



HORIZON CALL: CL5-2022-D3-01-Demonstration of innovative forms of storage and their successful operation and integration into innovative energy systems and grid architectures

[Back to projects' list](#)

SINNOGENES



Storage **INNO**ventions for **Green ENER**gy Systems

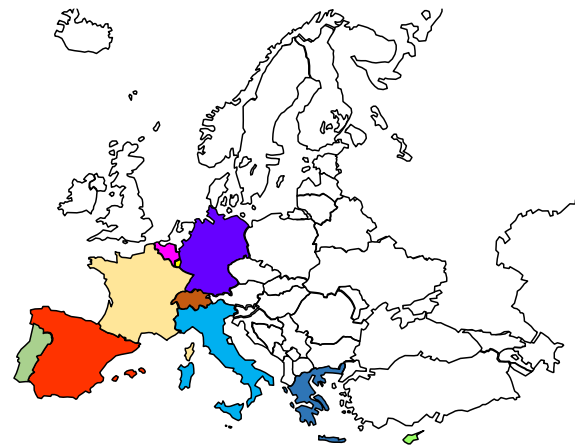
This project focuses on developing a complete framework of methodologies, tools and technologies (SINNO energy toolkit) that will assist the transition to clean energy by providing innovative energy storage solutions and flexible power generation while ensures the compatibility of systems and the standards of distributed energy storage for participation in flexibility markets.

From 2023	Project total cost	EU contribution	Website
To 2026	9 687 547.56	7 964 444.00	sinnogenes.eu

Technologies and services deployed

	Technologies for consumers	✓ Demand response
	Grid technologies	✓ Network management and control tools, micogrid
	Large-scale storage technologies	✓ Hydro-pump storage, thermal energy storage
	Distributed storage technologies	✓ EVs, batteries (Lithium-ion, Lead-acid Batteries, Redox flow batteries), flywheels, ultracapacitors
	Generation technologies	✓ Wind farms, PV plants, Power-to-Gas

Project partners' countries



Coordinator: UNISYSTEMS LUXEMBOURG SARL

UNISY (Luxembourg)

Other partners:

- UNISYSTEMS LUXEMBOURG SARL (Luxembourg)
 - UNI SYSTEMS SYSTMATA PLIROFORIKIS ANONYMI EMPORIKI ETAIRIA (Greece)
- UBITECH ENERGY (Belgium)
- ARTELYS (France)
- RINA CONSULTING SPA (Italy)
- FUNDACION CIRCE CENTRO DE INVESTIGACION DE RECURSOS Y CONSUMOS ENERGETICOS (Spain)
- FONDAZIONE BRUNO KESSLER (Italy)
- METAMIND INNOVATIONS IKE (Greece)
- CINTECH SOLUTIONS LTD (Cyprus)
- UNIVERSITA DEGLI STUDI DI GENOVA (Italy)
- CAPWATT, S.A. (Portugal)
- INESC TEC - INSTITUTO DE ENGENHARIADE SISTEMAS E COMPUTADORES, TECNOLOGIA E CIENCIA (Portugal)
- UNIVERSIDADE DO PORTO (Portugal)
- FUNDACION CARTIF (Spain)
- CENTRO DE INVESTIGACIONES ENERGETICAS, MEDIOAMBIENTALES Y TECNOLOGICAS-CIEMAT (Spain)
- INSTRUMENTACION Y COMPONENTES SA (Spain)
- FUNDACION PARA EL DESARROLLO DE LAS NUEVAS TECNOLOGIAS DEL HIDROGENO EN ARAGON (Spain)
- SCHNEIDER ELECTRIC ESPANA SA (Spain)
- DEUTSCHES ZENTRUM FUR LUFT - UND RAUMFAHRT EV (Germany)
- SANDDORN GMBH HERZBERG (Germany)
- DIACHEIRISTIS ELLINIKOU DIKTYOU DIANOMIS ELEKTRIKIS ENERGEIAS AE (Greece)
- INDEPENDENT POWER TRANSMISSION OPERATOR SA (Greece)
- ETHNIKO KAI KAPODISTRIAKO PANEPISTIMIO ATHINON (Greece)
- ETHNIKO KENTRO EREVNAS KAI TECHNOLOGIKIS ANAPTXYIS (Greece)
- Energy Web Stiftung (Energy Web Foundation) (Switzerland)
- TRANSPORTS PUBLICS GENEVOIS (Switzerland)
- UNIVERSITE DE GENEVE (Switzerland)
- Hitachi ABB Power Grids Ltd. (Switzerland)



Project Description

Context: In SINNOGENES participating 27 partners from Portugal, Spain, France, Belgium, Luxembourg, Germany, Greece, Italy, Cyprus and Switzerland. It includes 6 demonstration sites in 5 different European countries. The proposed energy toolkit (SINNO) will be tested in different environments and demand sectors.

Scope.

