Global Underwater Hub

SUBSEA CABLE SYSTEMS

Market Intelligence Report

SAMPLE

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Credit: JDR Cable Systems

Introduction

As offshore wind grows to become the dominant renewable energy source for coastal nations, subsea cables become the critical arteries which transfer production from sea to shore, joining the grid network and powering countries.

The scale of the opportunity and challenge is substantial; volumes which grow to hundreds of thousands of kilometres of inter-array, export and interconnector cables and the requirement to grow a robust and reliable network with sensible intervention contingencies.

The supply chain has many of the building blocks in place to succeed in this space, whilst retaining capacity for the adoptions, adaptions and innovations required to balance global supply and demand requirements.

About Global Underwater Hub

Global Underwater Hub is the leading trade and industry development body for the UK's underwater sectors. Led and governed by industry, Global Underwater Hub represents, promotes and support all sectors of the multi-billion pound underwater industry, which includes oil and gas, offshore wind, hydrogen and CCUS, wave and tidal energy, aquaculture, defence, subsea telecoms and cables and marine science.

We support our member companies and stakeholders by providing access to market intelligence, industry collaboration, networking and learning opportunities, sector expertise, contacts and specialist support to accelerate growth and build value.

Global Underwater Hub is helping to transform the UK's underwater industry into one of the largest and fastest-growing industries in the country, accelerating the drive to net zero and creating high value jobs and exports.

This report was compiled by GUH's Market Intelligence team and AMP Partners. Our thanks to Alex MacPhie for his invaluable contribution.

Credit: JDR Cable Systems

Cable components

The cable is produced by surrounding a core made of a conductive metal, such as aluminium or copper, with a combination of insulation and then a material that acts as a protective armour. Within the armour the cable also contains fibre optic wires to allow the transfer of data and communications along the cable. The complete cable is then bound.

Core

The core is the primary conductor responsible for transferring generated electrical energy from offshore turbines to substations and onward to the grid. It is usually made from either aluminium or copper, depending on the application.

- Aluminium is commonly used in static cables for inter-array and export systems because it is lightweight and cost-effective, reducing overall cable weight and installation complexity.
- Copper is preferred for dynamic cables in floating wind farms due to its superior fatigue resistance and mechanical strength under continuous movement and bending cycles. The conductor is typically stranded rather than solid to improve flexibility and reduce stress concentration; critical for long-term reliability.

Insulation

Surrounding the core is a layer of insulation that prevents electrical leakage and provides thermal and water resistance.

- The most widely used material is cross-linked polyethylene (XLPE), which offers excellent dielectric properties, high thermal endurance and mechanical toughness, making it ideal for high-voltage applications such as export and HVDC cables.
- Ethylene propylene rubber (EPR) is another option, valued for its flexibility and ease of installation, particularly in lower-voltage or dynamic cable designs. Insulation acts as the first barrier against moisture ingress and thermal stress. This requirement is increased for HVDC systems where the insulation must also withstand continuous DC stress without degradation, requiring advanced formulations and rigorous testing.

Armouring

Armouring provides a degree of protection against external forces such as abrasion caused by contact with the seabed, fishing gear, anchors and continuous dynamic movement. The make-up of the armouring includes various layers which provide different elements of protection. Armouring design varies by application, with single or double layers depending on burial depth, seabed conditions and environmental risks.

- Steel wire is the most common armouring material, offering high tensile strength and impact resistance. Following this, lead sheathing is often added for water-blocking and corrosion protection, especially in deep-water or high-risk environments. Increasingly, advanced polymer layers are used in dynamic cables to reduce weight and improve flexibility, which is essential for floating wind applications.

Outer sheath

The outer sheath is the final protective layer that seals the cable against environmental exposure. It provides resistance to seawater, abrasion and mechanical impacts that might be experienced during installation and operation.

- Typically made from polypropylene or polyethylene, materials are chosen for their durability, flexibility and resistance to chemical degradation. Some designs incorporate anti-fouling coatings or water-blocking tapes to prevent ingress and maintain integrity over decades of service.

Fibre optics

Modern subsea cables often include integrated fibre optic strands within the cable structure. Initially incorporated to facilitate data transfer and communication between offshore assets, these fibres also enable real-time monitoring of cable health, including temperature, strain and vibration, through distributed sensing technologies. These can play an essential role in supporting predictive maintenance by identifying early signs of degradation or fault conditions.

Fibre optics are becoming standard in high-value projects, particularly for HVDC export cables and interconnectors, where reliability and monitoring are critical.

Features	Inter-array (static)	Inter-array (dynamic)	Export (HVAC)	Export (HVDC)	Interconnector (HVDC)
Voltage	66kV -> 132kV	66kV -> 132kV	220kV -> 275kV	±320kV -> ±525kV	±320kV -> ±525kV
Current type	AC	AC	AC	DC	DC
Core material	Aluminium	Copper	Aluminium	Copper / Aluminium	Copper / Aluminium
Insulation	XLPE / EPR	XLPE / EPR	XLPE	XLPE	XLPE
Armouring	Steel / lead	Steel / lead	Steel / lead	Steel / lead	Steel / lead
Typical diameter	70-300mm	<150mm	150-300mm	150-300mm	150-300mm

Cable accessories and protection systems

Protecting a cable that faces continuous risk from currents, seabed movement, scour, abrasion and stress at touchdown points and cyclic bending requires a varied and critical collection of accessories and systems designed to provide security. As opposed to turbines or other largely fixed elements, cables are vulnerable, whilst at the same time requiring near constant up-time. Robust protection systems are therefore essential to ensure reliability over the long-term, whilst minimising costly failures. These components play a vital role in ensuring the mechanical stability and operational safety of subsea cable systems.

