



A real choice

by Alexa Ivy

Shipping faces an increasingly complex decarbonisation landscape. Owners must make tough decisions about which fuels will keep their vessels compliant and commercially competitive over the decades ahead. New analysis by Swiss marine power company WinGD and green energy producer Envision Energy suggests liquefied natural gas (LNG) continues to offer a compelling transition pathway today, while the economics of green ammonia are improving faster than many in the industry may realise.

As the International Maritime Organization's (IMO) target of net-zero emissions from shipping by or around 2050 approaches, owners ordering ships today already need a compliance pathway in mind. But the global regulatory framework that will steer the decarbonisation journey has yet to be finalised.

Shipowners must also attempt to account for fuel prices, bunker availability, and emerging clean technologies that will also impact the economics of climate compliance. With responsibilities to their investors, customers, and employees to run financially viable businesses, owners and operators need to see a clear business case to make the switch to green fuels.

Some pioneers are already confident they can make it work, evidenced by strong year-on-year growth in methanol- and ammonia-capable newbuild orders. But many smaller shipowners, operators, and charterers – who make up most of the market – remain cautious. Order books for vessels running on very low sulphur fuel oil (VLSFO) remain strong as owners delay investment decisions until there is greater clarity on fuel costs, availability, and future regulatory penalties or incentives.

Yet, waiting for complete certainty may prove just as costly as acting too soon. According to Andrea Lazzaro, Business Development at WinGD, investment decisions made today will increasingly determine a vessel's competitiveness throughout its operating life. "The industry is moving

from a question of technical feasibility to one of commercial timing," he says. "Shipowners now need to decide how much future carbon exposure they are willing to carry."

Even while the future remains uncertain

To help owner-operators weigh these decisions amid so much uncertainty, WinGD and green energy producer Envision Energy undertook an analysis of operating costs of green-fuelled vessels on the container and bulk trades between China and Australia. The findings from the *Renewable Fuel Economics* report suggest that, under even moderate global carbon-pricing scenarios, green ammonia could approach cost parity with conventional marine fuels significantly earlier than many shipowners expect.

The study used current pricing, including bunkering green ammonia in China, to model vessel performance using fuel consumption data, emissions abatement requirements, and tank-to-wake emissions based on the real-world performance of (dual-fuel) engines in WinGD's existing portfolio: ammonia- X-DF-A, methanol- X-DF-M, and LNG-fuelled X-DF.

"Decisions about vessel design and propulsion systems must often be made several years before delivery, even while the future regulatory and fuel landscape remains uncertain," Lazzaro points out. "Outside of Europe, there is currently no carbon pricing scheme in effect for greenhouse gases emitted by ships, but we do know that the IMO also intends to go in the direction of carbon

pricing if the proposed Net-Zero Framework is approved. It is important for shipowners to factor the impact of these measures into their decision-making."

Until recently, the price gap between green and conventional fossil fuels appeared too large to be covered by a carbon pricing fee, unless it were set at an unreasonably high level. However, as production capability scales up, the price trajectory of sustainable fuels such as green ammonia appears to be going steadily down. As the WinGD-Envision Energy study shows, it could reach a point where a moderate set of regulatory incentives (e.g., carbon pricing/reward system) could make it competitive on the marketplace against fossil fuels, offering a compelling business case for long-term environmental compliance to many owner-operators.

Ammonia's cost parity

The results show that LNG currently remains the most cost-competitive fuel option under prevailing market conditions. "For the time being, LNG makes sense as a reduced-carbon transitional fuel," explains Lazzaro. "For both our theoretical container ship and the bulkier, LNG offers a 5.0-6.0% OPEX saving on VLSFO-fuelled vessels over the first eight-year phase of the IMO framework." The possibility of blending increasing quantities of low-GHG bioLNG and eLNG into the mix, combined with bunk and claim or mass balancing, will allow LNG to remain an environmentally compliant fuel for a very long time.

