



TADEK
Ocean Engineering

Cable Fatigue Analysis & Monitoring

GUH Cables 2026

09/09/2026



1

Why Cable Fatigue?

Understanding the financial and technical drivers for proactive cable fatigue monitoring in offshore wind.

2

Sophistication in Fatigue Analysis

How to include the sophistication of inter-layer friction in your fatigue calculation methodology.

3

OrcaFlex Model Value

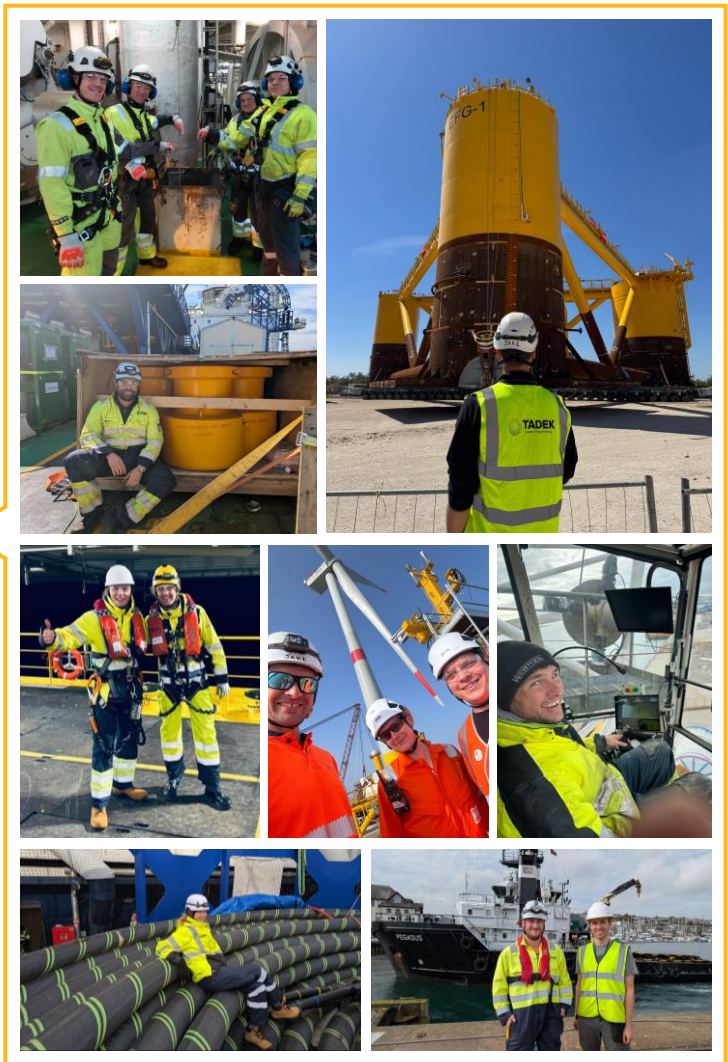
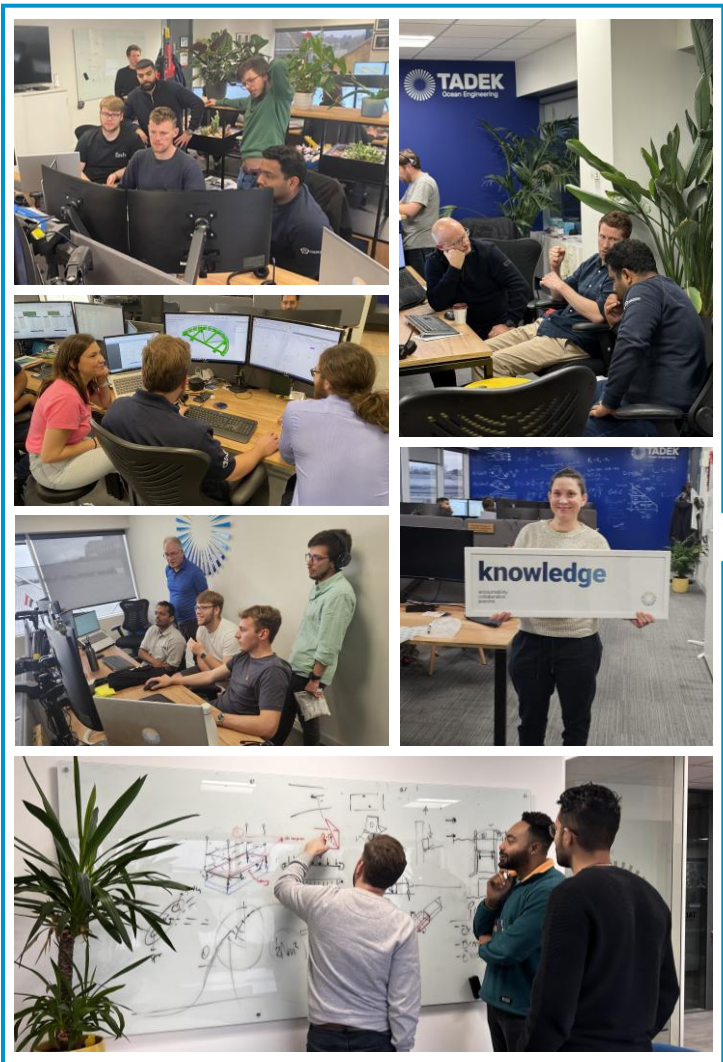
Extracting maximum value from design-phase OrcaFlex models for continuous operational monitoring.

