



Offshore projects: exposures, challenges and enablers

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Foreword

The involvement of insurers is essential to renewable energy projects, particularly in providing financial investment capacity and risk management solutions. Our experience indicates that offshore initiatives often operate on the margins of profitability as they compete with other sustainable energy sources. In many cases, national or state support remains a crucial requirement for project implementation.

Green energy projects frequently encounter recurring types of incidents and claims, which can be seen year after year, in project after project. A persistent challenge lies in the insufficient transfer of risk management insights and loss prevention strategies between operators. A more open culture and time spent on sharing information about losses would lead to better loss prevention worldwide over time.

At If Insurance, we recognize the importance of sharing industry-wide knowledge and best practices—leveraging our comprehensive claims data—to benefit manufacturers, companies, and other stakeholders within the renewable sector. Offshore projects, in particular, present unique risks, many of which can be effectively managed through insurance solutions. Project Insurance offers crucial protection to investors, mitigating potential financial losses arising from unforeseen damages.

Enabling renewable energy

Offshore wind power stands out as an established renewable energy source that continues to play a vital role in the coming decades. As the industry grows, it is anticipated that Nordic developers and suppliers will extend their involvement well beyond their home markets, participating in offshore wind projects globally. This global presence will allow them to contribute their skills and experience to renewable initiatives around the world, reinforcing the transition to sustainable energy on a broad scale.

Our philosophy is that insurers should collaborate closely with clients to identify solutions for successful projects. When evaluating risks—such as those in wind farm development, interconnector cables, and electrification initiatives—we use a comprehensive approach, which enables better risk management and loss prevention solutions for our clients.

We prioritise core principles and encourage early discussion on renewable and green industry projects. We aim to build trust with clients and partners, ensuring projects are safe and incident-free.

In this report, Tom Guttormsen, Nordic CAR/EAR and Energy Risk Engineer at If Insurance, provides insights into exposures, challenges and enablers that offshore renewable projects encounter.

Offshore projects: exposures, challenges and enablers

The article assesses the resulting exposures and challenges to capital-intensive investments and explores enablers for effective risk mitigation. The margin for successful investments in offshore renewable projects is currently very low compared to other industries, and at all stages in the planning and execution phases developers are looking to lower the Levelised Cost of Energy (LCOE) to make their project profitable. Amid rising geopolitical tensions, energy security is also challenging environmental sustainability as a top priority, and this is in a global perspective reshaping regulations, policies, and market dynamics. This shift puts significant strain on developers and supply chains.

Offshore renewable projects

Offshore renewable projects normally refer to energy generation initiatives that harness renewable resources located in marine environments — typically seas or oceans— rather than on land. These projects are designed to produce clean energy while minimising environmental impact and reducing reliance on fossil fuels.

The most widely used projects are wind farms with bottom fixed turbines, but as the development continues, the development areas are moved further offshore and, in many regions, also into deeper water and floating wind will be imperative for feasible solutions. The turbines are normally connected with inter array cables to an offshore substation and further to the grid with export cables carrying power with high voltage in AC or DC cables. The discussion in this article is also valid for other offshore renewable projects like wave energy and tidal energy projects and interconnection cables that are installed to ensure a stable power grid between regions and countries.

LCOE and new technologies

Levelised Cost of Energy (LCOE) defines the average cost per unit of electricity, usually in €/MWh or \$/MWh, generated by a specific energy project. LCOE accounts for all costs over a project's lifetime, and it allows for apples-to-apples comparisons between technologies. It is also the key metric used to compare the cost-effectiveness of different energy generation technologies over their lifetimes. This parameter is often the decision-making tool for developers, and it also have a direct impact on the bankability of a new project.

A key component in LCOE as a parameter relates to Capital Expenditure (CAPEX) and Operational Expenditure (OPEX). In order to make projects profitable, there is significant pressure to reduce the CAPEX. To do this, new technologies need to be developed and industrialised to ensure the cost effectiveness of the entire supply chain.



The most significant technological advancement has been the development of larger and larger turbines to reduce the cost of internal infrastructure within wind farms. Additionally, there is a growing need for more efficient installation methods and new vessels with enhanced capacity.

