

26th World Gas Conference

1 – 5 June 2015, Paris, France



THERMAL AND ELECTRICAL STORAGES IN SYNERGETIC USE WITH COGENERATION IN RESIDENTIAL BUILDINGS

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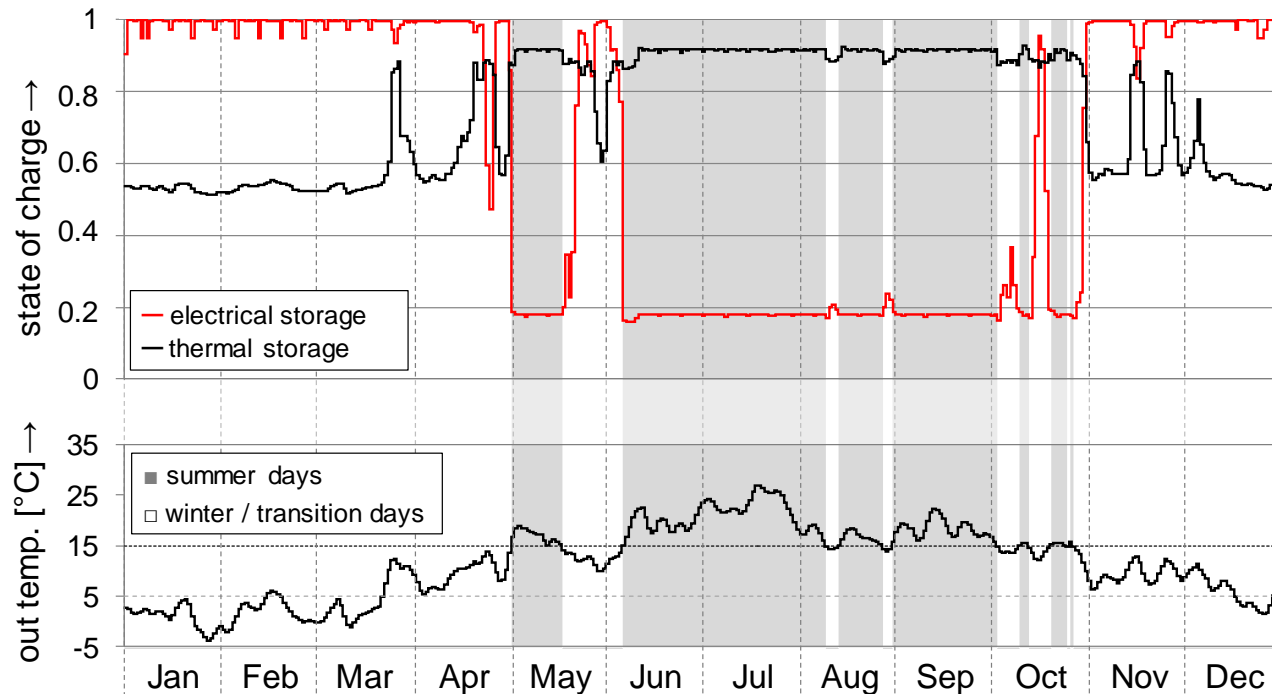
Methodology

- Object and end-user characterisation
 - Energy demands: domestic hot water, space heating, electricity
 - Allocation of annual demands in a one minute resolution
- Combined heat and power (CHP) and Auxiliary heating device (AUX)
 - CHP performance characteristics depend on implemented technology
 - Comparability by an automatised AUX dimensioning method
- Thermal and electrical storages
 - Energy-balance models considering unique storage characteristics
- Heat-controlled operating strategy without CHP modulation

Benchmarks

- Power-to-heat ratio
 - Electrical power (or demand) compared thermal power (or demand)*
 - Common benchmark for CHP systems – (also applicable for objects)
- Self-use ratio
 - Amount of self-used compared to overall produced CHP electricity*
 - A high self-use ratio improves the economic system efficiency (GER)
 - The economic impact depends on the political framework for CHP
- Electrical (and thermal) demand coverage degree
 - Amount of self used CHP electricity compared to overall requested electricity from the object / end-user (or heat)*
 - A high coverage degree correlates with a high degree of self-sufficiency

