

Researchers design and patent a low-cost offshore wind turbine

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Researcher Climent Molins of the UPC's Department of Civil and Environmental Engineering with his prototype floating structure for offshore wind turbines.

Researchers at the Department of Civil and Environmental Engineering

of the Universitat Politècnica de Catalunya (UPC) have designed and patented a floating platform for offshore wind turbines that can reduce energy costs to 12 euro cents per kilowatt hour (kWh) through a more efficient design and cheaper building materials.

Researchers Climent Molins and Alexis Campos, of the UPC's Department of Civil and Environmental Engineering, have developed a model of a floating structure for [offshore wind turbines](#) anchored at great sea depths that makes them competitive through cost savings in construction and maintenance.

The prototype, WindCrete, is a cylindrical structure with a large float and a ballast base that makes it self-stabilising. According to the researchers, who belong to the Barcelona School of Civil Engineering, the main innovations of this model compared to similar ones on the market are the seamless, monolithic structure and the use of concrete for its construction.

By using concrete instead of the more expensive steel that has been used previously, the construction cost is reduced by 60%. In addition, concrete is more resistant in the marine environment, so the structure has fewer maintenance requirements and a life of about 50 years. The absence of joints in the platform increases its durability against the effects of wind and sea and avoids the damage that normally appears in transition areas.

Cheaper energy and easier installation

The WindCrete includes a 5-megawatt (MW) wind turbine that can carry rotors of up to 15 MW with a minimum increase in the cost, making it far more economical. The new system reduces the cost of wind energy to 12 cents per kilowatt hour (kWh). This is half the price per kWh of this type of energy (about 24 cents) in the Canary Islands, one of the regions

where wind power is to be promoted. Given the long useful life of this prototype, the possibility of replacing the turbine with a more powerful and more profitable one has been considered.

Partially submerged offshore platforms of this type require a minimum depth: 90 m in the case of WindCrete. However, there is no technical maximum depth at which they can be installed. In the Gulf of Mexico, for example, there are oil platforms of this type anchored at depths of up to 2300 m.

European project

The prototype was developed within the framework of the European project "Alternative floating offshore substructure for offshore wind farms" (AFOSP) (www.kic-innoenergy.com/innovation-projects/afosp/), which is carried out in the framework of KIC-InnoEnergy in collaboration with Stuttgart Wind Energy at the University of Stuttgart and Gas Natural Fenosa. A preliminary design was carried out to ensure technical and economic feasibility. In order to check the behaviour of the platform and its anchoring system in an environment that simulates the sea, trials were also carried out in the wave flume of the UPC's Maritime Engineering Laboratory (LIM), using a WindCrete prototype with a scale of 1:100.

References in a report from the Scottish government

The WindCrete model was included in a report by the Carbon Trust association of experts in sustainability and energy published by the Scottish government on the current state of floating [wind](#) technology. The study specifically examines key trends in this technology, costs, and barriers to commercialisation based on the analysis of 18 models that are currently on the market.

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