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# Asia: The Next Frontier for the Offshore Wind Industry



# Introduction



**The Asia Wind Energy Association was established in December 2016 to become the leading trade association for the wind energy sector in Asia Pacific.**

**The association acts as the regional platform for all wind power industry stakeholders to collectively promote the best interests of the wind power sector.**

**The Asia Wind Energy Association is supported by a wide variety of stakeholders from the offshore and onshore wind industry.**

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# Regular Industry Updates

## Our Daily and Weekly Newsletter

@asiawindenergy Asia Wind Energy Association



5 Jun 2018 - India: Gujarat's Vikas Shakti Energy Park 200 MW wind power at the 2. Gujarat.

5 Jun 2018 - India: GCL AEM to build \$450 million offshore wind farm.

8 Jun 2018 - Australia: Eyre Peninsula MEO won't allow investment in offshore wind at all.

7 Jun 2018 - China: CGN, CGB, China Resources Island Wind Farm, Cuijin, Suzhou.

7 Jun 2018 - Vietnam: Indevco, Power Vietnam wind farm.



### Events

4th Asia Offshore Wind Day Taipei - 18 September 2018

China: ZPMC Delivers Longyuan Zhenhua 3 Installation Vessel

Taiwan: Cross-strait risks cannot be ignored, insurer warns offshore wind

APAC offshore wind power outlook, 2017-2027e



4 June 2018 South Korea: Macquarie floats 1GW Korea plan

Macquarie Group is teaming up with South Korean company Gyeongbuk Floating Offshore Wind Power to jointly develop a 1GW floating wind project off the coast of the Asian country...



China: ZPMC Delivers Longyuan Zhenhua 3 Installation Vessel

Taiwan: Cross-strait risks cannot be ignored, insurer warns offshore wind



Taiwan: Cross-strait risks cannot be ignored, insurer warns offshore wind



### Events

4th Asia Offshore Wind Day Taipei - 18 September 2018

## Quarterly Update on the Asia-Pacific Wind Industry

February 2019

The Asia Wind Energy Association and Wood Mackenzie Power & Renewables are initiating a collaboration to share their research findings on the APAC wind market and technology trends through a quarterly industry update.

### Winds of change blowing offshore in Asia Pacific

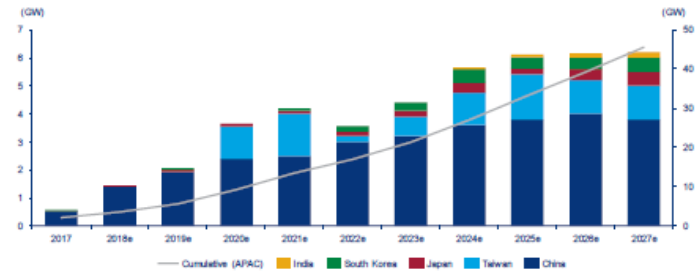
#### Introduction

According to research findings from Wood Mackenzie Power & Renewables, Asia Pacific's offshore wind capacity will rise 20-fold to 45 GW in 2027.

#### Significant growth in China and Taiwan

Leading the charge is China, which offshore wind capacity is expected to grow from 2 GW last year to 31 GW in the next decade. Next is Taiwan which will account for 20% or 8.7 GW of offshore wind capacity by 2027, making it the largest offshore wind market in Asia-Pacific excluding China (APeC) by 2020. Currently, Taiwan relies heavily on coal, gas and nuclear for power. Despite public push back on denuclearisation, the government still intends to reduce nuclear capacity in the long term. Renewable energy such as offshore wind is poised to help fill this gap – as more than 5.7 GW of offshore wind projects have been approved by the central government.

APAC offshore wind power outlook, 2017-2027e



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# Offshore Wind: Can the Asia-Pacific Region Catch up with Europe?

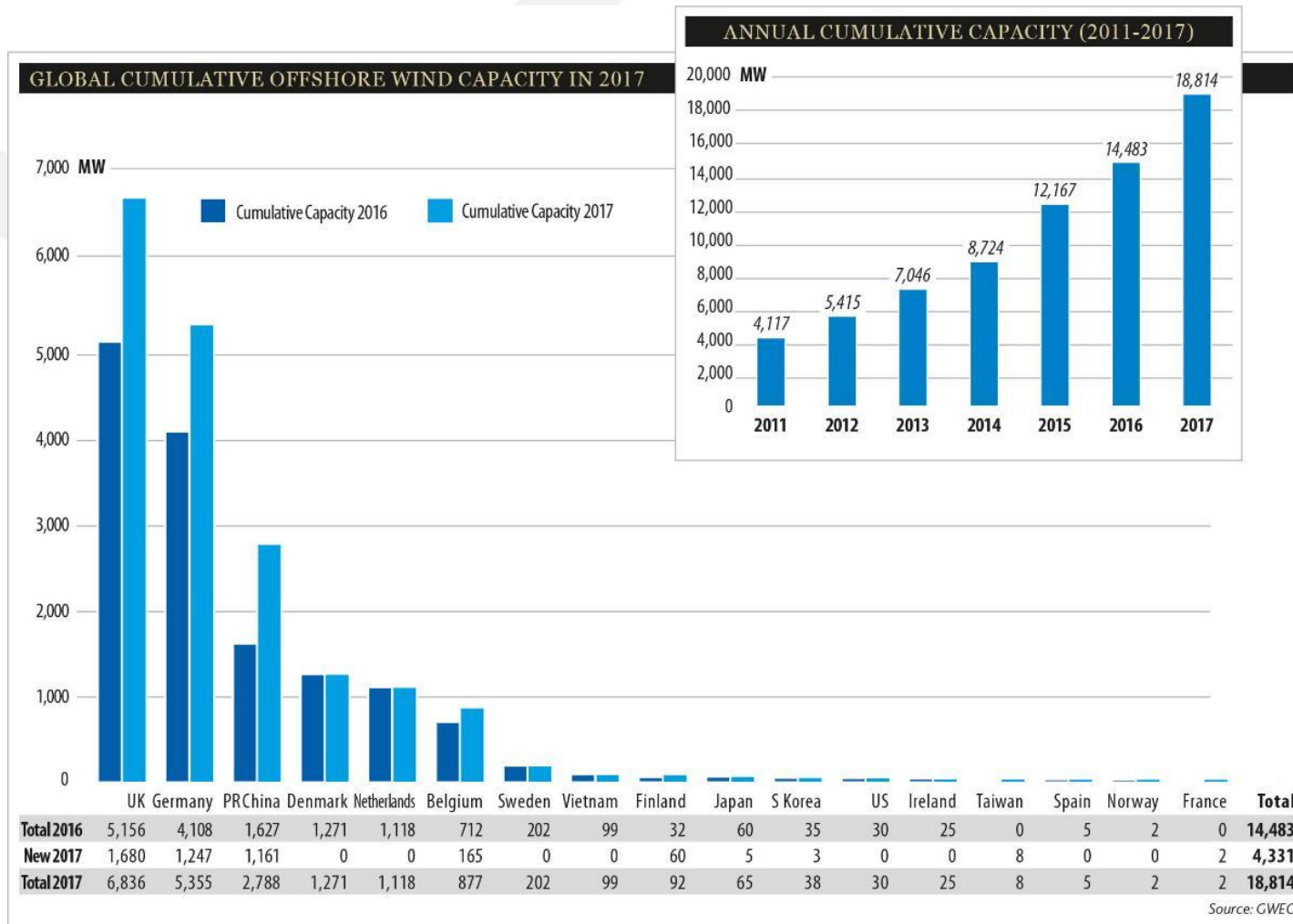
The question is not If... but When

# Regional Overview of the Asia Offshore Wind Industry



# Global – Overview

| Overall installed offshore wind capacity was close to 23 GW by the end of 2018.

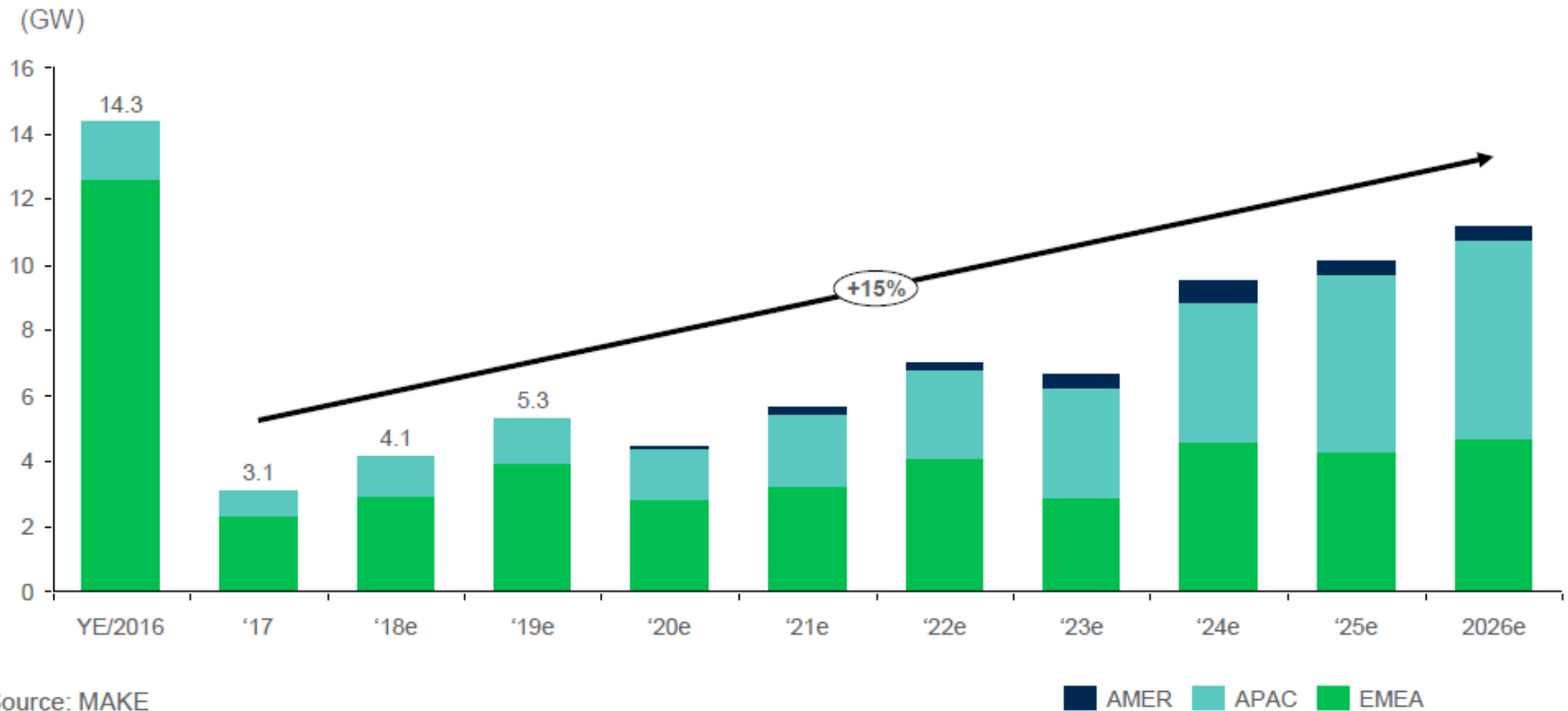


| The offshore wind market grew by 0.5%, to 4.49 GW of new installations (4.47 GW in 2017).

