



EnergyNest

The Thermal
Battery company™

Decarbonizing industrial heat with Thermal Batteries

Workshop on Thermal Energy Storage for industry, buildings and
marine applications, SINTEF, Trondheim, Norway, 12.11.2021

Christopher J. Greiner, CTO

EnergyNest

- Founded in Norway in 2011
- 3 offices; Billingstad - Norway (HQ), Germany and Spain
- 17 employees and rapidly growing
- Pilot completed in 2017
- First commercial order in 2019
- Signed €110m (1.1bn NOK) investment deal with Infracapital in April 2021
- **3 demonstration projects** in execution (as of Nov. 2021)
- Government grants from EU, Innovation Norway and NFR

<https://www.youtube.com/watch?v=pBjt-UrTrkE>
<https://www.youtube.com/watch?v=3s4UI-cNX9g>



EnergyNest technology



ThermalBattery™ Module

Dimensions (LxWxH): 2.4 x 2.4 x 6.0 meters

Capacity: Up to 1.5 MWh_{th}

Materials: HEATCRETE® & steel

Temperature & pressure: up to 420°C / 100+ bar

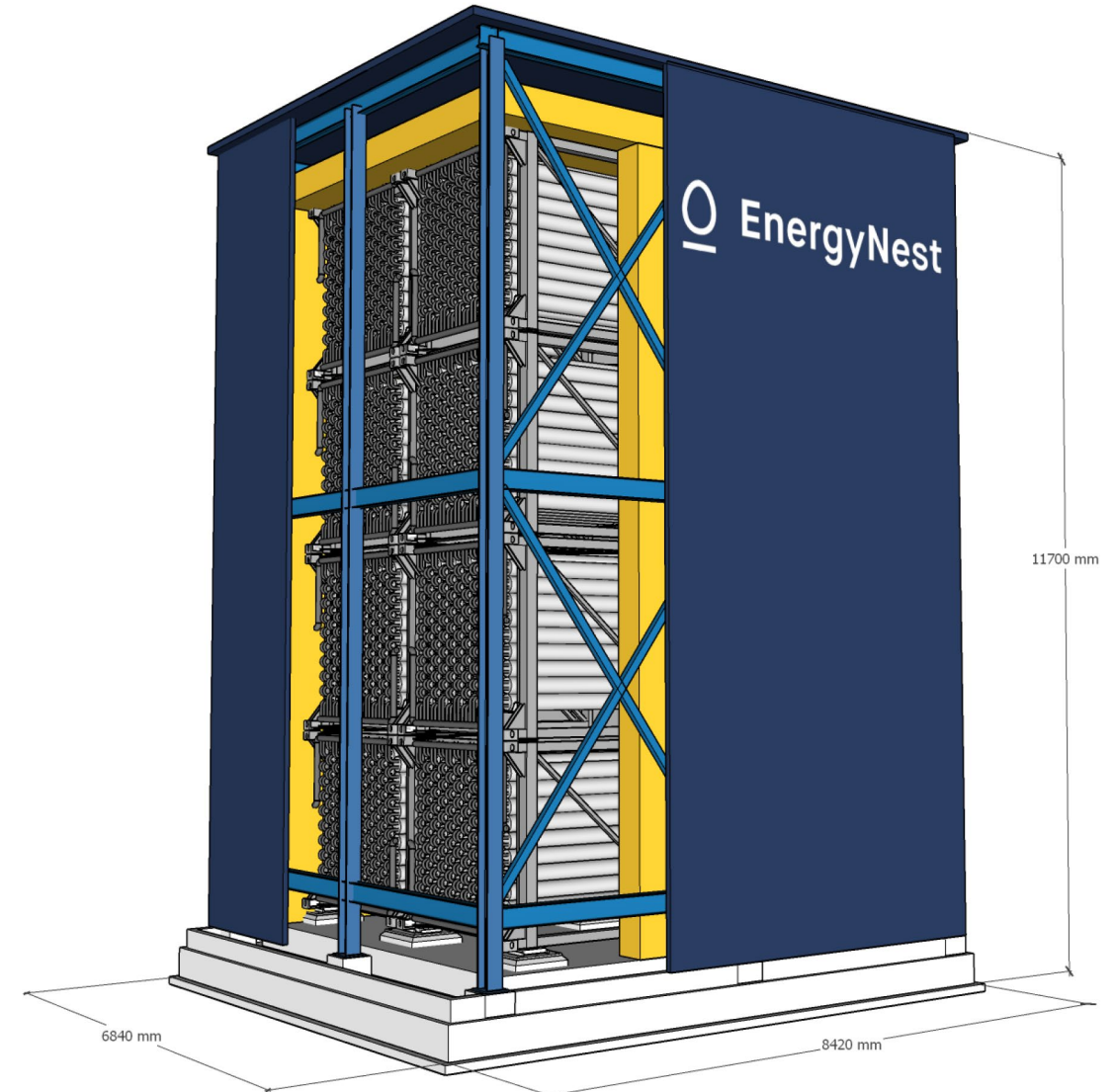
Heat transfer fluids: Thermal oils, water/steam

