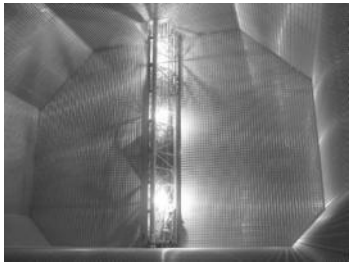
Expert in LNG

INVESTOR DAY

Saint-Rémy-lès-Chevreuse







12 December 2017

Safety | Excellence | Innovation | Teamwork | Transparency

Disclaimer

AGENDA

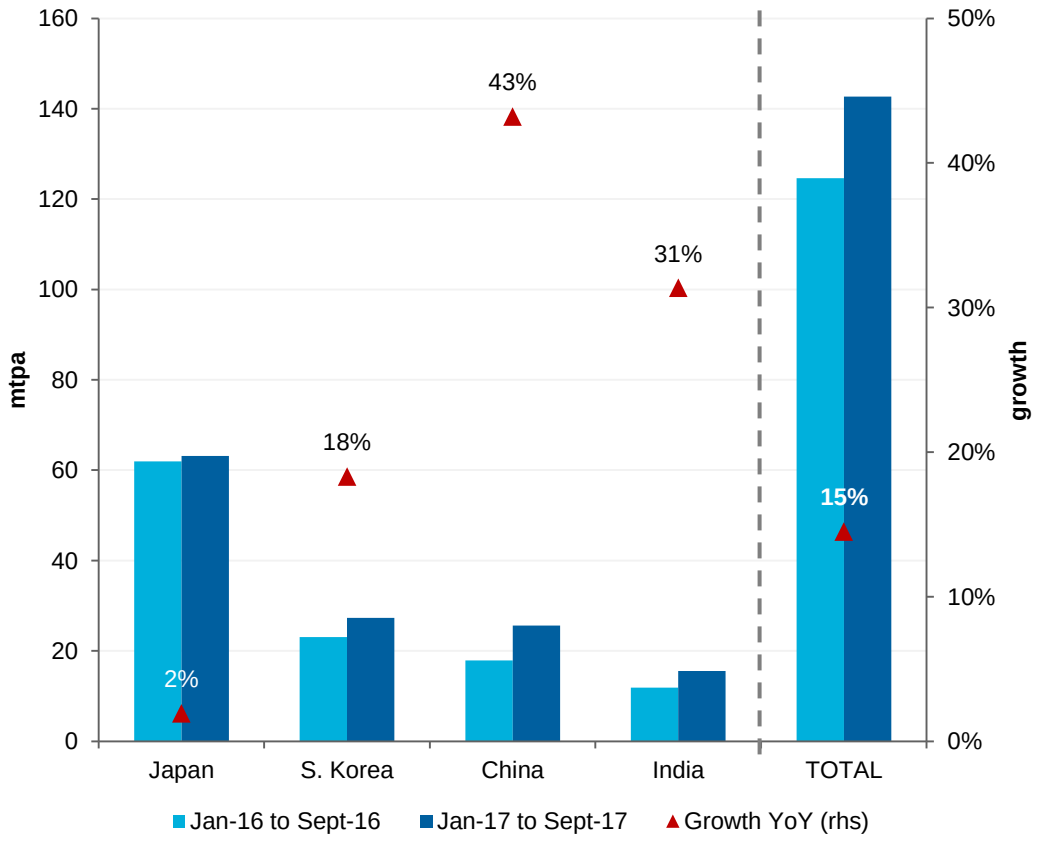
- **1. Introduction**
  - Philippe Berterottière
- **2. Technologies: Mark V and Mark III Flex+**
  - Frédérique Coeuille / Karim Chapot
- **3. LNG as Fuel**
  - David Colson
- **4. M&A strategy**
  - Philippe Berterottière / Marc Haestier
- **5. Conclusion**
  - Philippe Berterottière

1 Introduction: market update

Philippe Berterottière

Asian LNG imports growing in 2017 vs. 2016 due to structural energy mix evolution

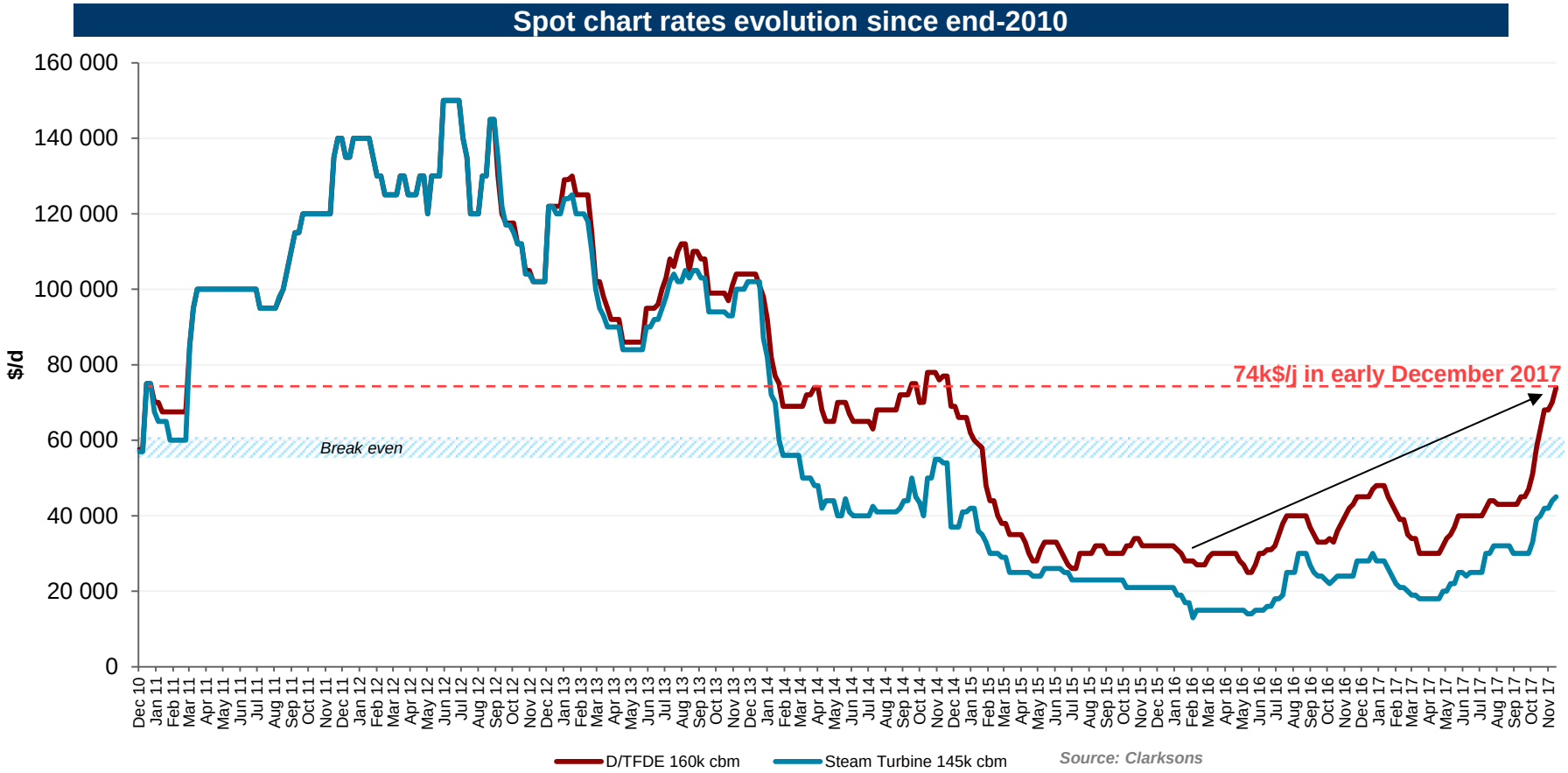
Top-4 LNG importers demand comparison 2017 vs. 2016



