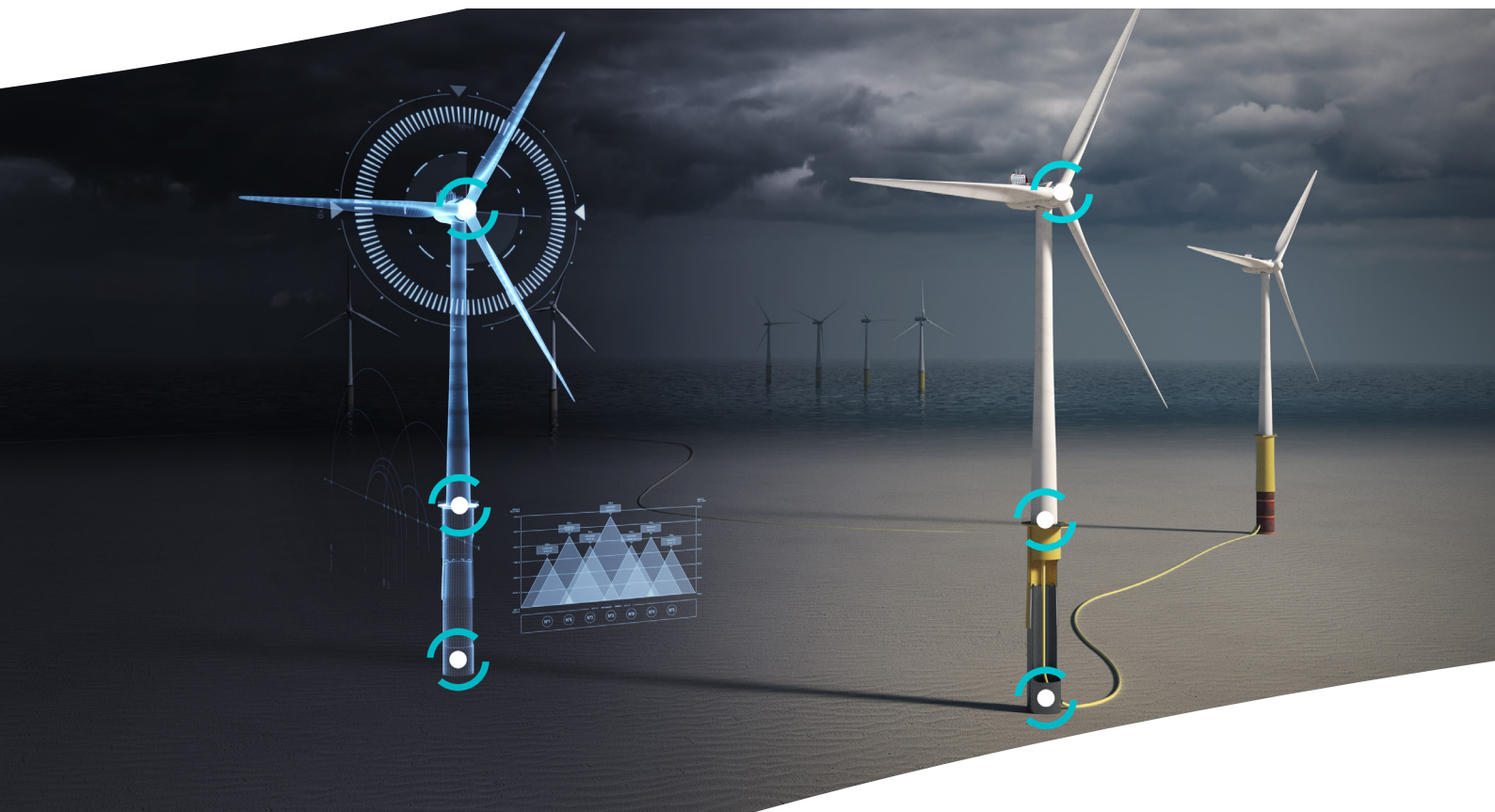


# Offshore Wind Optimisation

*Advanced engineering support and digital twins for reduced cost*

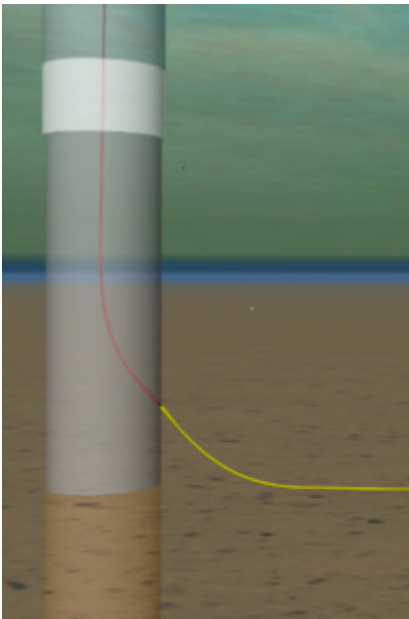


*4Subsea has in-depth understanding of complex dynamic analysis of slender and non-slender structures in wind, waves and currents. We develop and refine analytical tools and methods based on extensive accumulated experience, enabling us to provide the best possible services to our clients.*

