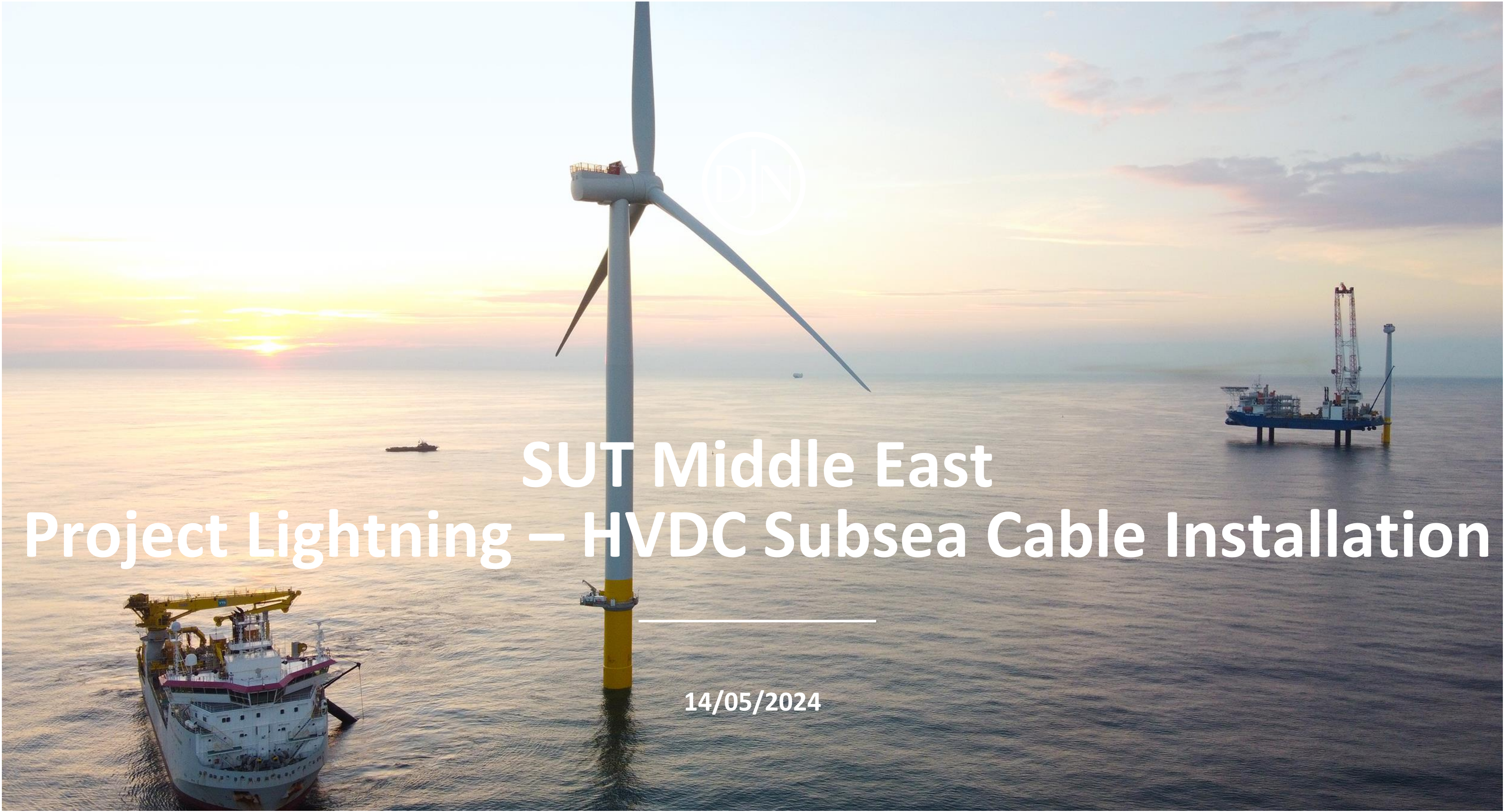




SUT Middle East Project Lightning – HVDC Subsea Cable Installation

14/05/2024





1. Company Introduction
2. Project overview
3. Technical installation

Contents



**Global
experience and
family owned.**

Family business



Generation of joiners

Leo De Nul sets up a business as building contractor and ‘qualified staircase manufacturer and joiner’ in 1849.

