



Technology for a sustainable world

Start decarbonizing now with LNG as fuel

TECHNOLOGY FOR A SUSTAINABLE WORLD

Agenda



01 COMPANY & TECH OVERVIEW



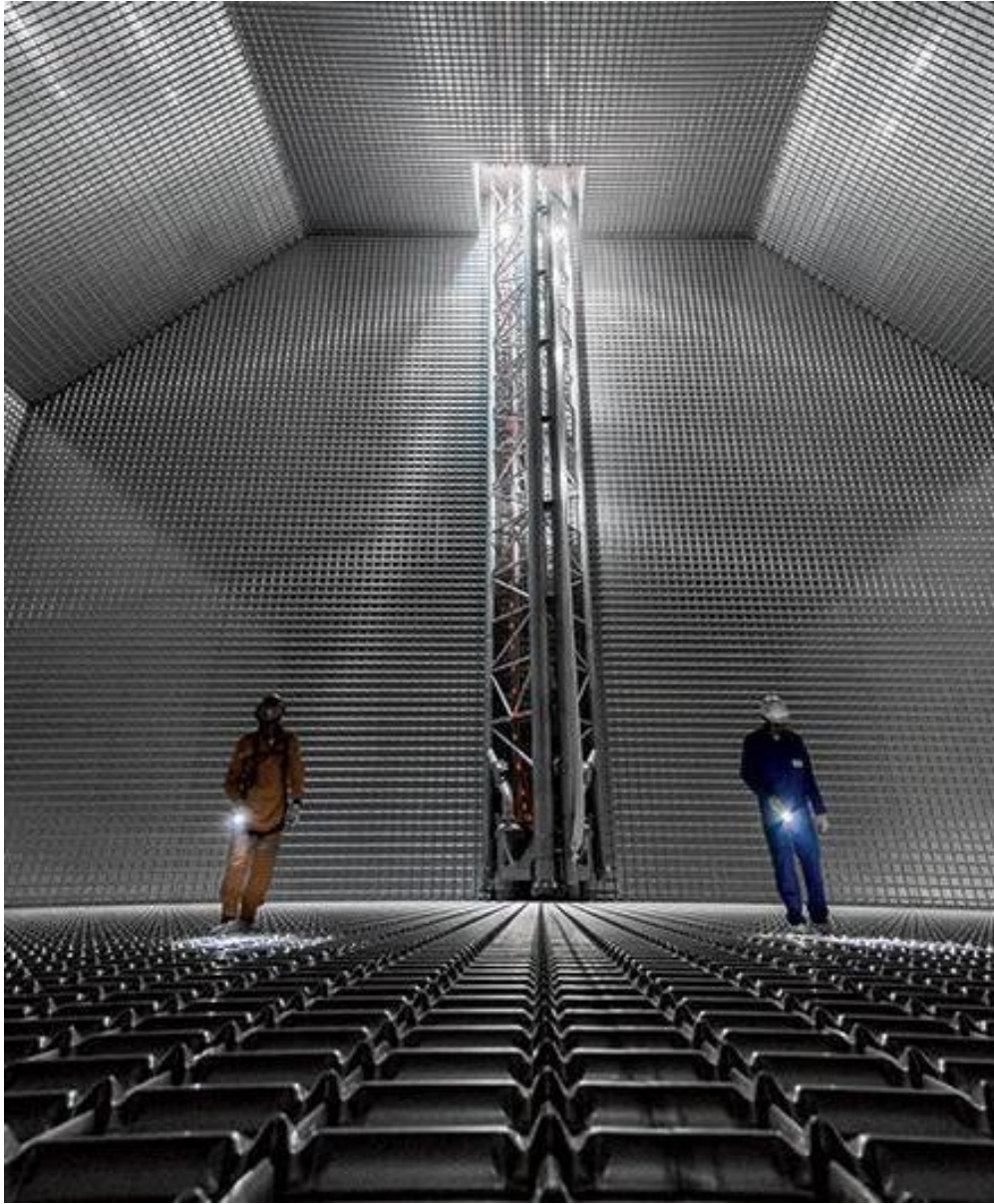
02 ALTERNATIVE FUELS LNG & METHANOL



03 ONGOING PROJECTS & INNOVATIONS



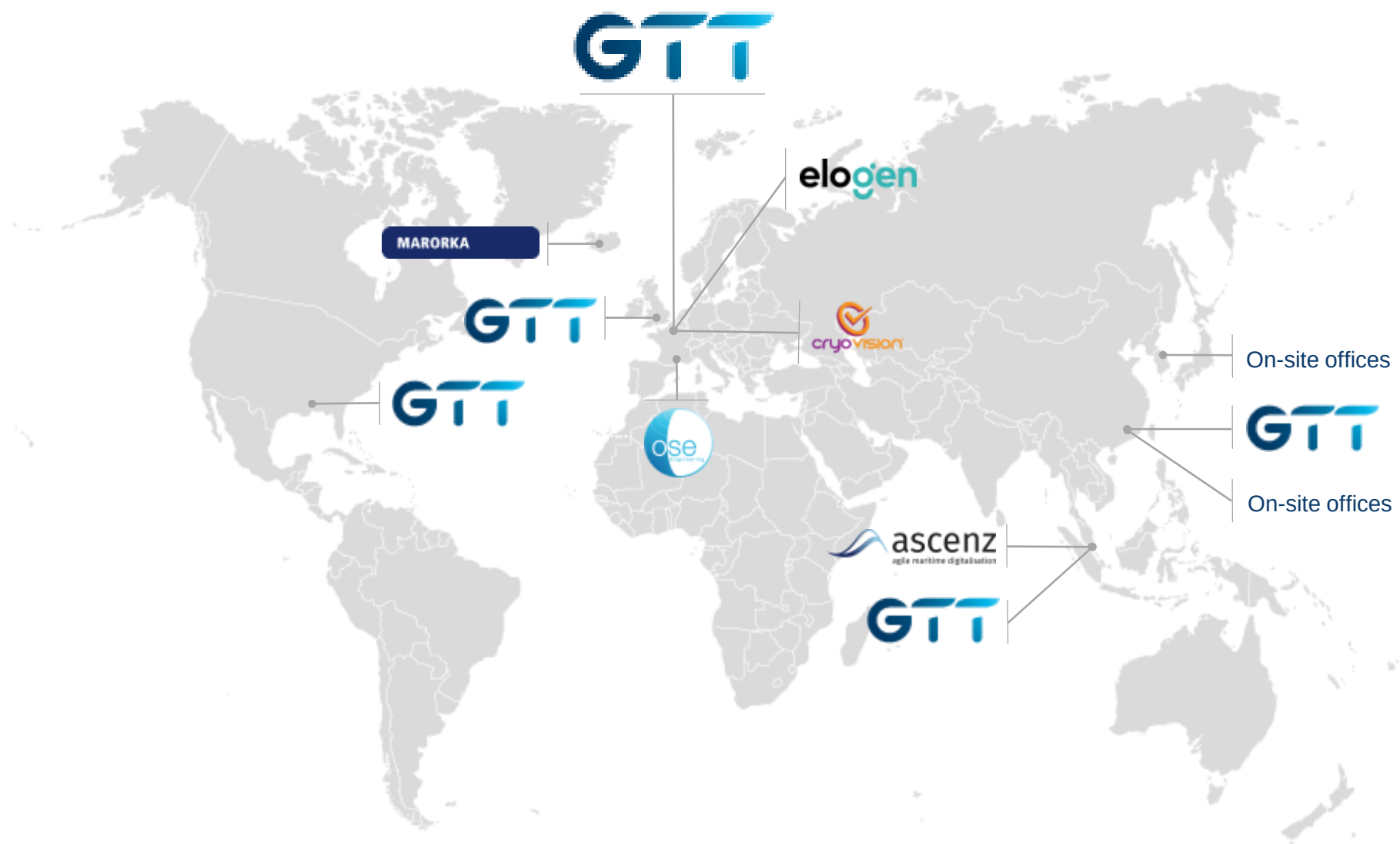
04 NEW DESIGNS



1

Company & Technology Overview

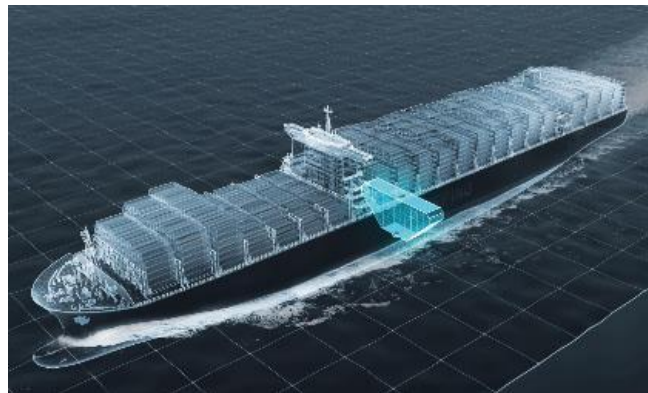
A WORLDWIDE GROUP



GTT KEY FIGURES



800+ LNG Carriers and FSRUs in service or in order



50+ onshore tanks and GBS in service or in order

60 years of experience and innovation in cryogenic containment

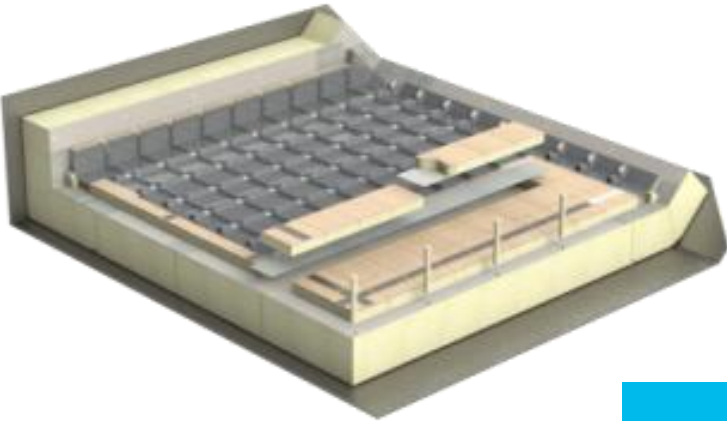


90+ LNG fueled ships and bunker vessels in service or in order

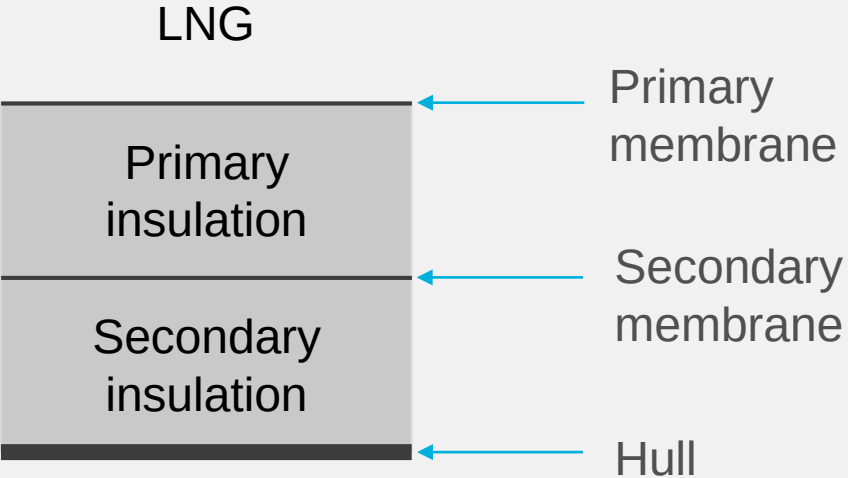


