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Liquefied Natural Gas Small-Scale Services in the European Union

CEER Report

Liquefied Natural Gas Work Stream
of the
Gas Working Group

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INFORMATION PAGE

Abstract

This document (C21-LNG-41-03) provides conclusions drawn from a benchmarking on the available liquefied natural gas (LNG) small-scale services in the EU, as well as their access conditions and tariffs in the different European LNG terminals.

Within the EU Members States (MS), a variety of services and different regulatory approaches related to the small-scale services can be observed. The paper highlights the current state of the art and shows the progress reached so far. The services developed around LNG terminals are of growing importance. In many cases, they are connected to road and maritime transport, but also with conventional gas consumers who live far from natural gas networks and who are supplied by trucks.

This study aims to provide increased transparency for the LNG market segment. At the same time, it gives both regulators and stakeholders valuable information to understand, supervise and regulate these services, extending best market practices.

Target audience

European Commission, national regulatory authorities, Member States, energy suppliers, traders, gas consumers, gas industry, consumer groups, LNG terminals and other network operators, academics and other interested parties.

Keywords

Liquefied natural gas, LNG, LNG terminal, small-scale LNG services, competition between EU terminals, new LNG services, regulatory coordination, LNG tariffs and transparency, national regulatory authorities, European Commission.

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Related documents

CEER documents

- CEER Report on How to Foster LNG Markets in Europe, July 2019, Ref. C18-LNG-37-03.
- CEER Report on Removing LNG barriers on gas markets, December 2017, Ref. C17-LNG-32-03.
- CEER Presentation on Removing barriers to LNG and to gas storage product innovation, October 2016.
- CEER Analysis on the role of LNG to improve security of supply, February 2016, Ref: C15-LNG-25-03.
- CEER Status Review on monitoring access to LNG terminals in 2009-2013, September 2014, Ref: C14-GWG-111-03.
- CEER Monitoring Report on Implementation of the Transparency Template in the European LNG Terminals, 20 December 2013, Ref.C13-GWG-102-04.
- CEER Status Review and evaluation of access regimes at LNG terminals in the EU, CEER, 12 March 2013, Ref. C12-LNG-15-03.

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EXECUTIVE SUMMARY

Background

In recent years, we have witnessed the growing importance of liquified natural gas (LNG) small-scale services within the area of influence of LNG terminals in the EU.

These services allow natural gas to reach geographic areas where it would be difficult or impossible to supply this energy source by other means, e.g. where deploying transmission and distribution pipelines connected with the main natural gas grid is impossible or does not make sense economically. They also allow natural gas to be used as a source of energy for road vehicles (from small cars to heavy trucks), for railway and for maritime transportation, substituting in some cases for more polluting fuels. Additionally, thanks to small-scale services, shippers can acquire LNG stocks. This benefits in particular LNG small-scale users that may have difficulties to access the wholesale LNG market. Through these services, they can buy natural gas in liquid hubs and then transform it into LNG through the use of the virtual liquefaction service.

Objectives and contents of the document

Due to the particularities and specificities of LNG small-scale services, this study contains a benchmarking on the availability of services, access conditions, congestion management procedures and tariffs related to the services provided in the different European LNG terminals.

As there is no concrete regulatory definition for small-scale LNG services at European level, the paper defines them as most participants in the natural gas sector implicitly do: LNG small-scale services load/unload small quantities of LNG from LNG terminals and intermediate LNG tanks into different transport means addressed to different uses. This report covers the following services: loading of LNG into ships for bunkering purposes, truck (or rail) LNG loading and virtual liquefaction.

This study aims to note the relevance of and provide increased transparency for this market segment, while it gives both regulators and stakeholders valuable information to understand, supervise and regulate these services, extending best market practices.

Brief summary of the conclusions

All over Europe, there are LNG terminals offering LNG small-scale services, such as LNG loading for bunkering purposes and truck loading services. In the case of the virtual liquefaction service, it is currently only offered in three countries. Some terminals are currently developing or analysing the possibility to develop virtual liquefication services in the future.

Access to small-scale LNG services is either regulated or negotiated, with the majority of services offering regulated access. In some cases, capacity is initially provided by open seasons or auctions, but in the majority of cases a first-come-first-served principle applies, either directly on the capacities or, at least, to sell the remaining capacity not sold after a market procedure. Congestion management procedures are in place, but differ considerably from EU Member State (MS) to MS. The main congestion management tool is enforcing payment of reserved capacity even if it is not used. Tariffs also differ significantly among MS, both in structure and in the price per unit of energy loaded.

1 Introduction

In the last years, we have witnessed the growing importance of LNG small-scale services, within the zone of influence of the European LNG terminals[1]. These services constitute a useful and versatile instrument that allows end consumers to use natural gas in a range of settings: in the household, for commercial uses, for industrial activities and even in transport.

They allow natural gas to reach geographic areas where it would be difficult or impossible to supply this energy source by other means, e.g. where deploying transmission and distribution pipelines connected with the main natural gas grid would be difficult or would not make sense economically. They also allow natural gas to be used as a source of energy for road vehicles (from small cars to heavy trucks), for railway and for maritime transportation, substituting for other fuels in some cases.

Additionally, small-scale services also foster competition, as they make possible that shippers, particularly LNG small-scale users who may have difficulties to obtain the LNG they need to supply their customers, have additional tools and alternatives to secure their supplies in a competitive way. These shippers, for which it can be difficult to access wholesale LNG markets or to buy LNG stored in the tanks of the terminals to bigger players, can acquire LNG stocks to supply their final customers by buying natural gas in liquid hubs and then "transform" it into LNG using the virtual liquefaction service.

In this context, and due to the particularities and specificities of LNG small-scale services, this study contains a benchmarking on the availability of services, access conditions, congestion management procedures and tariffs related to the services provided in different European LNG terminals.

As there is no concrete regulatory definition of small-scale LNG services at European level, this paper defines them as most participants in the natural gas sector implicitly understand them: LNG small-scale services load/unload small quantities of LNG from LNG terminals and intermediate LNG tanks into different transport means addressed to different uses. However, this report only covers the following services:

- Loading of LNG into ships for bunkering purposes

  LNG can be directly supplied from the terminal loading arms to the ships which will use the LNG as a fuel (terminal to ship). In other cases, it will be supplied to intermediate vessels which will subsequently use it to supply ships for bunkering purposes (ship-to-ship) or onshore bunkering fuelling stations.

- Truck (or rail) LNG loading[2]

  The LNG loaded can supply individual consumers, isolated distribution networks not connected to the main grid (frequently known as "satellite plants"), fuelling stations for

[1] This report includes also LNG terminals in the United Kingdom (UK).

[2] In some countries, , the LNG is loaded into ISO containers. For example, in Portugal, the ISO containers are transported by trucks from the Sines terminal to the port of Lisbon. From there, they are shipped by vessels to the island of Madeira and once on the island, the containers are again transported by road to the Vitória thermoelectric power plant. The containers return to Sines for refilling, restarting a new cycle.

road or maritime transportation or even ships via hoses from the dock (truck to ship operations).

