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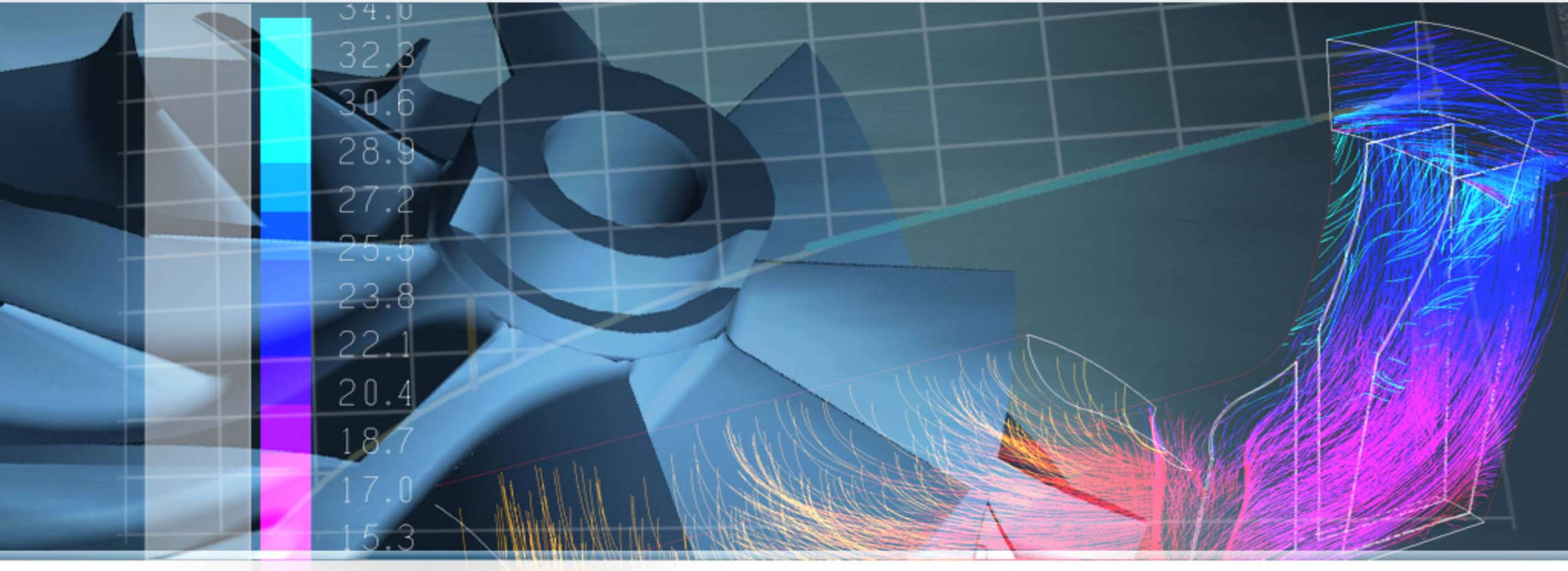


Institut für Luft- und Kältetechnik Dresden gGmbH

IEA-Task 53 Meeting Palma de Mallorca

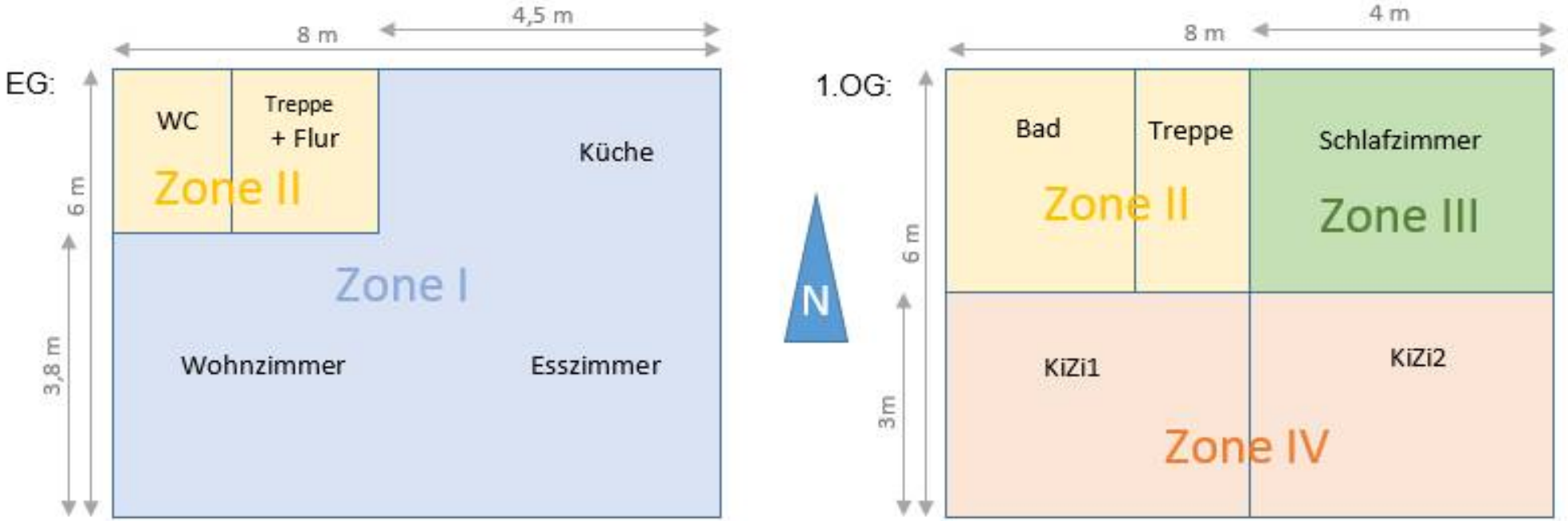
Simulation Results and Experimental Investigations

