

Experiences from national first movers in solar assisted district heating systems with seasonal heat storage

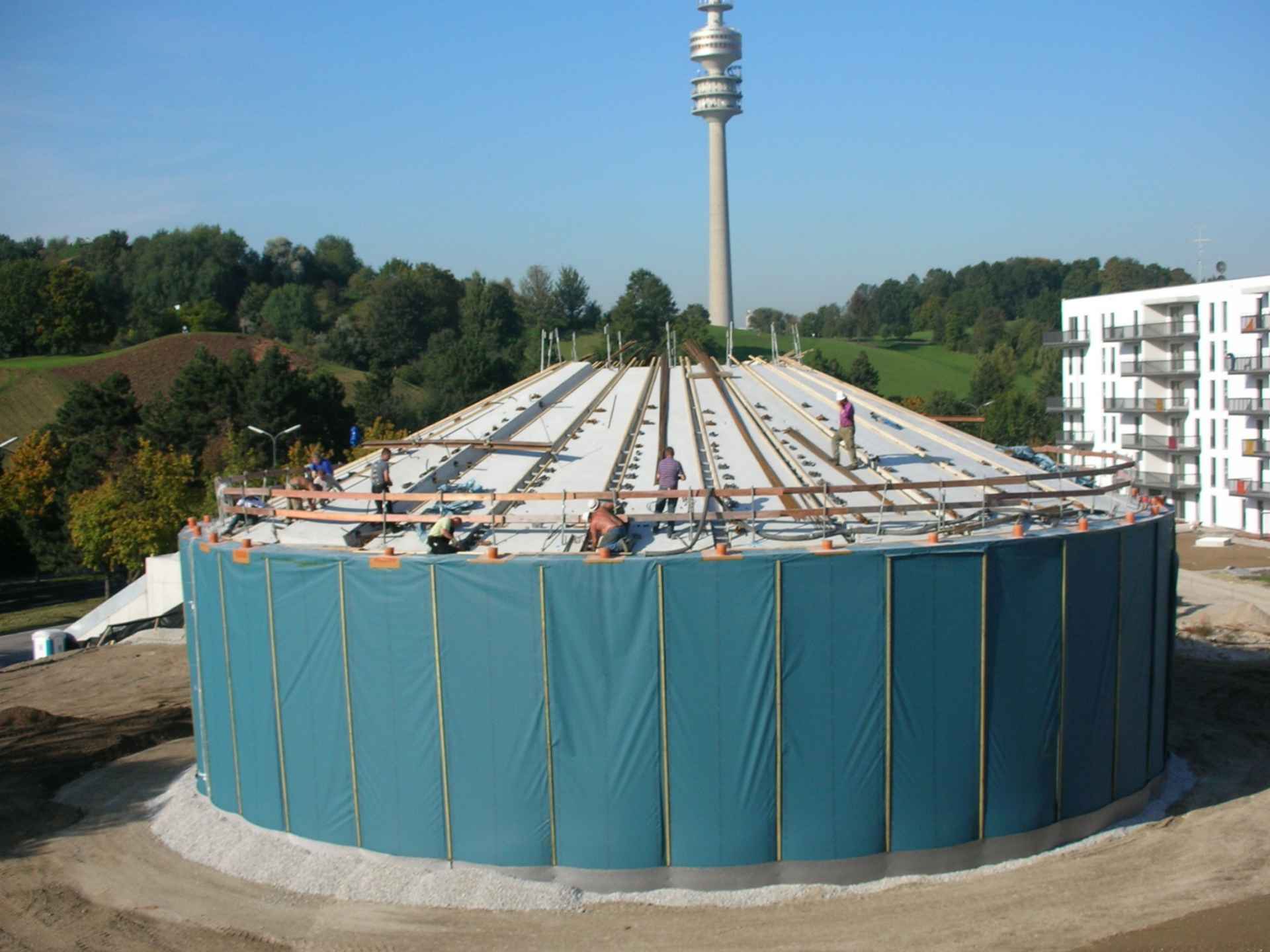
Presentation at the 2nd International SDH Conference in Hamburg,
03.06.2014

Dipl.-Ing. Dirk Mangold

Steinbeis
Research Institute
for Solar and
Sustainable
Thermal Energy
Systems

Meitnerstr. 8
D-70563 Stuttgart
www.solites.de

solites



Experiences from national first movers in SDH with STES

- Main view on the overall system
- Recommendations for project development
- Examples: seasonal thermal energy storage (STES) and solar collector array

