

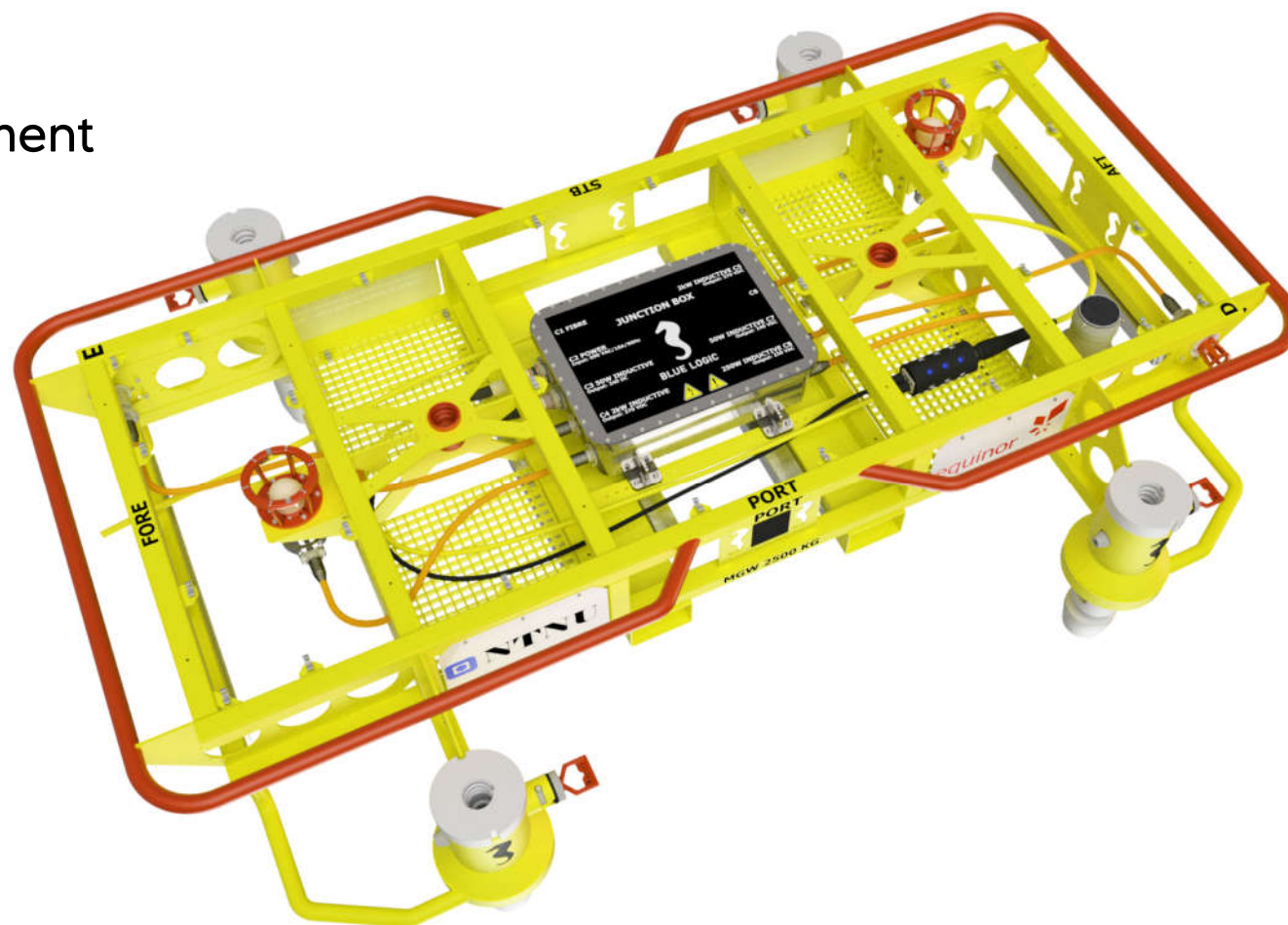
UID™ Subsea Docking Station

Jan Christian Torvestad, Equinor



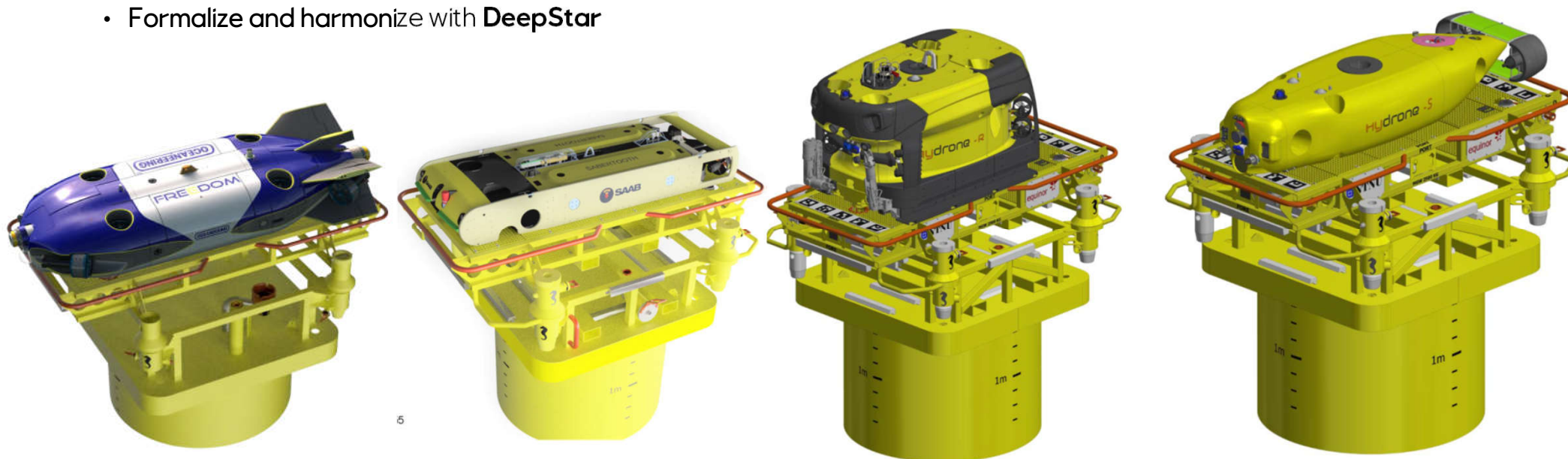
Docking station development

1. Philosophy (generic interfrace)
2. Shallow water (Dora)
3. Trondheimsfjorden
4. Åsgard
5. Potential projects



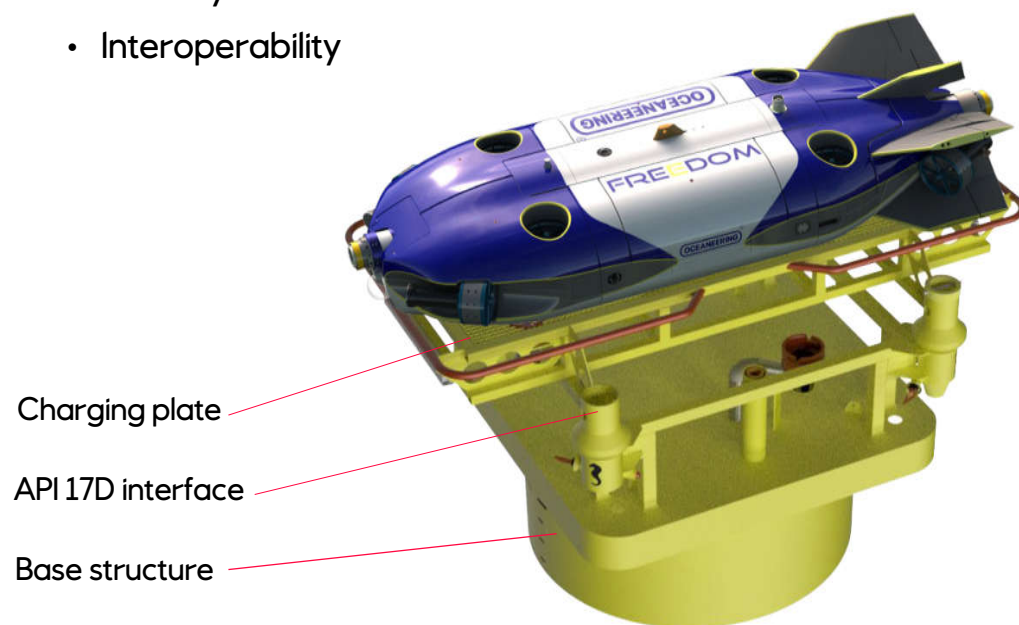
UID™ generic subsea docking station

- Wireless interfaces in SWiG
- Harmonize interface towards major drone suppliers
- Formalize and harmonize with **DeepStar**



UID™ subsea docking station

- Provides power and communication to Underwater Intervention Drones
- Combines several technologies
- Industry standard on interfaces
- Interoperability

