

SIMOPRO Riser Replacement

Novel method for replacement of pliant wave risers whilst continuing production on platform

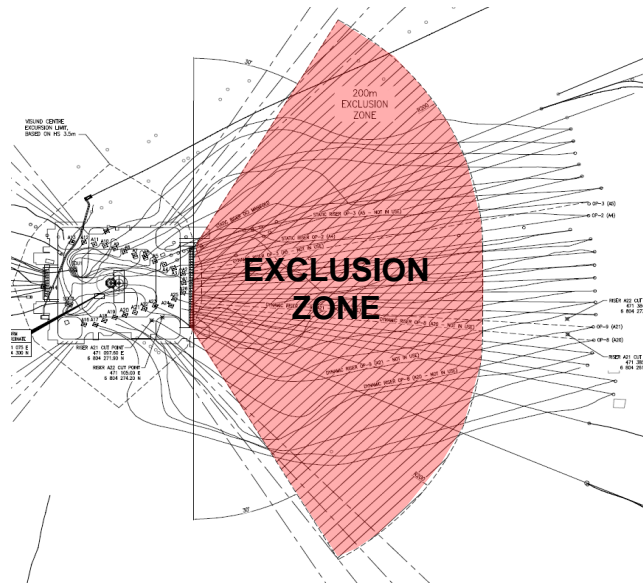
Helen Tunander
Ocean Installer



SIMOPRO METHOD

What is it?

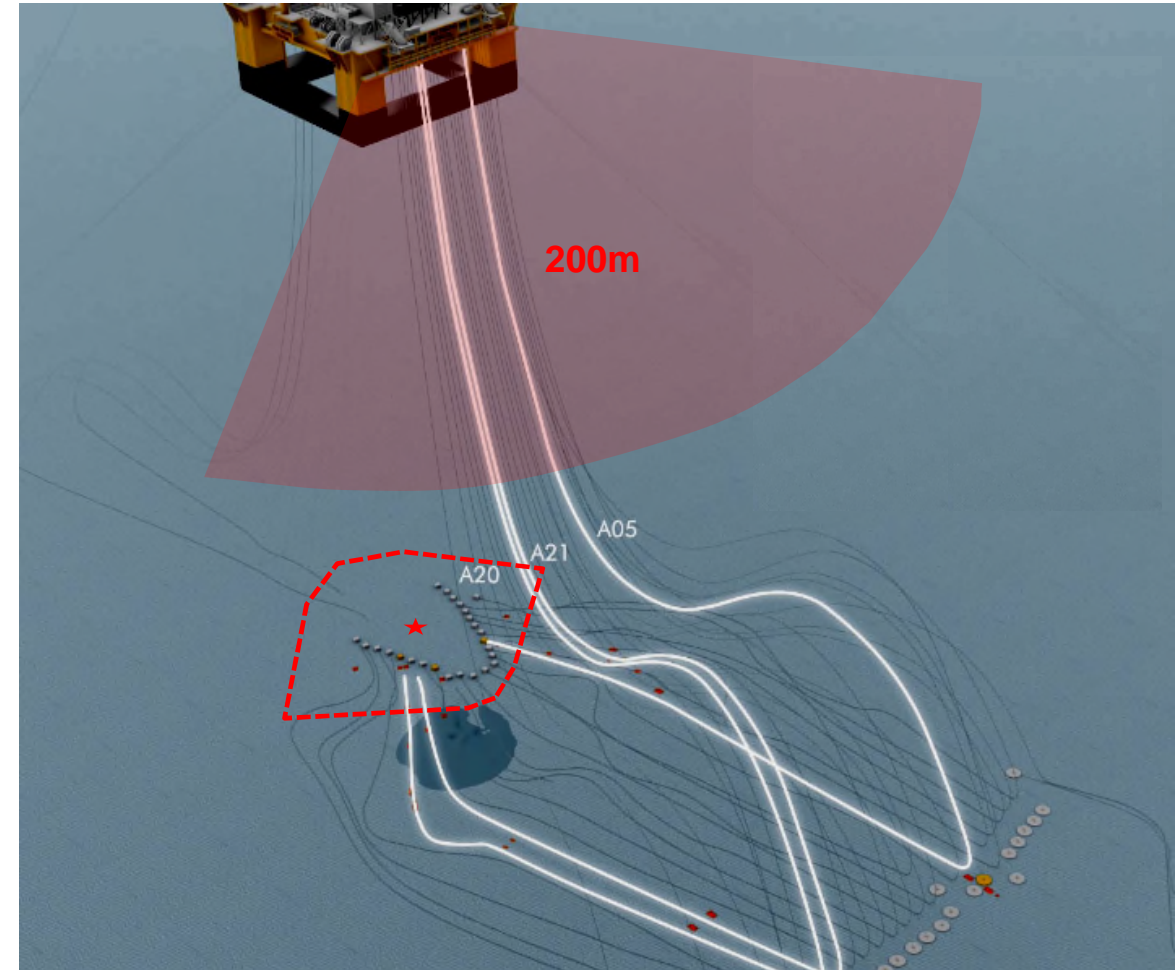
- **Simultaneous Marine Operations and Production** – SIMOPRO
- New industry risk assessments of frequency of DP incidents
- **200m Exclusion Zone** on all Statoil platforms with free hanging risers implemented
- No vessel entry in this zone whilst production is ongoing
- Additional to the Safety Zone, approx. 800m radius around platform
- Ocean Installer was challenged by Statoil to develop method of replacing risers with vessel staying 200m away from platform at all times
- Main company benefit: **No shutdown of production on platform**



SIMOPRO METHOD

What is it?

- 3 risers replaced at Visund in 2015 using SIMOPRO
- Pliant wave risers, free hanging from balcony
- Wells directly under platform center position
- Visund FPU is able to move approx. 70m from center position
- 200m Exclusion Zone moves with platform
- Installation Vessel – Normand Vision
- Neighboring risers were shut down



