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“LNG MARKET ANALYSIS AND FREIGHT RATES”

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Athanasios Nikolaidis
“LNG market analysis and freight rates”

***“Keep Ithaca always in mind.
Arriving there is what you are destined for.
But don’t in the least hurry the journey.”***

Excerpt from Ithaca

Written in Greek by C. P. Cavafy

Translated by Edmund Keeley and Philip Sherrard



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I gratefully acknowledge Professor Theodore Pelagidis for supervising the present thesis. He has read and commented on my thesis drafts and has challenged me to focus on the significant factors of market volatility in general, as also to the main reasons and under which circumstances freight rates alter, as the maritime circles develop.

I am grateful to my parents, Katerina and Orestis Nikolaidis, for nurturing me in a love for learning.

Last but not least, I would like to thank Tampoura Penelope for her valuable assistance, as well as for the encouragement.

May God bless you all.



Absract

For an industry that is just over 50 years old, liquefied natural gas (LNG) has developed vastly and is at the moment portion of the change in the worldwide energy market. Over the last two decades LNG trade has grown four times and is expected to double-up over the two decades ahead.

To understand the mechanisms under which LNG trade has risen, we should first get familiarized how the LNG circle works and what type of vessels are used to transport it. Furthermore the spot where we find LNG ships in the value chains shall be enlighten.

Moreover, the global import and export stakeholders are to be presented in order to understand the trade routes as also the imbalances of trade between producers and consumers. Truly important is also to clear the amounts of gas produced, as also the important role the floating storage and regasification units play and how all these when combined together, make a volatile freight market.

Finally, presenting the major LNG charterers and the main LNG carriers will give a clean view on how the game is played on terms of supply and demand capacity. Finally the freight rates will be the supportive tool to understand the market volatility and shall provide some useful information on what we have to expect in the future.

Key Words

LNG, LNG vessels, FSRU's, LNG imports, LNG exports, LNG freight rates



ΠΕΡΙΛΗΨΗ

Για μια βιομηχανία που είναι λίγο πάνω από 50 ετών, το υγροποιημένο φυσικό αέριο (ΥΦΑ) έχει αναπτυχθεί σε μεγάλο βαθμό και αυτή τη στιγμή αποτελεί μέρος της αλλαγής στην παγκόσμια αγορά ενέργειας. Τις τελευταίες δύο δεκαετίες το εμπόριο ΥΦΑ έχει αυξηθεί τέσσερις φορές και αναμένεται να διπλασιαστεί τις επόμενες δύο δεκαετίες.

Για να κατανοήσουμε τους μηχανισμούς υπό τους οποίους έχει αυξηθεί το εμπόριο ΥΦΑ, θα πρέπει πρώτα να εξοικειωθούμε με τον τρόπο λειτουργίας του κύκλου ΥΦΑ και τον τύπο των πλοίων που χρησιμοποιούνται για τη μεταφορά του. Ακολούθως, πρέπει να καθορίσουμε το σημείο στις αλυσίδες αξίας, στο οποίο γίνεται χρήση των πλοίων ΥΦΑ.

Επιπλέον, αναφέρονται οι παγκόσμιοι φορείς εισαγωγής και εξαγωγής προκειμένου να γίνουν αντιληπτοί οι εμπορικοί δρόμοι για το ΥΦΑ καθώς επίσης και οι εμπορικές συναλλαγές μεταξύ παραγωγών και καταναλωτών ΥΦΑ. Σημαντικό είναι επίσης να καθοριστούν οι ποσότητες παραγόμενου φυσικού αερίου, καθώς και ο σημαντικός ρόλος που διαδραματίζουν οι πλωτές μονάδες αποθήκευσης και επαναεριοποίησης και πώς όλα αυτά όταν συνδυάζονται μαζί, καθιστούν μια ασταθή αγορά εμπορευματικών μεταφορών.

Τέλος, με την ανάλυση των κύριων ναυλωτών ΥΦΑ και των κύριων μεταφορέων ΥΦΑ θα δοθεί μια καθαρή εικόνα για τον τρόπο με τον οποίο το παιχνίδι παίζεται με όρους προσφοράς και δυναμικότητας ζήτησης. Τέλος, οι ναύλοι θα αποτελέσουν το υποστηρικτικό εργαλείο για την κατανόηση της αστάθειας της αγοράς και θα παράσχουν ορισμένες χρήσιμες πληροφορίες σχετικά με το τι πρέπει να περιμένουμε στο μέλλον.



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Abbreviations

Bcf/d	:	billion cubic feet per day
CF	:	Cubic Feet
CM	:	Cubic Meters
DWT	:	Deadweight
FSRU	:	Floating Storage Regasification Unit
FSU	:	Floating Storage Unit
LNG	:	Liquified Natural Gas
MT	:	Million Tons



Introduction

It is almost self-evident that in the near future natural gas will become even more dominant as a means of energy supply, due to the ever-rising global socio-political demands for gradual decarbonization (Stern, 2017). The natural gas is, today, the most sought-after fuel due to its high calorific value, reduced environmental burden, and efficient combustibility. It is being ranked as the cleanest source of energy after renewables, due to its combustion quality and its low content in pollutants. The successful natural gas exploration worldwide shows that there are undoubtedly huge reserves of natural gas available on the planet. The options for transporting gas are either by a network of land-based pipelines and / or by means of LNG tankers in the open seas.

As said, the surging global demands in greener energy supply promote the shift to natural gas which does not leave the shipping sector unaffected. The Liquefied Natural Gas (LNG) has been the focus of global shipping interest as energy transfers dominate global bulk shipping. The need to transport large quantities of natural gas between distant maritime areas has increased the market share for LNG carrying ships in recent years, and there are promising prospects for faster development in this industry. Over the past few years many new LNG vessels have been ordered by both Greek and Chinese shipowners who are leading the way in this fast-growing market segment (Spiers et al., 2019).

This thesis' major scope is to present an LNG market analysis of today, especially after the COVID-19 pandemic hit, that altered the financial environment globally. Furthermore, an LNG market overview will be analyzed and the global imports and exports will enlighten how the main trade routes of LNG are working today. At the same time specified will be the significant role for geopolitics and economic power the floating storage and regasification units (FSRU) play. The LNG shipping is the way to transfer this source of energy, thus the stakeholders shall be indicated. As so, this thesis appoints the top LNG charterers as also the top LNG carriers. Finally, and according to the aforementioned abet the freight rates as they have been configured during the recent years, shall be the theme of discussion.



1 Literature Review

Shipping remains the base of international trade as more than 90% is being transported through oceanic corridors. Through the years it is widely proven that shipping is a cost effective and practical way to transport the great volumes of commodities required. Moreover, procedures such as registration, marine insurance, ship’s construction, crew, ownership etc. can all originate at the same from different countries.

Shipping may be a patterned, regular and volatile business where supply and request play a really consequence part. Worldwide financial conditions and political advancements influence the request side, whereas the measure and accessibility of the worldwide armada influence the supply side. Awkward nature between request and supply called imbalances of trade influence resource values, cargo rates and profit.

Shipping capacity extended unfathomably within the decade some time recently the money related emergency as the worldwide economy developed and basic shifts have happened, such as the gigantic extension of China’s economy. Thus, the lull in worldwide development and misfortunes in China’s economy have affected shipping.

Shipping has confronted the challenges related with overabundance capacity that was commissioned amid solid advertise conditions which has exacerbated the issues (the delivery period of a ship is up to three years and once orders are placed, they are difficult to cancel). In any case, the industry did survive. The market has continuously come back, though still distant from its past highs.

1.1 Theoretical framework.

One of the foremost powerfully developing sectors of the gas industry is the production of the liquefied natural gas (LNG). Reasons for this, is firstly the plausibility of LNG delivery to remote regions and secondly to the adaptability of chains in logistics which permits to significantly diminish political territorial dangers, something that has occurred to be critical for Russia.

In spite of the broad geographical distribution, conventional expansive and medium-tonnage projects confront the issue of LNG (SLNG) industry, which makes it possible to travel from ocean conveyance to neighborhood vitality supply by steam vessels, railroads or road transportation system. 488 billion cubic meters was the amounted volume of liquefied natural gas trade in 2020. According to the below chart, 485 billion cubic meters



was the total increase, between year 1970 and 2020. Australia awarded the largest exporter of LNG for 2020 with an export volume of 106.2 billion cubic meters in total. On the other hand, the largest importer with a total of 102 billion cubic meters was no other than Japan at the same year (Litvinenko, 2020).

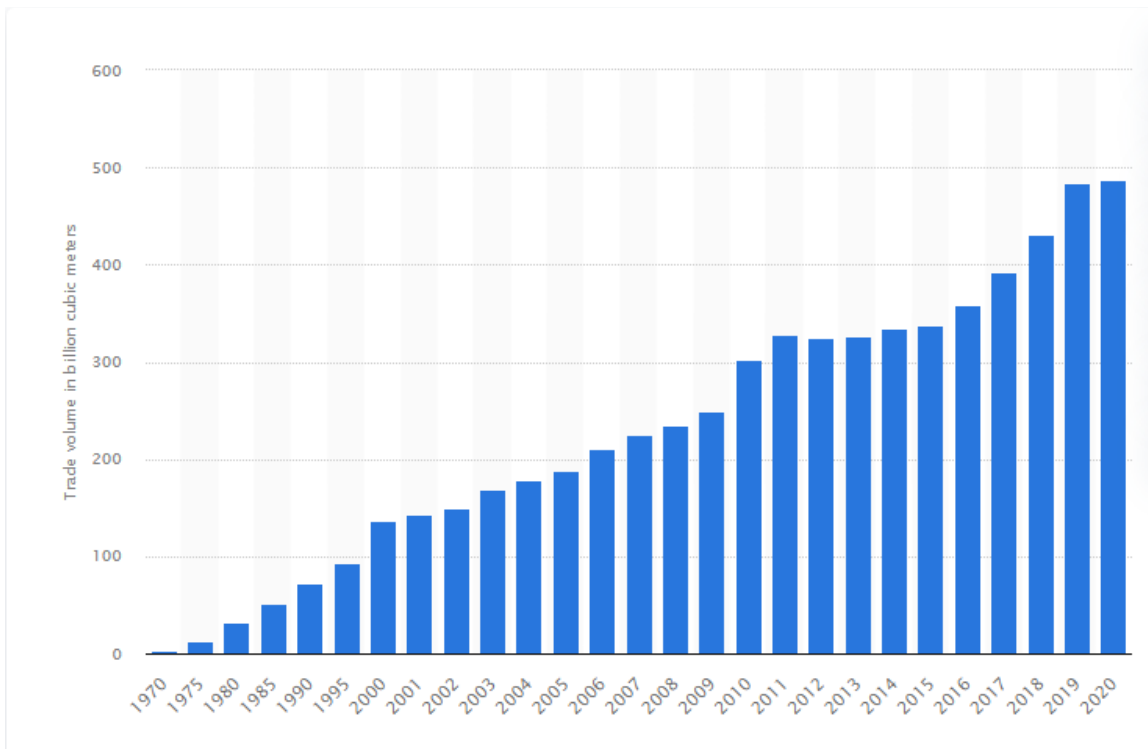


Figure 01: Global LNG volume since 1970 (Statista, 2022)

1.1.1. Key drivers for growth of LNG Market Worldwide

There are several factors that stimulate the growth of the market such as:

- Population Growth: United Nations have estimated the global population is expanding, being expected to reach 8,6 billion in 2030 and almost 11,2 billion in 2100.
- Demand expansion: world develops faster and at least 50% more energy will be required by the year 2070.
- Relieving the climate: Decarbonization is a must, as energy related CO2 emissions have to be decreased to 18 billion tones by the year 2040.
- Air quality improvement: Worldwide air pollution is connected to wasteful vitality utilized in each segment of human action including industry, transportation and agriculture.



