
Collaboration with Global Players to fast-track Taiwan's Offshore Wind Development

2018



Executive summary

Between the third quarter of 2017 and the second quarter of 2018, the Taiwanese government raised its 2025 offshore wind target, approved 10.5 gigawatts (GW) planned offshore wind projects and awarded 5.5GW offshore wind capacity to 10 developers for grid connection by 2025. Taiwan is on track to make the global top ten offshore wind markets by 2025 as well as become Asia Pacific's number two. Eight of the developers are non-Taiwanese. The two leading global offshore wind turbine manufacturers have entered the market. Experienced Western companies across the entire offshore wind supply chain have set up in Taiwan, putting the country on track to become Asia-Pacific's offshore wind hub. Yet there is still room for more partnerships between Taiwanese companies diversifying into the offshore wind industry and experienced European offshore wind companies in order to develop a local offshore supply chain capable of installing 10GW capacity and serving the wider region.



Private image by Thomas Poulsen

This *Collaboration with Global Players to fast-track Taiwan's Offshore Wind Development Report* (the Report) is part of a series of reports on the global emerging offshore wind markets. The reports have been crafted by the Panticon team during the months of April through November, 2018 to mark the new name of the management consulting company. Panticon is particularly strong in the Offshore Wind and Logistics sectors within the three core disciplines of Strategic Management Advisory, Mergers & Acquisitions, and Market Research & Analysis.

The Report has been created using an extensive library of data sources (see Reference section). The main data sources used as the basis for the Report were made up of 500+ pages and mainly consisted of various publications by government related organisations, academic journal articles, offshore wind industry articles, and press releases by firms across the offshore wind market supply side as well as demand side.

The Report contains forward-looking statements, which by their very nature, address matters that are, to different degrees, uncertain as they pertain to the future. These, or any other uncertainties, may cause the actual future results to be materially different than those expressed in the forward-looking statements as contained within this Report. At Panticon, we do not undertake to update our forward-looking statements, nor do we assume any liability for actions or dispositions made by firms, organisations, and/or individuals based on information contained in this Report.

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Collaboration with Global Players to fast-track Taiwan's



Image: MOEA/ cropped

In 2018 Taiwan's Ministry of Economic Affairs (MOEA) awarded grid capacity to eleven offshore wind projects under the first process of its kind in Taiwan. The map shows the location of the eleven selected projects (the 708MW Yunlin to be built in two phases);

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List of abbreviations

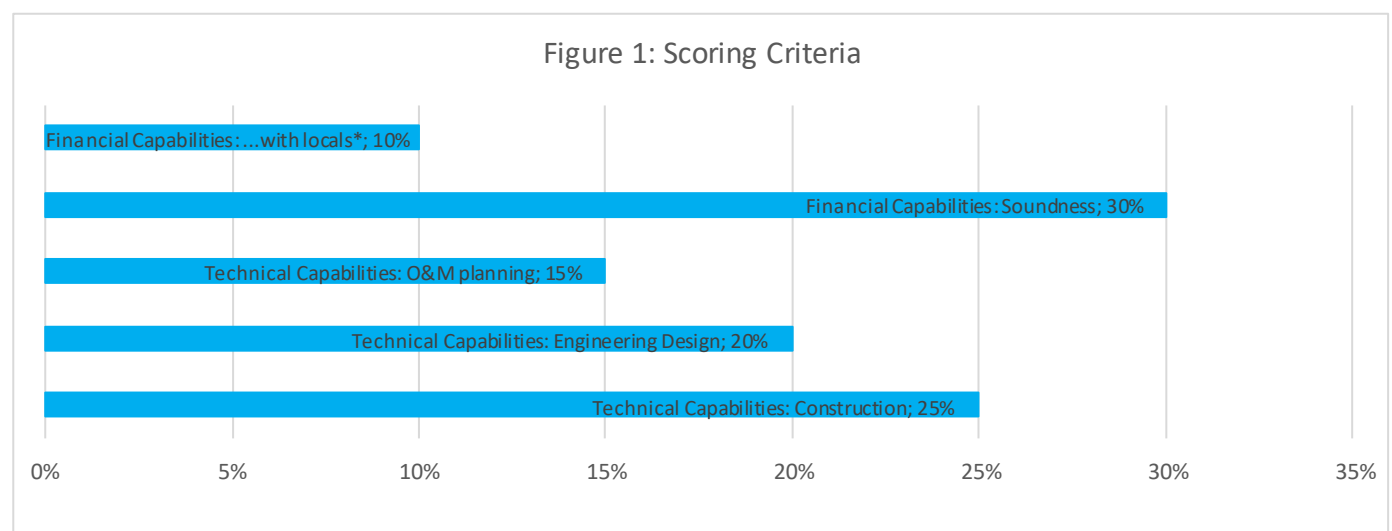
CIP	Copenhagen Infrastructure Partners
CSBC	China Shipbuilding Corporation
CSC	China Steel Corporation
DEME	Dredging, Environmental and Marine Engineering NV
DGA	Diamond Generating Asia
EIA	Environmental Impact Assessment
EPA	Environmental Protection Administration
EnBW	Energie Baden-Württemberg AG
FIT	feed-in tariffs
GW	gigawatt
IDB	Industrial Development Bureau
ITRI	Industrial Technology Research Institute
JV	Joint-venture
MOEA	Taiwan's Ministry of Economic Affairs
MoU	Memorandum of understanding
MW	Mega-Watt
MWh	Megawatt hour
O&M	Operations and maintenance
OWF	Offshore wind farm
Taipower	Taiwan Power Company
TGC	Taiwan Generations Corporation
TIPC	Taiwan International Ports Corporation
TWD	Taiwanese Dollars

1. Introduction

Taiwan kicked off its offshore wind development in July 2012 with plans for three pilot projects totaling nearly 360 megawatts (MW). Out of this, 8MW came online in 2017 while another 237MW is set to come online by 2020.