SIMOPRO METHOD

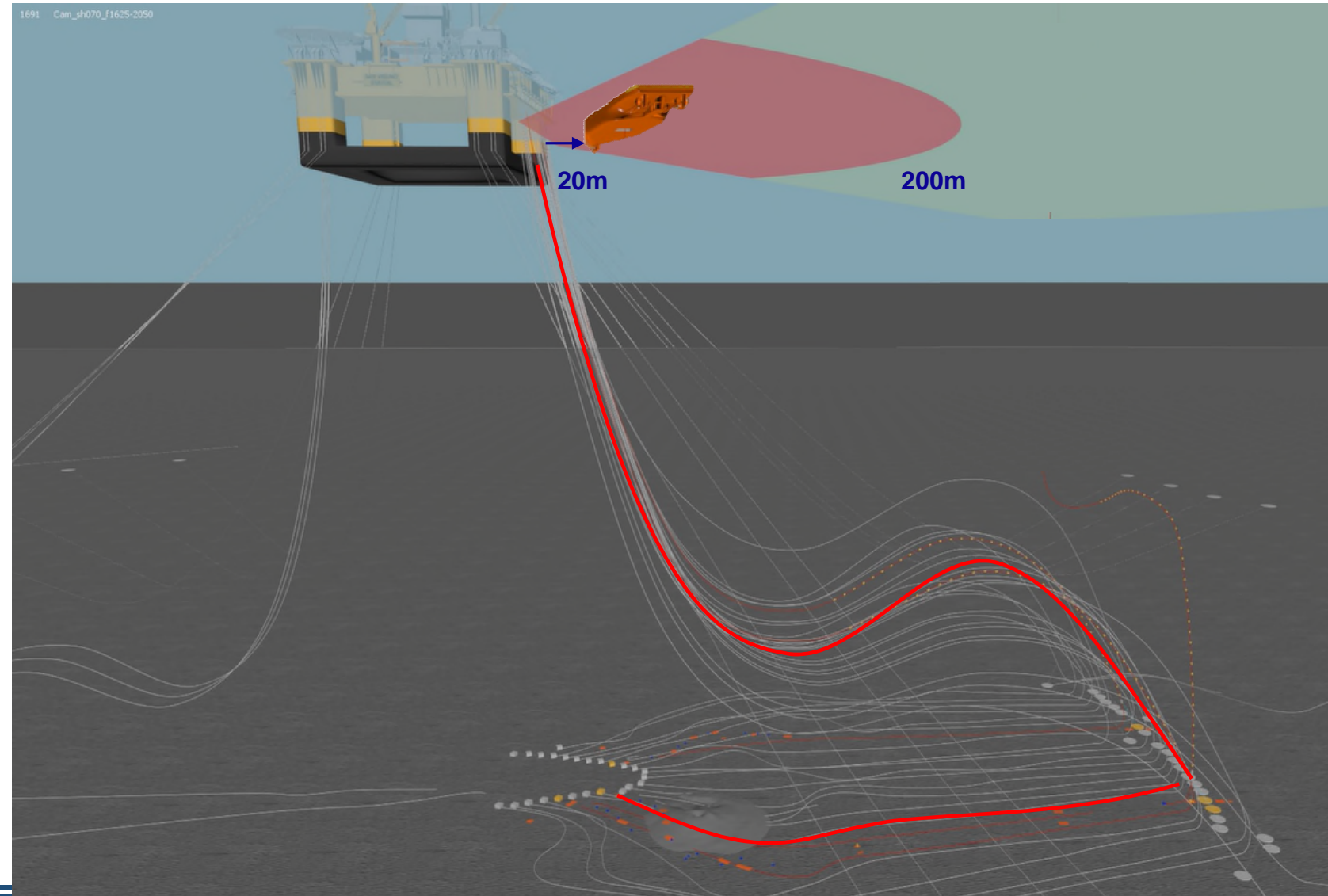
Visund 2015

TOPSIDE TRANSFER FOR RECOVERY

- Initial status:
 - Riser to be recovered topside end first
 - Topside end lowered from balcony on platform winch

- Standard method:
 - Vessel close to platform (~20m)
 - Crane deployed with 20m rigging
 - ROV flies and connects rigging to head
 - Weight of riser transferred to crane
 - Weight of riser transferred to A&R wire in moonpool

- Main SIMOPRO challenge:
 - Topside transfer to vessel 200m away



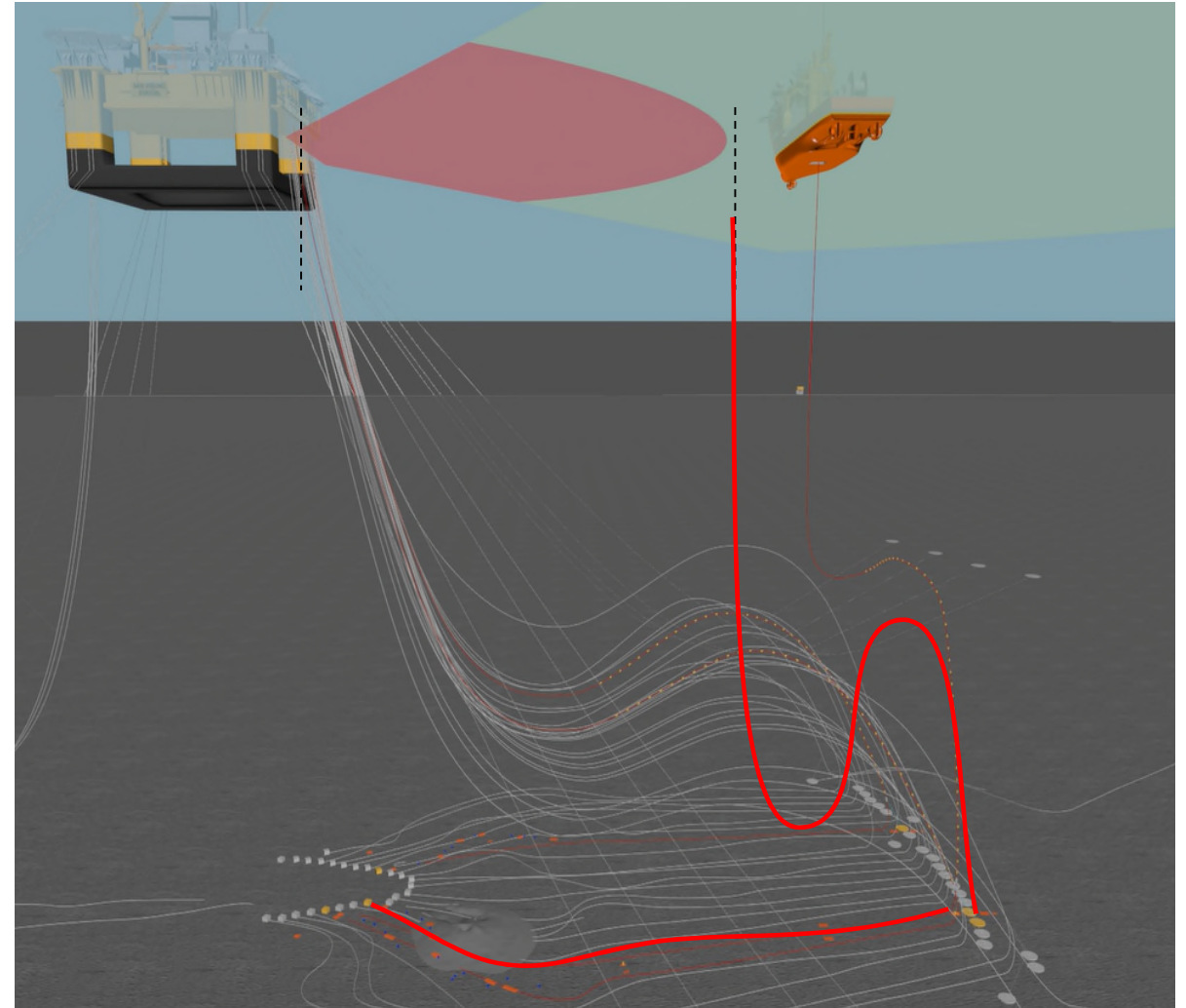
SIMOPRO METHOD

Visund 2015

TOPSIDE TRANSFER FOR RECOVERY

Possible issues with riser configuration & properties:

- Low sagbend (possible dragging across seabed)
- Water depth
- Riser length
- Riser configuration
- Existing assets on seabed
- Small bend radius at hog bend and sag bend
- Riser weight



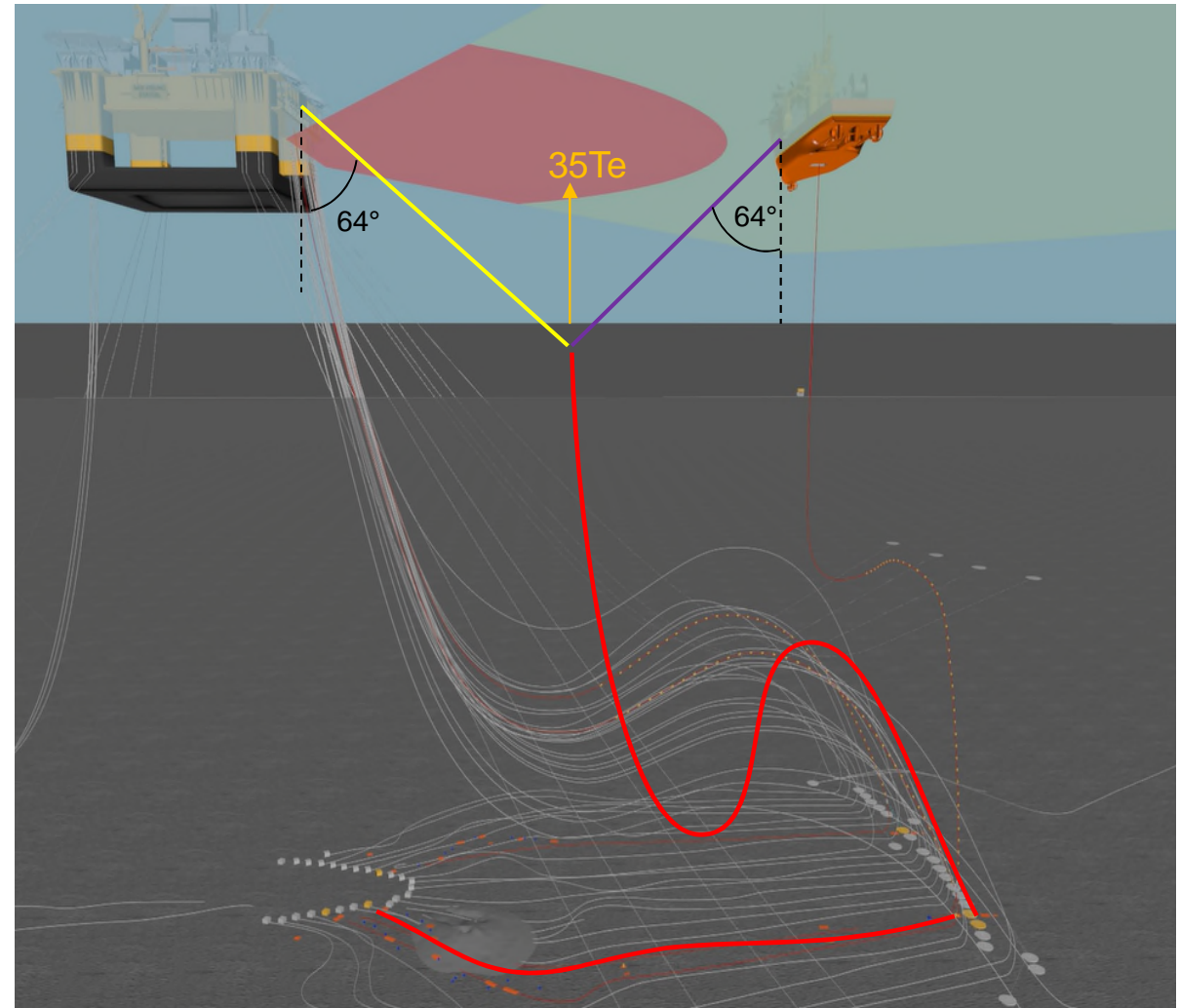
SIMOPRO METHOD

Visund 2015

TOPSIDE TRANSFER FOR RECOVERY

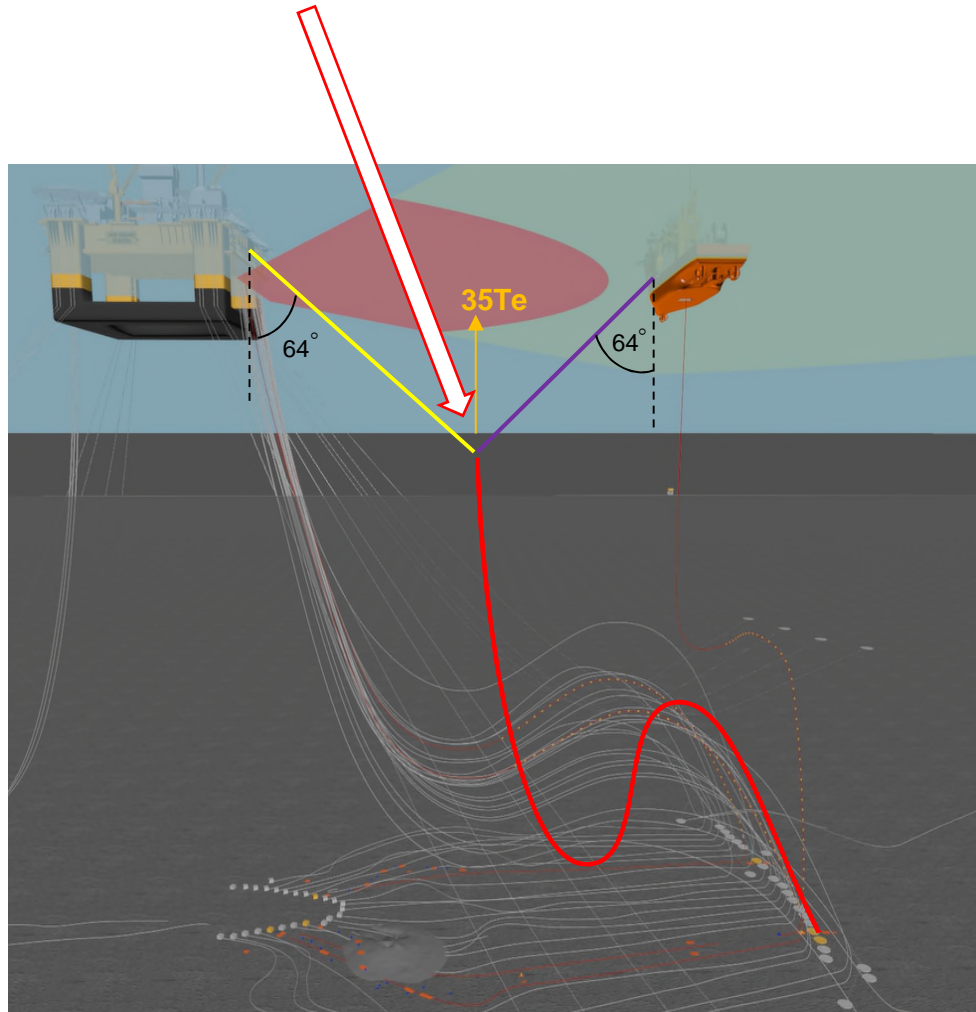
Engineering issues

1. High lateral loads and angles at head
