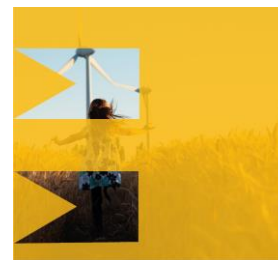


Greenet

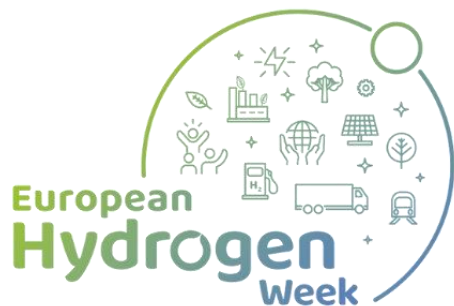


The network of Horizon Europe
Cluster 5 National Contact Point.



CENER

GRID INTEGRATION, STORAGE AND HYDROGEN DEPARTMENT



European Hydrogen Week 2024
GREENET Pitch session
TechForum, 19th November 2024



The GREENET project has received funding from the EU Horizon Europe programme under Grant Agreement No 101069604

Spanish National Renewable Energy Centre

Applied research in **renewable energies:**



Wind Energy



Biomass



Solar (PV and thermal)



Grid Integration, Electric Storage and Hydrogen



Energy in buildings

20 M€

Income

240

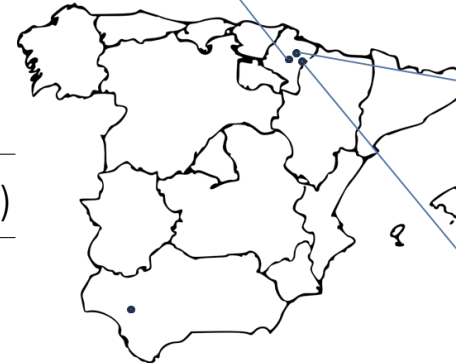
Staff employed

> 1000

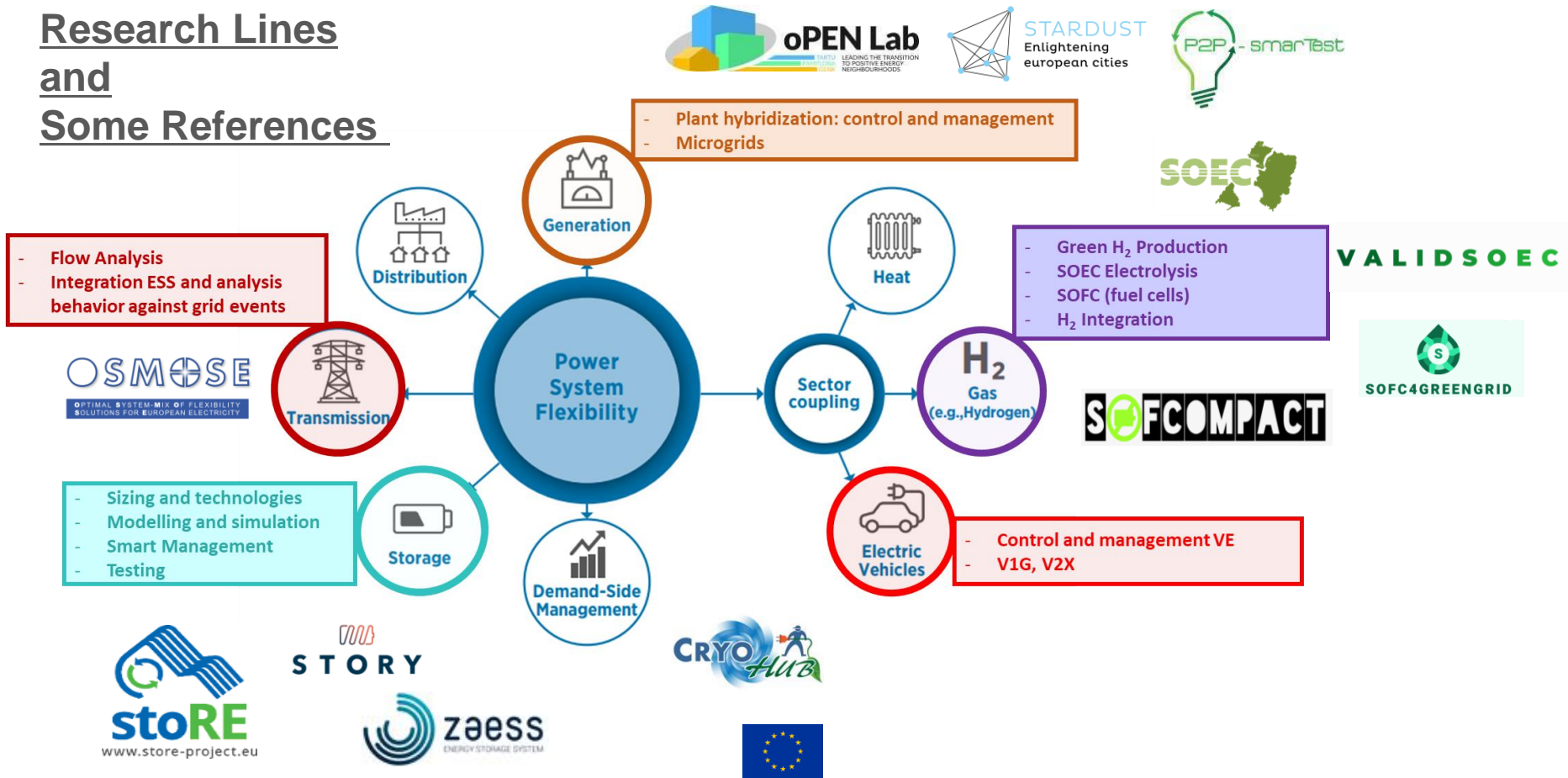
Clients around the world five continents

