



SEMINAR AGENDA

2011 Protective Relay Seminar & Exposition

August 23 - 25, 2011
Buena Vista Palace Hotel
Lake Buena Vista, Florida, USA
Industry Expo: August 24 - 25, 2011

Monday, August 22, 2011

10:00 – 17:00 **Registration & Information Desk Open**

Tuesday, August 23, 2011

7:00 – 17:00 **Registration & Information Desk Open**

7:00 – 8:00 **Breakfast**

INTRODUCTION GENERAL MATTER

8:00 – 8:15 Welcome Remarks

*Richard K. Ladroga, P.E.
VP, Global Strategic Development*

8:15 – 9:00 **History of Protection**

Protective relaying has steadily advanced over the last 100 plus years. We have seen accelerated improvements in protective relaying since the advent of microprocessor relays. This presentation will take a look at developments in protective relaying that have led to the technology we have today.

*Marion Cooper
Schweitzer Engineering Laboratories*

9:00 – 10:00 **ANSI/IEEE Devices**

This class will cover the uses of device numbers to classify power system protective devices. The class will cover the history of the device functions and how the device numbers are used in modern relays protective functions and settings. The class will also cover wiring diagrams standard schematics symbols and current transformer and power transformer standard connections.

KNOWLEDGE IS POWER

This agenda is preliminary and subject to change



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*Michael Childers, P.E.
Doble Engineering*

10:00 – 10:15 **Break**

10:15 – 12:00 **Power System Fundamentals**

This class covers the fundamentals of power system analysis. The class will cover the subjects of phasors for power system values, per-unit values for power system quantities and the use of symmetrical components calculations to determine power system fault currents and voltage sags.

*Michael Childers, P.E.
Scott Schnell, P.E.
Doble Engineering*

12:00 – 13:00 **Lunch**

13:00 – 14:00 **Instrument Transformers**

This presentation includes an overview of principle of operation of instrument transformers in particular Capacitor Voltage transformers (CVT) and current transformers(CT). In the presentation material Trench will cover types of CVTs and CTs, the different ratings of instrument transformers, the manufacturing, accuracy classes and testing in general of instrument transformers.

*Jorge Ribeiro
Trench Limited*

14:00 – 15:00 **Protective Relay Design History**

This presentation will present a time-line of protective relay design and application history of the last 110 or more years. It will cover the general progress of three major relay classification technologies . . . electromechanical, solid state and numerical, and provide detailed focus on the evolvment of line protection.

*Elmo Price
ABB*

15:00 – 15:15 **Break**

15:15 – 16:15 **Industry Topics**



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Digital relays, communications, and time synchronization have dramatically improved our ability to monitor and control the power system. We will discuss the application of new technology such as synchrophasors and high speed communications to enhance system reliability and to optimize use of distributed assets.


Ed Atienza
Schweitzer Engineering Laboratories

16:15 – 16:45 **Q & A Session — “Ask the Experts”**

Pre-submitted and new questions from the floor will be presented and answered by a panel of experts. Also — “ASK DOBLE” questions & answers will be presented.

ADVANCED TUTORIALS

These tutorials will offer a detailed look at dynamic relaying, fault analysis, Comtrade files, and many other topics plus live demonstrations allowing attendees to put the knowledge learned during the Seminar into practical application.

The expanded program options are marked with the following sign: 

9:00 – 10:00 **Dynamic Relay Testing**



This tutorial will present a modern and more meaningful way to test relays and relay systems. Participants will learn why the traditional method of testing individual relay functions using steady-state calibrations is no longer a viable test method for testing modern multifunction relays. If these relays are tested under the pseudo power system conditions created by steady-state testing, problems in testing and in understanding the relay’s operation can occur. Dynamic relay testing means testing under true simulated power system conditions.

