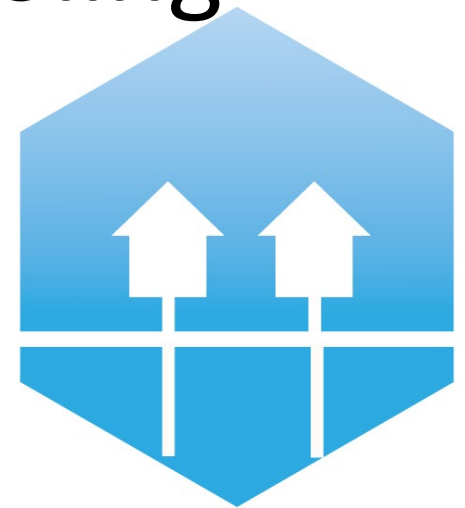
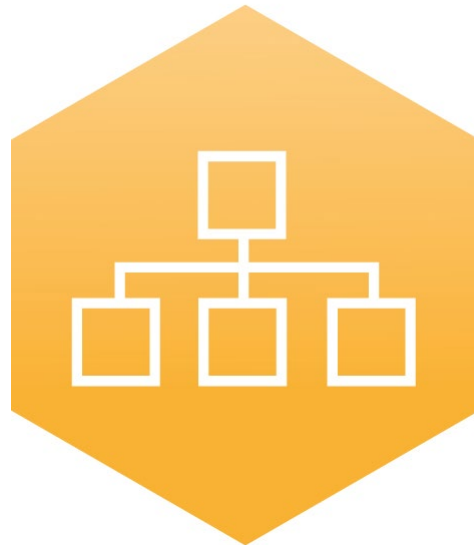


# Recommendations for Combined District Heating and Cooling Networks



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#SES4DH2018

**4DH**  
4<sup>th</sup> Generation District Heating  
Technologies and Systems

# Agenda



- 1. The FLEXYNETS concept**
- 2. Potential advantages**
- 3. Pre-design numerical tool**
  - Results & discussions
- 4. Conclusions**



# The FLEXYNETS concept



- The FLEXYNETS concept consists of a distribution network that works at “neutral” temperatures.
- Reversible HPs exchange heat with the network on the demand side. In this way, the network can provide simultaneously heating and cooling.