In July 2015, **Taiwan's Ministry of Economic Affairs (MOEA)** unveiled 36 zones of potential for offshore wind farm (OWF) development. Between August 2015 and June 2017, the MOEA raised Taiwan's 2030 offshore wind target from 3 GW to 4GW before introducing a 2025 target of 3GW. Finally, in July 2017, MOEA raised the 2025 offshore wind target from 3GW to 5.5GW.

In January 2018, **MOEA's Bureau of Energy** released the "*Directions for Allocating Installed Capacity of Offshore Wind Potential Zones*" which stipulated the Selection Procedure and the Auction Procedure. To take part in the Selection Procedure, and the subsequent Auction Procedure, the OWF developer had to have the capabilities as shown in Figure 1.



(*) i.e. 10% or 10 points awarded if 20%-plus project financing is local
Source: Panticon (September 2018)

In April 2018, MOEA held the Selection Procedure Round which was conducted in 2 stages within which a certain MW capacity was put out to bid. Stage 1 of the Selection Procedure, for grid connection before 2020, had no local content restrictions. The planned capacity of 500MW was oversubscribed by 238MW and this was above the 100MW allowance limit which was accepted because the two involved OWF projects are not located in the Changhua area. Stage 2 of the Selection Procedure, for grid connection in the period 2021-2025, had a planned capacity of 3000MW. Capacity of 3098MW was awarded, oversubscribed by 98MW and within the 100MW allowance limit. The local content requirements for Stage 2 projects increase progressively in three grid connection phases: 2021-2022, 2023, and 2024-2025 (see Figure 2). Winners of the Selection Procedure Round, 10 developers across 12 planned OWFs, are eligible for a 20-years feed-in tariff (FIT) based system of 5,849.8 Taiwanese Dollars (TWD) per megawatt hour (MWh). Alternatively, developers can opt for TWD7,117.7/MWh for the first 10 years and TWD3,568.5/MWh for the next 10 years.

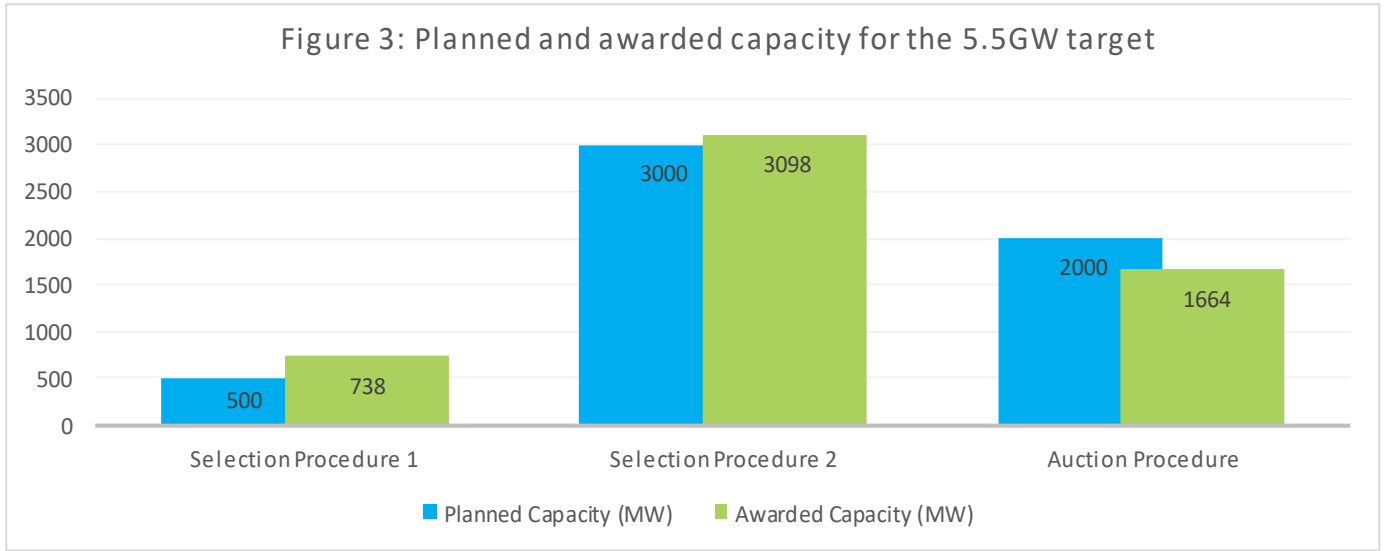
Figure 2: Local Content Requirements and Commissioning year

