# Coastal & Offshore Modelling Symposium

COMS2026

# Design and modelling of floating wind hull, mooring and dynamic cables for an Irish perspective


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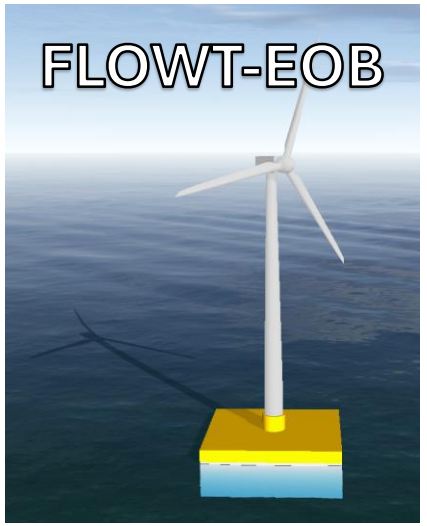


26 Feb, 2026
Cork, Ireland

# Outline

1. Modelling Overview
2. IDEA-IRL
    1. Overview
    2. 10 reference floating wind farm designs
    3. Focus on Kinsale Mooring Design
3. FLOWT-EOB
    1. Overview
    2. Barge design
    3. Mooring design
4. Conclusions

# IDEA-IRL

IDEA - IRL
INTERGRATED DESIGN OF FLOATING WIND ARRAYS IRELAND

IEA Wind TCP Task 49
Integrated Design on Floating wind Arrays (IDeA)

UCC
Coláiste na hOllscoile Corcaigh
University College Cork, Ireland

GDG
GAVIN & DOHERTY GEOSOLUTIONS

WIND ENERGY IRELAND

seai SUSTAINABLE ENERGY AUTHORITY OF IRELAND

# FLOWT-EOB

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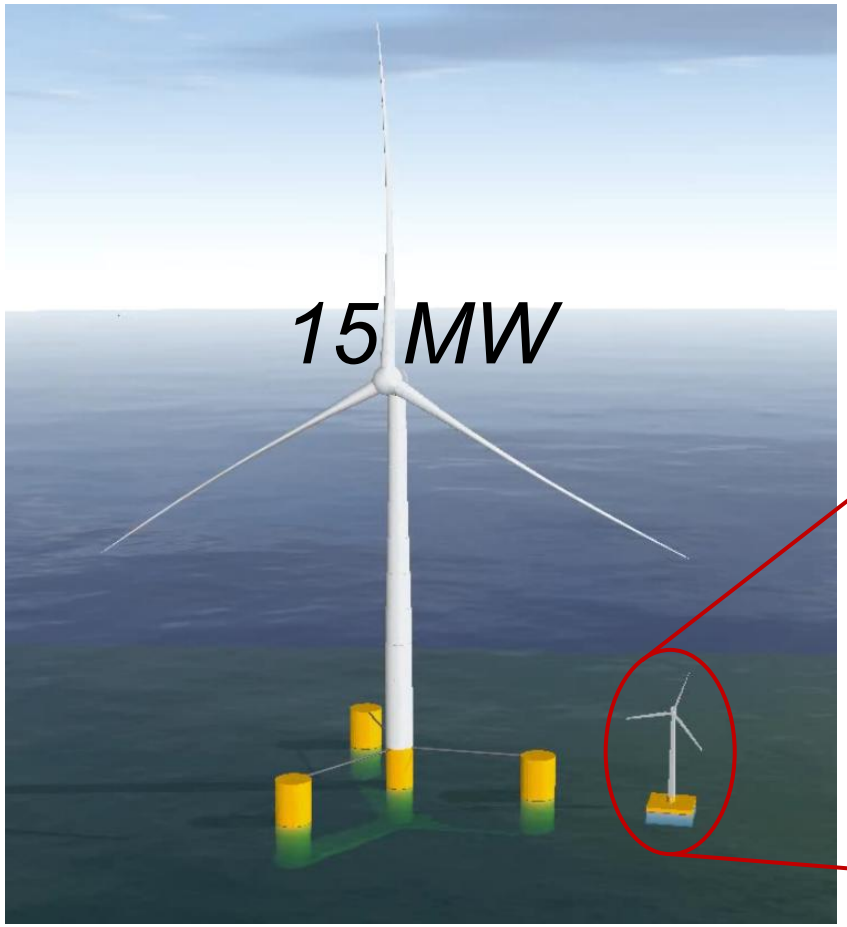
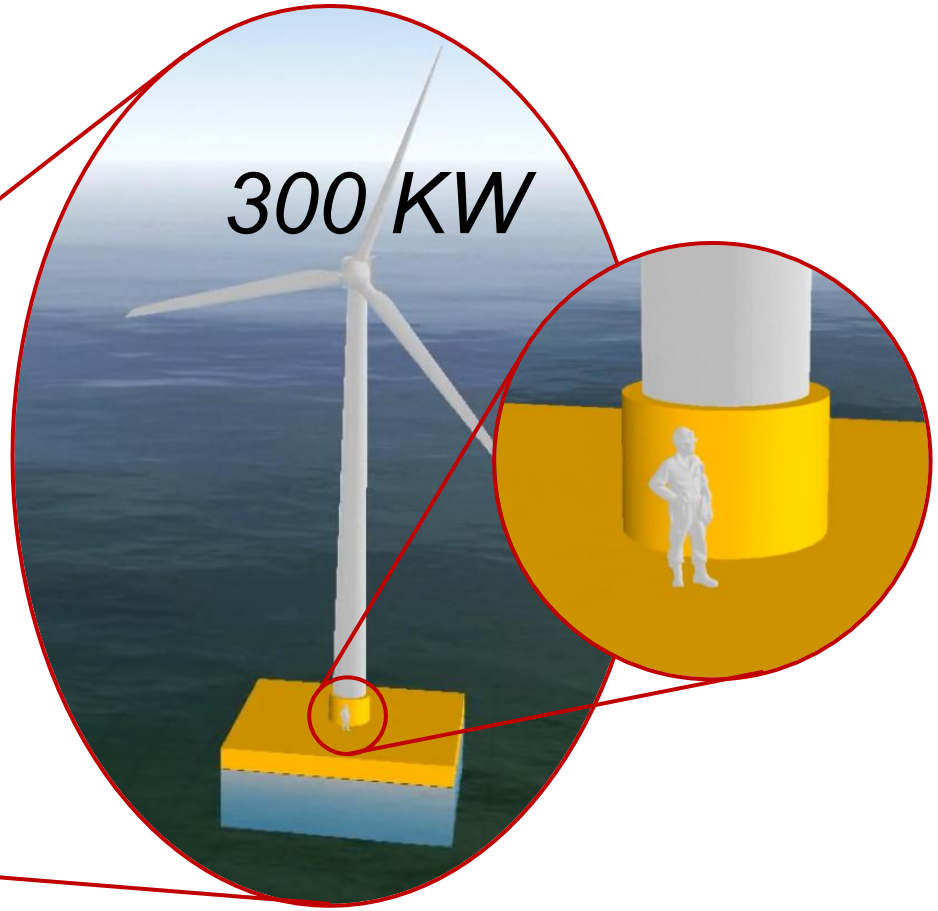
# IDEA-IRL




