H-DisNet

www.h-disnet.eu

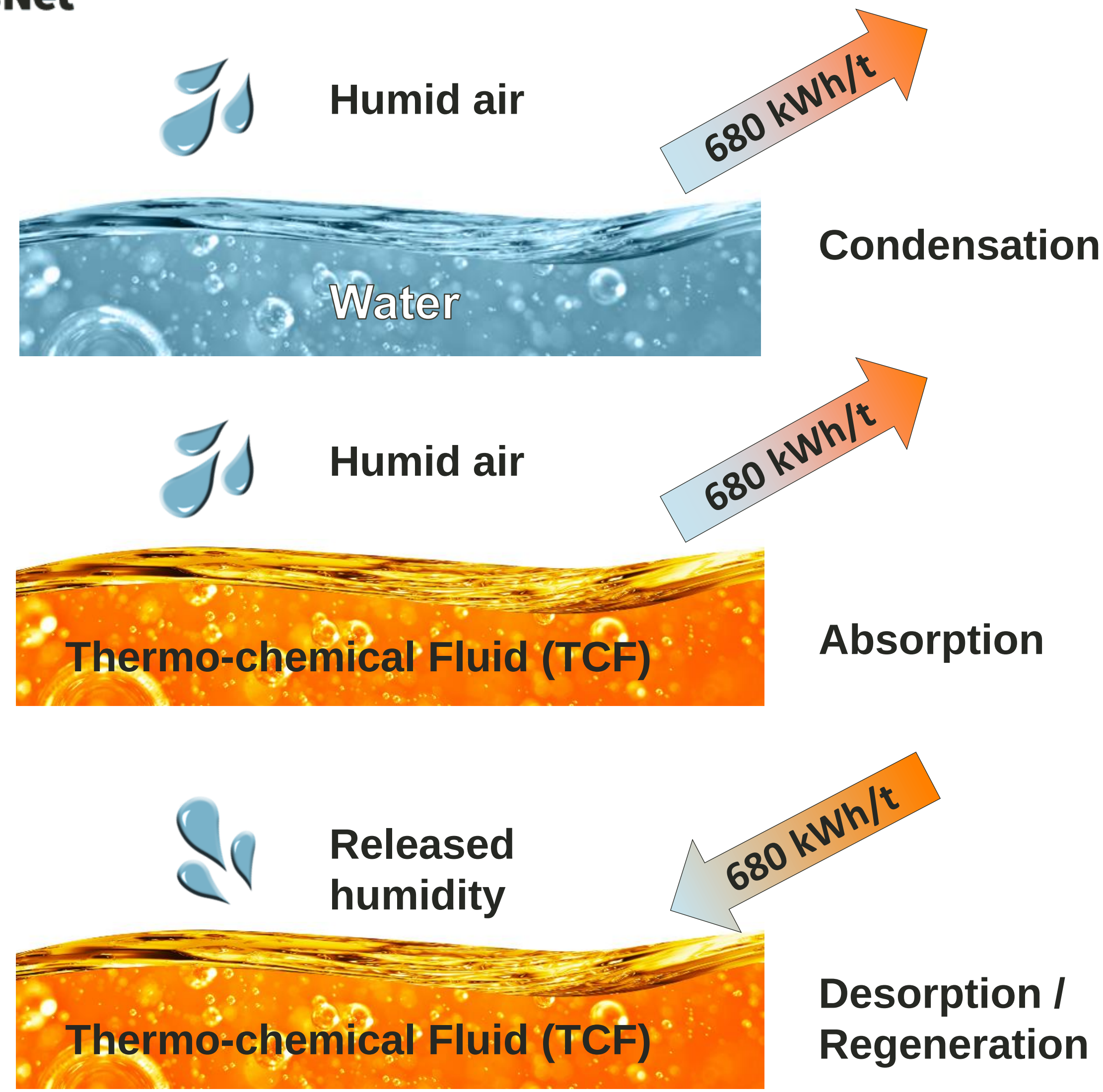
Intelligent Hybrid Thermo-Chemical District Networks

Philipp Geyer, Prof. Dr.-Ing., KU Leuven (Coordinator)
Muhannad Delwati, MSc., KU Leuven
Christian Engel, Dr.-Ing., Thermaflex
Martin Buchholz, Dr.-Ing., Watergy GmbH
Andrew Smallbone, PhD, University of Newcastle

Smart Energy Systems and 4th Generation District Heating
12 September 2017 · Copenhagen

