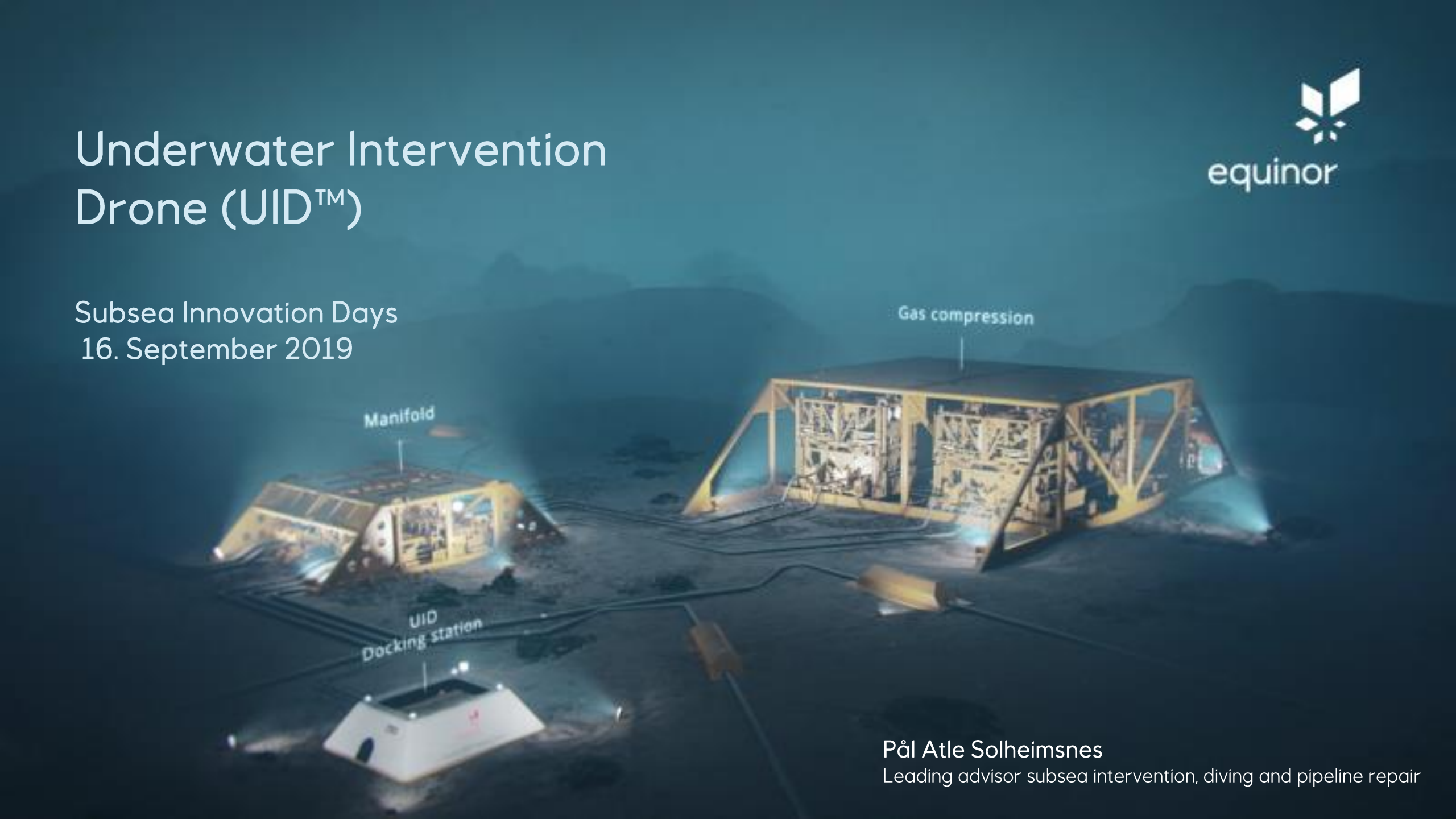
Underwater Intervention Drone (UID™)

Subsea Innovation Days
16. September 2019



Pål Atle Solheimsnes
Leading advisor subsea intervention, diving and pipeline repair

The robots and drones will make our work easier

The future is robotised, automated and connected

This is especially true for the everyday repetitive tasks and high-risk operations. Autonomous assets keep our people safe and reduce our carbon footprint - freeing up the time and creativity of our workforce to develop better and bolder energy solutions.