Jan Frans Jozef De Nul

Establishment of the company PVBA Jan De Nul to execute all types of public and private works.

Jan Pieter & Dirk De Nul

Expanding the company’s expertise and start to execute projects well beyond European borders.

Pieter Jan & Julie De Nul

Sixth generation of family managers both driven to further drive the growth of the company.



**Total solution
provider.**



• Marine Services.

- Concept realisation, design, expansion and maintenance of ports, rivers and coastlines.



• Offshore Services.

- Full balance of plant, design, installation and cable connections of all aspects of offshore energy projects.



• Civil Activities.

- Design and construction of onshore infrastructure, buildings and foundations.



• Environmental Activities.

- The answer to environmental issues. Reconversion of sites and maximal valorisation and reuse of sediments.



• Project Development.

- We take on the complete development track and create space for new destinations, in close cooperation with end users, investors, public authorities and business partners.



- **Land reclamation.**

- Creation of new beaches and developing new land.



- **Coastal and shore protection.**

- Maintaining and protecting coastlines and vulnerable coastal areas.



- **Port infrastructure works.**

- Constructing terminals or entire port buildings from scratch.



- **Dredging.**

- By dredging we maintain, deepen or widen waterways.



• Seabed interventions.

- We 'prepare' the seabed for the installation of offshore structures.



• Rock installation works.

- We stabilize, reinforce and protect offshore structures with gravel, rocks or concrete.



• Installation of offshore structures.

- Thanks to our versatile fleet, Jan De Nul Group is able to install any offshore structure.



• Installation of cables and umbilicals.

- Jan De Nul Group connects offshore structures and brings offshore energy ashore.
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• Dismantling and Hoisting.

- The installation vessels of Jan De Nul Group install, dismantle and remove offshore structures.

