SCCER EFFICIENCY OF INDUSTRIAL PROCESSES

Heat Recovery at the Building Scale

Passive and active heat recovery approaches

SCCER EIP Annual Conference – 24.09.2020

Bruno Hadengue, Eberhard Morgenroth, Tove A. Larsen, Luca Baldini

In cooperation with

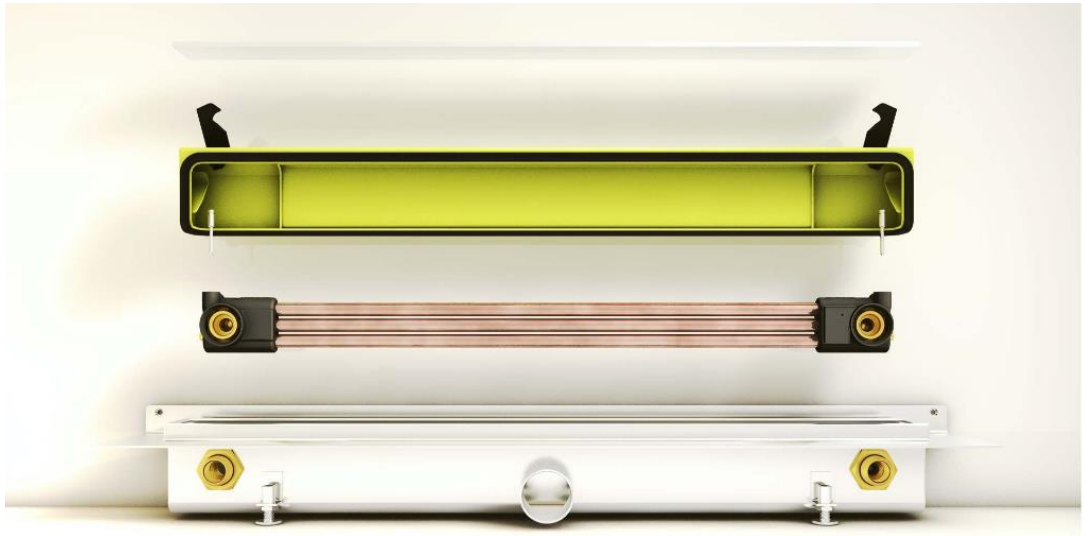
Schweizerische Eidgenossenschaft
Confédération suisse
Confederazione Svizzera
Confederaziun svizra

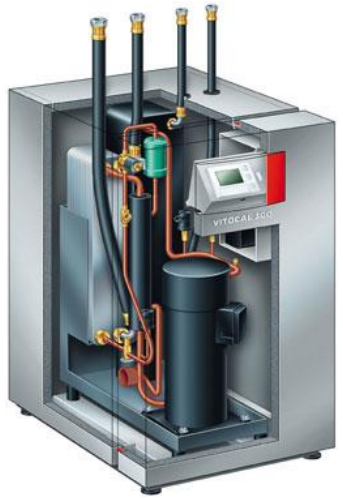
Swiss Confederation

Innosuisse – Swiss Innovation Agency

Domestic waste water heat recovery

- Passive – Drain water heat recovery with DW-HX
- Active – Collected waste water heat recovery with heat pump





