Super wind turbines represent a major technological breakthrough

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Credit: Tecnalia

Harnessing the wind's energy is the objective of a new project, which aims to provide an important breakthrough in offshore wind industrial solutions.

The EU-funded project, called SUPRAPOWER, is working on a more powerful, reliable and lightweight superconducting offshore wind turbine. The four-year project has the expertise of nine European partners from industry and science under the coordination of Tecnalia in Spain.

The SUPRAPOWER team believes that current turbines need new solutions to provide better power scalability, weight reduction and

reliability. This is because their enormous size and weight drives up the cost of both fixed and floating foundations, as well as operation and maintenance (O&M) costs. Manufacturers have been focusing on ways to reduce the O&M costs of wind turbines for some time.

This is where the team at Technalia think they may have the edge by means of superconduction. They see this as the way forward in building an efficient, robust, and compact wind power plant with a 10 MW superconducting generator. This will contribute to substantial savings on energy and raw materials, and extend the service life of the turbine.

Indeed, superconductivity is an area in which one of the project's collaborators, the Cryogenic Engineering Division at the Karlsruhe Institute of Technology (KIT), is focusing on. Researchers specialised in technical physics are working on ways to ensure that the superconducting generator can run efficiently by developing a rotating cryostat which can cool the superconducting coils down to minus 253 °C. This temperature is crucial for ensuring that the electric current flows without resistance. Below a certain temperature, superconductors have no electrical resistance and conduct electricity without loss.

Dr Holger Neumann, head of the Cryogenic Engineering Division, explains further: 'Since the cooling performance of such coolers is limited, we must ensure that heat between them and the superconducting coils is conducted well. Besides, we must consider the influence of rotation on the heat pipes we may use. On the other hand, the cryostat needs a highly effective thermal insulation.'

Project coordinador, Iker Marino Bilbao from Technalia's Energy and Environmental Division, adds, 'Our main objectives for the first year is to validate the modular rotating cryostat concept. We will then produce a conceptual design of the superconducting scale generator. As well as design, construct, and test superconducting dummy coils for the

construction of generator (500 kW scale generator) coils in 2014. These will be tested at the laboratory.'

Accordingly, their breakthrough solutions promise to reduce turbine head mass and overall size which, in turn, will reduce turbine manufacturing cost by 30 %.

Wind power is expected to make a major contribution in turning around inefficient energy across Europe. The EU has set a target to cut its emissions to 20 % below 1990 levels as part of efforts to dramatically reduce greenhouse gas emissions and enhance energy security.

More information: SUPRAPOWER www.suprapower-fp7.eu/
Tecnalia www.tecnalia.com/en

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