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Setting an **Asian LNG market price** Part 2 – the search for a local solution

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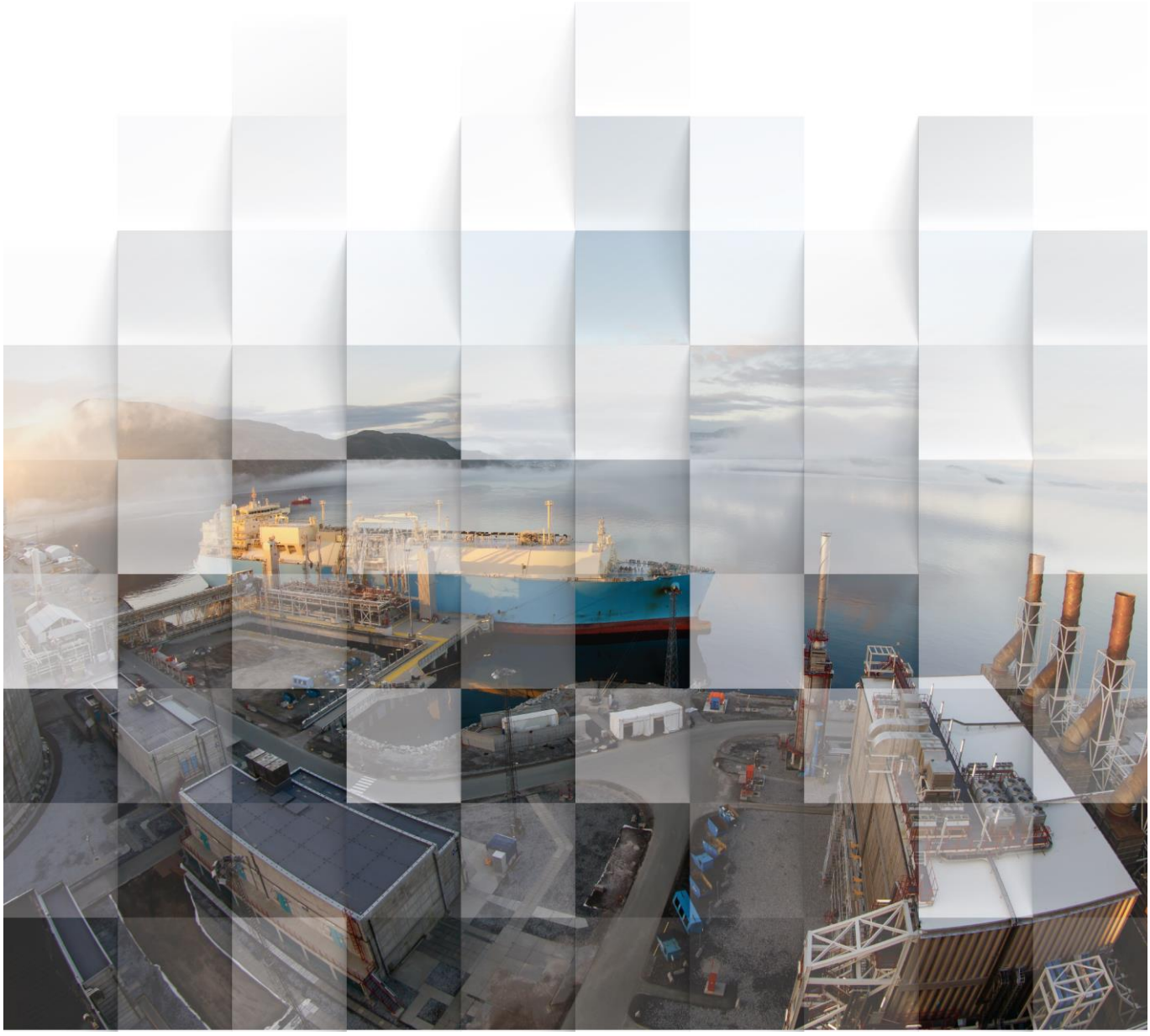

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Executive summary

This paper is the concluding part of an earlier paper in which we discuss the need for a 'made in Asia' solution for an alternative LNG benchmark price to the JCC and propose that the solution may lie in the establishment of a replacement index under which LNG traded on the basis of a virtual LNG hub.

