Prospects of Solar Thermal and Heat Storage in DHC

Presentation in Brussels, 02.06.2010,
Euroheat and Power + COGEN Europe

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Prospects of solar thermal and heat storage in DHC

1. Why: Introduction
2. How: Solar thermal and heat storage technologies
3. When: State of the art of R+D

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Solites - Steinbeis Research Institute for

- solar and sustainable
- thermal
- energy systems

A member of the Steinbeis Foundation:
turnover in 2009 over 100 Mio Euro
with technology transfer, consultancy and research

Solites is i.a.:

- Advisor to different ministries in the field of R&D for large scale solar thermal systems, seasonal heat storage and renewable energy
- Chairman of the German Experts Group on Seasonal Heat Storage
- Member of different expert groups for large scale solar thermal systems, i.e. IEA/ OECD experts group on thermal energy storage

Basics: Steps towards reduction of CO_2-emission

1. Energy savings
2. Energy efficiency
3. Renewable energies

Why solar thermal in district heating systems

How do we heat our houses in 2030+?:

- E.g. Sweden: by biomass!
- E.g. South Europe: no more heating, but cooling needed!?
- E.g. Germany: biomass is needed for mobility
  geothermal: yes, on some places
  solar thermal: yes! Own energy resource!

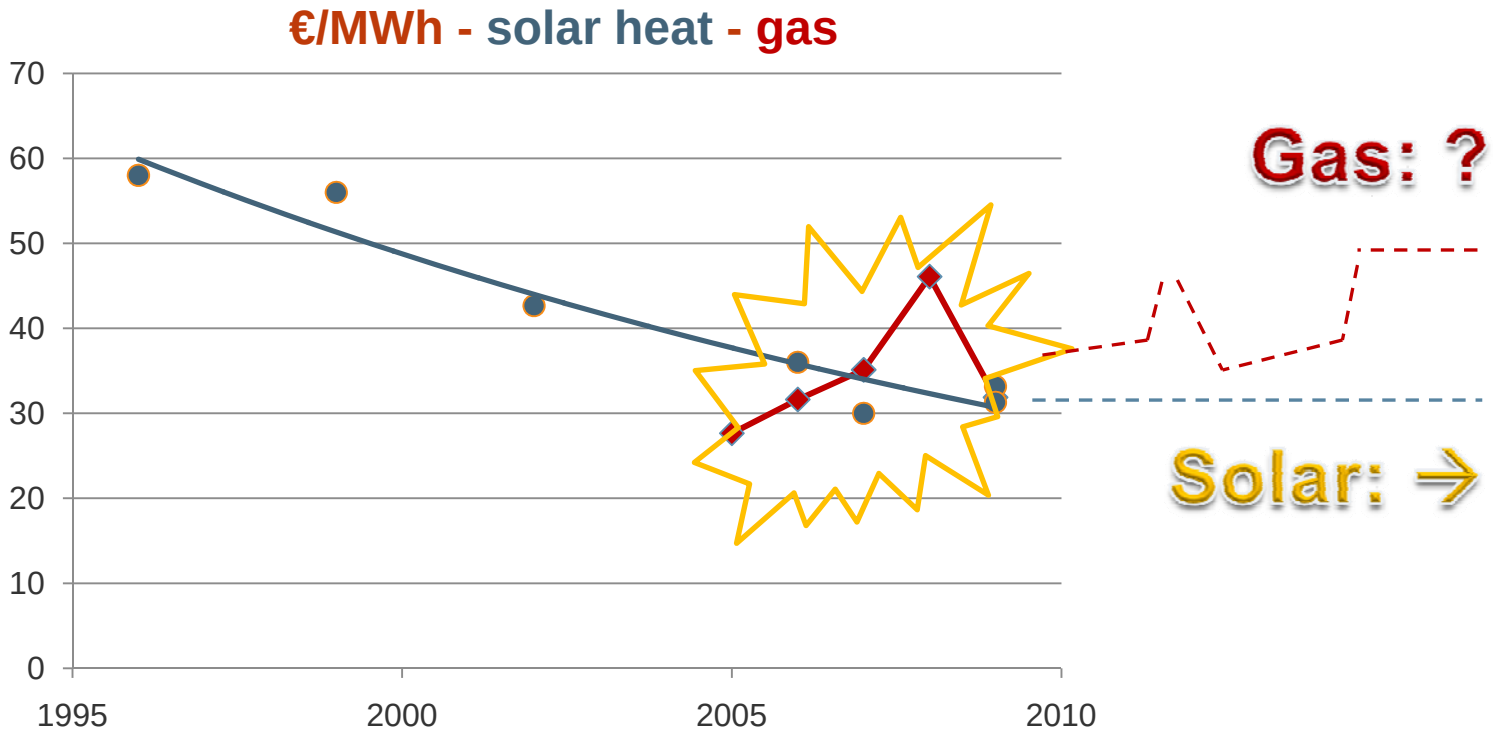
Vision of the ESTTP (now RHCTP)

