

AHEAD

Advanced Heat Pump Demonstrator - How to produce high pressure steam with heat pumps?

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Mission Innovation Webinar, 25th November 2025

AHEAD: ADVANCED HEAT PUMP DEMONSTRATOR

- demonstration project for heat pump based steam production at 11 bar (184 °C)
- integrated at a production site of Takeda in Vienna

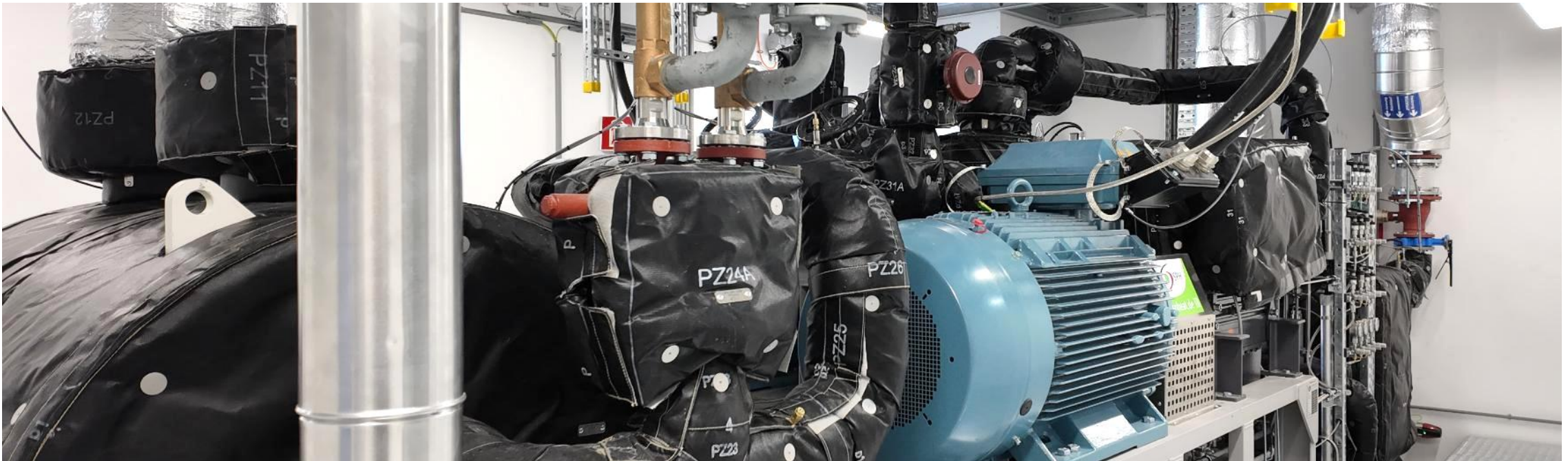
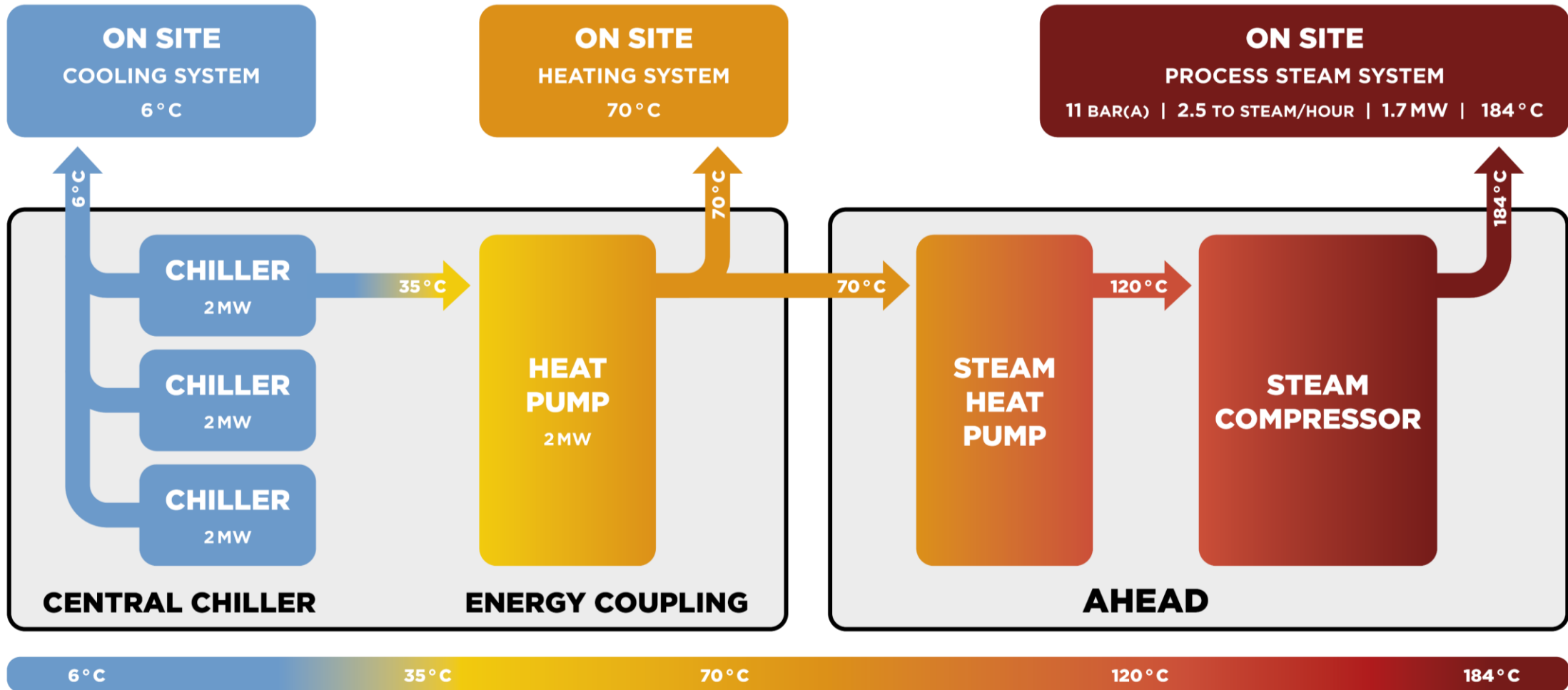


