The future of fuels used today and new technology fuels after MEPC 83

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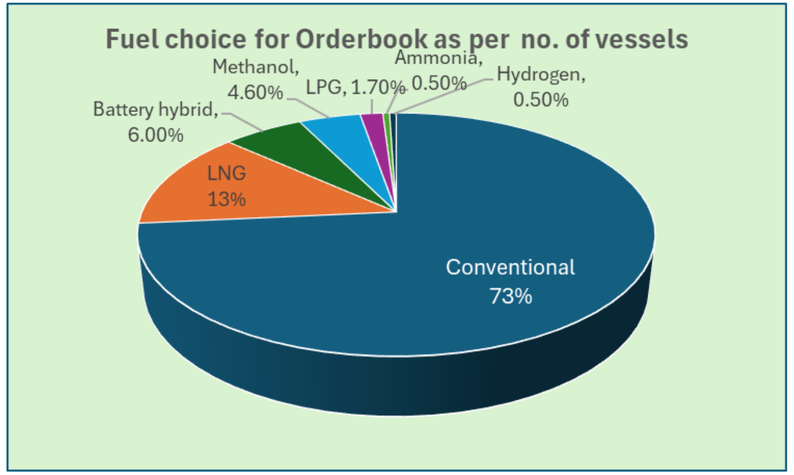
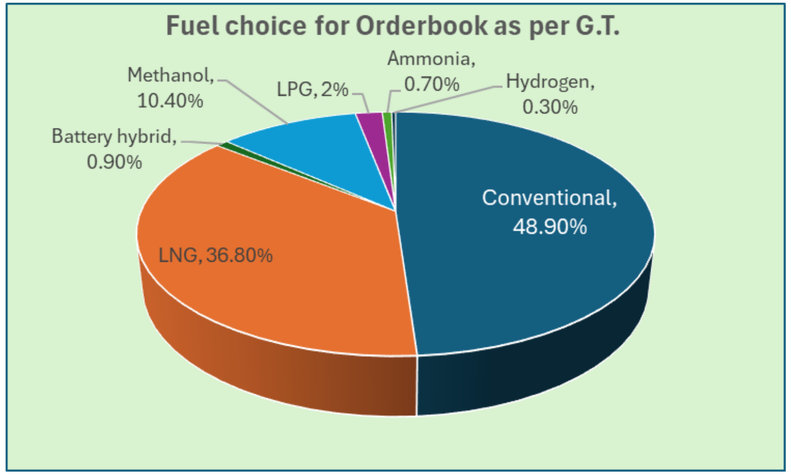
Alternative fuels used in Maritime industry

2.2% of Current Fleet in number of vessels and **8.8%** measured at G.T. is currently with Alternative Fuel

While **27.31%** of orderbook in number of vessels and **51.2%** measured at G.T. is currently with Alternative Fuel





LNG is the preferred alternative Fuel. Mainly at LNG carriers, container vessels and VLCCs.

LPG for LPG tankers
Methanol on excising Methanol carriers but also on several Container vessel orders.

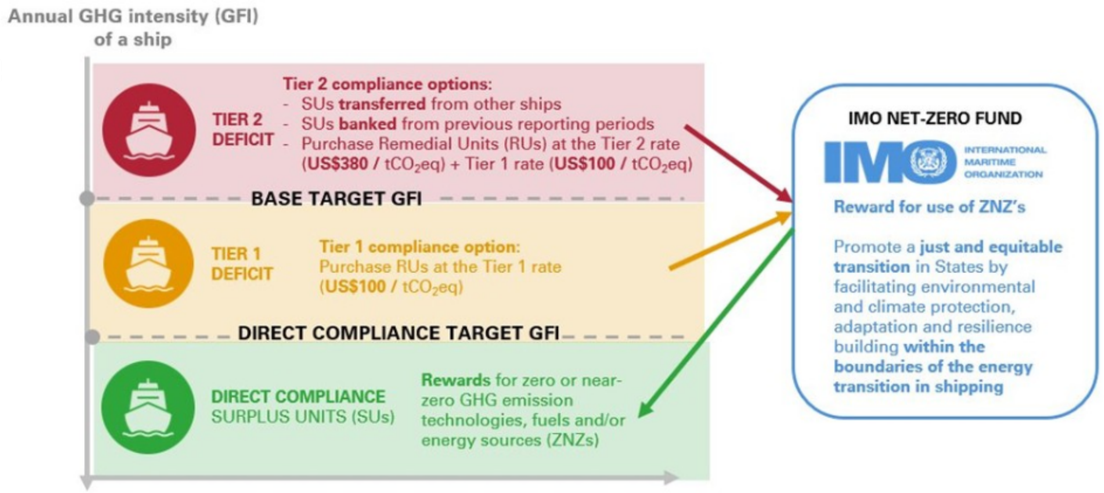
MEPC 86-Just postpone GFI based taxation for NZF.

