
FRAUNHOFER ISE: NEW GENERATION COOLING SYSTEMS

Related Activities



Dipl.-Ing. Constanze Bongs

Fraunhofer Institute for Solar Energy Systems ISE

IEA-SHC Task Definition Workshop
Paris, April 21, 2013

www.ise.fraunhofer.de

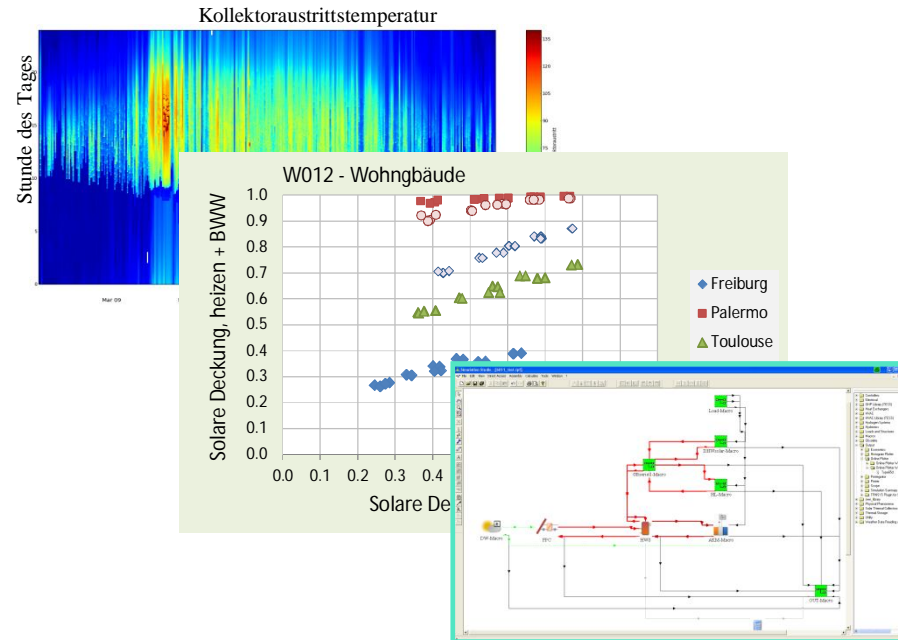
AGENDA

- Solar Cooling Activities at Fraunhofer ISE
- Smart Technologies at Fraunhofer ISE
- Contributions and Remarks

Sorption Technology – Systems and Applications

Fields of Action

- Planning support
- Monitoring
- Analysis of system operation
- Modelling and Simulation



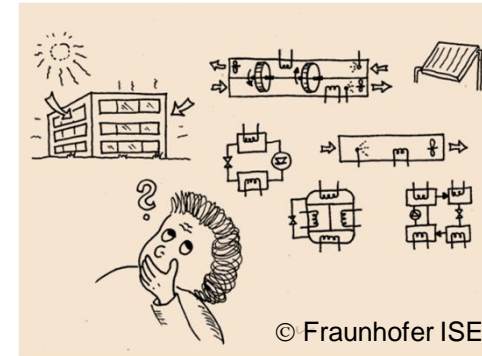
■ R&D in the fields of:

- Sorption materials (Group Materials Development and Characterisation)
- Sorption components (Group Component Development)
 - Advanced heat exchangers, evaporators, adsorbers
- Open sorption technology: ECOS – advanced DEC cycle

Sorption Technology – Systems and Applications

Planning Support

- Feasibility studies & Concept evaluation
- **System modelling and performance simulation**



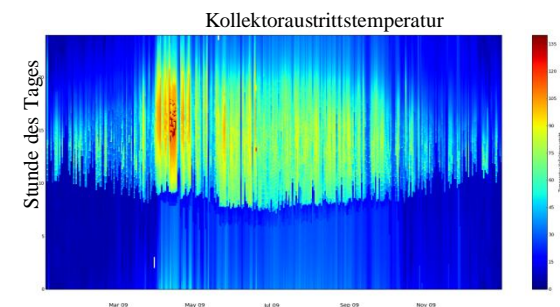
Monitoring

- Definition of Measurement Design
- Installation of Measurement Equipment
- Data Evaluation and Reporting
- Web-Interface for Data Visualisation



