Future of Thermal Energy Storage

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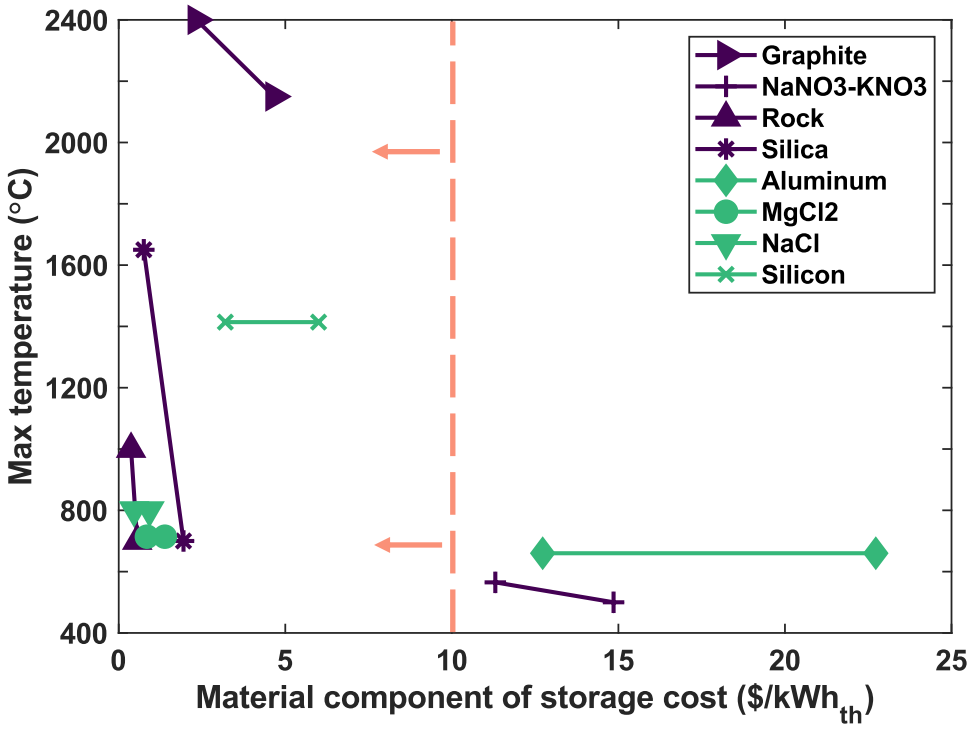
What is Thermal Energy Storage?

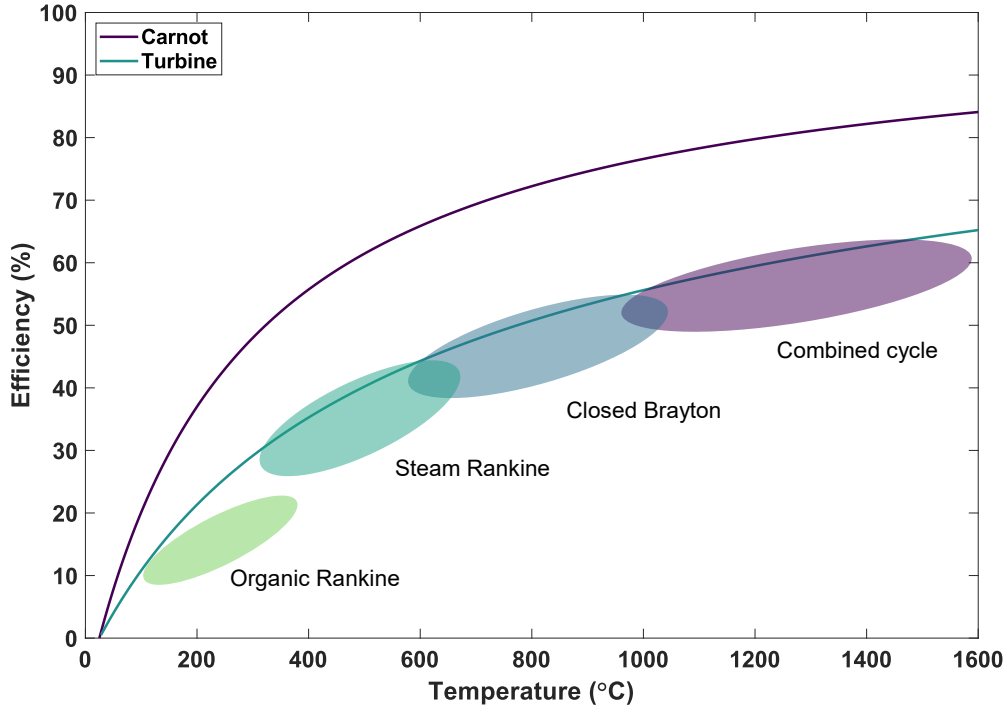
Electricity → Heat → Electricity

Characteristics of Thermal Energy Storage (TES)

