

# The case for LNG retrofit and jumboisation of container vessels

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## Panellist documents:

Page 2:

Jean-Benoît Bensoussan, Gaztransport & Technigaz

Thibault Vinet, Alwena Shipping

Bai Fuqing, COSCO SHIPPING Heavy Industry (Zhoushan)

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**CONTAINER**  
SHIPPING & TRADE

**marine**  
**propulsion**  
& auxiliary machinery



# LNG retrofit and jumboisation

Building the case  
of the retrofit

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May 2022



# The LNG retrofit and jumboisation concept



LNG Dual Fuel retrofit and jumboisation with membrane containment system for Very Large Container Ships

Approval in Principle

Issued to:	ALWENA SHIPPING, GTT & COSCO ZHOUSHAN
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# Leverage LNG conversion and cargo capacity increase



LNG fuel tank allows to meet environmental regulation with prolonged asset lifetime

LNG conversion drives OPEX down

Additional cargo container section increases vessel operational profitability

# Agenda

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1

REGULATION

2

FOCUS LNG

3

RETROFIT  
OPERATIONS &  
TECHNICAL  
SOLUTIONS

4

BUSINESS CASE

5

CONCLUSION

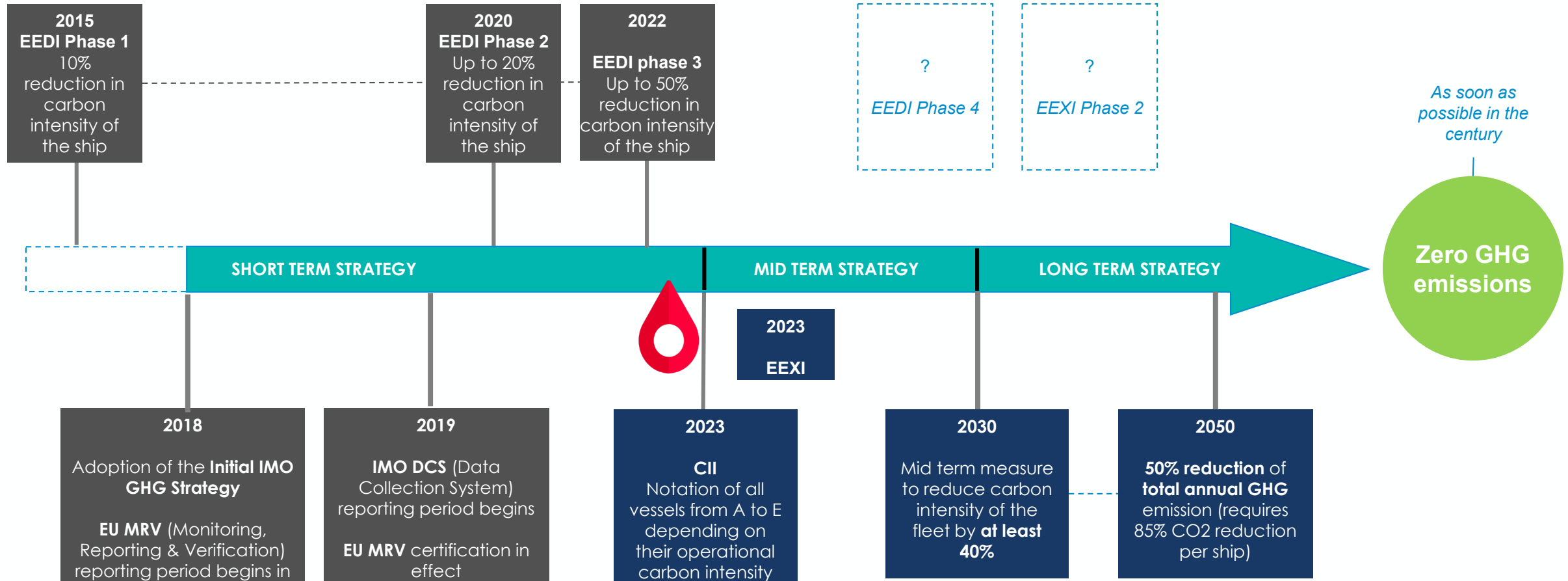
# Regulation



# 2023 a tipping point in the environmental regulation

## New ships

## IMO GHG Strategy timetable

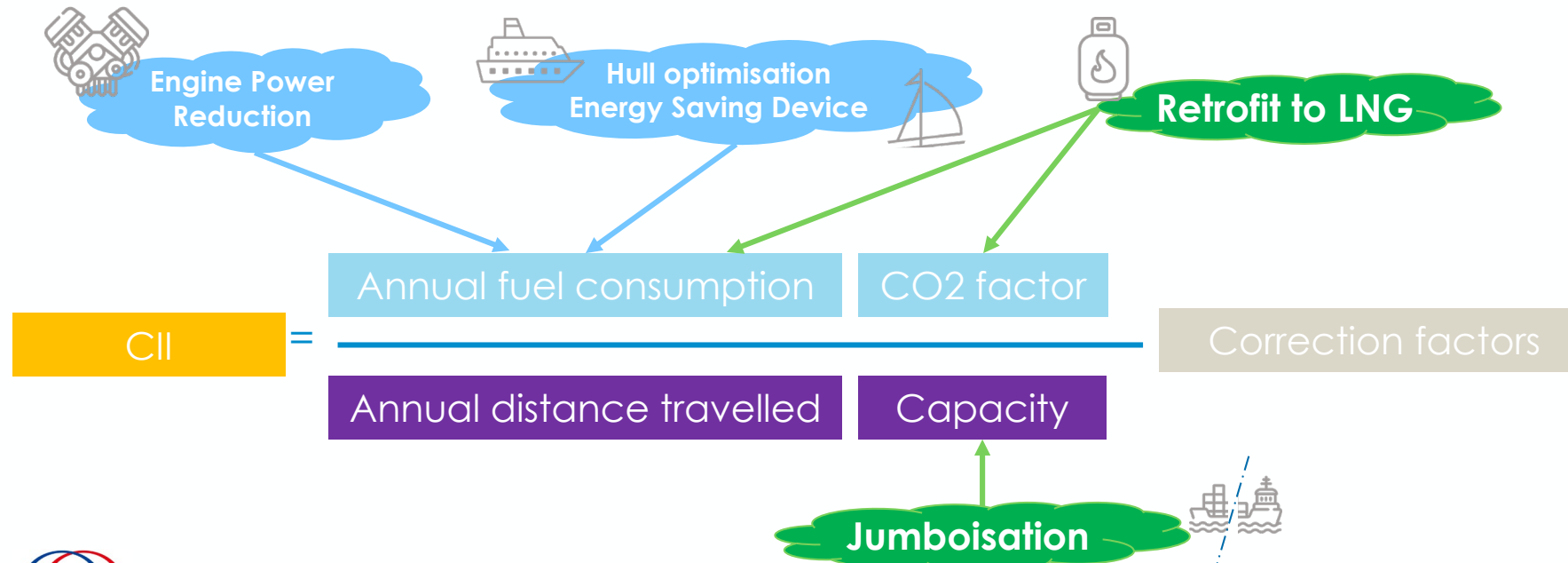
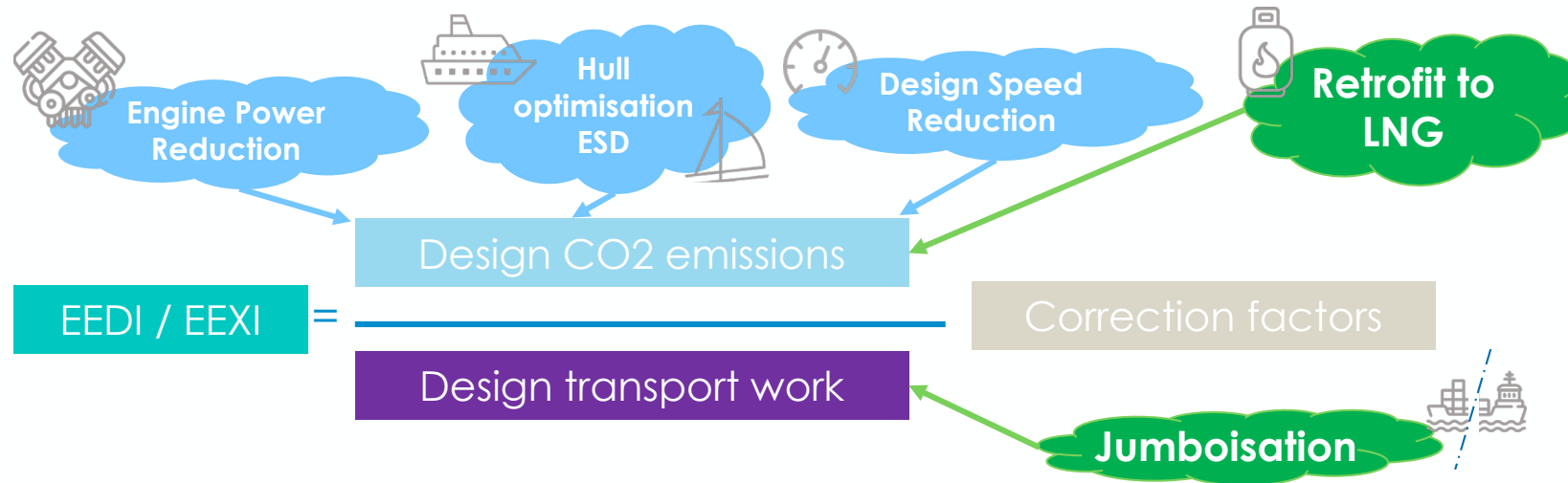


