

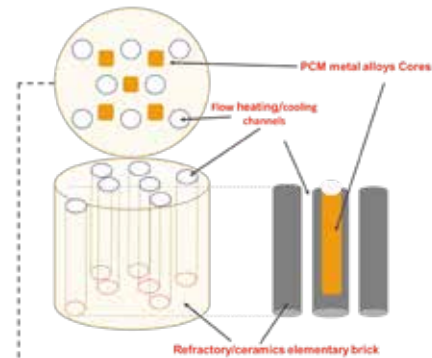
Approach

(methodologies, partnership, and resources)

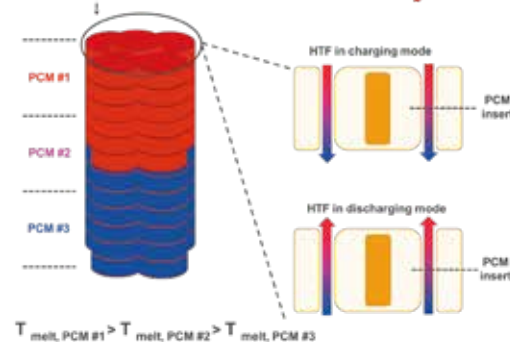
The HEATERNAL concept will ensure 48-hours heat storage capacity at an industrial scale through modeling and simulation approaches. It will be optimized through a hybrid storage unit of a refractory brick containing a Phase Change Material (PCM). The PCM composition will be adjusted to comply with multiple industrial applications.

Heaternal Concept

HEATERNAL Heat Storage Unit



HEATERNAL TES System



HEATERNAL Partners

The consortium is a robust partnership comprising 3 leading European research centers (RTOs), 1 university as well as 7 private companies, including 3 SMEs. It spans the entire full innovation chain and encompasses key elements of the value chain, including end-users and process engineering.

Belgium

France

Spain

Portugal

11 Partners

4 European Countries

Partners



Launched in May 2023, HEATERNAL has received funding from the European Union's Horizon research and innovation program under Grant Agreement n° 101103921 for 3 years and 6 months. However, views and opinions expressed are solely those of the author(s) only and do not necessarily reflect those of the European Union. Neither the European Union nor the granting authority can be held responsible for them.



Innovative High-Temperature Thermal Storage for Industrial Applications

www.heaternal.eu

heaternal_eu heaternal-project



Heaternal Mission

The HEATERNAL aims to develop a Thermal Energy Storage (TES) System (TESS) conceived to attend to industry needs of constant high temperature (HT) to reduce the Mtons CO2 released by industrial processes in the EU.

Objectives

OPTIMIZED COST-EFFECTIVE SYSTEM

- 01 To maximize thermal performances of TES Unit (energy density, heat transfer capacity).
- 02 To simulate full TESS integration for 3 use cases.
- 03 To ensure the economic viability and environmental sustainability of the system.

INCREASE THE THERMAL STORAGE LIFETIME BY UP TO 10 YEARS

- 04 To ensure the reliability of the thermal storage Unit from 600-900°C.
- 05 To validate a 50 kWh-scale (TRL5) prototype via accelerated ageing tests corresponding to 2 years of the UGIT use-case and via thermos mechanical models considering heat transfer and thermal stress.

SPEED UP THE MANUFACTURABILITY FOR RAPID MARKET ENTRY

- 06 To minimize system footprint.
- 07 To ensure HEATERNAL R&D results in a system that can be rapidly manufactured and improved: compatible with high MRL7 processes for urgent decarbonization and exploring lower MRL processes for next-gen thermal performance.

TO ENSURE THE SOLUTION MARKET ENTRY BY 2030 AND PROMOTE 10% OF THE MARKET SHARE BY 2040

- 08 To engage stakeholders to invest in TRL7/8 demonstration and/or factory adoption.

About

The HEATERNAL vision is to create a viable, short-term thermal energy storage (up to 48 hours) that would enable the replacement of fossil fuels by industrial waste heat and renewable electricity

Why?

High-temperature heat is needed for industrial processes, and there is not a viable decarbonization solution today. Heat in the face of climate and geopolitical urgencies, pursuing the substitution of fossil fuels with industrial waste heat and renewable electricity it's a priority in energy-efficient industry solutions.

How?

The collaborative objective is to create a prototype and model for an innovative thermal energy storage concept that draws from substantial scientific and industrial expertise. This involves two key components: inventive phase-change materials and unit designs that amplify unit energy density by 350% compared to ceramic bricks, and manufacturing proficiency that guarantees swift integration of materials and units into factories by 2030. The solution proposed by HEATERNAL effectively addresses industrial requisites, including a minimal footprint, a lifespan exceeding 10 years, and a swift return on investment.

The project brings four specialized public research teams focused on prototyping and modeling thermal systems, phase-change materials, and 3D printing to implement viable short-term thermal energy storage within up to 48 hours.



HEATERNAL Outcomes

The HEATERNAL project will pave the way for high-temperature heat storage solutions in industrial applications. Thereby enhancing energy efficiency for climate stabilization and cleaner air. It also addresses energy poverty issues and ensures access to clean renewable energy.

Key outcomes of the project include:

- Decarbonizing materials production in Europe by reducing the need for fossil fuels in the industry;
- Developing models and designs for Thermal Energy Storage (TES) and systems.
- Creating new materials and designs to be tested in a TRL5 TES prototype dedicated to high-temperature processes (metals, minerals), with easy scalability.
- Ensuring industrial relevance in terms of cost, footprint, temperature, rapid scalability, etc, through Life Cycle Assessment (LCA) and Techno-Economic Analysis (TEA) with a focus on Findable, Accessible, Interoperable, and Reusable (FAIR) data.
- Achieving adoption by more than 3 energy-intensive industries by 2030.
- Facilitating the engagement of 8 companies for upscaling HEATERNAL technologies.
- Achieve a solid market share by 2040, targeting a 10% increase in Industrial Waste Heat Recovery (IWR) for EU minerals and metals and a 0.5% increase in process electrification in the global metals industry.