

26/08/2015

Smart Energy Systems and
4th Generation District
Heating



Selection of design scenarios for an industrial waste heat based micro-district heating network supplying low- energy buildings



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CITYOPT Project

- Holistic simulation and optimization of energy systems in Smart Cities.
- EU FP7 funded R&D project
- 7 partners
- Total budget 3,8 million €
- Feb 2014 – Feb 2017



Case study: possible micro-DHN in Vienna

- Aim: to integrate the existing thermal energy supply systems of the buildings and the waste heat of the cooling system of the RTA's climatic wind tunnel in a thermal network :
 - use of the waste heat to cover the office buildings' heating demand
 - Reduce the costs to cool the climatic wind tunnel

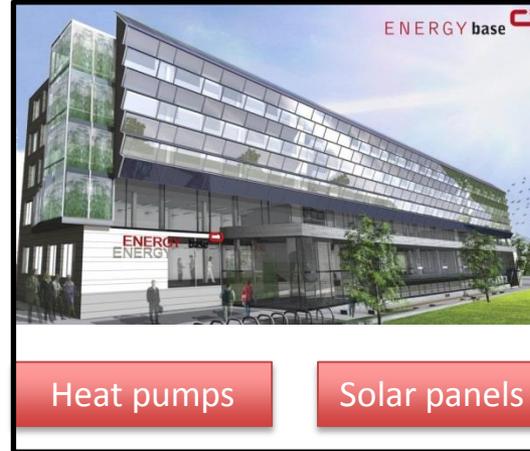


Case study: possible micro-DHN in Vienna

TechBase



EnergyBase



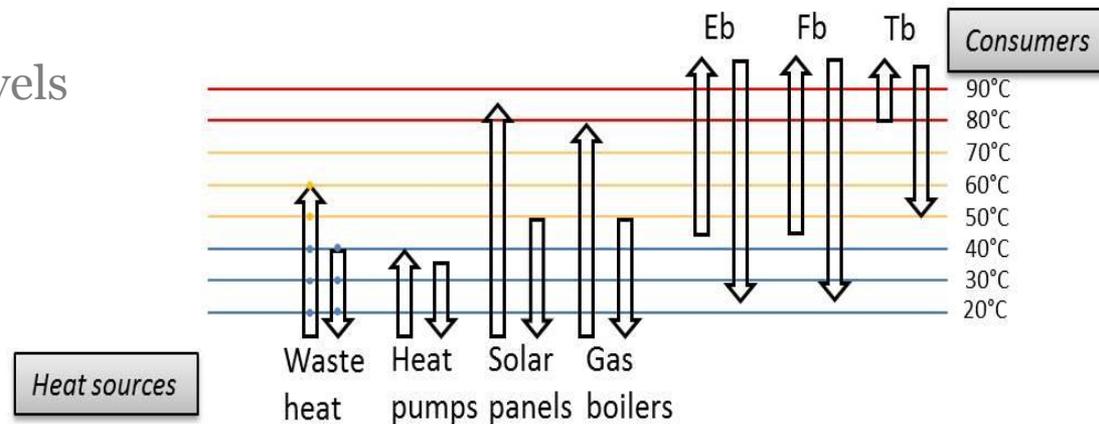
FutureBase



Case study: Challenges

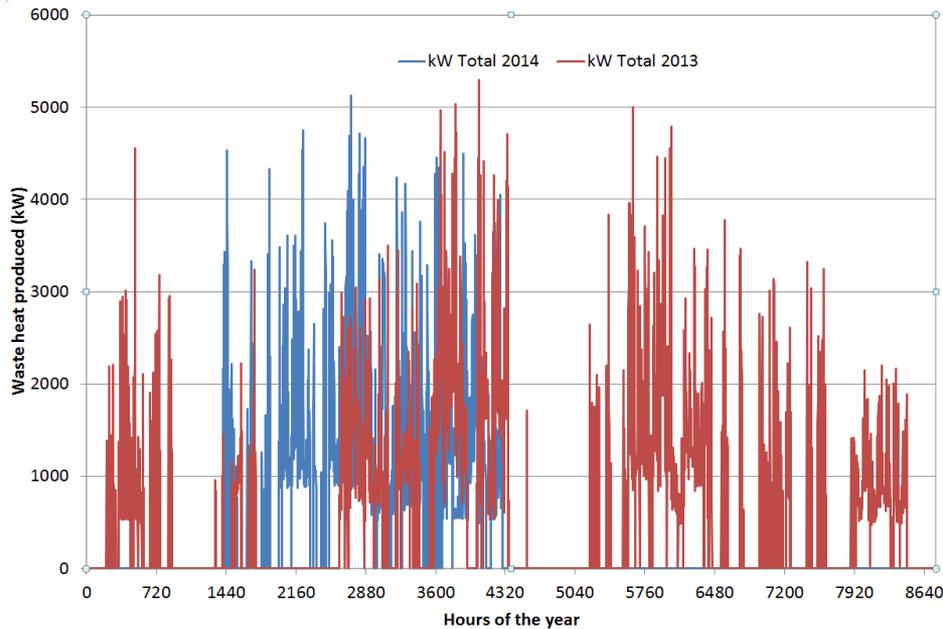
- Integration of :
 - Fluctuating heat sources, prosumers
 - Storages (long term & short term)
 - Different heat demand & profiles : low temperature & standard buildings
 - Different temperature levels

- Need of :
 - New system design
 - New control strategies
 - New business models

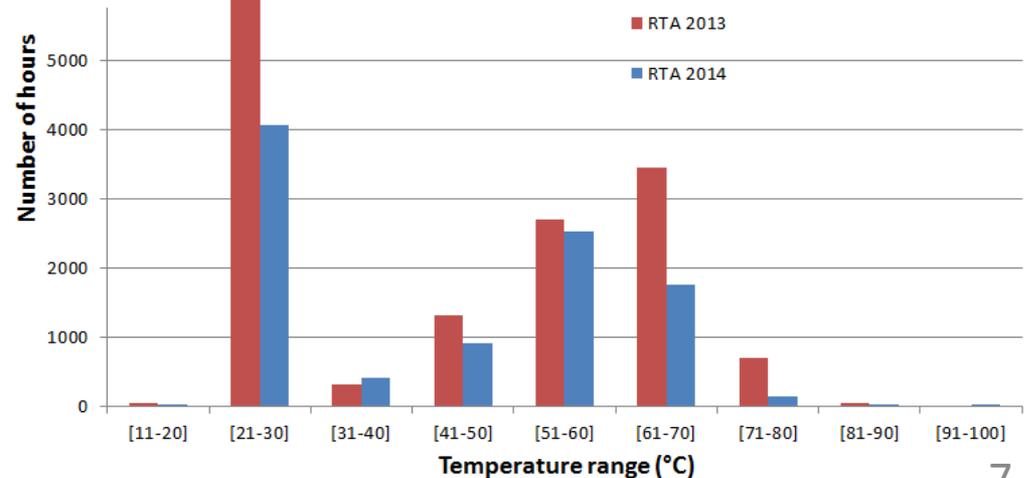


➔ Case that can be scaled up or adapted to other cases of refurbishment/extensions (if waste heat is available)

