



LNG Carriers :

The Floating Pipeline Powering Global Gas Expansion: Unveiling its Hidden Enablers

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LNG Carriers: The Floating Pipeline Powering Global Gas Expansion: Unveiling its Hidden Enablers

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1 Executive Summary

The past decade marked a 'Golden Age' for the LNG industry, fueled by rising Asian gas demand, surging U.S. LNG exports, and geopolitical shifts in Europe. LNG trading volumes have surpassed those of traditional pipeline gas, with LNG carriers expanding threefold from 325 units in 2014 to 970 in 2023.

This report by Solutions For Our Climate (SFOC) sheds light on the crucial yet often overlooked industries behind this rapid expansion of the LNG shipping market, in particular comparison to the more prominent segments of the fossil gas value chain.

Key findings of the research underscore the **significant financial contributions from South Korea's public financiers, totaling \$44.1 billion for 652 LNG carrier ship financing cases over the past 10 years from 2013-2023**. In addition, this report suggests a significant shift in the ownership landscape of LNG carriers for the past decade: while **private equity-based entities and traditional shipowners have majorly placed orders for LNG ships**, energy majors have reduced their involvement.

The findings highlight imminent risks, as the projected orders for LNG carrier fleets are expected to exceed the estimates by the International Energy Agency (IEA), potentially jeopardizing global climate targets. To address these concerns, the report recommends urgent actions to the relevant stakeholders as below:

1. Financiers:

- Public and private financiers should suspend funding for new LNG carriers.
- Investors should apply exclusion criteria to the LNG shipping players.

2. Shipowners:

- Shipowners should disengage from the increasingly precarious LNG shipping market.
- Vessel portfolios should be readjusted to align with the Paris Agreement.

3. Shipyards:

- Korean and Chinese shipyards should diversify their focus to tap into the renewable energy sector and promote the growth of innovative and green-fueled shipbuilding markets.

Failure to realign LNG carrier capacity in line with the net-zero trajectory poses severe risks to global climate targets, including surpassing the critical tipping points scientists have warned about. Stakeholders are advised to act on the above recommendations to mitigate these potential risks and contribute to a more sustainable and resilient energy future.

2 Current Landscape of LNG Trading and its Changing Dynamics

This report begins by examining the historical trends of fossil gas trading by its flow type, and the long-term projection of the LNG trading landscape in light of climate scenarios. We then dive into the shifts in LNG demand and supply in the recent years (2021-2022) to understand the evolving dynamics.

2.1 LNG Trading Volume Surpasses Pipeline Gas, Leading to Record High LNG Prices in 2022

Since 2011, the volume of LNG trading has almost doubled, from 324 billion cubic meters (bcm) in 2011 to 531 bcm in 2022. This growth was driven by traditional Asian importers like Japan and Korea, as well as the rapidly growing Chinese market. The expansion coincided with a diversification of the supply sources, particularly coming from the U.S., which led to the emergence of shorter and more flexible LNG contracts.¹ The start of the U.S. LNG export in 2016, facilitated by advancements in shale gas extraction technologies, significantly increased LNG trading volume. Conventionally, the consumption of LNG buyers was limited to their own use, without accounting for the potential flexibility to redirect shipments. However, with the influx of flexible contracts from US LNG export terminals that allowed reselling, LNG has positioned itself as a widely traded commodity, prompting many global energy companies to set up dedicated LNG trading desks.

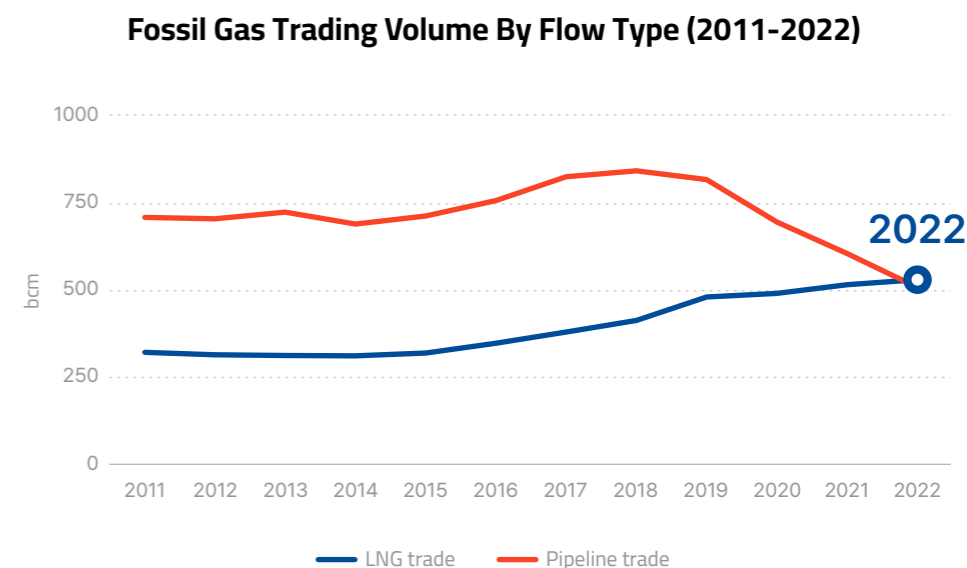


Figure 2-1 Fossil Gas Trading Volume by Flow Type (2011 - 2022)
Source: SFOC, IGU's Global Gas Report for 2019, 2020, 2022 and 2023

¹ LNG Market Trends and Their Implications, IEA (2019)

Data compiled by SFOC from IGU's Global Gas Reports for 2019, 2020, 2022 and 2023 shows that LNG trading volume surpassed that of piped gas for the first time in 2022, as illustrated in Figure 2-1. According to data by CEDIGAZ, the global LNG trade volume in 2022 reached a record high of 51.7 billion cubic feet per day (bcf/d), a 5% increase from 2021.² This demand spike was primarily attributable to Russia's decision to reduce pipeline gas supply to the European Union, which caused EU buyers to purchase an unprecedented volume of LNG. Such a sudden rise in demand, coupled with the limited regasification capacity in Europe causing significant traffic congestion across LNG import terminals, propelled the LNG spot price to an all-time peak of \$70.50/mmbtu in August 2022.

2.2 Post-Ukraine Invasion Shifts: The End of Golden Age for LNG

The energy landscape is undergoing profound shifts following Russia's invasion of Ukraine. This pivotal event, marked by the record-high spot LNG prices, is expected to reshape energy markets and policies for years to come, steering a global transition towards cleaner, more secure, and more affordable energy systems.³

For the first time since 2015, Asia has seen a decrease in its LNG imports in 2022, a 7.6% drop compared to 2021. The downturn comes with LNG being perceived as an unreliable energy source vulnerable to sudden price hikes. Notably, China recorded a substantial decrease, with imports down by 20% YoY.⁴ The Institute for Energy Economics and Financial Analysis (IEEFA) foresees that sustained high global LNG prices, sluggish LNG demand growth, reduced gas consumption in Europe, and a consistent investment in cost-competitive energy alternatives over the past few years will further challenge global LNG demand outlook in the upcoming years.⁵

Moreover, the IEA has forecasted for the first time in their 2023 report that fossil gas demand is projected to peak before 2030 under the current stated government policies (STEPS). In Figure 2-2, referencing IEA's World Energy Outlook 2022, three scenarios are showcased: the Stated Policies Scenario (STEPS), the Announced Pledges Scenario (APS), and the Net Zero Scenario (NZE). While STEPS indicates the need for greater LNG export capacity by 2050, the APS, which considers governmental pledges, expects the global LNG trade volume to peak around 2030, suggesting that current establishments could mostly cover future requirements. The most stringent NZE scenario, designed to achieve a 1.5°C global temperature cap, foresees an imminent peak in LNG trade volume, implying that the present LNG infrastructure suffices for upcoming demands.

² <https://www.eia.gov/todayinenergy/detail.php?id=57000>

³ Energy markets one year after the Ukraine invasion, Zero Carbon Analytics (2023)

⁴ The LNG Industry GIIGNL Annual Report (2023), 8-9 pages

⁵ Global LNG Outlook, IEEFA (2023)

LNG Trade by Scenario Compared to Existing and Under Construction

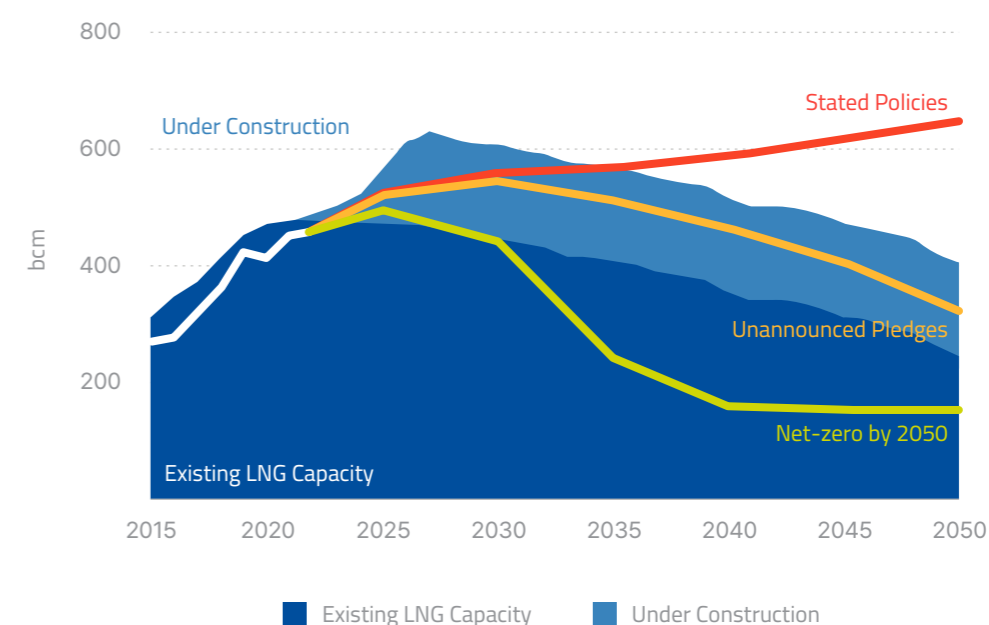


Figure 2-2 LNG trade by scenario compared to existing and under construction
Source: World Energy Outlook, IEA (2022)

In its updated Net Zero Roadmap report, the IEA reiterated that new long-lead time upstream oil and gas projects are no longer needed. It predicts a 20% decline in fossil gas demand by 2030 in the NZE scenario.⁶ This rapid decline in LNG demand poses unprecedented risks for the industry newcomers who enter the market with new gas fields and LNG carriers. The fossil gas value chain experienced a 'Golden Age' over the past decade, mostly driven by the expansion of LNG. However, the tables have turned – it now faces significant uncertainties arising from prevalent geopolitical risks and global climate change responses. Given this context, placing bets on further LNG expansion may present consequential risks for stakeholders.

⁶ A renewed pathway to net zero emissions, IEA (2023)

<https://www.iea.org/reports/net-zero-roadmap-a-global-pathway-to-keep-the-15-0c-goal-in-reach/a-renewed-pathway-to-net-zero-emissions>

3 LNG Carriers: The Floating Pipeline Powering Global Fossil Gas Expansion

In the fossil gas value chain, LNG carriers serve as floating pipelines, connecting the LNG supply sources to their demand destinations and facilitating the expansion of its value chain. Once built, LNG carriers lock in the LNG trading volume for the vessel's entire lifespan, typically lasting 25-30 years or longer. They fulfill such a role based on long-term or spot charter agreements.

The LNG value chain begins with exploration of production of fossil gas. Afterward, the gas is liquified into LNG, which is then marine transported via LNG carriers. Finally, the LNG undergoes a regasification process before reaching the ultimate end users. LNG shipping represents about 20% of the total cost involved in the LNG value chain, as illustrated in Figure 3-1 below.