# FLOWT-EOB



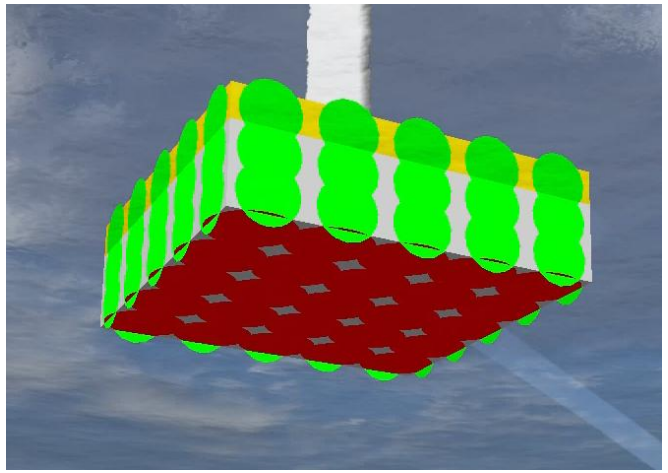
# 1. Modelling Overview

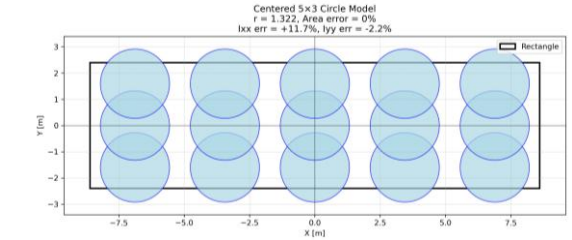
**WTG load assessment:**

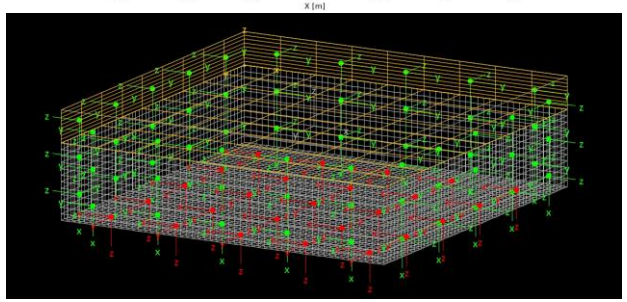
- IDEA-IRL fully coupled integrated load assessment (ILA)
- FLOWT-EOB decoupled WTG wind loads

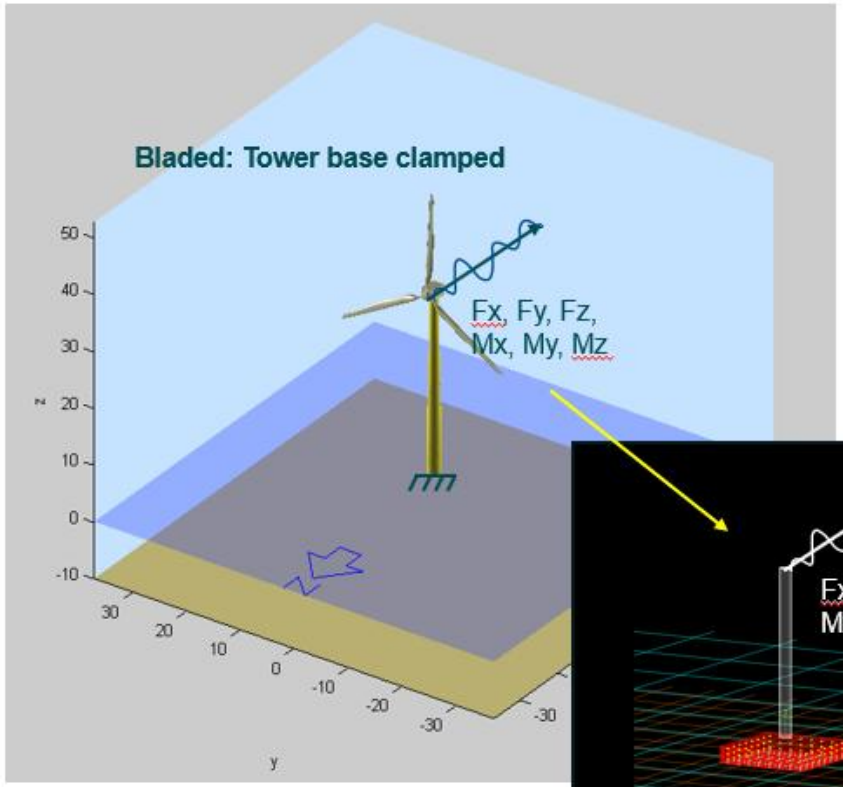
**Hydrodynamic:**

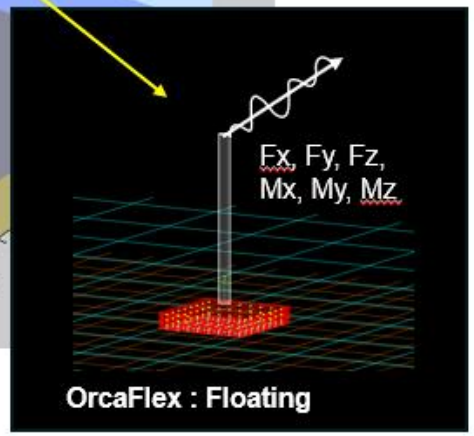
- Both projects: Hybrid Hydrodynamic database (HDB) & Morison drag approach



