



Why it makes no sense to have gas-powered ships

October 2022

Summary

- The use of liquefied natural gas to power ships is becoming a popular option in the shipping industry.
- It is unacceptable to build more vessels that are dependent on fossil fuels given the climate emergency and the energy crisis Europe is experiencing.
- T&E calculated that in theory an average of nearly 7 million EU households could be powered by gas used to power ships by 2030.¹
- European policymakers should ensure that the shipping sector chooses green fuels through the FuelEU Maritime Regulation and the Alternative Fuels Infrastructure Regulation.

1. Context

The shipping industry is becoming more reliant on gas to power its vessels. Today, 923 ships can be powered with liquefied natural gas (LNG) and 534 LNG-powered vessels are on order around the world.² This trend is occurring at the same time as Europe experiences an energy crisis that could lead to a complete cut-off of Russian gas exports to Europe, disrupting gas supply and affecting people's ability to heat their homes – an aspect already worsened by skyrocketing prices.

The maritime sector's growing appetite for gas is also taking place as major EU laws affecting the availability and choice of fossil-based and renewable-based fuels are being negotiated. A previous T&E study already demonstrated that the draft FuelEU Maritime Regulation – which will require ships to progressively lower the greenhouse gas footprint of their energy usage on board – could be responsible for further driving new LNG demand up to one quarter of European shipping energy fuel

¹ The comparison between shipping and household gas demand is used in this report to illustrate the amount of gas used by ships. T&E does not advocate the use of gas and campaigns for a rapid reduction of fossil fuel consumption.

² DNV. (2022). *Maritime Forecast to 2050: Energy Transition Outlook 2022*. Retrieved September 23, 2022 from <https://www.dnv.com/maritime/publications/maritime-forecast-2022/index.html>

demand by 2030.³ In addition, the European Commission’s proposal for the revision of the Alternative Fuels Infrastructure Regulation (AFIR) aims to make the deployment by 2025 of LNG refuelling infrastructure a legal requirement in key EU ports.

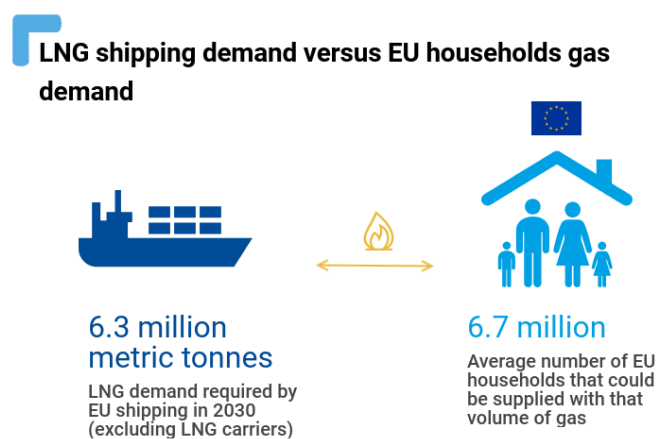
These proposals ignore the climate implications of promoting LNG in shipping. LNG is made up primarily of methane, a powerful greenhouse gas which is 82.5 times more potent than CO₂ over a 20-year period.⁴ Methane is known for leaking in the atmosphere during the production process, transport, and for slipping during its use on board the vessel. These proposals also overestimate the role of LNG-substitute fuels, such as biomethane and e-methane, in justifying investments in LNG bunkering infrastructure or ships: there isn’t going to be enough biomethane produced sustainably to meet LNG vessels’ energy needs in addition to demand from land sectors, and the costs of e-methane are unlikely to make it the marine fuel of the future.⁵

At a time when households, public services, and industry are being asked to lower their energy consumption to prepare for the 2022 winter season and considering the EU’s target to decrease its dependency on fossil fuels, the promotion of gas in shipping via climate regulations is becoming a more and more dangerous prospect. This worrying trend could further exacerbate the energy security crisis – on top of worsening the climate crisis.

2. Gas to power ships: A threat to Europe’s energy security

2.1. How much gas is the shipping industry using?

To illustrate the potential impact on gas demand with concrete examples, T&E has decided to compare the energy usage of LNG-powered ships to that of households across the EU and in several European countries for the years 2020 and 2030. The results show that an average of 210,795 households in the EU could be supplied with



Notes: T&E study on the FuelEU Maritime estimated that LNG demand in EU shipping could increase from 6% in 2020 to 23% in 2030, should the text be adopted as proposed by the Commission. The amount of gas required for LNG-powered ships (other than LNG carriers) is compared to the average household gas consumption in the EU.

