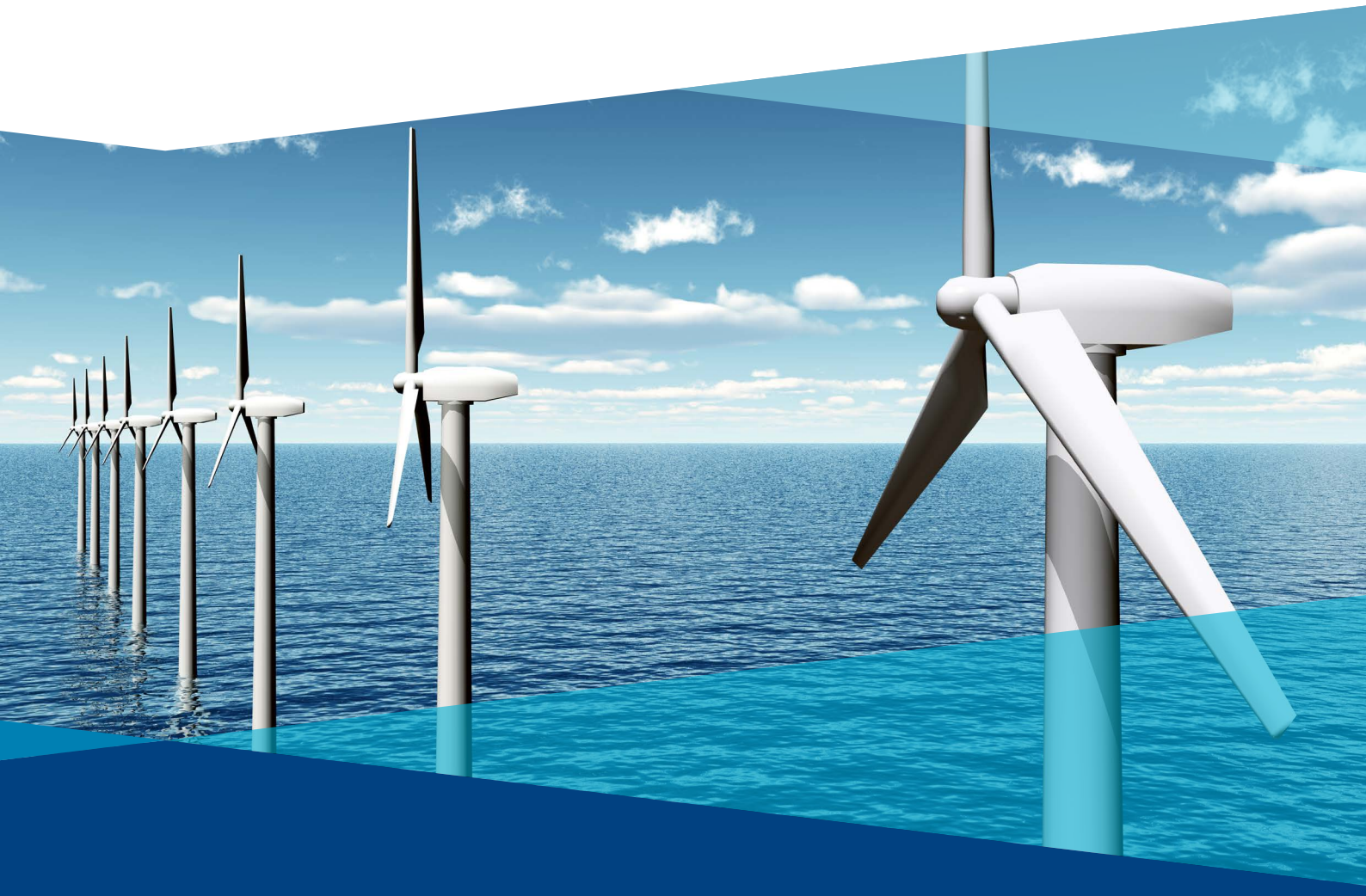
MARSH JLT SPECIALTY

JUNE 2020

Asia Offshore Wind
Insurance Opportunities

Prepared by Insurer Consulting Group Asia



MARSH

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Executive Summary

Across the globe, renewable energy is expected to witness a 50% capacity addition of around 1,200 GW between 2020 and 2025. This growth will be led by solar photovoltaic, followed by onshore wind. Offshore wind is expected to witness a three-fold increase in its capacity by 2025, fueled by European markets and expanding markets such as China and the US. During 2010 to 2018, offshore wind energy has witnessed an average annual growth of 30% and continues to have a lot of untapped potential around the globe.

In recent years, many countries in Asia have been considering investing more in offshore wind energy due to its high economic efficiency. While all territories covered in this report have significant potential for offshore wind projects, each is at a different stage of development and thus faces unique challenges.

Cumulative Estimated Construction Premium

2020 to 2025
$2 billion

Total estimated market capacity

USD 1 billion	**USD 1.5 billion**
WITH NATURAL CATASTROPHE	**WITHOUT NATURAL CATASTROPHE**

Note: For the territories covered in the report

FIGURE 1

Total Estimated Upcoming Capacity
(Figures in GW)

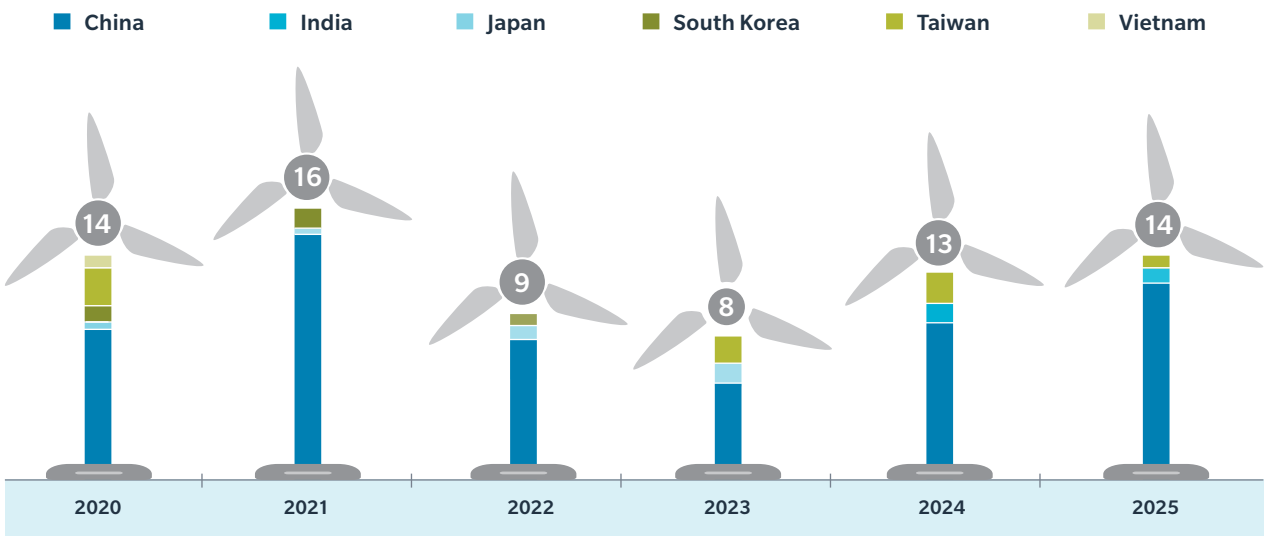
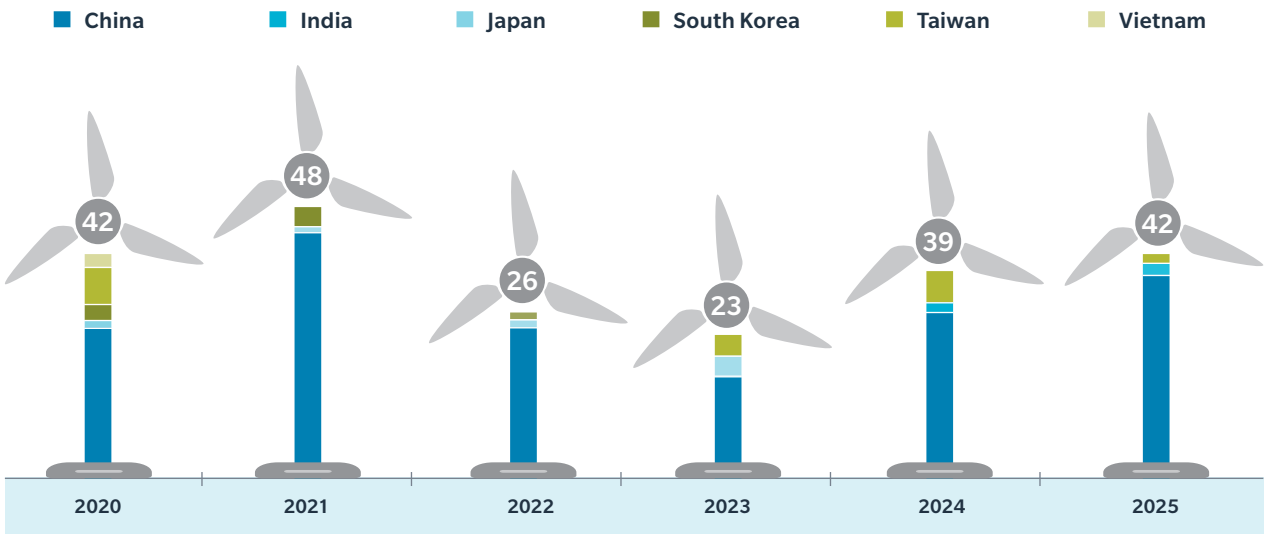


FIGURE 2

Capital Expenditure for Upcoming Projects
(Figures in USD billions)



Investments in China and Taiwan will drive the insurance market in the region. While the Chinese market is dominated by local insurance companies, foreign insurers have a scope in the Taiwan market, which has significant investments planned for the next five years. Other countries such as South Korea, Japan, and Vietnam have some potential, considering the large risk appetite of insurers. Meanwhile, India lags behind with its limited government push. The cumulative estimated construction premium between 2020 to 2025 is approximately $2 billion while the total estimated capacity available in the market is USD 1 billion with natural catastrophe and USD 1.5 billion without natural catastrophe. There is a high potential for natural catastrophe coverage, considering the high frequency and severity of the tsunamis and typhoons in the region, which are key risks leading to property damage and suspension of business operations. Business interruption coverage can witness increased uptake due to damage caused to sub-sea cables or any other technical issues. It has been common for projects to witness delays in start-up, increasing the importance of having insurance coverage. Also, offshore wind projects are at risk of contractors' error due to the rising pressure of cost reduction, which is translating into an adoption of low experience local contractors.

