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Elia presentation – EuDA conference

The strategic and security challenges of the construction of the Princess Elisabeth Island

20-11-2025

Pierre-Yves Guillermin

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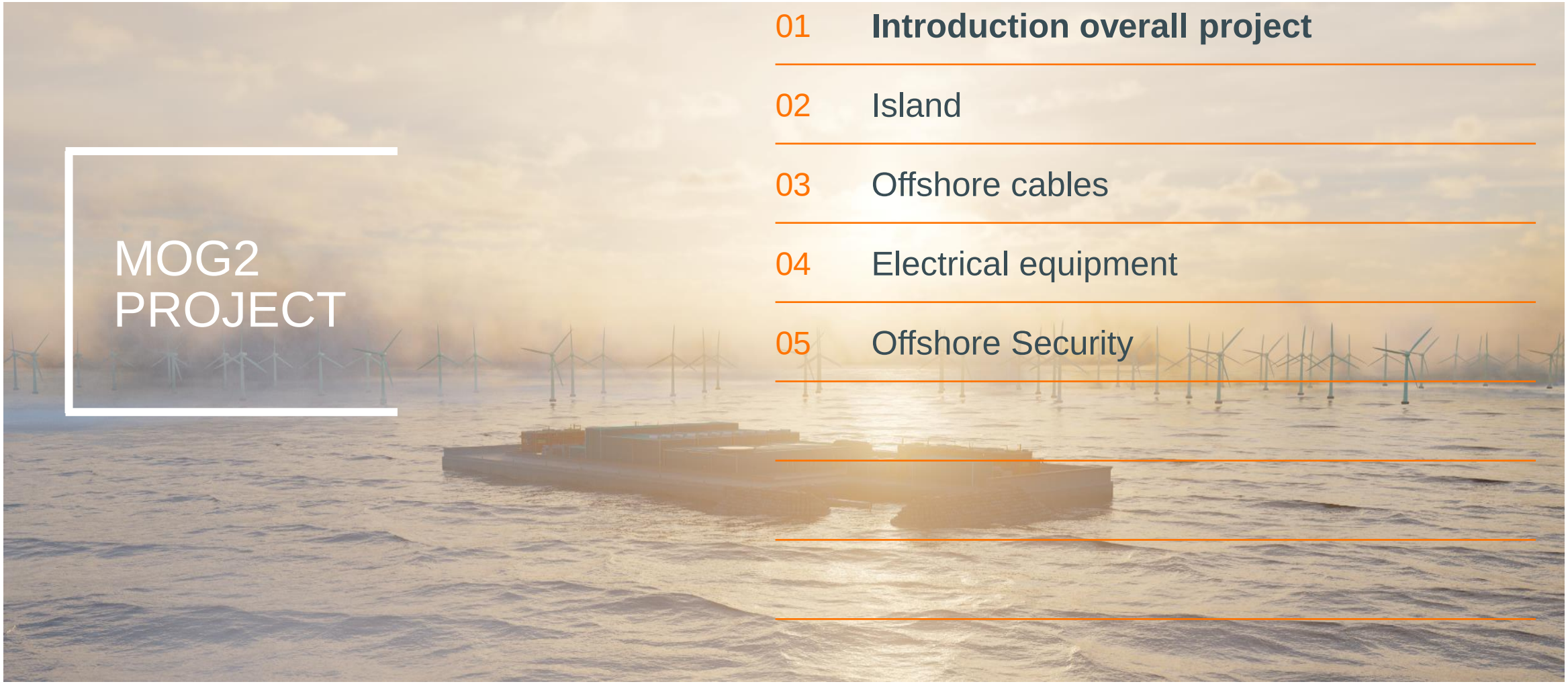

01 **Introduction overall project**

02 Island

03 Offshore cables

04 Electrical equipment

05 Offshore Security

Fundamental shifts are expected in the coming decades

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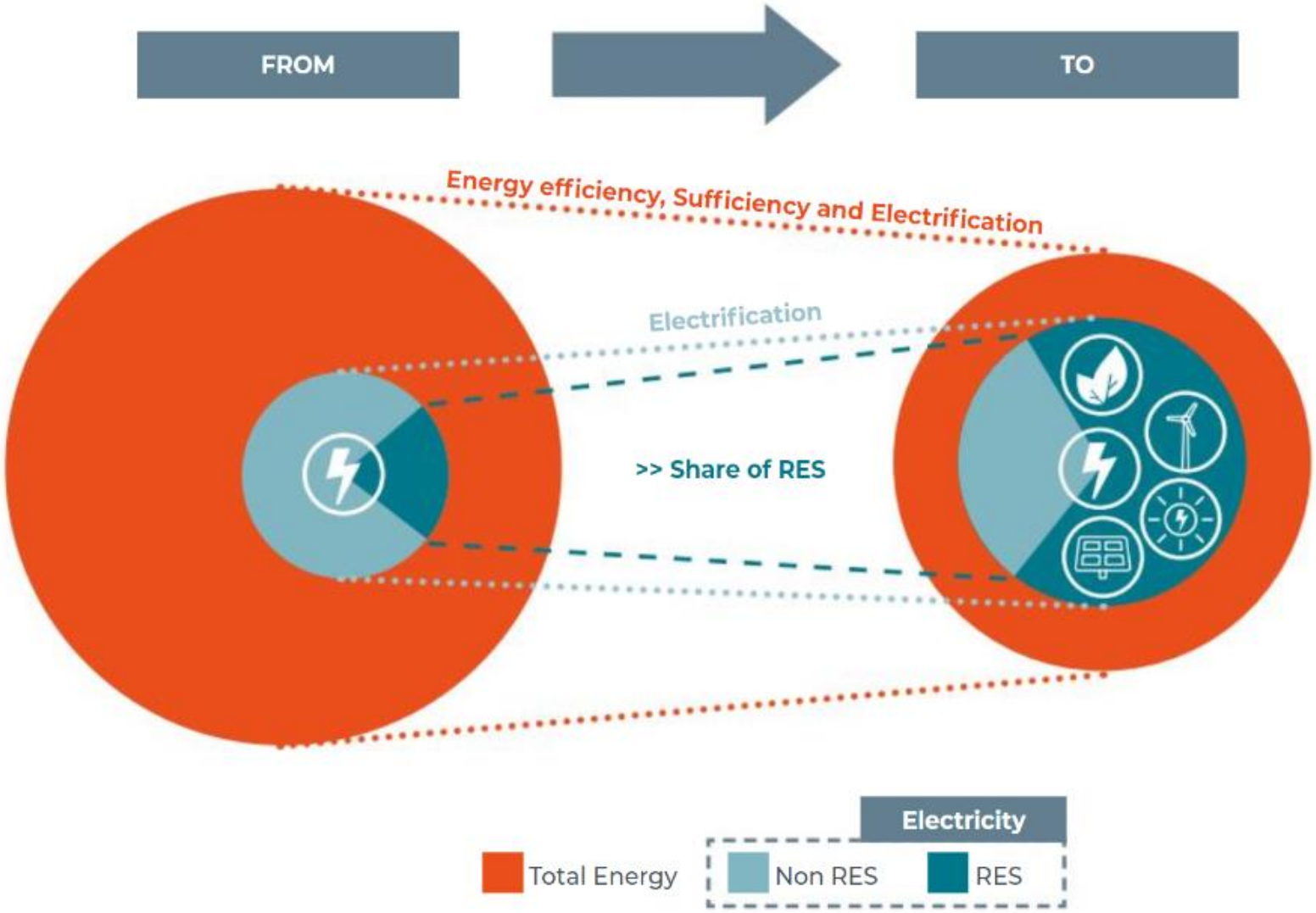

The total amount of energy consumed will be reduced through the use of additional **energy efficiency and sufficiency measures** but also through **additional electrification** as it mostly uses less energy to deliver the same energy use

The share occupied by electricity in final/ end energy consumption will increase with **additional electrification**

Renewable generation will increase both in the overall energy mix and in the electricity mix

Source: Inspired from 'Increasing the EU's 2030 emissions reduction target' report from European Climate Foundation and Climact.

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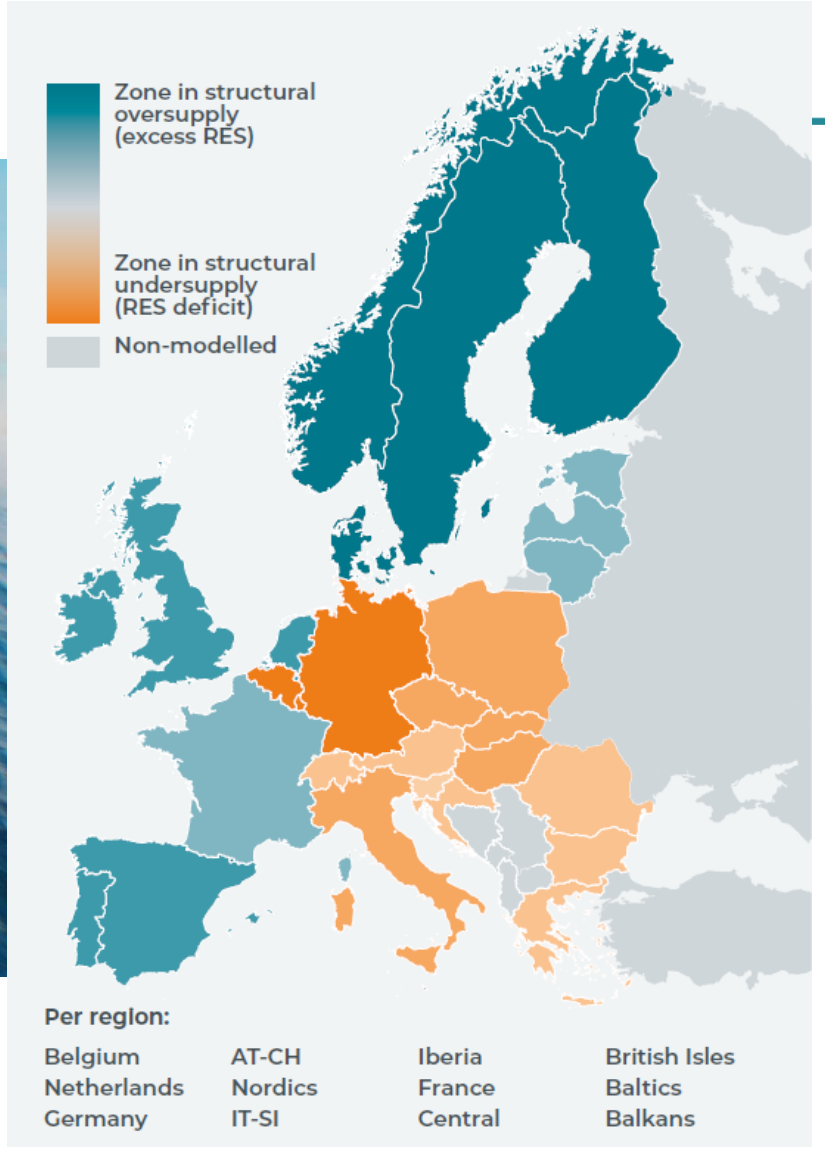

