

Rico Schoeni

## Offshore wind turbines and the technology that powers them

Ever wonder how wind turbines operate autonomously, with such little human intervention, in the middle of the sea? Rico Schoeni, Market Manager for Industry at HUBER+SUHNER, gives PES an inside look at the latest developments and the type of technology currently in development to power offshore wind farms.

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With the ever-increasing effects of global warming, coupled with the environmental and economic costs of fossil fuels, never before has renewable energy been in such demand.

A research report from the World Energy Council has even predicted that the world's demand for power is set to double by 2050, leading to a global rush to construct as many renewable energy sources as possible. One of the most popular and effective sources of clean, renewable energy is wind power.

Now, when people think of wind turbines, the image that most likely comes to mind is the towering white windmill-esque structures usually set to the backdrop of rolling green fields. The most popular new venture for this technology, however, is in the realm of offshore turbine sites, located primarily on continental shelves across Europe and the World. Already, there are multiple offshore sites across Europe, comprising hundreds of separate turbines producing thousands of MW of power with the UK, Norway and Belgium being home of Europe's largest offshore wind power producers.

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Unless they make frequent trips out to sea, it is unlikely that most people have seen an offshore wind farm up close and even more unlikely is that they understand the various technology that makes these wind farms operational. Since wind turbines must operate autonomously, it is essential that they have reliable communications and control equipment inside to ensure they run smoothly and correctly.

Communication and Control are the backbone to be able to run a wind turbine, from simple things such as starting the wind turbine to controlling wind speed, temperature, frequency, gear oil temperature, wind load/stress on tower and blades, etc, to operational monitoring (power output, voltage, current and frequency). By closely monitoring such parameters and autonomously adjusting, an optimal power output can be secured and maintenance windows can be planned well ahead, and only if absolutely necessary.

Previously, the cost of constructing these off shore turbines and installing their necessary cable systems was a serious obstacle for power companies. However this cost has been reduced considerably thanks, in part to the new economical technologies utilised by the suppliers of these components.

Despite the cost of these constructions decreasing, offshore wind remains one of the most expensive sources of electricity,

being more expensive than both coal and natural gas. The availability of cheaper alternatives has led to many viewing offshore wind power as an unsustainable renewable energy source. However, recent research suggests that offshore power will become a huge, global industry. Estimates generated by the Organisation for Economic Co-Operation and Development (OECD) suggest that by 2030, 8% of the global ocean economy will be generated from offshore wind turbine sites, providing over 435,000 jobs disproving the previous doubts surrounding the energy alternative's potential.

Whilst cost was arguably one of wind power's biggest obstacles, there also exists the serious issue of environmental limitations for these sites. With these turbines being created in locations often many miles from the nearest land, bringing reliable power and communication cable to these sites is a costly and difficult prospect. That is why HUBER+SUHNER's aim is to provide the highest quality products for one of the most demanding environments which can be installed in an easy and self-explaining way; hence, making the difference in reliability and smartness of installation and avoiding long and expensive downtimes. HUBER+SUHNER has a long heritage in providing passive solutions in fibre optics as well as radio frequency, which is why we see our strength in providing solutions

that offer best in class properties and reliability to enable powering and linking complex active equipment with a solution which acts as an enabler.

The communication-related issues which come with constructing sites offshore in these environments require many kilometres of cable to connect the sites to the power stations and substations, and with offshore parks being only accessible by boat or helicopter, the technology must be reliable and resilient to avoid time-consuming and costly trips. Also, by providing a modular approach whilst installing the wind turbine, failure risks can be reduced during building and first installation phase.

plays the vital role of allowing the offshore site's corresponding power station to communicate with and monitor the turbines supplying the station with power. This role, is understandably important and HUBER+SUHNER's position as one of the world's leading fibre optic and communication systems developers makes them ideal candidates to provide these solutions.

Currently, waters exceeding 60 metres in depth, prevent the creation of offshore turbine sites limiting the potential for such sites to produce even further power. However, designs which overcome this limitation are already under development opening the potential for the creation of

