COURSE OVERVIEW EE1127
Testing Techniques for Electrical Assets

Course Title
Testing Techniques for Electrical Assets

Course Date/Venue
October 05-09, 2025/Meeting Plus 9, City Centre Rotana, Doha, Qatar

Course Reference
EE1127

3.0 CEUs (30 PDHs) AWARD

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 Testing Techniques for Electrical Assets. It covers the importance of electrical testing in asset reliability, critical electrical assets, types of testing and electrical safety in testing operations; the testing equipment and tools that includes the megohmmeter (insulation tester), multimeter, clamp meter, primary and secondary injection kits and HiPot, TTR, VLF, ductor tester, SFRA analyzer; planning and preparing electrical testing, interpret test results and baselines and standards and guidelines in testing; the power cable testing techniques, transformer diagnostic testing, oil-filled transformer oil testing and switchgear and circuit breaker testing.

During this interactive course, participants will learn the insulation testing and dielectric strength, grounding and earth resistance testing, electric motor testing techniques and generator testing and monitoring; the protection relay testing and calibration, primary injection testing of protection circuits, battery and DC system testing and control panel and wiring check; the thermal imaging and infrared thermography, partial discharge (PD) testing, vibration analysis and acoustic testing, online monitoring systems for assets and electrical asset health indices; the root cause analysis using test data, maintenance strategy based on test results and reporting and documentation.

Course Objectives

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

- Apply and gain an in-depth knowledge on testing techniques for electrical assets
- Discuss the importance of electrical testing in asset reliability, critical electrical assets, types of testing and electrical safety in testing operations
- Identify testing equipment and tools that includes the megohmmeter (insulation tester), multimeter, clamp meter, primary and secondary injection kits and HiPot, TTR, VLF, ductor tester, SFRA analyzer
- Plan and prepare electrical testing, interpret test results and baselines and discuss standards and guidelines in testing
- Perform power cable testing techniques, transformer diagnostic testing, oil-filled transformer oil testing and switchgear and circuit breaker testing
- Determine insulation testing and dielectric strength, grounding and earth resistance testing, electric motor testing techniques and generator testing and monitoring
- Carryout protection relay testing and calibration, primary injection testing of protection circuits, battery and DC system testing and control panel and wiring check
- Explain thermal imaging and infrared thermography, partial discharge (PD) testing, vibration analysis and acoustic testing, online monitoring systems for assets and electrical asset health indices
- Develop root cause analysis using test data, maintenance strategy based on test results and reporting and documentation

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 of testing techniques for electrical assets for electrical engineers, maintenance engineers and technicians, testing and commissioning engineers, asset integrity and reliability engineers, substation and switchgear operators, utility and power plant engineers, electrical safety officers, inspection and compliance officers and other technical staff.

Course Fee

US$ 6,000 per Delegate. This rate includes H-STK® (Haward Smart Training Kit), buffet lunch, coffee/tea on arrival, morning & afternoon of each day.

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.

  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.

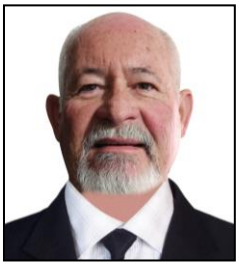
- The International Accreditors for Continuing Education and Training (IACET - USA)

  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.