SolarSplit Project – Mono-Split

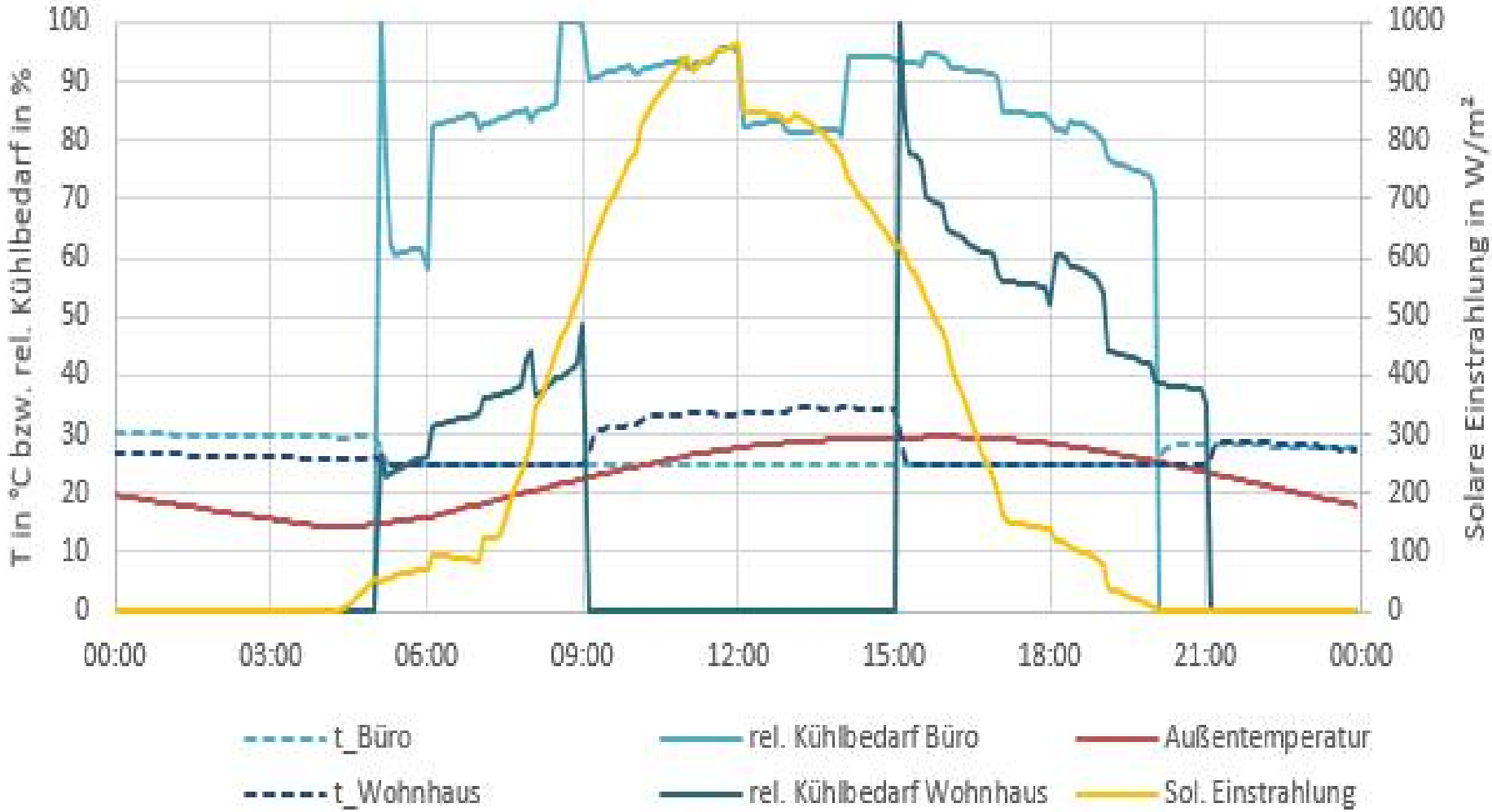
www.ilkdresden.de

Building Simulation
Storage Dimensioning

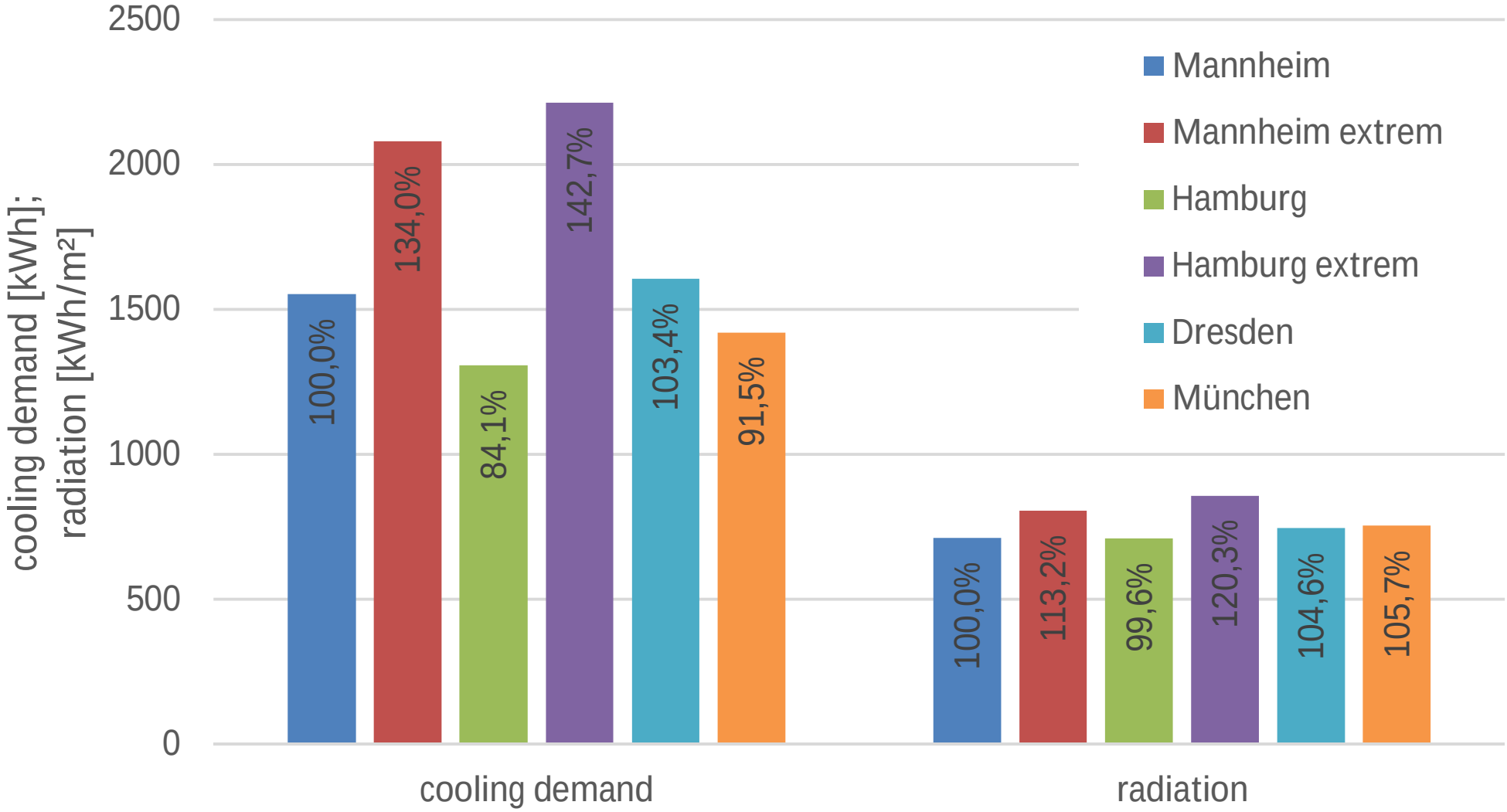
- In the first step simulations were carried out to find appropiated ice storage sizes → relevant for a huge number of development actions
