



Introduction to Allseas

13 July 2023 — Kingston, Jamaica



Allseas' activities



(video)

Allseas – Dare to Pioneer

Founded in 1985, pushing the boundaries of technology, with innovation and entrepreneurial spirit.

- A world-leading contractor in the offshore energy market.
- Experts in pipelay, heavy lift, subsea construction and deep-sea mineral collection.
- Offices in Switzerland, The Netherlands, Belgium, Houston TX, Australia and Malaysia.
- Over 2,500 employees worldwide.
- Eight offshore construction vessels.

Pushing the boundaries of technology in 1986

Allseas' first vessel *Lorelay* was the world's first pipelay vessel to operate on full Dynamic Positioning.

This revolutionised offshore pipelaying.

She installed more than 9000 km of pipeline worldwide in depths up to 2730 m.



Pushing the boundaries of technology in 1998

Solitaire, the world's largest and most technically advanced pipelay vessel when launched in 1998.

Holds almost every deep-water pipelay record.



Pushing the boundaries of technology in 2016

Pioneering Spirit, operational since 2016.

Installs and removes large offshore platforms in a single piece and record-weight pipelines in all water depths.

The world's largest and most sophisticated construction vessel.

Capacity and efficiency unrivalled anywhere in the industry.



-
- (video)

Pipelines installed



27,000 km

>300 projects

<3000 m deep

Platform removals

Shell – Brent

- Delta topsides (24,000 t) in 2017, Bravo topsides (25,000 t) in 2019 & Alpha topsides (17,000 t) in 2020
- Charlie topsides (34,000 t) in 2023

CNR – Ninian Northern

- Topsides (14,200 t) in 2020 and jacket (8100 t) in 2022

Repsol/SBM – Yme

- Topsides (13,500 t) in 2016

Spirit Energy – Morecambe Bay

- DP3 topsides (5500 t) & DP4 topsides (5400 t) in 2021
- DP3 jacket (3000 t) & DP4 jacket (3000 t) in 2023

Aker BP – Valhall

- QP topsides (3400 t) in 2019 & jacket (3600 t) in 2021
- DP topsides (5800 t) & jacket (3000 t), PCP topsides (14,000 t) in 2022
- PCP jacket (9500 t) in 2025

TAQA – Northern North Sea Assets

- Eider Alpha jacket (13,500 t) & topsides (11,600 t) TBC
- Tern Alpha jacket (12,000 t) & topsides (22,000 t) TBC
- Cormorant North jacket (13,400 t) & topsides (16,000 t) TBC
- Cormorant Alpha topsides (25,4000 t) TBC

Repsol – Gyda

- Topsides (18,400 t) & jacket (11,000 t) in 2022

Aker BP – Hod

- Topsides (1000 t) & jacket (3500 t) in 2025

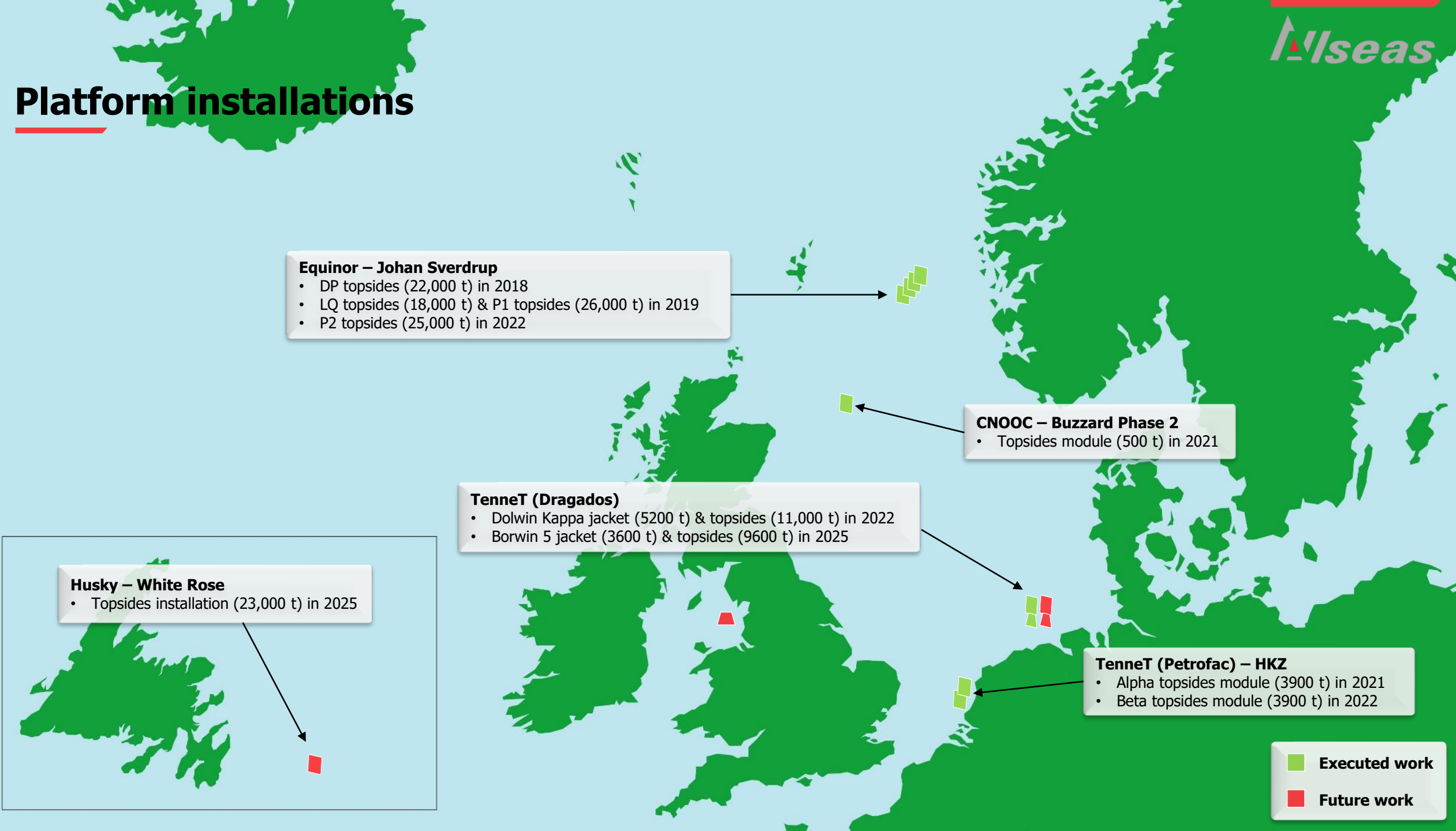
TotalEnergies – Tyra

- TEA topsides (14,000 t) & TWA topsides (7600 t) in 2020
- TEA jacket (5000 t) & TWA jacket (3000 t) in 2022

Executed work

Future work

Platform installations



Equinor – Johan Sverdrup

- DP topsides (22,000 t) in 2018
- LQ topsides (18,000 t) & P1 topsides (26,000 t) in 2019
- P2 topsides (25,000 t) in 2022

CNOOC – Buzzard Phase 2

- Topsides module (500 t) in 2021

TenneT (Dragados)

- Dolwin Kappa jacket (5200 t) & topsides (11,000 t) in 2022
- Borwin 5 jacket (3600 t) & topsides (9600 t) in 2025

