

OUTLOOK FOR LNG IMPORTS INTO THE EU TO 2025

BY LUCA FRANZA



CIEP PERSPECTIVES ON EU GAS MARKET FUNDAMENTALS

This paper is part of the series 'CIEP Perspectives on EU Gas Market Fundamentals'. This is the result of a comprehensive research project conducted in 2016 with a view to anticipate possible developments in gas supply and demand in the EU in the run-up to 2025 and discuss the sustainability of the EU's diversification efforts.

The authors would like to express their gratitude to CIEP colleagues and CIEP associate fellows involved in this research project for their crucial support in providing feedback and guidance. Additionally, the authors are grateful to all the external reviewers from the industry, who greatly contributed to strengthen the analysis.

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SERIES

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NUMBER

2016 | 2D

EDITOR

Deborah Sherwood

DESIGN

Studio Maartje de Sonnaville

PUBLISHED BY

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FUNDAMENTALS

1 INTRODUCTION

Liquefied Natural Gas (LNG) is often quoted as being a plausible alternative to pipeline gas from Russia¹ for consumption in the EU, where supply diversification is being sought – especially after EU-Russia relations have soured owing to the political crisis in Ukraine. In this vein, the European Commission (EC) has recently heralded a new ‘LNG Strategy’ which calls for actively engaging with current and prospective LNG suppliers and for completing the internal market to enable gas imported as LNG to flow unhindered within the EU. This adds to other supply diversification prospects for new land-bound supply lines from a number of countries located to the southeast of Europe, as analysed in a dedicated paper.²

This paper discusses the extent to which LNG could contribute to supply diversification. This is done by investigating how much additional LNG could reach Europe in the next decade. There is a clear distinction between the period up to 2020 – for which additional volumes can be more easily quantified, given that they will originate from capacity already under construction – and the period between 2020 and 2025 – in which the degree of uncertainty is higher due to the need to consider supplies from projects on which final investment decisions (FIDs) have not yet been taken.

Chapter 2 offers an outlook for the LNG market up to 2020. It discusses and quantifies future LNG volumes, as well as their bearing on the global and European market balance. The focus is on flexible LNG, which we define as volumes of planned LNG production that are either not covered by a long-term contract (uncontracted) or, albeit being part of one, are not committed to a final buyer by a trader/reseller or used by final buyers in their markets (uncommitted). The position of Europe as a ‘sink market’ that absorbs most of the world’s surplus LNG – defined as the portion of flexible LNG that is not solicited by any other markets – is also discussed. In order to understand how much flexible LNG will eventually end up in Europe, we especially need to consider Europe’s own absorption capacity, which will be reflected in spot price levels, and market fundamentals in other regions, particularly non-OECD Asia.

1 Franza, L., ‘Outlook for Russian Pipeline Gas Imports Into The EU to 2025 – CIEP Perspectives On EU Gas Market Fundamentals’, CIEP, 2016

2 Franza, L., ‘Outlook for Gas Imports From New Suppliers Into The EU to 2025 – CIEP Perspectives On EU Gas Market Fundamentals’, CIEP, 2016

Chapter 2 presents three different scenarios, building on a discussion of these elements rather than pointing to one future forecast, given persisting uncertainties. A partial utilisation of liquefaction capacity in the US due to low European prices and a recovery in Asian demand are identified as the main factors that could limit the actual availability of flexible LNG for Europe.

Chapter 3 explores the outlook for the LNG market up to 2025, by which time market conditions may have changed, with a risk of market tightness due to underinvestment in the coming years. In terms of security of supply, it is important to ascertain whether Europe will continue to be the 'sink' market for surplus LNG – with no control over the long term and no guarantees that LNG will flow steadily – or whether Europe will be able to count on additional LNG volumes as a long-term source of diversification.

2 LNG MARKET OUTLOOK TO 2020

SUPPLY SIDE: LEGACY CONTRACTS AND UPCOMING PROJECTS AT THE FID STAGE

LIQUEFACTION CAPACITY ADDITIONS

A wave of FIDs (Final Investment Decisions) on new liquefaction capacity – amounting to approximately 160 Million Tons per Annum (MTPA)³ – took place between 2009 and 2015, mostly owing to expectations of sustained high gas demand in Asia. Some of the volumes resulting from these FIDs have already reached the market. Several of these projects in Australia, Indonesia, Papua New Guinea⁴ and the first train at Sabine Pass in the US have in fact become operational and delivered their first cargoes. Production gains from these projects were partially offset by temporary closures in Angola, Egypt and Yemen, which have tempered the effect of the new start-ups on market fundamentals. Larger volumes still have to come on stream between the time of writing⁵ and 2020, corresponding to a total capacity of approximately 110 MTPA.

The bulk of the last wave of FIDs came from Australia⁶ and the United States⁷, each with some 60 MTPA in additional liquefaction capacity. Apart from a small-scale project in Cameroon, the most recent FIDs⁸ were all taken in the US in 2015, in spite of the low price environment that has prevailed since mid-2014. While half of the new Australian capacity has already come on stream, almost all of the US projects are still under construction. Outside these two countries, the only big project at the FID stage that is scheduled to start delivering by 2020 is Russia's Yamal LNG

3 This includes the following projects: Australia Pacific LNG or APLNG, Queensland Curtis or QCLNG, Gladstone or GLNG T1-T2, Gorgon T1-T3, Prelude, Ichthys T1-T2 and Wheatstone T1-T2 (Australia); Sabine Pass T1-T4 (Phase 1), Sabine Pass T5 (Phase 2), Cove Point, Cameron T1-T3, Freeport T1-T3, Corpus Christi T1-T3 (United States); Yamal LNG (Russia); MLNG9, PFLNG1, PFLNG2 (Malaysia); Caribbean LNG (Colombia); Cameroon LNG; Donggi Senoro (Indonesia) and PNGLNG (Papua New Guinea), with an aggregate liquefaction capacity of 157 MTPA.

4 APLNG, QCLNG, GLNG and Gorgon's first train in Australia, Donggi Senoro in Indonesia and PNGLNG in Papua New Guinea.

5 Summer of 2016.

6 APLNG (9 MTPA), Queensland Curtis (8.5 MTPA), GLNG T1-T2 (7.8 MTPA), Gorgon T1-T2-T3 (15.6 MTPA), Prelude (3.6 MTPA), Ichthys T1-T2 (8.4 MTPA), Wheatstone T1-T2 (8.9 MTPA). Capacity having received FID in Australia after 2009: 61.8 MTPA.

7 Sabine Pass T1-T2-T3-T4-T5 (22.5 MTPA), Cove Point (5.3 MTPA), Cameron T1-T2-T3 (12 MTPA), Freeport T1-T2-T3 (13.2 MTPA), Corpus Christi T1-T2 (9 MTPA). Capacity having received FID in the US after 2012: 62 MTPA.