- Building structure was chosen to meet German applications of Mono-Split-Units
- Two different insulation standards were applied: EnEV2016 and WSchV82
- Building thermal capacity was studied as cold storage



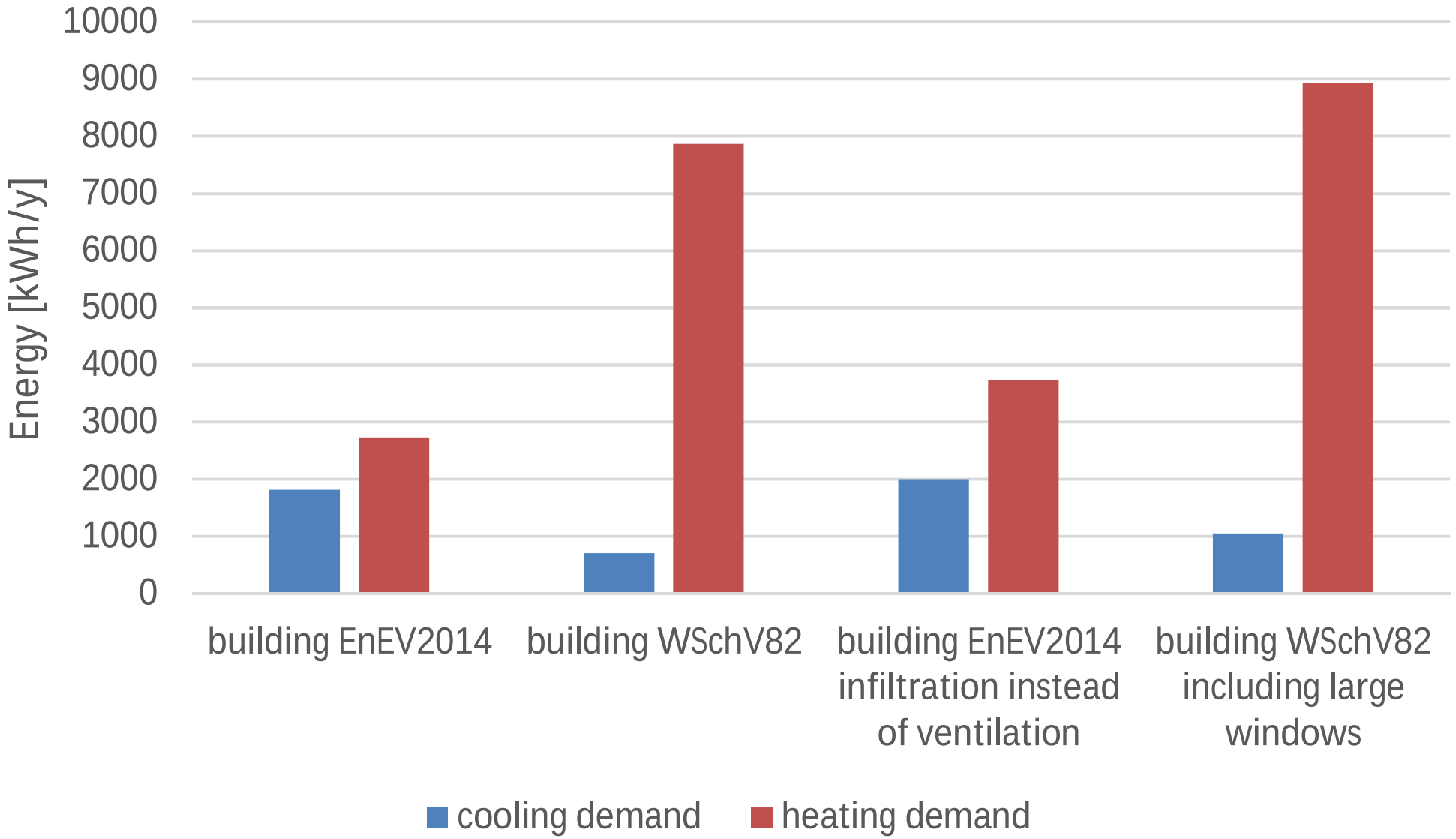
Comparision Single Family House vs. Office Building