+

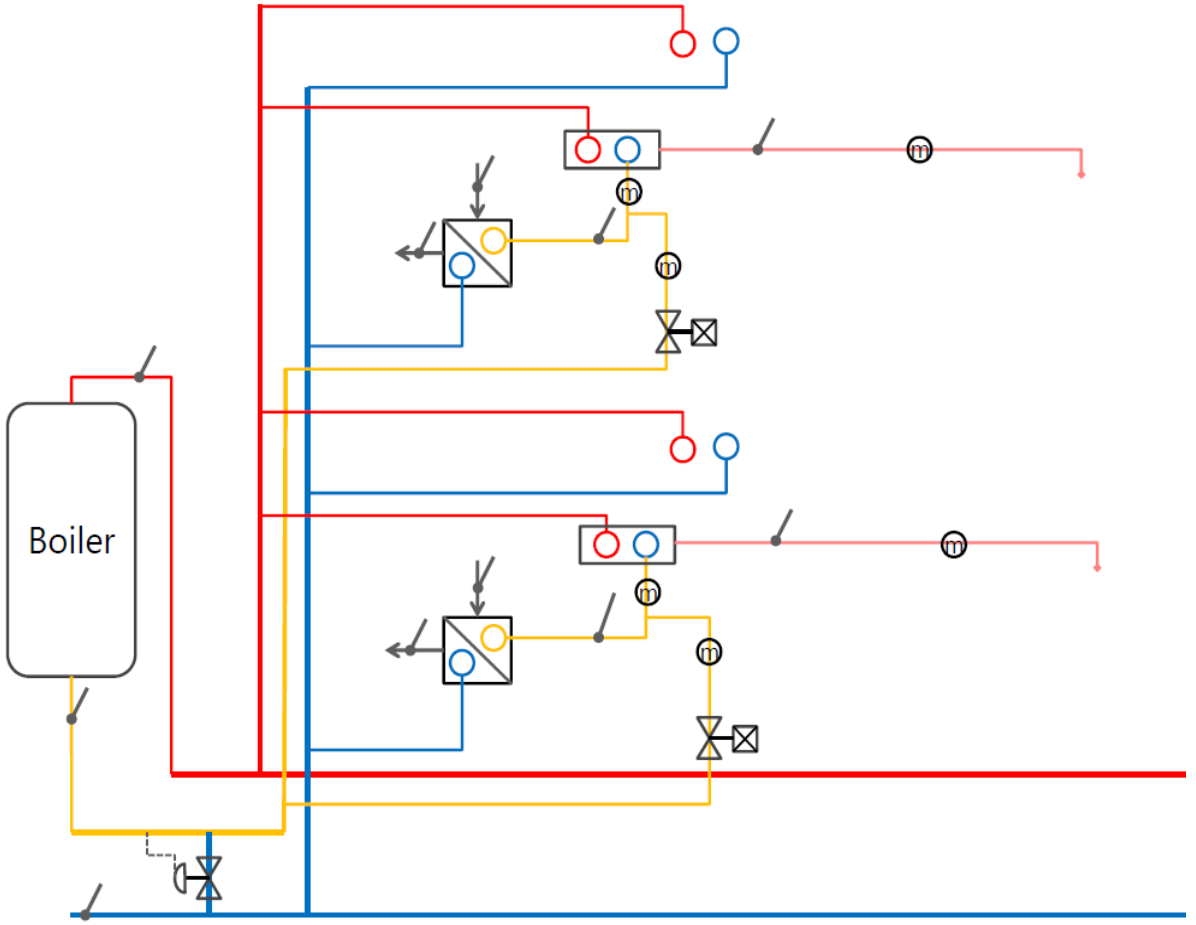
Passive Wastewater Heat Recovery

Active Wastewater Heat Recovery

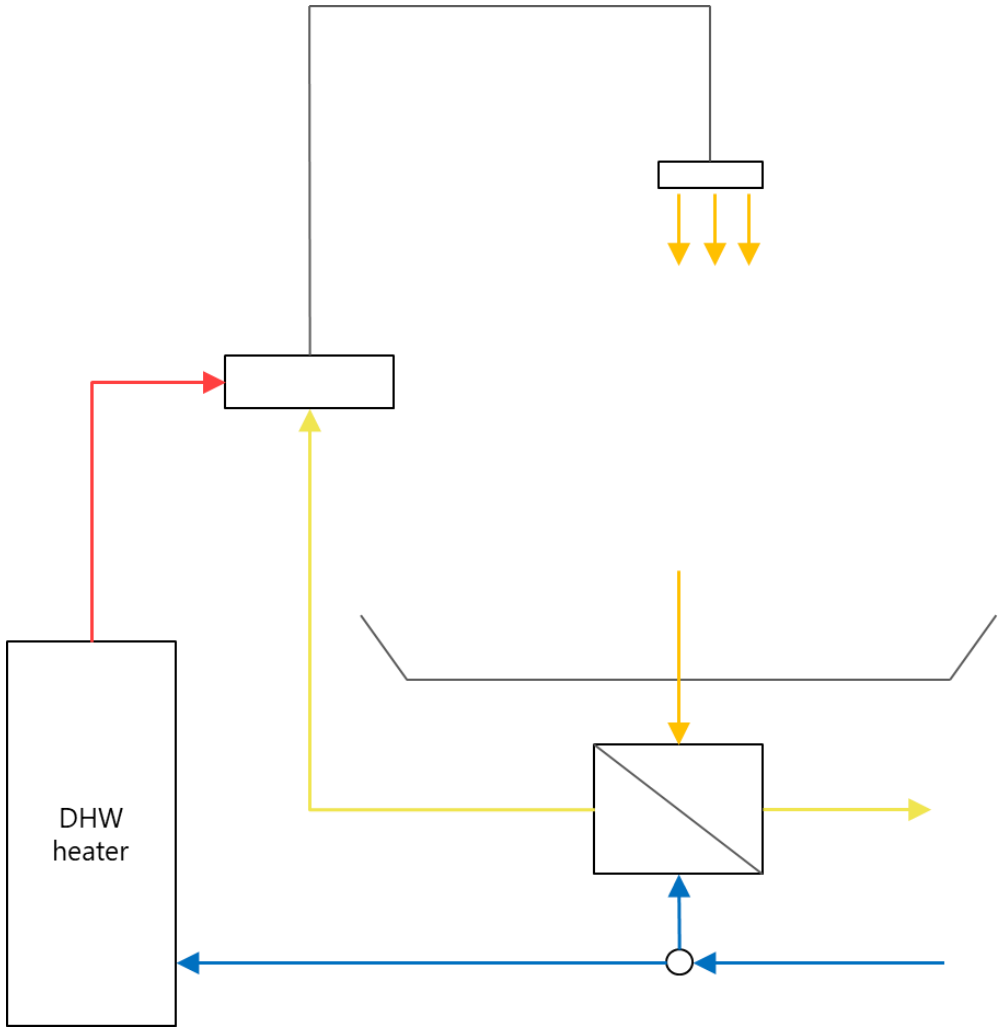
Passive Wastewater Heat Recovery

Active Wastewater Heat Recovery

Passive HR: NEST - Installation