Insurance is important for these projects because most of them are financed through bank loans rather than directly from a company's balance sheet. They often only become profitable with government support, for instance through contracts for difference i.e. subsidies from the governments or tax credits.

Lenders are less willing to be exposed for risks and the market for insurance are increasing to close the gap between investors, developers and financial institutions. Offshore wind is capital intensive, and

the risk exposure is consequently also high if any uncertain events are happening, and yes incidents and accidents do happen and the insurance in the development phase and the operation phase is a cost factor that hits the various fragile projects. This article discusses the exposure, challenges and enablers seen from all parties involved in a project development.

History of incidents

Most incidents and losses are concentrated in the construction phase, and cable issues have by far been the most frequent and costly type of incident. About 40% of reported insurance incidents are related to cables, and about 80% of the cost is related to these incidents. This is a disproportionate number, as in an offshore wind farm, cable procurement and installation normally account for some 10–15%

of total CAPEX. TGS – 4C Offshore has reviewed cable incidents known to date and causes for these incidents in their Market Update Report for Offshore Transmission and Cable Intelligence Q2 of 2025. Industry data from TGS-4C has documented 383 cable failures (see chart below). Of these, 179 are attributed to unknown or miscellaneous causes, 59 to installation errors, 35 to mechanical issues, 25 to external impacts, 21 to design flaws, and 17 to environmental factors. The remainder are linked to other incidents like anchor strikes, cable protection system (CPS) failures, manufacturing defects, fiber optic faults, aging, and jointing deficiencies. Poor installation techniques remain the leading cause of failure in their review. Significant learnings have been taken from these cable incidents, but the industry is not very open to sharing these learnings as it is considered proprietary information.

It feels like déjà vu. Despite years of progress and technological advancement in offshore wind development, we continue to see the same types of incidents that plagued the industry in its early days. Why, with all the experience gained, are these issues still recurring? This pattern is reminiscent of the early years in the oil and gas sector, where failures

involving umbilicals and risers dominated the claims landscape. Over time, those issues were addressed through rigorous design codes and standardized testing, including qualification for the actual environmental and structural application. Today, such failures are far less frequent.

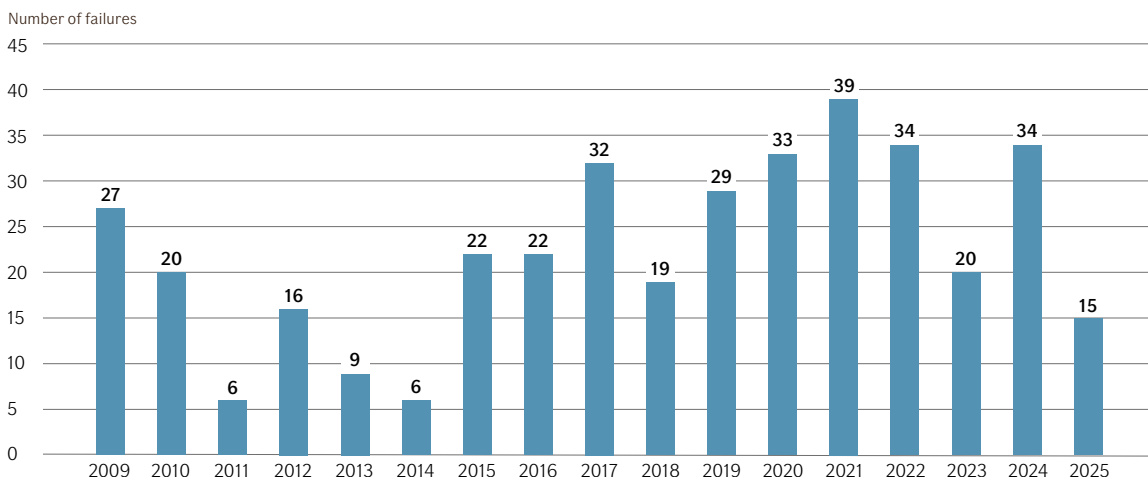
To better understand why offshore wind has not followed the same trajectory as the offshore oil and gas industry, we would like to highlight four critical elements that, in our view, are essential to improving the success and reliability of offshore renewable projects:

- Human factors
- Ground conditions
- Technical standards and project certification
- Marine Warranty Survey

Human factors

In today’s corporate landscape, ESG (Environmental, Social, and Governance) has become a central pillar of value creation across all industries. While the term is often equated with “sustainability,” its interpretation can vary widely between organizations and contexts. For some, unfortunately, ESG remains a buzzword – an item on a checklist – rather than a meaningful driver of change.