Main sources : National Custody Agencies and Ministries ; Wood Mackenzie

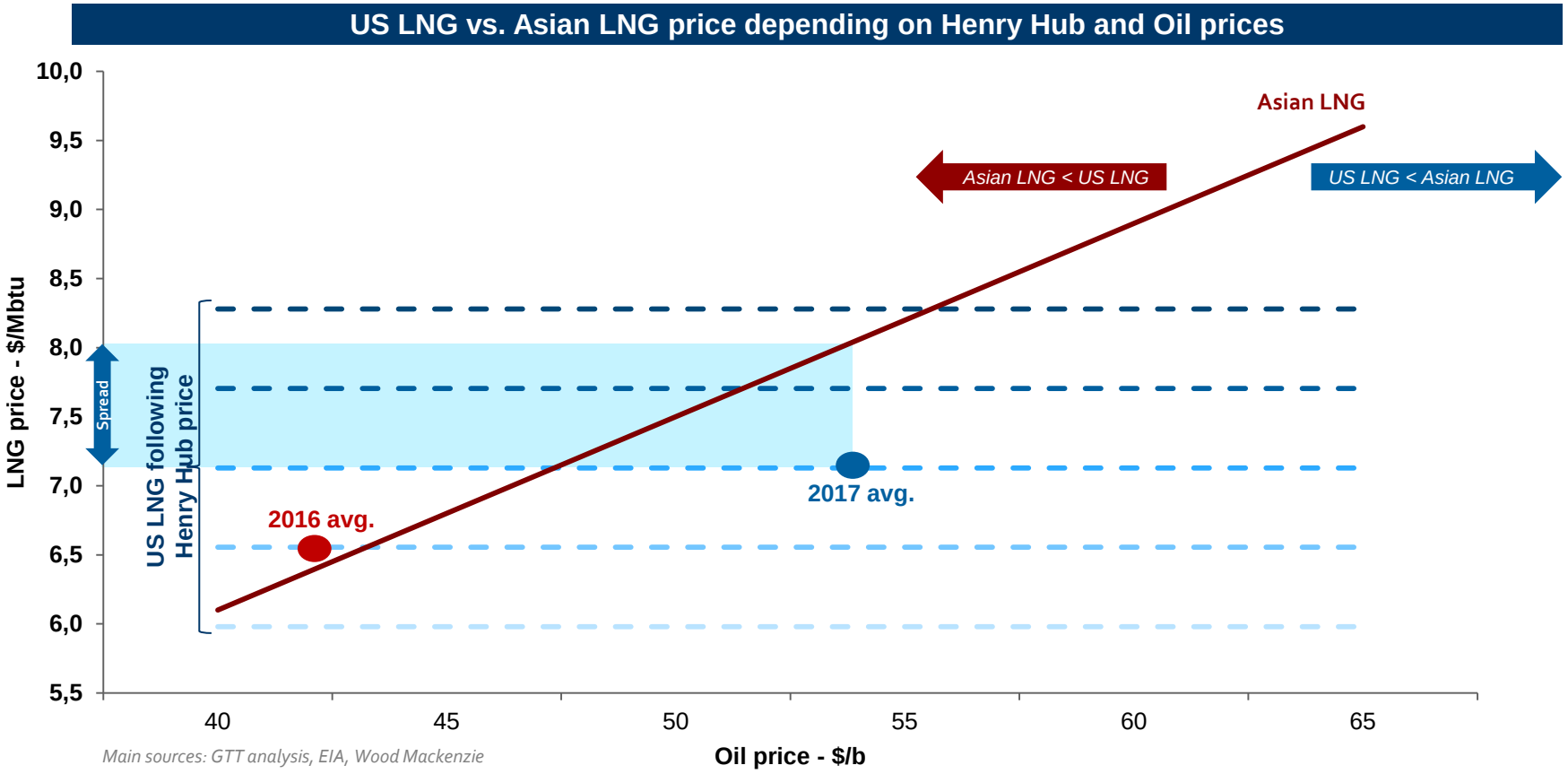
- **Demand of top-4 LNG importing countries (60% of imports in 2016) grew by 15% in 2017 vs. 2016 (Jan to Sept. YoY), mainly due to:**
  - **Coal to Gas switch**, especially in China due to environmental considerations and LNG competitiveness vs. coal
  - **Lower nuclear restart**, especially in Japan due to social and legal issues
- **Coal progressive slowdown in China and South Korea expected to strengthen in the mid/long term**

Spot market recovering trend



- Recovering trend since early-2016
- Currently reaching levels not observed since 3 years; eventually above breakeven
- Trend expected to continue as market is tightening with strong demand and new supply beginning to come on stream (mainly from the US)

US LNG competitiveness in Asia



- **2017 avg. : JCC = 53,3$/b and Henry Hub = 3,0$/Mbtu**
  - US LNG ≈ 7.1$/Mbtu
  - Asian LNG ≈ 8.0$/Mbtu

Assumptions

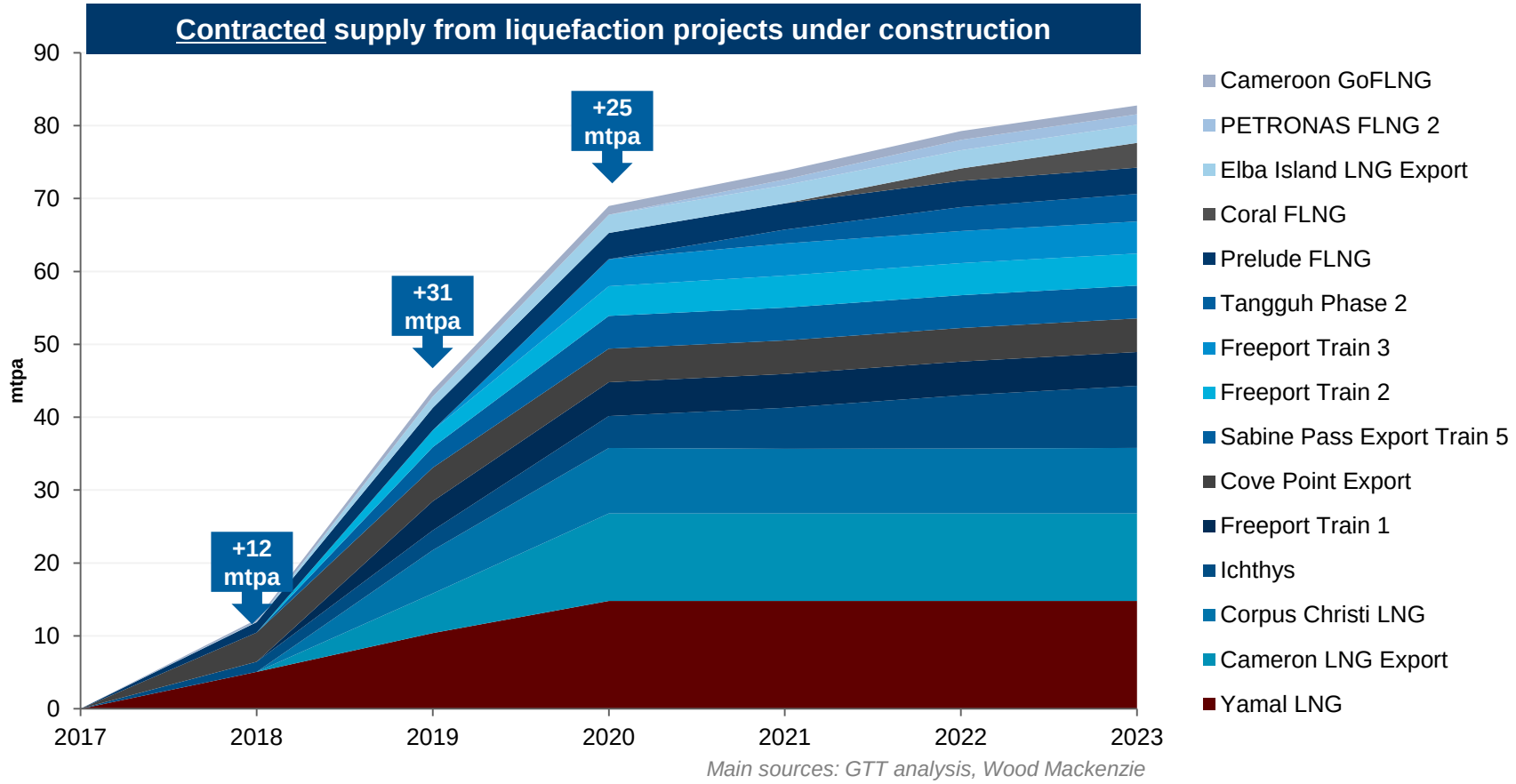
US LNG:

- HH+15%
- Tolling Fee: 2.25$
- Shipping: 1.43$ (US East ->Japan, 174k cbm Me-GI or X-DF)

Asian LNG:

- Slope: 14% of JCC price
- Constant: 0.5$

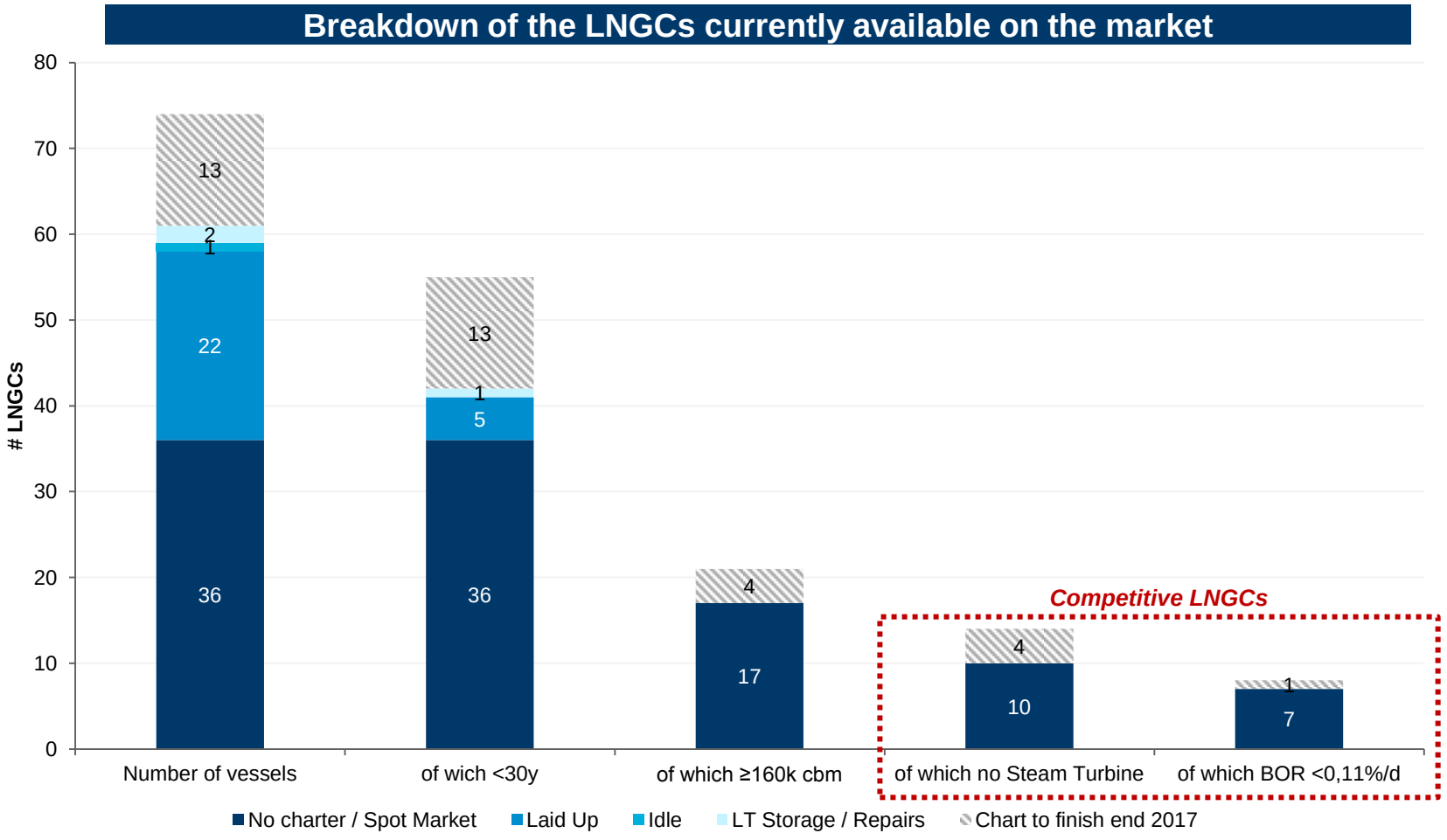
Important new LNG volumes to hit the market in 2019 and 2020



