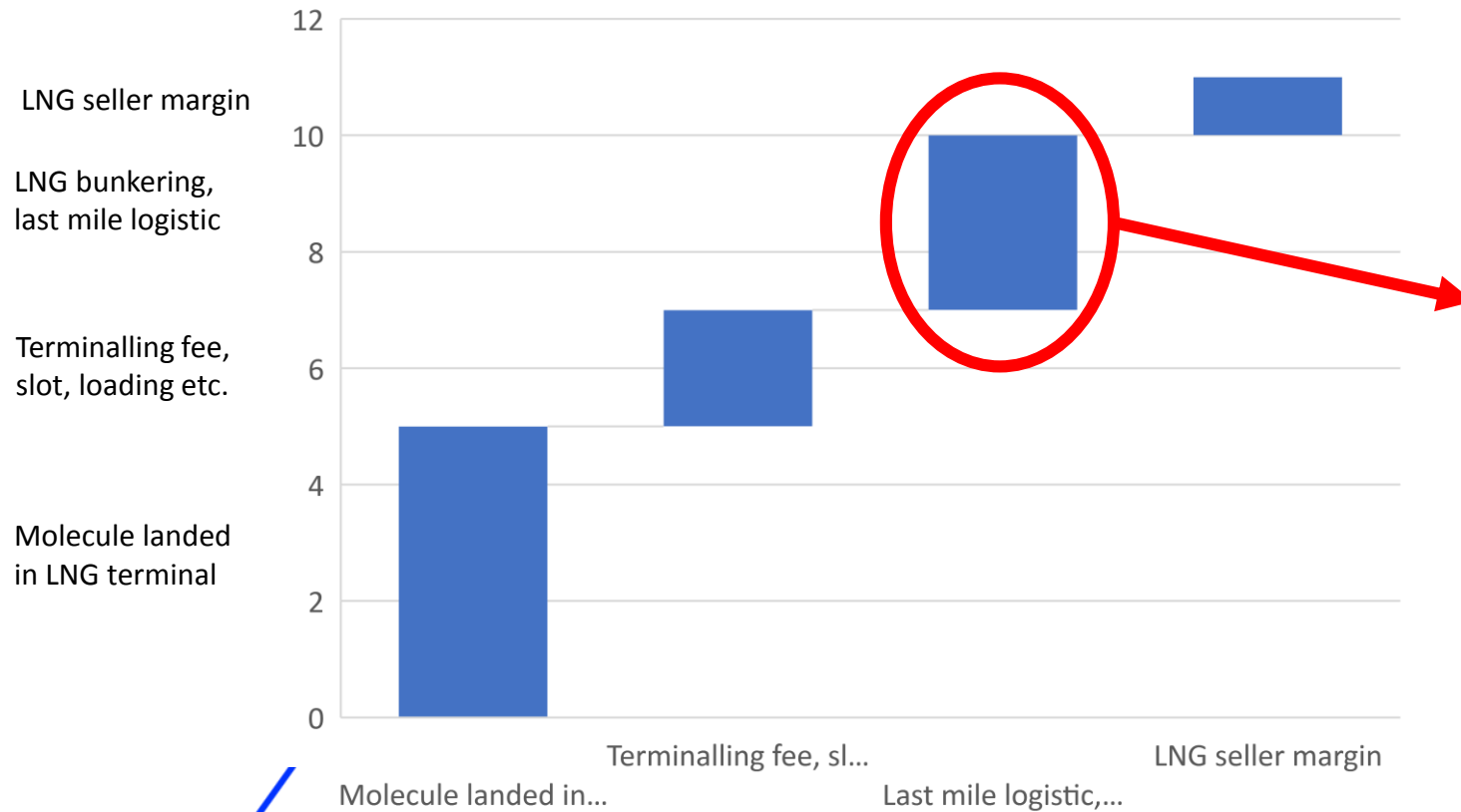


QUADELPROP LNG bunker ship

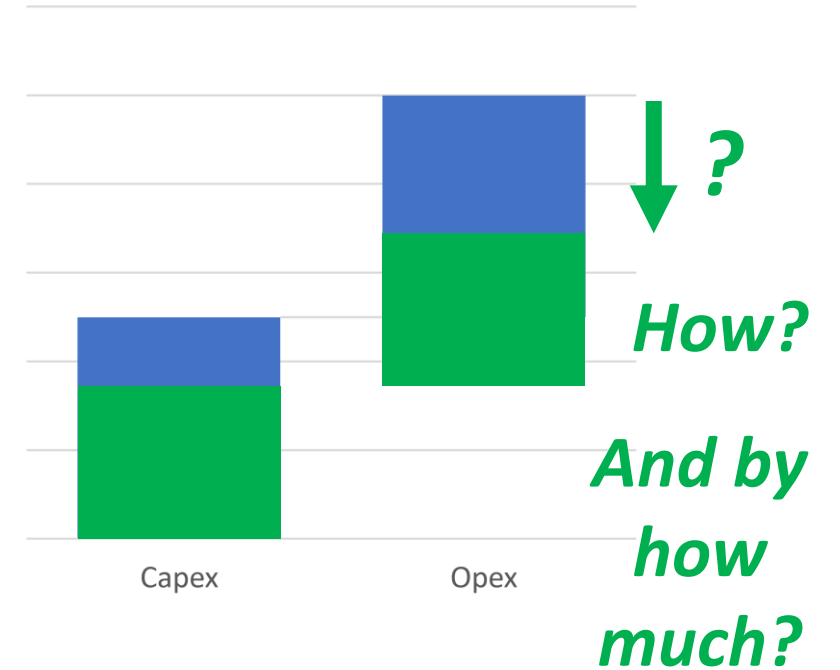
A new approach to ship-to-ship LNG bunkering