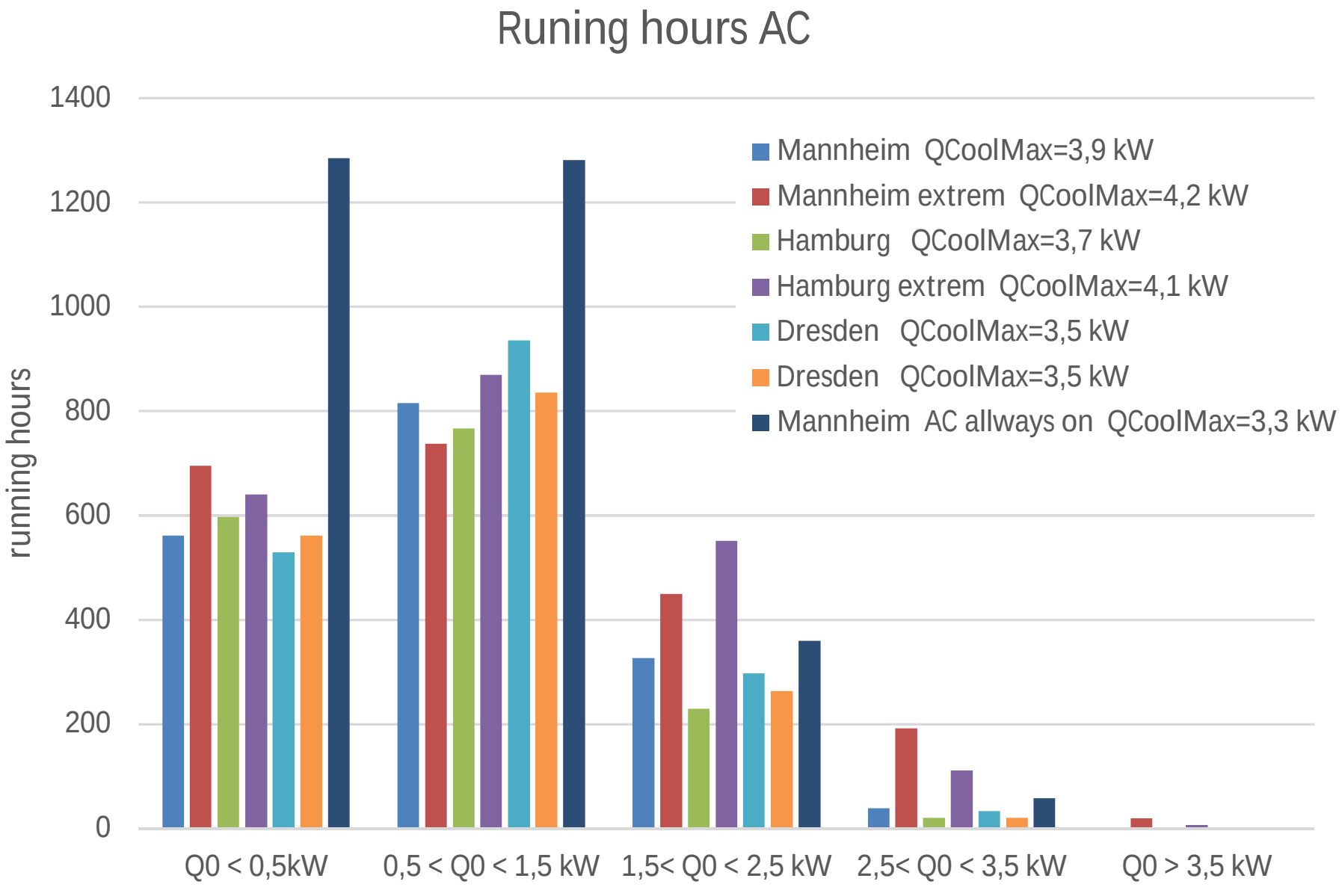
Influence of the climate



Influence of the insulation level and infiltration / ventilation effect



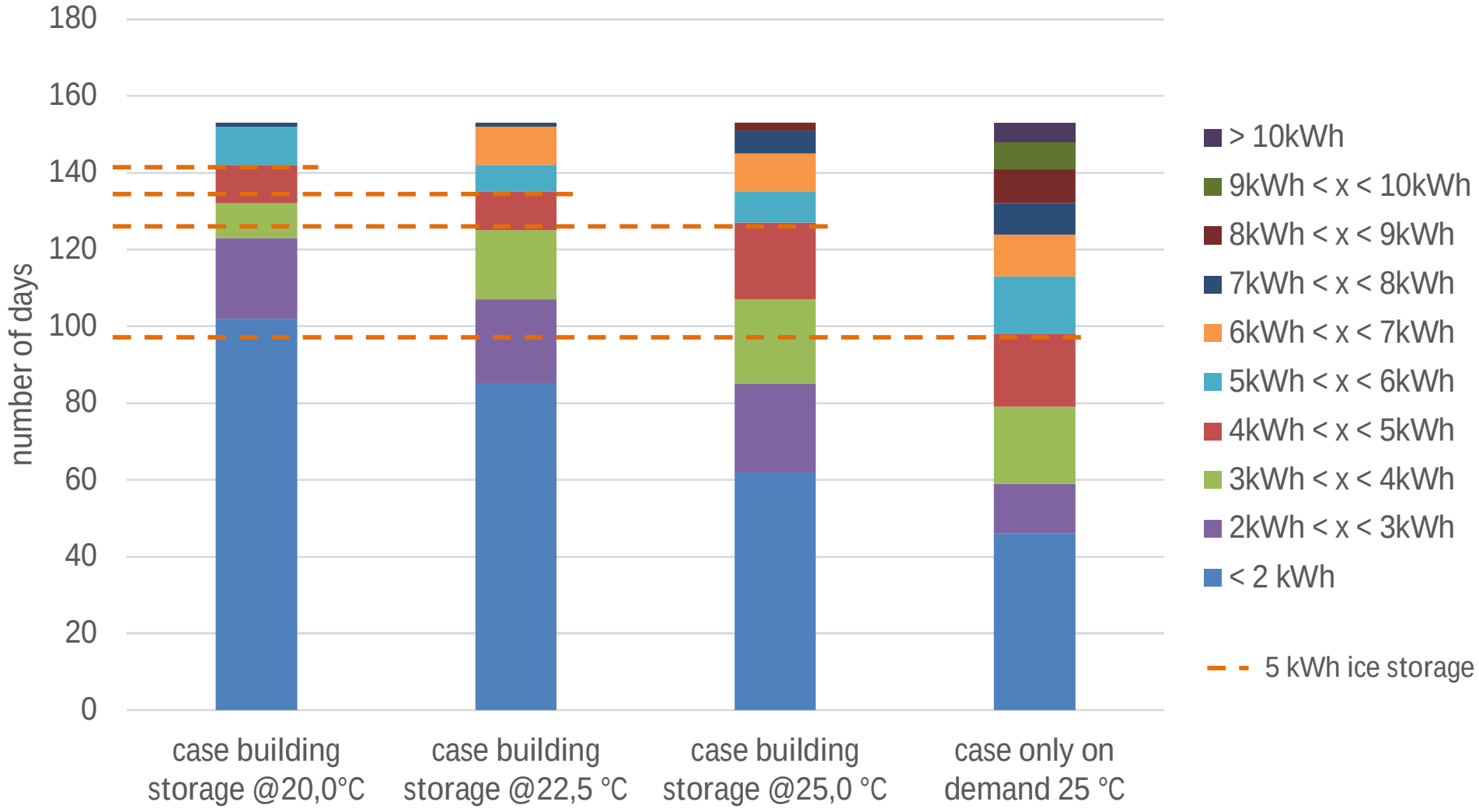
Runing Hours of Split Unit



Storage Effect of Building and Ice Storage

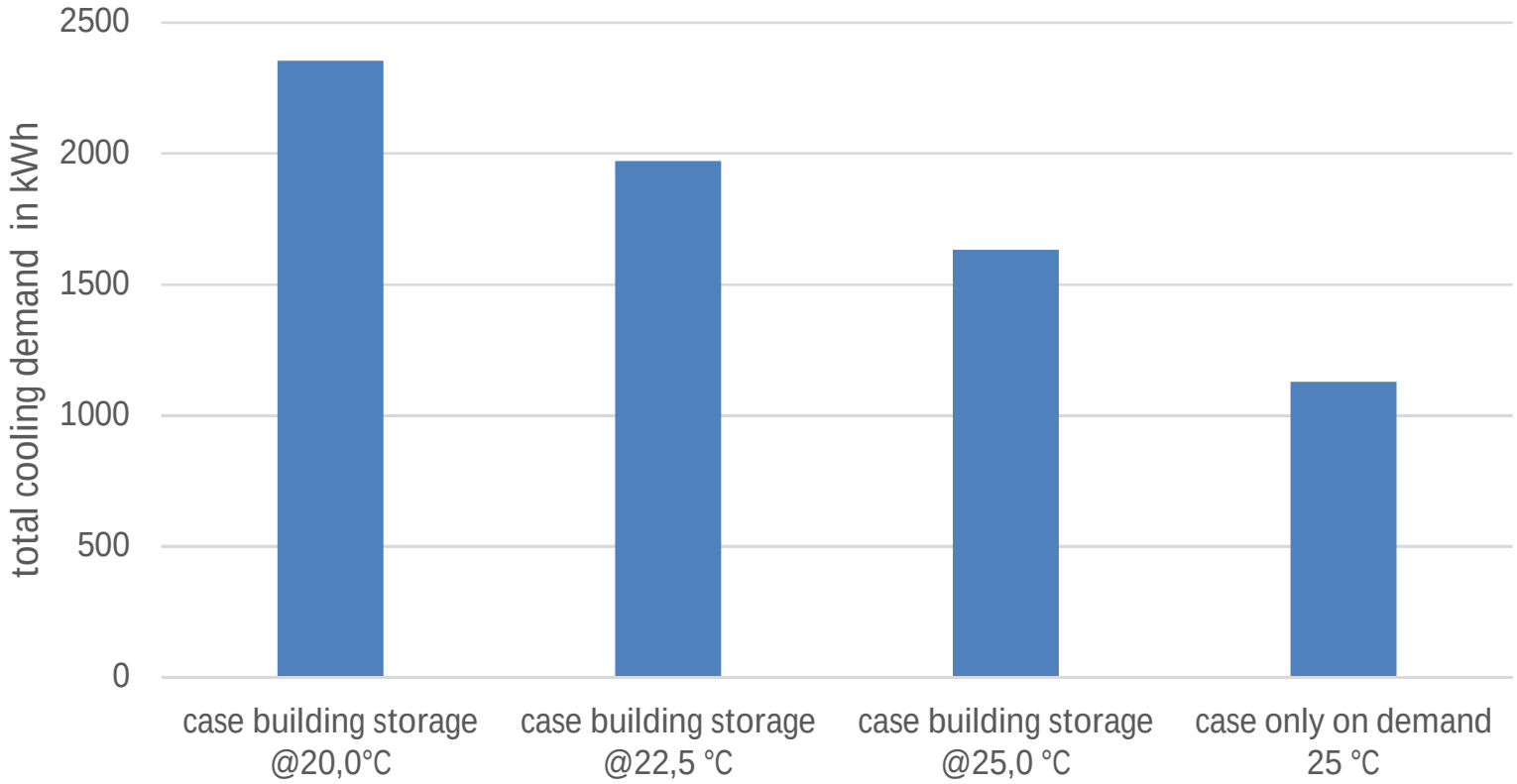
- **4 different scenarios for sizing the storage**
