

# Offshore Wind Supply Chain Overview

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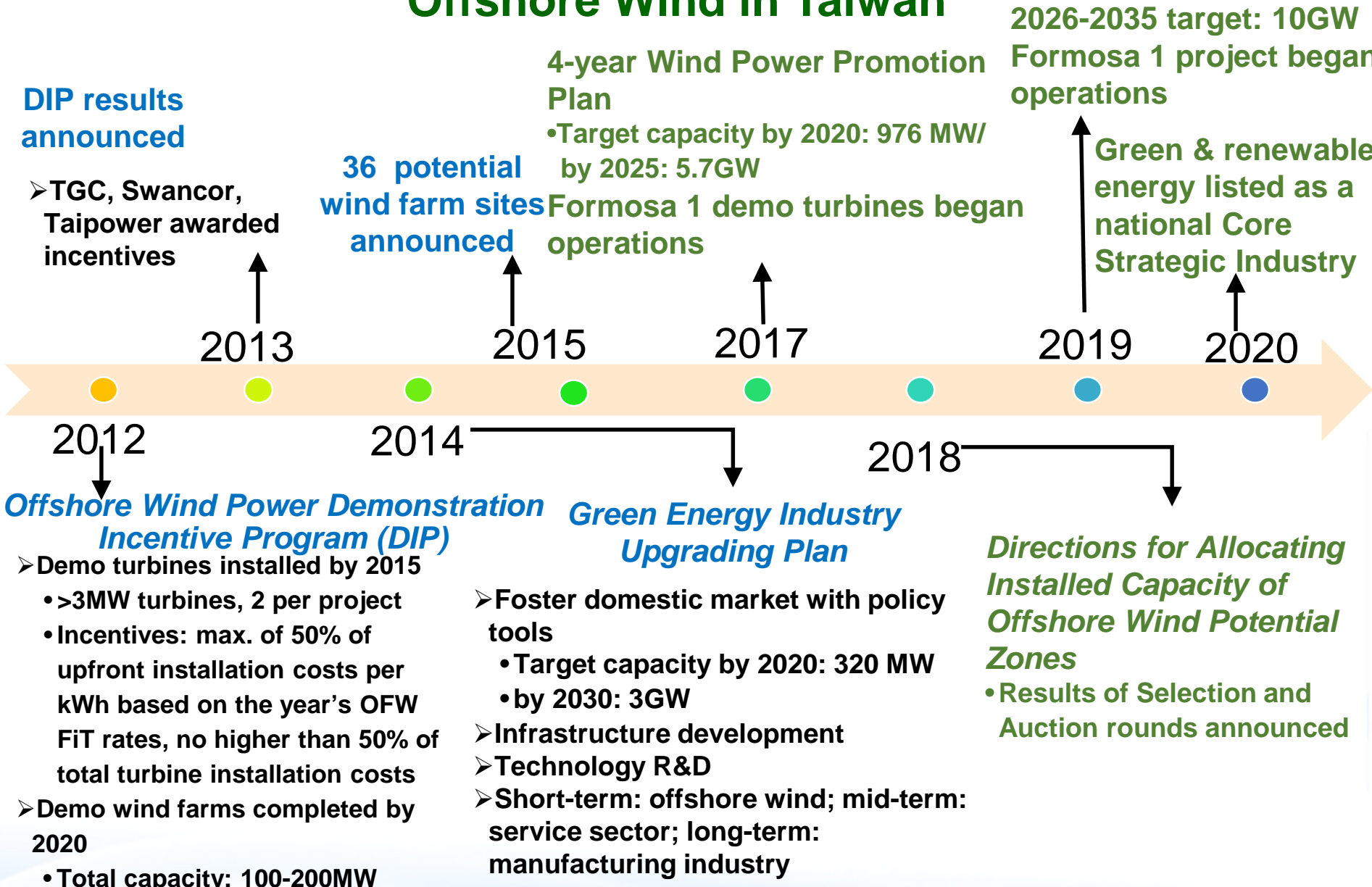
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**Conclusion**