Green Fuels in question due to unavailability and due to Health-related problems

LNG in question from IMO

VLSFO/HFO available but high taxation will make it very expensive the following years

Biofuels are welcomed by all industries but what will be the available quantities for Shipping



What is better?
IMO CO2 taxation(if it will be the only one)
or EU + UK + China + Turkey + Africa countries + +

Sustainable Transport Investment Plan

Brussels 5.11.2025

On current challenges as regards production, availability and price of sustainable fuels

· As regards the production side of sustainable fuels, the plan points out, it is urgent to scale-up renewable and low carbon fuel production in the EU, in order not to run into new dependencies

· According to the STIP, e-fuels are not available on a commercial scale in either maritime or aviation

· The plan furthermore deplores the exorbitant price difference between e-fuels and conventional fuels and explains that while more than 40 e-fuels production projects are at a planning stage in the EU, none has been able to reach a final investment decision so far

· As regards biofuels, the STIP identifies limited availability of sustainable feedstock and competing demand from other sectors. On a more positive note, the strategy points out that "*sustainable feedstocks for advanced biofuel production, such as lignocellulosic residues from agriculture, agrifood residues, manure residues and waste, are currently underexploited and could be scaled up".*

Possible solutions and action points

· STIP suggests that the waterborne transport sector is to make use of different technologies (including wind assisted propulsion) and a broad basket of sustainable maritime fuels (SMF), including LNG as a transitional fuel. LNG, with effective methane slip mitigation technologies, can also reduce GHG emissions, according to the plan.

· When it comes to the EU's contribution to meet those targets, the plan refers to the mainstream funding programmes and schemes, in particular the Innovation Fund, Horizon Europe, the EIB, and the European Innovation Council. However, it stresses the EU cannot be up to the challenge on its own and calls Member States to top up EU-funding streams, i.a. by using ETS revenues.

· Further suggestions - include double-sided auctions (or contracts for difference) for fuel supply and power-purchase agreements for renewable and low-carbon fuels

· The Commission will also assess possible mechanisms using tradable SAF and SMF and evaluate book and claim options.

Can we produce Geen Fuels with existing infrastructure-Not enough for Green Fuels

Annual production of Green energy		**8,300 TWh** [1]	
Energy for production of green **ammonia**		38.2	GJ/MT NH3 [2]
Green Ammonia for shipping		661	Million MT
Green Energy for ammonia for shipping		**7,015**	**TWh**
Power-to-methanol conversion efficiency		48.2% [3]	
Energy content of methanol		23.0	GJ/MT
Green Methanol for shipping		618	Million MT
Green Energy for methanol for shipping		**8,191**	**TWh**

Sources:

1. https://www.iea.org/reports/global-energy-review-2021/renewables
2. https://pubs.rsc.org/en/content/articlelanding/2020/ee/c9ee02873k
3. file:///C:/Users/atr01/Downloads/energies-13-03113-v2.pdf

Nuclear for Marine use

New Technologies like Molten Salt Cooled Reactors(**MSCR**), Liquid Metal-cooled Reactor(**LMCR**), High temp. reactors(**VHTR/HTR**) , promise to offer safe and endless power without emissions

Biggest obstacle is to change people's perception for Nuclear Power

- Imagine a vessel that will never need to stop for refueling!!!
- It will not have to pay for CO2 taxes!!

What about the waste, even if it is much less than conventional Nuclear reactors.
Will we need specialized personnel? Can we train large number of engineers in these technologies?

