



WAH KWONG
MARITIME TRANSPORT HOLDINGS LIMITED



VENTURE
MARINE SERVICES

DECARBONIZATION STRATEGIES

WAH KWONG – EXISTING FLEET VESSELS



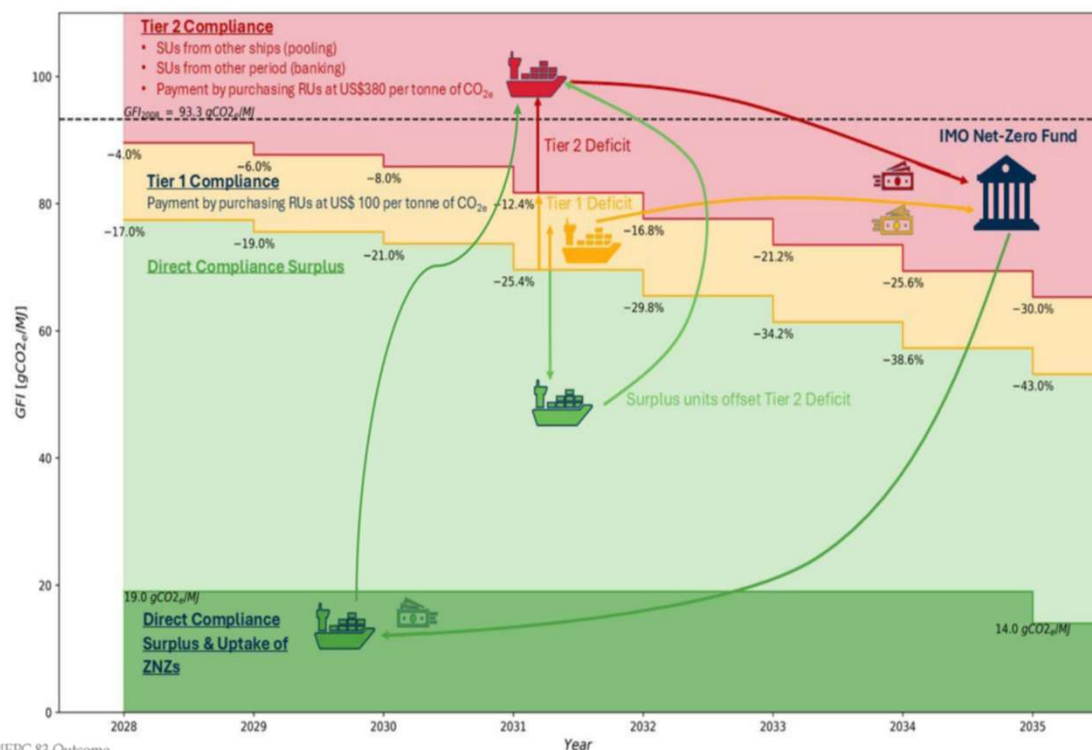
Agenda



1. **MEPC 83 : brief recap**
2. **Efficiency improvement**
 - (a) Technical - upgrades and efficiency improvement
 - (b) Operational - performance improvement
3. **Options**
 - (a) Voyage Optimization
 - (b) Installation of Energy Saving Devices
 - (c) Innovation / New technology
 - (d) Alternate Fuel
 - (e) Retrofit – Dual fuel (LNG/Methanol/Ammonia)
 - (f) Retrofit – OCCS / Carbon Capture System (CCS)
4. **Decarbonisation strategies**
 - (a) Periodic maintenance / Dry docking
 - (b) Energy- Fuel switch to green fuel (Biofuel) to minimise GFI Impact
5. **Drydock upgrades**
 - (a) Efficiency improvement (Rotor Sail)
 - (b) Decarbonization by use of CCUS
6. **Conclusion**

(1) MEPC 83 : brief recap

Strong Signal IMO to adopt decarbonization with 2 Tier tax and incentive mechanism



Compliance cost from 2028

* \$380/ton CO_{2e}, if not meeting base target

* \$100/ton CO_{2e} if not meeting direct target

VLSFO to incur both taxes from Day 1

Incentives to encourage the use of Green fuels

Surplus units : value TBD (might be \$ 320~ 350/ton CO_{2e})

Net zero funds : benchmarks 19g/MJ (2028) & 14g/MJ (2035)

Uncertainties prevail : Voting in October 2025 for adoption, US showing reluctance.