Global operations networks are established to optimise performance by connecting operations, knowledge and expertise.

Our solutions for energy production in the future will be lighter, more subsea and remotely controlled. This is not only much safer, but the emissions are close to half compared to conventional solutions.

UID ?

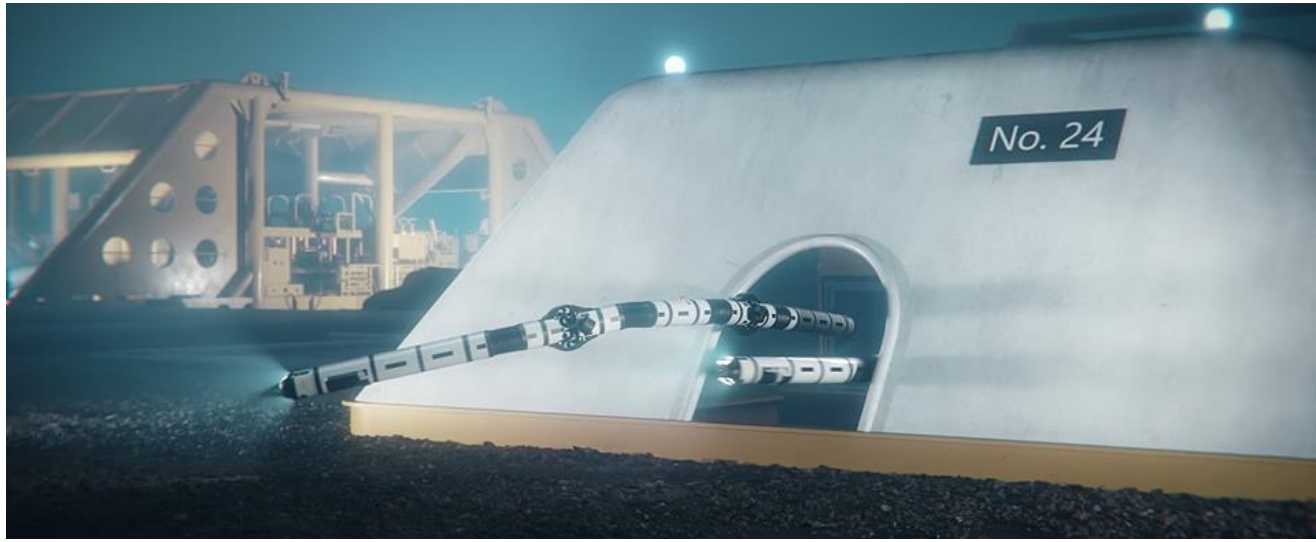
Underwater Intervention Drones (UID)