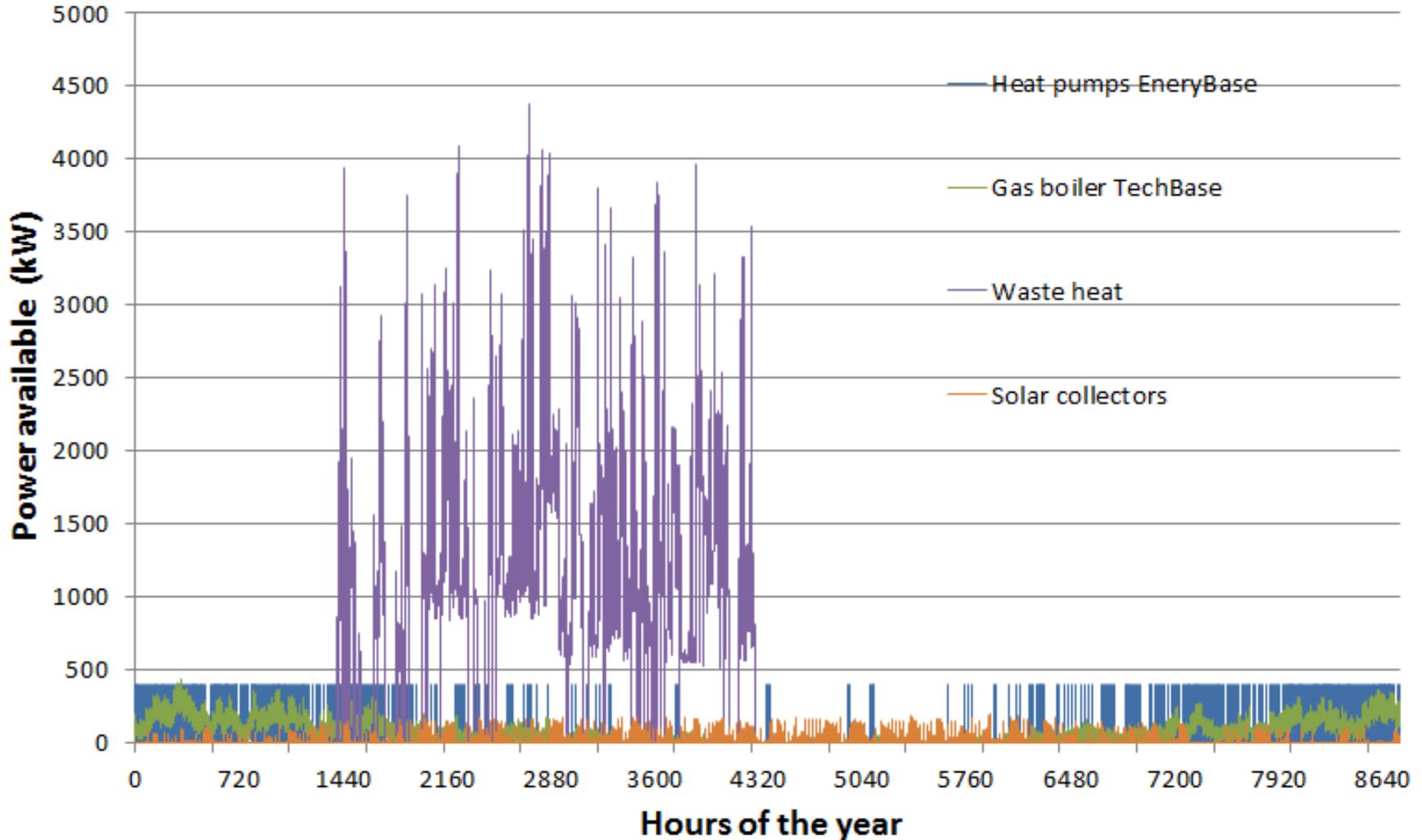
Challenge: different supply profiles



RTA waste heat available,
2013 - 2014

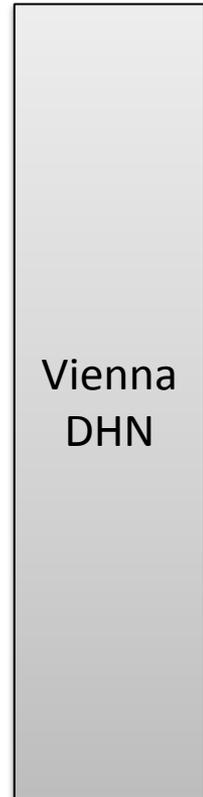


