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Editorial by the Coordinator

Dear readers,

It is my pleasure to present the BEST-Storage project which we kicked off half a year ago at the Renewable Energy House in Brussels where the European Heat Pump Association is headquartered.

The European Commission (EC) considers that energy storage is key for increased renewable energy production, energy efficiency and for energy security. As stated in their 2023 recommendations on energy storage, the Commission states that to achieve the European Union's climate and energy targets, decarbonize the energy sector and tackle the energy crisis, our energy system needs to undergo profound transformations amongst which stands the need for technologies that facilitate flexibility as the share of renewable energy in the electricity system is expected to reach 69 % by 2030. Thermal energy storage technologies are a piece of this puzzle as they can provide flexibility and balancing services to the electricity grid and therefore provide a cost-saving system integration solution by absorbing variable renewable electricity production (e.g. wind and solar energy).

In line with these objectives, BEST-Storage aims to demonstrate the potential of modular thermal energy storage concepts for residential applications. Three different high volumetric energy density storage concepts will be developed and tested in real conditions allowing to decouple power delivered (charging & discharging) and energy stored. This means that none of the storages have heat exchangers inside the vessel where energy is stored. Due to the decoupling of power and energy stored, the storage is inherently modular providing cost savings, flexibility in design, size and operation of a storage systems. In total, four storage solutions will be developed and tested at different TRL levels: one thermo-chemical material (TCM) storage, two PCM slurry solutions and one sensible water storage with vacuum insulation (VI).

Currently, the consortium of twelve partners spread across 6 countries has focused on the preliminary steps identifying promising technical configurations for the systems specifically in terms of modelling and materials evaluation. As a next step, their application to our 3 real demonstration sites located in Thessaloniki (Greece), Eibar (Spain) and Tartu (Estonia) will be assessed.

In parallel, work will be started on evaluating the potential for novel business models around peak load management and thermal energy storage in residential buildings. The BEST-Storage project is also in close cooperation with other Horizon Europe projects focused on thermal energy storage to share knowledge and experiences and benefit from synergies for dissemination and communication through the

organization of grouped events and workshops.

I hope you enjoy reading this newsletter and embark on this journey with us. We welcome any feedback and suggestions you might have to make the BEST-Storage newsletter more informative and useful to you.

Hugo Grasset

News from the Real Demo Sites

Eibar, Spain

- **Location:** Iñaki Goenaga, 5, 20600, Eibar, Gipuzkoa, Spain
- **Type of climate:** Eibar has an oceanic climate. Rain falls in every month of the year. The average annual temperature in Eibar is 16° and the average annual rainfall is 699 mm. It does not rain for 120 days per year, the average humidity is 78% and the UV Index is 4.
- **Type of building:** Industrial, research center
- **Technology involved:** PCM-emulsion slurry storage system will be based on oil in water emulsion system; Vacuum insulated (VI) water storage system; Advanced Control Algorithms
- **Demo responsible:** Giroa-Veolia



What has been done so far:

Up to the preparation of this document, the technological solution to be installed in order to carry out the project has been defined. To this end, we have analysed the chillers available on the market and selected the equipment to be installed. The main selection criteria have been:

- Preliminary sizing stated in the proposal stage.
- Availability of information from the manufacturer to be able to create an accurate mathematical model of the system.

On the other hand, the usual materials used in refrigeration installations have been analysed to find out if there are any technical limitations.

We have also made progress in the preliminary design of the installation, taking into account the real possibilities of the installation and even added the inclusion of the Newton Vacuum tanks not foreseen in the proposal phase of the project.

We are also working on the analysis and integration of signals in the cloud to be used by the project.

What are the next steps:

The next steps we are going to take in the installation of Tekniker is the visit to the facilities to define the layout and the necessary components for the final installation

of the equipment.

Definition of the necessary signals for the implementation of the monitoring and control system as well as the definition within the ontology of the Giroa-Veolia database.

Definition of the communication system and integration into SCADA and the cloud.

Find out more about Demo Sites

Tartu, Estonia

- **Location:** Tartu, Estonia
- **Type of climate:** Between maritime and continental climate
- **Type of building:** Single-family home
- **Technology involved:** TCM and vacuum storage
- **Demo responsible:** TREA



What has been done so far:

The first months have been mainly engaged in exchanging information. Initially, we found out what information we need to get from the owner of the house. The equipment to be created for the Estonian demo house is in the development stage and it is not yet quite certain what information is needed. To begin with, we have been looking for possible installation locations and sizes of devices. In addition, the drawings and parameters of existing devices are gathered and forwarded. We have received the current PV panels production (from year 2022) and excess electricity from the owner of the house

What are the next steps:

A more detailed description of the equipment should be revealed in the coming months. Then it is necessary to determine the installation requirements and possibilities of these devices. The vacuum storage device has a CE mark and its installation is simple. For the TCM device, it is necessary to find out more precisely its parameters and compliance with fire safety requirements. If panels are added to the roof, it is necessary to order roof strength calculations. Above all, it is important to ensure that the supplied equipment corresponds to our climate and can be

integrated into the existing system.

