Norsk Industri

DELIVERY MODELS FOR OFFSHORE WIND

Delrapport – Global offshore wind market

norskindustri.no

Preface

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 potential Norwegian supply chain relevant for Offshore Wind.

However, the global market is substantial and this report describes the volumes and discuss potential business opportunities for Norwegian suppliers.

The report is divided in two parts.

Part one gives a global Offshore Wind market update showing the status in most relevant countries and the forecasted development in the respective country. The detailed report is written by RCG in cooperation with NORWEP, ref Appendix ##.
Part two explores the potential for Norwegian companies to export their goods and services to foreign offshore wind markets. The detailed report is written by BVG with input from NORWEP's regional advisors and Norwegian offshore wind directors, ref Appendix ##.

Cover photo: Fred Olsen Windcarrier

Content

Summary

The global Offshore Wind market report shows significant global growth for the industry and clearly shows that Offshore Wind has evolved into a global business with a substantial volume. This market represents a significant market opportunity for the relevant Norwegian supply chain.

In 2020, momentum increased for large-scale offshore wind development in emerging markets. Countries in Europe, South America and Asia Pacific, with no operational offshore wind, announced projects upwards of 1 GW capacity during the course of the year. Ambitious site designs utilising next generation turbines, floating foundations and multi-purpose interconnectors (MPIs) entered development across all global regions. UK is still the largest Offshore Wind market but is expected to be passed by China in 2022.

Bottom fixed offshore wind is dominating the global market compared to floating wind and the market situations is expected to stay like this in the near future.

Floating offshore wind developments remain largely concentrated in emerging markets where fixed bottom technology remains less viable. Scotland and Norway have defined projects. New projects have been announced in Italy and the Canary Islands, a hub for floating wind innovation projects. Further floating wind plans were also announced in South Korea for Equinor, Aker Offshore Wind, CIP, Total and Macquarie.

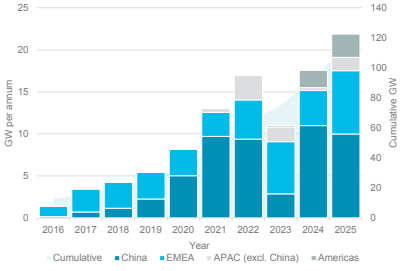
GLOBAL MARKET | REGIONAL UPDATES | FORECAST

Global Commissioning Forecast

China is forecast to surpass the UK as the leading offshore wind market by the end of 2021. In addition to the leading markets of EMEA, Taiwan and the USA are expected to add significant capacity between 2021 and 2025.

Commissioning activity and forecast by region (2016 - 25)

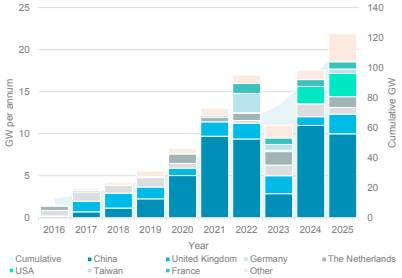
China is forecast to lead deployment as projects race to qualify for the national feed-in-tariff (FiT).



- China is expected to lead installation in 2021 and 2022. Whilst the project FiT rate in China expires at the end of 2021, supply chain bottlenecks are expected to force some projects into 2022 commissioning dates.
- Projects that received CfDs in the UK, FiT clarifications in France and permits in the Netherlands in 2019 are scheduled to enter construction from 2021 onwards.
- APAC ramps up from 2022 and US projects from 2024, as schemes with grid connection are expected to be installed.

Commissioning activity and forecast by country (2016 - 25)

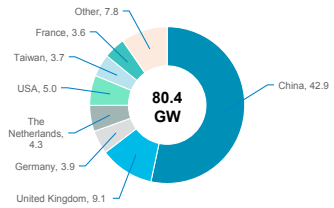
China will surpass the UK in installed capacity during 2021.



- Due to the drive to install projects before the expiry of the national FiT rate, China is expected to overtake the UK as the leader in operational capacity by the end of 2021.
- The UK is set to remain a leading offshore wind market with over 10.5 GW of new capacity due to be commissioned from 2020 to 2025.
- Large-scale projects in Taiwan from the first auction round (2018) are scheduled to come online from 2021, with major additions taking place in 2022.

