





# Offshore wind export markets A report for NORWEP

Final report May 2021



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- Our highly experienced team has an average of over 10 years' experience in renewable energy.
- Most of our work is advising private clients investing in manufacturing, technology and renewable energy projects.
- We've also published many landmark reports on the future of the industry, cost of energy and supply chain.

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# Contents

1.	Introduction	7
2.	Structure and approach	7
3.	Summary	8
4.	Established markets	9
	4.1.China	9
	4.2. Denmark	15
	4.3. France	18
	4.4.Germany	21
	4.5.Netherlands	24
	4.6. Taiwan	27
	4.7.UK	
5.	Emerging markets	33
	5.1.Ireland	
	5.2. Japan	
	5.3.Poland	39
	5.4. South Korea	42
	5.5.US	45
	5.6.Vietnam	48
6.	Potential markets	51
	6.1.Australia	51
	6.2.Baltic States	52
	6.3.Brazil	53
	6.4. India	54
	6.5. Italy	55
	6.6.Spain	56
	6.7.Sweden	57

# List of figures

Figure 1 Scale of offshore wind industry in each province	10
Figure 2 Proportion of current installed capacity in China by province, total 11GW	10
Figure 3 Proportion of Chinese projects in development, total 125GW (including development zones).	10
Figure 4 Offshore wind installation forecast for China, showing the peak in installations in 2020 and 2021 caused by the end the FIT.	
Figure 5 Map of projects in Denmark by development status (bubble sizes scale with project capacity).	15
Figure 6 Offshore wind market forecast for Denmark.	15
Figure 7 Map of projects in France by development status (bubble sizes scale with project capacity)	18
Figure 8 Offshore wind market forecast for France	18

# Offshore wind export markets

Figure 9 Map of projects in Germany by development status (bubble sizes scale with project capacity).	21
Figure 10 Offshore wind market forecast for Germany	21
Figure 11 Map of projects in the Netherlands by development status (bubble sizes scale with project capacity)	24
Figure 12 Offshore wind market forecast for the Netherlands	24
Figure 13 Map of projects in Taiwan by development status (bubble sizes scale with project capacity).	27
Figure 14 Offshore wind market forecast for Taiwan	27
Figure 15 Map of projects in the UK by development status (bubble sizes scale with project capacity)	30
Figure 16 Offshore wind market forecast for the UK	30
Figure 17 Map of projects in Ireland by development status (bubble sizes scale with project capacity)	33
Figure 18 Offshore wind market forecast for Ireland	33
Figure 19 Map of projects in the Japan pipeline by development status (bubble sizes scale with project capacity)	36
Figure 20 Offshore wind market forecast for Japan	36
Figure 21 Map of projects in Poland by development status (bubble sizes scale with project capacity)	39
Figure 22 Offshore wind market forecast for Poland	39
Figure 23 Map of projects in South Korea by development status (bubble sizes scale with project capacity)	42
Figure 24 Offshore wind market forecast for South Korea	42
Figure 25 Map of projects in the US by development status (bubble sizes scale with project capacity)	45
Figure 26 Offshore wind market forecast for the US	45
Figure 27 Map of projects in southern Vietnam by development status (bubble sizes scale with project capacity)	48
Figure 28 Offshore wind market forecast for Vietnam	48
Figure 29 Forecast for offshore wind in Australia	51
Figure 30 Forecast for offshore wind in the Baltic States	52
Figure 31 Forecast for offshore wind in Brazil	53
Figure 32 Forecast for offshore wind in India	54
Figure 33 Forecast for offshore wind in Italy	55
Figure 34 Forecast for offshore wind in Spain.	56
Figure 35 Forecast for offshore wind in Sweden	57

# List of tables

Table 1 Summary of each country	8
Table 2 List of notable current offshore wind suppliers in Denmark	16
Table 3 List of notable current offshore wind suppliers in France.	19
Table 4 List of notable current offshore wind suppliers in Germany	22
Table 5 List of notable current offshore wind suppliers in the Netherlands	25
Table 6 List of notable current offshore wind suppliers in Taiwan	28
Table 7 List of notable current offshore wind suppliers in the UK.	31
Table 8 List of notable current suppliers in Ireland.	34
Table 9 List of notable current suppliers in Japan	37



Table 10 List of notable current suppliers in Poland	40
Table 11 List of notable current suppliers in South Korea.	43
Table 12 List of notable current suppliers in the US	46
Table 13 List of notable current suppliers in Vietnam	49

# 1. Introduction

Norwegian Energy Partners (NORWEP) is an enabling body that promotes the Norwegian energy industries in international markets, including offshore wind.

Offshore wind markets globally have been expanding rapidly as costs have fallen and countries are increasingly looking to renewable energy to meet decarbonisation targets. The Norwegian market, however, is expected to remain small, relative to offshore wind industries in other countries, and not large enough to satisfy the breadth and depth of the Norwegian supply chain.

NORWEP has commissioned BVG Associates to write this report exploring the potential for Norwegian companies to export their goods and services to foreign offshore wind markets.

# 2. Structure and approach

We examined a number of countries from either established offshore wind markets, emerging markets or potential markets:

- Established markets: China, Denmark, France, Germany, Netherlands, Taiwan and the UK (China was covered in greater detail as the market is very large)
- Emerging markets: Ireland, Japan, Poland, South Korea, US and Vietnam
- Potential markets: Australia, the Baltic States, Brazil, India, Italy, Spain and Sweden.

In each country we covered a number of sections to identify the potential for Norwegian companies in each country (potential countries covered fewer sections as the market is more uncertain):

# The market

- A short summary of the current offshore wind industry, the regulatory processes involved in developing offshore wind farms and Government targets.
- BVGA's offshore wind forecast to 2030 to show the size of the potential opportunities.

# Local content policies

 A description of any policies that require or incentivise local suppliers to be used ahead of foreign companies (thereby limiting the opportunity for Norwegian suppliers).

## **Competitive business practices**

- A summary of the ease of doing business in the country covering local language, cultural differences and openness to working with foreign companies.
- An assessment of the safety of doing business in each country using Transparency International's Corruption Perceptions Index. This ranks 180 countries and territories by their perceived levels of public sector corruption, according to experts and business people<sup>1</sup>.

# Supply chains

- A short summary of the offshore wind supply chain in each country.
- A list of suppliers in the priority supply chain areas identified by NORWEP as the greatest potential for Norwegian suppliers:
  - o EPCI contracting
  - o Subsea cables
  - Offshore substations (foundations, topsides and electrical equipment)
  - Smart structural technologies (services including engineering and design, instrumentation, digitisation, weather forecasting and geoscience surveying)
  - o Vessels and equipment
  - o Installation equipment and support services, and
  - Maintenance and inspection services.
- The size and nature of supply chains in similar industries including oil and gas, shipbuilding and maritime, and steel-making and fabrication. A declining market with large numbers of suppliers may lead to companies looking to enter the offshore wind industry, proving greater competition for Norwegian companies but also opportunities to collaborate.

# Potential new entrants

• A description of companies that will be, or have the potential to, entering the market. This consists of companies known to be entering the offshore market or may be transitioning from other industries.

# Profiles of notable firms

 A description of foreign companies that have entered the market in the country. We included a short profile of each company and discussed some of the key reasons for its success that Norwegian companies can

<sup>&</sup>lt;sup>1</sup> Transparency International, 2021, Corruption Perceptions Index (available at <u>https://www.transparency.org/en/cpi/2020/index/</u>, last accessed March 2021).



learn from. In some cases we profiled a native company if there are relevant lessons to be taken.

### Useful sources of information

• A short list of useful sources that Norwegian companies should use to learn more about the offshore wind industry in each country.

# 3. Summary

A summary of each country included in the study is shown in. We summarised countries using the following criteria:

#### Ease of doing business

- Easy = no cultural differences to be navigated
- Moderate = minor or few cultural differences to be navigated
- Difficult = significant or many cultural differences to be navigated

## Size of the opportunity (at 2030)

- Large = commissioning more than 10GW between 2021 and 2030
- Medium = commissioning between 3GW and 10GW between 2021 and 2030
- Small = commissioning less than 3GW between 2021 and 2030.

#### Table 1 Summary of each country.

Country	Type of market	Ease of doing business	Size of the opportunity (at 2030)
China	Established	Difficult	Large
Denmark	Established	Easy	Medium
France	Established	Moderate	Medium
Germany	Established	Easy	Large
Netherlands	Established	Easy	Medium
Taiwan	Established	Moderate	Large
UK	Established	Easy	Large
Ireland	Emerging	Easy	Medium
Japan	Emerging	Moderate	Medium
Poland	Emerging	Moderate	Medium
South Korea	Emerging	Moderate	Medium
US	Emerging	Moderate	Large
Vietnam	Emerging	Difficult	Medium
Australia	Potential	Easy	Small
Baltic States	Potential	Moderate	Small
Brazil	Potential	Difficult	Small
India	Potential	Moderate	Medium
Italy	Potential	Easy	Small
Spain	Potential	Easy	Small
Sweden	Potential	Easy	Small

# 4. Established markets

# 4.1.China

# The market

China was the largest offshore wind market in by annual installations in 2020 and will overtake the UK in terms of the largest cumulative installations during 2021. The Chinese offshore wind industry was slower to establish than many of the major European countries, like Denmark, Germany, the Netherlands and the UK, having less than 100MW of installed capacity in 2010. Since then the market has grown substantially, installing over 8GW in the last three years and making up half of global installations in 2020. It has an installed capacity of around 11GW.

#### Location and environment

China's coastline runs around 15,000km from the Bohai Sea in the north, through the Yellow Sea, the East China Sea and the South China Sea. Most of China's EEZ lies on the continental shelf with large areas of water less than 50m deep extending out to 200km in places and all of the wind farms installed to date use fixed foundations. While there have been no commercial scale floating offshore wind projects installed to date, there will be a large floating industry in some provinces, for example Guangdong, once the shallow sites have been developed.

#### Regulatory process

The regulatory process for consenting offshore wind farms in China is complex. There are two approaches, either a developer-led route or a competitive auction-led route:

- In the developer-led route, a developer can identify a potential site and project and must apply to the local National Energy Administration (NEA) to conduct preliminary surveys. Once complete, the Local NEA evaluates and scores these projects for criteria including technical capability, track record and price. Projects with the highest scores are included with priority in the province's Construction Plan. Successful projects are allowed to build without a competitive procedure.
- In the competitive auction-led route, the Local NEA identifies areas suitable for offshore wind projects and completes preliminary surveys. It then runs a competitive tender where developers bid on the same criteria as the developer-led route.

Grid connections for offshore wind projects are usually paid for and constructed by the developers, initially, and costs are reimbursed by the state-owned TSO.

Price support is currently provided by FITs. This scheme is due to close in 2021 and there has been no announcement of a scheme to replace it. This deadline has led to a peak of installations in 2020 and the same is expected in 2021 before the scheme ends. The cancellation of the centrally provided subsidies has created some uncertainty in the market as subsidies will now be provided at the provincial level. It is expected that the FIT offered by individual provinces will be lower than the current central prices, although most provinces are yet to announce their individual schemes. The tariffs offered will reflect the relative wealth of individual provinces, with the wealthier areas able to offer higher subsidies. Industry is expecting costs to continue to reduce through a combination of capex reductions, reduced balance of plant costs due to larger turbines and reductions in the cost of finance.

This has created some uncertainty in the market, although the huge pipeline of projects and expected cost reductions means that the industry's growth is expected to continue.

There are few regulations that apply to foreign companies, for example they can own up to 49% of projects, other than projects close to Taiwan.

#### Government position

The Chinese Government is supportive of offshore wind and renewables generally. The NEA set a target of achieving 5GW of grid-connected offshore wind by 2020 which it has exceeded significantly. It recently announced a goal of becoming net zero by 2060 which is ambitious for the world's largest CO<sub>2</sub> emitter. This drive to decarbonise represents the Chinese commitment to renewables and offshore wind, and it will release a new national offshore wind target for 2025 later this year. These national targets have been cascaded through companies, including generators and grid firms, and provinces, who must create their own practical plans to deliver net zero.

Provinces have their own targets which are more ambitious than the national targets, some have released targets already for 2025:

- Guangdong: 15GW of installed capacity by 2025, and that it will also be subsidy free from 2024
- Jiangsu: 14-15GW of installed capacity by 2025, and
- Zhejiang: 5GW of installed capacity by 2025.

#### Forecast

The majority of offshore wind farms installed to date have been installed in the Jiangsu region, north of Shanghai. Around 65% (5GW) of total installed capacity in China is in the Jiangsu region.

In the next decade the industry is forecast to grow considerably. We forecast that China will have an installed capacity of 59GW by 2030, over 50% higher than the next largest country, the UK. The largest growth is due to occur in the Guangdong province. It currently has around 900MW of installed capacity, around 12% of China's total. Guangdong has close to 9GW of projects currently in development due to be commissioned before 2030.



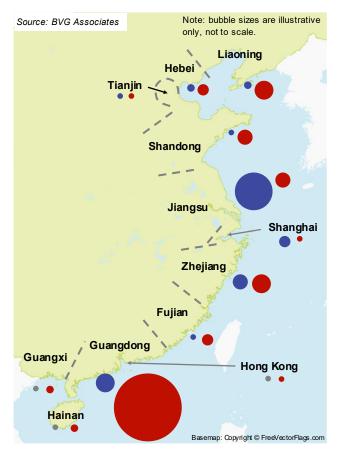


Figure 1 Scale of offshore wind industry in each province.

Blue = proportion of total installed capacity in China. Red = proportion of Chinese projects in development. Grey = no installed capacity.

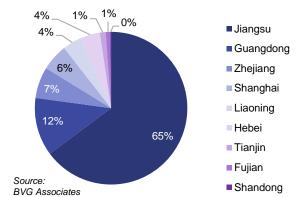


Figure 2 Proportion of current installed capacity in China by province, total 11GW.

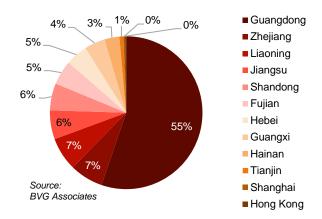


Figure 3 Proportion of Chinese projects in development, total 125GW (including development zones).

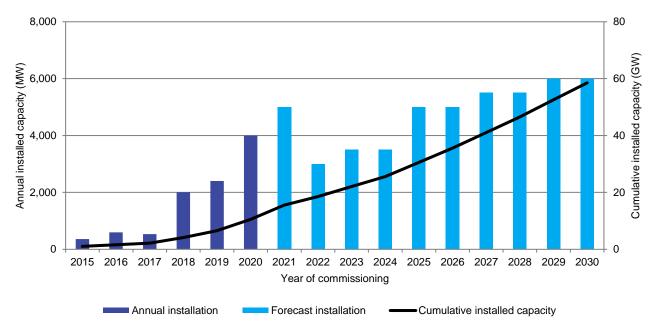


Figure 4 Offshore wind installation forecast for China, showing the peak in installations in 2020 and 2021 caused by the end of the FIT.

# Key offshore wind farm owners

The four largest developers/owners by current offshore wind installed capacity are summarised below. All are Central State-Owned Enterprises (CSOEs). Most have partnered with other owners to develop projects in the past, but more are developing projects individually as their confidence and experience has grown. They are also actively buying into European projects.

Notable owners outside of the top four include Shanghai Electric (no current installed capacity, it has around 9GW of projects in development due to be installed after 2030) and China Power International (no current installed capacity but signed a memorandum of understanding (MOU) with Equinor in 2019 to develop offshore wind projects in Europe and China).

## China Energy Investment Corporation (CHN Energy)

CHN Energy is a CSOE headquartered in Beijing. It has over 80 branches and subsidiaries across its seven business areas. The bulk of CHN Energy's wind energy capacity has been developed by two subsidiaries, Guodian Power Development Co and China Longyuan Power Group Co.

CHN Energy has around 1.8GW of installed offshore wind, with the vast majority installed the Jiangsu province. It has mainly operated as the sole owner but has partnered with EDF on the Dongtai Four (H2) project. It has around 600MW of projects in development, with 400MW due to be installed in Fujian and 200MW in Jiangsu.

#### State Power Investment Corporation (SPIC)

SPIC is a CSOE with headquarters in Beijing and was formed in 2015 following a merger between China Power Investment Corporation (CPIC) and State Nuclear Power Technology Co. (SNPTC). It is active in the wider energy market in China and has a portfolio of generation assets in coal, hydropower, nuclear power, and renewable energy.

SPIC has a current offshore wind installed capacity of around 1.3GW, mainly located in the Jiangsu province. It partnered with China Datang, CGN and Shanghai Green Energy on the 100MW Donghai Bridge projects in Shanghai. SPCI has around 1.6GW of projects in development, equally split between the Jiangsu and Guangdong provinces.

# China General Nuclear Power Group (CGN)

CGN is a CSOE with headquarters in Shenzhen (Guangdong province) and is one of the two major nuclear power companies in China. It develops wind and other renewable projects under its non-nuclear subsidiary CGN New Energy.

CGN has around 1GW of installed offshore wind capacity, of which 400MW is located in the Guangdong province and the rest split between Jiangsu, Shanghai and Zhejiang. It

has 6.3GW of projects in development, of which 4.8GW will be installed in the Guangdong province.

China Three Gorges Corporation (CTG)

CTG is a Beijing-headquartered CSOE that operates the 22GW Three Gorges hydropower project on the Yangtze River in the Hubei province, the largest hydropower project in the world. It announced in 2019 that it will no longer develop hydropower projects and will focus on offshore wind through its subsidiary CTG New Energy. CTG also owns a 70% share of the Shanghai Investigation, Design & Research Institute (SIDRI).

CTG has around 1.1GW of installed capacity, 500MW in Jiangsu and 300MW in Liaoning. It also acquired a majority ownership share of the German 300MW Meerwind Meerwind Süd/Ost project in 2016. CTG has around 4.6GW of projects in development. Around 2.3GW will be installed in the Guangdong province with the rest installed in Fujian, Jiangsu and Shandong.

# Offshore wind supply chain

The offshore wind supply chain in China has developed in parallel to the European supply chain and is now wellestablished. Chinese suppliers exist for all stages and supply chain categories for wind farm development, construction, installation and operation and developers use European suppliers by exception. An example is installation vessels for which the Chinese market cannot satisfy demand and represents a significant opportunity for Norwegian vessel owners.

While the Chinese market has been relatively isolated from Europe for both importing and exporting in the past, lines of communication and trade are progressively opening.

# Design houses

Any type of construction in China must be signed off by a design institute. In offshore wind they either work at a zoning and provincial level or on individual wind farm designs. Design houses usually offer standard designs and procedures. They also make recommendations and provide supporting information but do not normally specify products from a single supplier. For example, they may recommend a turbine model, but the final procurement decision is made by the developer.