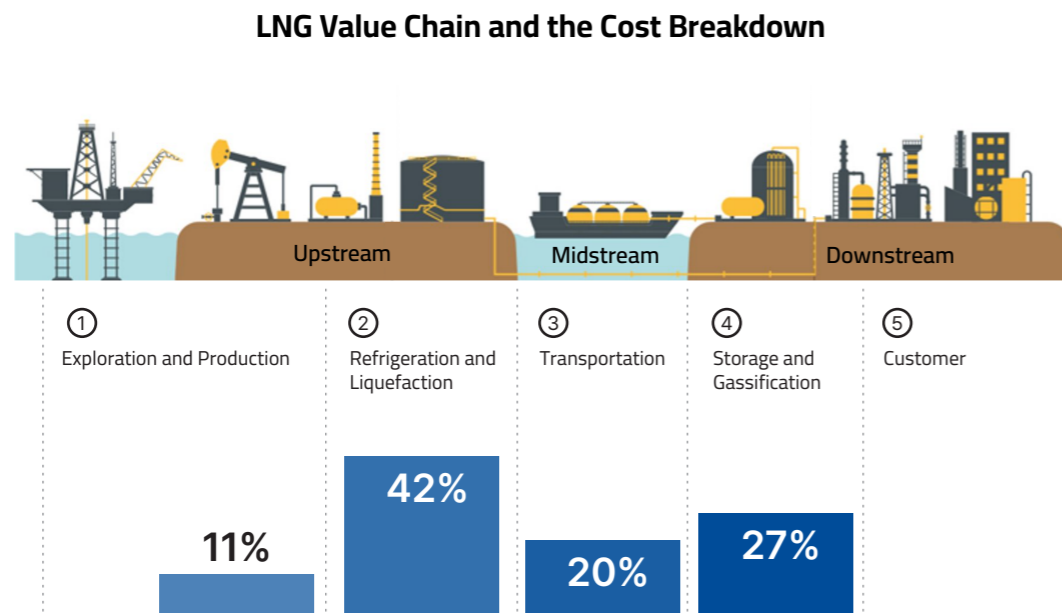


Figure 3-1 LNG value chain and the cost breakdown (costs for LNG receiving terminal and power plant excluded)
Source: SFOC, Fueling the climate crisis, SFOC (2021) & Key Issues and Challenges on the Liquefied Natural Gas (LNG) Value Chain, IECR (2018)

The liquefaction of fossil gas offers an alternative means for the industry to transport fossil gas to distant demand sources where traditional pipelines are of little use, due to practical constraints. This process greatly reduces the volume of fossil gas by approximately 600 times. A case in point is South Korea importing about 3.64 million tons of LNG per month in 2023, according to the Korea Customs Service.⁷ This translates into roughly 48 shipments per month, assuming the use of LNG carriers with a capacity of 170,000 cubic meters.

⁷ The LNG import volume from January to August of 2023 was divided into 8 to calculate the monthly average volume, utilizing the data from the Korea Customs Service.

Since the first LNG shipment in 1959 by MT "Methane Pioneer" from Louisiana, the U.S., to England, the number of LNG carriers has grown markedly, now totaling over 650 active ships. Spurred by record-breaking new orders made last year, which reached 320 units, around half of the currently operating LNG carriers are now being constructed. Korean shipyards are playing a notable role here, overseeing the construction of approximately 80% of these carriers as of October 15, 2023.

3.1 Stakeholders around LNG Carriers

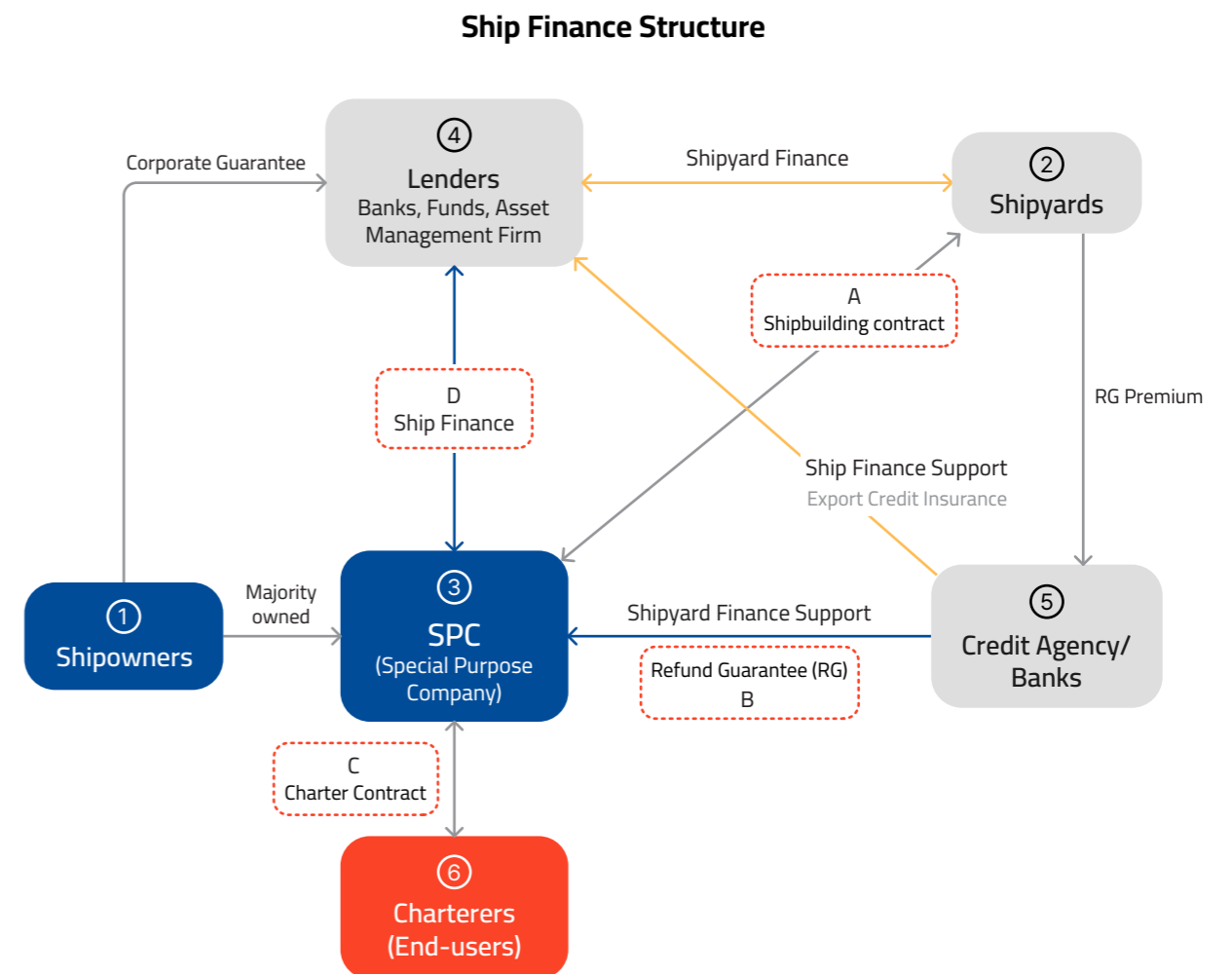
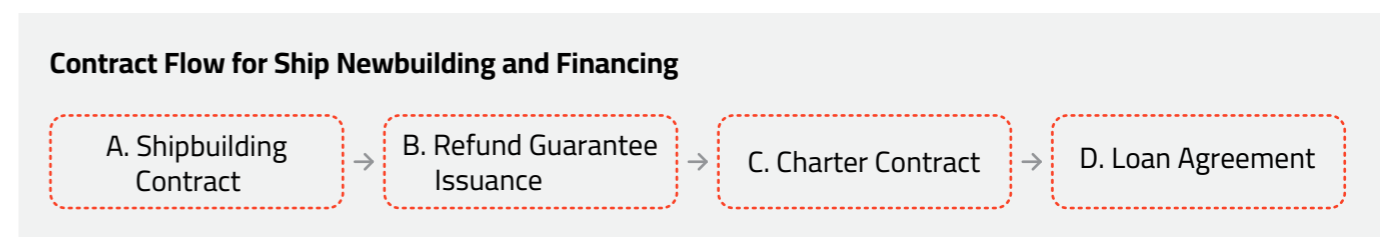


Figure 3-2 Dynamics in the shipping industry in ship finance
Source: SFOC



In the LNG carrier industry, various stakeholders play critical roles by participating in the project finance structure of LNG carrier shipbuilding projects, contributing to the expansion of the LNG shipping sector. Understanding the dynamics among these key players and their changing trends is essential to grasp the industry's current state, future challenges, and risks. The primary stakeholders in this industry include shipowners, financiers, shipyards, and major equipment suppliers. Figure 3-2 above illustrates the relationships between shipyards, shipowners, financiers, and charterers in the context of a typical ship finance structure. The contract flow begins with shipowners initiating a newbuilding order.

① **Shipowners** refer to enterprises that own and use vessels for profit. Traditionally, the use of the term 'shipowner' was confined to only address companies that owned and managed their ships. However, the evolution of the industry has introduced new entities like V ships and Wilhelmsen, which specialize in vessel operation and maintenance without owning the ships themselves. For clarity purposes, this report uses 'shipowners' as an inclusive term to denote companies that possess vessels, including shipping and maritime companies.

② **Shipyards** or shipbuilders include companies like Hyundai Heavy Industry or China State Shipbuilding Corporation (CSSC) in China that constructs commercial vessels. Shipyards will be covered in more detail in the next chapter. Shipyards also procure major equipment such as marine engines and LNG cargo tanks from equipment providers like the ones below:

- **Marine Engine Manufacturers:** MAN Energy solutions and Winterthur Gas & Diesel (WinGD) dominate the LNG carrier propulsion engine market, effectively forming an oligopoly. WinGD used to be part of Wartsila, a Finnish company, until it sold its shares to CSSC in 2015.
- **LNG Cargo Containment System Provider:** Gaztransport & Technigaz SA (GTT) in France is renowned in the LNG industry for its cargo containment systems. The majority of LNG carriers (above 125,000 cubic meters) use GTT's cargo tanks to maintain LNG at the required temperature of -163°C. Shipyards pay an average of 5% of the vessel's cost as a royalty to GTT.

③ **Special Purpose Company (SPC)** is a subsidiary created by a parent company to isolate financial risks in project finance. This arrangement provides assurances to lenders by insulating the asset from the broader financial risks of the shipowners. The SPC, while owned and supported by the shipowners, serves as the primary contracting party for shipbuilding agreements with shipyards and for loan contracts with financial institutions.

④ **Lenders**, including banks, investment funds, or asset management firms, provide financing to borrowers for the acquisition of ships. As previously noted, funds from lenders are transferred to the SPC, which then forwards the payments to shipyards in accordance with the shipbuilding contract. Lenders are classified as senior or junior based on their loan-to-value ratio and their claim on the collateral.

⑤ **Credit Agencies** encompass export-import banks, export credit or insurance agencies, and technology warranty companies, often affiliated with government bodies. These agencies enhance the creditworthiness of transactions by offering warranties or guarantees that mitigate the risks lenders face concerning shipyards or borrowers. They provide instruments like export credit insurance or refund guarantees, enabling lenders to offer reduced interest rates. This, in turn, lowers the total capital cost for shipowners, or the borrowers.

⑥ **Charterers or End-users** are the main players in this ship financing scheme as they determine the ultimate credit quality of the loan. The success of project finance hinges on the credit standing of these end-users, who are the final signatories on charter contracts that trigger the subsequent shipbuilding and loan agreements. In the LNG shipping sector, charterers typically include major energy firms such as Shell or Chevron on the export side, as well as LNG traders and importers like KOGAS, Tokyo Gas, or electric utility companies.