A key part of maintaining cable integrity is securing its position and shielding it from external forces across its operational life. For static cables in fixed-bottom wind farms, these protection measures include cable protection systems (CPS), which are designed to guard against impact and abrasion. Other items include touchdown protection to prevent against excessive cable bending, particularly at entry points, and scour protection which is mitigated by mattresses or rock placement to keep the seabed stable. In addition to protection from sediment shift, these solutions also protect against fishing gear and anchor strikes.

Moving to dynamic cables in floating wind, additional considerations will need to be taken into account as the cable will be in almost continuous movement, increasing the risk of fatigue over the cable and farm life. Additional components can include bend restrictors which limit curvature and present over-bending. Efforts to anchor the cables whilst also maintaining controlled flexibility are also key.

Cable protection systems

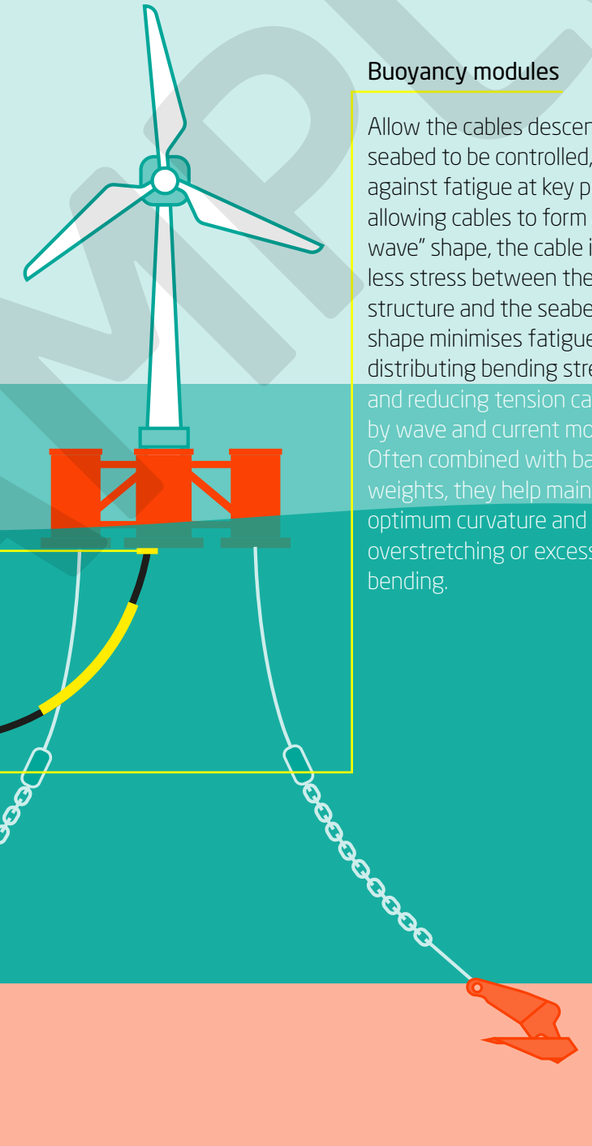
Cable protection systems (CPS) are designed to safeguard subsea cables from both mechanical damage and environmental stress and are essential for maintaining cable integrity over decades of operation. CPS mitigate common risks such as abrasion from seabed contact, over-bending at critical points and impact from fishing gear or dropped objects such as anchors. Typical solutions include abrasion sleeves for seabed touchdown zones, vertebrae-style bend restrictors for dynamic sections and modular protective shells for crossings.

Connectors

Connectors provide a pluggable interface between cable sections and enable disconnection and reconnection when required, without needing the cable to be cut. Looking across the required multi-decade operations and maintenance planning, they are particularly valuable for tow-to-port maintenance strategies or phased installation schedules. Modern connectors are engineered to maintain electrical performance under high-voltage and harsh marine conditions while allowing rapid assembly and disassembly offshore.

Hang-offs

Hang-off assemblies secure the cable at its termination point on a turbine or substation structure. They provide mechanical support and load transfer from the cable to the foundation while accommodating movement and tension. Hang-offs are critical for both static and dynamic systems, ensuring that cables remain stable and protected at the interface between subsea and topside environments.



Buoyancy modules

Allow the cables descent to the seabed to be controlled, protecting against fatigue at key points. By allowing cables to form a "lazy wave" shape, the cable is under less stress between the floating structure and the seabed. This shape minimises fatigue by distributing bending stresses and reducing tension caused by wave and current motion. Often combined with ballast weights, they help maintain the optimum curvature and prevent overstretching or excessive bending.

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