Entry into force (year 2027) : 16 months after adoption

OPERATIONS
VOYAGE OPTIMIZATION
SPEED MANAGEMENT
WEATHER ROUTING
JIT (JUST IN TIME)
CARGO HANDLING

TECHNICAL
AUTO PILOT UPDATE
PMI VIT (MC ENGINE)
ME ECO TORQUE (GOVERNOR SPEED RANGE))
ME PMI ACCO(ADAPTIVE CYLINDER CONTROL, PDEV)
ME ECO TUNNING
ULTRASONIC FOR HULL/PROPELLER
ESD-PSV / NOZZLE
ESD – HVAF / PBCF / PROPELLER CAP
ESD – RUDDER BULB
PROPELLER TRIMMING
PROPELLER EXCHANGE
LED LIGHTS
VFD
SHAFT GENERATOR
A) TURBOCHARGER UPDATE -NOZZEL RING +DIFFUSER
B) TURBOCHARGER UPDATE -NOZZEL RING +DIFFUSER +WHEEL
C) TURBOCHARGER UPDATE -SHAFT+WHEEL + (NOZZEL RING +DIFFUSER)
SHORE POWER AMP
WASTE HEAT RECOVERY
HEAT INSULATION PAINT ON MONKEY ISLAND

HULL AND PAINT
100% HULL BLAST
LOW FRICTION ANTI-FOULING PAINT
PAINT FOR PROPELLER

ENERGY
B30 BIO FUEL
B100 / GREEN BIO FUEL

INNOVATION
WIND ASSISTED PROPULSION
BATTERY BANK (PTO/PTI)
HYBRID
AIR LUBRICATION SYSTEM
SOLAR POWER
CCUS

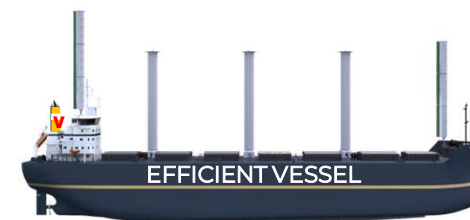
SMART
System

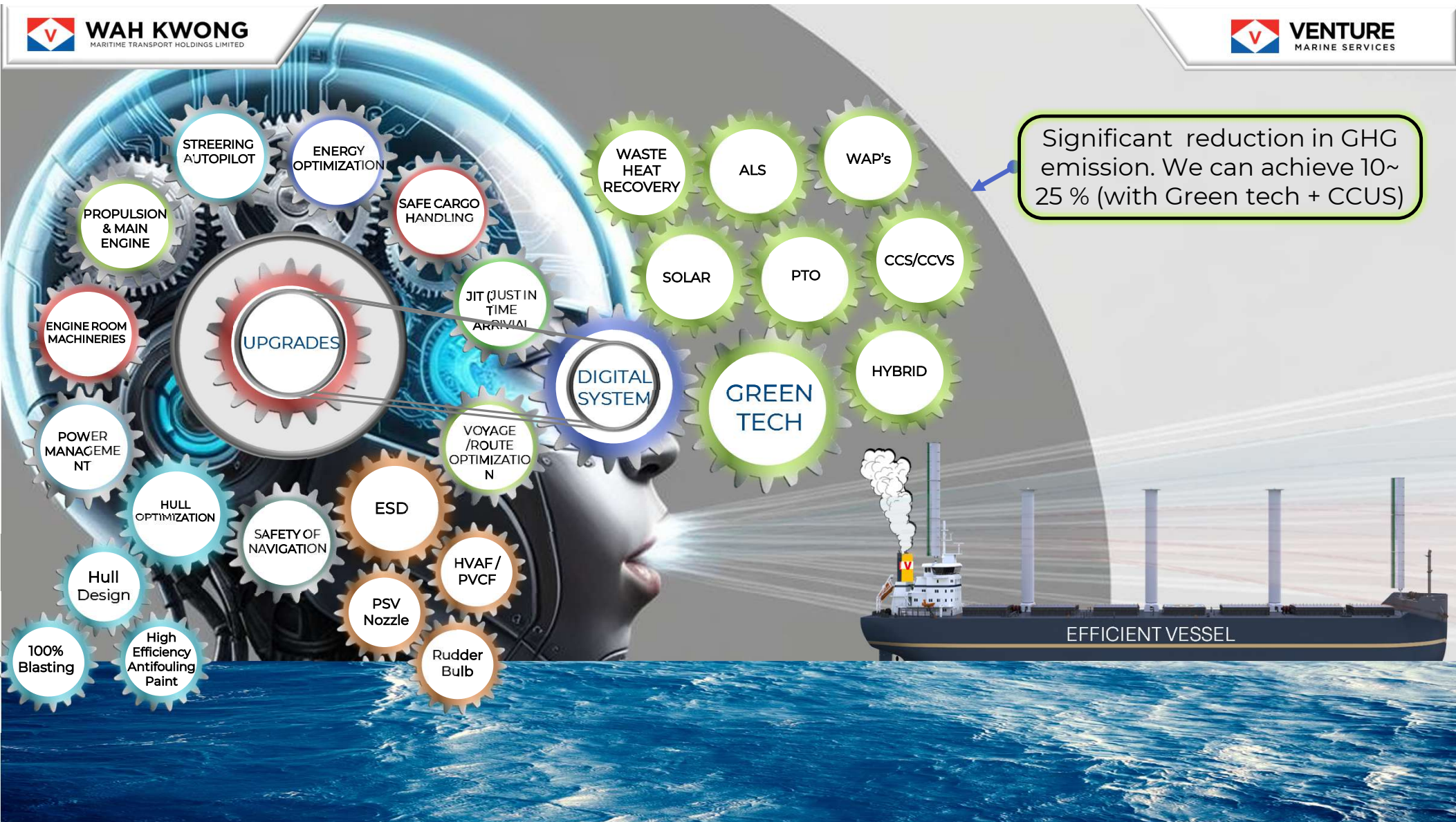
SMART
operation

Upgrades

Green