Challenge: different supply profiles



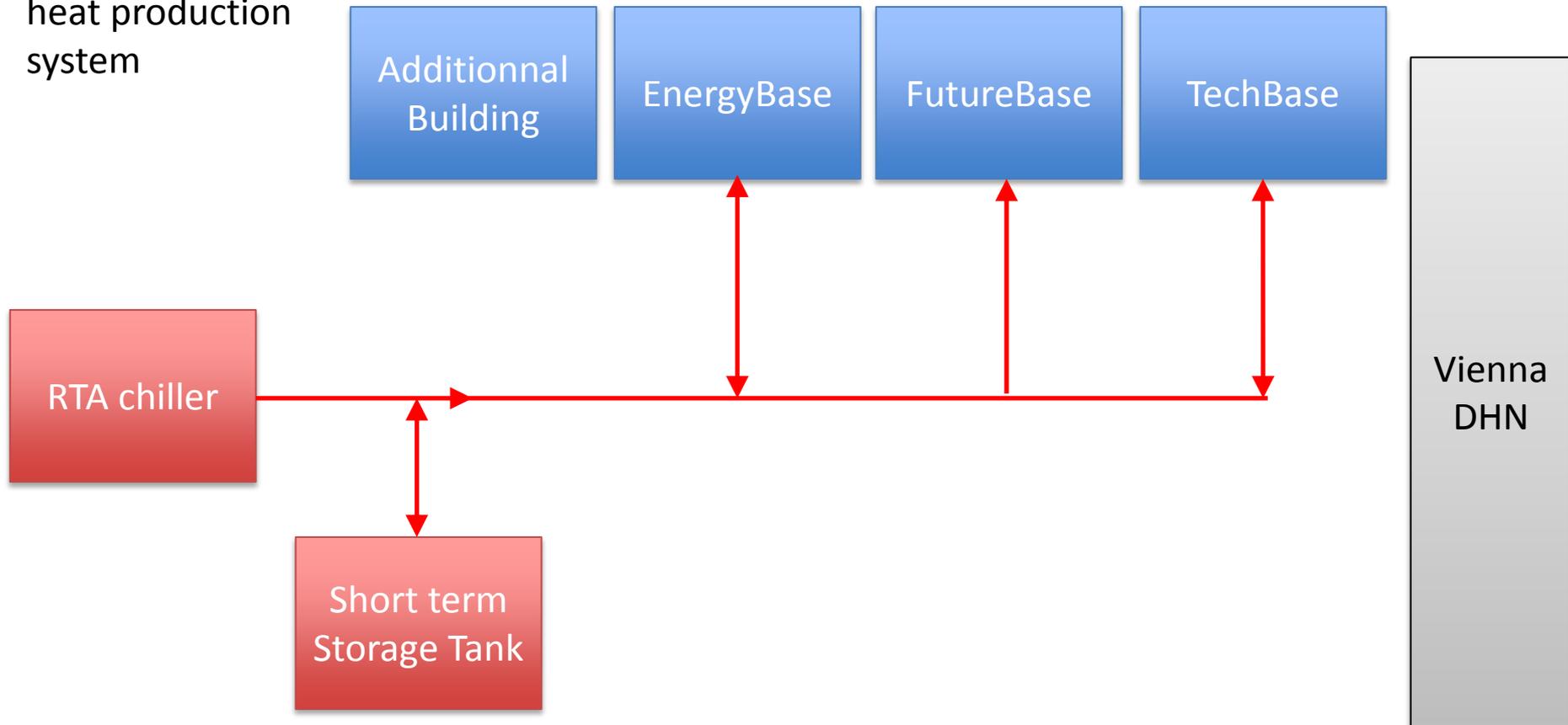
Reference scenario: individual heating (current status)

