

PORtZONE Episode 10: Shore Power for Dry Bulk terminals: Challenges and Solutions

Presented by:



Sean McCaskill

Shore Power Solutions Manager, Americas

Charlotte, NC, USA

Cell: +1 704.236.3568

email: smccaskill@igus.net

Shore power products include:

igus Mobile Shore Power Outlet (iMSPO[®]), e-chain Reel[®], Triflex Dispenser[®] Systems, e-loop[®]

Table of Contents

- Why to consider shore power in your port electrification planning
- Shore power basics
- The “Connection Dilemma”
- Case Study: Shore Power in container terminals
- Special considerations for dry bulk terminals
- Get started!

Prepared for:



Health concerns



May 1, 2023

Support for California Ocean-Going Vessels At Berth Waiver

Re: Docket ID No. EPA-HQ-OAR-2023-0152

Comment from the American Lung Association

Via email: a-and-r-docket@epa.gov

The American Lung Association calls on the United States Environmental Protection Agency (EPA) to approve California's waiver to implement recent amendments to the Ocean-Going Vessels At Berth (At Berth) regulation. The California Air Resources Board (CARB) adopted this updated policy to increase the use of shore-power for a wider range of vessels calling on California's ports. The updated rule is a key method to reduce regional air pollution burdens and neighborhood-level disparities in carcinogenic diesel exhaust.

Californians face the most difficult air pollution challenges in the United States. The American Lung Association's "State of the Air" 2023 report found that California is home to six of the ten most ozone-polluted cities in the United States, including the top four.¹ Despite decades of progress in reducing air pollution, Californians still face risks associated with unhealthy air, including asthma attacks, strokes, heart attacks, lung cancer and premature death. Low-income communities and communities of color face disproportionate burdens and disparities in health impacts, including portside communities directly impacted by oil tankers, auto carriers, cruise ships and other ocean-going vessels addressed through CARB's lifesaving policies.

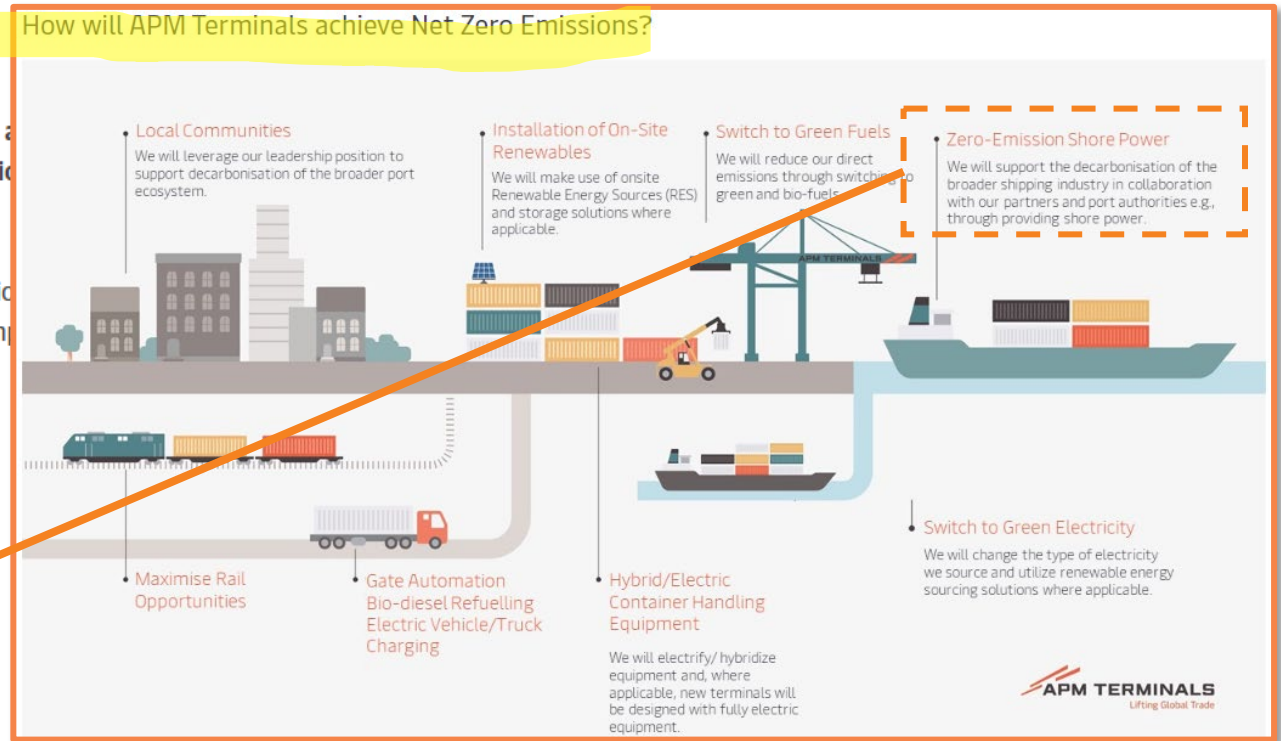
Internal company directives...

01/13/2022

APM Terminals commits to industry-leading reduction in greenhouse gas emissions

APM Terminals will bring forward its Net Zero greenhouse gas emission target to 2040, a reduction in absolute (total) emissions has been set as an interim milestone for the period by any terminal operator to date.

This commitment builds upon the company's existing strategic approach to decarbonisation to reduce its carbon footprint. It will also contribute to a broader target set by parent company to reduce greenhouse gas emissions in 2040 across all business entities.



Zero-Emission Shore Power
 We will support the decarbonisation of the broader shipping industry in collaboration with our partners and port authorities e.g., through providing shore power.

* Source apmterminals.com

Local and Global emissions reduction goals

[MARITIME](#) / [NEWS](#) / [STATUTORY](#)

The EU agrees on well-to-wake GHG limits to energy used on board ships from 2025

For ships trading in the EU, the EU's legislative bodies have reached an agreement on the FuelEU Maritime regulation setting well-to-wake GHG emission intensity requirements on energy used on board from 2025. From 2030, the regulation also mandates the use of shore power for container and passenger ships in certain EU ports.