European Solar Thermal Technology Platform

- “Solar generated heat makes a considerable share (> 10 %) of the heat generated for block and district heating systems in Europe”
- 1 % would be feasible within 10-20 years ?!
- 10 % would require seasonal heat storages ..!?

Economic situation of large scale solar thermal in Denmark

Price development of gas and solar heat:



Source: Marstal- and Braedstrup Fjernwarme, Denmark

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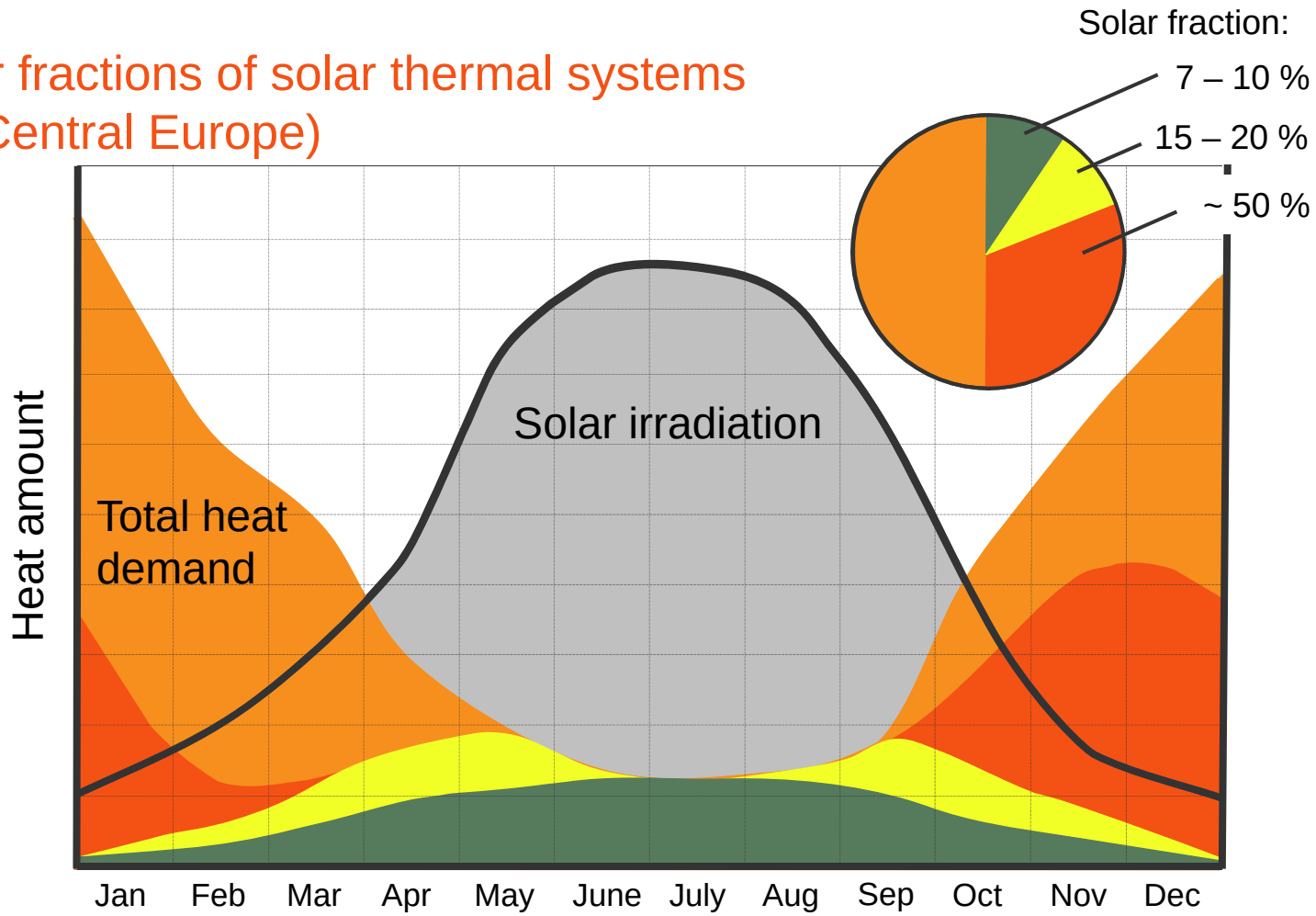
Solar fractions of solar thermal systems (for Central Europe)



