2nd International Conference on Smart Energy Systems and 4th Generation District Heating
Aalborg, 27-28 September 2016

Integration of solar thermal systems into existing district heating systems

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4DH
4th Generation District Heating
Technologies and Systems

Agenda

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- Why integrating solar thermal systems into existing DH system?
- Which methodology is advisable?
- What is the optimal size of the solar field?
- What benefit will you get from a storage?
- What are the parameters for system optimisation?

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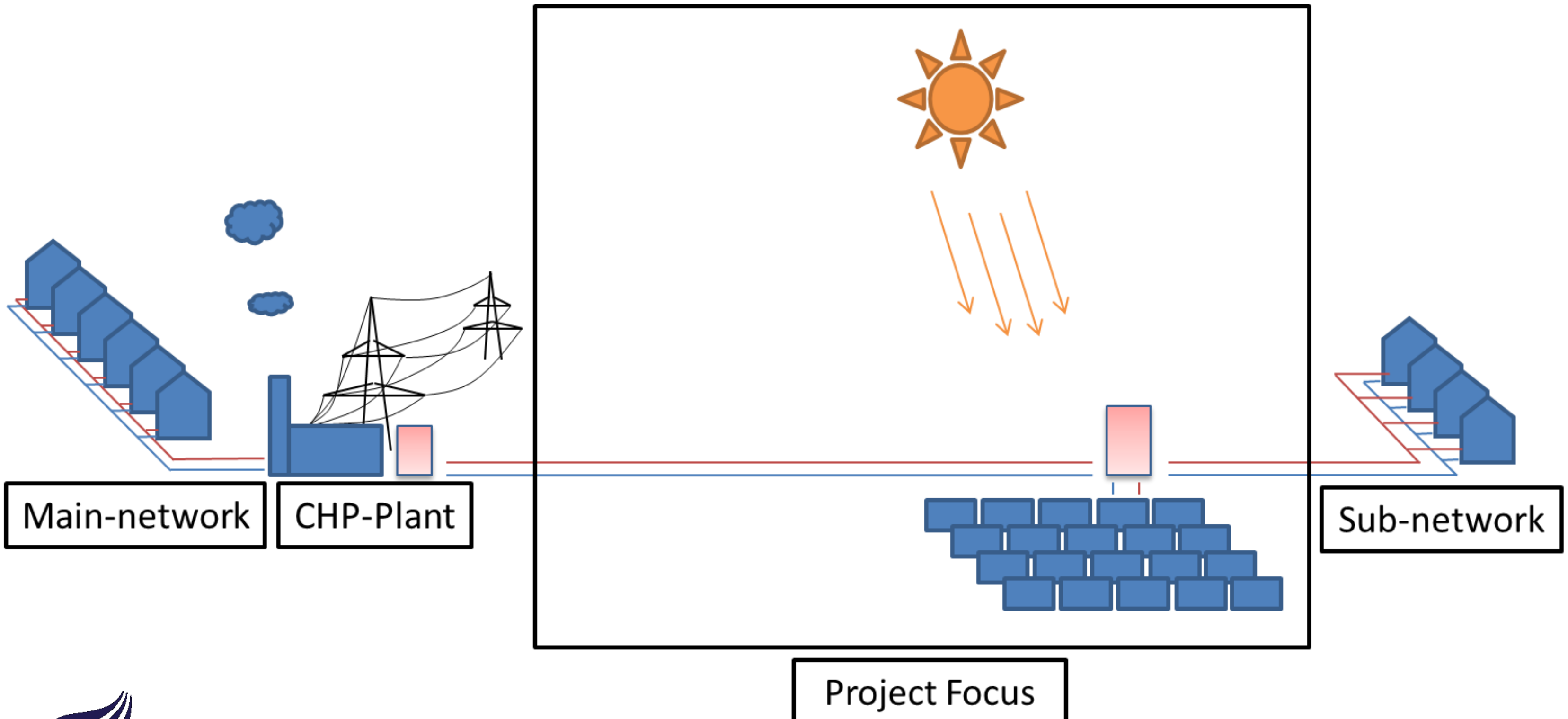
Project focus



Why integrating solar thermal into existing district heating system?

