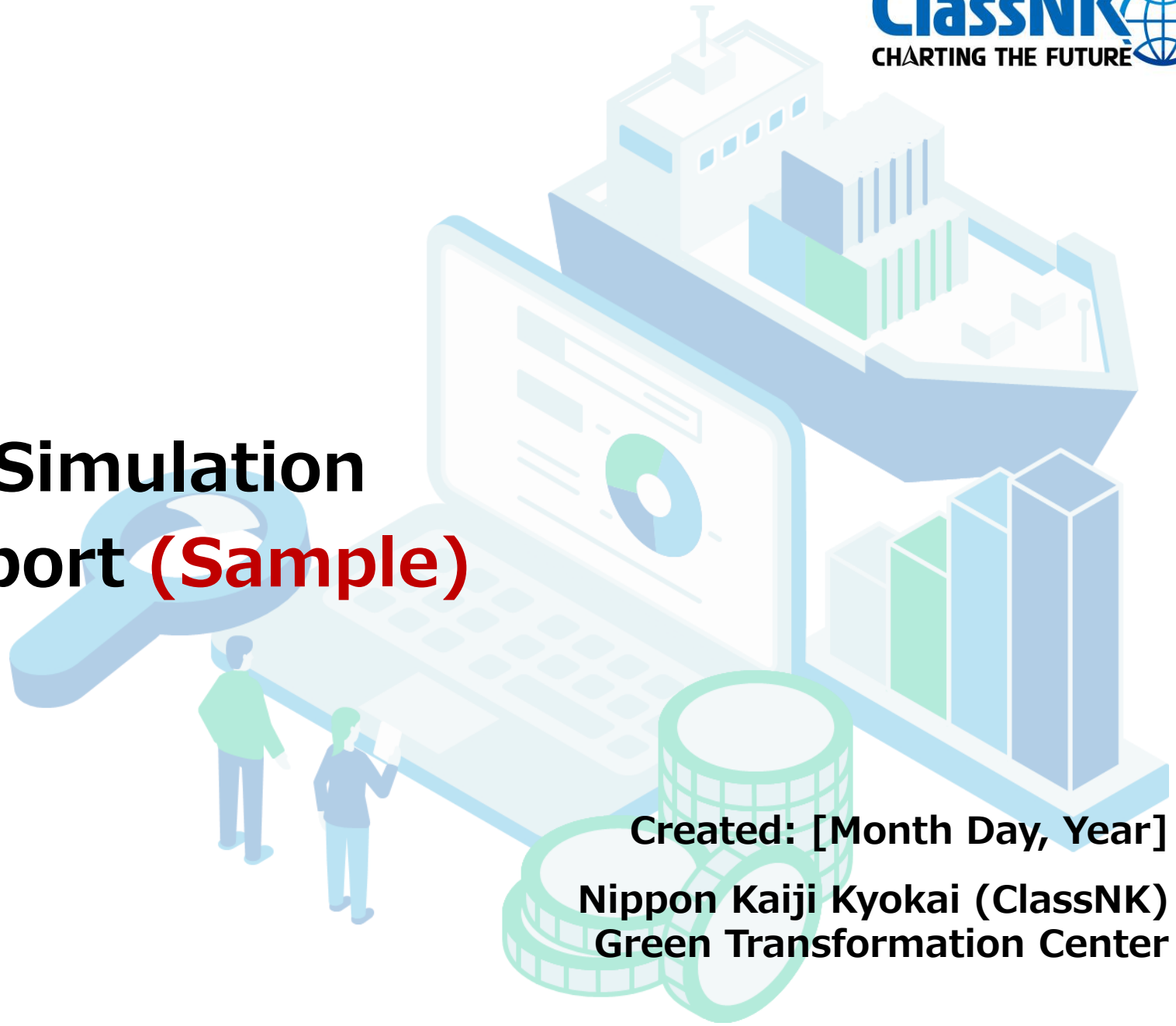
For [Company Name]

ClassNK Fleet Cost Simulation Cost Estimation Report (Sample)



Created: [Month Day, Year]