- SINNOGENES will demonstrate the operation of energy storage technologies in different concepts and architectures including: operation of hydro-pumped storage in an insular ecosystem, hybrid energy storage technologies in industrial microgrids coupled with local RES, and decarbonization of industrial processes with the help of PV plants.
- SINNOGENES will enhance the penetration rate of RES in different demand sectors across the EU. The innovative storage technologies will be coupled with local RES in industrial, urban, commercial, agricultural, and mobility demand sectors. Also, the coupling with other energy-carrier networks will test the flexibility potential of the various energy storage assets.
- SINNOGENES will provide a clear innovation by applying cutting-edge storage technologies in sectors where either are absent or inefficient to fulfil the business requirements. The project will consider the environmental and socioeconomic perspective of the new designs, so a dedicated Life Cycle Analysis (LCA) and Life Cost Analysis (LCC) will be conducted. The environmental and the economic benefits of the innovative storage technologies in the demonstrations setups will be compared with existing business-as-usual practices in the field of sustainable development and circular economy.
- SINNOGENES will ensure smooth integration with systems and standards to enable the participation in flexibility markets and the exploration of minimum requirements for participation in the markets both from a technical and market compatibility perspective. Interoperability with systems, such as connection to existing infrastructure of gas networks (electrolysers), utilization of heat-pumps to leverage the geothermal energy in existing well for efficient operation of district heating, optimization of existing hydro-pumped storage operation with new investment planning using digital twinning, is also considered.
- The SGAM architecture will be employed in the project, along with the standard, in order to analyse, formulate, and report the use cases that will be demonstrated in the pilot areas, contributing towards

the validation of the SINNO energy toolkit. Also, standards that are essential for the integration of the energy storage solutions with existing systems and devices in buildings, EV charging stations, industrial environments etc. will be considered.

- The project aims to reach high interoperability potential for all the storage technologies presented, in the respective demonstration environment, since in most pilot sites many energy vectors and storage technologies will be coordinated. At the project's final stage, in the replicability and scalability analysis, the interoperability aspect will be investigated also in other concepts, offering a pathway towards adoption in the EU.
- Two dedicated tasks in the SINNOGENES project investigate the technical and regulatory barriers, and the market compliance of the energy storage systems for participation in the flexibility markets. Also, the consumer engagement perspective is also considered, through the exploration of common practices used in previous projects. These will also be reported in the BRIDGE WG of consumer engagement.
- SINNOGENES has a dedicated Task in order to maintain a high level of engagement with BRIDGE activities throughout the project's lifecycle.

Technical description and implementation. The project focuses on harvesting the flexibility potential of assets existing in different levels of the energy system, in order to provide flexibility services to operators through the utilization of innovative storage technologies. SINNOGENES will exploit the benefits that each innovative storage technology offers, to provide a portfolio of flexibility services encapsulating the following aspects:

- Types of flexibility service: Peak-shaving, Fast Frequency, Regulation, black start, energy arbitrage, congestion relief, dynamic regulation
- Time horizon: Short-term (Intra-day, Real-time), Medium-term (Day-ahead to Week-ahead), Long-term (Planning)
- Procured by: Microgrid Operator, TSO and DSO
- Cross-energy carriers: electricity coupling with Heating and Cooling, and hydrogen.

Replicability: It is essential to replicate the SINNOGENES energy toolkit in as many geographies as possible, addressing different system needs, consumer segments and needs, economic conditions or different climates. Therefore, SINNOGENES will be fully tested in six (6) frontrunner demonstration campaigns in five (5) dispersed countries. In addition, in order to maximize the impact of

the project, thorough replication plans will be developed as a detailed Scalability and Replicability Analysis (SRA).

Impact:

SINNOGENES will have a serious impact in terms of economic, environmental and social benefits for European citizens, as well as for other stakeholders involved in the energy storage value chain (DSO, TSOs, LECs, etc.).

Social: SINNOGENES partners will work towards a broader cooperation of energy carriers (heat, hydrogen, electricity) contributing to EU climate targets while the flexibility services provided through the project will support the penetration of RES in the grid resulting in a direct reduction of CO₂ emissions. Furthermore, the innovative storage solutions proposed by SINNOGENES will support industrial consumers in reaching their environmental targets, it will offer easier access to self-consumption and will offer an easy and smooth integration and exchange of energy data for all types of stakeholders.

Economic: SINNOGENES work on innovative storage solutions will contribute to reducing their cost and enhancing their performance. Additionally, the technology stack will ensure interoperability among various storage solutions to facilitate the provision of flexibility services promoting SaaS business models.

Environment: SINNOGENES accelerates decarbonization of the EU electricity sector, contributing to the climate change mitigation targets set by the EU, by increasing the ability to efficiently utilize the flexibility of residential BESS, EVs, flywheels, ultracapacitors, power-to-heat and power-to-gas storage even at the edge of the distribution grid. The overall SINNOGENES technology package relieves the problems arising due to the stochastic nature of RES generation and enables the increase of the RES penetration rate in the EU energy mix. Consequently, the involved actors contribute towards the EU climate mitigation and adaptation goal, in line with the transition requirements for climate action highlighted by the Fit-for-55 package. Moreover, the SINNOGENES developed interfaces regarding the integration of hydrogen in existing electricity networks reduce natural gas consumption leading to lower CO₂ emissions.

Market Transformation: SINNOGENES will promote storage flexibility in the market, it will reduce energy costs for market participants and allow reduced RES curtailment. As a result, economic benefits will arise for the different actors in the energy value chain. Moreover, it will allow energy communities to become active agents in the energy sector by providing, for instance, flexibility to the DSO, while the blockchain-based green origins will lower the entry barriers for market participants increasing market liquidity.

Policy: The new electricity market design does not contain provisions regarding the energy storage facilities. This however has not been considered as a complication for the development of storage in the Member States, except in the case of large-scale projects such as pumped hydro or the exploitation of natural reservoirs. Moreover, energy taxation is also not addressed by the new market design, except for the requirement for network charges to not include costs supporting unrelated policy objectives. However, in 2019 the discussion on energy taxation has been reopened, with a European Commission communication and the evaluation of the Energy Taxation Directive (ETD). SINNOGENES will analyse the existing regulatory framework and disseminate the results of this analysis to the relevant policy makers providing feedback in the context of stakeholder consultation process.