8 Sabine Pass Train 5, Corpus Christi Trains 1 and 2, Freeport Train 3.

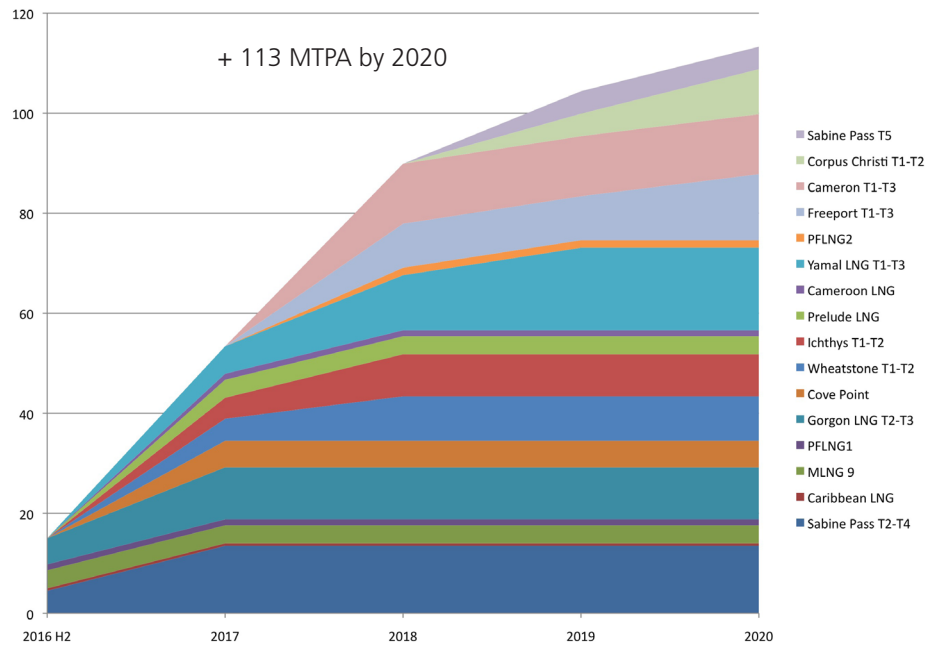


FIGURE 1: LIQUEFACTION CAPACITY ADDITIONS FROM PROJECTS CURRENTLY UNDER CONSTRUCTION (UPDATED TO MAY 2016), IN MTPA.

(16.5 MTPA). Additionally, smaller-scale projects are under construction in Malaysia⁹, Cameroon¹⁰ and Colombia¹¹.

The new 110 MTPA liquefaction capacity expected to be on stream by 2020 will add to the present nameplate capacity of approximately 300 MTPA¹². Current LNG supply stands at 250 MTPA, or 50 MTPA short of today's nameplate capacity, as for various reasons not all LNG plants are fully utilised.¹³ While in some cases there is insufficient feed gas due to aging fields or rising domestic demand, in other cases, it is because of technical problems delaying project start-up. In the case of Australia it is because projects are still in the ramp-up phase. Finally, there can be disruptions to supplies to LNG plants owing to geopolitical instability (as in Libya and Yemen). Plants that are currently running below capacity due to insufficient supplies will probably still run below capacity in 2020. Assuming that all other plants, including Libya, Yemen and

9 An additional train at Bintulu and two floating LNG (FLNG) platforms, with a total capacity of 6.3 MTPA.

10 With a capacity of 1.2 MTPA.

11 With a capacity of 0.5 MTPA.

12 This figure (rounded from 303 MTPA) is an update of GIIGNL's numbers contained in the report 'the LNG Industry in 2015': the nameplate capacities of Gorgon (Train 1), Australia Pacific LNG (APLNG), Gladstone/GLNG (Train 2) and Sabine Pass (Train 1) have been added to the GIIGNL figure, while the capacities of plants in Angola, Egypt, Libya and Yemen (projects that have been stopped for technical issues or force majeure) have been subtracted.

13 Lower-than-average utilisation rates are found in Algeria, Angola, Australia, Egypt, Indonesia, Libya, Oman, Trinidad, Tobago and Yemen.

Angola¹⁴, as well as all the LNG projects currently under construction¹⁵ or in ramp-up¹⁶ will run at full capacity by 2020, the maximum functioning liquefaction capacity in 2020 would not exceed 400 MT.

During an earlier round of LNG developments that took place in the 2000s, project developers in countries such as Qatar and Angola took their investment decisions without securing commitments from markets and were then caught unprepared by the surge in US shale production in the second half of the 2000s. To the contrary, the developers of the last wave of new projects made sure to pre-sell the bulk of their forthcoming LNG production. As construction of these projects is well under way and most of their output has been contracted, they will proceed regardless of the evolution in market conditions.

As is explained further below, however, it is possible that there will be delays and renegotiations – and that only part of the planned liquefaction capacity will eventually be used. In fact, LNG demand scenarios¹⁷ forecast LNG demand (and therefore supply) in 2020 as being distinctly below 400 MT (more typically in the range of 350-370 MT in bullish projections, and as low as 310 MT in bearish projections).¹⁸

ESTIMATES FOR THE FLEXIBLE LNG POTENTIAL TO 2020

This new wave of LNG is likely to compound the situation of oversupply and falling gas prices that has been in effect since the spring of 2014, on the back of both weak gas demand in Asia and persistently low oil prices. As is discussed in the next sections, not all of this LNG will find its way to Europe, as the majority of it is contracted to other markets. Yet larger volumes of flexible LNG may well find their way to Europe in the coming years. A preview of this trend was offered in 2015, when European net imports of LNG grew by 5.1 MT, or 15.8% relative to 2014.¹⁹

Even if, as mentioned, most of the volumes originating from new projects have been pre-sold, a share of both Australian and US LNG that recently received FIDs has been

14 Nameplate capacities: Angola (5.2 MTPA), Libya (3.2 MTPA), Yemen (6.7 MTPA).

15 As mentioned above, the aggregate nameplate capacity of these projects is approximately 110 MTPA.

16 Australian projects launched in the last few months and the first train of Sabine Pass (aggregate nameplate capacity: 22.6 MTPA).

17 These are not bottom-up, but rather built from supply, as supply and demand for LNG are considered approximately equal due to the very small volumes in storage.

18 LNG demand in 2020 will reach 366 MT according to FGE (Facts Global Energy), 310-356 MT according to WoodMackenzie and 345 MT according to IHS Cera (scenarios produced in 2015-2016).

