



Offshore Wind Lessons Learnt.
“The Race to Scale”

Matthew Yau
November 2023

LWI Team.



Independent Loss adjusters, specialised in handling Power, Utilities & Renewable Energy claims:

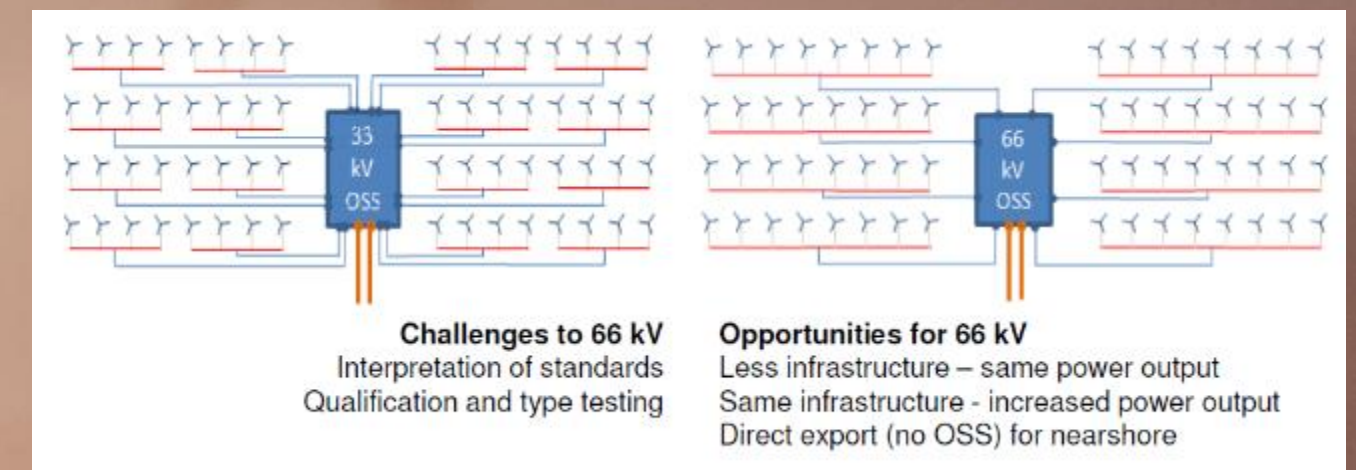
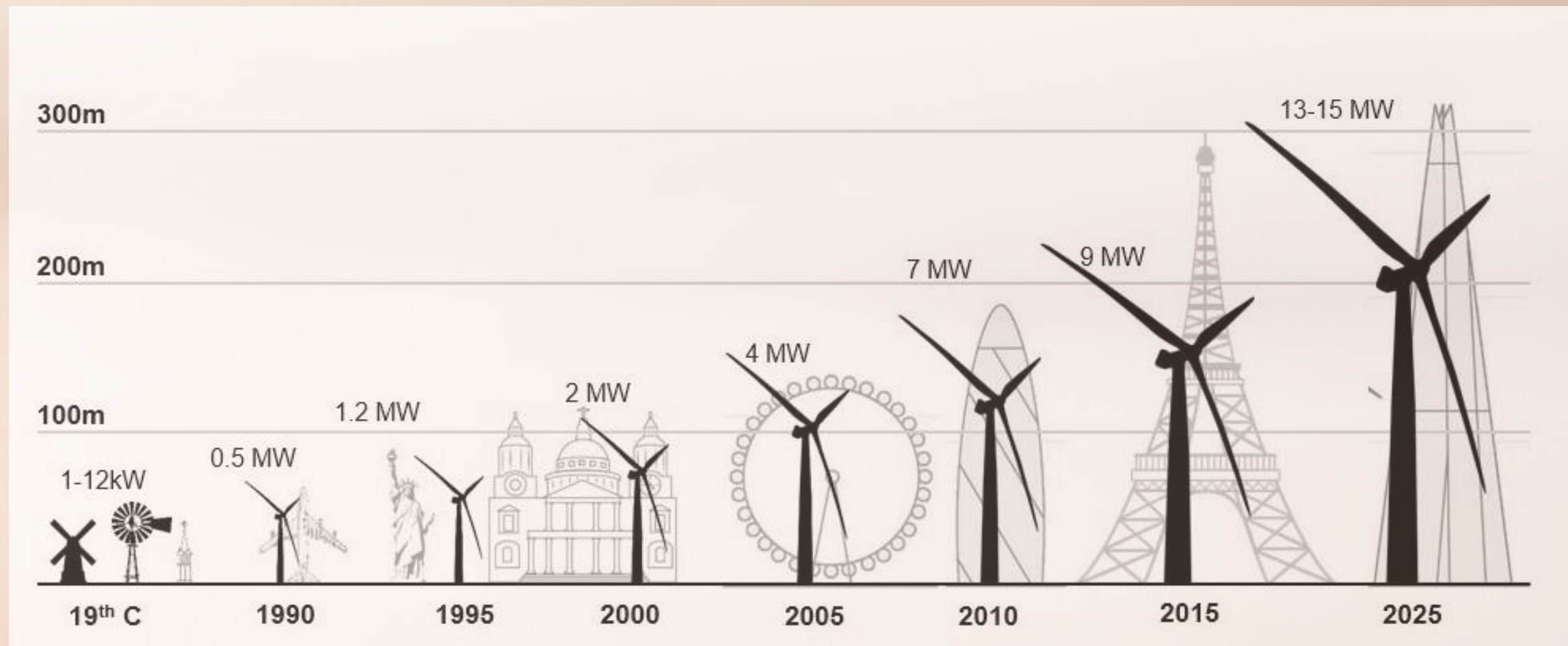


Offshore Wind Experience: Range of skillsets, qualified engineers, industry trained experts, Chartered forensic accountants & Chartered Insurance specialists, with over 20GW of installed experience:

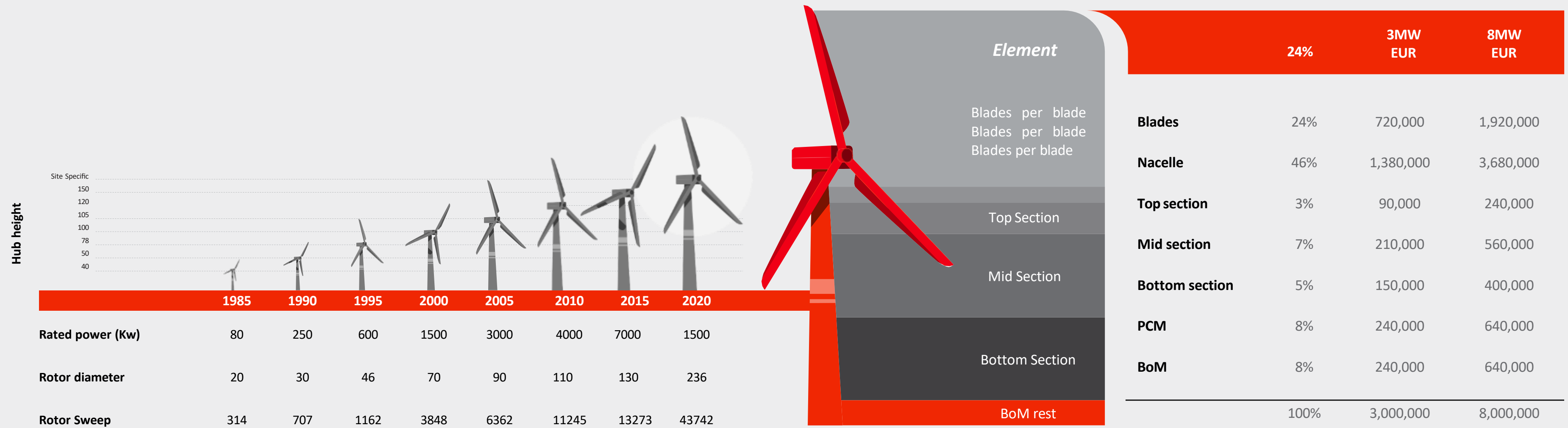
- 335+ Offshore wind claims
- 43+ Offshore Wind Construction projects (CAR)
- 28+ Operational Wind projects (OAR)
- USD1.3bn in settled claims over 10+ yr period
- USD1.4bn notified in the last 2yrs.

Evolution of Technology.

- Since the 80's turbines are now 100x more powerful 55kW → 15MW
- Rotor diameter up to 200m, swept area of 2 x football fields
- 33kV historically (max. for MV standards), doubling the voltage & power
- Doubling the WTG size triples the power generation, reducing costs
- Only a handful of vessels which can install the newest, largest turbines



Race to Scale.

