SYSTEM CONCEPTS AND APPLICATIONS

Werner Weiss

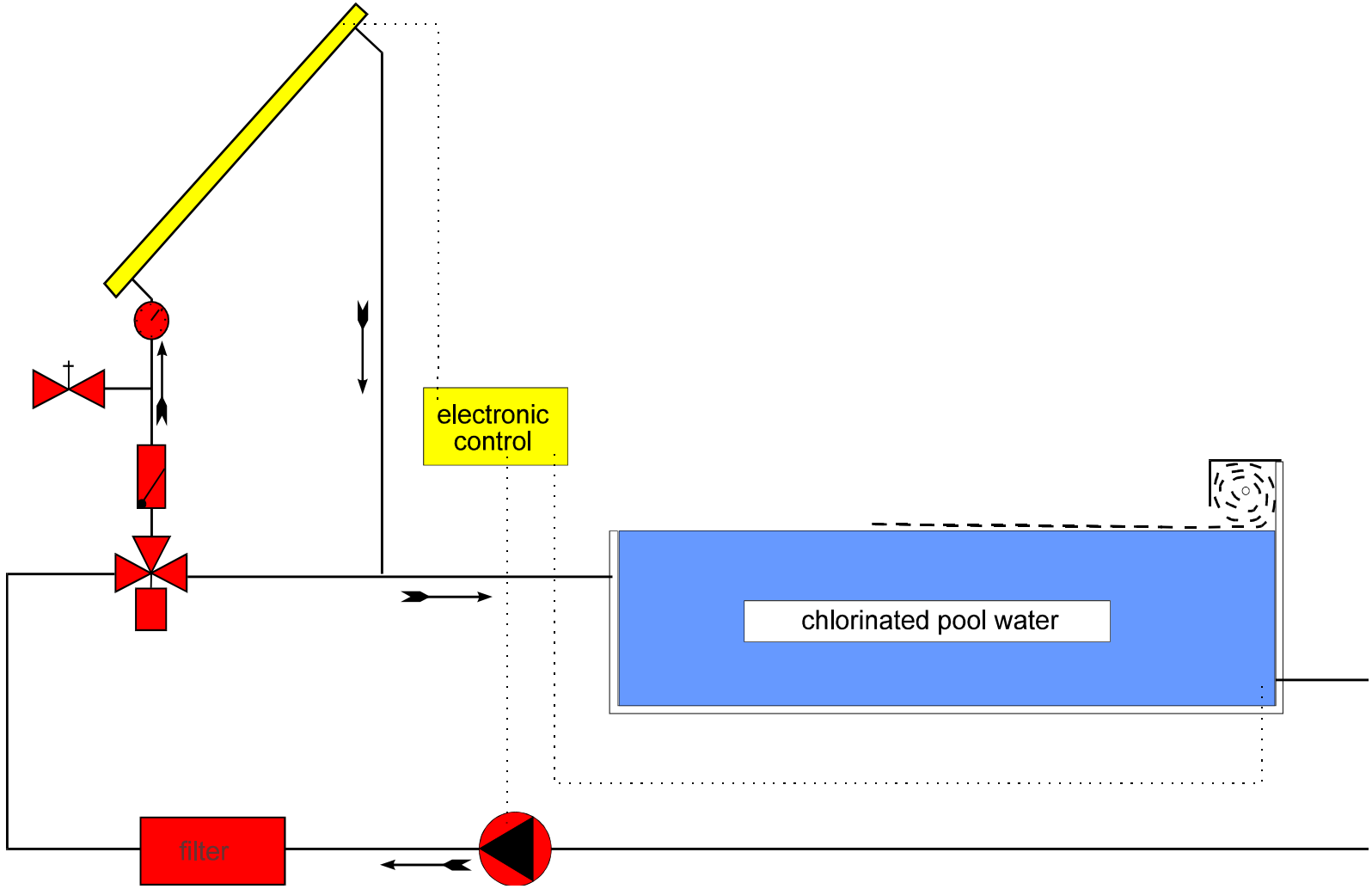
AEE - Institute for Sustainable Technologies (AEE INTEC)
A-8200 Gleisdorf, Feldgasse 19
AUSTRIA

PLASTIC ABSORBERS

financed by
Austrian
Development Cooperation

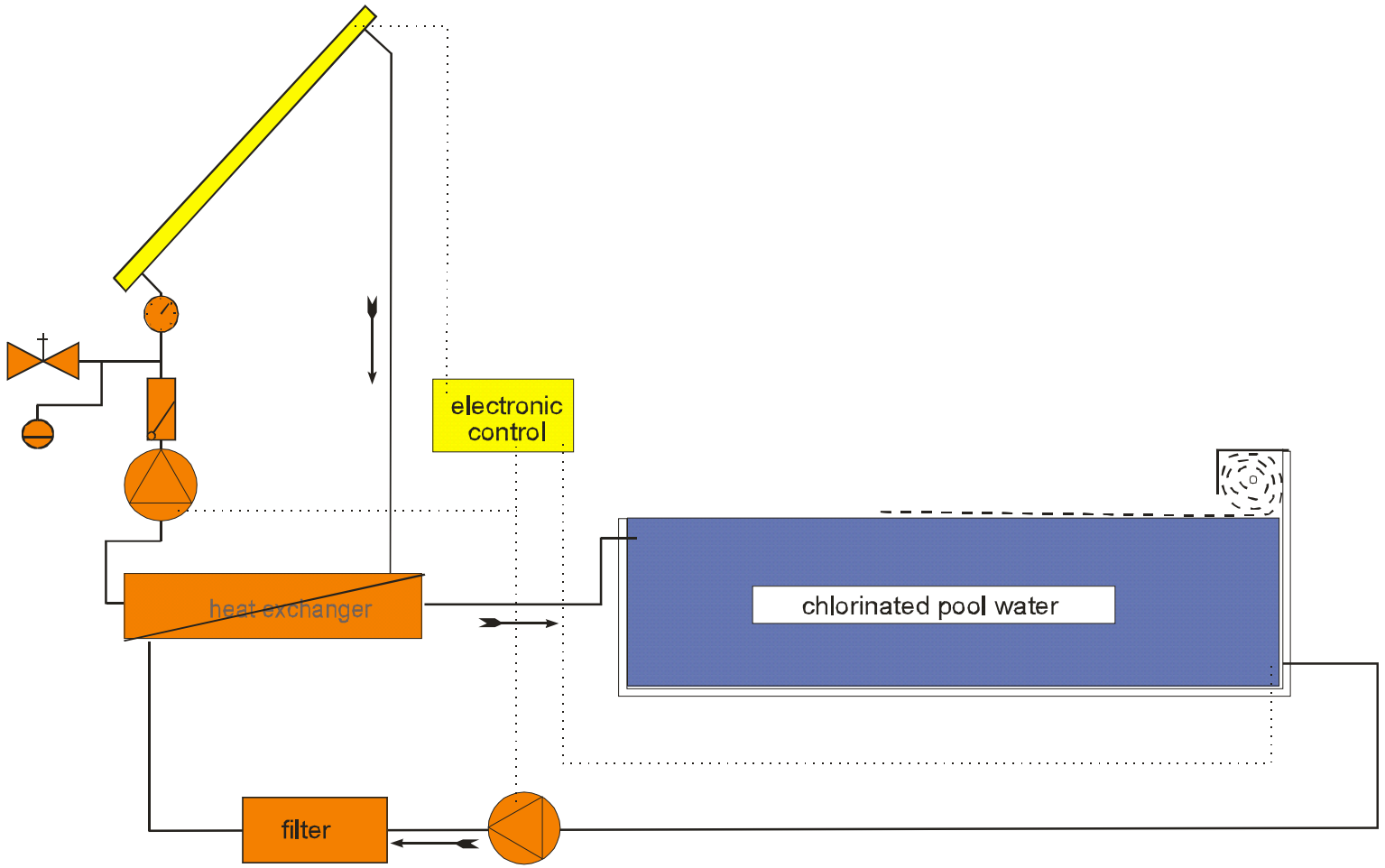
SWIMMING POOL SYSTEM

financed by
Austrian
Development Cooperation



SWIMMING POOL SYSTEM

financed by
Austrian
Development Cooperation



SWIMMING POOL SYSTEM

financed by
Austrian
Development Cooperation

The energy demand of an outdoor pool is mostly influenced by the water temperature.

The largest losses are the surface of the pools.

That is the reason why the size of the absorber area is given as a proportion of the total water surface area.

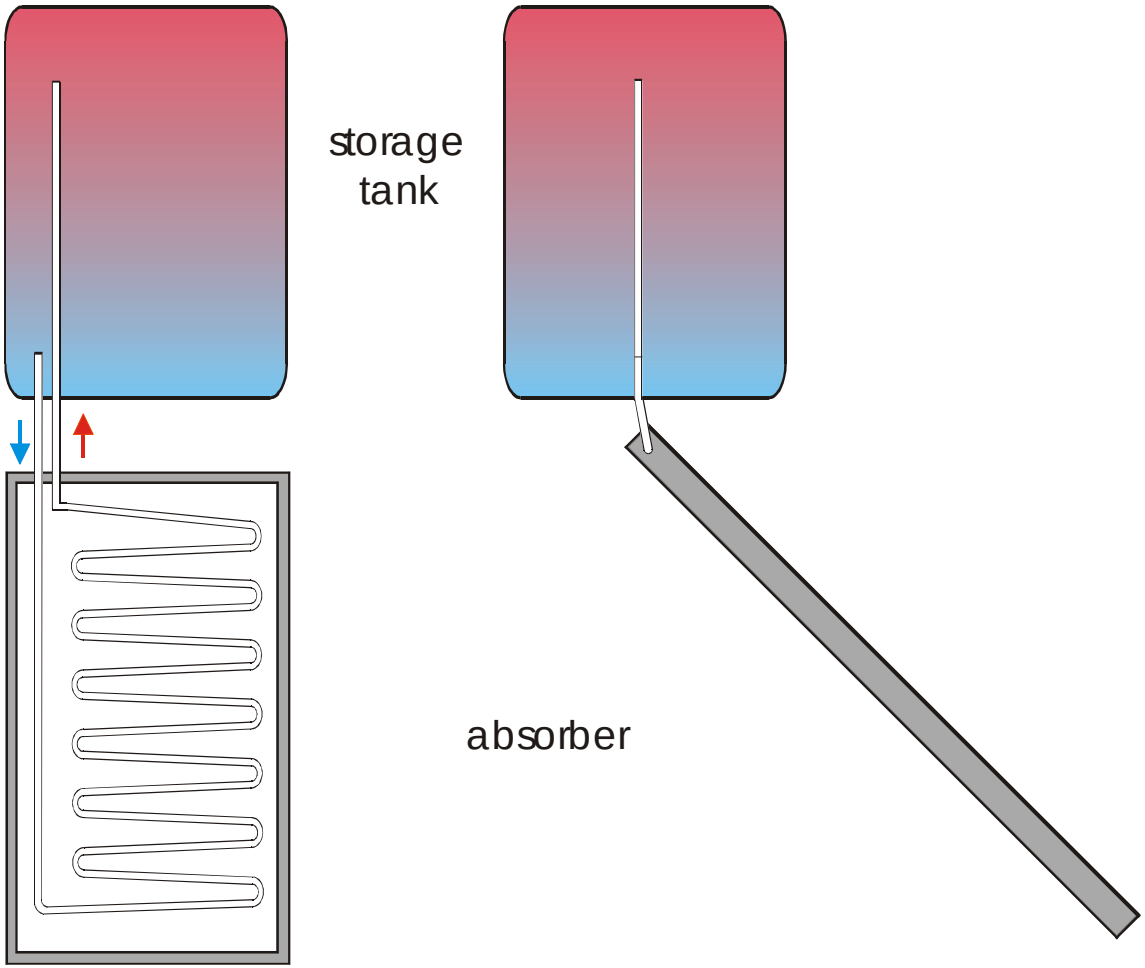
As a rule of thumb, this should be between 80 and 100% of the pool area for weather conditions in central Europe.

