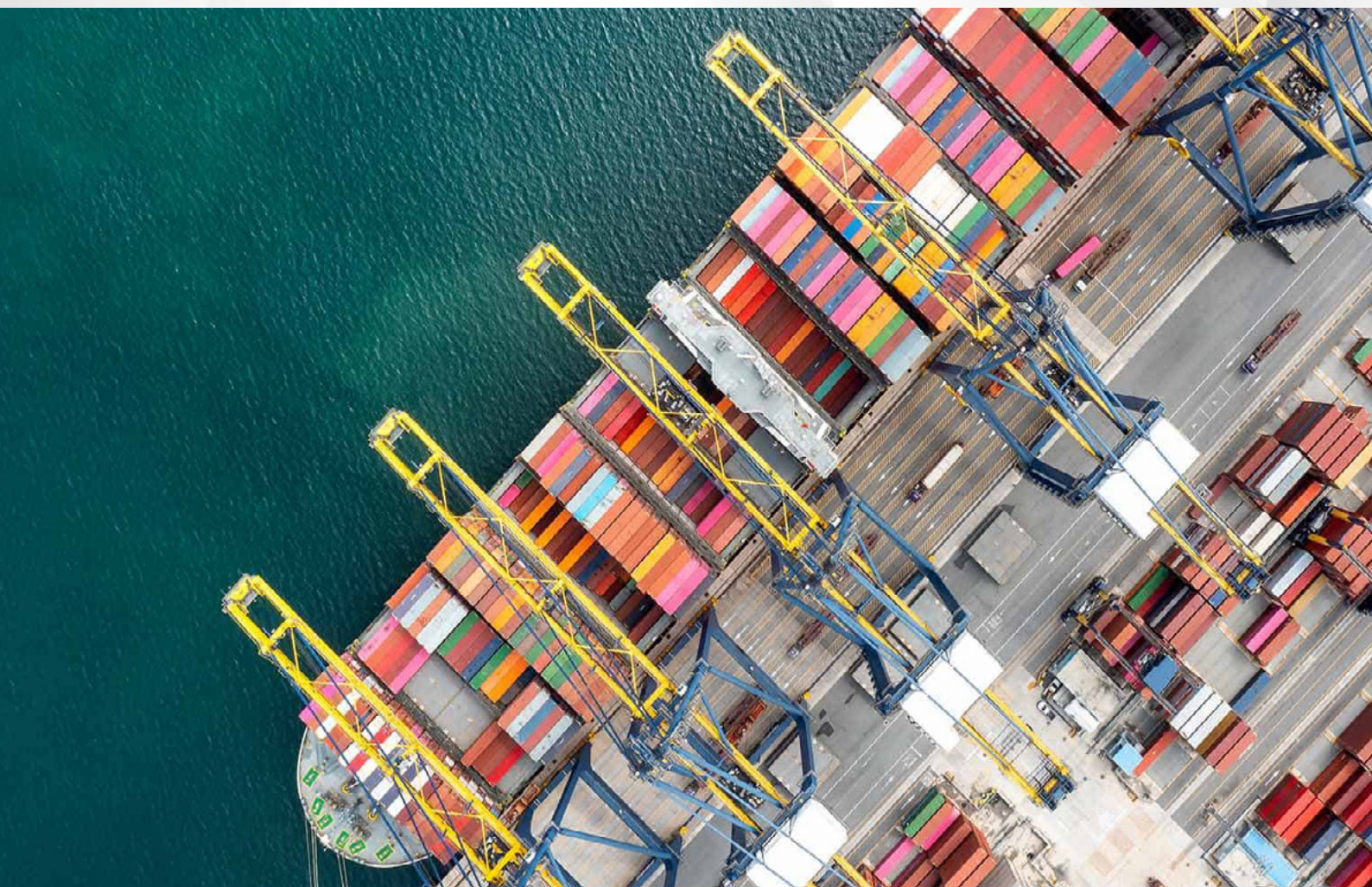


14TH – 16TH MAY 2024 | NOVOTEL AMSTERDAM CITY, AMSTERDAM, THE NETHERLANDS

BEYOND THE BASKET OF FUELS: MEETING AMBITIOUS CLIMATE GOALS



BEYOND THE BASKET OF FUELS: MEETING AMBITIOUS CLIMATE GOALS

Maritime operators are approaching a crossroads. Regulatory pressure to reduce emissions has steadily increased worldwide. On a global scale, the International Maritime Organization (IMO) has set a target of reducing greenhouse gas emissions by at least 50% compared to 2008 levels by 2050, known as IMO50. In the shorter term, IMO30, the industry body's 2030 target of cutting emissions by at least 20% by 2030, has become a regulatory driver across the shipping industry.

