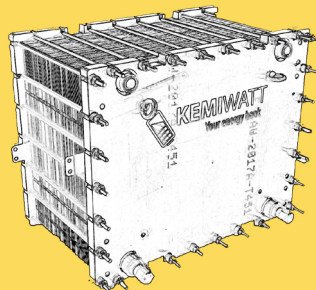


# HYBRIS

Enhanced Hybrid Storage Systems



<https://hybris-project.eu/>



@HybrisEU



/company/hybris-project



Funded by the  
European Union  
(Grant Agreement No. 963652)

**Batteries have a  
bad reputation.  
But batteries are  
evolving.**

## Meet HYBRIS

A new generation of battery-based hybrid storage solutions for smarter, sustainable and more energy efficient grids and behind-the-meter systems.



High-quality and technologically innovative batteries are key to reach the goals of the European Green Deal and contribute to the zero pollution ambition set in it. Not only can batteries now deliver better performance but they are becoming more cost-effective, sustainable and safe all along their entire life cycle.

Because of these improvements, advanced batteries are expected to play a major role in electricity grid management in systems with a high share of renewable electricity. While no single storage technology is able to serve all the high-energy and high-power needs of electrical grids and microgrids, a dual approach that combines more than one energy storage system can have an increased ability to optimise power/energy performances. In addition, innovative storage technologies can also perform multiple or bundled applications, such as a combination of load levelling, frequency regulation and backup power. These features allow microgrids to optimize their Distributed Energy Resources (DER) and balance frequency and voltage.

# A Dual System for Energy Storage

HYBRIS is an integrated, 3-year industrially driven action that brings together 15 partners from 6 European countries with the aim to develop a novel battery enabled hybrid storage system.

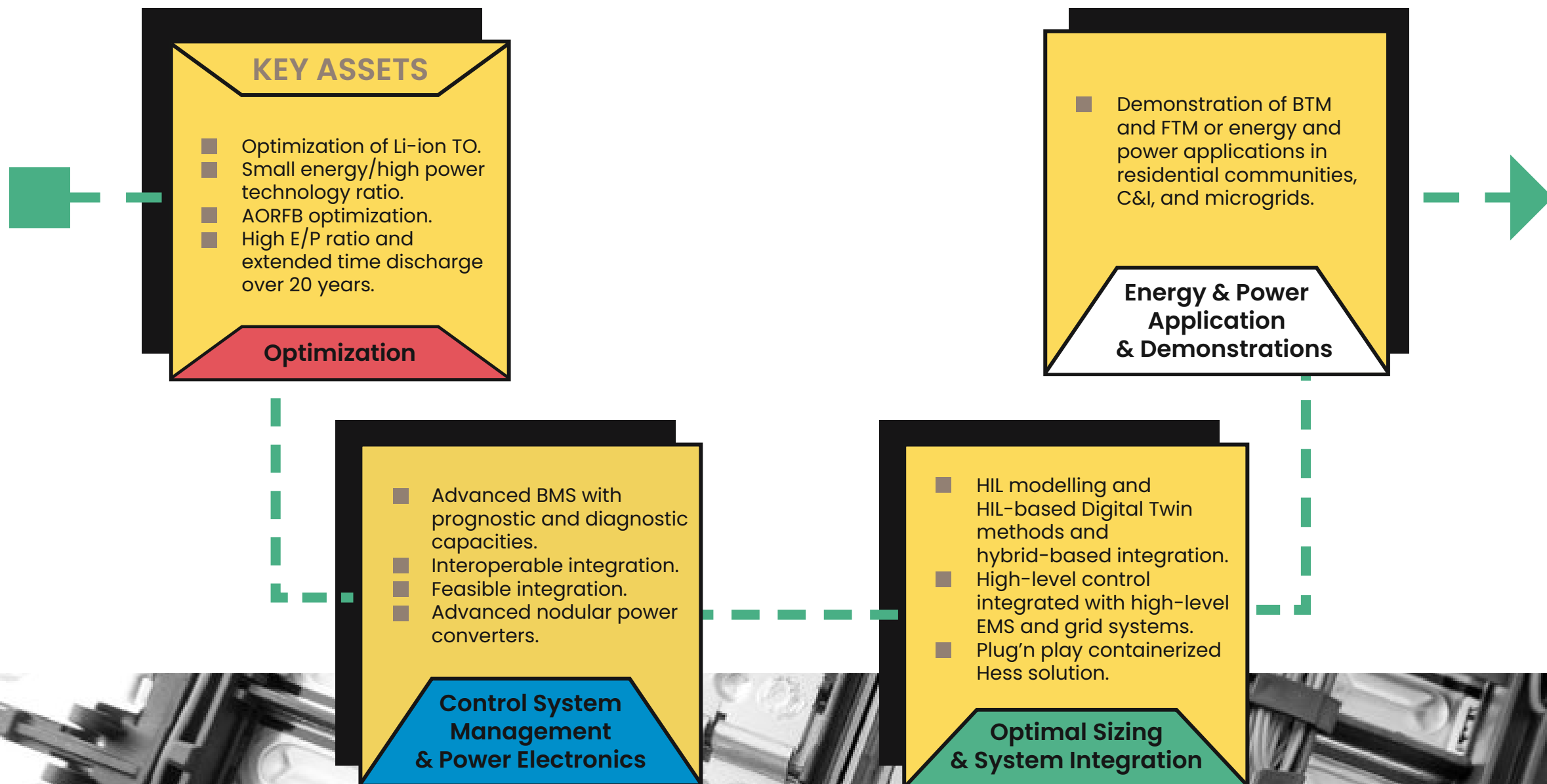
The novel Hybrid Energy Storage System (HESS) developed by our project is based on battery hybridization. HYBRIS will be twinning at system level two of the best energy storage technologies available: Lithium Titanate (LiTO), a high-power density component, and Aqueous Organic Redox Flow Batteries (AORFB), a high-energy storage component. These two technologies are coupled with the development of a breakthrough Battery Management System, Novel Power Electronics and an advanced Power Management System which is fully integrated with Energy Management Systems (EMS) and Grid Systems.