Steinbeis Research Institute
for Solar and Sustainable
Thermal Energy Systems
www.solites.de

solites

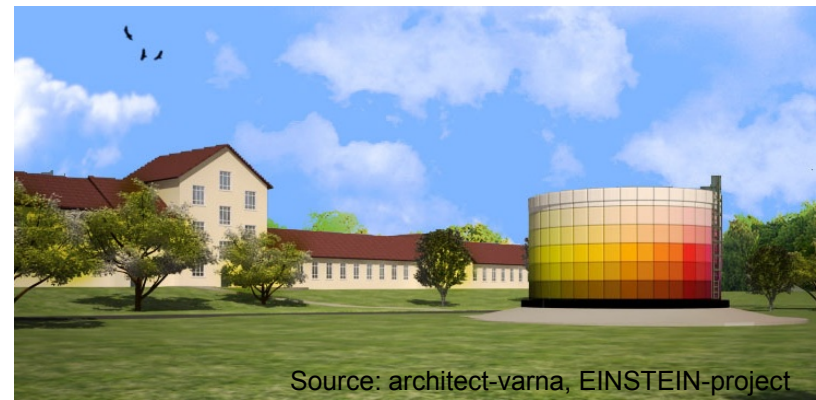


Pilot plants with seasonal thermal energy storage in Germany



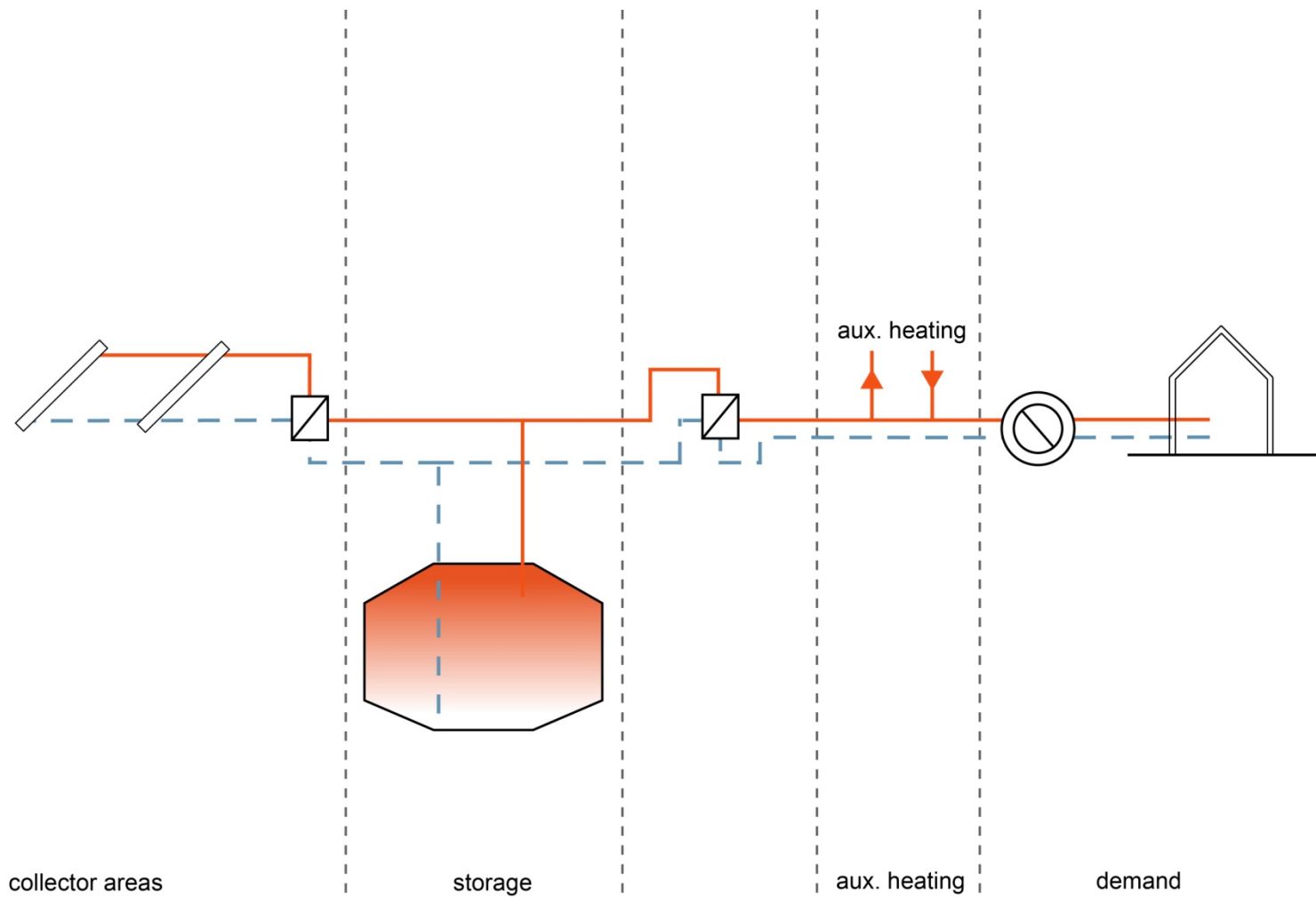
New pilot plants in development in Europe

