Navigating the complexities of offshore cabling: the lessons and challenges

Kathy Wood, Divisional Director at GoBe Consultants, part of APEM Group, speaks to PES about the evolving complexities of offshore cabling. From seabed congestion and consenting challenges to the influence of strategic initiatives, she shares crucial lessons learned, emerging risks and the cutting-edge tools developers are using to secure efficient, sustainable grid connections in an increasingly crowded marine environment.

PES: It's good to talk to you, Kathy. To start, what are the primary challenges developers face when seeking consent for cabling in offshore wind projects?

Kathy Wood: The main challenge for offshore cable consenting is finding space on the increasingly congested seabed. Developers must identify suitable routes between offshore wind farms and onshore grid connection points while minimising interactions with existing seabed infrastructure and users, as well as significant impacts on protected areas and species.

Increasing competition for the seabed, due to pipelines, cables, environmental protection and fishing, requires offshore wind developers to dedicate more time and resources to early cable route selection and design processes. This is essential to avoid significantly impacting overall project timelines and costs.

PES: How has the Offshore Transmission Network Review (OTNR) and the subsequent Holistic Network Design (HND) and HND Follow Up Exercise (FUE) influenced the approach to transmission cables in offshore wind projects?

KW: These initiatives address the need for a strategic approach to connecting increasing amounts of offshore wind generation, particularly in Scottish waters, to the UK's grid network. Whilst they primarily respond to increasing onshore congestion and aim to reduce onshore impacts, they also inevitably influence offshore route selection.

The OTNR and HND have introduced a more holistic approach to network design, considering the integration of renewable energy sources with onshore grid connections and accommodating future energy scenarios. This should provide developers with greater confidence and better enable the achievement of net zero targets.

PES: With the increasing congestion in the seas, how can developers manage the risks associated with defining and consenting offshore cable corridors?

KW: Early understanding of risks is crucial. Developers benefit from conducting early stage assessments to identify environmental, human and physical constraints. Engaging with stakeholders and government bodies early on can help mitigate risks and ensure smoother project progression.

Developers can identify potential obstacles and inform practicable route design by conducting thorough early constraints analysis, site investigations and environmental impact assessments. This proactive approach not only reduces the likelihood of encountering unforeseen issues but also enhances the long-term feasibility of the project. APEM Group can help developers navigate this process.

Maximising advanced technologies such as remote sensing provides valuable insights into seabed conditions and helps optimise cable routing decisions. High-resolution mapping of bathymetry, sediment composition and subseafloor structures supports the identification of potential geohazards, such as sand waves, boulders or steep gradients. This allows for more accurate assessment of burial feasibility, minimising environmental impact and reducing installation risks.

PES: What lessons have been learned from previous rounds of offshore wind projects, particularly about cable consents, and how can these lessons be applied to future projects?

KW: In the early rounds of offshore wind development, both grid capacity and physical space for transmission assets were less constrained than they are now. As more offshore wind projects have been developed, there have been increasing calls for a more coordinated and strategic approach to offshore transmission and interconnection. These calls come from developers seeking certainty and local communities advocating for more infrastructure to be located offshore, leading to the OTNR, HND and HND FUE initiatives mentioned above.

Information and lessons learned from the construction and operational phases of offshore wind projects continuously feed back into the development phase. This enhances our understanding of potential environmental impacts and mitigation measures, such as a better understanding of cable protection requirements and their inclusion in consent documents, as well as the use of the most suitable installation techniques.

PES: Can you elaborate on the specific environmental constraints that impact the consenting process for both marine export and inter-array cables?

KW: Existing infrastructure, such as offshore wind farms, oil and gas facilities, pipelines and cables, must be carefully assessed for commercial, technical and safety impacts. Fishing intensity and anchorage areas also require consultation with fishers. Cable routing should consider seabed topography and geology, avoiding steep slopes and increasing burial depth in high-sediment areas.

Kathy Wood

Coastal challenges like erosion are crucial for minimising environmental impacts and ensuring project feasibility.

Developers also need to assess impacts on marine habitats and protected species, conducting environmental assessments and engaging with conservation organisations. Construction activities may need to be planned around ecological cycles to avoid disrupting habitats. Interaction with protected sites may require additional assessments and habitat compensation measures.