Batteries

	Sea going	Idle at port/anchor	Cargo operations
Containers	Yes	Yes	Yes
Bulkers	Yes	Yes	Yes
Tankers	Yes	Yes	Yes
	✓ Peak shaving (*avoid fluctuation of engine load*) ✓ Ultra slow steaming / drifting (*avoid completely to run main engine*)	✓ Zero emissions	✓ Zero emissions ✓ Spinning reserve (*less gensets running*) ✓ Improved dynamics (*in case of sudden start of a heavy consumer*)
	✓ No risk of blackout		

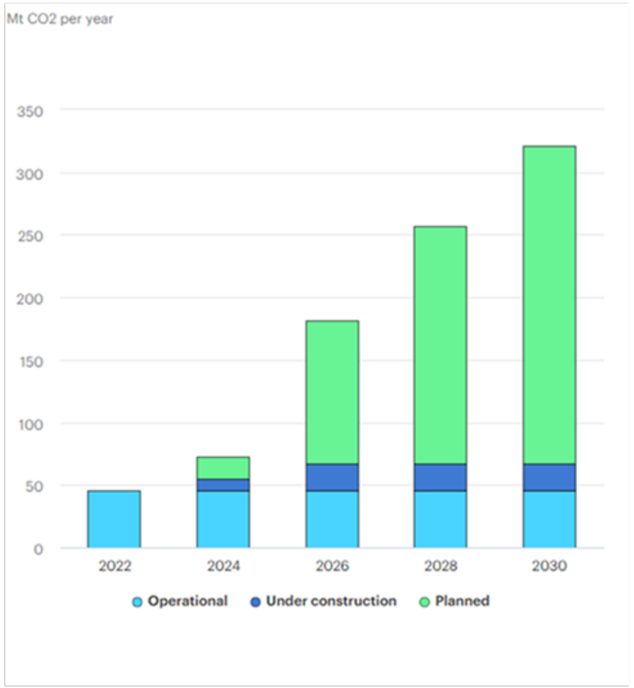
The use of traditional generators is minimized, and so do maintenance and repairs as well

CCUS : Solution for carbon intensive industries

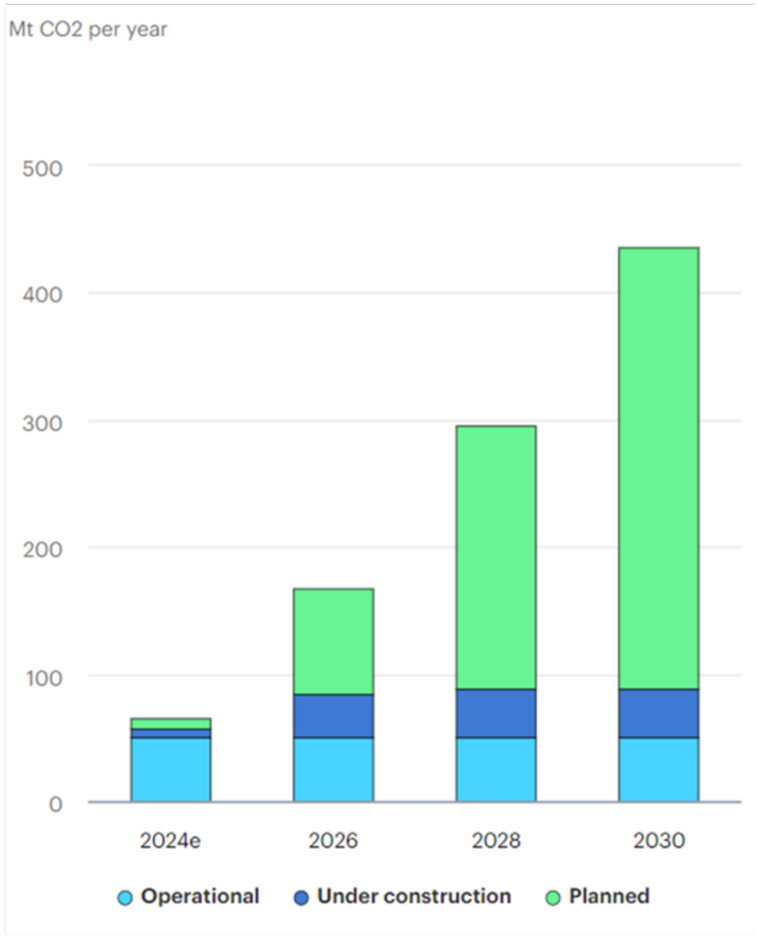
Cement, fertilizer, iron and chemicals / petrochemicals industries are the most significant industrial CO2 emitters, accounting for about 25% of total CO2 emissions globally and 66% of the industrial sector.