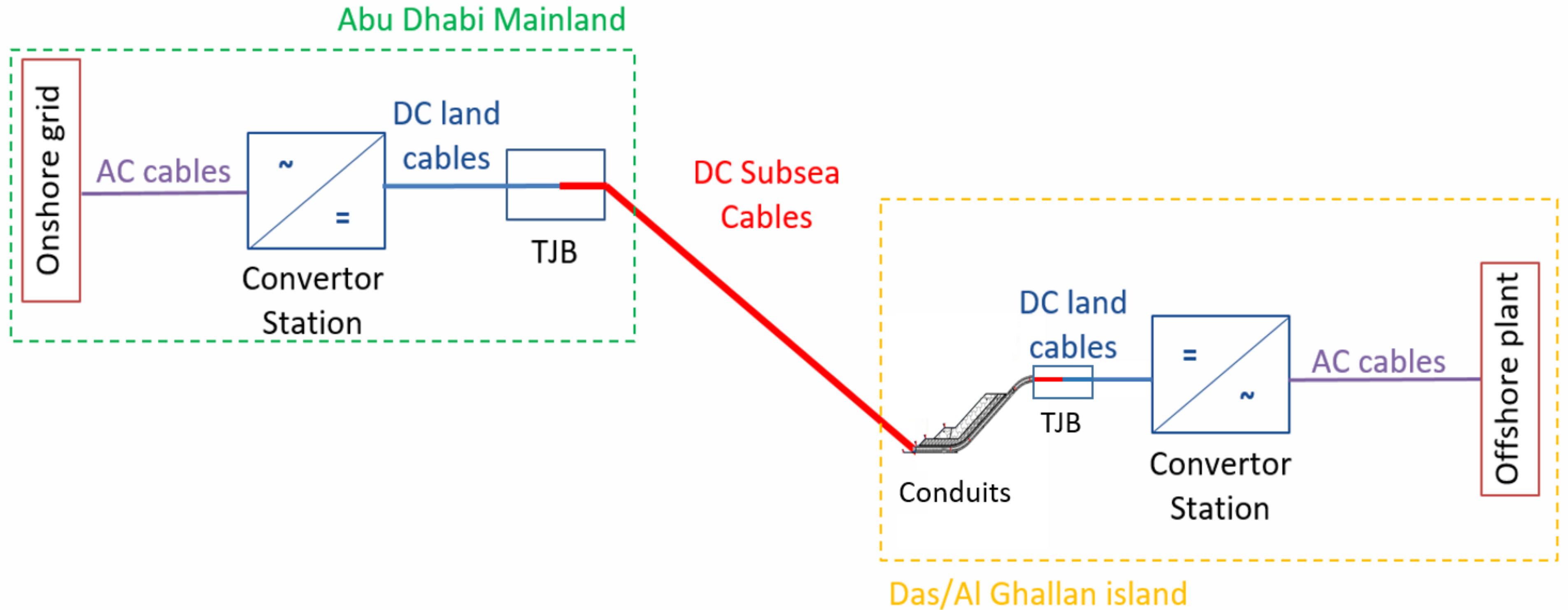
Project description



About the Lightning project



The flow of power





Technical Installation



Technical

JDN scope of work

- A. Pre-engineering survey
- B. Engineering phase
- C. *Cable design and manufacturing (Support)*
- D. Cable loading
- E. Pre-lay dredging works
- F. Subsea cable installation
- G. Cable protection works: backfilling, rock installation & cable burial
- H. Civil works for HVDC cable installation (TJB installation, onshore cable installation)
- I. Conduit installation
- J. Post-installation survey

Technical: Pre-engineering phase

Pre engineering activities

- Preliminary Cable Burial risk assessment (CBRA) - Longitude
- Preliminary Burial Assessment Study (BAS) – JDN in-house
- Rock Berm assessment - Longitude
- Preliminary cable route to Al Ghallan
- Geotechnical & geophysical survey campaign
- Design freeze
 - Conductor size
 - Cable length

Technical: Cable design and manufacturing



Cable Manufacturing Facilities:

Arco Felice Plant
(Italy)



→ ZAKUM cluster
+ installation



Cable Manufacturing Facilities:

Sumitomo Electric Industries, Ltd.
(Japan)

