



Design challenges Taiwan vs. Rest of the World

and
設計的挑戰臺
灣和世界其他國家

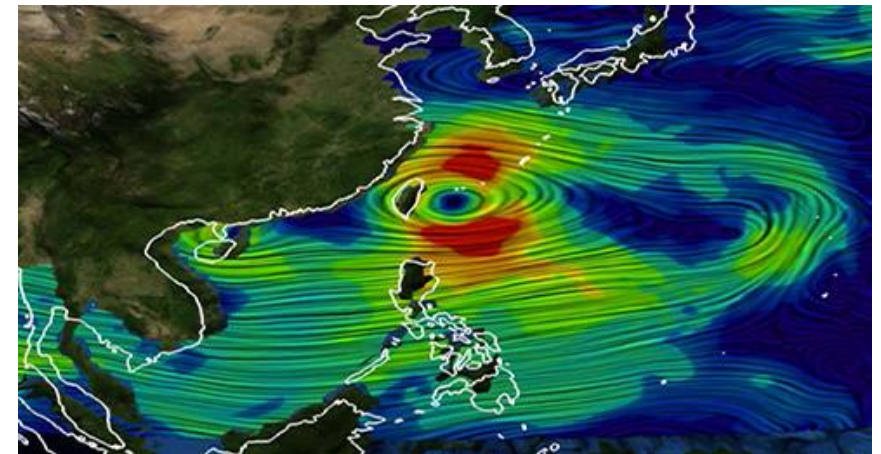
Tim Camp

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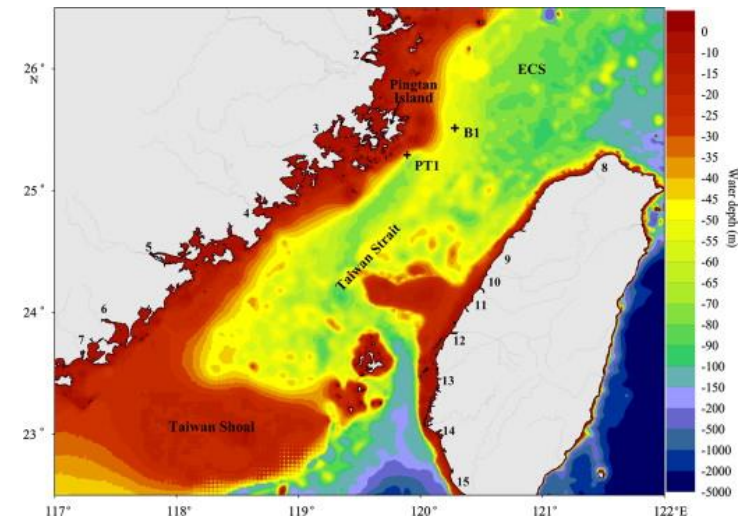
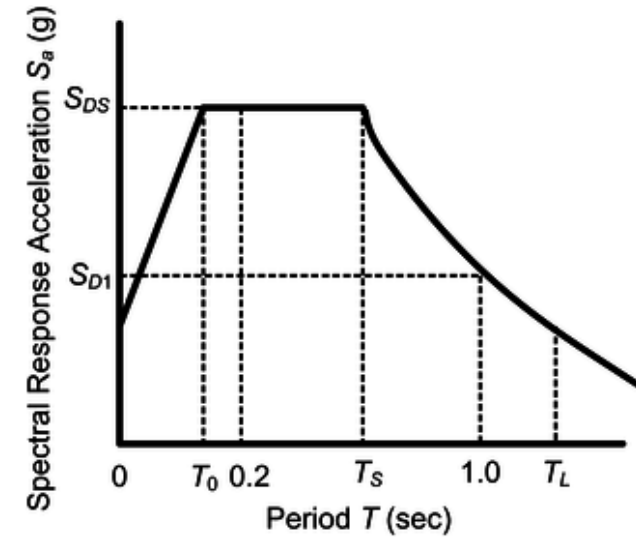
Typhoon conditions 颱風條件

- Note guidance soon to be provided in IEC 61400-3-1
 - Two informative annexes on tropical cyclone loading:
 - Annex H: Prediction of extreme wave heights during tropical cyclones
 - Annex I: Recommendations for alignment of safety levels in tropical cyclone regions
- Robustness level criteria suggested (as API RP-2A) to verify the global structural integrity of the substructure and foundation 魯棒性水准標準建議，以驗證全球結構完整性的子結構和基礎
- For unmanned / medium consequence of failure 對於無人/中故障的後果 (Exposure Category L-2):
 - 50-year return conditions define design level criteria
 - 500-year return conditions define robustness level criteria
 - Additional SLS check on verticality after 500-year conditions



Seismic & sea bed conditions 地震與海床條件

- Seismic events not typically design-driving for the turbine (designed for emergency stops) 通常風機驅動設計不為的地震事件考慮 (為緊急停止而設計)
- Likely to be critical for the foundation design – especially in cases of soil liquefaction 可能對基礎設計至關重要，特別是在土壤液化的情況下
- Sea bed composition and bathymetry affected by river flows following heavy rain 豪雨後河流流量對海床組成和水深的影響





Fabrication, installation & maintenance 製造、安裝和維護

設計約束

Design constraints

- Fabrication facilities & expertise 製造設備和專門知識
 - Pile rolling facilities 疊軋設備
 - Welding capabilities 焊接能力
- Transportation (ports & other logistics infrastructure) 運輸 (港口及其他後勤基礎設施)
 - Component size & weight 元件尺寸和重量
 - Crane capacities 起重機的能力
- Onshore transport requirements 陸上運輸的要求
- Installation & maintenance vessels 安裝維護船舶
 - Lifting capacity 吊裝能力
 - Crane height 起重機的高度
 - Limiting sea states for installation & maintenance work 安裝維修工作的極限海況
 - Size, weight & height of components expected to be replaced offshore 預計離岸更換組件的尺寸、重量和高



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Dr Tim Camp
Director Turbine Engineering

LOC Renewables

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A service menu for LOC Renewables, presented as a vertical stack of colored boxes. At the top, three images represent the sectors: an oil rig (Oil & Gas), wind turbines (Renewables), and a ship (Shipping). Below these are three columns of services. The first column lists services for Oil & Gas, the second for Renewables, and the third for Shipping. The middle section lists shared services across all sectors. The bottom section lists specific technical services for each sector.

OIL & GAS	RENEWABLES	SHIPPING
MARINE WARRANTY & CONSULTING		
TECHNICAL ADVISORY, DUE DILIGENCE & EXPERT WITNESS		
OWNER'S ENGINEERING & PROJECT MANAGEMENT		
TRANSPORTATION & INSTALLATION ENGINEERING		
MANAGEMENT OF MARINE CASUALTIES AND WRECK REMOVAL		
METOCEAN GEOTECHNICS ELECTRICAL STRUCTURES CIVILS	NAVAL ARCHITECTURE HYDRODYNAMICS MOORINGS MARINE & SUBSEA ENGINEERING	MARINE OPERATIONS SUPERVISION SURVEYS INSPECTIONS AUDITS