- Virtual liquefaction

  This service is based on reverse nomination from the transmission network at the terminal's re-delivery point, increasing LNG in tanks. It does not comprise any storage capacity, which is an additional service that should be independently contracted.

Although there are other services that some agents and some literature consider as small-scale LNG services, i.e. cooling down, transhipment, reloading (for purposes other than bunkering), etc., they are not covered in this report.

Given the growing importance of these small-scale services developed from and around LNG terminals, and given the variety of services and the different regulatory approaches, this report's summary of the current picture shows the progress reached so far.

2 LNG markets outlook

Although the main goal of this report is to elaborate a complete benchmarking of the available services, access conditions and tariffs related to small-scale services in the different European LNG terminals, it is also important to look at the LNG sector at an international level as, indeed, the LNG market has become a global one.

2.1 Key trends of the LNG market

The LNG market is a very dynamic, international market, in which the number of players continues to grow. Despite the drop in energy demand during the height of the Covid-19 pandemic, LNG trade has become even more global. Some 42 countries imported LNG from 20 exporting countries in 2020 (Source: GIIGNL Annual report 2021).

In the table below, the main facts and figures of the LNG sector at an international level in 2020 are summarised and compared to 2019.

Demand-side	Supply-side
42 *importing countries* *(12 in EU)*	**20** *exporting countries*
947 Mt (*) *regasification capacity* *(183.8 Mt in EU = 19.4% share)* **+ 2.8 %** *(***26 Mt***) vs 2019*	**454 Mt** *liquefaction capacity* - **+ 5.6 %** *(***24 Mt***) vs 2019*
Five largest consumers: Mt (% share): ○ Japan: 74.43 Mt (20.9%) ○ China: 68.91 Mt (19.3%) ○ South Korea: 40.81 Mt (11.5%) ○ India: 26.63 Mt (7.5%) ○ Taiwan: 17.76 Mt (5.0%)	Five largest producers: Mt (% share): ○ Australia: 77.77 Mt (21.8%) ○ Qatar: 77.13 Mt (21.7%) ○ USA: 44.76 Mt (12.6%) ○ Russia: 29.6 Mt (8.4%) ○ Malaysia: 23.85 Mt (6.7%)
356.1 Mt *Global trade* *(81.59 Mt in EU = 22.9% share)* **+ 0.4%** *(***1.4 Mt***) vs 2019*	

(*) *Mt = Million tons*

Table 1 – Main figures of the LNG sector at an international level in 2020 vs 2019
(Source: GIIGNL Annual report 2021)

After a year of relative stagnation from mid-2020 to mid-2021, traded LNG volumes are again growing across the globe. This is due to the recovery of the activities in Asia, particularly in China, which led to increased LNG imports in Asia and sky-high prices in Q3 and Q4 2021.

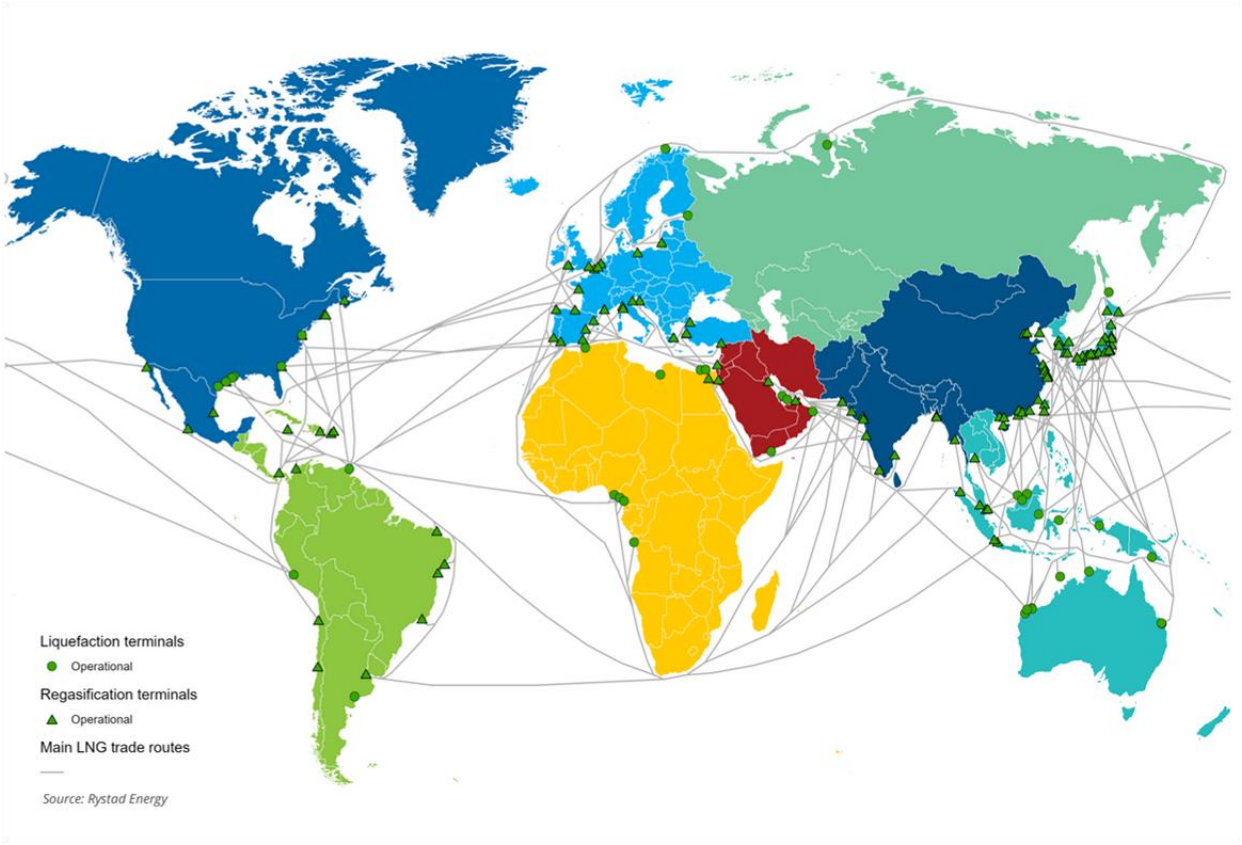


Figure 1 – Main LNG trade routes at international level

LNG trade grew at different rhythms during the last three decades. After a steady growth during the 1990s, there were some sharp increases in the first decade of the 2000s, around 2010. After that with a few years of an almost constant LNG demand followed by a year of relative stability in the global LNG trade due to the Covid-19 pandemic in 2020, the global pace of growth has accelerated again in the second half of 2021, mainly due to increased demand from Asia. As a result, the global LNG trade during the second decade of the 21st century (2020 vs 2010) has increased by 136 million metric tonnes (Mt) or 62%.

In 2020, the Covid-19 pandemic and the related lockdowns that were imposed around the world heavily impacted LNG trade. The lockdowns resulted in significant reductions of economic activity, especially in major LNG importing countries such as Japan, China and South Korea. Instead of the foreseen growth rate of around 8%, global LNG trade remained more or less constant with a growth of 0.4%. This increase is smaller than in 2019 (40.9 Mt). This is due to the fact that Europe continued to be supplied with LNG as the Asian markets were in lockdown, taking advantage of the subsequently lower prices.