# Global – Outlook

| Significant capacity will be added; driven by Europe and Asia

## Global offshore wind market outlook, 2017 to 2026e

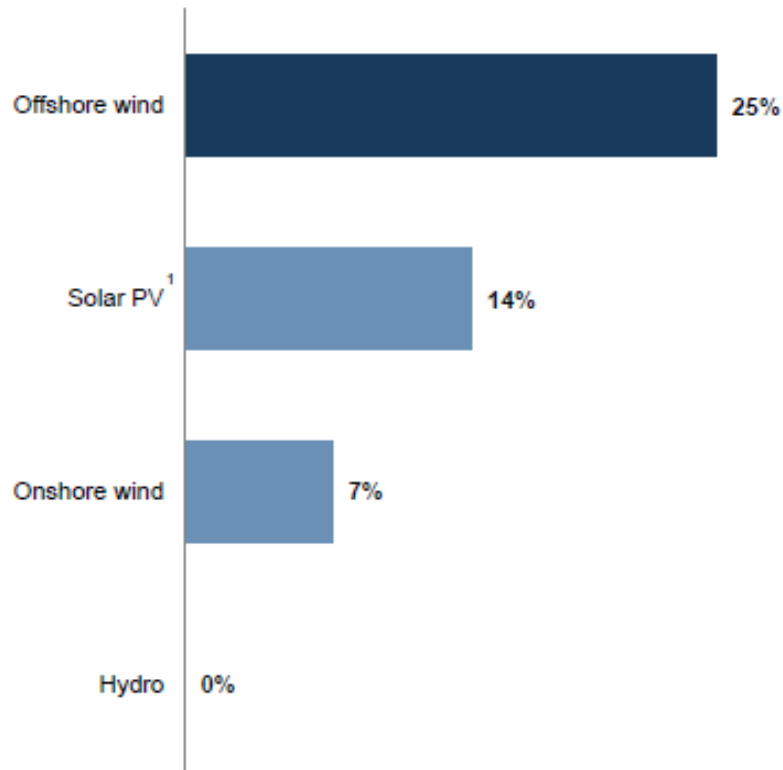


| The European region will grow at CAGR of 8%, significantly superseded by the APAC region, which will grow at a CAGR of 26%.

# Global – Key Drivers

| Offshore wind will lead other renewable technologies in the coming year.

Fastest growing renewable technology in OECD  
Installed capacity CAGR, 2014-2020  
%



## Offshore wind power offers multiple advantages

### Utility size power generation

*659 MW Walney Extension will power more than 460,000 UK homes*

### Offers +45% capacity factors<sup>2</sup>

*Significantly higher than onshore wind and solar PV*

### Industry of significant scale

*Industry maturity, volume and technological development offer attractive business opportunities and steep learning curves*

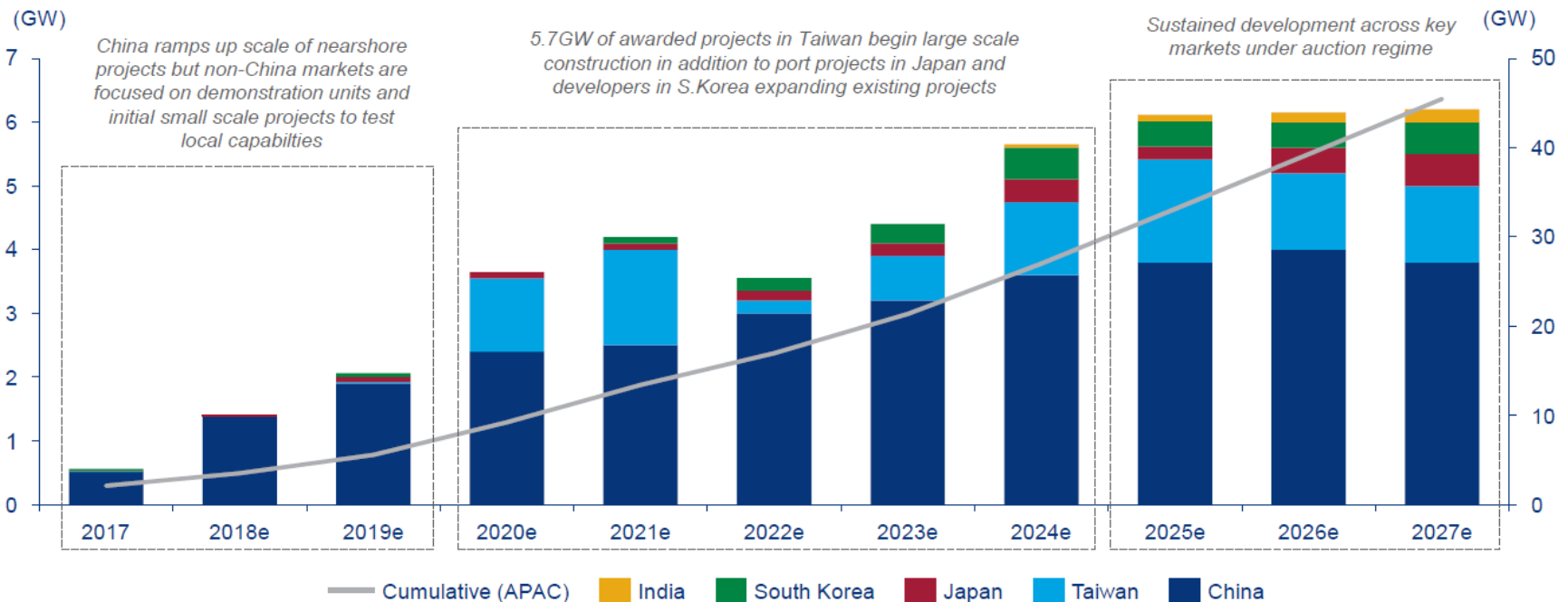
### Limited visual impact on landscape

*Wind farms are built far from shore*

# Asia-Pacific – Outlook

| Cumulative offshore capacity to reach 45 GW by 2027.

## Asia Pacific offshore outlook 2017-2027e

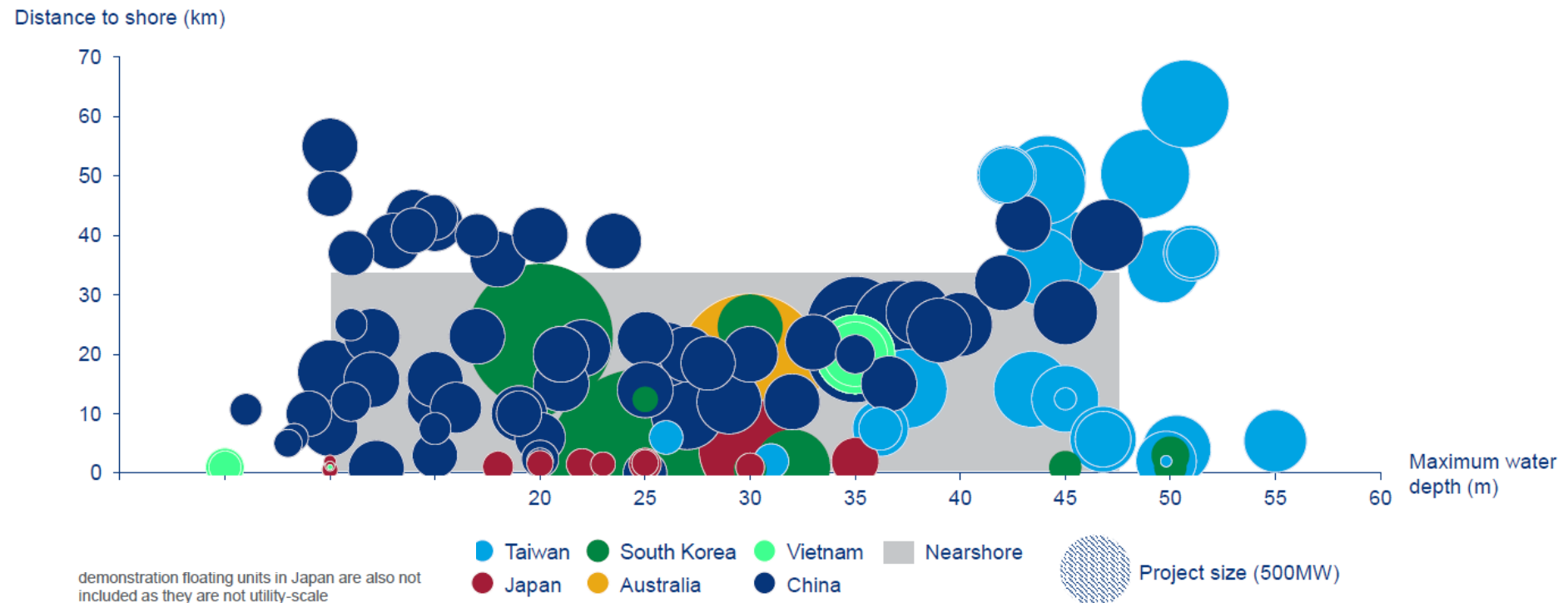


| Despite a slow start, large-scale growth post-2020 will average 5 GW of new annual added capacity.

# Asia-Pacific – Outlook

| APAC has a diverse range of offshore projects due to varying marine conditions.

