



International Energy Agency Energy Conservation through Energy Storage Programme *since 1978*

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*Cukurova University, Turkey
INNOSTOCK 2012
May 16-18, 2012, Lleida, Spain*

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The Challenge



Without compromising our future
how can we dream of a
fossil fuel-free
future ?



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Alternatives to Fossil Fuels



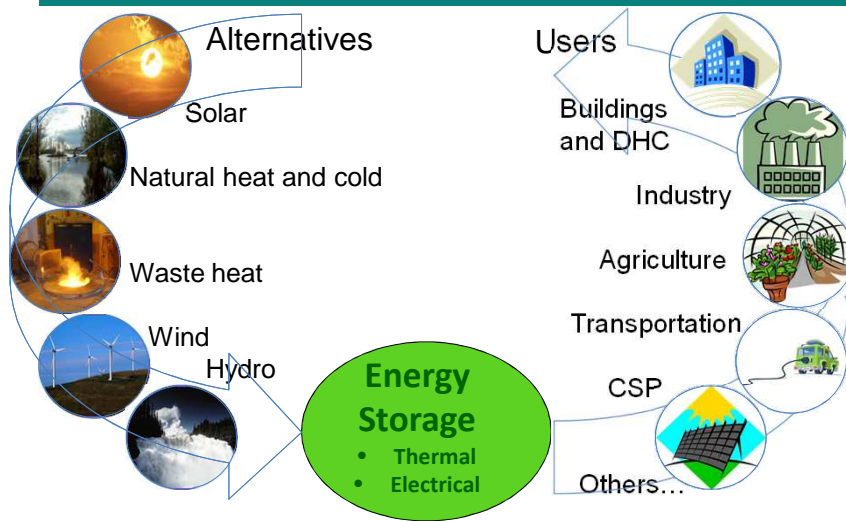
- Renewables
 - solar, wind, biomass, hydro, geothermal
- Natural heat and cold
 - air, ground, surface water and oceans
- Waste heat from industrial processes

Most of these sources have an intermittent nature.

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Energy Storage Matching Supply and Demand



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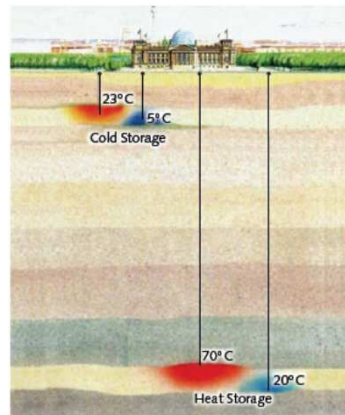
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Energy Storage Technologies



Energy storage systems cover a wide range of different storage technologies for different applications

- Thermal or Electrical Energy Storage
- Storage Capacity (Wh-GWh)
- Charging / Discharging Power (W-MW)
- Storage Period (short-long term storage)



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Mission of ECES



“To facilitate an integral research, development, implementation and integration of energy storage technologies to optimize energy efficiency in any kind of energy system and to enable the increasing use of renewable energy instead of fossil fuels.”

ECES Strategy Plan 2011-2015

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Participating Countries


15 countries, 3 Sponsors



 Belgium	 Canada	 China	 Finland
 France	 Germany	 Italy	 Japan
 Korea	 Norway	 Sweden	 Turkey
 USA	 IF Technologies, NL	 Institute of Heat Eng. Univ of Tech Warsaw, PL	 Univ of Lleida, ES
 Slovenia	 Denmark		


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Completed Annexes in 2006 - 2010




Annex 18: Transportation of Thermal Energy Utilizing Thermal Energy Storage Technology

- Assessment of multifunctional fluids as pumpable TES
- Feasibility Studies for transporting heat/cold via train, truck or boat



Annex 19: Optimised Industrial Process Heat and Power Generation with Thermal Energy Storage

- Identification of possible near term economic applications of TES in the industrial sector
- Development of suitable technical solutions
- Estimation of market potential for industrial application and concentrated solar power



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Ongoing Annexes



Annex 21: Thermal Response Test for Underground Thermal Energy Storage

- Development of time and cost efficient methods
- Evaluation of experimental results and standardisation of test procedures

Operating Agent: Germany



Annex 23: Applying Energy Storage in Ultra-low Energy Buildings

- Evaluation of energy storage use in energy efficient buildings
- Concept development and demonstration projects

Operating Agent: Canada



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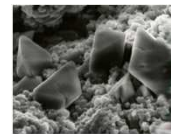
Ongoing Annexes



Annex 24: Compact Thermal Energy Storages – Material Development and System Integration (Joint Annex with SHC-IA)

- Defining criterias for evaluation of thermal energy systems and their potential
- System application

Operating Agent: Germany, The Netherlands



Annex 25: Surplus Heat Management using Advanced TES for CO2 mitigation

- Identify and demonstrate cost-effective strategies for surplus heat management using advanced TES
- Increase awareness on potential of surplus heat utilization for CO2 mitigation