Commissioning forecast by country (2021 - 25)

France, Taiwan and the USA are expected to deploy their first large-scale projects in the forecast period.



- The 42.9 GW of growth in China is initially driven by the FiT surge. After a hiatus in 2023 with projects not fully funded, commissioning is expected to pick up from 2024.
- Mature markets still dominate the near-term commissioning forecast. However, the global market is trending towards a more diversified commissioning pattern as offshore wind technology penetrates new markets, including the US which sees a larger share of annual installations by 2025.

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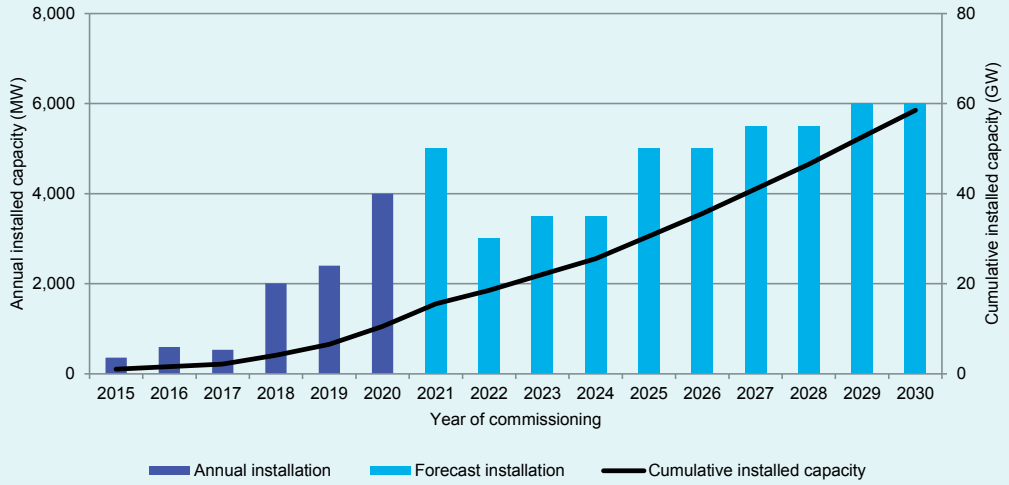
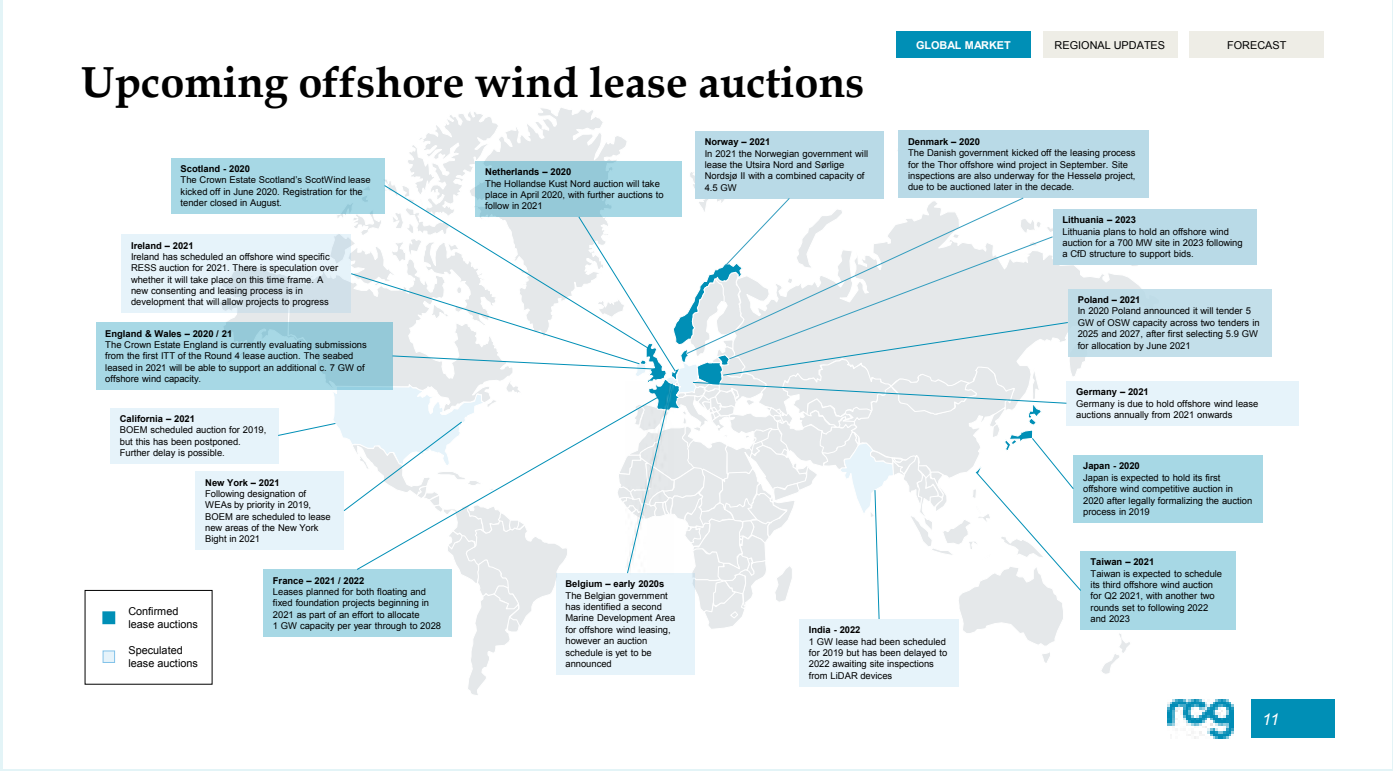
Global Commissioning Forecast

