



Energy research Centre of the Netherlands

Exploring the potential of thermal energy storage: Introduction to the cross-cutting panel's Focus Group 2

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Thermal Energy Storage – relevance

- 49% of primary energy demand in EU is for heating purposes, 50% of fossil fuel for heating is low-T
- Thermal Energy Storage (TES) is enabling technology for R(T)ES
 - Increase of solar thermal yield (and CSP systems!)
 - Cost-effectiveness of district heating and biomass systems
 - Increase in performance of geothermal and heat pump systems
 - Potential contribution TES for EU: 8000 PJ/year

Thermal Energy Storage – technologies / R&D

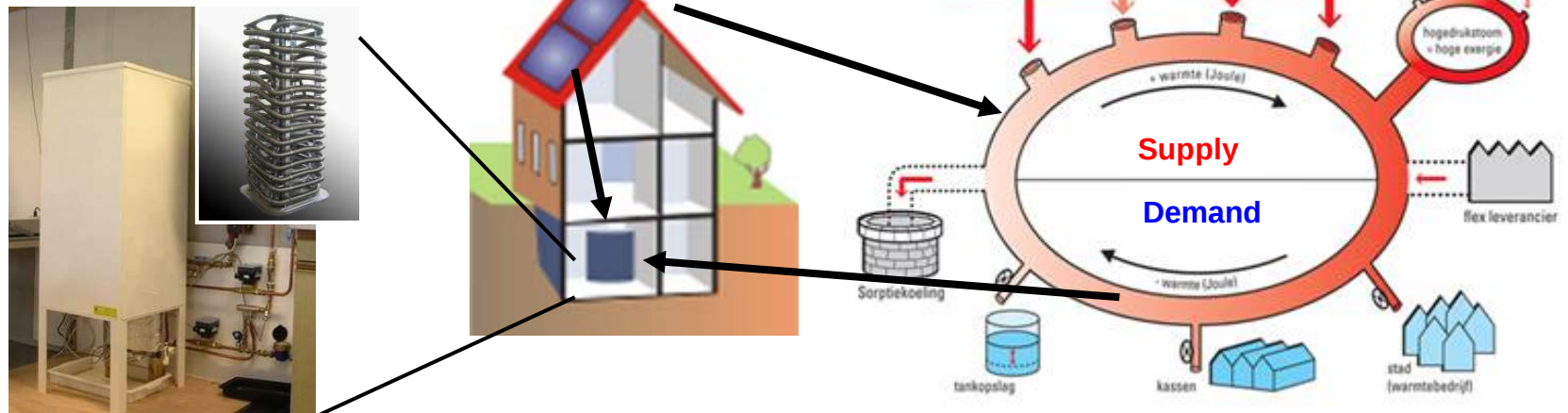


- Sensible heat (e.g. water tank, aquifer)
- Phase Change Materials (parafin, slurry)
- Sorption
- Thermo-Chemical Materials



Thermal Energy Storage – Priority area I

- Daily (1-7) thermal energy stores
 - TES building components
 - System performance (decentral cold storage)
 - Central-decentral exchange (e.g. heat/cold storage for peak shaving)