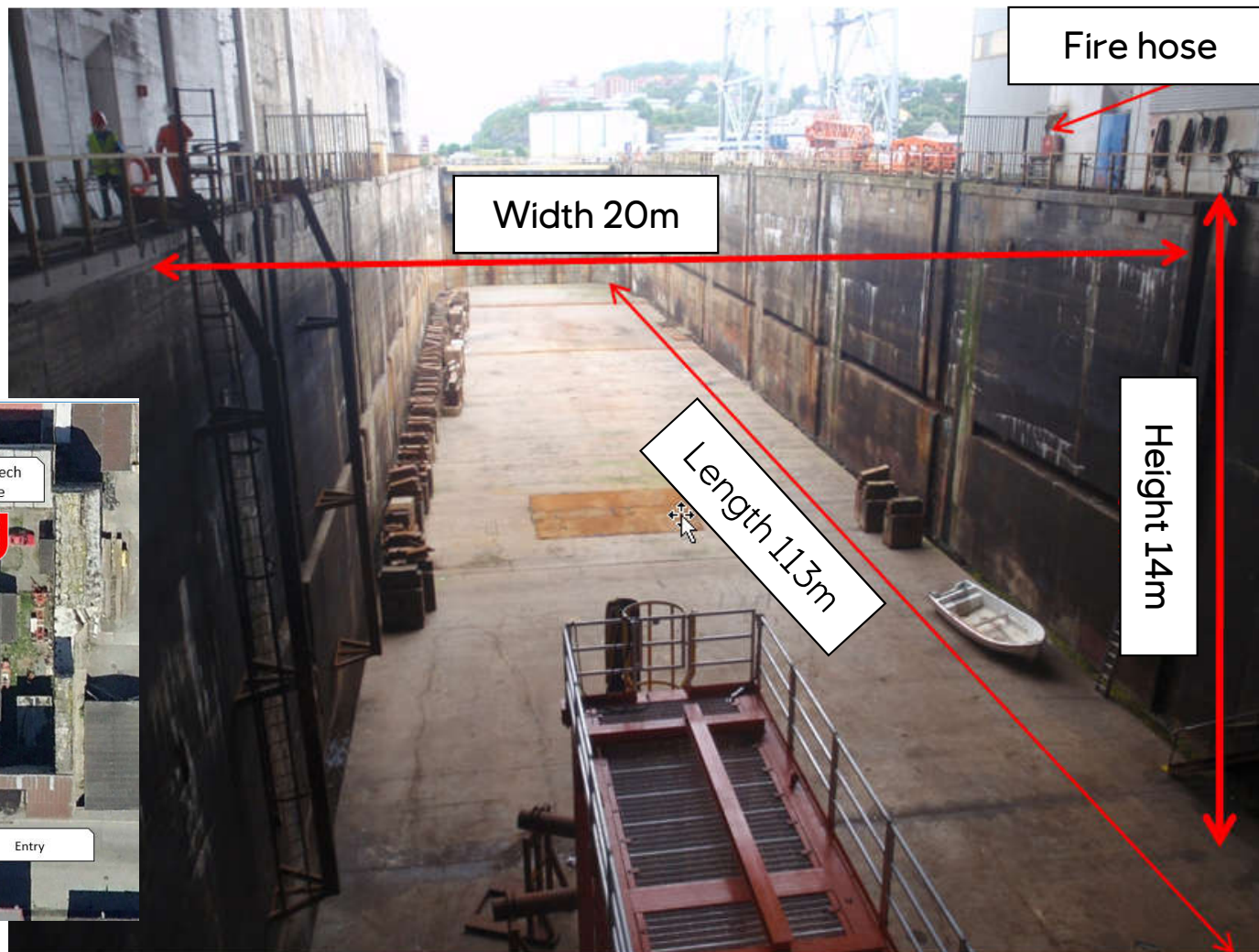
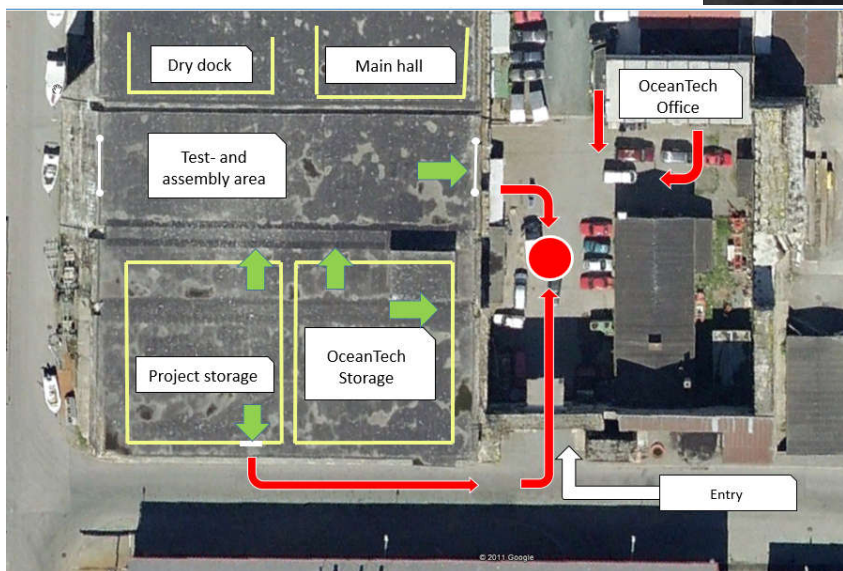


i5

Junction box



Dora dry dock testing



Trondheim

OVERVIEW



- Trondheim Biological Station**
- NTNU premises.
 - Control room connected to docking panel.



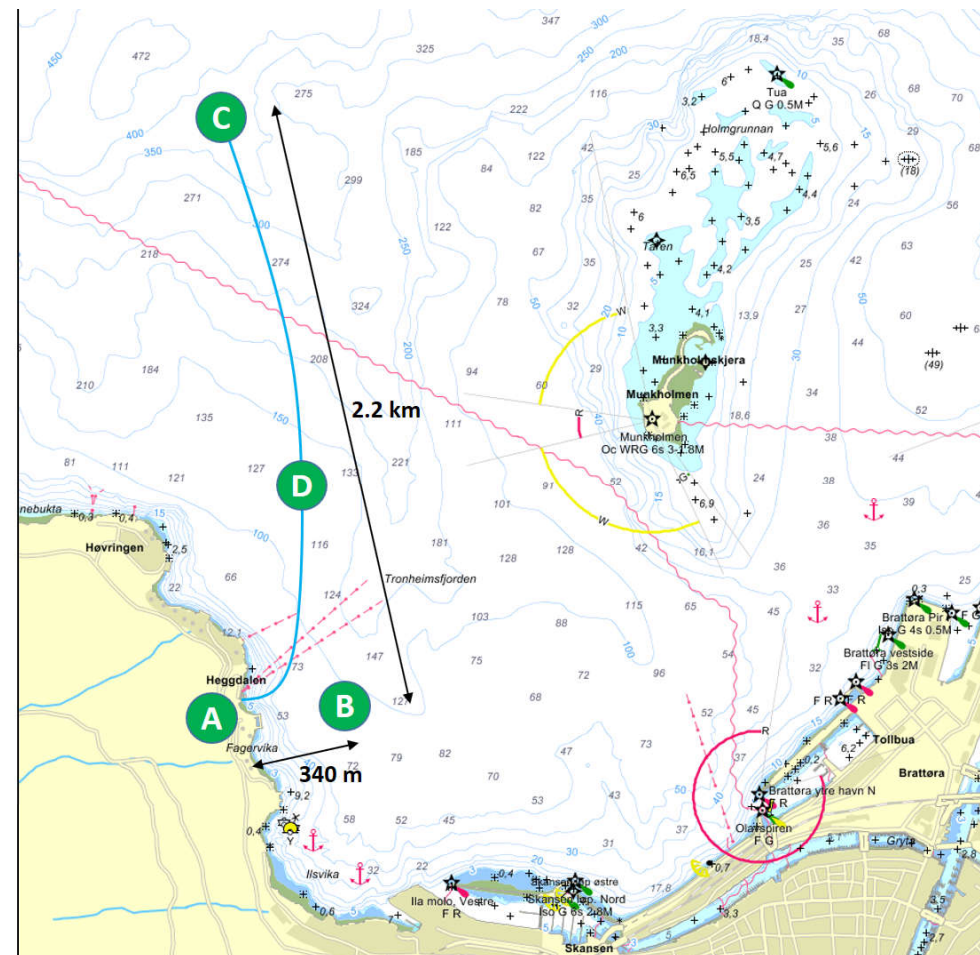
- Statoil Pig Loop**
- Installed in 2016.
 - Allows realistic testing of subsea inspection and intervention.



