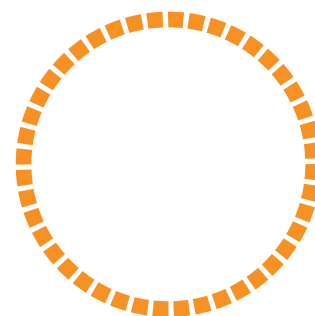


OFFSHORE WIND CABLE MANUFACTURING AND INSTALLATION FORECAST *2018–2028*

ARRAY AND EXPORT CABLES



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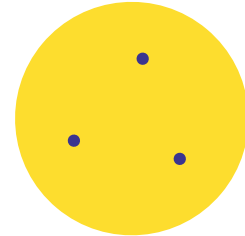


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REPORT OVERVIEW



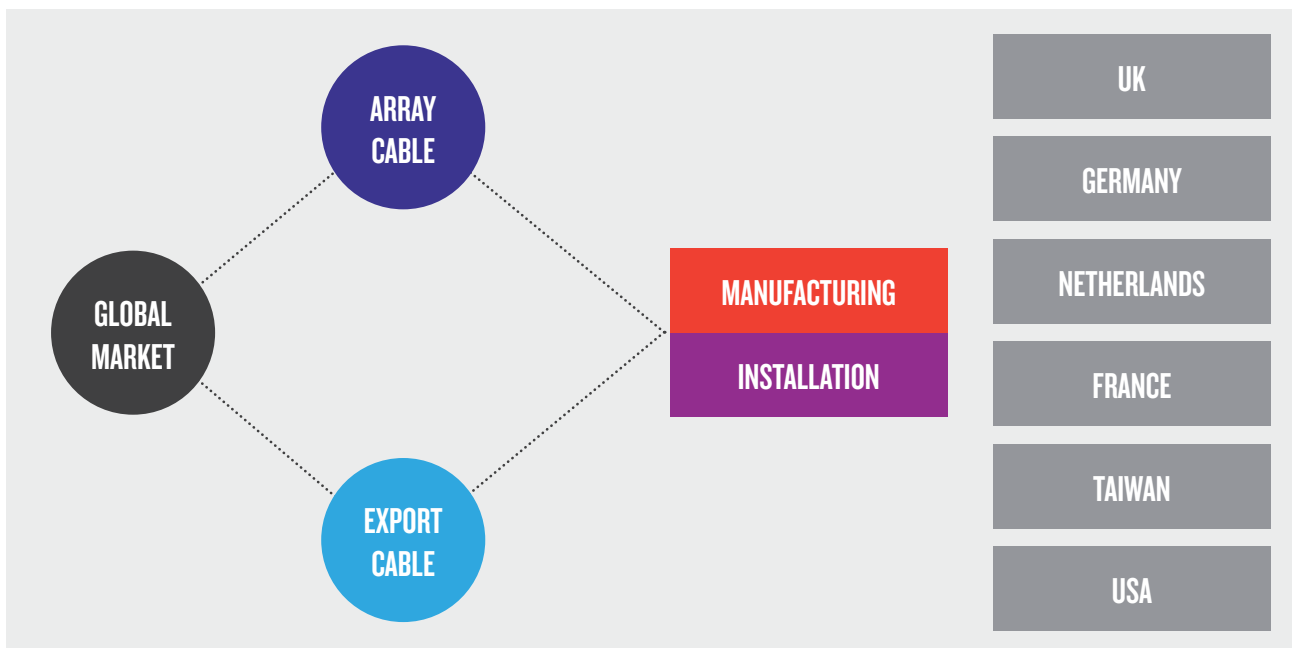
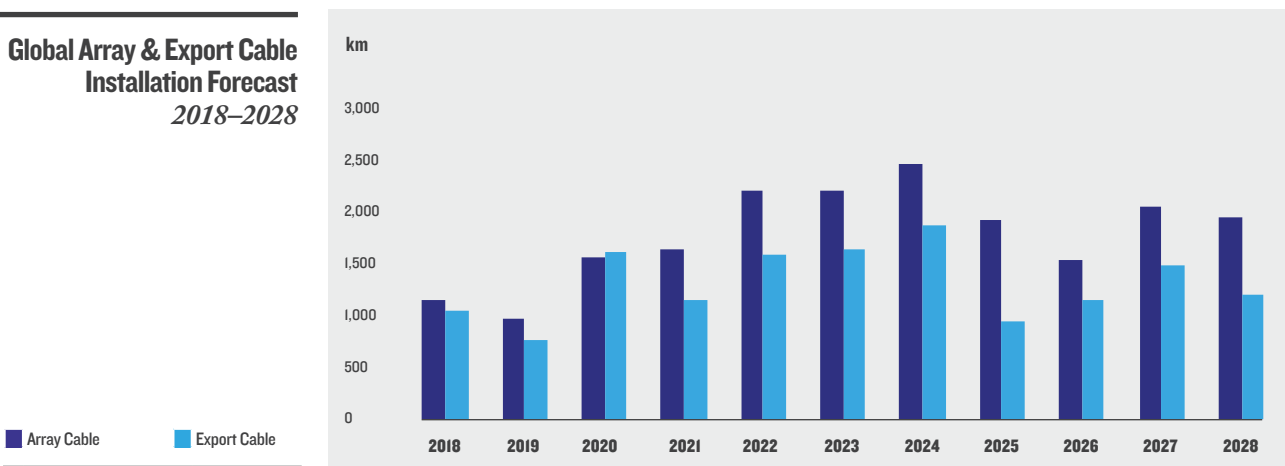
GLOBAL OFFSHORE WIND CABLES MARKET OVERVIEW