2021-2022	2023	2024-2025
▪ Towers ▪ Onshore electrical equipment ○ Transformers ○ Switches ○ Switchboards ▪ Foundations ▪ Vessels ○ Geological investigation ○ Logistics support ○ Crew transfer vessels ○ Subsea cable installation	▪ Towers ▪ Onshore electrical equipment ○ Transformers ○ Switches ○ Switchboards ▪ Foundations ▪ Vessels ○ Geological investigation ○ Logistics support ○ Crew transfer vessels ○ Subsea cable installation ○ Turbine & foundation installation ○ Transport ▪ Subsea cables ▪ Turbine components ○ Transformers ○ Switchboards ○ Power supplies	▪ Towers ▪ Onshore electrical equipment ○ Transformers ○ Switches ○ Switchboards ▪ Foundations ▪ Vessels ○ Geological investigation ○ Logistics support ○ Crew transfer vessels ○ Subsea cable installation ○ Turbine & foundation installation ○ Transport ▪ Subsea cables ▪ Turbine components ○ Transformers ○ Switchboards ○ Power supplies ▪ Gearbox ▪ Generator ▪ Power converters ▪ Blade ▪ Nacelle

Source: Panticon (September 2018)

In June 2018, MOEA held the Auction Procedure Round. Unsuccessful projects in the April 2018 Selection Procedure Round which had scored 60 or above were eligible. Due to oversubscription in the April 2018 Selection Procedure, the residue for the Auction Procedure fell from the planned 2GW to 1.66GW. The capacity went to two developers across four OWFs. Procurement rates were much lower than in the April 2018 round and ranged from TWD2,224.5/MWh to TWD2,548.1/MWh.

Figure 3 shows the planned capacity as well as the awarded capacity in the Selection and Auction Procedures.



Source: Panticon (September 2018)

Notable state-related players which impact project selection and grid connection in Taiwan include the Review Committee of the **Environmental Protection Administration (EPA)** of the Executive Yuan, the MOEA, the MOEA’s Bureau of Energy, the **MOEA’s Industrial Development Bureau (IDB)** and utility **Taiwan Power Company (Taipower)**. The EPA grants environmental impact assessment approvals (EIA) under a rigorous analysis and review process, the IDB grants construction permits, and Taipower provides the grid connection. Grid connection for the planned 5.5GW offshore wind capacity is expected to be built in 2021-2025.

1.1. Factors favouring offshore wind development

Political will and an open business climate to experienced global offshore wind players are driving offshore wind development in Taiwan.

Political will in favour of renewable energy development: Green energy is one of Taiwan President Tsai Ing-wen's five "pillar industries." Taiwan has a 20-year subsidy regime in place and has identified more than 30 sites for potential offshore development.

A relatively open business climate: Unlike other offshore wind markets in Asia, Taiwan has welcomed a number of foreign offshore wind players across the entire OWF value chain.

Prohibition of Chinese companies: Taiwan prohibits the hiring of Chinese companies to work on infrastructure projects. This has opened opportunities for the established European players and unleashed intense competition among developers as well as other supply chain players.

Asia offshore wind hub ambitions: Taiwan is in the process of quickly establishing local supply chain expertise via partnerships and joint-ventures (JVs) with top global offshore wind players. JVs are not mandated to be majority owned by locals.

Energy independence: Taiwan seeks to reduce its dependence on fossil fuel imports and has political will to phase-out nuclear power

Excellent offshore wind resources: Wind speeds at identified OWF development sites average 12 metres per second (m/s).

Lengthy onshore wind development approvals: Onshore wind farms, often built on government-owned land, are subjected to the government's land use approvals which are extended over nine-year intervals - a major concern for project financiers.

1.2. Factors hindering offshore wind development

Challenging offshore wind conditions and a local industry with limited offshore wind experience pose threats to Taiwan's offshore wind development ambitions.

Prevalence of typhoons, tsunamis and earthquakes: Taiwan has wind speeds in the International Electrotechnical Commission 1 T category .

Intensive and highly restrictive permitting process: Top global offshore wind developers have had permit applications rejected for further review as many as three times.

Limited local experience and technology to develop offshore wind energy.

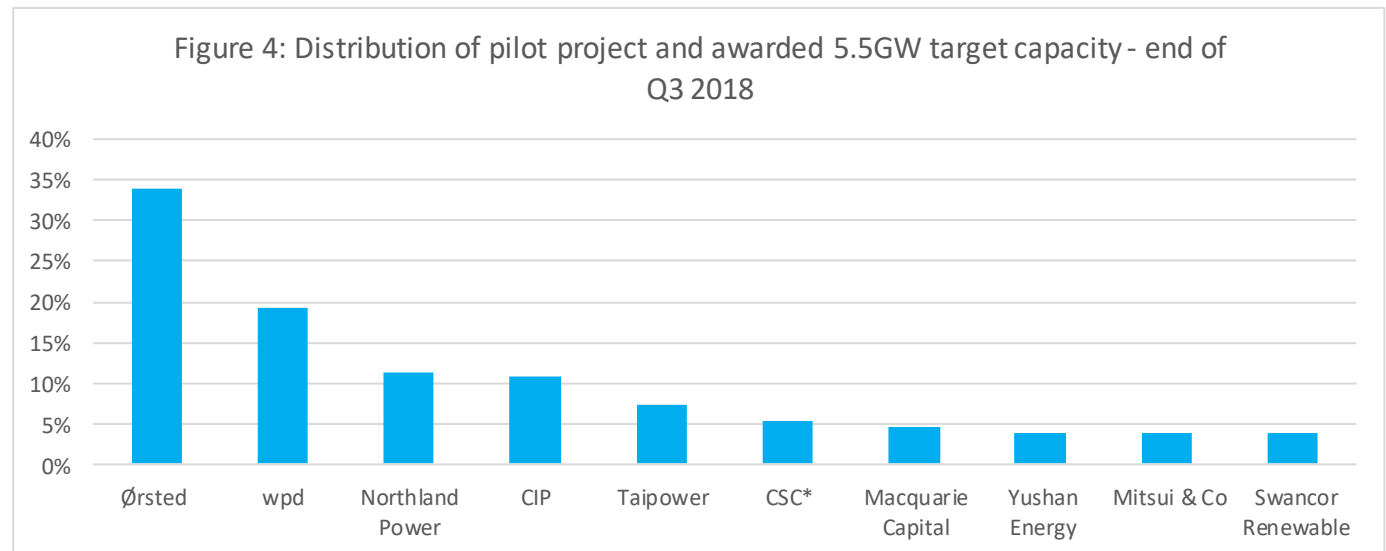
Limited financial planning expertise and industrial know-how of OWF operations.