This paper, therefore, explains what is meant by a virtual LNG hub and discusses whether a replacement index for the JCC needs to be either a DES- or FOB-based index. We express a view that the relevance of DES vs FOB is less significant where there are sufficient liquid and transparent sources to ascertain the LNG spot charter costs necessary to calculate, with any accuracy, the appropriate net-back or net-forward price to or from the relevant LNG delivery destination.

We further consider whether the main spot LNG reference prices currently have either the liquidity or transparency required in order to be the basis for a suitable JCC replacement benchmark. We note and compare the differences between the baseline assumptions applied in the methodologies used by the relevant price reporting agencies, which may explain why different prices are reported by the agencies for, essentially, the same product. The reasons for these differences are not readily transparent and, therefore, can be challenging for a market user to understand.

Another challenge of a virtual LNG hub is assessing the accuracy of the price signal it offers against physical LNG demand. With this in mind, we use Singapore as a case study to discuss whether sufficient LNG demand could exist for a virtual Singapore LNG index to be assessed against. We conclude that although currently such demand does not exist, for a variety of reasons (including the Singapore government's focus on promoting itself as an LNG hub and the impact of environmental regulations, which encourage use of LNG as a bunker fuel for commercial shipping), there is potential for that to change in the immediate near term.

In conclusion, we note that the virtual LNG hub proposal is a solution designed to collapse the time differential between the establishment of a natural gas trading hub in Asia and the need to establish a credible replacement for the JCC for the forthcoming renewals of the long-term LNG supply contracts of various buyers.

Introduction

In the first part of this client briefing we discussed the need for the development of an Asian pricing solution for long-term LNG supply contracts to replace the current oil-linked Average Japan LNG Price[1]. We debated whether developing a benchmark to replace this needed to be based on the supply and demand signals arising from an Asian natural gas trading hub (whether physical or virtual) or whether a different local solution would be more appropriate for Asia.

This question has become more legitimate, in particular as Asian LNG begins to react to its own fundamentals and the absence of geographic pipeline connectivity between countries means that a price signal for one Asian country does not necessarily reflect the demand dynamics of another.

On the assumption that a replacement of the Average Japan LNG Price is something that the market wishes to achieve (in less than five years), we therefore propose the idea of a virtual LNG hub to enable the creation of a benchmark that satisfies the following features:

- Accuracy in its price signal
- Sufficient liquidity
- Adequate transparency
- Geographic acceptance

We explore whether there are current spot Asian benchmarks that already exist in the market today that meet the above-mentioned requirements and whether they can form the basis of a suitable eventual replacement for the JCC-linked Average Japan LNG Price.

What is a virtual LNG hub?

The point of a virtual natural gas hub is that, unlike a physical hub, gas may be delivered at any one of multiple entry or exit points within the virtual location. The size of the virtual location is determined by the size of gas network zone. By analogy, the idea of a virtual LNG hub would be similar. Depending on whether the choice of contract was for DES or FOB (on which, see below) LNG would be delivered either to or from a location within the vicinity of a specific country or, for example, a group of nearby ports in different countries rather than a specific geographical gas entry or exit point in one country.

[1] https://www.reedsmith.com/ENR/?section=publication

An additional contrast to note is that the proposal is not for a natural gas hub but an LNG hub. As the dynamics of dependency on or demand for LNG as a fuel source for energy generation in the respective Asian countries are not the same, it is hard to support the idea that one country's natural gas demand should be the basis of another country's LNG price. For example, where particular geographic and political circumstances lead to a country's dependency on LNG (e.g., Japan), it does not automatically mean that another country (e.g., India) will have similar drivers. The concept of treating some countries as having "common but differentiated responsibilities and respective capabilities" with respect to their climate change obligations under the Paris Agreement also means that some Asian countries (e.g., Japan) will not be able to heavily rely on some alternative fuel sources (such as coal) that others very well may be able to rely on (at least in the medium term)[2]. Therefore, the demand and policy drivers behind one country's willingness to pay a certain price for LNG do not logically or sensibly translate into the willingness of another country to do the same.