3.2 LNG Shipowners

LNG shipowners play a pivotal role in connecting LNG producers with consumers, facilitating the maritime transportation of gas through their fleet of LNG carriers. The shipowners' decision on fleet expansion has a direct consequence on the industry's overall trajectory, which underscores the necessity for careful monitoring. LNG shipowners generate profit in three distinct ways:

- **Vessel Chartering:** Shipowners enter into contracts, known as vessel charter contracts, with end-users or charterers as illustrated in the above Figure 3-2. The duration of these contracts may vary, ranging from as short as a single voyage lasting around 15 days, to as extensive as the vessel's entire operational lifespan, which can be up to 30 years or longer. Various entities, including LNG exporters and importers, traders, and even other shipowners, may engage in such vessel chartering.
- **Pool:** The industry has recently adopted the concept of 'pools'. Under this model, shipowners contribute their vessels into collectively managed fleets called pools, operated by third-party operators like Cool Company. A designated pool company takes charge of commercial management of these pooled vessels. With this shift in commercial responsibility, the role and performance evaluation of the original shipowners now depend more on how efficiently they manage their cost of capital. This change facilitated the entry of finance-backed shipowners into the LNG carrier industry. This has paved the way even for companies without expertise in commercial vessel management to participate in the LNG shipping market, a topic which will be explored further in this section.
- **Asset Play:** Shipowners can also realize significant profits from the sale of their assets, leveraging secondhand markets that offer more favorable conditions. The returns from such asset sales can often be substantially profitable, making it the largest profit source for some companies. However, this approach also comes with its share of risks, given the volatile nature of asset valuations.

3.2.1 LNG Shipowners in 2014 vs 2023

We conducted a comparative analysis of shipowners' composition and their respective fleets including ships on order, using data from IGU's World LNG Report 2014 and the current data as of 15 October 2023 from Clarkson. A detailed comparison table can be found in *Appendix 2*.

The objective of the study was to identify which types of shipowners have significantly expanded their fleets in the past decade, and to understand the extent of their growth. The following categorization was employed for clarity.

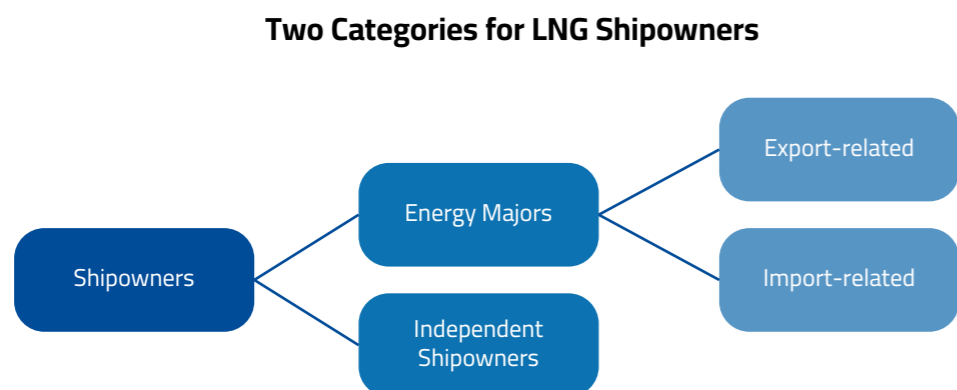


Figure 3-3 LNG Shipowners category
Source: SFOC

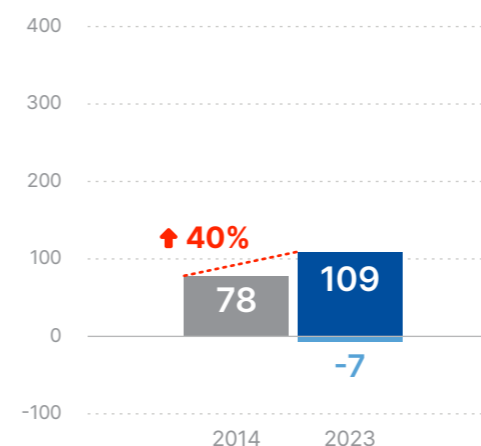
In contrast to other vessel types like bulk carriers or oil tankers, major energy companies played a significant role in the early development of the LNG shipping market. Their high involvement was largely attributable to the complexity of cargo handling processes and the required compatibility between LNG carriers and ports, which were often owned by energy giants themselves.

- **Energy majors:** Energy majors either refer to the energy companies themselves or shipowners connected to energy majors either through joint ownership or energy major's newbuilding program. Companies like Chevron, BP Shipping and Qatar Gas (Nakilat) belong to this category. Energy majors can be further sub-categorized into export-related and import-related companies.
- **Independent Shipowners:** This category includes all the other companies that are not classified as energy majors. Examples include traditional shipowners with a longstanding history and legacy in the shipping industry like Mitsui OSK Lines (MOL) and Nippon Yusen Kaisha (NYK) in Japan, Angelicoussis Group in Greece, and Knutsen OAS Shipping in Norway.

Key Observations: Explosive Growth in Fleet Size and Shipowner Capacity

For the past 9 years, the size of the LNG carrier fleet has almost tripled from 325 to 970, including 320 units currently on order. Consequently, the number of shipowners that own those fleets also increased by 40%, from 78 to 109. During the same period, 38 new shipowners entered the LNG shipping market, while 7 exited. The average fleet number owned by each shipowner saw a twofold increase, from 4.2 to 9 vessels. This trend suggests that the overall volume of individual shipowners has also doubled over the last decade.

LNG Shipowners Growth by number of companies



LNG Shipowners Growth by fleet size

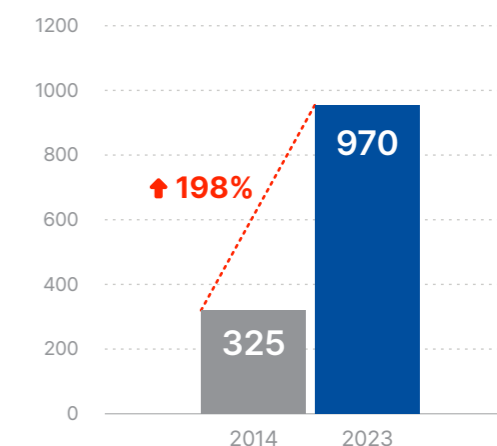


Figure 3-4 LNG Shipowners Growth (By the number of company-left, and by their fleet-right)
Source: SFOC, World LNG Report, IGU (2014), Clarkson

Key Observations: Independent Shipowners Dominate the LNG Shipping Market, Outweighing Energy Majors

LNG Fleet Ownership Snapshot in 2014 and 2023

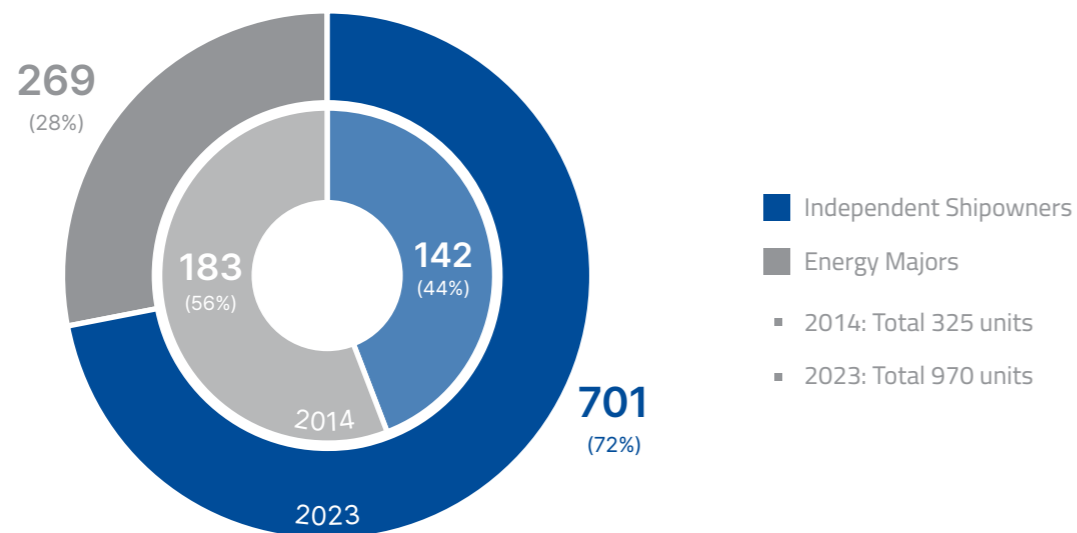


Figure 3-5 LNG Fleet ownership snapshot in 2014 and 2023
Source: SFOC, World LNG Report, IGU (2014), Clarkson

Meanwhile, there has been a notable decline in the proportion of the LNG fleet owned by energy majors. While their fleet size grew from 183 ships to 269 ships by 47%, the LNG fleet of independent shipowners experienced explosive growth, surging from 142 ships to 701. This translates to a staggering 394% increase in the LNG fleet operated by independent shipowners. As a result, the share of LNG fleet ownership between independent shipowners and energy majors has dramatically flipped – from 44% vs 56% in favor of energy majors, now to 72% vs 28% in favor of independent shipowners. The current dominance of independent shipowners in the LNG shipping market is clearly pronounced.

Key Observations: Shift in Energy Majors Involvement

Data indicates a 24% growth in the fleet size of export-related companies, while import-related companies have seen a remarkable increase of 125% as illustrated in Figure 3-6. This shift is aligned with changes in LNG cargo contract terms, which noticeably moved toward the Free on Board (FOB) types that assign the responsibility for transport arrangement onto LNG importers. This, in turn, has prompted import-side companies to more actively engage in the LNG carrier sector.

In the evolving landscape of LNG trading sector, the decline in the share of energy major companies may reflect a strategic withdrawal from asset-heavy investments in favor of more flexible and less capital-intensive models.

LNG Fleet Owned by Energy Majors (Export vs Import)

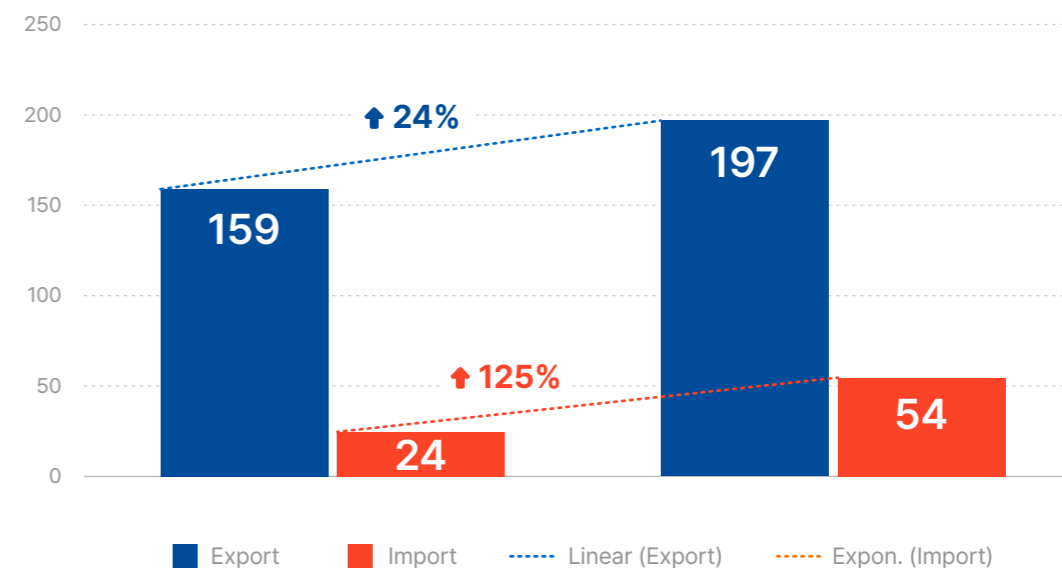


Figure 3-6 LNG Fleet Owned by Energy-majors (Export vs Import)
Source: SFOC, World LNG Report, IGU (2014), Clarkson

Further Analysis on New Shipowners Background: Emergence of PE or Leasing-backed Shipowners

Through a comparative analysis of LNG shipowners and their fleet in 2014 versus 2023, it has been identified that 38 new shipowners emerged in 2023. To highlight meaningful trends, 'new shipowners' were defined to refer to those appearing for the first time in 2023 or those that grew from fewer than 2 ships in 2014 to over 5 in 2023. Further analysis found these new shipowners have backgrounds in private equity (PE), financing, or existing shipping companies. As for the new shipowners with PE backgrounds, PE's share ratio ranges from having minority shares (as low as 7.21%) to majority share or complete ownership.⁸ As for new shipowners identified to have 'Financier' backgrounds, companies that are classified as financial institutions such as China Development Bank and CSSC Leasing—a leasing arm under the China State Shipbuilding Corporation—belong to this category. Notable examples of spin-offs from shipowners subsequently acquired by PE are H-Line and Hyundai LNG Shipping, which have been categorized as new shipowners irrespective of their prior affiliations. A detailed list of all 38 new shipowners can be found in *Appendix 3*.