Examples of Chinese design institutes include Guangdong Electric Power Design Institute Co. (GEDI), PowerChina Huadong Engineering Corporation (HDEC) and Shanghai Investigation, Design & Research Institute (SIDRI). A number of Chinese design institutes have worked with European counterparts including Atkins, DNV and Rambøll. Up to now, they have not been seen to have the same level of expertise as their European equivalents but are making steady progress.



#### Turbine suppliers

The Chinese offshore wind market has predominantly used Chinese turbine suppliers and has rarely used European turbines. Goldwind, Envision and MingYang are the largest and most established Chinese suppliers. Goldwind has recently sold the first Chinese offshore wind turbines in Europe at Taranto, in Italy. All are behind the European turbine manufacturers GE, SGRE and Vestas in the offshore turbine ratings they offer but have caught up significantly in the last couple of years. Shanghai Electric is also experienced in manufacturing turbines under license from SGRE.

While manufacturing blades, nacelles and towers in China, almost all Chinese turbine suppliers have acquired European design companies for designs and capability. An example is Goldwind's acquisition of Germany turbine supplier VENSYS Energy in 2008.

#### Cable suppliers

China has a number of established high-voltage power cable suppliers which have considerable experience in supplying array and export cables to offshore wind farms in China. The largest suppliers are Hengtong Optic, Ningbo Orient Cable and ZTT. These suppliers have predominantly supplied to Chinese projects and are now starting to export cables to the European offshore wind market.

#### Substation suppliers

China has a large steel manufacturing industry and so has a large number of offshore substation topside suppliers. The suppliers with the greatest experience include Jiangsu Changfeng Ocean Equipment Manufacturing, NTOC, Sinopec and ZPMC.

Chinese suppliers of high-voltage equipment include China Transpowers Electric and Dongguan Transpower Electric Products. Some European companies have a large presence in the Chinese high-voltage equipment market including Hitachi-ABB Power Grids and Siemens.

#### Smart structural technologies

China has a number of smart structural technology suppliers. Geotechnical and geophysical surveying is carried out by companies that include Guangdong Electric Power Design Institute (GEDI), Hydrochina Huadong Engineering Corporation and Shanghai Investigation Design & Research Institute (SIDRI). Metocean and weather forecasting is supplied by companies like East China Investigation and Design Institute, and it has a large number of instrumentation suppliers.

#### Vessels, equipment and support service suppliers

Vessels create bottlenecks for the Chinese offshore wind industry as there are only a few purpose-built wind installation vessels. Some of the large engineering companies including CCCC, COSCO Shipping and Keen Offshore Engineering operate vessels but current demand far outstrips the fleet's capacity. This could be a potential opportunity for Norwegian suppliers.

China is experienced in offshore oil and gas, commercial freight and other maritime industries so has a large number of shipbuilders, vessel equipment suppliers and support service providers. This includes China Merchants Heavy Industry, which recently built an installation vessel for Norwegian installer OHT, and China State Shipbuilding Corporation.

#### Maintenance and inspection suppliers

Maintenance and inspection services are provided by most of the turbine manufacturers and by large engineering companies like Huadian Heavy Industries. A small number of European companies are active in this sector. This notably includes submarine cables installer and maintenance provider S. B. Submarine Systems (SBSS). SBSS is a JV between China Comservice and the UKbased Global Marine Systems.

#### Local content policies

China does not have any formal local content policies. The sudden push to grow the industry from 2010 has meant developing projects as quickly as possible has been the priority, and the steady rotation of senior managers has meant a focus on low CAPEX rather than full lifecycle cost of energy.

While projects and developers have been free to use suppliers from outside of China, in practice this has rarely happened. This is mainly due to the trust that Chinese companies have with their own counterparts and the greater ease of doing business with them. Using Chinese suppliers also tends to be the cheapest option, particularly in manufacturing, given the higher labour costs of European companies and the expensive shipping costs.

The change in subsidy regimes this year means that developers are now under much greater pressure to make projects profitable without subsidies. This means that there are unlikely to be any formal content requirements or incentives introduced, although it is likely that Chinese suppliers will remain the first choice of developers.

#### **Competitive business practises**

China is the largest country in the world by population and has the second largest economy. It has been developing rapidly over the past 20 years. It is still seen as a challenging place to do business and has a rank of 78 out of 180 countries in the Corruption Perceptions Index, lower than almost all European countries.

It can difficult for European companies to do business in China for a number of reasons. Firstly, the language barrier is significant. The official language in China is Mandarin (also referred to as Standard Chinese) and is the most commonly spoken dialect. The level of English is variable within the business world, with young professionals speaking better than older and more senior managers. It can be difficult to communicate effectively without a translator.

Secondly there are large cultural differences between China and Europe. Decision making can take longer than Europeans are accustomed to as building relationships are a key part of business and following hierarchy is very important. The concept of 'face', simplified as the preservation of self-image and honour, plays a crucial role in Chinese society. The concept manifests itself in many ways, but openly disagreeing or challenging is a sign of disrespect and can cause business relationships to break down.

There are geopolitical issues that can make working in China complex. It has a very tense relationship with Taiwan, where there have been ongoing disagreements over whether Taiwan should be recognised as sovereign state. This doesn't have significant impacts on business, only that Chinese wind farm owners cannot own any portion of Taiwanese wind farms, Chinese registered vessels cannot work in Taiwan and there are limits on the sea bed data foreign firms can work with. China has also had a difficult relationship with Japan but this has been improving in recent years.

There is also a challenge in selling consultancy services in China, as most companies are more willing to buy standard off-the-shelf products, services or software than bespoke versions. For example, they preferred to buy standard wind turbine designs from Aerodyn than to buy bespoke wind turbine designs from DNV.

It is a very different market to Europe and so requires significant investment of time, finances and people to be successful. Norwegian companies are held in high regard in China.

# Key get rights

Successful Chinese market entry usually meets several important criteria.

- 1. Companies have a leading product or service that offers a distinct value proposition and the sales and reputation that comes with it
- They invest in local people to reach Chinese decision makers and navigate the regulations and culture. Local offices often follow so that warranties are properly supported, rather than using sales agents
- They tend not to use joint ventures as these are generally harder to make work in the long term due to the significant cultural differences and different priorities for major decision making
- 4. They manufacture and provide support locally to meet cost targets and be responsive, with strong technical support from Europe

- 5. They appreciate that China is different and do not try to replicate their western operations. For example labour can be cheaper than automation and processes may need to be adapted to take place in standard factories provided by the authorities, and
- 6. They look for opportunities that China can provide to their operation in the west, for example low-cost manufacture of vessels.

These can be difficult for some companies to commit to but there are examples of foreign companies, including Norwegian companies, that have successfully entered Chinese markets.

## Examples of successful foreign firms

#### Jotun

Jotun is a Norwegian company that specialises in paints and coatings. It is represented in over 100 countries and supplies to various industries including civil engineering, oil and gas, vessels and ports. It established itself in China in 1983 and has since expanded, now operating multiple manufacturing facilities and offices across the country.

Jotun has been successful in China as it has invested in a local workforce and has an experienced Chinese sales team. This has allowed Jotun to avoid many of the potential pitfalls. It has also continually invested in its facilities and innovated. This has ensured Jotun is price competitive with local competitors and is a performance leader within the painting and coatings industry.

#### EDF

EDF is an energy utility headquartered in France. In offshore wind it acts as a project developer. It is also a world leader in nuclear power and entered the Chinese nuclear industry over 30 years ago. It is one of the few foreign companies active in the Chinese nuclear industry.

In 2020 EDF created a joint venture with China Energy Investment Corporation (CEI) to develop offshore wind farms in China. In this case, we expect the EDF-CEI joint venture to succeed because of EDF's previous experience in China, combined with EDF's offshore wind expertise.

#### Hitachi ABB Power Grids

Hitachi ABB Power Grids is a joint venture between Japanese conglomerate Hitachi and Swedish-Swiss technology company ABB. Hitachi ABB Power Grids supplies equipment for high-voltage grid infrastructure. It has steadily built its presence in China working with numerous local companies in different cities. It is now at the forefront of HVDC transmission projects in China because it has invested heavily in its Chinese capability.

#### LM Wind Power

LM Wind Power, a subsidiary of turbine manufacturer GE, manufactures turbine blades in many countries across the world. It entered the Chinese market in 2001, bringing



market-leading blade manufacturing capabilities. It has used its global wind industry knowledge and its experience working in China to increase its presence as the local wind industry grew and recently opened its fourth blade factory in China.

## Useful sources of information:

- China Energy Portal news site dedicated to tracking news and policy changes in China (<u>https://chinaenergyportal.org/en/</u>)
- China Wwind eEnergy Aassociation (CWEA) trade association representing wind energy in China and conference organiser (<u>http://www.cwea.org.cn/union\_introduce.html</u>)
- Chinese Government guide to working in China as a foreign company (<u>http://english.www.gov.cn/services/doingbusiness</u>)
- Global Wind Energy Council (GWEC) reports, data and news on global wind industries including China (<u>https://gwec.net/</u>)
- Norwegian embassy, which is very active in China

# Offshore wind export markets

# 4.2. Denmark

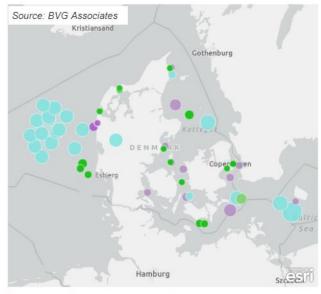
# The market

Denmark was a wind energy pioneer and the first country to develop commercial-scale offshore wind farms. It currently has around 2GW of operating offshore wind capacity, which is smaller than other European markets like the UK, Germany, the Netherlands and Belgium.

All of Denmark's operational offshore wind farms are fixedbottom and all projects in development or development zones are located in a maximum water depth of 40m. For this reason, it is unlikely there will be any floating offshore wind farms in Denmark for some time.

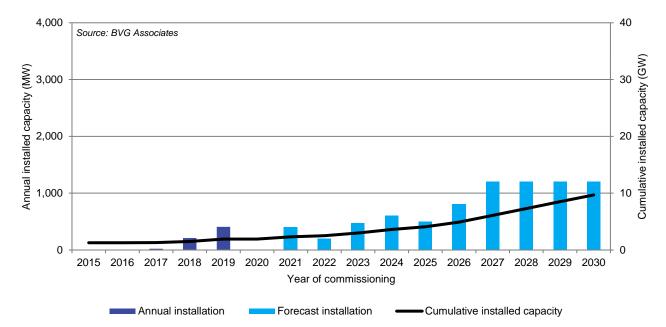
Projects are mostly developed through Government tenders, although there is also a developer-led route. The tender process is managed by the Danish Energy Agency (DEA), part of the Ministry of Energy, Utilities and Climate, which acts as a one-stop-shop for the industry in Denmark. The DEA identifies areas suitable for offshore wind development via marine spatial planning and conducts preliminary investigations. It then awards sites to developers through a competitive tender based on electricity price/MWh for 20 years with most permits in place, at least in principle.

Denmark does not have an explicit offshore wind target but has one of the most ambitious plans to reduce carbon emissions. It has committed to reducing emissions to 70% below 1990 levels by 2030 and to achieving net zero by 2050. It also recently announced plans for two energy 'islands' with 5GW of offshore wind capacity to be built by 2030, one in the North Sea and one in the Baltic Sea. We forecast that Denmark will have an installed capacity of about 10GW of offshore wind by 2030.



Operating 
 Under construction 
 Pre construction
 Consent approved 
 Under development 
 Development zone

Figure 5 Map of projects in Denmark by development status (bubble sizes scale with project capacity).



#### Figure 6 Offshore wind market forecast for Denmark.

#### Local content policies

Denmark became established as the home of the onshore wind industry in the 1990s. In the early years of the wind industry, the Danish Government supported the export of wind technology globally, through export credit and other mechanisms. It also supported R&D activities.

This highly-favourable political environment created a climate in which industry has invested for the long term.



Denmark retains a national culture of collaboration within Danish supply chain, where possible. The wind industry is a key element in a relatively small economy, and relationships between industrial players are long-lasting and deep.

The government has not imposed local content policies, but often Danish players buy Danish. For many years, for example, there have been hardly any non-Danish wind turbines operating in Denmark.

Such policies are unlikely to change, with Danish players continuing to succeed in a globalising market, especially at the upper end of the supply chain.

#### **Competitive business practices**

Norwegian companies have traded with Denmark for many years, and typically each can understand the other's language reasonably well, as well as both being highly proficient in English. Any commercial engagement with Danish firms needs to recognise the strong sense of Danish national pride and capability in the wind industry. Denmark is seen as even safer to do business in than Norway, currently heading the Transparency International Corruption Perceptions Index.

## Offshore wind supply chain

Denmark has two strong, globally active offshore wind farm developers, Ørsted and Copenhagen Infrastructure Partners. It is also home to SGRE and Vestas, the top two leading offshore wind turbine suppliers.

# Table 2 List of notable current offshore wind suppliersin Denmark.

Priority supply chain area	Suppliers	
EPCI contracting		
Subsea cables		
Offshore substations	Bladt, Semco Maritime	
Smart structural technologies	COWI, Gram &Juhl, Maersk, Ramboll	
Vessels and equipment	Cadeler, Maersk	
Installation equipment and support services	Liftra	
Maintenance and inspection services	Cadeler, Global Wind Service, Maersk, All NRG	

#### Supply chains in similar industries

#### Offshore oil and gas

Denmark has a well-established petroleum industry and most production take place offshore. It has been producing oil and gas from the Danish area of the North Sea since 1972. More than 55 platforms carry out production across 19 oil and gas fields. Total is the operator in charge of production from 15 fields, while INEOS is the operator of three fields and Hess the operator of one field. Denmark produced around 8MTOE of oil and natural gas in 2019.

The oil and gas industry in Denmark has been in decline since it peaked around 2005. Between 2012 and 2019, oil production decreased by 50% and gas production decreased by 47%. This comes as the Danish government commits to ending oil and gas production in the North Sea by 2050.

#### Shipbuilding and maritime

Denmark is a well-established maritime nation. Its geographic location has fostered the development of the country's shipping industry. Denmark has a number of maritime business services to support its international shipping sector. Most notably is Maersk Line which is the world's largest freight shipping company. Other large Danish shipping companies include DFDS, J. Lauritzen, Norden and Torm. These companies operate from Denmark's large commercial shipping ports; namely, Copenhagen, Aarhus, Aalborg and Fredericia.

The Danish maritime industry holds a strong position in the global market due to highly technological and specialised products and solutions. It is leading the way in green solutions in shipping, working to increase efficiency, reduce fuel consumption and limit carbon emissions.

The shipbuilding industry in Denmark has faced the same challenges as elsewhere in Europe. Competition from Asia forced shipbuilding yards in Denmark to close, in the latter part of the twentieth century. Denmark still has a number of shipbuilding yards, but many have realigned themselves to cater to the needs of the offshore wind industry.

#### Steel-making and fabrication

Denmark does not have a steel-making industry. The country's only steelworks facility closed in 2002 following bankruptcy.

NLMK DanSteel produces hot-rolled structural steel plates for the wind industry (onshore/offshore), and various other uses of large structural steel plate and profiles, using steel billets from Russia.

In support of the oil and gas, offshore wind and construction industries Denmark has a range of steel fabricators including Bladt and Welcon, who are in turn supported by very strong consulting engineers such as Ramboll and COWI.

# Potential new entrants

As offshore wind is such a mature industry in Denmark, there are unlikely to be many new entrants, though more players will continue their transition from oil and gas.

Ørsted has led this transition, now almost exclusively operating in renewable energy.

A.P. Møller-Maersk has had involvement in offshore wind installation and DSV Panalpina in pre-installation transport for some time. Danish banks have also played important roles.

Further down in the supply chain, many Danish companies transitioned into onshore wind during the last 40 years, and many of these have since incorporated supply to offshore wind.

# Profiles of notable firms

## SGRE

German multinational conglomerate Siemens bought Danish turbine supplier Bonus in 2004. It is now part of Siemens Gamesa Renewable Energy (SGRE). The wind turbine supplier has grown from a market share of 9% and 750 employees, highly focussed in Denmark, to a global business with 25,000 employees, through further acquisition and rapid internal growth, especially in offshore wind.

Although the Danish influence at SGRE has been diluted, especially via German and Spanish staff (after the merger with Spanish turbine supplier, Gamesa), it has kept leadership of offshore wind and strong technical and purchasing functions in rural Denmark, in order to preserve the core of its expertise, and also to continue to tap in to wind industry talent at a range of industrial and academic institutions in Denmark.

#### Ørsted

Ørsted is a Danish offshore wind developer but is relevant to mention. It has been the dominant market leader in offshore wind development for a long time and has the largest offshore wind installed capacity of any developer. It rebranded from DONG (Danish Oil and Natural Gas) in 2017, choosing a distinctly Danish name and has kept a strong Danish focus in the way it does business.

With an oil and gas heritage and early staffing from Danish energy and technology institutions, it has a very large team of offshore wind competence and has led the industry in its hands-on approach to technology and project delivery. It has used its Danish technical expertise to develop and manage more of its offshore wind farms in-house than most other developers, although others are now starting to catch up. This has allowed it to take on more risk than its competitors and develop projects at lower cost.

# Useful sources of information

- Danish Energy Agency Government department responsible for energy policy (<u>https://ens.dk/en</u>)
- Wind Denmark trade association for wind energy in Denmark (<u>https://en.winddenmark.dk/</u>)



# 4.3. France

# The market

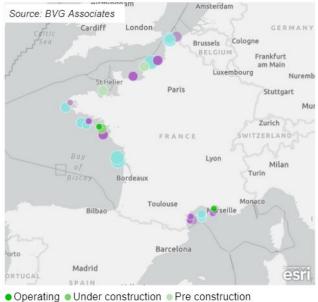
France has been slow to develop offshore wind energy, despite its good wind resource and large amount of available maritime space. It currently has only one operational project, a 2MW floating demonstrator, no commercial-scale offshore wind farms have been commissioned yet. In the last couple of years the industry has finally taken off with several projects in construction and development.

France has areas suitable for fixed-bottom foundations on its west coast and this is the location of most of the projects in development. It also has a small area of shallow water on its south coast in the Mediterranean. It also has large areas of deeper water so may have a larger floating market than many of the countries around the North Sea.

Projects are mostly developed through Government tenders. The first two tenders used a classic tender approach where the Government prescribed a set of project specifications before inviting bids. Winners were selected based on financial capabilities but also on other criteria. In the third tender, developers were permitted to consult on the project specifications before they are invited to tender. Winners were selected on their technical and financial capabilities.