4

Live Hindcast Monitoring

Achieving continuous fatigue monitoring by live-feeding hindcast environmental data into damage models.

Tadek: What makes us strong



Why are we talking about Cable Fatigue?

50%+

of total claims spend

from subsea cables — vs. ~30% of claims by frequency

2×

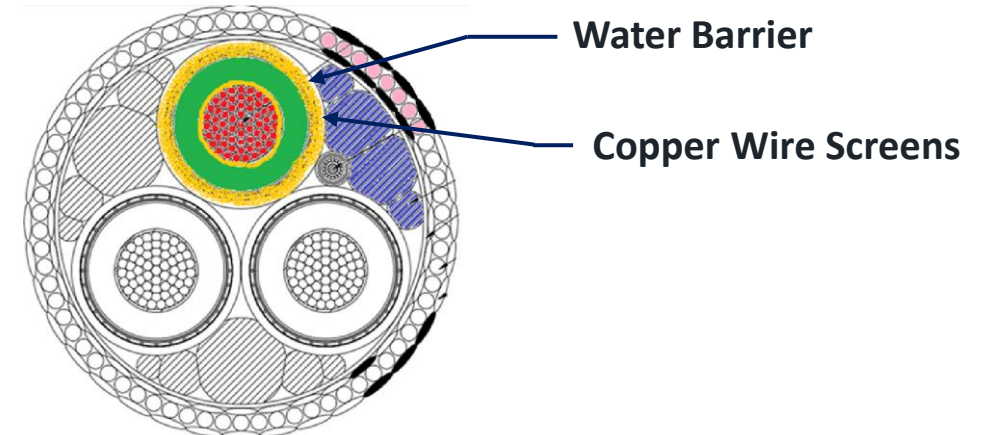
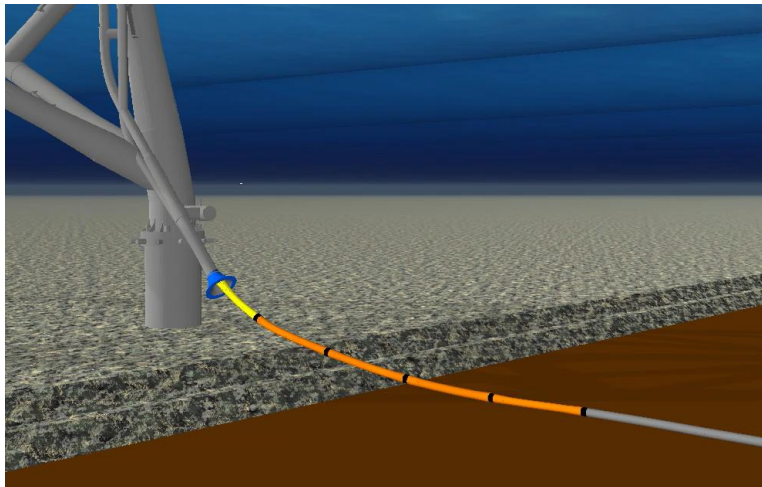
average claim growth