2. High wire angles at platform
3. High wire angles at vessel
4. Distance of load transfer



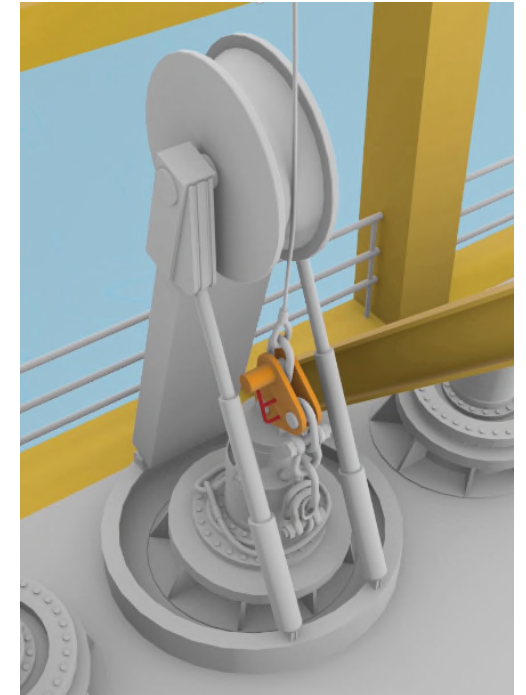
SIMOPRO METHOD

1. High lateral loads and angles at head



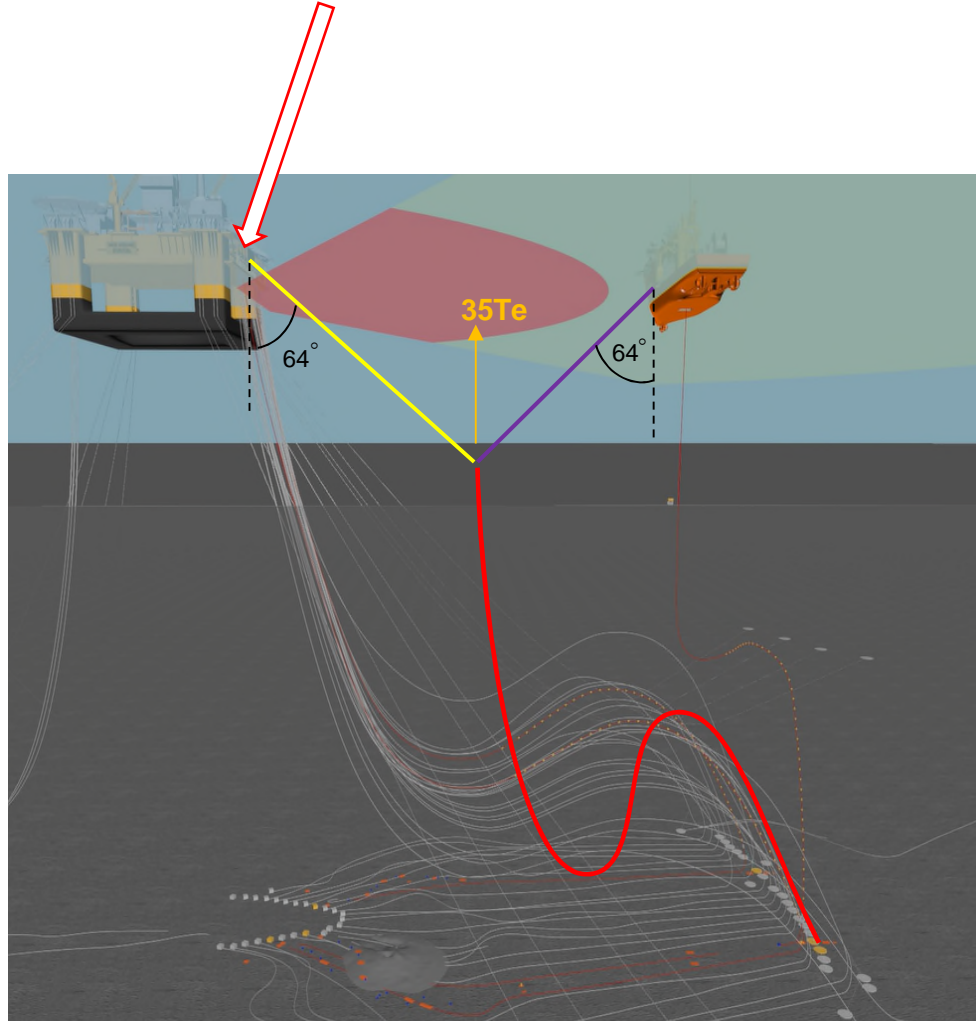
TRIPLATE DESIGN

- ROV operable: releasable and connectable
- Capable of handling lateral loads and angles
- Small enough to fit through hang-off slot



