Webinar

What comes after molten salt?

An exploration of next generation TES

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Strengths and weaknesses of molten salts

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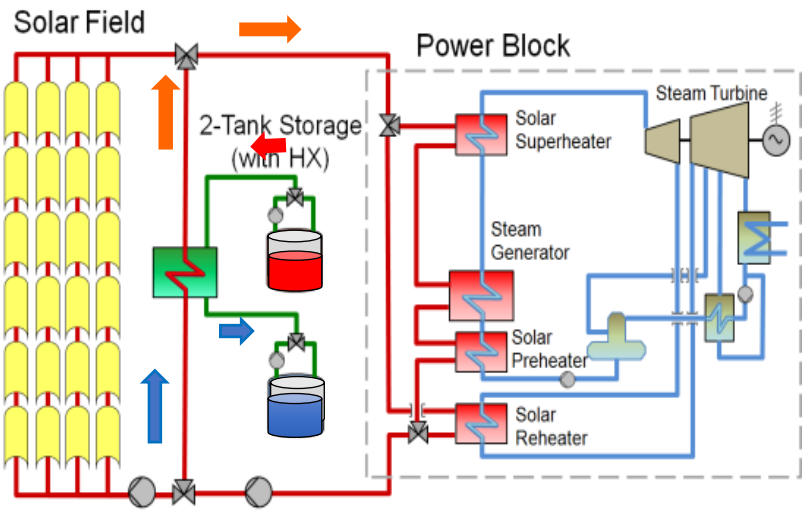
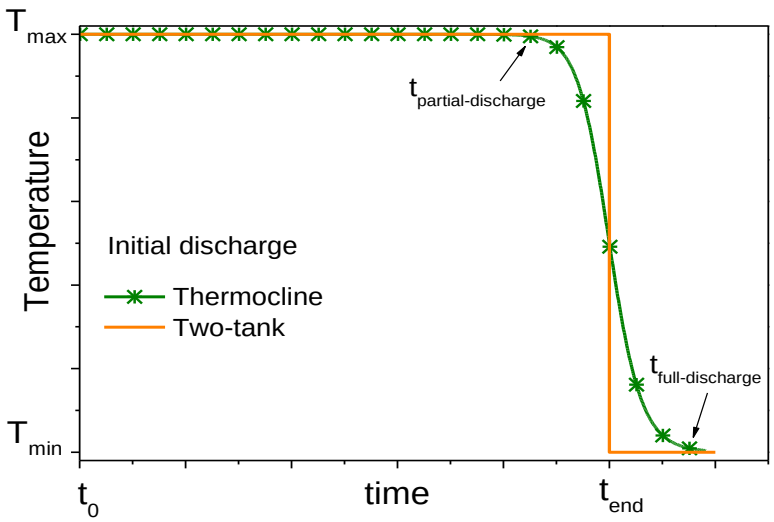
Molten salts in a STE power plant

- Large stored energy density (~2800 kJ/m^3 ºC => 2,8·10^5 kJ/m^3 for ΔT=100ºC)
- No need of pressurized tanks
- Previous solar experience: Solar Two (USA, 105 MWh),
  CESA-1 (Spain, 12MWh, steam as HTF), Themis (France, 40MWh), MSEE/Cat B (USA, 7MWh)
- Stored energy is EFFICIENTLY transferred to the HTF & PB