# I. Offshore Wind Industry Policy (1/9)

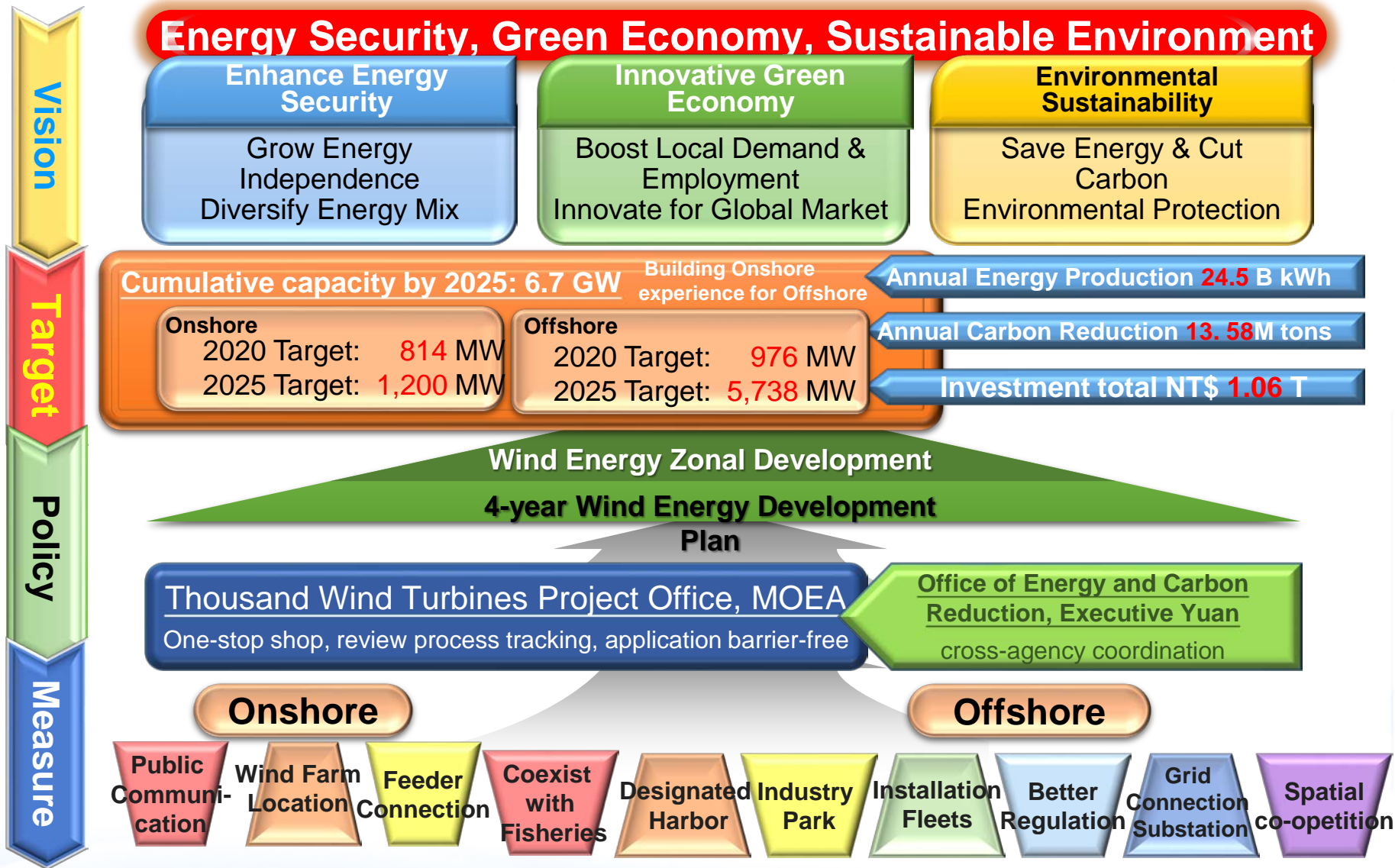
## Offshore Wind in Taiwan





# I. Offshore Wind Industry Policy (2/9)

## Executive Yuan Approved 4-year Wind Energy Development Plan



Source : Thousand Wind Turbines Office



# I. Offshore Wind Industry Policy (3/9)

## Offshore wind power is both an energy policy and a industry policy

### Phase 3

Zonal Dev.



### Phase 2

Potential Sites



### Phase 1

Demo Incentives

#### ③ Build the industry led by the government

- 2026-2035: release 1GW/year (10GW in total)
- Two-phase selection: first qualification assessment, then price comparison

#### ② Announce sites for application

- 2021-2024: wind farm selection (3.8GW in total)
- 2025: wind farm auction (1.7GW in total)

#### ① Provide subsidies to accumulate experience

- 2017: 2 demo sets at Formosa 1
- 2019: 60 sets (120MW in total) at Formosa
- 2020: 21 sets (109.2MW in total) at Taipower

#### ③ Further industry dev.

- ✓ Continue the energy of potential site suppliers
- ✓ Optimize investment environment
- ✓ Become Asia-Pacific offshore wind power hub

#### ② Facilitate industry cluster

- ✓ South-North foundation cluster (SDMS, Century)
- ✓ Taichung Port turbine cluster (SGRE、MVOW)

#### ① Guide supplier engagement

- ✓ Turbine components- Swancor, Fortune, Powercom, Walsin
- ✓ Foundation- Ming Rong Yuan



# I. Offshore Wind Industry Policy (4/9)

## The commitments of “Guidelines for Allocating Installed Capacity of Offshore Wind Potential Zones.”

- In selection stage, the selected developers with completion due in 2021-2025 **commit** to submitting a specific **industrial relevance program** and **supporting material**.
- Developers to submit the above two documents according to year of grid connection. **IDB issues an Opinion Letter** to help **improve developer program** before it is **reviewed by BOE**.



- Capacity awarded originally: 0.5GW (in practice: 0.738GW)
- Criteria: technical (60%) & financial capability (40%)
- Submit supporting material according to establishment permit application requirements, progress strictly reviewed

Source:BOE

- Capacity awarded originally:3GW (in practice: 3.098GW)
- Criteria: technical & financial capability
- Commitments Required:
  - **Specific industrial relevance program: by 2018/11/15 for 2021-2022 completion, 2019/11/15 for 2023-2025 completion**
  - Best available techniques & strategy to minimize environmental impact
  - Power Development Fund used for environmental protection & CSR projects

- Capacity awarded originally: 2GW (in practice: 1.664GW)
- 2-Stage review process
  - ✓ Qualification: a score >60 in the selection process
  - ✓ Proposals with lower FIT rates are selected
- Grid connection capacity for 2021-2025 awarded, with flexible requirements



# I. Offshore Wind Industry Policy (5/9)

Jan. 18, 2018: Announcement of Taiwan's Offshore Wind Industry Policy

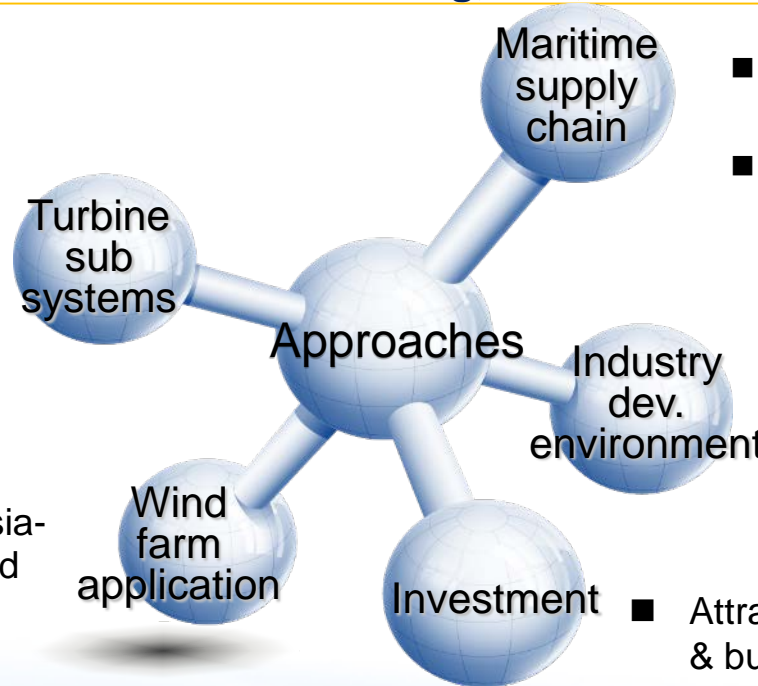
## Goal

Promote the dev. of Taiwan's offshore wind power industry, build the supply chain, and compete in **Asia-Pacific markets**

## Strategies

- (1) **Build infrastructure for the industry to develop upon:** plan offshore wind power zones to facilitate investment and form clusters.
- (2) **Facilitate the dev. of supply chain:** Attract international manufacturers to Taiwan via market incentives; encourage international and local suppliers to form partnerships in turbine manufacturing, foundation and vessel manufacturing, etc.; create a supply chain for the industry.