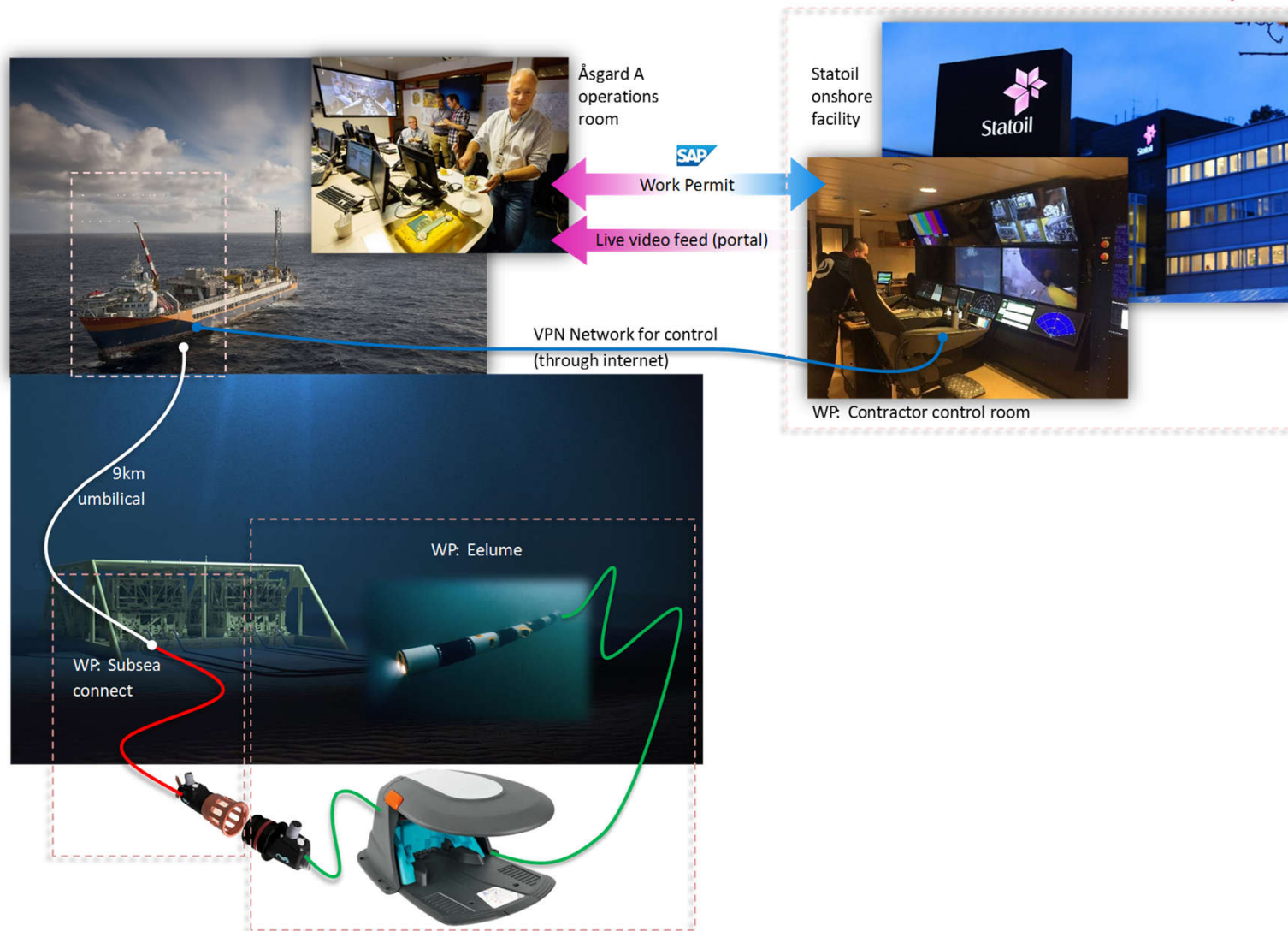
- Statoil docking panel**
- Under development by Statoil.
 - Facilitates power and communication for subsea resident IMR solutions.



- Seabed cable to docking panel**
- Needs to be installed.
 - Supplies power and communication to docking panel from shore.