Along with the technological developments that enable FSRUs and FLNGs to be deployed with great speed in Asian countries that have hitherto struggled with the practicalities of land-based regasification plants (e.g., due to a lack of sea-bed depth along the coast in Bangladesh), very often it is not the natural gas demand that drives the pursuit for LNG but the availability and access to LNG itself. Perhaps this is yet one more reason why LNG is developing a pricing dynamic of its own.

FOB vs DES

Asian markets have historically been DES based and U.S./EU markets FOB based. This preference is probably historically reflective of the nature of the long-term supply contracts and the destination clause restrictions that have now irked the Japanese government so much that it is now saying that "easing or elimination of destination clauses is indispensable for achieving a flexible and liquid LNG market"[3].

The reality is that when looking to replace the Average Japan LNG Price (a DES index), it is most likely that the replacement will also be assumed to be a DES index.

Purely into context of spot markets, whether the index is FOB or DES based is perhaps less significant in circumstances where the LNG shipping costs can be adequately determined, managed and, ideally, hedged to reflect the delivery cost differentials between Asian LNG delivery points. This is presently not as easy a task as is the case for traditional wet cargoes. Yet LNG shipping costs are increasingly an important driver of the commercial value generated through Pacific basin and Atlantic basin arbitrage trades and help establish the level of price spreads between regions.

The LNG shipping costs constitute the sum of chartering costs, brokerage fees, bunker fuel/boil-off costs, port and transit costs and insurance. Among these various costs, the most significant are the chartering costs and the bunker fuel/boil-off costs. The ability to manage the price risk of these two components is therefore key to the ability to maximise spot LNG opportunities.

However, there is probably no one way in which these various cost items are universally managed by LNG market participants. In the context of charter costs, where LNG vessels are on long-term charter, it is easier to treat some of the cost as sunken (along with brokerage and some insurance costs) when diverting cargoes using existing portfolio shipping capacity.

This is particularly the case for those who manage their LNG business on a portfolio basis rather than on a back-to-back trading basis. This leaves portfolio traders with greater scope to be price competitive compared to the trader who is calculating their offer factoring in the spot (trip) charter rates for the relevant diverted location. After all, sunken costs are not relevant for calculating the 'point–to-point' incremental shipping cost that is most important in the decisions on whether to divert LNG cargo.

Given the variety of approaches towards management of shipping costs, the only aspect that can therefore properly be said to be suitable for hedging or benchmarking is the spot LNG charter rates. Where the appropriate benchmarks for spot LNG charter costs for the most likely routes (e.g., Australia to Japan or Qatar to Japan) are available, this reduces the significance of whether the underlying LNG index is a FOB or DES index as determination of the appropriate net forward or net back can be carried out with greater accuracy.

Unfortunately, there are few indices for LNG charters that arguably have the requisite liquidity and transparency needed to supplement the LNG benchmark. With regional LNG prices converging through oversupply, the significance of shipping costs may become a primary influence in regional price spreads.

The accuracy of the price signal at the LNG trading hub

With a virtual hub, particularly where there is no actual requirement for LNG to be physically delivered for the pricing signal to arise (e.g., via exchange-listed LNG products), it is a challenge to ensure that the reference price produced from the index correlates to real

[2] As has been (effectively) acknowledged by the Japanese government in the METI Announcement (see below).

[3] Ministry of Economy, Trade and Industry, "Strategy for LNG Market Development – Creating Flexible LNG Market and Developing an LNG Trading Hub in Japan".

supply and demand principles and is, therefore, not purely speculative. It is this factor that has historically justified using natural gas prices to set the price for LNG in the U.S. and EU markets. However, in the context of a virtual LNG trading hub, the index-based price can be benchmarked against a liquid natural gas market (where there is one) or against actual physical supply of and demand for LNG (e.g., through LNG bunkering, LNG liquefaction or LNG storage) at the location of or proximate to the virtual LNG point.