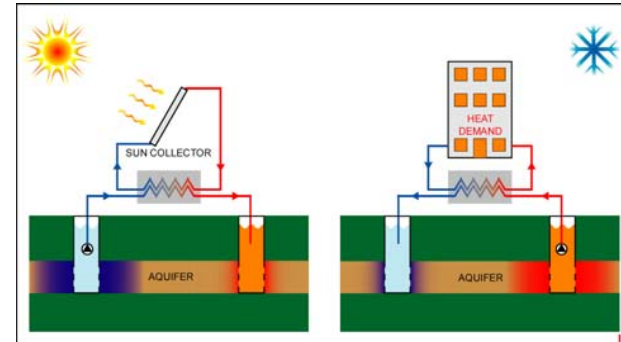


Thermal Energy Storage – Priority area II

- **Seasonal thermal energy stores**

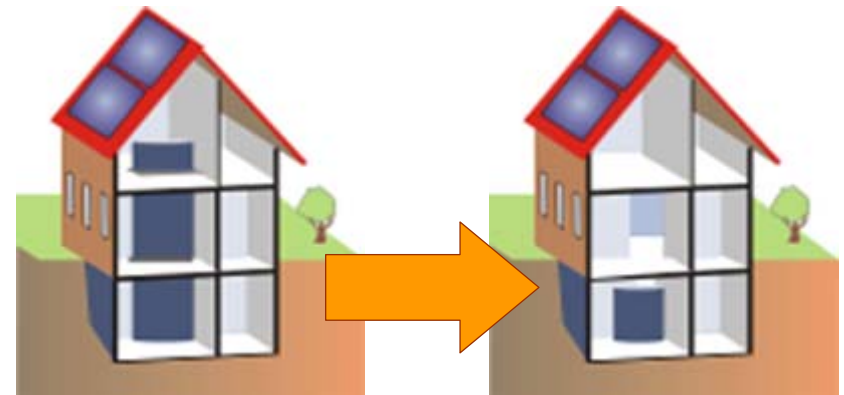
- **Large centralised**

- Thermal balance
 - Well-well interaction
 - Legal barriers



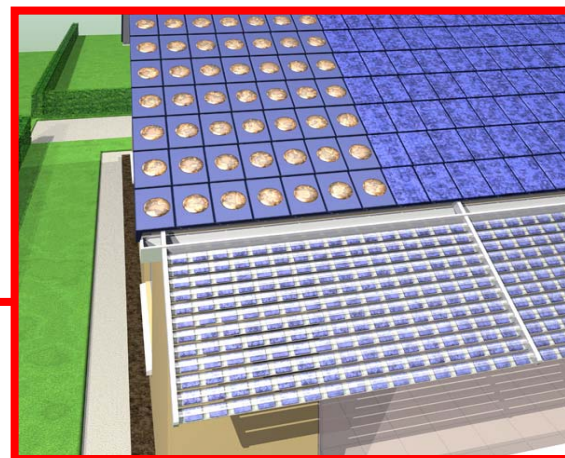
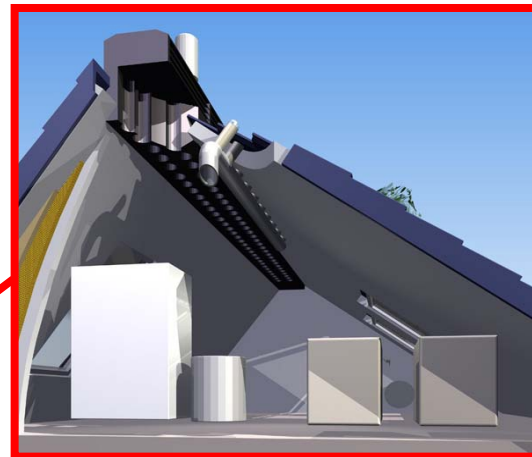
- **Compact decentralised**

- Material characterisation
 - Material engineering
 - Charge/Discharge Reactor Development



Thermal Energy Storage – Priority area III

- **System Integration of thermal energy storage**
 - Cost /Labour/Emission reduction
 - System performance
 - Applications linked to building renovation

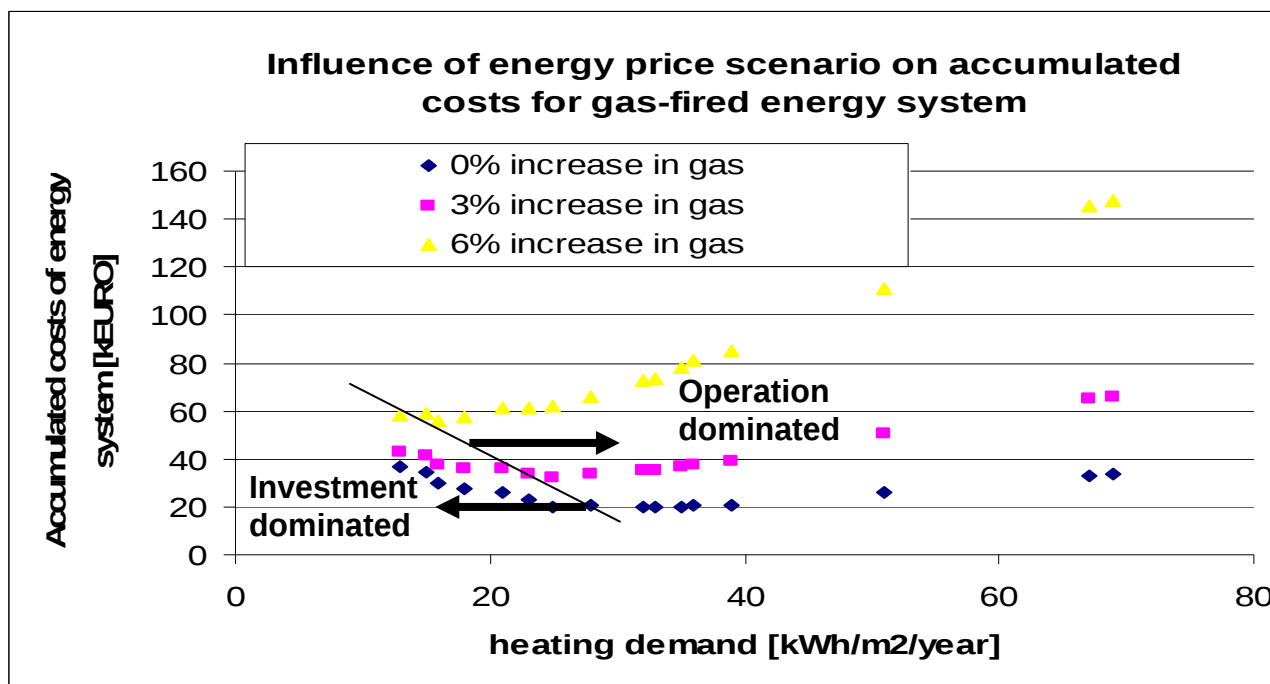


Market perspective: The value chain

- Material supplier (*PCM/TCM*)
- Component supplier
- System developer (*TES/RES*)
- Wholesale
- Retail / Installer
- Customer

Market perspective: housing sector

- Value of (low temperature) heating



- Total installation cost is only 2-3 k€

Market perspective – an example

Finding Moore's law of CTES

Current (Water)

- Domestic heat stored 2010:
 - System 0,03 GJ (solar boilers)
 - Total EU: 30 PJ
- Duration heat stored: Day
- Energy density storage system: 0,2 GJ/m³
- System investment costs: 2-3 k€
- System operation costs: 0,7-4 k€/a

Future (TCM)

- Domestic heat stored 2050:
 - System 20 GJ
 - Total EU: 8000 PJ
- Duration heat stored: Year
- Energy density storage system: 1-2 GJ/m³
- System investment costs: 10-15 k€
- System operation costs: 0,1-0,4 k€/a

⇒ Growth factor of 15% increase installed capacity next 40 years



Thank you for your attention!

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