2 What is LNG

LNG is nothing less than liquefied natural gas ready to be either storage or transported. It is undeniable that many people in need of energy are located far from the gas fields and running pipelines through the hinterland is not cost-efficient even impractical at times. The solution to this problem is to cool the gas in order to shrink its volume and reform it to liquid, becoming easy to ship it overseas or storage it in a safe way. When natural gas is turned cool to -162°C then LNG is formed. During the cooling process the volume of gas downgrades 600 times, as a result it can be safely shipped. Reaching the destination reverse procedure is followed, thus LNG is regasified. Furthermore, it is easily piped to the industry, to homes or else to be used for heating or to produce electricity. Research has also shown that LNG is becoming a cost-competitive and much cleaner fuel to be used in transportation (Magnus and Møller, 2021).

The value chain for the LNG is made up in four major stages as per below:

- Exploring earth to discover natural gas and gas production afterwards. This usually happens when in search for oil fields.
- Conversion of natural gas into a liquid state as to be efficiently transported by LNG carriers.
- Utilization of the LNG special vessels to ship it worldwide.
- Regasification procedure and storage in special tanks as to be moved to the final destination through pipeline systems.

Pipelines are commonly used to transport the natural gas at the regional level as a preferred way.

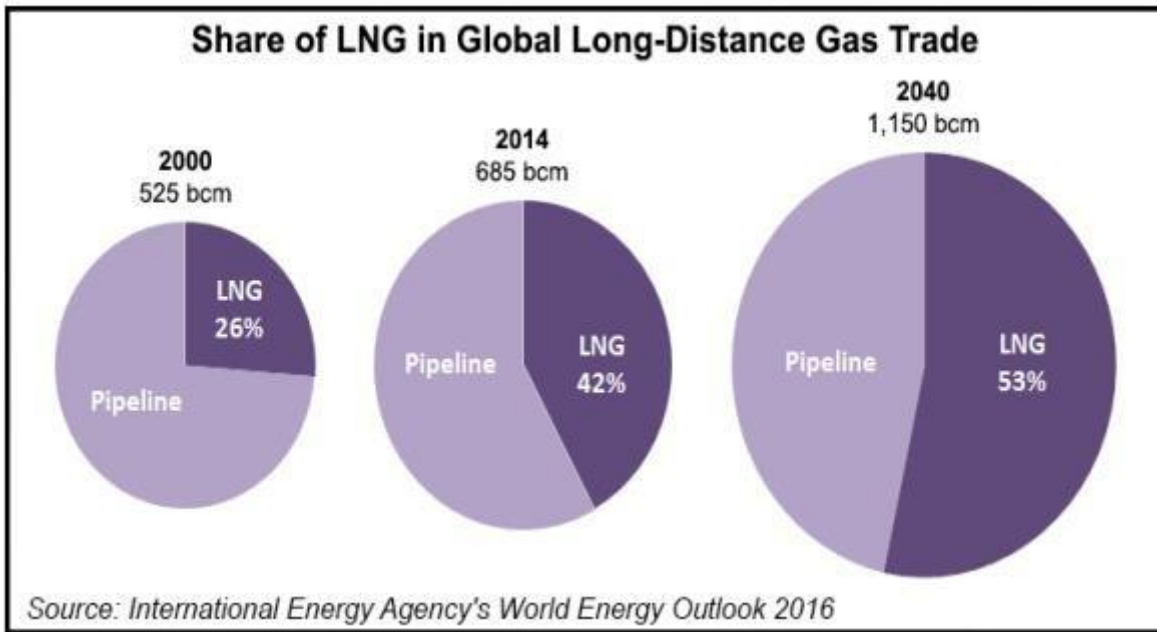


Figure 02: Share of LNG in Global Long Distance Gas Trade (Morgan Stanley, 2019)

The above diagram explains how special restrictions in cost occur regarding long distances. Over a number of thousand kilometers, the achievability of the pipeline is dubious or without a doubt totally blocked.

LNG, except of advantages, has a major disadvantage too. LNG is mostly consisted of methane. Methane has an even worse impact to the environment as greenhouse gas than CO₂. The World Bank on a published report in April 2021 about the climate change, has spotted the impact of LNG's emissions when used as fossil fuel, and tried to advocate for new rules about the emissions of methane. A matter of fact is that established shipping companies such as Maersk and Euronav have also expressed their doubts on how sustainable can LNG be, as transition fuel and they appointed that such investments may slow-down the decarbonization and will delay the energy transition (UNCTAD, 2021).

2.1 Historical Background

It was back to 1959 when LNG cargo was shipped from Louisiana to the UK making trans-oceanic transportation of liquefied natural gas reality. Not more than 5 years passed after this first LNG shipment, that the UK has started importing LNG from Algeria. It was back then, that Sonatrach, a gas and oil state-owned company became world's LNG first major exporter. 1964 was the year when the first LNG tanker was built. As the patent of this vessel grew into a fleet over the years, this pioneer engineered vessel was the reason that LNG shipping was about to become the new sector for this industry.



2.2 Types of LNG Vessel

Pretty useful when analyzing aspects that concern the LNG is to identify the classification of the LNG vessels. The segmentation of these vessels was proposed by the IMO and was finally established with major criteria the tank arrangement. Moreover, this classification has further segmentation according to (Magnus and Møller, 2021). As a result the classification occurred is as per below:

- Independent tanks. In these vessels, tanks are not part of the hull structure. This is critical because they are not taken into consideration when calculating the hull's strength. The vessels with independent tanks are further subdivided as follows:
 - Type A: The tanks' pressure is down creased to 700mbar. Similarities are identified between the tanks of an oil-carrier and these tanks. The general structure seems very similar and follows the classic design used to oil carrier as well.
 - Type B: 700mbar and below is the common operational pressure. Contrary to type A, both the spherical Moss-tank and the IHI SPB prismatic tanks require an auxiliary barrier as a fraction.
 - Type C: In this case the vessel code commands that pressure is above 2000mbar, as a result no barrier is required. Common shapes that we usually find these tanks may be either cylindrical, bilobe or even spherical depending on the ship's general arrangement. To avoid the risk of gas spillage holds are equipped with detectors, as there is no obstruction between hull and the tanks.

The other category of the classification is consisted by the vessels with integral tanks.

- Integral tanks. The vessel's body is comprised by the tanks as part of the hull and so tanks are very crucial when calculating the hull's strength. This classification is also subdivided in two other segments as per below:
 - TGZ Mark III. These tanks follow a structure comprised by layers. From outside to inside we first find the hull separated by a boundary that hides a triplex film, followed by the appropriate insulation which is primary and finally a stainless steel barrier. That concept has been a Technigaz design.
 - GT 96. In this case Gaztransport was the one to develop that design. What is more, the tank is supported by two membranes, a basic and an auxiliary both manufactured by what is called Invar. These tanks are comprised by perlite boxes while nitrogen is used to flush those boxes to succeed the appropriate insulation.



2.3 How does the cargo cycle for LNG work?

The LNG can be loaded only after adequate procedures due to the very low temperatures. If these preparations are not followed correctly that may result into thermal stress to the tanks and the pipes.

In order to assure safe loading, the following actions must take place in that order (Magnus and Møller, 2021):

- At the beginning the tanks and holds must be dried and cleaned. In order to avoid condensation, corrosion or even ice-formation, humidity must be removed and all kind of impurities as well.
- At the second stage, in order to decrease moisture and the levels of oxygen, nitrogen gas is inserted into the cargo tanks. Nitrogen also prevents corrosion and helps in detecting any leaks if the composition of air varies.
- At the third stage, the tanks are “gassed up” by cylinder cleansing warm LNG vapor, consequently evacuating remaining idle gas and wrap up the drying procedure. The tanks are at this moment prepared to be cooled down gradually to approximately -110C to -130C with LNG vapor.

At last, the tanks are prepared to be stacked with LNG. The LNG carrier can be stacked by utilizing either a conventional wharf or an improved jetty less exchange system.

When an LNG vessel release the cargo to an LNG terminal, cargo pumps purge the tanks either totally, or take off a little portion of the cargo on board, as a “heel” to be utilized for tank cooling afterwards.

2.4 Where in the value chain do we find LNG ships?

Natural gas is the most environmentally friendly combustion option from fossil fuels, which means that prioritizing its use globally will help reduce global CO2 emissions and improve public health. The LNG process allows this profitable fuel to be safely and efficiently offloaded aboard purpose-built LNG vessels. Liquefied Natural Gas is commonly transported overseas through shipping. LNG plants and fields are usually placed in remote areas; as a result shipping is most often the only way to transport natural gas. Thus, LNG vessels are the key link between the liquefaction plants and the regasification units in the LNG value chain.

