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# Fraunhofer Institute for Solar Energy Systems ISE



Director:  
Prof. Joachim Luther



**Fraunhofer** Institut  
Solare Energiesysteme

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# Fraunhofer Gesellschaft



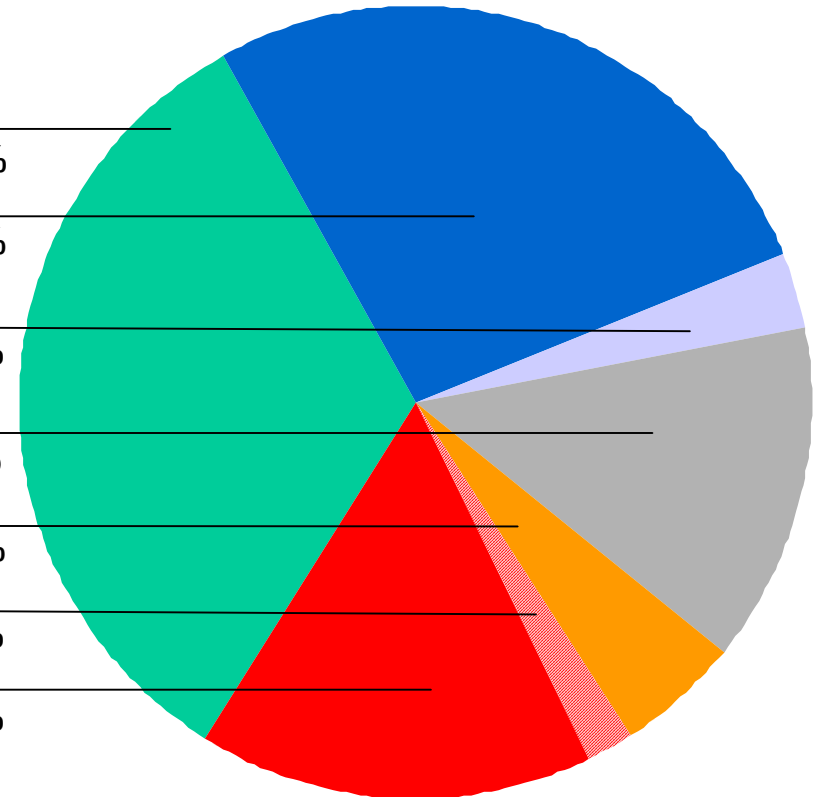
- leading organisation for applied research in Germany
- conducts commissioned research for the industrial, tertiary and public sector
- prepares readily applicable solutions to technical and organisational problems for private-sector clients, rapidly and cost-effectively
- 58 research institutes throughout Germany
- affiliate institutes in Europe, the USA and in Asia
- 13 000 employees, the majority of whom are qualified scientists and engineers
- annual research budget of around 1 billion Euro

# Revenue structure Operation 2003 (prel.)

Operation: 21,3 Mio Euro  
Investment: 1,9 Mio Euro

Total: 23,2 Mio Euro

Industry	33%
Federal Government Projects	27%
Regional Government Projects	3%
European Union	14%
Others	5%
Special Programs, FhG	2%
Basic Funding*	16%



\* 90% Federal Government  
10% Regional Government



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# Personnel Fraunhofer ISE

Research and Development	113
Commercial and Technical Services	28
Press and Public Relations	3
Doctoral Students *	54
Diploma Students*	45
Scientific Assistants, Practical Trainees, etc.	173
 Sum of the Employees	 416

\*some with contracts at universities

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# Fraunhofer ISE Areas of Business