Sources: Transport&Environment on the basis of Eurostat data

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³ T&E. (2022). *Quarter of EU shipping will run on LNG by 2030 locking in fossil fuels for decades*. Retrieved September 22, 2022 from <https://www.transportenvironment.org/discover/quarter-of-eu-shipping-will-run-on-lng-by-2030-locking-in-fossil-fuels-for-decades/>

⁴ IPCC. (2021). *Climate Change 2021 - The Physical Science Basis. Working Group - Contribution to the Sixth Assessment Report of the Intergovernmental Panel on Climate Change*. Table 7.15, page 1017. Retrieved September 22, 2022 from https://www.ipcc.ch/report/ar6/wg1/downloads/report/IPCC_AR6_WGI_FullReport.pdf

⁵ Comer B., O’Malley J., Osipova L. & Pavlenko N. (2022). *Comparing the future demand for, supply of, and life-cycle emissions from bio, synthetic, and fossil LNG marine fuels in the European Union*. Retrieved September 23, 2022, from https://theicct.org/wp-content/uploads/2022/09/Renewable-LNG-Europe_report_FINAL.pdf & Fricaudet M., Taylor J., Smith T., Rehmatulla N. (2022). *Exploring methods for understanding stranded value: case study on LNG-capable ships*. Retrieved September 22, 2022 from <https://www.ucl.ac.uk/bartlett/energy/news/2022/sep/shipping-sectors-costly-affair-lng-marine-fuel>

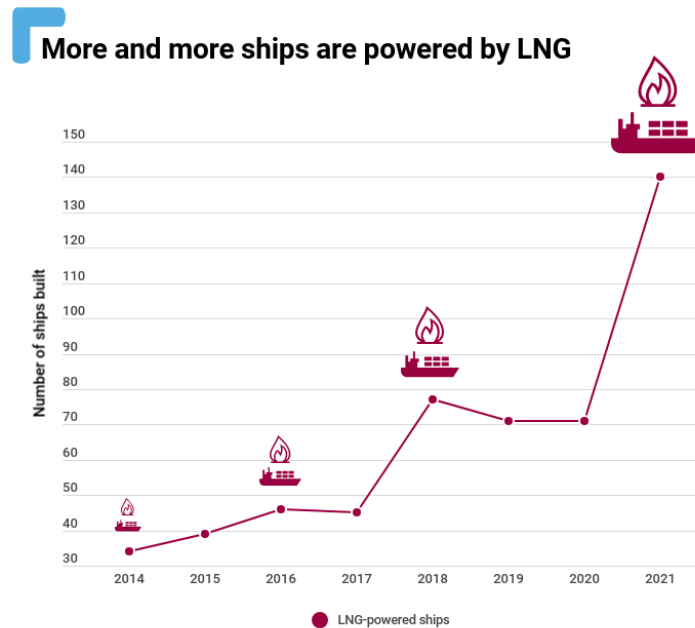
the volume of gas required to power the existing fleet of LNG-powered commercial ships today.⁶ That number could jump to an average of nearly 7 million households in the EU by 2030 should there be no changes to the EU legislative framework.⁷ For context, 7 million households represent more than the entire population of Belgium or Sweden and a little less than the population of the Netherlands.

2.2. Why is this a problem?

Europe's energy security plans call on ensuring that households and other essential users are prioritised in supply of natural gas. But are commercial vessels a priority candidate to use gas as a fuel? And does it make sense to push the maritime sector to become more dependent on gas in the mid and long term, while Europe is trying to wean itself off natural gas as soon as possible?

All EU countries have until March 2023 to reduce their gas consumption by 15%, according to Europe's plan to wean off Russian gas. The emergency plans also mentions that "where possible, priority should be given to switching to renewables or cleaner, less carbon-intensive or polluting options".⁸ This is clearly an opportunity to ensure that the maritime sector does not become dependent on LNG and move instead towards renewable-based fuels such as green hydrogen.

Preventing the uptake of gas in shipping must happen now, before all segments of the maritime industry fall into the gas trap. Today, tankers, including LNG carriers, represent the biggest share of LNG-powered vessels, but other types of ships are being tempted by the gas option. Only one LNG-powered cruise ship was built in 2018; in 2022, five of them are – that represents a third of all the cruise ships to be delivered that year. A similar trend can be observed for containerships: in 2018,



Notes: This graph shows the number of LNG-powered vessels built per year since 2014. All vessels types were included in this graph (bulk carriers, chemical tankers, LNG carriers, oil tankers, containers, cruiseships, ferries, general cargos, Ro-Ros, and car carriers).

