General project information

General data

Project acronym	COMHPTES
Full title	Flexible Compact Modular Heat Pump and PCM based Thermal Energy Storage System for heat and cold industrial applications
Project number	Cetp-FP-2023-00496
Call identifier	2023 CM2023-06 Heating and cooling technologies
TRI	TRI 4 - Efficient Zero Emission Heating And Cooling Solutions
Project website	
Project duration	December 2024 - November 2027

Summary

COMHPTES aims to develop innovative, cost-effective, and compact heat pump (HP) and thermal energy storage (TES) technologies, and to demonstrate them up to TRL 5 in a fully integrated flexible and modular system able to supply heating and cooling on demand for industrial applications. Also included in this study are the interfaces with affordable renewable energy systems, waste heat recovery, and district networks. The COMHPTES system will address industrial end-users with flexible heat loads and temperature requirements in the ranges from 0.5 to 10 MW-t and 5 to 225°C, respectively, which represent approximately half of the total industrial installations and a quarter of the total process heat consumption in EU. The COMHPTES system will build upon the compactness and modularity of its technologies to best comply with space constraints in industry, and to enable gradual technology adoption, thereby reducing large upfront investments and operational risks.

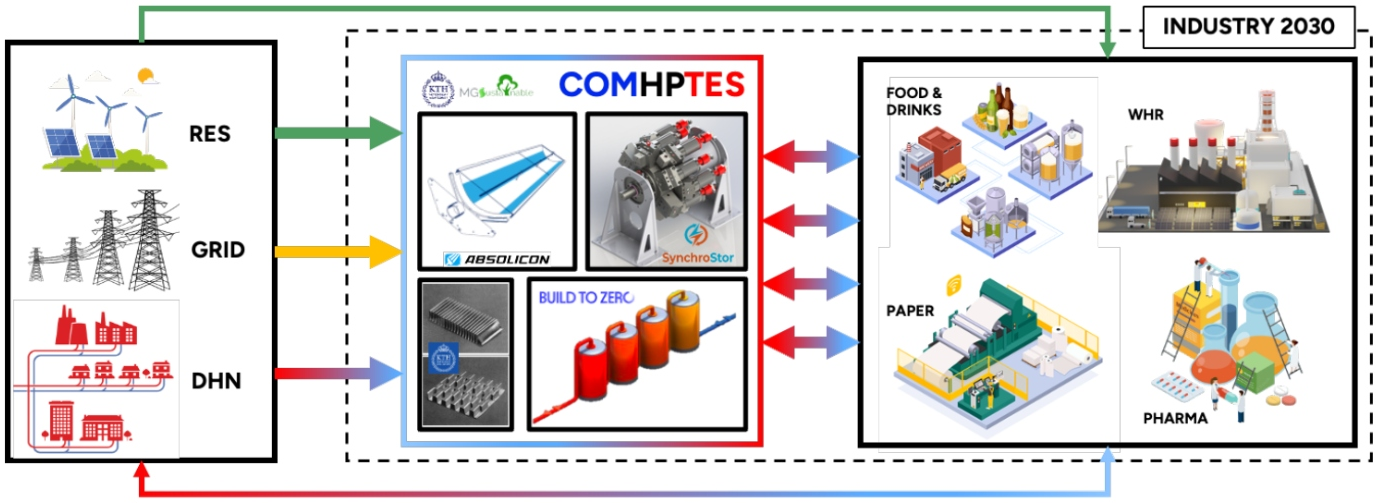
The first challenge is the need to decarbonize industrial heating and cooling. Most of the energy consumed by industry, up to 80%, is in the form of thermal energy. Most of this energy is currently met by fossil fuels, accounting for about a third of global CO2 emissions. Another challenge is that fossil fuel-driven thermal energy is inexpensive, making the business case for renewable thermal energy less attractive. COMHPTES exploits thermal energy storage to make use of cheaper renewables when they are available. Another challenge addressed is how to implement large scale heat pumps for small to medium scale industries. Many of these industries do not have space for large heat pumps, therefore, a novel, compact design using a natural refrigerant like CO2 with high volumetric efficiency is considered.

To push the boundaries of this technology, the heat pump must be validated at an appropriate scale on industrial use cases. Techno-economic and dynamic models will be used to evaluate the industries and locations where this technology makes the most sense, with the goal of derisking further investment in this field and showcasing the benefits of implementing such a system.

The ambition of the COMHPTES project is to promote new low-carbon thermal energy systems (specifically, heat pumps, thermal energy storage, and parabolic trough collectors) to encourage industrial decarbonization in segments using process heating (in the range of 175 to 225°C) and cooling (at 5°C).

The expected result of the COMHPTES project is a validated heat pump compressor/expander system using CO2 as the refrigerant. The validation will be based on demand matching for a set of industrial use cases.

The project aims to advance modular and compact natural refrigerant heat pump systems. By showing that this technology is suitable for high heat consuming industries operating with limited space, the impact expected will be to increase awareness in these sectors of new beneficial technologies which are validated in the COMHPTES project. In addition to the impact of the development and demonstration of the integrated system, the project also advances the state of the art for components of the system through innovative technologies developed for the heat pump, the thermal energy storage, and the heat exchangers.



Project partner organisations (funded and self-financed) being part of the project consortium

Organisation (full name)	Function	Funding agency (FA) or self-financed	Country
Absolicon Solar Collector AB	Project partner	SWEA	SE
BUILD TO ZERO SL	Project partner		ES
KUNGLIGA TEKNISKA HOEGSKOLAN	Project coordinator	SWEA	SE
MG SUSTAINABLE ENGINEERING AB	Project partner	SWEA	SE
SynchroStor	Project partner	SE	GB

Project financials

Sums built on the data provided / confirmed by funding agencies according to contacts.

Total project costs in EUR	€ 3,045,353.60
Total funding	€