

The National Hydrogen Center (CNH2) has been dedicated to promoting the development and application of hydrogen technologies since its establishment in 2007.

It is a public consortium between the Ministry of Science, Innovation and Universities and the Regional Government of Castilla-La Mancha, with each holding a 50% stake, and its headquarters are located in Puertollano (Ciudad Real).

With a multidisciplinary and highly qualified team, CNH2 carries out research, engineering, consultancy, and regulatory development projects across all links of the hydrogen value chain, from production to end use.

www.cnh2.es



HYDROGEN STARTS HERE

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MICROGRIDS LABORATORY



The Microgrid Laboratory focuses on the development and testing of systems based on hydrogen technologies and their hybridization with other energy storage solutions, such as batteries and supercapacitors, integrating them into microgrids and smart grids.

AREAS

- ▶ **Microgrid Optimization:** Development and validation of Energy Management Systems (EMS), with integration into standard platforms and openness to Modbus-compatible solutions.
- ▶ **Power Electronics:** Real-time control using OPAL-RT platforms integrated with MATLAB/Simulink.
- ▶ **Interoperability:** Infrastructure at various scales (1 kW, 30 kW, and 90 kW).
- ▶ **Power Hardware-in-the-Loop (HIL):** Using grid emulators integrated into the OPAL-RT platform.

SERVICES

- ▶ **Testing and Validation**
- ▶ **Predictive Control**
- ▶ **Rapid Prototyping**
- ▶ **Power Hardware-in-the-Loop Emulation**
- ▶ **Development of Optimization Algorithms and Power Electronics**

EQUIPMENT

EXPERIMENTAL MICROGRID I

- ▶ Microgrid integrated on a 24 V DC bus, operable either in island mode or connected to the grid via a 2 kW bidirectional inverter.
- ▶ PEM electrolyzer and fuel cell of 1 kW, with hydrogen storage in metal hydrides.
- ▶ Electrical storage systems consisting of gel batteries (24 V, 1,110 Ah).
- ▶ Renewable energy generation systems, including an 800 W mini wind turbine and a 3 kWp photovoltaic array.



Batteries, Supercapacitors, HIL Equipment, and Loads



EXPERIMENTAL MICROGRID II

90 kW and 30 kW grid emulators; 5 kW PEM electrolyzer and PEM fuel cell with H₂ storage at 200 bar; 30 kW supercapacitors (714 Wh); 30 kW lithium-ion batteries (38.8 kWh); 30 kW wind energy emulator; and power electronics capable of integrating electrolyzers up to 30 kW (20–230 V DC, 0–600 A) and fuel cells up to 15 kW (20–170 V DC, 0–400 A).

OTHER EQUIPMENT

Magna Power programmable DC source (0–375 V DC, 0–117 A, 45 kW, solar emulator); California Instruments MX45 programmable AC/DC source, 45 kVA/30 kW (grid emulator); and programmable AC/DC loads, 48.9 kVA.