Some of the common challenges faced across countries include a high risk of natural catastrophic events, which is a threat to the construction and operations of projects. Also, limited grid connectivity delays these projects, hampering the developers' revenue-generating potential.

China has been at the forefront of offshore wind development, backed by its government policies. The companies are now focusing on the adoption of innovative techniques to reduce the overall project cost and meet the government's aim of grid parity. However, the move towards grid parity reduces the revenue-generating scope of developers.

Only two **Indian** states have been identified to have the potential for offshore wind development, and regulatory delays reduce the short-term prospects. To support the first-ever offshore wind farm in the Gulf of Khambhat (Gujarat), the government was considering a viability gap funding. While this may enable the compensation of cost differences between conventional and offshore wind, it may not be a sustainable solution. The Indian government is framing environment laws, which will increase the liability of developers.

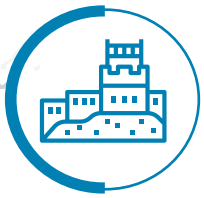
To replace the energy of suspended nuclear power plants and reduce its fuel imports, **Japan** has been promoting offshore wind by allowing operations by both local and foreign companies in the country's territorial waters (outside port-related areas) for up to 30 years. Japan has been experimenting with floating technology to tap deep-water power. However, the lengthy environmental assessment is a key concern among developers.

South Korea's government has an ambitious target of having an offshore capacity of 12 GW by 2030, representing around 68% of their wind energy. In 2018, South Korea had around 46MW of offshore wind capacity. The uptake of projects is expected to begin by local power companies required to increase their share of renewable energy development.

Taiwan has significant potential for the generation of offshore wind energy, although developers have some unique struggles in terms of the stringent requirement of local sourcing. Considering that the local supply chain is at its nascent stage, construction and operations of the plants are at risk.

With only one offshore wind plant in operation as of December 2018, **Vietnam** has a large untapped potential considered for exploration by foreign companies. A favorable aspect includes the presence of large equipment manufacturers which enables a smooth development of the supply chain focused on the local requirements. However, the lower tariff compared to its peers is a threat to the industry's development.

Market Insights: **By Territory**



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CHINA

Overview

China emerges as a leader in offshore wind energy

After exploring onshore wind energy, the government has been diverting its efforts towards the relatively less explored but high potential offshore wind energy segment.

In terms of installed capacity of offshore wind energy globally, China contributed a 20% share in 2018, only behind the UK and Germany, which accounted for 34% and 27% respectively.

As part of the 13th five-year plan (2016 to 2020) for National Economic and Social Development, the government aimed to accelerate offshore energy development to achieve on-grid connectivity of 5 GW by the end of 2020. China has been quick to develop its offshore potential, with over 10 GW of offshore wind capacity under construction in June 2019, with another 40 GW that has received approval.

Drivers

Favorable climatic conditions attract investments in the Eastern provinces

As part of the development of wind-energy-related projects in the eastern part of China, the government is focusing on offshore projects. This decision is predominantly due to the climatic conditions (positioning in the monsoon zone) and the proximity of the coasts to main cities. In January 2019, 24 offshore wind power projects with a combined capacity of 6.7 GW and an investment value of USD 17.71 billion (CNY 122.3 billion) were approved in Jiangsu Province, located in the eastern part of China. It is a part of the province's ambitious plan known as "Three Gorges on Sea", which involves the development of 10 GW offshore wind power plants.

Government policies attract investment in offshore segment

To develop its renewable energy industry, the government is offering various incentives such as income tax exemption, favorable loans, and subsidies for the construction of offshore wind farms. The government has also taken definitive action to overcome wastage and grid connectivity issues, which have historically hindered the development of the segment.

Proportion of capacity by territory 2018

UK	34%
Germany	27%
China	20%
South Korea	0.2%
Vietnam	0.4%
Japan	0.3%
Taiwan	0.03%
India	0.0%
Other Countries	18%
Total	**100%**

This has become increasingly important as wind projects are being developed at larger distances from the land and in larger sizes. Concerning offshore projects, China has also recently announced the development of high-voltage direct current systems which are more efficient in transmitting power over the large distances under the sea.

Investment in innovative productivity techniques

Transportation of key components such as wind turbines and blades can be a challenging task with offshore projects and in particular turbines located in isolated locations. Chinese wind farm operators currently prefer boats and ships to transport technicians, but this is subject to weather conditions and can be very time-consuming. To tackle this, the government is considering the use of helicopters to reduce time wastage and increase efficiencies, thus increasing wind energy output.

Companies adopting technology to reduce LCOE

In 2018, the average turbine size in the market was 4 MW. However, this is changing as companies are developing larger-sized turbines to reduce the levelized cost of energy (LCOE). In 2019, five companies introduced new models in medium speed and direct drive solutions and it is estimated that the annual average turbine size in China will be 5 MW in 2020 and 7 MW in 2025. Further technological advancements include HZ Wind power's* development of a 210-meter rotor for offshore wind turbines, with a capacity of 10 MW.

FIGURE 3 Offshore Wind Energy Capacity (GW)

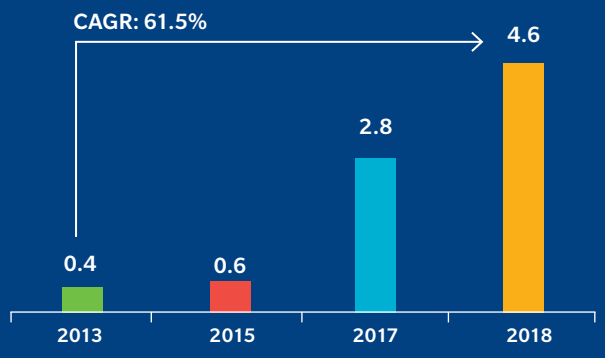
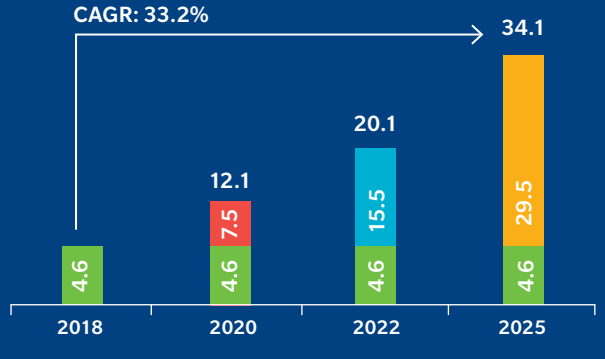


FIGURE 4 Additional Offshore Wind Energy Capacity Outlook (GW)



The H210-10 MW turbine can generate power of around 40 million kWh annually, which is twice the amount currently produced by 5 MW turbines. The new H210-10 MW turbines will be installed in Fujian and Guangdong, while HZ Wind power will be developing turbines with 230-meter rotors that will be used in Jiangsu and Zhejiang provinces.

**HZ Wind power is a subsidiary of the state-owned China Shipbuilding Industry Corporation*

Challenges and Risks

Grid-parity results in decreasing tariffs

As China moves towards grid-parity, the government has reduced tariffs for offshore wind energy, impacting the revenue-generating potential of developers. In May 2019, the National Development and Reform Commission switched from a fixed Feed-In-Tariff (FIT) to a bidding FIT under a guidance rate determined by the government.

The new offshore projects will join the bidding FIT with an upper limit of USD 0.12 per kWh (CNY 0.8 per kWh) and USD 0.11 per kWh (CNY 0.75 per kWh) for 2019 and 2020 respectively.

Meanwhile, bidding for intertidal offshore wind projects is as per the FIT guidance for onshore projects. Projects that received approvals in 2018, and will connect to the grid before the end of 2021, will receive the benefit of the fixed rate of USD 0.12 per kWh (CNY 0.85 per kWh), applicable in 2018.

Typhoons are a major threat to development of offshore wind energy projects

Like other North Asian countries, China is at risk of natural catastrophes, particularly typhoons, between May to November. There is thus a short window for undertaking the development of such projects, especially in the southern and eastern coastal regions.

Risk Assesment

China's offshore wind energy segment has been expanding mainly due to favorable climate conditions and government policies. Also, there has been an adoption of innovative techniques to reduce costs.

