



Multi-Megawatt Lab at the Fraunhofer ISE

### Power Electronics and Grid Integration

In our business area "Power Electronics and Grid Integration" we research, develop, test and evaluate power electronic components, circuits and innovative system concepts. We constantly strive to set new standards and work together with our partners from industry and research to bring advanced ideas to market. Technological progress in the field of power electronic components allows more efficient, compact, and resource-saving power converter solutions. In addition, issues related to the stable operation of converter-based grids and systems are becoming increasingly important. The department is divided into three groups and an accredited TestLab and focuses on the following topics:

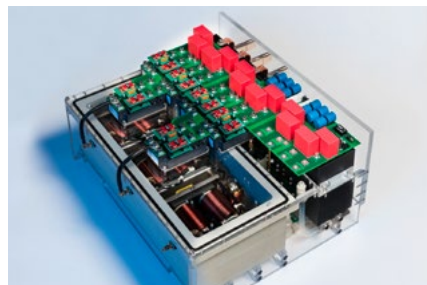
#### Power Converter Units

This group combines extensive expertise in power electronics for photovoltaic, storage systems and e-mobility with a unique laboratory infrastructure. We are specialists in developing customized

power electronics solutions for grid-feeding and grid-forming PV and storage systems, conductive and inductive chargers, fuel cells and electrolyzers. We focus on reducing costs and resources and optimizing power density and control performance.

#### High Power Electronics and Systems

Thanks to numerous industrial R&D projects, we have acquired profound competences in the field of converters for low and medium voltage up to the multi-megawatt range. We develop high-power converters and innovative system concepts such as PV hybrid power plants. We characterize power electronic semiconductor devices with respect to their static and dynamic parameters up to 20 kV blocking voltage and 3 kA current capacity. Our extensive laboratory infrastructure with test and development facilities for DC and AC systems in the voltage range up to 36 kV and power ratings up to 20 MVA form the basis for our services on behalf of our industrial partners and public clients.



A 250 kVA inverter stack with 3.3 kV SiC transistors (developed at Fraunhofer ISE)

#### Converter Based Power Grids

Electrical energy systems are changing from an electromechanical to a power-electronics-based system. The group develops grid-forming converters that stabilize the grid during normal operation as well as in fault situations without the need for synchronous generators.

We model the dynamic properties of converters and simulate their impact on the grid stability. We analyze the interactions between converters and other grid components. Conformity assessment of inverters with new ancillary services is crucial for reliable grid operation. We develop new test methods for grid-forming converters as well as new grid control schemes and test them in our Multi-Megawatt Lab.

#### TestLab Power Electronics

The multi-megawatt equipment of the TestLab Power Electronics enables the testing of power generation units according to international grid codes as well as performance and climatic tests. Amongst others, fault ride-through test facilities (UVRT and OVRT) for up to 10 MVA are available. We use high-precision and dynamic testing equipment for the measurement of the efficiency as well as the harmonic emissions of high-power converters. Moreover, we support our customers in modeling power generation units and systems as well as grid segments.