- Dale, Norway
- Vitoria Gasteiz, Spain
- Szentendre, Hungary
- Warsaw, Poland
- Bilbao, Spain
- Austria
- France
- ...



Source: architect-varna, EINSTEIN-project

SDH with STES – standard system layout



Experiences from national first movers in SDH with STES

- SDH with STES is a multidimensional technical system
 - Project development and realization need cooperation of different building sectors
 - Policy makers might be involved in the project
 - For some subsystems no technical standards are available
 - SDH with STES need high investment costs to save a lot of running costs
- > Start of pilot project development is first step of all!

SDH: solar district heating
STES: seasonal thermal energy storage

Project development of a SDH system with STES

1. Predesign phase

- First predesign with simple design tools like sdh-online.solites.de
- Check of available collector area
- Check of geological conditions on possible storage building sites
- Check of interactions with district heating system
- Check of ...?

-
- Economic calculation
 - Clearance of possible funding
 - Solving of the chicken-and-egg problem

-> Start of pilot project design!

Ground mounting of solar collectors in DK and S



Building integration of large collector arrays



Collectors on subconstruction:

- + obvious interface to building
- higher costs
- > cost for subconstruction might be higher than cost for collectors!



Collectors as watertight roof:

- + cost savings
- A lot of interfaces to solve
- time line according to building