Husky – White Rose

- Topsides installation (23,000 t) in 2025

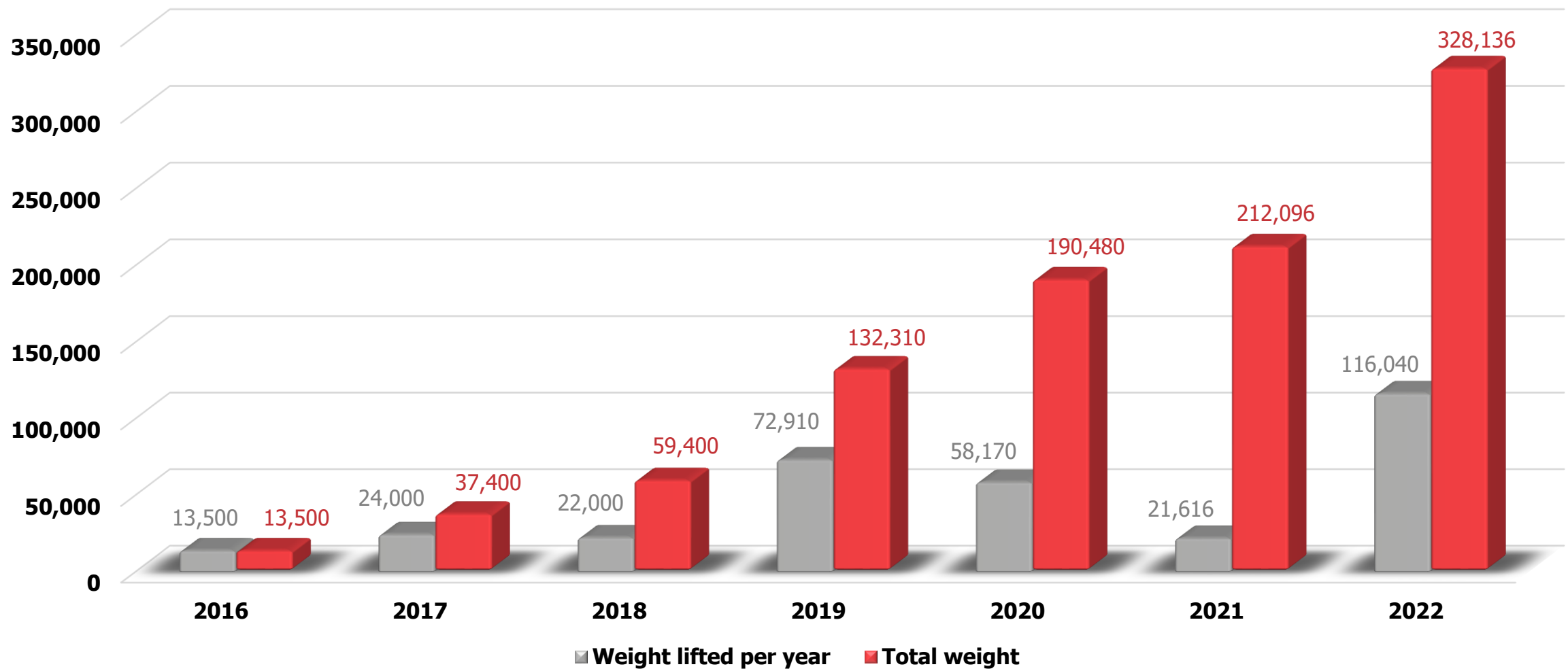
TenneT (Petrofac) – HKZ

- Alpha topsides module (3900 t) in 2021
- Beta topsides module (3900 t) in 2022

■ Executed work

■ Future work

Platform facilities weight lifted year on year (end 2022)



Our mission

We are pioneers in heart and soul. In a world that is changing more than ever, we are constantly finding new ways to enable and deploy groundbreaking advances in the offshore energy market.

Our mission is to remain a frontrunner in the offshore energy market by continuously pushing the boundaries of technology.

That's how we've always done it...



Our vision for the future

As new markets emerge, so do opportunities to apply our engineering expertise to develop new technology that will play a key role in the energy transition.

We optimise our solutions to drive efficiency and minimise the potential environmental impact.

We pioneer the development of ground-breaking offshore technology, driven by creative thinkers who dare to try new things.

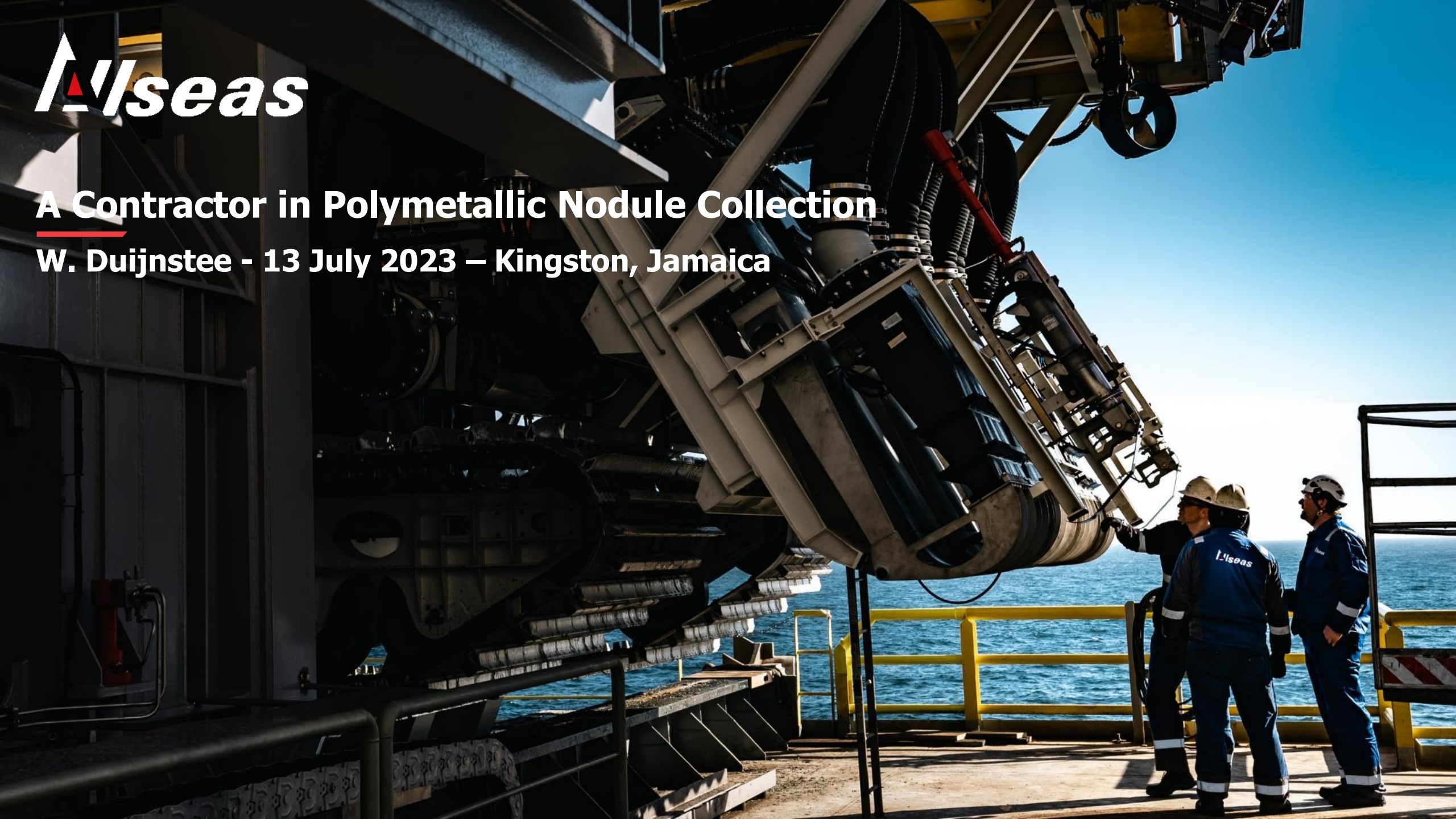
So which technical boundary will we push next...?





