



## **COURSE OVERVIEW EE1130**

### **Generator Excitation Systems & AVR**

*Selection, Commissioning, Operation, AC Generator Maintenance & Troubleshooting including AVR Adjustments*

#### **Course Title**

Generator Excitation Systems & AVR:  
Selection, Commissioning, Operation, AC  
Generator Maintenance and  
Troubleshooting including AVR Adjustments

#### **Course Date/Venue**

June 30-July 04, 2025/Glasshouse Meeting  
Room, Grand Millennium Al Wahda Hotel,  
Abu Dhabi, UAE

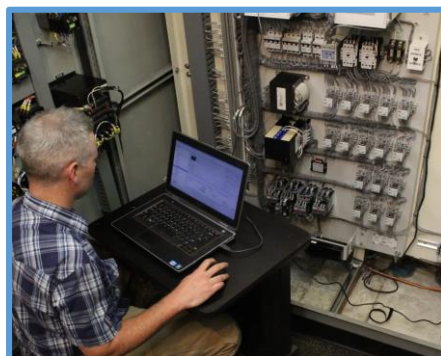
#### **Course Reference**

EE1130

#### **Course Duration/Credits**

Five days/3.0 CEUs/30 PDHs

#### **Course Description**



***This practical and highly-interactive course includes various practical sessions and exercises. Theory learnt will be applied using our state-of-the-art simulators.***

This course is designed to provide participants with a detailed and up-to-date overview of Generator Excitation Systems & AVR: Selection, Commissioning, Operation, AC Generator Maintenance and Troubleshooting including AVR Adjustments. It covers the generator excitation systems, types of excitation systems and automatic voltage regulators (AVRs); the synchronous generator basics, control systems and reading and interpreting diagrams; the criteria for system selection and AVR selection parameters; and the commissioning procedures, safety and compliance and integration with power systems.

Further, the course will also discuss the operational parameters, monitoring techniques and performance optimization; troubleshooting operational issues by identifying abnormal readings, diagnosing faults, implementing corrective actions and preventing recurrence; and the the maintenance scheduling, training and skill development, preventive maintenance practices and testing procedures.



During this interactive course, participants will learn the calibration techniques, fault diagnosis, spare parts management and documentation and reporting; the advanced troubleshooting techniques covering signal tracing, oscilloscope usage, software diagnostics and intermittent fault detection; the AVR adjustments and upgrades including integration with renewable energy sources; the future trends in excitation systems comprising of digitalization and automation, remote monitoring capabilities, AI and machine learning applications and sustainability initiatives; and the emergency response planning covering contingency procedures, disaster recovery plans, communication protocols and training and drills.

### **Course Objectives**

Upon the successful completion of this course, each participant will be able to:-

- Apply and gain an in-depth knowledge on the selection, commissioning, operation, AC generator maintenance and troubleshooting including AVR adjustments of generator excitation systems and AVR
- Discuss generator excitation systems, types of excitation systems and automatic voltage regulators (AVRs)
- Interpret synchronous generator basics, control systems and reading and interpreting diagrams
- Identify the criteria for system selection and AVR selection parameters as well as carryout commissioning procedures, safety and compliance and integration with power systems
- Apply operational parameters, monitoring techniques and performance optimization
- Troubleshoot operational issues by identifying abnormal readings, diagnosing faults, implementing corrective actions and preventing recurrence
- Employ maintenance scheduling, training and skill development, preventive maintenance practices and testing procedures
- Apply calibration techniques, fault diagnosis, spare parts management and documentation and reporting
- Implement advanced troubleshooting techniques covering signal tracing, oscilloscope usage, software diagnostics and intermittent fault detection
- Apply AVR adjustments and upgrades including integration with renewable energy sources
- Discuss the future trends in excitation systems comprising of digitalization and automation, remote monitoring capabilities, AI and machine learning applications and sustainability initiatives
- Apply emergency response planning covering contingency procedures, disaster recovery plans, communication protocols and training and drills