Roof integrated collectors in Crailsheim



Project development of a SDH system with STES

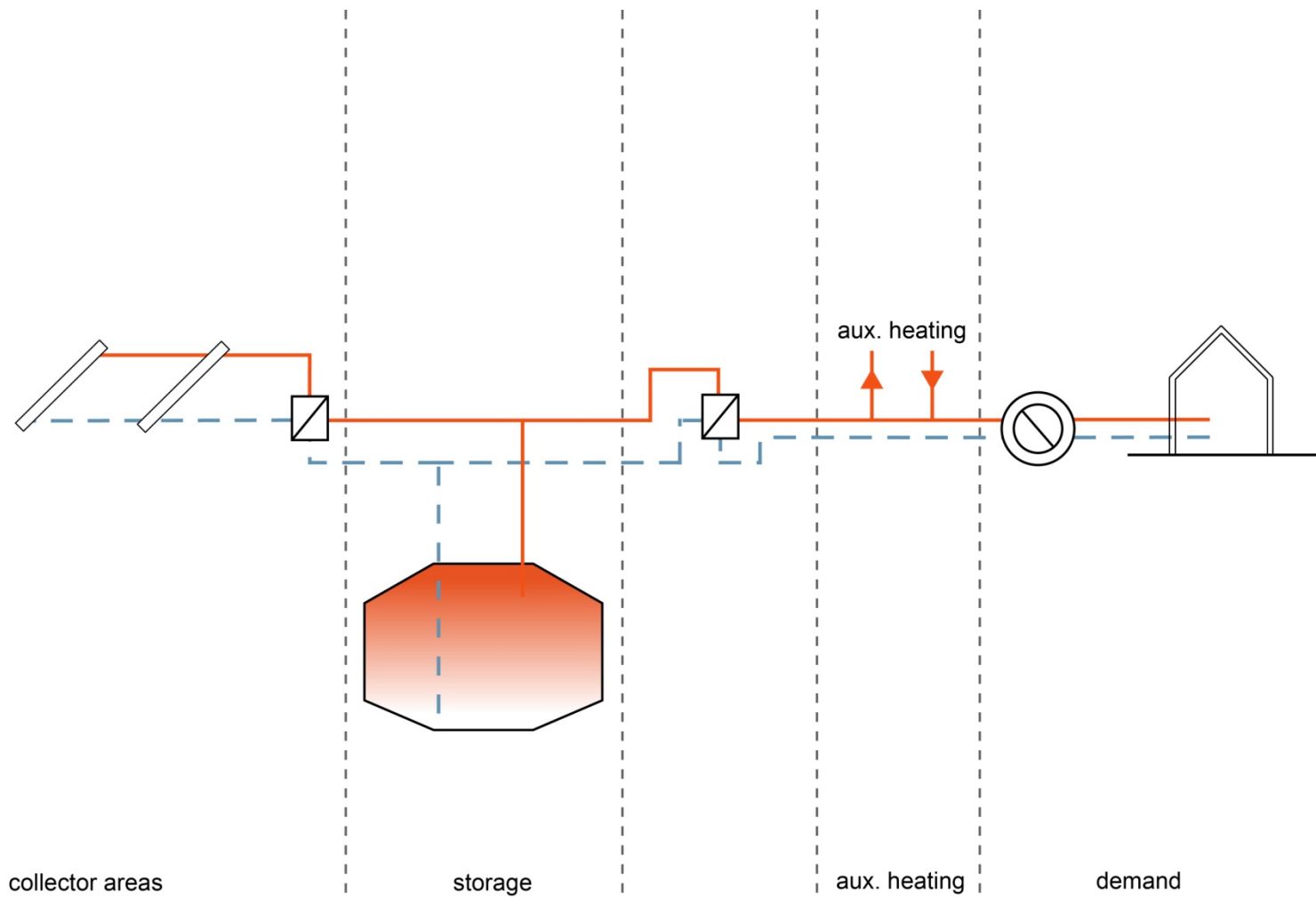
2. Design phase

- **First: Detailed system simulation for technical and economical optimization of the heat generation system and its components**
(collector area, STES, heat pump?, system integration, control strategy)