Site specifications of planned offshore wind projects in APAC

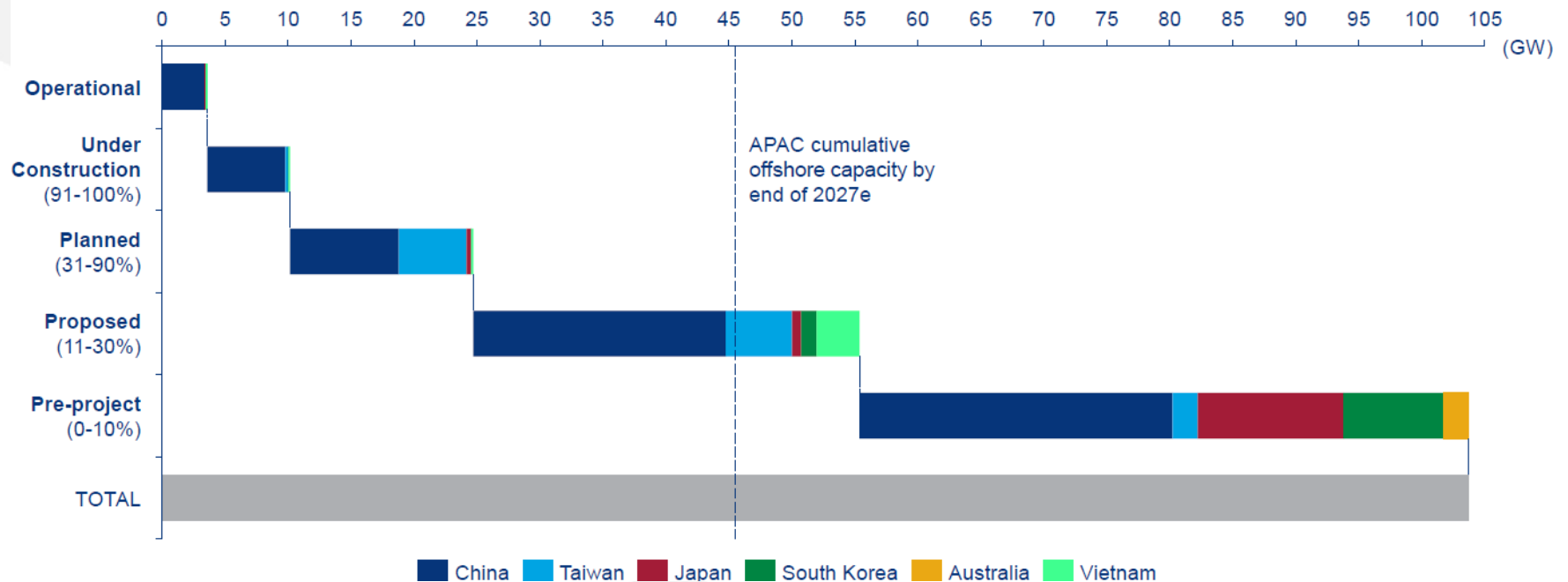


| Majority of projects in the pipeline focus on grounded nearshore projects.

# Asia-Pacific – Outlook

| Almost half of all proposed offshore projects in APAC will be realized in ten years.

Status of APAC offshore wind pipeline by YE/2018

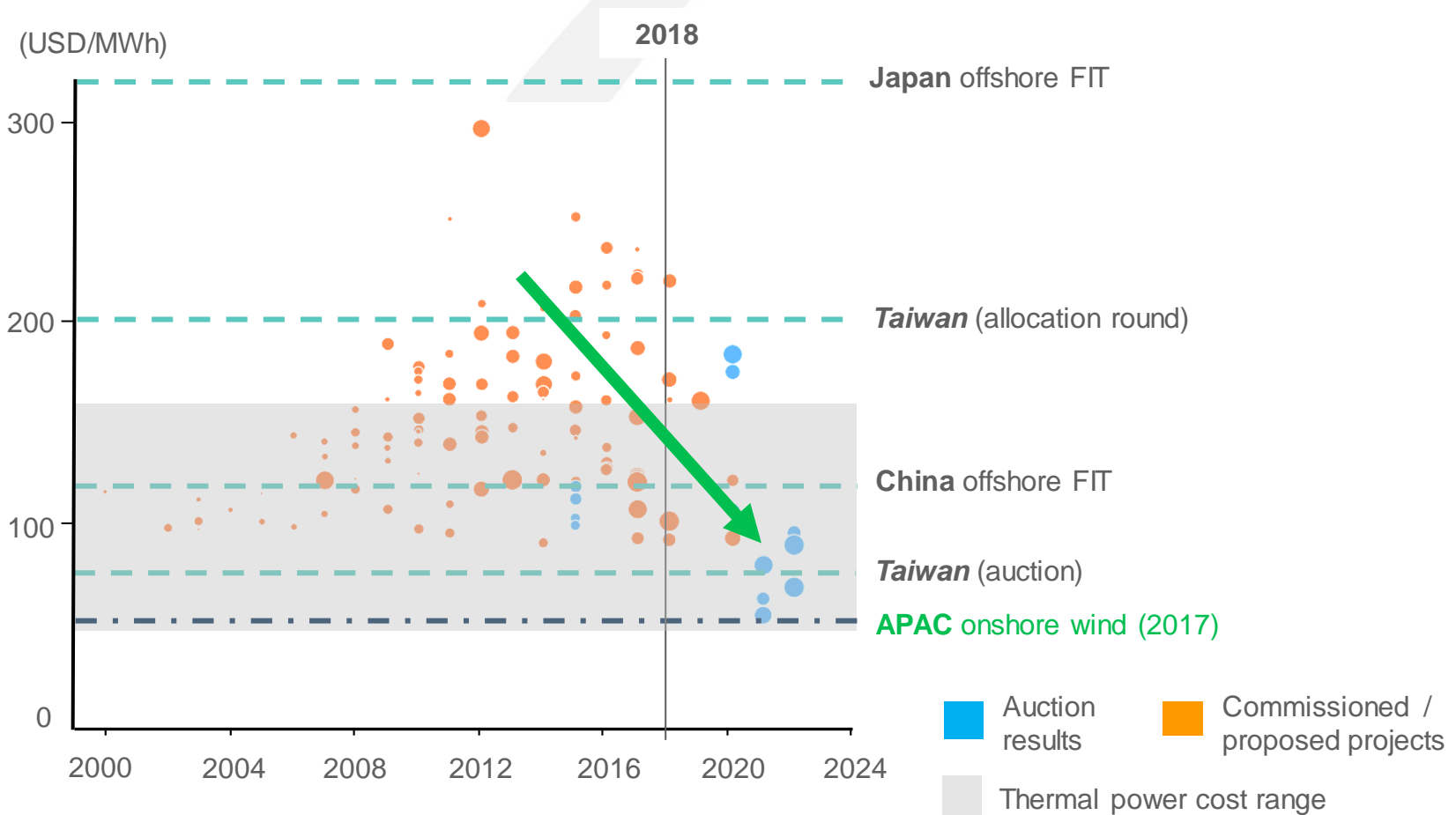


| Developers are increasingly ambitious with plans for over 40GW of non-China offshore projects post 2020.



# Asia-Pacific – Outlook

## | Global offshore wind LCOE and Asia Pacific offshore wind prices



## | Offshore wind prices will drop below thermal prices

# Asia-Pacific – Outlook

| Only a few select markets have real potential for offshore wind.

## Screening of Asia Pacific excluding China (APeC) markets

● = Yes   ● = Limited   ● = No

Markets	Active offshore development	Subsidy support for offshore	National offshore plans	Coastlines suitable for offshore	Developers interest in offshore	Domestic wind power supply chain
Australia	●	●	●	●	●	●
India	●	●	●	●	●	●
Indonesia	●	●	●	●	●	●
Japan	●	●	●	●	●	●
Kazakhstan	●	●	●	●	●	●
Mongolia	●	●	●	●	●	●
New Zealand	●	●	●	●	●	●
Pakistan	●	●	●	●	●	●
Philippines	●	●	●	●	●	●
South Korea	●	●	●	●	●	●
Sri Lanka	●	●	●	●	●	●
Taiwan	●	●	●	●	●	●
Thailand	●	●	●	●	●	●
Vietnam	●	●	●	●	●	●

Note: Markets shown are those with track record in wind power or active wind power markets  
Source: MAKE

Yellow = Potential long-term market  
Green = Short/Medium-term market

# Offshore Wind Market in China



# China - History

**2008**

First offshore wind project,  
Donghai Bridge 100MW  
- Developers: Datang, CGN,  
SPIC, Shanghai Green Energy

**2009**

Policy support started  
→ Development plans and  
targets for 2010, 2015,  
2020

**2010**

First offshore concession  
projects (2 inter-tidal & 2 near-  
shore), all in Yancheng, Jiangsu,  
totaling 1GW

**2013**

**December:**  
389 MW  
installed

**2014**

**H2 2014 - H2 2015:** 10 projects started  
construction, 6 completed partial installation

**2015**

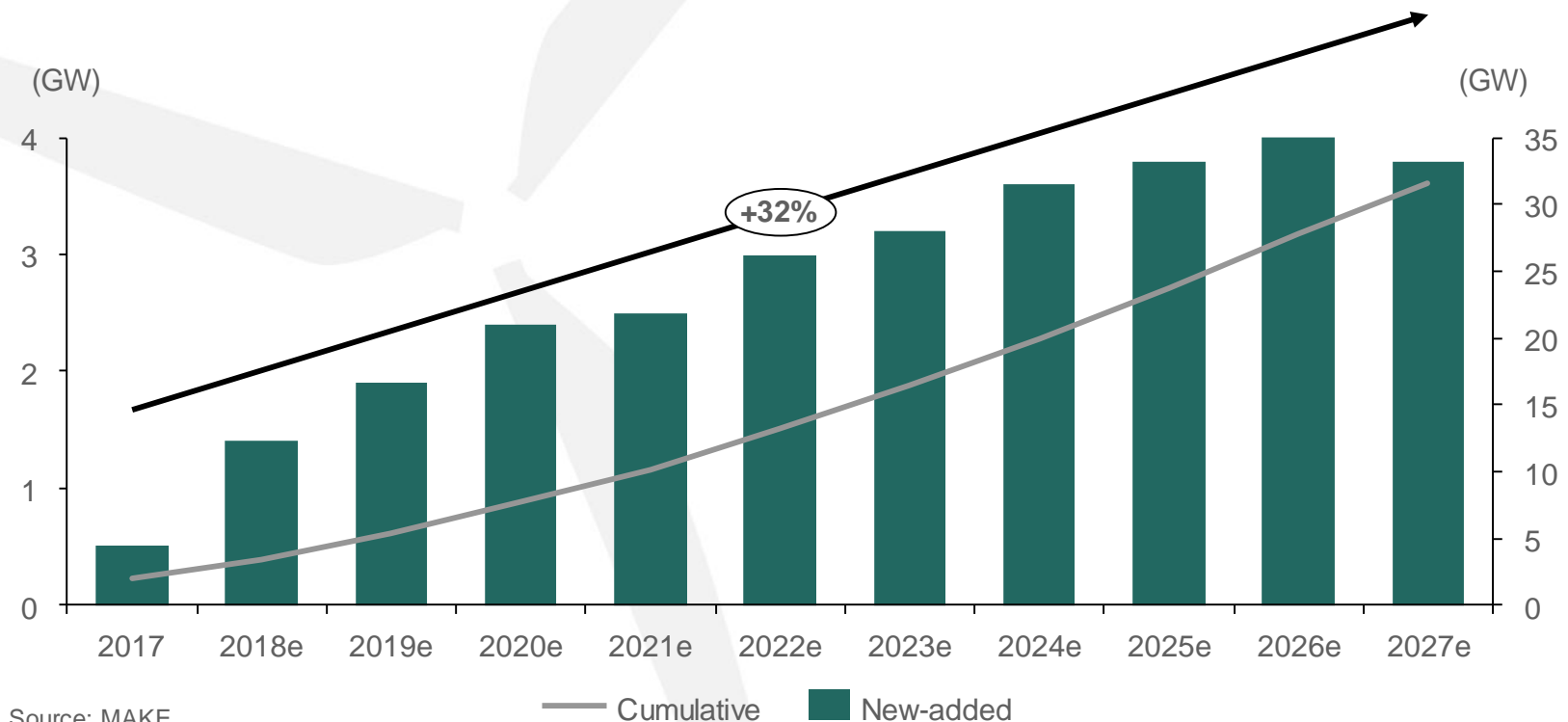
**September:** first offshore  
substation installed in Asia (110kV  
offshore substation)  
**December:** cum. installed capacity  
919MW, grid-connected 793MW

