

Durability, Smart Design Focus of Offshore Wind Cabling

No offshore wind project would be complete without the cabling needed to carry the produced energy onshore. As an integral part of the offshore wind industry, cabling may be small in comparison to overall costs must absolutely be kept low to generate revenue. Yet the cabling side of offshore wind is still relatively inexperienced, and as such has suffered a lot without consistent, safe, efficient cabling alternatives and installation methods. Given the drive for faster offshore wind farm installations, a push for lower cap and operations costs, and a requirement for long-lasting systems that stand the pressures of harsh offshore conditions, the need for reliable, cost-effective solutions has vastly increased in years of late. What's more, cable failures throughout Europe have shone the spotlight on the need to provide greater cable protection and install more robust cabling equipment.

Pushing Cable Protection to Ensure Offshore Wind Profitability

The Lillgrund offshore wind farm in Sweden stopped operating for almost two months, causing many to raise the alarm once again about the need for cable reliability to be considered during wind farm design. Failures like this one have substantial costs both in lost revenue and repair operations.ⁱ As we know, an offline wind farm can cost upwards of 2 million € a day!

Unlike onshore wind farm installations, offshore cabling routes are often extremely difficult to access, making it increasingly difficult to locate and repair faults. The addition cost of specialized, in-demand vessels compounds the problem, especially given the very small number available worldwide with suitable capabilities.

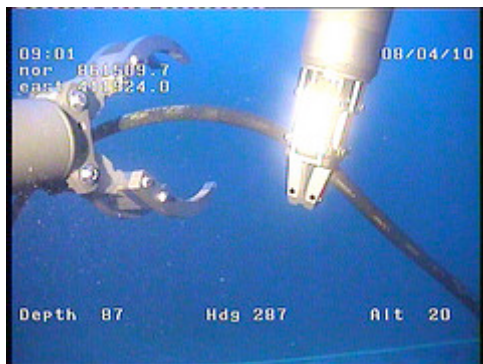


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As such, perhaps one area receiving the most attention within the offshore wind cabling sector is the production of better cable protection systems – solutions that can be adapted to current cable systems without a lot of extra expense or hassle. One offering in the world of cable protection will be applied to the E.ON Humber Gateway Offshore Wind Farm in the UK.ⁱⁱ The PEFLEX subsea cable protection system they've selected will protect subsea array cables and export cables against movement due to wave action and turbulence through exposed monopole scour zones. It is designed with a series of

interlocking polyurethane vertebrae half sections that are interspersed with elastomeric sleeves. Used with J-tube and J-tubeless connections at the subsea entry point, the PEFLEX locks into place and is clamped and fastened into place with Inconel strapping and banding. Their protection solution also guards against abrasion, impact, fatigue, and over-bending.ⁱⁱⁱ

Because of the additional protection of the cables, the company also promises faster, cheaper installation. The system is installed without divers and without an ROV. As such, like other cable protection systems, the new cable system will help to reduce costs on both the install and operations phases of a wind farm project located offshore.

Another example of new innovations in offshore wind cabling protection is a compound cable solution. This type of cable protection system is designed for jacket structures, gravity based foundations, and tripods, and is meant to replace conventional steel J-tubes which have been used in the oil and gas sector for many years as protection for power cables as they are connected to subsea foundations.

They're calling this type of solution a two in one product because it provides both cable protection and replaces the J-tube. The hope is that this type of solution will reduce capital costs while providing both installation costs savings and offering lower long-term operational expenses. Jack Simpson of Tekmar,



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maker of one of these compound designs, recently explained, "This one product costs a quarter of the price. Installation is cheaper too. This is a bit of a game changer. Cabling represents about 7% of the cost of installing turbines but historically 70% of the insurance claims - it's a very risky element. We need this to reduce risk and reduce cost."^{iv}

As one example, Tekmar's TekTube is said to reduce installation time and costs, in part by being installed onshore rather than offshore. The system can be secured to the foundation, sealed in place, and then transported offshore to the wind power site where it accepts the power cable from the cable installation vessel.

Other solutions being applied to subsea cabling for protection include things such as bend restrictors that limit the curvature of cabling, as well as bend stiffeners, which prevent over-bending during

installation. Suppression strakes designed with computational fluid dynamics principles are also becoming more common to prevent damage from vibration forces over free spans.

Smart Cable Technologies for Ease of Offshore Wind Repair and Maintenance

Increasing the durability of cable hardware is one way to ensure it can be installed without experiencing damage, and that it will function more long term without failure. However, no hardware has yet to be produced that provides 100% assurance against damage and failure. Regardless of how robust, virtually all cable designs will eventually experience faults. What's more, even with great survey methods to ensure the easiest installation and least disturbance of cabling hardware cannot guarantee that the equipment won't be exposed to hazards that result in damage and wind farm shutdown.

So given the reality that no solution is perfect, other companies are looking to develop smarter cable technology that can make the inevitable failure and maintenance requirements for cables much simpler and more cost-effective. Current cable technology is relatively low-tech, offering little in the way of help when it comes to pinpointing the location or cause of failures. As such, there are extremely high costs for locating and diagnosing cable problems.

Smart cable technology is the answer. This technology is fast becoming capable of several things conventional cable is not. For instance, smart cables are being designed to include functionality such as continuous cable condition monitoring, pre-fault localization and detection, and the ability to send information to a web-based status monitoring system. These systems usually consist of advanced cabling hardware, sensors, control units, as well as control centers where all data points are collected, monitored, and analyzed.

One example of this kind of smart cable technology comes from Tecnalía, a firm working with PDL Solutions and JDR Cable Systems and funded by the UK government. They are working to design and develop smart cable technology for use in the UK offshore wind sector. Their goal is to reduce the levelised costs of offshore renewable energy.^v The benefits of smart cable technology include being able to monitor and indicate where insulation degradation is taking place; testing non-intrusively (under normal load and voltage) the functionality of cabling without interrupting service; pinpointing areas where cable is failing with a high degree of accuracy, and more.

Specialist Vessels and Greater Cable Durability a Growing Concern for Offshore Wind

As the offshore wind industry continues to mature, greater specialization is taking place in the area of vessel development in order to make cable laying safer, faster, and more cost-effective. Van Oord, for instance, recently commissioned the construction of a new offshore cable laying vessel dubbed the

Damen Offshore Carrier 7500. The ship will be a multi-purpose design that incorporates a flush working deck design with offshore installation capabilities for a variety of settings. The ship will be dedicated to cable laying, and therefore will be equipped with specialized equipment, such as a heavy lift, RoRo transport, and other tools for the installation of electricity cables for offshore wind farms.

As cable laying garners more attention within the sector as potential cost-saver (or profit-killer), greater resources will be applied to creating such specialist vessels as these. Along with an increased interest in installing cables with a higher degree of durability and smarter cables that can make repair and maintenance much less painful, there's a lot yet to be done to ensure offshore cabling for the wind industry reaches full maturity.^{vi}

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Maryruth can't help but seek out the keys to environmental sustainability - it's the fire that gets her leaping out of bed every day. With green writing interests that range from sustainable business practices to net-zero building designs, environmental health to cleantech, and green lifestyle choices to social entrepreneurship, Maryruth has been exploring and writing about earth-matters and ethics for over a decade. You can learn more about Maryruth's work on JadeCreative.com.

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