EPRC SHORT COURSE: Microgrids and Distributed Generation Integration

DATES: November 10-11, at ISU

Who: This is a 2-day short course for distribution engineers, power supply planners, analysts and managers—anyone dealing with the practical challenges of integrating significant utility- or customer-scale distributed generation (DG) resources, from the point of view of interconnection studies, distribution system protection schemes for optimum reliability and resiliency, optimal operation of DG resources, and resource planning including DG.

What: The purpose of the course is to provide methods, best practices and cases studies for DG integration. Application problems will be presented and solved.

Major topic areas include: Characteristics of DG, planning for microgrids and utility resiliency, distribution protective relaying for two-way flows, power electronics, including smart inverter technology, power quality problems (volt/var optimization) and solutions.

This class provides 1.5 CEUs (15 PDH) of continuing education, certified by Iowa State University.

Course Instructors:

Scott Benson, Lincoln Electric Generation Planner: LES's community solar project and Value of Solar methodology.

Michael Coddington, Senior Electrical Engineering Researcher, National Renewable Energy Lab: Distribution System Operation and Planning for high DG penetration.

Dr. Mariesa Crow, Professor of Electrical Engineering, University of Missouri Science and Technology: Electric Vehicle impacts on distribution operation and planning, and: Energy storage latest technology options.

Dr. Joshua Hambrick, Principal, General Electric Energy Management: Benefits and Costs of distributed generation, and development of distribution analysis software

Brian Lydic, Fronius: Smart Inverter Technology and implications of this technology for managing variable generation resources.

Dr. James McCalley, Professor of Electrical and Computer Engineering, Iowa State University: Energy Storage Options and Economics

Jana Sebestik, Office of Math, Science and Technology Education, University of Illinois: a tool for developing Time of Use Rates

Dr. Zhaoyu Wang, Assistant Professor of Electrical and Computer Engineering, Iowa State University: Modernized Distribution System Operation and Planning- particularly volt/var control and conservation voltage reduction.

This course is being offered in partnership with the Department of Energy's GEARED program MidAmerica Regional Microgrid Education and Training Grant (MARMET).

Where: Instruction will be offered in Iowa State University's Coover Hall (home to the Electrical and Computer Engineering Department) classroom 3041/3043.

When: First Day, 9 am to 5 pm and Second Day, 8 am to 4 pm.

Cost: If you register by November 3rd, 2015, the registration cost will be $600 per utility attendee. After November 3rd, registration will be $700 per attendee. NOTE: EPRC members receive a 10% discount. The cost includes instruction, a visitor parking pass (ISU Staff lots), breaks and lunches both days.

How to register: complete registration form online or contact Barbara Brown (515 294 8057) or barbarab@iastate.edu with questions.

NOTE: EPRC cancellation policy will be in effect: You must cancel by October 20 to receive a refund. IF EPRC does not have enough registrants to run the course, moneys will be refunded.

TOPICS

1. **OVERVIEW:** An update of DG integration: current costs per kW, per kWh, best technologies, definitions.

2. **Storage:** technical and cost characteristics of the most promising technologies now.

3. **Distribution System Operation:** current operation: what additional *protective relaying* and metering and SCADA updates might be needed for high DG? Costs, benefits, examples

4. **Volt/Var optimization**, conservation voltage reduction and the general topic of Voltage and frequency regulation challenges and solutions for high penetration of variable resources:

5. **Distribution System Planning:** Best practices for planning for high DG penetration,discussion of DG impacts on volt/var control, reliability, service restoration, network reconfiguration (design for a dynamic distribution system) and system resilience.

6. P**ower quality concerns with variable resources-** controls and research.

7. **Utility-scale DG Resource Planning** : community solar case study from Lincoln Electric System

8. **Smart Inverter technologies:** state of the art, current installations, costs, benefits

9. **Game-changing technology update**

10. **Electric vehicle technology update:** value to the grid, problems with reliability

11. **Microgrids-**definition, potential utility benefits, cost considerations, control considerations, should future distribution system planning be based on microgrids? Details: ownership of microgrids, microgrid-aided service restoration, black-start capability, critical load protection, and reliability impacts of microgrids.

12. **Impacts of high DG on the bulk electric system-** is this a problem, what controls are needed?

13. **Demand response:** state of the art now (a discussion of smart metering, Time of Use (TOU) rates, Critical Peak Pricing (CPP), Peak Time Rebates (PTR), Direct Load Control (DLC), cost/benefit analyses

14. **Utility economic considerations:** assessing the value of various DG technologies – primer on the "Value of Solar" methodology, and ownership models for generation and storage