£1.67m (2010–15) → £3.08m by 2020,

40–60

days average downtime

per array / export cable repair



Source: GCube Insurance, "Uncharted Waters" claims report (2010–2020); Lloyd Warwick loss-adjusting data, as reported by industry press and DNV.

What makes cable fatigue analysis interesting?

1

Cross-Section Modelling

Layer geometry · material prop · friction coefficients

2

Stress Factors

Tensile and stick & slip curvature stress factors

3

Fatigue Analysis

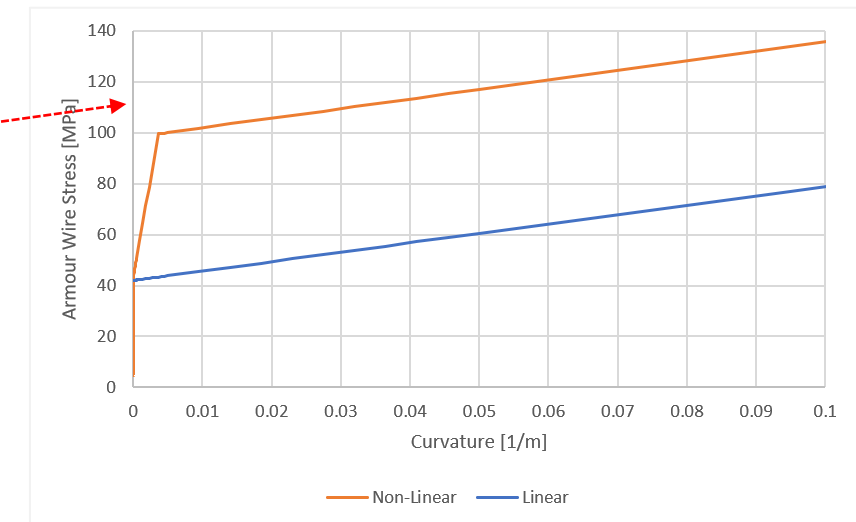
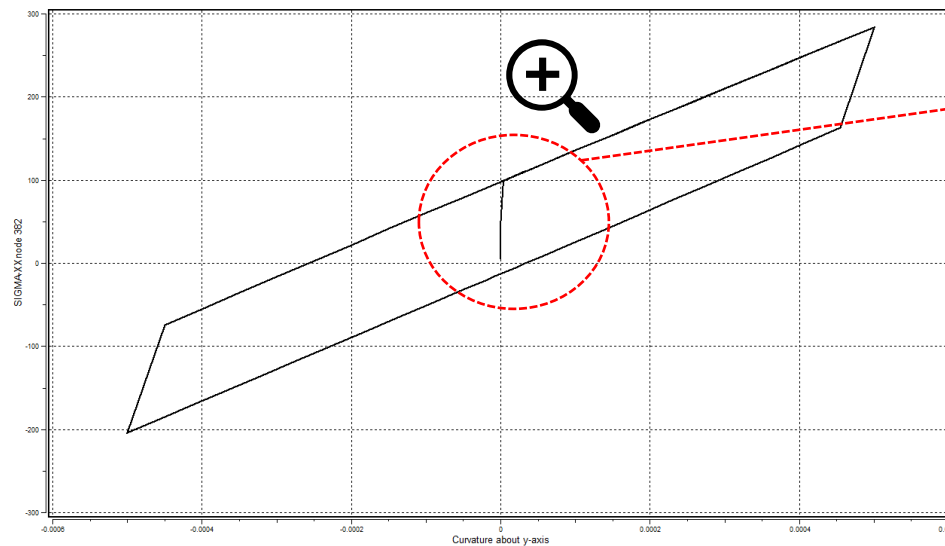
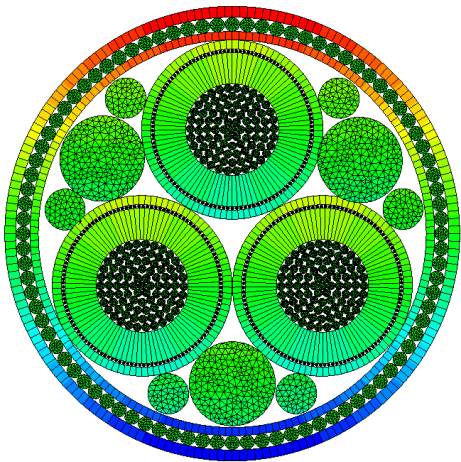
Rainflow counting · Stress range · SN curve · Damage