These innovations are the groundwork of an advanced hybrid storage solution for microgrid applications that is high-performing, cost-effective and environmentally-friendly. The project will validate its power and energy applications in both grid and behind-the-meter market segments through its three pilot sites, which will attend to each specific power and energy needs, response time and discharge time, covering applications from seconds to several hours.

## Did You Know?

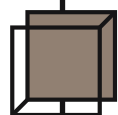
HYBRIS is aligned with the Integrated SET-Plan Action 7 which promotes the implementation of storage technologies to help increase the share of renewable energy sources and improve the flexibility and reliability of electrical grids.

# Key Assets

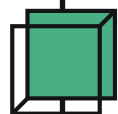




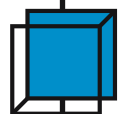
## The Impacts



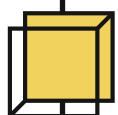
Increased competitiveness of electrical energy storage by balancing power needs with energy needs.



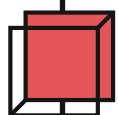
Providing a more efficient system with a longer and better performing lifespan with a Round Trip Efficiency (RTE) above 90% for LiTO and above 75% for AORFB, and expected lifetime above 12 years.



Optimizing balance-of-plant and installation costs with a reduction of 15-40 % in CAPEX and 20-40 % in OPEX.



Project results should put the energy storage cost on the path to fall below 0.05 €/kWh/cycle by 2030.

