Hilfe2

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EMPA

Materials Science & Technology

Chemical heat storage using Na-leach

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Folie 1

Hilfe2

Diese Folie enthält zwei Mastergruppen (Master und Titelmaster), welche den Corporate-Design-konformen Auftritt definieren. Der jetzt zugewiesene Empa-Master 1 sieht für die Titelfolie das Empa-Logo vor. Den weiteren Folien ist kein Logo zugewiesen. Für längere Vorträge mit Zwischentiteln empfehlen wir, den Folien mit Zwischentiteln den Empa-Master 2 (mit Logo unten rechts) zuzuweisen. Dazu öffnen Sie via Ansicht > Aufgabenbereich > Foliendesign-Entwurfsvorlage rechts die Masterauswahl. Nun markieren Sie im linken Ansichtsfenster die Folien, denen Empa-Master 2 zugewiesen werden soll (mindestens zwei, ansonsten für den ganzen Satz Empa-Master 1 verwendet wird). Weitere Hilfe erhalten Sie bei Monika Ernst, 4995 (Empa, Dübendorf)

M. Ernst; 04.02.2005

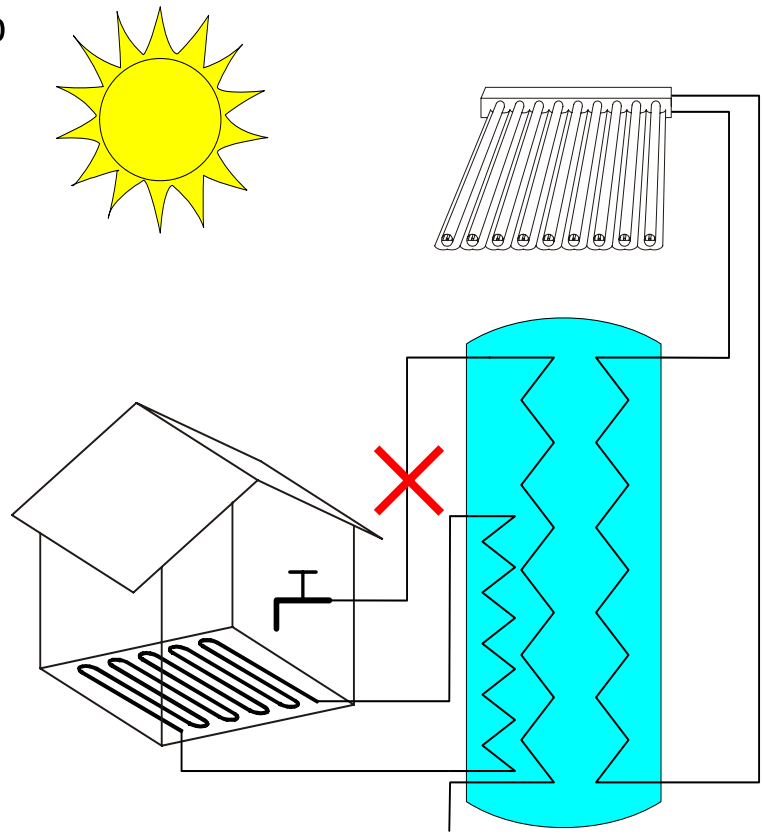
Content of the presentation

- Long term storage: State of the art
- Thermo chemical storage: principle
- Concept
- Design
- Status of work
- Future work

Long term storages: State of the art

Long term storages (sensible storages) cover typically 30% to 60% of the needed heating energy during winter time.

Domestic hot water not always can't be produced directly.



Advantages of water storages:

- Known technology
- No dangerous material

Disadvantages of water storages:

- Permanent loss of heat
- Voluminous

Goal: Solar covers 100% heating demand

Precondition:

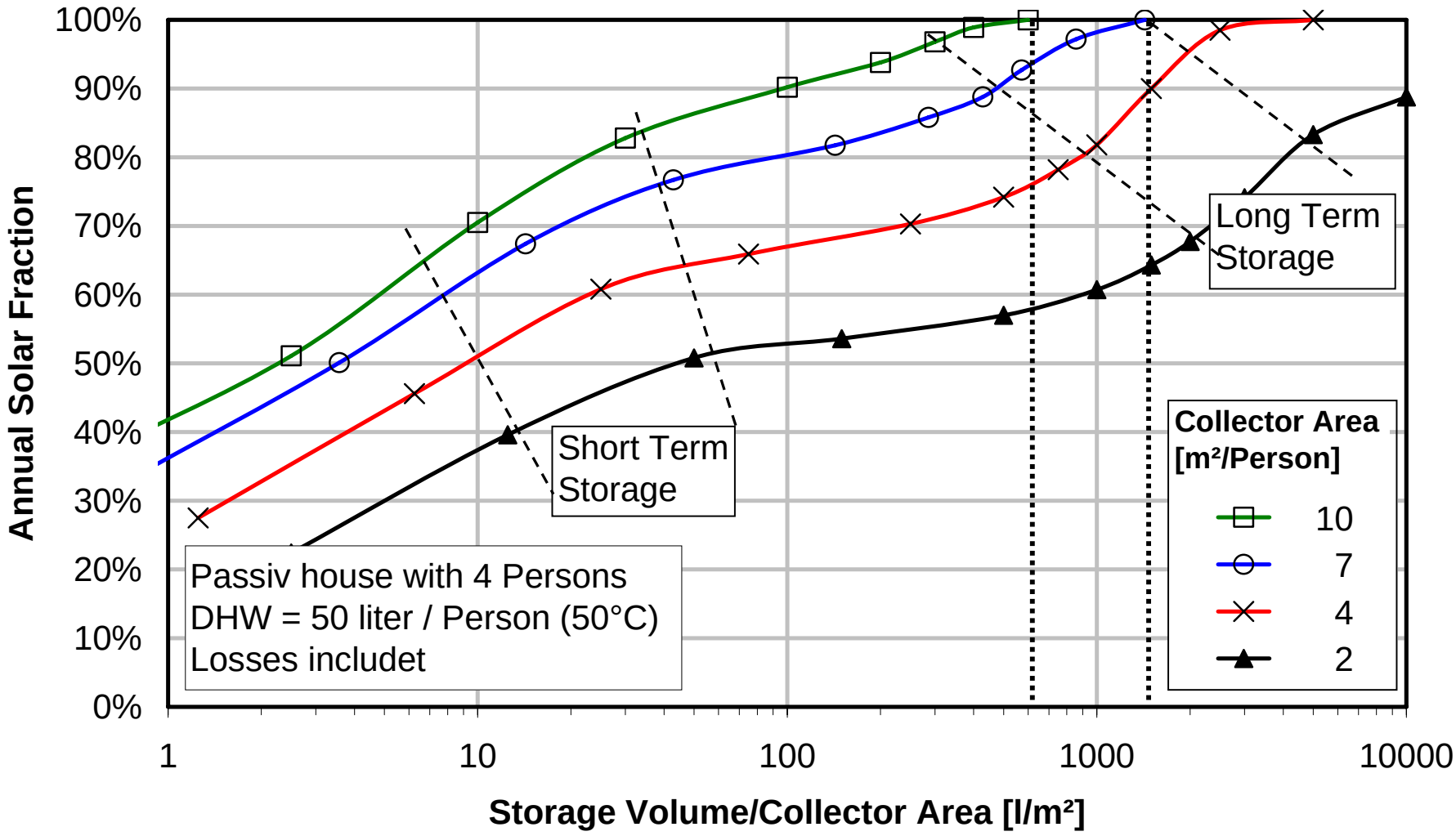
Building in passive house or Minergie standard

Central-European climate

Technical requirements:

- 30 – 50m² solar collectors
- 20 – 40m³ water storage

Storage Volume and Solar Fraction



Source: Energy and Building Technology for the 2000 Watt Society, 2003

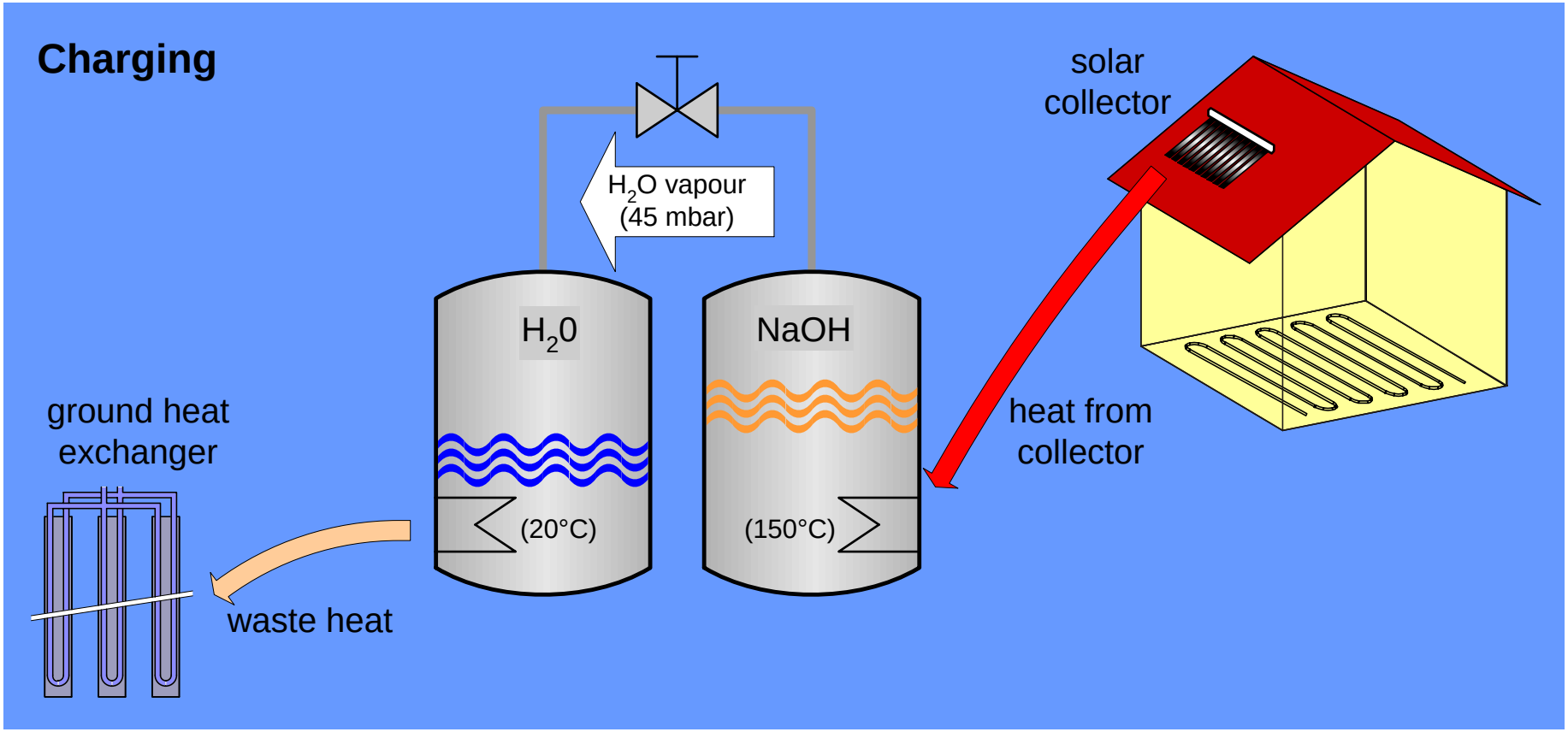
Conclusion long term storage:

- To cover the last 10% of heat energy, unproportionally high storage volume are needed
- Solar collector area needs to be large to cover the permanent losses

