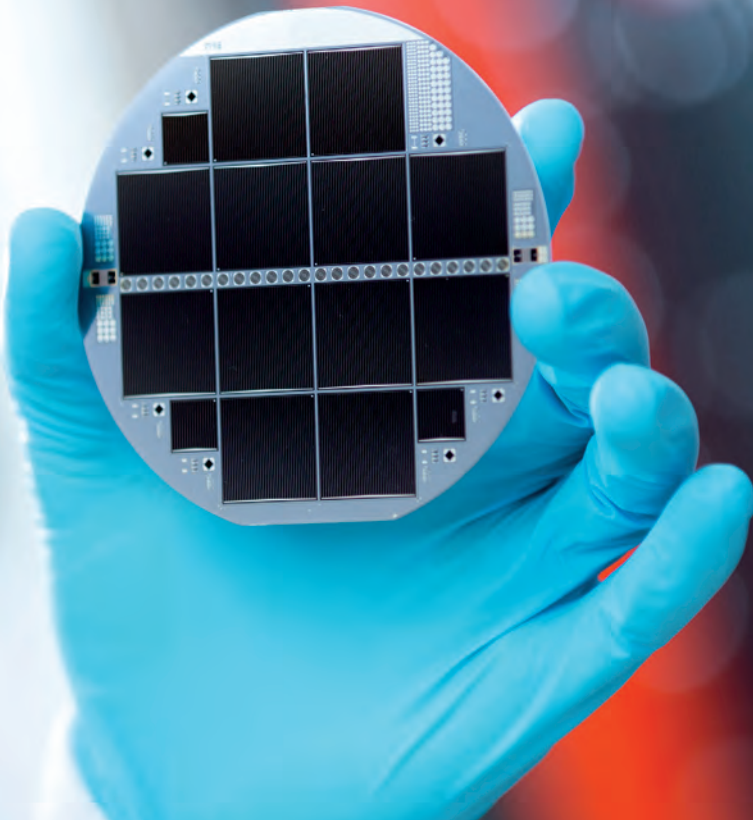




**Fraunhofer**  
ISE

FRAUNHOFER INSTITUTE FOR  
SOLAR ENERGY SYSTEMS ISE

# A SHORT OVERVIEW





## **Fraunhofer Institute for Solar Energy Systems ISE**

Founded in Freiburg, Germany, in 1981, the Fraunhofer Institute for Solar Energy Systems ISE is the largest solar energy research institute in Europe, with a staff of 1200. It creates technological foundations for supplying energy efficiently and on an environmentally sound basis in industrialized, threshold and developing countries. With its research focusing on energy conversion, energy efficiency, energy distribution and energy storage, it contributes to broad application of new technology. In 2017 the Institute's budget (including investments) totalled 89.4 million euros.

Together with clients and partners from industry, politics and society in general, Fraunhofer ISE develops technical solutions that can be implemented in practice. It investigates and develops materials, components, systems and processes in five business areas. In addition, Fraunhofer ISE also offers testing and certification procedures. It features excellent laboratory infrastructure. Fraunhofer ISE is certified according to the quality management standard, DIN EN ISO 9001:2008.

## Spectrum of Activities

In its research activities, Fraunhofer ISE develops new products, processes or services and optimizes existing ones. To do so, the Institute finds promising technical solutions and transfers technology from science and research to industry and society at large. As a partner for industry, the Institute orientates itself according to our clients' requirements and contributes toward their economic value generation. The Institute carries out research and development projects at various phases in the life cycle of a given technology. Depending on the task and requirements of our clients and the technological readiness level of the topic, the Institute offers services in various forms:

- » New material / process
- » Prototype / pilot series
- » Patent / licence
- » Software / application
- » Analysis based on measurement technology / quality control
- » Advice / planning / studies
- » Services (measurement, testing, monitoring)



## Business Areas

### Photovoltaics

#### Silicon Photovoltaics

- » Feedstock, Crystallization and Wafering
- » Epitaxy, Si-Foils and SiC Deposition
- » Characterization of Process Materials and Silicon Materials
- » Doping and Diffusion
- » Surfaces: Conditioning, Passivation and Light-Trapping
- » Metallization and Patterning
- » High-Efficiency Cell Fabrication and Analysis
- » Pilot Processing of Industrial Solar Cells
- » Metrology and Production Control
- » Thin Film Silicon Solar Cells
- » Technology Assessment

#### III-V and Concentrator Photovoltaics

- » III-V Epitaxy and Solar Cells
- » Concentrator Assemblies
- » Concentrator Optics
- » High-Concentration Systems (HCPV)
- » Low-Concentration Systems (LCPV)
- » Silicon Concentrator Solar Cells
- » Power-by-Light

## Emerging Photovoltaic Technologies

- » Dye and Perovskite Solar Cells
- » Organic Solar Cells
- » Photon Management
- » Tandem Solar Cells on Crystalline Silicon

## Photovoltaic Modules and Power Plants

- » Module Technology
- » Module Calibration
- » Service Life and Failure Analysis
- » Photovoltaic Power Plants
- » Building Integrated Photovoltaics
- » Forecasting of Solar Irradiance and Power
- » PV for Mobility



## **Energy Technologies and Systems**

### Solar Thermal Technology

- » Materials Research and Optics
- » Thermal Collectors and Components
- » Thermal Systems Engineering
- » Thermal Storage for Power Plants and Industry
- » Water Treatment

