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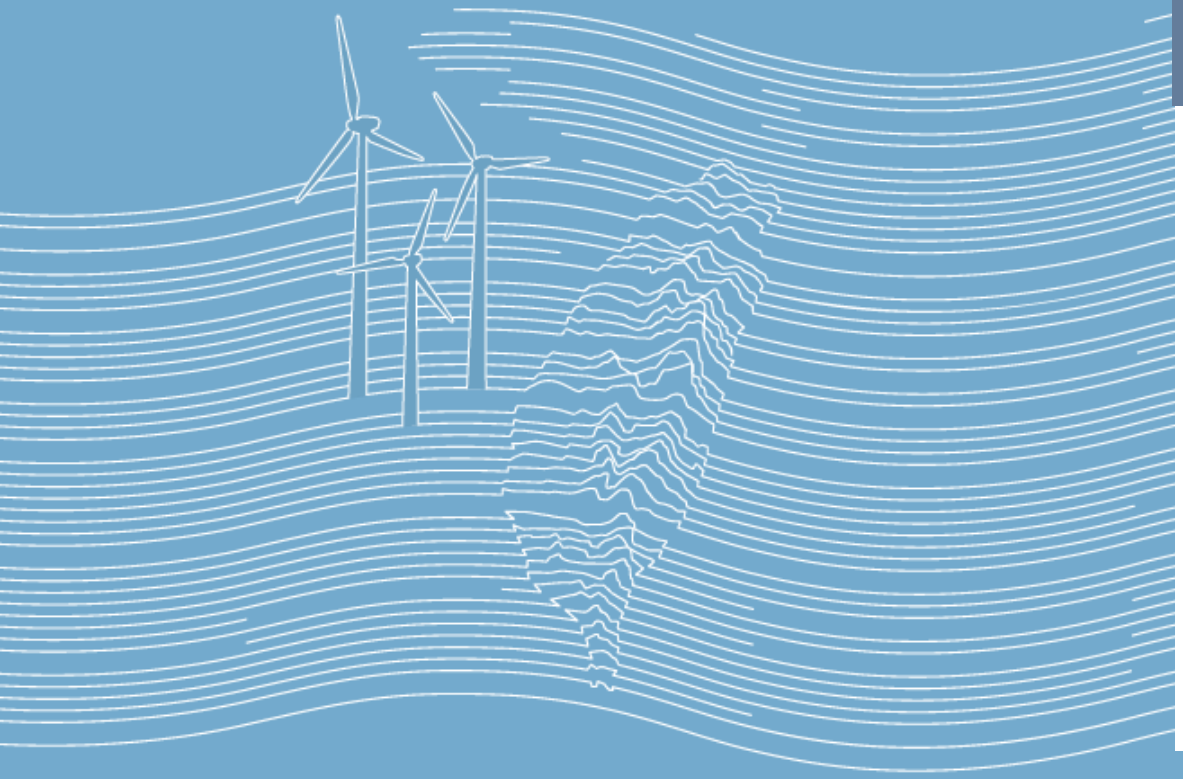
# Outlook for the Taiwanese Offshore Wind Market



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哥本哈根基礎建設基金

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**Maya Malik**

Senior Director
Copenhagen Offshore Partners
Taiwan

**9 May 2019**

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## Maya Malik

- 15+ years in energy & infrastructure

COP · DONG energy / Ørsted · Shell

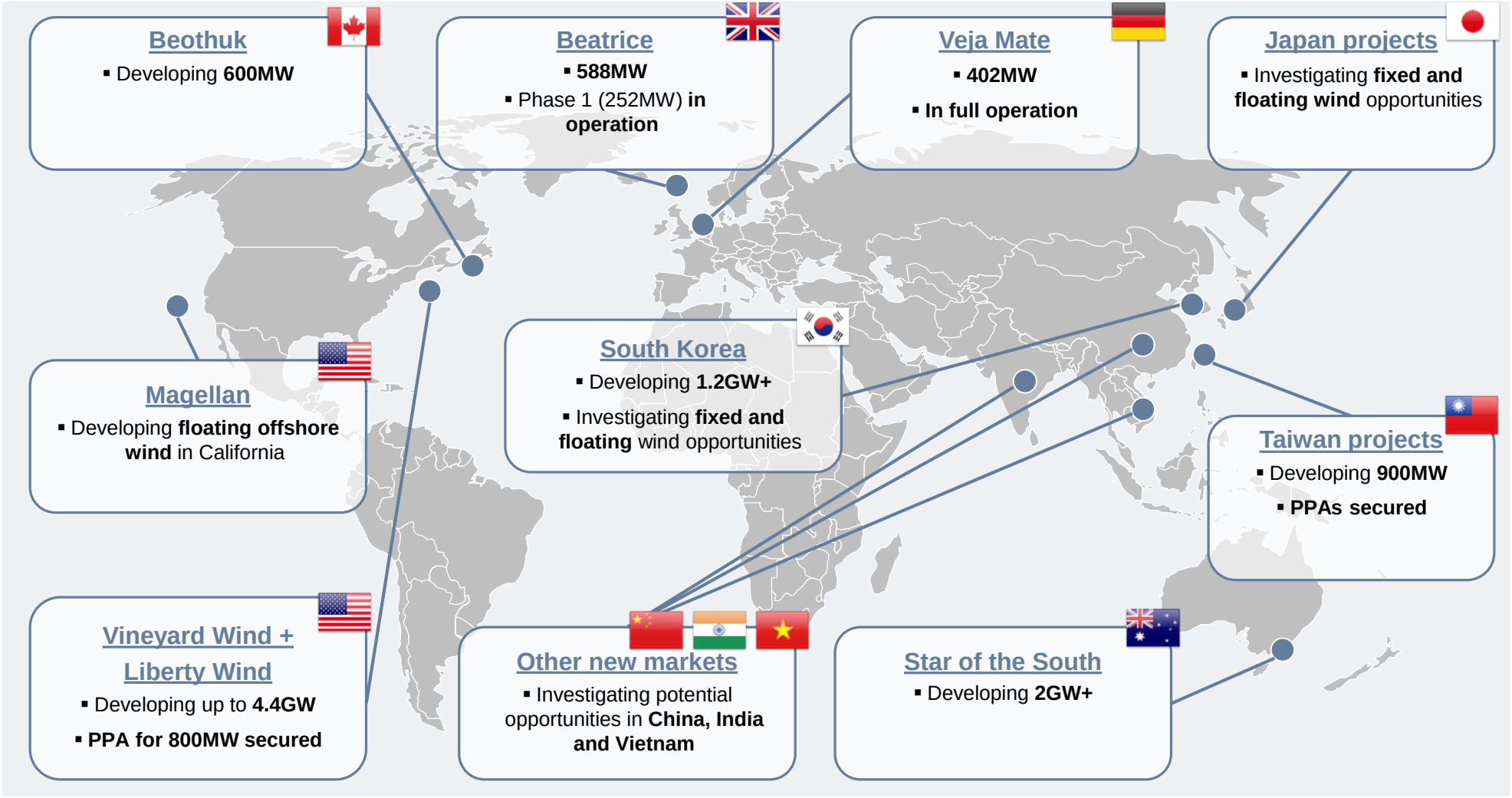
- Europe, Asia & Australia
- Bachelor of Engineering
- MBA (INSEAD)

