

150米測風塔設置與氣象式光達比對技術發展

150m Met Mast Installation and Technical Developments in Meteorological LiDAR Comparison

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摘 要

國內因應離岸風電發展，於 105 年由經濟部標準檢驗局責成財團法人金屬工業研究發展中心，於臺中港台電高美風場旁設置 100 米測風塔，在梅姬颱風過境期間，實際測得 100 米高度十分鐘平均風速達每秒 53.2 公尺(53.2 m/s)，據以修訂 CNS 15176-1 國家標準，增訂風力機 Class T 颱風等級設計風速，進而促成臺日合作推動 IEC 國際標準更新，並藉以確立離岸風場風力機於極端風況之耐受性要求。

經世代演進，現應用於國內離岸風場第二期~第三期開發，離岸風力機單一機組已達 14 至 15 MW，機艙高度可達 150 米。且因陸域或離岸風場在開發前，皆需量測開發場址風況至少1年，以利掌握場址實際條件執行風況評估，隨科技發展，多以氣象式光達取代測風塔，節約成本進行量測。而國際間標準及檢測技術發展，仍以一座符合標準的測風塔，將光達測得風況數據相互比對，藉以確認氣象式光達準確度。

因應國內氣象式光達發展與應用、風電機組朝大型化邁進致高度漸增，以及長期蒐集高空風能數據可幫助瞭解國內在地環境條件，大數據得以提供學研單位研析，並進一步做為國家標準訂定之依據，金屬工業研究發展中心執行經濟部標準檢驗局計畫，經評估及協調後，於台電彰濱綠能園區設置 150 米測風塔，在 114 年 10 月底設置完成啟用，共配置 7 層儀器量測各高程風況。期能藉由大數據完善風能資料庫，並發展氣象式光達比對技術，提升遙測儀器設備應用時數據可追溯性，協助氣象、綠能、電力等產業發展以及國家淨零排放目標。

關鍵字：測風塔、氣象式光達

Abstract

In response to the development of offshore wind energy in Taiwan, the Bureau of Standards, Metrology and Inspection of the Ministry of Economic Affairs commissioned the Metal Industries Research & Development Centre to install a 100-meter met mast Taiwan Power Company's Gaomei Wind Farm near the Taichung harbor in 2016. During Typhoon Megi, actual measured wind speed at the 100-meter height, the 10-minutes average wind speed reached 53.2 m/s. Based on this, the CNS 15176-1 national standard was revised, adding a V-reference, T(tropical) class design wind speed for wind turbines. The measured data and simulation estimation process thus facilitated in Taiwan-Japan cooperation in updating IEC international standards, thereby establishing the withstand capability requirements for offshore wind turbines under extreme wind conditions.

The wind turbine type through generations of evolution, offshore wind turbines are now used in the second and third phases of offshore wind farm development in Taiwan, reaching 14 to 15 MW per units and nacelle heights reaching

150 meters. Furthermore, since wind conditions at onshore/ offshore wind farms require at least one year of wind measurement before development, to accurately assess the actual conditions and conduct site evaluations. The meteorological LiDAR are increasingly replacing met mast due to technological advancements and saving costs. However, international standards and testing technologies still rely on a compliant met mast to compare wind data with meteorological LiDAR, thereby confirming the accuracy of the meteorological LiDAR.

In response to (1) the local development and application of meteorological LiDAR in Taiwan, (2) the increasing size and height of wind turbines, and the requirement for long-term collection of high-altitude wind energy data to understand local environmental conditions, the large-scale data can be provided to academic and research institutions for analysis and further used as a basis for national standard revise. The Metal Industries Research & Development Centre (MIRDC), following a project by the Bureau of Standards, Metrology and Inspection of the Ministry of Economic Affairs, after evaluation and coordination, installed a 150-meter met mast at the Taipower Changhua Coastal Green Energy Park. The met mast was completed and put into operation at the end of October 2025. This met mast is equipped with seven layers of instruments to measure wind conditions at various elevations. It is hoped that big data can be used to improve the wind energy database and develop meteorological LiDAR data comparison technical to enhance the traceability of data when using remote sensing instruments and equipment. Thereby assisting the development of industries such as meteorology, green energy, and power, as well as the country's net-zero emission goal.

Key words : Met mast, Meteorological LiDAR

交通部中央氣象署 **115** 年第四十屆天氣分析與預報研討會 — 中英雙語摘要格式說明 —

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