COURSE OVERVIEW EE1115
Solar PV/BESS/Renewables

Course Title
Solar PV/BESS/Renewables

Course Date/Venue
Session 1: June 16-20, 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
EE1115

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 Solar PV/BESS/Renewables. It covers the types of renewable energy and its importance in the global energy transition; the role of renewable energy in reducing carbon emissions; the solar energy principles, solar radiation and its importance in PV systems; the types of solar panels and efficiency and performance factors of solar panels; solar photovoltaic (PV) system components, solar PV system design and sizing, photovoltaic energy generation principles and the difference between grid-connected versus off-grid systems.

Further, the course will also discuss the importance of energy storage in renewable energy integration; the different types of energy storage systems, advantages of battery energy storage systems (BESS) and economic and environmental benefits; the battery technologies for BESS and BESS design, sizing, operation, control and applications; the safety issues in energy storage systems, standards and regulations for battery storage and regular maintenance practices; and the lifecycle management and safety protocols for battery management and handling.

During this interactive course, participants will learn the PV system performance monitoring and the common issues in solar PV systems; the maintenance strategies for solar PV systems, troubleshooting PV systems, battery maintenance and performance evaluation; optimizing solar PV and BESS integration; the hybrid systems, microgrids and off-grid solutions, energy management systems (EMS) and grid integration of renewable energy systems; the advanced control techniques for hybrid systems and the emerging technologies in solar PV including advancements in energy storage technologies; the smart grid and IoT in renewable energy, global trends in renewable energy policy and regulation; and the economic and environmental impact of renewables and future challenges and opportunities in solar PV/BESS.

Course Objectives

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

- Apply and gain a comprehensive knowledge on the solar PV/BESS/renewables
- Discuss the types of renewable energy and its importance in the global energy transition including the role of renewable energy in reducing carbon emissions
- Explain solar energy principles, solar radiation and its importance in PV systems, types of solar panels and efficiency and performance factors of solar panels
- Identify solar photovoltaic (PV) system components, solar PV system design and sizing, photovoltaic energy generation principles and the difference between grid-connected versus off-grid systems
- Discuss the importance of energy storage in renewable energy integration, different types of energy storage systems, advantages of battery energy storage systems (BESS) and economic and environmental benefits
- Carryout battery technologies for BESS, BESS design and sizing, BESS operation and control and applications of BESS
- Identify safety issues in energy storage systems, comply standards and regulations for battery storage and implement regular maintenance practices, lifecycle management and safety protocols for battery management and handling
- Apply PV system performance monitoring and identify the common issues in solar PV systems comprising of degradation of solar panels over time, inverter failures and system shutdowns, hotspots and shading issues and dust, dirt, and environmental impacts on performance
- Employ maintenance strategies for solar PV systems, troubleshooting PV systems, battery maintenance and performance evaluation and optimizing solar PV and BESS integration
- Recognize hybrid systems, microgrids and off-grid solutions, energy management systems (EMS) and grid integration of renewable energy systems
- Apply advanced control techniques for hybrid systems and discuss the emerging technologies in solar PV including advancements in energy storage technologies
- Determine smart grid and IoT in renewable energy, global trends in renewable energy policy and regulation, economic and environmental impact of renewables and future challenges and opportunities in solar PV/BESS

