Policy and Promotion of Wind Power in Taiwan

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Overview

- Targets & Strategies
- Phases of Promotion
- Domestic Industry
- Summary

Energy Reform in Taiwan

Guidelines on Energy Development

01

A stable, affordable and low-risk supply-demand system for energy.

02

Innovative green technology to foster employment and economic growth

03

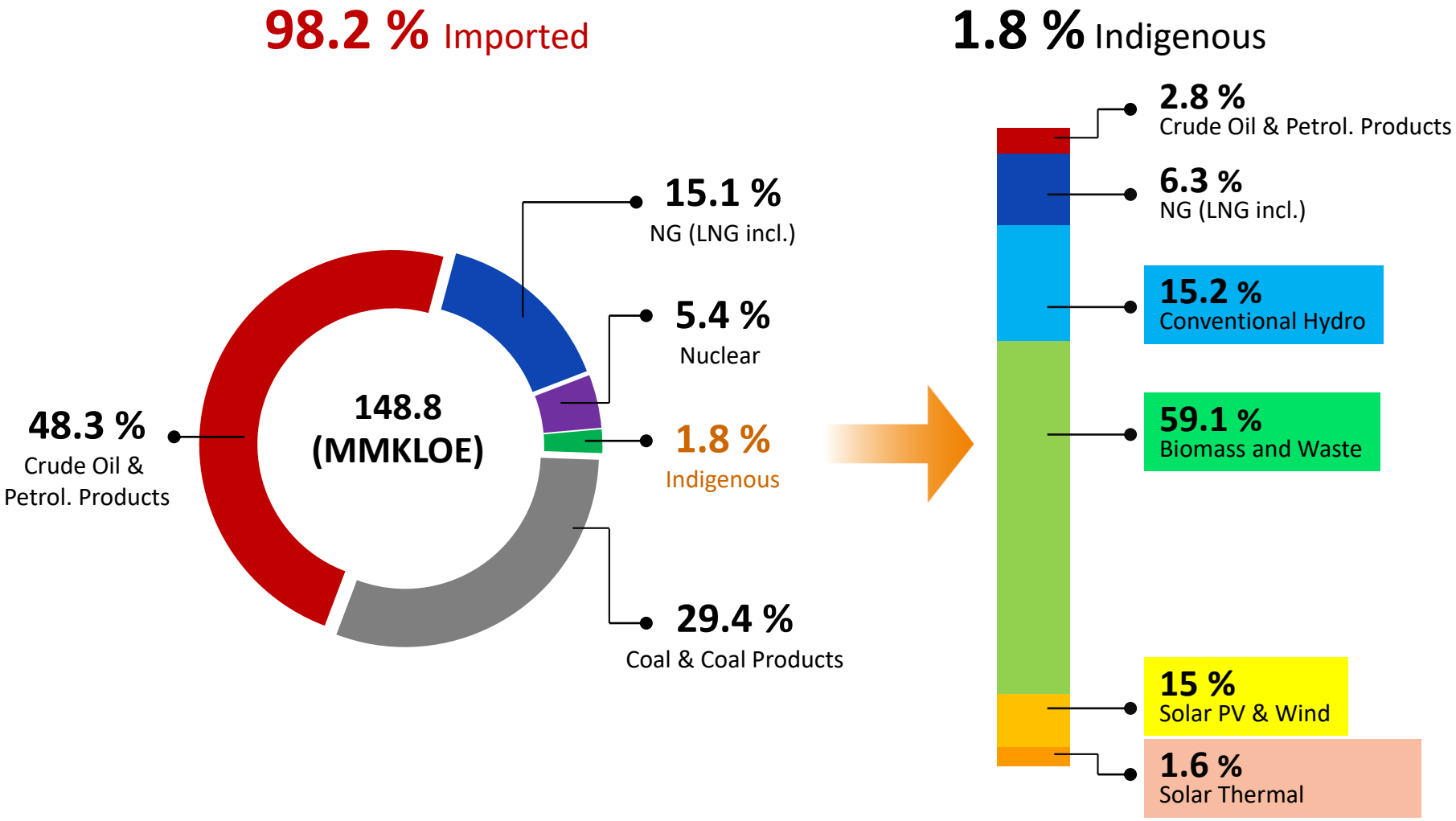
A clean energy system and healthy living environment.

04

Facilitate energy transition and energy market reform.

Energy Mix

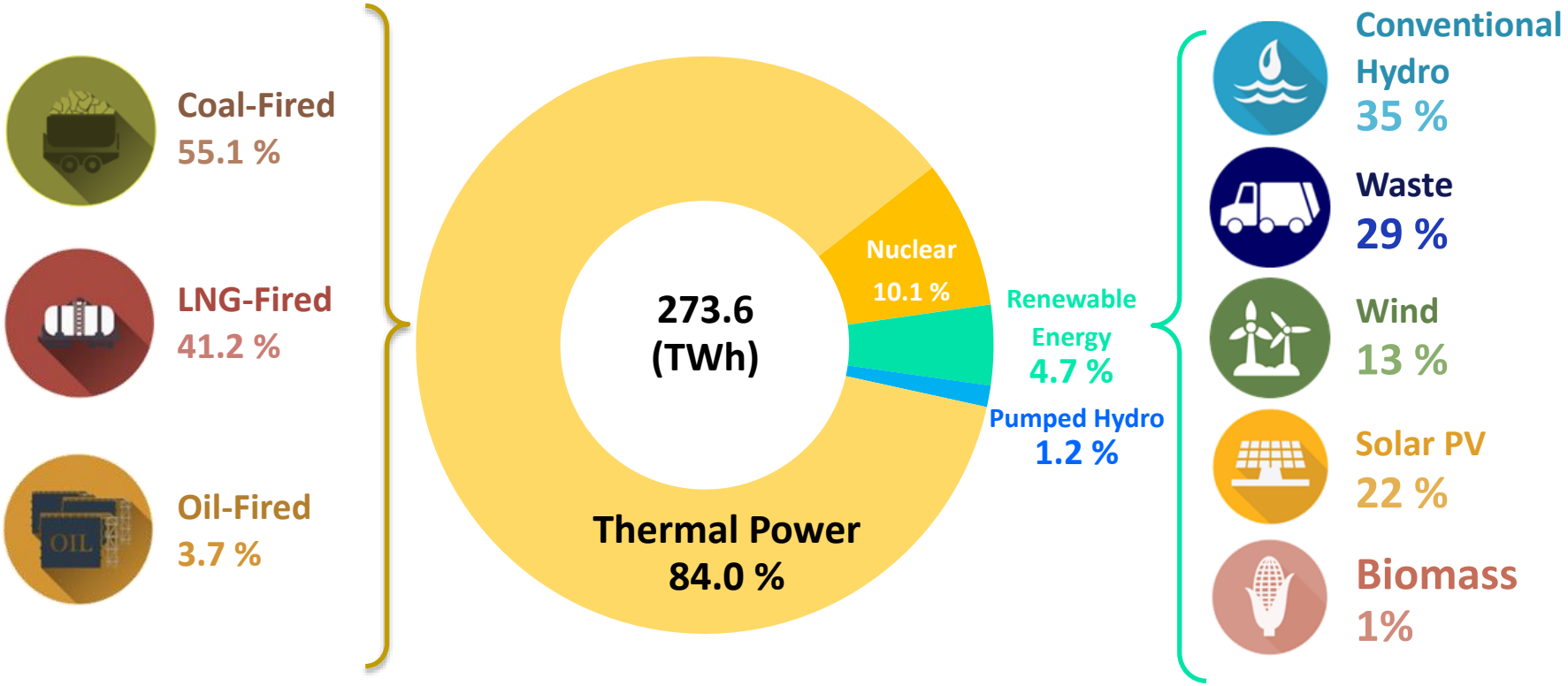
Total Energy Supply (2018)