4

Damage Reporting

Hotspot · Design life

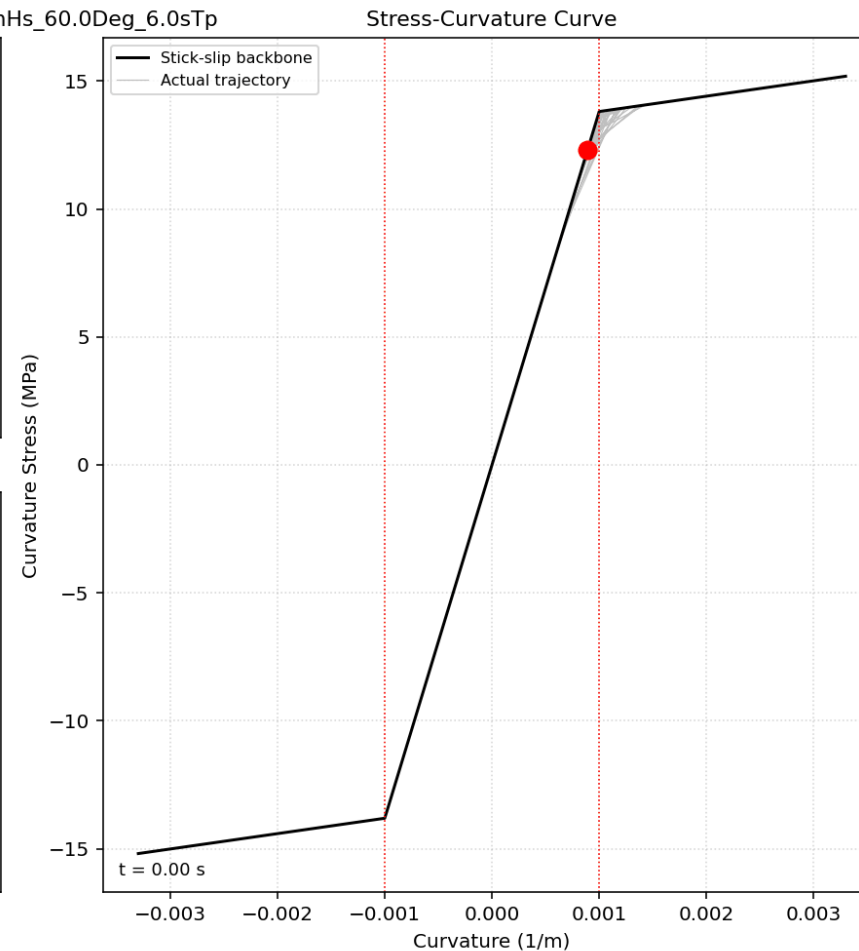
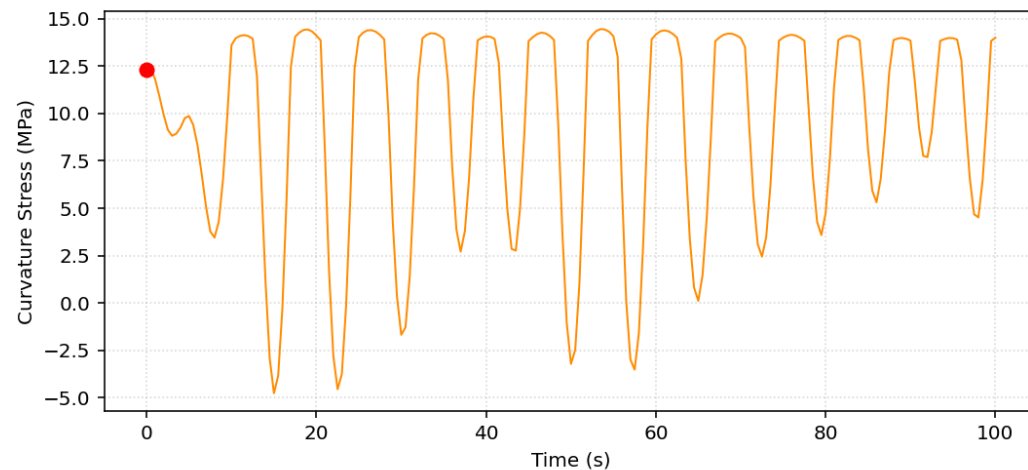
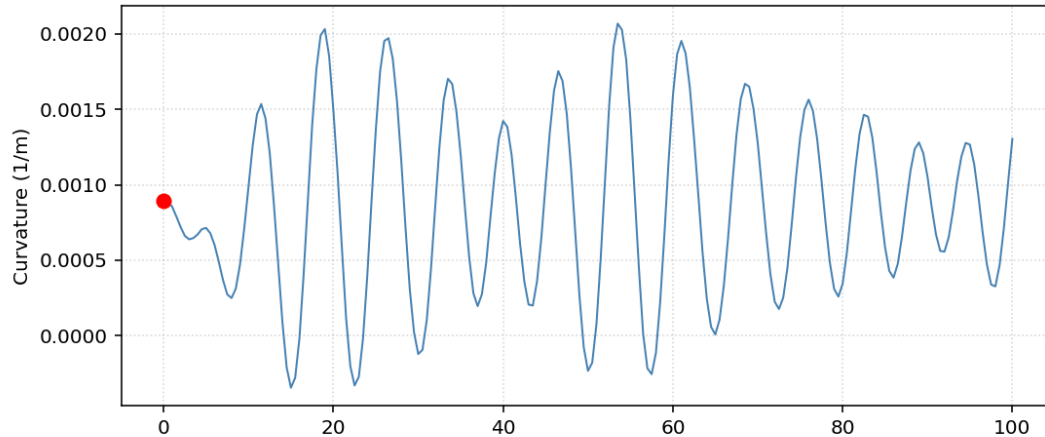
Inter-layer friction: Stick – slip behaviour