## All ships

In force / Binding      Not in force / Non binding

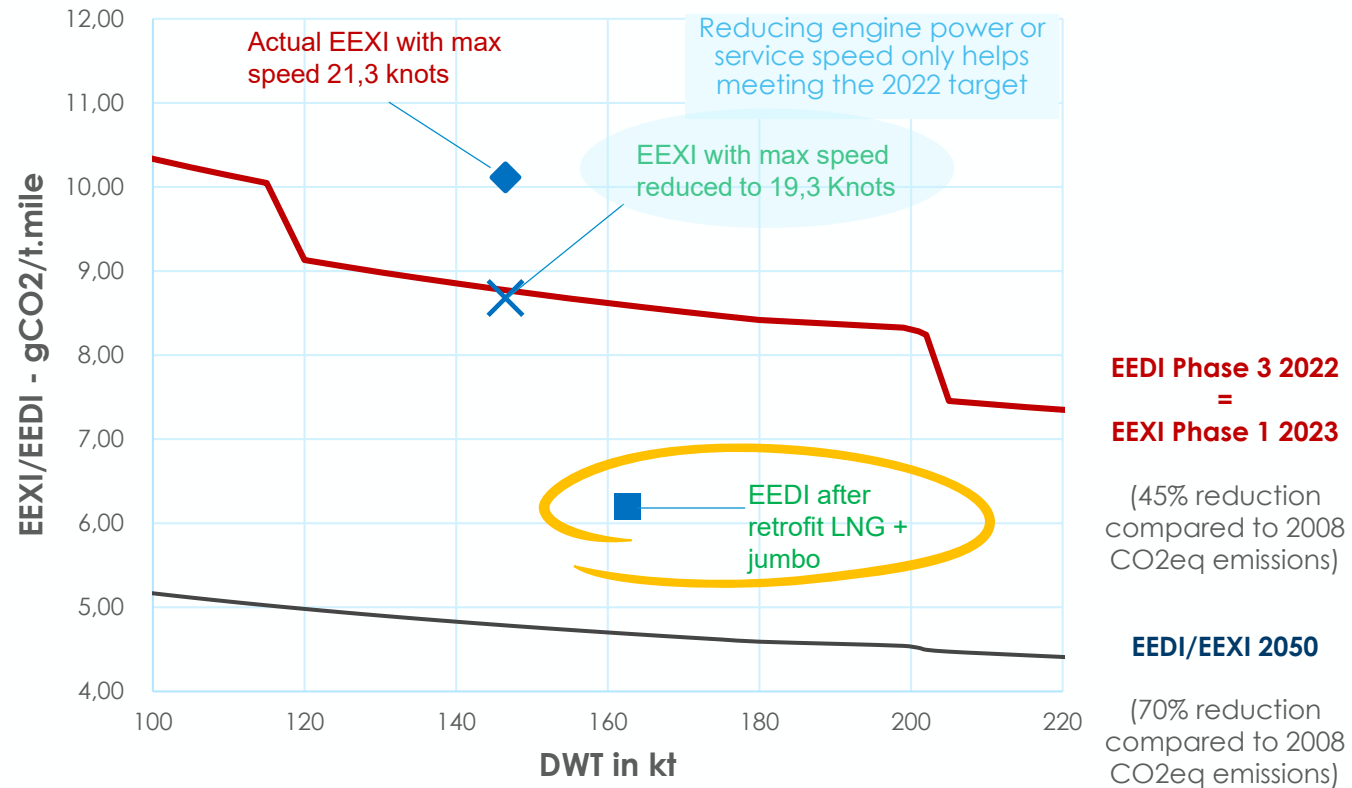


# Impacting all levers in EEXI / CII formula at the same time

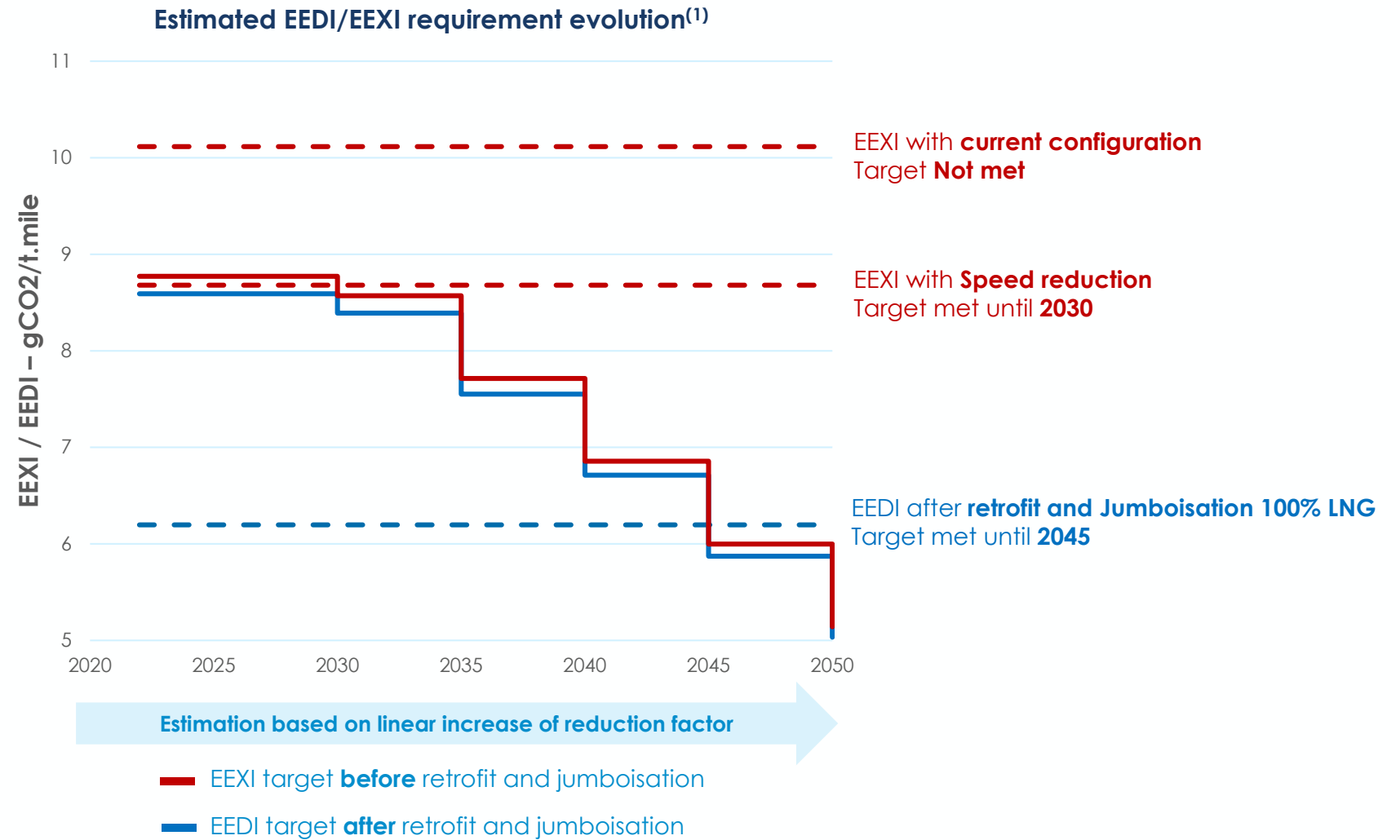


# LNG retrofit & jumbo reduces emission per transport