Quo Vadis Secundum COVID?

Regulatory Framework in Shipping

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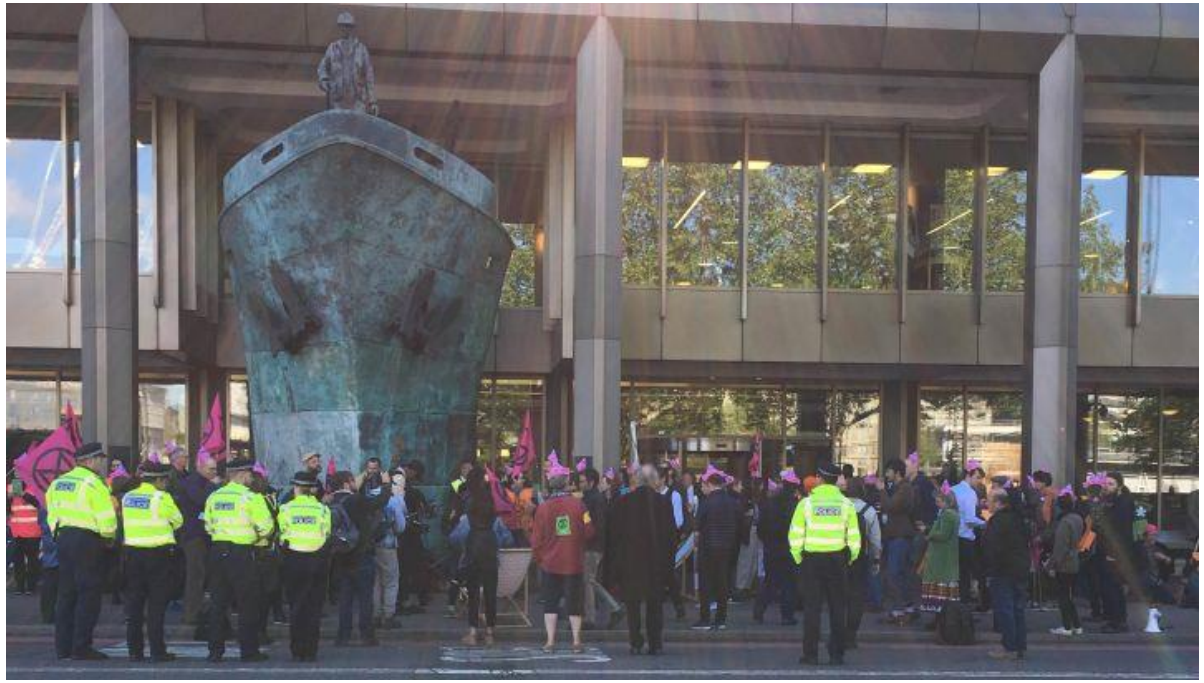
IMO & Shipping are under pressure to act