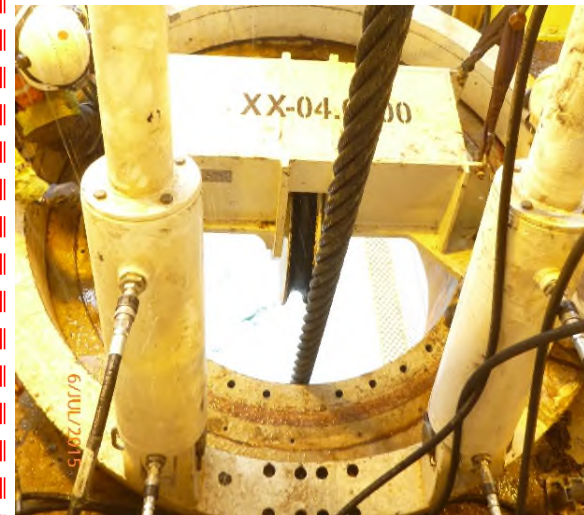
SIMOPRO METHOD

2. High wire angles at platform



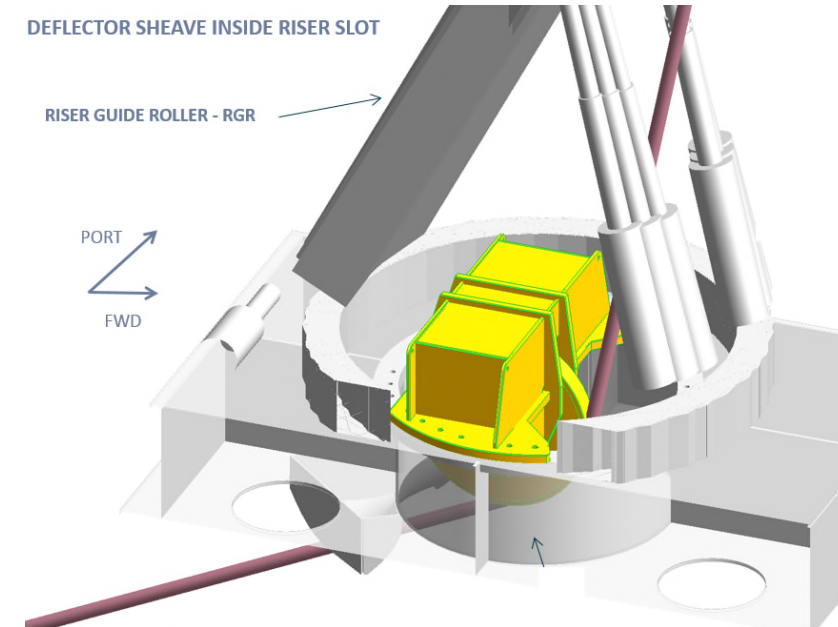
TOPSIDE DEFLECTOR SHEAVE DESIGN

- Allows for high exit angles of platform pull-in wire
- Mounted on hang-off after lowering of riser
- Size constraints
- Depth of sheave to avoid obstacles