However, as China moves towards grid-parity, tariffs will reduce, impacting the revenue-generating capacity of developers.

Moreover, natural catastrophic events such as typhoons increase the risk of damage and suspension of business activities in the construction and operational phases.

Lower revenue generating capacity and high risk of natural catastrophic will impact construction and operations of projects.

INDIA

Overview

Gujarat and Tamil Nadu possess the most potential for offshore wind energy

India has been slow in the capturing of offshore wind energy from its 7,600-kilometer coastline. It was only in October 2015, that the government released the National Offshore Wind Energy Policy. The government now has an ambitious target of 5 GW of offshore wind energy capacity by 2022 and 30 GW by 2030. However, as per the National Institute of Wind Energy, the targets will not be achieved until 2023 or 2024.

As per initial estimates, the two states representing the most potential for offshore wind energy are Gujarat, with the ability to generate around 106,000 MW of energy and Tamil Nadu, with the ability to generate around 60,000 MW of energy.

As per preliminary estimates, offshore energy will distributed evenly throughout the year. On the other hand, 60% of the onshore energy is only available for three to four months. India's first offshore wind farm would be in the Gulf of Khambhat, Gujarat, with a capacity of 200 MW. It will be a demonstration wind farm project. Eight sites have been identified in both states through a program which is known as Facilitating Offshore Wind in India, launched in December 2013 and led by the Global Wind Energy Council.

Regulations allows leasing of blocks for a period of 35 years

The Ministry of New and Renewable Energy released draft lease rules for offshore wind in 2019, applicable to the leasing of offshore blocks anywhere between 100 and 500 square meters and up to 200 nautical miles off the coast within the exclusive economic zone off the Indian coast. For prospecting, the lease can be for five years, while for developers it will be for 30 years, with a facility to extend for five additional years.

Drivers

Availability of technical know-how as that is the essence of the support

In April 2019, the Indian government gave ex post facto approval to an agreement signed with Denmark for the co-operation in renewable energy development including offshore wind energy. The areas of co-operation would include building technical capacity for managing offshore projects, measures to develop and sustain a highly efficient wind industry, ensuring usage of high-quality wind turbines and other components, forecasting, and scheduling of offshore wind, among others. The European Union will back a feasibility study for plants in Tamil Nadu. In November 2019, the central government gave a go-ahead to install Light Detection and Ranging (LiDAR) devices in the Dhanuskodi, Valinokkam, and Thoothukudi coastlines in the Gulf of Mannar, which will measure the wind speed.

The data collection platform will be operational for two years and will confirm the wind potential of these sites. After a year of collecting the information, the government may conduct a full energy assessment in support of the feasibility study.

Government bridging the funding gap

In June 2019, the government was discussing the approval of a viability funding gap of around USD 900 million (EUR 800 million) to support the first-ever offshore wind farm in the Gulf of Khambhat, Gujarat.

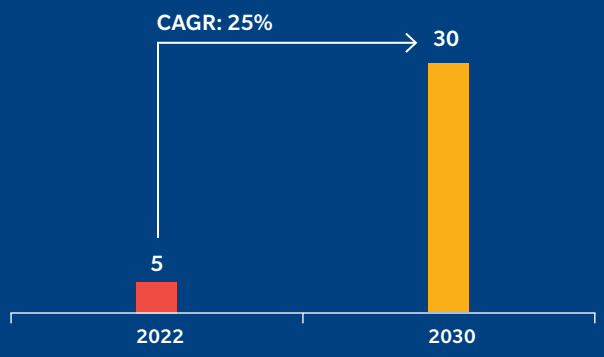
The funding will be disbursed during the construction phase. It will cover the cost, which is higher than the tariff of USD 0.05 per kWh (INR 3.5 per kWh) that the state's electricity distribution company will pay for procuring of the power.

Challenges and Risks

Infrastructure and other supply chain developments may restrict operations of plants

The two states of Gujarat and Tamil Nadu have multiple renewable energy projects such as solar and wind which are already connected to the grid, hence their ability for offshore wind energy will be an additional variable for integration into the grid network and is seen as a challenge. Although there have been discussions around the plan for grid stability, nothing has been finalized, thereby making it less attractive for foreign investors.

FIGURE 5 Offshore Wind Energy Capacity Outlook (GW)



Most Potential for Offshore Wind Energy

GUJARAT	106,000 MW
TAMIL NADU	60,000 MW

In June 2019, government was discussing approval of viable funding gap of around

USD 900 million

for first ever offshore wind farm in Gulf of Khambhat, Gujarat

Moreover, the government policy does not mention port augmentation and utilization for offshore wind projects, which are essential for construction, operation, maintenance, repowering, and decommissioning of plants. Also, there is no mention of the modification of the existing ports. Further, developers are responsible for the development of transmission facilities which require them to charge higher tariffs.

Another challenge for developers includes the inability of roads to handle wind farm equipment. The road network, which is patchy and underdeveloped, requires detailed planning and high cost to maintain or rebuild. In some cases, the roads are also narrow, and investment is required to widen them. The struggle increases for offshore projects as the size of the blades can be as high as 120 meters, while for onshore projects it is in the range of 40 to 70 meters. As per the Wind Independent Power Producer Association, transportation cost adds around 8% of the project cost. Additionally, the blades are not manufactured by local companies so they will have to be either imported or the local companies will have to modify their plants. These hurdles may delay the start of plant operations.

High tariffs may impact the feasibility of projects

Projects in India require procurement of equipment and technology at a high price which will increase the overall project costs. However, this is significantly beyond the average power purchase cost and procurement capacity of distributors.

The tariff for the offshore wind projects is expected to be between USD 0.10 to 0.13 per unit (INR 7 to 9 per unit), which is a lot higher than USD 0.040 to 0.041 per unit (INR 2.8 to 2.9 per unit) for onshore wind projects.

Meanwhile, the funding of the gap by the government in all cases may not be a sustainable solution. Also, as per the national offshore wind energy policy, the offshore energy projects will be allocated through a competitive bidding policy

Developers have witnessed cancellation and delay in projects

In April 2018, the government sought expression of interest for developing an offshore wind farm in the Gulf of Khambhat with a capacity of 1,000 MW. Despite 34 companies, local and multinational, showing interest in the project, the National Institute of Wind Energy re-invited bids for conducting an offshore geotechnical investigation in April 2019. The scope of work includes offshore geotechnical investigation work at existing three LiDAR and two additional proposed LiDAR. As on November 29, 2019 the tender for the project is not likely to happen before March 2020. These multiple delays are likely to impact the achievement of the 2022 target of 5 GW, thereby delaying the construction of the project.

Environment rules may restrict offshore wind development

Apart from focusing on achieving its capacity targets, the government has also been framing rules around the protection of the marine environment. As per the draft of offshore wind energy ideas, any project causing damage to marine ecology will be canceled. It highlights the damage to both flora and fauna beneath the seawater and threat to human life and property during underwater activities. In case of environmental damage, the government can take control of the offshore wind energy project or suspend its operations.

Risk Assessment

The slow uptake of offshore wind energy is challenged with limited infrastructure and supply chain development. There have been several delays concerning government actions, thereby increasing the costs for developers and delaying their revenue-generating potential. Also, environmental regulations threaten the construction and operation of a project.

Project delay due to slow government actions is a huge threat for offshore projects.

JAPAN

Overview

Opening of the market and site identification are the initial government measures taken

To replace lost energy and power due to the shutdown of nuclear plants and reduce dependence on imported fuels, the Japanese government has been focusing on exploring the potential of developing offshore wind energy. Until 2018, Japanese regulations only allowed offshore wind farms in ports and harbor areas (representing 1.5% of territorial waters), which restricted large-scale development.

However, effective 1st April 2019, a law was implemented enabling offshore wind farms to be operated both by local and foreign companies in Japan's territorial waters (outside port-related areas) for up to 30 years.

The law will enable Japan to make the most of its 29,750 kilometers of coastline, which possesses the offshore wind potential of 1,600 GW. Until 2018, only 4% of this potential was realized from seven sites. In July 2019, the government identified 11 potential sites for offshore wind farms, which includes four areas in Akita prefecture: Noshiro (Mitane and Oga), Yurihonjo (North and South), Happou and Noshiro, and Katagami; three in Aomori prefecture, Nihon sea (north), Nihon sea (south) and Mutsu bay; two in Nagasaki prefecture: Goto and Saikai, one in Tokyo prefecture: Choshiand one in Niigata prefecture (Murakami & Tainai). Preparations for wind and geological surveys have begun for Noshiro (Mitane and Oga), Yurihonjo (north and south), and Choshiand Goto.