### Exclusive Smart Training Kit - H-STK®



*Participants of this course will receive the exclusive “Haward Smart Training Kit” (H-STK®). The H-STK® consists of a comprehensive set of technical content which includes **electronic version** of the course materials conveniently saved in a **Tablet PC**.*

### Who Should Attend

This course provides an overview of all significant aspects and considerations on the selection, commissioning, operation, AC generator maintenance and troubleshooting including AVR adjustments of generator excitation systems and AVR for electrical engineers, maintenance engineers and technicians, power plant operators, instrumentation and control engineers, utility and industrial electrical personnel, project engineers, technical managers and supervisors and those who are involved in the operation, maintenance, design, and commissioning of generators and their associated control systems.

### Training Methodology

All our Courses are including **Hands-on Practical Sessions** using equipment, State-of-the-Art Simulators, Drawings, Case Studies, Videos and Exercises. The courses include the following training methodologies as a percentage of the total tuition hours:-

- 30% Lectures
- 20% Practical Workshops & Work Presentations
- 30% Hands-on Practical Exercises & Case Studies
- 20% Simulators (Hardware & Software) & Videos

In an unlikely event, the course instructor may modify the above training methodology before or during the course for technical reasons.

### Course Fee

**US\$ 5,500** per Delegate + **VAT**. This rate includes H-STK® (Haward Smart Training Kit), buffet lunch, coffee/tea on arrival, morning & afternoon of each day.

### Accommodation


Accommodation is not included in the course fees. However, any accommodation required can be arranged at the time of booking.

### **Course Certificate(s)**


Internationally recognized certificates will be issued to all participants of the course who completed a minimum of 80% of the total tuition hours.

### **Certificate Accreditations**

Haward's certificates are accredited by the following international accreditation organizations: -

-  British Accreditation Council (BAC)

Haward Technology is accredited by the **British Accreditation Council** for **Independent Further and Higher Education** as an **International Centre**. Haward's certificates are internationally recognized and accredited by the British Accreditation Council (BAC). BAC is the British accrediting body responsible for setting standards within independent further and higher education sector in the UK and overseas. As a BAC-accredited international centre, Haward Technology meets all of the international higher education criteria and standards set by BAC.

-  The International Accreditors for Continuing Education and Training (IACET - USA)

Haward Technology is an Authorized Training Provider by the International Accreditors for Continuing Education and Training (IACET), 2201 Cooperative Way, Suite 600, Herndon, VA 20171, USA. In obtaining this authority, Haward Technology has demonstrated that it complies with the **ANSI/IACET 2018-1 Standard** which is widely recognized as the standard of good practice internationally. As a result of our Authorized Provider membership status, Haward Technology is authorized to offer IACET CEUs for its programs that qualify under the **ANSI/IACET 2018-1 Standard**.

Haward Technology's courses meet the professional certification and continuing education requirements for participants seeking **Continuing Education Units (CEUs)** in accordance with the rules & regulations of the International Accreditors for Continuing Education & Training (IACET). IACET is an international authority that evaluates programs according to strict, research-based criteria and guidelines. The CEU is an internationally accepted uniform unit of measurement in qualified courses of continuing education.

Haward Technology Middle East will award **3.0 CEUs** (Continuing Education Units) or **30 PDHs** (Professional Development Hours) for participants who completed the total tuition hours of this program. One CEU is equivalent to ten Professional Development Hours (PDHs) or ten contact hours of the participation in and completion of Haward Technology programs. A permanent record of a participant's involvement and awarding of CEU will be maintained by Haward Technology. Haward Technology will provide a copy of the participant's CEU and PDH Transcript of Records upon request.