A Contractor in Polymetallic Nodule Collection

W. Duijnstee - 13 July 2023 – Kingston, Jamaica



Layout of today's presentation

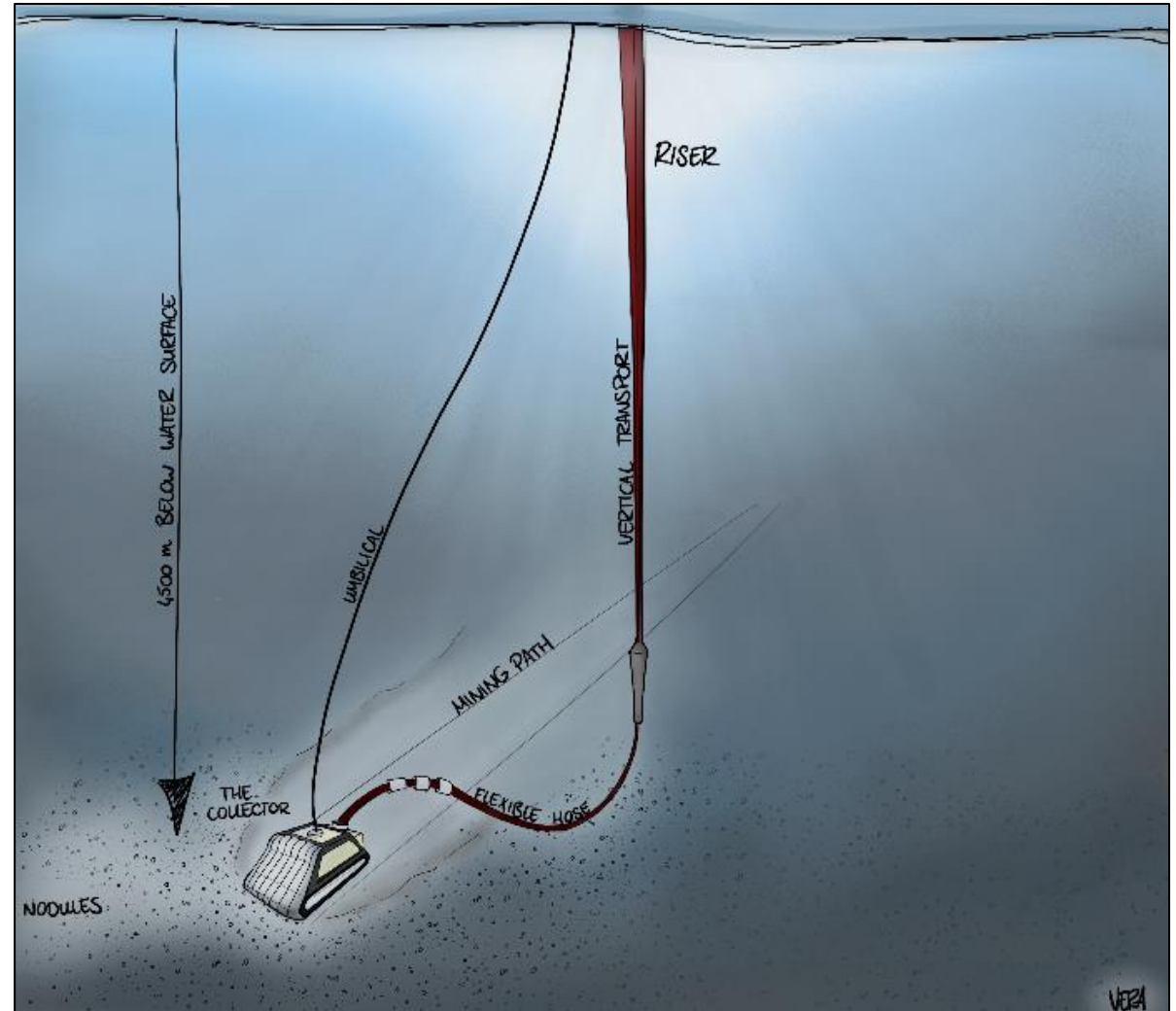
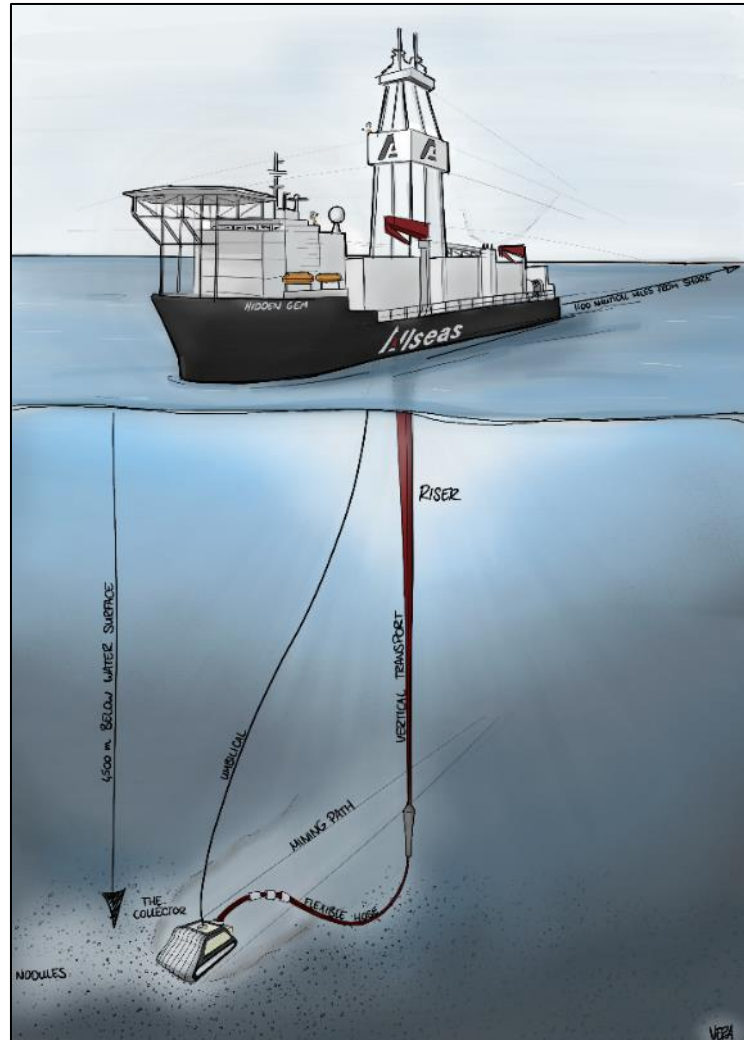
- The start: Design and pilot test preparations
- Pre-testing our concept
- Integrated Nodule Pilot Collection Test, the "Pilot Test"
- What's next? The Follow-up





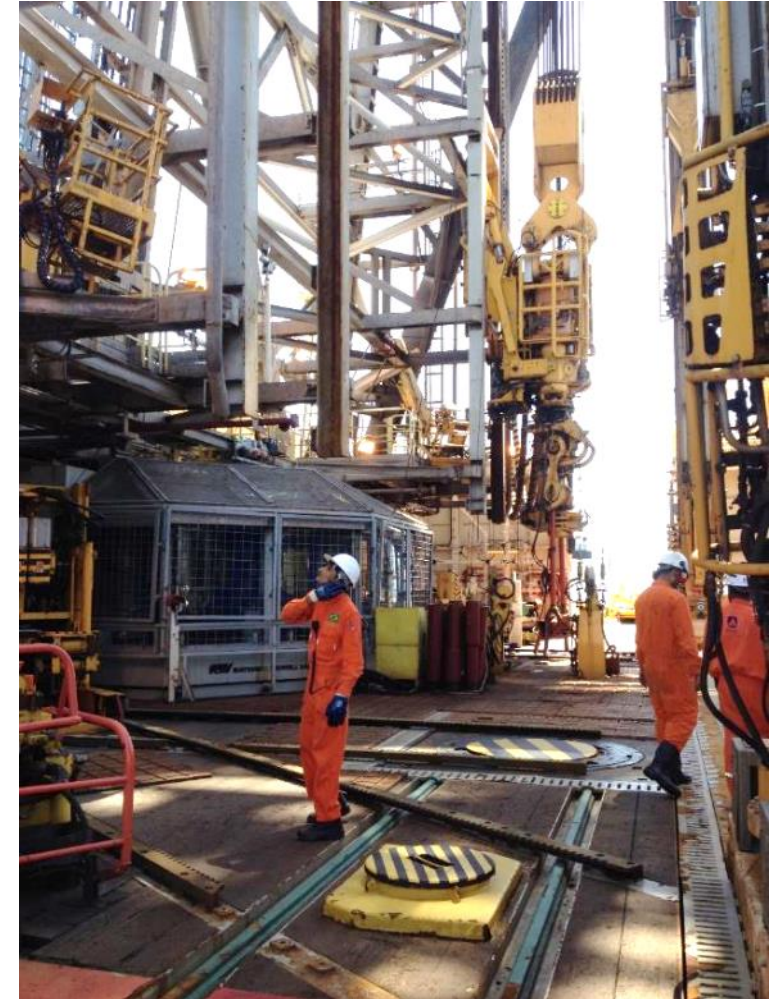
Design and pilot test preparations

How to: Nodule collecting concept



Nodule Collection Support Vessel

- Former drilling vessel:
 - Capabilities to build a riser pipe;
 - More sustainable compared to a new vessel;
 - With minimum adjustments, fulfils all requirements.