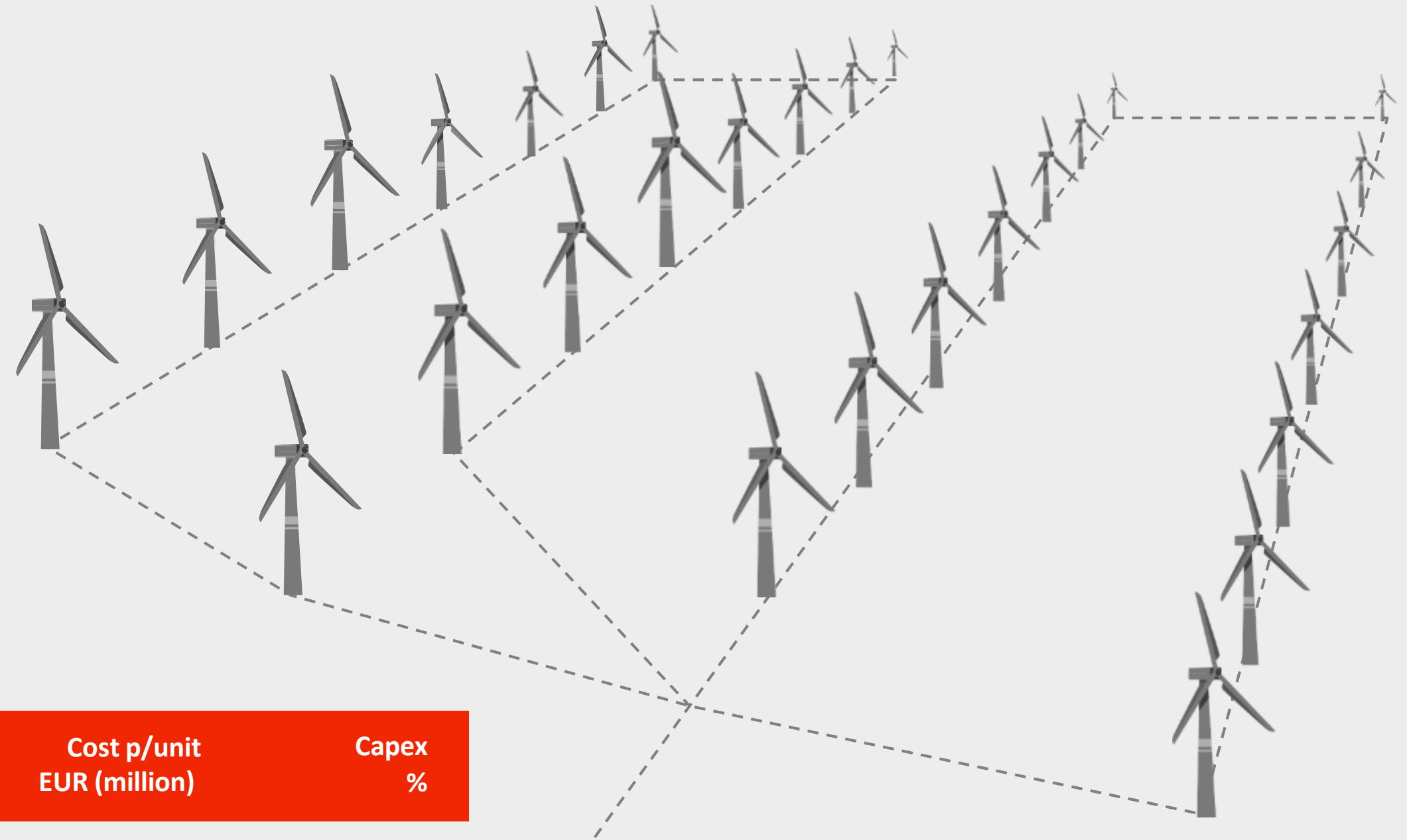


Variables which affect repair costs such as:

- Time of year, winter vs summer repairs
 - Availability of vessels, CAR vs OAR, suitability of vessels
 - Location, Europe vs US vs Asia
 - Consequential damage, removal of wreck etc.
- as turbines get larger = smaller pool, higher mob/day rates etc.

Capex Breakdown.

- 504MW Offshore wind Farm
- Water depth 20 - 32m
- Estimated Contract Value EUR 2.5bn



Unit/s	Item/s	Cost EUR (million)	Cost p/unit EUR (million)	Capex %
140	Turbines	1,342	10	54
144	Foundations	467	3	19
280	Inter array cables	120	1	5
3	Export Cables	163	55	6
2	Offshore Transformer Platforms	191	96	8
1	Onshore Substation	92	92	4
1	Project Management	106	106	4





Offshore Wind Fires.



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제주 한경면 해상풍력발전기 화재 헬기 투입 진압중

Key Coverage.

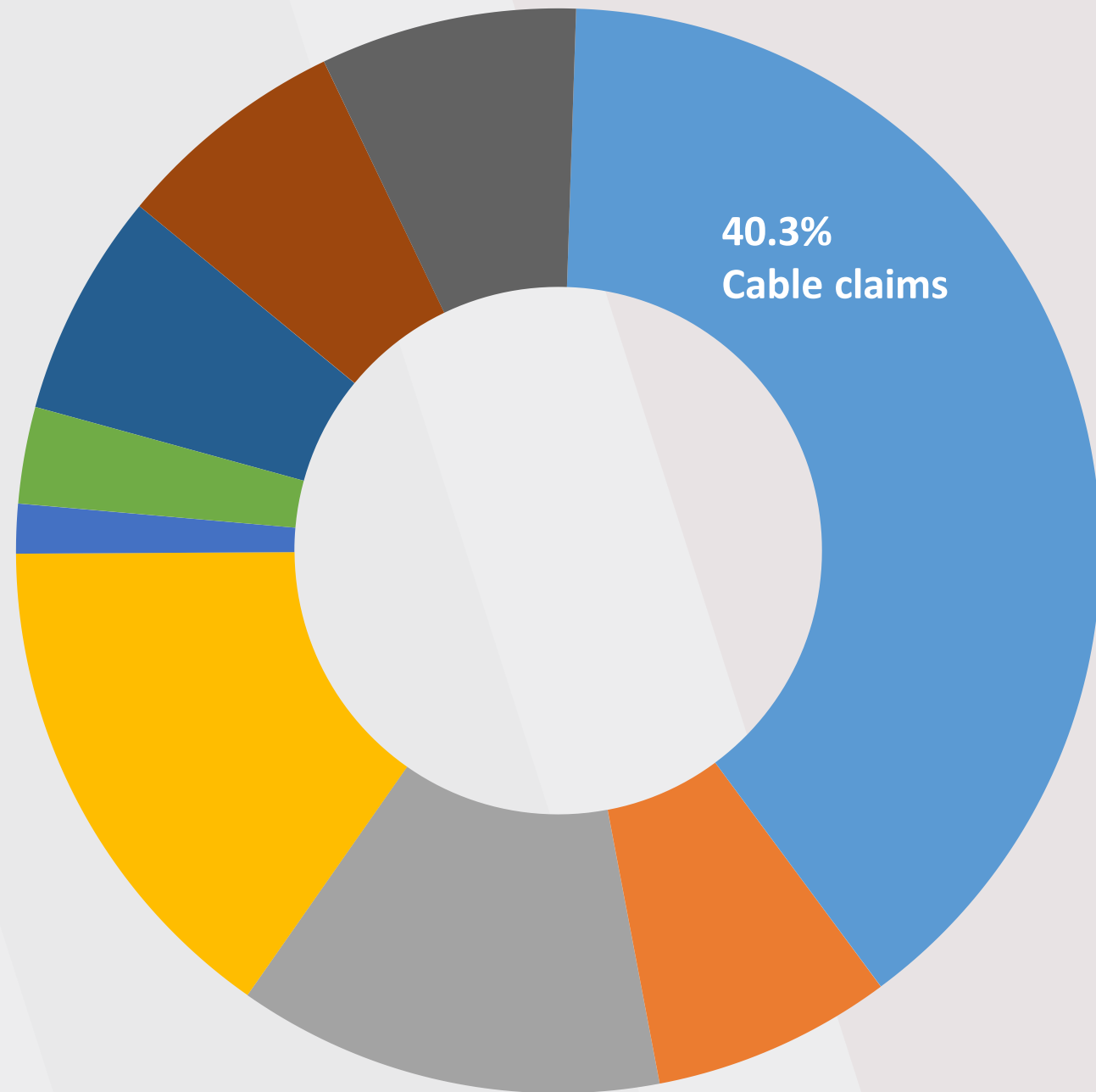
What's Covered

- Physical damage to project assets
- Revenue Loss due to resultant delay
- Revenue loss due to key installation equipment damaged on site
- Transportation, installation and ongoing operation
- All parties agreed under contract
- Third party property damage and bodily injury (TPL)
- Design defect – LEG2 vs LEG3

What's not covered?

- Non-damage (S&L)
- Delay from schedule slippage
- Contractor's plant and equip.
- Vessels – damage or liability
- Wear and tear (normal)
- Corrosion (normal)
- Warranties and guarantees
- Assets not included in the Sum Insured
- Breach of the MWS recommendations
- Lack of Due Diligence

CAR Claims 2005 - 2022.