GTT MEMBRANE TECHNOLOGIES

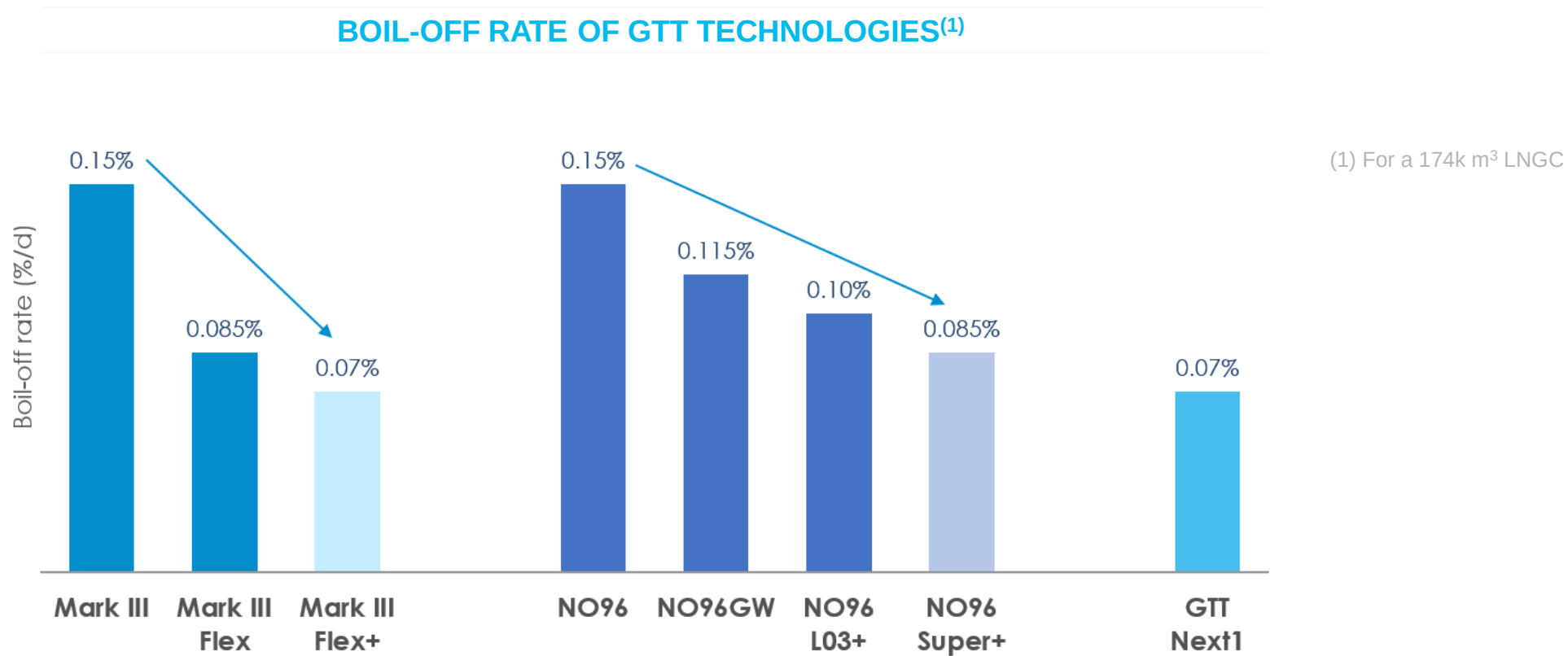
Mark III system



NO96 system



BETTER BOR AND ENERGY EFFICIENCY



Better energy efficiency and reduced GHG emissions by halving boil-off rate in a decade

02

Alternative fuels LNG & Methanol



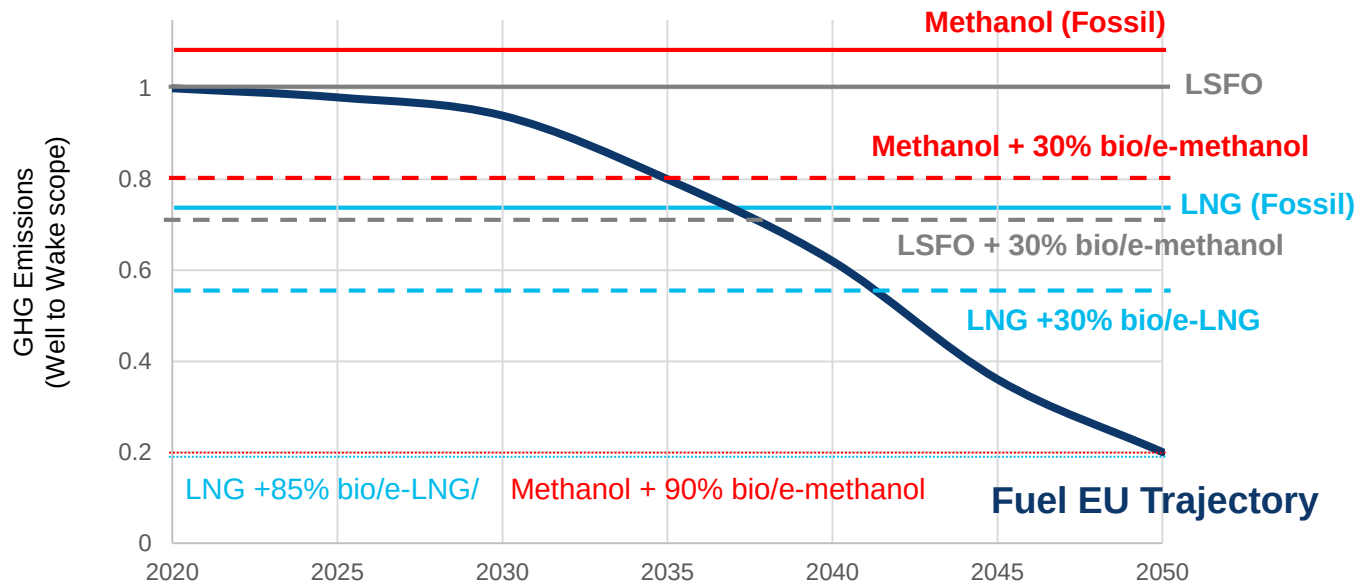
LNG: THE BEST TRANSITION ENERGY FOR THE SHIPPING INDUSTRY

	Alternative fuels		
	LNG	Methanol	Ammonia
Current CO ₂ emissions (g _{CO2} /kWh WtW ⁽¹⁾)	530	720	790
Decarbonisation potential (in next 10-15 years)	 With bio and e-fuels	 e-ammonia only	
Price ⁽²⁾ (\$/MWh)	~38\$	~70\$	~66\$
Other emissions (NOx, SOx, PM ⁽³⁾)			
Energy density (GJ/m ³)	25 Enable greatest autonomy	16	13
Infrastructure availability			
Safety challenges			