Method of collecting

(video)

Film of test

Before



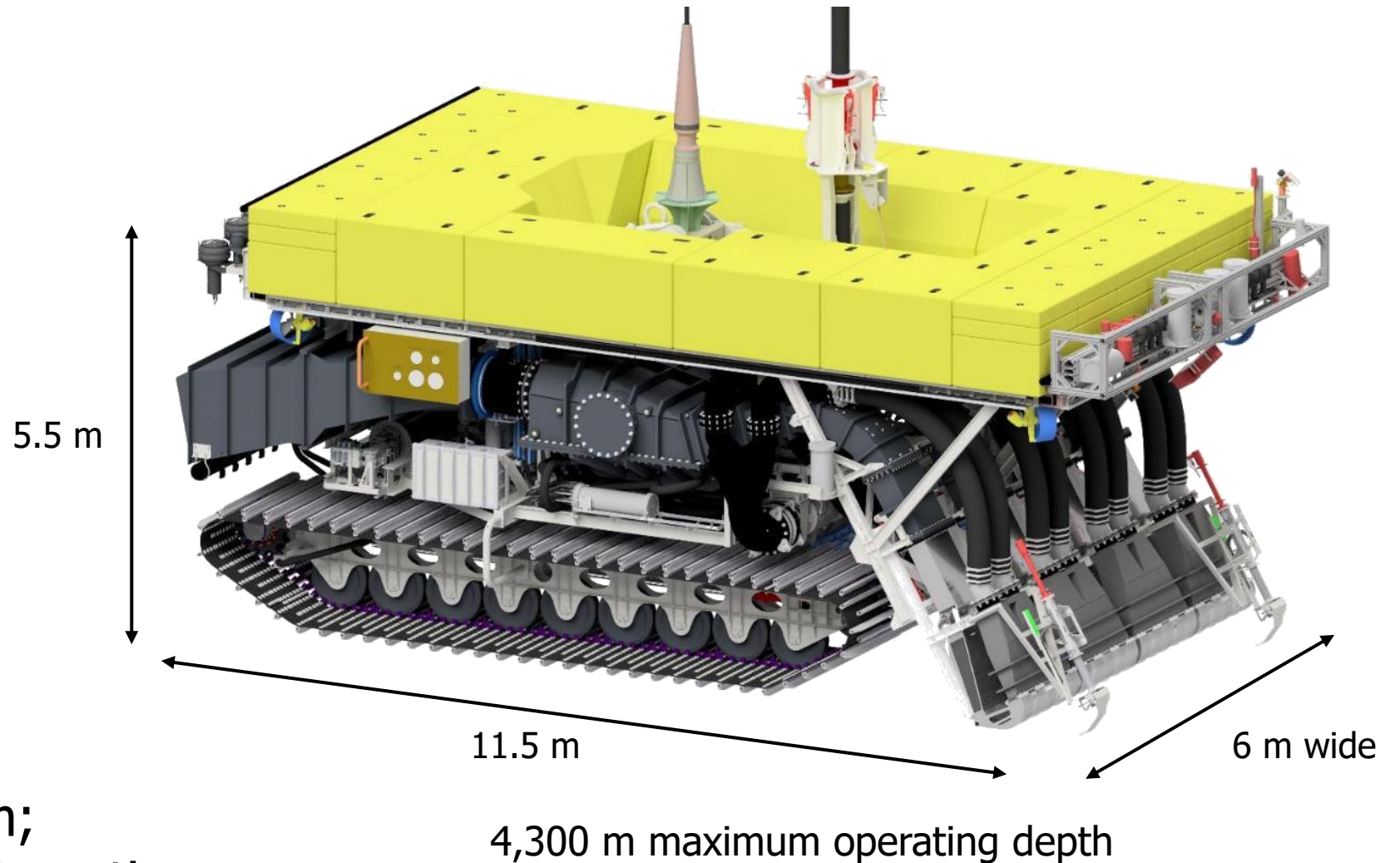
Nozzles are designed to minimize seabed disturbance in combination with high pick-up efficiency.

Multiple tests were done in a Dutch water and soil flume (water tank) using artificial nodules.

After



Designing a collector



Designed to minimize environmental impact:

- Low-impact tracks;
- Fines rejection system;
- Efficient diffuser configuration;
- Coandă-effect nozzles.



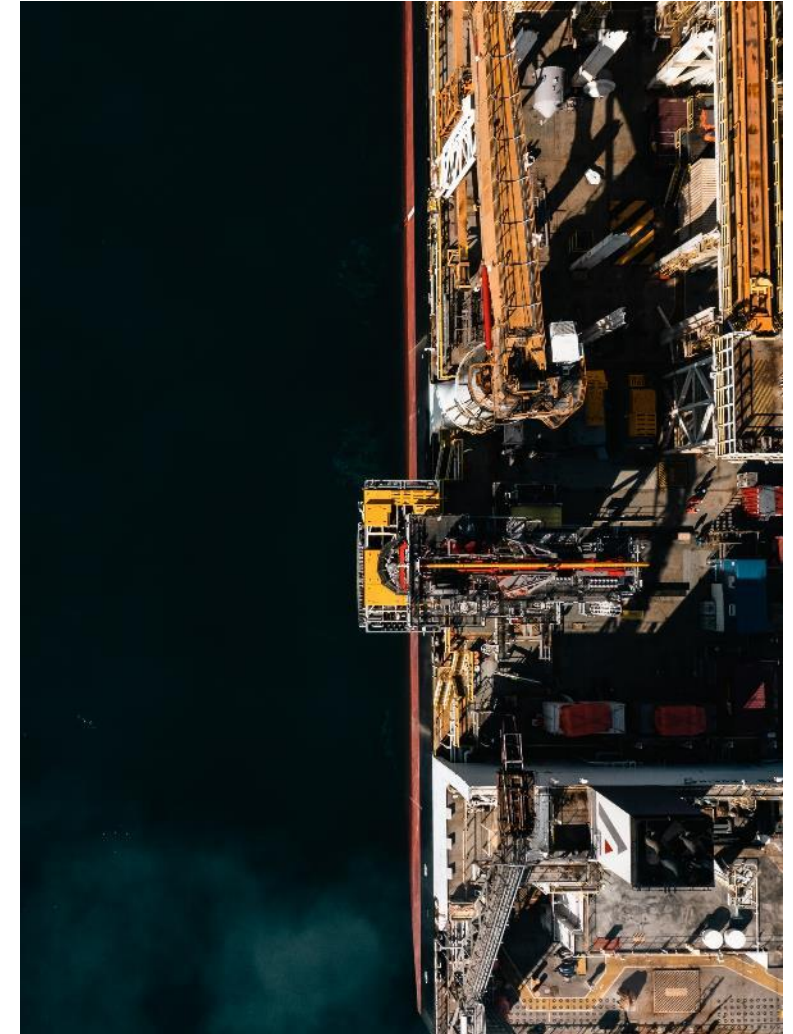
Pre-testing our concept

The goals for the pre-tests

- Functional and integration test of equipment.
- Prove the functioning of mechanical and software systems of the collector during driving on the seafloor.
- Prove the functioning of the system under high load.

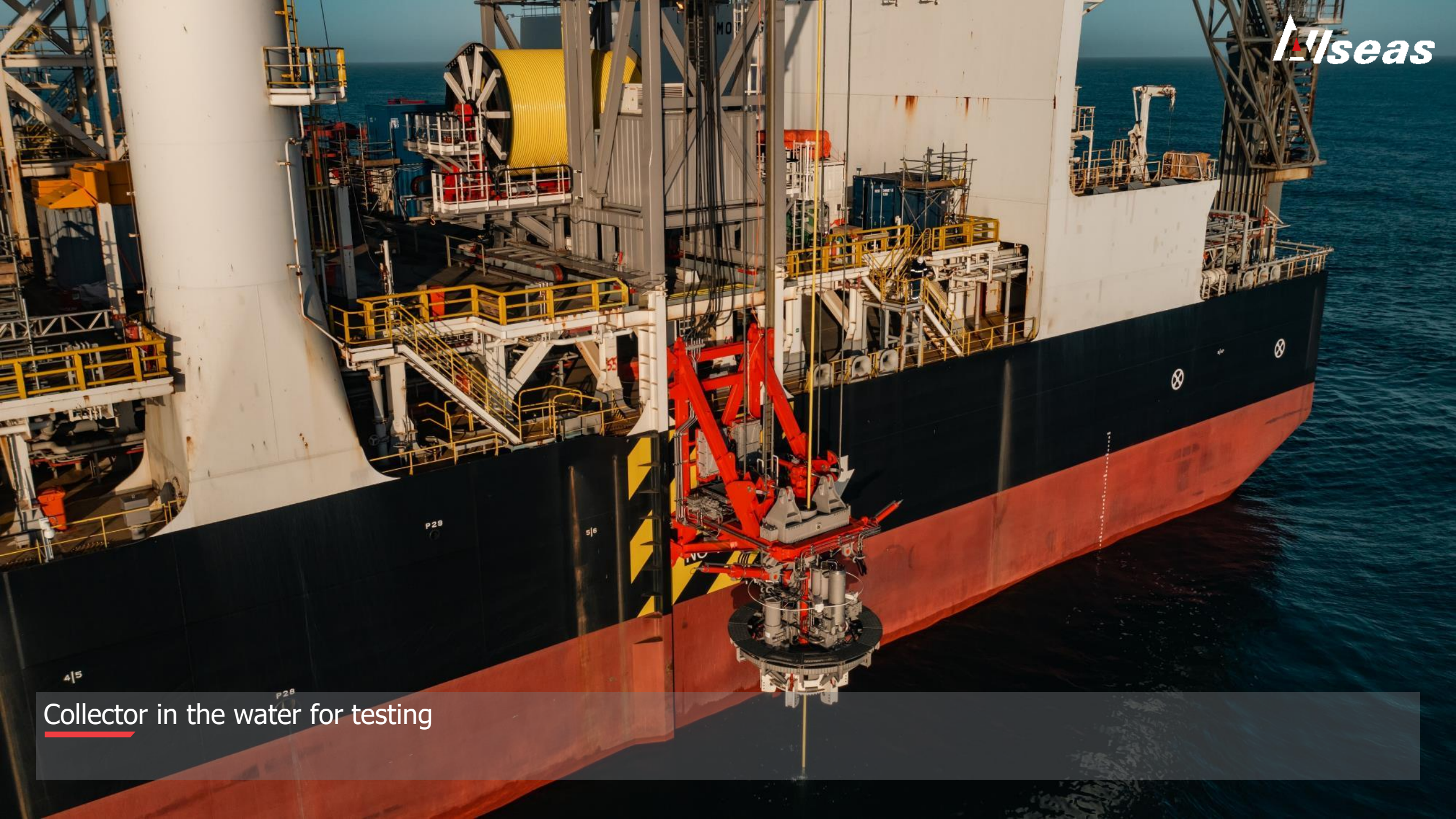
First pre-test (21): North Sea, Dutch Section.

