

As Offshore Wind Scales Up, its Cable Monitoring Systems Need an Upgrade



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Offshore wind is an industry in a hurry. The urgency to transition from fossil fuels and embrace sustainable energy sources has escalated over the past two years and offshore wind is essential to meeting targets such as global net zero emissions by mid-century and keeping global warming to within a maximum of 1.5 degrees Celsius.

Such goals are intrinsic to governmental and corporate strategies across the globe. Industry analysts believe it will take a colossal financial commitment to develop the required infrastructure to support a predicted spike in installed worldwide offshore wind capacity to 250 gigawatts in under ten years. It is estimated more than \$800bn worth of capital and operational expenditure (CAPEX and OPEX) will have been allocated by the time we reach the next decade.

That translates to many hundreds of miles of new export and inter-array cables needing to be manufactured and installed as turbines increase in capacity and ever bigger developments are rolled out.

But while cables represent approximately 10% of CAPEX outlay on offshore wind projects, during operations at least 75% of all insurance claim payments relate to subsequent cable failures, according to industry figures. Data generated by the ORE Catapult tells the story – with more than 90% of all

failures originating at either the design, manufacturing or installation phases.

At Proserv, alongside our offshore wind technology partners, we have estimated that there will be a failure for every 1,000 metres of export cable – and just 91 metres of inter-array cable. When a typical inter-array cable failure could cost more than £4mn to repair and require nearly 40 days of downtime, it would be natural to assume that current traditional cable monitoring systems (CMS) must offer real-time, clear visibility of system performance and cable integrity. But this is not the case.

Siloed systems and blind spots

Offshore wind is expanding rapidly but equally it is also beginning to mature with some wind farms, after more than a decade of continuous operation, inevitably starting to display wear and tear. But the initial design of many existing assets did not typically consider the vital need for future data capture and a capability for real-time, synchronous monitoring.

Traditional CMS, typically harnessing distributed temperature or acoustic sensing, collect important data but the interpretation of these via graphs or trending analysis

on the human-machine interface (HMI), is not intuitive enough to enable operators to make effective, real-time decisions based on the condition, integrity and performance of their cable assets, and thus direct their intended operations and maintenance (O&M) strategy. Current systems also operate in silos processing data in isolation without any wider correlation.

This means that operators and asset owners gain only a partial view of cable performance and integrity, with significant blind spots. For instance, traditional systems invariably have in-built alarm triggers which are activated as and when a certain parameter rises above or drops below a specific set point. With only limited visibility of what is going on, and supported by a system that does not allow real-time, effective decision-making, how can an operator know if a real problem exists once an alarm is triggered?

Blind spots leave operators entirely on the back foot unable to make proactive decisions, as faults and failures could emerge undetected on the trending analysis on the HMI. A further drawback to traditional CMS is that captured data is usually downloaded and handed to a cable specialist for interpretation and reporting. This usually takes several weeks and is a retrospective process.

Holistic cable monitoring

A new methodology, integrating increased data collection and real-time monitoring, is undoubtedly required to aid visibility across both existing and future wind farms.

A year ago, I wrote about Proserv's role, as part of a technology consortium alongside Synaptec and BPP Cable Solutions, leading the development of a holistic cable monitoring system as a major step-change to traditional methods. Much progress has been achieved and now we have a disruptive new system, known as ECG™.

ECG™ is a direct response to market needs. Benefitting from industrial sponsorship from ScottishPower Renewables, the technology incorporates multiple parameters such as distributed temperature, acoustic and also electromechanical sensing (via Synaptec's unique passive electrical and mechanical sensor systems), with synchronous, real-time monitoring across multiple assets, and continuous automated data analysis.

Once fully engaged and applied, machine learning will detect emerging faults in cable performance, even within normal operating boundaries, potentially indicating future issues requiring remedial action to alleviate the likelihood of failures from occurring. So, our intuitive dashboard will not only indicate the live, real-time condition of export and

inter-array cables, but will also predict future failures, estimate time to any failure, and supply fault mitigation recommendations.

Meanwhile, the technology can be retrofitted to existing systems combining all historical data within the new solution, making it entirely flexible and scalable, while it is equally applicable to both fixed bottom and floating wind structures.

The core aim of our solution is to provide a genuine shift in maximising power generation, optimising efficiencies, reducing the incidence of failures and sudden outages, while enabling proactive, targeted deployment of OPEX where it is most critically needed across an asset.

In December last year, our ECG™ solution was chosen to provide inter-array cable monitoring on one of the world's largest offshore wind projects currently taking shape in the North Sea off the UK coast.

As offshore wind matures and scales up to increase

Offshore Wind Fact Box:

\$810bn
of investment in
offshore wind by
2030

(Rystad Energy)

Global installed
base of **250**
gigawatts
by 2030

(Rystad Energy)

At least **75%**
of offshore wind
insurance claim costs
are cable related

(ORE Catapult)

More than **90%**
of cable faults
occur in the design,
manufacturing or
installation phase

(ORE Catapult)