What makes fatigue analysis interesting?

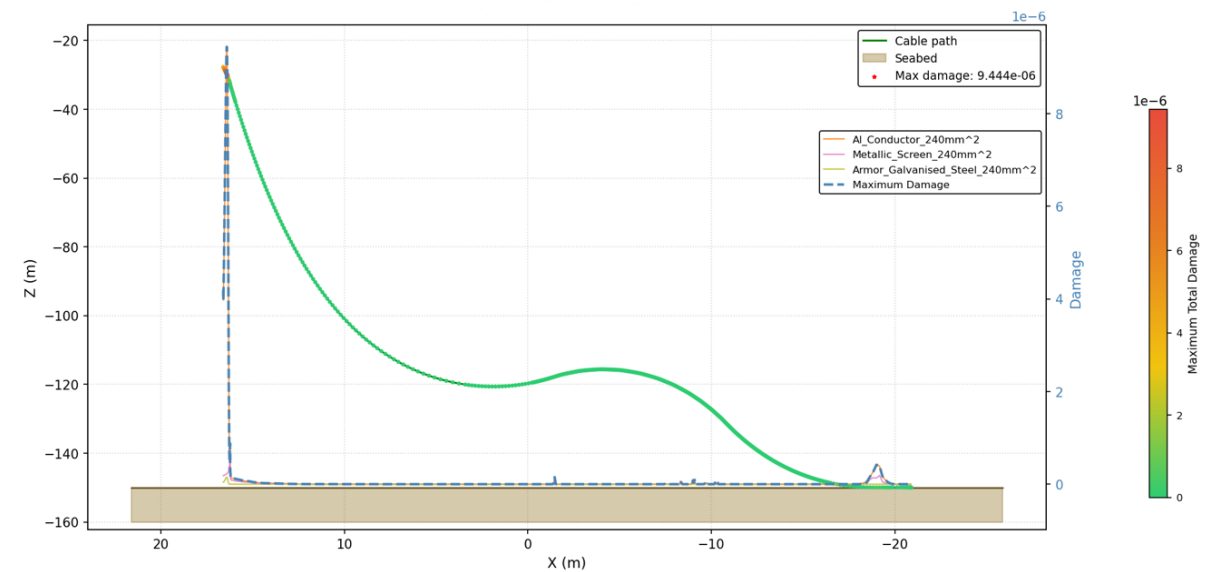
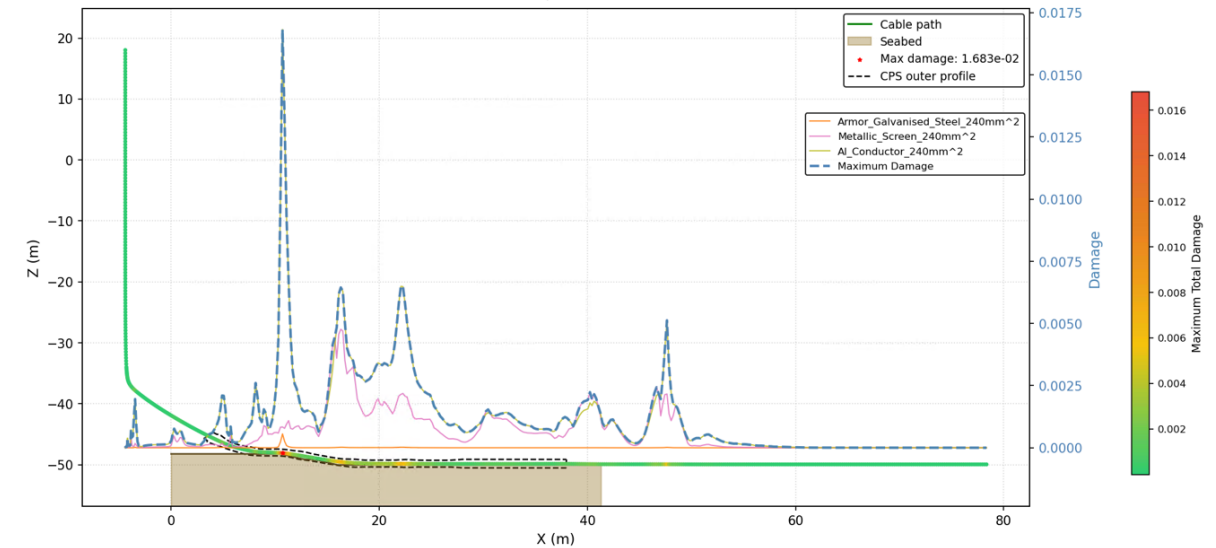