### **Course Instructor(s)**

This course will be conducted by the following instructor(s). However, we have the right to change the course instructor(s) prior to the course date and inform participants accordingly:



**Mr. Pan Marave, PE, MSc, BEng, is a Senior Electrical & Instrumentation Engineer with over 40 years of extensive experience in Oil, Gas, Petrochemical, Refinery & Power industries. His expertise includes CEMS Operations and Maintenance, ABB 11KV Distribution Switchgear, Operation & Maintenance of Rotork make MOVs, Maintaining Instrument Air Compressors, Circuit Breaker, HV Switchgear Maintenance, HV/LV Electrical Authorisation, Basic Electricity, Electrical & Special Hazards, Personnel Protection, HV/LV Equipment, Motor Controllers, Electrical Switching Practices, Emergency Planning, Safety Management, Safety Instrumented Systems (SIS), Safety Integrity Level (SIL), Emergency Shutdown (ESD); DCS, SCADA & PLC; Measurement (Flow, Temperature, Pressure); Process Analyzers & Analytical Instrumentation; Process Control, Instrumentation & Safeguarding; Process Controller, Control Loop & Valve Tuning; Industrial Distribution Systems; Industrial Control & Control Systems, Power Systems Protection & Relaying; Earthing, Bonding, Grounding, Lightning & Surge Protection; Electric Power Substation & Systems; Electrical Engineering Principles; Motor Control Circuit; Electrical Fault Analysis; Electrical Networks & Distribution Cables; Circuit Breakers, Switchgears, Transformers, Hazardous Areas Classification and Detailed Engineering Drawings, Codes & Standards. Furthermore, he is also well-versed in Microprocessors Structure, Lead Auditor (ISO 9000:2000), ISO 9002, Quality Assurance, and Projects & Contracts Management.**

Presently, Mr. Marave is the **Technical Advisor** of **Chamber of Industry & Commerce** in Greece. Prior to this, he gained his thorough practical experience through several positions as the **Technical Instructor, Engineering Manager, Electronics & Instruments Head, Electrical, Electronics & Instruments Maintenance Superintendent, Assistant General Technical Manager** and **Engineering Supervisor** of various international companies such as the **Alumil Mylonas, Athens Papermill, Astropol** and the **Science Technical Education**.

Mr. Marave is a **Registered Professional Engineer** and has **Master's and Bachelor's** degrees in **Electrical Engineering** from the **Polytechnic Institute of New York** and **Pratt Institute of New York (USA)** respectively. Further, he is a **Certified Instructor/Trainer, a Certified Internal Verifier/Assessor/Trainer** by the **Institute of Leadership & Management (ILM)** and an active member of the **Technical Chamber** and the **Institute of Electrical and Electronics Engineer (IEEE)** in Greece. He has presented and delivered **numerous international** courses, conferences, trainings and workshops worldwide.

### **Course Program**

The following program is planned for this course. However, the course instructor(s) may modify this program before or during the course for technical reasons with no prior notice to participants. Nevertheless, the course objectives will always be met:

#### **Day 1: Monday, 30<sup>th</sup> of June 2025**

0730 – 0800	Registration & Coffee
0800 – 0815	Welcome & Introduction
0815 – 0830	<b>PRE-TEST</b>
0830 – 0930	<b>Introduction to Generator Excitation Systems</b> Role in Generator Performance • Importance in Voltage Regulation • Impact on System Stability • Overview of Excitation System Types
0930 – 0945	Break
0945 – 1045	<b>Types of Excitation Systems</b> Static Excitation Systems • Brushless Excitation Systems • Rotating DC Exciters • Hybrid Systems
1045 – 1145	<b>Automatic Voltage Regulators (AVRs)</b> Basic Principles of Operation • Types of AVRs (Electromechanical, Analog, Digital) • Key Components & Their Functions • Integration with Excitation Systems
1145 – 1230	<b>Synchronous Generator Basics</b> Construction & Operation • Stator & Rotor Components • Magnetic Field Interactions • Power Generation Principles
1230 – 1245	Break
1245 – 1330	<b>Control Systems Overview</b> Role of Governors • Interaction with Excitation Systems • Load Sharing & Frequency Control • Protection Mechanisms
1330 – 1420	<b>Reading &amp; Interpreting Diagrams</b> Single-Line Diagrams • Control Schematics • Wiring Diagrams • Symbols & Notations
1420 – 1430	<b>Recap</b> Using this Course Overview, the Instructor(s) will Brief Participants about the Topics that were Discussed Today and Advise Them of the Topics to be Discussed Tomorrow
1430	Lunch & End of Day One