Main sources: GTT analysis, Wood Mackenzie

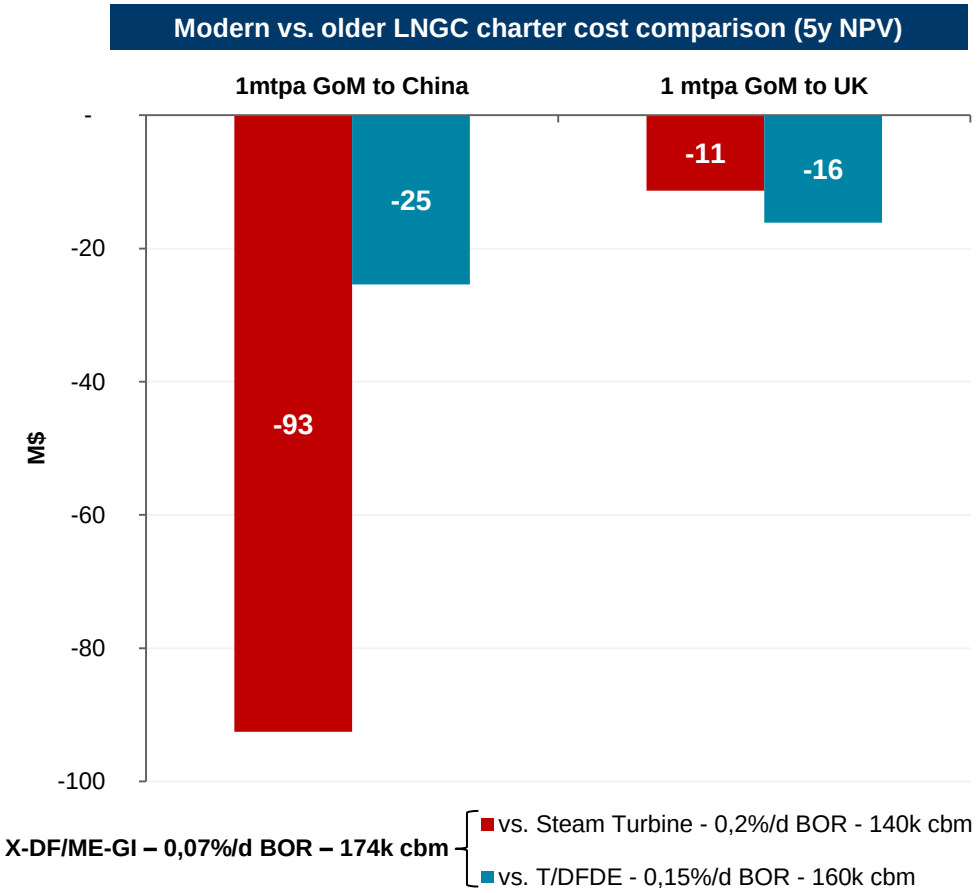
- **~ +70 Mtpa of contracted supply to come on stream by 2020**
- **New ship orders to be placed from early 2018 to be delivered in late 2019 / early 2020**

Overcapacity: 7 to 10 competitive LNGCs available on the market



Main sources : GTT Analysis, Wood Mackenzie, Clarksons, IHS

Modern vessels competitiveness



Main sources: GTT analysis, Poten & Partners, Wood Mackenzie

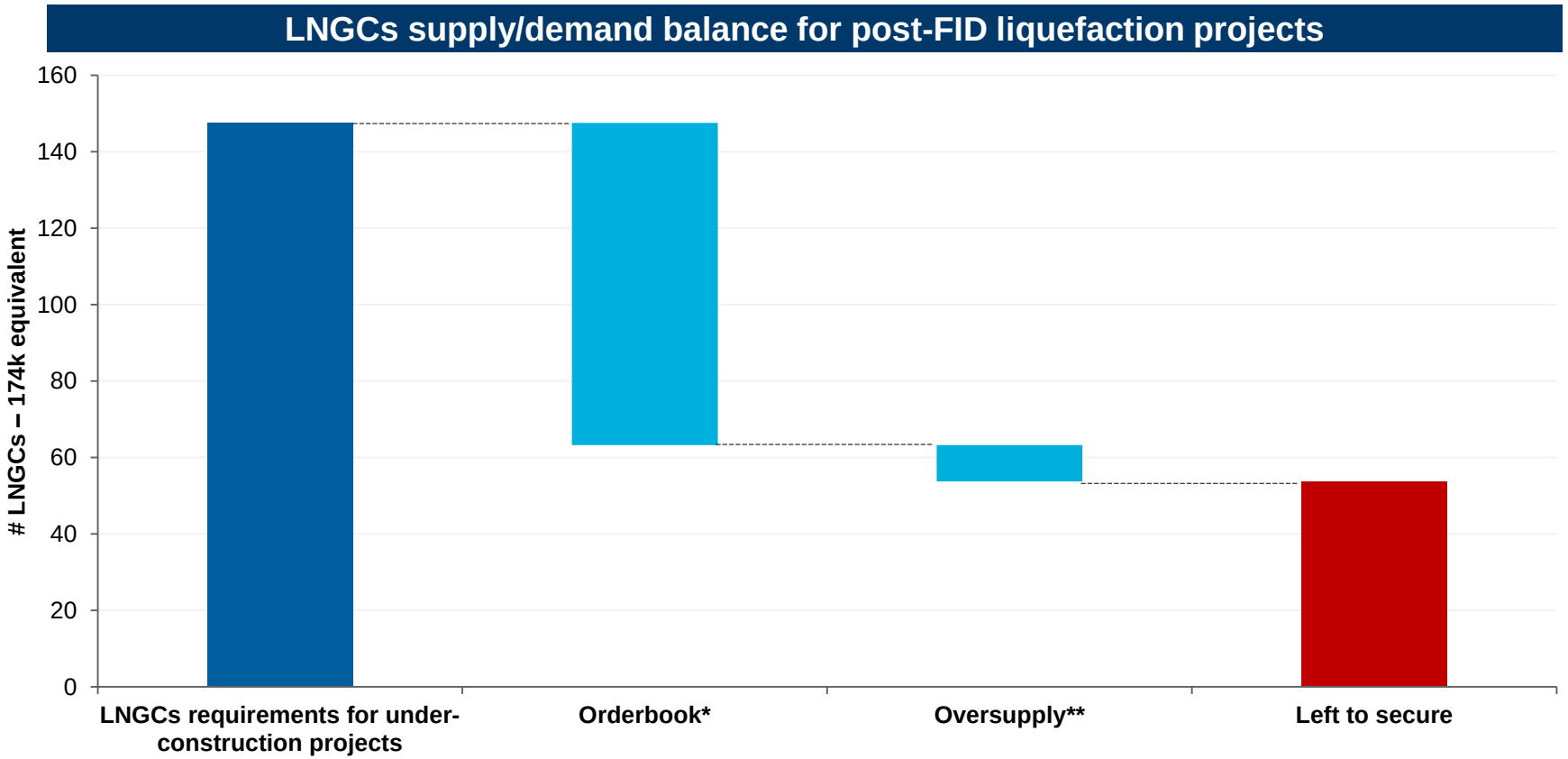
- **From a charterer perspective, modern vessels are always more economical to lift volumes:**
  - Either on long routes (US-Asia) or shorter ones (US-Europe)
  - Even for a short period of time (5y)

Capacity and consumption/BOR are the main drivers, even in a low LNG fuel price environment

Main assumptions

		ST	T/DFDE	X-DF/ME-GI
Charter rates	*k$/d*	60	70	80
Consumption laden	*t/d*	137	102	72
Consumption ballast	*t/d*	85	80	64
Discount Rate	*%*	8%		
5y avg. LNG fuel price	*$/mmbtu*	8,3		

LNGC supply & demand mismatch



Main sources : GTT analysis, Wood Mackenzie, Clarksons

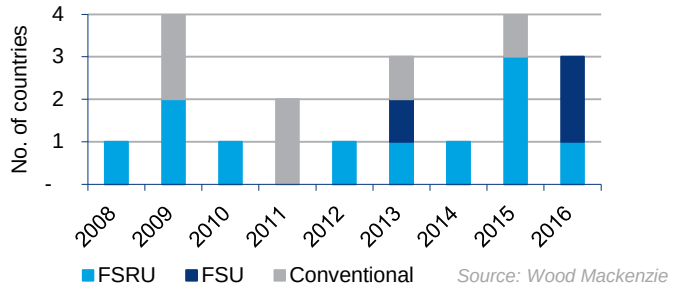
* Vessels on order for currently operational projects not to be counted
** Recent / Competitive vessels: ≥160k cbm, D/TFDE, <30 y.o.

