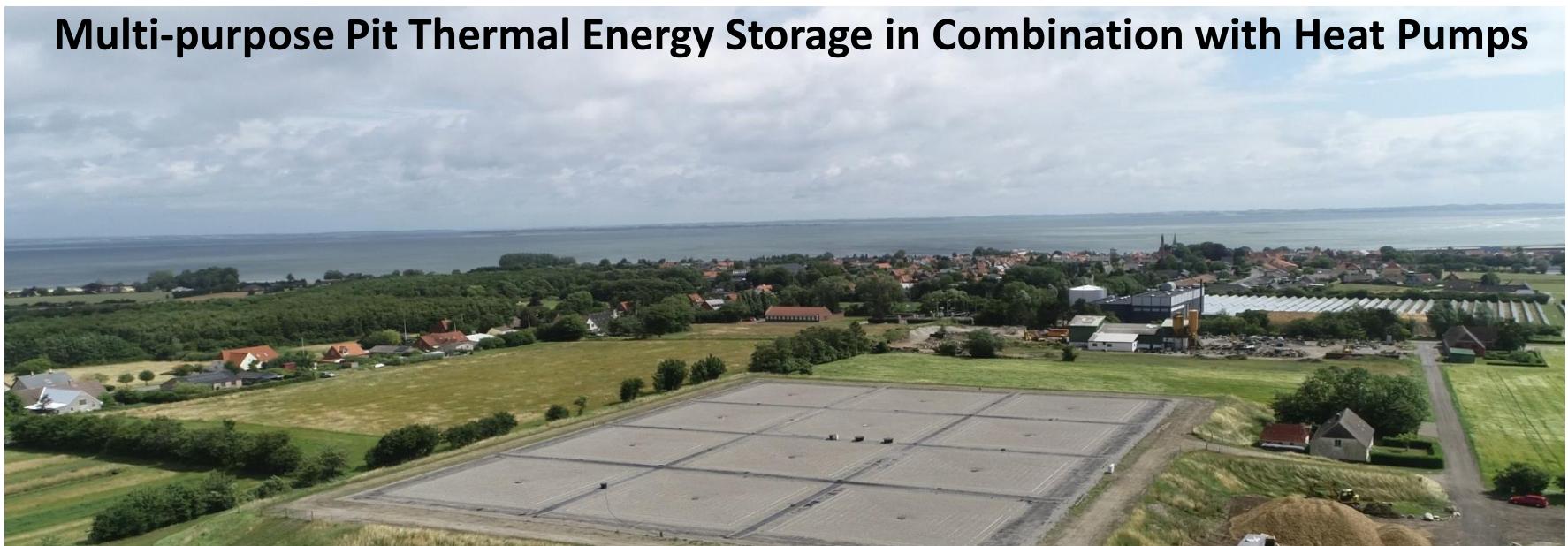


Multi-purpose Pit Thermal Energy Storage in Combination with Heat Pumps



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AALBORG CSP
- Changing Energy



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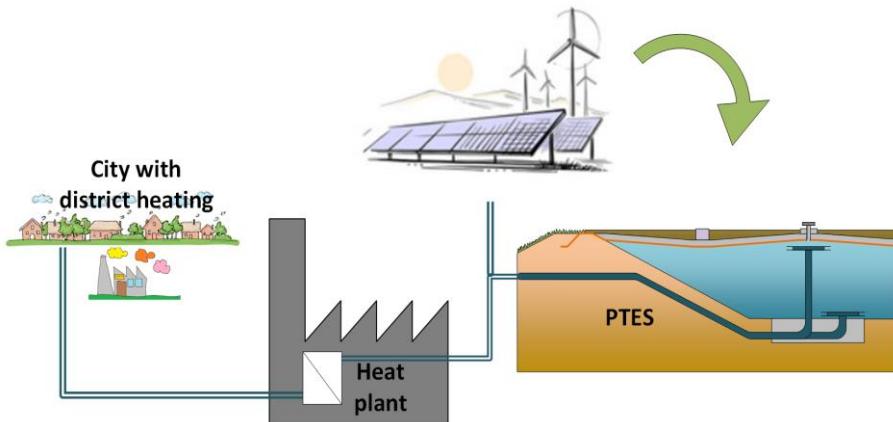
Vestas