- **Project development in Taiwan (900MW)**
- **Previously headed ops set up for 12 offshore windfarms**
- **Previously head of asset integrity management - projects, structures & electrical systems (4 GW)**

| | | |
|---|---|---|
| CIP COPENHAGEN INFRASTRUCTURE PARTNERS | Founded in **2012** | By 5 senior offshore wind executives |
| **Investment Strategy** | Long-term investment | Buy & hold |
| **Partnership Approach** | | Active Investor<br>Local partners |
| **Dedicated Team** | • M&A<br>• Asset Management<br>• Technical capability | COP |
| **Fund Size** | € ~7bn | 42 investors |


- *Name witheld

# CIP has a global offshore wind portfolio



# CIP in South Korea

CIP is proposing to develop 1.2+ GW of floating offshore wind in Ulsan

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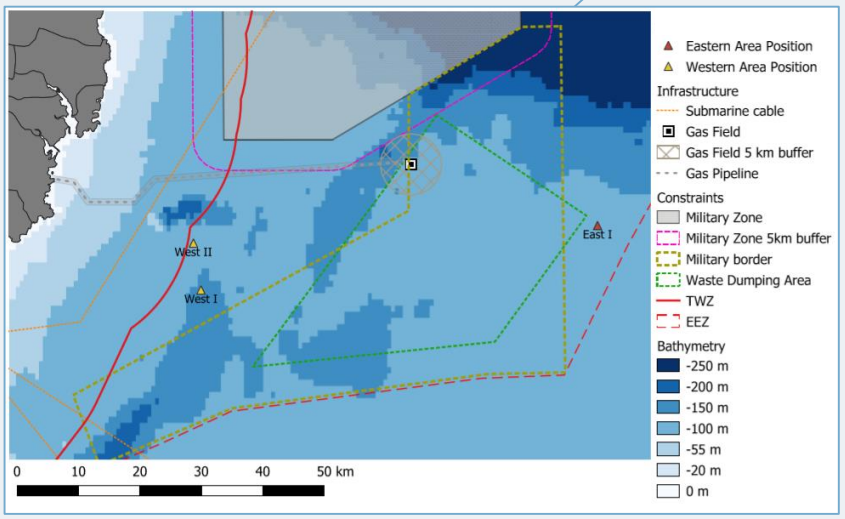
## Potential sites

- FliDAR positions identified
- Permit applications submitted
- Investigating fixed bottom oportunities




| | Sites | Capacity |
|---|---|---|
| 1 | **Floating Phase 1** | **400MW** |
| 2 | **Floating Phase 2** | **400MW** |
| 3 | **Floating Phase 3** | **400MW** |

**Local Content**

- Local production:
  - Floating foundations, transition pieces and mooring lines
  - Turbine towers
- Local harbours and onshore civil

**Key Facts**

- Wind speeds ~**8.3m/s**
- Water depths **100-200m**
- **Tetra Spar** floating technology

**Timeline**

- Phased construction until 2028. Potential completion:
  - Site 1: 2023-24
  - Site 2: 2025-26
  - Site 3: 2027-8

# CIP in Taiwan

CIP was awarded 900 MW of projects by the Taiwanese government as part of a highly competitive selection process

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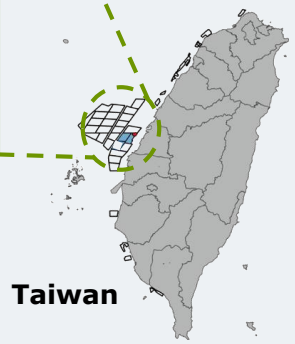
## Project sites

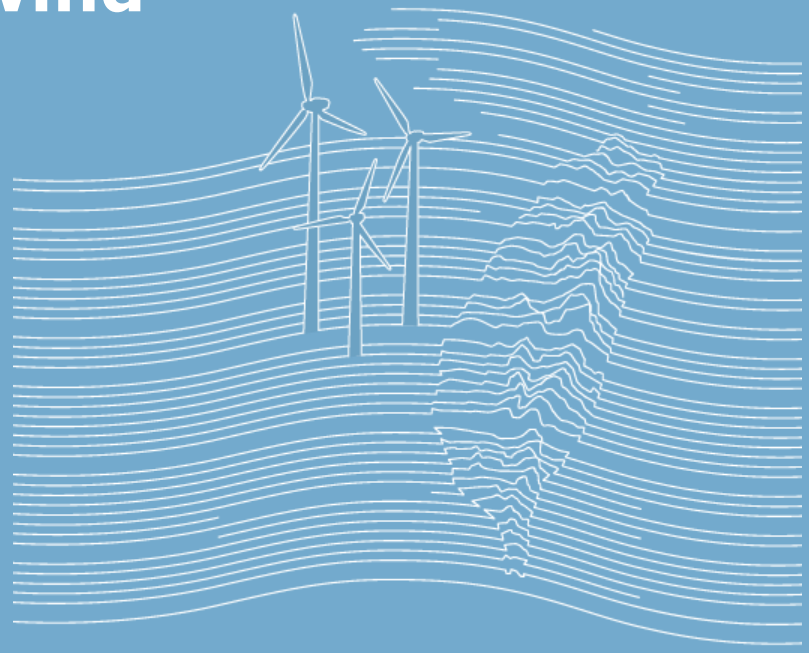



Taiwan

| | |
|---|---|
| **Chang Fang** | ▪ **552 MW**<br>▪ Connection in **2021 & 2023** |
| **Xidao** | ▪ **48 MW**<br>▪ Connection in **2024** |
| **Chong Neng** | ▪ 300 MW<br>▪ Connection in **2024** |
| **Site Conditions** | ▪ Wind speeds ~**10m/s**<br>▪ **12-18 km** from shore<br>▪ Water depths of **30-50m** |
| **Key Suppliers** | ▪ **Wind turbines:** Mistubishi-Vestas<br>▪ **Foundations:** Century Steel-Bladt & China Steel |

**CIP will install 900MW in Taiwan from 2021 to 2024**

# Taiwan offshore wind
# Project allocation



# How it began: Government took initiative to assess sites

36 potential sites were identified based on wind resource, water depth, and environmental impact