Published:
22 May 2023

SHARE: [in](#) [t](#) [f](#)



* Source DNV.com

NEWS • News

Lowenthal calls for end to ocean shipping pollution during Long Beach town hall

The congressman said his proposed Clean Shipping Act would eliminate in-port carbon emissions by 2030.

By [KRISTY HUTCHINGS](#) | khutchings@scng.com |

PUBLISHED: September 3, 2022 at 6:00 a.m. | UPDATED: September 5, 2022 at 9:13 a.m.



CALIFORNIA AT-BERTH REQUIREMENTS

The California Air Resource Board (CARB) 2020 At-Berth Regulation for vessels has begun phasing in emission controls as of 01 January 2023.

ENFORCEMENT NOTICE

CARB issued an [Enforcement Notice](#) on 30 March 2023 detailing:

- An extension to reporting requirements.

KEY NOTES

- Applicable Vessel Types: All ocean-going vessels

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 by many different names...

Shore power can be referenced by several names

Shore Power

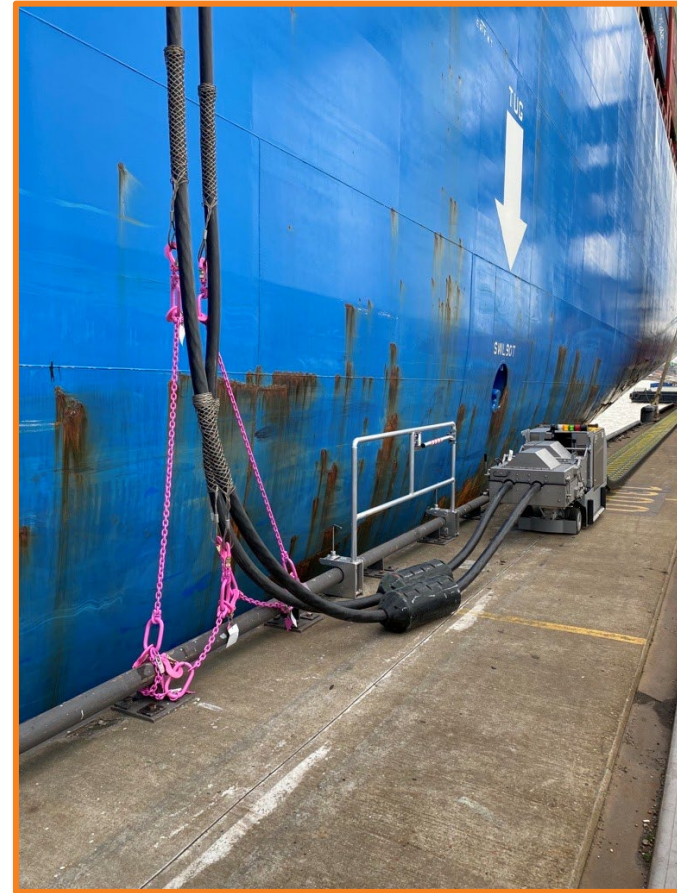
Shore Connections

O.P.S.
(Onshore Power Supply)

A.M.P. (Alternative
Maritime Power)

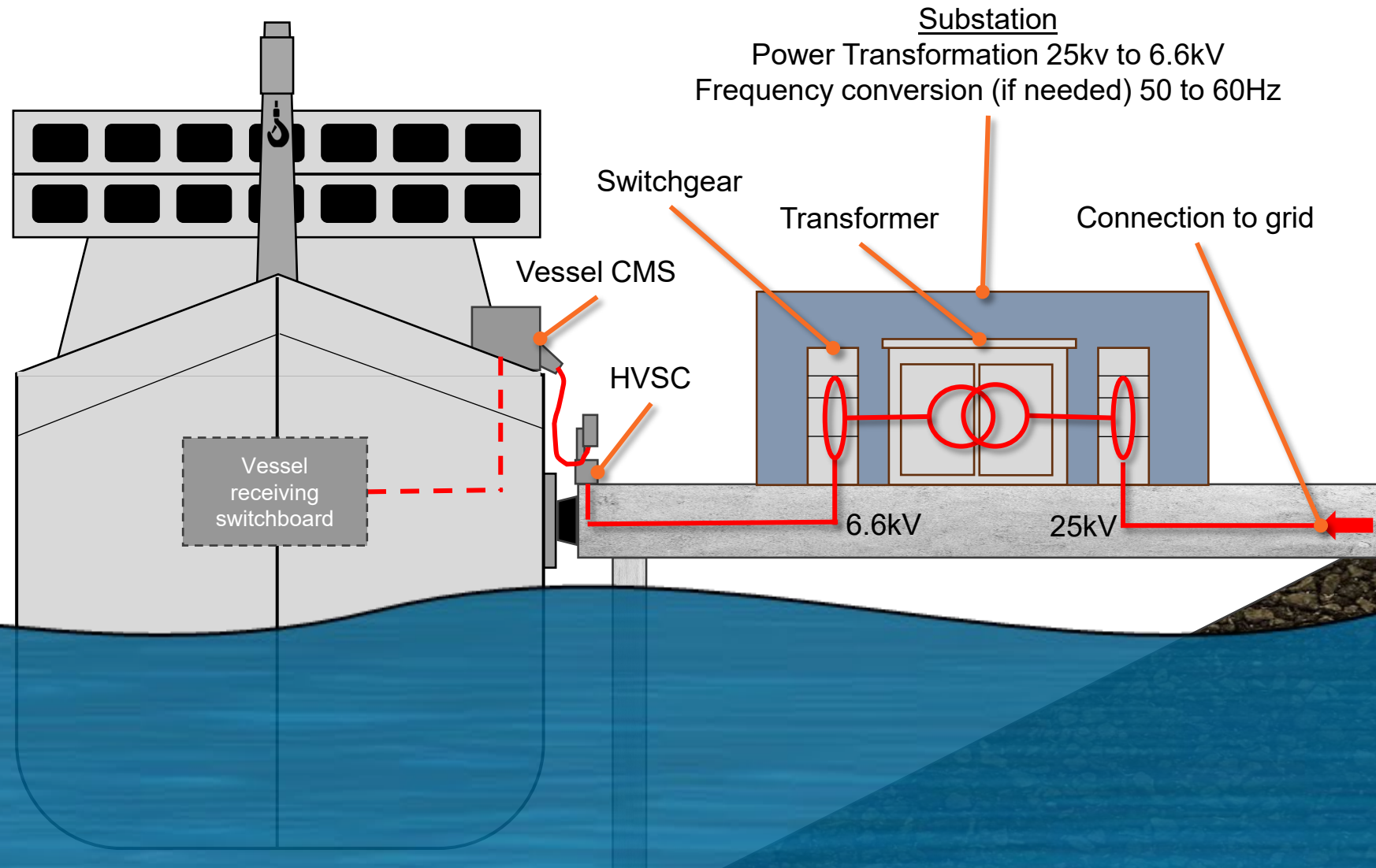
Shore to ship power

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.