It shall also be noted that despite the present lack of a "home market", assuming this is defined by a Norwegian market, the potential in Norway's "near market" is significant. Looking at the market in the North Sea basin, Poland and France, this market is close to us geographically and it also represents trade partners the Norwegian industry has a long and proven track record in doing business with. The figure showing upcoming lease auctions and the forecast for the UK market, clearly demonstrates this opportunity.

The market specific evaluation demonstrates that the attractiveness of the different markets for Norwegian suppliers have big variations. Experience has shown that understanding the local conditions is a vital factor in succeeding in a global market. In particular it is important to understand how the requirement to local content is handled. Quite often this is not put forward as a strict requirement, as in EU where this is not in accordance with EU regulations. But still, this is an important evaluation criteria and finding a local partner or setting up a local entity might be key factor in entering the market.



UK is still the largest Offshore Wind market but is expected to be passed by China in 2022.



Upcoming lease auctions shows the opportunities close to Norway and in the North Sea basin.

1 Global Market Summary report

Based on NORWEP's annual market report an update was written for this project by RCG.

GLOBAL

In 2020, momentum increased for large-scale offshore wind development in emerging markets. Countries in Europe, South America and Asia Pacific, with no operational offshore wind, announced projects upwards of 1 GW capacity during the course of the year. Ambitious site designs utilising next generation turbines, floating foundations and multi-purpose interconnectors (MPIs) entered development across all global regions.

EMEA

In Europe's established offshore wind markets, operational capacity increased at a rapid rate during 2020 with commercial project construction ongoing in Belgium, France, Germany, the Netherlands and the UK. Early-stage portfolios in the Baltic Sea emerged as prominent global players partnered with local firms to advance projects in anticipation of new lease auctions in Poland and a revised grid connection model in Sweden. In Italy and Spain new floating projects were announced, whilst the novel Hywind Tampen project reached FID in Norway.

APAC

China's offshore wind market is dominated by local developers; but international players are starting to enter via partnerships. Site construction continues as numerous projects seek to qualify for the FiT rate, due to expire at the end of 2021. In Q3 the continued interest and activity in Japan's pipeline of projects grew to become the largest in the region (excluding China), only to be surpassed by Taiwan in Q4 as developers prepare sites for future tenders. In 2020 the first projects were announced in the Philippines. Americas New project activity in the

AMERICAS

Americas during 2020 was focused on Brazil, where approximately 16 GW of development capacity was added. Despite the increased activity from both local and international developers, the government is yet to formalise an offshore wind framework. In the US, oil and gas giant BP entered the offshore wind industry, buying into Equinor's East Coast project pipeline, acquiring a 50% stake. Additional offshore wind solicitations were announced for New York and New Jersey, and the CVOW demonstrator became the second operational project in the region when it delivered power to the Virginia grid in September.

