

A New Laboratory for Wind Energy Testing Facilities in NCREE

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The development of offshore wind power has reached maturity in Europe. However, due to Taiwan's geological and geographic condition, Taiwan faces more challenges in the development of offshore wind power as it has to consider the impact of multiple natural hazards such as earthquakes and typhoons. Therefore, the National Science and Technology Council project entitled "Smart Disaster Prevention Platforms for Supporting Structures of Offshore Wind Turbines (OWT)" was proposed by the National Center for Research on Earthquake Engineering (NCREE). The mission of this project is to construct a new laboratory for the testing and V&V of OWT infrastructures. A long-term monitoring system for the OWT and west coast under seismic motion could also be developed for a new seismic hazard map. In this regard, the new laboratory aims to feature two major testbeds:

The first testbed is a 500 g-ton geotechnical centrifuge with a 1D shaker for scale physical model tests in simulating high confining pressure in depths and earthquake excitation, as shown in Figure 1. The silty sand or silty clay, which differs from the soil property in Europe, and is prone to earthquake-induced liquefaction, comprises the typical soil type on the seabed of southwestern Taiwan offshore. Therefore, the foundation design of offshore wind turbines is oftentimes overly conservative and needs remedy to reduce project costs and operational risks. The geotechnical centrifuge can also be used for studies of submarine pipelines, earthen dams, slope stability, ground subsidence, etc.



Figure 1. Geotechnical Centrifuge System.

The second testbed serves as an R&D initiative for rotor blades in static, dynamic, and fatigue testing of both onshore and offshore turbines, which helps the advancement of the design/analysis and manufacturing chain in Taiwan from small to large turbines, as shown in Figure 2. The reaction wall and strong floor system will also be designed to be flexible to be utilized for testing long steel supporting structures as well.

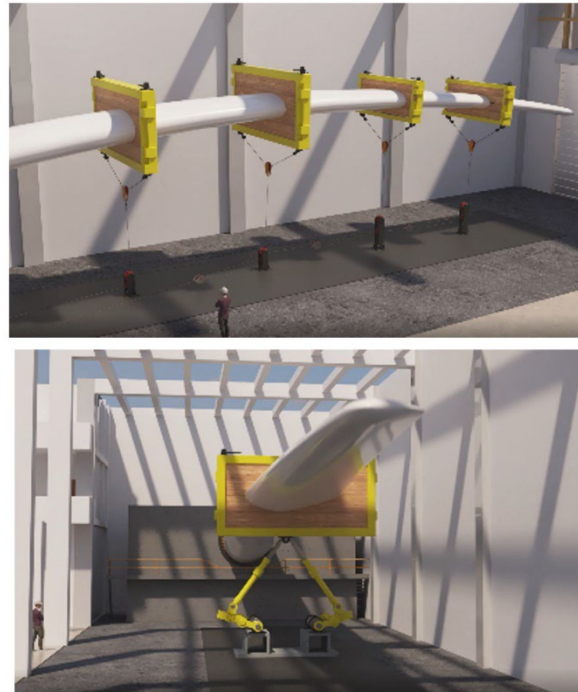


Figure 2. Multi-functional Testing System.

The NCREE Wind Energy Laboratory is projected to be completed by the end of 2027. The laboratory is expected to become a major thrust for Taiwan to engage in international and industrial collaborations in design, analysis, monitoring, and advanced testing technology development related to OWTs.