DEFLECTOR SHEAVE INSIDE RISER SLOT

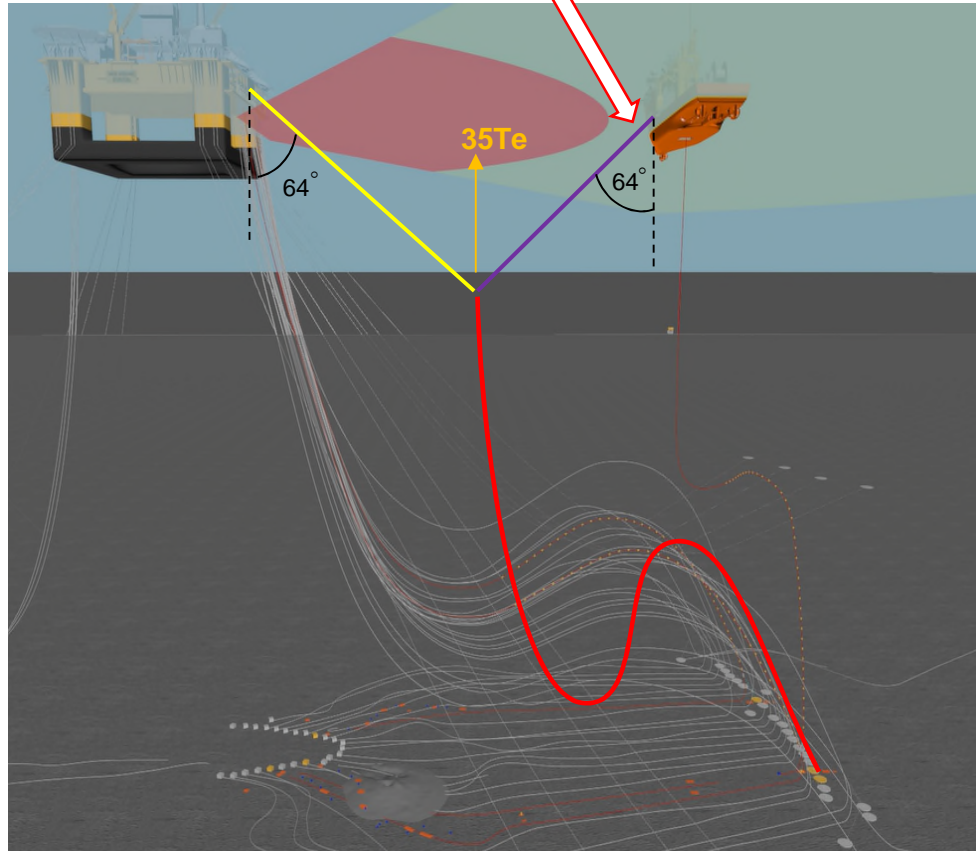
RISER GUIDE ROLLER - RGR



Patent Pending

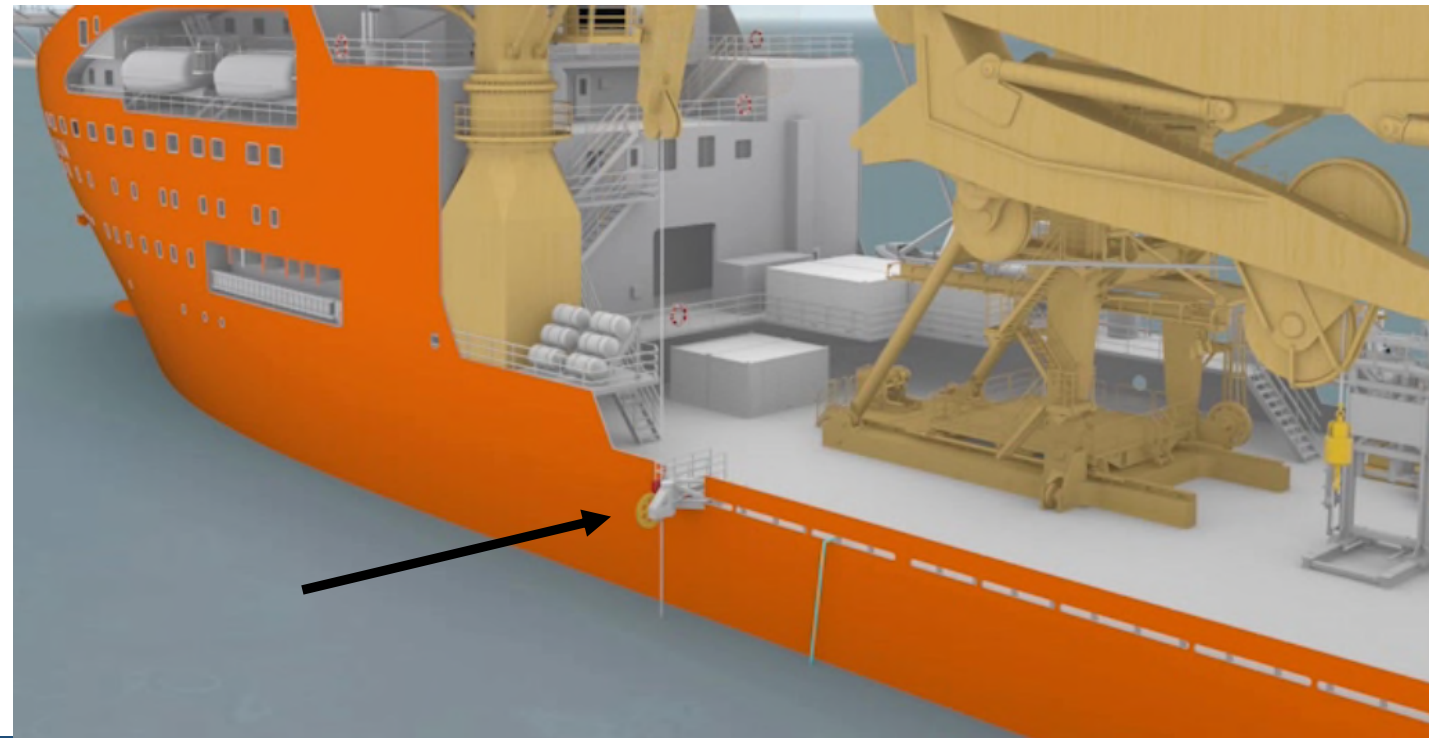
SIMOPRO METHOD

3. High wire angles at vessel



VESSEL DEFLECTOR SHEAVE DESIGN

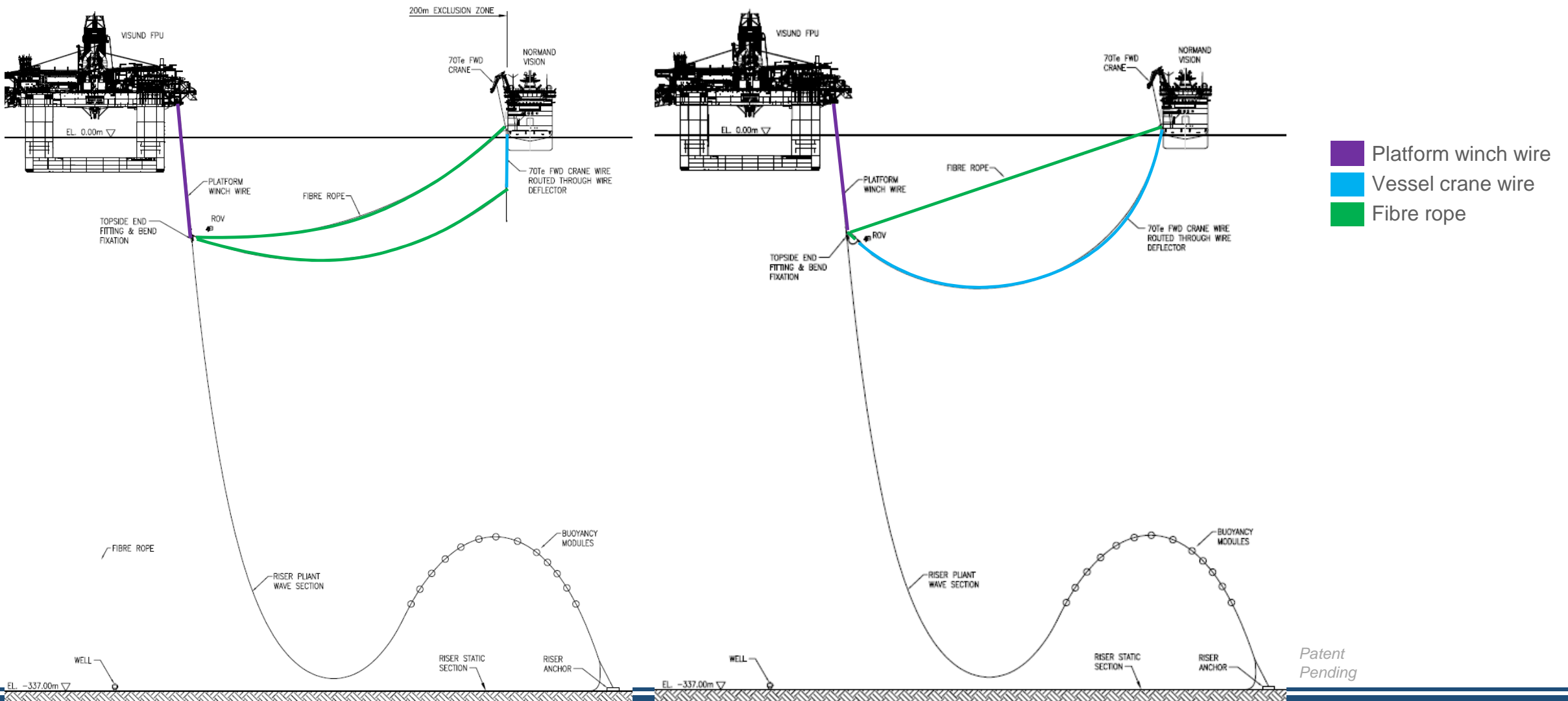
- Allows for high exit angles of vessel crane wire
- Mounted on side of vessel
- Swivel function to allow heading changes
- Gate to keep wire in sheave