Re-exporting operations represented less than 1% of the net LNG traded at only 2.59 Mt in 2020. The main share of this volume goes to Asia (1.88 Mt, of which China represents 1.22 Mt). The top three countries that re-exported LNG volumes were Singapore (1.08 Mt), France (0.46 Mt) and the Netherlands (0.44 Mt). Considering that the main drivers for this kind of operation are price differentials between regions, this is an indicator that LNG prices were closely linked.[3] Additionally, considering that LNG demand in Asia will grow in the coming

[3] Cf. Graph infra TTF M1 vs JKM M1.

years, and a strong proportion of supply contracts are either short-term, spot (40% in 2020) or contain re-routing provisions, it is likely that re-exports could remain limited to specific cases or markets situations in the future.

2.2 Demand side outlook 2020

There has been a significant increase of the global regasification capacity, reaching at present 947 Mt. In 2020, 27 Mt of capacity were added, an increase of 2.8% compared to 2019.

This growing trend of the global regasification capacity is expected to be maintained in the near future. Indeed, at the end of 2020, new regasification capacities of 157 Mt were under construction. 74% of this new capacity is located in Asia and new capacity projects include 11 new floating facilities and 22 new onshore plants.

In 2020, Europe accounted for 19.4% of the regasification capacity (183.8 Mt) with its 29 LNG terminals in the EU plus UK (25 terminals in EU-27). Three European countries (Spain, UK and France) are part of the eight largest countries in terms of LNG storage infrastructure, with storage capacities of 69 billion cubic metres (bcm)/year, 48 bcm/year and 34 bcm/year respectively. The total storage capacity in Europe amounts to 10 million m^3 of LNG (5.9 bcm).

It is worth noting that all European LNG terminals are onshore plants, except four: Porto Levante (Italy, offshore), Klaipėda (Lithuania, floating storage and regasification unit (FSRU)), Toscana (Italy, FSRU) and Delimara (Malta, floating storage unit (FSU)).

LNG imports (356.12 Mt) represent 38% of the regasification capacity and 78% of the liquefaction capacity worldwide.

In terms of regional demand, Asia is the biggest consumer, concentrating 71.4% of the imports in 2020, for a volume of 254.43 Mt. It is in this region that we find the five largest LNG importing markets. Japan has historically been the main consumer of LNG and it represented approximately 21% of global demand in 2020. Continental China, whose economy was the first major one to recover from the pandemic, was the second largest importer, with 19% of global LNG imports, and is expected to remain in that position. Its imports grew at a rate of 11.7% in 2020, reaching 68.91 Mt. India, the fourth world importer (7.5% of global LNG trade), also saw its imports increase significantly in 2020, reaching 26.63 Mt, an increase of 11%.

As several new LNG terminals are under development in Asia (and in China in particular) (cf. supra), this region is likely to continue to see an increase of LNG imports in the near future. With regard to China, its coal-to-gas switch policy is likely to result in a further increase of its importance as a LNG importing country.

In Europe, LNG imports have decreased by 5% in 2020 compared to 2019, reaching 81.59 Mt in 2020, representing only 23% of global LNG imports. On the one hand, this is due to the lockdowns imposed in many European countries and on the other hand, to the rising importance of renewable energy sources in the electricity generation sector.

Of the 356.1 Mt LNG imported in 2020 worldwide, 40% (142.5 Mt) were imported on a spot or short-term basis.

In 2020, EU LNG cargoes were loaded from receiving terminals in six countries. The total volume was 3 Mt in 2020, there was an increase of 9.5% compared to 2019.

Regarding small-scale LNG trucks loading activity, 28.9 Mt were loaded worldwide in 2020, an increase of 31.74% compared to 2019. The biggest part of such activity took place in Asia (24.6 Mt in 2020, of which 22.9% occurred in China alone).

2.3 Supply side outlook 2020

In 2020, liquefaction capacity increased by 5.6% compared to 2019, adding 24 Mt to the global LNG export capacity, to reach a total of 454 Mt/year.

There were 20 countries exporting LNG in 2020[4]. The LNG world production increased by 0.4% compared to 2019, reaching 356.1 Mt.

In terms of LNG sourcing, the Pacific basin amounted to 146.2 Mt (41% of regional exports in 2020). Australia is the main producer of LNG in the region and contributes to 21.8% of the global LNG production in 2020 (77.77 Mt, +3.2% compared to 2019). Also in this region, Malaysia is the fifth LNG exporting country (6.7%) with 23.85 Mt in 2020 (-9% compared to 2019).

In the Middle East, Qatar is now the second largest producer, with 77.13 Mt (19% of the regional production). Until 2018, it was the leading producer in the region.

Other main LNG producers are the United States of America (USA), which ranks third worldwide with 44.76 Mt LNG exported (12.6% of global exports). The USA is the LNG producer that has experienced the biggest increase in LNG production in 2020 (+32.6% compared to 2019). Russia, on the other hand, had a relatively stable production level (+1.1%) with 18.35 Mt produced at the Yamal Plant.

2.4 Supply contracts evolution

The market has evolved from a situation where LNG volumes were only supplied under long-term contracts, with restrictive destination clauses (that were eventually amended to a specific point of delivery), to a more flexible context, where supplies combine long-term contracts (that may contain specific re-routing arrangements), short-term contracts and even spot transactions.

According to GIIGNL figures[5], contracts of less than four years duration represented 40% of global LNG supplies in 2020. Hereunder, spot volumes (delivery within three months) reached 35% of total imports in 2020 (125Mt), compared to 27% of total imports in 2019.

The main reasons for this high percentage of short-term and spot volumes are 1) the higher possibility of arbitrage between regions as the LNG market is now a global one, and 2) the flexibility that LNG offers compared to pipeline gas.

Even though there is a growing trend to move away from long-term contracts, such contracts might still be needed to reach final investment decisions (FID) on new projects that will be needed in the future to meet the expected demand growth in Asia.

[4] According to the International Gas Union's (IGU) 2020 World LNG report.

[5] GIIGNL Annual Report 2021 (Retrieved from: https://giignl.org/wp-content/uploads/2021/11/GIIGNL_Annual_Report_November2021.pdf)

2.5 LNG pricing in 2021 and its impact on the future

After the record low prices seen throughout the pandemic in 2020 and at the beginning of 2021, LNG prices have reached levels that were not thinkable a year ago (prices exceeded 100 €/MWh). This development was supported by a strong demand recovery in Asia mainly, after a slow 2021 (first half) and low storage levels at the beginning of the gas year. In particular, Chinese buyers were very active in 2021.

As shown in the figure below, the Japan Korean Marker (JKM) drastically increased through 2021, and the TTF followed the same trend. Both remained very high since October 2021.