Ref. Energy Statistics, Bureau of Energy, Ministry of Economic Affairs, TAIWAN

Power Mix

Total Electricity Generation (2018)



Ref. Energy Statistics, Bureau of Energy, Ministry of Economic Affairs, TAIWAN

Targets of Renewable Energy

- To raise renewable energy to achieve **20 %** renewable electricity generation by **2025**.

		Power Capacity (MW)			Electricity Generation (TWh)		
		2017	2020(f)	2025(f)	2017	2020(f)	2025(f)
Solar PV		1,768	6,500	20,000	1.7	8.1	25.6
Wind	onshore	**684**	**814**	**1,200**	**1.7**	**1.9**	**2.8**
	offshore	**8**	**976**	**5,738**	**0.2**	**3.5**	**20.7**
Geothermal		-	150	200	-	1.0	1.3
Biomass		727	768	813	3.5	3.8	4.3
Hydro Power		2,089	2,100	2,150	5.4	4.9	5.1
Fuel Cell		-	22.5	60	-	0.2	0.5
Total		**5,276**	**11,331**	**30,161**	**12.4**	**23.4**	**60.2**

Ref. Bureau of Energy, Ministry of Economic Affairs, TAIWAN

Targets of Wind Power

Principle	Reach Short–term Target	Achieve Long-term Commercial Scale
Strategy	**Demonstration** in Shallow Water	**Zonal Development** in Shallow & Deep Water

	current	short-term	long-term
	2019	2020	2025
onshore	696 MW	814 MW	1,200 MW
offshore	Demo. Turbines 8 MW	Demo. Wind Farms & Zones of Potential 976 MW	Zones of Potential & Zonal Development 5,738 MW

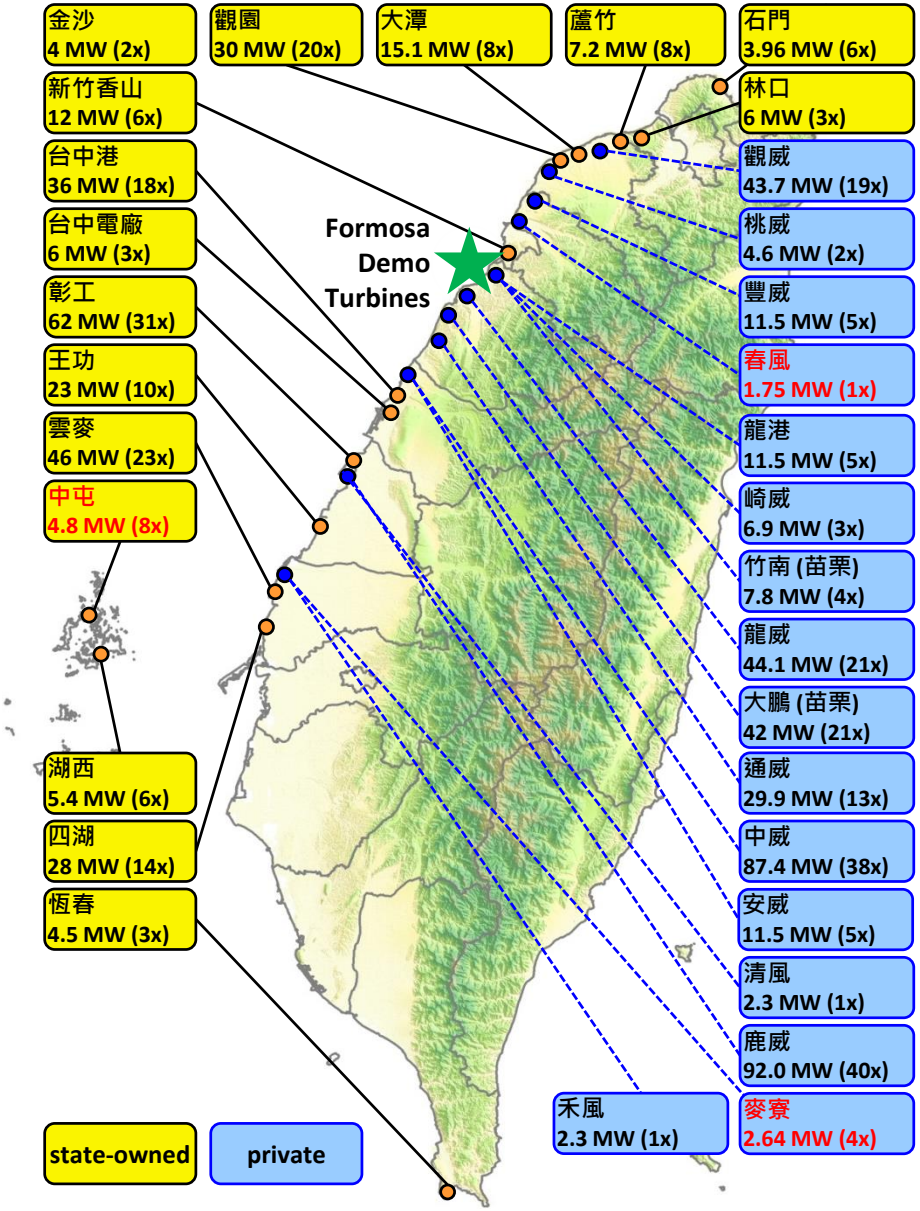
Current Status

Onshore (by the end of January 2019)

- **State-owned:** 169 WTs / 294 MW
- **Private:** 183 WTs / 402 MW
- **Total:** 352 WTs / 696 MW
  (11.0 % of all RE)
- **2018 Production:** ≈ 1,679 GWh
  (13.2 % of all RE)