work by 1/3

### EEDI/EEXI evolution per deadweight tonnage



# Retrofit & Jumbo allows to be compliant until 2045



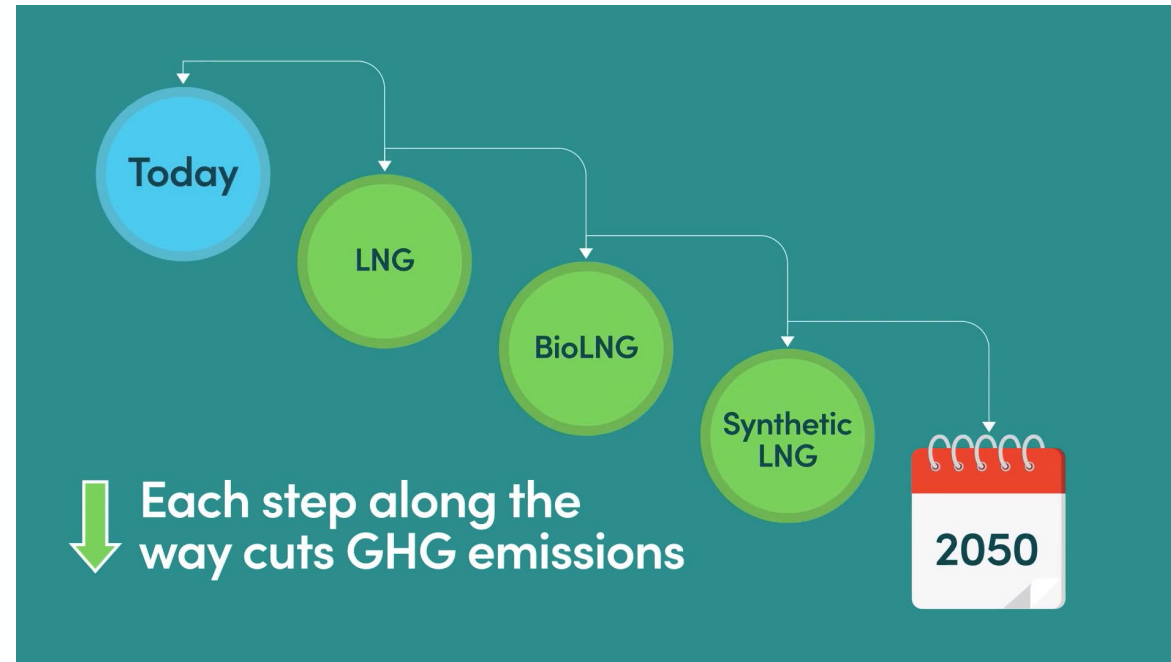
Source : (1) Provided EEXI and EEDI are calculated according to the same formula and follow the same baseline