Tony Giuliante; President
ATG Consulting

10:00 – 10:15 **Break**

10:15 – 12:00 **Event Record Review to Verify Relay & Apparatus Performance**



This tutorial will present techniques on how to read, interpret, modify and convert digital fault records so that they can be played back into a relay to verify relay performance. The process of creating a COMTRADE file to perform a transient



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simulation test will also be presented. These techniques will be used to analyze and validate actual relay performance during a line fault on a 345 kV line.

*Tony Giuliani; President
ATG Consulting*

12:00 – 13:00 **Lunch**

13:00 – 14:00 **COMTRADE FILES**



Since the inception of the COMTRADE standard in 1991 (C37.111) only a small number of users have successfully used the playback of digital fault recorder data to analyze relay response to power system disturbances. The use of COMTRADE files for protection testing is still limited due to the users' lack of familiarity with the standard. A good understanding of the COMTRADE standard allows the user to easily create a new file, or modify an existing file, to test the protection.

This tutorial will explain the basic structure of COMTRADE files and familiarize the user with how to edit or create COMTRADE files for use in protection testing.

*Jay Gosalia; Vice President of Market Solutions
Doble Engineering*

14:00 – 15:00 **Introduction to IEC 61850**



This class will cover the functions of IEC 61850 along with some examples of line protection in different relays. The class will cover how the GOOSE message of IEC 61850 are structured and are delivered and received to other devices on the protective network.

*Michael Childers, P.E.
Doble Engineering*

15:00 – 15:15 **Break**

15:15 – 16:00 **End to End Testing**



End to end testing will be highlighted in this tutorial.

*Scott Schnell
Doble Engineering*



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16:15 – 16:45 **Q&A Session – “Ask the Experts”**

Pre-submitted and new questions from the floor will be presented and answered by a panel of experts. Also – “ASK DOBLE” questions & answers will be presented.

Wednesday, August 24, 2011

7:00 – 17:00 **Registration & Information Desk Open**

7:00 – 8:00 **Breakfast**

DISTRIBUTION PROTECTION

8:00 – 9:00 **Over Current Coordination (Distribution)**

This part of the session will include the basic concept of coordinating over current relays in a power system and will include the following:

- Basic concept of over current coordination
- Coordinating intervals
- Requirements for achieving Phase and Ground coordination
- Polarizing quantities used in phase and ground directional relaying
- Issues with polarization for ground relaying

*Ed Khan; Solutions Manager, Protection Test Applications
Doble Engineering*

9:00 – 10:00 **Reclosing**

Principles, philosophies, applications including:

- Basic concepts of reclosing
- Criterion for selecting the reclosing delays
- Advantages of implementing reclosing
- Differences between reclosing on transmission and distribution circuits
- Discussion on circuits where reclosing is not desirable

*Glenn Goldfarb
ABB*



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10:00 – 10:15 **Break**

10:15 – 11:15 **High Z Faults**

Designing and setting protective relaying schemes that are sensitive to high impedance faults and cold load pickup without losing selectivity or that result in nuisance tripping or conductor burndown can be challenging. This presentation will consider methods presently available to address these challenges.

*Scott Secrest, P.E.; Director of Engineering
Three-C Electric*

11:15 – 12:00 **Distributed Generation**

Protection of distribution circuits with traditional types of distributed generation (synchronous or induction generators) is well understood. The introduction of newer generation sources such as fuel cells, PV systems, wind power, and battery storage which utilize power electronic devices to connect to the ac power system present new challenges to the protection and operation of distribution systems. This presentation will present some of these issues and how they are currently being addressed.

