



# CMA SHIPS - LNG Program

Achievements and Challenges

Symposium on alternative low-carbon and zero-carbon fuels for shipping

(9 and 10 February 2021)

**CMA CGM**  
GROUP

**CMA SHIPS**

**IMO** INTERNATIONAL  
MARITIME  
ORGANIZATION



- AN AMBITIOUS PROGRAM  
1.4K, 15K, 23K TEUS: VESSELS MAIN FEATURES & EQUIPMENT  
AN INDUSTRIAL PARTNERSHIP FOR AN INDUSTRIAL PROJECT
- A DECISIVE STEP TOWARD ENERGY TRANSITION  
EEDI & CII  
23K EMISSIONS MEASUREMENTS AND PERSPECTIVES
- A USE RATE IN PERMANENT PROGRESS  
USE RATES RAMP UP  
BRAKE SPECIFIC FUEL/GAS CONSUMPTION COMPARISON (g/kWh)
- A SUPPLY CHAIN UNDER CONSTANT DEVELOPMENT  
BUNKERING FACILITIES  
BUNKERING OPERATIONS & RETEX
- A STRONG TRAINING PROGRAM
- CHALLENGES FACED AND ROOM FOR IMPROVEMENT
- CONCLUSION



### ▪ THE VISION

*"We are paving the way for a maritime transport industry where both economic competitiveness and growth will go hand in hand with sustainable development and the fight against climate change [...] and we will go further to build an even cleaner industry"*





## AN AMBITIOUS PROGRAM FOR A NEW GENERATION OF VESSELS

### ▪ COMBUSTION / AIR QUALITY PERFORMANCES & ENERGY EFFICIENCY

The **Energy Efficiency Design Index** (EEDI), which measures the environmental footprint of a vessel, is improved by 20% compared to a conventional vessel.

The result is a **reduced carbon footprint** and **improved air quality**, particularly for populations living in coastal areas and in port cities. LNG Technology also allows the use of **organically-produced biomethane** made from agricultural and domestic waste. Biomethane is a renewable energy that emits up to 80% less CO<sub>2</sub> compared with conventional fuel.

During the first LNG bunkering of the CMA CGM Jacques Saadé, the use of biomethane - via the purchase of Guarantee of Origin certificates for 13% of the total fuel delivered - significantly reduced the carbon footprint of the LNG used in this operation.

A better **energy efficiency** than its equivalent running on fuel oil.

**-99%**  
in SO<sub>x</sub>  
Emissions

**-91%**  
in airborne  
particulate  
matter

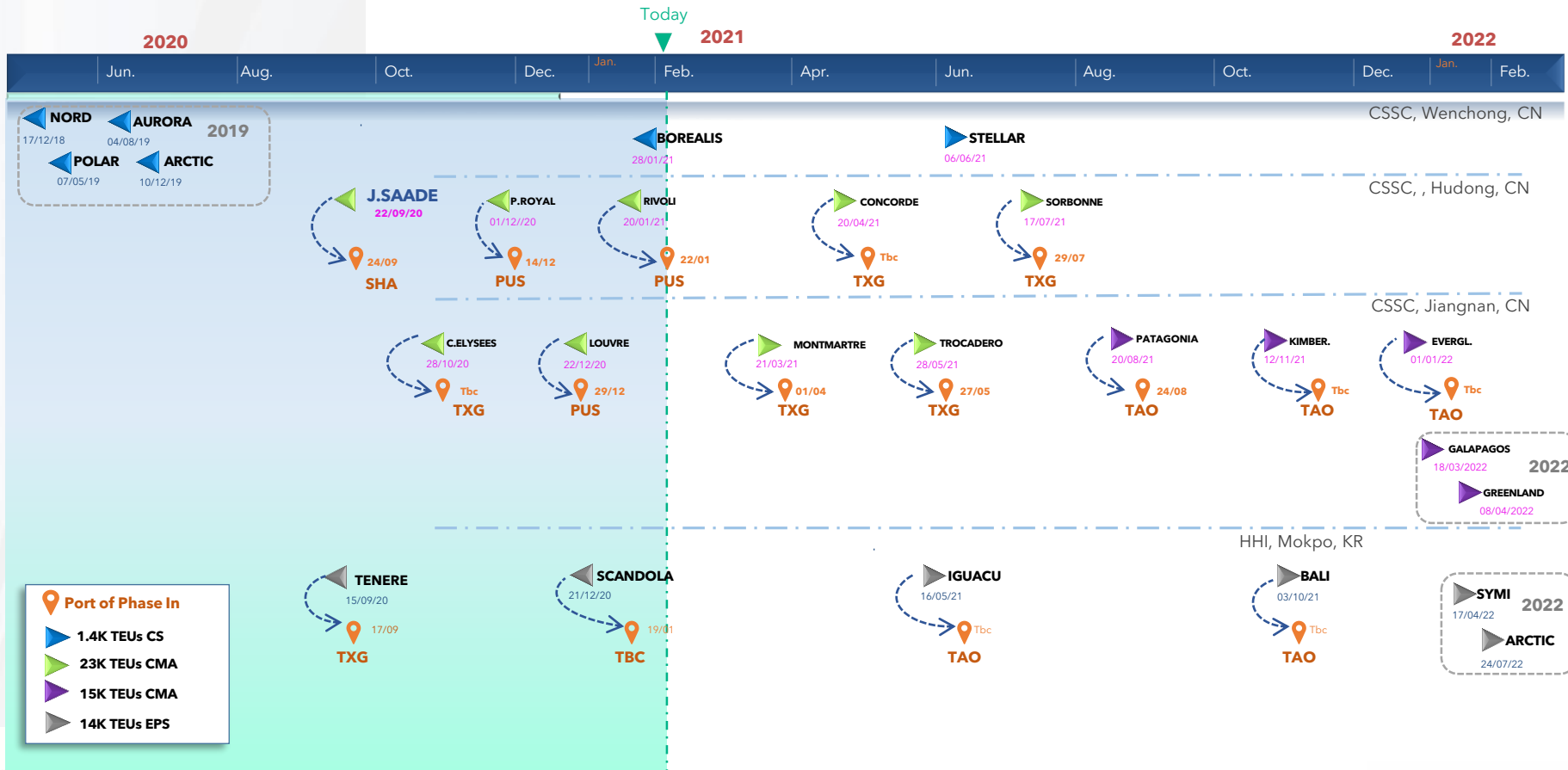
**-92%**  
in NO<sub>x</sub>  
Emissions

Up to  
**-20%**  
in CO<sub>2</sub>  
emissions





# AN AMBITIOUS PROGRAM: LNG MASTER SCHEDULE



**Port of Phase In**

- 1.4K TEUs CS
- 23K TEUs CMA
- 15K TEUs CMA
- 14K TEUs EPS

CMA Ships Estimated Readiness JJ/MM/YY vs Lines request DD/MM



# AN AMBITIOUS PROGRAM : DELIVERY STATUS



**#26**  
**LNG Vessels**



**#4**  
**Series**



**#4**  
**Shipyards**

## DELIVERED



### ▶ 1.4 K Teus:

Containerships Nord  
Containerships Aurora  
Containerships Polar  
Containerships Arctic  
Containerships Borealis

### ▶ 23 K Teus:

CC Jacques Saade  
CC Champs Elysées  
CC Palais Royal  
CC Louvre  
CC Rivoli

### ▶ 14 K Teus:

CC Tenere  
CC Scandola

**#12**  
LNG-powered  
vessels  
delivered

## TO COME

### ▶ 1.4 K Teus:

Containerships Stellar

### ▶ 23 K Teus:

CC Montmartre  
CC Concorde  
CC Trocadero  
CC Sorbonne

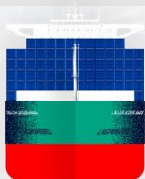
### ▶ 15 K Teus:

CC Patagonia  
CC Kimberley  
CC Everglade  
CC Galapagos  
CC Greenland

### ▶ 14 K Teus:

CC Iguacu  
CC Bali  
CC Symi  
CC Arctic

**#14**  
LNG-powered  
vessels to come





# 1.4K TEUS: VESSELS MAIN FEATURES & EQUIPMENT



CMA CGM		NORDIC / CONTAINERSHIPS CSSC Wenchong H5510 ~3 / 5538 / 5543		CSSC	
<b>MAIN PARTICULARS</b>		<b>MAIN ENGINE</b>		<b>VESSEL CAPACITIES</b>	
Length over all	169.95 m	WINGD	7RTFLEX 50DF	With max. number of Containers	
Length between perp	160.96 m	MCR	10 080 kW @ 124 RPM	IMO visibility guideline	
Breadth	29.6 m	HFO spec (ME/Aux. Eng./Boiler)	700/700/700cSt	On deck (6 tiers)	844 TEU
Depth	14.85 m		SG1.01	In hold	536 TEU
Draught, design	8.5 m	Propeller type	CPP 4 Blades	<b>Total</b>	<b>1 380 TEU</b>
Draught, scantling	9.6 m	Bow / stern thruster	920 / 720 kW	Rows max. in holds/on hatches	9 / 10 Rows
Air draft	m			Tiers max. in holds/on hatches	5 / 6 Tiers
Deadweight on Td	Ton	<b>FUEL OIL CONSUMPTION OF MAIN ENGINE</b>		El. Plugs (for reefer Container)	
Deadweight on Ts	19 500 Ton	(L.C.V=10,200kcal/kg)		<b>Total</b>	
Lightship weight	9 066 Ton	D.F.O.C at NCR	35 MT / day of LNG + 1MT / day of MGO	Stability (xx t/TEU, hetero at Ts)	
Service Speed	19.15 Ton		46 MT/day	Stability (14 t/TEU homo. at Ts)	
(10 080 kW, Td. 15%SM)		Cruising range	3 200 NM on LNG 6500 NM on fuel	(based on 8ft 6inches, 45% Container VCG)	
SWBM	xxx t.m			<b>NAVIGATION EQUIPMENT</b>	
<b>CLASS : ABS</b>		<b>POWER SUPPLY</b>		2 –consoles Radar Plant with ARPA	
+A1, Container Carrier, E, + AMS, +ACCU, SH, SHCM, TCM, UWILD, ICE CLASS 1A, RW, CPS, GFS(DFD), BWT, GP, RRDA, CSC, CLP-V		Diesel Generators 1* 1110 +3* 620 kW		1- ECDIS	
<b>TANK CAPACITIES</b>		Shaft generator 1800 kW		1 - Auto Pilot / 1 Gyro compass	
Heavy fuel oil	815 m <sup>3</sup>	Emergency Generator kW		1 - DGPS navigator + 1 DGPS	
Marine diesel oil	155 m <sup>3</sup>	<b>CARGO HATCH COVER</b>		1 speed log dual axis and 1 echo sounders	
LNG	660 m <sup>3</sup>	Type Flap type		<b>TONNAGE :</b>	
Fresh water	106 m <sup>3</sup>	Stack weight 60 MT/20ft & 90 MT/40ft		GT : 17 960	
Ballast water	8 700 m <sup>3</sup>	<b>COMPLEMENT</b>		Suez GT : xxx	
		Crew of 19 persons		NT : 6 875	
				Suez NT : xxx	



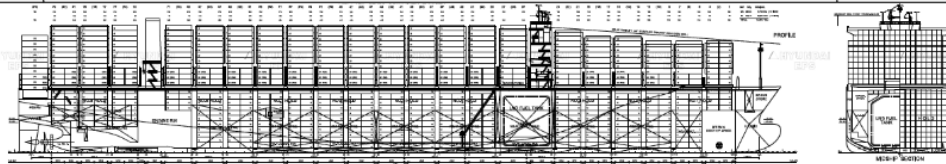


# 14K TEUS: VESSELS MAIN FEATURES & EQUIPMENT



## EPS 15 000 Teus DUAL FUEL

HHI (S990 ~995)



### MAIN PARTICULARS

Length over all	366 m
Length between perp	350 m
Breadth	51 m
Depth	29.85 m
Draught, design	14.5 m
Draught, scantling	16 m
Air draft	Less than 66.2 m
Deadweight on Td	134 800 Ton
Deadweight on Ts	158 800 Ton
Lightship weight	Xx xxx Ton
Service Speed	1.52 knots
(Td, NCR, 15% Sea Margin)	
SWBM	8 300 00 kN.m

### CLASS : LR

+1 00A 1 Container Ship, ShipRight (SDA, FDA, FDA SPR, WDA2, CM, ACS(B)), \*IWS, LI, +LMC, LFPF(GF, NG), UMS, with descriptive notes: ShipRight (BWMP(T), IHM, S CM).

### TANK CAPACITIES

LNG Membrane tank (Type B)	12 000 m <sup>3</sup>
Heavy fuel oil	5 300 m <sup>3</sup>
Marine diesel oil	1 400 m <sup>3</sup>
Lubricating oil	xxx m <sup>3</sup>
Fresh water	500 m <sup>3</sup>
Ballast water	41 300 m <sup>3</sup>

### MAIN ENGINE

MDT – HHI EMD	111G90ME-C10.5 GI-EGRTC
NOX Tier II	EGR TC Cut out
SMCR	46;630 kW x 75.7 RPM

Fixed pitch propeller	x Blades
Bow	1* 3 000 kW

### FUEL OIL CONSUMPTION OF MAIN ENGINE

(L.C.V=42 700 KJ/kg)

D.F.G.C at NCR	111.5 MT/day
DFOC at NCR	137.6 MT/day
Cruising range (diesel mode)	22 800 NM
Cruising range (gas mode)	23 700 NM

### POWER SUPPLY

Diesel Generators	4 x 3,700 kW
Em'cy Generator	250 kW

### CARGO HATCH COVER

Type	Steel pontoon type
Stack weight	90 MT/20ft & 180 MT/40ft
Panel weight	Max.45 tons of each panel (excluding container loose fittings)

### COMPLEMENT

Crew of 32 p + 6 Suez crew

### VESSEL CAPACITIES

With max. number of Containers

On deck (11 tiers)	8 780 TEU
In hold	6 032 TEU
Total	14 812 TEU
Rows max. in holds/on hatches	18 / 20 Rows
Tiers max. in holds/on hatches	11 / 11 Tiers

IMO visibility guideline

El. Plugs (for reefer Container)	
On Deck	1 000 FEU
In Hold	0 FEU
Total	1 000 FEU

Stability (14 t/TEU homo. at Ts) 10 370 TEU (based on 8ft 6inches, 45% Container VCG)

### NAVIGATION EQUIPMENT

- 1 – conning station
- 2- ECDIS
- 1 - Auto Pilot / 2 Gyro compass
- 2 – DGPS navigator
- 1 speed log,