**2016**

**Q1 – Q3:** 4 projects commissioned (1 inter-  
tidal, 3 nearshore, total 382MW)  
9 projects under construction (4 partially  
installed and grid-connected)  
**September:** First nearshore project,  
CGN's Rudong  
**October:** largest nearshore project in  
China: Three Gorges' Jiangsu Xiangshui  
(200MW)

# China - Overview

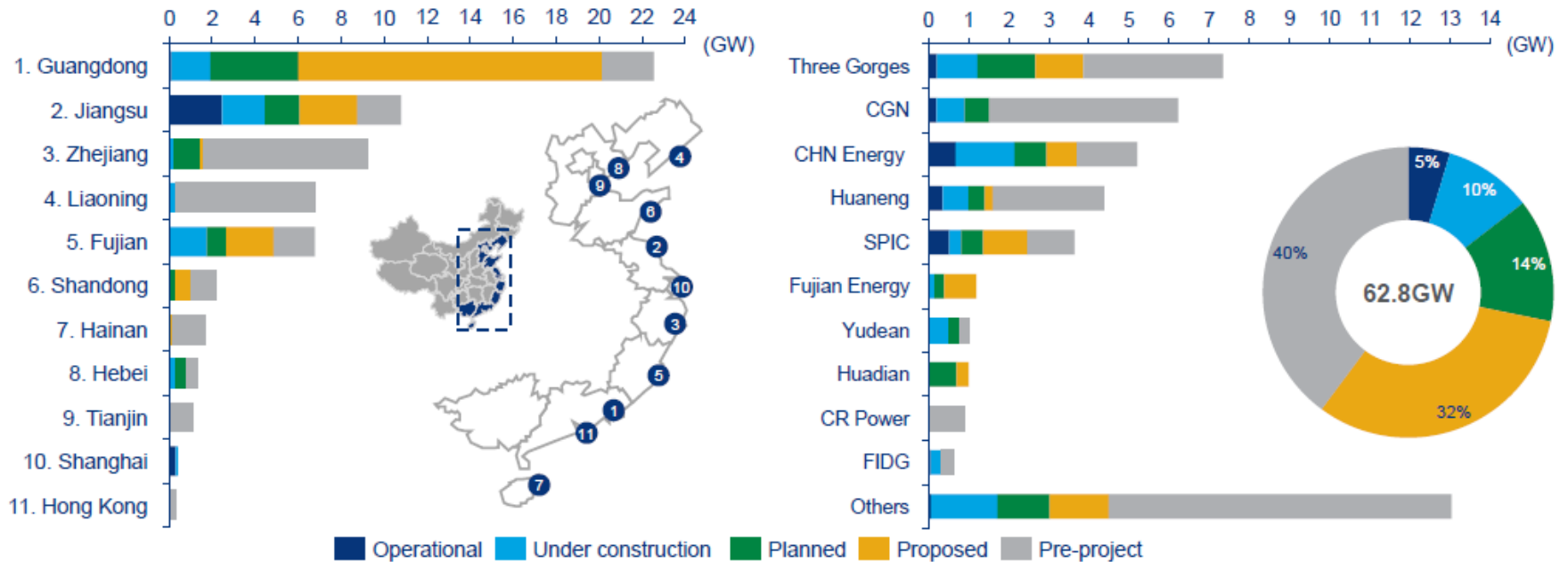
| Growth driven by regional policy incentives.



| Offshore wind growth will continue to expand even with the introduction of auction scheme in 2019 as it is part of key energy strategy plans by central and local governments.

# China – Regional Overview

**| Guangdong and Jiangsu province comprise 53% of all offshore pipeline in China.**



**| State-owned developers dominate offshore project pipeline with Three Gorges leading.**

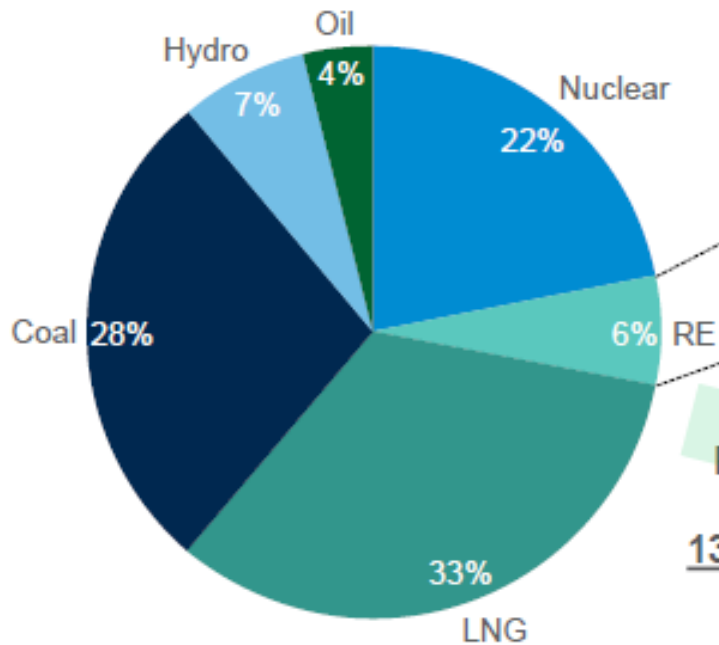
# Offshore Wind Market in South Korea



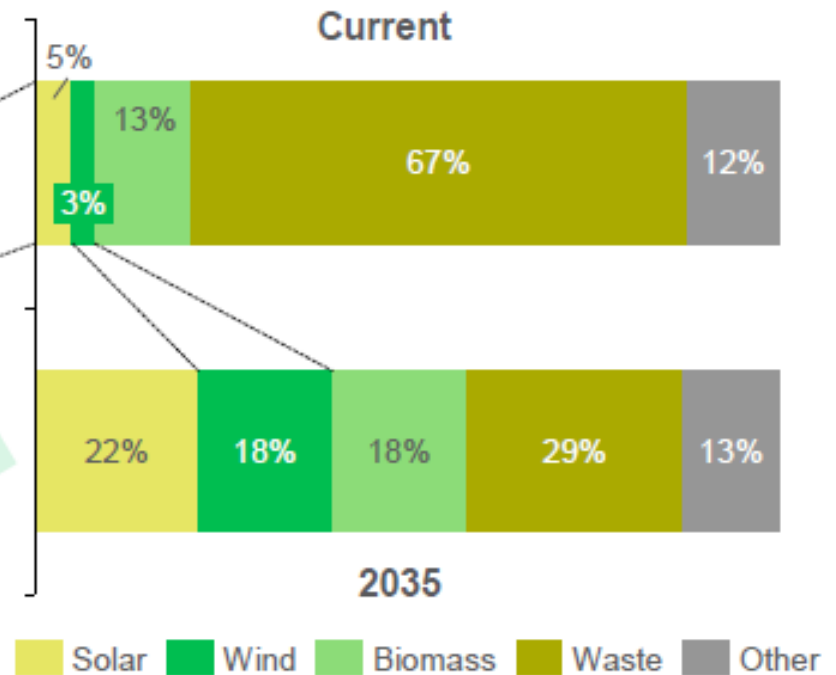
# South Korea - Overview

| Wind power's share of renewable energy is set to increase

South Korea 2016 energy mix



South Korea's RE mix: 2016 and 2035



RE share to increase to 13.4% by 2035

Note: Renewable Energy (RE),  
Source: MAKE, Ministry of Trade, Industry and Energy (MOTIE)

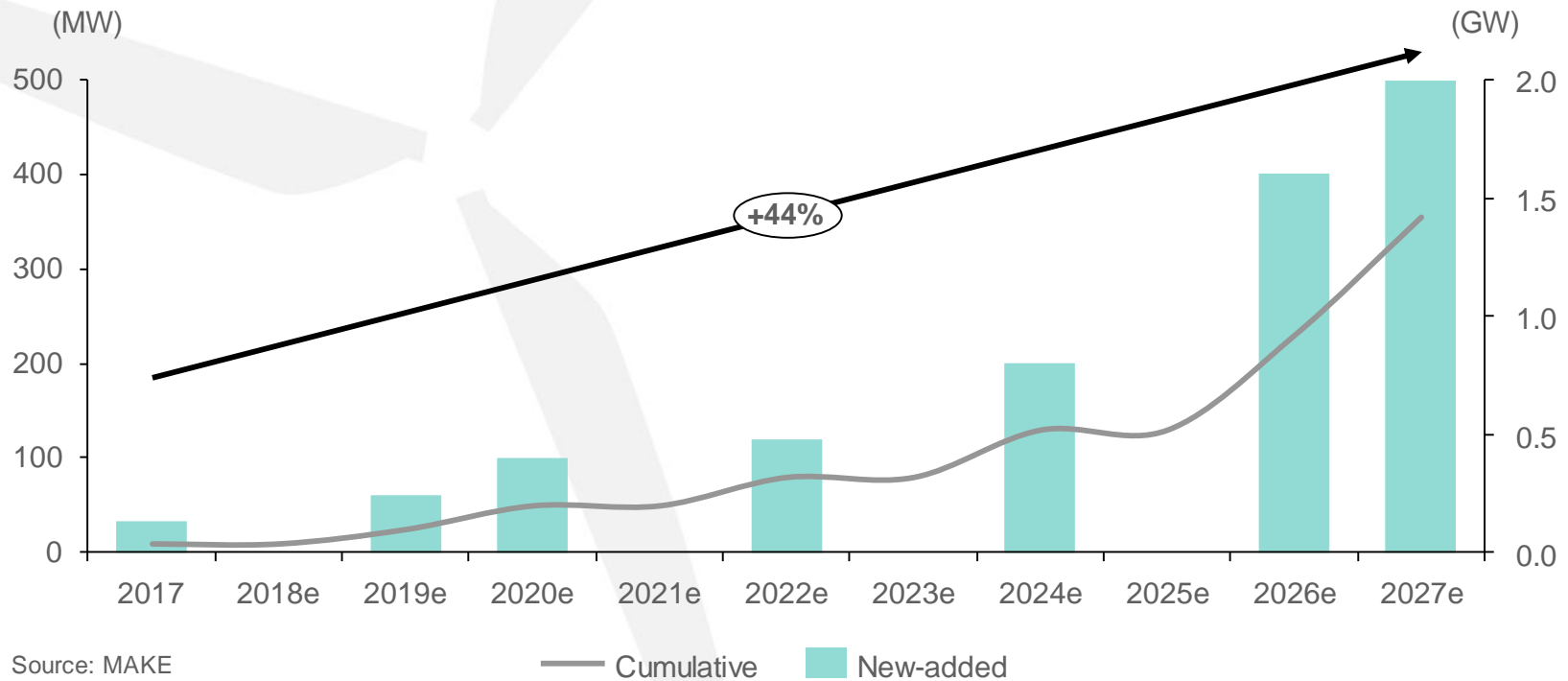
| South Korea's future energy plan is based on expanding renewable energy, especially solar and wind, to counter reduction in future share of fossil fuel energy sources.