*Scott Secrest, P.E.; Director of Engineering
Three-C Electric*

12:00 – 13:00 **Lunch**

SUBSTATION PROTECTION

13:00 - 15:00 **Station Bus Protection**

- What is bus protection
- Various schemes that can protect a bus
- CT saturation and bus protection
- Description of Low impedance and high impedance bus protection
- Advantages and Disadvantages of Hi and Lo impedance bus protection
- New algorithms in microprocessor relays to detect CT saturation

*Ed Khan; Solutions Manager, Protection Test Applications
Doble Engineering*

This agenda is preliminary and subject to change



15:00 – 15:15 **Break**

15:15 – 16:15 **Coordinating Generator Protection with Transmission Protection – NERC Standards and Pending Requirements**

During the 2003 blackout, 290 power generators tripped off-line. These trippings resulted in the loss of 52,000 MWs of generation. Investigation of these trippings indicated that many were due to improperly set generator relays and lack of coordination with transmission line protection. A total of 194 generator units during the 2003 blackout were tripped by identified generator protective relays. A list of the protection elements that tripped included: mho-distance, voltage-controlled/-restrained overcurrent relays, over-excitation (volts/hertz), undervoltage, reverse power, loss-of-field, under/overfrequency and inadvertent generator relaying. Preventing the improper tripping of generation during transmission system disturbances is of great concern to NERC. Some of the trippings which occurred during the 2003 blackout were undoubtedly correct, but many were improper.

This tutorial will outline current NERC standards that address coordination of generator and transmission line protection. It will also discuss setting guidelines for generator protective elements that mis-operated during the 2003 blackout. Many of these setting recommendations were developed by various Working Groups within the IEEE.

Charles J. Mozina
Beckwith Electric Co., Inc.

16:15 – 16:45 **Q&A Session – “Ask the Experts”**

Pre-submitted and new questions from the floor will be presented and answered by a panel of experts. Also – “ASK DOBLE” questions & answers will be presented.

ADVANCED TUTORIALS

8:00 – 9:00 **Testing Demonstration of KD and SEL Phase Distance Relays Dynamic Characteristic**



This tutorial will demonstrate the dynamic characteristic of the KD and SEL phase distance relays. Attendees will see that the true distance characteristic of a KD phase distance relay does expand depending on the Source Impedance Ratio (SIR). The same test will be repeated for a SEL phase distance relay.

Tony Giuliante; President
ATG Consulting



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9:00 – 10:00 **Fast Bus Sectionalizing Using IEC 61850**



This class will demonstrate the use of fast bus sectionalizing using IEC 61850 to block an upstream feeder breaker for low side fault conditions. The class will have a live demonstration on how to use the Doble GSE 3.0 Goose configurator software along with Protest and SEL IEC61850 software products.

*Michael Childers, P.E.
Doble Engineering*

10:00 – 10:15 **Break**

10:15 – 11:15 **End to End Testing**



This tutorial will explore end to end testing.

*Michael Childers, P.E.
Scott Schnell, P.E.
Doble Engineering*

11:15 – 12:00 **AURORA Testing**



This tutorial will present AURORA testing.

*Ed Atienza
Schweitzer Engineering Laboratories*

12:00 – 13:00 Lunch

13:00 – 14:00 **Transformer Protection Testing**



*Scott Schnell, P.E.
Doble Engineering*

14:00 – 15:00 **Power Line Protection Using IEC 61850**





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This class will demonstrate the uses of an ABB670 relay for power line protection. The relay will use IEC61850 to send trip and close signals while at the same time the Doble F6150 test set will inject the power system fault current and voltages values and simulate the power line breaker sending the breaker status signals 52 a and 52 b back to the relay using IEC 61850.

*Michael Childers, P.E.
Doble Engineering*

15:00 – 15:15 Break

15:15 – 16:15 **Realistic Testing of Power Swing Blocking and Out-of-Step Tripping Functions**



Traditional power swing blocking functions based on concentric impedance characteristic or dual blinder schemes can be tested with conventional state simulation testing methods. However, this testing method does not represent a realistic power system swing condition due to sudden jumps in impedance, voltage, and current values. It is not suitable for testing the more recent power swing detection schemes based on rate-of-change of current or rate-of-change of impedance. A transient playback of recorded power swings, or transient files from EMTP and stability programs provide a realistic test but require highly specialized personnel, and it is difficult to target the impedance zones to test. An easier way of simulating realistic waveforms has been developed that can test all types of power swing and out-of-step detection schemes.