LNG price breakdown

LNG price breakdown (USD/mmbtu)



Last mile logistic capex / opex

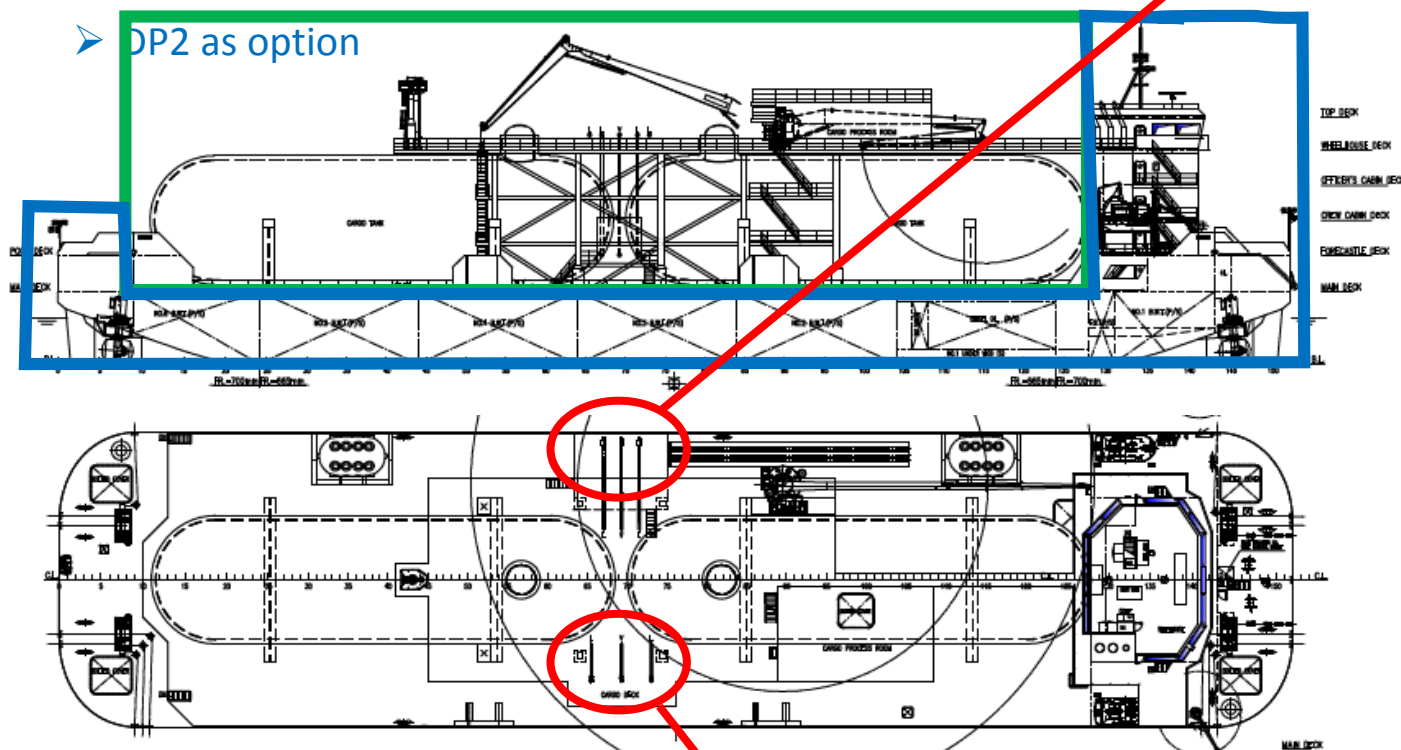


Focus on:

- *Safety*
- *Maneuvrability*
- *Simplicity & reliability of operations*
- *Lowering costs without compromising other aspects*
 - ✓ *Defining the real operating profile of the ship*
 - ✓ *Concentrating on the very mission of the ship: bunkering*
 - ✓ *Eliminating any features or items not absolutely necessary for the mission*
 - ✓ *Reducing interfaces*
 - ✓ *Avoiding « over-engineering »*
 - ✓ *Encouraging Frugal innovation*