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 solar PV/BESS/renewables for engineers and technicians, renewable energy professionals, project developers and EPC contractors, facility and energy managers, government and regulatory authorities, utility and grid operators, investors and financial analysts 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. Mostafa Amin is a **Senior Electrical Engineer** with over **25 years** of extensive Onshore & Offshore experience within the **Oil & Gas**, **Petrochemical and Power** industries. He is an expert in **Renewable Energy**, **Solar Energy**, **Energy Storage Methods**, **Overhead Power Line Maintenance Patrolling & Washing**, **Energy Transmission & Distribution**, **Transmission Line** Structures, Insulators & Accessories, **Transmission Line Construction & Maintenance**, **Insulated Power Cables**, High Voltage Applications, **Transmission Line Parameters**, Sag & Tension of Conductor, Geomagnetic Disturbances, Reactive Power Compensation, **Overhead Line Troubleshooting**, **Electrical Equipments & Control Systems**, **Electric Distribution System Equipment**, **Electrical Power Generation**, **Electric Substation & Distribution, Protection Relays** Maintenance & Application, **Power Transformers** Operation & Maintenance, **Power Transformers** Protection, **Power System** Protection & Coordination, **Power Management** Systems, Protection System Tuning & Configurations, **Distribution System** Operation & Maintenance, **Earthing System**, **HV/LV Motors** Maintenance & Protection, **Circuit Breakers**, Lighting Systems, Underground Cables and Uninterruptible Power Supplies (**UPS**). Further, he is also well-versed in Maintenance & Troubleshooting of UPS Systems & Battery Power Supplies, DC Power Plant, Electric Power System Troubleshooting, Electric Motor Testing, Practical Troubleshooting of Electrical Equipments & Control Circuits, Motors & Variable Speed Drives, Diesel Generators, Analogy/Digital Field Instruments, Direct Current Panels, Gas Turbines, Fire & Gas Detection, Hazardous Area Classification & Intrinsic Safety, Permit to Work & Risk Assessment, Sequence Programming and Programmable Logic Controllers (**PLC)**. He is currently the **General Manager** of **Petrobel** wherein he manages the overall company operation and developing strategic plans.

During his career life, Mr. Mostafa has gained his expertise and thorough practical experience through handling challenging positions such as being the **Assistant General Manager**, **Department Manager**, **Section Head**, **Instructor/Trainer** and **Electrical Engineer**.

Mr. Mostafa has a **Bachelor** degree in **Electrical Power & Machines Engineering**. Further, he is a **Certified Instructor/Trainer**, a **Certified Internal Verifier/Assessor/Trainer** by the **Institute of Leadership & Management** (**ILM**) and has delivered numerous trainings, courses, workshops, conferences and seminars internationally.

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

0730 – 0800	*Registration & Coffee*
0800 – 0815	*Welcome & Introduction*
0815 – 0830	***PRE-TEST***
0830 – 0930	***Overview of Renewable Energy*** *Definition and Types of Renewable Energy • Importance in the Global Energy Transition • Role of Renewable Energy in Reducing Carbon Emissions • Integration with Conventional Power Systems*
0930 - 0945	*Break*
0945 – 1045	***Solar Energy Basics*** *Solar Energy Principles: Photovoltaic and Thermal • Solar Radiation and its Importance in PV Systems • Types of Solar Panels: Monocrystalline, Polycrystalline, and Thin-Film • Efficiency and Performance Factors of Solar Panels*
1045 - 1145	***Solar Photovoltaic (PV) System Components*** *PV Modules, Inverters, and Charge Controllers • Mounting Structures and Tracking Systems • Balance of System (BOS) Components • Energy Storage Systems (ESS) Integration*
1145 - 1230	***Solar PV System Design of Sizing*** *System Design Parameters: Capacity, Efficiency, and Location • Tools for System Design: Software and Calculation Methods • Sizing of Inverters and Batteries • Optimizing Energy Production and Consumption*
1230 – 1245	*Break*
1245 – 1330	***Photovoltaic Energy Generation Principles*** *The Photovoltaic Effect and Energy Conversion Process • Current and Voltage Characteristics of Solar Cells • Maximum Power Point Tracking (MPPT) • Performance Analysis of PV Systems*
1330 - 1420	***Grid-Connected versus Off-Grid Systems*** *Grid-Tied Solar Power Systems: Components and Benefits • Off-Grid Systems: Design, Components, and Applications • Hybrid Systems and Integration Challenges • Regulatory and Technical 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

0730 – 0830	***Basics of Energy Storage*** *Importance of Energy Storage in Renewable Energy Integration • Different Types of Energy Storage Systems • Advantages of Battery Energy Storage Systems (BESS) • Economic and Environmental Benefits*
0830 – 0930	***Battery Technologies for BESS*** *Lead-Acid, Lithium-Ion, and Flow Batteries • Performance Metrics: Efficiency, Lifespan, and Cost • Safety and Maintenance Considerations • Comparing Battery Technologies for Different Applications*