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

LNG AS FUEL COMPLIES NOW AND LATER

LNG AND METHANOL TRAJECTORY VS FUEL EU MARITIME REGULATION



Source: GTT analysis, EU

LNG compliant until 2035-2040

Methanol is not compliant today

- Requires an **challenging quantity** of bio & e-methanol
- **These vessels are expected to run mainly on diesel**

03

Ongoing Projects & Innovations

GTT



FROM SMALL TO LARGE SCALE LNG FUEL OPERATIONS



- ***Clean Jacksonville*** since 2018 in Florida
- **More than 300** bunkering operations



- ***Gas Agility*** since Nov 2020 in Rotterdam
- ***Gas Vitality*** since Jan 2022 in Marseille

EXPANDING LNG BUNKERING FLEET



Image courtesy of MOL

**TOTALENERGIES / PAVILION / MOL
at SEATRUM**

12,000 m³ LNG Bunker Vessel

2 x 6,000 m³ tanks, Mark III Flex

Delivery Q4 2023

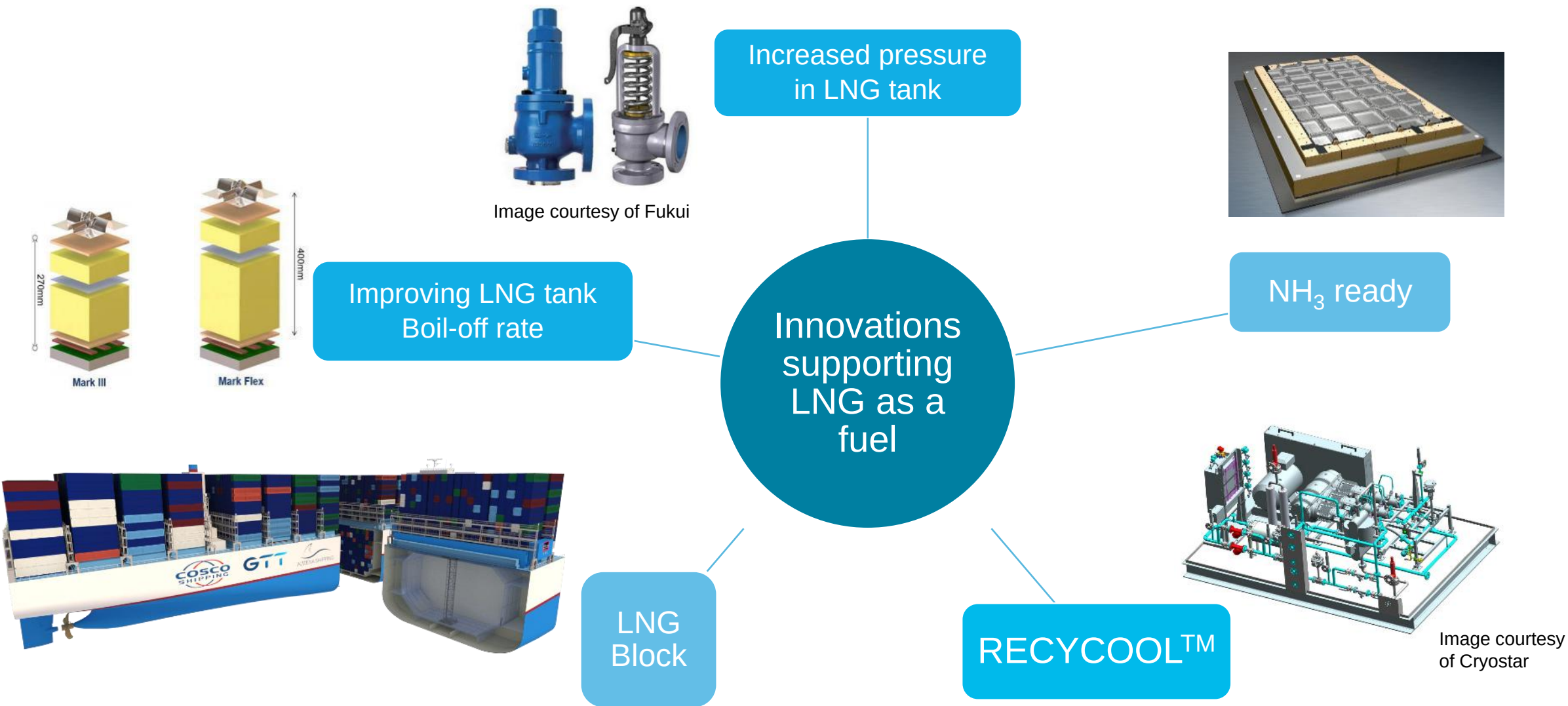
High bunkering rate

BUNKERING IN SINGAPORE

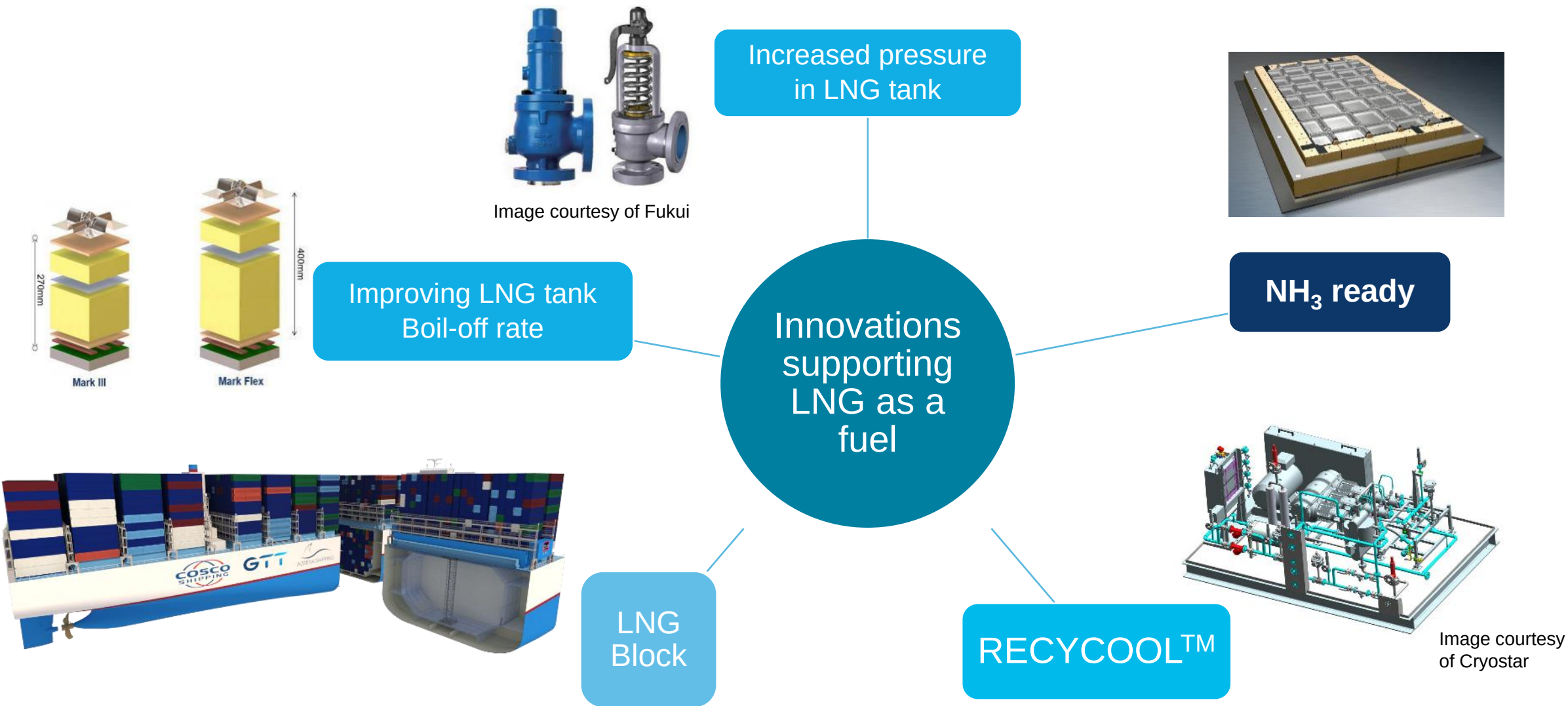
GTT REFERENCES IN DUAL FUEL CONTAINERSHIP FLEET

Owner															Not disclosed	
Charterer															Not disclosed	
Capacity (TEU)	15,000 to 23,000	15,000	13,000	15,000	15,600	7,600	15,600	7,900	14,000	7,900	8,000	7,700	8,200	23,000	24,000	15,500
Number	14	6	6	5	4	10	6	6	4	6	6	2	4	4	10	5
LNG (m³)	14,000 to 18,600	14,000	14,000	12,000	12,700	6,000	12,700	6,000	13,800	6,000	6,000	6,100	7,500	18,600	18,600	12,700
GTT Techno	Mark III	Mark III	Mark III	Mark III	Mark III Flex	Mark III	Mark III Flex	Mark III Flex	Mark III	Mark III Flex	Mark III Flex	Mark III	Mark III Flex	Mark III	Mark III	Mark III Flex
Fuel compat.	LNG	LNG	LNG	LNG + NH ₃ Ready	LNG	LNG	LNG	LNG	LNG + NH ₃ ready	LNG	LNG	LNG	LNG + NH ₃ Ready	LNG	LNG	LNG
Shipyard	 															
Engine																
Status	In Service	Ordered														
Order	2017 - 2019	2021					2022									2023
Class																