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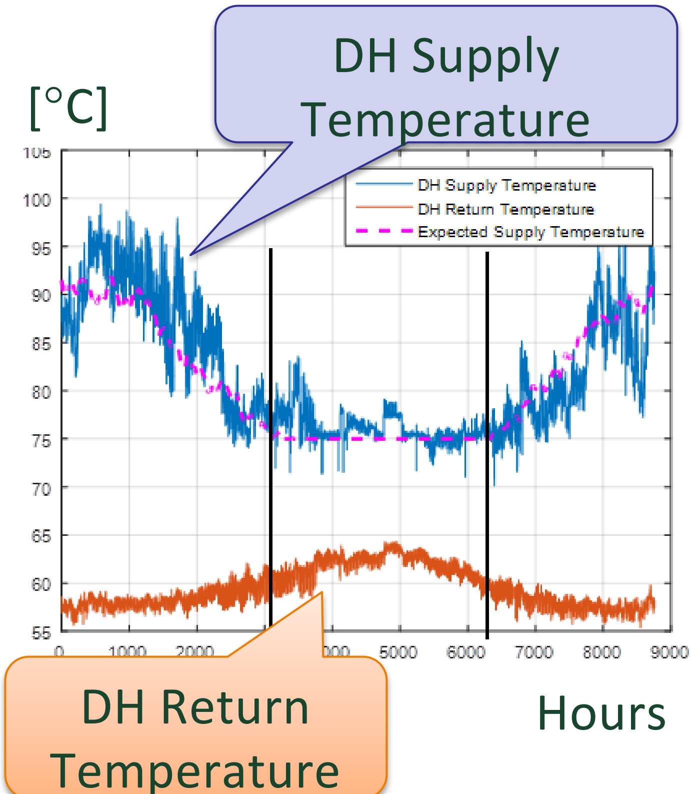
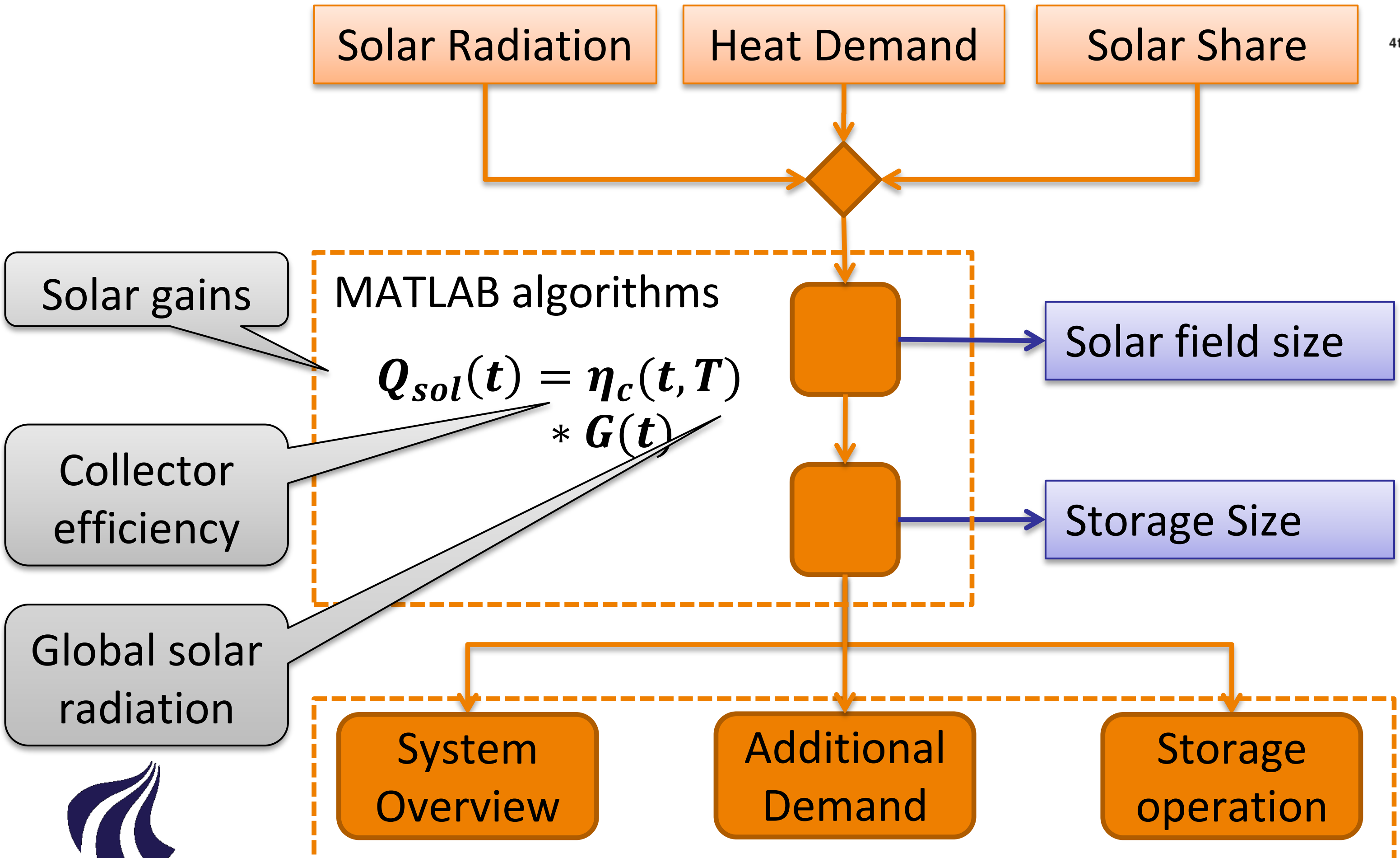