Discharge



$Q_{discharge}$~ constant



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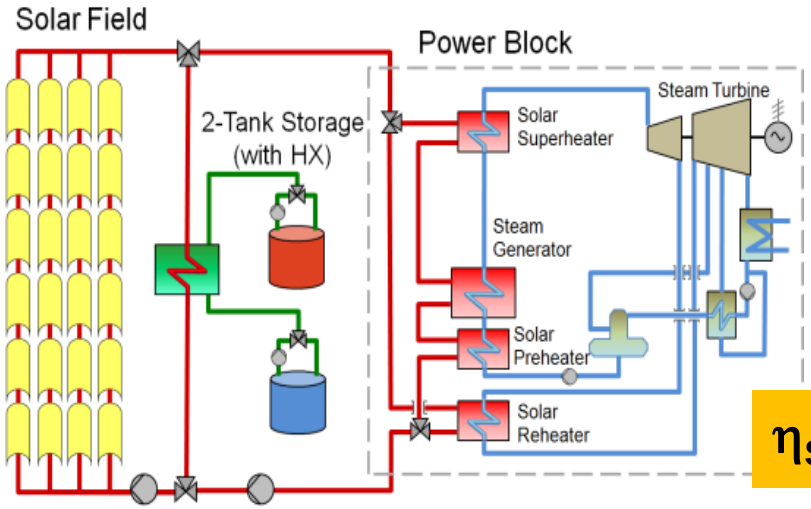
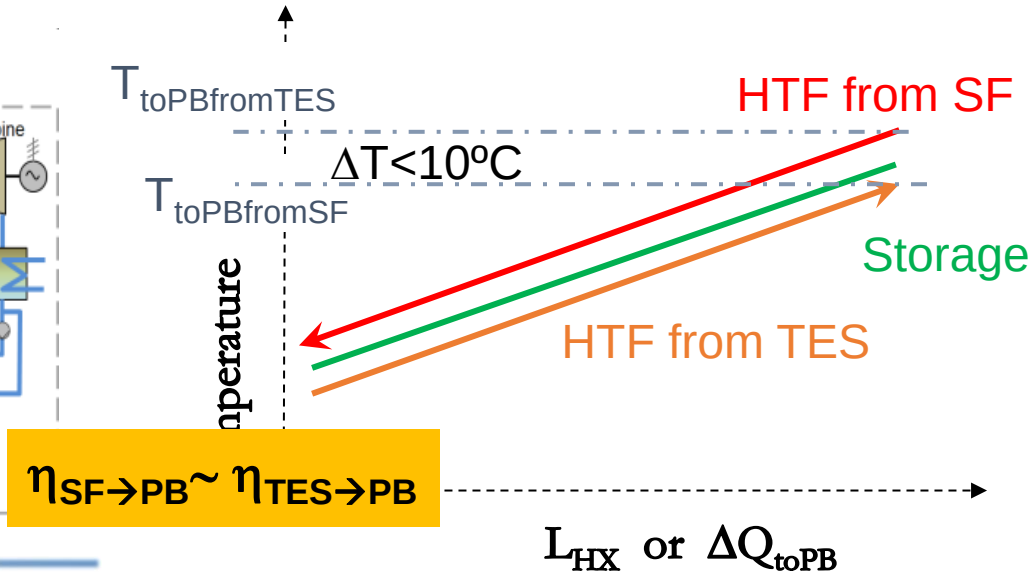
- Large stored energy density (~2800 kJ/m^3 ºC => 2,8·10^5 kJ/m^3 for ΔT=100ºC)
- No need of pressurized tanks
- Previous solar experience
- Stored energy is EFFICIENTLY transferred to the HTF & PB
- Output temperature similar to primary heat source's: nearly no penalization on the power block efficiency