- **We believe that shipping market is short of LNGCs for liquefaction projects currently under construction (post-FID)**

FSRUs – The importing countries game changer is gaining momentum

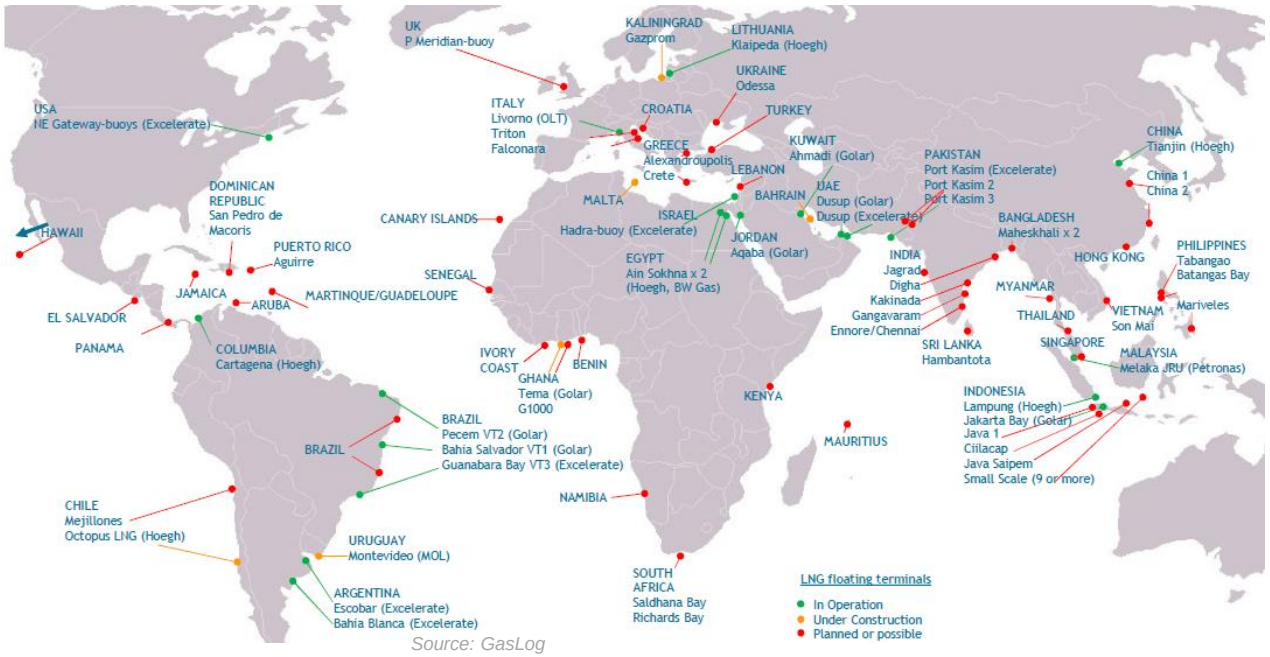
- **Major competitive advantage vs. land-based terminals:**
  - Quick to build/deploy & mobile
  - Better local acceptability & easier permitting
  - Affordable / no upfront CapEx
  - Adapted to more volatile LNG prices
  - Quality controlled construction in shipyards with available and skilled workforce

Since 2008, more than half of new LNG importing countries have chosen FSRUs instead of onshore terminals



- **More than 30 FSRUs currently in service or under construction**
- **8 orders of FSRUs since January 2017**
- **11% of 2016 LNG imports through FSRUs**
- **Worldwide development**
  - Asia (India, China, …)
  - Europe (Turkey, Croatia, …)
  - South & West Africa
  - LatAm & Carribeans

FSRUs market outlook



Source: GasLog

Summary

- **Since the beginning of 2017, the market is showing strong recovery signs**
- **Solid fundamentals to support this recovery in the short term and accompany growth in the long term**
- **Many LNGCs still expected in the short term**
- **FSRU high dynamism will also support the LNG shipping market**

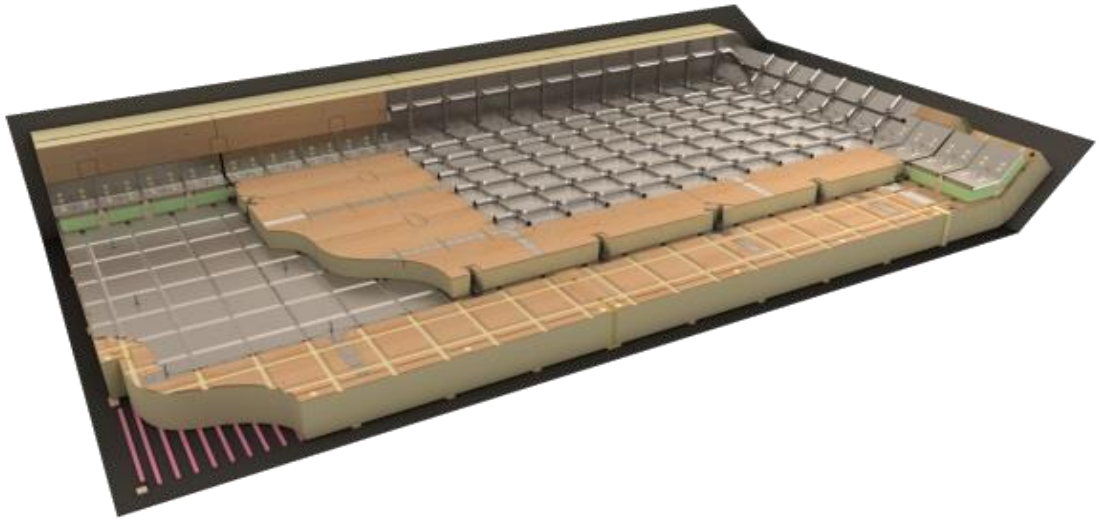
2

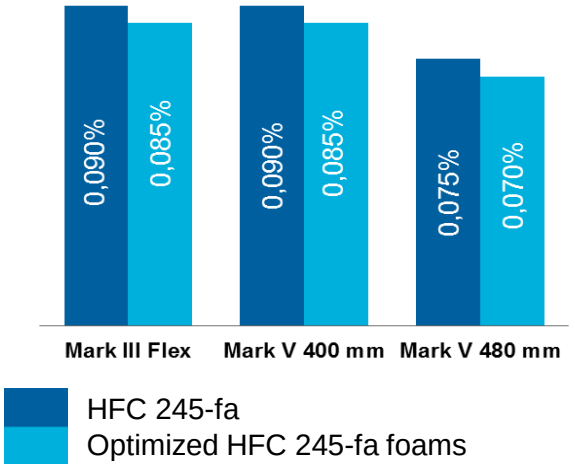
Mark V / Mark III Flex+ development update

Frédérique Coeuille
Karim Chapot

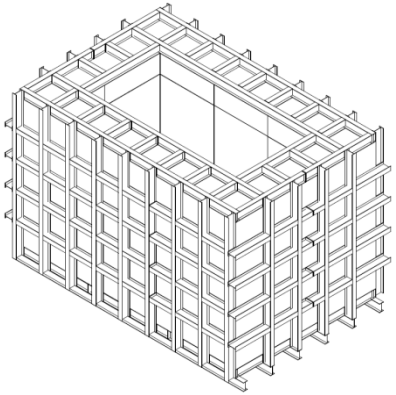
Mark V- quick reminder

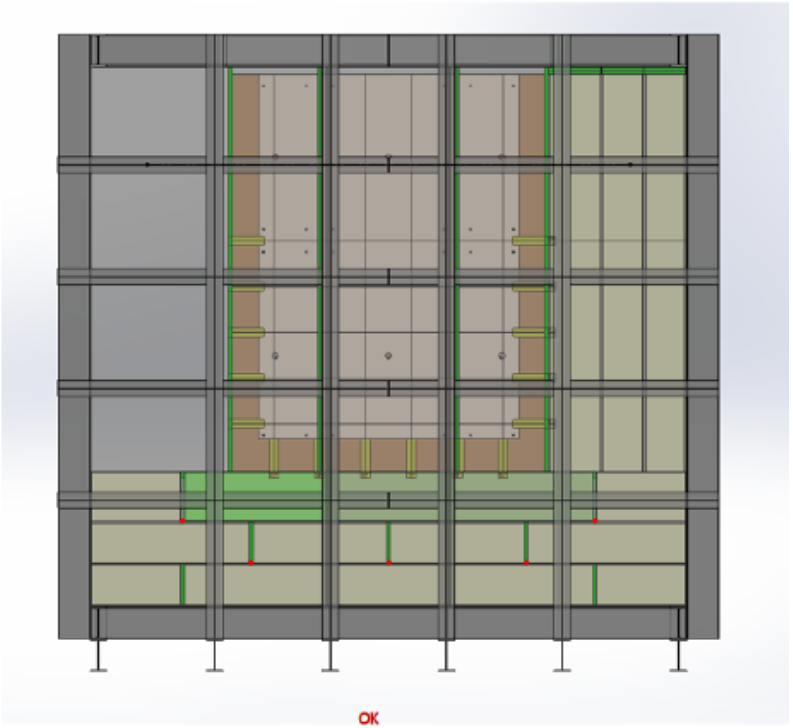
- **A system based on the Mark III concept**
  - A flexible metallic secondary membrane
  - Mark III primary membrane
  - R-PUF insulation panels, with thickness up to 480mm
  - Improved BOR compared to Mark III Flex : 0,07%





R&D study – Mock-up



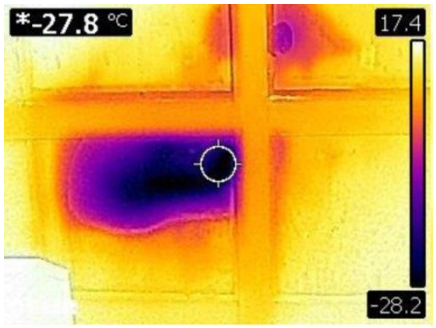


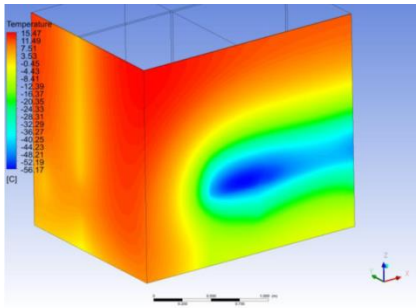
- **R&D mock-up (size 6,8 x 4,4m)**
  - Mark III system without secondary membrane
  - 1m thick insulation

