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### 我國先導型離岸風場地震力評估考量

### Evaluation of Seismic Demand for offshore wind pilot project in Taiwan

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#### 摘要

我國位處於強震區，且西部海域海床土壤軟弱，土壤液化潛勢極高，於離岸風機支撐結構設計時需將地震力之影響納入考量。由於我國目前並無離岸風機本土設計規範，而國外相關設計規範對於離岸風場地震力評估建議方法亦相當缺乏。本文以台電公司先導型離岸風場為例，依台電公司海氣象觀測塔鄰近鑽探點位之土壤條件進行地震危害度分析與地盤反應分析，評估先導型離岸風場之設計地震力。分析所得之地表設計地震反應譜主頻率朝長週期(低頻)區域偏移，顯示長週期支撐結構受震水平加速度受到土層效應影響可能產生放大效應。但是對於自然振動週期約介於 2.5~3.5 秒之構造物，以地震危害度分析與工址地盤反應分析得到之工址地表設計地震水平加速度仍小於依建築物耐震設計規範及解說(2011)建議計算所得之結果。建議進行我國離岸風場開發時，應同時考量風場區位及海床土壤動態特性，進行地震危害度分析與地盤反應分析，以合理決定離岸風場設計地震力。本研究建議之設計地震力分析方法應納入我國離岸風機本土設計建議規範，以確保我國離岸風場開發安全性與經濟性。

關鍵詞：離岸風場、設計地震力、地震危害度分析、地盤反應分析

#### Abstract

Taiwan is located on the circum-Pacific seismic belt and the seabed soil conditions of Taiwan Strait are mainly modern alluvium consisting of soft and loose sedimentary deposits. Seismic loading and soil liquefaction potential should be considered in the design of supporting structure of offshore wind turbine in Taiwan. European offshore wind farms are not set up in the earthquake zone and there is no detailed description of seismic loading evaluation in the international standards and guidelines. In this study, a procedure including the seismic hazard assessment and the site response analysis to evaluate the seismic demands for offshore wind farms in Taiwan is proposed. According to the soil data of boreholes of the offshore wind pilot project near Changhua, the seismic loading determined from the procedure suggested in this paper for a supporting structure with fundamental vibration period of 2.5 to 3.5 seconds is lower than the value obtained from the suggestions of Seismic design specifications and commentary of buildings published by Construction and Planning Agency in Taiwan for onshore structure seismic design. The proposed procedure presented in this study is a necessary complement to the existing international offshore standards for offshore wind farms development in the earthquake zone.

**Keywords:** Offshore wind, Seismic loading, Seismic hazard assessment, Seismic ground response analysis