SATU Presidents' Forum
of Southeast and South Asia and Taiwan Universities
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2016 SATU Joint Research Scheme Program

NCKU Application Form

Date: 2016 / 04 / 25 (year /month/day)

1. Hosting Center/College

International Wave Dynamics Research Center / Tainan Hydraulics Laboratory

2. Project Title

Combined wind, wave and current loadings on fixed and floating offshore wind turbines

3. Principal Investigator

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4. Co- Principal Investigator from the same unit– If any

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5. Project Details

Project Description	**Introduction** Taiwan's Bureau of Energy plans to increase the percentage of renewable energy from 7.7% in 2009 to 11.2% in 2015, and make further efforts to reach 15.1% in 2025. The percentage in wind power for the previous goal is 0.8% in 2009, 3.4% in 2015, and reaching 5.3% in 2025. Wind power is expected to become the fastest growing and highest occupying among all renewable energies in Taiwan, indicating its importance and urgency. Therefore, the development of offshore wind power in Taiwan is moving toward to the next

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step: to establish the demonstration wind farm before the end of 2016. Tainan Hydraulics Laboratory (THL) of National Cheng-Kung University has the best experimental facilities and experienced researchers in Taiwan and has carried out lots of physical modeling tests on the combination of wind, wave and current loadings on fixed wind turbines with different types of foundations as well as floating type system with/without mooring lines. Our facilities are able to carry out high-quality experiments and we are looking for collaborators, especially for the experts in the numerical modeling.

Experimental Facilities

THL has three featured experimental facilities that can be used to investigate the effects of wind, wave and current interactions with structures – (a) large-scale wave flume (300m×5m×5m), (b) medium wave/current flume (MWF, 200m×2m ×2m) and (c) wind/wave/current basin (WWCB, 27m×19m×1.5m). For example, we have done some tests with a 1:36 scale model in the MWF for the fixed jacket type offshore wind turbine foundation under typhoon-scale wave and current loadings together with rigid and mobile seabed. In addition to MWF, we have paid attention on the dynamic motion of the floating platform (semi-submersible type) with/without mooring line system in the WWCB. The maximum wind speed that can be generated is around 10 m/s and it corresponds to 70 m/s wind at full scale assuming a Froude scale of 1:50. Compared to the prototype, the elaborate scale model has only 2% error in geometric dimension, total weights and gravity position. Different wave directions, wave environments, drafts, wind intensities, current speeds and combined wind/wave/current were applied to study the instability of FOWT and operating conditions. The six-degree-of freedom (DOF), accelerations and drift forces were measured to compare with model result and improve the existing design.

Prospective Achievement

The PI and Co-PIs have plenty experiences in the area of coastal engineering in theoretical, numerical and experimental aspects, and we are warmly seeking for possible collaborations with Southeast and South Asia Universities, especially for the researchers are interested in numerical simulation on the scour of wind turbine foundation and floating structure dynamics. The high-quality data produced from THL can be provided for model-data comparison.

Please email satu@email.ncku.edu.tw before 2016.4.27(Wed.) for application.