- Facilitate international collaboration
- Facilitate the dev. of key subsystems & components
- Facilitate cases of local wind farm application
- Help expanding Asia-Pacific markets and enter international supply chains



- Facilitate international collaboration
- Create a supply chain for the industry
- Build infrastructure for the industry to develop upon
- Plan industry zones to facilitate industry clusters
- Attract international vendors to invest & build factories in Taiwan
- Strengthen matching mechanism



# I. Offshore Wind Industry Policy (6/9)

## Clear List of Items and Timeline for Industrial Development

- ◆ **76** consulting meetings convened during Sep 20 to Dec 15 in 2017 (in total 50 wind farm developers, system suppliers, local component suppliers and industry associations), to measure technical gaps and investment willingness for further assessment and planning
- ◆ Industrial development **items** and **timeline** formulated based on technical maturity level among local suppliers and planning practices of international suppliers.

	Preparation (2021-2022)	Phase I (2023) (incl. preparation phase items)	Phase II (2024-2025) (incl. preparation phase & Phase I items)
<b>Foundation (IDB)</b>	Foundation		
<b>Electrical Components (IDB)</b>	Onshore electrical components (transformer, switchgear, distribution panel)	Submarine cable	
<b>Wind Turbine (IDB)</b>	Tower	Nacelle assembly, transformer, distribution panel, UPS, canopy & spinner, cable, hub casting, fastener	Gearbox, generator, PCS, blade and resin, nacelle housing, nacelle bedframe casting
<b>Marine Engineering (BOE)</b>	<ul style="list-style-type: none"> <li>✓ Construction and supervision of surveying, cable laying, exploration, etc. Vessel and machine planning and design and safety management</li> <li>✓ Ship-building: vessels for survey, supply, arrangement, transportation, cable laying</li> </ul>	<ul style="list-style-type: none"> <li>✓ Construction and supervision of tower, foundation, etc. Vessel and machine planning and design and safety management</li> <li>✓ Ship-building: vessels for installation &amp; transportation</li> </ul>	Construction and supervision of turbines, vessel and machine planning and design, safety management





# I. Offshore Wind Industry Policy (7/9)

## Domestic suppliers preferred in marine engineering projects

- ROC-flag vessels owned by a company or entity formed pursuant to ROC laws are preferred.
- If the vessel used is owned by a legally formed international joint venture (IJV), the domestic company should own more than half of the shares in the IJV; the IJV should also own more than half of the shared of the said vessel.
- If using foreign flag vessels proves necessary, a non-capacity letter from marine engineering trade associations, as well as a “ROC crew training plan” are required. Maritime and Port Bureau’s (MPB) *Operation Directions for Foreign Flag Ships Applying to Stay in Any Harbor or Port Other Than Those Announced as International Ports by the ROC* should be followed.
- MOEA planned to formulate a mechanism for reviewing the degree of industrial relevance of OFW vessels.





# I. Offshore Wind Industry Policy (8/9)

## 4 Drivers for Building OFW Supply Chain in Taiwan

### • National Financing Guarantee Scheme

- ✓ 10Bn-NTD in size, with 100Bn financing guarantee resources
- ✓ Application to open by end of 2020
- ✓ Wind farm developer: max loan for local goods & service procurement: 30Bn NTD, max guarantee period: 20y (per company).
- ✓ Domestic equipment & service provider: max loan: 2Bn NTD; for export purpose: 500Mn NTD, max guarantee period: 5y

### • Taichung Harbor: OFW Industrial Park

- ✓ Turbine component production, nacelle assembly
- ✓ Pre-assembly port
- ✓ O&M base

### • Foundation clusters at Taipei Harbor & Sinda Harbor (Kaohsiung)



### • Offshore Wind Master Program Course

#### • Welder Training

- ✓ Gov: technology upgrading for OFW foundation industry
- ✓ Education: Fortune Institute of Technology, NKUST
- ✓ Industry: CSBC Academy, Century-Bladt welding school

#### • Maritime talent development

- ✓ MIRDC Maritime Talent Devt. & Accreditation Center (Kaohsiung)
- ✓ TIWTC (Taichung)
- ✓ NKUST (Wind Industry Training Base)

### • OFW Industrial Relevance Program building supply chain

- ✓ Setting up factory via sole proprietorship/ JV
- ✓ Tech transfer, OEM
- ✓ Supply chain partners

### • OFW engineering and key component inspection & certification program

### • O&M inspection and servicing technologies program



# I. Offshore Wind Industry Policy (9/9)

## Offshore Wind Regulations in Taiwan

Announcement Date	Agency	Regulation	Description
2019.9.23	BSMI	Guidelines for Project Certification and Review of Wind Farms	Demonstration offshore wind farms should apply for project certification and review within 6 months after obtaining establishment permits
2020.1	MOL	Health and Safety Guidelines for Offshore Wind Farms	Employers shall formulate a safety and health management plan and implement accordingly, in order to ensure worker health and safety on offshore wind farms.
2020.8.24	BOE	COVID-19 Prevention and Control Guidelines for Offshore Wind (Revised 3.0)	Epidemic prevention and control measures targeting personnel working in offshore wind, covering personnel entry and exit, work shifts, and foreign vessels operating in Taiwan
2020.9.10	MOL	Announcement to approve Personnel Working for the Construction, Operation and Maintenance of Offshore Wind Farms or Onshore Wind Farms as the Type of Workers Specified in Article 84-1 of Labor Standards Act (LSA)	Due to poor weather conditions and safety risks, offshore wind workers at times cannot carry out operations as scheduled, or avoid working at height or solving failures. When Articles 30, 32, 36, 37 and 49 of LSA apply in relevant situations, such personnel should be approved as the Type of Workers Specified in Article 84-1 of LSA and granted flexibility in work arrangement.