Without shipping half the world will freeze and the other half will starve

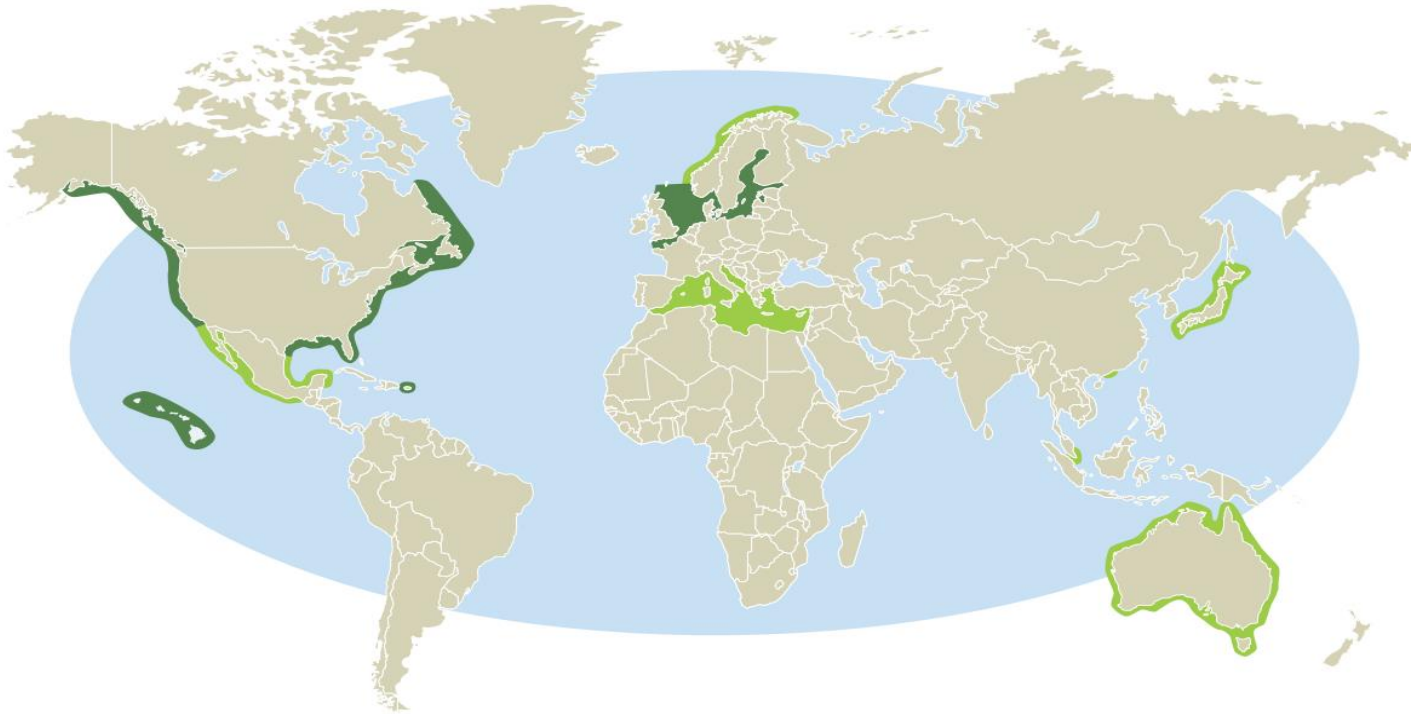
→ Civil society movement

→ Poseidon principles – Green bonds

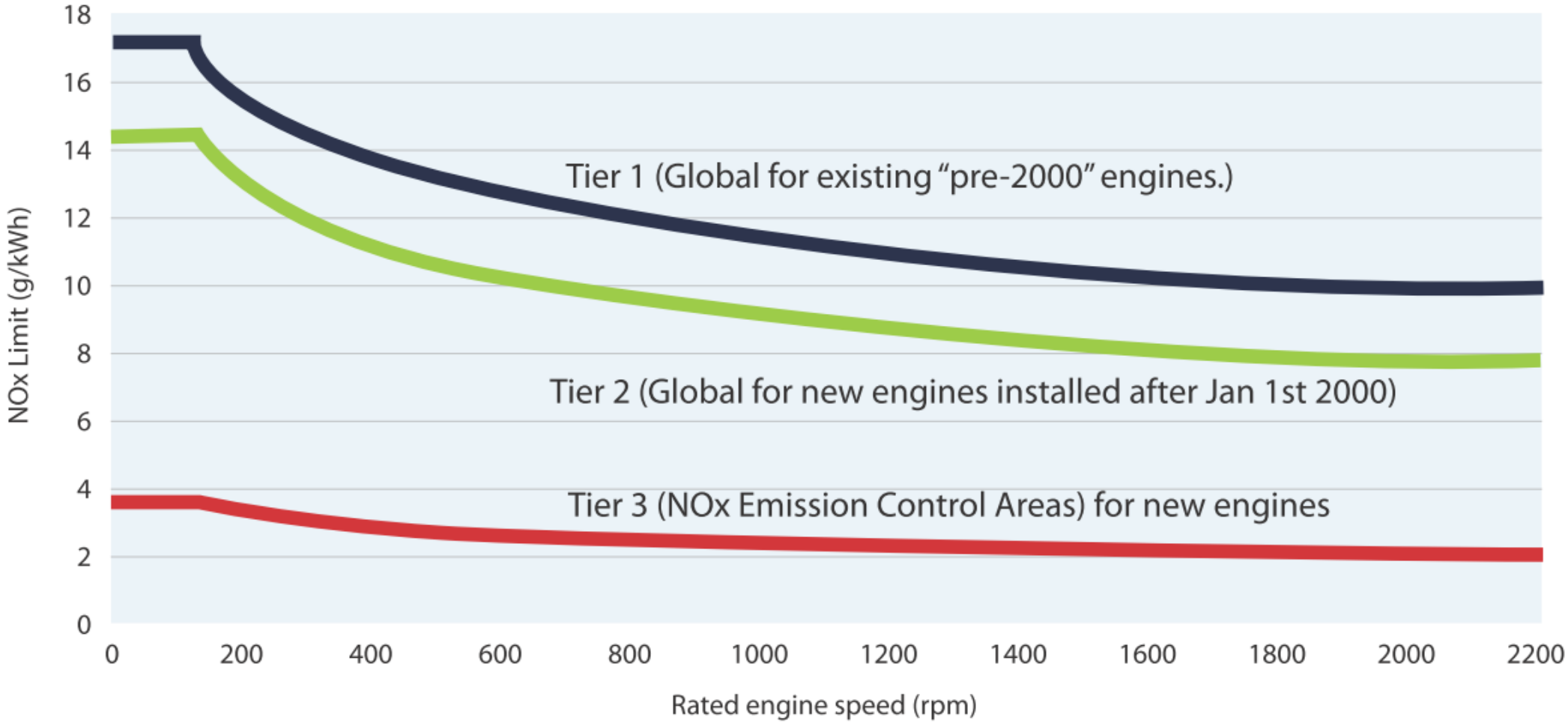


POSEIDON PRINCIPLES

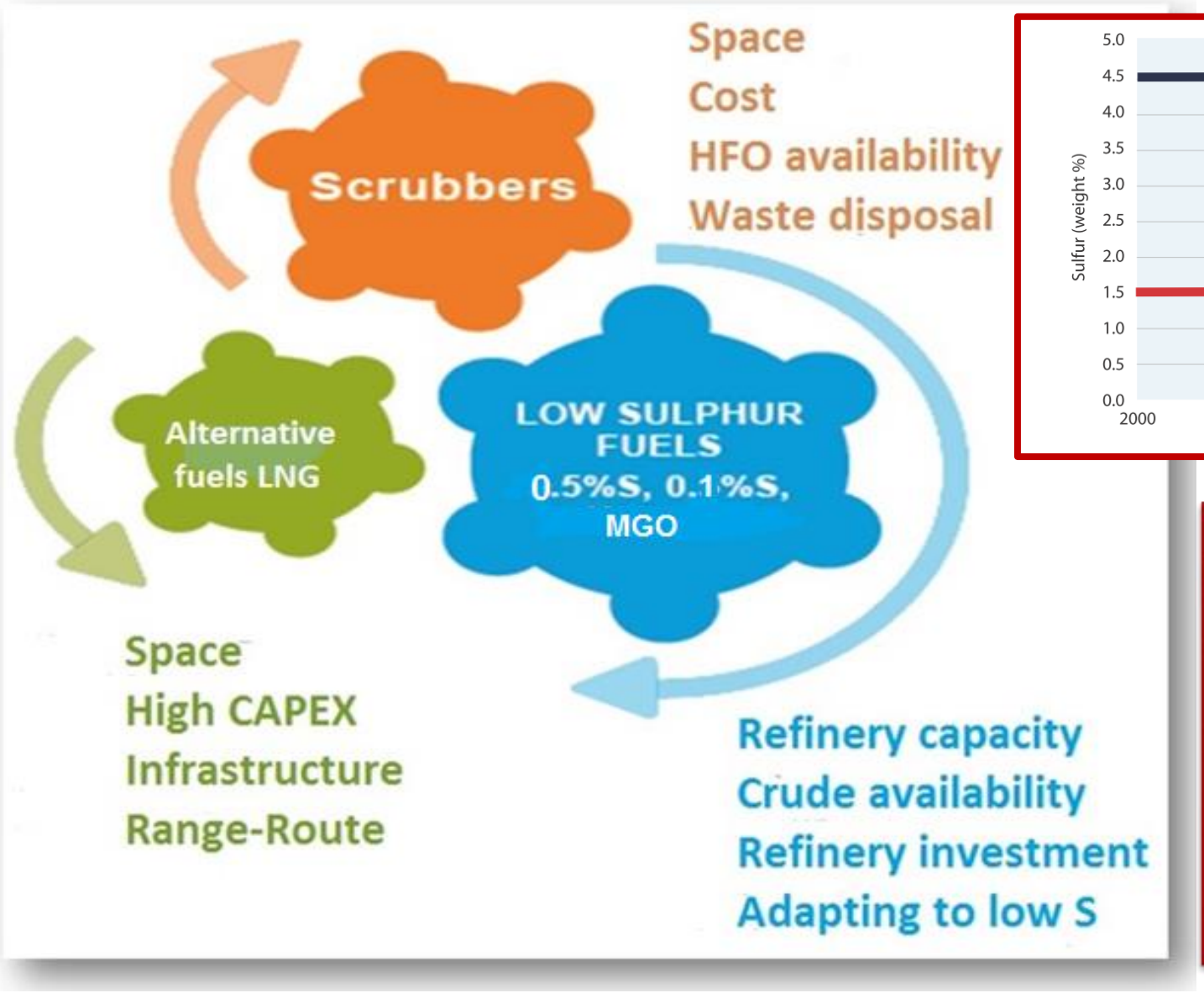
ECAs NECAs & Potential ones

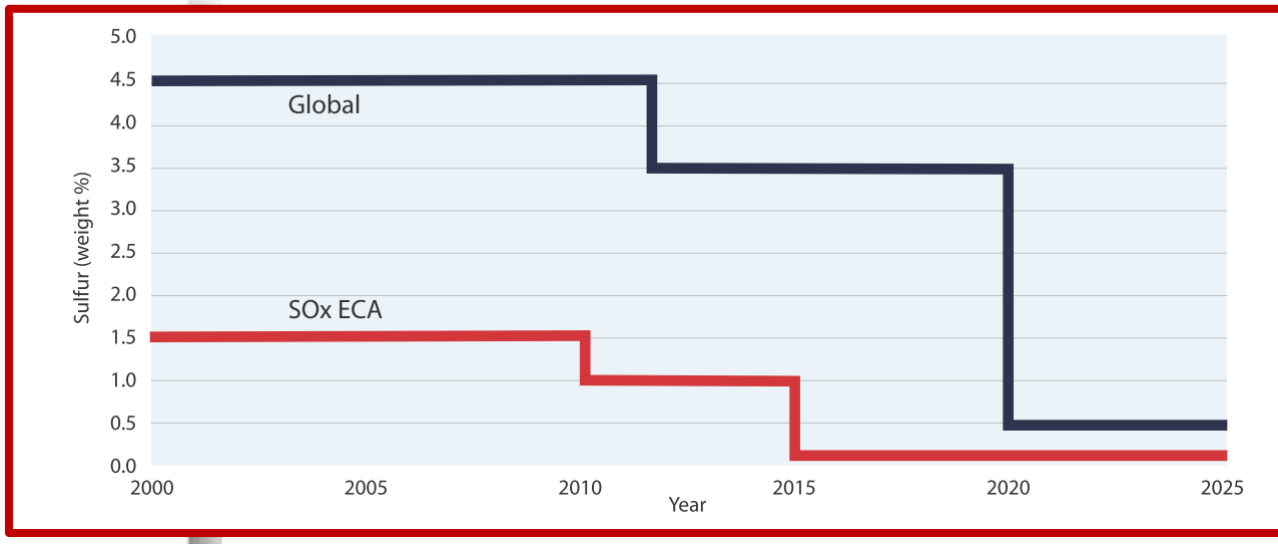


NOx limits in NECAs



Compliance Options – Which Option to Follow?

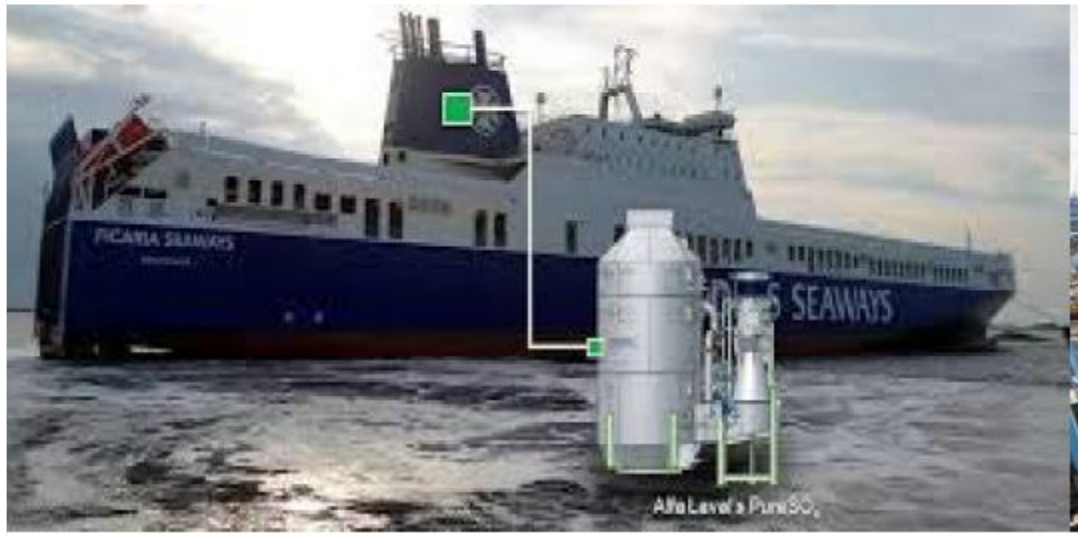




Area	Sulphur limit	Scrubbers
Global	0.50% (2020)	Local restrictions may apply for open-loop scrubbers
SECA	0.10%	Yes
EU	0.10% in all ports	Open-loop scrubbers restricted in some countries
China	0.50% in national waters (12 nm)	Certain restrictions apply for open-loop scrubbers
California	0.10% within 24 nm	No, only with research exemption

The scrubber solution: a financial-based decision

Heavy Fuel Oil + Scrubber or
Marine Gas Oil max 0.1% Sulphur



IMO levels of ambition

- Reduction of CO_2 emissions per transport work (carbon intensity), as an average across global shipping fleet, by at least 40% by 2030, pursuing efforts towards 70% by 2050, compared to 2008

- Reduction of total annual GHG emissions from international shipping by at least 50% by 2050 compared to 2008, while, at the same time, pursuing efforts towards phasing them out by 2100 consistent with the Paris Agreement goals.