Charge / Discharge



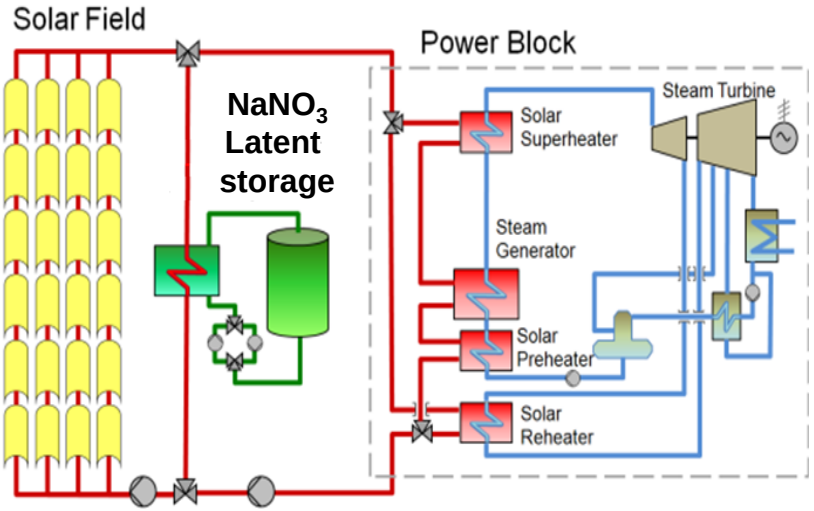


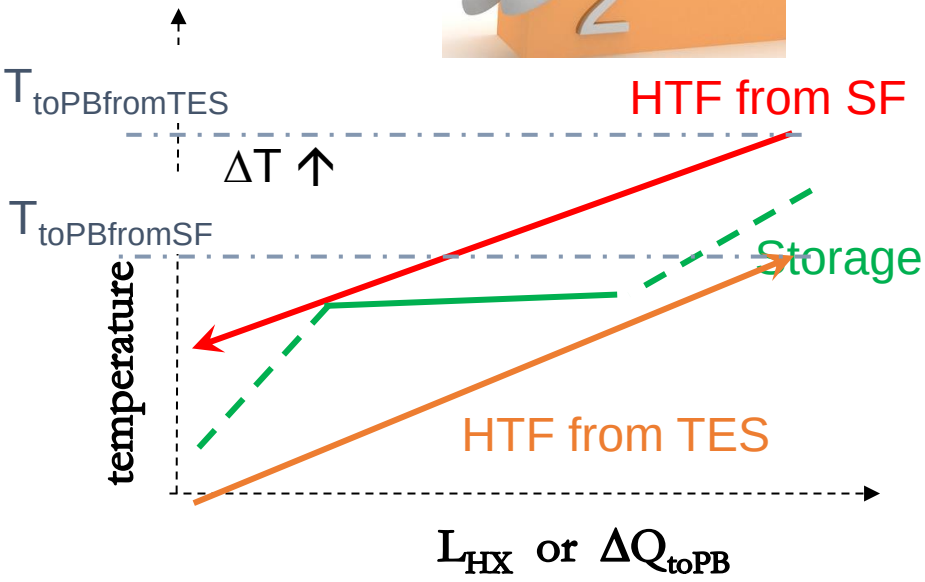
Is a single PCM storage appropriate for oil PT solar power plant?

- Larger stored energy density (~3,3·10^5 kJ/m^3 with $NaNO_3$/306ºC)
- No need of pressurized tanks
- Stored energy is efficiently transferred to the HTF & PB
- Output temperature VERY DIFFERENT to primary heat source's: **penalization** on the power block efficiency