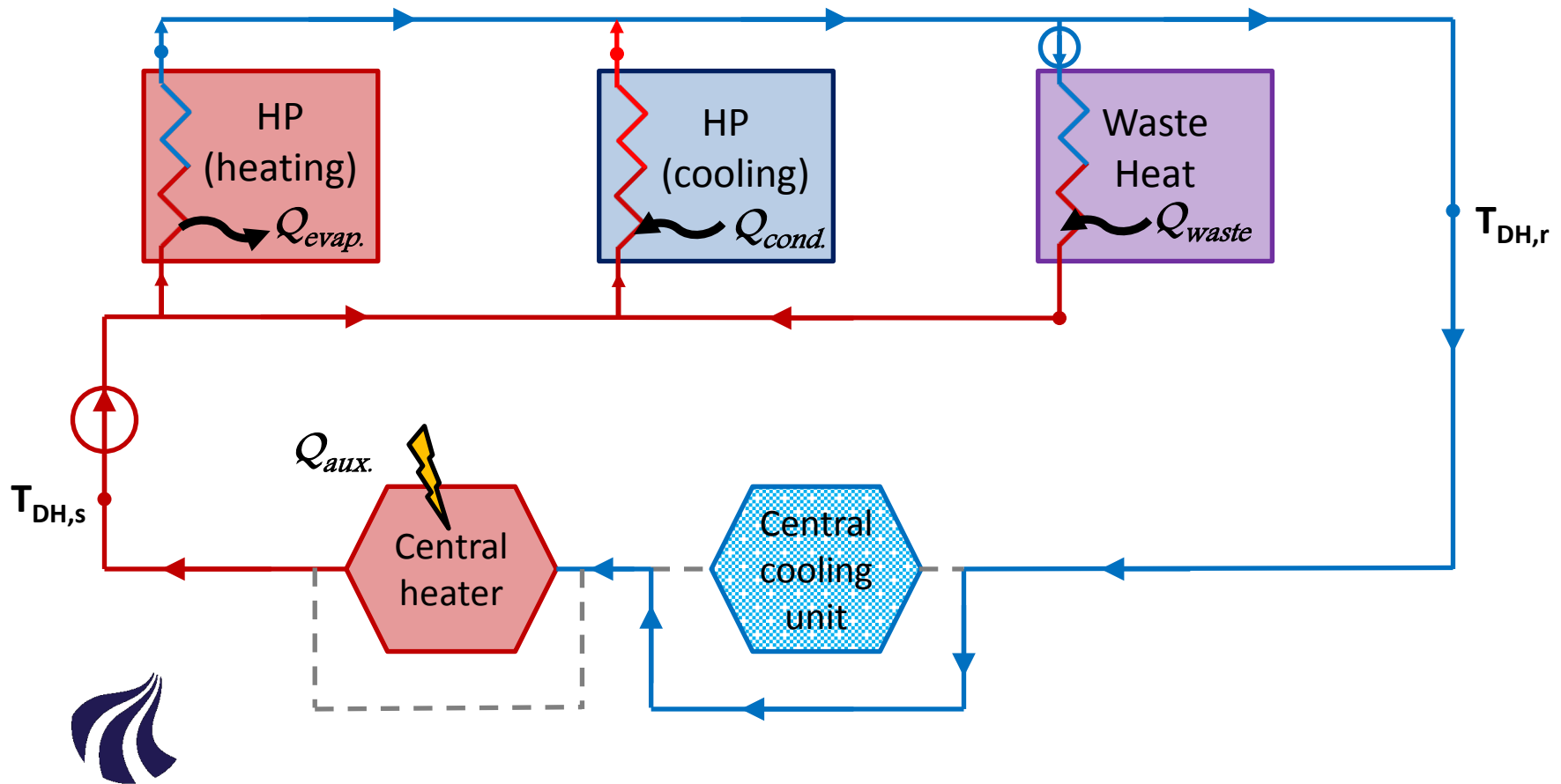
# Potential advantages



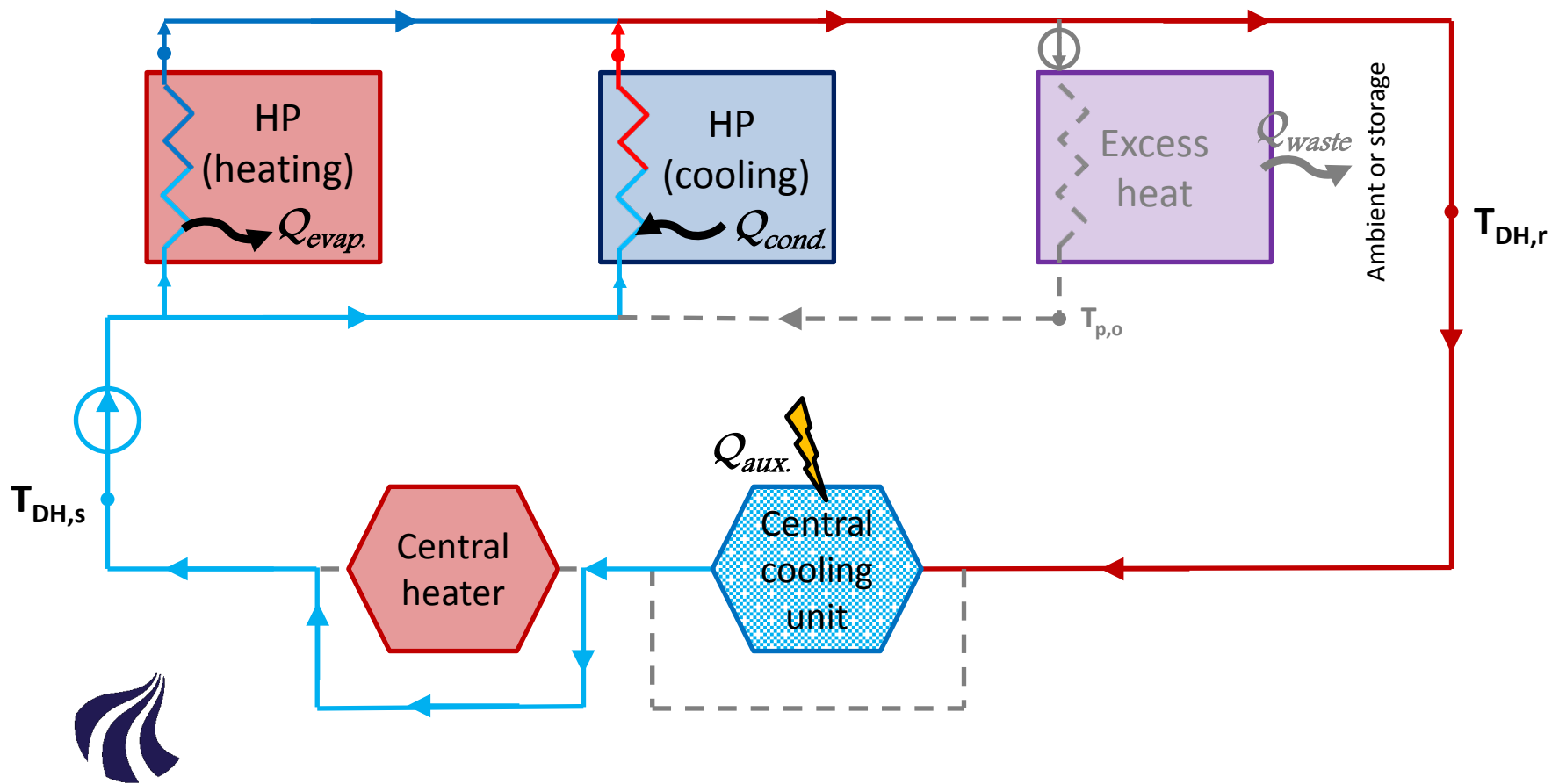
- The FLEXYNETS concept has the following potential advantages:
  - Simultaneous supply of heating and cooling
  - Recovery of condensing heat from cooling demand
  - Lower heat losses from the network
  - Lower installation cost for the network
  - Direct exploitation of low-temperature heat sources