### TONNAGE :

GT : xxx	NT : xxx
Suez GT : xxx	Suez NT : xxx



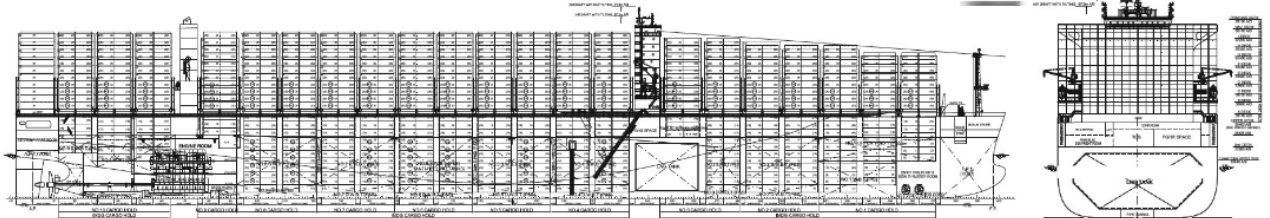






# 15K TEUS: VESSELS MAIN FEATURES & EQUIPMENT



		<b>CMA CGM NEWBUILDING 15 000 Teus DUAL FUEL</b> <b>CSSC (H2654 ~ H2658)</b>			
					
<b>MAIN PARTICULARS</b>		<b>MAIN ENGINE</b>		<b>VESSEL CAPACITIES</b>	
Length overall	366 m	WINGD	10X92DF	With max. number of Containers	
Length between perp	355 m	MCR	51,680 kW x 80 RPM	<b>IMO visibility guideline</b>	
Breadth	51 m	HFO spec (ME/Aux. Eng./Boiler)	700cSt	On deck (12 tiers)	9 144 TEU
Depth	30.2 m	Fixed pitch propeller	SG1.01	In hold	6 110 TEU
Draught, design	14.5 m	Bow	5 Blades	<b>Total</b>	<b>15 254 TEU</b>
Draught, scantling	16 m		2* 2 500 kW	Rows max. in holds/on hatches	18 / 20 Rows
Air draft	Less than 67.5 m	<b>FUEL OIL CONSUMPTION OF MAIN ENGINE</b> (L.C.V=42 700 KJ/kg)		Tiers max. in holds/on hatches	11 / 11 Tiers
Deadweight on Td	130 200 Ton	D.F.G.C at NCR	156.4 MT/day	<b>IMO visibility guideline</b>	
Deadweight on Ts	155 000 Ton	DFOC at NCR	193.6 MT/day	On Deck	1 400 FEU
Lightship weight	48 500 Ton	Cruising range	22 000 NM	In Hold	400 FEU
Service Speed	22 knots	<b>POWER SUPPLY</b>		<b>Total</b>	<b>1 800 FEU</b>
(Ts, NCR, 15% Sea Margin)		Diesel Generators	4 x 4,320kW	<b>Stability (14 t/TEU homo. at Ts)</b>	
SWBM	8 900 00 kN.m	Em'cy Generator	1 x 2,880kW 340 kW	10180 TEU (based on 8ft 6inches, 45% Container VCG)	
<b>CLASS : BV</b>		<b>CARGO HATCH COVER</b>		<b>NAVIGATION EQUIPMENT</b>	
BV, I +HULL, +MACH Container Ship, dualfuel, Unrestricted Navigation, +VERISTAR-HULL FAT25, WHISP2, +AUT-UMS, MON-SHAFT, INWATER-SURVEY, CPS(WBT), CLEANSHIP, GREEN PASSPORT EU, AUT-PORT, LASHING-WW, LI-HG-S2, ESA, +ALP, SDS		Type	Steel pontoon type	2 – Multipurpose consoles Radar Plant with ARPA	
<b>TANK CAPACITIES</b>		Stack weight	90 MT/20ft & 180 MT/40ft	3- ECDIS/ conning (Multipurpose consoles)	
LNG Membrane tank	14 022 m <sup>3</sup>	Panel weight	Max. 45 tons of each panel (excluding container loose fittings)	1 - Auto Pilot / 2 Gyro compass	
Heavy fuel oil	2 558 m <sup>3</sup>	<b>COMPLEMENT</b>		2 – DGPS navigator	
Marine diesel oil	1 522 m <sup>3</sup>	Crew of 37 p + 7 Suez crew		1 speed log single axis, 1 speed log triple axis and 2 echo sounders	
Lubricating oil	652 m <sup>3</sup>			<b>TONNAGE :</b>	
Fresh water	516 m <sup>3</sup>			GT : 153 870	NT : 69 253
Ballast water	42 000 m <sup>3</sup>			Suez GT : xxx	Suez NT : xxx





# 23K TEUS: VESSELS MAIN FEATURES & EQUIPMENT



## CMA CGM NEWBUILDING 23 000 Teus DUAL FUEL

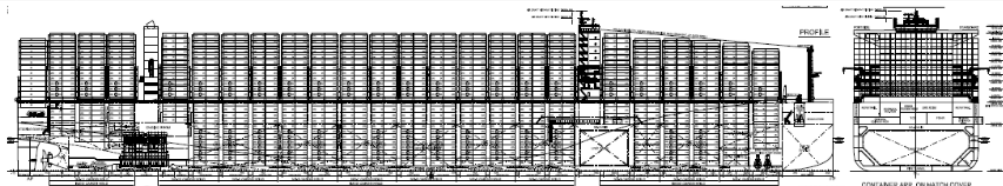
CSSC – HZ & JN

EEDI : 6.035 under LNG (7.289 under HFO, estimation)



江南造船(集团)有限责任公司

江南造船(集团)有限责任公司  
JIANGNAN SHIPYARD (GROUP) CO., LTD.



### MAIN PARTICULARS

Length over all	399.9 m
Length between perp	393.9 m
Breadth	61.3 m
Depth	33.5 m
Draught, design	14.5 m
Draught, scantling	16 m
Air draft	75 m
Deadweight on Td	189 260.5 Ton
Deadweight on Ts	221 250.6 Ton
Lightship weight	67 104.7 Ton
Service Speed (Ts, NCR, 15% Sea Margin)	21.55 knots
SWBM	1 436 000 t.m

### CLASS : BV

I, \*Hull, \*Mach, Container Ship, DUAL FUEL  
Unrestricted Navigation, VERISTAR HULL FAT 25,  
\*Aut-UMS, Monshaft, In Water Survey, CPS (BWT),  
CLEANSHIP, GREENPASSPORT EU, \*Aut-Port,  
Lashing WW, LI-HG-S2, ESA, +ALP, SDS

### TANK CAPACITIES

LNG	18 600 m <sup>3</sup>
Heavy fuel oil	2 500 m <sup>3</sup>
Marine diesel oil	1 500 m <sup>3</sup>
Lubricating oil	800 m <sup>3</sup>
Fresh water	550 m <sup>3</sup>
Ballast water	55 500 m <sup>3</sup>

### MAIN ENGINE

WINGD	12X92 DF
MCR	63 840kW) @ 80 RPM
HFO spec (ME/Aux. Eng./Boiler)	700/700/700cSt
Fixed pitch propeller	SG1.01
Bow	5 Blades
	2* 3 000 kW

### FUEL OIL CONSUMPTION OF MAIN ENGINE

(L.C.V=42 700 KJ/kg)

D.F.G.C at NCR	192 MT/day
DFOC at NCR	239.1 MT/day
Cruising range	21 000 NM

### POWER SUPPLY

Diesel Generators	2x Wartsila 9L34DF 4320 kW
	4x Wartsila 8L34DF 3840 kW
Em'cy Generator	340 kW

### CARGO HATCH COVER

Type	Steel pontoon type
Stack weight	90 MT/20ft & 220 MT/40ft
Panel weight	Max 45 tons of each panel (excluding container loose fittings)

### COMPLEMENT

Crew of 40 p + 7 Suez crew

### VESSEL CAPACITIES

With max. number of Containers

	IMO visibility guideline
On deck (12 tiers)	13 328 TEU
In hold	9 784 TEU
Total	23 112 TEU

