

GRIDED

The Center for Grid Engineering Education

A Tutorial Series

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

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 tutorial series to learn how 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, and hence all utilities and the distribution systems they operate.

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 advisors.
- 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 solar photovoltaics
- (PV) on rooftops and in larger arrays connected to the
- distribution system. Realizing the full value of DER
- investments requires a hub-and-spoke 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 the 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 standards of service quality and reliability they demand, the distribution grid needs to be designed to expand its capability to accommodate DER operation. DER offers benefits to the grid in the form of reduced capacity requirements, 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, we are offering four short courses. Each focuses on a key aspect of designing and operating distribution systems. As a collection of courses, GridEd provides the means to prepare utility staff and others to address the issues for the future grid systematically and thoroughly.

Course Content

The following four courses are being offered:

- **Course 1:** *Distributed Storage & Generation Technologies & Applications*, Charlotte, July 16 & 17, 2014
Introduces critical technologies of the future power grid
Instructor: Haresh Kamath – Program Manager – EPRI
- **Course 2:** *Electric Power Distribution Systems*, New York City, August 20 & 21, 2014
Familiarizes students with distribution grid design and operation
Instructor: Tom Short, Technical Executive – EPRI
- **Course 3:** *Dynamic Distribution System Modeling*, Nashville, September 11 & 12, 2014
Learn about the dynamic characteristics of the distribution system of the future
Instructor: Roger Dugan, Sr. Technical Executive – EPRI
- **Course 4:** *Business Case Analysis in Electric Utility Industry*, Washington D.C., September 29 & 30, 2014
Addresses the fundamentals of analyzing business cases which are needed to transition to the future
Instructors: Bernie Neenan, Technical Executive & Jeff Roark, Principle Technical Leader – EPRI

These courses are being offered sequentially to allow a student to acquire a diverse but interconnected knowledge base with information and understanding to

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

address the challenges of designing and operating the future grid. Individual tutorial participation offers a way to train several functionally focused staff with a bank of knowledge. An individual who takes the entire tutorial series will be able to provide expertise that spans several functional areas. Seating is limited to 30 students per course and all courses are open to public. Registration is available through EPRI Events at <http://grided.epri.com>.

The fees for attending these courses are as follows:

- Any single course is \$1,200.
- Companies with three or more students in a single course receive a 20% discount (\$960 for each student).
- A student taking all four courses receives a 20% discount (for a total price of \$3,840).
- Special arrangements are available for in-house training at company sites.
- Additional discounts available to GridEd funders.

EPRI Contacts

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