UID – Underwater Intervention Drone, is a hybrid of

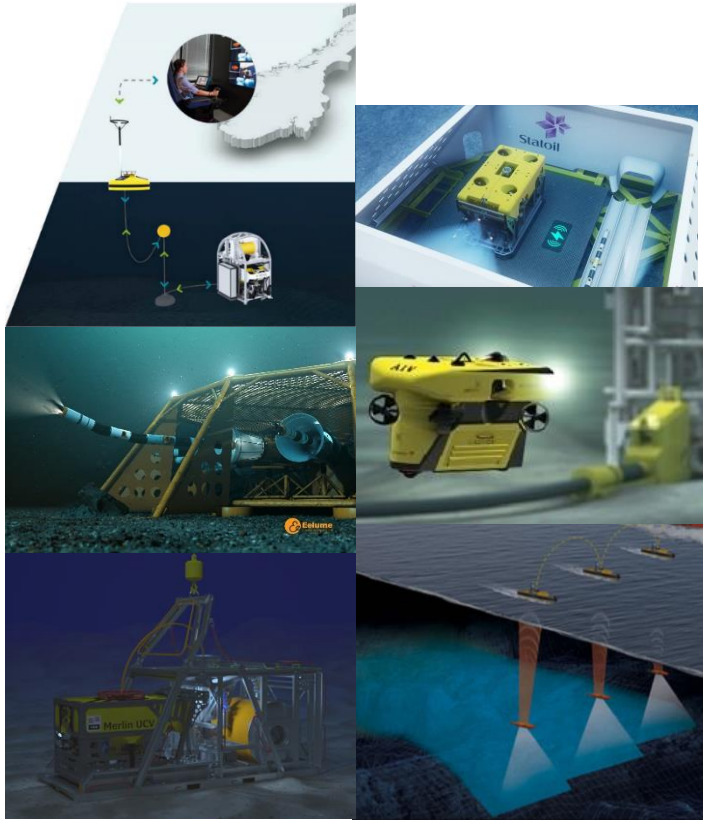
ROV – Remotely Operated Vehicle

AUV – Autonomous Underwater Vehicle

UID™ is trademarked by Equinor to secure freedom to use in the industry



Underwater Intervention Drones (UID™)
Operator Business Case



- **Always safe**
  - Reduce human exposure
  - Simplify procedures
  - Online response
- **High value**
  - Reduce need for specialized vessels
  - Reduce operating cost: onshore remote operations
  - Increase Production Efficiency (PE)
  - Increase usage of installed infrastructure
  - Profitable field development in remote areas
- **Low carbon**
  - Reduce CO_2 emission
  - Improve environmental and condition surveillance

Objective: Develop and implement underwater intervention drones for resident application with semi-autonomous and autonomous functionality.

Exemple of Equinor funded technology

Stepwise development of Eelume functionality

Phase 1 - 2018

(LOOP funding)

- Tethered operation from shore and vessel
- Visual inspection
- 150 meter depth rate

@Trondheimsfjorden

Phase 2 - 2019

(LOOP + start Demo2000)

- 1+ months subsea residence
- Visual inspection
- Operate valves (class 4)
- 500 meter depth rate

Phase 3 - 2020/2021

(Demo2000)

- Wireless operation
- Long term residence
- 100+ km battery range
- Autonomous inspection of pipelines and SPS (operator monitors and can take control)
- Autonomous transit between docking stations
- Tool rack with several interchangeable tooling options
- Onshore control room
- 500 meter depth rate

@ Trondheimsfjorden and Åsgard Pilot test site

Subsea docking station –

Important need for UlD development

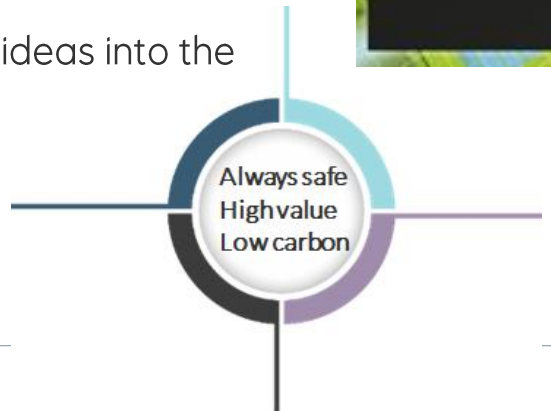
Subsea docking Station – Why is this important for Equinor

In general

- **key enabler** to more efficient offshore operation in the future with use of underwater intervention drones
- make an industry standard for subsea charging and communication, the "**subsea petrol station"**
- increase implementation **speed** of underwater intervention drones
- the drone supplier industry to focus on **drone development**

