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A centrifugal compressor
cooling system using water
as working fluid

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Case Study: Cooling of a Data Center



Key application data:

- Location:
Bremen, Germany
- Cooling capacity:
25 kW constantly
- Air temperature in aisles:
25 °C constantly
- Outside heat exchanger:
Air cooled dry cooler

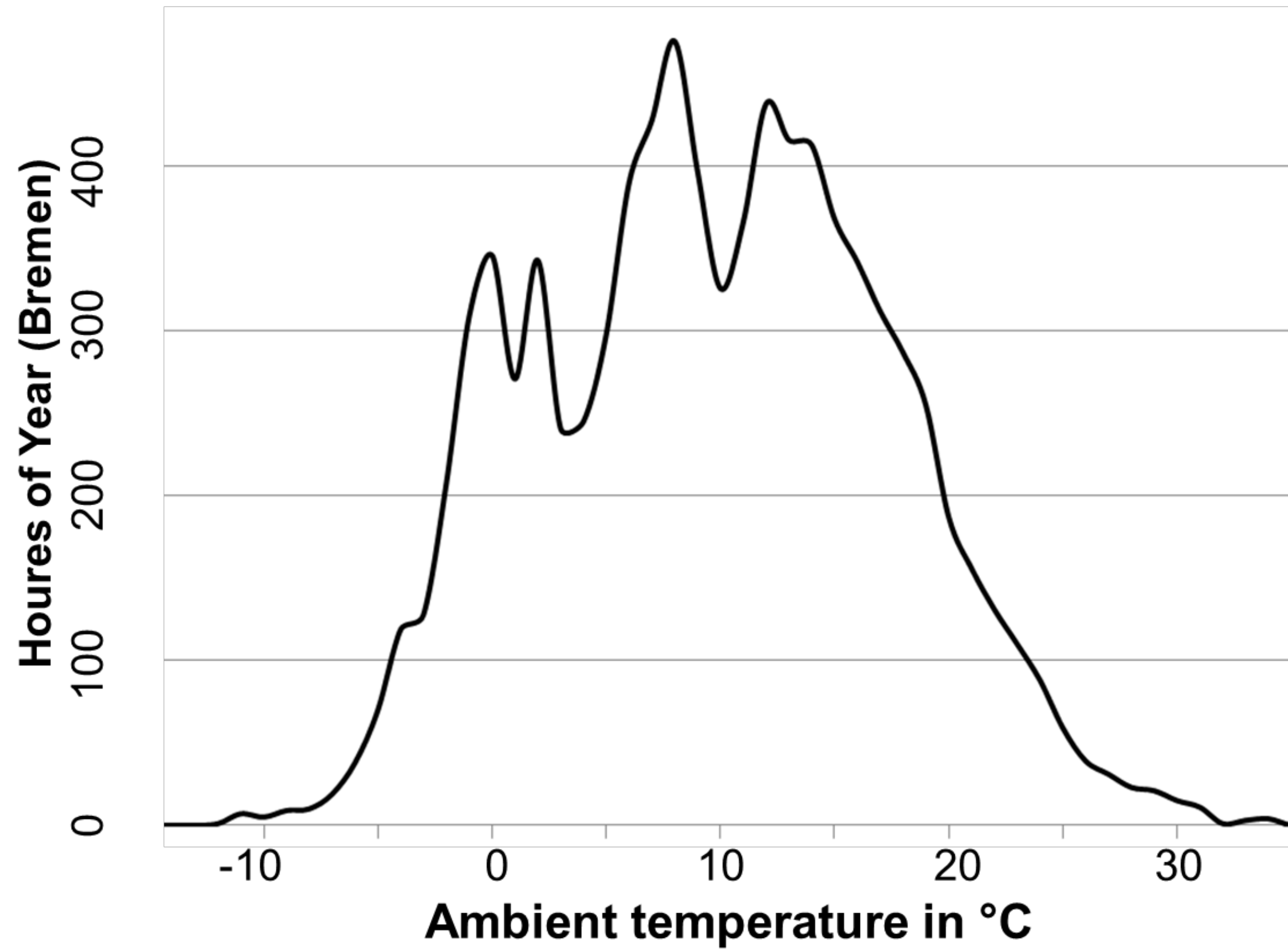
The installed eChiller unit:

- Chiller using water - R718 - as refrigerant
- Operational modes: free cooling, one and two stage operation depending on ambient temperature
- Centrifugal direct driven compressors
- Operates in vacuum of 10 – 100 mbar
- Heat sink and heat source decoupled by braze plate heat exchangers



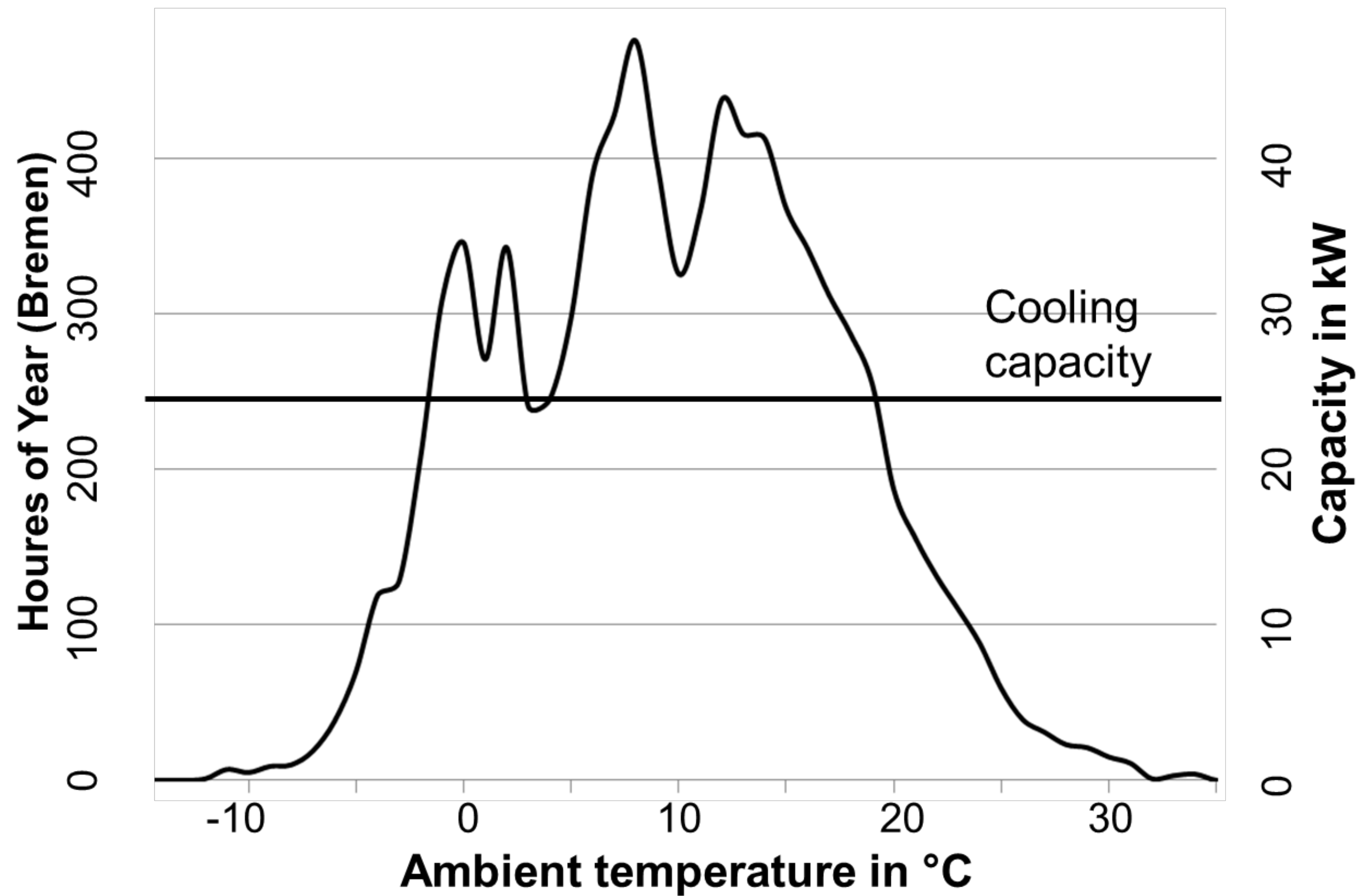
Operation of the unit:

- Ambient temperature distribution at the location of the unit



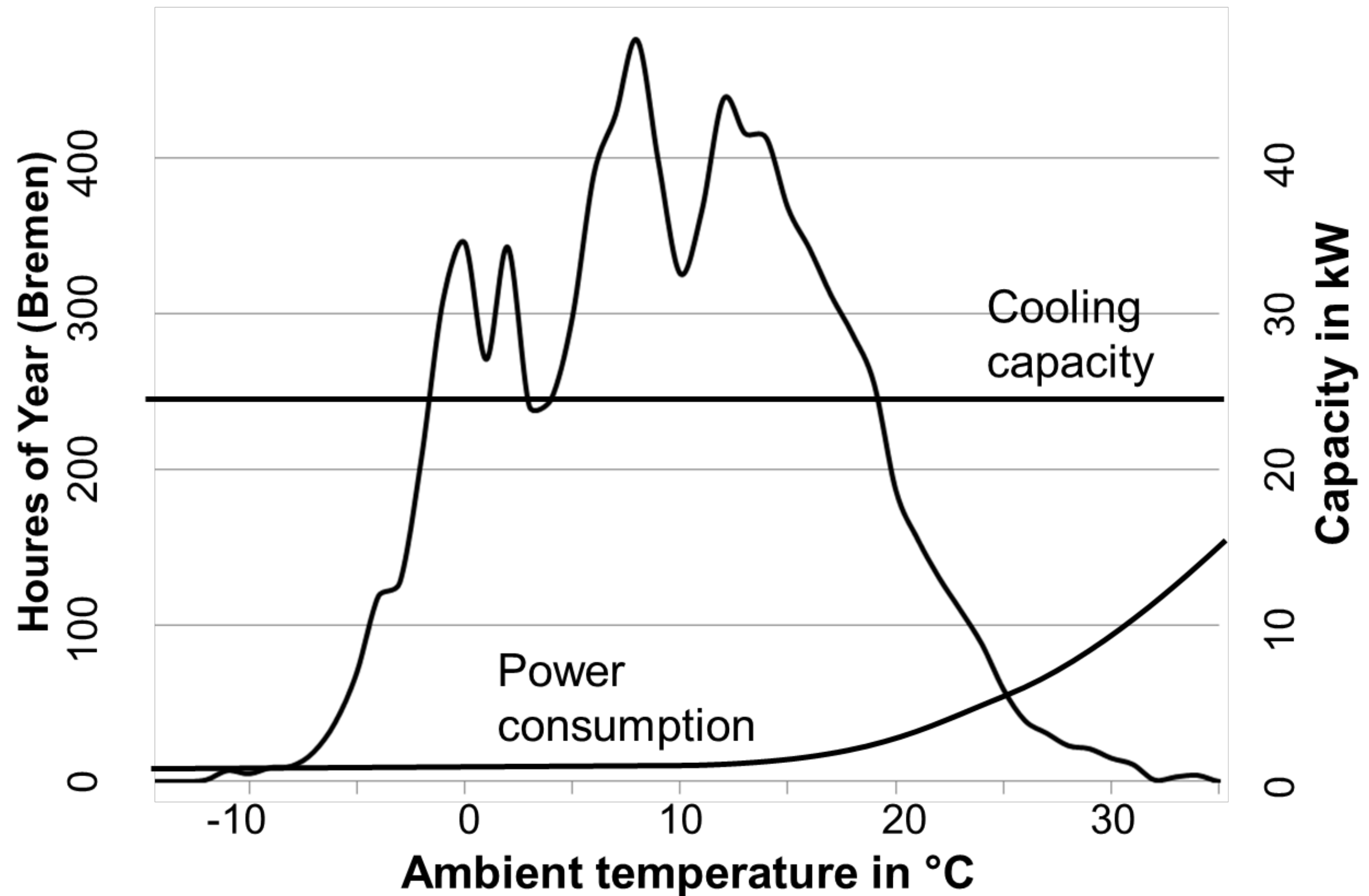
Operation of the unit:

- Ambient temperature distribution at the location of the unit
- Cooling capacity 25 kW all year



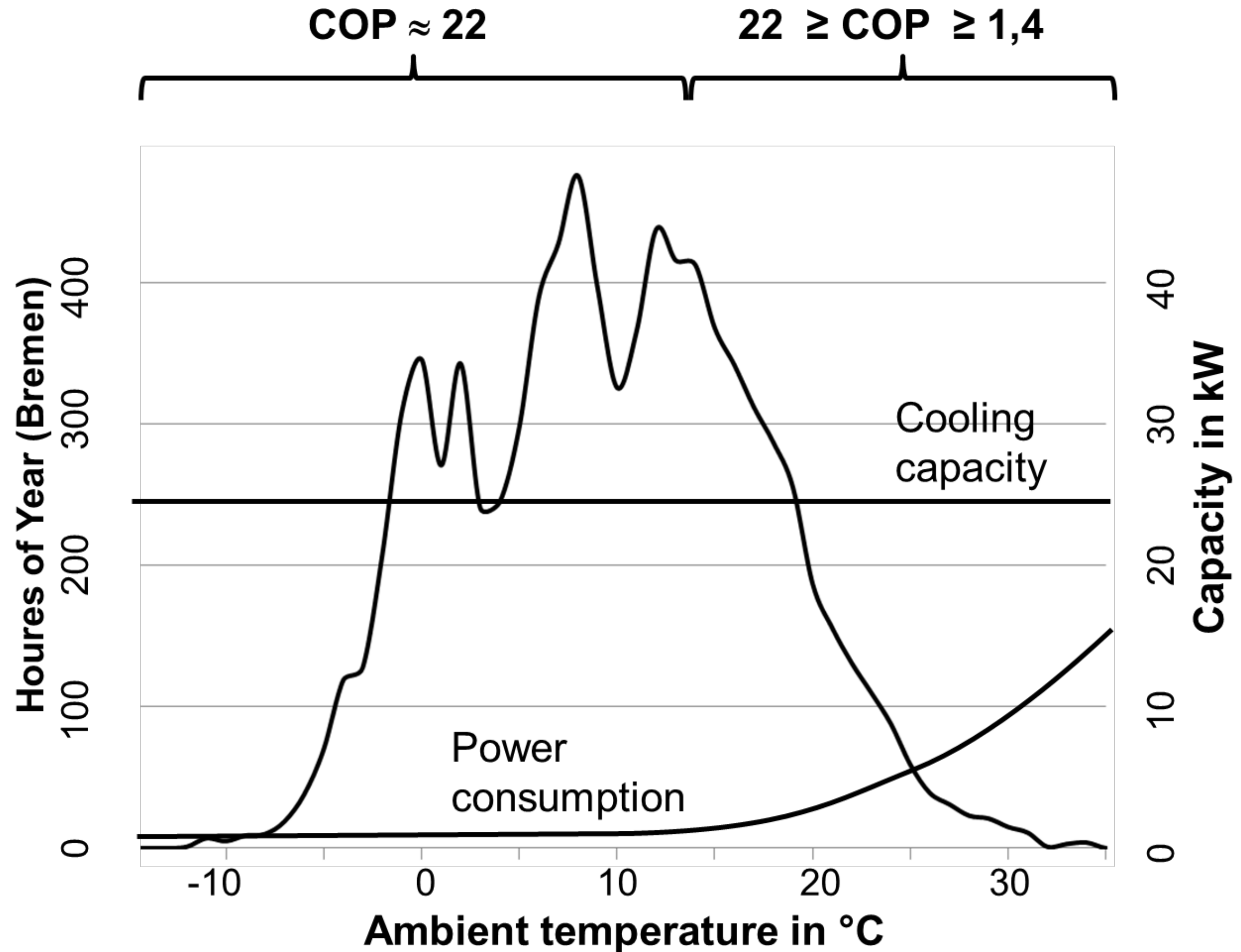
Operation of the unit:

- Ambient temperature distribution at the location of the unit
- Cooling capacity 25 kW all year
- Power consumption of unit rising from 1,1 kW (free cooling mode) to 17 kW (two stage operation)