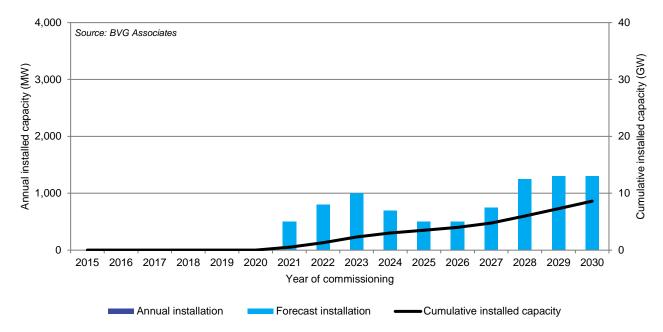
The tendering process has been simplified in recent years. Permits are now more flexible to allow for changes in key project characteristics, such as number and size of turbines, and the consenting process is more streamlined.

France has a target of achieving net zero by 2050 and has an offshore wind target of having an installed capacity of 5.2-6.2GW by 2028. We forecast that France will meet this target, having 6GW by 2028 and 8.5GW by 2030.



Consent approved 
 Under development 
 Development zone

Figure 7 Map of projects in France by development status (bubble sizes scale with project capacity).





#### Local content policies

France has placed local content as a high priority. The first two tender rounds had strong incentives to build turbine component factories. This led to French-owned turbine suppliers, Alstom (since acquired by GE) and Areva (since acquired by SGRE), both promising blade and turbine nacelle assembly factories, which are now being built.

Slow progress in delivering these projects has been partly due to the inexperience of the consortia and the late consenting objections. The extended Round 1 lead times led to a clear mismatch between French prices and those being achieved in auctions elsewhere. This in turn caused further delays as the French government renegotiated the prices of contracts with the project consortia.

Future leasing rounds are unlikely to have the same emphasis on local content and are likely to encourage the participation of more experienced companies.

# **Competitive business practices**

The official language in France in French. In business, some grasp of the French language is often expected when speaking to French people. However, English is frequently used when working with foreign companies albeit not as readily as with other European countries. The business culture is similar to most western European countries, although it has a very formal and hierarchical structure.

Traditionally France has tended to be more internally focused and less open to working with foreign businesses than are other European countries, with a particular emphasis of government and business working together to create local champions for industries seen to be of national importance. Although it is becoming increasingly open to international business, a strong pro-French mindset remains.

It has a ranking of 23 out of 180 countries in Transparency International's Corruption Perceptions Index. This lower than many of the other western European countries like Belgium, Germany and the Netherlands.

# Offshore wind supply chain

The infancy of the French offshore wind market means that its supply chain is limited. Notable French companies active in the offshore wind industry include the developer EDF Renewables and floating innovator IDEOL. It is also home to shipbuilder and offshore substation manufacturer Chantiers de l'Atlantique and Eiffage (the parent company of steel manufacturer Smulders).

The early pursuit of local content in the French development process meant that French turbine suppliers Alstom and Areva (since acquired by GE and SGRE respectively) both committed to building turbine factories. GE's factory in Cherbourg is starting to manufacture blades for the new Haliade-X turbine. SGRE's factory in Le Havre will produce blades and nacelles and is expected to begin operation in 2021.

The French supply chain will also be active in the foundation supply chain, for example concrete gravity base foundations will be manufactured by Bouygues Construction (in consortium with Saipem) for Fécamp and jacket structures are being final-assembled in France by a consortium including Eiffage and Atlantique Offshore Energy (from subassemblies made in Spain) for Saint-Brieuc.

Table 3 List of notable current offshore wind suppliersin France.

Priority supply chain area	Suppliers
EPCI contracting	Alstom Grid, Areva Grid, TechnipFMC, Bouygues, Eiffage, TechnipFMC
Subsea cables	
Offshore substations	Chantiers de l'Atlantique
Smart structural technologies	See text below table.
Vessels and equipment	Chantiers de l'Atlantique, Beneteau
Installation equipment and support services	Bourbon Offshore
Maintenance and inspection services	Omexom (via purchase of EWE OSS),

French innovators active in floating wind development, including Ideol and Naval Energies, are likely customers for smart structural technologies and floating foundation installation and support equipment.

# Supply chains in similar industries

#### Offshore oil and gas

There is no substantial oil and gas production within France. In 2019, it produced around 1MTOE of oil and natural gas. Oil and gas production mainly comes from onshore reserves in the Paris Basin (north east) and Aquitaine Basin (south west).

In recent years, oil and gas production has contracted. Between 2012 and 2019, oil production decreased by 10% and gas production decreased by 97%, to a negligible amount. As such, the French Government have passed legislation to end oil and gas production on its mainland and overseas territories by 2040.

#### Shipbuilding and maritime

The French maritime sector, which includes the shipbuilding industry, marine renewable energy, nautical industries and services as well as the offshore industry, is diverse. It has a strong commercial shipping industry with around 40 trade ports.



France has an established shipbuilding industry. It has, however, struggled in recent years due declining demand and increased competition from Asian countries. Owing to the county's leading shipyard, Chantiers de l'Atlantique, France continues to be the second largest cruise ship manufacturer in the world. Chantiers de l'Atlantique also produces military ships for the French Navy.

It is also a manufacturer of pleasure boats which would have relevant capabilities for the CTV market, for example Beneteau.

#### Steel-making and fabrication

France has an established steel manufacturing industry. It has a steel making capacity of 19 million tons per year and employs around 20,000 people. The domestic supply of steel is used for the manufacture of steel products across several industries, including automotive, machinery, construction and infrastructure.

Faced with the same challenges as other European countries, France has seen a decline in its steel industry. Increased competition and reduced demand, as a result of changes in the automotive industry, has caused the country's capacity to contract. This trend will be compounded by the coronavirus pandemic.

#### Potential new entrants

Future local content requirements in France are unlikely to be as stringent as they have ben in the past, but it is still likely to be a material consideration for developers. This greater demand for French companies means there may be a greater opportunity for French companies in the French market, and a smaller opportunity for foreign companies.

# Profiles of notable firms

#### Siemens Gamesa Renewable Energy (SGRE)

SGRE was formed in 2016 by a merger between the two turbine suppliers Siemens Wind Power and Gamesa and is now the market leader in turbine supply. It acquired turbine supplier Adwen (JV between French turbine supplier Areva and Spanish supplier Gamesa) in 2017 and is in the process of constructing a turbine factory at Le Havre, having been originally proposed by Adwen.

The French market places a very high priority on French content and so is an important part of SGRE's strategy for the French market, for which it has the majority of turbine contracts for projects in development. Whether the factory will remain competitive for the long term remains to be seen.

#### GE Wind Energy

GE Wind Energy is a subsidiary of the US conglomerate General Electric. In the wind industry it operates as a turbine supplier. In 2014 it acquired the power and grid businesses of French engineering company Alstom, including its Haliade turbine. GE continued with Alstom's plans to construct French turbine factories and now operates a blade factory in Cherbourg and a nacelle factory in Saint-Nazaire.

It has needed these facilities to provide the turbines for the Saint-Nazaire project and satisfy local content regulations. It has not won any additional turbine supply contracts for French projects so it remains to be seen whether it keep both factories open as GE starts to scale up production for its larger Haliade-X turbine,

#### Useful sources of information

- French Agency for the Environment and Control of Energy Consumption (ADEME) – (<u>www.ademe.fr</u>)
- French Wind Energy Association (France Energie Eolienne) – trade association representing wind energy in France (<u>https://fee.asso.fr/</u>)

# Offshore wind export markets

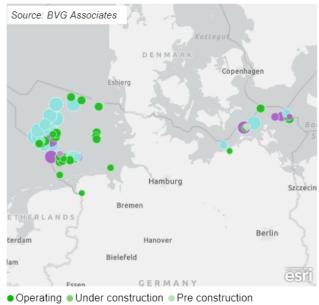
# 4.4. Germany

# The market

Offshore wind energy is a relatively young industry within Germany, since the country was slow to embrace offshore wind technology. Although it is now the second largest market in Europe, it did not install any commercial-scale projects until 2014. Between 2014 and 2019, about 1GW was added annually, though currently there is little activity due to the transition in price support from FITs to CfDs. Germany currently has around 8GW of installed offshore wind capacity.

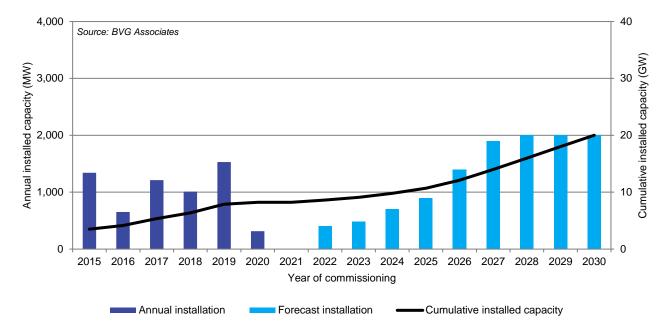
Germany's EEZ covers a part of the southern North Sea and a small area in the southern Baltic Sea. Most of the area has shallow water depths so is unlikely to develop floating projects before 2030.

Projects are developed through single-stage Government tenders. The Government carries out preliminary environmental assessments for pre-selected sites. It then holds leasing tenders and provides developers with the information needed to bid. Successful bidders then enter a CfD price auction bidding on an electricity price per MWh. Winning projects also receive a grid connection paid for and built by the proactive German TSOs 50Hertz and TenneT. This approach allows the TSOs to proactively develop a shared offshore grid. Germany has targets of 20GW of installed capacity of offshore wind by 2030 and 40GW by 2040. It is expected to meet these targets and there are concerns in the industry that they are not ambitious enough given the cost reductions in other offshore wind markets. We forecast it will have 20GW of offshore wind installed capacity by 2030.



Consent approved 
 Under development 
 Development zone

Figure 9 Map of projects in Germany by development status (bubble sizes scale with project capacity).



#### Figure 10 Offshore wind market forecast for Germany

#### Local content policies

Germany has no formal local content policies or requirements. Under the previous price-support regime, local content was not a consideration. Despite this, Germany projects have tended to use German suppliers where possible, as there is a strong trust in local competence.



Germany is currently transitioning to a CfD price support scheme and it is possible that local content requirements or incentives may be introduced. It is trying to accelerate its offshore wind industry after a period of inactivity, so it is unlikely that any local content requirements will be very restrictive.

## **Competitive business practices**

The official language in Germany is German, although English is spoken by many and is frequently used in business when dealing with foreign companies.

Germany has the largest economy in the EU and there are no significant differences in German business practices for Norwegian companies to be aware of.

It is very open to working with foreign businesses and has a long history of working with Norwegian companies.

is seen as an easy place to do business. It has a ranking of 9 out of 180 countries in Transparency International's Corruption Perceptions Index, two places below Norway.

# Offshore wind supply chain

Despite its late market entry Germany was an early mover in offshore wind industrial development and so has had an established offshore wind supply chain. It has struggled in recent years from the stop-start nature of the German industry and has since been overtaken by other countries.

One of its strengths is in heavy industry, including steel production and fabrication. This notably includes monopile manufacturers EEW and Steelwind Nordenham (and its parent company, the steel plate supplier Dillinger). It is also home to SGRE's nacelle factory in Cuxhaven and two subsea cable factories.

Another strength is its high number of smaller companies designing and making specialised engineering products and sub-systems, many of which are active in the onshore wind energy market and may have transferrable technologies.

A relative weakness is its wider offshore engineering base which is partly linked to its lack of offshore oil and gas reserves and small offshore petroleum industry. None of the major European installers or EPCI contractors are based in Germany (most are Dutch or Belgian).

# Table 4 List of notable current offshore wind suppliersin Germany

Priority supply chain area	Suppliers	
EPCI contracting	50Hertz and TenneT (both TSOs but act as EPCIs for transmission systems)	
Subsea cables	NKT and Prysmian	

Priority supply chain area	Suppliers
Offshore substations	EEW
Smart structural technologies	Deutscher Wetterdienst, Fraunhofer Institute, Geo- Engineering, Ramboll, Tractebel Overdick
Vessels and equipment	Liebherr, MAN Energy Solutions, Meyer Werft
Installation equipment and support services	Menck
Maintenance and inspection services	Deutsche WindGuard Offshore, Deutsche Windtechnik, Muehlhan Wind Service

# Supply chains in similar industries

#### Offshore oil and gas

Oil and gas production in Germany is centred in the north of the country. Most oil and gas production comes from onshore reserves. The only offshore production of oil in German waters takes place in the Mittelplate, about seven kilometres off the North Sea coast. In 2019, Germany produced around 9MTOE of oil and natural gas.

While domestic production of oil in Germany has remained consistent within recent years, gas production has contracted considerably. Natural gas production in 2019 was around 50% of what it was in 2012. It is, however, anticipated that domestic gas production will increase as coal and nuclear energy sources are phased out. Gas plants will predominantly be fuelled by fossil natural gas until 2030 at the earliest. Germany, however, intends to move towards power-to-gas technology, which uses renewable energy to make synthetic gas, such as green hydrogen. This presents an opportunity for gas firms to enter the offshore wind market.

#### Shipbuilding and maritime

Germany has a strong and internationally competitive maritime sector. It is home to the Port of Hamburg which is regarded as one of the most important container shipping ports in the world. Germany owns around 4.4% of the world's shipping fleet in DWT.

Germany has the largest shipbuilding industry in Europe. It has, however, struggled in recent years due to declining demand for offshore vessels and competitive pressure from Asian shipbuilding nations. Germany has been able to retain demand for specialist, high quality vessels, such as research vessels and cruise ships. The coronavirus pandemic, however, is likely to cause investments decisions relating to new ships to be postposed or cancelled. This slump in demand is a concern for the German shipbuilding industry and may prompt shipping businesses to expand their offering and provide services to the offshore wind sector.

#### Steel-making and fabrication

Germany is the largest steel producer in the EU. It has a steel making capacity of 52 million tons per year and employs around 86,000 people. The steel produced in Germany is mainly used by the construction and automotive industries, with mechanical engineering and metal processing industries accounting for a smaller share of steel consumption. Most steel production takes place in west Germany.

Steel production in Germany began to fall in 2010 due to a drop in demand following the 2008 financial crisis. The industry managed to stabilise in the years that followed, despite increased competition within Europe and China. In recent years, however, the automotive industry has begun to realign itself with the transition to e-mobility. This has reduced the demand for steel as the automotive industry changes its technology. The economic downturn caused by the coronavirus pandemic is adding to these difficulties as demand remains weak.

# Potential new entrants

Offshore wind has been well-known for a number of years in Germany as it was one of the first countries to support the industry. Firms in similar sectors will have seen the industry stutter in recent years and so suppliers may have been put off.

The growth predicted in the coming years may tempt firms to enter the market, but there are unlikely to be many firms who might want to enter but have not considered it already.

# Profile of notable firms

# Prysmian

Prysmian is a cable supplier headquartered in Italy and is a market leader in offshore wind array and export power cables. It operates factories in a number of countries. In 2017 Prysmian acquired General Cable and its NSW subsea cable factory in Nordenham, Germany.

The factory has been successful thanks to its location (being close to the North Sea) and Prysmian have utilised the factory's experience and technical expertise synonymous for German manufacturing.

# Useful sources of information

 Federal Association of Wind Farm Operators Offshore (BWO) - Association that represents all companies that plan, construct and operate offshore wind farms in Germany. The BWO is the central contact on all questions concerning offshore wind energy (https://bwo-offshorewind.de/en/)

- Federal Ministry for Economic Affairs and Energy (BMWi) – Government Department setting energy policy in Germany (https://www.bmwi.de/Navigation/EN/Home/home.html
- German Offshore Wind Energy Foundation Foundation that consolidates the role of offshore wind energy and promotes its expansion in the interest of environmental and climate protection. It has established itself as a non-partisan, supra-regional and independent communication platform for the entire sector (<u>http://www.offshore-stiftung.de/en</u>).
- German Wind Energy Association (BWE) trade association representing wind energy in Germany (<u>https://www.wind-energie.de/</u>)



# 4.5. Netherlands

# The market

The Netherlands was one of the first countries in Europe to install offshore wind farms, building its first project in 1994. Since then, offshore wind in the Netherlands has been 'stop-start'. No projects were commissioned from 1996 to 2007. Then around 110MW were installed in 2007 and 2008. This was followed by a period of no instillations until 2015, since when it has seen several large wind farms installed. It currently has an installed capacity of 2.6GW.

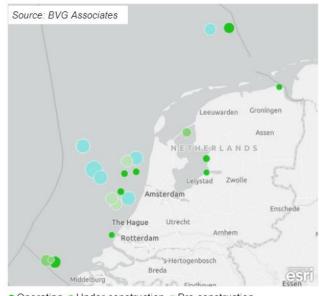
All of the Dutch EEZ lies in the southern North Sea with water depths mostly less than 50m. For this reason, it is likely that all offshore wind farms will be fixed-bottom with no floating projects.

The Dutch Government determines where offshore wind projects should be located. It conducts preliminary environmental investigations and then runs tenders where developers bid for the same sites. It is a single auction development process with auction winners awarded both a subsidy and a lease. Grid connections are provided by the Government and are proactively developed by the Dutch TSO, TenneT.

The Netherlands has recently held zero-subsidy auctions, where winners are determined based on a range of noncost criteria assessing developers' ability to deliver the project. It has held zero-subsidy auctions in 2018 and 2020, each awarding around 700MW.

After being slow to expand capacity, the Netherlands has made significant commitments to the growth of the

industry, which is able to do as it has a large area of suitable seabed. It has a target of increasing installed capacity to around 11GW by 2030 and is expected to meet its target based on its well-structured program of site leases and auctions, as well as its supply chain maturity. This aligns with its aims of achieving zero  $CO_2$  emissions from its electricity supply by 2050, similar to many European countries.



Operating 
 Under construction 
 Pre construction
 Consent approved 
 Under development 
 Development zone

Figure 11 Map of projects in the Netherlands by development status (bubble sizes scale with project capacity).

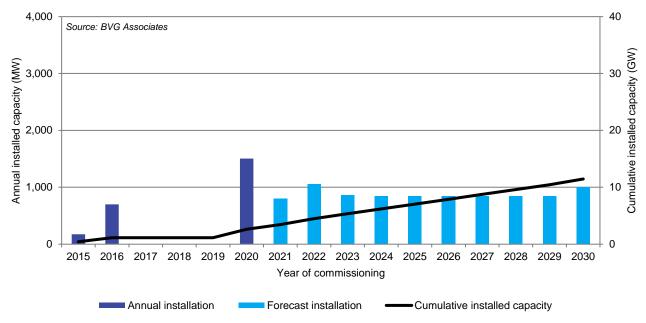


Figure 12 Offshore wind market forecast for the Netherlands.

# Offshore wind export markets

# Local content policies

The Netherlands has no formal local content targets or enforceable requirements for offshore wind farms. It has pursued a 'lowest cost' approach of building offshore wind farms. It aims for projects to have a very low cost of energy so that the subsidies offered by the Government can be as low as possible. It has recognised that it would not be able to achieve such low-cost projects (now zero-subsidy) if it imposed local content restrictions on developers.

