



ABN AMRO Bank N.V.

Asian Offshore Wind Survey 2018

ABN AMRO conducted an offshore wind survey with 107 members of the Asia Wind Energy Association – here is a summary of our main findings

1. Japan and South Korea – The next offshore wind markets to accelerate?

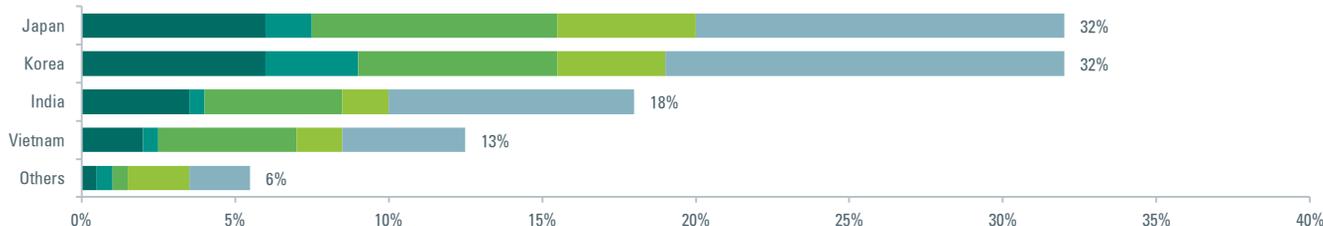
In reaction to Taiwan’s successful offshore wind farm auctions in April and June 2018, market participants believe that other Asia Pacific countries will jolt into action to benefit from this positive market momentum. Japan and South Korea in particular are expected to fast-track offshore wind plans in response. Both countries are positioned to ride on strong regulatory tailwinds – South Korea aims to triple the share of renewables in its power mix by 2030 with its offshore base ballooning to 13GW from a negligible level now, while Japan wants to boost its share to 22-24% by 2030 and set rules to promote (offshore) wind power generation specifically.

This bullish view is shared by 64% of respondents. Interestingly, between these 2 countries, Suppliers are relatively more bullish on South Korea whilst Technical and Market Consultants prefer Japan instead. India follows at a distant third place.

Legend

	Project Developers
	Suppliers
	Technical Consultants
	Market Consultants
	Legal Consultants
	Others

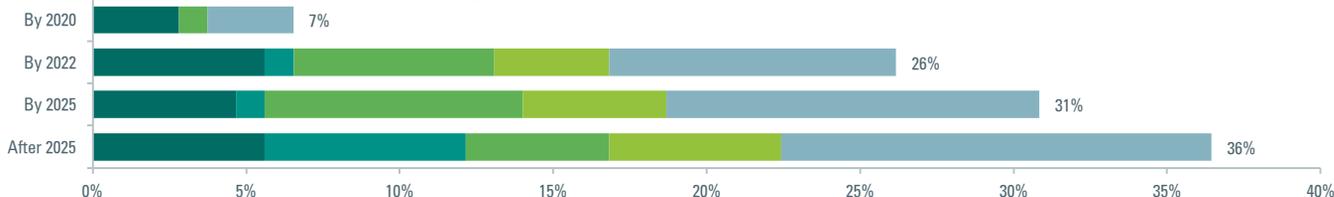
Within the next 3 years, which of the below countries do you expect to commence the construction of a 100MW offshore wind project?