Thermosyphon Systems for Hot Water Preparation

financed by Austrian Development Cooperation

Thermosyphon Systems for Hot Water Preparation

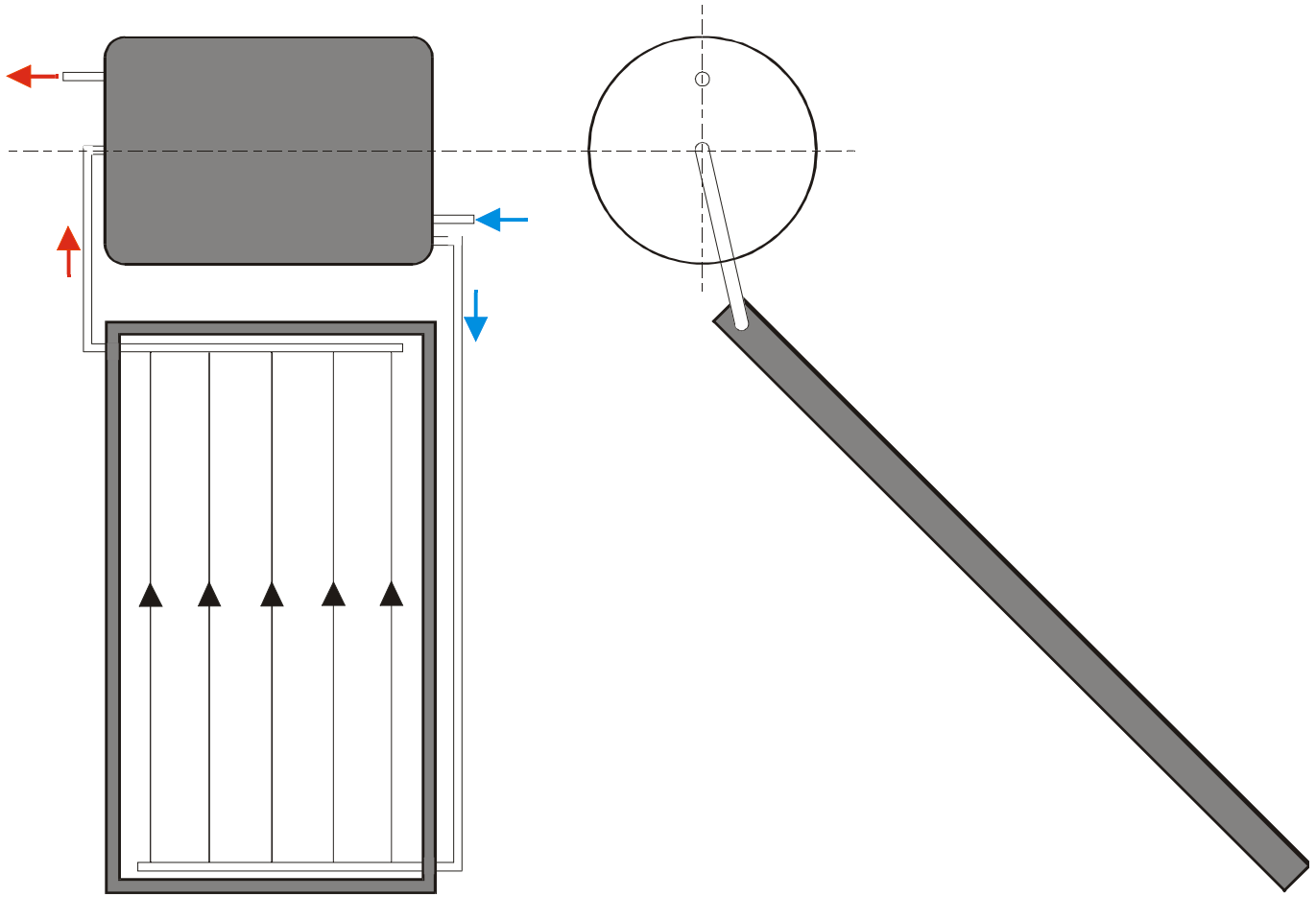
financed by
Austrian
Development Cooperation



Thermosyphon Systems for Hot Water Preparation

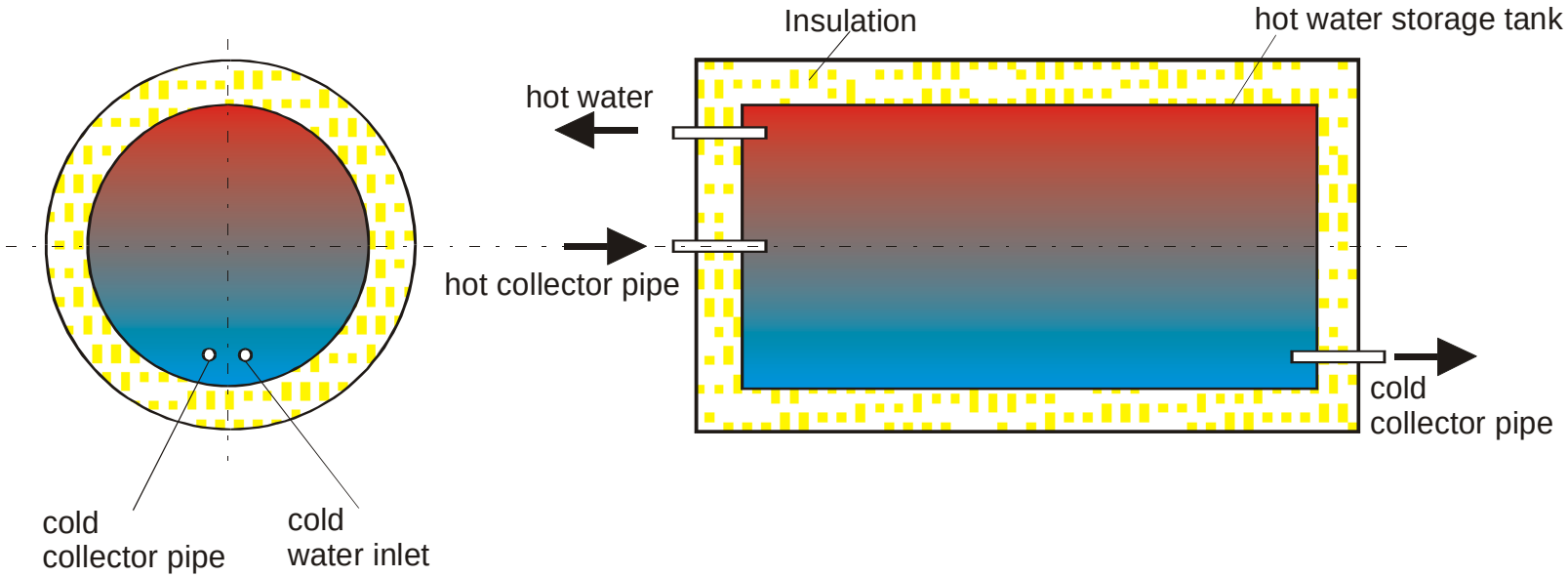
financed by Austrian Development Cooperation

Direct system, horizontal storage tank



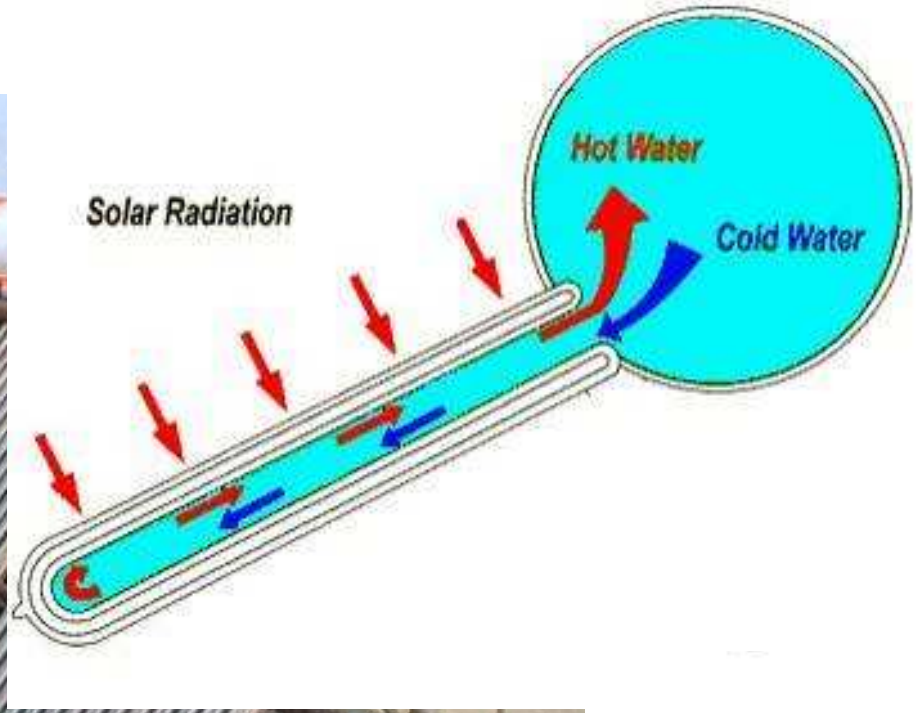
Thermosyphon Systems for Hot Water Preparation