Lifetime: up to 30-50+ years^{a)}

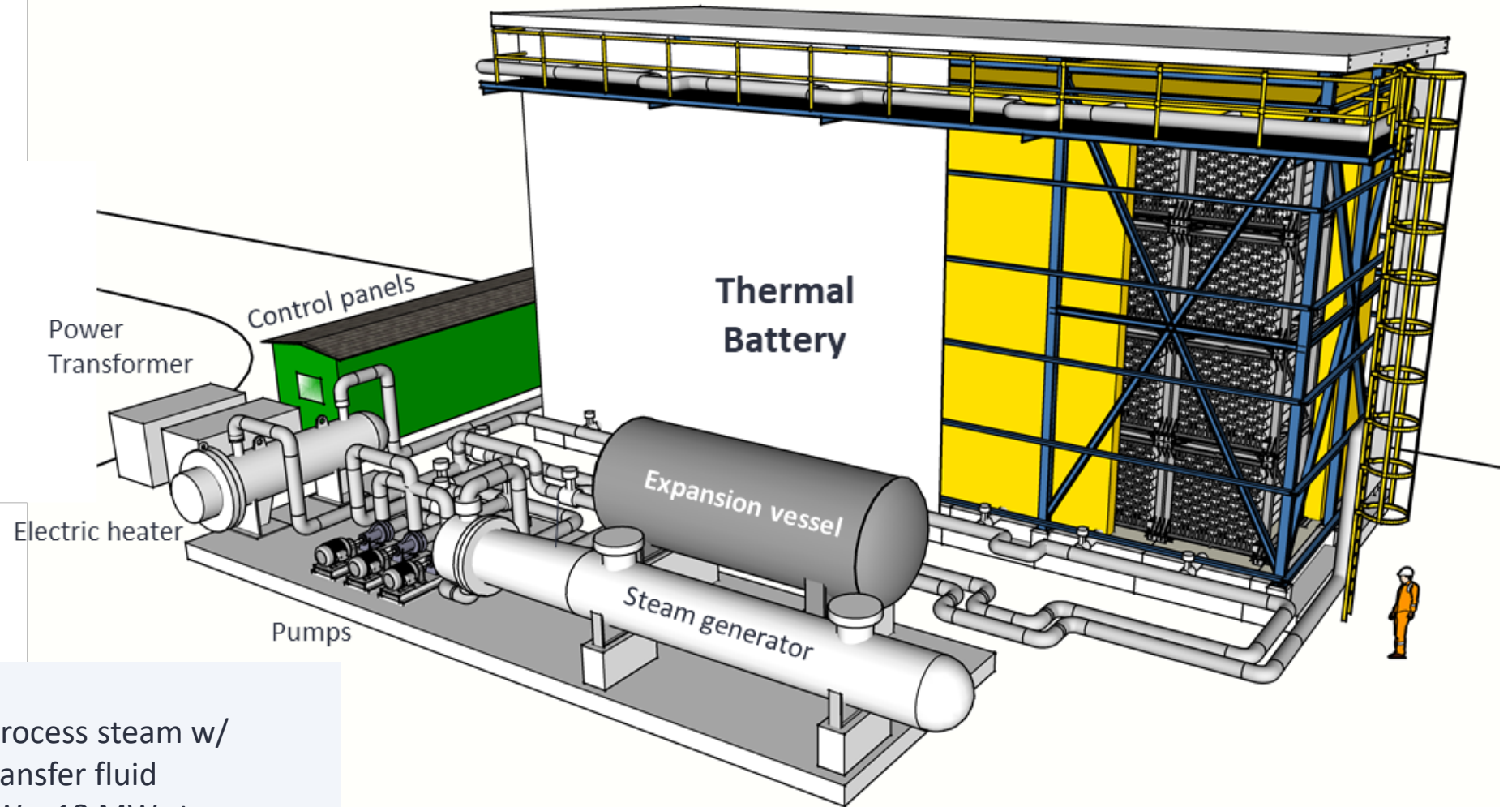
Carbon payback: ~2 months^{b)}

^{a)} Depends on heat transfer fluid

^{b)} One cycle per day, replacing natural gas



System solution (example)



Example:

Electrification of process steam w/
thermal oil heat transfer fluid
45+ MWh_{th}, 14 MW_{el}, 18 MW steam gen.

Four applicable industrial use-cases

1.

Waste heat recovery to process heat/steam
and/or electricity

2.

Balancing steam demand and supply

3.