Given that there is currently no such liquid natural gas trading hub in Asia (see part 1 of this paper) and it is unlikely that we shall see one in the next five or so years[4], we explore, below, the availability of an LNG physical hub that may afford the facility to test the correlation between the Asian LNG Spot Price obtained through the index and the actual cost of physical LNG. Please note that, in volume terms, it would be quite typical for index- or exchange-traded volumes to exceed by multiples the actual physically traded volumes.

Case study: Singapore

Absent a regional market[5], Singapore is unlikely to become a sufficiently large natural gas trading hub to offer price signals achieved at comparable EU or U.S. gas hubs. The IEA 2013 Study raised concerns surrounding the number of physical market participants in the natural gas market in Singapore, highlighting that there are only nine active gas shippers in the market with a limited amount of domestic natural gas demand (11.3 bcm in 2015)[6].

However, for LNG it may be different. There is strong government support for establishing Singapore as an LNG hub for Asia. This is reflected in its holistic natural gas and LNG strategy[7].

Singapore's LNG strategy has a number of strands. It includes the LNG terminal it opened through state-owned Singapore LNG in 2013 and which has since expanded its capacity. Most significantly, the terminal is open-access (giving Singapore a regulatory advantage over many other Asian countries) and has an importing and re-exporting capability, three storage tanks and 6 Mtpa worth of throughput capacity[8].

Managing delivery time windows for LNG cargoes, including delays caused by adverse weather or technical issues, requires hedging or the ability to bridge the delivery timing mismatch with LNG storage facilities. On this, Singapore has first-mover advantage.

The Singapore Government also announced that it will permit importation of spot LNG into Singapore from the second half of 2017 but capped at up to 10% of its total gas imports.

LNG bunkering is another strand of its strategy that is due to come online in 2017. Driven by shipping environmental regulations[9] that cap the sulphur content of marine fuel at 0.10 per cent from January 2015 within the applicable SO_x emissions control area (**ECA**[10]) zones in various parts of the globe and by 2020[11] to 0.5 per cent globally (i.e., all areas outside of ECA zones), all shipowners will need to have taken steps to meet their emissions compliance obligations, including by some shipowners converting their vessels to use LNG as a bunker fuel[12]. The Maritime and Port Authority of Singapore has awarded a tender for the build of the necessary infrastructure to support LNG bunkering to vessels from 2017. Given the environmental impetus, a surge for LNG demand in strategic bunkering hubs such as Singapore may occur. Infrastructure to support this has already been installed at the GATE terminal at Rotterdam and equivalent plans are contemplated by RWE in Germany.

In January 2016 the Singapore Exchange (**SGX**) and its subsidiary, Energy Market Company (**EMC**) formed the FOB Singapore SGX LNG Index Group (**SLInG**): a spot price index to create a price reference source for Asian LNG with FOB deliveries in the vicinity of Singapore "as a virtual location of cargo"[13]. More than 20 market participants participate in the index providing twice-weekly quotes based on a prescribed methodology. The justification for Singapore as a virtual location for

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4 It is notable that the recent METI Announcement was a call for a Japanese LNG trading hub but with a target to achieve this by the early 2020s.

5 Despite the existence of a natural gas pipeline to Indonesia and Malaysia, there is little immediate prospect of the Singaporean gas trading market growing into a cross-border ASEAN/regional market.

6 Source: *BP Statistical Review of World Energy* (June 2016).

7 In October 2015, the Energy Market Authority in Singapore launched a consultation on the suitability of developing a secondary gas trading market. One of its key drivers was to create a trading platform for discovery of domestic gas prices which would "complement Singapore's position as a hub for LNG trading activities, thus aiding the price discovery of Asian LNG". See "Development of a Secondary Gas Trading ('SGTM') in Singapore", *Energy Market Authority Consultation Paper* (October 2015).

8 Phase 3 of the project involves a fourth storage tank and a further 3 Mpta being added by 2018.

9 Annex VI to the International Convention for the Prevention of Pollution from Ships (MARPOL Convention).

10 For example, ECAs exist for the Baltic Sea area, the North Sea area, the North American area and the United States Caribbean Sea area.