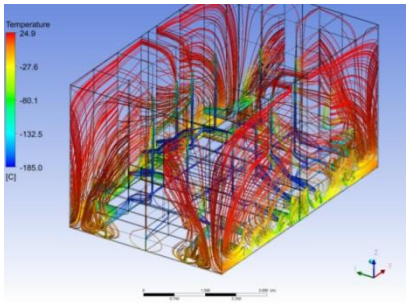
R&D study – Mock-up

Cold spot South face West side

Cold spot South face East side



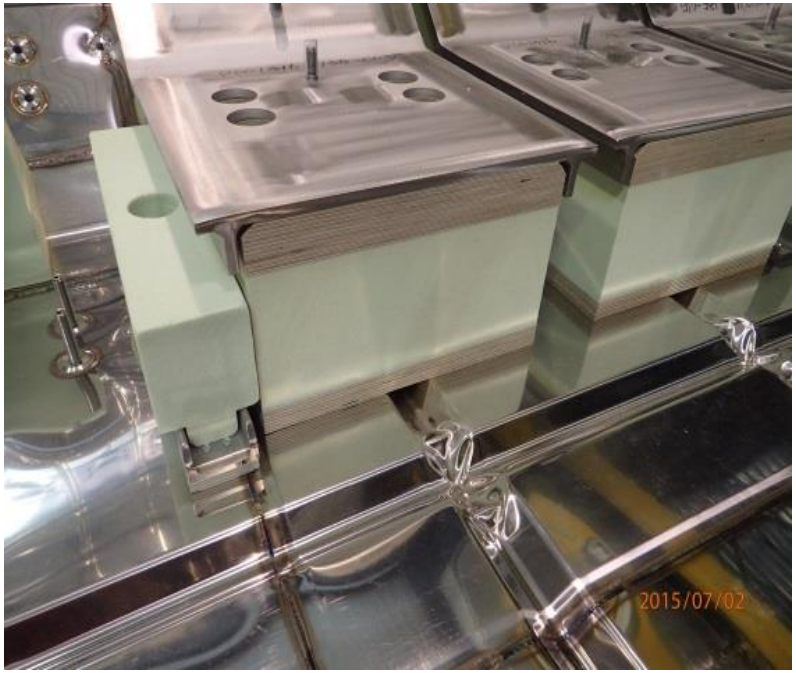




- **Thermal loops developing through the insulation**

Lessons learnt for Mark V system

- **Based on this mock-up experience, complementary investigations were launched on Mark V design to secure BOR guarantee and safety**
  - Thermal assessment considering potential convection inside insulation spaces
  - Evaluation of void spaces consequences inside corrugations & between insulation panels



On-going Tests

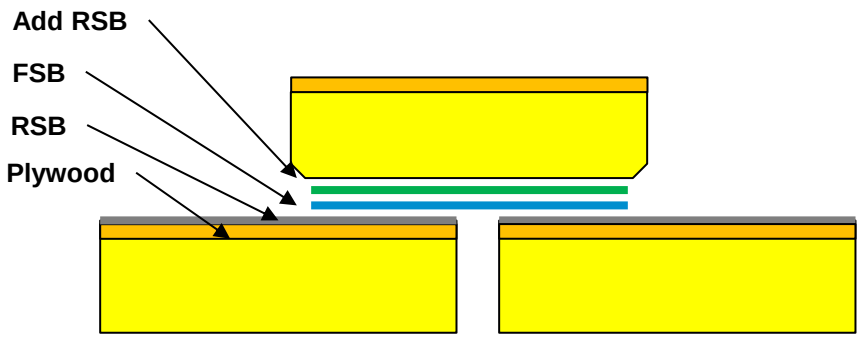
Conclusion about Mark V

- **Mark V technology marketing on hold**
  - During investigation for insulation panel convection
  - Internal convection tests & simulations are on-going

- **Objectives**
  - Design & validate technical solutions to improve Mark V thermal behaviour
    - Improved solution both on thermal performance and cost effectiveness
    - Full scale tests for qualification

Main Characteristics of Mark III Flex+

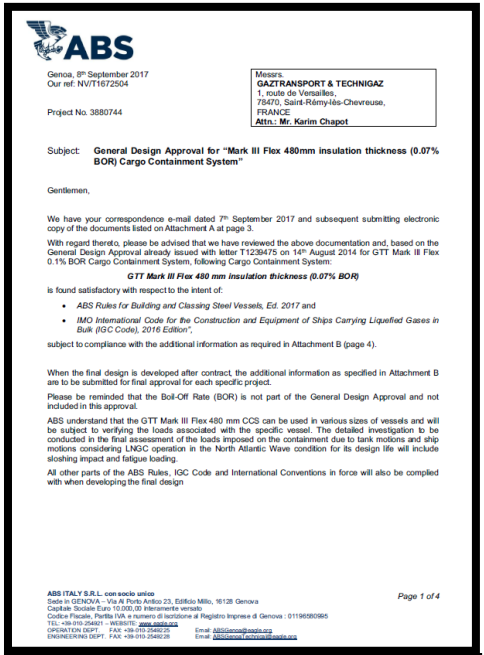
- **480 mm thick insulation panels**
- **Guaranteed BOR : 0,07%V / day**
- **Benefitting from latest secondary barrier improvement**
  - Already fitted on 6 vessels already delivered by SHI
  - Fatigue gain increased by a factor of 10



- **Also supported by:**
  - Strong technical background developed over the last 8 years
  - Return of experience on 47 vessels in operation and 22 vessels under construction

Class Approval

- **ABS : General Design Approval (GDA) granted on 8th September 2017**
- **LR : General Approval (GA) granted on 23th October 2017**
- **DNVGL : General Approval for Ship Application (GASA) under progress expected by end of 2017**
- **BV : Design Approval (DA) under progress expected by end of 2017**



ABS

Genoa, 8th September 2017
Our ref: NV/T1672504

Project No. 3880744

Messrs.
GAZTRANSPORT & TECHNIGAZ
1, route de Versailles,
78470, Saint-Rémy-lès-Chevreuse,
FRANCE
Attn.: Mr. Karim Chapot

Subject: **General Design Approval for "Mark III Flex 480mm insulation thickness (0.07% BOR) Cargo Containment System"**

Gentlemen,

We have your correspondence e-mail dated 7th September 2017 and subsequent submitting electronic copy of the documents listed on Attachment A at page 3.

With regard thereto, please be advised that we have reviewed the above documentation and, based on the General Design Approval already issued with letter T1236475 on 14th August 2014 for GTT Mark III Flex 0.1% BOR Cargo Containment System, following Cargo Containment System:

GTT Mark III Flex 480 mm insulation thickness (0.07% BOR)

is found satisfactory with respect to the intent of:

- *ABS Rules for Building and Classing Steel Vessels, Ed. 2017* and
- *IMO International Code for the Construction and Equipment of Ships Carrying Liquefied Gases in Bulk (IGC Code), 2016 Edition*",

subject to compliance with the additional information as required in Attachment B (page 4).

When the final design is developed after contract, the additional information as specified in Attachment B are to be submitted for final approval for each specific project.

Please be reminded that the Boil-Off Rate (BOR) is not part of the General Design Approval and not included in this approval.

ABS understand that the GTT Mark III Flex 480 mm CCS can be used in various sizes of vessels and will be subject to verifying the loads associated with the specific vessel. The detailed investigation to be conducted in the final assessment of the loads imposed on the containment due to tank motions and ship motions considering LNGC operation in the North Atlantic Wave condition for its design life will include sloshing impact and fatigue loading.

All other parts of the ABS Rules, IGC Code and International Conventions in force will also be complied with when developing the final design

ABS ITALY S.R.L. con socio unico
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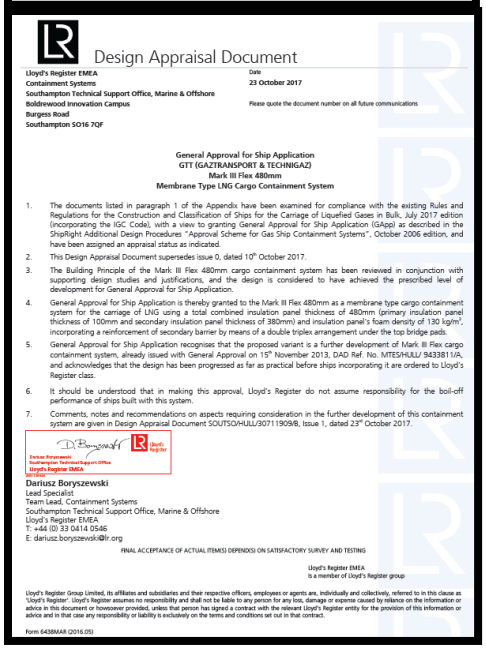

Design Appraisal Document

Lloyd's Register EMEA
Containment Systems
Southampton Technical Support Office, Marine & Offshore
Boldrewood Innovation Campus
Burgess Road
Southampton SO16 7QF

Date
23 October 2017

Please quote the document number on all future communications

General Approval for Ship Application
GTT (GAZTRANSPORT & TECHNIGAZ)
Mark III Flex 480mm
Membrane Type LNG Cargo Containment System

1. The documents listed in paragraph 1 of the Appendix have been examined for compliance with the existing Rules and Regulations for the Construction and Classification of Ships for the Carriage of Liquefied Gases in Bulk, July 2017 edition (incorporating the IGC Code), with a view to granting General Approval for Ship Application (GApp) as described in the ShipRight Additional Design Procedures "Approval Scheme for Gas Ship Containment Systems", October 2006 edition, and have been assigned an appraisal status as indicated.
2. This Design Appraisal Document supersedes issue 0, dated 10th October 2017.
3. The Building Principle of the Mark III Flex 480mm cargo containment system has been reviewed in conjunction with supporting design studies and justifications, and the design is considered to have achieved the prescribed level of development for General Approval for Ship Application.
4. General Approval for Ship Application is thereby granted to the Mark III Flex 480mm as a membrane type cargo containment system for the carriage of LNG using a total combined insulation panel thickness of 480mm (primary insulation panel thickness of 100mm and secondary insulation panel thickness of 380mm) and insulation panel's foam density of 130 kg/m³, incorporating a reinforcement of secondary barrier by means of a double triplex arrangement under the top bridge pads.
5. General Approval for Ship Application recognises that the proposed variant is a further development of Mark III Flex cargo containment system, already issued with General Approval on 15th November 2013, DAD Ref. No. MTESHULL/ 943381/A, and acknowledges that the design has been progressed as far as practical before ships incorporating it are ordered to Lloyd's Register class.
6. It should be understood that in making this approval, Lloyd's Register do not assume responsibility for the boil-off performance of ships built with this system.
7. Comments, notes and recommendations on aspects requiring consideration in the further development of this containment system are given in Design Appraisal Document SOUTSO/HULL/30711909/8, Issue 1, dated 23rd October 2017.