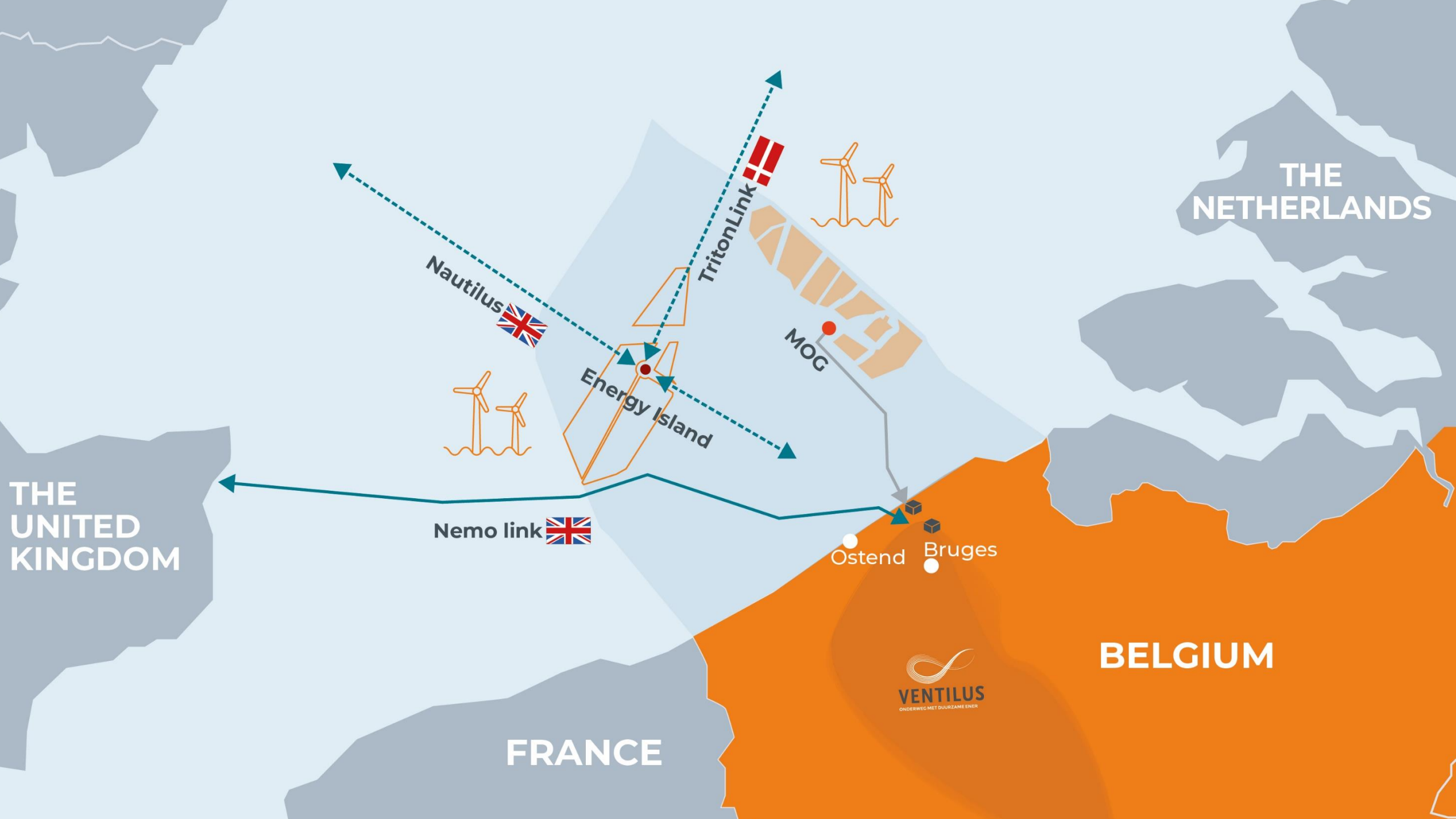
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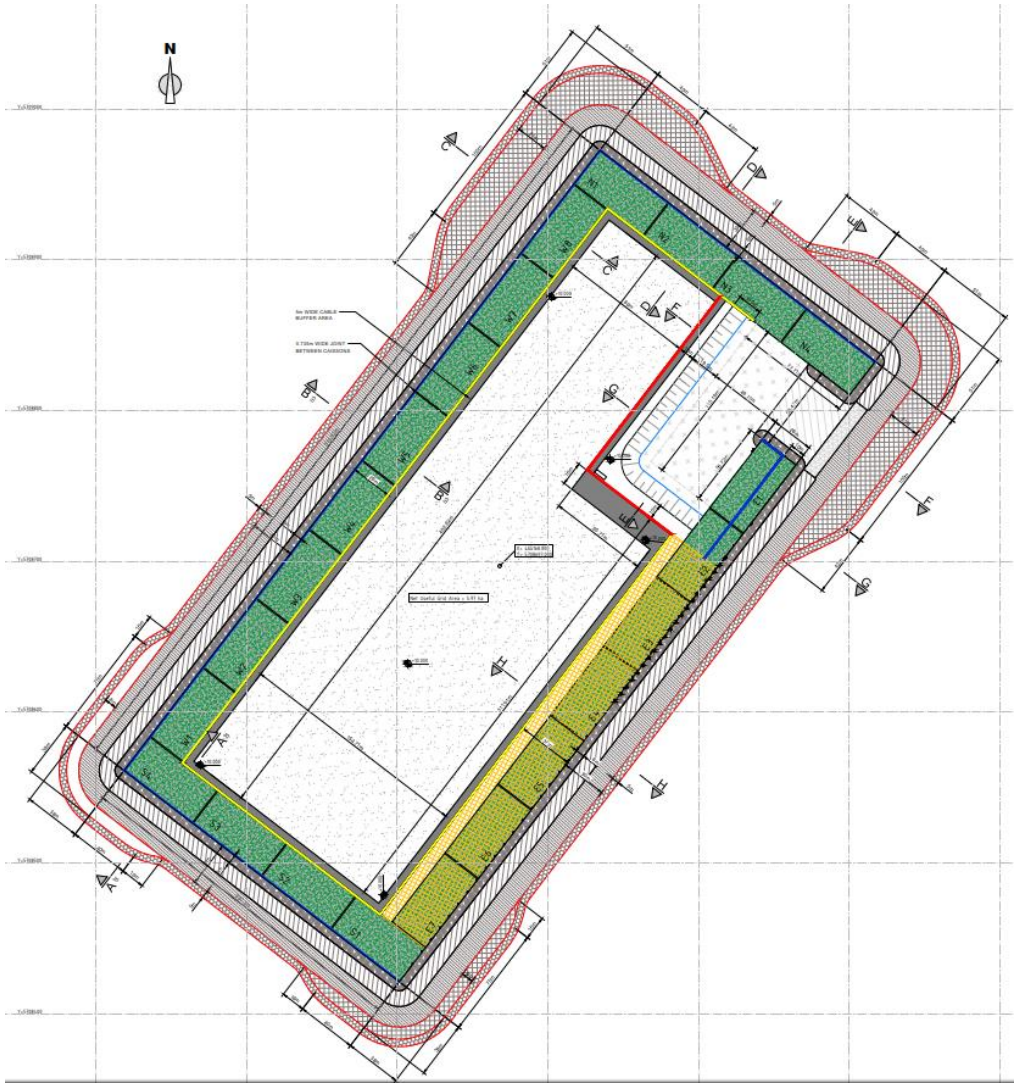
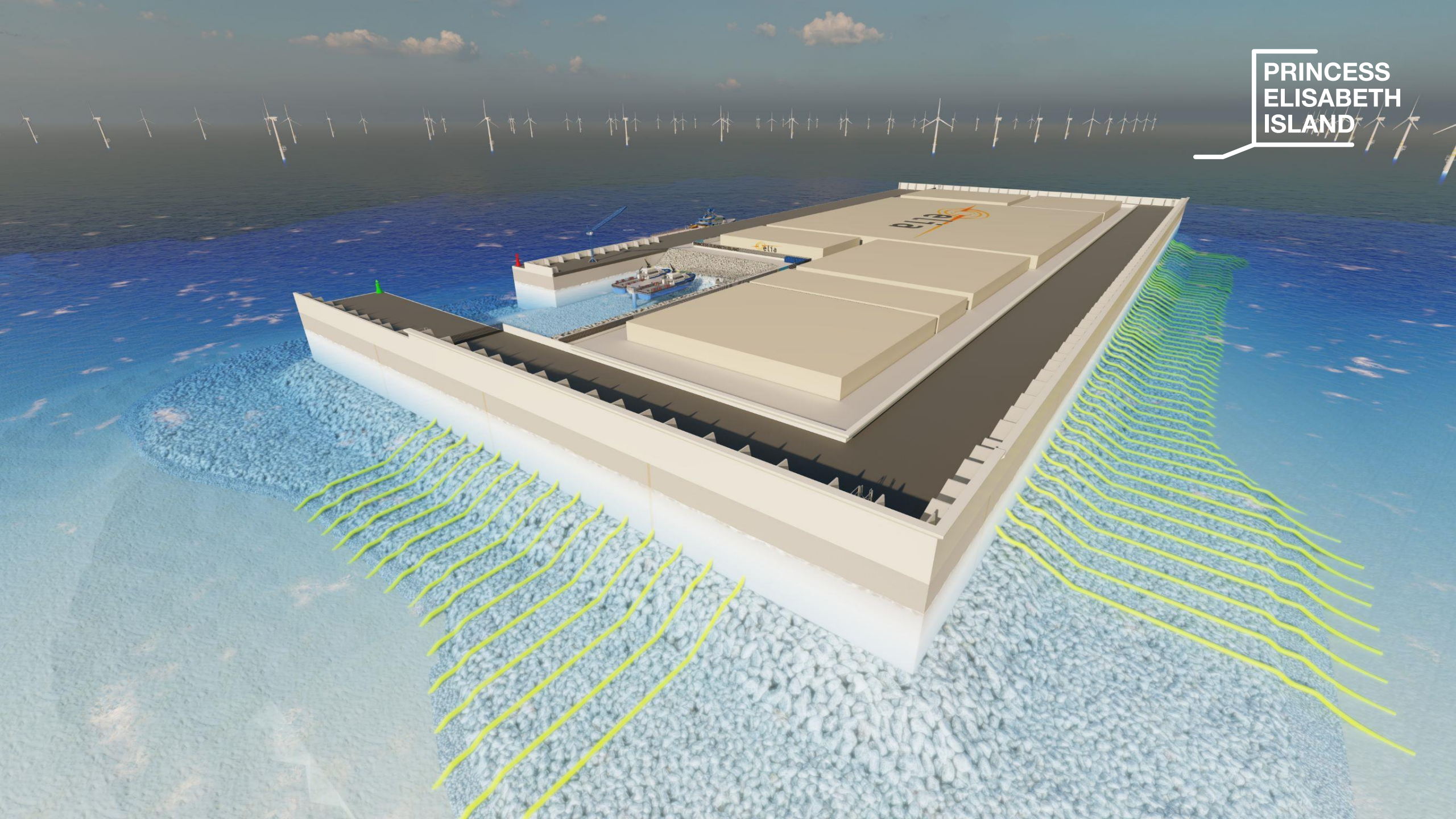
TritonLink
Nautilus
Energy Island
MOG
THE UNITED KINGDOM
Nemo link
Ostend
Bruges
BELGIUM
VENTILUS
ONDERWEG MET DUURZAME ENER
FRANCE

Introduction overall project



Main objects EPCI Works

- Fabrication, transport and installation of **23 caissons (58 m long, 28 m wide, 28-31 m high).** 200.000m3 concrete + 40.000tons rebar. + 95 cable entries.
- Procurement and installation of **rubble mound (caisson foundation) 200.000m3 , scour protection 85.000m3, toe protection 110.000m3**
- Dredging, reclamation and compaction of the island core after perimeter completion. **Total 3.000.000m3**
- Island finishing works such as **CTV harbour revetment (82.000m3), cable culverts, ring road, quay wall and CTV furniture and aids to navigation**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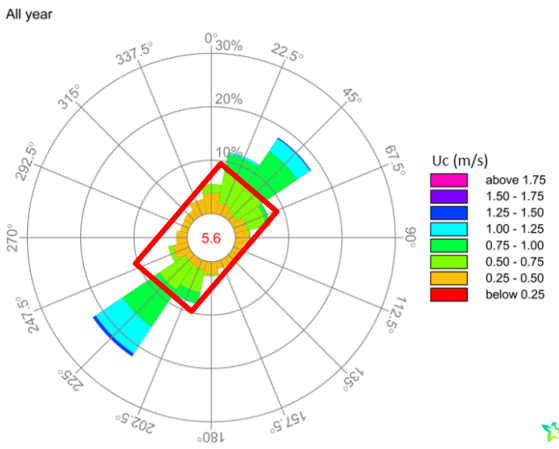
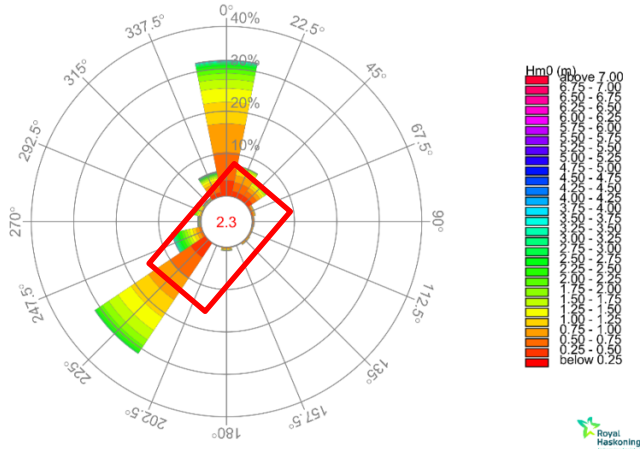
Design conditions

- Water depth ca 20m (-18mLAT to MSL +2.13mLAT)
- Sand banks (-14mLAT to -19mLAT) and sand dunes moving at 3-10m/year
- Tidal range of ca 3m in normal conditions (+0.7mLAT → +3.7mLAT). With surge & SLR this can go to < -1mLAT and > +7mLAT
- Eb & flood current of 1.2 – 1.5m/s. Near the island this is double
- Severe waves up to Hs = 7.5 – 8m, Tp = 12-13s. Strongly reflected by the island





- Directional current
- Directional waves

=> location of CTV harbour & quay

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Design changes to comply with Overtopping Requirements

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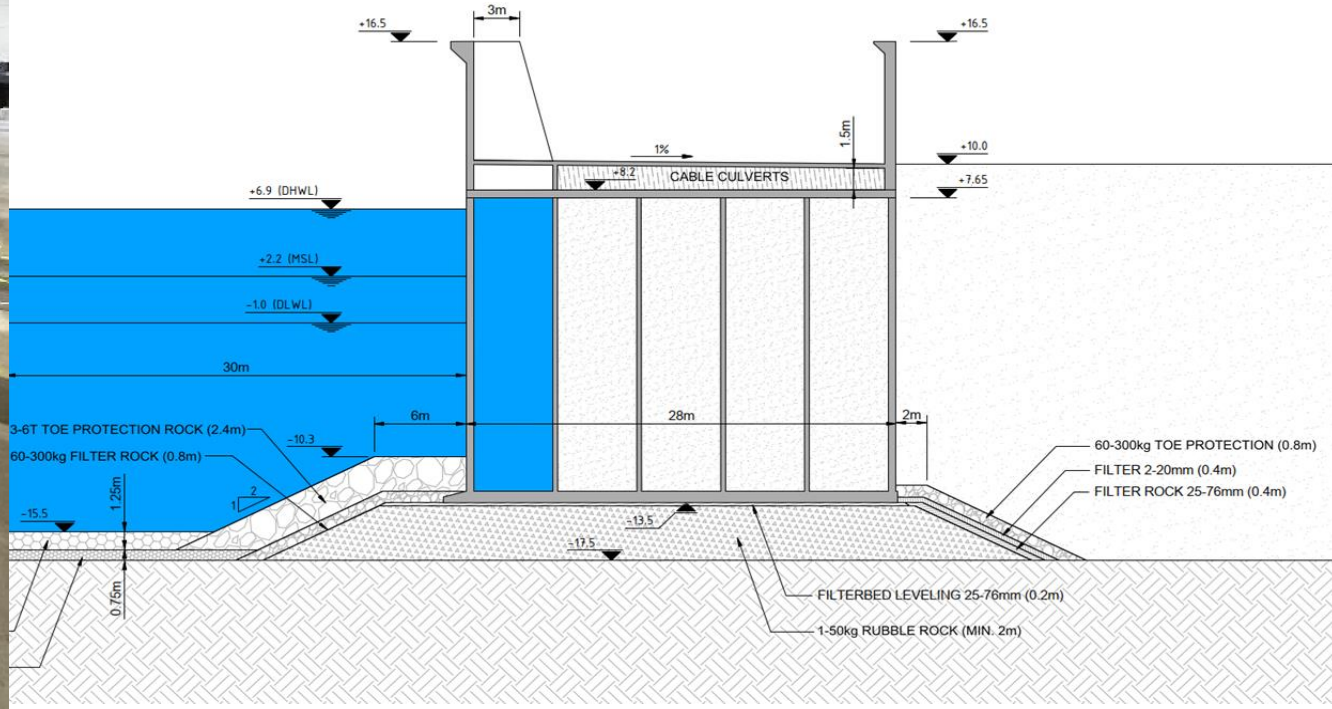
- Overtopping requirements
  - q < 1 l/m/s
  - Vmax average < 1m³/m and maximum 1.5m³/m

