Static Cable for Offshore Wind TLP

MARIN bluewater TKI WIND OP ZEE Rijksdienst voor Ondernemend Nederland

Goal of the project

De-risk the power cable for a deep draft TLP floating wind system by understanding and validating the power cable behaviour in tank and model tests

JIP execution

- Cable static analysis
- Integrity of cable for extreme (storm) conditions
- Wind turbine induced fatigue
- Floater induced fatigue
- Wave orbital motion induced fatigue
- VIV induced fatigue

Emphasis on lazy wave, mud mats, bend restrictors, etc.

JIP Project plan

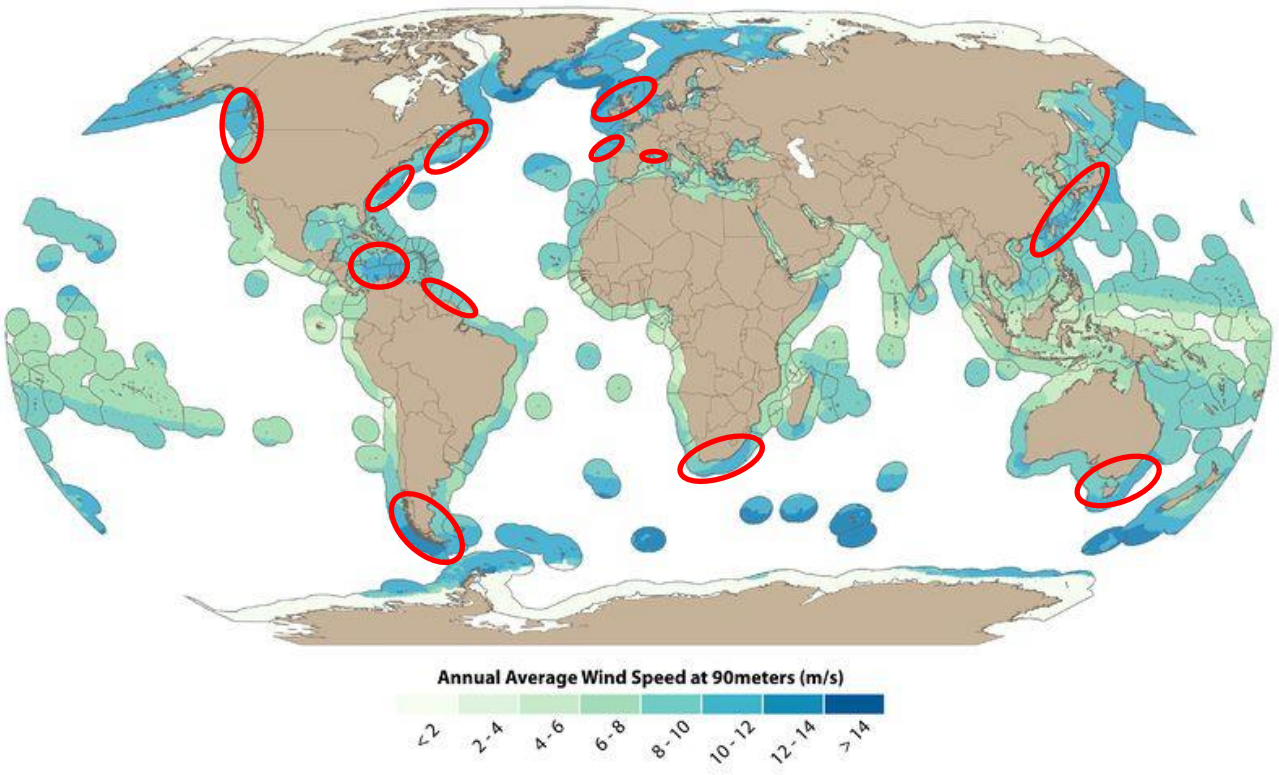
WP 1 Design of TLP and electrical cable

WP 2 Wave basin model test

WP 3 Hexapod tests electrical cable

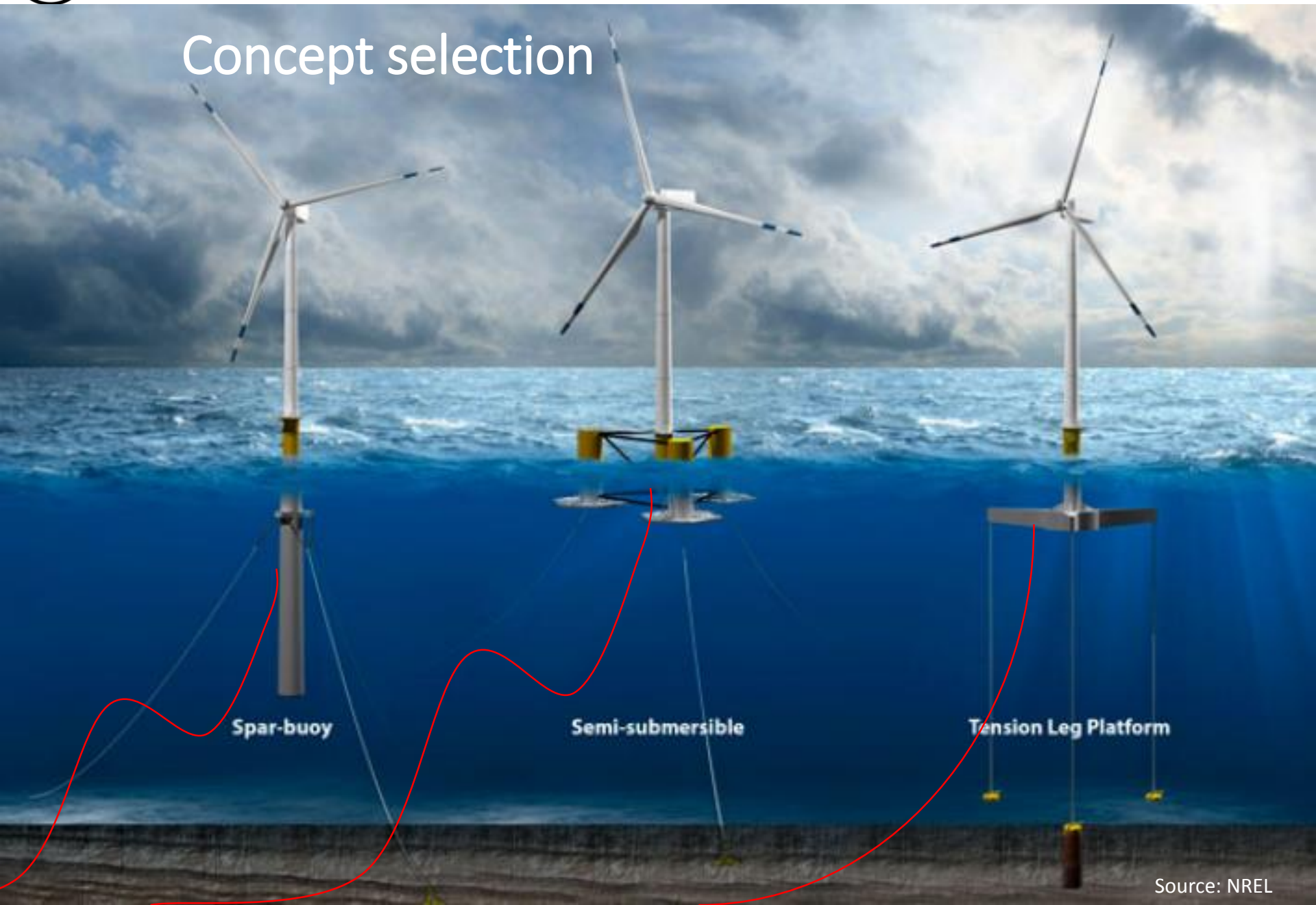
WP 4 Project management

Areas worldwide suitable for floating wind



High Annual Energy Production but……. also high extreme events!