19 Almost half of this growth in net imports (2.4 MT) can be attributed to a lower number of reloads from the region, notably from Spain and Belgium. (GIIGNL-2016).

left uncontracted, or has been purchased by buyers who in turn have no firm commitment to supply markets for all (or part) of their volumes. These are the volumes that need to be considered when analysing prices and the evolution in market balance, in order to understand how much LNG will find its way to Europe. There may be different reasons as to why not all of the volumes were locked in firm contracts. Producers of LNG may themselves be interested in disposing of uncommitted volumes on a short-term basis, in order to capture arbitrage opportunities. A growing number of LNG buyers also wish to take trading positions in LNG: notably international oil companies with large portfolios and commodity traders, but also other players.²⁰ In a few cases, it is possible that project developers did not manage to sign as many long-term contracts as they wished – but nonetheless proceeded to FID, counting on the fact that the market would gradually absorb the uncommitted volumes.²¹ Moreover, it should not be forgotten that an unprecedented number of projects were competing for FID in the late 2000s and early 2010s, encouraging project developers to move quickly in order to capture a market window that could otherwise close.

It is estimated that 15²²-20²³ MTPA of prospective LNG from US projects are not pinned to a specific final buyer. These volumes are either unsold or uncommitted in the portfolios of IOCs or trading houses.²⁴ Australian projects also left some 7 MTPA unsold.²⁵ When resuming operations, the LNG plant in Angola will also deliver around 5 MTPA of uncommitted LNG.

Unless these volumes are locked in long-term contracts in the next few years²⁶, they will add to the current pool of flexible LNG, composed of volumes from operational projects that are already being sold on the spot or under short-term contracts. This pool includes, for instance, 25 MTPA of Qatari LNG that are already being sold on the spot or on a short-term basis. Furthermore, a number of long-term contracts – covering aggregate volumes of more than 50 MTPA – are due to expire by 2020. The

20 Also, other buyers (including Asian NOCs and utilities) may have sufficient contractual flexibility to deviate from their first-choice destination markets if these are not able to absorb all the volumes originally earmarked for them. These all add to the pool of flexible LNG.

21 Thirty-four countries were importing LNG in 2015, compared with only 15 in 2005.

22 BG Group, May 2015.

23 Wood Mackenzie, September 2015.

24 Both sets of players also have committed volumes in their portfolios.

25 The IEA Medium-Term Gas Market Report (2014) indicated that 10% of Australian capacity coming on stream by 2020 was uncommitted. A similar figure can be found in Corbeau, A. and Ledesma, D., 'LNG Markets in Transition', Kapsarc, April 2016.

26 The analysis contained in this chapter does not take into account the flexible Sales and Purchase Agreement (SPA) signed in July 2016 between Qatargas and RWE (1.1 MTPA for 7.5 years). This contract does not however substantially change the conclusions of this and other chapters.

possible non-renewal of some of these contracts may further contribute to increasing the pool of flexible LNG, while in some cases gas previously sold abroad under long-term contracts will be rerouted to growing domestic markets (such as Indonesia's) rather than liquefied and sold on the spot.

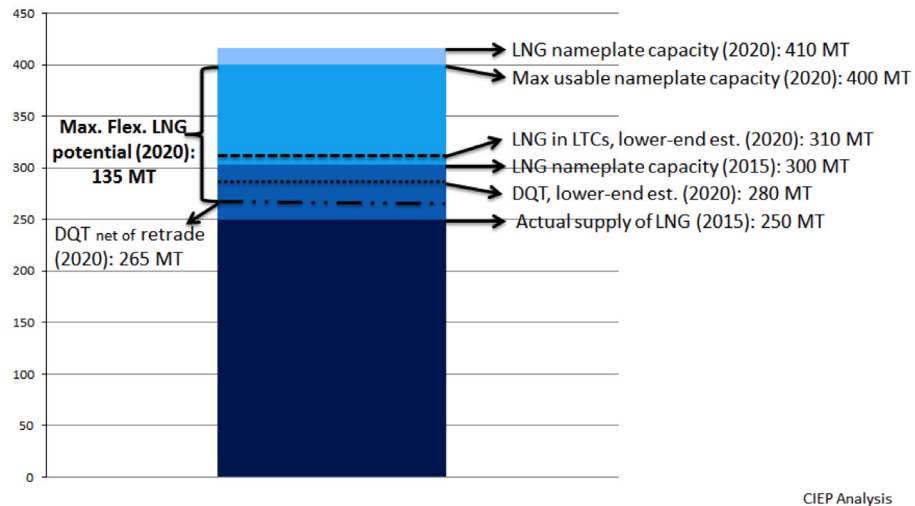
Although estimating volumes of flexible LNG that may effectively come on stream in the future is difficult, it is possible to at least identify the maximum potential for flexible LNG by 2020. This maximum potential will be achieved if all of the following conditions are met:

- a. The full production capacity of 400 MTPA – estimated in the previous section on the basis of a number of optimistic assumptions – is actually available by then;
- b. Long-term contractual commitments lie at the lower end of estimates (a range of 310-340 MT in 2020²⁷), and are all minimised (assuming a downward flexibility of as much as 10%)²⁸;
- c. None of the expiring contracts are renewed;
- d. A further estimated 15 MTPA remains uncommitted and is available for re-trading; and
- e. No new term contracts are concluded with emerging markets.

On these grounds, we estimate that the maximum potential flexible LNG by 2020 would be as much as 135 MT, which compares to today's 67 MTPA of LNG that are sold on the spot or under short-term contracts. It is important to stress that this is only an indication of the maximum potential, while the outlook for flexible LNG that may effectively come on the market by 2020 is very different.

27 IHS Cera, Wood Mackenzie, GIIGNL.

28 There is a consensus that unlike long-term contracts for sales via pipeline (where ACQ levels can now be as low as 70%), long-term contracts for LNG are much less flexible in terms of volumes, with take-or-pay levels at around 90-95% of ACQ.



CIEP Analysis

FIGURE 2: GLOBAL LNG LIQUEFACTION CAPACITY, VOLUMES CONTRACTED IN LONG-TERM CONTRACTS (LTCs), DOWNWARD QUANTITY TOLERANCE (DQT) AND RE-TRADE POTENTIAL ESTIMATES UP TO 2020 RELATIVE TO LIQUEFACTION CAPACITY AND SUPPLY IN 2015, IN MTPA (CIEP ANALYSIS).

DEMAND SIDE: ABSORPTION CAPACITY BY WORLD MARKETS

Having offered an approximate quantification of the maximum potential flexible LNG by 2020 and discussed supply-side factors, we now proceed to examining the absorption capacity of Europe and other markets, including a discussion of:

- Short-term LNG arbitrage dynamics, to establish what volumes, once loaded on a vessel, would preferentially move in the direction of Europe rather than Asia; and
- More structural factors that determine how much of the maximum flexible LNG potential identified in the previous sections would effectively come on the market. This depends on the capacity of different markets to absorb flexible LNG, which primarily rests on demand and the ensuing price signals, but also on infrastructure, regulation and other characteristics of the receiving market.