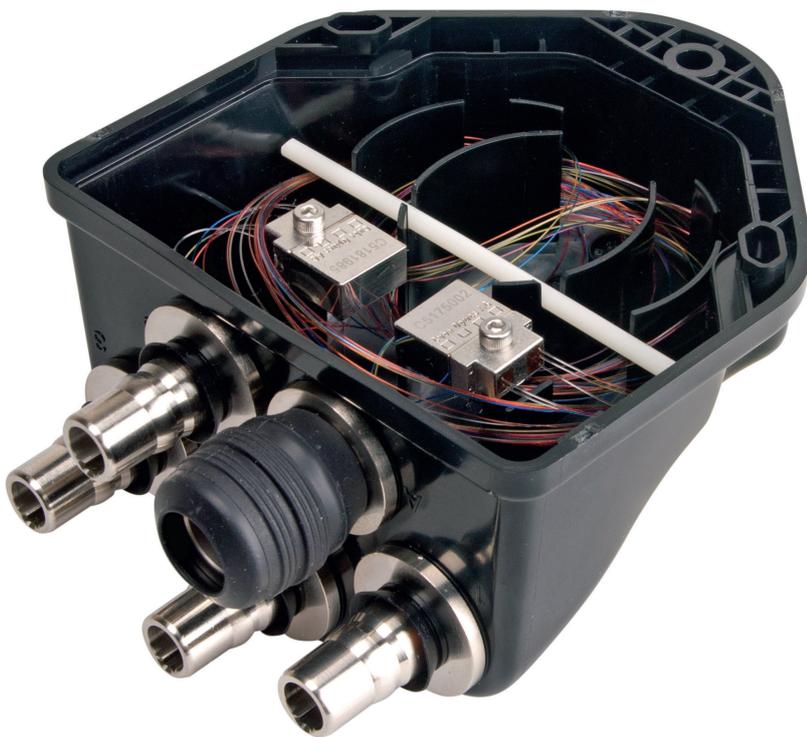
**The technology**

As a company, HUBER+SUHNER recognise the importance of the development and integration of reliable, renewable and sustainable energy infrastructures, and we have already taken part in the implementation of multiple environmentally-friendly hybrid vehicle projects, as well as the future proofing of data centres and other vital communication systems. This experience sets us as ideal candidates in the development and production of renewable energy systems, utilising our previous experience and close ties and partnerships to major industry leaders to demonstrate HUBER+SUHNER's place as an integral aspect of any successful development or construction process. We are an innovative technology company, so we pride ourselves on staying ahead of our competitors and the evolving demands of our customers by focussing on finding creative and effective solutions that are cost effective and future-proof.

For example, bearing in mind that fibre quantity increases due to increased applications running on fibre, we currently offer the highest fibre density harsh environment connector with the smallest footprint on the market. Having the possibility to produce cables which withstand chemicals are tested and verified to fire resistance and torsion under low temperature enables our solution to fit perfectly in offshore environments.

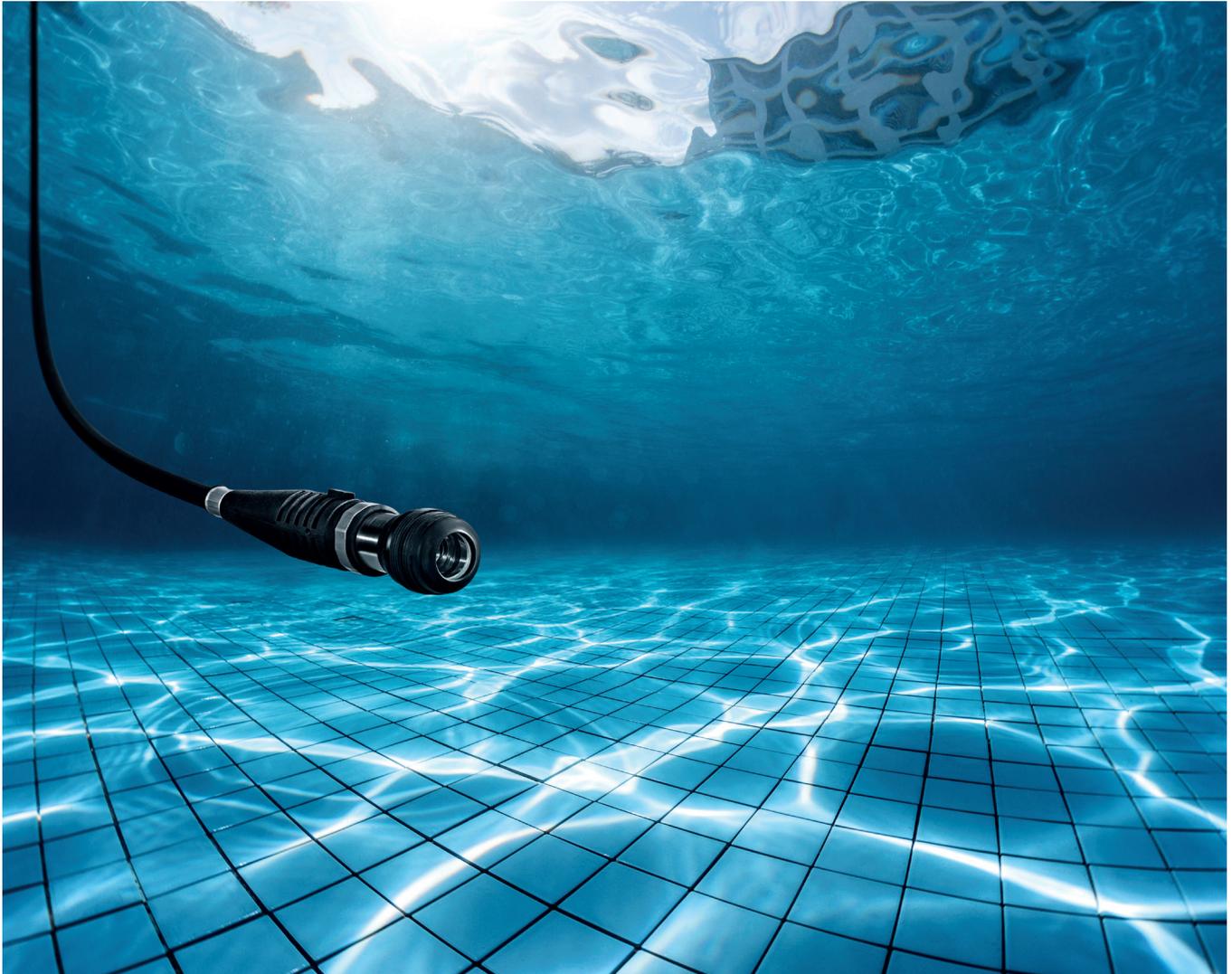
Through industry leading research into efficient and environmentally resistant communication cable systems, HUBER+SUHNER have been able to overcome many of the obstacles that limited the effectiveness of renewable energy infrastructures. In terms of this technology's impact on the offshore wind industry, the company's ongoing development and production of vital, machine mechanism parts known as C parts ensure there is reliable data transmission for big wind-energy operations and that generator parts remain protected despite the harsh operating conditions.

