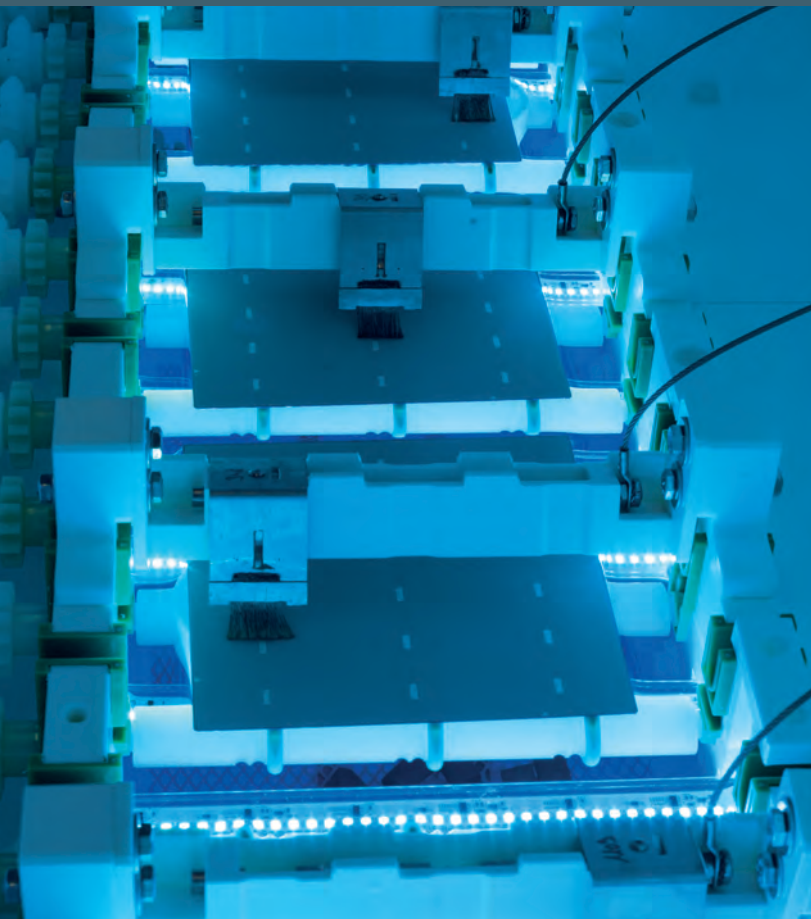
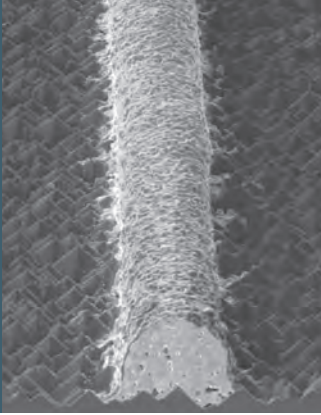


FRAUNHOFER INSTITUTE FOR
SOLAR ENERGY SYSTEMS ISE

A SHORT OVERVIEW





The Institute

The Fraunhofer Institute for Solar Energy Systems ISE is committed to promoting sustainable, economic, safe and socially just energy supply systems based on renewable energies. Its research provides the technological foundations for supplying energy efficiently and on an environmentally sound basis in industrialized, threshold and developing countries throughout the world. Focusing on energy efficiency, energy conversion, energy distribution and energy storage, the Institute develops materials, components, systems and processes in twelve business areas. Here we apply our scientific know-how, equipment and methods from eleven different areas of expertise.

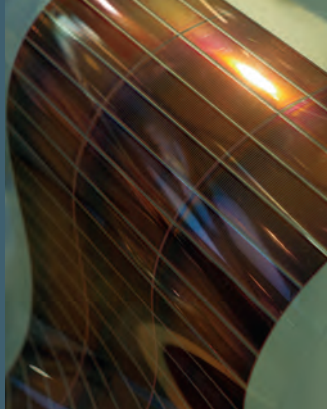
With activities extending well beyond fundamental scientific research, the Institute is engaged in the development of production technology and prototypes, the construction of demonstration systems and the operation of testing centers. The Institute plans, advises, tests and provides know-how and technical facilities as services. Fraunhofer ISE has been certified according to DIN EN ISO 9001:2008 since March 2001.