In Europe and the UK, 2035 will be pivotal. In 2021, the UK's sixth [carbon budget](#) included an emissions reduction target of 78% by 2035, incorporating shipping emissions for the first time. Meanwhile, in 2022, the [European Parliament](#) announced that greenhouse gas emissions released from the energy used by ships needed to be cut by 2% as of 2025, 14.5% as of 2035 and 80% by 2050, compared to 2020 figures.

The International Transport Forum's (ITF) 2018 report [Decarbonising Maritime Transport](#), produced, offered an ambitious but realistic plan for achieving almost full decarbonisation by 2035 by utilising existing technologies. It offered four potential pathways, projecting an 82-95% emissions reduction, and cited key contributors to meeting these goals as alternative fuels, renewable energy, technological advancements, and operational measures. However, one scenario assumed a low uptake of LNG, the report raised questions about LNG bunkering and cautioned that the release of unburnt methane could diminish environmental benefits.

Since 2018, many operators have switched to LNG-powered ships, despite ITF concerns.



According to IMO data, LNG consumption in shipping rose from 14.6 million tonnes in 2019 to 17.7 million tonnes in 2021. Despite the rise of LNG, it might not be enough to meet emission reduction needs beyond 2035. In particular, LNG boil-off, whereby LNG evaporates in the heat, can lead to fuel loss and increased emissions. But operators are looking at alternatives, such as ammonia, methanol, bio-LNG, bio-diesel, synthetic LNG and hybrid vessels, as regulations become more stringent and green targets draw closer.

Pablo Garcia, Fleet Projects Director, Balearia, sums up the ideal scenario for operators – instead of **“spreading the investigation and investment efforts”** with a complicated basket of fuels, it makes sense to focus on developing **“two or three clean options to concentrate and speed up the process”**, especially as investment in infrastructure is required for each fuel, which can take a long time.

OPERATOR AND INDUSTRY PERSPECTIVES ON ALTERNATIVE FUELS

Operators and industry bodies are already transitioning to cleaner fuels amid ambitious emissions targets and stringent regulations aimed at meeting the global 2050 net-zero target.

Balearia uses a mix of fuels, including dual-fuel LNG, hybrid diesel, very low sulphur fuel oil, and diesel. Garcia says that tests on bio-LNG have been promising – although it is still more expensive and less available than conventional LNG – but with e-LNG, it offers a pathway for dual-fuel LNG vessels. Additionally, he points out that blending diesel with bio-diesel aids regulatory compliance and helps manage shortages of other fuels.

However, Garcia explains that it is important to look at the bigger picture regarding the practical considerations of the fuel transition. He says that it would be **“perfect”** for operators to pay a reasonable price **“without having to do anything major to their vessels [and without] any major infrastructure investment.”**

With each fuel type requiring infrastructure, a multi-fuel solution can be problematic for ports, with cost pressures and space for facilities, including storage plants and bunkering, and different procedures needed for each fuel type, Garcia says.

Other challenges include the cost and carbon footprint of transporting fuel and ensuring that enough renewable electricity is generated to power homes, businesses and industry, as well as maritime fuel production and infrastructure.

The next round of IMO greenhouse gas negotiations is scheduled for March 2024. The International Chamber of Shipping (ICS) and the International Bunker Industry Association (IBIA) have submitted a joint proposal for a simplified global greenhouse gas fuel standard. The organisations have proposed a voluntary energy pooling compliance mechanism in case maritime fuel producers cannot supply alternative fuels in the quantities needed to meet increasingly stringent standards.