IMO INTERNATIONAL MARITIME ORGANIZATION

Emissions from shipping between 2012 and 2018 (thousands tons)

- → Honeymoon lasted from 2008-2012
- → Slow steaming- Larger ships
- → We need a revolution to reach target

The share of shipping emissions in global emissions has increased from **2.76% in 2012** to **2.89% in 2018**.

	2012	2012	2018	2018
	Vessel-based	Voyage-based	Vessel-based	Voyage-based
CO_2	848,000	701,000	919,000	740,000
CH_4	59	55	148	140
N_2O	47	39	51	41
SO_2	10,800	9,100	11,400	9,600
NOx	19,700	16,900	20,200	17,100
$PM_{2.5}$	1,527	1,304	1,589	1,351
BC	73	59	79	62
NMVOC	790	674	861	725
CO	742	628	829	692

EEDI

Required for newbuildings since 2013. Sea trials verification

EEXI

Required for all ships. Not verified by sea trials. Design Adopted Nov 2020

EEOI

Recommended by IMO Not recorded Operations

AER

Recommended by IMO DCS recorded Operations

Required

DWT dependent

$A(DWT)^B$

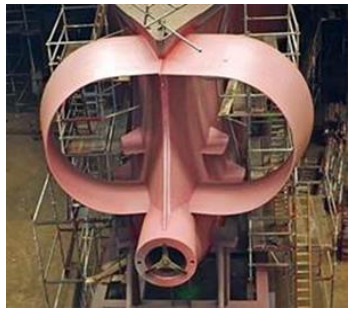
Attained

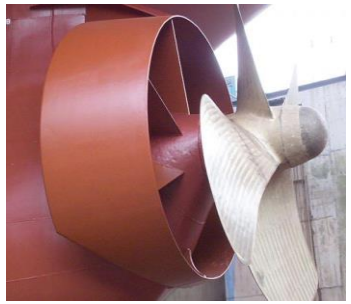
MCR, Capacity, fuel

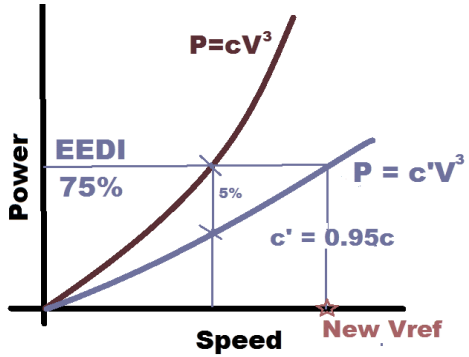
Speed, Consumption

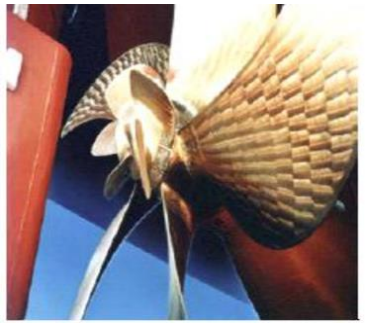
EEXI important parameters

$$\frac{\left(\prod_{j=1}^{n} f_j\right)\left(\sum_{i=1}^{nME} P_{ME(i)} \cdot C_{FME(i)} \cdot SFC_{ME(i)}\right) + \left(P_{AE} \cdot C_{FAE} \cdot SFC_{AE}*\right) + \left(\left(\prod_{j=1}^{n} f_j \cdot \sum_{i=1}^{nPTI} P_{PTI(i)} - \sum_{i=1}^{neff} f_{eff(i)} \cdot P_{AEeff(i)}\right) C_{FAE} \cdot SFC_{AE}\right) - \left(\sum_{i=1}^{neff} f_{eff(i)} \cdot P_{eff(i)} \cdot C_{FME} \cdot SFC_{ME}**\right)}{f_i \cdot f_c \cdot f_i \cdot Capacity \cdot f_w \cdot V_{ref} \cdot f_m}$$









EE-Index =

THE EEXI REGULATORY FRAMEWORK

ATTAINED EEXI

Existing Ship

Attained EEXI< Required ???

REQUIRED EEXI CHECK

Comply?

Not Compliant

Efficiency Improvement Required

- Engine Power Limitation
- Alternative Fuel
- Energy Saving Device
- Other Verifiable Options

SURVEY & CERTIFICATION

Attained CII< Required?