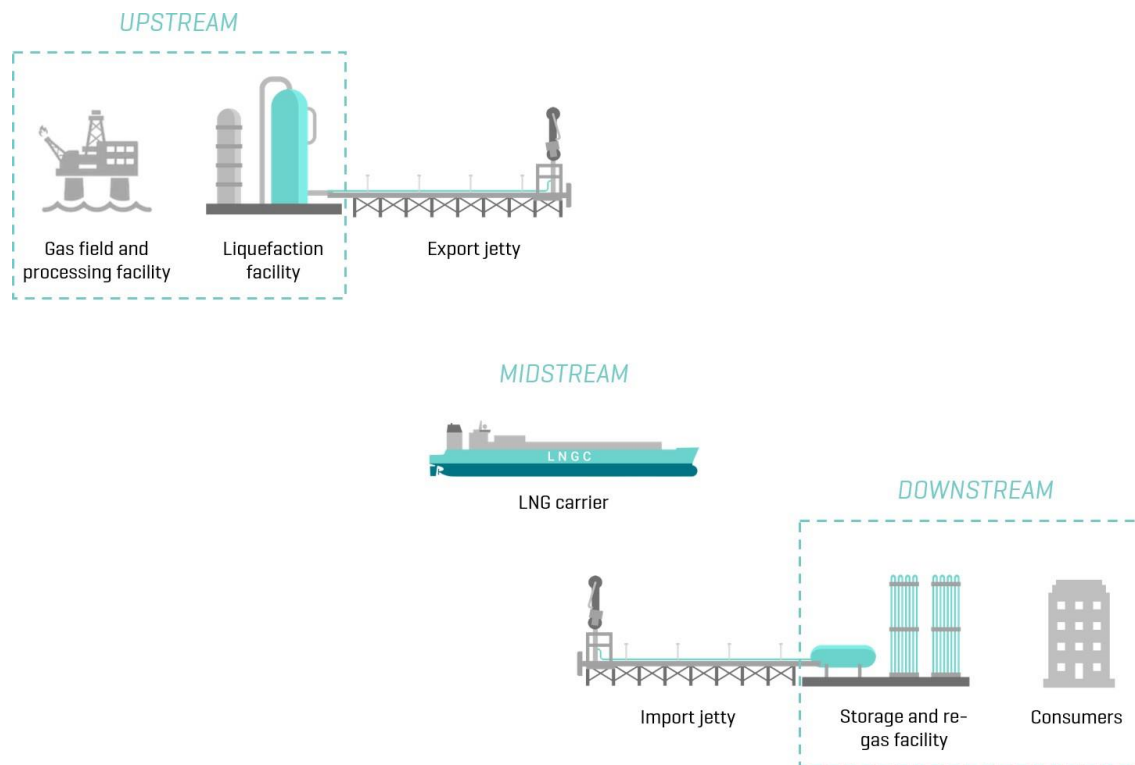


Figure 03: LNG Value chain (Eikens, 2020)

The most common value chain for the LNG is the relation between producers and consumers and the procedure of shipping in the middle, in order the product to be transported as shown on the above diagram.

3 Methodology

In this report, secondary data is used. It comes as an explanatory research, analyzing the LNG market in total. Furthermore, the way LNG freight rates moving is presented and the LNG trade routes depending on the LNG imports and exports, as well. The main sources of this report were found in the annual reports of UNCTAD, Moore Maritime Index, Clarksons, The World Trade Statistical Review and IGU_WorldLNG_2021. What is more, some information used, is also found in newsletters and sites regarding the LNG market.



4 Overview of the LNG Market

In 2020 and the year following, the international LNG trade continued the gearing up shift, reaching almost 357 MT, although COVID-19 and its impacts to the supply and demand chain had been intense. In other words the average 47 Bcf/d in comparison to the 46.8 Bcf/day in 2019 as provided by the bar chart on the below figure speaks for itself. Furthermore, highly appointed is that the total development in 2020 was truly decreased in amount reaching only 1.5 MT contrary to the almost 41 MT of growth in 2019 (IGU, 2021).

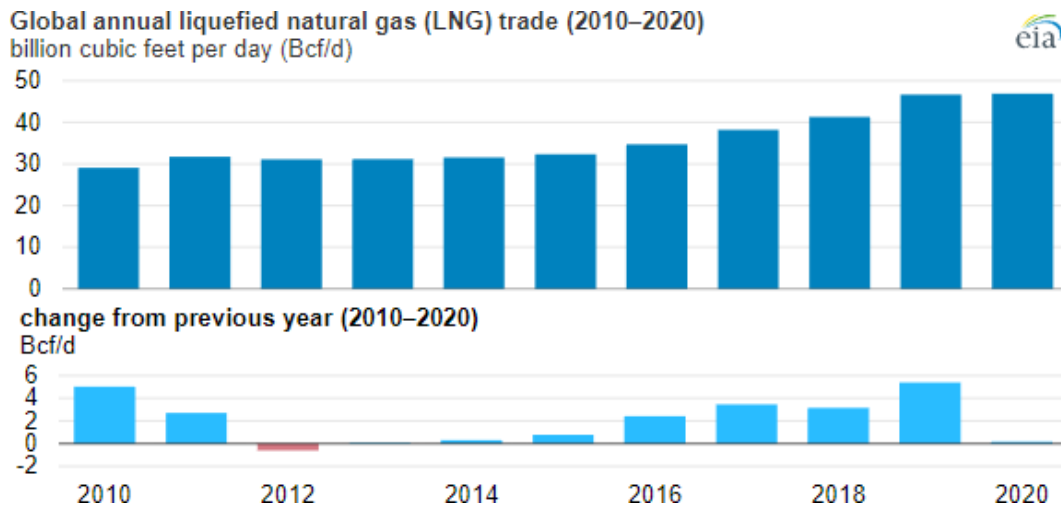


Figure 04: Global annual LNG trade 2010-2020 (EIA, 2022)

What is more, COVID-19 pandemic had eliminated the usual request for gas, however a small growth around 0.5% has been remarked. Observing the period between 2015 and 2019 it is easily understood that LNG trade had been expanded widely and more specifically in 2018 and 2019 has been sky-rocketed touching an even more than 40% increase (EIA, 2022).

The growth race was headed by U.S and Australia by far, while Qatar followed closely. On terms of numbers the high limits were reached with an almost (+11 MT) and (+2.4 MT) accordingly for the first aforementioned countries while it was remarkable the fact that biggest exporter in the world was no other than Australia that had an increase of almost 2.5 MT (from almost 75.5 MT in 2019 to almost 78 MT in 2020. On the other hand, Qatar exportation had decreased between these two years by 0.7 units reaching almost 77 MT in 2020. The country that followed was Russia taking the fourth place touching the serious amount of almost 30MT. Important to mention regarding regions is pronouncing Asia Pacific as the place with the largest exportation capability with almost 131 MT of



export totally, which shows a small fall of almost 0.5 MT contrary to the results of 2019 (EIA, 2022).

Before getting familiarized with the global LNG trading routes and the imports and exports regarding the three major stakeholders, Europe, Asia and USA, it is important to have an overview of the global LNG demand as presented on the diagram below.

COVID-19 restrictions have created a decrease in demand, while commercial challenges due to the price development also occurred. Additionally, to the aforementioned, some technical issues were the major reasons that a number of markets had exported lesser volumes of LNG in 2020 contrary to 2019. Countries such as Trinidad & Tobago Malaysia, Egypt, Algeria and Norway were spotted with the largest decrease in volume as shown on the table below (EIA, 2022) .

Global LNG Trade	LNG Exporters & Importers	LNG Re-Exports
+1.4 MT Growth of global LNG trade	Myanmar commenced LNG imports in 2020, and is therefore the 39 th importing market ¹	+1 MT Re-exported volumes increased by 66% YOY in 2020
Global LNG trade reached an all-time high of 356.1 MT in 2020, another year of consecutive growth. China provided 7.2 MT in new net import demand, and Asia increased net imports by 9.5 MT. Contractions were largest in Mexico (-3 MT), France (-2.5 MT) and Japan (-2.4 MT).	China, India, Chinese Taipei, the United States (Puerto Rico), and Brazil increased net imports through expansion of import capacity. Growth in exports came from the United States (+11 MT) and Australia (+2.4 MT).	Re-export activity increased in 2020 to 2.6 MT (1.6 MT in 2019). Asia received the largest volume of re-exports (1.59 MT), while Asia Pacific re-exported the highest volumes (1.25 MT).

Table 01: LNG global trade – export- import (EIA, 2022)

In 2020 the major LNG importers was the East region. China, South Korea and India have driven the lead contrary to 2019 when back then, Europe due to the netbacks was the major importer of large amounts of LNG. The numbers speak by themselves, as 11.5 MT and maybe a little more was the total growth of the East region in 2020. In the meantime, Asia Pacific continued to be the largest importing region reaching the tremendous amount of 147 MT, while Asia kept the second place with around 107 MT and a noticeable increase around 10 Mt from the previous year. The net imports of China and India played an important role to that event. Myanmar was the unexpected player that aroused as an importing market with a small yet not insignificant amount of 0.2 MT of LNG (IGU, 2021)



Before providing the last and fully updated results of the exports and imports of Liquefied Natural Gas by market for the year 2020, it is necessary to know what were the trade routes before COVID-19 evoked as total disruption.

Top 5 Large LNG Trade Routes YTD 2019

From	To	Cargo Miles Bn CBM-NM	Cargo Quantity CBM
Australia	Japan	211.15	54,810,366
Australia	China	192.93	49,127,931
USA	South Korea	69.14	6,902,812
USA	Japan	66.70	6,593,056
Qatar	Japan	64.58	10,363,241

Source: VesselsValue October 2019



Table 02: Top 5 Large LNG Trade Routes 2019 (Hellenic Shipping News, 2019)

The above table demonstrates that Japan and China head the lead between the top 5 importing countries on terms of cargo miles within year 2019. Furthermore, East is proclaimed to be the largest importer as the aforementioned countries when combined they reach almost the 67% of the whole demand to import LNG among the first five countries.

China’s strategy to be benefited from the development of the LNG sector is worth to comment as the moves made towards a smooth energy transition from conventional sources into the LNG are clear. Comparing Australia to China trade within years 2018 and 2019, it is verified that China’s vast development is in upward drift to achieve this energy transition.



Top 5 Large LNG Trade Routes YTD 2018

From	To	Cargo Miles Bn CBM-NM	Cargo Quantity CBM
Australia	Japan	202.39	52,496,840
Australia	China	160.05	40,496,840
USA	South Korea	91.78	9,071,910
Qatar	Japan	69.59	10,990,641
Malaysia	Japan	56.55	19,704,069

Source: VesselsValue October 2019



Table 03: Top 5 Large LNG Trade Routes 2018 (Hellenic Shipping News, 2019)

4.1 Exports of Liquefied Natural Gas by Market

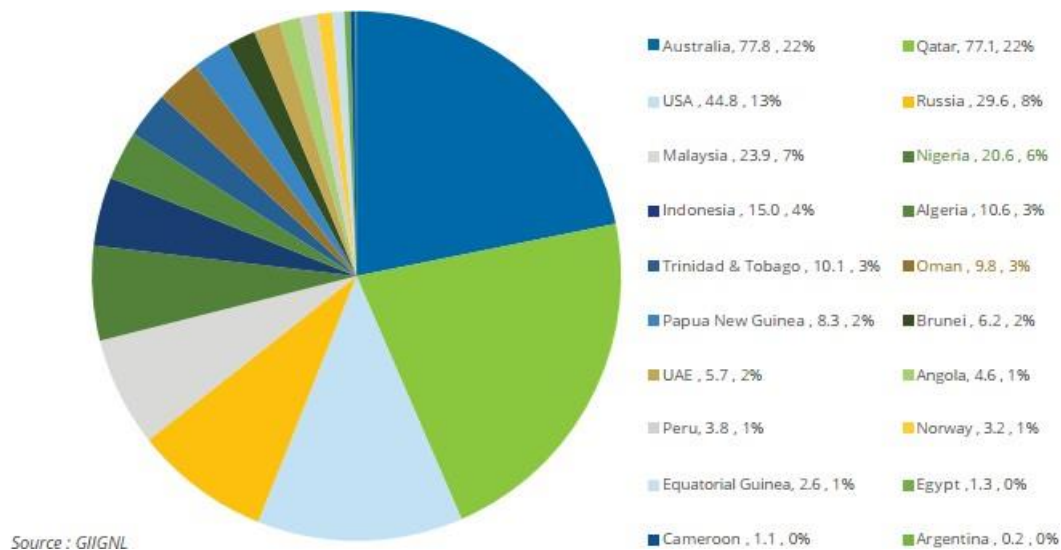


Figure 05: Exports of Liquefied Natural Gas by Market (GIIGNL, 2020)

The year 2020 was characterized by the fact that the U.S added almost the total liquefaction capacity, as the markets did not export at all due to COVID-19 pandemic. The above figure clarifies that Australia became the biggest exporter reaching a 77.8 MT high and taking the lead from Qatar that managed to export 77.1 MT. However, on terms of percentages, as shown on the pie-chart they both acquired an equal 22% market share. Well noticed in 2020, was the increased export capacity of the U.S reaching 44.8 MT. That means that U.S leveled up 11 MT from the year before which equals a tremendous



percentage increase of 33%. This increasement was pronounced as impressive if ones think the cancellations that took place due to COVID-19 disruption. Number four on the ranking was Russia for 2020, staying in the same place with a slight increase of 0.3 MT versus 2019, reaching export capacity of 29.6 MT. Finally, worth mention is that Angola and Papua New Guinea, although being in the lower positions, they profited from nourish gas accessibility with some minor increments in export trades reaching 0.2 MT and 0.1 MT individually contrary to year 2019.