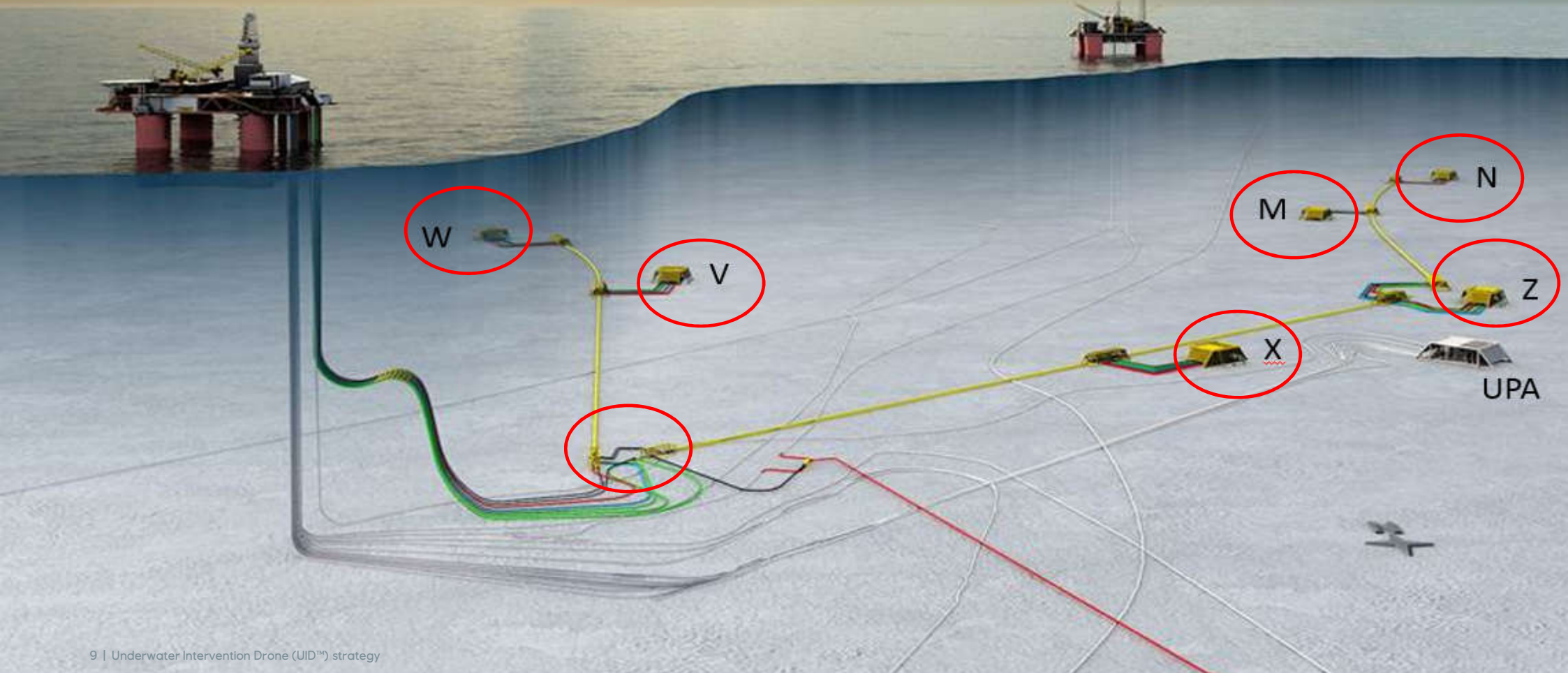
Åsgard pilot



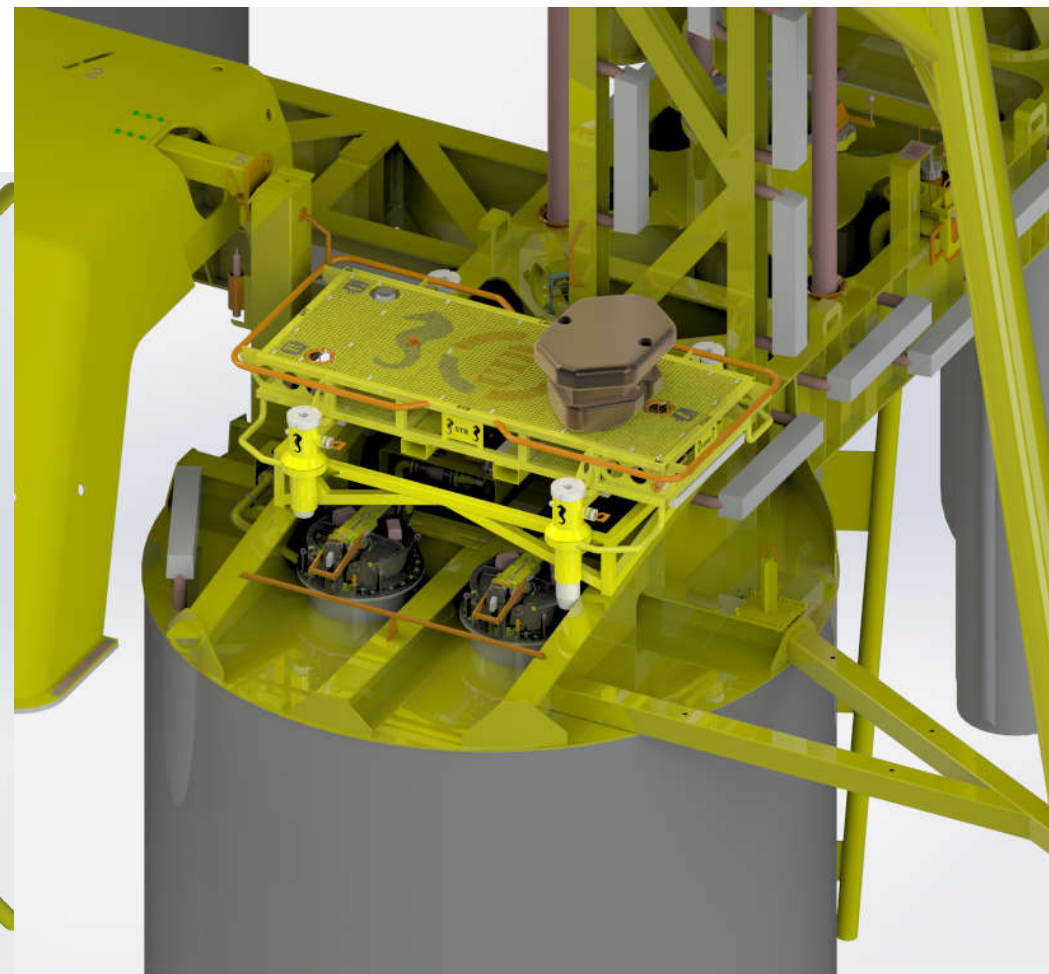
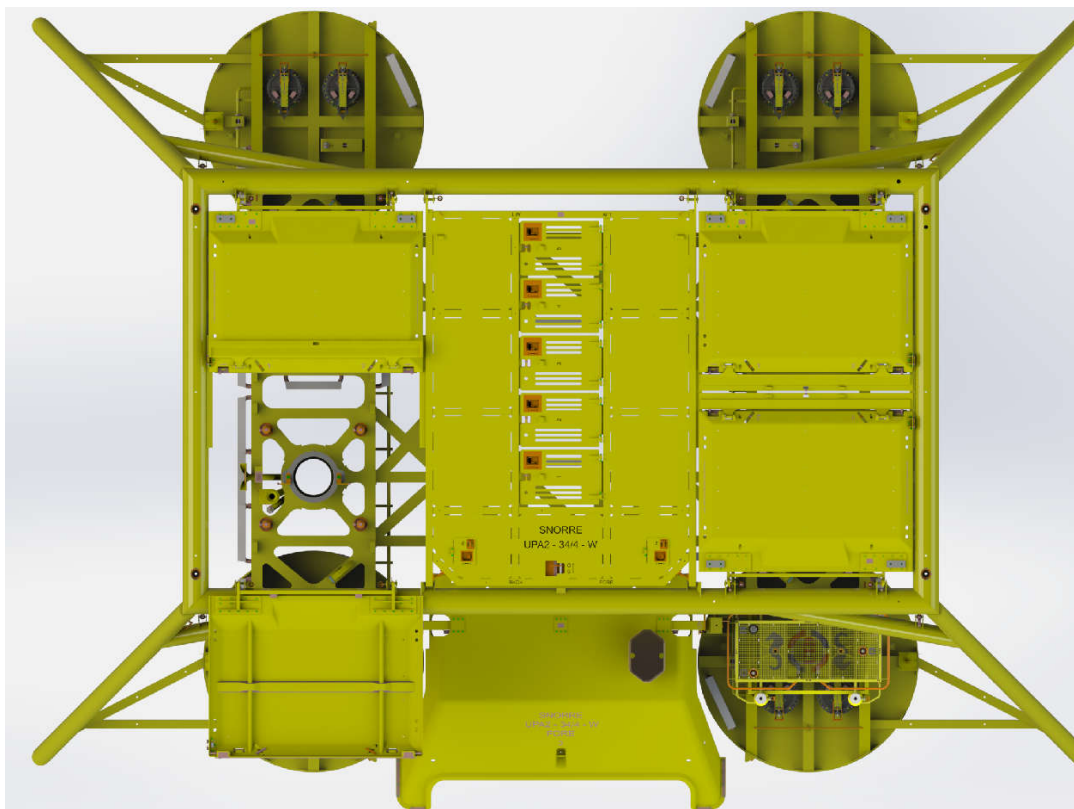
Potential use in Snorre Expansion Project (SEP)

Snorre A

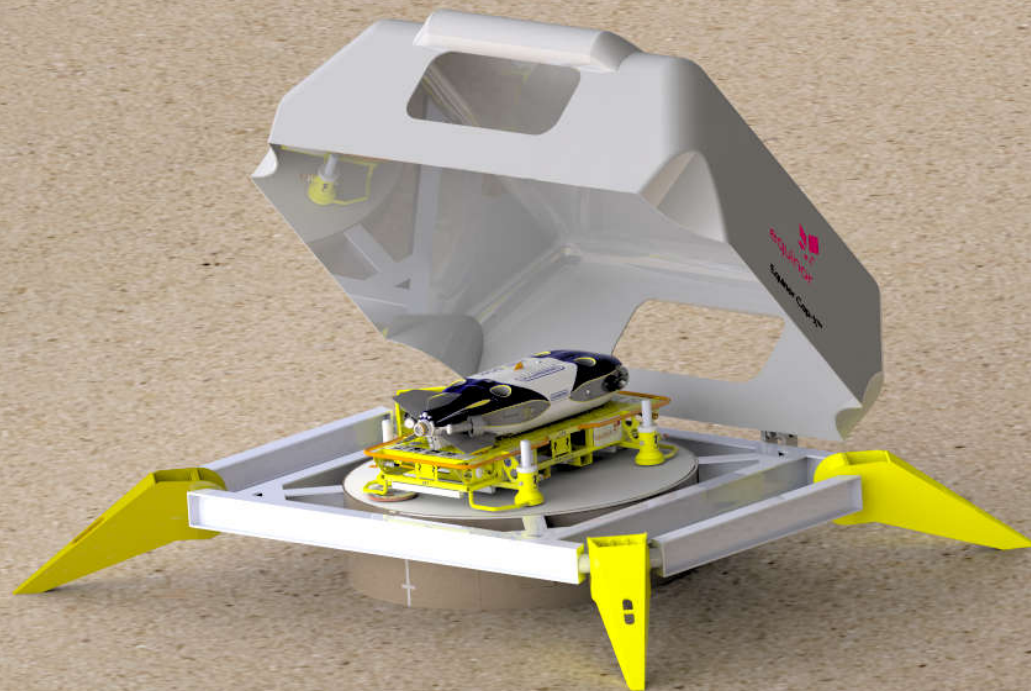
Snorre B

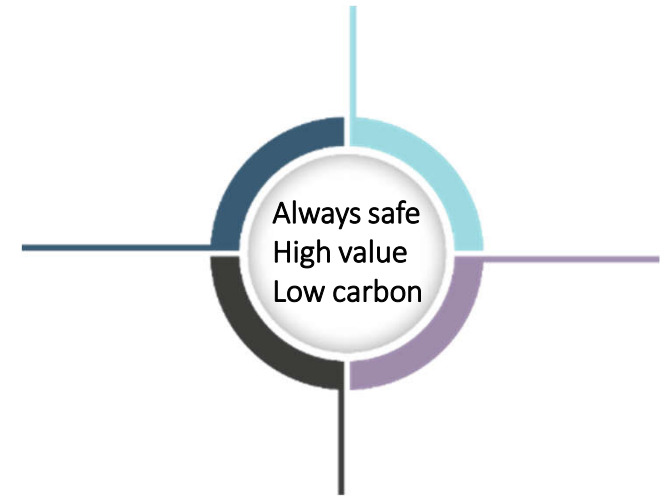


Potential integration in structures



Stand alone with cover





UID™ Subsea Docking Station

Jan Christian Torvestad - M.Sc.
Equinor

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Subsea USB – Standard Interface

Qualification for BOP applications

On the market since 2005



It took 12 Years to be accepted

FFÜ 2006 – Statoil IB Center:

Stavanger Aftenblad | Fredag 3. februar 2006 7

Vil revolusjonere undervannsoperasjoner

Et nytt patent fra Ifokus Engineering AS skal spare oljenæringen for både tid, penger og miljø.

Inga Sverdrup | tekst

BESPARENDE: Under Subsea-konferansen «Et hav av utfordringer» i går, presenterte ingeniørene i Ifokus Engineering for første gang sin lenge godt bevarte hemmelighet. En ny oppfinnelse gjør det mulig å skifte avansert verktøy på miniubåter mens de fremdeles befinner seg under vann.

– Poenget er at overførselen av strøm og kommunikasjon foregår gjennom et patentert prinsipp uten galvanisk kontakt, sier produktsjef Kurt Thomassen.

Ett års arbeid

Produktet er basert på et patentert prinsipp for kontaktløs energioverføring utviklet av det norske firmaet WPC i Kristi-

ansand. I ett år og uten statlig støtte har WPC og Ifokus samarbeidet om utviklingen av den multifunksjonelle kobleren.

– Jeg har selv jobbet med slike miniubåter og har sett hvor tungvint det er så fort man skal bytte verktøy, sier prosjektleder og ansvarlig for utviklingen, Lars Gunnar Hodnefjell.

– Nå kan alt gjøres mens ubåten fremdeles befinner seg på dypt vann. Det sparer man enormt mye tid og penger på, sier han.

Ifokus har tatt patent på produktet og håper på at det skal revolusjonere bransjen og bli standard over hele verden.