Historic subsea cable failures (TGS-4C Offshore Market Update Report for Offshore Transmission & Cable Intelligence Q2 2025).



But ESG, particularly the “S” for Social, is far more than soft talk. It’s about people, culture, and behaviour – factors that are increasingly under pressure in a world where leadership styles are shifting. In some regions, there’s a growing emphasis on strong, individual leadership over collaboration and collective responsibility. This trend risks sidelining the very elements that make organizations resilient and safe.

In our view, attention to the so-called “soft” issues – human factors – is not just relevant; it’s essential. A strong safety culture, built on trust, openness, and shared responsibility, is one of the most effective barriers against incidents. It’s not just about procedures and systems; it’s about people who feel empowered to speak up, question decisions, and take ownership of their role in a project.

From planning to execution, a culture that encourages collaboration and psychological safety ensures that risks are identified early and addressed effectively. When workers understand their responsibilities and feel confident in raising concerns, they become active participants in maintaining safety – not passive observers. Organizations that truly embrace ESG principles foster environments where safe job analysis, peer-to-peer accountability, and continuous learning are the norm. These aren’t just compliance measures – they’re cultural indicators of a mature, responsible organization.

Moreover, when procedural flaws or design oversights slip through the cracks, it’s often human factors that are able to detect and mitigate them. A vigilant, engaged workforce is one of the most powerful safeguards a project can have.

Ground conditions

Typical explanations for mistakes in offshore renewable projects include poor workmanship, incorrect design, lack of understanding for installation risks and poorly described operational procedures. Developers and suppliers are very reluctant to share incident information and root-cause analyses, as

this is considered proprietary information that may adversely impact their reputation. Nonetheless, one clear reflection from our experience at If is that many incidents have a root cause related to understanding ground conditions, rather than operational procedures, design errors, or poor workmanship.

Unknown or unexpected ground conditions may, in the worst cases, lead to loss of foundations, which is extremely costly and time-consuming to rectify. More often, as described earlier, we see cable incidents, which are usually related to operational procedures, trenching incidents, and unexpected scour phenomena. In reality, the root cause for these incidents is often related to poorly-understood ground conditions and environmental effects. Repair work for such incidents is very costly, due to lack of specialized vessel availability, challenges related to remobilization of vessels, and very high vessel day-rates.

The geotechnical supplier market is heated; developers will push Development Expenditure (DEVEX) and Capital Expenditure (CAPEX) costs as low as possible. In this process, the inherent spatial soil variability may not be properly investigated or understood. For decades, the Norwegian Geotechnical Institute (NGI) has been at the forefront of offshore geotechnical design, research, and innovation. The expertise at NGI ranges from seabed surveys and foundation design to monitoring and risk management. To better understand this challenge, we interviewed **Thomas Langford**, Director Offshore Energy at NGI, and asked about their recommended process for site investigations and geotechnical design.