Collaboration with environmental experts ensures alignment with conservation goals and regulations. APEM Group has dedicated technical teams who can advise on impacts and work with developers to provide practicable mitigation measures.

PES: Mobile seabed and sand waves present significant challenges. How do these physical aspects affect cable installation and maintenance?

KW: Mobile seabed and sand waves can expose cables, increasing the risk of cable damage due to spanning. Burying cables below the seabed reference level can help mitigate this risk by placing cables in deeper and less mobile sediment layers, although this approach is costly and could potentially be more impactful.

Early collaboration with geotechnical experts and marine engineers ensures that seabed mobility, along with environmental factors, is considered at an early stage of route design. Route options avoiding areas of high mobility can then be compared against those requiring greater cable burial depths, in line with specific project requirements.

PES: What are the common issues related to cable spanning and breakages, and how can they be mitigated?

KW: Early planning and understanding of seabed conditions can help avoid issues and reduce the need for post-installation protection measures, such as mattressing. If additional cable protection is required where cables cross designated sites, obtaining consent can be challenging.

Regular inspections and maintenance activities are crucial to ensure the long-term integrity of the cables. Developing

contingency plans and emergency response strategies to address issues during the operational phase of projects is also essential.

Approximately 75% of cable damage is caused by human activities like fishing and anchor strikes. To minimise these incidents, it's crucial to avoid operational hazards through data analysis and consultation about ship anchorages and fishing grounds. Conducting a Cable Burial Risk Assessment (CBRA) ensures protection where hazards are unavoidable. Continuous risk monitoring, including updates for environmental or activity changes and real-time vessel traffic monitoring, is essential. Issuing warnings when vessels anchor or fish in risky areas can further mitigate damage.

PES: How do the requirements for additional consents for cable protection affect project timelines and costs?

KW: The need for additional consents for cable protection, particularly within designated sites, can strain project timelines and increase costs. Early engagement with regulatory bodies can minimise delays. Engaging with statutory nature conservation bodies and conducting appropriate assessments is necessary to ensure that designated nature conservation sites are not adversely affected.

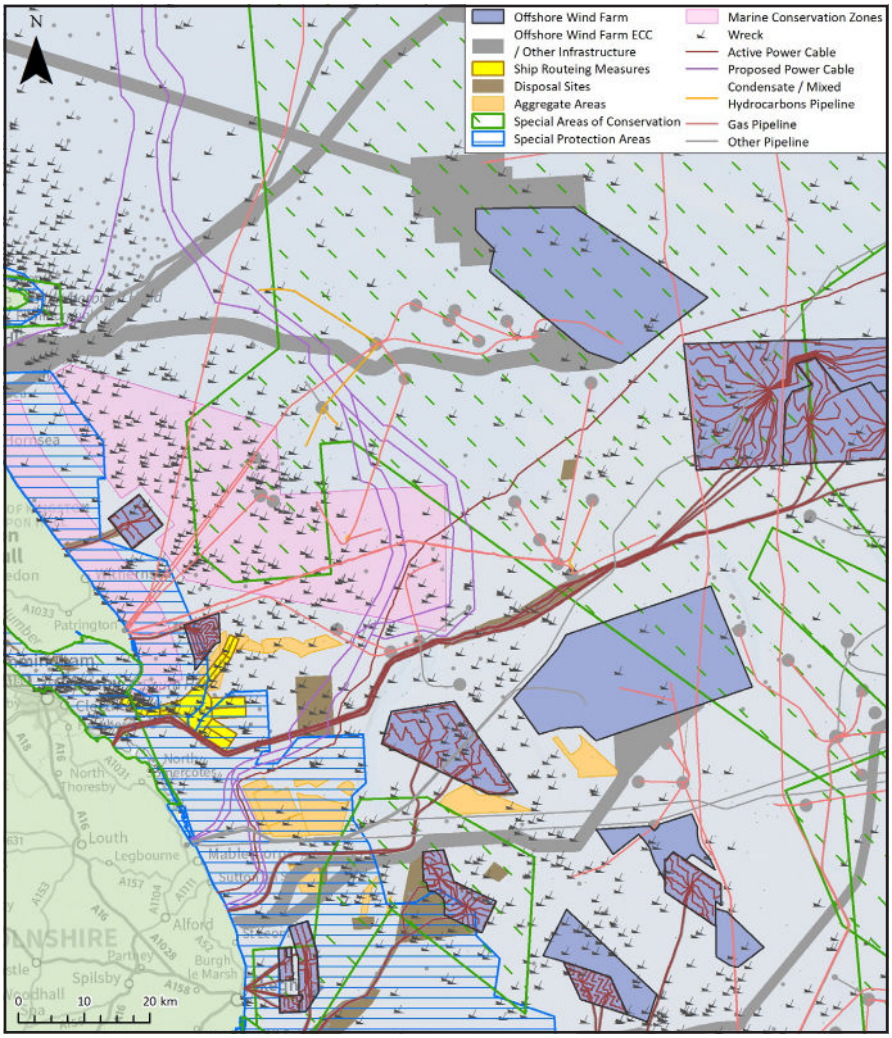
Navigational stakeholders, including the Maritime and Coastguard Agency, ports and harbours, must be assured that any protective measures do not impede access to shallow water channels or heighten the risk of grounding. By providing data on likely vessel sizes, tidal heights and water depths, a robust safety case can be established to show that risks are manageable.

