This project has received funding from the European Union's Horizon 2020 research and innovation program under grant agreement No. 864496

ComBioTES

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Compact bio-based thermal energy storage for buildings

SUSTAINABLE PLACES 2023

INTRODUCTION

Funding scheme and call identifier:

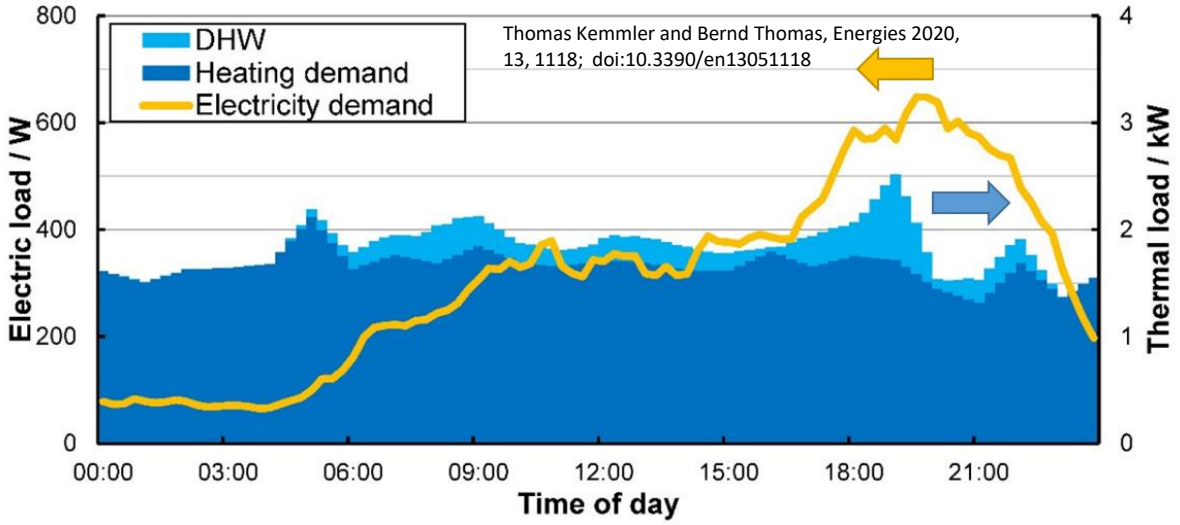
Research and innovation project, H2020-LC-SC3-2019-ES-SCC

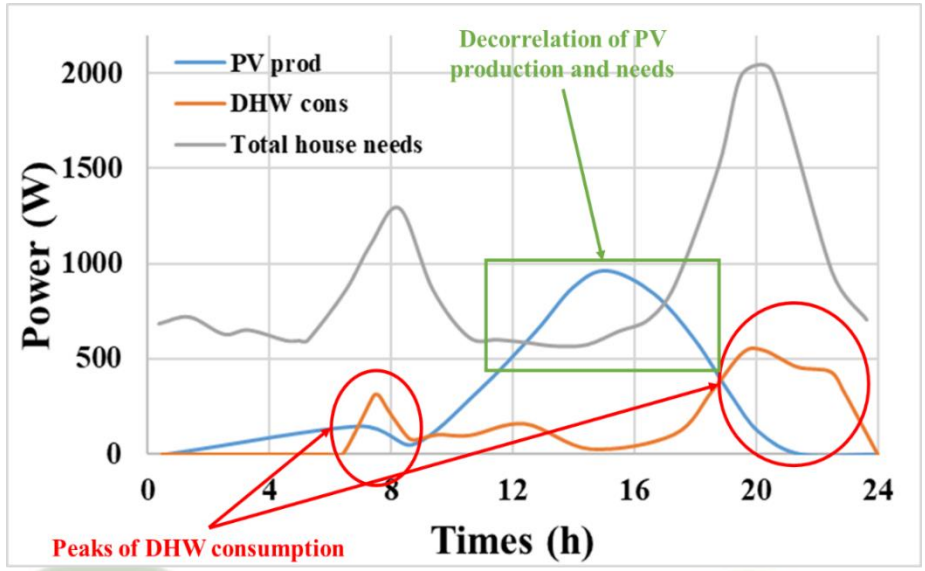
Initial start date: 11/2019
Stop of the project due to HM's insolvency: 12/2019
Restart date and duration, after suspension: 1st June 2021, for 48 months

Project funding: € 3,999,128.75 (95 % of total cost)