Europe Engineering
Southampton Technical Support Office
Lloyd's Register EMEA

Dariusz Boryszewski
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Team Lead, Containment Systems
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FINAL ACCEPTANCE OF ACTUAL ITEM(S) DEPEND(S) ON SATISFACTORY SURVEY AND TESTING

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Form 6438MAR (2016.05)

Conclusion about Mark III Flex+

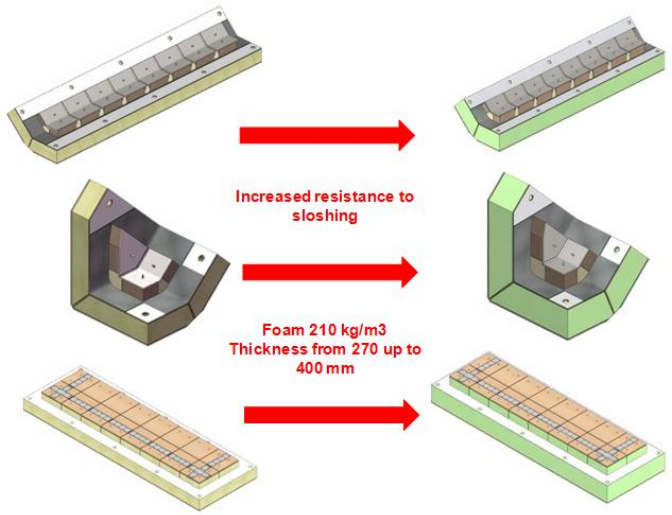
- **Guaranteed BOR of 0.07%V/day**
- **The system is based on well known and sea proven components**
- **The strong technical background shows:**
  - Fatigue behaviour is enhanced by a factor of 10
  - Safety coefficient is increased by 75% in flexible secondary barrier

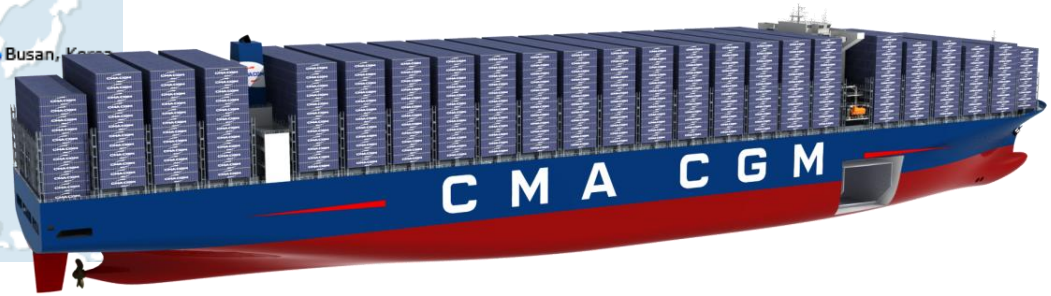
LNG as Fuel

David Colson

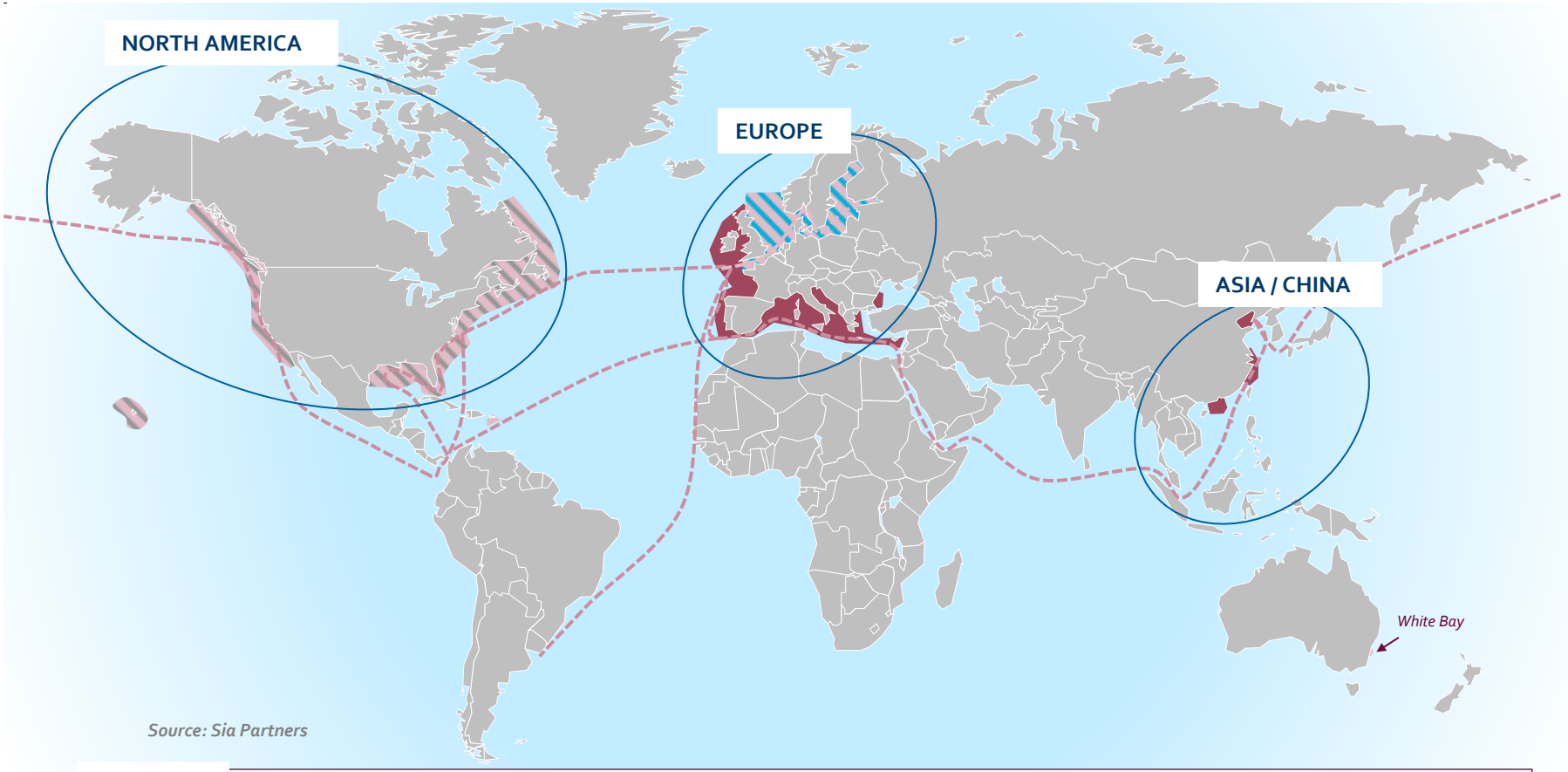
LNG fuel focus – CMA CGM order

- **LNG integrated membrane tanks of 18,600 cbm**
  - Space optimization
  - Designed for one bunkering operation per round trip
- **Mark III Flex (270 mm) technology for the fuel storage system**
  - Polyurethane Foam 130 kg/m3 and 210 kg/m3
  - Sea proven technology
  - Guaranteed Boil Off Gas
- **Maximal pressure: 700 mbarg**
  - Flexibility to handle and store Boil Off Gas
- **Positive impact on global LNG demand**
  - LNG Consumption of 300,000 tons per year for the 9 vessels, i.e. eq. 0.1% of LNG global production





Environmental regulations going worldwide, following main shipping routes



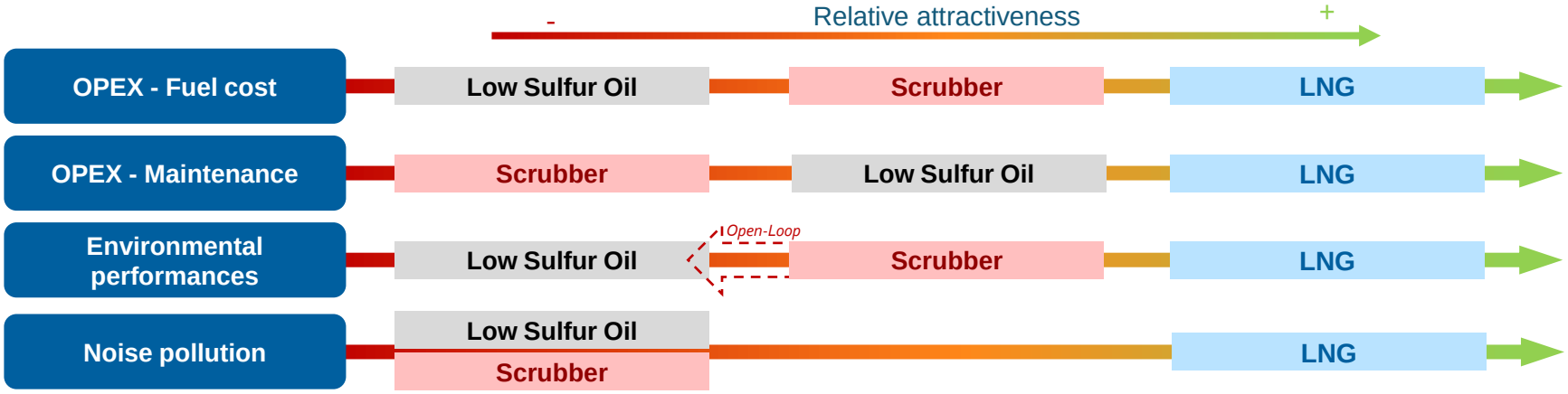
Caption

- Main shipping routes
- SOx
  - Current SOx emission control areas (≤0,1% SOx)
  - Future emission control zones (≤0,5% SOx)
  - Future emission control zones (≤0,5% SOx) – IMO Global Sulphur Cap (≤0,5% Sox)
- NOx
  - Current NOx emission control area
  - Future NOx emission control area (Tier III)

