



The role of TES in future fossil-free energy systems

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Heating and cooling are responsible of half of the energy demand in Europe

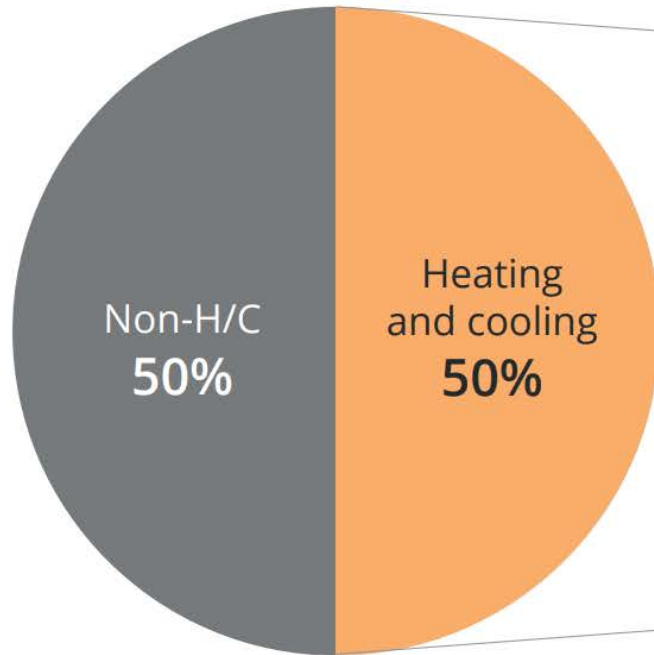


Figure 1:
Total final energy in 2015 (EU28)