Rows max. in holds/on hatches	22 / 24 Rows
Tiers max. in holds/on hatches (Hold : 11 x 9'6" or 9x8'6"+3x9'6")	12 / 12 Tiers

EI. Plugs (for reefer Container)	
On Deck	1 400 FEU
In Hold	800 FEU
Total	2 200 FEU

Stability (10 t/TEU, hetero at Ts)	19 836TEU
Stability (14 t/TEU homo. at Ts) (based on 8ft 6inches, 45% Container VCG)	14 810 TEU

### NAVIGATION EQUIPMENT

- 4 – Multipurpose consoles Radar Plant with ARPA
- 1- ECDIS/ conning
- 1 - Auto Pilot / 2 Gyro compass
- 2 - DGPS navigator
- 1 speed log single axis, 1 speed log triple axis and 2 echo sounders

### TONNAGE :

GT : 236583	NT : 101823
Suez GT : 139 799	Suez NT : 220 016





# AN INDUSTRIAL PARTNERSHIP FOR AN INDUSTRIAL PROJECT

7

years of R&D

3

JIP

10+

leading  
industrials &  
partners

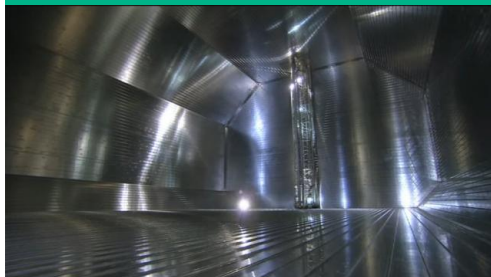
Ship construction: **CSSC**  
Ship certification: **Bureau Veritas**  
Engine design: **Win GD**  
Gas handling system, auxiliary systems: **Wärtsilä**  
LNG tanks design: **GTT**  
LNG pumps: **Cryostar**  
LNG refueling systems: **Total/Rotterdam harbor/RWG**

...

**#3 Joint Industry  
Projects**  
(CMA CGM, DSME, CSSC,  
DNV, ABB, OMT, GTT)

**LNGPOWERED**

THE LNG TANK



**GTT**  
Expert in LNG

THE WIN GD X92 DUAL FUEL ENGINE.



**WIN GD**

# A DECISIVE STEP TOWARD ENERGY TRANSITION



## 23K DF

EEDI 6,32

EEDI with S/G 6,09

## 15K DF

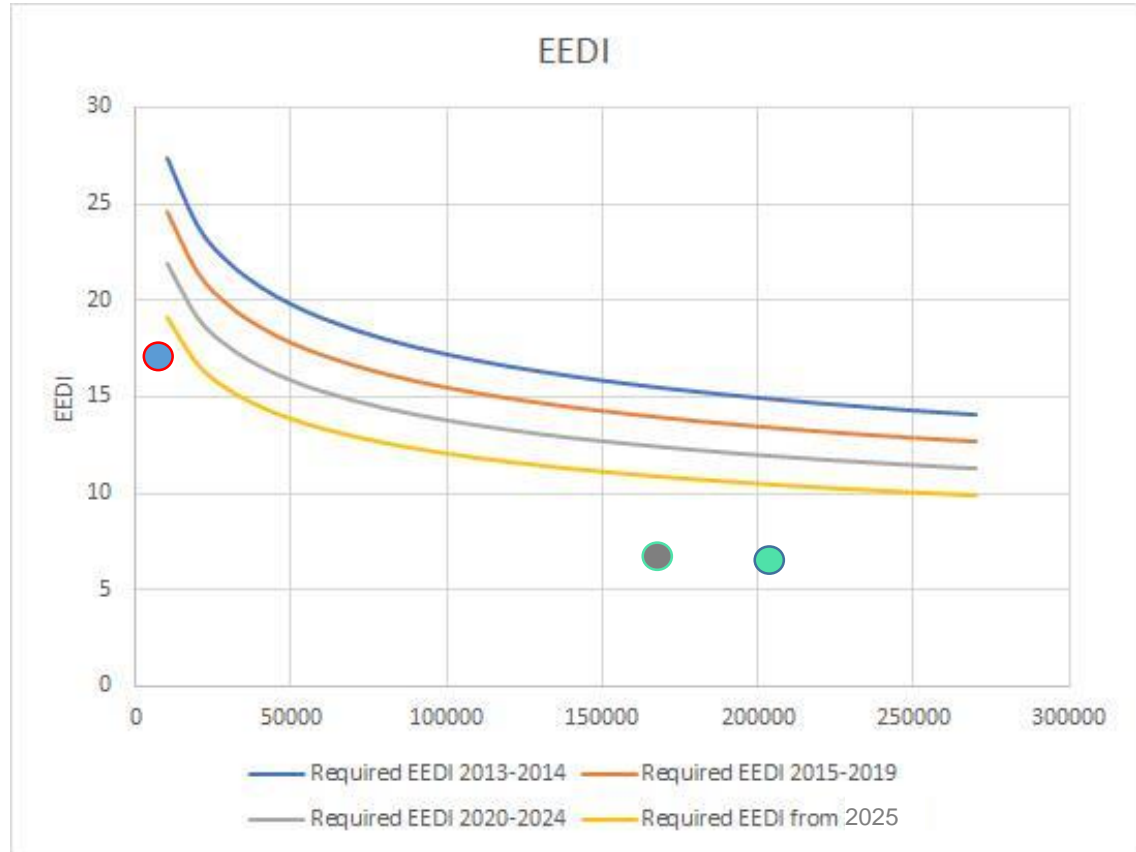
EEDI 6,54

EEDI with S/G 6,29

## 1.4K DF

EEDI 16,41

## THE ENERGY EFFICIENCY DESIGN INDEX

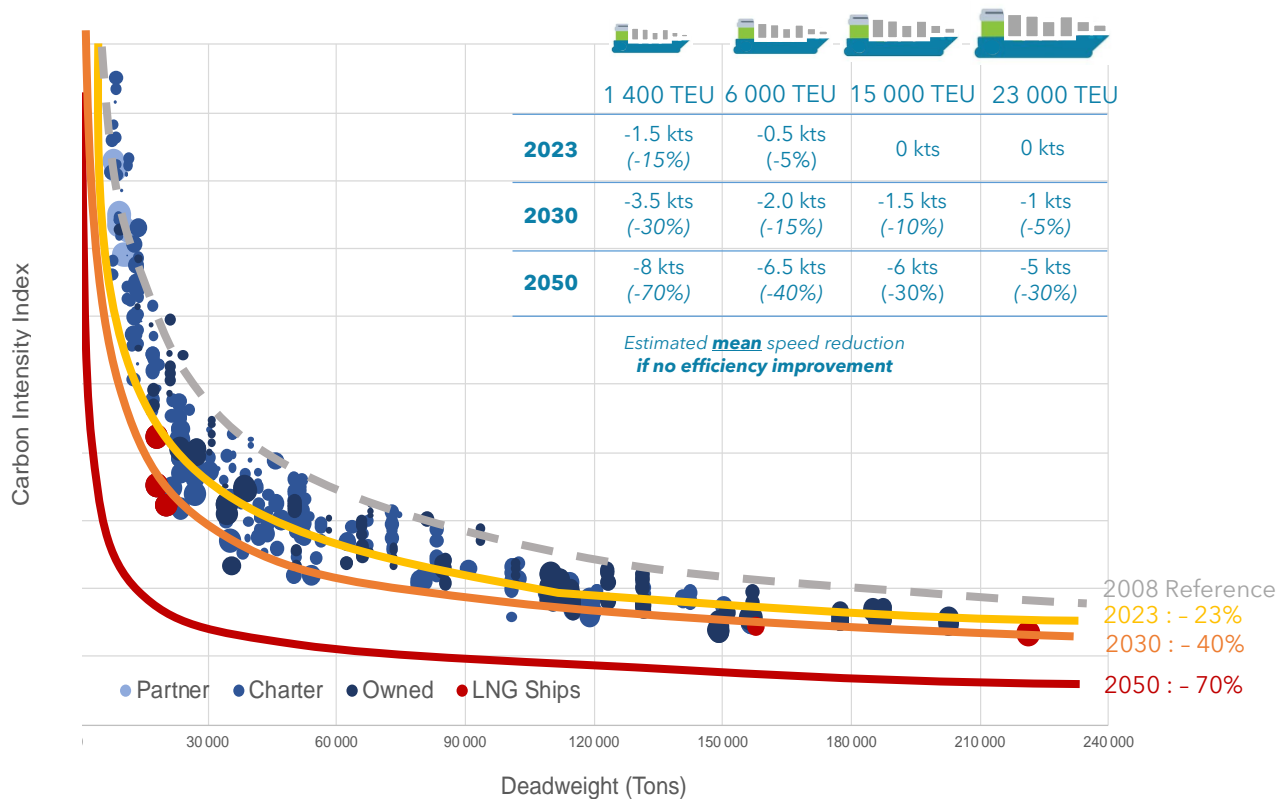
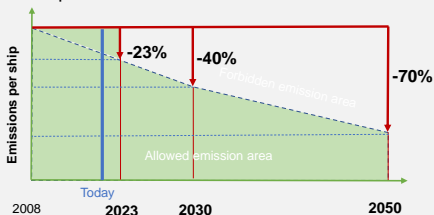