Staff: 1277

including students and student assistants

Annual Budget: 86,1 million euros, including investments

(December 2014)



Areas of Business

In its twelve business areas, Fraunhofer ISE carries out applied research to develop new technologies, processes and solutions:

Silicon Photovoltaics

- Feedstock, Crystallization and Wafering
- Crystalline Silicon Thin-Film Solar Cells
- 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
- Module Integration
- Amorphous Silicon Multi-Junction 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



Dye, Organic and Novel Solar Cells

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

Photovoltaic Modules and Power Plants

- Module Development
- Module Characterization
- Service Life of Modules and Materials
- Module Testing
- Photovoltaic Power Plants
- Building Integrated Photovoltaics

Storage Technologies

- Battery Systems
- Redox Flow Batteries
- Latent Heat Storage
- Cold Storage
- Storage for Low Temperature Solar Thermal
- High Temperature Storage
- Membrane Electrolyzers and Hydrogen Storage Systems

Hydrogen and Fuel Cell Technology

- Hydrogen Production by Water Electrolysis
- Thermochemical Processes for Hydrogen Production
- Fuel Cell Systems
- Biomass for Materials
- Power-to-Liquid



Solar Thermal Technology

- Thermal Solar Systems
- Service Life of Collectors and Components
- Heat Transfer and Heat Transport
- Solar Cooling and Refrigeration
- Solar Process Heat
- Solar Thermal Power Plants
- Solar Thermal Façades
- Decentralized Water Purification Systems

Energy Efficient Buildings

- Building Energy Concepts
- Smart Home Technologies
- Building Management and Operation
- Façades and Windows
- Lighting Technology
- Electrically and Thermally Driven Heatpumps
- Heat Transfer in Building Energy Systems
- Cooling and Air-Conditioning in Buildings

Energy Efficient Power Electronics

- Grid-connected Inverters and Storage Systems
- Off-Grid Energy Systems
- Electromobility
- New Devices and Applications
- Electricity Grids



Zero-Emission Mobility

- Charging Infrastructure for Electric Vehicles
- Battery Systems for Mobile Applications
- Grid Integration of Electric Vehicles
- Fuel Cell Electric Vehicles
- Hydrogen Infrastructure
- Thermal Management in Vehicles

System Integration and Grids – Electricity, Heat, Gas

- Operation of Energy Supply Systems
- Smart Energy Cities
- District Concepts and Heat Grids
- Power Distribution Grids and Operating Equipment
- ICT for Components in Smart Grids
- Power-to-Gas
- Biomass for Energy
- Autonomous Power Supplies and Mini-Grids
- Solar Desalination

Energy System Analysis

- Techno-Economic Assessment of Energy Technologies
- Market Analysis and Business Models
- Planning and Operating Strategies of Power Plants
- National and Regional Energy Supply Concepts
- Modeling of Energy Supply Scenarios

Fields of Expertise

Fraunhofer ISE performs R&D using the newest scientific methods and developments from its eleven fields of expertise.

- Materials Research
- Semiconductor Technology
- Surface Technology
- Optics and Photonics
- Systems Technology
- Electrical Engineering and Controls Technology
- Information and Communications Technology
- Chemical Engineering and Processing Technology
- Production Technology
- Measuring, Testing, Monitoring
- Modeling and Simulation

Service Units

Fraunhofer ISE provides calibration, measurement, examination and testing services in its 16 specialized service units.

- CalLab PV Cells
- CalLab PV Modules
- TestLab PV Modules
- TestLab Solar Thermal Systems
- TestLab Solar Façades
- TestLab Power Electronics
- ServiceLab PV Power Plants
- ServiceLab Smart Energy
- ServiceLab Batteries
- ServiceLab Lighting and DC Appliances
- ServiceLab Heat Pumps and Chillers
- ServiceLab Heat Exchangers
- ServiceLab Phase Change Materials
- ServiceLab Thermochemical and Porous Materials
- ServiceLab Air Handling Units
- ServiceLab Fuel Cells

Fraunhofer ISE External Branches

The external laboratories and outposts of Fraunhofer ISE, whose focus is on the development of materials for solar cells or semiconductors, are the Laboratory and Service Center LSC in Gelsenkirchen, the Center for Silicon Photovoltaics CSP in Halle and the Technology Center for Semiconductor Materials THM in Freiberg. Fraunhofer CSP is operated in cooperation with Fraunhofer IWM in Freiburg and Halle, and THM with Fraunhofer IISB in Erlangen respectively. The Fraunhofer Center for Sustainable Energy Systems CSE in Boston fosters that established European know-how and technology in the field of renewable energy is adapted for and introduced into the American market. In close cooperation between Fraunhofer ISE, Fraunhofer CSE and the Massachusetts Institute of Technology MIT, activities concentrate on solar technology and energy efficient building. In Center for Solar Energy Technology (CSET) in Chile, scientists and engineers from Fraunhofer ISE, the Pontificia Universidad Católica de Chile and other Chilean universities perform research on generating solar electricity and process heat as well as water treatment.

Networking within the Fraunhofer-Gesellschaft

- Fraunhofer Alliances: Energy, Batteries, Building Innovation, Nanotechnology, Space, SysWater
- Fraunhofer Electromobility Systems Research Project
- Fraunhofer Group Materials, Components
- Fraunhofer Networks Electrochemistry, Energy Storage Systems and Networks, Intelligent Energy Networks, Sustainability, Wind Energy
- Fraunhofer Initiative »Morgenstadt – City of the Future«

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