The decarbonization of these industries is a top priority

It is reasonable that shipping shares solution with other industries (CCUS)



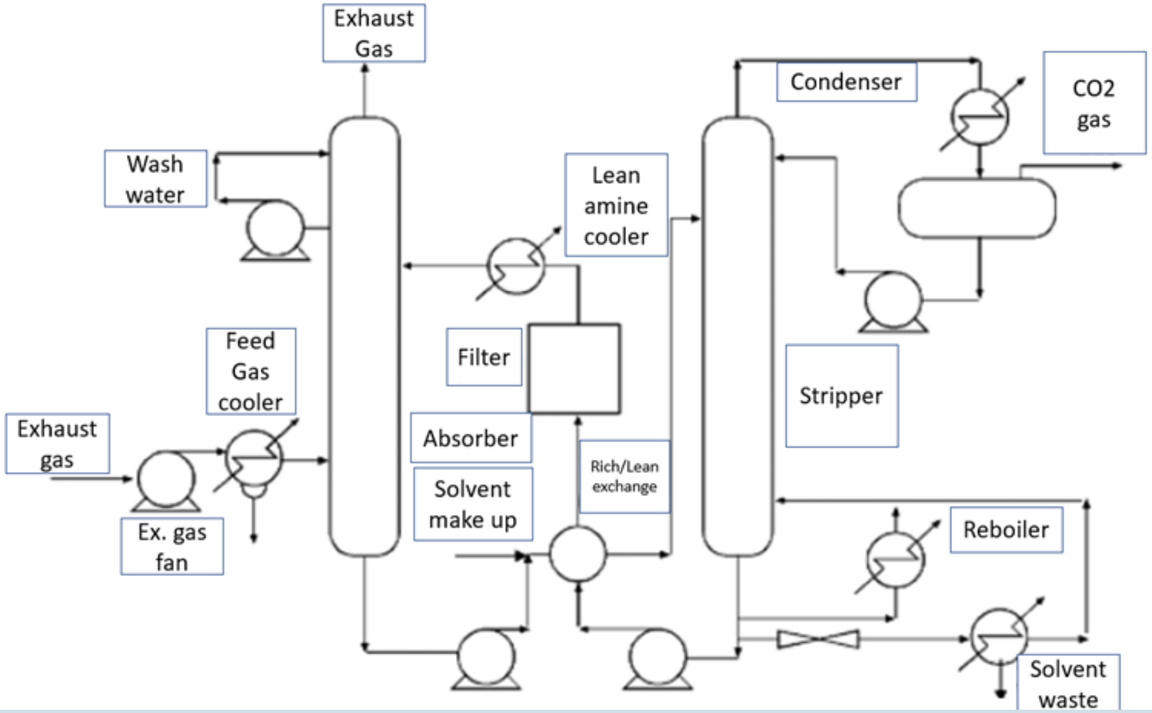
Status 24-Mar-2023



Source : IEA