# Principle scheme (winter)



# Principle scheme (summer)



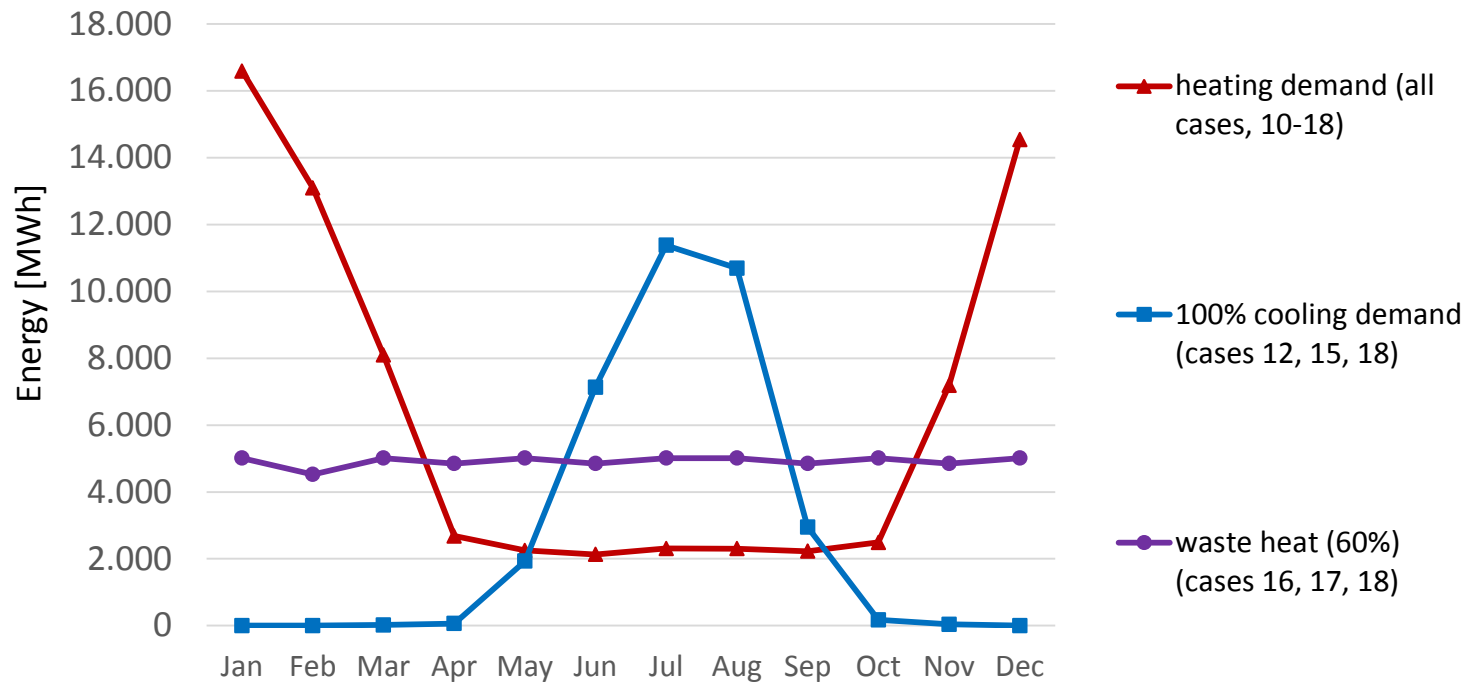
# General parameters



Parameter	Value	Unit
Location	Rome	
Heating demand	76	GWh/y
Cooling demand (nominal)	34	GWh/y
Waste heat available	59	GWh/y
Space heating temperatures	50 – 30	°C
Space cooling temperatures	10 – 15	°C
Central heater	Gas boiler	-
Price of electricity (private)	200	€/MWh
Price of electricity (industrial)	100	€/MWh
Price of natural gas	30	€/MWh
Price of waste heat	10	€/MWh
FLEXYNETS supply temperature	25	°C