Grant Agreement no.: 864496

Grid load shifting at residential scale





Adapted from ECS pect, rapport final 2021 and Simulation of a ZEB Electrical Balance with aHybrid Small Wind/PV, January 2021

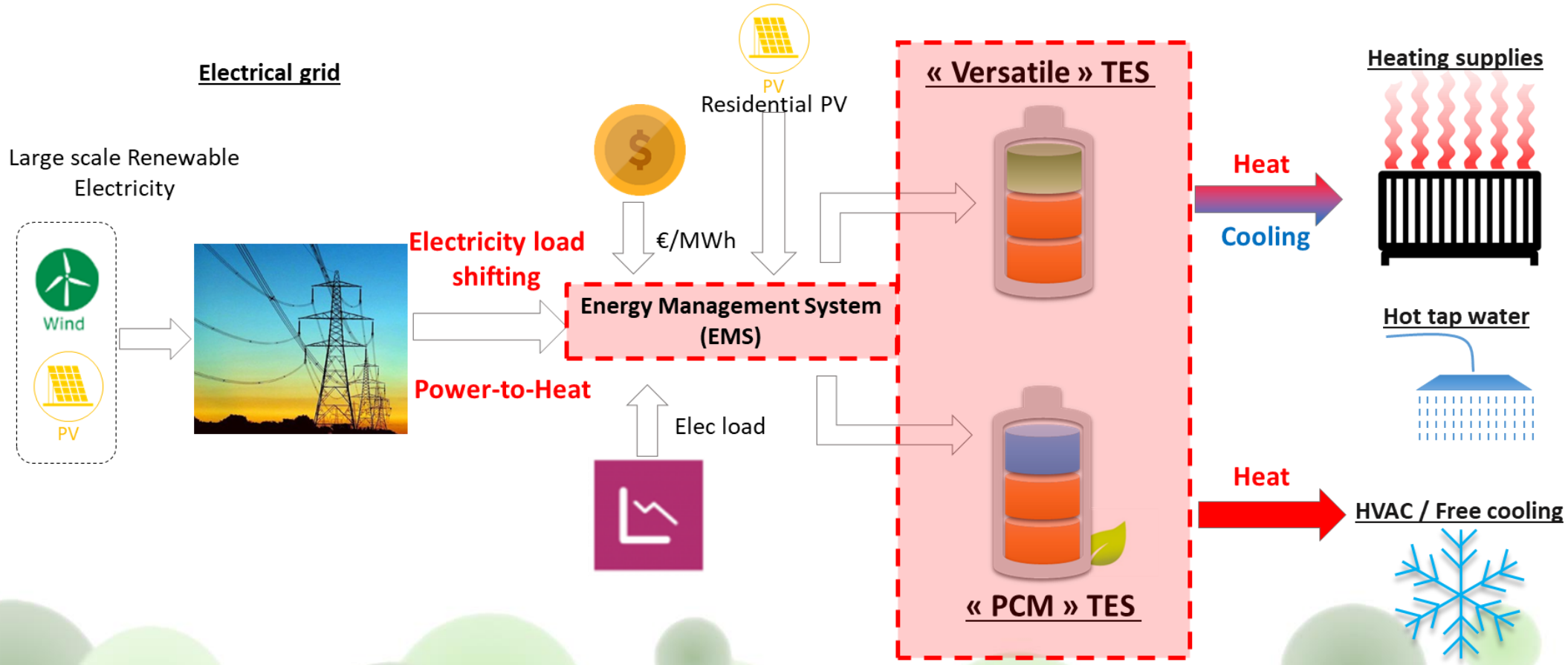
- Peaks of DHW consumptions in the morning and in the evening.
- Peak of electricity demand concomitant with DHW peak.
- Major temporal shift between the DHW and electricity profiles and the profile of PV production.