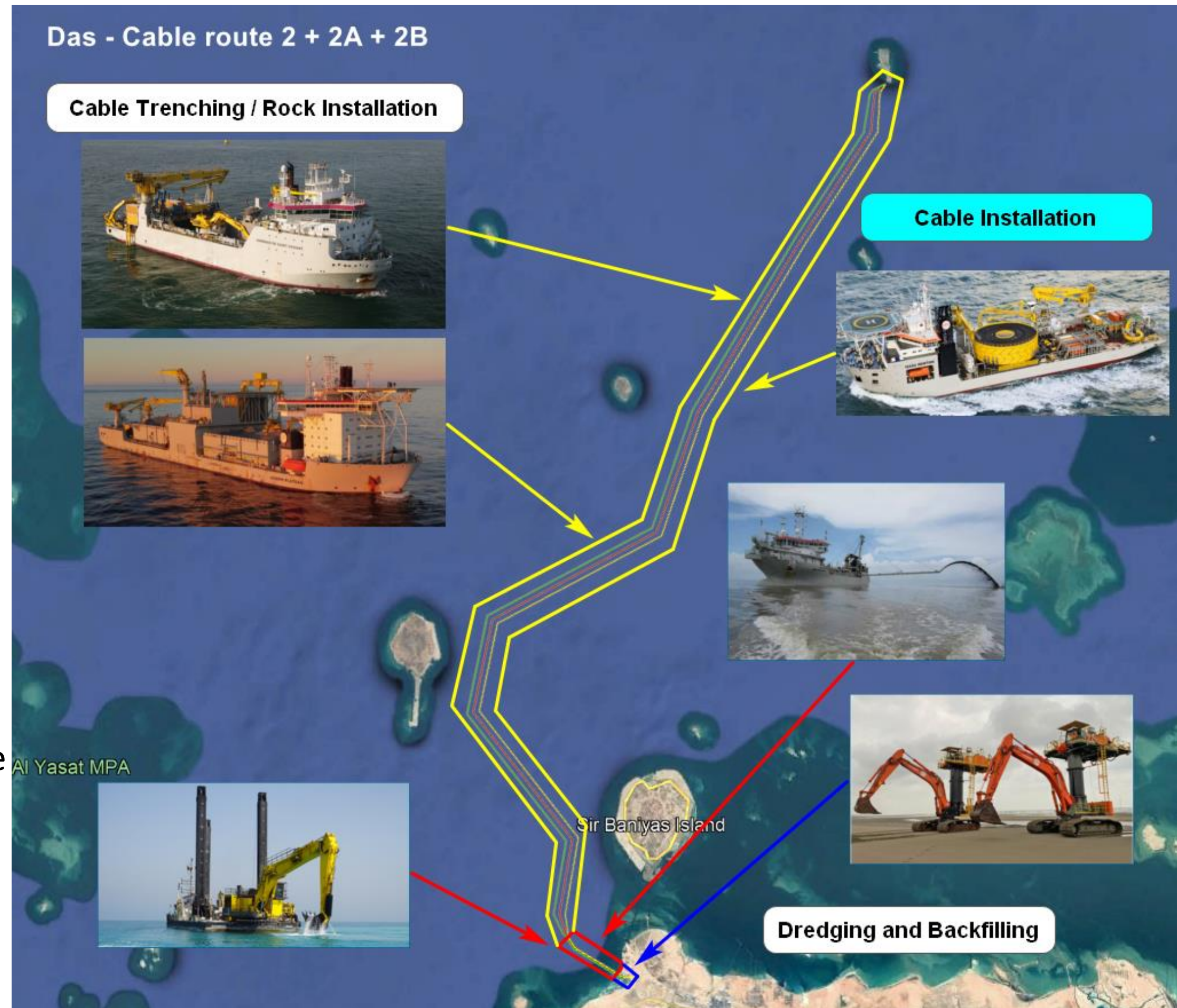


→ Only DAS cluster
JDN performs installation

Putting all our equipment to work



- Cable lay vessel Isaac Newton
 - >10,000 ton cable on board (~140km per carousel)
- TSHD Sebastiano Caboto
 - Trailer suction hopper dredger to design a trench
 - Used in soft materials (sand)
- BHD Jerommeke & Bernini
 - Backhoe dredger to design a trench
 - Used in hard materials (rock / clay)
- MPV Daniel Bernoulli
 - Mattress installation to protect underlying assets
 - Jet trenching to bury the cable under the seabed
 - Rock installation in shallow areas to protect the cable
- SRIV Joseph Plateau
 - Rock installation in deeper areas to protect the cable