# A DECISIVE STEP TOWARD ENERGY TRANSITION

## THE CARBON INTENSITY INDEX PATHWAY

### Process of Carbon Intensity Index

1. Define a reference line of efficiency vs Deadweight
2. Define the reduction factor over the time
3. Define non compliance penalties



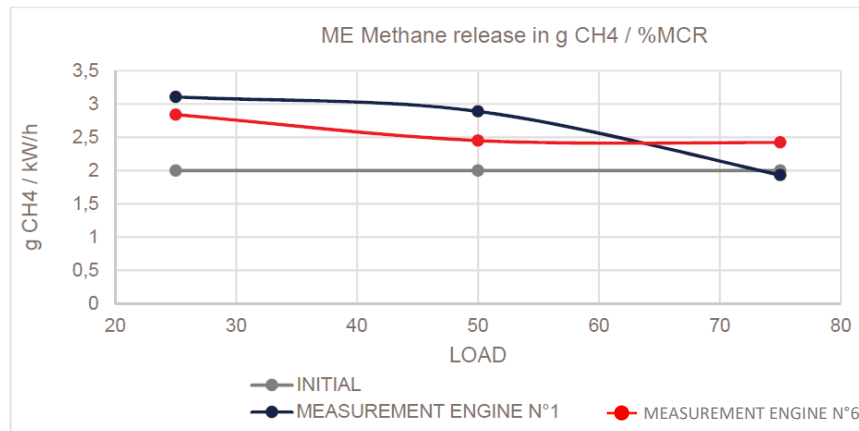
LNG powered vessels have already reached 2030 target and have the potential to further improve



## 23K EMISSIONS MEASUREMENTS AND PERSPECTIVES

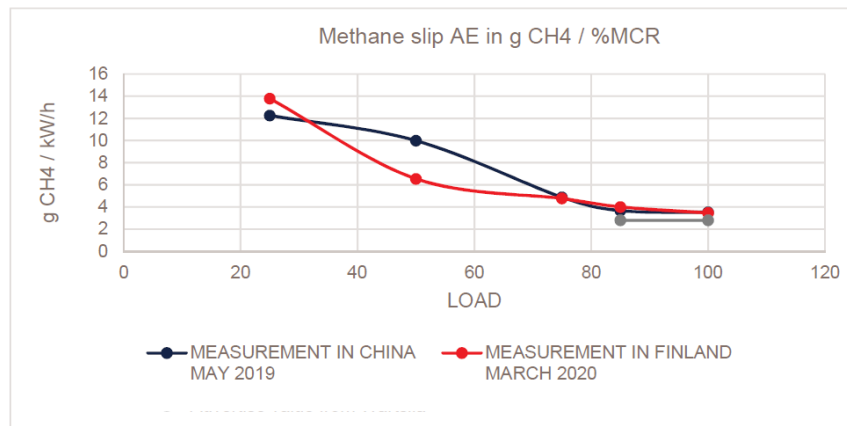
The goal is to **reduce the emission** from the **main engine** and **optimize** the use of the **auxiliary engines**:

- Use of the **cold energy** of the LNG to recover frigorie for the accommodation and the vessel usage instead of producing it.
- Recycling of the **exhaust gases** to reduce the methane slip and use the thermal energy to produce electricity.
- Optimize the **power management system** to operate the auxiliary engines on an optimal load.
- Add a **shaft generator** to avoid using the auxiliary engines and increase the load on the main engine (which increase its efficiency).



Results of the measurements for the main engine (WinGD - 12X92DF)

The design of the engine has been reviewed between the number 1 and the number 6 with a focus on the piston rings. It allows a **reduction of the methane slip** during its actual operation, below 62%.



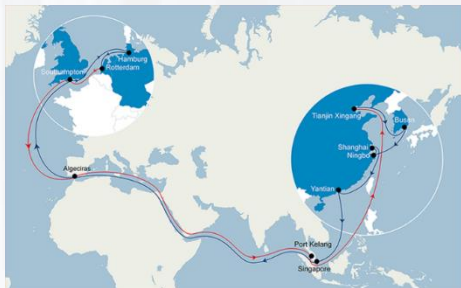
Results of the measurements for the auxiliary engines (Wärtsilä 34DF)



## 23K EMISSIONS MEASUREMENTS AND PERSPECTIVES

measurements during vessel operation:

The operation selected is the main leg of the **FAL1** between Singapore and Suez corresponding to most of our major customers' needs.



Consumption/day	Diesel engine with scrubber	Dual Fuel engine
HFO 3.50%S	174.4 t	0 t
VLSFO 0.50%S	0 t	0 t
MDO	0 t	0.8 t
LNG	0 t	147.4 t
<i>Unburn fuels</i>	<i>No THC* measurements available</i>	<i>2.38 t of Methane AE: 0.31 t + ME: 2.06 t</i>
Emissions/day as computed by IMO		
CO <sub>2</sub>	543 t	408 t (-24.9%)
SO <sub>x</sub>	1.35 t	0.014 t (-99%)
NO <sub>x</sub>	15.4 t	1.21 t (-92.1%)
PM10	0.24 t	0.08 t (-66.7%)