Tech

Green
Energy





SMART Operation : SMART SYSTEM for our NB Vessels

SMART Notations for : 4- LNG vessels, 2-LR2 Tankers and 4-NDY 63K Bulklers

SMART SHIPS

COMPOSITION OF THE CLASS MARK

Two-dimensional approach
SMART (_ _)

SCOPE

The scope of application of the smart function:

- H - Hull
- M - Machinery
- N - Navigation
- MH - Machinery Health Monitoring
- EnE - Energy Efficiency
- X - Special

DATA CYCLE

Smart group's number:

- 1 - Computer Based Ship
- 2 - Connected Ship
- 3 - Augmented Ship
- 4 - Remotely operated and Autonomous ship

6

- ❖ NDY 63k bulker : SMART (EnE3), SMART (MH3)
- ❖ Hengli LR2 tankers : SMART (EnE3), SMART (MH3), H1 and M1
- ❖ LNG/C at DSIC : SMART (EnE3), SMART (MH3), H1 and M1

Propulsion efficiency

Main engine combustion optimization

Silicon paint / Premium quality Anti-fouling paints

Optimize usage of energy onboard

Save energy / no wastage of energy

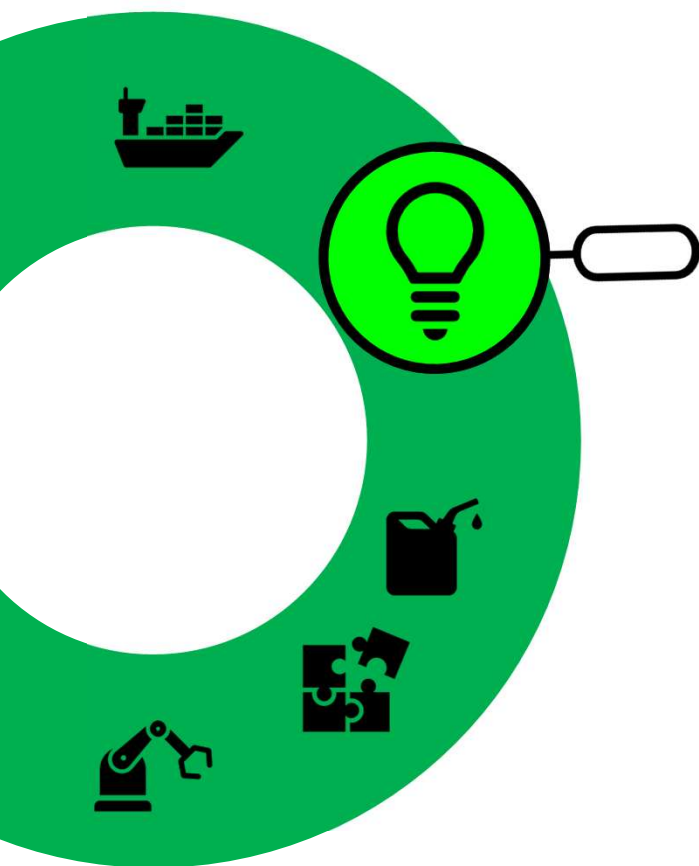


(3a) Voyage Optimisation

Options
Optimize Port Stay
Just in time (JIT)
Voyage/Speed Optimization
Weather Routing

