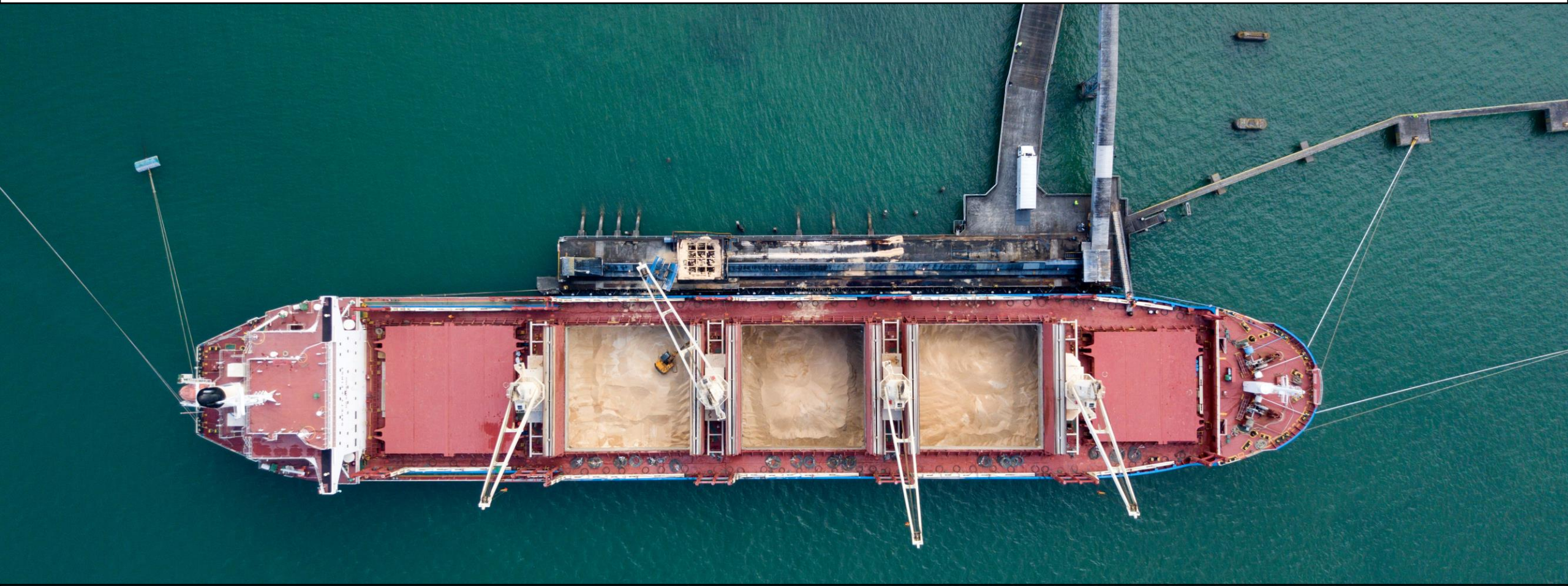
Shore Power for Bulk Terminals



Leader in moving energy supplies for Zero-Emission

ABTO Conference October 25-26, 2023

Presented by:

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Shore power products include:
igus Mobile Shore Power Outlet (iMSPO®), e-chain Reel®, Triflex Dispenser® Systems, e-loop®

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Prepared for:

ABTO ASSOCIATION OF BULK TERMINAL OPERATORS

Why plan for Shore Power?

Solutions are needed…

There is a wave coming…

Are you **READY**!

Developments and tools to help reach the goals

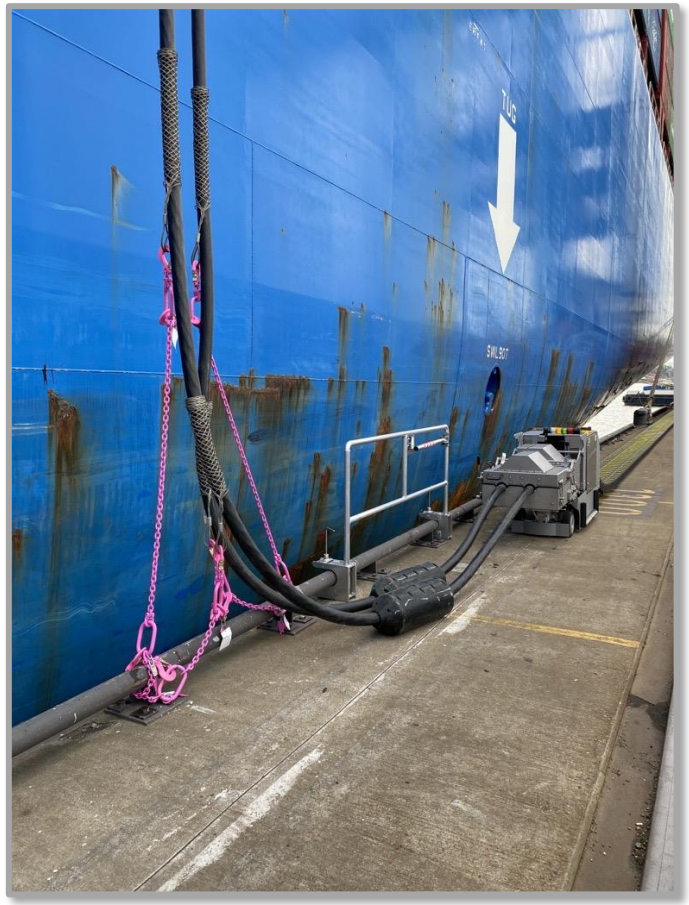
Alternative fuels and engine technologies