Nippon Kaiji Kyokai (ClassNK)
Green Transformation Center

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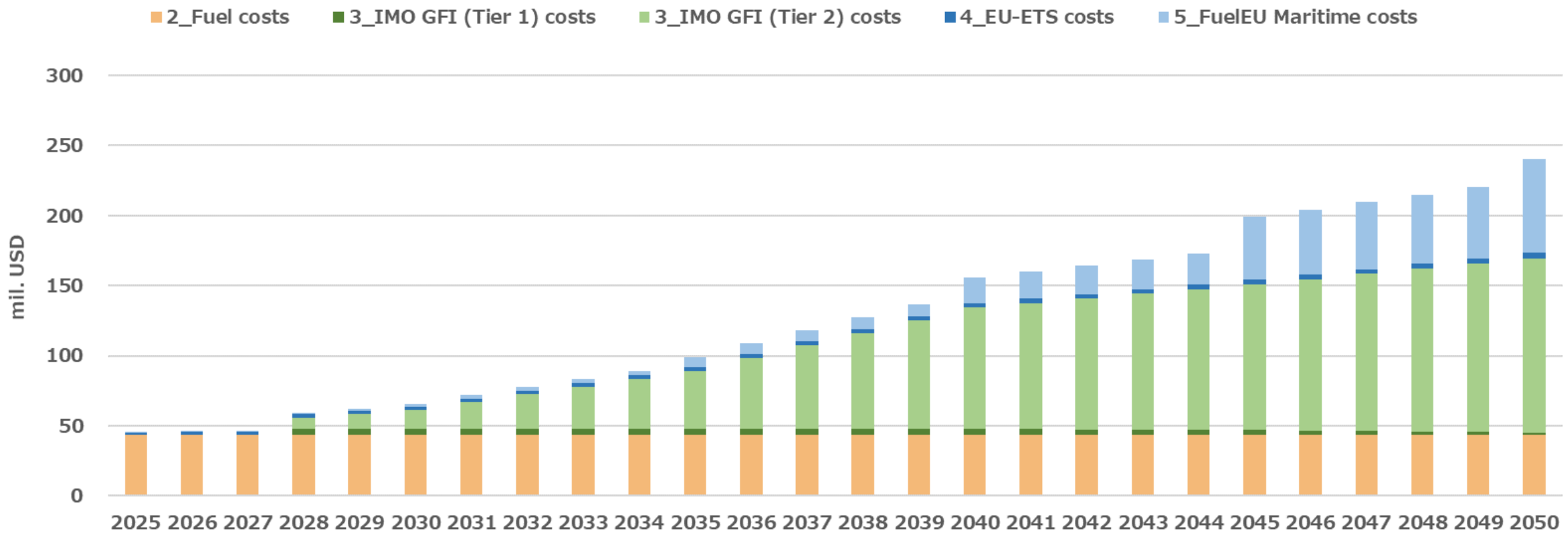


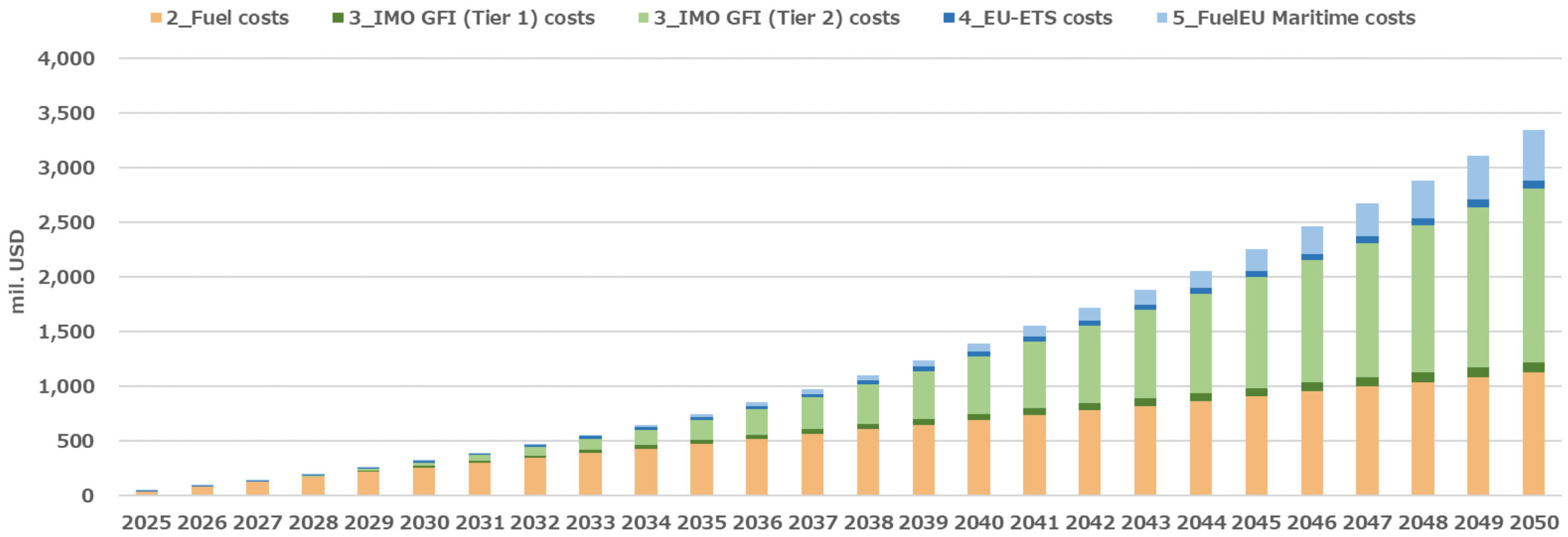
- In 2028, the total cost for the entire fleet (7 vessels) is USD 59,131,833, representing a 27.2% increase from 2027's total cost.
- If conventional fuel oil use continues, the fleet's total regulatory costs (IMO GFI, EU-ETS, FuelEU Maritime) will increase to a level comparable to fuel costs by 2033.
- If conventional fuel oil use continues, the fleet's total regulatory costs will increase to 4.5 times the fuel costs by 2050.

