ELECTRIC POWER RESEARCH INSTITUTE

GEARED

GridEd

The Center for Grid Engineering Education

Dynamic Distribution System Modeling with OpenDSS

This course is the third of a series of four courses developed and offered by GridEd to address several evolving forces that will alter the fundamental operating characteristics of the electric grid, transforming it from a one-way central supply structure to one that has bidirectional power flows resulting from distributed energy resources (DER). Self generating consumers or those with electric storage devices will alter the design requirements for the electric distribution system. This course focuses on dynamic distribution system modeling with OpenDSS. Course content covers advanced techniques for analyzing many problems emerging from modern distribution systems that require time-varying simulations, including:

- Integration of distributed generation
- Integration and design of microgrids
- Accommodating high penetration of electric vehicles, solar PV, storage, and other technologies that tend to disrupt traditional operation of the distribution system
- Advanced modeling of distribution automation
- Design of communications and controls

The course emphasizes the modeling of integrated grid technologies with time-varying characteristics that have potentially disruptive impacts on load profiles, voltage profiles, reliability, and efficiency. Further, problem sessions enable students to work through relevant real-world problems. The course presents examples applications of EPRI's open-source and freely available OpenDSS program, which was designed for dynamic modeling of distribution systems.

Who Should Attend

This course is for those who have taken GridEd's short course on Distribution Engineering or who have sufficient distribution engineering experience and an electrical engineering background. One should have the ability to understand the operation of common voltage and var control equipment found on utility distribution systems. Familiarity with the configuration and operation of distribution system and industry terms will be helpful to the student.

Registration Information

Date: September 11 & 12, 2014
Course Length: 2-Days
PDH* Available: 16-Hours
Registration Fee:
- $1,200 per person
- 20% discount for organizations sending three or more attendees
- 20% discount for individuals who take all four GridEd short courses

Location: Omni Nashville Hotel
150 Third Avenue South
Nashville, TN 37201
Registration: http://grided.epri.com

Students should bring a laptop computer with Windows, Excel, and Internet connection capability. Optional: Visual C#, MATLAB

For More Information

Roger Dugan, rdugan@epri.com or 650.855.2268
Steven Coley, scoley@epri.com or 865.218.8179

*Professional Development Hours

Meet the Instructor

Roger Dugan is a Senior Technical Executive in the Power System Studies program area of EPRI's Power Delivery & Utilization Sector. His current research activities focus on power system simulation software with an emphasis on distribution system analysis. His work covers distributed resources, renewable energy, harmonic analysis, and distribution planning.

Prior to joining EPRI, Dugan held various positions with the Systems Engineering department of Cooper Power Systems and was Senior Consultant for Electrotek Concepts, Inc. in Knoxville, Tennessee.

Dugan was elected a Fellow of the IEEE in 2000 for his contributions to the analysis of harmonics and transients. In 2005, he received the IEEE Excellence in Distribution Engineering Award. He is past- Chair of the IEEE Power and Energy Society Test Feeder Working Group. Dugan coauthored Electrical Power Systems Quality, available from McGraw-Hill, a widely used textbook on Power Quality.

Dugan received a Bachelor's degree in electrical engineering from Ohio University in 1972 and a Master's degree in Engineering in Electric Power Engineering from Rensselaer Polytechnic Institute in 1973.

Course Outline

Day 1

- Brief Introduction to Distribution Systems
- Why Dynamic Distribution Modeling?
  - Capturing Both Time-specific and Location-specific Value
- Introduction to OpenDSS
- How Does OpenDSS Work?
- OpenDSS Architecture
- Circuit Modeling Basics
- OpenDSS Scripting Basics with Class Exercise
- Scripting for Large Circuit Models with IEEE 8500-Node Test Feeder
- Examples of Modeling of Selected Volt-Var Control Devices
- OpenDSS COM Interface: Exploiting the Power of the Program
- Class Exercise

Day 2

- Loadshapes and Smart Grid Simulation – the Key to Dynamic Modeling
  - Loadshape Examples
  - Defining Loadshapes
  - Connecting Loads, Generators, and other Elements to Loadshapes
  - Other Shapes in OpenDSS
- Solar PV Simulations
  - Basics of PVSystem Model
  - Voltage Analysis
  - Protection Analysis
  - Power Quality Analysis
  - Determining Feeder Hosting Capacity
  - Smart Inverter Modeling
- Class Exercise: Increasing Hosting Capacity via Voltage Control

May 2014

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