Exhaust treatment and capture and control systems

OGV at berth electrification known my many different names…

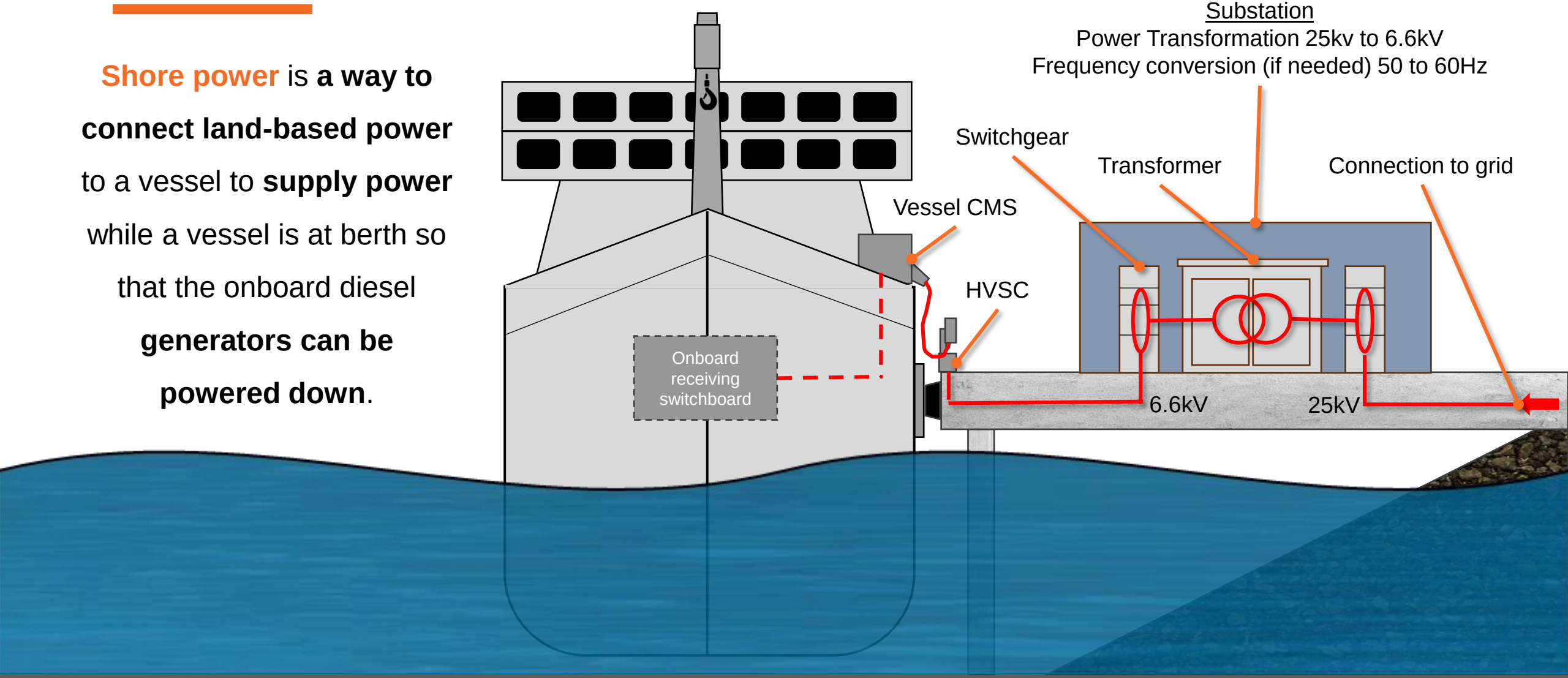
Shore power is known by many names in different areas

- Shore Power
- Shore Connections
- O.P.S. (Onshore Power Supply)
- A.M.P. (Alternative Maritime Power)
- Shore to ship power
- Cold Ironing



Shore power basics

Shore power is **a way to connect land-based power** to a vessel to **supply power** while a vessel is at berth so that the onboard diesel **generators can be powered down**.

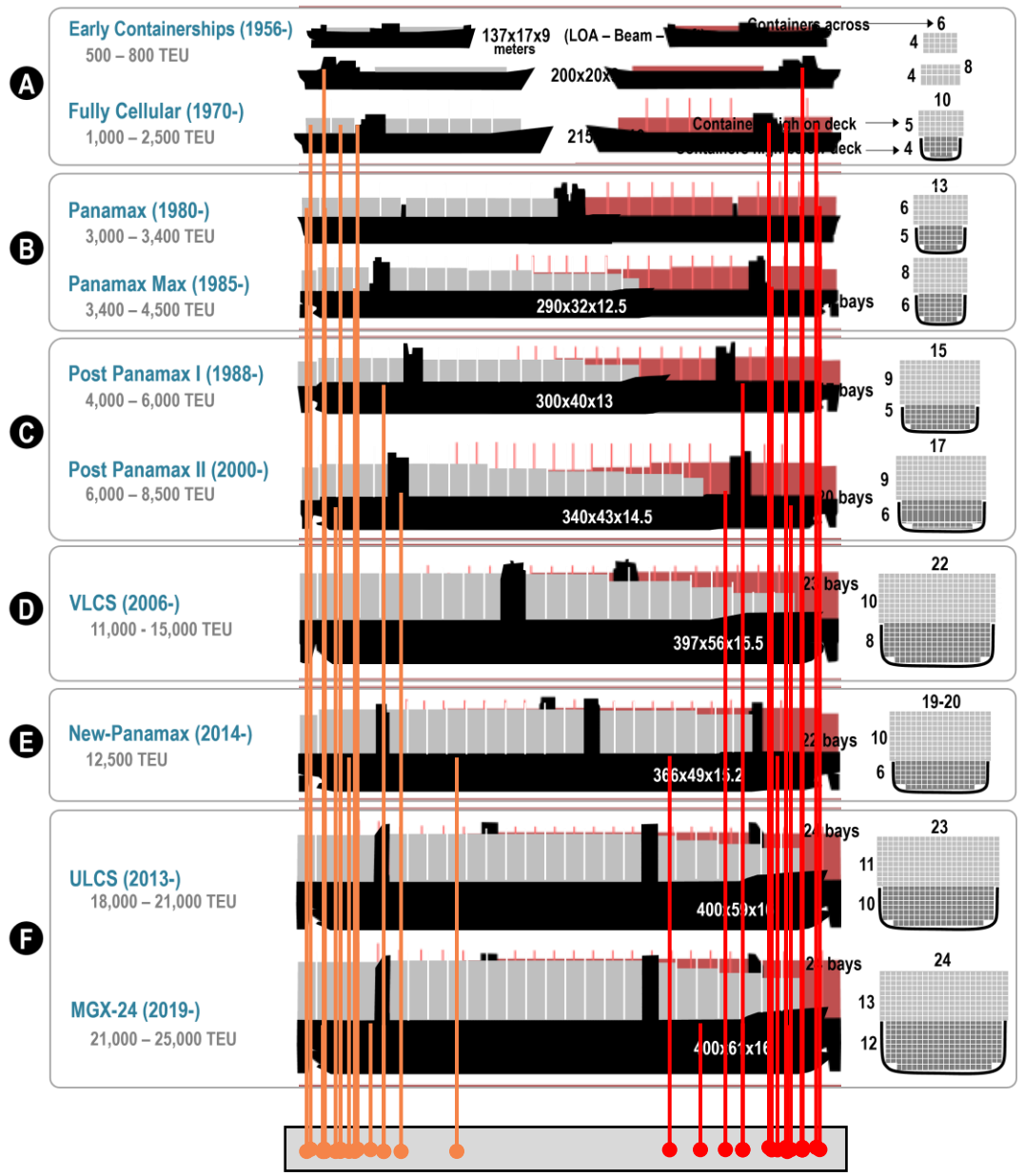


Onboard CMS locations

Different LOA's create different alignments for the onboard Cable Management Systems (CMS)