Fremtidens teknologi

– Elektrisitet er fremtiden. Det fører ikke til miljøskadelige utslipp, og det har ingen påvirkning for livet under vann. Det har også vært et viktig aspekt når vi har jobbet med dette, sier Thomassen og peker på akvariet der prototypen og gullfis-

ker lever godt sammen.

– Denne typen kontaktløs energioverføring er også mye tryggere for personellet som håndterer slike apparater. Når strømmen overføres, har du ingen åpne elektriske kontaktflater å tenke på, og du har mindre deler som kan gå i stykker, sier Hodnefjell.

Arbeidet med oppfinnelsen har ikke vært diskutert utenfor bedriften før den ble presentert i går.

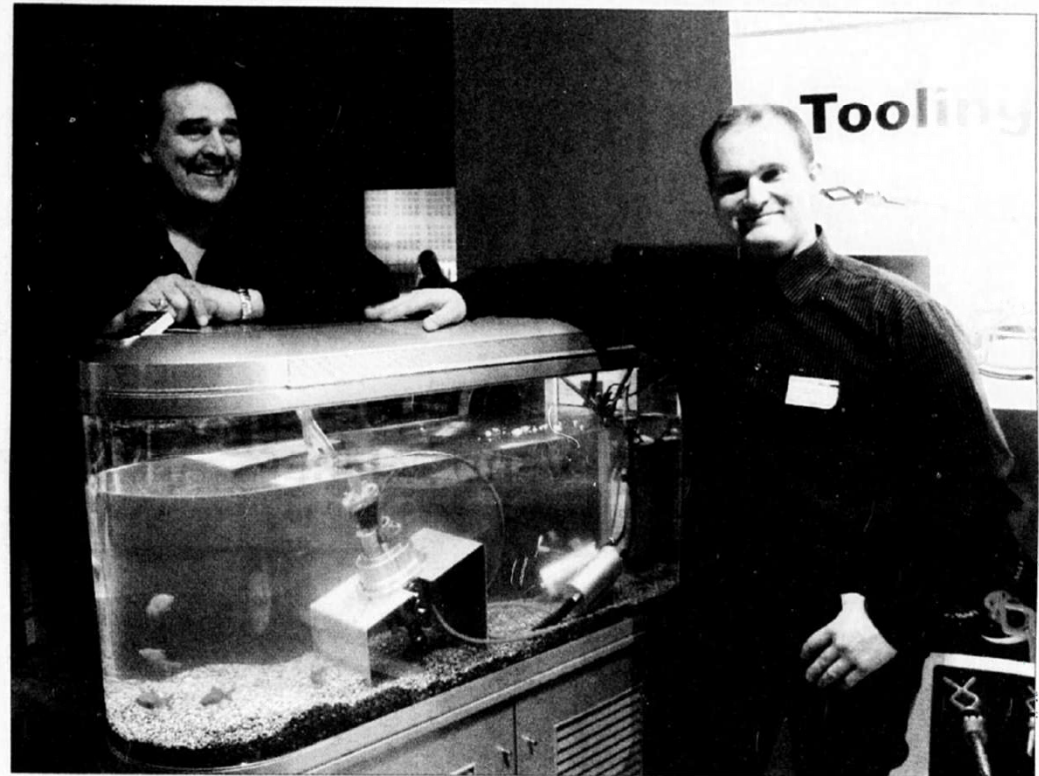
– Vi er veldig spente på reaksjonene, men håper å ha solgt de første i løpet av første halvdel av 2006, sier administrerende direktør John Smith.

inga.sverdrup@aftenbladet.no

PETER SMART:

Produktsjef Kurt Thomassen (t.v.) og prosjektleder Lars Gunnar Hodnefjell fra Ifokus Engineering, presenterte i går et produkt de håper skal revolusjonere undervanns-bransjen.

(Foto: Ifokus)



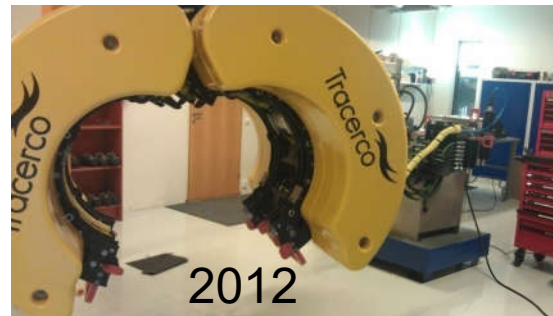
Inductive Subsea Connectors History and Product Range



2005
2007
2008



2014



2012



2016



2016

BLUE LC



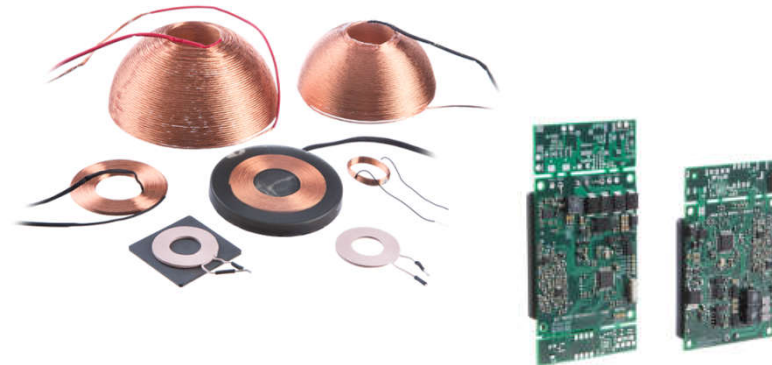
Implementation

Standard solutions



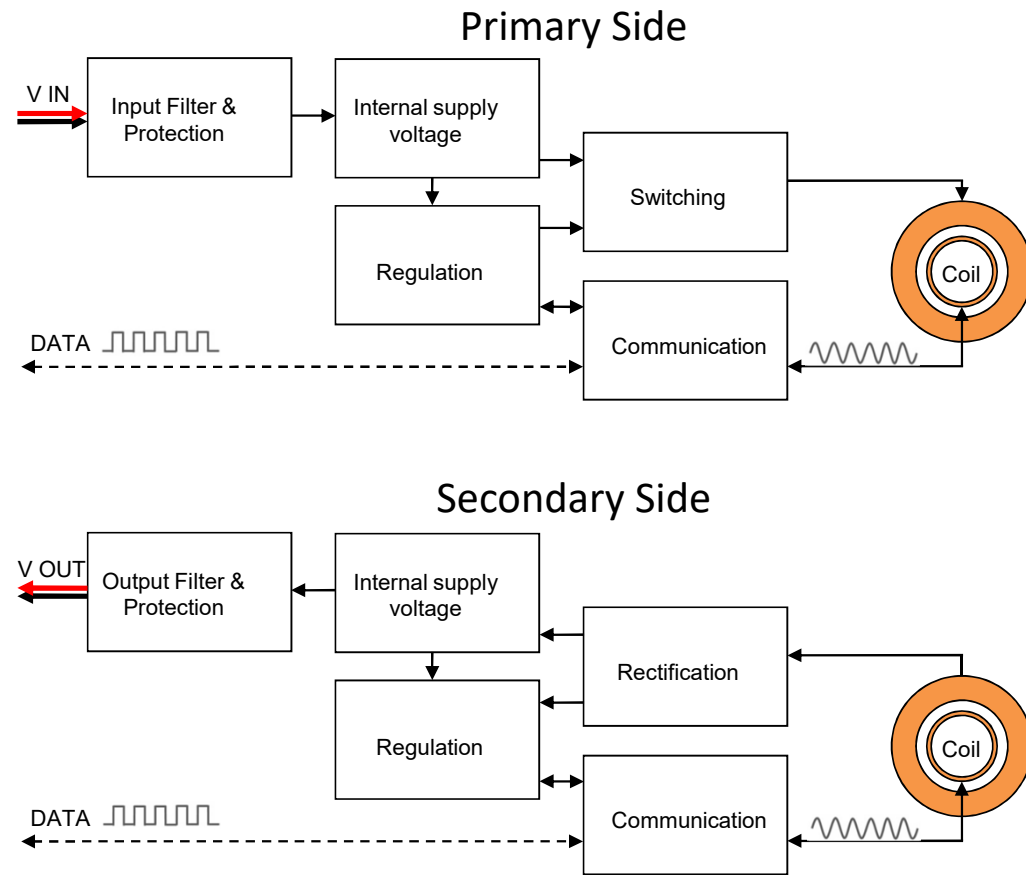
- Standardized system
- Low cost
- Short time to market
- Low power & performance

Custom solution



- Flexible size and shape
- Power & communication
- Bi-directional power
- High power & performance

Wireless Power Block Diagram

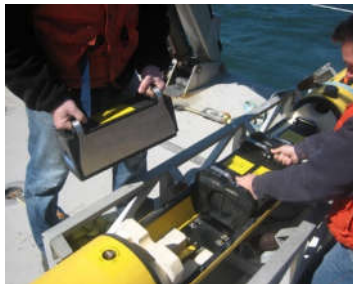
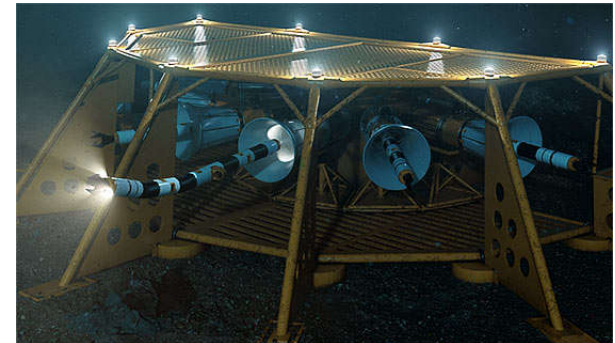


