Haward Technology Middle East

COURSE OVERVIEW EE1102
Power Plant Design

Course Title
Power Plant Design

Course Date/Venue
Session 1: July 14-18, 2025/Glasshouse Meeting Room, Grand Millennium Al Wahda Hotel, Abu Dhabi, UAE
Session 2: October 27-31,2025/Glasshouse Meeting Room, Grand Millennium Al Wahda Hotel, Abu Dhabi, UAE

Course Reference
EE1102

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 Power Plant Design. It covers the power plant design key parameters, power generation technologies, components of power plants and design considerations for efficiency and sustainability; the safety regulations and standards, risk assessment and mitigation strategies, emergency response planning and hazardous material handling; the thermodynamics in power plant design, heat generation and transfer mechanisms, steam and gas turbines and energy conversion efficiency; and the cooling systems in power plants and the impact of environmental conditions on heat transfer.

Further, the course will also discuss the electrical power generation systems and power plant control systems; the power plant protection, fault management and instrumentation and monitoring in power plants; the energy distribution and grid management, integration of AI and machine learning for predictive maintenance and automation of monitoring and diagnostics; the mechanical design of power plant components; and the piping and pressure systems and structural and civil design of power plants.

During this interactive course, participants will learn the water treatment systems in power plants, maintenance and reliability engineering and cost and resource management in power plant design; the environmental regulations and compliance and sustainability in power plant design; the air and water quality management, disaster preparedness, risk management and decommissioning and plant life extension; the digitalization and smart technologies in power plants, advanced energy storage and grid management; and the hydrogen fuel and its role in future power generation and development of small modular reactors (SMRs) and their design.

Course Objectives

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

- Apply and gain an in-depth knowledge on power plant design
- Discuss power plant design key parameters, power generation technologies, components of power plants and design considerations for efficiency and sustainability
- Carryout safety regulations and standards, risk assessment and mitigation strategies, emergency response planning and hazardous material handling
- Recognize thermodynamics in power plant design, heat generation and transfer mechanisms, steam and gas turbines and energy conversion efficiency
- Identify cooling systems in power plants and the impact of environmental conditions on heat transfer
- Recognize electrical power generation systems and power plant control systems as well as apply power plant protection and fault management and instrumentation and monitoring in power plants
- Employ energy distribution and grid management, integration of AI and machine learning for predictive maintenance and automation of monitoring and diagnostics
- Describe the mechanical design of power plant components, piping and pressure systems and structural and civil design of power plants
- Apply water treatment systems in power plants, maintenance and reliability engineering and cost and resource management in power plant design
- Review environmental regulations and compliance and sustainability in power plant design
- Carryout air and water quality management, disaster preparedness, risk management and decommissioning and plant life extension
- Discuss digitalization and smart technologies in power plants, advanced energy storage and grid management, hydrogen fuel and its role in future power generation and development of small modular reactors (SMRs) and their design

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 power plant design for electrical engineers, process engineers, instrumentation and control engineers, project managers and planners, utility and energy sector professionals, plant operators, maintenance supervisors and other technical staff.

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 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.

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
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**. 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)