Drivers

Investment volumes have increased due to the high potential of offshore wind

Willingness to finance the development of offshore wind plants has been shown by many companies including Orix, Tokyo Electric Power Co. Holdings, and E.ON. From January 30 to March 15, 2019, Orix undertook an acoustic seabed survey offshore of Choshi, Chiba Prefecture. The company is planning to spend USD 917 million (JPY 100 billion) towards the development of wind farms on the coast of Chiba Prefecture, which will include 20 large turbines with a power capacity of 200 MW. Subject to government approval, the operations are expected to commence in 2025. Also, global players such as Orsted A/S have signed an agreement with Tokyo Electric Power Company Holdings to develop the Choshi offshore wind project, for which the latter has been conducting a seabed survey. Canada based Northland Power joined hands with Shizen Energy to form Chiba Offshore Wind Inc. which will have a combined capacity of 600 MW. Additionally, lenders such as Mizuho Financial Group, along with Mitsubishi UFJ Financial Group and Sumitomo Mitsui Financial Group are considering financing

FIGURE 6 Offshore Wind Energy Capacity (MW)

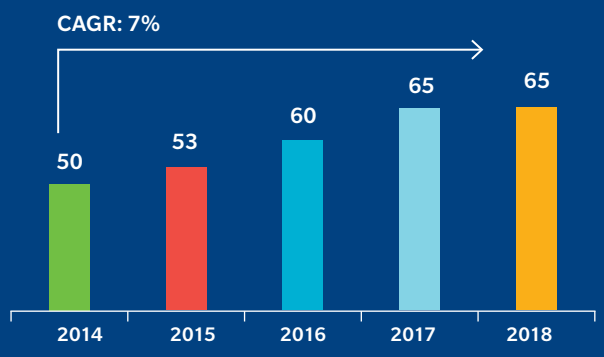
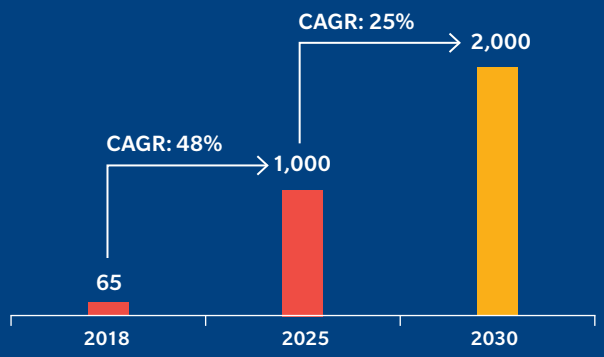


FIGURE 7 Offshore Wind Energy Capacity Outlook (MW)



10 offshore wind energy projects as lead underwriters. As per a study conducted by Mizuho, 13 projects are undertaking environmental assessments, representing a lending opportunity of USD 18.3 billion (JPY 2 trillion). This accounts for around 40% of the total spending on renewable energy projects of USD 45.8 billion (JPY 5 trillion).

Floating offshore wind farms will facilitate deep-water power production

Around 99% of 9,074TWh of the annual technical potential of Japan is located in deep waters and the realization of this potential will require floating platform technology. Japan was the first to install a floating turbine at the Fukushima Forward demonstrator project and had multiple projects in pilot phases. In May 2019, Japan's 5th full large scale floating wind turbine commenced operations 15 km off the coast of Kitakyushu. It is a Hibiki barge-type floating offshore wind power generation system using IDEOL's "damping pool" foundation and a 3.2 MW Aerodyn two-bladed turbine. Multiple partnerships have been formed to explore the floating wind farms opportunity. In June 2019, local company Shizen Energy partnered with France-based Ideol, which is engaged in the design and manufacturing of concrete floating foundations for the offshore wind industry. The two will develop a floating wind farm in Kyushu, along with exploring future expansion potential. Since partnering with Shizen, Ideol has also partnered with Taisei Corp to further develop concrete floating foundations.

Challenges and Risks

Move towards competitive bidding process will reduce market attractiveness

Compared to other renewable energy sources, offshore wind energy becomes more attractive due to higher feed-in-tariffs (FiT). In 2018, the tariffs for offshore wind farms were USD 0.3 per kWh (JPY 36 per kWh), which is 80% higher than USD 0.18 (JPY 20) for onshore wind farms and around twice than the rate of solar energy. However, there is a shift towards a competitive bidding process and awarding of tenders will be done through an auction which is likely to begin in the first half of 2020. The government is targeting FiT of around USD 0.07 to 0.08 per kWh (JPY 8 to 9 per kWh) by 2030 for fixed offshore wind, bringing it in line with European markets (for projects aiming for commercial operations in the early 2020s). This decision has been met with resistance as the market maturity is higher in Europe compared to Japan, which is at the beginning of its domestic life cycle and industry supply chain.

High frequency and severity of natural catastrophes impact construction and operations of wind farms

Japan is prone to natural catastrophes, especially typhoons, earthquakes, and tsunamis which result in significant destruction of property and lives. In August 2018, Typhoon Cimarron hit Japan which resulted in the collapse of a 600kW Mitsubishi Heavy Industries turbine installed in Hyogo prefecture. Later in September 2018, Typhoon Jebi resulted in damage to a 2 MW Enercon turbine and a blade of a 1.5 MW GE turbine in Wakayama prefecture.

Delay due to lengthy environmental impact assessment

Offshore wind farms can be large and given that they often produce more than 10MW of power, they require an environmental impact assessment (EIA) to be completed.

All five stages of the EIA except the survey, forecast, and evaluation phases, involve consultation with public authorities and can take up to five years to complete.

Other considerations: Opposition from the fishing community and grid connectivity

The development of offshore wind energy has been hindered by Japan's fishing community as it can harm marine life and negatively impact their revenue-generating capability. Also, Japan has different transmission system operators for different prefectures and there exists uncertainty around the entity responsible for spending towards grid development. This impacts the revenue-generating potential and delays the starting of operations.

Risk Assesment

The large offshore wind energy potential, coupled with the need to shift from thermal and nuclear sources, will lead to an increase in new project developments, thereby increasing construction risks. These projects are attracting interest from both domestic and foreign companies, which could lead to transactional risks. The adoption of floating technology increases the exposure to environmental, health & safety, and other operational risks. Additionally, offshore wind energy projects in Japan face a high risk of natural catastrophes due to the harsh climate conditions, which are a threat in both the operational and construction phases. Limited infrastructure related to grid connectivity and protests by local communities increases the risk of delay in operations, thereby impacting their revenue-generating potential.

Transactional risks, natural catastrophe, limited infrastructure and opposition from communities are major threat.

SOUTH KOREA

Overview

Offshore wind will play a significant role in Korea's renewable energy strategy

Offshore wind is expected to play a significant role in South Korea's renewable energy development plan, with the government planning to have offshore capacity of 12 GW by 2030, representing around 68% of the wind energy target.

However, it is expected to miss the target. In the short-term, the Ministry of Trade, Industry and Energy aims to develop small and medium-sized offshore wind farms with a capacity of up to 500 MW. In the medium to long-term scale, South Korea plans to develop large-scale floating offshore farms along with the adoption of next-generation technology. Jeollabuk-do and Jeollanam-do provinces have more than 90% of ongoing offshore wind projects due to favorable geographic and weather conditions. South Korea's offshore wind energy industry has been attracting European companies, including Norway's Equinor and Denmark's Orsted which are developing opportunities in South Korea.

Drivers and Trends

Regulations push local power companies towards offshore wind energy

In 2012, the government replaced the feed-in-tariff model with the Renewable Portfolio Standard (RPS). The RPS scheme is the key driver for uptake in renewable energy and requires large power producers (capacity of over 500 MW) to increase their share of renewables to 10% by 2023. Offshore wind is preferred by the government since it is considered to have higher economic efficiency. Additionally, the government is pushing for renewable energy through loans, where repayments can be deferred for five years.

South Korea's geographic location will encourage offshore wind investment

Floating offshore wind farms are being considered to capture the potential arising from the geographic location of South Korea. In February 2019, a consortium was formed by Norway-based Equinor, Korea National Oil Corporation (KNOC), and Korea East-West Power (EWP) to develop a 200 MW floating offshore wind project, Donghae 1, 58km off the coast of Ulsan City. Construction of the farm is planned to start in 2022, with power production commencing in 2024. In October 2019, another consortium was formed between EDP Renewables, Aker Solutions, and Korea Floating Wind Power (KFWind) to develop a 500 MW floating wind farm off Ulsan. Many developers were attracted to the Ulsan area for offshore wind, predominantly due to the arrangement of shipyards, maritime expertise, and availability of port facilities. Towards the start of 2019, the city also signed an MoU with four development consortiums to construct and maintain floating wind farms and create a local supply chain for the industry.

FIGURE 8 Offshore Wind Energy Capacity (MW)

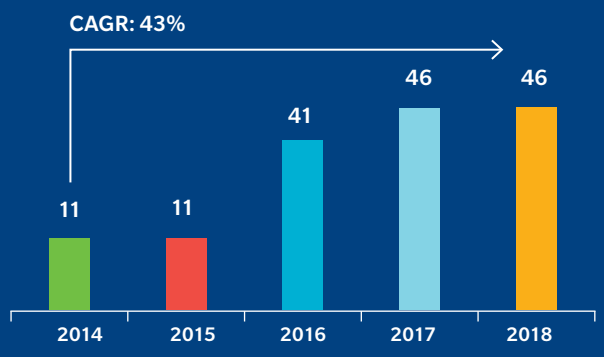
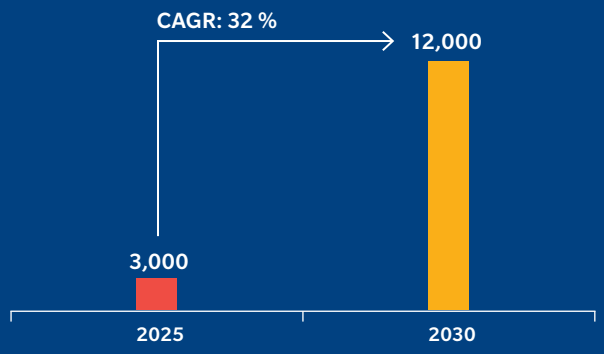


FIGURE 9 Offshore Wind Energy Capacity Outlook (MW)



Existing local expertise will assist with the development of offshore wind

There are an estimated 750 companies involved in parts manufacturing, shipbuilding, and offshore plant building that will enable South Korea to develop offshore wind energy opportunities. There have also been consultations by the government to establish clusters in the south-east region to create synergies between the various companies present on the ground.