No correlation

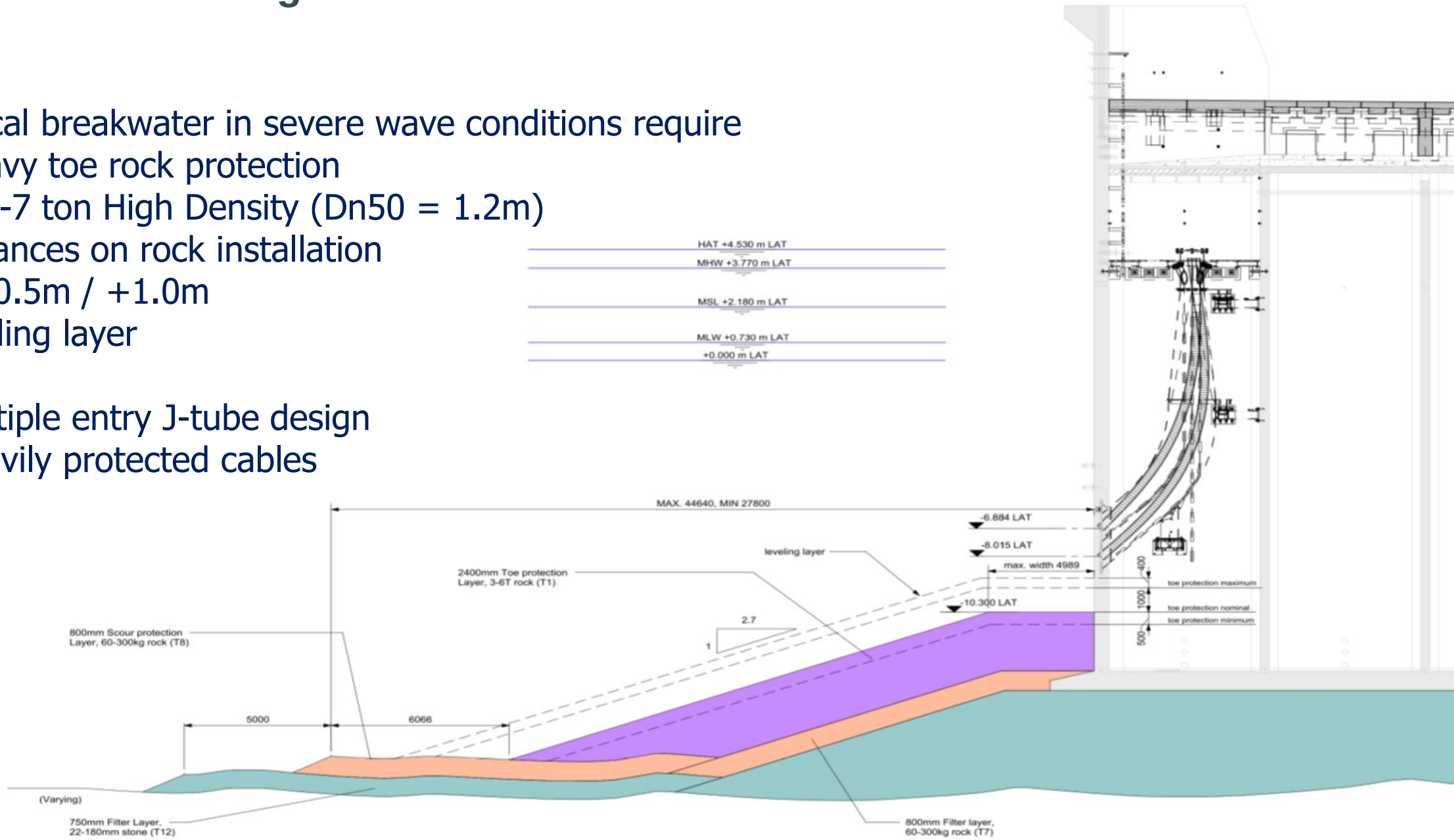


Design – cable landings

- Vertical breakwater in severe wave conditions require a heavy toe rock protection
  - 4-7 ton High Density (Dn50 = 1.2m)
- Tolerances on rock installation
  - -0.5m / +1.0m
- Levelling layer

⇒ Multiple entry J-tube design

⇒ Heavily protected cables



Cable landings

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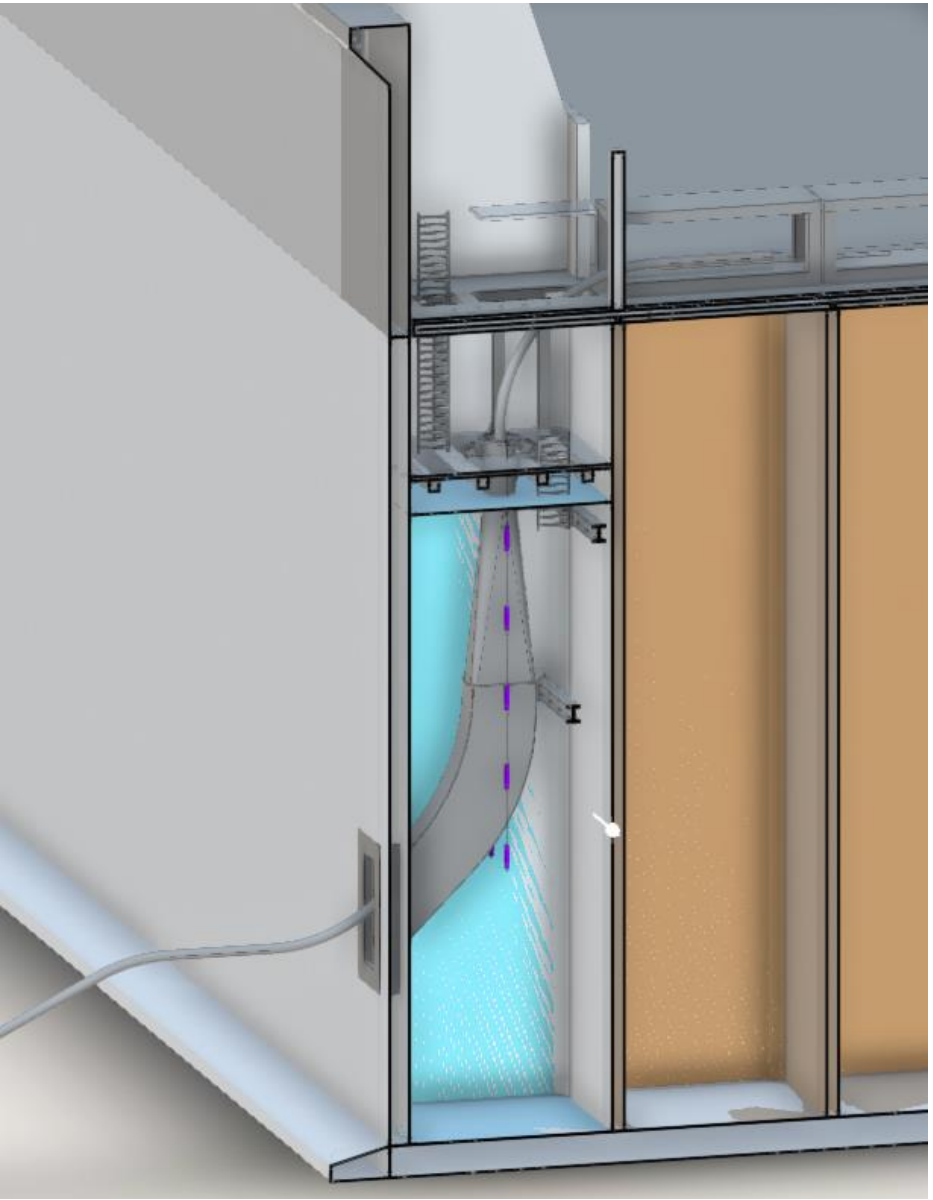

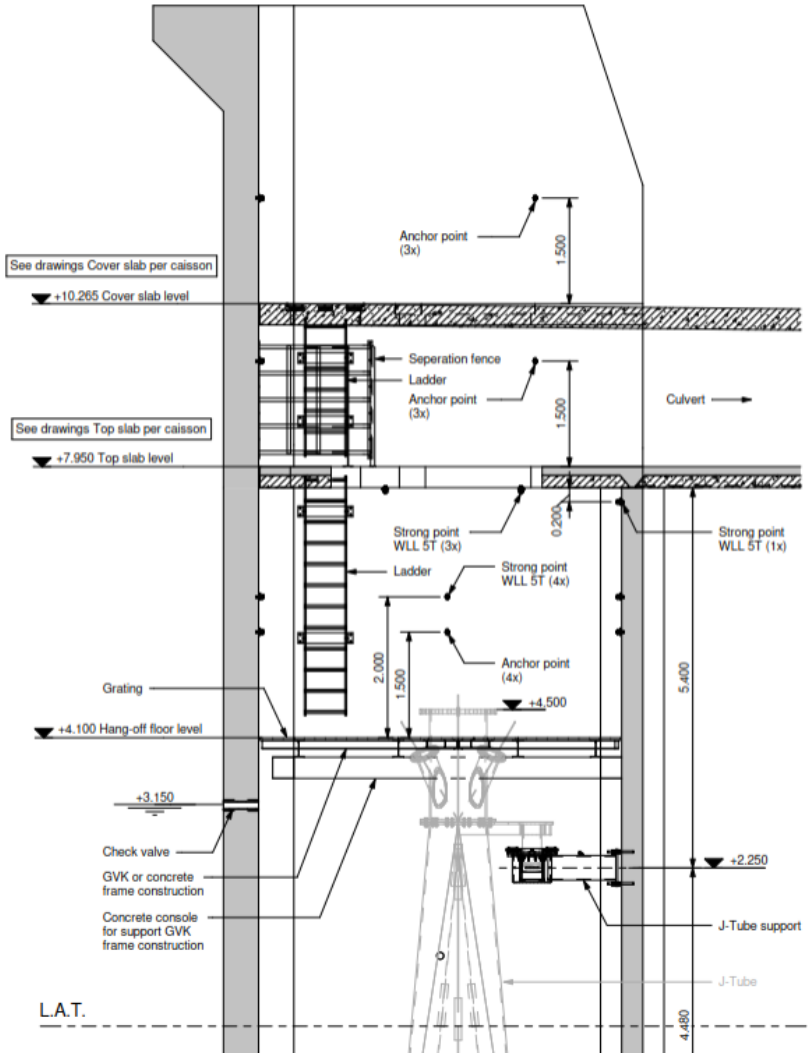

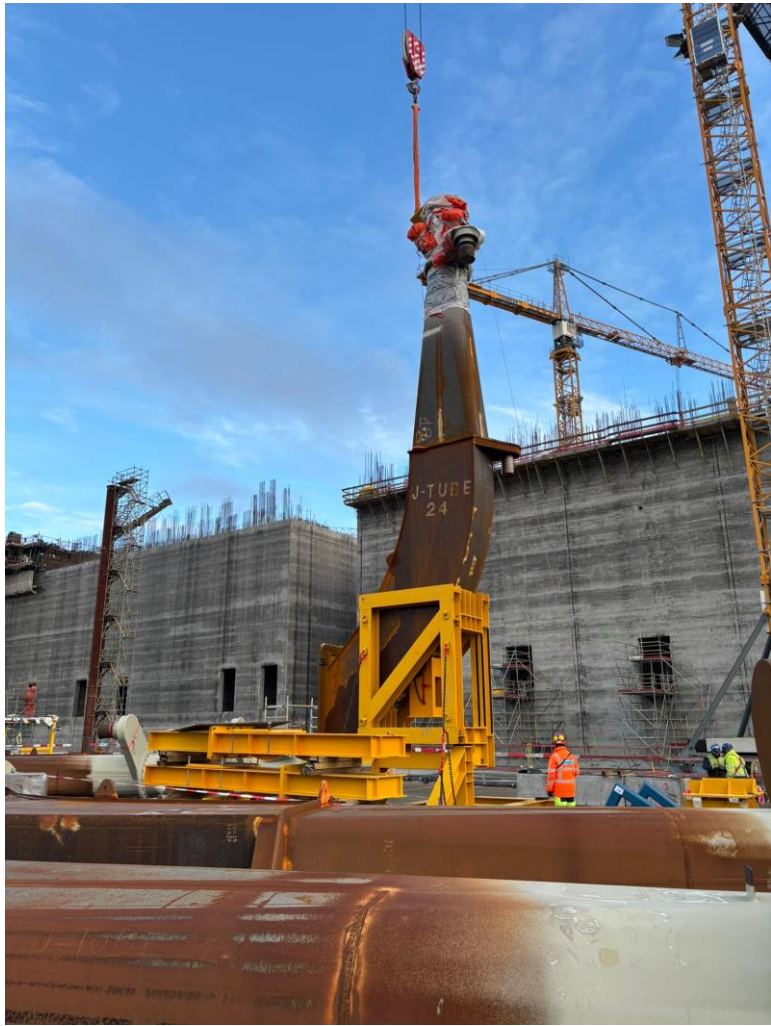

Safe access to the island

- CTV harbour for safe personnel transfers
- Quay area for larger equipment transport
- Strong cross current
- Short stopping distance