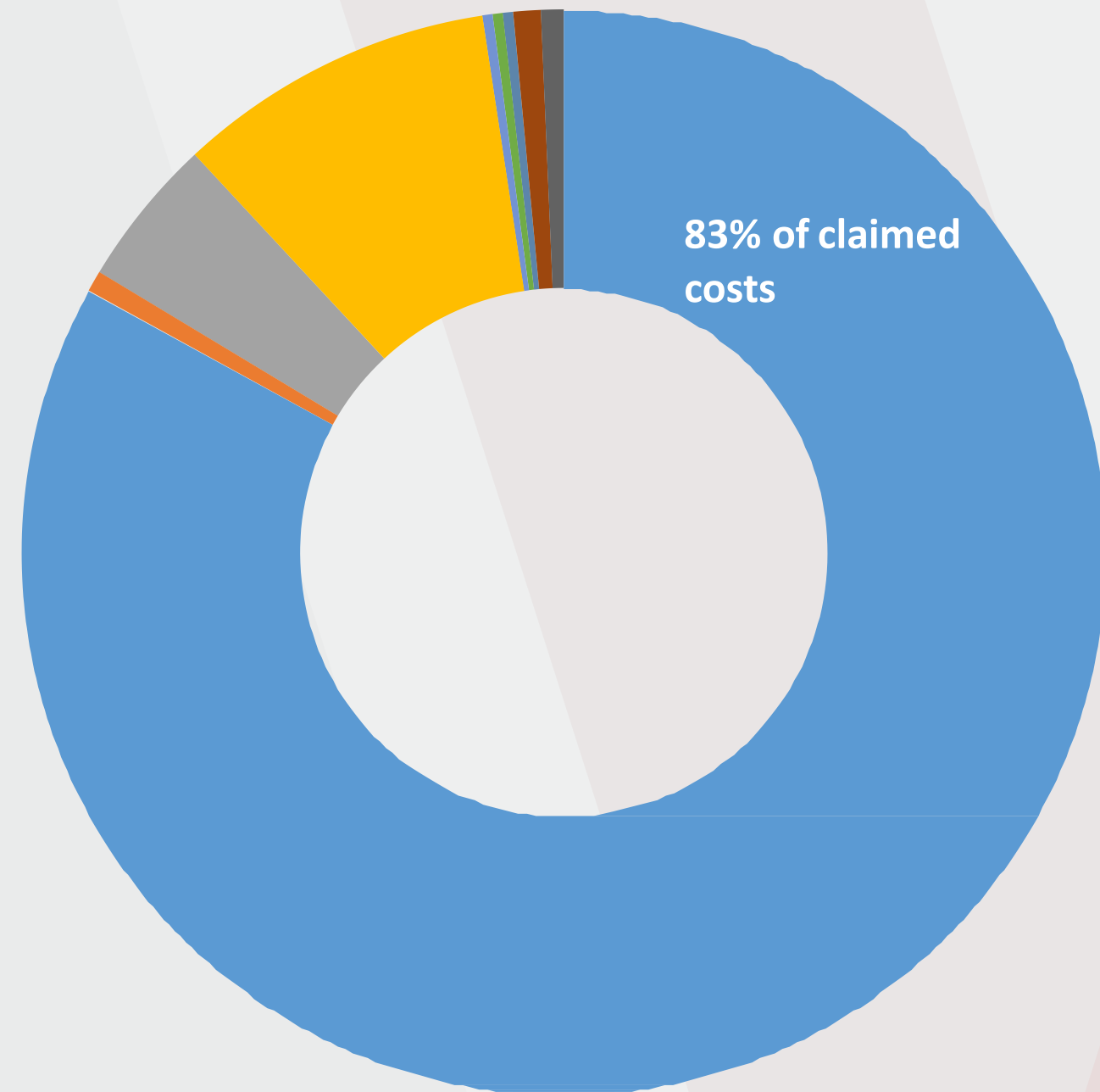


Number of CAR CLAIMS

- Cable claims 40.3%
- Collision 6.9%
- Foundation 15.3%
- Electrical 12.5%
- Lightning 2.8%
- Fire 1.4%
- Blades 4.2%
- Assembly 6.9%
- Deduction 9.7%



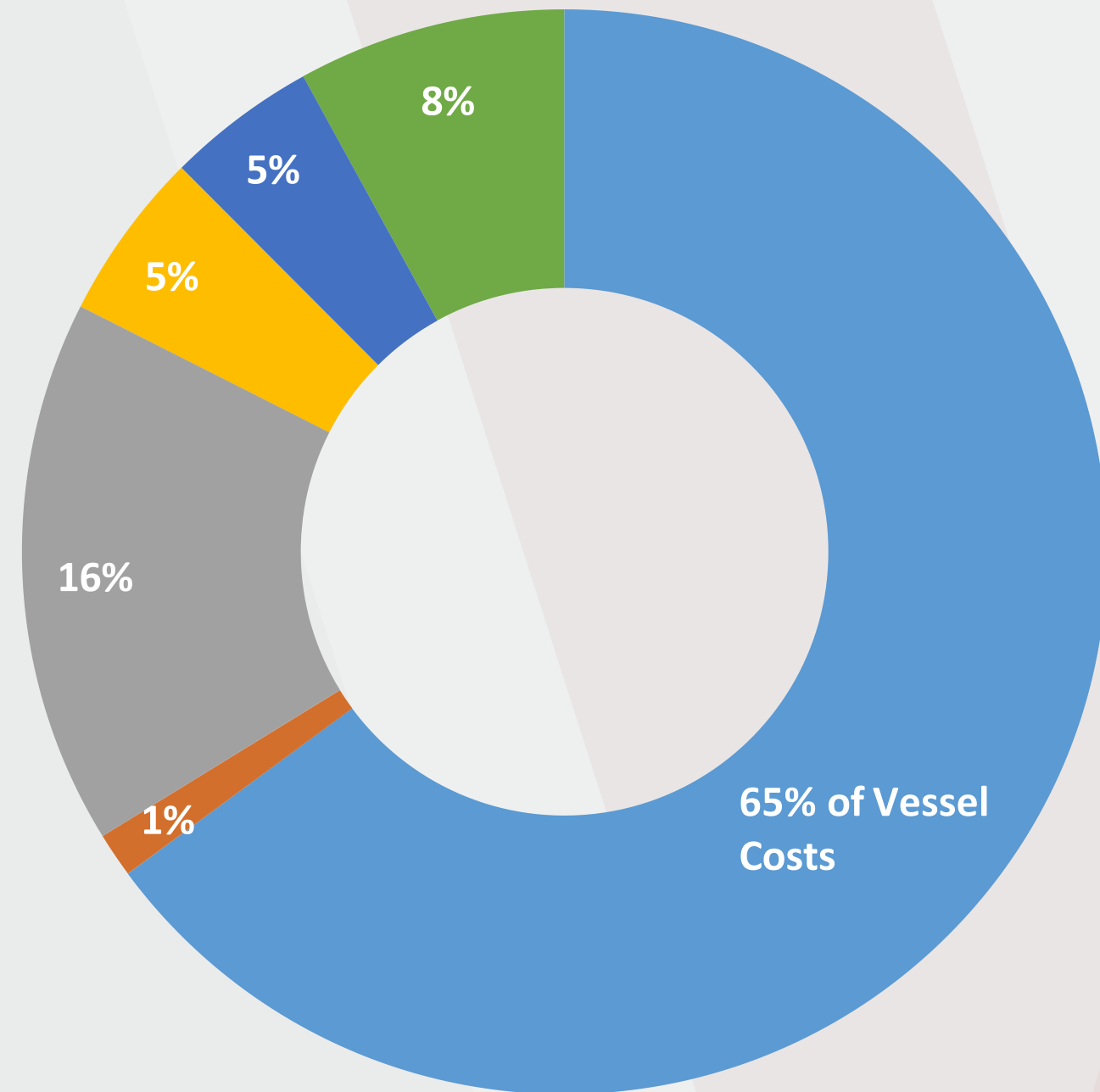
CAR Claims 2005 - 2022.



Share of total Claims Cost

- Cable claims 83%
- Electrical 4.5%
- Fire 0.3%
- Blades 0.3%
- Deductible 0.8%
- Collision 0.6%
- Foundation 9.5%
- Lightning 0.3%
- Assembly 0.8%

CAR Claims 2005 - 2022.

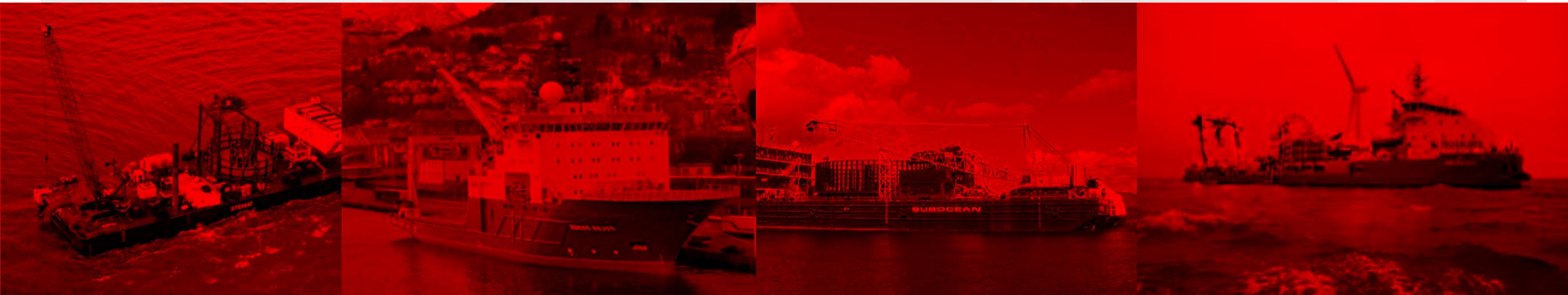


Breakdown of costs

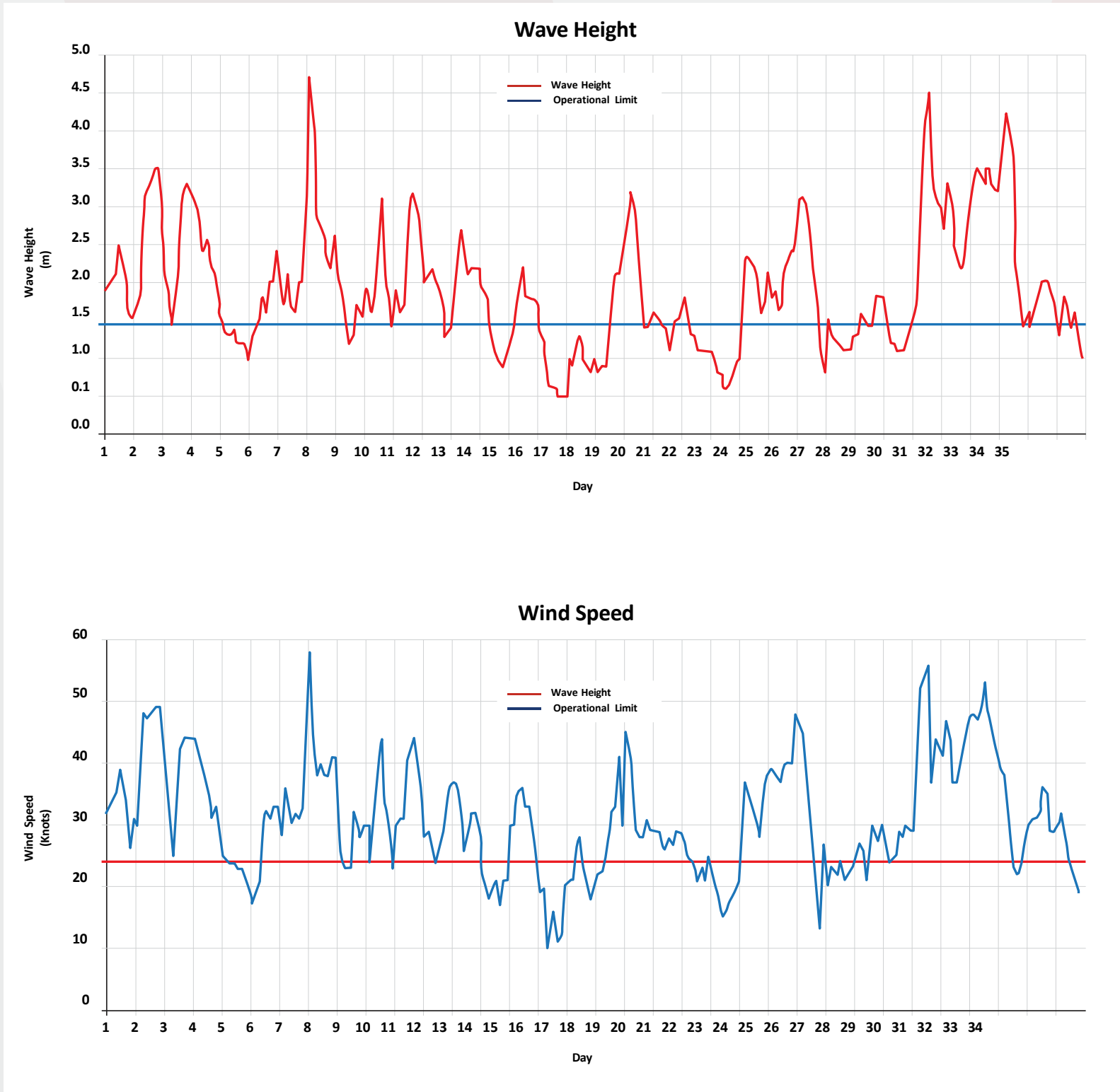
- Vessel Charges = 65%
- Special Machinery (Third Party) = 1%
- Site Works (contractor labour) = 16.5%
- Materials = 5%
- Engineering (Survey / Consultants) = 4.5%
- Admin (Overhead / Legal / Insurance) = 8%