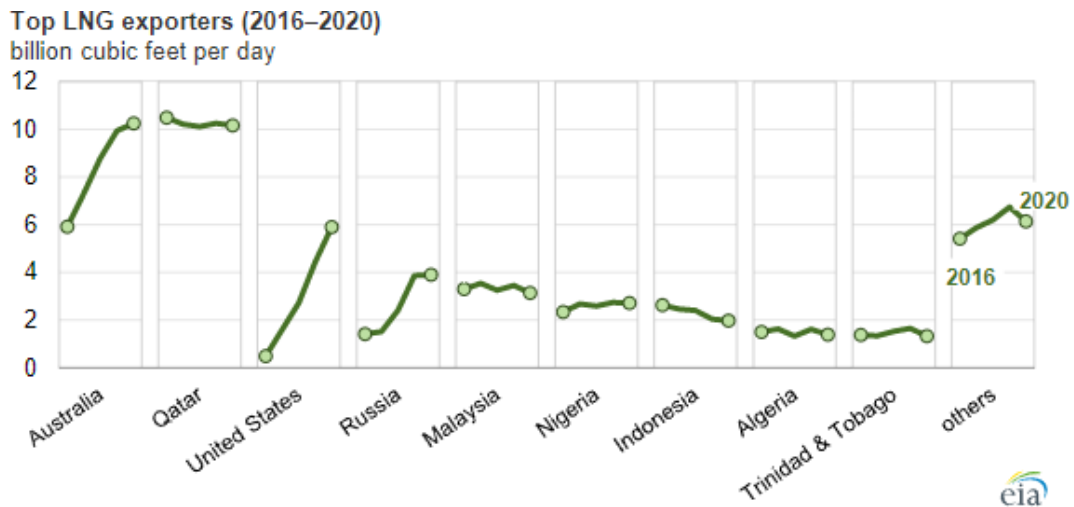
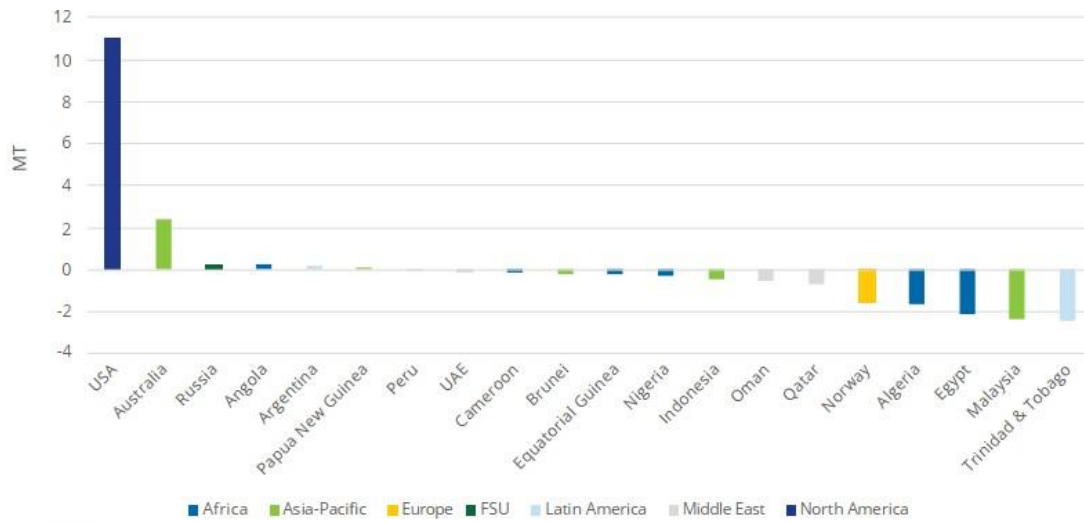


Figure 06: Top LNG exporters 2016-2020 (EIA, 2022)

An overview of the top LNG exporters in billion cubic feet per day within years 2016 and 2020 is presented on the above diagram showing that the largest expansion was made by the U.S. while Australia followed, whether the rest of the major exporters stayed almost stable.



Source : GIIGNL

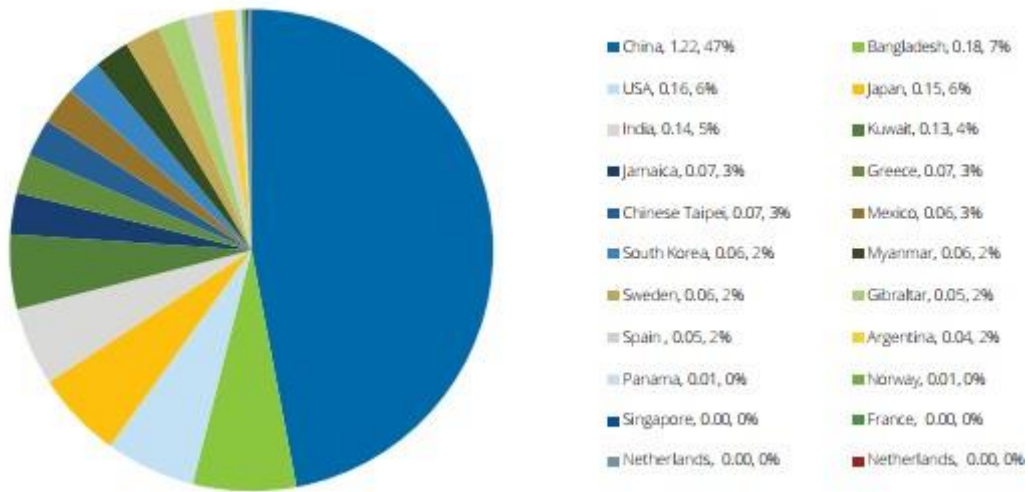
Figure 07: LNG exporters 2019-2020 (GIIGNL, 2020)

The export players that faced huge decreases in 2020 versus 2019 at a total sum of 10.1 MT were Norway, Algeria, Egypt, Malaysia and Trinidad & Tobago. The main reasons for these export decreases were the feedback availability challenges for Trinidad & Tobago, the economic changes due to the price volatility for Egypt and Malaysia, while Algeria felt the competition with U.S volumes into Europe and some technical issues at Snøhvit LNG for Norway (GIIGNL, 2020).

Countries that faced smaller scale decreases were Qatar, Oman and Indonesia. Contrary to 2019, there have been fourteen markets in total that faced significant reductions that reached 12.7 MT in total. Asia Pacific continued to lead the race as the largest exporter with a total 131.2 MT which was slightly less than 2019. North America was proclaimed the region with the biggest increase in exports as the United States didn't stop driving the race with a 11 MT add-on since the previous year. On the other hand, the biggest decrease is found in Europe due to Norway firstly, as mentioned before at a total 33% contrary to 2019.



Figure 3.4: Re-Exports Received in 2020 by Receiving Market (in MT)

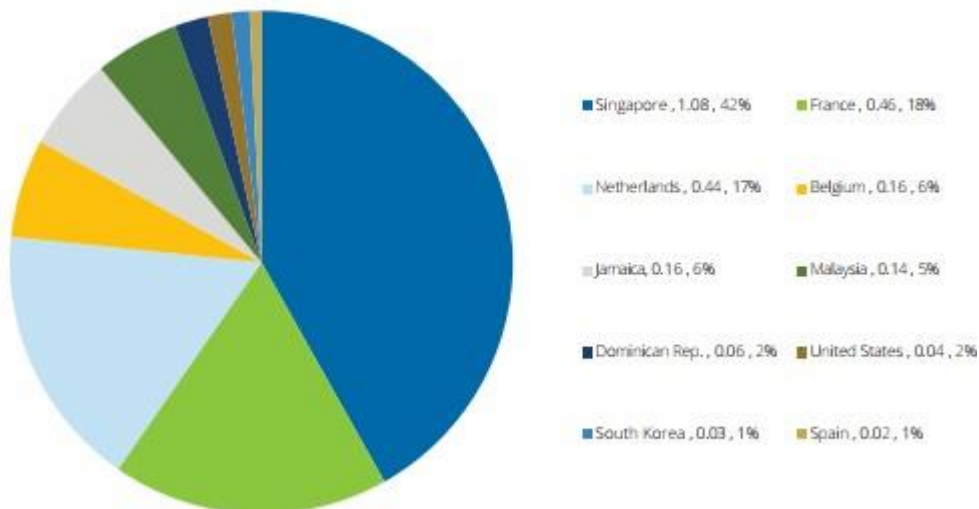


Source : GIIGNL

Figure 08: Re exports received in 2020 by receiving Market in MT (GIIGNL, 2020)

Finally re-exported trade has a general increase from 1.6 MT to 2.6 MT equal to 0.6% versus 2019 and was almost the 1% of the total worldwide LNG trade in 2020. Ten markets have absorbed re-exports with Singapore and France to be the first ones without any change since 2019. Worth to mention was that Asia Pacific loaded almost the 50% of all the volume that have been re-exported while on the same route was Europe loading about the 42%. (IGU, 2022)

Figure 3.3: Re-Exports Loaded by Re-loading Market in 2020 (in MT)



Source : GIIGNL



Figure 09: Re exports loaded by re- loading Market in 2020 in MT (GIIGNL, 2020)

4.2 Imports of Liquefied Natural Gas by Market

Myanmar was a newcomer in the worldwide LNG imports, by importing 0.2 MT. Despite the fact, that restrictions against COVID-19 had great impact on the supply chain, the major importers such as China, South Korea and India managed to achieve, imports reaching 11.7 MT in total. Although Turkey increased LNG imports achieving a 1.35 MT, the most significant increase in net imports was observed in Asia who contrary to 2019 imported 9.5 MT more (GIIGNL, 2020).