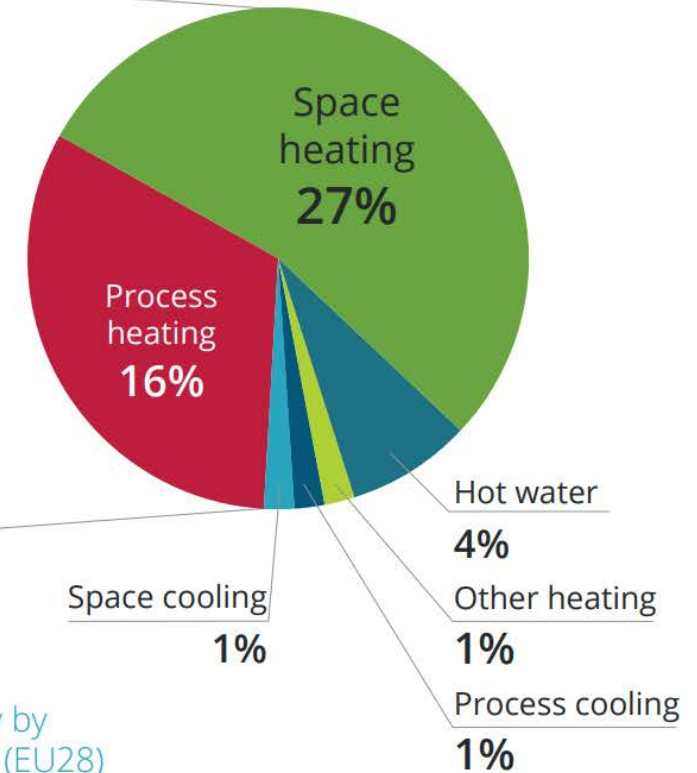
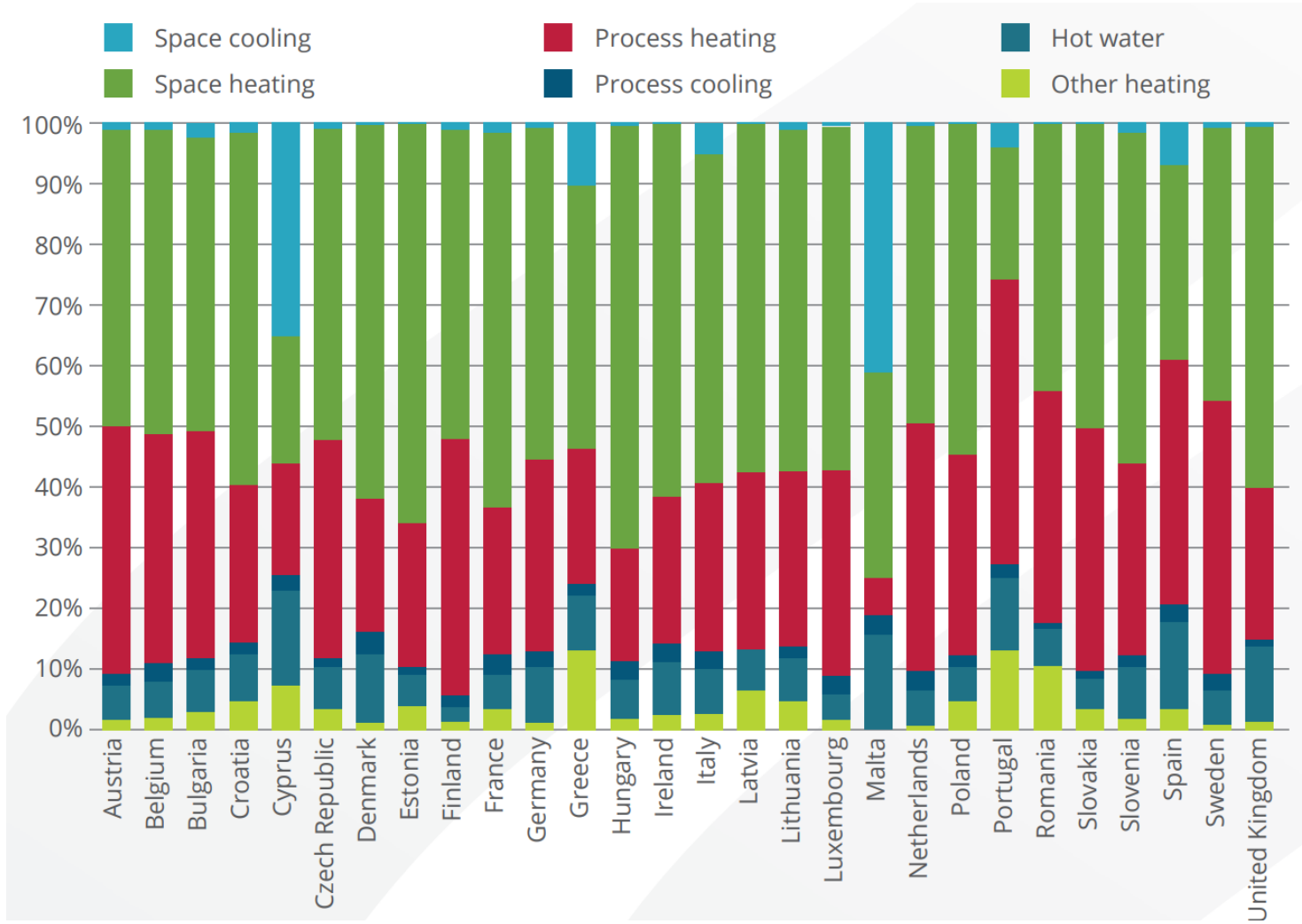