CAR Claims – Cables.

- Average claim cost: EUR 5,000,000
 - Inter-array cable damage: EUR 1,850,000 – 15,000,000
 - Export cable damage: EUR 10,000,000 – 100,000,000
- 57 of the last 60 construction projects have experienced cable claims
 - Avg cable repair time c.100 days,
 - Avg revenue loss WTG/day c. EUR15 -25k
 - Vessel costs a major contributor (EUR 100,000 – 300,000p/day)



Offshore – Standby / WoW.



Poor Workmanship.

Claim: Circa EUR 5,200,000

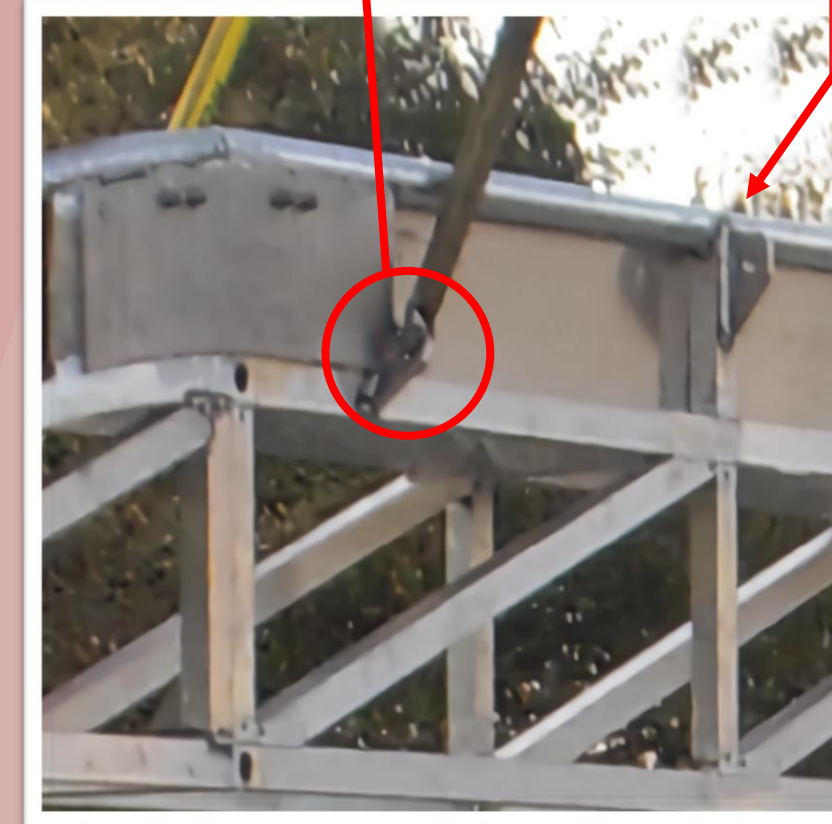
Damage: 132kV Export Cable and submarine joint

Cause:

- Lifting frame was incorrectly hooked up to manoeuvring points and not lifting points
- Manoeuvring points failed dropping the cable and frame

Lessons learned:

- Operators were not familiar with the frame and its safe operation
- The lifting points were not clearly colour coded, which is good practice



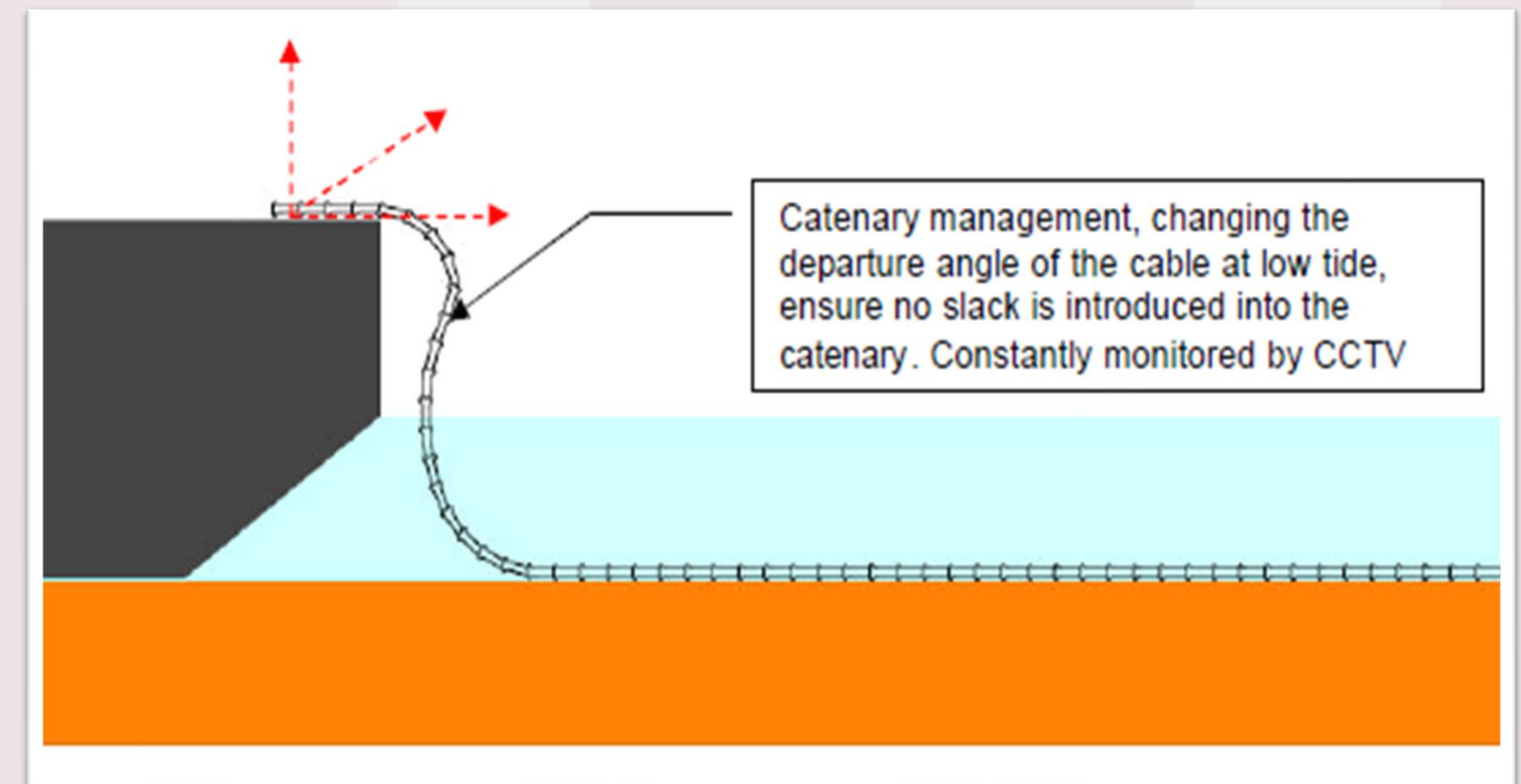
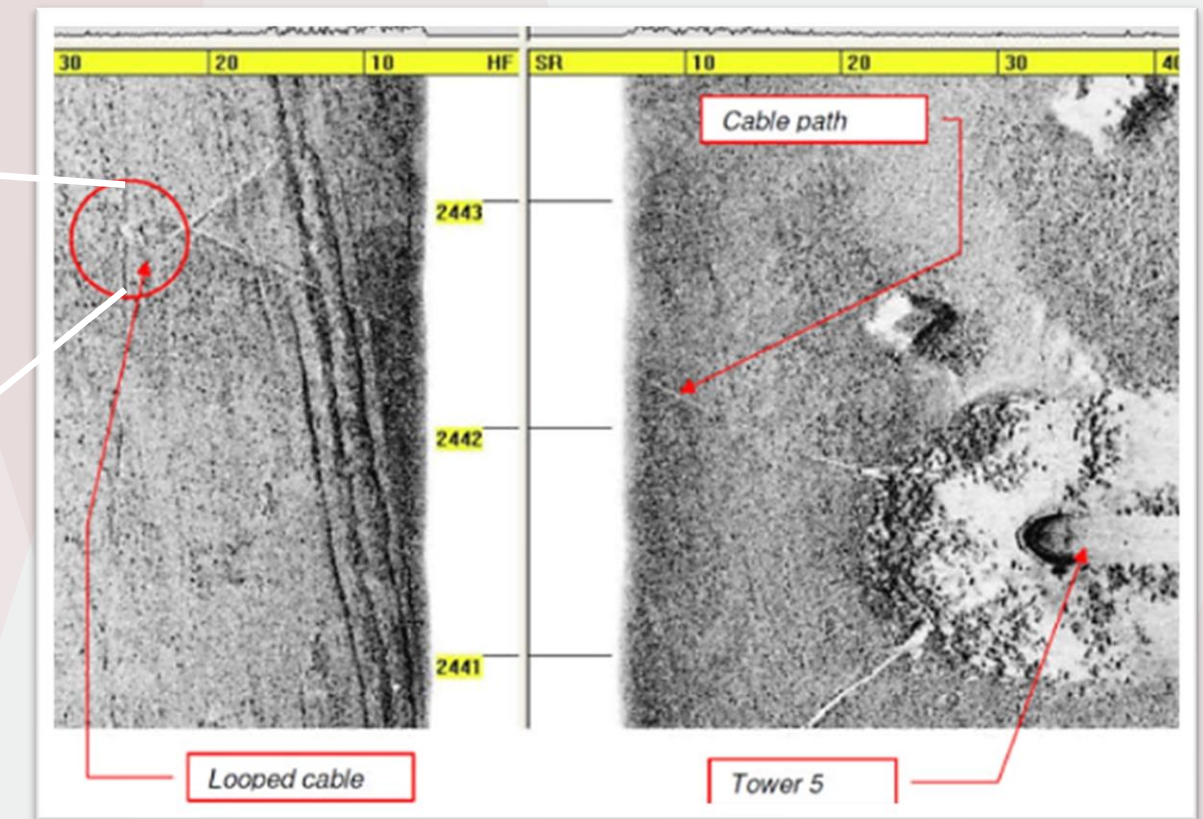
Manoeuvring point

