

離岸風機固定式水下結構關鍵技術開發

執行單位

行政院原子能委員會核能研究所

計畫主持人

黃金城

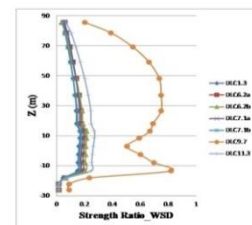
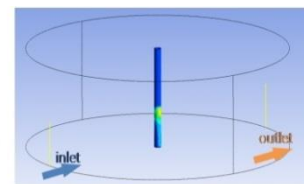
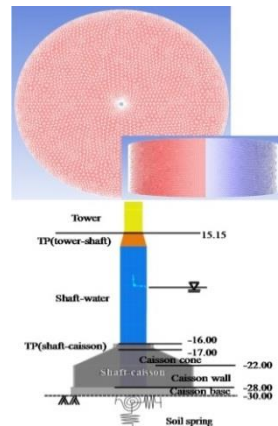
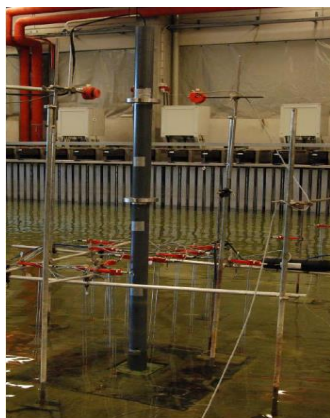
本計畫研發主軸為離岸風機固定式水下支撐結構之設計、分析、測試及驗證之整合，基礎淘刷保護工設計與土壤等效動態彈簧模組等，用以建立國內自主化的離岸風機固定式水下結構關鍵技術，並建立離岸風機系統之結構健康與基礎淘刷監測與預警系統。

1. 離岸風機水下結構之設計、分析、測試及驗證之整合技術應用於協助國內驗證單位以及設計導則審查。

2. 研發基礎淘刷警報浮筒裝置及預警系統。

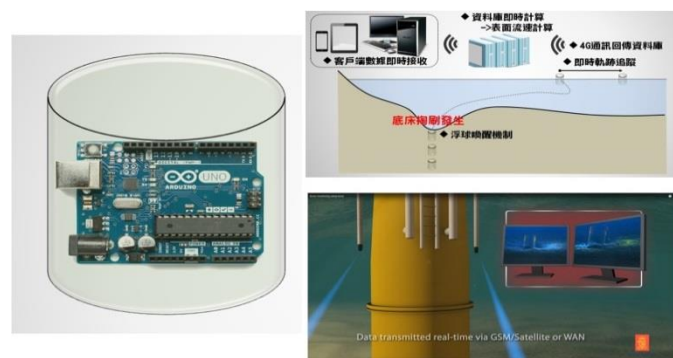
3. 結構健康線上監控系統用於提升長期營運維護結構安全之可靠度技術建立。

4. 土壤彈簧模組建立以協助開發商結構驗證需求。

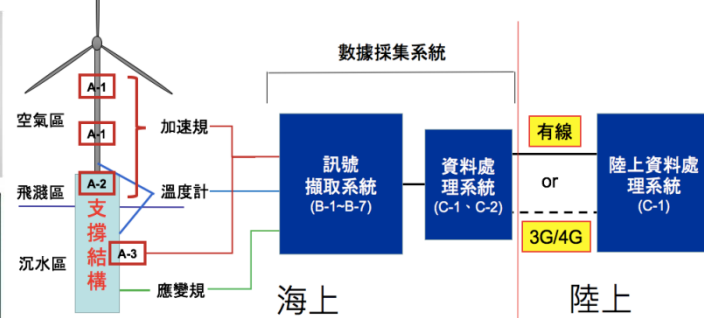


水工縮尺試驗模型(資料來源:IEA Wind Task30/OC5)與應力補償邊界模型樁側推試驗平台

複合重力式工程可行性評估



浮筒裝置與監測預警系統示意圖



結構健康線上監控系統

● 計畫簡介:

本計畫建構之離岸風機固定式水下結構關鍵技術包括(1)風機固定式水下結構設計驗證技術(2)風機塔架結構安全監測、模擬與破壞早期預測、(3)風機基樁淘刷監測、模擬與預測及(4)風機動態基礎勁度計算模組開發等。所建立之設計、分析、測試及驗證技術等，將用以確認國內場址相關影響參數並改善模擬精準度，以提升工程技術能力並提升國內風場長期運轉維護之可靠度。

● 核心技術:

1. 國內首次進行水下固定式結構縮尺水工試驗，以建立設計、分析、測試及驗證技術整合，並改善模擬精準度，以提升工程技術能力。
2. 建立國內唯一應力補償邊界模型樁側推試驗平台，並配合西部海床不同粉土細粒料含量，導入霧式震落法，以提供國內風場土壤等效彈簧之驗證資料。
3. 開發淘刷預警系統協助海洋風電公司，於苗栗後龍兩支示範風機單樁基礎之淘刷監測與預警工作。

Key Technology Development for Fixed Bottom Underwater Structures and Foundations of Offshore Wind Turbines

Execution Unit

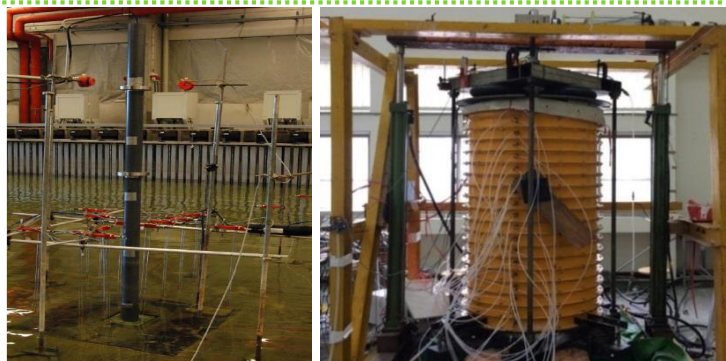
Institute of Nuclear Energy Research
Atomic Energy Council, Executive Yuan

Project Director

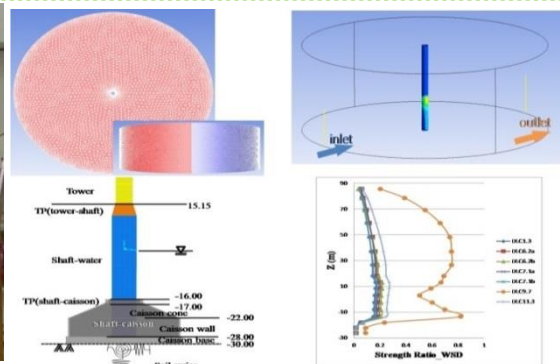
Huang, Chin-Cheng

The project aims to establish the key technologies for fixed bottom underwater structures and foundations, including integration of structural design, analysis, test and verification/validation, scour protection design and dynamic foundation stiffness. Localization of key technologies for offshore wind is to be developed in this work.

1. The technological integration of structural design, analysis, test and verification/validation is used to assist verification units in domestic and design guidelines reviews.
2. Development of surveillance and prediction equipment for scouring of pile foundations.
3. Development of on-line structural health monitoring for long term operation and risk management.
4. Establishment of dynamic soil spring modules for verification demand from developers.



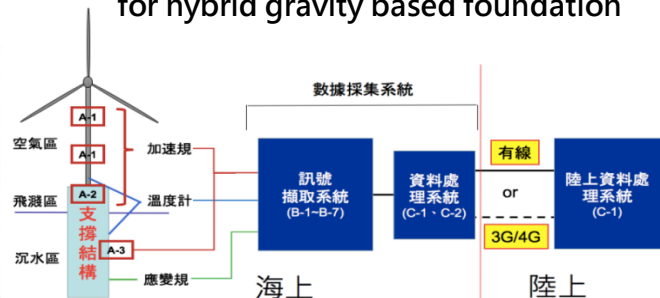
Scale testing structural model (source: IEA Wind Task30/OC5) and boundary stress controlled testing platform



Engineering feasibility assessment for hybrid gravity based foundation



Surveillance and prediction equipment for scouring of pile foundations



Structural health on-line monitoring system

● Content of the Research Project :

The key technologies comprise (1) surveillance, simulation and proactive failure prediction for structural safety of wind turbine tower, (2) surveillance, simulation and prediction for scouring of pile foundations, (3) design and verification technology for offshore wind turbine with fixed bottom underwater structures and foundations, (4) calculation module development of dynamic foundation stiffness for offshore wind turbines.

● Important techniques :

1. The first scale hydrodynamic tests of fixed support structure are to be established for integration of structural design, analysis, test and verification/validation, and to improve the calculation accuracy and engineering capability.
2. With the western coast of different silt content, a boundary stress controlled testing platform and mist pluviation method are developed to establish the dynamic soil springs for domestic offshore wind farms.
3. Development of the surveillance and prediction equipment for scouring of pile foundation for use of Formosa wind farm.