LNG Shipowners Background Categorization

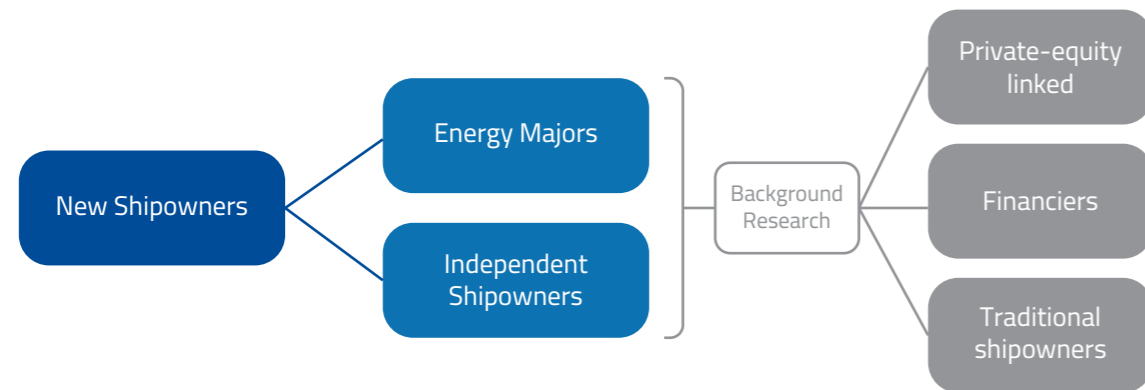


Figure 3-7 LNG Shipowners background categorization
Source: SFOC

Out of the 38 new LNG carrier shipowners, 8 (21%) are affiliated with energy majors - 7 related to LNG import/trading and 1 to export. The remaining 30 have no ties to energy majors. Respectively, energy majors account for 18 ships (7%) of the new entrants' fleet while independent shipowners account for 230 ships (93%) as shown in Figure 3-8. This further highlights the significant presence independent shipowners have among the new players in the market.

⁸ Minority share refers to Vanguard holding 7.21% of Exceleerate Energy. Due to the limited data on non-listed companies, we anticipate that the actual involvement of PE may surpass the indications provided in this report.

Further analysis shows 10 of the new owners (26%) are private equity-backed, owning 112 ships, accounting for 45% of the new fleet. Another 6 owners (16%) are financed by leasing firms, possessing 14 ships and contributing to 6% of the new fleet. The remaining 22 owners (58%) are independent shipping companies transitioning from other vessel segments, having 122 ships and making up 49% of the new fleet. In summary, about half of the recent new entrants are traditional shipowners transitioning into LNG carriers, while private equity and leasing companies account for the other half.

New LNG Shipowners Fleet (Total 248 units)

● Independent Shipowners ● Energy Majors

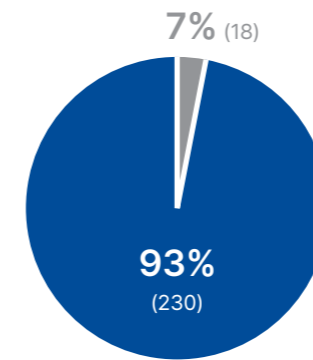


Figure 3-8 New LNG shipowners fleet
Source: SFOC, World LNG Report, IGU (2014), Clarkson

New Shipowners Composition by number of ships (Total 248 units)

● Independent Shipowners ● PE-linked ● Financier

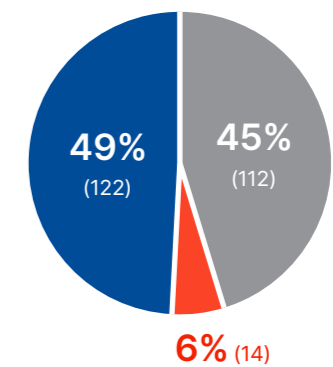


Figure 3-9 New LNG carrier owners' background composition
Source: SFOC, World LNG Report, IGU (2014), Clarkson

This analysis reveals a dramatic expansion in the LNG carrier fleet, largely driven by traditional shipowners diversifying into LNG carriers and the increasing influx of PE and leasing-backed companies. However, the magnitude of this growth raises concerns about its sustainability and alignment with market demand. Furthermore, its trajectory is not in line with the efforts to combat climate change, nor with a just energy transition.

Another noteworthy development is the emergence of private equity (PE) fund-linked shipowners in the LNG carrier sector. Private equity funds began their foray into the LNG shipping sector by purchasing the LNG fleets of traditional shipping firms in the late 2010s. Today, financial powerhouses have established their own specialized LNG shipping entities, such as Global Meridian, Oceonix Services backed by JP Morgan, and Energos supported by Apollo Partners. This trend mirrors the rise of PE-backed LNG liquefaction facilities, particularly in the United States. After lifting a 40-year ban on crude oil exports in 2015, the U.S. began exporting LNG in 2016 and quickly rose to the second-largest LNG exporter. Private equity has been a key driver in this expansion, supporting 86% of existing LNG export terminal in the U.S.⁹

Analysis of the Top 50 LNG Shipowners

Within the LNG fleet owned by the top 50 shipowners, as outlined in *Appendix 1*, the dominance of traditional family-run shipowners with a long history stands out. Altogether, they possess 629 ships, constituting 76% of the total fleet of 833 units. The remaining 204 units (24%) are associated with energy majors. Notably, PE-linked shipowners represent around 28% of the fleet, emerging as significant players in this sector.

Fleet Owned by Top 50 LNG Shipowners (Total 833 units)

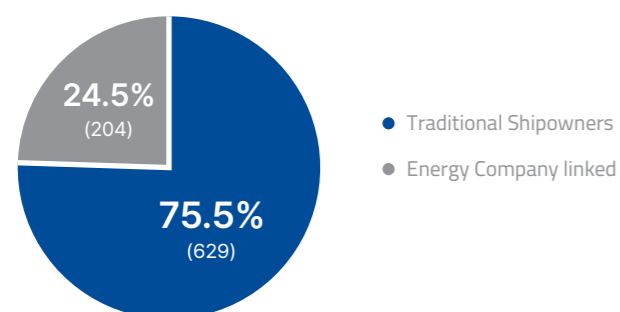


Figure 3-10 Composition of LNG fleet owned by the Top 50 LNG Shipowners (2023)
Source: SFOC, Clarkson

LNG Floating Infrastructure Providers

Floating Storage and Regasification Units (FSRU) are used for LNG storage and regasification. Compared to traditional onshore regasification plants, FSRUs offer greater flexibility, lower capital outlay and a faster means of importing LNG. FSRU Shipowners like Hoegh, Excelerate Energy and BW continue to operate the largest fleets of active FSRUs, while New Fortress Energy, a new player, entered the market in 2021 after the acquisition of Golar, a traditional LNG shipowner's FSRUs. Interestingly, large portions of these FSRU companies are again linked with private equity firms – Excelerate Energy by Vanguard, Energos by Apollo Partners, Golar LNG and BW LNG associated with Cobas Asset management.

⁹ <https://pestakeholder.org/news/private-equity-fuels-Ing-at-the-expense-of-communities-and-the-climate/>

3.3 Shipyards

Shipbuilding Companies (Shipyards): These firms are responsible for constructing LNG carriers. They work closely with shipowners and end-users, often tailoring vessels to specific needs. Their capacity and technological capabilities can impact the availability and cost of new LNG carriers, thereby influencing the operational dynamics of shipowners. Constructing LNG carriers typically entails more highly specialized aspects compared to other commercial vessels like bulk carriers or oil tankers. There are only a handful of shipyards possessing the capability to meet the technical demands. Only shipyards licensed by GTT to use their designs, or those with their proprietary containment system technologies, are eligible for constructing universally operable conventional large-size LNG carriers.

South Korean shipyards dominating LNG shipbuilding market, Chinese following closely with 500% YoY growth

Three major Korean shipyards – Hanwha Ocean, Hyundai Heavy Industries and Samsung Heavy Industries – have historically dominated LNG carrier orders since the 1990s. Their expertise in handling complex cryogenic containment systems makes them the preferred choice for most LNG shipowners.

LNGC on Order by Shipyard

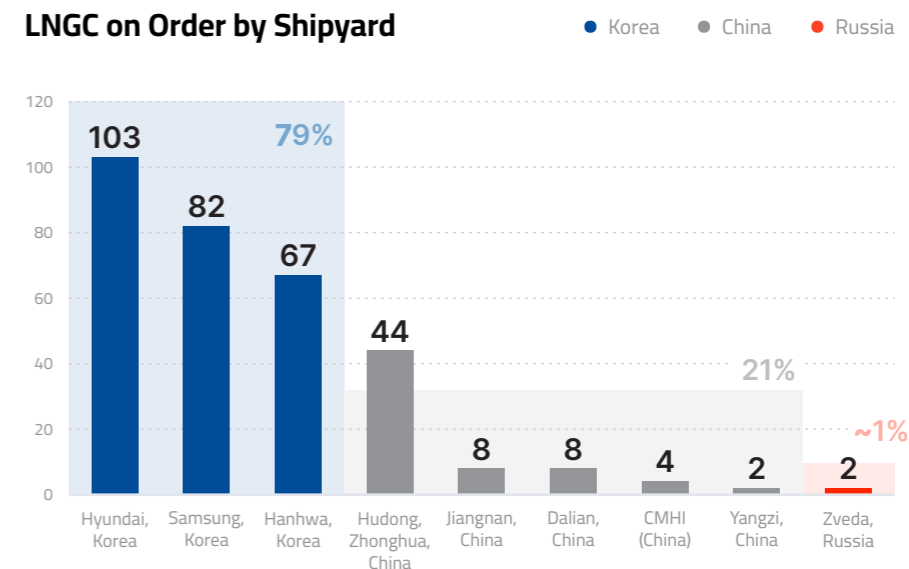


Figure 3-11 LNG carriers on order by shipyard as of 15 October 2023
Source: SFOC, Clarkson

In recent years, however, some Chinese shipyards like Jiangnan, Dalian and Yangzijiang have started building LNG carriers, initially to cater to domestic needs. The limited capacity in Korean shipyards and rising newbuild prices (reaching USD 250 million by the end of 2022 from USD 200 million at the end of 2021) have recently drawn more conventional LNG carrier orders to Chinese yards. Despite such growth, Korean shipyards still continue to account for the lion's share of LNG carrier orders to the present day. As of October 2023, Chinese shipyards represent around 20% of the LNG orderbook compared to approximately 80% for their Korean counterparts as depicted in Figure 3-11 above. The expansion of Chinese yards strengthens the industry's capacity as a whole and fosters pricing competition, potentially contributing to a more elastic LNG shipping market.

3.3.1 LNG Carrier Order Workflow: Speculative Orders

The LNG carrier newbuilding contract process requires strategic timing as it takes about three years or more to complete the LNG carrier construction. Due to its inelastic nature, shipowners may decide to place a new ship order either after securing employment (Charter contract) for a vessel or even before signing a ship charter contract. In this report, the act of placing a ship order without a secured employment shall be referred to as making a ‘speculative order’.

When placing a speculative order based on anticipated demand, shipowners evaluate factors such as LNG offtake contract volumes, final investment decisions (FID) for LNG liquefaction and regasification facilities, and energy mix announcement by major LNG importers, among others. On the LNG carrier supply side, factors to consider include slot availability at shipyards, newbuilding prices, and expected delivery dates.

