

NATIONAL RENEWABLE ENERGY CENTRE

The National Center of Renewable Energies (CENER) is a cutting-edge technological center dedicated to the investigation, development and promotion of renewable energies inside and out of Spain.

CENER offers a wide range of services and investigation applied to the needs of companies, organisms and institutions. It specializes in direct application investigation, development on demand and innovation (R&D+) and its objective is to provide a high added value to its clients.

It has six areas of activity: wind energy, photovoltaic solar and thermal solar power, biomass, bioclimatic and electronic power architecture and accumulation of energy. CENER also has laboratories and installations dotted with the most innovative of systems making it a center of reference on a European level.

CENER participates in key R&D lines, carries out studies and energetic audits, elaborates regulating standards, transfers technology and leads training programs. It is also a member of various Normalization Committees.



RENEWABLE ENERGIES GRID INTEGRATION DEPARTMENT

The main objective of the Renewable Energies Grid Integration Department is to research and develop systems that permit a wider and better integration of renewable in the electricity network.

The department analyzes issues that could lead to an increase of renewable energies in the energy mix, proposing measures to a better integration of them in the network including storage systems, that permit an appropriate management of the electricity network.



Activities:

Technical assistance in the following:

- High Voltage.
- Grid Integration.
- Energy Storage.

The Department forms part of:

■ Asociación Española de Hidrógeno (AeH2) [Spanish Hydrogen Association].

■ AEN/CTN 181 "Tecnologías de Hidrógeno" (Hydrogen Technologies) for normalisation, particularly in GTB activities. Hydrogen generation through electrolysis processes.

■ Plataforma Tecnológica Española del Hidrógeno y las Pilas de combustible (Spanish Technological Platform for Hydrogen and Fuel Batteries). Estrategia y Planificación, Subgrupo Producción Hidrógeno mediante Electrólisis) (Group for Strategy and Planning, Subgroup for Hydrogen Production through Electrolysis).

■ Red Española de Pilas de Combustible, Hidrógeno y Baterías Avanzadas (Spanish Network for Fuel, Hydrogen and Advanced Batteries), which depends on MEC-CSIC (Spanish Ministry for Education and Science and the Centre for Scientific Investigation), in the area of Production of Hydrogen from Wind Energy.

■ Grupo de Aplicaciones y Grupo de Redes de la Red Científico Tecnológica del

Sector Edificio (Reoltec) de la AEE (the AEE's Applications Group and the Technological and Scientific Network for the Wind Energy Sector) (Reoltec).

■ CIGRÉ (W/G B4.39 integration of Large Scale Wind Power with HVDC and Power Electronics) for the integration of wind energy in the distribution network through the use of high voltage applications in constant current and electronics.

■ European Power Electronics Association (EPE).

■ IEEE/PES Working Group on the Lightning Performance of Distribution Lines.

■ IEEE/PES Working Group on the Lightning Performance of Transmission Lines.

■ Various members of the team are expert evaluators for R&D + i for the European Commission and ANEP (National Agency for Evaluation and Prospective), which depends on the Spanish Ministry for Education and Science (MEC).

ELECTROCHEMICAL LABORATORY



This laboratory is specialised in the electrochemical process, for which it has a Parstat 2273 potentiostat and a KEPCO/PAR booster (BOP 20-20M model).

Electrochemical characterisation is performed for electro components, such as polymeric membranes, MEA, electrodes, etc. An analysis is subsequently performed on the response and the capacity of the electro prototypes for various watts connected to renewable energy systems that have been designed and produced in the centre.



LABORATORY FOR THE INTEGRATION OF RENEWABLE ENERGY AND HYDROGEN

Measurements are taken of characterisation and performance of electrolyzers. Trials are performed of control systems and electronic capacity adapted to electrolyser - renewable energy systems, as well as hydrogen conversion systems where necessary.

This laboratory is divided into two; one section is used to perform tests and the study of hydrogen handling with maximum security, as required by ATEX for work with explosive material, and the other section of the laboratory is used to monitor such trials.

A 1 Nm³/h alkaline electrolyser connected to a converter is capable of simulating the generation of electricity from a renewable source, allowing the study of the operation of the full system of equipment connected to renewable sources, such as a wind energy.



ELECTRONICS LABORATORY

This laboratory is used for the analysis and development of converters with various applications within the sphere of renewable energy.

The laboratory also has the necessary equipment to record, analyse and simulate the performance of wind energy installations under the various situations that could arise in the network.

The equipment in the electronics laboratory is complemented with a test bench where it is possible to simulate the performance of wind turbine technologies and their interaction with the network, mainly in the face of disruptions, as well as R&D activities relating to the accumulation of kWts produced in wind turbine.



HIGH VOLTAGE

The studies and consultancy services on lightning protection in power installations, as for example in wind mills.

This service provides technical assistance in the following areas:

- Analysis the risk of the installations against lightning discharge according EC regulation.

■ Design new concepts of lightning protection systems including grounding system.

■ Systems to prevent lightning discharges using field measures and simulation tools.

GRID INTEGRATION

This area resolves the problems derived from the integration of renewable energy in the electricity network, combining theoretical studies (through simulations) and field tests (no measurements) analysis the performance of the wind turbine and the wind mills in the face of transients phenomena and particularly during voltage dips.

This service provides technical assistance in the following:

■ Study of the performance of equipment during voltage, dips, particularly:

Tests

Simulations using specific software.

■ Embed Generation.

■ HVDC applications in wind farms.

■ Dynamic simulation and steady - state analysis using specific software.

ENERGY ACCUMULATION

The main objective of this area is to develop storage systems that allow further integration of renewable energy within the generation mix.

Work is currently performed using the hydrogen vector as the storage system for energy, produced through the electrolysis of water from renewable sources, which results in green [renewable] hydrogen. Other systems are also investigated such as flow batteries.

This service provides technical assistance in the following areas:

■ Improvements in the integration of renewable energy, using hydrogen as an storage energy system.

■ Production of hydrogen through electrolysis from wind energy and the conversion of hydrogen to electricity.

Modelling of electrochemical systems: electrolyzers, fuel cells, etc.

Modelling of alternative conversion systems (turbines, motors, etc).

Dimensioning of installations necessary for the integration of hydrogen in wind farms.

■ Use of hydrogen in residential applications. Dimensioning of the installations necessary to integrate hydrogen in buildings



DEPARTAMENTO DE INTEGRACIÓN EN RED DE ENERGÍAS RENOVABLES



estamos construyendo el futuro

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