FINAL DRAFT REPORT

TCO calculations Dutch Aid Scheme Clean Maritime Vessels

Final Draft Report

26 May 2026

Ministry of Infrastructure and Water Management

REBEL

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Introduction

Objective of this study

The Dutch government has the objective to reduce carbon emissions from the Dutch owned fleet. For this purpose, the Ministry structured a subsidy in support of constructing newly built or retrofitted vessels which run on renewable fuels. For this purpose, Rebel has prepared a study analysing how big the funding gap is of sailing on renewable fuels vis-a-vis sailing on conventional fuels, considering future regulations that have been agreed upon in recent years.

In response to the subsidy approval request form of the Dutch government, the European Commission requested additional calculations on the total cost of ownership (TCO[1]) for two types of vessels:

- One large vessel (above 5,000 GT)
- One large offshore vessel

For both vessels, calculations are required for retrofitted vessels as well as newbuild vessels.

The TCO calculations are based on and consider the following additional conditions:

- A 15-year operational period
- Differences in regulatory coverage (EU ETS and FuelEU Maritime)
- Cost structures considered on both CAPEX and OPEX bases
- Marpol EEDI/EEXI requirements

Taking this into account, the objective of this study is to assess whether EU ETS and Fuel EU Maritime provide sufficient incentives for building and taking into operation clean propelled vessels, or whether additional support will be needed to incentivise a switch to other renewable fuels.

What has changed since the previous study

Rebel carried out an initial assessment on the costs of sailing on renewable fuels late 2023. Since the study carried out by Rebel, there have been a few changes which we analyse in this report:

- Addition of offshore vessel as second reference vessel
- Updated CAPEX figures for new and retrofitted vessels
- Modelling the impact of FuelEU in addition to EU ETS on the TCO
- Providing a lifetime cost analysis for different years of delivery
- Updating fuel price scenarios, both for the conventional fuels, as well as the renewable energy prices and the anticipated declining costs of the renewable fuels.

The following assumptions about the vessel newbuild and retrofit costs have been updated:

Assumption	Rebel report 2023	Current assumption
CAPEX – VLSFO - Container vessel 2,000TEU	30.8 mln	32.2mln
CAPEX – Methanol - Container vessel 2,000TEU	38.5 mln	39.3 mln
Retrofit costs – Methanol - Container vessel 2,000 TEU	8.5 mln	7.8 mln
CAPEX – H2 Fuel Cell - Container vessel 2,000TEU	80.1 mln	59.3 mln
Retrofit costs – H2 Fuel Cell - Container vessel 2,000 TEU	54.2 mln	29.8 mln

It is noticeable that in three years time, the anticipated newbuild costs of hydrogen fuel cell vessels have significantly decreased.

On the next page, we describe the current (renewable) fuel price assumptions and scenarios.

[1] *TCO (Total Cost of Ownership) includes all costs over a vessel's lifetime, such as capital expenditure, fuel, operations, maintenance, and any additional compliance or retrofit costs.*

VLSFO and MGO price scenarios and assumptions

Assumptions

- Shortsea vessels sail with VLSFO and use MGO in ports. Offshore vessels use MGO for sailing, Dynamic Positioning (DP) activities, and in port.
- The analysis is done in real terms. As such, VLSFO is assumed to remain at a stable price of EUR 475/ton through 2039. From 2040 onwards, the price is projected to decline by 1% annually, reflecting reduced demand driven by the significant increase in FuelEU targets.
- Similarly, MGO is assumed to remain at a stable price of EUR 600/ton through 2039. From 2040 onwards, the price follows a similar pattern as VLSFO.

Price scenario used in this study

- VLSFO and MGO become more expensive over time once EU ETS and FuelEU costs are added.
- In this study, pre-Iran war VLSFO and MGO fuel prices are used to reflect a long-term perspective. Therefore, we do not use today's inflated prices, assuming a return to more stable market conditions over the considered period. These price assumptions are also in line with those used in the previous study.

Cost (EUR/ton)	2030	2035	2040
VLSFO	475	475	470
EU ETS	473	630	788
FuelEU Penalty	155	358	752
FuelEU Surpl.	-	-	-
Total Cost	**1,102**	**1,463**	**2,010**
EUR/GJ	*27*	*36*	*50*

Cost (EUR/ton)	2030	2035	2040
MGO	600	600	594
EU ETS	481	641	802
FuelEU Penalty	137	354	774
FuelEU Surpl.	-	-	-
Total Cost	**1,218**	**1,595**	**2,169**
EUR/GJ	*29*	*37*	*51*

FuelEU consists of two components: a penalty for fuels exceeding the emissions threshold and a tradable surplus generated by fuels that perform below the threshold. In the table on the right, these are reflected as 'FuelEU Penalty' and 'FuelEU Surplus'. Together, these two determine the net impact of FuelEU on the total fuel costs.

Fuel price scenarios

Mitigating rising VLSFO prices through bio-blending

Assumptions

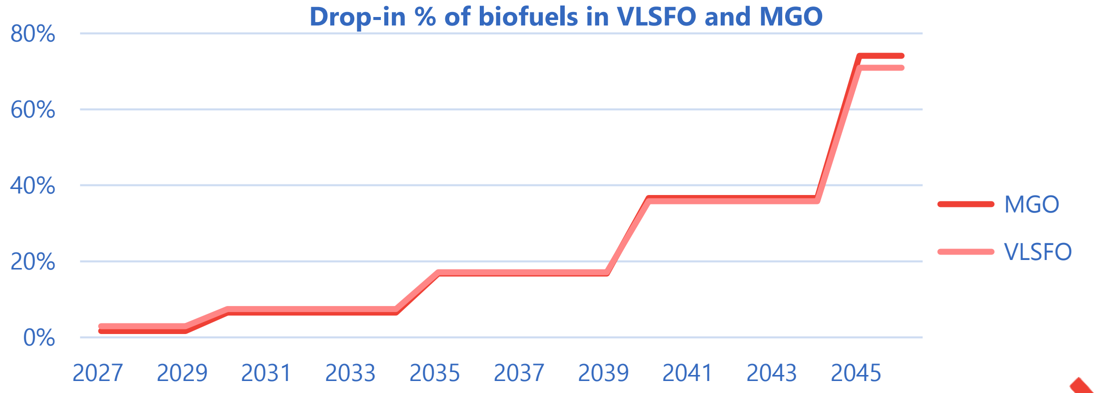
- For biofuel, we assume that hydrotreated vegetable oil (HVO) is used. This biofuel is priced at EUR 1,500/ton today. Per year, the price increases by 1% because of more demand and limited sources of feedstock. From 2038, prices of these fuels will stabilize.
- Following the bio-fuel drop in scheme on the right, bio-blended VLSFO prices increase from EUR 557/ton in 2030 to EUR 913/ton in 2040, including EU ETS costs this is EUR 995/ton in 2030 and EUR 1,444/ton in 2040. Bio-blended MGO prices increase from EUR 1,113/ton in 2030 to EUR 1,522/ton in 2040 including EU ETS costs.

Price scenario used in this study

- Bio-blended VLSFO and MGO prices increase over time due to the incurred costs of EU ETS.
- Under the EU ETS, sustainable biofuels can be assigned a zero-emission factor, meaning no emission allowances are required for their use. Under FuelEU Maritime, biofuels contribute to reducing the GHG intensity and can significantly lower or eliminate compliance costs.
- As a result, biofuel-powered vessels are not required to incur costs to comply with FuelEU regulations, whereas vessels using non-biofuels must pay EU ETS costs.
- Vessel owners are expected to optimize operations to minimize these FuelEU compliance costs. This will be done by blending in biofuel into the fuel mixture. We estimate that the share of biofuel drop-in will roughly follow the FuelEU GHG-intensity goals. See the figure on the right.
- This scenario assumes relatively stable bio-blended VLSFO and MGO prices and sufficient production capacity. However, this requires a substantial scale-up in biofuel production, as approximately 70% of current bunkered volumes would need to be biofuel-based by 2045.

Cost (EUR/ton)	2030	2035	2040
Bio-blended VLSFO	557	677	907
EU ETS	437	522	506
FuelEU Penalty	0	3	25
FuelEU Surpl.	-	-	-
Total Cost	**995**	**1,203**	**1,438**
EUR/GJ	*25*	*30*	*36*

Cost (EUR/ton)	2030	2035	2040
Bio-blended MGO	663	777	996
EU ETS	450	534	508
FuelEU Penalty	0	2	11
FuelEU Surpl.	-	-	-
Total Cost	**1,113**	**1,313**	**1,515**
EUR/GJ	*26*	*31*	*35*



Methanol price assumptions

Assumptions

- Methanol-powered container and offshore vessels operate entirely on methanol.
- Bio-methanol is significantly cheaper than E-Methanol. However, due to an expected shortage of feedstock in the future, bio-methanol is expected to increase in price. Prices are shown in the figure on the right.
- Bio-methanol is currently more expensive than VLSFO, even when accounting for the current FuelEU surplus. It is only under scenarios with increasing FuelEU surplus bonuses that bio-methanol could become cost-competitive, contingent on sufficient availability.
- For e-methanol, we expect an opposite trend to bio-methanol. Due to advances in production technology and economies of scale, prices will decrease significantly over time.
- Under the EU ETS, methanol can be assigned a zero-emission factor, meaning no emission allowances are required for their use. Under FuelEU Maritime, methanol contributes to reducing the GHG intensity and can significantly lower or eliminate compliance costs.
- Both fuels benefit from FuelEU surplus effects. We assume that FuelEU surplus units are priced at EUR 210/ton in 2026 and EUR 250/ton in 2030 after which it remains at this level through 2040 and 2050.

Cost (EUR/ton)	2030	2035	2040
Bio-Methanol	935	983	1,003
EU ETS	-	-	-
FuelEU Penalty	-	-	-
FuelEU Surpl.	(328)	(290)	(215)
Total Cost	**607**	**693**	**788**
EUR/GJ	*30*	*35*	*39*

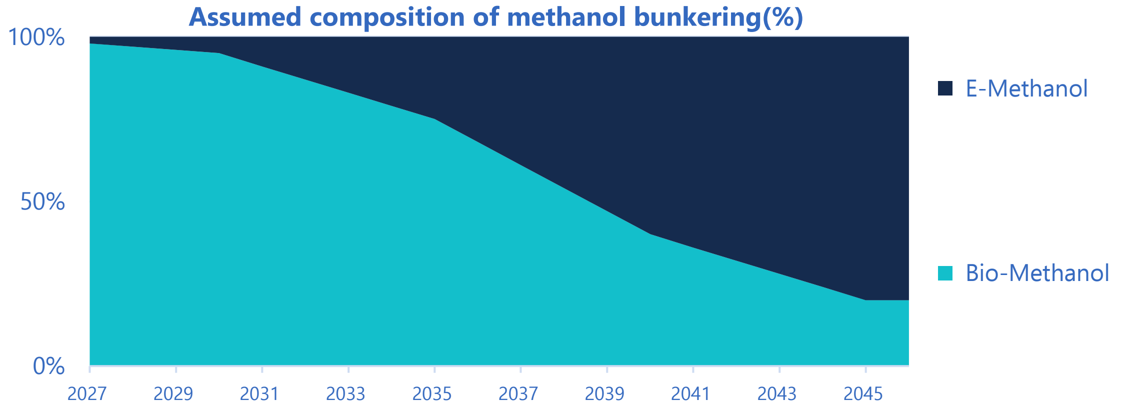
Cost (EUR/ton)	2030	2035	2040
E-Methanol	1,395	1,163	930
EU ETS	-	-	-
FuelEU Penalty	-	-	-
FuelEU Surpl.	(328)	(290)	(215)
Total Cost	**1,067**	**873**	**715**
EUR/GJ	*53*	*44*	*36*