In case a shipowner is interested in placing a speculative order for an LNG carrier, it would typically follow the standard vessel technical specification provided by shipyards, ensuring the vessel’s compatibility with most LNG terminals. The following presents a glimpse into the typical newbuilding contract process:

- ① Shipowners send out a Request for Proposal (RFP) to their shipyards of their choice.
- ② In response, shipyards offer their quotes based on their standard specifications.
- ③ Negotiations begin between the shipowner and the shortlisted shipyards, where commercial terms such as shipbuilding price, payment terms, and delivery schedule are hashed out.
- ④ Upon reaching a preliminary agreement with the finally chosen shipyard, both entities sign a Letter of Intent (LOI), which remains valid for approximately a month.
- ⑤ Within the validity of this LOI, comprehensive discussions take place. Both parties dive into the shipbuilding contract’s commercial and legal aspects, as well as any technical specifications that might influence the final contract price.
- ⑥ Once the parties reach an agreement on the final contract terms, the shipbuilding contract, complemented by the technical specifications, is finalized and signed.
- ⑦ This contract takes effect once the shipyard presents the shipowner with a refund guarantee (RG) from their banking institution.
- ⑧ The shipowner makes the first installment, setting the construction process in motion. The loan agreement in ship finance is signed after the issuance of the RG, aligning with the shipowner’s financing plan.



Figure 3-12 Newbuilding Contract Process
Source: SFOC

3.3.2 LNG Carrier Order Workflow: Orders Driven by Energy Majors

Unlike the speculative order approach, energy majors occasionally take an active role in the shipbuilding order process to construct LNG carriers exclusively for their own use. Since ExxonMobil set the precedent in 2022 for its newbuilding program where end-users selected shipyards and secured slots prior to contracting shipowners, such a practice has since then been embraced by other energy companies, including QatarEnergy.¹⁰

Growing Involvement of End-users in the Shipbuilding Process

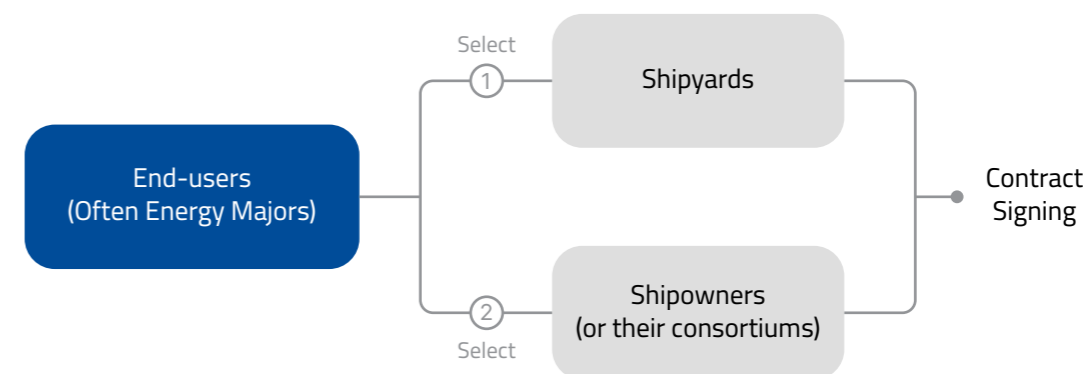


Figure 3-13 Growing Involvement of End-users in the Shipbuilding Order
Source: SFOC

In this model, as illustrated in Figure 3-13, end-users collaborate with the shipyards of their choice to develop their own technical specifications for LNG carriers that suit their needs, before finalizing the preliminary commercial terms. Thereafter, they open closed tenders, inviting LNG shipowners to submit bids for the project. Shipowners calculate charter rates by incorporating their ship management and operating costs on top of the vessel contract price for the time charter contract period. Once shipbuilding contracts are signed, financiers step in to provide financing to shipowners. Unlike the speculative order approach, this method, led by energy majors, is preferred by financiers because it is backed by end-users with higher credit quality than typical shipowners right from the project initiation. Loan agreements are typically signed after the shipbuilding contract. This model offers cost certainty to end-users as they may have a clearer picture of the upfront costs (i.e. shipbuilding price) and potentially assume better positions in negotiations by directly engaging with shipyards themselves.

¹⁰ As the world’s largest LNG exporter, Qatar’s state-owned QatarEnergy has been actively involved in LNG carrier newbuildings, securing shipyard slots for 66 vessels in 2022 and 17 more recently for its second newbuilding phase.

3.3.3 LNG Carrier Orderbook Development

Historically, the LNG carrier industry has experienced significant fluctuations in order volumes, largely due to major events that have influenced the fossil gas landscape. Here's how these pivotal moments correlated with surges and drops in the LNG carrier orderbook volumes:

LNG Carrier Orderbook History

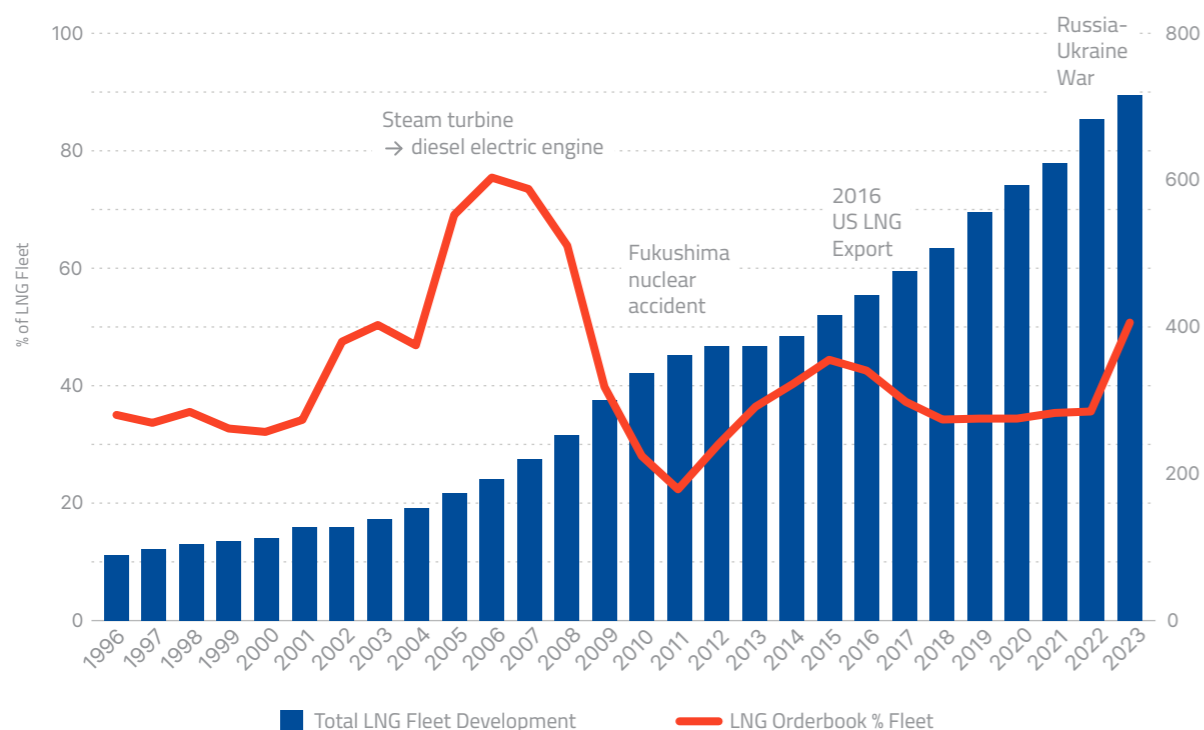


Figure 3-14 LNGC Orderbook Capacity History
Source: SFOC, Clarkson

Note: The line refers to the shares of LNG carriers on order in relation to the existing LNG fleet.

2006 Introduction of Diesel Electric Engine: This technological advancement has resulted in higher efficiency of LNG carriers, leading to a surge in orders by 88%.

2008 The U.S. Shale Gas Boom: The sudden increase in U.S. fossil gas production created a new source of LNG, spurring demand for carriers to transport it.

2011 Fukushima Nuclear Accident: The disaster led to a shutdown of nuclear plants in Japan, causing an immediate spike in LNG imports and, consequently, a rise in carrier orders.

2012 Commencement of the U.S. Sabine Pass LNG Export Terminal Construction: This marked the U.S.'s entry into the global LNG export market, generating anticipation toward increased LNG traffic.

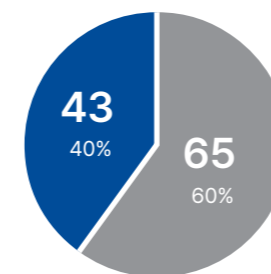
2016 First LNG Export from the U.S. by Cheniere: Cheniere executed the first LNG export from the U.S. The orderbook share had dropped to 40% by this time, as the market had been more stabilized.

2021 Russia Gazprom's Suspension of Piped-Gas Supply to Europe (Yamal-Europe pipeline): This event triggered a sudden surge in LNG as a replacement to piped gas, driving up orders for carriers.

As of October 15, 2023, the current LNG orderbook comprises of 320 vessels, constituting 50% of the active fleet. This ratio is unprecedented in the modern LNG carrier era since 2010 as seen in Figure 3-14, indicating the industry's oversupply issue. According to the Climate Analytics and SFOC report (2023), the projected oversupply for the LNG fleet is estimated at 31% under the stated policy scenario, 34% in the announced pledges scenario, and a substantial 65% under the Net Zero Emission by 2050 scenario.¹¹

LNGC Orderbook in 2014 (Total 108 units)

● Chartered ● Speculative Order



LNGC Orderbook in 2023 (Total 320 units)

● Chartered ● Speculative Order

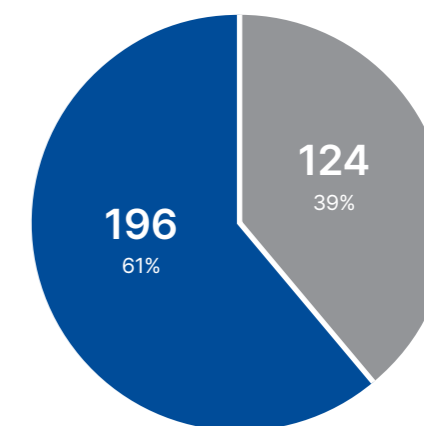


Figure 3-15 LNGC Orderbook ratio 2014 vs 2023
Source: SFOC, World LNG Report, IGU (2014), Clarkson

Note: As of 15 October 2023, we compiled publicly available information on the charter contracts of the newbuilding orders. This data was then integrated with Clarkson's data to calculate the number of speculative orders.

The IEA's Gas Market Report Q1-2023 reveals that LNG carrier orders soared to an all-time high of 165 in 2022, marking a 130% spike from the previous year. Remarkably, approximately 39% of these orders were speculative, as depicted in Figure 3-15. This ratio is alarming, considering that the fleet size has tripled, signaling grave uncertainties and risks for stakeholders like never before. The LNG market's prospects, once considered rosy back in 2014, are no longer valid. Surpassing global LNG trading volumes under the stated policy scenario, the market faces a permanent oversupply as the global shift toward the net-zero goal accelerates renewable deployment, further reducing the demand for fossil gas.

¹¹ High and dry: The global energy transition's looming impact on the LNG and oil shipbuilding industry, Climate Analytics and SFOC (2023)

4 South Korea's Public Financing in LNG Carriers

Heavy industries like shipbuilding serve its strategic role in driving economic growth in developing nations. Historically, countries such as Japan, Korea, China, and now India have leveraged heavy industries to create jobs and boost exports, thereby generating foreign revenue. Public financing remains a key enabler for these nations to support such industries. However, the evolving landscape in the LNG sector, shaped by volatile fossil fuel industries and a rapid transition toward renewables, necessitates a careful reconsideration of the public support to heavy industries. This scrutiny should ensure that public funds align with global climate targets and are not locked into unsustainable. Climate Analytics' 2023 report finds that under the IEA's Net Zero Emissions scenario aligned with Paris Agreement goals, no new LNG carrier builds would be compatible with limiting warming to 1.5°C. Maintaining the current levels of financial support for new orders could result in a "pouring water into a leaky bucket" situation, leading to stranded assets.

While this report focuses on data from Korea's public financing sectors, the issue extends beyond just Korea. It is also relevant to China, where the share of LNG carrier orders has seen a recent uptick, and Japan, where numerous legacy LNG shipowners leverage affordable financing to place speculative orders for LNG carriers.