Steep learning curve: The ambitious offshore wind targets by 2025 present a steep learning curve challenge for local players because of the relatively short timeframe as well as for the experienced Western players whose experience is mostly from the European markets.

Prohibition of Chinese companies: Taiwan prohibits the hiring of Chinese companies to work on infrastructure projects. China, which is geographically closer to Taiwan than western Europe, is the world's number three offshore market with an established local offshore wind supply chain. Meanwhile, relations between China and Taiwan may complicate the operations of Western players' with plans to be active in both markets.

2. Offshore wind farm developers and owners

In the following, recent updates up to the second quarter of 2018 pertaining to developers and owners of planned OWFs are outlined. The sequence is based on the size of the developer's or group owners' project portfolio capacity in Taiwan - installed as well as per capacity awarded in April 2018 and June 2018 (see Figure 4).



*with CIP and Mitsubishi's DGA involvement
Source: Panticon (September 2018)

- Danish energy company **Ørsted**, opened an office in Taiwan in November 2016 and has four Greater Changhua projects (570MW, 598MW, 613MW og 645.5 MW) with EPA approval. Its market entry strategy has centred on supporting local content development. In 2017, it courted 170 Taiwanese companies and identified 15 for close collaboration. In February 2018, Ørsted indicated it is to work with several Taiwanese partners (the Changhua County government, Taipower, **the Industrial Technology Research Institute (ITRI)** and **National Changhua University of Education**) to develop a MW-size energy storage pilot project in Changhua County. Three (1.82GW) of Ørsted's four planned Greater Changhua OWFs were successful in the April 2018 and June 2018 rounds.
- German developer **wpd** was the biggest winner in the April 2018 Selection Procedure round. Its two projects with a combined capacity of 1010MW qualified for FITs. It has already started the procurement process for projects and appointed **Sumitomo Mitsui Banking Corporation** as financial advisor with financial close planned by the end of 2018.
- In May 2017, Canada's **Northland Power Inc.** formed a 60-40 JV with Singapore-based **Yushan Energy** to develop two OWFs - **Hailong II** and **Hailong III**. Final EPA approval for the projects came in April 2018 and the JV has since selected Danish contractor **Semco Maritime** for an engineering study for the projects. Phase 1 of the planned Hailong II OWF qualified for FITs in April 2018. In May 2018, Japan's **Mitsui & Co** bought a 50% stake in **Yushan Energy Co's** 40% stake in the Hailong II and III projects. Phase 2 of Hailong II as well as Hailong III were successful in the June 2018 round, bringing the JV's total portfolio to 1.044GW.

- In May 2017, Denmark's **Copenhagen Infrastructure Partners (CIP)** acquired three offshore wind sites under development from **Fuhai Wind Farm Corporation**. The three sites have a total capacity of up to 1.5GW. CIP is developing the projects in co-operation with **Taiwan Generations Corp (TGC)**. In September 2017, CIP signed a memorandum of understanding (MoU) with the Changhua County government to speed up administrative processes for the 1.5GW projects as well as develop and establish a local offshore wind industry chain in Changhua County. In October 2017, CIP officially opened a project office in Taiwan. In March 2018, CIP signed a MoU with **Taiwan Life Insurance (China Trust Financial Holding)** to jointly invest in and finance planned OWFs in Taiwan. CIP planned OWFs totalling 600MW qualified for FITs in April 2018.
- Taipower wholly-owns the consented 109.2MW Changhua I pilot OWF. The project has faced delays due to, among other things, compensation regarding fisheries. Taipower's 300MW Changhua Phase 2 was picked in the April 2018 Selection Procedure Stage 2. Taipower plans to install 1,010MW of offshore wind capacity off Changhua County divided into two project phases.
- In October 2017, state-owned **China Steel Corporation (CSC)** announced collaboration with CIP and **Mitsubishi's Diamond Generating Asia (DGA)** for a planned 450MW OWF as well as plans to set up an operations and maintenance (O&M) base. 300MW of the planned OWF qualified for FITs in April 2018.
- Taiwan's **Swancor** is partnering with Australia's **Macquarie Capital Ltd** and Germany's **Energie Baden-Württemberg (EnBW)** to develop up to 2GW (552MW, 720MW and 732 MW phases) in the Formosa III OWF. EnBW acquired a 37.5% stake in February 2018. Formosa III was not selected in the April 2018 Selection Procedure while the 378MW Formosa II was.
- In December 2017, French developer **Eolfi** and **Cobra Concesiones** formalised a partnership (**Eolfi Greater China**) to develop a portfolio of five 500MW floating wind power projects off Taiwan. However, a third review by the EPA rejected approval of the first project, citing concerns over navigation safety.
- In February 2018, the EPA rejected local **TGC's** plans for the Fuhai OWF because of delays over the first phase, issues with the local fishing industry, and the potential environmental impact (proximity to a dolphin habitat and protected reefs) of the wind farm.