Co-funded by the Horizon 2020 programme of the European Union, Grant No. 695780

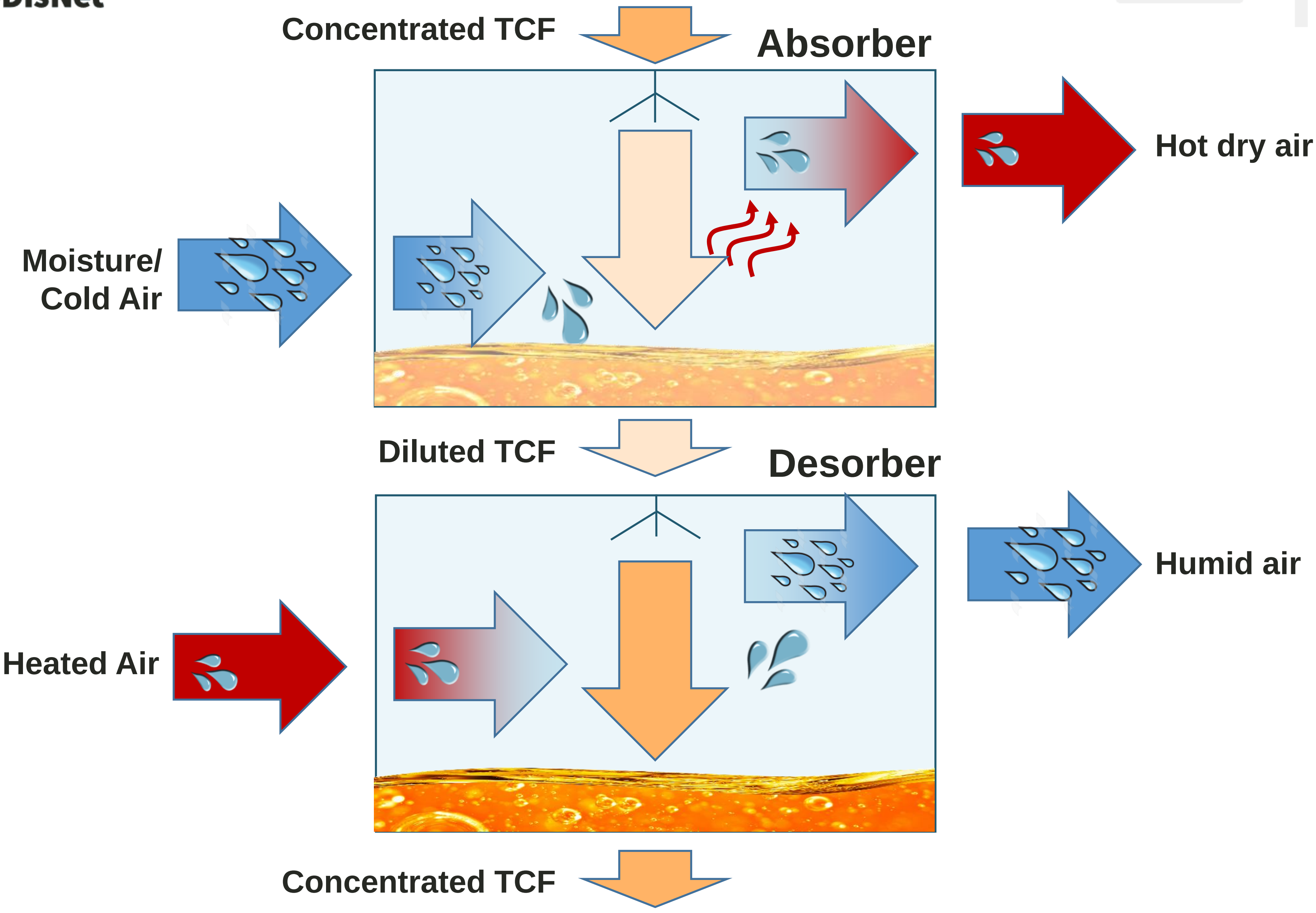
Thermo-chemical processes



Provide three services in a thermo-chemical network:

- «use case» Industrial drying
- «use case» Space heating
- «use case» Space cooling

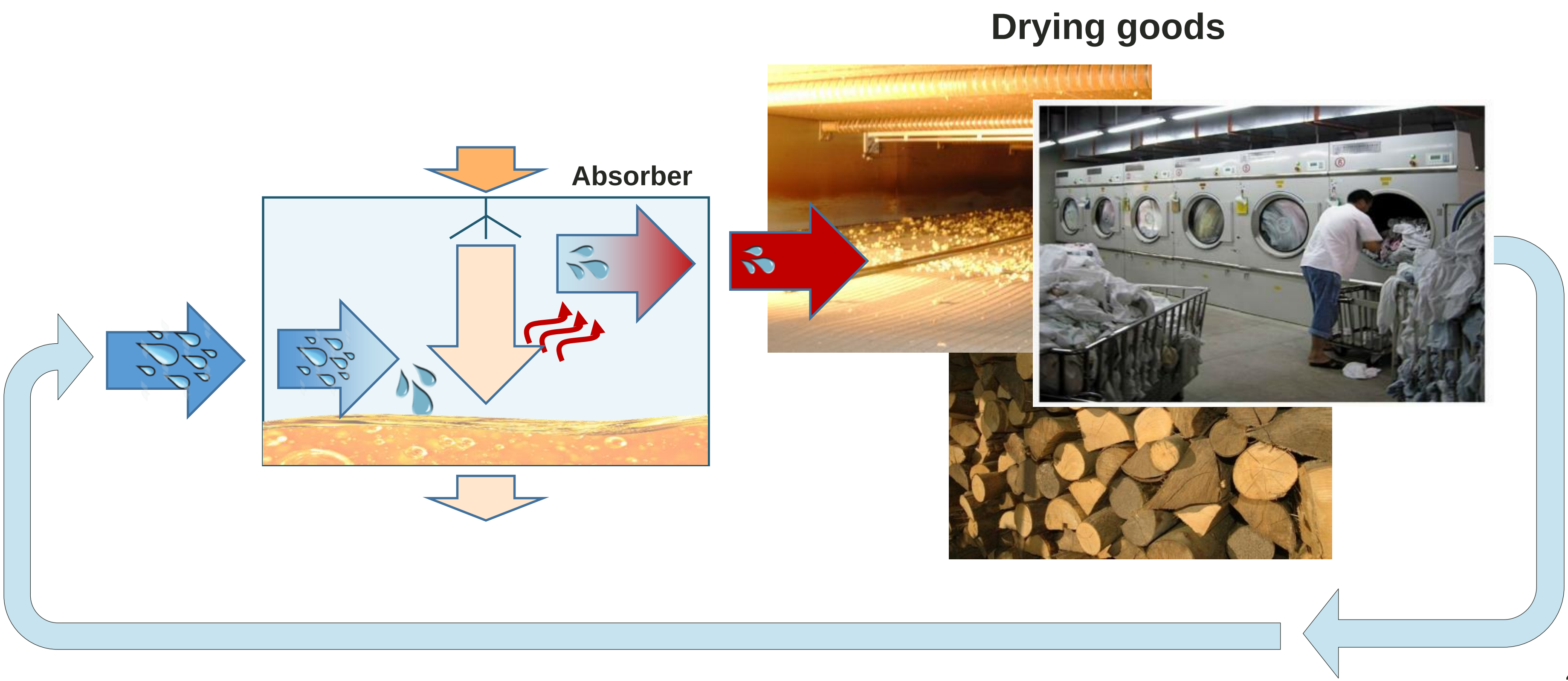
Absorber/Desorber



Industrial drying

«use case»
Industrial drying

- Absorption produces dry air
- Usable directly for drying
  - Reduction of primary energy consumption
- Humidity control by stabilization function of TCF