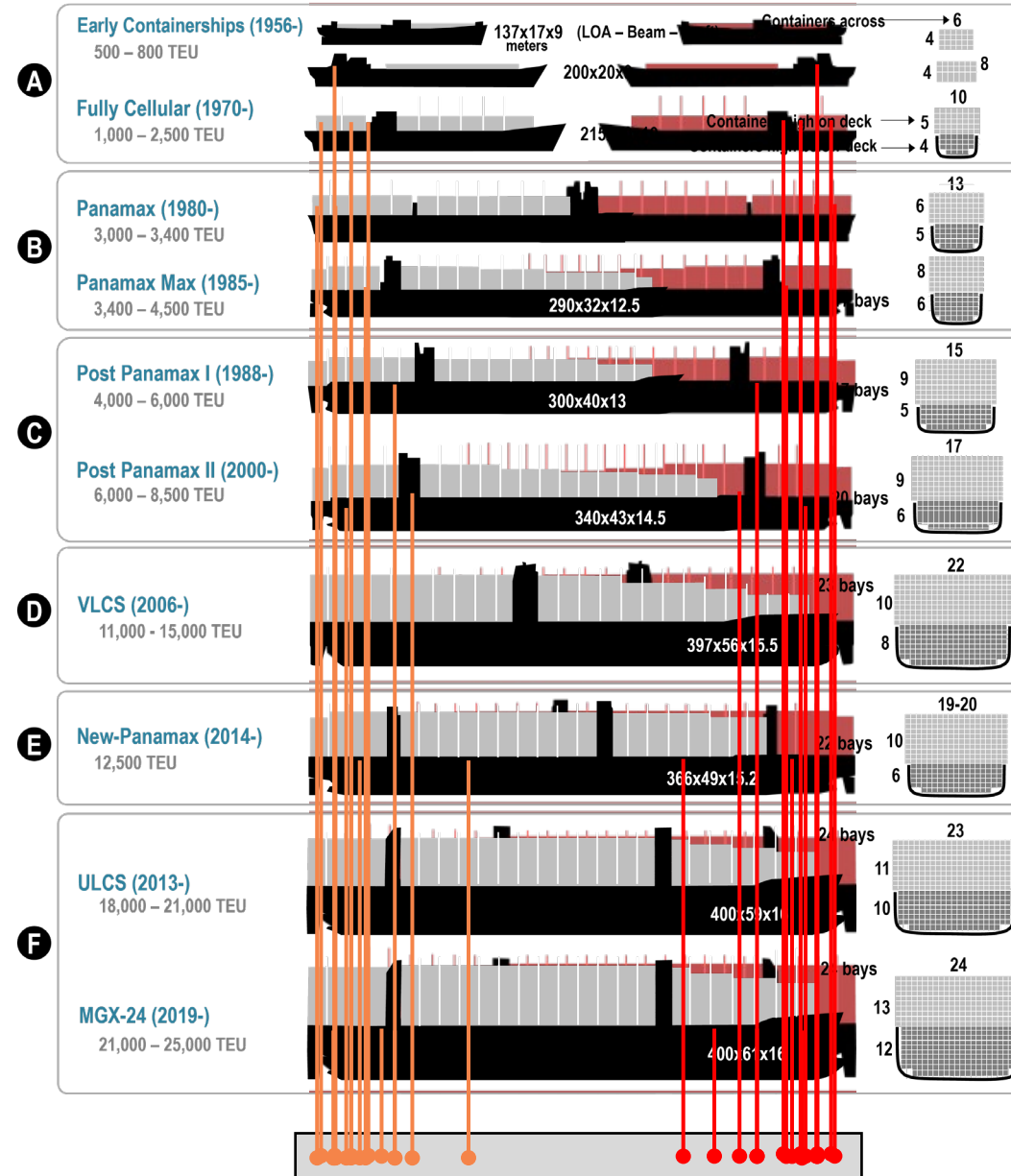


The “Connection Dilemma”

- Multiple locations of onboard CMS
- Berthing arrangement variety: LOA, port/starboard, multiple vessels
- Limitations of onboard CMS and shoreside cable handling
- Fixed outlet vs mobile outlet layouts