Collaboration with NTNU

- Strengthen the **collaboration** between academia and industry to be able to standardize digital solutions
- Academia to **contribute** even more to business needs in the industry
- Easier for **minor companies** to utilize their smart ideas into the marked



Trondheimsfjorden test center

OVERVIEW

A

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

B

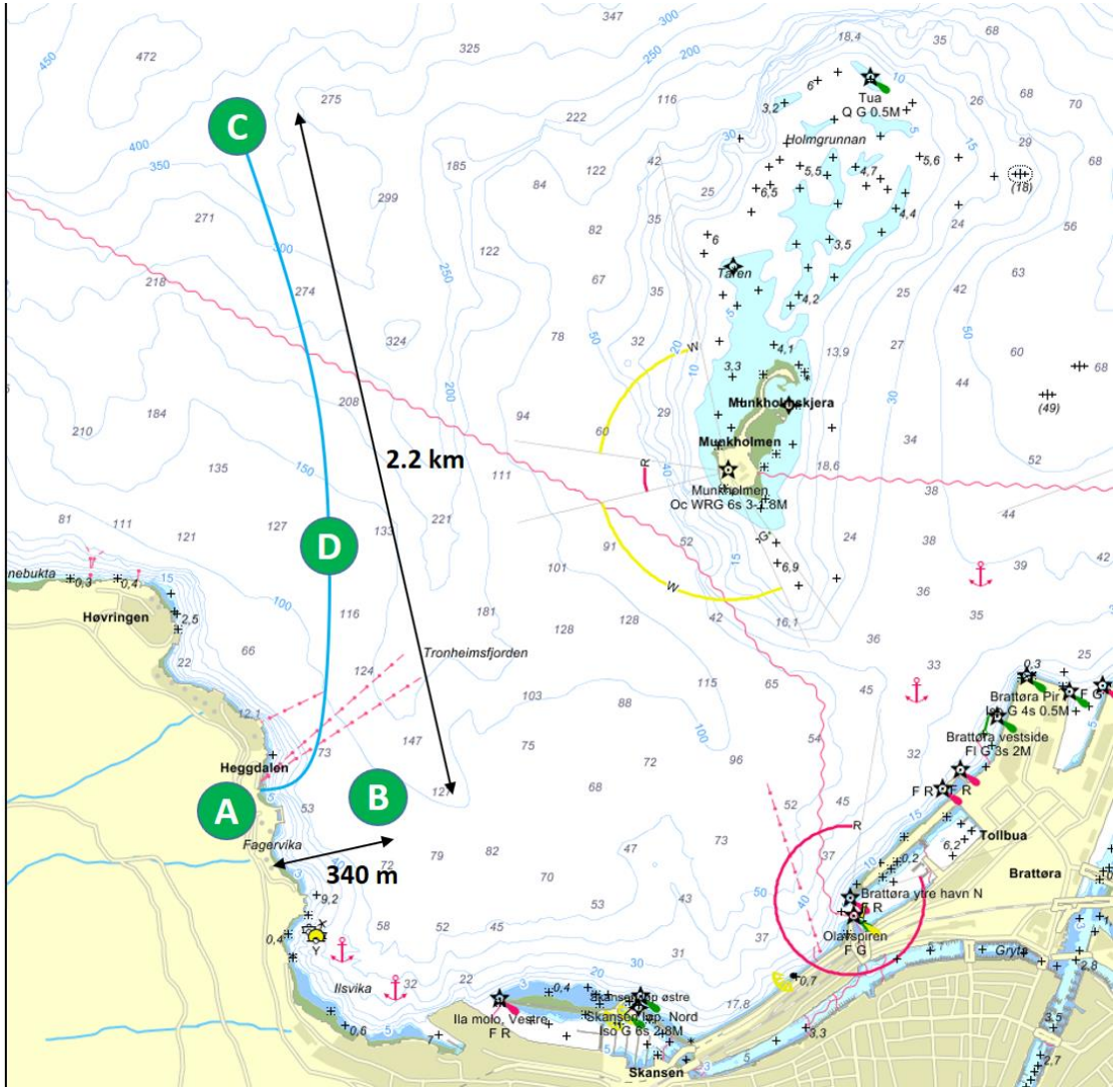
Statoil Pig Loop
- Installed in 2016.
- Allows realistic testing of subsea inspection and intervention.