In this section, we delve into the financing supports from 18 March 2013 to 10 August 2023 for LNG carrier projects by three public financial institutions and two maritime-focused public agencies, namely the Korea Development Bank (KDB), Export-Import Bank of Korea (KEXIM), Korea Trade Insurance Corporation (K-SURE), Korea Ocean Business Corporation (KOBC), and Korean Asset Management Association (KAMCO). The data was obtained in consultation with the office of Gu Ja-geun, a member of the South Korean National Assembly, and included: (i) details of the guarantees provided; (ii) details of the loans provided; (iii) details of the equity investments made; (iv) the parties to the contract; and (v) project region.

4.1 Financing Structure of LNG Carriers Ship Finance

The total of 12 different types of LNG vessel-related financial support were classified into four main categories: 1. Ship finance; 2. Ship finance support; 3. Shipyard finance; and 4. Shipyard finance support. The key factor guiding this categorization is whether the beneficiary is a shipowner that owns and leases ships or a shipyard constructing LNG vessels. Additional consideration made was whether the financial support is direct funding or an indirect mechanism in a form of guarantee or insurance so as to promote financing activities for shipowners or shipyards. The structure map and the table below describe their roles and interactions among the involved entities.

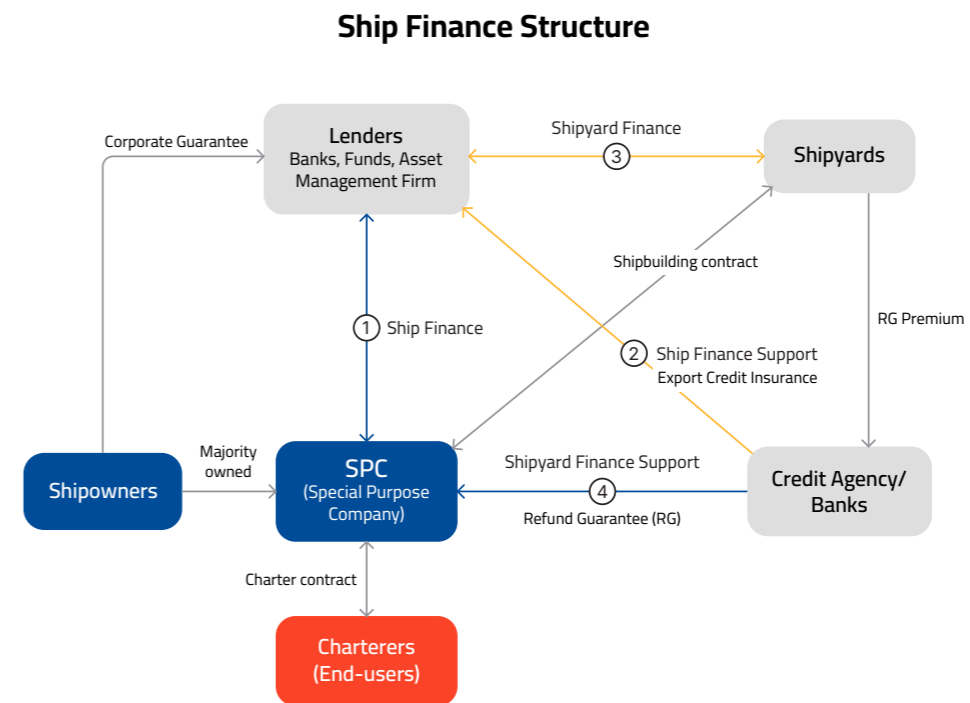


Figure 4-1 Ship Finance Structure
Source: SFOC

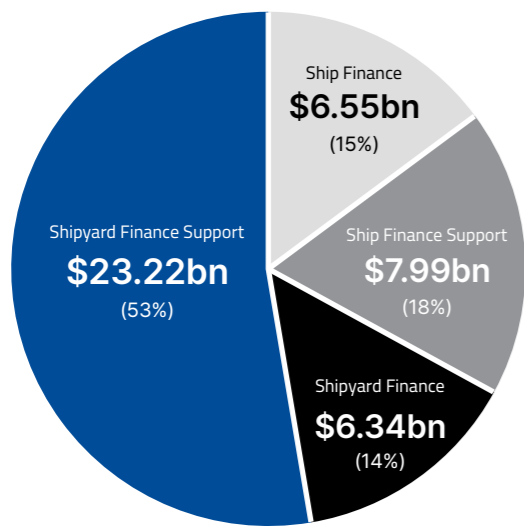
Role	Type
① Ship Finance	<ul style="list-style-type: none"> Funding provided for ship purchases made by shipowners. This is backed by the vessel as a collateral, and the charter contract as a project revenue Sale and Leaseback Ship Funds Senior and Subordinated Loans
② Ship Finance Support	<ul style="list-style-type: none"> Insurance/guarantee products provided to a ship finance received by a shipowner from another financial institution to reduce the shipowner's financing costs through discounted interest rates Ship Introduction Guarantee Export-related Financial Guarantee Export Bond Insurance Medium and Long-term Export Credit Insurance
③ Shipyard Finance	<ul style="list-style-type: none"> Funding provided directly to shipyards Export Facilitation Loan Export Project Loan Export-based Loan
④ Shipyard Finance Support	<ul style="list-style-type: none"> Insurance/guarantee products tailored to address risks originated from shipyards Advance Payment Bond Warranty Bond Refund Guarantee

Figure 4-2 Categories of Ship Finance
Source: SFOC

4.2 Breakdown by Financial Product Category

Over the past decade, Korean public financing institutions provided funding to LNG carrier projects on 652 occurrences, reaching a cumulative support of \$44.1bn. This came in the form of loans [1. Ship Finance and 3. Shipyard Finance] or guarantees [2. Ship Finance Support and 4. Shipyard Finance Support], totaling \$44.09bn, and equity investments amounting to \$0.04bn. In consideration of the relatively small volume of the equity component and its primary focus on purchasing secondhand LNG vessels, instead of investing in newbuilding, it has been excluded from the following analysis.

Korea's Ship Financing Distribution by amount (Total USD 44.09bn)

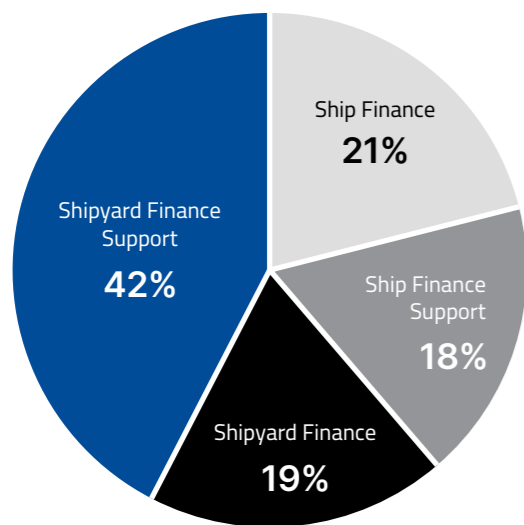


Of the four financing categories discussed, in terms of financing size, 4. Shipyard finance support ranked first with a total of \$23.2bn. In this category, 'Advance payment bond' was the predominantly utilized financial product.

Figure 4-3 Korea Ship financing distribution 2013-2023
Source: SFOC, Korea National Assembly Audit

Note: The data was rounded to the first decimal place.

Most Used Ship Financial Product in Korea



The distribution pattern remained similar based on the number of financing cases: more than half (61%) of these cases involved support for shipyards. While guarantees [4. Shipyard Finance Support] to shipyards remained the major form of support, constituting 42% of all cases, there was a noteworthy increase in the proportion of cases involving loans [1. Ship Finance] to shipowners.

Figure 4-4 Most used financial product by financing case
Source: SFOC, Korea National Assembly Audit

South Korea's Public Financing in LNG Carriers (2013-2023)

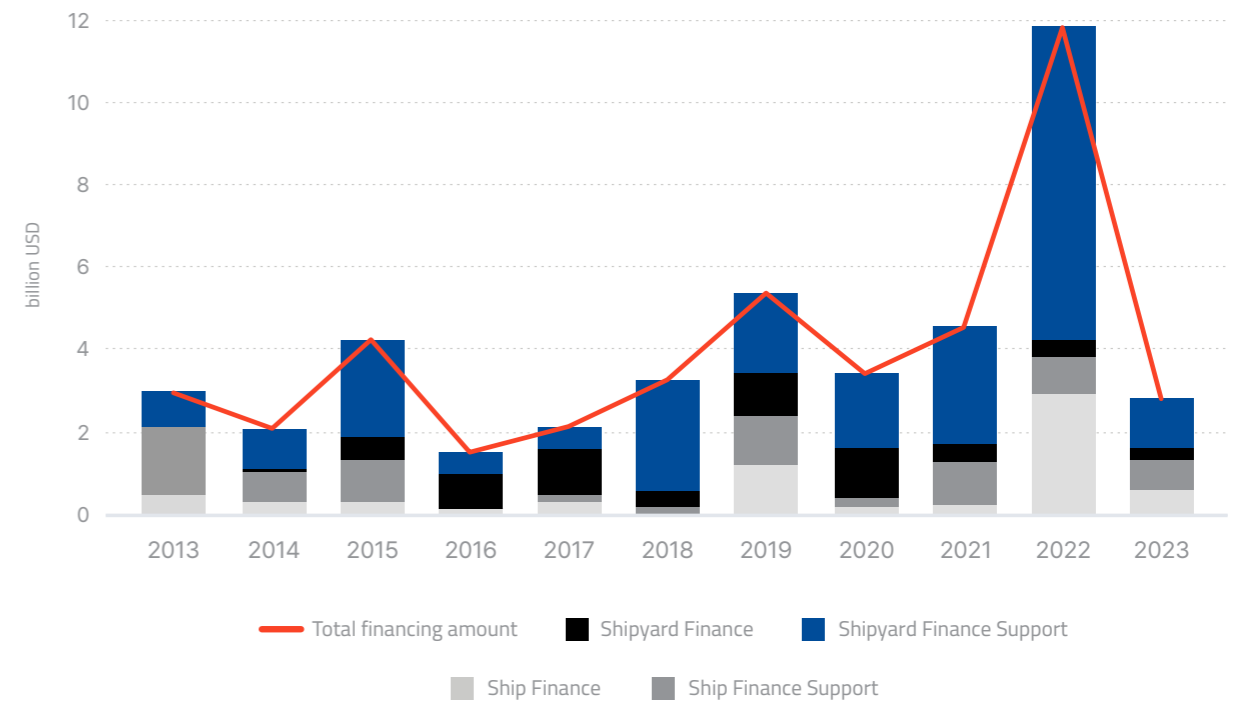


Figure 4-5 South Korea's Public Financing in LNG Carriers
Source: SFOC, Korea National Assembly Audit