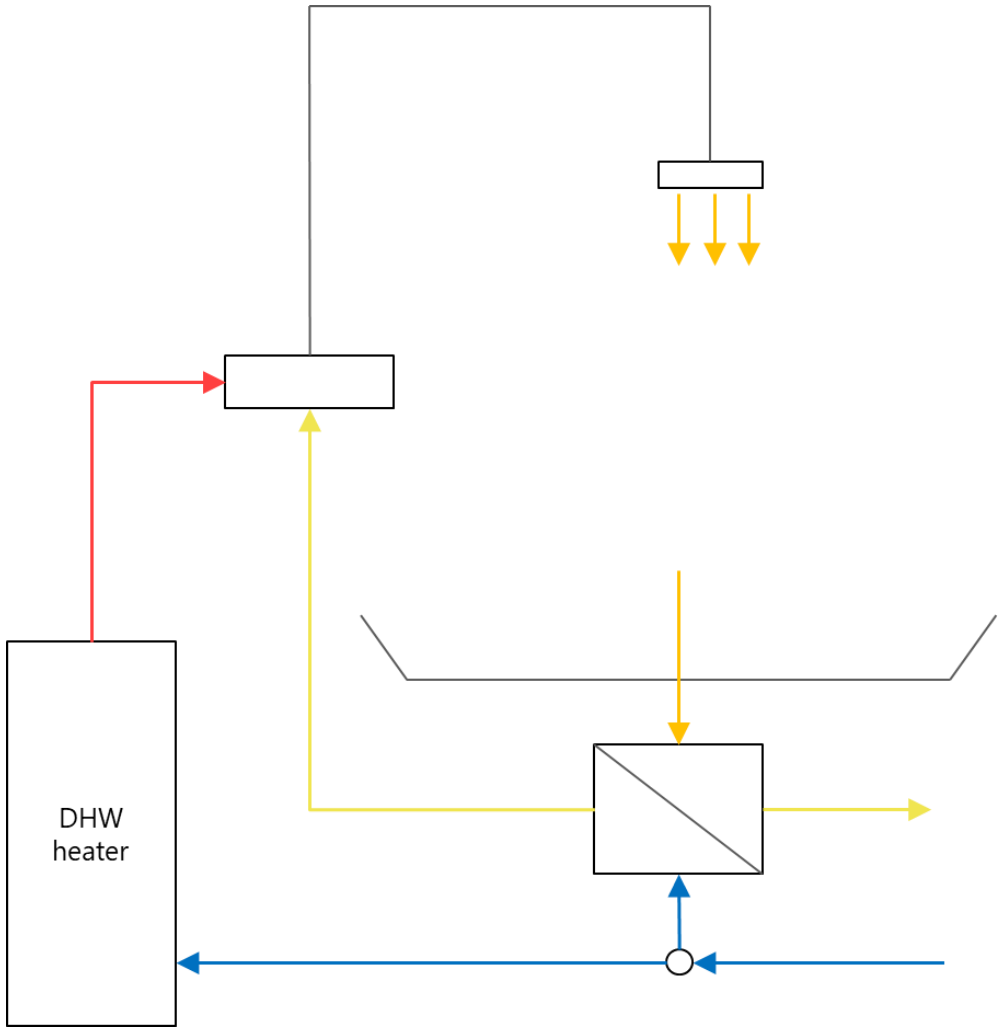


Passive HR: NEST - Installation

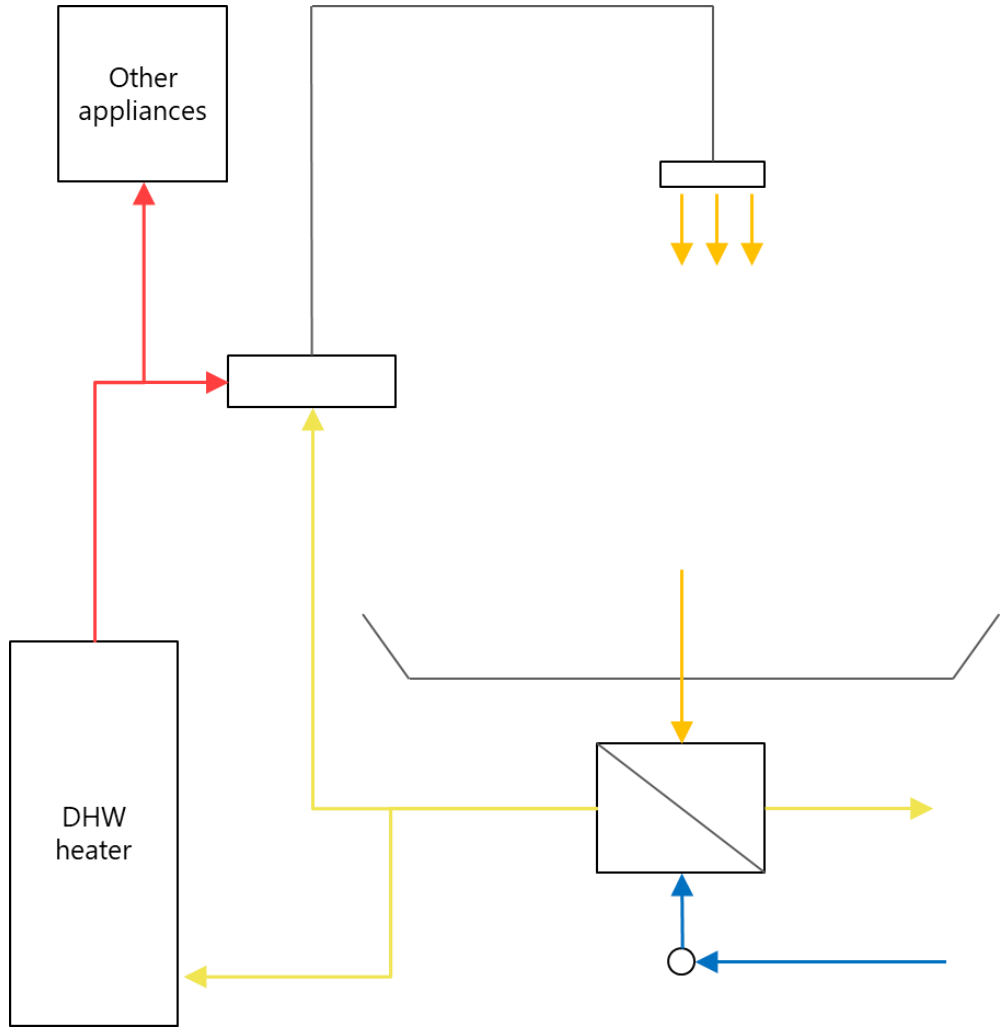


local mode

Passive HR: NEST - Installation

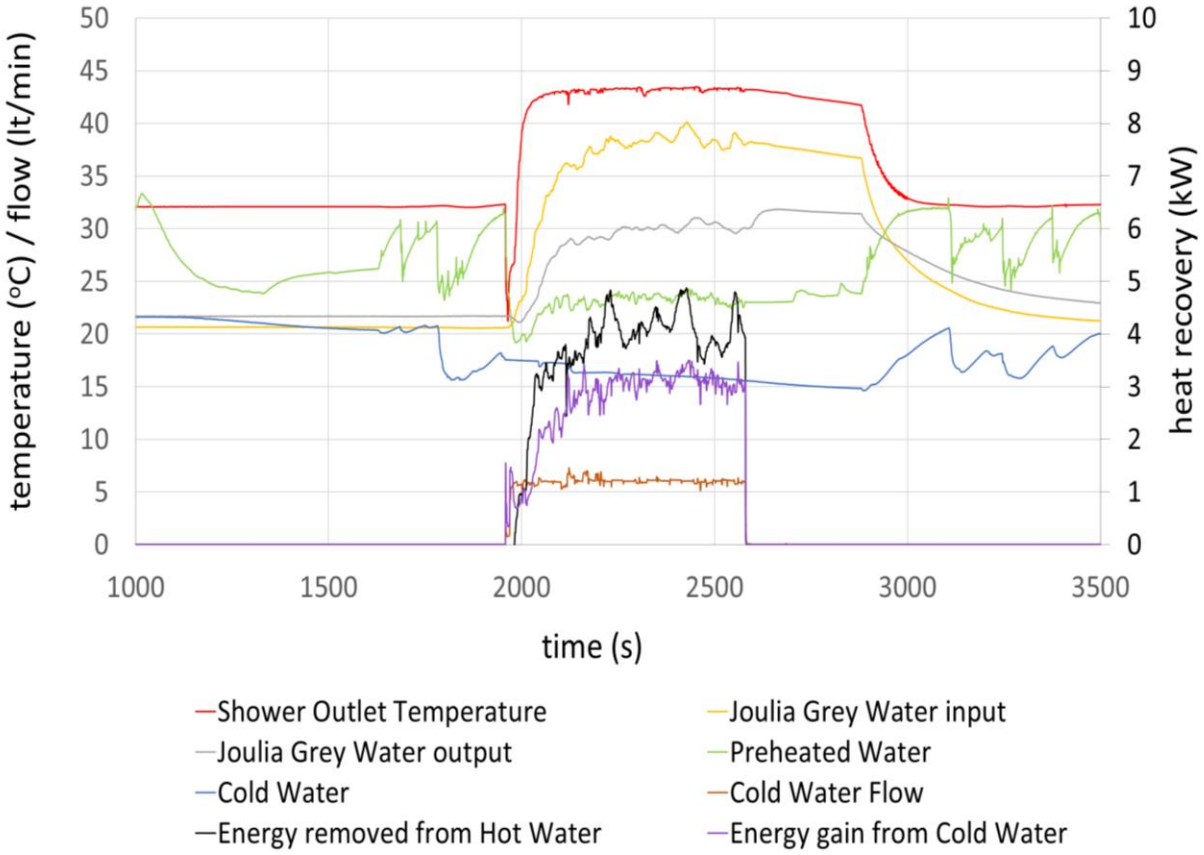


local mode

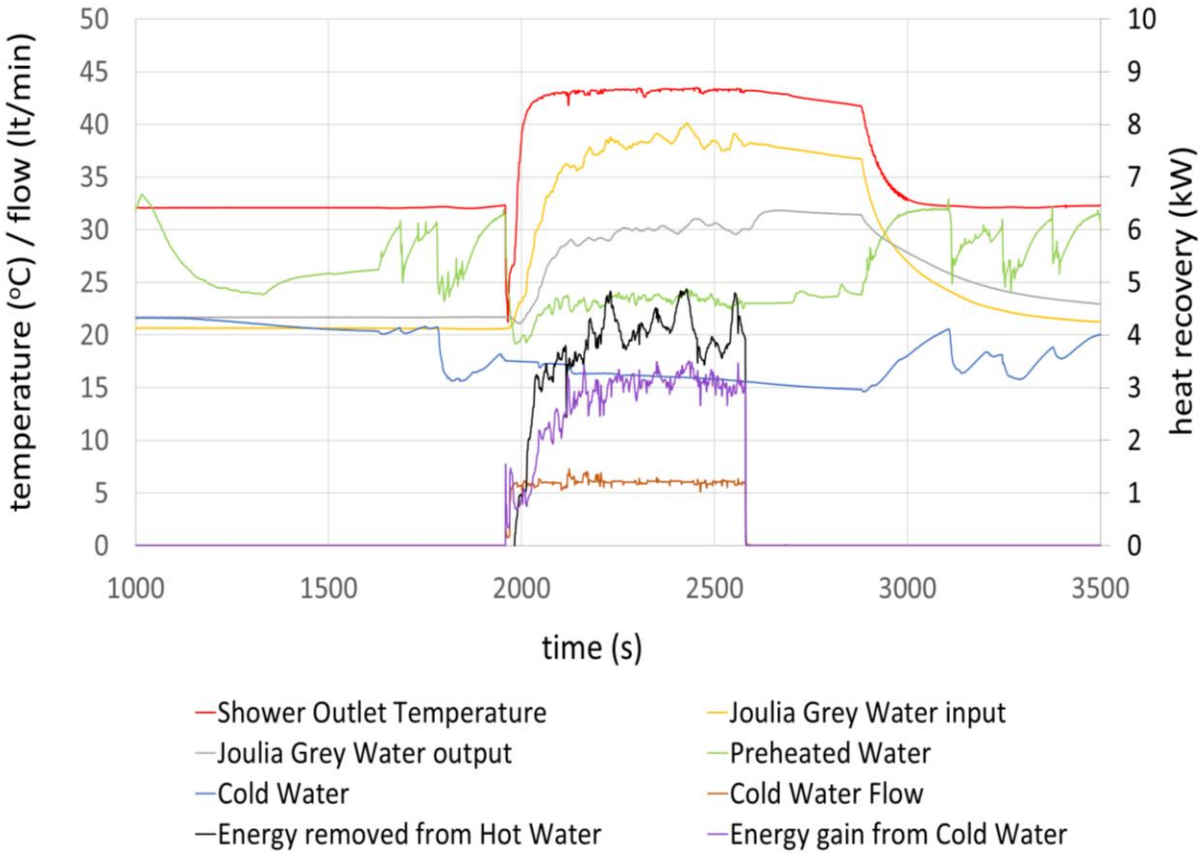


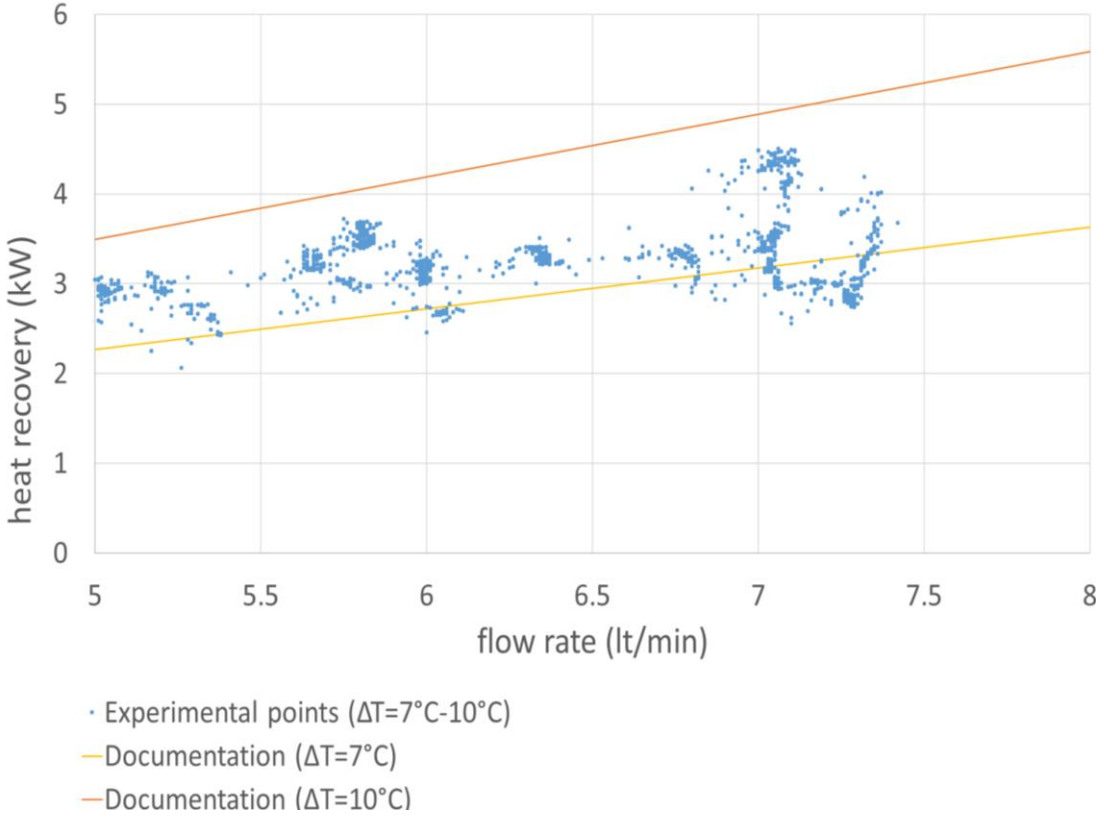
