

Electric Energy Storage Solutions Hub





Photovoltaic plant at the Electric Energy Storage Solutions Hub, located in Masdar City

The global adoption of renewable energy has increased demand for low-cost, reliable and flexible electricity storage solutions. The ability to store energy produced for later use enhances the use of renewable energy by offering flexibility and continuity of power supply.

Masdar's Electric Energy Storage Solutions Hub (EESH) is a state-of-the art testing and R&D hub for electric energy storage technology. The EESH is operated by Masdar and Khalifa University of Science and Technology, in collaboration with TÜV Rheinland. The EESH combines an outdoor test stand with indoor laboratories to demonstrate, test, develop and refine research related to electric energy storage. The test stand enables real-time simulation of various micro-grid scenarios, enabling industry and researchers to optimise their inventions and ensure their applicability to real-world scenarios.

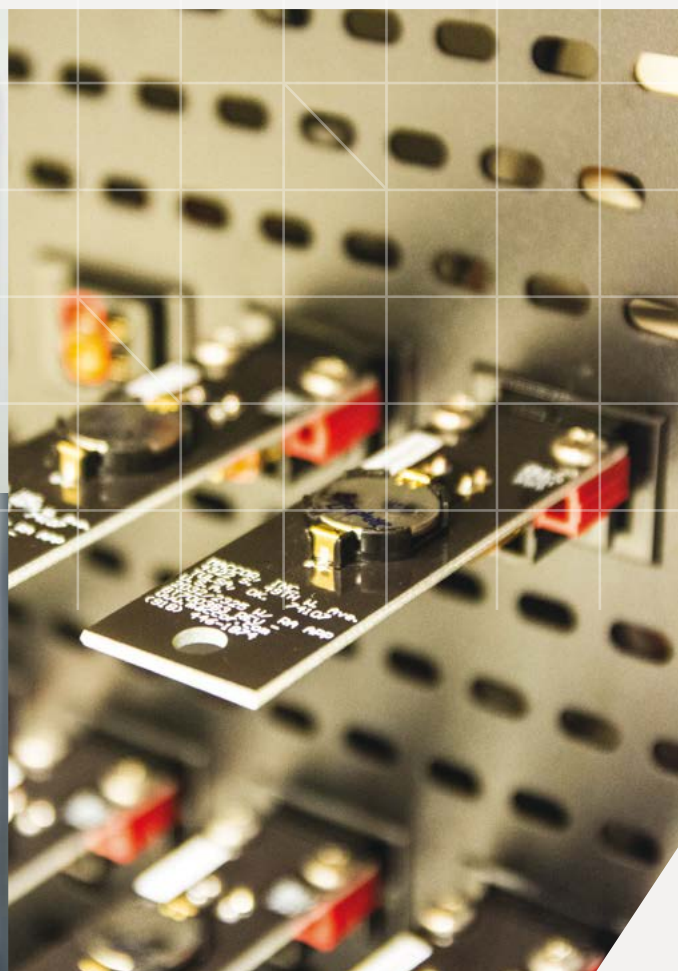
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At a glance

- Targets development, demonstration and deployment of energy storage solutions
- Performance testing of technologies such as batteries, fly-wheels and supercapacitors
- Provides real-world performance verification, and the opportunity to improve and commercialise solutions
- Simulates micro-grid scenarios
- Electricity supply provided by an on-site PV plant
- Allows for outdoor and indoor testing, as well as laboratory testing
- Opportunity for development and analysis in collaboration with Masdar Institute, part of Khalifa University of Science and Technology



EESSH Micro-Grid Test Facility



The EESSH currently supports the work of Energy Services, a specialised team that delivers renewable energy in remote areas or under complex conditions. The EESSH provides insights into the performance, reliability, robustness and operational characteristics of electric energy storage technologies. This data better enables the team to design, select and integrate the best energy storage solutions for each particular project, location and client.

In addition, by being located within Masdar City, EESSH supports research efforts conducted by the faculty and students of the Khalifa University of Science and Technology focused on the integration of research and education in applied science and engineering. The EESSH and Khalifa University of Science and Technology complement one another's activities by linking industry players with research clusters and by connecting laboratory scale technology to outdoor testing.

- Enable local and global industry players to develop and demonstrate advanced electric energy storage technologies
- Partnership between Masdar, TÜV Rheinland and Khalifa University of Science and Technology



Research at Khalifa University of Science and Technology

ESSH MICRO-GRID TEST FACILITY

Enabling the testing of energy storage systems (ESS) in a solar powered micro-grid configuration

The set-up at the ESSH mimics a micro-grid scenario by employing a PV plant producing electricity and an energy storage system to store excess daytime electricity and release it when there is not enough available from the PV plant. The test set-up also includes programmable 'electronic loads' configured to simulate electricity consumers such as a village. The testing process is carried out independent of the main Abu Dhabi grid, with an emphasis on simulations representing real-world situations. This permits accurate measurements of the electricity flowing from or to the energy storage system, the electricity flowing to the electronic loads, and the electricity flowing between the storage and inverter inside the ESS.



Analyser

Measures energy flows in the micro-grid

- 3-phase AC energy flows at the load (demand)
- 3-phase AC energy flows at the ESS (storage)
- DC energy flows within the ESS



ESS Storage

Stores and releases electricity to meet micro-grid demand



ESS Inverter

Converts Alternating Current (AC) electricity into Direct Current (DC)

ESS

- 3-phase inverter to represent micro-grid scenarios
- Balances energy supply and demand



Switch Box

Switching between grid-connected and micro-grid (off-grid) mode

- Micro-grid is main operation mode
- Grid-connected mode to rapidly charge or cycle ESS



Load Simulator

Programmable loads to represent micro-grid electricity consumers

- Maximum load of about 13kW
- Three loads, one per phase
- Programmable scenarios to simulate projects and scenarios



PV Modules

A photovoltaic plant provides the micro-grid system with electricity

- Configurable capacity from 2 to 16kWp
- Configuration allows match with size of ESS under testing
- Plant dedicated to ESS testing



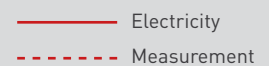
Solar Inverter

Converts Alternating Current (AC) electricity into Direct Current (DC)

- Two inverters of 8kW each
- Micro-grid tied inverters
- 3-phase inverter to represent micro-grid scenarios



Electricity Grid



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