Thomas Langford,
Director Offshore
Energy at NGI

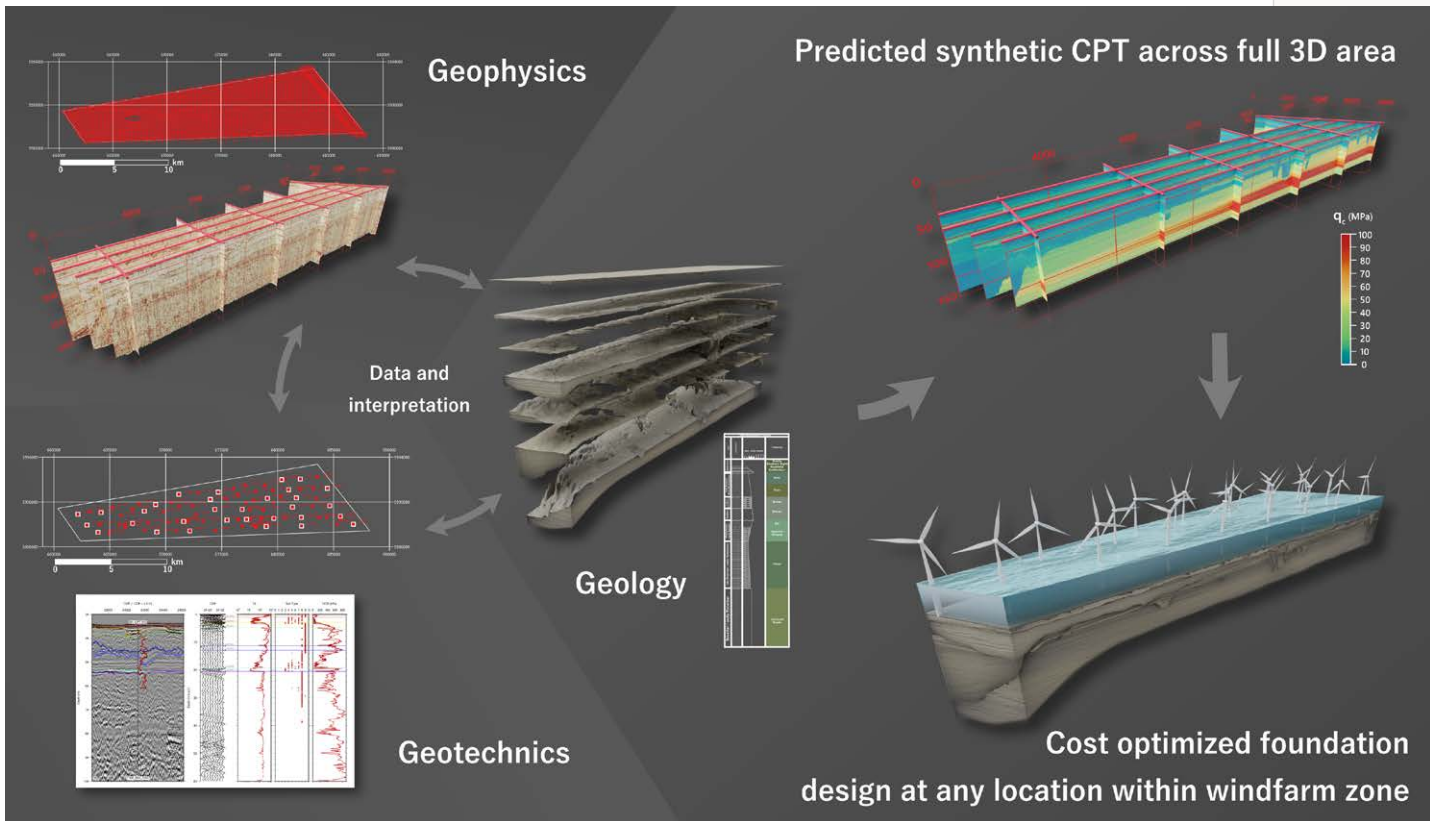


Image courtesy of NGI

He explains that they recommend integrating geological knowledge, high-resolution geophysical data, and geotechnical data into a so-called Quantitative Integrated Ground Model. To make this happen, a collaborative effort is required to merge geophysical and geotechnical data from the field and laboratory into a consistent geological framework. A well-planned site investigation survey strategy is needed to develop such an integrated ground model, and data must be collected during a series of geophysical and geotechnical surveys, ensuring that geotechnical boreholes and in situ test locations are located on geophysical survey lines.

The in-situ tests are normally so-called cone penetration tests (CPTs), where various soil parameters may be derived from measured tip resistance, pore pressure, and side friction on an instrumented rod pushed into the soil. Advanced laboratory tests on soil samples are also combined with the in-situ tests and with results from

Ultra-High-Frequency Seismic (UHRS) through a proprietary prediction model to create a global 3-D understanding of the entire development area. The methodology is illustrated in the figure above.