Temporally differentiated results



Case study 

Düsseldorf, GER

Year 2006

25,000 kWh_{th}/a

Power-to-heat: 0.16

Otto-engine

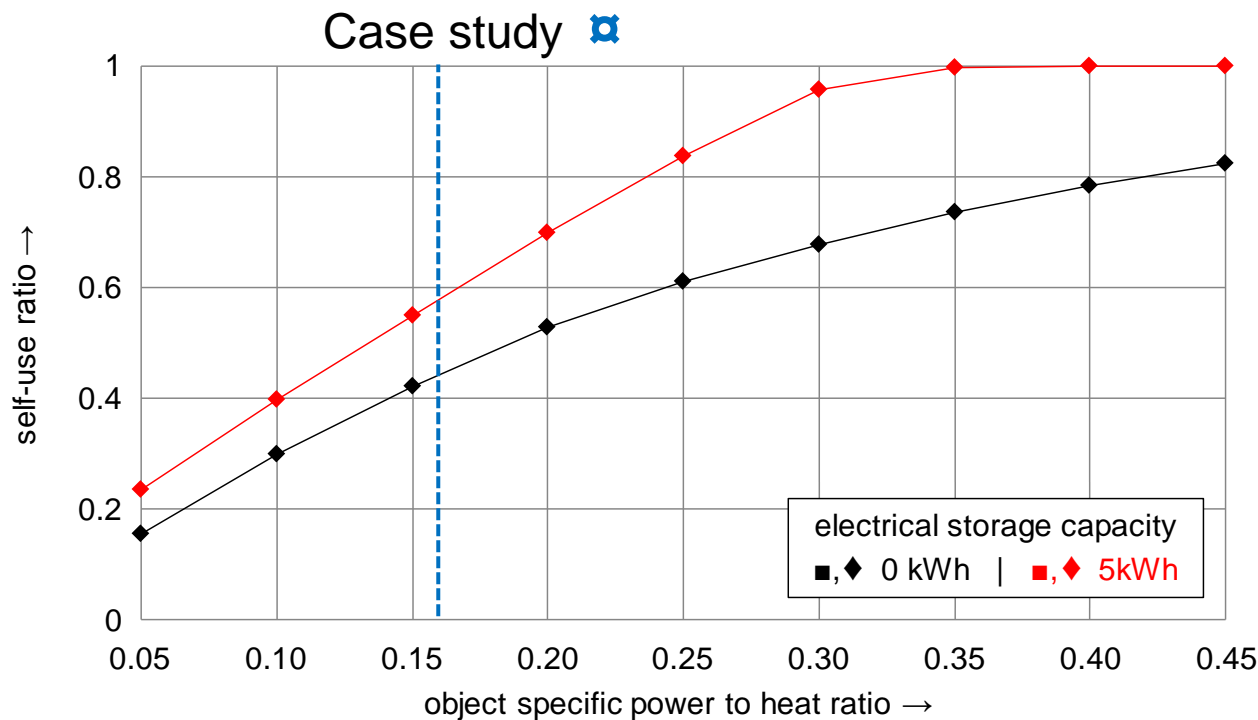
power: 1 kW_{el}

Power-to-heat: 0.4

th. storage: 11 kWh

el. storage: 5 kWh

Parameter variation | self-use ratio



On case study 

Dimensioning:

Relation between
object and CHP
power-to-heat ratio

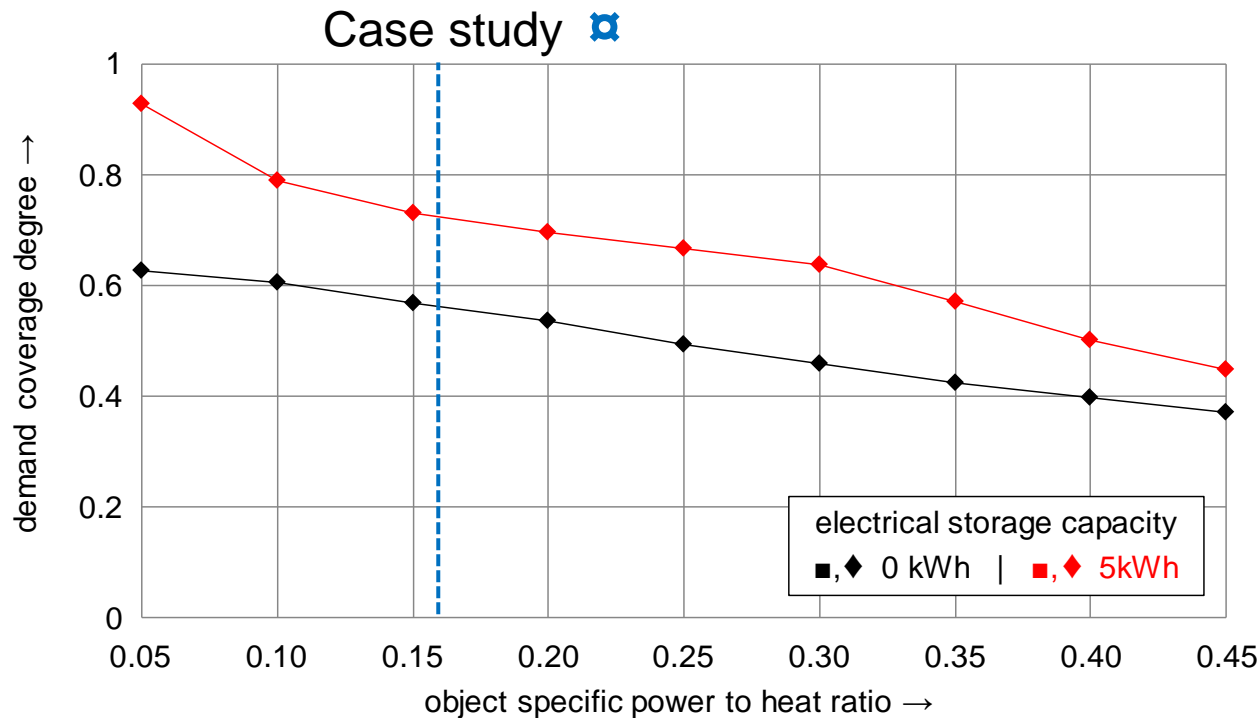
Electrical storage:

Improved self-use

Restrictions:

Heat-controlled
operating strategy

Parameter variation | demand coverage degree



On case study

Dimensioning:

Relation between
object and CHP
power-to-heat ratio

Electrical storage:

Improved coverage

Restrictions:

Heat-controlled
operating strategy

Outlook

- Optimisation potentials
 - Long term thermal and / or electrical storages
 - Variable CHP power-to-heat ratios
 - Modulating CHP performances
 - Different control strategies
- Next steps
 - Development of an electrical storage controlled operating strategy
 - Analyse and evaluate the impact of CHP influencing parameters

Thank you for your kind attention

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Acknowledgement

Grateful acknowledgement is made for financial support by the “progres.NRW programme” of the state North Rhine- Westphalia and the “European Regional Development Fund” within the scope of the project “roadmap | KWK.NRW”