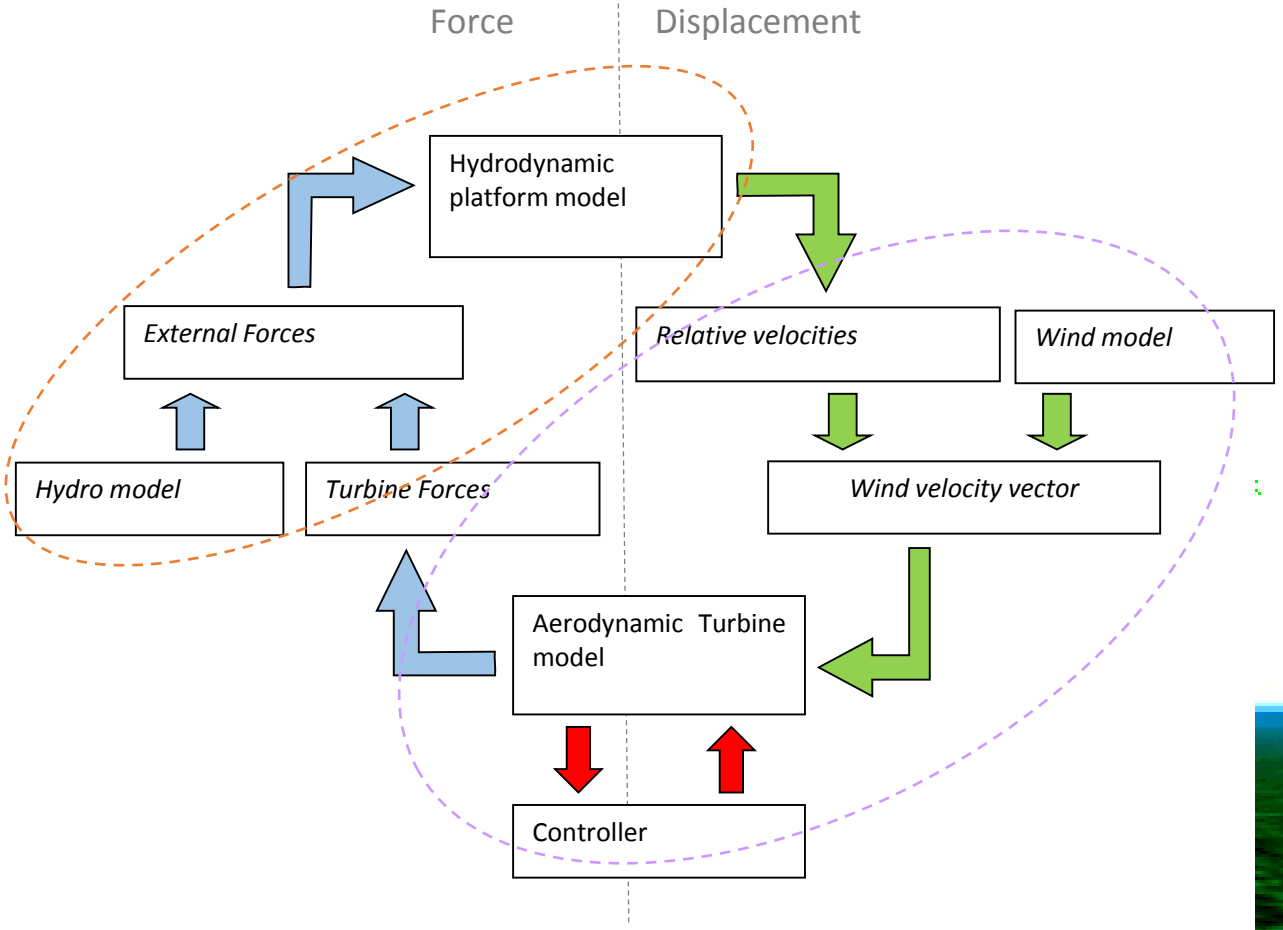
Concept selection

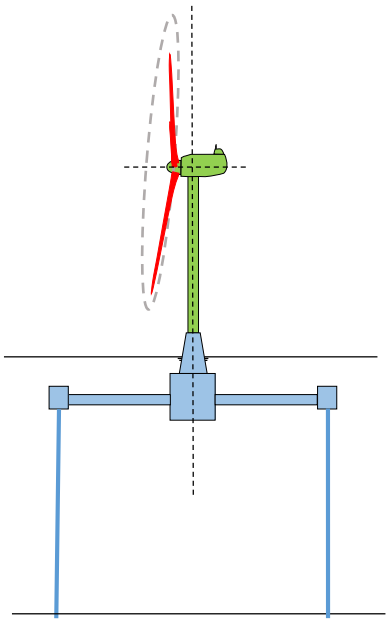


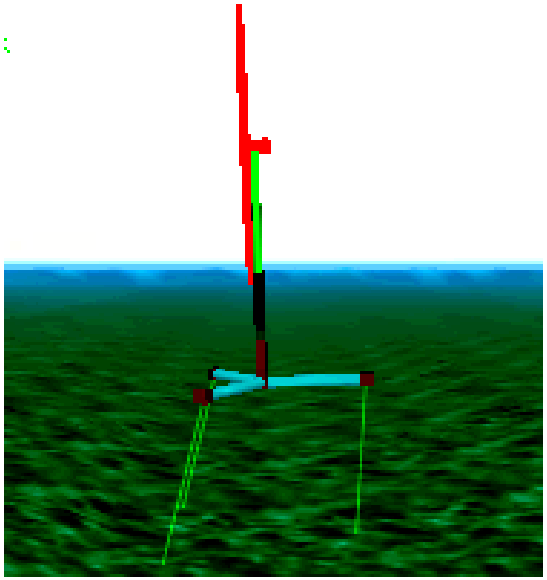
Source: NREL

Coupled TLP floater – WTG

2 phased approach

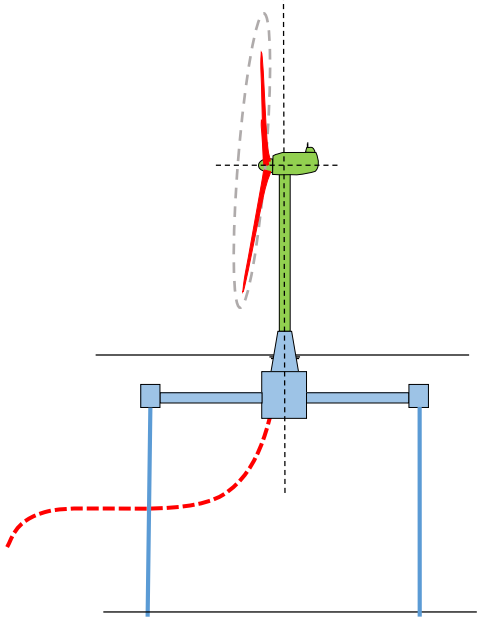






Bluewater floating wind TLP

- Limited movements of floater (quasi static)
- Power cable connection is the ‘Achilles heel’ offshore renewables
- Conventional dynamic power cables expensive
- TKF power cable suitable for some dynamic loads