- Reducing the primary energy factor and specific CO_2 emissions of DH system
- Supplying a sub-network independently in the summer
- Increasing the flexibility of CHP operation and of supply temperature in the main-network
- Avoiding a backup boiler for the solar district heating system

Which methodology is advisable?



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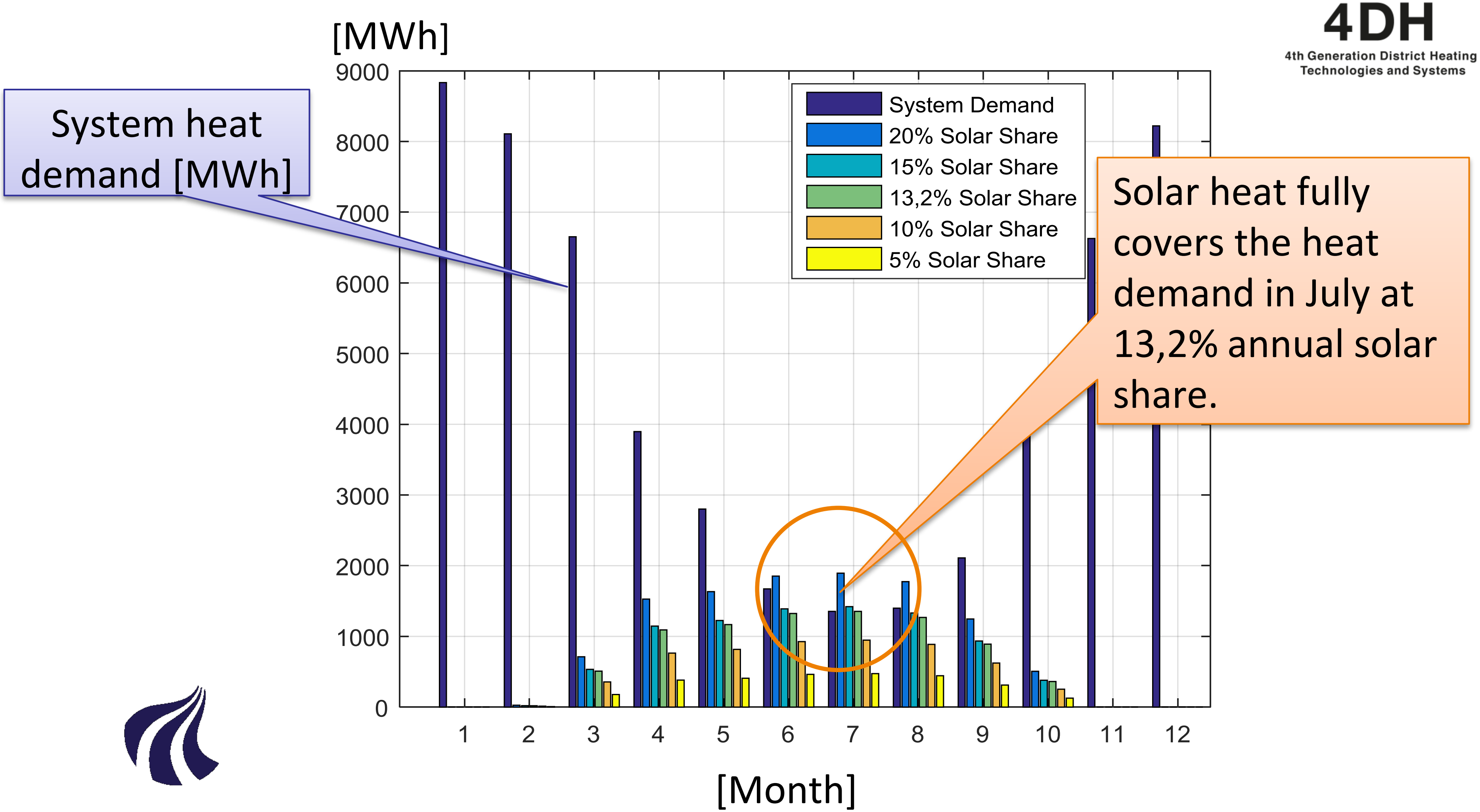
What is the optimal size of the solar field?