# **Competitive business practices**

The official language in the Netherlands is Dutch. The majority of people in the Netherlands speak excellent English and it is often used in business.

The Netherlands is a small country so is experienced in working with companies from other countries, it is perhaps the most open of all countries, along with the UK, to work with companies from other countries. It tends to overlook any cultural differences with foreign companies. There are no significant differences in business practices between the Netherlands and most other countries in Europe. It is a very safe place to do business and is ranked by Transparency International as the 8<sup>th</sup> least corrupt country in the world.

As it is a member of the EU there are import tariffs and quotas on goods imported to the Netherlands from outside of the EU, although Norway receives preferential tariff rates as a member of the European Free Trade Association (EFTA).

# Offshore wind supply chain

The Netherlands has an established offshore wind supply chain that is strongly utilised in the European market and further afield.

It is particularly strong on marine contracting, with its established oil and gas and dredging industries. Dutch marine contractors frequently win contracts in Europe for offshore installation and manage large EPCI contracts.

It is also strong on steel fabrication for offshore wind farms. The market leader in monopile fabrication Sif, has two facilities in the Netherlands.

# Table 5 List of notable current offshore wind suppliersin the Netherlands

Priority supply chain area	Suppliers
EPCI contracting	Boskalis, Heerema, Seaway 7, Van Oord,
Subsea cables	TKF

Priority supply chain area	Suppliers
Offshore substations	Hollandia, HSM Offshore, Kersten Europe, Smulders, SPT Offshore
Smart structural technologies	Deep BV, DTN, GSO, IV Groep, KCI, KNMI
Vessels and equipment	Ballast Nedam, Gusto MSC, Huisman, KenzFigee, Royal IHC, Tetrahedron, Van Aalst
Installation equipment and support services	Lift-Tex Industrie, Schuerman Sea Fastening, Sledge Hammer, Royal IHC
Maintenance and inspection services	Acta Marine, C-Bed, C- Ventus

# Supply chains in similar industries

## Offshore oil and gas

The oil and gas industry in the Netherlands is established in the southern North Sea, producing around 28MTOE of oil and natural gas in 2019. The country mainly produces natural gas and is one of Europe's biggest gas producing countries. Its largest producer is the global oil company Shell.

In recent years, production has decreased significantly, with natural gas production in 2019 around 40% of production in 2012. This may lead to firms in the Dutch oil and gas market looking to enter the offshore wind market.

#### Shipbuilding and maritime

The Netherlands has a strong industrial base in dredging and many of the marine contractors active in offshore wind have previous experience in dredging. It also has a strong freight shipping industry and is home to the Port of Rotterdam. It is the largest cargo port in Europe and is a key transit point for goods transportation to and from inland Europe.

It has a long history in shipbuilding and the industry is still worth around \$5 billion per year. It manufactures mainly dredging and offshore support vessels, by the likes of Damen, Feadship (Royal Dutch Shipyards) and Holland Shipyards.

There may be firms from the Dutch shipbuilding and maritime sectors looking to enter the offshore wind sector as the industry grows and the demand for support vessels increases.



#### Steel-making and fabrication

The Netherlands has an established steel-making industry with a capacity of 7 million tons per year. The fabrication industry in the Netherlands is also strong. It produces small steel parts and components for a number of industries, in addition to larger more complex steel structures.

Many of the steel manufacturing firms in the Netherlands are active in offshore wind already, producing foundations and substations.

## Potential new entrants

The offshore wind industry is mature and well-known in the Netherlands. Firms in similar industries like oil and gas and shipbuilding will have seen the growth of the industry for a number of years. This means that there are unlikely to be many firms who might want to enter OW who have not considered it already.

The experience and scale of the supply chain in western Europe across other countries like Denmark, Germany and the UK means that, while the industry is growing, it will be hard for new firms to enter the offshore wind market. This is the case particularly for steel fabrication for which competition in Europe is high.

## Profiles of notable firms

#### NOV

NOV (previously National Oilwell Varco) is an American company that works primarily in the US oil and gas industry. It manufactures equipment used in drilling and production and also provides oilfield services. In 2018 NOV acquired GustoMSC, a Dutch company providing vessel design services to the oil and gas market. GustoMSC also had some exposure to the offshore wind industry, designing offshore wind installation vessels and maintenance vessels.

GustoMSC is now one of the leading vessel designers in the offshore wind industry and has benefited from NOV's extensive offshore experience. Its global brand has also improved GustoMSC's exposure and its backing makes GustoMSC a more attractive option to its clients.

#### Sif

Sif is a Dutch steel fabricator but is relevant to mention. It has previously provided jackets for the oil and gas industry but now mostly provides monopiles for offshore wind farms. It is one of the largest monopile manufacturers in Europe.

Sif's success in the industry is driven mainly by its willingness to invest in its facilities. Monopile fabrication is a more automated process than fabricating lattice steel structures like jacket foundations. The capability of rolling and welding machinery is therefore crucial to competitiveness. Sif has continually invested in its machinery allowing it to produce larger diameter monopiles with faster welding and at greater volumes. This has allowed Sif to keep pace with growing demand.

#### Useful sources of information

- Netherlands Enterprise Agency useful information about trade in the Netherlands (<u>https://english.rvo.nl/topics/sustainability/offshorewind-energy</u>)
- Netherlands Wind Energy Association trade body covering wind energy in the Netherlands (<u>https://www.nwea.nl/</u>)
- OffshoreWIND.biz covers worldwide offshore wind news and contains information about many Dutch suppliers (<u>https://www.offshorewind.biz/</u>)

# Offshore wind export markets

# 4.6. Taiwan

# The market

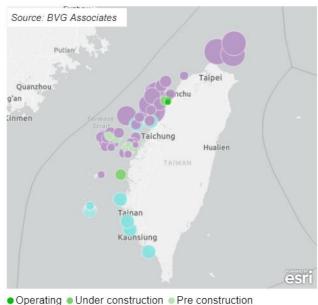
Taiwan has emerged as one of the leaders of offshore wind industry within Asia due to high wind speeds and favourable government commitments. It currently has around 130MW of installed capacity and this is expected to grow significantly in the coming years.

Taiwan's east coast has very deep water, but its west coast is shallower and this is the location of all of all of its projects in development and the few which have recently been commissioned. The majority of the market will be fixed with few floating projects.

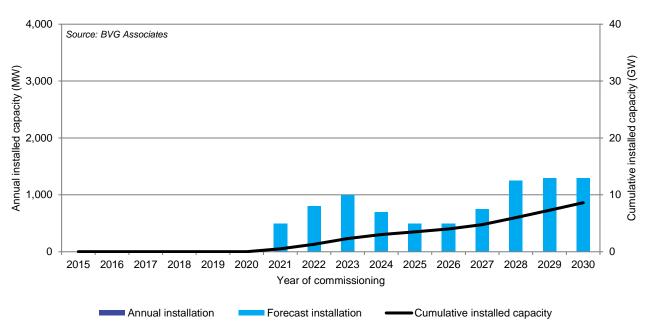
Offshore wind farm sites are awarded to developers through auction. Particular sites are identified by the Government and developers are invited to register interest. The developer is then obliged to obtain several permits and authorisations before it can construct the wind farm. Renewable generation in Taiwan is supported by a FIT scheme. The FIT scheme is managed by Taiwan Ministry of Economic Affairs, which defines the FIT rates on a yearly basis. Developers can also sell power directly to end users through private PPAs.

Taiwan has ambitious offshore wind targets and aims to have 5.7GW of offshore wind installed capacity by 2025.

We forecast Taiwan will have just over 4GW of offshore wind by 2025 and will reach its 5.7GW target a year or two later. We expect the industry to continue to grow steadily to around 10GW by 2030.



Consent approved 
 Under development 
 Development zone



# Figure 14 Offshore wind market forecast for Taiwan

## Local content policies

Taiwan has developed its offshore wind strategy with a clear focus on the local industrial development benefits of being a first-mover. Its stated ambition is to become "the green energy development centre of Asia". It aims to

establish a Taiwanese supply chain that will export to the Asia-Pacific Market.

Taiwan currently has amongst the highest local content requirements for offshore wind projects and developers with allocated capacity must submit localisation plans that cover specific, designated components before obtaining

Figure 13 Map of projects in Taiwan by development status (bubble sizes scale with project capacity).



consent. These policies require additional investment and collaboration between developers and local manufacturers to build supply chain capability enough to build projects while meeting localisation requirements.

The current policies have been successful in driving investment in the Taiwanese supply chain. The existing system is expected to evolve in the coming years when there is a greater focus on cost and other nearby markets develop their supply chain capabilities.

#### **Competitive business practices**

The most widely spoken language in Taiwan is Mandarin (a subtle variation to the Mandarin spoken in China) although English is fairly well spoken. English literacy rates have been increasing in recent years and there was a plan in 2020 to have English added to the list of national languages, but this did not come to fruition.

The culture in Taiwan places a high value on forming strong relationships. Hierarchy plays a significant role in the Taiwanese business culture, which can lead to delays in the decision-making process, although procedure and following protocol is of lower importance than it is in other Asian countries like Japan and South Korea.

Taiwan has a ranking of 28 out of 180 countries in Transparency International's Corruption Perceptions Index. This is one of the highest in Asia but slightly lower than many countries in western Europe.

#### Offshore wind supply chain

The infancy of Taiwan's offshore wind industry means that the experience of its existing supply chain is limited. The focus on local content has meant that a number of offshore wind suppliers have plans of establishing themselves in Taiwan. Both SGRE and Vestas are developing nacelle and blade factories in Taiwan respectively.

On foundation manufacturing, two European steel manufacturers have partnered with local companies for foundation manufacturing in Taiwan. Danish steel fabricator Bladt has established a JV with Century Wind Power (a subsidiary of the Taiwanese engineering company Century Iron and Steel Industrial) called Century Bladt Foundation. The JV is in the process of constructing a monopile and jacket factory that is expected to open shortly. Taiwanese engineering contractor Formosa Heavy Industries has worked with German monopile manufacturer Steelwind Nordenham to supply monopiles to the Yunlin project. Table 6 List of notable current offshore wind suppliersin Taiwan.

Priority supply chain area	Suppliers
EPCI contracting	CSBC Shipbuilding, Formosa Heavy Industries, Star Energy, Seaway 7, TECO Electric & Machinery
Subsea cables	
Offshore substations	Fortune Electric, TECO Electric & Machinery
Smart structural technologies	
Vessels and equipment	CSBC Shipbuilding, HungHua Construction, Woen Jinn Harbor Engineering
Installation equipment and support services	
Maintenance and inspection services	CWind Taiwan

#### Supply chains in similar industries

#### Offshore oil and gas

Taiwan has very limited domestic energy resources and a very small offshore oil and gas industry. It predominantly relies upon imported oil, coal and natural gas as its main source of energy, with nuclear and renewable sources contributing in a small part.

#### Shipbuilding and maritime

As an island nation, maritime industries are an important part of Taiwan's economy. Much of this activity is centred around maritime transport and commercial fishing. Through its rapid industrialisation, it has positioned itself as a key shipping and logistics hub for the Asia-Pacific region. Taiwan owns around 2.5% of the world's shipping fleet by dead wight tonnage.

There is a small shipbuilding industry in Taiwan. CSBC is the country's largest shipbuilding enterprise. It produces military vessels and container ships. It has also recently entered a joint venture with DEME Offshore to produce the first Taiwan-build heavy-lift offshore wind instillation vessel. Other yards are significantly smaller and can produce small commercial ships, patrol boats and research vessels. The industry has, however, struggled to keep pace with neighbouring Asian nations and has lost market share in recent years.

#### Steel-making and fabrication

Taiwan has an established and growing steel industry. It has a steel making capacity of 29 million tons per year. The fabrication industry in Taiwan is also strong. As such, steel production supplies construction, infrastructure, shipbuilding, automotive and machine manufacturing industries.

Taiwanese steel production showed steady growth between 2009 and 2014, prompting an expansion in manufacturing capacity. Production has levelled out in recent years with production consistently outpacing consumption. Between 2015 and 2019, an average of 22 million tons of steel was produced per year. The coronavirus pandemic has, however, reduced demand and steel output has fallen.

# **Potential new entrants**

The priority of local content over lowest cost in the Taiwanese offshore wind industry means that there is a large demand for Taiwanese suppliers. While this reduces the opportunity for Norwegian companies to export to Taiwan, there is a large opportunity for Norwegian firms to develop partnerships with Taiwanese companies to service the local market(s).

The size of its steel-making and fabrication industries means that there may be further local suppliers looking to enter the offshore wind market potential in similar supply chain categories, for example foundation and substation manufacturing.

# Profiles of notable firms

# Copenhagen Infrastructure Partners

Copenhagen Infrastructure Partners (CIP) is a Danish investment company that owns and develops wind farms. It is currently involved in developing offshore wind projects in markets that include Germany, South Korea, Vietnam and the US (although rarely as the sole owner). It focuses mainly on projects outside of Europe.

CIP opened a Taiwanese project office in 2017, at an early stage of the market's development, and has grown to become one of the most active developers. The reason for this is primarily due to its readiness to work with local companies. It has announced partnerships and MOUs with a number of organisations including CECI Engineering Consultants and Reiju Construction, and launched an apprenticeship scheme for turbine technicians at a local university.

This approach means that CIP is well placed to meet the local content requirements and establish itself as one of the

prominent owners and stakeholders in the Taiwanese offshore wind industry.

## DNV

DNV (previously DNV GL) in one of the largest classification bodies in the world. Based in Norway it delivers testing, certification and technical advisory services to energy industries including offshore wind.

It has recently entered the Taiwan Offshore Wind Project Certification Alliance (TOWPCA) set up by the Taiwanese Government to promote the local supply chain. DNV's key to success in Taiwan not only stems from its extensive experience in offshore wind farm development, but also from its commitments to cultivate strong partnerships with the local supply chain and engage local talent to create a thriving job market in Taiwanese offshore wind industry.

# Useful sources of information

Asia Wind Energy Association – trade association promoting wind energy in Taiwan and Asia (<u>https://www.asiawind.org/</u>)



# 4.7.UK

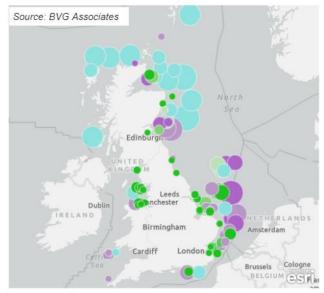
The UK offshore wind industry is the most developed in the world, with a total installed capacity of around 11GW at the end of 2020. The UK installed its first offshore wind project in 2000 and the industry has grown steadily since.

Most offshore wind farms have been built in the North Sea and a few in the Irish Sea due to the shallow water depths, favourable ground conditions and high wind speeds. This continues to be the location of most new projects, although developers are now developing and building projects off the east and north coasts of Scotland too.

Almost all offshore wind projects installed to date have been fixed bottom (primarily using monopiles), with two pre-commercial floating projects installed.

Offshore wind farms in the UK are funded through Contracts for Difference (CfD) auctions that are run by the Department for Business, Energy and Industrial Strategy (BEIS) and its delivery partners. The first auction took place in 2014 and they are held every two years.

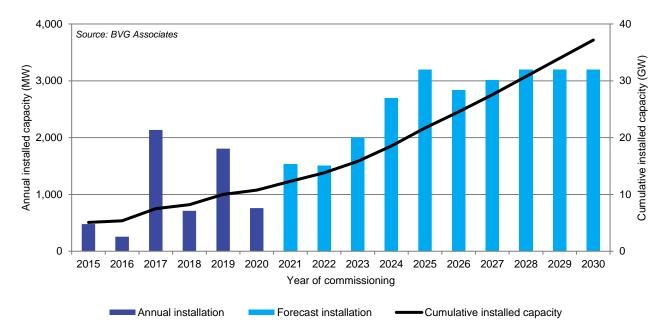
In England and Wales, leases for offshore wind farms are awarded through auctions held by The Crown Estate in England. The fourth leasing round, "Round 4", was completed in February 2021 and was a very competitive process awarding around 8GW of capacity. Leases in Scotland are awarded by Crown Estate Scotland, with the first "ScotWind" auction taking place in 2021 after being heavily delayed. The UK Government has set a target of achieving 40GW of installed offshore wind capacity by 2030 amid the wider goal of becoming net zero by 2050. Installing approximately another 30GW in the next 10 years will require major upgrades of the national grid. We forecast that the UK will get close to this target and will have 37GW of offshore wind by 2030.

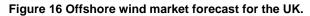


Operating 
 Under construction 
 Pre construction

 Consent approved 
 Under development 
 Development zone

# Figure 15 Map of projects in the UK by development status (bubble sizes scale with project capacity).





#### Local content policies

The UK currently has a local content target of around 50% across the lifecycle but this is not enforceable and there is

no checking against what was proposed during the planning stage.

Low local content in the UK has been seen by the Government as an issue, as it feels developers are not

# Offshore wind export markets

sticking to their targets and industry is not doing its part to invest in UK jobs.

It has a target of 60% local content for projects installed from 2030 onwards as part of the offshore wind sector deal announced in 2019. Local content regulations are expected to have stronger (some) enforcement measures in future lease and CfD rounds.

## **Competitive business practices**

The official language in the UK is English which is spoken in business. The UK is generally very open to foreign contractors and foreign investment in UK firms, it is perhaps the most open of all countries, along with the Netherlands, to work with companies from other countries. It has a ranking of 11 on the Transparency International Corruption Perceptions Index, a few places below the Netherlands and Germany.

There are no significant differences in business practices between the UK and the rest of Europe and it tends to overlook any cultural differences with suppliers from other countries.

The UK left the European Union in 2020 and no longer follows EU trade rates and tariffs. The trade agreement between the UK and the EU provides for zero tariffs on goods. The UK signed a trade continuity agreement with Norway in December 2020 that ensures 95% of goods trading with Norway will stay tariff-free. The agreement came into force in 2021.

#### Offshore wind supply chain

The UK has an experienced supply chain for offshore wind and is particularly strong in development and design activities. Most of the major European developers have well-staffed offices in the UK, as do many of the engineering firms active in offshore wind farm design.

It has more limited capabilities in balance of plant manufacturing, with much of the heavy steel fabrication now outsourced to Europe, the Middle East and Asia. This may change in the next few years as the UK Government is looking to boost local content and incentivise companies to establish tier-one offshore wind manufacturing facilities in the UK.