Offshore

- **2 demonstration turbines have been installed on 27th October, 2016.**



Ref. Bureau of Energy, Ministry of Economic Affairs, TAIWAN

Taiwan Offshore Wind Potential

Shallow Water

Depth: 5-20 m
Area: 1,779 km^2
Potential: 9 GW

Feasible: 1.2 GW

Deep Water

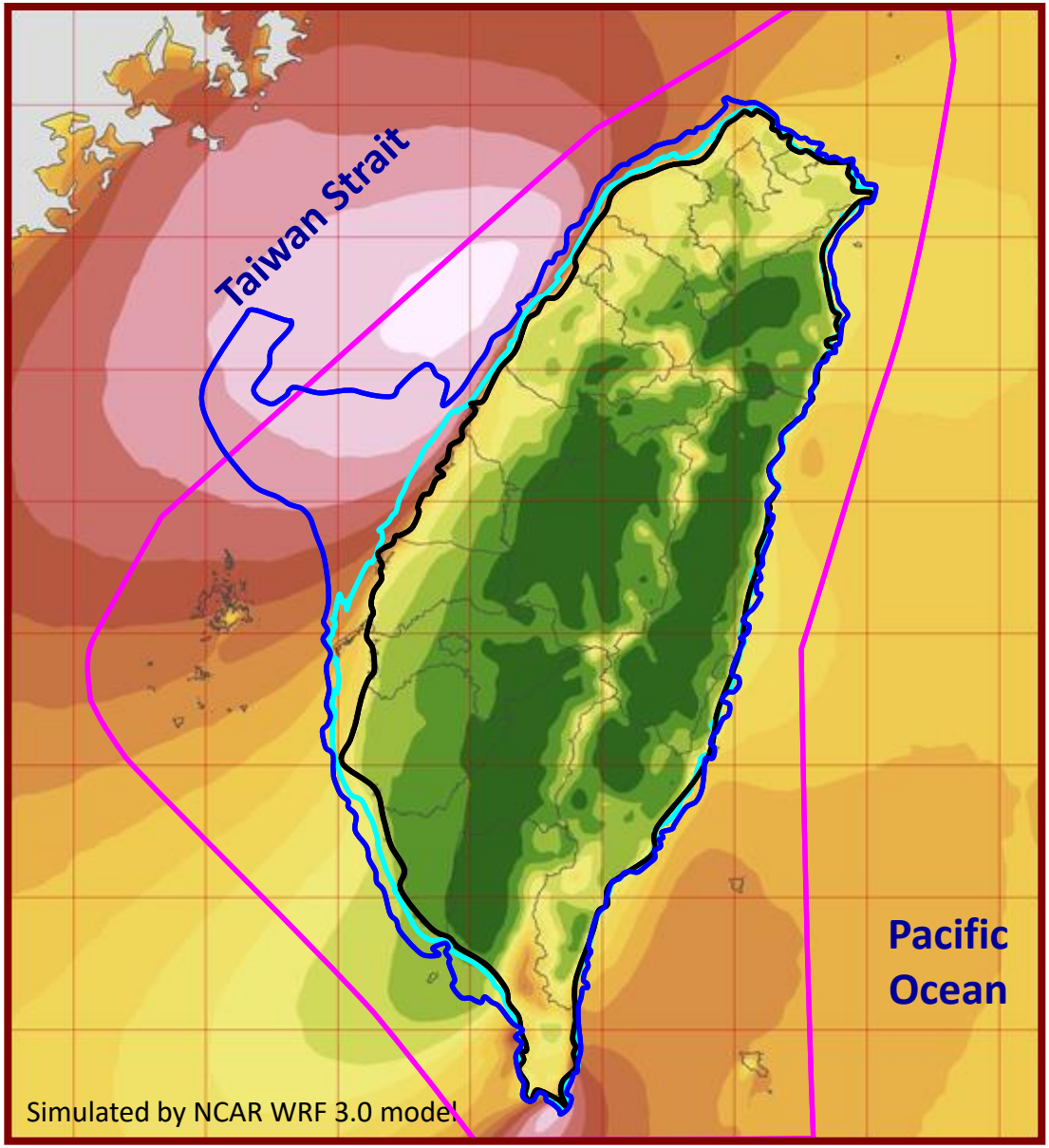
Depth: 20-50 m
Area: 6,547 km^2
Potential: 48 GW

Feasible: 10 GW

Deeper Water

Depth: > 50 m
Potential: 90 GW

Feasible: > 10 GW



Wind Power Density(W/m2)

< 100	400 - 500	800 - 900	1,200 - 1,300
100 - 200	500 - 600	900 - 1,000	1,300 - 1,400
200 - 300	600 - 700	1,000 - 1,100	1,400 - 1,500
300 - 400	700 - 800	1,100 - 1,200	> 1,500

Ref. “Wind Resource Assessment Handbook,” ITRI, 2011

Strategies for Offshore Wind

DIP

- **Offshore Demonstration Incentive Program** (示範獎勵辦法)
  - **Incentives for Pioneers**
  - Subsidy for 2 Wind Farms by 2020

ZAP

- **Directions of Zone Application for Planning** (場址作業要點)
  - **Transition Period**
  - 36 Zones of Potential

ZD

- **Offshore Zonal Development** (區塊開發)
  - **Self-sustaining Industry**
  - Strategic Environmental Assessment (SEA)

Topics

- Targets & Strategies
- **Phases of Promotion**
- Domestic Industry
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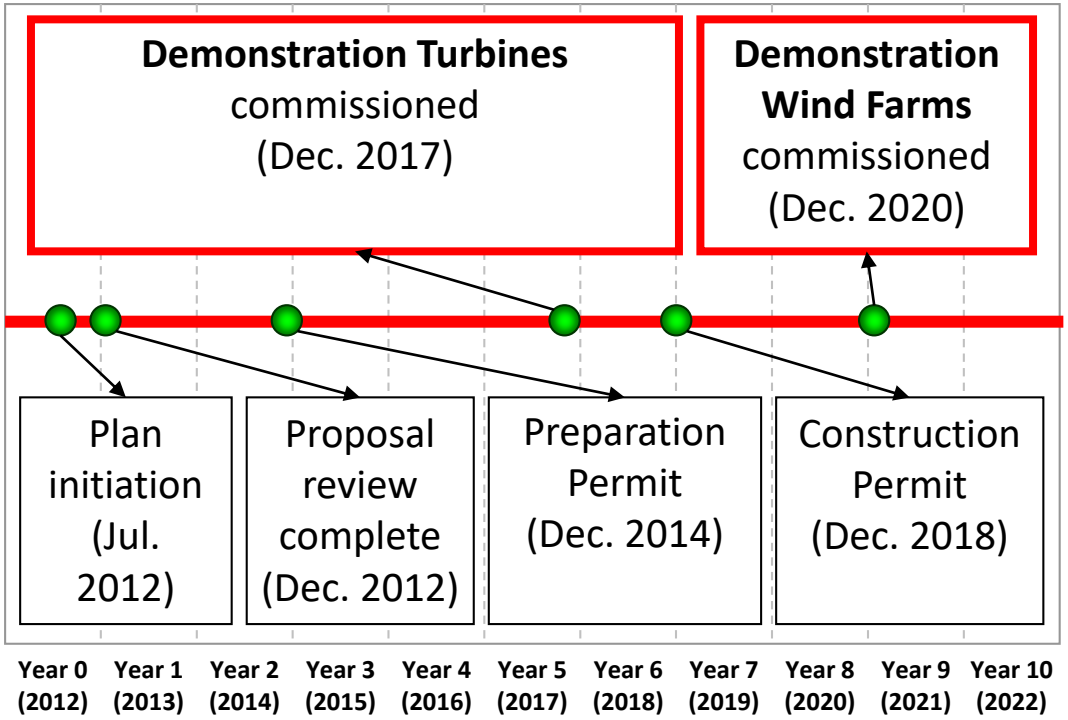
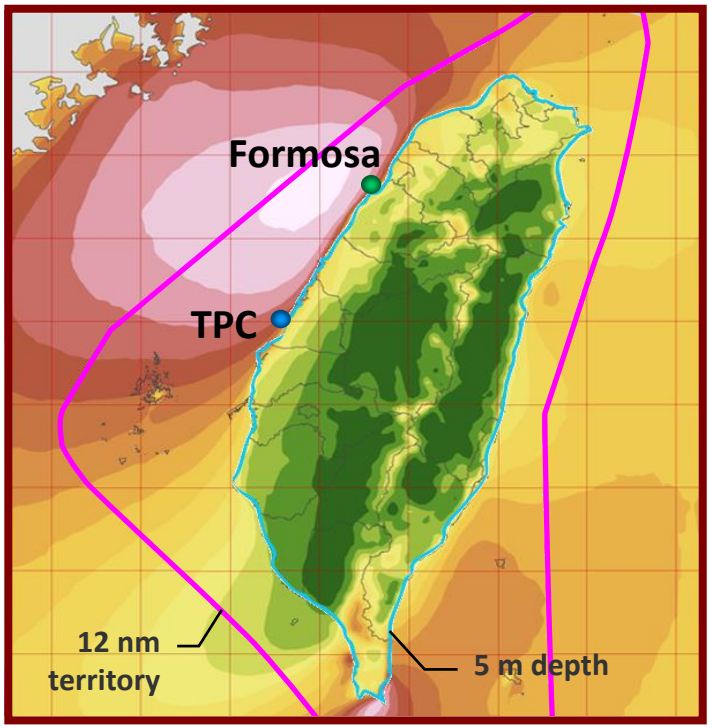
Demonstration Incentive Program