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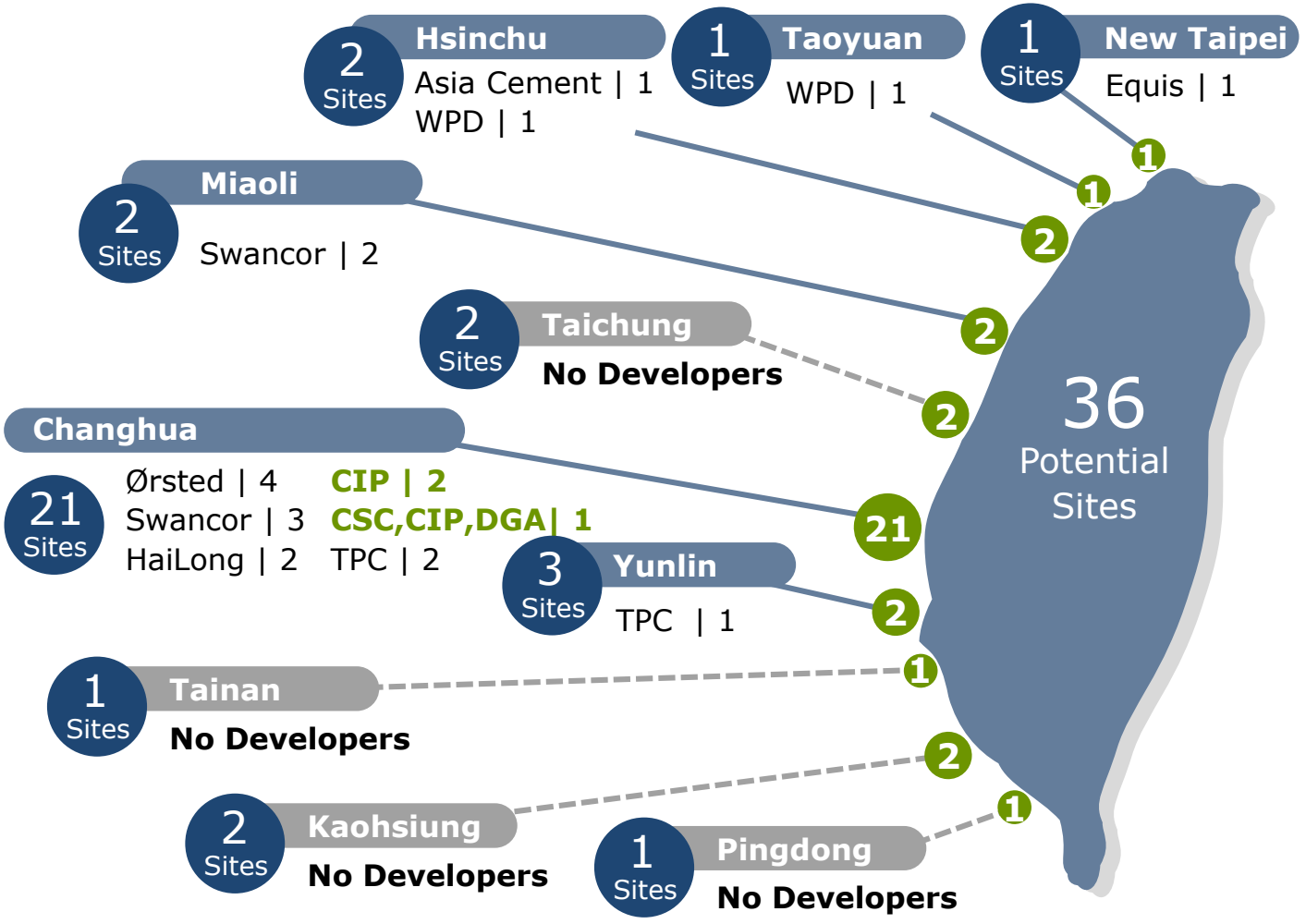
## Site Allocation Approach

- In 2015 the government announced 36 potential sites and guidelines for development
- Research institutes were commissioned to screen sites based the following criteria:
  - ✓ **Wind resources (9.5-10.5m/s)**
  - ✓ **Water depth (below 50m)**
  - ✓ **Distance from shore (5-60km)**
  - ✓ **Avoidance of sensitive zones (military, environmental, existing cables and pipelines)**



# Taiwan offshore wind projects planned in phases

Priority of projects shifted from fast delivery to localisation, then to cost

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| | Pre entry | Selection Stage - 3 GW | | Bidding Stage - 2.5 GW |
|---|---|---|---|---|
| | | Stage 1 (2020) | Stage 2 (2021-2024) | Focus: Price competitiveness |
| | | Focus: Fast delivery | Focus: Localisation | |
| **Prerequisite** | ▪ Preparatory office in Taiwan<br>▪ Financially capable | ▪ Pass pre entry<br>▪ Opinion letters from authorities<br>▪ Available grid connections | | ▪ Pass pre entry<br>▪ Only projects that participated in Selection were eligible to bid |
| **Process** | ▪ Apply for site recordation<br>▪ Apply for EIA from environmental authority | ▪ Submit proposal detailing preferred grid connection point & year, technical capabilies, financial strength, and community initiatives<br>▪ Submit localisation plan<br>▪ PPA and final tariff post award | | ▪ Submit bid price<br>▪ PPA based on bid price for 20 years |
| **Selection Standards** | ▪ Feasibility of proposed capacity and wind farm planning<br>▪ Environmental impact | ▪ Able to deliver projects on time<br>▪ Localisation plan (2021-2024)<br>▪ Evaluation standards: | | ▪ Price |

# Overview of offshore wind pipeline from 2017-2025

By 2025, over 5.7GW is planned to be installed in the Taiwan Strait

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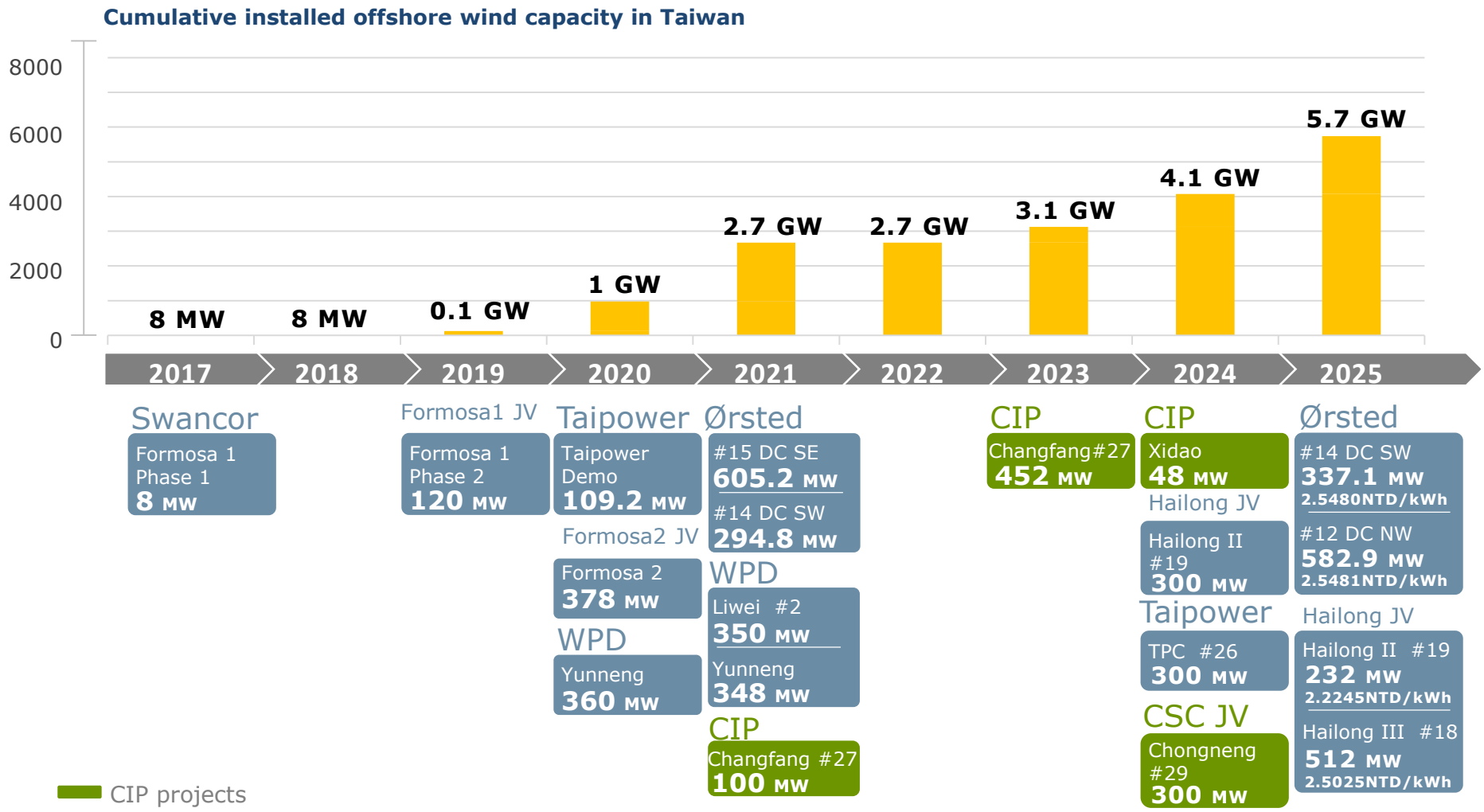
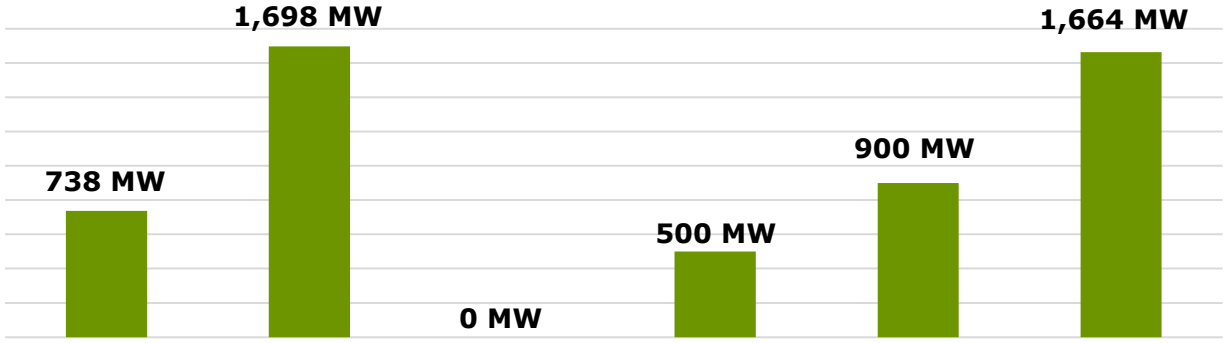