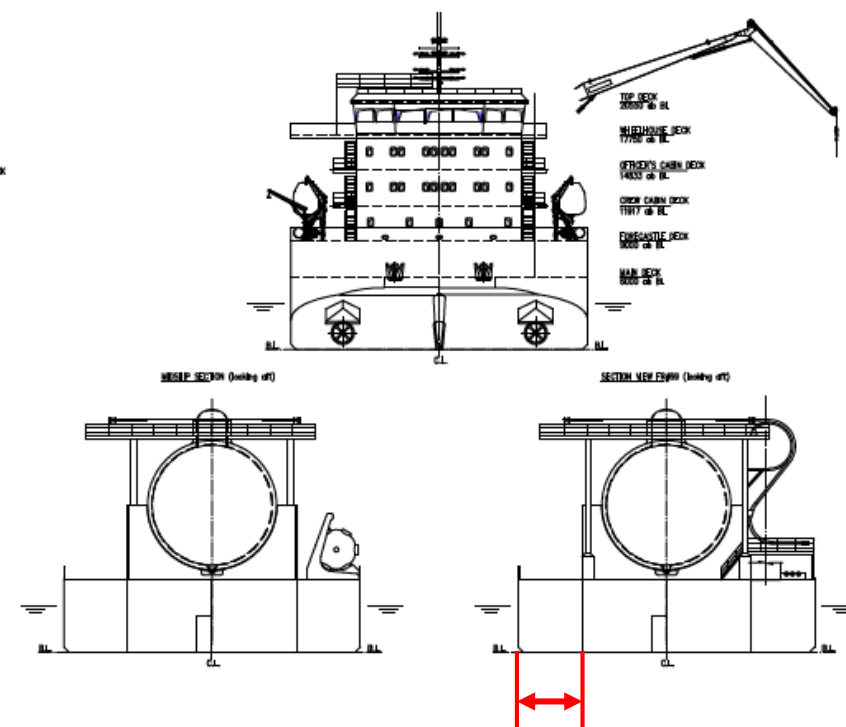
Exemple 1: QUADELPROP 5400

- 2 x 2700 m3 type C tanks with full capacity SCU (Sub-Cooling Unit)
- 4 x 750 kW azimuthal thrusters electric drive
- Diesel or DF power generation
- DP2 as option



Manifold dedicated to LNG bunkering (interface with client ship)

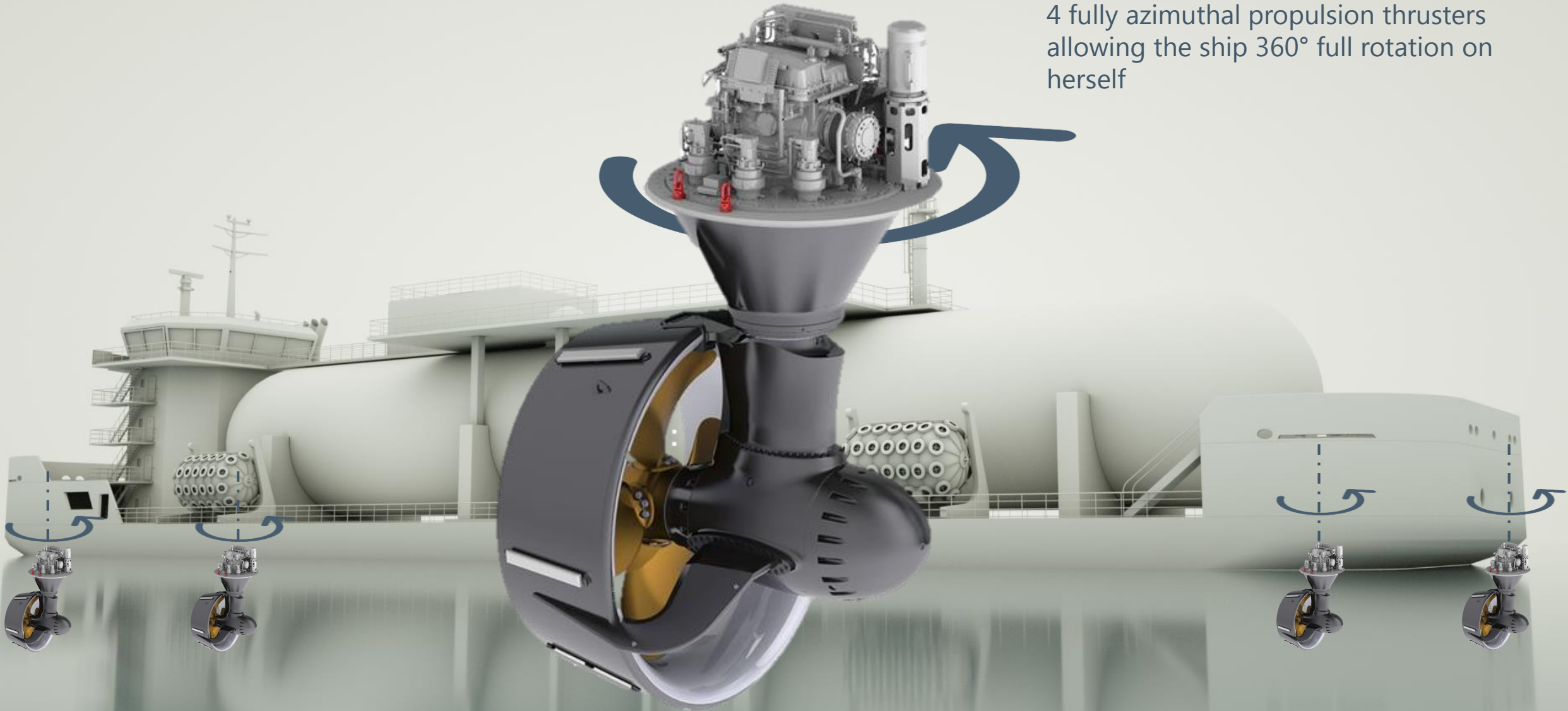
Manifold dedicated to LNG loading (interface with LNG terminal)