Domestic hot water system (100 % solar in summer)

Combisystem (hot water and space heating)

Central Solar Heating Plant with Seasonal Storage

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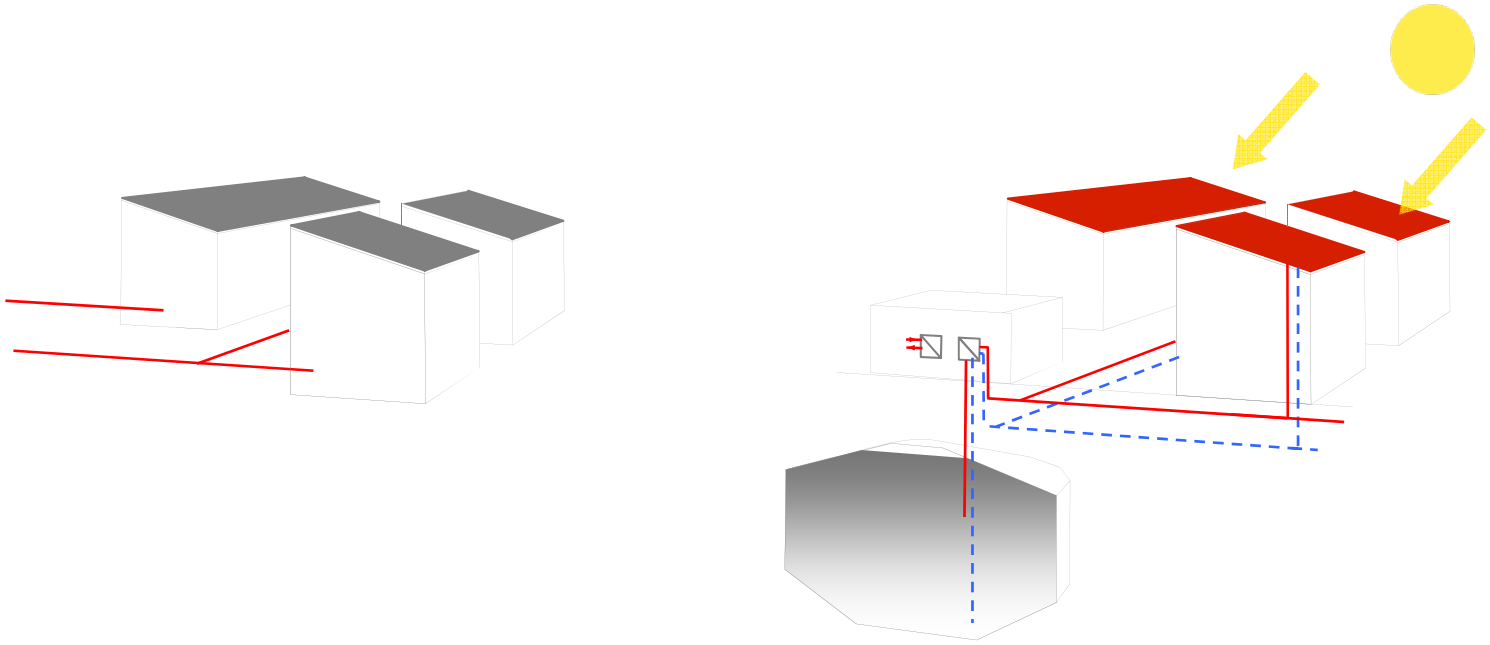
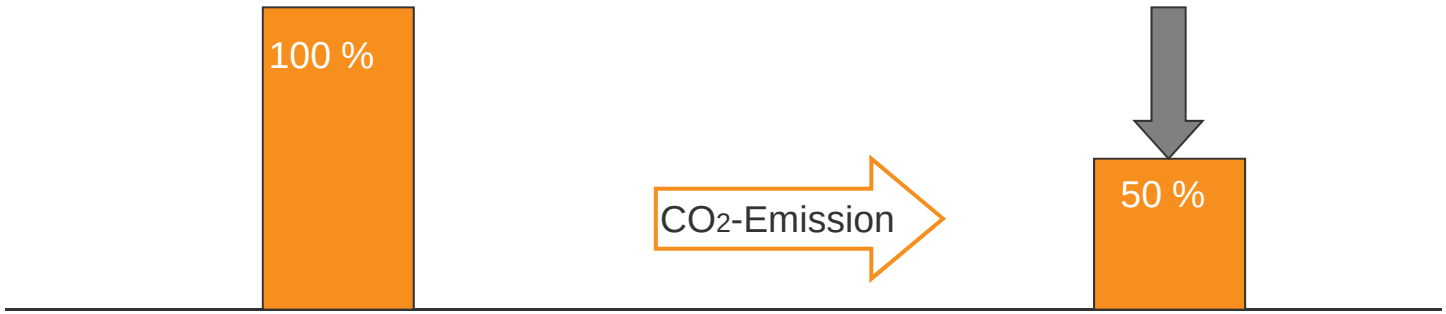
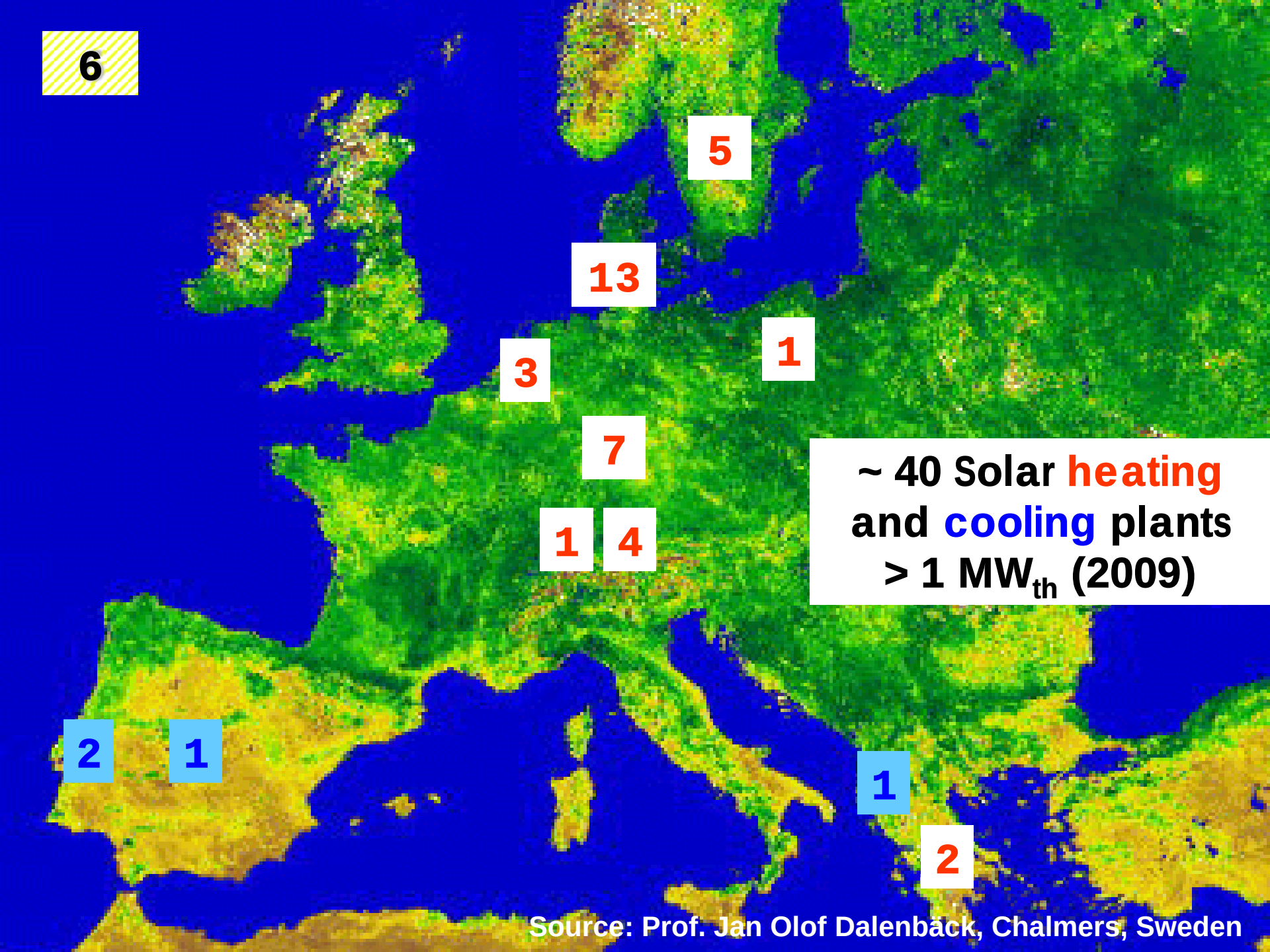
Central solar heating plant with seasonal storage