# Table 7 List of notable current offshore wind suppliers in the UK.

Priority supply chain area	Suppliers
EPCI contracting	Siemens Energy
Subsea cables	JDR Cables
Offshore substations	GE Power, Siemens Energy

Priority supply chain area	Suppliers
Smart structural technologies	Atkins, COWI, DNV GL, Fugro, Gardline, Horizon Geosciences, Met Office, Ramboll, StormGeo, TNEI
Vessels and equipment	Seajacks, Bibby Marine, CWind
Installation equipment and support services	SMD, Osbit
Maintenance and inspection services	Briggs Marine, CWind, James Fisher Marine Services (EDS HV), Global Wind Service, Worley (3Sun)

## Supply chains in similar industries

#### Offshore oil and gas

The UK has an established oil and gas industry which produced around 90MTOE of oil and natural gas in 2019. The majority of oil and gas production comes from offshore fields in the North Sea. The UK has one of the largest petroleum industries in Europe.

Oil and gas production within the UK has been fairly consistent in recent years. Between 2012 and 2019, oil production increased by 16% and gas production increased by 1%. In 2019, the upstream oil and gas sector is projected to have supported around 270,000 jobs in the UK. The global coronavirus pandemic has significantly impacted the oil and gas industry and has caused large petroleum players to accelerate their move into the UK offshore wind market, particularly BP.

#### Shipbuilding and maritime

The UK has a rich maritime heritage and the sector contributes around £19 billion to the UK economy. It has a number of large freight shipping ports, including Felixstowe and Southampton. In addition, the UK owns around 2.6% of the world shipping fleet in dead-weight tonnage (DWT) and has a cluster of maritime business services to support its international shipping sector.

The shipbuilding industry in the UK is negligible. There are a small number of shipyards engaged in building large ships but mainly specialise in the production of specialist research vessels and warships. Key suppliers include Babcock International, BAE Systems, Cammell Laird, Ferguson Marine, Harland and Wolff and Rolls-Royce. Several of these shipyards have already provided services to the offshore wind industry.



#### Steel-making and fabrication

The UK has a long-standing steel-making industry. It has a steel-making capacity of 12 million tons per year and employs around 32,000 people. The domestic supply of steel is used for the fabrication and manufacture of steel products across several industries, including automotive, construction, infrastructure and energy.

The steel industry has been in decline for several years. Overcapacity in EU steel-makers and competition from Asian suppliers made more expensive UK-produced steel less competitive. This notably caused the Redcar steelworks to close in 2015 which was followed by other steel-makers reducing their UK production capacity. Combined with uncertainty over Brexit and the resulting trade tariffs, the UK steel-making industry has struggled to recover.

#### Potential new entrants

The anticipated growth of the UK offshore wind industry and ambitious targets for local content mean that there is likely to be a large number of new entrants.

Steel fabrication in the UK is highly politicised and is thought to be a key area of new supply chain development needed to meet the 60% local content targets. The Korean manufacturer SeAH has signed a Memorandum of Understanding to construct a monopile factory in the UK, and additional facilities are expected to be developed for turbine tower fabrication. The percentage value-added locally will be limited if non-UK steel is used.

The UK has a large number of oil and gas service providers that are looking to enter the offshore wind industry. They are likely to target offshore wind installations, operations, maintenance and service (OMS) substructure design, hydrogen production and the electrification of offshore oil and gas facilities.

# Profiles of notable firms

#### Siemens Gamesa Renewable Energy (SGRE)

SGRE was formed in 2016 by a merger between the two turbine suppliers Siemens Wind Power based in Germany and Gamesa based in Spain. SGRE has grown to become one of the market leading turbine manufacturers (along with Vestas and GE) and has the largest installed capacity of offshore wind turbines in the world.

In 2016, SGRE opened a factory in the UK to manufacture offshore wind turbine blades. It is still one of the largest blade factories in the world, and SGRE recently submitted a planning application that would double the factory's size and enable it to manufacture the latest 100m+ blades.

One of the reasons for the factory's success is its involvement with the local community. The factory is a large local employer with SGRE reporting in 2017 that over 95% of its employees lived within 30 miles of the factory. This is particularly important given the UK's priority of local content. It also has stimulated other business in the area and funds education programs through its partnership with the University of Hull.

## EEW OSB

EEW is a German global steel fabricator that manufactures monopiles and transition pieces through its subsidiary EEW SPC. In 2014 it bought a fabrication yard in Teeside in the UK with Danish steel fabricator Bladt Industries, Offshore Structures Britain (OSB). It was operated by both parties until 2017 when EEW took sole ownership of the site, becoming EEW OSB.

The factory has mainly been used to manufacture transition pieces which it supplied to UK and European offshore wind farms. In recent years, however, the orders allocated to the factory have slowed due to stiff cost competition from other fabrication yards elsewhere in Europe. In late 2020 the factory was mothballed due to having no more orders.

## Useful sources of information

- Department for Business, Energy and Industrial Strategy (BEIS) – Government department setting energy policy in the UK (<u>https://www.gov.uk/government/organisations/depart</u> ment-for-business-energy-and-industrial-strategy)
- Offshore Wind Growth Partnership publicly funded programme supporting supply chain growth (<u>https://owgp.org.uk/</u>)
- RenewableUK trade association for renewable energy in the UK (<u>https://www.renewableuk.com/</u>)

# 5. Emerging markets

# 5.1. Ireland

# The market

The Irish offshore wind market is currently in its very early stages with only 20MW installed. The industry is expected to grow in the next decade following increased focus on offshore wind from the Irish government.

The east and south east costs of Ireland have good wind resource coupled with large areas of shallow water suitable for fixed-bottom offshore wind farms. However, most of the seabed that is less than 60m deep is within 25km of land and we expect new sites will face scrutiny on the cumulative effects of visual intrusion. There are also considerable grid-related restrictions to overcome.

The west coast of Ireland has excellent wind resource but is mostly deep water, even close to shore. It has large potential for floating projects, but the good wind resource will be balanced by difficult sea conditions and a weak grid infrastructure. Floating projects are unlikely to be installed before 2030.

The process for developing offshore wind farms in Ireland is developer-led. Developers must identify prospective site locations and apply for a sea bed lease. Subsidy is either provided by corporate PPAs or by Renewable Electricity Support Scheme (RESS) auctions. These are auctionbased pay-as-you-bid allocation rounds. The first RESS auction was held in 2020, and was dominated by onshore wind and solar. It is likely there will be three or four more rounds by 2028, with offshore wind dominating and possibly having its own pot.

There a strong positive political drive and intent in Ireland towards renewable energy. The planning and allocation processes are still maturing, resulting in a lack of clarity in some areas. It has a target of 3.5GW of installed capacity by 2030. We expect this to be met by projects currently in the planning pipeline.



Operating 
 Under construction 
 Pre construction
 Consent approved 
 Under development 
 Development zone

Figure 17 Map of projects in Ireland by development status (bubble sizes scale with project capacity).

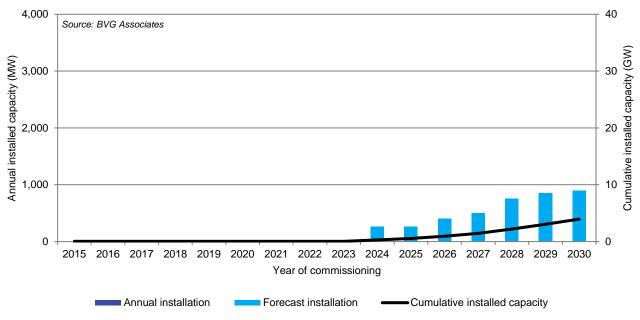


Figure 18 Offshore wind market forecast for Ireland.



## Local content policies

There is currently no requirement for Irish content as part of any of the consenting, grid or route to market processes. The Government seems to be realistic about the limited capability of the Irish supply chain and there is no expectation that policy will shift in this area.

## **Competitive business practices**

The working language is English for all business. Ireland is an outward looking country and dealing with non-Irish companies is completely standard practice. It is seen as a reliable country to do business with and has a ranking of 11 out of 180 countries in Transparency International's Corruption Perceptions Index.

There are no business practices that would significantly differentiate Ireland from any other northern European country. It is nevertheless a small country with a strong sense of social cohesion and building strong personal relationships with key stakeholders is good business practice.

# Offshore wind supply chain

The Irish supply chain has some capability for offshore wind projects, most of which is due to the cross over with other industries, such as onshore wind, vessel handling and subsea cabling.

Irish offshore wind projects are expected to rely heavily on the UK supply chain, however there is potential for Brexit to cause some disruption to this in the short term.

Ireland has a strong supplier base in the consultancy-type areas of the supply chain (including development and consenting, environmental, geology and hydrology, legal and tax) but has little in the way of heavy industry. Ireland has a reasonable ports infrastructure.

Priority supply chain area	Suppliers
EPCI contracting	
Subsea cables	
Offshore substations	Atkins
Smart structural technologies	Arup, DNV, Fugro, GL Gavin & Doherty Geosolutions, INFOMAR, K2 Management, Techworks Marine, Wood, XOCEAN
Vessels and equipment	Harland and Wolff

Priority supply chain area	Suppliers
Installation equipment and support services	
Maintenance and inspection services	Alpha Marine

## Supply chains in similar industries

#### Offshore oil and gas

There is a small petroleum industry in Ireland. Natural gas dominates production, with no commercially viable oil reserves. The gas fields are mainly located off the south coast of Ireland, except for the Corrib gas field to the west of the island. Vermilion Energy is the current operator of the Corrib gas field, while there are several major players engaged in exploration.

The outlook for the oil and gas industry in Ireland is unfavourable. The island is seen as a high-risk location for exploration due to the lack of commercial discoveries and regulatory and planning challenges. In addition, the government has recently passed legislation banning oil exploration and phasing out gas exploration. With the industry's inevitable decline, oil and gas players may look to enter the offshore wind market.

#### Shipbuilding and maritime

Ireland has a small maritime industry. As an island nation, it is dependent on ports and shipping services to transport goods. As such, commercial shipping dominates Ireland's maritime industry. Its geographical position, however, leaves it isolated from major European trading routes. It also has small tourism and fishing sectors.

Ireland has a rich history of shipbuilding. This is mainly owed to Belfast's Harland and Wolff shipbuilding yard which produced ocean liners throughout the twentieth century. The company's inability to adapt to changing marine requirements has led to financial difficulties, with the last ship being built in 2003. It has since been contracted to work on other heavy marine engineering projects, including offshore wind developments. This is, however, the last of Ireland's major shipbuilding yards.

#### Steel-making and fabrication

There is no significant steel-making industry in Ireland – it is limited to secondary fabrication facilities. This is mainly due to a decline in manufacturing and construction. Remaining steel fabrication activity is focused on niche production, such as agricultural machinery, material handling and process engineering.

# Potential new entrants

It is likely that any significant new entrants to the Irish offshore market will be existing global developers looking to partner or buy sites currently under development. There is only a slim chance at this stage that a developer can establish a new greenfield site and be operational by 2030 – they would need to have done a lot of preparatory work already to have any chance at all.

It is more likely that some major developers will set their sites on to gain first mover status for floating on the west coast.

It is expected that new entrants from both within Ireland and from overseas will materialise in the next few years to support the construction and eventual operations of the east coast projects that are successful in the second RESS auction in 2022.

# Profile of a notable foreign firm

XELLZ B.V. is a project logistics management provider based in the Netherlands.

In February 2020 it was announced that they had secured land at the Port of Rosslare in Ireland to establish an offshore wind supply base. They secured 200,000m<sup>2</sup> of land to facilitate a supply base for installation and operating companies for the near future offshore wind industry. In June they added a further 100,000m2 and stated the intention to create a Free Zone at the port to further ease the flow of goods on offshore projects. It also has interest in two port on the west coast.

XELLZ is a global logistics solution provider with offices in The Netherlands, Germany, USA, Africa, Belgium and Ireland. Their move into Ireland reflects the comment above regarding new entrants in the supporting services associated with offshore wind. It is a major investment of around 40-50million and was achieved through extensive stakeholder engagement at government, county and local level. The location of Rosslare is also strategically important for wind farms located off the west coast of the UK.

# Useful sources of information

Wind Energy Ireland – trade association representing wind energy in Ireland (<u>https://windenergyireland.com/</u>)



# 5.2. Japan

# The market

The Japanese offshore wind industry is at an early stage and currently has a total installed capacity of around 150MW. This mainly consists of small prototype or demonstrator projects under 20MW.

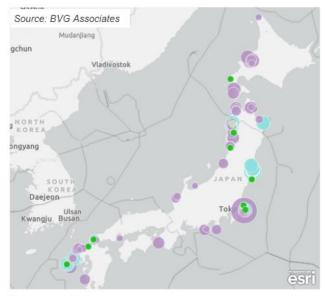
Japan has areas with shallow water depths suitable for bottom-fixed offshore wind but has a much larger potential for floating. The infancy of both the Japanese market and floating technologies means that most offshore wind farms installed by 2030 will be bottom-fixed, with floating becoming a greater proportion in later decades.

The Japanese Government selects areas suitable for offshore wind (called Promotion Zones), specifically the Ministry of Economy, Trade and Industry (METI) and the Ministry of Land, Infrastructure, Transport and Tourism (MLIT). The METI and MLIT will hold their first public auctions for Promotion Zone leases this year. Winning bids are selected based upon price, capability and local contribution. Price support is provided by a Feed-In Premium, consisting of a fixed feed-in price above the market price and a variable top-up price.

Japan has a target of generating 22-24% of electricity from renewable energy by 2030 (currently at around 18%) and is expected to meet this target.

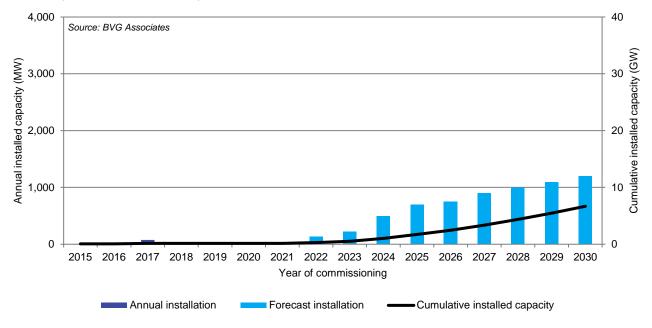
After a large joint industry Cost Reduction Study supported by a broad industry coalition, fronted by GWEC and JWPA and delivered by Mitsubishi Research Institute and BVGA, a serious acceleration is underway, consisting of industry dialogue to address key challenges, establishing a common long-term vision for industry growth, and improving the regulations and frameworks to facilitate offshore wind.

One early element of this has been a shared vision from the Council for Government-Industry Dialogue of 10GW offshore wind auctioned by 2030 and 30-45GW by 2040, aligned with a significant cost-reduction target to be delivered between 2030 and 2035. We forecast 7GW of installed capacity in Japan by 2030, with 0.5GW of this to be floating.



Operating 
 Under construction 
 Pre construction
 Consent approved 
 Under development 
 Development zone

Figure 19 Map of projects in the Japan pipeline by development status (bubble sizes scale with project capacity).





# Local content policies

The Council for Government-Industry Dialogue has set a vision for 60% Japanese content by 2040, and industry is working on recommendations based on UK processes to monitor local content.

The first auction indirectly weights local content and there is active consideration about how this process will be evolved in future. So far, small early offshore wind projects have used significant local supply, but at unsustainably high cost. Upcoming projects have higher imported content. As policies are not yet defined, it is too early to predict what, or how successful, they will be.

### **Competitive business practices**

English is spoken reasonably well in senior busines circles. Historically, the offshore wind sector in Japan has been relatively isolated, but many partnerships are now being established, especially between project developers and marine contractors.

With the 3<sup>rd</sup> largest economy in the world, Japan is just outside the top 10% with a rank of 19 in the Transparency International Corruption Perceptions Index. With a conservative, relationship-dominated culture, it can take time to establish trust with Japanese companies.

The keiretsu arrangement of conglomerates of companies with interlocking share holding arrangements, centred around a major bank, has limited competition between these conglomerates within domestic industries and has had an effect on limiting takeovers by foreign firms.

# Offshore wind supply chain

Japan has competence in design and manufacture HV electrical systems, subsea cabling, foundations (including floating) and vessels. Many of its industrial conglomerates could play significant roles in offshore wind.

### Table 9 List of notable current suppliers in Japan

Priority supply chain area	Suppliers
EPCI contracting	Deme, Hitachi Zosen, Van Oord, other Japanese conglomerates will supply
Subsea cables	Furukawa, Nexans, Sumitomo Electric (inc. J- Power Systems)
Offshore substations	Fuji Electric, Hitachi, Mitsubishi Electric, Risho Kogyo, Siemens, Toshiba
Smart structural technologies	Fugro, Kisojiban, Japanese Meteorological Agency

Priority supply chain area	Suppliers
Vessels and equipment	Daiichi Kensetsu Kiko, Fukada Salvage & Marine Works, Obayashi Corporation, Toa Construction, Penta-Ocean Construction
Installation equipment and support services	Nobody to mention in particular
Maintenance and inspection services	EOS Engineering & Service Co., Juwi Shizen Energy, Toda Corporation

# Supply chains in similar industries

### Offshore oil and gas

Japan has limited oil and gas reserves and a small petroleum industry. The main public-owned upstream oil and gas companies are Japex, JOGMEC and Inpex while private companies include Cosmo, Eneos and Idemitsu. Other key players include Marubeni, Mitsubishi, Mitsui, and Sumitomo.

In recent years, Japan's oil and gas production has been in decline. Between 2012 and 2019, oil production in Japan fell by around 30% and gas production fell by 16%. This is primarily due to a reduction in fossil fuel demand.

### Shipbuilding and maritime

Japan has a large maritime industry and has one of the largest freight shipping industries in the world.

It has the third largest shipbuilding industry in the world behind South Korea and China. Japan manufactures all types of vessels but specialises in chemical tankers, container ships and bulk carriers. The top shipbuilding companies include Imabari Shipbuilding, Japan Marine United, Mitsubishi Shipping, Namura Shipbuilding, Oshima Shipbuilding and Tsuneishi Shipbuilding. Japan is facing increased competition from China and South Korea which has forced a wave of consolidation in recent years, and the industry needs strong political backing to remain competitive.

### Steel-making and fabrication

Japan is the third largest steel-making country in the world, behind China and India, though production has declined slightly over the past ten years. The coronavirus pandemic has reduced demand significantly due to economic and



manufacturing slowdowns in related industries but will likely bounce back.

### Potential new entrants

There are likely to be suppliers active in the European offshore wind that establish themselves in Japan once some of the regulatory processes have been finalised. MHI Vestas is believed to be planning a Japanese blade and nacelle factory.

There are also likely to be a few of the large Japanese oil and gas, steel-making and steel fabrication firms enter the offshore wind industry but we are not aware of any firm plans at this point

### Profile of a notable firm

#### MHI Vestas Japan

MHI Vestas Japan is a joint venture between Japanese engineering company Mitsubishi Heavy Industries and the Danish turbine manufacturer Vestas. The two companies were previously in a partnership to manufacture offshore wind turbines, with Vestas acquiring MHI's share in the JV in 2020. The two companies have extended their partnership in Japan only, to expand the use of offshore and onshore wind in Japan.