  - building is only cooled on demand (then people are present)
  - building is cooled to 25 °C with energy from PV
  - building is cooled to 22,5 °C with energy from PV
  - building is cooled to 20 °C with energy from PV
- **Storage dimensioning was done by comparing the required cooling energy outside of the PV-production time**

PV-Cooling Days Depending on Cold Storage Size

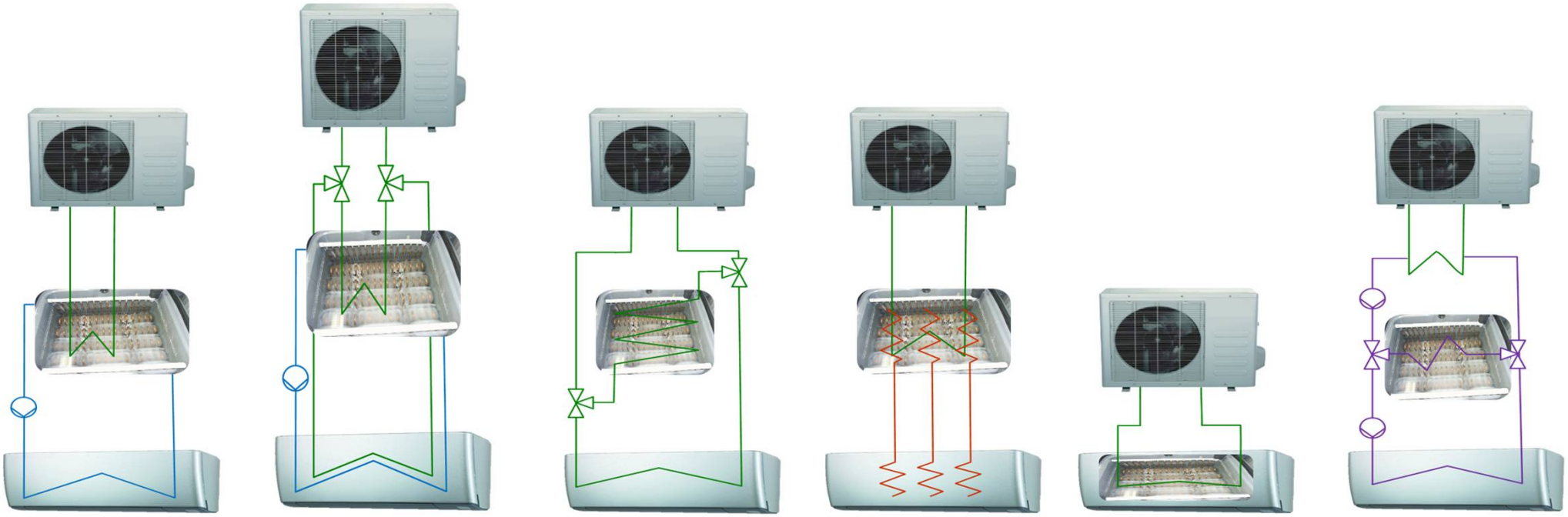


Using the Building as Storage

- Cool down the building during PV-generation even if no people are present
- Inreasing thermal losses
- Without forcast based control → risk of generating heating demand