3. Local offshore wind farm supply chain

3.1. Development and consent lifecycle phase

The development and consent lifecycle phase has seen the most number of European offshore wind players working with various agencies of the Taiwanese government in laying the ground for offshore wind take-off. Institutions that have been closely working with the European firms include: **ITRI** (which is supporting the industry as co-ordinator and the primary technical institute) **CR Classification Society**, Taiwan's **Institute of Economic Research**, **Metal Industries Research and Development Centre** and the **Electric Research & Testing Centre**.

Selected European firms in this lifecycle phase are shown in Table 1.

Table 1: Selected foreign companies in Taiwan's offshore wind development and consent phase		
Company	Country of origin	Services
ABS Consulting	US	Exchange of technical information in the areas of offshore wind inspection and verification, safety and risk management and certification, as well as technology innovation
BMT Asia Pacific	Singapore	Consulting services to Taiwan's ITRI; devising a set of localised, best practice guidelines for offshore wind farm development
Gardline	UK	Cooperation with local Global Aqua Survey (G.A.S) on offshore survey projects in Taiwan
Global Maritime	UK	Marine warranty surveys, inspections and testing services, etc.
Global Renewables Shipbrokers (GRS)	Germany	Brokerage services on turnkey solution basis for a geotechnical soil investigation campaign
ITPEnergised	UK	Consulting services to Taiwan's ITRI; devising a set of localised, best practice guidelines for offshore wind farm development
K2 Management	Denmark	General consultant - Formosa 1 phase 1
Mott MacDonald		Technical, environmental & commercial due diligence (Formosa 1 Phase 1); Design review of anchor bolt system (Formosa 1 Phase 2)
Niras	Denmark	Owner's engineer; client advisory on issues includes tendering, basic design, review of detailed design, training, and capacity building
ODE (Doris Group)	UK	Owner's engineers
Offshore Wind Consultants	UK	Technical due diligence services to assess vessel suitability for wind turbine installation
Ramboll	Denmark	Consulting services to Taiwan's ITRI; devising a set of localised, best practice guidelines for offshore wind farm development
Renewables Consulting Group	UK	Training services for offshore wind industry
Wind Minds	Holland	MoU with local CECI Engineering Consultants in a tender for a Taipower project

Source: Panticon, based on multiple sources

3.2. Installation and commissioning lifecycle phase

3.2.1. Offshore wind turbines

The two leading global offshore wind turbine manufacturers - **Siemens Gamesa** and **MHI Vestas** - are likely to dominate the Taiwanese offshore wind market.

- Siemens Gamesa, which supplied the 8MW Formosa I phase 1 OWF, is preferred supplier for the 120MW phase 2. In March 2018, Siemens Gamesa signed an MoU for Formosa II regarding local supply chain development. In May 2018, Siemens Gamesa signed a letter of intent with wpd for exclusive negotiations over supply of turbines for the Yunlin OWF. In August 2018, Siemens Gamesa signed ten MoUs with global (**AH Industries, Jupiter Bach, KK Wind Solutions, Nissens, RMG Steel** and **Wuerth** – all from Denmark) and local (**Yeong Guan Group, SINBON Electronics, TA YA Electric Wire & Cable, Walsin Lihwa Corporation** and **TECO Electric & Machinery**) suppliers of turbine components and sub-components aimed at developing a local supply chain. In October 2018, Siemens Gamesa signed supply deals with local companies Swancor (resin for blades for the 120MW Formosa 1 phase two OWF project) and a joint venture between CS Wind and Chin Fong (towers for Wpd's 640MW Yunlin OWF project).
- In March 2018, CIP selected MHI Vestas as preferred supplier for CIP's three offshore wind projects off the Changhua coast with a combined capacity of 1.5GW. In May 2018, Taiwan's TECO Electric & Machinery signed a MoU with MHI Vestas to produce generators for MHI Vestas' 9.5 MW and other wind turbines. In October 2018, MHI Vestas signed a conditional contract with South Korean tower manufacturer **CS Wind** and Taiwanese firm **Chin Fong Machine Industrial** for the manufacturing of turbine towers in Taichung Harbour.
- Meanwhile, Japan's **Hitachi** was picked in April 2018 by Taipower to supply turbines for the latter's 109.2MW Changhua I OWF. In the aftermath, Hitachi announced intentions to set up a construction plant in Taiwan.

3.2.2. Balance of plant

Balance of plant has seen a number of Taiwan-Europe partnerships and MoUs, intensifying from November 2017 onwards.

3.2.2.1. Contractors

- Among contractors, experienced European players look set to dominate whilst partnering with local players. Even before the offshore wind development gathered speed, Taiwan's largest shipbuilder, state-owned **China Shipbuilding Corporation (CSBC)** had revealed intentions to tap into the OWF market to reduce its reliance on shipbuilding. In May 2017, CSBC signed a MoU with developer CIP for installation services as part of CIP's acquisition of 1.5GW projects from **Fuhai Wind Farm Corporation**.
- In December 2017, Belgium's **GeoSea** (a unit of **Dredging, Environmental and Marine Engineering NV (DEME) Group**) and **CSBC** formed a JV, **CSBC-DEME Wind Engineering Co. Ltd**, focused on OWF construction in Taiwan. In March 2018, CSBC-DEME Wind Engineering signed a letter of intent with Canada's **Northland Power** and Singapore's **Yushan Energy** to lead construction activities of the roughly 1GW Hailong II and Hailong III OWFs.
- In April 2018, Taipower contracted Belgium's Luxembourg-based **Jan De Nul Group** for the foundation design, fabrication and installation, wind turbine installation, supply and cable installation at Taipower's 109.2MW Changhua I OWF. In May 2018, Jan De Nul signed another contract for the design, procurement and installation of the wind turbine foundations for the 120MW Formosa I Phase 2 OWF.
- In May 2018, wpd named Dutch contractor **Van Oord** as preferred foundation contractor to design, manufacture and install foundations at wpd's Yunlin OWF.
- In November 2018, wpd awarded Seaway Offshore Cables (part of Subsea 7) a contract for the supply and installation of the export and inner array grid cable system for the Yunlin OWF.