# II. Promoting Industry Clusters (1/4)

## Industry Cluster Allocation

Legend	
	International Commercial Port
	Supporting Port
	Domestic Commercial Port
	Industrial Harbor
	Special Cargo Stevedoring & Other Special Facility (Commercial Port Law)
	Transfer Vessel Harbor

**Taipei Port**  
Foundation Production Base



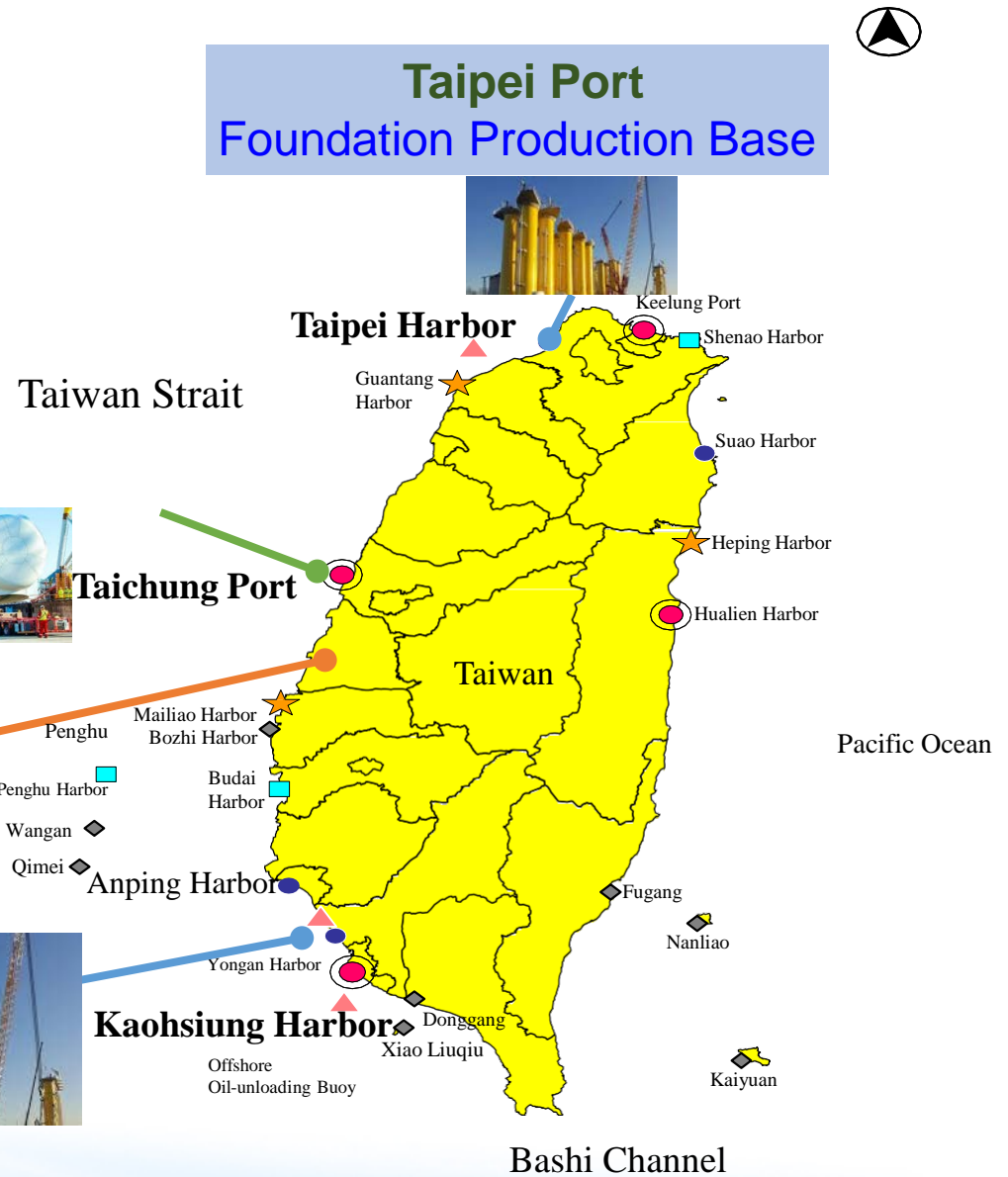
**Taichung Port**  
Wind Turbine Component Manufacturing, O&M base