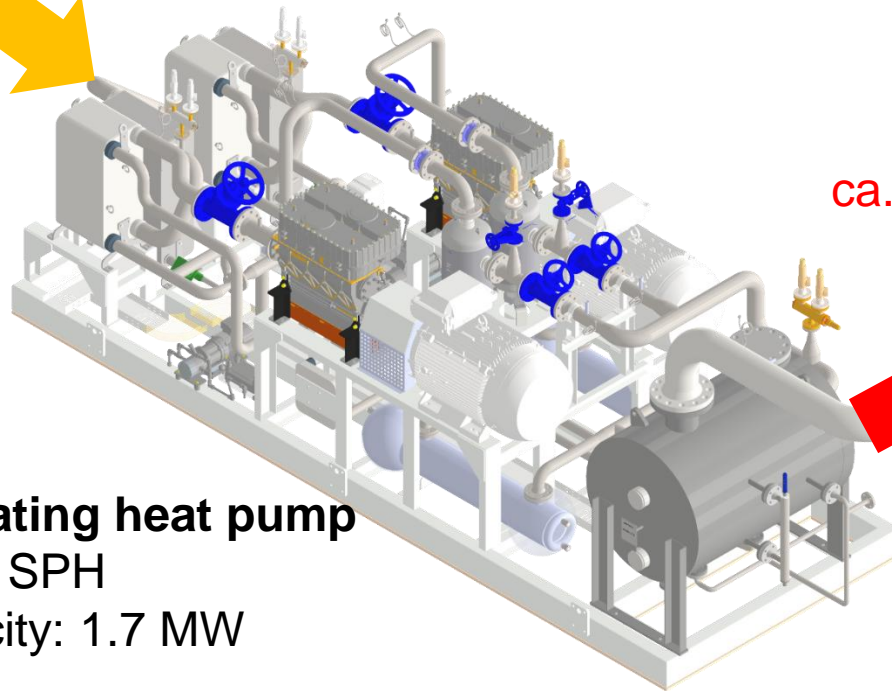
photo: Takeda

TAKEDA'S ENERGY PLANT (LANGE ALLEE 24)