C

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

D

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

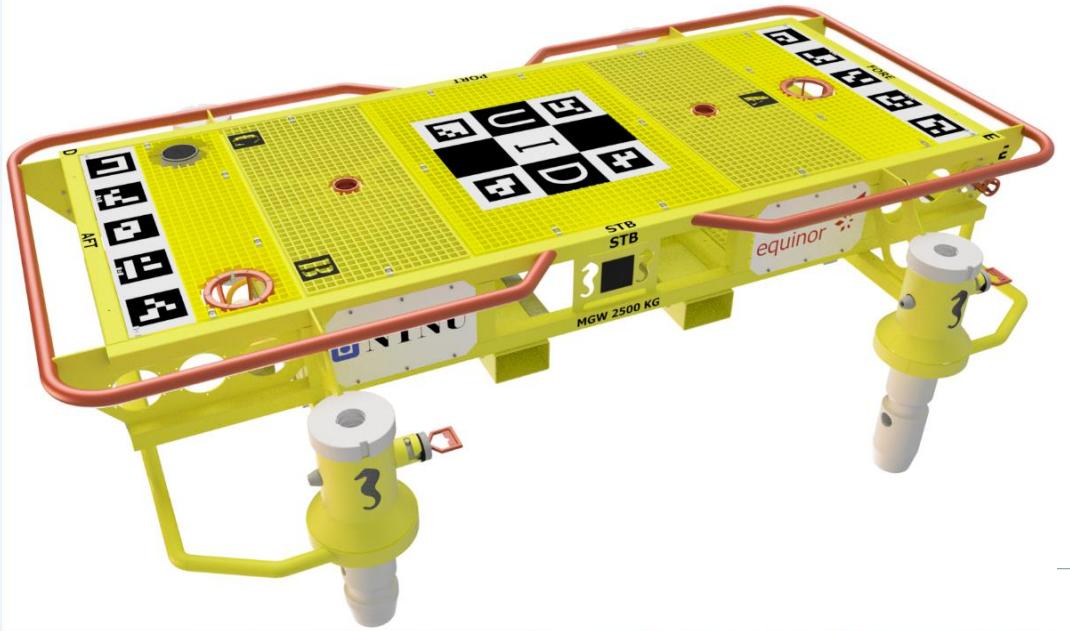



NYHETER

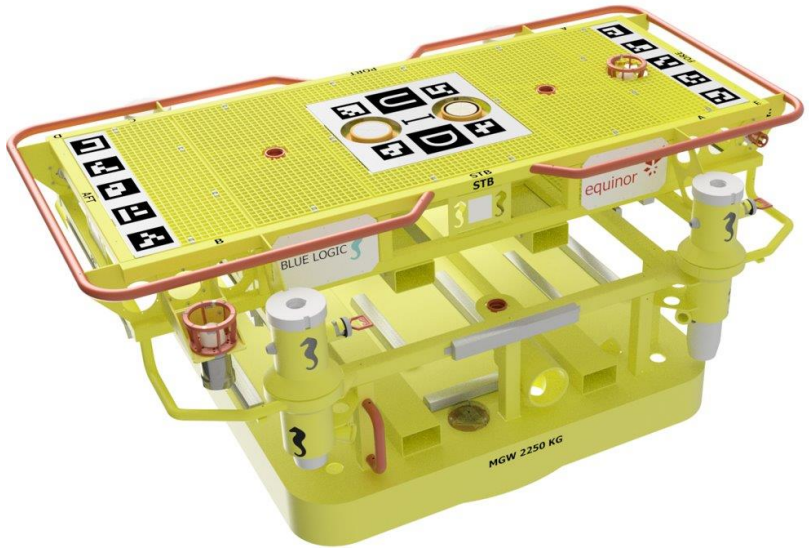
22

Forus-gründere og Equinor skal lade droner under vann

Kilde: Sysla



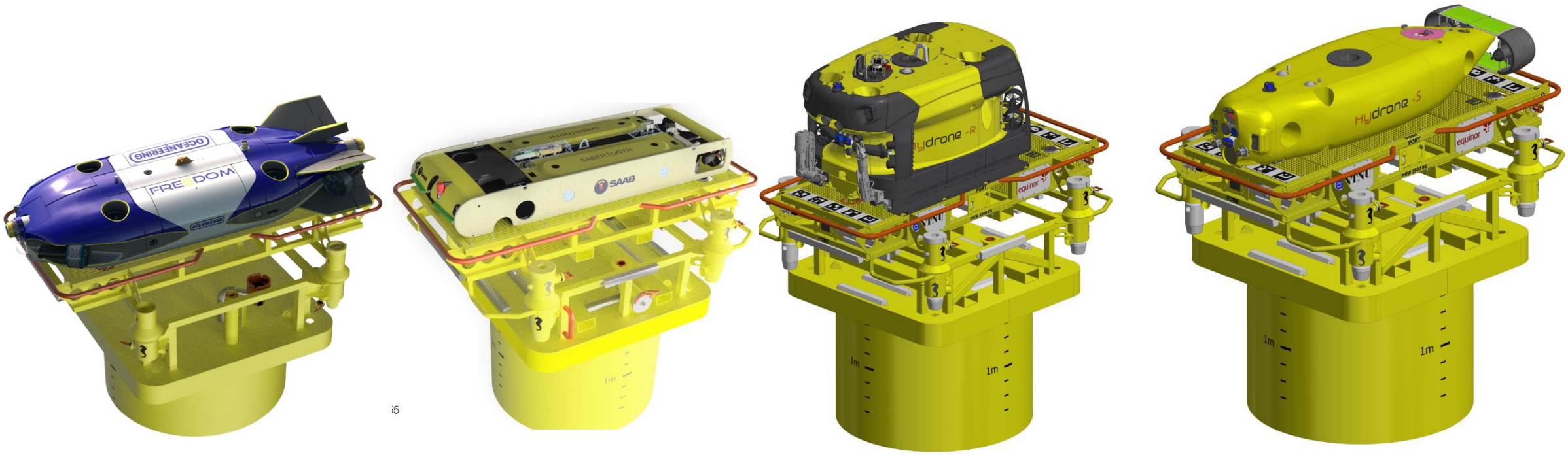
Video from Dora, testing April 2019



Latest version of docking station

UID™ generic subsea docking station

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