Find out more about Demo Sites

Thessaloniki, Greece

- **Location:** Thessaloniki, Greece
- **Type of climate:** Mediterranean
- **Type of building:** Two-floor residential household
- **Technology involved:**
 - Thermo-Chemical Energy Storage (TCM),
 - Vacuum Insulated Water Storage (VI)
- **Demo responsible:** Kyriakos Panopoulos



What has been done so far:

- Collection & Verification of demo infrastructure specifications
- Organization of a series of meetings targeted at the WP5 (DEMO) activities that CERTH leads.
- In the first meeting of the series the following were discussed:
 - Synergies/interactions between partners involved in the development of the systems and CERTH which owns the building.
 - Identification of systems that need to be installed on top of the existing infrastructure, TCM and VI (Solar thermal panels, heat/cold distribution devices such as Fan coils and/or 4-way ceiling cassettes)
 - Suggestion of different configurations and integration options to match the requirements optimally in terms of installation complexity, cost, size, and safety.
 - Identification of the operation scheme of the building and the changes that have to be done in its management system (BMS) in order to incorporate the TCM and VI.

What are the next steps:

- Creation of a detailed flowsheet with all the components that will be installed. This involves specifying the specific components, equipment, materials, and technologies that will be used in the infrastructure. Detailed design may include architectural drawings, engineering specifications, equipment lists, and construction plans.
- Permitting and regulatory compliance must be ensured for each new system installed.
- As part of the Task 3.5 “Development of an TCM storage adaptive control strategy for building integration”, that will be built into the implemented control interfaces.

Find out more about Demo Sites

Meetings, Events and Fairs

Best-Storage Kick-Off Meeting



On January 9th and 10th of this year, the partners of the Best-Storage project convened for their first in-person meeting at the Energy Renewable House in Brussels, Belgium. The consortium gathered to kick off the project and discuss the next steps to achieve the ambitious objectives of Best-Storage.

The meeting served as a platform for productive discussions and collaborative decision-making. The partners engaged in comprehensive deliberations on the project's management approaches, leveraging their collective expertise and diverse perspectives. The goal was to identify the most effective strategies to accomplish the objectives set forth by Best-Storage, align their efforts, and establish a strong foundation for future collaboration.

Bridge Initiative GA



From Tuesday, 28th to Thursday, 30th of April, BEST-Storage participated in the BRIDGE General Assembly. To develop a structured understanding of the cross-cutting problems that are encountered in the demonstration projects and may pose a barrier to innovation, the European Commission has launched the BRIDGE initiative. It brings together projects from Horizon 2020 and Horizon Europe that are focused on the smart grid, energy storage, islands, and digitalization. The BRIDGE process encourages ongoing knowledge sharing among projects, enabling them to speak with a single voice through four different Working Groups (WGs) when making recommendations for the future exploitation of the project results.

The assembly, organised by the BRIDGE Secretariat at Martin's Hotel, spanned three days. The first day featured a plenary session summarizing the work of the WGs and showcasing completed projects. The second day included a focus topic session and four parallel sessions moderated by the European Commission. The third day concluded with a plenary session presenting initiatives, completed projects, and discussions on future topics.

European Sustainable Energy Week 2023



From June 20th to 22nd, 2023, Brussels hosted the European Sustainable Energy Week, a significant event centered around renewables and energy efficiency. The event has served as a platform for fruitful discussions, fostering collaboration among industry experts, policymakers, researchers, and other stakeholders.

Best-Storage project has participated, with other related projects, by setting up a stand at the Charlemagne Building. This involvement presented an opportunity for Best-Storage to showcase its work to a diverse array of stakeholders and industry enthusiasts. The project's stand served as a hub of information allowing visitors to delve into the project's innovative research and advancements in energy storage.

News, Articles and Press Release

- Innovationnewsnetwork, "Sustainable heat pumps and storages for effective heating and cooling" ([available here](#))

Meet the Consortium



University of Applied Sciences and Arts
of Southern Switzerland

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