Europeans largest solar thermal plant in Marstal on Aero, Denmark
Marstal – 18 300 m² - 13 MWth - 1996/2003-


6
5
13
1
3
7
1
4
~ 40 Solar heating and cooling plants > 1 MW$_{th}$ (2009)
2
1
1
2
Source: Prof. Jan Olof Dalenbäck, Chalmers, Sweden

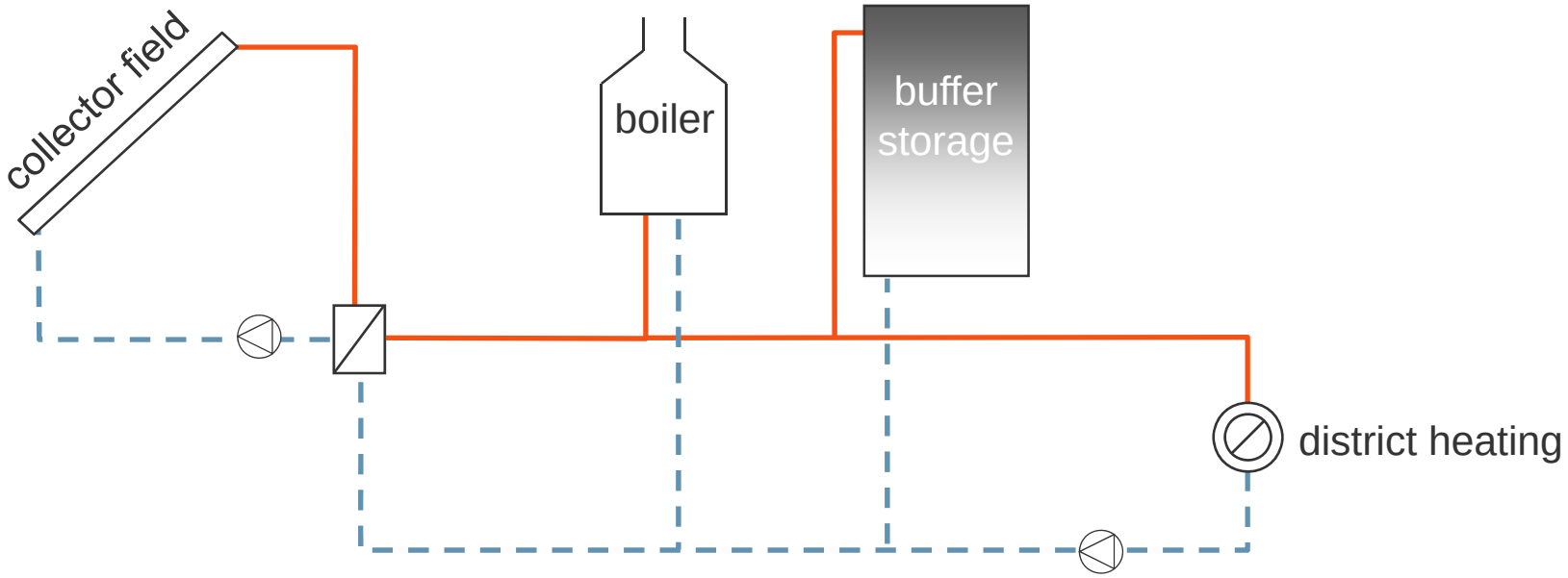
First large scale solar heating plant in Europe:1979 (Gothenburg, S)

e.g. Falkenberg, Sweden: 5500 m², 4 MW_{th} , built in 1989

Source: Prof. Jan Olof Dalenbäck, Chalmers, Sweden

Solar collector fields in Crailsheim, largest German solar city 2010

Typical large scale solar thermal district heating system



- You can not turn the collector field on all time you might want to.
- The collector field might be „turned of“ when you do not want it.
- Solution: Dimensioning by system simulation and usage of storage

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Solar thermal energy versus heat of CHP

a definitive YES and NO …

- Example: New pilot plant with E.On Hanse Wärme in Hamburg:
  multi functional heat storage
  to store solar thermal energy seasonally and
  to highten the usage of waste heat from CHP

- But: Solar thermal in district heating might rise
  the balanced CO_2-emissions of CHP-systems.
  Seasonal heat storage can be a solution.