In a November 2023 [statement](#), Simon Bennett, Deputy Secretary General of the ICS, said that meeting decarbonisation targets was important **“not only for shipping, but for the world.”** He added that the joint proposal allowed for **“flexibility to enable compliance by ships should fuels of the required greenhouse gas intensity not always be available.”**

“The proposed method of pooled compliance would be a private arrangement between shipping companies and would avoid unnecessary administrative burden for governments, including developing countries’ administrations, whose support will be vital to move forward at IMO,” Bennett explains.

“The bunker industry fully supports an internationally agreed greenhouse gas fuel standard for 2030, which will help to create a global market for marine fuels with a reduced greenhouse gas intensity, including sustainable biofuels largely supplied as blends, which many existing ships are expected to use to enable them to comply,” adds Edmund Hughes, the IBIA representative at the IMO.

NAVIGATING REGULATORY CHALLENGES



As well as more stringent emissions targets for shipping in the UK and EU, other regions are setting similar goals for shipping operators. But these targets vary because the IMO does not have the authority to force countries to pass laws. In 2021, for example, former US climate envoy [John Kerry](#) announced plans to work with IMO countries to adopt the goal of achieving zero emissions in international shipping, a more ambitious goal than that of the IMO itself. However, [US targets](#) of achieving net zero by 2050 do not include shipping emissions.

Garcia describes regulation compliance for the maritime industry as **"quite clear": "We have to comply or we have to pay – if you are not complying with the emissions regulations, you pay and you continue operating."** But he adds that when penalties become unaffordable, there is a stronger incentive to switch fuels. Garcia estimates that by 2050, Balearia could pay 25 million euros per vessel per year in penalties if they did not switch fuels.

He is unsure if the 2050 net-zero target will be met: **"It's not only the marine sector that has to meet this target, [all industries] have the same target, and the easiest way is to electrify everything, where possible ... so renewable energy will be needed for the grid, where efficiency is higher, and only remaining renewable energy, if any, should be dedicated**

to producing synthetic fuels for maritime and aviation."

For example, Garcia says that to deliver one kilowatt of energy to a synthetic fuel ship's propeller, up to 10 kilowatts of renewable energy may be needed to produce the fuel required in the first place. Therefore, if renewable energy production cannot keep up with the needs of alternative fuel producers, as well as wider grid needs, mass electrification – and therefore regulatory compliance and meeting net-zero targets – may be challenging.

However, Garcia adds that the need to comply helps to **"shake the industry, so everybody is looking for solutions."** He cites hydrogen and carbon capture technology as two promising, but immature, examples, along with reasonably priced, readily available synthetic diesel, which makes sense for many operators as it does not require vessel modifications, and electrification, particularly for smaller vessels and shorter distances.

"But maybe it is time to reduce options and focus on a few possibilities," Garcia suggests. **"This will concentrate the investigation and investment efforts, and speed up the process of green fuel at reasonable price and with good availability, while allowing time to get fuel and infrastructure ready for operations."**

SEA-LNG, a multi-sector industry coalition established to demonstrate the benefits of LNG as a marine fuel, is optimistic about bio-LNG's prospects, especially in regard to infrastructure requirements. Its [July 2023 analysis](#) of LNG bunkering worldwide found that bio-LNG bunkers are available at almost 70 ports across Asia, North America and Europe, with the global fleet of 355 LNG-powered vessels capable of using bio-LNG without any modification. SEA-LNG found that bio-LNG can reduce greenhouse gas emissions by up to 80%, compared to marine diesel on a well-to-wake basis.