Estimation Results: Annual Total Costs (Details)

Unit: USD

Year	Fuel costs	IMO GFI (Tier 1) costs	IMO GFI (Tier 2) costs	EU-ETS costs	FuelEU Maritime costs	Total costs
2025	[illegible]	0	0	[illegible]	[illegible]	[illegible]
2026	[illegible]	0	0	[illegible]	[illegible]	[illegible]
2027	[illegible]	0	0	[illegible]	[illegible]	[illegible]
2028	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
2029	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
2030	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
2031	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
2032	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
2033	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
2034	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
2035	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
2036	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
2037	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
2038	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
2039	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
2040	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
2041	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
2042	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
2043	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
2044	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
2045	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
2046	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
2047	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
2048	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
2049	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
2050	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]

Estimation Results: Cumulative Total Costs



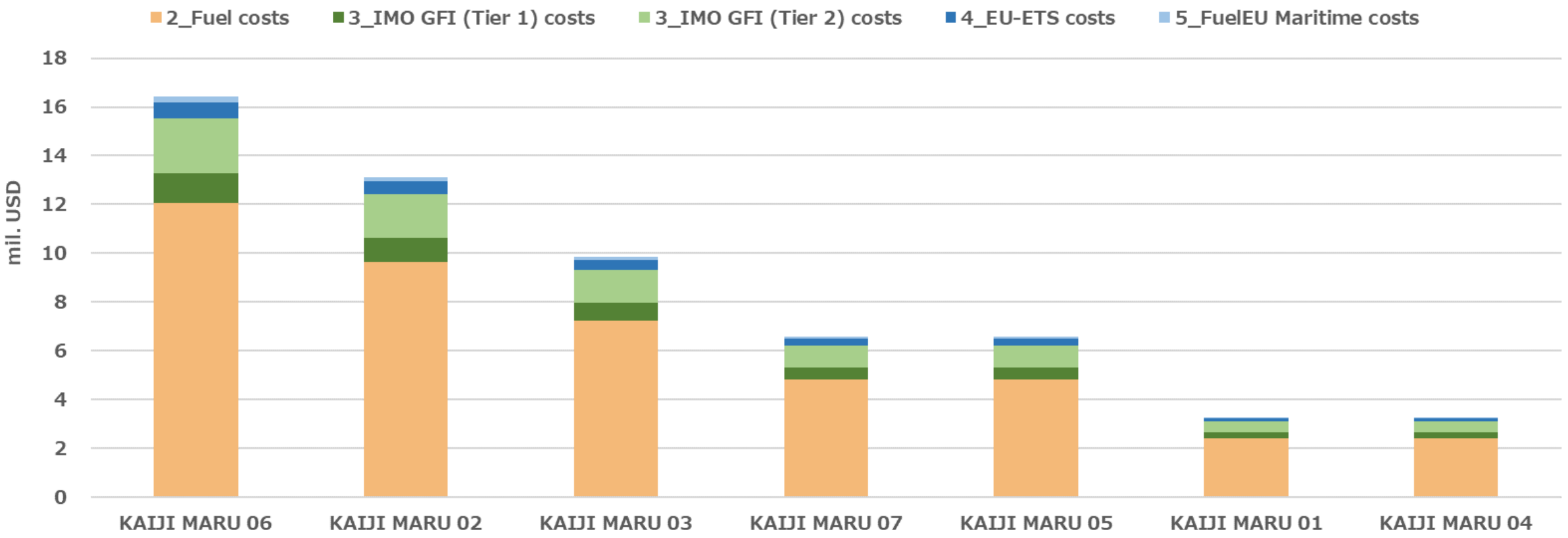
- The cumulative total cost of the entire fleet (7 vessels) up to each year is as follows.
  - ✓ 2030: USD [redacted]
  - ✓ 2040: USD [redacted]
  - ✓ 2050: USD [redacted]