INNOVATIONS FOR FLEXIBILITY



INNOVATIONS FOR FLEXIBILITY



FIRST LNG DUAL FUEL CONTAINERSHIPS IN KOREA



ZIM / SEASPAN at SHI

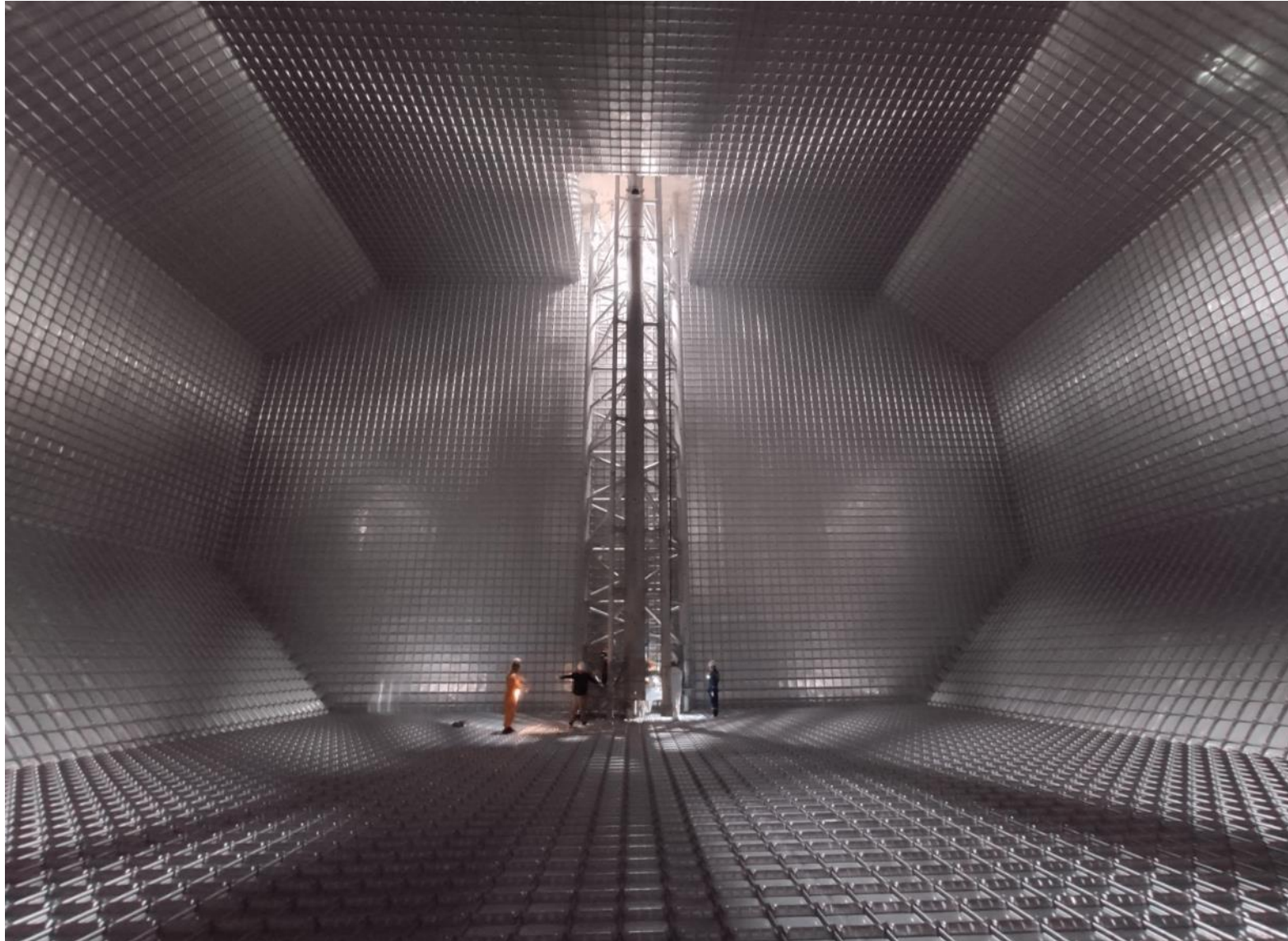
15,000 TEU container vessel (x5)

12,000 m³ LNG tank, Mark III

Delivery from October 2023

FUEL FLEXIBILITY – Ammonia

MEMBRANE TANK WITH AMMONIA READY NOTATION



AMMONIA READY NOTATION

References:

Container vessel orders including additional features for NH₃ readiness.

Approvals in Principle



ClassNK



Several readiness levels:

Steel grades, steel structure reinforcement, tank shape

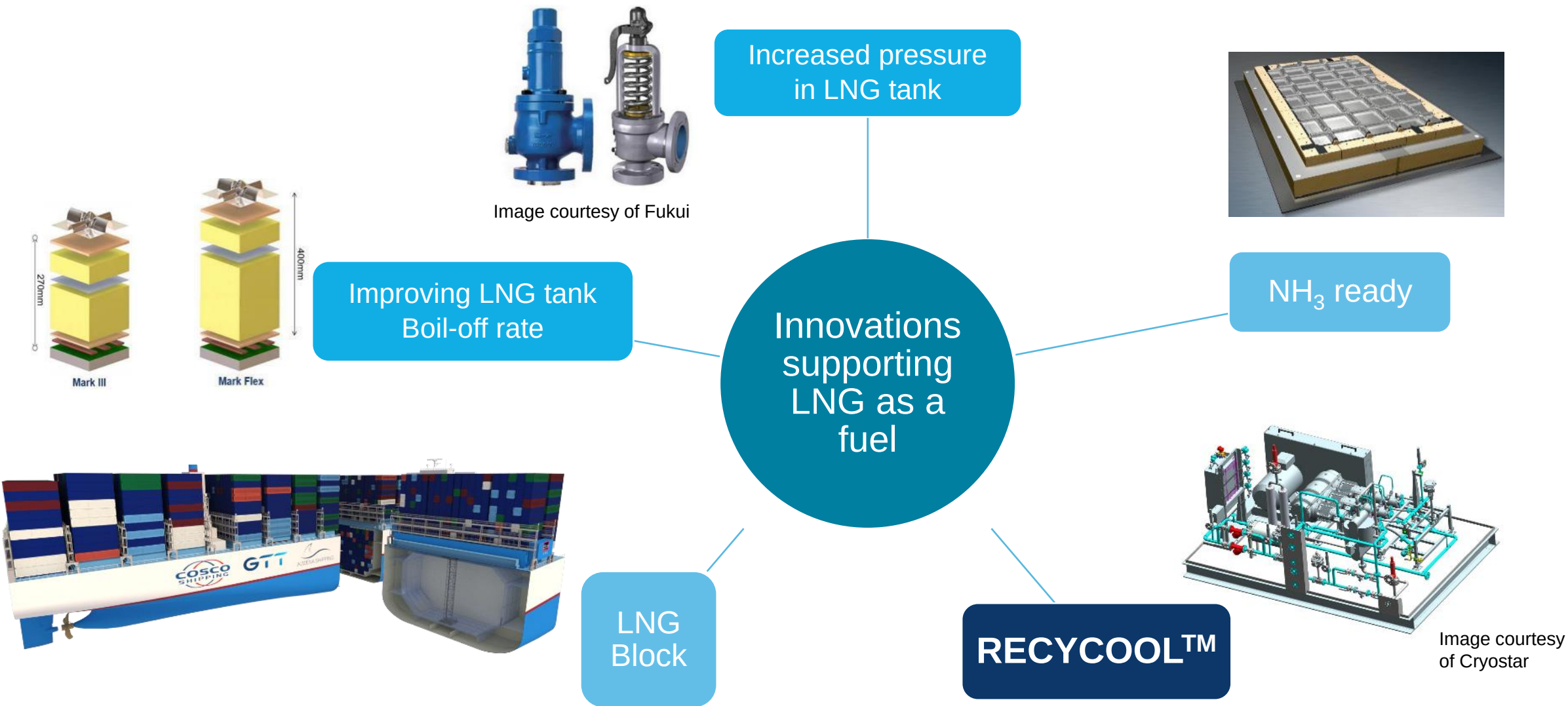
Challenges:

Sloshing, insulation material compatibility



GTT CEO receiving AIP for NH₃ Readiness from DNV CEO during NorShipping 2023

INNOVATIONS FOR FLEXIBILITY



FROM LARGE TO MID-SIZE LNG DUAL FUEL CONTAINER VESSEL



CMA CGM at SHI

7,600 TEU container vessel (x10)