Onboard CMS locations

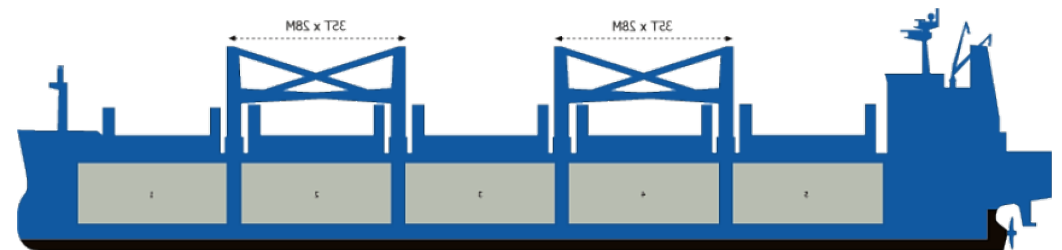
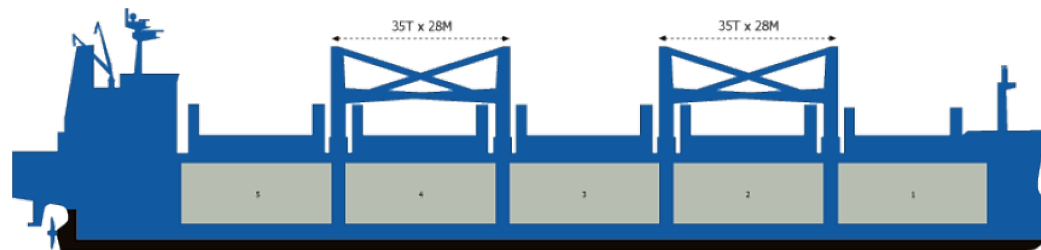
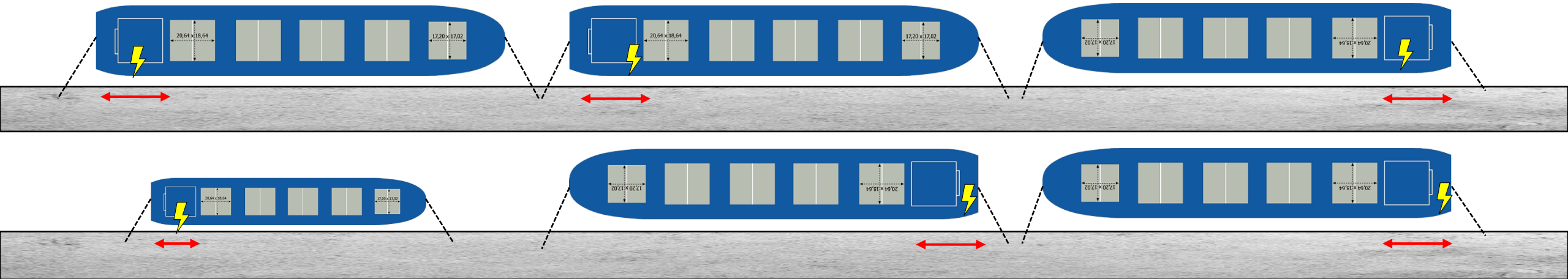
- Vessel size and berthing position can affect CMS to shore alignment
- Starboard and port side berthing further complicate
- CMS location can be positioned in many locations between the stern and bridge



Starboard berthing

Port berthing (mirrored)

Berthing arrangement impact on connection points

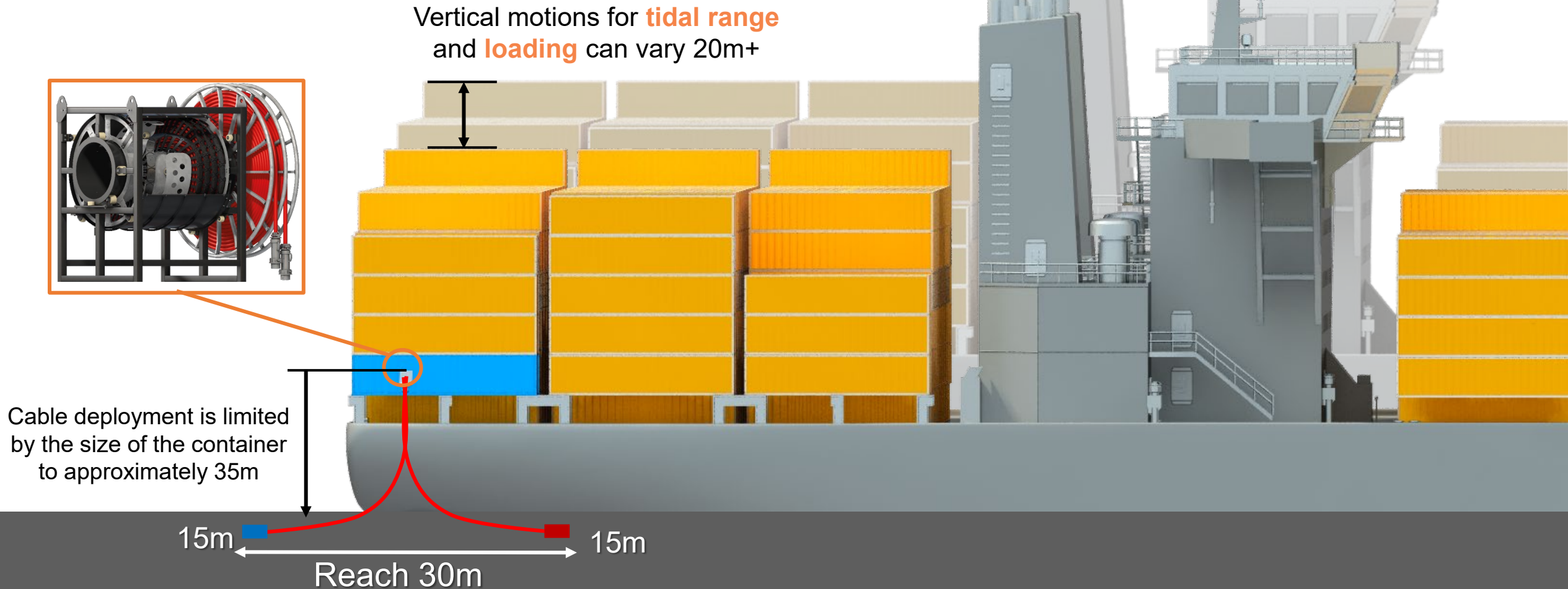


CMS Possible Positions
Starboard side 30m

CMS Possible Positions
Port side 30m

Changing positions of onboard cable management systems...