Status 30-Apr-2025

CO_2 capture ≠ SO_x scrubbing

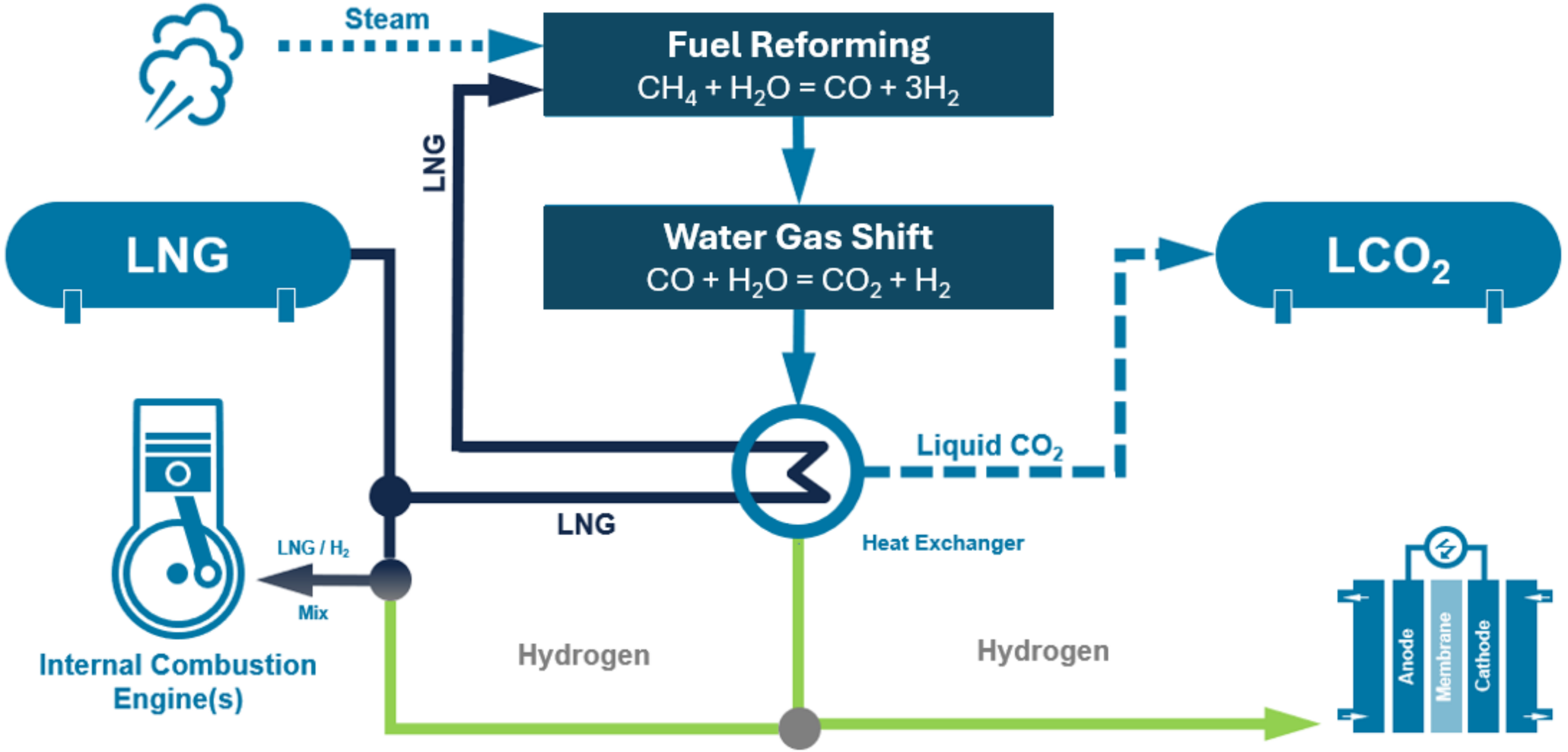


The absorption of CO2 depends on its partial pressure (concentration) in the ex.gas , which in case of marine engines is small