The latest technology developed and produced by HUBER+SUHNER, specifically for the offshore wind industry is the RADOX® Wind low frequency cable. RADOX® is designed to deliver the highest quality communication network between the power station and the wind turbines. This allows for the constant maintenance and monitoring, of these offshore sites, without having to physically travel out to sea to check all of the many components



HUBER+SUHNER's Fiber-Optic Connections with CWDM/WDM Technology have already been integrated into several offshore sites around Europe, within which they play a crucial role in supplying reliable power and communication services. The importance of these issues cannot be understated, with hundreds of thousands of homes and businesses relying on these offshore wind power sites, reliability in the provision of this power is vital. This sort of technology

major offshore sites outside of Europe, primarily the USA. This possibility is an exciting opportunity for companies such as HUBER+SUHNER to develop technology to meet these new demands and construction projects intended to begin in the 2020's. Offshore wind technology is becoming more important not only in UK but everywhere and we anticipate a global acceptance and cohesion towards the creation of renewable energy infrastructure and even more advanced technologies.



that comprise the turbine. HUBER+SUHNER's modularisation technology allows components of the turbines to be sorted into remotely monitored and controlled modules, allowing for far easier maintenance, as well over all future proofing, by allowing for quick and effective replacement and renewal of outdated components and modules.

### The Future of Offshore Wind Energy

The main objective for offshore wind energy, as an industry, is to increase the efficiency and energy output of Europe's already existing sites. This is planned to be made possible through the developments and technology produced by companies, such as ourselves, whose work in the development of solutions such as RADOX®, has contributed towards the goals of the industry to improve the efficiency of pre-existing offshore wind sites.

Currently, the over 25,000 turbines in countries such as the UK, Belgium and

Germany require that they are replaced every 10-15 years, as part of what is known as the "repowering" project. The costs included in replacing existing turbines are understandably high; however, through relevant modular technology, the need to completely replace existing turbines is mitigated. The reliability of C part components has also reduced the frequency that even the most minor components need to be replaced within a turbine. The larger and more efficient a wind turbine, the more important it is to use resistant and, above all, maintenance-free cables.

As well as this, the offshore wind energy industry is hoping to expand from the shallower water of the oceans of Europe and begin creating sites in the deep seas off the coasts of the United States and other locations around the world within the coming decade. HUBER+SUHNER have already begun preparing for the upcoming challenges that such harsh application fields will present. These new sites will

incorporate the existing technology being implemented across European offshore sites. We currently see in offshore wind that generated power will be higher per wind turbine and this pushes the market to upgrade and change. Such changes always demand more connections. With power, the systems will also push limits and, therefore, control and sensor applications will become more important. Our solutions today already target the possibility to upgrade and add more capacity.

Our efforts to continually develop and produce the most up to date and modern modular technology has allowed for these exciting prospects to become ever closer to becoming a reality. It is through the efforts of companies like HUBER+SUHNER and their partners that serious strides are being made towards a European-wide renewable energy infrastructure, which will assist in the answering of the constantly increasing demand for energy on a global scale.

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