Port and starboard berthing create additional alignments

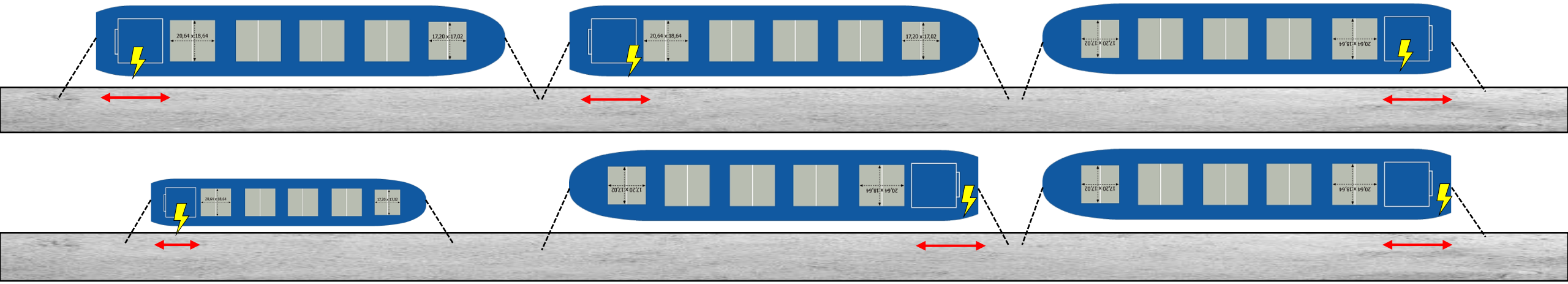
CMS locations can vary in between the stern and bridge

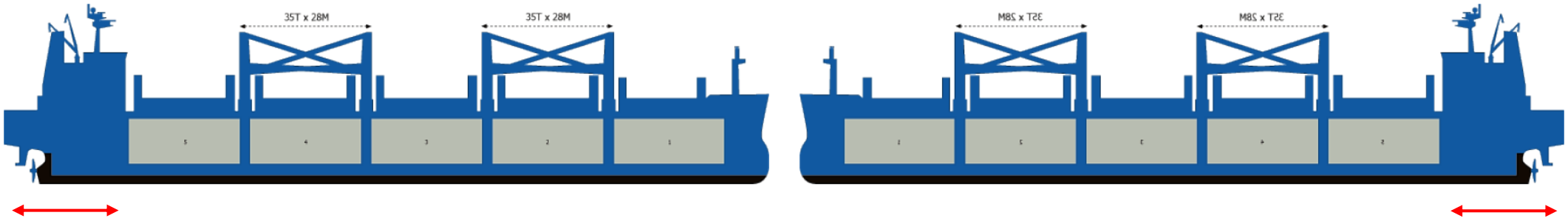


Starboard berthing

Port berthing (mirrored)

Berthing arrangement impact on connection points



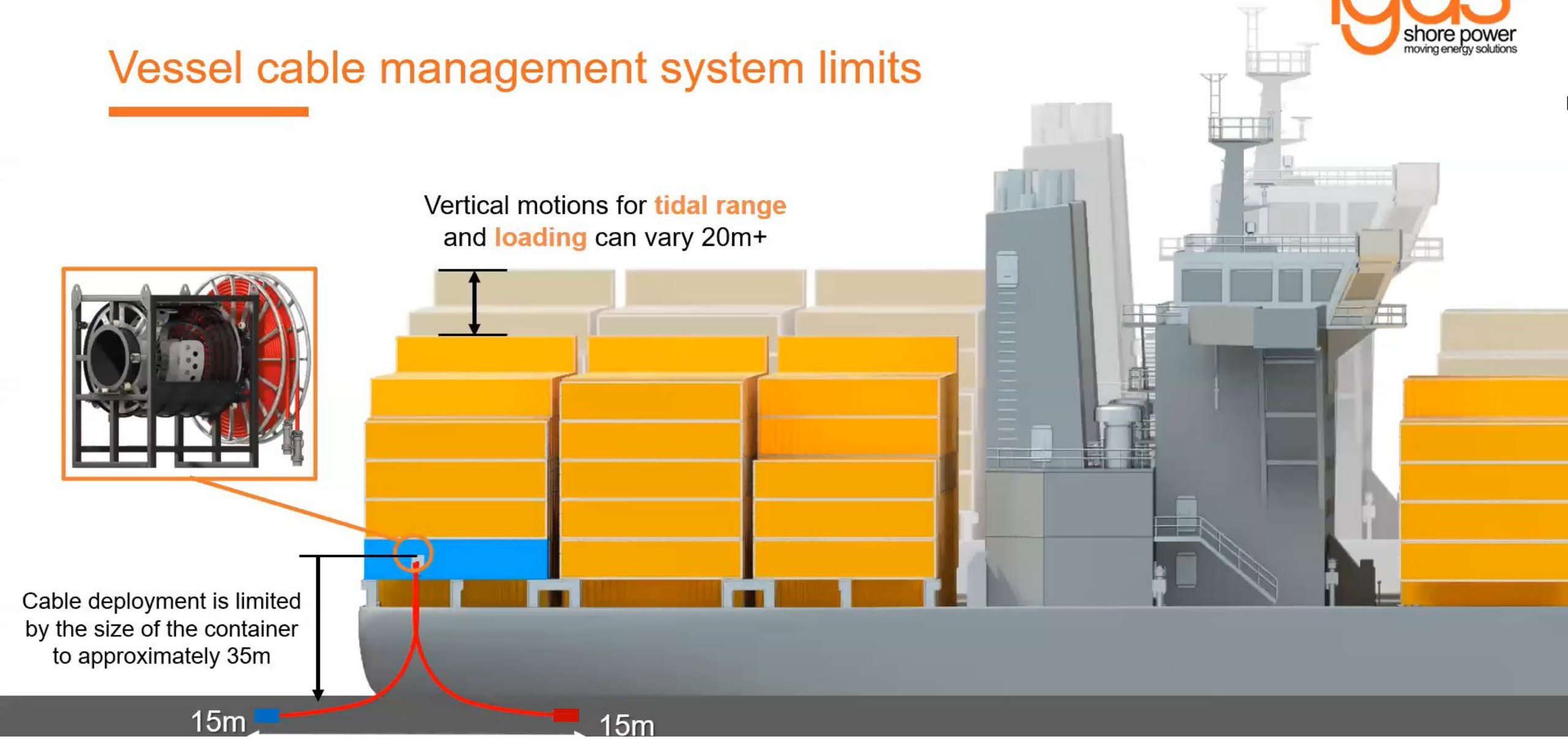


CMS Possible Positions
Starboard side 30m

CMS Possible Positions
Port side 30m

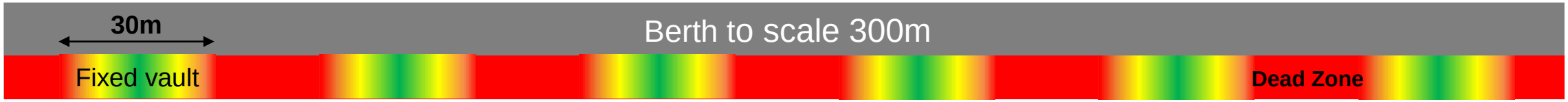
Changing positions of onboard cable management systems…