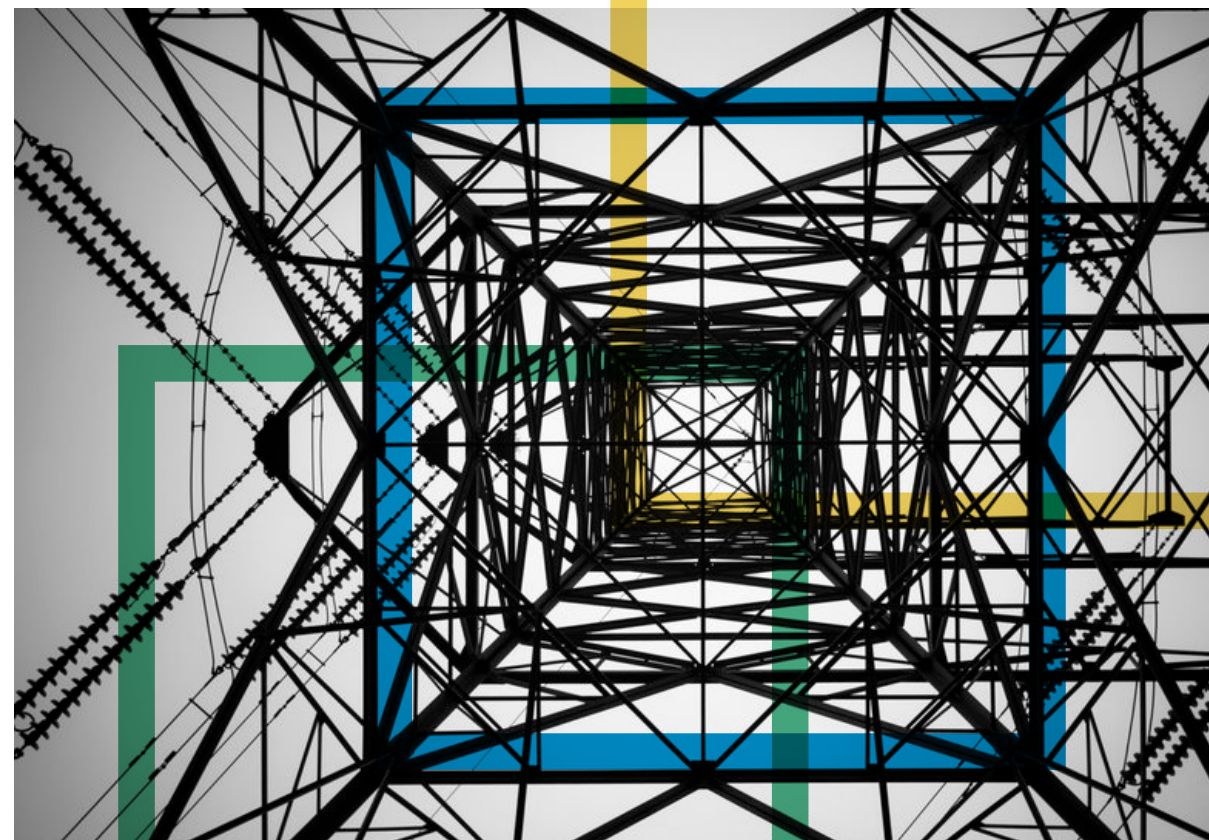


Replication potential validated via 3 pilot sites.

## Our Technologies

Energy storage systems are becoming a viable and sustainable solution in enhancing electric grid stability and supporting renewable energy use.

We are an ambitious project with a very simple and straight-forward approach: following a step-by-step development of our technology, from battery technology optimization to HESS enabled services deployment and demonstration, passing through optimal sizing, and system integration towards use case validation and demonstration.



# HESS Core Concept and Battery Technologies

We propose the combination of high power and fast response performant lithium ion battery based on LTO and an Aqueous Organic Redox Flow batteries, free of metals, as an environmentally friendly solution to be the energy supplier workhorse of this hybrid configuration.

This combination is producing the best economic case comparing with the efficiencies and economic values of each one of battery types, while prolonging the life expectancy for both types of batteries. Capex and stored kilowatt-hour cost are reduced and operative range is extended in terms of services offered, storage time, peak energy and power releasable, working temperature accepted.