0930 - 0945	*Break*
0945 – 1130	***BESS Design & Sizing*** *Key Factors in BESS Design: Storage Capacity, Discharge Rates, and Depth of Discharge • Energy Management Systems (EMS) and Control Strategies • Integration with Solar PV Systems • Sizing and Selecting Battery Systems Based on Demand and Supply Patterns*
1130 - 1230	***BESS Operation & Control*** *Battery Charging and Discharging Cycles • Optimizing Energy Storage and Release Timing • Power Electronics for Managing Battery Systems • Battery Monitoring and Management Systems (BMS)*
1230 - 1245	*Break*
1245 - 1330	***Applications of BESS*** *Grid Stabilization and Frequency Regulation • Peak Shaving and Load Leveling • Remote Area Power Supply and Off-Grid Applications • Integration with Renewable Energy Sources*
1330 - 1420	***BESS Safety & Maintenance*** *Safety Issues in Energy Storage Systems • Standards and Regulations for Battery Storage • Regular Maintenance Practices and Lifecycle Management • Safety Protocols for Battery Management and 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 Two*

Day 3

0730 – 0830	***PV System Performance Monitoring*** *Key Performance Indicators (KPIs) for PV Systems • Tools and Software for Performance Monitoring • Assessing Energy Yield and System Losses • Reporting and Troubleshooting System Performance*
0830 – 0930	***Common Issues in Solar PV Systems*** *Degradation of Solar Panels Over Time • Inverter Failures and System Shutdowns • Hotspots and Shading Issues • Dust, Dirt, and Environmental Impacts on Performance*
0930 - 0945	*Break*
0945 – 1130	***Maintenance Strategies for Solar PV Systems*** *Preventive versus Corrective Maintenance • Inspection Protocols and Frequency • Cleaning and Ensuring Panel Efficiency • Monitoring Inverter and Electrical Components*
1130 - 1230	***Troubleshooting PV Systems*** *Identifying Faults in PV Systems: Electrical and Mechanical • Troubleshooting Inverter Issues and Faults • Diagnosing Wiring, Fuse, and Connection Problems • Performance Testing and Analysis*
1230 - 1245	*Break*
1245 - 1330	***Battery Maintenance & Performance Evaluation*** *Monitoring Battery Health and Efficiency • Performance Testing and Diagnostic Tools for BESS • Temperature Effects and Load Impact on Battery Life • Battery Life Extension and Capacity Management*

1330 - 1420	***Optimizing Solar PV & BESS Integration*** *Strategies for Maximizing System Efficiency • Smoothing Intermittent Power Generation • Grid-Connected Storage Optimization • Future Trends in PV and Storage Technologies*
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

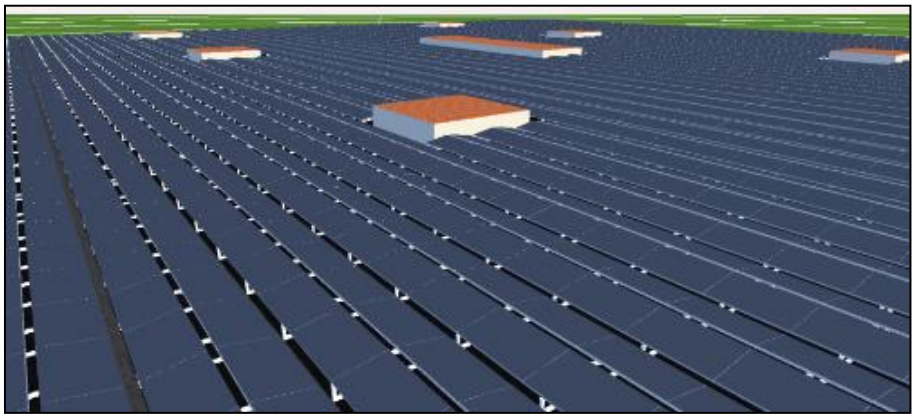
0730 – 0830	***Hybrid Systems: PV & BESS Integration*** *Benefits and Challenges of Hybrid PV/BESS Systems • System Architecture and Layout • Hybrid System Design Considerations • Economic Advantages of Hybrid Systems*
0830 – 0930	***Microgrids & Off-Grid Solutions*** *Concept of Microgrids and their Role in Energy Independence • Design Principles for Off-Grid PV/BESS Systems • Case Studies: Successful Microgrid Applications • Future Potential of Hybrid Systems in Remote Areas*
0930 - 0945	*Break*
0945 – 1130	***Energy Management Systems (EMS)*** *Role of EMS in Hybrid Systems • Algorithms for Load Forecasting and Energy Optimization • Smart Grid Technologies and Energy Storage • Real-Time Monitoring and Control Strategies*
1130 - 1230	***Grid Integration of Renewable Energy Systems*** *Challenges of Integrating PV and BESS with the Grid • Grid Codes and Regulations for Renewable Integration • Stability and Frequency Regulation • Smart Grid Infrastructure and Demand-Response Systems*
1230 - 1245	*Break*
1245 - 1330	***Advanced Control Techniques for Hybrid Systems*** *Optimization Algorithms for Power Flow Management • Demand-Side Management and Load Shifting • Energy Storage Charging/Discharging Optimization • Predictive Control for Renewable Energy Systems*
1330 - 1420	***Case Studies in Hybrid System Applications*** *Solar PV/BESS Hybrid Systems for Utility-Scale Applications • Industrial and Commercial Hybrid Systems • Residential Solar Energy Storage Systems • Lessons Learned and Best Practices*
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 Foure*