### Building Energy Technology

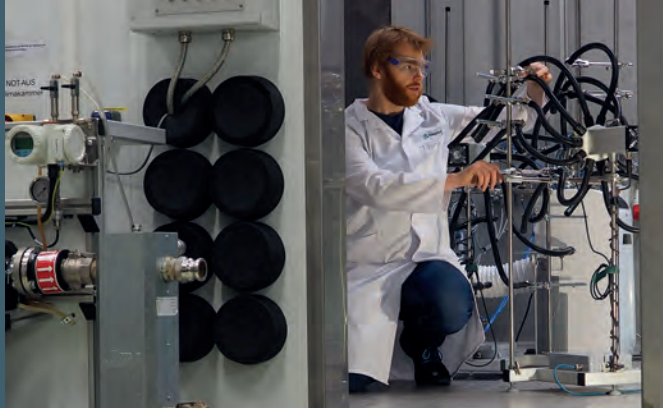
- » Building Envelope
- » Heating and Cooling Technologies
- » Energy Concepts and Building Performance Optimization
- » Thermal Storage for Buildings
- » Materials and Components for Heat Transformation

### Hydrogen Technologies

- » Thermochemical Processes
- » Hydrogen Production by Water Electrolysis
- » Fuel Cell Systems

### Energy System Technology

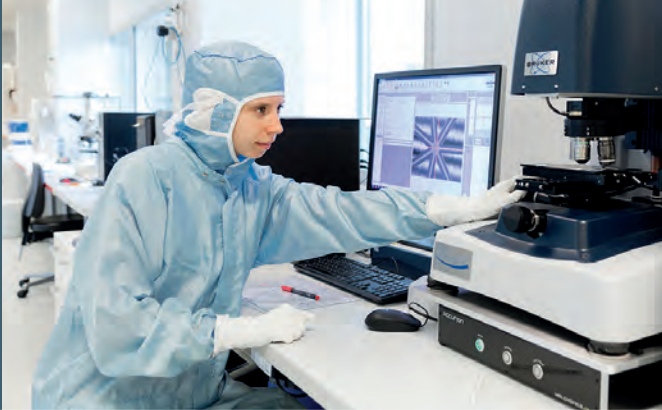
- » Power Electronics
- » Smart Grid Technologies
- » System Integration – Electricity, Heat, Gas
- » Battery Systems for Stationary and Mobile Applications
- » Energy System Analysis



## Accredited Laboratories

In addition to its R&D activities Fraunhofer ISE offers independent testing and certification services to commercial enterprises and scientific institutions. Complementing its research and development centers, the Institute has two calibration and five test laboratories which are accredited:

- » CalLab PV Cells
- » CalLab PV Modules
- » TestLab PV Modules
- » TestLab Solar Façades
- » TestLab Solar Thermal Systems
- » TestLab Power Electronics
- » TestLab Heat Pumps and Chillers



## R&D Infrastructure

A special feature of Fraunhofer ISE is its excellent technical infrastructure. Laboratories with a floor area of 15 700 m<sup>2</sup> and state of the art equipment and facilities are the basis for our competence in research and development. The R&D infrastructure of Fraunhofer ISE is divided into eight Laboratory Centers and four production-relevant Technology Evaluation Centers:

- » Center for High Efficiency Solar Cells
- » Center for Emerging PV Technologies
- » Center for Optics and Surface Science
- » Center for Material Characterization and Durability Analysis
- » Center for Heating and Cooling Technologies
- » Center for Energy Storage Technologies and Systems
- » Center for Power Electronics and Sustainable Grids
- » Center for Fuel Cells, Electrolysis and Synthetic Fuels
- » SiM-TEC – Silicon Materials Technology Evaluation Center
- » PV-TEC – Photovoltaic Technology Evaluation Center
- » Module-TEC – Module Technology Evaluation Center
- » Con-TEC – Concentrator Technology Evaluation Center



## External Branches, Cooperations and Networking

- » Laboratory and Service Center, Gelsenkirchen LSC, Germany
- » Fraunhofer Center for Silicon Photovoltaics CSP, Halle/Saale, Germany
- » Technology Center for Semiconductor Materials THM, Freiberg, Germany
- » Fraunhofer Center for Sustainable Energy Systems CSE, Boston, Mass., USA
- » Fraunhofer Chile Research – Centro para Tecnologías en Energía Solar (FCR-CSET), Santiago, Chile

Fraunhofer ISE is member in several alliances and networks of the Fraunhofer-Gesellschaft:

- » Fraunhofer Alliances: Energy, Batteries, Building Innovation, Nanotechnology, Space and Water Systems (SysWasser)
- » Fraunhofer Electromobility Systems Research
- » Fraunhofer Group: Materials, Components
- » Fraunhofer Networks for Electrochemistry, Energy Storage Systems and Grids, Intelligent Energy Grids, Sustainability, Wind Energy
- » Fraunhofer Initiative “Morgenstadt – City of the Future”
- » Sustainability Center Freiburg (together with Albert-Ludwigs-University Freiburg)

## Contact

### **Fraunhofer Institute for Solar Energy Systems ISE**

Institute Directors

Prof. Dr Hans-Martin Henning

Phone +49 761 4588-5547

Dr Andreas Bett

Phone +49 761 4588-5210

Press and Public Relations

Karin Schneider M.A.

Phone +49 761 4588-5150

[karin.schneider@ise.fraunhofer.de](mailto:karin.schneider@ise.fraunhofer.de)

Heidenhofstr. 2

79110 Freiburg, Germany

Phone +49 761 4588-0

Fax +49 761 4588-9000

**[WWW.ISE.FRAUNHOFER.DE](http://WWW.ISE.FRAUNHOFER.DE)**