PTES, Pit Thermal Energy Storage

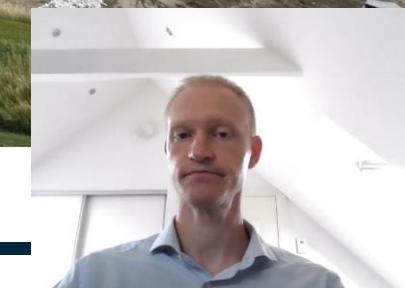
Low cost storing energy in a green future

- A flexible energy system that will enable the conversion from conventional fossil fuel energy to fluctuating renewable energy sources requires large scale energy storage.
- The PTES technology is a low-cost energy storage for thermal energy up 90°C. Energy is simply stored in pure water.
- PTES enables storing of excess energy for later use in district heating networks resulting in increased flexibility and efficiency of the heat production. This includes:
 - excess heat from solar heating plants, power plants or industrial processes
 - excess electricity produced by wind or PV stored as heat
- Collecting waste heat/power and using it for district heating later helps lower energy loss and reduces our carbon footprint.

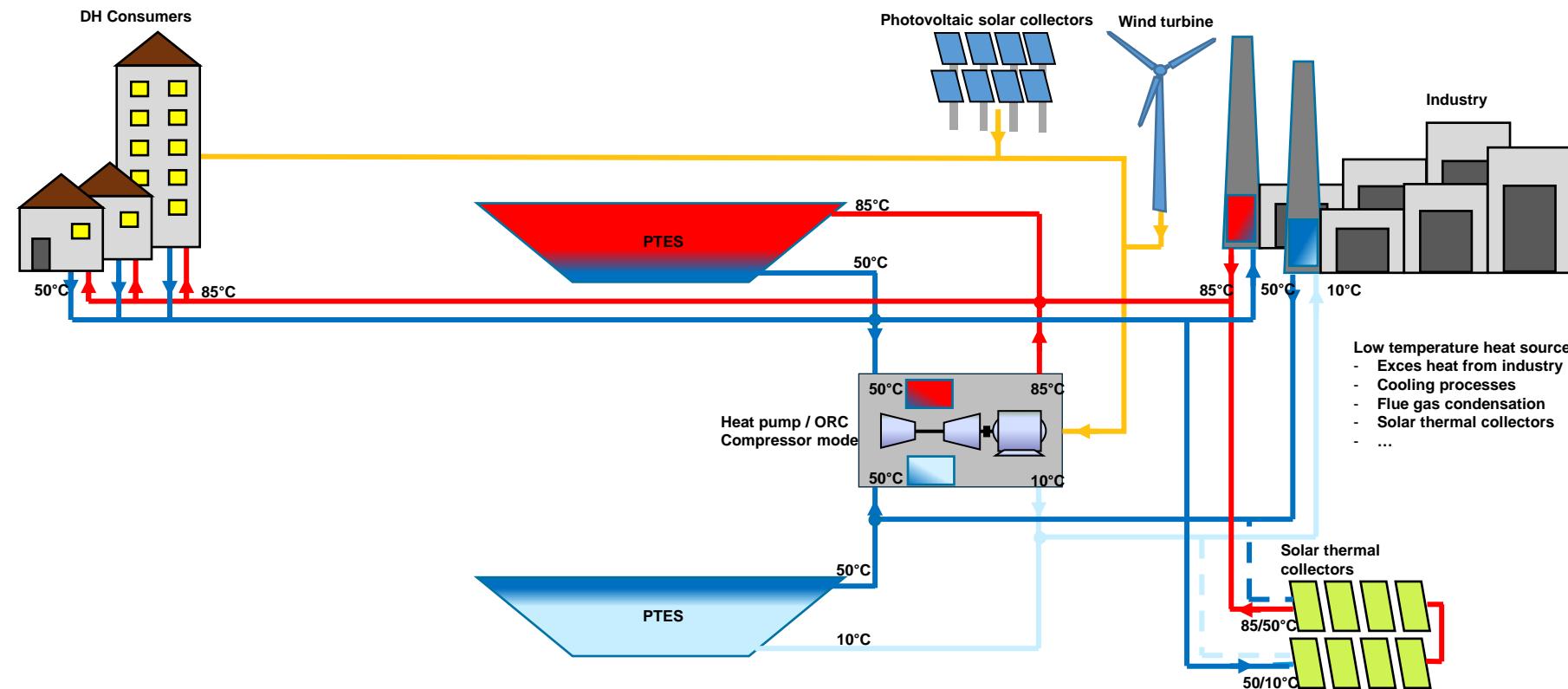


PTES, Pit Thermal Energy Storage

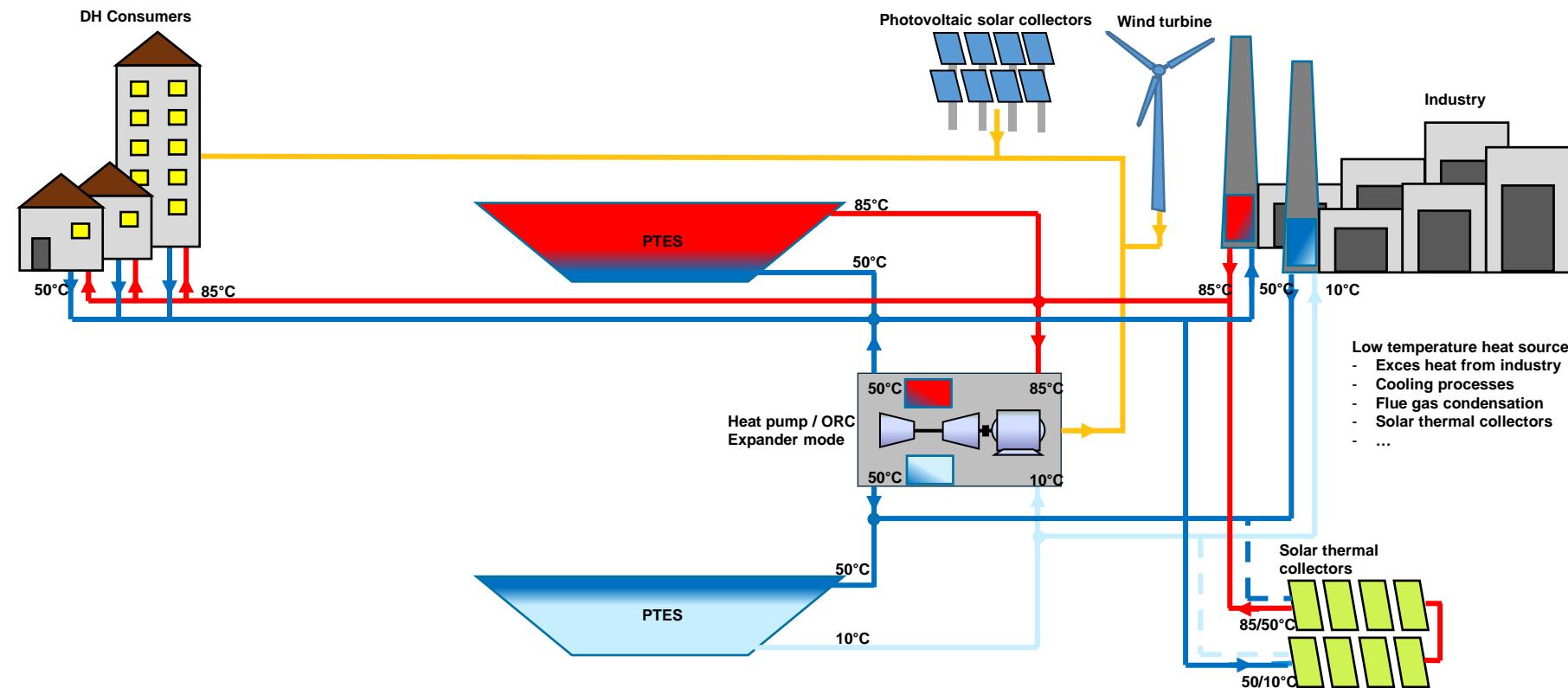
The next generation of storing energy in a green future