Poor Workmanship.



Cables – Catenary Management.

- Claim:** EUR 1,850,000 – 15,000,000
- Damage:** 33kV Cable out of spec (MBR)
- Cause:**
- Poor catenary management
 - Slack in cable, introduced a loop
 - Loop tightened beyond MBR during pull in



Cables – MWS / Weather.

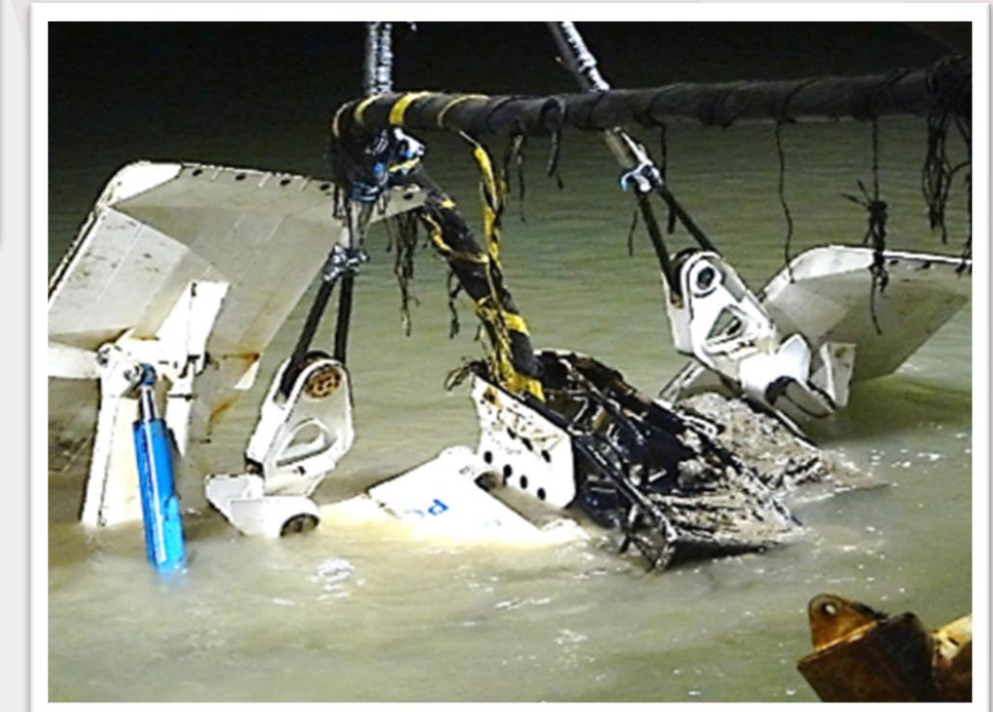
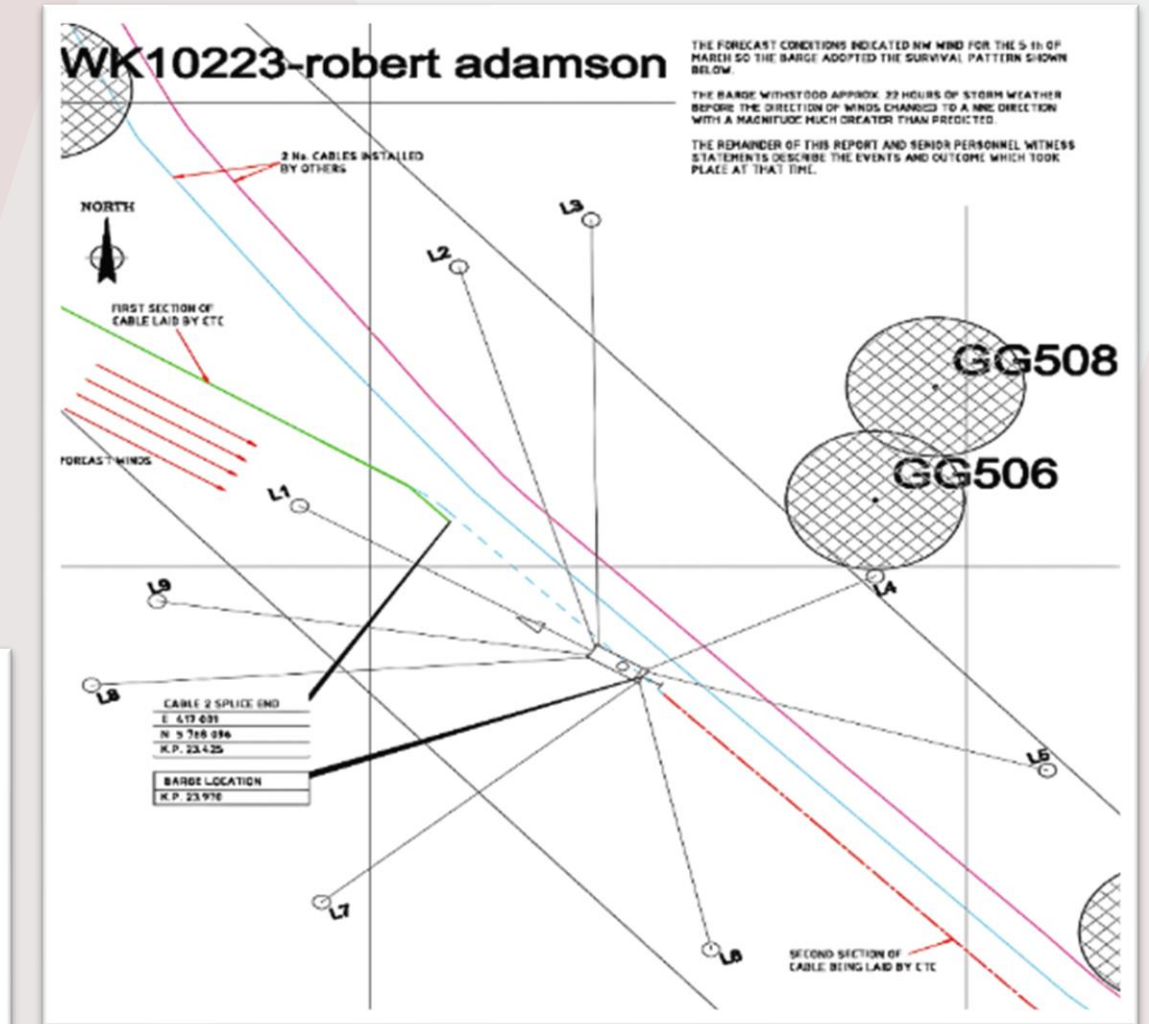
Claim: Circa EUR 12,000,000

Damage: Significant damage to 56m of 132kV Export cable

Cause: Small weather front which was un-forecast came through the area giving unexpected direction and wind speed.

The barge was in survival position, but was not able to survive the almost-beam-on winds and swells from this unexpected system

Lesson learned: MWS provided strong recommendations to consider seeking shelter, Barge Master decided to continue



Offshore – Transit.