➔ Real Time Simulations at Siport21 (Madrid)

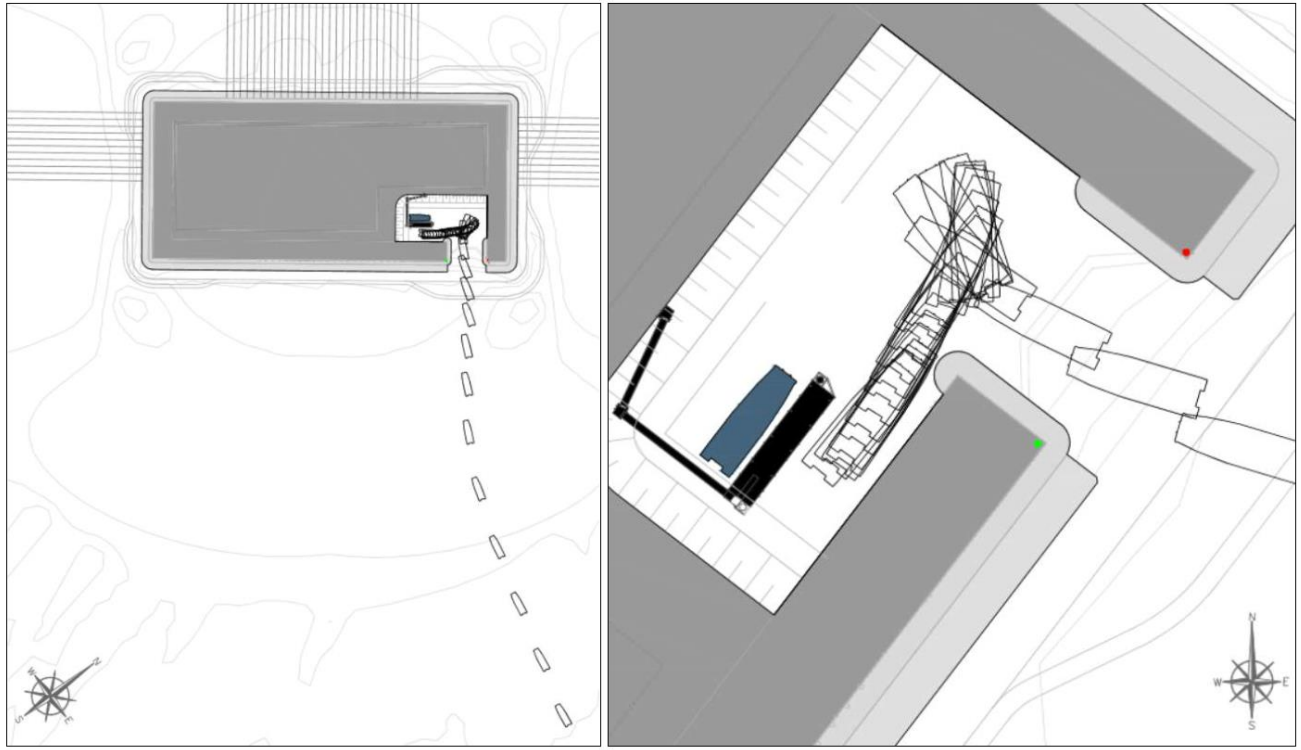

Figure 11. Approach East berth. Flood spring current, SW 28 kn wind

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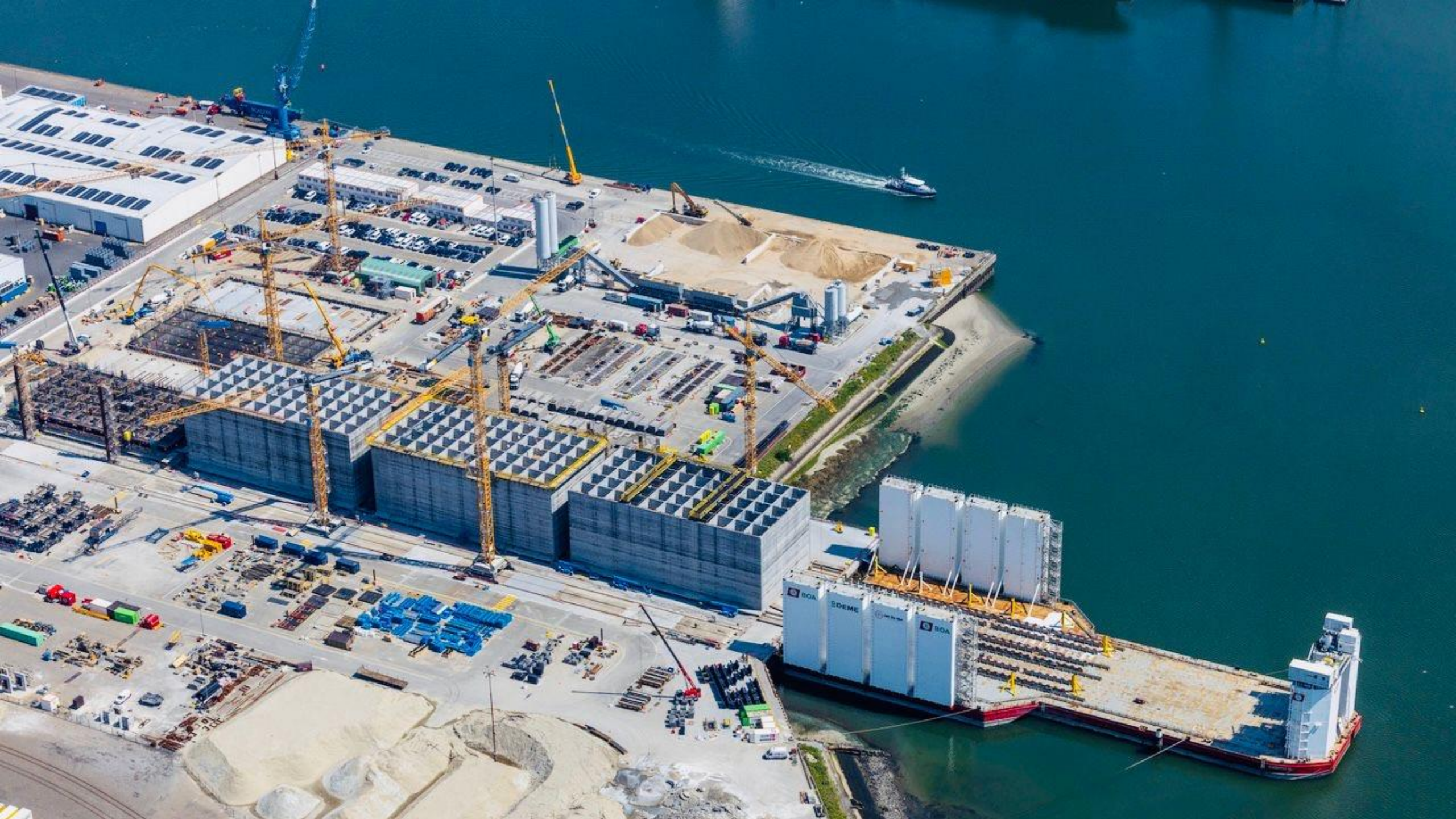
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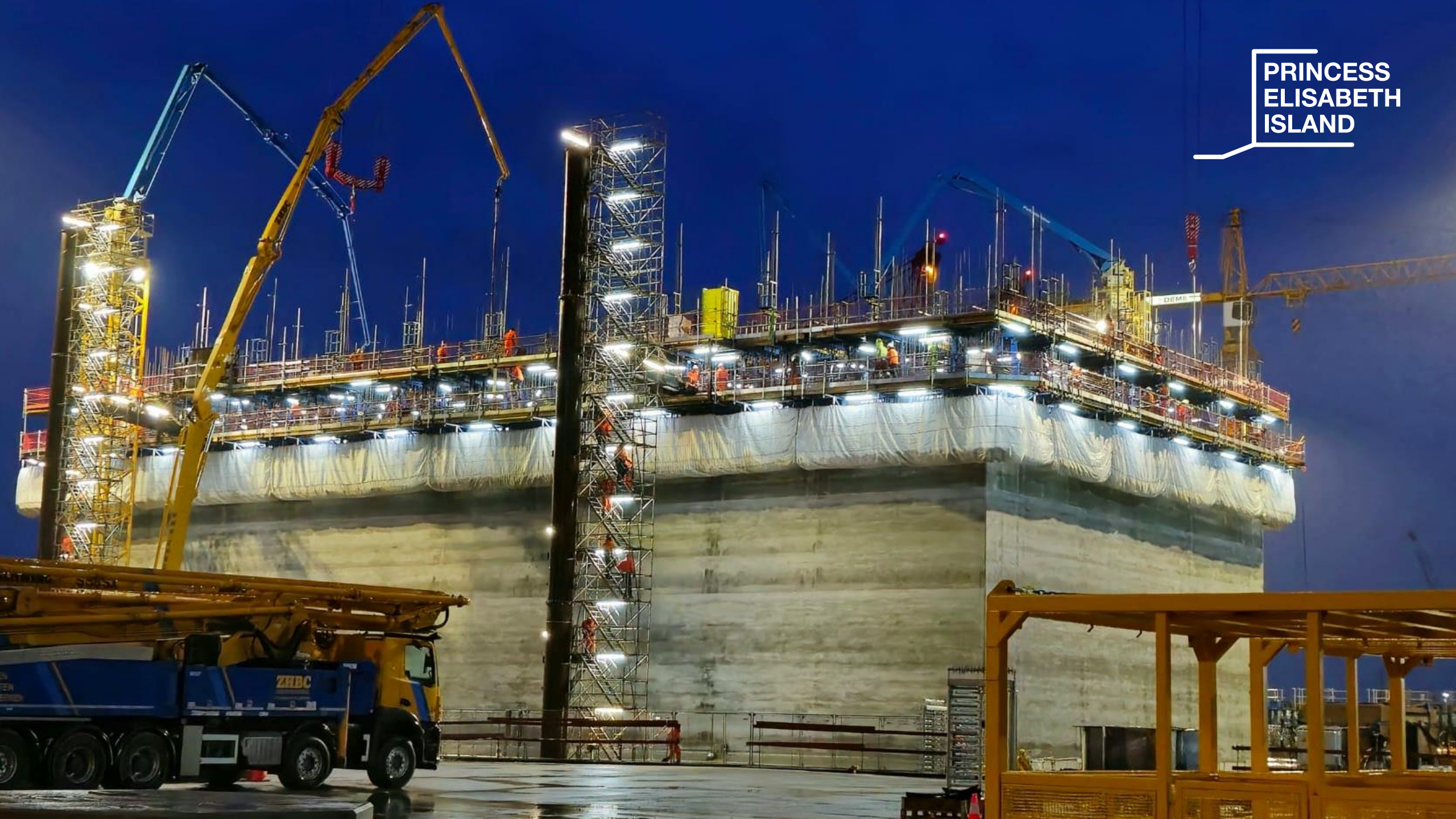
BOA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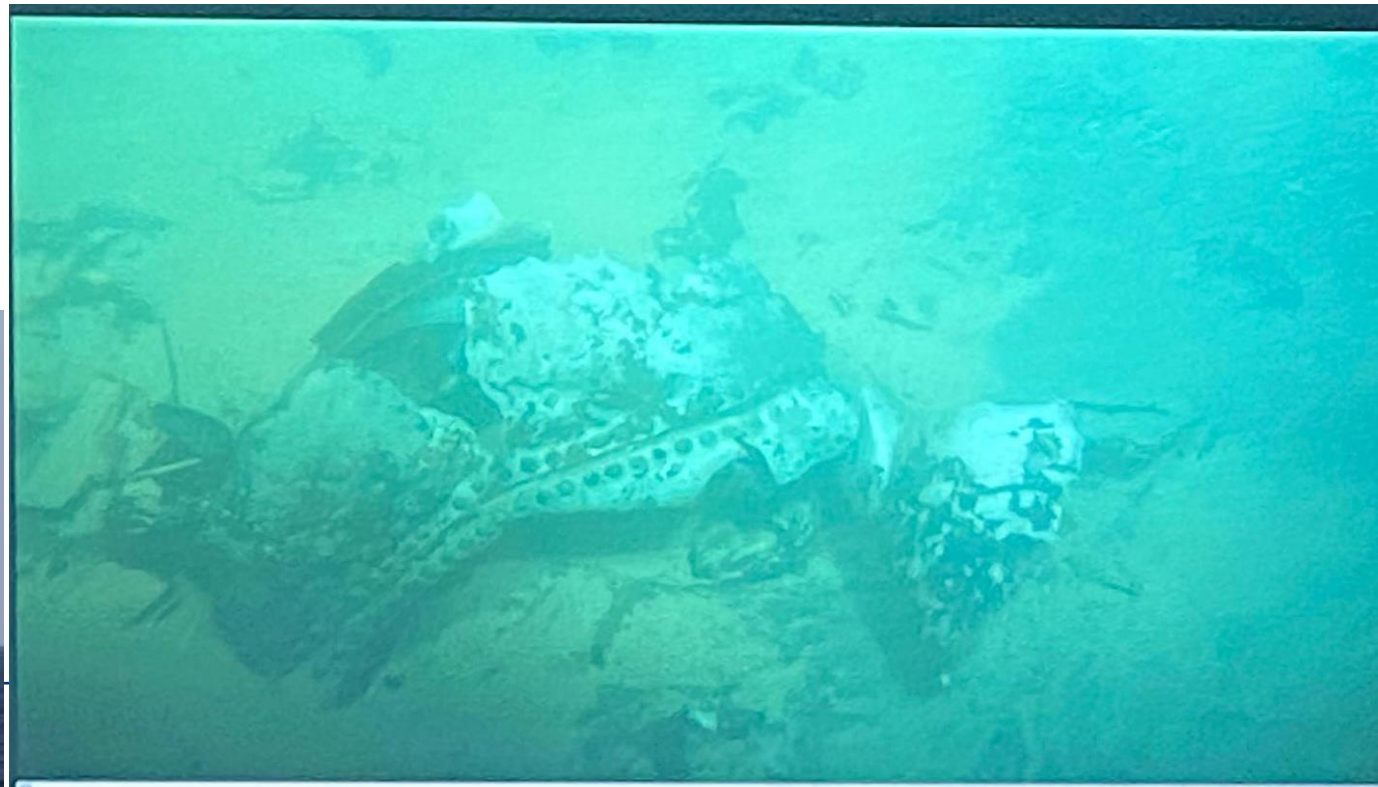
Offshore preparation works