Estimation Results: Cumulative Total Costs (Details)

Unit: USD

Year	Fuel costs	IMO GFI (Tier 1) costs	IMO GFI (Tier 2) costs	EU-ETS costs	FuelEU Maritime costs	Total costs
2025	[illegible]	0	0	[illegible]	[illegible]	[illegible]
2026	[illegible]	0	0	[illegible]	[illegible]	[illegible]
2027	[illegible]	0	0	[illegible]	[illegible]	[illegible]
2028	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
2029	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
2030	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
2031	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
2032	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
2033	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
2034	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
2035	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
2036	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
2037	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
2038	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
2039	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
2040	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
2041	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
2042	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
2043	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
2044	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
2045	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
2046	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
2047	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
2048	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
2049	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
2050	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]

Estimation Results: Total Costs In 2028 (By Vessel)



- MV "KAIJI MARU 06," which has the highest annual fuel consumption in the entire fleet, incurs the largest total cost.
- By reducing MV "KAIJI MARU 06's" annual GHG intensity through fuel conversion, it's possible to generate a greater surplus in compliance balance for IMO GFI and FuelEU Maritime.

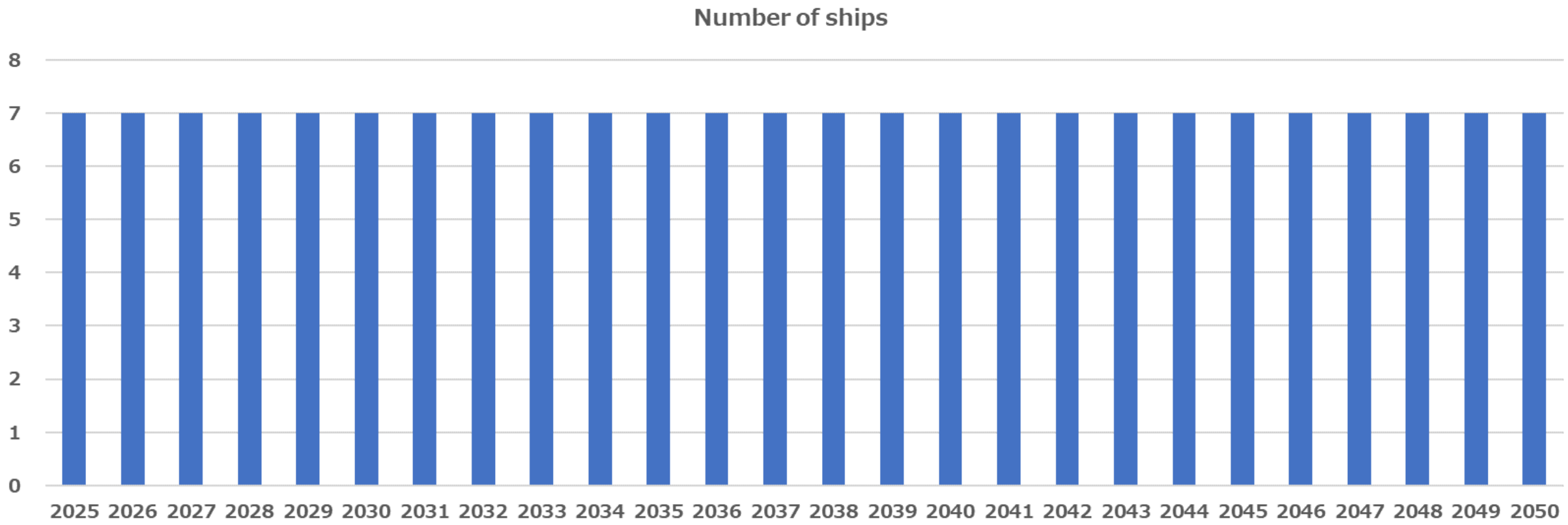
Estimation Results: Total Costs In 2028 (By Vessel)