Claim: Circa EUR 50,000,000
(cables, deck equipment, carousel)

Cause: Loose or missing hatch covers, flooding of
the ballast tanks

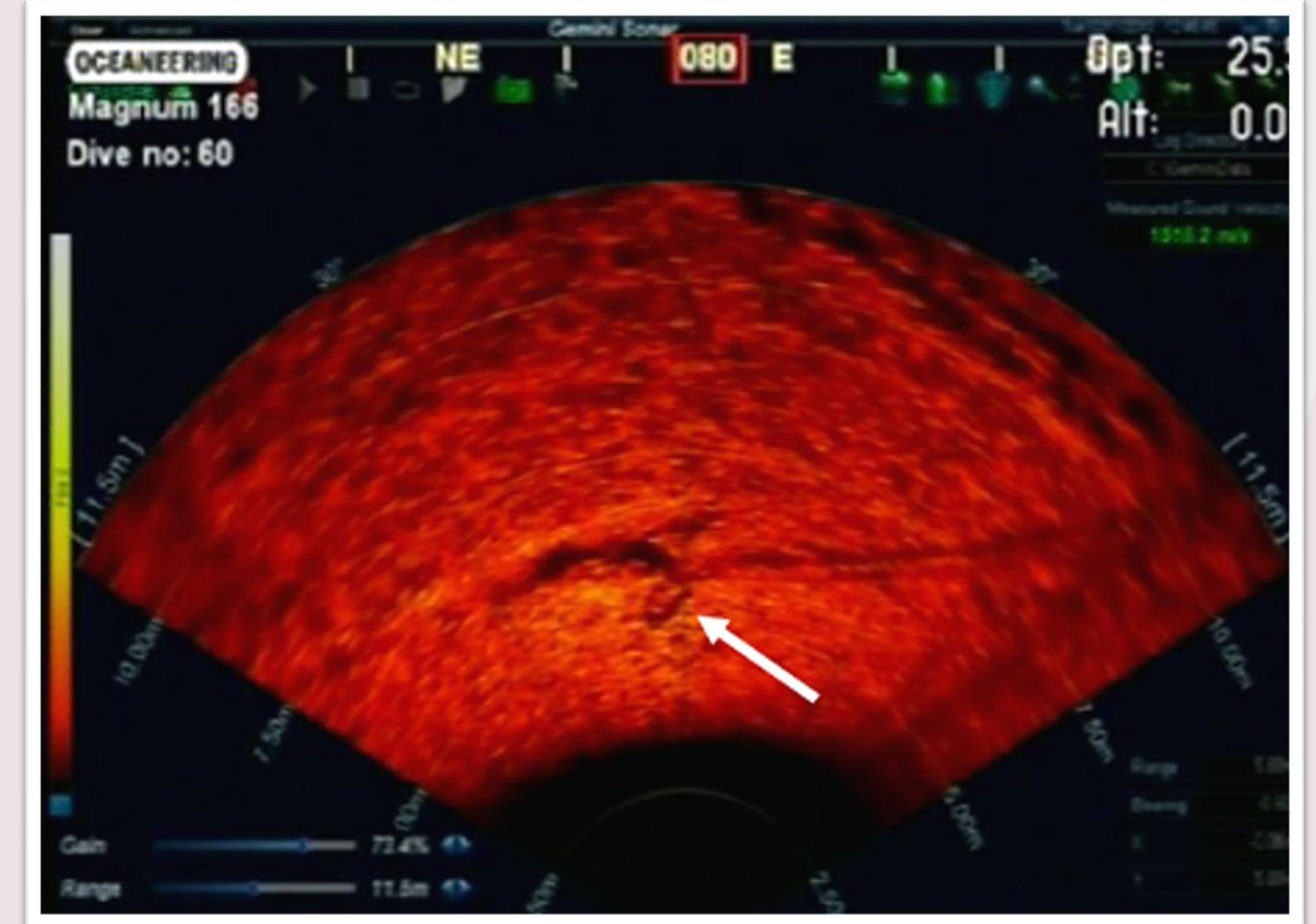
Damage: Total loss of 2 x Export cables in
3000m+ of water

Lesson Learned: Importance of MWS suitability and
towage survey



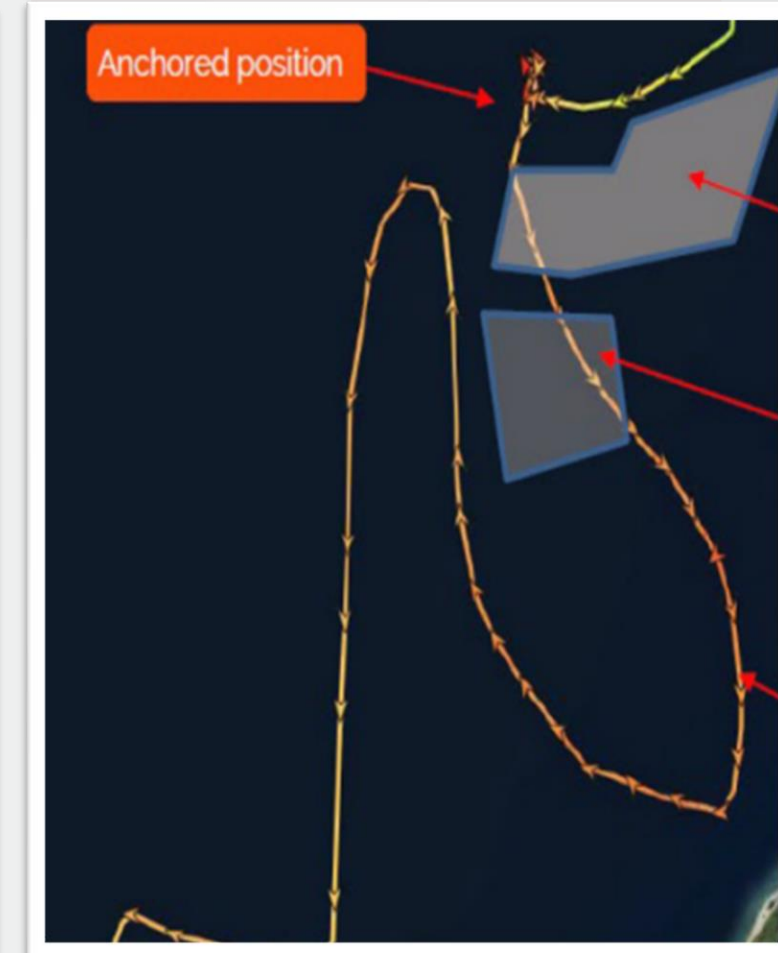
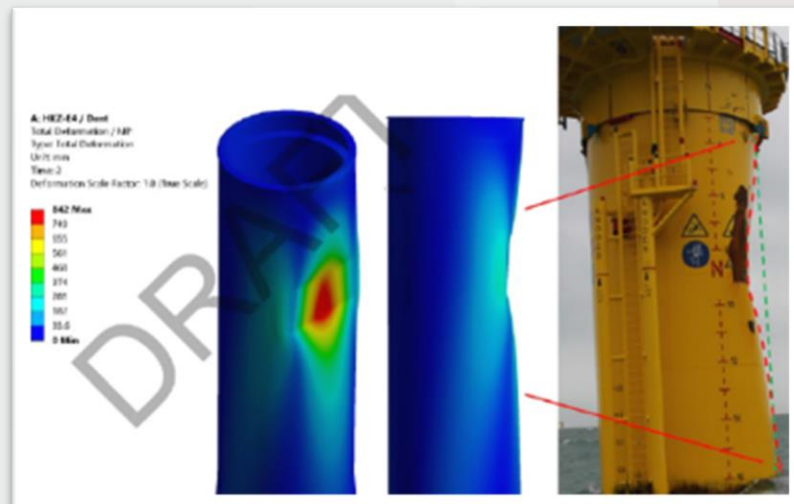
Cable losses – Summary.

- Poor workmanship
- Sub-contractor inexperience
- Recklessness due to tight deadlines
- Use of the wrong vessel or equipment for the task
- The time allocated for these sub-contractors is kept to a minimum due to high vessel costs – sometimes shortened by weather conditions
- Cable laying is a complicated task e.g. busy shipping lanes, weather and tidal effects etc.



Damage to Foundations.

- Claim:** EUR 25 -70m (PD/DSU)
- Damage:** Substantial damage to foundation due to vessel collision
- Cause/Effect:** Anchor Chain broke during storm, vessel drifted without power colliding with a WTG foundation and OSP jacket

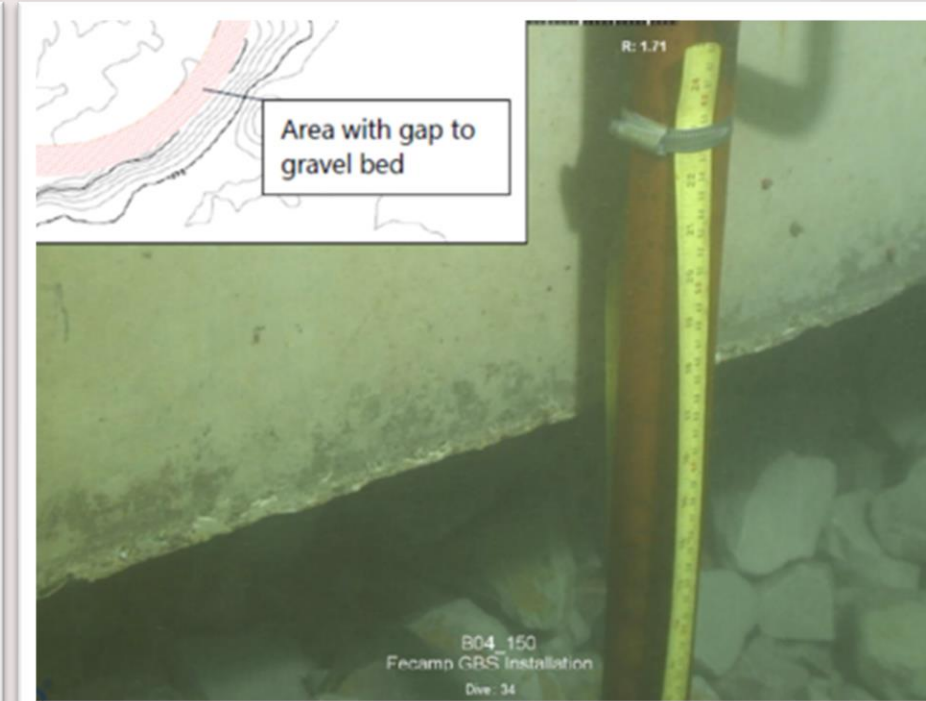


Damage to Foundations.

Claim: Circa EUR 30(PD)

Damage: Substantial damage to foundation due to vessel collision Vessel did not take into account current drift, incorrect waypoint set during transit (operator error). Damage to secondary steel and foundation moved

Cause/Effect:



Blades.