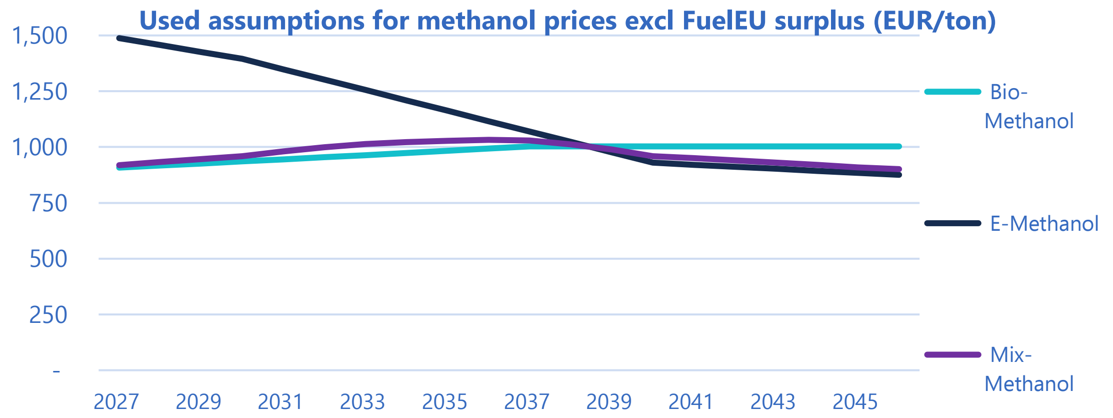
Methanol price scenarios

Price scenario used in this study

- We expect that bio-methanol supply will be insufficient to meet total demand. This is because of an expected uptake in methanol demand as well as a limited increase in feedstock availability.
- As a result, vessel owners are expected to use a blend of methanol over time, consisting of both bio-methanol and e-methanol.
- This methanol fuel mix is projected to shift from predominantly bio-methanol in the early years to approximately 80% e-methanol by 2045.
- The figures on the right show the assumptions and the used price for the methanol mix that will be used in this study.

Cost (EUR/ton)	2030	2035	2040
Mix-Methanol	958	1,028	959
EU ETS	-	-	-
FuelEU Penalty	-	-	-
FuelEU Surpl.	(328)	(290)	(215)
Total Cost	**630**	**738**	**745**
EUR/GJ	*31*	*37*	*37*





Hydrogen price scenarios and assumptions

Assumptions

- It is assumed that hydrogen-powered container and offshore vessels are powered by a hydrogen fuel cell and operate entirely on hydrogen. We did not allow for the use of multiple fuels on a single trip.
- Hydrogen is assumed to be green hydrogen, due to the incentive provided by FuelEU Maritime.
- As for E-methanol, we expect that the price of hydrogen will decrease significantly over time. This is because of advances in production technology, economies of scale and a global uptake of trade in hydrogen.
- Following market consultation with shippers and a bunker trader, we assume a price of EUR 9,500/ton today, decreasing over the years to a level of EUR 5,225/ton in 2035. From there, it will decrease with 1% per year.

Price scenario used in this study

- For hydrogen-powered vessels, no biofuel blending or drop-in fuels are assumed. Thus, the prices below are the price used in the TCO calculations. The reduction in assumed surplus is being offset by the lower production costs of green hydrogen.

Cost (EUR/ton)	2030	2035	2040
H2	8,550	7,125	5,225
EU ETS	-	-	-
FuelEU Penalty	-	-	-
FuelEU Surpl.	(2,571)	(2,338)	(1,887)
Total Cost	**5,979**	**4,787**	**3,338**
EUR/GJ	*50*	*40*	*28*

EU ETS and FuelEU price scenarios and assumptions

EU ETS and FuelEU Assumptions

- Both container and offshore vessels will be subject to both regulations.
- We assume that FuelEU surplus units are priced at EUR 210/ton in 2026 and EUR 250/ton in 2030 after which it remains at this level.
- The ETS price development is based on an ABN AMRO forecast[2]. This forecast show that prices will increase to a level of EUR 200/ton in 2035. We assume a 3% increase after this. This ETS forecast was selected as it is the most recently published, dating from the end of 2025.
- CO_2 emissions from renewable methanol, hydrogen, and biofuels are not subject to EU ETS charges as per the EU ETS guidance document of October 2025.

Fuel	Lower Calorific Values (MJ/g)	WtW CO2 emissions (gCO2e/MJ)
VLSFO	0.0410	91.7
MGO	0.0427	90.6
Bio-Diesel (HVO)	0.0440	17.24
E/Bio-Methanol	0.0200	13.14
Hydrogen	0.1200	0.0

Note: Values used to calculate the compliance deficit under FuelEU Maritime, which determines the associated compliance penalty or surplus.
Source: FuelEU Guidance Document, October 2025

Other fuel assumptions

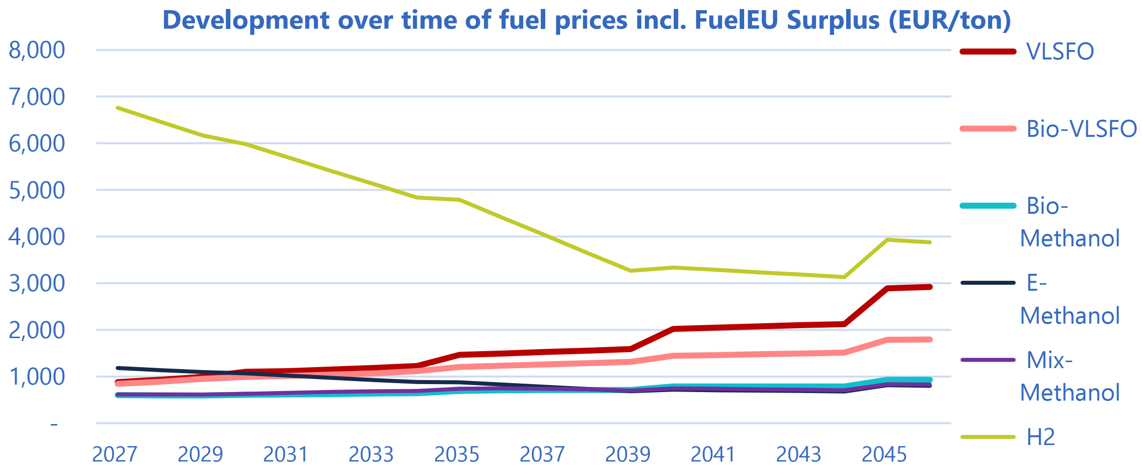
- We have taken Lower Calorific Values (LCV) from the guides annexed to the FuelEU legislation, which are listed in the table on the right.
- For all fuels, a difference in engine efficiency, specifically in energy conversion and resulting fuel consumption, was taken into account.
- The analysis is looking at the TCO of a vessel. It is noted that because of the larger bunker tanks needed for hydrogen, that the amount of transported product will be lower.

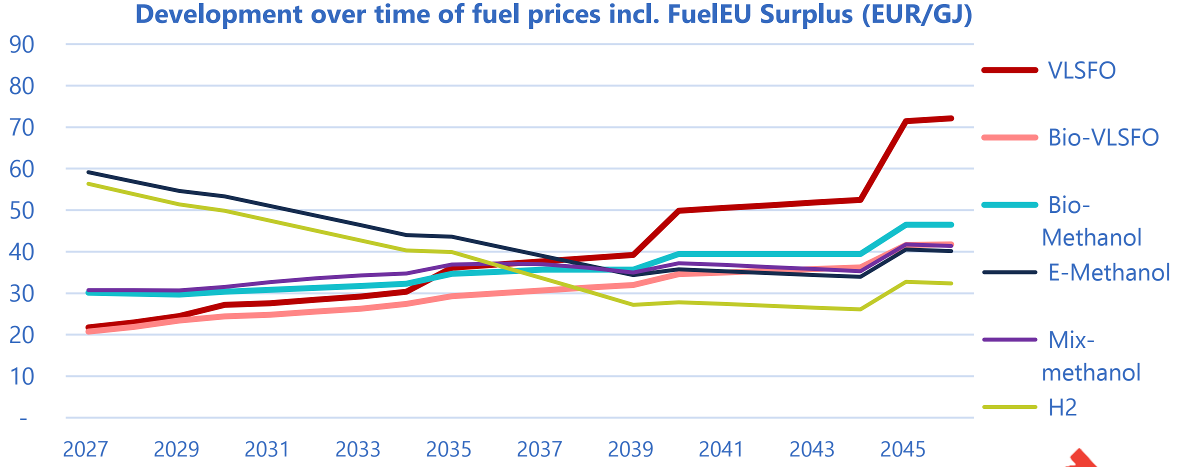
[2] *https://www.abnamro.com/research/en/our-research/esg-economist-scenarios-shaping-eu-ets-prices*

Fuel price and energy price development

Important findings on the price evolution

- Costs for maritime fuels are typically expressed in EUR/ton (of fuel). However, this differs across fuels, especially for renewable fuels, due to variations in energy density and conversion efficiency, making them not directly comparable in EUR/ton. Therefore, EUR/GJ is used as a basis for comparison.
- In terms of EUR/GJ, the bio-blended VLSFO blend is the most price competitive over time. Because the blending of biofuels eliminates FuelEU penalties, the avoided compliance costs will be higher than the more expensive underlying price of the biofuels.
- By 2038, EU ETS and FuelEU Maritime costs significantly narrow the gap between conventional (non-bio) and clean fuels, improving the business case for the clean vessels.
- In terms of EUR/GJ per fuel, e-methanol and hydrogen costs decline over time, while bio-methanol and VLSFO increase, leading to a convergence in fuel costs.
- The sharp increase around 2045 significantly raises the effective cost of VLSFO due to higher FuelEU targets and EU ETS compliance costs.
- FuelEU compliance costs are driven by the lowest-cost compliant fuel, which is currently assumed to be biofuels.
- The price of bio-methanol is close to VLSFO through 2040. After 2040, tightening FuelEU targets significantly improve the relative competitiveness of methanol and hydrogen by increasing penalties on higher-emission fuels.
- Beyond this point, bio-methanol prices converge towards those of e-methanol and hydrogen as supply constraints and demand continues to increase.
- The costs of hydrogen decline rapidly until 2039 after which it stabilizes from 2040 onwards.





Total Cost of Ownership

Methodology, scope and assumptions

Methodology

- We developed a financial-operational TCO model that assesses the funding gap between building, owning and operating conventional and alternative-fuel vessels.
- The model compares CAPEX and OPEX across vessel types (shortsea container and offshore) and propulsion technologies.
- The model calculates total cost of ownership for a period of 15 year and identifies the funding gap between conventional vessels and clean vessels.
- We perform a qualitative sensitivity analysis to assess various factors and cost drivers that impact the TCO.
- We use well-to-wake (WtW) CO_2 emissions and associated regulatory costs (e.g. EU ETS, FuelEU) to capture the full policy impact on vessel economics.