FLOWS OF LNG BASED ON NETBACKS

The table below aims to compare the attractiveness of Northeast Asia and Europe for LNG volumes from various producing countries. Netbacks are calculated here as the difference between the price offered at the delivery point minus transport costs – and thus show the direction that would be taken by LNG vessels that are already loaded and not pinpointed to a specific final destination. The table therefore gives us an indication of current arbitrage dynamics.

Netbacks in US\$/MMBtu From ↓ To →	Northeast Asia @ 5 \$/MMBtu (WGI Asia Spot Avg 15 May-15 June)	United Kingdom @ 4.8 \$/MMBtu (NBP Spot Avg 15 May-15 June)
Algeria	3.6	4.1
Australia	4.0	3.7
Indonesia	4.1	3.7
Malaysia	4.0	3.6
Nigeria	3.6	4.0
Norway	2.8	4.1
Peru	3.4	3.5
Qatar	3.9	3.8
Russia (Sakhalin)	4.1	3.6
Trinidad and Tobago	3.4	4.0
United States (Gulf Coast)	3.1	3.8

TABLE 1: NETBACKS FOR DELIVERIES TO NORTHEAST ASIA AND THE UK IN MAY-JUNE 2016 (WGI ESTIMATES). DEFINITION OF NETBACK ADOPTED HERE: PRICE AT DELIVERY *MINUS* SHIPPING AND, FOR THE UK, REGAS TERMINAL COSTS. CFR. WGI NETBACK METHODOLOGY FOR MORE DETAILS ON THE UNDERLYING ASSUMPTIONS. NETBACKS LEADING TO A CLEAR PREFERENCE FOR ONE OF THE TWO MARKETS ARE HIGHLIGHTED IN COLOUR.

Differences in netbacks offered by Asia and Europe are at present quite thin. This is especially remarkable if we consider that until a year ago, LNG produced in the Atlantic Basin was being diverted and re-exported to Asia because of the premium prices then paid by this market. Based on this table, at parity of conditions, we can conclude that flexible volumes from the Atlantic Basin would flow to Europe rather than Asia. Conversely, flexible volumes from Australia, Indonesia, Malaysia, and the Sakhalin Island would sail to Asia. Asian and European netbacks for Qatari LNG are at almost the same level, confirming the country's position as arbitrageur between the two basins. It is, however, important to underline that this is just a portrait of current short-term dynamics, and that even relatively small variations in the Europe-Asia price gap may have an impact on flows. There can also be strategic considerations at the base of suppliers' choices, as demonstrated by Qatar's continued supply line to the UK in years when Asian netbacks were more attractive.

It is nonetheless possible to draw some conclusions for the longer term based on this analysis. In fact, in the current market conditions (expected to last until 2020) it is unlikely that Asian prices will structurally remain lower than European spot prices.²⁹ This suggests that most of the flexible LNG from the Asia-Pacific region will continue flowing to Northeast Asia rather than Europe in the coming years. Conversely, it is possible that the price gap between Northeast Asia and Europe will increase in the coming years due to higher oil prices. Asian gas prices are in fact more closely linked to oil prices than European gas prices are. This entails that in case of an oil price rebound Asia would offer better netbacks and thus more LNG from the Atlantic Basin would sail to Asia, as was the case until mid-2014.

EUROPE'S ROLE AS 'MARKET OF LAST RESORT' AND UNDERLYING FACTORS

Europe currently appears to be the 'market of last resort' or 'sink market' for global LNG, and as such is providing support to global gas prices, including, notably, Asian prices. The definition of Europe as 'market of last resort' does not necessarily refer to its role in relation to every single supplier, as for some suppliers it could in fact be the 'market of choice' – as showed by Table 1. This definition rather refers to the broader role of 'shock absorber' that Europe is currently playing in the global gas market, exemplified by Figure 3. The Figure offers a framework with which to understand the factors influencing Europe's capacity to soak up volumes of flexible LNG unsolicited by other markets – referred to as 'surplus LNG'. In default of Europe's absorption capacity, we could imagine scenarios where global gas prices fall in a downward spiral, possibly to levels near the Henry Hub price.

Europe's absorption capacity is based on a number of factors, including the size of the EU gas market, its growing liquidity and the availability of abundant and easily accessible regasification capacity and storage.

²⁹ Europe is providing support to global gas prices, and European spot prices function as floors for Asian spot prices.

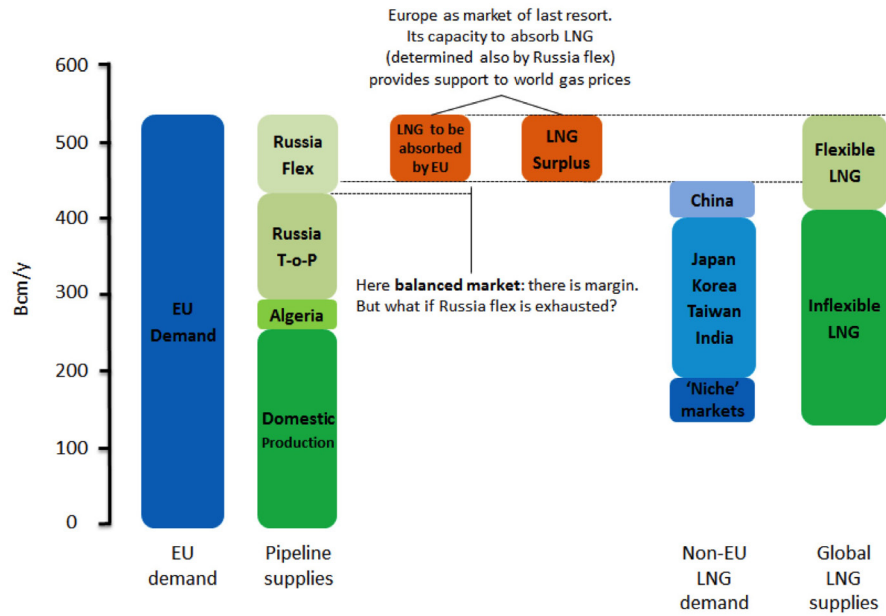
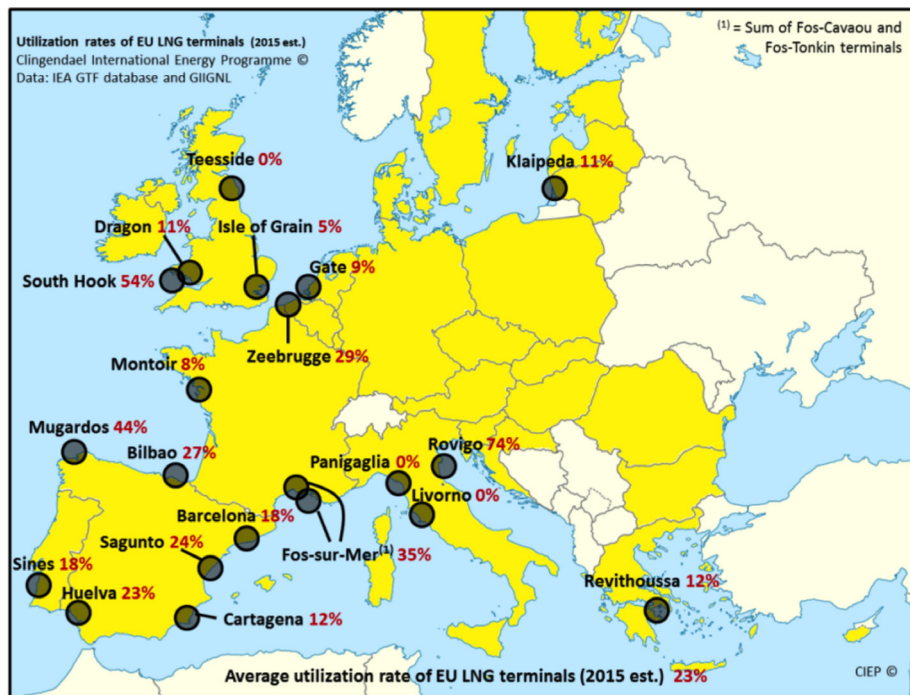