matched flow mode

Passive HR: NEST - Results



Passive HR: NEST - Results

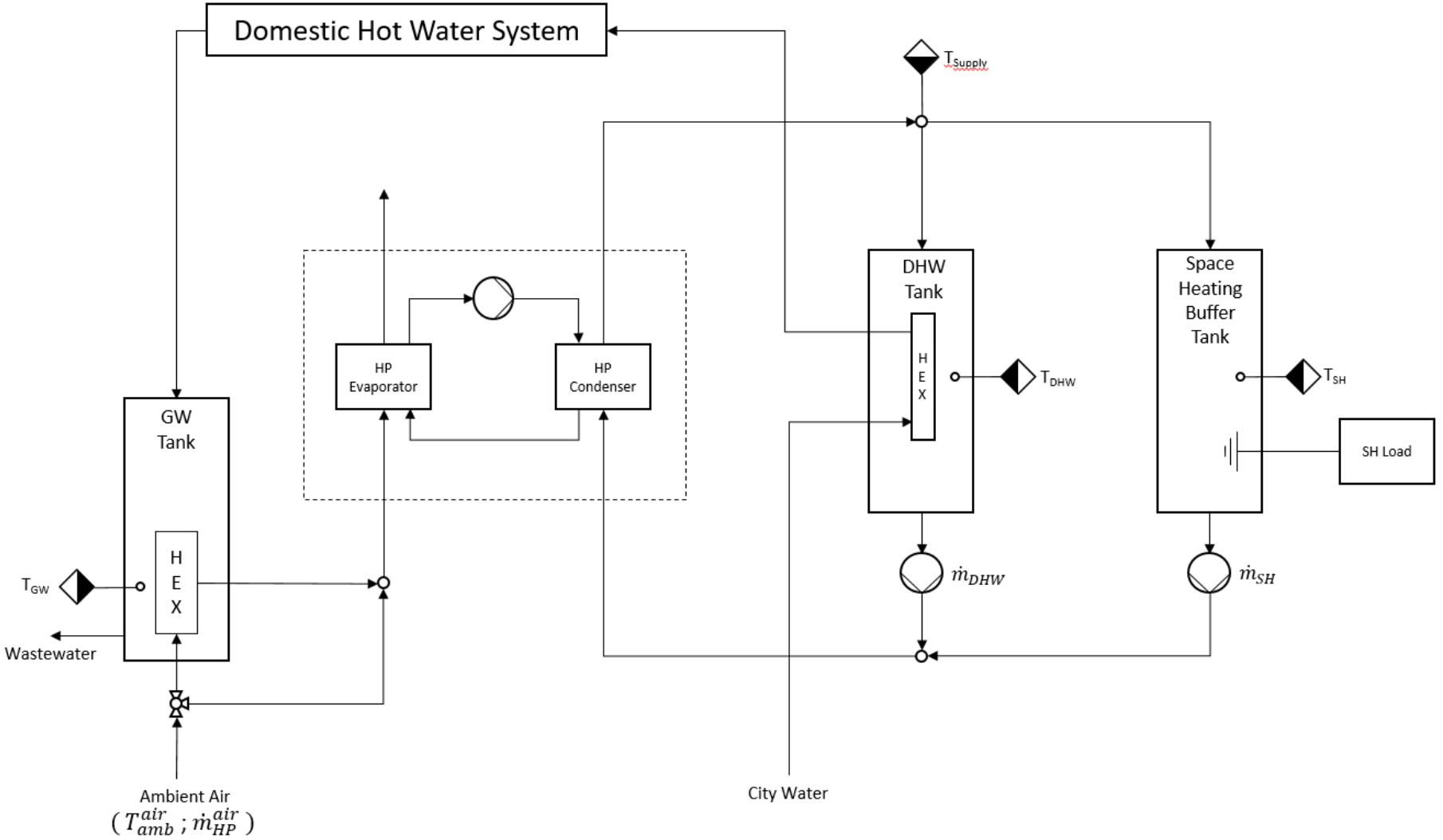




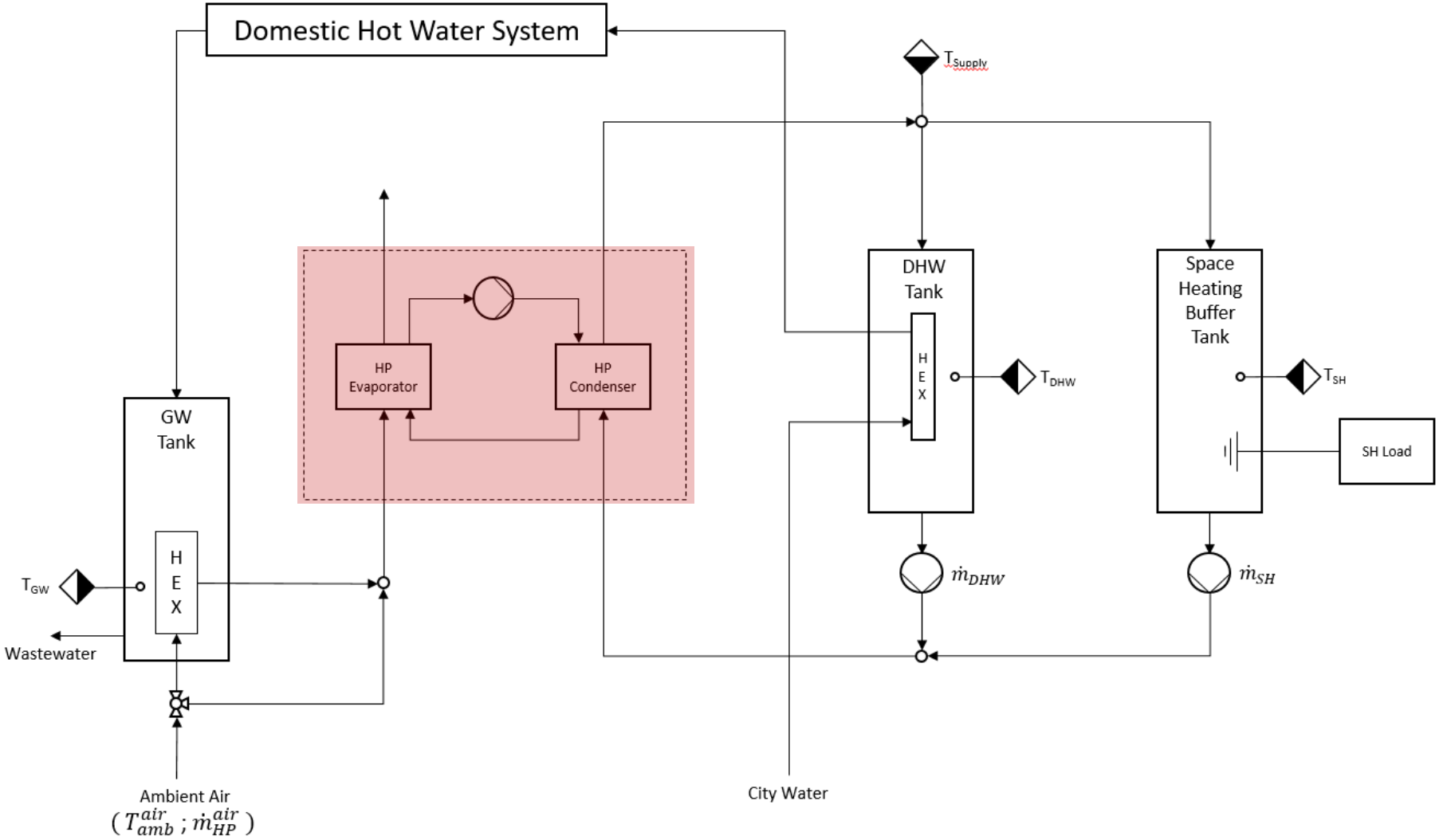
Passive Wastewater Heat Recovery

Active Wastewater Heat Recovery

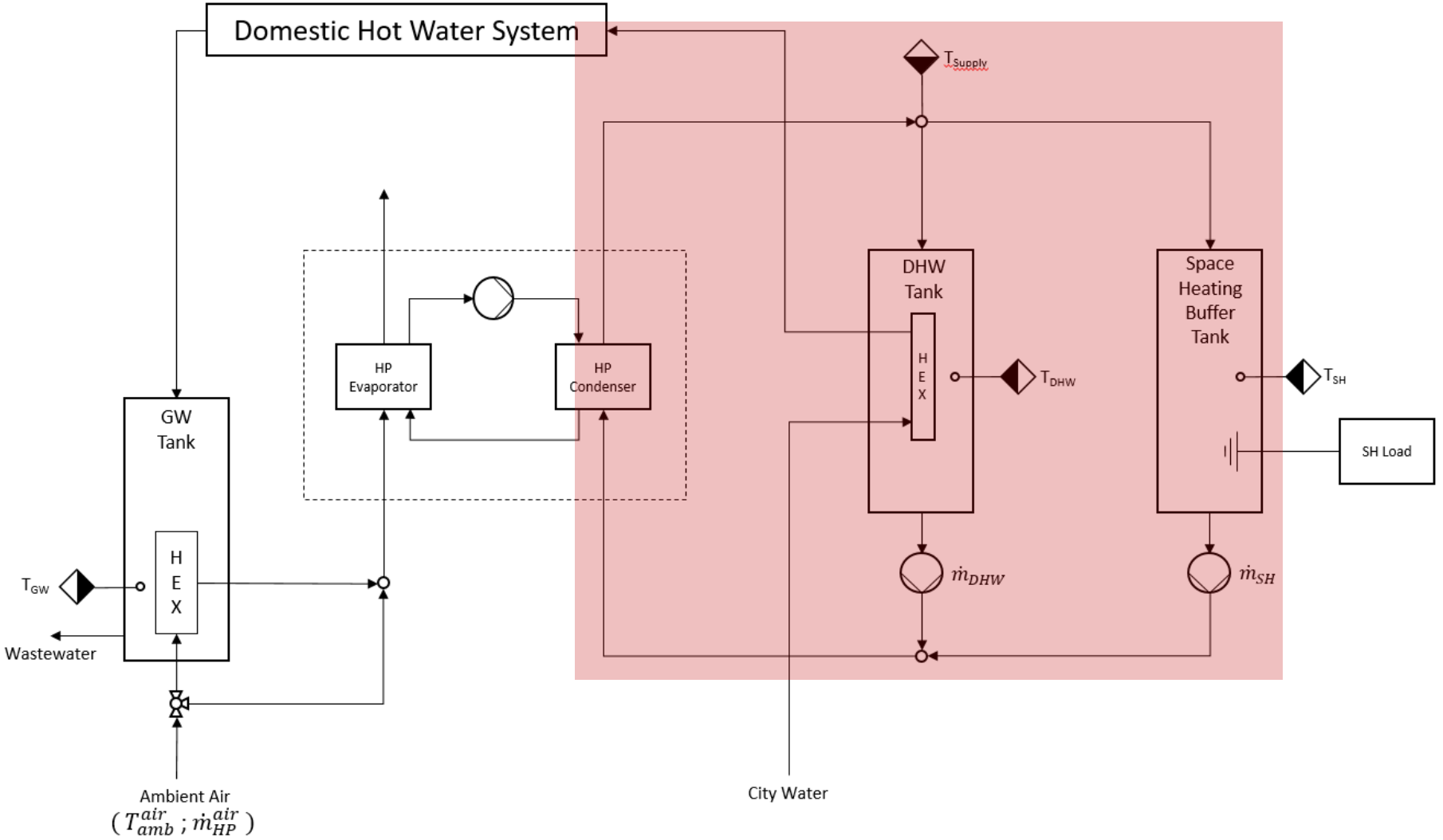