„Renovation“ of STES in Hamburg to multifunctionality, 2010

Integration of solar thermal in CHP-district heating net in Graz, AU

- Collector array: 1407 m²
- Solar yield: 540 MWh/ year
- Thermal load: approx. 845 kW
- Start up: 2002

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SDH in Munich: installation of solar collectors, 2007

Start of operation: 2007

24800 m² heated area (2300 MWh/a)

2900 m² solar collectors

5700 m³ tank

Solar fraction: 47 %*

*simulation results ZAE

Construction of the seasonal heat storage in Munich , 5700 m³, 2007

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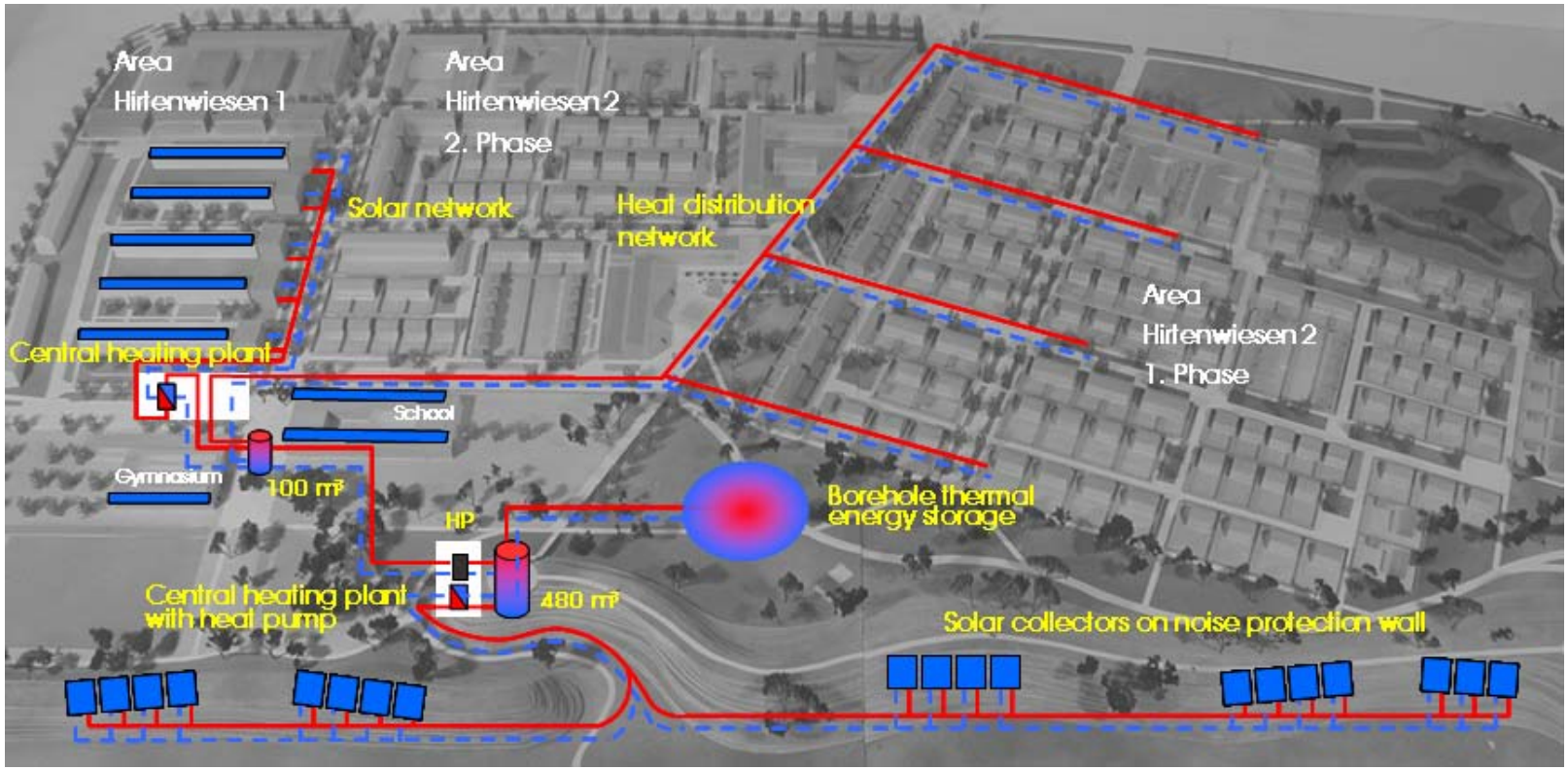
SDH in Crailsheim, Germany, 2007