Challenges and Risks

The industry still needs to overcome supply chain and turbine supply challenges

South Korea is home to numerous shipbuilding and offshore plant companies that are now investing in wind energy to diversify their portfolios away from their core industries. For instance, a well-known cable provider, LS Cable & System, is based in South Korea. Many of these companies have expertise in onshore wind but lack the experience in large-scale offshore wind segment, such as in Europe, which has developed turbine models of 8–10 MW. Increasing turbine size is a key factor that enabled the declining cost of production in Europe; hence, Korean manufacturers need to work towards reducing the cost, which is currently around 10 to 15% higher.

Local experience in offshore wind farm development varies; Unison has no experience in offshore wind energy space, Hyosung has developed a 5 MW offshore turbine with Aerodyn, while Samkang is the only local company involved in the complete manufacturing of offshore wind-power generator substructures. Other challenges include the limited local supply of vessels which are required during installations of offshore wind energy. The soft muddy seabed experienced off Korea's shores makes the use of jack-up vessels difficult. Also, the muddy seabed makes it difficult to install foundations and other equipment as it can be easily damaged.

Objections raised by various communities and agencies hinder commencement of projects

Similar to other Asian countries, the local fishing community has been opposing the development of offshore wind farms due to the impact on their revenue-generating potential. An objection has also been raised by the Ministry of National Defense for the development of offshore wind energy projects in the southern coast due to presences of naval bases.

Natural catastrophes expected to hinder construction and operational activities

Companies are aware of the threat of natural catastrophe events that can hinder business activities and thus developers are investing in equipment to overcome this challenge.

For instance, in July 2019, a 5.56MW offshore wind turbine, developed by Doosan Heavy Industries & Construction (DHIC), received an A type certificate, after the turbine withstood typhoon Chaba (2016) which recorded wind speeds of up to 56.5m/s (the fourth-highest daily speed on record).

There are other exposures that may impact various business activities, such as delays in maintenance activities, delay in start-up, and casualty risks.

Risk Assessment

The regulatory requirement for the uptake of renewable energy and the higher incentives attached to offshore wind are expected to increase development of offshore wind energy, thereby increasing construction risk. Additionally, uptake of floating wind technology has other risks associated, such as environmental, health & safety, and operational risks. The local shipbuilding industry is expected to benefit from the offshore wind projects, for example, the advanced wind farm installation vessel, 'Seajacks Scylla', was developed in South Korea.

However, it will also face challenges such as limited experience in large-scale projects which will be essential to reduce the overall production and operational costs. Along with the limited supply of vessels, supply chain exposure, and opposition from the local fishing communities and the defense department, there will be an increase in the likelihood of delay in start-up costs. Another major hindrance will be natural catastrophes which have the potential to damage business operations and further delay construction.

TAIWAN

Overview

Favorable climatic conditions are less explored for offshore wind farms

Despite favorable geographic locations and climatic conditions, Taiwan is currently behind its domestic offshore wind development. Until the end of 2018, Taiwan's only offshore wind farm was the Formosa 1 project which had two 4 MW wind turbines. Taiwan has a target to develop around 5.7 GW of offshore wind capacity by 2025 and aims to add a further 10 GW between 2026–2035. The average wind speed in Taiwan is over 11 meters per second which is considered to be very favorable for offshore wind operations.

Drivers and Trends

Foreign companies have been attracted to Taiwan's potential offshore market

In April 2019, Denmark-based Orsted finalized an investment for a new 900 MW offshore wind farm in Changhua. The company also has a 35% share in the first-ever offshore wind farm of Taiwan, Formosa 1. Other owners of the project include Japan-based JERA (32.5%), Australia-based Macquarie Capital (25%) and Taiwan-based Swancor Renewable Energy (7.5%). In October 2019, six Denmark-based companies: ProCon Wind Energy, A-leaf, All NRG, Comtech, Hytor, and Site Solution Partners agreed to a partnership, opening a shared office in Taiwan. While each of these companies will continue to operate independently, the partnership will enable them to serve their customers in Taiwan who require a local presence.

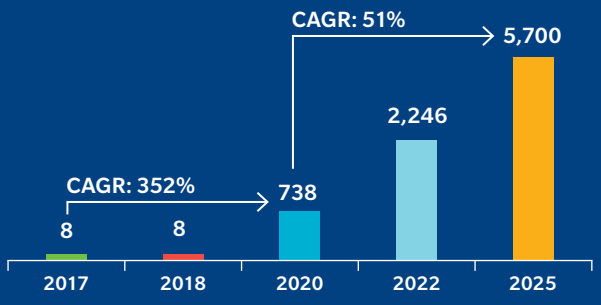
Penetration into the market is mainly through acquisitions

The offshore wind energy industry is witnessing an increasing number of deals involving the acquisition of stakes among investors and developers. In April 2019, a consortium of Japanese investors led by Sojitz Corporation acquired a 27% stake in offshore wind farm Yunlin (capacity of 640 MW), while in October 2019, JERA agreed to acquire a 49% stake from Macquarie Capital in the 376 MW Formosa 2 project.

Changes to regulations will contribute towards the development of offshore wind capacity

In January 2019, the cap on the energy procurement was increased from 3,600 kWh to 3,750 kWh to encourage the use of 8 MW turbines rather than 4 MW turbines. Additionally, developers now have a tiered tariff of USD 0.20 per MWh (TWD 6.2795 per MWh) for the first ten years and USD 0.13 per MWh (TWD 4.1422 per MWh) for the decade that follows. This regulatory amendment was made to ensure that developers are committed to the project for a minimum of ten years, a key requirement by project financers.

FIGURE 10 | Offshore Wind Energy Capacity and Outlook (MW)



Foreign developers partner with local companies to ensure adherence to regulations

Foreign companies that have entered the Taiwanese market continue to partner with local suppliers to adhere to the local sourcing requirements and regulations. In November 2019, Siemens Gamesa, a preferred wind turbine supplier for the 300 MW Hai Long 2 project, signed a procurement agreement with a local company, Yeong Guan, for castings and Swancor for blade manufacturing products. The developers of the 376 MW Formosa 2 project, which started construction in November 2019, have also taken measures by partnering with three engineering and consulting companies, specifically for the onshore engineering design work. One of the local companies involved is Fortune Electric which will deliver the onshore infrastructure needed to connect the wind farm to the local electricity network.

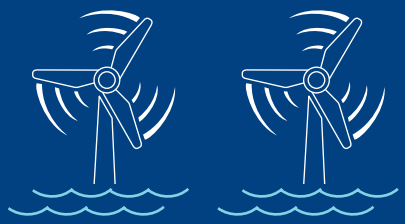
Challenges and Risks

Reduction in tariffs: a set-back for the offshore wind energy developers

The offshore wind industry is currently under pressure due to the new government that formed in 2018 because it announced the rolling back of the attractive FiT offered. Initially, it was announced that the rates for projects that finalize the power purchase agreements (PPA) in 2019 will be reduced by 12.7% to USD 0.17 per kWh from USD 0.19 per kWh (TWD 5.1060 per kWh from TWD 5.8498) for the next 20 years.

After considering feedback from developers, the reduction was restricted to 5.7%, bringing the average rate to USD 0.18 per kWh (TWD 5.516 per kWh) for 20 years. The government has also introduced a tiered production cap of 100% of FiT for output of up to 4,200 annual full-load hours (48% load factor), 75% for production between 4,200 to 4,500 annual full-load hours (48-51% load factor), and 50% for production over 4,500 annual full-load hours (over 51% load factor).

2018
Only offshore wind farm



Formosa 1

Two 4 MW wind turbines

10 YEARS

USD 0.20 per MWh
(TWD 6.2795 per MWh)

10 + 10 YEARS

USD 0.13 per MWh
(TWD 4.1422 per MWh)[2]

Additionally, there have been delays in the issuance of permits, resulting in foreign developers that won development rights in April 2018, being unable to benefit from the higher FiT.

The domestic supply chain and lack of technical experience has provided challenges for foreign companies

To make Taiwan a regional hub for the supply of offshore wind projects, the government has made local sourcing an important factor for awarding projects. Although the government has announced plans to work with local universities and technical colleges to train talent, which is in short supply, this process is lengthy. The establishment of a local supply chain requires significant investment, which becomes increasingly challenging in an environment of lower tariffs.

In October 2019, the Ministry of Economic Affairs re-affirmed its decision on the use of the local supply chain by warning foreign investors that failing to fulfill localization targets would lead to their replacement by other developers.

Another key challenge is the geopolitical tensions, which prohibits the involvement of experienced Chinese companies to offset the local market.

Natural Catastrophes, in particular typhoons and earthquake, are a threat to the establishment of the industry

The benefits offered by the climatic conditions of Taiwan also pose a challenge, especially during extreme weather conditions and events. The high frequency of typhoons and earthquakes is a significant threat to the development of the offshore wind industry, in particular from an insurance perspective, as insurers and reinsurers become increasingly averse to Nat Cat exposures. Since the Formosa 1 phase 2 project started construction in May 2019, there have been four typhoons that have impacted the project's development.