FIGURE 3: FRAMEWORK FOR THE GLOBAL GAS MARKET BALANCE (SOURCE: TIMERA ENERGY).



MAP 1: UTILISATION RATES OF EU LNG REGASIFICATION TERMINALS (2015 ESTIMATES, CIEP, BASED ON IEA AND GIIGNL DATA).

With regard to the last point, as indicated by the map above, only 23% of the EU's 190 Bcm regasification capacity was utilised in 2015. From a physical regasification capacity point of view, this would theoretically be sufficient to accommodate all the potential flexible LNG (135 MT or 185 Bcm) identified for 2020, although there would probably be limitations to third party access in some regasification terminals owned by LNG producers, and this would somehow limit absorption capacity. On the other hand, additional regasification capacity is either under construction (Dunkerque, Swinoujscie) or planned (Krk, Estonia LNG).

Europe's absorption capacity is also influenced by the flexibility of its supply profile, notably the upward and downward volume flexibility offered by Russian long-term contracts. With the US poised to become one of the core sources of flexible LNG in the world markets, Wood Mackenzie expects that as much as 55% of US LNG could be sold in Europe.³⁰ Europe's role as shock absorber is important for US LNG, which has relatively high variable costs and a high sensitivity to LNG market prices. In the US, LNG marketers (buyers) have long-term tolling agreements and pay a fixed liquefaction fee upfront³¹, but need to buy the feed gas at US market prices and pay for shipping³² and, where appropriate, regasification. It is particularly the cost of purchasing feed gas that makes US LNG relatively sensitive to LNG market prices. For instance, Wood Mackenzie estimates that a European spot price of 3\$/MMBtu may cut US liquefaction capacity utilisation by as much as 40%. Other consultancies project US liquefaction utilisation rates to be 50-70% throughout the period 2016-2020. When discussing US liquefaction utilisation prospects, it is also important to keep in mind variations in the Henry Hub price. It is estimated that this will remain low thanks to a very low-cost resource base (the US has 24 Tcm of gas that would break even at 3\$/MMBtu), but of course a narrower Henry Hub-NBP price gap would incentivise American gas to be marketed in the US rather than being liquefied and shipped to Europe.

As is discussed in a separate paper on prospects for Russian supplies to Europe, Russia could afford lower European prices (3-3.5\$/MMBtu) than the marketers of US LNG (needing at least 4\$/MMBtu) to recover variable costs incurred in selling LNG to Europe. Although Russia is not following a volume-over-value strategy in Europe at the moment, it may decide to actively protect market share in future. If Europe does not offer a sufficient price to absorb US LNG unsolicited by other markets, some of the US capacity expected to become operational by 2020 could be shut in (between 30 and 50% according to various sources).³³

30 Wood Mackenzie, 2016.

31 Which is thus treated as a sunk cost.

32 Although there are sunk costs in shipping, too.

33 'Wood Mackenzie says up to 50% of US LNG is at risk of shut-in over the next five years', LNG Industry, 9 March 2016.

PROSPECTS FOR FLOWS OF FLEXIBLE LNG TO EUROPE

As can be construed from the representation in Figure 3, there are market developments which could test Europe's absorption capacity severely and trigger a fall in global LNG prices. To the contrary, if demand either in or outside of Europe recovers and/or the flexible supply base is reduced for whatever reason (outages, delays, or the signing of new long-term contracts committing volumes to a specific destination), oversupply will be relieved and prices will go up. To explore the probabilities of these uncertainties and their consequences, three scenarios have been examined.

SCENARIO I – A WAVE OF FLEXIBLE LNG INTO EUROPE

A scenario in which the maximum potential flexible LNG up to 2020 of 135 MTPA actually comes to the market – and particularly to Europe – would not only hinge on the set of audacious assumptions presented in the previous section, but also on the premise that market prices will continue to exceed the marginal costs of supply for all of this LNG.

To offer an approximate quantification of the implications of some of the assumptions examined in the previous section, taking the higher end of the contracted volume range (340 MT) and assuming lower downward flexibility (5%) would in itself reduce the estimated flexible volume potential up to 2020 by as much as 40 MT (or 95 MT rather than 135 MT).

In addition, it is most unlikely that all of the expiring contracts, mostly servicing the Asian markets, will not be renewed. Negotiations may well lead to contract renewals, albeit with more favourable terms including more flexibility. Even if contracts are not renewed, it would be unlikely that demand for all the volumes covered by expiring contracts would fully fall away. It can therefore be expected that a large part of these volumes will still find their way to the same buyers.