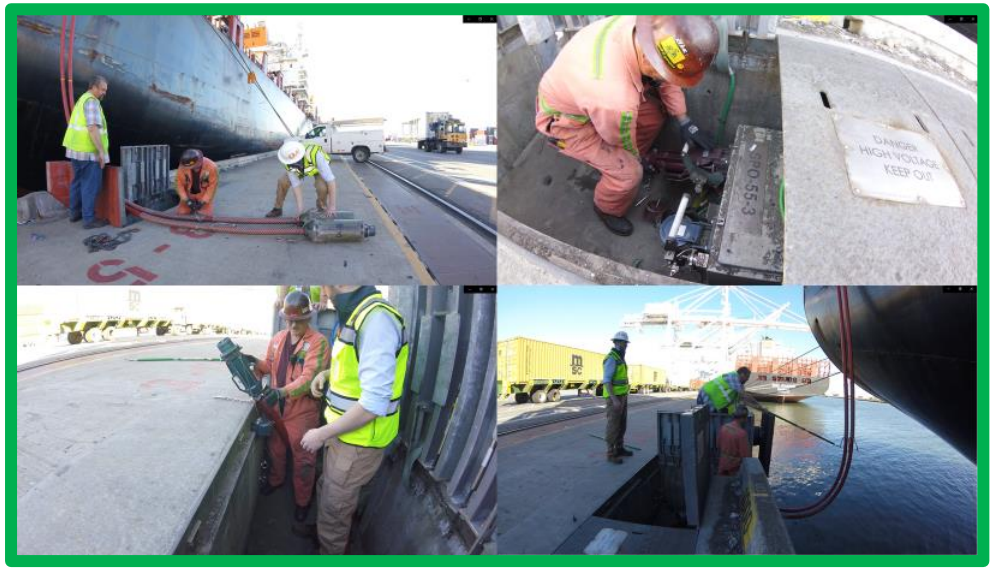
Vessel cable management system limits



Fixed outlet layouts do not provide sufficient coverage

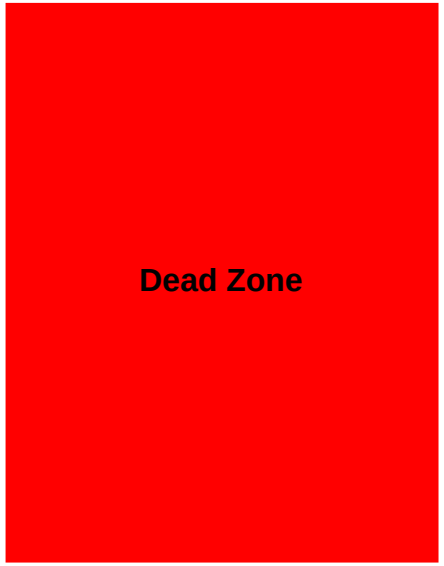
6 vaults, 1 every 50m





Green area = close alignment
acceptable connection

Yellow area > 7m misalignment
Difficult connection



Red area = No connection
“Dead Zones”

The best cost per meter and most connection flexibility

- Fixed outlets require more equipment, more maintenance, and dangerous cable extenders
- Fixed outlets have the highest cost per meter of linear coverage and construction costs
- Installing an outlet every 50m will not future-proof your operation and construction is very expensive

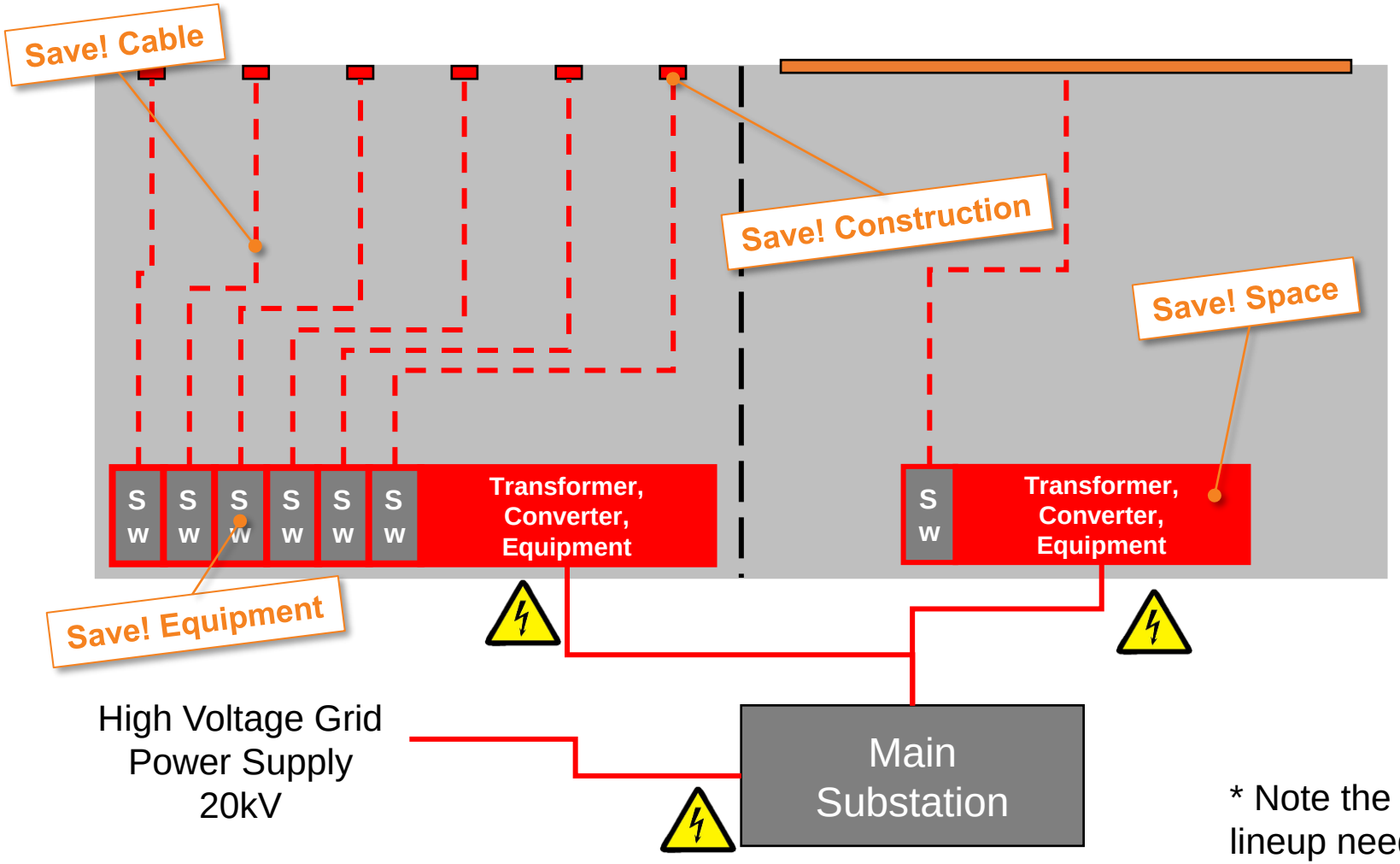
(6) FIXED shore power outlets = 120m total coverage based on theory = max. 40% linear coverage on quay

