

Proposal Evaluation Form

	EUROPEAN COMMISSION Horizon Europe (HORIZON)	Evaluation Summary Report - Innovation actions
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Call:	HORIZON-CL5-2022-D3-01
Type of action:	HORIZON-IA
Proposal number:	101096921
Proposal acronym:	THUMBS UP
Duration (months):	48
Proposal title:	Thermal energy storage solUTions to optimally Manage BuildingS and Unlock their grid balancing and flexibility Potential
Activity:	HORIZON-CL5-2022-D3-01-14

N.	Proposer name	Country	Total Cost	%	Grant Requested	%
1	VEOLIA SERVICIOS LECAM SOCIEDAD ANONIMA UNIPERSONAL	ES	798,875	9.66%	559,213	7.98%
2	FUNDACION CARTIF	ES	661,250	8.00%	661,250	9.44%
3	UNIVERSITA DEGLI STUDI DI GENOVA	IT	410,000	4.96%	410,000	5.85%
4	THE UNIVERSITY OF BIRMINGHAM	UK	636,457.5	7.70%	636,457	9.08%
5	CONSIGLIO NAZIONALE DELLE RICERCHE	IT	478,750	5.79%	478,750	6.83%
6	UNIVERSIDAD DE LLEIDA	ES	345,000	4.17%	345,000	4.92%
7	algoWatt SpA	IT	394,875	4.78%	276,413	3.95%
8	Plus Advanced Technologies BV	NL	446,000	5.39%	312,200	4.46%
9	SORPTION TECHNOLOGIES GMBH	DE	525,625	6.36%	367,938	5.25%
10	Gradyent B.V.	NL	367,875	4.45%	257,513	3.68%
11	ETHNIKO KENTRO EREVNAS KAI TECHNOLOGIKIS ANAPTYXIS	EL	381,250	4.61%	381,250	5.44%
12	JOHANNEBERG SCIENCE PARK AB	SE	599,275	7.25%	599,275	8.55%
13	I-TES SRL	IT	629,500	7.61%	440,650	6.29%
14	GRID SINGULARITY GMBH	DE	313,750	3.79%	219,625	3.13%
15	UNIVERSITA DEGLI STUDI DI MESSINA	IT	201,250	2.43%	201,250	2.87%
16	Kelvin BV	NL	156,250	1.89%	109,375	1.56%
17	UBITECH ENERGY	BE	321,250	3.89%	224,875	3.21%
18	NANOPHOS ANONIMI EMPORIKI ETAIRIA ANAPTIXIS KAI YPIRESION - NANOPHOS COMMERCIAL SOCIETE ANONYME OF SERVICES AND DEVELOPMENT	EL	251,165	3.04%	175,816	2.51%
19	THE ECONOMIC AND SOCIAL RESEARCH INSTITUTE LBG	IE	197,053.75	2.38%	197,054	2.81%
20	POLITECNICO DI TORINO	IT	152,375	1.84%	152,375	2.17%
	Total:		8,267,826.25		7,006,279	

Abstract:

THUMBS UP aims to develop and demonstrate thermal energy storage (TES) at daily (based on environmental friendly PCM) and weekly level (based on TCM sorption technology) solutions to be easily integrated in EU buildings (both connected and not-connected to DHN) to increase their energy efficiency as well as to exploit Power-to-Heat (PtH) approaches also to make EU Buildings as grid flexibility actors. THUMBS UP wants to overcome all the limits of state-of-the-art building-integrated PCM and TCM TES technologies, increasing TES energy density and reducing CAPEX. THUMBS UP innovates at different levels, from modelling to materials and enhance heat exchanger solutions, targeting demonstration at TRL 7. High-performance TES solutions part of an EU sustainable economy is a factor at the core of THUMBS UP. The project develops truly i) bio-based PCMs from raw materials currently wasted in the EU food industry, turning them into valuable TES materials and ii) TCMs relying exclusively on non-hazardous materials and on water as working fluid. THUMBS UP TES will be demonstrated in 3 demosites (a single-family building in Spain and 2 multi-family buildings in Sweden/Spain) in different EU climates and energy market contexts also to assess THUMBS UP replication potential in two replication sites (ITA, NL). Via its demonstration and replication campaign, THUMBS UP promotes TES role as key enabling technology to optimize thermal comfort and energy efficiency in buildings as well as to promote PtH as facilitator of RES grid integration in a sector coupling approach, to be studied via innovative modelling tools. THUMBS UP gives specific attention to how to fully integrate TES solutions into buildings and wider smart energy networks by combining the technology advancements with TES-tailored digital innovations. THUMBS UP widens the capability to control, monitor and forecasts how to operate building-integrated TES systems to provide services toward both the H&C and power sector.