financed by Austrian Development Cooperation



THERMOSYPHON SYSTEM - China

financed by
Austrian
Development Cooperation

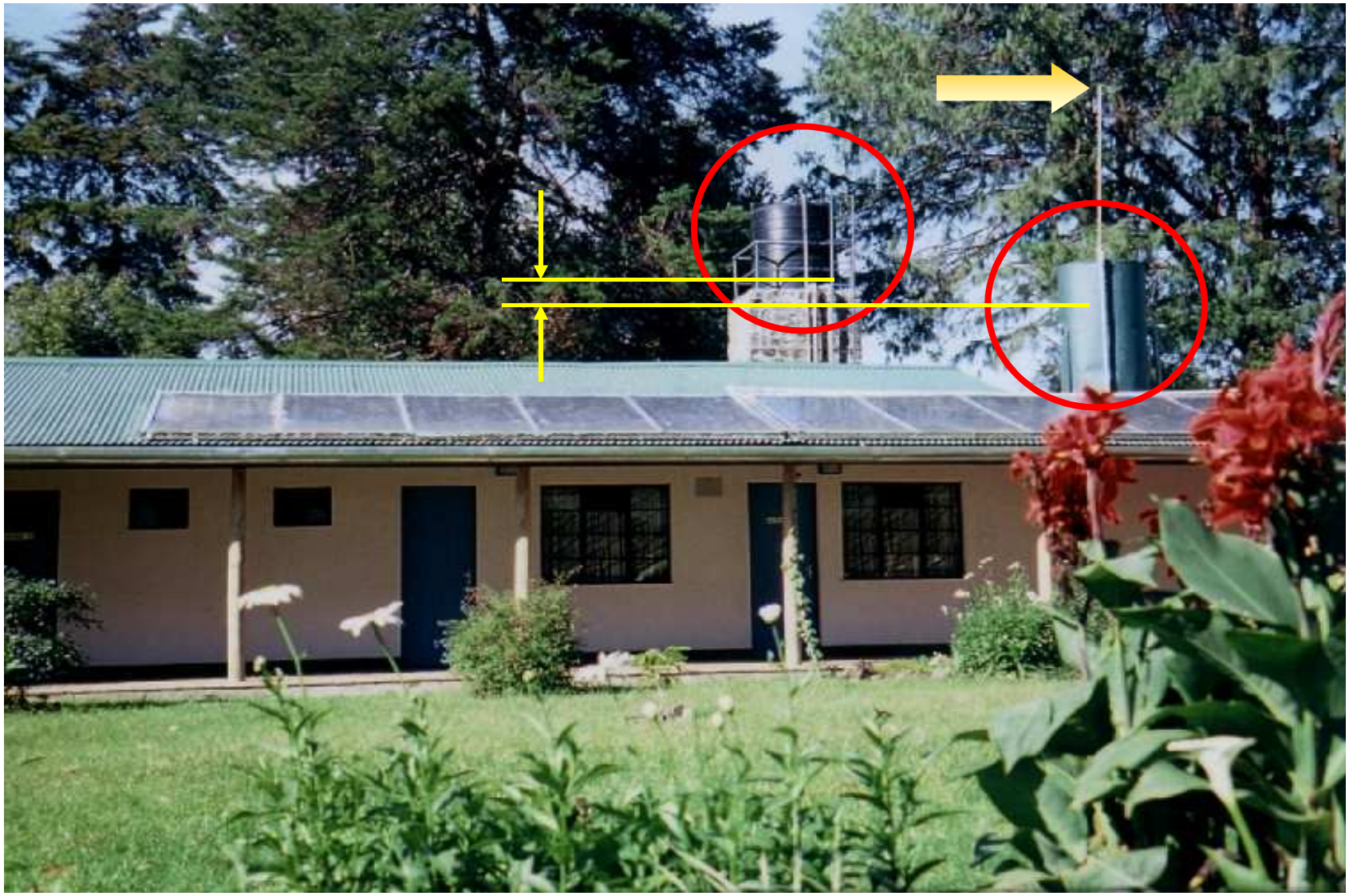


THERMOSYPHON SYSTEMS

financed by
Austrian
Development Cooperation

Non pressurized storage tanks

financed by
Austrian
Development Cooperation



THERMOSYPHON SYSTEMS

financed by
Austrian
Development Cooperation

Water conditions suitable or open circle systems

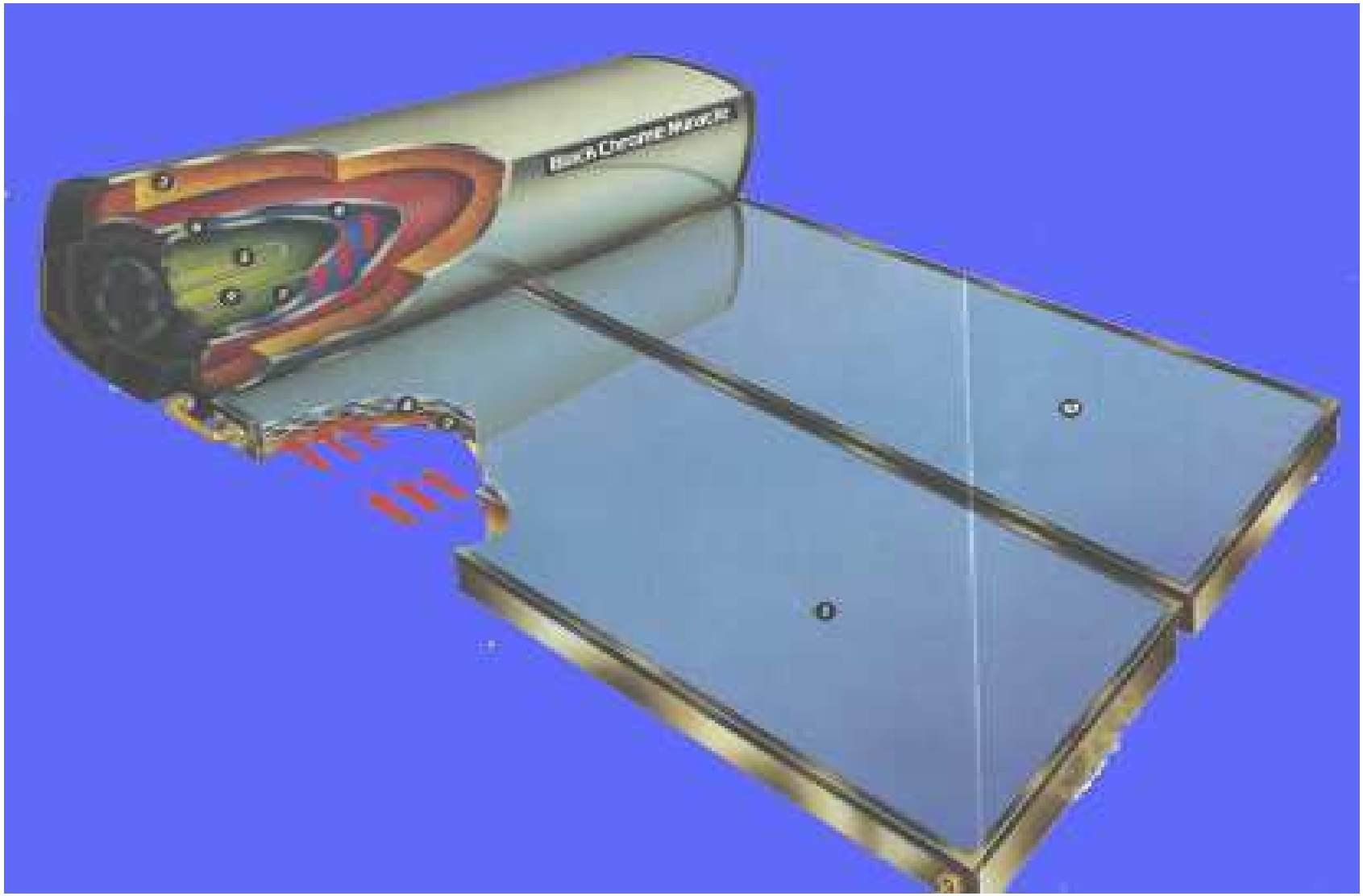
financed by Austrian Development Cooperation

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

financed by
Austrian
Development Cooperation

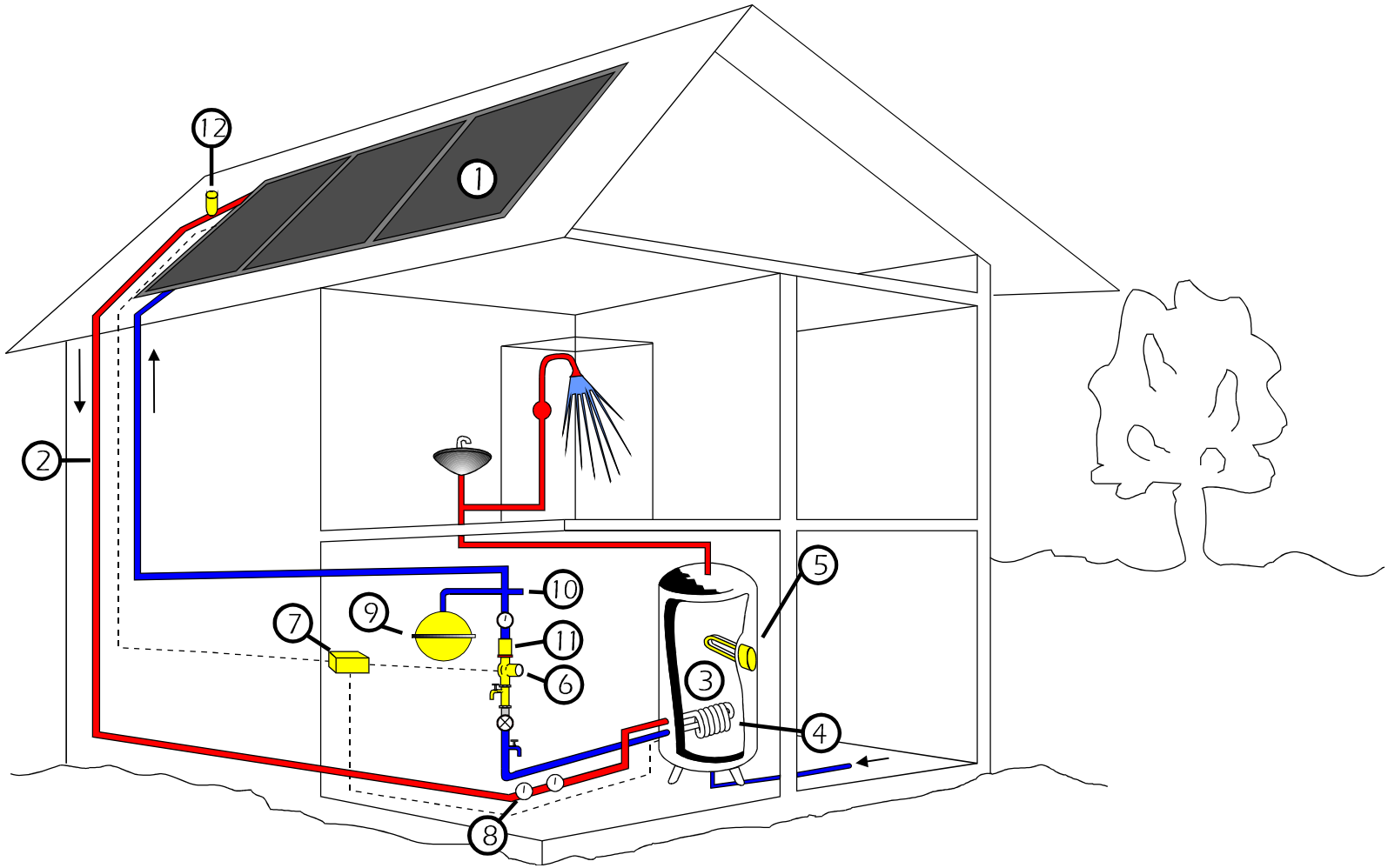


Domestic Hot Water System with Forced Circulation

financed by
Austrian Development Cooperation

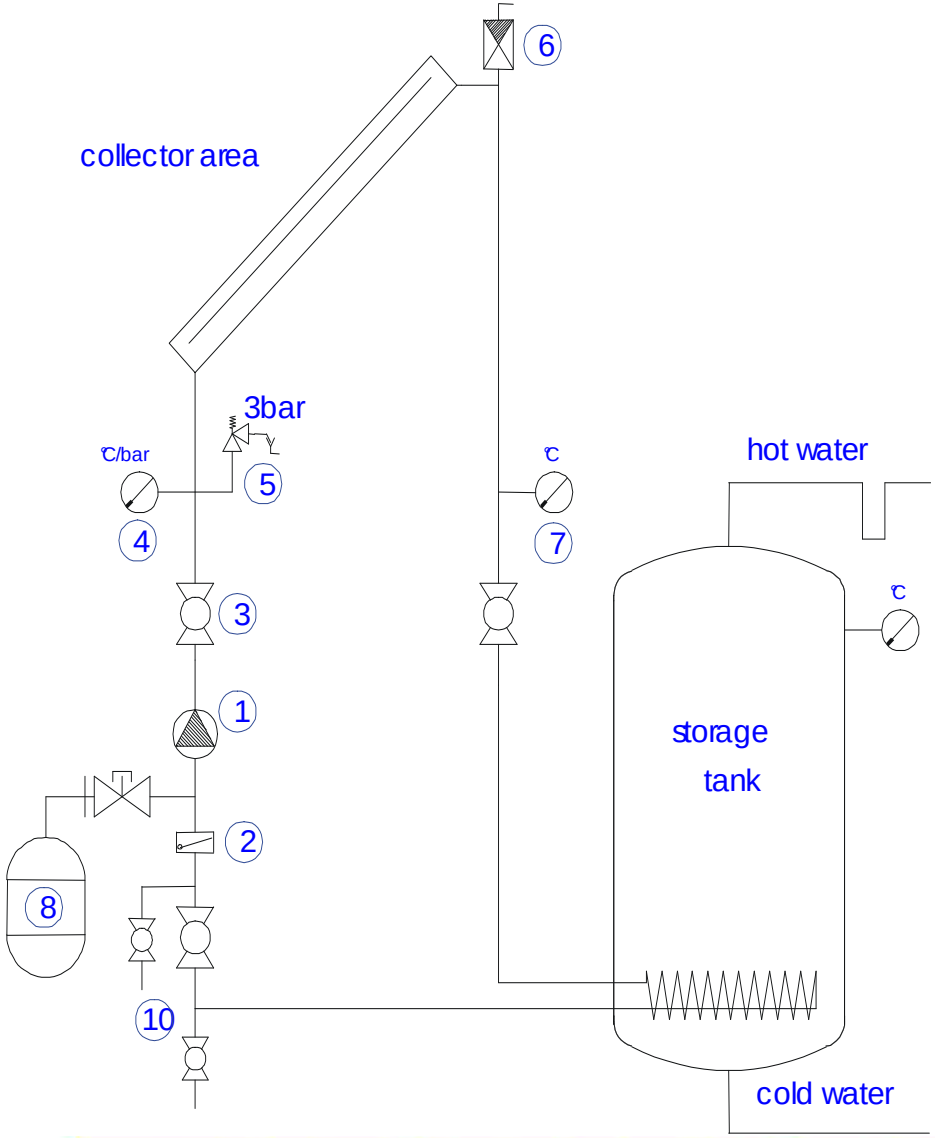
Domestic Hot Water System with Forced Circulation

financed by
Austrian Development Cooperation



HYDRAULIC SCHEME OF A SOLAR HOT WATER SYSTEM

financed by Austrian Development Cooperation



1. circulation pump
2. gravity brake
3. lock valve
4. thermometer and pressure gauge
5. pressure relief valve
6. escape valve
7. thermometer
8. expansion tank
9. fill and empty valve

