

HKU project funded under the NSFC/RGC Joint Research Scheme

## **Theoretical and Experimental Study of the Performance of Suction Bucket Foundation for Offshore Wind Turbines under Complex Geological and Multi-hazard Conditions**

Principal Investigator (Hong Kong):

**Professor Jun Yang, Department of Civil Engineering, Faculty of Engineering**

Project Summary:

China is rapidly expanding its offshore wind power sector to achieve its carbon neutrality target by 2060. This growth necessitates the development of more economical and rational design methods for offshore wind turbine (OWT) foundations. One of the promising foundation types is the suction bucket foundation, which offers several attractive advantages in terms of construction efficiency and cost effectiveness.

The primary objective of this joint project is to develop a comprehensive understanding of the performance of suction bucket foundations in soft clay and silty sand under normal and extreme loading conditions pertinent to the offshore environment of southeast China. By taking advantage of the complementary strengths of the Hong Kong team and the Mainland team, the project integrates advanced laboratory element tests, centrifuge shaking table tests, constitutive modeling, and numerical simulations.

The proposed research will provide first-hand physical data and insights crucial to the evaluation of the performance of suction bucket foundations installed in marine clay and silty sand, and it will also provide a solid basis for improving existing methods and assumptions. From a long-term viewpoint, the findings from this project will lead to safer and more economical designs of suction bucket foundations for OWT and will eventually contribute to the clean energy development – one of the grand challenges facing the world today.

港大「聯合科研資助基金計劃」項目

### **複雜地質條件海上風電吸力桶基礎動力多災害分析理論與試驗研究**

首席研究員（香港）：

**工程學院土木工程系教授（岩土工程） 楊峻教授**

項目簡介：

為應對氣候變化，在 2060 年前實現碳中和目標，中國正在進行大規模的海上風電項目開發和建設。為了使海上風電項目順利完成，設計出經濟且合理的基礎形式是其中的重要環節。在可供選擇的基礎形式中，吸力桶基礎由於其在建設效率和成本效益方面所具有的優勢，使得其成為了具有廣泛發展前景的一種。

基於此，本聯合項目的主要目標為對軟粘土和粉細砂地基中吸力桶基礎在常規和極端荷載（颱風、地震）作用下的力學響應進行全方位的分析。通過借助於香港大學團隊和同濟大學團隊的互補優勢，本項目將開展高精度室內單元體實驗、離心振動台試驗、以及對應的本構模型開發和數值模擬分析。通過本研究項目，廣泛分佈於我國東南沿海的原狀軟粘土、粉細砂的力學特性將得到準確評估。同時，進一步可以對埋置於其中的吸力桶基礎的力學響應進行全面分析，從而完善目前的設計理論和設計方法。從長遠來看，本研究項目所取得的研究成果有助於設計出更為安全、經濟的海上風電吸力桶基礎形式，最終助力能源轉型，實現社會可持續發展。