# 2

## Focus LNG



# LNG is a longterm sustainable choice

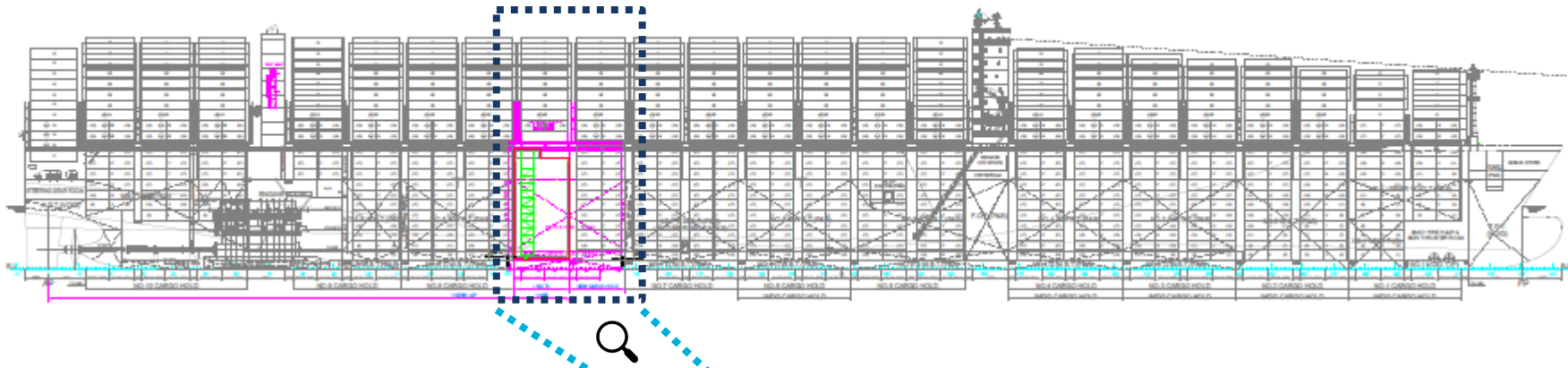


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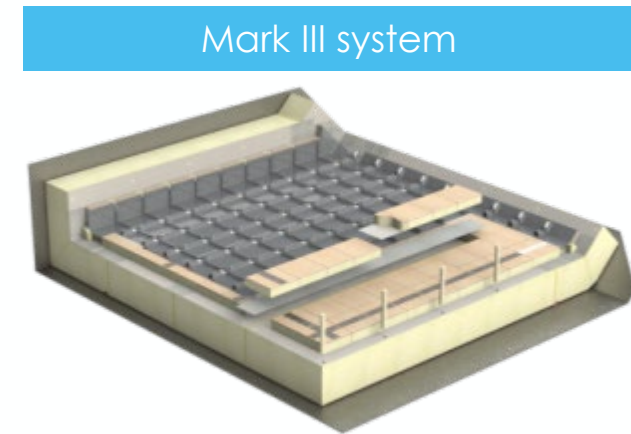
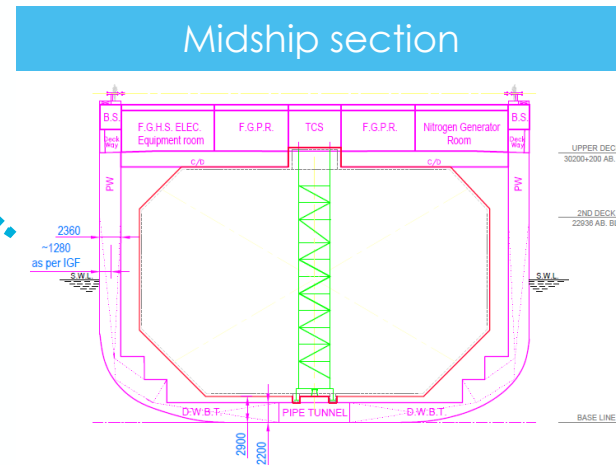
## Retrofit operations & technical solutions



# GTT LNG tank technology offers maximum operational flexibility



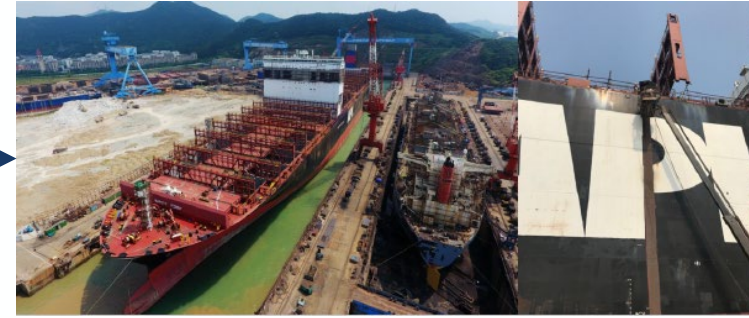
- Added section length: **28.9m**
- Additional cargo capacity: **1,148TEU**
- Deadweight increase: **16,000T**
- LNG Tank capacity: **12,230m<sup>3</sup>**
- Membrane technology: **Mark III (270mm)**
- Design Daily BOR: **0.255%V/day**
- Design BOG flowrate: **542 kg/h (CH<sub>4</sub>)**



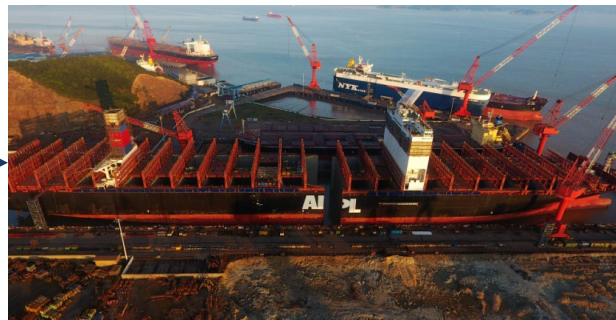
# Conversion main operations are well managed by shipyards



Block construction – prior to vessel arrival



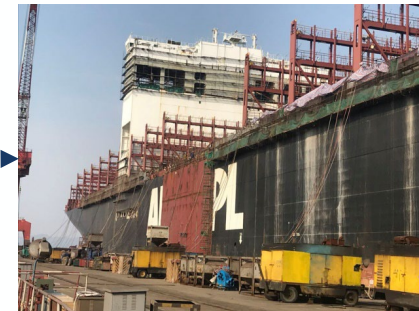
Vessel arrival in dry dock



Vessel cut



Floating in & out vessel new and existing sections



Welding of the new section

Pictures courtesy of CHI ZHOUSHAN



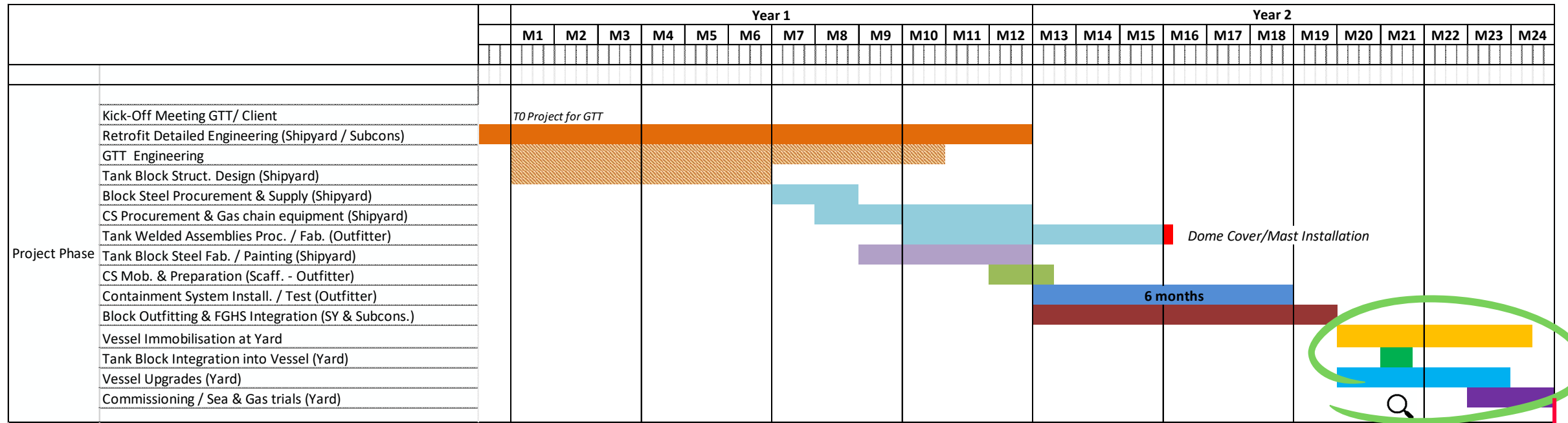
# 2 years project for 4 months vessel off hire