LNG is the major compliance options for shipowners

- **A shipowner has three main options to ensure compliance**
  - Use Low Sulfur Oil (MDO/MGO, LSHFO) *light investment but high fuel cost*
  - Install a scrubber *intermediate investment but O&M hurdles*
  - **Switch to LNG as fuel** *higher investment but lowest fuel cost*

- **LNG offers key advantages in terms of OPEX and environmental performances**



LNG is the only solution allowing comprehensive environmental compliance

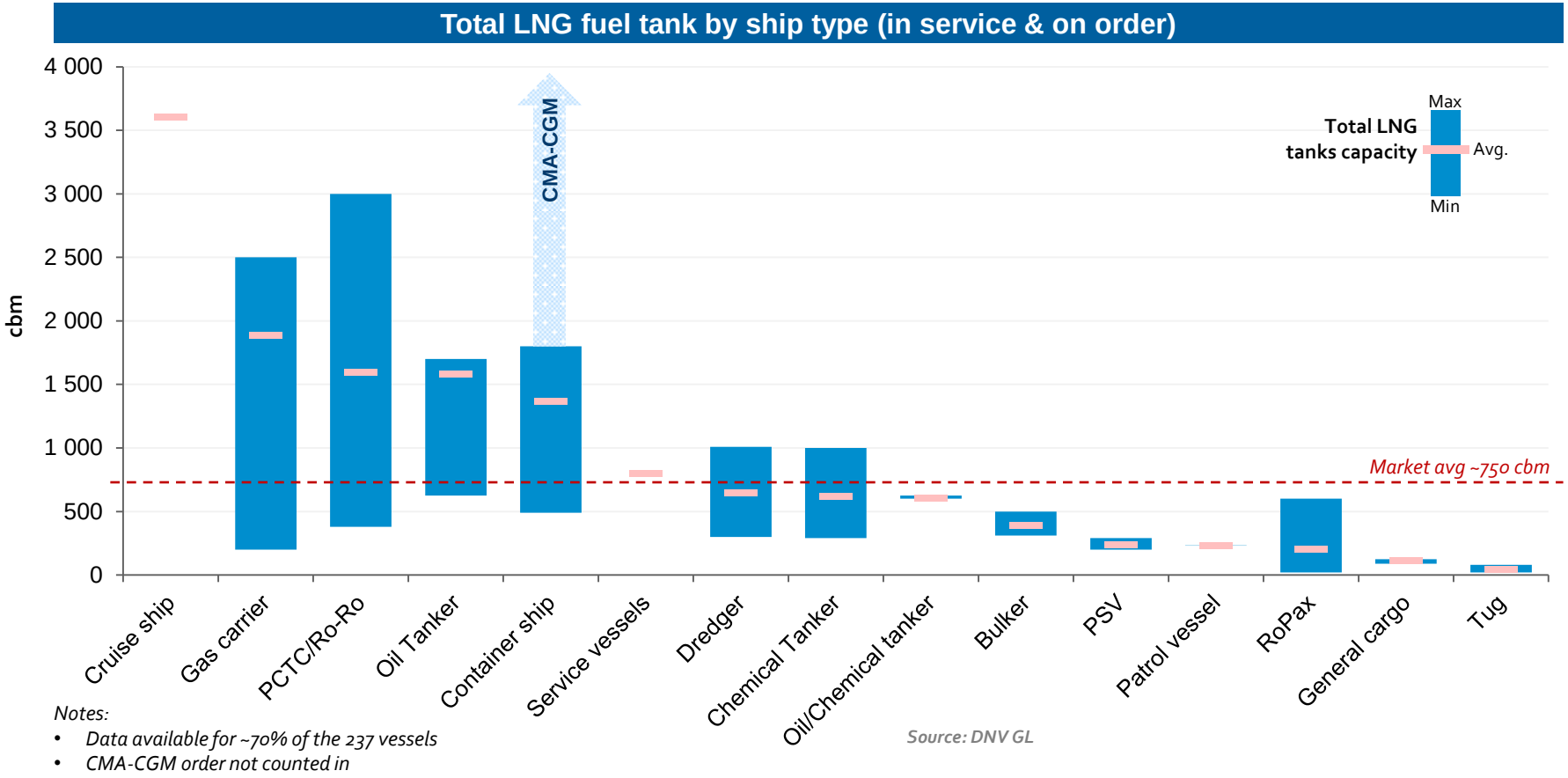
Pollutant	Level	HFO *(Heavy Fuel Oil)*	LS HFO *(Low Sulfur HFO)*	ULS HFO *(Ultra Low Sulfur HFO)*	MGO / MDO[1] (Marine Gasoil/Diesel Oil)	Scrubber +HFO	LNG
SOx (Sulfur Oxides)	3,5%						
	0,5%						
	0,1%						
NOx[2] (Nitrogen Oxides)	Tier II						
	Tier III	+EGR/SCR[3]					*Except for certain engines*

1) Only DMA and DMB class
2) Depends primarily on engine technology
3) EGR: Exhaust Gas Recirculation ; SCR: Selective Catalytic Reduction

Compliance Yes | Under condition | No

- **LNG is the only mature solution directly compliant with all environmental regulations**
- **Implementation of NOx reduction in Northern Europe will degrade oil fuel's and Scrubber's competitiveness**

Current LNG Fuel market situation



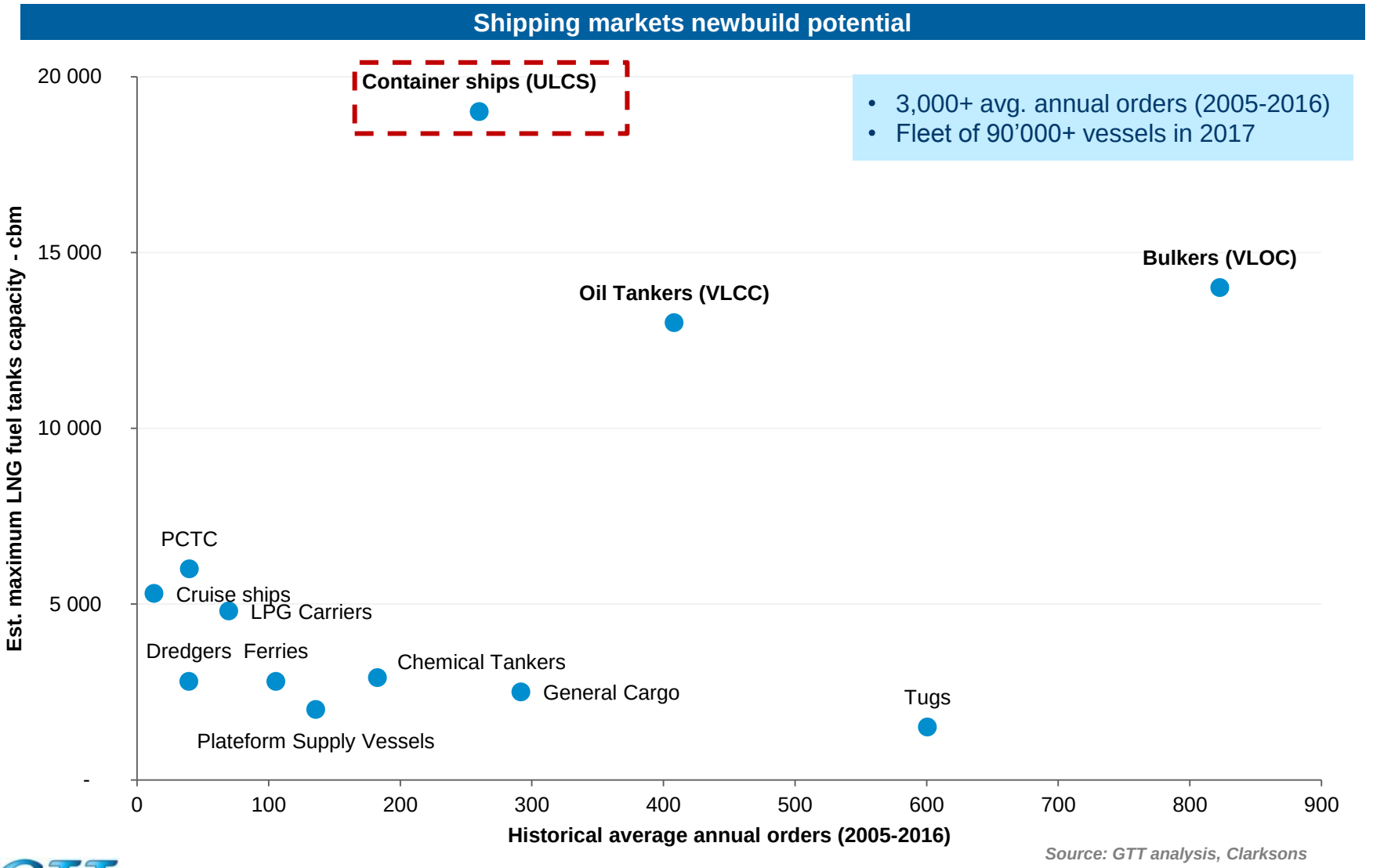
Notes:

- *Data available for ~70% of the 237 vessels*
- *CMA-CGM order not counted in*

Source: DNV GL

- **A recent market which has started with small ships and where Type C technology has been preferred** (tugs, ferries, PSV, … with LNG tanks up to several hundreds of m^3)
- **Large vessel segment where GTT technologies is the most relevant is just emerging** (container ships, bulkers, … with several thousands of m^3 and more)

