



UNIVERSITAT POLITÈCNICA
DE CATALUNYA
BARCELONATECH



[ENERGY]

RESEARCH, DEVELOPMENT & INNOVATION AT THE UNIVERSITAT POLITÈCNICA DE CATALUNYA - BARCELONATECH (UPC)

The Universitat Politècnica de Catalunya - BarcelonaTech (UPC) specialises in the fields of engineering, architecture, science, and technology, including technologies applied to energy. In this field, the main focus areas are:

Production

- Photovoltaic energy
- Hydropower energy
- Wind energy
- Bioenergy & biofuels
- Solar thermal energy
- Ocean energy
- Geothermal energy
- Nuclear energy & safety

Distribution and consumption

- Energy efficiency in industry
- Electric vehicles
- Consumers - smart grids
- Energy efficiency in buildings
- Fuel cells & hydrogen

As a result of the UPC's recognized research track record in its areas of specialization, we can offer a wide range of services:

- R&D technology transfer projects
- Consortiums for national and Horizon Europe projects
- Patents
- Technology assessment
- Specialized facilities

The UPC is a leading university in Spain in volume of research and technology transfer to companies. It has become one of the major hubs of knowledge in Southern Europe.

[PRODUCTION]

PHOTOVOLTAIC ENERGY

- Photovoltaic reconfigurable systems for energy
- Modular power conversion architectures
- Grid-connected photovoltaic systems
- Modelling and control of PV inverters and converters
- Refrigeration and thermal management of PVpanels
- Hybridization of PV power facilities with other energy sources



HYDROPOWER ENERGY

- Vibration analysis and diagnostics in machinery
- Predictive maintenance
- Advanced monitoring and damage detection
- Structural dynamics, effects of fluid on structural response
- Experimental and numerical investigation of cavitating flows
- Numerical simulation in turbulent flows
- Hydropower plant performance
- Production analysis of mini hydropower plants

WIND ENERGY

- Transmission systems for offshore wind power plants
- Analysis and design of advanced controllers for wind turbines
- Analysis of harmonics flow in wind power plants and design of mitigation measures
- Analysis of the performance of wind power plants
- Design of mini-wind generators
- Wind turbine blade virtual wind tunnel



[PRODUCTION]

BIOENERGY & BIOFUELS

- Microbial fuel cells in constructed wetlands
- Biofuel production from algal biomass
- Low-cost anaerobic digesters
- Hydrogen production from biomass

SOLAR THERMAL ENERGY

- Integration of solar ponds: energy storage and energy production
- Solar collectors using transparent insulation materials (TIM)
- Receivers in concentrating solar power plants
- Thermal storage in concentrating solar power plants
- Grid integration of solar power



GEOTHERMAL ENERGY

- Very low enthalpy geothermal energy (up to 30°C)
- Low enthalpy geothermal energy (from 30°C to 90°C)
- Medium enthalpy geothermal energy (from 90°C to 150°C)

NUCLEAR ENERGY & SAFETY

- Nuclear safety. Probabilistic risk assessment
- Nuclear instrumentation
- Nuclear power plants
- Nuclear fusion reactors
- Nuclear waste characterization



OCEAN ENERGY

- Wave energy resource assessment
- Wave energy balance in wave models
- Testing of wave energy capture devices
- Optimization of buoy geometry design
- Fluid-structure interaction for buoys and waves
- Overtopping devices



[DISTRIBUTION & CONSUMPTION]

ENERGY EFFICIENCY IN INDUSTRY

- Saving energy through design
- Integration and intensification of processes
- Integration and circular economy in chemical processes
- Energy storage systems (heat storage tanks and accumulators, thermochemical storage)
- Heat recovery and alternative heating
- Heat exchangers

ELECTRIC VEHICLES

- Intelligent management of EV
- Modelling EV battery aging for second life business models
- Cooling of batteries
- Electric traction and mechatronics for EV
- Energy efficiency, industrial electronics and high voltage systems for EV
- Design of charging stations

CONSUMERS - SMART GRIDS

- Smart grid architecture and big data
- Power systems design
- Power electronics and mechatronics
- Electrical power conversion and AC/DC grids
- Integration of new power sources: renewable power
- Study of demand response management schemes
- Advanced control of electrical systems

ENERGY EFFICIENCY IN BUILDINGS

- Bioclimatic architecture
- Energy-efficient illumination systems
- Building envelope, building insulation technologies
- Building energy management solutions



FUEL CELLS & HYDROGEN

- Modelling and control of systems based on proton exchange membrane fuel cell-based systems
- Fuel cell control laboratory, modelling and experimental characterisation
- Fuel cell efficiency and durability analysis
- Ethanol reformers for hydrogen production
- Fuel cell systems controller design
- Integration of fuel cells into vehicles
- Catalytic and photocatalytic hydrogen production as fuel for fuel cells



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Generalitat de Catalunya
Departament de Recerca i Universitats
Secretaria General