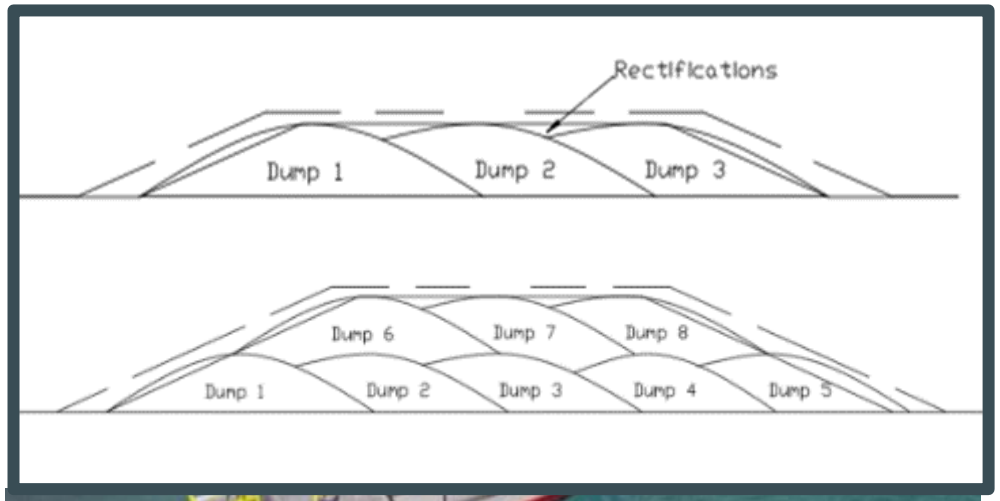
- Geophysical + geotechnical surveys
- UXO survey + removal

ELIA – MOG2 ALARP CERTIFICATE (PRINCESS ELISABETH ENERGY ISLAND CONSTRUCTION)

Elia Doc Number: ***MOG2-RPS-WPZ-MSV-REP-0004***



Offshore activities 2024



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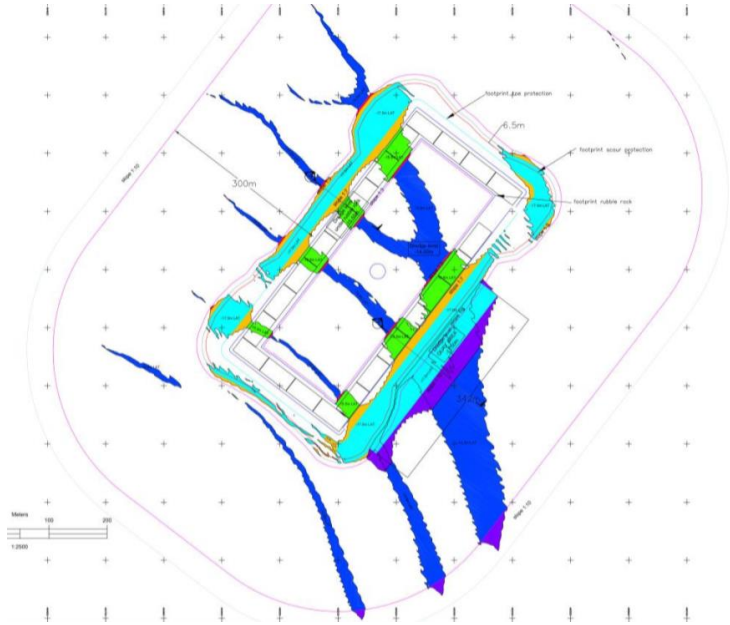
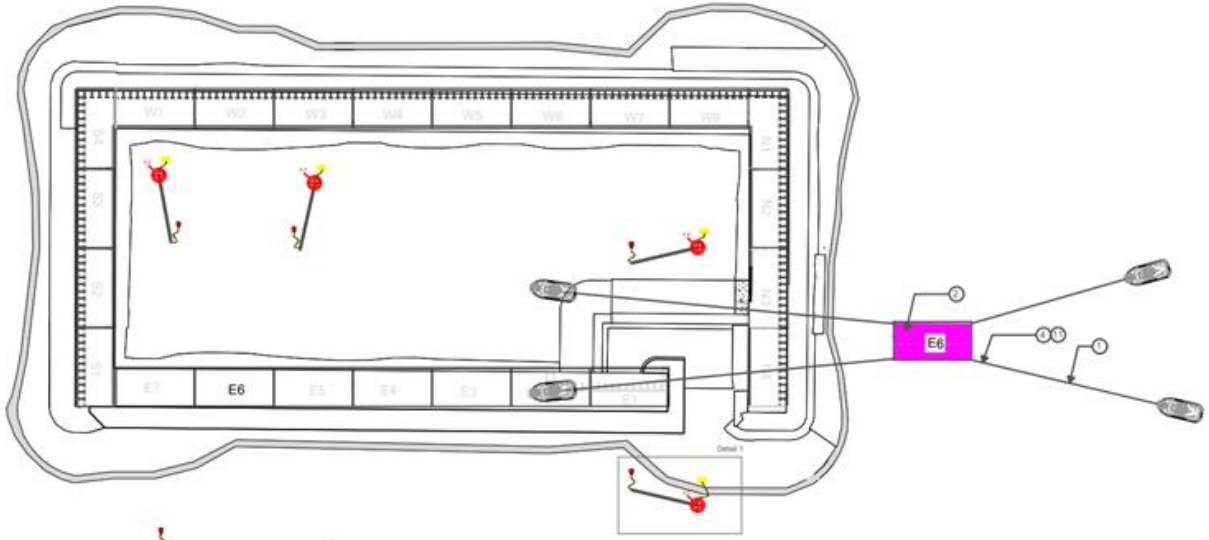
- Pre scour dredging
- Rock foundation installation (rubble mound + scour protection



Offshore activities 2025



- Foundation levelling
- Install as many caissons as possible
- Fill caissons with local sand
- Install rocks for stability and winter protection
- Remaining works in summer 2026

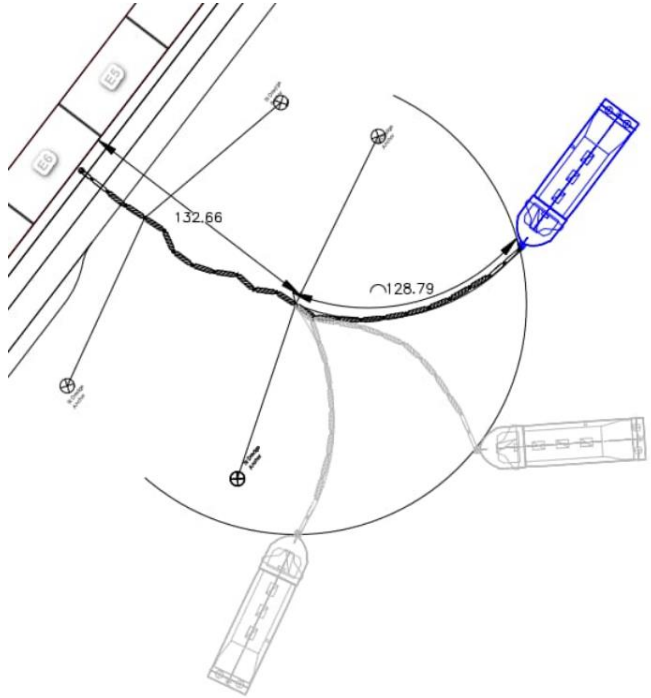
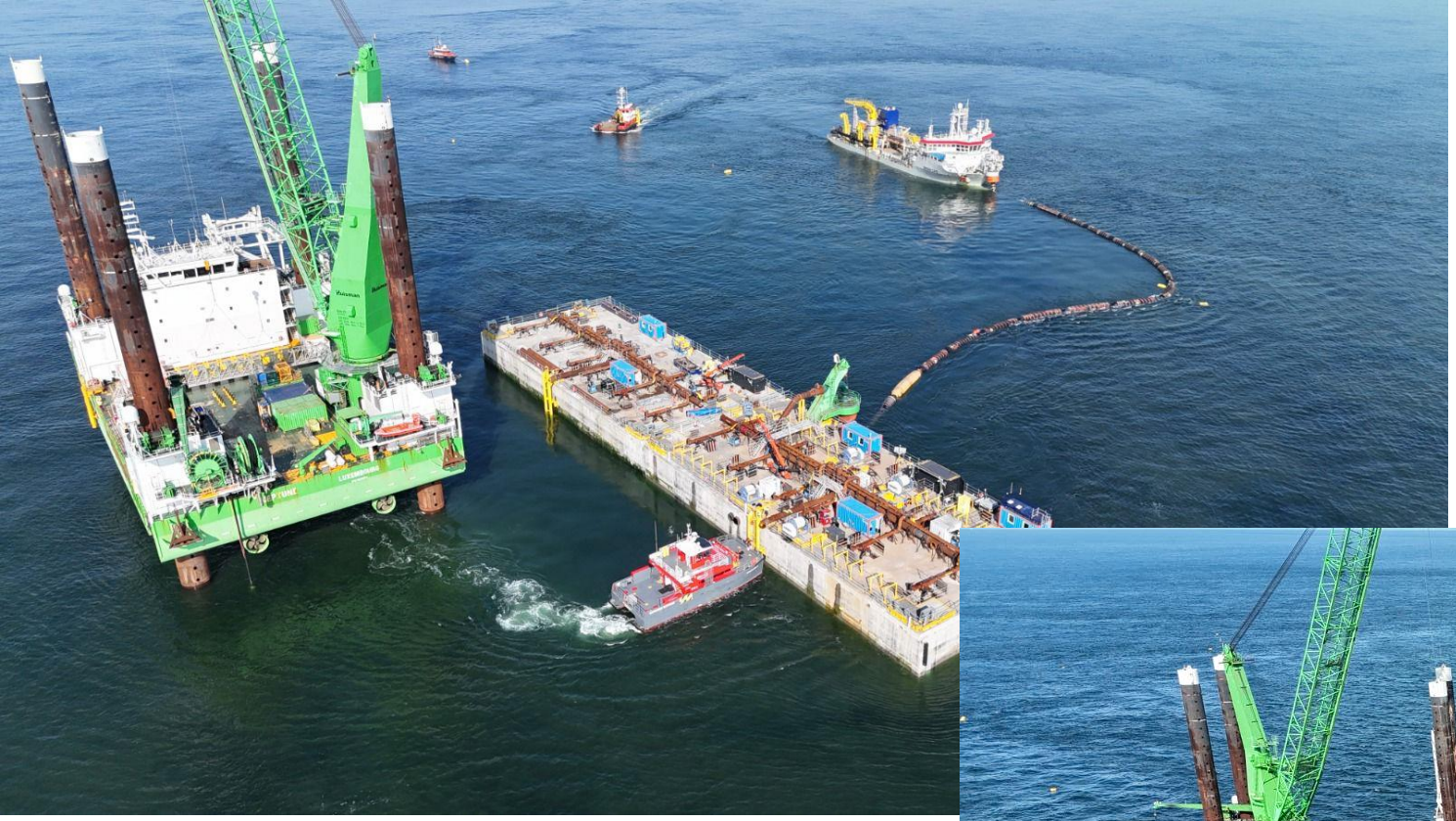


Figure 21: Floating pipeline and Tristão da Cunha preliminary lay-out sketch.