# Selection projects: Localisation requirement

Developers have signed up to localisation criteria based on the wind farm connection year

- **Most localisation burden is on 2023 & 2024 projects**
- **2023 & 2024 projects must localise 20-25 components**
- **All projects must deliver a local content proposal by Nov 2019**
- **Proposal must be supported by supplier agreements**

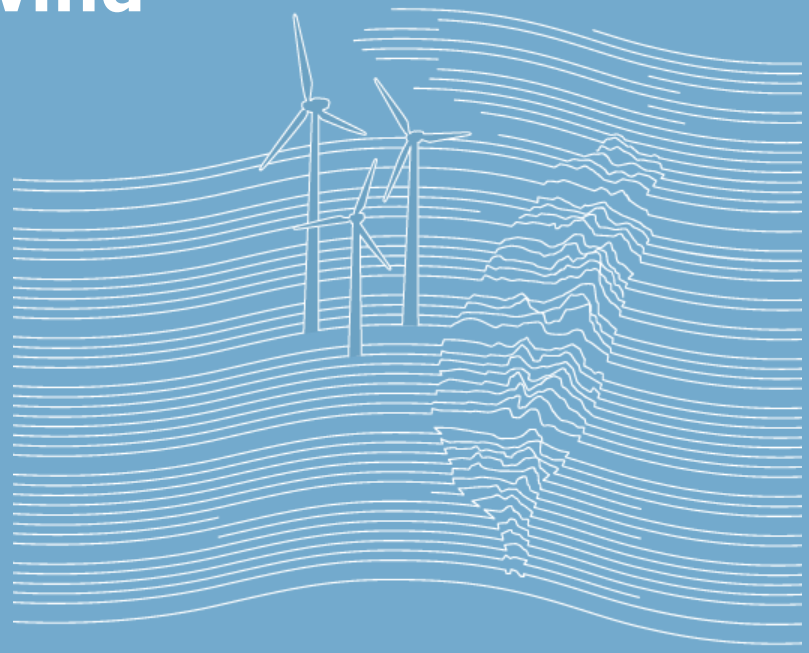
**Installed capacity by connection year**




| Localisation Commitment | 2020 | 2021 | 2022 | 2023 | 2024 | 2025- |
|---|---|---|---|---|---|---|
| **Towers** | No requirement for localization | ✓ | ✓ | ✓ | ✓ | No requirement for localization |
| **Foundations** | | ✓ | ✓ | ✓ | ✓ | |
| **Power facilities** | | ✓ | ✓ | ✓ | ✓ | |
| **Vessels** | | ✓ | ✓ | ✓ | ✓ | |
| transportation, cable-laying | | ✓ | ✓ | ✓ | ✓ | |
| transportation and installation vessels | | | | ✓ | ✓ | |
| **Submarine cables** | | | | ✓ | ✓ | |
| **WTG** | | | | ✓ | ✓ | |
| rotor-nacelle assembly | | | | ✓ | ✓ | |
| transformers | | | | ✓ | ✓ | |
| distribution panels | | | | ✓ | ✓ | |
| UPS | | | | ✓ | ✓ | |
| nose cones | | | | ✓ | ✓ | |
| cables | | | | ✓ | ✓ | |
| hub casting | | | | ✓ | ✓ | |
| fasteners | | | | ✓ | ✓ | |
| gear boxes | | | | | ✓ | |
| power generators | | | | | ✓ | |
| power conversion systems | | | | | ✓ | |
| blades and their resin | | | | | ✓ | |
| nacelle housing | | | | | ✓ | |
| nacelle base casting | | | | | ✓ | |

New elements for that year

# Taiwan offshore wind
# Political outlook



# Local elections were held in Nov 2018 as projects were securing key consents and PPAs

Change of local government in Changhua County disrupted offshore wind projects

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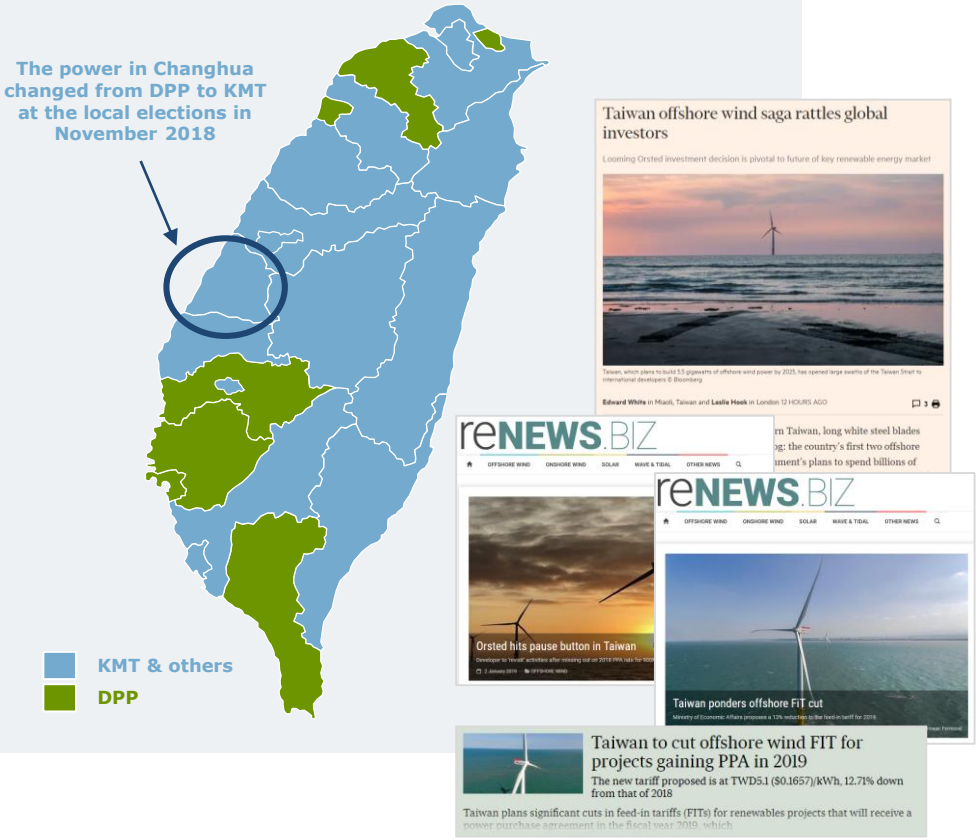
**Landslide win for opposition party KMT**

