

GRIDED

The Center for Grid Engineering Education

A Special GridEd Tutorial at Salt River Project

Addressing the Educational Needs for Engineers Designing and Operating Future Electric Grids with Distributed Energy Resources (DER)

Friday, March 6, 2015 at Salt River Project

The Salt River Project (SRP) is joining the GridEd project initiative. As a first action, SRP is seeking to educate its engineers, managers, and executives on the latest industry issues and challenges associated with designing and operating future electric grids with DER. This one-day tutorial will provide a summary of a four-course tutorial series launched by GridEd in 2014. The material will include a summary of the full course content, selected topics in detail from the course material, and selected topics from courses that are planned for 2015. Emphasis will be placed on distributed solar photovoltaics (PV). SRP is sponsoring this one-day tutorial and is generously opening it to others as a public offering within limited seating capacity of the teaching facility.

A detailed syllabus for the tutorial is available upon request. The following is a high-level outline of the one-day tutorial, which will be provided on March 6 at the offices of SRP:

- Introduction: Background, Objectives, and New Learning (Tom Reddoch) – 30 minutes
- Distributed Generation Technologies and Applications (Haresh Kamath) – 60 minutes
- Smart Inverter Standards and Grid Codes (Aminul Huque) – 45 minutes
- Electric Power Distribution Systems (Tom Short) – 60 minutes
- Dynamic Distribution System Modeling (Jeff Smith) – 75 minutes
- Smart-Inverter Grid Support Functionalities (Aminul Huque) – 45 minutes
- Business Case Analysis in the Electric Utility Industry (Jeffrey Roark) – 45 minutes

- This tutorial is intended for executives, managers, and engineers interested in the design and operation of future electric grids with DER. It has been sponsored by SRP and opened to the public without charge. Six professional development hours are available for this course. Registration is required at <http://grided.epri.com/courses.html>.

• A Timely Training Opportunity

- The role and value of the electric grid are being transformed by consumers who want more choices in how they are supplied electricity. The engineers who plan and operate the grid must evolve to meet these new challenges. You are invited to enroll in a special tutorial that introduces concepts and principles needed to design and manage an integrated grid that anticipates and accommodates inevitable changes in how electricity is supplied and consumed to meet consumer and business needs.
- Several evolving forces 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. New electric loads—such as electric vehicles and heat pumps—and self-supply sources will alter the system load shape. Although these changes are evolving unevenly across the U.S., market trends demonstrate that eventually this transition is inevitable throughout all parts of the country. Therefore, DER will influence all utilities and their distribution systems.

GridEd – The Center for Grid Engineering Education

In 2013, the Department of Energy awarded to EPRI a project known as Grid Engineering for Accelerated Renewable Energy Deployment (GEARED), an educational initiative to develop and train the next generation of power engineers so that they can help shape the electric grid of the future. In response, EPRI created GridEd – The Center for Grid Engineering Education, which is comprised of EPRI, our university partners (Georgia Technological Institute, University North Carolina Charlotte, Clarkson University, and University of Puerto Rico Mayaguez), and utility and industry sponsors. As part of the DOE project, GridEd is developing short courses for utility staff and others who want to prepare themselves to help transform the electricity grid.

Transition of the Electric Power System

The electric power system is beginning to change fundamentally and profoundly—rapidly in some geographical areas, inevitable in all—with the rise of DER, such as small natural-gas-fueled generators, combined heat and power plants, electricity storage, and PVs on rooftops and in larger arrays connected to the distribution system. Realizing the full value of DER investments requires a distribution grid that accommodates a two-way flow of electricity. Through a combination of technological improvements, policy incentives, and consumer choices in technology and service, the role of DER will become more important in the future.

DER and grid-provided power do not compete with each other; they are complementary sources of power when they are jointly planned. Today's grid, especially its distribution system, was not designed to accommodate a high penetration of DER while sustaining high levels of electric service quality and reliability. The technical characteristics of certain types of distributed generation, such as variability and intermittency, affect the grid quite differently from traditional central power stations. To fully realize the value of DER and to serve all consumers at the standards of service quality and reliability that they demand, the distribution grid needs to be designed to expand its capability to accommodate DER operation. DER offers potential benefits to the grid in the form of reduced capacity requirements while forming a symbiotic relationship. The foundation for creating this symbiotic relationship is what EPRI is calling the Integrated Grid. Its realization requires utility technical staff that can plan and operate such a system.

Therefore, engineers and planners that are tasked with developing and operating the future grid will require new and innovative knowledge. GridEd is dedicated to fulfilling this training role. As a first step in the process, GridEd offered four short courses in 2014. Each course focused on a key aspect of designing and operating distribution

The Electric Power Research Institute, Inc. (EPRI, www.epri.com) conducts research and development relating to the generation, delivery and use of electricity for the benefit of the public. An independent, nonprofit organization, EPRI brings together its scientists and engineers as well as experts from academia and industry to help address challenges in electricity, including reliability, efficiency, affordability, health, safety and the environment. EPRI also provides technology, policy and economic analyses to drive long-range research and development planning, and supports research in emerging technologies. EPRI's members represent approximately 90 percent of the electricity generated and delivered in the United States, and international participation extends to more than 30 countries. EPRI's principal offices and laboratories are located in Palo Alto, Calif.; Charlotte, N.C.; Knoxville, Tenn.; and Lenox, Mass.

Together . . . Shaping the Future of Electricity

systems. As a collection of courses, GridEd provided the means to prepare utility staff and others to address the issues for the future grid systematically and thoroughly. In 2015, GridEd is expanding its offering to include smart inverters, microgrids, and current industry practices such as net metering and interconnection standards.

Course Content

GridEd's practice is to offer sequential courses to allow a student to acquire a diverse but interconnected knowledge base with information and understanding to address the challenges of designing and operating the future grid. Individual course participation offers a way to train several staff functionally on a particular bank of knowledge. An individual who takes the entire tutorial series will be able to provide expertise that spans several functional areas. All GridEd courses are open to public and available for registration through EPRI Events at <http://grided.epri.com/courses.html>.

For More Information

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