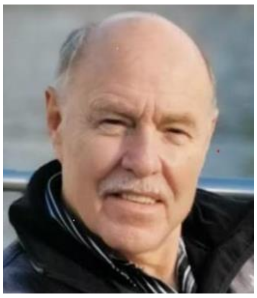
Haward Technology is an Authorized Training Provider by the International Accreditors for Continuing Education and Training (IACET), 2201 Cooperative Way, Suite 600, Herndon, VA 20171, USA. In obtaining this authority, Haward Technology has demonstrated that it complies with the **ANSI/IACET 2018-1 Standard** 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. Fred Du Plessis is a **Senior Electrical Engineer** with over **45** years of extensive experience within the **Oil**, **Gas**, **Petrochemical**, **Refinery** & **Power** industries. His expertise widely covers in the areas of **Thermal Gas Power Generation**, **Power Station** Operations, **Power Generation Plant Outage** Management, **Power System** Analysis, **Power System** Generation & Distribution, **Electric Power System** Design, **Renewable Energy**, **Energy Storage** Technologies, Maintenance, Testing & Troubleshooting, **Transformer Protection**, **Transformer** Problem and Failure Investigations, **Power System Operation and Control**, Fault Analysis in **Power Systems**, **HV/MV Cable Splicing**, **High Voltage Electrical Safety**, **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**, ORHVS for Responsible and Authorized Person **High Voltage Regulation**, **Transformers** Maintenance, inspections & repairs, Commissioning of **LV & HV Equipment**, Oil Purification and **High Voltage Maintenance**, HT Switch Gear - Testing, Safe Operating, Maintenance, Inspection & Repairs on **LV & HT Cables** - Testing (Pulse & Megger), Line Patrol in **Low Voltage & Distribution**, **Transmission**, **Operating Principles up to 132KV**, Abnormal Conditions & Exceptions, Commissioning & Testing, **Transformer Inspections & Repairs**, **Live Line Work up to 33KV**, **Basic Power System Protection**, **High Voltage** Operating Preparedness Phasing (**110V to 132KV**), **HV Operating & Fault** Finding (up to 132KV), Maintenance & Construction Supervision, **VSD/VFD** Installations & Testing, **Electrical Panel Design**, **VSD/VFD Installations & Testing**, Instrument Installation and wiring, **AC/DC Supplies & Change Over Systems**, **AC & DC Winders** and VLF Testing, **Gas Turbines**, **Steam Turbine** with a **Station Generation**, **Project** Management & Project Controls, **Water Treatment & Reverse Osmosis** Plant Management and **Mechanical Maintenance** Management.

During Mr. Du Plessis's career life, he has gained his practical experience through several significant positions and dedication as the **Project Manager/Owner**, **Maintenance Manager**, **Project Excecution Manager**, **Commissioning & Operating Manager**, **Acting Operating Manager**, **Optimization/Commissioning Manager**, **Operating Support Manager**, **Operating Production/Shift Manager**, **Operations Lead Engineer**, **Electrical Engineer**, **Production/Maintenance Planner**, **Unit Shift Supervisor**, Principal **Plant Operator**, **Workshop & Maintenace Consultant**, Assistant **Electrical Supervisor**, Trainee **Motor Mechanic** and **Senior Instructor/Trainer** from various international **power station** companies like the Dunamis Energy, Peterhead Power Station, Lijaco Services, Eskom, Matla Power Station, Grootvlei Power Station, Ellisras Brick & Ceramic, Hlalisanani Mechanical Contractor, Matimba Power Station, Matimba Power Station, Eskom Kriel Power Station and Transvaal Provincial.

Mr. Du Plessis has a **Bachelor's** (with Honours) degree in **Operations Management**. Further, he holds certification in Red & Silver Seal Accreditation Power Generation – (ESETA), a SAMTRAC & NOSA **Auditor** – (NOSA), a **Certified Instructor/Trainer** and has further delivered various trainings, seminars, conferences, workshops and courses globally.