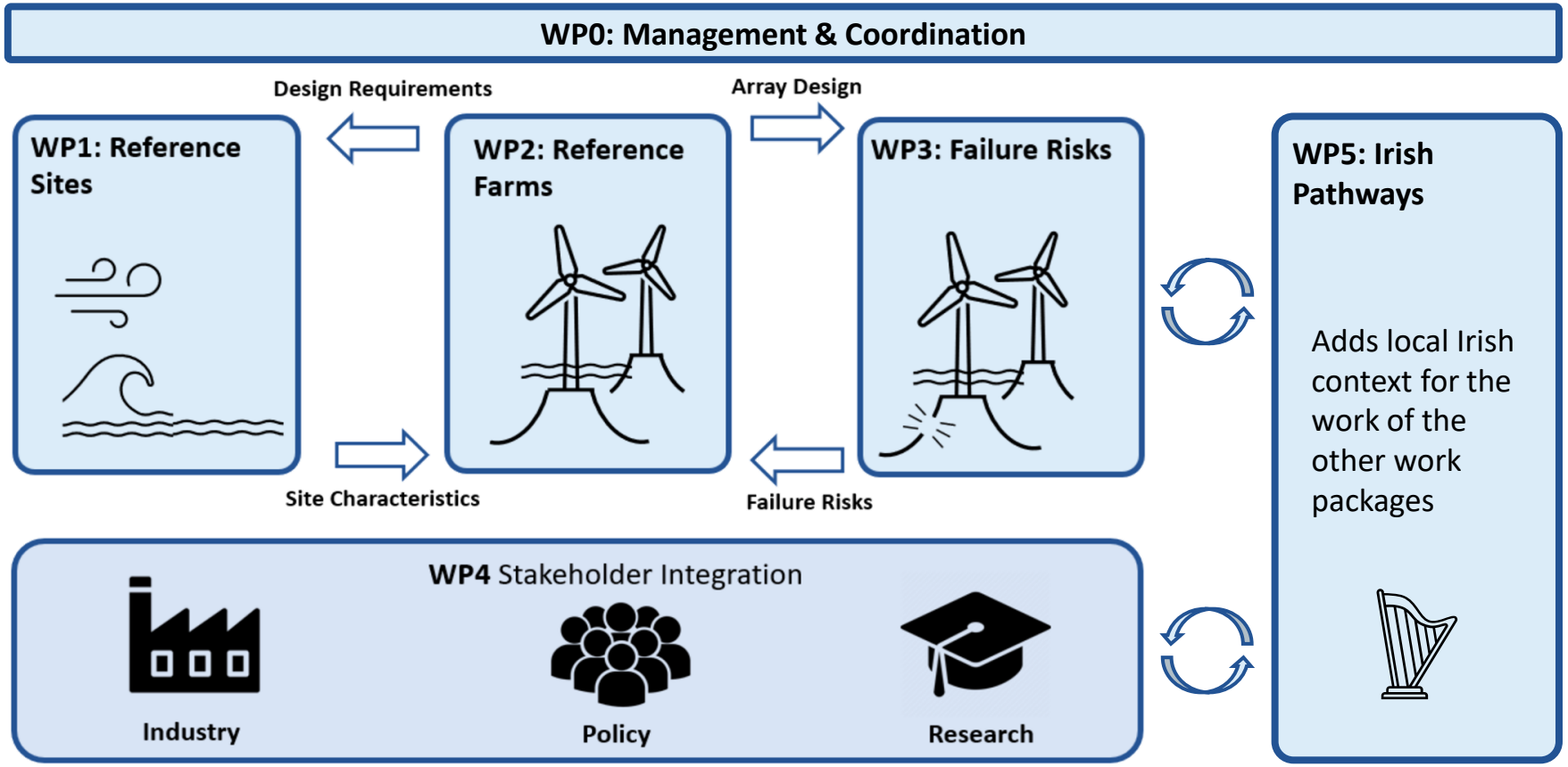




# 2.1 IDEA-IRL: Overview



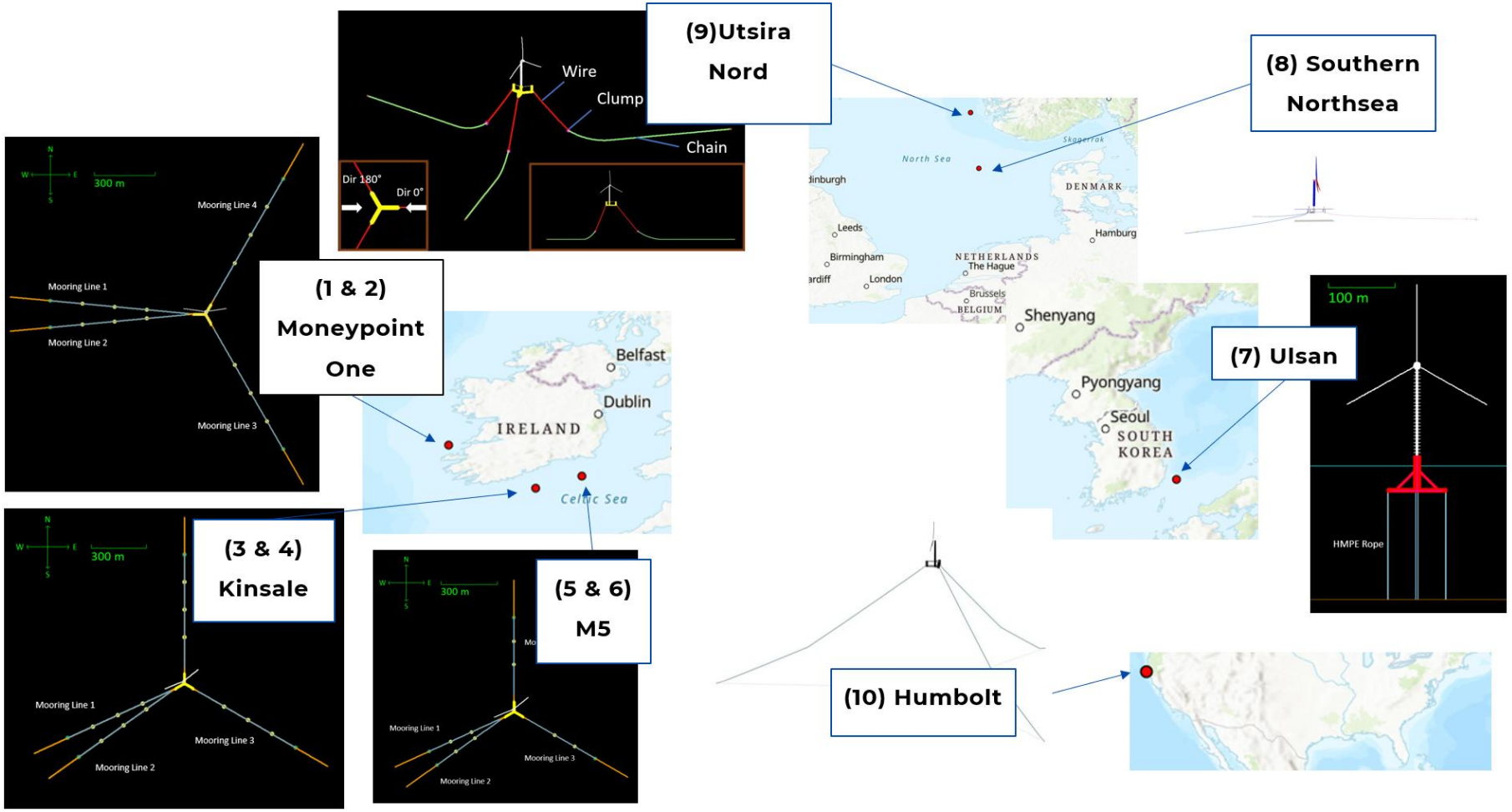
# 2.2 IDEA-IRL: 10 reference floating wind farm designs





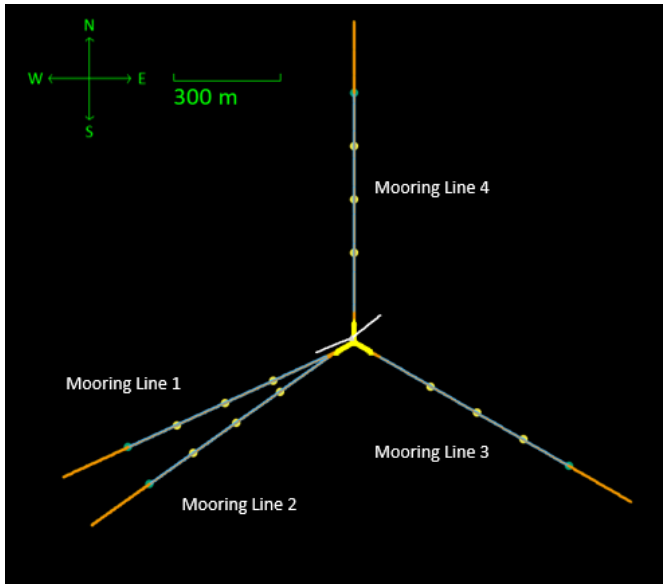
| No. | Name | Location | Water depth (m) | Significant wave height 50 year return period (m) | Substructure | Mooring |
|---|---|---|---|---|---|---|
| 1 | Moneypoint One Baseline | West coast, Ireland | 100 | 14 | Volturn US-S | Semi-taut |
| 2 | Moneypoint Max Density variant | West coast, Ireland | 100 | 14 | Volturn US-S | Semi-taut |
| 3 | Kinsale Semi-taut Baseline | South-West coast, Ireland | 95 | 15.15 | Volturn US-S | Semi-taut |
| 4 | Kinsale with TFI LRD | South-West coast Ireland | 95 | 15.15 | Volturn US-S | LRD |
| 5 | M5 Phase 1 (200 MW) | M5 metocean buoy, South-East coast. Ireland | 70 | 11.4 | Volturn US-S | Semi-taut |
| 6 | M5 Phase 2 (200 + 800 MW) | M5 metocean buoy, South-East coast, Ireland | 70 | 11.4 | Volturn US-S | Semi-taut |
| 7 | Ulsan | Sea of Japan, South Korea | 200 | 14 | IDEA-IRL TLP | TLP |
| 8 | IEA Wind Task 49 - Shallow | Southern Northsea, Norway | 60 | 12.94 | Volturn US-S | Semi-taut |
| 9 | IEA Wind Task 49 - Intermediate | Utsira Nord, Norway | 300 | 14.4 | Volturn US-S | Catenary |
| 10 | IEA Wind Task 49 -Deep | Humbolt, California, USA | 800 | 11.8 | Volturn US-S | Taut |