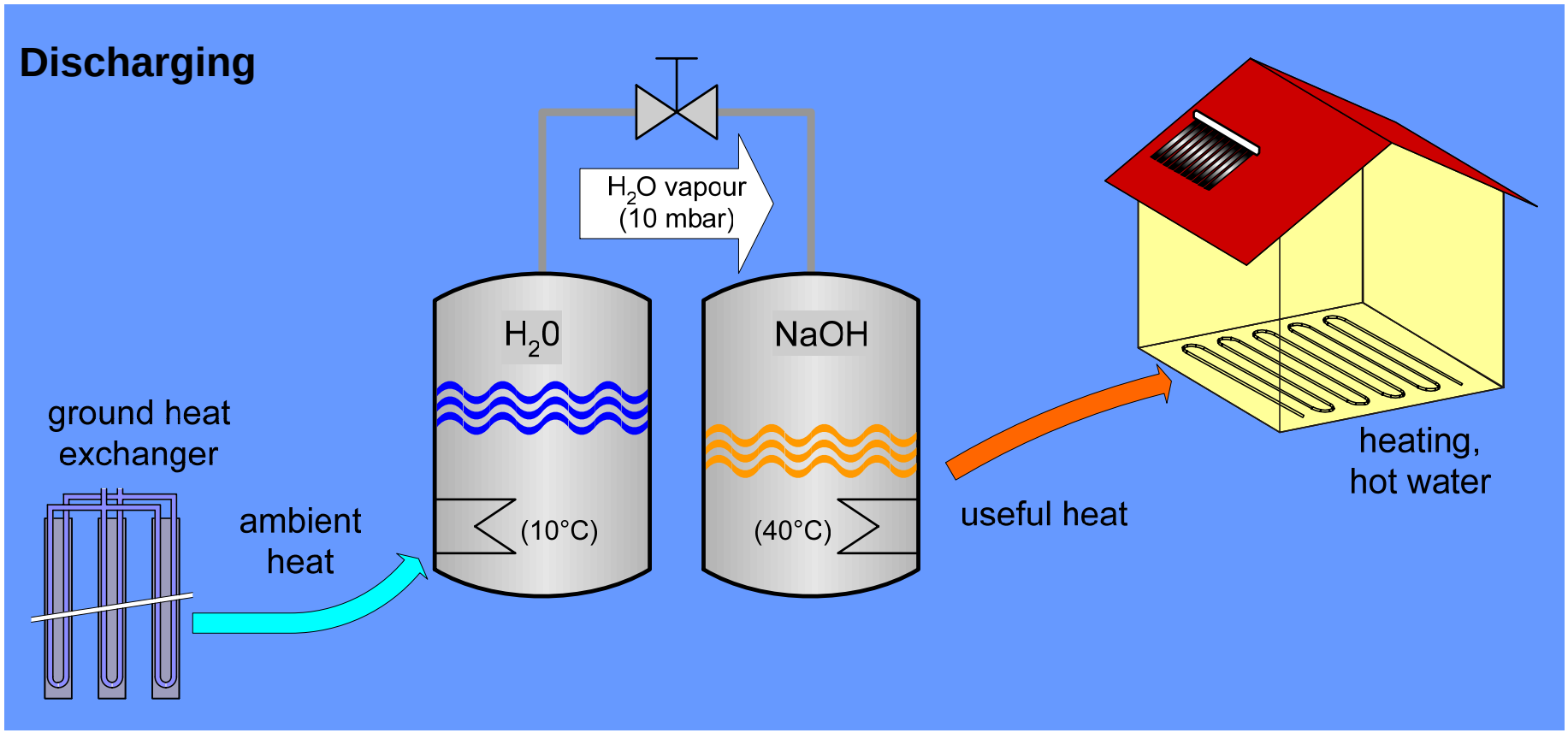
New possible concept: chemical heat storage

- No losses during storage time
- High heat capacity
- Costs shall not be higher than with water storage