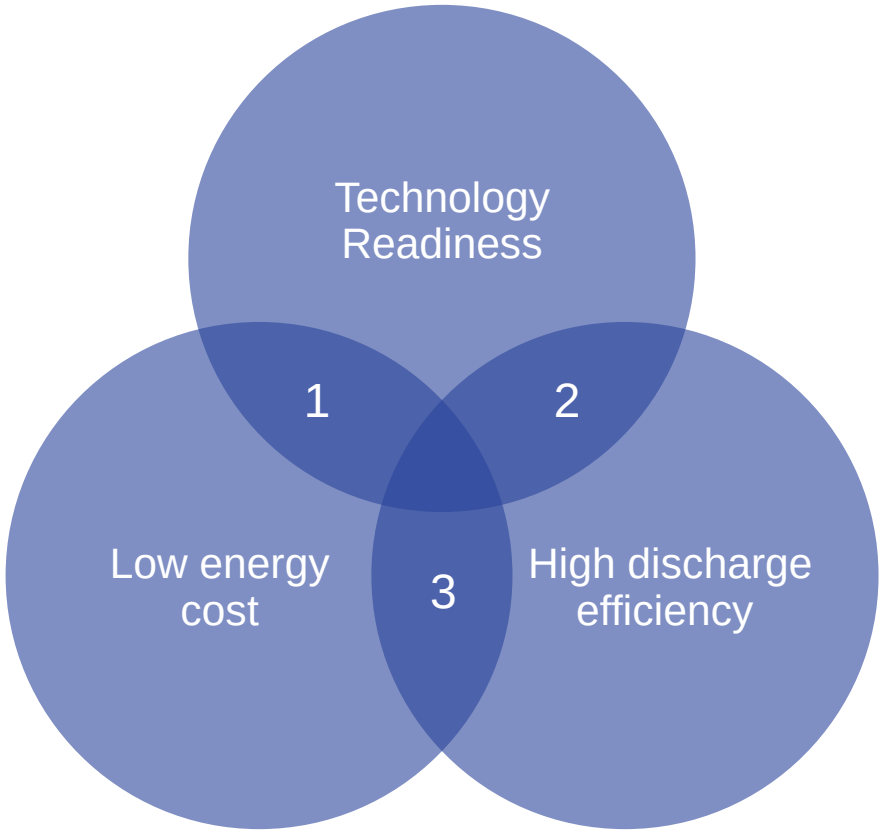
Low-cost storage materials



Heat-to-electricity efficiency



3 Design strategies for TES

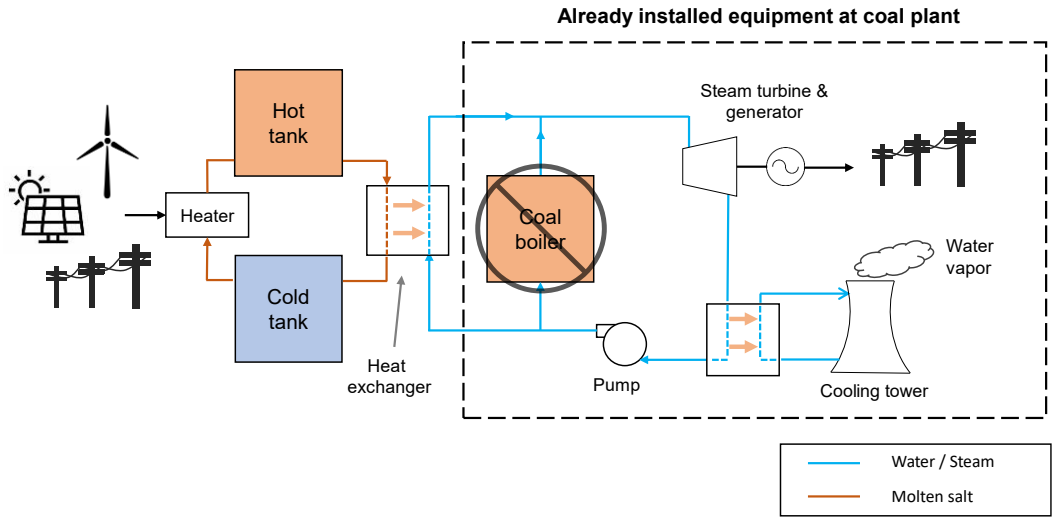


1. Retrofit steam turbines with TES (< 700°C)