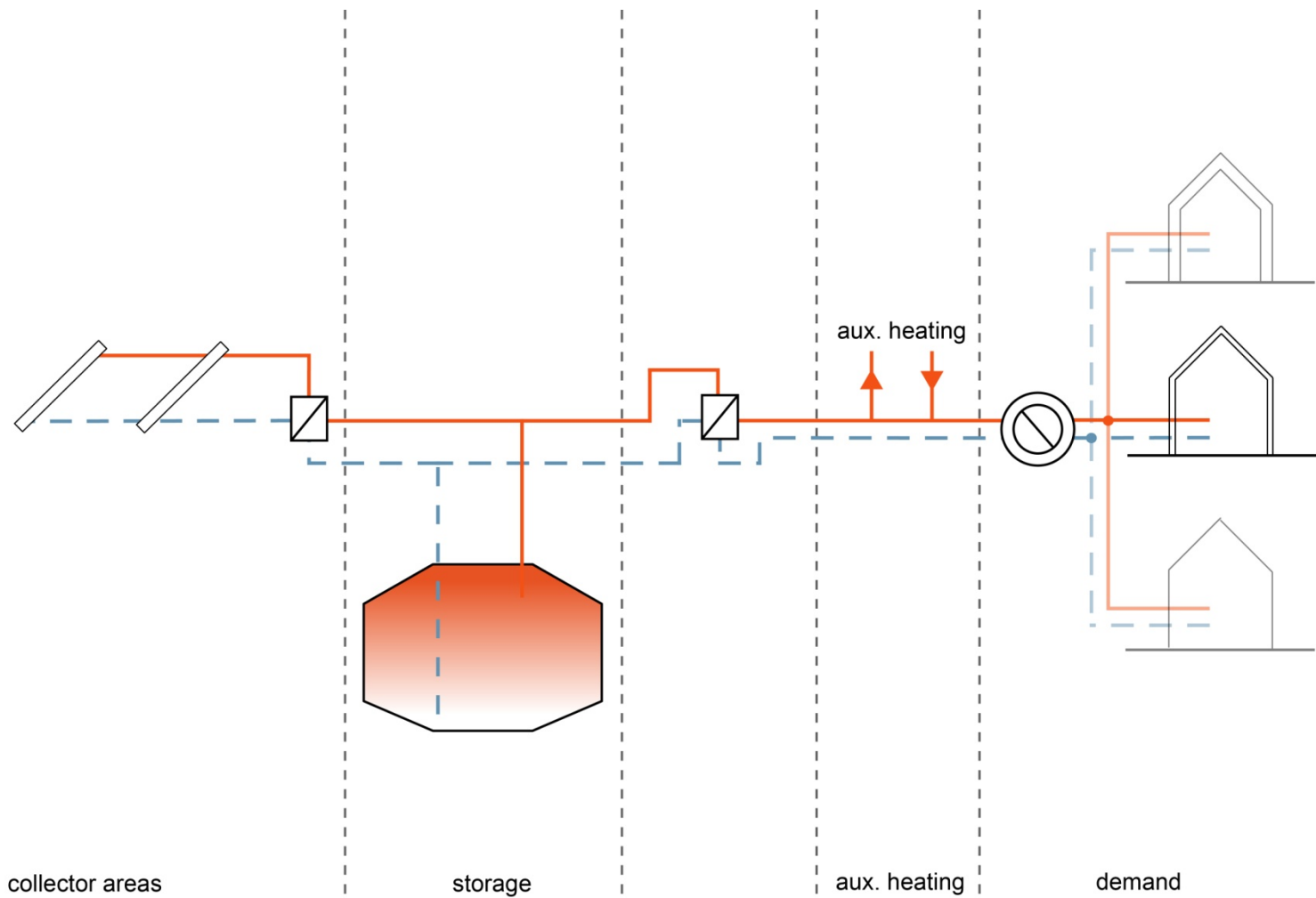
A STES is no gas burner

- A STES is a passive system component that does not produce any energy by itself.
- The benefit of a STES is mainly determined by the system in which the storage is integrated in.
- The STES has to be designed by **system simulation!**

