SYSTEM CONCEPTS AND DESIGN PRINCIPLES

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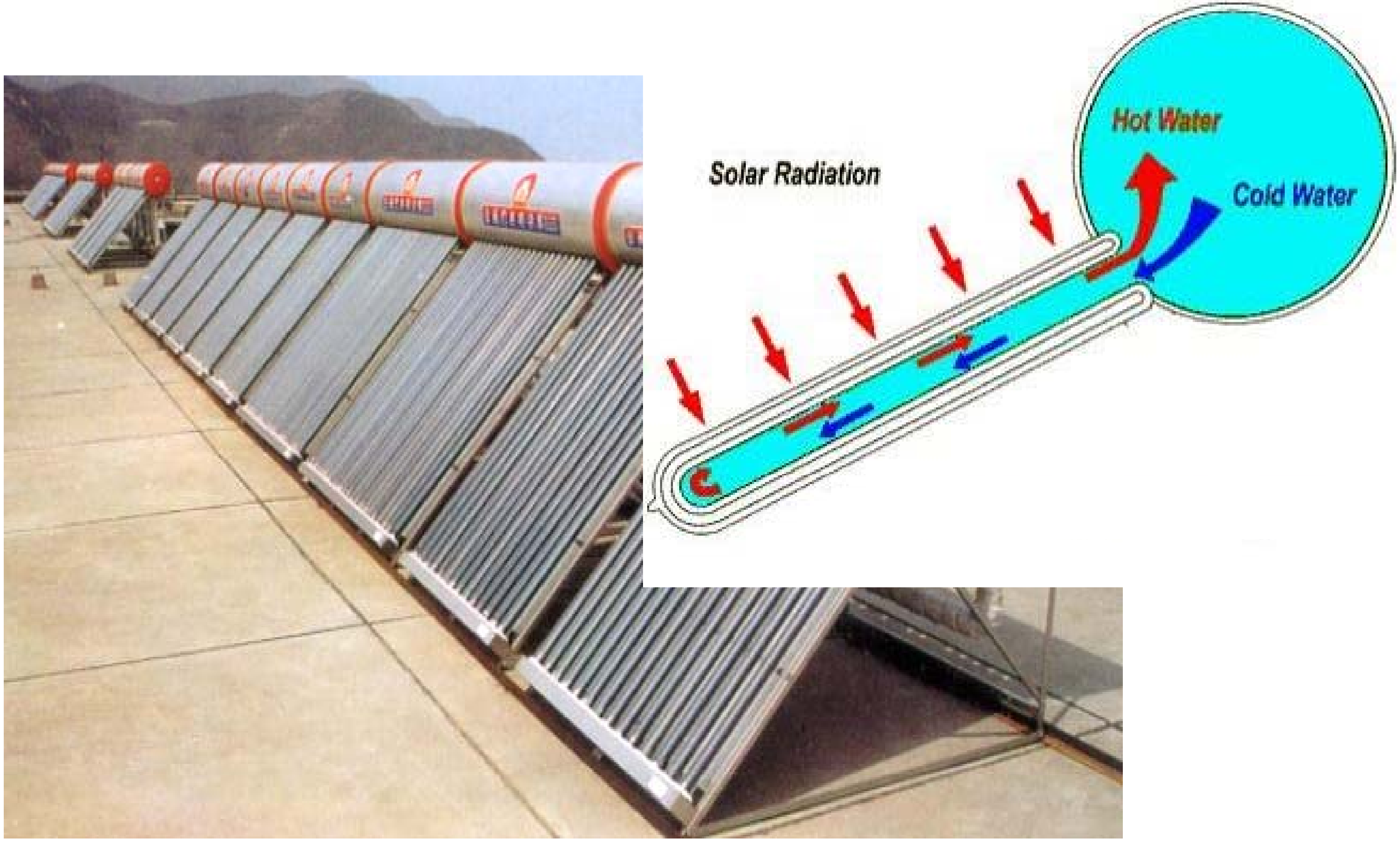
AUSTRIA

THERMOSYPHON SYSTEM - China



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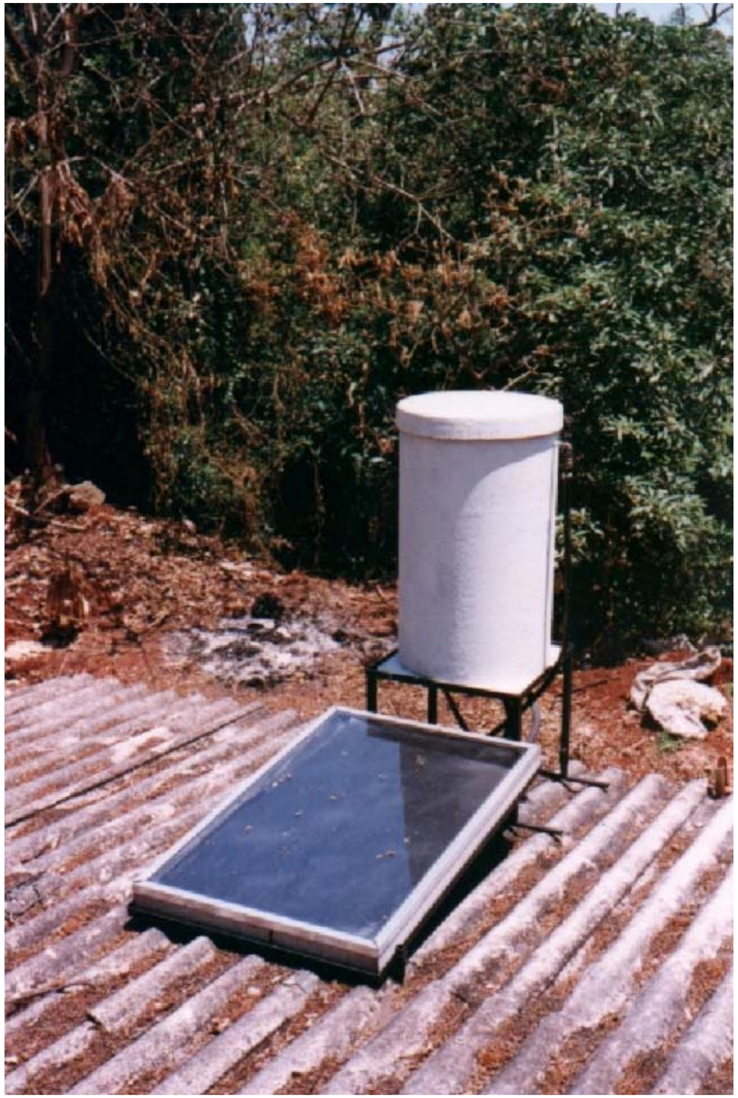
THERMOSYPHON SYSTEMS



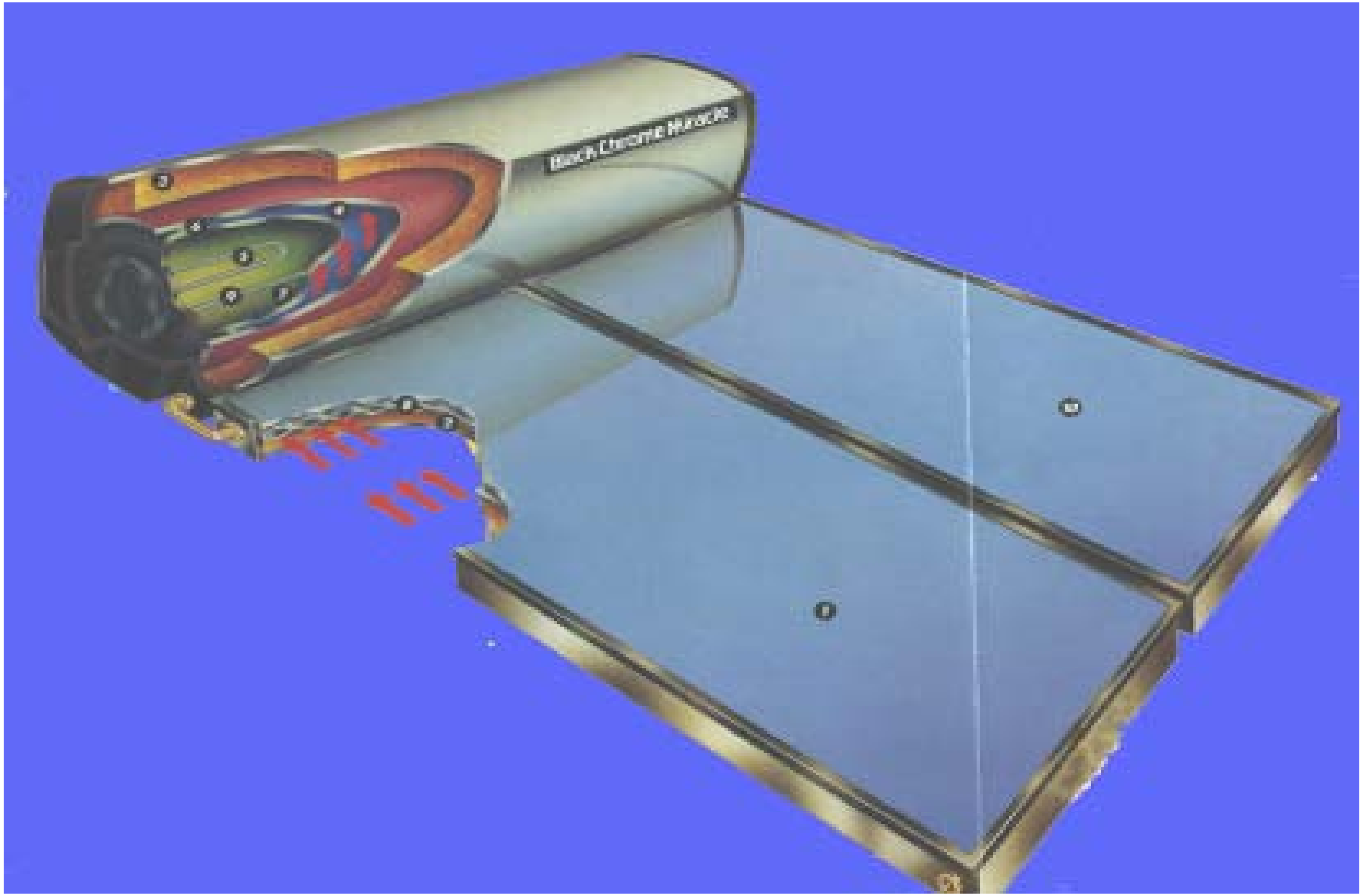
THERMOSYPHON SYSTEMS

Water conditions suitable for one-circuit systems

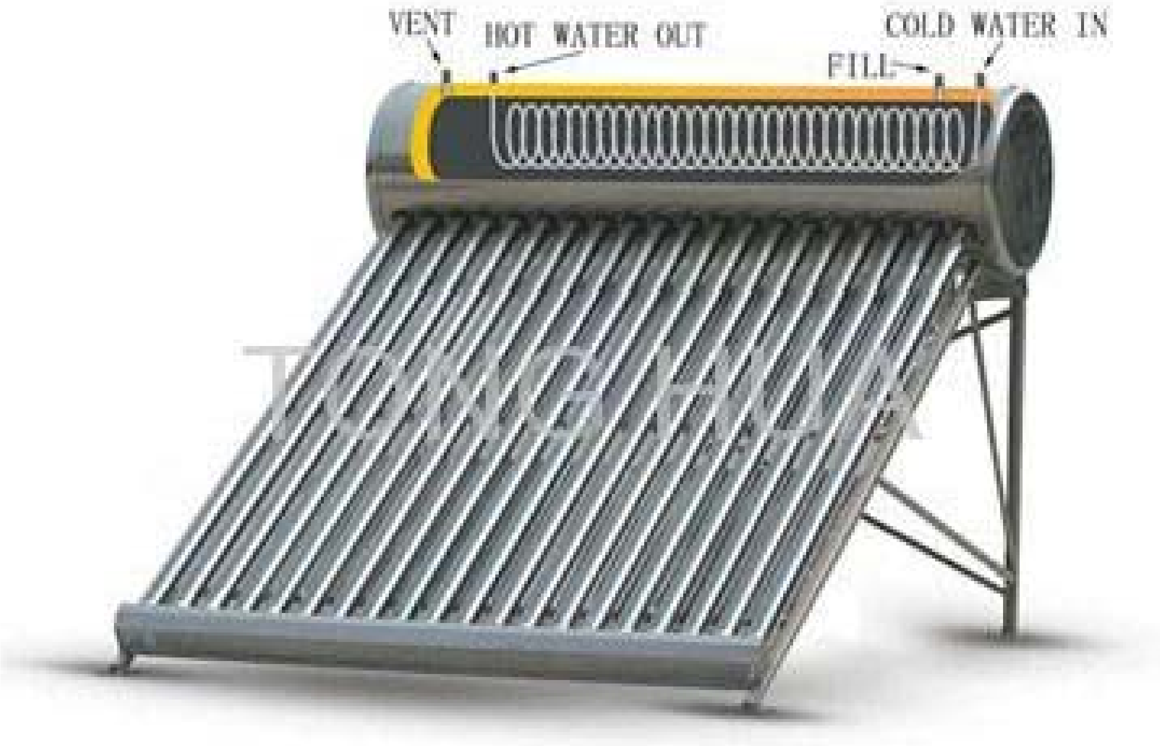
Description	Maximum Recommended Level
Ph	6.5 - 8.5
TDS	600 mg/l
Total Hardness	200 mg/l
Chlorides	300 mg/l
Magnesium	10 mg/l
Calcium	12 mg/l
Sodium	150 mg/l
Iron	1 mg/l