Analysis of system operation

- Optimisation of system control
- System and subsystem efficiency evaluation
- Quantifying system energy and emissions savings



Sorption Technology – Systems and Applications

Ongoing and previous relevant activities

- EVASOLK
- Solarthermie 2000+
- Solera, Agrokühl: concentrating solar collector field + absorption chillers

- Operating Agent of former IEA SHC Task 25 and IEA SHC Task 38
- Member to ongoing IEA Tasks/ Annex (selection):
 - SHC / HPP 44: Solar thermal and heat pumps
 - SHC / ECBCS 47: Solar renovation of non-residential buildings
 - SHC 48: Quality assurance for solar cooling
 - HPP 34: Gas driven heat pumps
 - HPP 40: Heat pumps for zero energy buildings
 - HPP 43: Fuel driven heat pumps

Department Smart Grid

Smart Grid Technology

Software- and hardware-development, embedded-systems, smart metering, prototyping, communication technology



Smart Grid Technology

User Behavior and Field Trials

Behavioral science, socio-economic, Feedback analysis, statistics und stochastic

User Behavior and Field Trials



Energy Management and Grids

Energy Management and Grids

marketing concepts, business models, electric and thermal energy systems in the distribution grid, simulation of grid and energy systems, optimization, virtual power plants, SmartEnergyLab

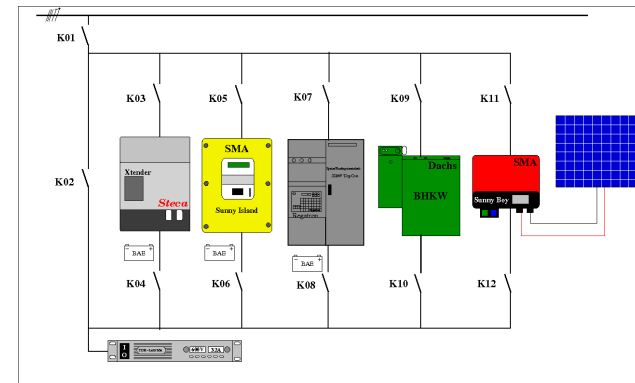


Laboratory for Intelligent Energy Systems in Buildings

SmartEnergyLab



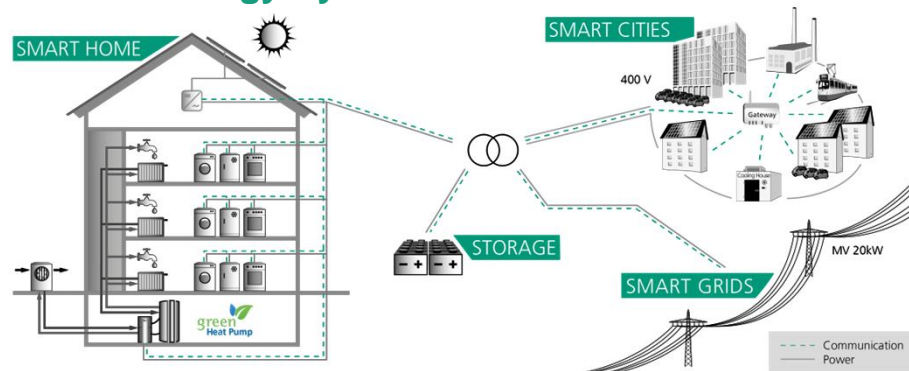
- Simulation of various »Smart Home«-Typologies
- Island operation, PV-, solar thermal, micro-CHP and other grid coupled systems (Hardware-in-the-Loop-Operation)
- Combination of thermal and electric systems (producer, storage, consumer) with intelligent metering systems
- Integration of E-vehicles as mobile consumers



Operating Heat Pumps in Future Energy Systems

Group of Energy Management and Grids

Future Energy System



■ Ongoing Research:

■ Technical and Economical **Peak Load Reduction Analyses** for selected European countries