- KMT won 15 counties (up from 6)
- DPP won 6 counties (down from 13)




**How did this impact offshore wind?**

- **Ruling party DPP** had pushed the **'no nuclear homeland'** policy and accelerated offshore wind projects
- Opposition party **KMT won in Changhua County** (where most windfarms are located)
- In December 2018, Changhua County **withheld approvals** of all developers Establishment Permits
- Delays caused Changhua developers to **receive 2019 FIT rates**, which were not yet set
- 2019 FIT rate was initially announced ~12% lower than 2018, and ultimately set **~6% lower**
- European **media attention** affected investor sentiment

# Local elections included 3 energy related referendums

Public favoured the shift from coal, but were not as passionate against nuclear

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## Election energy referendums

| | |
|---|---|
| In favour of not building new coal-fired plants ? | YES ~80% |
| In favour of phasing out thermal power? | YES ~80% |
| In favour of closing nuclear plants by 2025? | NO ~64% |

**Public were anti-air pollution but not necessarily anti-nuclear**

**Central government remained supportive of renewable energy policy, explaining that nuclear plants could not be reactivated by 2025**

"the results of local elections **will not change the central governments energy policy**. The **offshore wind power policy** will be promoted **according to the schedule**"

# Federal elections will be held in January 2020

Ruling DPP central government likely to push for maximum local content and remain conservative on all decision making

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**Nov 2018**
Local Elections

**DPP (in power)**
Down from 13 to 6 counties

**KMT (opposition)**
Up from 6 to 15 counties

**Jan 2019**
By-Elections

**DPP defeats KMT**

**Mar 2019**
By-Elections

**TIE between parties**

**Former Premier William Lai announces bid for DPP presidential nomination**

**April 2019**
By-Elections

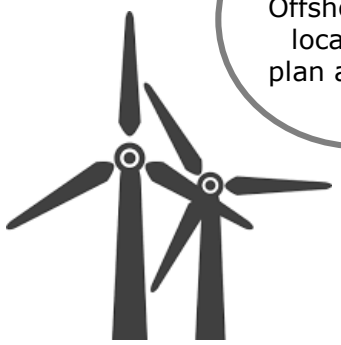
**Terry Gou announces bid for KMT presidential nomination**

**May 2019**
DPP Primary

**June 2019**
KMT Primary

**Jan 2020**
Federal Election Day

**1.4 GW**
Offshore wind localisation plan approvals



# Elections can impact energy policies in Taiwan

Governments are highly sensitive to public opinion

- **1st presidential election was in 1996**
- **Public highly enthusiastic over elections**

- **Politicians often use public opinion as a basis for policy decisions**

- **Consent processes often involve public hearings and panel decision making – outcomes can reflect political views**

**What is the political outlook for offshore wind?**

- **Initial** offshore wind policy was **designed by the KMT** when it was in power
- The **KMT** is against DPP policies, but **support green power** in principle
- Current DPP government expected to maintain a **strong stance on localisation** and be **tough on developer deviations** to local content plans
- If offshore wind becomes a debated issue, investors may become nervous

# Taiwan offshore wind
# Industry status

# 2019 FIT rate was challenged due to low auction prices

Low auction prices and local elections drew political & public attention to offshore wind

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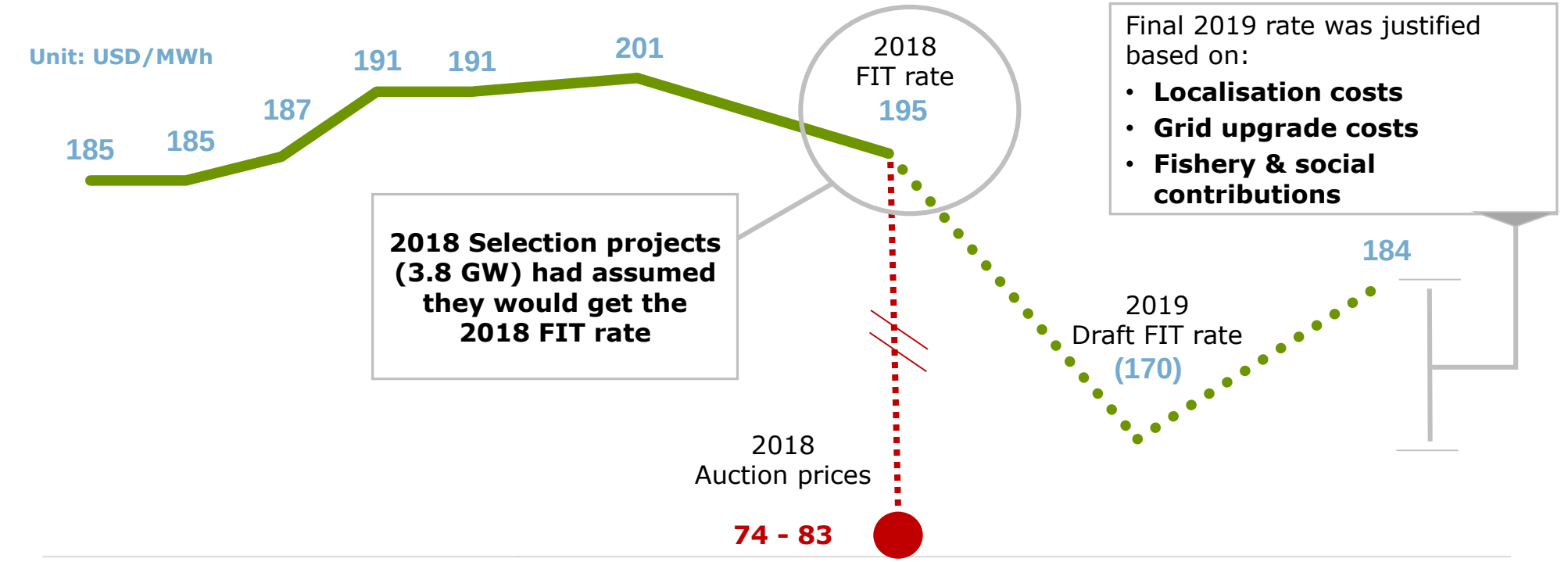


**PPAs signed to date under FIT regime**

(Auction PPAs not yet signed)