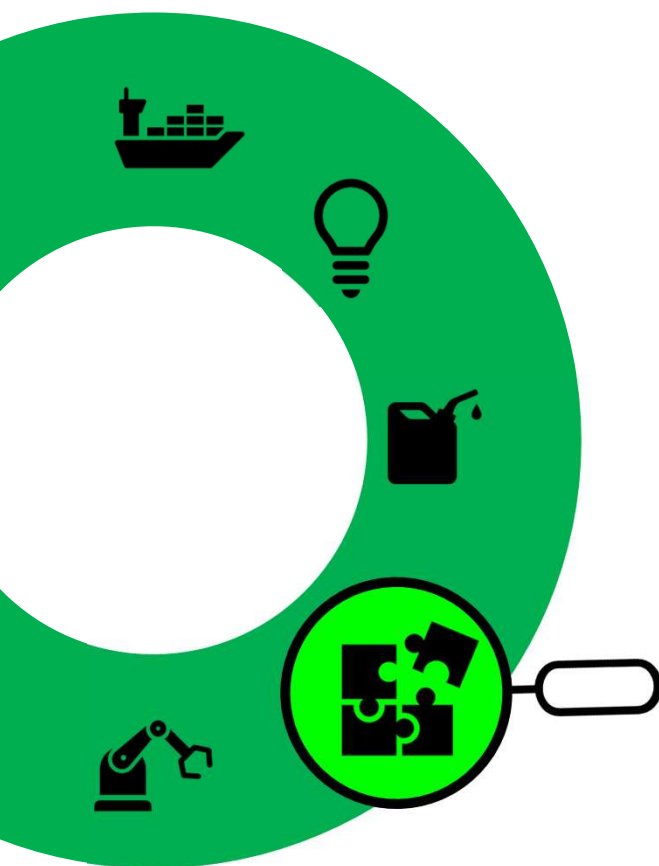


(3b) Energy Saving Devices

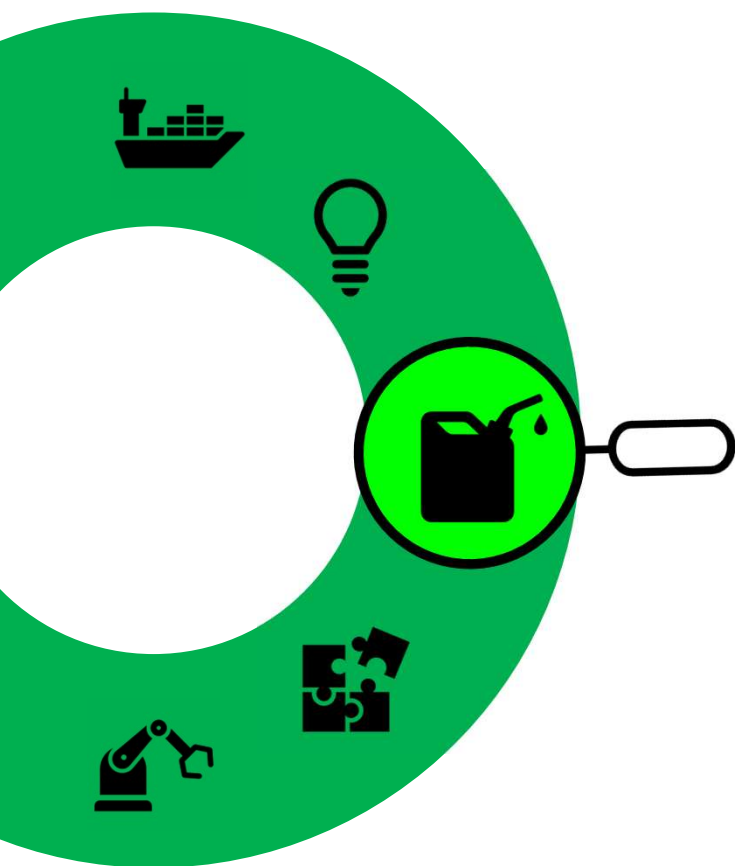


Options	ESD category
Hub Vortex Absorbed Fins (HVAF) / PBCF	A
Pre-Swirl Vanes – PSV/ Energo Pro Fin/ Mewis Duct	A
Rudder Bulb	A
Solar Panels for auxiliary loads	C-2
Shore power	C-2
Fuel cells for aux system	C-2
Kappel Propellers	A
Waste Heat Recovery generator	C-1
Power Take-off (PTO) or Shaft Generator	C-1

(3c) Innovation /New Technology



Options	ESD Category
Air Lubrication	B1
Rotor Sails	B2
Skysails (kites)	B2
Sail Wings	B2
Energy Storage Battery	C2



(3d) Alternative Fuel

Fuel Option
LNG Fuel (with Dual-Fuel Conversion)
LPG/Ethane (with Dual- Fuel Conversion)
Methanol (with Dual- Fuel Conversion)
Ammonia (with Dual- Fuel Conversion)
Hydrogen (with Dual- Fuel Conversion)
Nuclear power

Biofuels	Electro-fuels
Biofuels (with Dual-Fuel Conversion)	e-MGO
Bio-MGO	e- LNG
Bio- LNG	e-Methanol
Bio- methanol	e-NH3

(3e) Retrofit – Dual fuel (LNG/Methanol/Ammonia)

Retrofit existing Vessels to enable to use either LNG or Methanol or Ammonia.