(6) FIXED shore power outlets = 12m total coverage based on real experience = max. 4% linear coverage on quay

(1) igus Mobile Shore Power Outlet (iMSPO®) system = 300m complete coverage = 100% linear coverage on quay

*** Berth to scale 300m**

Shore Power planning: fixed outlet vs. mobile outlet costs

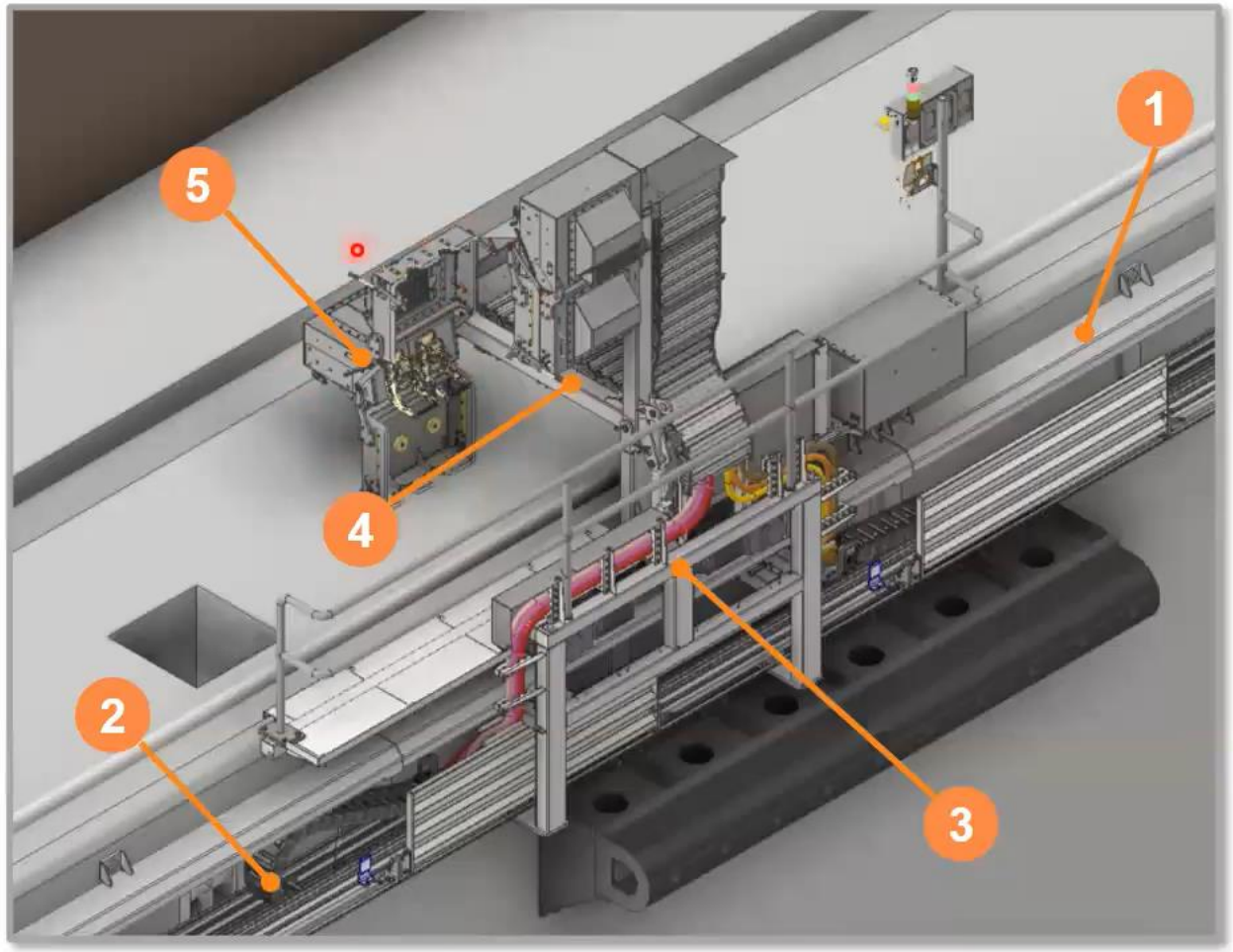


Project interfaces:

- High voltage grid power supply
- Construction of electric house
- Equipment:
  Frequency conversion 50Hz->60Hz
  Transformation 20kV->6.6kV
- Fixed cabling for high voltage shore power supply 6.6kV including construction
- 6 x fixed outlets per berth (or more)
- or 1 x iMSPO per berth

* Note the size of the real estate and equipment lineup needed for e-house between the two layouts