11 *See*: http://www.imo.org/en/MediaCentre/PressBriefings/Pages/MEPC-70-2020sulphur.aspx

12 Other alternatives include use of distillates and scrubbing.

13 SGX, "Creating an Asian Market for LNG – Introduction to FOB Singapore SGX LNG Index Group" (February 2016) (**SLInG Paper**).

Asia is premised on the approximately 2,000 cargoes that annually pass through the vicinity of Singapore because of its location at the intersection of most eastbound seaborne routes into the Asia-Pacific region.

In parallel, SGX launched two cash-settled SGX FOB Singapore SLInG LNG derivatives contracts: one a swap contract and the other a futures contract. The main difference between the two contracts appears to be their size, with the lot size of the swap contract being 10,000 mmBTU compared to 1,000 mmBTU for the futures contract.

Most recently, the EMC launched a new North Asia index for DES deliveries to ports in Japan, Korea, Taiwan and China. We understand that SGX will also list a derivative based on this index. It is unclear whether this North Asia product is aimed at picking up a share of exchange-traded LNG business that is otherwise being hosted in competing exchanges[14] or represents an admission that SGX's FOB Singapore products were ahead of their time.

On top of the physical infrastructure, to ensure commercial focus and talent are also headquartered in Singapore for the region, Singapore has managed to attract a significant number of LNG portfolio players and traders (many of whom may benefit from its Global Trader Programme). It is understood that about 20 LNG market participants manage their global LNG business from Singapore today.

In terms of physical LNG markets against which to possibly test the accuracy of the price discovery through LNG index-based products, we are not aware of any other Asian jurisdiction as advanced as Singapore. It is fair to say that the physical demand for LNG is not yet there but depending on the developments in the next year or two, Singapore could very well be the most strategically poised country in Asia that could take advantage of such developments. If so, having an LNG spot index based on a physical LNG demand in Singapore would make a lot of sense.

"Singapore FOB is intended to become a virtual LNG hub for south-east Asia"[15].

Sufficiency of liquidity

There are currently a number of LNG spot indices in the market published by the various price reporting agencies (PRAs), the most well-known of which are:

Index	Publisher	Derivative Products
Japan Korea Marker (JKM)	S&P Global Platts	ICE, CME
Argus Northeast Asia (ANEA)	Argus Media	None
Singapore SLInG (SLInG)	SGX LNG Index Group	SGX[16]
RIM DES Japan LNG Assessment	RIM Intelligence Co.	JOE[17], NYMEX

All of the above indices are broadly similar in terms of their geographical focus (with the exception of the SLInG) and also cater for similar specifications. There are some differences in the methodological approaches of the various indices when analysed more closely, particularly in respect of the cost elements that are taken into consideration at the time price adjustments are made. Please see the table in Annex 1 for a comparison of the various methodologies.

The main concern that has been expressed regarding the various indices is that they "lack depth, exhibit too much volatility, and could be influenced by individual players"[18]. The JKM index, as the oldest of the group, appears to have attracted the greatest following[19] but even then, the average number of daily cargoes probably does not exceed two[20]. Furthermore, competition between each of the PRAs and the creation of sub-regional or new indices are only likely to fragment the limited amount of regional liquidity available. Absent a growth in additional physical LNG demand (e.g., for LNG as a bunker fuel to address emission requirements), it is hard to see any large increase in the number of daily regional cargoes traded, so raising the question of where the required additional liquidity is to come from.

As highlighted in the concluding part of part 1 of this paper, increased liquidity would be assisted if:

- An Asian LNG industry body, bringing together a wide range of market participants, was created to promote good industry trading practices, which in turn would help reduce artificial or exaggerated differences in the market (e.g., standardisation of LNG gas specifications at export, or agreement on enhancement specifications for receiving terminals,

[14] *See* footnote 19 of part 1 of this paper.

[15] Professor Stern, Chapter 8, p. 487, *LNG Markets in Transition: the Great Reconfiguration*, Oxford University Press.