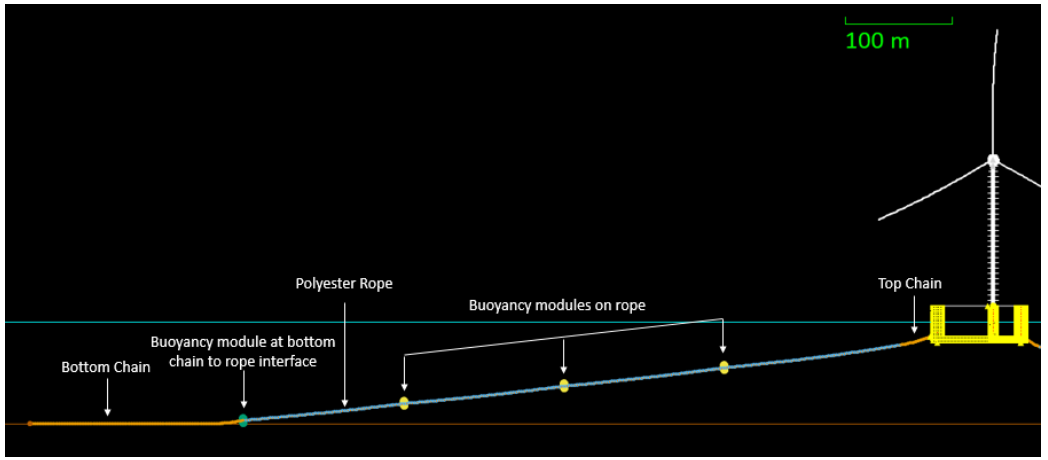
# 2.2 IDEA-IRL: 10 reference floating wind farm designs



# 2.2 IDEA-IRL: Kinsale

| Kinsale Mooring Properties | | | | |
|---|---|---|---|---|
| **Section** | Parameter | Line 1 & 2 | Line 3 & 4 | Units |
| **Overall** | **Mooring Radius** | **898.6** | **900.7** | m |
| | **Pretension (with marine growth)** | **556.3** | **1034.7** | kN |
| **Top Chain** | Length (Unstretched) | 30 | 30 | m |
| | Nominal Diameter | **175** | **195** | mm |
| | Dry mass (without marine growth) | 612.5 | 760.5 | kg/m |
| | Type and grade | Studless R4 | Studless R4 | / |
| | MBL (fully corroded) | 22508 | 26797 | kN |
| **Polyester Rope** | Length (Unstretched) | 615.7 | 615.7 | m |
| | **Nominal Diameter** | **240** | **240** | **mm** |
| | Dry mass (without marine growth) | 39.1 | 39.1 | kg/m |
| | MBL | 17741 | 17741 | kN |
| **Distributed Buoys on Rope** | Spacing (from bottom chain) | 150 | 150 | m |
| | No. of Buoys | 3 | 3 | / |
| | Net Buoyancy | 29.2 | 29.2 | kN |
| **Bottom Chain** | Length (Unstretched) | 200 | 200 | m |
| | **Nominal Diameter** | **175** | **195** | **mm** |
| | Dry mass (without marine growth) | 612.5 | 760.5 | kg/m |
| | Type and grade | Studless R4 | Studless R4 | / |
| | MBL (fully corroded) | 22508 | 26797 | kN |
| **Buoy at Chain Rope interface** | Net Buoyancy | 99.5 | 99.5 | kN |



# 3.1 FLOWT-EOB: Overview

- Floating Wind Testbed integrated with Energy System Observatory (FLOWT-EOB)
- Floating wind platform to be deployed in Cork harbour, within 3 km of the UCC Beaufort Building, HQ of the RI MaREI Centre
- FLOWT -EOB  is a research infrastructure award to UCC to deploy a floating wind turbine in Cork Harbour for research and training purposes and will add to the capacity of the Lir National Ocean Test facility.
- Export cable to feed into the UCC Beaufort Building
- WTG up to 300 KW

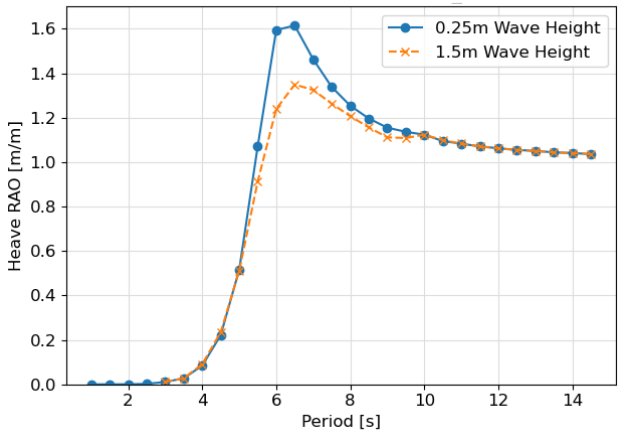
GDG scopes covered:

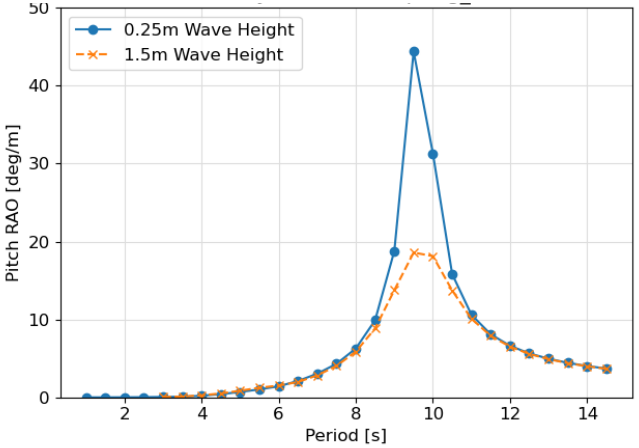
- Consenting (MAC and MUL)
- Barge hydrodynamic and structural design
- Mooring and anchor design
- Dynamic cable design, export cable routing and landfall assessment
- Preliminary Execution strategy
- Cost assessment

