



## Course Information Letter ---- TG504

### (GE) STEAM TURBINE EHC MK-II CONTROLS TG504

The EHC System is divided into 3 major sections that involve the control of the turbine. These are Speed, Load, and Flow. This course explains the purpose of each input and output signal of a given section along with an operational description of its functionality with respect to the control of the turbine. After a thorough discussion of each section, the association of each section to another is explained to provide a working knowledge of the EHC System in that the attendee knows the HOW, WHEN, and WHY of the signals used to control the valves; signals used for testing the various components of the turbine; and signals used for safeguarding the turbine. Insight into the design criteria of the circuits, priorities for calibration, sequence of calibration, calibration techniques, and need for accuracy is given as only a HPC Certified Instructor can accomplish.

**Topics include:** Turbine Control Concepts, Prints and Documentation, Valve Actuators, Front Standard, AC/DC Power & Ground, Speed Control, Load Control, Valve Position Control, Standby Control, Trip and Monitoring.

Has an upgrade been considered for your EHC Mark-II? If so, this course provides some useful information. When is an upgrade inevitable? What benefits are to be gained from an upgrade? Which vendor does one choose? How does one start in preparing for an upgrade? From the information gathered and learned from the Steam Turbine Controls Upgrade Seminar that HPC sponsors, these questions and more will be discussed.

Recommended for Engineers and E&I Technicians.

**OBJECTIVES:** Upon completion of this course the participant will be able to:

1. Participants will be able to describe the relationship of all control components to each other component and the overall system using a block diagram.
2. Participants will be able to demonstrate the ability to use GE prints and schematics.
3. Participants will be able to describe operation of the individual steam valve control devices (Control Pac) and the front standard trip and reset devices.
4. Participants will be able to describe the output of each major subsystem in terms of the inputs and all internally generated signals. Subsystems include Speed Control, Load Control, Flow Control, and Pressure Control.
5. Participants will be able to demonstrate the knowledge needed to troubleshoot analog and logic control systems.
6. Participants will be able to demonstrate the knowledge needed to evaluate the OEM Line-Up procedures to evaluate and recalibrate the various systems.

### COURSE DATES/LOCATION/FEE

For current dates / locations / prices, please see HPC's website, [www.hpcnet.com](http://www.hpcnet.com).

### SATISFIED CLIENTS:

AES Corporation, AmerEnergy – Clinton Nuclear Station, AmerenUE – Callaway Nuclear Station - Entergy Operations - Riverside Nuclear Plant, First Energy – Bruce Mansfield Station and Perry Nuclear Station, Louisville Gas & Electric - Trimble County, Lower Colorado River Authority, MidAmerican Energy - Council Bluffs and Neal Stations, North Atlantic Energy Services - Seabrook Nuclear Plant, Ohio Edison, Oklahoma Gas & Electric – Sooner Station, Pennsylvania Power - Bruce Mansfield, Southern Nuclear Operations – Plant Vogtle Nuclear Station, Texas Municipal Power Agency – Gibbons Creek Station, Western Kentucky Energy, Wisconsin Power & Light - Columbia Station, Wisconsin Public Service - Weston Station

## COURSE OUTLINE

### Monday

**Valve Actuators:** MSVs, MCVs, RSVs, IVs, Disk Dump Valves, Fast Acting Solenoids, Servovalves, Test Solenoids  
**Front Standard Operating Mechanisms:** MSV, MTV, MLSV, MTPV, ELSV, MTSV, MTP, OTSV, ORSV, ORP, O/S Trip  
**Prints and Drawing Practices**

### Tuesday

**AC/DC Power and Ground:** Power Supplies, Automatic Switchover, Grounding Systems, and Monitoring  
**Speed Control Unit:** Low Value Gates, Speed/Acceleration References, F/V Converters, Wobblator, Backup Overspeed Trip, Trip Anticipator, Speed Control Calibration, and System Logic

### Wednesday

**Load Control Unit:** Stop Valve Amplifier, Intercept Valve Amplifiers, Control Valve Amplifier, Load Reference Amplifier, Load Limit / Runback, Stage Pressure Feedback, FA / PA Circuits, Power Load Unbalance / Logic, Early Valve Actuation, Load Control Unit Logic, Standby Control, Speed Line Matching, Calibration Procedures, Plant Communications

### Thursday

**Flow Control Unit:** Admission Modes, Valve Position Units,  $E_L$  vs.  $E_F$ , CV Position Unit, Crack Points, Valve Loop Setup Procedures, Valve Test Logic, Main Stop Valve Logic, Control Valve Logic, Combined Valve Logic, AMS Discussions

### Friday

**Trip and Monitoring:** Individual Trips, 125 VDC / 24 VDC Crossover Trip Bus, Front Standard Automatic Test Sequences  
**Line Up Instructions**  
**Big Picture Schematic Discussions**  
**Maintenance & Troubleshooting**  
**Upgrading the EHC:** Inevitable, Vendor Choice, Benefits Gained, How To Start Evaluation

## 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](mailto: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, this course depends too much on print reading.
- What is the cost for HPC Technical Service to deliver this course at our location? Well, of course that can vary, but generally speaking, if you're planning on having 6+ attend, when considering your T&L, it is to your advantage to perform the course at your plant (office). You gain from the customization and price.
- Can HPC Technical Services perform a functional checkout and calibration of your control system during the upcoming outage OR provide troubleshooting support should it be required? Yes we can. Call or contact Harold Parker, [hparker@hpcnet.com](mailto:hparker@hpcnet.com) for our rate sheets and any further information required.