This approach can be used to predict characteristic geotechnical soil parameters for the design of non-borehole locations and can provide design data for any point within a development area. This reduces offshore vessel time for soil investigations because the parameter estimates are based on geophysical data. It may also reduce DEVEX cost and improve design parameters for any elements of the field development that have an interface with the soil conditions. From a risk perspective, the ground model also captures the uncertainty of the parameters which allows the designer and project owner to better understand and manage project risks.

Thomas says that this approach has become increasingly common for large developers as the industry has evolved. However, licensee agreements with the authorities in most countries are based on an auction model, which means that each potential developer generally needs to perform an initial regional soil investigation to understand the ground conditions, without focusing on an optimal long-term strategy for developing a 3-D ground model. In some countries, like the Netherlands, government agencies take care of acquiring an integrating data to provide a ground model to prospective bidders, to provide a “level playing field of geodata” and facilitate lower bids.

Geotechnical design of foundations is normally done by various design houses and typically transport and installation of the foundations may be handled by large contractors. Cable burial assessment and protection will often be handled by separate cable suppliers and consultants. The unclear organizational and contractual boundaries between the two design groups have in some cases resulted in severe damage to cables at the interface where the cables enter the foundations due to abrasion effects on the scour protection around the foundations.

A final word from Thomas is to highlight there are aspects of soil behaviour that are not fully understood, with design rules remaining partly empirical and not necessarily directly applicable in new regions. For such locations, he strongly recommends the use of large-scale testing and monitoring to improve the design methodology so that future foundations in the same area can be safely designed without excessive conservatism. This approach has been used successfully in several projects, and experience has shown significant reductions in risk and CAPEX.

Technical standards and project certification

While most technical components in offshore renewable projects adhere to strict national and international design standards – including electrical cables – the gap often lies in type testing under real-world conditions. Cables may be well-designed and tested from an electrical functionality perspective, but not necessarily optimized for the harsh environments in which they operate.

One recurring challenge is the somewhat unclear division of responsibility among key stakeholders: foundation designers, installation contractors, cable manufacturers, and cable protection system suppliers. Each party may be confident that their component meets industry standards or has undergone sufficient testing. Yet, when it comes to the interfaces between systems, accountability becomes murky. Unlike the oil and gas sector, where project-specific type testing is now standard practice, offshore wind projects often lack this level of scrutiny. Interface routines exist, and suppliers respond from their respective domains, but gaps remain – especially when it comes to how components interact in the field.

To address these persistent issues, the industry may benefit from an extended use of third-party certification. To shed more light on this topic, we interviewed **David Maloney**, Director Subsea Cables, Renewables Certification at DNV.

David explains that the sector already has the expertise required to fix the problems. Cable suppliers (OEMs, i.e., Original Equipment Manufacturers) and developers are packed with people who have the skills and know-how to get a grip on cable failures. A lot of good work is already ongoing in this regard, but it’s often being done in



David Maloney,
Director Subsea
Cables, Renewables
Certification at DNV

isolation, company to company. If the industry is to efficiently and effectively address this problem, it will require the establishment of best practices, and this is where third-party certification, and standardization can add the most value.

Standards and certification will help to bring more order and clarity to the subsea cable design process, setting a benchmark for the suitability of the products and technologies. Traditionally, industry standards have focused more on the electrical aspects of cables, as opposed to the full asset design, but there is an opportunity to complement existing standards with new measures, something that DNV is proudly leading with their suite of design standards. The importance of having an integrated standards landscape is already well accepted for turbines and floating foundations, but this way of thinking should be extended to cables. With little effort, aligning design interfaces and responsibilities could make a big difference in the performance of subsea cables.

Markets like the US, Taiwan, and Poland now require third-party certification of their subsea power cables, including CPS solutions, and there is growing recognition among regulators that the industry hasn't been documenting this sufficiently, given the recent spate of public failures. Furthermore, these failures are starting to influence existing markets, with regulators

requesting more information regarding subsea cables. Overall, we see this as a trend that may result in other jurisdictions focusing further on subsea cables.

David is also advocating industry collaboration and knowledge sharing via Joint Industry Projects (JIPs), which are likely to provide significant opportunities in mitigating risks. DNV is currently leading two such JIPs in which subsea power cables for offshore wind are included: Floating Wind Reliability JIP and Floating Offshore Wind Substations Phase 2 JIP. Lessons learned and experience from the industry must be collected, evaluated, and translated into requirements documented in globally accepted design standards. Such a framework could help clarify responsibilities, ensure comprehensive testing for the actual application, and reduce the risk of failure at critical interfaces. Certification not only enhances technical assurance – it also fosters collaboration and transparency across the supply chain.