**Swancor**
- Formosa 1 Phase 1 **8 MW**

**Taipower**
- Taipower Demo **109.2 MW**

**F1 JV**
- Formosa 1 Phase 2 **120 MW**

**WPD**
- Yunneng **708 MW**

**F2 JV**
- Formosa 2 **378 MW**

**CIP**
- Changfang I-II **552 MW**
- Xidao **48 MW**

**Ørsted**
- #15 DC SE **605.2 MW**
- #14 DC SW **294.8 MW**

**CSC JV**
- Chongneng #29 **300 MW**

**Hailong JV**
- Hailong II #19 **300 MW**

CIP involved projects

# Developers continued to progress projects and solve industry issues

In Taiwan CIP and other developers are leading cross industry solutions

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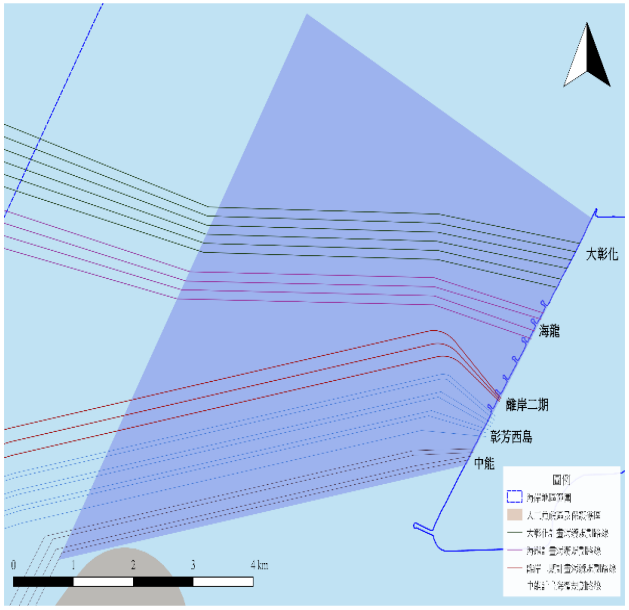
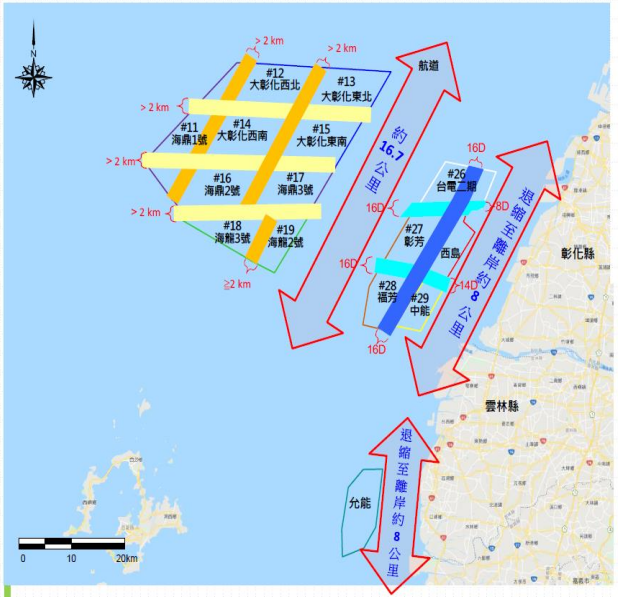
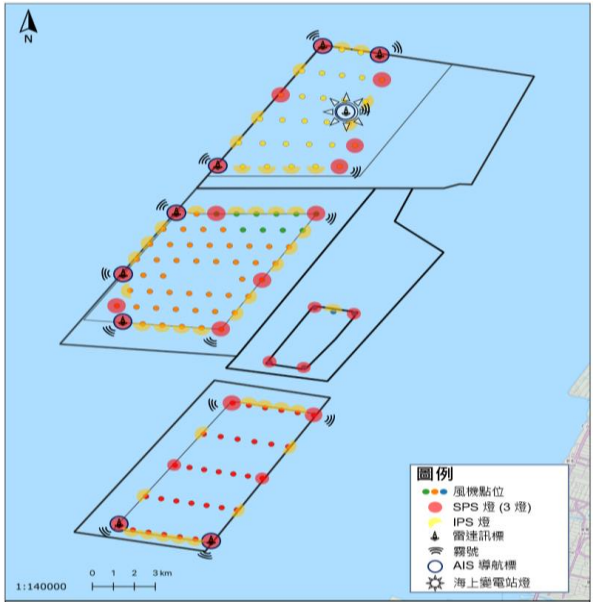
## Onshore & Offshore Cable Routes




## Bird Corridors

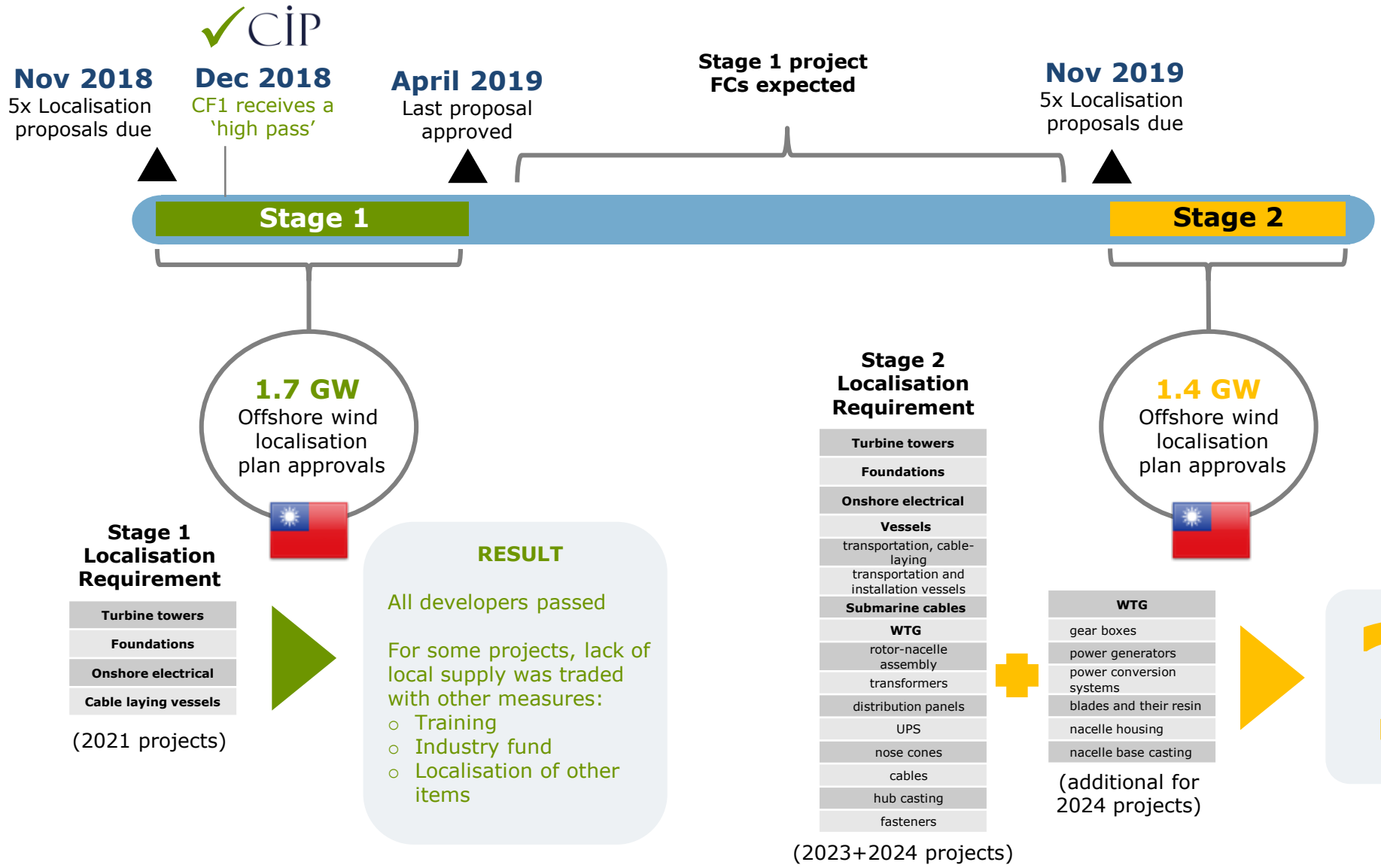



## Marine Coordination & Navigation



# Localisation & FCs will dominate the rest of 2019

Government has taken a strong position on localisation – deviations must be endorsed by local industry associations