HW80CT



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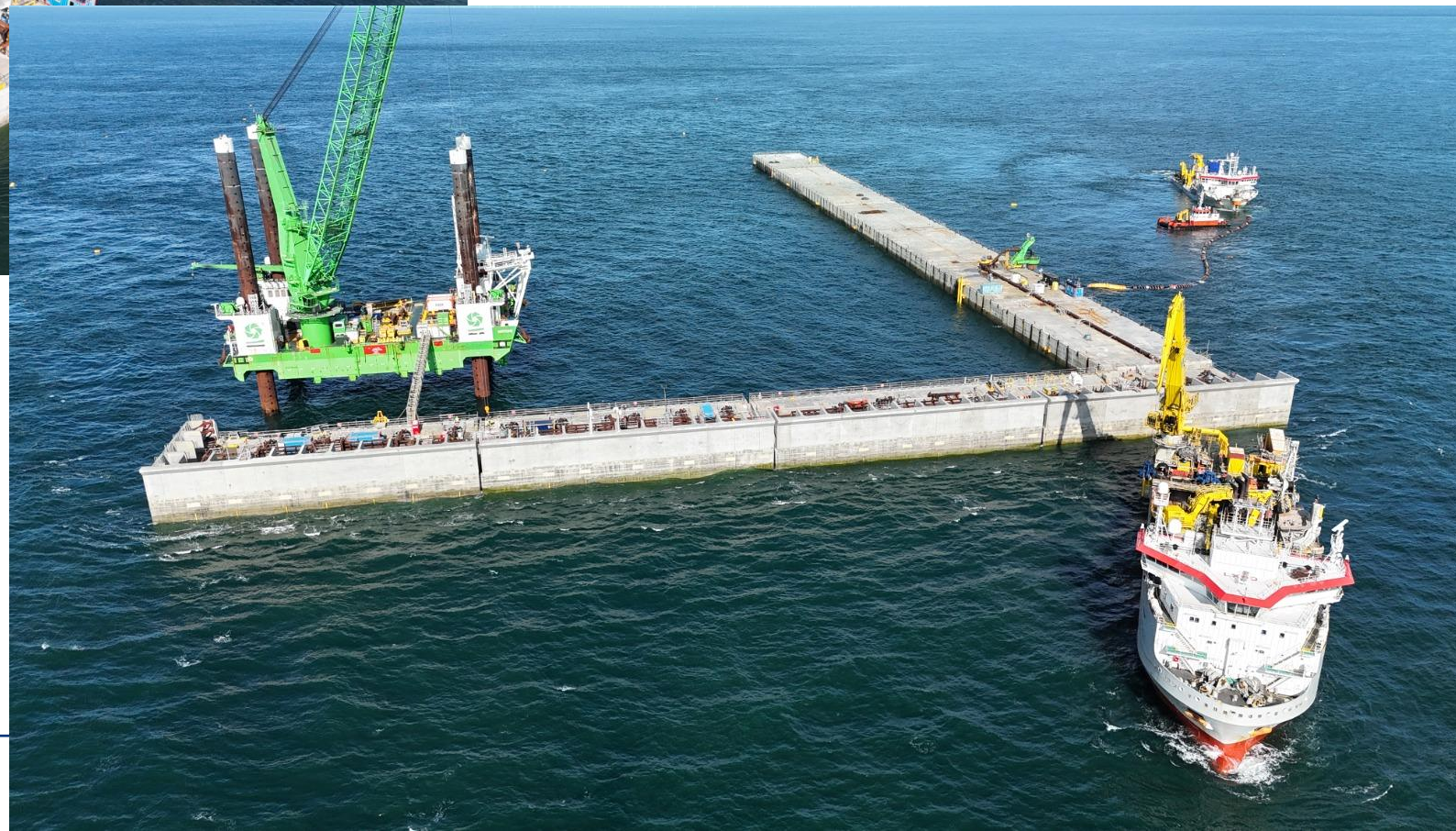
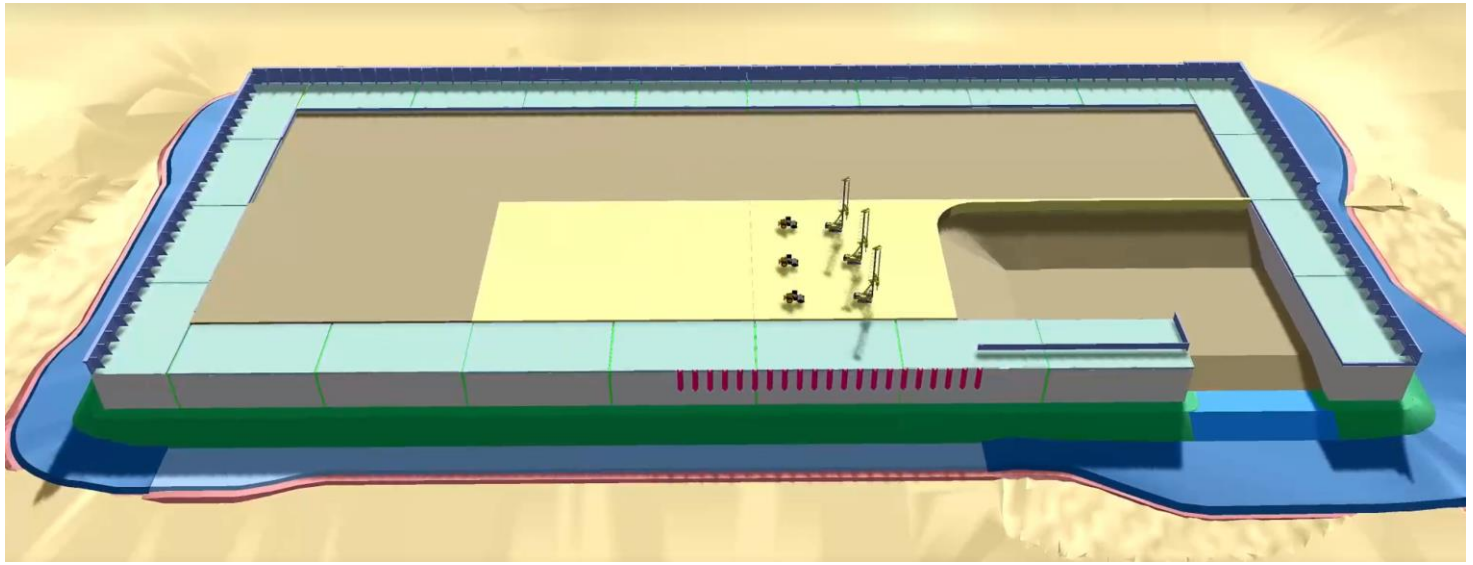
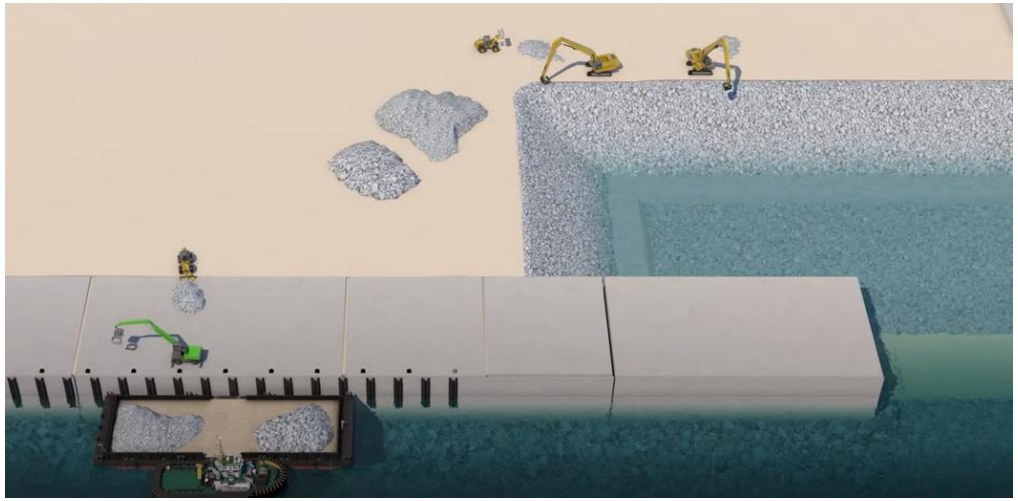


Offshore activities 2026

- Install remaining caissons
- Finalizing reclamation via pumping/dumping
- Compaction
- Finalize CTV harbor and quay wall
- Complete remaining works





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Grid topology

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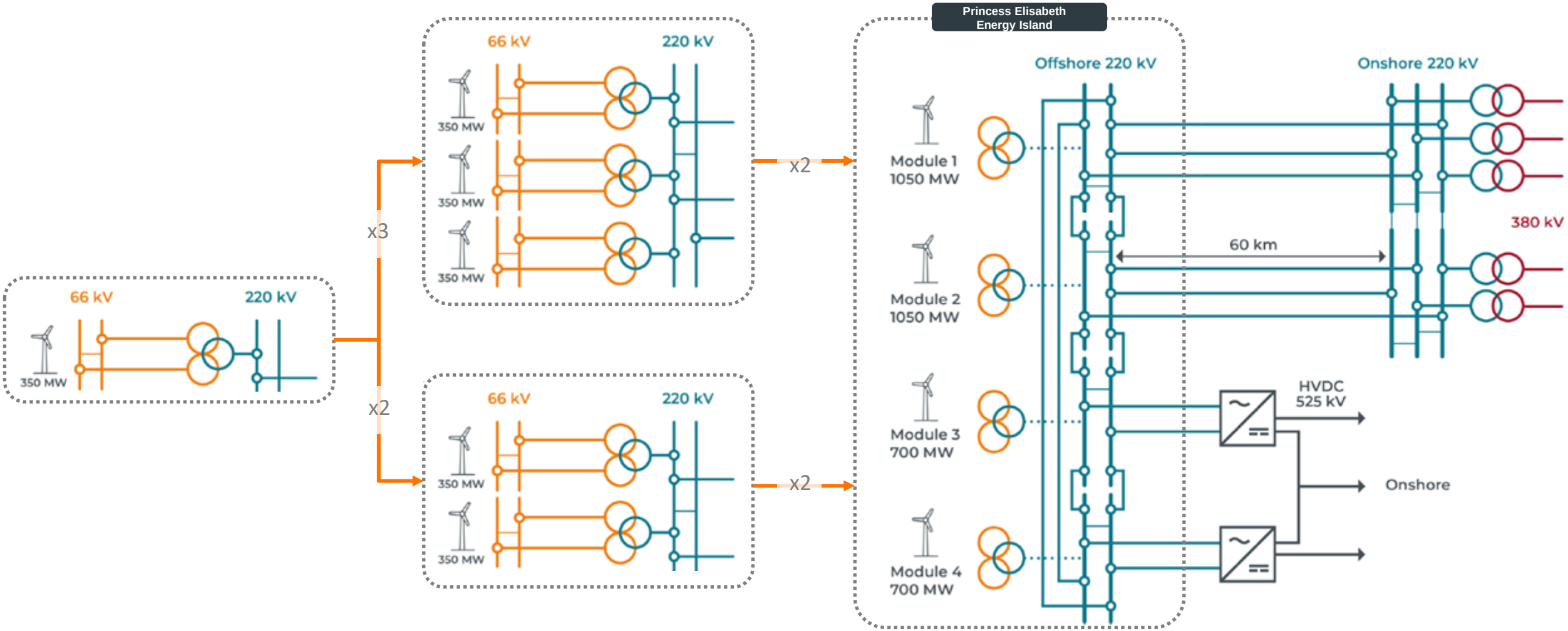

DC offshore cables consist of single core cables which could be bundled prior to installation

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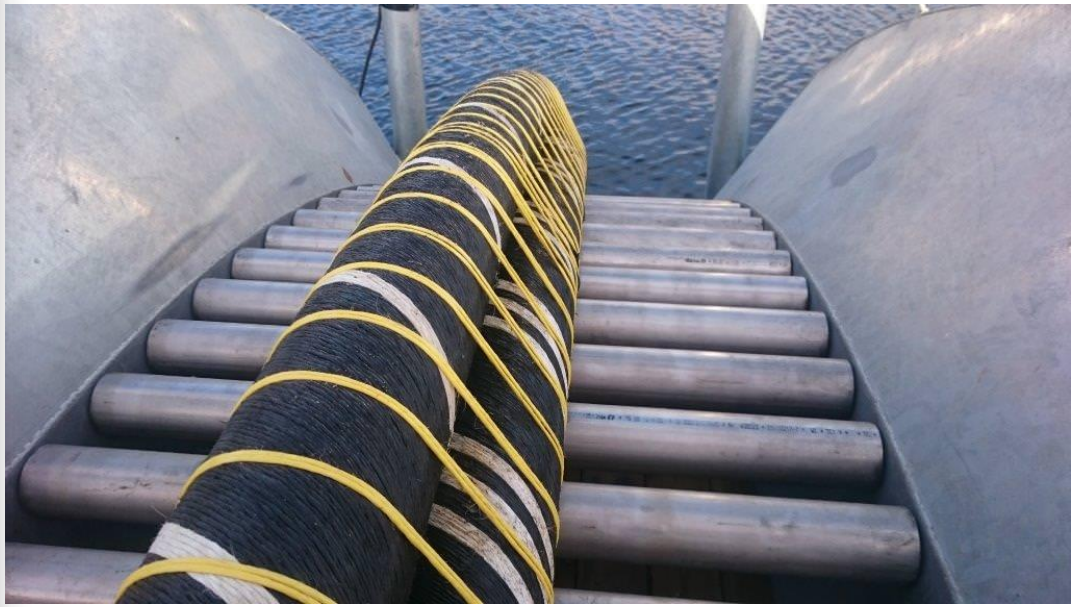
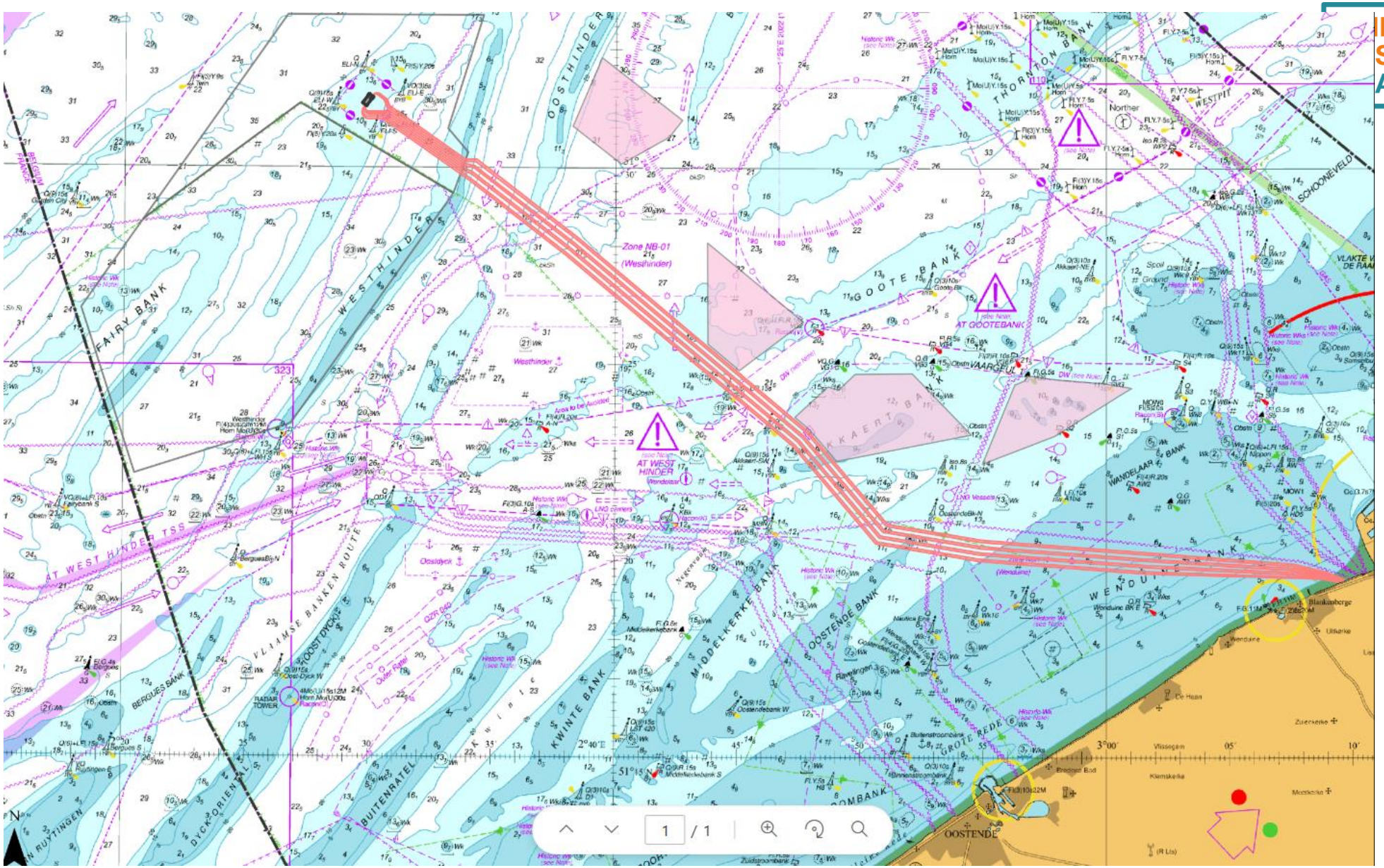
AC three phase cable