Projects that encounter difficulties in achieving target burial depths can face prolonged and challenging consent processes for remedial burial or protection. Incorporating sufficient contingency plans in the early stages of cable routing and assessment to address unforeseen issues can significantly mitigate these risks.

PES: From a strategic perspective, what programmes and actions are in place to support the planning and environmental requirements for offshore wind grid connections?

KW: The Marine Recovery Fund, being developed by Defra, aims to compensate for environmental impacts from marine developments. Though not yet policy, it will guide developers in identifying compensation strategies like new Marine Protected Areas, habitat restoration, biodiversity enhancement and research programs. Participation can demonstrate environmental stewardship, align with regulations and ease the consenting process. Compensation measures must be scientifically grounded and developed with statutory bodies, conservation organisations and communities for ecological and social acceptance.

APEM Group promotes early integration of nature-positive strategies and compensation measures in project planning. We recommend innovative habitat creation and restoration to enhance biodiversity and ecosystem resilience. Through strategic planning, ecological assessment and stakeholder engagement, we help clients identify compensation opportunities that benefit the environment and coastal communities.



PES: What role does stakeholder engagement play in the consenting process, and how can it be optimised to reduce risks and delays?

KW: Stakeholder engagement is critical for reducing risks and delays. Early and meaningful conversations with stakeholders, including other sea users and nature conservation bodies, help developers identify and mitigate risks collaboratively, ensuring smoother project progression.

Through global experience and leading over 10 GW equivalent of offshore wind consent applications in 2024, APEM Group has a deep understanding of effective stakeholder engagement to influence the desired project outcome. This involves transparent communication, active listening and promptly addressing concerns.

PES: Finally, can you share any innovative methodologies or technologies that are being developed to tackle the challenges associated with offshore wind grid connections?

KW: Innovative methodologies and emerging technologies are addressing environmental and engineering challenges in offshore cable installation. Removable cable protection systems maintain cable integrity during operation and allow full seabed restoration post decommissioning, supporting a sustainable lifecycle and habitat recovery.

Autonomous underwater vehicles (AUVs) with high-resolution sonar, sub bottom profilers and magnetometers optimise marine surveys. AI driven data processing enables rapid interpretation of geospatial data, optimising cable routes and identifying geohazards like sand waves, boulder fields or unexploded ordnance (UXOs).

APEM Group supports developers in connecting projects to the grid with services like constraints analysis, stakeholder engagement and technical expertise on physical processes, benthic habitats, designated sites and human impacts. We also offer detailed vessel traffic analysis and CBRA.

Partnering with engineering consultancies, we provide route engineering expertise. Our planning and environmental services ensure workable consents and ongoing compliance, maximising investment efficiency and supporting the UK's net zero targets with reliable grid connections.

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