FlexCHESS

Flexibility services based on Connected and interoperable Hybrid Energy Storage System

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FlexCHESS consortium prepares for the project's final review, presenting validated results across five European pilot sites

As the Horizon Europe-funded FlexCHESS project (Grant Agreement No. 101096946) approaches the end of its implementation period, the consortium is now preparing for the final review, during which partners will present the full body of evidence, results and impact generated across the project's technical, demonstration, dissemination and exploitation activities.

Coordinated since 2023 by a consortium bringing together academic, industrial and technology partners from across Europe and beyond, FlexCHESS set out to develop and validate "flexibility services based on a connected and interoperable Hybrid Energy Storage System" – an approach designed to allow heterogeneous, distributed energy resources to operate together as a single, coordinated Virtual Energy Storage System (VESS). As the project enters its closing phase, partners are now consolidating the technical, scientific and societal results that will be presented to the European Commission and independent reviewers.

Validated demonstration across five pilot sites

A central achievement of the project is the successful deployment and demonstration of the FlexCHESS solutions across five pilot sites in the United Kingdom, Slovenia, Spain, Italy and Türkiye, each addressing a distinct real-world context for flexibility provision:

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- Spain (Bullas, Murcia) – a renewable energy community pilot combining photovoltaic generation, storage and demand-response strategies to increase local self-consumption and stakeholder engagement;
- Italy – a multi-building pilot demonstrating coordinated flexibility across tertiary and residential assets;
- Slovenia – an electric vehicle and VESS integration pilot exploring smart charging and aggregated flexibility;
- United Kingdom – an industrial pilot simulating flexibility provision and demand response in energy-intensive processes;
- Türkiye – an island energy system pilot testing the scalability of the FlexCHESS approach under constrained grid conditions.

Across these five sites, the consortium has demonstrated more than five distinct use cases and engaged a broad base of stakeholders, in line with the project's original targets for replicability and scalability of the VESS concept. This demonstration activity has allowed FlexCHESS to reach Technology Readiness Level 7 (TRL 7), confirming that the system has been successfully demonstrated on real assets in operational environments – a key milestone for a research and innovation action of this scale.

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Core technical results

Beyond the pilot demonstrations, the final review will showcase a comprehensive set of technical outcomes developed throughout the project's work packages:

- Validation of the CHESS aggregation concept, enabling heterogeneous distributed energy resources – batteries, flywheels, electric vehicles and flexible loads – to be combined and operated as a single Virtual Energy Storage System;
- Delivery of the FlexCHESS open digital platform, integrating forecasting, digital twin modelling, decision-support tools, flexibility services and market participation functionalities within a single, interoperable environment;
- Development of the CHESS-plug, an affordable interoperability solution enabling existing appliances and storage assets to be connected and to participate in flexibility services without costly replacement;
- Demonstrated improvements in flexibility service performance, including measurable gains in load shifting, storage efficiency and the activation of market participation workflows;
- Integration of blockchain-based smart contracts to ensure transparent, secure and traceable reward mechanisms for flexibility providers;
- Development of replicable operational models for energy communities, tertiary buildings, industrial sites and island energy systems, supporting take-up beyond the original pilot contexts.

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From research results to market uptake

In parallel with the technical demonstration, Work Package 5 has advanced the project's exploitation strategy through the concept of the "FlexCHESS Factory": a proposed sustainable entity designed to carry the project's key results – the open platform, the digital twin, the CHESS-plug and the blockchain-based rewarding system – beyond the lifetime of the grant. Planned revenue streams include consultancy services, flexibility services, supply of the CHESS-plug, and certified training for operators, students and professionals, supported by business cases targeting CAPEX and OPEX reductions of over 25%, return on investment above 30% and payback periods of under four years.

Sustained dissemination and communication activity

Over the course of the project, the consortium has maintained an active dissemination and communication programme, including five newsletters distributed to subscribers across Europe and beyond, eight press releases and non-scientific articles, a dedicated project website, and a growing presence on social media. Scientific dissemination has included peer-reviewed publications and presentations at international conferences, while engagement with industrial and institutional stakeholders has been pursued through Open Living Labs, public webinars and multidisciplinary workshops organised around each pilot site and work package

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Looking ahead to the final review

The forthcoming final review will provide the consortium with the opportunity to present this full body of results to the European Commission and independent reviewers, and to demonstrate how the FlexCHESS approach – from the validated VESS concept to the open digital platform and the pilot demonstrations across five countries – contributes to the development of smarter, more flexible and more interoperable energy systems across Europe. The consortium will also use the review as a platform to set out its plans for the sustainability of project results through the FlexCHESS Factory and continued engagement with energy communities, industry and policymakers.

Further information on the FlexCHESS project, its partners and its results is available on the project website and through the consortium's social media channels.

About FlexCHESS

FlexCHESS ("Flexibility services based on Connected and interoperable Hybrid Energy Storage System") is a 36-month research and innovation project funded by the European Union's Horizon Europe programme under Grant Agreement No 101096946. Coordinated by Université d'Aix-Marseille (AMU), the consortium brings together ten partners — energy companies, utilities, research centres and universities — to improve the storage capacity and resilience of European smart grids through the Virtual Energy Storage System (VESS) concept, distributed ledger technology and a digital-twin platform.

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