Photo: Fred Olsen Windcarrier

FLOATING OFFSHORE WIND

Floating offshore wind developments remain largely concentrated in emerging markets where fixed bottom technology remains less viable. Scotland and Norway have defined projects. New projects have been announced in Italy and the Canary Islands, a hub for floating wind innovation projects. Further floating wind plans were also announced in South Korea for Equinor, Aker Offshore Wind, CIP, Total and Macquarie. In July, WindFloat Atlantic – the world's second multi-turbine floating project – was commissioned off the coast of Portugal.

FINANCIAL

Financial investment activity With the final investment decisions for the Dogger Bank A and B projects in November, 2020 became the largest year on record for financed offshore wind capacity. Whilst investments were mostly settled on European projects, Japan's first commercial fixed foundation development – Marubeni, Obayashi Cosmo Eco Power's Akita sites also reached the pre-construction phase.

MERGERS & ACQUISITIONS

Iberdrola led global acquisition activity with transactions on large portfolios in Sweden, Poland and Japan, as well as an expanded interest in South Korea. Oil and gas players BP and Eni notably entered the sector, acquiring de-risked assets in the USA and UK respectively.

POLICY AND LEASING

Offshore wind leasing activity has ramped up globally in 2020, with the progression of the TCE Round 4 and CES ScotWind lease auctions in the UK, continued preparations and clarifications for upcoming tenders in France, Japan, Norway, Poland, Taiwan and Germany, and the announcement of future leasing plans in emerging markets such as Lithuania. With the election of democrat Joe Biden as US President, leasing conducted by federal authorities is expected to ramp up in 2021.

FORECAST

Large-scale projects upwards of 700 MW in the mature European markets dominate the near-term offshore wind forecast. Utility-scale projects are also due to come online in the Asia Pacific region – outside of China – for the first time in 2021. Despite multiple US projects submitting construction plans, revisions to project capacities have resulted in planning delays for sites across the market. New projects announced in Brazil are unlikely to come online until at least 2030, after the initial forecast period.

Photo: Fred Olsen Windcarrier

A new global energy structure is being shaped now

2 Country Specific report

The purpose of this section is to evaluate the most relevant markets.

The purpose of this section is to evaluate the most relevant markets and provide information to potential suppliers assisting them in the process of choosing the correct markets to prioritize. It should be noted that this evaluation will vary between the individual companies based on their size, existing foothold in the market, type of product, risk profile etc.

We examined several countries from either; established offshore wind markets, emerging markets or potential markets. We split these markets into the following groups;

- 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 several sections to identify the potential for Norwegian companies in each country.

- The market
- Local content policies
- Competitive business practices
- Supply chains
- Potential new entrants
- Profiles of notable firms

ATTRACTIVENESS OF THE DIFFERENT MARKETS

Based on the country specific evaluations, an overview was established indicating the attractiveness of the different markets for Norwegian suppliers. This overview is based on the following parameters;

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

Summary of countries

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

Offshore Wind is turning truly Global

Abbreviations

EPCI	Engineering Procurement, Construction, and Installation
HVA/C	Heating, Ventilation and Air Conditioning
HVAC	High Voltage Alternating Current
HVDC	High Voltage Direct Current
LCC	Life Cycle Cost
LCOE	Levelized Cost of Energy
MCA	Maritime and Coastguard Agency
NCS	Norwegian Continental Shelf
NORWEP	Norwegian Energy Partners
NPV	Net present value
O&M	Operations and Maintenance
OFTO	Offshore Transmission Owner
OMS	Operation, Maintenance and Services
OPEX	Operating expenditures
SOV	Service Operation Vessel
TSO	Transmission System Operator
WTG	Wind Turbine Generators

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