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. Ken Steel is a **Senior Electrical & Instrumentation Engineer** with over **30 years** of extensive experience. His expertise widely covers the Introduction to **Solar Energy Systems**, Solar Power System Components and Configuration, Introduction to **Solar** Inverters and Batteries, Understanding **Electrical** Circuits for **Solar** Installations, Hands-On Workshop: Build a Simple Solar Setup, **Solar Energy and Electrical Safety Essentials**, Basic Troubleshooting of **Solar PV Systems**, **Energy Efficiency and Solar Integration** Basics, Step-by-Step **Solar Installation** Practices, **Solar Energy** for Technicians and Field Operators. Further, he is also well-versed in **Process Control Instrumentation**, **Process Instrumentation & Control**, **Process Control**, **Instrumentation**, , **Instrumentation** for Process Optimization and Control, Process Automation and **Instrumentation** Systems Integration, Troubleshooting in **Process Control Systems, Process Control** & Safeguarding, Troubleshooting & **Problem Solving**, **Process Instrumentation** and Control Techniques, Troubleshooting **Instrumentation** and Control Systems, GC Processes Troubleshooting and Control Systems, Programmable Logic Controllers (**PLC**), **SCADA System**, **PLC & SCADA** - Automation & Process Control, **PLC & SCADA** Systems Application, Technical **DCS/SCADA,** Distributed Control System (**DCS**) Principles, Applications, Selection & Troubleshooting**, Electrical Motors Testing**, **Heat Tracing** & Insulation Installation & Testing, **HV Terminations**, **High & Low Voltages** on Overhead Cranes, **HV/MV Cable Splicing**, **Cable & Over Head Power Line**, **HV/MV Switchgear, HV Cable** Design, **Medium & High Voltage** Equipment, **High Voltage Circuit Breaker** Inspection & Repair, **High Voltage Power** System, **HV Equipment** Inspection & Maintenance, **HV Switchgear** Operation & Maintenance, Resin / **Heat Shrink & Cold Shrink** Joints, **HV/LV Equipment**, **LV & HV** Electrical System, **Cable** Splicing & Termination, **High Voltage** Electrical Safety, **LV**, **MV & HV Cable** Installations & Properties, **LV Substation**, **MV & LV Cable**, **UPS Systems**, **MV & LV** Direct on Line Motor Drives, **MV & LV** VSD Motor Drives, **MV & LV** Soft Starter Motor Drives, **LV Two Speed Motor Drives**, Underground **Transformer Oil Containment Tank**, **Electrical & Instrumentation Construction** Installation, 1500KW, 1000KW, 1752KW **Diesel Power Plant Installation**, **110KV Overhead Line**, **110KV Outdoor Switchgear**, 110KV/10KV 6500KVA **Transformer**, **Transformer Substation**, 1600KVA 10KV/0.4KV & 2 Off 1000KVA **Diesel Generators**, 1600KVA 10KV/0.4KV & 1650KVA **Diesel Generator**, **110KV/35KV/10KV Substation**, 110KV/10KV **Transformers**,110KV & 2 Off 6KV **Overhead Lines**, 34.5KV,13.8KV ,4.16KV & 480V **Switchgear**, 4.16KV & 480V MCC, **Transformers & Motor Drives** Substations, **Diesel Driven Generators**, **Overhead Cranes**, **Overhead Cranes & HVAC Units**, **AC & DC Drives**, **Data Logger**, **Electrical, Instrumentation & Mechanical** Installation Maintenance, Slab Mills, Pre Heat Ovens, Hydraulic Shears, Stamping Machine, Gearboxes, Rollers, Pumps, Valves, Electro Magnets & Pump House Operation, Boilers Construction And Commissioning, Valve Calibration & Testing, Level Gauges, Pressure & Flow Transmitters Installation & Calibration, Pressure & Leak Testing of Boilers, Leak Testing, SMP, Elect, I&C, F&G, HVAC & Utility Services, Nitrogen Leak Test Operations, Steam Blowing Activities, SMP, Elect, I&C, F&G, HVAC & Utility Services, PTW Issue (PA/AC), Installation & Mechanical Piping and Hydro Testing & Leak Testing of Lines Installation.

During Mr. Steel's career life, he has gained his practical experience through several significant positions and dedication as the **3GP PBF & Boilers SC Commission Support**, **SC Site Execution Superintendent**, **E&I Construction Superintendent**, **High Voltage Construction Supervisor**, **Control & Power Construction Supervisor**, **Electrical & Instrumentation Supervisor**, **Electrical Technician**, **Construction Support Electrical Engineer**, **E&I Engineer**, **Electrical/Instrumentation Site Supervisor**, **Q.A/Q.C Inspector**, **Electrical/ Instrumentation Technician**, **Maintenance Fitter Instrumentation Technician**, **Millwright**, **Apprentice Millwright** and **Senior Instructor/Lecturer** for Tengiz Chevron Oil Kazakhstan, Al Jubail Saudi Arabia, Escravos Delta state Nigeria, Lurgi S.A, SuD Chemie Sasol Catalysts, J C Groenewalds Construction (LTA), Tycon (Goodyear S.A.), Dragline Construction and Iscor Vanderbijlpark.