Scope

- We use a cost-based perspective. The model excludes revenues, margins, and freight rates, assuming these converge to cost levels over time. Government aid is excluded as well.
- The focus lies on direct lifecycle costs: CAPEX and OPEX; excludes indirect and one-off costs (e.g. training, R&D) as immaterial to total TCO.
- The analysis is conducted in real terms (today's price level), assuming uniform inflation across cost components.
- Key inputs include fuel prices, newbuild and retrofit cost premiums, and emission cost assumptions (based on CE Delft, 2023). Alternative fuel costs are built bottom-up from production, conversion (e.g. electrolysis), transport, storage, and bunkering.
- The model does not include temporary market price premiums from supply–demand imbalances. Besides, it does not it include potential external price pressures from competing sectors. These dynamics are described as sensitivities on p. 17.

OPEX component	Description	Source
Crew costs	80k per FTE per year	Industry benchmarks / Rebel
Maintenance	0.5% of newbuild price	Industry benchmarks / Rebel
Insurance	0.4% of newbuild price	Industry benchmarks
Administration	1.1 mln per year	Rebel assumptions
Fuel costs	Engine efficiency assumptions	Rebel / literature
Bunker prices	VLSFO, MGO prices based on 2026 bunker costs, see previous slide	Interviews and market data
Alternative fuel costs	Methanol and LH_2 bunker costs, see previous slide	Interviews and market data
Port fees	Port dues	Port tariffs / benchmarks
Marine services	Pilotage, towage, mooring	Port tariffs
Routing component	Description	Source
Distance	Rotterdam – Bilbao (~770 nm), offshore vessel 250nm per trip.	Route assumptions
Trips per year	Shortsea 50 weekly trips per year, offshore 20 two-weekly trips per year.	Rebel assumptions and interviews
Speed	14 knots for shortsea, 8kts for offshore.	Operational assumption
Discounted TCO	Description	Source
Discount rate	10% real WACC for a shipping line.	Rebel assumptions, literature
Offshore vessel	Description	Source
Newbuild and retrofit price	MGO: 42.3 mln Methanol: 50.7 mln; 10.2 mln retrofit costs Hydrogen Fuel Cell: 76.1 mln; 38mln retrofit costs	Interviews with shipbuilders and -owners

Modelling approach on CAPEX, financing, and subsidies

- Newbuild and retrofit CAPEX figures are translated into annual capital costs using an annuity calculation, assuming a 10% WACC and a 10% residual value of the vessel excl the drivetrain.
- The annuity-based calculation of capital costs best reflects market reality, as most vessels are financed through debt, typically covering around 80% of the investment cost.
- The economic lifetimes assumed is 25 years for the vessel and 15 years for the clean-fuel drivetrain. For the drivetrain, a similar annuity calculation is used for the capital costs, though the residual value is assumed to be zero.
- Subsidisable costs decline over time, reflecting the expected reduction in additional CAPEX as clean-fuel technologies advance (see annexes for the additional CAPEX per year of delivery).
- For the subsidy NPV calculations on p. 21–24, payouts are spread 30% in year 0, 50% in year 1 and 20% in year 3, discounted at 10%.
- The model is built in nominal terms without an inflation assumption, so the EUR 4 mln subsidy cap effectively depreciates in real terms over the analysis horizon.

CAPEX component	Description	Source
Newbuild cost	Vessel newbuild costs for VLSFO, Methanol, LH_2 engines	Rebel assumptions based on interviews
Financing costs	WACC / cost of capital	Rebel model assumptions
Vessel lifetime	25 years	Rebel model assumptions
Drivetrain lifetime	15 years	Rebel model assumptions

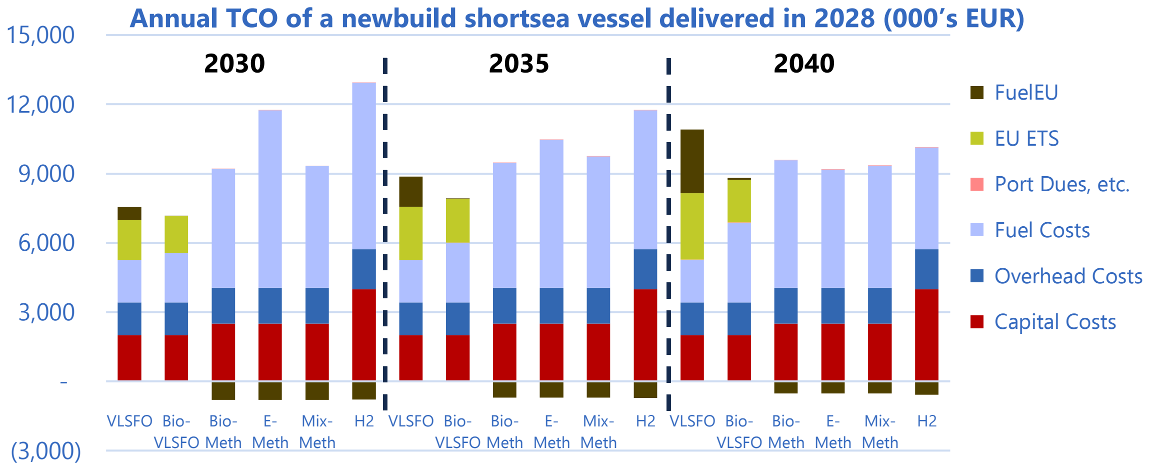
TCO - Shortsea vessel

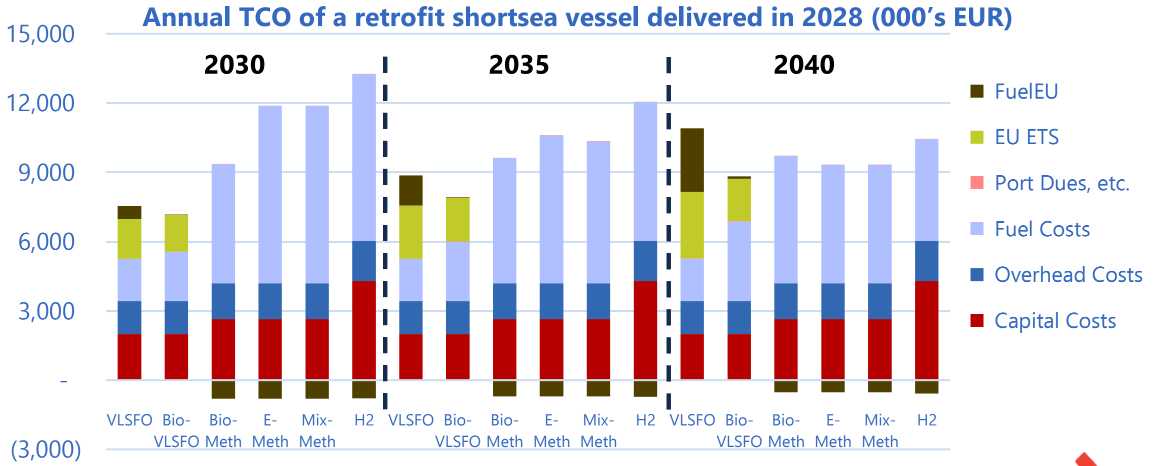
Introduction

- This slide shows the total costs of ownership (TCO) per year of a 2,000 TEU shortsea vessel. It shows the TCO for the four types of fuel:
  - VLSFO/MDO (conventional)
  - Bio-blended VLSFO
  - Bio- , E-methanol, and the mix of these.
  - Hydrogen
- For three moments in time; 2030, 2035 and 2040

Key results

- For shortsea newbuilds and retrofits, bio-blended VLSFO results in the lowest TCO over time. This indicates that the strategy to minimize FuelEU compliance costs is effective in this segment.
- Methanol-powered vessels become significantly cheaper over time. By 2040, their TCO is almost comparable to that of bio-blended VLSFO vessels.
- Hydrogen powered shortsea vessels are more expensive than methanol and bio-blended VLSFO vessels through 2030 and 2035. In 2040, as for methanol, hydrogen come close to bio-blended VLSFO in terms of TCO.
- Fuel costs remain the largest cost block across all propulsion types. The CAPEX is higher for clean vessels but is increasingly offset by lower fuel costs over time.





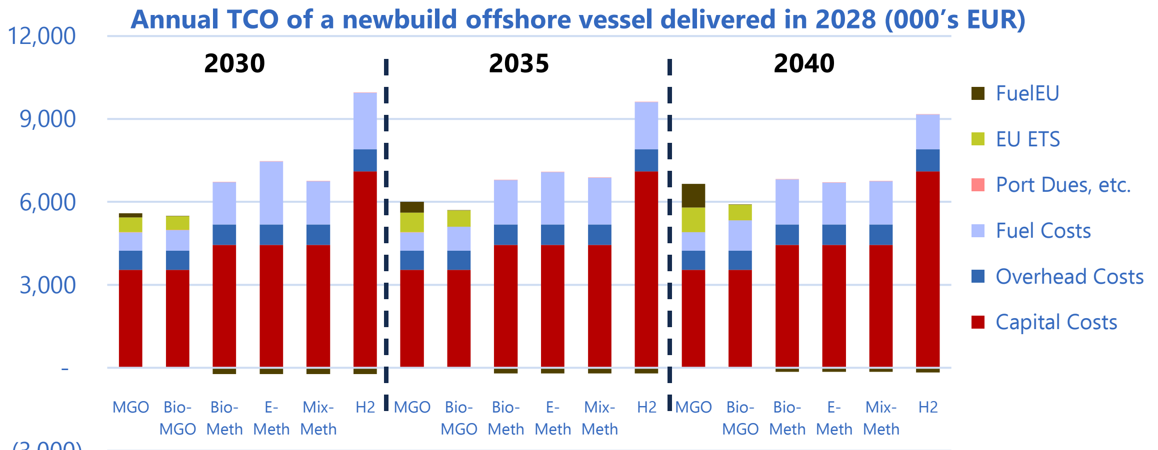
TCO - Offshore vessel

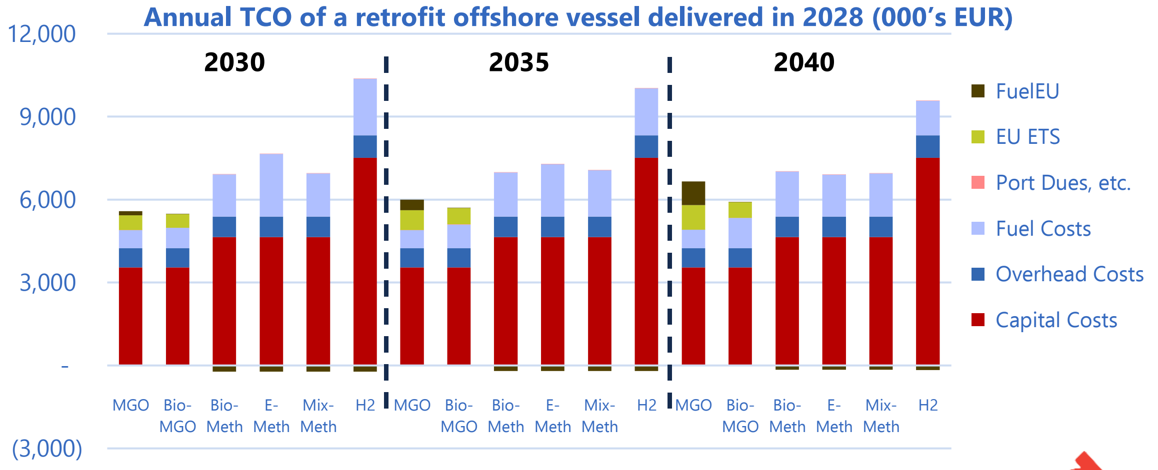
Introduction

- This slide shows the total costs of ownership (TCO) per year of a 6,500 GT offshore vessel. It shows the TCO for the four types of fuel:
  - VLSFO/MDO (conventional)
  - Bio-blended VLSFO
  - Bio- , E-methanol, and the mix of these.
  - Hydrogen
- For three moments in time; 2030, 2035 and 2040
- For the offshore vessel, we assume an offshore support vessel operating at offshore wind farms. These vessels primarily operate in DP mode and therefore have lower fuel consumption than vessels, such as shortsea vessel, that mainly sail.