#### **Day 2: Tuesday, 01<sup>st</sup> of July 2025**

0730 – 0830	<b>Criteria for System Selection</b> Load Requirements • Environmental Considerations • Compatibility with Existing Systems • Cost-Benefit Analysis
0830 – 0930	<b>AVR Selection Parameters</b> Voltage & Current Ratings • Response Time & Accuracy • Stability & Reliability • Manufacturer Specifications
0930 – 0945	Break
0945 – 1100	<b>Commissioning Procedures</b> Pre-Commissioning Checks • Functional Testing • Calibration Processes • Documentation & Reporting
1100 – 1230	<b>Safety &amp; Compliance</b> Adherence to Standards (e.g., IEEE, IEC) • Risk Assessment & Mitigation • Personal Protective Equipment (PPE) • Emergency Procedures

1230 – 1245	Break
1245 – 1330	<b>Integration with Power Systems</b> Synchronization with the Grid • Load Sharing Among Generators • Reactive Power Management • Communication Protocols
1330 – 1420	<b>Case Studies</b> Real-World Commissioning Scenarios • Challenges Faced & Solutions Implemented • Lessons Learned • Best Practices
1420 – 1430	<b>Recap</b> Using this Course Overview, the Instructor(s) will Brief Participants about the Topics that were Discussed Today and Advise Them of the Topics to be Discussed Tomorrow
1430	Lunch & End of Day Two

**Day 3: Wednesday, 02<sup>nd</sup> of July 2025**

0730 – 0830	<b>Operational Parameters</b> Voltage Regulation • Reactive Power Control • Frequency Stability • Load Variations
0830 – 0930	<b>Monitoring Techniques</b> Use of SCADA Systems • Data Logging & Analysis • Alarm Management • Predictive Maintenance Indicators
0930 – 0945	Break
0945 – 1100	<b>Performance Optimization</b> Fine-Tuning AVR Settings • Load Balancing Strategies • Minimizing Losses • Enhancing System Responsiveness
1100 – 1230	<b>Troubleshooting Operational Issues</b> Identifying Abnormal Readings • Diagnosing Faults • Implementing Corrective Actions • Preventing Recurrence
1230 – 1245	Break
1245 – 1330	<b>Maintenance Scheduling</b> Routine Inspections • Preventive Maintenance Tasks • Condition-Based Maintenance • Maintenance Documentation
1330 – 1420	<b>Training &amp; Skill Development</b> Operator Training Programs • Simulation Exercises • Certification Requirements • Continuous Learning Opportunities
1420 – 1430	<b>Recap</b> Using this Course Overview, the Instructor(s) will Brief Participants about the Topics that were Discussed Today and Advise Them of the Topics to be Discussed Tomorrow
1430	Lunch & End of Day Three

**Day 4: Thursday, 03<sup>rd</sup> of July 2025**

0730 – 0830	<b>Preventive Maintenance Practices</b> Visual Inspections • Cleaning & Lubrication • Tightening Connections • Replacing Worn Components
0830 – 0930	<b>Testing Procedures</b> Insulation Resistance Testing • Functional Testing of AVRs • Load Testing • Thermal Imaging
0930 – 0945	Break
0945 – 1100	<b>Calibration Techniques</b> Setting Voltage & Current Limits • Adjusting Response Times • Verifying Accuracy • Recording Calibration Data