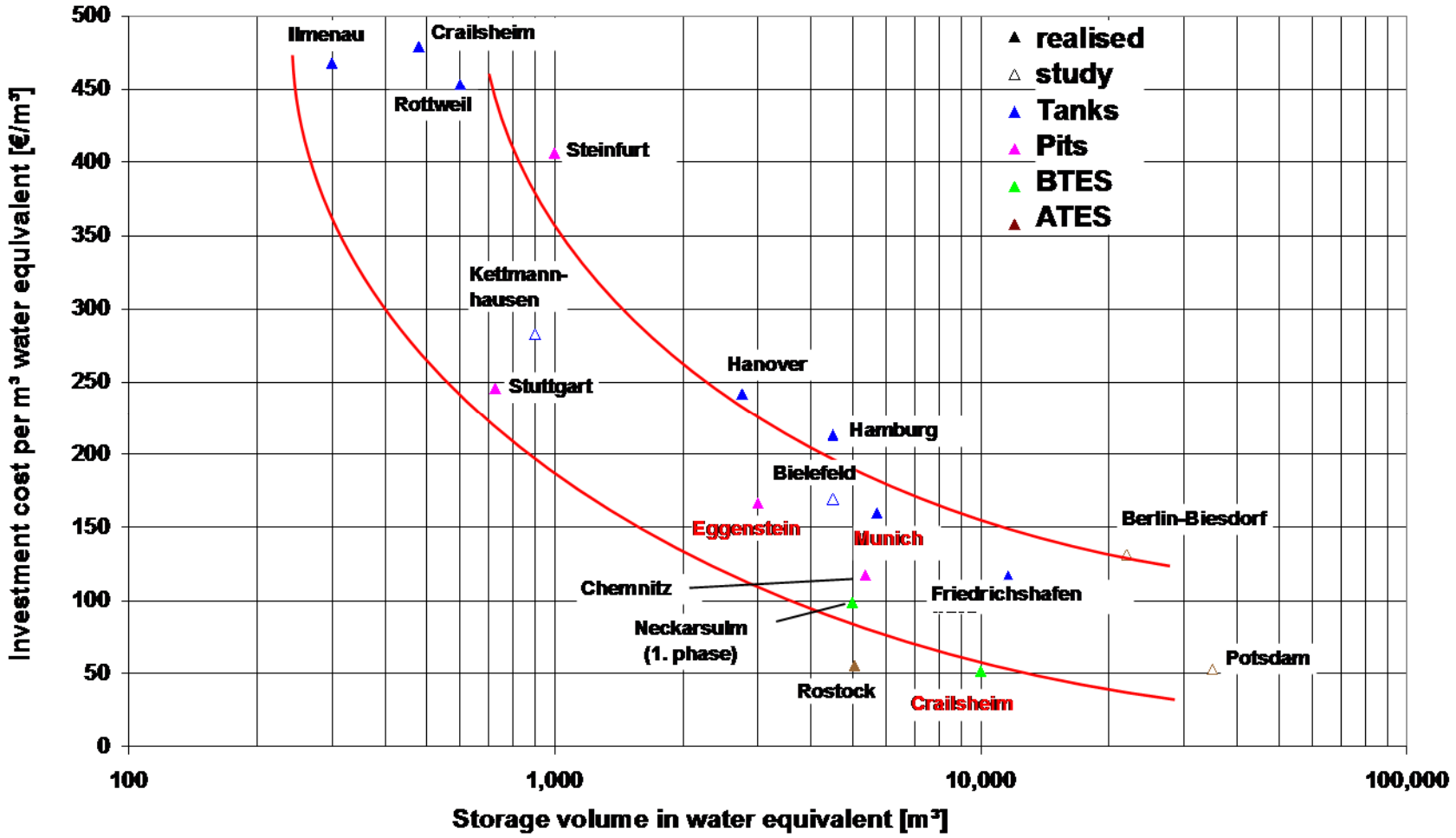
service area:	260 apartments, school, gym.	STES:	37500 m³ (BTES)
heat demand:	4100 MWh/year	el. heat pump:	530 kW
solar collectors:	7300 m² (aperture)	solar fraction:	50 % (design)
buffer storage:	100 + 480 m³ (water tank)	solar heat cost:	19 Euro-Cent/kWh