Key Results

- Offshore vessel operations are less favorable for clean fuels than shortsea operations. While lower fuel consumption reduces the premium for renewable fuels, it also limits the impact of regulatory incentives, resulting in a weaker overall incentive to switch.
- For this vessel type, the bio-blended MGO reference case has the lowest cost between 2030 and 2040.
- By 2040, methanol-powered vessels approach this cost level, but remain slightly higher. In the years after, the TCO gap will be closed.
- For hydrogen, this gap is not closed, as significantly higher CAPEX has a substantial impact on TCO.
- CAPEX has more impact on offshore vessel costs in general than for shortsea vessels. This makes that the funding gap is not closed in the same time period as shortsea vessels.
- FuelEU surplus benefits are not so impactful on the costs of operations as with shortsea vessels.





Break even points – Shortsea Vessel

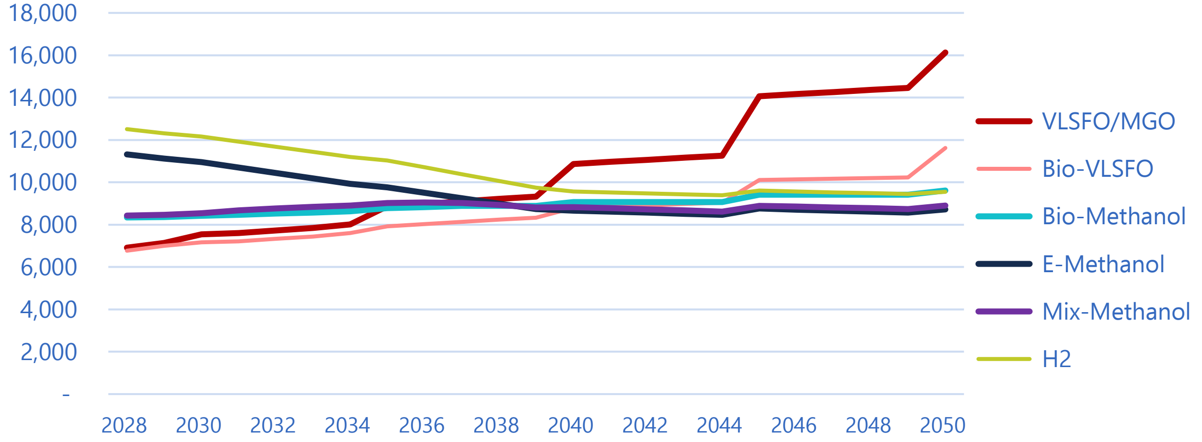
Introduction

- This slide shows the TCO evolution of the reference shortsea vessels, both newbuild and retrofit, for the four types of fuels.
- The figure shows the years in which the annual TCOs reach a break-even point.
- This break-even point does not imply that investments can be deferred until this point. Rather, timely investment in clean vessels is required to enable the necessary developments to take place.
- The lines in the chart on the right incorporate a FuelEU surplus, which is based on the penalty surcharge. When pooling is applied, the resulting costs of these vessels are expected to fall between the bio-VLSFO and VLSFO/MGO lines.

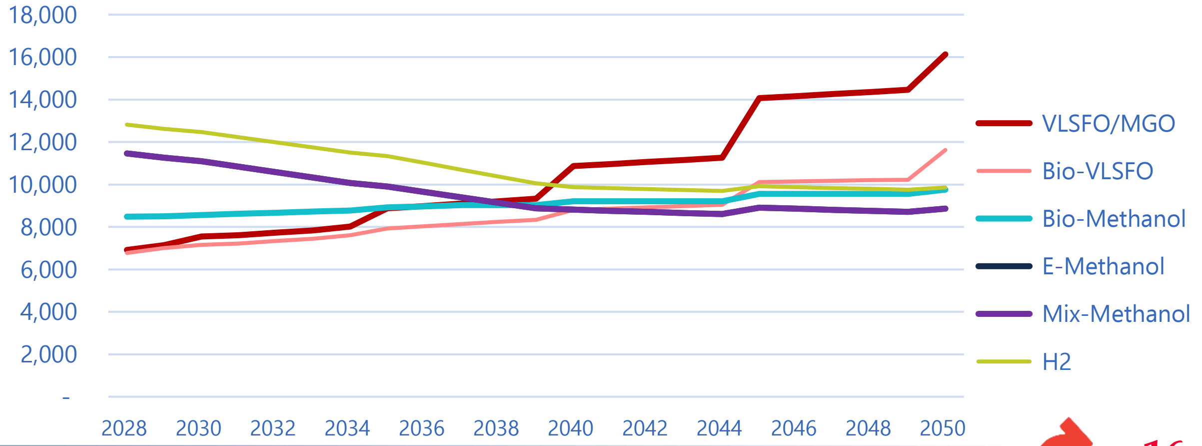
Key Results

- For shortsea vessels, the bio-blended VLSFO (reference vessel) and methanol vessels reach break-even in annual TCO in 2040 in both newbuild and retrofit cases.
- Hydrogen's TCO are break-even with bio-blended VLSFO in 2045. Its costs remain at a level just above methanol through all years.
- Retrofit and newbuild TCO are similar over the years.
- Retrofitted vessels have similar cost levels as the newbuild vessels.

Annual TCO costs for newbuild shortsea vessels delivered in 2028 (000's EUR)



Annual TCO costs for retrofit shortsea vessels delivered in 2028 (000's EUR)



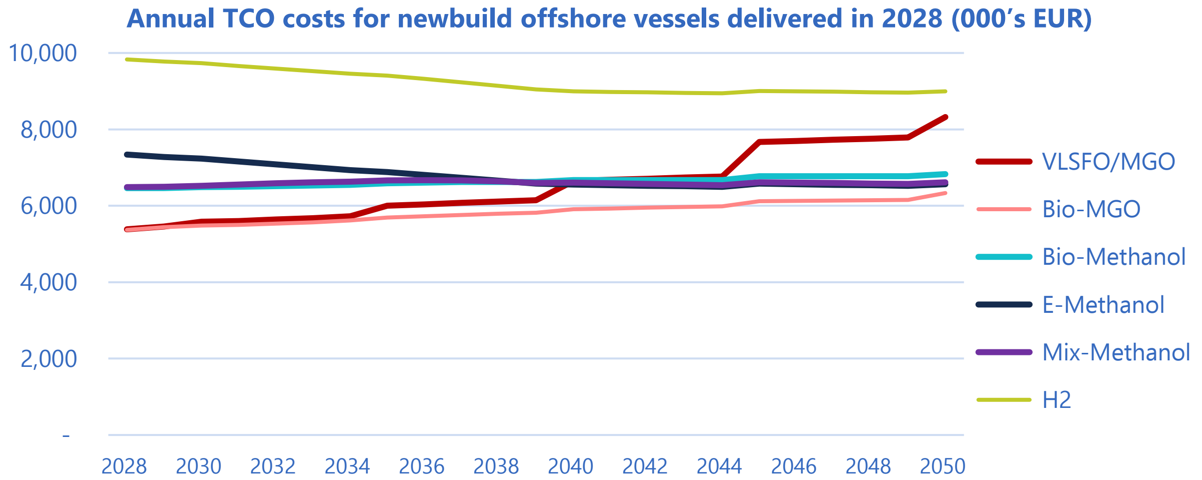
Break even points – Offshore Vessel

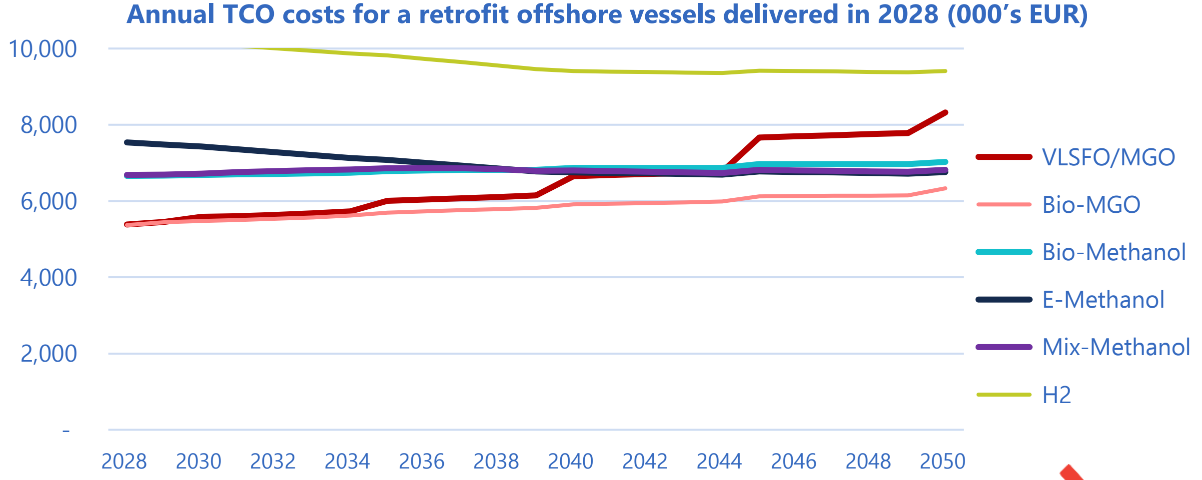
Introduction

- This slide shows, similarly to the previous slide, the TCO evolution of the reference offshore vessels, both newbuild and retrofit, for the four types of fuels.
- The figure shows the years in which the annual TCOs reach a break-even point.
- This break-even point does not imply that investments can be deferred until this point. Rather, timely investment in clean vessels is required to enable the necessary developments to take place.

Key Results

- For offshore vessels, for all alternative fuels included in this study, the break-even point comes after 2050.
- Only the methanol powered vessel comes close to the TCO of the reference vessel.
- Hydrogen remains above both methanol and conventionally powered vessels and does not come close to the TCO levels of the others.
- FuelEU Maritime and EU ETS are not able to close the funding gap between conventional and clean offshore vessels.
- Retrofitted vessels have similar cost levels as the newbuild vessels.





Break even points per vessel delivery year – Shortsea Vessel

Introduction

- This slide presents the total discounted TCO (in millions of euros) over a 15-year period for different vessel build years.
- The year of delivery is assumed to coincide with the first year of operation. For later build years, the newbuild price is assumed to decrease as production technology advances and economies of scale develop, resulting in lower capital costs for the vessel.

