ALMA MATER STUDIORUM
UNIVERSITÀ DI BOLOGNA

RENEWABLE ENERGY

The development of the most impactful technologies enabling the accomplishment of a low-carbon energy society is one of the main drivers of contemporary research in the area of energy.

Research at the University of Bologna on Renewable Energy regards the development of models and techniques to foster the inclusion of RES into energy systems (electric, thermal, etc.).

Renewable Energy integration into Energy Systems: Advanced monitoring and control solutions of stability in electric networks with large penetration of RES; Development of advanced electrochemical storage systems for energy systems with large penetration of RES; Development of technologies and components that support enhanced integration of renewables and storage combined with intelligent control of the power flow; Design and optimization of cogeneration and trigeneration systems based on RES; Exploitation of advanced communication networks for fostering RES penetration into the electric grid; Integration of ground source heat pump and of aquifer thermal energy storage with groundwater and soil remediation.

Onshore & Off-shore Wind: Models for environmental and economic evaluation of **wind turbines**; Modelling and simulation of **airborne wind energy converters**; Design and techno-economic analysis of **multi-purpose offshore platforms** for marine renewable energy harvesting.

Ocean energy: Design of wave energy converters for **combined energy production and coastal protection** purposes; Design, manufacturing and testing of **all-polymer wave energy converters** with high performance and low cost.

Geothermal energy: Characterization of **geothermal reservoirs** for the climatization by **heat pumps**; Numerical simulation of **reservoirs, aquifers and geothermal fields**; Design and simulation of ground heat exchangers (shallow geothermics); Geochemical survey on **thermal waters and gas discharges** in geothermal sites; Dynamic simulation and optimization of **vertical ground heat exchangers and of heat pump** systems; Design and technoeconomic analysis of geothermal heat pumps.

Next generation of solar photovoltaics (PVs): Manufacturing of flexible **organic photovoltaic cells**; Manufacturing and characterization of **polythiophene based photovoltaic** devices; Manufacturing and characterization of **germanium thin film photovoltaic** devices; Defect characterization of **silicon** (crystalline, multi and nano-crystalline, amorphous) for PV applications; Technoeconomic analysis of **thermophotovoltaic systems**.

HIGHLIGHTS

European Projects:

LEAP-RE - *Long-Term Joint EU-AU Research and Innovation Partnership on Renewable Energy H2020*

Hybrid-BioVGE - *Hybrid Variable Geometry Ejector Cooling and Heating System for Buildings Driven by Solar and Biomass Heat H2020*

GEOT€CH - *Geothermal Technology for €conomic Cooling and Heating* H2020

MERMAID - *Innovative Multi-purpose Offshore Platforms: planning* H2020

CORES - *Components for Ocean Renewable Energy Systems* FP7