Serial Defects / Damage.

reNEWS 12 May 2016

Senvion gets to work on 6MW blade cracks

Turbine manufacturer Senvion is racing to tackle a serial issue with blades on 6MW offshore machines. The Hamburg company said "anomalies have been noticed in the rotor blades" of some models in its 6.XM range. "There are small cracks at a particular area of the blades," a spokeswoman confirmed.

Faults were detected during inspections at RWE's 295MW Nordsee Ost wind farm in the German North Sea. Engineers were investigating a summer 2015 blade loss at the project, since shown to be an isolated case caused by an error in production, when the separate serial issue was discovered.

"Based on our preliminary findings potential anomalies can be addressed in two ways," the spokeswoman said, "by an optimised design for newly produced blades and retrofit measures for existing blades."

Fifty sets need to be overhauled. These include 24 turbines of the 6.2M1.26 series installed at Nordsee Ost and 18 similar sets of blades produced but not yet installed at WPD's under-construction 111MW Nordergrunde wind farm.

also in the North Sea. The remaining eight sets are believed to have been produced for Northland and RWE's 332MW Nordsee 1 project, which again is under construction. "Further examinations are being conducted together with our customers, the supplier and external specialists to validate the potential cause and verify the solutions," the spokeswoman said.

Senvion expects technical availability of a solution "by the middle of 2016" and does not foresee ongoing implications for Nordergrunde or Nordsee 1, she added.

Turbine faults cost Siemens EUR 223m

6 November 2014 by Patrick Smith, Be the first to comment

GERMANY: Costs related to faulty wind turbines have hit Siemens' results, forcing the wind division into a loss for both the fourth quarter and 2014.



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Grout failures bite MT Hojgaard



17/04/2014
MT Hojgaard has been found liable for grouting issues at Eon's 160MW Robin Rigg offshore wind farm off the UK, which will result in a Dkr195m (£21m) hit to financial results for 2014.

SSE beats Fluor in £300m wind farm legal fight

20 Nov 2012 / Greig Cameron, Deputy Business Editor

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A £300 MILLION claim against a joint venture offshore wind farm owned by Scottish & Southern Energy (SSE) and RWE has been thrown out.

Engineering giant Fluor had submitted the claim over a dispute about foundation parts of some of the turbines operated by Greater Gabbard Offshore Winds (GGOW).

SSE confirmed yesterday a UK arbitration panel had ruled in GGOW's favour, meaning it would not have to pay Fluor.

Vestas V90 crisis takes new twist after ZF gearbox failures

25 May 2012 by John McKenna, Be the first to comment

WORLDWIDE: Lead manufacturer seeks compensation from suppliers ZF and Schaeffler after 15% of V90-3MW turbines are hit by bearings failure.

Vestas is set to seek compensation from its suppliers over a gearbox bearings fault affecting its V90-3MW turbines in what is the latest in a series of crises to engulf the firm.

The Danish manufacturer revealed in its results for the first financial quarter of 2012 that it was setting aside an additional €40

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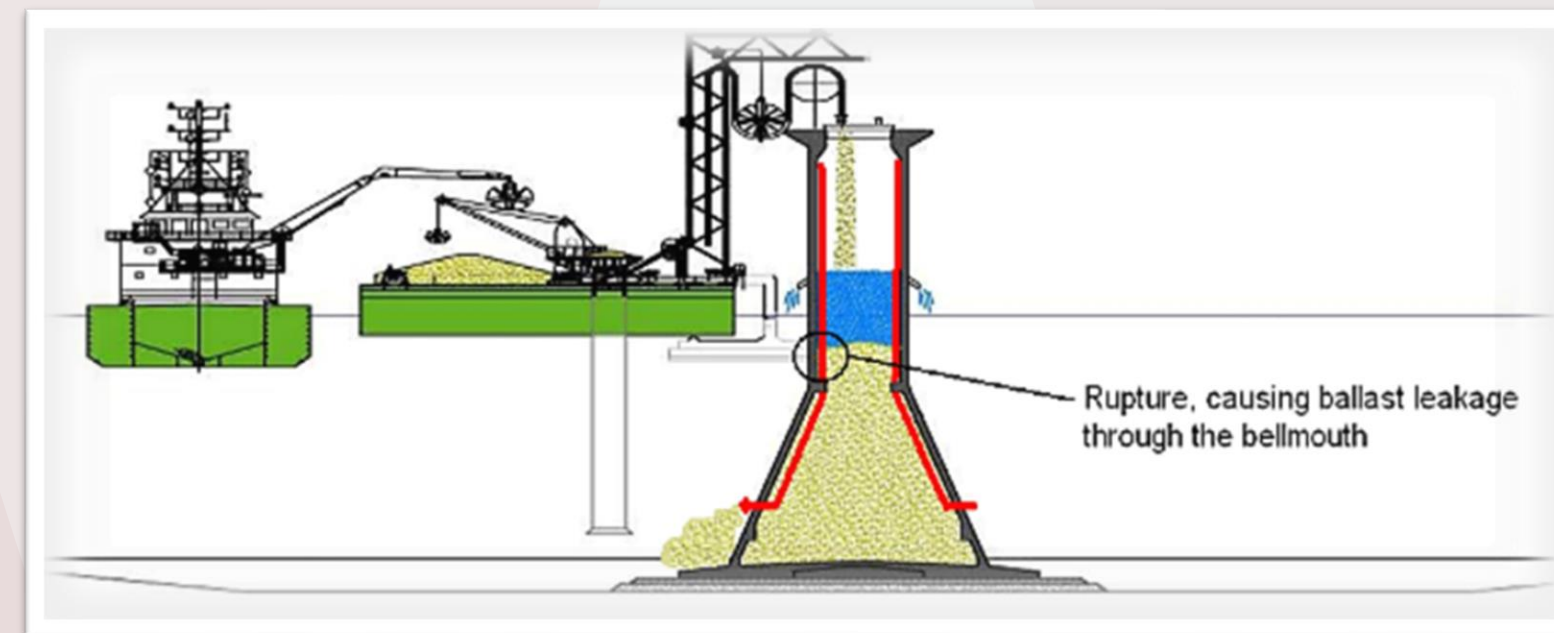
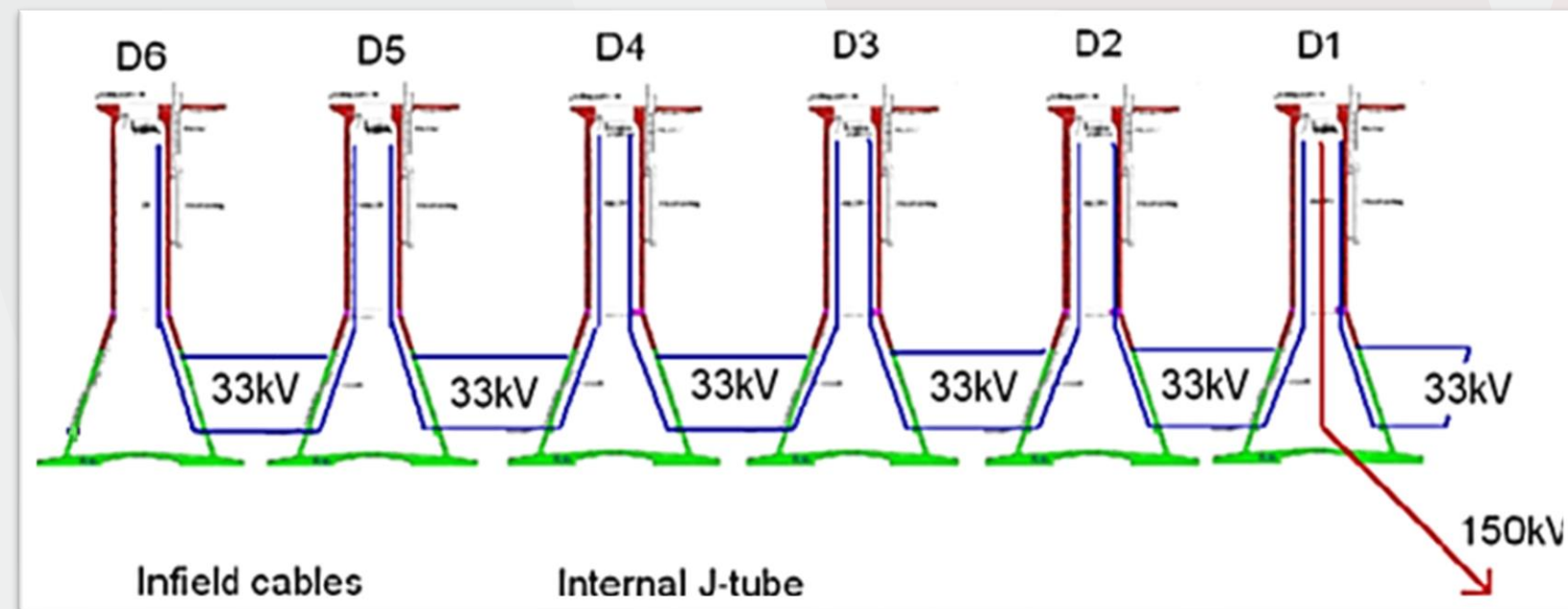
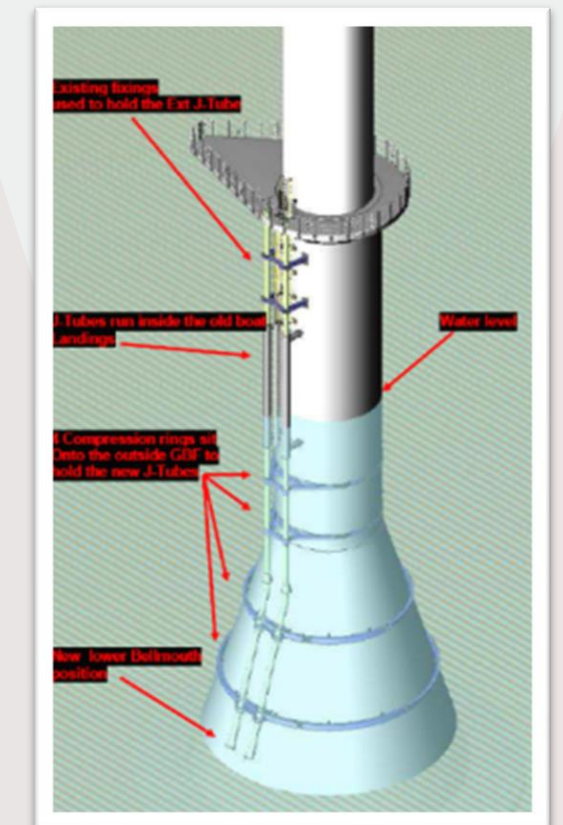
Serial Defects / Damage.