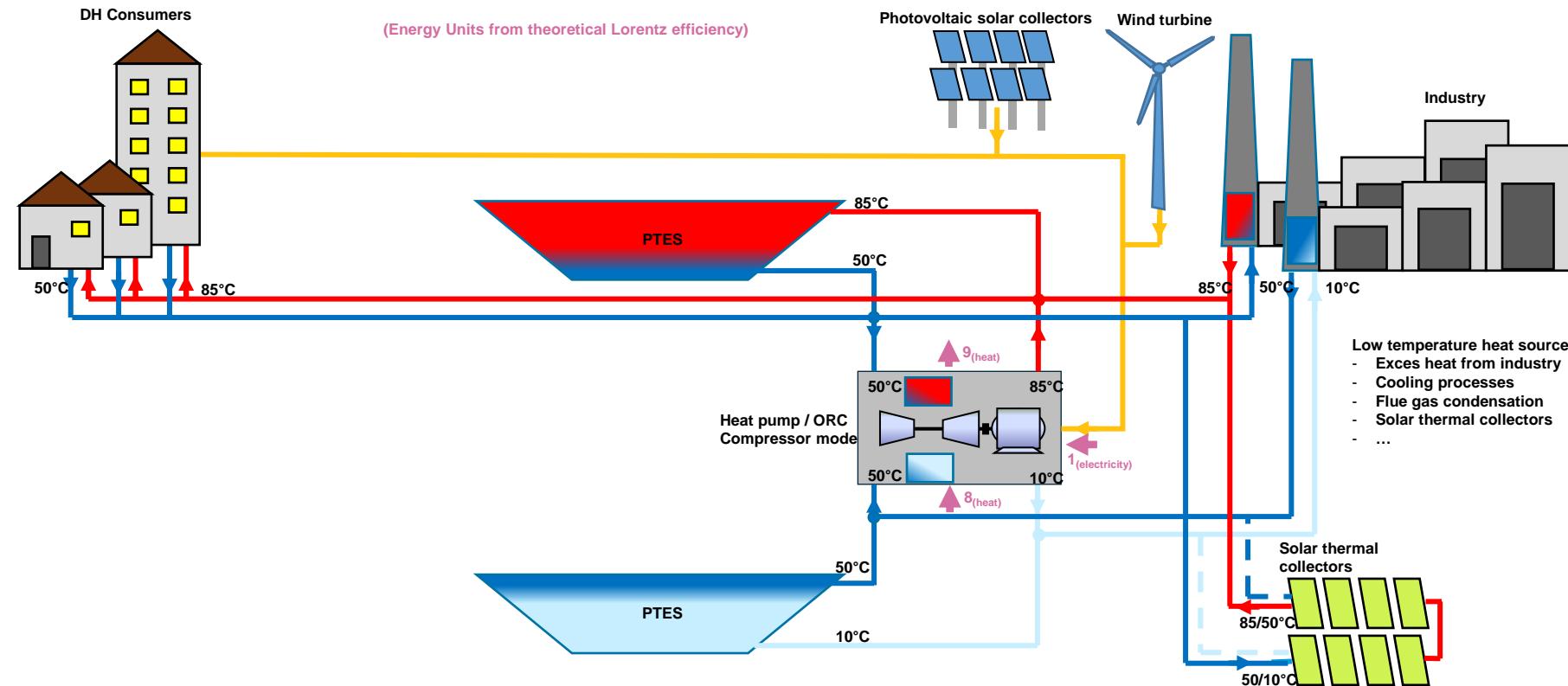
Combining PTES and heat pump