B/5 : damage stab sustainability

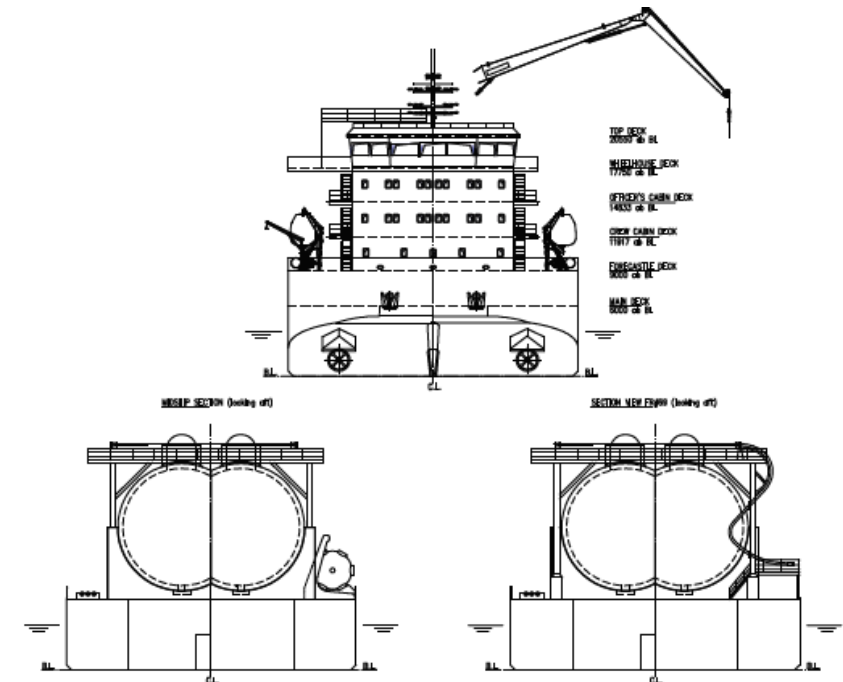
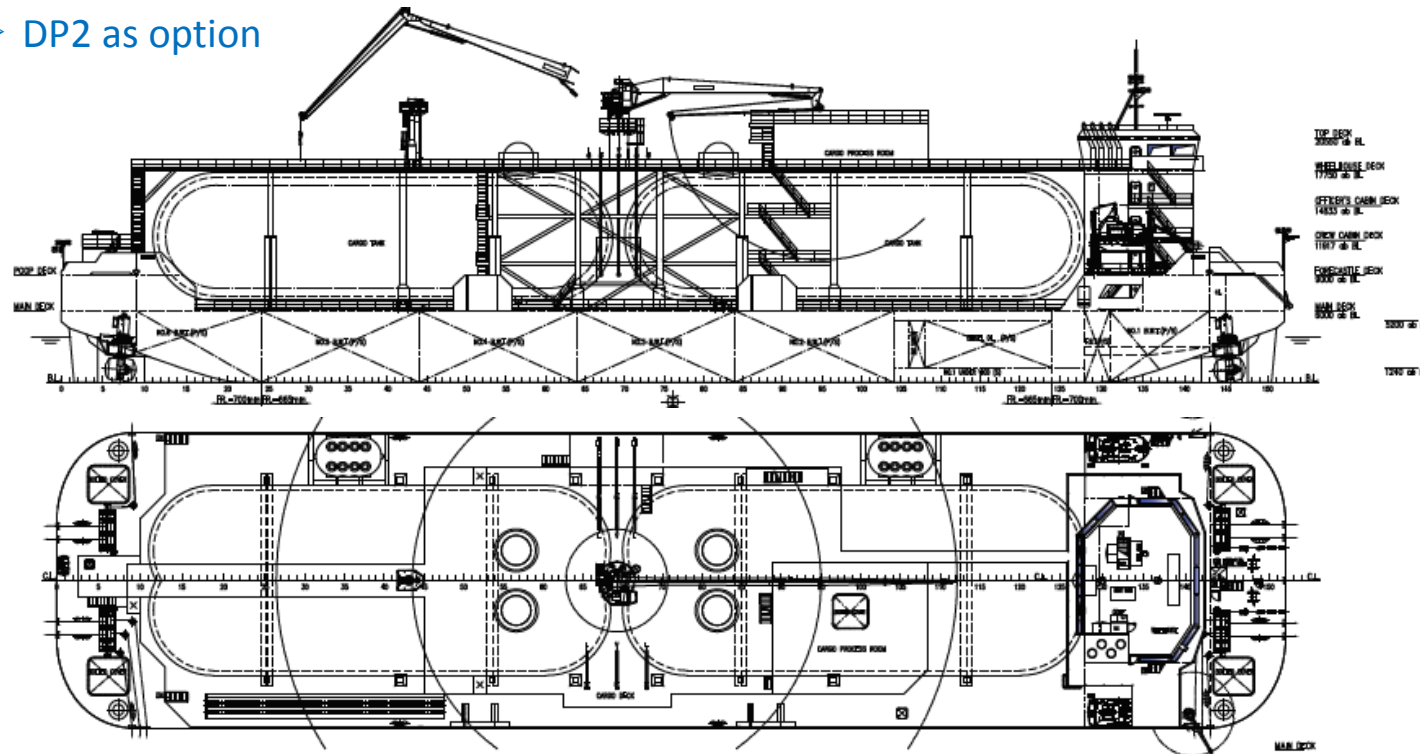
Example: Quadelprop 5400

LNG Capacity : 2 x 2700 m³ type C tanks
102,8 m x 24,6 m x 3,8 m (design draft)
4 fully azimuthal propulsion thrusters
allowing the ship 360° full rotation on
herself