1100 – 1230	<b>Fault Diagnosis</b> <i>Common Failure Modes • Use of Diagnostic Tools • Interpreting Test Results • Root Cause Analysis</i>
1230 – 1245	<i>Break</i>
1245 – 1330	<b>Spare Parts Management</b> <i>Inventory Control • Identifying Critical Spares • Supplier Management • Cost Considerations</i>
1330 – 1420	<b>Documentation &amp; Reporting</b> <i>Maintenance Logs • Test Reports • Compliance Records • Continuous Improvement Plans</i>
1420 – 1430	<b>Recap</b> <i>Using this Course Overview, the Instructor(s) will Brief Participants about the Topics that were Discussed Today and Advise Them of the Topics to be Discussed Tomorrow</i>
1430	<i>Lunch &amp; End of Day Four</i>

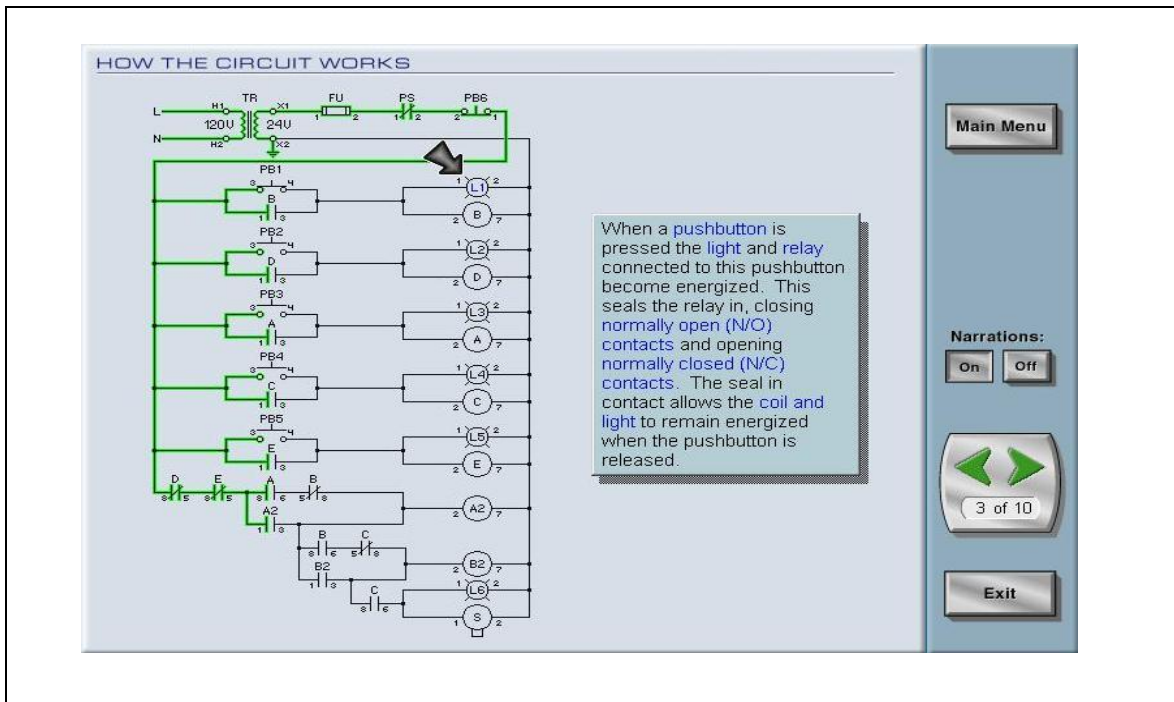
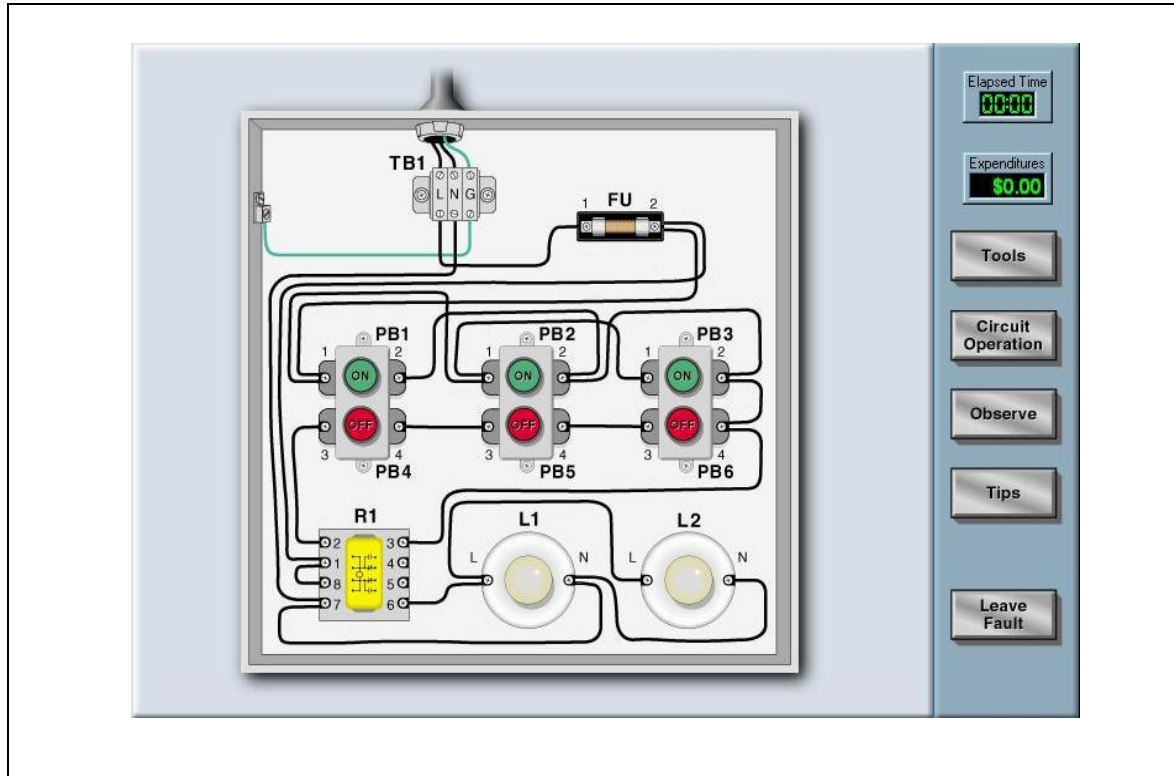
**Day 5: Friday, 04<sup>th</sup> of July 2025**