Active HR: System Model



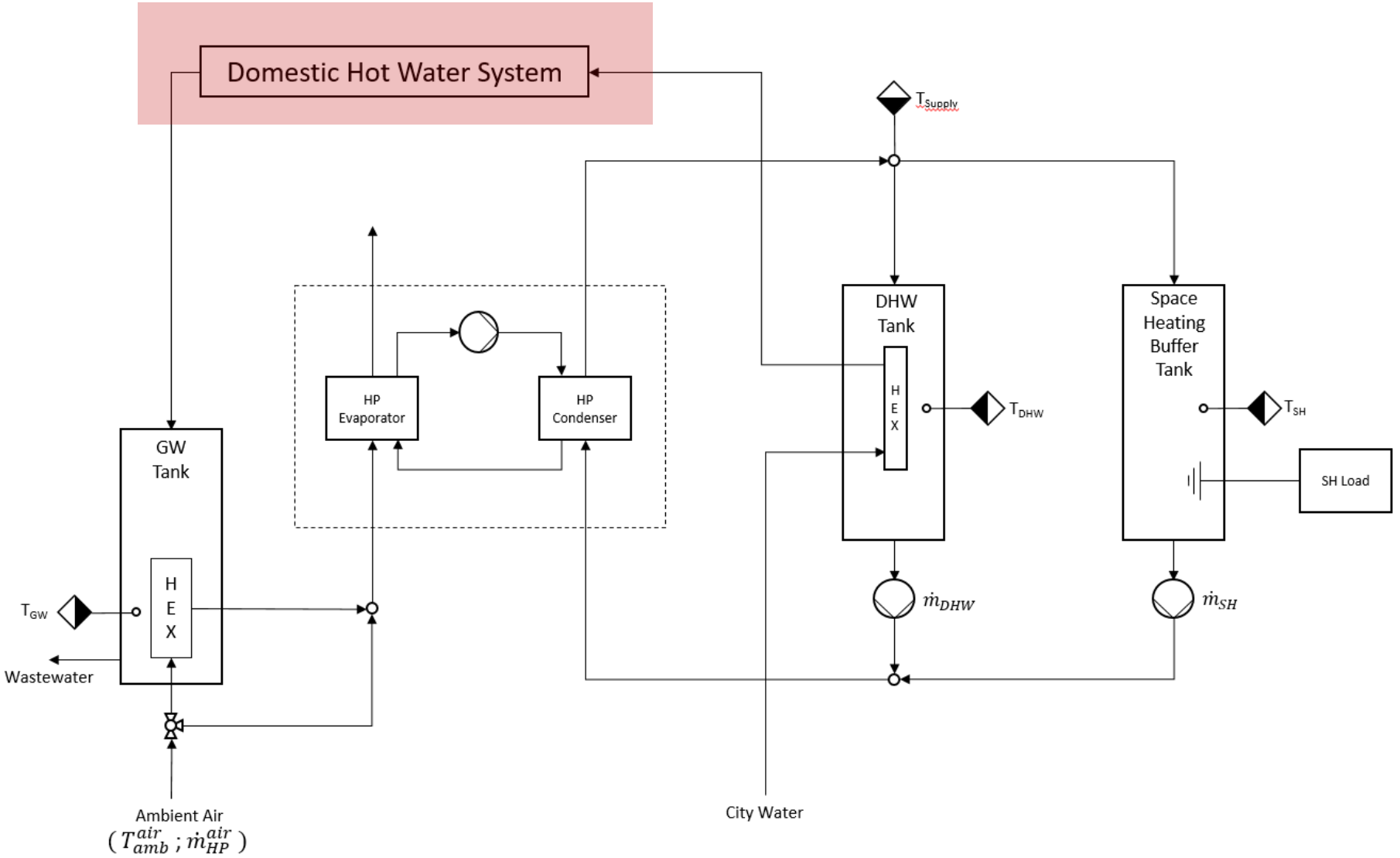
Active HR: System Model



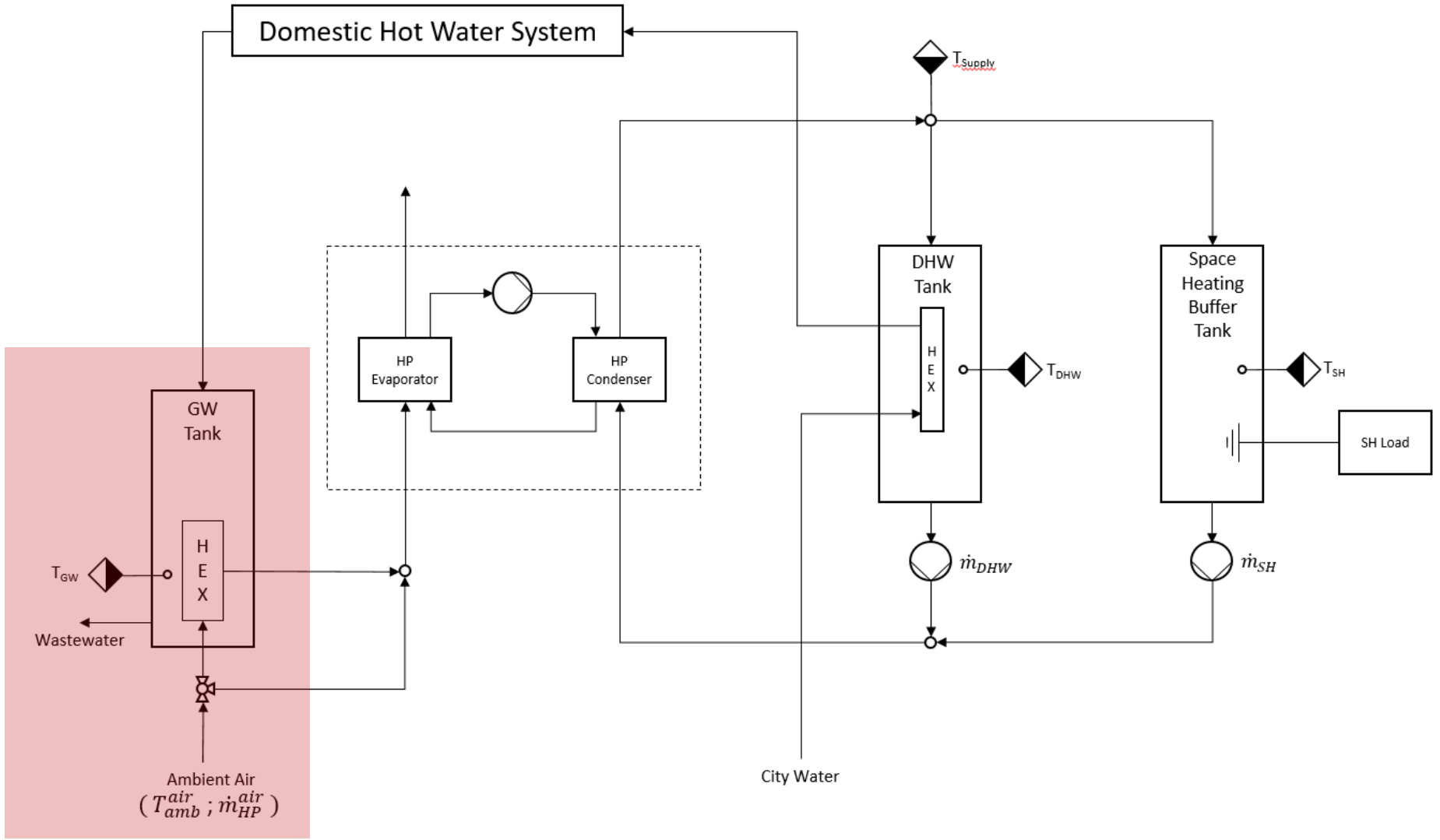
Active HR: System Model



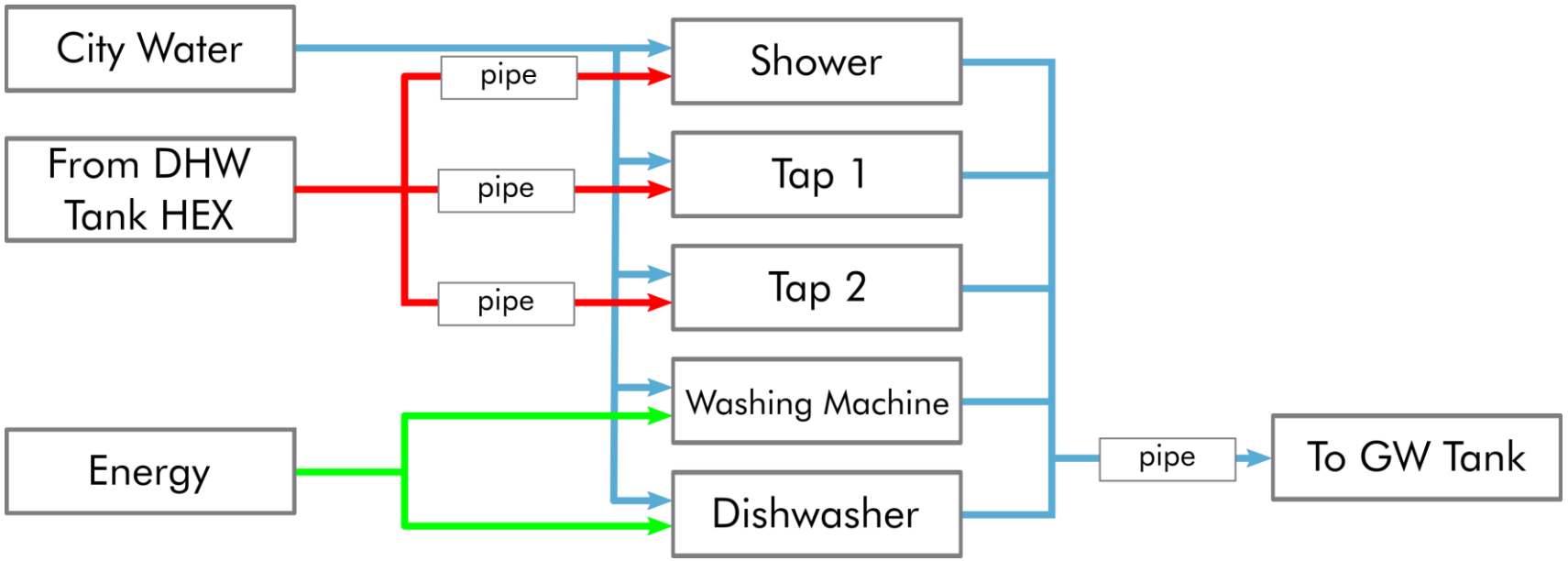
Active HR: System Model



Active HR: System Model