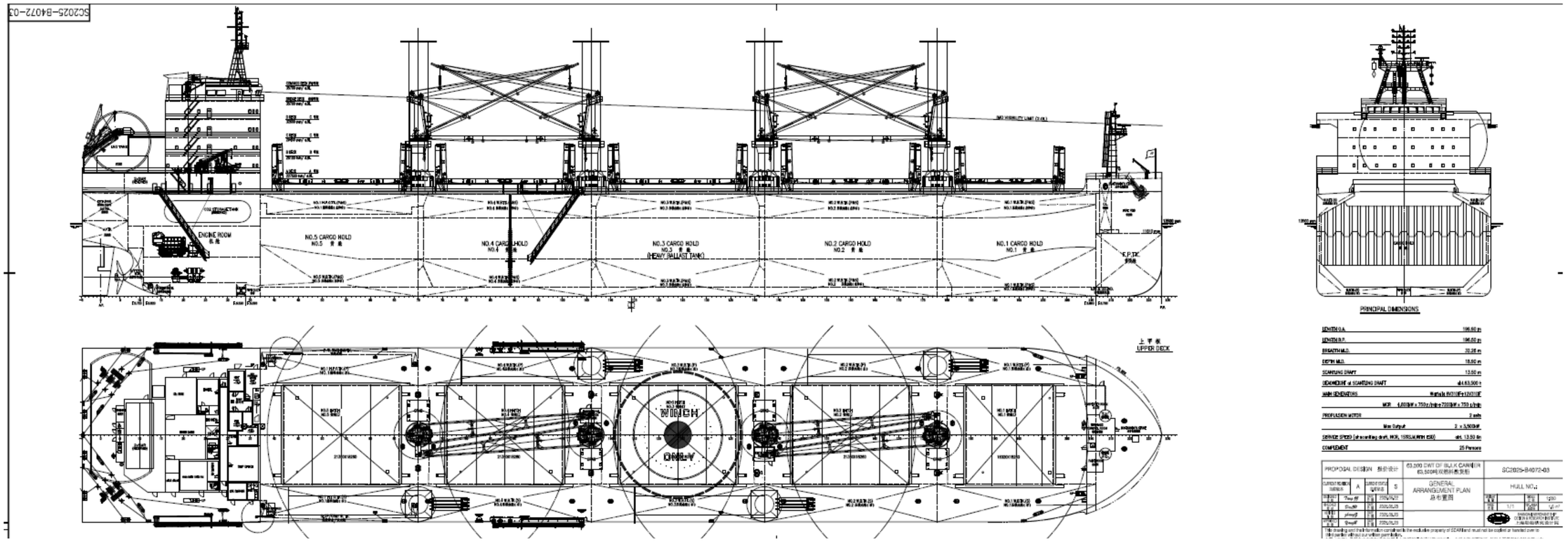
Due to its very complex nature (heat & mass transfer process sensitive to hydromechanic and thermodynamic factors), the post combustion is very sensitive to vibrations and it is highly unlikely that it will perform on bord a ship

The post combustion is very sensitive to impurities (NOx, SOx, PM) : their presence will rapidly degrade the chemical solvent, while their removal needs higher standards that catalysts and scrubbers

Pre-combustion capture / Steam Methane Reforming



Electrification and Hydrogen production onboard



Costs involved with Fuel EU Maritime

	reduction GHG index	Eligible GHG emissions 15%		Eligible GHG emissions 25%		Eligible GHG emissions 50%	
		HFO	LNG	HFO	LNG	HFO	LNG
2028	2.0%	-60,991	204,493	-101,652	340,822	-203,304	681,644
2029	2.0%	-60,991	204,493	-101,652	340,822	-203,304	681,644
2030	6.0%	-159,205	98,635	-265,341	164,392	-530,682	328,783
2031	6.0%	-159,205	98,635	-265,341	164,392	-530,682	328,783
2032	6.0%	-159,205	98,635	-265,341	164,392	-530,682	328,783
2033	6.0%	-159,205	98,635	-265,341	164,392	-530,682	328,783
2034	6.0%	-159,205	98,635	-265,341	164,392	-530,682	328,783
2035	14.5%	-367,908	-126,314	-613,180	-210,524	-1,226,360	-421,047
2036	14.5%	-367,908	-126,314	-613,180	-210,524	-1,226,360	-421,047
2037	14.5%	-367,908	-126,314	-613,180	-210,524	-1,226,360	-421,047
2038	14.5%	-367,908	-126,314	-613,180	-210,524	-1,226,360	-421,047
2039	14.5%	-367,908	-126,314	-613,180	-210,524	-1,226,360	-421,047
TOTAL Cost benefit from the use of LNG			**3,028,136**		**5,046,893**		**10,093,786**

Assume : 7,300 MT liquid fuel

- ✓ FuelEU will not incur extra costs until 2039
- ✓ Cost savings can be used for pooling with existing ships

Thank you!