LNG fuel Market potential: to be driven by newbuilds

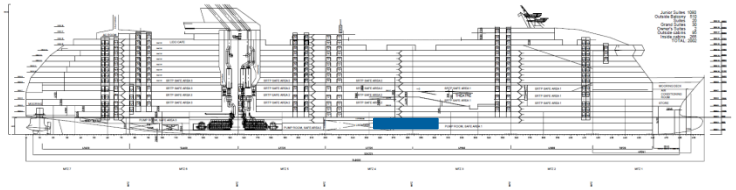


Source: GTT analysis, Clarksons

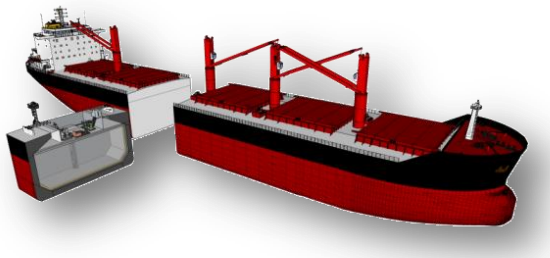
GTT LNG solutions offering

- GTT has developed solutions for the main applications of LNG Fuel

Solutions for Container Vessels new build and retrofit



Cruise Ship – optimizing the space for additional passengers



Cost effective solution for bulk carriers

Lean bunker barge to standardize the market

- A wide network of partnerships is being set up to benefit from these various opportunities

Conclusion about LNG Fuel

- GTT technologies for LNG Fuel have been validated by the market
- GTT focused on very large vessels
- Expertise and services of GTT are key factors of success on this market
- GTT is working on the setting up of a wide partnership network to accompany this development, as illustrated by the cooperation agreement finalised recently with Wärtsilä
- This market will represent a significant share of the LNG market

4

M&A strategy

Philippe Berterottière
Marc Haestier

Ascenz transaction

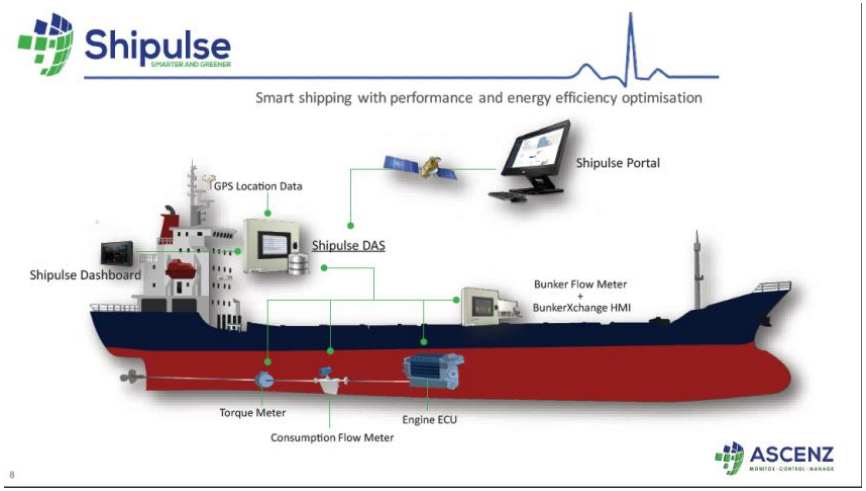
- **Acquisition of 75% of the share capital from founders and several investment funds**
- **Founders to retain 25% of the share capital and continue to manage the company**
- **Funded in cash**
- **No significant impact on GTT's financial structure**
- **Commercial and technical synergies**

ASCENZ
MONITOR · CONTROL · MANAGE

Ascenz is a dynamic EMS provider

Activities, markets & awards

- Based in Singapore, founded in 2008
- Provides remote fuel consumption and bunkering monitoring solutions
- Positioned on fast growing markets
- Markets : Offshore Supply Vessels (OSV), container ships, oil and crude carriers, bulk carriers, bunker ships and gas carriers (target) – 360+ ships equiped
- Recipient of the 2016 Singapore « Enterprise 50 award » for local companies excelling in their domain, Founders nominated as Singapore's EY Entrepreneurs of the year 2017
- Track record in real time data acquisition for a fleet of vessels



Ascenz's business in brief

- **A complete smart solutions provider fitting ships with data collection and analysis systems**

Business model & Strategy

Business Model

• 95% of sales on a non-recurring basis from systems installation

Strategy

1. Integrate further down the value chain with analytics / optimization modules
2. Transition to a service-based business model
3. Expand in EMEA starting 2017 and use ship management companies as a distribution channel

Products overview

Online portal

Onboard interfaces
Performance and bunkering monitoring

Data Acquisition System

Sensors

Installed fleet

Type	# installed	Tot. market(1)	References
Ocean going vessel (container, bulk, tanker)	131	22 276(2)	PIL, Formosa Plastics, Evergreen, APL, YANG MING
Offshore support vessel	186	1 517	IMC, Bumiarmada, Petronas, EMAS
Tugboat	30	NA (not considered: not main business for Ascenz)	PSA Marine
Bunker	13	NA (not considered: not main business for Ascenz)	Maersk, Hong Lam Marine
Total	360		

(1) *Total addressable market - Only ships of 20 year or less are considered*
(2) *Includes container ships, bulk carriers, oil tankers, crude ships and chemical carriers*

Ascenz' founders

Chia Yoong Hui
Founder, chairman, CEO & shareholder

- CEO since 2008
- 20 years of experience in technology and business management
  - Previously founded an IT consultancy company in 1998
- Operational intelligence industry innovator
- Degrees:
  - B.Sc. degree in Business Computing with Financial Management
    University of Wales
  - MBA
    University of Southern Queensland

Sia Teck Chong
Co-Founder, board member, CTO & shareholder

- CTO since 2008: leads R&D and technical and services operations
- 15 years of experience in R&D in wireless mobile networks and wireless communication between equipments
- Deep maritime industry expertise (Naval Senior Technical Specialist in the Singapore Navy for 6 years)
- Degrees :
  - Advanced Diploma in Information System Technology
    Singapore Polytechnic
  - Diploma in Electronics and Communication
    Singapore Polytechnic

GTT's strategic roadmap

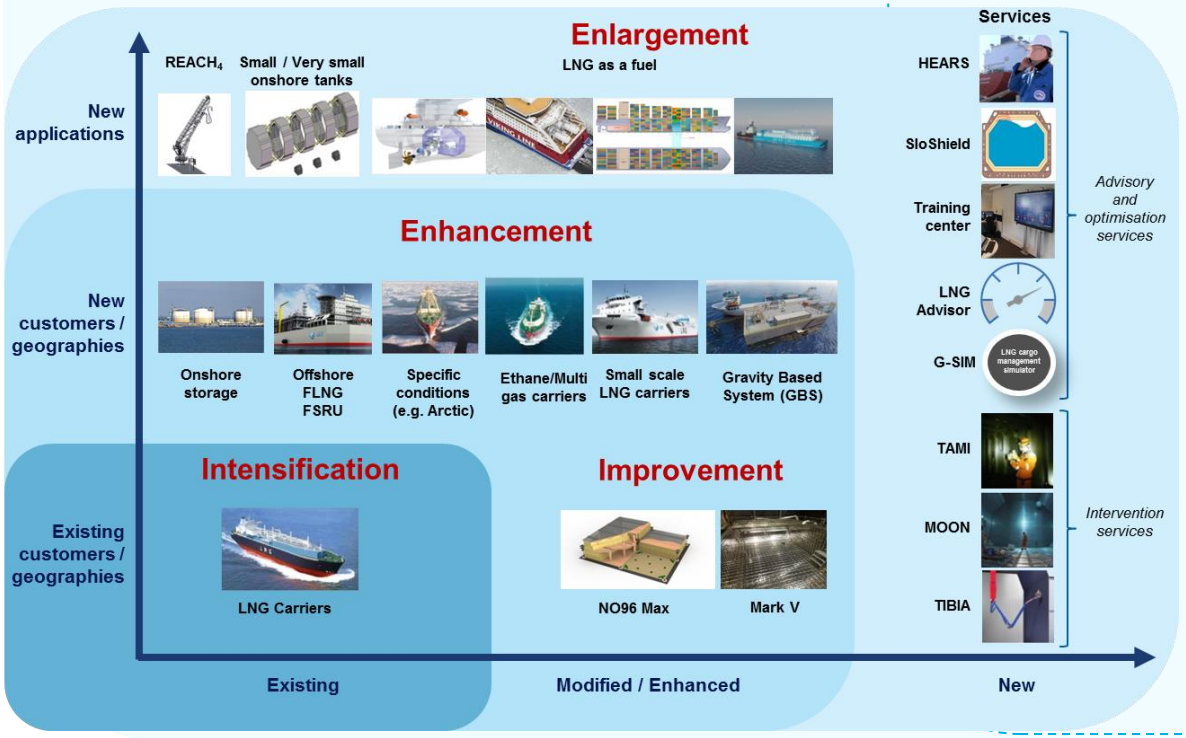
Gas handling technologies

Fuel Gas handling system for vessels

Growth, Technology, Transformation

Superior LNG gas handling systems

Advanced decision support systems



Framework service and maintenance contract (Shell Prelude)

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Smart shipping

Summary

- **Two strategic objectives**
  - Consolidate GTT position on core business
  - Develop new growth areas
- **Means**
  - Reinforce key internal competences
  - Operational or business agreements with partners
  - Acquisitions

5 Conclusion

Philippe Berterottière

Q&A session

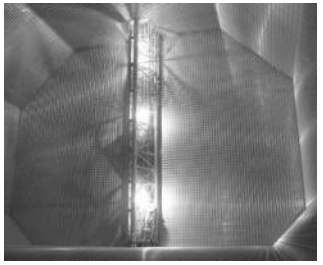
Expert in LNG

INVESTOR DAY

Saint-Rémy-lès-Chevreuse







12 December 2017

Safety | Excellence | Innovation | Teamwork | Transparency