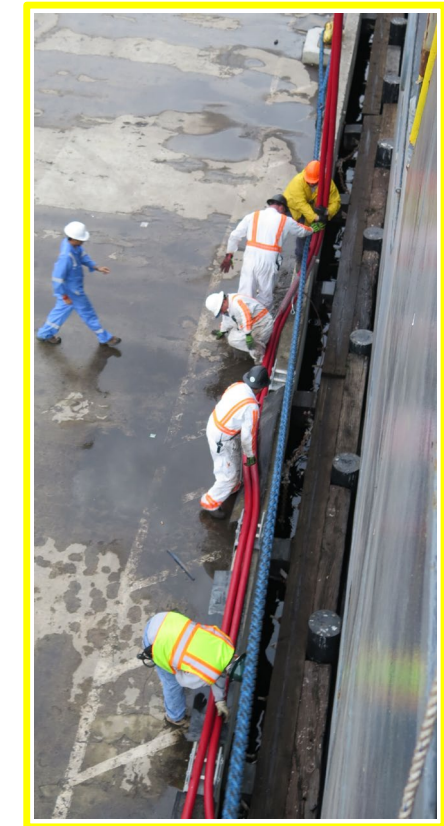
Vessel cable management system limits



Misalignment with outlets cause issues for handling



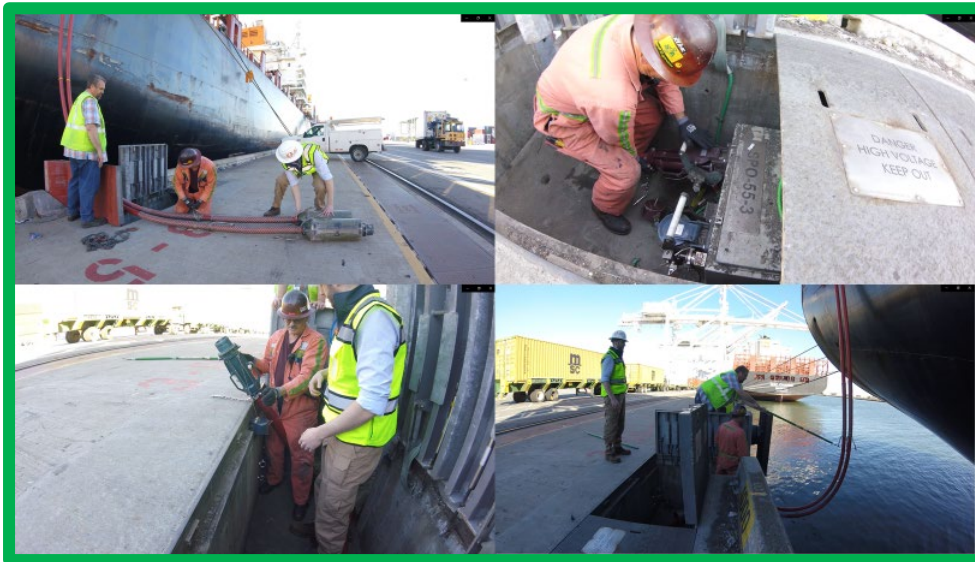
Example of perfect alignment situation



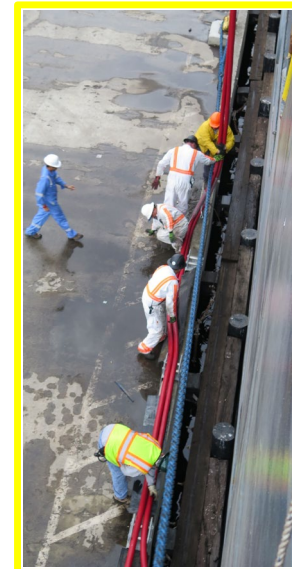
Example of misalignment

Fixed outlet layouts do not provide sufficient coverage

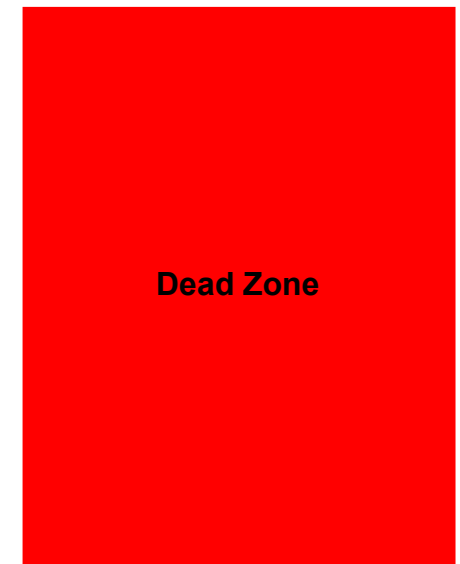
6 vaults, 1 every 50m



Green area = close alignment acceptable connection



Yellow area > 7m misalignment Difficult connection



Red area = No connection "Dead Zones"

Theory vs practical application vs a better solution

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

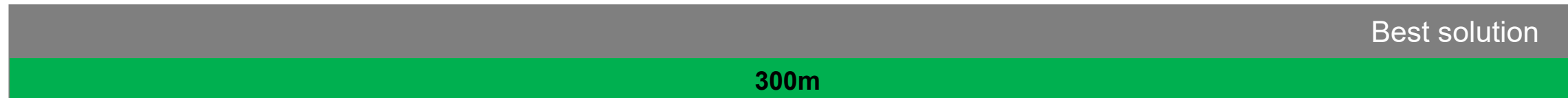
6 vaults = 120m total coverage = max. 40%