# CIP is working with international and local suppliers to realise localisation in Taiwan

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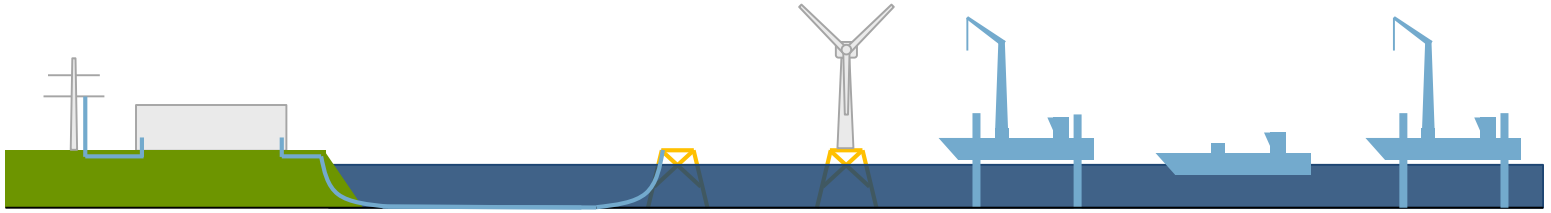


| | Onshore Electrical | Onshore Civil & structure | Offshore cables | Jacket foundations | Wind turbines | Foundation installation | Cable installation | WTG installation |
|---|---|---|---|---|---|---|---|---|
| Local Contractors | CTCI, PECL | CTCI, PECL | TAYA GROUP, HE | CECI, Century Iron & Steel Industrial Co,Ltd, CHINASTEEL | CHIN FONG | CSBC CORPORATION, TAIWAN; HUNG HUA CONSTRUCTION CO., LTD. | HUNG HUA CONSTRUCTION CO., LTD. | CSBC CORPORATION, TAIWAN |
| International Contractors | N/A | | LS Cable & System, Prysmian Group, JPR | RAMBOLL, BLADT INDUSTRIES, EEW | MHI VESTAS OFFSHORE WIND, CS WIND | Boskalis, DEME | SIEM, subsea 7 | seajacks, DEME |

## Wind Turbine Supply

- Signed award & localization agreements with MHI Vestas
- **Nacelle pre-assembly & tower, and blade production planned in Taiwan**

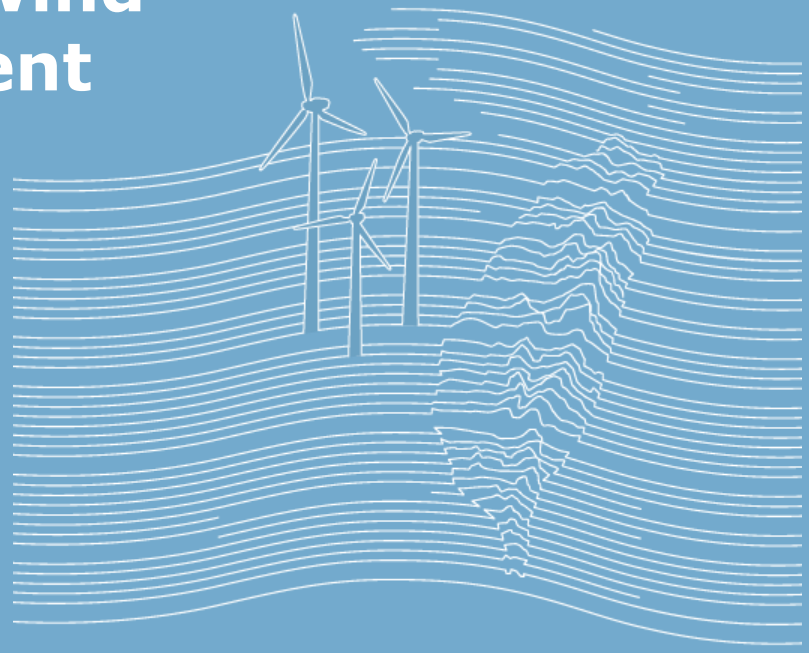
## Foundation Design

- **Rambøll to partner with CECI** in a 3 way agreement with CIP

## Foundation Supply

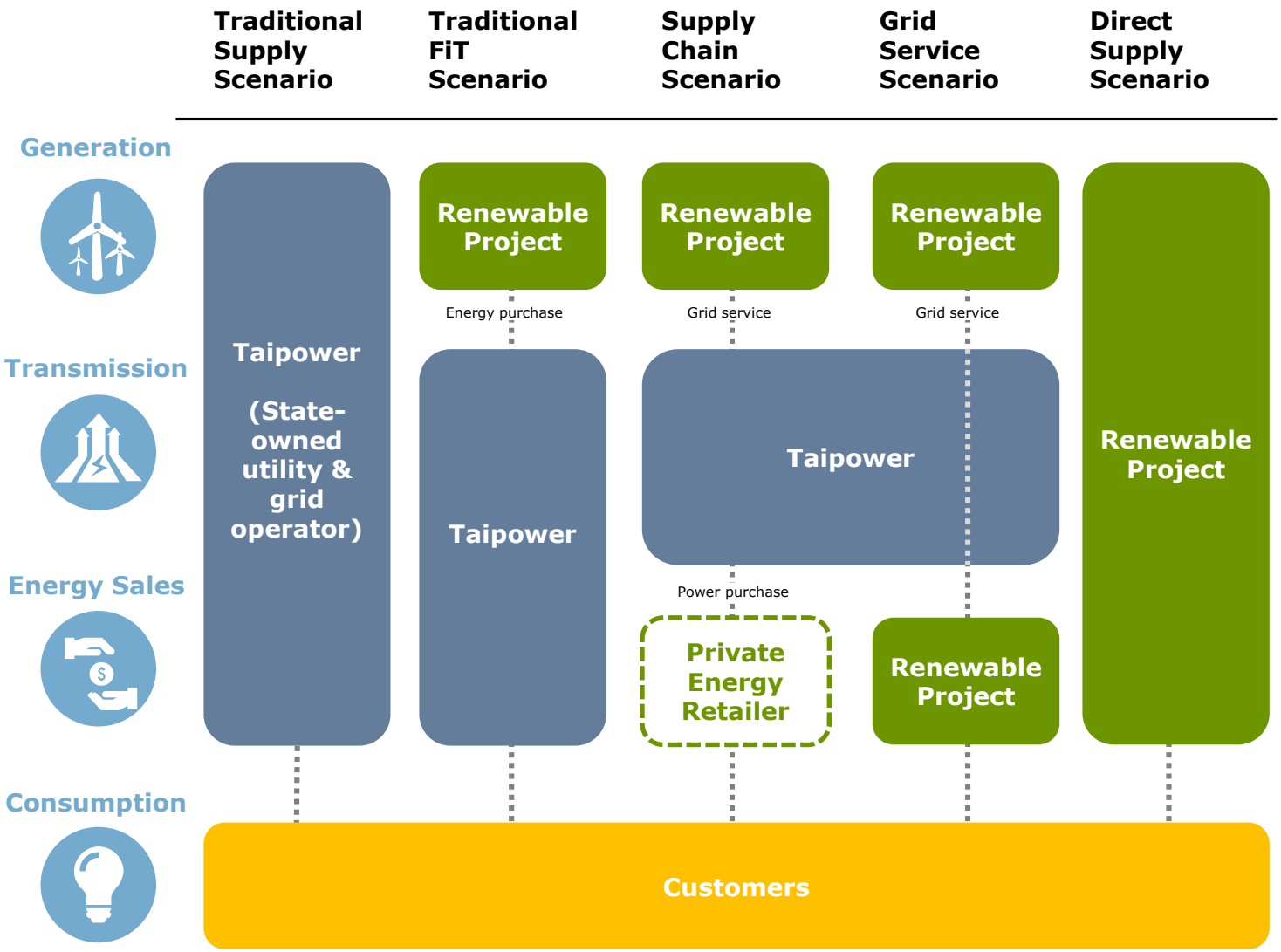
- Facilitated **partnership between worlds most experienced jacket fabricator and local fabricator**
- 300 jobs created