Operating Agent: Spain



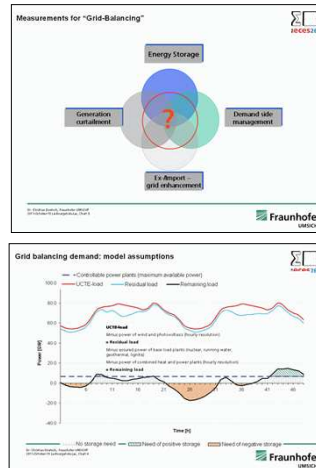
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Ongoing Annexes



Annex 26: Electric Energy Storage: Future Energy Storage Demand

- Identification of typical (fluctuating) energy demand and production in a given area for different grid situations
 - Calculation of energy storage demand as part of the total balancing demand to reach economic maximum
 - Analysis and characterisation of different energy storage technologies
- Operating Agent: Germany**



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Planned Annexes



Quality Management in Design, Construction and Operation of Borehole Systems

Design, Construction and Operation Phases

Learn from experiences, don't make a mistake twice!

- Expected start time: June 2012
- Time frame: 3 years
- Suggested Operating Agent: Germany



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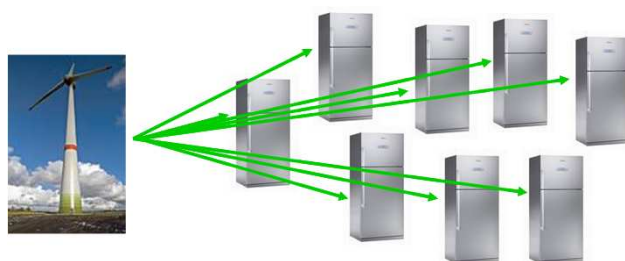
Planned Annexes



Integration of Renewable Energies by Distributed Energy Storage Systems

Balancing fluctuations of renewables by energy storage

- Task definition phase: June 2012 – December 2012
- Annex duration: January 2012 – December 2015
- Suggested Operating Agent – Germany



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Achievements UTES



- Underground Thermal Energy Storage (UTES) become a standard design option in many countries:
 - Buildings,
 - Shopping malls,
 - Airports,
 - Greenhouses,
 - Hospitals,
 -

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Achievements Numerous UTES Projects



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Achievements



- Thermal Response Test –TRT: “Door opener for BTES”




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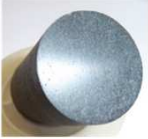
Achievements

New R&D topics in material development



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- Sensible
 - New materials from waste materials
- Phase change
 - Microencapsulation, form-stabilization
- Thermochemical
 - New adsorbents
 - Chemical reactions for seasonal storage
 - Vehicle thermal energy storage - VTES




ACW ceramics

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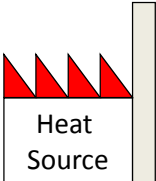
Achievements

Waste heat on wheels

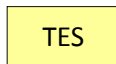


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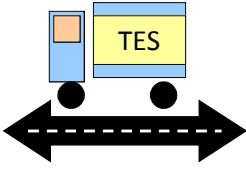
Mobile Adsorption Storage



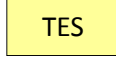
Heat Source



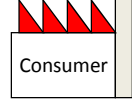
TES



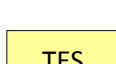
Truck + Container



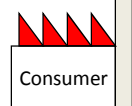
TES



Consumer




TES



Consumer

- Industrial Waste Heat
- Process Heat
- Waste Incineration
- Heating
- CHP Plants
- Drying
- ...




ZAE BAYERN




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Achievements


Waste heat on wheels



Mobile Adsorption Storage

Waste Incineration
(Charging Temp. 150 °C)



Material Zeolite / 13 t
Capacity max. 3 MWh
Power max. 1 MW

Drying Process
(Dischar. Temp. 180 °C)

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Achievements

Information Dissemination




- Workshops in conjunction with Annex Experts Meetings
- Organization of International Tri-annual Conferences on Energy Storage for the past 30 years : Storage Olympics
 - TERRASTOCK 2000: Stuttgart, Germany
 - FUTURESTOCK 2003, Warsaw, Poland
 - ECOSTOCK 2006, Pomona, New Jersey, USA
 - EFFSTOCK 2009, Stockholm, Sweden
 - INNOSTOCK 2012, Leida, Spain



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ECES Benefits and Impact



- Global collaboration for efficient energy use and energy conservation
- Numerous projects utilizing renewable energy sources
- Mitigation of CO₂ emissions
- Information dissemination and technology transfer


Energy Storage is one of the key technologies of Future Energy Systems.



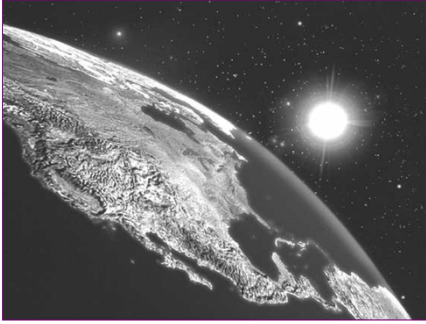
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Can we afford to delay using more energy storage technologies?



**EARTH
CAN'T
WAIT !**



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Thank you for your attention



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