"The fact that bio-LNG is commercially available now and being used as a drop-in marine fuel by operators in Europe, North America and Asia, demonstrates the sustained contribution that the LNG pathway can make to decarbonising our industry," says Adi Aggarwal, General Manager of SEA-LNG. **"Climate change is a stock and flow problem, the longer our industry waits to start using low-carbon fuels, the tougher the decarbonisation challenge will be."**

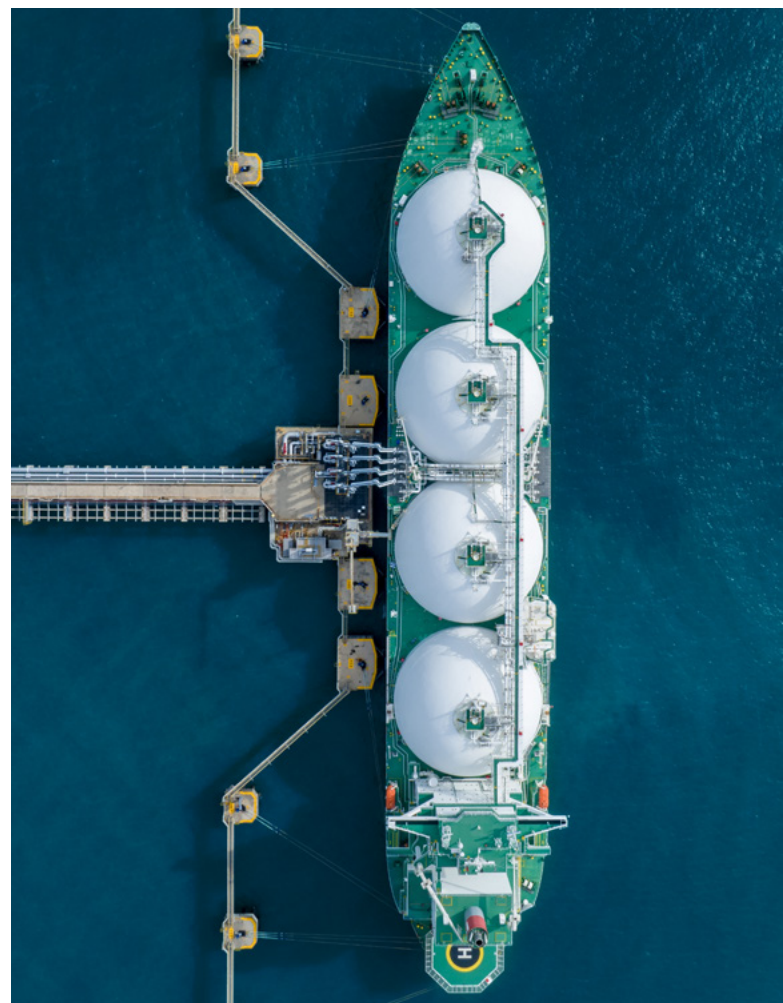
The EU's [provisional FuelEU Maritime Agreement](#) includes a trajectory for ships to reduce emissions by 6% as of 2030, up to 80% by 2050, along with a 2% renewable fuels usage target from 2034 if less than 1% of renewable maritime fuels are of non-biological origin by 2031.

Green shipping corridors offer another strategy for governments and shipping companies to work together. In December 2023, Singapore and six Japanese ports announced plans for a [green and digital shipping corridor](#) for alternative fuel vessels. However, strategies for staying on track could be unclear. A September 2023 [EOS Intelligence report](#) on meeting green targets by switching to alternative maritime fuels found that **"the feasibility of this change still remains to be assessed."**

While Garcia stresses the importance of alternative fuel developers in moving solutions forward and at scale, government interventions, such as the EU ETS, a European carbon trading

system that aims to cut greenhouse gas emissions by setting emissions limits and allowing companies to trade emissions, rights, will play a role in keeping operators on track for 2050 net-zero goals as it comes into effect next year.

However, an October 2023 [Accelleron survey](#) of 200 shipping industry decision-makers found that four out of 10 shipping companies complain about **"insufficient regulatory framework conditions and a lack of political support for the introduction of e-fuels."** With the survey also finding that 92% of shipping companies report a **"significant contribution in reducing greenhouse gas emissions"** and 68% seeing a **"competitive advantage"** in switching to cleaner fuels, there is potential for change, especially if governments and the private sector cooperate closely in the coming years.





CURRENT AND FUTURE FUEL OPTIONS

A range of fuels is being explored by operators to reduce the environmental impact. The choice of fuel depends on vessel type, operations, costs and infrastructure availability, with increasingly tighter environmental regulations and a growing need to mitigate the impact of climate change playing a crucial role in decision-making for operators.

