



Fraunhofer Institute for Solar
Energy Systems ISE



R&D along the entire value chain

Center for Electrical
Energy Storage

R&D for the Energy Transition

Center for Electrical Energy Storage

Electrical storage systems are a key component of the energy system. The Center for Electrical Energy Storage at Fraunhofer ISE with its advanced equipment and industry-oriented pilot systems offers a unique infrastructure for a broad-range of R&D services along the entire battery value chain. With this, we want to increase the competitiveness of Germany as a production location and accelerate the progress of the energy transition.

Our services

- development of new battery (active) materials and production processes
- electrochemical and microstructural characterizations
- battery production technology: new production processes, sample battery cells
- development, production and characterization of battery systems
- battery testing and optimization: battery safety, aging models, battery management systems
- integration of battery and battery-coupled systems: simulation, design and evaluation
- design of battery systems: impacts of aging, cost developments, and regulation on operational strategies and business models



Laboratory facilities at the Center for Electrical Energy Storage. Our R&D services range from materials and production technology through battery testing up to systems research, design and operation.

Together with our industrial partners, we are driving forward the development of sustainable, safe and high-performance energy storage systems. Making use of the wide range of specialized equipment available in our labs, the Fraunhofer researchers apply their extensive expertise in simulation, technology assessment and data management. We provide the following services in four comprehensive laboratories:

Lab Battery Materials and Cell Production

For industrial customers, we develop processes first on a laboratory scale, then assist in bringing them up to the pilot scale and further optimizing them. Our focus is on sustainable processes such as dry coatings or the development and use of mini environments with the aim of reducing the production costs of battery cells.

Lab Characterization and Post-Mortem Analysis

We carry out detailed material and post-mortem analyses, identifying, for example, the causes of performance problems or failures. This allows us to significantly increase the safety of battery cells. Our equipment enables us to perform our tests under inert conditions starting with opening of the cell through to the final analysis.

Lab Battery Engineering, Production and Testing

In this lab we deal with optimizing cell formation processes, customized electrical and thermal characterization, modeling of battery aging, temperature control, prototype construction, second life storage, innovative fast-charging techniques, destructive and non-destructive safety tests and the development of innovative test environments.

Lab Energy Storage Application and Innovation

With the equipment in our laboratories, we can simulate energy systems with storage components and control them using energy management systems. Thus, we offer our partners an optimal environment for the development and qualification of operating and control strategies for storage systems.



Occupying around 3,700 m² of laboratory space, our state-of-the-art infrastructure and equipment allows us to work on process steps along the entire battery value chain. Our equipment and systems in each laboratory:

Lab Battery Materials and Cell Production

- powder synthesis, slurry production, dry electrode manufacturing
- roll-to-roll coating
- semi-automatic pouch cell production
- drying rooms with DP -55°C/-30°C

Lab Characterization and Post-Mortem Analysis

- scanning electron microscopy (SEM) including EDX, EBSD and SXES
- crystal structure analysis (XRD)
- chemical composition analyses (ICP-OES, elemental analysis)
- surface determination investigations (BET, Hg porosimetry)
- cell openings in the glovebox

Lab Battery Engineering, Production and Testing

- various electric battery testers (5–1000 V)
- climate chambers (some as walk-in)
- mechanical test rigs
- thermal characterisation of batteries (calorimeter)
- safety test benches (including propagation)

Lab Energy Storage Application and Innovation

- rooftop PV system with 873 kWp
- hybrid battery storage system 836 kWh/560 kW
- fast charging infrastructure for electric vehicles
- electronic loads and sinks for emulating different energy systems
- integration of different energy management systems (EMS)

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