Small-scale LNG: A red herring or a hidden opportunity?

The potential of containerised liquified natural gas for Europe's energy security

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Key takeaways:

- Small-scale liquified natural gas (ssLNG) is a technically & economically proven value chain, with an estimated global market of $10 billion in 2023.
- The value chain currently serves niche markets, such as off-grid industry, and LNG-powered vehicles and vessels, primarily in the US, China and Europe.
- A business case for inter-regional containerised ssLNG trade to Europe is not a given, but the building blocks, such as supply, logistics and demand, are present.

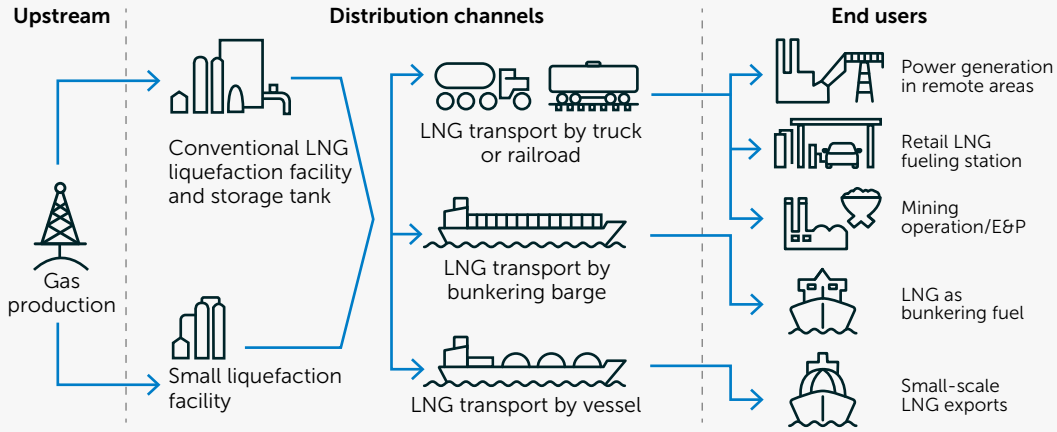
Introduction

The war in Ukraine prompted Europe to de-couple from Russian natural gas supplies, which made up 40% of Europe's total gas imports, or 14% of Europe's total final energy consumption, before February 2022.[1] The shift away from Russian pipeline gas created a need for liquified natural gas (LNG) to bridge the gap. European LNG import grew by 60% in 2022, and outpaced pipeline gas supply for the first time in May 2023. LNG dominance has created new risks, such as the reliance on fixed entry points (regassification facilities), and exposure to price volatility on the spot market. The risks prompt the consideration of alternative flows, given that LNG demand in Europe is expected to persist in the near future.[2]

Alongside conventional, large scale LNG facilities, there are also small-scale LNG liquefaction facilities. These have a capacity of less than 1 million tonnes per annum (Mtpa), compared to 3-7.7 Mtpa at conventional LNG facilities. Due to its flexible supply chain, the ssLNG market can supply smaller LNG users, such as LNG bunkering for vessels and fuel stations for vehicles. The ssLNG market is valued at $10 bn in 2023, compared to the conventional LNG's $75 bn,[3] and is expected to grow to $16 bn by 2028.[4]

1 *Where does the EU's gas come from?* European Council, 2023, https://tinyurl.com/ym85hmnz.
2 *Shell LNG Outlook 2023*, Shell, 2023, https://tinyurl.com/2cdxme6p.
3 *LNG Market - Share, Size, Analysis & Industry Overview*, Mordor Intelligence, 2023, https://www.mordorintelligence.com/industry-reports/global-lng-market-industry.
4 *Small Scale LNG Market Size, Report & Companies, Mordor Intelligence, 2023,* https://www.mordorintelligence.com/industry-reports/small-scale-lng-market.

Figure 1: Schematic overview of the containerised ssLNG value chain within the ssLNG market. Adapted from IHS Markit, 2019.



Source: International Gas Union (IGU), Shell, IHS Markit

The conventional LNG value chain usually starts at the liquefaction facility at the point of production or export, from where it is transported in a specialised LNG tanker vessel, and regassified at the point of import, to be distributed to consumers via pipeline. There is an alternative form of transport, where LNG is carried in liquified form directly to the consumer. One such form is via a containerised ISO tank, which allows for modal shifts and an agile supply chain from the point of liquefaction directly to the consumer, creating transportation options between break bulk and LNG tanker vessels.

In an era of concerns over stranded (regassification) assets,[5] due to the energy transition ambitions of the EU, ssLNG can provide incremental asset development, with containerised transport bypassing costly liquefaction and regassification facilities. It can create the extra LNG supply necessary for EU's short term energy security, without disavowing its long-term commitment to shifting away from fossil fuels. With liquefaction plants ranging from 0.1 to 0.5 Mtpa, a fraction of the conventional LNG plants, lower capital expenditures, land use and construction time frames are possible. SsLNG brownfield expansion can occur within 12-18 months, while new projects are finalised within 18-30 months from the final investment decision. This is far less than 50-72 months for conventional LNG.