Amid myriad choices, LNG is holding firm as a bridging fuel, even if its future beyond 2035, and certainly beyond 2050, is uncertain. It is not a zero-emissions fuel, infrastructure costs are high, especially in regions that are underserved by facilities for bunkering and refuelling, and long-term costs are influenced by market dynamics.

DNV's [Alternative Fuels](#) Insight (AFI) study for 2023 found that when examining new-build ships, LNG orders for 2023 were the most popular, while a considerable number of methanol orders were for retrofits. The containers segment was the most active for the LNG market with 48 orders, followed by car carriers at 40 and tankers at 30.

The DNV study found that 298 alternative fuel ships were ordered last year, representing an 8% year-on-year increase. Methanol orders increased, with 138 ordered in 2023. In the same period, 130 LNG-powered ships were ordered (down from 222 in 2022), along with 11 ammonia vessels. While LNG is cleaner than traditional fuels, it still emits CO₂. Ammonia emits no CO₂ during combustion but presents challenges, such as safe handling and toxicity.

Methanol derived from renewables burns cleanly, while sustainably produced green hydrogen is gaining attention for its emissions-free propulsion. Biofuels from sustainable sources are being explored, along with electric propulsion, including battery and hybrid solutions, for different sized vessels and route lengths.

Other options include wind-assisted technologies, such as sails, to harness wind energy and reduce fuel consumption.

CSL is an operator that has made great strides with its Great Lakes biofuel programme, reaching a cumulative 75,000 running hours on B100 biodiesel between 2019 and 2023. B100 biodiesel is produced from waste unrelated to food production. The operator has run eight vessels continuously on biodiesel for between five and eight months per year since 2021.

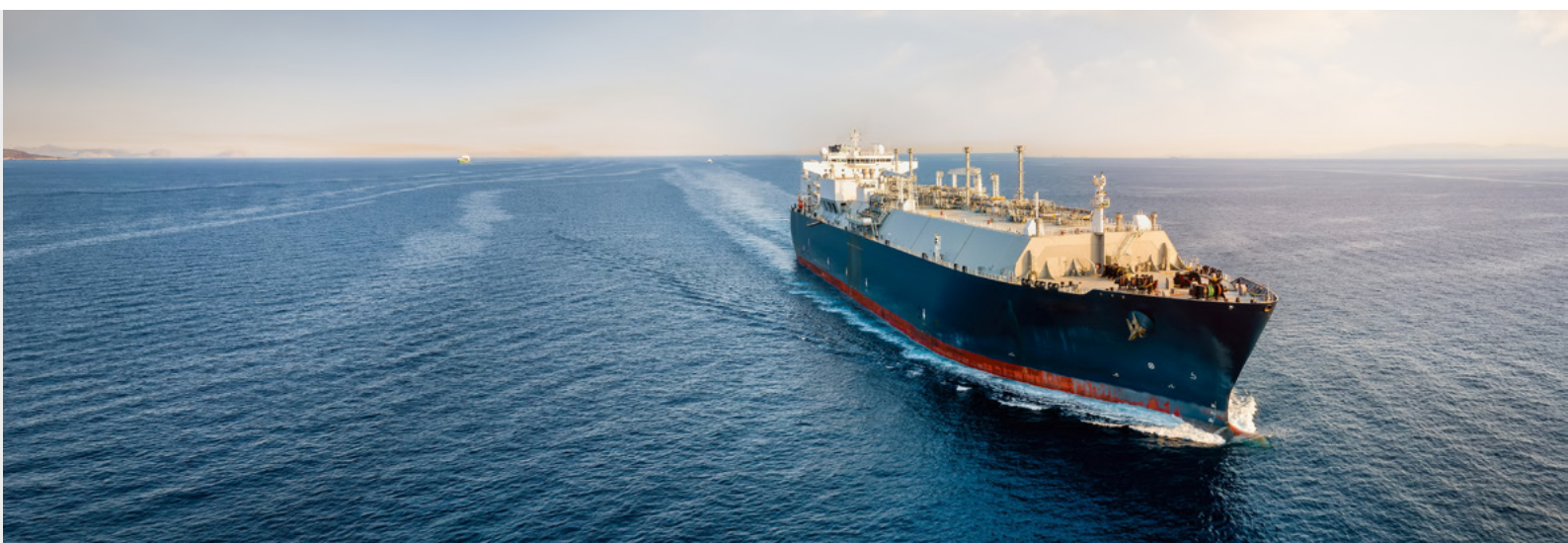
"In 2023, our biofuel fleet set a new record by using 16,400 metric tonnes of B100 biodiesel in a single season, marking our highest consumption to date," says Louis Martel, CSL president and CEO. **"This translates into an 80-to-90% reduction in greenhouse gas emissions, leading to the avoidance of 50,000 metric tonnes of CO2 across our Great Lakes fleet."**