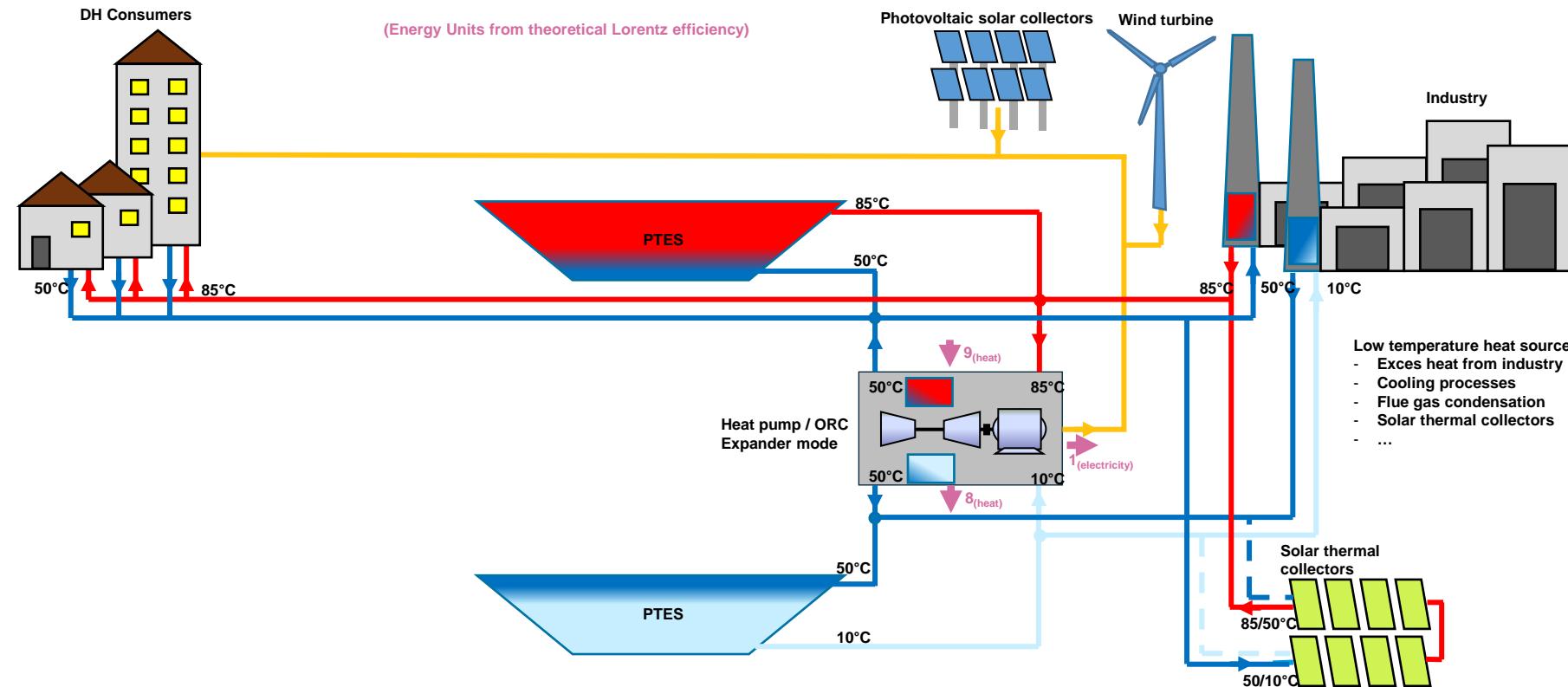
Reverse the process – PTES as electricity storage