6 vaults = 12m total coverage = max. 4%



1 iMSPO system = 300m total coverage = 100%



* Berths to scale 300m

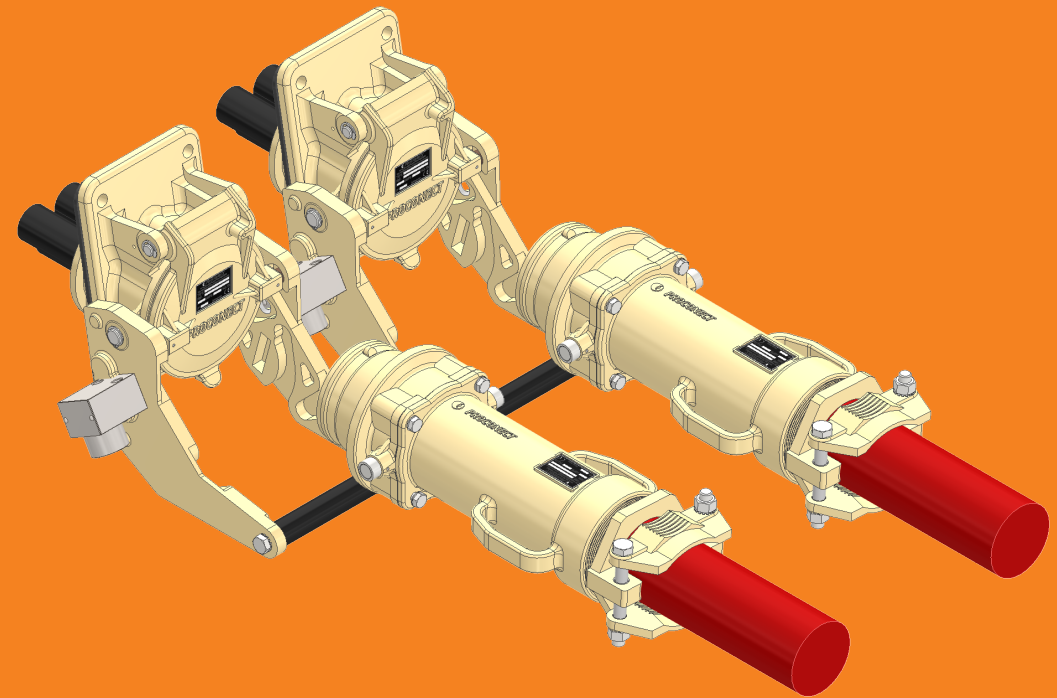
Video: iMSPO operational concept

<https://youtu.be/5QO6-VilwuA?si=jVHlzJrYAGD1rvr2>

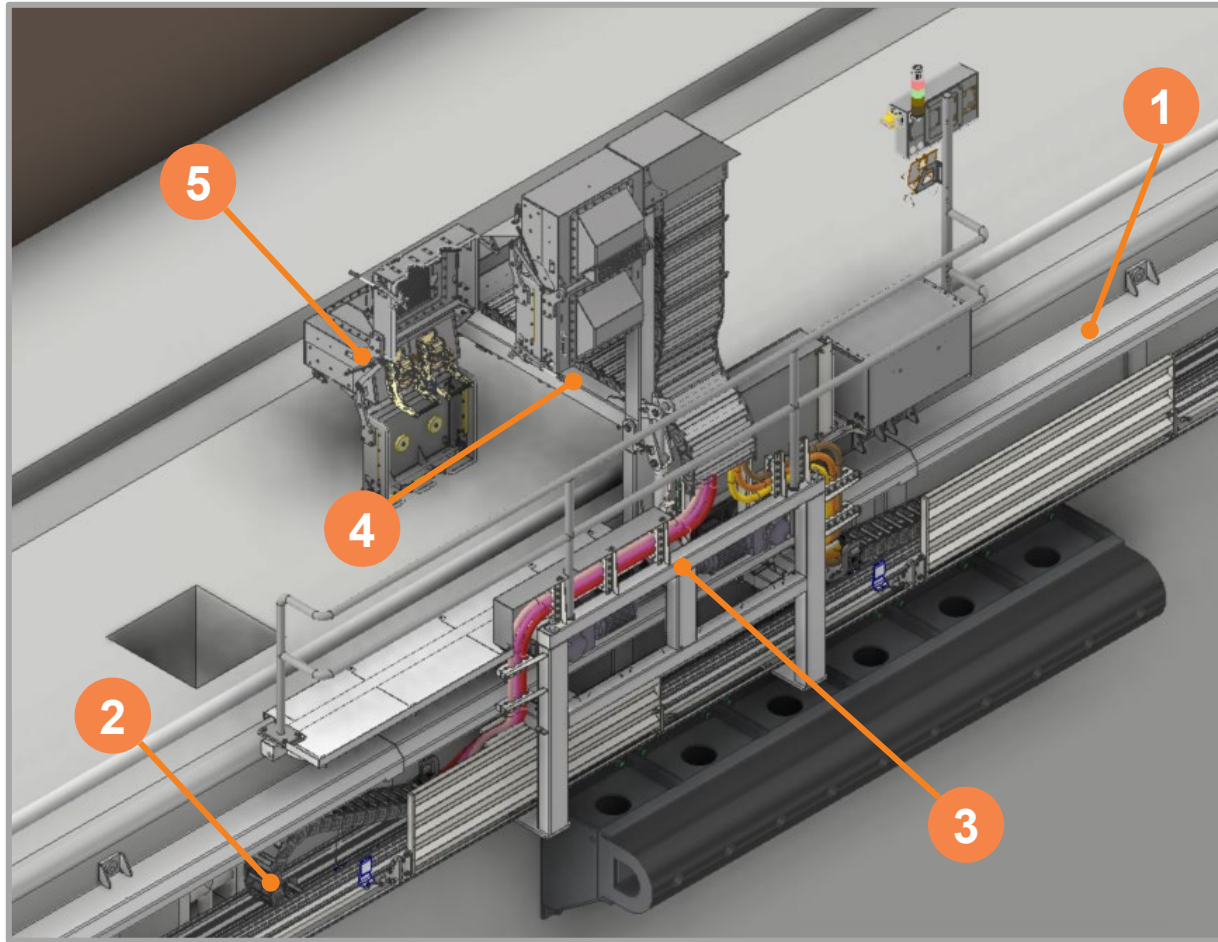


Container/Cargo Vessel Case Study

Standard Container/Cargo Standard
IEC 80005-1 Annex D 6.6kV, 7.5MVA



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

Traveling Carriage operated via wireless pendant



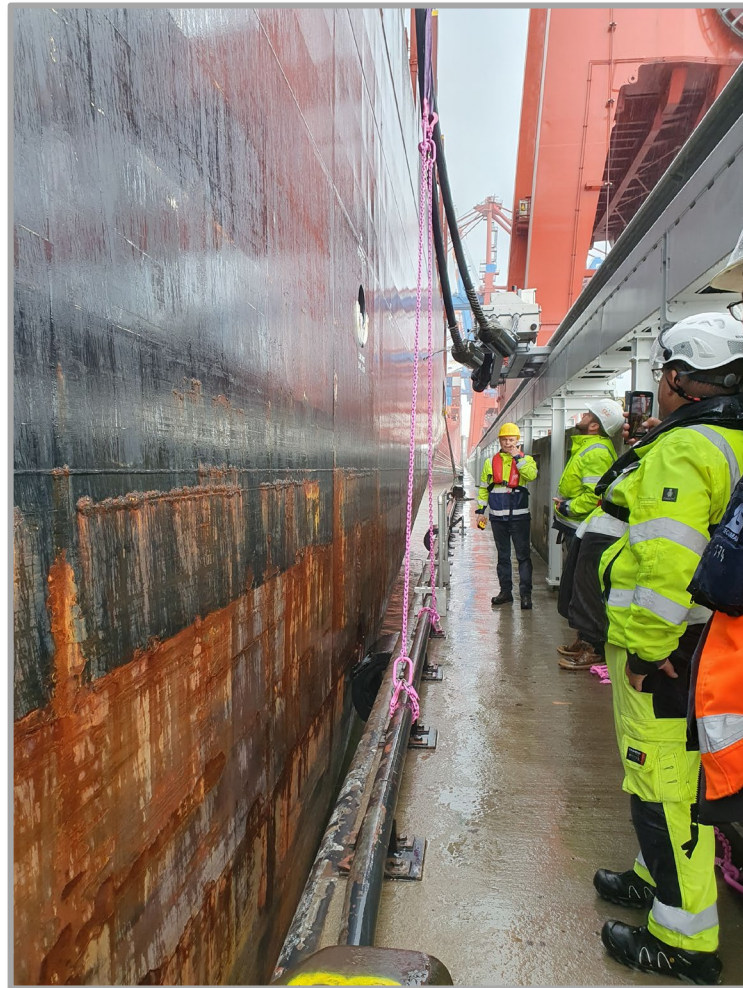
Midpoint j-boxes where cables are fed into iMPSO system



iMPSO systems are center-fed and are a vaultless solution regardless of installation location.

This reduces construction costs for existing wharves

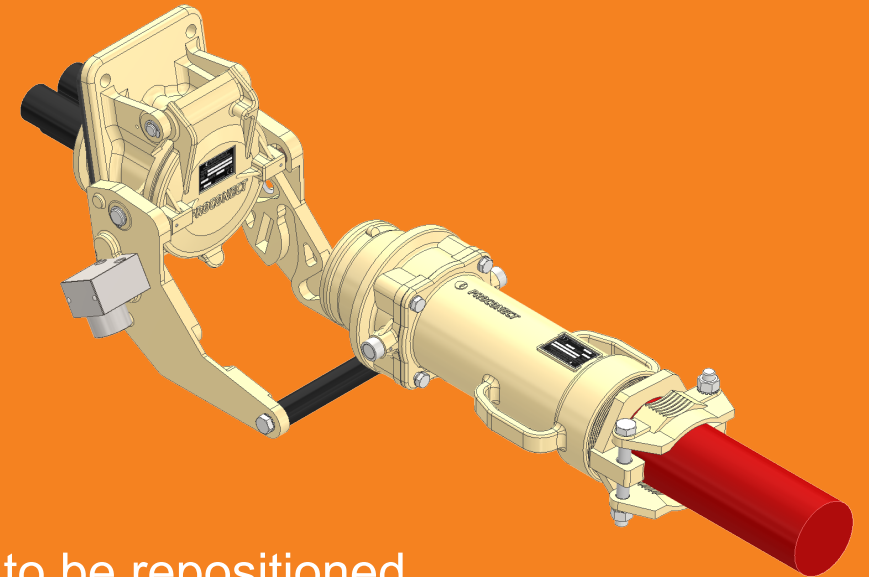
Views: Locked Socket Box, Strain Relief, Cable Slack



- Connection is complete with both socket box/ carriage and cables not preventing safety egress from terminal