H-DisNet

Heating and heat recovery

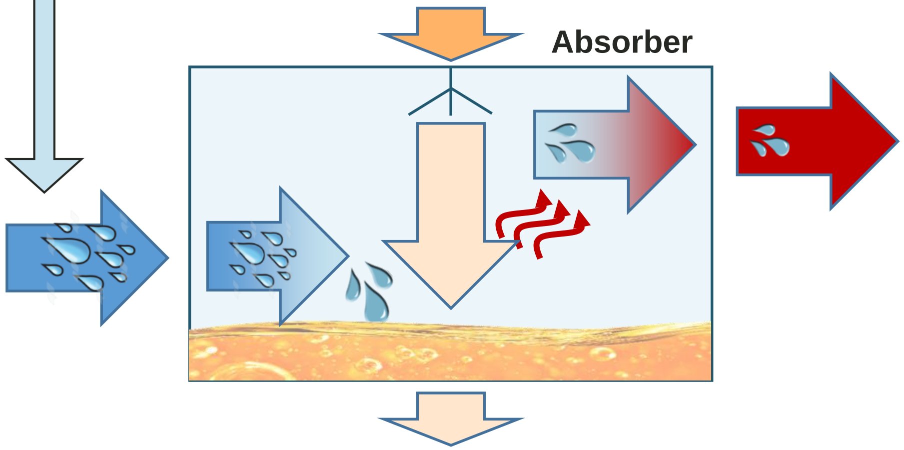
«use case»
Space heating

Heating demand

External humid air sources (Greenhouse as building-attached Humid air solar collector)

Internal sources: Heat recovery (sensible/latent)