Head office and Production facility
in Haaksbergen, the Netherlands

Subsea production facility
in Lochem, the Netherlands

TKF PREMIUM DRY DESIGN

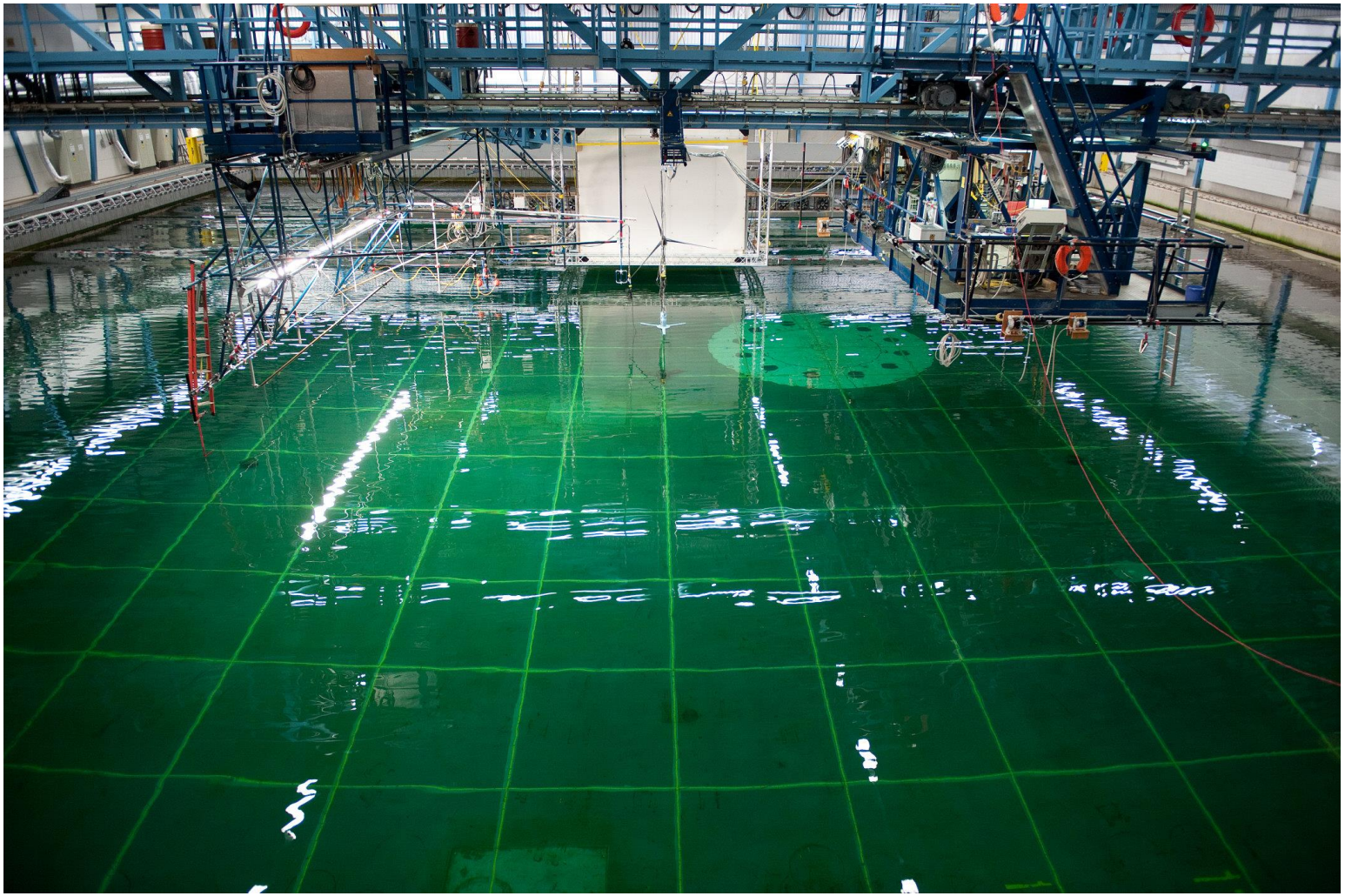
- A modern design based on state of the art production technology
- Modern and environmental friendly materials
- Designed according to the latest international standards
  - Aluminium or Copper conductors
  - XLPE insulation
  - Individual core screen by 100% tight welded metal
  - Individual radial water tight barrier
  - Integration of Optical Fibre Cables
  - Steel wire armoring
  - Extruded bedding and HDPE outer sheath