Ice Storage Integration
Technical Concepts Studied



Experimental Investigation of Mono-Split-Unit with Ice Storage

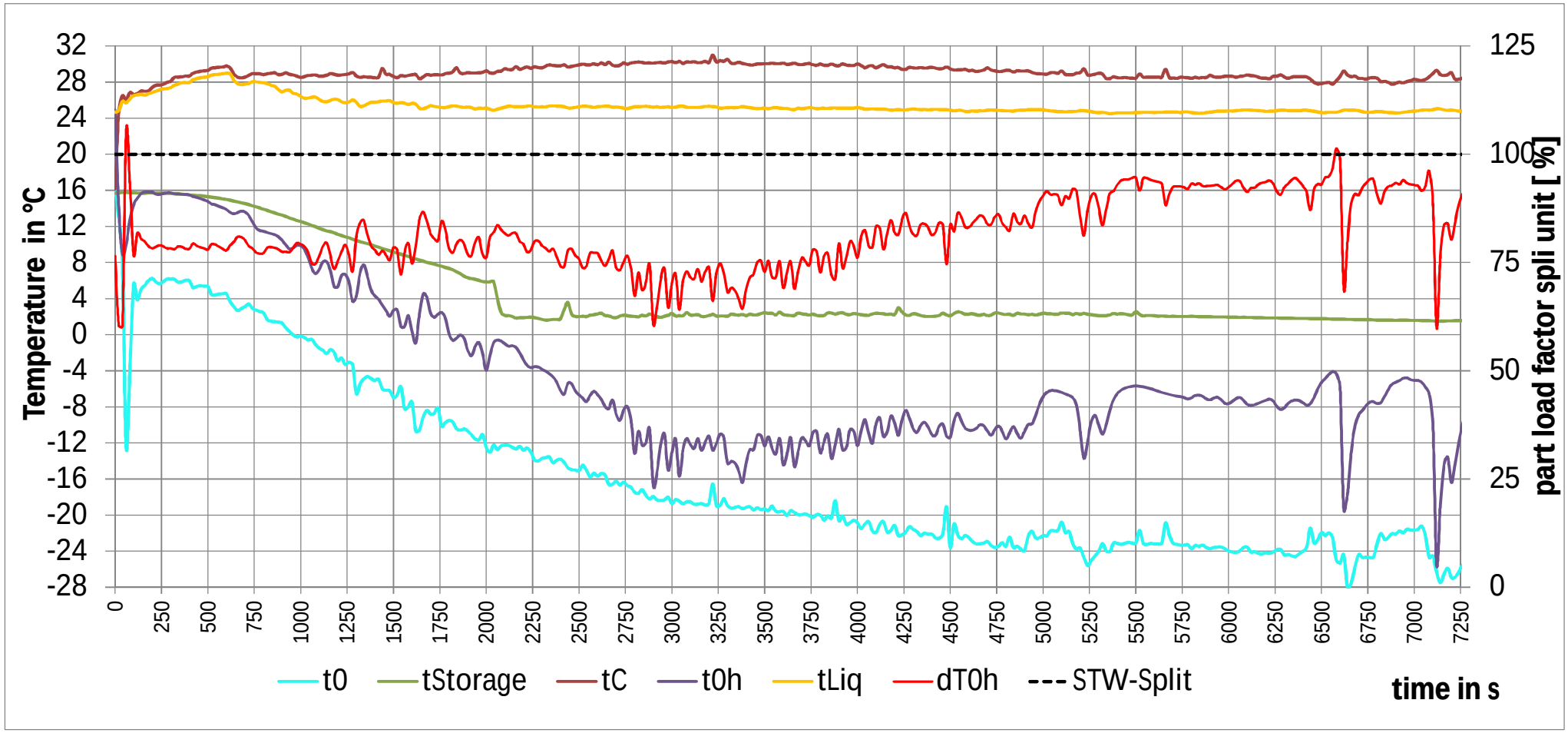
Experiences from the experimantal investigations

- **Refrigerant charge prediction is done during runtime by observing condenser outlet (→ no gas bubbles) and evaporator outlet (→ stable but not to high super heat)**
- **In our first experiments:**
  - condenser outlet never became fully liquid (→ to low charge)
  - evaporator outlet was in two phase region, no super heat (→ to high charge)