3.2.2.2. Foundations

Local players, with strategic partnerships with experienced European players, look set to dominate foundations supply.

- In November 2017, **Taiwan's Century Wind Power (CWP)**, a subsidiary of **Century Iron & Steel Industrial (CISI)**, signed a MoU with Denmark's Ørsted to collaborate on turbine foundation manufacturing. The agreement includes CWP and Ørsted working on the goal to make CWP preferred supplier to commence the substructure serial manufacturing works from two plants at **Taipei Harbour** in early 2020, and supply foundations for Ørsted's Greater Changhua projects. The same month, CWP and Denmark's **Bladt Industries** signed a MoU to cooperate on fabricating jacket foundations and outfitting transitions pieces for Taiwan's offshore wind market. Bladt Industries will apply its know-how and experience to the JV. In March 2018, Ørsted signed its first manufacturing contract in Taiwan for a jacket foundation transition piece mock-up to be built by CWP. In April 2018, CIP selected CWP and Bladt Industries as preferred suppliers of 150 jacket foundations for CIP's three offshore wind projects in Taiwan. In August 2018, Bladt Industries and CWP announced they were forming a JV – Century Bladt Foundation Co.
- Still in November 2017, Taiwan's top steel maker **CSC** signed a MoU with Ørsted under which the two companies will work jointly to ensure that CSC's production lines are ready in 2020 to manufacture and assemble underwater foundation substructures. CSC is building a nearly TWD 6 billion plant in Singda Harbour, Kaohsiung, to manufacture undersea foundations for offshore wind turbines set for completion in 2019. In November 2018, Ørsted signed a contract with CSC-subsidary **Sing Da Marine Structure Corporation** to supply 56 jacket foundations for the first 900MW Greater Changhua projects, subject to power purchase agreement signing and final investment decision.
- An example of Taiwan-Taiwan partnership is the March 2018 MoU between **Formosa Heavy Industries Corp** and developer **Swancor Holding Co** to produce underwater structures for wind turbines for **Swancor**.
- In May 2018, Thailand's oil and gas company **CUEL** signed its first offshore wind contract with Belgian contractor **Jan De Nul Group** to fabricate and supply 20 transition pieces for the Formosa 1 Phase 2 OWF in Taiwan. CUEL will fabricate the transition pieces from its Laem Chabang yard on the Eastern coast of the Gulf of Thailand.
- In June 2018, foundations contractor for the Formosa I Phase 2 OWF Jan de Nul awarded German **EEW SPC** a contract for the production of 20 monopile foundations.
- In October 2018, Ørsted awarded contracts for the manufacture of foundation pin pile to Taiwan's Formosa Heavy Industries and CSBC Corporation for the Changhua OWF projects.

3.2.2.3. Installation vessels

Taiwan faces a critical bottleneck when it comes to installation vessels. For the short-term, the local players are still unable to supply the specialised vessels.

- In May 2018, Siemens Gamesa contracted UK-based **SeaJacks** for turbine installation at the Formosa I phase 2 OWF.

In the medium-term, local players are expected to be more involved in OWF construction.

- In November 2017, **CSBC** revealed it is to develop specialty vessels including turbine installation vessels for OWF construction.
- In December 2017, **Woen Jinn Harbour Engineering** signed a MoU with developer Ørsted to make Woen Jinn the preferred offshore cable installation partner for Ørsted's four Greater Changhua OWFs. The MoU also aims at helping Woen Jinn become a competitor in the Asia Pacific region. Meanwhile, in January 2018, Woen Jinn contracted **Longtitude Engineering** (UK) to undertake a month-long feasibility study of Woen Jinn's WJ#5 cable lay barge. In September 2018, Ørsted awarded Woen Jinn a contract for inter-array cable installation at the Greater Changhua OWFs including a special financial arrangement to allow Woen Jinn to invest in a new cable installation vessel, WoenJinn#7.



Private image by Thomas Poulsen

3.3 Operations and maintenance lifecycle phase

Ports in Taichung Harbour, Kaohsiung, Keelung and Taipei, have emerged as Taiwan's offshore wind ports. A number of the aforementioned suppliers have manufacturing plants in counties where these ports are located. Turbine manufacturers, developers and balance of plant suppliers have signed a flurry of MoUs in 2017 and 2018.