Unit: USD

Ship name	Fuel costs	IMO GFI (Tier 1) costs	IMO GFI (Tier 2) costs	EU-ETS costs	FuelEU Maritime costs	Total costs
KAIJI MARU 06	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
KAIJI MARU 02	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
KAIJI MARU 03	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
KAIJI MARU 07	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
KAIJI MARU 05	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
KAIJI MARU 04	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
KAIJI MARU 01	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]

For Reference

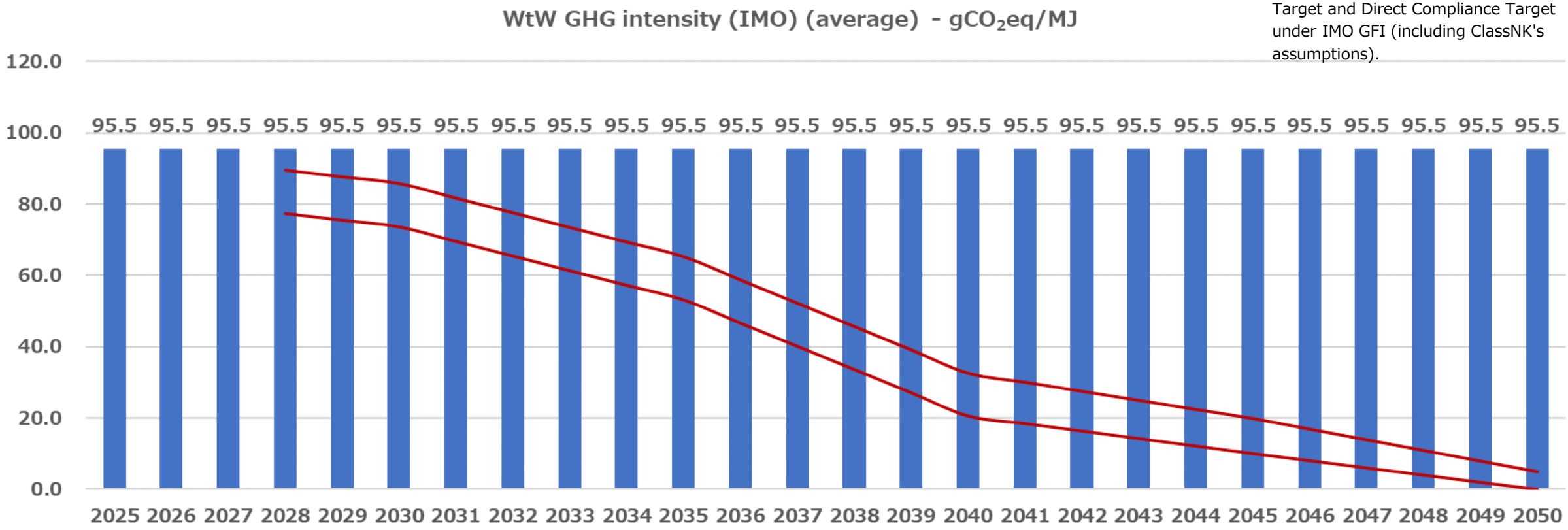
For Reference: Number of Ships (Entire Fleet)



- The number of ships was 7 at the time of the cost simulation.
- The number of ships is assumed to be maintained until 2050 for the estimation.
- Each vessel's lifespan is assumed to be 20 years, and vessels exceeding this lifespan are assumed to be replaced with new vessels of the same type, size, and fuel engine, with no energy efficiency improvement.