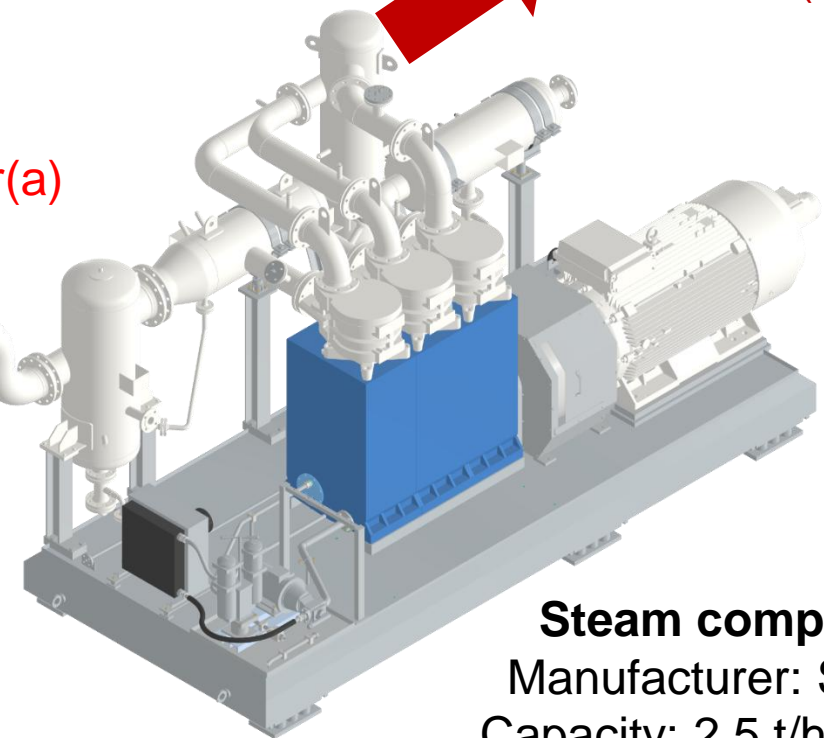
AHEAD: ADVANCED HEAT PUMP DEMONSTRATOR

warm water
70°C



Steam generating heat pump
Manufacturer: SPH
Heating capacity: 1.7 MW
COP: ca. 4.4
Refrigerant: 180 kg R600 (n-butane)

steam
120°C
ca. 1,9 bar(a)



steam
184°C
ca. 11 bar(a)

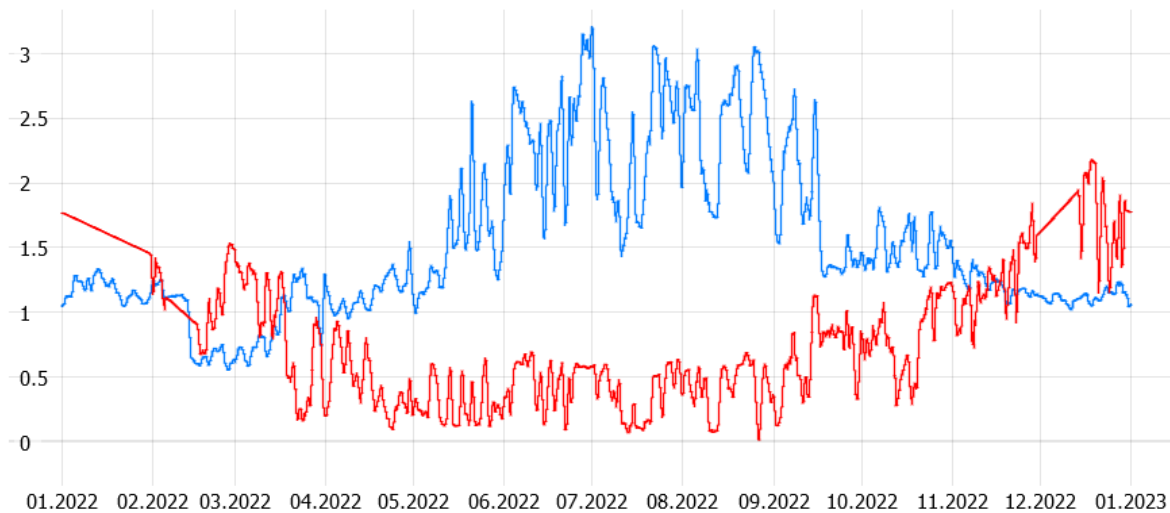
Steam compressor
Manufacturer: Spilling
Capacity: 2.5 t/h steam