SIMOPRO METHOD

4. Distance of load transfer

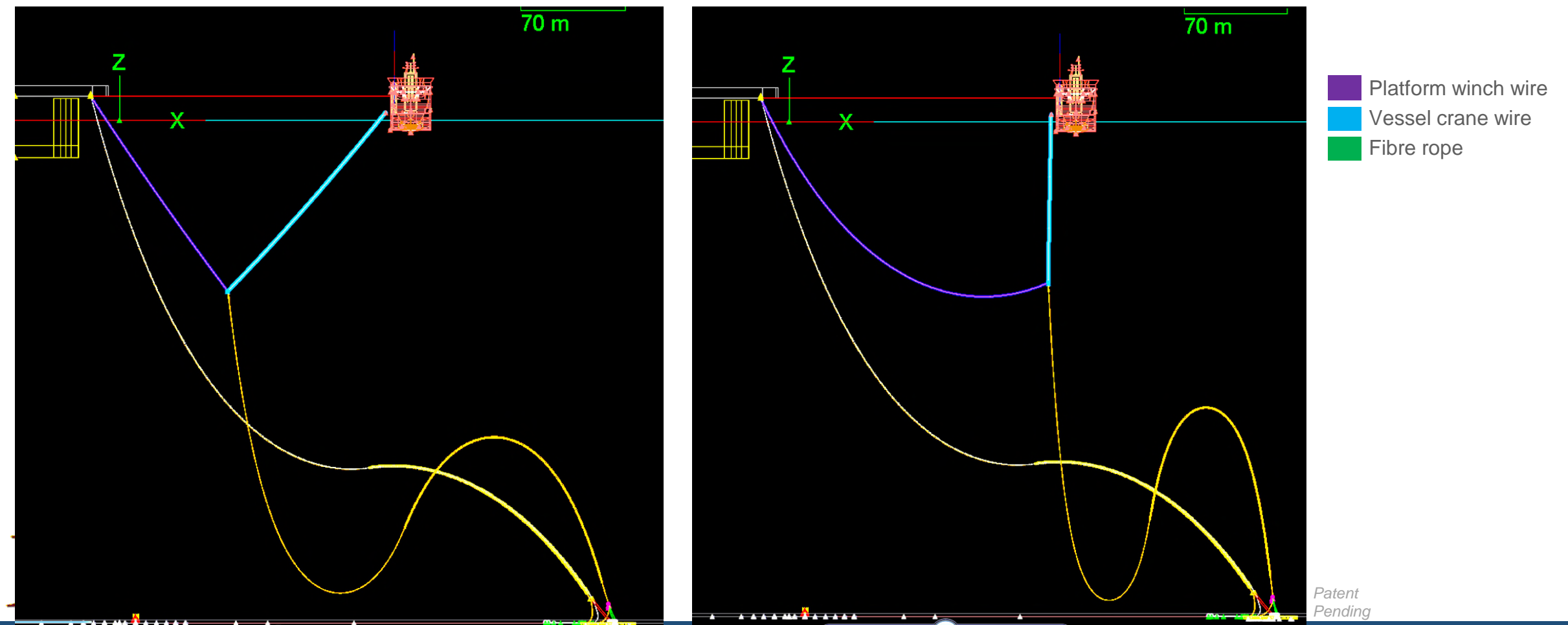
Using neutrally buoyant fibre rope and snatch blocks to connect 2Te crane block to riser head 200m away



SIMOPRO METHOD

4. Distance of load transfer

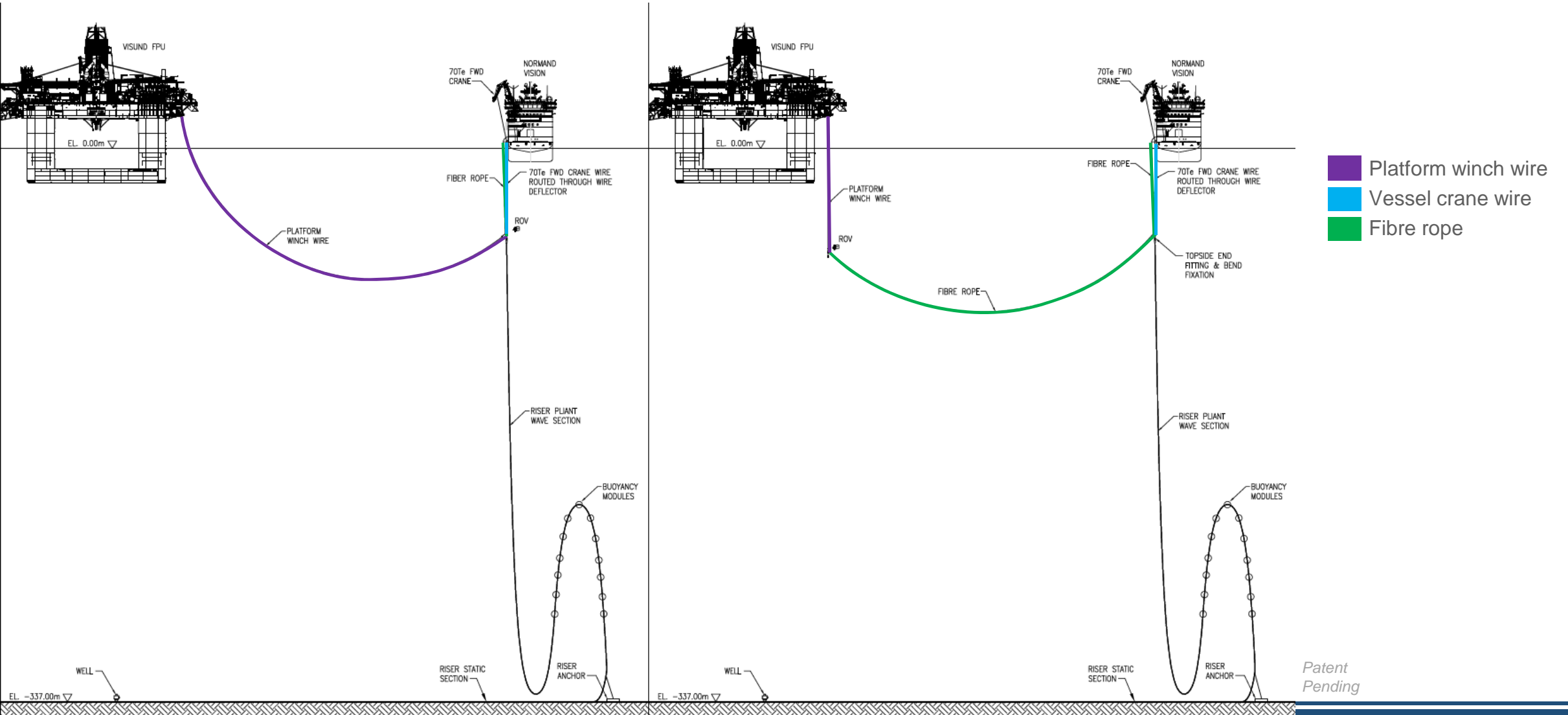
Transfer riser weight to crane – high wire angles and lateral loads