Add. Building
and FutureBase
are low-Energy
building with
heat pump



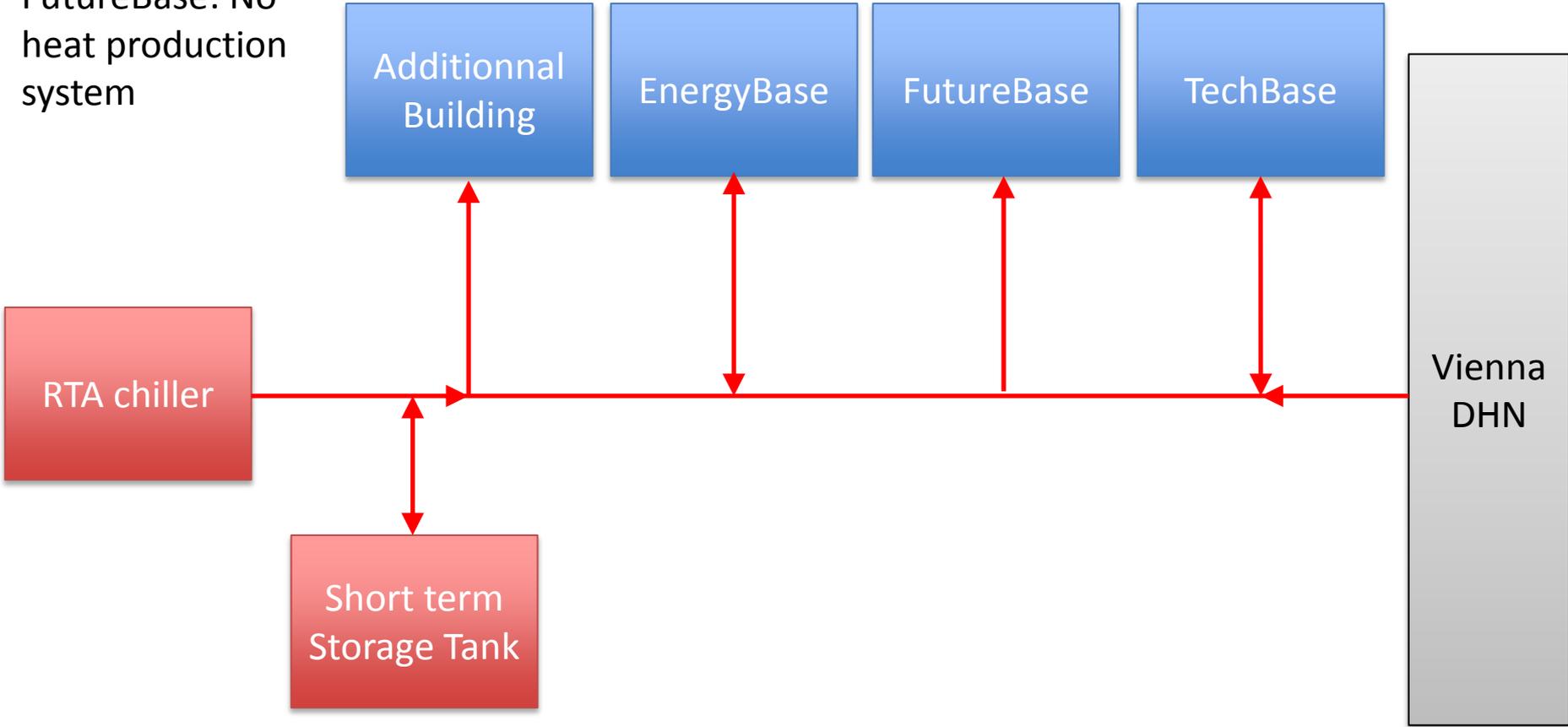
Scenario 1: micro DHN

FutureBase: No