Although the Asia-Pacific market share was lowered by 1% on 2020 in comparison to 2019, the regions with the most imports had been no others than Asia and Asia-Pacific (IGU, 2021).

Figure 3.5: 2020 LNG Imports and Market Share by Market (in MT)

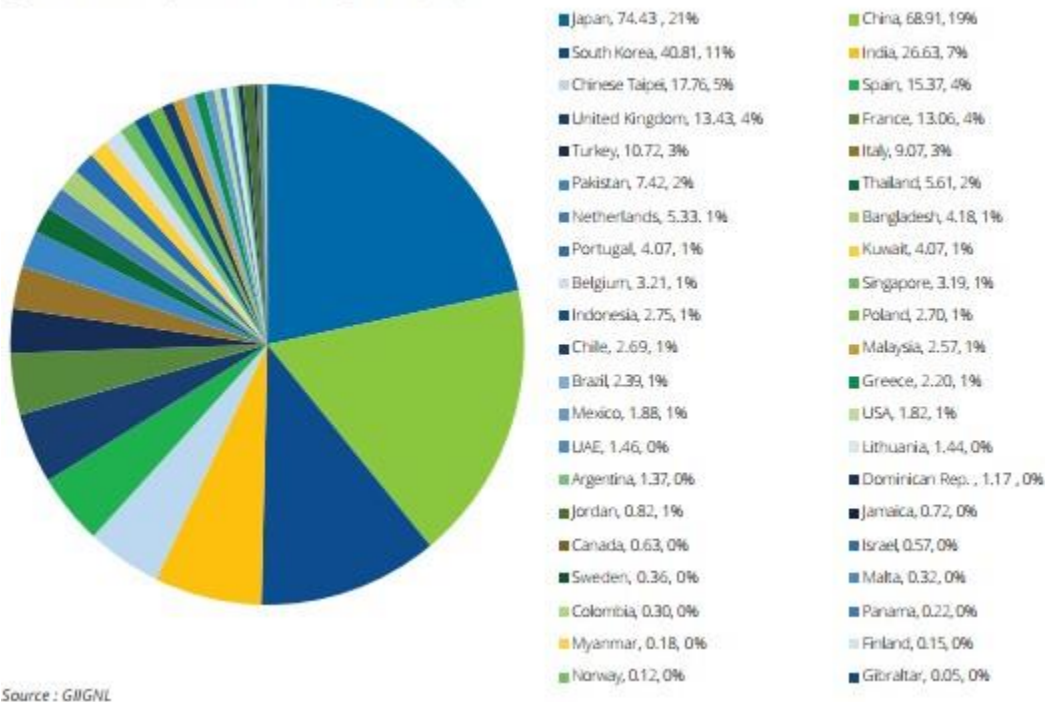


Figure 10: 2020 LNG imports and Market share by Market in MT (GIIGNL, 2020)

Asia-Pacific demand for LNG was covered through net import development by countries such as Thailand, South Korea and the Chinese Taipei. This came opposing to a significant diminish in net imports in countries such as Malaysia, Singapore and Indonesia.



Moreover, the fact that Asia-Pacific faced a cold winter while noteworthy changes have occurred on the domestic energy supply and demand, were the main reasons of the improvements, mentioned on the above paragraph. Asia’s market share grew even larger, with the support of Myanmar and Bangladesh and profoundly China, achieving a 10.2 MT of net imports. Although COVID-19 disruption implied critical confinements, the year 2020 was a low-cost period and some of the mentioned countries above, were profited by this fact, while they acquired extra brief-term volumes and regasification capacity development (GIIGNL, 2020).

On the other hand, Europe felt the impact of the pandemic deeply and the lockdowns on the major European cities played a significant role, resulting markets with very low demand. At the same time, due to the environmental policies for utilizing renewable forms of energy, European net imports were depressed reaching 81.6 MT in 2020 instead of 85.9 MT in 2019 resulting a noteworthy 5% decrease. To become more specific, the largest decreases were found in France and Belgium while noticeable had been Turkey’s and Poland’s net imports with 10.72 MT and 2.70 MT, accordingly.

Whereas Argentina inclined up the sends out at the beginning of 2020, it ceased sending out by the first year’s half as household request expanded and eventually ended the constitution of Tango FLNG, instep bringing in 0.2 MT of LNG. Egypt’s Idku LNG was reduced but sloped up trades once more towards the conclusion of the year. Net imports development by Chile and Jamaica, have supported Latin America to import a 0.8 MT surplus. Finally, Mexico decrease in 2020 in importing LNG versus 2019 by 3MT resulted to North America’s decrease in net imports by almost 3.5 MT, while Middle East kept stability due to internal fluctuations within countries’ imports (IGU, 2021).

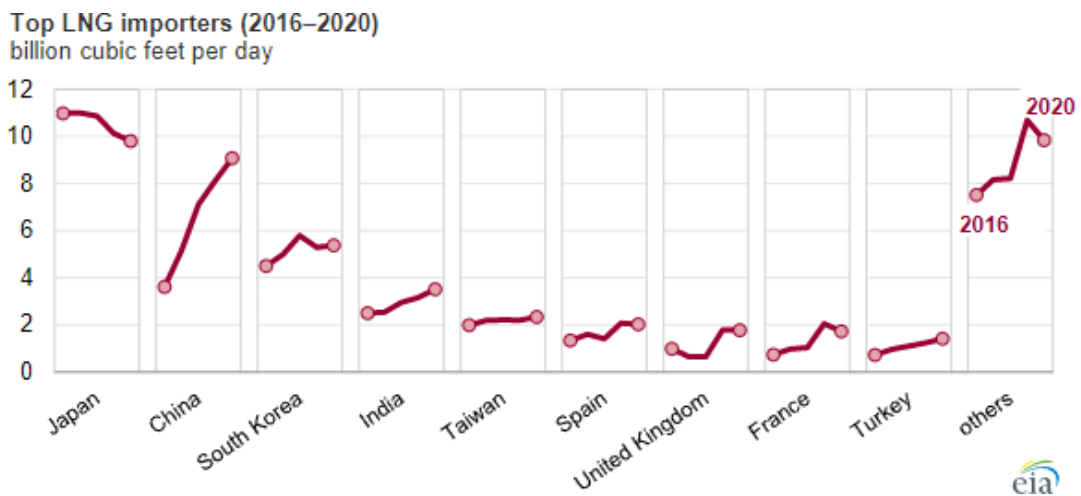


Figure 11: Top LNG importers in 2016- 2020 (EIA, 2022)



The diagram above presents an overview of the top LNG importers on terms of billion cubic feet per day during the years 2016 and 2020. Moreover, it is appointed that the Chinese market was one to show the largest expansion, when at the same time significantly noticeable are South Korea's fluctuations where we can locate a smooth level-up the years 2016 and 2017 while the following years 2018 and 2019 has shown a decrease. Finally, we observe that the rest of the importers have slightly increased the demanded amount of LNG.

4.3 FSRU Market

LNG demand is growing vastly, and the main reason is no other except of the competitive price; filler reasons are the ecological characteristics that seem to be in-line with IMO restrictions as also the energy that LNG provides as a fossil fuel. It is undeniable that during the LNG combustion procedure, less pollutants are emitted or produced contrary to what take place with oil and coal (Chiara & Giuseppe, 2014). The diverse variety of imports and as a result the competitive purchase price, are the major advantages of the procedure that takes place to re-gasify natural gas. LNG terminals are a monopolistic way to transport natural gas within the hinterland between importing and exporting countries. However, re-gasification procedure through FSRU's seems to be a cost- efficient alternative that gains share in this game.

The components of a Floating Storage and Regasification Unit (FSRU) , consist of LNG carriers that liaise the export facility and the import site as feeders and of course a double-hulled LNG vessel in a permanent anchorage. The LNG vessels are either designed for that purpose from the beginning or they are reconverted in order to service this role. Their length alters between 300 and 400 meters and their beam is around 70 meters wide and depending on the initial scope of built, may or may not have a propulsion system. What alters an LNG carrier from an FSRU is the existence of the re-gasification plan and the LNG storage tanks with all the necessary equipment for the vaporization procedure. (Nikolaidis, 2020).

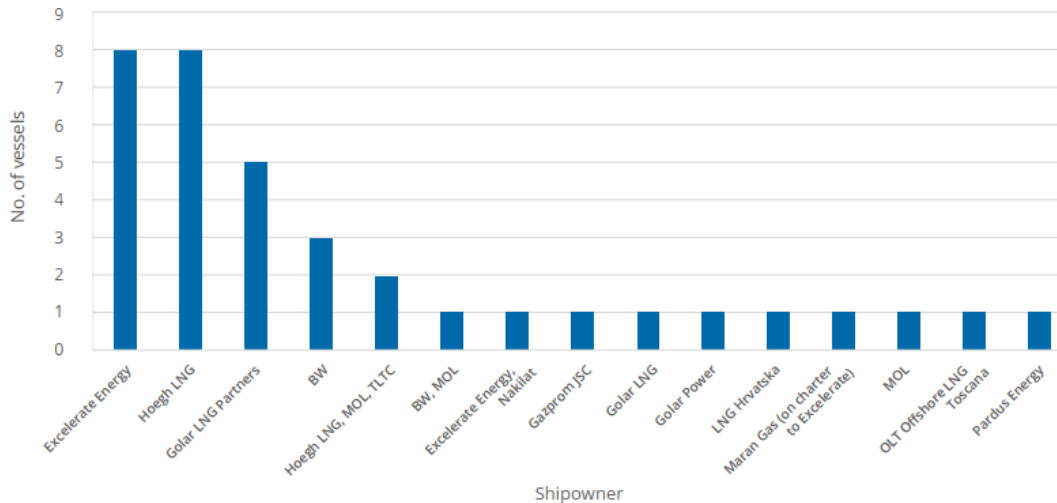
What is more FSRU possesses a major advantage known as fast-track implementation. A newbuild FSRU requires 24-36 months to be finished and at the same time an FSRU conversion requires only 6-18 months. On the other hand, a conventional land-based terminal needs 48-72 months to be accomplished. A representative example driven from the current market is BW's newbuild 170,212 m³ LNG FSRU. BW Singapore, is presently permanently moored alongside a jetty in the Port of Ain Sokhna, Egypt. This project was



pronounced of high national importance and was accomplished within a 5-month schedule from the inception to the first use (Nikolaidis, 2020). Whatsoever, worth to mention, as a primary consideration for the FSRUs is the high operating expenses (IGU, 2021).

Furthermore, FSRUs bears positive attributes such as the wide range of water depths that can be anchored. Either in shallow waters with approximate depth between 20-30 or in even greater depths utilizing for each case different mooring systems. All the mooring system have been evaluated as completely safe and operational.