Vessels can use Bio Fuel (B30 to B100) without retrofit taking certain operational precautions and following Maker's guidance

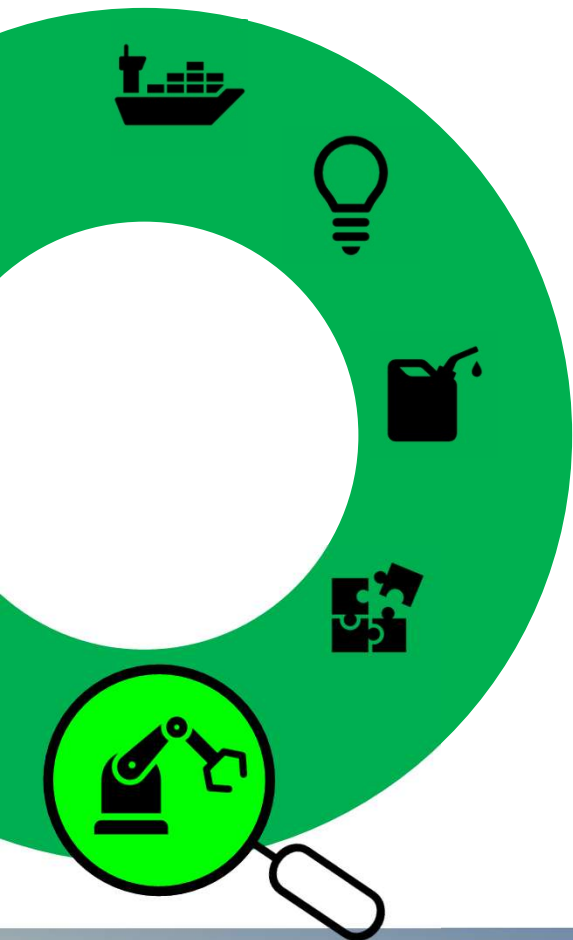
(3f) Retrofit – OCCS / Carbon Capture System (CCS)

Pre-combustion: Steam Methane Reforming

- an innovative way to use energy with fuel cells
- without hassles of storing H₂ at very low temperature

Post-combustion:

- CCS (Carbon Capture Sequestration) / CCUS
- CO₂ capture with use of Lime [CaO], convert to Lime Stone [CaCO₃]. Reversible process.



(4a) Decarbonisation strategies - periodic maintenance / Dry docking

DRY DOCKING 1		DATE	15/11/2025
No.	Levers	% Saving	Spend.
1	100% Hull Blast / HQ AF Paint (Paint+Yard)		
2	Auto Pilot Update		
3	ESD – Rudder Bulb		
4	Apply Paint For Propeller		
5	PMI VIT(MC Engine)		
6	ESD-PSV / Nozzle		
7	ESD – HVAF/ PBCF / Propeller Cap		
8	Propeller Trimming		
		In Total	9.01% USD xxx
		GFI Sav.2026-2028 Oil Sav.2026-2028	



DRY DOCKING 2		DATE	15/11/2028
No.	Levers	% Saving	Spend.
1	100% Hull Blast / HQ AF Paint (Paint+Yard)/2		
2	Propeller Exchanging		
3	LED Lights		
4	VFD		
		In Total	6.02% USD xxx
		GFI Sav.2029-2031 Oil Sav. 2029-2031	



Cape Size Bulker (Road Map)

DRY DOCKING 3		DATE	15/11/2031
No.	Levers	% Saving	Spend.
1	100% Hull Blast / HQ AF Paint (Paint+Yard)/2		
2	Shaft Generator (If vessel not sale in 3yrs)		
3	A.Turbocharger Update -Nozzel Ring +Diffuser		
4	CCUS (subject to MEPC approved & shore disposal facility available)		
5	PTI option with battery - to keep in mind (If vessel not sale in 3yrs)		
		In Total	4.55% USD xxx
		GFI Sav.2032-2034 Oil Sav. 2032-2034	

