIS from a turnkey perspective
- Assess reliability and system planning implications for GIS
- Describe substation safety and security using AIS vs. GIS
- Discuss GIS maintenance
- Review SF6 gas management strategies and techniques
- Explain proactive services for maximizing GIS life
- Address GIS condition monitoring
- Describe medium voltage GIS
- Review the differences between medium voltage GIS and high voltage GIS

WHO SHOULD ATTEND

- Distribution executives and managers
- Substation and distribution engineers
- Project managers involved in substation design, modification, and instillation
- Utility asset managers
- Construction firms involved in GIS projects
- Transmission and distribution planners
- Utility environmental managers
- Anyone wanting to learn more about the basics of gas insulated substations
AGENDA

MONDAY, JANUARY 29, 2018

8:00 – 8:30 am  Registration and Continental Breakfast

8:30 am – 12:00 pm  Workshop Timing

High Voltage GIS
- Fundamental characteristics of GIS
  - Early GIS Designs
  - Current three in one and single phase GIS designs
  - Comparison of AIS and GIS
  - AIS/GIS interface
  - GIS engineering and layout considerations
- The business case for GIS
- Turnkey perspective
- Grid hardening with GIS
  - Reliability and system planning implications
  - Enhanced safety and substation security
- GIS Maintenance
  - SF6 gas management strategies and techniques
  - Proactive service for maximizing GIS life
    - Maintenance, refurbishment and expansions
  - Position monitoring and camera systems
  - GIS condition monitoring
- Latest GIS technology evolutions and innovations

Medium Voltage GIS
- Overview
- Purpose vs. high voltage GIS
- Fundamental characteristics

Questions

Conclusion
WORKSHOP INSTRUCTORS

Nick Banks

*Grid Integration and Substation Business Development, ABB*

Nick Banks currently works with the Grid Integration & Substations Business Development and Proposals team in Raleigh, North Carolina. In this role, Nick supports proposals and helps develop customer focused solutions across multiple market segments in including utilities, public powers, renewables and industrials. Nick started his career with ABB two and a half years ago as Strategic Account Business Development Manager for the Transformer Services group. Prior to joining ABB, Nick held several roles with GE Energy including supply chain, engineering and sales in the Gas Turbines and Energy Management groups. Nick holds a Bachelor’s Degree in Mechanical Engineering from North Carolina State University, where he led various projects in renewable energy and EV charging infrastructure.

Pat Ervin

*Business Development Manager, ABB*

Mr. GL “Pat” Ervin is the Business Development Manager for ABB Power Grids North American compact substation group. ABB Power Grids is the partner of choice for a stronger, smarter, & greener grid. He is responsible for convincing utilities to convert from large traditional substation switching technology to modern compact systems. He has seven years of experience developing compact substations for ABB and another 30 years of experience developing distributed control systems, generator excitation systems, distributed generation (microturbines), distribution apparatus (capacitors, arresters, & cutouts), power transformers, uninterruptible power supplies, & cable accessories. He received a Bachelor of Science General Studies degree from West Point.

Carl Kilcrease

*Business Development Manager, ABB*

Carl Kilcrease is Business Development Manager with ABB Power Grids – Grid Integration located in Raleigh, NC. He previously worked for ABB Transformers Division as both Marketing Manager and Project Manager located in South Boston, VA. Prior to working for ABB, Carl worked for Eaton’s B-Line Business as Quotation Manager located in Highland, IL. He also worked for General Electric for 12 years in a variety of quality, engineering, and marketing roles, including Commercial Operations Manager in the Industrial Solutions Business located in Mebane, NC. Carl served 4 years in the USMC where I was a Physical Security Inspector at Camp Lejeune, NC. In that role he was responsible for inspecting all critical facilities, including substations, and he wrote reports to the Commanding General with physical security recommendations.

Thomas Schulz

*Manager – North American Gas Insulated Substations, ABB*

Thomas graduated with a Masters Degree in Electrical Engineering from HTWK in Leipzig/Germany in 1996 specializing in Power Technology. He has been with ABB since 1999. As a project manager for airport projects in Kazakhstan, Uzbekistan and Kyrgyzstan he was responsible for the project handling for airport specific facilities and control as well as the power supply transmission lines and high voltage substation equipment.

Today Thomas Schulz is the ABB GIS Manager for North America. In this function he is responsible for the marketing and sales of the GIS from conceptual design to all technical and commercial aspects of the GIS.
POST-CONFERENCE WORKSHOP

GIS Commissioning: Best Practices and Considerations

WEDNESDAY, JANUARY 31, 2018

8:00 – 8:30 am Registration and Continental Breakfast

8:30 am – 12:00 pm Workshop Timing

OVERVIEW

This workshop will provide a brief introduction to the GIS commissioning process. The instructor will begin with a review of GIS commissioning basics and an overview of GIS field assembly. He will describe gas-related inspections, circuit breaker inspections, disconnect/ground switch checks, and contact resistant measurement. He will discuss how to conduct instrument transformer checks. Attendees will leave with an understanding of cable commissioning, grounding concerns and practices, and local controls and interlocking commissioning. The workshop will include a brief overview of operations and maintenance practices and will conclude with a review of safety and environmental considerations.