FSRU’s can easily adapt to the demand anywhere or at any time needed, before even being redeployed anywhere else, due to the capability of importing LNG with a “plug- and-play” element. A great example is the one of Brazil, as in order to provide an optimization to the LNG delivery, Petrobras has swapped out FSRU’s (IGU, 2021).



Source: Rystad Energy

Figure 12: Floating Storage and Regasification unit ownership (Eurostat, 2011)

The active worldwide LNG fleet is consisted from 37 FSRU’s after last year’s add-ons of Excelerate Sequoia and Vasant 1. This number is almost the 7% of the total LNG vessels fleet. The well-known ship-owners of the FSRU fleet are no others the Golar LNG, Excelerate Energy and Hoegh LNG.

The cargo capacity of the FSRU’s globally was 5.7 million cubic meters at the end of 2019. For 2020, 4 FSRU’s have been delivered while the orderbook comprised of 7 more FSRU’s. In 2020 35 vessels were delivered and added to the global LNG fleet with a result of 572 vessels in active existence, including FSRU’s and FSU’s (global fleet is consisted at the moment of 37 FSRU’s and 4 FSU’s). This speaks to a 7% development from 2019,



which can be compared to a 1% development in number of LNG voyages, a figure that was lower than anticipated, generally due to COVID-19 request disturbance.

Moreover, natural gas has proved to be a great energy form, ideal for heating, power generation and domestic use. Thus, the European countries have assessed that advantage as of great benefit due to natural gas applicability to the abovementioned sectors. It is undeniable that the main source of LNG, that Europe is importing, is originated from Russia and Algeria and as the imports in 2020 have exceeded 70%, regasification terminals are important issues to consider on terms of the European countries' energy future (Nikolaidis, 2020).

Noteworthy is the fact that Indian region is consisted of countries with different economical background. The geopolitical stability is not the same neither the development in infrastructures, as a result the demand for energy totally differs between them. However, these territories have in common the vast internal growth of middle- class population with better education, and urbanization becomes their main characteristic which in turn creates a bigger challenge called enormous increase of energy demand as GDP progress over the years is a reality. Energy shortages in India, Pakistan and Bangladesh make governments push for demand and exploitation of natural gas, partly due to the global commitment to reduce greenhouse gases and because it is more economical. Therefore, the supply availability from almost all sources of LNG was increased. Consequently, more new entries have been added to the LNG importers, because of decreased LNG prices and enormous supply availability verifying the rules of demand and supply. It is easily understood that countries sensitive to prices, including Pakistan, Bangladesh or India found a solution by importing LNG in order to address individual gas demand. Suppliers then, seize the opportunity and see those markets with an optimistic view (IGU, 2021).

Be that as it may, FSRUs have not been free of issues. Conveyance delays, control cuts and rising costs have influenced certain ventures, somewhat hosing request for the vessels. Additionally, spikes in constitution rates can spur shipowners to utilize the ships as LNG carriers, lessening the number of FSRUs working as regasification or capacity units.

Inside the current worldwide armada, it was 24 FSRUs to be utilized as regasification terminals for the aggregate of 2020, outlining the degree to which administrators are capitalizing on their flexibility. Advances in unconventional oil and gas production and the adoption of a more effective international climate policy impact on supply–demand balances in the petroleum sector, causing shifts in financial flows and capital accumulation. Such changes may in turn, lead to shifts in the power balance between oil



and gas exporting and importing countries (IGU, 2021) . The following interstate relationships may be particularly sensitive: the United States and the Gulf countries, Russia and the EU member states. Unconventional oil and gas may also play a role in the emerging superpower competition between China and the United States. The geopolitical changes one expects from gas and climate policy depends on how one understands the current geopolitical situation in various parts of the world, and how strong the current geopolitical competition is seen to be. In spite of the abovementioned fact the FSRU global fleet will expand even more, and this is confirmed by the fact that 4 FSRU’s have been delivered in 2021 and three more conversions are taking place at this moment in Singapore shipyards (IGU, 2021).

5 LNG Shipping

World LNG fleet in 2020 consisted of 572 active vessels after the delivery of 35 LNG ships during the previous year. 37 were appointed as floating storage and regasification units. The numbers speak by themselves, as this growth represents a 7% growth. The truth is that growth was lower than expected due to COVID-19 disruption, thus delays in deliveries and increased use of floating LNG storage was observed (IGU, 2021).

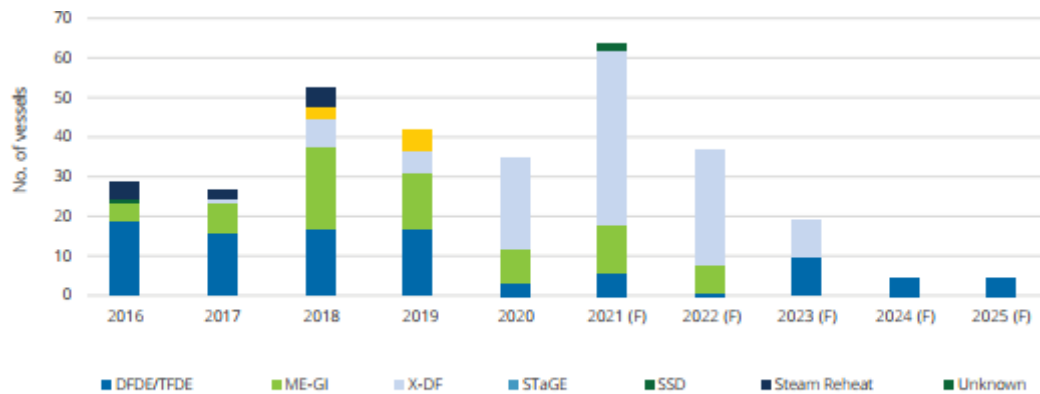
5.1 Overview

The vast development of the LNG market has been a trademark for the past decade. However, research provides useful information that this trend has started a lot earlier at the beginning of the running century. The year 2008 has stopped the development of most industries, as so a crucial slowdown has been observed to the LNG industry as well, with an orderbook almost empty. However, things bounced back and since 2013 a non- stop rising trend has started for the LNG market which is still drifting upwards. The year before was a live proof for the LNG market that economies of scale are still required as the vessels mostly chartered were around 175,000 cubic meters. That was also a sign that the expansion of 2016 for the canal of Panama has been a route preferably utilized. Observing the worldwide LNG fleet, we identify mostly newly build ships due to the liquefaction capacity that has shown a progressive increase within these first twenty years of the century (IGU, 2021).

Ship-owners do expect even further expansion of the LNG trade and that is easily identified by closely watching the strategic moves they make, giving a sign that LNG market has not yet reached its too limit. Furthermore, the orderbook had the tremendous



number of 130 vessels under construction by the end of year 2020. Checking this number as a percentage to the total number of existing LNG vessels back then, we can understand that the under-construction vessels were almost one quarter of the worldwide fleet. What is more to say, the orderbook as we run the first quarter of year 2022 seems to have icebreaker-class vessels under construction and this is a serious sign for the preferred trading routes regarding the regions that import and export LNG. Deliveries within year 2021 touched the number of sixty-four, as a result the total supply capacity for LNG shipping has been expanded even more.



Source: Rystad Energy

Figure 13: Historical and future vessel deliveries by propulsion type 2016- 2025 (IGU, 2021)

Hyundai Heavy Industries, Samsung Heavy Industries and Daewoo Shipbuilding comprise the core of the South-Korean ship-building industry. All of them as major shipbuilders focus to high quality results implementing all the up to date IMO’s guidelines driven from the vastly evolving maritime environment with only target to achieve improved fuel efficiency and to succeed lower emissions in total. Furthermore, the moves towards replacing the propulsion system that was used previously, with the new M-type which thrives as an electronically controlled technology of the ME-GI system is one more sign that LNG market will be dominant in the future. Moreover, judging from the fact that the ship-building industry is guided to manufacture more vessels with X-DF systems verifies the abovementioned statement.

5.2 Top LNG charterers and LNG carriers

Before starting the charter market analysis, it is very important to present the top LNG charterers and the top LNG carriers as well. Having already provided the insight about the import and export countries and getting familiarized with the common LNG trading



routes, getting deeper into the profile of the major stakeholder companies will boost our understanding of how and why freight market rates alter.

5.2.1 Top LNG charterers

- ExxonMobil

A 40-year experienced company in the fuel supply sector. ExxonMobil is characterized as the global leader due to the expansion of her portfolio of liquefied natural gas at an attempt to meet global demand (Marine Digital, 2021).

- Chevron

Chevron is trying to grow the capacity even faster than f the enormous number of 1,1 billion cubic feet gas per day, believing the predictions of the experts that demand will reach a 130% by year 2035.

- Royal Dutch Shell

Shell delivered in Algeria in year 1964 the first LNG plant. With many different ways this company creates the trends of the LNG trade as at the moment has a supply project representation in more than 10 countries.

- China National Petroleum Corporation

A state-owned company with expanded operations and a production capability of 15,13 million tons of LNG back in 2018. The company focuses to a 640,000cubic meters capacity and its diversified portfolio includes three different LNG terminals.

- TOTAL

This company has achieved integrated operations. Across the LNG value chain, the company managed to deliver services including production, liquefaction and distribution to end-users, utilizing its LNG fleet of vessels.

- BP

Company’s target is the provision of total innovative solutions. BP’s branding has focused on the commercial services by leveraging the portfolio on the supply and shipping sector. The tremendous production of 25 billion cubic meters per year for the European market verifies the abovementioned.



5.2.2 Top LNG carriers

In order to pronounce who are the top LNG carriers, the evaluation criteria should be determined at first. In this essay, fleet size will be one of our assessment methods and the other shall be the fleet value.

On the following table conducted on the end of year 2020, owners are sorted by the fleet size and the results show the MOL came first with 45 vessels, when the rest 4 of the top 5 maned a fleet of less than 35 vessels. Remarkable is the fact that at position number 5 is the Greek privately owned by Angelikoussis, shipping company Maran Gas Maritime.