Tab. 1. Consumables costs and IMO penalties (thousand \$) for a 16k TEU container ship in 2029-36

Year/fuel	VLSFO	LNG	eLNG	Green methanol	Green ammonia
2029	15,449	15,862	41,101	29,745	14,657
2030	16,186	16,056	41,801	30,455	15,379
2031	16,922	16,250	42,502	31,165	16,100
2032	18,542	16,726	44,043	32,727	17,687
2033	20,163	18,348	45,584	34,289	19,274
2034	21,783	19,970	47,125	35,851	20,862
2035	23,403	21,592	48,666	37,414	22,449
2036	25,023	23,214	50,206	38,976	24,036
Total	157,471	148,018	361,028	270,622	150,444

Source for all tabs.: WinGD and Envision Energy's Renewable Fuel Economics

Tab. 2. Consumables costs and IMO penalties (thousand \$) for a 210k dwt bulk carrier in 2029-36

Year/fuel	VLSFO	LNG	eLNG	Green methanol	Green ammonia
2029	5,088	5,247	13,546	9,704	4,305
2030	5,329	5,312	13,778	9,936	4,542
2031	5,571	5,376	14,010	10,168	4,778
2032	6,102	5,533	14,519	10,679	5,298
2033	6,633	6,070	15,029	11,190	5,818
2034	7,164	6,607	15,539	11,701	6,338
2035	7,696	7,143	16,049	12,212	6,858
2036	8,227	7,680	16,559	12,723	7,378
Total	51,810	48,968	119,029	88,313	45,315

Tab. 3. IMO surplus¹ income (thousand \$) for a 16k TEU container ship and for a 210k dwt bulk carrier in 2029-36

Year/fuel	Container			Bulk		
	eLNG	Green methanol	Green ammonia	eLNG	Green methanol	Green ammonia
2029	23,437	18,622	20,622	7,766	6,863	7,619
2030	22,737	17,912	19,900	7,534	6,631	7,382
2031	22,036	17,202	19,179	7,302	6,399	7,146
2032	20,495	15,640	17,592	6,793	5,888	6,626
2033	18,954	14,078	16,005	6,283	5,377	6,106
2034	17,414	12,516	14,417	5,773	4,866	5,586
2035	15,873	10,953	12,830	5,263	4,355	5,066
2036	14,332	9,391	11,243	4,754	3,844	4,546
Total	155,278	116,314	131,788	51,468	44,223	50,077

¹ Surpluses (the financial reward earned by vessels whose emissions fall below the regulatory baseline) were calculated using the [Global Center for Maritime Decarbonisation's GFI calculator](#)

However, green fuels may have the potential to reach a lower price point when developed at a large scale. Indeed, under the initial eight-year phase of the proposed IMO Net-Zero Framework, green ammonia approaches cost parity with VLSFO – even without the extra reward for zero- or near-zero-emission fuels proposed by IMO. “This analysis shows how regulatory levers and ship type can really impact fleet economics,” notes Lazzaro. “One thing is clear: the operating cost gap between green-powered vessels and conventionally fuelled vessels is closing.”

That gap narrows further beyond the initial eight-year phase. Even under a moderate regulatory trajectory, clean fuels – particularly green ammonia – begin to show big

net cost advantages over fossil-based fuels. For the first eight years, the modelled green ammonia-fuelled container vessel would cost slightly more to operate than an LNG-run ship, but across its operating life to 2050

it would cost 3.0% less. For a bulk carrier, green ammonia outperforms LNG on a cost basis even in the first phase – a result of the outsized impact of surplus-gathering against relatively smaller fuel costs (Tab. 3).

According to the analysis, a green ammonia-powered container vessel reduces OPEX by around \$21 million compared to an LNG-fuelled ship, or by more than \$50 million compared to a VLSFO-run vessel. For the ammonia bulk carrier, the respective savings are \$18 million and \$28 million.

“The question is, are these savings enough to offset the premium on a clean-fuelled newbuild?” inquires Lazzaro. “At current prices, this may be a marginal call. But over the longer term, we can expect those OPEX savings to ramp as the regulatory framework evolves and ammonia prices continue to fall.”

Hedging against future uncertainty

Green ammonia producers are confident that pricing will fall as production ramps up. Numbers from Envision Energy, which runs the world's largest green hydrogen and ammonia production facility in China's Gobi Desert, suggest the current price of green ammonia bunkering on the coast of China (\$710 per tonne) will reach parity with grey ammonia in a few years.

This convergence of two trends – falling green ammonia prices and emerging carbon pricing – helps build the business case for green ammonia today. Lazzaro says shipowners now have a real choice when it comes to making investments in new capacity. “Engines capable of running on ammonia represent not only a potential decarbonisation pathway but, over the longer term, a hedge against future regulatory and fuel-price uncertainty.”

Ultimately, the analysis suggests shipowners need not wait for perfect clarity. With green ammonia approaching cost parity sooner than expected – and regulatory frameworks likely to tighten – engine choices made today are hedging bets against tomorrow's economics. □

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