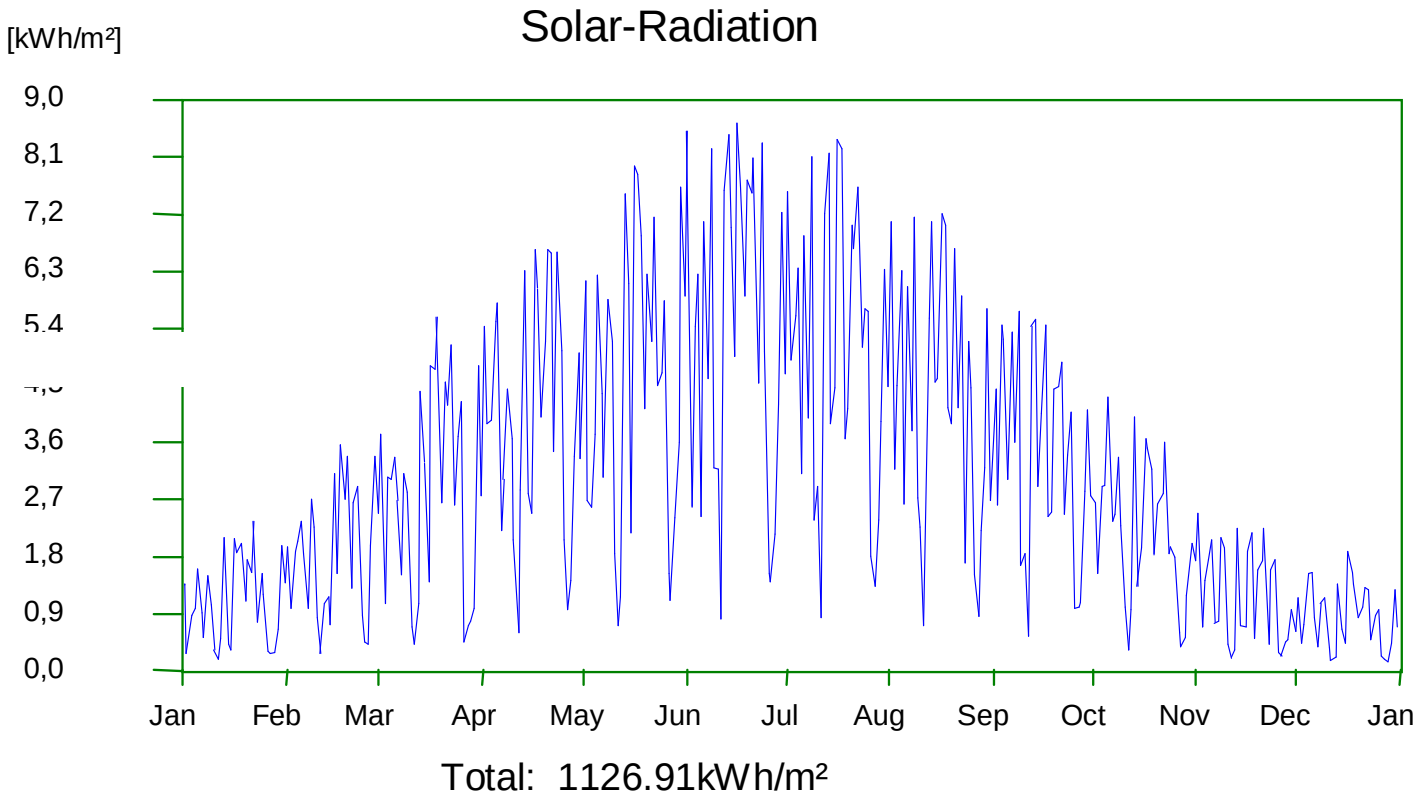
Solar Combisystems

financed by
Austrian
Development Cooperation

Preconditions and Requirements

Solar Combisystems

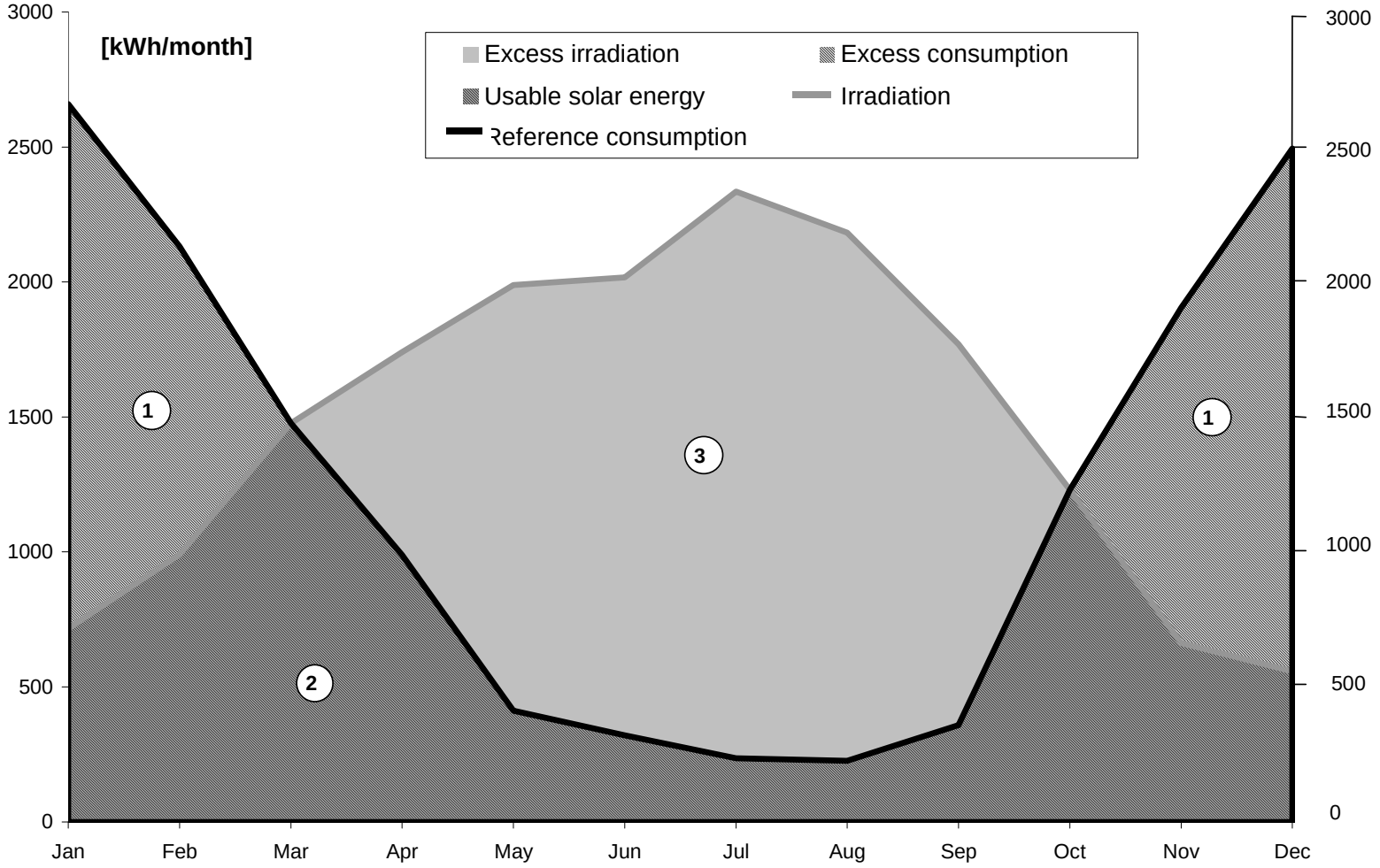
financed by
Austrian
Development Cooperation



Total: 1126.91kWh/m²

Solar Combisystems

financed by
Austrian
Development Cooperation



Space Heating

Flow temperature: 30 - 50 ℃
Return temperature: 20 - 40 ℃

Demand:

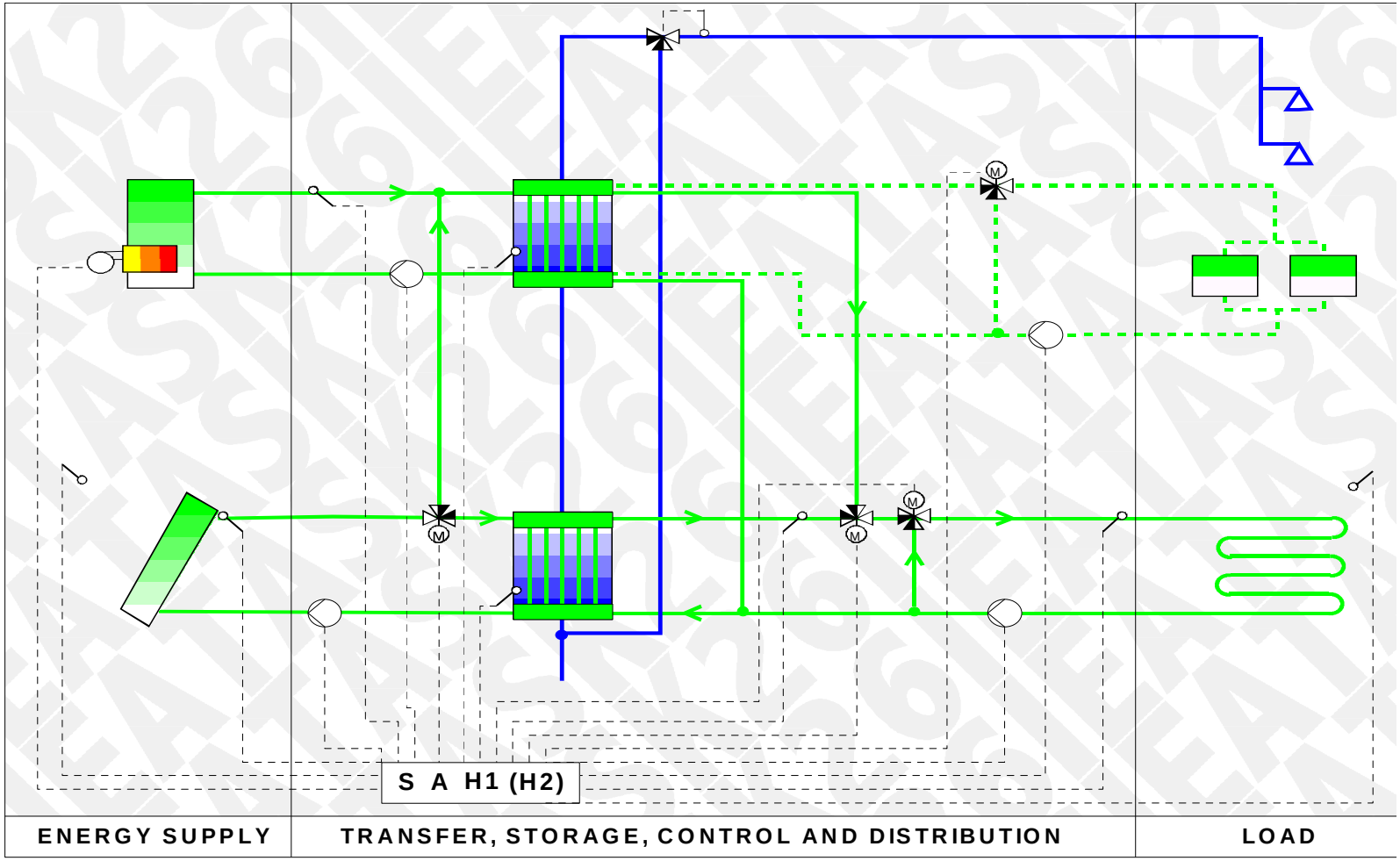
- is not always corresponding to the solar irradiation

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

Solar Combisystems

financed by Austrian Development Cooperation

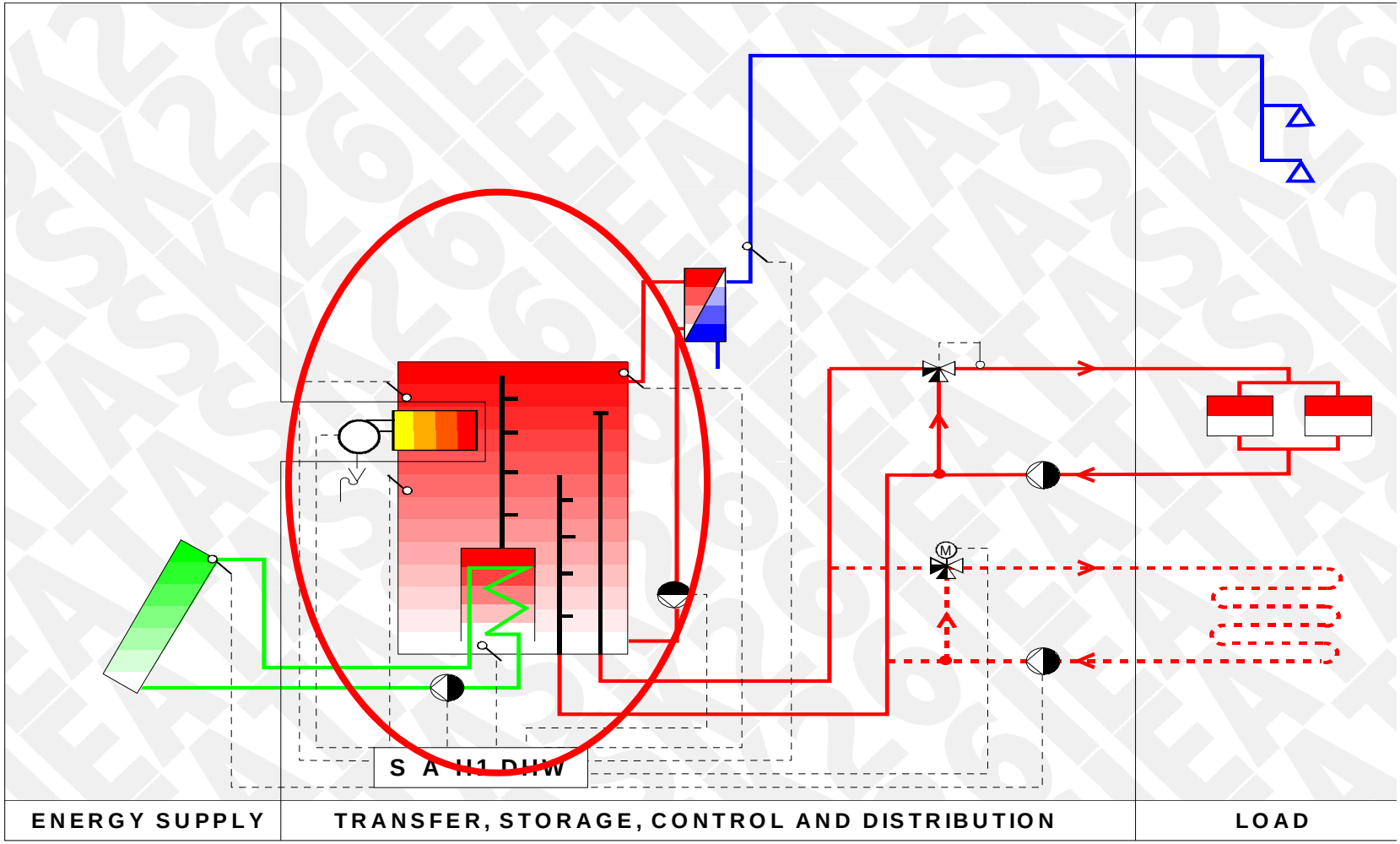
System using the thermal mass of the building to store the heat