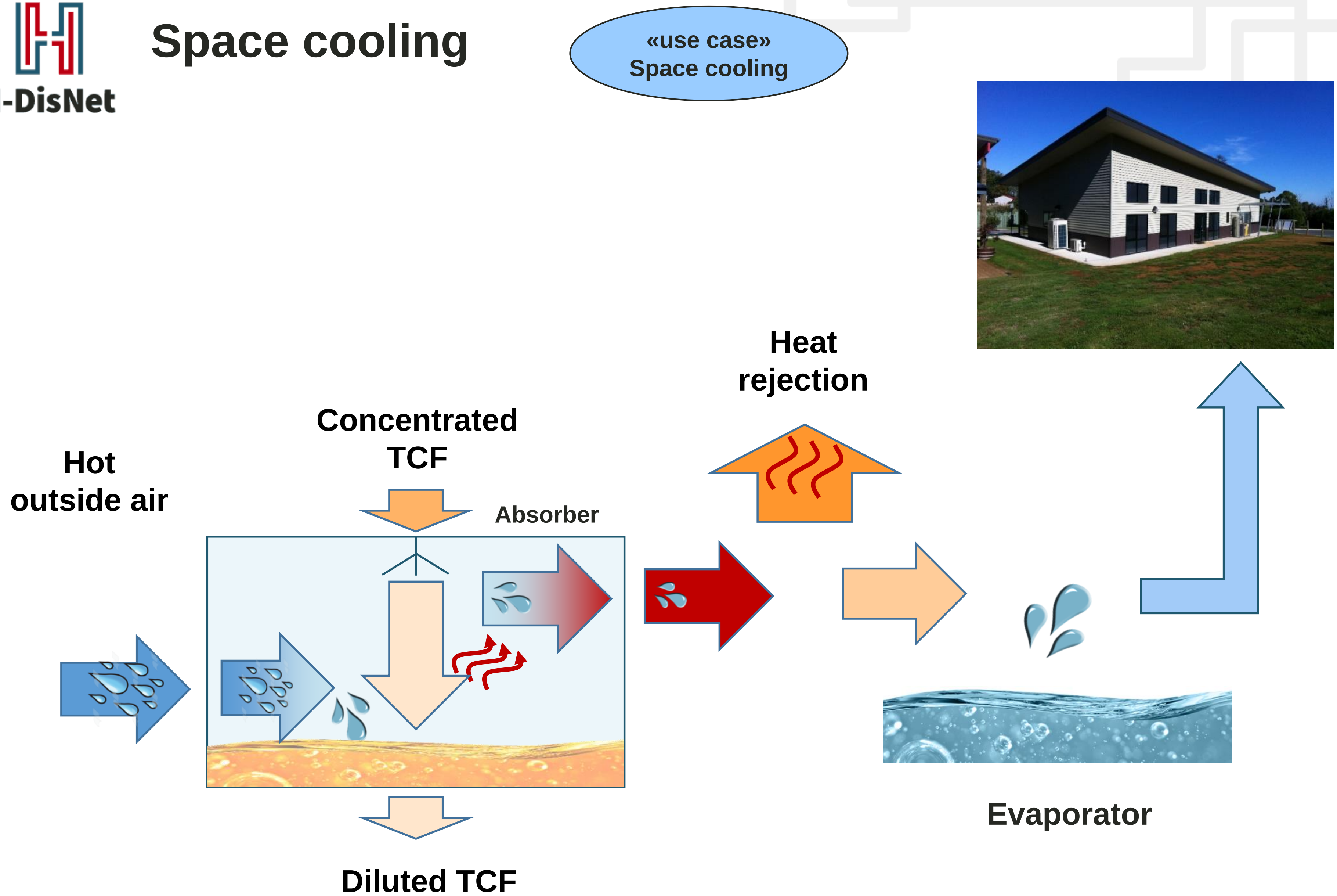
Concentrated TCF



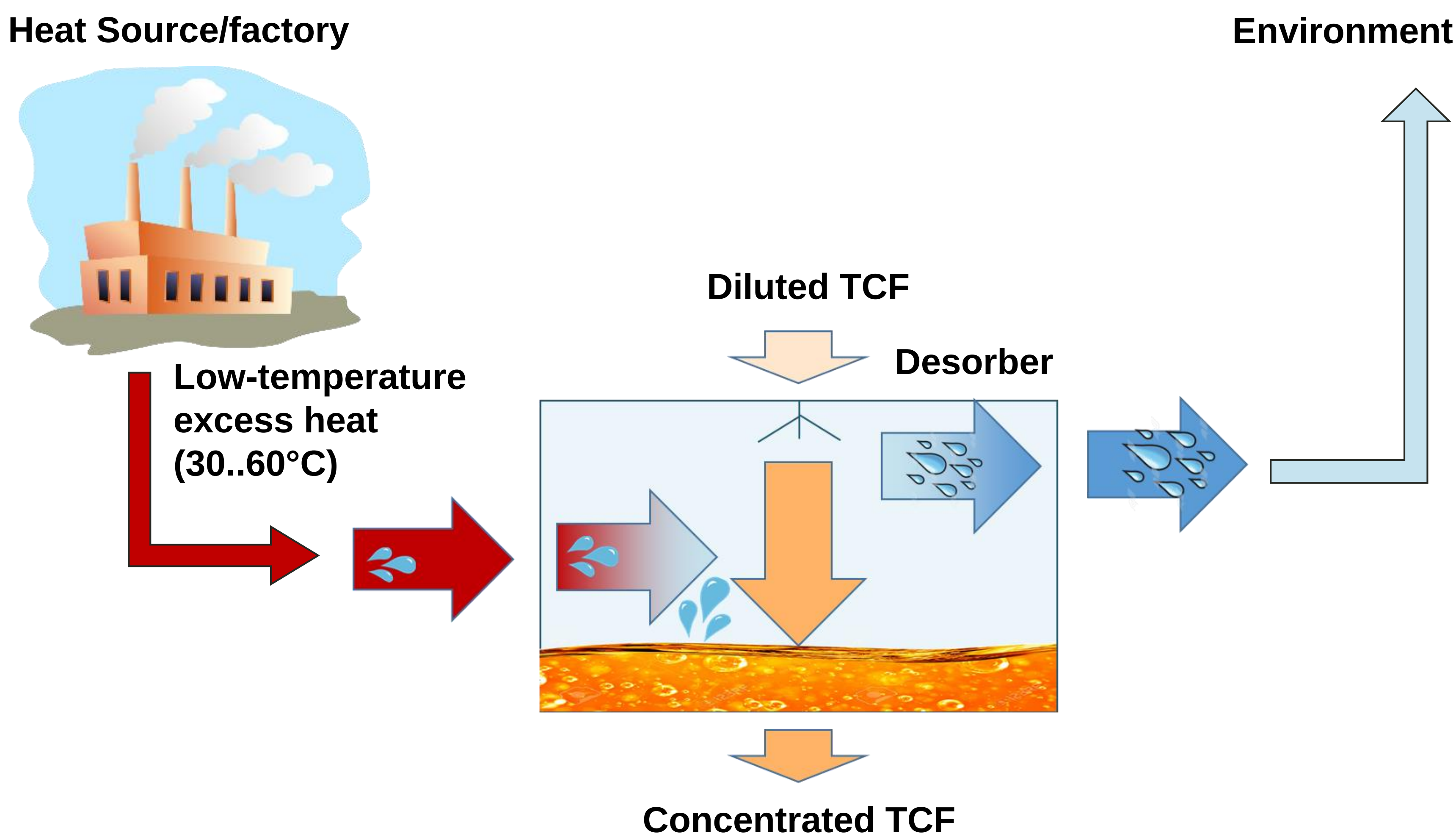
Heating and humidity control service

Diluted TCF

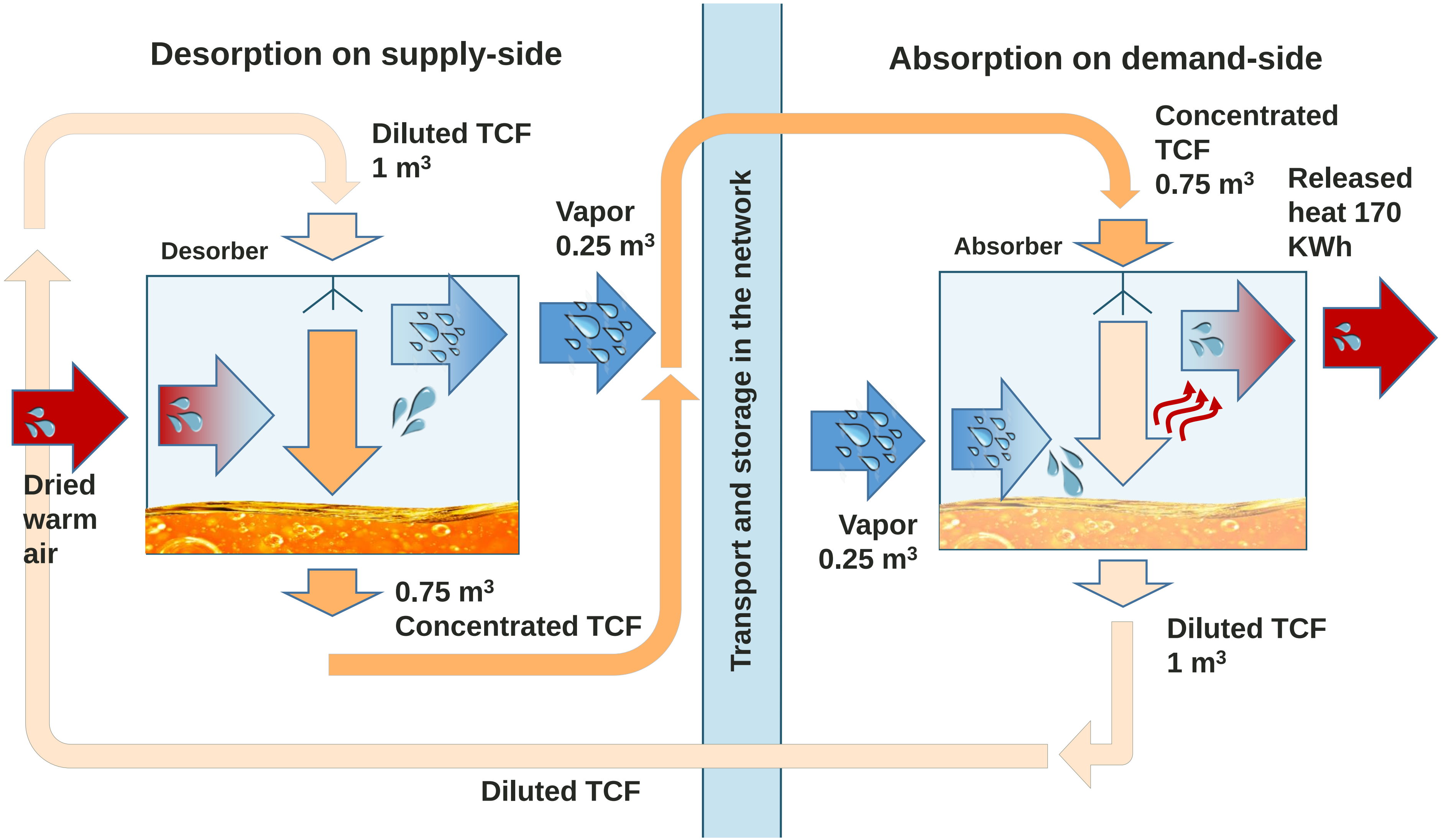
Space cooling



Regeneration on supply-side



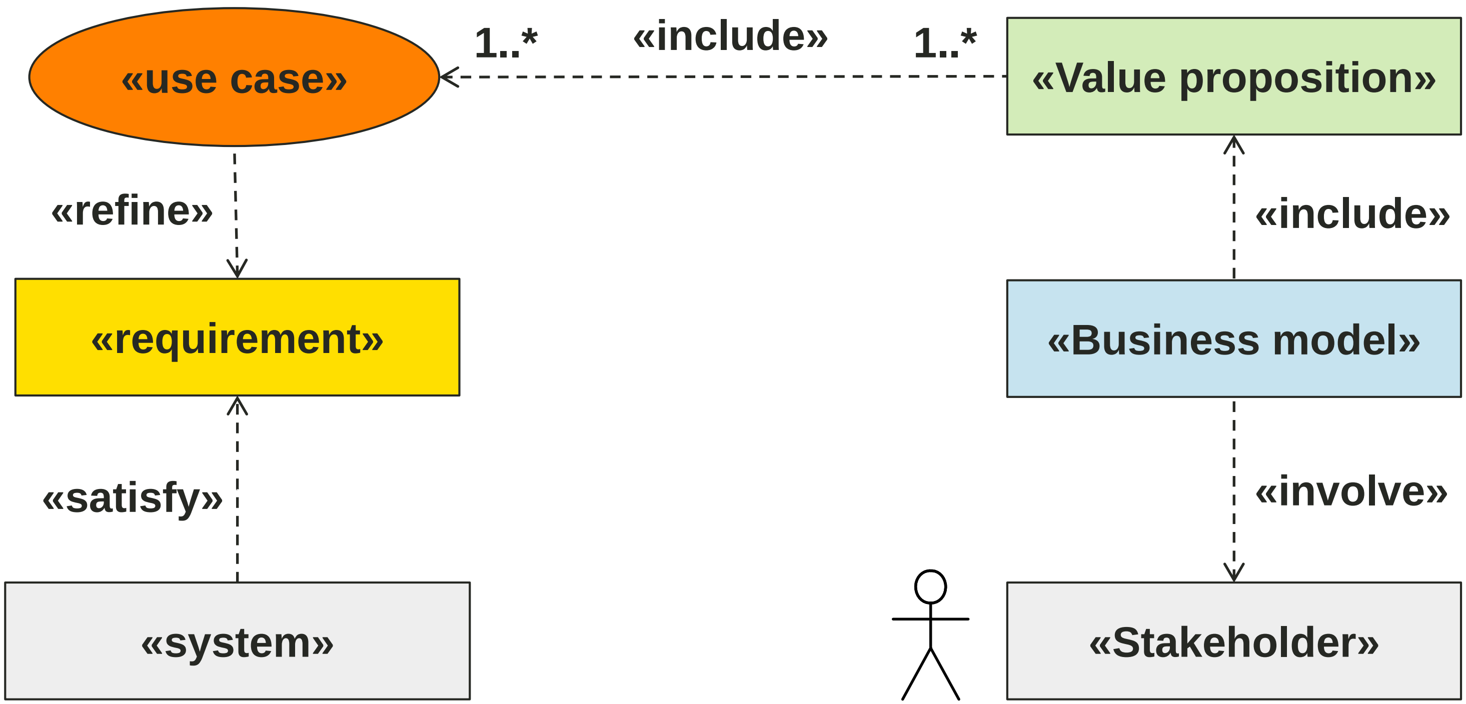
Thermo-chemical processes in a network