6,000 m³ LNG tank, Mark III

Delivery from October 2023

BOG RECONDENSER

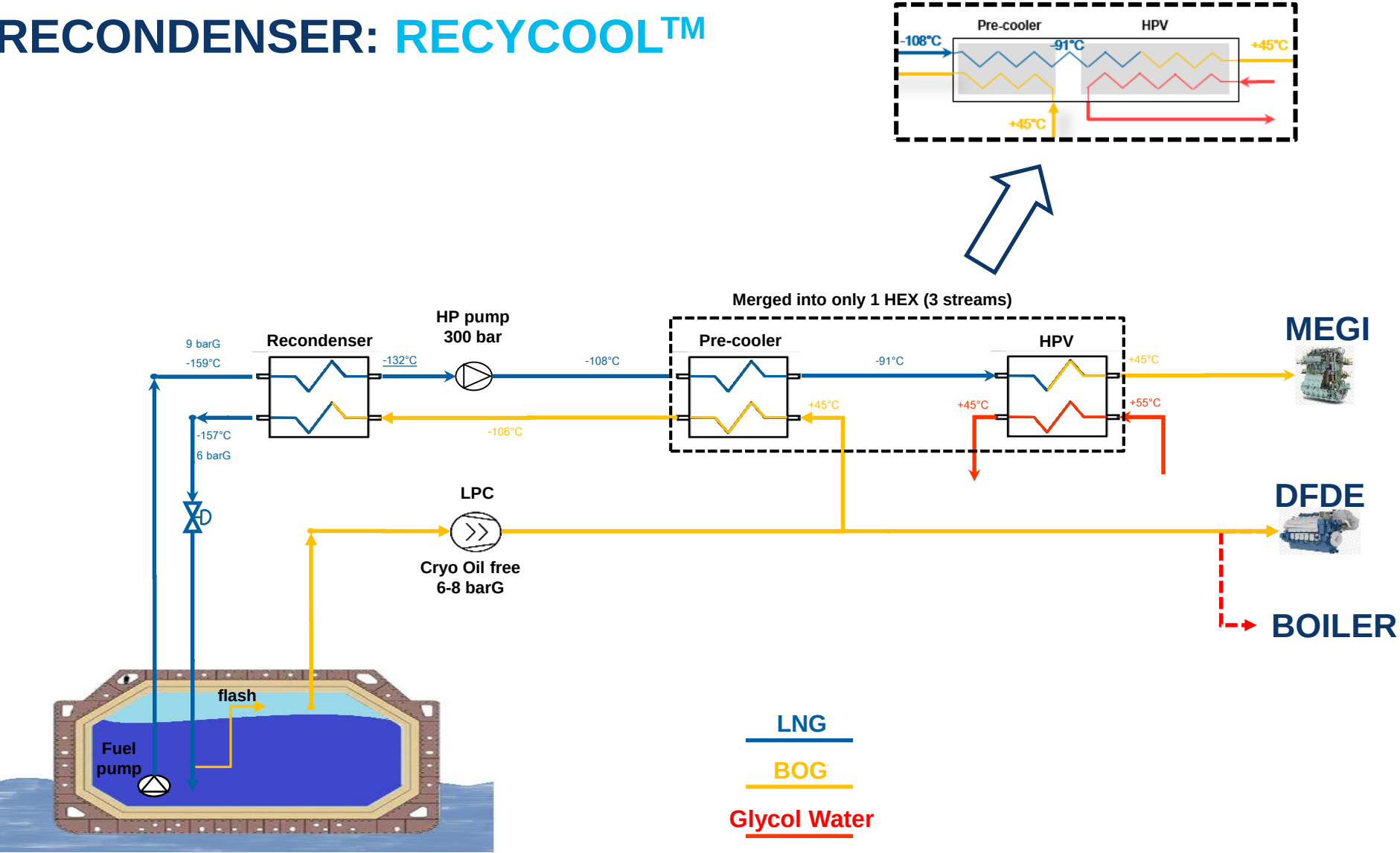
FLEXIBILITY IN BOG MANAGEMENT



RECYCOOL™

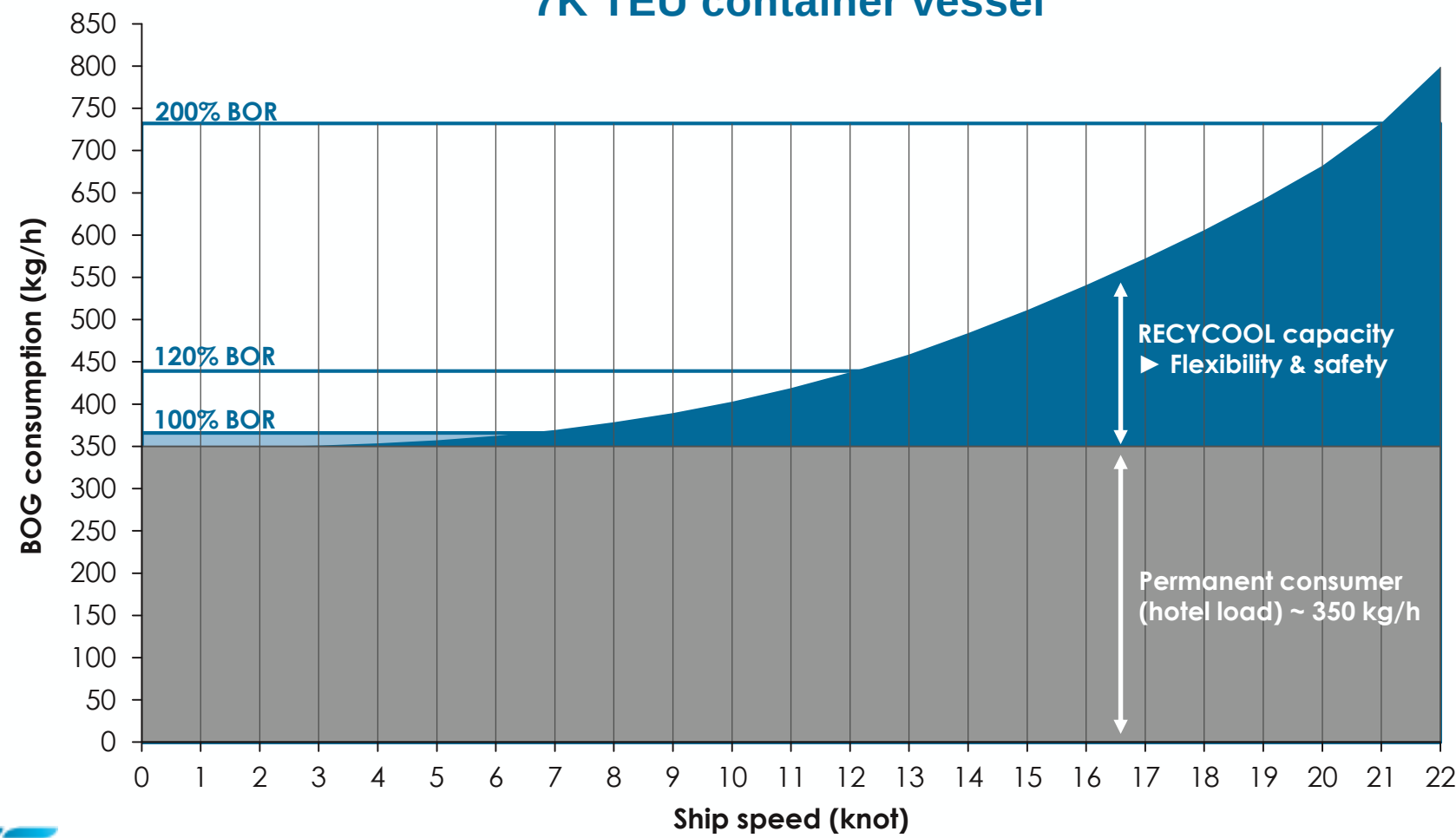
GTT patented Recondenser system

GTT RECONDENSER: RECYCOOL™



RECYCOOL™ PERFORMANCE

BOG capacity with RECYCOOL 7K TEU container vessel



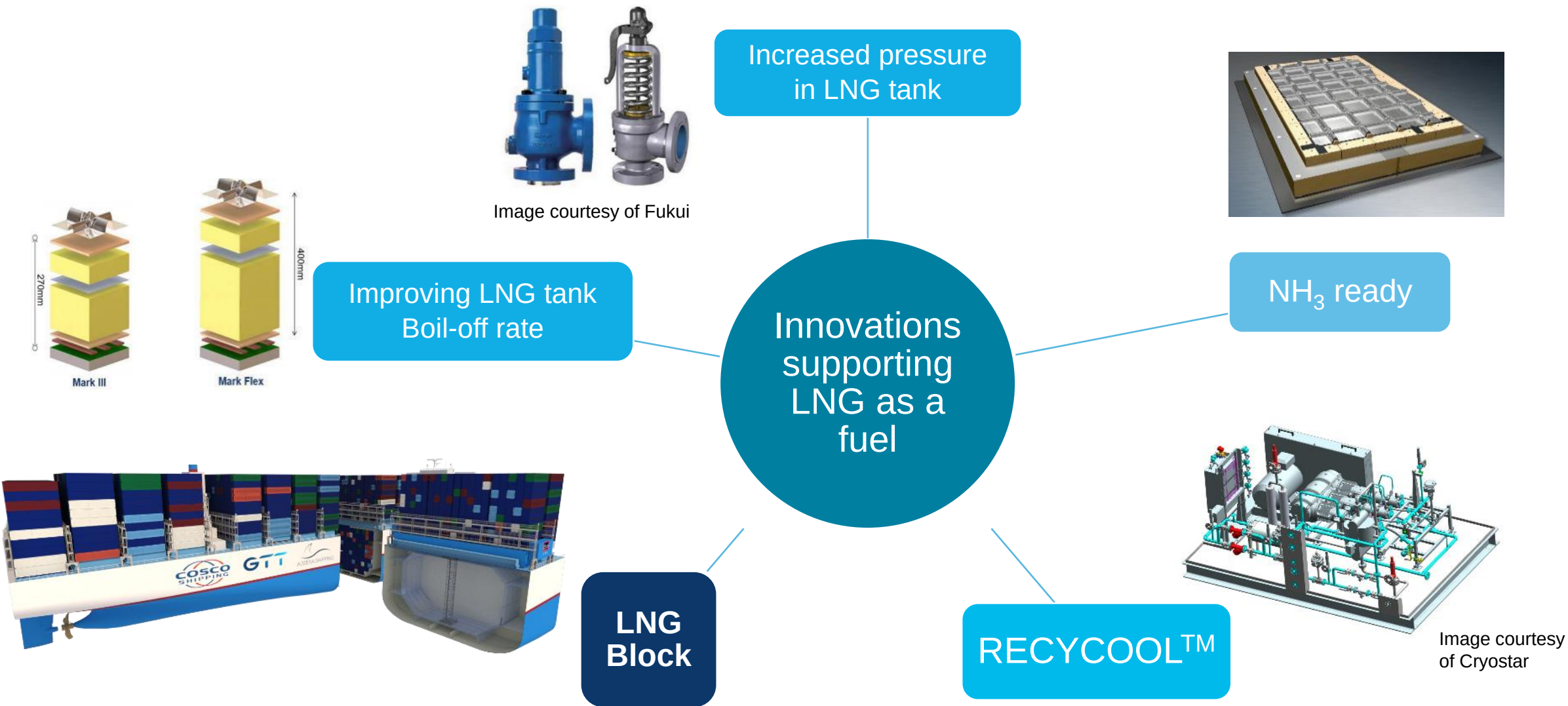
LNG fuel tank:

Volume = 6 043 m³
BOR = 0.310% v/d

Engines data:

M.E. = 33 MW (SMCR)