Thermal storage at residential scale

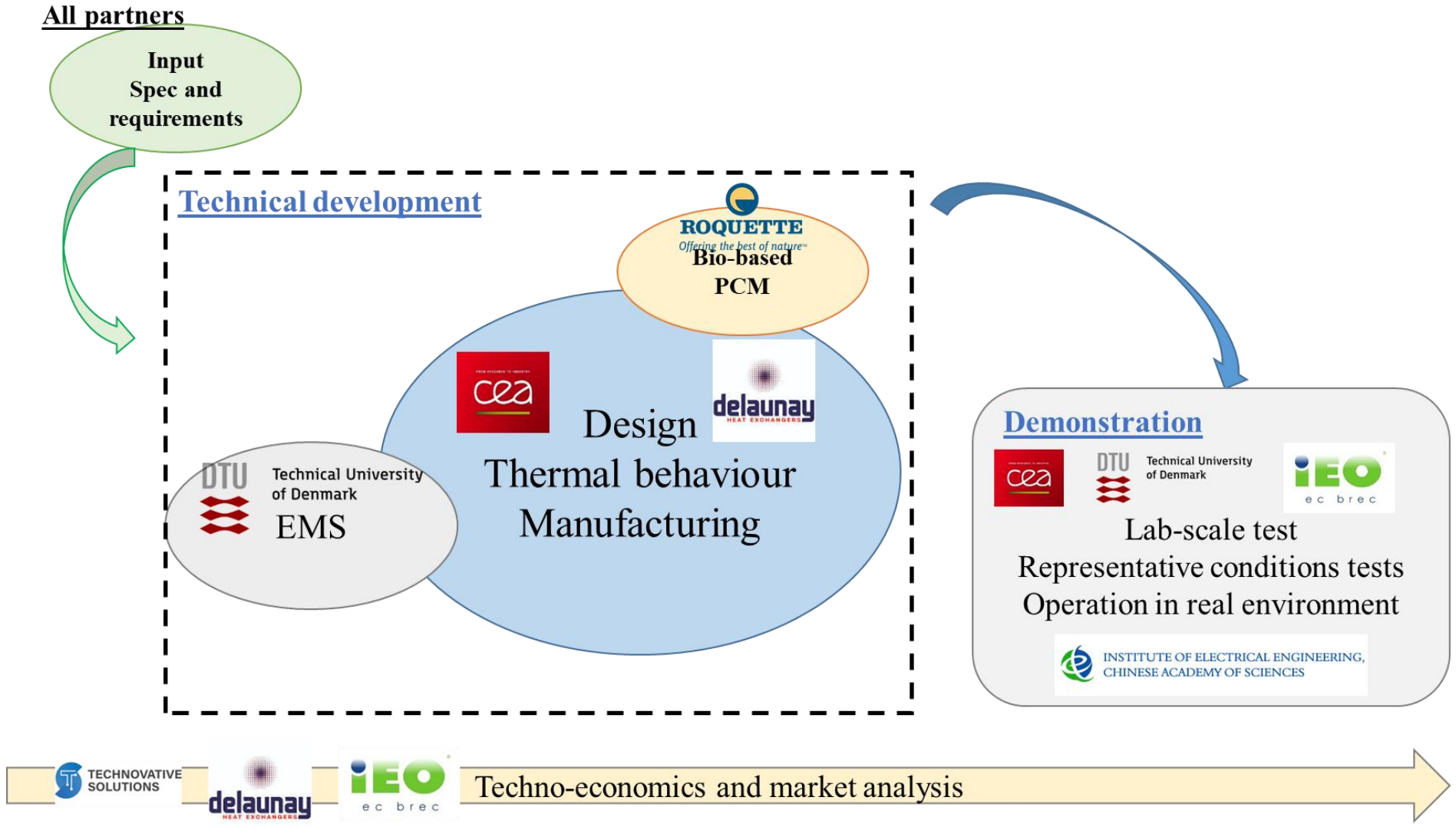
- Opportunity to contribute to the shifting of the peak demand on the electrical grid.
- Opportunity to correct the temporal mismatch between PV production and thermal needs.

GLOBAL CONCEPT

ComBioTES proposes to develop a modular compact thermal energy storage (TES) solution for heating, hot tap water and cooling with regard to thermal end-uses in buildings. This thermal energy storage solution will be fully adapted for electricity load shifting.