Second pre-test (9): Atlantic, Canary Islands, Spain.





Hidden Gem ready for drive testing on the North Sea, Dutch Section

An aerial view of an offshore supply vessel's deck. A large yellow cable reel is visible on the left. A red crane is lowering a circular collector device into the water. The vessel has a white upper hull and a black lower hull with a red stripe. Various deck structures, railings, and equipment are visible. The sea is blue with some whitecaps.

Collector in the water for testing



Testing of vertical lift system, Atlantic, Spain.

Testing of vertical lift system, Atlantic, Spain.

The results of the pre-test

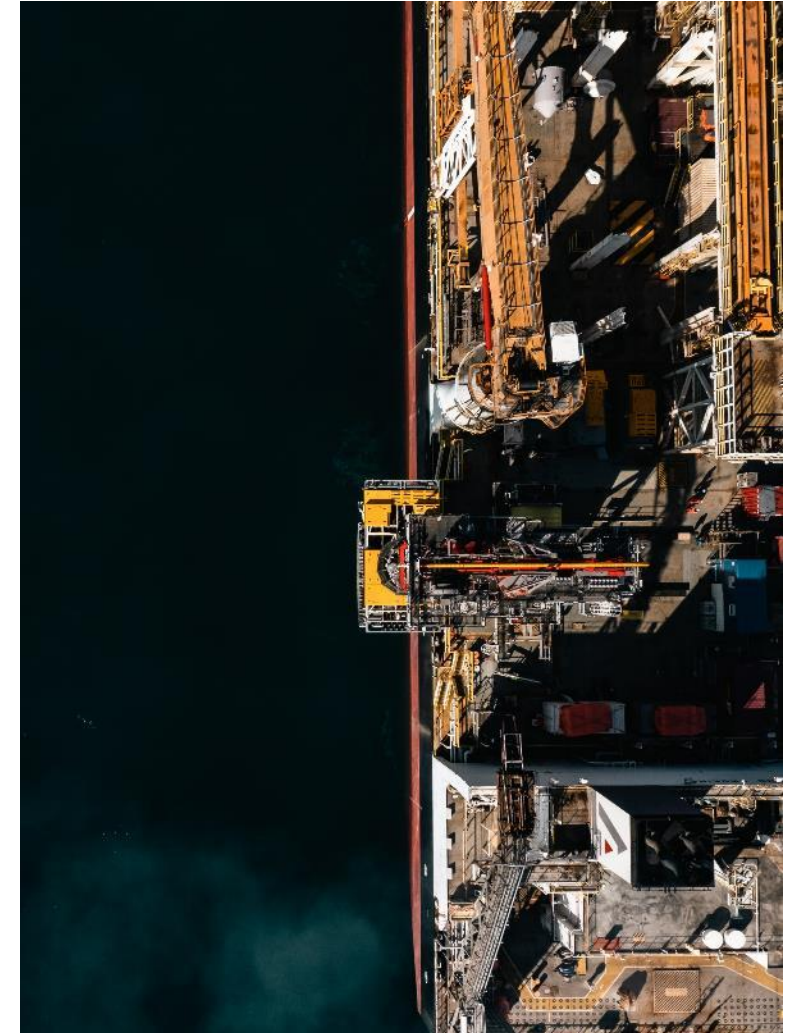
- Functional and integration test of equipment - **PASSED**.
- Prove the functioning of mechanical and software systems of the collector during driving on the seafloor - **PASSED**.
- Prove the functioning of the system under high load - **PASSED**.
- The system passed a total of 30 tests offshore.
- System ready for the Integrated Nodule Pilot Collection Test in the Clarion Clipperton Zone.



Integrated Nodule Pilot Collection Test

The goals for the pilot test

- Assess environmental impact both short and long term;
 - Monitoring of the mid-water and benthic plumes;
 - Monitoring of the physical and biological impacts.
- Proof of concept of prototype collecting equipment;
- Reliable collecting system:
 - Operate 24/7;
 - Minimize mechanical downtime.
- Nodule collecting efficiency.





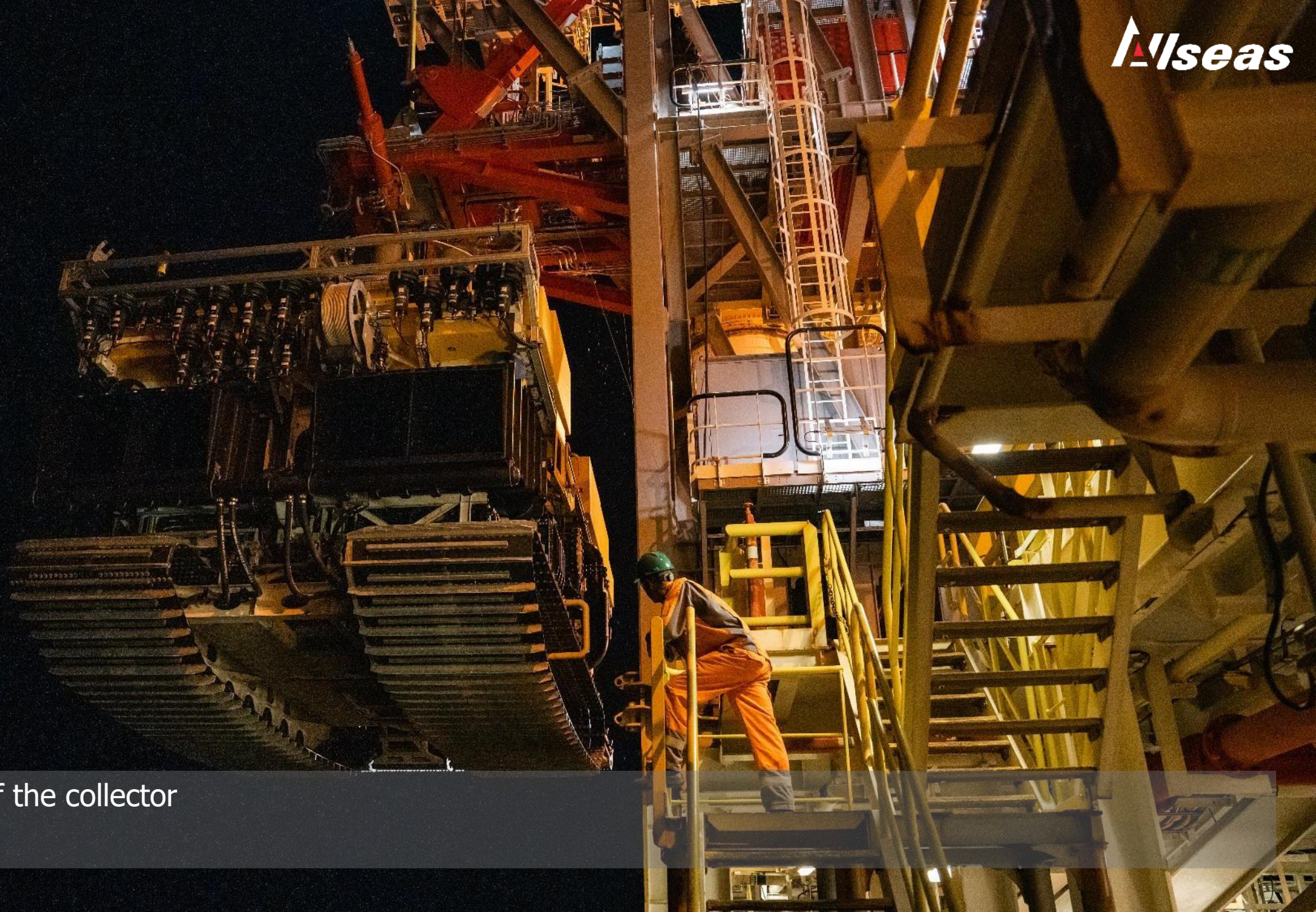
Allseas vessel Fortress delivers final project material