Key Results

- The shortsea business case improves for clean vessels in later delivery years while for the conventional vessels it is deteriorating.
- Methanol's 15-year discounted TCO remains stable at a level of around 66-67 million EUR for all build years.
- Until the delivery year 2035, bio-blended VLSFO vessels have a lower TCO than methanol and hydrogen vessels. From build year 2036, methanol vessels have a lower discounted TCO.
- Hydrogen improves over later delivery years and does reach similar levels in TCO as bio-blended VLSFO in 2038.

Discounted Total Costs of Ownership (TCO) of a shortsea vessel for a 15-year period per year of delivery (mln EUR)

Delivery year	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040
Counterfactual case													
VLSFO/MGO	62.7	64.8	66.8	69.3	72.0	74.9	78.0	81.2	84.3	87.7	91.2	95.1	99.2
Bio-blended VLSFO	57.7	58.9	59.9	61.2	62.5	63.8	65.2	66.6	68.1	69.7	71.3	72.9	74.7
Clean fuels													
Bio-Methanol	65.6	65.8	66.0	66.4	66.7	67.1	67.5	67.9	68.3	68.6	69.0	69.4	69.8
E-Methanol	77.3	75.5	73.8	72.3	70.9	69.6	68.4	67.3	66.5	65.8	65.2	64.9	64.8
Mix-Methanol	66.4	66.5	66.6	66.8	66.9	66.9	66.8	66.7	**66.6**	66.4	66.2	66.0	66.0
H2	86.1	84.1	82.1	80.1	78.2	76.4	74.7	73.1	71.5	70.2	**69.1**	68.2	67.5

For retrofitted vessels, the annual TCO is comparable to that of newbuild vessels. As a result, the break-even point is expected to be similar, or, in the case of hydrogen, delayed by one to two years.

Break even points per vessel delivery year – Offshore Vessel

Introduction

- This slide presents the total discounted TCO (in millions of euros) over a 15-year period for different vessel delivery years.
- The year of delivery is assumed to coincide with the first year of operation. For later build years, the newbuild price is assumed to decrease as production technology advances and economies of scale develop, resulting in lower capital costs for the vessel.

Key Results

- Though, the TCO improves for clean vessels in later delivery years, their total TCO does not fall below that of bio-blended MGO vessels on a discounted basis.
- For offshore vessels, the total TCO of clean vessels is not competitive with that of the conventional vessels as well.
- Bio-blended MGO offshore vessels have a rather stable discounted TCO over time because of the lower fuel consumption and related costs.
- For vessels delivered after 2040, methanol remains more expensive based on TCO than conventional offshore vessels.
- Hydrogen remains the most expensive option for all delivery years but does show a significant decrease in TCO over time.

Discounted Total Costs of Ownership (TCO) of an offshore vessel for a 15-year period per year of delivery (mln EUR)

Delivery year	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040
Counterfactual case													
VLSFO/MGO	44.2	44.8	45.4	46.2	47.1	48.0	49.0	50.0	51.0	52.1	53.2	54.4	55.7
Bio-blended MGO	42.6	42.9	43.2	43.5	43.8	44.1	44.4	44.7	45.0	45.3	45.6	45.9	46.2
Clean fuels													
Bio-Methanol	49.8	49.6	49.3	49.3	49.3	49.3	49.3	49.3	49.5	49.6	49.7	49.8	49.9
E-Methanol	53.2	52.4	51.7	51.1	50.6	50.1	49.6	49.2	48.9	48.7	48.6	48.5	48.4
Mix-Methanol	50.0	49.8	49.5	49.5	49.4	49.3	49.2	49.0	49.0	48.9	48.8	48.8	48.8
H2	72.2	71.1	70.0	68.9	67.8	66.7	65.7	64.7	63.7	62.7	61.9	61.7	61.6

For retrofitted vessels, the annual TCO is comparable to that of newbuild vessels. As a result, the break-even point is expected to be similar, or, in the case of hydrogen, delayed by one to two years.

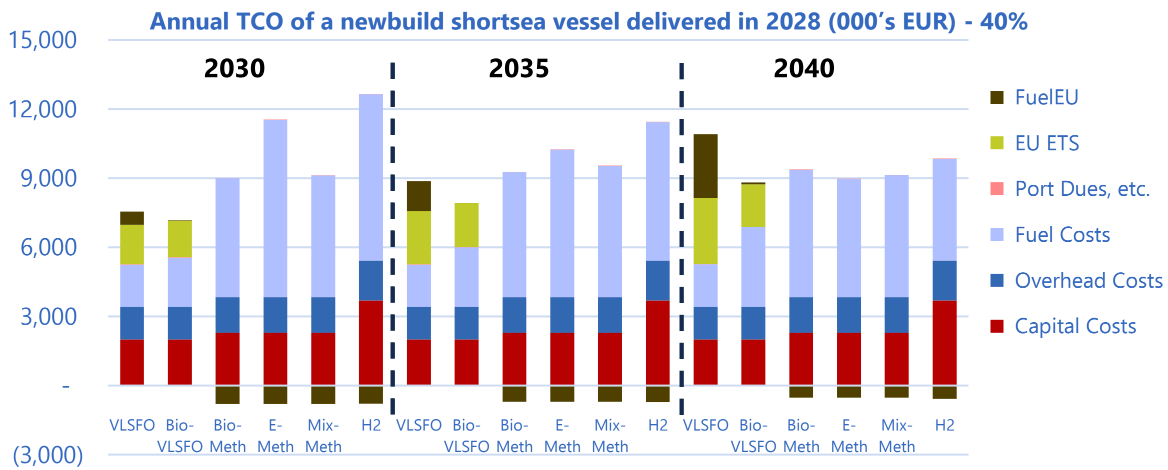
Subsidy percentages

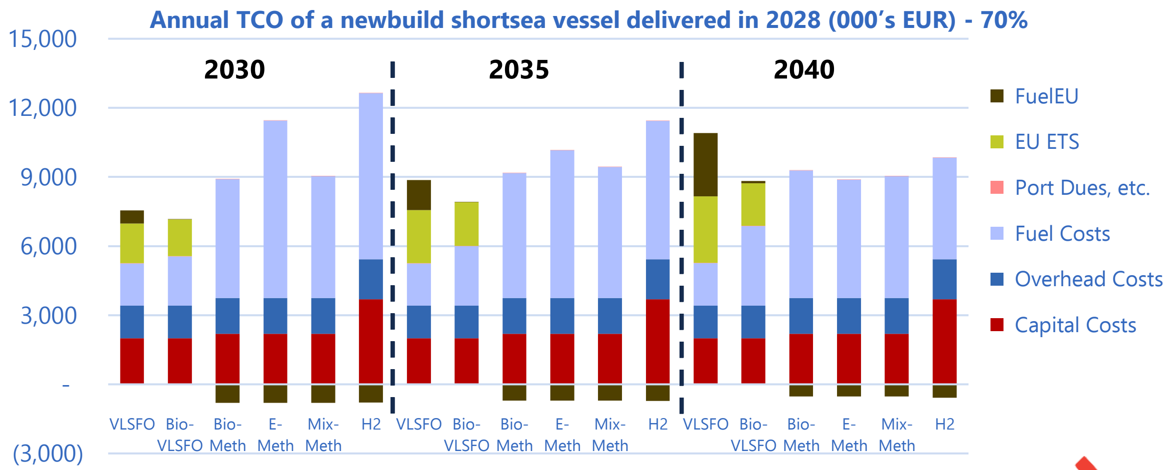
TCO - Shortsea vessel – Subsidy

- This slide shows the total costs of ownership (TCO) per year of a 2,000 TEU shortsea vessel. It shows the TCO for the four types of fuel:
  - VLSFO/MDO (conventional)
  - Bio-blended VLSFO
  - Bio- , E-methanol, and the mix of these.
  - Hydrogen
- For three moments in time; 2030, 2035 and 2040
- Under a subsidy percentage of 40% and 70% of the additional CAPEX.
- The subsidy is incorporated into the capital cost component shown in the chart.
- Only with a 40% subsidy percentage, the newbuild and retrofit shortsea vessel subsidies do not exceed the 4.0 mln subsidy cap. All other cases reach the 4.0 mln subsidy cap.
- TCO figures are shown for newbuild only. Retrofit TCO is not separately calculated, as costs are broadly similar with retrofit somewhat more expensive. Therefore, the newbuild case represents the lower bound of the TCO gap and provides the conservative justification for the subsidy level.
- A full breakdown of additional CAPEX, subsidy amounts, and discounted subsidy values per build year for shortsea vessels is provided in the annex (pp. 31–32).

Subsidy amount for 40% and 70% of add. CAPEX of a shortsea vessel delivered in 2028

Fuel type	Newbuild		Retrofit	
Subsidy	*40%*	*70%*	*40%*	*70%*
Methanol	2.8 mln	4.0 mln	3.4 mln	4.0 mln
Hydrogen	4.0 mln	4.0 mln	4.0 mln	4.0 mln





Break even points per vessel delivery year – Shortsea Vessel – CAPEX Subsidy

- This slide presents the total discounted TCO (in millions of euros) over a 15-year period for different vessel delivery years and 40% and 70% subsidy on the additional CAPEX.
- The maximum subsidy is 4.0 million for deliveries up to and including 2030, and 3.5 million for deliveries from 2031 onwards.
- With a 40% subsidy, methanol powered shortsea vessels in operation from 2034 have a lower discounted TCO than the bio-blended VLSFO vessels.
- Hydrogen powered shortsea vessels that are operated from 2037 have a lower TCO than bio-blended VLSFO vessels, assuming 40% subsidy on the additional CAPEX.
- With a 70% subsidy, methanol powered shortsea vessels in operation from 2033 have a lower discounted TCO than the bio-blended VLSFO vessels.
- Hydrogen powered shortsea vessels that are in operation from 2037 have a lower TCO than bio-blended VLSFO vessels, assuming 70% subsidy on the additional CAPEX.
- TCO figures are shown for newbuild only. Retrofit TCO is not separately calculated, as costs are broadly similar with retrofit somewhat more expensive. Therefore, the newbuild case represents the lower bound of the TCO gap and provides the conservative justification for the subsidy level.
- A full breakdown of additional CAPEX, subsidy amounts, and discounted subsidy values per delivery year for shortsea vessels is provided in the annex (pp. 32–33).