Borehole Thermal Energy Storage (BTES) in Crailsheim, 37500 m³, 2008

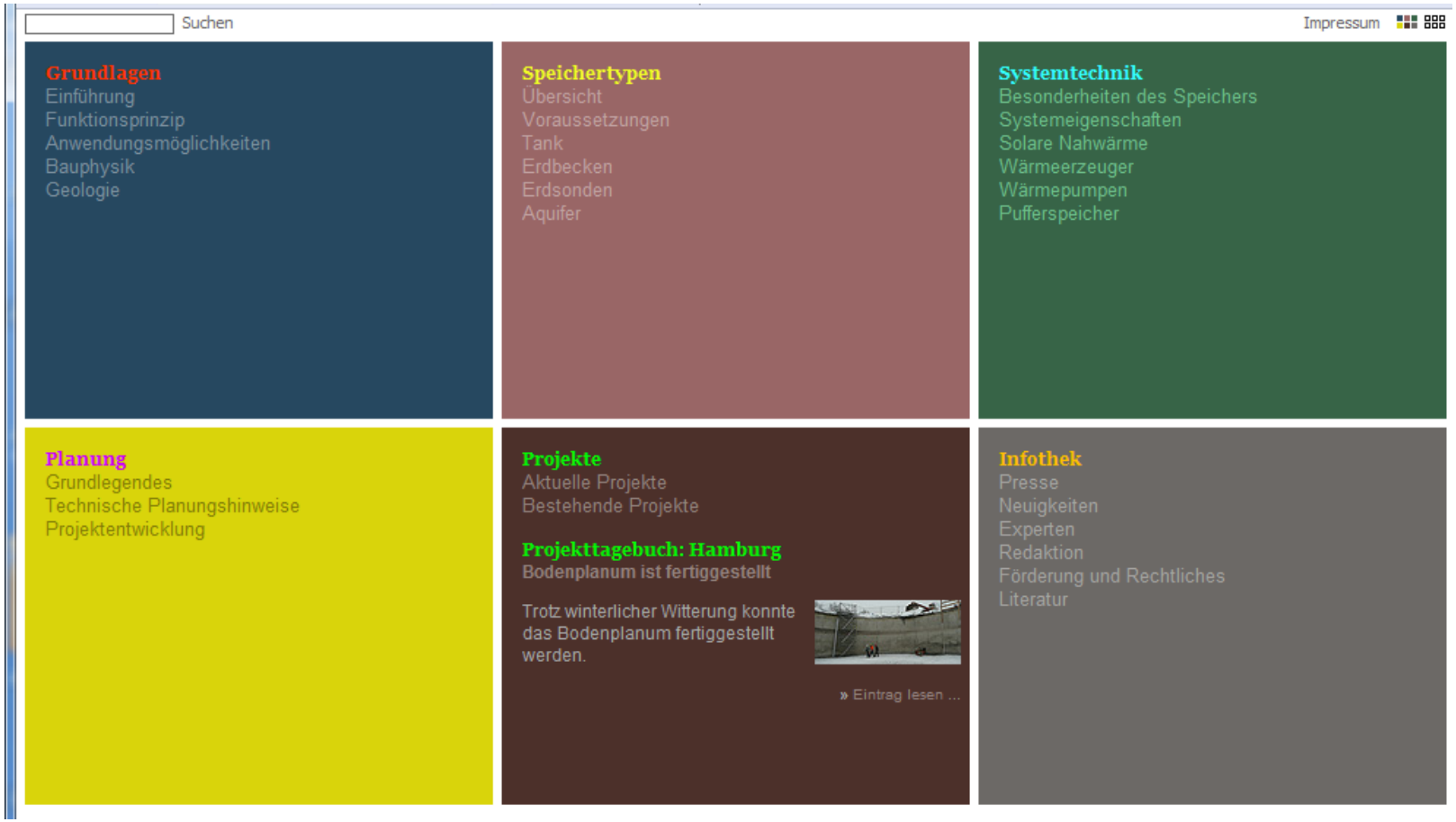
Crailsheim: new buffer storage with 3 bar pressure for 100 m³ water in concrete containment

Pit storage in Eggenstein, 4500 m³, 2008

Investment cost of seasonal thermal energy storages



Start of technology transfer in Germany: www.saisonalspeicher.de



European Project: **SDHtake-off** - Solar District Heating in Europe






- **Integration of large-scale solar thermal plants in new and existing district heating networks**
- Actions for preparing a commercial market introduction of solar district heating in Europe
- cooperation of associations, companies and institutes of the district heating and solar thermal sectors
- **Project Duration:**
  01/07/2009 - 30/06/2012
- **Partner countries:**
  AT, BE, CZ, DE, DK, IT, SE
- **Coordinator:**
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Intelligent Energy Europe

SDH solar district heating

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SDHtake-off – Website: **www. solar-district-heating.eu**

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