B30: 10%
FO: 90%

B20: 20%
FO: 80%

B30: 30%
FO: 70%

B30: 55%
FO: 45%

B30: 75%
FO: 25%

B30: 100%
FO: 0.0%

B30: 0%
B100: 35%
FO: 65%

B30: 0%
B100: 45%
FO: 55%

2028

2029

2030

2031

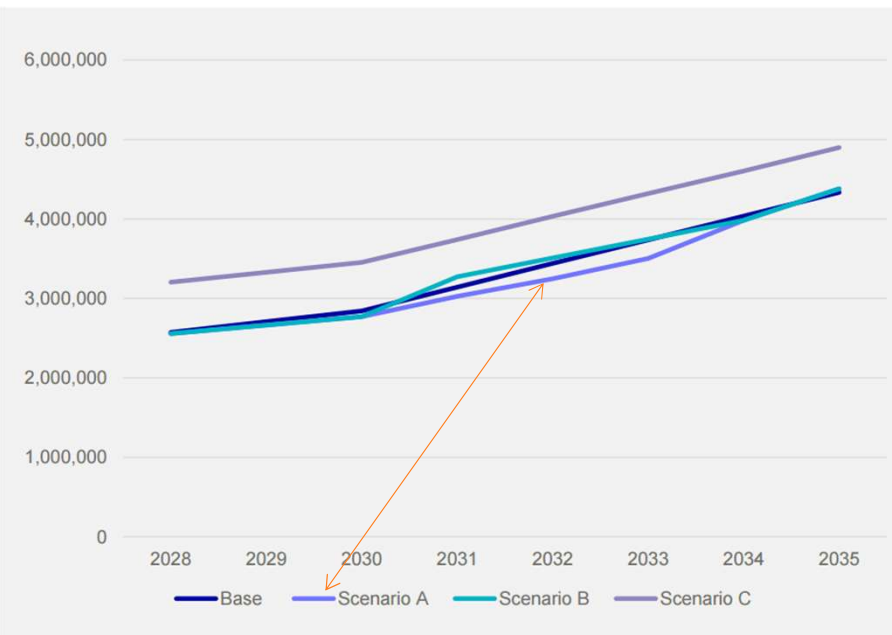
2032

2033

2034

2035

Year	MDO/MG O	LFO	VLSFO	B30		B100	
	ton	ton	ton	ton	%*	ton	%*
2028	553	425	3,357	382	10%	0	0%
2029	553	425	2,984	763	20%	0	0%
2030	553	425	2,611	1,145	30%	0	0%
2031	553	425	1,679	2,099	55%	0	0%
2032	553	425	933	2,862	75%	0	0%
2033	553	425	0	3,816	100%	0	0%
2034	553	425	2,425	0	0%	1,411	35%
2035	553	425	2,052	0	0%	1,814	45%



Scenario A



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5a) upgrades in Dry dock- efficiency improvement (Rotor Sail)