# South Korea - Overview

| Ambitious RE targets require large-scale offshore wind.

## South Korea offshore wind power outlook, 2017-2027e

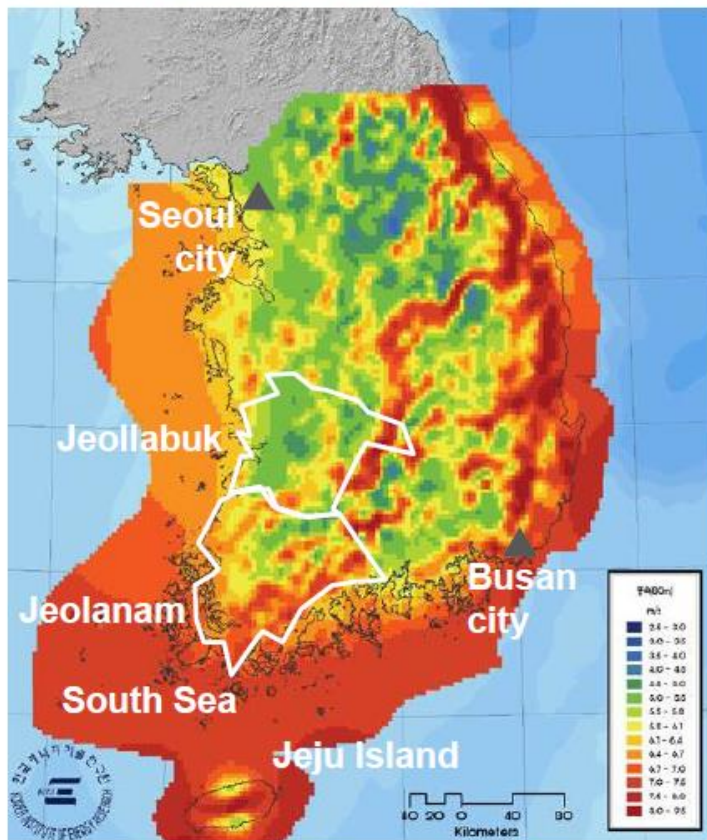


| Scaling up existing capacity and building up local capabilities to sustain growth. New policy support measures are expected to further drive growth in mid-long term.

# South Korea – Potential

| Rich offshore wind resources particularly in South Sea area.

## South Korea theoretical offshore wind map



Source: MAKE. KIER.

■ <6.49m/s    ■ 6.5-7.9m/s  
■ 8.0+ m/s

## DRIVERS

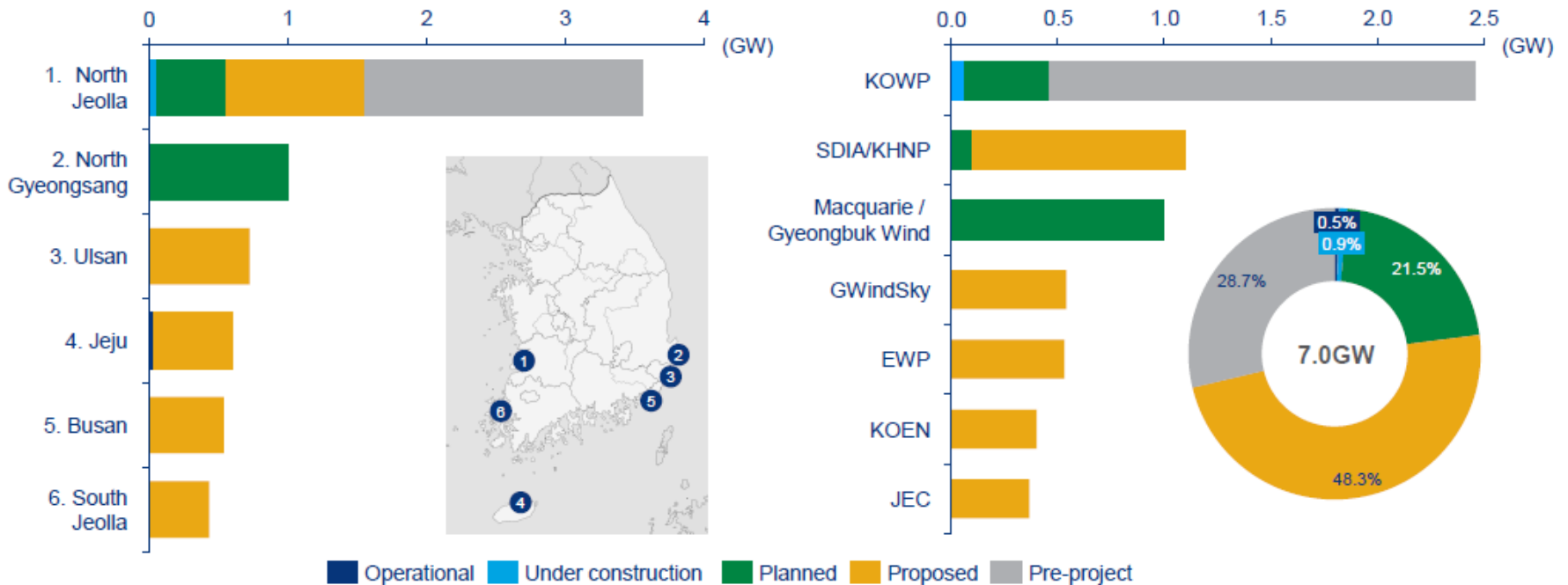
- Offshore wind is identified as a potential high technology manufacturing sector: Enables sector to receive national R&D support of which the government believes local companies can become world class companies
- Parts of local supply chain are already integrated with global offshore wind supply chain: Local cables, towers, forgings suppliers are already global offshore suppliers and testing facilities are already available

## BARRIERS

- No installation vessels in South Korea: There is no plans to import expensive vessels from Europe and companies are actively looking for a local solution – due to soft muddy seabed, it is difficult to utilize jack-up vessels
- Difficult negotiations with local population: Particularly difficult with fishermen over high compensation and has already delayed even projects by local companies leading to higher than expected projects costs

# South Korea – Outlook

| National level projects are key to attract investment and drive economies of scale.



| Korean government wants to capitalize on potential floating offshore technology by leveraging its mature shipbuilding industry.

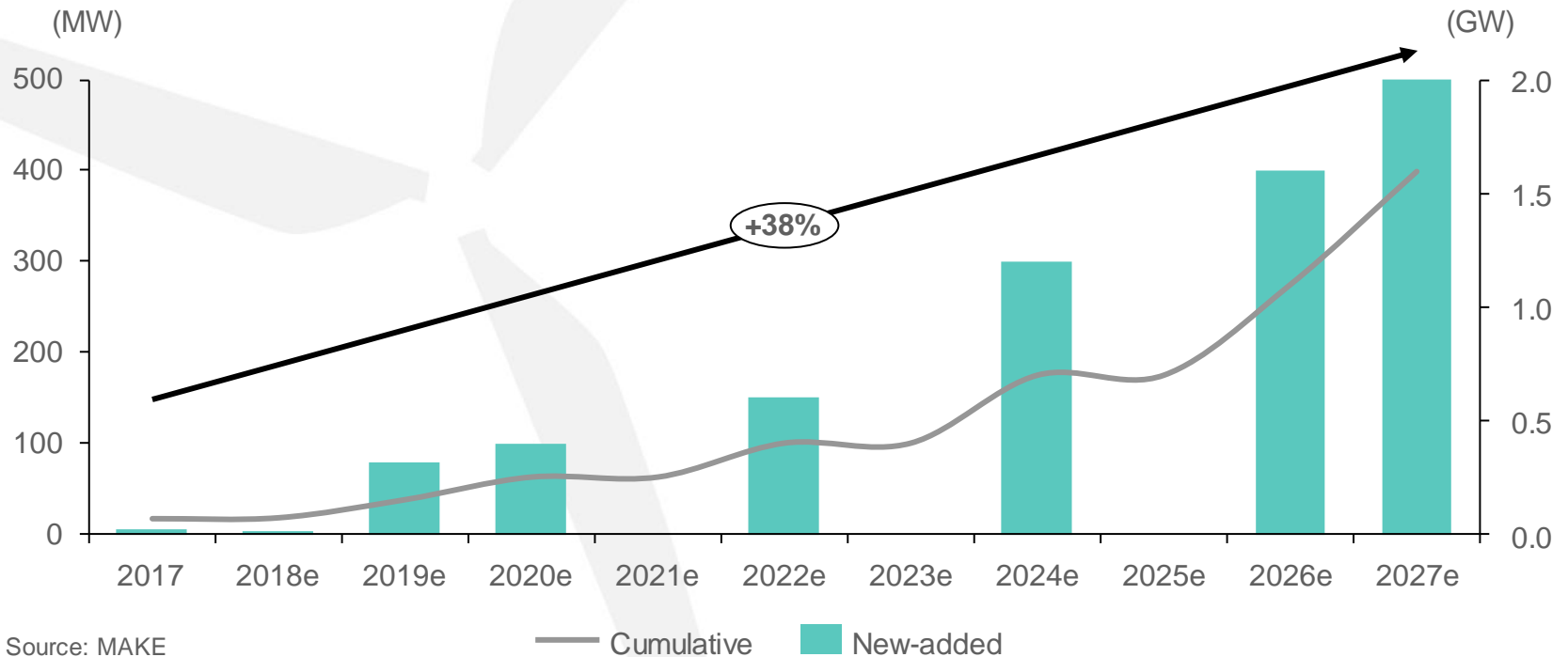
# Offshore Wind Market in Japan



# Japan - Overview

| Slow to start but will start to accelerate post-2020

## Japan offshore wind power outlook, 2017-2027e

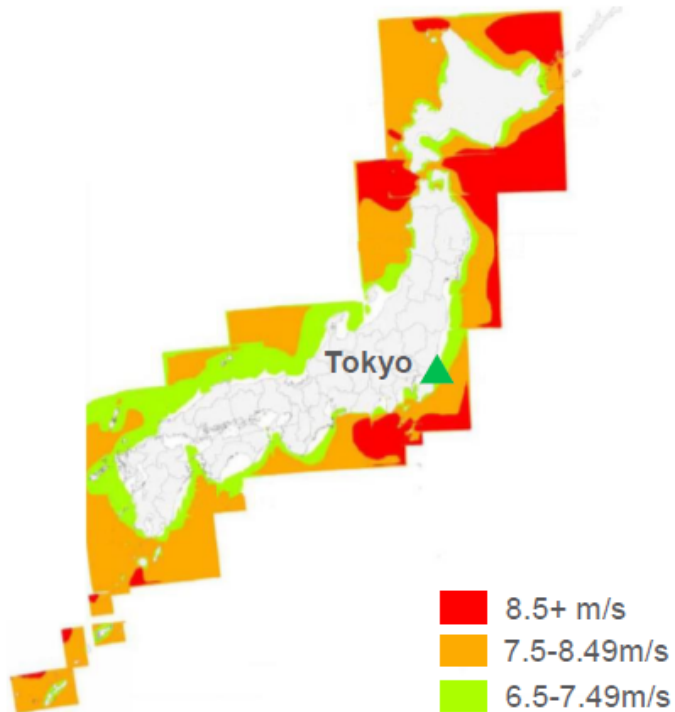


| Early port/harbor projects will give way to large-scale nearshore projects.