Discounted TCO of a shortsea vessel for a 15-year period per year of delivery (mln EUR) – 40% add. CAPEX subsidy

Delivery year	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040
Counterfactual case													
VLSFO/MGO	62.7	64.8	66.8	69.3	72.0	74.9	78.0	81.2	84.3	87.7	91.2	95.1	99.2
Bio-blended VLSFO	57.7	58.9	59.9	61.2	62.5	63.8	65.2	66.6	68.1	69.7	71.3	72.9	74.7
Clean fuels													
Bio-Methanol	63.0	63.3	63.6	64.1	64.5	64.9	65.4	65.8	66.2	66.5	66.9	67.3	67.7
E-Methanol	74.7	73.1	71.5	70.0	68.6	67.4	66.2	65.2	64.4	63.7	63.1	62.8	62.7
Mix-Methanol	63.9	64.1	64.3	64.5	64.7	64.7	**64.7**	64.6	64.5	64.3	64.1	63.9	63.9
H2	82.5	80.5	78.5	77.0	75.1	73.3	71.6	69.9	68.4	**67.0**	65.9	65.0	64.4

Discounted TCO of a shortsea vessel for a 15-year period per year of delivery (mln EUR) – 70% add. CAPEX subsidy

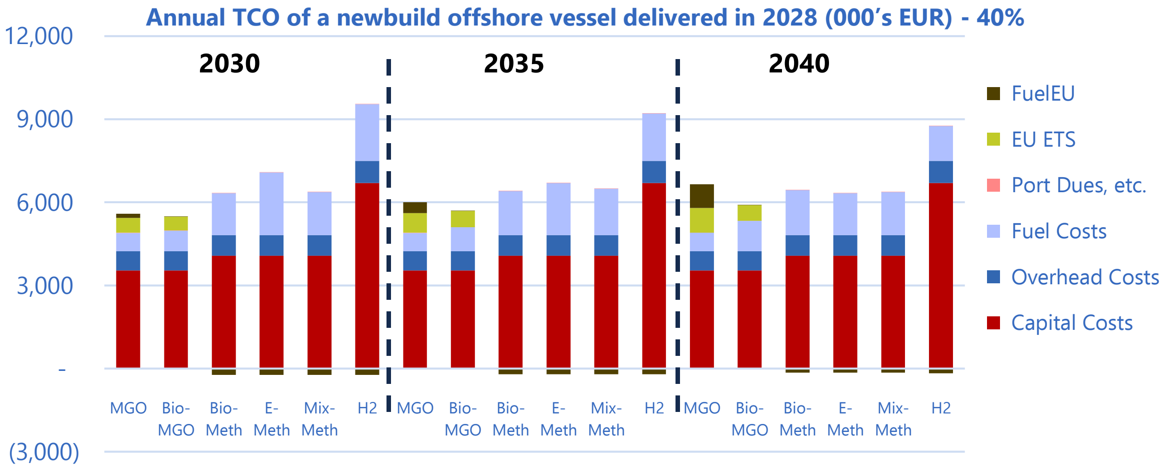
Delivery year	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040
Counterfactual case													
VLSFO/MGO	62.7	64.8	66.8	69.3	72.0	74.9	78.0	81.2	84.3	87.7	91.2	95.1	99.2
Bio-blended VLSFO	57.7	58.9	59.9	61.2	62.5	63.8	65.2	66.6	68.1	69.7	71.3	72.9	74.7
Clean fuels													
Bio-Methanol	61.9	62.1	62.3	63.2	63.6	64.0	64.3	64.7	65.1	65.5	65.8	66.2	66.6
E-Methanol	73.6	71.9	70.2	69.1	67.7	66.4	65.2	64.2	63.3	62.6	62.1	61.7	61.6
Mix-Methanol	62.8	62.9	63.0	63.6	63.7	**63.7**	63.7	63.5	63.4	63.2	63.0	62.9	62.8
H2	82.5	80.5	78.5	77.0	75.1	73.3	71.6	69.9	68.4	**67.0**	65.9	65.0	64.4

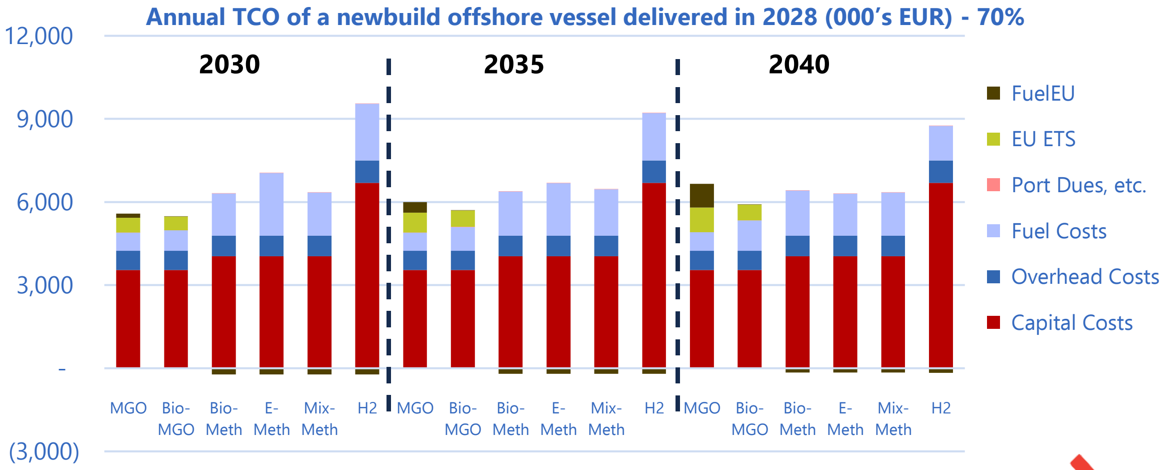
TCO - Offshore vessel - Subsidy

- This slide shows the total costs of ownership (TCO) per year of a 6,500 GT offshore vessel. It shows the TCO for the four types of fuel:
  - VLSFO/MDO (conventional)
  - Bio-blended VLSFO
  - Bio- , E-methanol, and the mix of these.
  - Hydrogen
- For three moments in time; 2030, 2035 and 2040
- The subsidy is incorporated into the capital cost component shown in the chart.
- Under a subsidy percentage of 40% and 70% of the additional CAPEX.
- Only with a 40% subsidy percentage, the newbuild offshore vessel subsidies do not exceed the 4.0 mln subsidy cap. All other cases reach the 4.0 mln subsidy cap.
- TCO figures are shown for newbuild only. Retrofit TCO is not separately calculated, as costs are broadly similar with retrofit somewhat more expensive. Therefore, the newbuild case represents the lower bound of the TCO gap and provides the conservative justification for the subsidy level.
- A full breakdown of additional CAPEX, subsidy amounts, and discounted subsidy values per delivery year for shortsea vessels is provided in the annex (pp. 33–34).

Subsidy amount for 40% and 70% of add. CAPEX of an offshore vessel delivered in 2028

Fuel type	Newbuild		Retrofit	
Subsidy	*40%*	*70%*	*40%*	*70%*
Methanol	3.7 mln	4.0 mln	4.0 mln	4.0 mln
Hydrogen	4.0 mln	4.0 mln	4.0 mln	4.0 mln





Break even points per vessel delivery year – Offshore Vessel – CAPEX Subsidy

- This slide presents the total discounted TCO (in millions of euros) over a 15-year period for different vessel delivery years and 40% and 70% subsidy on the additional CAPEX.
- The maximum subsidy is 4.0 million for deliveries up to and including 2030, and 3.5 million for deliveries from 2031 onwards.
- With a 40% subsidy, methanol powered vessels achieve lower TCO than the bio-blended MGO vessel in 2040. Hydrogen powered offshore vessels do not achieve lower TCO than the bio-blended MGO vessels.
- With a 70% subsidy, methanol powered offshore vessels in operation from 2039 have a lower discounted TCO than the bio-blended MGO vessels.
- For hydrogen powered offshore vessels, under a 70% subsidy break-even is not achieved.
- TCO figures are shown for newbuild only. Retrofit TCO is not separately calculated, as costs are broadly similar with retrofit somewhat more expensive. Therefore, the newbuild case represents the lower bound of the TCO gap and provides the conservative justification for the subsidy level.
- A full breakdown of additional CAPEX, subsidy amounts, and discounted subsidy values per delivery year for shortsea vessels is provided in the annex (pp. 34–35).

Discounted TCO of an offshore vessel for a 15-year period per year of delivery (mln EUR) – 40% add. CAPEX subsidy

Delivery year	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040
Counterfactual case													
VLSFO/MGO	44.2	44.8	45.4	46.2	47.1	48.0	49.0	50.0	51.0	52.1	53.2	54.4	55.7
Bio-blended MGO	42.6	42.9	43.2	43.5	43.8	44.1	44.4	44.7	45.0	45.3	45.6	45.9	46.2
Clean fuels													
Bio-Methanol	46.4	46.3	46.3	46.3	46.4	46.5	46.5	46.6	46.7	46.8	46.9	47.0	47.1
E-Methanol	49.9	49.2	48.6	48.1	47.6	47.2	46.8	46.4	46.2	46.0	45.8	45.7	45.7
Mix-Methanol	46.7	46.6	46.5	46.5	46.5	46.4	46.3	46.2	46.2	46.1	46.1	46.0	**46.0**
H2	68.6	67.5	66.3	65.7	64.6	63.5	62.5	61.5	60.5	59.6	58.7	58.5	58.5

Discounted TCO of an offshore vessel for a 15-year period per year of delivery (mln EUR) – 70% add. CAPEX subsidy

Delivery year	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040
Counterfactual case													
VLSFO/MGO	44.2	44.8	45.4	46.2	47.1	48.0	49.0	50.0	51.0	52.1	53.2	54.4	55.7
Bio-blended MGO	42.6	42.9	43.2	43.5	43.8	44.1	44.4	44.7	45.0	45.3	45.6	45.9	46.2
Clean fuels													
Bio-Methanol	46.2	45.9	45.7	46.2	46.2	46.2	46.2	46.2	46.3	46.4	46.5	46.6	46.7
E-Methanol	49.6	48.8	48.0	47.9	47.4	46.9	46.4	46.0	45.8	45.5	45.4	45.3	45.2
Mix-Methanol	46.4	46.2	45.9	46.3	46.2	46.1	46.0	45.8	45.8	45.7	45.7	**45.6**	45.6
H2	68.6	67.5	66.3	65.7	64.6	63.5	62.5	61.5	60.5	59.6	58.7	58.5	58.5

Sensitivity Analysis

Sensitivity Analysis (1/2)

Key sensitivities

The future development of fuel prices is highly uncertain.

- **VLSFO/MGO:** the future price of oil products is very difficult to forecast. On the one hand, it is expected that with less future demand, prices will decrease on the long term. On the other hand, fossil fuel prices are highly sensitive to geopolitical and economic developments. Under such conditions, VLSFO and MGO prices may exceed the assumptions used in this analysis. On the TCO, higher VLSFO and MGO prices would bring the break-even point closer to today whereas lower prices would have an opposite effect.

- **Biofuels:** the main uncertainty in the price of bio-diesel and bio-methanol is the availability of feedstock. Besides, as many different sectors are making the transition to sustainable fuels, the question is how much of these fuels will become available to the maritime sector. This is the case for bio-diesel and bio-methanol. A shortage in supply of these biofuels, accompanied with higher prices, would delay break-even with conventional vessels.

- **E-methanol and hydrogen:** For e-methanol and hydrogen, the opposite applies. Production of these fuels is currently expensive, but it is expected that production prices will decrease as advancements in the production will take place. If the technology is developed faster than assumed in this study, and economies of scale are realised faster than assumed in this study, this has a downward effect on the TCO in the future. On the other hand, if economies of scale are delayed because of difficulties in the scale-up trajectory, this could result in higher TCOs for these fuels.

- **FuelEU surplus:** The price of FuelEU compliance surplus generated through pooling depends strongly on the balance between supply and demand, which is driven by the price of renewable fuels relative to FuelEU targets and surplus price. If renewable fuel prices are high, surplus units become scarce and their prices rise. Conversely, when prices are low, surplus units are more abundant and their prices decline. Given this uncertainty, higher surplus prices would benefit clean vessels and would bring the break-even point closer.

- **Weighted Average Cost of Capital (WACC):** The WACC used by vessel owners and shipping companies reflects their perception of investment risk. In the maritime sector, WACC is typically around 10%. However, investments in clean vessels may be perceived as higher risk, which can lead to a higher WACC. An increase in WACC would raise the required return on investment and shift the break-even point for these vessels (see p. 15–16) further into the future.