# Taiwan offshore wind
# Future development



# Taiwan is stepping towards a liberalised electricity market

As restrictions are lifted, the market will see more options and business models




**The Electricity Act was amended in Jan 2017:**

- **Taipower may be separated** into generation, transmission and retail companies
- Allows **private energy retailers to operate**
- Allows consumers to choose **energy source**
- Promote **RECs transaction**

In Jan 2019, Google signed its first corporate PPA in Asia with a 10MW Taiwanese solar plant

# Phase 3 offshore wind development in Taiwan

Guidelines for phase 3 development may be announced in late 2019

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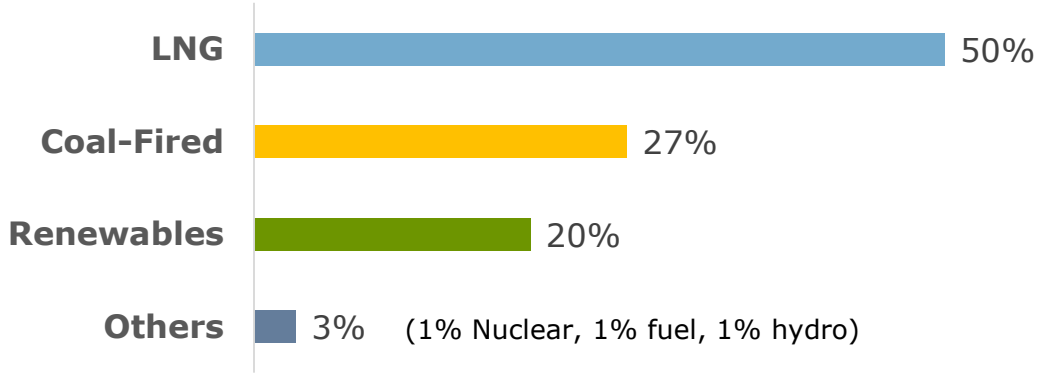
## 2025 Energy Supply Ratio Targets (announced in Mar 2019)

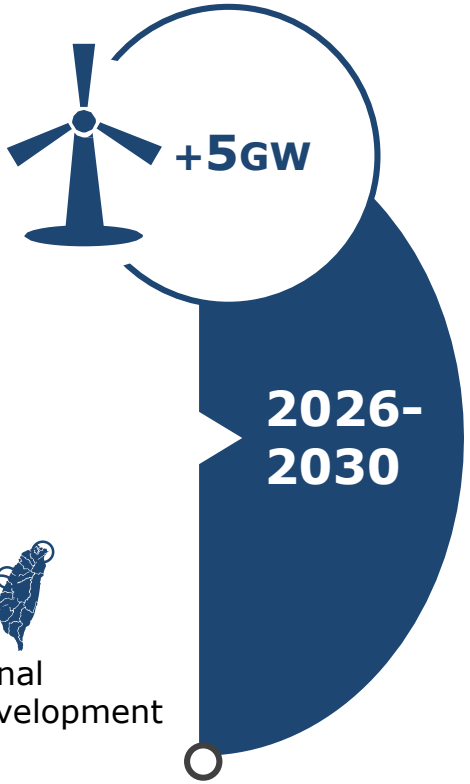



### Offshore wind development status at 2025

- **4.8 GW** of offshore wind sites with **valid EIAs**
- **Grid upgrades** complete with **~5 GW additional capacity**
- Key **harbor upgrades** are all expected to be complete by 2023

### Potential framework

- **Auction based** process for ~5GW
- **1 GW auctioned per year,** starting from 2021
- Sites with **valid EIA** may have preferences
- **Localisation requirements may be incorporated**




### Zonal Development (2026-2030)

- Market-driven development
- Developed supply chain
- Low marginal cost for those already in Taiwan

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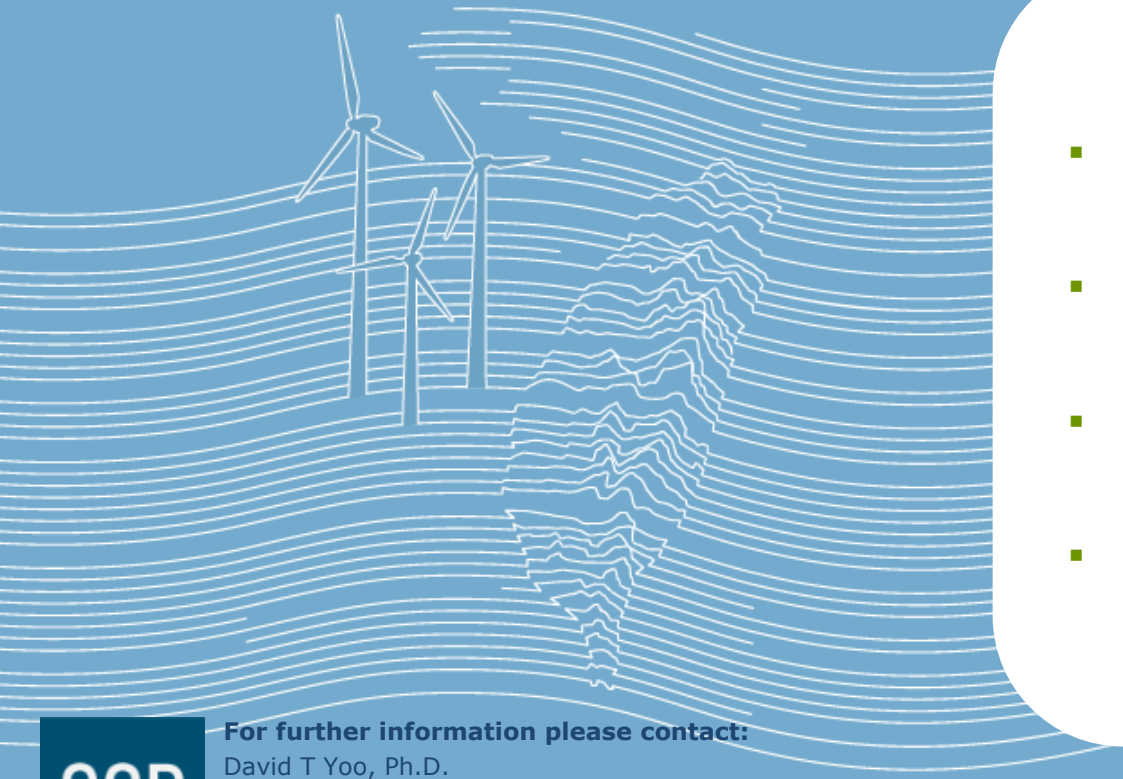
# Outlook for the Taiwanese Offshore Wind Market



## Summary

- Financial close for a number of projects & start of construction
- Extensive supplier and government discussions on localisation
- More news on future 5GW Zonal Development framework
- Federal election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