This presentation covers a brief review of power swing blocking and out-of-step tripping schemes, the more realistic simulation testing methods for generating stable power swing conditions and severe out-of-step or pole slip conditions and a live demonstration testing of these testing methods.

*Jun Verzosa
Doble Engineering*

16:15 – 16:45 **Q&A Session – “Ask the Experts”**

Pre-submitted and new questions from the floor will be presented and answered by a panel of experts. Also – “ASK DOBLE” questions & answers will be presented.

16:30 – 19:30 **Manufacturers Expo & Reception**

The industry’s top manufacturers and service providers will be on hand to provide answers to your questions, increase your knowledge with demonstrations, present



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you with promotional materials and product catalogs, and help you develop new contacts.

Thursday, August 25, 2011

7:00 – 17:00 **Registration & Information Desk Open**

7:00 – 8:00 **Breakfast**

TRANSMISSION LINE PROTECTION

8:00 – 9:00 **Distance Relaying**

In this session, basic principles of the design and application of the distance protection is covered. Basic measurement of MHO characteristic and its evaluation to the present time format will provide basic understanding of how the distance protection makes the measurement without going in to the complex mathematics and involved algorithms. Basic methods of polarizing circuits will be discussed and its effect on the measurement.

*Jay Gosalia; Vice President of Market Solutions
Doble Engineering*

9:00 – 10:00 **Pilot Schemes**

Basic principles of pilot schemes will be presented. Each pilot scheme will be discussed in detail with its logic and pros and cons of the application. This session will provide a complete understanding on how pilot schemes function during power system events and how it aids protection in making the right decision.

*Jay Gosalia; Vice President of Market Solutions
Doble Engineering*

10:00 – 10:15 **Break**

10:15 – 11:00 **Current Differential Protection**

In this session all types of differential scheme applied to power system apparatus and its basic application. Each differential protection applied will have its own challenges and those challenges will be discussed along with the solution as applied to the scheme. This presentation will provide good understanding of overall use of differential protection applied to different apparatus.

Jay Gosalia; Vice President of Market Solutions

This agenda is preliminary and subject to change



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11:00 – 13:00 Lunch & Manufacturers Exposition

The industry's top manufacturers and service providers will be on hand to provide answers to your questions, increase your knowledge with demonstrations, present you with promotional materials and product catalogs, and help you develop new contacts. Lunch will be served inside the Expo Hall.

13:00 – 14:00 Power Swing Blocking and Out-of-Step Tripping Functions

This presentation discusses basic power system stability and system oscillations, due to sudden changes in the transmission network brought about by events such as faults and disconnection of equipment, load or generation, and the possible misoperation of protection elements due to these power swings. Methods of blocking protection elements from misoperating on power swings are discussed. On the other hand, for severe power swings and out-of-step conditions, an out-of-step tripping function may be required to perform a controlled trip to separate parts of the system into sub-grids that will eventually settle at stable states, instead of a total system collapse.

*Jun Verzosa
Doble Engineering*

14:00 – 15:00 Loadability of Transmission Protection Systems

This presentation covers issues related to the encroachment of load into the transmission protection operating region that can potentially cause the protection to either misoperate or restrict how much load a transmission apparatus is allowed to carry. Methods of overcoming the problem are presented including load blinding features of modern relays and setting compromises between higher loadability versus protection coverage.

*Jun Verzosa
Doble Engineering*

15:00 – 15:15 Break

15:15 – 16:15 Ancillary Relay Functions

Modern protection relays include additional functions that supervise or supplement the main protection functions. This presentation covers some of the ancillary functions including switch-onto-fault protection, stub bus protection, VT or fuse failure supervision, CT supervision, and broken conductor detection.

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*Jun Verzosa
Doble Engineering*

16:15 – 16:45 **Q&A Session – “Ask the Experts”**

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