

NEPII_12

NREL 5MW 離岸參考風機於 GL Tropical Cyclone Technical Note 與 IEC 設計標準之極端氣候極限負載計算比較 Comparison of Extreme Load Calculations in Extreme Climate between GL Tropical Cyclone Technical Note and IEC Offshore Wind Turbine Design Guideline Using NREL 5 MW Reference Offshore Wind Turbine

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摘要

台灣位於太平洋颱風多發地區，而歐洲國家針對離岸風機所參考的 IEC 61400-3 設計標準並無考慮颱風環境設計負載案例，因此若要使用 IEC 國際規範來設計符合本土化離岸風機，勢必要探討颱風特性對於風機整體結構的影響。本研究參考有考慮颱風負載案例的 GL Tropical Cyclone Technical Note 與 IEC 61400-3 設計標準來進行極限負載計算比較，採用 NREL 5 MW 離岸參考風機與本土化 30 米水深桁架式支撐結構，應用美國國家再生能源實驗室(NREL)所開發之 FAST 7.0 版為動態負載計算軟體，針對正常運轉、停機與停機時發生故障的設計負載案例進行極限負載計算比較。最後由結果顯示部分零組件受到的颱風負載大於 IEC 標準的設計負載，因此未來需考慮本土化離岸風機對於颱風的安全可靠性評估。

關鍵詞：颱風、離岸風機、GL Tropical Cyclone Technical Note、IEC 61400-3、極限負載。

Abstract

The constantly observed typhoon in Taiwan has not been considered by European countries in the design load cases for the offshore wind turbine referenced to the IEC 61400-3 design guideline. Therefore, to use IEC design guideline for local offshore wind turbine, the effect of typhoon for the overall structure must be investigated. The purpose of this paper is to investigate the difference in load calculation between the GL Tropical Cyclone Technical Note and the IEC 61400-3 offshore wind turbine design guideline. The NREL 5 MW offshore wind turbine is selected as the reference offshore wind turbine model with a local jacket support structure in 30 meters water depth and the FAST 7.0 code developed by NREL is employed as the dynamic load calculation tool. The design conditions considered in this paper are normal power production, parked, and parked with occurrence of fault. Results showed that the typhoon loading is more than that using the IEC 61400-3 in the some components. Therefore, it is paramount that the effect of typhoon should be considered for the safety and reliability assessment of local offshore wind turbine in the future.

Keywords: Typhoon、Offshore wind turbine、GL Tropical Cyclone Technical Note、IEC 61400-3、Extreme load.