Demonstration Projects of Offshore Wind

- **MOEA provides subsidies to encourage pioneers**
- **To confirm feasibility in terms of administration, technology and finance**
- **2 Demonstration Wind Farms (238 MW) to be commissioned by 2020**

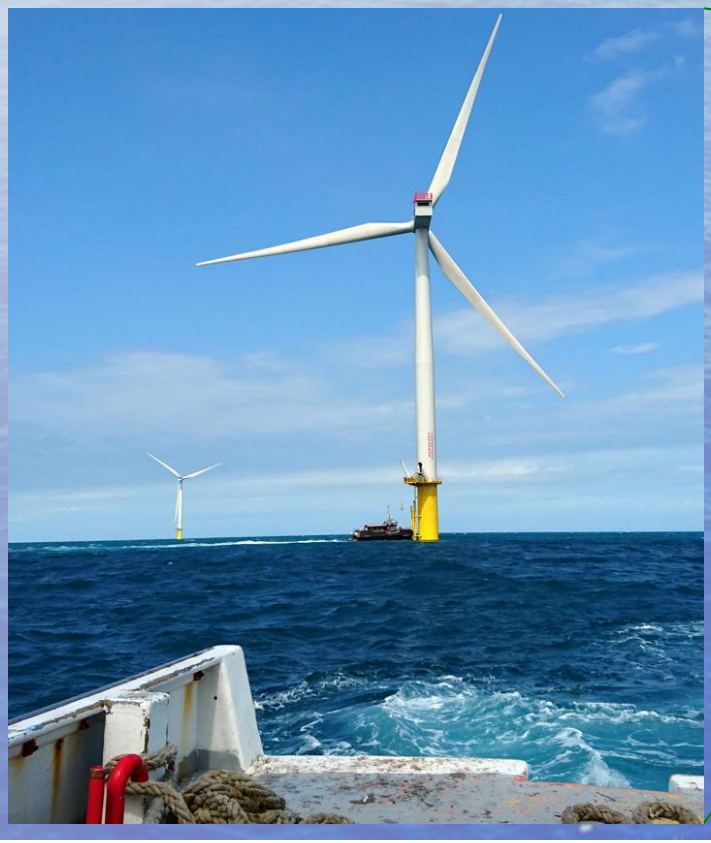


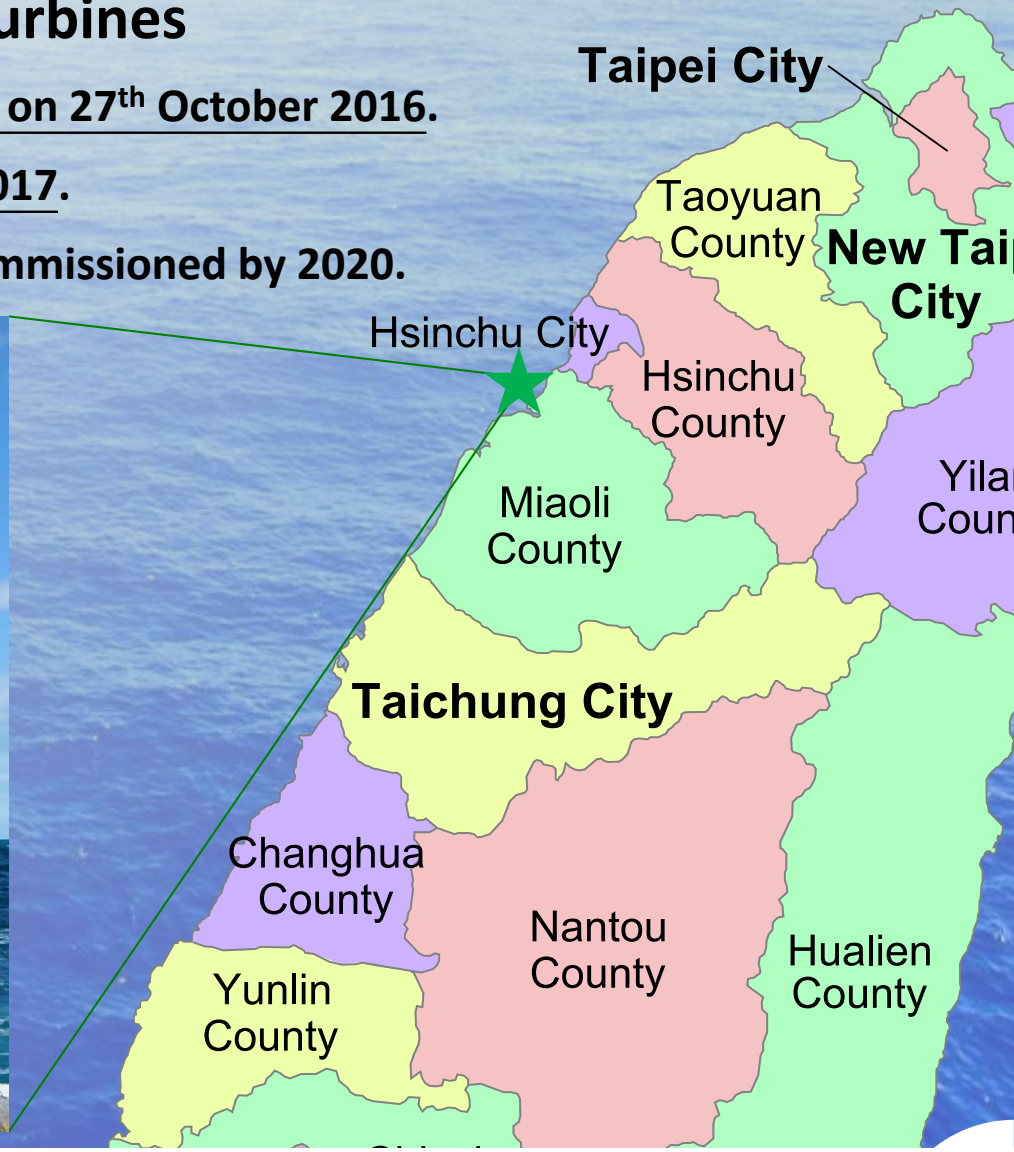


Demonstration Incentive Program

Formosa Demonstration Turbines

- 2 Siemens 4-MW turbines installed on 27th October 2016.
- Fully commissioned on 28th April 2017.
- Demonstration wind farm to be commissioned by 2020.





Zone Application for Planning