Sensitivity Analysis (2/2)

Emission and compliance cost sensitivities

Next to the FuelEU surplus sensitivity, there are more sensitivities related to compliance costs.

- **IMO NZF:** We expect that the implementation of the IMO NZF would accelerate the global adoption of renewable fuels. This could have two opposing effects. First, increased demand could outpace supply, leading to shortages and higher prices, particularly in the early years. Second, stronger demand could stimulate investment and scale-up in the production of renewable fuels. This would have a downward pressure on prices.

- **EU ETS (reserves):** On 1 April 2026, the European Commission proposed adjustments to the EU ETS reserve to stabilize the carbon market. Such adjustments could lead to lower EU ETS prices and thus lower TCO for conventional vessels, delaying the break-even point. Shipping companies may also factor in that similar regulatory adjustments cannot be ruled out under FuelEU Maritime, reinforcing a more cautious investment outlook.

Vessel sensitivities

- For shortsea vessels, TCO is driven mainly by fuel and compliance costs because annual fuel consumption is high. Changes in fuel prices and compliance costs can therefore materially shift the break-even year.
- For offshore vessels, TCO is more sensitive to CAPEX because fuel consumption is lower relative to total lifetime cost under the current operating profile. Changes in fuel and compliance costs therefore have less impact on the break-even year.
- In the shortsea and offshore shipping sector, there are numerous vessels below the 5,000GT size. These vessels are currently outside of the scope of both EU ETS and FuelEU Maritime. From the perspective of vessel owners and shipping lines, it could be beneficial to order vessels just below this threshold to bypass compliance costs. However, this depends on the operational requirements of the vessel, such as capacity.
- For other vessels, such as bulk tankers and Ro-Ro vessels, we expect that the TCO patterns will be like those of the shortsea vessels.

Vessel overhaul counterfactual

- A further realistic counterfactual applies to both cases in this study. Rather than acquiring a new vessel at the end of its operational lifetime, owners may opt for a major overhaul to extend service life. Since the vessel is already fully depreciated, capital costs are limited to the overhaul expenditure, and the higher operational costs of an older, less efficient hull are likely offset by avoiding the investment in a new compliant vessel. This is a particularly plausible response for the period 2030–2040, when FuelEU targets remain relatively modest. From 2040 onwards, as targets substantially increase, building and operating a clean vessel becomes more cost effective. As a result, this overhaul strategy would lower the counterfactual cost base, delay the break-even point, and defer the business case for new clean vessel investment until regulatory pressure makes it unavoidable.

The analysis on this and previous slides includes multiple sensitivities, making the projections more uncertain than typically seen in the industry. Given this elevated uncertainty, shipping companies are likely to adopt a more cautious, "wait-and-see" approach, compared to the more decisive investment behavior usually observed in capital allocation decisions.

LET'S TALK

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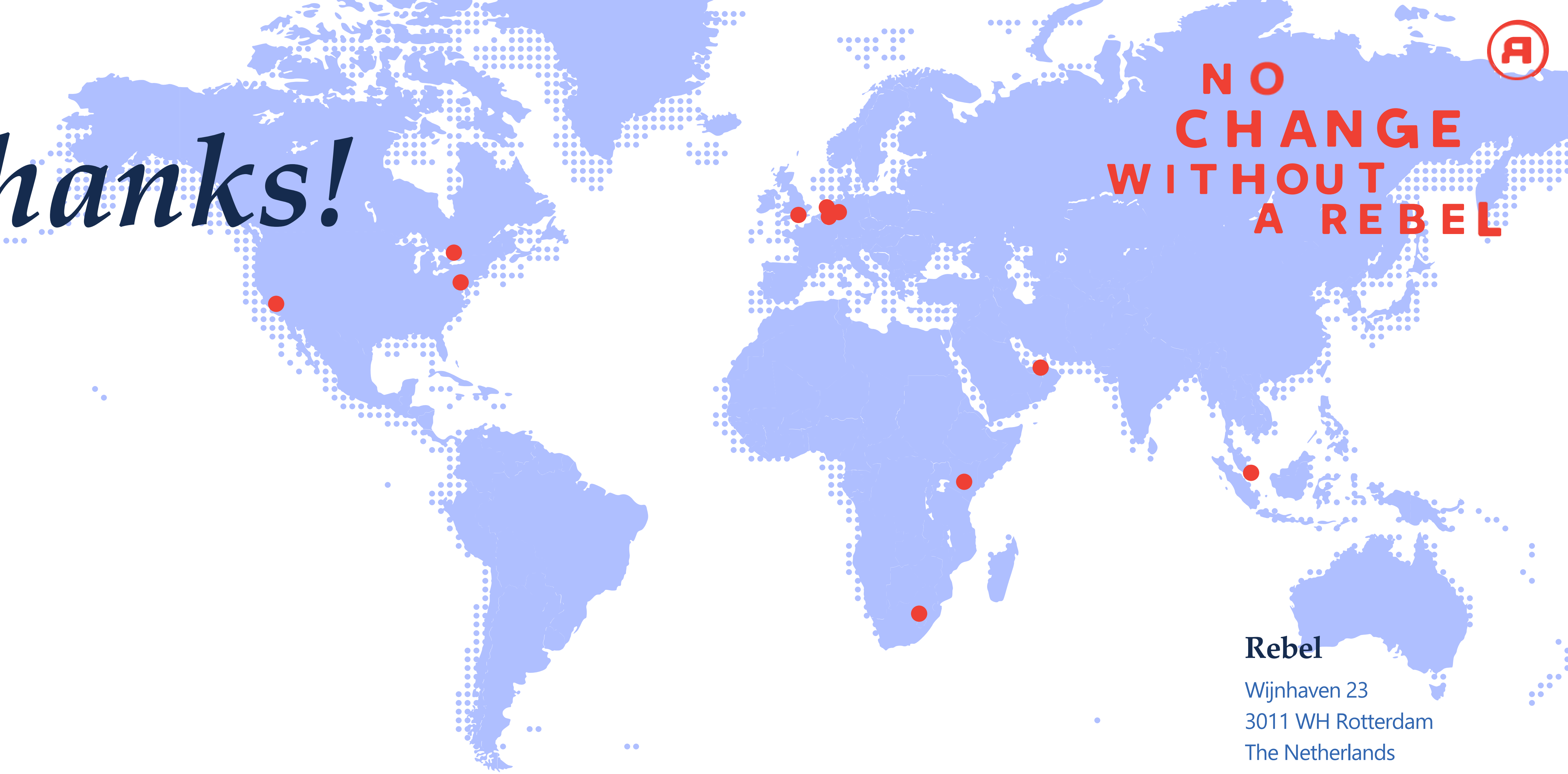

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Annexes

EU Maritime Fuel Regulations

EU regulation for decarbonizing shipping applies to all vessels above 5,000 GT entering EU ports, regardless of flag. The key regulation consists of two elements: Fuel EU and EU ETS

The system covers:

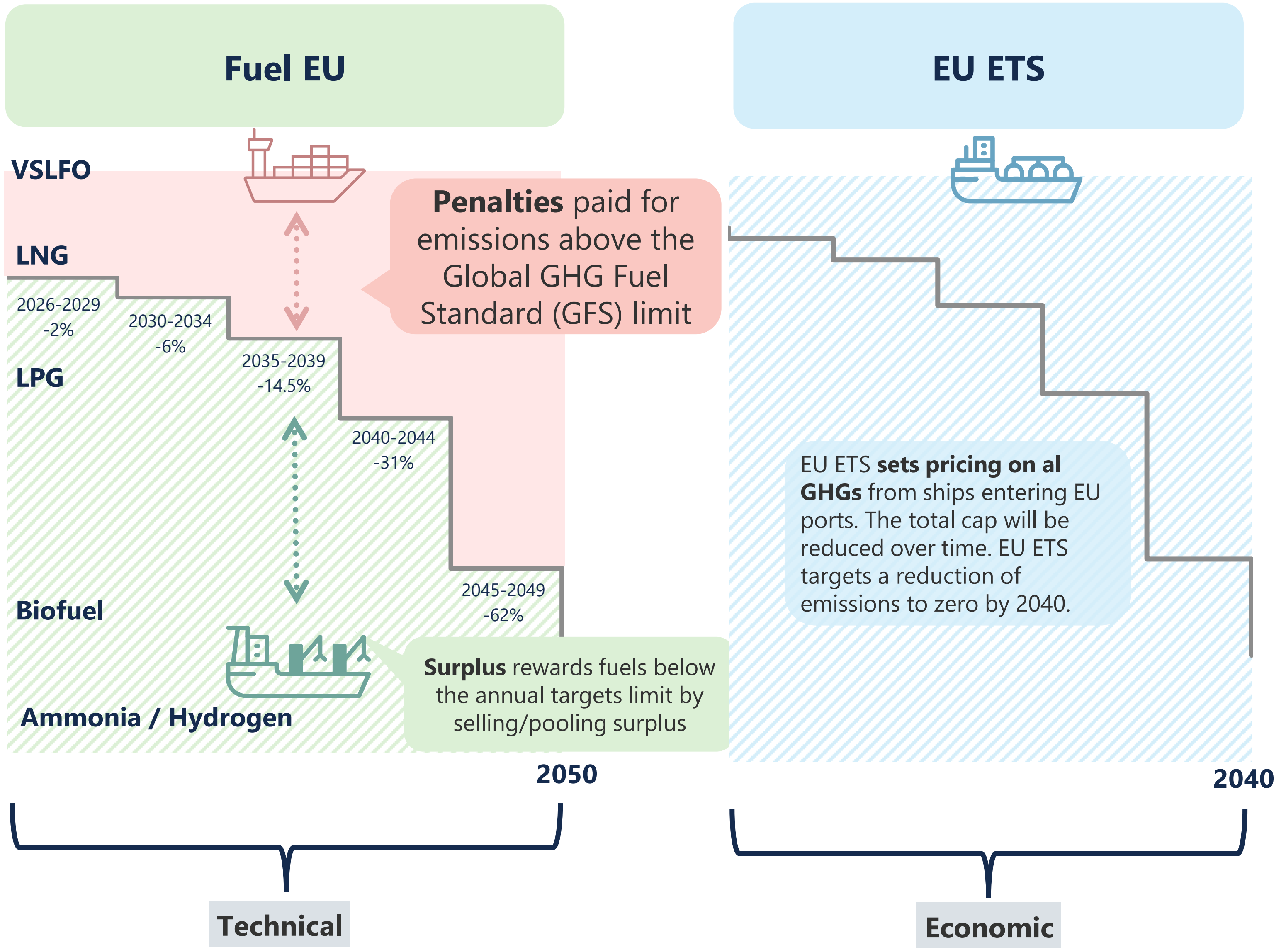
- 50% of emissions from voyages starting or ending outside EU
- 100% of emissions that occur between two EU ports and when ships are in EU ports
- Includes carbon dioxide (methane and nitrous oxide from this year)

Technical (**Fuel EU**)

- Limits GHG content of energy used by ships calling at EU ports – Well to Wake (WtW)
- Not complying will result in penalty by calculating the excess emissions back to an equivalent tonnage of VLSFO and applying a penalty of 2,400 EUR/tonne VLSFO
- Surplus below the GFS can be traded per ton CO2 avoided.