Mechanical test rig

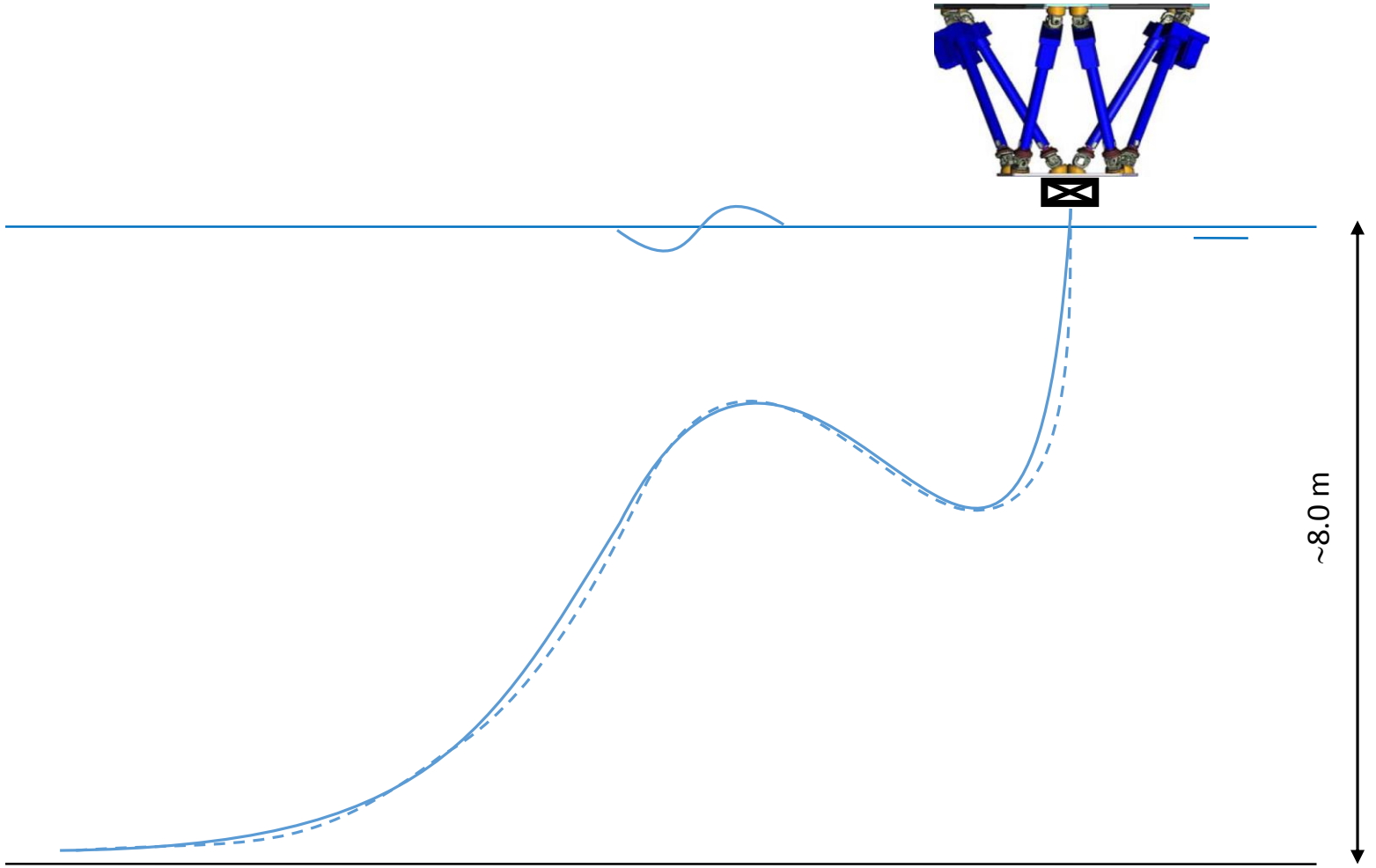
Flexibility and easy access to the execution of development tests and witnessed type test

- Pulling capacity of 600 kN
- Executed on cable, cable with factory joints and on repair joints.
- Pulling heads enable measurement of forces and torque on cable, core and SWA
- Tensile tests - Tensile bending test - Bending stiffness – Torque distribution - Compression test - Slip stick

WP 21 Wave basin tests



WP 22 Hexapod tests (Q3, 2018)



Fibre optic instrumentation

- total of 40 FBGs
- 10 locations
- 3 FBGs on armouring wires
- 1 dummy FBG
- 1 microstrain resolution
- 1 kHz sample rate

Project results

- ✓ Proven feasibility of low cost quasi-static power cable system for a TLP wind application
- ✓ Increase TRL of whole system to allow full scale demonstration

Future works

- ✓ Detailed VIV analysis of electrical cable -> ACDC JIP
- ✓ Full scale monitoring of electrical cable