**Changhua Fishing Port**  
Offshore Wind O&M Base



**Singda Harbor**  
Foundation Production Base

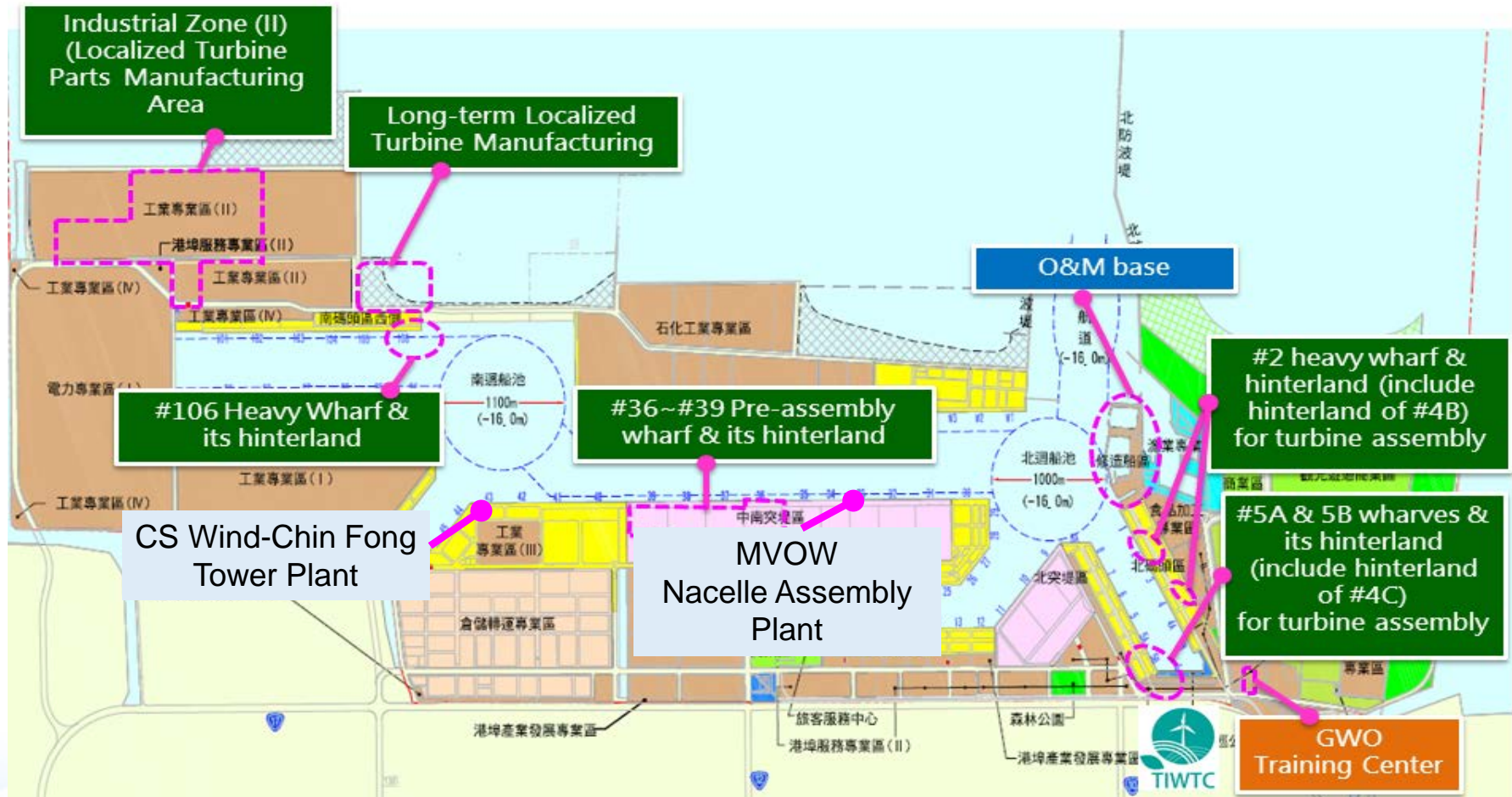




# II. Promoting Industry Clusters (2/5)

## Offshore Wind Component Industry Cluster at Taichung Port

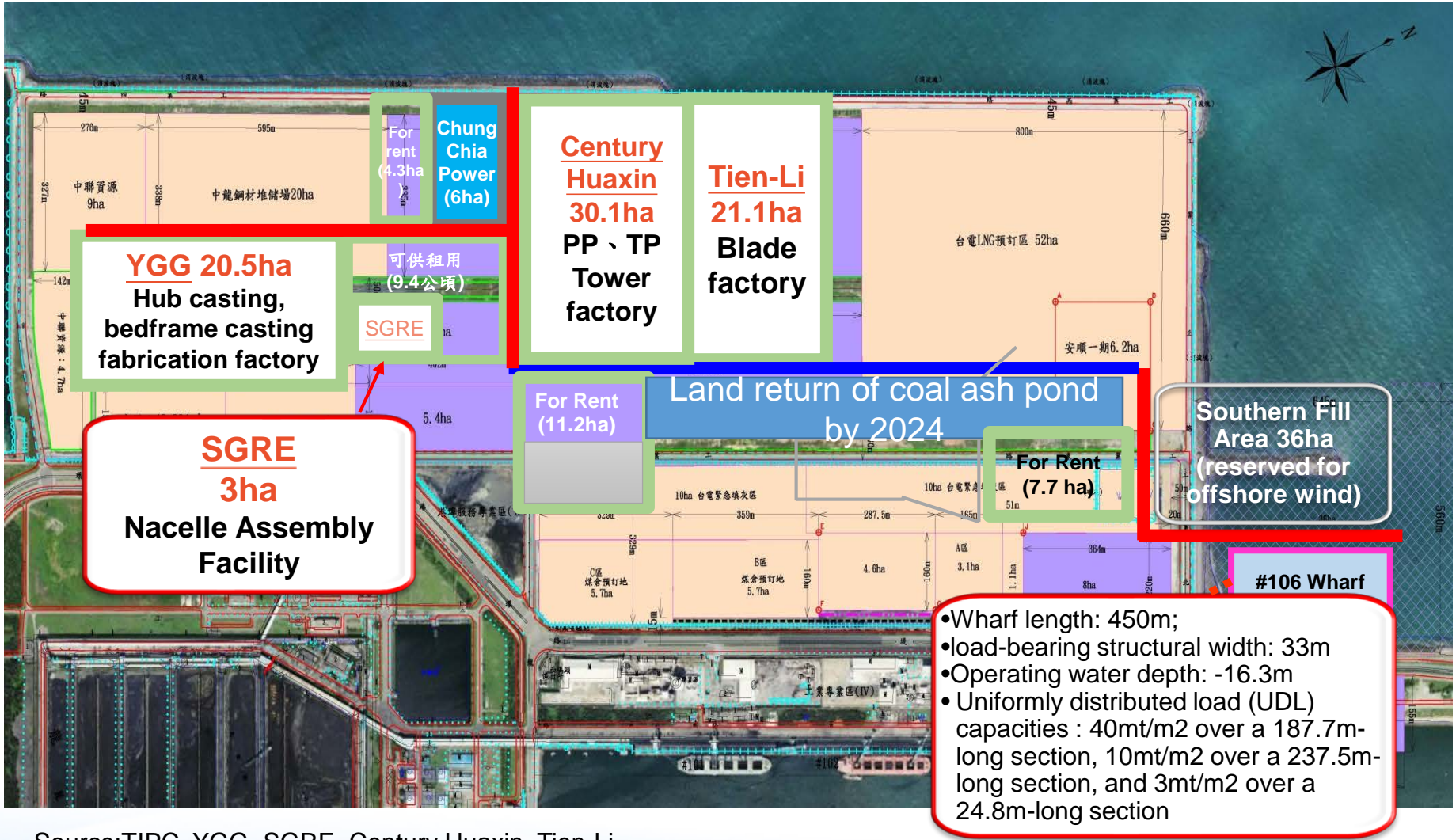
- ◆ Wharf No. 106, completed on April 17th of this year will soon be put into service receiving wind turbine parts and materials and shipping out assembled turbine components ready for installation.
- ◆ Wharf No. 5A and 5B completed on June 10th of this year.
- ◆ Wharf No. 36 will be completed by the end of this year.