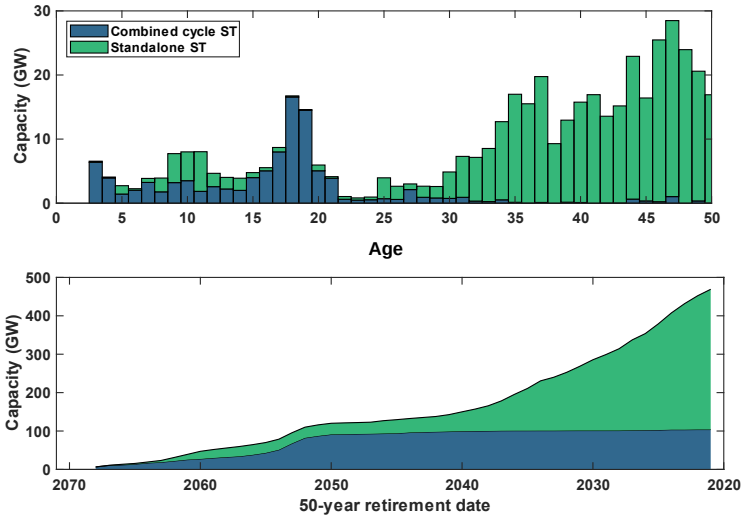
2. Higher efficiency power cycles (600 – 1000°C)

3. High temperature (>1200°C)

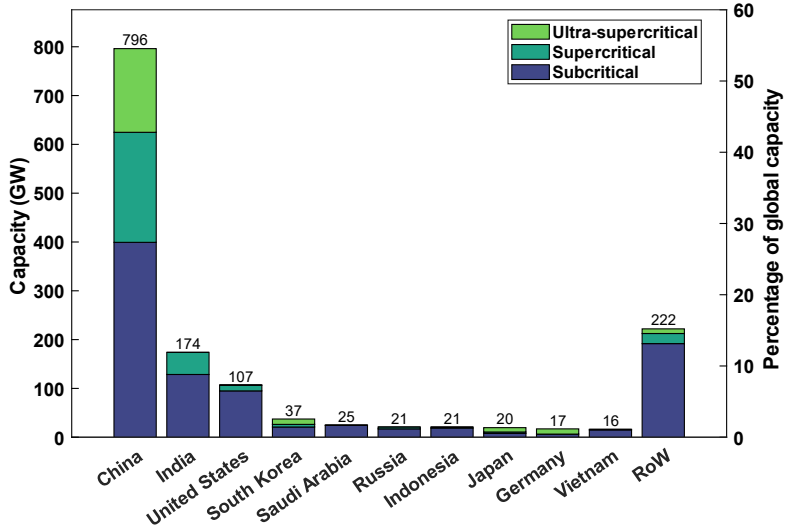
1. Retrofit of steam turbine plants for near-term TES