[Phase 2] ZAP

Siting for Zones of Potential (ZoP, 潛力場址)

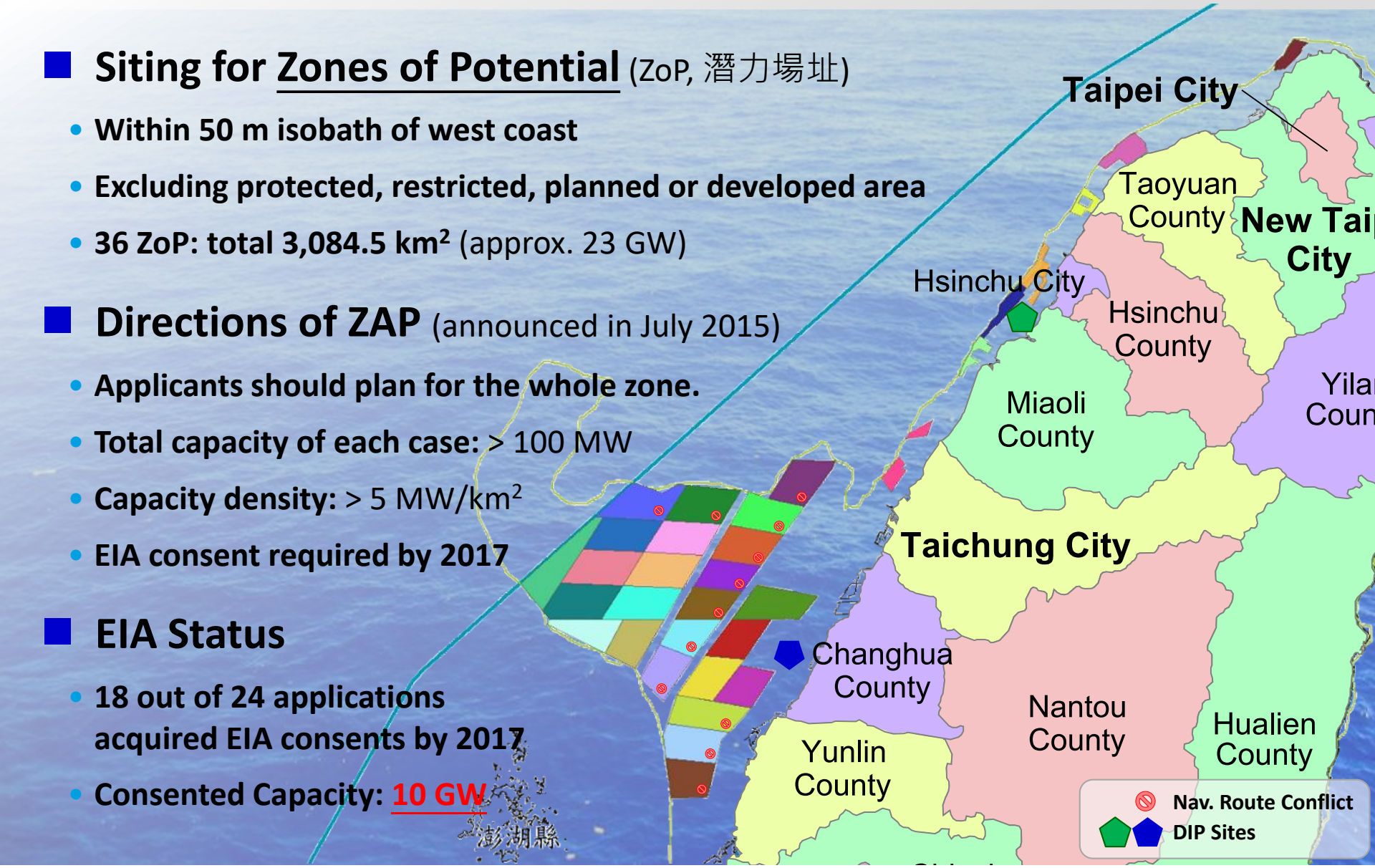
- **Within 50 m isobath of west coast**
- **Excluding protected, restricted, planned or developed area**
- **36 ZoP: total 3,084.5 km² (approx. 23 GW)**

Directions of ZAP (announced in July 2015)

- **Applicants should plan for the whole zone.**
- **Total capacity of each case: > 100 MW**
- **Capacity density: > 5 MW/km²**
- **EIA consent required by 2017**

EIA Status

- **18 out of 24 applications acquired EIA consents by 2017**
- **Consented Capacity: 10 GW**