iMSPO general description



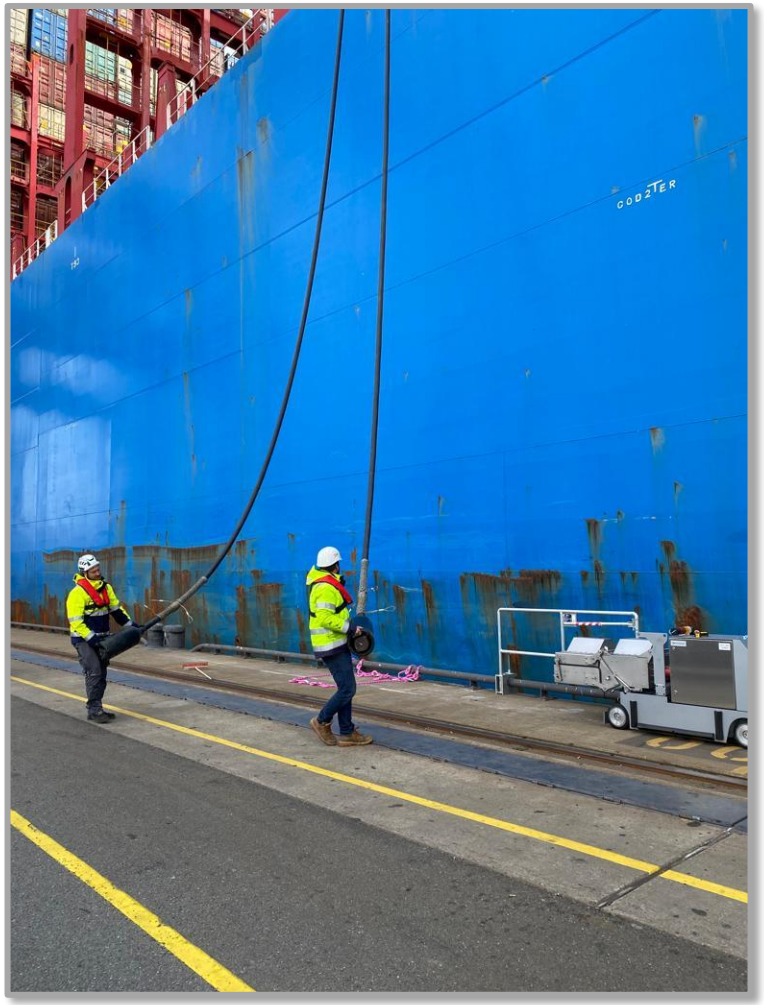
Core components

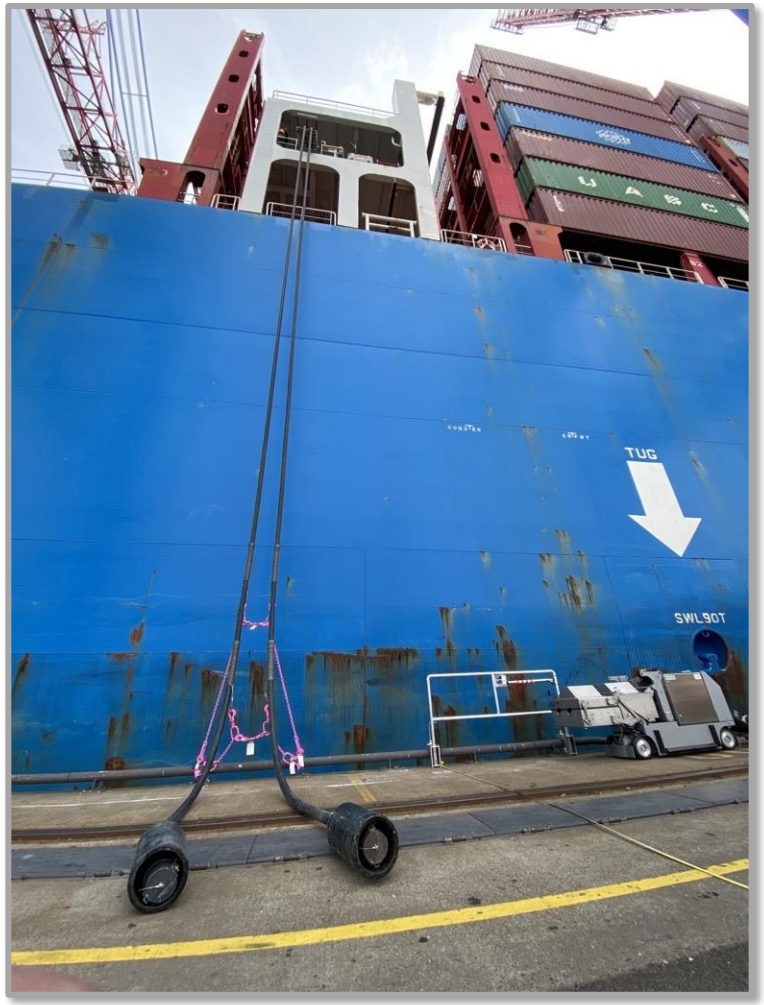
1. Track Element (TE) guides carriage and protects e-chain system
2. E-Chain System (ECS) Guides and protects cables while in motion
3. Traveling Carriage (TC) contains propulsion system and transports arm and socket box
4. Delivery Arm (DA) positions the socket box for plugging and power supply
5. Socket Box (SB) Type approved box with sockets and protection for plugs

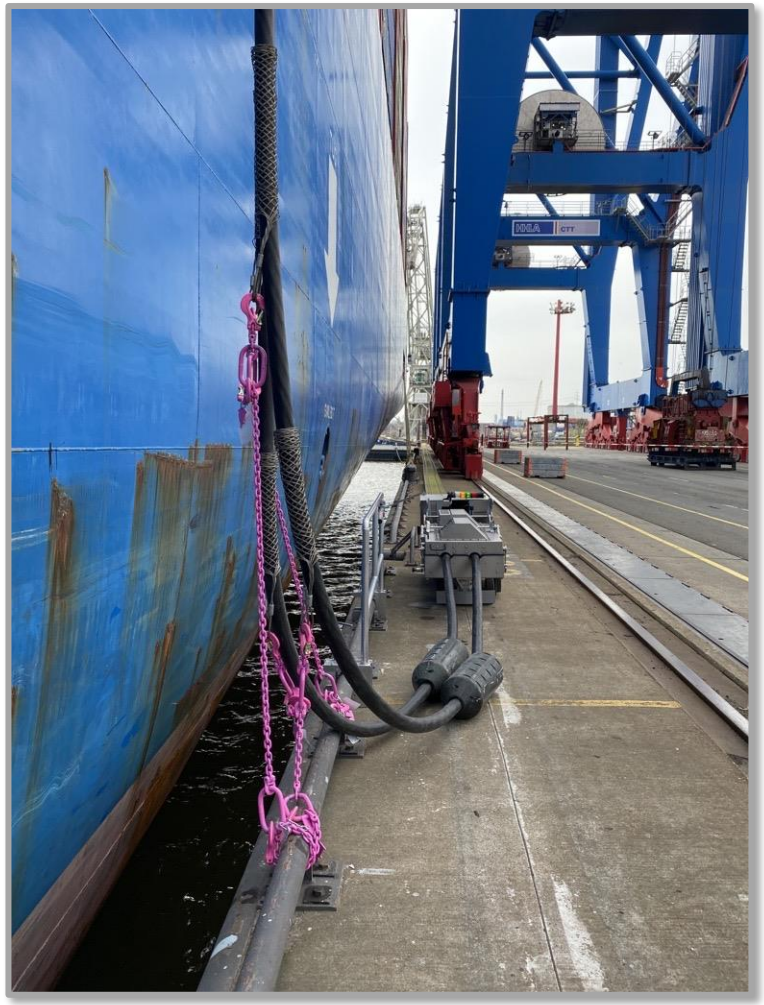
Products: Shore Power e-chain® Reel

- Minimal construction and very little berth outage time required for installation
- Up to 150m of flexibility from the end of the terminal
- Very small runway space needed (less than 1m) between bollards and crane