heat production
system



Scenario 2: extended micro DHN

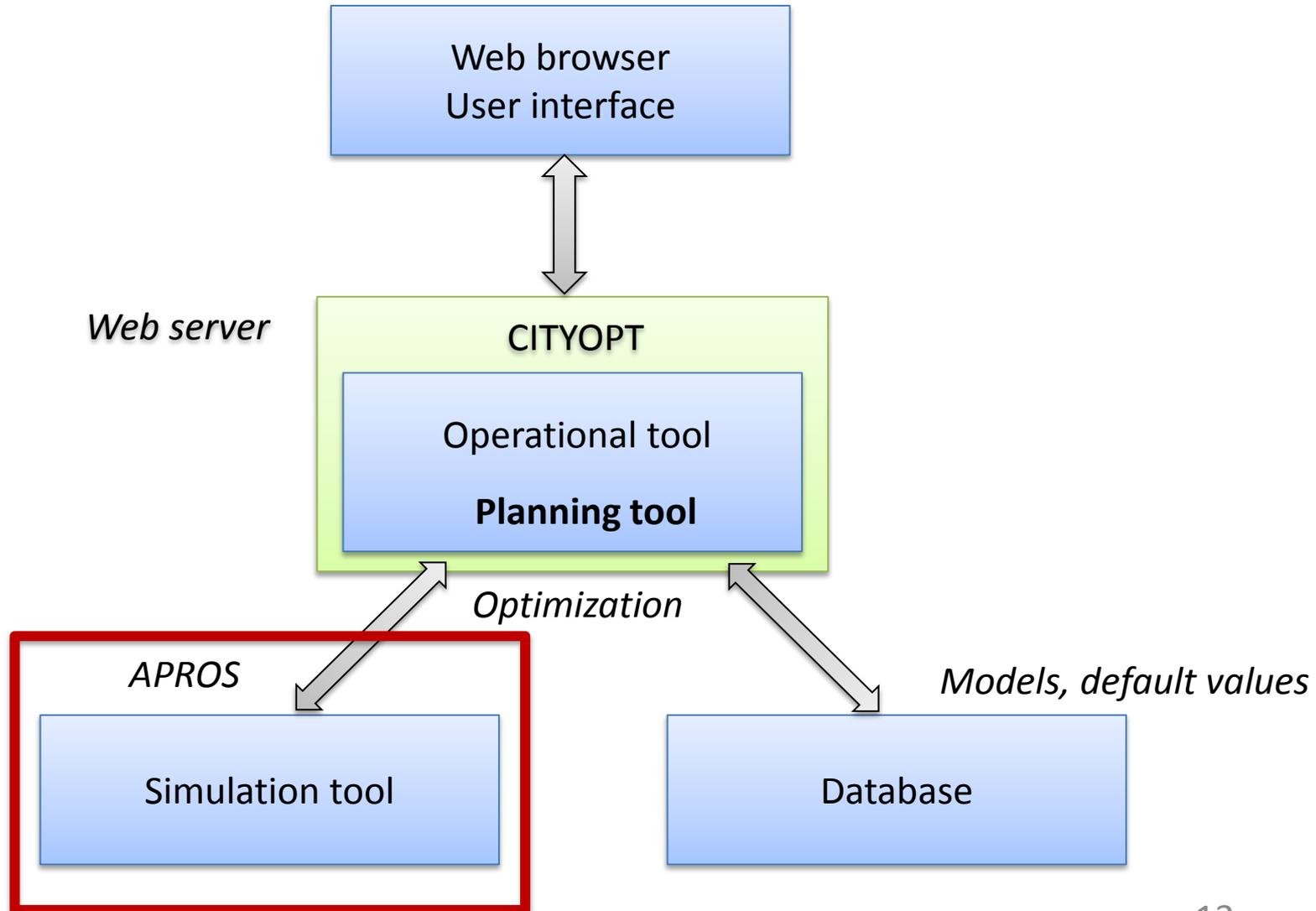
Add. Building,
FutureBase: No
heat production
system