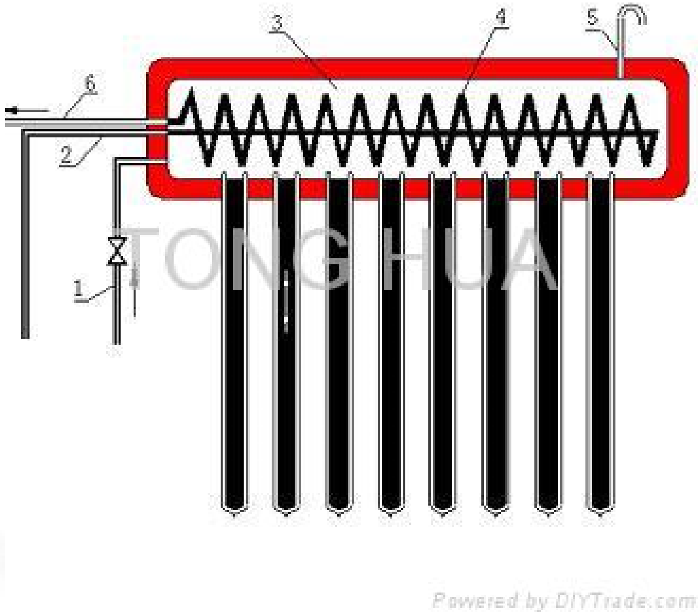
Source: Solar Edwards, Australia

INDIRECT SYSTEM



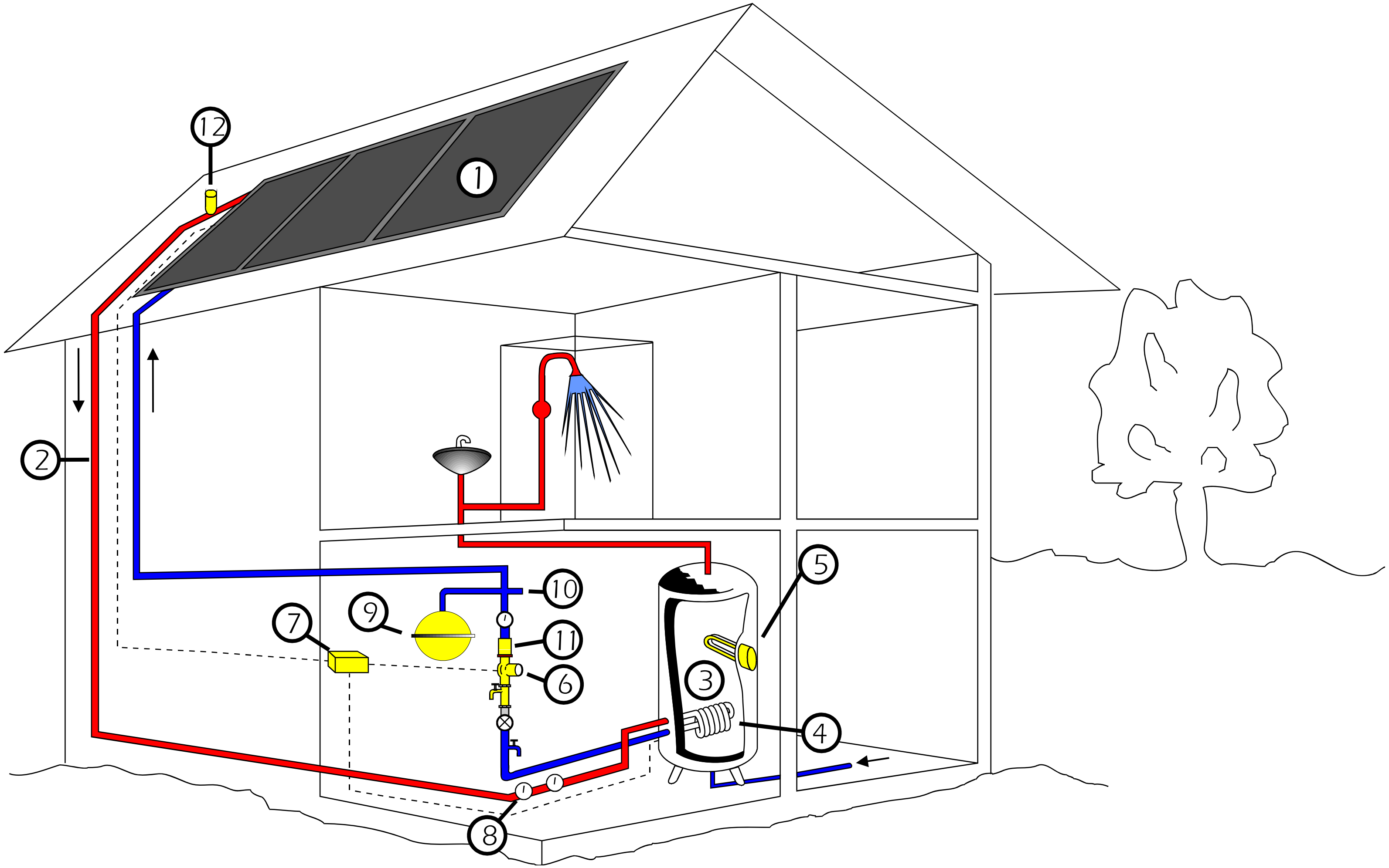
Indirect Thermosyphon System



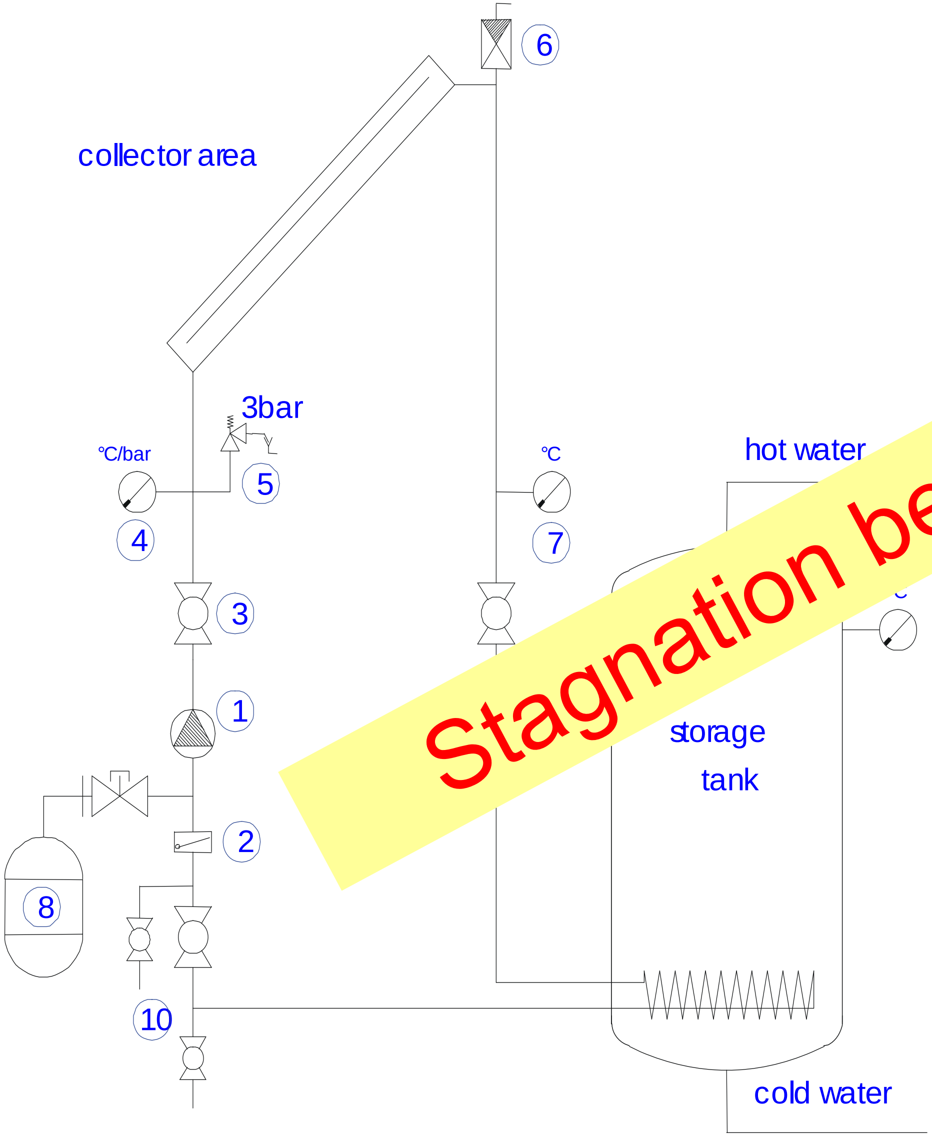


Source: TONG HUA, China

Domestic Hot Water System with Forced Circulation



HYDRAULIC SCHEME OF A SOLAR HOT WATER SYSTEM



1 circulation pump
2 gravity brake
3 lock valve
4 therm pressure gauge
5 alve
valve
hermometer
8 expansion tank
9 fill and empty valve

Stagnation behaviour!

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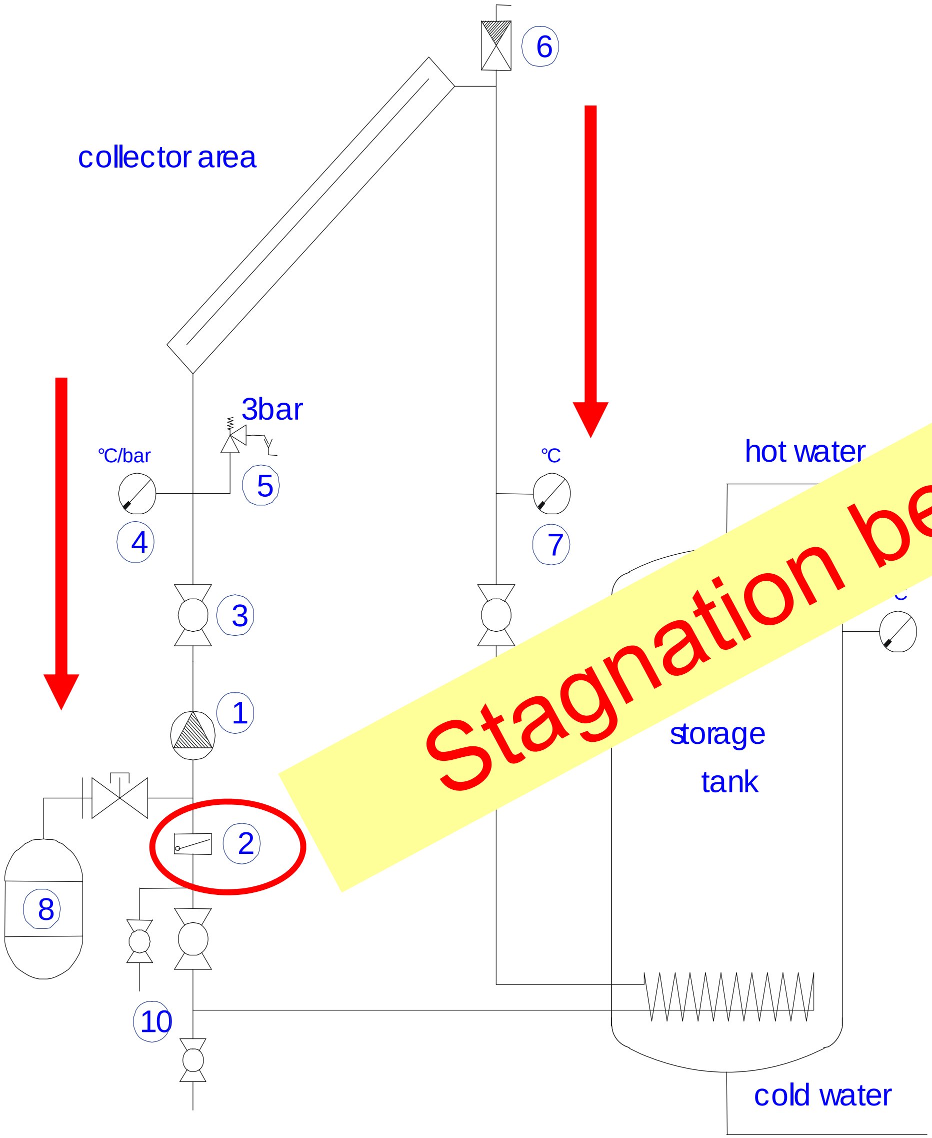