# 3.2 FLOWT-EOB Barge Design

- Barge designed for significant wave heights up to 1.67m, Tp ~ 4.6s, water depth ~ 14m MSL
- Design extremely sensitive to swell (long period waves)
- Pitch/Roll Rotations < 12 °

| Parameter | | Units |
|---|---|---|
| Length | 16.00 | m |
| Beam | 16.00 | m |
| Depth | 5.73 | m |
| Interface level wrt SWL | 3.50 | m |
| Draft in operating condition | 4.23 | m |
| Freeboard | 1.50 | m |
| Displacement in operating condition (incl. marine growth & water ingress) | 1165 | Ton |
| Heave period (free floating, incl. marine growth & water ingress) | 6.37 | s |
| Pitch period (free floating, incl. marine growth & water ingress) | 11.62 | s |

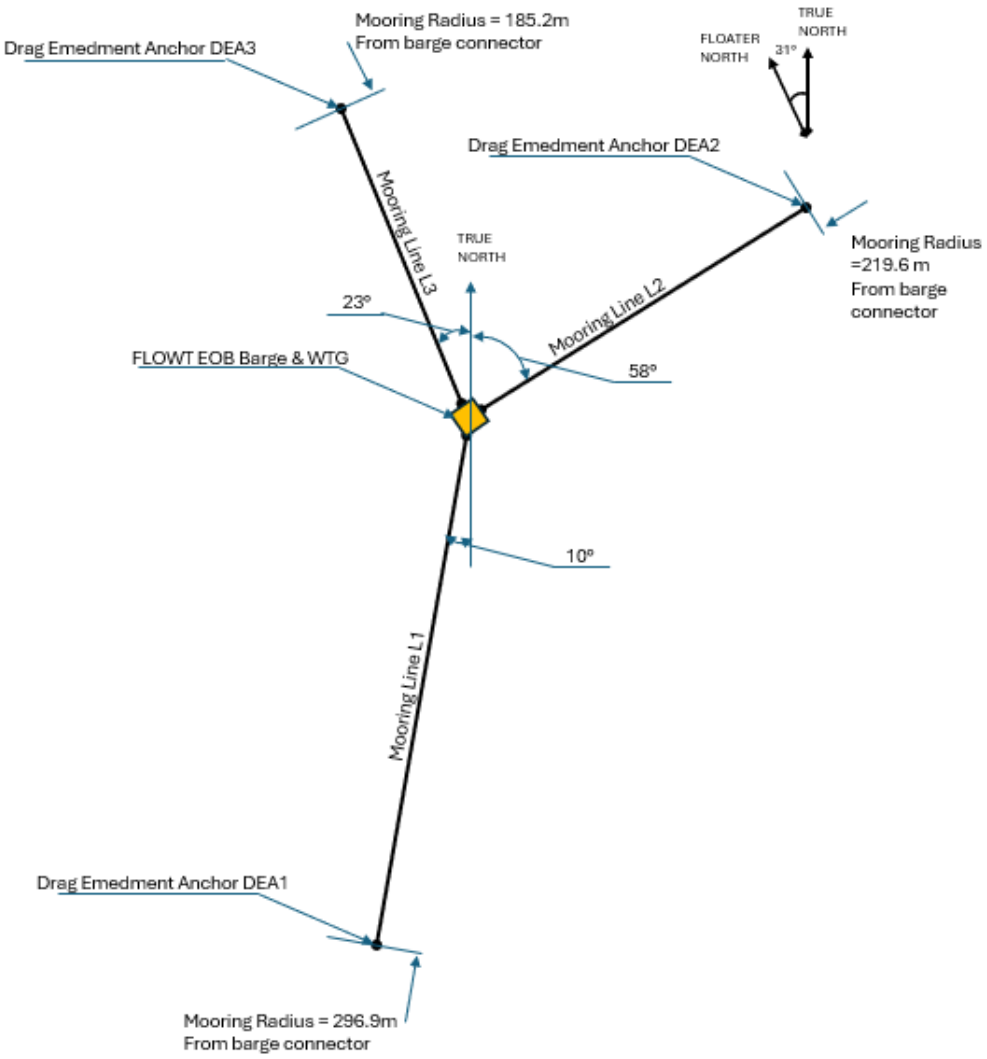


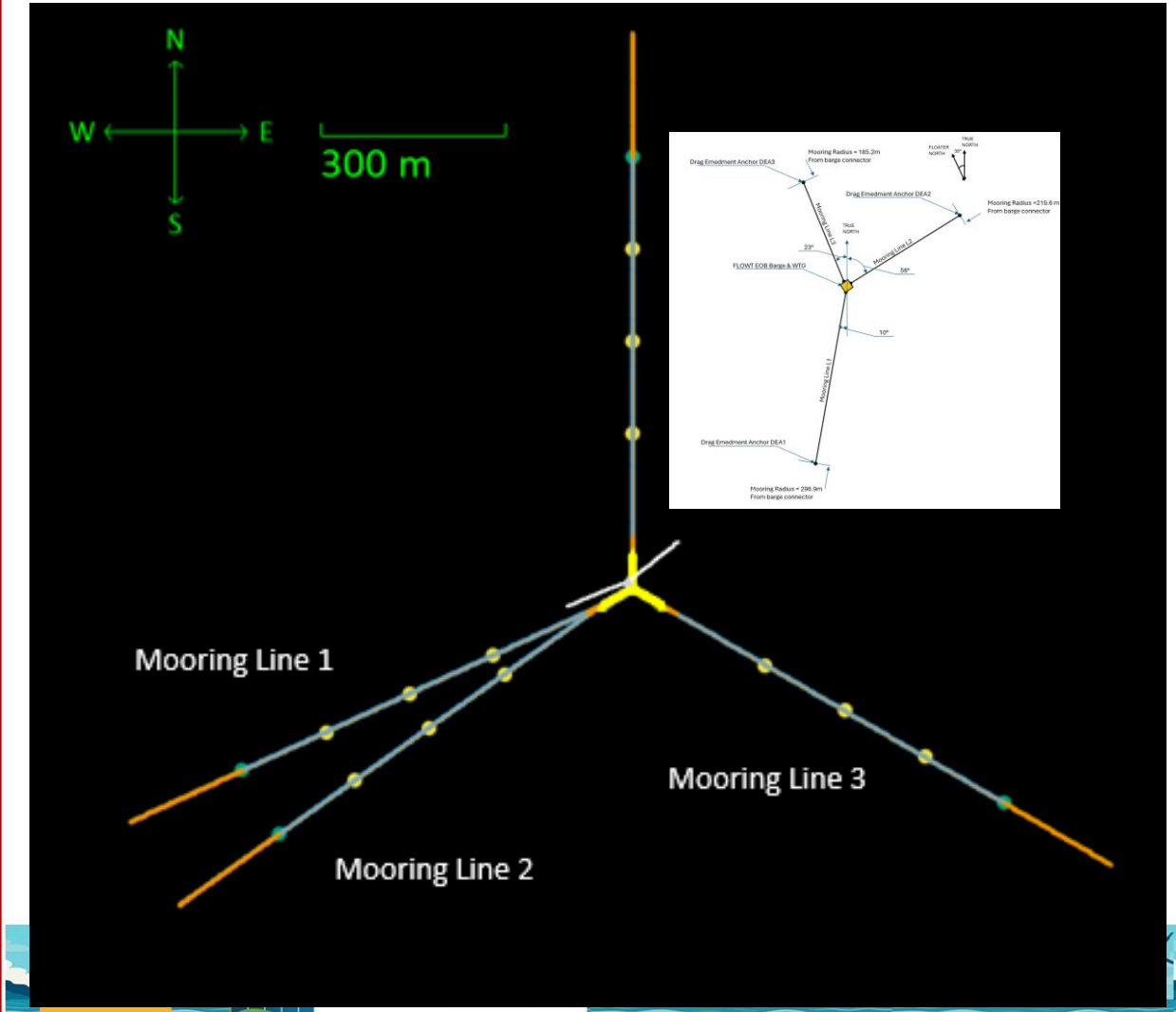