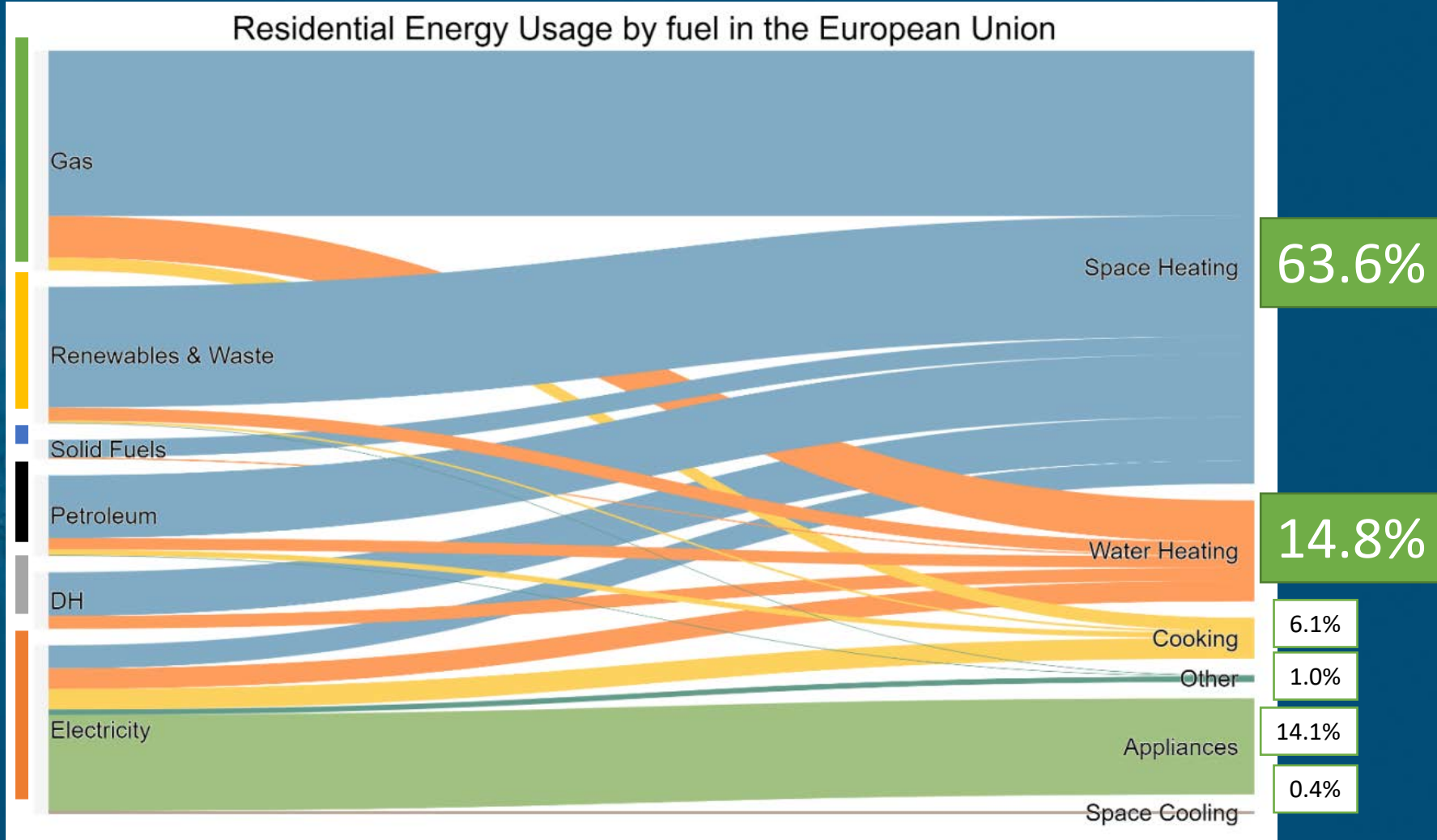
Figure 2:
H&C final energy by end-use in 2015 (EU28)