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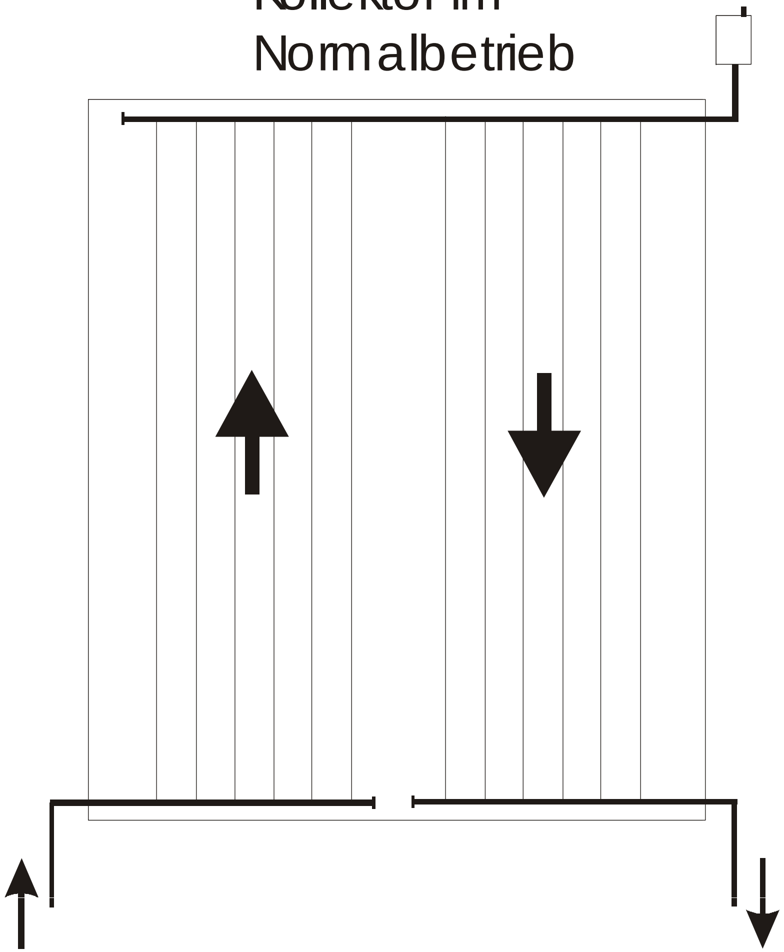
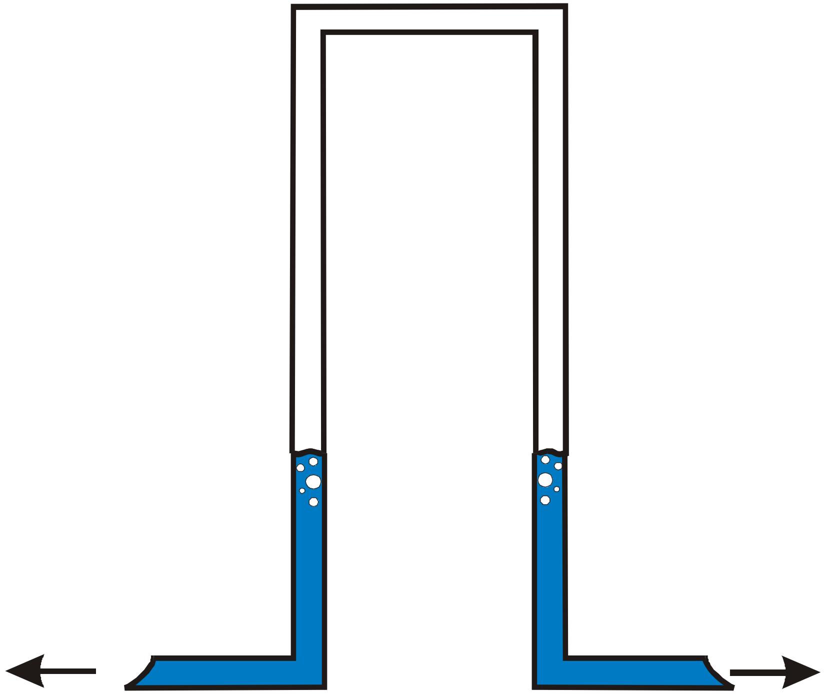
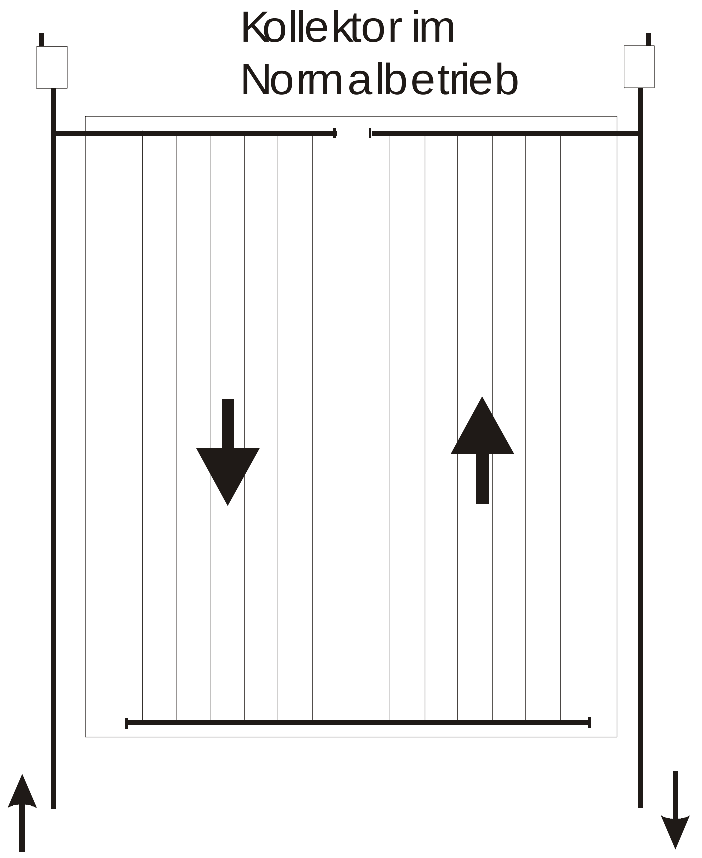
Stagnation behaviour

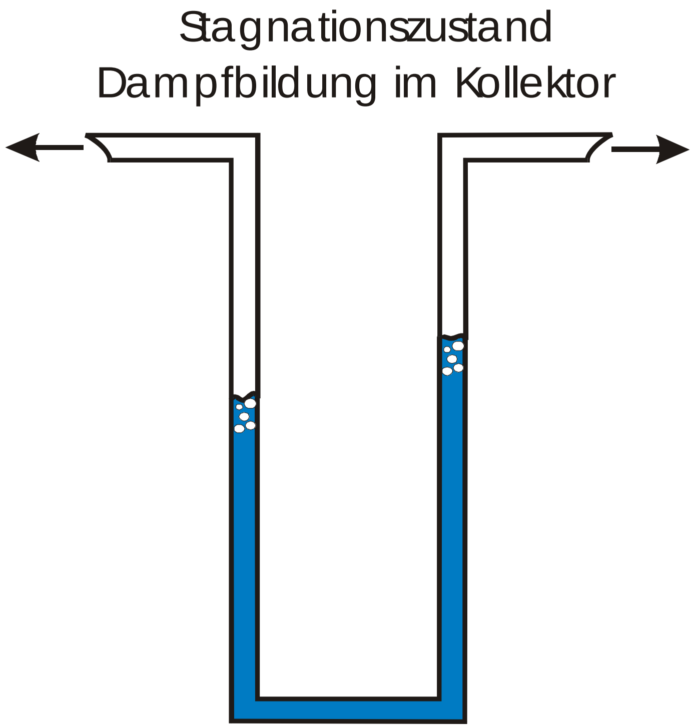




Stagnation behaviour

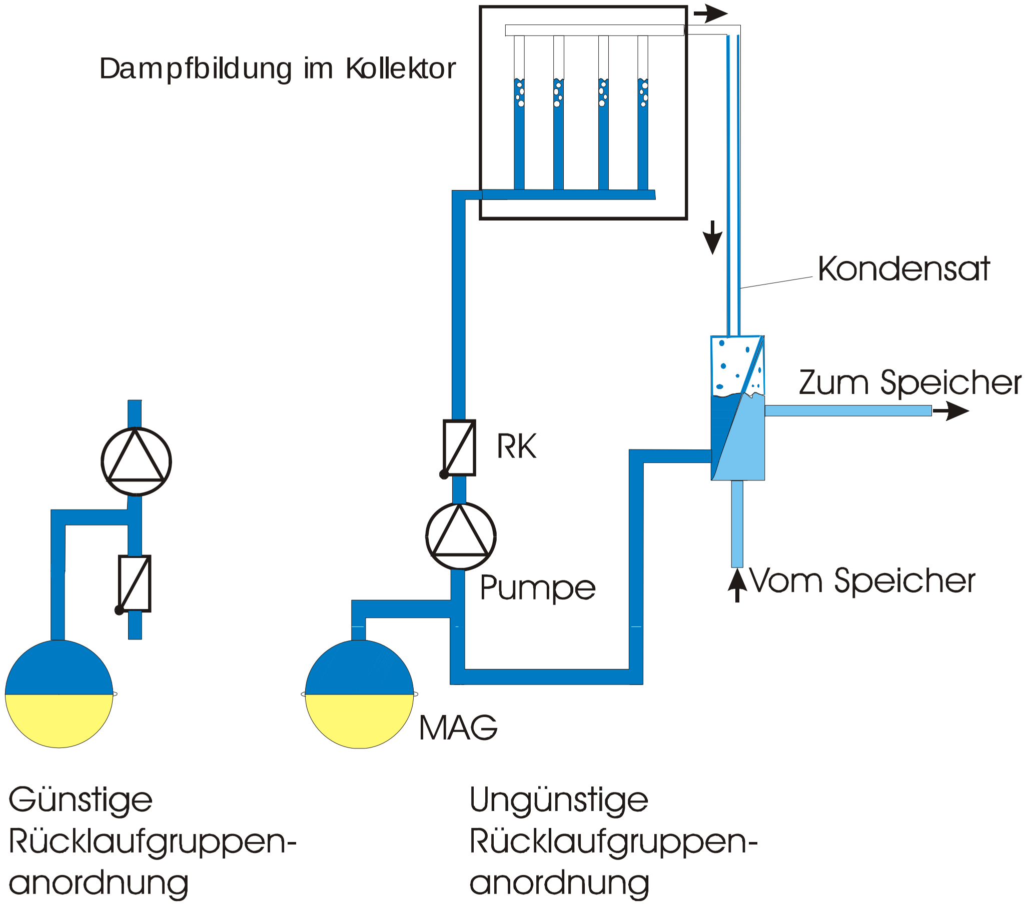
Kollektorverschaltung mit ungünstigem Entleerungsverhalten:





Stagnation behaviour

Einfluss der Rückschlagklappenposition relativ zur Ausdehnungsgefäßanordnung auf das Entleerungsverhalten von Kollektoranlagen



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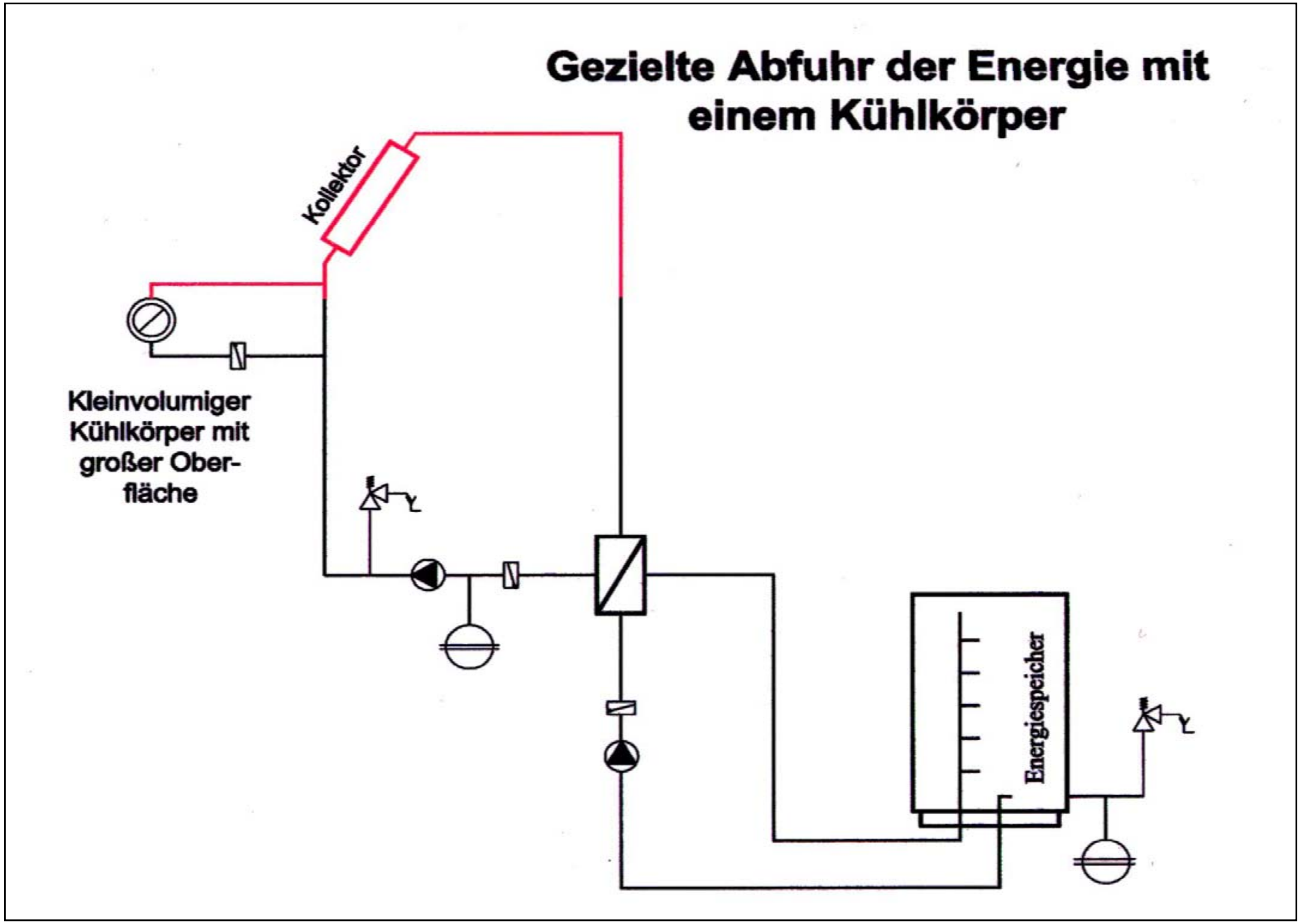