Mr. Steel has a **Diploma** in **Electronics Mechanic**. Further, he is a **Certified Instructor/Trainer** and delivered numerous trainings, courses, workshops, seminars and conferences internationally.

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.

Accommodation

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

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: ***Sunday,05th of October 2025***

0730 – 0800	*Registration & Coffee*
0800 – 0815	*Welcome & Introduction*
0815 – 0830	***PRE-TEST***
0830 – 0930	***Introduction to Electrical Asset Testing*** *Importance of Electrical Testing in Asset Reliability • Overview of Critical Electrical Assets (Motors, Transformers, Breakers) • Types of Testing: Routine, Type, Diagnostic, Predictive • Testing During Commissioning, Maintenance and Troubleshooting*
0930 - 0945	*Break*
0945 – 1045	***Electrical Safety in Testing Operations*** *Electrical Hazards and Shock Prevention • Arc Flash Risk Analysis and PPE • Lockout/Tagout (LOTO) Procedures • Safe Approach Distances and Test Boundaries*
1045 - 1145	***Testing Equipment & Tools Overview*** *Megohmmeter (Insulation Tester), Multimeter, Clamp Meter • Primary & Secondary Injection Kits • HiPot, TTR, VLF, Ductor Tester, SFRA Analyzer • Calibration and Maintenance of Test Instruments*
1145 - 1230	***Planning & Preparing for Electrical Testing*** *Test Procedures and Job Plans • Test Equipment Selection and Setup • Permits, Risk Assessments and Job Safety Analysis (JSA) • Documentation and Tagging*
1230 – 1245	*Break*
1245 – 1330	***Interpreting Test Results & Baselines*** *Trending versus Absolute Measurements • Establishing Reference Values and Acceptance Limits • Comparing with Standards (IEC, IEEE, NETA) • Data Logging and Software Reporting*

1330 - 1420	***Standards & Guidelines in Testing*** *NETA, IEEE, IEC Standards for Electrical Testing • Manufacturer's Recommendations and Test Intervals • ANSI/ASTM Test Methods • Regulatory and Insurance Considerations*
1420 – 1430	***Recap*** *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: ***Monday,06th of October 2025***

0730 – 0830	***Power Cable Testing Techniques*** *Insulation Resistance Testing (IR) • Very Low Frequency (VLF) Testing • Tan Delta and Partial Discharge Testing • Cable Fault Location and Time Domain Reflectometry (TDR)*
0830 – 0930	***Transformer Diagnostic Testing*** *Insulation Resistance and Polarization Index (PI) • Transformer Turns Ratio (TTR) Test • Sweep Frequency Response Analysis (SFRA) • Winding Resistance and Excitation Current Tests*
0930 - 0945	*Break*
0945 – 1130	***Oil-Filled Transformer Oil Testing*** *Dissolved Gas Analysis (DGA) • Moisture Content and Dielectric Strength • Furan Analysis for Paper Degradation • Oil Quality Assessment and Interpretation*
1130 - 1230	***Switchgear & Circuit Breaker Testing*** *Contact Resistance (Ductor Test) • Timing Analysis (CB Timing Test) • Insulation Resistance and HiPot Tests • Dynamic Resistance Measurement (DRM)*
1230 - 1245	*Break*
1245 - 1330	***Insulation Testing & Dielectric Strength*** *Megger Testing for Motors, Cables, Transformers • Spot Reading, Timed Testing, and Step Voltage Methods • Dielectric Withstand (HiPot) Testing Principles • Capacitance and Dissipation Factor Measurements*
1330 - 1420	***Grounding & Earth Resistance Testing*** *Fall-of-Potential Method • Clamp-On Ground Resistance Testing • Soil Resistivity (Wenner Method) • Ground Grid Continuity and Bonding Checks*
1420 – 1430	***Recap*** *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: ***Tuesday,07th of October 2025***

0730 – 0830	***Electric Motor Testing Techniques*** *Insulation Resistance and Polarization Index • Surge Comparison and Winding Resistance Tests • Rotor Bar, Bearing and Core Testing • Offline versus Online Motor Diagnostics*
0830 – 0930	***Generator Testing & Monitoring*** *Stator and Rotor Winding Testing • Excitation System Diagnostics • Synchronization Checks • Thermal Monitoring and Trending*
0930 - 0945	*Break*