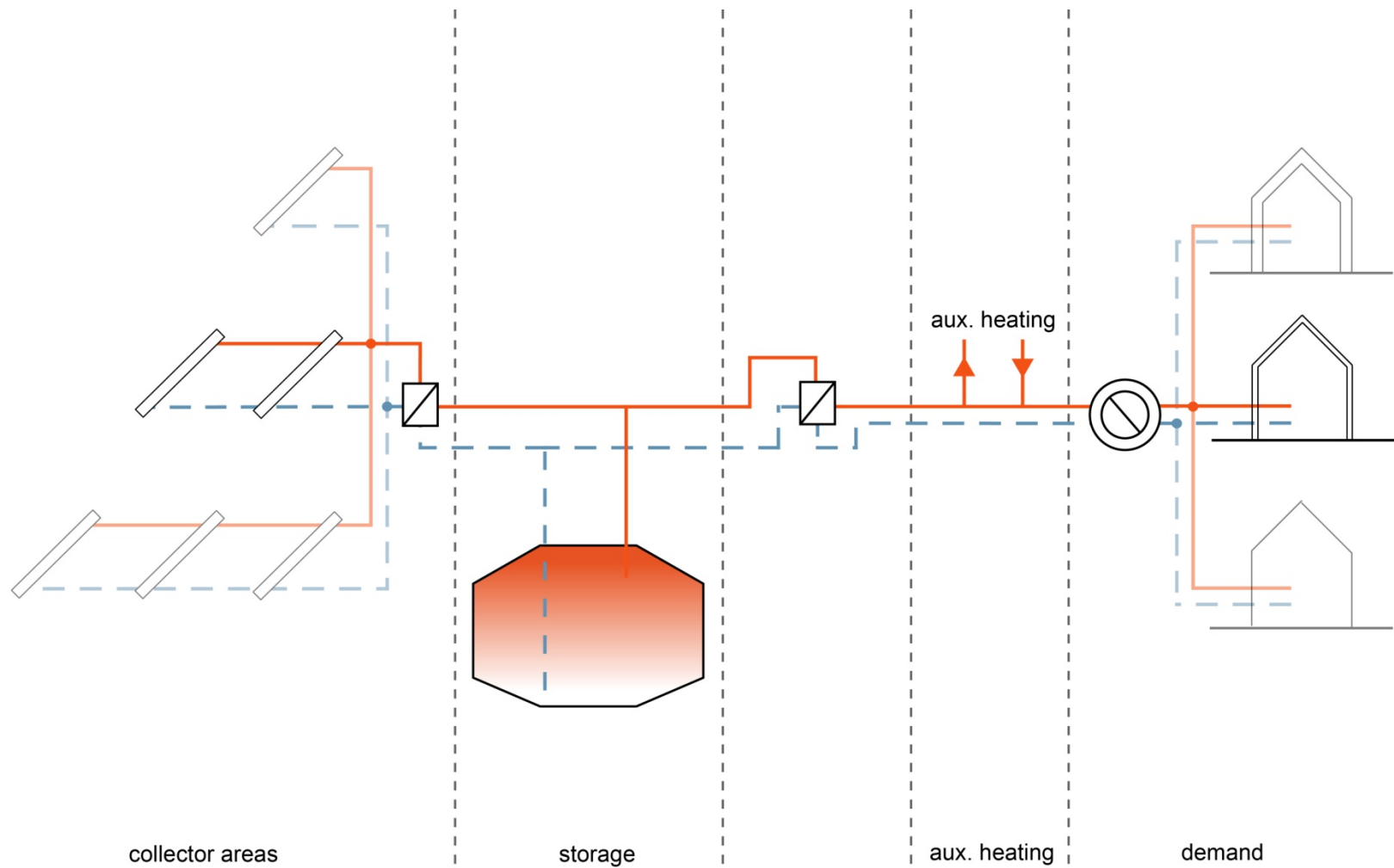
SDH with STES – standard system layout



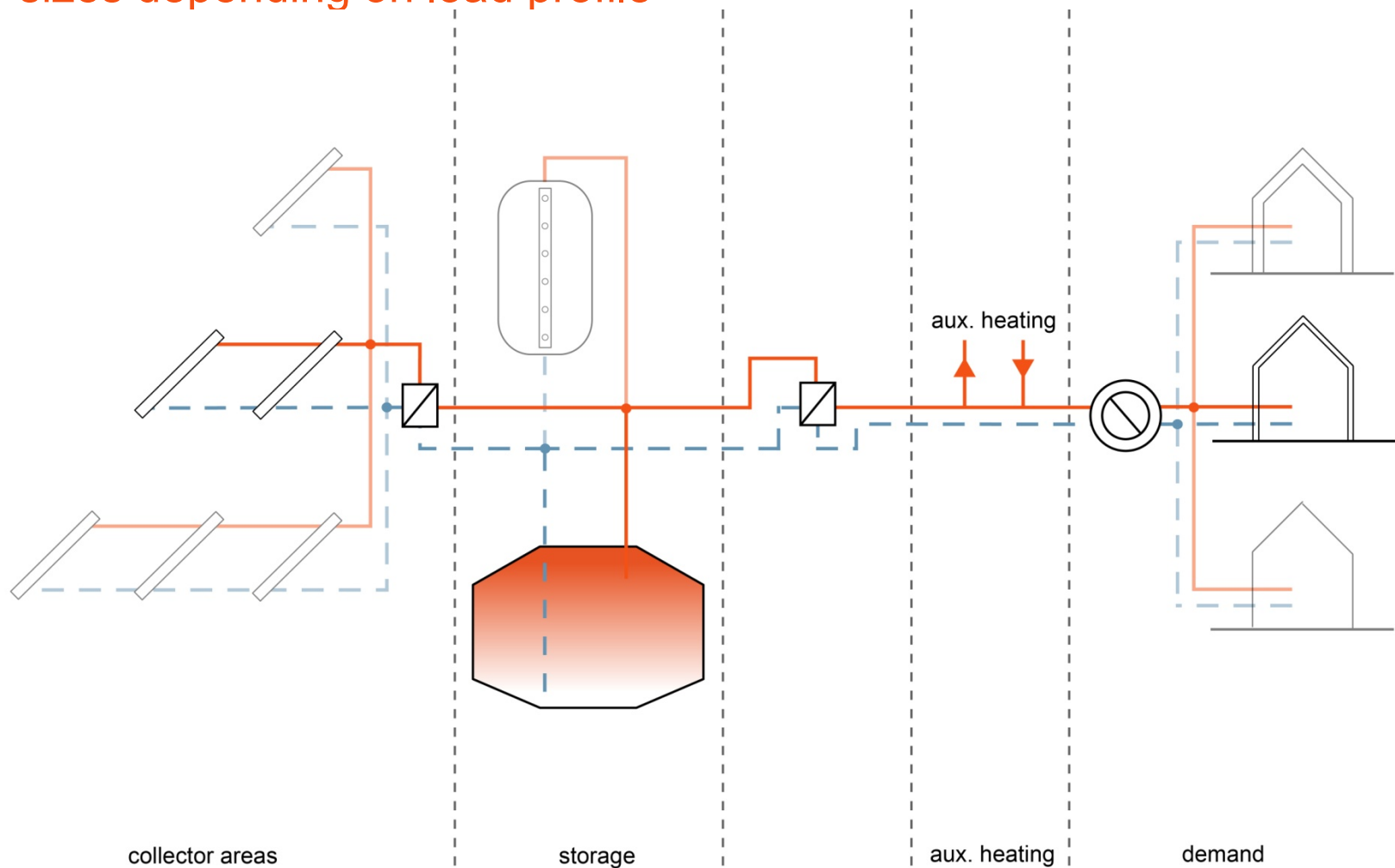
SDH with STES – dependency on load profile