The annual rate of global array and export cable installations is forecast to nearly double in the next six years.

2018 installations of array cables and export cables are forecast to be 1,156km and 1,043km respectively. The manufacturing cost of array cables being installed in 2018 will be £332m and export cables will cost £620m.

Installations of array and export cables will peak in 2024, with 2,453km of array cables and 1,884km of export cables forecast to be installed in this year. These installations are being driven primarily by projects in the UK, Germany, Taiwan and the USA. The global cable manufacturing costs for 2024 are forecast to reach a combined £1.7bn. Array cables will equate to £647m of this total, while export cables will make up over £1.064bn.

Global Array & Export Cable Installation Forecast 2018–2028



GLOBAL OFFSHORE WIND CABLES MARKET SEGMENTATION

This report looks at the manufacturing and installation of both array and export cables in the offshore wind sector. It analyses these markets on a global level, a regional level, and then on a country-specific level. The above figure illustrates the breakdown of this report.

HOW THIS REPORT DELIVERS VALUE

This report delivers added value by revealing:

- Global market forecasts and analysis covering the period 2018 to 2028
- Regional and national market forecasts and analysis from 2018 to 2028
- Cables manufacturing costs analysis and forecasts from 2018 to 2028
- Details and analysis of contracting activity
- Exclusive interviews with key contributors in the cables market
- Profiles of leading companies working within the sector
- Conclusions

KEY QUESTIONS ANSWERED BY THIS REPORT

- How many kilometres of export and array cables will be installed annually between 2018 and 2028?
- Which companies have been awarded contracts for the installation and manufacturing of export and array cables between 2013 and 2023?
- What are the annual manufacturing costs of export and array cables forecast to be installed between 2018 and 2028?
- Which countries are forecast to witness the largest number of cables installations?
- How will the market shares of the market spaces change by 2028, and which geographical region will lead the market in 2028?
- Which companies make up the offshore wind cables supply chain, and what services do they provide?

WHY YOU SHOULD READ THIS REPORT

- Enhance your strategic decision making
- Strengthen your research, presentations and business plans
- Learn which emerging market opportunities to focus upon
- Increase your industry knowledge
- Keep up to date with crucial market developments
- Develop informed growth strategies
- Build your technical insight
- Discover trends to exploit
- Strengthen your analysis of competitors.