# II. Promoting Industry Clusters (3/4)

## Offshore Wind Component Industry Cluster at Taichung Port



Source:TIPC, YGG, SGRE, Century Huaxin, Tien-Li



# II. Promoting Industry Clusters (4/4)

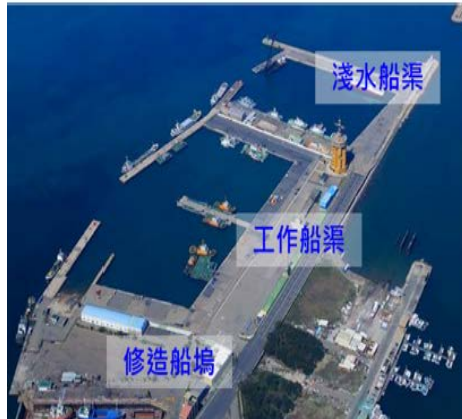
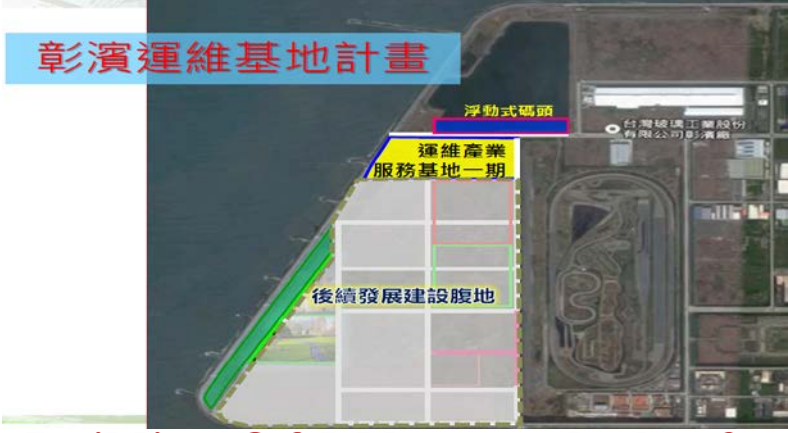
## Changhua Fishing Port and Taichung Harbor as O&M base

Changhua

CIP, China Steel

Taichung

Ørsted, Hai Long



### 1. Building O&M base and wharf

- Feb 2019: TIPC announced guidelines for berth management for Taichung’s OFW O&M Base. Ørsted already inked 20-year wharf lease with TIPC.
- July 2020: CIP signed contracts with Reiju Construction and CECI Engineering Consultants to build an O&M center for its Changfang/Xidao project, to invest in 210Mn NTD, completion due in Oct 2021.
- Aug 2020: Phase I construction of O&M base at Changhua Fishing Port commenced, set to provide 44 berths when completed.
- Sep 2020: Ørsted held groundbreaking ceremony fir its O&M base, operation begins 2022.

### 2. Building O&M Team

- Turbine manufacturer: turbine O&M; local suppliers (SWE, Star Energy, TOWSC, Vestech): BoP system O&M (technology transfer by Netherland’s ECN)

Note: BOP (Balance of Plant) refers to power plant operations, excluding marine engineering, covering project management, sea cable engineering, onshore power engineering and data monitoring system.



# III. Industry Development Status(1/4)

## Phase I Demonstration Incentive Program

### ★ Formosa @Miaoli

- Capacity: **128MW** (32 turbines)
- **Distance to shore: 2-6 km; water depth: 15-35 m**
- **106/4/28-2 demo turbines (8MW) began commercial operation-** collaboration with local specialists including CSBC (port logistics), Woen Jinn Harbor Engineering (cable laying), Fortune Electrics (onshore cables & substation), CECI (engineering consulting) and Unitech (EIA technical consulting)
- 106/12/12-power purchase agreement signed with Taipower
- **Demo wind farm(120MW)-grid connection completed late Dec 2019**

### ★ Fuhai (TGC) @Chunghua

- Capacity: **120MW** (30 turbines)
- Distance to shore: 8-12 km; water depth: 20-45 m
- **Unsuccessful negotiations with fisheries, EIA approval denied**
- 107/1/17-review committee **denied request of extension of time**
- **108/3/20-EIA approval obtained**

### ★ Taipower @Chunghua

- Capacity: **110(109.2)MW** (21 Hitachi 5.2MW turbines)
- Distance to shore: 7-9 km; water depth: 15-26 m
- 21 foundations supplied by South Korean SamKang M&T
- **107/2/13 contract awarded to Hitachi and JDN**
- **In accordance with the government's new regulations on epidemic prevention and the time of the application process, and strive to complete installation this year**