[16] EMC has also launched a North Asia SLInG but SGX has not yet listed a product for this.

[17] Japan OTC Exchange.

[18] Chapter 8, p. 483, *LNG Markets in Transition: the Great Reconfiguration*, Oxford University Press.

[19] According to a CME research paper of April 2016, "an estimated 40% of the spot and short-term contracts are currently priced off the Platts JKM index".

[20] Chapter 8, *LNG Markets in Transition: the Great Reconfiguration*, Oxford University Press.

in order to accept a wider quality range of gas). Ultimately, such a body could also facilitate or accelerate market convergence towards one or more reference prices or delivery locations.

- Industry-standard Master Sale and Purchase Agreements (MSPAs) specifically tailored to spot and short-term trading (whether on FOB or DES terms) were created and used, which could have the effect of increasing OTC trade in spot LNG. This could by extension trigger an increased development of hedging products. And if industry-standard contracts can be used for other commodity products, such as oil, coal and iron ore, why not for LNG?

Adequate transparency

A common issue raised by market participants is a lack of transparency regarding the price of LNG. The fragmentation of the LNG markets in Asia, along with the limited trading volume (as compared to oil), makes issues of transparency more acute. The need for regular reporting by regulators on various aspects of LNG and, by extension, the natural gas market would help market participants with their decision making provided the information was objective and reliable.

At this stage, the spot indices published by the PRAs rely on their own methodologies and the reporting by their price reporters (except in the case of the SLInG, which relies on the price reporting of its 20 or so index participants). As the methodologies currently operate, in order for a Thai LNG purchaser to work out the appropriate price for spot LNG on any day, they may well have to work out the netback of a price published by one of the PRAs based on prices for LNG deliveries to Japan or Korea. In order to do so, that purchaser may look at one or more of the spot indices that all offer a similar price for a region. However, within the prices for a day reported by those agencies there are usually differences. In a low-margin market those differences will become increasingly important. An analysis of how those PRAs determine their prices could explain some of those differences and is therefore, worth considering. See also Annex 1.

The comparison highlights a number of points about the various indices. Although there are similarities, they nonetheless are different because they use different standards in their baseline assumptions against which they adjust the quotes received. These adjustments are partially subjective in that the price reporters make informed decisions based on their training and access to tools that are often proprietary to the relevant PRA. For example, whether it is or is not the best source, the freight cost adjustment for Platts is made only against its own LNG freight cost assessments. In contrast, RIM assesses against "trading information obtained in the OTC market".

This means that market users often make their own further price adjustments against the published prices, not only for the netback described in the Thai example above, but also due to their own internal views of the various assumptions, standards, etc. adopted by the PRAs.

It is little wonder that many buyers are unclear as to what price they should be paying for their LNG.

Is a Singapore LNG price a feasible solution?

In its current form of the SLInG FOB index, probably not. However, many of the ingredients that have been discussed above could be capable of being delivered through a combination of (i) a SLInG DES contract, plus (ii) suitable LNG freight reference prices to allow for net forward calculations to be assessed for deliveries to each of the key port locations. The acquisition of the Baltic Exchange by SGX and the fact that SGX already has a number of wet freight exchange-traded products means that developing the necessary LNG freight contracts is within its reach.

The key arguments supporting the development of a virtual DES index in Singapore may be summarised as follows:

- The choice of Singapore as a virtual DES point allows liquidity to concentrate at a single (and relevant) geographical point for the whole of Asia.
- A SLInG DES product can, together with the appropriate LNG freight product, remove the lack of transparency and price uncertainty caused by the need for netback and freight cost adjustments currently made by the various PRAs.
- The choice of Singapore as a virtual DES location is not dependent on an actual physical cargo to be offloaded or stored in the Singapore LNG terminals.
- Many of the LNG market participants that manage their global business from Singapore on a portfolio basis already use Singapore as a national location from which to base their freight pricing decisions.
- In a market heading towards oversupply, narrowing margins and the need to maximise the arbitrage opportunities between the Atlantic basin and Pacific basin markets, the significance of accurate pricing and hedging tools has never been more important. The differences between Asian markets that have been DES based, and U.S. and Australian markets that have been FOB based mean that the riskiest aspect of the LNG market may not just be the price discovery of the LNG price but also the ability to accurately manage the freight cost volatility. The ability to concentrate the necessary freight products based on a single route (e.g., Singapore to Japan, or Singapore to India) will allow for greater freight

liquidity and help facilitate the development of new LNG freight products.