- Strain relief chains are in final configuration attached to the bull rail
- Ship cabling is supported so that MBR for the cables is not violated.

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. For Mobile Shore Power products must be used that have good resistance to corrosion, abrasion and be suitable for use in a marine climate.

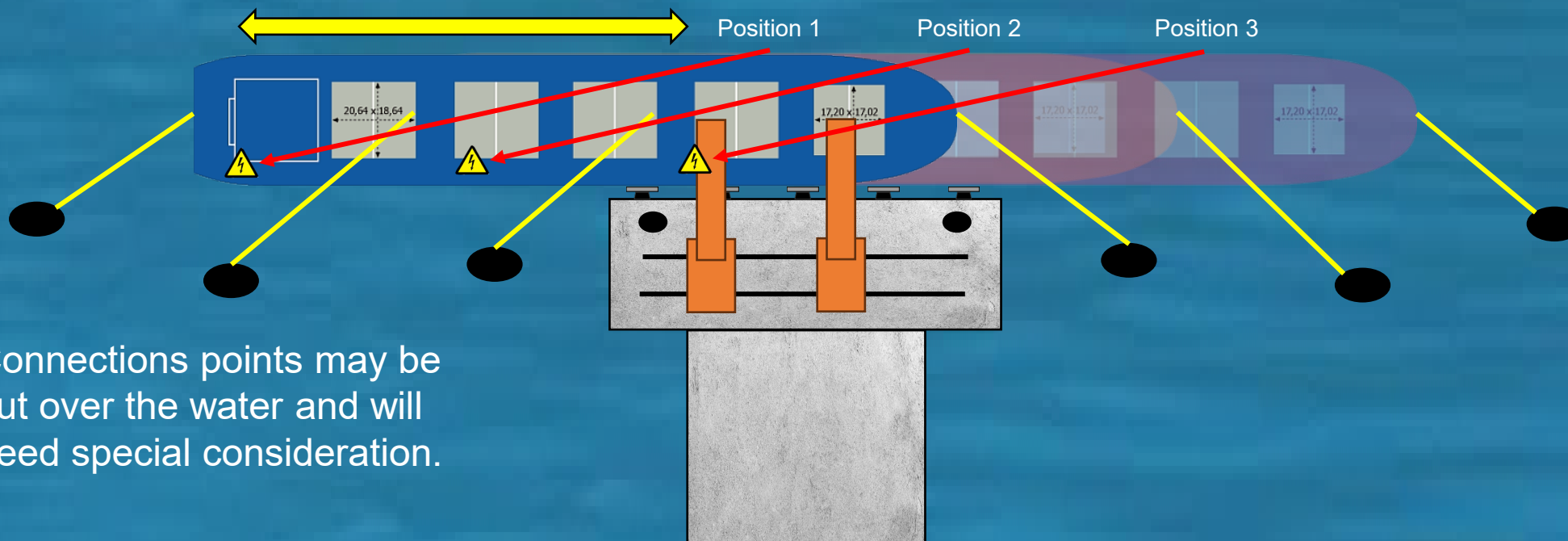
Challenge 2: EX area considerations

- Connections should be made in areas away from classified areas.
- Be careful of cable reel solutions that have a slipping 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

Terminals that do not have the size to accommodate bringing the entire vessel alongside may need to reposition during the loading process to reach all hatches



Connections points may be out over the water and will need special consideration.