# Japan - Potential

| Strong offshore wind resources, particularly in Northern Japan.

## Japan theoretical offshore wind map



## DRIVERS

- **Large offshore zones and wide port network:** Japan has the eighth largest Exclusive Economic Zone (4.5 million km<sup>2</sup>) in the world and has a long established maritime industry
- **Pioneering offshore floating foundation:** Offshore wind provides an opportunity for local companies to become leaders in floating offshore foundations – already the govt. is supporting floating demonstrations as a potential export industry in the future

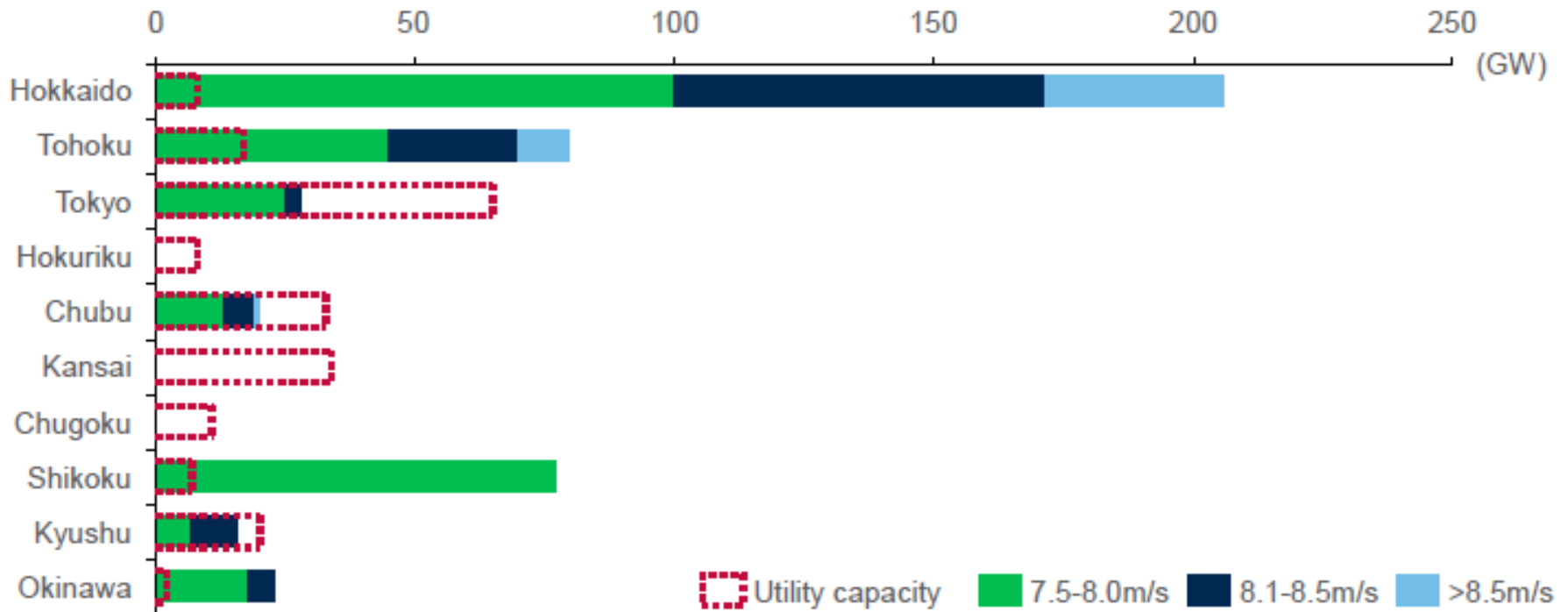
## BARRIERS

- **Best offshore zones suffer from curtailment:** Despite rich offshore wind resources in Hokkaido, Tohoku and Kyushu region, they suffer from curtailment by regional utilities who are more supportive of conventional power sources
- **Offshore rich zones have low power demand:** Power demand in Hokkaido and Tohoku region combined is only half of Tokyo

# Japan - Potential

| Offshore potential heavily restricted by regional utilities

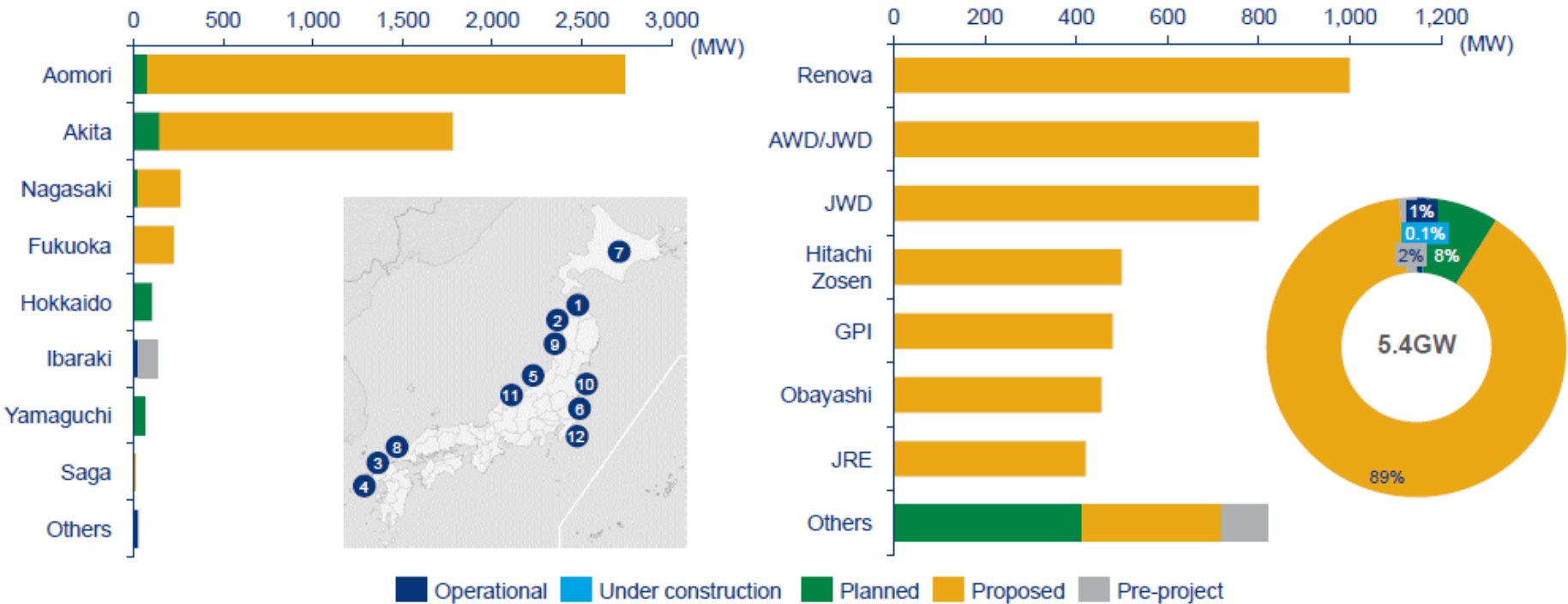
## Offshore wind potential and utility capacity



| Supply and demand mismatch as regions with the best wind resource also have the least utility grid capacity and heavy demand areas have limited wind resources.

# Japan - Outlook

| Despite over 5GW of pipeline, majority of projects are still undergoing EIA.



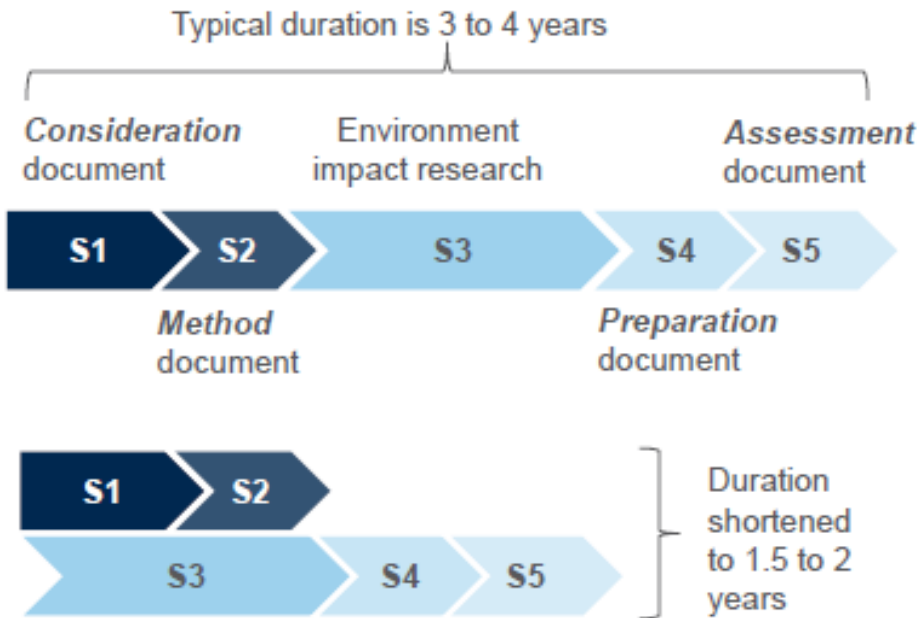
| The pace of commercialization remains slow due to long EIA process but new regulations governing general sea areas will help reduce project risk and encourage more investment.