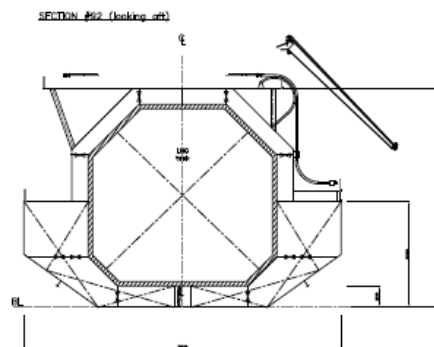
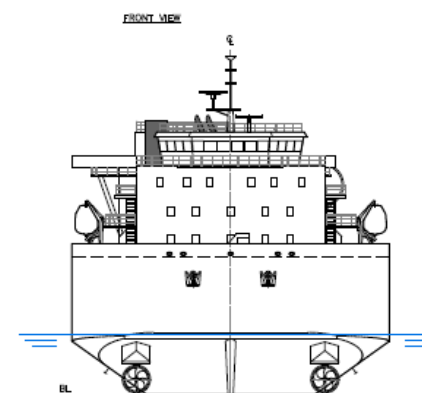
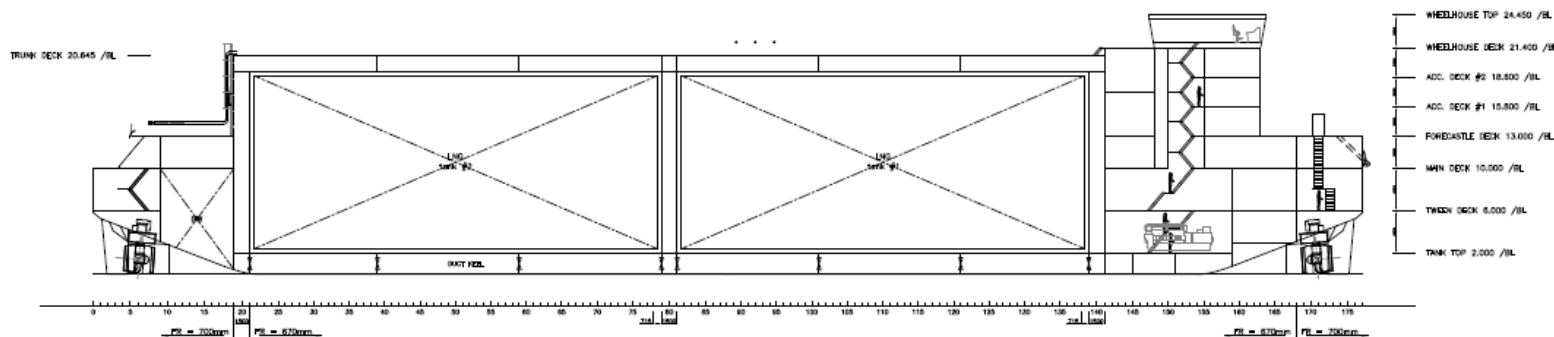
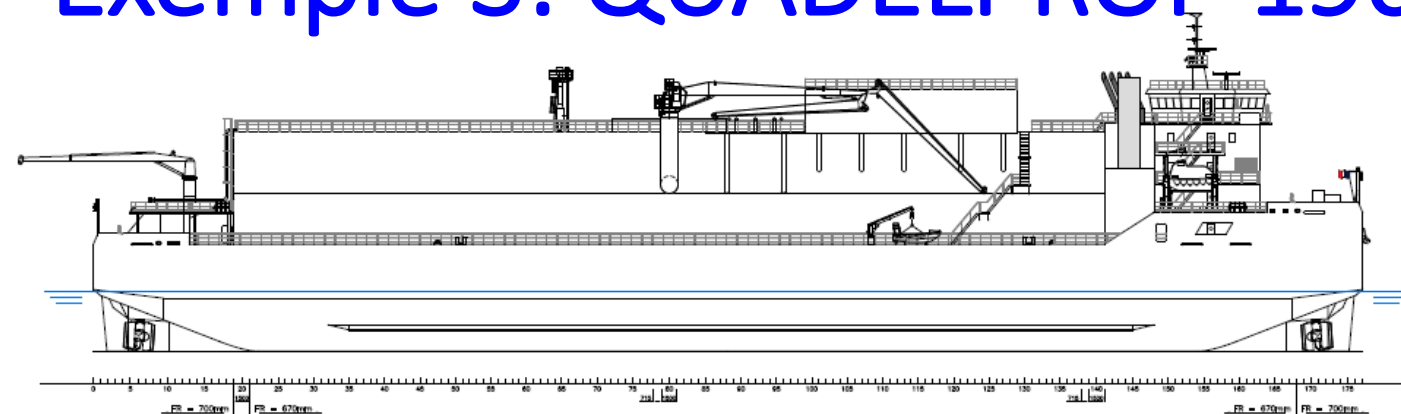


Exemple 2: QUADELPROP 8700

- 2 x 4350 m3 bilobe type C tanks with full capacity SCU
- 4 x 750 kW azimuthal thrusters electric drive
- Diesel or DF power generation
- DP2 as option