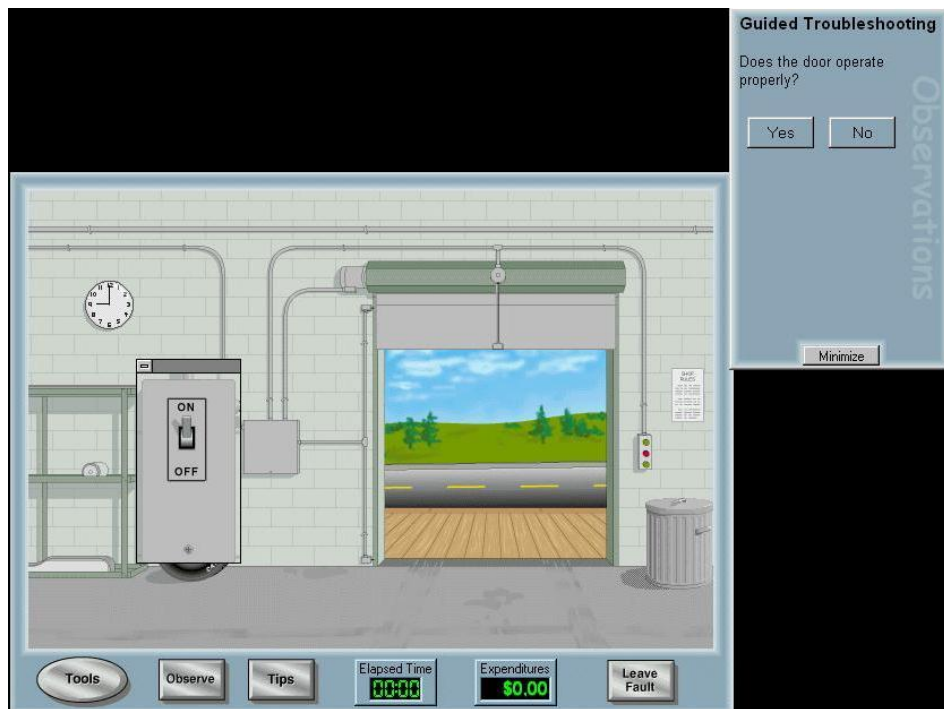
0730 – 0830	<b>Advanced Troubleshooting Techniques</b> <i>Signal Tracing • Oscilloscope Usage • Software Diagnostics • Intermittent Fault Detection</i>
0830 – 0930	<b>AVR Adjustments &amp; Upgrades</b> <i>Firmware Updates • Parameter Tuning • Integration of New Features • Compatibility Considerations</i>
0930 – 0945	<i>Break</i>
0945 – 1100	<b>Integration with Renewable Energy Sources</b> <i>Challenges with Variable Inputs • Hybrid System Configurations • Grid Stability Concerns • Regulatory Requirements</i>
1100 – 1215	<b>Future Trends in Excitation Systems</b> <i>Digitalization &amp; Automation • Remote Monitoring Capabilities • AI &amp; Machine Learning Applications • Sustainability Initiatives</i>
1215 – 1230	<i>Break</i>
1230 – 1345	<b>Emergency Response Planning</b> <i>Contingency Procedures • Disaster Recovery Plans • Communication Protocols • Training &amp; Drills</i>
1345 – 1400	<b>Course Conclusion</b> <i>Using this Course Overview, the Instructor(s) will Brief Participants about the Course Topics that were Covered During the Course</i>
1400 – 1415	<b>POST-TEST</b>
1415 – 1430	<i>Presentation of Course Certificates</i>
1430	<i>Lunch &amp; End of Course</i>