2. Floating offshore wind – Coming to Asia soon?

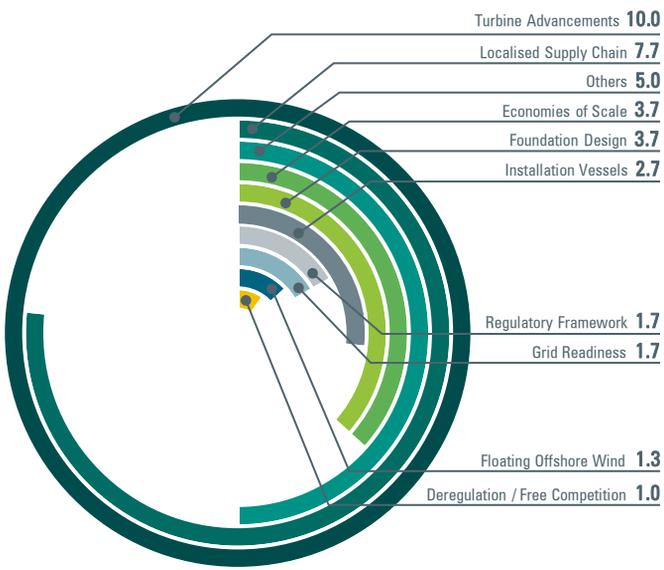
Considering that up to 80% of global offshore wind resources are in water depths of more than 60 metres, traditional seabed-fixed installations have their limitations, which facilitates the potential for floating wind turbines in Asia. That being said, given the emerging nature of the technology, participants anticipate that more time is needed for commercial acceptance. This is evident as only 7% is of the opinion that over 500 MW will be installed by 2020.

When do you expect the total installed floating offshore wind capacity in Asia to exceed 500 MW?



The outlook is somewhat more positive in the medium-term. We observe that 63% of respondents expect more than 500MW of offshore wind capacity to be installed by 2025. However, this view is not shared by Suppliers – an overwhelming 78% in the category believes this will only occur after 2025. In summary, an apparent disconnect exists between development plans and supply chain availability at this stage.

3. There is significant scope to lower offshore wind costs in Asia – How quickly will it materialise?



Relative importance of other technical drivers vis-à-vis Turbine Advancements

According to IRENA, the global weighted average LCOE for offshore wind projects commissioned in 2017 was USD 0.14/kWh. Their expectation furthermore suggests that projects commissioned in 2020 and beyond should reach levels below USD 0.10/kWh. Latter achievability is further supported by the recent zero subsidy bids that have emerged in Europe. European offshore wind installation costs have declined steadily in recent years and newly installed capacity has become a competitive source of generation vis-a-vis thermal generation.

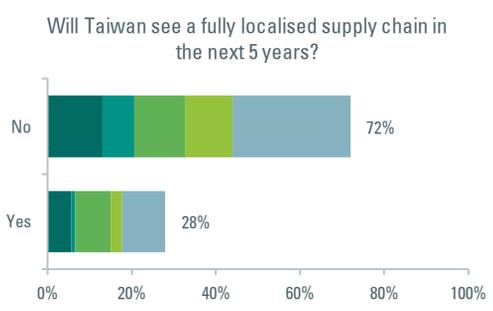
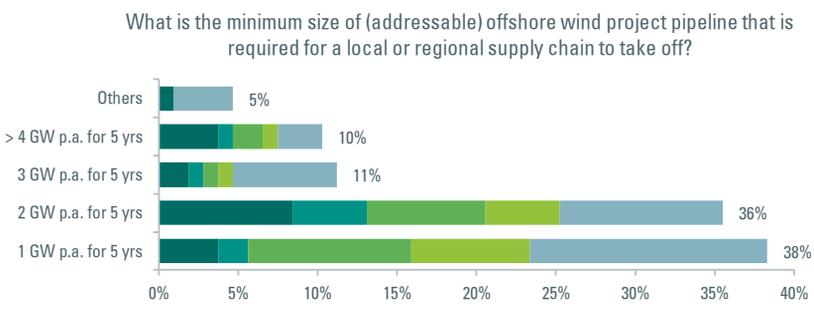
The main drivers for this cost reduction have been – (i) technology improvements, (ii) efficiencies in installation, (iii) contracting / procurement strategies (EPC vs. Multi Contracting) and supply chain, and (iv) general learning curve of market participants.

Last but not least, LCOE has also decreased due to enhanced O&M strategies that focus on condition-based maintenance preferably during low wind periods.

In the survey, the main contributors expected are turbine advancements, supply chain localisation and achieving critical mass.