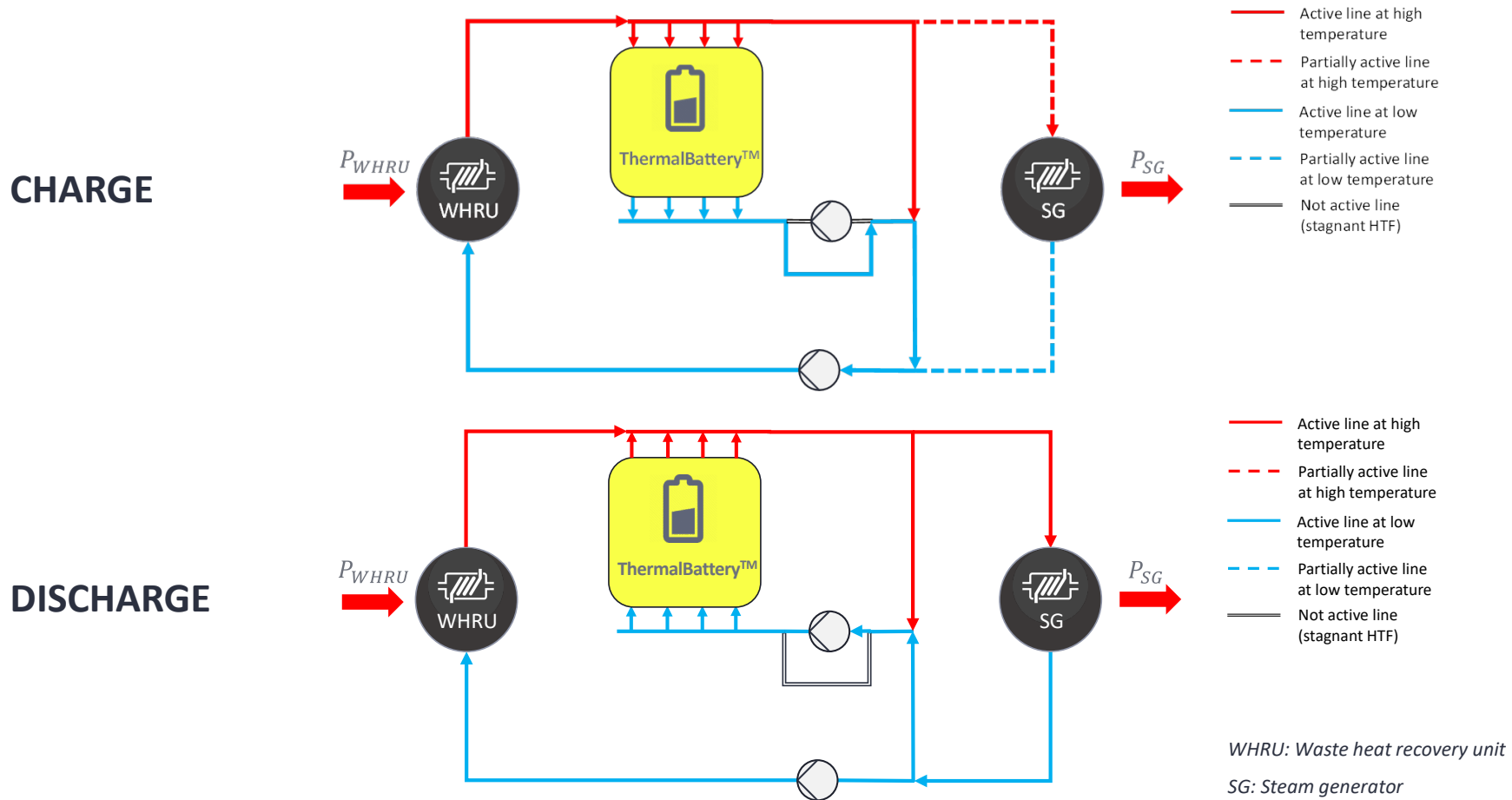
Electrification of process heat/steam

4.