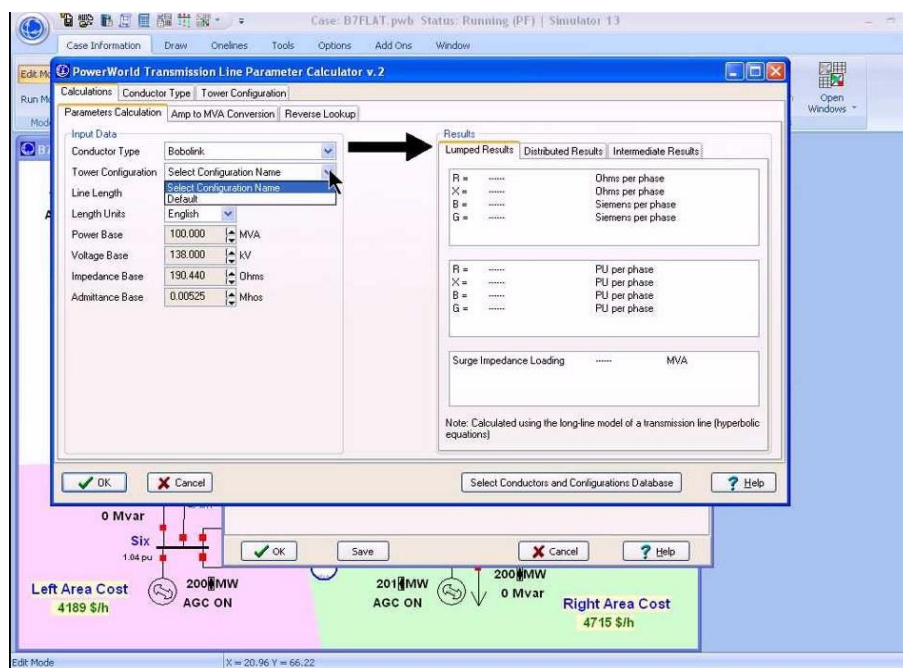
### Simulator (Hands-on Practical Sessions)

