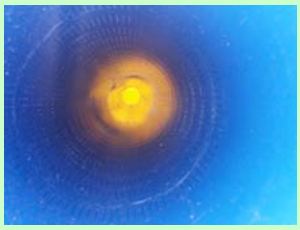
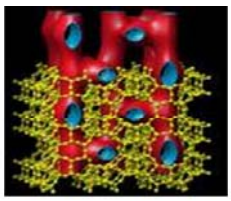
International Energy Agency

Energy Conservation through Energy Storage Programme



Current Annexes

- Annex 18 **„Transportation of Thermal Energy Utilizing Thermal Energy Storage Technology“**, 2006 – 2009, OA: Sweden
- Annex 19 **„Optimized Industrial Process Heat and Power Generation with Thermal Energy Storage“**, 2006 – 2009, OA: Germany
- Annex 20 **„Sustainable Cooling with Thermal Energy Storage“,** 2005 – 2009, OA: Japan
- Annex 21 **„Thermal Response Test for Underground Thermal Energy Storage“,** 2007 – 2010, OA: Germany
- Annex 22 **„Thermal Energy Storage for Greenhouses“,** 2009 – 2012, OA: Canada
- Annex 23: **„Applying Energy Storage in Ultra-low energy Buildings“,** 2009 – 2012, OA: Canada
- Annex 24/42 **„Compact Thermal Energy Storages – Material Development and System Integration”,** 2009 – 2012, OA: Germany / The Netherlands



Energy Storage - central component in energy-efficient systems

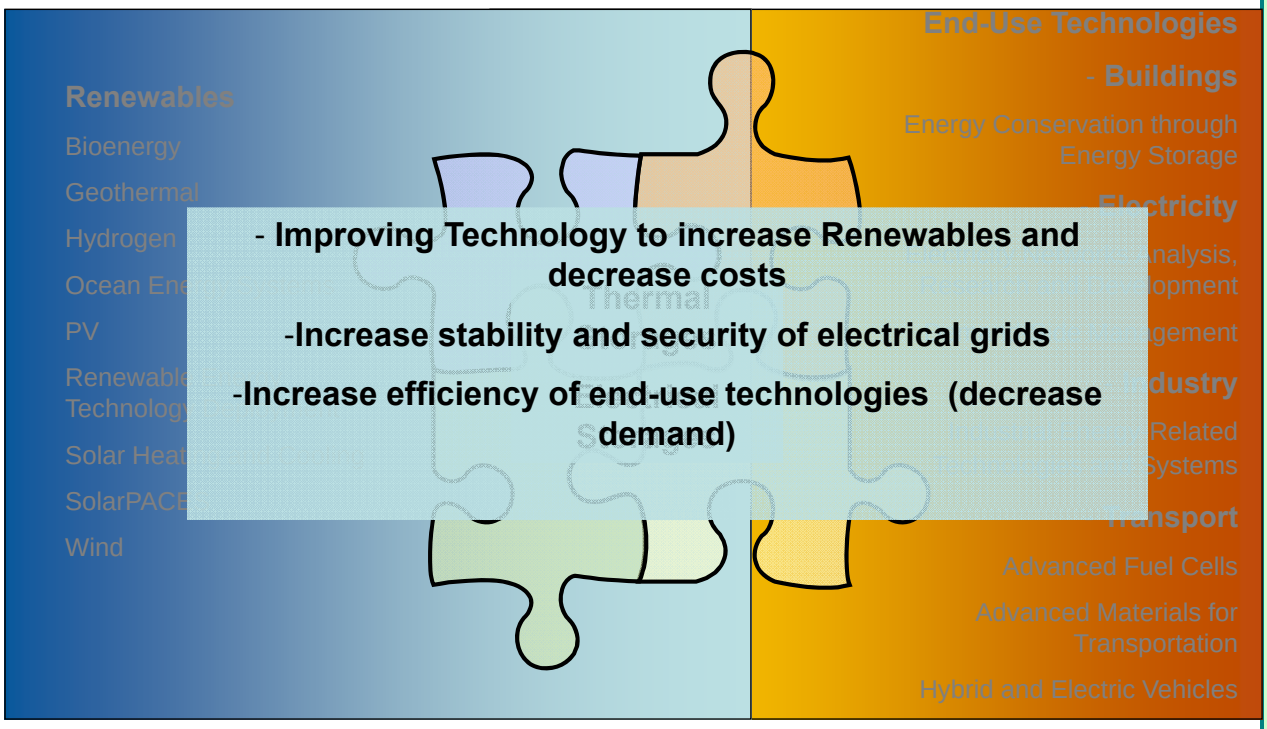
Waste Heat, Power Generation
Renewable Energies