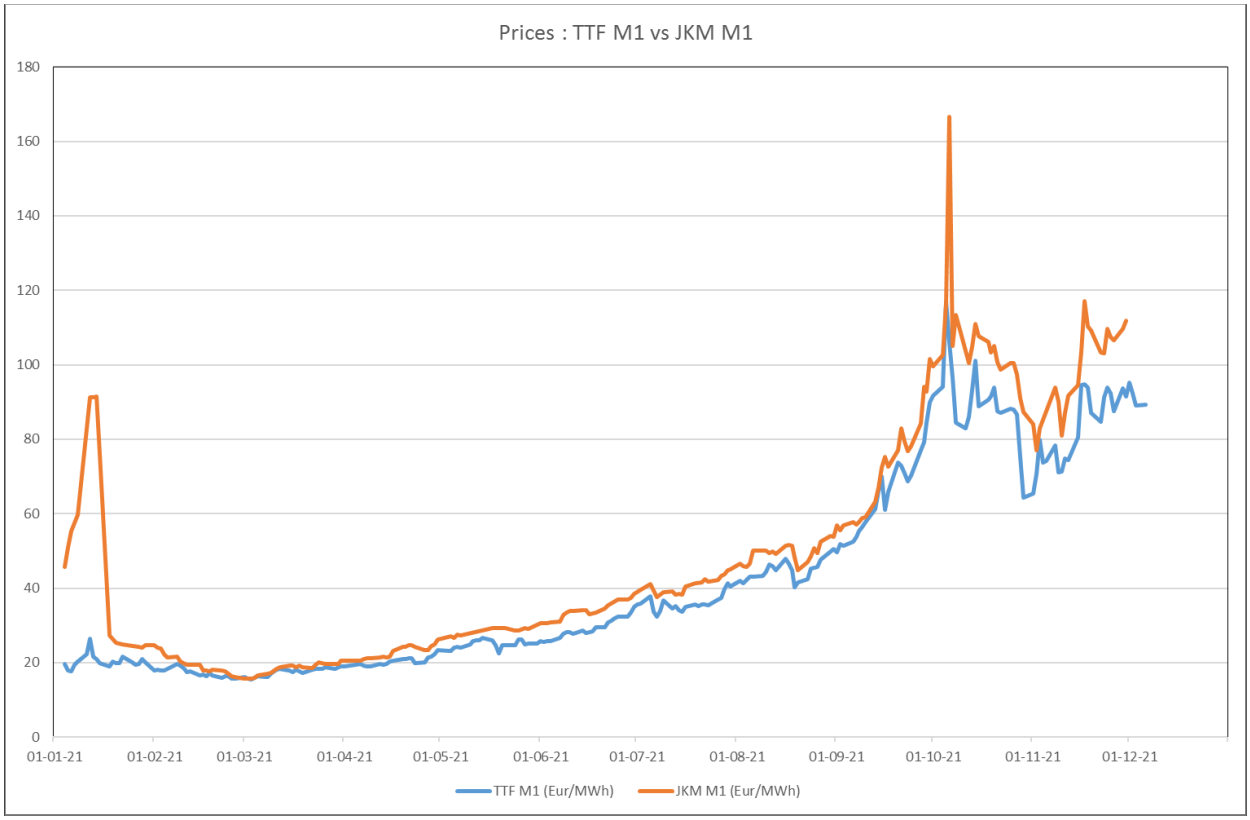


Figure 2 – JKM and TTF evolution along 2021

The question however remains: How long will strong prices last for? What is the outlook for LNG FIDs?

Resulting from the analysis above, analysts observe a significantly growing activity in Asia that is recovering from the pandemic and that is affecting the global LNG market with its willingness to pay very high prices.

In Europe, the uncertainty related to Russian supply and the low level of storage in winter 2021/2022 is leading to very high prices and extreme volatility in a context of decarbonisation and high demand from gas power plants. LNG helps to balance the situation, mainly by increasing imports from USA but also with some cargo reloaded in Asia to Europe. This will have repercussions on the different components of the LNG value chain, e.g. liquefaction infrastructures, shipping, receiving terminals, etc. As a result, the LNG sector is expected to further expand in the near future.

3 LNG small-scale services in the EU

3.1 Infrastructure and services outlook

This section analyses the existing small-scale LNG infrastructures in European LNG (large-scale) terminals and the services they provide. It also considers planned infrastructure and services and existing policies or incentives to promote them.

As can be observed in the table below, the situation varies greatly from one terminal to another. While certain terminals offer three small-scale LNG services, some offer only one or two services and others provide none. While the ships loading (for bunkering purposes) and truck loading services are more frequent, virtual liquefaction is only offered in a few cases.

Country	Nr	Terminals	Operator	Small-scale ship loading				Truck loading			Virtual liquefaction
				Nr. of bunkering jetties		Loading cap. (m3 LNG/h)	Year of start-up	Nr. of loading bays	Nr. trucks/year	Year of start-up	
				Exclusively used for bunkering	Not exclusively used for bunkering						
Belgium	1	Zeebrugge	Fluxys LNG	-	2	Jetty 1: 5200 Jetty 2: 1500	2010	2	8000	2010	Interr. cap: send-out nominations exceeding the minimum send-out rate.
Finland	3	Pori	Gasum	-	1	400	2016	2	14600	2016	-
		Tornio	Manga LNG	-	1	300	n/a	n/a	n/a	n/a	-
		Hamina	Hamina LNG Oy	Estimated commissioning date: beginning 2022							
France	4	Dunkerque	Dunkerque LNG	-	1	n.a.	2021	1	3000	2020	-
		Fos Cavaou	Elengy	-	1	n.a.	2019	1	3650	2019	-
		Fos Tonkin	Elengy	-	-	-	-	1	5840	2014	-
		Montoir	Elengy	-	-	-	-	1	2555	2013	-
Greece	1	Revithoussa	DEFSA	Under development							
Italy	3	Toscana	OLT Offshore LNG Toscana	Under development. Estimated commissioning date: by 2022							
		Panigaglia	GNL Italia	Under consideration							
		Porto Levante	Terminale GNL Adriatico	-	-	-	-	-	-	-	-
Lithuania	1	Klaipėda LNG terminal	SC Klaipėdos Nafta	-	1	5000	2017	-	-	-	-

Country	Nr	Terminals	Operator	Small-scale ship loading				Truck loading			Virtual liquefaction
				Nr. of bunkering jetties		Loading cap. (m3 LNG/h)	Year of start-up	Nr. of loading bays	Nr. trucks/year	Year of start-up	
				Exclusively used for bunkering	Not exclusively used for bunkering						
		Klaipėda reloading station	SC Klaipėdos Nafta	1	-	500	2017	2	11680	2017	-
Malta	1	Delimara	BumiArmada	-	-	-	-	-	-	-	-
Netherlands	1	Gate	Gate Terminal	1	2	n/a	2018	3	11680	2016	Under study
Poland	1	Świnoujście	Polskie LNG	Under development. Estimated commissioning date: beginning 2024				3	11950	2016	-
Portugal	1	Sines	REN Atlântico	-	-	-	-	3	13140	2003	5 GWh/day Interruptible capacity.
Spain	6	Barcelona	Enagás	0	2	4200 (both jetties)	1969	3	21170	1969	4 GWh/day Firm capacity.
		Cartagena	Enagás	0	2	Jetty 1: 7222 Jetty 2: 4000	1989	3	21170	1989	
		Huelva	Enagás	0	1	3600	1988	3	21170	1988	
		Bilbao	BBG	0	1	3000	2003	1	6205	2003	
		Sagunto	SAGGAS	0	1	3000	2006	2	12775	2006	
		Mugardos	Reganosa	0	1	2000	2007	2	12775	2007	
Sweden	2	Lysekil	Skangas	-	-	-	-	-	-	-	-
		Nysahamn LNG	AGA Gas	-	-	-	-	-	-	-	-
	3	Dragon	Dragon LNG	-	-	-	-	-	-	-	-