Exemple 3: QUADELPROP 19000

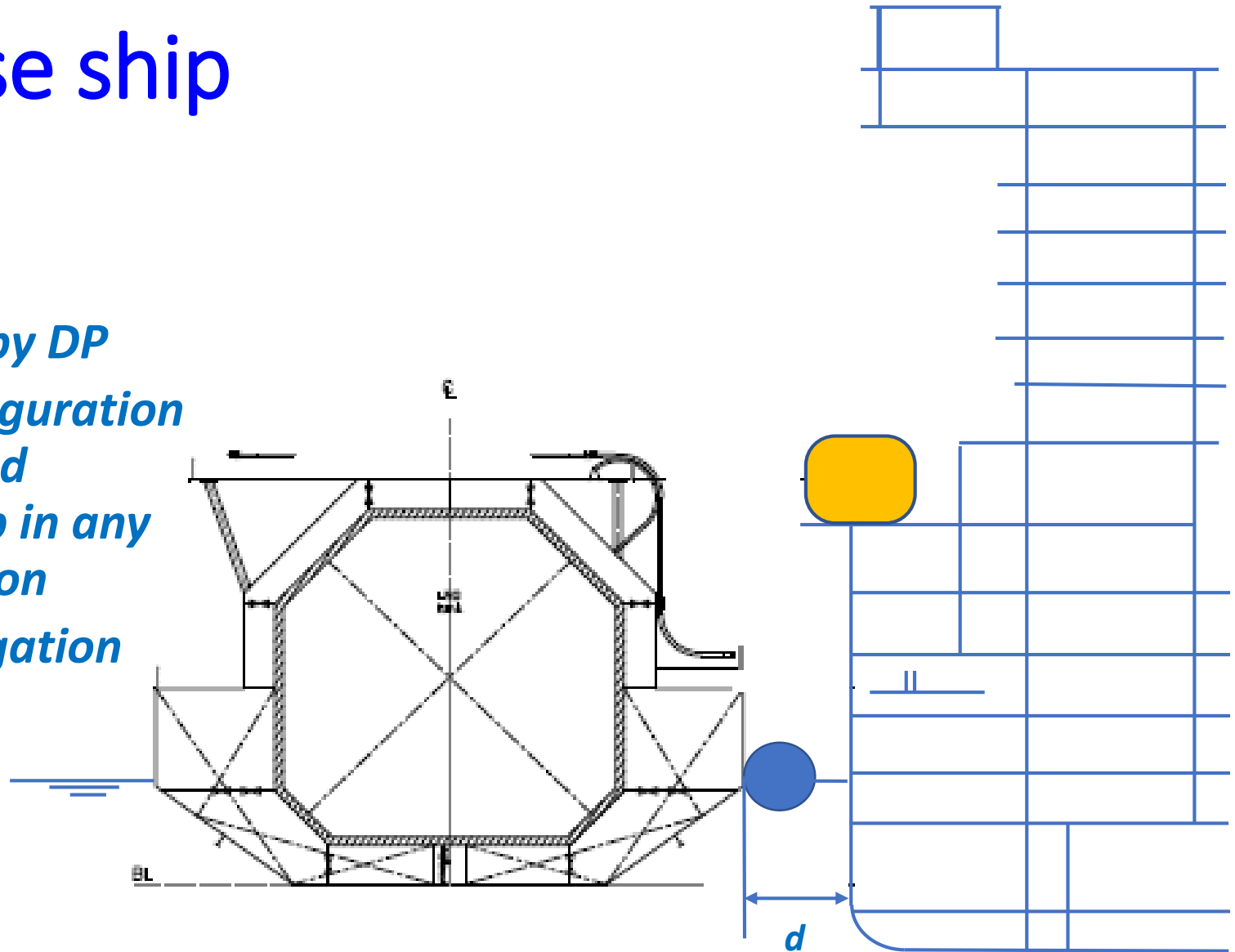


- 2 x 9500 m3 GTT Mark3 Flex membrane tanks with full capacity SCU & GCU
- 4 x 1100 kW azimuthal thrusters electric drive
- Diesel or DF power generation
- DP2 as option