Assumptions/control strategy

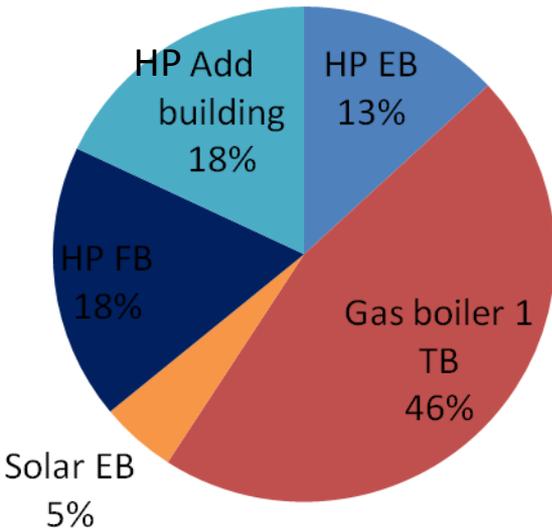
- The control system tries to maintain the supply temperature of EnergyBase in the micro DH (same as add. building and FutureBase)
- TechBase boiler used to heat up the temperature for TechBase and as a back-up for the other buildings
- Priority order of heat sources used:
 1. Waste heat
 2. Vienna DH network
 3. Own production sources (Solar, HP, gas boiler)