Limited commitment to resolving grid connectivity challenges

Similar to other Asian economies, Taiwan has been witnessing challenges relating to its grid infrastructure. It is not expected that the areas withhigh wind resources will have a higher load, thereby making it important to have a grid infrastructure that can transfer over long distances. Although the government has ensured improvements to the grid connectivity, there is no commitment or a provision to compensate the developers for the loss. As such, significant delay in start-up risks continue to be associated with these projects which could hinder further investment into the industry.

Risk Assessment

Taiwan's offshore wind industry faces multiple challenges. Stringent regulatory requirements relating to local sourcing will continue to impact the development of projects, while its geography means that it is exposed to Natural Catastrophe risks, in particular typhoons and earthquakes. Additionally, infrastructure limitations relating to grid connectivity and capacity are also major hurdles in the development of the wind power industry. Geopolitical challenges with China also act as a major hurdle for offshore wind power development.

Stringent regulatory requirements, infrastructure limitations, geopolitical challenges, natural catastrophic will continue to impact the development of projects.

VIETNAM

Overview

Large untapped potential expected to ensure energy supply

As of December 2018, the only operational offshore wind energy project in Vietnam was located in the Mekong Delta region and had a capacity of 99 MW.

However, given the favorable wind speed, the technical potential for offshore wind energy within 200 km is around 475 GW.

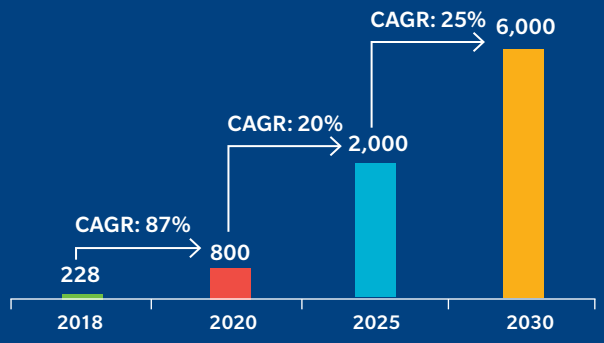
The fixed offshore wind potential is 261 GW and 214 GW for floating. The wind resources are focused on the southwest coast of Vietnam which has a technical potential of around 165 GW for fixed offshore wind. Another potential site for a fixed foundation is in the Gulf of Tonkin (northern region) which has the capacity for 88 GW. Towards the south of the Gulf, there is a potential capacity of 39 GW for floating wind. From the water that runs south of Vietnam to the central region south of Hue, a floating wind farm with a capacity of 175 GW can be developed. The government has been backing the wind energy mainly due to a shortage in energy supply expected in the near future.

Drivers

Foreign companies investing in large-scale projects

Singapore-based Enterprize Energy is developing offshore wind farms with a capacity of 3.4 GW — the largest in the world. The total investment in the project is around USD 12 billion. In July 2019, the Vietnamese government approved the assessment of area covering 2,800km located 20–50 kilometers off the Binh Thuan province. The project involves five phases of 600 MW each and one of 400 MW. Operation of the first phase is expected to start from 2022 and subsequently the remaining four 600 MW through to 2026. In 2018, Enterprize Energy joined hands with MHI Vestas (Turbine manufacturer), DNV GL (technology firm), Renewable Energy Global Solutions, PetroVietnam consortium comprising Petroleum Equipment Assembly & Metal Structure, and VietSovPetro for offshore wind development. In 2018 South Korea-based Doosan Heavy Industries & Construction signed an agreement with the government-based EVN (Vietnam Electricity) to support the development of an offshore wind and energy storage demonstration project.

FIGURE 11 Wind Energy Installed Capacity and Outlook (MW)



Presence of equipment manufacturers back offshore projects development

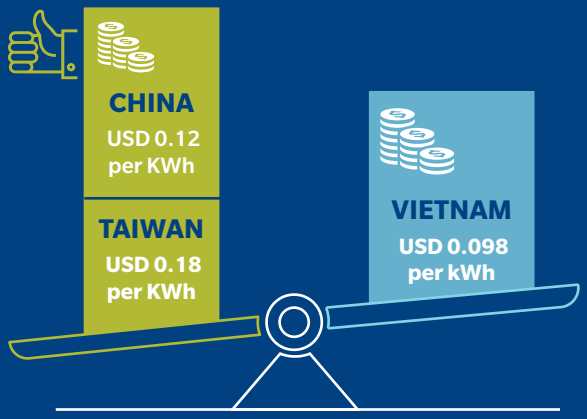
Vietnam hosts some manufacturers of wind farm equipment that are a part of the global supply chain. South Korea-based CS Wind has a manufacturing unit in the Ba Ria-Vung Tau Province, while Hyosung Heavy Industries has a presence in Vietnam. The latter is involved in the manufacturing of wind turbines. Also, General Electric has a wind turbine generator factory in Hai Phong. This enables the smooth development of the supply chain focused on the local requirements.

Challenges and Risks

Feed-in-tariffs are lower than those offered by Taiwan and China

Another driver attracting investors are the FiTs for offshore projects with rates of USD 0.098 per kWh (VND 2,223/kWh). The rate was effective from November 1, 2018 and applicable for projects starting commercial operations by November 1, 2021. This tariff is considered to be low compared to those offered by other Asian countries. For instance, Taiwan has tariffs of USD 0.18 per KWh, while China has an upper limit of around USD 0.12 per kWh. Also, there have been suggestions that the same should be available until 2025, considering the long duration of construction and establishment of a supply chain. Hence, the FiT is a hindrance to the financial feasibility of the project.

Effective from November 1, 2018 and applicable for projects starting commercial operations by **November 1, 2021**



Harsh climatic conditions may disrupt operations of offshore

In the past, Vietnam has witnessed some harsh cyclones which can hinder the construction and operations of offshore wind energy projects.

For example, in November 2019, Vietnam was hit by Tropical Cyclone Nakri which resulted in the wind speed reach up to 115–145 km/h (70–90 mph) near and just north of Tuy Hòa.

Investments at risk due to changes in PPA model

The revised regulations and power purchase agreements transfer the transmission risk to the developer of wind farms, while EVN is only responsible for the purchasing of the output if it's shared to the delivery point. The developer is responsible for loss due to grid repair, inspection or testing, break downs, and recovery after a breakdown, among others. Also, the modified termination compensation is still below expectations of international investors and their financiers. The creditworthiness of EVN is a key concern among international developers and lenders, as the government guarantees are unlikely to be available for renewable energy projects. The risk has been reduced to some extent, as the government has announced a 'Direct PPA' pilot project in 2021, wherein a renewable energy generator will be able to sell directly to the consumers.

Grid connectivity and complex regulatory process hinder offshore wind farm development

Grid connectivity can prove to be a major hindrance to the development of offshore wind energy. The rapid installation of solar PV could "cannibalize" the remaining grid capacity for wind projects. The government has plans for a 500kV reinforcement of the grid to Ho Chi Minh City by 2025, but this will not be sufficient. Other hindrances include the complex and cumbersome permitting process, which has at least 29 different individual permits, agreements, or licenses for farms. The involvement of government bodies at the state and regional level, which increases the approval processes from few days to several months, can take years, thereby delaying the construction and other activities of the project.

Risk Assessment

The large potential for fixed and floating offshore wind energy is being explored by foreign investors; the segment is also backed by the presence of equipment suppliers. However, the lower tariffs compared to other Asian countries, cyclonic conditions, long regulatory approval losses, limited grid connectivity, and unfavorable terms of the PPA can challenge the construction of the projects.

Lower tariffs, cyclonic conditions and complex regulatory process along with limited grid connectivity are major hinderance.

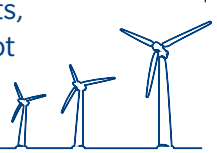
Insurance Landscape

25 insurers were surveyed to identify the potential arising from offshore wind energy projects in the six target countries.

Demand to be driven by high investments in China and Taiwan

High opportunity markets
(considering upcoming projects and capital expenditure)

While Chinese offshore wind energy projects are largely driven by domestic investments, Taiwan has been attracting a lot of foreign participants.