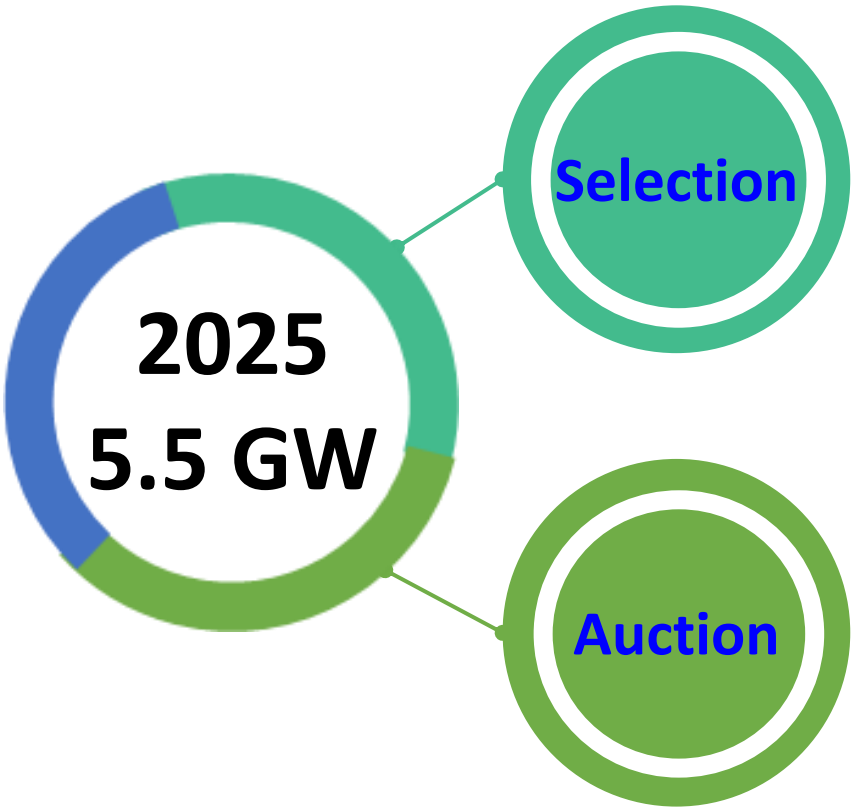


Zone Application for Planning

[Phase 2] ZAP

Grid Allocation Scheme (GAS) for ZAP

- Announced on 18th January 2018
- Qualification: registered ZAP developers with EIA consent by the end of 2017



To commission by 2020

- Applicants compete by the **progress of the Preparation Permit**, technical capability, and financial capability.

To commission between 2021-2025

- Applicants compete by the **technical capability** and **financial capability**.
- **Localization commitment** is also required.

FIT price

- Eligible only if scored above **60 points** but not allocated in the Selection stage.
- Prioritized by the **bidding price** of FIT.

