



INTRODUCTION TO DISTRIBUTED GENERATION AND INTERCONNECTION TECHNOLOGIES

Location:
ECNE Headquarters, Windham, New Hampshire

April 20-21, 2010

ENERGY COUNCIL OF THE NORTHEAST

Power Utility Institute

Who Should Attend:

This two-day course is designed for engineers, distributed generation system integrators and energy planners which need to learn about or enhance their background in distributed generation technologies and interconnection issues. **An electrical engineering background and basic knowledge in three phase power and power distribution systems is recommended.** The course will also be of interest to non engineering utility professionals who deal with regulators and customers on DG issues and seek a more extensive understanding of the various technical aspects involved with interconnection.

Instruction Methodology:

Each topic is taught from the perspective of both the theory and practical application based on proven industry experience. Informal quizzes and problem solving are utilized to enhance the instructional experience. A sample problem or set of problems will be worked through for most sections of the class. **Students should be proficient with a scientific calculator and bring one to the class so that they can work through the exercises.**

Problem exercises include:

- Calculating fault contributions from generators
- Calculating the voltage influence of a generator on the power system
- Screening for voltage flicker due to DG energy sources
- Calculating life-cycle cost of energy from various DG sources
- Determining if protective relaying setting adjustments are needed

Instructor:

Philip Barker, Founder and Principal Engineer, Nova Energy Specialists, LLC. Mr. Barker's distinguished career as a consulting engineer includes 14 years with Power Technologies, Inc. (PTI) and three years with EPRI's Power Electronics Applications Center. For the past five years he has devoted his attention to founding Nova Energy Specialists, a consulting firm providing analytical services related to power systems, distributed generation and energy technology research.

Mr. Barker is a Senior Member of IEEE and a member of the American Solar Energy Society. He participated in the development of the original IEEE-1547 distributed generation interface standard and has assisted several states in their development of first-generation DG interconnection requirements. He has also authored 31 technical papers and articles.

**IOU Full Members, Municipal Members and Associate Members qualify for the reduced tuition rate of \$750. IOU Affiliate Member tuition is \$975.
Non member tuition is \$1095.**

Space is limited and registrations are accepted on a first requested, first honored basis. If the course is oversubscribed a second course may be scheduled.

INTRO TO DG & INTERCONNECTION TECHNOLOGIES

COURSE SYLLABUS

April 20th, Course Hours 8:00 AM - 4:00 PM:

Class Introduction and DG Overview

Review of DG Technologies

- Internal combustion engines
- Small combustion turbines
- Fuel Cells
- Photovoltaic (PV) systems
- Wind turbines
- Small scale hydro
- Small steam turbines
- Cogeneration technologies
- Energy storage devices

DG Power Converters and Operating Behavior

- Inverters
- Synchronous generators
- Induction generators
- Loading
- Dynamic response

DG Power System Impacts

- Voltage regulation
- Flicker

April 21st, Course Hours 8:00AM - 4:00PM

DG Power System Impacts (continued)

- Impact on fault levels
- Relay and fuse coordination issues
- Ground fault overvoltage
- Islanding issues and protection
- Harmonics, power quality, ferroresonance

Interconnection Practices, Requirements and Standards

- Relays and settings
- IEEE, UL and other standards
- Typical interconnection configurations

Design Methods to Harden Power System Against DG

Wrap up and Conclusion

Course Syllabus subject to change (instructors' discretion)

Please the registration form to enroll in this and other PUI classes. Registrations accepted on first-requested, first honored basis.

Please contact Kim Fuller (kfuller) at ECNE, (603) 437-2577 regarding any special dietary needs or special arrangements.



POWER UTILITY INSTITUTE

COURSE ENROLLMENT FORM

| Course Title | Date | Tuition (Member/Affiliate/ Non Member) |
|--|--|--|
| Intro to Distributed Generation  | January 20 - 21, 2010 April 20-21, 2010 | \$750/975/1095 |
| Power System Communications  | February 9 - 11, 2010 Sept. 21-23, 2010 | \$500/875/1200 |
| Introduction to Project Management  | March 10 - 11, 2010 | \$500/850/995 |
| Overhead Distribution System Designs & Layouts | March 30 - April 1, 2010 | \$525/875/995 |
| Electrical Calculations I Technician Level | April 15 - 16, 2010 | \$425/725/895 |
| Project Management Level II  | May 19 - 21, 2010 | \$1350/1700/1995 |
| Electrical Calculations II Engineering Level | May 27-28, 2010 | \$425/725/895 |
| Overview of the Electric System & Organization | June 15 - 16, 2010 | \$425/725/895 |
| Distribution Transformer Sizing and Selection | September 29 - 30, 2010 | \$425/725/895 |
| Underground Distribution System Designs & Layouts | October 27 - 29, 2010 | \$525/875/995 |
| Asset Management  | November 16 - 17, 2010 | \$400/700/895 |
| Protection of the Distribution System | December 1 - 3, 2010 | \$550/895/1020 |

Members that qualify for reduced tuition at the Full Member Rate:

Bangor Hydro-Electric Company
 Central Vermont Public Service Corporation
 Green Mountain Power Corporation
 Maine Public Service Company
 National Grid
 The United Illuminating Company
 Unitil Service Corporation
 Vermont Electric Power Company, Inc.