Country	Nr	Terminals	Operator	Small-scale ship loading				Truck loading			Virtual liquefaction
				Nr. of bunkering jetties		Loading cap. (m3 LNG/h)	Year of start-up	Nr. of loading bays	Nr. trucks/year	Year of start-up	
				Exclusively used for bunkering	Not exclusively used for bunkering						
United Kingdom		Isle of Grain	Grain LNG	-	-	-	-	2	13140	2005	-
		South Hook	South Hook LNG Terminal	-	-	-	-	-	-	-	-

Table 2 – LNG Small-scale infrastructures and services provided by European LNG terminals (Source: NRAs)

In most cases for **ships loading for bunkering**, the service is provided by means of the terminals' main jetties. These are actually mainly used for the unloading and re-loading of large-scale operations. Only in two European terminals, are there jetties exclusively dedicated to bunkering and that do not interfere with other services. Loading capacities are very heterogeneous, varying from 300 to 5200 m^3 LNG/hour.

Concerning **truck (and rail) loading**, the service is provided in almost all countries but not by all terminals. Several countries that currently do not provide this service are considering or planning its implementation in the short term, e.g. Italy or Greece. As for the truck loading infrastructures, the terminals which provide this service have currently between one and three loading bays. In terms of the potential number of trucks that each bay can load, there are significant differences, meaning the loading capacities vary between 2,555 and more than 7,000 trucks per year. The explanation for these differences is based on many factors, such as the different LNG loading rates, the different management of the loading operation from the entrance until the exit of the truck from the terminal (checking process, queue management, etc.), the weekly and daily availability timetable, etc.

Only four countries provide the service of **virtual liquefaction** so far. Three of them (Belgium, Italy and Portugal) offer the service on an interruptible basis and one country (Spain) offers capacity on a firm basis. In some cases, the capacity is limited to a certain amount which is usually modest compared to the physical send-out capacity of the terminals. In other cases, it is only limited to nominations exceeding the terminal's minimum send-out rate capacity. Italy and the Netherlands are investigating the implementation of this service in the short term.

Apart from the services and infrastructures mentioned in Table 2, new infrastructure and LNG small-scale services in EU terminals are planned for the coming years.

In Belgium, following the fast-growing interest in such projects, the LNG terminal operator has already decided to build four new trucks loading bays, which should be commissioned by 2024.

In Finland, the commercial commissioning of the Hamina-Oy LNG terminal will offer new capacity for ships and truck LNG loading services soon.

In the Greek Revithoussa terminal, the first trucks loading bay is currently under development, and they also have a construction project for a new facility for the loading of ships with a capacity of 1,000 m^3 to 28,000 m^3.

In Italy, the ships loading service is expected to start in the Toscana LNG terminal by 2022. The virtual liquefaction service started in November 2021. As for the Panigaglia LNG terminal, virtual liquefaction is expected to be offered in the short term. The operator is considering making the appropriate infrastructure changes necessary to develop both trucks and ships loading small-scale services.

In Lithuania, the government is planning to invest in LNG fuelling infrastructure for vehicles, which once commissioned, will become an additional destination for LNG loaded in trucks.

In the Dutch LNG terminal of Gate, the offer of virtual liquefaction service is currently under evaluation.

In the Polish terminal, a project covering the construction of new offshore infrastructure is under development. It will allow to offer new small-scale bunkering services both, ship-to-ship and

terminal-to-ship services. Regarding truck loading services, additional capacity was planned to be commissioned by the end of 2021.

In Portugal, the terminal operator plans to build a new ship station, in order to supply bunkering operations without interfering with normal LNG large-scale operations.

Additionally, it should be noted that there are no remarkable direct incentives or subsidies to promote the development of new small-scale infrastructure in the majority of EU countries at present. These pieces of infrastructure are built based on market-based principles or following a regulated planning approach.

3.2 Capacity allocation mechanisms

There is a very wide variety of capacity allocation mechanisms (CAM) applied across European LNG terminals, as it is shown in the next table. As regards **LNG loading service**, most of the terminals (71%) offer it on a regulated basis. For **truck loading services**, this rate is reduced to 61% and in the case of **virtual liquefaction**, all terminals located in the four countries offering this service do so on a regulated basis.

Terminals	LNG Loading	Truck loading	Virtual liquefaction
Belgium - Zeebrugge	Regulated	Regulated	Regulated
Finland - Pori	Regulated	Regulated	-
Finland - Tornio	Regulated	Regulated	-
Finland - Hamina	-	-	-
France - Dunkerque	Negotiated	Negotiated	-
France - Fos Cavaou	Negotiated	Negotiated	-
France - Fos Tonkin	-	Negotiated	-
France - Montoir	-	Negotiated	-
Greece -Revithoussa	-	-	-
Italy – Toscana	Negotiated	-	Regulated
Italy - Panigaglia	-	-	-
Italy - Porto Levante	-	-	-
Lithuania - Klaipėda terminal	Regulated	-	-
Lithuania - Reloading station	Negotiated	Negotiated	-
Malta - Delimara	-	-	-
The Netherlands - Gate	Negotiated	Negotiated	-
Poland - Świnoujście	-	Regulated	-
Portugal - Sines	-	Regulated	Regulated
Spain – Barcelona	Regulated	Regulated	Regulated
Spain - Cartagena	Regulated	Regulated	Regulated
Spain - Huelva	Regulated	Regulated	Regulated
Spain - Bilbao	Regulated	Regulated	Regulated
Spain - Sagunto	Regulated	Regulated	Regulated
Spain - Mugardos	Regulated	Regulated	Regulated
Sweden - Lysekil	-	-	-
Sweden - Nysahamn LNG	-	-	-
United Kingdom - Dragon	-	-	-
United Kingdom - Isle of Grain	-	Negotiated	-
United Kingdom - South Hook	-	-	-

Table 3 – Access regime for small-scale services in European LNG terminals (Source: NRAs)

LNG loading service

The Zeebrugge LNG terminal operator allocates the capacity on the primary market either through open subscription or open season processes. The remaining capacity after these processes is allocated via an auction window on a first-committed-first-served basis.

As for the Finnish LNG terminals, during the allocation, first-phase users notify the capacity reservation volumes upon making the reservation and then, if these exceed the available capacity, they will be distributed equally according to the ratio of booked capacity between reserves.

In the case of the regulated Lithuanian LNG terminal, the annual CAM provides some particular rules which are implemented in case the demand exceeds the available capacity. After this process, the capacity is also allocated on a spot basis through a first-come-first-served mechanism.