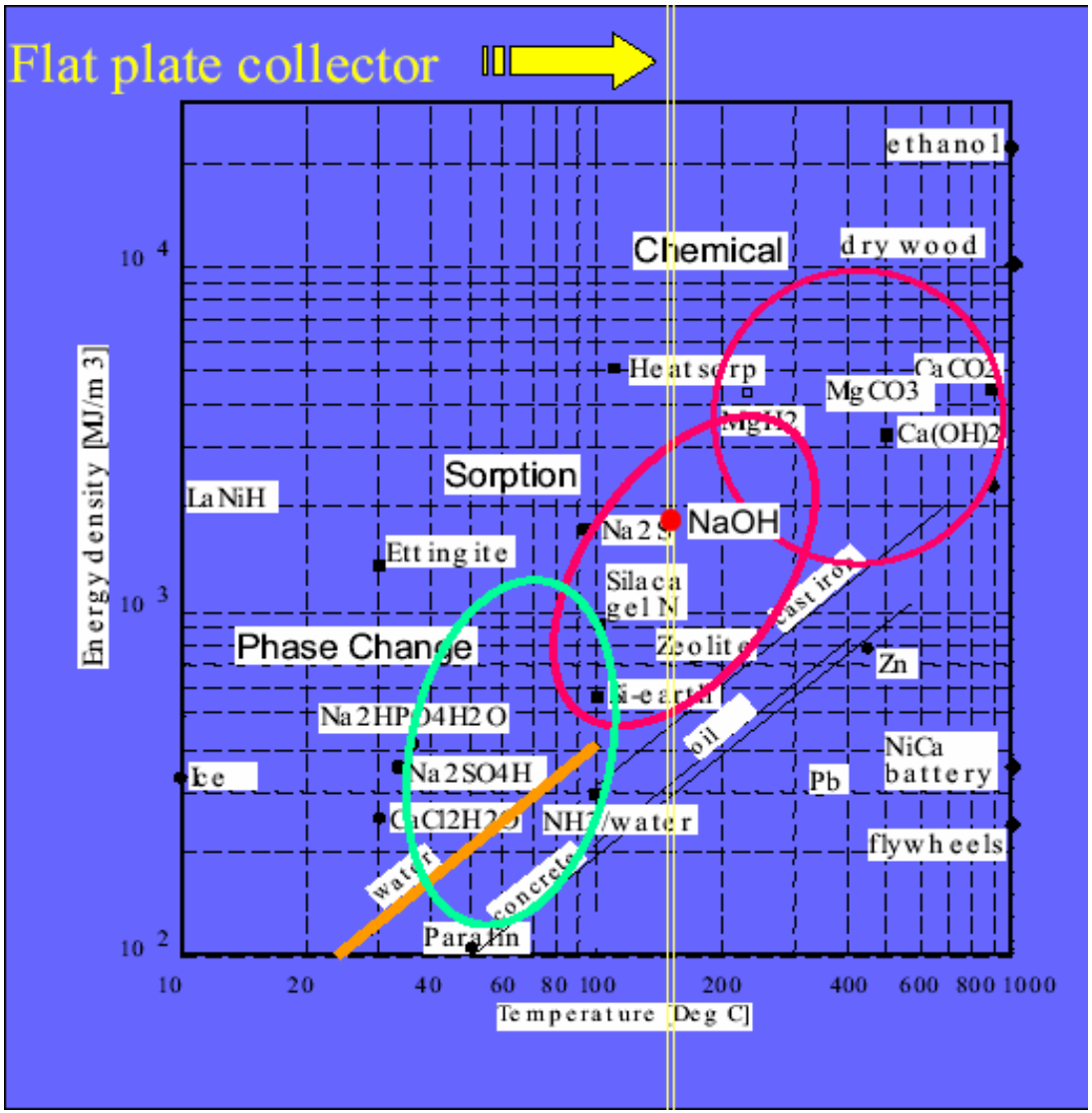
Thermo Chemical Storage: Principle



Thermo Chemical Storage: Principle