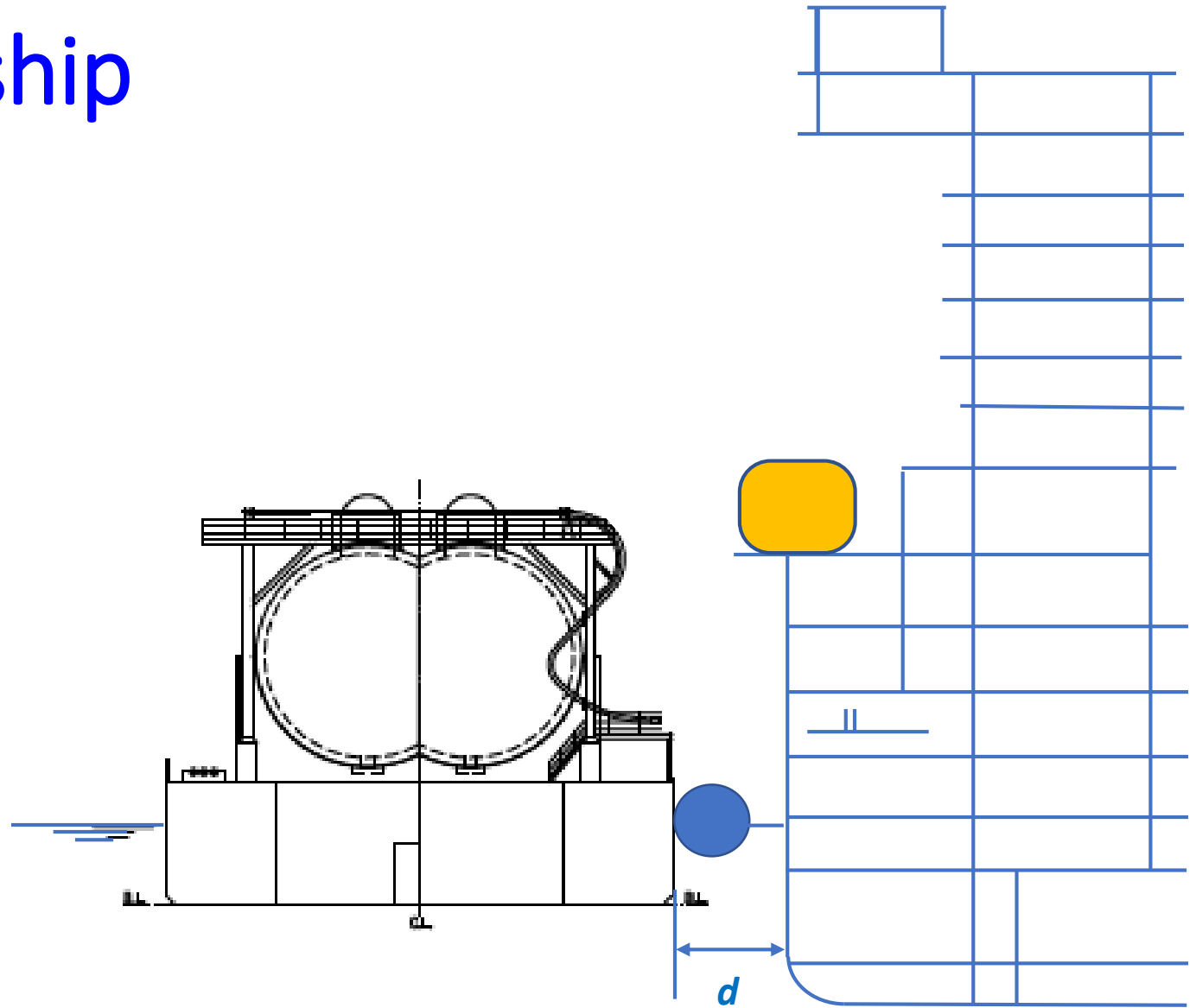
Bunkering cruise ship

➤ In DP mode

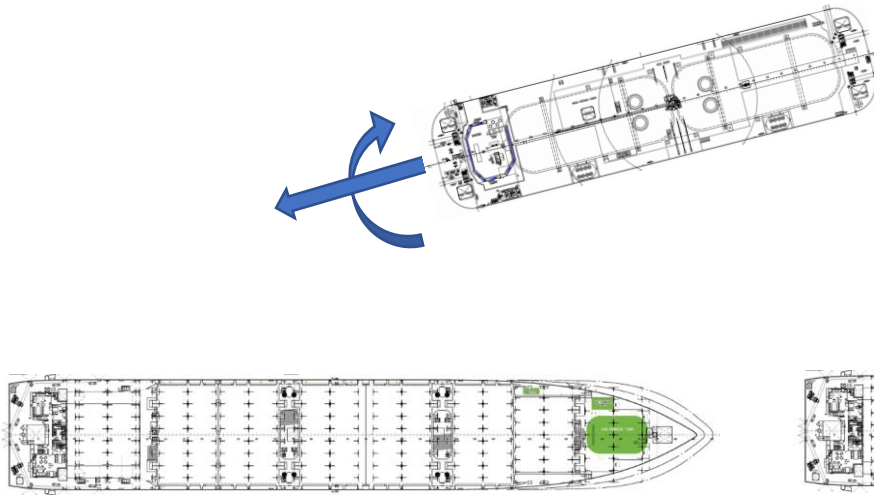
- ✓ No mooring lines
- ✓ Clearance 'd' controlled by DP
- ✓ Bunker ship section configuration adapted to maintain good clearance with client ship in any draft, roll & pitch condition
- ✓ Fenders in water as mitigation measure