Sources: Transport&Environment

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⁶ Excluding LNG carriers

⁷ In this analysis, T&E assumed that all LNG capable ships are using LNG as their main fuel. It is important to note that the majority of those LNG capable ships can also be powered with another fuel. Fuel choice may change depending on availability, cost, and regulations among other factors.

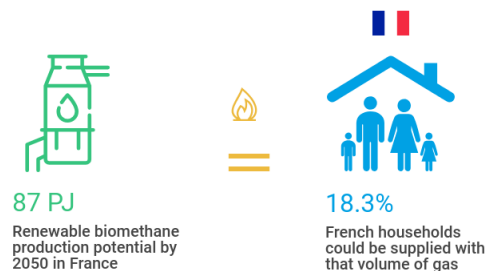
⁸ European Commission. (2022). *Save Gas for a Safe Winter: Commission proposes gas demand reduction plan to prepare EU for supply cuts*. Retrieved September 22, 2022 from https://ec.europa.eu/commission/presscorner/detail/en/ip_22_4608

seven LNG-powered container ships were built, but for the year 2022, that number jumped to 16. At the time of publication, 29 LNG cruise ships and 171 container ships are on order around the world.⁹

2.3. Could biomethane be the solution?

One could wonder whether the national production of sustainable biomethane could eventually replace fossil gas in EU households? The results show that this would be challenging.¹⁰ In France, only 18.3% of the country's household gas demand could be fulfilled by biomethane in 2050, whereas in Italy, the national biomethane production could fulfil only 7% of households' demand for gas by that year. These are conservative estimates as it assumes that the number of households' gas demand in France and Italy remains the same and does not take into account future competition for biomethane from other industries such as chemicals, heavy duty vehicles, or power generation.

Could France's biomethane production fulfil households' gas demand?

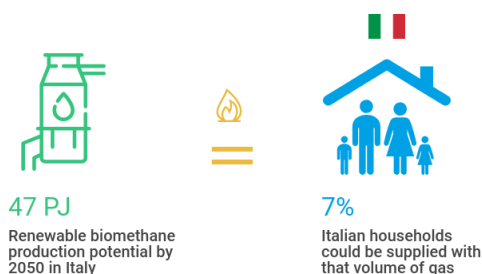


Notes: The amount of renewable biomethane production was taken from the 2018 ICCT study and was compared to the 2019 household gas use based on Eurostat data. We calculated that the total annual households gas use in France is equal to 475.7 petajoules.

Sources: Transport&Environment on the basis ICCT and Eurostat data.

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Could Italy's biomethane production fulfil households' gas demand?



Notes: The amount of renewable biomethane production was taken from the 2018 ICCT study and was compared to the 2019 household gas use based on Eurostat data. We calculated that the total annual households gas use in Italy is equal to 675.2 petajoules.

Sources: Transport&Environment on the basis ICCT and Eurostat data.

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The fact that some households could theoretically be powered by sustainably-produced biomethane does not imply that this would be a viable economic option. A study by the ICCT estimates that the projected price of sustainable biomethane from landfill gas in the EU would fall between €10.50 and €19.30 per gigajoule depending on the size of the production facility by 2030. On the other hand, the price of fossil LNG by 2030 would likely come back to €7.30 per gigajoule (although LNG prices are difficult to predict).¹¹

⁹ DNV. (2022). Alternative Fuels Insight Platform. Retrieved September 22, 2022 from [Alternative Fuels Insights for the shipping industry – AFI platform \(dnv.com\)](https://www.dnv.com/alternative-fuels-insights-for-the-shipping-industry-afi-platform)

¹⁰ Baldino C., Pavlenko N. Searle S., Christensen A. (2018). *The Potential for Low-Carbon Renewable Methane as a Transport Fuel in France, Italy, and Spain*. Retrieved September 23, 2022 from <https://theicct.org/publication/the-potential-for-low-carbon-renewable-methane-as-a-transport-fuel-in-france-italy-and-spain/>

¹¹ Comer B., O'Malley J., Osipova L., Pavlenko N. (2022). Comparing the future demand for, supply of, and life-cycle emissions from bio, synthetic, and fossil LNG marine fuels in the European Union. Retrieved September 23, 2022 from https://theicct.org/wp-content/uploads/2022/09/Renewable-LNG-Europe_report_FINAL.pdf

3. Recommendations on upcoming EU legislation

Without a radical change to EU legislation in shipping, gas demand in this sector could make up 23% of marine fuels by 2030. Any policy support for fossil LNG in shipping is in sheer contradiction with today's efforts to protect Europe from an energy security crisis. Moreover, seeing the low volumes of biomethane available to decarbonise already existing gas demand from households, encouraging LNG investments in shipping also puts the sector at risk of a technology lock-in. There is also a growing concern around the potential of LNG ships becoming stranded assets, as zero-emissions fuels such as green hydrogen and ammonia become more cost-competitive by 2030.¹²