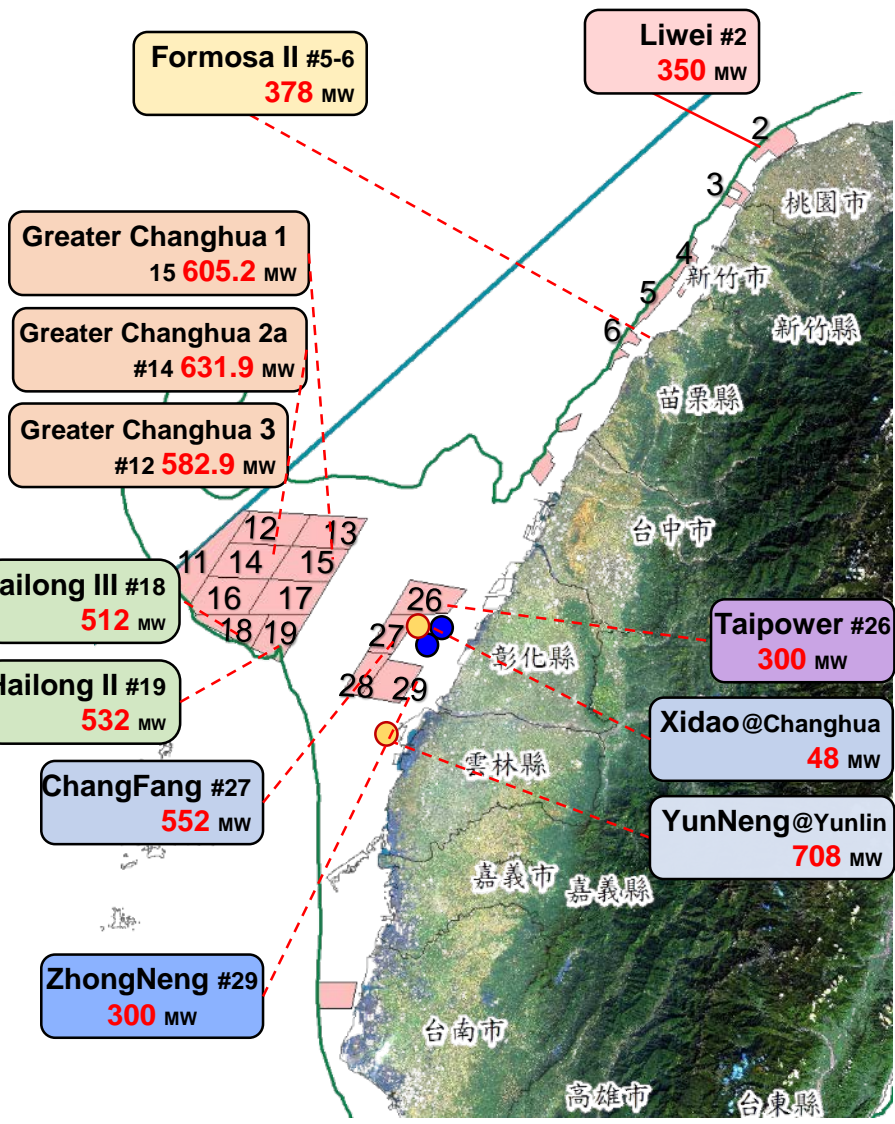




# III. Industry Development Status(2/4)

## Phase II Potential Zones

Offshore Wind Farm	Cap	COD	Turbine Supplier	Foundation Supplier	PP Supplier	Substation Supplier
Formosa I	128	2017	SGRE 4MW	EEW	-	Fortune
		2019	SGRE 6MW	EEW		
Formosa II	378	2020	SGRE 8MW	Semcorp Marine Saipem	EEW Korea	Fortune
YunNeng I	360	2020	SGRE 8MW	Steelwind	-	GE
YunNeng II	348	2021		FHI	-	GE
Li Wei	350		TBD	CWP	-	TBD
Greater Changhua Southeast	605.2	2021	SGRE 8MW	SDMS Samkang Hyundai	CSBC FHI Century Iron	Star Energy
Greater Changhua Southwest I)	294.8					
(Greater Changhua Southwest II	337.1	2025	TBD	TBD	TBD	TBD
Greater Changhua Northwest	582.9					
ChangFang I	100	2021	MVOW 9.5MW	CWP	CI CTCI	TECO
ChangFang II	452	2023				
Xidao	48	2024				
ZhongNeng	300	2024	MVOW 9.5MW	SDMS	SDMS	TECO
TPC Phase 1	110	2020	Hitachi 5.2 MW	Samkang	Edgen Murry MRY	CHEM
TPC Phase 2	300	2024	MVOW9.5MW	TBD	CI	CTCI
Hai Long I	300	2024	SGRE 14MW	TBD	TBD	TBD
HaiLong II	232	2025	TBD	TBD	TBD	TBD
HaiLong III	512					





# III. Industry Development Status(3/4)

## International Cooperation to Build Supply Chain

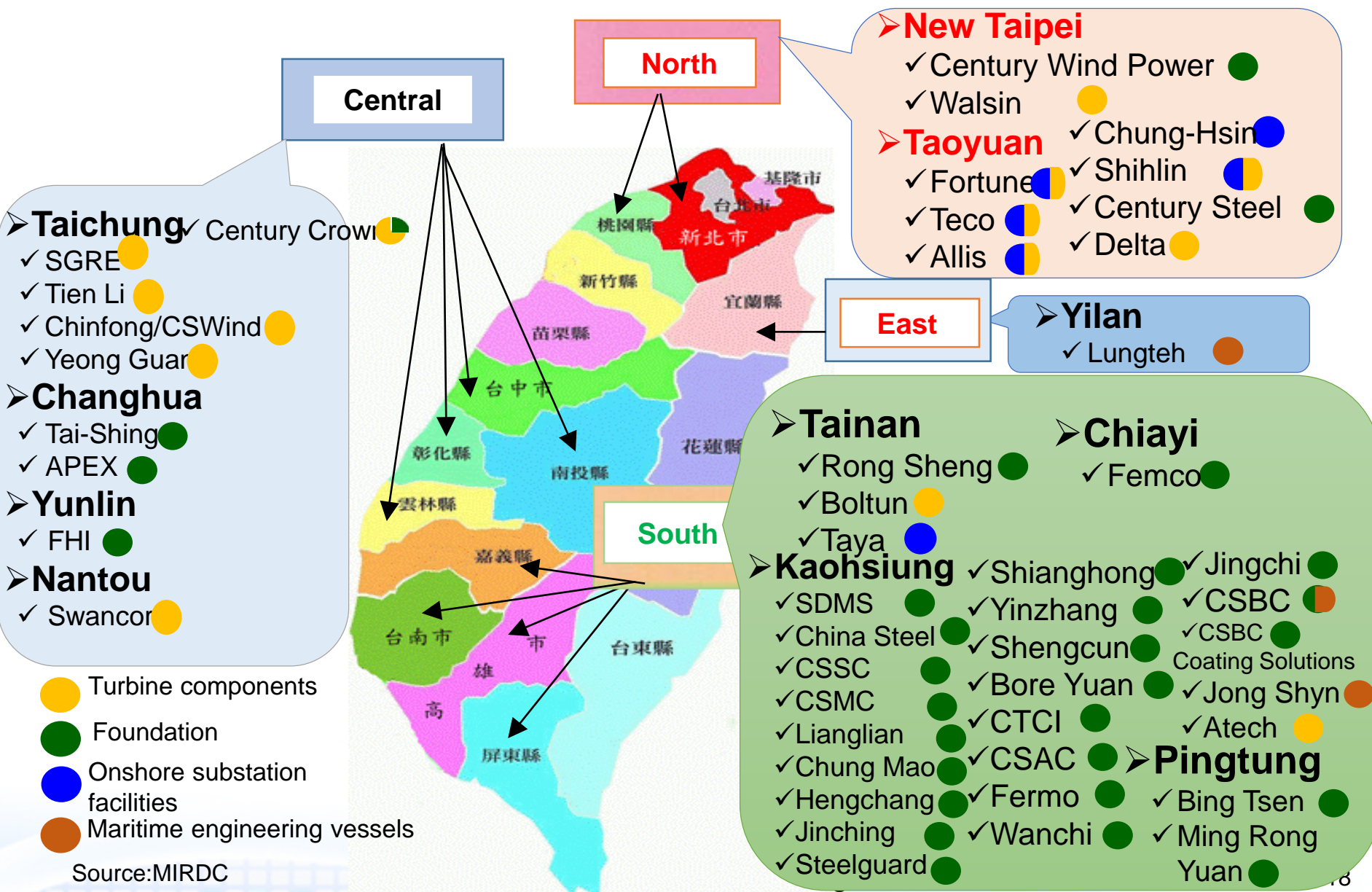
- **Strategic alliances around 4 major systems:** a **national team** composed of **Wind Team** (led by CSC) and **Marine Team** (led by CSBC), forming strategic alliances in **wind turbine, foundation, power facility** and **marine engineering**
- **Key manufacturing hub in Asia-Pacific:** attract **international developers, turbine manufacturers** to **set up APAC operating HQs** or office in Taiwan