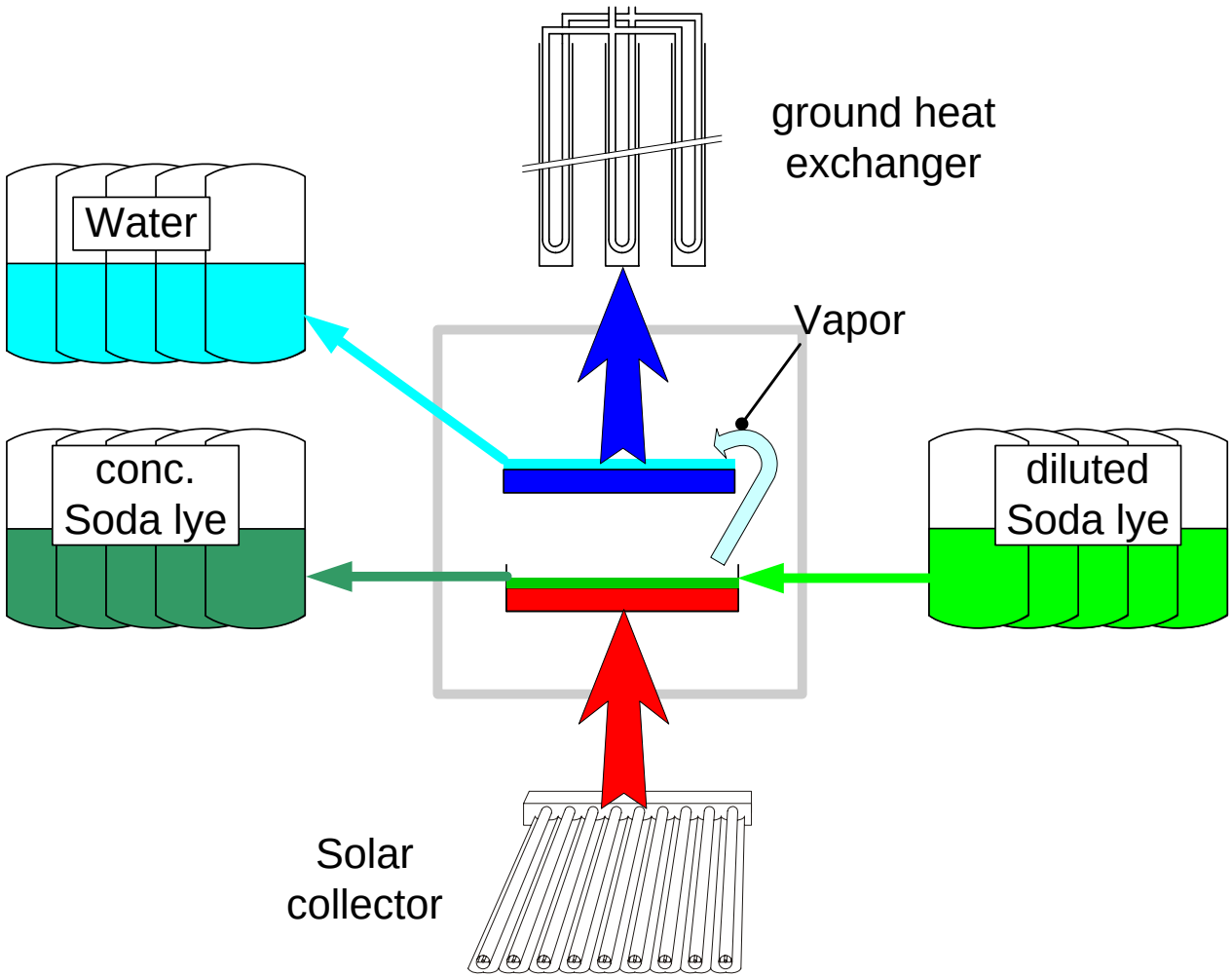
Potential of a NaOH Storage System



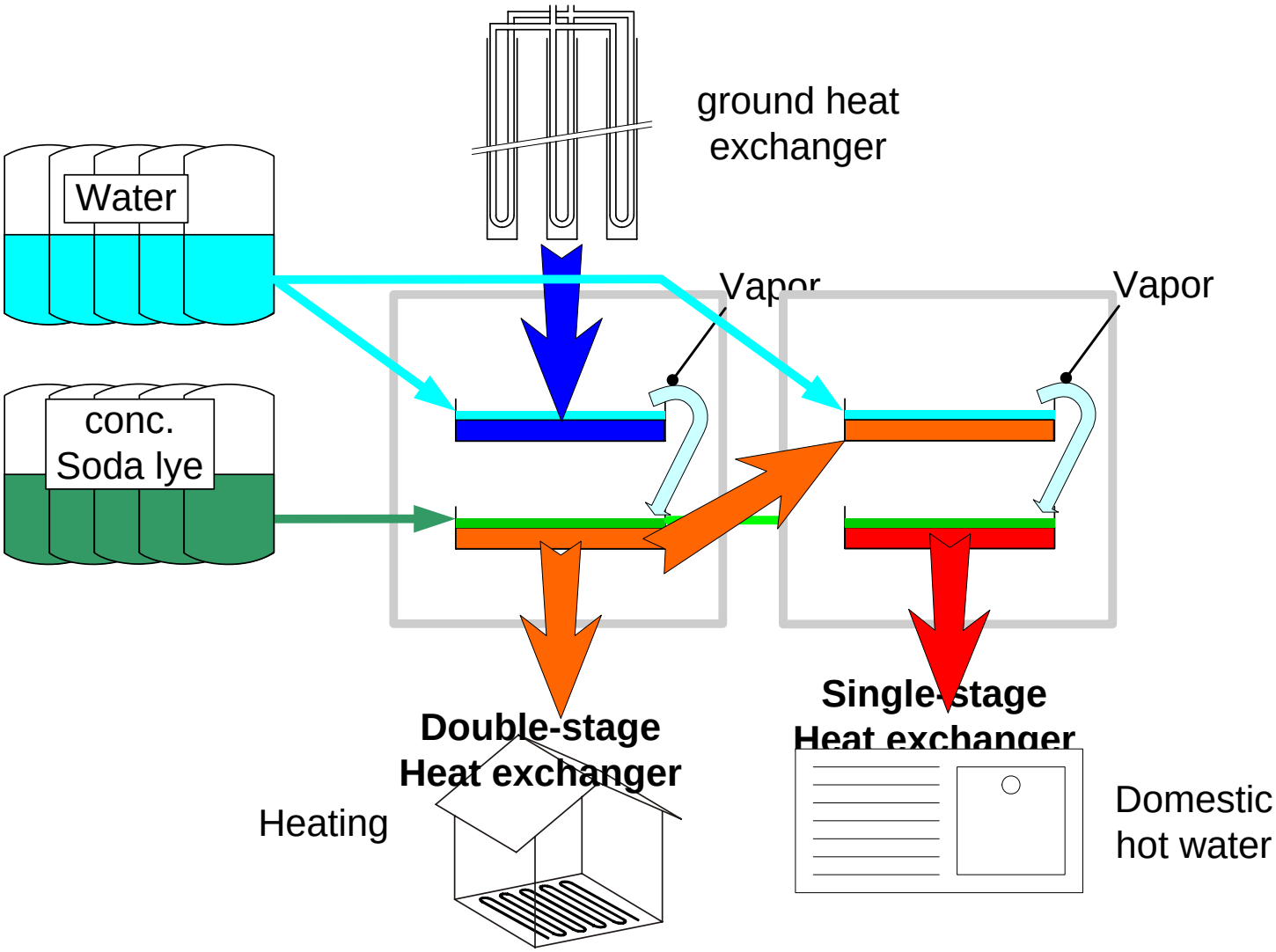
- Heat capacity for heating purposes:
  6 time better than a water storage
- Heat capacity for DHW:
  3 time better than a water storage