Space and process heating are the dominating demands

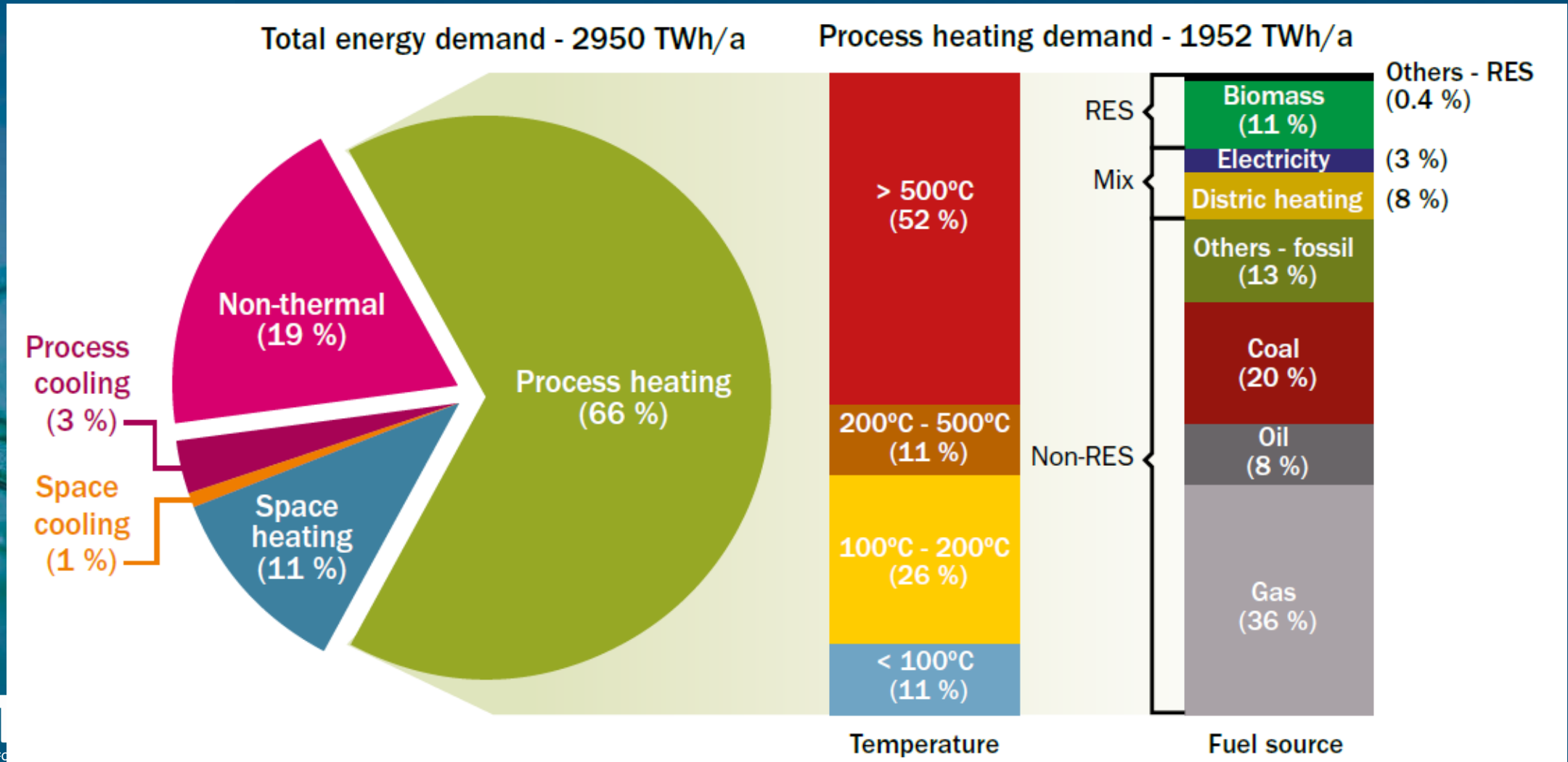


Source: Heat Roadmap Europe (2017)