4. Respondents recognise that localised supply chains could unlock value – But is this easier said than done?

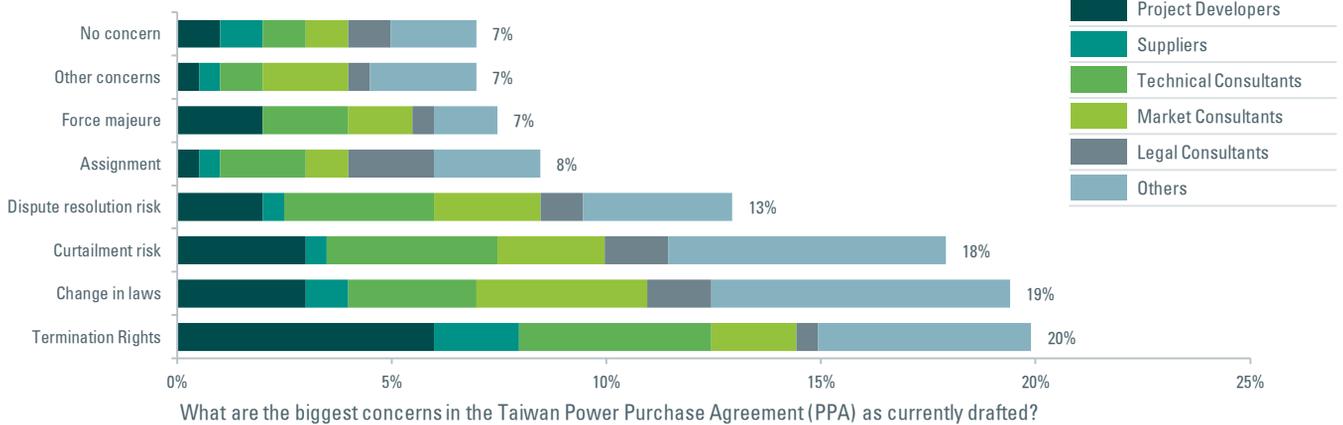
In Taiwan, the number of developers building long term strategic alliances (knowledge transfer) with local partners is growing. Will we finally see an Asia offshore wind sector emerge here? We expect increased potential local investment will have to be balanced with respect to forecasted regional market growth. Hence, we asked the question: what is the project pipeline required to invest in a regional supply chain? While 62% of respondents feel that a >2GW per annum pipeline is required, amongst Suppliers, this rose to almost 78%.



Digging deeper, 72% of respondents believe Taiwan will not see a fully localised supply chain in the next 5 years. When asked which portion of the offshore wind supply chain would remain predominantly international in Taiwan, 70% pointed towards turbines. This response may require more investigation, as at least 28% feel that a fully localised supply chain could developed in the next 5 years.

For a nascent industry that began just over 2 years ago, the Taiwanese offshore space has already shown significant progress. As an example, Developers are actively recruiting and educating local talent, including setting up training programmes in cooperation with leading European universities. Also, Suppliers are proactively encouraged to show their localisation plans and have begun to invest into local partnerships with manufacturers.

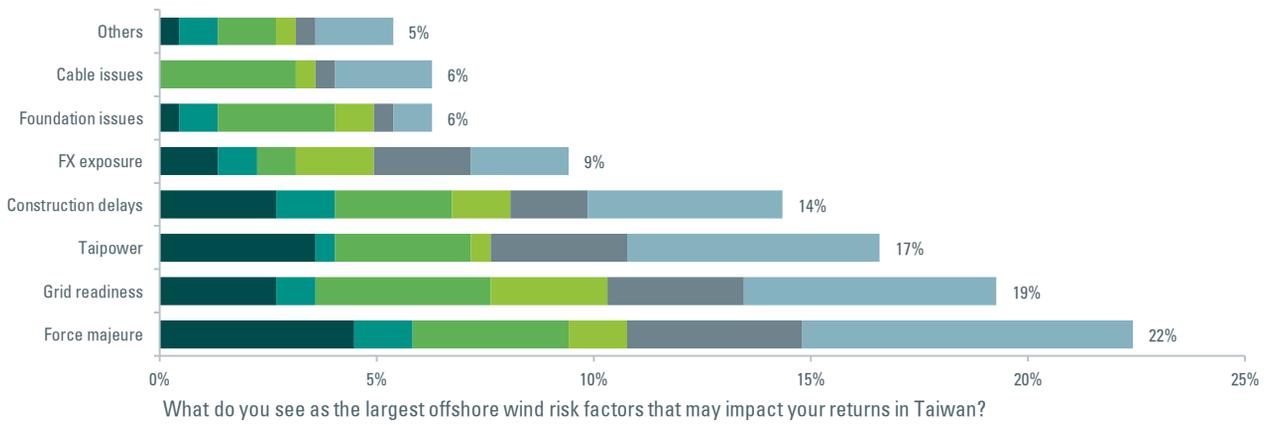
5. Risk wise, termination rights are the biggest concern within the Taiwanese PPA