Laying the cable is one thing, protecting it is another: **dredging**



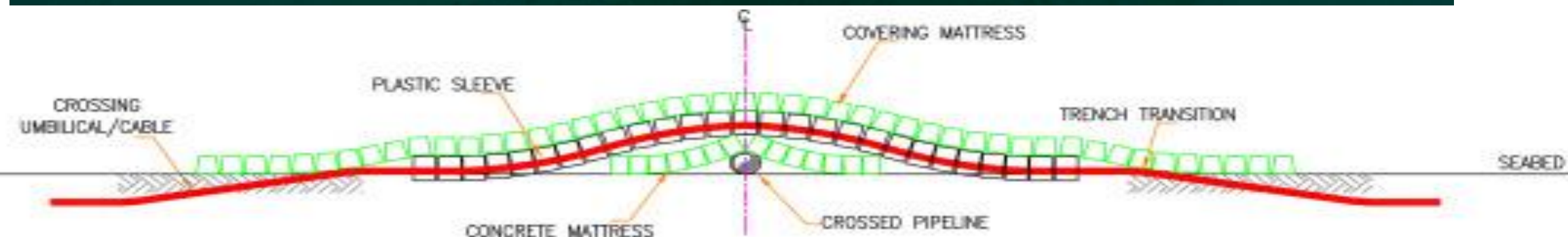
- Dredging of trench prior to cable laying
- Backfilling of trench post cable laying



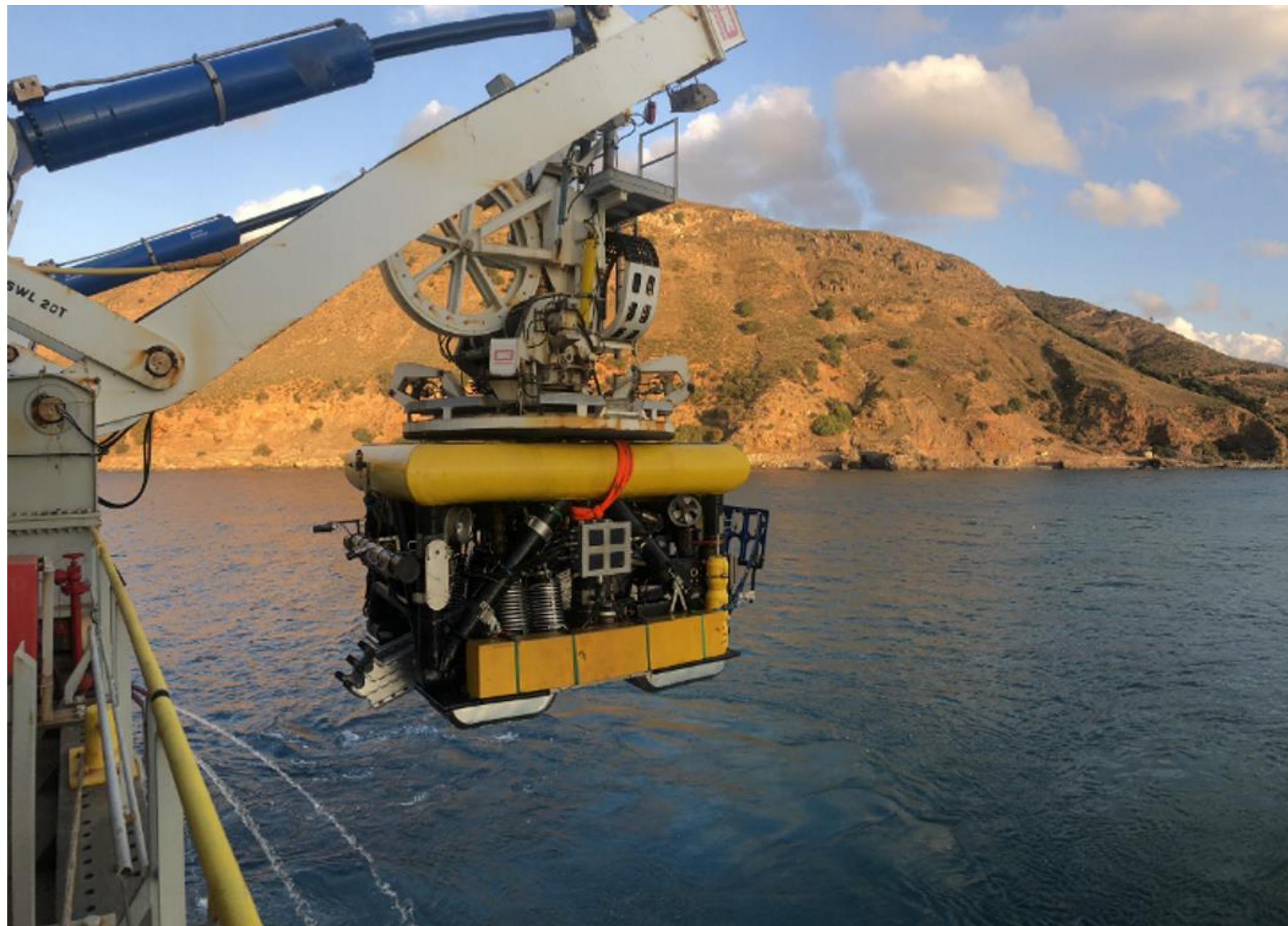
Laying the cable is one thing, protecting it is another: **mattresses**