Optimized LTO technology

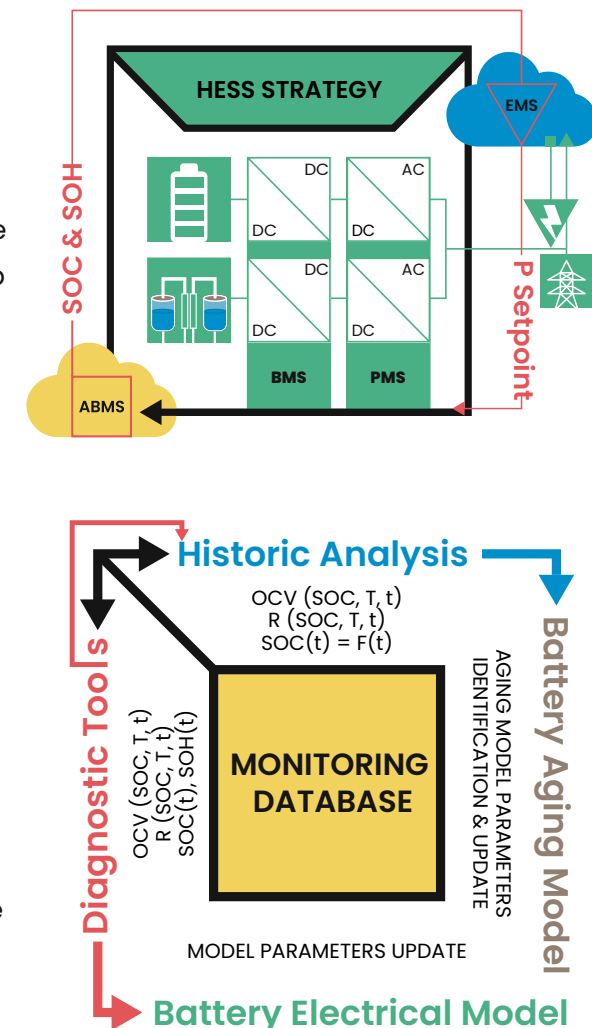


Optimized ORFB Technology

# Advanced Battery Management System and Power Electronics

Advanced Battery Management System (ABMS) is a diagnostic & prognostic solution for HESS health management supporting improved maintenance and optimal operation of the combination of ORF Li-ion Battery Energy Storage Systems (BESS).

Implemented in a server in the cloud, the Advanced BMS solution will benefit from more computational resources with the possibility to develop further complex storage system models. In addition, these diagnostic tools will advantageously help the HESS to detect potential BMS failures or errors. Moreover, in case of large HESS, the ABMS will be able to aggregate monitoring data from different BMS and thus achieve better battery state estimations. On the other side, to allow connection to the grid a conversion step is required, given that ESS operate in DC and the electrical network is AC. This is why batteries require of a DC/DC and a DC/AC for internal balance and control and deploying an optimal power converter is a key enabling technology within the whole integrated system of the Hybrid Energy Storage (HESS).

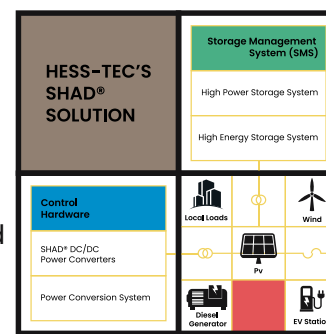


# Hybridisation: Optimal Sizing and System Integration

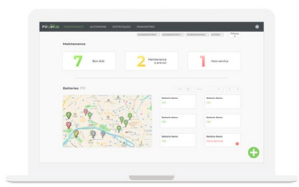
A set of technologies, tools and methods specifically designed for the integration of hybrid energy storage system. It includes the SHAD® integration technology package, the Power management system and the optimal sizing and validation by HIL (Hardware-in-the-loop) based Digital Twin.

## SHAD® integration technology package

This layer provides a real-time control capability to HYBRIS, considering an update real state of the assets, thanks to the hybridization algorithms included into the Power Management System (PMS) and implemented in a real-time HW and SW platform.



## Power management system



This implementation is based on an interactive method that minimizes oversizing due to possible deviations during the sizing process due to lack of information. It is based on two processes: Technology Modelling Process and Use Case Optimisation Process.