Course Program

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

Day 1

0730 – 0800	*Registration & Coffee*
0800 – 0815	*Welcome & Introduction*
0815 – 0830	***PRE-TEST***
0830 – 0930	***Overview of Power Plant Design*** *Definition and Objectives of Power Plant Design • Historical Development of Power Plants • Types of Power Plants (Thermal, Hydro, Nuclear, etc.) • Role of Power Plants in the Energy Sector*
0930 – 0945	*Break*
0945 – 1030	***Key Design Parameters*** *Load Estimation and Power Generation Requirements • Site Selection Considerations • Environmental and Regulatory Factors • Key Performance Indicators (KPIs) for Design*
1030 – 1130	***Power Generation Technologies*** *Thermal Power Generation Systems (Fossil Fuels) • Hydroelectric Power Generation • Renewable Energy-Based Power Generation • Nuclear Power Generation and its Applications*
1130 – 1215	***Components of Power Plants*** *Boilers, Turbines, and Generators • Heat Exchangers and Cooling Towers • Electrical and Control Systems • Fuel Supply and Waste Management Systems*
1215 – 1230	*Break*
1230 – 1330	***Design Considerations for Efficiency & Sustainability*** *Energy Efficiency in Power Plant Design • Environmental Impact and Emissions Reduction • Waste Heat Recovery and Reuse • Sustainable Design Practices*
1330 – 1420	***Safety & Risk Management in Power Plant Design*** *Safety Regulations and Standards • Risk Assessment and Mitigation Strategies • Emergency Response Planning • Hazardous Material Handling*
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

0730 – 0830	***Thermodynamics in Power Plant Design*** *First and Second Laws of Thermodynamics • Thermodynamic Cycles (Rankine, Brayton) • Efficiency Calculations for Thermal Systems • Thermodynamic Performance Metrics*
0830 – 0930	***Heat Generation & Transfer Mechanisms*** *Heat Generation in Combustion Systems • Heat Transfer in Boilers and Heat Exchangers • Types of Heat Exchangers Used in Power Plants • Thermal Conductivity and Resistance in Materials*
0930 – 0945	*Break*
0945 – 1100	***Steam & Gas Turbines*** *Working Principle of Steam Turbines • Working Principle of Gas Turbines • Performance Optimization of Turbines • Operational Challenges and Solutions*

1100 – 1215	***Energy Conversion Efficiency*** *Factors Affecting Energy Conversion Efficiency • Superheating and Reheat Cycles • Combined Heat and Power (CHP) Systems • Strategies for Increasing Conversion Efficiency*
1215 – 1230	*Break*
1230 – 1330	***Cooling Systems in Power Plants*** *Cooling Tower Design and Function • Types of Cooling Systems (Wet, Dry, Hybrid) • Cooling System Performance and Selection Criteria • Water Usage and Treatment in Cooling Systems*
1330 – 1420	***Impact of Environmental Conditions on Heat Transfer*** *Ambient Temperature Variations • Humidity and its Effect on Cooling Efficiency • Altitude and Atmospheric Pressure Considerations • Seasonal Operational Challenges*
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

0730 – 0830	***Electrical Power Generation Systems*** *Synchronous and Asynchronous Generators • Power Factor Correction and Load Balancing • Voltage Regulation and Control Mechanisms • Electrical Grid Connectivity and Integration*
0830 – 0930	***Power Plant Control Systems*** *Distributed Control Systems (DCS) • SCADA (Supervisory Control and Data Acquisition) Systems • Control Loop Design for Efficiency and Reliability • Alarms and Safety Interlocks in Control Systems*
0930 – 0945	*Break*
0945 – 1100	***Power Plant Protection & Fault Management*** *Electrical Protection Schemes (Overcurrent, Under/Over Voltage) • Fault Detection and Diagnosis • Relay Coordination and Backup Systems • Grounding and Short-Circuit Protection*
1100 – 1215	***Instrumentation & Monitoring in Power Plants*** *Types of Instrumentation Used (Temperature, Pressure, Flow) • Monitoring Key Parameters in Real-Time • Data Acquisition Systems and Analytics • Calibration and Testing of Instruments*
1215 – 1230	*Break*
1230 – 1330	***Energy Distribution & Grid Management*** *Transmission Systems and Grid Integration • Voltage and Frequency Stability in Grids • Power Distribution Systems and their Components • Smart Grid Technology and Innovations*
1330 – 1420	***Automation in Power Plant Design*** *Role of Automation in Optimizing Plant Operations • Integration of AI and Machine Learning for Predictive Maintenance • Automation of Monitoring and Diagnostics • Challenges in Automating Complex Systems*
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