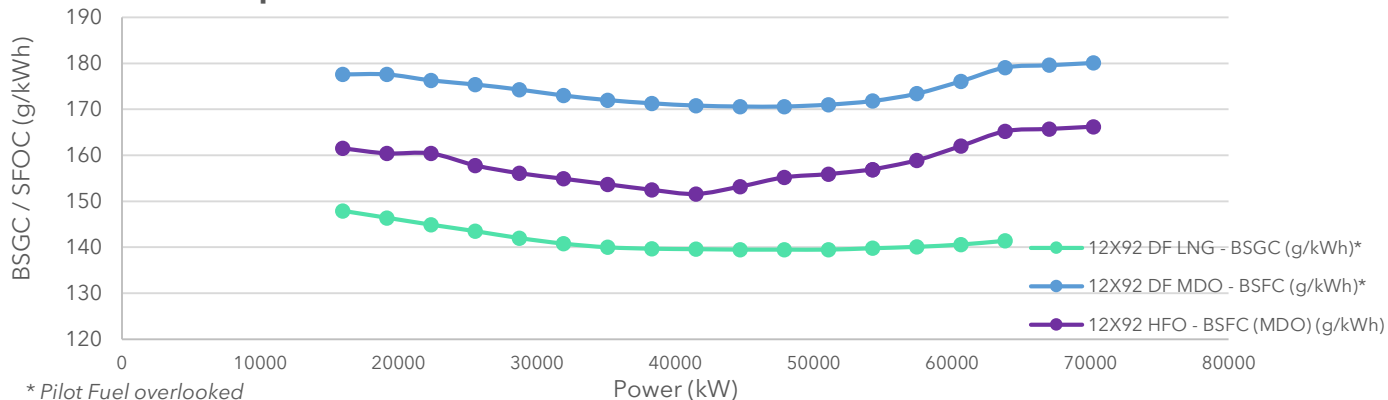
\*THC: Total Hydrocarbon Content – unburnt fuels and lubricants



# BRAKE SPECIFIC FUEL/GAS CONSUMPTION COMPARISON (g/kWh)

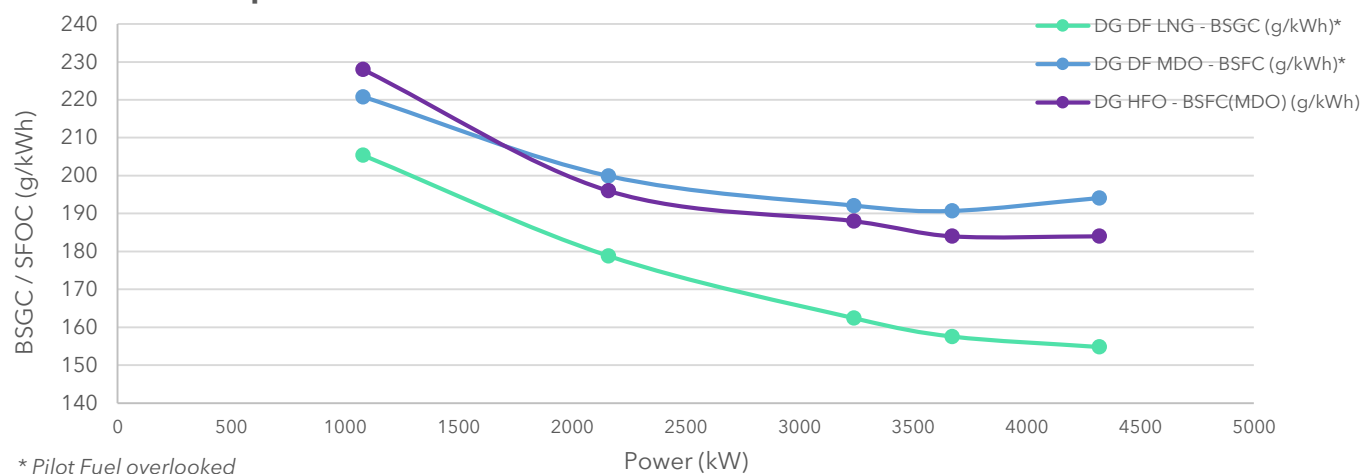
Gas fuel data: LHV Reference	50000	kJ/kg
Diesel fuel data: LHV Reference	42707	kJ/kg
LNG Density	465	kg/m3

## BSGC / BSFC Comparison - WINGD 12X92



Gas fuel data: LHV Reference	50000	kJ/kg
Diesel fuel data: LHV Reference	42707	kJ/kg
LNG Density	465	kg/m3