Solar Combisystems

Preconditions

and

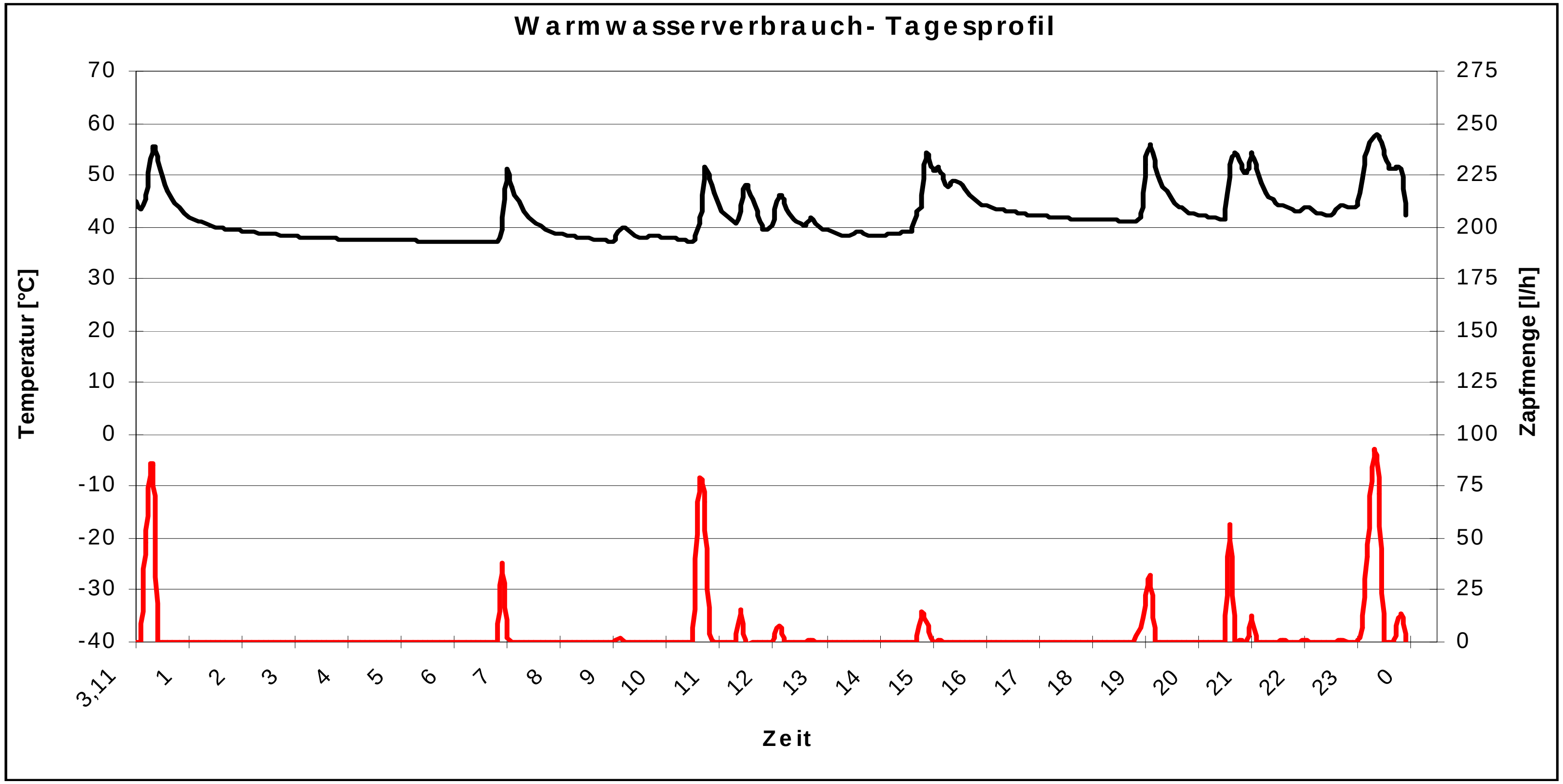
Requirements

Solar Combisystems

Hot Water

Hot water temperature: 60 °C

Cold water: 6 - 12 °C



Space Heating

Flow temperature: 30 - 50 °C
Return temperature: 20 - 40 °C

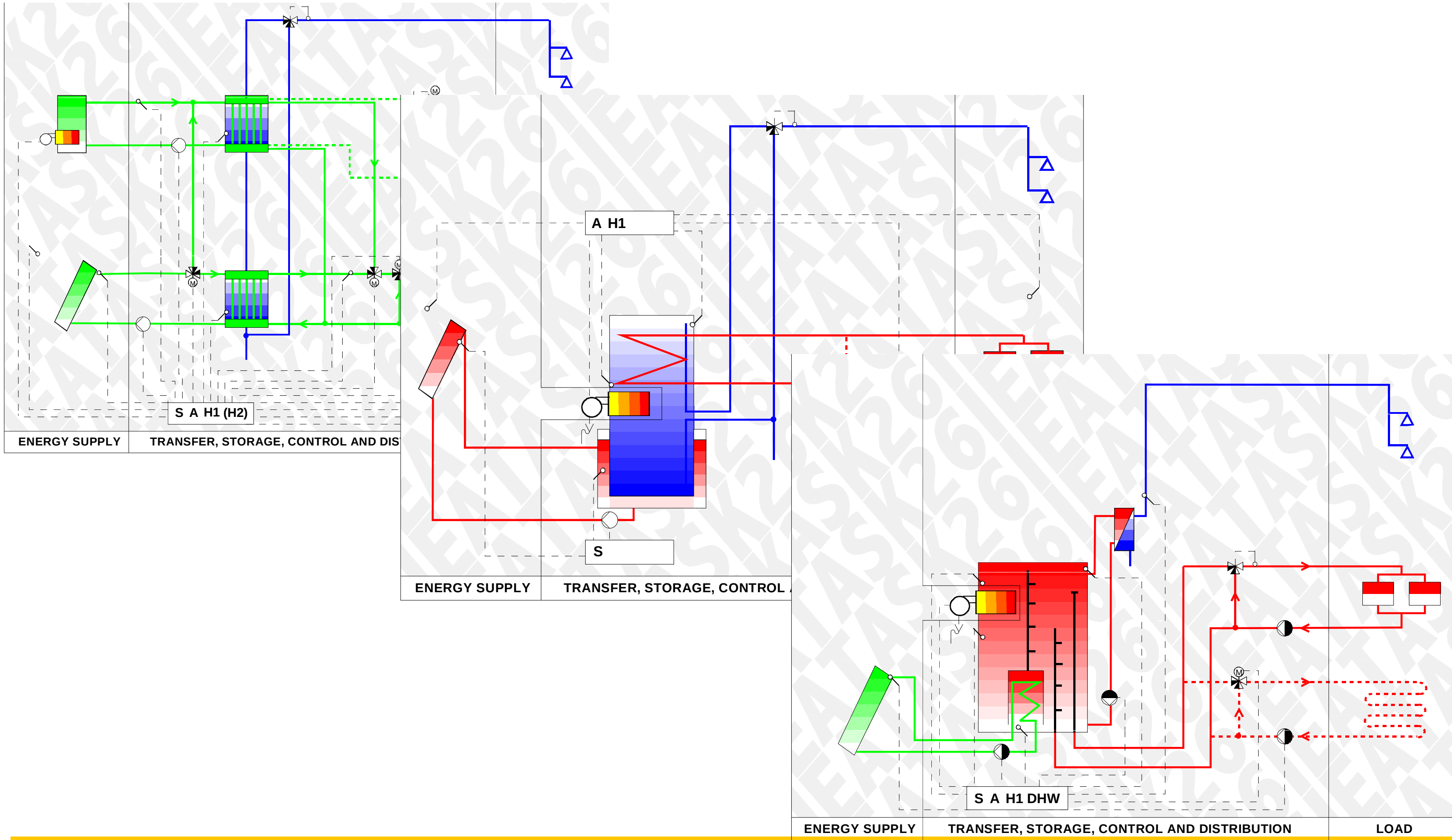
Demand:

- is not always corresponding to the solar irradiation

- varies in dependence of ambient temperature, passive solar gains and the internal gains of the building