# Japan – Challenges

## | EIA seen as major hurdle to offshore wind despite high FIT

### EIA process: current and suggested



Note: Wind condition research, land negotiations, etc. are conducted prior to EIA

Source: MAKE, Ministry of Environment

### Full EIA process is relatively new in Japan

- Japan's Environmental Impact Assessment (EIA) of which wind power projects was included in 2011 (for projects >10MW) came into effect in 2012 and has remained a substantial regulatory barrier to large scale uptake of wind power
- Duration of EIA can take upwards of 4 years with offshore projects so far requiring at the minimum 3 years to pass
- Cost of EIA can run into EUR millions so wind developers are unlikely to engage in EIA unless they are confident that their projects can pass despite the long duration required

| EIA remains costly and time-consuming process but reform remains slow, bogged down by bureaucratic processes as multiple government agencies are involved.

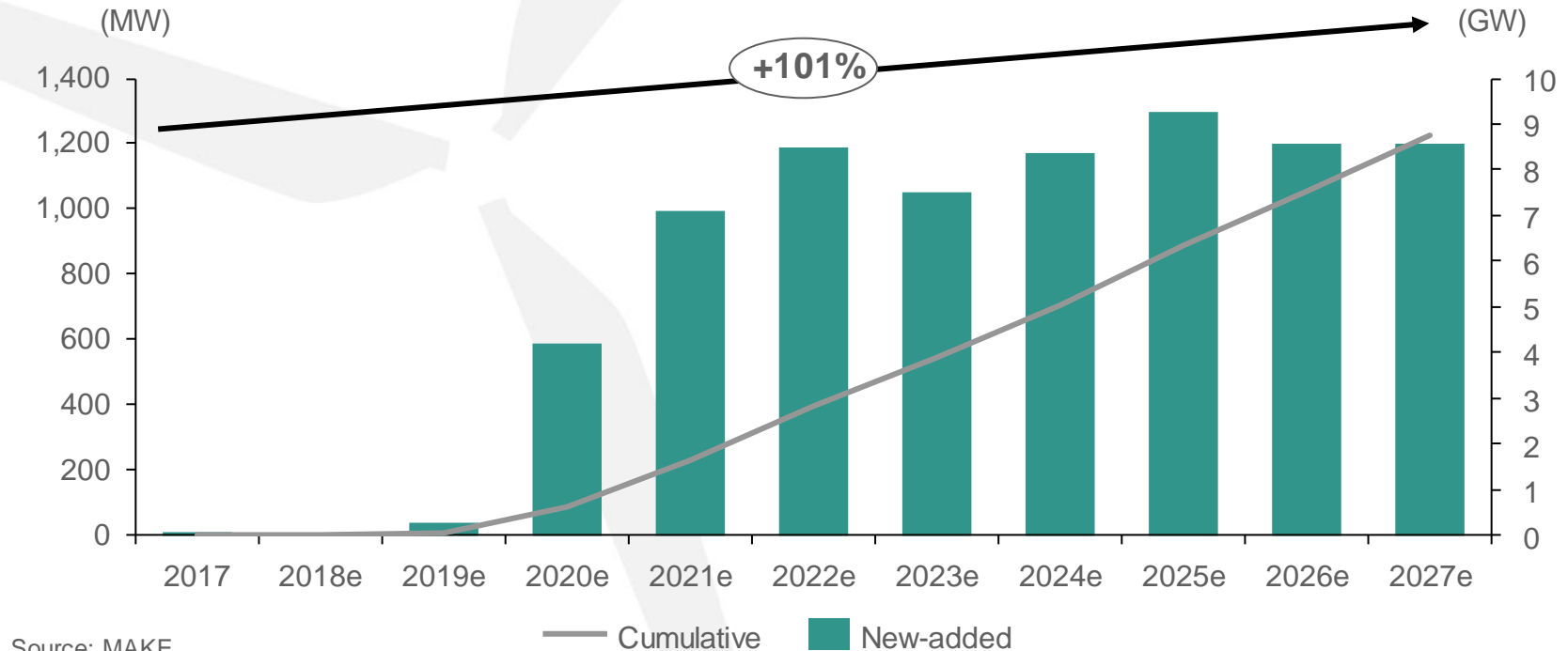
# Offshore Wind Market in Taiwan



# Taiwan – Overview

| On track to be second largest offshore market in APAC.

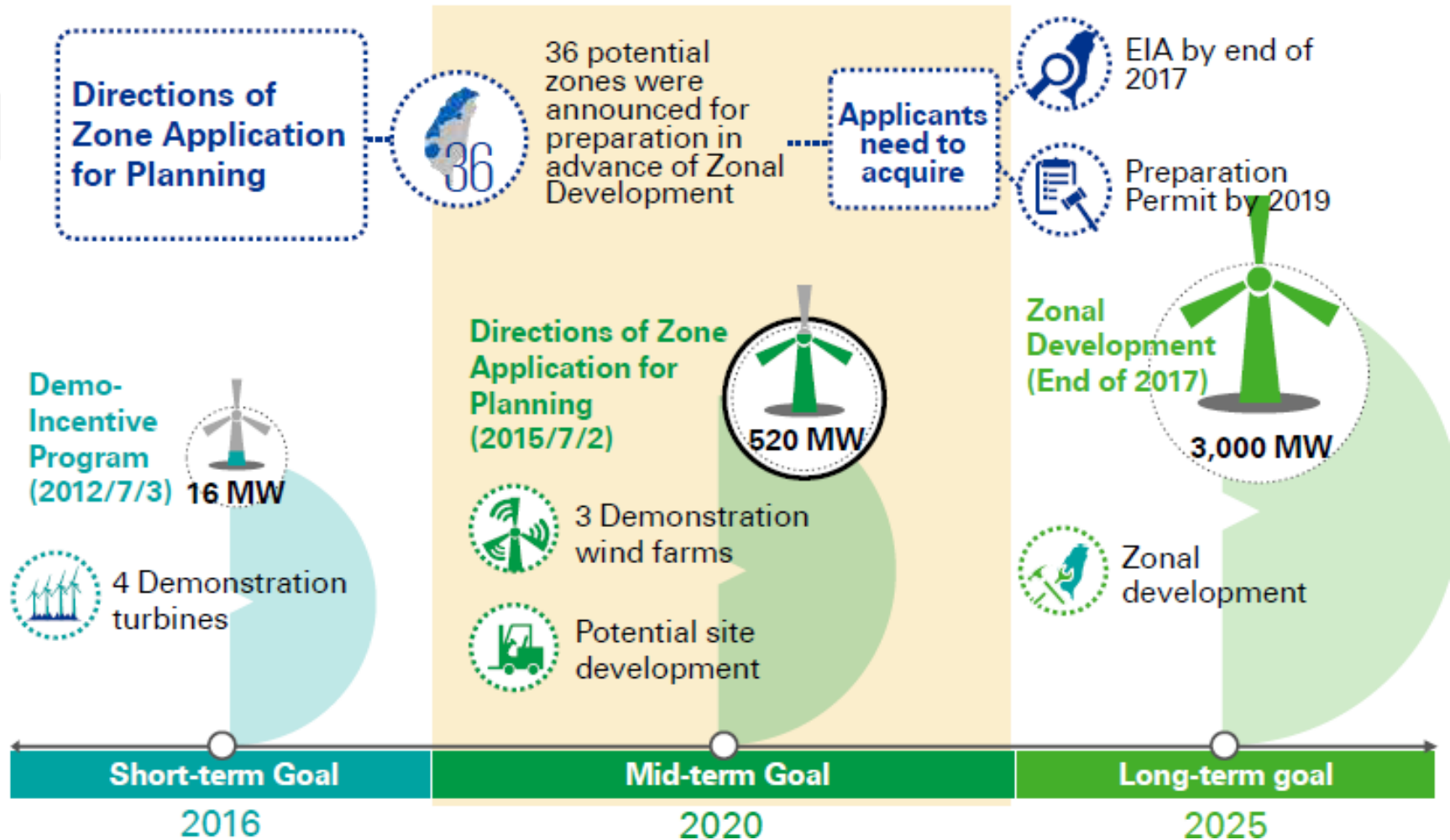
## Taiwan offshore wind power outlook, 2017-2027e



| Over 5.5GW of projects have been awarded to date with potential to reach over 10GW by the end of 2030 with future auctions

# Taiwan – Policy Overview

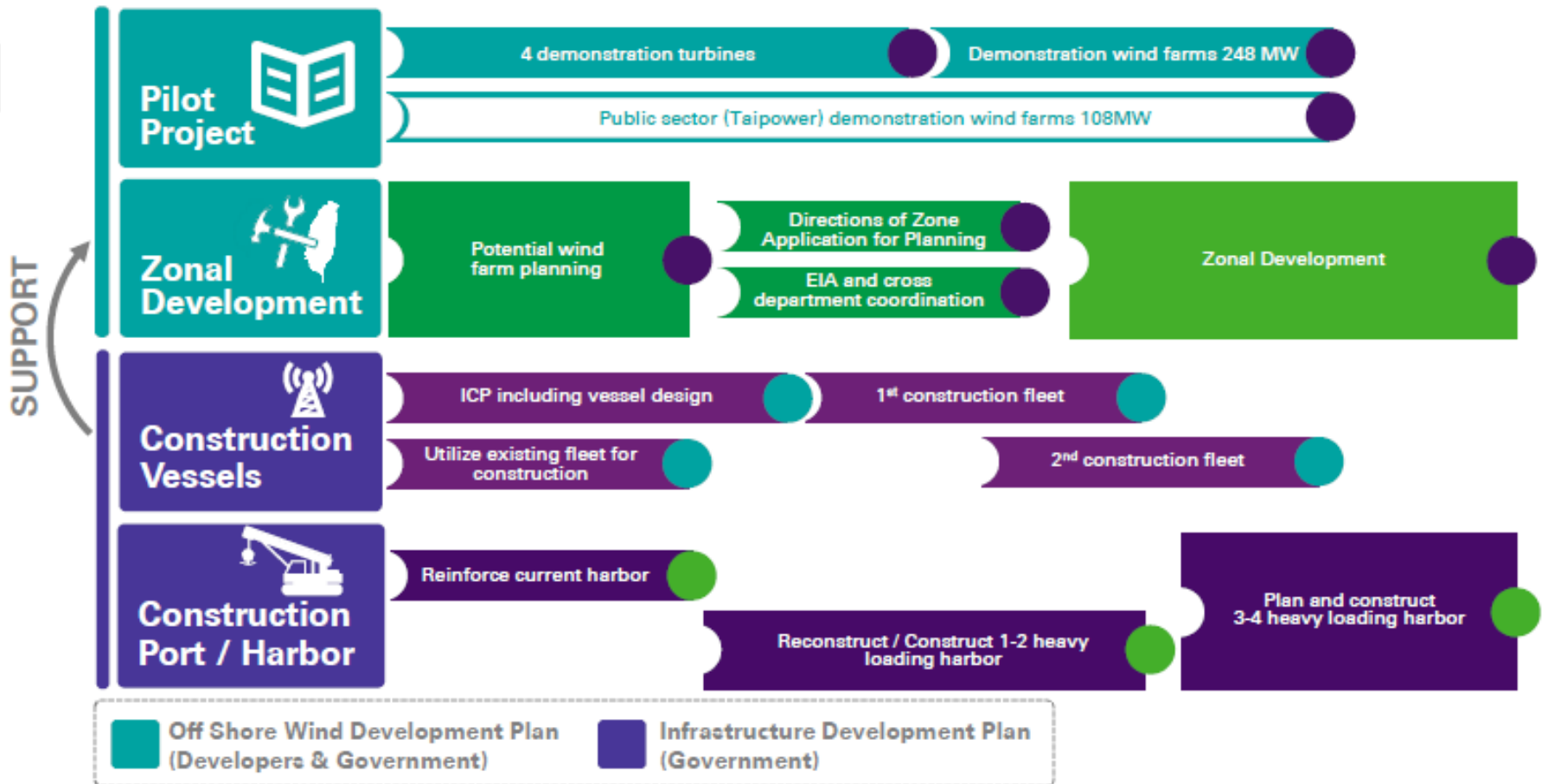
The Taiwanese government has a clear development plan