DC bundled cable



Source: https://balticoffshore.se/equipment/bundling-machines/

Offshore cable route



1. Cable crossings
2. Cable landing onshore/offshore
3. Cable thermal conductivity and fatigue
4. Amount of cables
5. Cable protection

Main challenges: offshore cables

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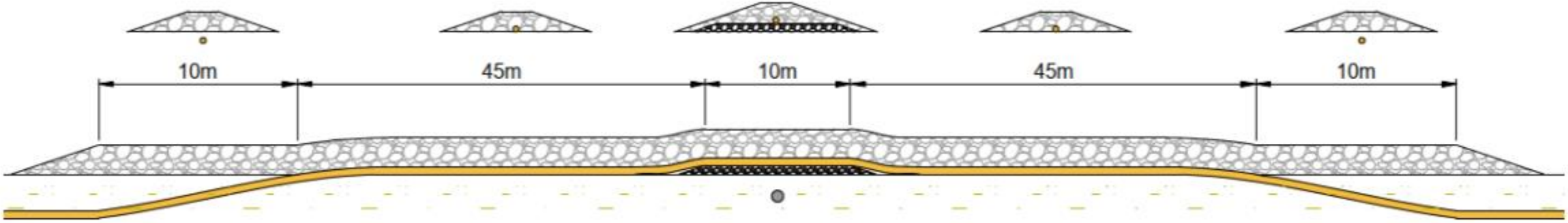

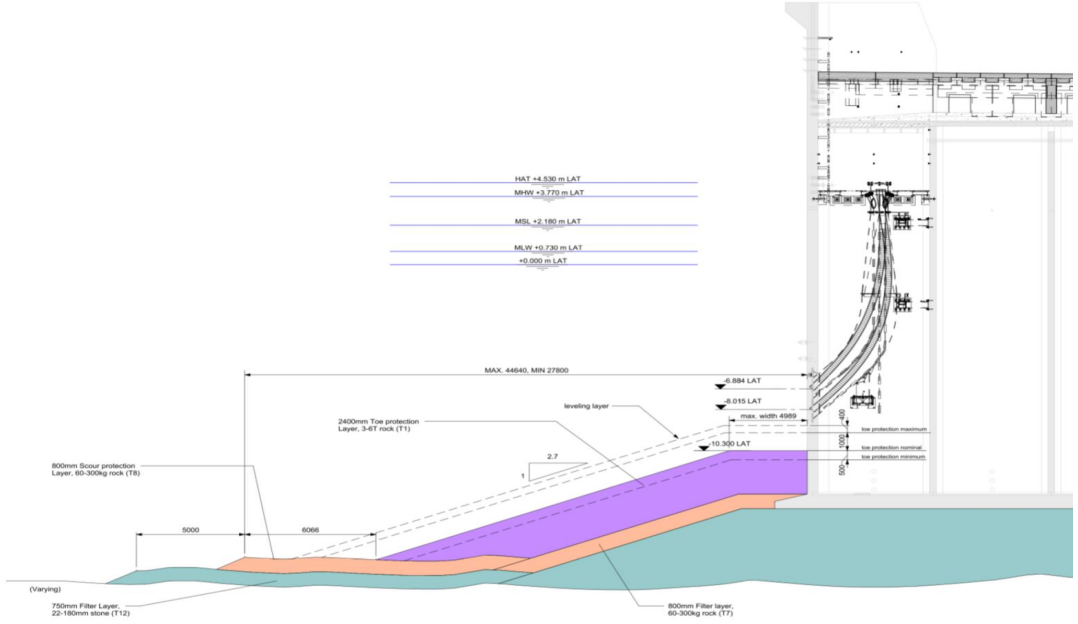

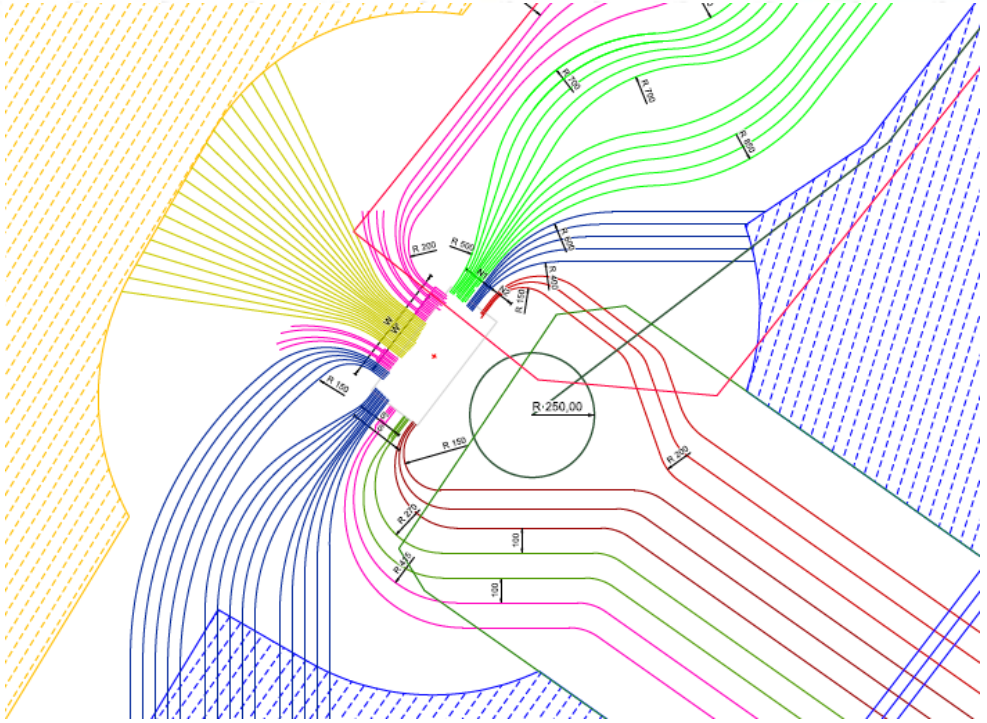

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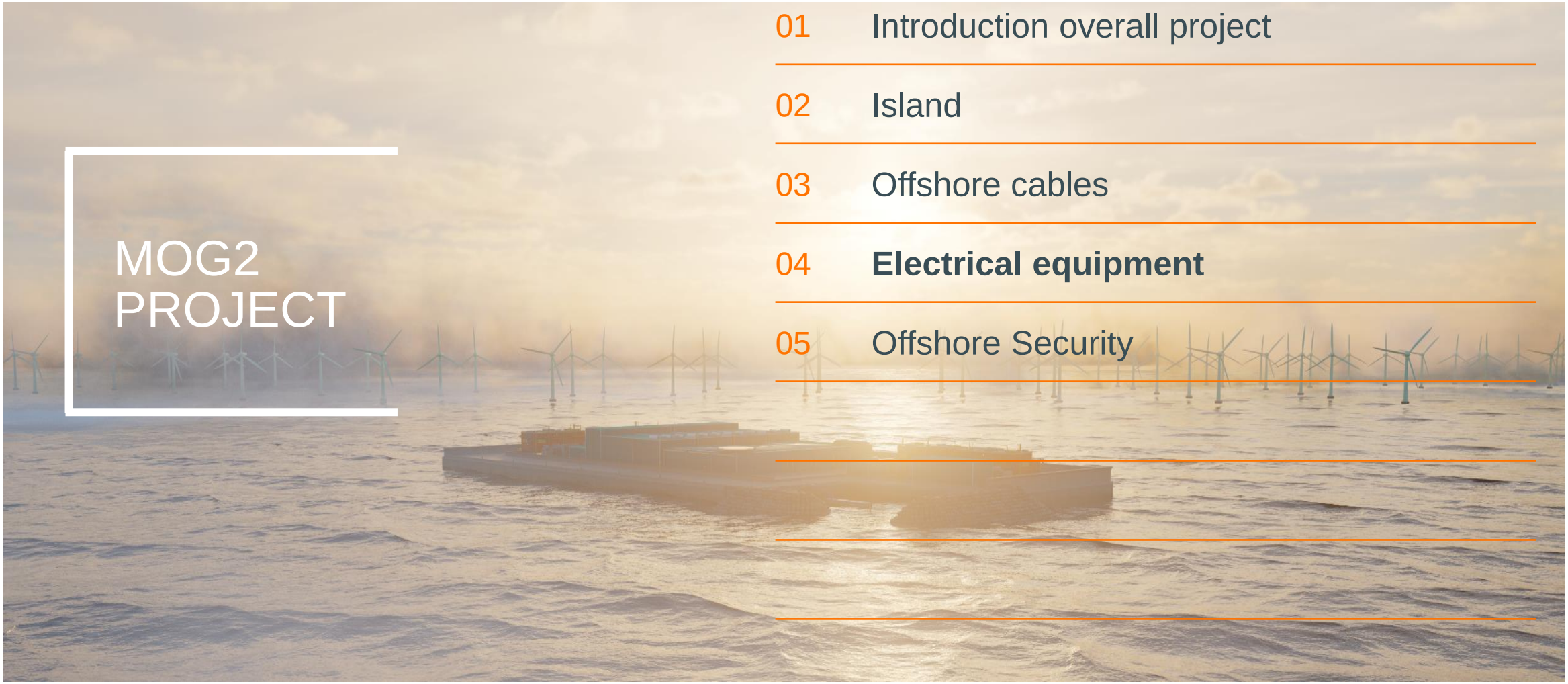

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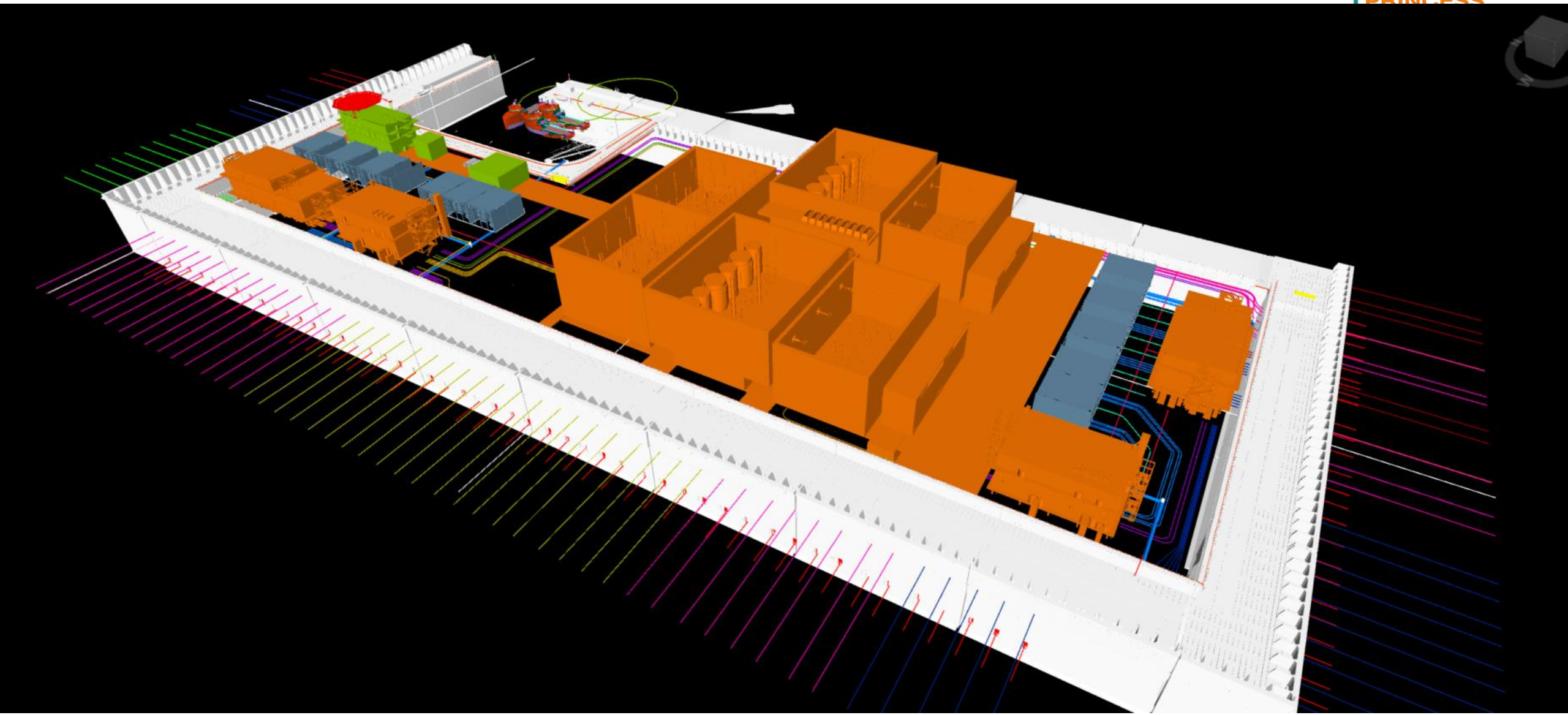