Solar Combisystems

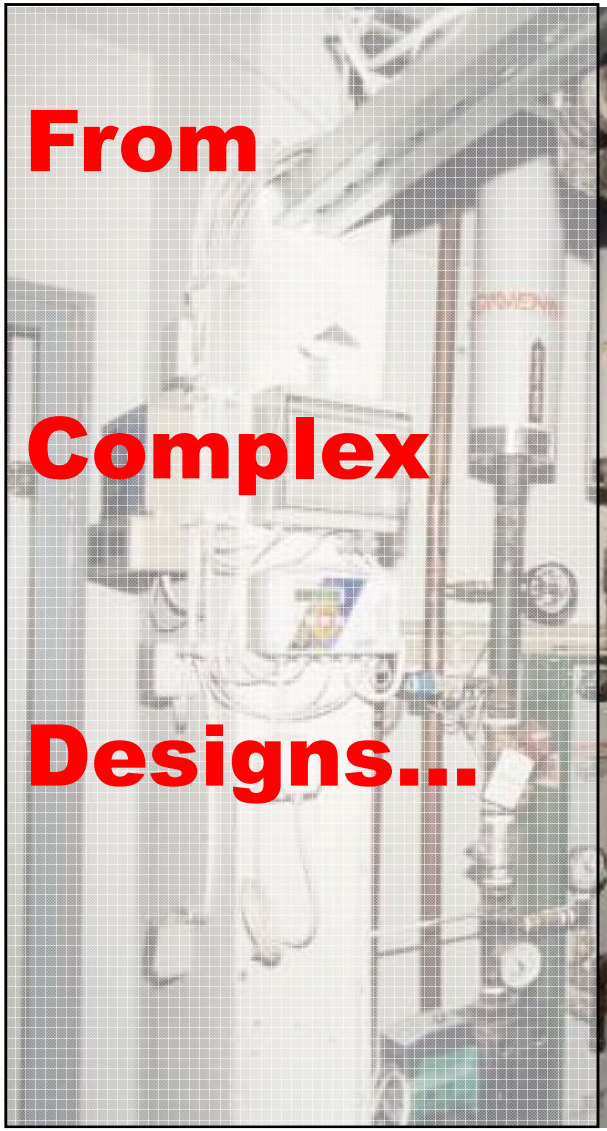
financed by Austrian Development Cooperation

Using the space heating store to store the heat



Solar Combisystems

financed by
Austrian
Development Cooperation



Solar Combisystems

financed by
Austrian
Development Cooperation

...to

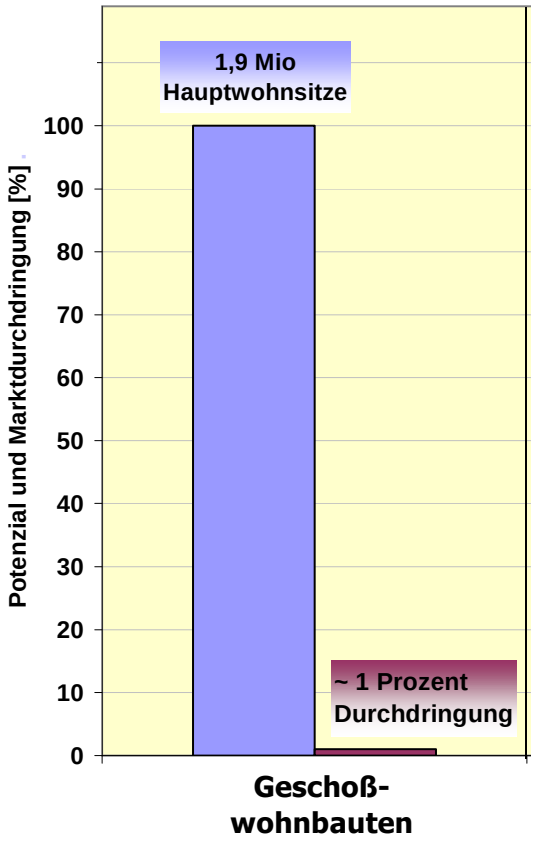
Compact

Products

Solar Combisystems

financed by
Austrian
Development Cooperation

Multi Family Houses Market Penetration



Solutions for Existing Buildings

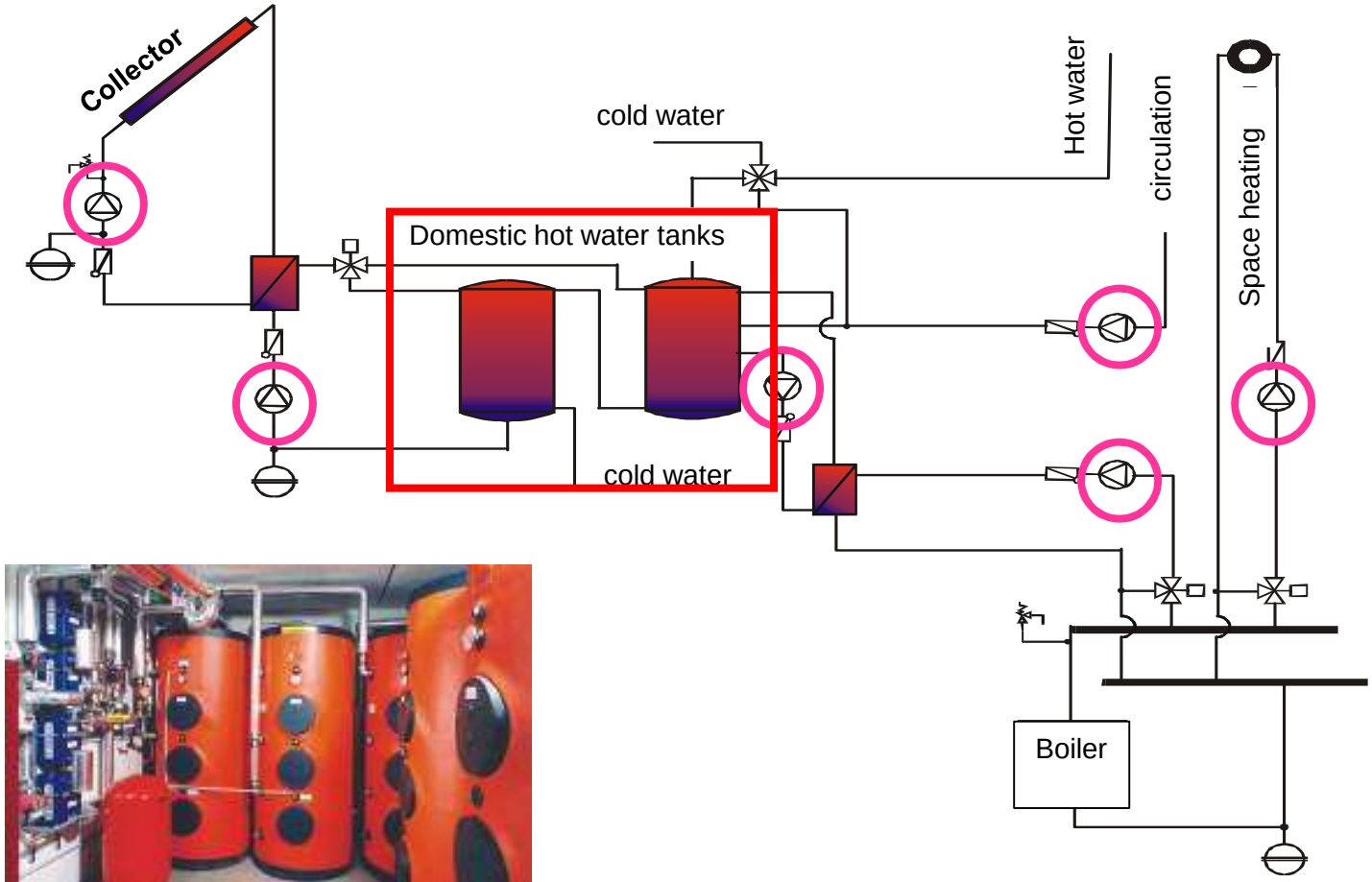
financed by
Austrian
Development Cooperation

financed by
Austrian
Development Cooperation

Development of System Concepts

1st Generation - Solar Plant Concepts for MFH

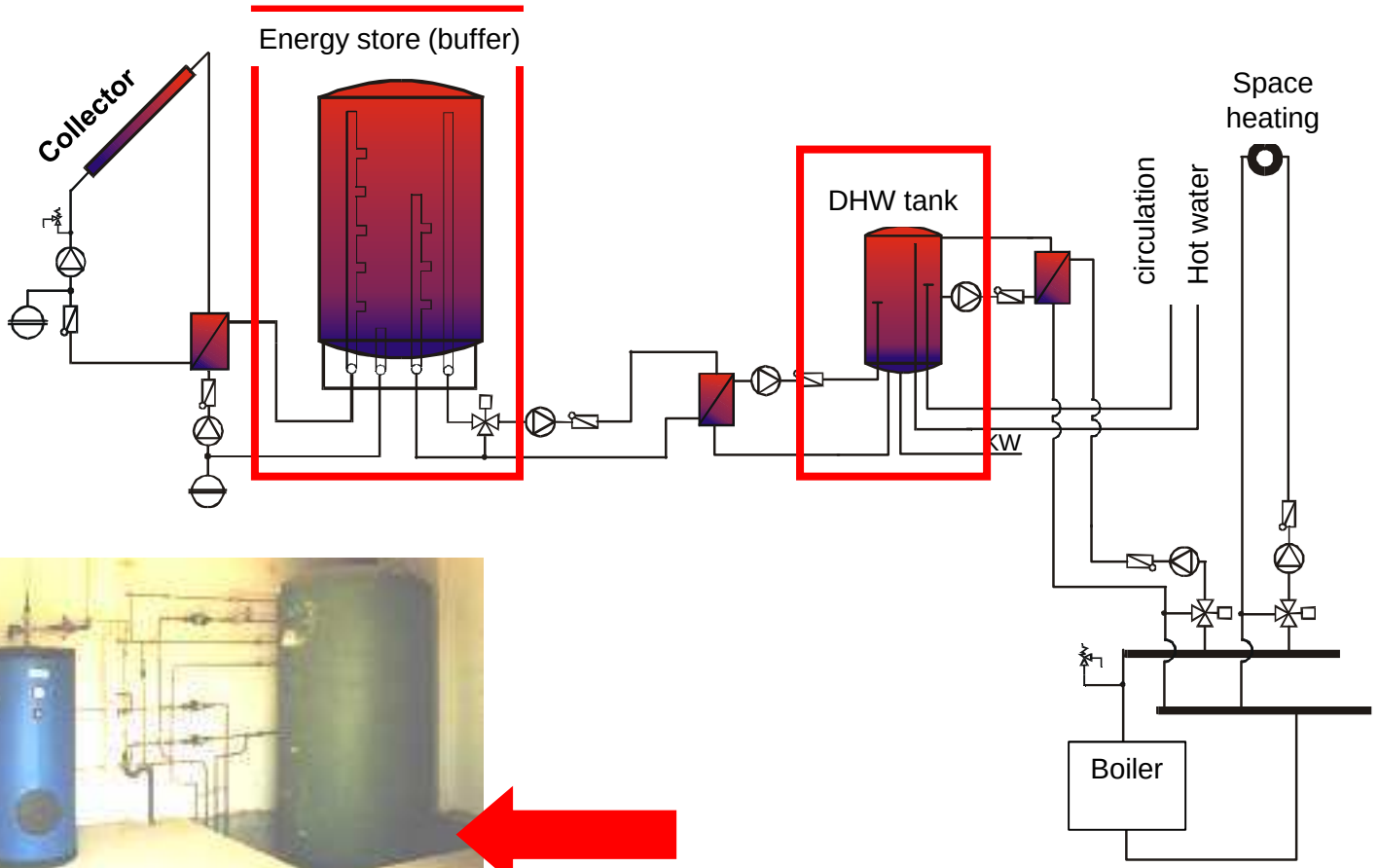
(Concept for a small number of flats)