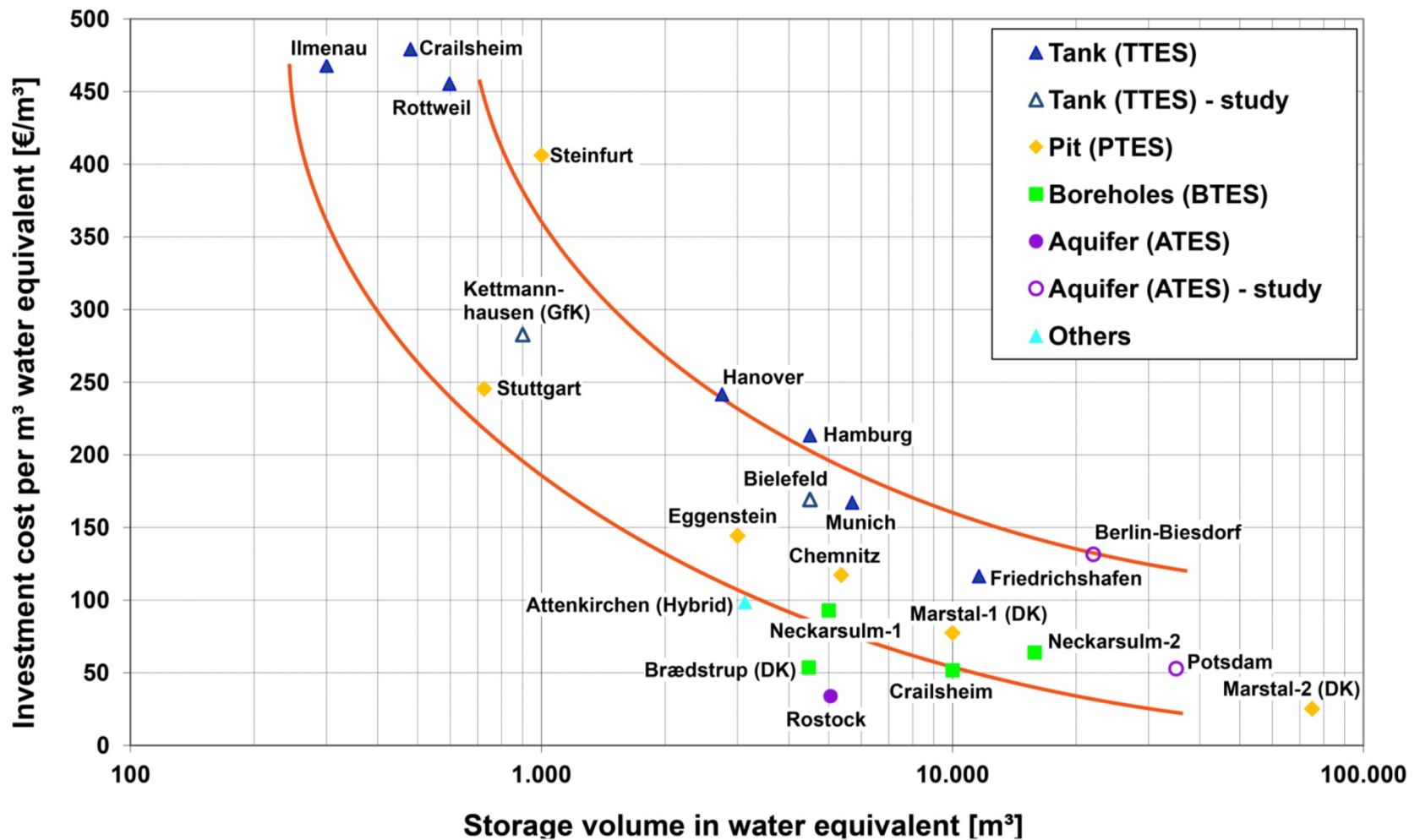
SDH with STES – variation of collector area for load profile