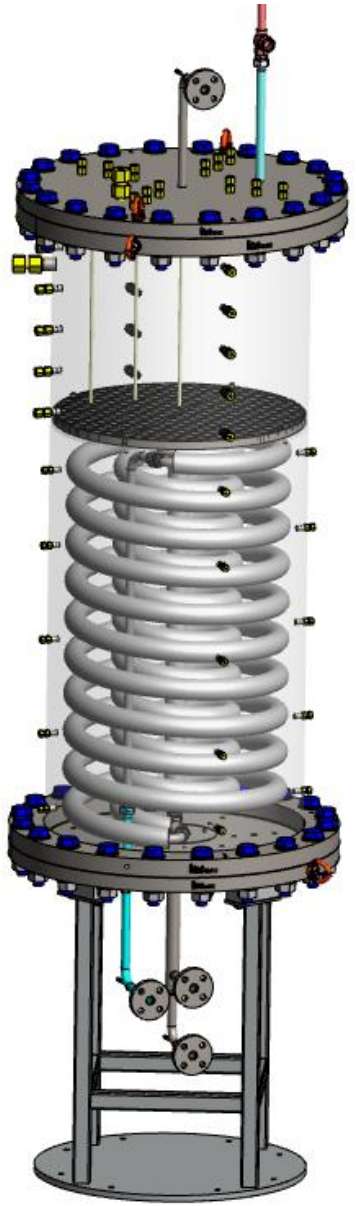


PROJECT ORGANISATION



Commissariat a l'énergie atomique et aux énergies alternatives (France) https://www.cea.fr/english	COORDINATOR TES design and characterization, demo-site
Roquette Freres SA (France) https://www.roquette.com/	PCM
Delaunay et Fils (France) https://www.delaunay.fr/fr/delaunay-fils/	Manufacturing
Danmarks Tekniske Universitet (Denmark) https://www.dtu.dk/english	EMS, demo-site
EC BREC Instytut Energetyki Odnawialnej SP Zoo (Poland) https://www.ieo.pl/en/	Market, demo-site
Technovative Solutions LTD (United Kingdom) https://www.technovativesolutions.co.uk/home	Techno-eco, market
Voltalis SA (France) https://www.voltalis.com/	
Institute of Electrical Engineering – Chinese Academy of Sciences http://english.iee.cas.cn/	TES characterization
AMIRES SRO (Czechia) https://amires.eu/	Dissemination, Management

Demonstration – Versatile storage



Winter mode
- Space heating
- Water thermocline + encapsulated PCM
- 11 kWh

Summer mode
- Space refreshment
- Direct contact water/Ice storage
- 9.5 kWh

State of progress
- Under manufacturing
- Available in Autumn 2023
- Important instrumentation
- Test planned in end 2023/beginning 2024

DEMONSTRATION
- At CEA and IEE-CAS
- Simulated conditions

Demonstration – PCM TES

- Tube and shell configuration
- RT70HC as PCM
- Multi-passes fluid flow configuration to increase the efficiency
- Internal electrical heating to increase the versatility and the easiness of installation

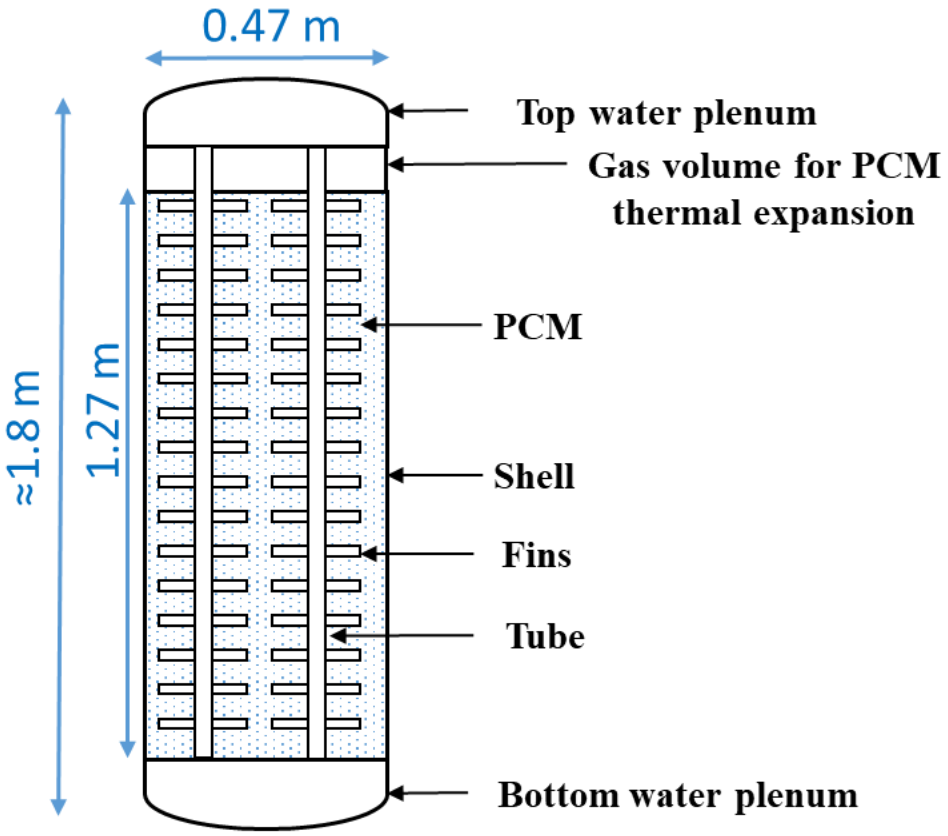
- 10.5 kWh for DHW production
- 9 kW for space heating