Simulation methodology

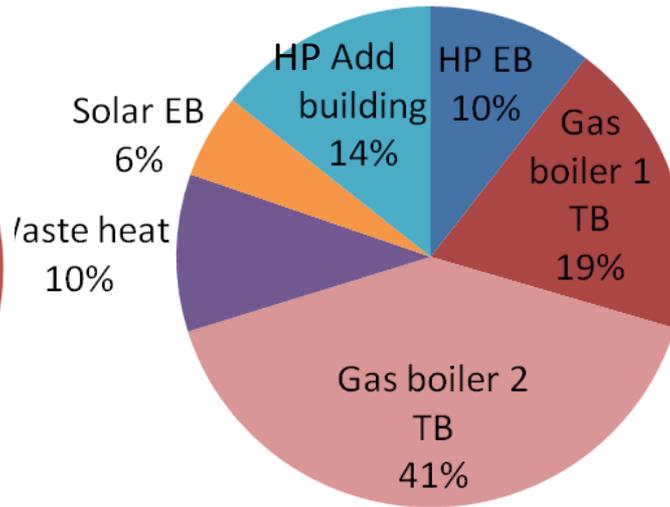


Preliminary results: Energy balance

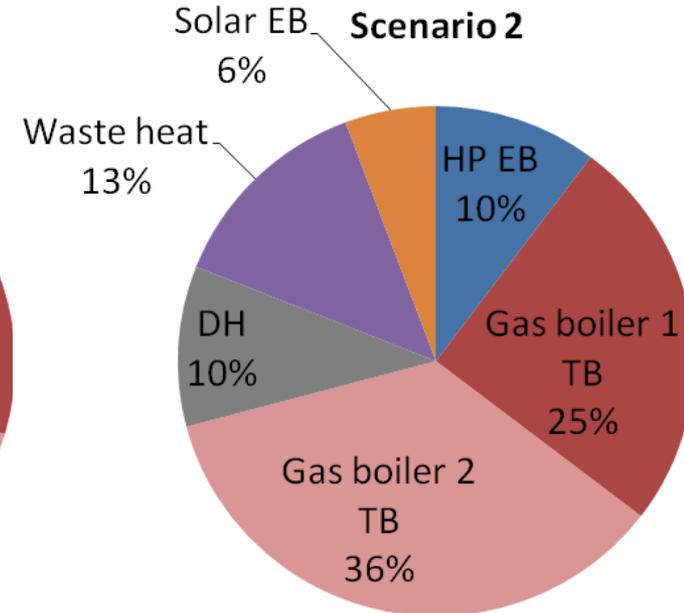
Reference Scenario



Scenario 1

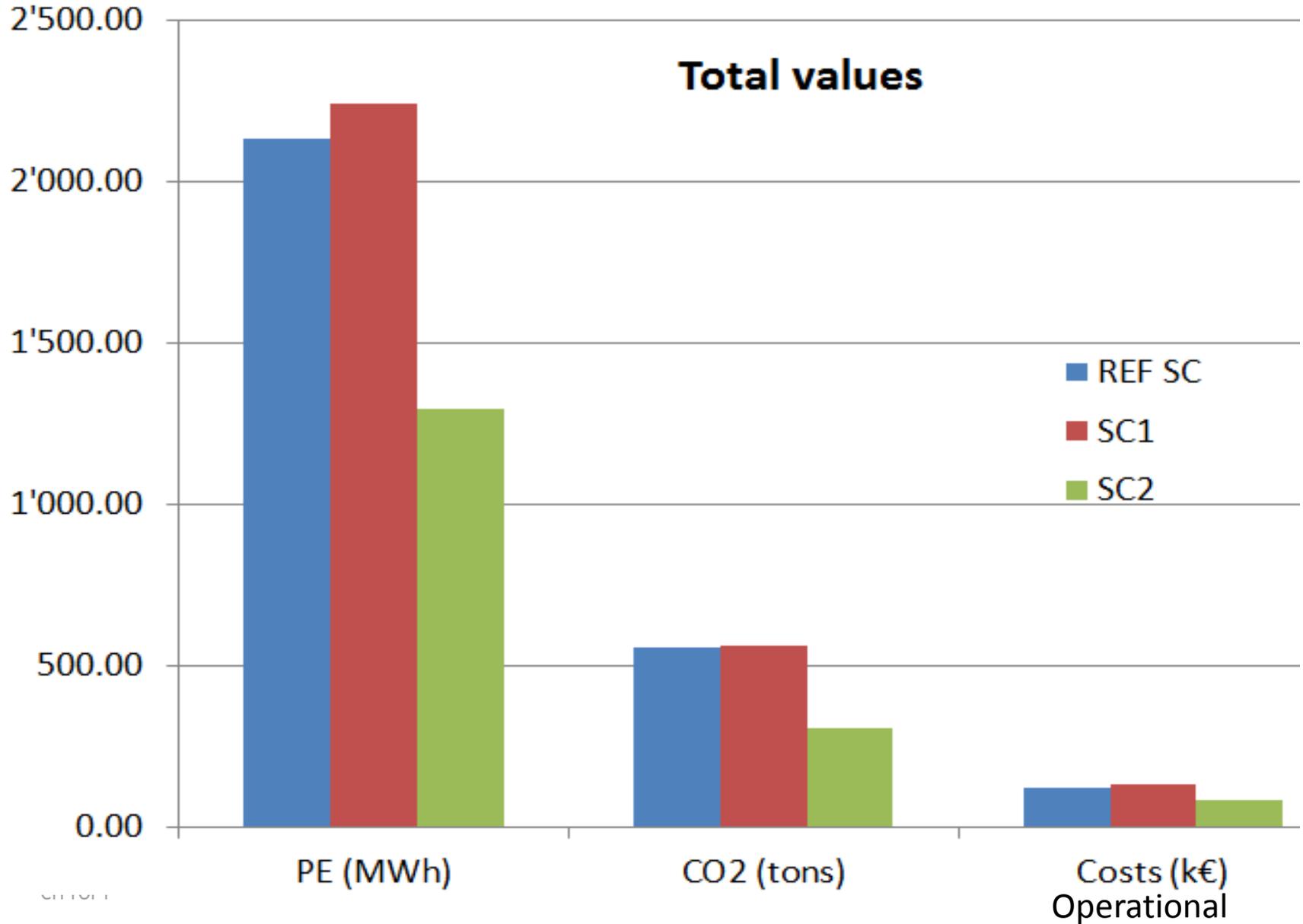


Scenario 2



Worst case scenario with 2014 waste heat data

Preliminary results



Conclusions

- Waste heat use:
 - More simulations are needed to evaluate the micro-dh over the years
 - Combination of several heat sources (fossil and renewable) can be more interesting than a major waste heat source
- Future work:
 - Ground storage integrated in the model
 - Hydraulic & controls optimization
 - Further economic evaluation (e.g. invest. costs)

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