AHEAD: ADVANCED HEAT PUMP DEMONSTRATOR

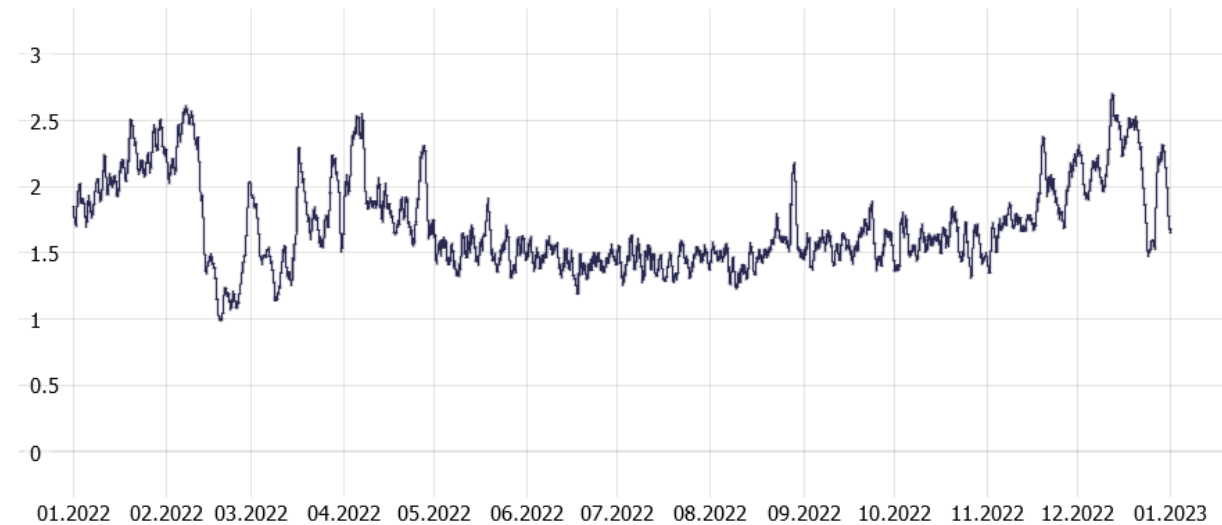
- Analysis of 162 versions in annual simulations
- Seasonal variations of sources and sinks (space heating, steam demand, waste heat of the chillers)
- Selection of suitable components (temperatures, pressures, capacity of the heat pump and steam compressor)