For Reference: Fleet GHG Intensity (IMO GFI)

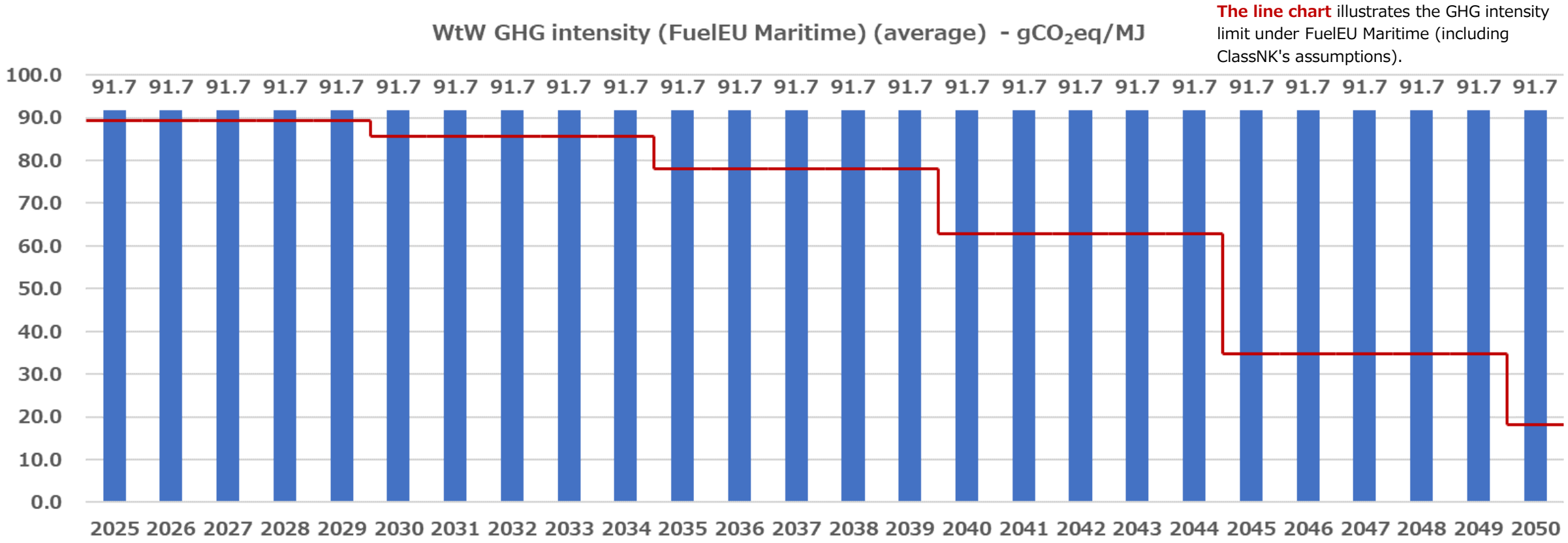
The line chart illustrates the Base Target and Direct Compliance Target under IMO GFI (including ClassNK's assumptions).



- The fleet's average GHG intensity was estimated based on each vessel's 2024 fuel consumption data (using conventional fuel oil only), assuming all vessels exclusively use HFO (Heavy Fuel Oil) with a sulfur content of 0.5% or less.
- If all vessels exclusively use HFO (with a sulfur content of 0.5% or less), the fleet's average GHG intensity under IMO GFI will be 95.48408 gCO2eq/MJ.
- By 2028, when IMO GFI is introduced, the fleet's average GHG intensity resulted in exceeding IMO GFI's limit.

For Reference: Fleet GHG Intensity (FuelEU Maritime)

The line chart illustrates the GHG intensity limit under FuelEU Maritime (including ClassNK's assumptions).



- The fleet's average GHG intensity was estimated based on each vessel's 2024 fuel consumption data (using conventional fuel oil only), assuming all vessels exclusively use HFO.
- If all vessels exclusively use HFO, the fleet's average GHG intensity under FuelEU Maritime will be 91.74420 gCO2eq/MJ.
- This results in the fleet's average GHG intensity exceeding FuelEU Maritime's limits by 2025, when FuelEU Maritime enter into force.

Assumptions

Assumptions: Fleet Data

No.	IMO No.	Ship name	Ship type	GT	DWT	Year built	Main engine	Fuel consumptions [tonne HFOeq]
1	1000001	KAIJI MARU 01	Bulk carrier	36,000	64,000	2015	Conventional fuel oil	5,000
2	1000002	KAIJI MARU 02	Containership	130,000	150,000	2018	Conventional fuel oil	20,000
3	1000003	KAIJI MARU 03	Crude oil tanker	150,000	300,000	2020	Conventional fuel oil	15,000
4	1000004	KAIJI MARU 04	Product/Chemical tanker	30,000	50,000	2020	Conventional fuel oil	5,000
5	1000005	KAIJI MARU 05	LPG carrier	53,000	60,000	2022	Conventional fuel oil	10,000
6	1000006	KAIJI MARU 06	LNG carrier	110,000	100,000	2025	Conventional fuel oil	25,000
7	1000007	KAIJI MARU 07	Vehicle carrier	80,000	30,000	2025	Conventional fuel oil	10,000