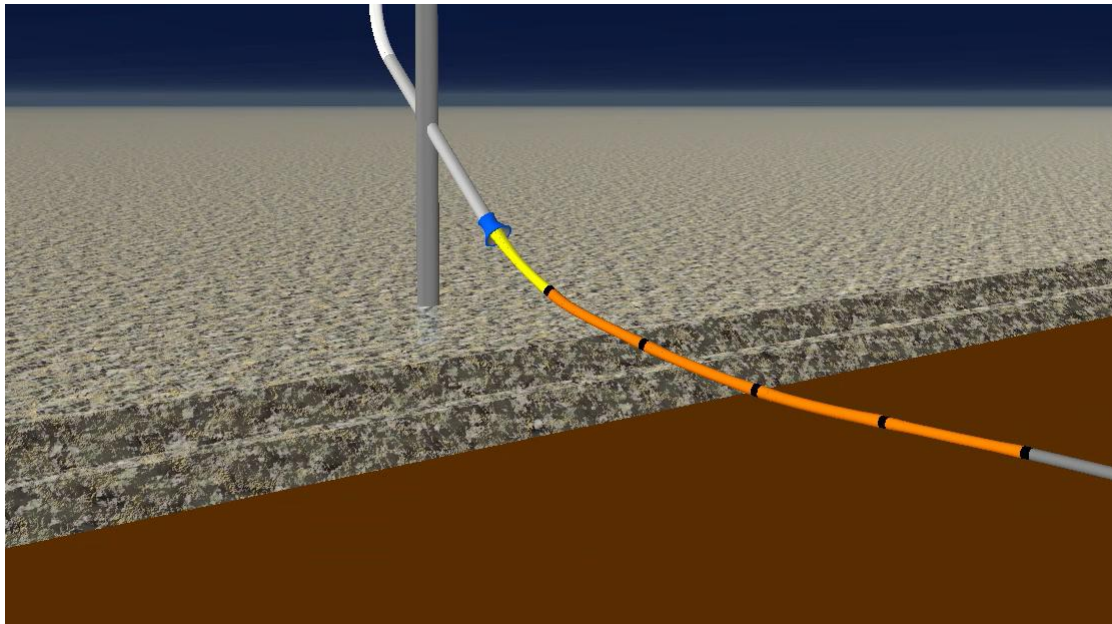
Inter-layer friction: Stick – slip behaviour