Waste heat of the chillers, MW

Space heating demand, MW



Steam demand, t/h



J. Riedl et al. Optimierung eines Wärmepumpensystems für Kälte und Dampf, DKV Konferenz, 2023.

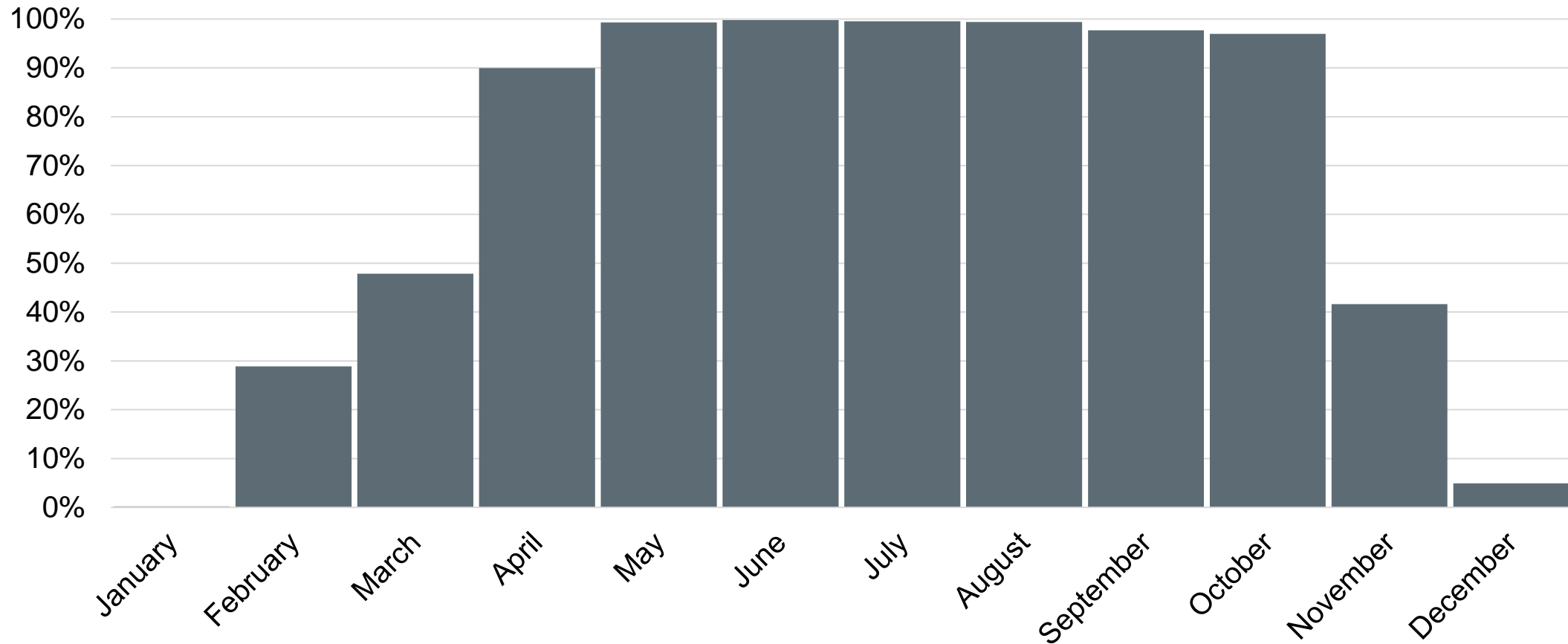
AHEAD: ADVANCED HEAT PUMP DEMONSTRATOR

- official commissioning in September 2025
- scientific monitoring and optimisation for more than 4000 h planned
- reduction of CO₂ emissions by ca. 80%
- almost CO₂ free steam generation for >7 months a year
- high multiplication potential in other sectors such as food and chemical industry



photo: Takeda

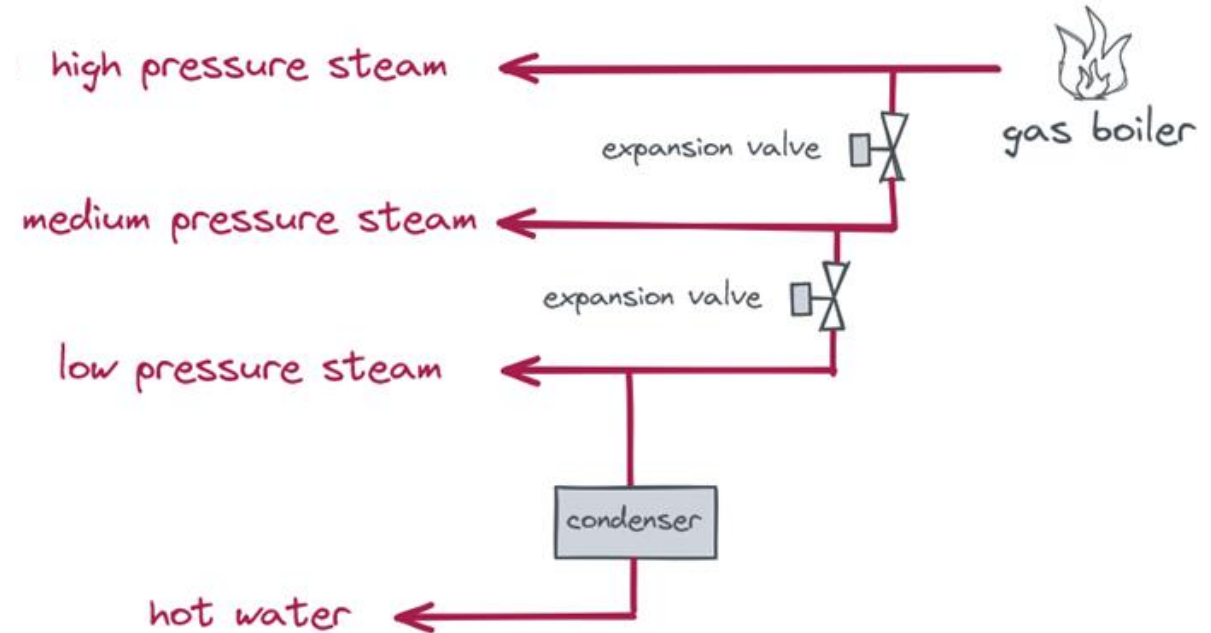
STEAM DEMAND COVERED BY AHEAD (SIMULATION)