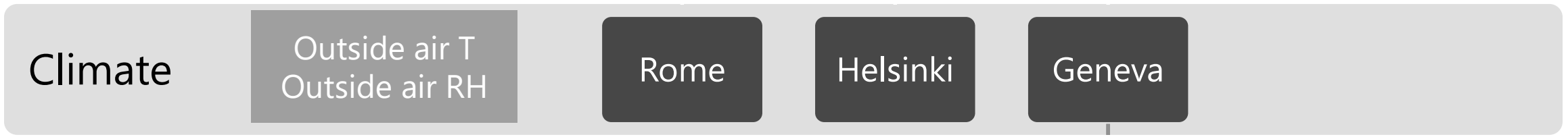
Active HR: Domestic Hot Water System



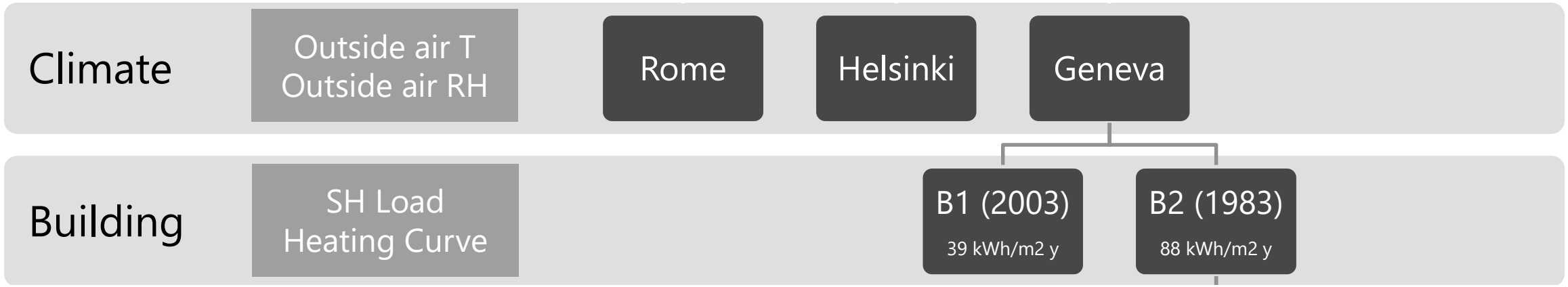
- Stochastic simulation of single water consumption events
- Plumbing layout and pipe losses
- Real water consumption schedules and loads