Galvanised_Steel_240mm² — WTG 240mm 40.0C 3.0m TIC-Unburied Protection 2kN-aV_100_4.0mHs_60.0Deg_6.0sTp



Hotspots & Damage

- Damage plotted along the cable highlights hotspots clearly.
- The damage curve pinpoints the exact location of critical areas.
- 3D visualisation shows damage as a colour gradient along the cable.
- Clear visualisation turns fatigue results into actionable insight.



What now?

DESIGN PHASE

- OrcaFlex models built
- Fatigue life verified against the Design Life – FLS Pass



SPData (\\TOL-NAS01) (S:) > Temp > Archive > Project1 - Archive			
Sort View ...			
Name	Date modified	Type	Si
FLS-A01_1_13.0mHs_30.0Deg_8.0sTp	19/08/2026 17:52	OrcaFlex simulatio...	
FLS-A01_2_13.0mHs_30.0Deg_9.0sTp	19/08/2026 17:52	OrcaFlex simulatio...	
FLS-A01_3_13.0mHs_30.0Deg_10.0sTp	19/08/2026 17:53	OrcaFlex simulatio...	
FLS-A01_4_13.0mHs_30.0Deg_11.0sTp	19/08/2026 17:53	OrcaFlex simulatio...	
FLS-A01_5_10.0mHs_30.0Deg_7.0sTp	19/08/2026 17:51	OrcaFlex simulatio...	
FLS-A01_6_10.0mHs_30.0Deg_8.0sTp	19/08/2026 17:52	OrcaFlex simulatio...	
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FLS-A01_13_7.0mHs_30.0Deg_7.0sTp	19/08/2026 17:51	OrcaFlex simulatio...	
FLS-A01_14_7.0mHs_30.0Deg_8.0sTp	19/08/2026 17:52	OrcaFlex simulatio...	

How to extract maximum value out of these models which are already built?

