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## Course Information Letter ---- TG522

### (GE) MK-V STEAM TURBINE CONTROLS TG522

This course targets the need for technicians/engineers to operate, maintain, calibrate and troubleshoot control systems such that availability and reliability can be maximized. This is accomplished by thoroughly understanding concepts of steam turbine control systems and how to use maintenance screens to quickly determine problems. HPC Technical Services' staff experience is that all too often a lack of understanding of the 'big picture' leads to difficulties in troubleshooting operational problems. Secondly, the Mk-V maintenance screens leave much to be desired. Operations reports a 'process alarm'. They provide you an 'alarm drop' number. Now what? How do you get from an alarm drop number to the I/O terminal point inside the Mk-V cabinet or at the source? All too often this simply takes too long when the goal is to get the machine started (or to keep it on). The difficulty is the ability to make use of the OEM supplied documentation. This course not only includes these two important skills but also provides a description of how the control signals are developed.

**Topics include:** Mk-V Hardware Familiarization, Operator Interface, Use of Documentation, Big Block Language, Control Overview, Speed Control Algorithms, Load Control Algorithms, Pressure Control Algorithms, Flow Control Algorithms, Power Load Unbalance, Automatic Turbine Startup, Valve Position Demand, Hydraulic Systems, Protective Circuits, On-Line and Off-Line Tests, Calibration, and Editing.

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

1. Demonstrate the ability to use OEM provided documentation that will include the Control Specifications, Control Sequence Program, I/O Configuration, CSP Cross Reference, Alarm Drop List, Application Manual, and P&IDs.
2. Demonstrate the understanding of the Mk-V hardware components, how they are accessed, and how they communicate.
3. Demonstrate the ability to troubleshoot an equipment alarm, given an Alarm Drop Number.
4. Demonstrate the ability to interpret the more routine diagnostic alarms and recognize appropriate actions.
5. Demonstrate the ability to follow the major "control signal path" through a Control Sequence Program.
6. Demonstrate the ability to trace the derivation of a command signal to the servomechanisms.
7. Demonstrate the knowledge necessary to calibrate turbine valve mechanisms.
8. Demonstrate the ability (or knowledge -- based upon equipment availability) to more efficiently use the Mk-V <I> /<HMI> screens for evaluating/calibrating systems.
9. Demonstrate the ability (or knowledge -- based upon equipment availability) to force logic to facilitate calibration.
10. Describe how to change constants or re-program ladder logic such as to add contact input/outputs, add alarms, and/or alter sequencing.
11. Given plant drawings, trace a signal to/from a field device through appropriate terminal boards, through circuit boards, to a digital "signal name".
12. Demonstrate the ability to follow signal flow to/from the <P> core to trip/reset the machine.
13. Describe differences between a <Q> trip and a <P> trip. Demonstrate an understanding of on-line and off-line test sequences.

### COURSE DATES/LOCATION/FEE

Scheduled as needed.

## COURSE OUTLINE

### Monday

#### **Introduction**

#### **Mk-V Hardware Familiarization**

**Operator Interface:** <I> or <HMI>, <BOI>, Displays and Logging

### Tuesday

**Documentation:** I/O Report, I/O Configuration, Reading a CSP, Application Manual, Control Specifications, Contact Inputs/Output, Sequencing, Analog Input/Output

#### **Big Block Language**

#### **Control Overview**

**Speed Control:** Description, Algorithm, and Calibration

### Wednesday

**Load Control:** Description, Algorithm, and Calibration

**Pressure Control:** Description, Algorithm, and Calibration

**Power /Load Unbalance:** Description, Algorithm and Calibration

**Automatic Turbine Startup** Description

### Thursday

**Valve Position Demand:** Description, Algorithm, and Calibration

**Hydraulic Systems**

### Friday

**Protective Circuits**

**On-Line and Off-Line Tests**

**Program and Field Modifications**



## 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 makes heavy use of prints.
- 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 provide "Technical Assistance" in conducting functional checkouts or troubleshooting problems? Yes we can. Call or contact Harold Parker, [hparker@hpcnet.com](mailto:hparker@hpcnet.com) for our rate sheets and any further information required.

## (GE) Mk-V Steam Turbine Controls – TG522

www.hpcnet.com

### WHAT YOU WILL RECEIVE:

1. 1 copy of HPC Technical Services' textbook, (GE) Mk-V Steam Turbine Controls, as written by Harold Parker.
2. A "Certificate of Completion" with 2.9 CEUs, authorized for issue by the International Associate of Continuing Education/Training.

### STEAM TURBINE I&C CERTIFICATION:

There are two levels of certification (Both levels require this course):

1. Engineer
2. I&C Technician

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 (S):



**Harold Parker** is the founder & President of H Parker & Company, Inc. 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, along with Stephen Parker, are the primary contributors 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.



**Stephen Parker.** Stephen has 6-years experience in the power generation industry and is largely responsible for HPC's Business Operation. He attended GE's Mk-V 2-week Training course in Salem VA in 2000, has been involved in troubleshooting Mk-V systems and has conducted HPC's Mk-V course 16 times to date. Stephen, along with Harold Parker, are the primary contributors to the development of the text used in this course. Mr. Parker holds a BA (1999 from Michigan State University).

**Robert Johndrow.** Bob Johndrow has 35+ years experience as a Field Engineer working on steam turbine generators. His experience includes steam turbine generator maintenance and testing, as well as considerable work on the steam turbine controls. He has worked on Mk-II, Mk-III, Mk-III+, Mk-IV, Mk-V and Mk-VI units as well as some of the Woodward controls. Bob earned a BS in Industrial Distribution from Clarkson University in Potsdam NY and also has GE Six Sigma Green Belt Certification. Bob accepted an early retirement package late 2003 and has worked as an independent as well as being associated with HPC Technical Services since then. He resides in Rhode Island.

### RECENT SATISFIED CLIENTS:

Doosan Heavy Industries\*\*, Great River Energy, Korea East-West Power, Korea Plant Services & Engineering, Korea Western Power, Southern Nuclear Operations

**HPC TECHNICAL SERVICES**  
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**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  
 Received info in the mail  
 Internet Search  
 Other: \_\_\_\_\_