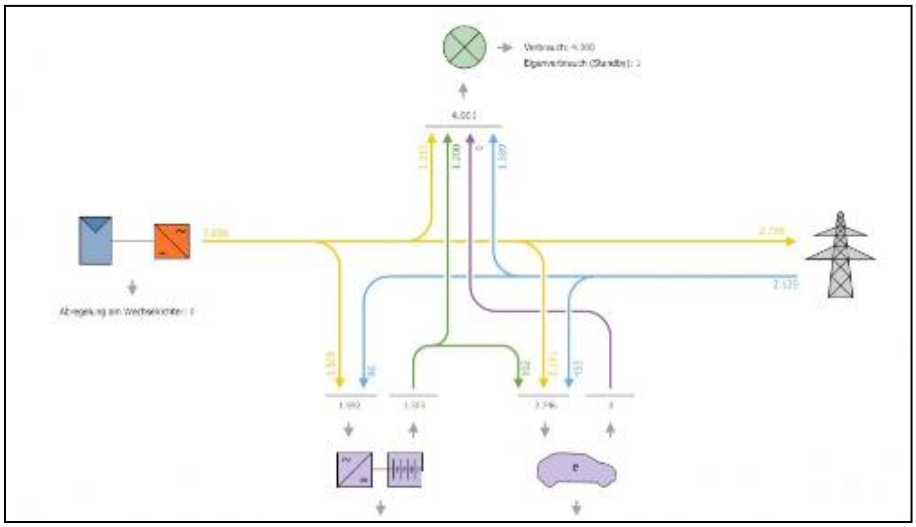
Day 5

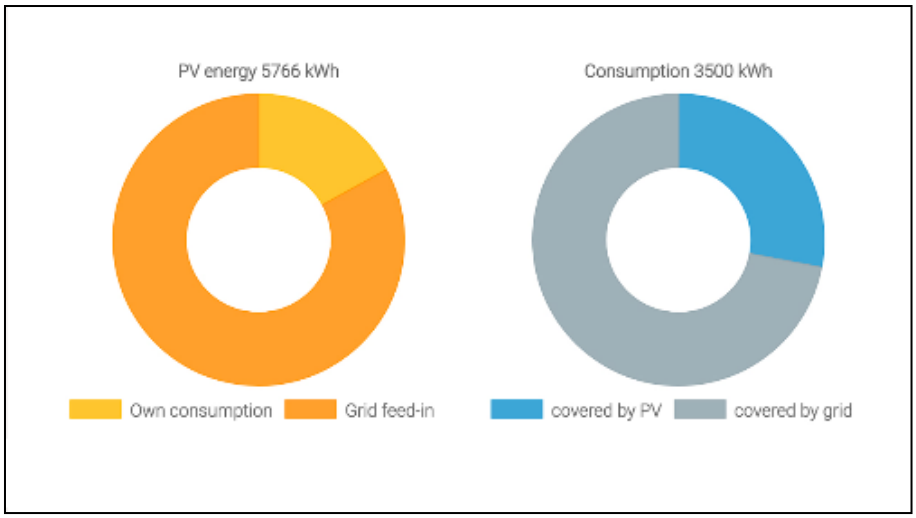
0730 – 0830	***Emerging Technologies in Solar PV*** *Next-Generation Solar Panels: Perovskite and Tandem Cells • Transparent and Flexible PV Technologies • Solar Cells Integrated into Buildings (BIPV) • Innovations in Solar Thermal Technologies*
0830 – 0930	***Advancements in Energy Storage Technologies*** *Solid-State Batteries and Next-Gen Chemistries • Flywheels, Compressed Air, and Thermal Energy Storage • Hybrid Storage Solutions for Optimizing Performance • Role of Artificial Intelligence in Storage Optimization*
0930 - 0945	*Break*
0945 – 1100	***Smart Grid & IoT in Renewable Energy*** *The Role of the Internet of Things (IoT) in Smart Grids • Real-Time Monitoring and Predictive Maintenance • Integration of Electric Vehicles (EV) and Renewable Energy • Automation and Remote Control in Renewable Systems*
1100 – 1200	***Global Trends in Renewable Energy Policy & Regulation*** *Government Incentives and Subsidies for Renewable Projects • Renewable Energy Certificates and Trading Systems • Policy Frameworks for Sustainable Energy Transition • International Collaboration and Energy Agreements*