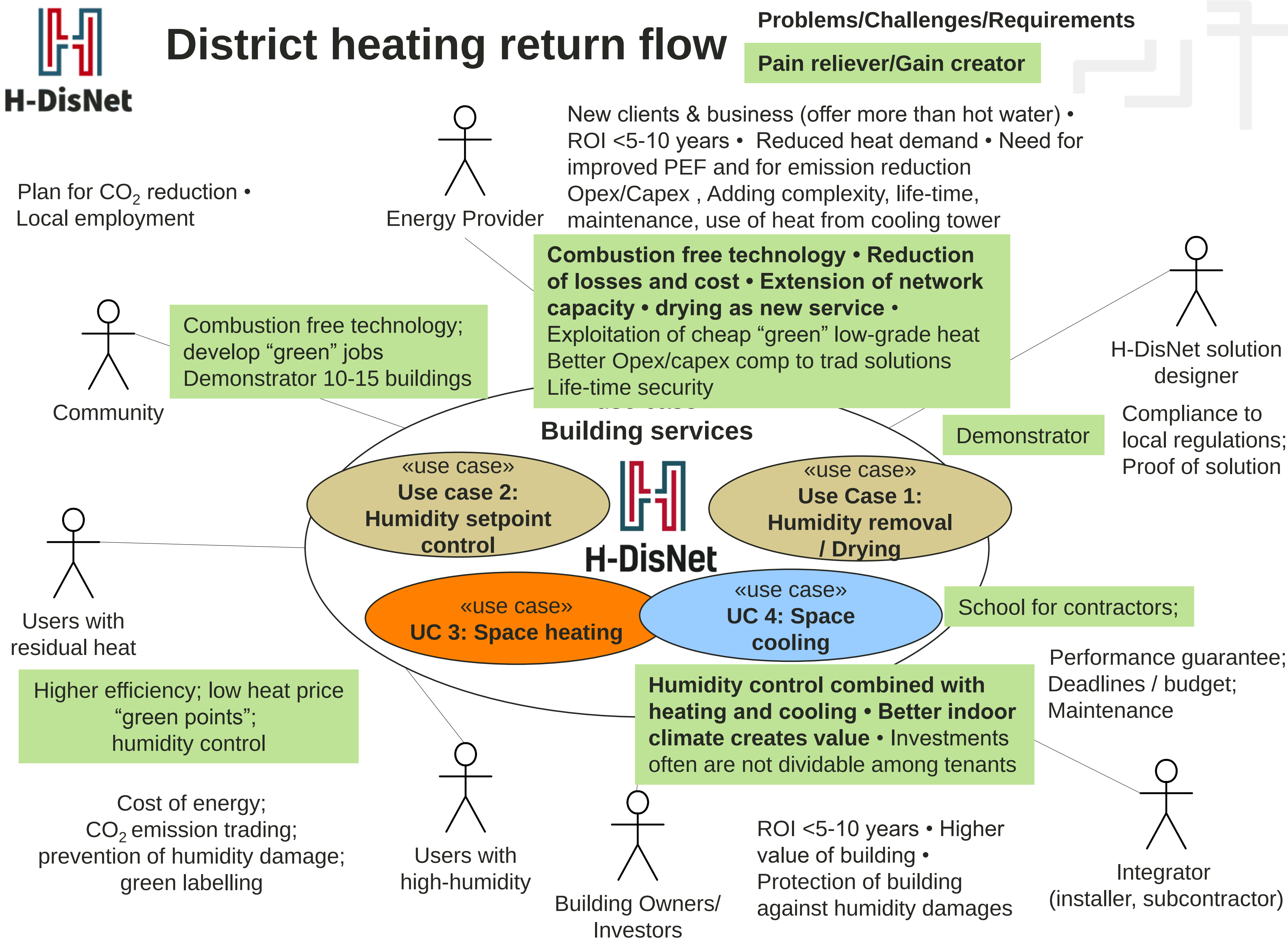
Use cases and value proposition

Technology application scenarios

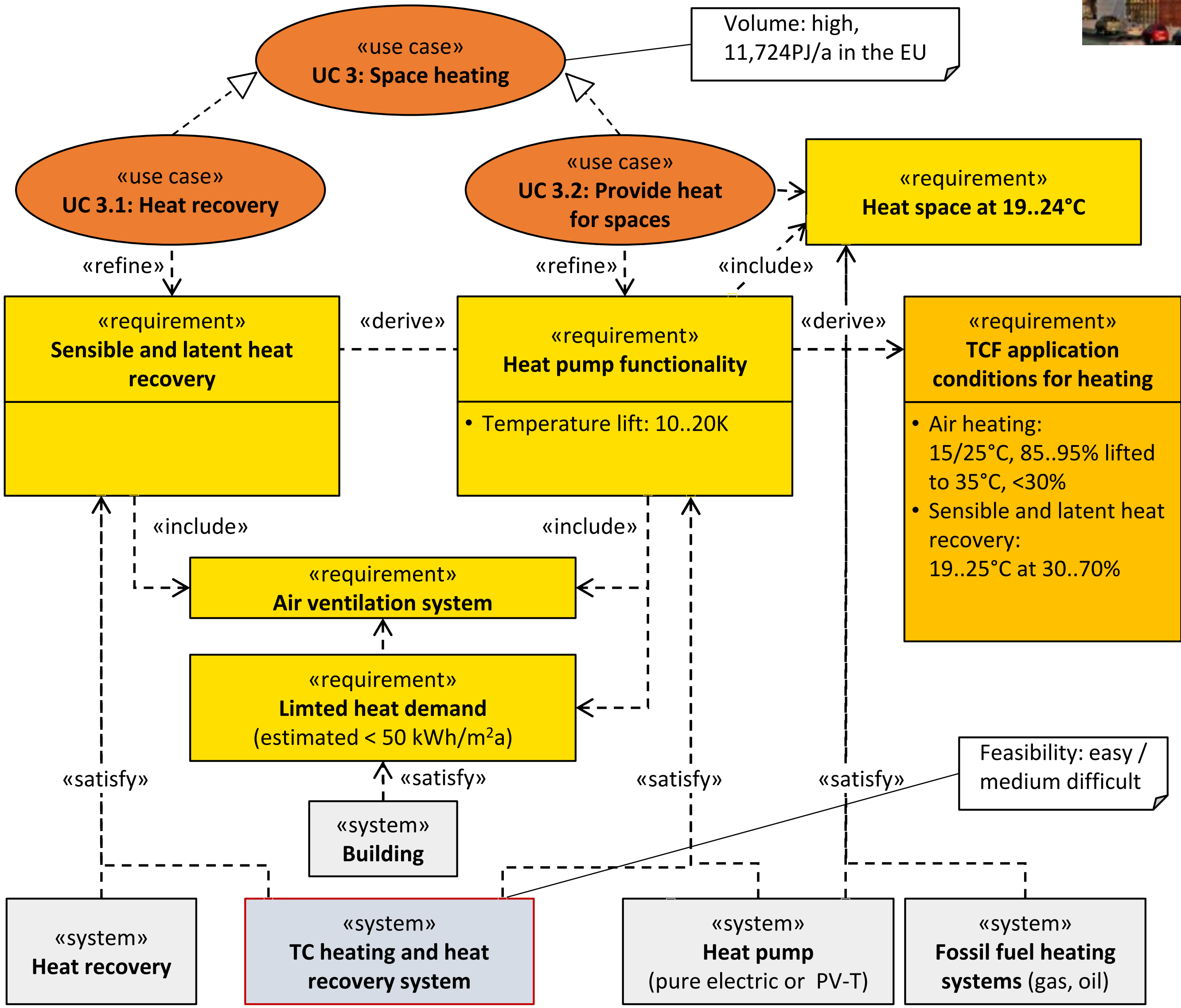
Economic strategy



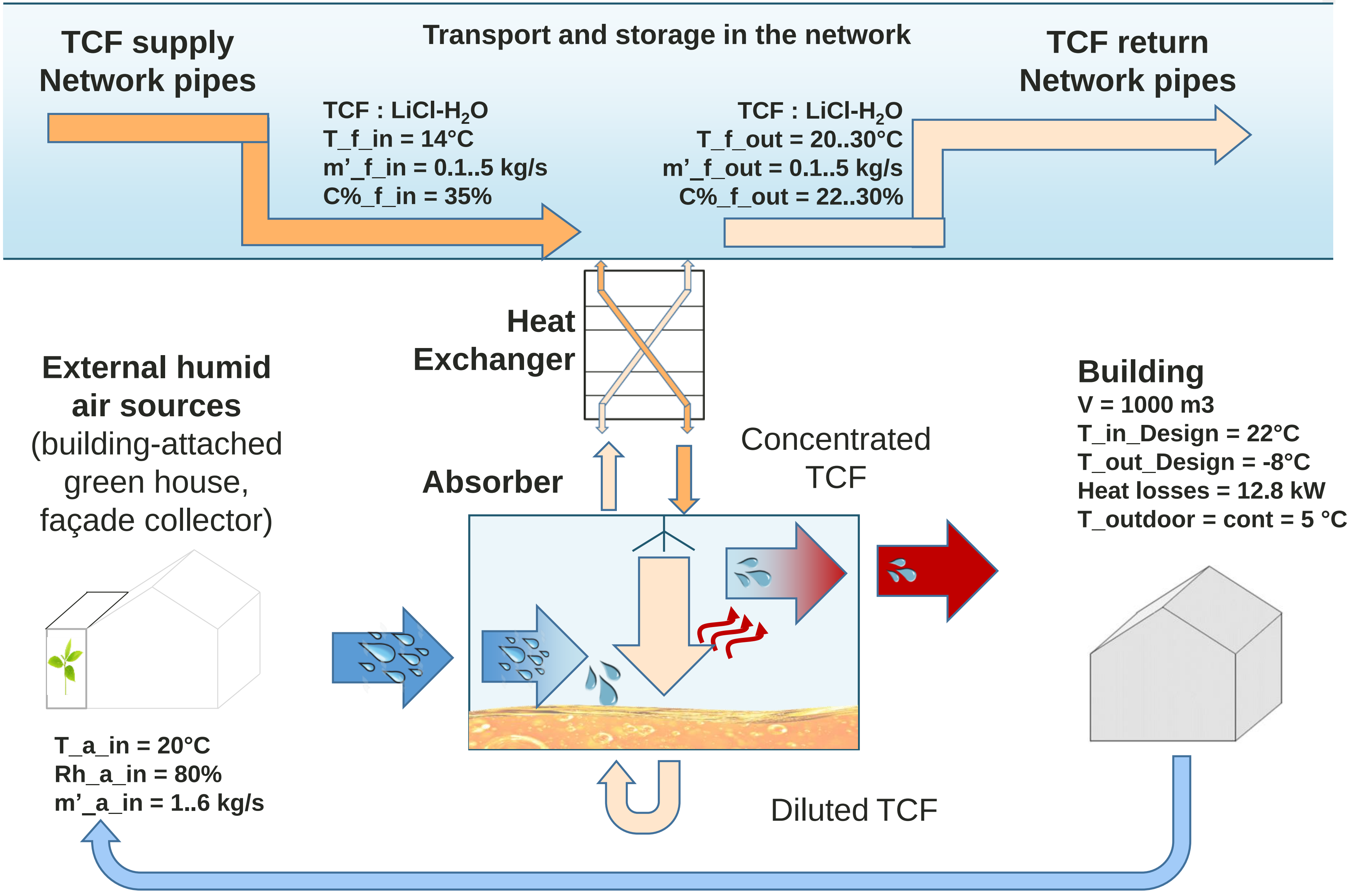
District heating return flow



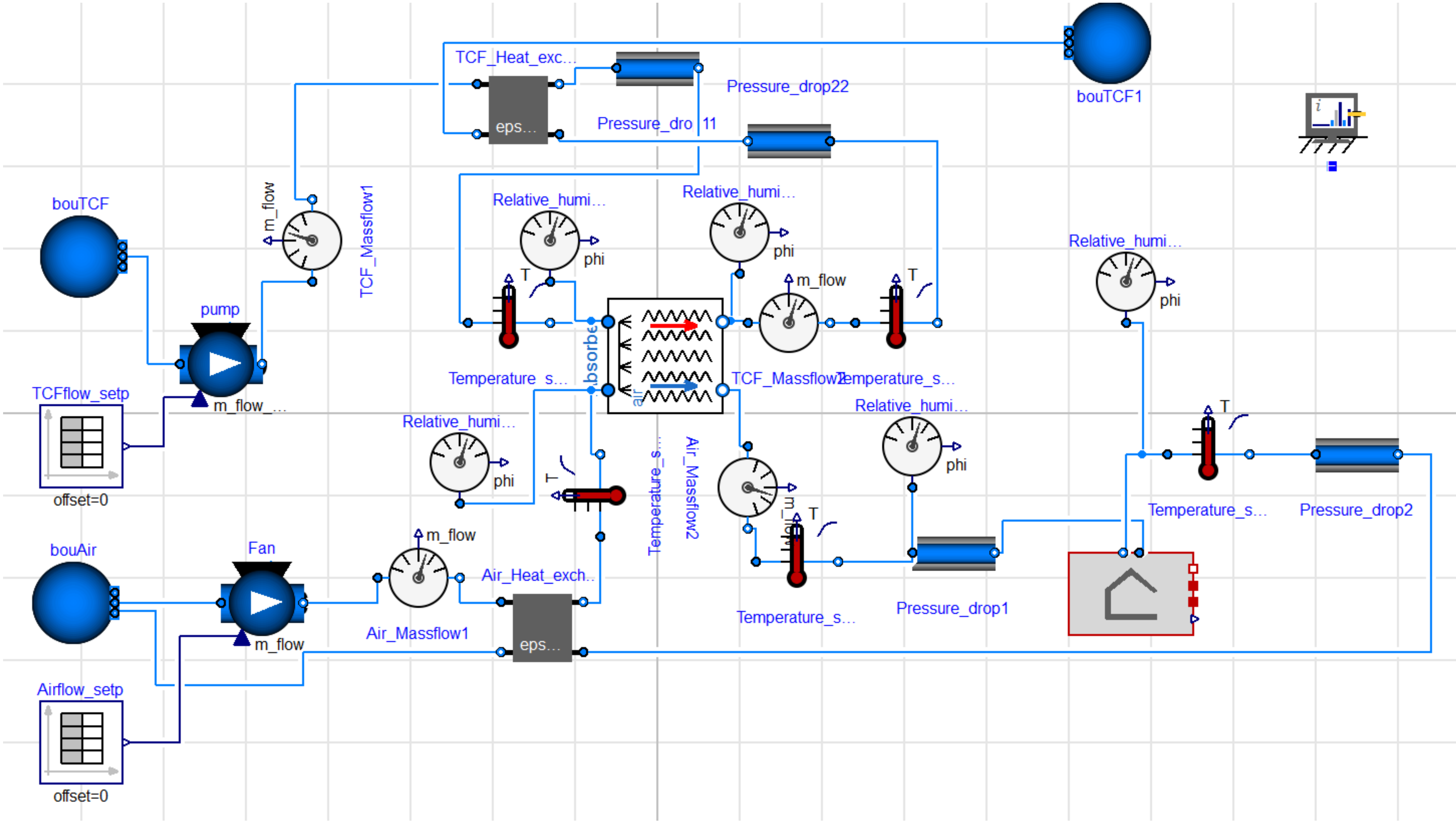
Use case 3: Space heating