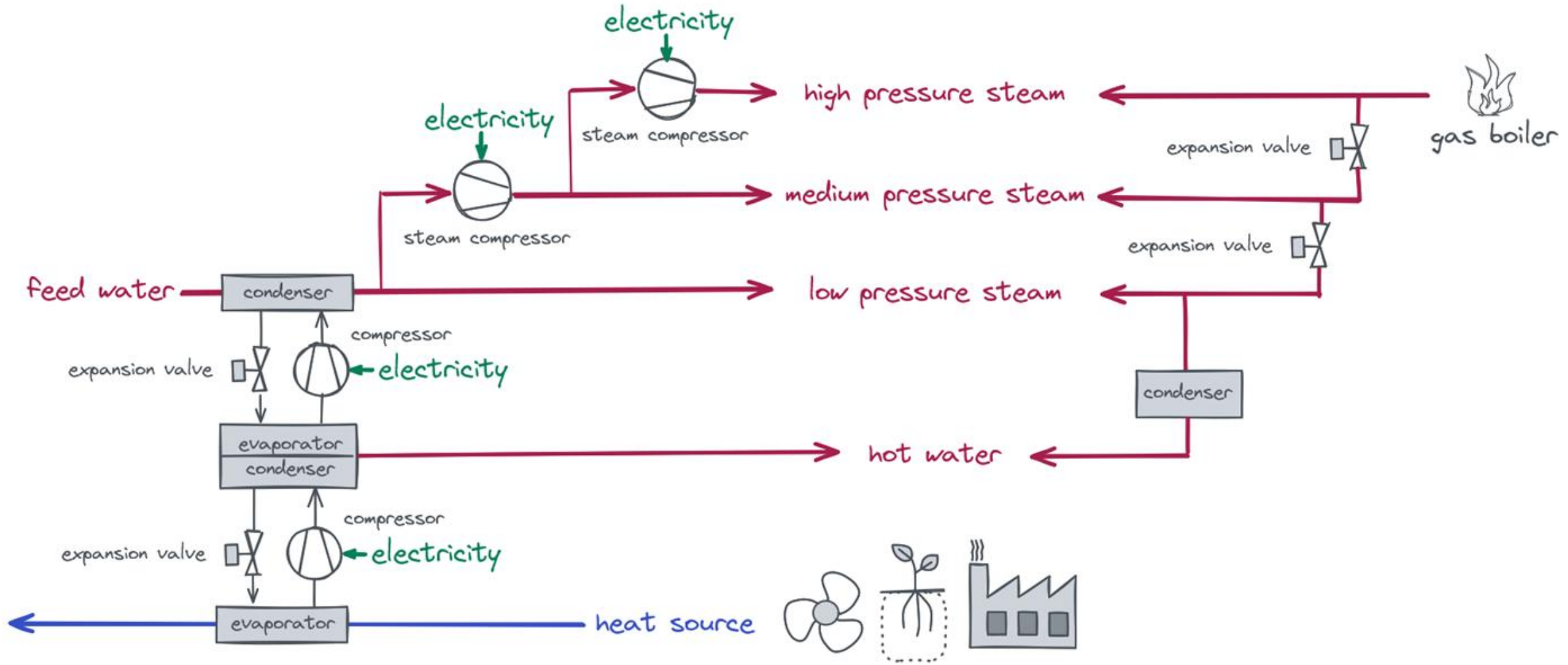
MULTIPLICATION POTENTIAL

Steam is the most important energy carrier in industrial processes and is used

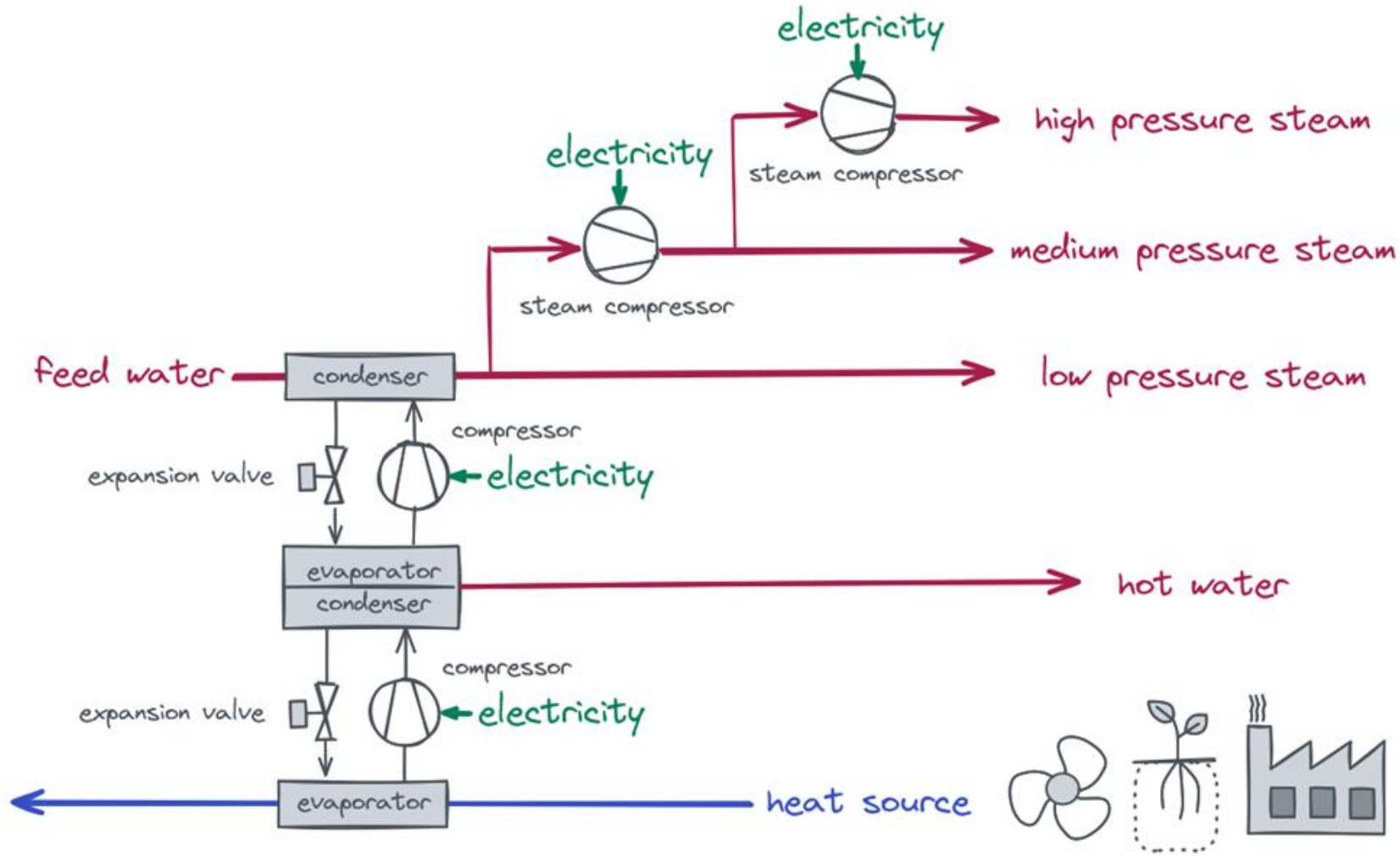
- for heat transfer
- as reactant



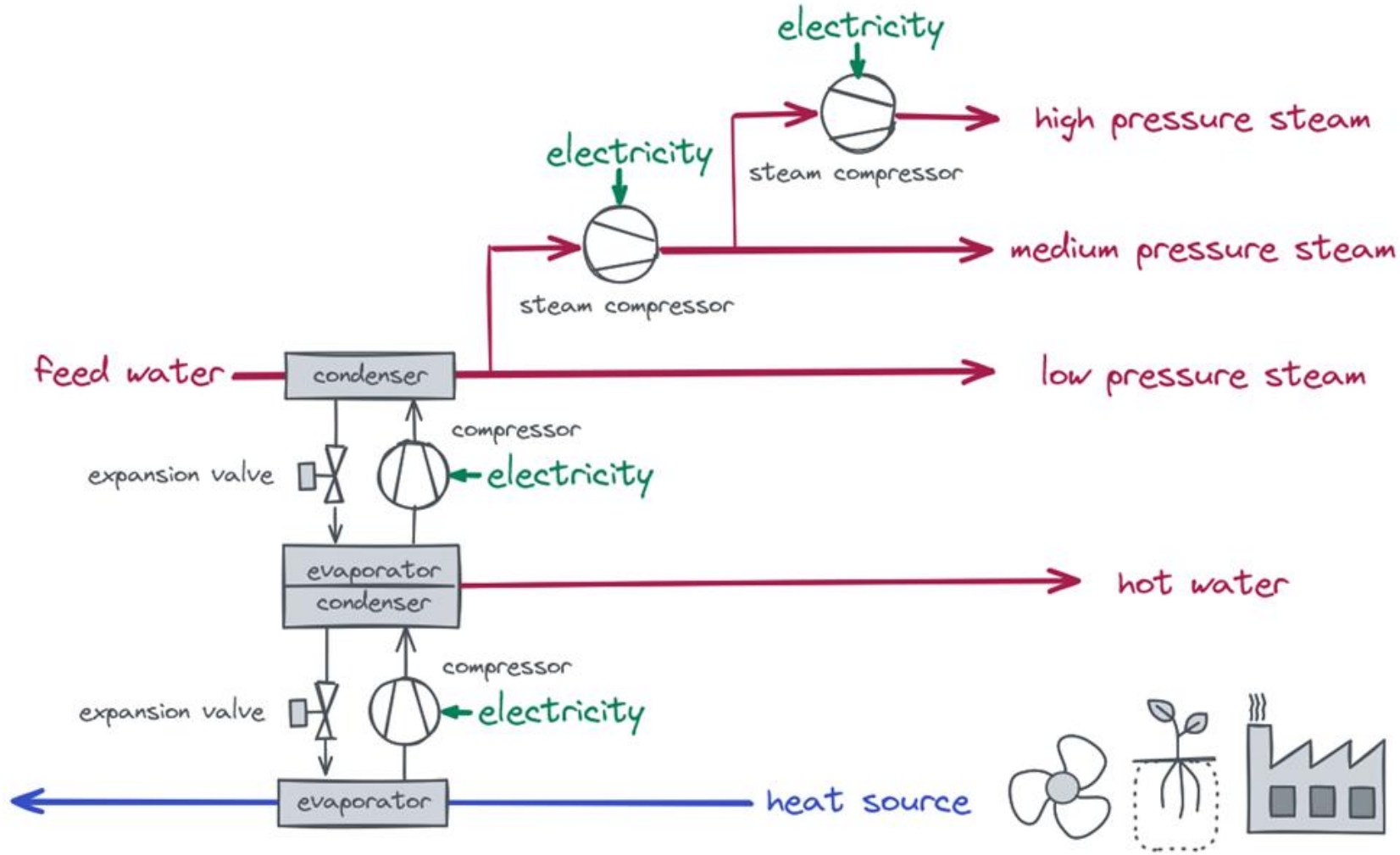
STEAM SUPPLY SYSTEMS IN INDUSTRY



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STEAM SUPPLY SYSTEMS IN INDUSTRY



Process integration

- Heat sources and heat sinks
- Integration is crucial for the efficiency of the solution
- What temperatures are really needed in the process?
- New process design

CONCLUSIONS

AHEAD demonstrates

- steam production with heat pumps at 11 bar/184°C
- at industrial scale

Heat pumps are a future-proof technology for process heat supply:

- Reduction of CO₂ emissions and increase in efficiency
- Electrification of heat supply
- On site waste heat recovery
- Integration is decisive for efficient solutions

Demonstration projects to establish new technologies



photo: Takeda

THANK YOU!

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