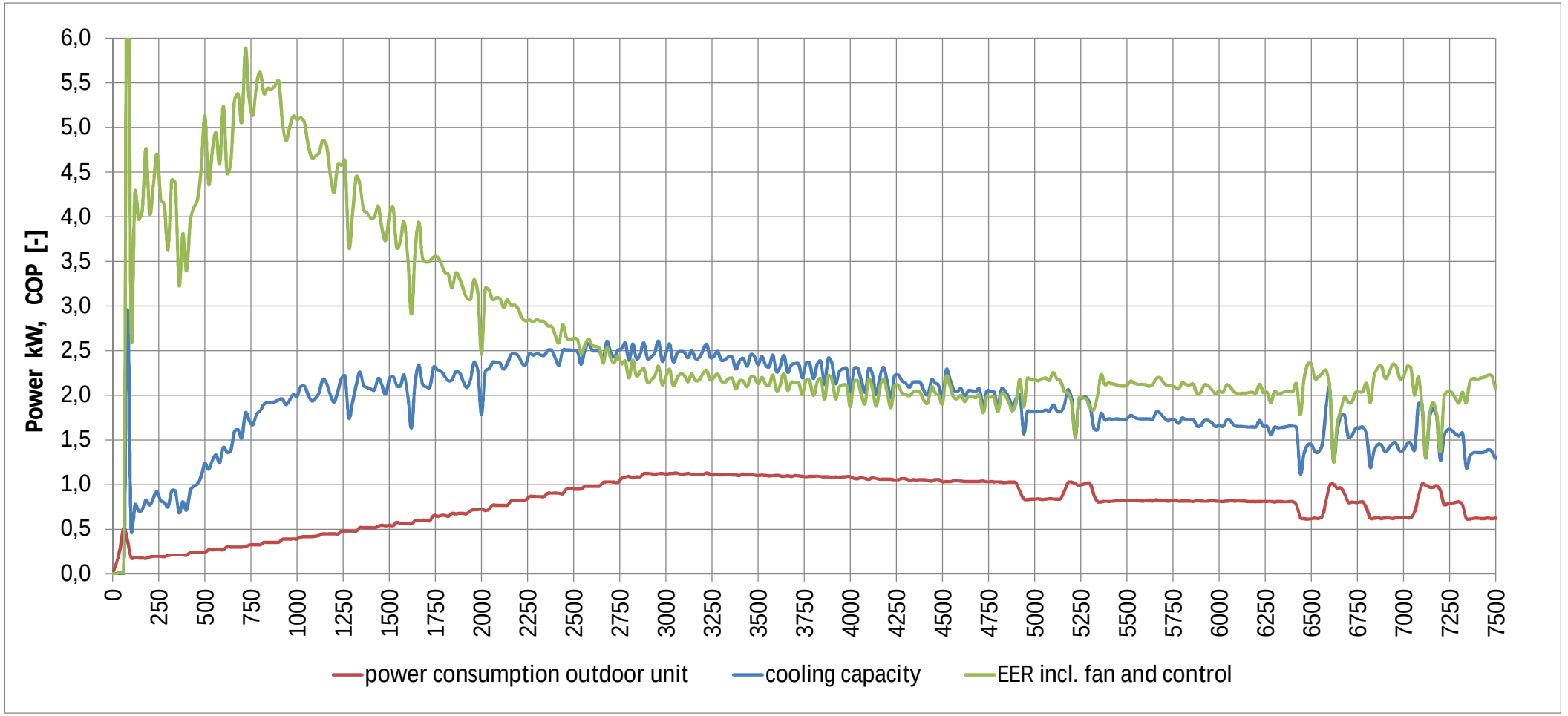
  - → anti-frost control of split unit avoided lower pressure level in evaporator
  - only one temperature sensor is used for super heat signal and frost signal

  - → additional expansion device necessary

Charge Process
Temperatures at Full Load



Charge Process
Powers and EER at Full Load



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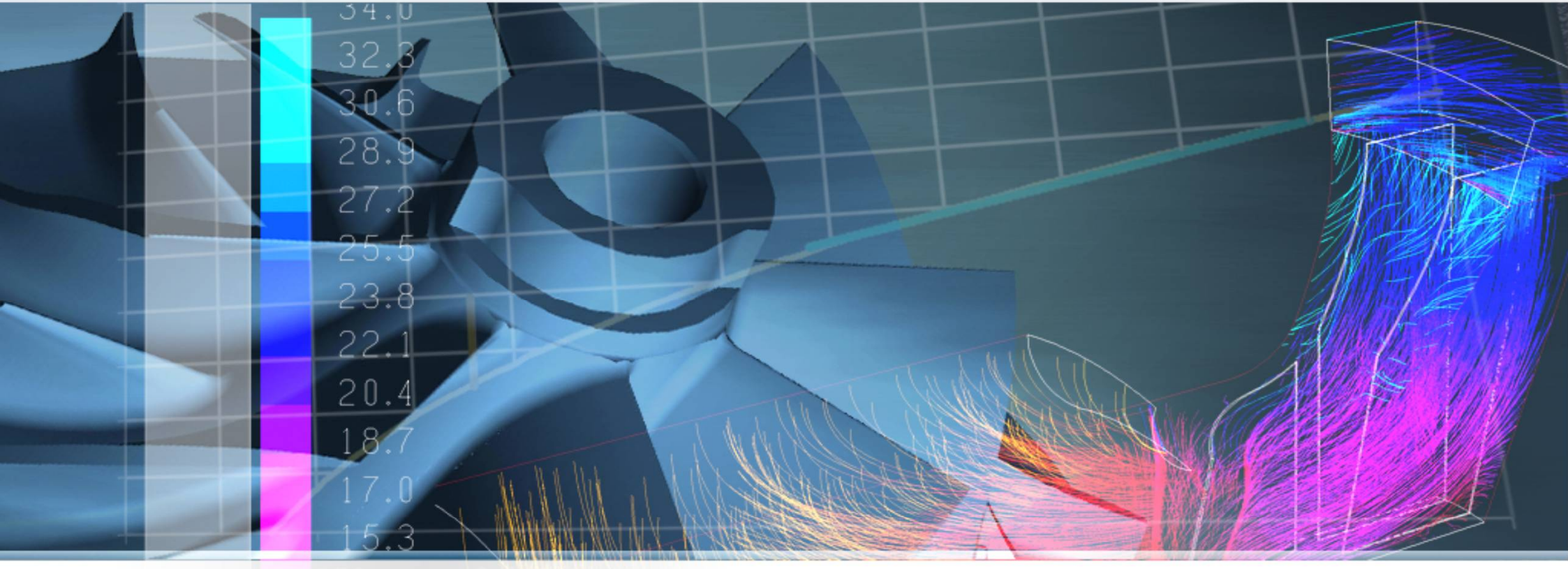

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