Overall retrofit project from vessel candidate selection to vessel delivery is **24months**

Block construction and membrane outfitting + FGHS integration is **10 months**

Vessel immobilisation at retrofit shipyard is **126 days**

Vessel in dry dock **42 days**



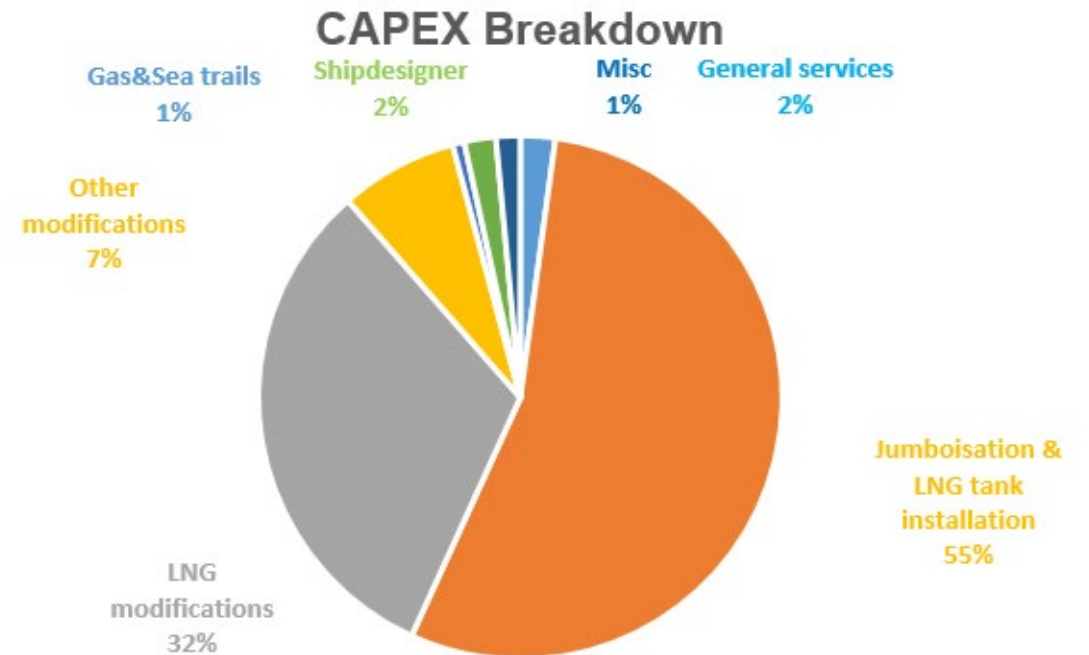
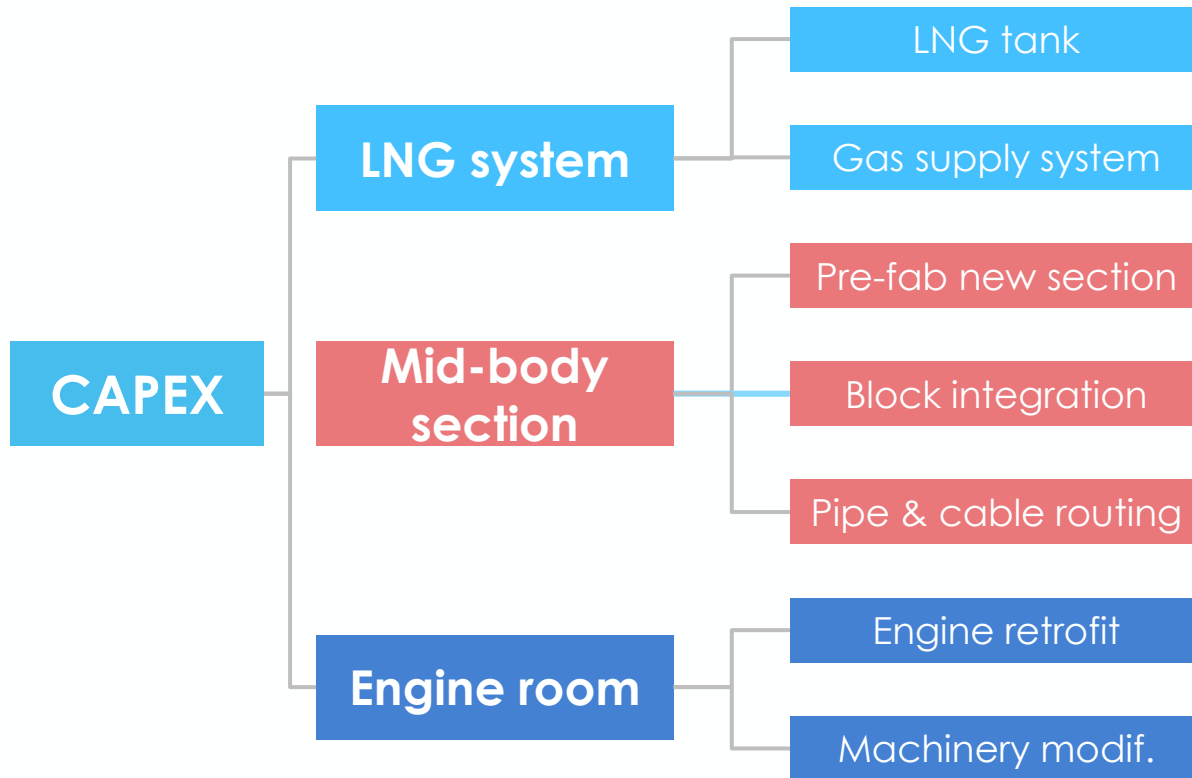
# 4

## Business Case



# \$41 million overall CAPEX for the conversion operation

Overall CAPEX is driven by the fabrication of the additional section  
LNG modification depends on the engine retrofit and FGHS maker selection



# Operational profile assumption to assess OPEX savings



**Trading route:** Europe to Asia

**Distance:** 24,900 nautical miles

**Service speed:** 17 knots

**Duration:** ~80 days

**Main Engine :** MAN B&W11S90ME-C10.5-GI-LPSCR Tier III  
(Retrofitted)

Equipped with SCR system

**MCR :** 46.000 kW x 76.0 rpm

**Auxiliary Engines:**

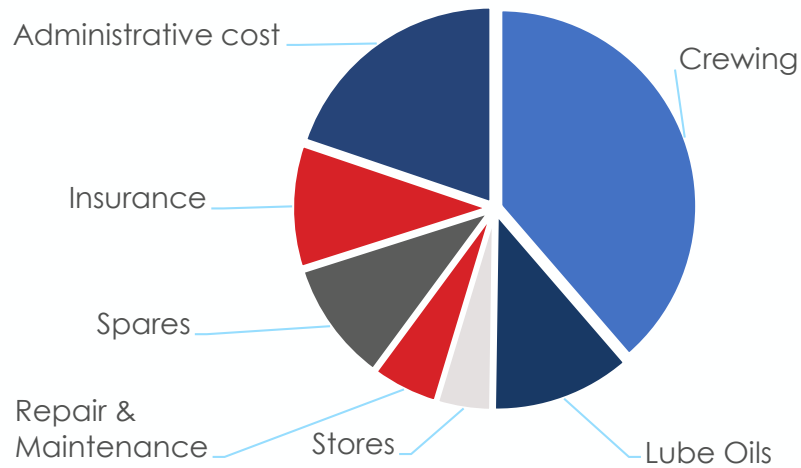
1x Wartsila 8L32 and 1x Wartsila 6L32 (already installed in the ship) equipped with SCR systems