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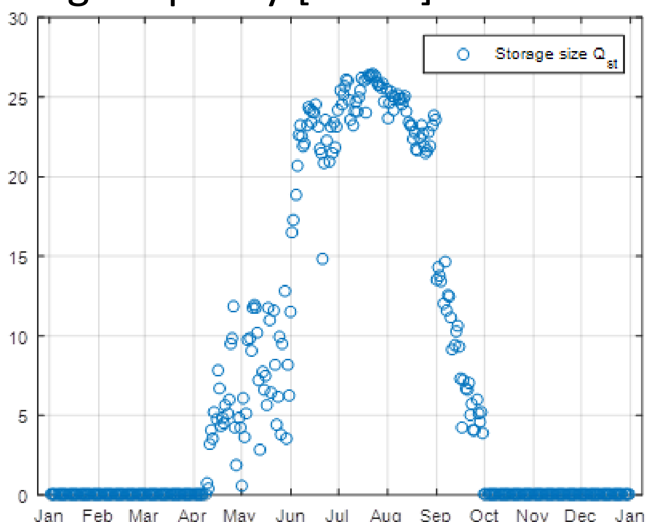
What benefit will you get from a storage?

Storage capacity [MWh]



Month

Fig. Needed storage capacity to store the solar surplus energy

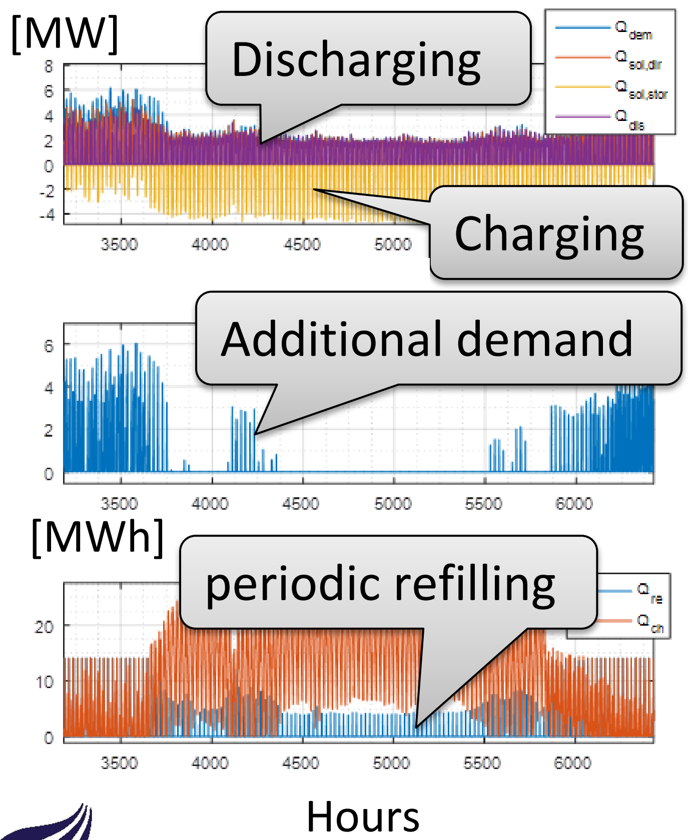
Requirements:

- Store the surplus solar heat of a single day
- Avoid heat losses

Scenario: Solar Share 13.2%

- Specific storage volume per collector area: 40 L/m^2
- Storage volume: 730 m^3
- Storage capacity: 27 MWh

What are the parameters for system optimisation?



- Results give load patterns for charging and discharging the solar storage.
- Instead of a backup boiler the DH main-network provides the additional heat demand.
- A periodic (daily) refilling process during the summer avoids (unexpected) additional heat demand from the main-network.

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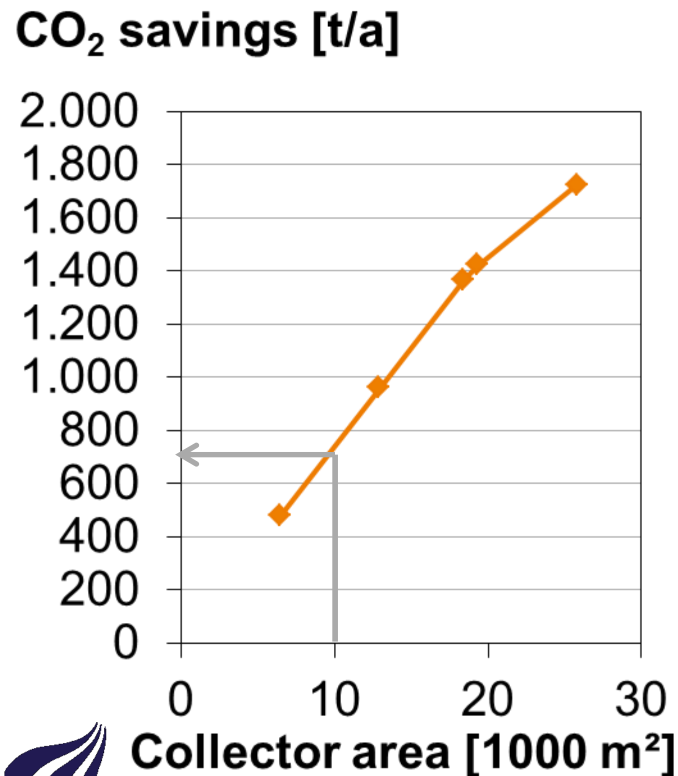
What are the parameters for system optimisation?



- Integration of solar thermal systems reduces the fossil fuel input at CHP plant.
- Specific CO2 savings of 600-800 t/ha*) can be expected for the specific case study+).

*) 1ha = 10.000 m²

+) modern coal CHP plant, Germany
CO2-emission factor: 172 g/kWh

Summary

- Integration of solar heat into DH systems brings operational flexibility to the CHP plant.
- Sub-networks can be supplied for certain periods of the year without backup boiler.
- Optimal system design is an offset between size of collector field and independence of the DH main-network.
- An exact dimensioning of solar field and storage size requires hourly input data.
- New methodology leads to detailed results and avoids over-dimensioning.

Thank you for your attention!

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