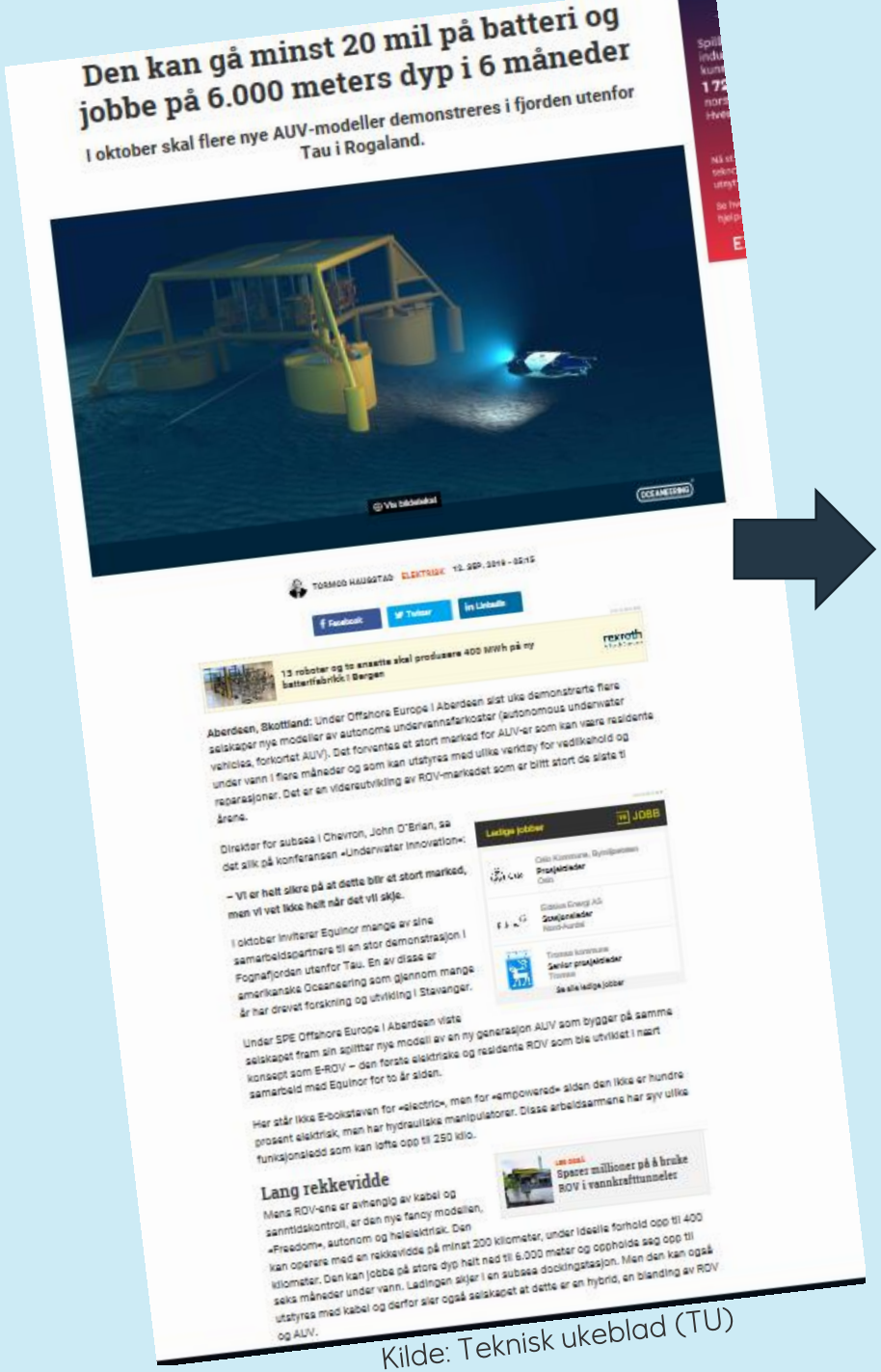


Thank you!

Time for questions

For further information, contact:

paso@equinor.com



Den kan gå minst 20 mil på batteri og jobbe på 6.000 meters dyp i 6 måneder

I oktober skal flere nye AUV-modeller demonstreres i fjorden utenfor Tau i Rogaland.

Kilde: Teknisk ukeblad (TU)

2–3 October there will be a UID drone event in Norway (Tau – Stavanger). This will be the densest display of drone technology and key stakeholders in the industry – ever. Main UID suppliers will attend to this event with examples of their latest developed drones. A sea trail will be performed with Oceaneering's new freedom subsea drone. The freedom will autodock on the world first underwater charging station

Link to UID Animation:

Oceaneering
https://youtu.be/4i4fd6le9Jg

iTec7 AIV
https://youtu.be/VBfjx7o9YS4

Saipem – Hydrone
https://youtu.be/nOQMpse36xQ

Houston Mechatronics:
https://www.youtube.com/watch?v=DZPjsB--qas&t=16s

Eelume
https://www.youtube.com/watch?v=ACC0-HcULoo&feature=youtu.be