■ **Energy Scenarios**

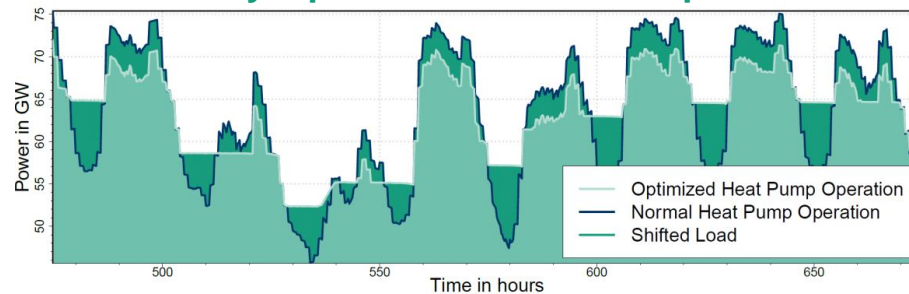
■ **Optimized control strategies** for Smart Buildings, Smart Cities and Smart Grids

■ **Storage Management**

■ Control of **Heat Pumps, CHP**

■ **Prediction Algorithms**

Grid-Friendly Operation of Heat Pumps



Possible Input to new IEA-SHC Task

■ Expected small ISE-funded project

(April 2013 to Autumn 2013)

Identifying interesting options using PV for cooling in

- grid connected systems
- off grid applications

Technical review of options, integration into building concepts, estimate on overall benefits (simulation)

Aim: Starting point for future R&D projects

■ EVASOLK:

Evaluation of chances and perspectives of solar thermal cooling in comparison to reference technologies

Status: Finished / Final calculations and reports are still being elaborated

■ General:

Financing of contributions to the IEA-SHC Task still to be organized

Support to topic PV-cooling signaled by the Federal Environment Ministry

Remarks for Discussion

- Open cycles (DEC / IEC) combined with compression cooling:
 - Concepts with sorptive dehumidification of interest ?
 - Concepts with indirect evaporative cooling of interest ?
- Concept of gas-driven heat pump with solar thermal support of low-temperature source / DHW of interest ?

- Remark on scope of task: 'food conservation not included'.

Why not?

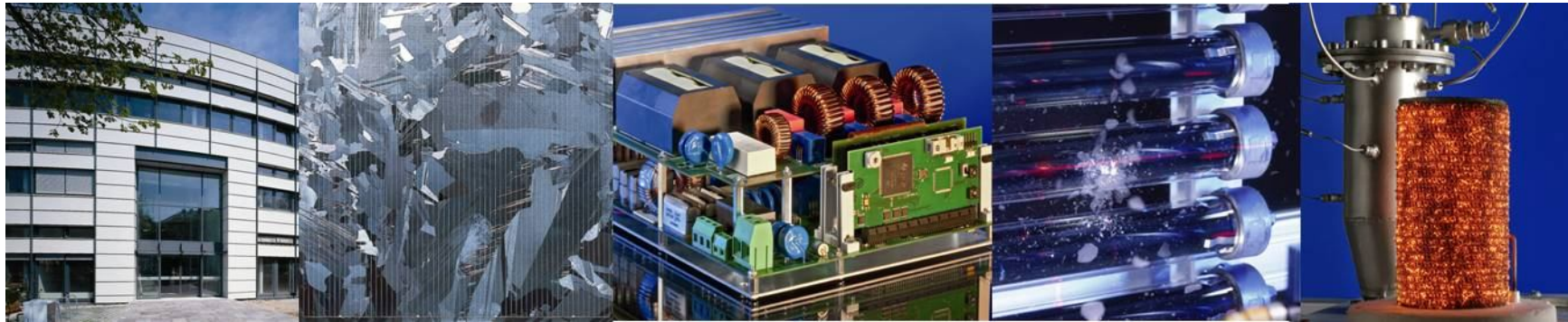
Chance to develop feasible solar thermal concepts
(results from pilot plant available {Fresnel coll. / NH₃-H₂O chiller / cold store} in cooperation with commercial cold store distributor)

- Remark on limit: 'direct coupling', especially for PV-chiller

Why?

Appropriate storage concepts – either thermal (sensible, latent) or electrical – and control concepts may force the use of local PV-cooling

Thank you for your attention!



Fraunhofer Institute for Solar Energy Systems ISE

Dipl.-Ing. Constanze Bongs

www.ise.fraunhofer.de

constanze.bongs@ise.fraunhofer.de