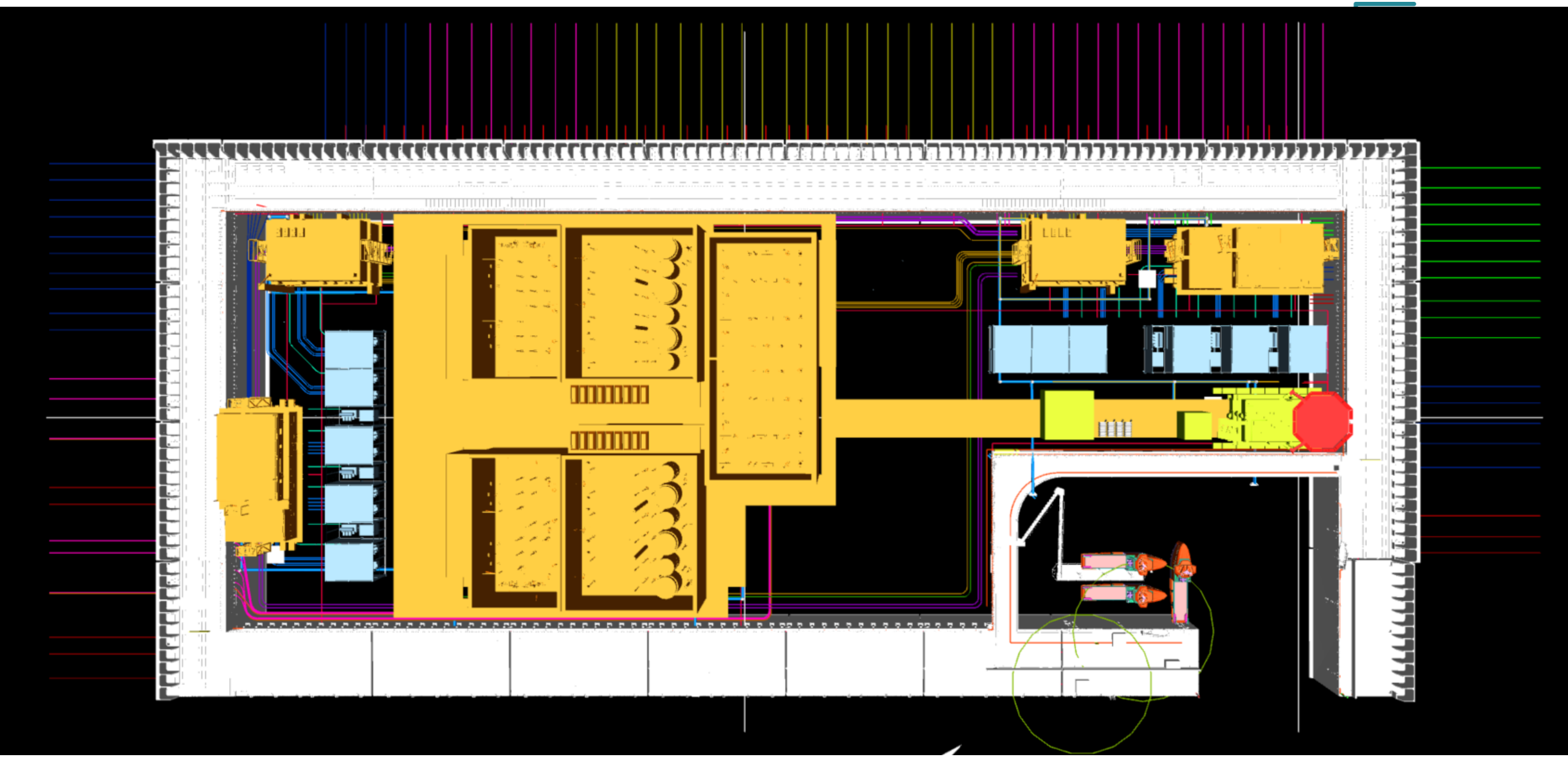

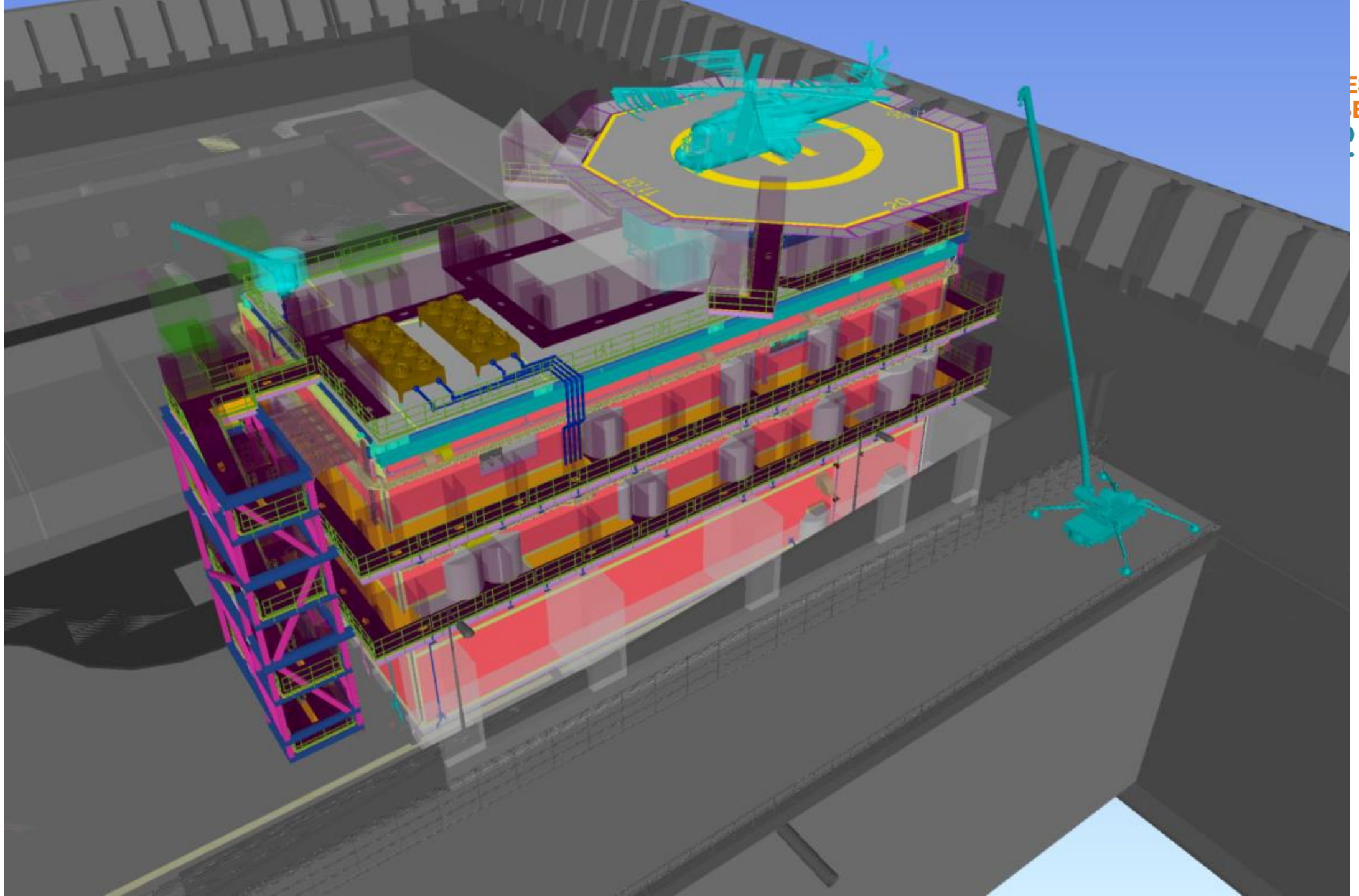

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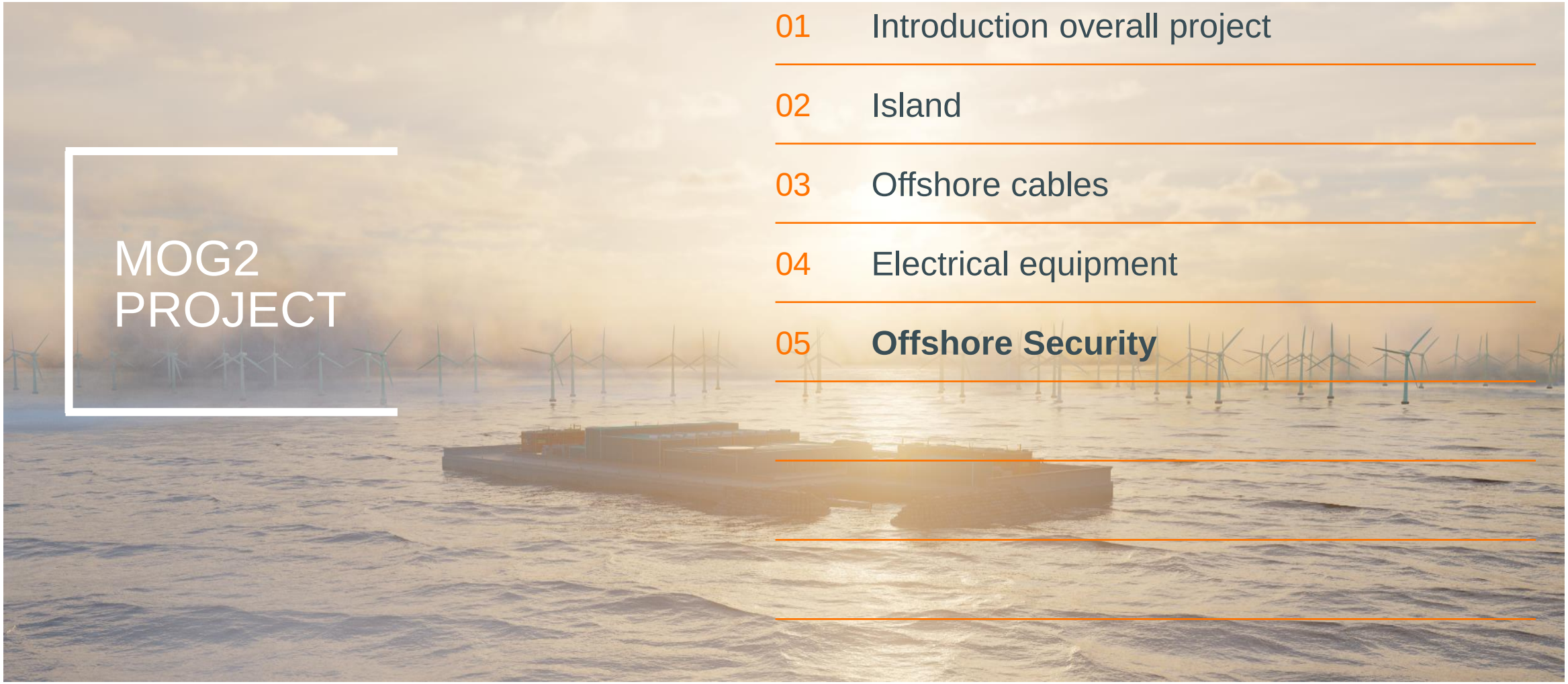

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Offshore Security

- **Challenges**
  - Scenario's High Impact Low Frequency (HILF) ~ difficulty defining "Probability" (Black Swans)
  - Limited benchmarking & government threat assessments
  - Fast changing (international) Security landscape
  - Vulnerability of the grid ~ "0" risk utopia => offshore important part of the bigger picture

- **Elia as *Collateral Damage* versus *Target***
  - Collateral: Smuggling, stowaways, environmental organizations, daredevils, …
  - Target: terroristic attacks, sabotage, unauthorized people, act of war

- **Approach**
  - Scenario based method
  - Offshore platform & island different measures
  - Holistic approach (People-safety, Infrastructure, assets & IT)
  - Conform to corporate risk framework (matrix probability ~ impact)

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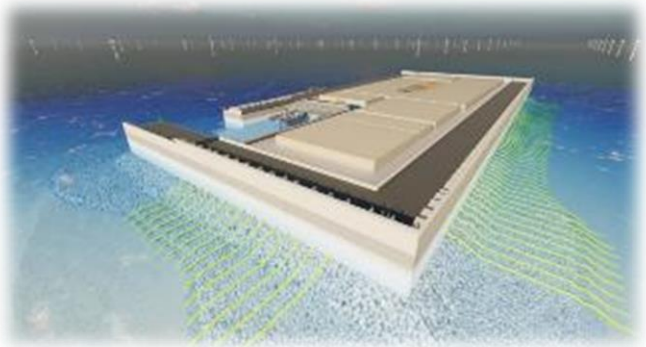

Offshore Security

1. **Island and intertidal**
   - Asset Security
     - Specific electronic measures in place (a.o. radar detection, thermal camera's,…)
     - Remote monitoring (24/7)
     - Focus on Security of access points & critical assets
2. **Under water security**
   - Cable Security
     - Optical fiber monitoring - Dynamic Acoustic System (DAS)
     - Vessel monitoring within cable corridors - Automatic Identification System (AIS)
   - Innovation
     - Underwater drones
3. **Above water and air security**

- **Innovation**
  - Drone-detection (drone neutralization)

Challenges

- Intervention time after alarm (close collaboration with public authorities) – 1h40min
- Criticality of cables
- Importance of private public collaboration

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