In the Dutch terminal, the capacity is allocated under the first-come-first-served principle.

At the Italian Toscana terminal, the capacity is offered by pay-as-bid auctions and the remaining capacity is allocated on a first-come-first-served basis.

Finally, the six Spanish LNG terminals allocate the capacity by means of auctions, which are periodically performed, monthly and annually. After that, the remaining capacity is allocated on a first-come-first-served basis.

Truck loading service

In Zeebrugge, the capacity on the primary market is subscribed following either an open season or a subscription window. Allocation is performed pro rata among the binding requests received, prioritising requests with a longer duration. LNG truck loading services available at the end of the corresponding subscription window or open season are allocated on a first-committed–first-served basis until a next subscription window is organised.

In Finland, there is a weekly schedule in which users need to update the upcoming and ongoing truck loading operations within seven days by declaring the daily truck loading schedules for the previous week no later than by 15:00 on Thursday.

In France, every day, the terminal operator makes a certain number of slots available online. This happens 14 days in advance, and customers can book these slots on a first-come-first-served basis.

In the Gate terminal, the situation is very similar to the French terminals, but in this case the schedule is done every month.

In the Polish LNG plant, truck loading service happens in addition to the basic regasification service and only users of this basic service can make use of that capacity as well.

In the Portuguese terminal, the capacity is also booked by means of slots, which are allocated on a first-come-first-served basis.

For the Spanish terminals, the capacity is allocated through auctions by the means of annual, quarterly, monthly, daily and intra-daily products. The capacity is booked in terms of kWh/day, instead of slots.

Virtual liquefaction

In Zeebrugge, the available capacity is automatically allocated on an hourly basis pro-rata to the requested quantities by each terminal user. This could be reduced in case of exceeding LNG storage capacity. In any case, the availability of the service is subject to total send-out nominations exceeding the minimum send-out rate defined in the LNG access code.

In the case of Portugal, the capacity is allocated through reservation, as foreseen in the CAM Network Code, and it is subject to the regasification use.

At the Italian Toscana terminal, the capacity is offered on interruptible basis and it is subject to the regasification usage.

As for the Spanish LNG terminals, the capacity is allocated through auctions. This service is provided in a virtual model and, in consequence, it is not provided at a specific location but in the virtual LNG storage tank.

3.3 Congestion management procedures

There are congestion management procedures in almost all EU countries, with some exceptions, in particular in some terminals where capacity is not congested. The most frequent mechanism in place is called “ship-or-pay” and describes the process when the shipper pays for the capacity booked, whether it used it or not.

In some cases, there are no “standard” congestion management procedures in place for these services, but the terminal operator has the responsibility to monitor and detect possible congestion situations and to manage them if necessary. For example, in the case of Finland, the terminal operator is entitled to terminate service contracts when the capacity has been reserved with the possible intention of hoarding instead of using it. This mechanism is valid for both, ships and trucks LNG loading services. In the case of France, the terminal operator is able to add additional slots if demand exceeds the supply or, conversely, to reduce the number of slots if demand is lower.

In Lithuania, use-it-or-lose-it long-term mechanisms are applied when congestion at the terminal occurs and shippers use the capacity below a certain percentage of the booked capacity. However, losing the capacity does not relieve the user from the obligation to pay for the contracted services under the same conditions as they would have paid if the capacities were fully used.

In Poland, when demand exceeds the supply, the capacity is allocated proportionally to the capacity booked for the basic service according to the capacity allocation mechanisms.

In the case of the Grain terminal, congestion situations are managed by a staggered allocation system, complemented with penalties, which are applied in case of late cancelation of the booked capacity.

As for the Spanish LNG terminals, apart from the use-it-or-pay-it principle, users are provided with the flexibility either to surrender the unused capacity or to sell it in the secondary market. In case they re-sell their booked capacity, the selling price is limited to the auction premium allocated in the primary market. Apart from this, the regulation also foresees the application of long and short-term use-it-or-lose-it mechanisms, applicable to the truck loading and virtual liquefaction services. In the case of ships loading service, users have to face penalties if they do not release the capacity well in advance.

3.4 Tariffs

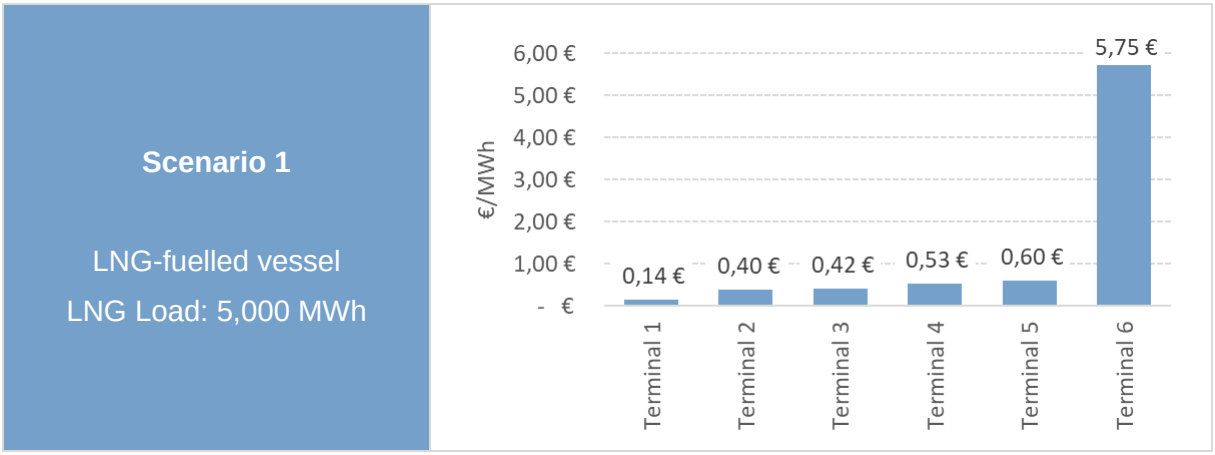
This section focuses on small-scale LNG services with accessible and public access tariffs. Services with negotiated access and non-public tariffs are not included. The basis for the analysis is the structure and values of the tariffs applied during the second half of 2021.

The tariffs applied to small-scale LNG services are very different across European LNG terminals, not only in quantitative terms but also in their inner structure.

For the loading of LNG into ships for bunkering service, some countries apply fixed terms (e.g. Finland), while others use variable terms (e.g. Spain or Lithuania, where the terms differ depending on the load's size). The Belgian terminal has both fixed and variable terms. In the case of Spain, the cost of this service per MWh is the same, independently of the amount of energy loaded, while in the other cases the cost decreases when the volume of LNG loaded increases.

In the figure below, there are three scenarios considered[6]: the load of 5,000 MWh to an LNG fuelled vessel (Scenario 1), the load of 25,000 MWh to a barge for bunkering (Scenario 2) and the load of 50,000 MWh (Scenario 3).