23

European projects in the last 5 years (17 ongoing)



Research Lines and Some References



Energy Management System for Hybrid Plants

- **Topic/area(s) to be addressed:** Operate with variable load and adequate flexibility to be coupled with renewable energy;
- **Specific contribution to the topic/área:**
 - Development of an **Energy Management System including hydrogen** (production and/or consumption) for optimal management of energy flows in plants with hybrid generation technologies and storage.
 - Design of management modules control/command equipment, communication protocols, operational simulation and tools (**Digital Twins**)
- **Technology profile & Experience:**
 - **EMS (Energy Management System)** capable of managing any installation that has renewable or conventional generation, as well as any storage technology on the AC side. This EMS integrates both the plant control and energy optimization algorithms of the available resources
 - Hardware in the Loop (**HIL**) and Software in the Loop (**SIL**) tools to simulate/modelling of coupling scenarios



Power Electronics Development

- **Topic/area(s) to be addressed:** improved balance of plant components to reduce parasitic losses and reduce cost when relevant in optimised electrical integration with renewables.
- **Specific contribution to the topic/área:**
 - Development of **specific power electronics for hydrogen devices (electrolysers, fuel cells).**
 - Deployment of **smart converter** in specific demos cases.
 - **Solid State Transformer (SST)** technology applied to electrolysers and fuel cells (e.g. SOEC, SOFC, rSOC)



– Technology profile & Experience:

- **Smart Converter:** designed for the management of microgrids (connected or isolated). It allows the integration in the DC part of any renewable generation source or storage systems, and as an input for a generator set.
- It also incorporates an **EMS (Plant Energy Management System)** capable of managing any installation that has renewable or conventional generation, as well as any storage technology on the AC side. This EMS integrates both the plant control and energy optimization algorithms of the available resources.

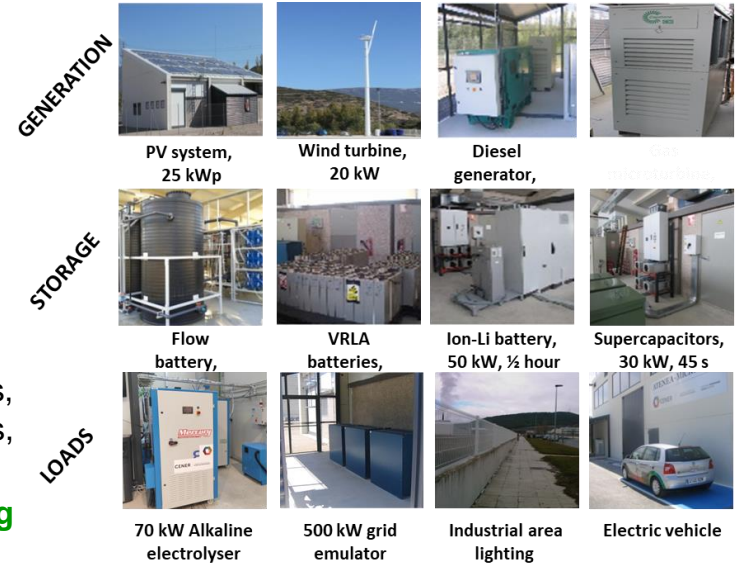
Prototype testing

– Topic/area(s) to be addressed:

- Operation with variable load and adequate flexibility to be coupled with renewable energy;
- MW scale direct coupling to renewable generation (both on- and off-grid) including offshore hydrogen production, aiming at identifying the best system configuration to reach competitiveness

– Specific contribution to the topic/área:

- **Testing of kW to MW size prototypes** (electrolyzers, batteries, etc) for improving coupling with RE; response to grid events, control and integration into EMS, etc.
- **Modelling/simulation of specific configuration integrating renewable energy**



– Technology profile & Experience:

- CENER owns a versatile **microgrid** (ATENEA), where different renewable energy production systems can be combined with conversion and electrochemical storage devices.
- **Grid emulator** (until 500kW), **Hardware in the Loop (HIL)** and **Software in the Loop (SIL)** tools to simulate/modelling of coupling scenarios

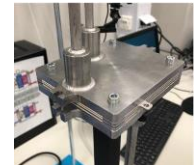
High Temperature electrolyser (SOEC) development

– Topic/area(s) to be addressed:

- SOEL (new stack designs and use of advanced manufacturing techniques).

– Specific contribution to the topic/área:

- **New electroactive materials** for electrolysers (SOEL) and Fuel Cells (SOFC)
- **New configurations/components for stacks and full systems.**
- CFD simulations of cells and stacks.
- Measuring stations from lab-scale (< 1 kW) to pre-commercial prototypes (2-5 kW).



– Technology profile & Experience:

- 300 m² **HyGrInLab space**: materials area; upscaling area; testing and Validation area;
- Inks & slurries formulation and production; lab-scale cell fabrication; structural and mechanical characterization; cell batch production (roll-to-roll); stack design & fabrication; cell & stack electrochemical testing.

Thank you very much

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