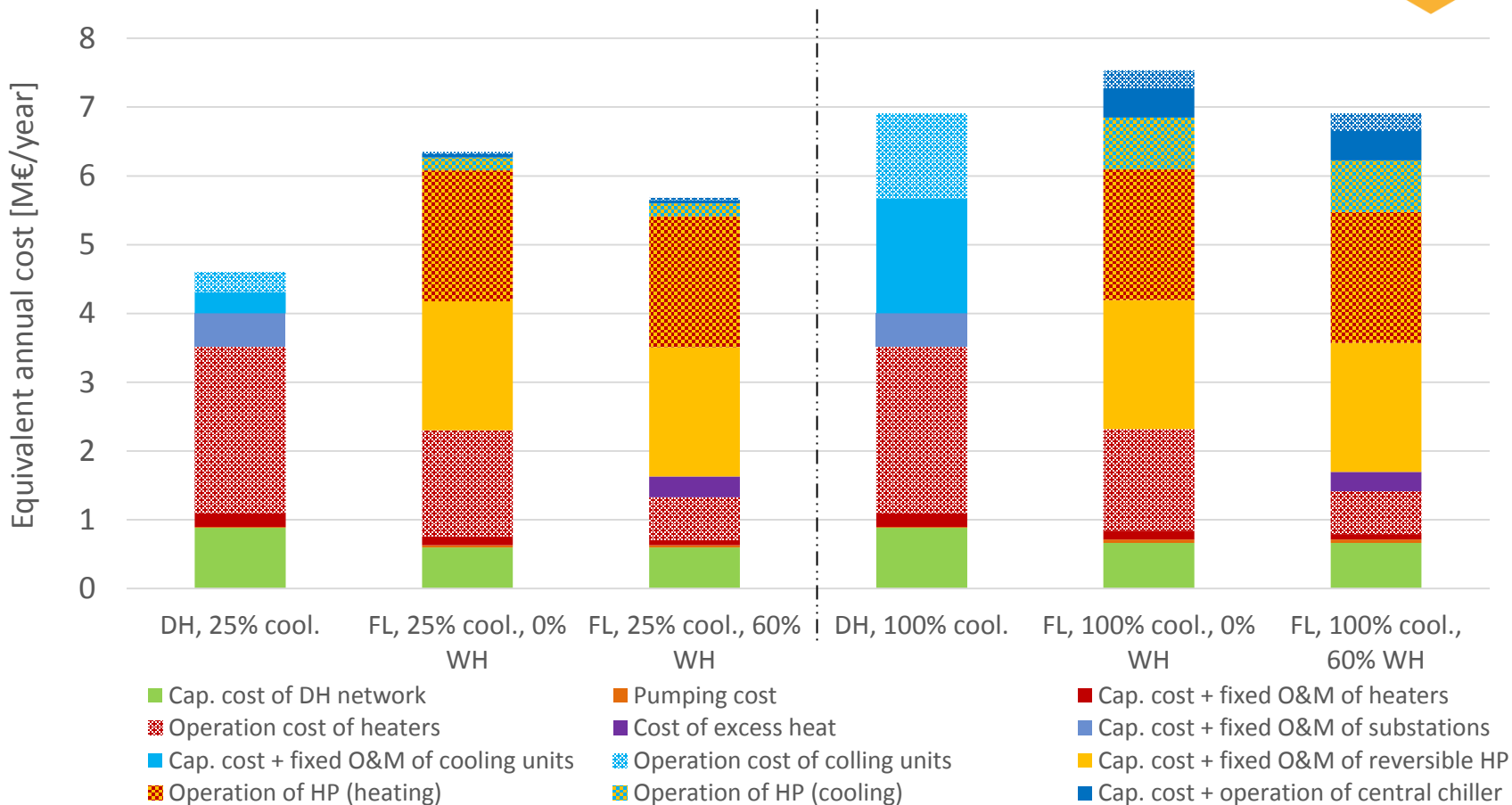


# Profiles

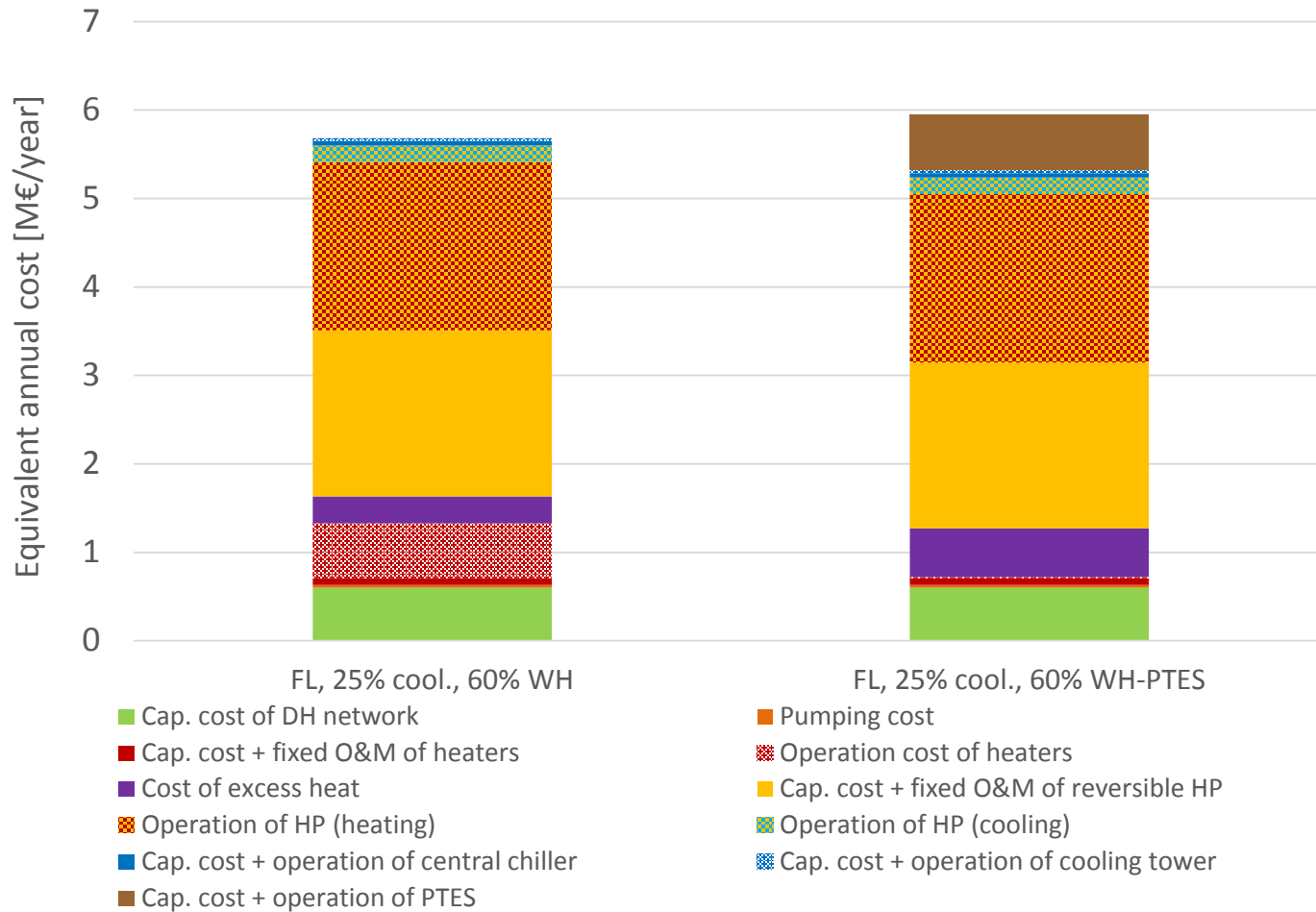




# Results (i)



# Results (ii)



# Conclusions



The FLEXYNETS concept can be competitive against conventional DH in the following scenarios:

- Low electricity prices
- Lower HP installation prices
- Presence of cooling demand
- Abundant waste heat at low temperature

Under the right boundary conditions, FLEXYNETS promises to offer

- Competitive price with respect to conventional DH
- Equivalent installation costs for the network
- Lower CO2 emissions and primary energy



# Thank you for your attention!

More information available at [www.flexynets.eu](http://www.flexynets.eu)



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Scenario	Settlement typology	Location	Heating price [€/MWh]	Cooling price [€/MWh]	Total CO <sub>2</sub> eq [kton/year]	CO <sub>2</sub> eq from electricity [%]
FL – 25% cooling – 0 WH	MFH-45	Rome	75	77	20.9	38.9%
FL – 100% cooling – 0 WH	MFH-45	Rome	66	74	23.6	48.3%
DH – 25% cooling – 0 WH	MFH-45	Rome	53	70	20.6	2.9%
DH – 100% cooling – 0 WH	MFH-45	Rome	53	85	22.4	10.6%
FL – 25% cooling – 60% WH	MFH-45	Rome	66	77	13.2	61.3%
FL – 100% cooling – 60% WH	MFH-45	Rome	58	74	16.5	68.8%
FL – 25% cooling – 60% WH PTES	MFH-45	Rome	70	77	8.2	99.1%



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# Cooling demands – no waste heat