Heating and heat recovery
Scheme and assumptions for simulation

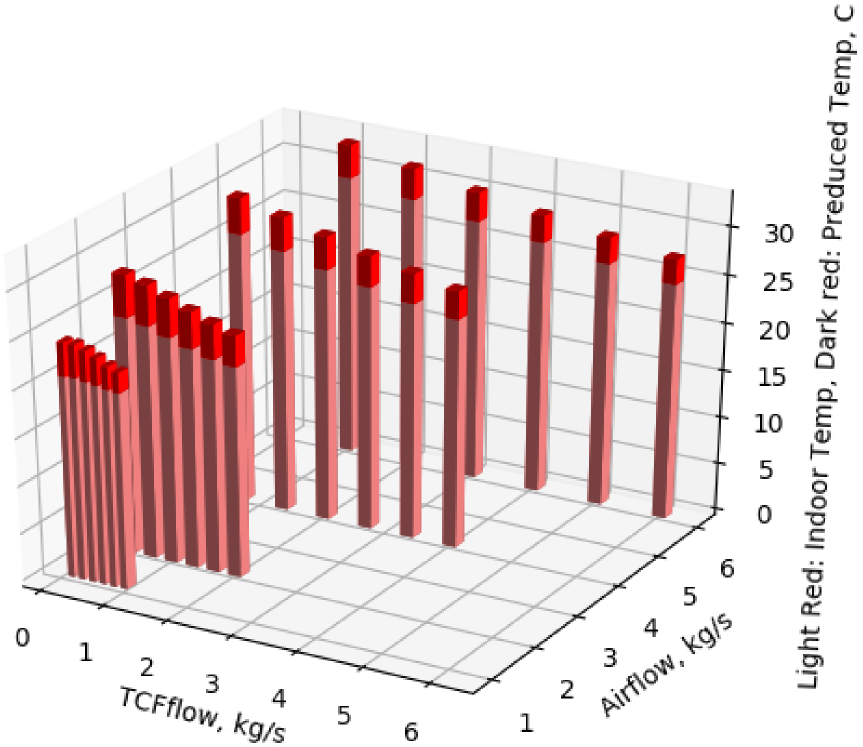


Heating and heat recovery
Modelica Simulation Model

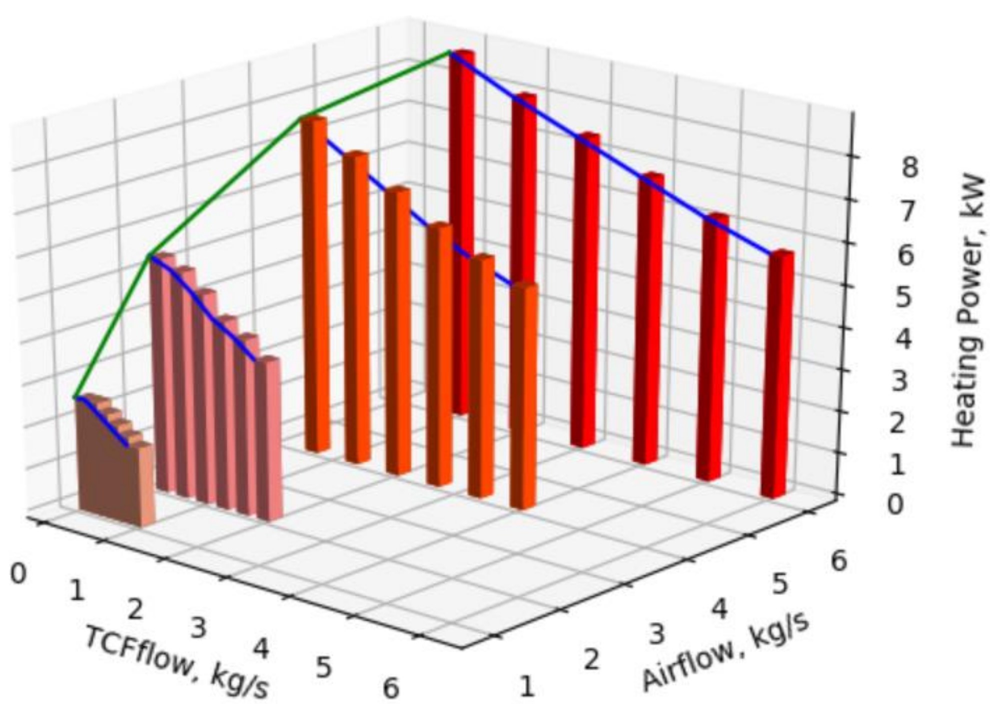


Heating and heat recovery
Simulation results

Temperature
vs airflow and TCF flow