Development of System Concepts

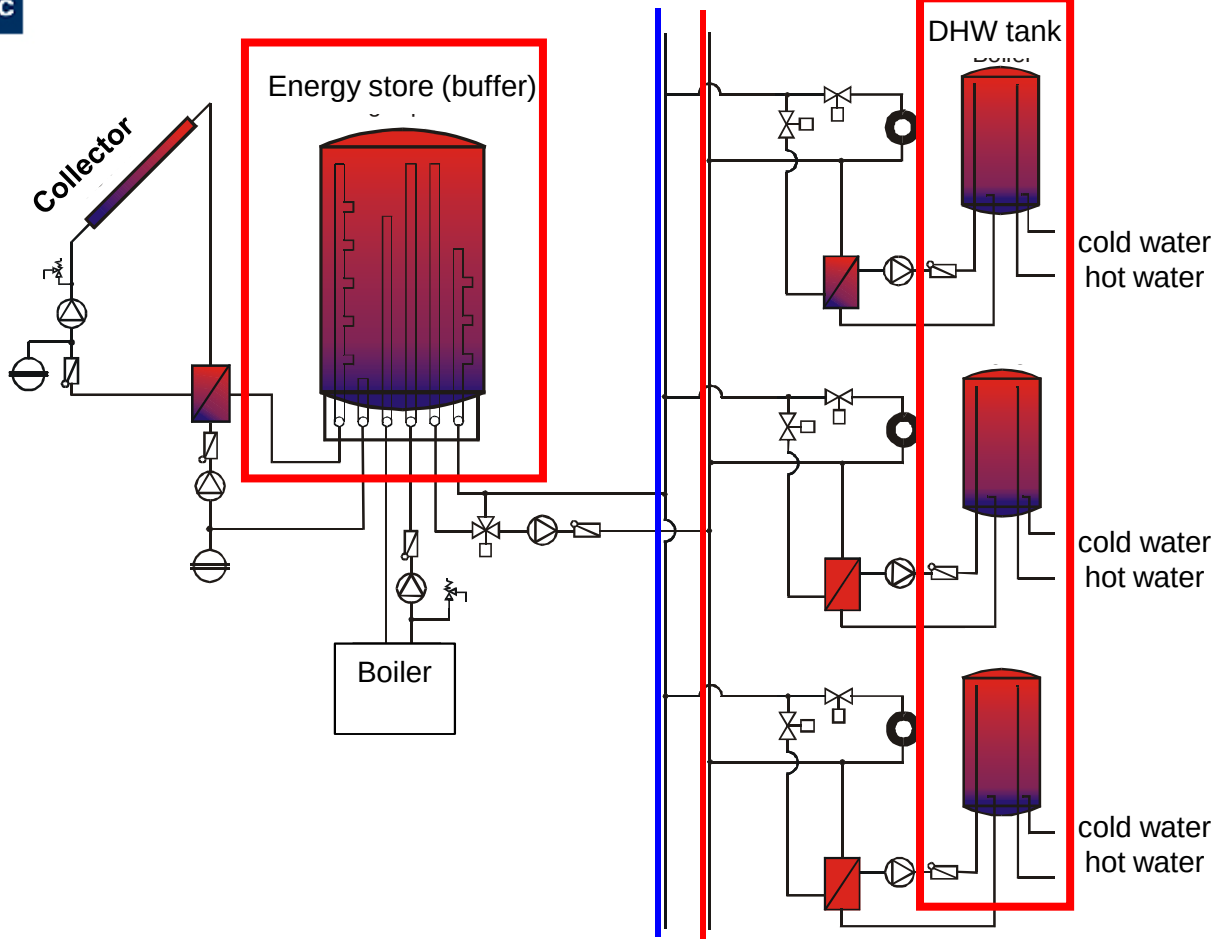
financed by Austrian Development Cooperation

2nd Generation - Solar Plant Concepts for MFH



Solar Plant Concepts for MFH

financed by
Austrian
Development Cooperation



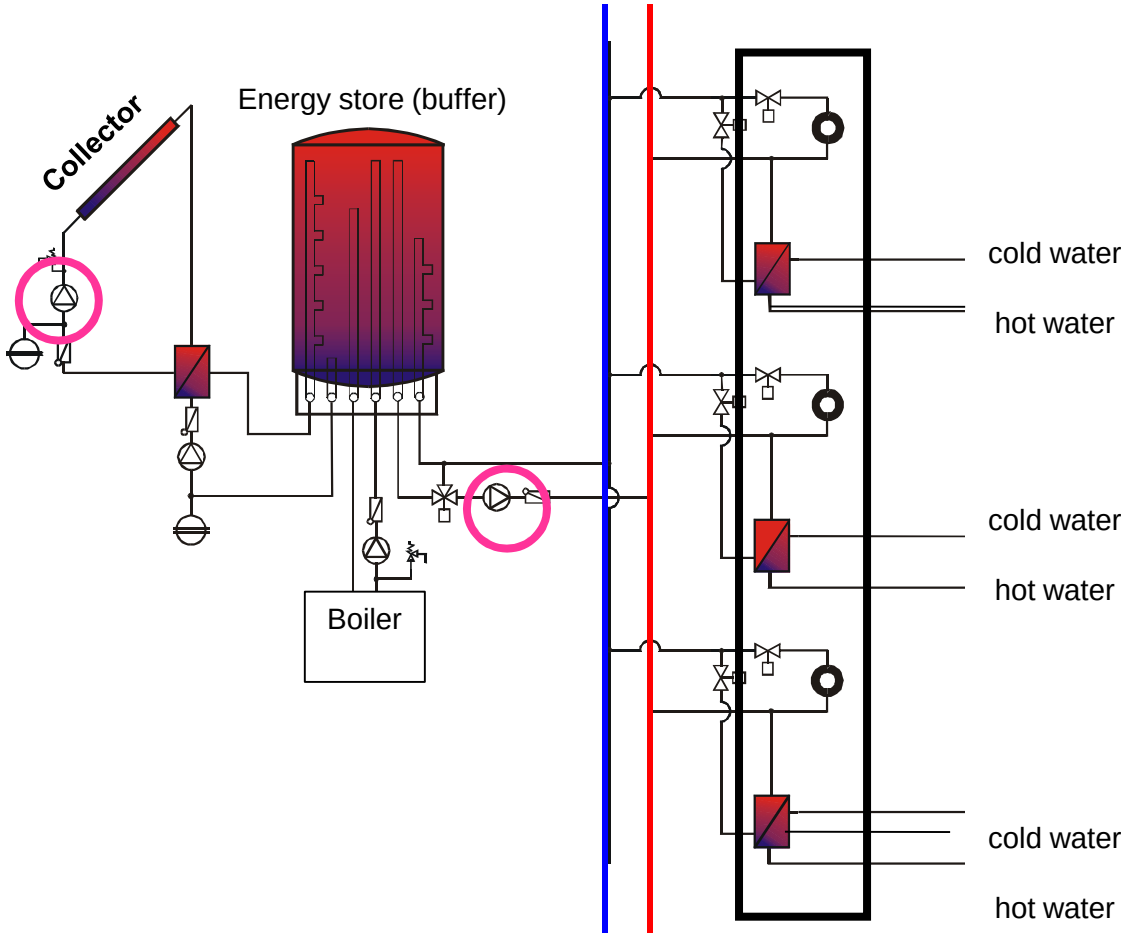
Heat distribution via 2-pipe network

Domestic hot water preparation via decentralised storage tanks

Preferred concept for row houses (low energy density)

Solar Plant Concepts for MFH

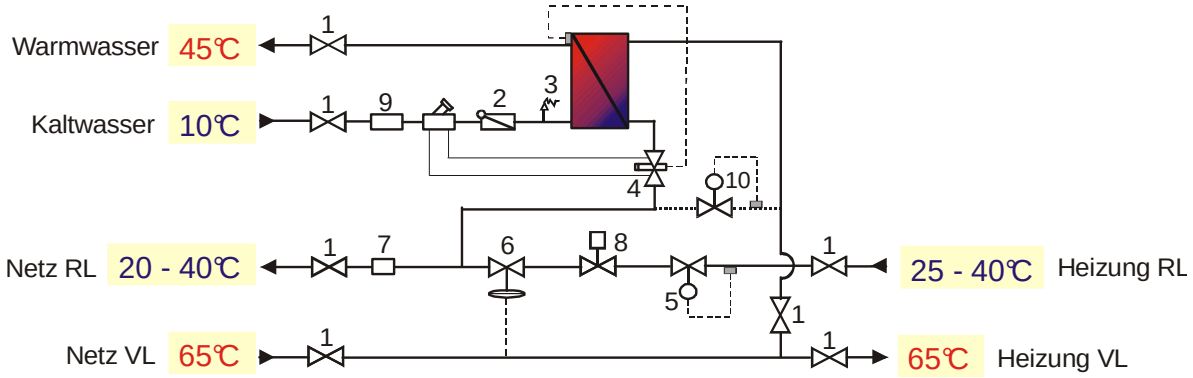
financed by
Austrian
Development Cooperation



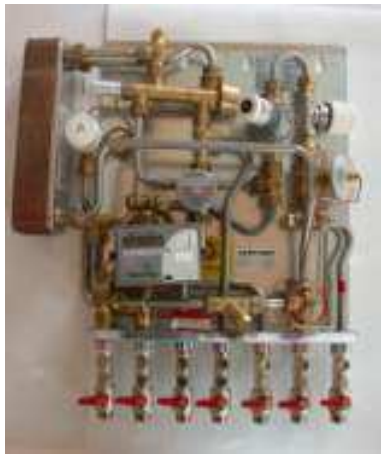
- Heat distribution via a 2-pipe network
- Decentralised instant hot water preparation
- Concept for „high energy density) MFH