METHODOLOGY

Primary Research

To provide added value to the readers of this report, RenewableUK has undertaken interviews with key individuals working in the offshore wind cables sector. Interviews have been conducted with companies involved in manufacturing, installing and repairing offshore wind cables, as well as with companies involved in the development of offshore wind projects. These interviews have provided key information that has helped to shape this report.

Secondary Research

Information for this report has been gathered from contracting data contained in RenewableUK's Project Intelligence Database. All data is sourced from publicly available information. Our comprehensive relational database is updated by RenewableUK analysts daily. The database helps to provide members with accurate, current data on our wind industry, helping them to keep track of this fast-moving sector. Further secondary research has also been undertaken for this report from sources such as company annual reports, company web sites and news reports.

Model Methodology

The forecasts in this report have been created using RenewableUK's Project Intelligence model. Where real dates and values are known, they are represented in the data. Unknown dates and values are modelled using assumptions and trends derived from the installed global base of offshore wind projects augmented with first hand data. To provide a market forecast, known and modelled values are phased per project between known and modelled dates.

Due to the nature of RenewableUK being an association that represents companies across the wind and marine energy spectrum, we have to remain unbiased with regards to our forecasts. It is for this reason that the forecasts that are illustrated in this report assume that all projects currently in the database will be fully commissioned. The forecasts from the database have also been supplemented with assumptions from external sources to fill in the gaps for projects that have yet to be announced beyond 2024. The data is accurate as of 1 August 2018, and the latest data can be obtained from the Project Intelligence Hub. To find out more about the Project Intelligence Hub please go to www.renewableuk.com/page/PIHome

Cable Costs Methodology

RenewableUK has forecast the costs of manufacturing array and export cables by analysing the values of past contracts that have been awarded and then generating a base figure for a single kilometre of cable by identifying an average trend with regards to the values of the contracts. This figure is then applied to the installation forecasts that are derived from the Project Intelligence model, and these costs are then adjusted based on the total length of cables that are forecast to be installed. Quantitative economic price adjustments are utilised to reflect the impact of market conditions on costs.

ABOUT RENEWABLEUK

RenewableUK members are building our future energy system, powered by clean electricity.

We bring them together to deliver that future faster; a future which is better for industry, billpayers, and the environment. We support 400-member companies to ensure increasing amounts of renewable electricity are deployed across the UK and access markets to export all over the world. Our members are business leaders, technology innovators, and expert thinkers from right across industry.

Our work is led by a Senior Management Team and supported by a Board of senior industry figures with a Business Plan setting out our work and priorities.

Collectively our members employ over 250,000 people — from international energy companies to small companies keen to build new markets and ready to disrupt our energy market with new products and services. The UK has some of the best natural resources in the world for these technologies. Renewables have proven their ability to deliver, and alongside gas and nuclear will be central to keeping the lights on and powering our economy. Our role is to maximise this opportunity and create the conditions that will see the renewable sector continue to thrive here.

DISCLAIMER

Forecasts presented in this document are derived from the Offshore Wind Project Intelligence model. Projections in this document do not represent a RenewableUK position and should only be used as guides to possible outcomes. For more information on methodologies and terms used please see the Methodology section and Glossary. RenewableUK takes no responsibility for losses incurred by the use of this information.

EXPERT INSIGHT



GLOBAL MARINE | GROUP

The Global Marine Group is an innovative market leader in offshore engineering and consists of three business units CWind, Global Marine and Global Offshore. Together the Group deliver a comprehensive range of services to the offshore renewables, utilities and oil & gas sectors, including cable installation, repair and trenching.

Name: **Andrew Lloyd**
Job Title: **Director of Power Cables**
Company Name: **Global Marine Group**

As Director of Power Cables, Andrew is responsible for business and project growth at the company. Andrew joined the Group in 2000, gaining a wealth of experience managing both telecom and power cable related installation and maintenance projects, before focusing solely on the Group's power cable development last year.

Can you say a few words about Global Marine Group and its business operations?