United States

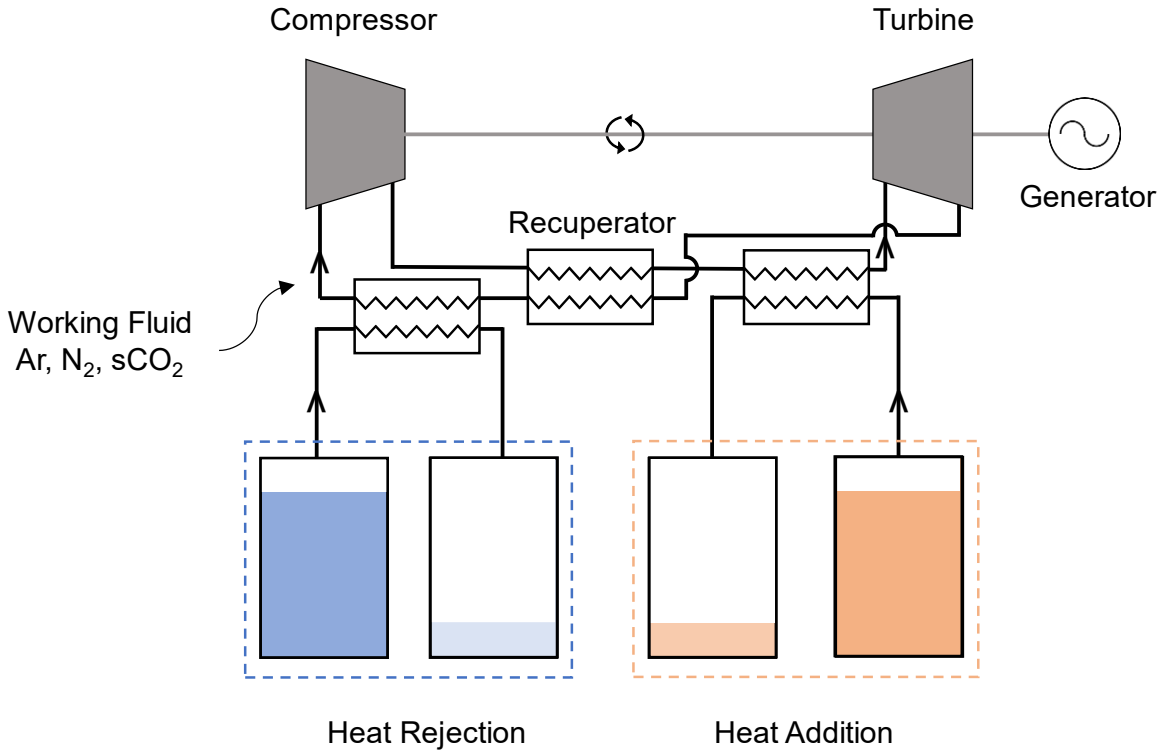


World



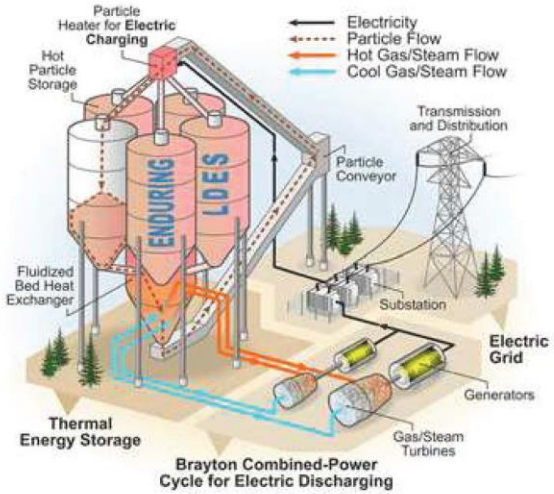
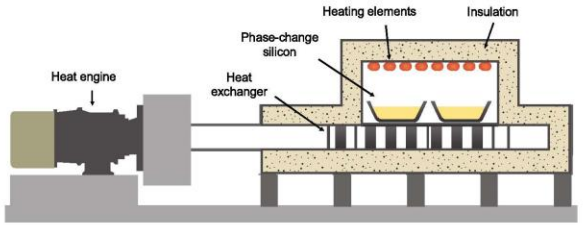
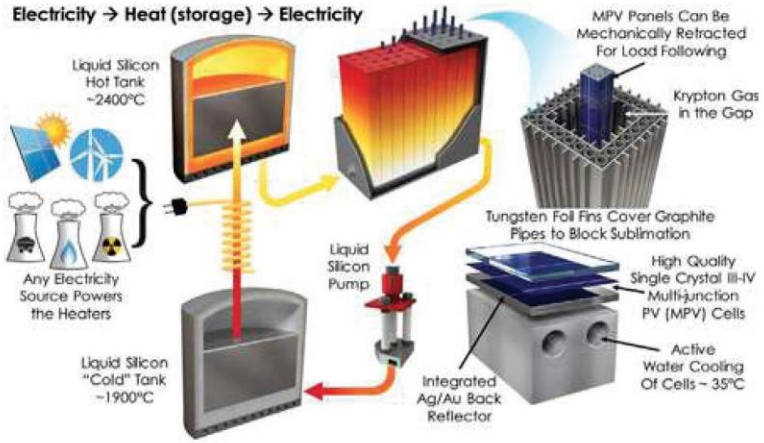
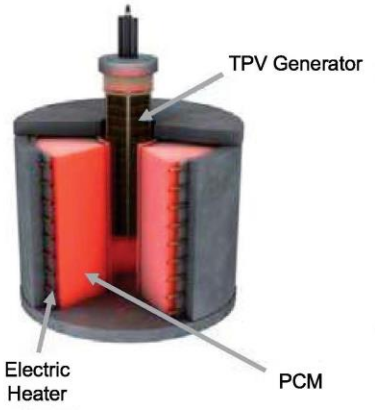
2. TES with higher efficiency power cycles at 600 – 1000°C

- Recuperated closed Brayton cycles
- Sensible or latent heat storage
- Option to charge with reverse Brayton cycle



3. High temperature (> 1200°C) for high efficiency TES

High temperature enables use of combined cycle or solid-state energy converters

	Sensible heat	Latent heat
Turbomachinery		
Alternative technologies		

Clockwise from top left: NREL, 1414 Degrees, AMADEUS, Sun-in-a-box

Key takeaways for TES

1. TES has potential for long duration energy storage

2. Low-cost materials < 5 $/kWh$_{th}$ compensate for lower efficiency
   – Use of widely available materials

3. Design strategies that enable low-cost TES today and in future for LDES
   – Also, opportunities to integrate TES with thermal processes