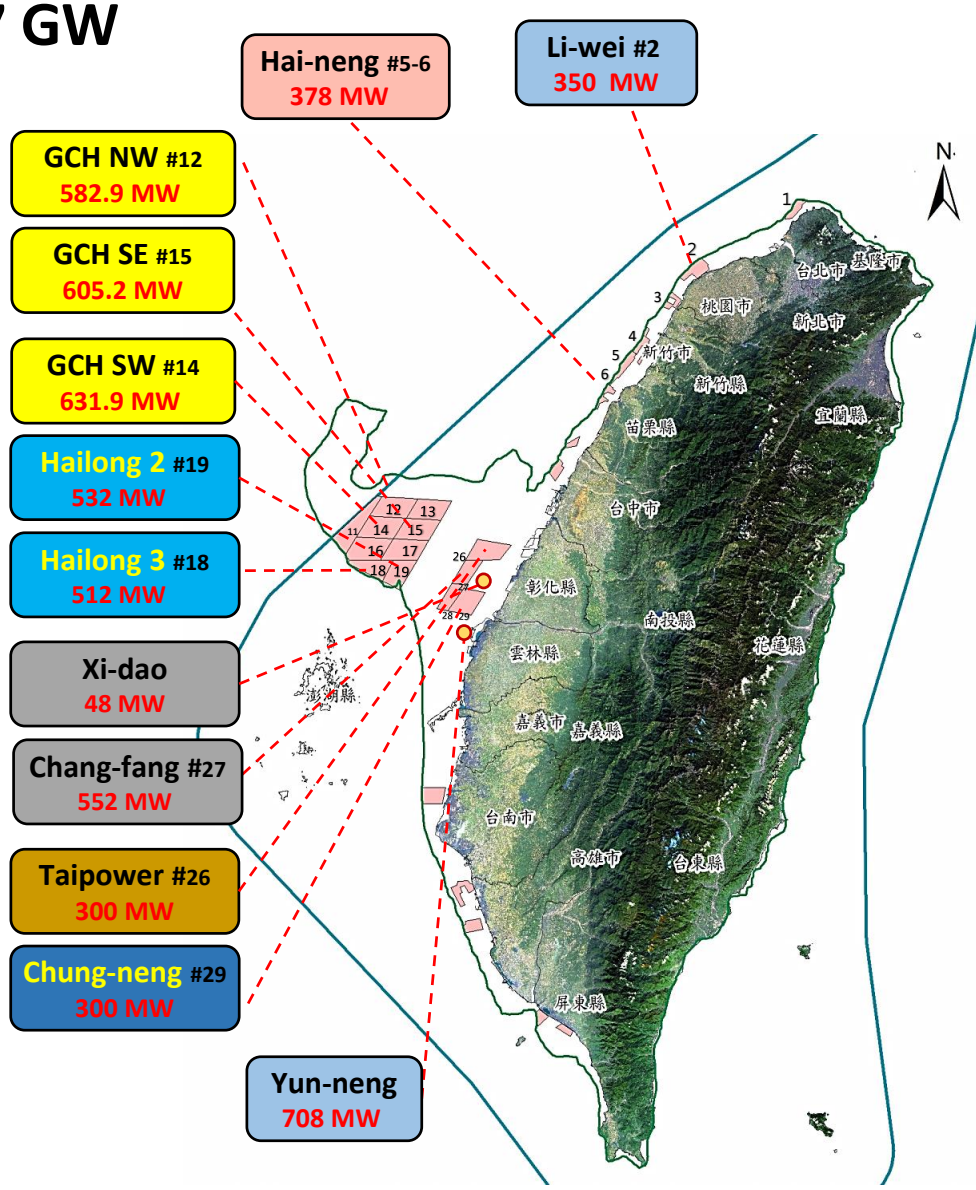
Zone Application for Planning

[Phase 2] ZAP

Selection 3.8 GW + Auction 1.7 GW

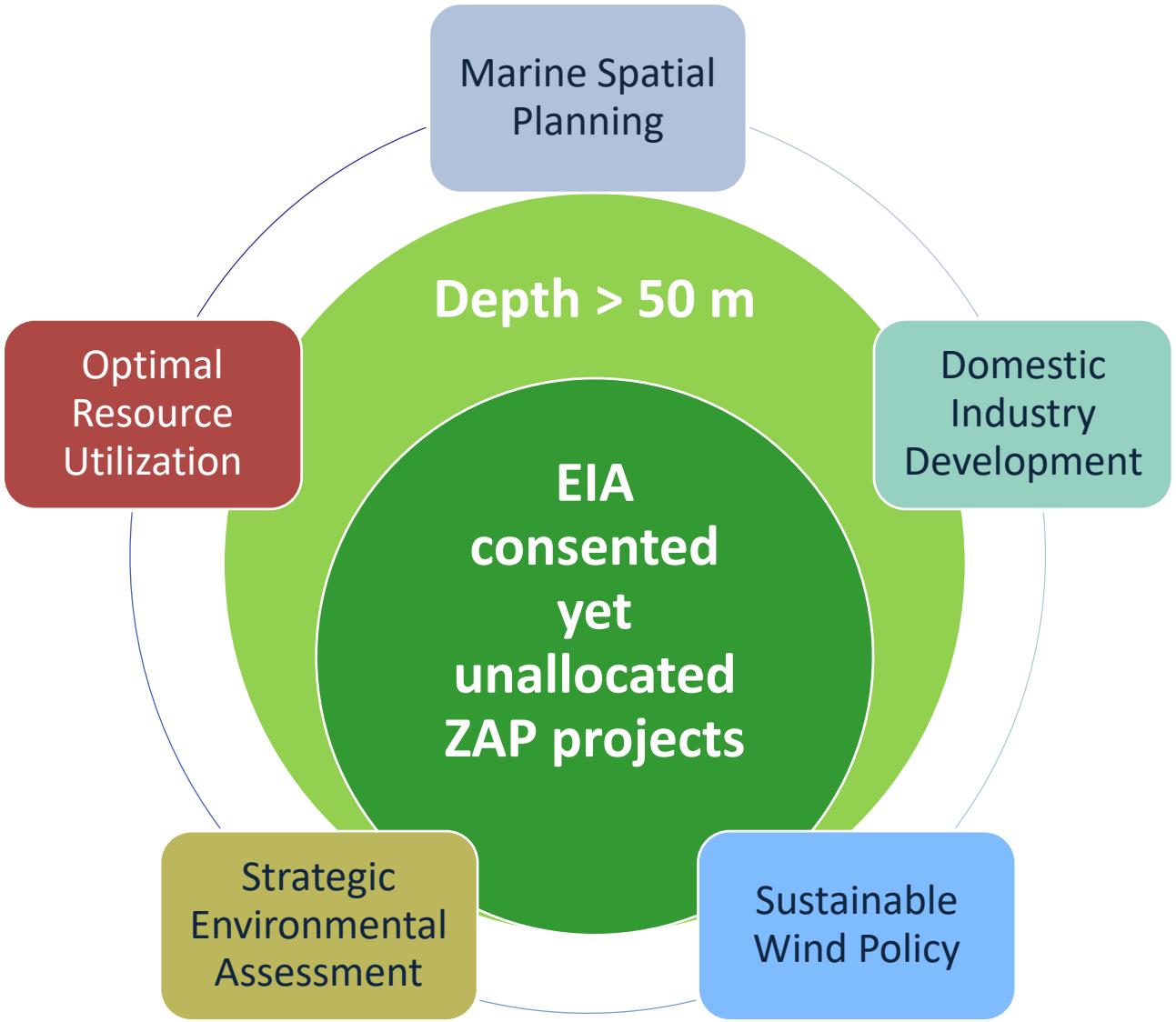
- 7 developers with 12 projects
- To commission 5.5 GW by 2025

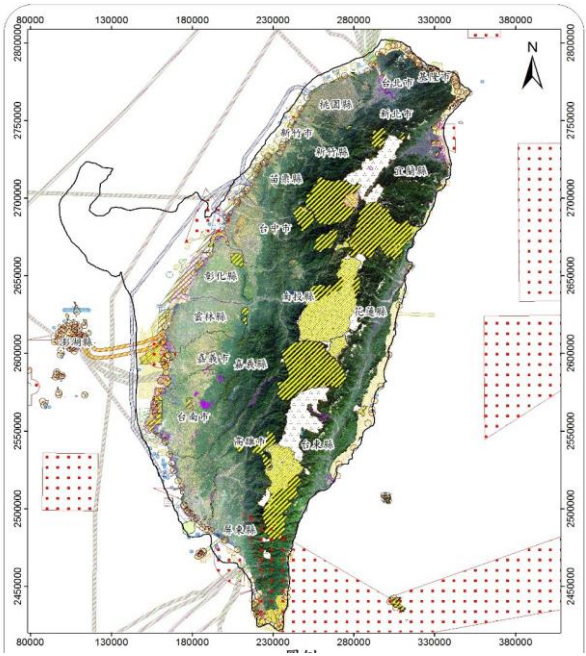
Developers	Prep. Office (ZoP No.)	Capacity (MW)	Turbine Supplier
wpd	Yun-neng 允能	708	SGRE
	Li-wei 麗威 (2)	350	(TBD)
Ørsted	Greater Changhua SE 大彰化東南 (15)	605.2	SGRE
	Greater Changhua SW 大彰化西南 (14)	631.9	
	Greater Changhua NW 大彰化西北 (12)	582.9	
Swancor & Macquarie	Hai-neng 海能 (5 & 6)	378	SGRE
NPI & Yushan Energy Northland Power Inc.	Hai Long 2 海龍二號 (19)	532	(TBD)
	Hai Long 3 海龍三號 (18)	512	
CIP Copenhagen Infra-structure Partners	Chang-fang 彰芳 (27)	552	MVOW
	Xi-dao 西島	48	
CSC	Chung-neng 中能 (29)	300	MVOW
TPC	Taipower 台電 (26)	300	(TBD)