WaterHub

Active HR: Scenario Tree

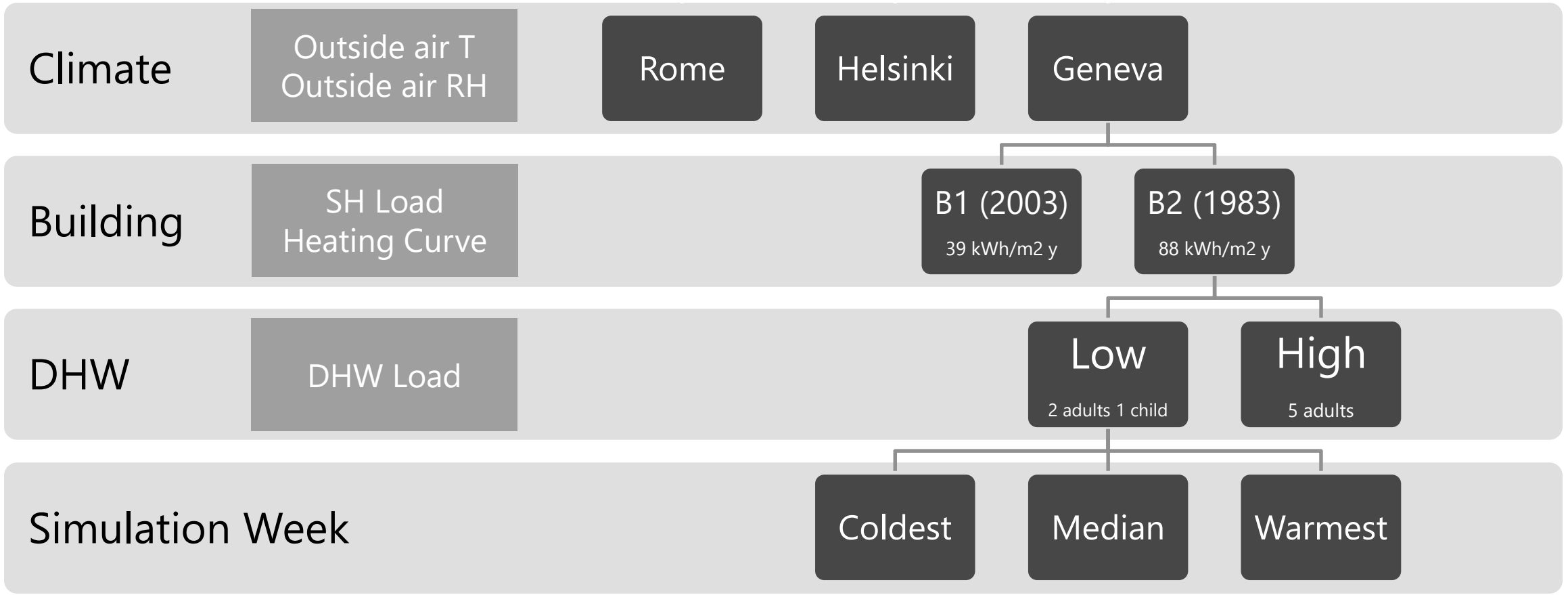


Active HR: Scenario Tree

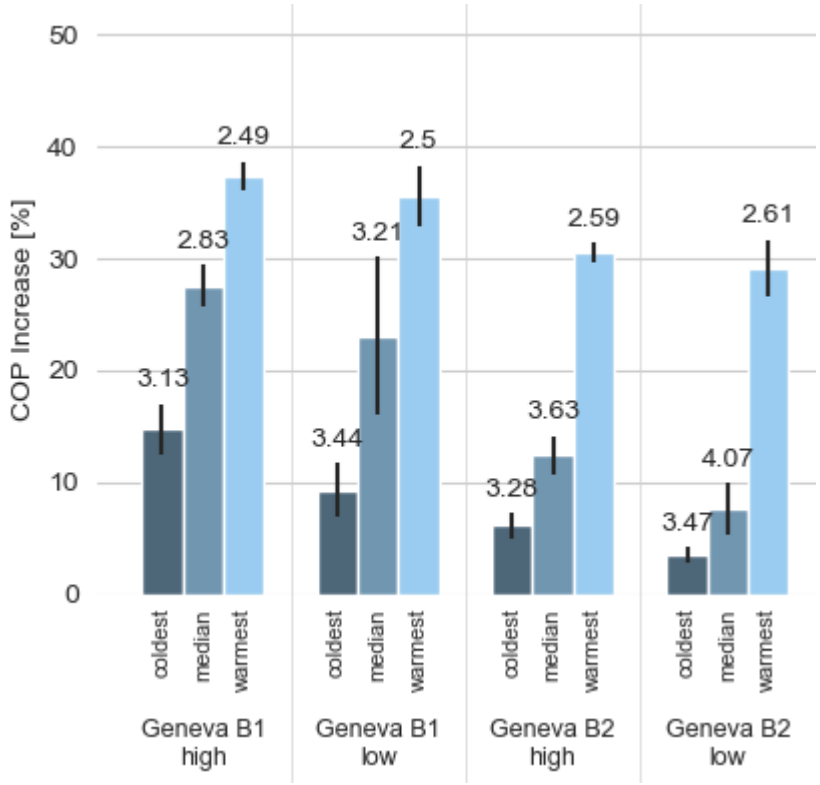


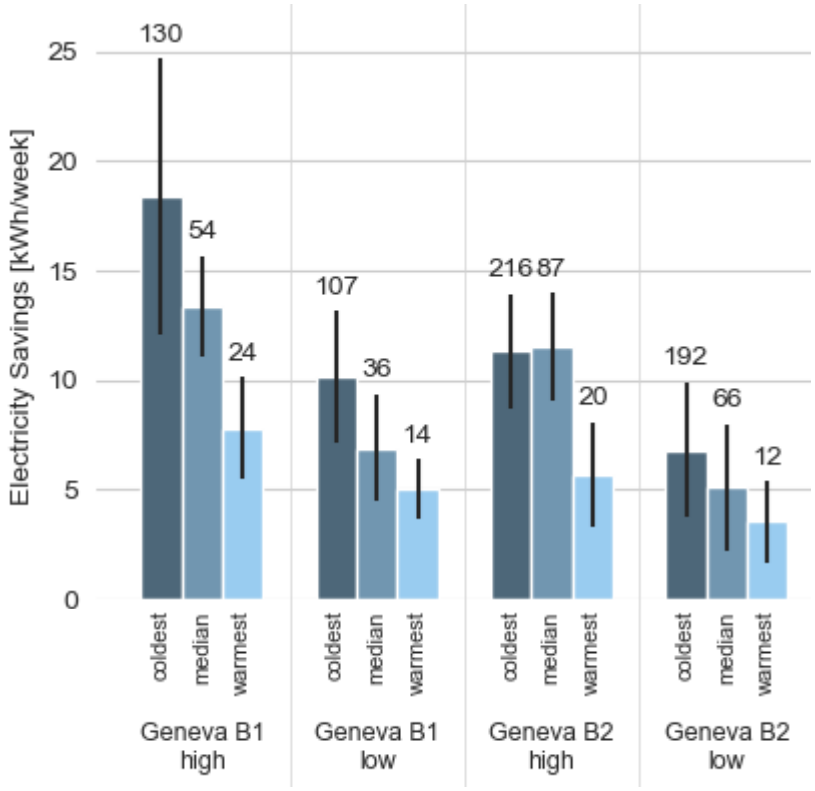
Active HR: Scenario Tree

Active HR: Scenario Tree

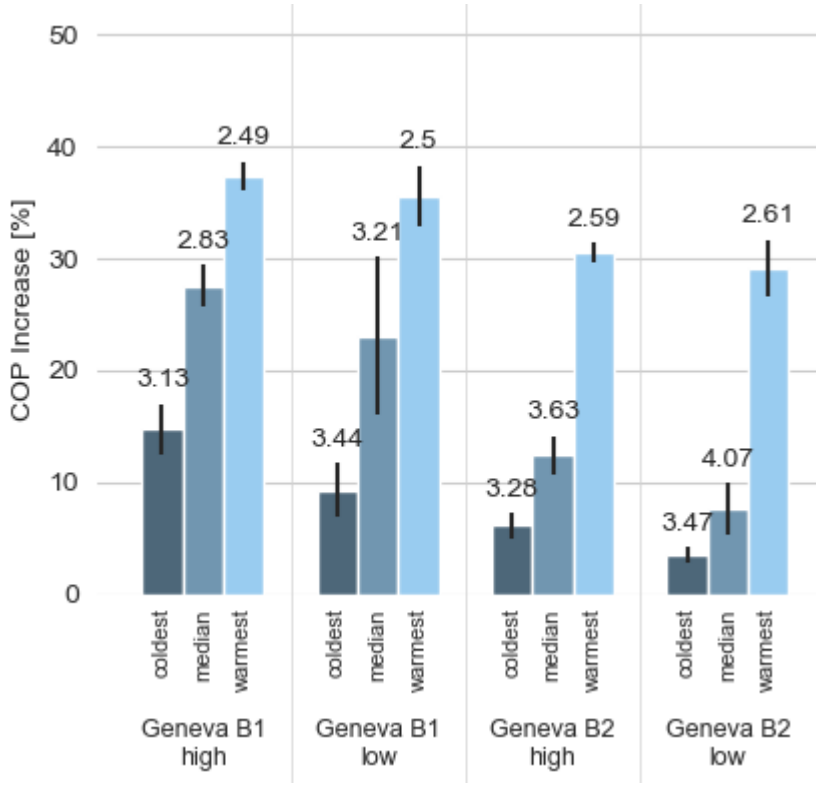


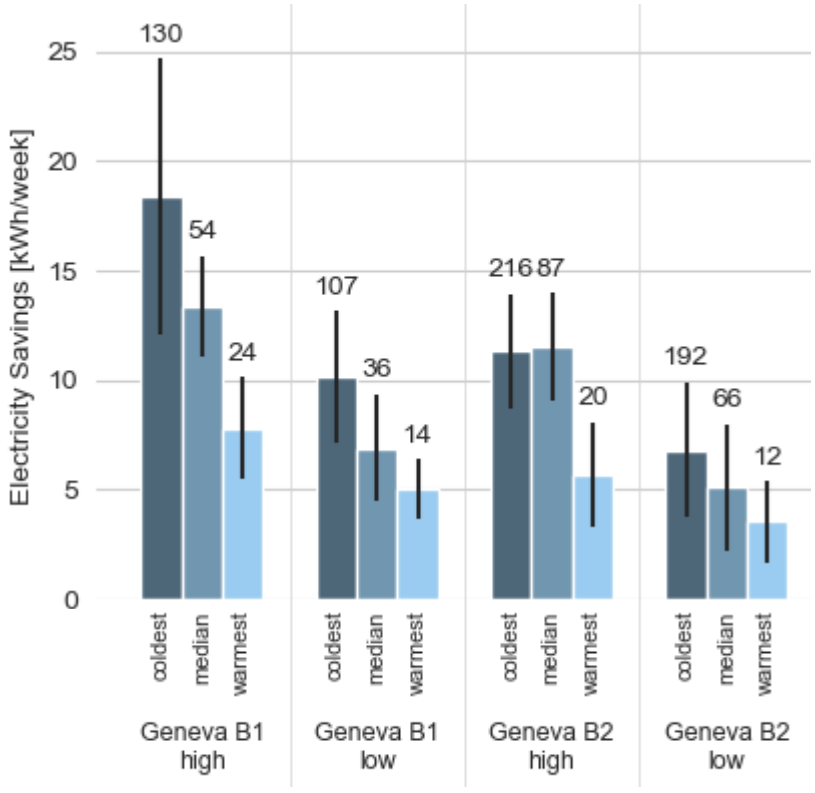
Active HR: Results (1/2)





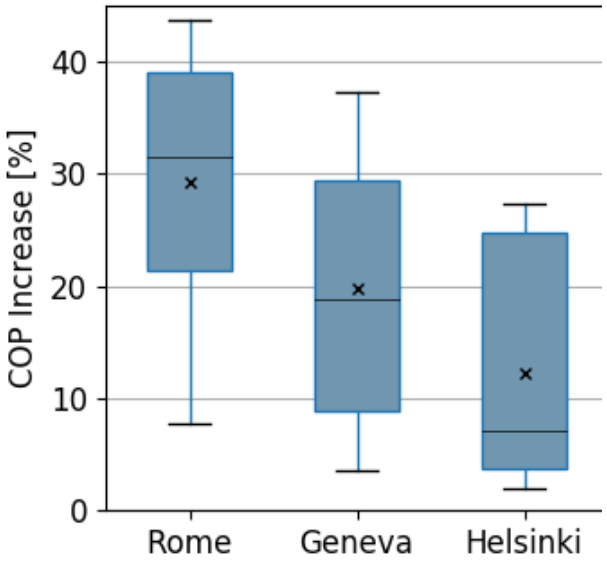
Active HR: Results (1/2)

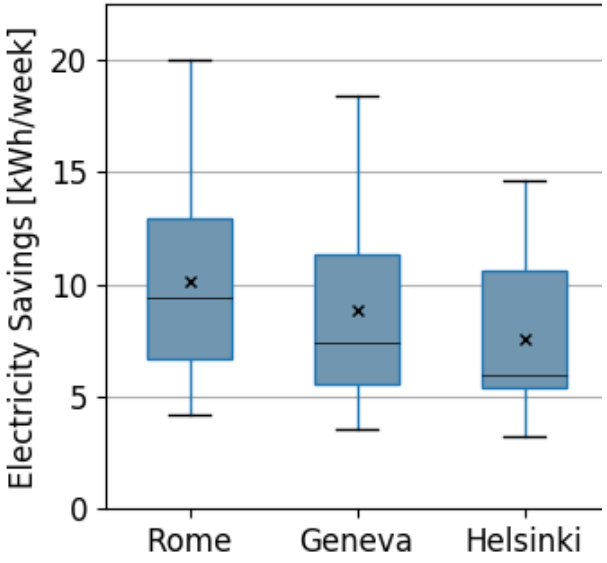




	Average COP Increase [%]	Average Electricity Savings [kWh/week]	Average Electricity Savings [kWh/year]
Geneva	19.7	8.8	460
Rome	29.3	10.1	525
Helsinki	12.2	7.6	395

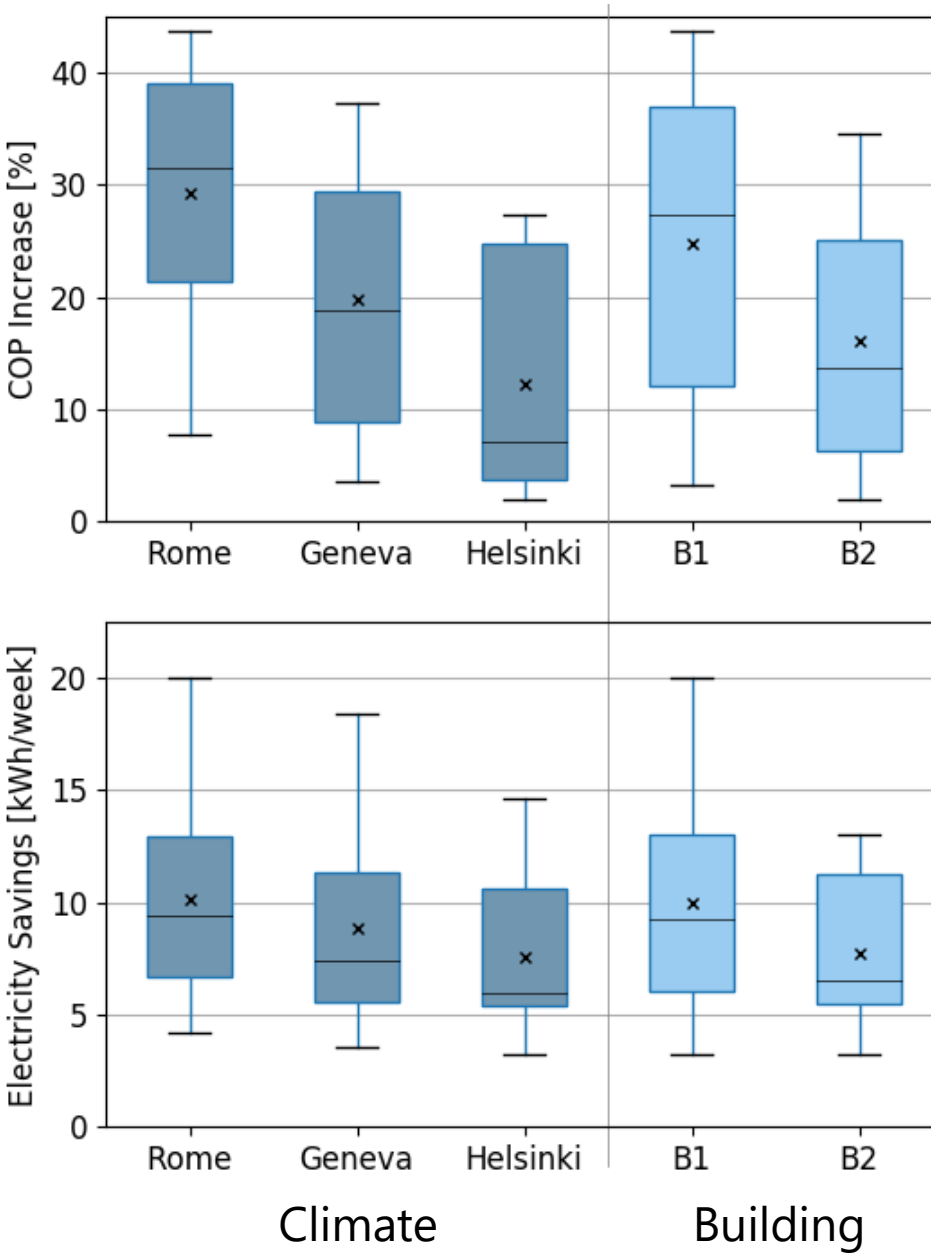
Active HR: Results (2/2)