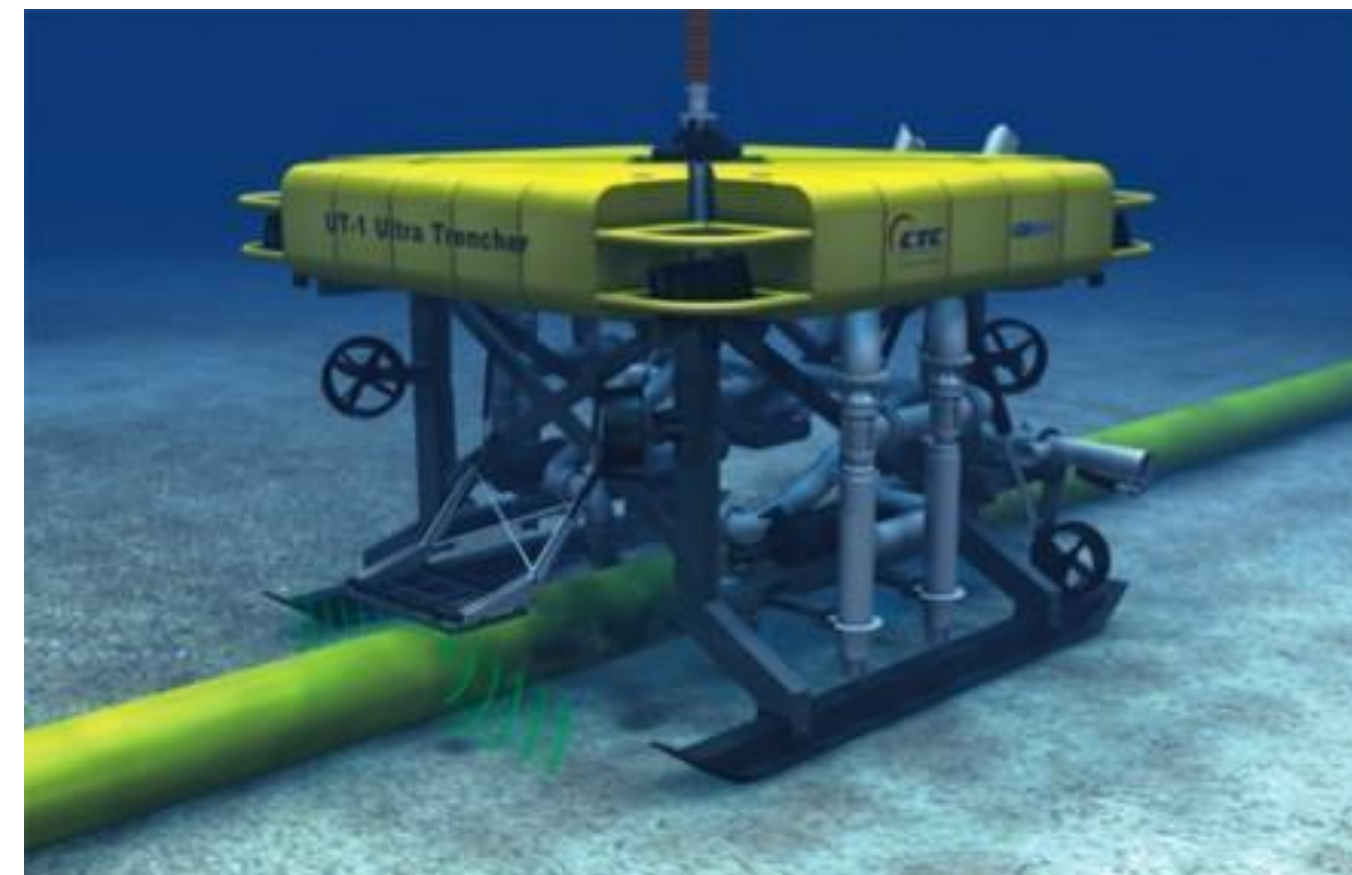
- Create a separation layer w/ assets
- Ensure stability
- Ensure protection