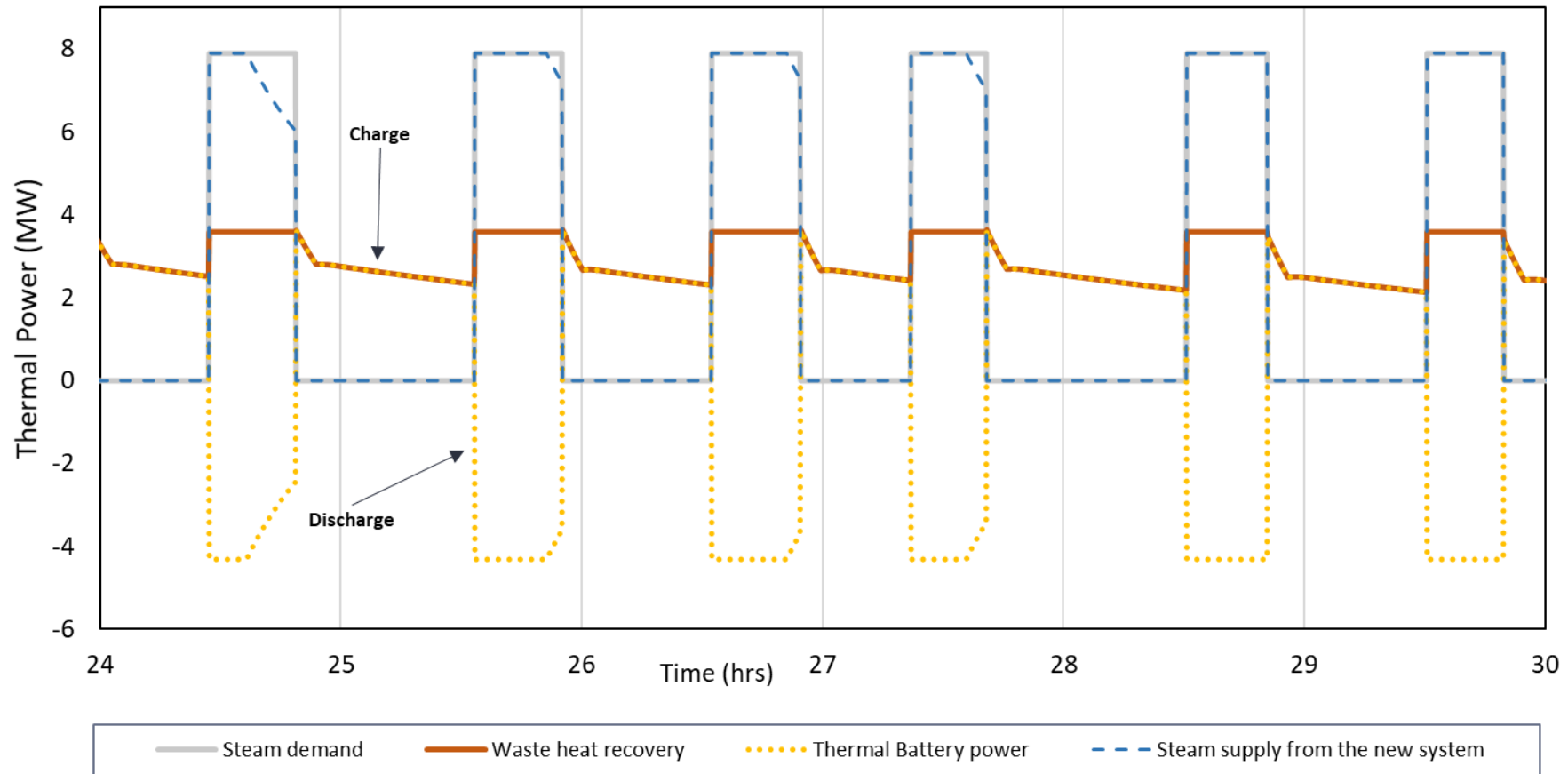
Concentrated solar to process heat/steam