# Taiwan – Policy Overview

Strong government support to develop offshore wind with appropriate infrastructure

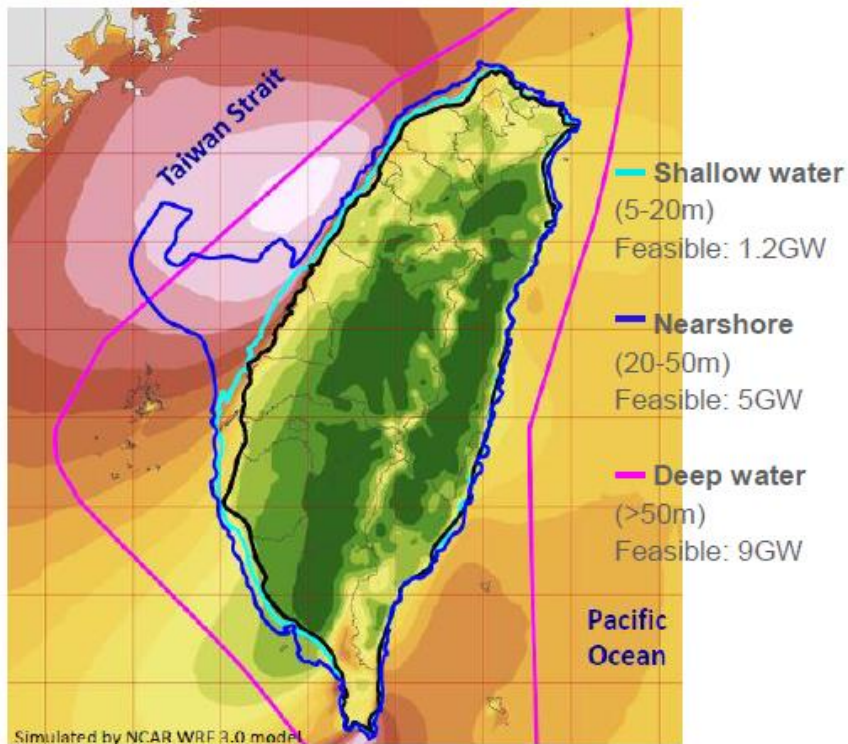
2012 2013 2014 2015 2016 2017 2018 2019 2020 §§ 2030



# Taiwan – Potential

| Offshore wind conditions along the Taiwan Strait are the best in APAC.

## Taiwan theoretical offshore wind map



Source: MAKE, ITRI

## DRIVERS

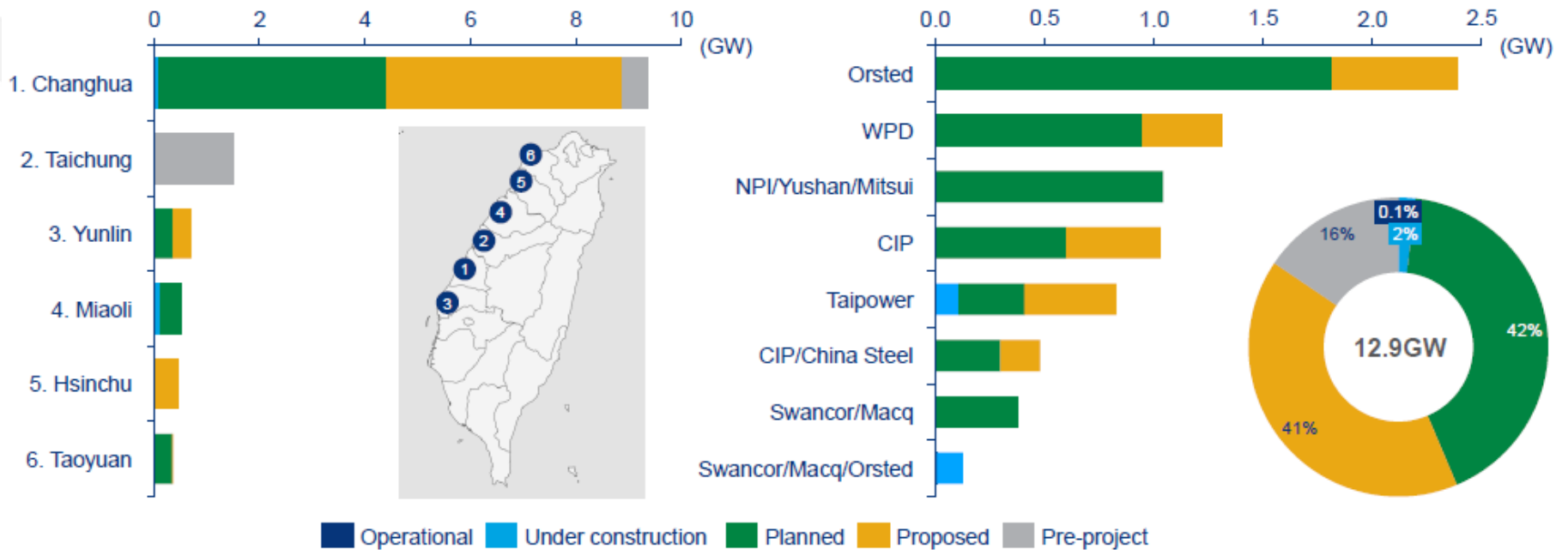
- **World class offshore wind resources:** Capitalize on some of the best offshore wind resources in the world along the Taiwan Straits
- **Public opposition to thermal and nuclear power:** Makes offshore wind power more attractive and offshore wind unlikely to face NIMBY opposition that has slowed onshore wind power development

## BARRIERS

- **Persistent delays and cost overruns:** Despite strong policy support and interest by private sector, in practice, all demonstration projects have met with delays (e.g. demonstration units were supposed to be completed by 2015) and cost overruns
- **Cannot rely on sourcing from China to lower costs:** Geopolitical reasons prohibit involvement of companies from China from getting involved in Taiwan offshore due to national security reasons

# Taiwan – Project Overview

| More than 70% of offshore wind applications are for projects in Changhua Country.



| Foreign developers dominate the offshore project pipeline.

# Taiwan – Challenges

| Infrastructure development will be critical for scaling the offshore wind development.



Lack of proper harbor infrastructure



Heavy loading harbor needs to be constructed



Harbor facilities needs to support future O&M



Grid needs to be upgraded



**Chunghwa**  
Concentrated potential wind farms in the Chunghwa region will require a grid capacity upgrade to handle the potential installed capacity



Rigorous permitting process



**The permitting process**  
needs to be simplified for a more facilitate more efficient development



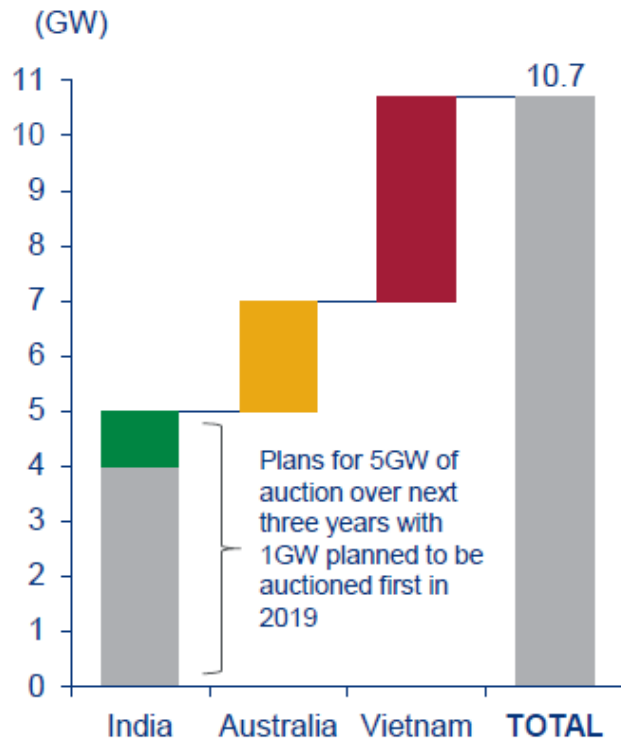
# Emerging Markets in Asia



# Emerging Markets

| Early planning is already underway in potential markets

## Planned pipeline of offshore projects



## Ambitious plans in India/Australia

- **India** – 1GW demonstration auction and potential future auctions. Government support will be required to match current onshore wind prices of USD40 per MWh.
- **Australia** – up to 2GW to offset thermal assets to be decommissioned. Open market will pressure on offshore wind prices with current prices of USD40-50 per MWh
- **Vietnam** – Government has approved higher FIT rates for offshore wind power in contrast to other markets.

# Conclusion



# Conclusion

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- The current offshore wind market is led by Europe, but Asia-Pacific is the market of tomorrow.
- China is leading the way with South Korea, Japan and Taiwan following.
- In China alone, >30GW of offshore wind is expected to come online through 2027. In total, we expect these four countries to install **45 GW** by 2027; our old estimate in 2017 was **11.2 GW** by 2027.
- Government support is required to provide enabling policies and to support required infrastructure (e.g. port and grid).
- New markets such as Australia, India, Thailand and Vietnam will start within 5 years.

# Closing





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# 7<sup>TH</sup> ASIA OFFSHORE WIND DAY

15 OCTOBER 2019 - TAIPEI

SUPPORTING ORGANIZATIONS   WORLD FORUM OFFSHORE WIND



Asia Wind Energy Association 

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# 8<sup>TH</sup> ASIA OFFSHORE WIND DAY

25 FEBRUARY 2020 - TOKYO

SUPPORTING ORGANIZATIONS   WORLD FORUM OFFSHORE WIND