Practical sessions will be organized during the course for delegates to practice the theory learnt. Delegates will be provided with an opportunity to carryout various exercises using our state-of-the-art simulator “Simutech Troubleshooting Electrical Circuits V4.1”, Power World” and “ETAP software”.

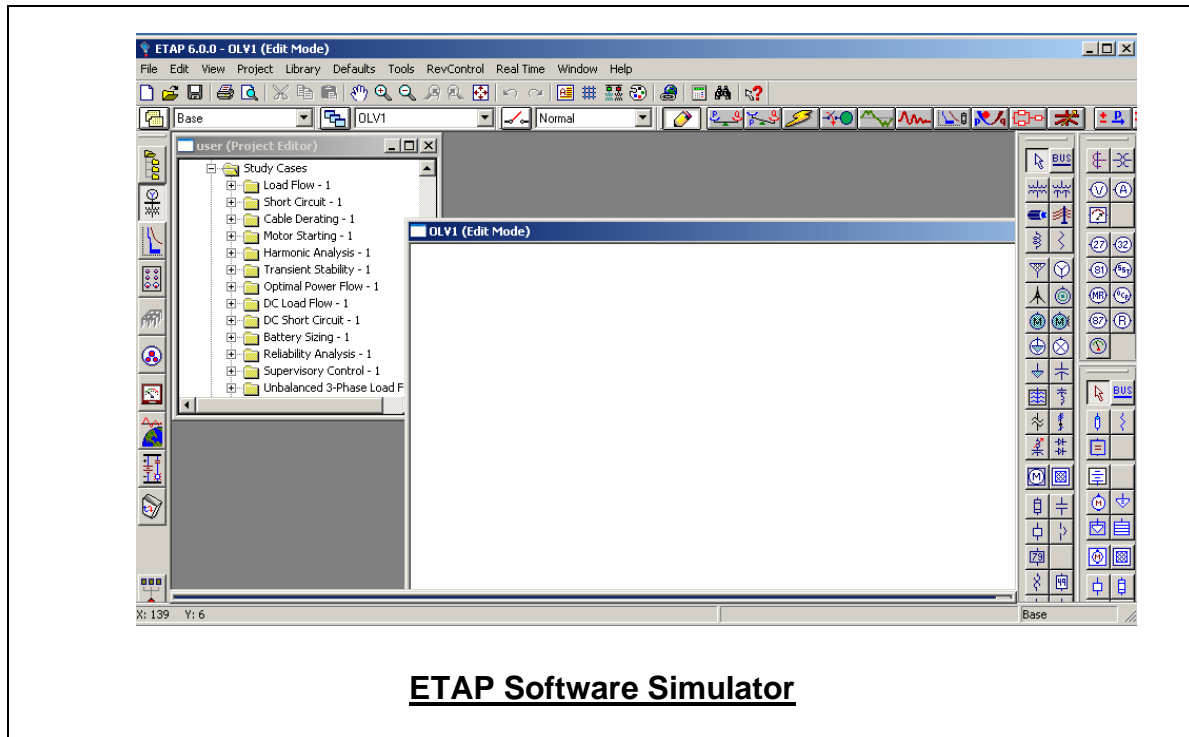




**Simutech Troubleshooting Electrical Circuits V4.1**



**Power World Simulator**



### **Course Coordinator**

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