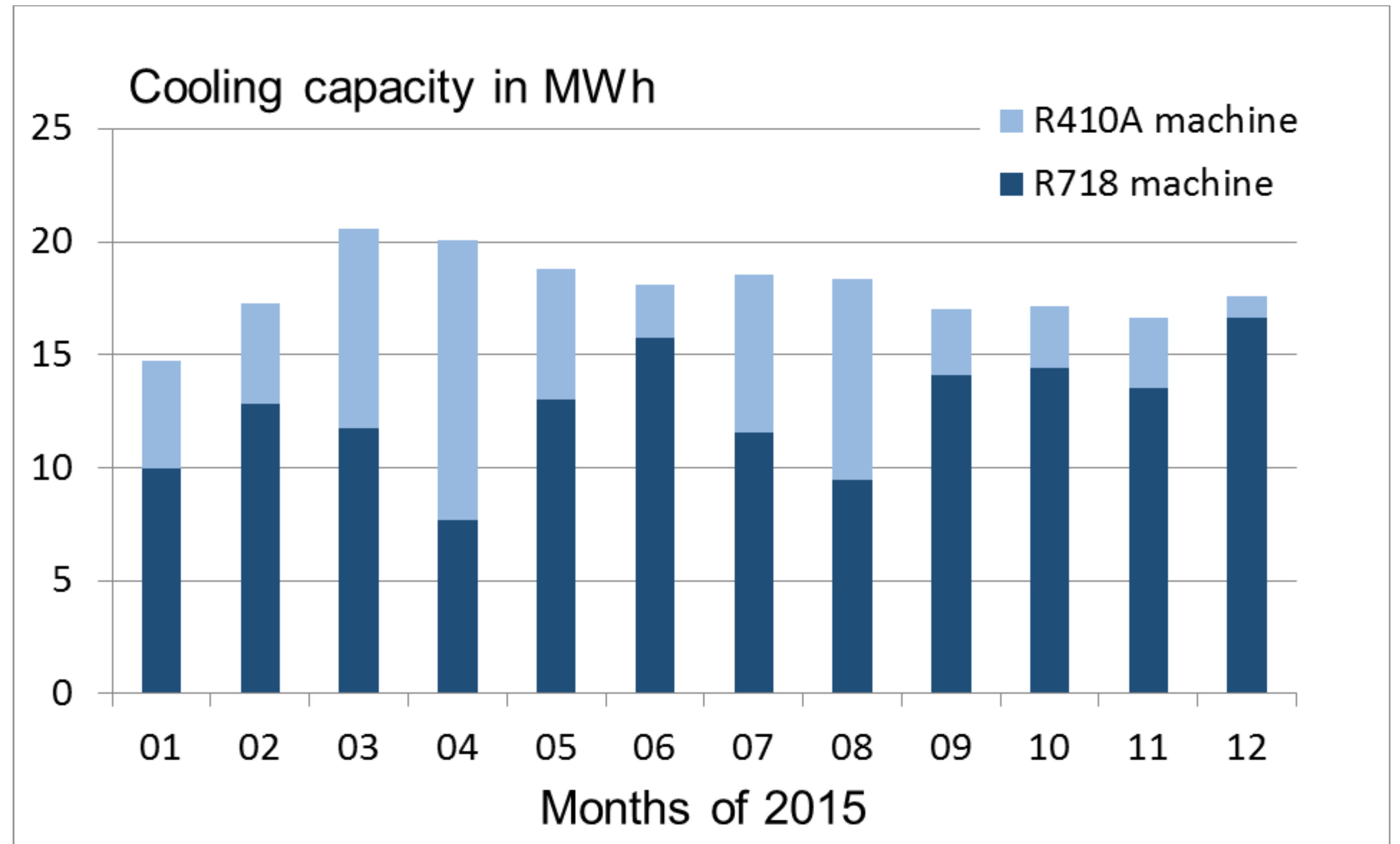
Operation of the unit:

- Ambient temperature distribution at the location of the unit
- Cooling capacity 25 kW all year
- Power consumption of unit rising from 1,1 kW (free cooling) to 17 kW (two stage operation)
- COP from 1,4 – 22 depending on operational mode