Geographic acceptance

"Singapore stands out as a neutral party being neither a major consumer nor producer of LNG. It is centrally located within Asia at the intersection of LNG trade routes in the Asia Pacific region. It is a key port for vessels passing through the Straits of Malacca and is a major oil trading hub already."[21]

Singapore is sometimes thought of as the Switzerland of Asia for a good reason: its philosophy of getting along with its neighbours and avoiding extreme conflict has been key to its success and to its becoming a hub for investment and innovation. These same characteristics can enable it to act as the talisman for developing an Asian LNG reference price.

Conclusion

Across the two parts of this paper we have sought to highlight a possible solution to the dilemma faced by Asian LNG market participants of replacing the JCC-linked Average Japan LNG Price with a suitable alternative index formed on the basis of a liquid spot reference price.

However, the solution is not mainstream in that it argues for a virtual LNG hub and not a natural gas trading hub. This is predominantly in recognition of the need for a faster solution than the ideal of developing a universally acceptable natural gas trading hub in Asia. On best estimates a natural gas trading hub is five to 10 years away.

As highlighted above, despite having many of the necessary ingredients, to date, Singapore has not yet succeeded in the goal of developing an Asian LNG reference price. However, it is still in a position to succeed, as compared to its rivals, with a few tweaks and strategic actions. This is especially so where there is recognition from Asian LNG purchasers and traders that time is not on their side and that, absent action, there is a risk that they may be locked into another cycle of oil-linked or HH linked hybrid long-term supply contracts.

[21] P. 9, SLInG Paper.

Annex 1

Comparison table of certain LNG spot-market pricing methodologies[22]

	JKM	ANEA	RIM	SLInG
Delivery type	DES	DES	DES	FOB
Delivery location	Japan, South Korea, Taiwan and China	Japan, South Korea, Taiwan and China	Japan, South Korea, Taiwan and China	Vicinity of Singapore
Frequency of data inputs	Daily	Daily	Daily	Bi-weekly
Costs included in assessment	Yes	Yes	Yes	No (port charges, terminal charges, freight, excluded)
Methodology assumptions for cost items:				
Vessel size for spot charter rate	155,000-180,000 m^3 normalised to 165,000 m^3	138,000-155,000 m^3 duel-fuel diesel electric (DFDE) vessels	135,000-150,000 m^3	135,000-175,000 m^3
Fuel cost price source	Platts bunker fuel assessment in US$/mt	Local rates	RIM bunker report for places including Singapore and Fujairah	Not specified
Fuel oil consumption	100 mt/day fuel oil-equivalent	122 mt/day (50% of fuel consumption)	Not specified	Not specified
Assumed journey speed	Average of 17 knots	19.5 knots (laden)	Not specified	Not specified
Boil-off rate	0.12%/day (laden) 0.09%/day (on ballast)	0.1%/day (98% vessel capacity utilisation)	Not specified	Not specified

[22] Please note that this is not intended to be comprehensive but merely illustrative of certain key features that may impact on the price assessed.

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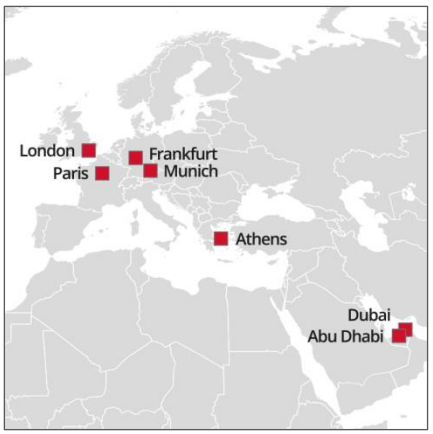

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