0945 – 1130	***Protection Relay Testing & Calibration*** *Functional Testing of Protective Relays • Secondary Injection Testing • Relay Coordination and Settings Validation • Testing Distance, Overcurrent and Differential Relays*
1130 - 1230	***Primary Injection Testing of Protection Circuits*** *Purpose and Procedure of Primary Injection • CT and Breaker Coordination Checks • Verifying Trip Curves and Response Time • Current Injection Setup and Interpretation*
1230 - 1245	*Break*
1245 - 1330	***Battery & DC System Testing*** *Battery Impedance Testing • Discharge and Capacity Tests • Float Voltage and Specific Gravity • UPS Systems Inspection and Alarms*
1330 - 1420	***Control Panel & Wiring Check*** *Continuity and Point-to-Point Testing • Terminal Torque and Connection Checks • Functionality of Control Circuits • Signal Testing and Verification*
1420 – 1430	***Recap*** *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*

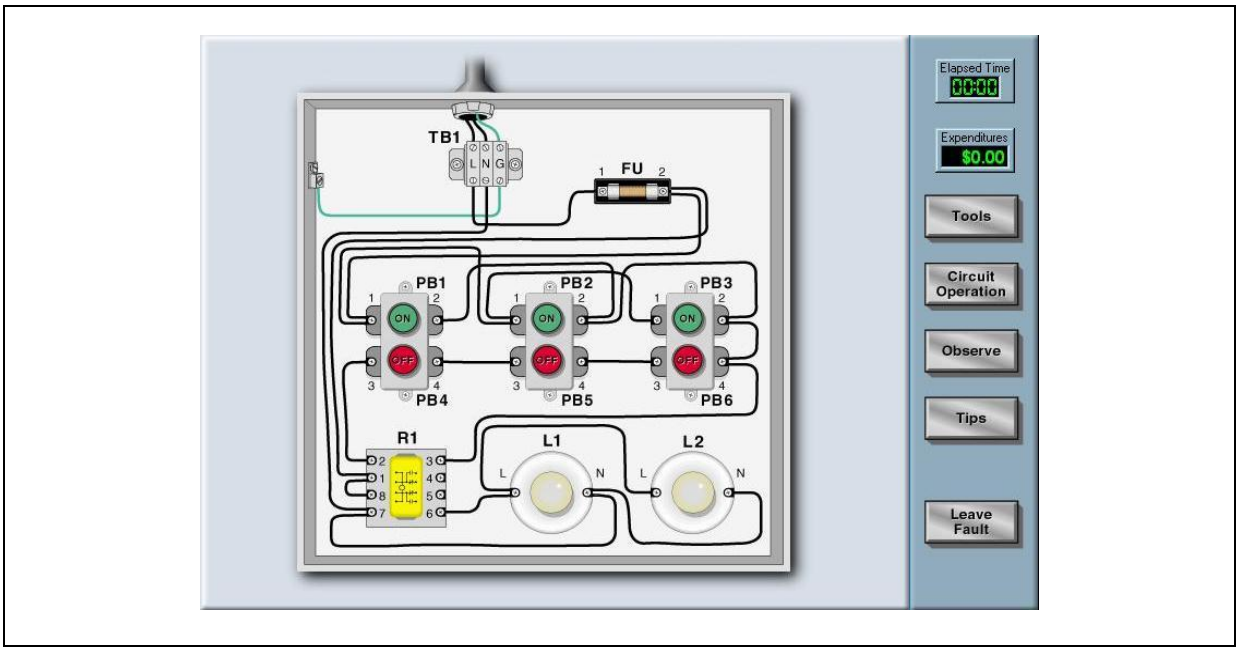
Day 4: ***Wednesday,08th of October 2025***

