



Course Information Letter ---- G404

GENERATOR PROTECTION G404

At the completion of this course, the participant will be able review, analyze, and make better decisions regarding generator protection. All discussions will be conducted to balance generator protection against inadvertent separation.

COURSE OBJECTIVES: Upon completion of this course, the participant should be able to:

- 1) Demonstrate the ability to interpret generator one-line diagrams.
- 2) Describe the concept of zone protection.
- 3) Describe the use of current and potential transformers used in protective relaying schemes.
- 4) Describe how a generator is at risk in fault-like conditions, to include:
 - a) Stator Ground
 - b) Stator Phase-to-Phase
 - c) Reverse Power
 - d) Voltage/Frequency
 - e) Phase Over-Current
 - f) Negative Phase Sequence Current
 - g) Inadvertent Energization
 - h) Field Ground
 - i) Loss of Synchronism
 - j) Loss of Excitation
 - k) Overspeed
- 5) Describe how conditions might be monitored to detect those generator conditions listed above.
- 6) Describe typical protective relay concepts that are employed to provide generator protection against those events described above.
- 7) Describe considerations to be used in determining settings and action of protective relays.

COURSE OUTLINE

1. **Review of Generator Operations:** Magnetism, Normal Operations, and One-Line Diagrams.
2. **Protective Relaying and Protective Zone Fundamentals**
3. **Use of Potential and Current Transformers**
4. **Stator Protection (Risk to Generator, Protective Relay Inputs, Decision Making, Alarm/Trip Function):** Ground Detection, Phase-to-Phase Detection, Reverse Power, Over-Voltage, Under-Frequency, Volts-per-Hertz
5. **Field (Rotor) Protection (Risk to Generator, Protective Relay Inputs, Decision Making, Alarm/Trip Function):** Field Ground, Loss of Excitation, Overspeed
6. **Generator Protection (Risk to Generator, Protective Relay Inputs, Decision Making, Alarm/Trip Function):** Loss of Synchronism, Negative Phase Sequence Current, Inadvertent Energization

WHAT YOU WILL RECEIVE:

- HPC Technical Services' fully illustrated textbook: Generator Protection.
- HPC's Certificate of Completion, including 2.2 Continuing Education Units, as authorized by the International Associate of Continuing Education/Training (IACET).

COURSE DATES/LOCATION/FEE

For current dates / locations / prices, please see HPC's website, www.hpcnet.com.

FREQUENTLY ASKED QUESTIONS

- Will HPC Technical Services bring this course to our location for our personnel only? YES, call or email Stephen Parker, stparker@hpcnet.com for a price quotation.
- Will HPC Technical Services customize the presentation at our site to suit our particular needs? Yes.
- Is HPC Technical Services' textbook available for purchase as a reference document? No.
- What is the cost for HPC Technical Service to deliver this course at our location? Well, of course that can vary and it needs to be priced on an individual need basis. You gain from the customization and price.
- Is HPC Technical Services' consultants available for "technical advise" on the evaluation of your maintenance procedures, systems, tests? Yes. Call Harold Parker, hparker@hpcnet.com for a rate sheet.

INSTRUCTOR (S):

John Marshall. Mr. Marshall, worked for GE 35 years in the power system service and installation business. 25 years of this time was in the international service business. During his career, Mr. Marshall's positions included Field Engineer, Service Supervisor, Technical Training Instructor and Senior Application Engineer. Mr. Marshall's work covered electrical power distribution and control of power generation equipment. His expertise is GE manufactured excitation systems for large and medium size generators used on gas and steam powered turbines. As a Technical Training Instructor for over 20 years, Mr. Marshall developed and presented training programs for GE manufactured excitation systems. As a Senior Application Engineer, Mr. Marshall's work included the upgrading/replacement of older excitation systems with GE's digital excitation system. His Field Service work was worldwide. BSEE degree from Virginia Polytechnic Institute and State University in Blacksburg, Virginia.

Bob Fleming. Provides support in electrical engineering topical areas. Specifically instructs HPC generator ops/maintenance and voltage regulator courses such as the Westinghouse WTA, WMA, and WDR Exciters. Up until mid-2004 Bob was employed by TCSA and was responsible for developing voltage regulator upgrades, troubleshooting system problems, calibrating WTA/PRX systems as well as Basler systems. From 1969 thru 1996 Mr. Fleming worked for Westinghouse Electric Corporation, Power Generation Service Division. Here he was a Generator/Exciter Specialist with extensive experience with installation, testing, rewinds and repairs of generators from 1-MW to 1500-MW. Bob resides near Pittsburgh PA.

HPC TECHNICAL SERVICES
500 Tallevast Road, Suite 101, Sarasota, FL 34243
Telephone: 941-747-7733 FAX: 941-746-5374
Website: www.hpcnet.com

REGISTRATION FORM

Company: _____

Plant: _____

Address: _____

City/State/Zip: _____

Telephone: _____ **FAX:** _____

Course Number/Title: _____

Course Dates: ____/____/____ **Thru** ____/____/____

Course Location: _____ **Course Fee:** _____

Please enroll the following individual(s) listed below:

Student #1: _____

Student #2: _____

Taking advantage of HPC's 3-4-2 Policy: Send 3, Pay for 2 when paying in advance.

Student #3: _____

Enrolled by: _____ **Date:** _____

METHOD OF PAYMENT

- Check to Follow
- Check Enclosed #: _____
- MC/Visa/AMEX #: _____
Expiration Date: _____ CV Code: _____
- Purchase Order #: _____

HOW DID YOU LEARN OF THIS COURSE?

- Familiar with HPC
- Received a fax
- Received an email
- Internet search
- Other: _____