- In July 2017, Taipower threw its weight behind a \$100m plan to build Southeast Asia's largest offshore wind port facility in Taichung which will support the developer's OWF construction and O&M.
- In December 2017, Siemens Gamesa signed a MoU with the **Taiwan International Ports Corporation (TIPC)** to begin a joint investigation into the development of areas of **Taichung Harbour** to support offshore wind development, including for manufacturing. In February 2018, Siemens Gamesa signed a MoU with Taiwanese **Yeong Guan Energy Technology Group** whereby Yeong Guan will be investigating the establishment of a foundry, machining and painting facilities at Taichung Harbour. In June 2018, **Taiwan International Windpower Training Corporation** and Siemens Gamesa signed a letter of intent with the **Global Wind Organization** to build a training centre for technicians in Taichung. In November 2018, Jan De Nul signed a MoU with TIPC to establish a logistics hub at the Taichung Port for the Formosa 1 Phase 2 OWF.
- **Century Wind Power** plans to build a €139m manufacturing plant (jacket foundations and outfitting transitions pieces) on 16 hectares of land in **Taipei Harbour** to be completed in 2019.

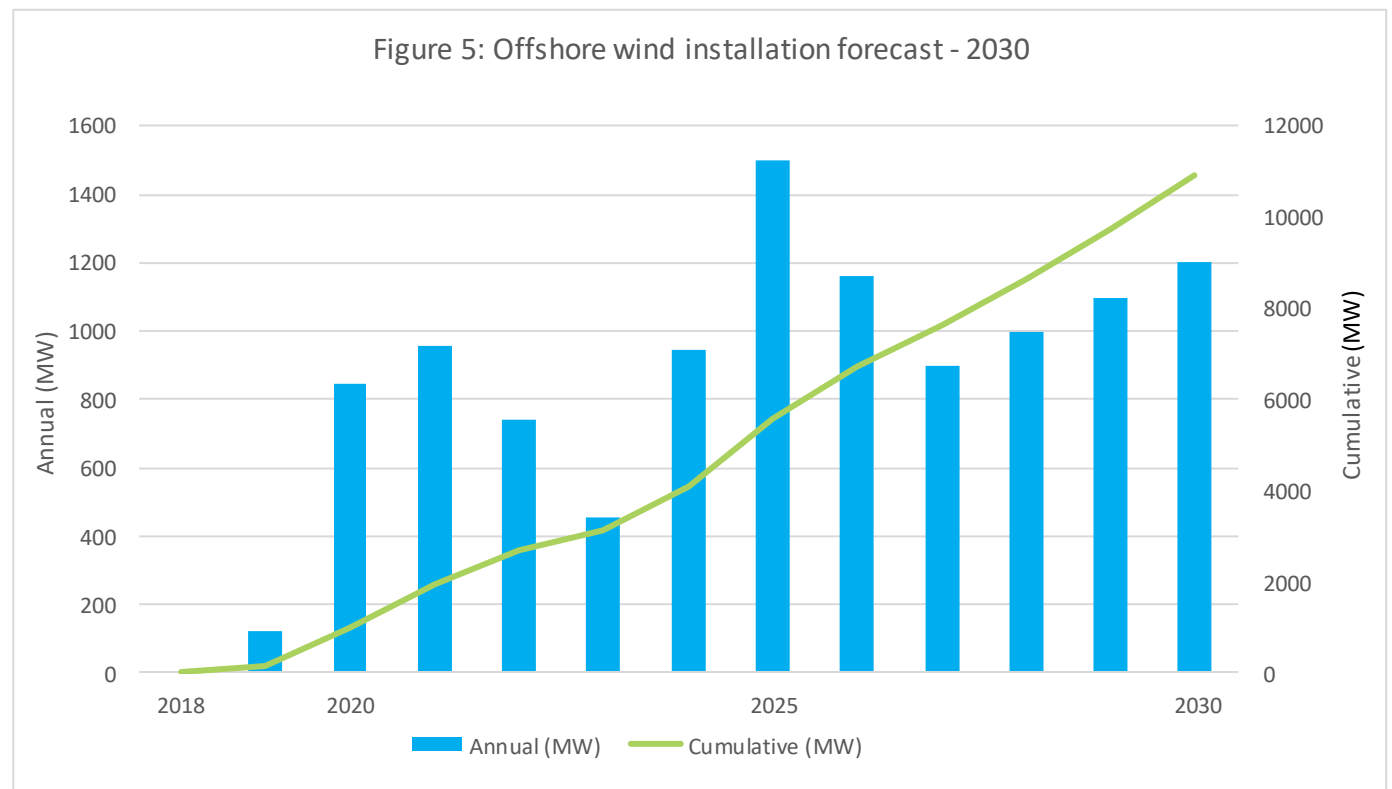
O&M vessels

With O&M still not yet fully under way, initial activity is being observed as well:

- In April 2018, Ørsted signed a MoU with **Taiwan Navigation** and **Eastern Navigation** for development of a local service operations vessel (SOV) solution for Ørsted's Greater Changhua OWFs. In July 2018, Taiwan's logistics firm **Kerry TJ Logistics** and Singapore's offshore marine services provider **PACC Offshore Services Holdings Limited (POSH)** formalised a JV company, **POSH Kerry Renewables**, to provide integrated supply chain and marine solutions to the offshore wind sector in Taiwan. The JV has since signed an MoU with **Rolls-Royce** to explore suitable designs for walk-to-work and service operations vessels. The same month, POSH Kerry Renewables secured its first contract to provide anchor handling, supply and standby support to an international geotechnical services operator during the site survey, installation and construction of an OWF.
- In August 2018, **TIPC** launched Taiwan's first offshore wind crew transfer vessel (CTV) at the Port of Taichung.
- In October, 2018, UK-based Njord Offshore secured a contract with Siemens Gamesa to provide a Service Accommodation & Transfer Vessel for the Formosa I OWF project. The 35-meter vessel is a hybrid between a service operations vessel and crew transfer vessel specially designed for the Taiwanese market.