2x Pure gas generator installed during the retrofit  
(Bergen 36:45 considered for study)

# \$1.4 million per year saved for a vessel running on LNG

## OPEX ESTIMATION

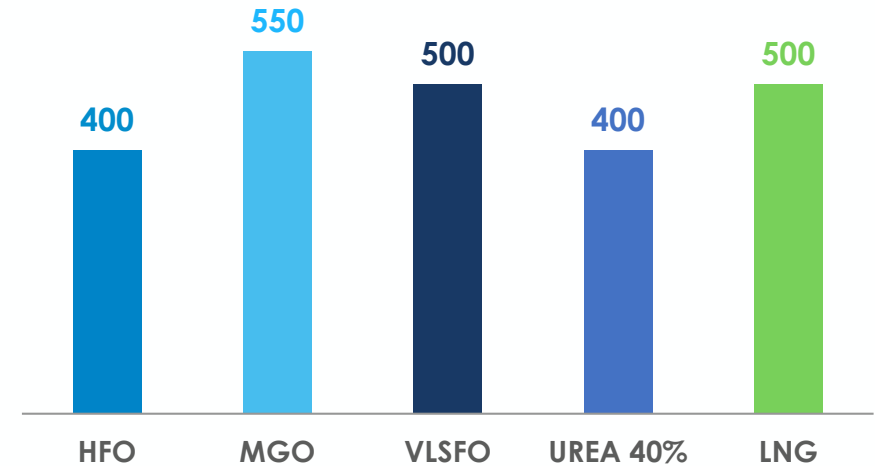
OPEX distribution



OPEX per day for LNG ship is estimated around \$16,000

## FUEL COST SAVING

Fuel & Urea costs in \$/ton



Fuel prices considered for the study are average prices before the latest conjectural events

# Payback after retrofit in less than 7 years



Fuel annual  
reduction cost

**\$1.4M**



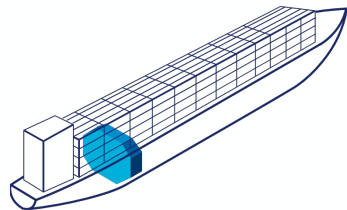
Additional  
annual revenue

**\$6M**



Off hire cost

**\$6M**

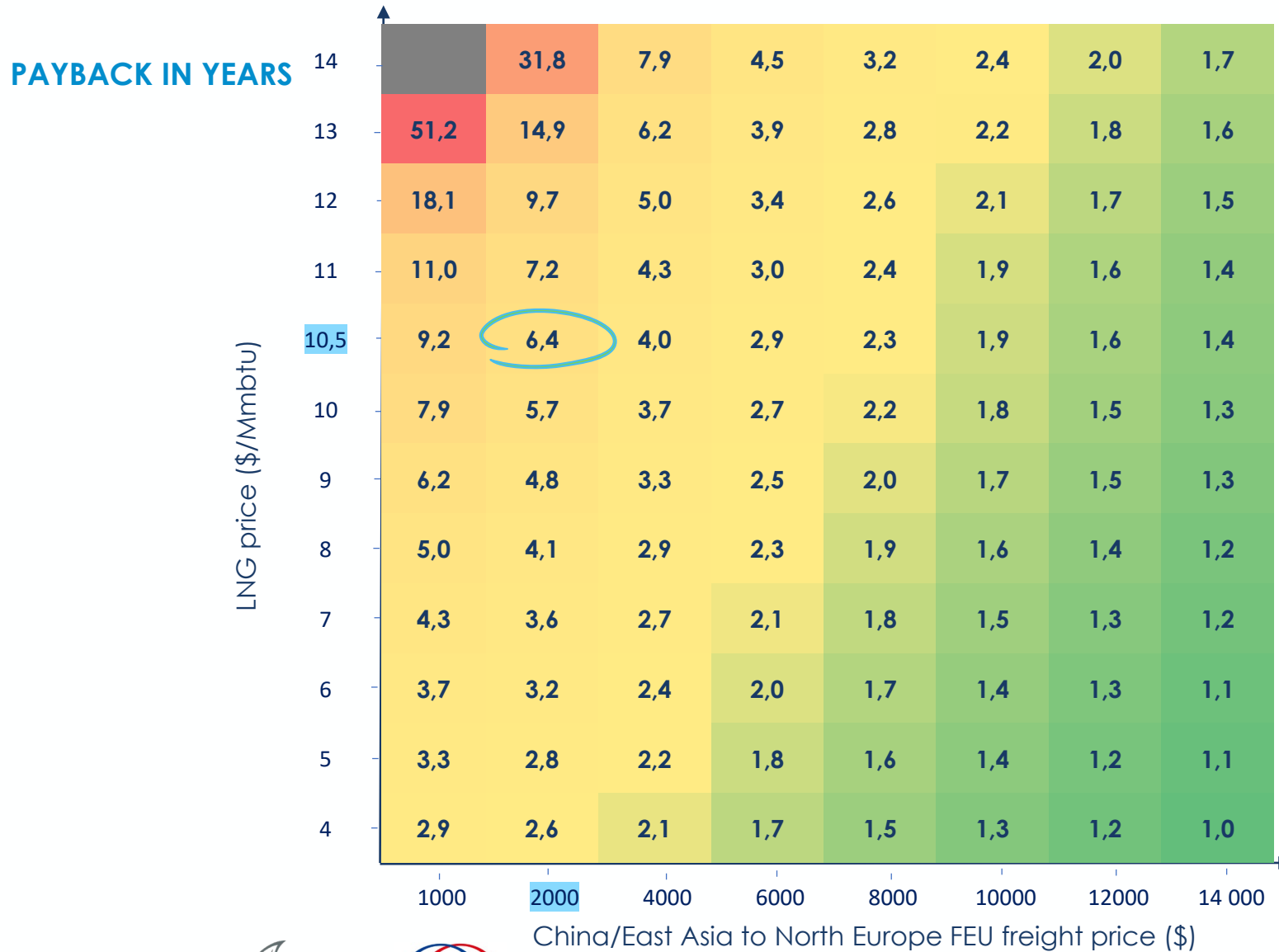


Retrofit CAPEX

**\$41M**

**7 years** payback  
during the extended life  
time of the vessel **until**  
**2045**

# Sensitivity on LNG price and freight price



- MGO : 550 \$/mt
- HFO : 400 \$/mt
- North Europe to China/East Asia FEU freight price : 900\$
- Filling rate EB : 60%
- Filling rate WB : 85%