0730 – 0830	***Mechanical Design of Power Plant Components*** *Boiler Design and Thermal Efficiency • Turbine and Generator Design Considerations • Pump and Valve Selection for Power Plant Systems • Mechanical Integrity and Failure Analysis*
0830 – 0930	***Piping and Pressure Systems*** *Piping System Design (Materials, Sizing, Routing) • Pressure Relief Valves and Safety Systems • Thermal Expansion in Piping Systems • Maintenance and Inspection Protocols for Piping*
0930 – 0945	*Break*
0945 – 1100	***Structural & Civil Design of Power Plants*** *Foundation Design and Soil Analysis • Structural Requirements for Boilers, Turbines, and Generators • Design of Cooling Towers and Chimneys • Civil Engineering Considerations in Plant Layout*
1100 – 1215	***Water Treatment Systems in Power Plants*** *Water Intake and Treatment Processes • Desalination and Reverse Osmosis Systems • Wastewater Treatment and Recycling • Impact of Water Treatment on Plant Efficiency*
1215 – 1230	*Break*
1230 – 1330	***Maintenance & Reliability Engineering*** *Preventive and Predictive Maintenance Strategies • Reliability-Centered Maintenance (RCM) • Spare Parts Management and Inventory Control • Performance-Based Maintenance Contracts*
1330 – 1420	***Cost & Resource Management in Power Plant Design*** *Cost Estimation and Budget Management • Resource Allocation and Scheduling • Risk Management in Cost Planning • Capital Expenditure versus Operational Expenditure Analysis*
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*