Wireless Subsea USB future

- AUV applications
- Replaceable Sensors
- Semi-permanent electrical tooling
- Retro Fit on Brown Field
- Distributed UPS – Fail safe Energy
- Reduced umbilical size and cost
- Trickle Charging
- Subsea Power Bank's
- CE-Marking
- DC-FO



Big data er ikke lenger bare for store selskaper, mener big data-ekspert I SAP. Illustrasjonfoto: Colourbox



MultiDog Lifting 13,5 WLL Male



Installation of UID Foundation Trondheim



Next Generation 10kW Charging UID Plate

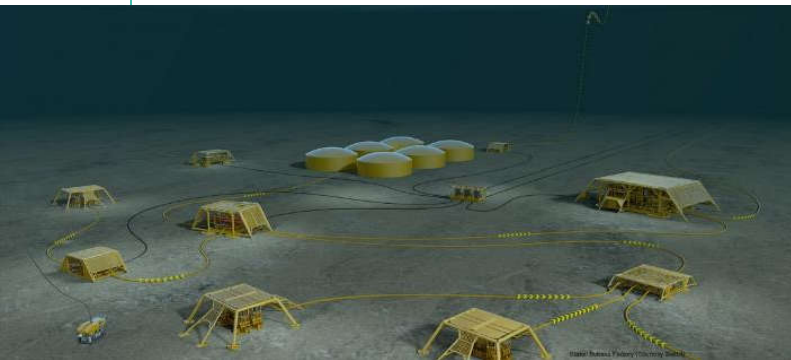
Major challenges:

- Navigation and accurate positioning during docking to charge efficiently
- Common mechanical locking interface
- Common Mechanical Skid interface
- Common Tool interface

How can the industry agree on a list of UID interfaces?

In the following slides we will present areas where we see challenges and potential solutions. This is not meant to be a list of conclusions, but rather an invitation to discuss potential solutions. We have performed several interface meetings with different service providers and are happy to discuss ways to improve the design for common benefit

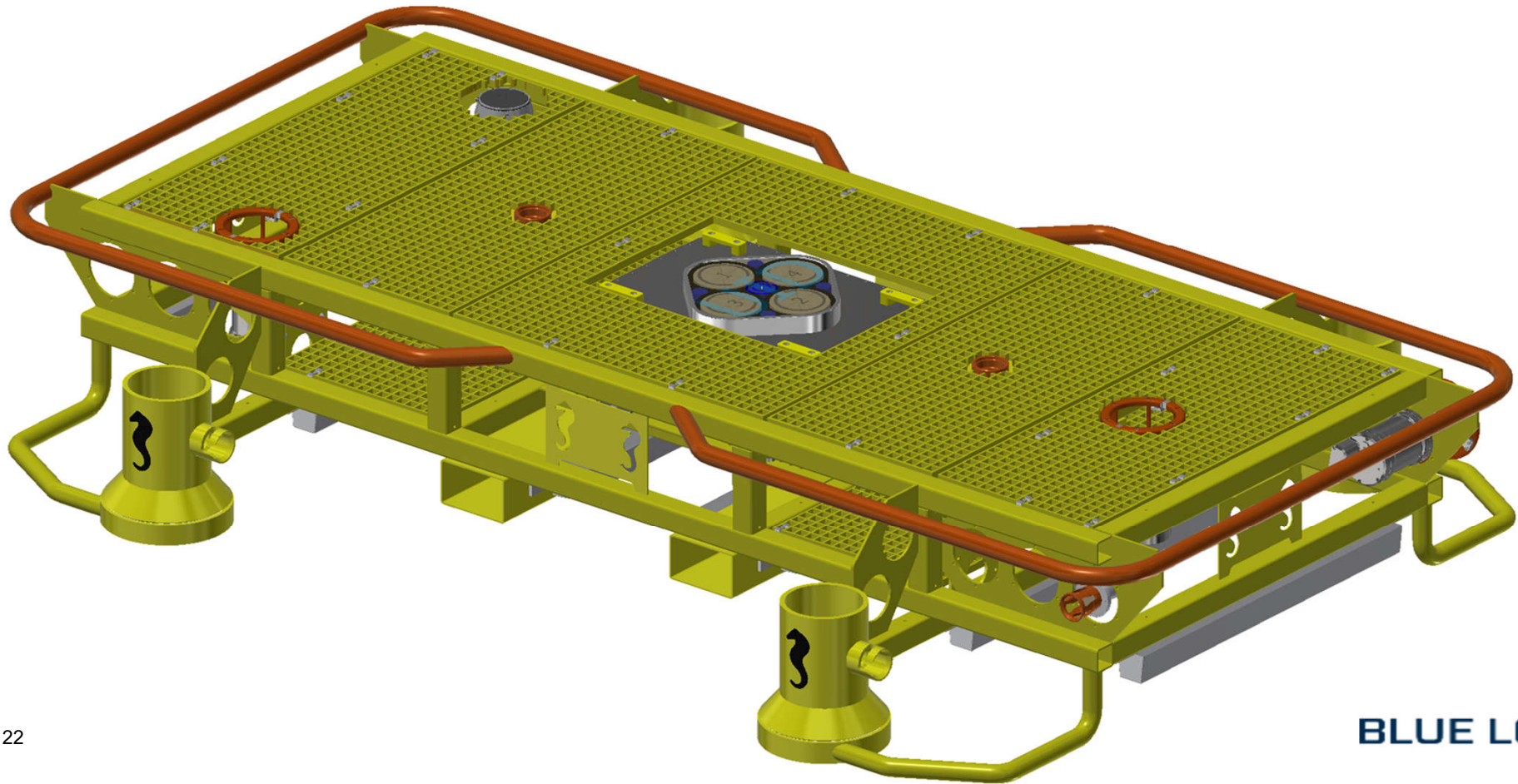
Subsea has one competitor: "Platform"



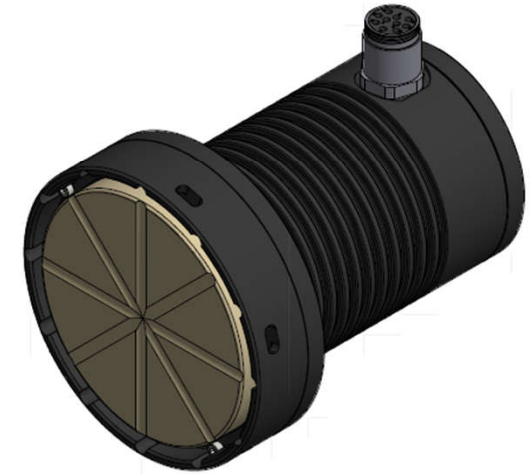
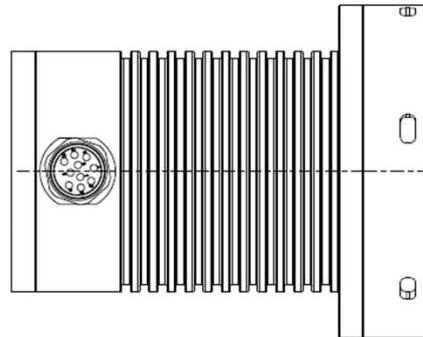
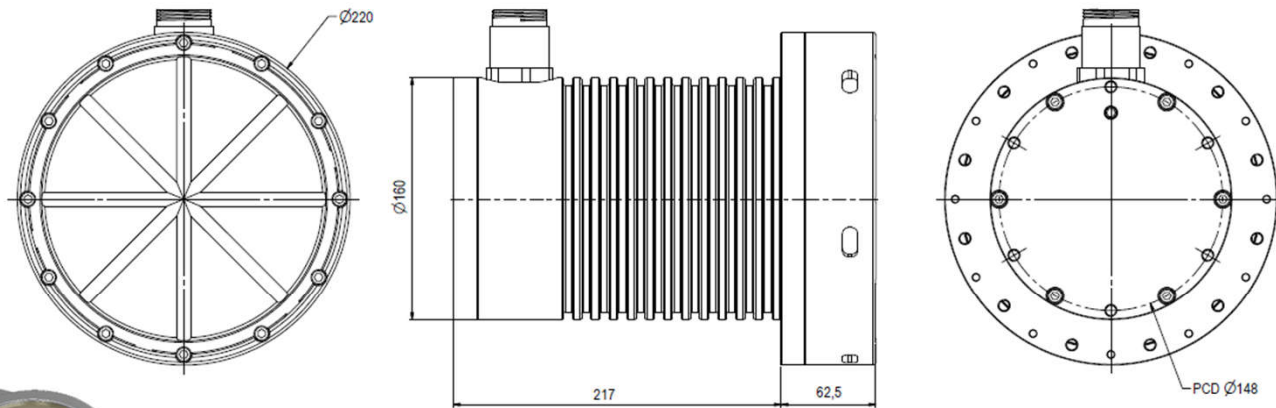
VS