Marine Warranty Survey

When it comes to marine operations, risks are inherent all the way from load-out through transportation to offshore installations. Marine projects carry significant investment exposure and challenges. This is where the Marine Warranty Survey (MWS) steps in and serves as a pivotal component in ensuring the safety and viability of marine projects.

The title of Marine Warranty Surveyor isn't something one earns through a standard academic path. There's no universal certification, no one-size-fits-all course. Instead, it's a role built on deep experience, technical expertise, and a nuanced understanding of marine operations. Crucially, being appointed as an MWS on one project does not automatically qualify someone for another. Each project has its own unique challenges, and the MWS must be selected accordingly.

The appointment of an MWS should not be seen as a box-ticking exercise to satisfy insurance requirements. Such an approach overlooks the real value an experienced MWS brings – not just in verifying design compliance, but in applying hard-earned lessons from previous projects. The right MWS contributes to safety, efficiency, and ultimately, project success.

Experience matters – and so does specialization. An effective MWS should preferably possess formal marine education and hands-on experience with the vessel type and project scope at hand. Ideally, they hold credentials as a Master Mariner, Naval Architect, or Structural Engineer, and have a working knowledge of the relevant industry standards. But qualifications alone aren't enough. The MWS must also be capable of supporting operations around the clock – not just during critical phases. This 24/7 presence often requires two MWS professionals per offshore rotation. While some projects may

hesitate at the added cost, the benefits are clear: better oversight, faster decision-making, and a richer transfer of operational knowledge to the project and to a broader MWS community.

To meet the evolving demands for these specialized marine projects, it's recommended that MWS activities align with the Joint Natural Resources Committee (JNRC) Code of Practice (COP) – formerly known as the Joint Rig Committee. While some tailoring may be necessary to suit specific project scopes, this framework provides a solid foundation for consistent, high-quality MWS engagement. Early dialogue between the client, the insurer, and the MWS team is essential. By proactively discussing scope adjustments, risk factors, and project-specific nuances, stakeholders can ensure the MWS role is not only compliant but genuinely effective.

Summary

Despite technological progress in offshore renewables, cable incidents continue to dominate insurance claims, often with disproportionate costs. While solutions exist, cost pressures and industry barriers seem to hinder their adoption.

This article highlights four key areas for enhancement:

1. **Ground Conditions Understanding.** Advanced 3D ground models integrating geophysics, geology, and geotechnical data can provide precise soil design parameters across development areas. However, these tools remain underutilized.
2. **Collaborative Knowledge Development and Project Certification.** Competitive pressures and concerns over intellectual property often limit collaboration between OEMs, suppliers, and developers. To overcome this, the industry should promote project certification, structured knowledge sharing, and collective learning – without compromising proprietary information. Joint Industry Projects (JIPs), which have long been successful in oil and gas, should be embraced

in renewables to develop globally accepted design standards. Insurers and brokers, too, should actively participate to help break down silos and foster cross-sector cooperation.

3. **Effective MWS Engagement.** Early and proactive dialogue between clients, insurers, and Marine Warranty Surveyor (MWS) teams is essential. By discussing scope, risks, and project-specific nuances upfront, stakeholders can ensure the MWS role is not only compliant but genuinely effective.
4. **ESG as a Cultural Foundation.** ESG principles should be embraced beyond compliance. They will shape a culture of safety, peer accountability, and continuous learning. A vigilant, engaged workforce is the strongest safeguard a project can have.

By increasing awareness among stakeholders around these four pillars, offshore renewable projects are likely to evolve from recurring setbacks to a future defined by fewer incidents and greater reliability and resilience.

For more than 15 years, we have insured green energy risks, focusing exclusively on Nordic-headquartered energy clients. Our thorough understanding of these risks enables us to provide coverage with confidence. We have significant capacity to support carefully assessed, high-quality risks, reflecting our experience and stability in the market.

For more information, contact If insurance



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