**7 years** payback during the extended life time of the vessel **until 2045**

# 5

## Conclusion



# Key take aways

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A 2 years process with only 4 month off hire, needs \$41 million investment with 7 years payback

LNG conversion allows to meet IMO ever more stringent requirements

LNG retrofit & jumboisation contributes to extend the lifetime of your asset and adds cargo capacity



**Thibault VINET**  
Project Manager  
Alwena Shipping

[Thibault.vinet@alwenashipping.com](mailto:Thibault.vinet@alwenashipping.com)



**Fuqing BAI**  
Project Manager  
COSCO Shipping Zhoushan

[Bai.fuqing@coscoshipping.com](mailto:Bai.fuqing@coscoshipping.com)



**Jean-Benoît Bensoussan**  
Business development Manager  
GTT

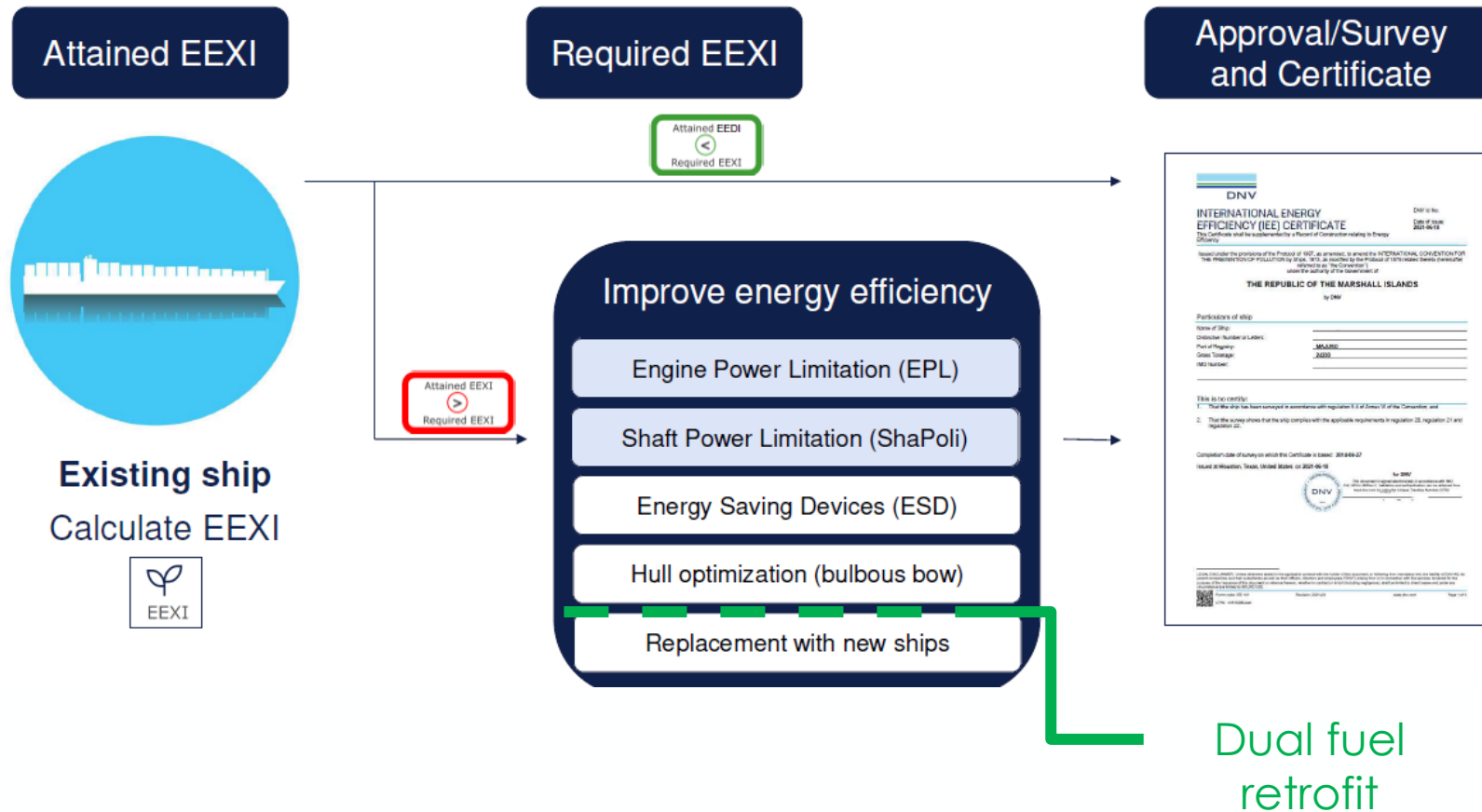
[jbbensoussan@gtt.fr](mailto:jbbensoussan@gtt.fr)



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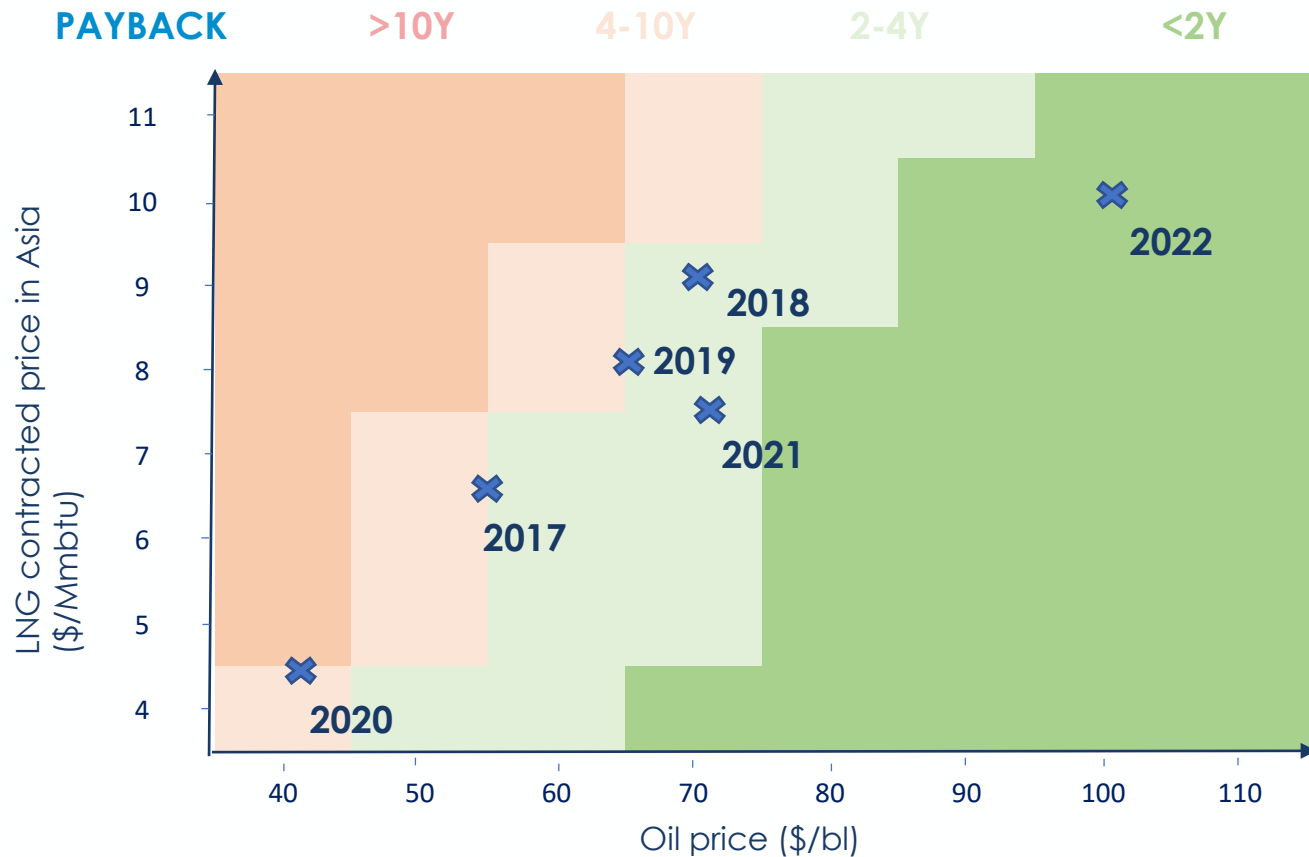
# How to comply with the new regulation