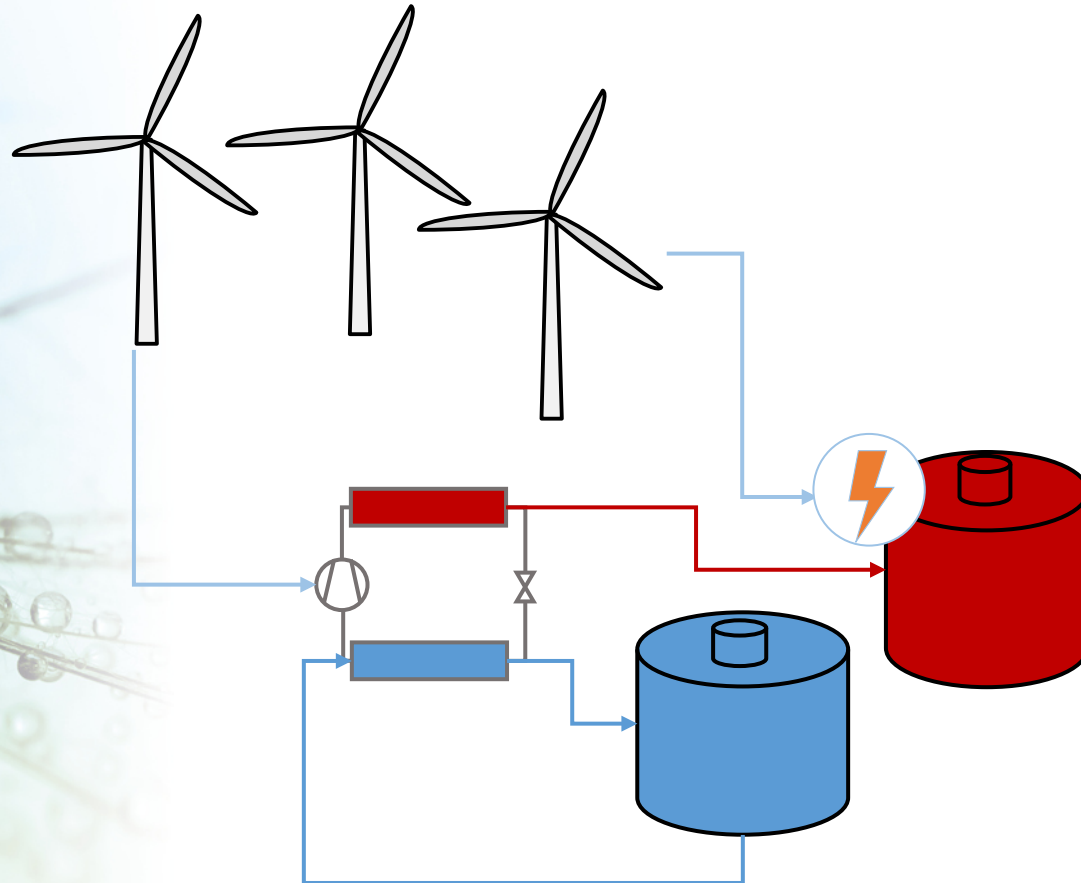
In the EU, a large share of the heating demand is covered with gas boilers