Moreover, assuming a prolonged weak demand in Asia and considering the limited depth and tradability in emerging markets like the Middle East and Latin America, Europe would have to take in very large volumes of flexible LNG (possibly as much as 100 Bcm), and it would have to do so with no considerable effect on prices. In fact, European spot prices are already around 4.5\$/MMBtu and would fail to attract US LNG if they were lower than 4\$/MMBtu. With lower prices, other sources of flexible LNG with low variable costs (for instance, Qatar) might still find their way to Europe, but the pool of flexible LNG would certainly be reduced. To conclude, this scenario seems conceivable only if:

- a. European gas demand grows much beyond general expectations (as established by CIEP's paper on gas demand outlooks, the most bullish scenario points to a 50 Bcm [38 MT] growth in import needs to 2020); and
- b. Russia relinquishes its defence of market share (allowing LNG sold on the spot to outcompete its supplies). The loss of competitiveness of Russian gas on the basis of price is unlikely but is at least conceivable in a situation where Gazprom keeps a relatively large portion of its gas pegged to oil and oil prices rebound. It is, however, difficult to imagine that Russia would accept losing significant market share.

Policy measures in support of LNG applications and trade (such as tax breaks for small-scale LNG, broader third party access, new terminals and more interconnectors to open land-locked or peripheral markets to LNG) can provide some additional support to Europe's LNG absorption capacity, but only if the two above conditions are met. Since an extremely steep rise in European gas import needs and Russia's acceptance of a significant loss in market share seem highly unlikely, this scenario can be discarded.

SCENARIO II - US LIQUEFACTION SHUT IN

In an alternative scenario, we hold the assumption that non-EU (especially Asian) LNG demand remains weak – but in the light of Europe's own absorption limits, the ensuing LNG surplus does generate downward pressure on European prices, bringing them below 4\$/MMBtu.

As a result, a portion of the liquefaction capacity under construction remains unutilised in this scenario, reducing the pool of flexible LNG coming on the market. As mentioned earlier, in fact, US LNG would need prices of around 4\$/MMBtu to cover variable costs.³⁴ Lower prices would soak up the pool of flexible US LNG, which we have assessed at approximately 20 MT in the previous sections. However, most non-US suppliers, and especially those that have vertically integrated supply lines, such as Qatar, would be able to bear very low prices (1-2\$/MMBtu) and could still sell LNG on a depressed European spot market rather than shut in liquefaction capacity.

The existence of unutilised liquefaction capacity is not a novel element. Today, for instance, only around 80% of the world nameplate liquefaction capacity is utilised. What may be more novel relative to previous years is that part of the newly developed liquefaction capacity could be deliberately left idle because of the very low prices.

³⁴ Assuming Henry Hub prices around 2.5\$/MMBtu.

It is quite possible that holders of unutilised liquefaction capacity – notably in the US – could be in a position to bring additional volumes of LNG onto the market in a relatively short time in case of a price recovery, thus smoothing possible commodity cycle dynamics and contributing to keeping global gas at lower levels than seen before the 2014 price shock.

Cost abatement measures and deals to optimise trade flows could also come into the picture, but we will discuss these in the outlook for 2020-2025, as they have more chance of becoming significant over a longer time horizon.

SCENARIO III – ASIA'S COMEBACK

In a third scenario, Asia offers its contribution to absorbing flexible LNG. As we have indicated, Europe's ultimate LNG intake also depends on non-EU LNG demand.

In Japan and Korea, LNG demand will most likely remain flat until 2020. Nuclear restarts and competition from coal, and increasingly also from oil, are hindering gas demand in these markets. A slower pace in nuclear restarts, policies to limit coal consumption and rising oil prices would be key contributors to sustaining gas demand in these two countries.

In China, most scenarios foresee a recovery in LNG demand (+50-60 bcm by 2020 relative to 2013 according to the IEA's *New Policies Scenario*), mainly driven by local clean air policies. Yet the slowdown in economic growth, macroeconomic and political interests in domestic coal, competition from domestic gas production (both shale and conventional) and possible progress in other supply options (Russian, Turkmen and Burmese pipelines) are all important factors of uncertainty that could result in huge variations in the country's LNG intake. However, more than two-thirds of the projected increase in LNG imports can be accommodated via import infrastructure that is already operational. Spare infrastructure capacity combined with cheap supplies and growing environmental concerns will likely boost LNG intakes.

With regard to India, demand is expected to grow by 20 Bcm by 2020.³⁵ India is a very price sensitive importer, and lower LNG import prices will stimulate policies in favour of LNG. It remains to be seen whether there will be time for these policies to have an impact on demand. Remaining obstacles are competition from coal, low end-user electricity prices, and bottlenecks in infrastructure, which cast significant uncertainties.

35 Medium-Term Gas Market Report, IEA, 2015

Finally, the potential absorption of Southeast Asian, Middle Eastern and Latin American markets should not be underestimated. Although individually smaller than Japan, China and India, these emerging markets can nevertheless absorb significant volumes on aggregate, although their gas demand is particularly sensitive to coal-gas competition dynamics.

The IEA's Medium-Term Gas Market Report is one of the most optimistic forecasts for non-OECD Asia's LNG outlook (+90 MT by 2021, or 120 Bcm, or 80% of the world's increase in LNG imports).

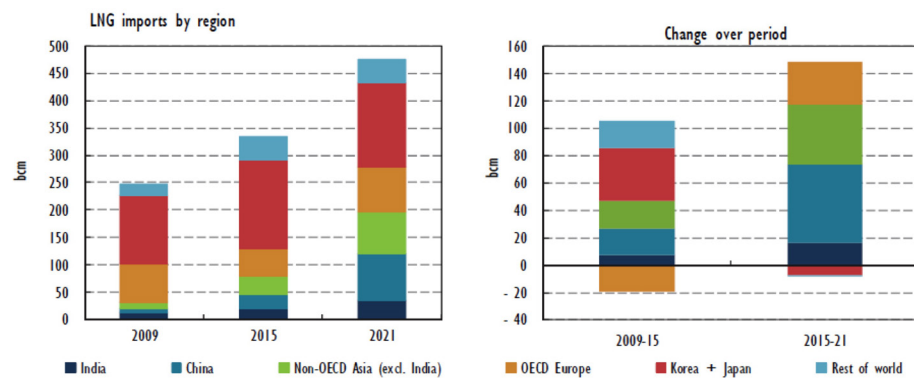


FIGURE 4: CHANGE IN LNG IMPORTS BY WORLD REGION (2009-2021), IEA MEDIUM-TERM GAS MARKET REPORT 2016.

Even under this relatively optimistic scenario, however, projected demand growth would not be enough to absorb the new capacity due to come on stream between 2015 and 2021, and the supply side will need to do its part to keep the market in balance (which translates into a high chance of liquefaction capacity remaining unutilised).

Under this scenario, the amount of flexible LNG that would need to be absorbed by Europe would be lower while global LNG prices would be sustained by the recovery in Asian gas demand.