- Engineering is on-going
- First prototype tested at CEA in beginning of 2024

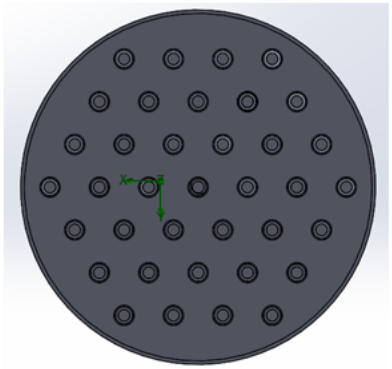
- Prototypes delivered in demo-sites in Summer 2024

Demonstration – PCM TES

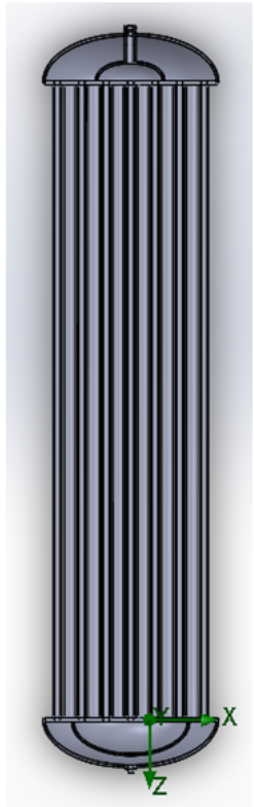
Global geometry



Tube bundle

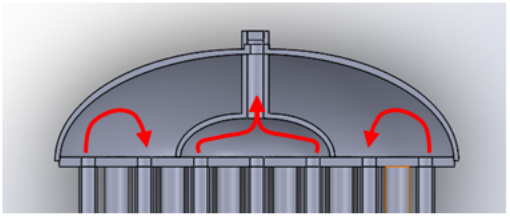


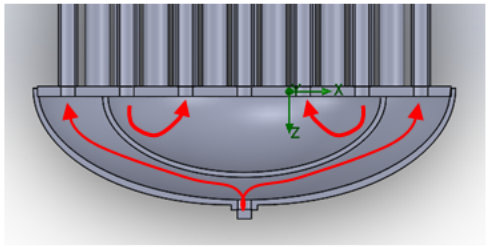
- 37 tubes DN25
- Tube thickness 2.4 mm
- Insert DN8
- G-type aluminum fins
- Fpi 8, fin height 15.88



Inlet/outlet plenums

2 concentric convex ends





2 concentric convex ends

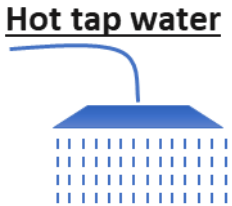
Demonstration – PCM TES

DTU SYLAB platform (Copenhagen, DENMARK)

- Representative house and installation
- Test of advanced control and communication
- Test of EMS
- « Reference » case for TES control
- Test of PCM TES

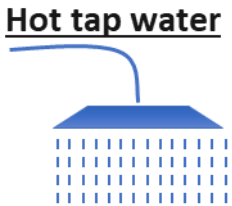
IEO test site (Bączal Dolny, POLAND)

- 200 m^2 single-family house
- Natural gas + heat pump + PV
- Test of the PCM TES



CEA test site (Chambéry, FRANCE)

- Individual representative houses
- Relevant size, thermal needs and applications
- Test of PCM TES



CHALLENGES

TES

- Replacement of the manufacturer
- Instrumentation
- Experimental characterization

EMS

- Algorithms
- Low-level EMS for all sites
- High-level EMS just for 2 sites

DEMONSTRATION

- Demo-site preparation
- Adequation TES/site/applications
- 1 year test

Short to medium term

COMMERCIALISATION

EUROPE

- Domestic use: Competition with water tank
- Large scale: valuable solution but out of scope

- TRL 6: too low for commercialisation
- More research foreseen

CHINA

- Pandemics
- Difficulty in market analysis
- Loss of the Chinese demo-site

- Market with good potential for TES

CONTACT US !

ComBioTES project https://combiotes.eu/ @combiotes

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