Continuous Fatigue Monitoring

1

Hindcast / Met-Ocean Service

ERA5 · Site Buoys

2

Environmental Data Pipeline

Hs, Tp, Dir, Current – hourly resolution

3

Damage Rate Look-up Tables

From OrcaFlex transfer matrices

4

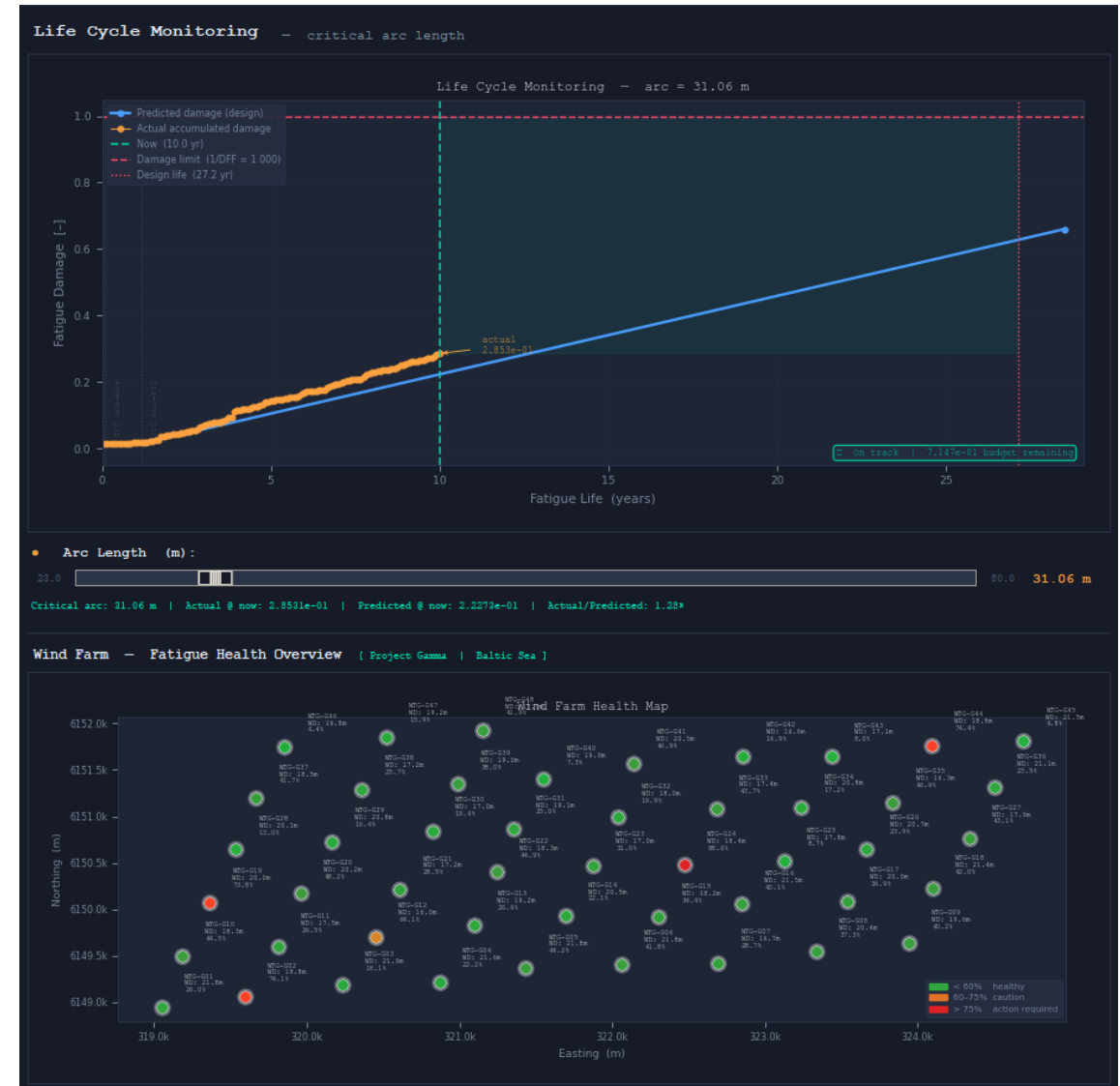
Accumulated Damage Engine

Per cable, per arc-length node

5

Lifecycle Monitoring Dashboard

Real-time design vs. actual comparison



What This Enables

1

Actual vs. Predicted

Monthly resolution reveals cables consuming fatigue budget faster than designed.

2

Early Warning System

Auto-flags when cumulative damage or rate approaches operator-defined thresholds.

3

Risk Profiling

Cable-by-cable scoring across a field
Can be combined with install record, monitoring data, age, and route conditions

4

Maintenance Scheduling

Prioritise inspection resources by fleet-wide fatigue health ranking.



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