4. Offshore wind installation forecast

By end of the first quarter of 2018, Taiwan’s EPA had approved 18 offshore wind projects with an aggregate capacity of up to 10.5GW while rejecting three projects of up to 915MW. Going by the positive developments from the third quarter of 2017 to the second quarter of 2018, and barring grid constraints, Taiwan looks likely to meet its set targets with non-significant delays (see Figure 5).



Source: Panticon (September 2018)

5. Conclusion

The Taiwanese government’s offshore wind policy has been so attractive that it has lured leading European firms across the entire offshore wind supply chain to set up base in the country whilst they eye the rest of Asia-Pacific. If the current momentum is maintained and steel is put in the water, Taiwan’s offshore wind market should become the region’s number two by 2025 and make the global top seven-to-ten offshore wind market by 2030. As developers and turbine manufacturers look to meet local content providers, partnerships with local players to establish a local supply chain are paramount. However, most local players do not meet the quality standards of the offshore wind industry. This remains a window of opportunity for experienced European offshore wind companies. Taiwan could become the role model that will encourage the rest of the region to boldly embrace offshore wind.

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Who we are

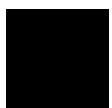
At Panticon, we are particularly strong in the Offshore Wind and Logistics sectors within our three core disciplines of **Strategic Management Advisory**, **Mergers & Acquisitions**, and **Market Research & Analysis**. We are mainly focusing on the business side to improve our clients' performance, create value in the long-term, and to create sustainable competitive advantages.

How we create value

- Tailor-made strategies
- Support M&A endeavours
- Share knowledge
- Analyse markets
- Advise our clients in every aspect of our three core disciplines



Strategic Management Advisory



Mergers & Acquisitions

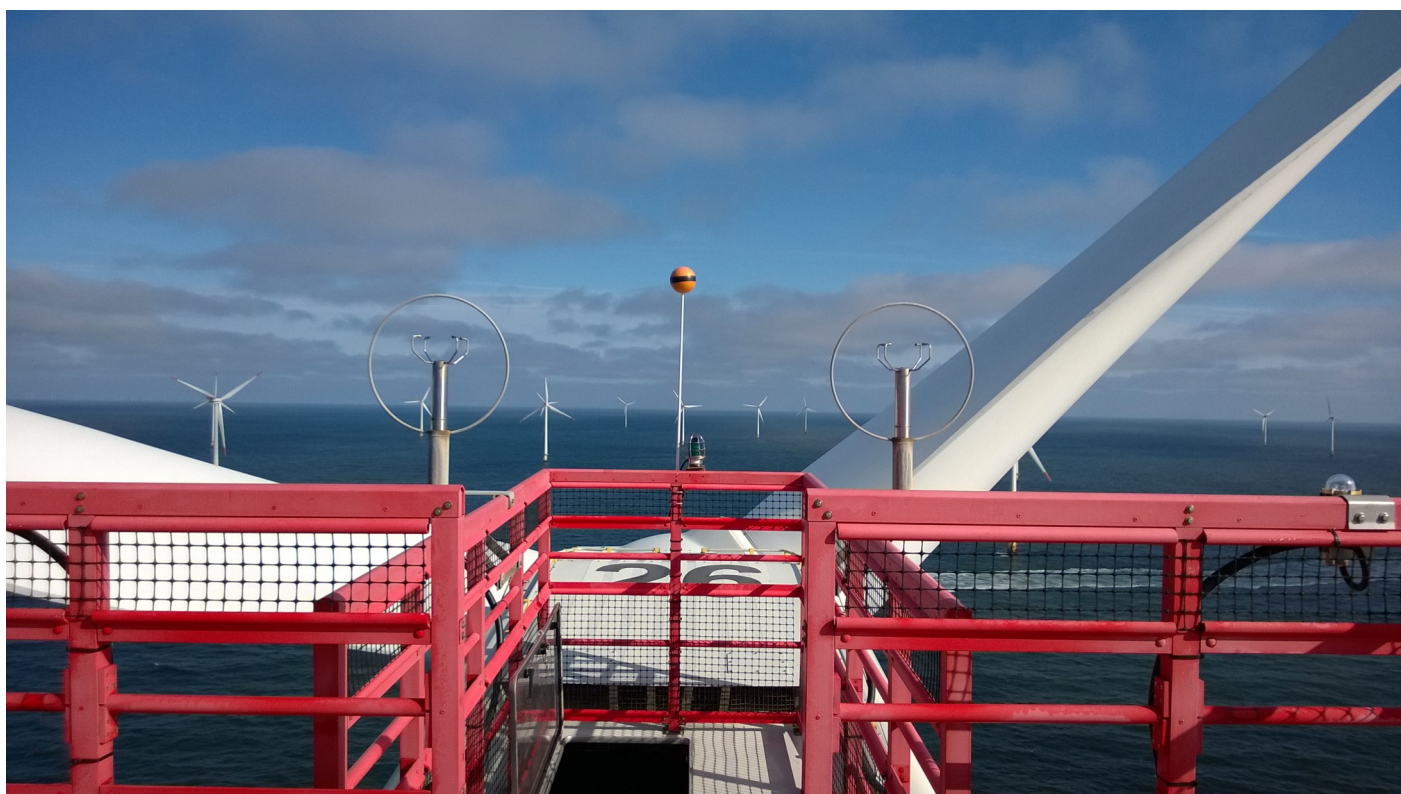


Market Research & Analysis



Offshore Wind

Logistics



Private image by Thomas Poulsen



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