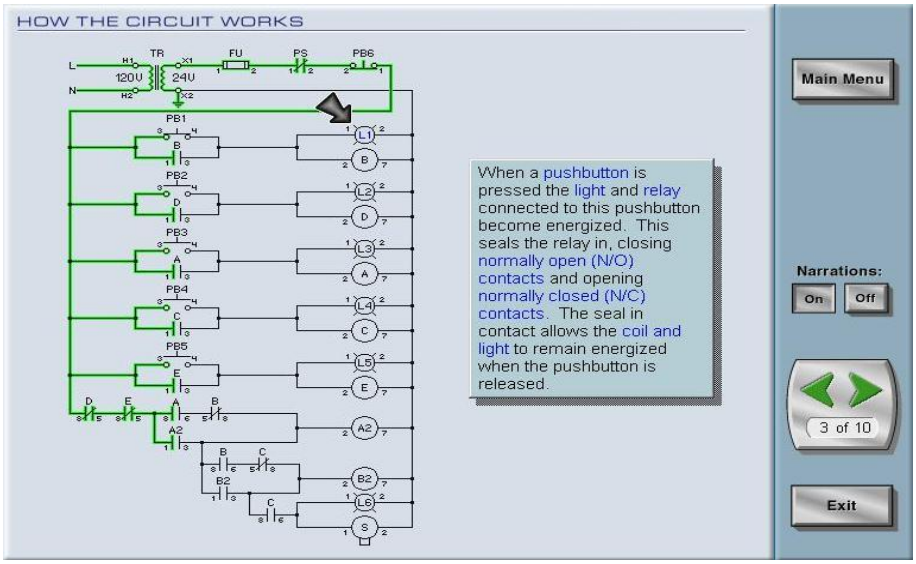
0730 – 0830	***Thermal Imaging & Infrared Thermography*** *Principles of IR Scanning for Hot Spots • Interpreting Thermal Images and Temperature Anomalies • Common Issues: Loose Contacts, Overloads • IR Inspection Program and Reporting*
0830 – 0930	***Partial Discharge (PD) Testing*** *PD Basics and Failure Modes • Online versus Offline PD Detection • Test Methods: Ultrasonic, TEV, HFCT • PD Monitoring for Cables and Switchgear*
0930 - 0945	*Break*
0945 – 1130	***Vibration Analysis & Acoustic Testing*** *Detecting Mechanical and Electrical Issues • Bearing Faults, Misalignment, Rotor Imbalance • Ultrasonic Leak Detection • Correlating Vibration Data with Electrical Testing*
1130 - 1230	***Online Monitoring Systems for Assets*** *Condition Monitoring versus Time-Based Maintenance • Online IR, PD, Moisture Sensors • Remote Data Acquisition and SCADA Interface • Alarm Setting and Threshold Configuration*
1230 - 1245	*Break*
1245 - 1330	***Electrical Asset Health Indices*** *Defining and Scoring Asset Health • Risk-Based Maintenance Prioritization • Integration with CMMS or EAM Systems • Example Dashboards and KPI Visualization*
1330 - 1420	***Root Cause Analysis Using Test Data*** *Data Correlation Across Test Results • Identifying Recurring Failure Patterns • Linking Test Failures to Environmental or Operational Causes • Reporting Findings and Recommending Corrective Actions*
1420 – 1430	***Recap*** *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 Four*