Arrival in Nori D field on 19th of September



First ROV dive – first glimpse of the nodules on the seabed



First deployment of the collector



260 W

Iseas

The seabed after collecting

A full-page photograph showing an offshore worker in a blue jumpsuit and white hard hat, standing on a platform and operating a large industrial collector. The collector is a long, black, cylindrical device with multiple sections, and it is discharging a large volume of dark, granular material into a collection bin. The background shows the complex steel structure of an offshore platform under a clear blue sky.

First nodules recovered by the collector

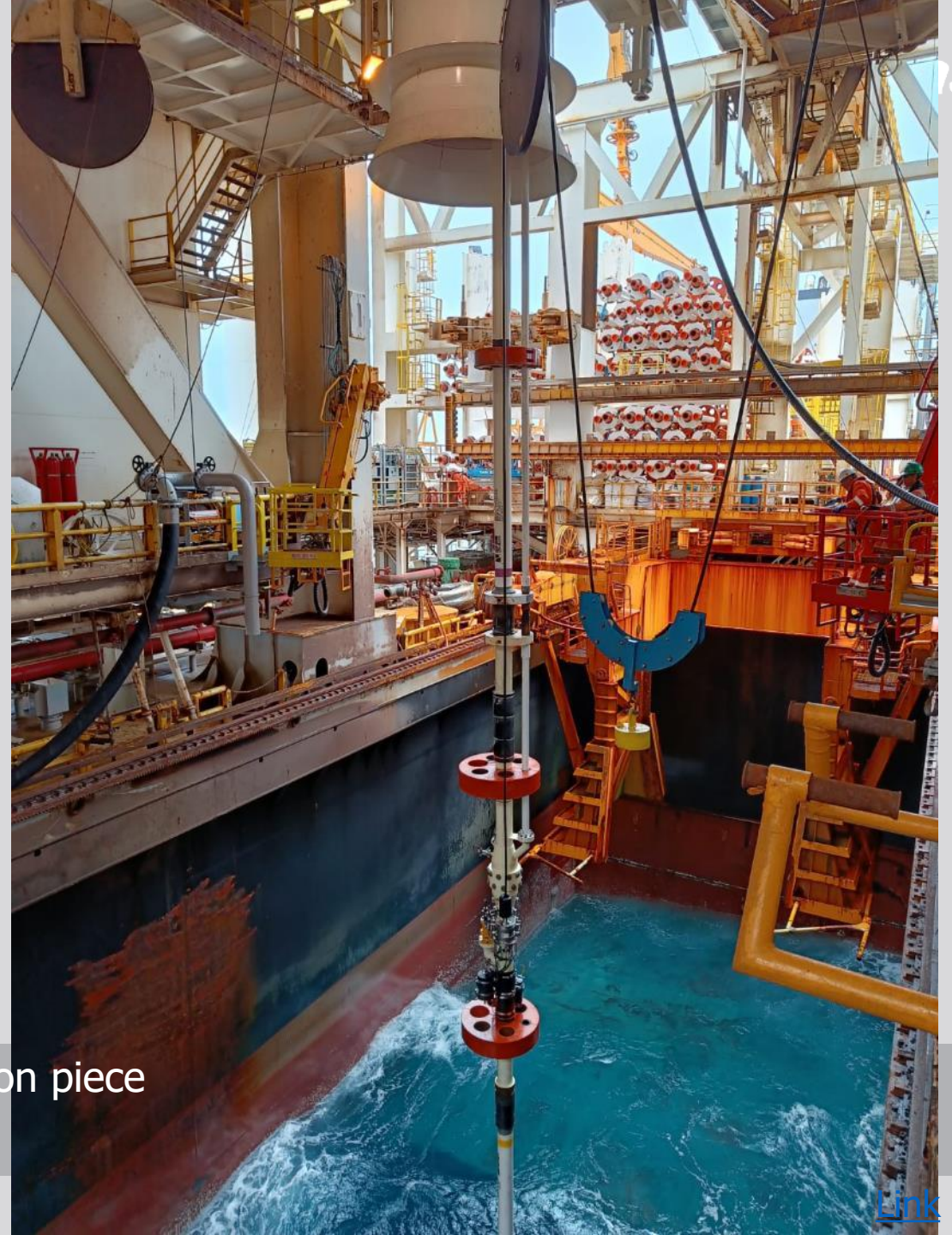
3t bulk sample of nodules from the diffuser

A photograph showing the deployment of a flexible jumper on the deck of an offshore supply vessel. A large, orange flexible pipe is being moved by a crane system. The pipe is supported by several yellow buoyancy elements, some of which are already attached to the pipe. A worker in an orange safety suit and green helmet is standing on the deck, guiding the pipe. The background shows the blue ocean and the white structure of the vessel. The text "Deployment of the flexible jumper including its buoyancy elements" is overlaid at the bottom left.

Deployment of the flexible jumper including its buoyancy elements



Deployment of riser special sections; riser base and airinjection piece



Connection the rigging to lift the riser sections



The image shows two workers, a man and a woman, in an industrial setting. They are both wearing hard hats and safety glasses. The man is wearing a green hard hat and the woman is wearing a white hard hat. They are both wearing tan work clothes with reflective yellow stripes. They are crouching down next to a large industrial pipe. The man is holding a blue hose that is connected to a sampling device. The woman is holding a small blue valve. The background shows a complex network of pipes and structural steel. The ground is wet and reflective. The overall scene is brightly lit, suggesting an outdoor or well-lit indoor environment.

Environmental sampling of return water

A woman with blonde hair tied back, wearing safety glasses and a light blue t-shirt, is working in a laboratory. She is wearing white gloves and is focused on a task involving a clear plastic tube and a small vial. The laboratory is equipped with various pieces of equipment, including a box of Kimwipes, a red cap, and several white containers. The background shows a glass partition and some pink sticky notes.

Analysing the samples in the refurbished mud laboratory

Trainee from the International Seabed Authority

Drill Floor Fire Works
Issues with the Rain.