Example 1: Waste heat recovery

Example case with stable waste heat source and intermittent steam demand

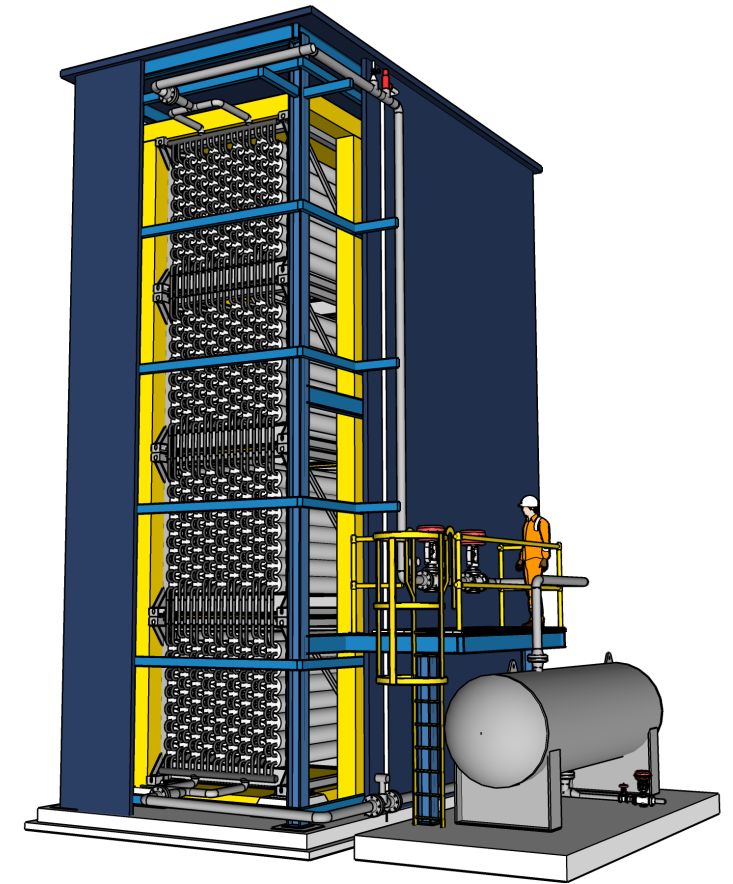
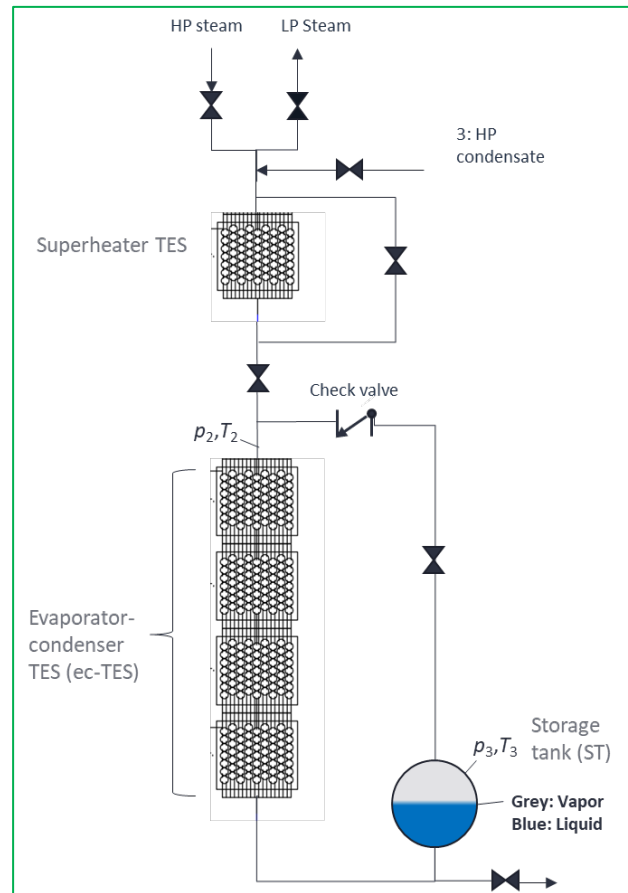