Compact Heat Distribution Units

financed by Austrian Development Cooperation



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

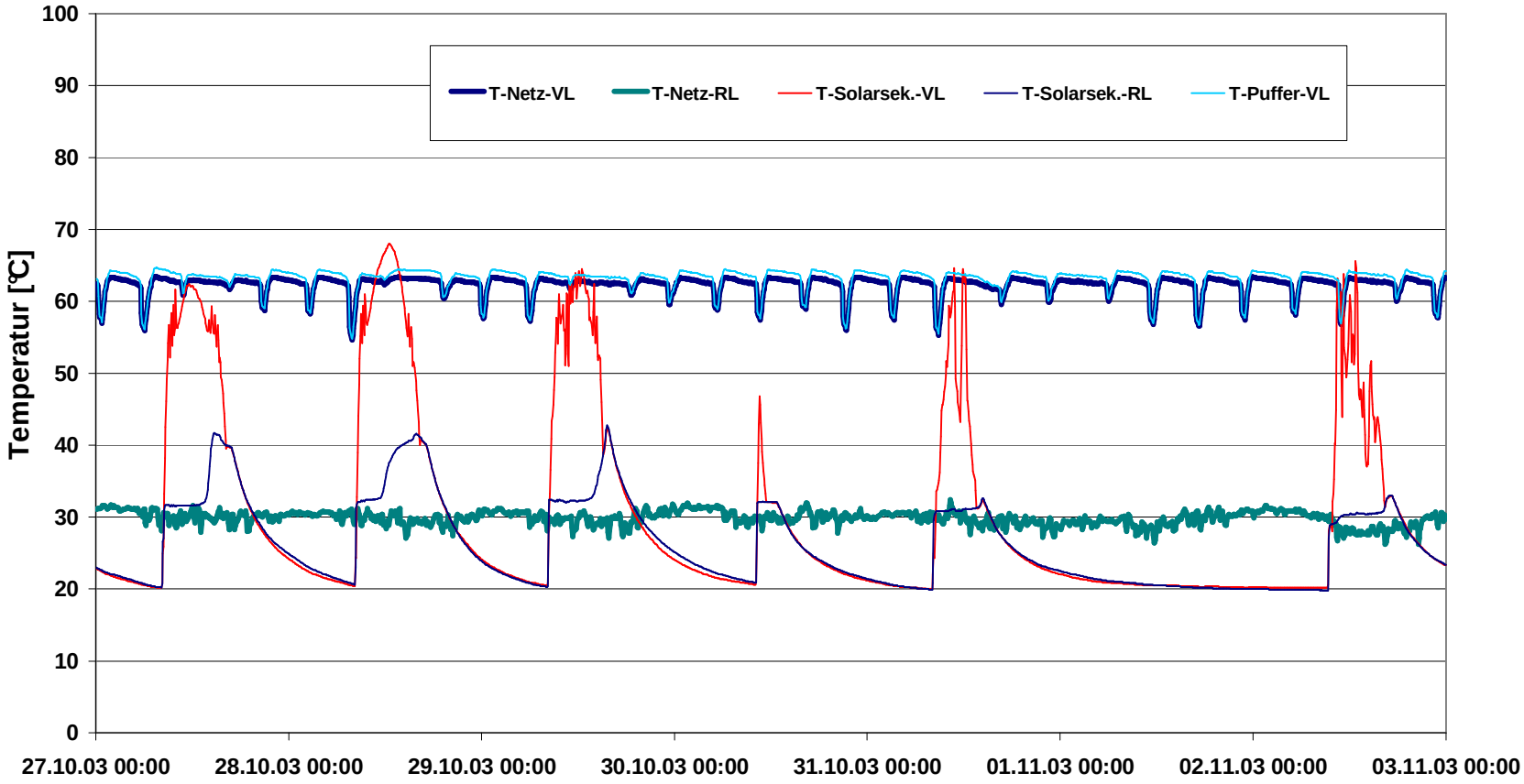


Advantages of 2-pipe networks

financed by
Austrian
Development Cooperation

Return flow nearly constant at 30°C

Ideal conditions for solar thermal systems



Advantages of 2 pipe concepts

financed by
Austrian
Development Cooperation

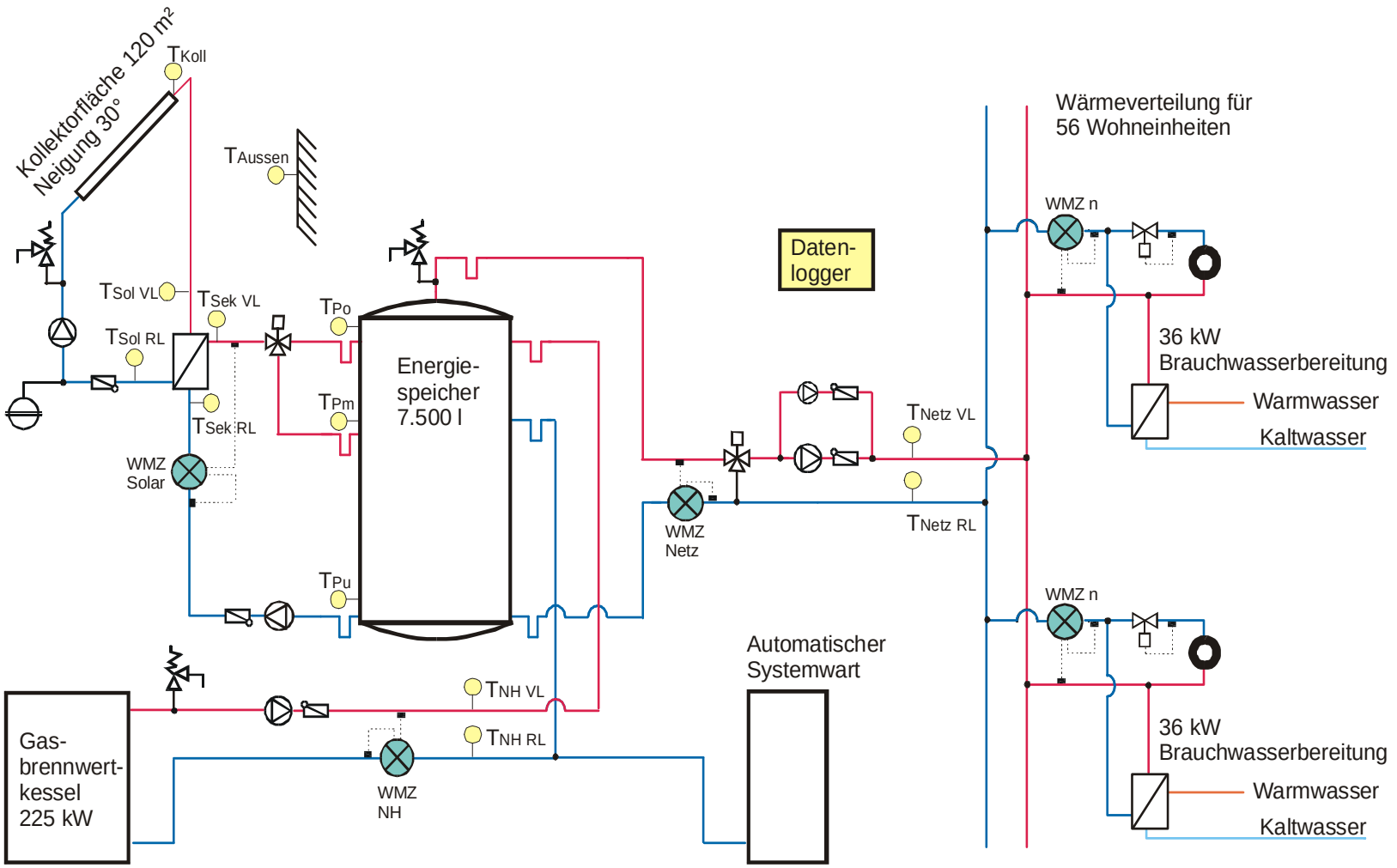
- Distribution losses minimized
- Provides in all cases integration into the space heating system
- No problems concerning legionnaires disease
- Easy counting of delivered energy for each flat due to integrated heat meters
- Prefabricated heat transfer stations reduce the labour cost, easy and faultless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

Dimensioning of Collector area and Storage Volume

	Solar Fraction Total Heat Demand [%]	Solar Fraction Hot Water Demand [%]	Collector area [m² per Person]	Storage volume [Litre / m² collector area]
Dimensioning: Cost/Performance Optimum	**15 - 20**	**50 - 60**	**0,9 - 1,4**	**50 - 70**
Dimensioning with approx. 100% Solar fraction in Summer	**25 - 30**	**70 - 75**	**1,8 - 2,2**	**60 - 80**

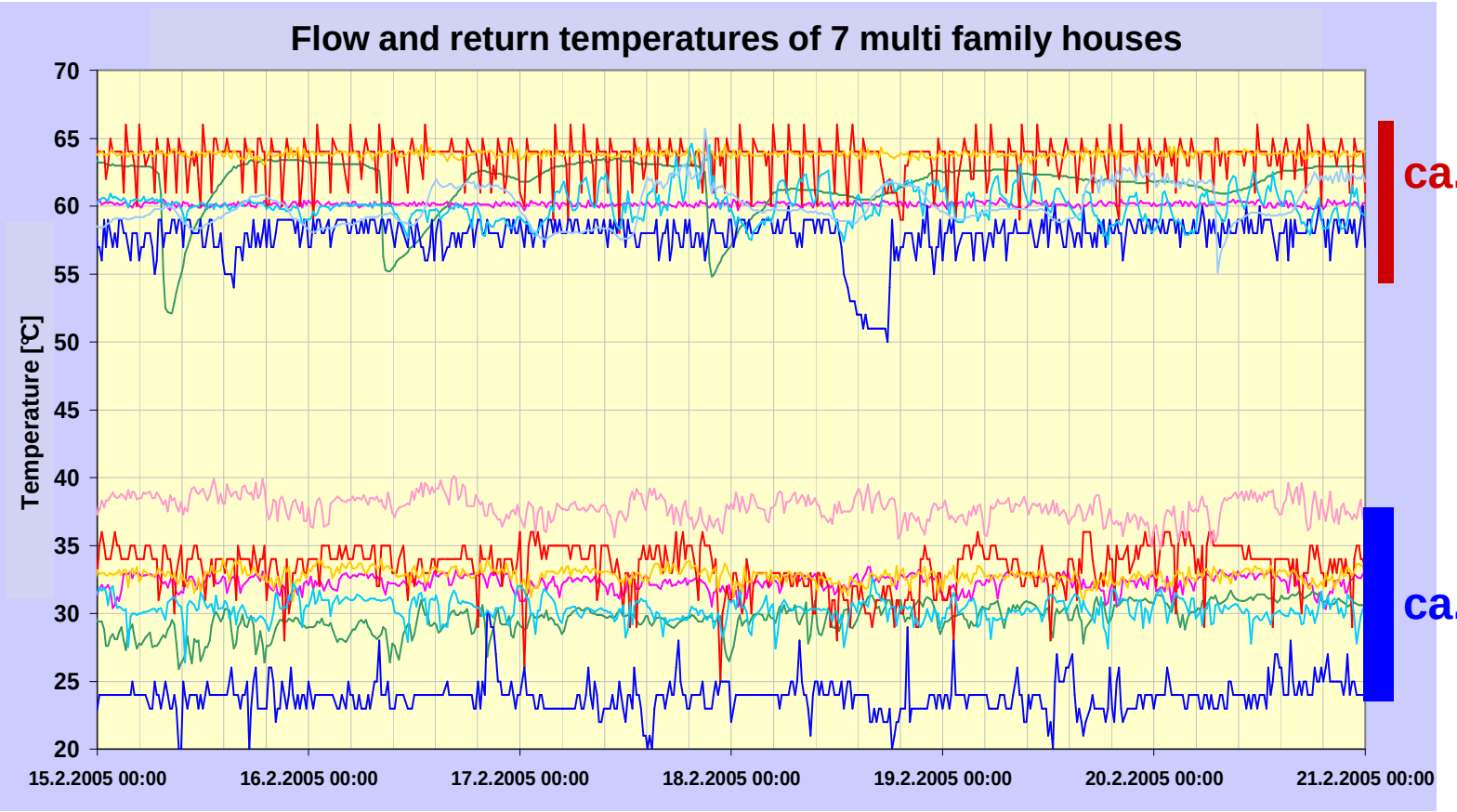
System Monitoring

financed by Austrian Development Cooperation



Flow and return temperatures

financed by Austrian Development Cooperation

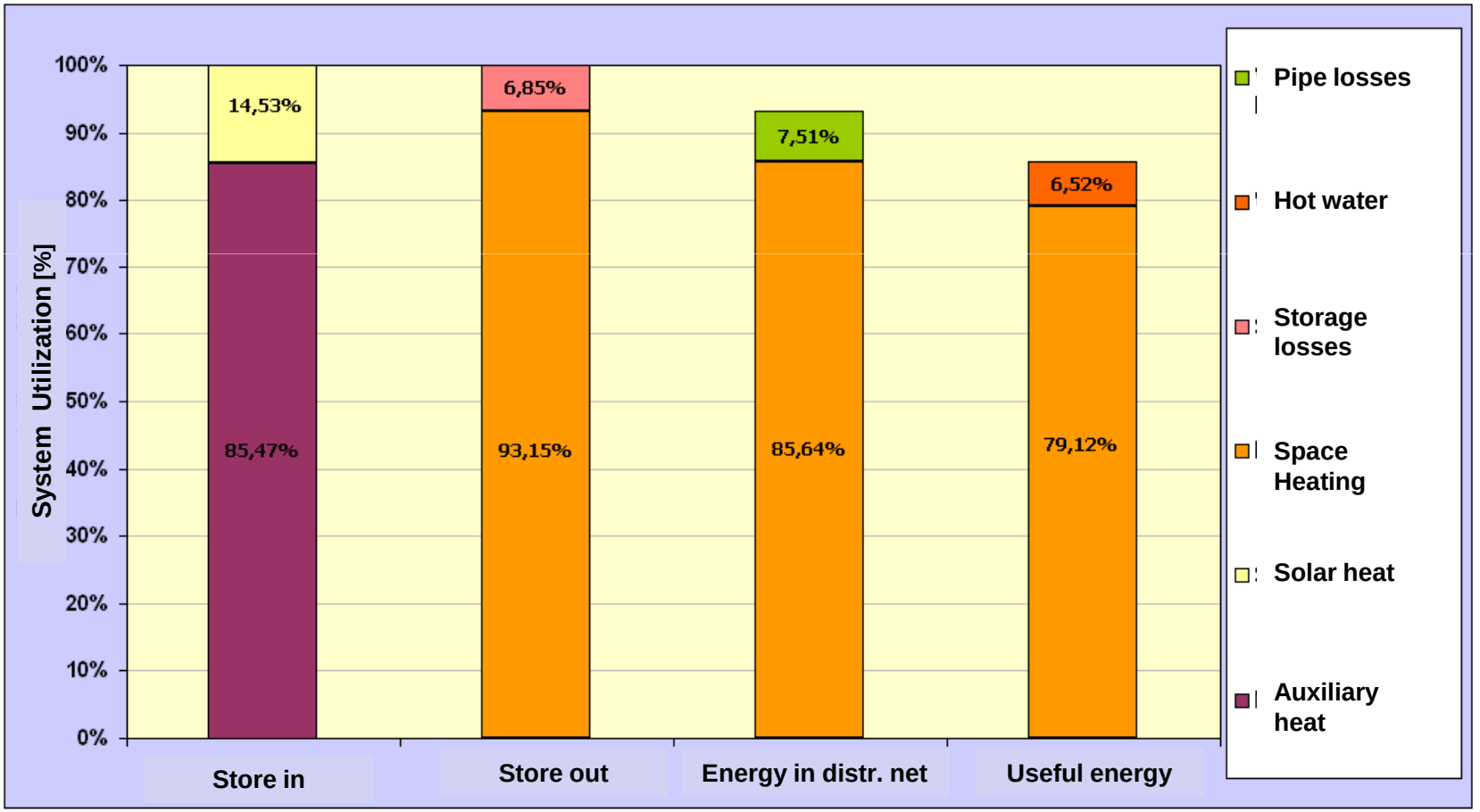


Low return temperatures of 30°C are necessary for a n optimised operation of solar thermal systems