..and the industry is even worse

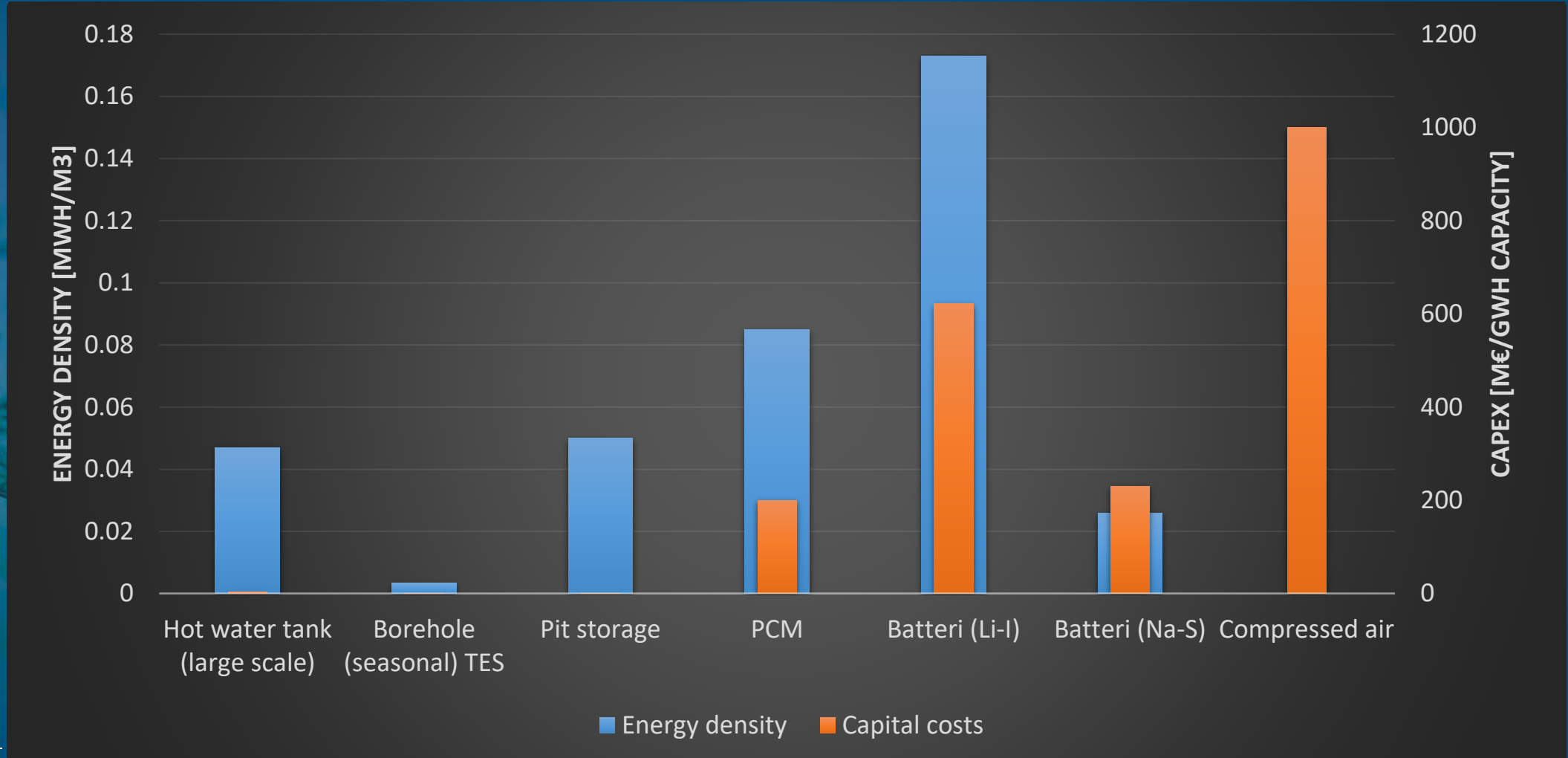


Why thermal energy storage?



- Electrification is the fastest way to decarbonization of the heating sector
- Prerequisite is a reduction in primary energy demand and a flexible operation of the loads.
- With heat pumps the primary energy demand can be reduced to one third.
- Through the combination with TES, heat or cold can be produced during low power price periods, to be utilized upon demand.

Thermal vs. electrical energy storage



What's lacking?

- Awareness of the potential of TES as a source of flexibility in a renewables-based grid
 - Demonstration projects of the use of flexible TES units in the industry and buildings are needed
 - Dissemination directed to policy makers and industry to increase the awareness
- Energy price structures that reward flexible customers with ability for load shifting
 - Currently energy costs mainly dependent on the amount of energy - not peak power
- Regulatory framework that support using of TES and waste heat/cold resources
- Energy-as-a-service: business models for electrified heat production systems incorporating TES
 - TES + heat pump systems can be capital intensive – and the investing company is often not the one that gets the largest benefit
 - Largest benefits in terms of flexibility are gained when energy companies own and operate the facility – according to the availability of low-cost renewable power



Thank you for your attention.