Energy Storage

- Space Heating and Cooling
- Process Cooling
- Cogeneration HP
- District Heating and Cooling

- Buildings
- Industry
- Transport
- Agriculture
- Power Generation

Energy Storage – a cross-cutting issue



Perspectives according to the ETP2008

Renewables

Fourfold increase of power production between 2005 and 2050

(ETP2008, BLUE-Scenario)

Increasing demand of controling power / backup power

- Virtual power plants
- More decentralized units / efficiency has to be improved and proven at all

Plug-In Hybrids

- **Batterie Costs are too high** (Li-ion: 700-900 €/kWh, reduction by 50-70% necessary)
- „EV Success“ case: **additional capacity necessary**

Increasing storage demand

- Transmission and distribution losses have to be reduced
- Storing directly is too expensive/impossible

Example 1/2: Potential of Plug-In-Hybrids

Facts

- 95% of total passenger cars drive less than 50km per distance (80% even less than 20km)
- In 2006: 46.6 mio. passenger cars in Germany

=> Electric vehicles could replace 10 mio. passenger cars

Average electric power: 25kW

Average storage capacity: 25kWh

5% of all ev connected to the grid

20% of traction storage usable

Result

Total controlling energy: 2.5 GWh

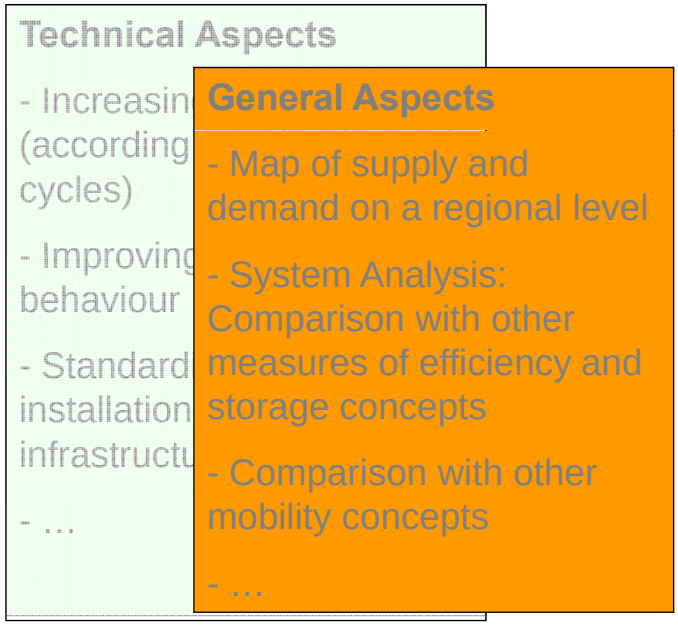
Total controlling power: 12.5 GW

Actual costs: 700-900 €/kWh

Additional electricity consumption: 22,5 TWh (≈ 4% of actual electricity demand), BMWi2007

(Source: FfE2007)

Example 1/2: Resulting R&D Demand



Example 2/2: Potential of fridges

Facts

- 40 Mio. households with **39.2 mio. fridges**

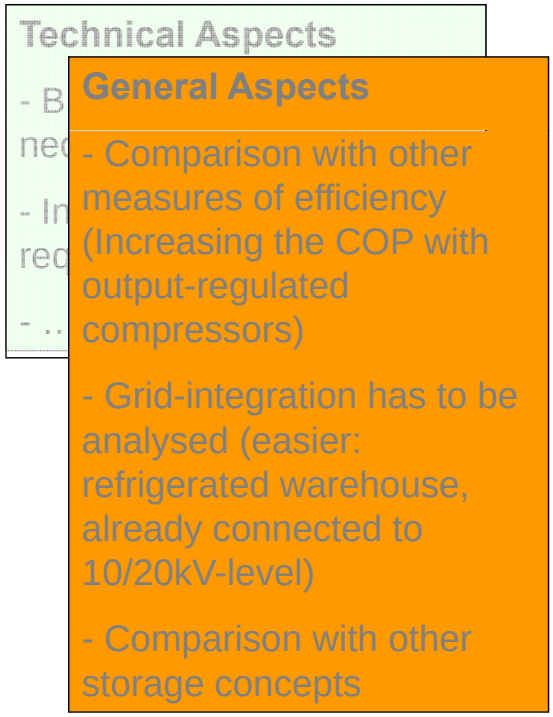
- Standard: A++, COP=1.2
- Half of the daily energy consumption can be stored with PCM (6°C, 2€/kg)
- 50% of fridges can be used as storage
- Charging time: 4h