14:07

10/10/22

14:35 Set umbilical ready to start

14:37 All 4 skids down @ 0.02 m from

14:43 Start Diffusers and Coanda knozzles

14:50 Start driving forward to start collecting

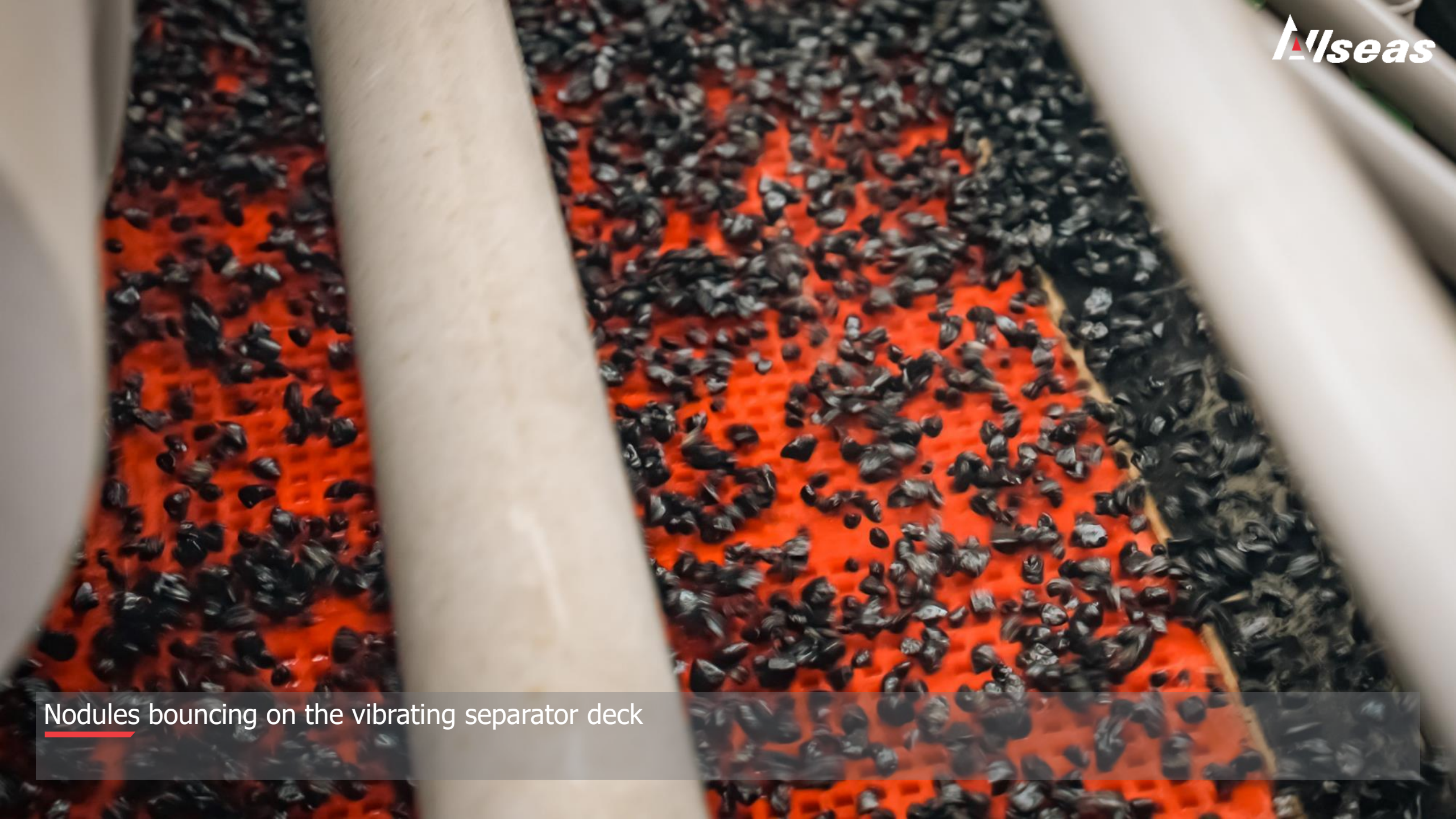
15:00 Paid-in 2 meters on umbilical wire

15:03 **NODULES !!**

reduce



Cyclone feeder of the separator deck

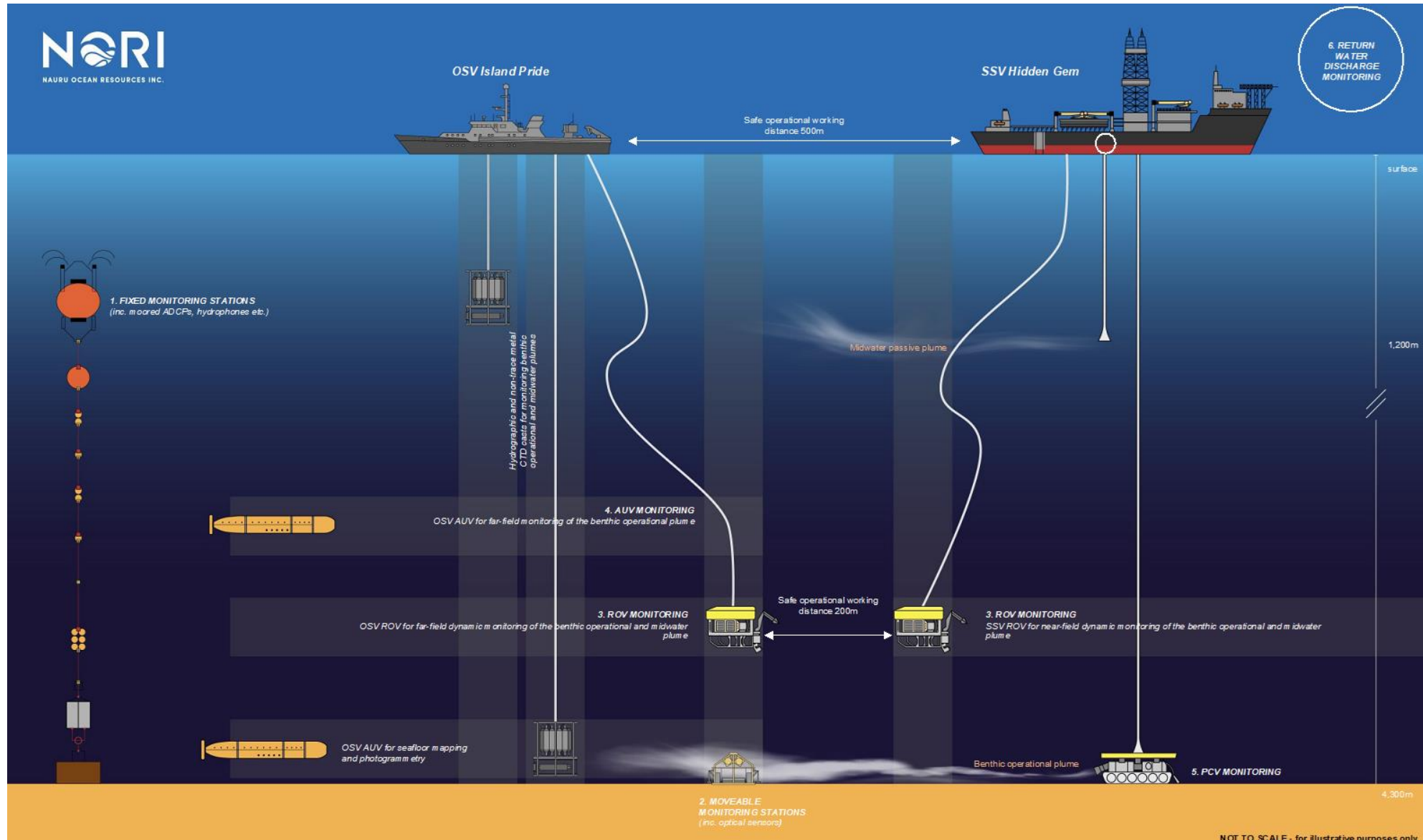
A close-up, high-speed photograph of a vibrating separator deck. The deck is covered with a thick layer of small, dark, irregularly shaped nodules. The nodules are bouncing and moving across the deck, which has a bright orange-red surface. The background is blurred, showing the industrial setting of the separator.

Nodules bouncing on the vibrating separator deck

A photograph of a large industrial facility, likely a steel mill, showing a conveyor belt system. The belt is filled with dark, granular material, identified as nodules. In the foreground, a worker in a bright orange high-visibility jumpsuit and a green hard hat is seen from the back, looking towards the conveyor. Another worker in a blue shirt and green hard hat is visible further back. The background is filled with complex industrial structures, including large steel beams and pipes. The overall scene is brightly lit, typical of an indoor industrial environment.

Nodule production on the conveyor belt

Environmental scope during pilot test



Figures of the environmental scope

50 monitoring stations distributed in and around the test field to monitor and map the far field plume *in situ*

BENTHIC PLUME ARRAY

- 7 x Fixed Landers with ADCPs, CTDs, OBS – optical backscatter
- 2 x Fixed bottom current and turbidity landers with acoustic modems that we interrogate in real time
- 3 x McLane sediment traps
- 20 x sediment plates measuring sedimentation
- 4 x Camera landers recording sedimentation
- 1 x acoustic mooring
- 1 X acoustic lander
- 1 x midwater mooring that we interrogate for midwater currents
- 7 x DGTs diffuse gel samplers
- 2 x AUVs mapping near and far field

MID WATER PLUME ARRAY

- 3 x ROVs (1 x on Island Pride with 10 x Niskin array for water sampling + ADCP + CTD and
- 2 x ROVs on Hidden Gem
- 1 x Trace metals CTD rosette with 12 Go-Flos for water samples
- 1 x Hydrographic CTD rosette with 24 niskins for water samples
- 1 x McLane Pump rosette with 7 x pumps

Biological and physical impacts: Collaborating with leading research institutions



The results of the pilot test

- All samples for environmental impact assessment are collected;
- All commissioning tests successfully executed;
- The collector has driven **83.4 km** on the seabed;
- In total, **3,020 t** of nodules were collected.
- Proved confidence in minimal environmental impact by system.