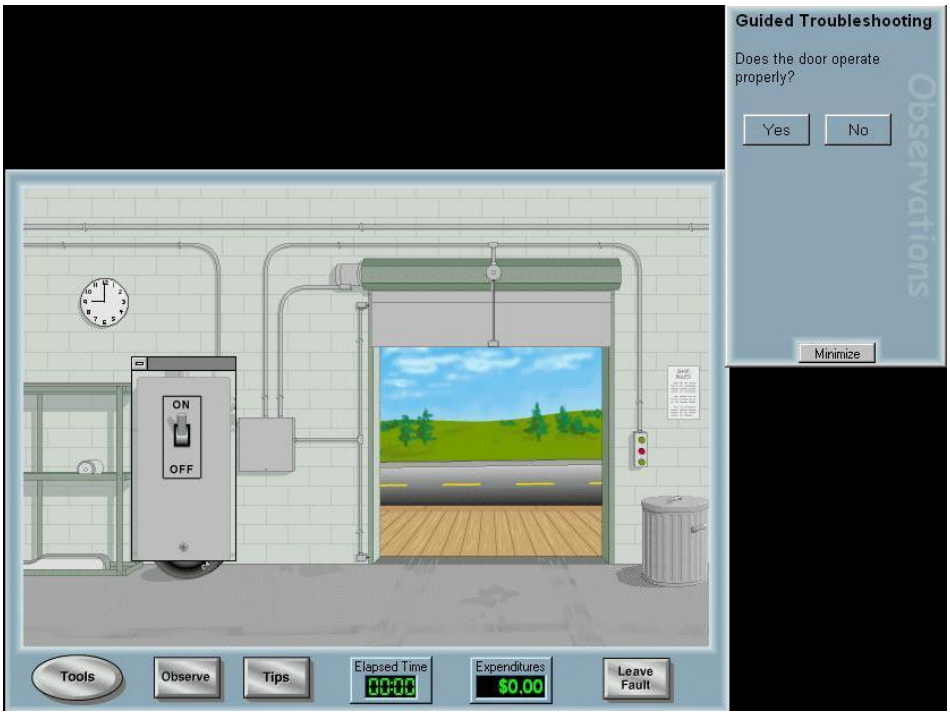
Day 5:	***Thursday,09th of October 2025***
0730 – 0830	***Practical Hands-On Demonstration (Lab/Field)*** *Insulation Resistance and PI Testing • Breaker Contact Resistance and Timing Tests • Cable VLF and TDR Testing Demo • Relay Testing Using Secondary Injection*
0830 – 0930	***Case Studies from Industrial Plants*** *Transformer Failure Due to Poor Oil Condition • Mis-Coordinated Relay Tripping • Motor Insulation Breakdown During Operation • Arc Flash Incident Linked to Undetected PD*
0930 - 0945	*Break*
0945 – 1100	***Maintenance Strategy Based on Test Results*** *Test Result Interpretation for Scheduling PM/CM • Integrating Testing with Predictive Maintenance • Deciding Repair versus Replace • Planning Shutdowns Based on Risk Indicators*
1100 – 1200	***Reporting & Documentation*** *Test Report Formats and Templates • Compliance Documentation (QA/QC, Audit) • Digital Tools for Documentation • Archiving and Data Analytics*
1200 - 1215	*Break*
1215 – 1345	***Course Review & Final Assessment*** *Recap of All Testing Techniques • Interactive Q&A and Group Discussions • Final Written or Practical Test • Feedback and Evaluation*
1345 – 1400	***Course Conclusion*** *Using this Course Overview, the Instructor(s) will Brief Participants about the Course Topics that were Covered During the Course*
1400 – 1415	***POST TEST***
1415 – 1430	*Presentation of Course Certificates*
1430	*Lunch & End of Course*

Simulator (Hands-on Practical Sessions)

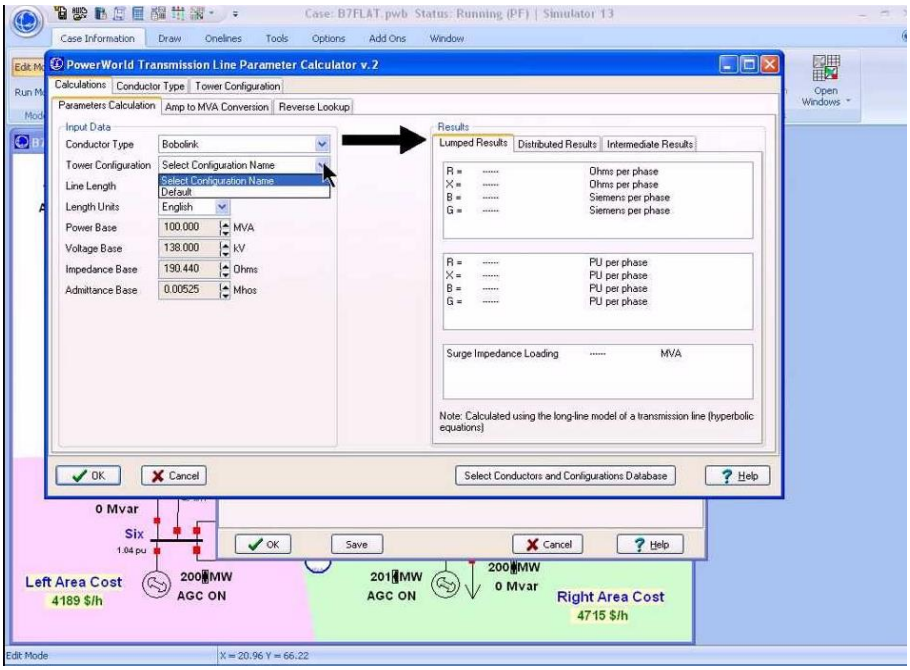
Practical sessions will be organized during the course for delegates to practice the theory learnt. Delegates will be provided with an opportunity to carryout various exercises using our state-of-the-art simulator "Simutech Troubleshooting Electrical Circuits V4.1", Power World" and "ETAP software".