Simulation



Example 2: Steam balancing

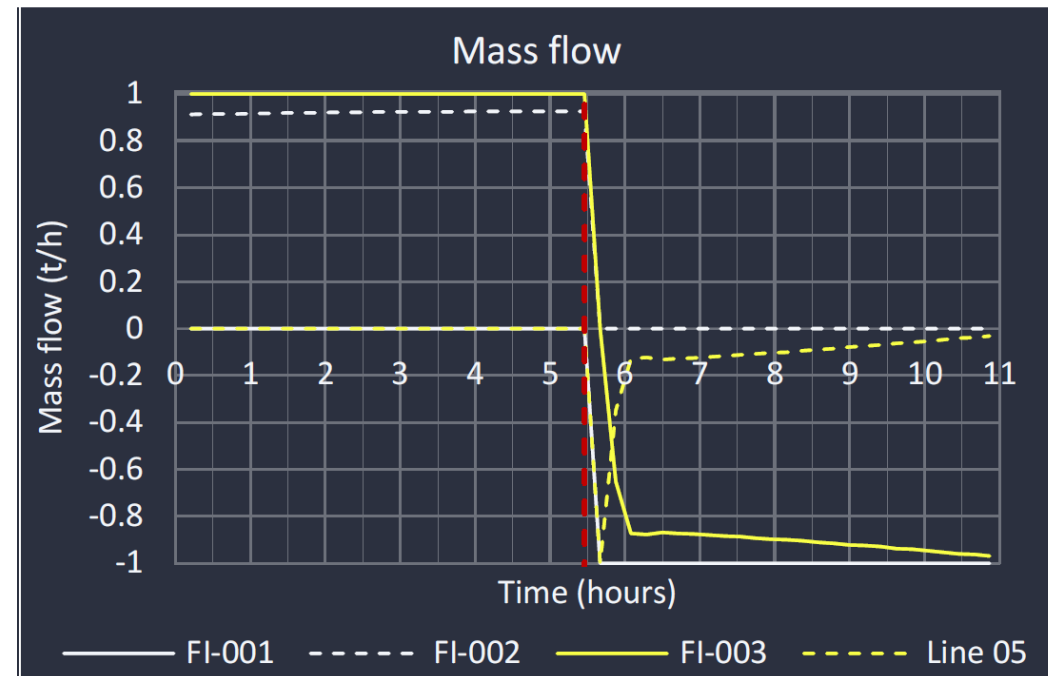
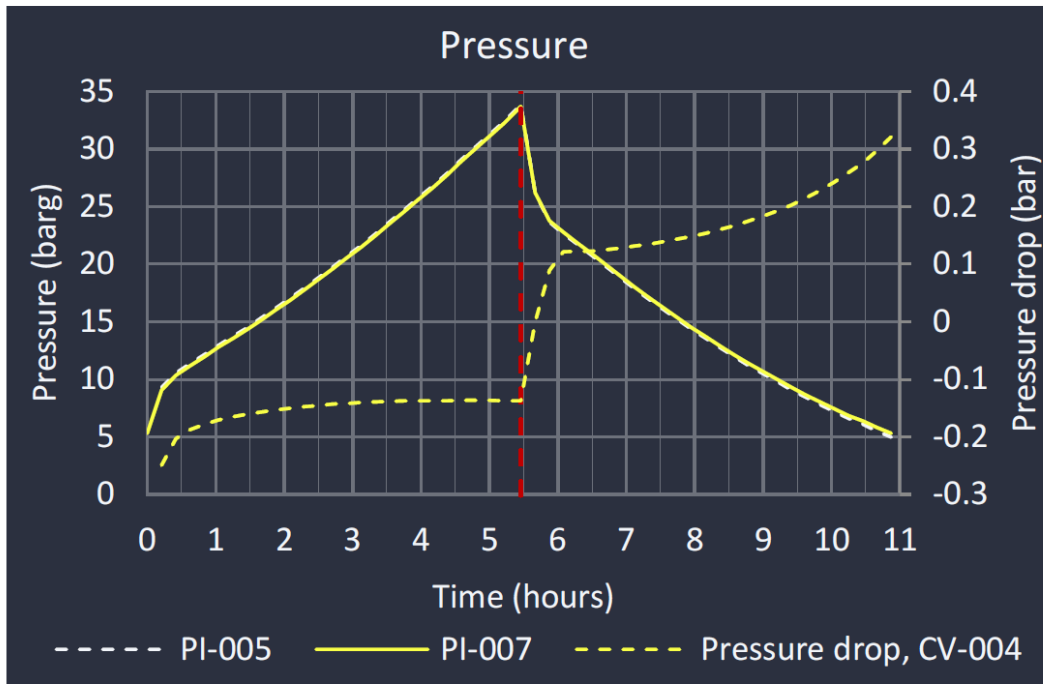
- Combines sensible heat storage in ThermalBattery™ modules with sensible + latent heat storage in pressure vessel(s)
- Can provide superheated steam (optional) up to ~400 °C at constant pressure and temperature
- Fast response (seconds)
- Stores both energy *and* mass (condensate)
- **Demonstrator under construction at Yara Porsgrunn**