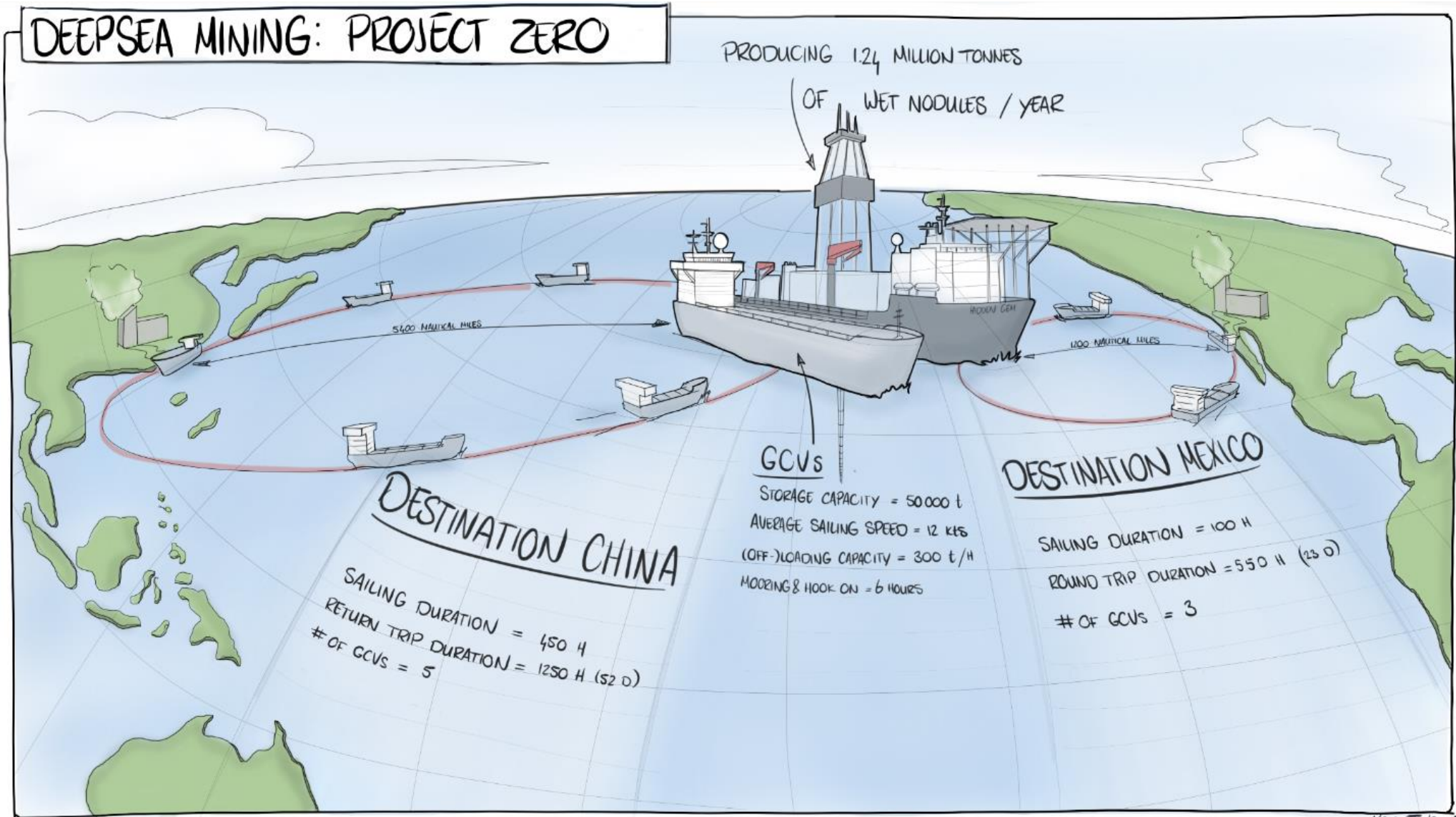


(video)



Follow-up

New scale



Vera Brion

Design of a new, more efficient, lower-on-impact, collector

Pilot Collector

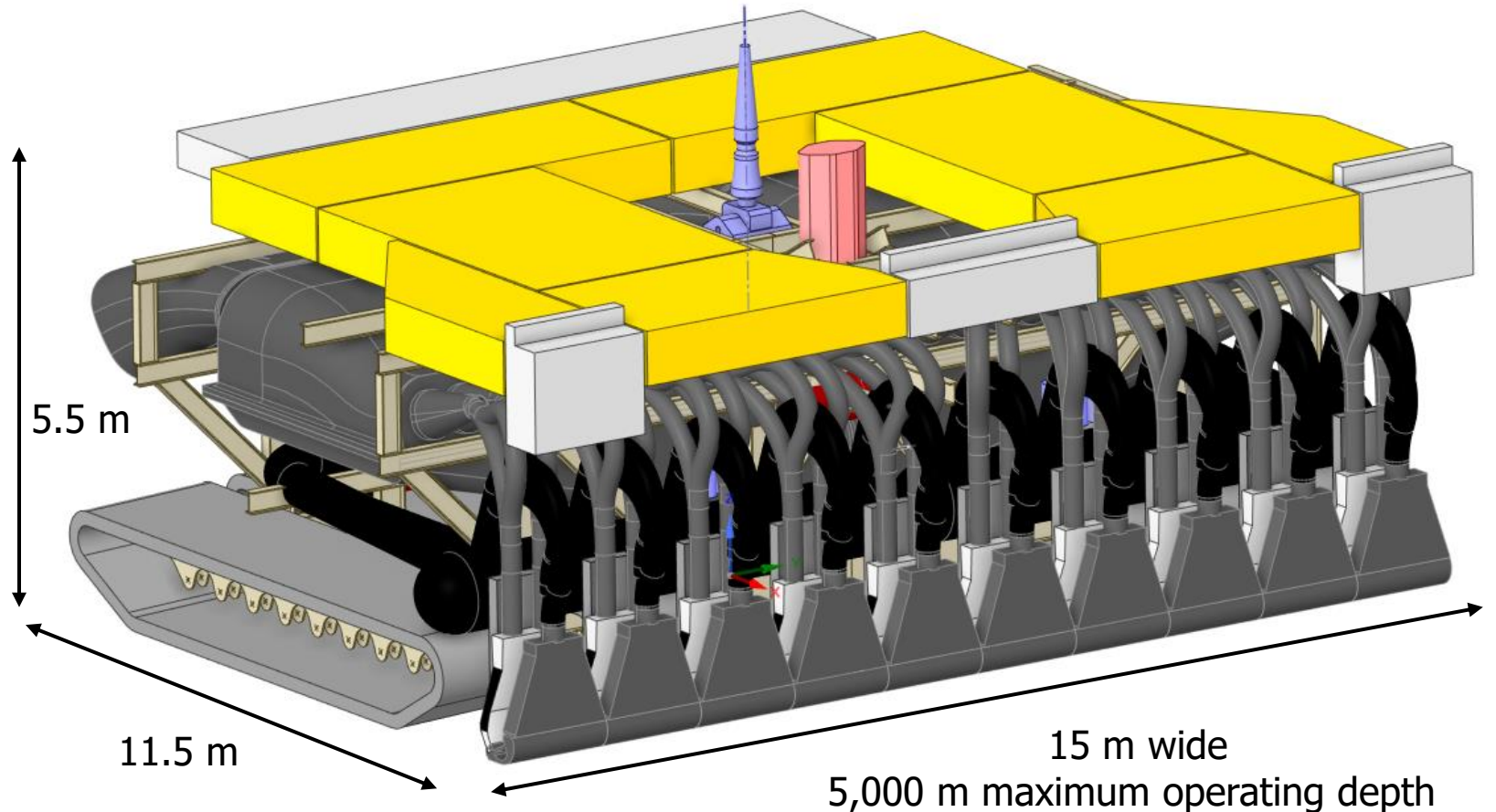


6 m wide
4,300 m maximum operating depth

Improve design to further lower the environmental impact:

- Low-impact tracks;
- Fines rejection system;
- Efficient diffuser configuration;
- Coandă-effect nozzles.

Project Zero Collector



Improvements highlights on the system

- Lowering the return water line outlet;
- Installation of additional sensors for even closer and real-time monitoring;
- Improved Coandă-effect nozzles for higher pick-up efficiency and plume reduction.