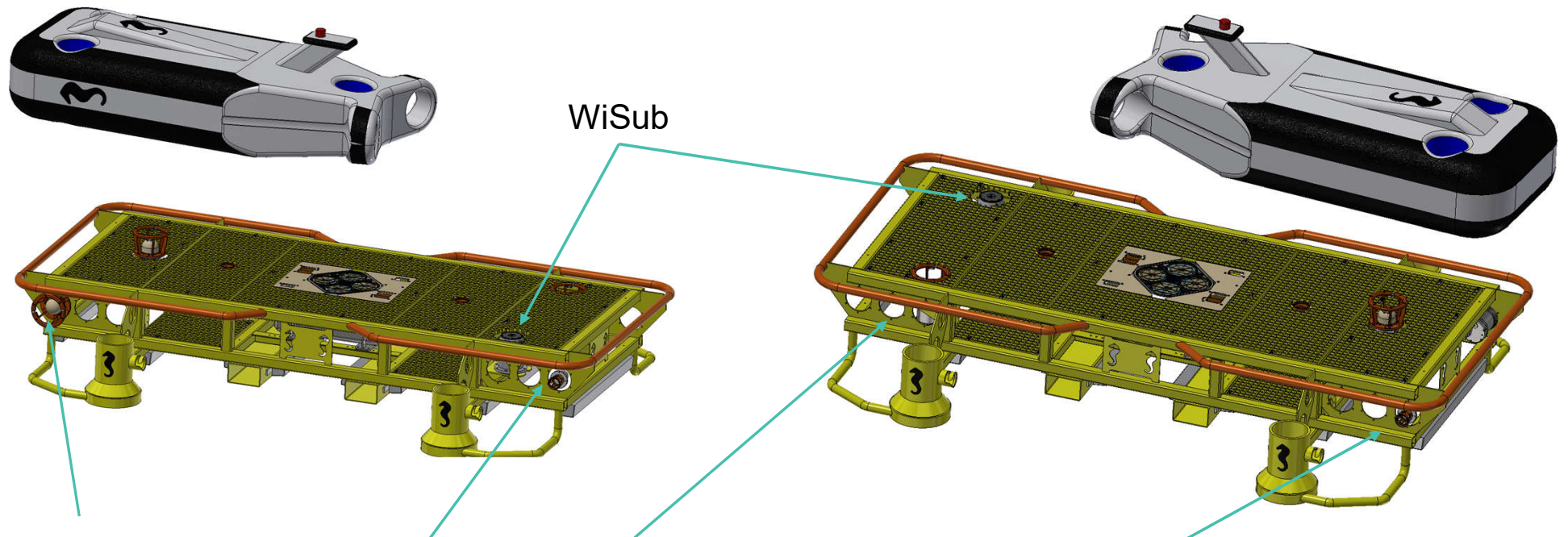
Next Generation 10kW Charging UID Plate



4 x 2,3kW Flat connector – 9,2 kW 325VDC

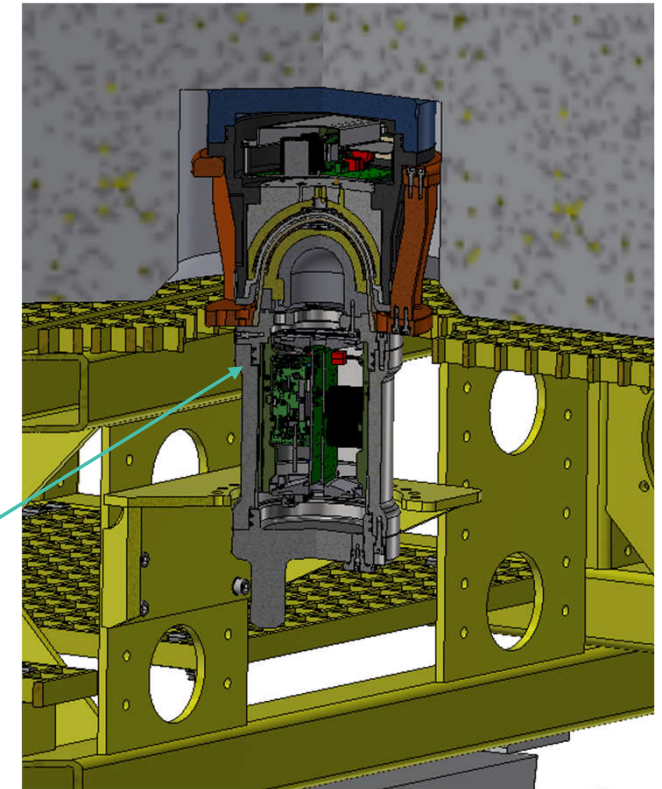
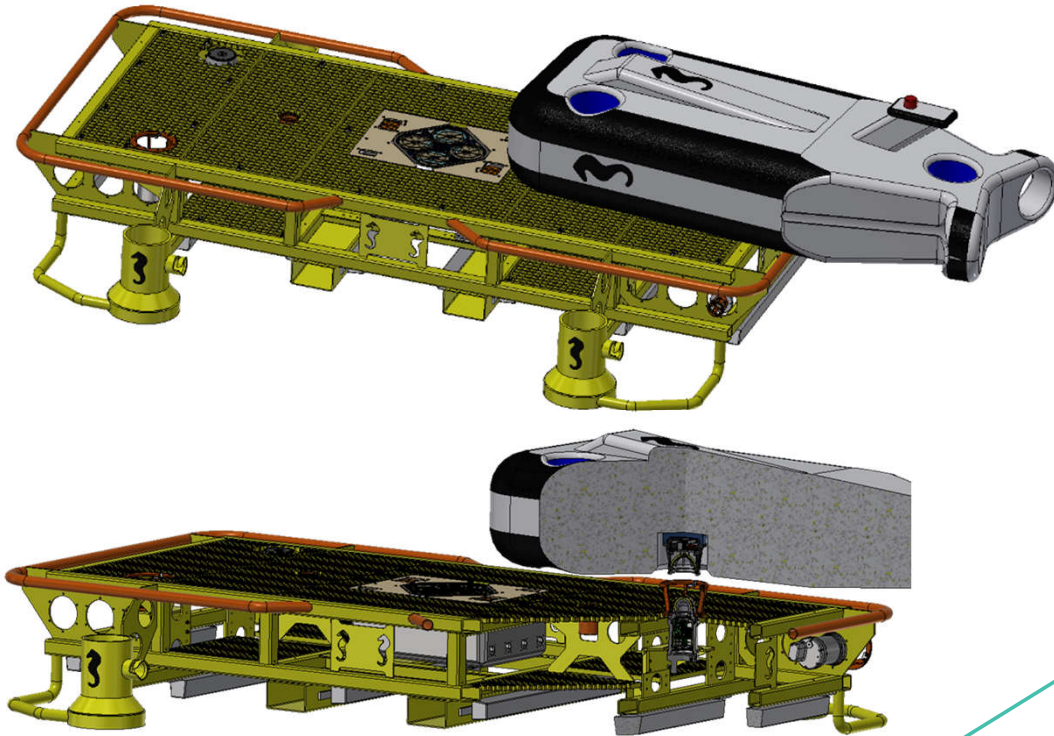


Next Generation 10kW Charging UID Plate



Room for 3 connectors in each corner:
Example 1 off 2kW and 2 off 50W for utility services:
Video, Blue Com, Tool box, Navigation (Water Linked)

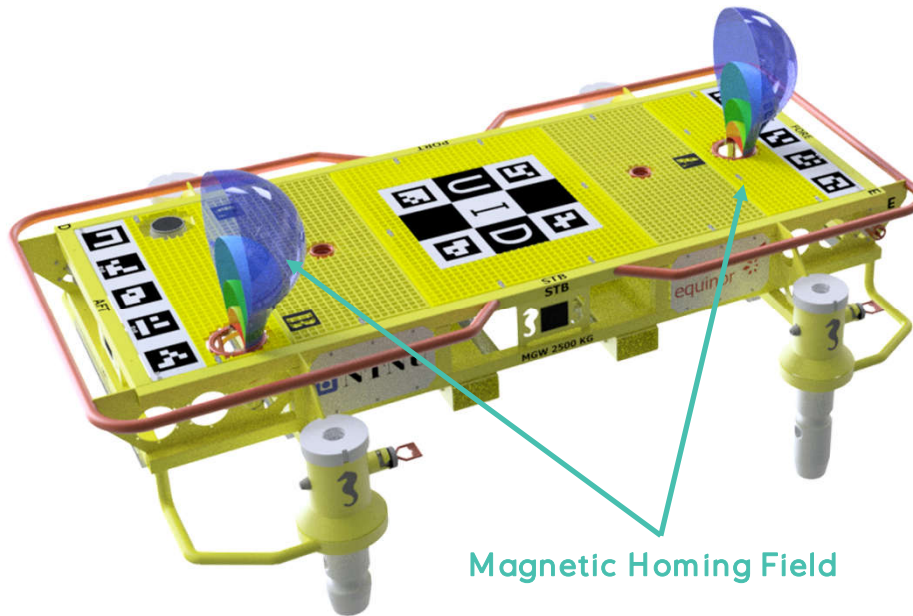
Next Generation 10kW Charging UID Plate



Dome connector with mechanical lock:
Drone can land, rest, and charge on docking plate
The Drone can spin around the connector

Next Generation 10kW Charging UID Plate

On-board navigation system detects the charging station and enables manoeuvring within approx. 50cm with high accuracy. Charging Station primary side inductive connectors activates active Homing Mode and the Drone detects the magnetic field.