Result

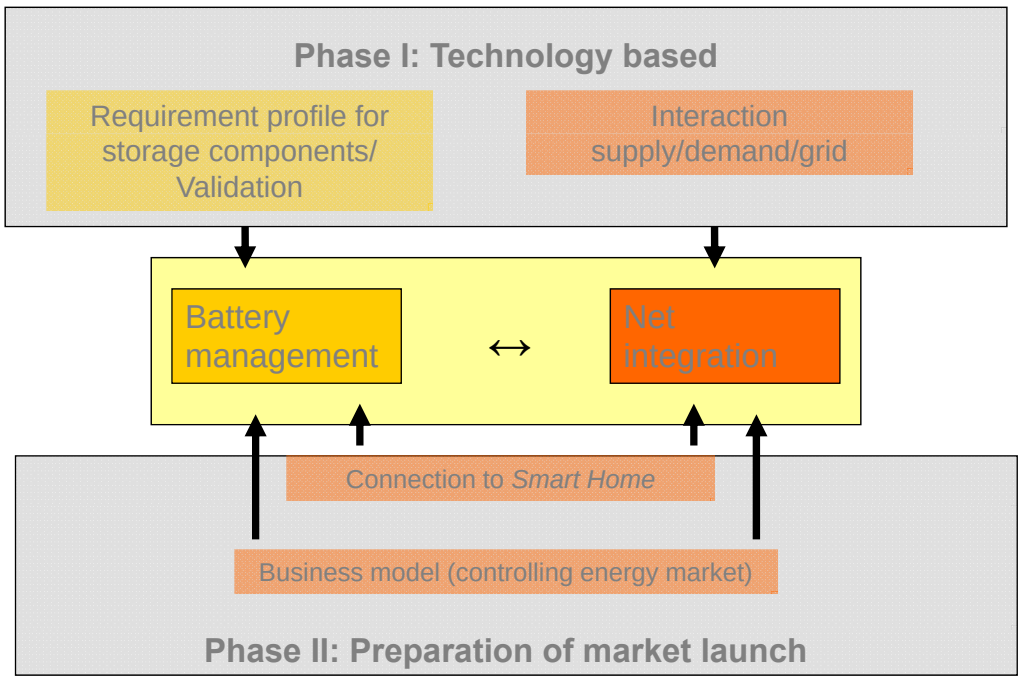
- Storage equivalent for 1.16 GW
- 4GWh can be stored
- Storage costs: ≈ 60 €/kWh

(Source: ZAE2009)

Example 2/2: Resulting R&D Demand



Annex proposal I: Standardisation



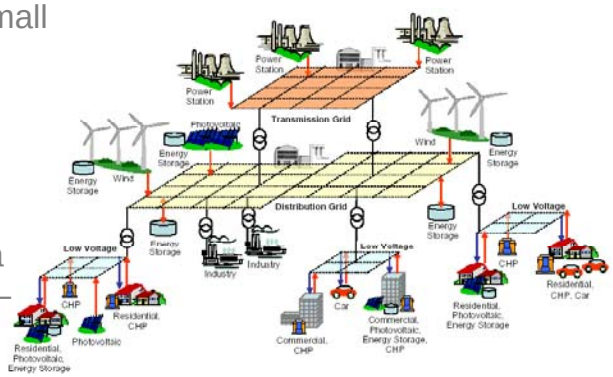
Proposal II: **Future electric Energy Storage Demand**

Task Objective:

- Developing a method to calculate the regional energy balancing demand and to derive regional storage demand

Approach:

- Divide the whole area into typical small self-similar elements
- Identify and characterize typical fluctuating/ conventional energy production and demand
- Derive energy storage demand as a share of the total balancing demand – respecting economic boundary conditions



Source: Fraunhofer UMSICHT

Next Steps …

"The Role of Energy Storage in Future Energy Systems" Workshop, September 30 – October 2, 2009, Bad Tölz, Germany

The aim of the workshop is:

- To identify potential synergies between all Implementing Agreements dealing with energy storage

Possible outcome:

- Joint annexes
- Storage coordination group to identify R&D-demand in future and start activities

Summary

- Energy Storage is a cross-cutting issue

- Energy Efficiency is strongly connected to storage solutions, but for economic reasons: As less storages as possible

-Technical aspects should be treated on a par with economical issues

- Judging the efficiency for transport solutions e.g. efforts to extend the system boundary