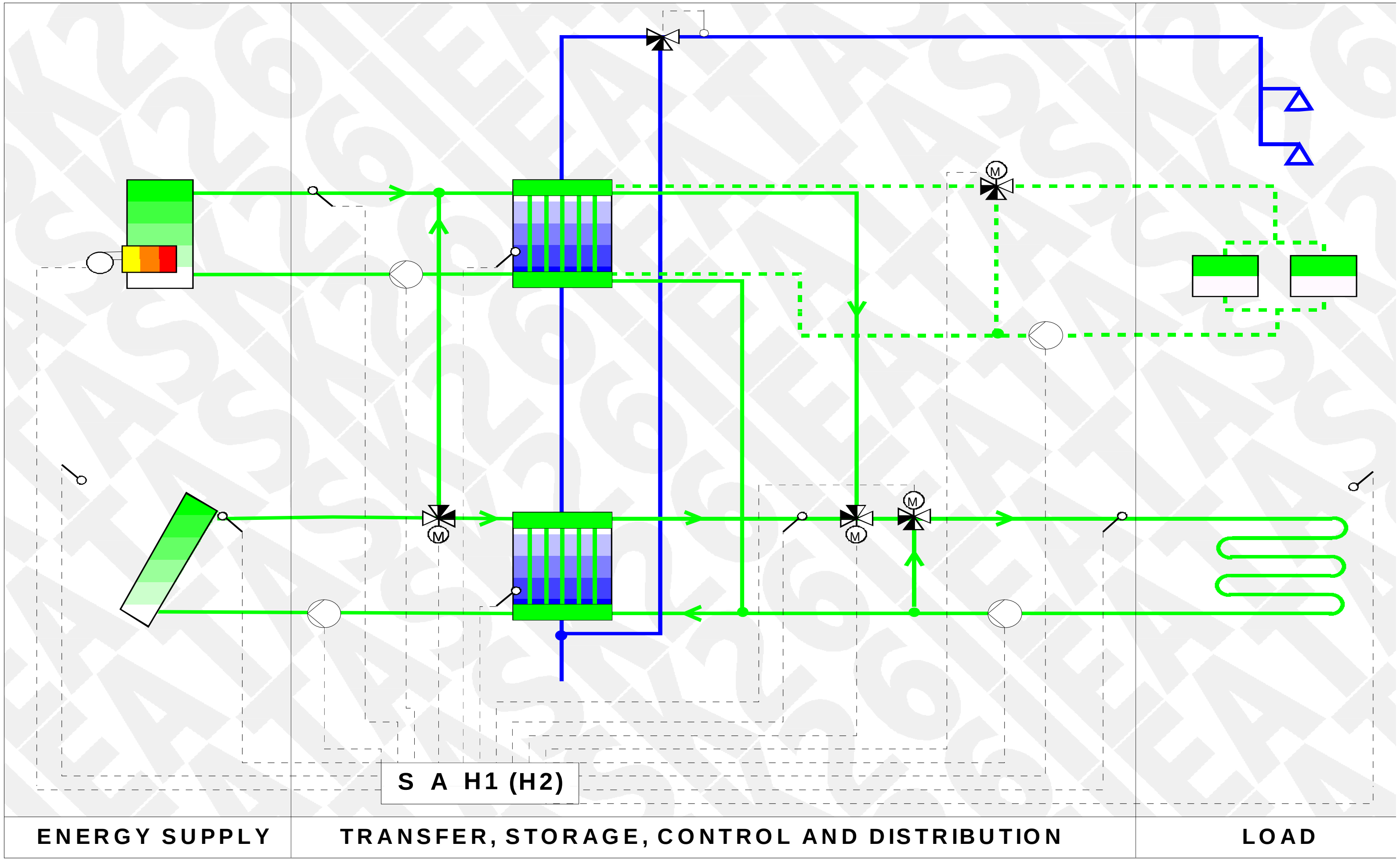
Solar Combisystems

Designs



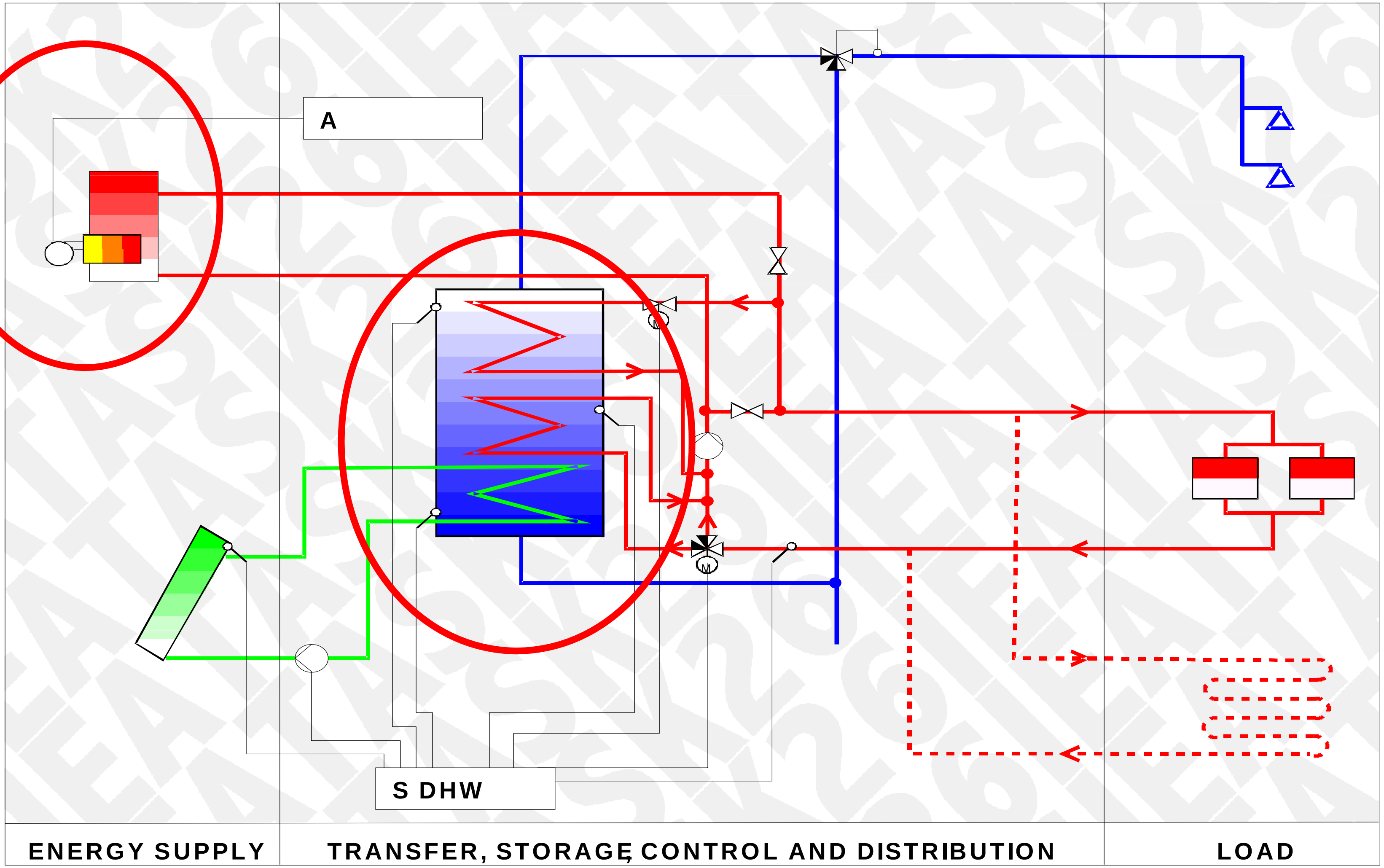
Solar Combisystems

System using the thermal mass of the building to store the heat



Solar Combisystems

Using the domestic hot water to store the heat



Solar Combisystems

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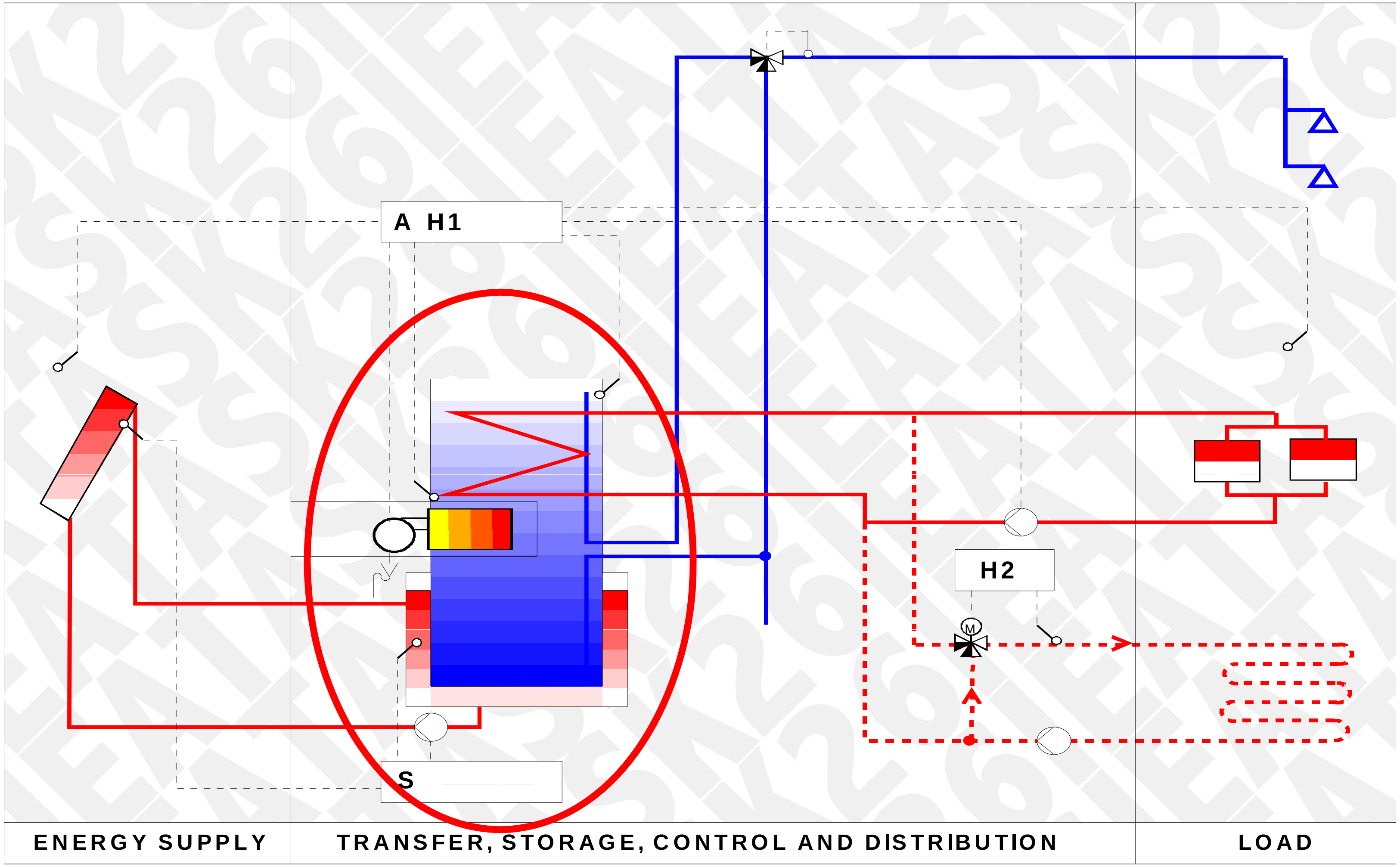
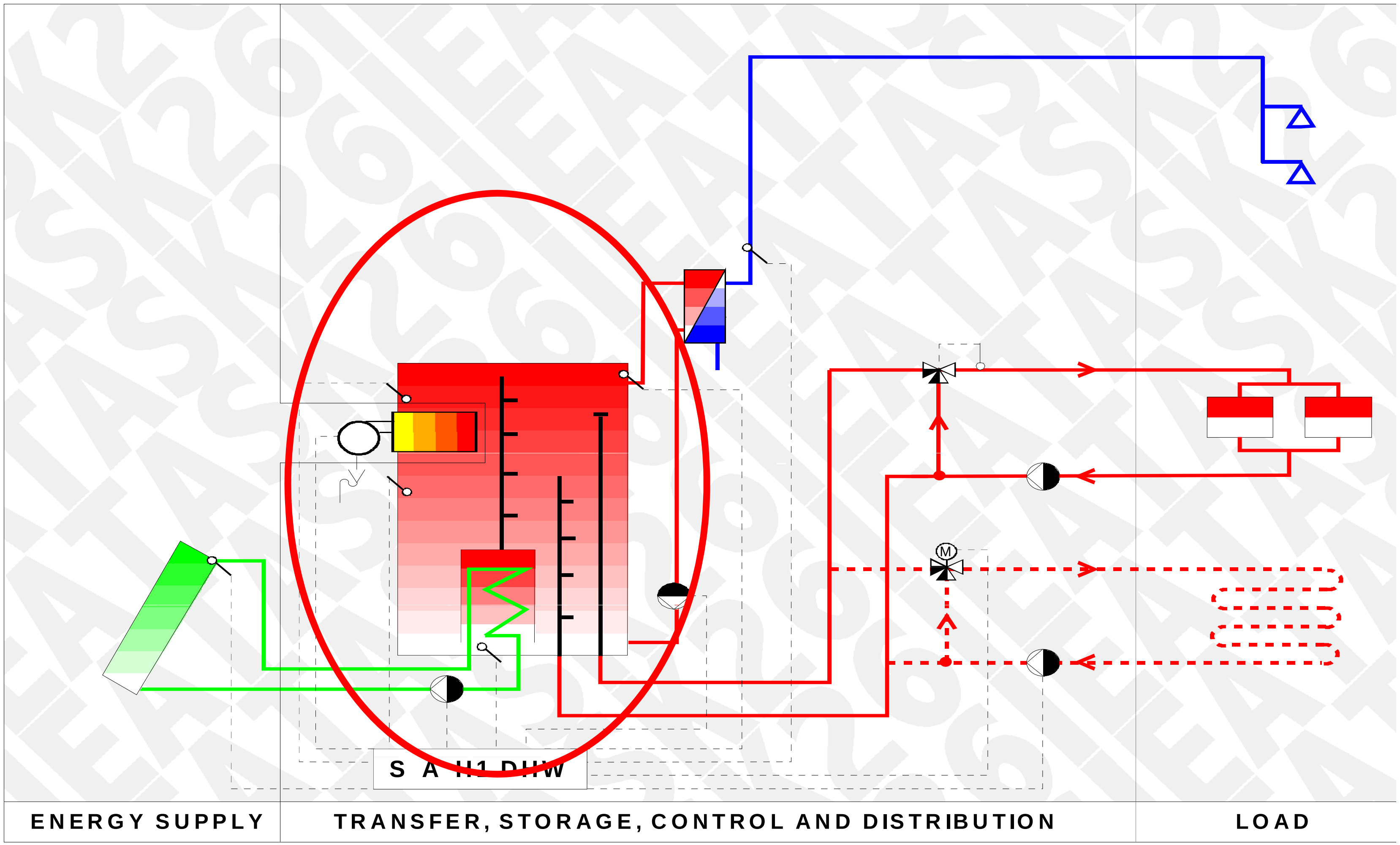


Solar Combisystems

Using the space heating store to store the heat



Solar Combisystems

Solar Combisystems

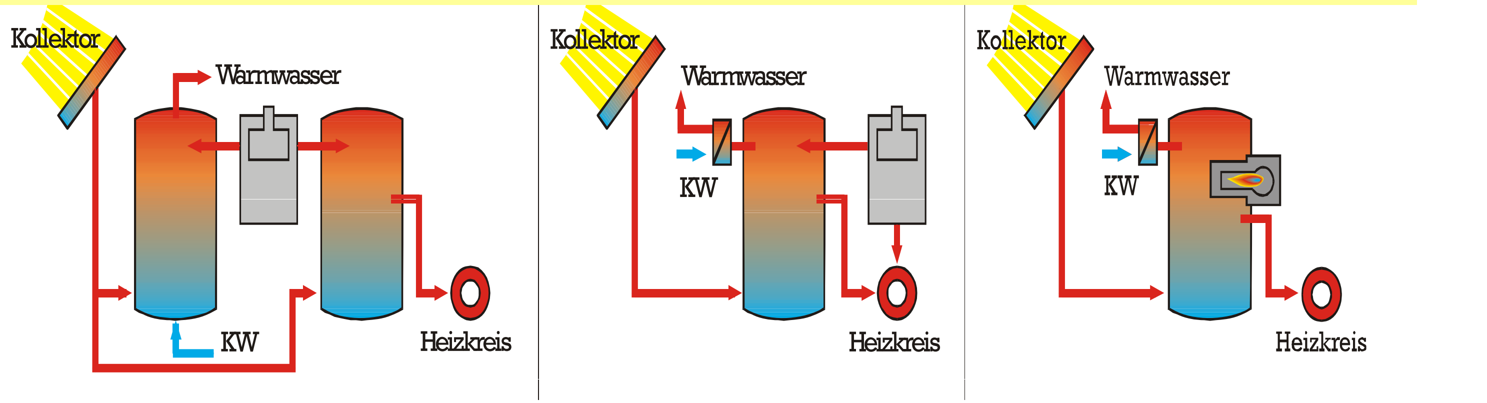
...to

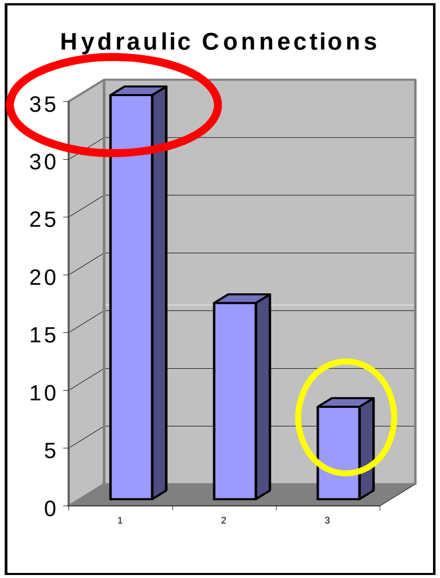
Compact

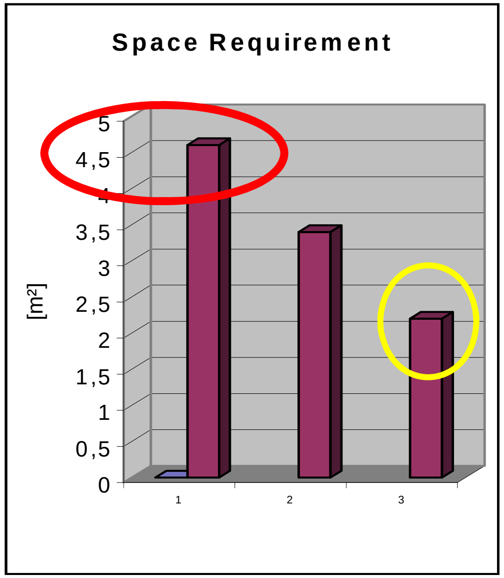
Products

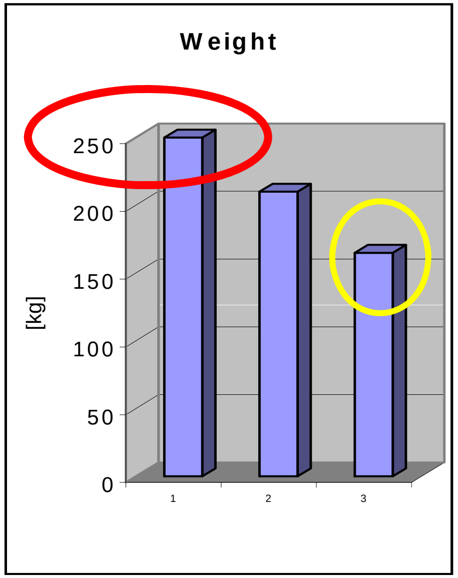
Solar Combisystems

Optimisation (SOLVIS)