"Global Marine Group, encompassing CWind, Global Offshore and Global Marine, has been involved in the offshore energy sector since the conception of the industry and we continue to deliver a wide variety of innovative cable installation, trenching and repair solutions. Our teams within the Group installed the cables for the UK's first commercial wind farm at Kentish Flats, as well as Europe's first at Horns Rev, and more recently at Merkur."

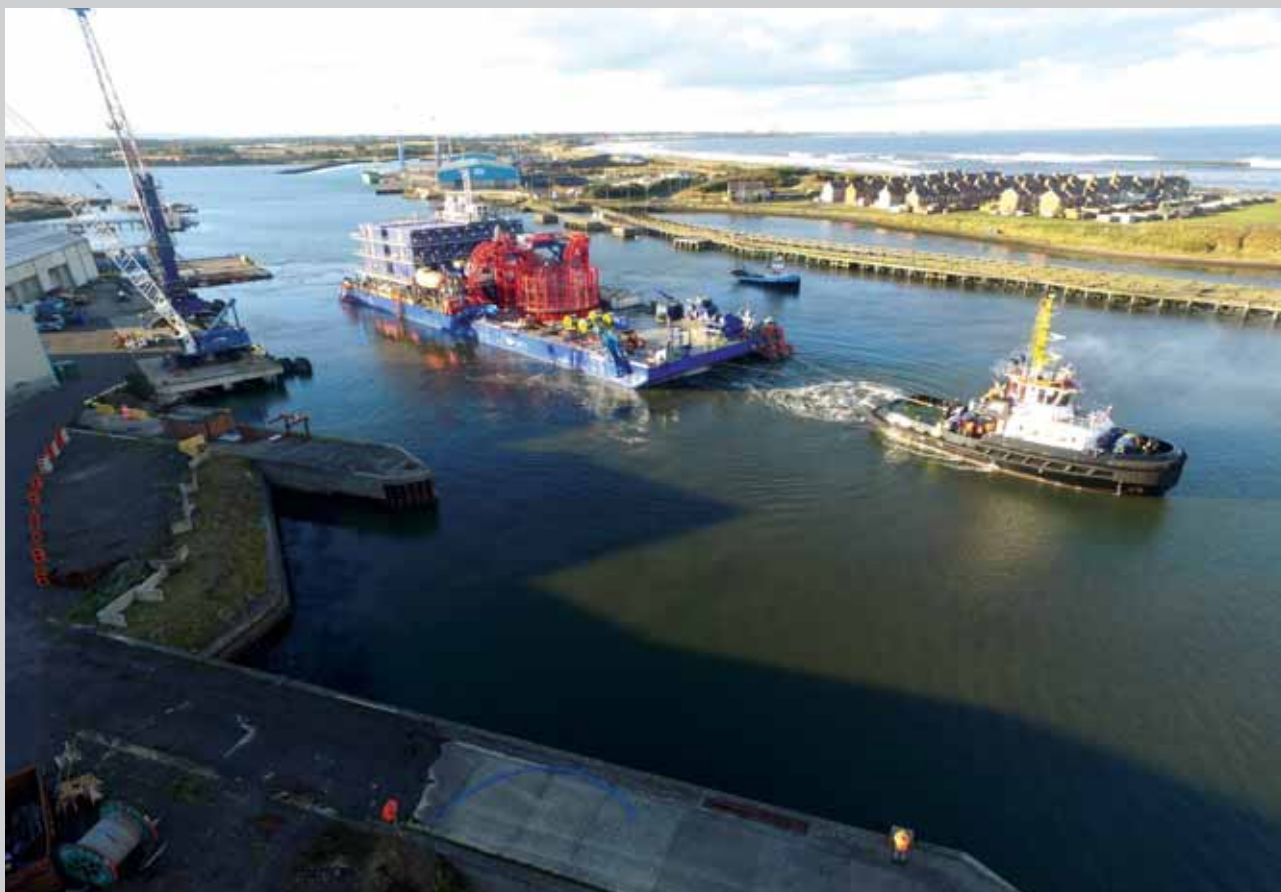
What are the key challenges with regards to the installation and maintenance of offshore cables?