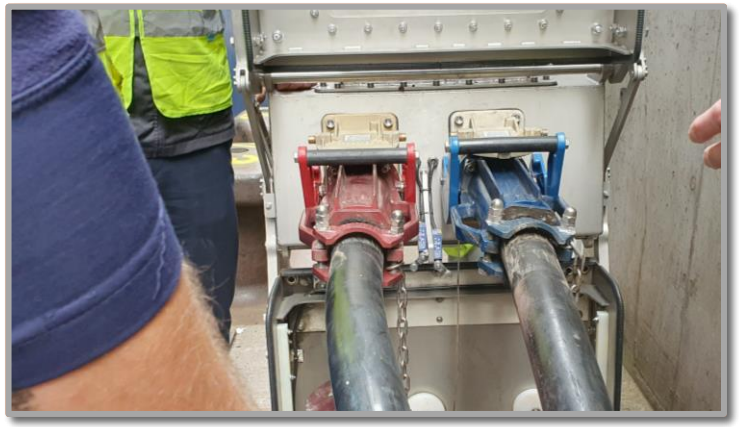
Deployment of cables from vessel and strain relieving





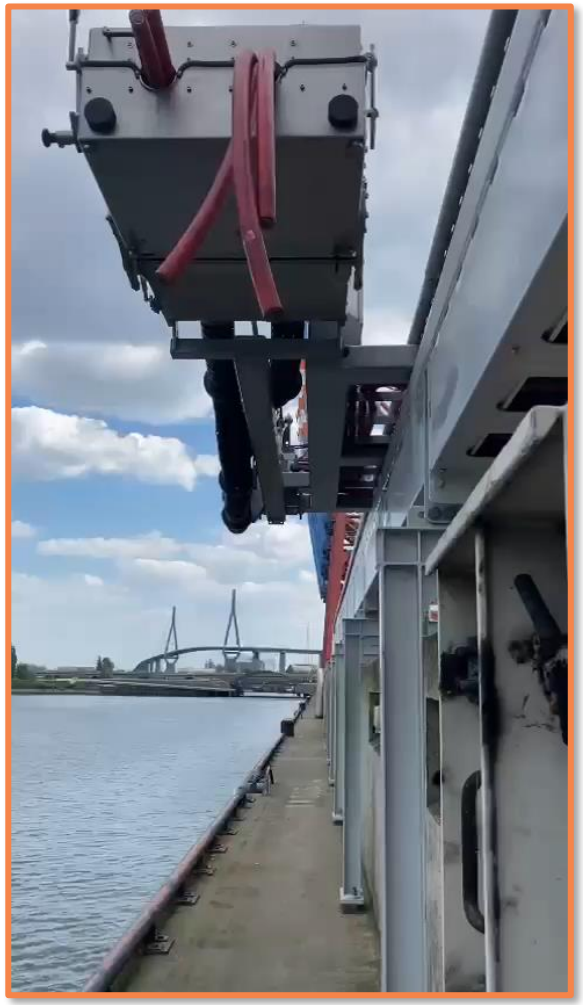


Product: igus® Mobile Shore Power Outlet (iMSPO®)



300m capability = coverage of an entire berth with 1 system

Product: iMSPO® Special design to fit space requirements

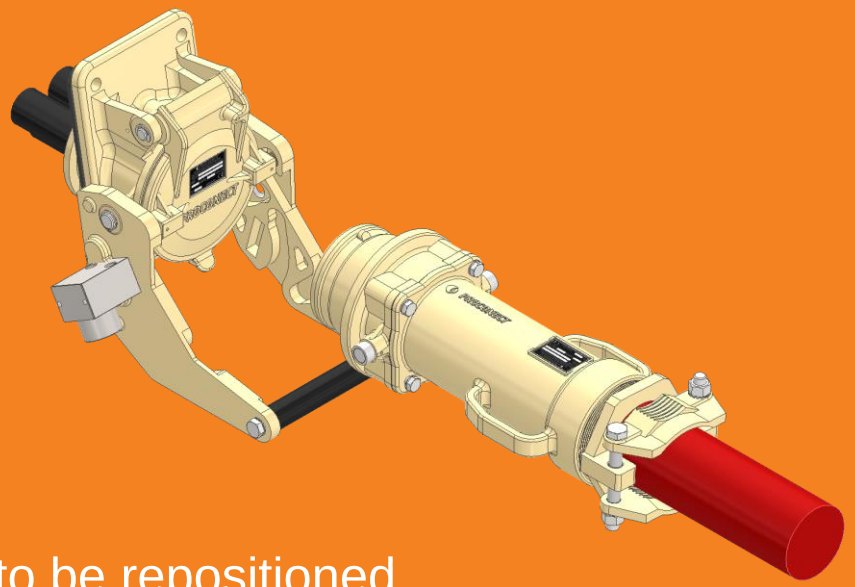


Mounting above flood wall = utilization of space available

Special Considerations for Dry Bulk Terminals

1. Aggressive environment for machinery
   - Products designed for this environment must be used

2. EX areas shore and vessel side
   - Shore power connections must be carefully considered



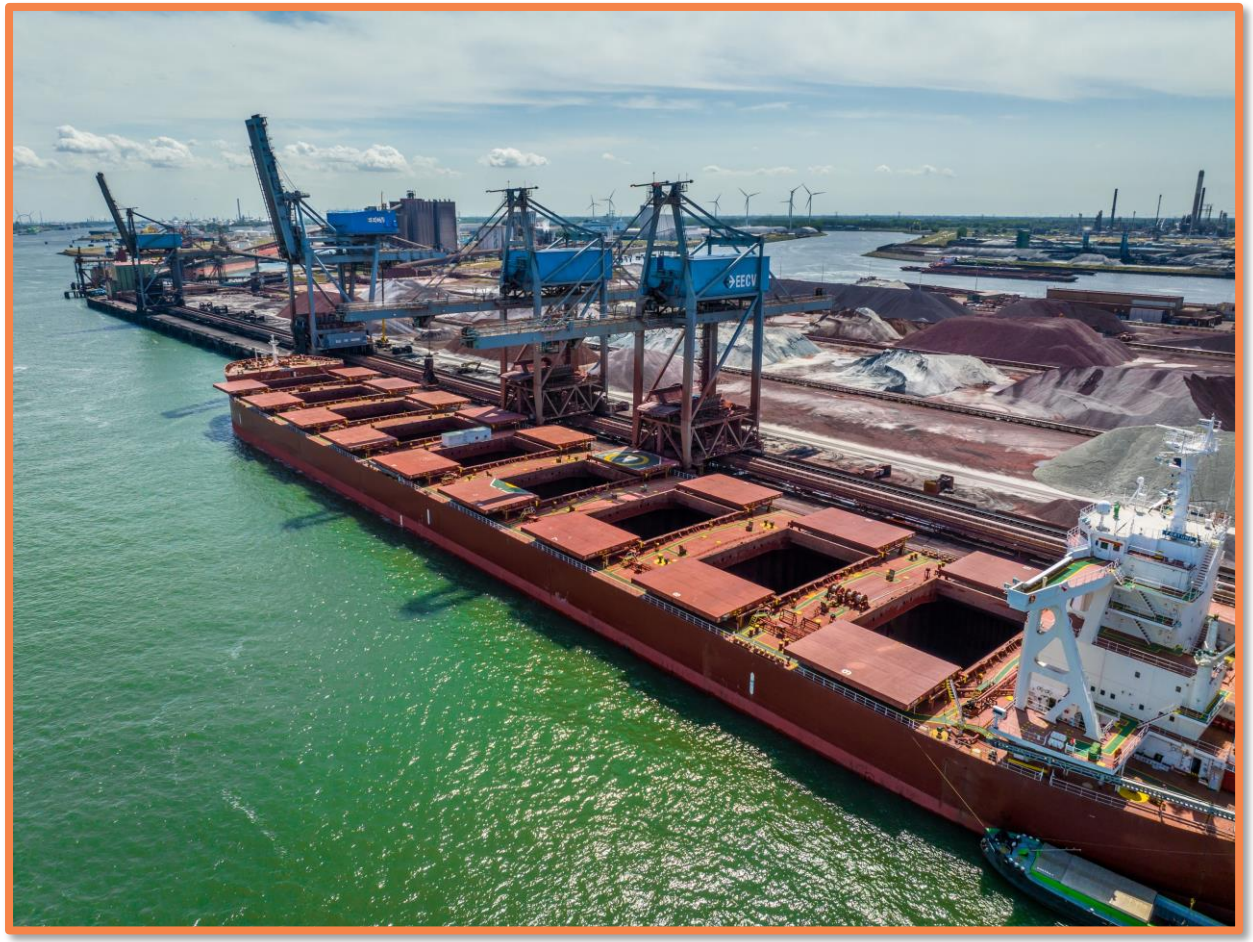
3. For smaller terminals and finger piers the vessel may need to be repositioned
   - It may be necessary to move the vessel to reach all hatches