Laying the cable is one thing, protecting it is another: **jet trenching**



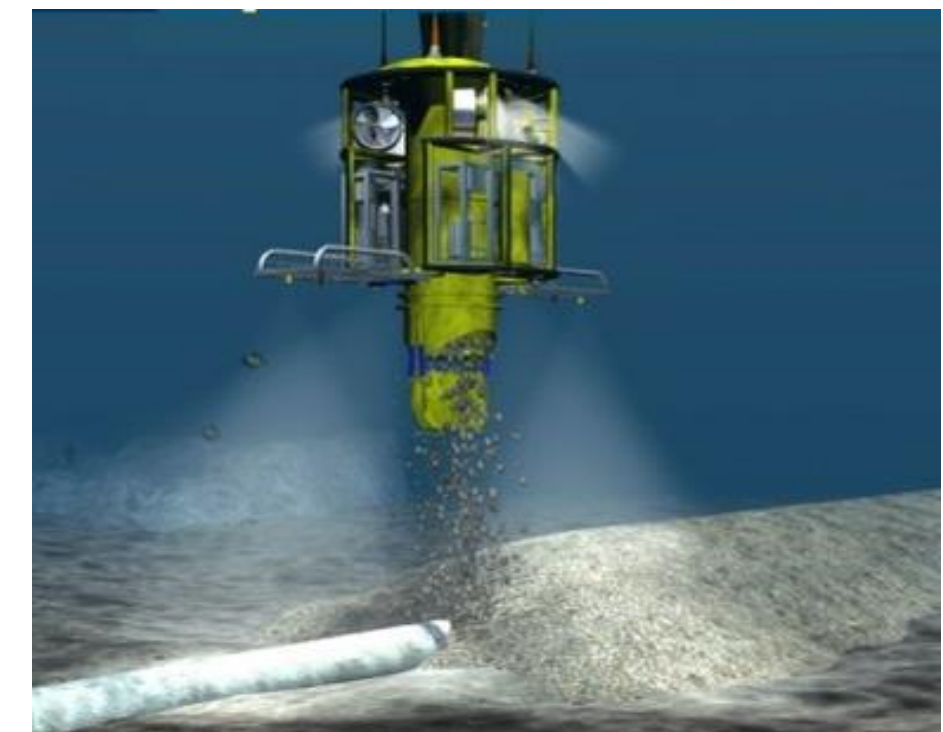
- ROV (Remote operated vehicle) PT1
- Inject water under high pressure into the soil
- Loosen up soil and let the cable sink
- Natural backfilling occurs