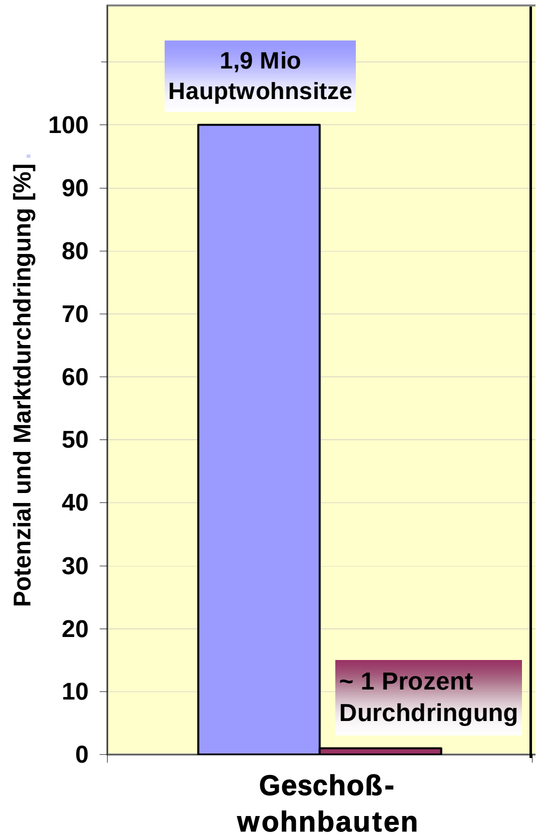




Solar Combisystems

MULTI FAMILY HOUSES

Market Penetration

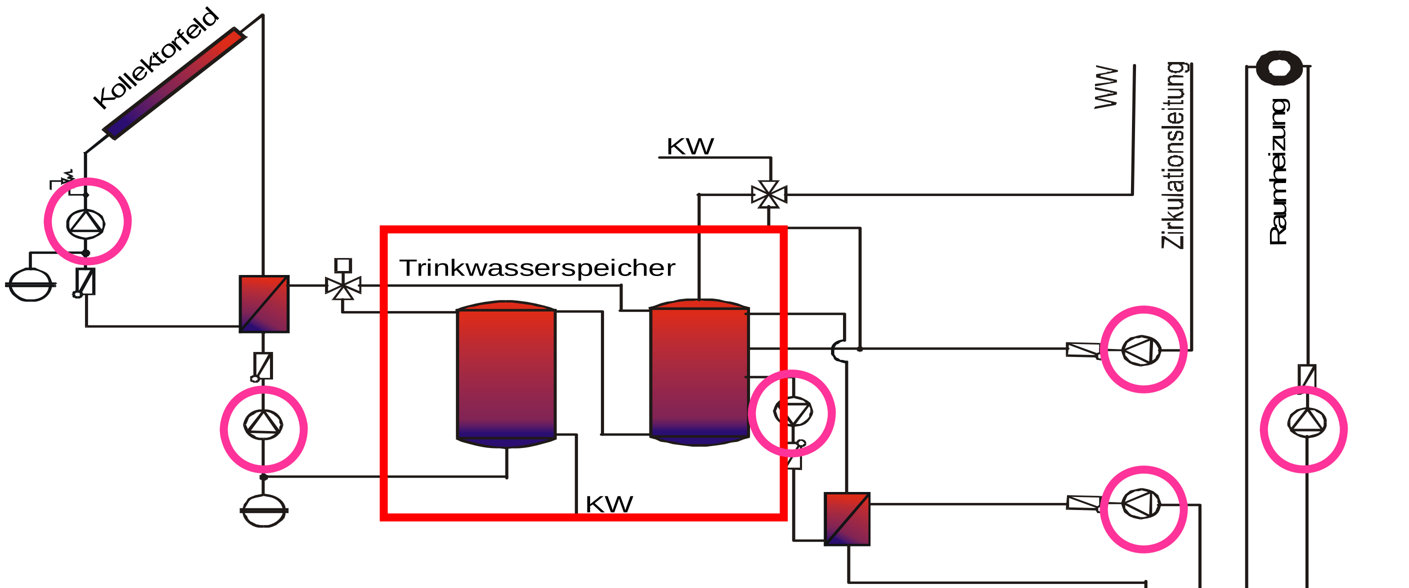


Solutions for Existing Buildings

Development of System Concepts

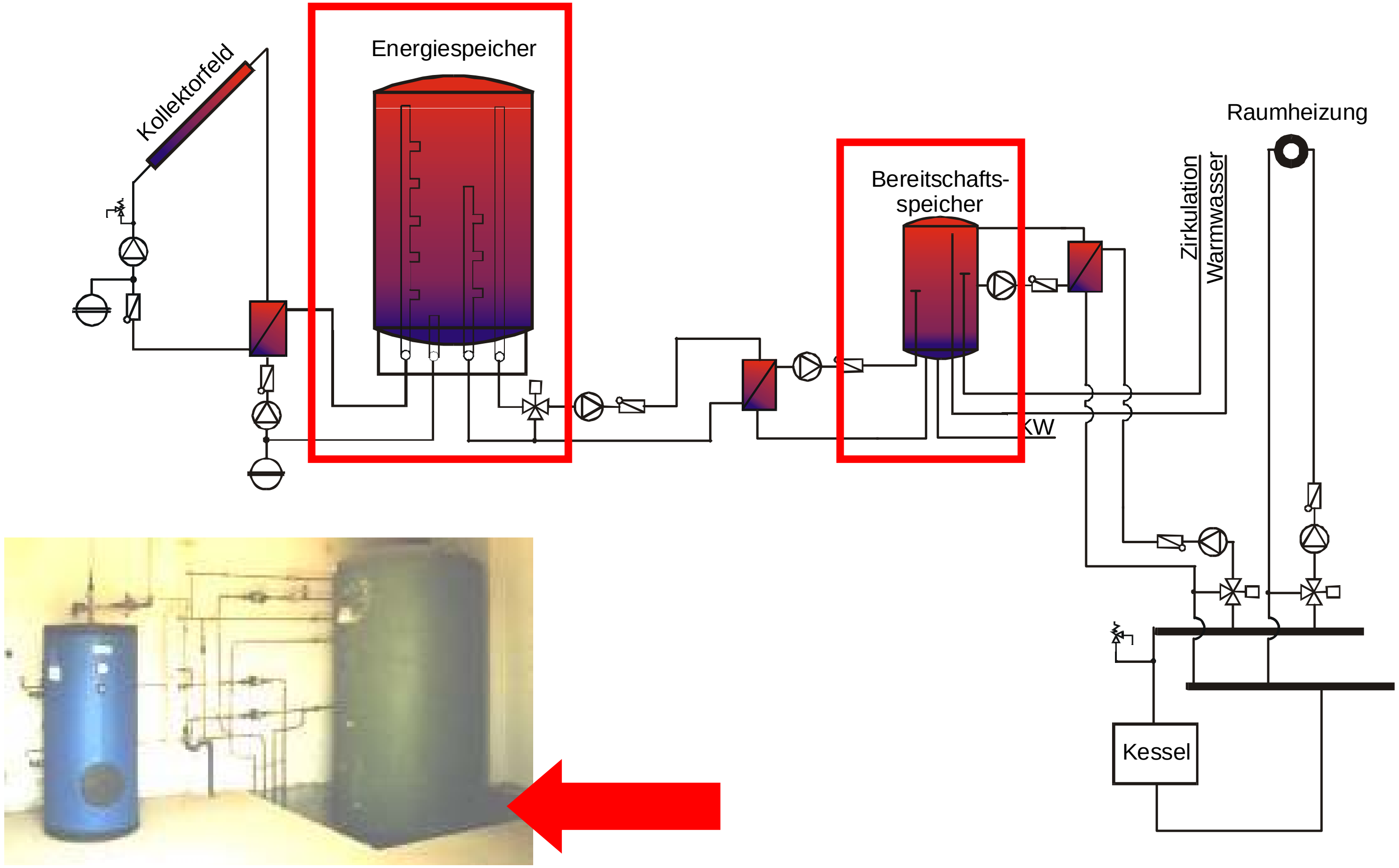
1st Generation - Solar Plant Concepts for MFH

(Concept for a small number of flats)