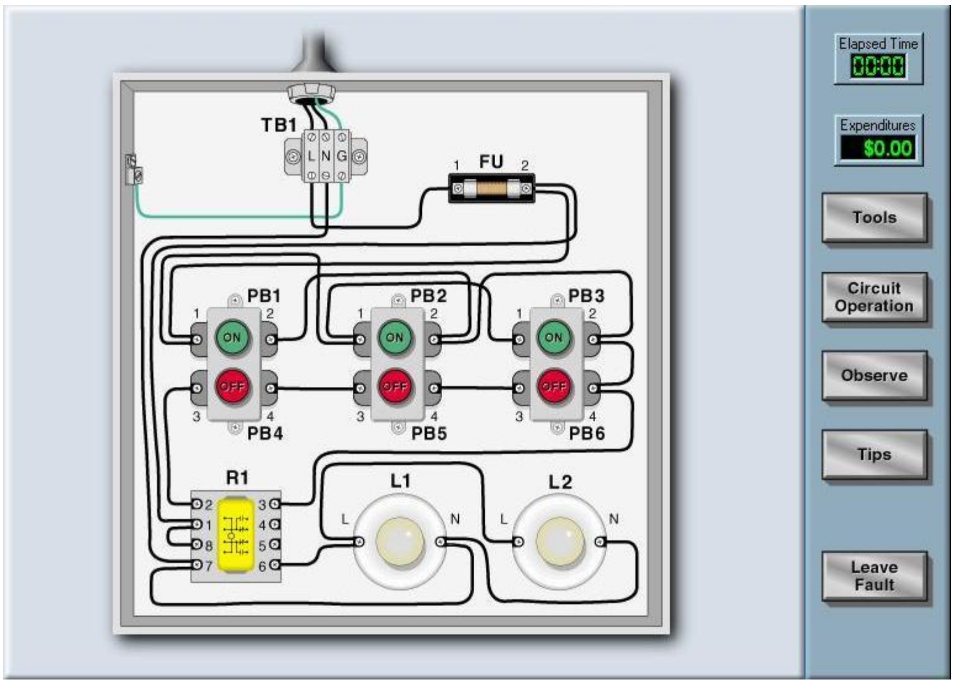
Day 5

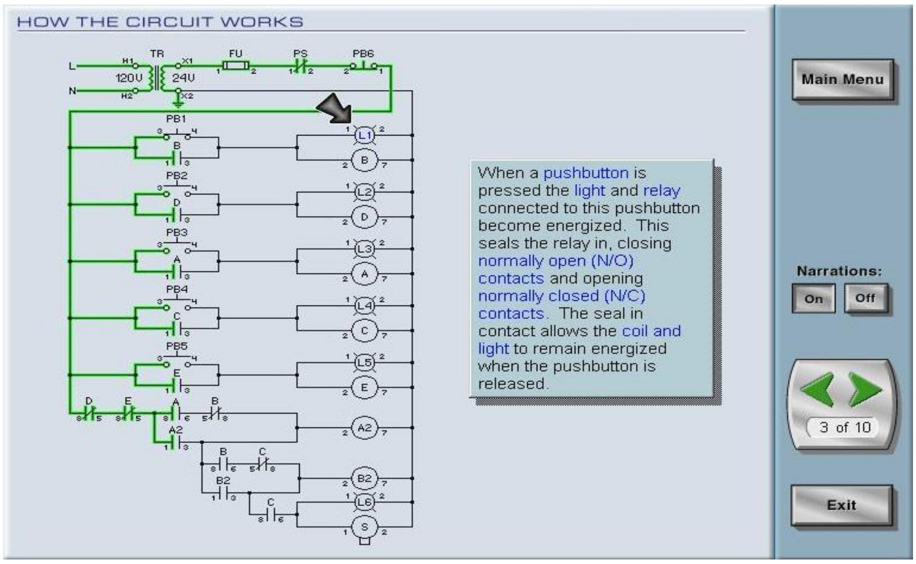
0730 – 0830	***Environmental Regulations & Compliance*** *National and International Environmental Standards (ISO, EPA, etc.) • Emission Control Technologies (NOx, SOx, Particulate Matter) • Waste Management (Solid, Liquid, and Gaseous Waste) • Environmental Impact Assessments (EIA)*
0830 – 0930	***Sustainability in Power Plant Design*** *Low-Carbon Technologies and Renewable Energy Integration • Carbon Capture and Storage (CCS) in Power Plants • Energy Efficiency Measures and Green Building Certifications • Renewable Energy Hybrid Systems in Power Plants*
0930 – 0945	*Break*
0945 – 1100	***Air & Water Quality Management*** *Air Pollution Control Devices (Scrubbers, Filters) • Water Treatment and Conservation Measures • Impact of Power Plants on Local Ecosystems • Climate Change and Adaptation Strategies in Plant Design*

1100 – 1215	***Disaster Preparedness & Risk Management*** *Emergency Response Plans for Power Plants • Natural Disaster Preparedness (Earthquakes, Floods, Fires) • Impact of Global Events (Pandemics, Geopolitical Risks) on Plant Operations • Business Continuity and Crisis Management*
1215 – 1230	*Break*
1230 – 1300	***Decommissioning & Plant Life Extension*** *Life Cycle Analysis and Planning for Plant Decommissioning • Techniques for Extending the Operational Life of Power Plants • Waste Disposal and Recycling During Decommissioning • Economic and Environmental Considerations for Decommissioning*
1300 - 1345	***Future Trends & Innovations in Power Plant Design*** *Digitalization and Smart Technologies in Power Plants • Advanced Energy Storage and Grid Management • Hydrogen Fuel and its Role in Future Power Generation • Development of Small Modular Reactors (SMRs) and their Design*
1345 – 1400	***Course Conclusion*** *Using this Course Overview, the Instructor(s) will Brief Participants about t Topics that were Covered During the Course*
1400 – 1415	***POST-TEST***
1415 – 1430	*Presentation of Course Certificates*
1430	*Lunch & End of Course*