LEARNING OUTCOMES

- Review GIS commissioning basics
- Discuss GIS applications
- Explain brief overview GIS field assembly
- Describe gas-related inspections
- Assess circuit breaker inspections
- Address disconnect/ground switch checks
- Review contact resistant measurement
- Explain AC withstand and Partial Discharge measurements
- Discuss cable commissioning and grounding concerns and practices
- Describe instrument transformer checks
- Assess local controls and interlocking commissioning
- Describe a brief overview of operation and maintenance practices
- Review safety and environmental considerations

WHO SHOULD ATTEND

- Distribution executives and managers
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- Utility environmental managers
AGENDA
MONDAY, JANUARY 31, 2018

8:00 – 8:30 am  Registration & Continental Breakfast

8:30 am – 12:00 pm  Workshop Timing

- GIS Commissioning Basics
- GIS Applications
- Brief Overview of GIS Field Assembly
- Commissioning
  - Inspections
    - Gas related inspections
    - Circuit breaker inspections
  - Disconnect/Ground switch checks
    - Process
    - FAQs
  - Contact resistance measurement
    - Setup
    - Circuit configuration
    - Merits
    - Interpretation.
  - AC withstand and Partial Discharge measurements
    - Setup schemes
    - Partial Discharge overview
    - Measurement techniques
    - Interpretation
  - Cable commissioning and grounding concerns and practices
    - Cable and GIS interface overview
    - GIS and cable commissioning requirements
  - Instrument transformer checks
    - Unique injection and access requirements
    - VT hipot/PD test concerns
  - Local controls and interlocking commissioning
    - Control circuitry overview
    - Automation vs hardware control
    - Mechanical and electrical interlock requirements
  - Brief overview of operation and maintenance practices
- Safety and environmental considerations

WORKSHOP INSTRUCTOR

Sean Parsi
Electrical Engineer, Kinectrics

Sean Parsi is an electrical engineer with Kinectrics (previously Ontario Hydro Research Division). In his current role, he is primarily focused on delivering engineering, field or laboratory technical services in commissioning, condition assessment or forensic studies of energy management products, with specializations in Gas Insulated Switchgear (GIS) and underground extruded cables and accessories. His area of research is condition assessment based on online & offline Partial Discharge (PD) measurement techniques on various types of switchgear including MV, HV GIS and MV metal-clad. He is currently a contributing member of IEEE-PES-Substations-GIS subcommittee and IEEE-PES-Switchgear-switchgear assemblies subcommittee. Sean was previously employed by Areva/Alstom T&D where he managed and completed over 50 GIS construction and commissioning projects in 21 countries and 5 continents.
INSTRUCTIONAL METHODS

Case studies, PowerPoint presentations, group discussion, and a site visit will be used in this event.

REQUIREMENTS FOR SUCCESSFUL COMPLETION

Participants must sign in/out each day and be in attendance for the entirety of the conference for continuing education credit.

IACET CREDITS

EUCI has been accredited as an Authorized Provider by the International Association for Continuing Education and Training (IACET). In obtaining this accreditation, EUCI has demonstrated that it complies with the ANSI/IACET Standard which is recognized internationally as a standard of good practice. As a result of their Authorized Provider status, EUCI is authorized to offer IACET CEUs for its programs that qualify under the ANSI/IACET Standard.

EUCI is authorized by IACET to offer 1.1 CEUs for the conference and 0.4 CEUs for each workshop.

REGISTER 3, SEND THE 4TH FREE

Any organization wishing to send multiple attendees to this event may send 1 FREE for every 3 delegates registered. Please note that all registrations must be made at the same time to qualify.

EVENT LOCATION

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Substitutions & Cancellations
Your registration may be transferred to a member of your organization up to 24 hours in advance of the event. Cancellations must be received on or before December 29, 2017 in order to be refunded and will be subject to a US $195.00 processing fee per registrant. No refunds will be made after this date. Cancellations received after this date will create a credit of the tuition (less processing fee) good toward any other EUCI event. This credit will be good for six months from the cancellation date. In the event of non-attendance, all registration fees will be forfeited. In case of course cancellation, EUCI’s liability is limited to refund of the event registration fee only. For more information regarding administrative policies, such as complaints and refunds, please contact our offices at (201) 871-0474.

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