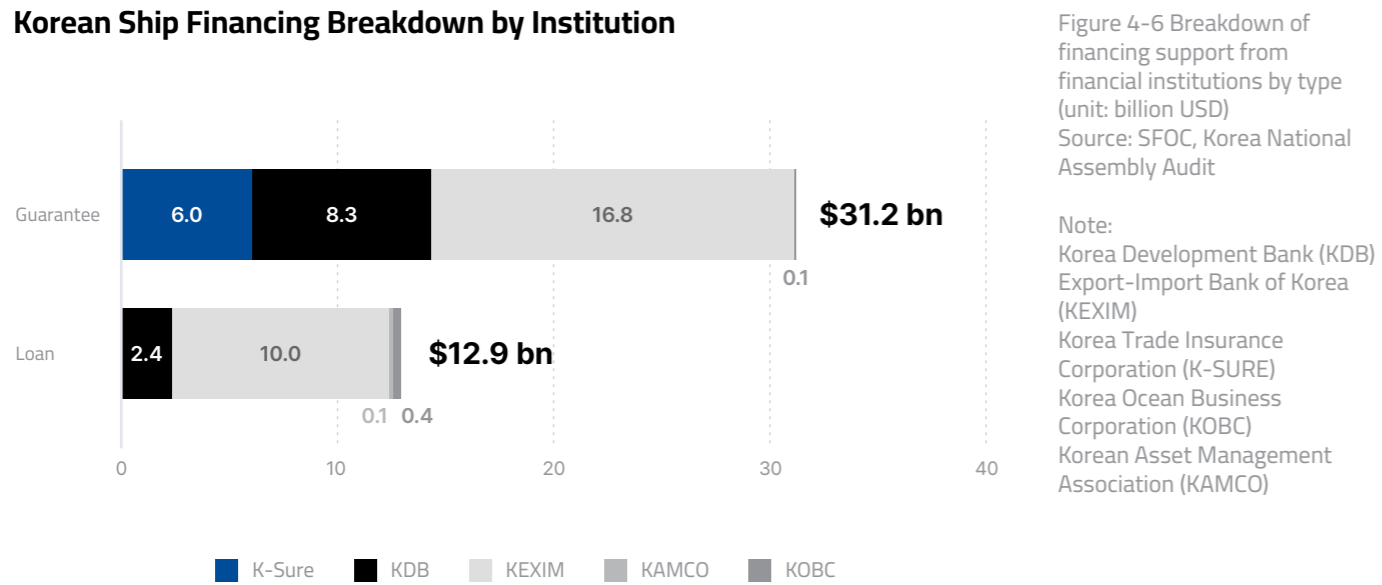
The yearly trend shown in Figure 4-5, based on the data from the National Assembly, shows that the record number of newbuilding orders for LNG vessels led to 2022 being the peak year for financial contracts as well. In 2022, both 1. Ship Finance and 4. Shipyard Finance Support were more frequently leveraged than other financing categories. The spike in ship finance in 2022 can be attributed to numerous Korean shipowners participating in Qatar's newbuilding program. Consequently, the surge in Shipyard Finance Support in the same year is due to the peak in order volume in 2022, primarily in the form of refund guarantee to shipowners. This trend suggests a potential increase in shipyard finance in the coming years, as shipyards will continue to require export-based loans for construction. This same pattern was observed in 2018, where there was a surge in shipyard finance support, followed by subsequent shipyard finance increase in 2019 and 2020. However, with most Korean shipyards having their yard slots booked until 2026 or 2027, there has been a decrease in new building contracting from Korean shipyards in 2023. This caused a significant portion of ship orders to be directed to the Chinese shipyards instead, also consistent with the reduction in Shipyard Finance Support in 2023.

4.3 Breakdown by Public Financial Institution

In terms of financial institutions, KEXIM participates in project financing deals both as a lender and as a credit agency for loans made by other institutions, as well as offering performance bonds. KDB engages in both lending and guarantee-related activities. Meanwhile, K-SURE specializes in insurance and guarantee-related services as a credit agency, without engaging in any lending functions.

When it comes to ocean-related agencies, KAMCO has established a shipping fund as a vehicle to finance LNG carriers, and has also provided equity investment via KDB Infrastructure Asset Management (KDB's subsidiary). Meanwhile, KOBC primarily focuses on ship funds and guarantees, as well as buying out older LNG carriers and leasing them to maritime companies.¹²

Korean Ship Financing Breakdown by Institution



In terms of distribution, the combined financing from the five entities amounts to \$31.2bn in guarantees [2. Ship Finance Support and 4. Shipyard Finance Support] and \$12.9bn in loans [1. Ship Finance and 3. Shipyard Finance]. The higher proportion of guarantees is due to inclusion of refund guarantees, which typically involve substantial amounts by nature.

Breaking the analysis down by institution, KEXIM provided the largest share of financing both in terms of financing size (the total financing amount of \$26.8bn, of which \$16.8bn was provided in guarantees to shipowners and shipyards) and the number of financing cases. K-SURE provided \$6bn exclusively in the guarantee segment, and KDB has contributed \$2.4bn in loans and \$8.3bn in guarantees (mostly to shipyards). Both KAMCO and KOBC predominantly offered category 1. Ship Finance.

¹² Fueling the Climate Crisis: South Korea's Public Financing for Oil and Gas, SFOC (2021)

4.4 Breakdown by Financing Destination

The findings from this section suggest that Korean public finance is fueling the global expansion of LNG carriers. As the main objective was to gauge the extent of Korean public finance channeled overseas, the following analysis is focused on the financing dedicated to shipowners only, namely 1. Ship Finance and 2. Ship Finance Support, since shipyard finance and related financial support products are aimed at domestic shipyards.

In examining ship finance destinations for 1. Ship finance, approximately 50% of the financed amount (\$3.24bn) was directed to domestic LNG shipowners. The remaining half (\$3.31bn) was provided by KEXIM and KDB to facilitate the expansion of LNG fleets for shipowners based in Greece, Nigeria, Norway, UK, Canada, France, China, Bermuda and Singapore.

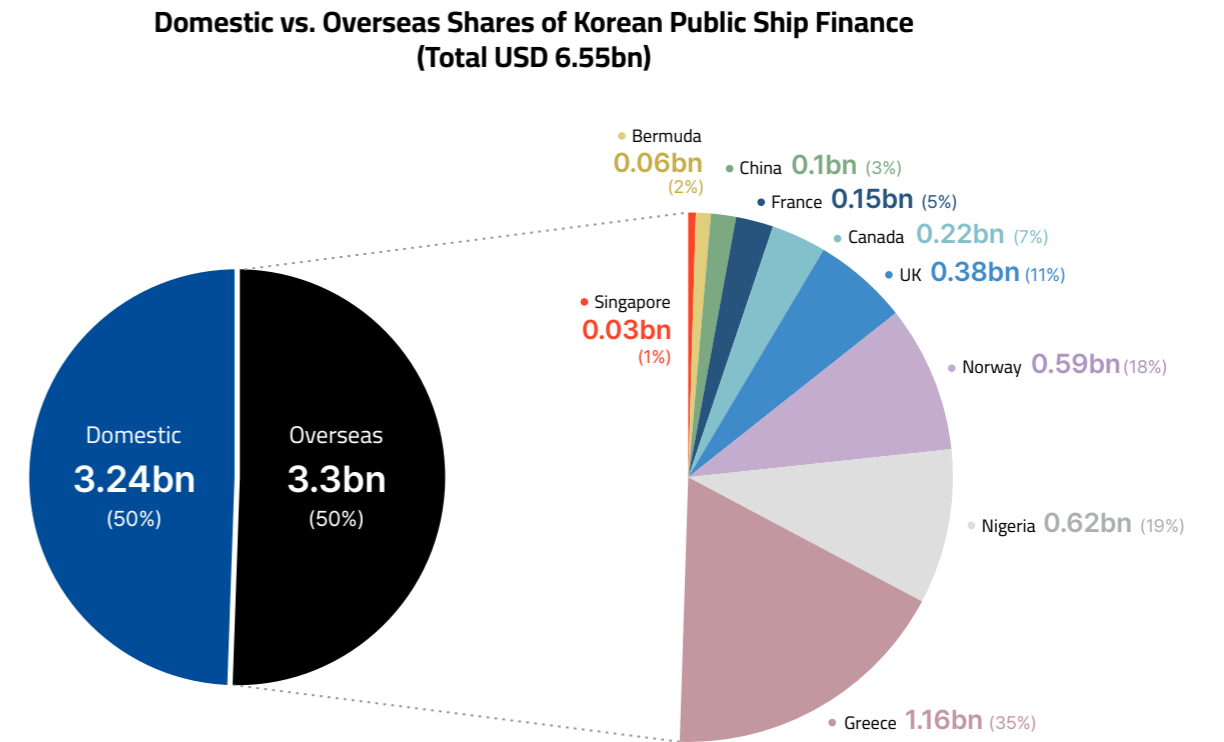


Figure 4-7 Domestic vs. Overseas share of ship finance (unit: financing amount)
 Source: SFOC, Korea National Assembly Audit

In the case of 2. Ship finance support, 99% of the financing amount (\$7.9bn) was directed towards overseas destinations, while only 1% (\$0.1bn) was allocated domestically with the assistance of the KOBC. The financing to overseas destinations was distributed between K-SURE and KEXIM with a respective ratio of 76% (\$6bn) to 24% (\$1.9bn) out of the total.

A closer examination of the figures highlight that K-SURE has dispersed its financing to a wide array of countries, including Germany, Liberia, Russia, the Marshall Islands, Malaysia, Malta, Bermuda, Cyprus, Singapore, and France. KEXIM, on the other hand, primarily directed its financing towards shipping companies in Greece (27%), Norway (26%), the UK (20%), China (14%) and France (13%).

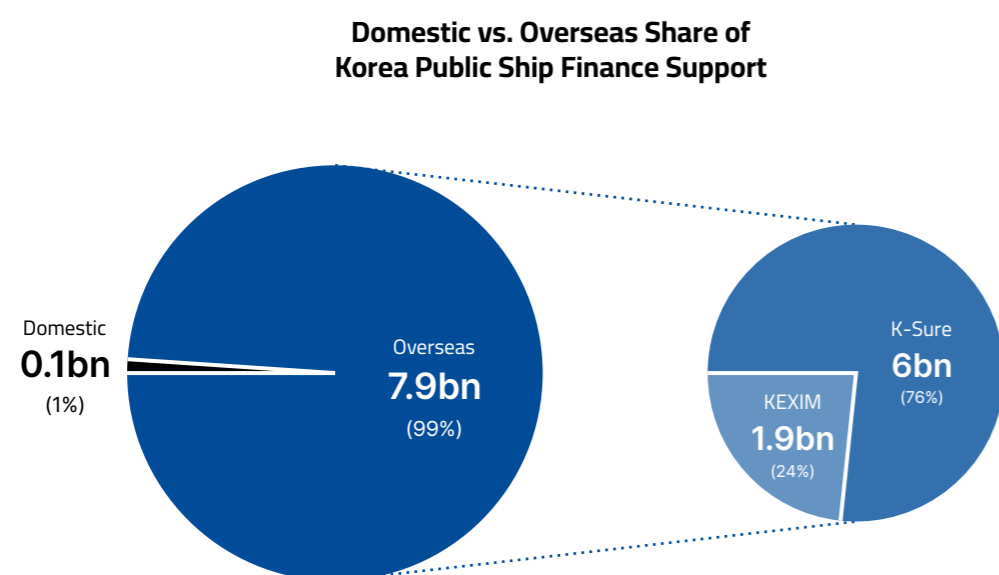


Figure 4-8 Domestic vs. Overseas share of ship finance support (unit: financing amount)
Source: SFOC, Korea National Assembly Audit

5 Emerging Risks in the LNG Carrier Market

The number of LNG carriers contributing to the expansion of the global LNG value chain has tripled over the last 10 years. This expansion has solidified the status of LNG in the fossil gas market. However, the exponential expansion of LNG carrier fleet has also pushed existing players including East Asian shipyards and public financiers knee-deep into the rising risks of fossil fuel financing. LNG shipowners who are newcomers, such as private equity-linked shipowners and traditional shipowners, now face the same risks. While LNG is positioned as a transitional fuel, the typically long operational lifetimes of LNG carriers and their infrastructure pose the danger of entrenching emissions for decades. As there arises a growing momentum to reduce worldwide reliance on fossil fuels, the industry is obliged to address the discrepancy between emissions reduction goals and the ongoing expansion of LNG fleets.

5.1 Financial and Commercial Risks

Last year, LNG stakeholders perceived the energy crisis triggered by Russia's invasion of Ukraine and the restructuring of the fossil gas supply chain as a significant opportunity, leading to record-breaking orders for new LNG carriers. Over the next 3-5 years, LNG shipping capacity is expected to increase by 50% as these LNG vessels initiate their operation.

However, contrary to the industry expectation, the demand for fossil fuels has started to trend downwards. The price volatility of fossil fuels, exacerbated by last year's energy security crisis, has expedited the global energy transition. As a result, as suggested by IEA last year, the outlook for fossil fuel use is projected to decrease across all scenarios for the first time in history. According to the updated Net Zero report published by IEA this year, by 2050, the demand for fossil gas should decrease to 23% of current levels. Ultimately, as global climate policies and energy transitions become more ambitious to stay in line with carbon neutrality objectives, the demand for LNG is expected to rapidly diminish.