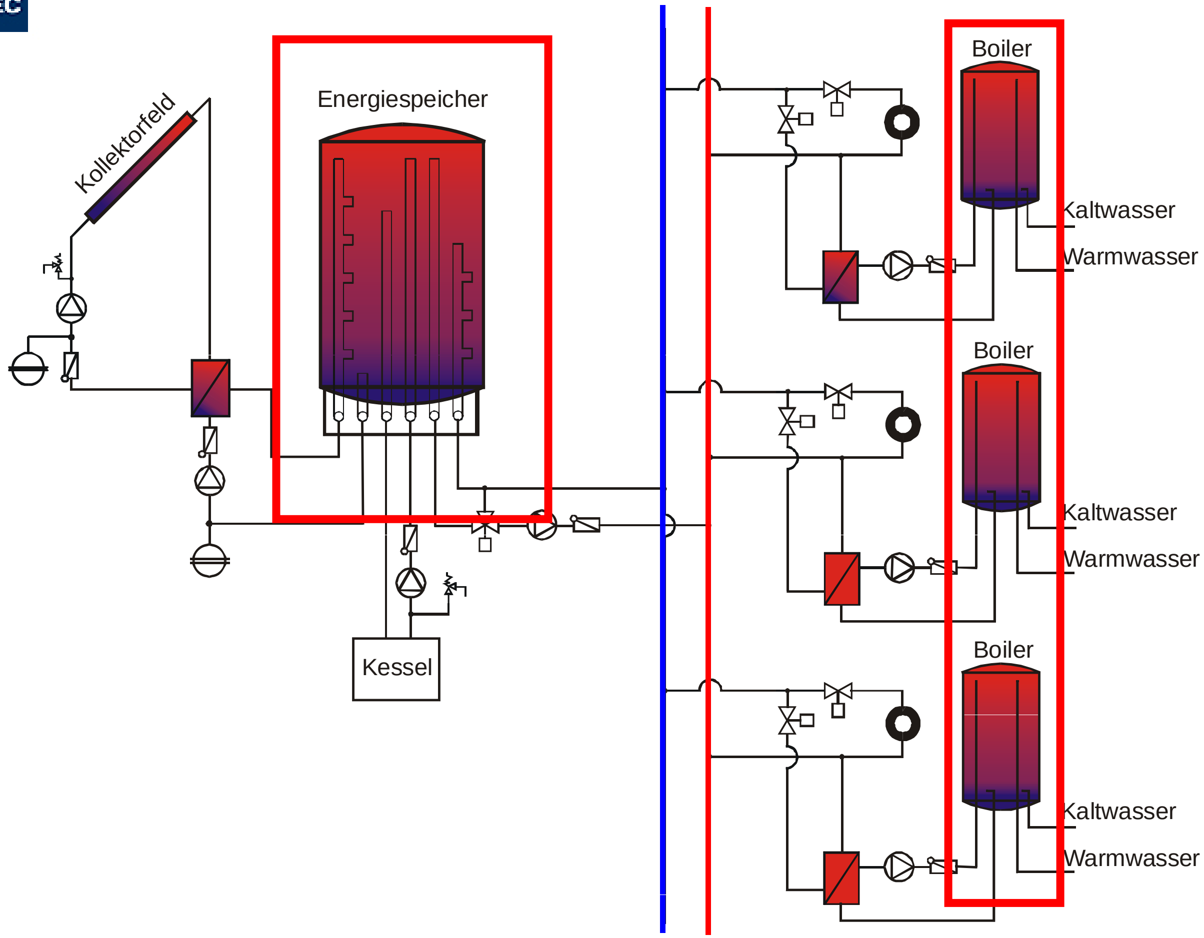


Development of System Concepts

2nd Generation - Solar Plant Concepts for MFH



3rd Generation - Solar Plant Concepts for MFH

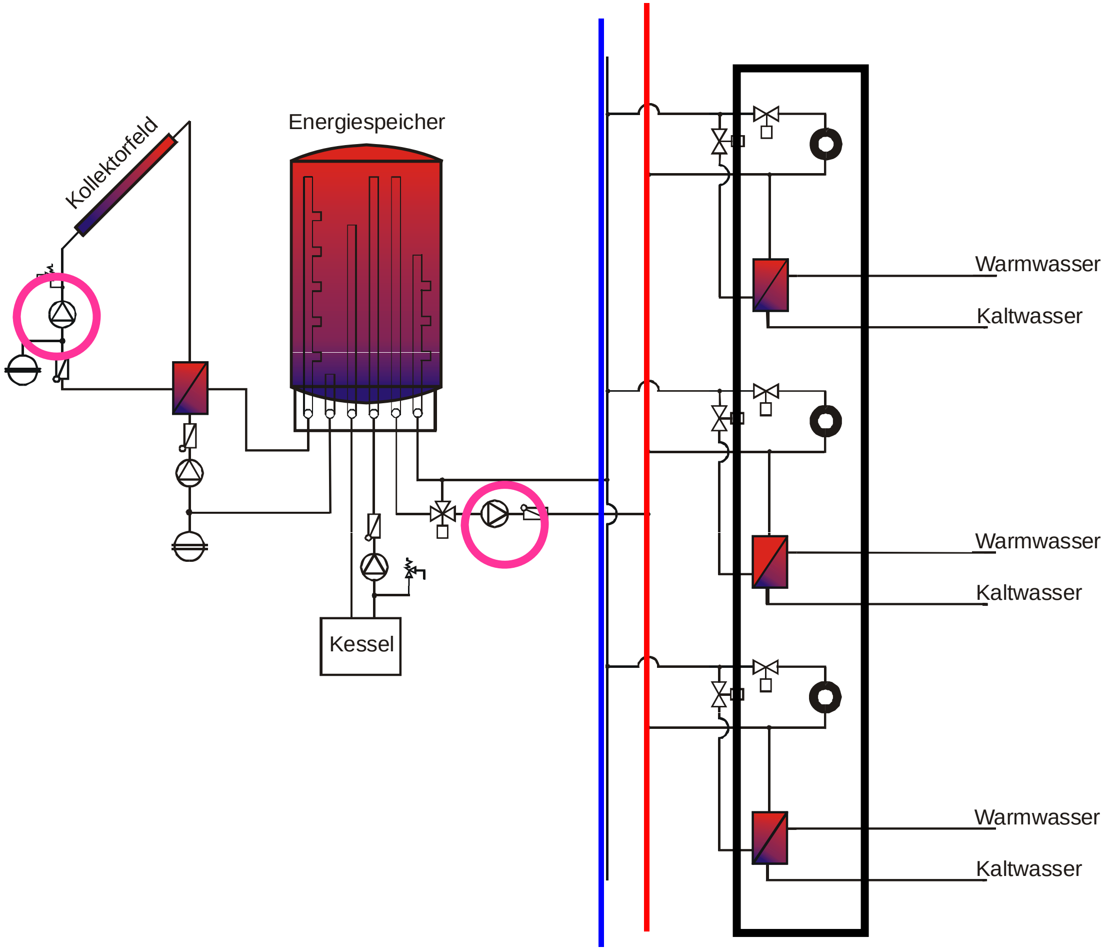


Heat distribution via 2-pipe network

Domestic hot water preparation via decentralised storage tanks

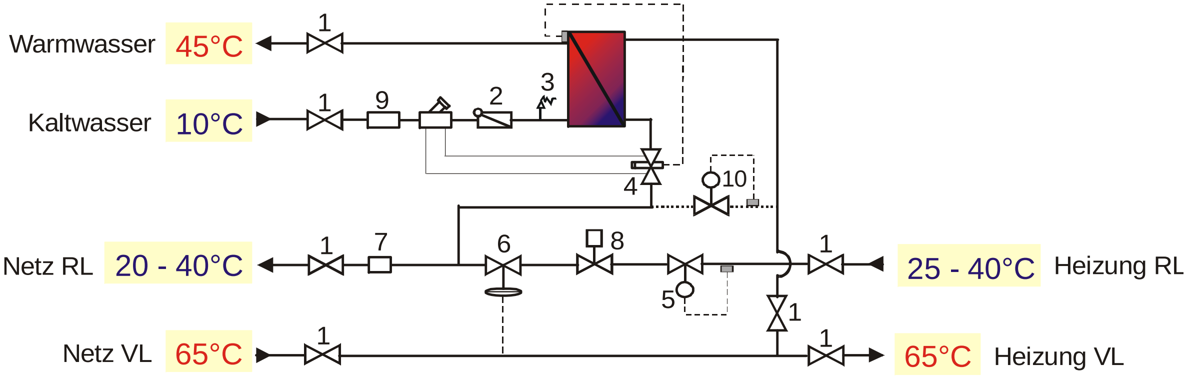
Preferred concept for row houses (low energy density)

3rd Generation - Solar Plant Concepts for MFH



- Heat distribution via a 2-pipe network
- Decentralised instant hot water preparation
- Concept for „high energy density) MFH

Compact Heat Distribution Units

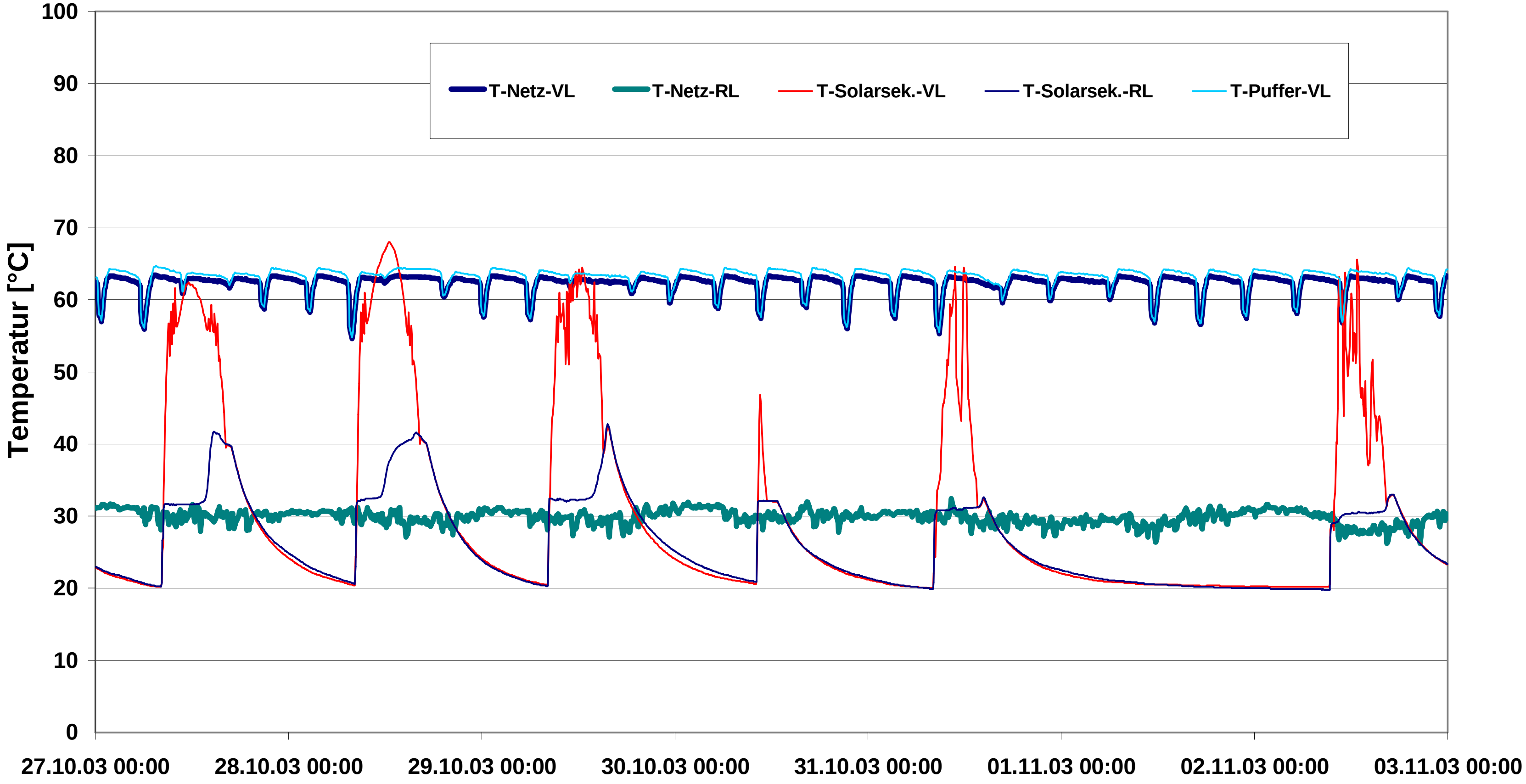


1 Absperrventil
2 Rückschlagklappe
3 Sicherheitsventil
4 Durchflussgesteuerter Temperaturregler
5 Rücklauftemperaturbegrenzer
6 Differenzdruckregler
7 Zählerpassstück
8 Zonenventil
9 Passstück Kaltwasser
10 Zirkulationsbrücke

Advantages of 2-pipe networks

Return flow nearly constant at 30°C

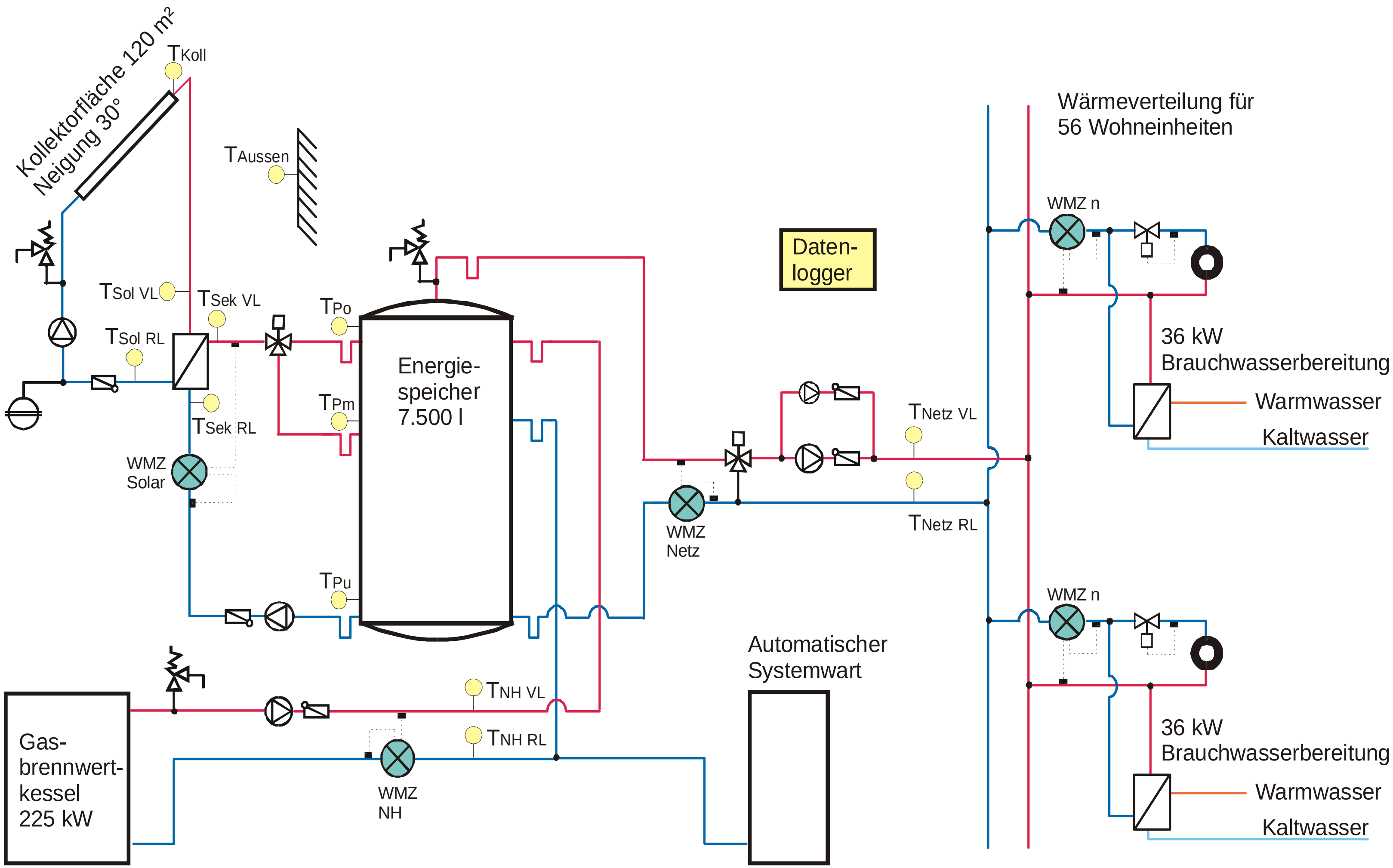
Ideal conditions for solar thermal systems



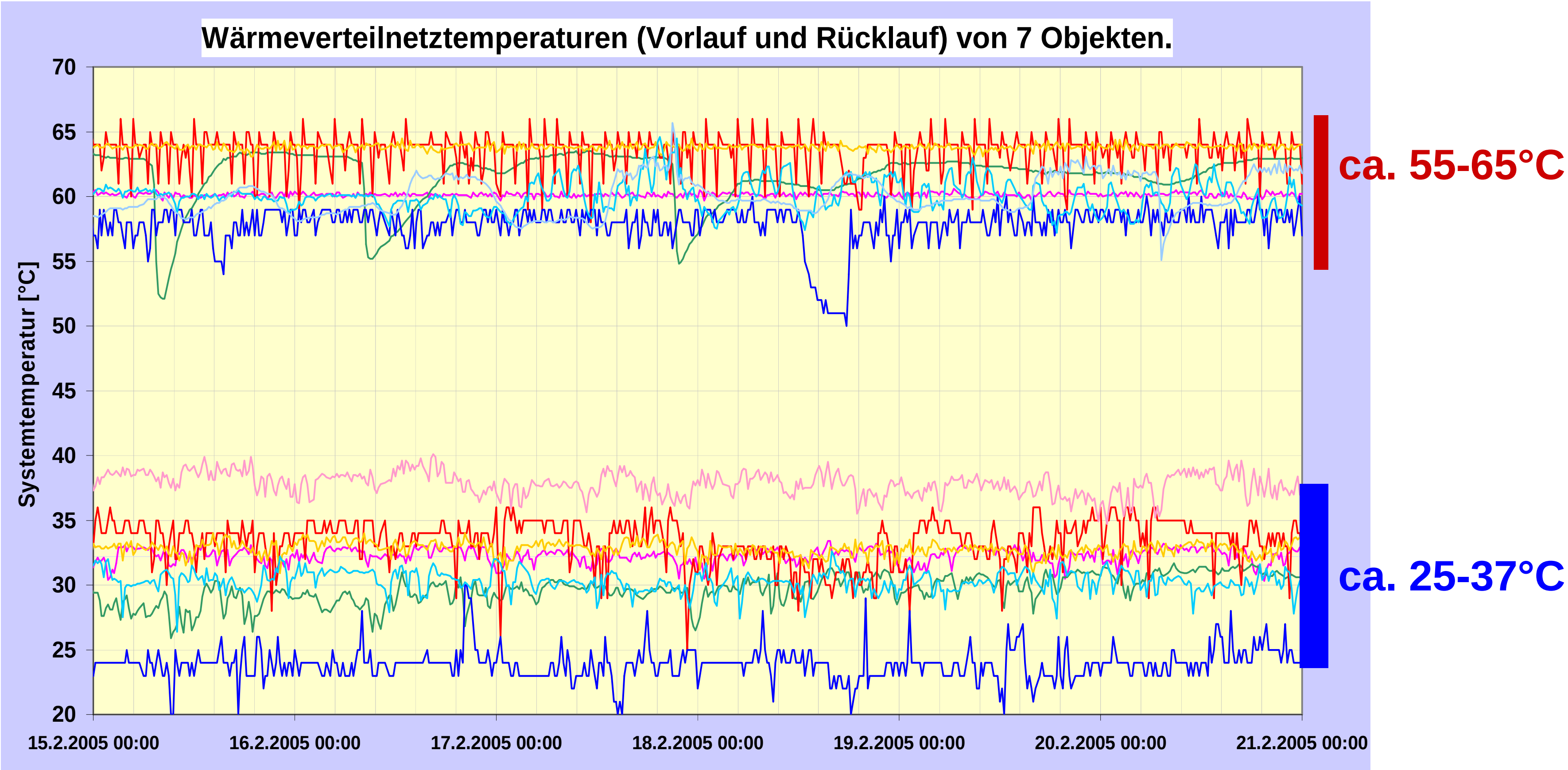
Advantages of 2 pipe concepts

- Distribution losses minimized
- Provides in all cases integration into the space heating system
- No problems concerning legionnaires disease
- Easy counting of delivered energy for each flat due to integrated heat meters
- Prefabricated heat transfer stations reduce the labour cost, easy and faultless installation