The MHI Vestas JV has been one of the major offshore wind turbine suppliers, second only to SGRE. Although this JV has been disbanded, the Japan-specific JV is likely to be successful due to the combination of Vestas' technical turbine knowledge and MHI's experience of the Japanese culture and working in Japan, along with their experience working together.

- Japan Wind Power Association (JWPA) trade association representing wind energy in Japan (<u>http://jwpa.jp/index\_e.html</u>)
- Ministry of Economy, Trade and Industry (METI) and Ministry of Land, Infrastructure, Transport and Tourism (MLIT) – Government departments responsible for renewable energy policy in Japan (<u>https://www.meti.go.jp/english/</u>, <u>https://www.mlit.go.jp/en/</u>)

# 5.3. Poland

# The market

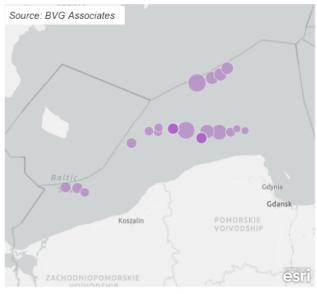
Poland currently has no offshore wind farms but has several projects under development. Poland's EEZ lies in the southern part of the Baltic Sea. The projects in development lie predominantly a maximum of 40km from shore, where site water depths are up to around 50m. This means that most of the Polish offshore wind market will use fixed-bottom foundations.

The regulatory framework in Poland is similar to the UK model where development is led by developers. Site leases are awarded to developers through tenders managed by the Ministry of Transport, Construction and Maritime.

Price support will be awarded through Contracts for Difference (CfD) allocations, the first round of which was confirmed in January 2021 when the Polish Parliament unanimously adopted Poland's first Offshore Wind Act. A CfD allocation for projects already in development will take place in 2021 that will award 5.9GW of capacity to those projects which meet set conditions by 30 June 2021. Two CfD auctions are planned for 2025 and 2027, that will be decided on price, each awarding 2.5GW.

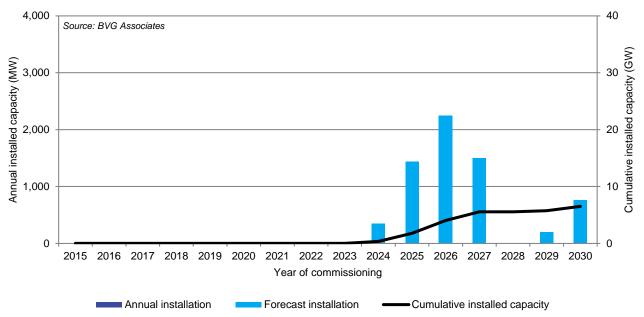
Poland does not have a specific target for achieving net zero, but it is heavily reliant on coal and on its current

trajectory it is unlikely to achieve net zero by 2050. We forecast that Poland will have 6.5GW of offshore wind installed capacity by 2030.



Operating 
 Under construction 
 Pre construction
 Consent approved 
 Under development 
 Development zone

Figure 21 Map of projects in Poland by development status (bubble sizes scale with project capacity).



### Figure 22 Offshore wind market forecast for Poland.

### Local content policies

There are no formal local content requirements in Poland. There is a requirement to submit a supply chain plan, with the applications for the allocation at end March 2021, containing commentary around competition, innovation and skills but also the freedom to talk explicitly about Polish content. The bringing forward of the allocations by about 18 months in 2020 means that there is little time to make local content changes beyond what is typical of the existing Northern European supply chain. There is considerable uncertainty whether there will be much Polish content or jobs realised by the first Polish offshore wind farms.



### **Competitive business practices**

The official language in Poland is Polish but English is used routinely when working with international companies. Site lease applications are required in English and Polish. Poland is ranked 45 on Transparency International's corruption perception index, lower than many European countries. Its current populist government is a risk to future levels of transparency.

In Poland's Soviet-era past, professionals were often suspicious of foreign business associates. It has since modernised and there are now few differences to the business culture in Western Europe, although personal relationships are still important to establish trust.

### Offshore wind supply chain

Poland has a small number of firms active in the offshore wind supply chain. This notably includes Teke-Fonika – Kabel, the Polish cable supplier that recently acquired UKbased JDR Cable Systems, the market leader in array cables. ST3 Offshore was a Polish foundation manufacturer but declared bankruptcy in 2020.

### Table 10 List of notable current suppliers in Poland

Priority supply chain area	Suppliers
EPCI contracting	
Subsea cables	Tele-Fonika Kable
Offshore substations	GOTECH, Mostostal Pomorze, Spomasz Smulders
Smart structural technologies	Ambiens, MEWO
Vessels and equipment	Crist, Damen Shipyards, Gdańska Stocznia Remontowa, Nauta-Hull, Poltramp Yard
Installation equipment and support services	
Maintenance and inspection services	Poland has no notable firms, but there are many Polish technicians who provide project support to offshore wind in other countries.

### Supply chains in similar industries

#### Offshore oil and gas

Poland has a small oil and gas industry and produced around 5MTOE of oil and natural gas in 2019. Natural gas accounts for most of its production. The majority of Poland's oil and gas reserves are found onshore rather than offshore. The Polish Oil and Gas Company (PGNiG), which is majority-owned by the government, is the largest domestic petroleum production company. Other key players include FX Energy, Grupa Lotos and PKN Orlen.

While oil production has increased in recent years, it is unlikely to grow further due to the county's limited reserves. In addition, legislation was passed in 2014 to encourage the development of shale-gas resources. Several domestic and international companies started operations, including Chevron, ConocoPhillips and ExxonMobil. However, economically recoverable volumes have been underwhelming, which has caused exploration work to be discontinued and investors to withdraw from Poland. The industry is likely to enter decline in the coming years.

### Shipbuilding and maritime

Poland's maritime industry is smaller than that of most European nations and is based around small-scale fishing and freight shipping. The shipbuilding industry in Poland is also small. While previously in decline, the 2008 financial crash almost halted the industry altogether. The few remaining shipyards produce mainly fishing boats and ferries.

#### Steel-making and fabrication

Poland has a modest steel-making industry. It has a capacity of around 12 million tons per year. ArcelorMittal is the largest steel producer in Poland. The steel industry in Poland has remained relatively stable over the past decade, despite competition from Asia and the introduction of US tariffs.

### Potential new entrants

There are few companies known to be establishing themselves in Poland, although Tele-Fonika Kabel is planning to expand into the export cable industry. There are a number of steel fabricators in Poland that could look to expand their offshore wind work including Spomasz Smulders and Energomontaż-Północ Gdynia.

It is unclear how many firms will establish Polish facilities when the industry evolves, although the existing European supply chain is likely to be strongly utilised.

### Profile of a notable firm

# ST3 Offshore

ST3 Offshore was a joint venture between MARS Closed-End Investment Fund and German company VTC Group (though ST3 Holding). It was based in Poland and fabricated MPs, TPs and jackets for the offshore wind industry. A major facility was purpose-built in 2015 to manufacture jacket foundations, although it is thought that the investment was not large enough to bring a step change to the efficiency of jacket manufacture.

ST3 only delivered two major jacket contracts, both for Ørsted, before being declared bankrupt in 2018. It is now under the control of the Polish Industrial Development Agency who recently put the yard up for sale.

The failure of the yard is mainly due to the competition in the steel fabrication industry. The specialised factory looked like a worthwhile investment on paper but struggled to win work amid competition from yards elsewhere in Europe, the Middle East and the Far East.

- Polish Offshore Wind Energy Society (PTMEW) trade association for wind energy in Poland (<u>http://www.ptmew.pl/en/home.php?lang=EN</u>)
- Polish Wind Energy Association (PWEA) trade association for wind energy in Poland (<u>http://psew.pl/en/</u>)



# 5.4. South Korea

# The market

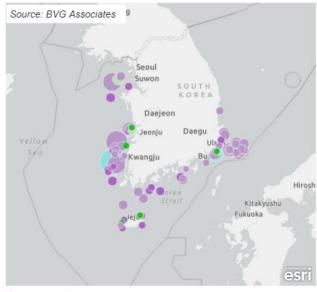
The offshore wind market in South Korea is currently in very early stages, with only 160MW of installed capacity. It does however have a large pipeline of projects and the industry has the potential to grow significantly in the coming decade.

South Korea's west coast has reasonably shallow water and will see mainly fixed-bottom offshore wind farms. Its east coast has deeper water and has great potential for floating, although few floating projects are expected to be commissioned before 2030.

The process for developing offshore wind farms in South Korea is developer-led. Developers must first acquire a temporary lease to collect metocean and other survey data and then a final lease to build and operate projects. They must also acquire all environmental permits via rather opaque processes and with a number of significant stakeholders typically not in favour of projects. Offshore wind projects must sell their electricity into the grid at the standard market price (corporate PPAs are not permitted). Subsidies are provided in the form of renewable energy certificates (RECs) awarded to renewable electricity generators that can be traded. Different technologies receive different multipliers for the RECs they are awarded (offshore wind has a high multiplier), but subsidy rates currently are too low and uncertain to facilitate financial investment decision (FID).

South Korea has high renewable energy targets but is a long way from delivering them. Government has an ambitious target of having 12GW of offshore wind installed

by 2030, but we forecast it will only have 6GW by this point. There is little alignment between Government and the international wind industry on the way forward for offshore wind. We anticipate that this year a process towards better Government-industry dialogue will start, which in time will lead to a clearer policy direction and better frameworks for leasing, permitting and revenue support. South Korean industry and Government recently announced an 8GW projects to be built off the south west coast.



Operating 
 Under construction 
 Pre construction
 Consent approved 
 Under development 
 Development zone

Figure 23 Map of projects in South Korea by development status (bubble sizes scale with project capacity).

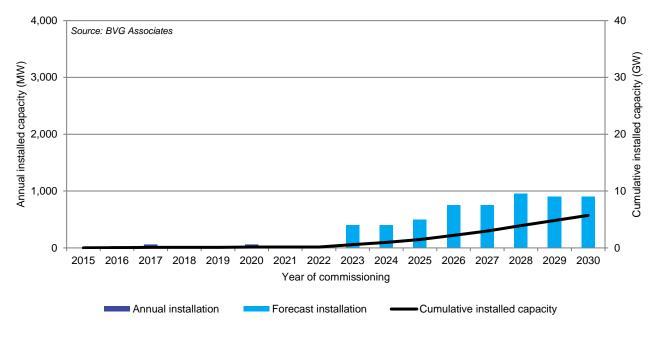


Figure 24 Offshore wind market forecast for South Korea

# Local content policies

There is no policy clarity in this area, but an understanding that currently Government would prefer to establish a strong local supply chain, including in turbines (for example, supplied by Doosan), despite the fact that this may drive the use of smaller technology and higher LCOE. It is likely that this will be a key area of the dialogue described above.

So far, for the small demonstration projects, there has been high local content, including 100% use of South Korean turbines, supplied by Doosan Heavy Industries and UNISON.

# **Competitive business practices**

Korean is the official language but English is spoken reasonably well in senior busines circles. The business landscape is dominated by giant, family-run conglomerates (referred to as 'chaebol'). Relationship and hierarchy are important, as is 'saving face' in any interaction.

With the 11<sup>th</sup> largest economy in the world, South Korea has a rank of 33 in the Transparency International Corruption Perceptions Index. With a conservative, relationship-dominated culture, it can take time to establish trust, but Koreans see themselves as relatively dynamic and straightforward. Many international players have partnerships in South Korea, as direct sales are hard to accomplish.

# Offshore wind supply chain

South Korea has exported towers, jacket foundations, steel plate and subsea cables. It has turbine suppliers with limited offshore wind experience, installation contractors and some installation vessels, though not suitable for largest turbines.

# Table 11 List of notable current suppliers in SouthKorea.

Priority supply chain area	Suppliers
EPCI contracting	Doosan, Hyundai
Subsea cables	LS Cable, Taihan
Offshore substations	Hyundai, Samkang M&T
Smart structural technologies	
Vessels and equipment	Daewoo Shipbuilding and Marine Engineering (DSME), Hyundai Heavy Industries, Samsung Heavy Industries

Priority supply chain area	Suppliers
Installation equipment and support services	
Maintenance and inspection services	KLEM

# Supply chains in similar industries

### Offshore oil and gas

South Korea has a negligible oil and gas industry due to limited domestic resources. Nearly all of South Korea's total petroleum and other liquids production, in 2019, was from refinery processing gains, non-conventional liquids, and biofuels production. The country relies almost entirely on crude oil imports to meet its demand.

### Shipbuilding and maritime

South Korea has a well-established maritime industry. It has five major container ports, including Busan which is the sixth busiest container port in the world. In addition, it owns around 4% of the worldwide shipping fleet by deadweight tonnage (DWT). The country also has a large fishing sector, but the maritime industry centres around shipbuilding.

It has the second largest shipbuilding industry in the world behind China. In 2020, it manufactured 33% of world's newly built large vessels. Daewoo Shipbuilding and Marine Engineering (DSME), Hyundai Heavy Industries and Samsung Heavy Industries are the top three shipbuilding companies in South Korea. In recent years, there has been fierce competition from China. This has led to market consolidation, but South Korea has remained competitive through efficient production and investing in technological capabilities. The industry is expected to remain strong in the coming years.

### Steel-making and fabrication

There is a large steel-making industry in South Korea with a capacity of 82 million tons per year. Domestic steel is supplied to the construction, automobile and shipbuilding industries. The leading three steel producers in South Korea are POSCO, Hyundai and Dongkuk Steel Mill.

Urbanisation and industrialisation drove demand for steel in the early part of the twenty first century and the industry grew as a result. The industry struggled considerably following the 2008 financial crisis due to weak demand in major steel-consuming sectors. The recovery and growth of these sectors, coupled with government-led stimulation policies, has sustained the industry in recent years. The coronavirus pandemic has created a significant downturn but it is expected to bounce back quickly. South Korean



suppliers have a reputation for high quality steel supply, which helps reduce manufacturing cost in offshore wind.

### Potential new entrants

It is likely that many of the large 'chaebol' conglomerates will enter the offshore wind market as it becomes more established (the likes of Lotte Corporation, Samsung Group and SK Group). All are experienced in engineering, construction and heavy steel fabrication so will likely enter the offshore wind industry as EPCI contractors, substation/steelwork suppliers or vessel manufacturers.

It is unclear whether Doosan, with its newly developed 8MW turbine, will play a major role in the offshore wind market against the larger turbines from elsewhere.

### Profile of a notable foreign firm

EEW is a German steel fabricator with presence in a number of markets, globally, that manufactures monopiles and transition pieces for the offshore wind industry. In 2001 EEW opened a steel pipe factory in Sacheon on South Korea's south coast which focuses on the production of small diameter pipework. In 2015 EEW opened a second factory in Gwangyang which the capability of producing pipework up to 5m in diameter, this is used in jacket foundations.

While neither factory produces complete products for the offshore wind industry, they are well positioned to expand their capabilities in the future. The success of EEW's factories in South Korea has been driven by playing to the strengths of the South Korean domestic industries, through using South Korea's world-leading steel plate suppliers like POSCO.

### Useful sources of information

Korea Wind Energy Industry Association (KWEIA) – trade association representing wind energy in South Korea (<u>http://eng.kweia.or.kr/</u>)

# 5.5.US

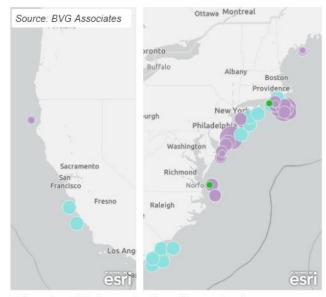
# The market

The US has been slower to develop offshore wind farms than Europe, installing its first 30MW offshore wind farm in 2016. It currently has an installed capacity of just 42MW but it has a large pipeline of projects in development. Statedriven offshore wind targets have exceeded 28 GW and are expected to result in over 40 GW of cumulative installed capacity by end of 2035. More than 9 GW of projects are well on track with offtake agreements, with ongoing solicitations enabling an additional 7 GW to follow by end 2021.

Most projects in development are off the east coast of the US, near the of Massachusetts and New York states, with water depths mostly less than 50m and therefore likely to use fixed-bottom foundations. The west coast of the US has deeper waters and so would only be suitable for floating foundations. Projects on the west coast are unlikely to be developed much before 2030. Maine is positioning itself as an incubator for floating projects.

The regulatory framework for offshore wind in the US is complex as the responsibility for offshore wind policy and regulation is split between states and the federal (national) government. The Bureau of Ocean Energy Management (BOEM) undertakes marine spatial planning and holds auctions for lease areas once development zones have been identified. Depending on the structure of the power sector, states encourage site development in different ways. Some, like New York, hold power purchase auctions for Offshore Renewable Energy Certificates (ORECs). Others, like Virginia, pass bills to require a proportion of retail electricity sales in the state to come from renewables according to a Renewables Portfolio Standard (RPS), which may also include requirements on utilities to build or acquire offshore wind. The site developer then submits a Construction and Operation Plan (COP) to BOEM to secure the necessary permits.

The US has no national target for offshore wind development, but some individual states like Massachusetts, New York and New Jersey have set ambitious targets. We forecast that the US will have a total installed capacity of 26GW by 2030.



• Operating • Under construction • Pre construction

Consent approved Under development Development zone

Figure 25 Map of projects in the US by development status (bubble sizes scale with project capacity).

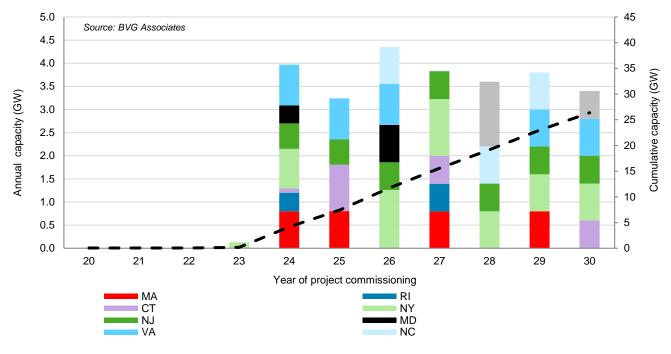


Figure 26 Offshore wind market forecast for the US.



### Local content policies

Each state decides how it will procure more renewables and whether it will specifically require an amount of offshore wind. Associated with that will be whether to require local content and what form that requirement will take.

Some states, like New York and New Jersey, are prioritising local content for its offshore wind farms. The approach in New York is to have auctions for Offshore Renewable Energy Certificates where successful bidders receive the price per MWh that they bid. In the two auctions held in New York to date, local content was given a 20% weighting in the scoring. Significantly, bids containing greater New York State economic benefits were successful including commitments to establish tower and foundation facilities in state.