Challenge 4: Space considerations

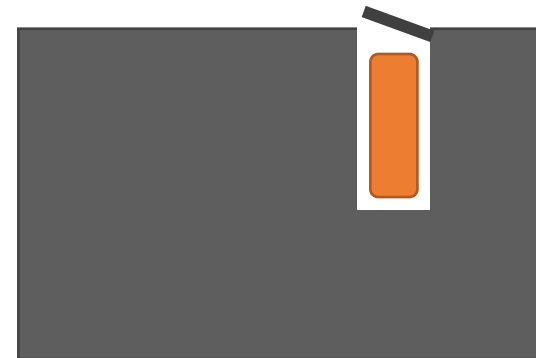
1. Quay face mounted on the face of the quay wall above the fenders
2. Deck mounted on the terminal surface in front of or behind the bollards
3. Trench installation where the e-chain system is installed in a trench
4. Custom solutions are possible for challenges with space or position



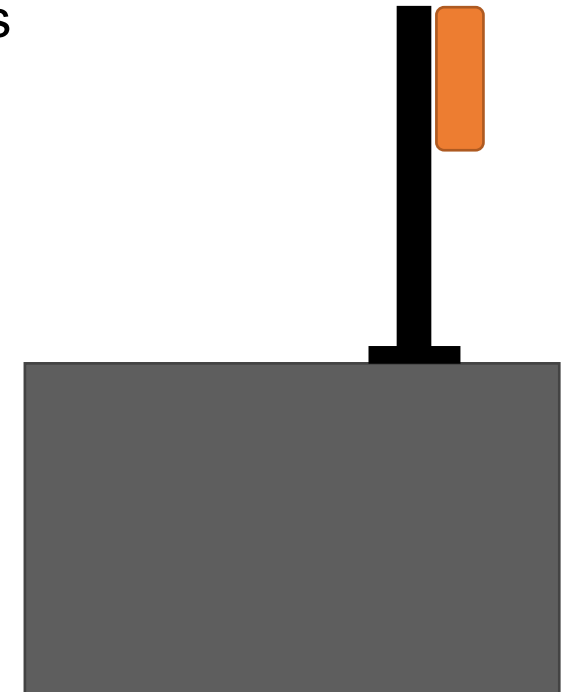
1. Best location to minimize interference with operations



2. If there is not enough clearance above fenders



3. The socket box carriage is the only external component



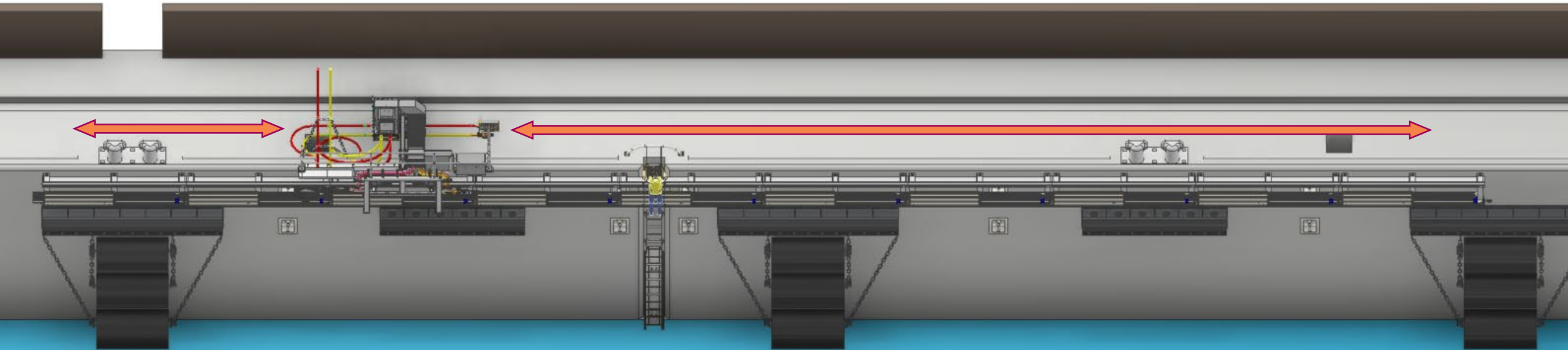
4. Space or equipment requires special attention

Where to start

- Familiarize yourself with the standards IEC 80005-1
- Determine your power needs: how many vessels, load profiles for each vessel...
- Study berthing arrangements and mooring line geometries
- Check your space requirements
 - Location of backland electrical equipment
 - Space available for ship-to-shore connection: Fenders, bollards, bull rails, crane rails
 - Cable installation and trenching
- Start planning early. These projects take time, and some equipment has long lead times.

Facts about shore power

- The technology that is required to implement shore power is available today.
- Shore Power can be implemented for immediate results in the most critical decarbonization areas such as ports surrounded by high population densities.
- With Mobile Shore Power technology, the ability to implement a future-proof system is now a reality.



Thank you for your time and attention!



Sean McCaskill

Shore Power Systems Manager, Americas

Charlotte, NC USA

Cell: +1 704 236-3568 email: smccaskill@igus.net

Thank you to Lukas for the invite



Questions, Comments, Discussion!

Shore power products include:

igus Mobile Shore Power Outlet (iMSPO[®]), e-chain Reel[®], Triflex Dispenser[®] Systems, e-loop[®]