Buildings and Technical Building Services

Solar Cells

Off-Grid Power Supplies

Grid-Connected Renewable Power Generation

Hydrogen Technology

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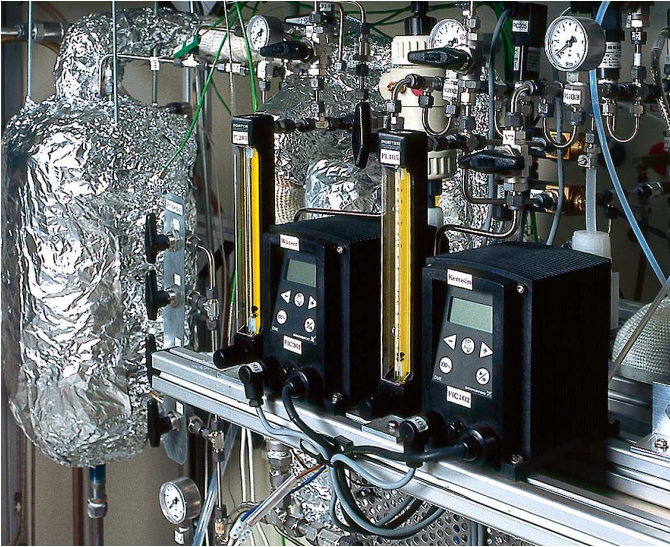
# Fuel Cell Systems and Hydrogen Generation

Natural gas reformer:  
for fuel cell application  
in combined heat and  
power plants



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# Fuel Cell Systems and Hydrogen Generation



Kerosine reformer:

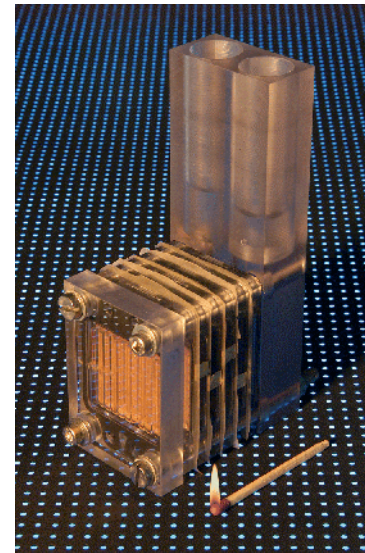
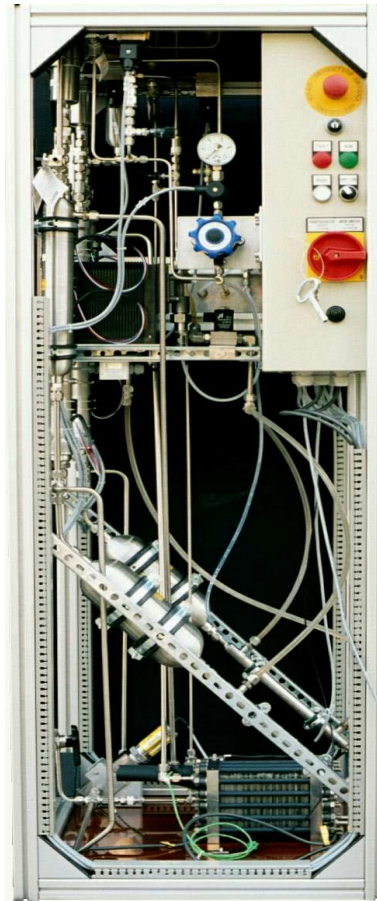
- APU for planes
- Water production an board



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# Fuel Cell Systems and Hydrogen Generation

