IEEE Standards Tutorial

Power Systems Surge Protection

Jonathan Woodworth

Principal Engineer, ArresterWorks

Monday, 4th February 2019, 10am to 4pm, at The University of Melbourne

Abstract:

Lightning is the second or third most significant cause of outages on most power systems. Mitigation of the effect of lightning is seldom understood and can often be improved. This in-depth course is designed for those responsible for the reliability of substations, distribution systems, and transmission systems. We will cover ways to improve the lightning performance of distribution and transmission lines by using arresters and other means. **For more details, please refer to programme on the next page.**

Biography of the presenter:

Jonathan started his career at Fermi National Accelerator Laboratory in Batavia, Illinois, where he was an integral member of the high energy particle physics team in search of the elusive quark. Returning to his home state of NY, he joined the design engineering team at McGraw Edison (later Cooper Power Systems) in Olean. During his tenure at Cooper he was involved in the design, development and manufacturing of arresters. He served as Engineering Manager as well as Arrester Marketing Manager during that time. Since 2008 he has been the Principal Engineer for ArresterWorks.

Though his entire career, Jonathan has been active in the IEEE and IEC standard associations. He is past chair of the IEEE SPD Committee, he is past chair of NEMA 8LA Arrester Committee, and presently co-chair of IEC TC37 MT4. He is inventor/co-inventor on five US patents. Jonathan received his Bachelor's degree in Electronic Engineering from The Ohio Institute of Technology and his MBA from St. Bonaventure University.

Registration: Members and visitors are welcome, RSVP at
https://ieee-pes-surge-protection-tutorial-2019.eventbrite.com.au

Cost (ex. GST): IEEE members $110, IEEE student members $50,
EESA members $190. All others $210.

Date/Time: Monday, 4th February 2019, 10am to 4pm. Lunch and afternoon tea will be provided.

Venue: The University of Melbourne, Parkville, VIC 3010 (Room number TBC)

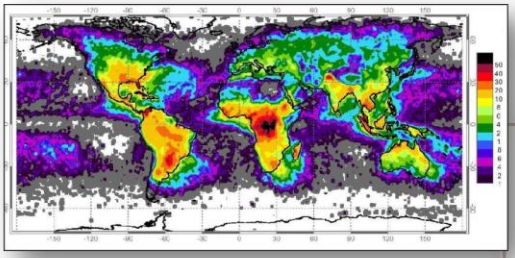
Parking: Ticketed parking is available at three locations (University Square Carpark, Royal Parade Car Park, and Eastern Precinct Car Park) within the Parkville campus. A number of other public car parks are also available within walking distance from the Parkville campus.

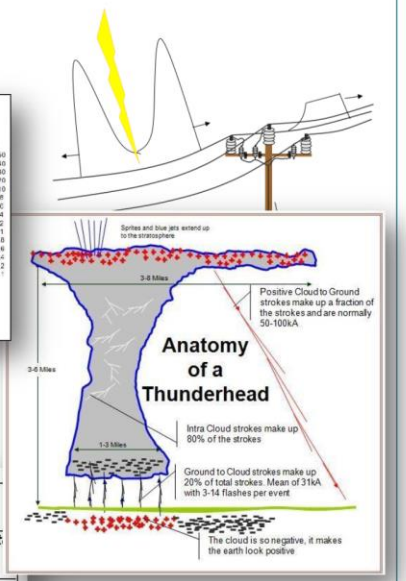
Minimum Numbers: Please note that for the workshop to proceed we need a minimum of 20 registrations. Should it not proceed registration fees will be fully refunded.

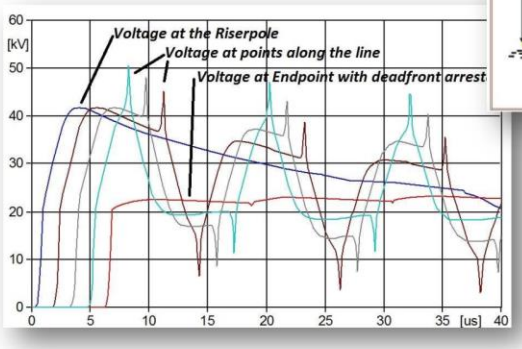
Further enquiries about this event, please contact us at pes.victorian@ieee.org

ArresterWorks

1 Day
Power Systems Surge Protection Seminar



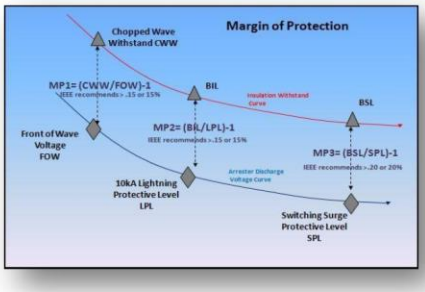




Power System Surge Protection Seminar

1-Day Seminar Overview

Lightning is the second or third most significant cause of outages on most power systems. Mitigation of the effect of lightning is seldom understood and can often be improved. This in-depth course is



designed for those responsible for the reliability of substations, distribution systems, and transmission systems. We will cover ways to improve the lightning performance of distribution and transmission lines by using arresters and other means.