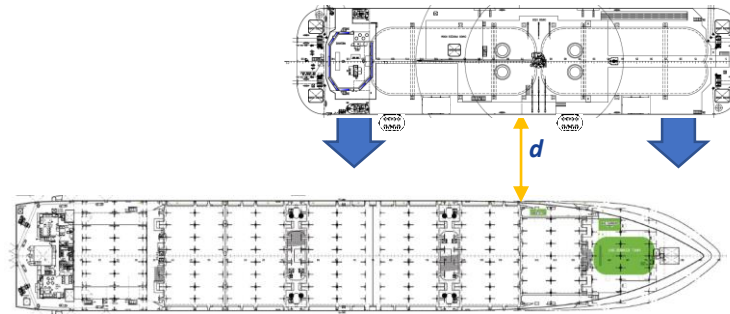
Bunkering cruise ship



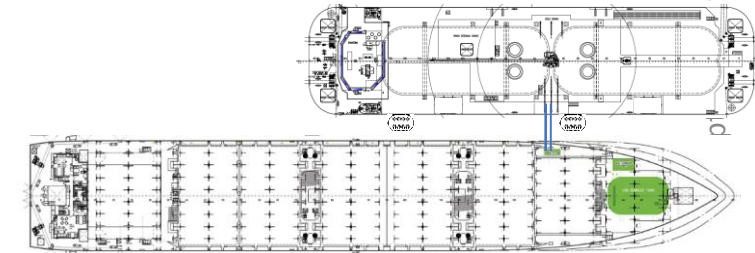
Bunkering operation in DP mode



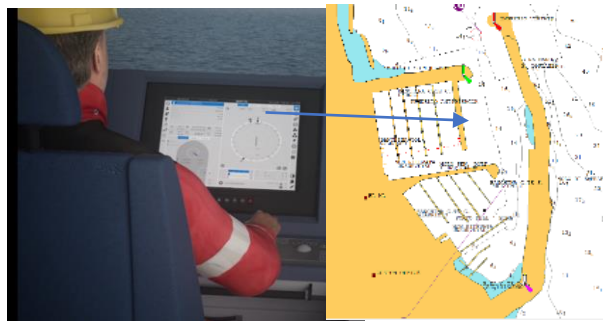
Step 1 : Approach Manoeuvre



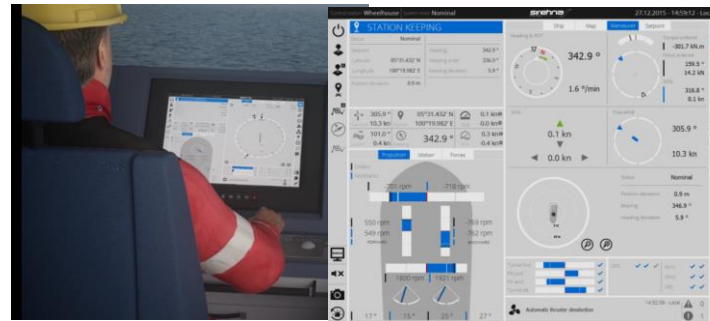
Step 2: Final Manoeuvre



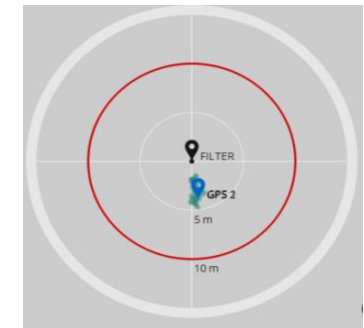
Step 3: Station Keeping



Navigation



Go to way point at low speed



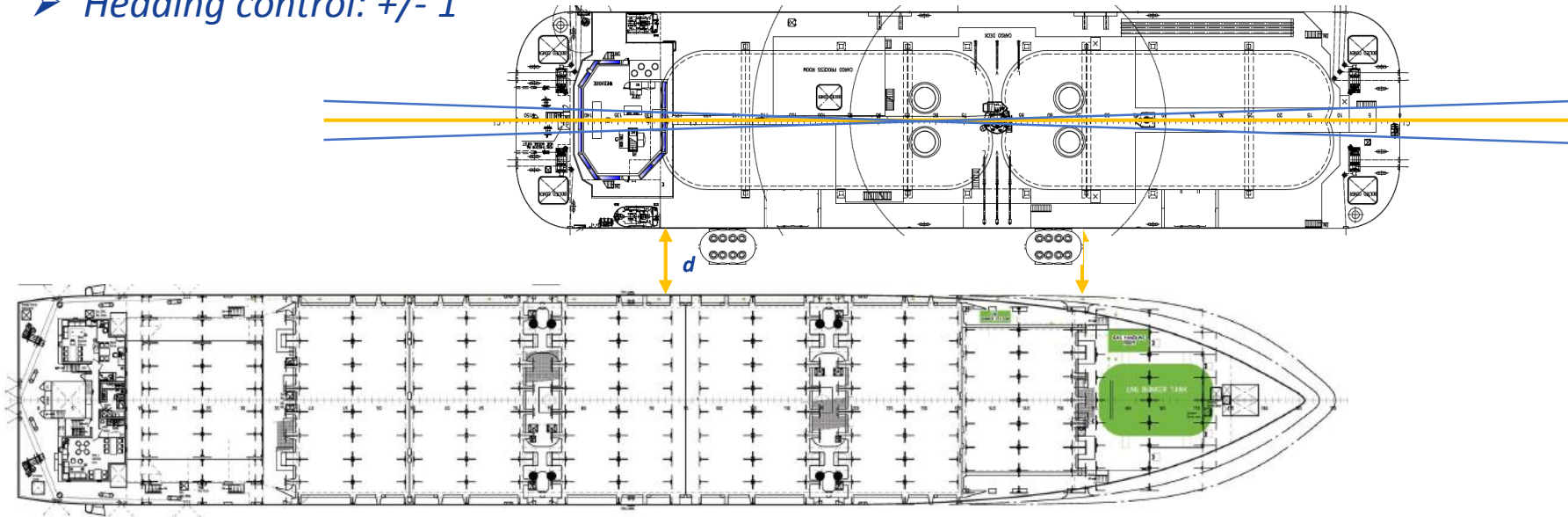
Keep position for a while

Connect transfer hoses and start bunkering

Bunkering operation in DP mode

Relative positioning:

- Distance control: $d \pm 0,5 \text{ m}$
- Heading control: $\pm 1^\circ$



Conclusion

- *High maneuverability:*
 - *well adapted for port operation (shorter LOA)*
 - *No need of tugs or pilots*
 - *DP2 ready*
- *Optimized for coastal navigation, lower Capex, lower Opex*
- *Simple and compact design:*
 - *Easy to build*
 - *Easy to operate*
- *AIP by BV pending (19k)*

Thank you

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