2kW Electrolyser



Miniature  
electrolyser for  
gaschromic windows



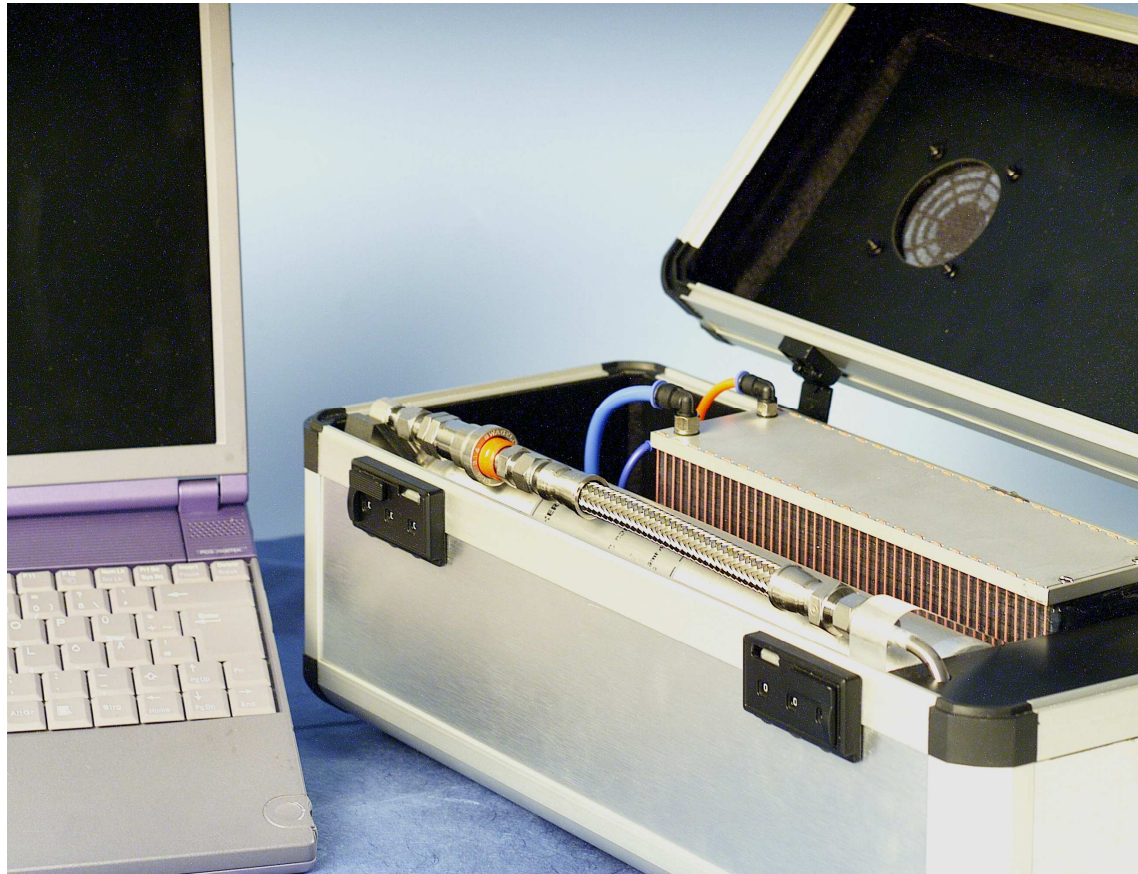
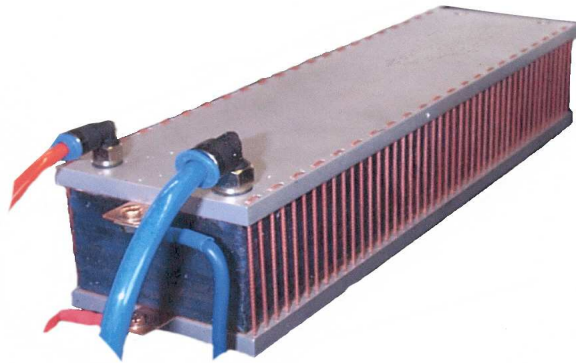
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# Mikro-Energy Technology: Micro Fuel Cells

Mobile Power Box:

200 W peak

50 W continuous power



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# Micro **C**ombined **H**eat and **P**ower (CHP) Plants in Residential Buildings: Environmental Potential and Economic Feasibility when Combined with Thermal Solar Systems