SIMOPRO METHOD

4. Distance of load transfer

Use of fibre rope to transfer platform winch wire safely back to platform

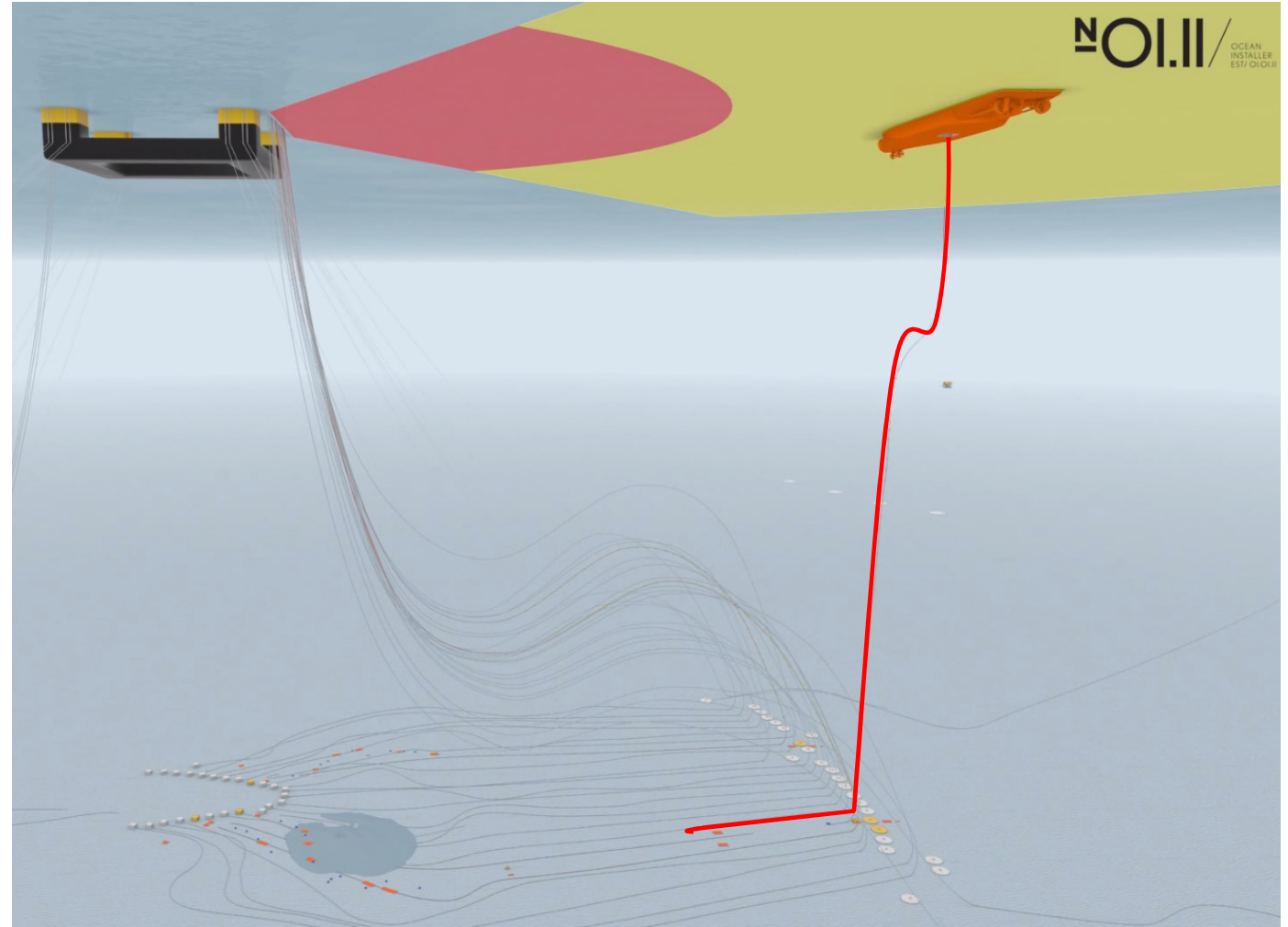


SIMOPRO METHOD

Visund 2015

REMAINING RISER RECOVERY

- Standard pliant wave recovery method:
- Perform flip of riser to place vessel outside anchor pattern
- Pull-down clump weight attached to anchor clamp
- Permanent anchor disconnected
- Static sections already cut – pulled out between anchors
- Buoyancy modules removed in moonpool



SIMOPRO METHOD

Benefits

Production benefits:

- No shut down of platform required

Aspects of improved safety:

- Vessel separation from platform
- Vessel clear of wall of risers - reduced dropped object risk
- Reduced risk of blow on to the platform

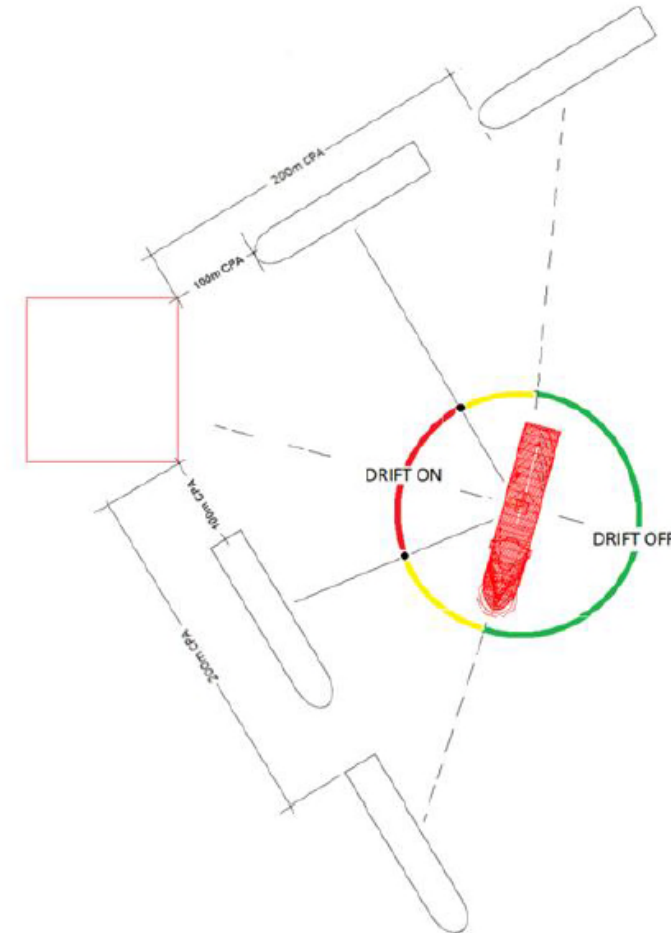
Aspects of improved efficiency:

- Vessel able to change heading - improves weather operability
- Vessel separation from platform, no conflict with helicopters & supply vessels

Improved working environment:

- Separation from gas alarms/leakage onboard platform
- Reduced noise between platform and vessel

Definition of drift sectors:



SIMOPRO METHOD

Key Challenges for Company

Approval and risk management of vessel entry into Safety Zone of live platform

- Hardware in the loop (HIL) testing of DP systems
- 3rd party risk assessor
- OI/Solstad management systems onboard
- DPO competence
- Understanding of systems/procedures
- Hardware
- Scenario assessments
- Collision assessments
- Vessel impact energy with FPU hull & risers
- Standby vessel for emergency hook-up and tow
- Platform managers involvement
- DFU matrix ("Defined Danger and Accident Areas")



SUMMARY

SIMOPRO riser replacements

- **Riser replacements from 200m is feasible**
- Depends on physical factors of the platform, field and riser - each case is different and needs to be assessed separately
- Offshore duration not significantly longer than with standard method
 - No more than 4 hours more per transfer on Visund
- More detailed engineering and bespoke equipment required
- More risks to be managed
- Depends on buy in from Company and all its entities, i.e. platform/operation managers as well as project