"Cable installation of turbines with monopiles is a pretty established sector now, however the burial of these cables can still throw up new challenges and our engineering and innovation team works hard to come up with new solutions to these challenges, such as the hybrid tool on the Q1400. Floating wind and the use of dynamic cables will be the next big challenge in the industry. Our Group experience in the oil & gas sector ensures that we can adapt



Images: Global Marine Group — Global Marine Group's Global Symphony working on recent cable installation projects.





our knowledge to provide effective solutions to the renewables industry.

Cable maintenance is in our DNA. We are currently transferring our expertise, gained over several decades of cable maintenance with the telecoms sector, into the power cable industry via our Complete Cable Care service offering. The repair of power cables requires specialist equipment, and for that we have invested in a cable repair barge, the ASV Pioneer, equipped with repair associated back deck equipment. This ensures that we can respond to our customers' needs whether this be a shallow water repair of an export cable or the replacement of inter-array cable using a DP2 cable ship from our fleet.

Reducing the outage time is at the heart of Complete Cable Care, and in order to meet this challenge we are working with our customers to bring down the long lead times that can be associated with preparing for repairs before the offshore repair works actually commence. One of the ways we have done this is by procuring three HV universal power cable joints, which we now hold in stock."

What are the current and future trends in the offshore wind cables installation sector?

"The industry continues to grow with new opportunities and markets emerging all the time. Floating offshore wind is already in use at some test sites across Europe, but this technology is only set to grow and develop further allowing for sites in deeper waters. We've recently completed an export cable installation at a floating offshore wind farm site. As mentioned already, our experience working within the oil & gas sector utilising similar technologies has provided us with the skills and know-how to work within these different environments. The floating technology utilised in this project is relatively new to the market, and it's great that we're a part of developing these deep water solutions for the future."

What new technological developments are occurring in the offshore wind cables installations sector?

"Technological developments are happening all the time, whether it be automated handling systems onboard

Image: Global Marine Group—Global Marine Group's ASV Pioneer barge supports their Complete Cable Care service, and has recently sailed for her maiden project.



Image: Global Marine Group—Global Marine Group's ASV Pioneer barge supports their Complete Cable Care service, and has recently sailed for her maiden project.

vessels to reduce manual handling, or new analysis techniques during the upfront engineering. One recent development we have successfully deployed is the hybrid cutting tool on the Q1400. This tool has both a cutting chain and water jets, effectively allowing the burial mode to switch between cutting or jetting depending on the soil conditions at any given moment. We are also developing a pre-lay plough, which will further reduce risk, cost and time, by enabling clearance and trenching ahead of the installation of towers and cables on site.”

What can be done to reduce installation costs?

“We are passionate about protecting and rapidly rectifying power cable faults — a critical infrastructure which as a population we are becoming increasingly reliant upon.

Currently, the recognised industry average time to repair a power cable is approximately 100 days. Utilising pre-engineered scenario plans, and our dedicated barge, we are able to respond rapidly to incidents and reduce operational downtime by up to sixty percent and potentially improve speed of repair to just 40 days, representing an entirely new level of service and reliability in the industry.

As part of the Global Marine Group, we have a long legacy in the telecoms industry, and are heavily involved and invested in the telecoms maintenance zone structures, which exist across the globe. Maintenance zones enable cable owners and operators to club together for mutual benefit, to ensure that costs are

affordable, response times are low and downtime is minimised.”

You provide a number of different services with regards to cable installations; do you consider any of these services as having more potential for growth to your business or is there equally requirements from the offshore wind sector?

“The Global Marine Group is uniquely placed to offer our customers almost the complete range of services in the offshore wind sector including cable installation, via CWind and Global Offshore. We continue to work hard to develop more services either in response to a specific customer requirement, or by ongoing innovation within the business to bring new services and products to market to meet an identified future need, or more efficient and safer ways of doing things. Our innovation team spans all three business units within Global Marine Group, to ensure that best practices, developments and new ideas are captured regardless of whether they come from the power or telecoms markets.”