Figure 3 shows that the spread of tariffs among the LNG terminals is significant. In the case of loading 5,000 MWh of LNG (Scenario 1), the highest price per unit (in €/MWh) is almost 40 times more expensive than the cheapest one. The differences diminish for bigger volumes of LNG and in Scenario 3 (load of 50,000 MWh), the spread between the most expensive and the cheapest tariff decreases to 8 times. Therefore, tariffs can have an impact in terms of competition as terminals offering this service compete at least at regional level.



[6] The scenarios are anonymised to guarantee the confidentiality of the NRA data.

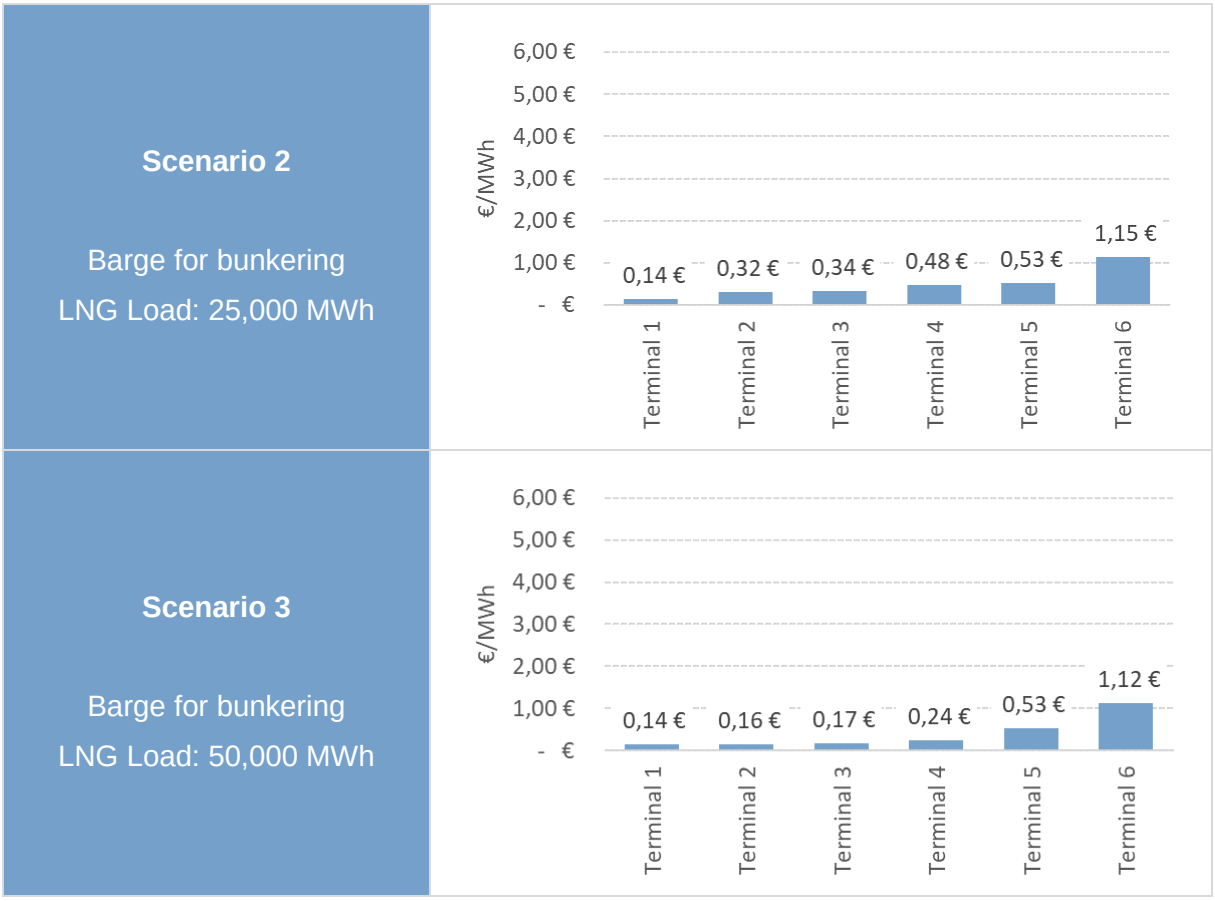


Figure 3 – Tariffs for loading of LNG into ships (for bunkering) service
(Source: NRAs)

As far as truck LNG loading service is concerned, most tariffs are established in terms of a capacity charge (fixed-term) per load or slot contracted. This charge can be affected by discounts in some cases, for instance, if the capacity is booked sufficiently in advance. Capacity granted could also be increased (for the price) if it is granted with a higher level of flexibility. In such a case, the holders of the capacity have the possibility to postpone the use of the booked slots to the following year. Other than that, only a commodity charge is added to the tariffs.

The tariffs applied in the Spanish LNG plants for this service differ from the rest of the terminals considered in this analysis as they have both capacity and commodity charges. Additionally, capacity charges are not being applied in terms of number of slots but are measured in the amount of kWh/d users contract. This definition is also affected by multipliers, depending on the products' duration concerned (yearly, quarterly, monthly, daily or intra-daily).

The trucks LNG loading service's tariffs spread is less significant than in the ships LNG loading service. Nevertheless, the most expensive still costs four times more than the cheapest tariff. These tariffs can also have an impact in terms of competition as terminals offering this service compete, at least at local level.

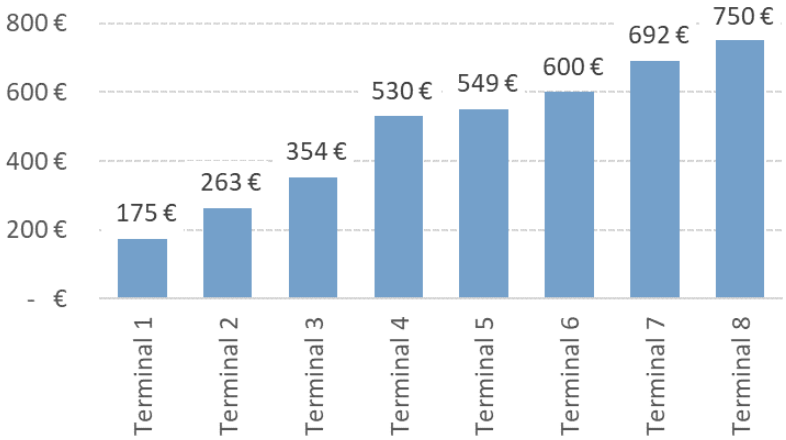


Figure 4 – Tariffs for truck LNG loading service
(Source: NRAs)

For the virtual liquefaction service, countries set either a relatively low tariff (Belgium, Italy and Spain) or no tariff at all (Portugal). By doing so, they consider the service's inner virtual nature. In the case of Belgium and Italy, the tariff is established in terms of €/MWh. The Spanish tariff only has a capacity term, which is affected by multipliers depending on the duration of the product contracted.

