

Dropping 'e' in LNG

Dual-fuel vessel owners should look to liquefied e-methane as a drop-in bunker fuel to make the most out of emission compliance, argue **Jonathan Gaylor** of Integr8 Fuels and **Maximilian Matheis** of TURN2X



We already know that fossil LNG-fuelled vessels will pay less to comply with the EU's Emissions Trading System (EU ETS) than vessels fuelled with conventional high sulphur fuel oil (HSFO), very low sulphur fuel (VLSFO) and low sulphur marine gasoil (LSMGO) because LNG has a lower carbon factor. Many of these LNG-fuelled vessels will also be compliant with FuelEU Maritime (FEUM) greenhouse gas (GHG) intensity reduction targets until 2030, 2035 and 2040, depending on their engine type and methane slip.

Dual-fuel vessels have recently benefited from low fossil LNG prices, which have rendered it a more attractively priced bunker fuel option to VLSFO, LSMGO (Rotterdam and Singapore) and HSFO (Rotterdam).

Liquefied e-methane, or e-LNG, is almost five times more expensive than fossil LNG, but because you need so little of it per vessel to meet FEUM targets for 2030-2039, it will not add much to the total price of a blend of fossil LNG and e-LNG. Any compliance surplus from extra e-LNG consumption will be added on top of a neutral compliance balance and averaged out across your fleet or pool, or it can be banked for future years.

INCOMING LNG GLUT

After the LNG bunker market was shaken by Russia's invasion of Ukraine and skyward prices, it now faces a period of oversupply, low prices and soon a doubling of the global LNG-fuelled fleet.

Massive fossil LNG production and export growth from the US and Qatar is set to put LNG in a prime position to continue to trade at discounts to conventional VLSFO and LSMGO prices. Fresh output boosts from Malaysia, Australia and others also form part of a wave of new supply.

So, if fossil LNG prices keep at sustained discounts to conventional fuels going forward, these discounts can be used to cover a higher price paid for e-LNG, which can be used to meet more and more stringent GHG reduction targets.

MASS BALANCING AND VIRTUAL LIQUEFACTION

And you do not necessarily need to blend e-LNG into fossil LNG physically. The LNG industry is increasingly becoming familiar with mass balancing and virtual liquefaction – accounting techniques that remove the need to move physical e-LNG molecules out to every ship and other end-users.

A shipowner can order a certain amount of e-LNG in its LNG blend but will actually receive pure fossil LNG in its ship's fuel tank. The shipowner will pay for, say 1% e-LNG, which will be produced and distributed to another end-user that has paid for fossil LNG and would otherwise have consumed only fossil LNG. More e-LNG will be consumed on the balance as a result and costs can be cut in its distribution and liquefaction, which can be done virtually and boost the competitiveness of e-LNG.

PRICE EDGE ON LIQUID BUNKER FUEL BLENDS

Integr8 Fuels estimates that 2% used cooking oil methyl ester (UCOME) blended with 98% VLSFO is priced around \$610/mt with current price levels in the ARA.

If you blend e-LNG into the fossil LNG, the e-part will count twice towards FEUM targets towards 2033 because it qualifies as a renewable fuel of non-biological origin (RFNBO) if it has GHG savings of more than 70%. Say

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you blend in 1% e-LNG with 99% fossil LNG, then that e-LNG component would count as 2% RFNBO and be priced around \$480/mt.

These prices have been adjusted for calorific contents to make them VLSFO-equivalents in terms of energy. In other words, e-LNG blends are about \$130/mt more cost efficient than biofuel blends when you compare energy for energy with 1-2% shares of renewables.

Taking the RFNBO argument a bit further, running just one vessel on 100% e-LNG can cover the FEUM compliance of 44 other similar vessels running on VLSFO between 2025-2029, according to a recent report by the [Mærsk Mc-Kinney Møller Center for Zero Carbon Shipping](#). This is because the e-LNG vessel generates a massive compliance surplus that can be averaged out across a fleet of conventionally fuelled vessels or a pool of vessels. Your compliance surplus can therefore be sold to other shipowners through pooling with them. It can also allow you to lower your EU ETS exposure and help improve your Carbon Intensity Indicator (CII).

FEUM HERE TO STAY

When we consider not just e-LNG on its own, but in blends with attractively priced fossil LNG, it becomes a more attractive proposition to dual-fuel vessel owners. This will lead to further investments into this space and continue to reduce costs.

It is important to note that FEUM is a long-term regulation that can enable shipowners to be confident about signing the long-term agreements that are necessary for e-LNG projects to get through the final investment decision stage. Since these projects will have strong commercial underpinnings, they are more robust.

As an e-LNG supplier or project developer, you need long term contracts to underwrite power purchasing agreements for these types of fuels. FEUM creates predictability through being an offtake enabler. This long-term focus does not generally align with the nature of the bunker market – which tends to favour spot deals – but FEUM is poised to help bridge that gap.

HOW IT'S MADE

E-LNG is an electricity-based fuel where green hydrogen is one of its two major components. The process of splitting water into hydrogen and oxygen through electrolysis is dependent on renewable electricity generation, so access to competitively priced electricity is key.

E-methane is e-LNG in gas form and has no upstream emissions because it is synthe-

sised at plants that combine green hydrogen from renewable electricity with biogenic CO₂. The green hydrogen allows renewable electricity to be stored off the grid and without a need for batteries. This green hydro-

yet technological readiness for hydrogen-fuelled vessels – which is why we need to move one step further with the molecules toward hydrogen derivatives such as e-LNG.

TURN2X recently launched its first com-

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gen is subsequently reacted with captured biogenic CO₂ and liquefied into e-LNG.

All of these processes are comparatively CAPEX- and OPEX-intense, but e-methane start-up TURN2X is actively working on lowering the levelised costs for e-LNG to become an even more competitive drop-in fuel.

A shared characteristic of all electricity-based fuels (i.e. e-LNG, e-ammonia and e-methanol) are the conversion losses, especially within the electrolysis. The conversion loss from methanation – which TURN2X uses to produce e-methane – is significantly smaller. Further increasing the efficiency of electrolysis will therefore become an important lever to reduce the energy conversion losses going forward.

THE CASE FOR E-LNG

It is almost impossible to electrify large-scale ocean-going ships and there is not


commercial e-methane plant in Spain's Miajadas. The location was chosen for its abundant solar energy potential, and because the electricity grid in this region in Spain is already suffering from congestion at certain times during the day, it has become harder for renewable electricity projects to come online.

The company is creating an off-grid opportunity to bring in renewables projects while finding another way of transporting it out of Spain – and sees the pan-European gas grid as the largest battery that we currently have.


Munich-based TURN2X is now looking to the maritime sector for long-term contract customers, and because FEUM does not have an end date, it can help underpin growing renewables demand in decades to come. This can, in turn, enable TURN2X to develop even more competitive and scalable solar PV projects on-site for affordable green electricity and further reduce the price of critical CAPEX components such as the electrolyser stacks and the proprietary methanation technology.


Maritime is one outlet for TURN2X, which has teamed up with Integr8 Fuels to reach a wide network of fossil LNG-fuelled vessels with e-LNG. Existing bunker infrastructure used to deliver fossil LNG can just as well be used to deliver e-LNG.

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