## WHAT YOU WILL RECEIVE:

1. 1 copy of HPC Technical Services' textbook, (GE) EHC Mk-II Steam Turbine Controls, as written by Harold Parker and revised by Mike Whisnant.
2. A "Certificate of Completion" with 3.2 CEUs, authorized for issue by the International Associate of Continuing Education/Training.

## STEAM TURBINE I&C MAINTENANCE CERTIFICATION:

Those who attend this course are automatically qualified to take HPC Technical Services' Certification Examination. This examination is offered at no additional expense to the participant. An 80% passing grade is required. The examination length will not exceed 2-hours. Those who complete this examination will receive a revised "certificate of completion" that recognizes this accomplishment along with two-copies of a "To Whom It May Concern" letter that states their accomplishment. (Two copies are provided, one for the participants' employer and one for the participants' personal file.)

Consult HPC's website, [www.hpcnet.com](http://www.hpcnet.com), for detail on this certification program.

**INSTRUCTOR/CONSULTANT (S):**

**Harold Parker** is the founder & President of H Parker & Company, Inc. Mr. Parker was the developer of the GE EHC Mk-I training program used by GE for the "advanced" training of their field engineering force. Mr. Parker has worked in the "Power Generation" industry for 36 years, 14-years with GE as a Field Engineer, Start-Up Engineer, Technical Training Specialist and Manager. In 1983 Mr. Parker resigned from GE and started a training company, Schenectady Learning Systems, in Schenectady NY, which evolved into H Parker & Company, Inc. today. During this post-GE period, Mr. Parker was briefly employed as Manager Turbine-Generator Services with General Physics (2-years) and as a Field Engineer with Mechanical Dynamics & Analysis (2-years). Mr. Parker is the primary contributor to the development of the text used in this course presentation. Mr. Parker holds a BSME ('69 from Lawrence Institute of Technology), a MBA ('81 from the State University of New York @ Albany) and is a member of ASME and ASTD.

**Robert Doughty**. Mr. Doughty has more than 30 years of experience in start up, maintenance and operation of both large and small turbine-generators. Bob started his career as a power plant instrumentation technician while he completed his BS degree in Engineering Technology (1976) at the University of Houston. He has worked as a start up and field engineer for one of the major turbine-generator OEM's and as a consulting engineer, supporting the initial operation of two nuclear fueled power plants. His most recent position (1999) as the President of Turbine Services, Inc., has allowed him to continue to provide on site technical direction, start up and controls adjustments for several major turbine inspections in the range of 35 to 835 MW. He is experienced in electro-hydraulic and mechanical governor control systems and turbine valve and control system up-grades. Bob is a member of ASME (18 years) and has worked closely with HPC on multiple projects, training as well as field service.



**Mike Whisnant**. Mr. Whisnant's career in the power industry began in May 1970. Being assigned as the lead tech for the EHC along with all of the support systems for the turbine gave Mike the opportunity to not only learn the EHC System but to master the system during his 31 years with Duke. Mike's first opportunity to teach the EHC Mark 1 came in January 1979. Realizing that he enjoyed the role of a standup instructor, he joined the training team at Oconee. During his time in training, he developed numerous system classes that were created on the "how". In other words, even though a well-qualified technician needs to know the purpose of a system to broaden their understanding in the big scheme of things within the power plant, the "how" of the system is what makes the system work to perform its intended function. This is the part that breaks; therefore, the technician needs a working knowledge of the "how" so that he/she is better equipped to perform troubleshooting. This "how" is what Mike worked to accomplish above and beyond regular duties. After his retirement in June 2001, he joined the staff of H. Parker & Company in September 2001 as their E&I Training Specialist, who provides training courses on steam turbines, generators, electrical operating systems, protective systems, etc. His duties have expanded to include being a consultant in the performance of a functional checkout and calibration of the EHC Mark 1 along with providing troubleshooting support should it be required?

**Joe Byrd**. Joseph Byrd has over 29 years of experience in the power industry, concentrating in the area of turbine-generator controls and operations. He graduated from North Carolina State University in December 1978 with BS in Mechanical Engineering. He began his career in January 1979 as a Field Engineer, and subsequently a Start-Up Engineer with GE and was lead Start-up Engineer on five turbine-generator installations. He left GE in 1986 to consult directly to utilities on control systems calibration and maintenance with MD&A. In June 2008, he ended his relationship with MD&A and became available to HPC to instruct. His primary areas of expertise are GE manufactured Large Steam and Mechanical Drive Turbine MHC control systems as well as EHC systems. Joe resides near Raleigh NC.



**John Mitchell**. John Mitchell is a multi-talented leader with over 33 years management, engineering, installation and maintenance experience in thermoelectric power plants. He is especially an expert in steam turbines, generators and their controls. Prior to June 2003 (when he accepted an early retirement package from GE), John was a Customer Training Specialist with the GE International Department. Other past responsibilities included being Manager, Engineering Services, Senior Application Engineer, Senior Service Engineer, Lead Training Specialist, Program Support Engineer, Instructor Technical Training, and Field Engineer. All of this on operation & maintenance of steam turbine generator hardware and controls. John resides in Schenectady NY.

**HPC TECHNICAL SERVICES**  
500 Tallevast Road, Suite 101, Sarasota, FL 34243  
Telephone: 941-747-7733 .... FAX: 941-746-5374  
Website: [www.hpcnet.com](http://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?**

- Attended HPC courses before
- Received a fax
- Received an email
- Magazine advertisement
- Internet search
- Other: \_\_\_\_\_