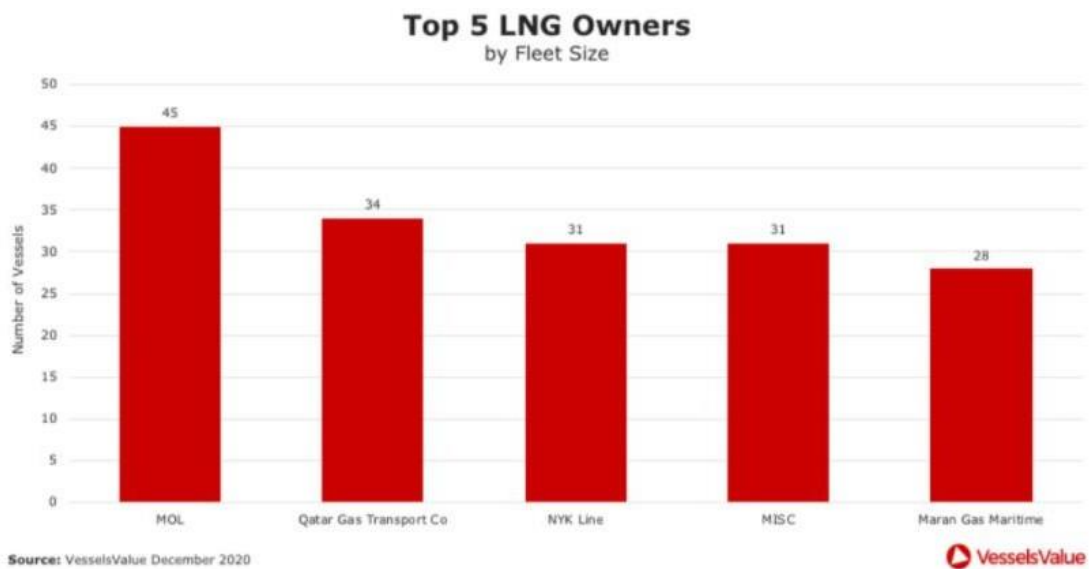


Figure 14: Top 5 LNG Owners (Snyder, 2020)

In case our evaluation is upon fleet value order the findings are very interesting, as the figure below is showing the number of vessels is not always an indicator of the value, firstly due to the age of the vessels and the new technologies implemented upon them, as also the capacity supply provided by each vessel.

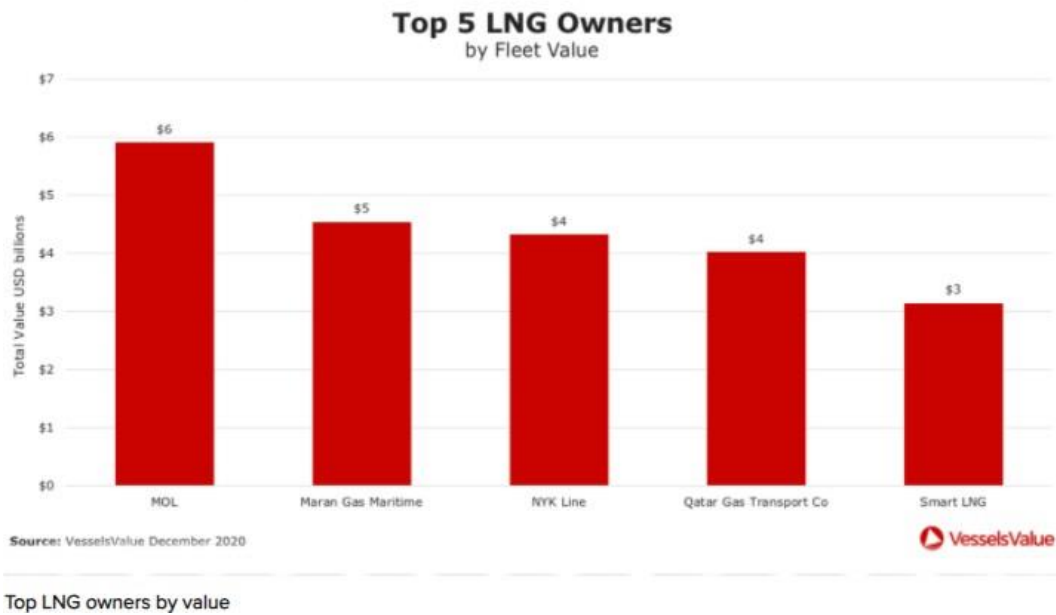


Figure 15: Top 5 LNG Owners (Snyder, 2020)

Furthermore, worth notice is that back in 2019, sometime before COVID-19 evoked as a random shock, three Greek-owned groups were the among the top LNG shippers in the United States. Angelikoussis group lead the race with Peter Livanos with Gaslog and Tsakos group followed accordingly. The Greeks have invested almost 10 billion dollars filling the east-yards orderbook with 33 of the total 66 orders for newbuilds back in 2018, being among the firsts who realized the energy switch from oil to energy forms more environmentally friendly, foreshadowing at the same time that within the next years they would increase the world supply capacity (GTP, 2019).

According to a Clarkson’s research presented by Seatrade Maritime News (Glass,2019) for the top Greek LNG shippers in 2019 has shown that in order of fleet value the top ones were Angelikoussis, Livanos, Economou and Prokopiou, as presented on the below table, with a total of 12.1 USD billion with a newcomer to follow later on 2020 Vangelis Marinakis with Capital Gas and with orders up to 10 newbuild vessels at Hyundai Heavy Industries .

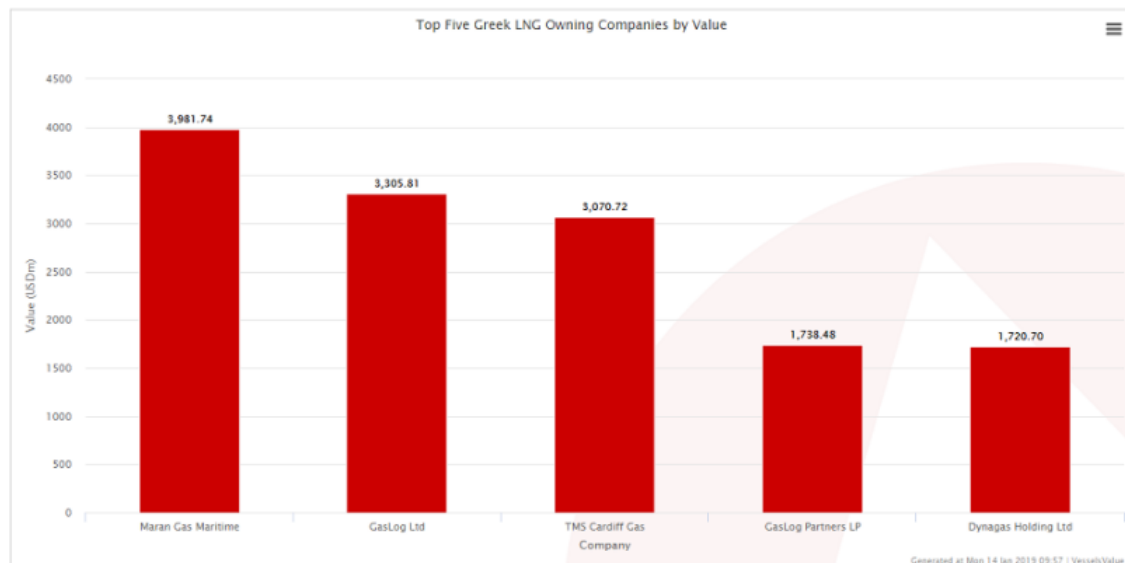


Figure 16: Top 5 Greek LNG Companies by Value (Glass, 2019)

5.3 Charter Market

Trough, recovery, peak and collapse are the four stages of a common maritime cycle. Fear and greed are the major components that illustrate the participants' profile. The imbalances of trade are usually penetrated and at the same time explained through the maritime mechanisms. Shipping demand and supply as also the balance between them usually spot the charter rates. The provided capacity by the carrier fleet is the last but not least reason the cycle keeps turning.

Having already in the previous chapters analyzed the import and export capacity of the main importers and exporters, we got familiarized with the LNG trading routes. The existence of the FSRUs and the FSUs showed, the evoking need of countries to supply the hinterland with LNG. IMO's regulation for decarbonization within the next years have turned into a main issue for the gas majors and the shipping industry to swift into more environmentally friendly forms of energy. The Greeks have set a record for the number of vessels ordered on the LNG new building orderbook.

Before analyzing the trends of today freight rates and the volatile situations the LNG charter market came through the pandemic, it seems wise to review LNG freight rates' course previously. What is more, in the beginning of the previous decade, rates for short-term LNG charter had increased rapidly, because of the Asian high demand for LNG at that period. What followed the Fukushima disaster was that the spot market for LNG



became tight. Since the year 2013 a huge freight decrease appeared, and rates fell from 155.000 USD per day on 2012 to 24.500 USD per day on 2015.

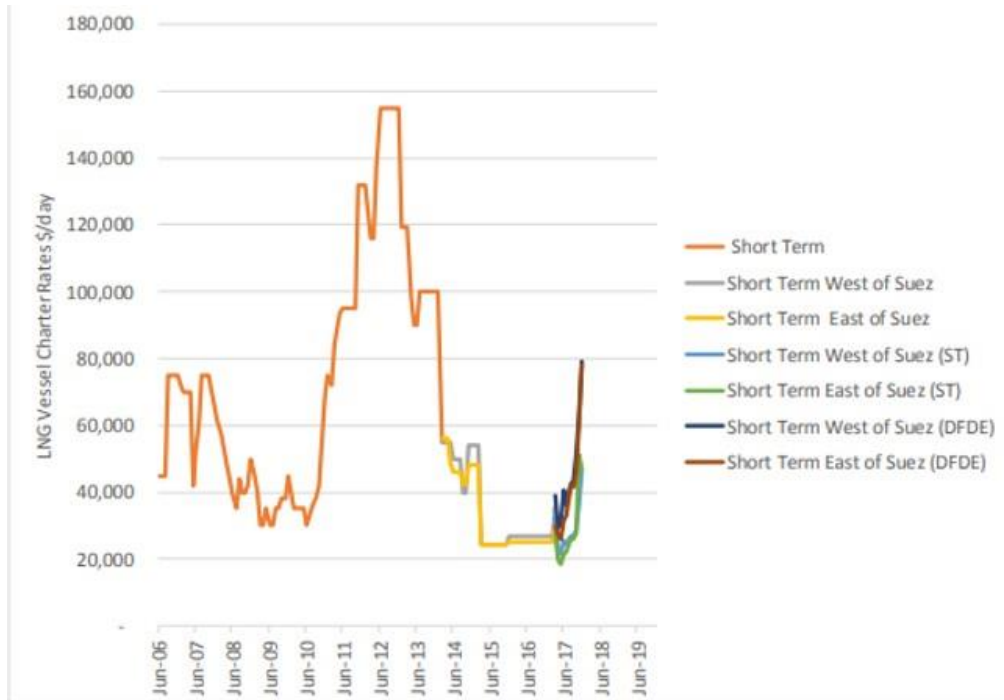


Figure 17: LNG carrier short - term charter rates \$/day, June 2006 to December 2017 (Oxford University, 2018)

COVID-19 has been a total disruption to the supply chain and resulted the uncertainty of the traders at the beginning of year 2020. Rates such as 70.000 USD per day were common for steam turbine LNG ships, for the TFDE ships were around 90.000 USD and a high of 105.000 USD has been reached by the X-DF/ME-GI vessels. COVID-19 impact was to stabilize the rising rates at the moment due to the slowdown of LNG demand. A severe decrease for the above categories has been mentioned and the rates reached lows of 20.000 USD, 30.000 USD and 40.000 USD accordingly within August of year 2020. When the price differential between Pacific’s and Atlantic’s Ocean basin started to grow again the prices have begun their upward trend again. In December the charter rates reached highs again at 105.000 USD, for steam turbine, 150.000 for TDFE and 165.000 USD for X-DF/ME-GI vessels. The poor growth and the mellow winter that followed, were the outcome of coronavirus, the impact of which was reduced by assimilation of overabundance supply by East and North Asian markets. (IGU, 2021).