Evaluation Summary Report

Evaluation Result

Total score: 13.00 (Threshold: 10)

Criterion 1 - Excellence

Score: **4.00** (Threshold: 3/5.00 , Weight: -)

The following aspects will be taken into account, to the extent that the proposed work corresponds to the description in the work programme:

- Clarity and pertinence of the project's objectives, and the extent to which the proposed work is ambitious and goes beyond the state of the art.
- Soundness of the proposed methodology, including the underlying concepts, models, assumptions, inter-disciplinary

approaches, appropriate consideration of the gender dimension in research and innovation content, and the quality of open science practices, including sharing and management of research outputs and engagement of citizens, civil society and end users where appropriate.

Overall, the proposal addresses this criterion very well, namely:

- The objectives are clear. The pertinence of the objectives is high. The project aims to develop short-term PCM storage materials and technologies based on a new bio-based PCM from raw materials as well as a storage unit with a heat exchanger optimised using topological methods. The project also targets long-term TCM by proposing a thermochemical-based storage unit that will utilise the sorption process. Additionally, it demonstrates these technologies in operational environments. The targeted charging power of the proposal is above 3kW/3h.
- There is credible and significant advancement in the state of art in developing and applying new PCM material, which is bio-based and developed from by-products from the food industry, and in the proposed innovative system.
- The proposed activities will credibly achieve TRL 7 at the end of the project. TRL evolution on technology level is suitably elaborated and included in the proposal.
- Interdisciplinarity is well addressed in the proposal which combines multiple disciplines including material science, thermodynamics, civil engineering, social sciences and environmental sciences.
- The quality of open science practices is high and include open access publications and, the use of open repositories. All project results and reports will be available on the website which will be set up for the project. The engagement of citizens, civil society, and end-users is appropriate.

Nevertheless, a small number of shortcomings are present, namely:

- The optimisation methods for heat and mass transfer in thermochemical storage through the bed and heat exchanger parameters are not sufficiently elaborated.
- The production and storage of cold is insufficiently addressed. The project targets the research and characterization of small-scale samples of PCM in a range of temperatures between 10-20°C. The efficiency of this approach is insufficiently demonstrated in terms of the quantity for the PCM production or for the temperature range.

Criterion 2 - Impact

Score: **5.00** (Threshold: 3/5.00 , Weight: -)

The following aspects will be taken into account, to the extent that the proposed work corresponds to the description in the work programme:

- **Credibility of the pathways to achieve the expected outcomes and impacts specified in the work programme, and the likely scale and significance of the contributions from the project.**
- **Suitability and quality of the measures to maximise expected outcomes and impacts, as set out in the dissemination and exploitation plan, including communication activities.**

Overall, the proposal successfully addresses all relevant aspects of the criterion. In particular:

- The credibility of the pathways to achieve the expected outcomes is high. The integration of the proposed solutions within the energy networks in buildings and their energy management systems will allow different functions, such as peak load reduction and energy-saving. In the proposed demonstrations, a different number of modules can be implemented in various scenarios and provide adequate heating and hot tap water for electricity load shifting.
- The modules will be very flexible and easily scalable and easy to integrate with H&C systems, work alone or in combination with other energy supply systems, and enable power to heat/cold transition.
- A novel thermal energy storage TCM system that is significantly more compact than present state of the art will be developed, enabling the storage of heat and cold for domestic applications for periods typically of four weeks long and longer.
- The credibility of the pathways to achieve the expected impacts is strong. The impacts are clearly identified and linked to support EU industrial leadership in key and emerging TES technologies. The impacts also support clean energy technologies, the security of energy supply, energy independence, and energy diversification.
- The proposed measures for dissemination and exploitation are very well elaborated and supported by a collaboration with the Celsius initiative. They include activities aimed at promotion, awareness-raising and communication, raising interest among stakeholders as well as exploitation-oriented dissemination.
- The exploitation plan is effective and credible. It includes key exploitable results down to the partner level with dedicated exploitation perspectives and the anticipated time to market. An appropriate strategy for managing and protecting intellectual property is elaborated.

Criterion 3 - Quality and efficiency of the implementation

Score: **4.00** (Threshold: 3/5.00 , Weight: -)

The following aspects will be taken into account, to the extent that the proposed work corresponds to the description in the work programme:

- **Quality and effectiveness of the work plan, assessment of risks, and appropriateness of the effort assigned to work packages, and the resources overall.**
- **Capacity and role of each participant, and the extent to which the consortium as a whole brings together the necessary expertise.**

Overall, the project addresses the criterion very well, in particular:

- The overall work plan is appropriate.
- The deliverables and milestones are clearly defined and appropriate to monitor the project.
- Most of the critical risks, including the technical risks are well identified and managed.
- The overall efforts assigned to most WPs are appropriate.
- The project includes a task to contribute to link with the BRIDGE activities.
- The consortium is an appropriate combination of SMEs, large companies and research organizations, and as a whole brings together the necessary expertise to carry out the project effectively.

Nevertheless, a small number of shortcomings are present, namely:

- The scheduling of some tasks in the work plan is inadequately addressed. For example the duration of Task 5.1 is too long. Similarly, the durations of tasks 5.4, 5.5, and 6.3 are not well-aligned with their related activities.
- One critical risk related to the development of the cold storages, and its mitigation measures, are insufficiently addressed. This refers to the

critical risk associated with not achieving a demo-stage for the cold storage, which is a critical component of the proposal since it mostly targets the production of small PCM samples at the cold-storing temperatures.

- A small share of resources requested are not credibly justified. For example. Partners 8, 9 and 12 request a large sum for a budget line indicated as "Other goods and services" without providing a sufficiently detailed justification.

Scope of the application

Status: **Yes**

Comments (in case the proposal is out of scope)

Not provided

Exceptional funding

A third country participant/international organisation not listed in [the General Annex to the Main Work Programme](#) may exceptionally receive funding if their participation is essential for carrying out the project (for instance due to outstanding expertise, access to unique know-how, access to research infrastructure, access to particular geographical environments, possibility to involve key partners in emerging markets, access to data, etc.). (For more information, see the [HE programme guide](#).)

Please list the concerned applicants and requested grant amount and explain the reasons why.

Based on the information provided, the following participants should receive exceptional funding:

Not provided

Based on the information provided, the following participants should NOT receive exceptional funding:

Not provided

Use of human embryonic stem cells (hESC)

Status: **No**

If YES, please state whether the use of hESC is, or is not, in your opinion, necessary to achieve the scientific objectives of the proposal and the reasons why. Alternatively, please state if it cannot be assessed whether the use of hESC is necessary or not, because of a lack of information.

Not provided

Use of human embryos

Status: **No**

If YES, please explain how the human embryos will be used in the project.

Not provided

Activities excluded from funding

Status: **No**

If YES, please explain.

Not provided

Do no significant harm principle

Status: **Yes**

If Partially/No/Cannot be assessed please explain

Not provided

Exclusive focus on civil applications

Status: **Yes**

If NO, please explain.

Not provided

Artificial Intelligence

Status: **No**

If YES, the technical robustness of the proposed system must be evaluated under the appropriate criterion.

Overall comments

Not provided



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