Cumulative Estimated Construction Premium

2020 to 2025
$2 billion

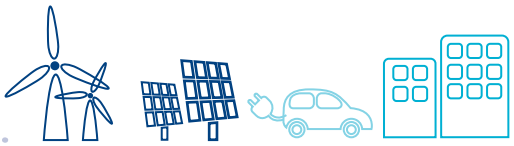


FIGURE 12 Total Estimated Upcoming Capacity (GW)

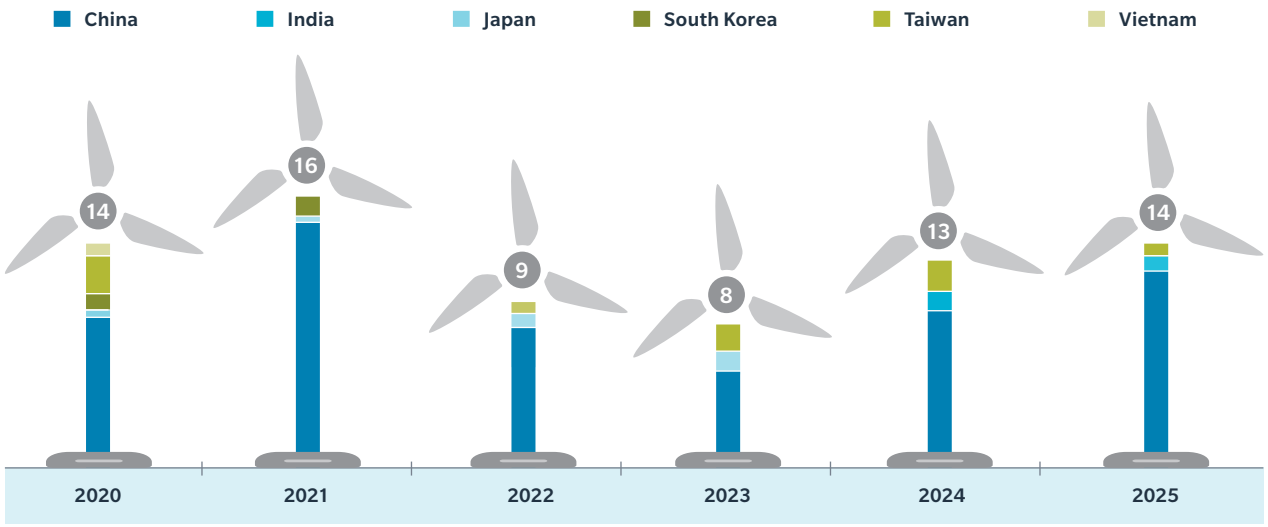


FIGURE 13

Estimated Upcoming Number of Plants

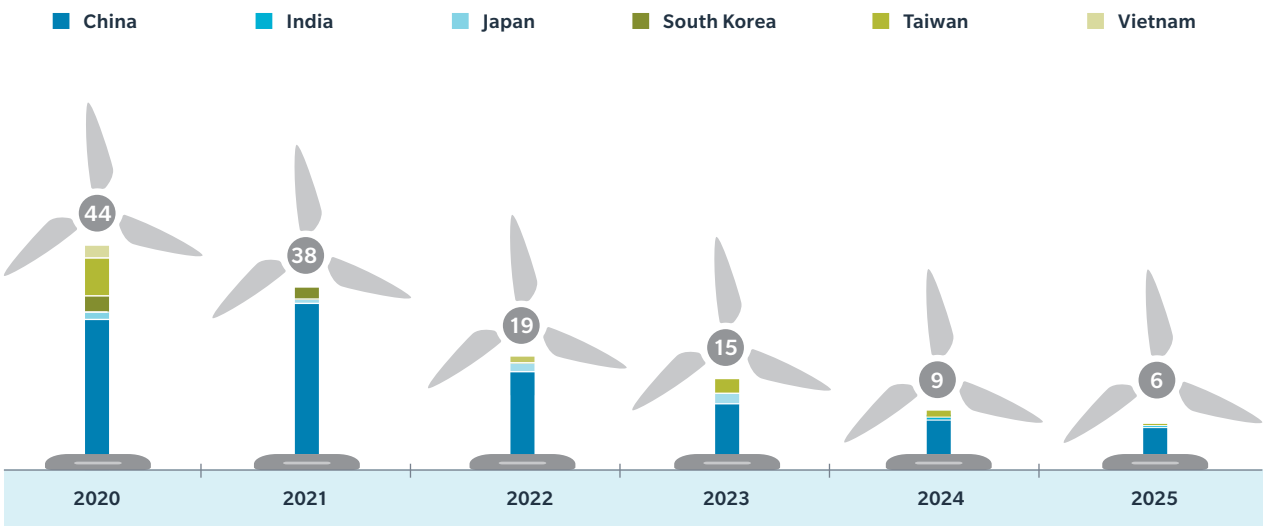


FIGURE 14

Capital Expenditure for Upcoming Projects (USD billions)

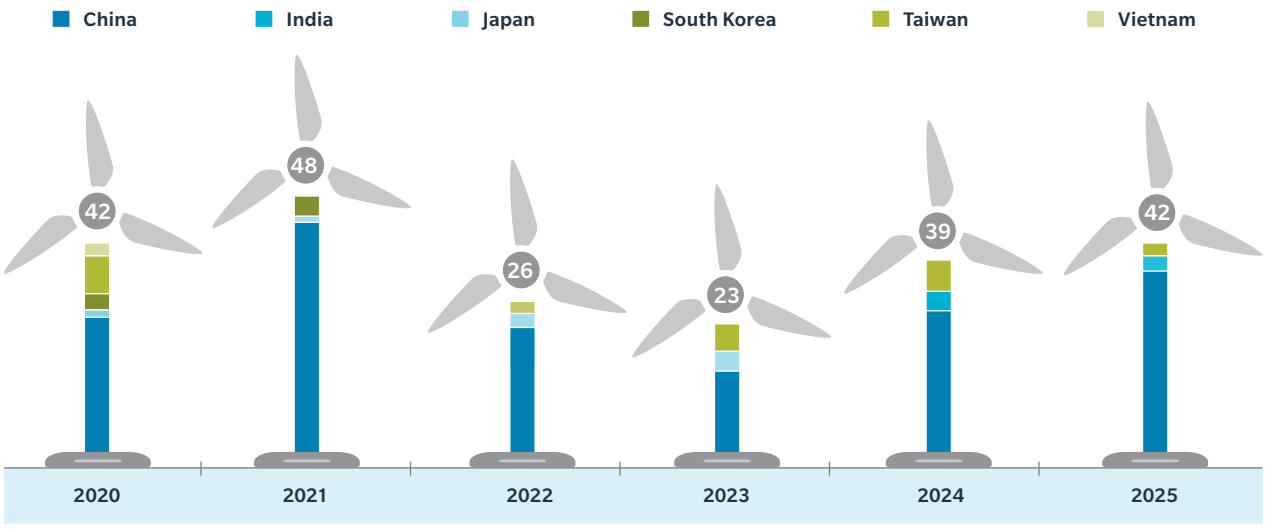


FIGURE 15

Insurers Risk Appetite For Offshore Wind Construction

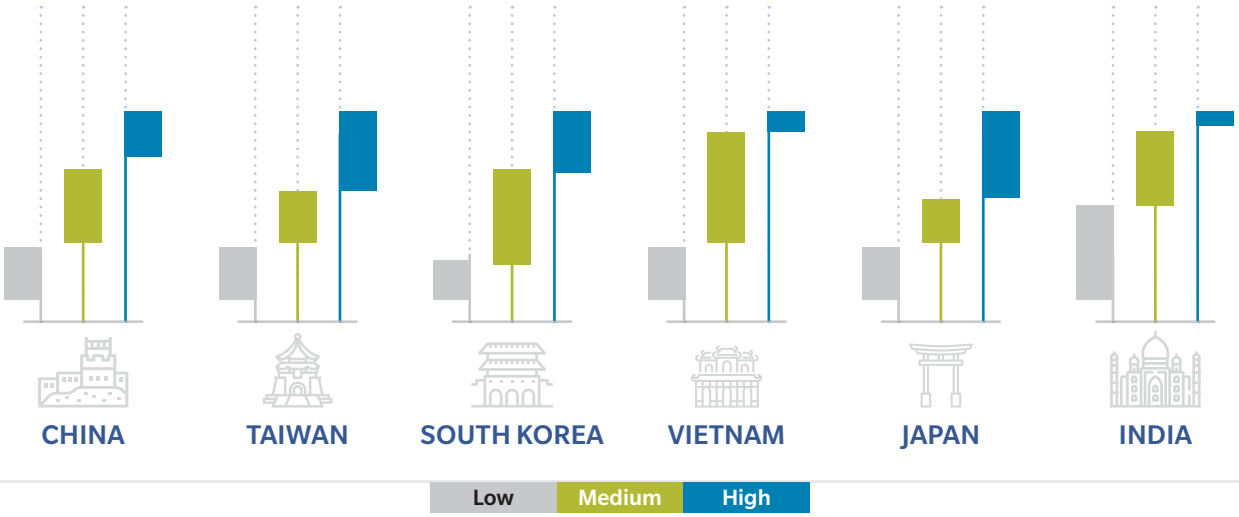
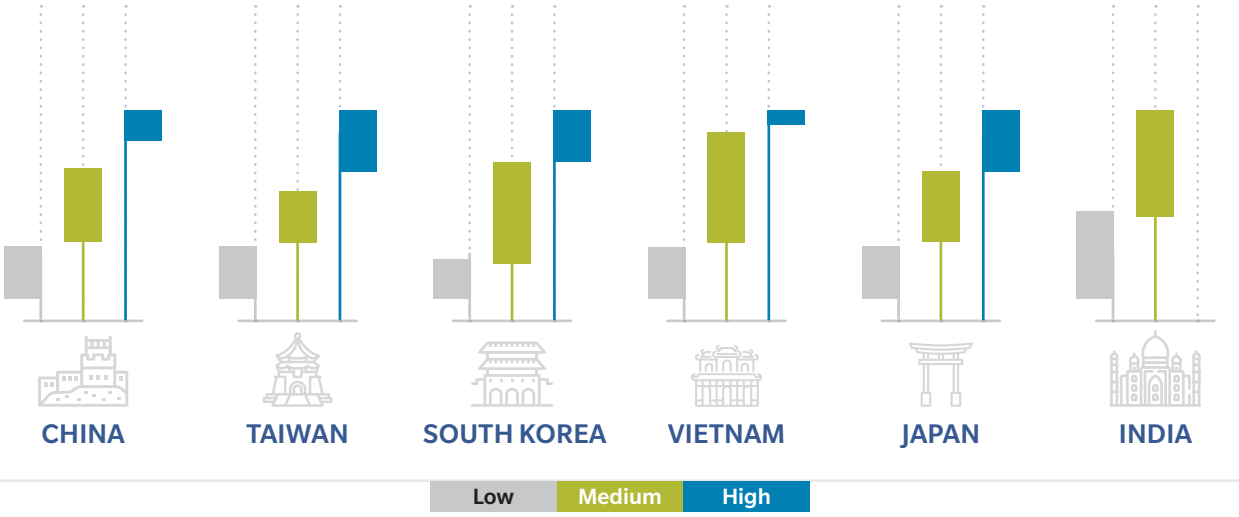