? YES

International Energy Efficiency Certificate

Carbon Intensity Indicator concept

$$CII = f\frac{CO2\ Emissions}{CapacityxDistance}$$

Capacity can be defined differently for ship type or per chosen indicator

possible CIIs

$$\text{AER} = \frac{\sum CO_2}{DWT_{max} \times Distance}$$

$$\text{EEOI} = \frac{\sum CO_2}{Cargo_{actual} \times Distance}$$

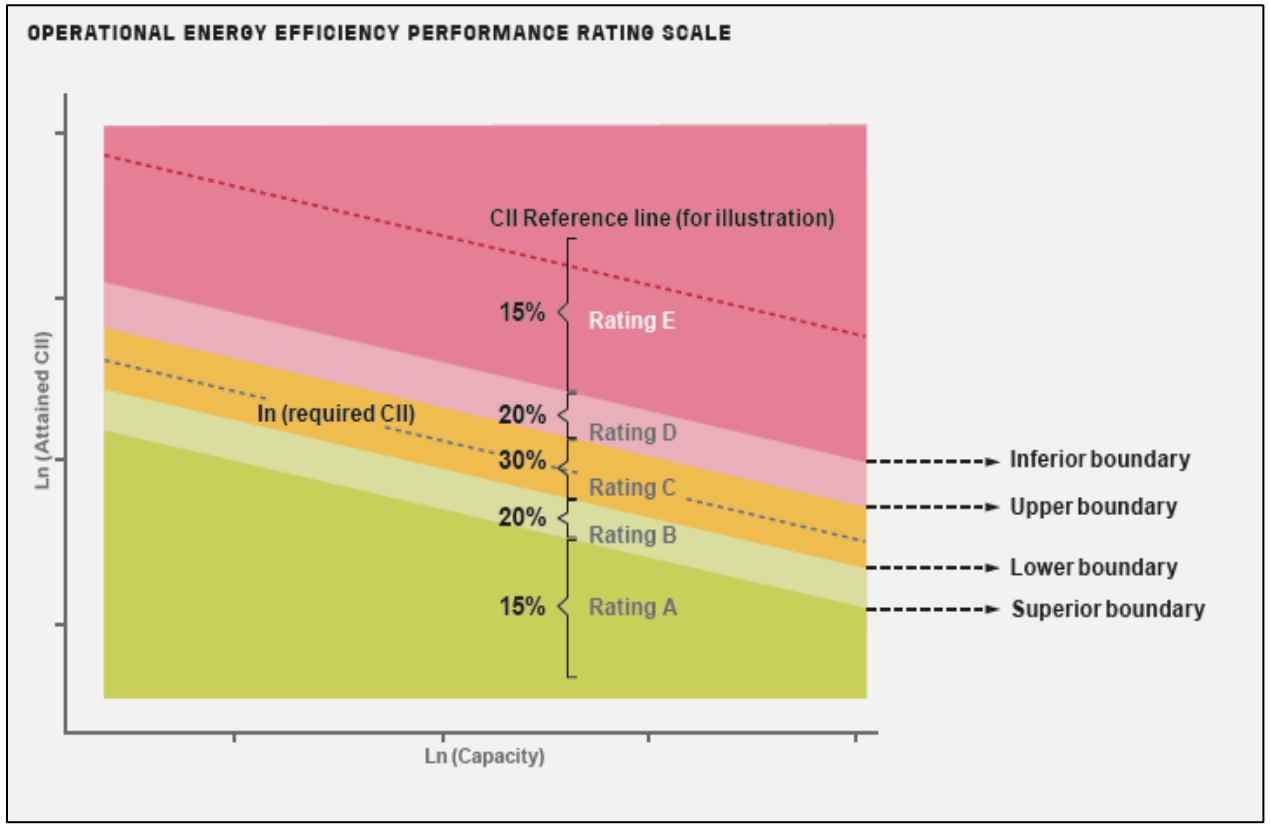
For Bulkers/tankers Capacity=Deadweight

CII Reference lines & rating boundaries

- ✓ **CII reference lines: no changes vs CG and ISWG GHG 8**

Ship type		Capacity	*a*	*c*
Bulk carrier		DWT*	4977	0.626
Gas carrier	65,000 and above	DWT	2384E7	1.910
	less than 65,000 DWT	DWT	8032	0.638
Tanker		DWT	5118	0.607
Container ship		DWT	1963	0.487
General cargo ship	20,000 DWT and above	DWT	61293	0.854
	less than 20,000 DWT	DWT	361	0.336
Refrigerated cargo carrier		DWT	6736	0.599
Combination carrier		DWT	151991	0.930
LNG carrier	100,000 DWT and above	DWT	9.860	0
	less than 100,000 DWT	DWT**	1966E10	2.498
Ro-ro cargo ship (vehicle carrier)		GT	5831	0.633
Ro-ro cargo ship		DWT	15958	0.677
Ro-ro passenger ship		GT	7691	0.586
Cruise passenger ship		GT	904	0.380