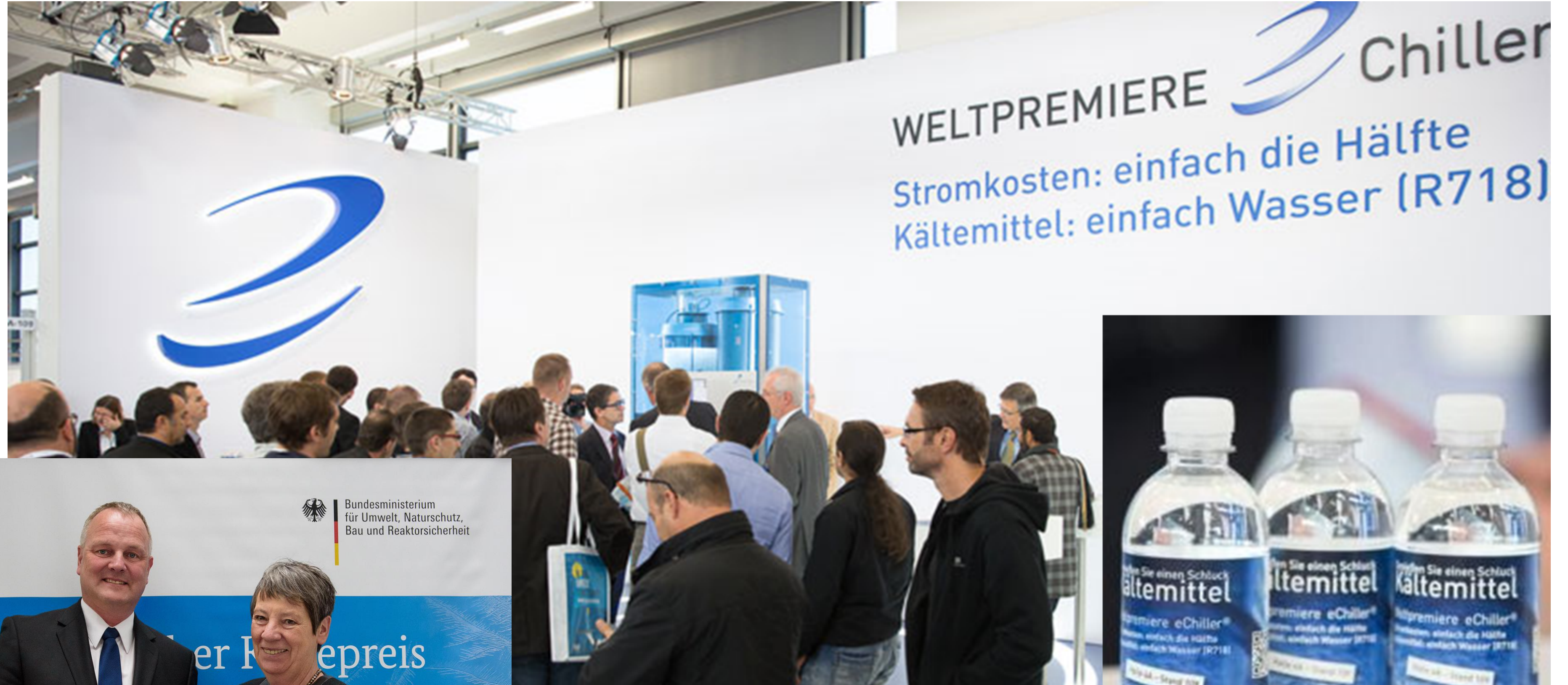
Unit results full year 2015:

- Total cooling capacity - eChiller: 170 MWh
- Annual COP: 14
 - ⇒ 3-4 times higher than R410A system
 - ⇒ Electricity savings: 50.000 kWh
 - ⇒ Electricity cost reduction 7000 €
 - ⇒ CO2 emission reduction: 31 t CO₂-eq.
- No failure since August 2015
- Second similar system installed at same location, showing equal performance



Next steps:

- Until Q3 2017
it will be proven
that the eChiller
is commercially &
technical viable
and suitable for a
global market entry



Technology presentation
at Chillventa 2014
and

German Refrigeration award ceremony April 2016



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Thank you very much!