A.E. = 2 MW (mini hotel load)

INNOVATIONS FOR FLEXIBILITY



FASTER CONSTRUCTION WITH LNG BLOCK



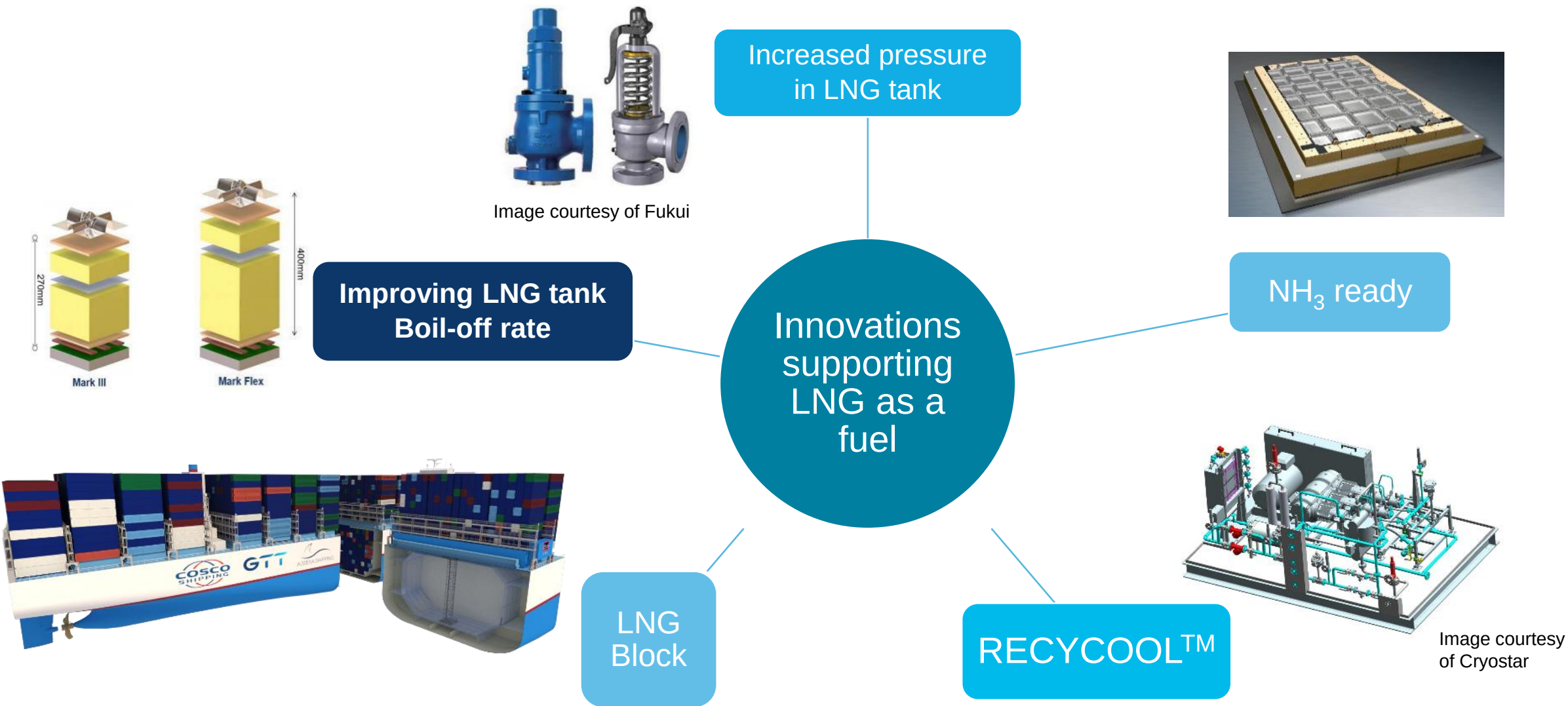
CMA CGM at JN

15,000 TEU container vessel (x6)

14,000 m³ LNG tank, Mark III

Delivery from December 2023

INNOVATIONS FOR FLEXIBILITY



FIRST LNG DUAL FUEL CONTAINER VESSEL WITH MARK III FLEX



Image courtesy of CIDO/MSC

MSC at HHI / HSHI

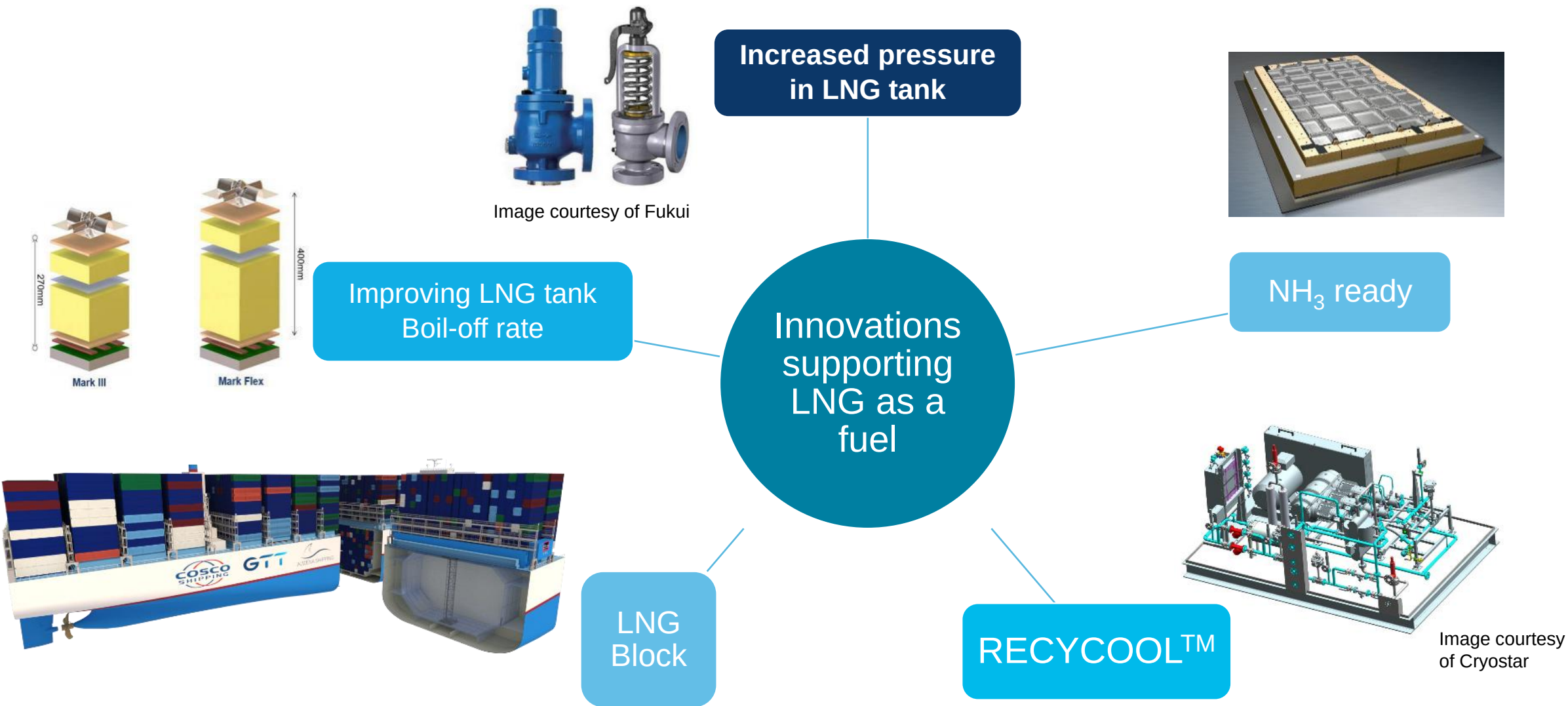
15,600 TEU container vessel (x10)