## BSGC / BSFC Comparison - Diesel Generator



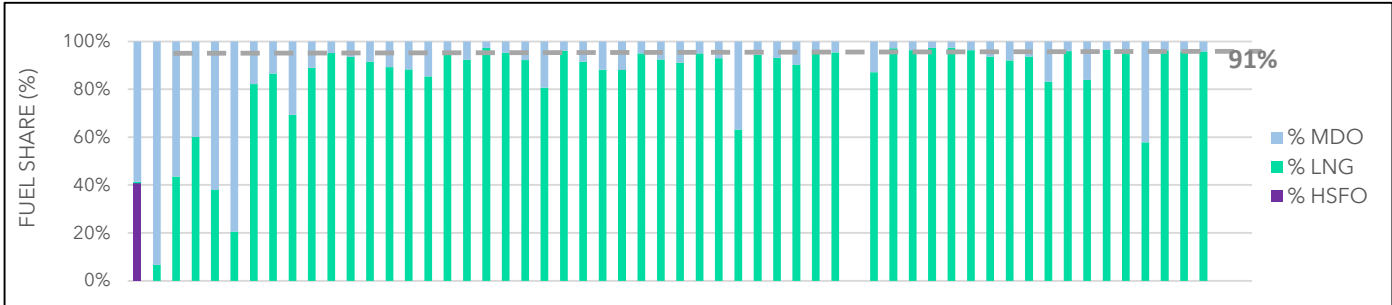




# 1.4K LNG USE RATE RAMP-UP

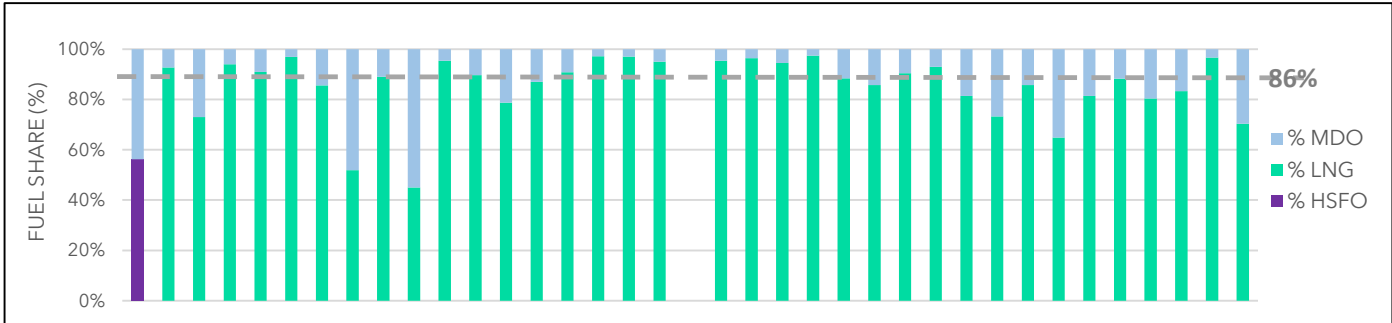
## CONTAINERSHIPS NORD

#784 days in operation



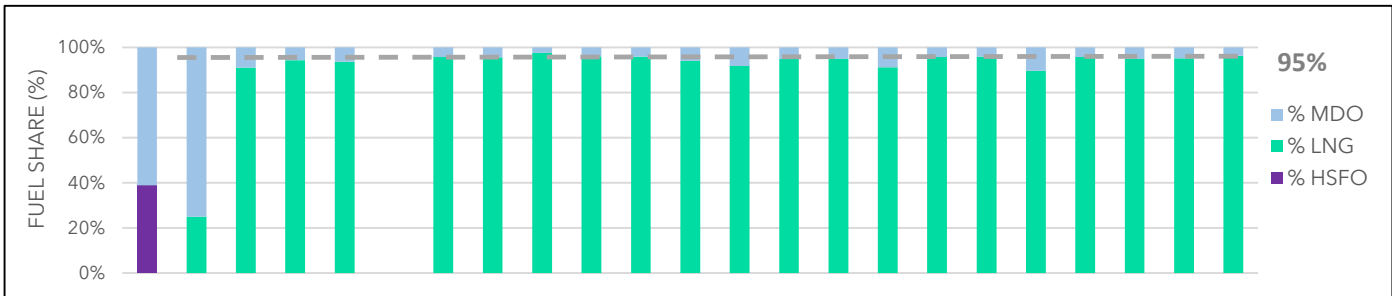
## CONTAINERSHIPS POLAR

#607 days in operation



## CONTAINERSHIPS ARCTIC

#422 days in operation

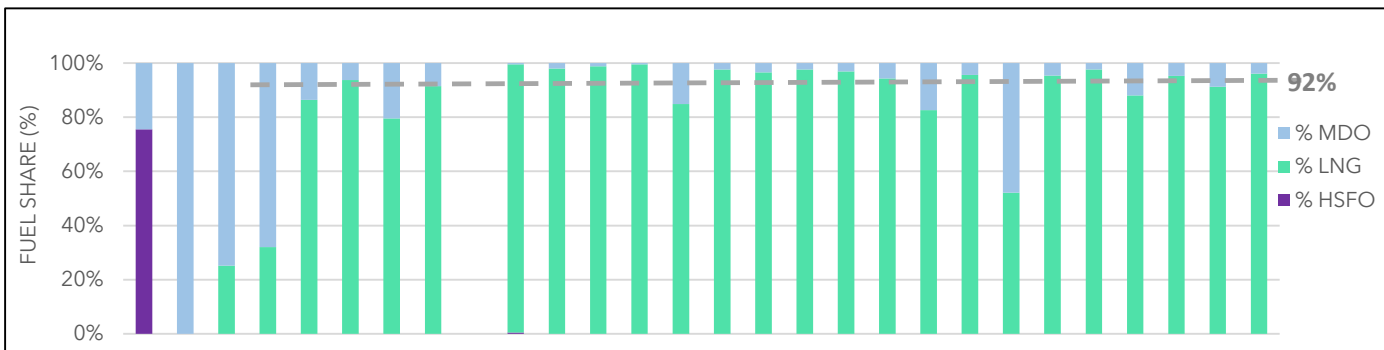




## 1.4K LNG USE RATE RAMP-UP

### CONTAINERSHIPS AURORA

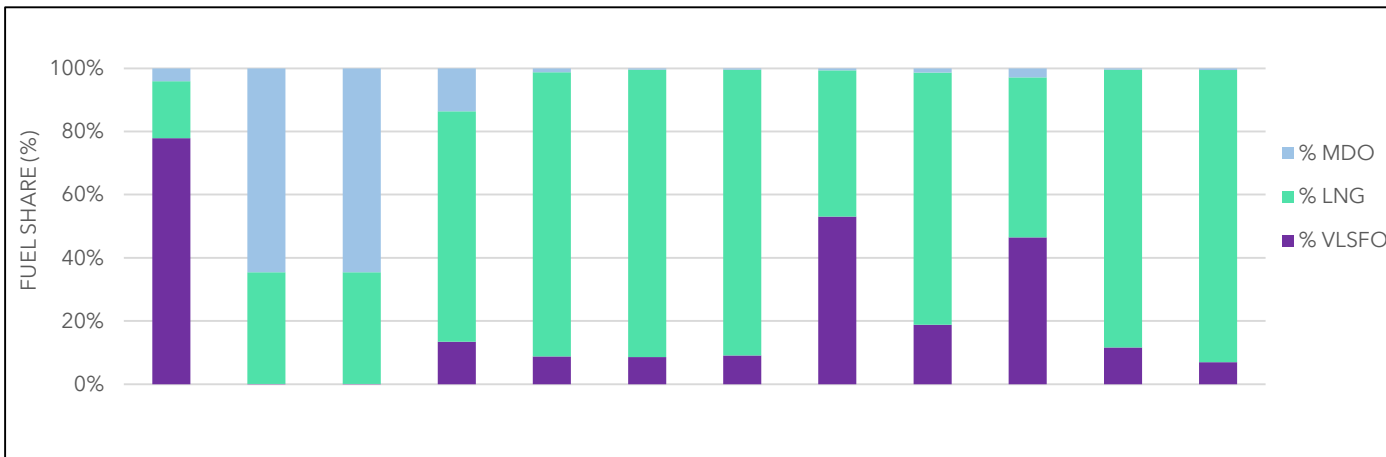
#550 days in operation



## 14K LNG USE RATE RAMP-UP

### CC TENERE

#517 days in operation\*



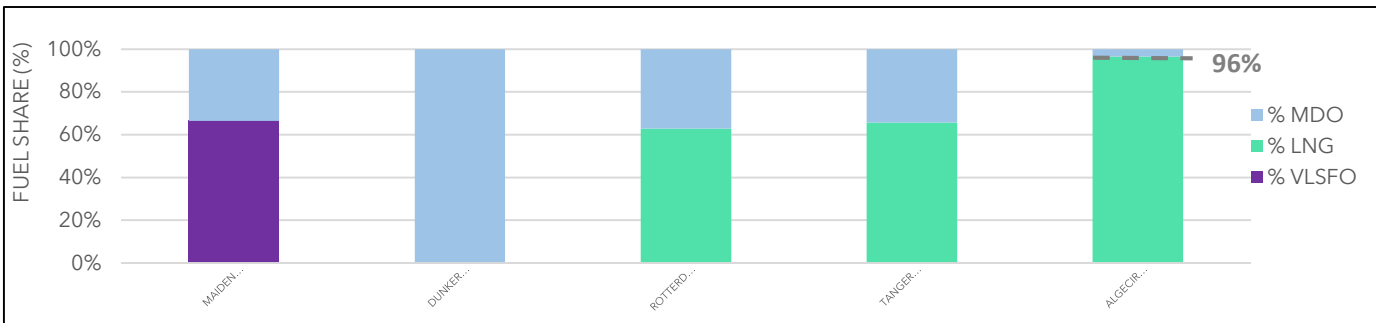
\*Vessel is due to be deployed on MEX line- curent FAL line does not allow a full round trip on LNG.