System Monitoring



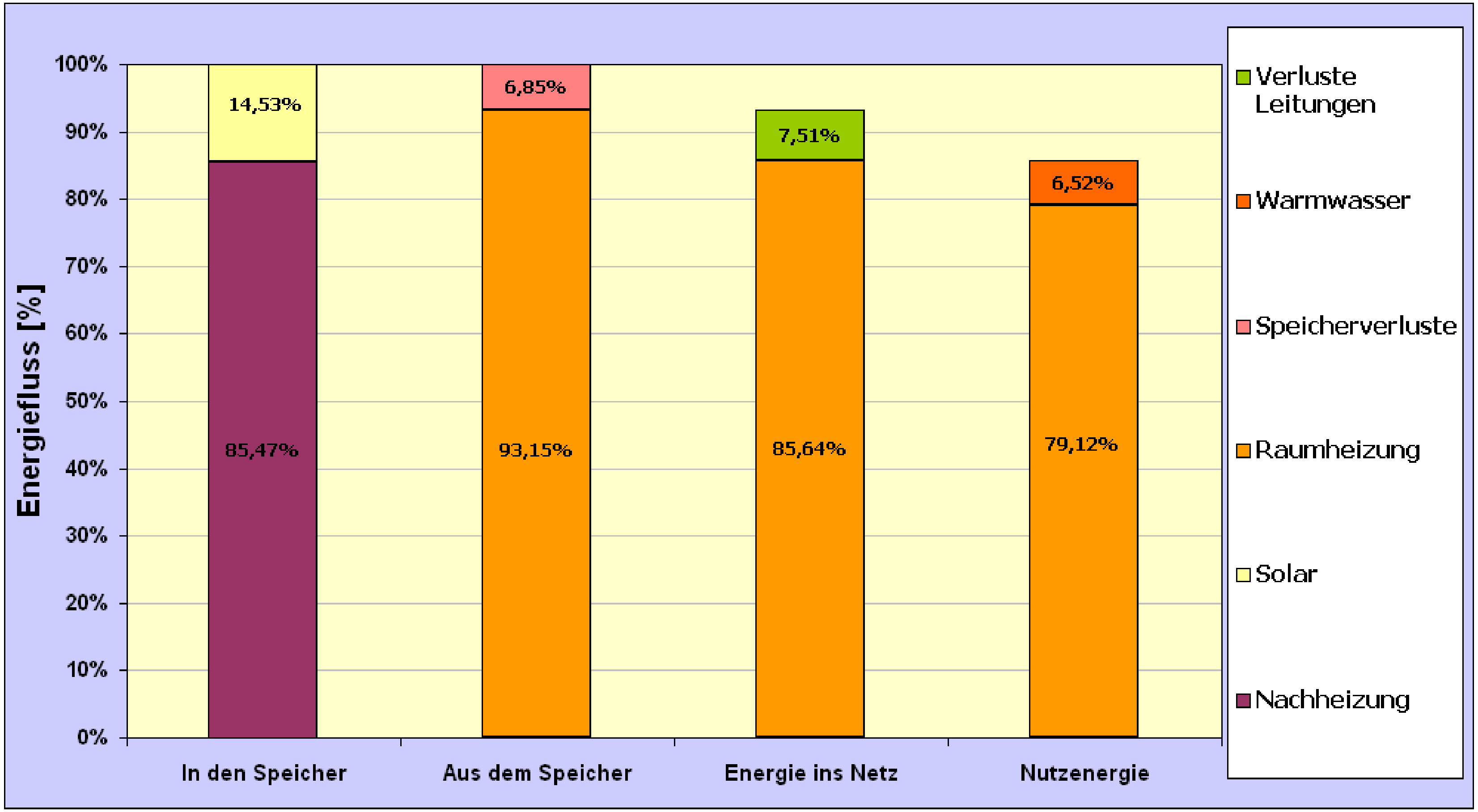
Flow and return temperatures



Low return temperatures of 30°C are necessary for an optimised operation of solar thermal systems

System Efficiency –
Annual system utilization

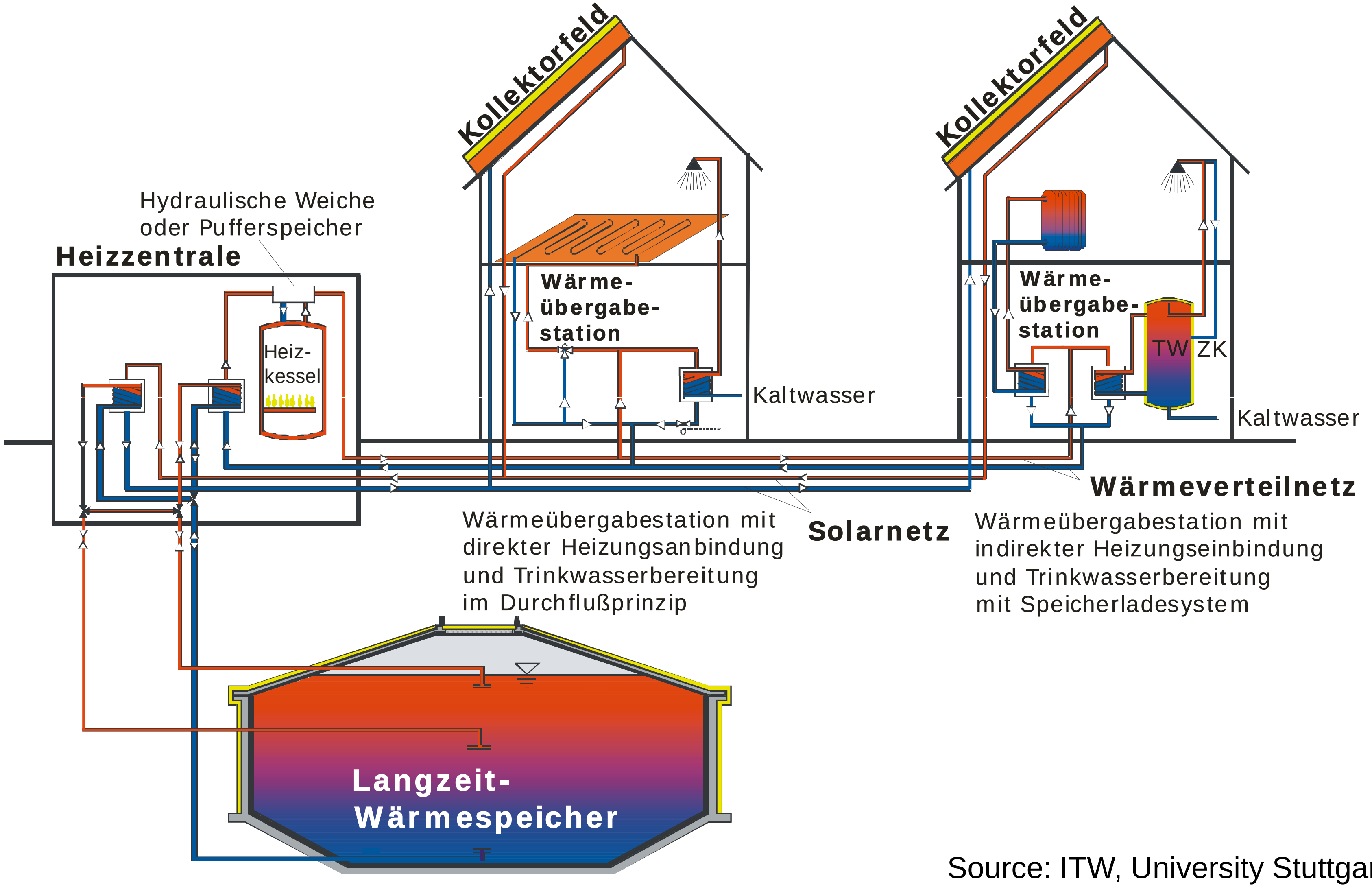
Ecellent system utilization between 80 and 90% are possible with 2-pipe networks!



Local District Heating – Hamburg, Germany

Local District Heating - Steinfurt-Borghorst, Germany

Local District Heating with Seasonal Storage



Source: ITW, University Stuttgart

Seasonal Heat Storages

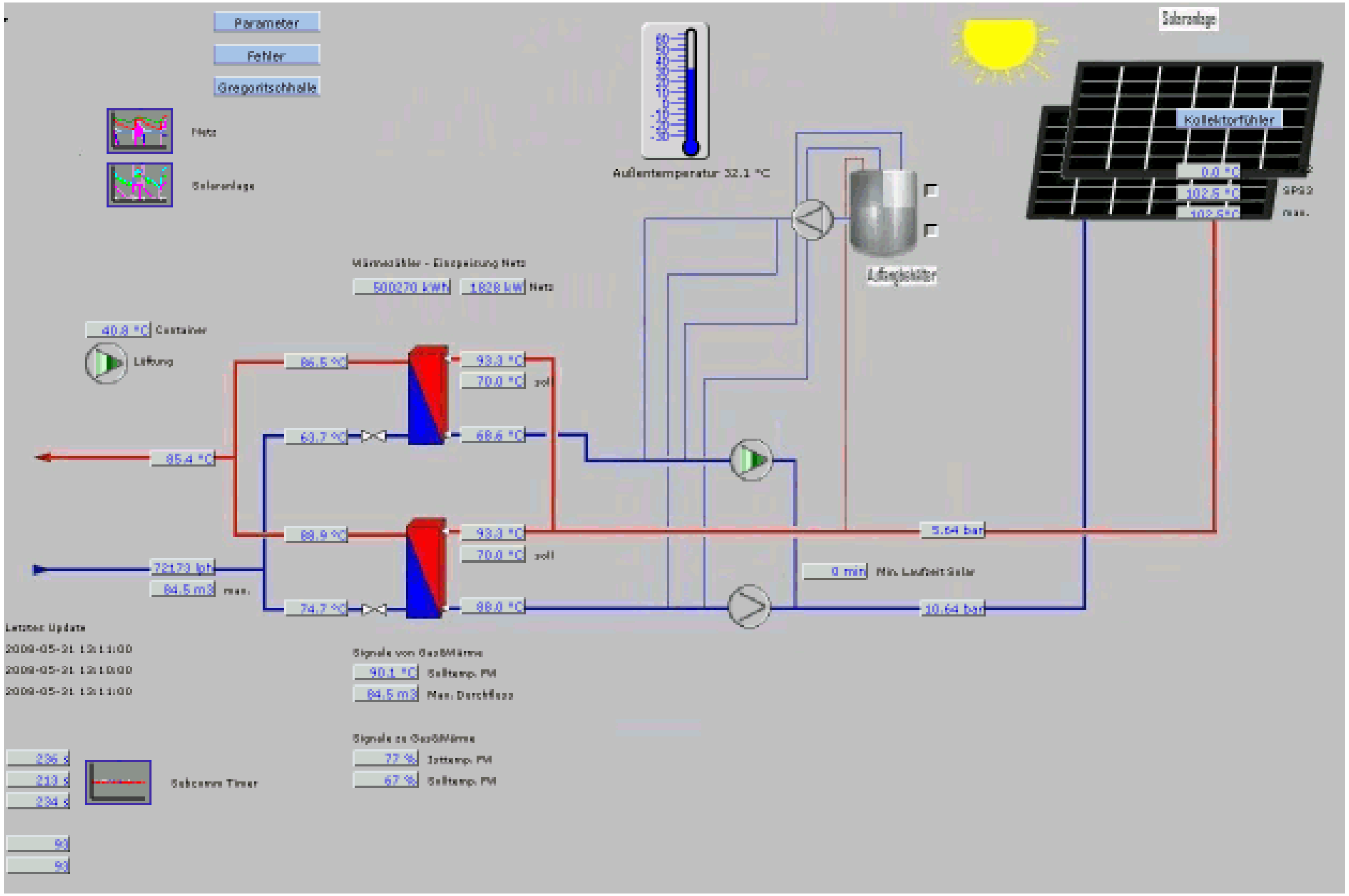
Heißwasser-Wärmespeicher

Kies-Wasser-Wärmespeicher

Erdsonden-Wärmespeicher

Aquifer-Wärmespeicher

District Heating – 1 MW_{th}, Graz



District Heating – 1 MW_{th}, Graz

District Heating – 3MW$_{th}$, AEVG, Graz, Austria

Solar District Heating – Marstal, DK – 13 MW_{th}

District Heating - Eibiswald

Solar assisted biomass district heating plant, Eibiswald with an installed capacity of 875 kW_{th}, (1250 m² collector array)