Source: J. van Berkel

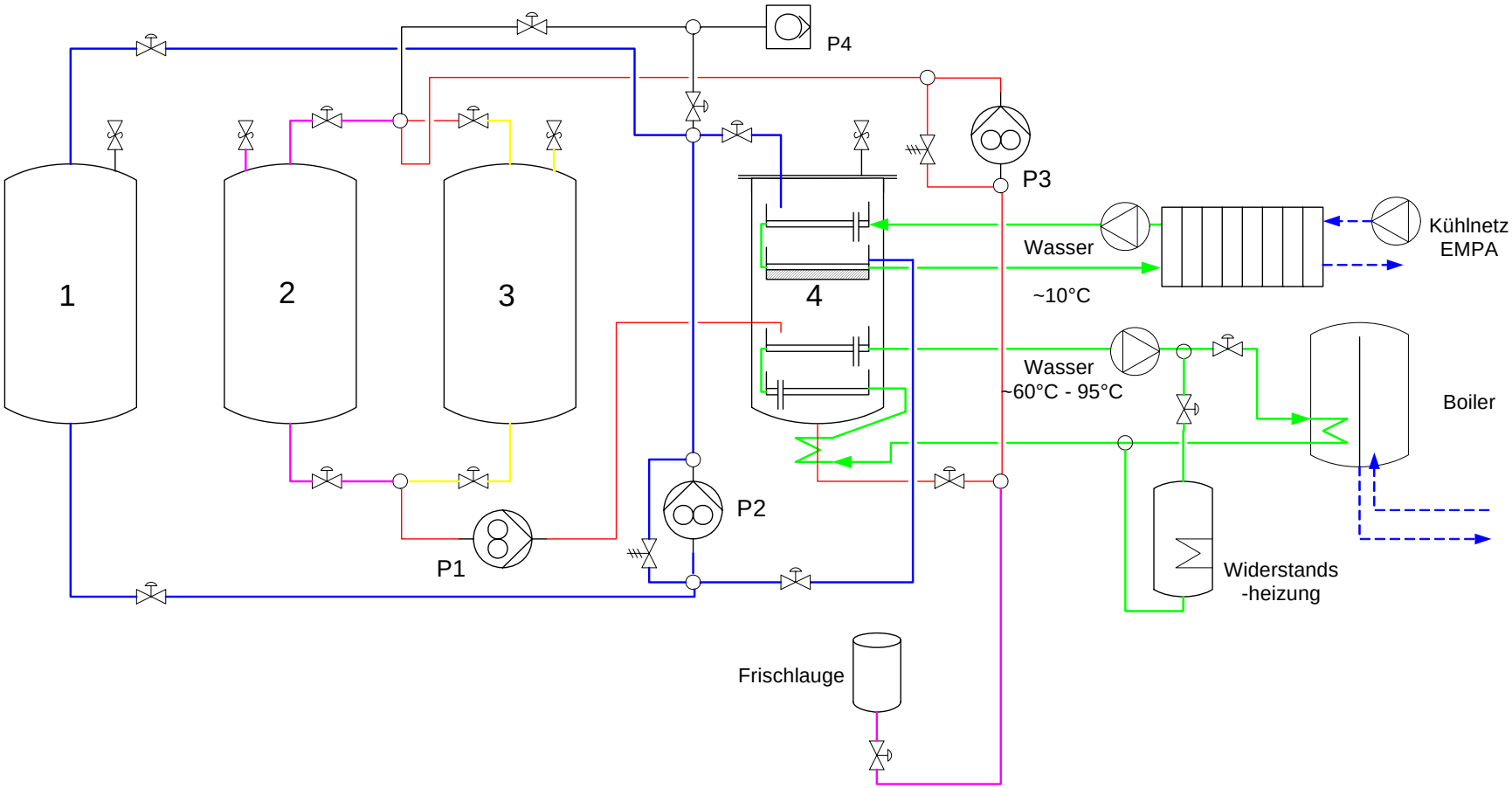
Concept: Charging the storage



Concept: Discharging the storage



Hydraulic scheme laboratory prototype:



Setup of the laboratory prototype

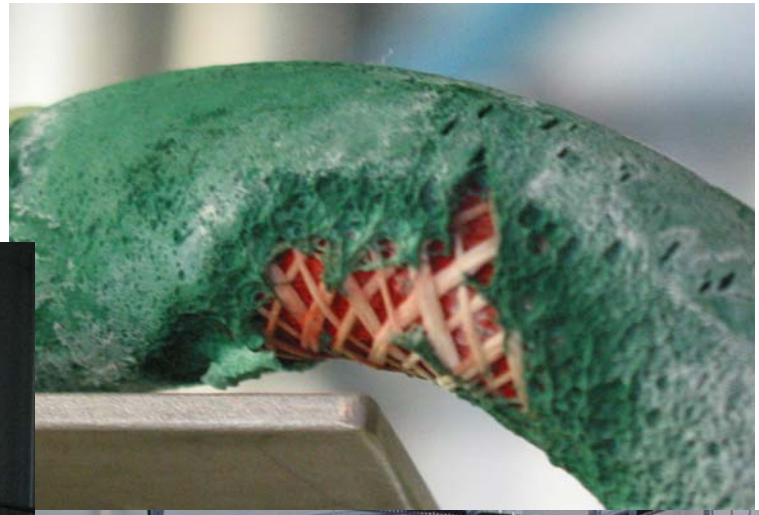
Status of the work on the NaOH Storage

- The storage was built and filled with soda lye.
- Loading tests has been performed. During that test,higher concentration of NaOH reached than expected.
- The high concentration of NaOH lye led to adjustments: Silicone hoses, which has been corroded in the lye are replaced. The high viscosity of the concentrated lye needed a change in the design of the tubes and pumps.
- Simulations on the laboratory prototype show (with assumptions about losses):
  - Calculated efficiency about 59% (heat out/heat in)
  - Volume ratio (compared to water) 290% (only NaOH considered)

Ongoing work:

- The simple simulation model will be upgraded and translated to Fortran (TRNSYS).
- TRNSYS simulations will be made to show the performance of the storage under “real” conditions. In the frame of the IEA Task 32 these results are compared with other storages.
- The laboratory prototype will be upgraded with double-stage heat exchangers.
- Further simulations are made to optimize System components (collector area, ground heat exchanger, cost of the system, etc.)

Galerie



Thank you for your attention!