浮動式離岸風機載台及繫纜系統關鍵技術開發與驗證

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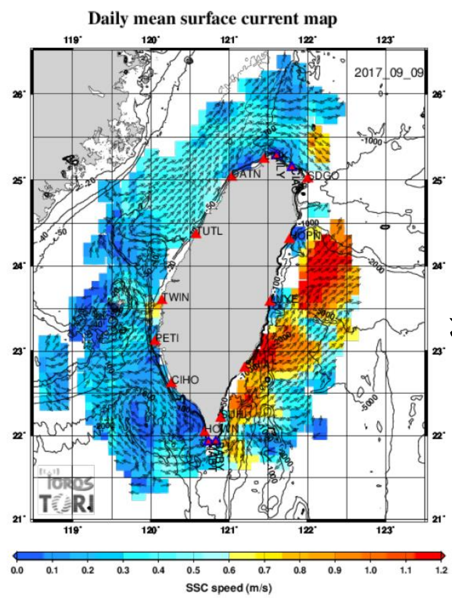
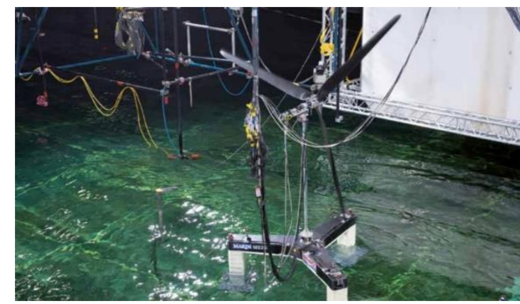
- 本計畫以發展適用於水深40米以上潛力場址之抗颱型浮動式風機為目標，除可大幅增加罹案方場可開發面積，成果亦有助於解決台灣離岸風電所面臨之困境，例如國內短期施工能量不足、未來風機大型化水下結構之選擇彈性、租用國外施工船隊成本高昂以及失去國內技術自主性等。

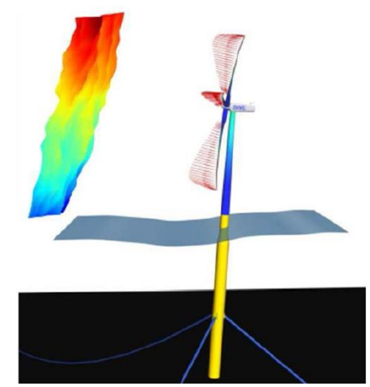
浮動式風機三大型式，依序為浮筒式(spar)、
半潛式(semi-submersible)與張力腿式(Tension Leg)



浮動風機潛在場址海氣象資料庫



浮動風機整機物理模型測試平台



浮動風機整機數值模擬

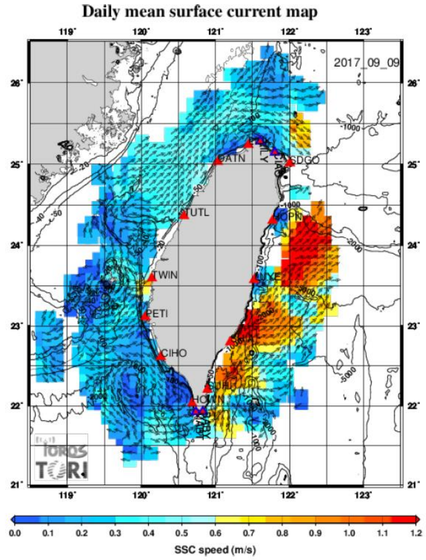
- **技術介紹:** 發展浮動式風機四大關鍵技術為目標，分別為
  - **浮動風機潛在場址海氣象資料分析與模擬:** 針對浮動風機潛在場址，藉由資料蒐集、數值模擬，建立海氣象資料庫與統計不同重現期環境條件(風浪流)，提供其他子計畫進行極限或疲勞荷載計算或水槽測試之輸入條件。
  - **浮動風機整機藕荷計算:** 建立耦合型浮動式離岸風機分析技術，完成水槽實驗驗證比對，並且開發浮動式離岸風機動態補償調控邏輯，達到抑制風機偏擺之效果與穩定風機之姿態，進而提升發電量。
  - **浮動風機整機物模測試:** 建構浮動式風機測試平台，完整重現台灣海域風浪流等環境外力，並完成高精度縮尺浮動式風機模型，進行整機耦合實驗測試，建構實驗資料庫，作為設計驗證之參考校驗。
  - **浮動風機經濟分析與產業環境建構:** 與產業需求銜接，綜整其他子計畫技術成熟度，並積極進行系統整合並與相關法人以及國內產業鏈結，以及建置國內浮動風機經濟成本模型，建議降低成本之技術發展優先順序，並建立友善產業環境。
- **目前發展情形:** 本年度以DeepCWind半潛式風機為主要模擬標的，並以台灣海域環境外力進行數值計算與實驗測試，提升國內既有之能量，進行抗颱型風機研發。

Key Technologies R&D and their validation for floating offshore wind turbine

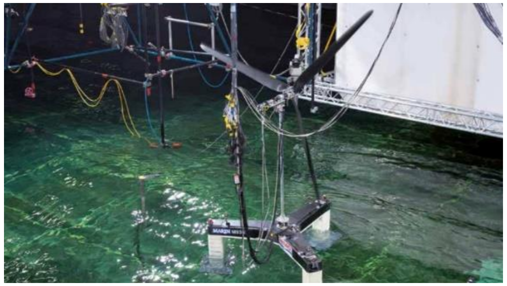
Execution Unit	Department of Hydraulic and Ocean Engineering, National Cheng Kung University
Project Director	Associate Prof. Ray-Yeng Yang

- This project aims to develop the high seakeeping floating offshore wind turbine (FOWT) for wind farms locating at a water depth greater than 40 m in Taiwan. The outcome can greatly increase the installed offshore wind power capacity and the technical autonomy. Furthermore, it also can provide a cost effective supporting structure for large wind turbine in the near future.

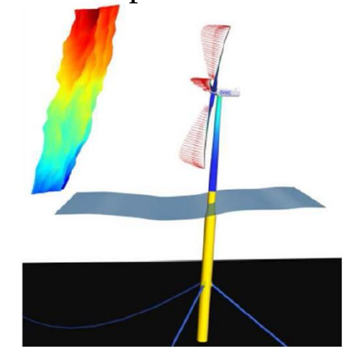
Three main types of floating offshore wind turbine. (left) Spar type, (middle) semi-submersible and (right) tension leg



MetOcean database for FOWT



Tank test platform for FOWT



Numerical simulation for FOWT

- **Technology:** This project aims to develop key technologies of FOWT in the first year, including:
  - **MetOcean database for FOWT:** The MetOcean database will be constructed by historical data and model simulation. It will provide external loadings of different return periods for FOWT design.
  - **Numerical model simulation of FOWT:** The de-couple/fully coupled simulation tools will be established. Furthermore, the dynamic compensation system for wind turbine will be developed.
  - **Tank test of FOWT:** To establish the tank test facilities and experimental technologies. Moreover, to provide comprehensive measurements and standard procedures for testing the performance of FOWT
  - **Economic analysis and supply chain of FOWT:** The cost modeling, international supply chain review and industry group set up will be assessed in order to build a cost effective FOWT and to enhance technical autonomy.
- **Current Stage:** In order to facilitate the technology development of high seakeeping FOWT in Taiwan, we select the DeepCwind semi-submersible FOWT as the simulation target. The site specific loadings will be input to the numerical simulation and tank test.