12,700 m³ LNG tank, Mark III Flex

Delivery from November 2023

VERY LOW BOR

INNOVATIONS FOR FLEXIBILITY



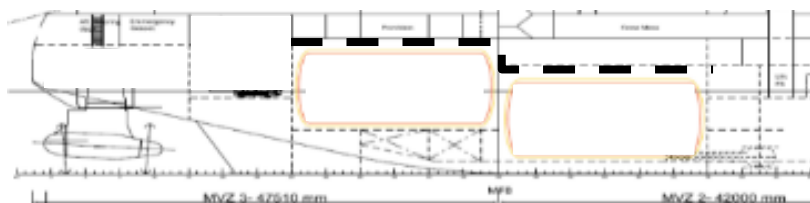
FIRST REFERENCE IN CRUISE SHIPS



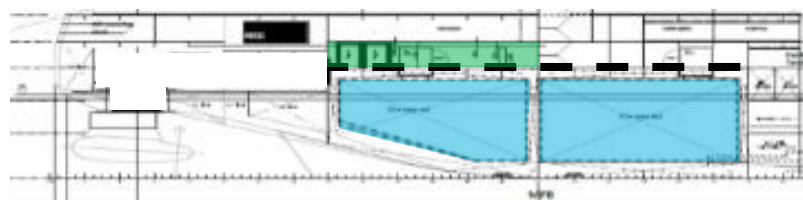
PONANT *Le Commandant Charcot*

WITH EFFICIENT SHAPES AND 2 BARG DESIGN PRESSURE

2 type C bilobe tanks 2,900 m³



2 membrane tanks 4,500 m³



4

New Designs

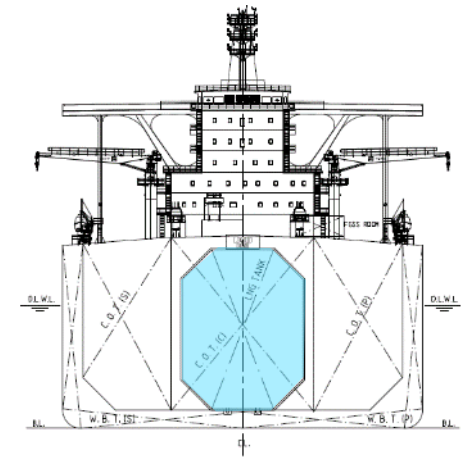
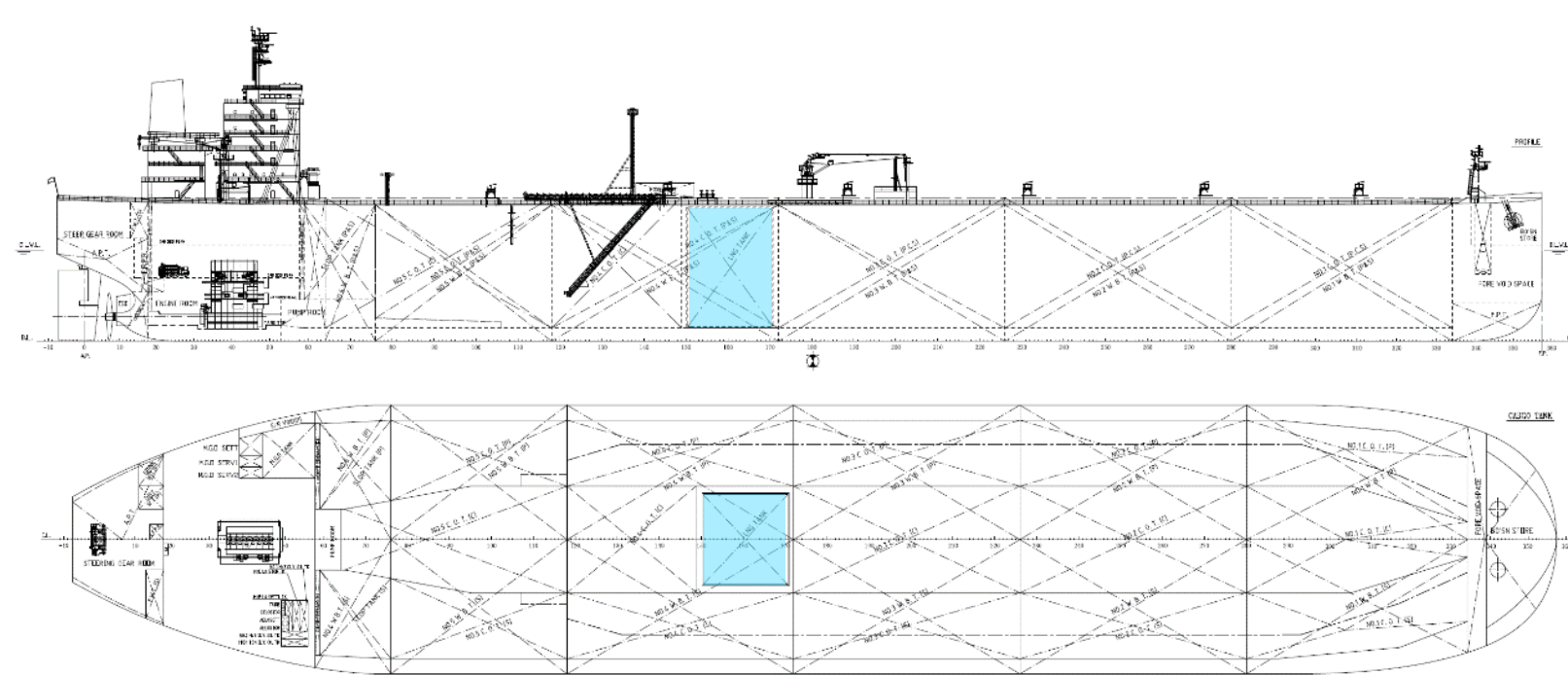
Tankers



Car Carriers

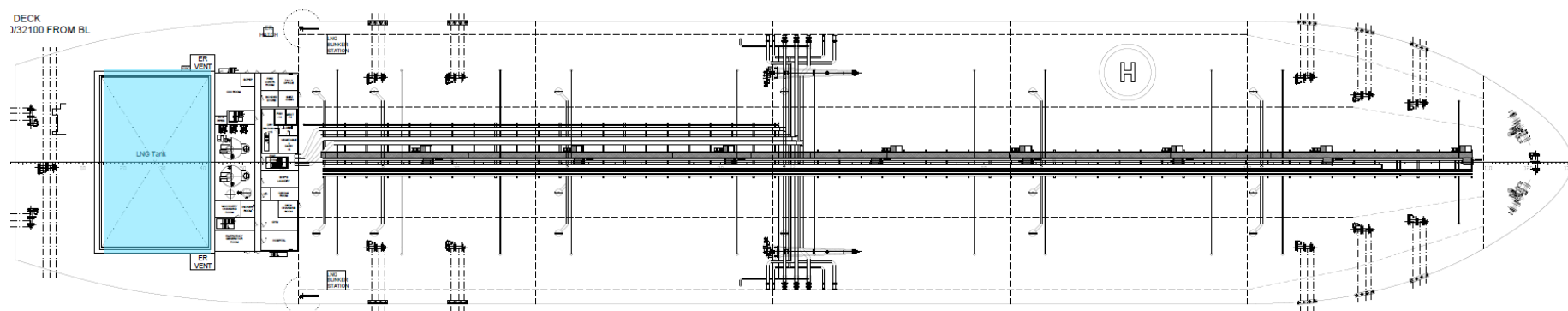
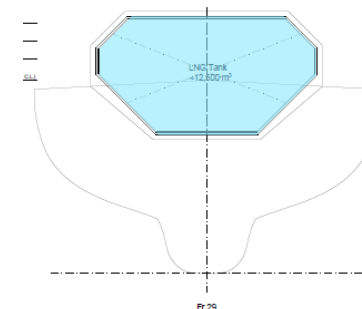
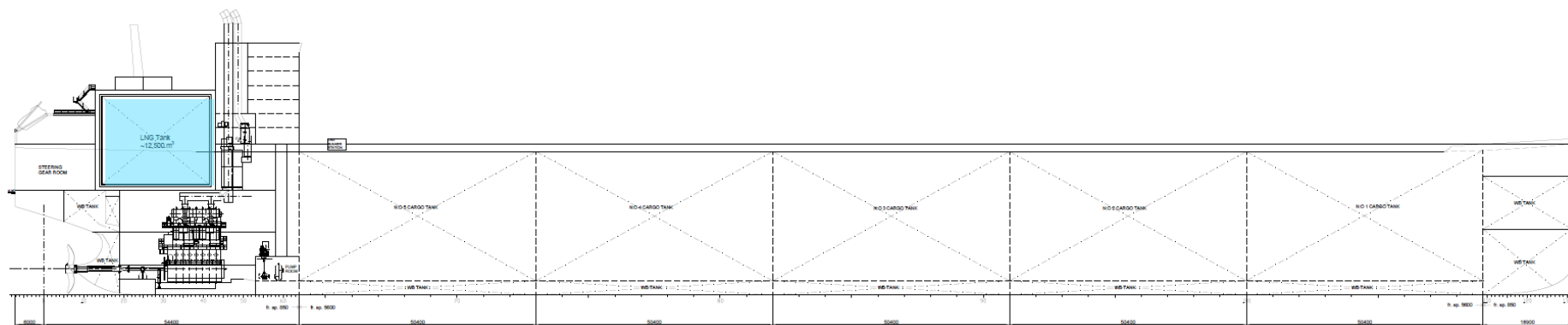