FINAL CONSIDERATIONS

To conclude, we ruled out the possibility that all of the 135 MT flexible LNG that might technically be available in 2020 will translate into actual flexible volumes of the same scale. The amount of flexible LNG that will actually come on the market by 2020 will predominantly be determined by the interaction of: a) European gas demand; b) demand for LNG in Asia – particularly non-OECD Asia; c) the

competitiveness of Russian gas in the European market; and d) supply-side responses to keep the LNG market in balance (notably, the shut-in of liquefaction capacity). These are the four elements displayed by Figure 3, which describes the factors influencing the global gas market balance, also clarifying Europe's function as a 'market of last resort'.

While the outlook for demand is quite uncertain in both Europe and Asia, it is highly likely that global gas markets will remain oversupplied until 2020, which will probably leave a portion of the US liquefaction capacity unutilised and possibly result in delays to other post-FID projects. Some volumes of LNG, notably from the US, are nevertheless expected to reach Europe's shore. On the other hand, we have suggested that Russia will probably not allow LNG to substantially displace its own supplies. Spot and short-term trade is expected to increase, as a number of buyers appear over-contracted and will try to re-trade part of the volumes bought under long-term contracts. An oil price recovery would have substantial impacts on flows, probably prompting Russia to further unlink its European gas contracts from oil to avoid losing market share and increasing Asia's attractiveness as a market for flexible LNG.

3 LNG MARKET OUTLOOK TO 2025

TOWARDS A NEW LNG BOOM-AND-BUST CYCLE?

In Chapter 2 we discussed the degree of uncertainty surrounding the translation of post-FID liquefaction capacity into actual supplies. For the period up to 2020, the notion that global LNG markets will be oversupplied seems undisputed. What is uncertain is the scale and the implications of this oversupply. Unsurprisingly, such uncertainty further escalates towards 2025, when doubts extend to the more fundamental question as to whether the market will still be well-supplied or, to the contrary, tight.

The looming risk is of course that a typical commodity cycle will unfold, whereby the current low price levels would discourage further investments, to the point that liquefaction capacity available in the run-up to 2025 would be insufficient to match the expected growth in LNG demand. The observation of trends in the last decade indeed suggests that the LNG business is still prey to cyclical dynamics.³⁶ One element that fuels fears of a repeated boom-and-bust dynamic is that gas may be trapped between a price that is insufficient to bring new LNG supplies on stream (i.e., to cover Long Run Marginal Costs, LRMCs) and one that undermines the competitiveness of gas on the market.

On the other hand, we could point out a few elements of novelty that may break, shorten or at least soften the cycle (smaller-scale projects, more price responsiveness, new business models, increased liquidity and number of buyers, cost abatements, etc.). This will be done in the next section.

Identifying the factors at play in the evolution in global market fundamentals between 2020 and 2025 is important to determine whether or not Europe will continue to receive large volumes of flexible LNG without needing to 'call' them (by offering higher spot prices or inking long-term deals). In this section, we will outline supply-side and demand-side factors at play and try to translate those into a discussion on trade flows with a specific focus on Europe as a destination market.

³⁶ The Asian economic crisis of the late 1990s and the ensuing buyers' market at the beginning of the 2000s led to lower gas prices, which contributed to stimulating demand, resulting in a wave of FIDs in the mid-2000s. This in turn compounded oversupply after 2008-2009, also on the back of the US shale revolution. A sellers' market and high prices in Asia after 2011, especially owing to booming Asian demand, led to another wave of FIDs in recent years, which are responsible for the looming oversupply.

SUPPLY-SIDE CONSIDERATIONS

On the supply side, one element that stands out is the slowdown in FIDs in response to the price collapse in 2014-2015. As we mentioned in the introduction to this chapter, the situation of oversupply outlined in the previous sections may turn into market tightness if investments are held up for a prolonged period of time. Much depends on the expectation of the supply/demand balance around 2025. Most scenarios indicate that oversupply will probably last beyond 2020 but project tighter LNG markets starting at around 2023-2025. Even in relatively conservative scenarios on future gas demand, the LNG glut is expected to disappear by the second half of the next decade.

For example, ExxonMobil estimates that new projects for about 100 MTPA will be needed by 2025 to meet the increasing demand. McKinsey estimates that 20 MTPA of new projects will be needed by 2023 and another 45 MTPA by 2025 to avoid a very tight global LNG market³⁷. Because projects typically require 6-7 years for the signature of SPAs and the construction of plants and associated infrastructure, McKinsey estimates suggest that FIDs on 20 MTPA would have to be taken in the next 2.5 years and FIDs on another 45 MTPA by the end of the decade. Based on Exxon's expectations, more FIDs should be concluded by 2020.

Some SPAs have also been signed for projects at pre-FID stages, but, similarly to FIDs themselves, the pace of contracting has slowed markedly over the past two years. Wood Mackenzie indicates that only 7 MTPA of LNG were locked in to new long-term contracts (not necessarily on pre-FID projects) by Northeast Asian buyers in the course of 2015, as compared to a yearly average of 30-35 MTPA in the period 2010-2012. The reasons for the slowdown of new investments are clear and fundamentally lie in the fact that there is little demand from the markets, and that prices are low while LRMCs remain relatively high.

The last market phase saw a lot of high-cost projects taking FID – notably in Australia. It is clear that this cannot be replicated in the current business environment. Even the most cost-competitive projects that could technically move towards FIDs in the next couple of years would approximately require a doubling of spot prices in Asia and Europe to deliver LNG profitably to those destinations once on stream.

Brownfield projects in the Pacific Basin and the Middle East are estimated to be the lowest cost suppliers for deliveries into Asia (8\$/MMBtu delivered), followed by projects in the US Gulf Coast (8.5-9.5\$/MMBtu), East African projects (above 10.5\$/MMBtu)

37 Maddock, K. and Lambert, P., 'Despite Low Oil Prices and a Weak Medium-term Outlook, LNG has a bright future', McKinsey Energy Insights, June 2015.