Zonal Development

Sustainability of industry & environment

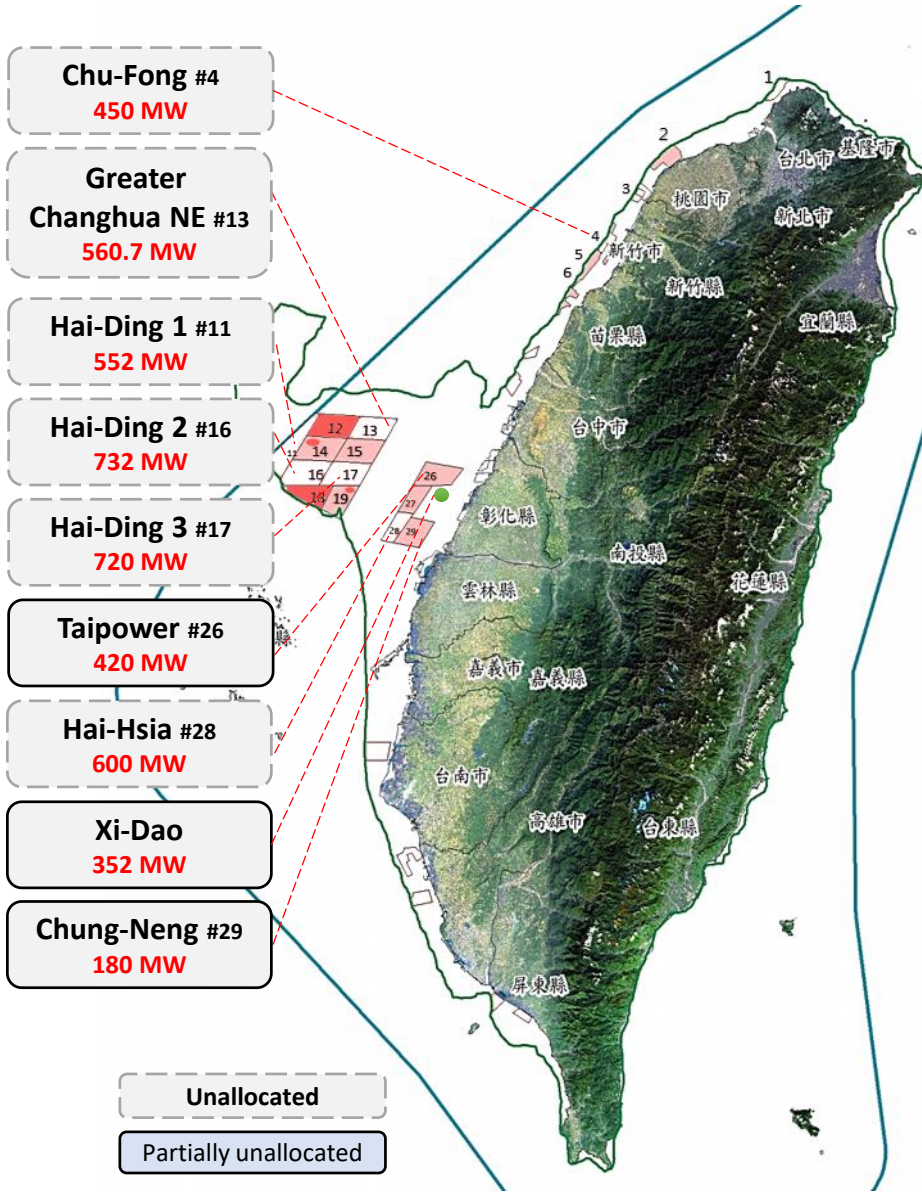




Zonal Development

Zonal Development (draft)

- Increase **1 GW/year** from **2026 to 2030**.
- EIA consented yet unallocated ZAP projects add up to **4.5 GW**.
- **Localization** will be incorporated to establish self-sustaining market and domestic supply chain.
- **Bidding** will also be considered to reduce electricity cost.
- Public consultation scheduled in **Q2 2019**.
- Announcement scheduled in **Q4 2019**.



Topics

- Targets & Strategies
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- **Domestic Industry**
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Objective and Schedule of Localization

Phase	Pre-Stage (2021 ~ 2022)	Phase 1 (2023)	Phase 2 (2024 ~ 2025)
Industrial development items	■ **Onshore Electric Equipment:** ● Tower ● Foundation ● Electrical Components 1. Transformer 2. Switchgear 3. Distribution panel ■ **Marine Engineering planning, design, construction, supervision, and manufacturing:** ● Construction and supervision of investigation, cable laying, exploration, etc. Ship and machine tool planning design and safety management. **[BOE]** ● Ship Building: provide the construction ship industry supply chain for new ships or ship restoration (including the ships for investigation, support, seabed preparation, transportation and cable laying.) **[IDB]**	■ **Wind Turbine Components:** Rotor Nacelle Assembly, Transformer, Distribution panel, Uninterruptible Power Supply, Spinner, Cable, Rotor Hub, Bolts ■ **Submarine High Voltage Cable** ■ **Marine Engineering planning, design, construction, supervision, and manufacturing:** ● Construction and supervision of tower, foundation, etc. Ship and machine planning design and safety management. **[BOE]** ● Ship Building: provide the construction ship industry supply chain for new ships or ship restoration (including the ships for transportation and construction) **[IDB]** ■ Pre-Stage items	■ **Wind Turbine Components:** Gearbox, Generator, Power Converters, Rotor Blade & Epoxy Resin, Nacelle Cover, Nacelle Bed Frame/Plate ■ **Marine Engineering planning, design, construction, supervision, and manufacturing:** ● Construction and supervision of wind turbines and others. Ship and machine tool planning design and safety management. **[BOE]** ■ Pre-Stage items ■ Phase 1 items

Supply Chain of Wind Power in Taiwan

Manufacture

Raw Material

Steel
CSC

Fiber
Formosa Plastics, TaiwanGlass, CHUNG YEH, Drewloong, etc.

Epoxy
Swancor, Eternal Materials, etc.

Components/Sub-system

Electrical Sys.
TECO, TATUNG, Fortune, Shihlin, Chung Hsin, Allis, Delta, etc.

Tower
CSC, Lihkang

Blade
HorizonYacht, China FRP, etc.

Gearbox
FHI

Control
TECO, AIDC, Advantech, etc.

Cast/Forge
YJF Casting, Yeong Guan, Yih Guang, Cheng Sheng, Cheng Feng, Nan Lung, San Eng, Shun Yu, Hongda, etc.

System

Onshore
TECO

Offshore
New Wind Power (TECO/CSC)

Balance of Plant (BoP)

Foundation
CSC, CSBC, Hung Hua, Chau-Hsen, Hwa Chi, MRY, etc.

Cable
TAYA, Walsin, etc.

Service

Planning
TPC, Sinotech, CECI, TMHI, Iy-Hsing, etc.

Investigation
Dragon Prince, Global Aqua, Hong-da, etc.

Construction
Chung Hsin, Fortune, LUXE, Star Energy, Woen Jinn, CSBC, Hwa Chi, AIDC, CSBC, CSC, Hung Hua, etc.

Maintenance
CSBC, Solvent, CSC, Vestech, etc.

Developer

Operation
TPC, Formosa, wpd, CSC, Ørsted, CIP, Yushan, NPI, TCCY, etc.

Matured

Capable

Localization for Marine Construction

- **Goal: To Support domestic industries**
  - Marine construction should be undertaken by **Taiwanese Vessels**.
- **Support Vessel: Tugboat, CTV, Guard Boat, etc.**
  - Long term service for **O&M** as well as other non-offshore wind construction.
  - Must be identified as **Taiwanese Vessels**.
- **Construction Vessel: Foundation or Turbine Installation, etc.**
  - Promote alliance between **domestic industry** and international companies.
  - Joint-venture with over **50 % share** from domestic entity.
- **Auxiliary Support: Training Courses, HSE, etc.**

Survey Vessel

Turbine Installation (TIV)

Crew Transportation (CTV)

Topics

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Summary

3-Phase Strategy for Offshore Wind

- **DIP** • [2012~] **Incentives for Pioneers**
- **ZAP** • [2020~] **36 Zones of Potential**
- **ZD** • [2026~] **Pipeline for sustainable domestic market**

Taiwan: the Best Entrance into Asian Market

- **Best wind resource**
- **Sustainable Policy**
- **Thriving Supply Chain**
- **High economic Freedom**

Outlook of 2025

Benefit of 5,738 MW of offshore wind by 2025:

Carbon Reduction

- Offshore wind production 3,750 kWh/kW
- Emission factor 0.554 kg/kWh

21.5 GWh of electricity &
119.2 million tons of carbon reduction annually

Job Opportunities

More than **20 thousand** job opportunities

- 1.2~7.5 people/MW according to EWEA
- 3.6 people/MW x 5.738 GW = 20,657 people

Investment Promotion

More than **1 trillion** NTD of direct investment

- 174.5 million NTD/MW
- 5.738 GW x 174.5 million NTD/MW = 1.0013 trillion

Thanks for Your Attention

Thousand Wind Turbines Promotion Office

http://www.twtpo.org.tw