In December 2023, CSL launched a 20-year partnership with Brighton Cement to build and operate a fully electric, battery-capable self-unloading vessel to support limestone operations in South Australia. Martel describes the vessel as **"groundbreaking"**, saying it will initially run on a hybrid, diesel and battery system that aims to replace 25% of diesel with electric power and reduce Scope 1 emissions by 40% compared to the ship it is replacing. The project aims to run the new ship entirely on electric power by 2031.

Looking ahead, Lloyd's Register Maritime Decarbonisation Hub's September 2023 report, [**The Future of Maritime Fuels**](#), outlined two potential paths for the future of maritime fuels – hydrogen-based fuels scenarios and biofuels scenarios.

Under the scenario whereby hydrogen-based fuels, such as blue and e-ammonia, capture between 20% and 60% of the market share and comprise up to 17.5% of global hydrogen demand by 2050, shipping would use more of these fuels than fertiliser or power generation sectors. The report concluded that while the technical potential to produce hydrogen is not a major concern, the ability to scale production at the required pace is challenging. However, increased maritime demand could drive development of infrastructure and scale up supply.

The biofuels-led scenario, including bio and renewable diesel and bio-LNG, has potential for growing market share, especially for bio-LNG, with a projected average of 34% by 2050. However, like hydrogen, meeting demand at scale may be a challenge. Despite this, the report describes bio-LNG as **"one of the leading candidates together with biodiesel overcoming logistic supply challenges, reaching zero or near-zero GHG status, and still being more competitive compared to other options."**



LONG-TERM GOALS

Investment on a global scale in both future fuel technologies and the development of the right infrastructure in the right places will be critical to meeting ambitious sustainability goals set by governments and decarbonising shipping.

A study by Persistence Market Research valued the global marine biofuel market at US\$3.5 billion in 2022, projected to expand with a CAGR of 7.5% between now and 2033, reflecting the bio-LNG ambitions in Lloyd's Register report.

With bio-LNG being more widely adopted across heavy-duty trucks, buses and ships, the drive to scale up production will become crucial to meeting climate goals, Lloyd's register found. The report called for **"significant expansion"** in bio-LNG production and for industry stakeholders to **"work together to identify opportunities for collaboration and overcome any barriers in the supply chain."**

Lloyd's Register concluded that fossil LNG can be **"a transition fossil fuel" for bio-LNG and other cleaner alternatives that "must be adopted within the decade"** because continued,

long-term use of fossil LNG **"is not in line with decarbonisation by 2050."**

Moving away from the basket of fuels is a practical way forward in the long term, according to Garcia: **"The whole idea of a basket of fuels sounds nice, but if there are too many choices, you simply cannot have the infrastructure for all those fuels in all ports, so it is better to try and narrow it down."**

Learning from LNG use is important, Garcia says, reflecting on how Balearia has used LNG since 2016 while observing that there is insufficient LNG infrastructure across many ports. Considerations, such as bunkering and transportation distances from storage plants to ports, need to be taken into account for investment and fuel development.

"A lot of big infrastructure needs a lot of space and, even if the space is there, the money and the time to develop it is still needed," Garcia says, summarising the key global challenge for developing and rolling out future maritime fuels at scale.

JOIN US AT:

NOVOTEL AMSTERDAM CITY,
AMSTERDAM, THE NETHERLANDS
14TH – 16TH MAY 2024