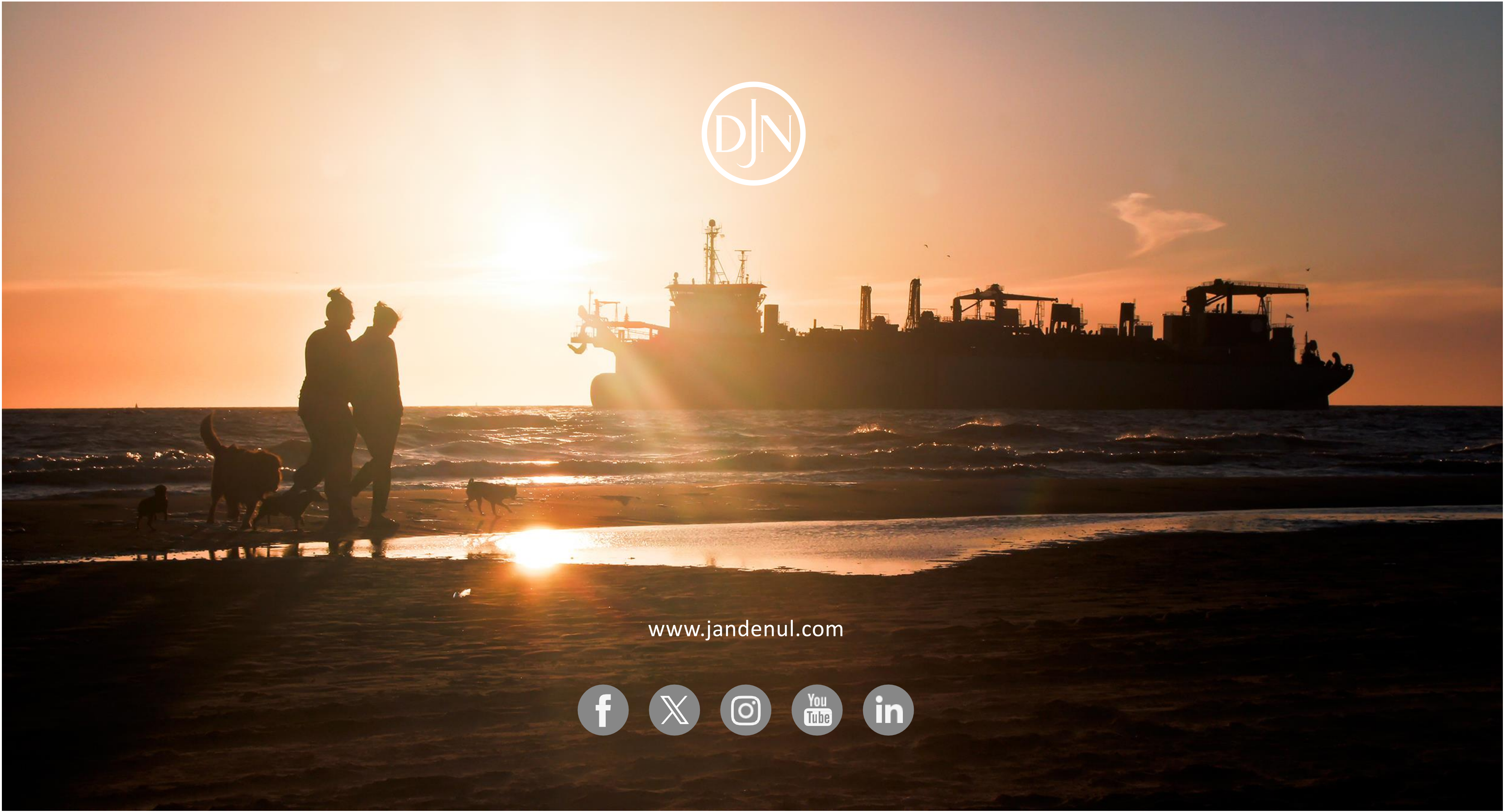


Laying the cable is one thing, protecting it is another: **rocks**



- Vessel can load up to 30,000t rocks
- Fallpipe can install rock berm up to 2,000m
- Up to 10cm precise during installation





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