# 3.2 FLOWT-EOB Mooring Design

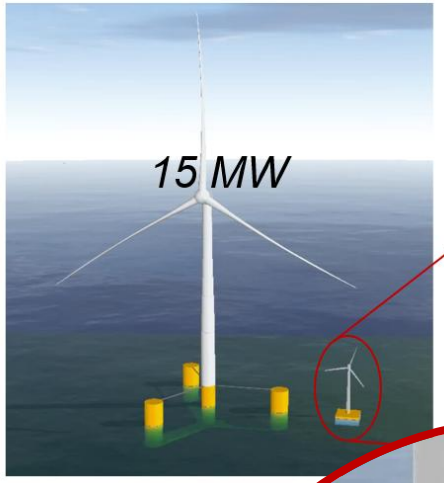
- Large water depth variations relative to water depth (14m + 3.44/ - 3.33)
- Significant constraints driving the mooring layout & anchor locations

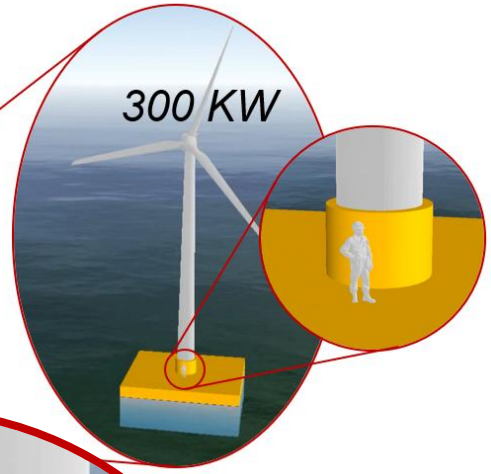
| Parameter | Line 1 | Line 2 | Line 3 | Units |
|---|---|---|---|---|
| Mooring angle | 58 | 190 | 337 | ° |
| Mooring radius from hull connector | 296.9 | 219.6 | 185.2 | m |
| Length (Unstretched) | 298.4 | 222.2 | 186.3 | m |
| Pretension | 247.7 | 142.4 | 185.8 | kN |
| Nominal Diameter | 60 | | | mm |
| Dry mass (without marine growth) | 71.64 | | | kg/m |
| Type and grade | Studless R3 | | | / |
| MBL | 3147 | | | kN |
| MBL (fully corroded) | 2683 | | | kN |