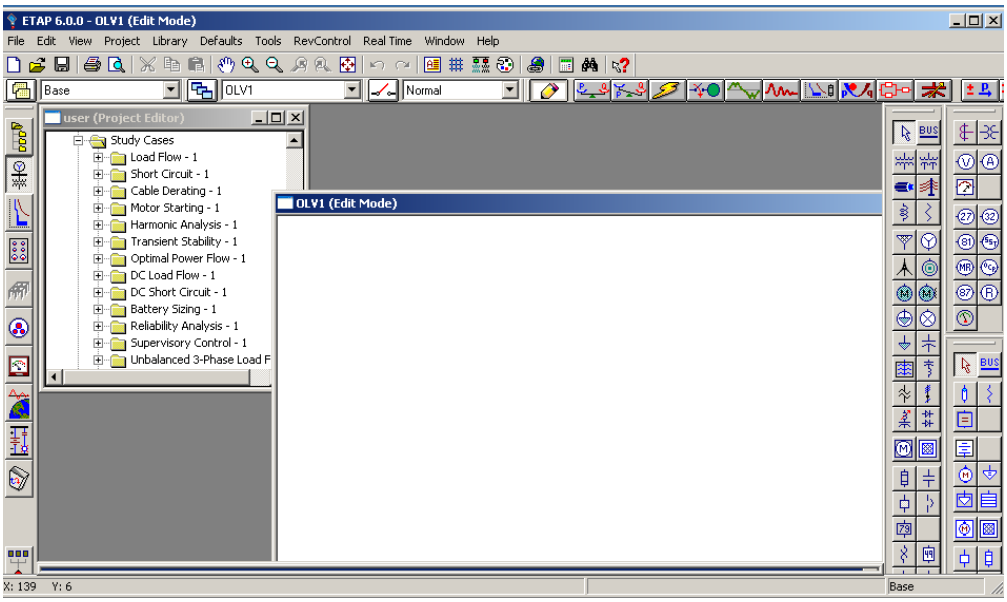




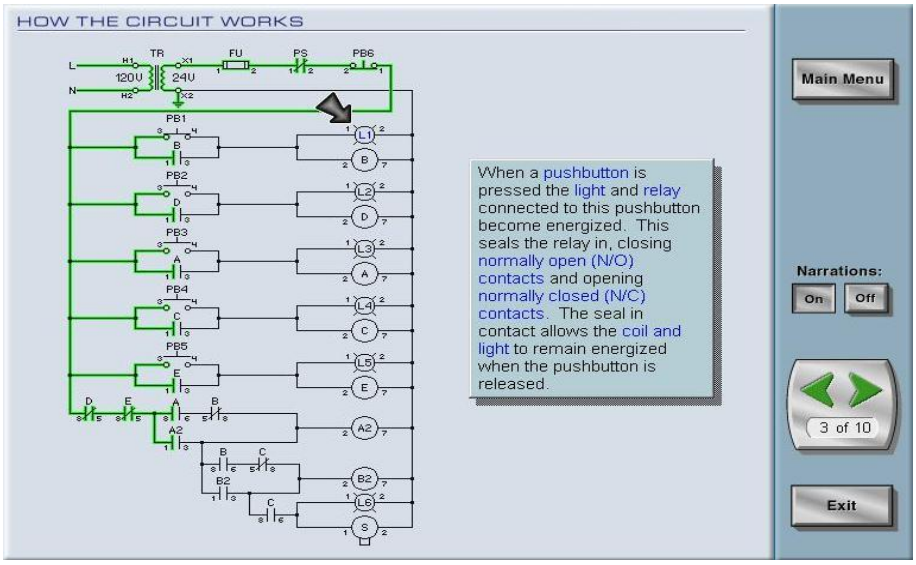
Simutech Troubleshooting Electrical Circuits V4.1