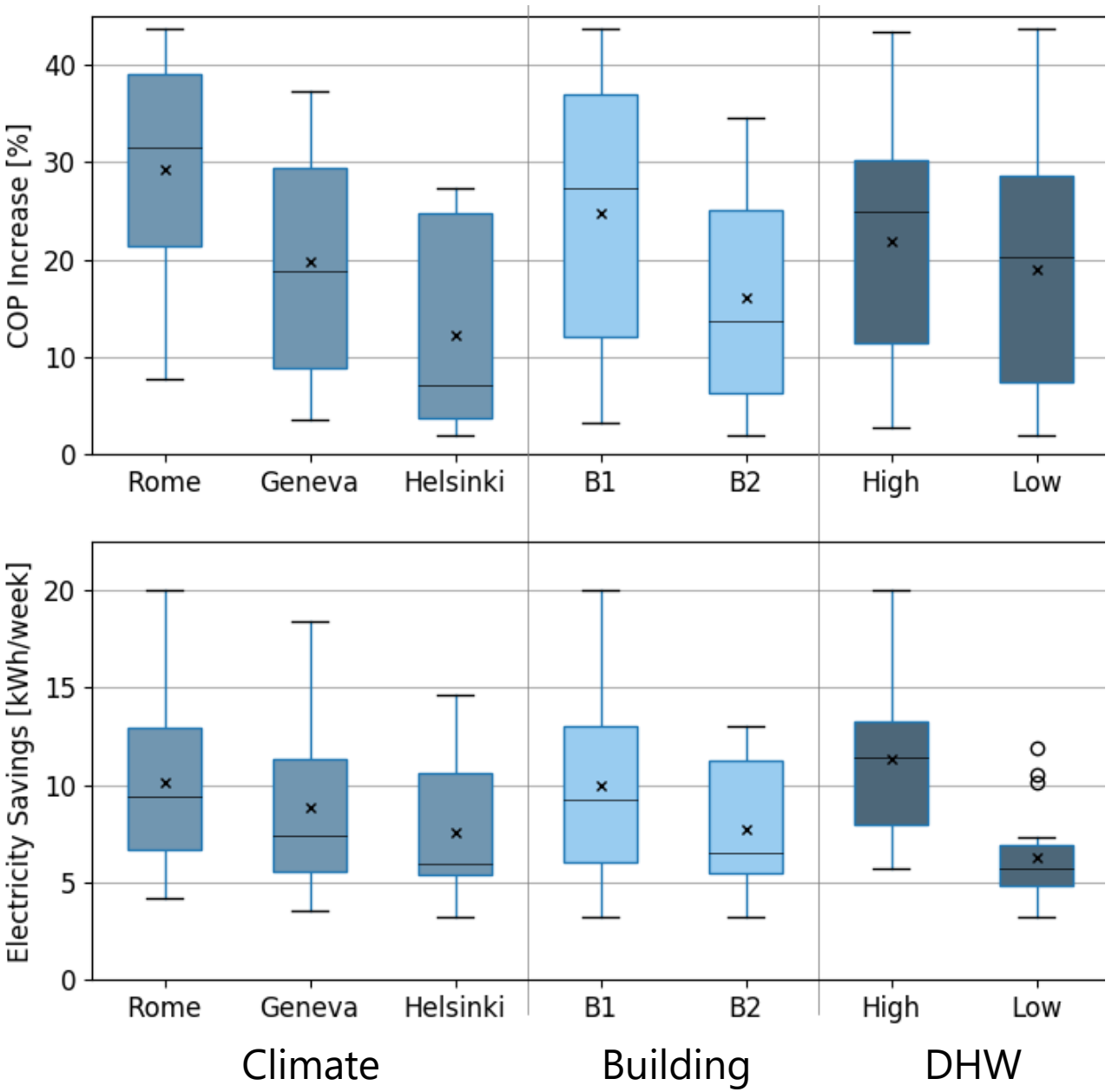


Climate

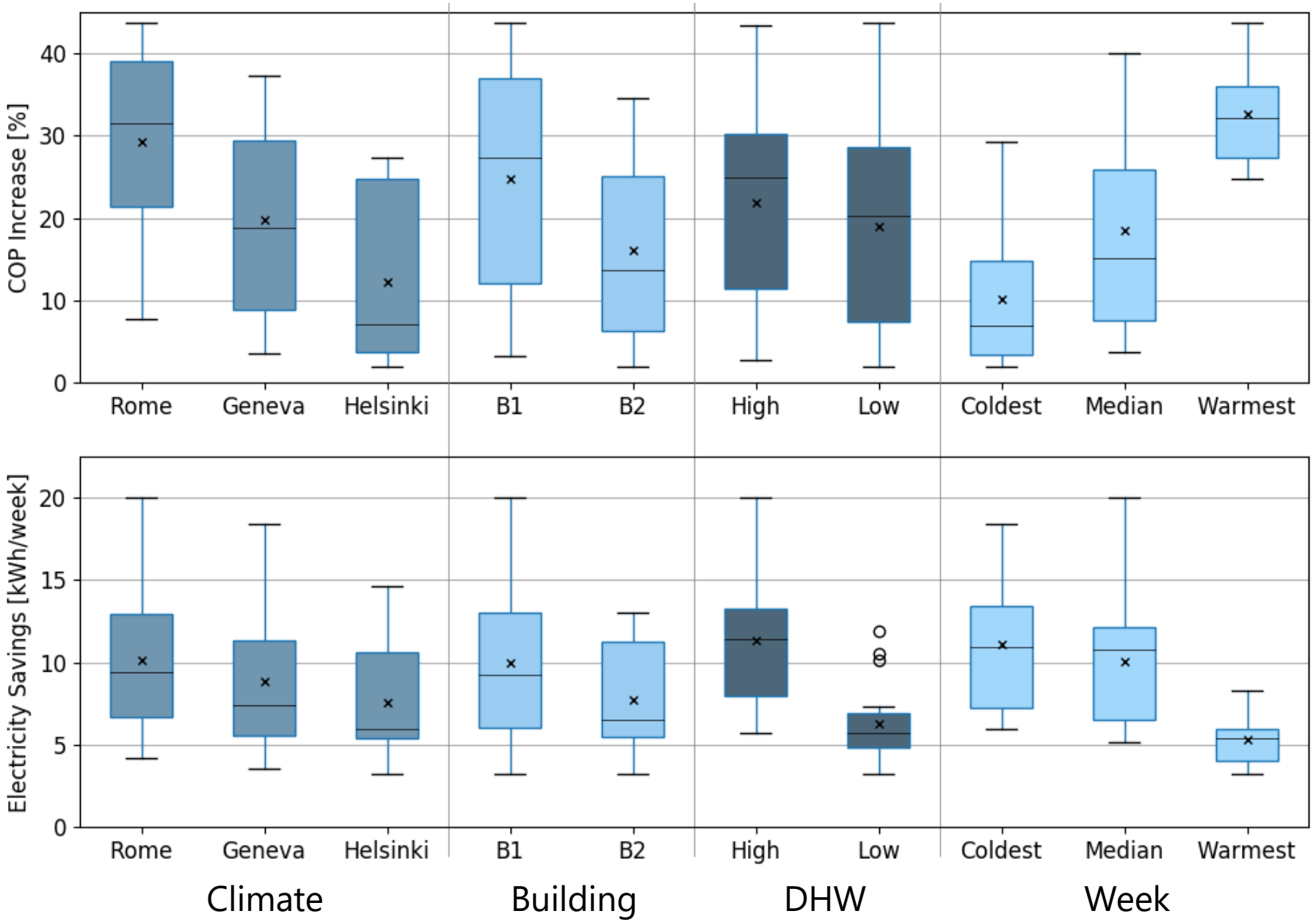
Active HR: Results (2/2)



Active HR: Results (2/2)



Active HR: Results (2/2)



Conclusions

- Domestic hot water systems are an increasingly significant share of the total energy consumption in buildings – passive and active heat recovery systems increase their efficiency.

Conclusions

- Domestic hot water systems are an increasingly significant share of the total energy consumption in buildings – passive and active heat recovery systems increase their efficiency.

- Passive heat recovery:
  - Experimental setup in NEST – Dübendorf
  - Experiments indicated **heat saving potential of up to 20% for DHW production**, amounting to about 750 kWh/a per household

Conclusions

- Domestic hot water systems are an increasingly significant share of the total energy consumption in buildings – passive and active heat recovery systems increase their efficiency.

- Passive heat recovery:
  - Experimental setup in NEST – Dübendorf
  - Experiments indicated **heat saving potential of up to 20% for DHW production**, amounting to about 750 kWh/a per household

300-600 GWh/a electricity savings
30’000-60’000 tons CO_2

Conclusions

- Domestic hot water systems are an increasingly significant share of the total energy consumption in buildings – passive and active heat recovery systems increase their efficiency.

- Passive heat recovery:
  - Experimental setup in NEST – Dübendorf
  - Experiments indicated **heat saving potential of up to 20% for DHW production**, amounting to about 750 kWh/a per household

300-600 GWh/a electricity savings
30’000-60’000 tons CO_2

- Active heat recovery:
  - Simulation study over wide range of scenarios (climate – building performance – DHW load – season)
  - In CH: **20% COP increase** – 460 kWh/a per household **electricity savings**.

Conclusions

- Domestic hot water systems are an increasingly significant share of the total energy consumption in buildings – passive and active heat recovery systems increase their efficiency.

- Passive heat recovery:
  - Experimental setup in NEST – Dübendorf
  - Experiments indicated **heat saving potential of up to 20% for DHW production**, amounting to about 750 kWh/a per household

300-600 GWh/a electricity savings
30'000-60'000 tons CO_2

- Active heat recovery:
  - Simulation study over wide range of scenarios (climate – building performance – DHW load – season)
  - In CH: **20% COP increase** – 460 kWh/a per household **electricity savings**.

200 GWh/a electricity savings
20'000 tons CO_2