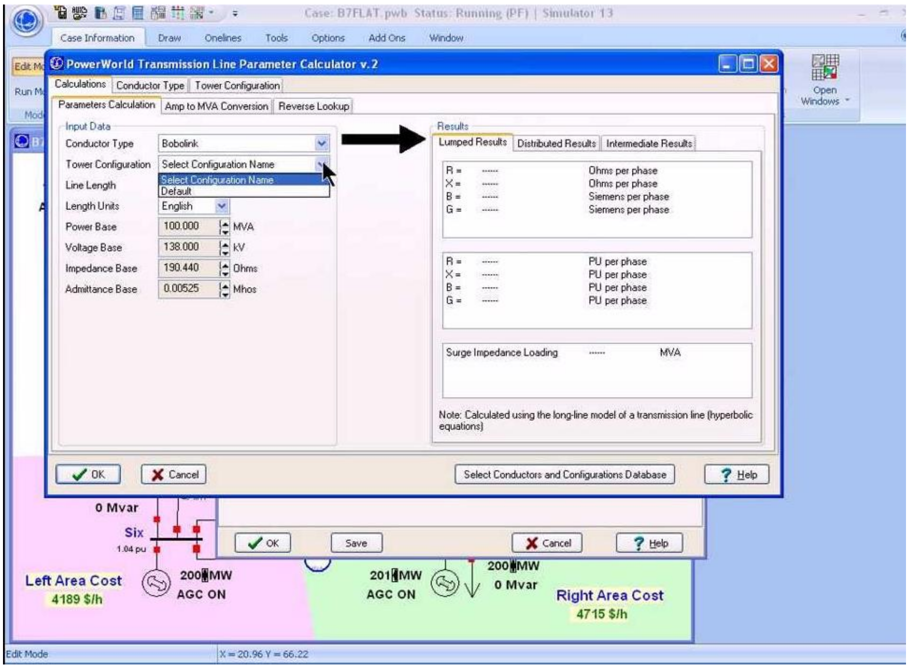
Simulator (Hands-on Practical Sessions)

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".

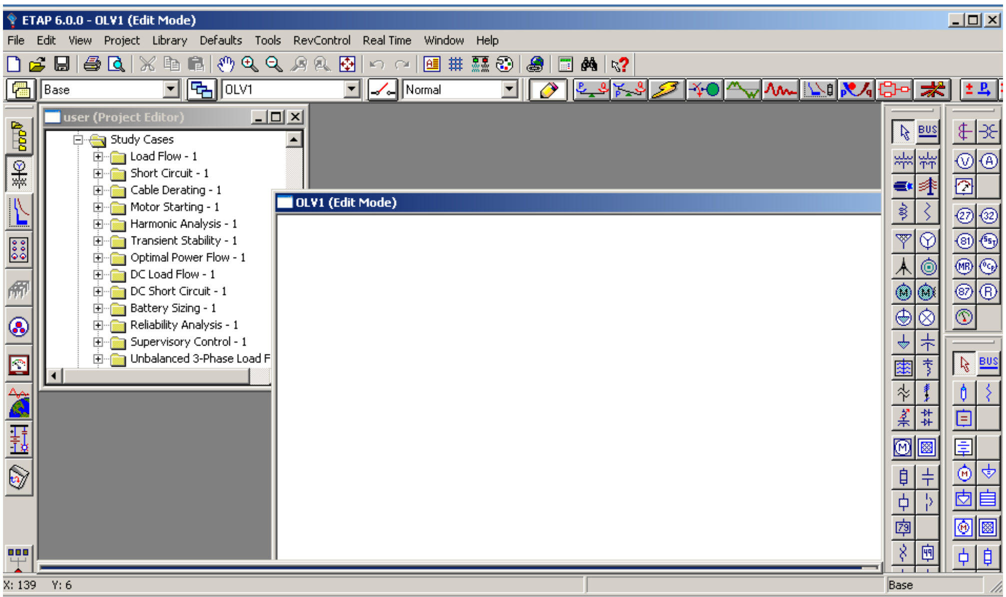




Simutech Troubleshooting Electrical Circuits V4.1



Power World Simulator



ETAP Software Simulator

Course Coordinator

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