Component	Local Supply Chain
Turbine system	<p>&gt;<b>15</b> local suppliers became suppliers of <b>2 global leading turbine manufacturers</b></p> <ul style="list-style-type: none"> <li>✓ SGRE(Germany) and MVOW(Denmark) to set up <b>nacelle assembly facilities</b> outside Europe for the first time</li> </ul>
Foundation	<p>&gt;<b>29</b> local suppliers joined supply chain system, forming <b>2 major industrial clusters</b></p> <ul style="list-style-type: none"> <li>✓ Taipei Port: Century Wind [joint venture b/n <b>Century Steel</b> and <b>Bladt</b>(Denmark)]</li> <li>✓ Xingda Port (Kaohsiung): Sing Da Marine Structure [<b>CSC-Nervi3n</b>(Spain) partnership]</li> </ul>
On shore Substation	<p>&gt;<b>10</b> local suppliers joined supply chain system</p> <ul style="list-style-type: none"> <li>✓ <b>EPC</b> for onshore transmission &amp; distribution: Taiwan Cogen[Star Energy], TECO, GE Taiwan</li> <li>✓ Electrical <b>component</b>: Fortune Electric-transformer; Fortune Electric, Chung-Hsin Electric-switch and switchgear</li> </ul>
Marine engineering	<p>&gt;<b>35</b> local suppliers joined supply chain system</p> <ul style="list-style-type: none"> <li>✓ Foundation and turbine installation projects led by CSBC-DEME Wind [<b>CSBC+GeoSea</b>(Belgium)], Boskalis Hwa Chi Offshore Wind [<b>Hwa Chi +Boskalis</b>(Netherlands)], Fugro IOVTEC[IOVTEC+<b>Fugro</b> (Netherlands)], <b>TMHI</b>(HungHua)+JDN(Belgium)</li> </ul>



# III. Industry Development Status(4/4)

## Taiwan's offshore wind industry clusters





# IV. Supply Chain Considerations for Zonal Development (1/3)

## Trends in Offshore Wind to 2030

- Wind turbines are growing **bigger** and more **modular with different subsystems**, making **smart and flexible manufacturing a necessity**.
- European companies moving **production base to Asia**; local and **timely supply** and **O&M services** become key to market success.

### Economic Growth

- OFW industry becoming **new driver** of Taiwan's economy
- Total target capacity of Asian countries by 2030 reaches 90GW, TW suppliers gearing up for Asia market, boosting export volume

### Tech Advancement

- Turbine capacity reaching 12-15MW, leading to different **standardized subsystem modules**
- Mega-size marine engineering vessels
- Floating foundations

### Post-glocalization Era

- European companies moving production base to Asia
- O&M demand to follow: routine monitoring, predictive diagnostics etc.

### Quality Life

- O&M base key to ensure smooth turbine operation and **stable supply of green energy**
- Foster OFW industry clusters, cultivate green- and white-collar skilled workers



### Sustainability

- Develop more energy-efficient, eco-friendly OFW products with **higher performance**
- Develop **recyclable materials**, reusable OFW products after decommissioning

### Changing Demographics

- Ageing population and low birth rate shrink labor force, **smart manufacturing solutions** required to boost productivity
- Innovative technology employed to pass on skills and knowledge



# IV. Supply Chain Considerations for Zonal Development (2/3)

## Knowledge Exchange and Business Networking for Offshore Wind Industry

Country	Japan	Belgium	Denmark
Date	Aug 26 2020	Sep 8 2020	Sep 29 2020
Name	aiwan-Japan Offshore Wind Power Smart O&M and Innovative Technology Hybrid Networking Meeting	Taiwan-Belgium Offshore Wind Power Smart O&M and Innovative Technology Hybrid Meeting	Taiwan-Denmark Offshore Wind Industry International Hybrid Networking Meeting
Local Participants	70	117	150
Foreign Companies	JERA Energy Taiwan, The Nippon Corrosion Engineering, Stella Technology, Japan Inspection, and British Engineering Services	MARLINKS, SARENS, CDWE, TRACTEBEL	CIP,MVOW, KK Wind Solutions, Nordisk Svejse Kontrol A/S、Peak Wind、Comtec Int、Seasight Davits, NIRAS





# IV. Supply Chain Considerations for Zonal Development (3/3)

## Proposed Mechanism for Zonal Development in Taiwan's OFW

Policy Announcement

	2026-2030 5GW	
Grid connection	2026-2027	2028-2030
Capacity	2GW	3GW
Selection	2022Q2	2024Q2

- 2031-2035 5GW**
- Dependent upon
    - ✓ Wind farm development during 2020-2025
    - ✓ Developer selection mechanism for 2026-2030
    - ✓ Global OFW technology trends

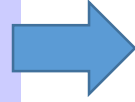
Eligibility

- EIA approval obtained
  - ✓ (conditional) Approval given on initial evaluation by EIA review committee
- Financial position
  - ✓ Developer's self-owned capital to account for >5% of total investment

Review Process

### Eligibility Review

- **Technical capacity:** development, project design, O&M planning
- **Financial capacity:** financial strength, capital, equity planning
- **IRP commitment:** to comply with IDB's IRP policy for Zonal Development



### Pricing Evaluation

- **Auction eligibility:** development, project design
- **Bid price ceiling:** max. price limits on developer bids
- **Auction order:** lowest bids first

Capacity Allocation

- **Max. Capacity per Project:** max. capacity of 500MW in each phase per project
- **Max. Capacity per Developer:** max. capacity of 2GW per Developer for 2026-2030 period



## V. Conclusion

- From US-China trade disputes to COVID-19 pandemic, the global trade and investment landscape will be reshaped by the restructuring of global chains, build-up of new regional chains, and distributed manufacturing.
- For governments worldwide, supporting local businesses and industries has become priority. President Tsai has announced new “Six Core Strategic Industries,” one of which being green and renewable energy, which covers offshore wind.
- After a series of meetings with industry stakeholders, the majority would like to see current localization efforts continue their way into Zonal Development.
- Taiwan remains keen to work with global OFW leaders during Zonal Development, leveraging experience and expertise from both sides to drive energy transition in Taiwan and together make successful entry into Asian market.



**Thank you for your attention!**