4. Space needed to install a solution
   - Crane rails, loading equipment, bollards and bull rails must all be considered

Challenge 1: Aggressive environment…

- Environmental conditions must be considered when planning for shore power.

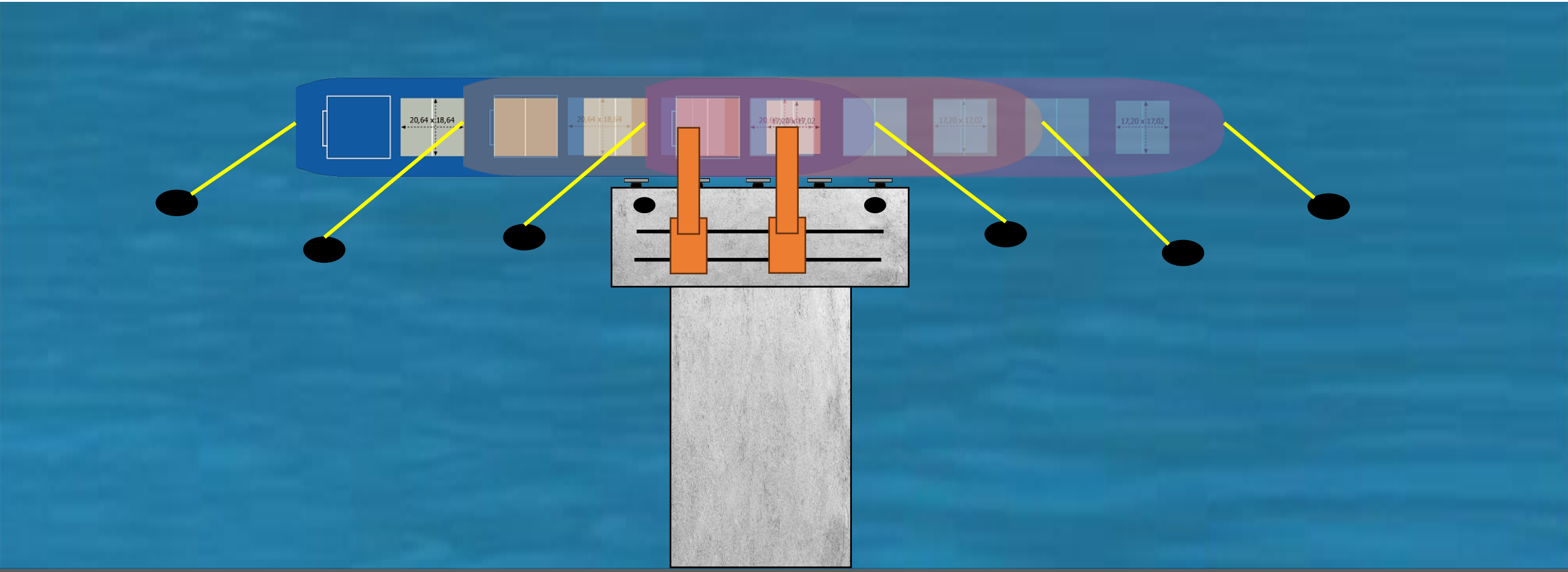
- Mobile Shore Power machines must use components that have good resistance to corrosion, abrasion and must be suitable for use in a marine environment.



Challenge 2: EX area considerations

- Connections should be made in areas away from classified areas.
- Be careful of cable reel solutions that have slip rings in them.
- The best location is from the bridge to the aft of the vessel.
- Land side considerations should be made as well.

Challenge 3: Movement of vessel during loading



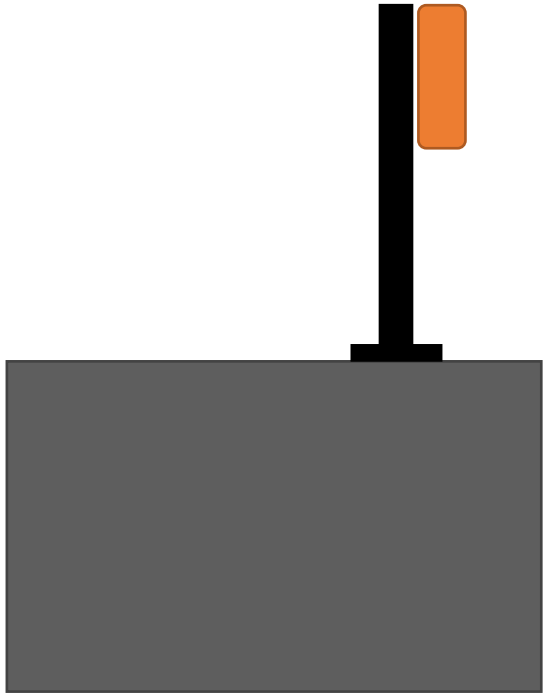
Challenge 4: Space considerations

1. Quay face mounted on the face of the quay wall above the fenders
2. Deck mounted on the terminal surface in front of or behind the bollards
3. Trench installation where the e-chain system is installed in a trench
4. Custom solutions are possible for challenges with space or position

1. Best location to minimize interference with operations

2. If there is not enough clearance above fenders

3. The socket box carriage is the only external component



4. Space or equipment requires special attention

Thank you for your time and attention!

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Thank you to ABTO for the invitation to present

BULK TERMINALS LISBON 2023
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