Market participants are most concerned with termination rights within the Taiwanese PPA. Whilst 61% of Project Developers share these concerns as well, only a surprising 12% of Legal respondents concur.

Do they gain comfort from the overall civil law legal system in Taiwan as well as previous precedents? Legal respondents instead see the most risks in collateral assignment, curtailment risk and change in laws.

6. Force majeure, grid readiness and Taipower are the main concerns participants have with impacting returns



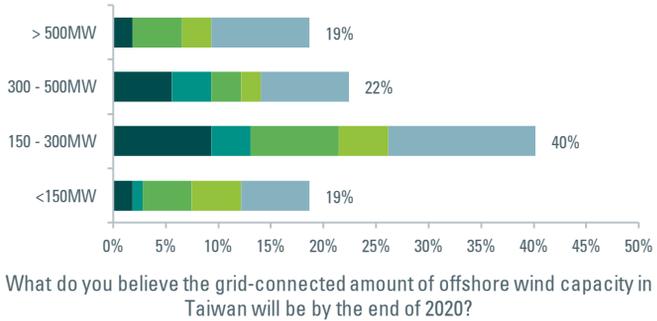
Taiwan offshore wind has attracted the interest of many overseas investors and developers due to its solid investment fundamentals including the need for power, shift towards renewable energy and excellent offshore wind resources.

That being said, Taiwan has its own set of unique and well-founded risks, including:

- Natural catastrophe exposure (i.e. typhoons, earthquakes and soil liquefaction) ; and
- Electricity grid readiness (i.e. capacity and adequacy of the grid).

An interesting survey outcome points to Technical Consultants considering cable installation and reliability and foundation design as important risks, while other respondents did not highlight these as issues.

7. A final note – Where does that leave us in Taiwan?



Tabling the awarded projects of Swancor, Macquarie, wpd and Taipower, 976 MW of offshore wind projects are slated to come online in 2020. Yet, 40% of respondents do not think that Taiwan will reach 300 MW by 2020. So much for development and construction risk?

All in all, Taiwan has, in a short span of time, managed to kick-off a burgeoning offshore wind industry and successfully attracted experienced and credible developers. We are optimistic that Taiwan is well-positioned to become a leading regional offshore wind hub, particularly buoyed by its consistent regulatory framework, favourable policy support and conducive business environment.