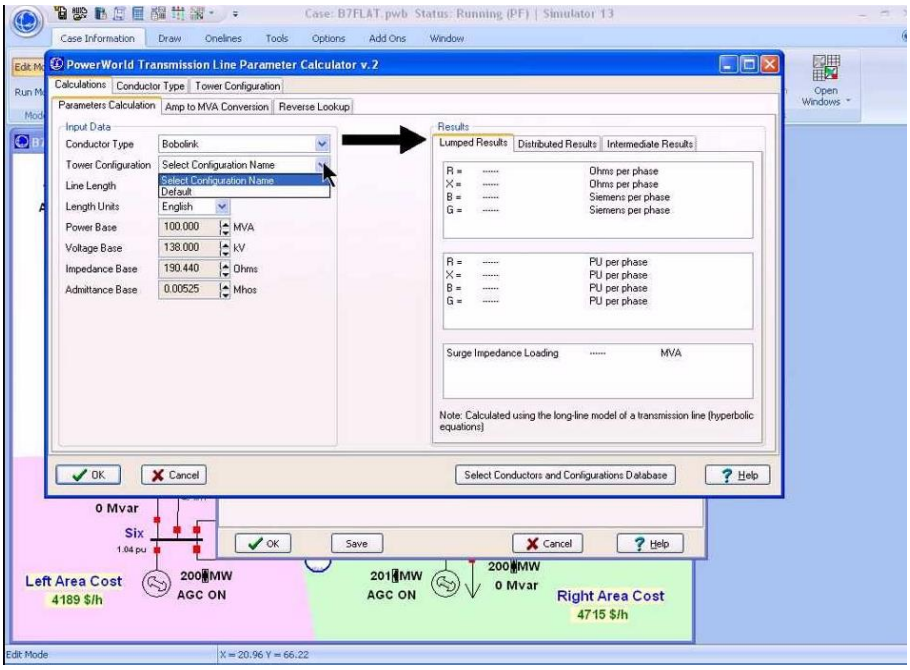
Power World Simulator



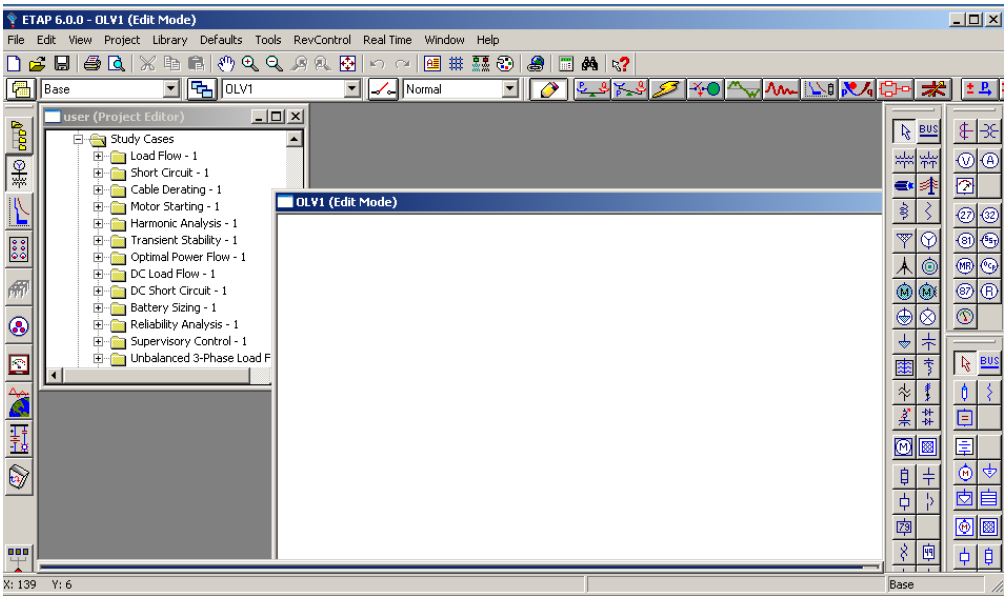
ETAP Software Simulator



Simutech Troubleshooting Electrical Circuits V4.1



Power World Simulator



ETAP Software Simulator

Course Coordinator
Reem Dergham, Tel: +974 4423 1327, Email: reem@haward.org