What Attendees Will Learn

- **Surge fundamentals**: lightning, switching, faults, ferroresonance, line drops, and others • **How to select the most appropriate type of lightning protection**: Shielding, lightning rods, arresters, no protection, and possibly underground • **The difference between arrester types**: Station, transmission line, distribution, secondary, liquid immersed, elbow, riser pole, and more
- **What the ratings of an arrester really mean** and how to compare one manufacturer to another • **Margin of protection fundamentals** along with insulation coordination fundamentals
- **Separation Distance Fundamentals**
- **Arresters failures:** How to avoid, assess, and test in the field
- **Insulation Coordination Fundamentals**
- **How to Calculate the Value of an Arrester**
- **Disposal and life cycle management** of arresters • **What standards govern arresters** and system improvements?
- **Trends in the industry in lightning protection**
- **Charge Transfer Rating Overview** Including a review of how to apply this new rating to your system.

Materials

Each attendee will receive an Overvoltage Protection workbook based on the slide presentation that can be used as a reference for years to come.

Who Should Attend

- Anyone new to the industry who wishes to learn the fundamentals of lightning protection
- Reliability engineers and other reliability personnel responsible for continuous improvement • Power system operations and maintenance supervisors
- Power engineering personnel who wish to broaden their scope of system understanding
- Linemen interested in learning more about surge protection.

Instructor

Jonathan Woodworth, Consulting Engineer, ArresterWorks, started his career at Fermi National Accelerator Laboratory in Batavia, IL after receiving his Bachelor's degree in Electronic Engineering from The Ohio Institute of Technology in 1972. As an Engineering Physicist at Fermi Lab, he was an integral member of the high energy particle physics team in search of the elusive quark. In 1979 he joined the design engineering team at McGraw Edison (later Cooper Power Systems) in Olean, NY. Returning to school after many years in industry, Jonathan received his MBA from St. Bonaventure University in 1995. Jonathan was employed for 28 years at Cooper Power System where he served as Engineering Manager for 13 years. Additionally, he held the position of Arrester Marketing Manager for 7 years.

In 2007 Jonathan along with business and life partner Deborah Limburg started up Arrester Works a surge protecting Consultantsy that serves the surge protection industry worldwide.

Jonathan is very active in the IEEE and IEC standard associations previously serving as Chair of the Surge Protective Devices Committee of IEEE PES, Chair of the NEMA High Voltage Arrester Section, and currently Co-Convener of the IECTC37 MT4 committee responsible for IEC Arrester Standards and Convenor of the IEEE High Voltage Arrester Test Standard Working Group.

1 Day Surge Protection Seminar Outline

1. **What is an Arrester Overview?**
2. **Why Do We Need Arresters?**
   a) Insulation Protection
      i) Types of Insulation ii) BIL and CFO and 60 Hz
   b) The lightning Surge
   c) The Switching Surge
   d) Traveling Wave Phenomena.
      i) The lightning Surge.

3. **Where are arresters applied and Why?**
   a) Dist Trans
   b) Station Trans
   c) Station Entrance
   d) Dist Cap Banks
   e) Dist Open Points
   f) Dist and Trans Riser Poles
   g) Regulators
   h) Station Cap Banks
   i) Underbuilt System Protection
   i) The Backflash
   j) Line Protection
   k) Reclosers
   l) Dead End Insulators
   m) Underground Cabinets
   n) Switchgear Cabinets
   o) Generators
   p) Motors
   q) Sheath Voltage Limiters

4. **Arrester Fundamentals**
   a) **VI Curve**
   b) **TOV**
   c) **Energy Handling**
   d) **Testing**
5. **System Fundamentals with respect to Arresters**
6. **How to Select an Arrester**
   a) **AC Rating**
   b) **TOV**
   c) **Margin of Protection**
   d) **Energy Rating**
      i) **Charge Transfer Ratings**
   e) **Fault Current Rating**
   f) **Mounting Considerations**

7. **ABB Virtual Factory Tour**
8. **Field Testing of Arresters**
9. **Safety Considerations and**
10. **The Transmission Line Arresters**
11. **Standards**
    a) IEC Standard Status
    b) IEEE Standard Status
    c) Trends