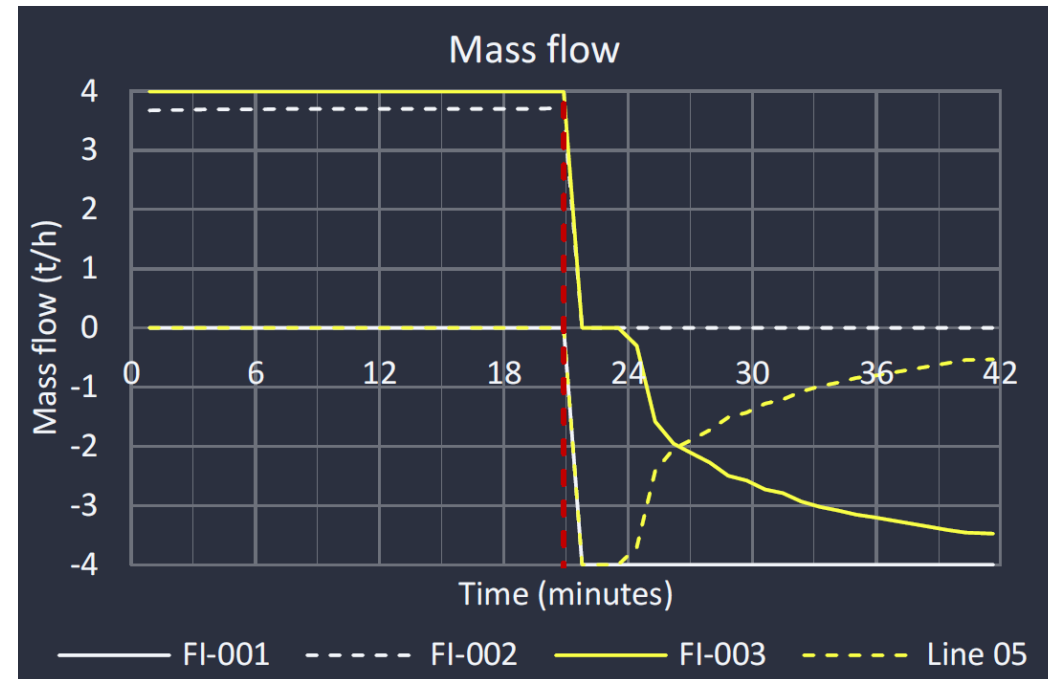
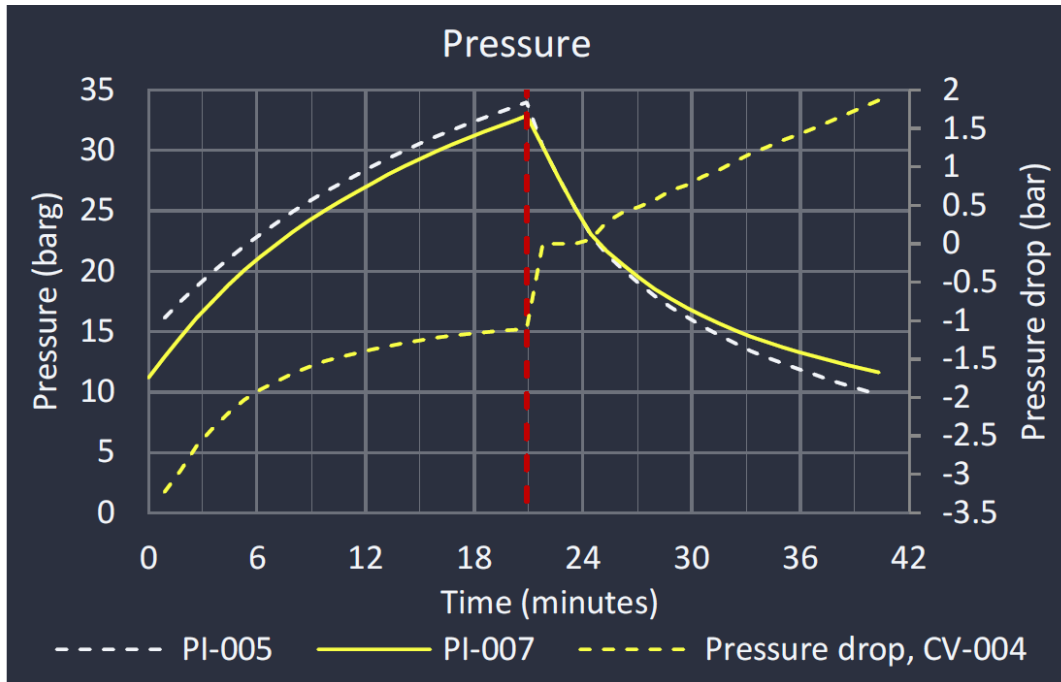
Demonstrator at Yara Porsgrunn



Simulation of charge & discharge at 1 t/h



Simulation of charge & discharge at 4 t/h



Summary

- EnergyNest is a technology company headquartered in Norway, with the worlds first commercial solution using concrete (HEATCRETE®) as storage material
- Technology will be proven at commercial scale in 3 projects during 2022
- Operates with thermal oil or water/steam at temperatures up to ~400°C
- Can serve (at least) 4 different industrial needs/use-cases
 - Waste heat recovery
 - Steam balancing
 - Electrification
 - Concentrated solar thermal



Contact us

+47 66 77 94 60

post@energy-nest.com

www.energy-nest.com