Other states like Massachusetts and Virginia are pursuing a different approach and are prioritising lower cost offshore wind but with less explicit local content requirements.

### **Competitive business practices**

English is the nationally spoken language in the US, and its business practices are indistinguishable from Western Europe. It does have a strong focus on well-defined contractual agreements, and an active claim management process, especially in large projects including EPCI scope. It is well-experienced in working with foreign companies and is ranked 25 in Transparency International's corruption perception index (similar to France and Taiwan).

There are a few key tariffs and pieces of legislation in the US that preserve its economic interest. This notably includes the Jones Act which requires vessels which transport loads between US ports to be performed by Jones Act compliant vessels, owned and operated by US firms with mainly US citizen ownership. It is spurring creativity as to how offshore wind installation will be done. US wind farms will need feeder vessels compliant with the Jones Act to transport components to foreign installation vessels for many years to come as there are currently no US-built wind installation vessels (although one is currently under construction), unless a work around to the Jones Act can be found.

Another is its heavy tariffs on imported steel (but not fabricated steelwork). The policies have been successful in protecting the local steel making industry.

The US also uses patents to defend the interests of US manufacturers. This has been evident recently as turbine manufacturer GE's patent enforcements against Enercon have kept Enercon out of the US onshore market. GE is now involved in legal disputes with SGRE over patent infringements in their latest offshore turbines.

### Offshore wind supply chain

Given only 42MW has been installed, there is little indigenous supply chain with most hardware being imported. Procurement decisions are yet to be announced but those building the first wind farms are European developers and they are expected to use much of their existing supply chains, initially. Offshore wind turbine suppliers will establish O&M directly, with potential to seek specialist support from suppliers to the oil and gas industry in the US gulf coast. Table 12 lists the emerging supply chain.

Priority supply chain area	Suppliers
EPCI contracting	
Subsea cables	LS Cable (cores), Nexans
Offshore substations	Hitachi-ABB
Smart structural technologies	Atkins, Fugro, Kongsberg, Ramboll, Simrad, TerraSond, Tetra Tech
Vessels and equipment	2nd Wind Marine, All Coast, Crowley Maritime, Dominion Energy, MiNO Marine, Mobro Marine, NOV
Installation equipment and support services	Nobody to mention in particular
Maintenance and inspection services	GE, ULC Robotics

### Supply chains in similar industries

### Offshore oil and gas

The US is the world's leading oil and gas producer and produced around 1,615MTOE of oil and gas in 2019. It has large reserves both offshore and onshore, with most wells and platforms found in southern central states and the Gulf of Mexico. The top four oil and gas players in the US are Chevron, ConocoPhillips, EOG Resources and ExxonMobil. There is a significant oil and gas supply chain of manufacturers and contractors.

In recent years, the US has seen a rapid growth in the commercial upstream oil and gas industry. Between 2012 and 2019, oil production increased by 90% and gas production increase by 40%. The industry, however, has been hit by the coronavirus pandemic as demand for oil

and gas has slumped. It is anticipated that the industry will recover, but uncertainty remains as new administration seeks to move towards renewables and re-regulate the oil and gas industry. This is likely to slow growth and increase interest in suppliers transitioning to offshore wind.

### Shipbuilding and maritime

The maritime industry in the US is well established, with very large container ports located in California on the west coast and New York, Virginia and Georgia on the east coast.

The US has a declining shipbuilding industry. Faced with competition from subsidised foreign shipbuilding industries and a lack of governmental intervention, the US has seen a decline in production since the 1980s. The US remains the leader in naval shipbuilding, but its larger commercial ship yards have seen a continued fall in demand as they struggling to compete with Asian competitors.

### Steel-making and fabrication

The US is the fourth largest steel-making capacity in the world with a capacity of 110 million tons per year. The US steel industry is in a period of recovery. Following a decline in demand in response to the economic recession of 2009, combined with China's subsidised over-production of steel, the industry entered a period of decline. The previous administration introduced tariffs in 2018 to reduce the levels of imported steel and foster the growth of the domestic industry. This has led to increased investment and production of steel and a shift to newer technologies.

# Potential new entrants

There are many potential new entrants to the US offshore wind market given the substantial pipeline of projects. For subsea cables this includes Southwire, and Kerite (Marmon Utility).

From the oil and gas industry supply chain this could include: Haliburton, Slumberger, Baker Hughes and NOV (to a greater extent).

It is expected that steel making firms will establish foundation production facilities in the US, and leading German monopile manufacturer EEW is planning to build a monopile factory in New Jersey in partnership with developer Ørsted.

# Profile of a notable firm

# Welcon

Welcon, based in Denmark, is the world's leading manufacturer of offshore wind towers. It has joined with US company Marmen, one of the largest onshore wind tower manufacturers in North America, to manufacture offshore wind towers at the Port of Albany in New York State. The port development will begin in 2021 and the wind tower production is scheduled for the end of 2023. This in an example of a partnership that has multiple benefits. Welcon benefits from Marmen's experience of working in the US, its contacts and supply chain. Marmen is able to learn from Welcon's own skills and knowledge to grow its own technological understanding. It also meets state objectives of local content and growing the local supply chain.

- American Clean Power Association (ACP) trade association promoting renewables in the US (https://cleanpower.org/)
- The Business Network for Offshore Wind (BNOW) the largest and most used OSW "Supply Chain Connect" database (https://www.offshorewindus.org/supplychain/)
- Many individual states including Massachusetts, New York, Virginia and North Carolina have their own supply chain registration portals.



# 5.6. Vietnam

### The market

Vietnam currently has a total installed offshore wind capacity of around 150MW, with a further 200MW under construction. Most of these wind farms are located nearshore in intertidal areas and in the southern part of the country.

There are large areas in both southern and northern Vietnam with water depths suitable for fixed-bottom foundations, so it is unlikely it will see many floating projects by 2030. Several very large wind farms, each of several GW, are in development.

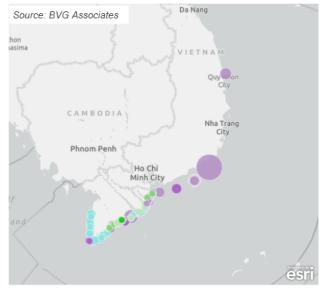
Much of the regulatory frameworks in Vietnam for offshore wind have not yet been established. The Ministry for Industry and Trade (MOIT) and Electricity Vietnam (EVN) have been undertaking detailed power planning, resulting in Power Development Plan 8 (PDP8) being published in draft form in early 2021. PDP8 sets a vision of 3GW of offshore wind by 2030 and 11GW by 2035.

Processes to secure seabed leases and project consents require developers to engage with multiple agencies and departments of Government at both central and Provincial level.

Price support is currently provided by FITs including an offshore wind tariff rate. To be eligible for these tariffs a project must reach commercial operation by November

2021. The Government has not yet set out a market mechanism that will apply after this date. Both FITs and auction approaches are being considered for the future.

We forecast that 5GW of offshore wind will be installed by 2030, higher than the 3GW draft target stated in PDP8.



Operating 
 Under construction 
 Pre construction
 Consent approved 
 Under development 
 Development zone

Figure 27 Map of projects in southern Vietnam by development status (bubble sizes scale with project capacity).

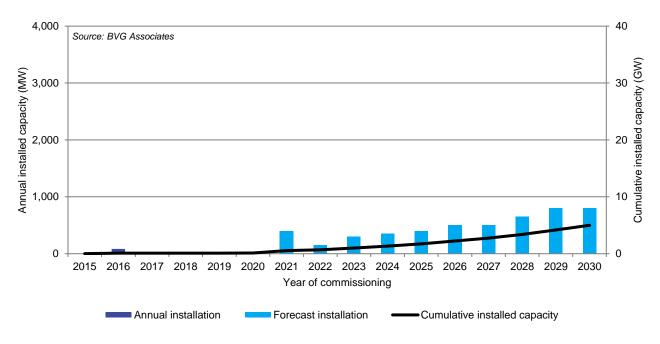


Figure 28 Offshore wind market forecast for Vietnam

# Local content policies

The Government recognises the opportunity for offshore wind to provide local economic benefit but has not put in place local content policies.

It is likely that developers will be required to support the development of a supply chain but there is no indication at this stage that this will include mandatory local content percentages.

# **Competitive business practices**

Vietnamese is the official language of Vietnam. English is spoken in international business dealings but is not universal. Translation and interpretation are often required in business transactions and in discussions with Government.

Vietnam has a modern and progressive international business outlook and many international businesses have operations there. It does, however, have a low ranking of 104 out of 180 countries in Transparency International's Corruption Perceptions Index which is lower than any European country.

It is a communist country, with a political system which can require patience and local guidance to get to know. Government decision making often requires several layers of authority to be respected.

Vietnam does not have the historical antagonism towards China that some other countries in east Asia have, so may be more willing to look to the Chinese offshore industry for supply than some of its neighbours.

# Offshore wind supply chain

Vietnamese companies have gained experience in delivering nearshore wind farms, but no conventional offshore wind farms in deeper waters have been constructed to date.

Vietnam does have experience in fabricating towers and transition pieces for offshore wind farms for the export market.

The multi-GW La Gan project in Vietnam recently signed a number of MOUs with local Vietnamese for foundation supply and port services.

# Table 13 List of notable current suppliers in Vietnam

Priority supply chain area	Suppliers
EPCI contracting	DEME, PTSC, Vietsovpetro

Priority supply chain area	Suppliers
Subsea cables	No suppliers in Vietnam.
	Installation: PTSC, Tan Cang Offshore Services, Thien Nam Offshore Services and Vietsovpetro
Offshore substations	ABB, Alpha ECC, Hyosung, PECC2, PetroVietnam Construction, PetroVietnam Marine Shipyard, PTSC, Vietsovpetro
Smart structural technologies	DNV-GL
Vessels and equipment	Alewijnse Marine Technology Damen Song Cam, Vuot Song Maritime
Installation equipment and support services	Huy Hoang Logistic & Transportation, PTSC, Vietsovpetro
Maintenance and inspection services	GE, DNV-GL SGRE, Vestas

# Supply chains in similar industries

# Offshore oil and gas

Over the past few decades, Vietnam has emerged as an important oil and natural gas producer in Southeast Asia. It has an establish petroleum industry, producing around 21MTOE of oil and natural gas in 2019. Nearly all of Vietnam's crude oil and natural gas reserves lie offshore, mostly in the basins off the country's southern coast. Oil and gas production activities are dominated by the state owned PetroVietnam (PVN). BP, Chevron, ExxonMobil, Zarubezhneft and several Asian national oil companies have formed partnerships with PVN.

The oil and gas industry in Vietnam is likely to continue to grow in the coming years. The country's rapid economic growth, industrialization and export market expansion has and will continue to drive demand. Vietnam has boosted exploration activities, introduced limited market reforms and attracted international investment in the oil and gas sector to accommodate growth.

### Shipbuilding and maritime

Vietnam has a growing maritime industry based around freight shipping. It has an extensive port infrastructure with



over 120 ports, of which 37 ports can accommodate ocean cargo vessels. With an average annual export growth of 12% the port infrastructure is in continuous development to facilitate this trend.

Vietnam is the world's fourth largest shipbuilding country. There are currently nine major shipbuilding factories across the country capable of producing a range of large vessels. The Government of Vietnam has ambitions to increase the global outreach of its shipbuilding capabilities. The overall outlook for the sector is promising, based on the competitive costs in the country.

#### Steel-making and fabrication

Vietnam has a rapidly expanding steel-making industry. It has a capacity of 24 million tons per year. The majority of domestic steel is supplied to the construction industry.

There has been a growing demand for steel in Vietnam over the past decade. This can be attributed to the country's rapid development, since the construction, manufacturing and infrastructure industries all require steel supply. The steady increase of steel demand has prompted investment in Vietnam's steel industry in recent years. While the coronavirus pandemic has cause demand to fall, it is anticipated that Vietnam's continued development and ability to export to Asian markets will sustain its growing steel-making industry.

### Potential new entrants

PetroVietnam (PVN) is a state-owned group with interests in oil and gas exploration, production, storage and distribution. Vietsovpetro is a joint venture between PVN and Russian state-owned oil enterprises.

Both PVN and Vietsovpetro have the capability and ambition to be a supplier to the offshore wind industry as a fabricator and EPCI contractor. They are known to be in the supply chain for several offshore wind projects that are in the development and pre-construction phases.

### Profile of a notable firm

#### CS Wind

CS Wind manufactures onshore and offshore wind turbine towers and transition pieces. It is headquartered in South Korea and has production facilities in China, Malaysia, Turkey and Vietnam.

CS Wind's Vietnamese production facility opened in 2003 and has successfully exported wind turbine towers across Asia and to projects outside of Asia.

CS Wind's success in Vietnam has been based on the presence of a highly skilled local workforce and the availability of good quality steel produced in Vietnam. Also key to its success in Vietnam has been establishing an export opportunity. Vietnam has only recently seen the emergence of an indigenous onshore wind market, and the development of the offshore market is at an early stage, so the wind tower production facility has been largely reliant on exports until recently.

### Useful sources of information

- Global Wind Energy Council relevant news on wind energy in Vietnam (<u>https://gwec.net/tag/vietnam/</u>)
- Vietnam Institute for Energy Transition Independent energy policy advisors in Vietnam (<u>https://vietse.vn/en/</u>)
- World Bank Group Offshore wind roadmap for Vietnam, authored by BVG Associates, to be published March 2021

(https://www.worldbank.org/en/topic/energy/publication/ expanding-offshore-wind-in-emerging-markets)

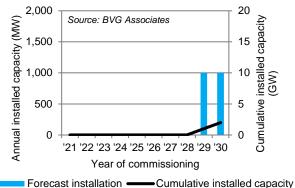
# 6. Potential markets

# 6.1. Australia

# The market

Australia has no offshore wind installed capacity but does have around 7GW of onshore wind. It has a single project under development but currently has no legislation or regulatory framework in place to build offshore wind farms.

Australia aims to reach net zero by 2050 but there is resistance to renewables at state and federal levels and it is trailing behind many developed countries in its renewable energy ambitions. We forecast that 2GW of offshore wind will be installed by 2030. The market will grow in later decades close to centres of demand, but progress may be slow given Australia's large onshore wind and solar resources. It does have plans of becoming a leading green hydrogen producer.



### Figure 29 Forecast for offshore wind in Australia.

# Local content policies

As yet, Australia has no policy position on offshore wind, but we anticipate an open market in due course. Large infrastructure projects must submit an Australian Industry Participation (AIP) plan describing how the Australian supply chain will be given a fair opportunity. In practice it is common to source some materials and services locally but collaboration with international companies is encouraged.

As a remote country with a relatively small population, Australia acknowledges that it does not have the critical mass for some industrial manufacturing industries and needs to import.

# **Competitive business practices**

Australia has no official language but English is almost universally spoken in business. It is seen as an easy place to do business and is 11 out of 180 in the Transparency International transparency index.

Business culture is straightforward and relaxed, and there is good openness to working with foreign companies. Many Norwegian companies are working in Australia already.

### Local supply chain

Australia has some experience in wind turbine manufacture and operation from onshore wind, but none in offshore wind. Its first offshore wind project (Star of the South) is progressing with mainly globally consultancies rather than local players. The project's developers are keen to develop the local supply chain during construction and operation.

### Other industry supply chains

### Offshore oil and gas

Australia has a well-established oil and gas industry, producing 151MTOE of oil and gas in 2019. The largest Australian oil and gas companies are BHP Billiton, Santos and Woodside Petroleum. International oil companies active in Australia include Chevron, Inpex, Shell and Total. Australia's oil production has been in decline for over a decade, while gas production has increased significantly. It is anticipated that oil production will continue to decline as the trend towards more gas and renewables increases.

### Shipbuilding and maritime

There is an established maritime industry in Australia, consisting of a wide range of activities including water freight transport, oil and gas extraction and passenger transport. The industry's main function centres upon the export of coal and other raw materials. Australia has a small shipbuilding industry. It constructs some defence and passenger ships, but most construction takes place in Asia.

### Steel-making and fabrication

Australia has a small steel-making industry, with a steel production capacity of 5.4 million tons per year. The two major steel makers are Arrium Steel and BlueScope Steel. The industry has declined since the financial crash in 2008, with increased competition from Asia and a high exchange rate compounding the industry's struggle. There are plans to reinvigorate the industry around green steel (using hydrogen instead of fossil fuels in the manufacturing process) beginning in the next few years.

# Potential new entrants

Players from parallel sectors could enter if the industry develops, particularly given that some of the foreign oil and gas companies active in Australia also develop offshore wind farms in Europe. Currently the pipeline of projects is not large enough to warrant significant investment.

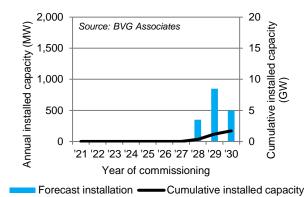
- Australian Renewable Energy Agency (ARENA) public body promoting renewables in Australia (<u>https://arena.gov.au/</u>)
- Star of the South Only offshore wind project in development (<u>https://www.starofthesouth.com.au/</u>)



# 6.2. Baltic States

# The market

The Baltic States of Latvia, Lithuania and Estonia currently have no offshore wind farms. The market in Lithuania is expected to develop first and its Government is making good process in developing the regulatory framework for offshore wind. It has an auction planned for 2023, and a target of installing 700MW by 2030. Estonia and Latvia are jointly developing a 1GW project but have no specific offshore wind targets and are expected to develop later. We forecast that the Baltic States combined will have around 2GW of offshore wind by 2030. All three countries are currently exploring their longer-term plans. There is a high level of cooperation between the countries.



# Figure 30 Forecast for offshore wind in the Baltic States.

# Local content policies

Estonia and Lithuania are working on local content policies, but none of the Baltic States have such policies for offshore wind now. Local content policies are in place for other renewable industries in the Baltics but are not overly restrictive to developers.

Confirmation of the local content policies is not expected for a few years as all three countries are in various stages of establishing regulatory frameworks for offshore wind. Estonia is the most advanced in this regard but cannot progress until its marine spatial plan has been finalised. Lithuania has experienced delays due to political changes.

# **Competitive business practices**

Each country has its own official language: Latvian, Lithuanian and Estonian. Levels of spoken English are good and it is often used in business, although public procurement tenders must be handed in in local languages.

The business practices in the Baltic States are similar to those in Western Europe. Businesses are very open to working with foreign companies, holding Nordic countries in particularly high regard. Many Baltic companies are more short term in their thinking than Norwegian companies may be used to.

Estonia is seen as the safest to do business with a ranking of 17 out of 180 countries in Transparency International's Corruption Perceptions Index. Lithuania and Latvia have rankings of 35 and 42 respectively.