FIGURE 16

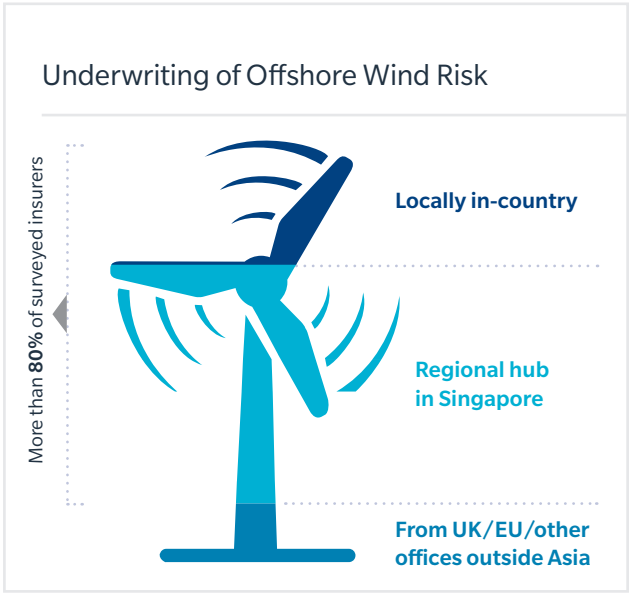
Insurers Risk Appetite For Offshore Wind Operations

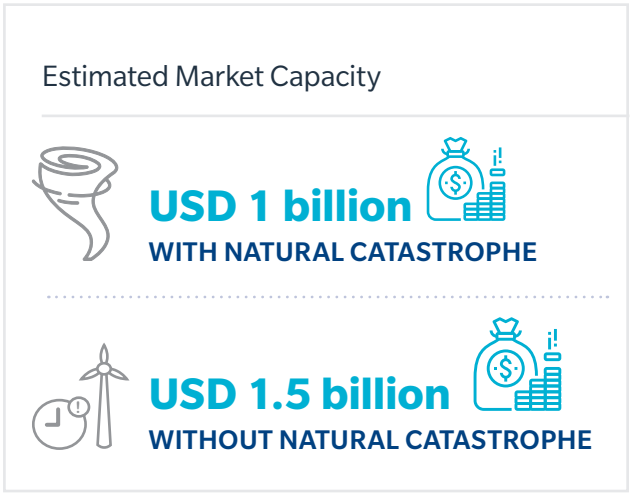


For the next six years (until 2025), China has a strong pipeline of projects, which will ensure cumulative investments of around USD 180 billion. Also, Taiwan has a strong pipeline (barring the year 2021), which brings the total investment to USD 20 billion. Although this is much lower than the dominant Chinese market, it remains high compared to other larger (than Taiwan) countries. While China provides a higher insurance potential indicated by capital expenditure on projects, and insurers indicate a medium to high risk appetite in the territory, the market is dominated by local companies leaving limited potential for foreign insures. Meanwhile, Taiwan represents a high potential for both local and foreign insurers.

The next in line is South Korea which is larger in size compared to Taiwan but has a total capex pipeline of around USD 6.3 billion. Japan and Vietnam also have a significant scope of offshore wind energy development due to high wind speeds and have only recently framed favoring regulations. However, the least opportunity has been seen for India, as insurers have also indicated their low risk appetite, considering the slow progress for tenders by the government, which increases the risk of delay in start-up. Similarly, South Korea has a high potential for insurance in the operational phase, while India has the least. Other countries such as China, Taiwan, Japan, and Vietnam have a high potential for insurance of operational plants.

Majority of the insurers underwrite risks within Asia; innovative solutions, a key to tap potential





More than 80% of surveyed insurers have the capacity for underwriting offshore wind energy risk in Asia. Insurers for offshore wind projects are required to have experience in the renewable energy space, along with reasonable financial strength, coupled with the required technical expertise.

As the business environment becomes more complex, alternative risk transfer solutions should be offered to gain a competitive edge in the market. One such example is parametric solutions.

Higher potential for coverages against losses due to natural catastrophe, delay-in-start-up, and contractor's error

The potential offerings for the Asia market will be for the risk arising from natural catastrophe coverage, considering the high frequency and severity of typhoons faced by high-potential countries such as China, Taiwan, and South Korea.

Hence, property damage, especially that arising from natural catastrophes, has a large potential in all six countries. Prospective for delay-in-start-up coverage is also expected to be high considering the limited grid infrastructure and regulatory delays in some counties such as India. Developers and other stakeholders are also at risk of facing business interruption due to damage to sub-sea cables or technical failure of foundations, which are relatively new concepts for the Asian market.
With the current market dynamics focusing on reducing the cost of production and involving local companies with no experience in offshore, there will be a potential for coverage against contractor's error. Considering the remote locations of the upcoming projects, marine cover will have a large potential.

Appendix

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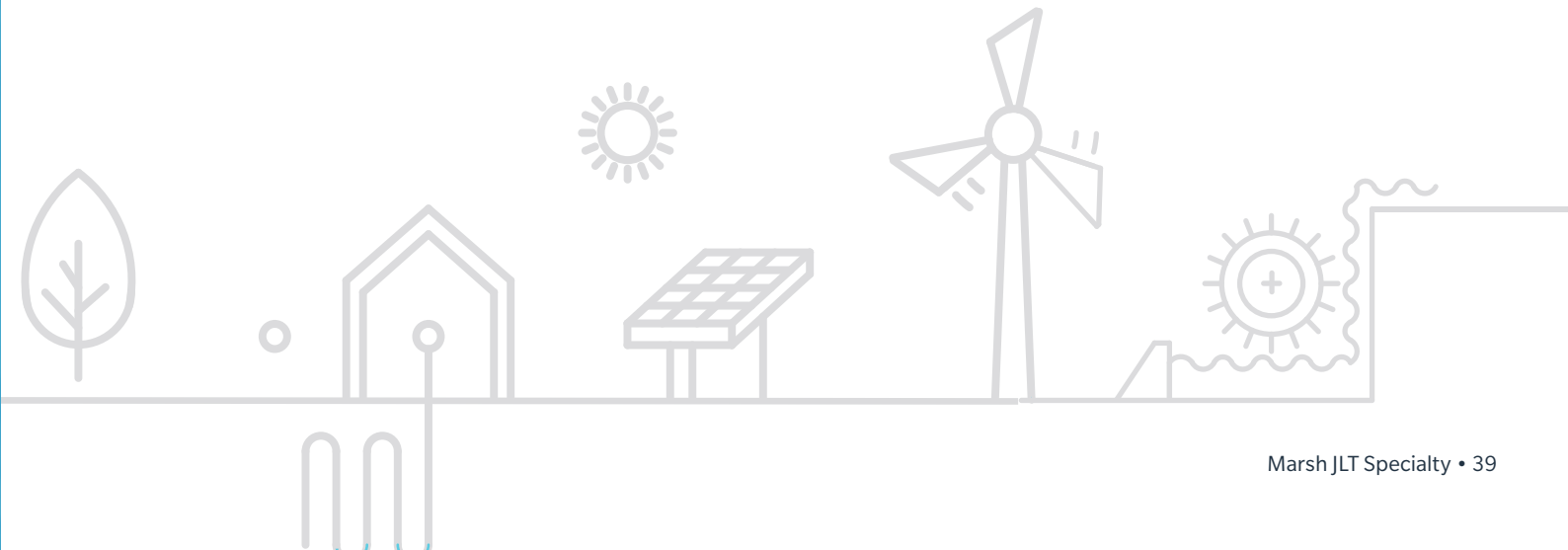
- Saur Energy International
- South China Morning Post
- Taiwan Power Company
- The Maritime Executive
- The New Indian Express
- Windpower Monthly
- Wood Mackenzie
- World Bank
- Xinhua News Agency

Currency Exchange

- Exchange Rate Conversion **1 USD = 6.9071 CNY**
- Exchange Rate Conversion **1 USD = 30.875 TWD**
- Exchange Rate Conversion **1 USD = 70.353 INR**
- Exchange Rate Conversion **1 USD = 109.07 JPY**



Key Contacts

For further information, please contact your local Marsh office or visit our website at marsh.com

Marsh JLT Specialty - Asia

Martin Beck

Offshore Wind & Renewable Energy Practice Leader

+65 69228130

Martin.Beck@marsh.com

Glenn Preece

Asia Power Leader

+65 69228060

Glenn.Preece@marsh.com

Insurer Consulting Group (ICG) - Asia

Rahul Patil

ICG Regional Data & Analytics Leader

Rahul.Patil@marsh.com

Shweta Desai

Deputy Manager – Strategic Research

Shweta.Desai@marsh.com

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