Economic (EU ETS)

- Pricing on all GHGs from ships – Tank to Wake (TtW)
- Max amount of GHG emissions under cap which will be reduced over time
- Covers 100% of reported emissions from 2026 onwards



Source: Edited from Maersk Mc-Kinney Moller Center for Zero Carbon Shipping

Additional costs and discounted subsidy value – Shortsea vessel

- The three tables show, per delivery year and fuel type, the additional CAPEX of a shortsea vessel relative to the bio-blended VLSFO counterfactual.
- The top table reports the nominal additional CAPEX, the middle table applies a 40% subsidy on that additional CAPEX, capped at EUR 4.0 mln.
- The bottom table shows the discounted (NPV) value of the subsidy, reflecting the typical 30%/50%/20% payout in years 0/1/3 at a 10% discount rate.
- The additional CAPEX declines over time as clean-fuel drivetrain costs decrease. As such, the nominal 4.0 mln cap is held constant, in real-terms the value decreases with each delivery year.
- TCO figures are shown for newbuild only. Retrofit TCO is not separately calculated, as costs are broadly similar with retrofit somewhat more expensive. Therefore, the newbuild case represents the lower bound of the TCO gap and provides the conservative justification for the subsidy level.

Additional CAPEX for a clean shortsea vessel per delivery year (mln EUR)

Delivery year	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040
Bio-Methanol	7.1	6.8	6.4	6.3	6.2	6.1	5.9	5.8	5.8	5.8	5.8	5.8	5.8
E-Methanol	7.1	6.8	6.4	6.3	6.2	6.1	5.9	5.8	5.8	5.8	5.8	5.8	5.8
Mix-Methanol	7.1	6.8	6.4	6.3	6.2	6.1	5.9	5.8	5.8	5.8	5.8	5.8	5.8
H2	27.0	26.4	25.8	25.1	24.5	23.8	23.2	22.5	21.9	21.3	20.6	20.0	19.3

CAPEX subsidy for a clean shortsea vessel per delivery year (mln EUR) – 40% add. CAPEX subsidy

Delivery year	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040
Bio-Methanol	2.8	2.7	2.6	2.5	2.5	2.4	2.4	2.3	2.3	2.3	2.3	2.3	2.3
E-Methanol	2.8	2.7	2.6	2.5	2.5	2.4	2.4	2.3	2.3	2.3	2.3	2.3	2.3
Mix-Methanol	2.8	2.7	2.6	2.5	2.5	2.4	2.4	2.3	2.3	2.3	2.3	2.3	2.3
H2	4.0	4.0	4.0	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5

Discounted subsidy for a clean shortsea vessel per delivery year (mln EUR) – 40% add. CAPEX subsidy

Delivery year	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040
Bio-Methanol	2.6	2.4	2.3	2.3	2.2	2.2	2.1	2.1	2.1	2.1	2.1	2.1	2.1
E-Methanol	2.6	2.4	2.3	2.3	2.2	2.2	2.1	2.1	2.1	2.1	2.1	2.1	2.1
Mix-Methanol	2.6	2.4	2.3	2.3	2.2	2.2	2.1	2.1	2.1	2.1	2.1	2.1	2.1
H2	3.6	3.6	3.6	3.2	3.2	3.2	3.2	3.2	3.2	3.2	3.2	3.2	3.2

Additional costs and discounted subsidy value – Shortsea vessel

- The three tables show, per delivery year and fuel type, the additional CAPEX of a shortsea vessel relative to the bio-blended VLSFO counterfactual.
- The top table reports the nominal additional CAPEX, the middle table applies a 70% subsidy on that additional CAPEX, capped at EUR 4.0 mln.
- The bottom table shows the discounted (NPV) value of the subsidy, reflecting the typical 30%/50%/20% payout in years 0/1/3 at a 10% discount rate.
- The additional CAPEX declines over time as clean-fuel drivetrain costs decrease. As such, the nominal 4.0 mln cap is held constant, in real-terms the value decreases with each delivery year.
- TCO figures are shown for newbuild only. Retrofit TCO is not separately calculated, as costs are broadly similar with retrofit somewhat more expensive. Therefore, the newbuild case represents the lower bound of the TCO gap and provides the conservative justification for the subsidy level.

Additional CAPEX for a clean shortsea vessel per delivery year (mln EUR)

Delivery year	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040
Bio-Methanol	7.1	6.8	6.4	6.3	6.2	6.1	5.9	5.8	5.8	5.8	5.8	5.8	5.8
E-Methanol	7.1	6.8	6.4	6.3	6.2	6.1	5.9	5.8	5.8	5.8	5.8	5.8	5.8
Mix-Methanol	7.1	6.8	6.4	6.3	6.2	6.1	5.9	5.8	5.8	5.8	5.8	5.8	5.8
H2	27.0	26.4	25.8	25.1	24.5	23.8	23.2	22.5	21.9	21.3	20.6	20.0	19.3

CAPEX subsidy for a clean shortsea vessel per delivery year (mln EUR) – 70% add. CAPEX subsidy

Delivery year	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040
Bio-Methanol	4.0	4.0	4.0	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5
E-Methanol	4.0	4.0	4.0	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5
Mix-Methanol	4.0	4.0	4.0	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5
H2	4.0	4.0	4.0	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5

Discounted subsidy for a clean shortsea vessel per delivery year (mln EUR) – 70% add. CAPEX subsidy

Delivery year	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040
Bio-Methanol	3.6	3.6	3.6	3.2	3.2	3.2	3.2	3.2	3.2	3.2	3.2	3.2	3.2
E-Methanol	3.6	3.6	3.6	3.2	3.2	3.2	3.2	3.2	3.2	3.2	3.2	3.2	3.2
Mix-Methanol	3.6	3.6	3.6	3.2	3.2	3.2	3.2	3.2	3.2	3.2	3.2	3.2	3.2
H2	3.6	3.6	3.6	3.2	3.2	3.2	3.2	3.2	3.2	3.2	3.2	3.2	3.2

Additional costs and discounted subsidy value – Offshore vessel

- The three tables show, per build year and fuel type, the additional CAPEX of an offshore vessel relative to the bio-blended VLSFO counterfactual.
- The top table reports the nominal additional CAPEX, the middle table applies a 40% subsidy on that additional CAPEX, capped at EUR 4.0 mln.
- The bottom table shows the discounted (NPV) value of the subsidy, reflecting the typical 30%/50%/20% payout in years 0/1/3 at a 10% discount rate.
- The additional CAPEX declines over time as clean-fuel drivetrain costs decrease. As such, the nominal 4.0 mln cap is held constant, in real-terms the value decreases with each delivery year.
- TCO figures are shown for newbuild only. Retrofit TCO is not separately calculated, as costs are broadly similar with retrofit somewhat more expensive. Therefore, the newbuild case represents the lower bound of the TCO gap and provides the conservative justification for the subsidy level.

Additional CAPEX for a clean offshore vessel per delivery year (mln EUR)

Delivery year	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040
Bio-Methanol	9.3	8.9	8.5	8.3	8.1	7.9	7.8	7.6	7.6	7.6	7.6	7.6	7.6
E-Methanol	9.3	8.9	8.5	8.3	8.1	7.9	7.8	7.6	7.6	7.6	7.6	7.6	7.6
Mix-Methanol	9.3	8.9	8.5	8.3	8.1	7.9	7.8	7.6	7.6	7.6	7.6	7.6	7.6
H2	35.5	34.6	33.8	33.0	32.1	31.3	30.4	29.6	28.7	27.9	27.0	26.2	25.4

CAPEX subsidy for a clean offshore vessel per delivery year (mln EUR) – 40% add. CAPEX subsidy

Delivery year	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040
Bio-Methanol	3.7	3.5	3.4	3.3	3.2	3.2	3.1	3.0	3.0	3.0	3.0	3.0	3.0
E-Methanol	3.7	3.5	3.4	3.3	3.2	3.2	3.1	3.0	3.0	3.0	3.0	3.0	3.0
Mix-Methanol	3.7	3.5	3.4	3.3	3.2	3.2	3.1	3.0	3.0	3.0	3.0	3.0	3.0
H2	4.0	4.0	4.0	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5

Discounted subsidy for a clean offshore vessel per delivery year (mln EUR) – 40% add. CAPEX subsidy

Delivery year	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040
Bio-Methanol	3.4	3.2	3.1	3.0	2.9	2.9	2.8	2.8	2.8	2.8	2.8	2.8	2.8
E-Methanol	3.4	3.2	3.1	3.0	2.9	2.9	2.8	2.8	2.8	2.8	2.8	2.8	2.8
Mix-Methanol	3.4	3.2	3.1	3.0	2.9	2.9	2.8	2.8	2.8	2.8	2.8	2.8	2.8
H2	3.6	3.6	3.6	3.2	3.2	3.2	3.2	3.2	3.2	3.2	3.2	3.2	3.2

Additional costs and discounted subsidy value – Offshore vessel

- The three tables show, per delivery year and fuel type, the additional CAPEX of an offshore vessel relative to the bio-blended VLSFO counterfactual.
- The top table reports the nominal additional CAPEX, the middle table applies a 70% subsidy on that additional CAPEX, capped at EUR 4.0 mln.
- The bottom table shows the discounted (NPV) value of the subsidy, reflecting the typical 30%/50%/20% payout in years 0/1/3 at a 10% discount rate.
- The additional CAPEX declines over time as clean-fuel drivetrain costs decrease. As such, the nominal 4.0 mln cap is held constant, in real-terms the value decreases with each delivery year.
- TCO figures are shown for newbuild only. Retrofit TCO is not separately calculated, as costs are broadly similar with retrofit somewhat more expensive. Therefore, the newbuild case represents the lower bound of the TCO gap and provides the conservative justification for the subsidy level.

Additional CAPEX for a clean offshore vessel per delivery year (mln EUR)

Delivery year	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040
Bio-Methanol	9.3	8.9	8.5	8.3	8.1	7.9	7.8	7.6	7.6	7.6	7.6	7.6	7.6
E-Methanol	9.3	8.9	8.5	8.3	8.1	7.9	7.8	7.6	7.6	7.6	7.6	7.6	7.6
Mix-Methanol	9.3	8.9	8.5	8.3	8.1	7.9	7.8	7.6	7.6	7.6	7.6	7.6	7.6
H2	35.5	34.6	33.8	33.0	32.1	31.3	30.4	29.6	28.7	27.9	27.0	26.2	25.4

CAPEX subsidy for a clean offshore vessel per delivery year (mln EUR) – 70% add. CAPEX subsidy

Delivery year	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040
Bio-Methanol	4.0	4.0	4.0	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5
E-Methanol	4.0	4.0	4.0	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5
Mix-Methanol	4.0	4.0	4.0	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5
H2	4.0	4.0	4.0	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5

Discounted subsidy for a clean offshore vessel per delivery year (mln EUR) – 70% add. CAPEX subsidy

Delivery year	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040
Bio-Methanol	3.6	3.6	3.6	3.2	3.2	3.2	3.2	3.2	3.2	3.2	3.2	3.2	3.2
E-Methanol	3.6	3.6	3.6	3.2	3.2	3.2	3.2	3.2	3.2	3.2	3.2	3.2	3.2
Mix-Methanol	3.6	3.6	3.6	3.2	3.2	3.2	3.2	3.2	3.2	3.2	3.2	3.2	3.2
H2	3.6	3.6	3.6	3.2	3.2	3.2	3.2	3.2	3.2	3.2	3.2	3.2	3.2