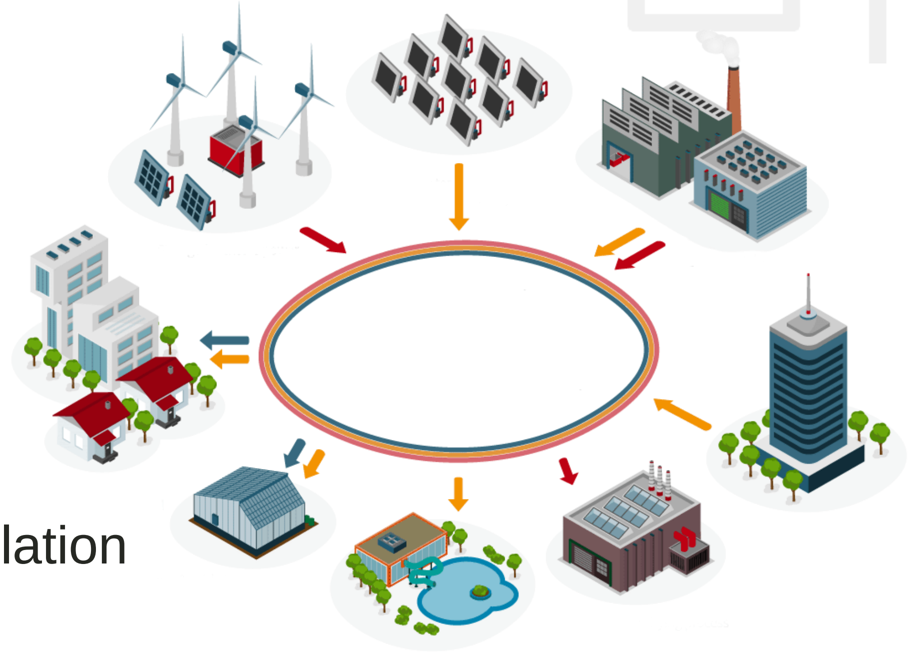


Heating power
vs airflow and TCF flow



Conclusions

- Three services:
  Heating, Cooling, Drying
- Return-flow exploitation
  - Extending network capacities
  - Interesting new service:
    Drying/Humidity control
- Heating has been shown in simulation
  - Low-temperature
  - High air recirculation



Future work:

- More realistic simulation
- Switch from physical multi-node simulation to quick-responding substitute model (machine learning) for simulation and control
- System-level validation of models at demonstrators
- Case studies on networks examining economic and environmental performance