The European Parliament has already voted in favour of stronger climate ambition, and a mandate for clean fuels uptake. We call on Member States and the European Commission to approve this more ambitious version and make it final legislation. This means adopting at least the following measures on the FuelEU Maritime, AFIR and RED proposals:

- Raise the level of GHG intensity reduction targets (FuelEU Maritime), so that ships start reducing their carbon footprint earlier. This means at least 20% GHG intensity reduction of energy use by 2035;
- Mandate at least 2% green hydrogen (-based fuel) use in EU shipping by 2030 under FuelEU Maritime, with a parallel mandate on fuel suppliers to deliver compliant fuels to ships under the Renewable Energy Directive;
- Mandate European ports to install appropriate refuelling points for green hydrogen (-based fuels) and discontinue requirements for new LNG infrastructure under AFIR.

Further information

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¹² Fricaudet M., Taylor J., Smith T., Rehmatulla N. (2022). *Exploring methods for understanding stranded value: case study on LNG-capable ships*. Retrieved September 22, 2022 from <https://www.ucl.ac.uk/bartlett/energy/news/2022/sep/shipping-sectors-costly-affair-lng-marine-fuel>

Methodology

The average EU household natural gas consumption was estimated using 2019 Eurostat data, by dividing total household consumption by the estimated number of households using natural gas. We used the results of a previous study¹³ on the FuelEU Maritime proposal to obtain volumes of LNG consumption by European shipping. We relied on the latest data reporting from the MRV and looked at the average emission intensity to determine whether the vessel was relying on LNG. The table below shows the estimated volumes of LNG that would be driven in the shipping market as a result of the FuelEU Maritime proposal, compared to the business as usual (BAU) LNG market share evolution.

We decided to take a conservative approach as to the volumes of LNG that could effectively be redirected towards household needs. This is why we have decided to exclude LNG tankers from our analysis as those vessels may partially use the boil-off gas of their LNG cargo to power their vessels as well as for other energy usage on board. The so-called boil-off may be more difficult to redirect towards consumers than regular bunker volumes.

However, we considered the entirety of gas volumes consumed by LNG ships on voyages between EU ports and between EU ports and third-countries (i.e. full scope of the EU MRV Regulation). We chose not to limit ourselves to a 50% scope for international voyages, assuming that a LNG ship would most likely use LNG over the whole duration of the voyage, not only on the regulated part of the extra-European legs.

	Geographical scope	2020*	2025	2030	2035	2040
BaU scenario	Semi-full scope (50/50 of international voyages)	1.7	2.7	4.6	7.2	10.3
	Full scope	2.3	3.8	6.5	10.1	14.4
FuelEU proposal scenario	Semi-full scope (50/50 of international voyages)	1.7	3.1	6.6	11.4	17.0

¹³ T&E. (2022). *FuelEU Maritime: T&E analysis and recommendations – How to drive the uptake of sustainable fuels in European shipping*. Retrieved September 23, 2022 from <https://www.transportenvironment.org/wp-content/uploads/2022/02/TE-Report-FuelEU-Maritime-1.pdf>

	Full scope	2.3	4.3	9.3	15.9	23.8
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Table 5: Volumes of LNG in the BaU and FuelEU proposal scenarios, in semi-full or full scope (Mt)

For 2020 the estimation does not account for the decrease in maritime traffic due to the COVID pandemic, as T&E fleet turnover model was built before 2020 MRV data was available.

To assess the biomethane production potential in France, Italy, and Spain, we relied on numbers provided by an ICCT study published in 2018.¹⁴ For the 2030 prediction, we have assumed that the share of gas for heating in households remained the same. We have also relied on T&E’s model that predicts that 23% of the marine fuel mix in the EU would be made up of LNG by 2030.¹⁵

¹⁴ Baldino C., Pavlenko N. Searle S., Christensen A. (2018). *The Potential for Low-Carbon Renewable Methane as a Transport Fuel in France, Italy, and Spain*. Retrieved September 23, 2022, from <https://theicct.org/publication/the-potential-for-low-carbon-renewable-methane-as-a-transport-fuel-in-france-italy-and-spain/>

¹⁵ T&E. (2022). *FuelEU Maritime: T&E analysis and recommendations – How to drive the uptake of sustainable fuels in European shipping*. Retrieved September 23, 2022 from <https://www.transportenvironment.org/wp-content/uploads/2022/02/TE-Report-FuelEU-Maritime-1.pdf>