- ✓ **CII rating boundaries: no changes vs CG and ISWG GHG 8**



EU Fit for 55

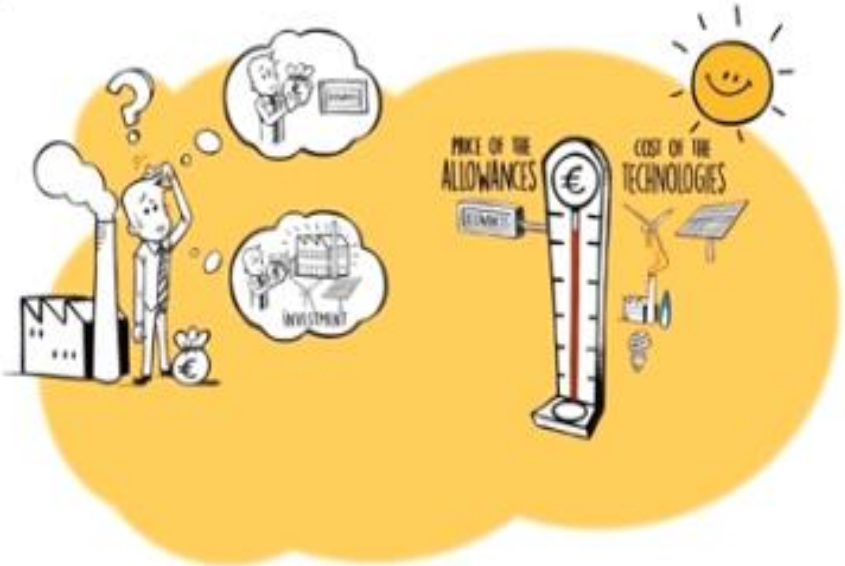
JULY 2021

Reduce EU net GHG emissions by at least 55% by 2030, compared to 1990 levels

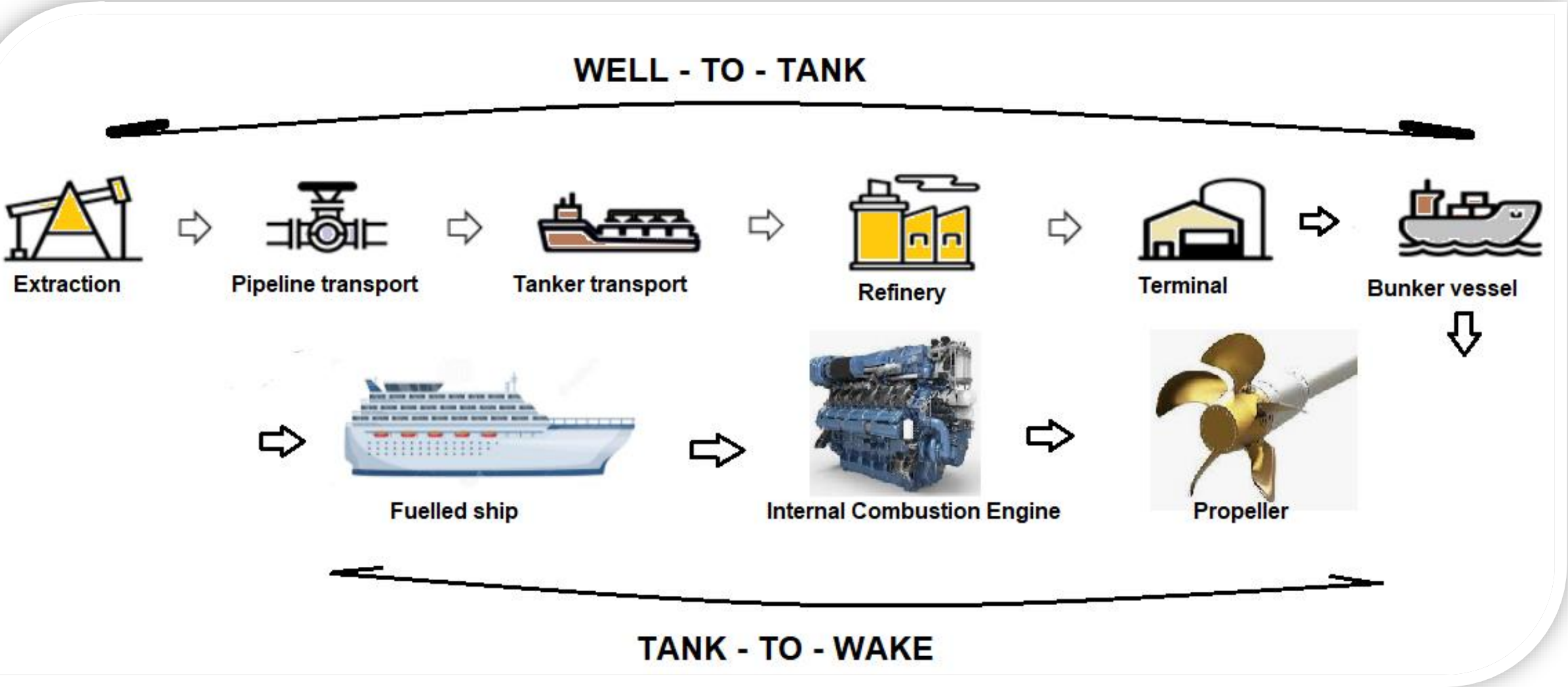
Main parts of the package that should impact maritime sector:

- **The extension of Emissions Trading System (ETS) to include maritime sector**
- **The Fuel EU Maritime initiative**

EU/ETS Maritime



LIFE CYCLE ASSESSMENT OF EMISSIONS



SLIPPAGE & FUGITIVE EMISSIONS

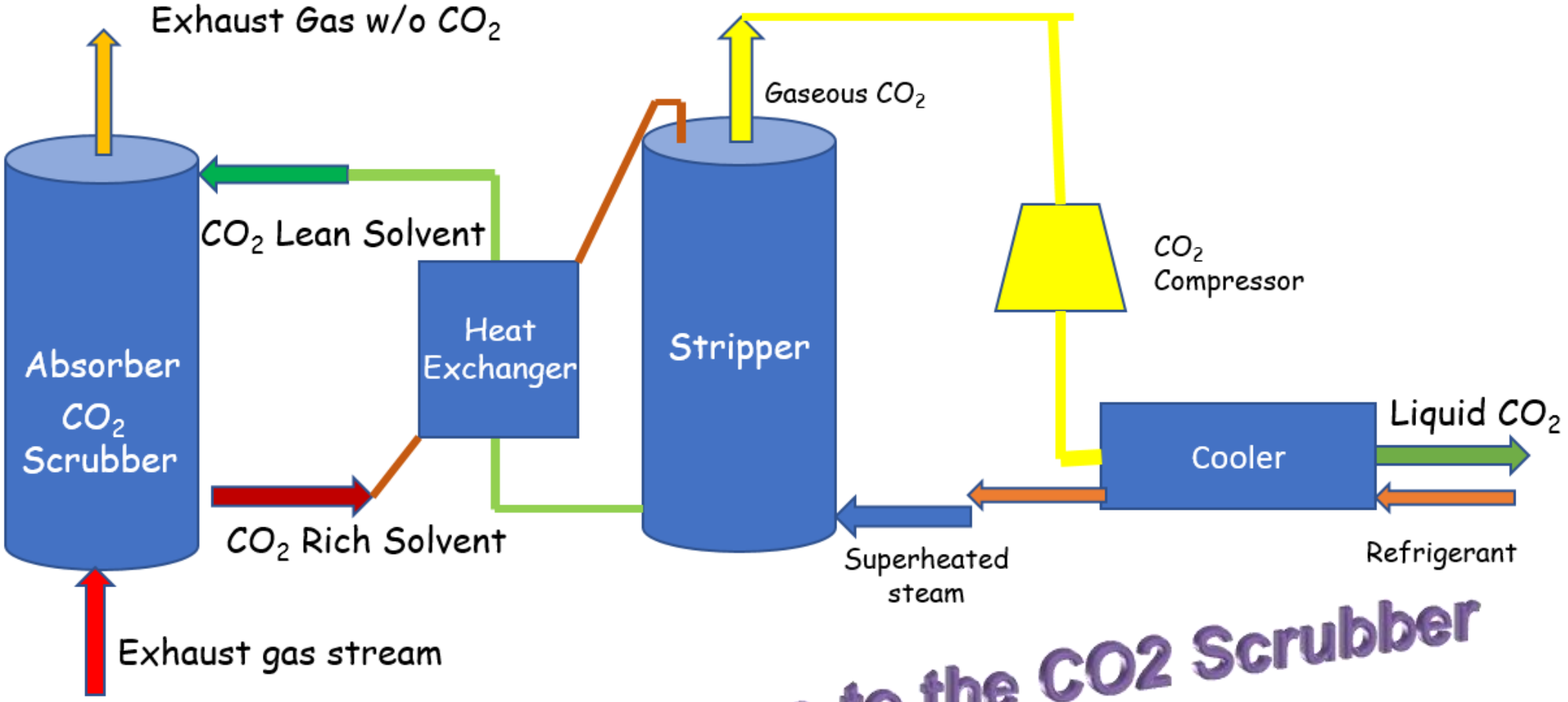
EQUIVALENT CO_2 EMISSIONS

$$CO_{2eq,TtW,j} = \left(C_{cf\ CO_2,j} \times GWP_{CO_2} + C_{cf\ CH_4,j} \times GWP_{CH_4} + C_{cf\ N_2O,j} \times GWP_{N_2O}\right) i$$

$$CO_{2eq,TtW\ slippage,j} = \left(C_{sf\ CO_2,j} \times GWP_{CO_2} + C_{sf\ CH_4,j} \times GWP_{CH_4} + C_{sf\ N_2O,j} \times GWP_{N_2O}\right) i$$

Gas	SAR	TAR	AR4
CO_2	1	1	1
CH_4	21	23	25
N_2O	310	296	298

Long term viability of LNG as fuel



Thank you!

BUREAU VERITAS

SHAPING THE FUTURE

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