Assumptions: General

Simulation period	2025 – 2050
Vessel's lifetime	Until 2050
Fuel type and consumption	Based on 2024 fuel consumption data: ✓ Fuel type: same as 2024 ✓ Fuel consumption volume: same as 2024 (HFO base)
Annual energy efficiency improvement	Not considered
Use of pilot fuel	Not considered
IMO GFI	✓ Contribution unit price (Tier 2): Constant at 380 USD/tonneCO_2eq until 2050 ✓ Contribution unit price (Tier 1): Constant at 100 USD/tonneCO_2eq until 2050 ✓ Unit price for transferring Surplus Units to other vessels: 380 USD/tonneCO_2eq ✓ Reward: Not considered
Share subject to EU Regulations	10% of all voyages
EUA price (EU-ETS)	Starting at 70.0 EUR/tonneCO_2eq (2025), increasing by 2.0% year-over-year
Exchange rate	Constant at 0.89 EUR/USD

Assumptions: Fuel Prices

	2025	2030	2035	2040	2045	2050	備考
HFO	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Biodiesel (B30)	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Biodiesel (B100)	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
LNG	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
bio-methane	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
e-methane	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Gray methanol	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
bio-methanol	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
e-methanol	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Gray ammonia	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
e-ammonia	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]

- The fuel prices are reference values based on ClassNK's research and do not guarantee the accuracy of the fuel prices.
- [illegible]
- [illegible]
- [illegible]

Assumptions: Well-to-Wake GHG Intensity

	IMO GFI	FuelEU Maritime
HFO	95.48408 gCO_2eq/MJ	91.74420 gCO_2eq/MJ
Biodiesel (B30)	75.92110	70.67229
Biodiesel (B100)	22.11989	16.38352
LNG (Otto dual fuel slow speed)	85.33134	82.86808
bio-methane (Otto dual fuel slow speed)	28.70968	27.37945
e-methane (Otto dual fuel slow speed)	19.53968	18.16808
Gray methanol	102.86281	103.15377
bio-methanol	12.86734	13.14450
e-methanol	12.46734	12.95377
Gray ammonia	123.63978	123.95108
e-ammonia	12.63978	12.95108

Note: The Well-to-Wake GHG intensity values for each fuel are assumed to remain constant until 2050. The difference in Well-to-Wake GHG intensity values between IMO GFI and FuelEU Maritime is due to variations in the emission factors, calorific values, and Global Warming Potential (GWP) values applied during calculation. Regarding GWP values, IMO GFI uses IPCC AR5 values based on IMO LCA Guidelines, while FuelEU Maritime uses IPCC AR4 values based on FuelEU Maritime regulations.

Assumptions: Well-to-Wake GHG Intensity Limits

Year	IMO GFI				FuelEU Maritime	
	Base target	Reduction rate from baseline	Direct compliance target	Reduction rate from baseline	GHG intensity limits	Reduction rate from baseline
2028	89.56800 gCO_2eq/MJ	4.0 %	77.43900 gCO_2eq/MJ	17.0 %	89.33680 gCO_2eq/MJ	2.0 %
2029	87.70200	6.0	75.57300	19.0	89.33680	2.0
2030	85.83600	8.0	73.70700	21.0	85.69040	6.0
2031	81.73080	12.4	69.60180	25.4	85.69040	6.0
2032	77.62560	16.8	65.49660	29.8	85.69040	6.0
2033	73.52040	21.2	61.39140	34.2	85.69040	6.0
2034	69.41520	25.6	57.28620	38.6	85.69040	6.0
2035	65.31000	30.0	53.18100	43.0	77.94180	14.5
…	…	…	…	…	…	…
2040	32.65500	65.0	20.61930	77.9	62.90040	31.0
…	…	…	…	…	…	…
2045	19.96620	78.6	10.07640	89.2	34.64080	62.0
…	…	…	…	…	…	…
2050	5.03820	94.6	0.00000	100.0	18.23200	80.0

Note: The figures in red are ClassNK's assumptions (not yet decided by the IMO). For the values of the Base target and Direct compliance target in the IMO GFI for 2035 and beyond, linear interpolation is used based on ClassNK's assumptions.

Contact

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