ABN AMRO – Selected Renewables and Utilities Credentials

<p>Infigen</p> <p>Senior Secured Term Loan and RCF AUD 605m</p> <p>Mandated Lead Arranger</p> <p>Asia Pacific 2018</p>	<p>Origin</p> <p>Unsecured Syndicated Loan Facility Refinancing USD 3,400m</p> <p>BMLA</p> <p>Asia Pacific 2018</p>	<p>Goldwind</p> <p>Senior Secured Syndicated Corporate Facility USD 300m</p> <p>Mandated Lead Arranger</p> <p>Asia Pacific 2018</p>	<p>Springbok II</p> <p>Utility Scale Solar Farm Back-leverage Project Refinancing USD 249m</p> <p>Sole LC Issuer and Lender</p> <p>North America 2018</p>	<p>Persimmon Creek Wind Farm 1</p> <p>199 MW Tax Equity Construction Bridge Loan USD 252m</p> <p>Participant</p> <p>North America 2018</p>
<p>Energy Developments</p> <p>Senior Secured Syndicated Multi-currency Refinancing AUD 850m</p> <p>Mandated Lead Arranger</p> <p>Asia Pacific 2017</p>	<p>Stockyard Hill Wind Farm</p> <p>528 MW Stockyard Hill Wind Farm Project Finance AUD 680m</p> <p>Mandated Lead Arranger & Hedging Bank</p> <p>Asia Pacific 2017</p>	<p>Alinta Energy</p> <p>Secured Syndicated Senior Term Loan Facility AUD 920m</p> <p>Mandated Lead Arranger & Hedging Bank</p> <p>Asia Pacific 2017</p>	<p>PARF Coopers Gap</p> <p>453MW Coopers Gap Onshore Wind Project Finance</p> <p>Mandated Lead Arranger & Hedging Bank</p> <p>Asia Pacific 2017</p>	<p>Origin</p> <p>Unsecured Syndicated Loan Facility USD 3,200m</p> <p>BMLA</p> <p>Asia Pacific 2016</p>

ABN AMRO – Selected Offshore Wind Credentials

Offshore Wind Financing				Offshore Wind Advisory	
<p>Blauwind</p> <p>Netherlands Offshore Wind Project Financing</p> <p>MLA & Hedging Bank</p> <p>The Netherlands 2018</p>	<p>Gemini</p> <p>Refinancing 600 MW Dutch Offshore Wind Project Finance</p> <p>MLA, Hedging, Account and LC Bank</p> <p>The Netherlands 2017</p>	<p>Butendiek</p> <p>Offshore Wind Project Refinancing</p> <p>MLA & Hedging Bank</p> <p>Germany 2017</p>	<p>Van Oord</p> <p>Sale of a stake in 600 MW Wind Farm Gemini to Alte Leipziger</p> <p>Adviser to Seller</p> <p>The Netherlands 2018</p>	<p>Lagerwey</p> <p>Sale of Wind Turbine Maker Lagerwey to Enercon</p> <p>Adviser to Seller</p> <p>The Netherlands 2018</p>	
<p>Green Investment Bank</p> <p>UK Wind Portfolio Financing</p> <p>MLA & Hedging Bank</p> <p>United Kingdom 2017</p>	<p>Merkur</p> <p>396 MW Offshore Wind Project Finance</p> <p>MLA & Hedging Bank</p> <p>Germany 2016</p>	<p>Race Bank</p> <p>573 MW Offshore Wind Project Finance</p> <p>MLA & Hedging Bank</p> <p>United Kingdom 2016</p>	<p>Sif</p> <p>Initial Public Offering for Offshore Wind Foundation Maker</p> <p>Joint Global Coordinator</p> <p>The Netherlands 2016</p>	<p>2-B Energy</p> <p>Capital Raise, including Equity, Debt Facilities and Grants - EUR 26.5m</p> <p>Adviser to Company</p> <p>The Netherlands 2014</p>	
<p>Nordsee One</p> <p>332 MW German Offshore Wind Project Finance</p> <p>MLA & Hedging Bank</p> <p>Germany 2015</p>	<p>Galloper</p> <p>336 MW UK Offshore Wind Project Finance</p> <p>MLA & Hedging Bank</p> <p>United Kingdom 2015</p>	<p>Gemini</p> <p>600 MW Dutch Offshore Wind Project Finance</p> <p>MLA, Hedging, Account and LC Bank</p> <p>The Netherlands 2014</p>	<p>TenneT</p> <p>Sale of a stake in EUR 1.9bn German Offshore Wind Transmission Project DoWin3</p> <p>Joint Financial Adviser</p> <p>Netherlands & Germany 2014</p>	<p>TenneT</p> <p>Sale of a stake in Offshore Wind Grid Connections HelWin 2 and DoWin 2</p> <p>Joint Financial Adviser</p> <p>Netherlands & Germany 2013</p>	

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