Source : DNV webinar EEXI and CII calculations July 2021

# LNG fuel: an increasingly competitive solution

## LNG AS FUEL PAYBACK FOR A 15K TEU CONTAINERSHIP IN ASIA



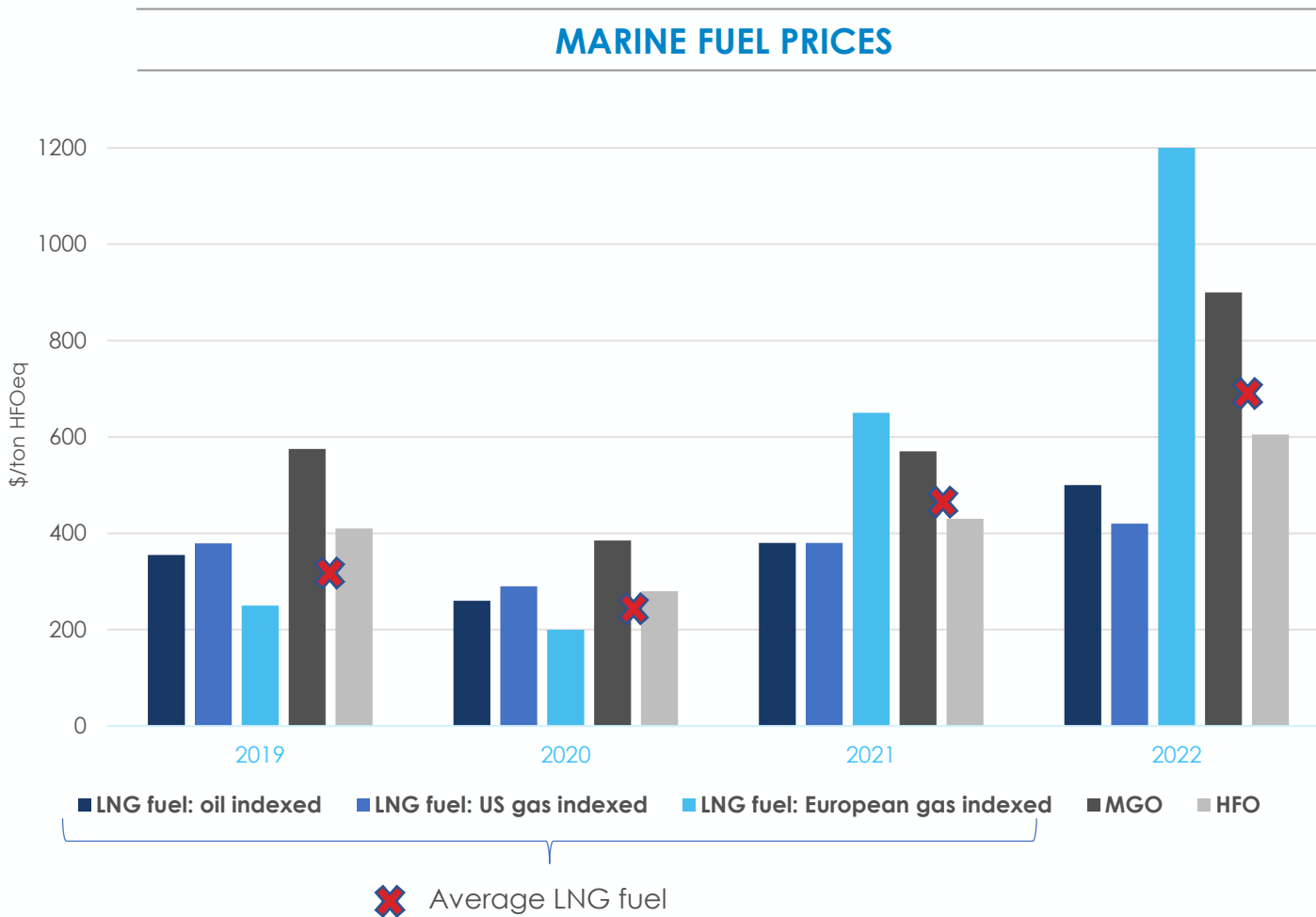
NB: LNG contracted price in Asia is based on a % Brent+0,5\$/ A \$100/ton HFOeq bunkering cost is added to LNG price/ Extracapex for LNG fuel: \$20mln, consumption: 100tHFO/d

**Current payback of 1,5y for a large containership**

- Apart from 2020 (COVID), payback ≤4 years for LNG fuel

**High oil prices significantly shorten LNG as fuel systems payback**

# LNG fuel – Remains economic in current crisis



## LNG as fuel remains competitive

- Oil and US gas indexation very competitive
- European gas indexation conjecturally penalized
- **LNG fuel remains competitive vs compliant oil fuels**

**26% of vessels ordered with LNG fuel propulsion in Q1 22 (42% in tonnage) – Clarksons**  
 Excluding LNG carriers

# LNG as fuel: the best transition energy for the shipping industry

## Alternative fuels

## Base Case

**Current CO<sub>2</sub> emissions**  
(g<sub>CO2</sub>/kWh WtW<sup>(1)</sup>)

530

720

790

690

**Decarbonisation potential**  
(in next 10-15 years)



With bio and e-fuels

e-ammonia only

Bio diesel only

**Price<sup>(2)</sup>**  
(\$/MWh)

~38\$

~70\$

~66\$

~55\$

**Other emissions**  
(NO<sub>x</sub>, SO<sub>x</sub>, PM<sup>(3)</sup>)



**Energy density**  
(GJ/m<sup>3</sup>)

25  
Enable greatest  
autonomy

16

13

33

**Infrastructure availability**



**Safety challenges**



(1) WtW: Well to Wake  
(2) Currently, in a normative year  
(3) PM: fine Particulate Matter