$\eta_{SF \rightarrow PB} >> \eta_{TES \rightarrow PB}$

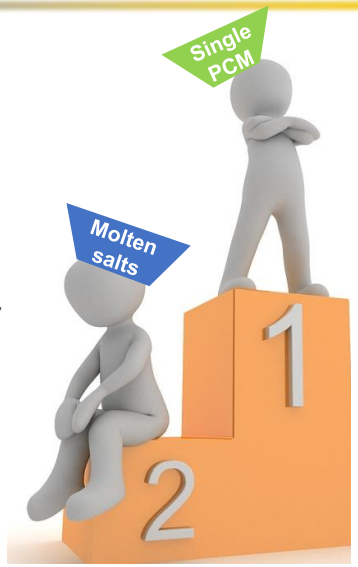
Charge / Discharge

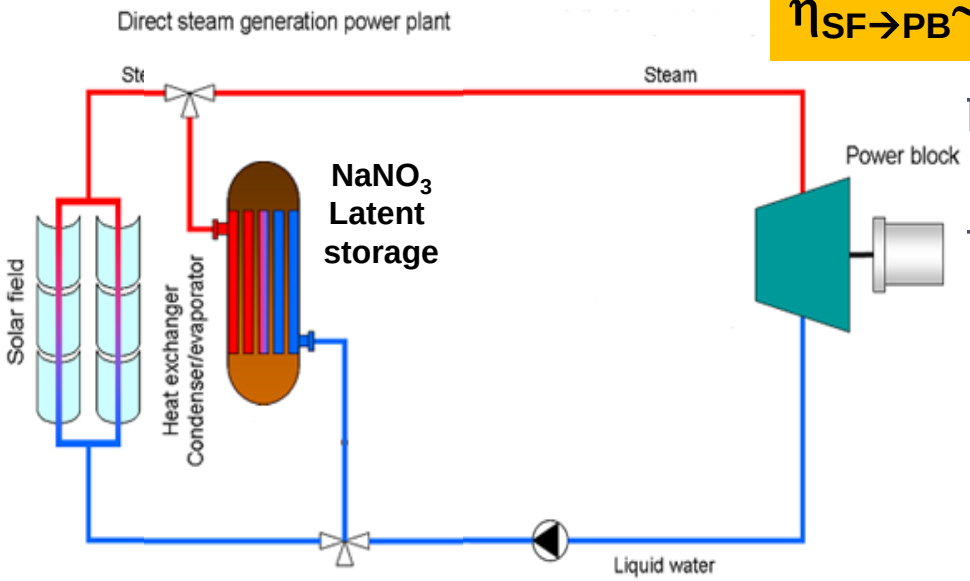




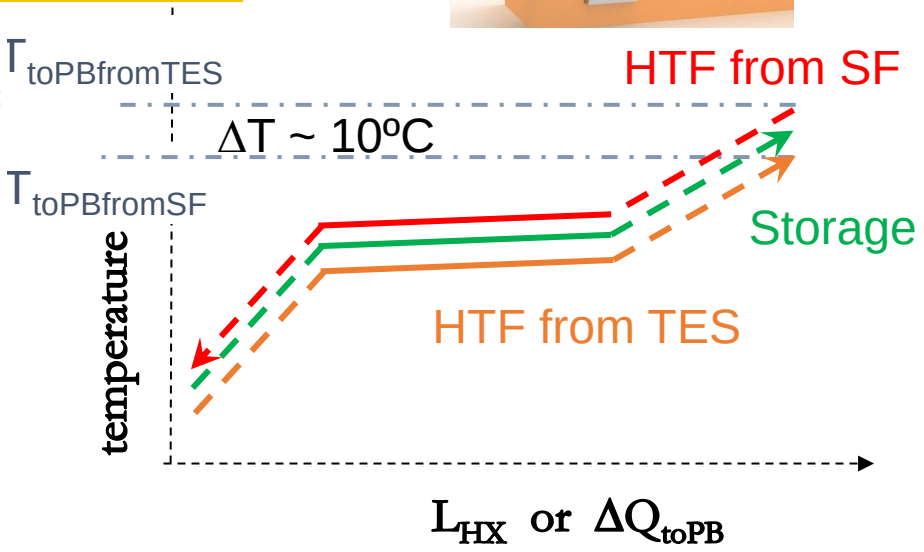
Latent storage is appropriate for DSG solar power plant

- Larger energy density (~3,3·10^5 kJ/m^3 with $NaNO_3$/306ºC)
- No need of pressurized tanks
- Stored energy is efficiently transferred to the HTF & PB ← additional heat transfer enchancing components
- Output temperature similar to primary heat source's : nearly no penalization on the power block efficiency





$\eta_{SF \rightarrow PB} \sim \eta_{TES \rightarrow PB}$



Weaknesses of molten salts

- Molten salts are not the best option for all innovative STE technologies (DSG, as an example)
- Available temperature range:
  - Upper limit: ~590ºC
  - Lower limit: 260ºC
- Corrosiveness:
  - Optimization of molten salt – structural material's quality
- Reliability of molten salt loop components

MOSA at PSA

BES I & II at PSA

An alternative to molten salt should take into account…

- Its storing material properties
- What additional components for having an efficient heat transfer of the stored energy may be required
- A good integration with the primary heat source and final user
- A lower cost with the same capabilities

☆ **Follow a holistic approach when proposing TES**


Thank you very much for your attention
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