Consequently, the LNG shipping market faces severe overcapacity risks and disruptions due to the decreasing fossil gas demand. Shipowners, who rely on long-term charters for extended long payback of initial investments, and banks and public financiers who provided loans with decades-long repayment scheme, are particularly prone to vulnerable market conditions.

Meanwhile, East Asian shipyards, which have consistently maintained stable cashflows through securing LNG carrier orders in recent years, are no exception to the impact of the drop in new orders. In South Korea, for example, LNG carrier orders played a significant role in alleviating the shipbuilding industry's downturn in the 2010s. From 2018, LNG carriers consistently accounted for around 20% of the new order volume (based on DWT) in the Korean shipbuilding industry, and this figure increased to about 50% in 2022. Without transitioning to alternative means of shipbuilding orders utilizing offshore wind and green fuels, a sharp drop in LNG carrier orders could have dire consequences on these shipyards.

5.2 Climate Risks

The world has experienced a catastrophic climate crisis this year, leading to assessments that 'the era of global warming' has ended. In July 2023, UN Secretary-General Antonio Guterres also warned that 'the era of global boiling' has begun. In March the same year, The Intergovernmental Panel on Climate Change (IPCC), an epistemic community of climate scientists, recommended that 'greenhouse gas emissions must peak before 2025 at the latest and fall by 43% at least below 2019 levels by 2030' to limit global temperature rise to 1.5°C in their 6th Assessment Report (AR6)¹³.

The escalating climate crisis underscores the urgent need for a swift phase-out of fossil fuels, leaving no room for any new fossil fuel projects to begin. Considering the imminency of the looming climate crisis, new investments related to oil and gas assets or companies reliant on their revenue on LNG related projects could severely tarnish the reputations of financial institutions.

Across the LNG value chain, LNG carriers play a crucial role connecting LNG supply and demand. Consequently, there is mounting global pressure on the LNG shipping and shipbuilding industry, as well as their investors, because their actions further expand the LNG fleets, conflicting with climate goals.

A trend of excluding oil and gas from financing has already begun among global financial institutions. Major players such as HSBC¹⁴, Societe Generale¹⁵, BNP Paribas¹⁶, Allianz¹⁷, Munich Re¹⁸, among others, have announced to exclude upstream oil and gas development projects from their future pipelines. With growing pressure on financial institutions, such an exclusionary trend is expected to extend further across oil and gas, including the LNG shipping market.

¹³ <https://www.ipcc.ch/2022/04/04/ipcc-ar6-wgiii-pressrelease/>

¹⁴ Energy Policy, HSBC (2022)

<https://www.hsbc.com/-/files/hsbc/our-approach/risk-and-responsibility/pdfs/221214-hsbc-energy-policy.pdf?download=1>

¹⁵ Oil & Gas Sector Policy, Societe Generale (2023)

<https://www.societegenerale.com/sites/default/files/documents/CSR/Oil-Gas-sector-policy.pdf>

¹⁶ Sector policy – Oil & Gas, BNP Paribas (2023)

https://cdn-group.bnpparibas.com/uploads/file/bnpparibas_csr_sector_policy_oil_gas.pdf

¹⁷ https://www.allianz.com/content/dam/onemarketing/azcom/Allianz_com/responsibility/documents/Allianz-Statement-oil-gas-business-models.pdf

¹⁸ Munich Re's approach to fossil fuels in underwriting and investment, Munich Re (2022)

https://www.munichre.com/content/dam/munichre/contentloungue/website-pieces/documents/MunichRes-approach-to-fossil-fuels-in-underwriting-and-investment.pdf/_jcr_content/renditions/original./MunichRes-approach-to-fossil-fuels-in-underwriting-and-investment.pdf

6 Recommendations

As covered in the last chapter, the current oversupply of LNG fleets will become more pronounced if confronted with the rapid transition of global energy system toward renewables. To mitigate risks, players in the LNG shipping market need to implement measures to ensure swift adaptation. Furthermore, considering the complexity of the LNG shipping market where various stakeholders interact, it is essential to provide recommendations tailored to different stakeholders of the market. Hence, this report provides recommendations for various stakeholders as stated below:

6.1 To Financiers

Both public and private financiers should immediately cease the funding of new LNG carrier shipbuilding projects to avert risks associated with stranded assets. Especially, financing for speculative LNG carriers, without long-term charter contracts, exposes financiers to the inherent volatility of the LNG shipping market.

To mitigate climate-related risks, private investors should establish divestment criteria and start engaging with stakeholders highly reliant on their revenues from LNG shipping market. This should not be restricted to shipowners and shipping companies; it extends to shipyards, equipment suppliers and cargo technology licensors alike.

6.2 To Shipowners

Shipowners, on the other hand, should disengage themselves from the increasingly jeopardizing market. Given the overall 35-year lifespan of LNG carriers, most of the LNG vessels on the orderbook risk ending up as stranded assets before their lifespan runs out, as the global community rushes its way to achieve the Net Zero targets. The secondhand LNG carrier market could sharply depreciate in value as the LNG shipping market transitions from a 'blue ocean' of opportunities to a 'red ocean' of competition. Shipowners who rely heavily on LNG carriers may experience considerable profit volatility due to the unpredictable fluctuations of fossil fuel prices. To mitigate and prevent these risks, shipowners should transition their portfolios to align with the Paris trajectory.

6.3 To Shipyards

Shipyards in Korea and China should diversify their business scopes into renewable energy sectors or innovative technologies, instead of clinging onto past practices. This view, trapped in the past, not only hinders reaching the global climate targets but also impedes progress towards sustainable transition, potentially locking companies into stranded assets.

7 Appendix

7.1 Appendix 1. Top 50 LNG Shipowners

Owner Group	Total Fleet	Avg. Age	Country	Remarks
Mitsui OSK Lines	58	9.0	Japan	
Nippon Yusen Kaisha	53	8.7	Japan	
Angelicooussis Group	53	7.2	Greece	
Qatar Gas (Nakilat)	43	15.8	Qatar	Energy major linked
Knutsen OAS Shipping	41	7.0	Norway	
Seapeak	38	11.7	Bermuda	Spun-off from Teekay, PE Linked (Stonepeak Infrastructure Partners)
BW Group	31	10.6	Bermuda	PE linked (Cobas Asset Management)
Dynacom	31	7.6	Greece	PE linked (Cobas Asset Management)
Petronas	30	16.2	Malaysia	Energy major linked
GasLog	29	7.7	Greece	
Cardiff Marine	24	6.1	Greece	
Oceonix Services Ltd	21	0.8	UK	PE linked (JP Morgan)
Capital Maritime	18	6.2	Greece	PE linked (Smith (Donald) & Company Inc.)
Celsius Shipping	18	1.9	Denmark	PE linked (Breakwater Capital & Bayside Capital)
H-Line Shipping	17	14.5	South Korea	PE linked (Hahn & Co.)
Hyundai LNG Shipping	17	19.7	South Korea	PE linked (IMM)
China COSCO Shipping	16	4.3	China P.R.	
SK Shipping	16	13.2	South Korea	PE linked (IMM)
K-Line	15	10.7	Japan	
Nigeria LNG	13	13.8	Nigeria	Energy major linked
ADNOC	13	27.7	U.A.E	Energy major linked
Eastern Pacific Shpg	13	7.6	Singapore	
H-Line/Pan Ocean/SK	13	0.0	South Korea	Energy major linked (Qatar project consortium)

Owner Group	Total Fleet	Avg. Age	Country	Remarks
NYK K-Line MISC CLNG	12	0.0		Energy major linked (Qatar project consortium)
Leif Hoegh & Co	12	9.8	Norway	
Fredriksen Group	11	3.4	Cyprus	
Excelerate Energy	11	13.6	US	PE linked (Vanguard)
Sinokor Merchant	10	32.2	South Korea	
SM Group	10	10.1	South Korea	
China Merchants	9	3.8	Hong Kong	
Asyad Shipping	9	16.4	Oman	Energy major linked
Nakilat JC	8	15.1	Qatar	Energy major linked
Chevron	8	7.9	US	Energy major linked
Alpha Tankers	8	3.0	Greece	
Thenamaris	8	9.9	Greece	
Global Meridian	8	0.0	Bermuda	PE linked (JP Morgan)
Apollo Global (Energos)	7	12.4	US	PE linked (Apollo partners)
MOL & CSLNG JV	7		Consortium	Energy major linked
Meiji Shipping	7	10.0	Japan	
Minerva Marine	7	2.0	Greece	
SCF Group	7	9.7	Russia	Energy major linked
Shell	6	25.7	UK	Energy major linked
BP	6	4.7	UK	Energy major linked
Seapeak CLSICO JV	6	4.5	Canada	Energy major linked (Yamal project)
Smart LNG	6		Russia	Energy major linked
Pan Ocean	6	7.6	South Korea	
CLNG	6	13.9	Hong Kong	
CNOOC/CMES/NYK JV	6		Consortium	Energy major linked
CNOOC/CSLNG/MOL JV	6		Consortium	Energy major linked
Tokyo LNG Tanker Co	5	16.0	Japan	Energy major linked (Tokyo Gas)

Source: SFOC, Clarkson

Note: Data as of 15 August 2023

7.2 Appendix 2. Change of LNG Shipowners and their Fleet (2014-2023)

	No.					Fleet				
	Shipowners	Energy Major	Energy Major Breakdown		*Total	Shipowners	Energy Major	Energy Major Breakdown		*Total
			Export	Import				Export	Import	
2014	38	40	25	15	78	142	183	159	24	325
2023	57	33	19	14	90	449	201	155	46	650
+/-	50%	-18%	-24%	-7%	15%	216%	10%	-3%	92%	100%

Source: SFOC, Clarkson, World LNG Report 2014 and 2023 (IGU)

Note: *Total includes the figures of Shipowners and Energy Majors.
In 2023, a single company was labeled as "unknown." and we categorized it under the classification of "Shipowners."

7.3 Appendix 3. New LNG Shipowners in 2023

Shipowners in 2023	Fleet	Category	Background
Alpha Tankers	8	Shipowner	New
Capital Maritime	18	Shipowner	New - PE Linked
Cardiff Marine	24	Shipowner	New
Chandris Group	2	Shipowner	New
China Dev Bank	5	Shipowner	New - Financier
CSSC leasing	4	Energy major - Import	New - Financier
Eastern Pacific Shipping / CoolCo	13	Shipowner	New
Energos	7	Shipowner	New - PE Linked
Excelerate Energy	11	Shipowner	New - PE Linked
Flex LNG	11	Shipowner	New - PE Linked
H-Line	17	Shipowner	New - PE Linked
Hoegh	12	Shipowner	New
Huaxia Bank	1	Shipowner	New - Financier
Hyundai LNG Shipping	17	Shipowner	New - PE Linked
Hyundai Motor Group	2	Shipowner	New
Karadeniz	1	Shipowner	New
KMARIN	1	Energy major - Export	New - Financier
Latsco	2	Shipowner	New
Lepta	1	Shipowner	New
Meiji Shipping	7	Shipowner	New
Minerva Marine	7	Shipowner	New
Navigare Capital	1	Shipowner	New - Financier
New Fortress	1	Shipowner	New - PE Linked
Oceanix Services Ltd	21	Shipowner	New - PE Linked
Pardus Energy	1	Energy major - Import	New
Schulte Group	5	Shipowner	New
Shandong Marine	1	Energy major - Import	New

Shipowners in 2023	Fleet	Category	Background
Sinokor	10	Shipowner	New
Thenamaris	8	Shipowner	New
Trada Maritime	1	Shipowner	New
Tsakos	3	Shipowner	New
Xinhang Shipping	1	Energy major - Import	New
CMES Shipping	8	Energy major - Import	New
Global Meridian	8	Shipowner	New - PE Linked
Hanwha Ocean	3	Shipyard	New
Hyundai Glovis	1	Shipowner	New - PE Linked
TPSH Leasing	2	Energy major - Import	New - Financier
Evalend Shipping	2	Shipowner	New

Source: SFOC, Clarkson, World LNG Report 2014 and 2023 (IGU)