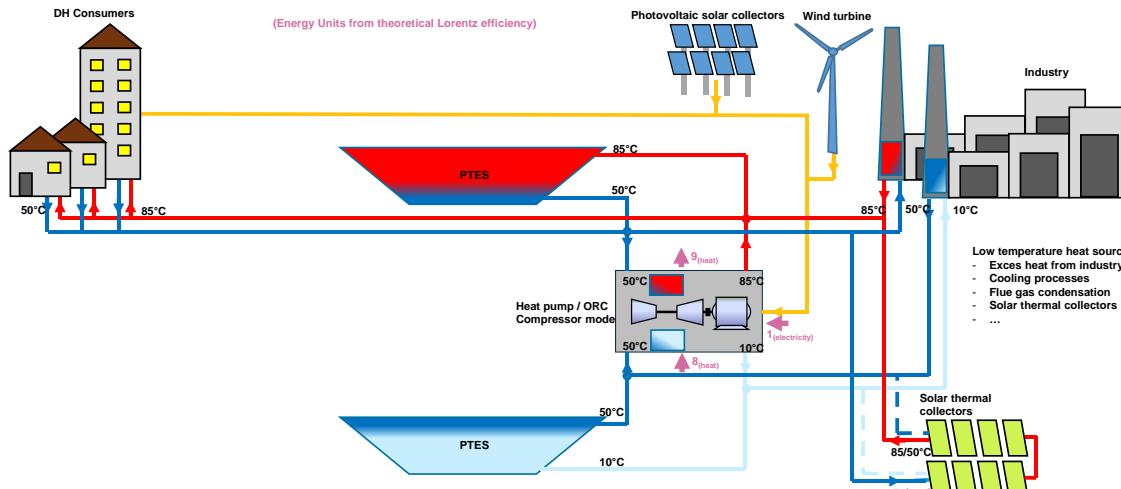
Efficiency - Charging



Efficiency - Discharging



Round trip efficiency – power to power



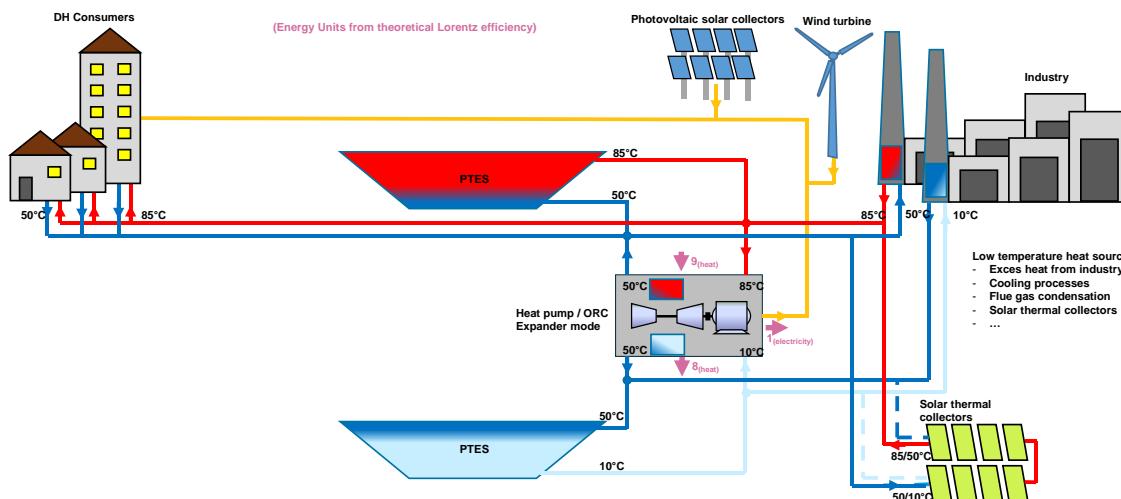
Charging

Ideal:

$$\eta = 9/1 = 9$$

Realistic?:

$$\eta = 9 * 0.7 = 6.3$$



Round trip power to power

Ideal:

$$\eta = 9 * 1/9 = 1$$

Realistic?:

$$\eta = 6.3 * 0.08 = 0.50$$



THANK YOU FOR YOUR ATTENTION

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