You signed a five-year cable repair framework agreement with Transmission Capital Partners in May 2018. Can you tell us about what work will be required from CWind under this agreement?

“Transmission Capital Partners (TCP) are responsible for Barrow, Gunfleet Sands, Ormonde, Robin Rigg, Lincs and Westermost Rough; all covered within the Complete Cable Care framework in case of fault or incident. This is the first group of OFTOs to sign up for Complete Cable Care solution, which is designed to respond more quickly to power cable damage, bringing new standards in readiness and rapid deployment to the industry.

The service is supported by Global Marine Group's fleet of cable ships and CTVs, including the ASV Pioneer. The ASV Pioneer barge is on permanent standby at our offshore service hub in Blyth, UK, and can operate from the beach out to a depth of 50m, covering the majority of all sites.

This is a landmark partnership for

us, and demonstrates the appeal of our robust and proactive approach to long-term cable care. The agreement raises the standard across the industry for pre-emptive intervention to cable repairs, preventing faults from occurring in the first place.

Since our agreement with TCP, we have also signed a five year fast-response cable repair agreement with Vattenfall which covers their entire European portfolio, as well as with Scottish & Southern Electricity Networks to support their cable replacement programme.”

Cable faults for offshore windfarms can account for great financial losses for developers. In your view, why are these faults occurring and what can be done to reduce the occurrence of failures?

“The first line of defence to ensure that a cable route is carefully selected to avoid hazards, difficult terrain, and busy shipping routes is proper planning, FEED studies and initial route engineering, based on in-depth survey data – all of which are vital services that we can offer to our customers. Route clearance, cable armouring and mattressing can minimise risk to the cable and damage caused by abrasion or entanglement, but only through adequate burial can cable be placed totally out of reach of such potentially harmful interaction.

On average at least ten subsea cable failures are declared to insurers each year in the offshore wind sector. Eighty five percent of all offshore power cable faults are caused by

‘external aggression,’ principally from fishing and ship anchors that are prevalent in the shallower waters where the majority of established wind farms are located. In 2017, a power cable was damaged by an anchor off the Isles of Scilly leaving all the inhabitants on the islands without power beyond backup generators. To minimise downtime and disruption, our specialist cable ship, the C.S. Sovereign, was mobilised to complete the repair in under a month; a huge reduction in comparison to the industry average of 100 days.

Our two Q1400 jet trenchers are designed for pre and post-lay trenching, as well as simultaneous lay and burial of cables to a burial depth of three metres. The systems, one of which is mobilised on Global Offshore’s Global Symphony, enable us to undertake projects which require precise installation in challenging seabed environments. Only last year, we completed remedial burial works on the CIEG (Channel Islands Electricity Grid) power cable between Guernsey and Jersey. This kind of preventative work can seem like a costly, unnecessary exercise, but in comparison to the cost and loss of earning associated with a cable fault, it pays to act in this more proactive manner.”

Outside of Europe, what other markets do you view as key areas for offshore wind developments that will require your services?

“The Global Marine Group has recently established a joint venture (JV) in Taiwan, CWind Taiwan. The

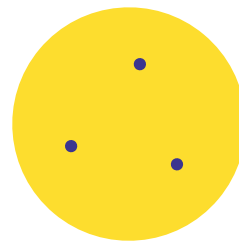
ultimate goal of the JV will be to provide all the services that CWind offers in Europe; topside, splash zone and subsea engineering services to the offshore renewables and utilities market as well as accredited training courses; which will also include cable lay. We are, of course, also closely following developments of other emerging markets such as the US.”

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2018 PRICES

RenewableUK Corporate Members: **£295.00**

Correspondent Members/Non-Members: **£495.00**



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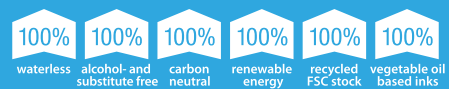
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