# Mooring scale comparison



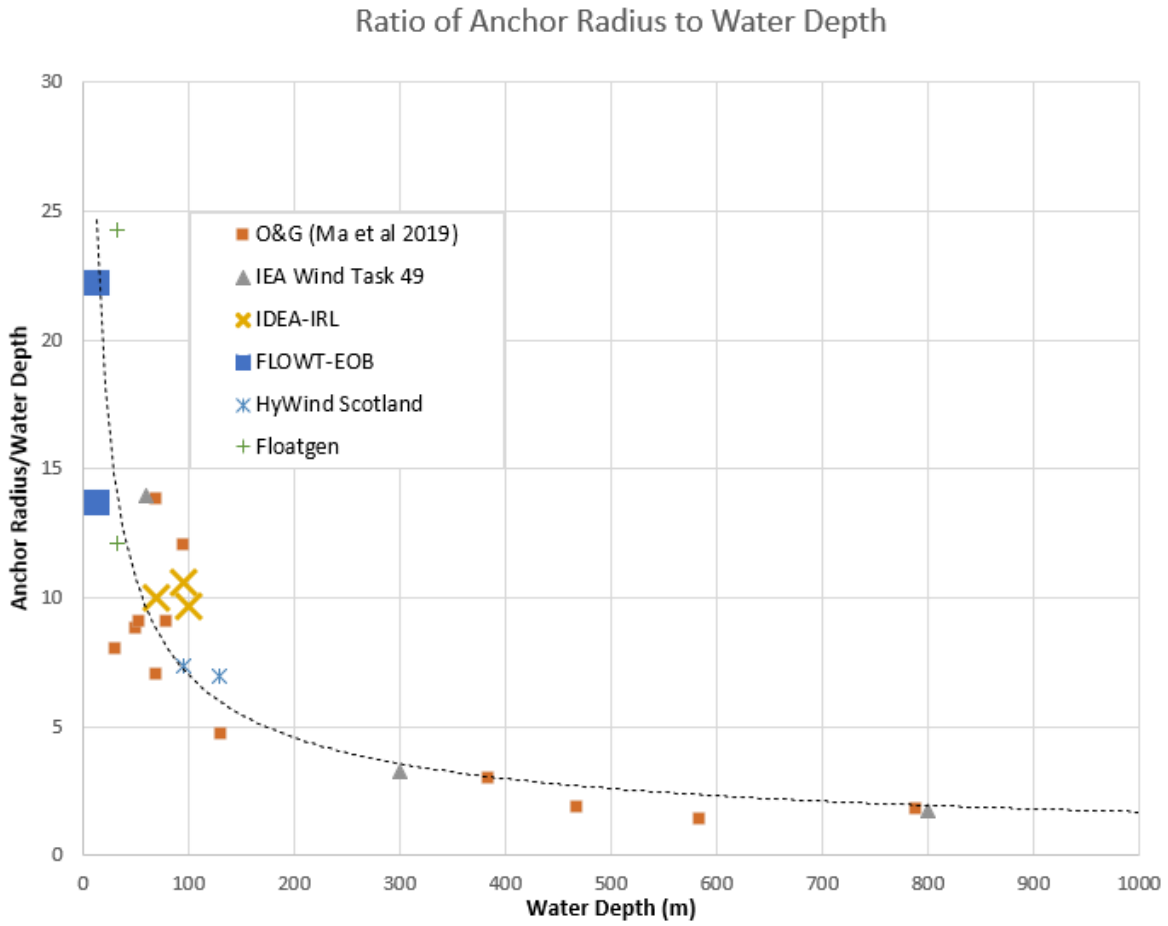




# 4. Conclusions

- IDEA-IRL mooring designs demonstrate it's feasible to produce mooring systems for severe Irish conditions for commercial scale WTG. Fatigue driving the required chain diameter
- Mooring designs for Irish sites are within reasonable limits with the caveat that the number of mooring lines may need to be increased to avoid large chain sizes (T&I limitation). 4 mooring lines ➔ 6 lines.
- A reminder that for mooring design, shallower water doesn't necessarily mean easier conditions.

  IDEA-IRL:
  - M5 70m water depth 214mm chain
  - Moneypoint One 100m water depth 204mm chain
  - Kinsale 95m water depth 195mm chain

  FLOWT-EOB:
  - Large mooring radius to water depth ratio required even with mild wave conditions



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Thank you, any questions?

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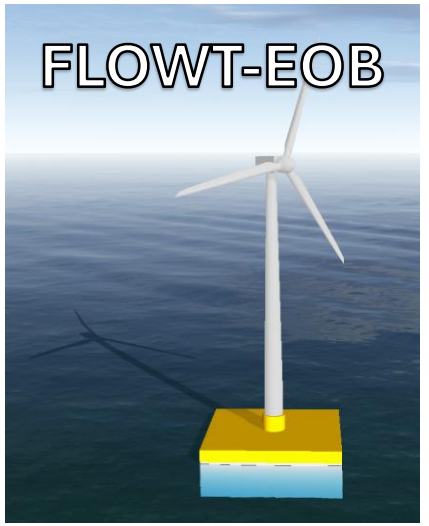


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# Appendix

| No. | Name | Location | Water depth (m) | Significant wave height 50 year return period (m) | Substructure | Mooring | No. of lines | Chain | Rope |
|---|---|---|---|---|---|---|---|---|---|
| 1 & 2 | Moneypoint One | West coast, Ireland | 100 | 14 | Volturn US-S | Semi-taut | 4 | 178 mm chain – 230 m x 2<br>204 mm chain – 230 m x 2 | 188 mm PE rope – 685m x 4 |
| 3 | Kinsale Semi-taut Baseline | South-West coast, Ireland | 95 | 15.15 | Volturn US-S | Semi-taut | 4 | 175 mm chain – 230m x 2<br>195 mm chain – 230m x 2 | 240 mm PE rope – 616 m x 4 |
| 4 | Kinsale with TFI LRD | South-West coast Ireland | 95 | 15.15 | Volturn US-S | Semi-taut / Taut with LRD | 3 | 195 mm chain – 160 m x 1<br>175 mm chain – 40 m x 2 | 226 mm PE rope -648 m x 1, & 384 m x 2<br>SeaSpring S8500 kN – 30m x1, & 13 m x 1<br>SeaSpring S5500 kN – 10 m x 3 |
| 5 & 6 | M5 Phase 1 and 2 | M5 metocean buoy, South-East coast. Ireland | 70 | 11.4 | Volturn US-S | Semi-taut | 4 | 184 mm chain – 230 m x 2<br>214 mm chain – 230 m x 2 | 196 mm PE rope – 414 m x 4 |
| 7 | Ulsan | Sea of Japan, South Korea | 200 | 14 | IDEA-IRL TLP | TLP | 6 | NA | 320mm HMPE – 160 m x 6 |
| 8 | IEA Wind Task 49 - Shallow | Southern Northsea, Norway | 60 | 12.94 | Volturn US-S | Semi-taut | 3 | 185 mm chain – 100 m x 3 | 277 mm PE rope – 670 m x 3 |
| 9 | IEA Wind Task 49 - Intermediate | Utsira Nord, Norway | 300 | 14.4 | Volturn US-S | Catenary | 3 | 172 mm chain – 817 m x 3 | 160 mm wire – 280 m x 3<br>80 ton clump weight x 3 |
| 10 | IEA Wind Task 49 - Deep | Humbolt, California, USA | 800 | 11.8 | Volturn US-S | Taut | 3 | 142mm chain 120m x 3 | 200 mm PE 1430 m x 3<br>40 ton clump weight x 3 |