System Efficiency – Annual system utilization

financed by Austrian Development Cooperation

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



Solar Combisystems

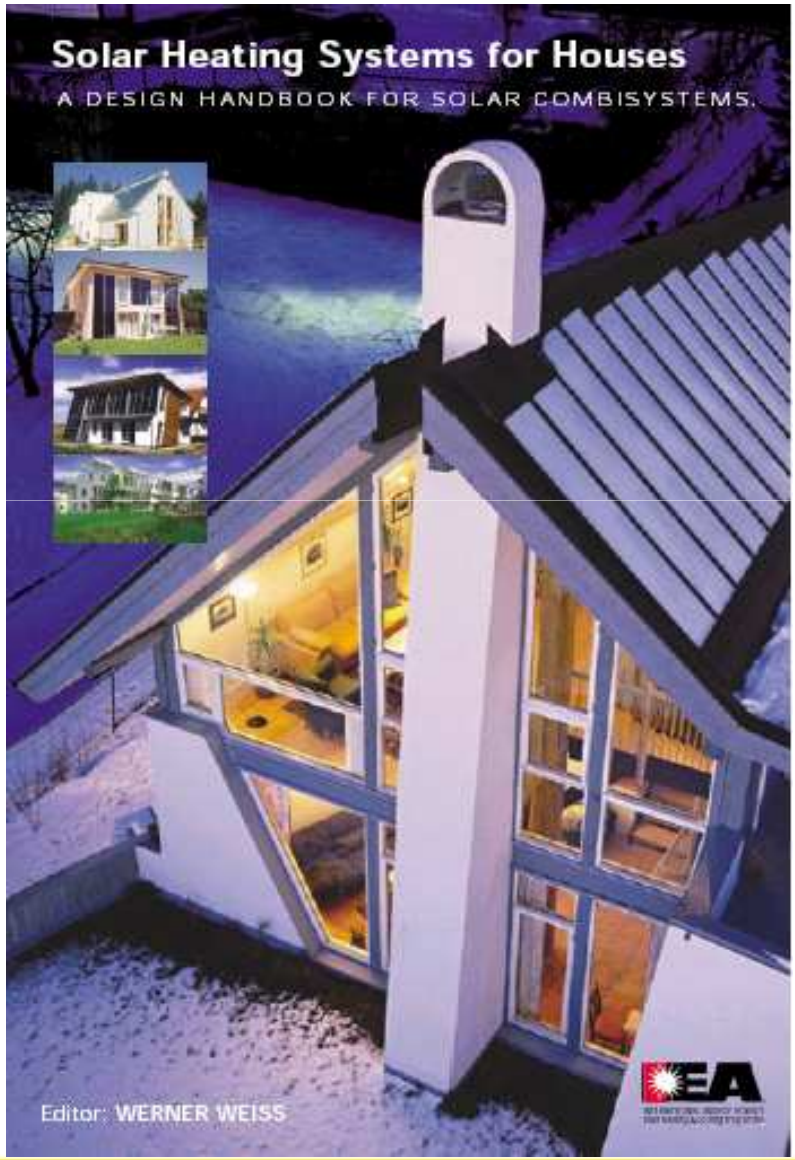
financed by
Austrian
Development Cooperation

More Information:

The book:

Solar Heating Systems for Houses

A Design Handbook for Solar Combisystems

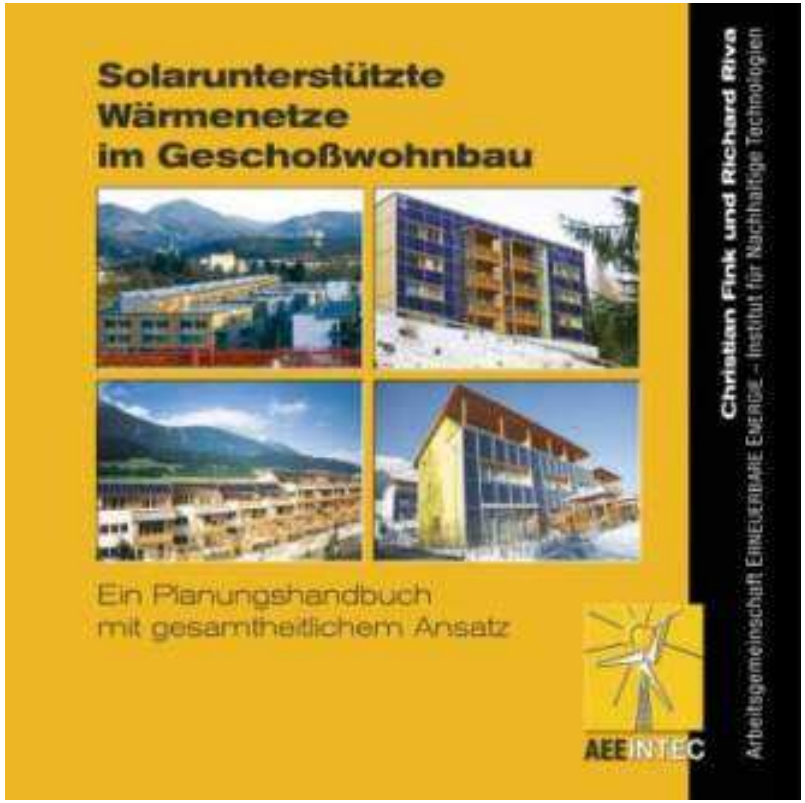


Mluti-familiy Houses

financed by
Austrian
Development Cooperation

This Design handbook is available for € 29,80 at

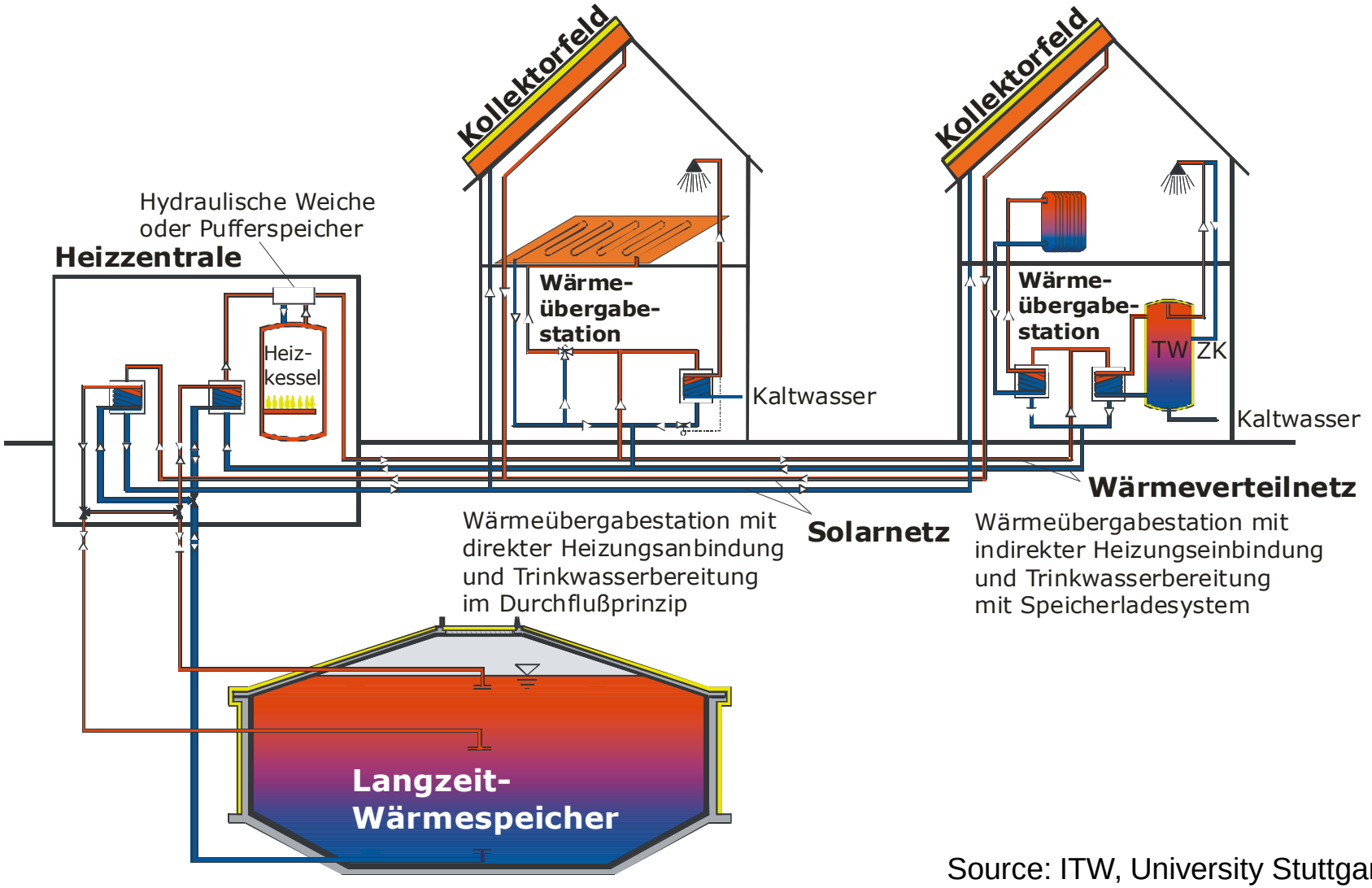
www.aee.at



Local District Heating - **Steinfurt-Borghorst, Germany**

Source: ITW, University Stuttgart

Local District Heating with Seasonal Storage



Source: ITW, University Stuttgart

Seasonal Heat Storages

Heißwasser-Wärmespeicher

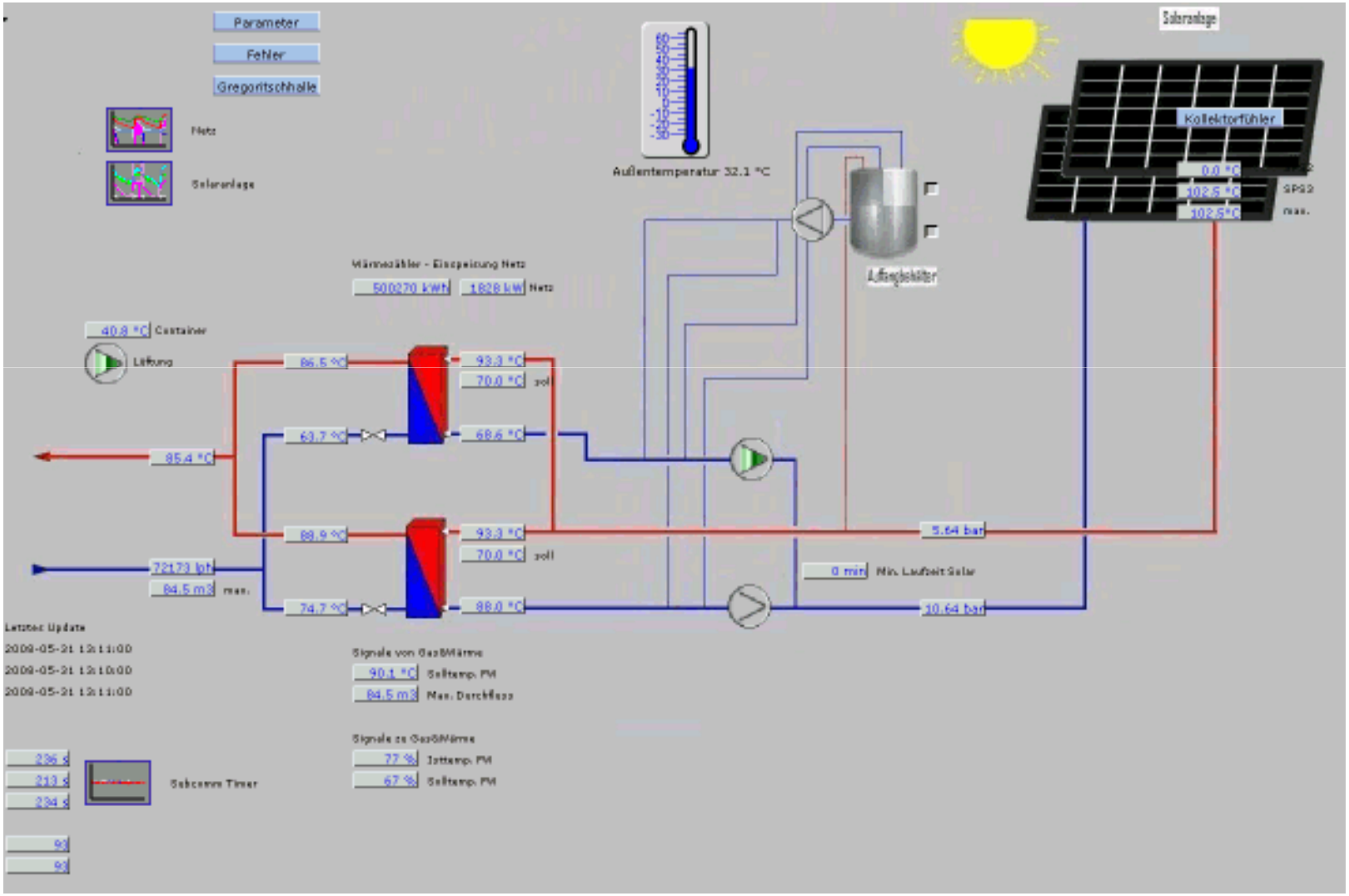
Kies-Wasser-Wärmespeicher

Erdsonden-Wärmespeicher

Aquifer-Wärmespeicher

District Heating – 1 MW_{th}, Graz

financed by
Austrian Development Cooperation



District Heating – 1 MW_{th}, Graz

financed by
Austrian
Development Cooperation

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

financed by
Austrian
Development Cooperation

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

financed by Austrian Development Cooperation