Circumstances: During the ballast infill of 6 Gravity Based Foundations, internal J-tubes collapsed.

Root cause findings: J-tubes were under designed for the service environment

Repair: Fitting 11 redesigned - External J-tubes (policy LEG3 excl. applies)

Cost of repair: GBP 24,000,000 (gross).



Wording.

SERIES LOSS CLAUSE

Subject to the terms and conditions of the Policy
Underwriters shall indemnify the Assureds in respect of loss or damage resulting from a fault, defect, error or omission in **design**, plan, **specification**, **material** or workmanship of the same nature, after application of the deductible and as covered under Clause XX and buy-back if applicable of Section I Terms and Conditions according to the following scale:

100% of the first loss amount.

75% of the second loss amount.

50% of the third loss amount.

No liability hereafter for fourth and subsequent loss amounts.

Adjustment.

Series Loss Clause		GBP
Cost of repair (gross)		24,000,000
Audit adjustment		(2,000,000)
LEG3 adjustment		(1,000,000)
WOW limit adjustment		(500,000)
Adjusted claim (gross)		20,500,000
Less Deductible		(500,000)
Adjusted claim net (before SLC)		20,000,000

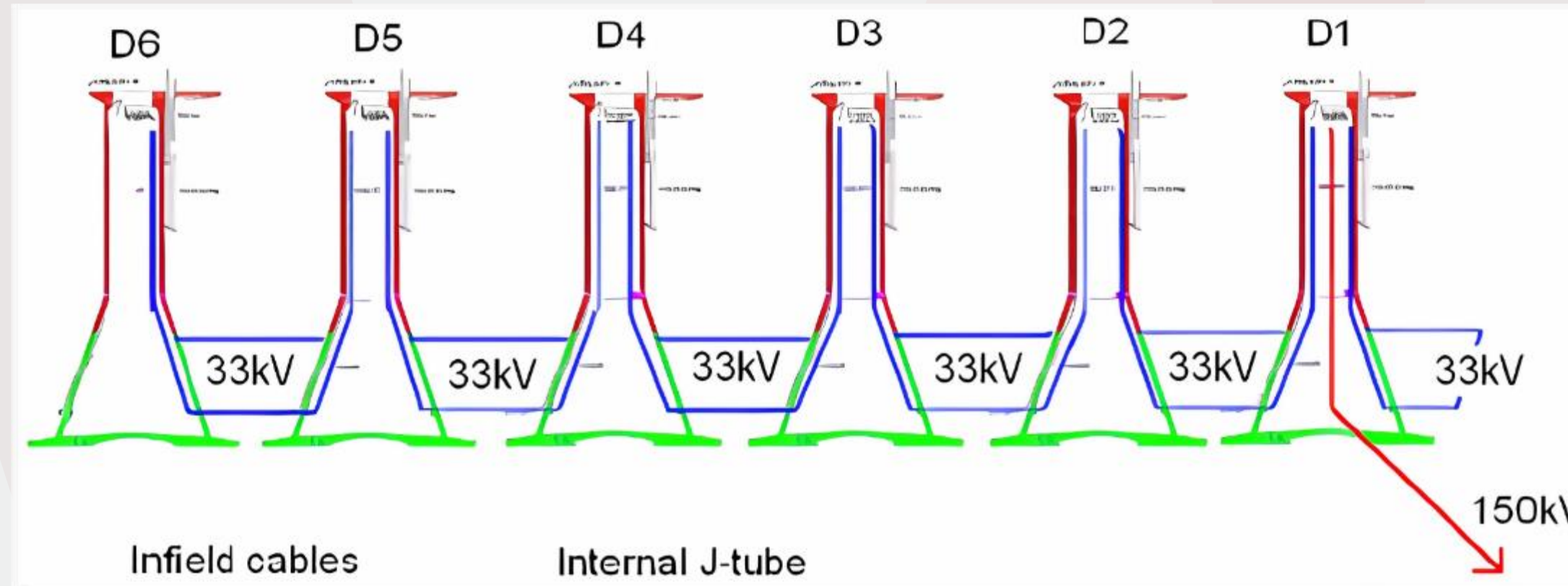
Number of defective parts

Cost per loss amount Weighted Even 1,818,182

Series Loss Clause		
First loss	100%	1,818,182
Second loss	75%	1,363,636
Third loss	50%	909,091
Fourth loss	0%	-

Adjusted Claim (after SLC) **GBP 4,090,909**

Adjustment.



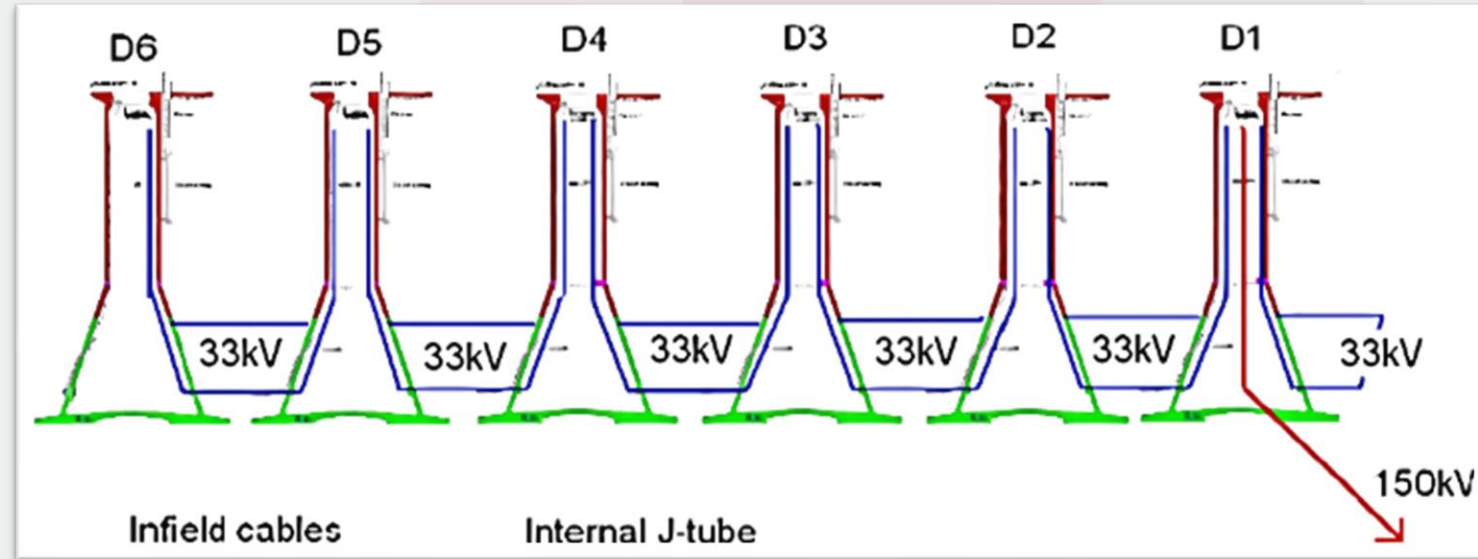
Defective part	Loss Amounts	SLC loss amount (GBP)	SLC application (GBP)
Foundation	6	3,333,333	7,500,000
J-tube	11	1,818,182	4,090,909

Adjusted Claim (after SLC – 6 foundations) | GBP 7,500,000

Even vs Weighted?

What measurement basis to use:

- Weighting using order of repair, order of discovery, order of construction, order of damage?
- Weighted using duration based on DPR review, with most favourable turbines picked



Loss #	Duration of repair (days)	Weighting (%)	Cost (GBP)	Rank
D1	16	32%	6,400,000	1st
D2	6	12%	2,400,000	
D3	13	26%	5,200,000	2nd
D4	3	6%	1,200,000	
D5	7	14%	2,800,000	3rd
D6	5	10%	2,000,000	
Total	50	100%	20,000,000	

Weighted Claim (after SLC)

GBP 11,700,000

Direct & Indirect Costs?

Direct costs = Cost which can be allocated to specific WTG's

Indirect costs = Costs will be incurred regardless of the number of WTG's repaired e.g. design costs

Should these costs form part of the SLC?

Types of costs	Allocation of costs	Cost (GBP)
Engineering	Indirect	4,000,000
Commercial	Direct	2,000,000 12,000,000 2,000,000
Operations	Direct	
Contracts	Direct	
		After SLC + weighting = GBP 9,36m
Total cost		20,000,000

Weighted Claim (after SLC) + Indirect Costs

GBP 13,360,000

Summary.

- **New Market entrants (developers & capacity) / regions (US, Japan, France, Vietnam, Taiwan)**
- **Skills & knowledge transfer**
- **Nat Cat exposure, accumulation of risks**

Today

- **Claims inflation & Volatility**
- **Post pandemic environment**
- **GEO politics (Brexit, etc. War in Europe, sanctions)**
- **Higher energy & commodity prices**
- **Supply chain disruptions**

New Technology

- **Larger turbines, deeper waters, foundation variability, supply chain / vessel bottle necks**
- **< WTGs per project, however...**
- **Design risks > individual values = Larger PD & BI losses**

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