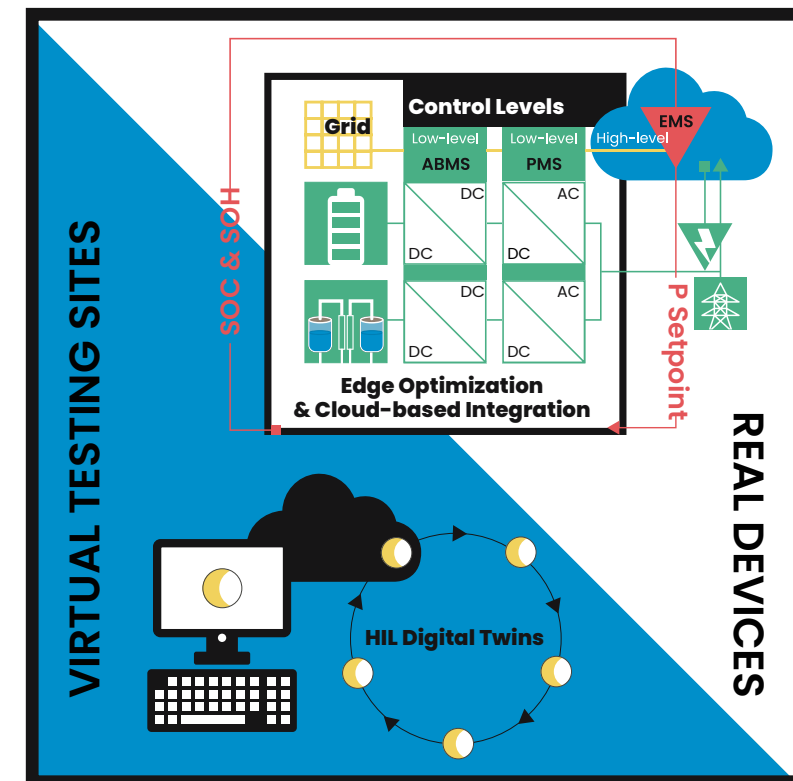
## Optimal sizing and validation by HIL based Digital Twin

The Digital Twin for HESS (DTH) technology is the extension of Typhoon HIL's (TH) modelling and signal processing functionalities. It supports the entire HESS system lifecycle.



# High Level Control & EMS / Replication

Our innovative, cloud-based Energy Management System (EMS) will centralise all the information and models to optimize the bids and assets handling. This enables a faster, real operation and better storage technology selection. By validating this overall high-level control in 3 different scenarios, the project will pave the way to optimize the HYBRIS system toward both power and energy applications targeting BTM and FTM segments.

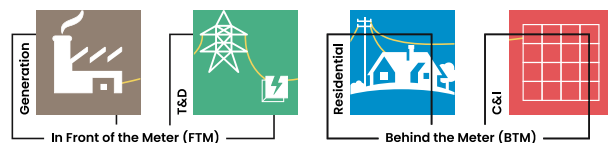




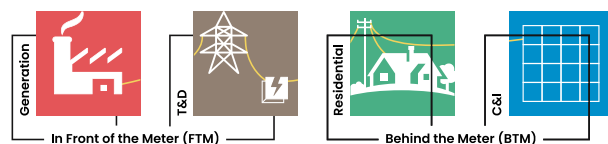
# Our Pilot Sites

In HYBRIS, these applications will be deployed in three high-impact pilot sites with high-replication potential. They are located in three different countries, each with a different use case application and representative business model.

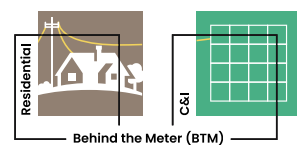
**Application Level 1** will explore individually the Residential and Commercial and Industrial.



**Application level 2** will explore the use of aggregated distributed energy resources in local microgrid.



**Application level 3** will enable the potential replication.



## Messina, Italy

**Partners:** SOLIDARITY AND ENERGY SPA – SAE

**Use Case Application:** Local residential energy community integrated in island grid

**Potential Outreach:** Local civic network (30+ entities), other national and international partners in the ASSIFERO and REVES networks. More than 100 photovoltaic plants in Sicily island (about 1 MW total power)



## Den Hague, Netherlands

**Partners:** 4YEF, ILECO

**Use Case Application:** Deployment of energy services in private grids (Business park)

**Potential Outreach:** Approx. 50-100 SME business parks across the Netherlands



## Brasschaat, Belgium

**Partners:** Quares, ILECO

**Use Case Application:** E-mobility hub with multipurpose EV charging with integrated PV generation

**Potential Outreach:** In total approx. 10-50 SME business parks across Belgium





# Discover who we are and how we will help build the electric grid of tomorrow.



HYBRID ENERGY STORAGE SOLUTIONS



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Member of the FLORES Network



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