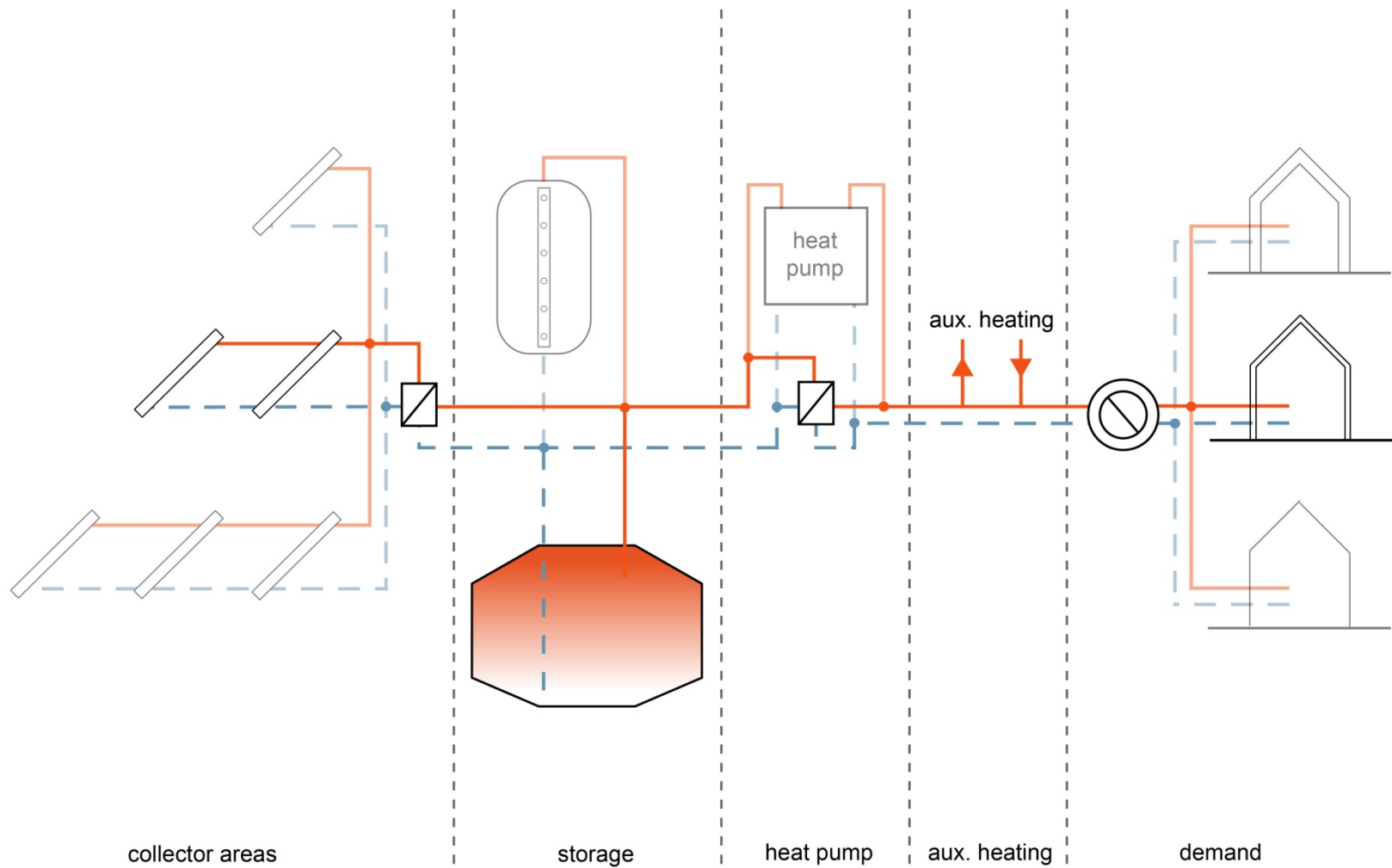
SDH with STES – variation of storage size for different collector sizes depending on load profile



Investment cost of seasonal thermal energy storages



SDH with STES – economic optimization by heat pump?



Project development of a SDH system with STES

2. Design phase

- **First: Detailed system simulation for technical and economical optimization of the heat generation system and its components** (collector area, STES, heat pump?, system integration, control strategy)
- If necessary: geological examination of building site*
- If necessary: clearance of permissions and contracts*
- Possible: parameter variation by system simulation for risk analyses

(... six months + * later ...)

- > System design for heat generation and storage is available!
- > Start of project planning!

Experiences from national first movers in solar assisted district heating systems with seasonal heat storage

Presentation at the 2nd International SDH Conference in Hamburg,
03.06.2014

Dipl.-Ing. Dirk Mangold

Steinbeis
Research Institute
for Solar and
Sustainable
Thermal Energy
Systems

Meitnerstr. 8
D-70563 Stuttgart
www.solites.de

solites