### Local supply chain

The supply chain in Baltic States is currently very limited and there are no prominent Baltic suppliers active in the wider European market or further afield. The developers currently developing projects in the Baltics are local energy companies including Eesti Energia, OÜ Utilitas and Sunly.

### Other industry supply chains

### Offshore oil and gas

The Baltic States do not have notable oil and gas industries. They depend upon fossil fuels for their energy supply with most oil and gas products imported from neighbouring countries like Finland and Russia.

### Shipbuilding and maritime

The Baltic States have small maritime industries compared to their European neighbours. Generally, the industries centres around freight shipping and coastal tourism. They do not have significant shipbuilding capabilities.

### Steel-making and fabrication

There is a negligible steel-making industry across the Baltic States. Metal processing, machinery production and equipment manufacturing, however, form a significant part of their economies.

### Potential new entrants

By 2030 the potential market in the Baltics is likely to be small, around 2GW. This is unlikely to be large enough to facilitate significant supply chain growth in the 2020s. The limited sizes of similar industries in the Baltics mean that there are unlikely to be many companies from similar industries transitioning into the offshore wind supply chain. The main entrants to the offshore wind industry in the Baltics are likely to be a small number of energy companies that will look to become offshore wind developers.

Lithuania, is a major centre for fertilizer production, so although the electricity demand is not high, alternative uses for offshore wind may be useful to this industry.

- Lithuanian Wind Energy Association (LVEA) trade association representing wind energy in Lithuania (<u>https://lvea.lt/en/</u>)
- Estonian Wind Power Association (EWPA) trade association representing wind energy in Estonia (<u>http://www.tuuleenergia.ee/en/</u>)

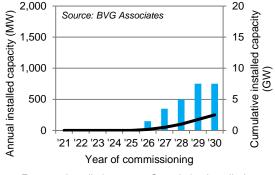
# 6.3.Brazil

# The market

Brazil has an established onshore wind industry of 16GW, and large solar PV and hydro industries, but currently no offshore wind operational. The Brazilian Government has published a draft roadmap for offshore wind and has asked the World Bank to deliver a roadmap also, to help industry and government align on a delivery target and to put in place the necessary policies and frameworks.

Brazil has an 'indicative' goal of net zero by 2060. It does not have any explicit targets for offshore or onshore wind, but both are predicted to grow in the coming decade. We forecast Brazil will have around 3GW of offshore wind by 2030. The opportunity is significant, but the case for offshore wind is not yet fully made as there is room for much onshore wind and solar still. A key consideration is that onshore wind potential is in the north, whereas greatest power demand is in the south, where there is also strong offshore wind potential.

A handful of early projects are being progressed, with developers hoping that sufficient permitting structure and revenue support are put in place to enable bankable construction of early projects in the mid-2020s.



Forecast installation ——Cumulative installed capacity

# Figure 31 Forecast for offshore wind in Brazil.

# Local content policies

Local content has been a significant consideration in onshore wind. A number of suppliers have set up locally following requirements for 60% local content in 2009 and in general the approach has been successful, due greatly to the scale of the local market. Local content requirements are in place for oil and gas (although are not restrictive) and additional local content policies can apply if finance is applied for from regional development banks.

It is likely that an approach of requiring some level of local content will also be used offshore.

# **Competitive business practices**

Brazil has the largest economy in South America and the 8th largest economy in the world. It is 94 out of 180 in the

Transparency International index, lower than any country in Western Europe.

The official language is Brazilian Portuguese and English is not widely spoken in business. Communication is relatively relaxed with verbal communication preferred to written. The business culture is similar to that in Europe but the subtle differences are significant. Building trust through personal contacts is key but takes a long time. Punctuality is expected from visitors, but local hosts can often be delayed and the bureaucratic procedures are complex to navigate.

# Local supply chain

Brazil has experience in onshore wind turbine component manufacture and assembly. Major turbine manufacturers GE, SGRE and Vestas all have manufacturing facilities in Brazil. It also has a large, experienced supply chains in steel fabrication from its strength in other sectors.

# Other industry supply chains

### Offshore oil and gas

Brazil has a well-established hydrocarbon industry and is the eighth largest oil producer in the world. Petrobras is the dominant local player, but most major foreign oil and gas companies are active in Brazil. Production has steadily increased over the past twenty years and is likely to continue with large untapped reserves.

### Shipbuilding and maritime

Brazil has a well-established maritime industry centred around commercial freight, oil and gas and shipbuilding. Most vessels produced are for the oil and gas industry. Government investments in recent years have helped shipbuilding to become a cornerstone of the Brazilian maritime industry.

# Steel-making and fabrication

There is a large steel-making industry in Brazil with a production capacity of 51 million tons per year. The country's capacity has grown over the past ten years to meet the steel demands of the construction, automobile, shipbuilding and oil and gas sectors. It is expected that the industry will continue to grow in the coming years.

# Potential new entrants

It is expected that established European suppliers will establish facilities in Brazil given the large potential market, likely introduction of local content requirements and wider regional market opportunities. European developers Equinor and Iberdrola have already publicised their interest in the Brazilian market and others are active.

# Useful sources of information

Summary of the Brazilian offshore wind potential published by EPE

(https://storymaps.arcgis.com/stories/1565a407d4a443029 e035b1844c8437b)

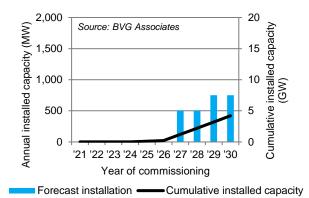


# 6.4. India

# The market

India has a large onshore wind industry, with around 38GW of installed capacity, but currently has no offshore wind. It planned to have a 1GW offshore wind tender in 2018 but this was delayed amid industry concerns over grid capabilities and a lack of clarity on the permitting process.

India has ambitious renewable energy targets which it has so far exceeded from non-offshore wind renewables. More recently it has set bold targets of installing 5GW of offshore wind by 2022 and 30GW by 2030. It is unlikely to meet these targets, but the Indian Government is now looking to set up new permitting and price support frameworks for offshore wind farms. It is working with the World Bank on a roadmap to finally get offshore wind moving following slow progress after two European interventions, the first starting in 2014. We forecast that India will have installed 5GW of offshore wind by 2030.



### Figure 32 Forecast for offshore wind in India.

### Local content policies

India's large onshore wind industry has driven a good amount of localisation. India imposed local content requirements for solar projects, but the impact on local industrialisation was not as great as anticipated.

As yet, the structure and criteria for offshore wind competitions has not been established, so it is unclear how local content policies will unfold. The World Bank will advocate competitive, cost-focussed processes rather than high local content. Onshore wind auctions have been highly competitive.

### **Competitive business practices**

Hindi is the official language of India, but states/union territories may have their own official language. English is widely spoken in senior business circles.

Relationships are key and hierarchy is important in business. There is a strong entrepreneurial, can-do attitude and there is an openness to working with foreign businesses. Despite being the 5<sup>th</sup> largest economy in the world, India is 86 out of 180 in the Transparency International index, lower than any country in Western Europe.

### Local supply chain

India has much experience in wind turbine manufacture and operation from onshore wind with GE, Suzlon and Vestas all manufacturing turbines in India. There are no Indian companies active in the offshore wind industry.

### Other industry supply chains

#### Offshore oil and gas

India has an established oil and gas industry, producing around 67MTOE of oil and gas in 2019 (similar amounts onshore to offshore). The state-owned Oil and Natural Gas Corporation (ONGC) is the largest oil and gas exploration and production company in India. With large reserves, high demand and favourable policies, the industry is set to continue to grow in the coming years.

#### Shipbuilding and maritime

India has an established maritime industry. The Government is investing in port facilities to cater for increasing traffic. India's shipbuilding industry has been in decline since the 2008 financial crash and a lack of Government support has hampered the industry's recovery. India still produces bulk carriers and defence ships across its 28 shipbuilding yards, but the decline is expected to continue without government support.

#### Steel-making and fabrication

India is the second largest steel-making country in the world, behind China, and has a steel-making capacity of 130 million tons per year. Key players include JSW Steel, Steel Authority of India Limited (SAIL) and Tata Steel. Indian infrastructure investment policies have driven the demand for steel by supporting the growth of Indian manufacturing industries. Demand is likely to continue growing in the coming years and continue to fuel India's steel industries.

#### Potential new entrants

While there are currently no Indian players in offshore wind, many companies in parallel industries will enter offshore wind as the market emerges (particularly those from the oil and gas, shipbuilding and maritime industries).

- Indian Wind Energy Association (InWEA) trade association promoting wind energy in India (<u>http://www.inwea.org/</u>)
- Ministry of New and Renewable Energy Government department responsible for renewable energy in India (<u>https://mnre.gov.in/</u>)

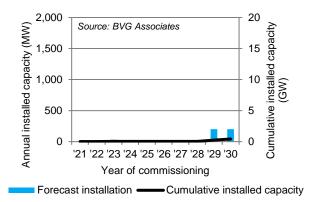
# 6.5. Italy

# The market

Italy has no installed offshore wind capacity. It has had several offshore wind projects proposed but all have been cancelled or delayed. Its first 30MW project at Taranto is under construction. The political attitude towards renewables in Italy is positive and it has an established onshore wind industry with 11GW of installed capacity.

There is currently no defined process in place for developing offshore wind farms in Italy and developers are at an early stage of establishing how to move forward with projects. The Government has been uncommunicative and current developers have low expectations for any streamlining of the process in the foreseeable future.

Italy has a target of reaching 19GW of wind installed capacity by 2030, of which 900MW will be offshore. Our forecast is lower, at around 400MW of offshore wind by 2030, due to the lack of clarity on the regulatory environment.



# Figure 33 Forecast for offshore wind in Italy.

# Local content policies

Italy has no local content policy for offshore wind but it has provided local content bonuses for the solar PV industry.

The Italian Government is trying to make renewable energy attractive to investors and so it is unlikely it will impose stringent local content requirements for offshore wind.

# **Competitive business practices**

The native language is Italian but English is commonly spoken in business. It freely works with foreign businesses and has a long history of working internationally.

Italy is seen as one of Europe's most corrupt countries. It has a ranking of 52 out of 180 in Transparency International's Corruption Perceptions Index, although perceived corruption in Italy has been falling in recent years and is mainly a problem in the south of Italy.

# Local supply chain

The offshore wind supply chain in Italy is limited. Its only suppliers active in offshore wind are Prysmian (market leading supplier of array and export cables) and Saipem (EPCI contractor and installer of substations and turbine foundations, with several fabrication yards).

Italy has an excellent reputation for machine tools and Davi is an important supplier of rolling equipment for the onshore and offshore wind industries.

# Other industry supply chains

### Offshore oil and gas

Italy has an established but small oil and gas industry with only modest reserves. In 2019, it produced around 9MTOE of oil and natural gas. There are both onshore and offshore reserves, however they are fragmented and located at considerable depth. The largest reserves are found in southern Italy and offshore Sicily.

The largest oil and gas company in Italy is Eni, which sometimes works in joint ventures with foreign companies (Shell, Total, and others). In recent years, oil and gas production declined in Italy and this trend is likely to continue as the Italian Government seeks to increase renewables.

### Shipbuilding and maritime

Italy has a large maritime industry, mainly centred around short-sea shipping in the Mediterranean. It is a strategic stop en-route to the Middle East and Italian ports mainly service liquid bulk traffic. The Italian shipbuilding industry is well-established. It produces primarily naval ships and cruise ships, with Fincantieri as Italy's lead manufacturer.

### Steel-making and fabrication

Italy has a well-established steel-making industry. It has a production capacity of 34 million tons per year, making it the second largest producer in the EU. Facing similar market challenges as other European countries, the Italian steel-making industry is in a period of decline.

# Potential new entrants

There may be new Italian entrants to the offshore wind market in Italy when the industry is more developed. The market is unlikely to be large enough to warrant significant supply chain development so will likely utilise the wider European supply chain.

- Italian Wind Energy Agency trade association for the Italian wind industry (<u>https://www.anev.org/</u>)
- GSE renewable support provider in Italy (<u>https://www.gse.it/</u>)
- Ministry of Economic Development oversees Italian energy policy (<u>https://www.mise.gov.it/index.php/en/</u>)



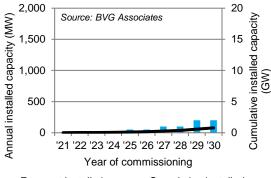
# 6.6. Spain

# The market

The offshore wind market in Spain is currently very small, consisting of one floating demonstrator project with an installed capacity of 5MW in the Canary Islands. Most of Spain's coastal areas have deep water and so will only be suitable for floating projects.

This is no system in place for offshore wind farms to progress in Spain. The Spanish Government is aware that changes to the process are required for offshore wind to develop and are planning on revising the regulatory framework in the next few years.

The Spanish government is very pro-renewables and has set ambitious targets of achieving 74% electricity generation from renewables by 2030 and net zero by 2050. It has no specific targets for offshore wind but aims to install an additional 22GW of wind power by 2030 (the vast majority of this will be onshore). The Canary Islands has its own target of 300MW of offshore wind by 2025. We forecast that Spain will have a total of around 800MW of offshore wind by 2030, starting in the Canaries and Balearic islands.



Forecast installation ——Cumulative installed capacity

### Figure 34 Forecast for offshore wind in Spain.

### Local content policies

Spain has no national local content policies for offshore wind or onshore wind. On a local level, a number of Spanish Autonomous Communities have used local content as a consideration when approving development applications for onshore renewables.

It is unlikely Spain will introduce large local content requirements for offshore wind given the small size of the market. If they are introduced, they are likely to be introduced at local levels rather than at a national level.

### **Competitive business practices**

Spain is a developed European country, although has a lower ranking than most of Western Europe in the Transparency International Index of 32 out of 180.

The official language is Spanish, but Catalan and Basque languages are also widely spoken in those respective Autonomous Communities. Many Spaniards are proficient in English and other European languages. Spain freely works with foreign businesses and has a long history of working internationally.

### Local supply chain

Spain's supply chain is experienced in the offshore wind industry. It mainly provides steel manufacturing with the likes of Haizea manufacturing monopiles and Navantia manufacturing jacket and floating foundations.

It has a good history of turbine manufacturing and SGRE and Nordex/Acciona operate multiple factories in Spain (although for onshore wind only). It is also home to EDPR and Iberdrola, both active offshore wind farm developers.

### Other industry supply chains

#### Offshore oil and gas

Spain has limited oil and gas reserves and consequently the industry is small. Cepsa and Repsol are the country's largest oil and gas companies. The industry has declined significantly since the 1990s producing around 4MTOE of oil and natural gas in 2019.

### Shipbuilding and maritime

Spain has a large maritime industry, and its freight and fishing industries are among the largest in Europe. Spain's location also makes it a logistical hub for shipping in Europe and the Mediterranean. The Spanish shipbuilding industry mainly provides specialist defence ships and research vessels. Navantia is the country's leading shipbuilding company and supplies steel jacket and floating foundations to the offshore wind industry.

#### Steel-making and fabrication

The steel-making industry in Spain is well-established and has a production capacity of 22 million tons per year. It is a net exporter of steel, with most steel used for construction and infrastructure in the EU. The industry has declined in recent years due to a fall in demand, high production costs and increased competition from other countries. The effects of the coronavirus pandemic are likely to compound the industry's struggle.

### Potential new entrants

There are unlikely to be any significant new entrants in the Spanish offshore wind supply chain. The small market and lack of large projects in the pipeline means that Spanish offshore wind farms are likely to use the wider European supply chain for the foreseeable future. The smaller floating offshore wind projects will support innovators.

### Useful sources of information

Spanish Wind Energy Association (<u>https://www.aeeolica.org/en/</u>)

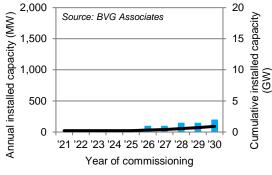
# 6.7. Sweden

# The market

Sweden has an established onshore wind industry with around 9GW of installed capacity. It also has 200MW of installed offshore wind although nothing has been installed since 2013. It does have a large number of projects in development.

Sweden has a target of achieving net zero by 2045 but no specific targets for offshore wind. The Government plan to provide the grid connection for offshore wind projects to make projects more competitive in future but its auctions will remain technology-neutral. For this reason we forecast that Sweden will have around 1GW of offshore wind by 2030.

Offshore wind is unlikely to be a large industry in Sweden, unless it is for export, as it has large hydropower and onshore wind resources which will be cheaper to develop than offshore wind.



Forecast installation ——Cumulative installed capacity

# Figure 35 Forecast for offshore wind in Sweden.

# Local content policies

Sweden does not have local content policies for offshore wind or onshore wind. Policies are unlikely to be introduced for offshore wind given that the likely size of the market will be small.

# **Competitive business practices**

The national language is Swedish, although English is spoken to a very high standard and is frequently used in business. The business practices in Sweden are very similar to those in Norway.

It is very open to working with foreign businesses and has a good working relationship with Norway. It is seen as a very good place to do business and has a rank of joint 3 out of 180 countries in Transparency International's Corruption Perceptions Index with a very similar score to Norway.

### Local supply chain

There are a number of suppliers in Sweden that are active in the European offshore wind industry. These include MMT (geophysical and geotechnical surveying) and NKT Cables (market leader in high-voltage cables). Hitachi-ABB is partly Swedish and is a market leader in high-voltage electrical equipment. Sweden is also home to the established developer Vattenfall.

### Other industry supply chains

### Offshore oil and gas

Sweden has no commercial oil and gas production due to limited resources. It instead relies upon renewable sources, such as hydro and biomass, and nuclear power, with a small proportion of imported fossil fuels.

### Shipbuilding and maritime

The Swedish maritime sector is important to the Swedish economy. Besides support services such as ports, stevedoring companies and shipbrokers, important suppliers to the shipping industry also include other shipping companies such as through suppliers of bunker oil, corporate services such as marketing and training, and shipyards and other subcontractors that assist with repairs, maintenance and spare parts. Sweden no longer has a commercial shipbuilding industry

### Steel-making and fabrication

Sweden has a small steel-making industry. It has a production capacity of 6 million tons per year. There are two integrated iron and steel production plants in Sweden, with additional scrap-steel production plants and processing plants. The majority of the steelworks are found in Bergslagen region. The steel industry has suffered because of increased market competition. There is, however, a drive to introduce hydrogen fuelled blast furnaces as the industry adapts to calls for reduced environmental impact.

### Potential new entrants

The market is Sweden is projected to be small, with around 1GW of offshore wind by 2030. This means it will be difficult for suppliers to justify establishing Swedish facilities. Instead, wind farms in Sweden are likely to use the wider European supply chain.

### Useful sources of information

Swedish Wind Energy Association (SWEA) – trade association representing wind energy in Sweden (https://swedishwindenergy.com/)