4Subsea offers a wide range of engineering support and digital monitoring services related to floating and bottom-fixed offshore wind systems. We cover all life cycle phases, starting with technology development and conceptual design through FEED and detailed design, procurement, construction, installation, operation, and decommissioning.

## KEY DELIVERABLES

- Concept development of Floating Offshore Wind Turbines (FOWT)
- Advanced coupled analysis
- Configuration design and fatigue analysis of inter-array and export cables
- Analysis of cable protection systems (CPS) for submarine cables
- Advanced FE analysis of cables/ structures
- Root cause investigations of cable irregularities
- Installation analysis and follow-up of offshore installation campaigns
- Subsea routing, on-bottom stability and protection for submarine cables
- Development of test procedures and follow-up mechanical testing of cables
- Monitoring cable motion and freespa
- Digital monitoring on [4insight.io](https://www.4insight.io)<sup>™</sup>
- Mooring system design for FOWT



## Offshore Wind Technology

4Subsea provides dedicated expertise for concept development and detailed engineering of offshore floating wind, as well as system design and analysis of inter-array and export cables. 4Subsea takes part in the IEA Offshore Code Comparison Collaboration Continuation projects (OC4 & OC5) with verification and validation of software for floating wind turbines. IN addition, we deliver digital services for cable monitoring and sub structure lifetime extension.

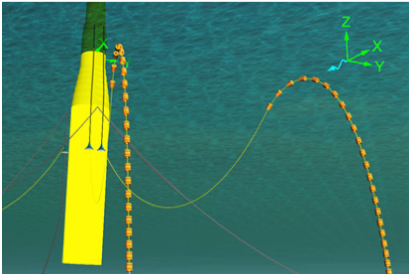
### Areas of Expertise

- Concept development
- Structural design
- Mooring system design
- Dynamic cable design
- Assembly and marine operations
- Digital monitoring solutions

### Inter-Array and Export Cable System Analysis

4Subsea provides expert advice on system cable design for bottom-fixed and floating offshore wind turbines and offshore sub-stations.

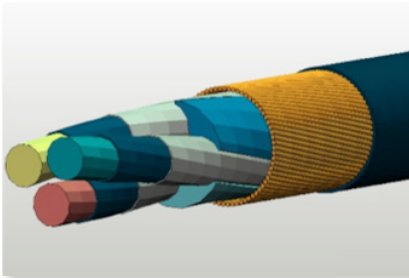
- Cable Protection Systems (CPS)
- Cable configuration system design
- Cable fatigue analysis
- Ancillary components (stiffeners, clamps, buoyancy)
- Installation analysis
- Tie-in analysis
- Subsea routing



### Structural Assessment & Monitoring

4Subsea has unique experience with structural assessment, damage investigation and monitoring of submarine power cables and umbilicals and offers advisory services to design, fatigue, testing and integrity management.

- Detailed FE analysis using MARC
- 2D model and axis symmetric modelling
- 3D model for validation and non-axi symmetrical cases
- Planning and execution of full scale test
- Small scale test - material
- Monitoring cable using autonomous sensor technology - fatigue, scour, freespan
- Data for validation of FE analysis
- Basis for risk assessment



4Subsea is a leading provider of technology and services that help operators optimise energy production from subsea oil & gas fields and offshore wind farms. We combine domain expertise with data analytics and digital services to maximise lifetime of assets, reduce operational cost and optimise future projects through data-driven design.

The company was established in 2007 and clients include the major energy operators as well as the large suppliers of sub-sea equipment. 4Subsea is headquartered in Asker, Norway with additional offices in Bergen, Kristiansand, Stavanger, Rio de Janeiro, and Aberdeen. 4Subsea is a company in the Subsea 7 Group. More info at [www.4subsea.com](http://www.4subsea.com).

**4Subsea - Share ideas, move forward**

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