5 Cooper, C., Europe heading for huge excess LNG import capacity, *experts warn*, Politico, 2023, https://tinyurl.com/3a8usys6.

Small-scale LNG today

The interest in the ssLNG value chain peaked in the late 2010s, during a period of low gas prices, and even though public interest has since faded, the niche industry is growing.[6] In 2022, the global LNG market size was 397 Mtpa, with demand projected to grow to 650-700 Mtpa by 2040.[7] The share of ssLNG as part of the larger market is difficult to estimate, however, in the US, most liquefaction plants are small scale.[8] Most conventional facilities, like Sabine Pass (Louisiana) and Cheniere – Corpus Christi (Texas) currently fill conventional LNG carriers, while ssLNG facilities in southern US serve cruise lines, coastal vessels, rocket fuel for space travel and exports to the Caribbean, among other uses.

Today, ssLNG is primarily concentrated in several markets: China as the largest market, southern United States as the fastest growing market, and parts of Europe for niche applications. Volumes generated by ssLNG plants primarily provide fuels for maritime and road transport, displacing diesel and marine fuel oils, and power generation for off-grid industry.[9] Growth of LNG is most expected in the marine fuel,[10] primarily for containerships and tankers, as well as ferries, industrial consumers, and heavy-duty transportation.

The ISO tanks follow a standard 40-foot cargo size, carrying 33 tonnes of LNG,[11] and can be transported aboard regular cargo vessels. In the US, for example, containerised LNG supplies Caribbean states from EAGLE LNG, a distribution facility in Florida, while neighbouring JAX LNG directly supplies oceangoing vessels and cruise ships.[12] In Europe, Prima LNG, a subsidiary of Dutch-based SHV Energy, distributes ssLNG from import terminals to off-grid clients via break bulk trucks, with ISO tanks used for the last-mile delivery. Another is Avenir LNG's HIGAS LNG Terminal in Sardinia, which also delivers last mile via break bulk ISO tanks.

6 *Mozambique Domgas Small Scale LNG*, Deloitte, 2020, https://tinyurl.com/4jpuw8hx; *Market Snapshot: Small-Scale LNG Plants Strategically Located to Meet Emerging Domestic LNG Demand*, Canada Energy Regulator, 2015, https://tinyurl.com/5ybjmr4p; *Small Scale LNG*, 2012-2015 Triennium Work Reports, International Gas Union, 2015, https://tinyurl.com/457sfdu3.
7 *Shell LNG Outlook 2023.*
8 Magill, J., *Small-scale LNG making market inroads, S&P Global Platts*, 2019, https://www.spglobal.com/en/research-insights/articles/small-scale-lng-making-market-inroads.
9 *Small going big: Why small-scale LNG may be the next big wave*, Strategy&, 2017, https://www.strategyand.pwc.com/gx/en/insights/2017/small-going-big.html.
10 *Shell LNG Outlook 2023.*
11 *New ISO tank containers for transportation of LNG*, Tank News International, 2022, https://tanknewsinternational.com/new-iso-tank-containers-for-transportation-of-lng/
12 *Small Scale and Containerized LNG*, US Department of Energy, 2022, https://tinyurl.com/48ydb3h3.

An opportunity for inter-regional trade to Europe?

In 2022, the EU imported 95 Mtpa of LNG, almost half of which came from the US.[13] While no LNG is supplied via ISO tanks inter-regionally into the EU at this time, a case can be made for its potential, particularly given that ISO tank distribution is already in place in Europe itself. The US, with expanding ssLNG export on its eastern coast, as well as high-traffic cargo routes to Europe, is the potential supplier of choice, able to quickly deliver cargoes directly to consumers. More proximate options are possible, such as creation of ssLNG in Israel, which could serve south-eastern Europe, such as the Greek islands.

Small-scale containerised LNG transport could diversify LNG supply and mitigate some of the price volatility in the EU market, without committing long-term capital to fossil fuel infrastructure. However, containerised LNG delivery in Europe is limited by a lack of consistent demand and the ssLNG value chain's compartmentalization. To shift containerised ssLNG from European last-mile to inter-regional scale, where ISO tanks are delivered directly from the export facility, a better understanding of demand is necessary, and stakeholders across the ssLNG value chain need to be connected. On the demand side, price competitiveness of containerised LNG is key, however, ssLNG's contribution to diversity of supply can motivate policy development in its favour. Whether containerised ssLNG delivery in(to) Europe is a red herring or a hidden opportunity depends on the ability of suppliers, consumers, and policy makers in exporting countries, as well as the EU and its member states, to collaboratively shape the market's contours. Bringing them together may provide Europe with added energy security via an additional means of LNG supply.

13 Elijah, D., *EU LNG imports reach all-time highs in December and 2022*, Kpler, 2023, https://tinyurl.com/ycy2zu8t.

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