1200 - 1215	*Break*
1215 – 1230	***Economic & Environmental Impact of Renewables*** *Cost-Benefit Analysis of Solar PV and Storage Systems • Environmental Footprint Reduction • Carbon Credits and Green Energy Certifications • The Role of Renewables in Achieving Net-Zero Targets*
1230 - 1345	***Future Challenges & Opportunities in Solar PV/BESS*** *Energy Storage Scalability and Cost Reduction • Market Dynamics: Competition and Investment • Grid Infrastructure and Capacity Limitations • Innovations in Energy Management for Improved Integration*
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*

Simulators (Hands-on Practical Sessions)

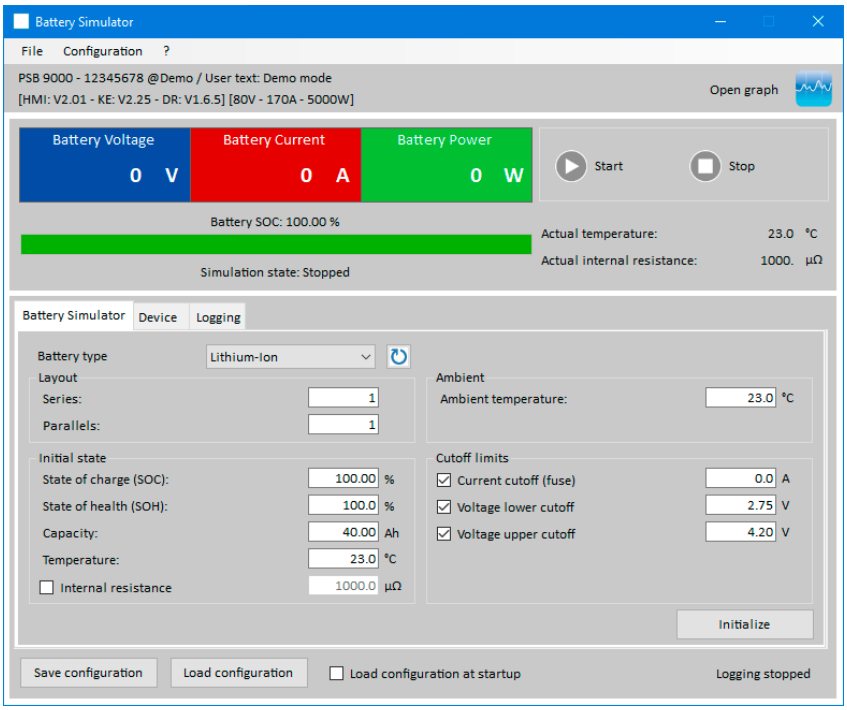
Practical sessions will be organized during the course for delegates to practice the theory learnt. Delegates will be provided with an opportunity to carryout various exercises using one of our state-of-the-art simulators “PV*SOL Premium” and “Battery simulator”.







PV*SOL Premium



Course Coordinator

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