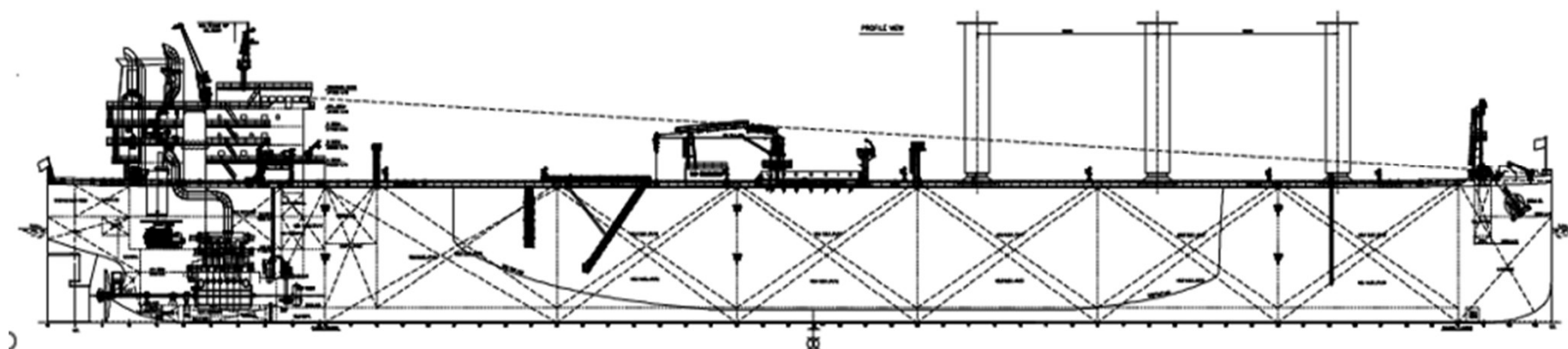
Upgrade option - Rotor Sail and CCUS

Mid size tanker– Arrangement of Rotor Sails on main deck



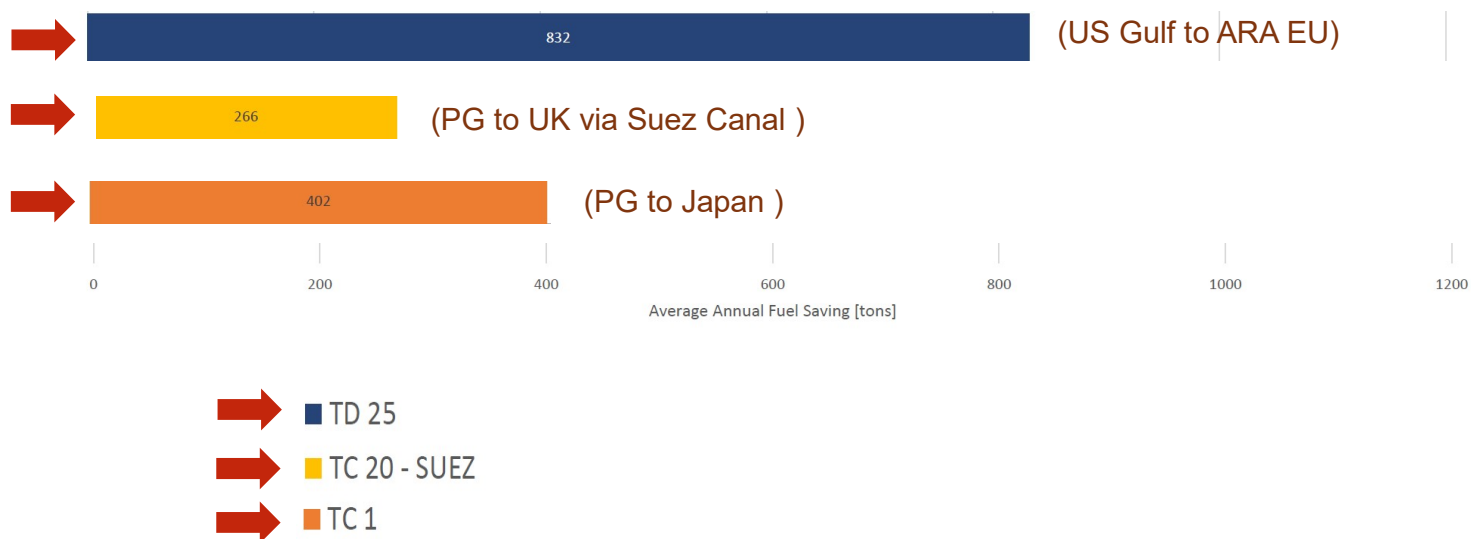
Upgrade option - Rotor Sail and CCUS

Midsized tanker – Arrangement / Configuration of Rotor Sail



A Study: The comparison between CCUS and Rotor Sail

LR2 Rotor Sail case study – Comparison of fuel savings for 3 routes (among several routes)



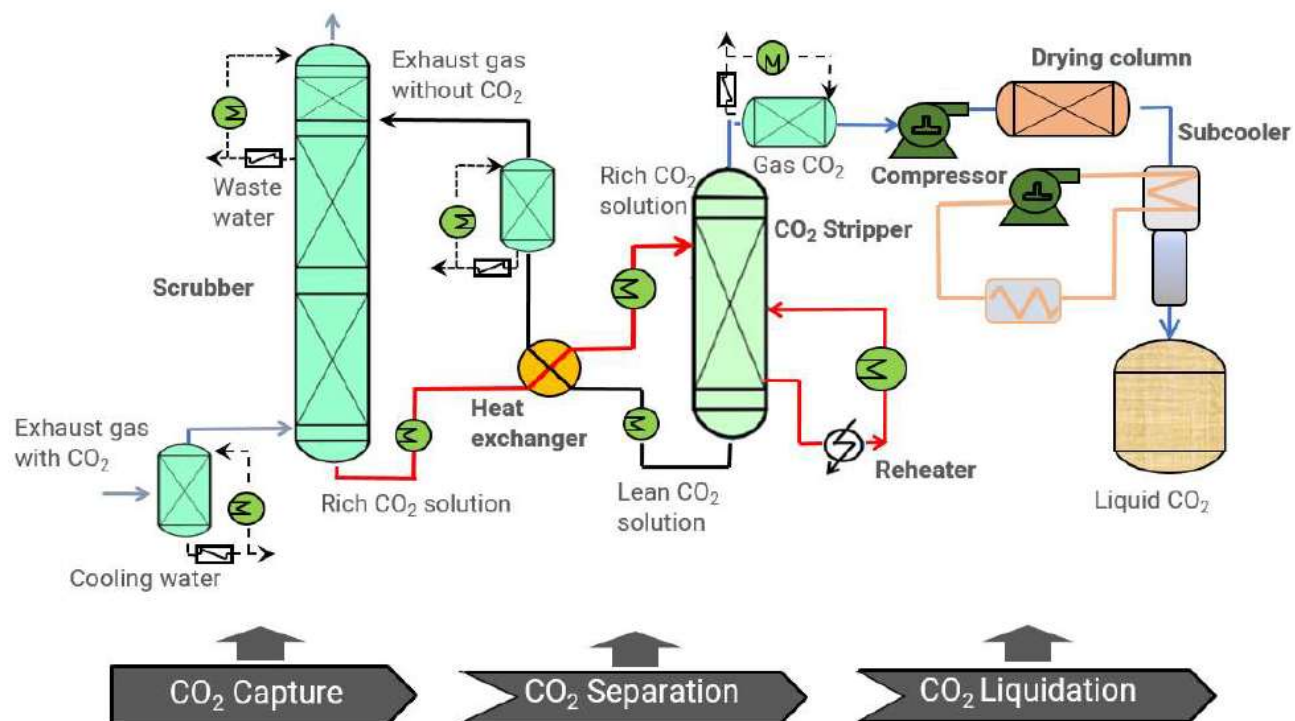
A Study: The comparison between CCUS and Rotor Sail