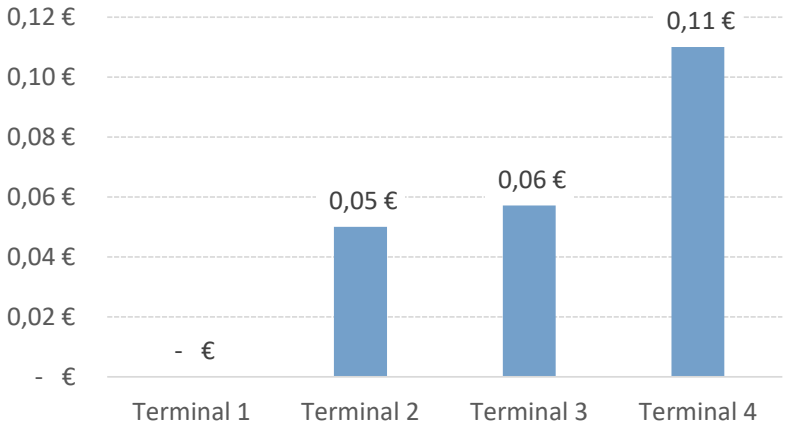


Figure 5 – Tariffs for virtual liquefaction service
(Source: NRAs)

5 Other aspects of the transmission chain that might condition the market development

Bunkering: Decarbonisation and environmental policies, i.e. restriction of sulphur emissions in ports or larger areas (e.g. Emission Control Areas), are some of the determining factors demand for bunkering. Nevertheless, the high gas prices experienced in Europe since the autumn of 2021 and the possibility that they remain at that level (over oil-parity) in the medium-run might slow the demand.

Capacity for LNG loading will depend basically on the service development in the current and new regasification terminals. Additional constraints could be the construction of enough barge capacity to load big vessels. The barge's size and its compatibility with both ports and vessels are also decisive drivers. This situation creates something of a "which came first, the chicken or the egg?" problem for developers.

Truck loading: Historically, demand, was driven by isolated gas consumers or virtual networks, despite the different levels of demand in various MS. This meant truck loading was specifically useful to gasify new areas with a small satellite terminal that supplies the isolated grid, or to provide large consumers in remote areas without network connection.

In recent years, demand increased due to transport demand related to fuel switching. Cars, trucks and ships are using gas or LNG substituting for oil products. This level of demand was created by decarbonisation and the gas price's competitiveness, helped sometimes with tax incentives or other tools to foster decarbonisation. However, fuel price competition (particularly with relatively high gas prices) might change the outlook for a rapid development.

Today, it is a well-established service in some MS and more terminals are installing truck loading facilities or increasing capacity for it. More loading installations in alternative locations will mean more capacity in terms of loading. However, the development might also lead to a reduction on the average length of truck transport, which will free up more truck capacity to serve new demand.

The availability of trucks to cater to this surge in gas demand for transport will also depend on safety regulation regarding road transport or ports and the possibility to increase flexibility of the trucks' fleet operations.

6 Conclusions

The LNG market is a dynamic international market in which the number of players continues to grow. Despite the global pandemic in 2020, LNG trade grew (+0.4% in 2020 vs 2019) and became even more globalised.

In the particular case of small-scale LNG services, capacities and use cases are increasing in European LNG terminals. In fact, some terminals foresee to increase the capacity offered and many of the terminals which currently do not provide these services plan to do so in the near future. To this end, there are several plans to install new infrastructure (additional truck loading bays, additional LNG loading jetties, dedicated docks, etc.) and/or to develop the rules necessary to provide these services.

At the time of writing, there are no notable direct incentives or subsidies in place to promote the development of new small-scale infrastructure in most EU countries. These infrastructures are mainly built based on market principles or following a regulated planning approach. Nevertheless, in some cases there are some “indirect” incentives, e.g. the promotion of LNG fuelling infrastructure and regulations that favour LNG powered vessels and the establishment of low-emission zones for cleaner transportation.

While regulated access is the most common practice in terms of the CAM, there is a wide variety of CAM applied across European LNG terminals. These mechanisms vary from simple first-come-first-serve, mainly in non-congested services, to organised capacity auctions of different products.

Almost all countries analysed have congestion management procedures in place. Only those terminals where capacity is not congested are an exception. The most frequent mechanism in place is the enforcement to pay for the capacity booked whether you use it or not. Apart from this, other mechanisms applied are the “classic” use-it-or-lose-it mechanism, long- and short-term mechanisms, or penalties charged in case capacity is released late.

The tariffs applied to the small-scale LNG services are different across European LNG terminals, not only in quantitative terms but also in their inner structure. Some have fixed terms, some have variable terms, and some have a combination of both options. In the case of the ships LNG loading service, the spread of tariffs between terminals is significant, while for the trucks loading service, tariffs are not so divergent. Virtual liquefaction service tariffs are low or even zero, given the virtual nature of this service. These tariff differences can have an impact in terms of competition among LNG terminals as those terminals offering the service compete, at least at regional level.

The differences encountered in this analysis might arise from the fact that the markets in different MS have historically developed at different times and for distinct uses in different parts of Europe.

On the one hand, LNG availability was not something common all over Europe until recently. On the other hand, network availability and therefore also the need for small-scale services varies across MS. Finally, the implementation of environmental regulations differs across regions depending on the availability of LNG sources (i.e. for bunkering in ports).

Regarding access regimes and tariffs definition, these topics were studied for the European transmission network and for regasification terminals. This means common practices were set either by regulation or by data sharing. However, this present paper is the first analysis of

regulators assessing small-scale access regimes. It will likely lead to reflections in the individual MS. Similarly, the development of bunkering and competition for the service will lead to a certain level of assimilation of services and even tariffs across Europe.

7 Annex 1 – List of abbreviations

Term	Definition
ACER	Agency for the Cooperation of Energy Regulators
CAM	Capacity allocation mechanism(s)
CEER	Council of European Energy Regulators
EC	European Commission
FID	Final investment decision
GLE	Gas LNG Europe
LNG	Liquefied natural gas
LSO	LNG System Operator
MS	Member State(s)
NRA	National Regulatory Authority
rTPA	Regulated Third Party Access
SoS	Security of Supply
SSO	Storage System Operator
TSO	Transmission System Operator

8 Annex 2 – About CEER

The Council of European Energy Regulators (CEER) is the voice of Europe's national energy regulators. CEER's members and observers comprise 39 national energy regulatory authorities (NRAs) from across Europe.

CEER is legally established as a not-for-profit association under Belgian law, with a small Secretariat based in Brussels to assist the organisation.

CEER supports its NRA members/observers in their responsibilities, sharing experience and developing regulatory capacity and best practices. It does so by facilitating expert working group meetings, hosting workshops and events, supporting the development and publication of regulatory papers, and through an in-house Training Academy. Through CEER, European NRAs cooperate and develop common position papers, advice and forward-thinking recommendations to improve the electricity and gas markets for the benefit of consumers and businesses.

In terms of policy, CEER actively promotes an investment friendly, harmonised regulatory environment and the consistent application of existing EU legislation. A key objective of CEER is to facilitate the creation of a single, competitive, efficient and sustainable Internal Energy Market in Europe that works in the consumer interest.

Specifically, CEER deals with a range of energy regulatory issues including wholesale and retail markets; consumer issues; distribution networks; smart grids; flexibility; sustainability; and international cooperation.

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More information is available at www.ceer.eu.