## 23K LNG USE RATE RAMP-UP

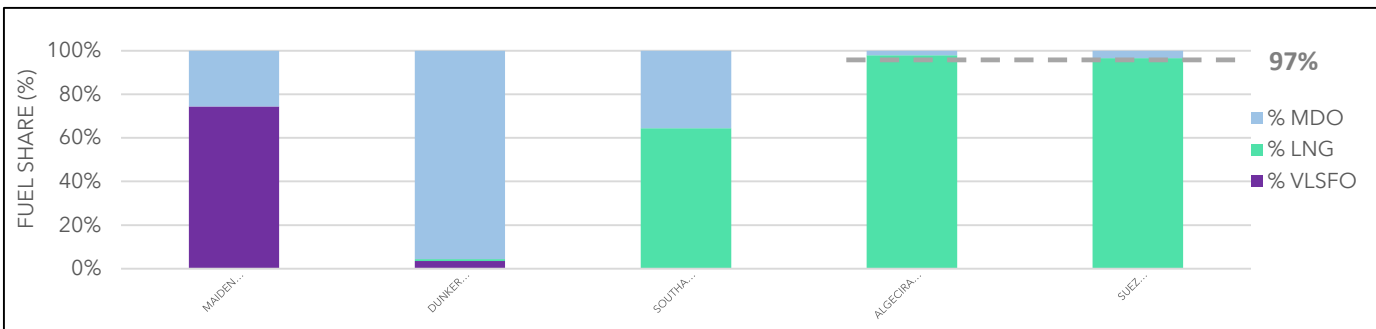
### CC PALAIS ROYAL

#62 days in operation



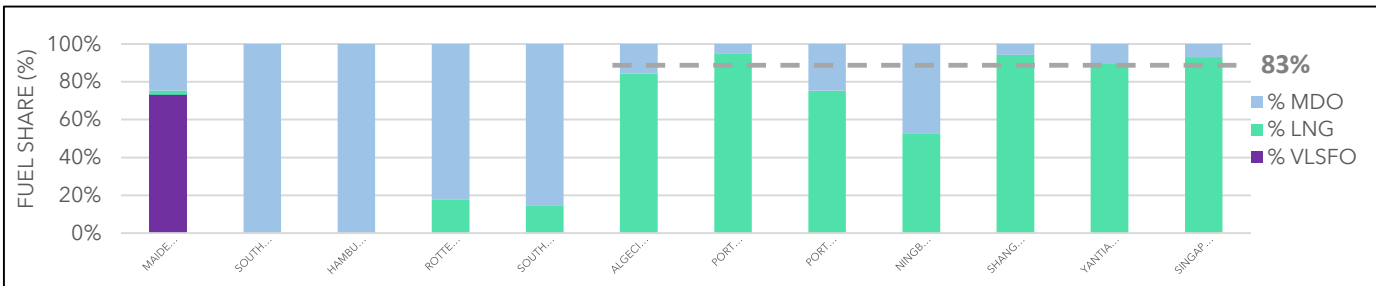
### CC CHAMPS ELYSEES

99 days in operation



### CC JACQUES SAADE

135 days in operation





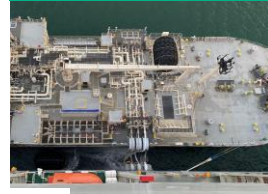
# A SUPPLY CHAIN UNDER CONSTANT DEVELOPMENT: BUNKERING FACILITIES





# FIRST BUNKERING OF CC JACQUES SAADE

BUNKERING OF CC J. SAADE



Cargo operations

- Ops duration: 45h
- 5200 moves
- Crane split: 4/5

**First Move**  
12-11-20 04:00

**Last Move**  
13-11-20 23:00

**EOSP**

11-11-20 22:00

**Berth**

12-11-20 02:00

**Berthing Time: 58h**

**Unberth**

14-11-20 12:00

LNGBV alongside: 53h

Bunkering

**Barge moored**  
12-11-20 03:00

**Barge unmoored**  
14-11-20 08:00

Safety meeting  
Plan : 2,5h  
**Real : 4h**

Hoses connection  
2,5h

N2 purging  
Plan:1h  
**Real:2.5h**

Cool down (3 to 4°C/h):  
Plan : 25h  
**Real : 24h**  
**Finished on 13/11, 8:00am**  
*Estimated T: 25°C*

Ramp up:  
Plan:1h  
**Real: 0.8h**

Pumping:  
Plan : 14h  
**Real:13h**  
Started 13/11, 08:00

Ramp down:  
1h

Hose purging & disconnect:  
4,5h

LNG

TOTAL GAS AGILITY





# BUNKERING OPERATIONS RETEX



▶ 1.4K Teus

**#145**

Bunkering ops done

▶ 23K Teus

**#4**

Bunkering ops done

▶ 14K Teus

**#2**

Bunkering ops done

CMA CGM

23K Bunkering Operations	CC J. SAADE	CC C.ELYSEES	CC P.ROYAL
Start Date	11/11/20	10/12/20	17/01/21
End Date	14/11/20	12/12/20	19/01/21
BV Alongside Time	53h	54h	45h
Connection & Preparation	9:03	13:35 <span style="color:red">➔</span>	08:04 <span style="color:green">➔</span>
Cooling Down	23:05	18:35 <span style="color:green">➔</span>	13:40 <span style="color:green">➔</span>
Bunkering	13:35	16:10 <span style="color:red">➔</span>	14:00 <span style="color:orange">➔</span>
Deconnection	09:00	03:10 <span style="color:green">➔</span>	3:25 <span style="color:green">➔</span>

Time in HH:MM

## POSITIVE POINTS

- Safety procedures
- Contractual aspects
- Bunkering planification
- Strong local Ops and close collaboration with RWG
- Harbor master involvement
- Simops procedures
- Technical support from GTT
- Shore expertise from CMASHIPS
- Hoses connexion

## ROOM FOR IMPROVEMENT

- Safety Briefing
- Communication ship/Barge
- Software Update ESD/FGHSS
- Mooring fenders
- Overall timing could be 35 H with a cold tank



CMA SHIPS



# A STRONG LNG TRAINING PROGRAM



## #12













### Training courses

A **dedicated Training Program** has been put in place for both **seafarers**  and **shore**  personnel.

In addition, CMA CGM Academy is now ready to offer 9 **"LNG Basics"** e-learning sessions to shore departments such as Operations, Chartering, or Bunkering teams.

## Regulatory Training

## CMA CGM Specific Training

<b>IGF Basic</b>	<b>IGF Advanced*</b>	<b>Live Bunkering LNG</b>	<b>Onboard period</b>	<b>LNG Practice*</b> <i>Simu GTT</i>	<b>Manoeuvring</b> <i>23K Simu</i>	<b>Wheel House</b>	<b>ME DF WGD 2T*</b> <i>Advanced</i>	<b>ME DF WGD 2T</b> <i>Electric.</i>	<b>AE DF 4 strokes*</b> <i>Wärtsilä</i>	<b>Gas Fire fighting</b>	<b>Maintenance &amp; DD</b> <i>GTT</i>
											



## #800

### Seafarers to be trained

- STCW compliant presential trainings : IGF Basic and Advanced (overview of LNG safety and technology)
- STCW compliant on board trainings with live bunkering and on board training
- LNG engines trainings with simulators : DF Main Engine, DF Auxiliary Engines, LNG handling
- Manoeuvring a 23K on wheel house simulator
- Safety on board with gas fire fighting



\*Now available **remotely**

**CMA SHIPS**



# CHALLENGES TO FACE AND ROOM FOR IMPROVEMENT



## CHALLENGES

### Technical topics related to a **prototype**:

- Main Engine: a world premiere
- First membrane Tank Containment System used for LNG as fuel.
- Fuel Gas Handling System never designed for such scale.

### Training program for both our seafarers and shore team:

- Low number and availability of certified IGF training centers.
- 800 seafarers to be trained in a bit more than 2 years.

## AREAS FOR IMPROVEMENT

The energy performance/Emissions can still be **improved by 15%**, working on:

- Methane slips: joint work in progress with our suppliers
  - Post combustion/Engine design
  - Electrical load sharing
- Aerodynamics and hydrodynamics designs
- Heat recovery





### A critical vector for the energy transition...

1. AN INNOVATIVE AND AMBITIOUS PROGRAM
2. AN IMMEDIATE, EFFICIENT STEP FOR THE ENERGY TRANSITION
3. A USE RATE CONSTANTLY PROGRESSING WITH LIMITED IMPACT ON OPERATION
4. A HIGH POTENTIAL FOR IMPROVEMENT / CONVENTIONAL SOLUTIONS
5. A TRAINING CHALLENGE FOR OUR CREW AND SHORE STAFF BUT ALSO AN OPPORTUNITY TO RAISE OUR SAFETY LEVEL
6. COMPATIBLE WITH BIO LNG

**...opening the way to low carbon alternative fuels.**

ACT WITH  
**CMA CGM+**  
TOWARDS CARBON  
NEUTRALITY





**CMA CGM**  
GROUP

**Thank you**

**CMA SHIPS**