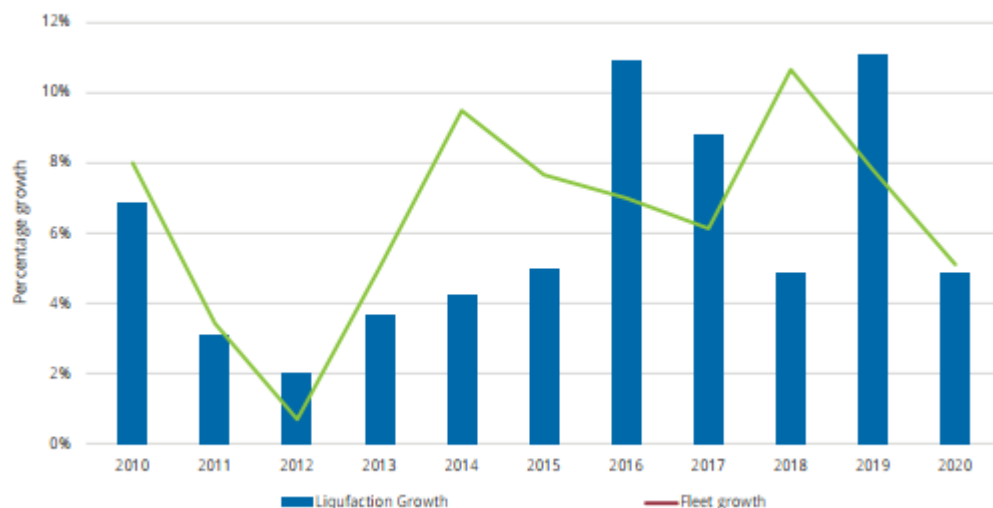
When time comes about for the sellers and the buyers to form their market strategies, charter rates are of high importance, especially when decisions for one’s contracts are to be decided. Since LNG market was set, the time-charter contracts were long-term as that



was the security for the funder to take the money back because LNG vessel were an extremely expensive asset. As the number of vessels increases steadily on the spot market, there is an alteration on the pricing and to market’s depth of charter fixtures. In any case, the lack of liquidity can still contribute to charter rate instability due to bungle between supply and demand.

Another important issue that concerns the shippers is the vessel utilization on terms of propulsion technology used. Steam turbine systems are not as efficient as TFDE who are in turns less efficient than X-DF/ ME-GI. At the same time the propulsion system is usually defining the LNG vessel’s size creating trouble to the capacity supply as most of the cargoes are not less than 150.000 CM.

Figure 6.9: Liquefaction capacity growth vs LNG global fleet count growth, 2010-2020



Source: Rystad Energy

Figure 18: Liquefaction capacity growth VS LNG global fleet count growth 2010- 2020 (IGU, 2021)

According to the above chart on the beginning of the previous decade the charter market was stable due to the adjusted development between the armada growth and the liquefaction capacity growth. Since 2013 an imbalance occurred due to the vastly growing global fleet in comparison with the total liquefaction capacity growth. As a result, charter rates decreased. That was happening until the year of 2015. At that point the vessel deliveries started to slow down while the liquefaction capacity had shown some increasing steps. By the end of 2017 the Asian LNG demand sky-rocketed the charter rates, but that did not last long. In 2018 correction evoked and the market became volatile again. Entering 2019 once again the liquefaction growth aroused much higher



than the global LNG fleet could afford to ship, and the rates increased again, until covid put a break on that course.

Figure 6.10: Spot charter rates east of Suez, 2015-2020



Source: Rystad Energy research and analysis, Argus Direct

Figure 6.11: Spot charter rates west of Suez, 2015-2020



Source: Rystad Energy, Argus Direct

Figure 19: Spot Charter rates east and west of Suez (IGU, 2021)

The figures above show that by the end of 2018 rates returned to about 30.000 USD for steam turbine ships and around 45.000 USD for the TFDE/DFDE, correcting the high rates achieved before but not last-longed due to several alterations within this period. By the beginning of the fourth quarter of 2019 an important number of vessels has been removed due to US sanctions towards COSCO, as a result charter rates started increasing again. The day rates sky-rocketed reaching a high around 150.000 USD for TFDE/DFDE and an even higher 160.000 USD for the X-DF/ME-GI. Afterwards, as already explained COVID-19 was the reason of a decrease during 2020. (IGU, 2021).

The pandemic disruption had a significant impact to the traders, as the uncertainty had them overwhelmed. This situation, affected the freights, as the spot rates for 2020



started at 70.000 USD but as pandemic escalated a fall was seen to all kind of vessel type while at the same time a brief rally occurred due to arbitrage opportunities between the Atlantic and pacific trade routes, but then US exports slowed down and balanced the freight demand, thus, rates once again were devoured. Ship-owners faced difficulties as they watched their ships operate as floating storage units with loss instead of profit.

The price differential between Atlantic and Pacific basin began the lift-up way and that was a crucial factor that explains why rates had started to climb again from the end of summer. This situation illustrates Asia’s high demand on winter months due to temperature expectations while delays on the transition of the Panama Canal appeared. Furthermore, on December 1018 as well show on the figure, rates came to be extremely high for that period as they followed the LNG price increase and the year closing found TFDE vessels as also X-DF/M vessels to be chartered at around 160.000 USD (IGU, 2021).

On 2019, the prices of LNG have demonstrated and varied from record lows to record highs. The LNG market in the beginning went straight down from pandemic’s global impact to incapability to keep up with demand’s worldwide recovery.

Coal shortages were mainly the reason Asia and Europe went into a battle race for securing energy sources. Global LNG imports are mainly from Europe and Asia as also the one third of the worldwide gas consumption. Due to the aforementioned LNG producers have focused on delivering their product mainly to the best-payers, as a result there is no much prospect left in a short-term fix (Janathan, 2021)

COVID-19 was a random shock that played a significant role and has implemented special rules and restrictions that caused severe delays to ship. LNG imports were necessary in order to gap the energy requirements as buyers were struggling to get enough gas for domestic use and restocking. Moreover, as shipping rates came high, spot prices have been rocketed, though they have returned to normality a little after. Since then, prices have bounced back, and rebuilding stocks was a hard thing to achieve for Europe.

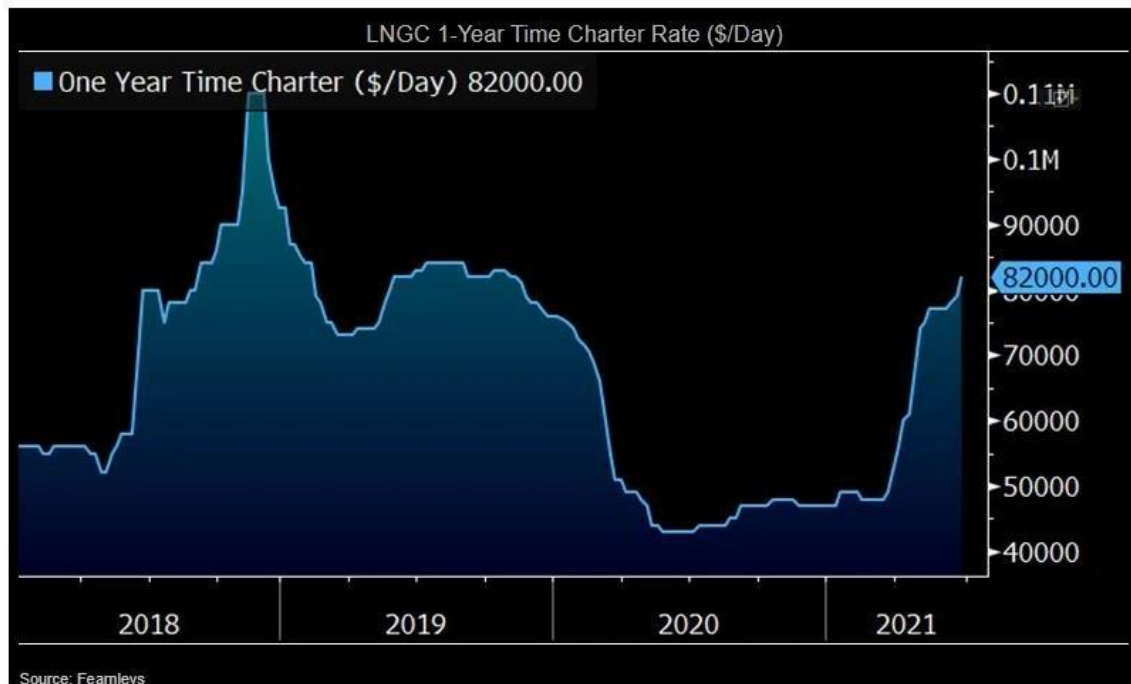


Figure 20: One Year Time Charter Rate 2018- 2021 (Bloomberg, 2021)

Strong request that relieving the weight of an overwhelming vessel-delivery plan this year and a lull in armada development anticipated in 2022 grants a better perspective of the LNG shipping market. The one-year quick rise of the charter rates seems to have a better outlook. The requested quantity of LNG may outpace fleet’s development, supporting rates, but a humbly oversupplied market usually includes hazards.



6 Conclusion

By the year 2040 there is an anticipation of 700 million tons for global LNG demand in accordance with accurate forecasts and figures and as long as Asian demand for large quantities for LNG still develops unequivocally. It is foreseen that the supply demand gap can be penetrated only with speculative supply during this decade.

IMO’s rules and regulation for decarbonization and desulphurization intrigue buyers and providers to get into deep technological alterations to address the true market needs, being compliant to all the restrictions. The strong request for cleaner energy supply brings further innovations to the utilization of the proper vessel to ship or storage LNG.

Increasing extraction of gas may affect exporting and importing countries and the interdependency between them. It starts by looking at oil exporters and importers at the general level, then turns to export–import interdependencies between specific regions, and finally surveys the main bilateral trade relationships (Jaffe, A.M. and Sullivan, M. 2012). As it is expected, the geopolitics of this aspect is very crucial as far as the power of influence as also the pressure into all aspects of trade that countries try to put into equilibrium.

Markets had always had their own means of self-regulation. The maritime cycles still flow following the prospective profit of the stakeholders. The truth lays beyond the fact that the end client will always pay the impact of trade which emanates from the imbalances of supply and demand at every single moment.

Some years ago there was a belief that the vastly developing LNG market would correct this uncontrollably rising trend. Instead of that, nowadays it is highly expected that LNG market has not reached the peak, as a result we still have to wait to see even higher freight rates depending on the supply capacity.



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