



IEEE Power Engineering Society Annual Meeting  
Denver, Colorado  
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## Interconnecting Distributed Resources to the Electric Power System

(Special Technical Session)

Wednesday, 9 June, 2004 1:00 PM - 5:00 PM

Sponsored by: 2004 General Meeting Organizing Committee

### Instructors:

P.K. Sen, Colorado School of Mines (CSM), Golden, Colorado

Tom Basso, National Renewable Energy Laboratory (NREL), Golden, Colorado

Ben Kroposki, National Renewable Energy Laboratory (NREL), Golden, Colorado

Hawk Asgeirsson, Detroit Edison, Detroit, Michigan

This special topic will cover many of the complicated issues with interconnecting distributed resources to the electric power system. From an overall market perspective, the most promising vision of a distributed power future is one that allows the full economic value of grid connected distributed power by stimulating markets through local benefits like lower electric cost, enhanced reliability and power quality, facility demand side management, and/or combined heat and power. This special technical session will also address the most recent developments in interconnection standards, utility DG applications, operational experience, interconnection testing and advanced technologies for interconnecting distributed resources with electric power systems.

## Course Outline

### **1. Distributed Generation, Resources and Interconnection**

#### **Background – P.K. Sen, CSM**

- Historical Perspective of Today's Distributed Generation Issues
- Overview of Distributed Generation Technologies

### **2. IEEE 1547 Interconnection Series – Tom Basso, NREL**

- Interconnection Systems
- IEEE 1547 - Interconnection Requirements and Technical Specifications
- IEEE 1547.2 -Application Guide for Interconnection Systems
- IEEE 1547.3 - Control and Information Exchange for

### **3. Interconnection Testing and Application – Ben Kroposki, NREL**

- IEEE 1547.1 - Interconnection Test Procedures
- Test Procedure Validation at NREL
- Residential and Commercial Applications

### **4. Utility DG Applications and Interconnections Issues –**

#### **Hawk Asgeirsson, Detroit Edison**

- Voltage Support
- Increase Reliability
- Interconnections



## **Bios**

- **Dr. P.K. Sen, P.E., Professor of Engineering, Colorado School of Mines, Golden, Colorado 80401, 303.384.2020, psen@mines.edu**

Dr. P.K. Sen has over 38 years of combined teaching, research, and consulting engineering experience. He received his Ph.D. degree at the Technical University of Nova Scotia (Dalhousie University), Halifax, Nova Scotia, Canada in 1974. Prior to joining Colorado School of Mines, Dr. Sen taught for 21 years at the University of Colorado. His industrial experience includes power plants and substation engineering design, system & feasibility studies and various aspects of power systems engineering applications. He has published over 75 papers on a variety of subjects related to Power Systems Engineering, Electric Machines and Renewable Energy, and has supervised over 100 graduate students. He is a Senior Member of IEEE, and a Registered Professional Engineer in the State of Colorado. Currently Dr. Sen is a Professor of Engineering, Chair of Electrical Engineering Program and the Site Director for the NSF Power Systems Engineering Research Center at Colorado School of Mines, Golden, Colorado. His current research interests include application problems in power systems engineering, renewable energy and distributed generation and power engineering education.

- **Thomas Basso, Senior Scientist, National Renewable Energy Laboratory, Golden, Colorado 80401, Tom\_Basso@nrel.gov**

Thomas (Tom) Basso is a senior scientist working at NREL in the Distribution and Interconnection R&D area of the NREL Distributed Energy and Electric Reliability Program. Prior at NREL, he conducted outdoor accelerated stress testing of photovoltaic (PV) modules and was NREL Project Leader for PV Management under the NREL/DOE PV Advanced R&D Project. Before NREL, he was Design Engineer with buildings industry consulting engineering firm; Design/Staff Engineer with manufacturer of air-cooled heat exchangers for the petrochemical, refinery, and utility industries; Standards Engineer for the American Society of Mechanical Engineers; and Instructor in the Mechanical Engineering Department of Northeastern University. Tom serves as Secretary for IEEE SCC21, 1547, P1547.2, P1547.3, and P1547.4; is Technical Advisor and manages US member participation in IEC TC8 System Aspects of Electrical Energy Supply; and, is a member of the IEEE; the IEC Joint Coordination Group for Decentralized Rural Electrification Systems; the American Society of Mechanical Engineers; and the American Solar Energy Society.



- **Benjamin Kroposki, P.E., Sr. Engineer, National Renewable Energy Laboratory, Golden, Colorado 80401, 303.275.2979, Benjamin\_Kroposki@nrel.gov**

Benjamin Kroposki is a senior engineer at NREL and leader of the Distributed Power Systems Integration Team. His expertise is in the design and testing of distributed power systems, and he has produced more than 30 publications in this area. Mr. Kroposki also participates in the development of distributed power standards and codes for IEEE, the International Electrotechnical Commission (IEC), and the National Electrical Code. He serves as secretary for IEEE P1547.1 and Chairman for IEEE P1547.4. Mr. Kroposki is a Senior Member of IEEE. Mr. Kroposki received his bachelor's and master's degrees in electrical engineering from Virginia Tech and is a registered professional engineer.

- **Haukur (Hawk) Asgeirsson, P.E., Supervising Engineer, Distributed Resource Planning System Planning and Engineering, Detroit Edison**

Haukur Asgeirsson is the Supervising Engineer of Distributed Resource Planning at Detroit Edison. In his current position, he is responsible for integrating Distributed Resources in the T & D planning and operating process. Since 2002, Mr. Asgeirsson has installed 18 distributed generation projects on the Detroit Edison distribution system totaling nearly 9MW. This includes DG installed internal to distribution circuitry that automatically operates to manage circuit loading.

Haukur is also the project manager responsible for DTE's DER Aggregation Communication and Control DOE Contract. In this project, a real time distribution modeling system has been created which integrates real time distribution circuit information, real time DG information and makes real time DG operating recommendations.

Prior to his responsibilities in Distributed Resources, his responsibilities included developing, budgeting and optimizing the Energy Delivery Preventive Maintenance programs at Detroit Edison. This included responsibility for developing the RCM and Substation Predictive Maintenance programs for Energy Deliver. Hawk is currently involved in a collaborative effort with Sandia Laboratory to test a transportable Advance Battery Energy Storage System, a 200kw/400kw zinc-bromine flow battery, which is being used a distributed resource on the distribution system.

Haukur Asgeirsson has co-authored IEEE Power engineering papers on the effect of reducing voltage for energy conservation and on a lightning storm severity assessment system designed and developed at Detroit Edison. He is a member of the IEEE Power Engineering Society, the T&D Maintenance Management Association and is a Registered Professional Engineer in the State of Michigan. Mr. Asgeirsson received his Bachelor and Masters degrees in Electrical Engineering from the University of Michigan. He was born and raised in Reykjavik, Iceland.