LR2 Rotor Sail case study – Performance of the sails

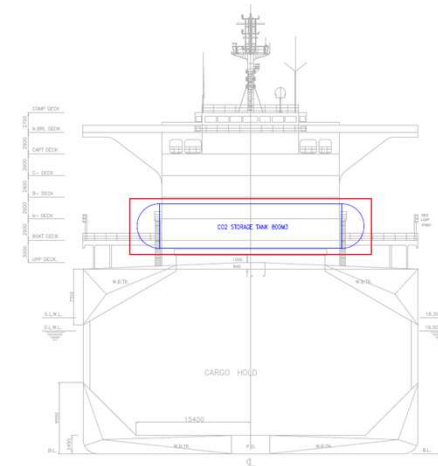
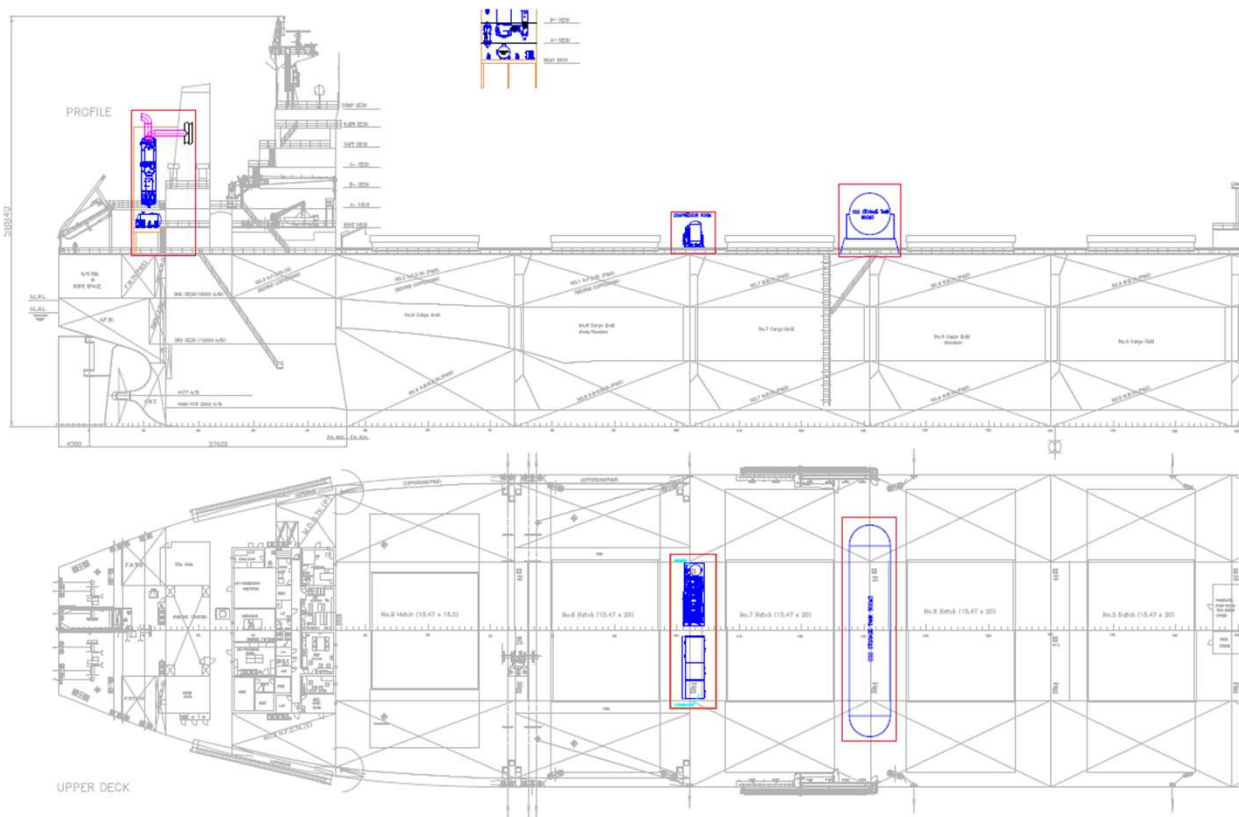
Summary of Savings

	(Case 2)	(Case 3)	(Case 1)
Route	TD 25	TC 20 - SUEZ	TC 1
Average net savings (kW)	810	259	391
Average net savings (%)	9.1 %	2.9 %	4.4 %
Annual fuel savings (tons/year)	832	266	402
Annual CO2 reduced (tons/year)	2 587	829	1 249
	(US Gulf to ARA EU)	(PG to UK via Suez Canal)	(PG to Japan)

CCS - System layout



CCS and LCO2 tanks arrangement for a typical Capesize Bulker



Which ever fuel is used in future and irrespective of type of Vessels (old or new) :

- Retrofit and upgrade the Vessel
- Install ESD, use suitable green Technologies
- Improve efficiency
- SMART operation
- Use low GFI fuel as available and suitable for Engine

Above are keys to success and helping to low total Opex



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THANK YOU





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