Benoit Sicre, Andreas Bühring, Matthias Vetter

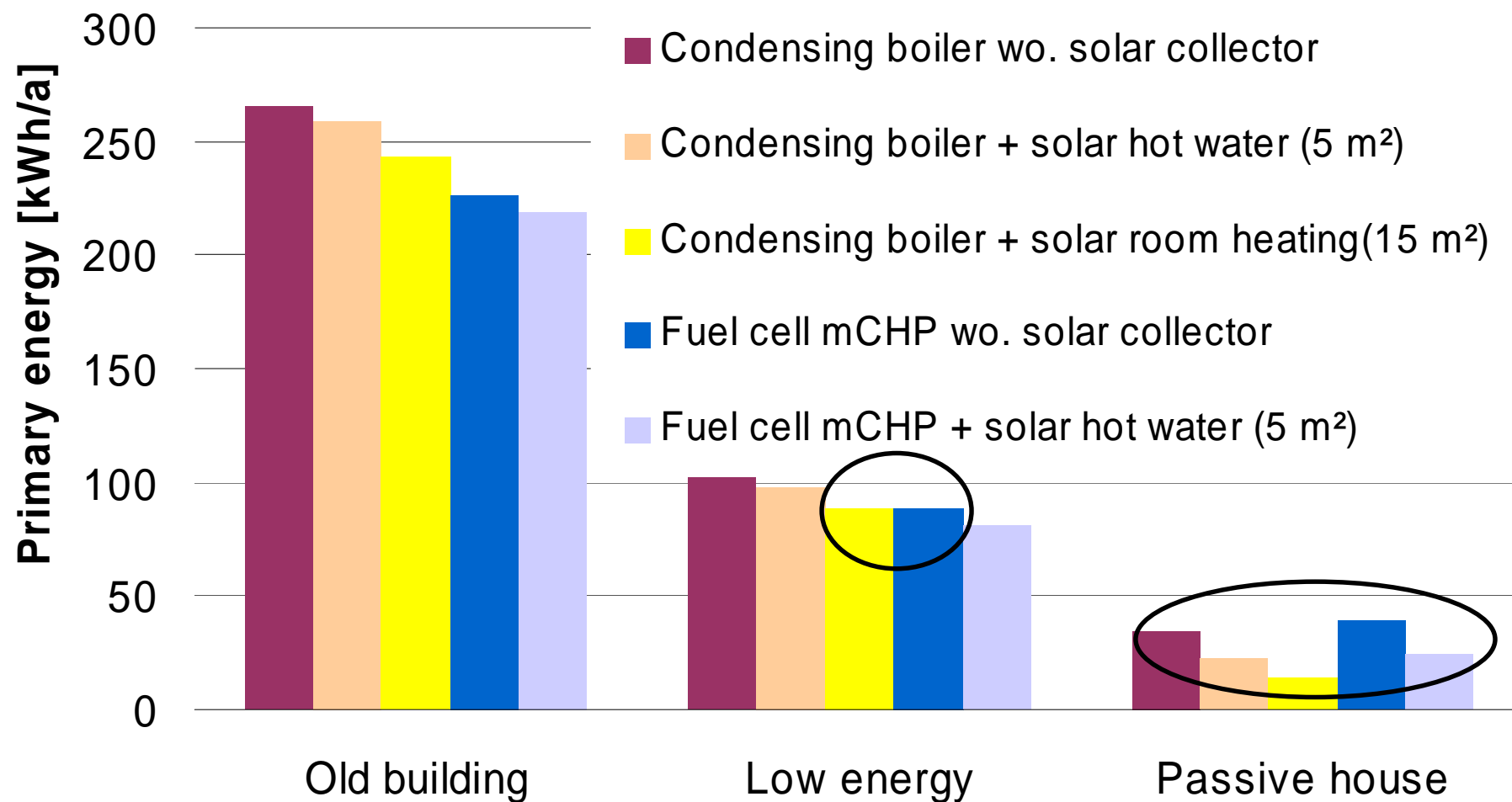
- solar contribution strongly reduces operating time in summer

## Consequences:

- prevention of solar investment and/or
- reduced solar yields in parallel operation



# Simulation results for PEM fuel cells



# Biomass gasification in a multi-stage gasifier

- 100 kW to 8 MW fuel input
- Tar-free gas, no gas scrubber
- Hot gas efficiency >>95 %
- Products:

Synthesis gas for:

Gas engine

CHP application

SOFC / MCFC

Gas turbine

Ashes: Mineral fertilizer

< 5 % Carbon