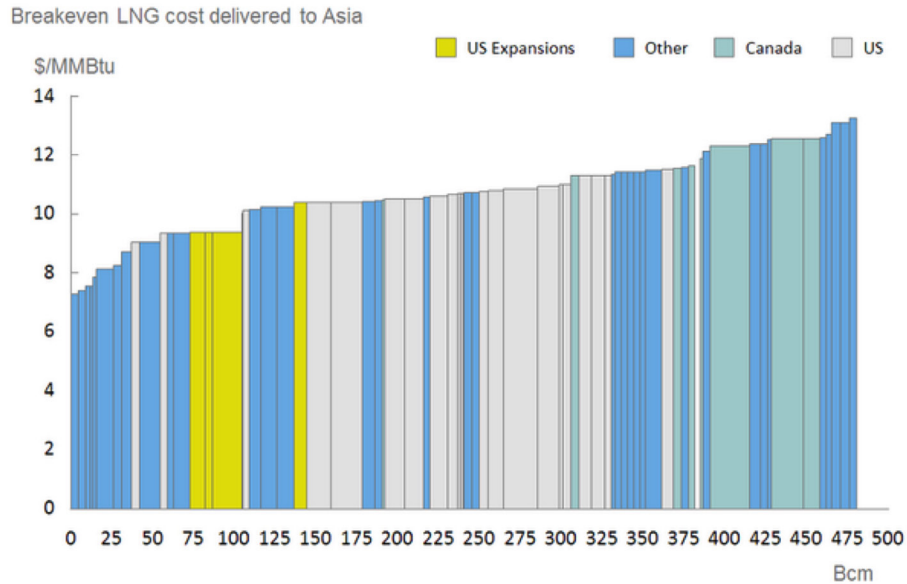


FIGURE 5: BREAKEVEN LNG COST CURVE (LNG DELIVERED TO ASIA FROM VARIOUS DESTINATIONS), MCKINSEY ENERGY INSIGHTS 2015.

and finally Canadian and Australian greenfields (above 11-12\$/MMBtu). Similar considerations apply for deliveries into Europe, for which the competitive advantage of US brownfield projects would be comparatively higher given the lower shipping costs.

Buyers may still want to diversify their sources of supply, however, which may impact contracting and flows along directions that are not necessarily in line with purely commercial considerations. This is the reason why we cannot rule out that relatively more expensive projects in East Africa, Canada or Russia will kick off before some of the relatively cheaper projects in the US Gulf Coast.

DEMAND-SIDE CONSIDERATIONS

Discussions about Asia's future call for LNG (and thus future Asian prices) are also central to determining the potential availability of LNG for Europe in the period between 2020 and 2025. In the longer term, the former's demand growth potential is in fact expected to be higher than the latter's, and non-OECD Asia will probably (once again) undertake the role of global demand catalyst to incite new FIDs. For reasons explained in this and other papers by CIEP, mostly related to the European demand outlook and the competitiveness of Russian supplies, it is difficult to imagine Europe undertaking such role. Nonetheless, Europe could of course benefit from Asia's 'call' and become a recipient of some of the new volumes – on both a short-term and a long-term basis.

The appetite for new long-term contracts is currently low, both in Asia and in Europe, and evolution in demand will determine if and when this situation changes.³⁸ For the moment, the expectation of protracted low prices further discourages project developers eyeing FIDs from taking predominantly speculative positions and counting on selling the bulk of their LNG output on the spot market. In other words, long-term contracts still appear to be the dominant financing model needed to take FIDs.

If investments in new projects are only made on the back of long-term supply contracts, then the timing and the characteristics of the transition from an oversupplied to a tighter market expected by or around 2025 will depend on demand. Forecasts for 2025 LNG demand are in the range of 400-430 MTPA³⁹, of which at least 130 MTPA originating from non-OECD Asia. Many factors are at play that may influence demand. Once again, the attention is mainly focused on China and India – while, especially in the period between 2020-2025, Southeast Asia and the Middle East could also contribute substantially to demand additions. The demand evolution in these markets as discussed in the previous chapter are essentially the same (although loaded with further uncertainty) for the 2020-2025 period.

POTENTIAL FOR BREAKING OR SOFTENING THE BOOM-AND-BUST CYCLE

THE EMERGENCE OF NEW BUSINESS MODELS AND TRADE FLOW MAXIMISATION

Although – as mentioned – long-term contracts are still the backbone of LNG trade, other forms of LNG contracts are becoming increasingly popular, offering more flexibility for volume as well as for delivery, for shorter-term and smaller volumes. More and more LNG is sold (at least partially) based on a short-term or spot basis, or with spot indexation. Sellers are reacting to customers demanding shorter-term deals for smaller volumes or supplies from multiple sources by adding more portfolio sales, and the portfolio approach is indeed becoming more and more popular. LNG business models could undergo some changes in the next years, and this could have an impact on traded volumes, though one which is difficult to measure. In the current market environment, buyers and sellers both face a number of risks, encouraging them to be more flexible than in the past.⁴⁰ Asian buyers in particular face the risk of limited market access to re-trade prospective over-contracted LNG. In order to overcome this obstacle they are actively setting up trading divisions and

38 The analysis contained in this chapter does not take into account the flexible Sales and Purchase Agreement (SPA) signed in July 2016 between Qatargas and RWE (1.1 MTPA for 7.5 years). This contract does not however substantially change the conclusions of this and other chapters.

39 IHS and Wood Mackenzie.

40 Examples provided by Wood Mackenzie at LNG18.

seeking joint procurement agreements with other buyers, as well as joint trading with other buyers, traders and portfolio players. Albeit to different degrees (depending on their portfolios), sellers are also generally threatened by the lack of market access and sluggish demand. Apart from attempting to lock customers in to long-term contracts, sellers are more prone than in the past to export to niche markets with higher credit risk profiles, such as Egypt, Jordan and Pakistan. They are also welcoming cooperative agreements with buyers to secure market access, as well as with other sellers to optimise trade. For instance, swaps could take place between a seller that pools most of its LNG in the Atlantic Basin and has committed to deliveries in the Pacific Basin and a seller that has an opposite trading position.

This is likely to bring more competition, price responsiveness and liquidity to the LNG market. The implications of an intensification of short-term trade and further decentralisation of the LNG business are difficult to capture in their entirety, as they could either bring more volatility or, to the contrary, prevent markets from substantially re-tightening. In this respect, US projects may once again play an important role as sources of price responsive, quickly deployable and low-cost LNG.

Another element that may contribute to softening the boom-and-bust cycle is that aggregators may take FID more speculatively or enter into new long-term contracts in anticipation of a tighter market, unintendedly prolonging the current oversupply if their assessment of future demand turns out to be wrong.

FINAL CONSIDERATIONS

This uncertainty on LNG market fundamentals up to 2025 is reflected in projections for LNG flows into Europe. Unless long-term contracts are signed in the next few years (for instance, as a result of deliberate diversification policies in countries that rely on gas imports from Russia for most of their consumption), Europe will continue to depend on the global market balance to procure LNG.

Given the evolution in LNG business models and the globalisation of the LNG market, however, it is possible that relatively large volumes of LNG will come to shore in Europe in the period 2020-2025 even in default of long-term contracts. Portfolio players especially are expected to play an important role in bridging the two requirements that are apparently at odds with each other: flexibility and FID security.

Overall, the US stands out as having a clear advantage in being able to secure FIDs and catch windows of opportunity in future, although this does not mean that FIDs on new projects in Russia, Canada and East Africa should be firmly excluded.



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