All Associate Members

All ECNE Associate Members can register at the reduced rate shown for Full Members.

As Affiliate Members, these IOUs qualify for tuition at the rate specified for Affiliates:

Central Maine Power NSTAR
 Northeast Utilities PSNH

All 2010 Municipal Members qualify for reduced tuition at the Full Member Rate. 2009 members included:

Ashburnham Municipal Light Plant
 Belmont Municipal Light Department
 Braintree Electric Light Department
 Chicopee Electric Light Department
 Danvers Electric
 East Norwalk Electric (Third Taxing District)
 Georgetown Light Department
 Groton Electric Light Department
 Hingham Municipal Light Plant
 Holyoke Gas & Electric Dept.
 Ipswich Municipal Light Dept.
 Littleton (MA) Electric Light & Water Department
 Littleton (NH) Water & Light Department
 Mansfield Municipal Electric Department
 New Hampshire Electric Co-Op
 North Attleborough Electric Department
 Peabody Municipal Light Department
 Reading Municipal Light Dept.
 South Hadley Electric Light Department
 South Norwalk Electric & Water
 Sterling Municipal Electric Light Department
 Taunton Municipal Lighting Plant
 Vermont Electric Co-Op
 Westfield Gas & Electric Light Department

COMPANY: _____

ADDRESS: _____

NAME: _____ PHONE: _____

EMAIL: _____ (Please supply phone # and email address of each registrant)

Course Title:

Date of Course:

1. _____
2. _____
3. _____
4. _____

Payment should accompany enrollment form. Full Members, Associate Members and Municipal Members can elect to be invoiced. Please invoice to: _____

Make checks payable to the Energy Council of the Northeast, or charge as indicated below.

Visa MasterCard American Express

Name on Card: _____

Number: _____ Exp. Date: _____



Return by fax to (603) 437-2855 or by mail to:

Energy Council of the Northeast P. O. Box 1029 Windham, NH 03087

Seating is limited. Registrations are accepted on a first-requested, first honored basis.

Please call the ECNE office at (603) 437-2577 to confidentially discuss any special needs (dietary or physical) that you may have.

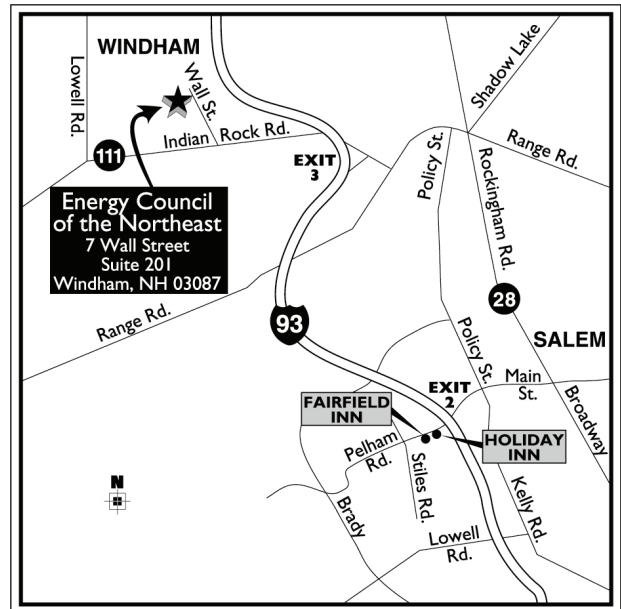
From Vermont: I-89 or I-91 to White River Junction. I-89 South to I-93 South, Exit 3. Left at end of ramp. Right at the light onto Wall Street. (Park & Ride on corner)

From Maine: I-95 to Route 495 South to Route 213 West to I-93 North, Exit 3. Left at end of ramp. Right at light onto Wall Street. (Park & Ride on corner)

From New Hampshire: I-93 South, Exit 3. Left at end of ramp. Right at light onto Wall Street. (Park & Ride on corner)

From the South: I-95 North or Route 495 North to I-93 North to Exit 3. Left at end of ramp, right at light onto Wall Street. (Park & Ride on corner)

From the West: I-90 (Massachusetts Turnpike) to Route 495 North to I-93 North. Left at end of ramp. Right at light onto Wall Street. (Park & Ride on corner)



**La Quinta Inn
(Formerly Fairfield Inn)**
(603) 893-4722
Ask for ECNE's corporate rate.

Nearby Hotels (Exit 2)

Both hotels are located off of Route 93 at Exit 2 on Keewaydin Drive. Turn left off of ramp (coming from North or South) onto Pelham Road. Turn left onto Keewaydin Drive.

Holiday Inn
(603) 893-5511
Ask for ECNE's corporate rate.