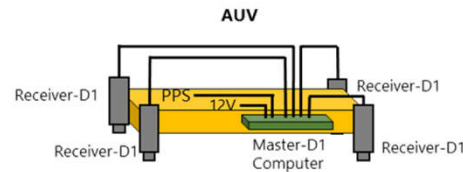


When the Drone is approaching the magnetic field, identification information is received and correct position and charging station is verified. The Drone enters into Homing mode and will use the magnetic field to precisely dock onto the inductive connectors.

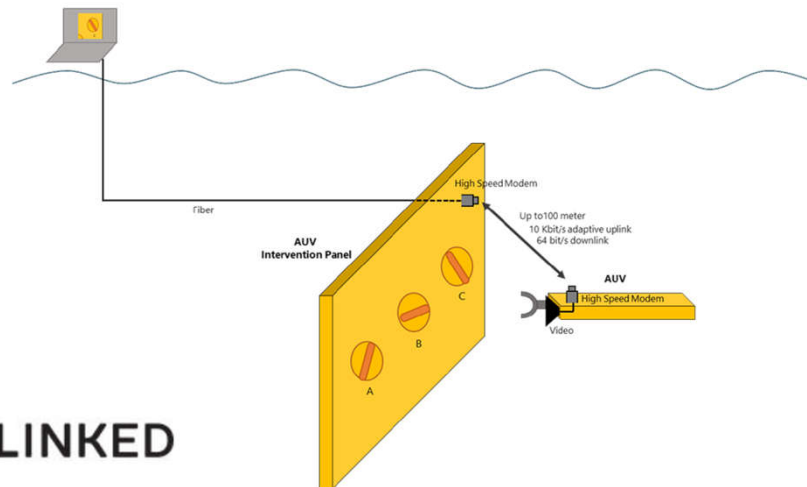
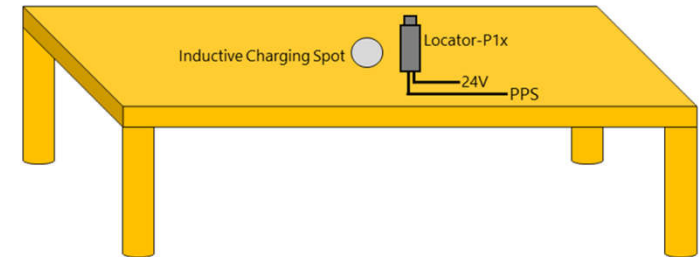


Next Generation 10kW Charging UID Plate

"GPS", MMS, SMS integrated in the Subsea USB



Charging Station

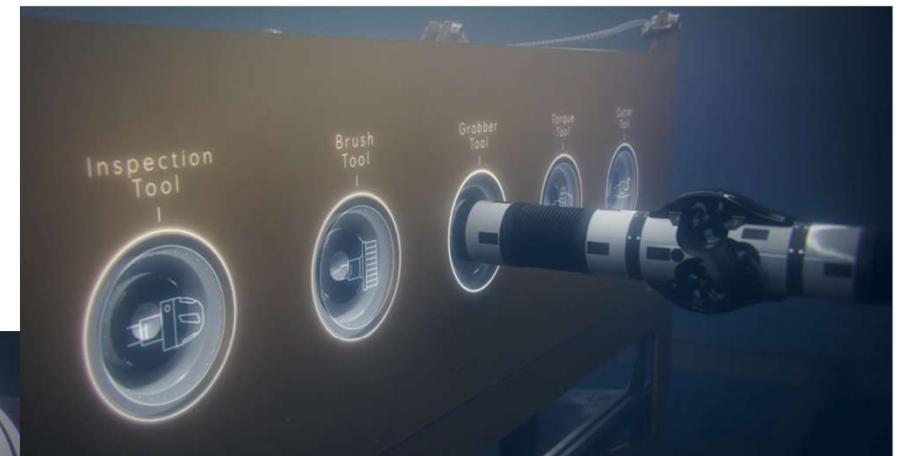


Electrical Torque Tool mounted on tool Carrier

Neutral Buoyant Electrical Torque Tool with buoyancy that can be mounted on a AUV with subsea change out.

Inductive Tool Carrier for Subsea Change out of tooling:

- 1) Cutting Tools
- 2) Survey Tool
- 3) CP probe
- 4) Cleaning Tool
- 5) Gripper Tools
- 6) Torque tools
- 7) UPS Power bank
- 8) Tether connection



Smart Inductive Power Grid

Retro-fit of UPS

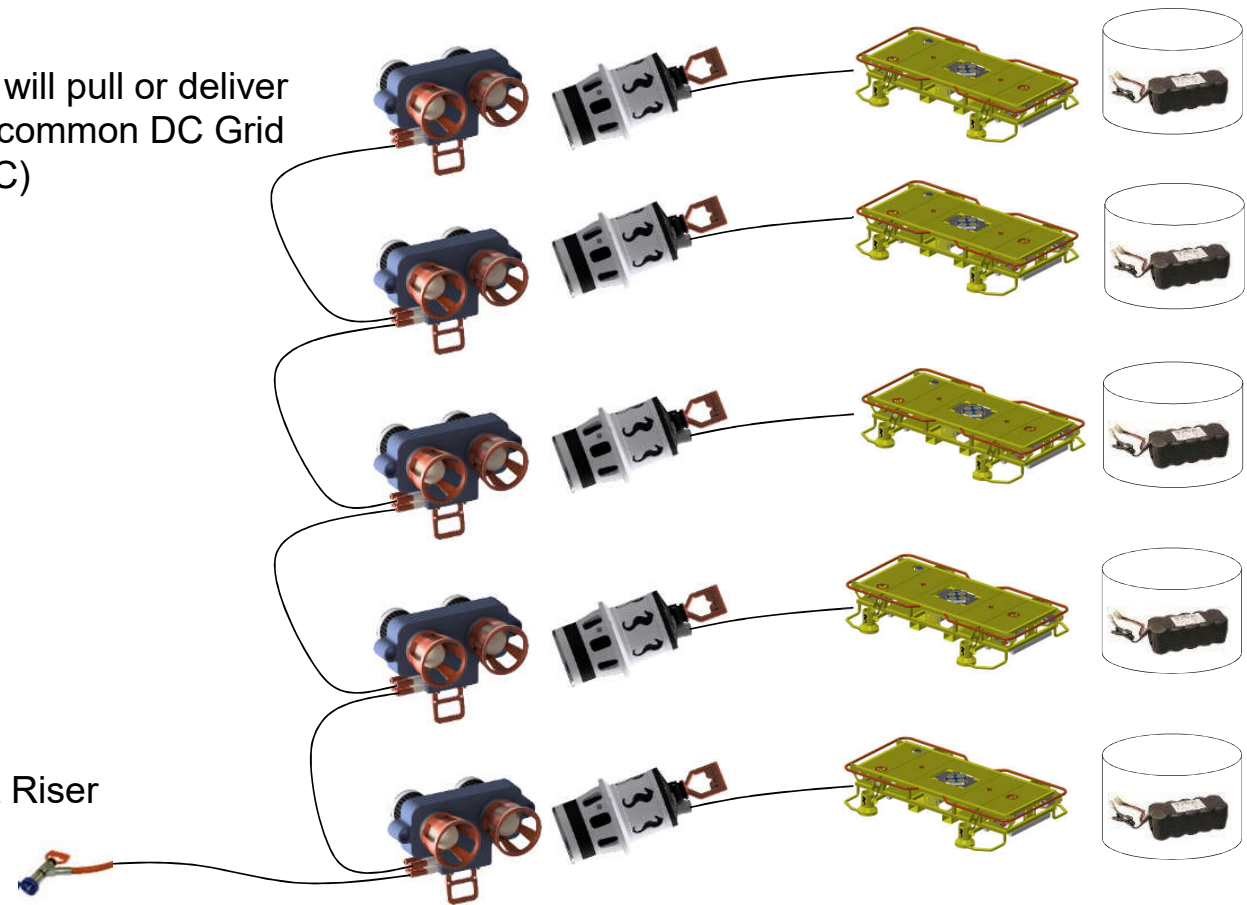
Template 4
Every system will pull or deliver power on the common DC Grid (300- 400V DC)

Template 3

Template 2

Template 1

Connected at Riser base



Subsea UPS
10-500 kWh
possible to connect several in parallel that will work together to maintain voltage in grid if 10kW charge

Summary

- First docking station in the process of being installed
- Flat charging station to fit all
- UID docking station is an true open standard
- 3D model of station is available to all
- NTNU national test centre for autonomous vehicles
- Blue Logic is working on the future improvements and are collecting input on next generation design.

Questions?

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Subsea
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