VLCC 305,000 DWT – LNG TANK IN CARGO AREA



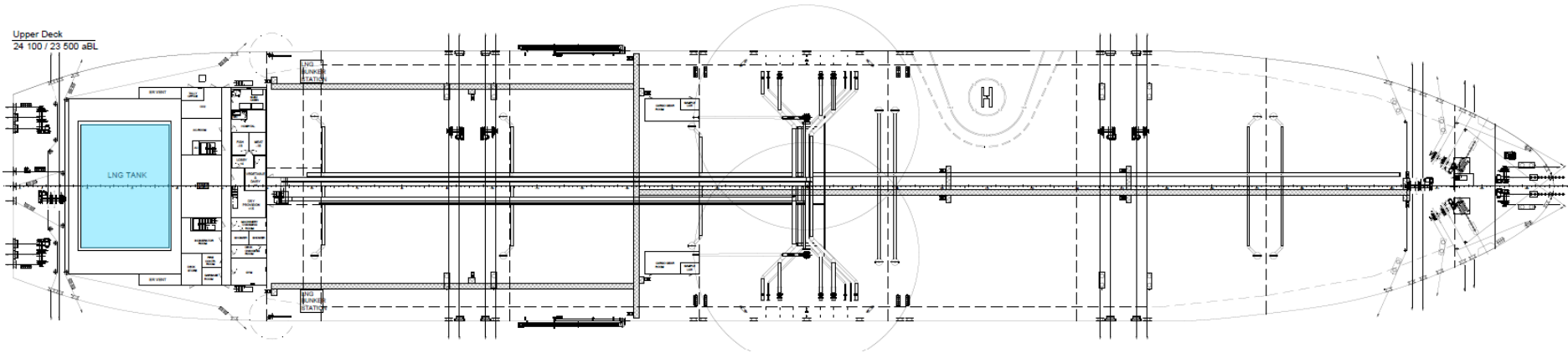
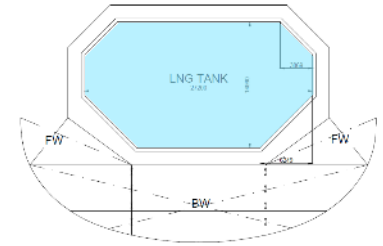
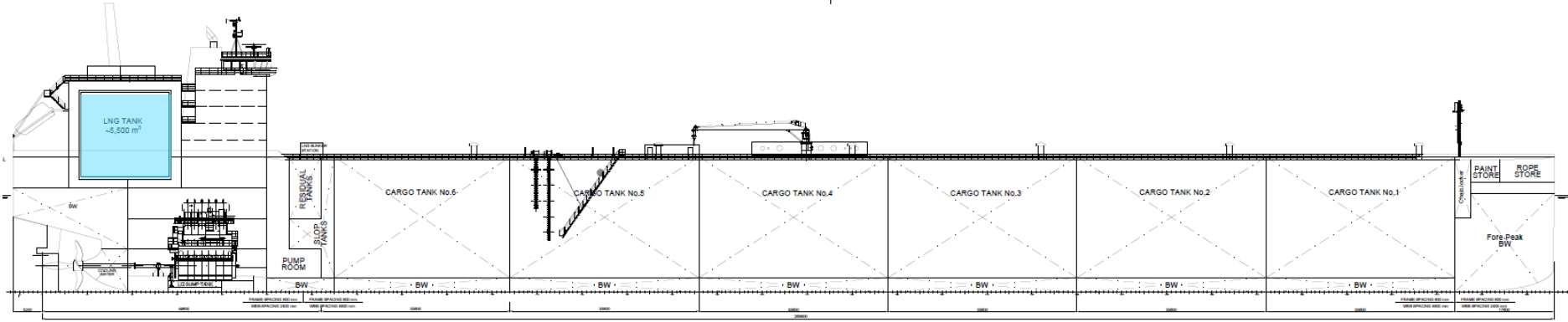
- Up to **14,000 m³**
- **No impact** on engine room and accommodations
- Tank **protected** from weathering
- **Limited** cryogenic pipes

VLCC 305,000 DWT – LNG TANK BEHIND ACCOMMODATIONS



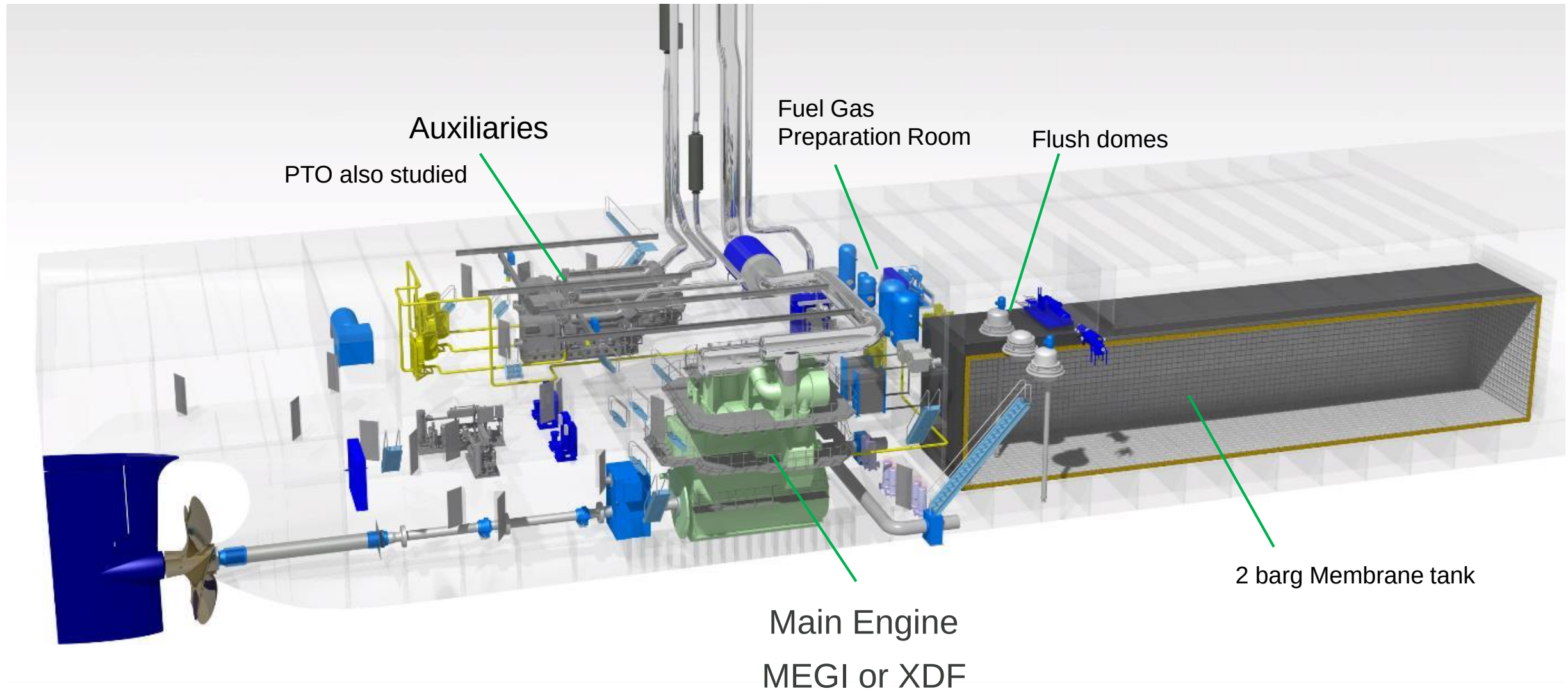
- Up to **12,500 m³**
- No visibility issue & close to engine room
- No impact on cargo capacity nor on deck
- **Compatible** with 2-row VLCC design with central bulkhead

SUEZMAX 160,000 DWT – LNG TANK BEHIND ACCOMMODATIONS



- Up to 6,500 m³
- No impact on cargo capacity nor on deck
- No visibility issue & close to engine room
- Under study with both Korean and Chinese shipyards

PCTC : SAVING CEUs WITH 2 BARG MEMBRANE TANK



KEY TAKE AWAYS

~ **100 ships** in service or on order with LNG fuel **membrane tanks**

Innovative solutions to maximise **flexibility** and **performance**

Save **space / cargo** and **increase autonomy** for all ship types

LNG experts to support owner & operator **at all project stages**

LNG is a fuel IN transition

900+ LNG fuelled ships sailing by 2026

Thank you !



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Business Development Manager

