

Setting an
Asian LNG market price
Part 1 – the need for a local solution

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

Executive summary

This paper examines the justification for the development of an Asian LNG reference price that is not benchmarked against the current Japanese Crude Cocktail.

In answering the question as to how an alternative reference price for LNG demand in Asia should be established, this paper critically considers the common argument that the development of a physical natural gas trading hub in Japan, China or Singapore is required. It then goes on to propose the idea of a virtual LNG trading hub as a 'made in Asia' solution that is more consistent with the current needs of the Asian market.

In exploring the case for an Asian virtual LNG hub, this paper also explores the features required to make it successful, including recognising the commercial need to have an operational alternative benchmark, with sufficient liquidity, available within a three- to five-year timeframe.

Introduction

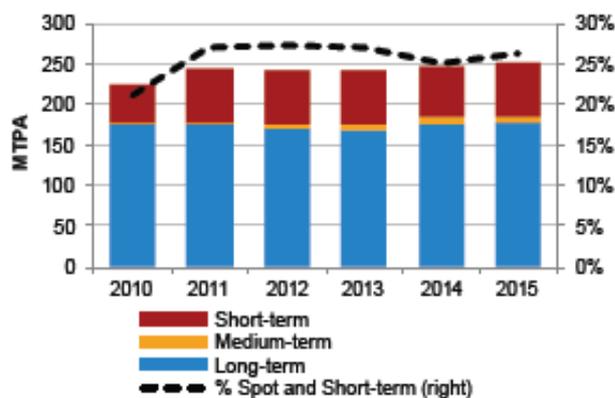
There are two unavoidable truths at present in the LNG markets. The first is that the amount of spot LNG volume, compared to the historic volume of LNG sold on a long-term supply basis, is rapidly increasing. The second is that, unlike the U.S. and European markets, Asia today remains the only market where the price of LNG is not benchmarked against natural gas prices but against a cocktail of crude oil prices. For the reasons outlined in this paper, it is possible that the combination of these two truths could justify a change to the status quo for Asian LNG pricing, provided a suitable and viable alternative is made available.

This paper, which is the first in a series of two, examines whether it is inevitable that Asian purchasers must continue to suffer the cost of the dislocation between crude oil and natural gas prices for another decade or whether relief is possible through an alternative benchmark, for example, in Singapore or Japan.

Market pricing of LNG

The LNG markets trade on the basis of contracts of various lengths. Because of the high capex costs associated with LNG production and supply, the significant majority of LNG production has historically been sold on the basis of long-term supply agreements lasting up to 20 years. The next highest volume of LNG is sold under spot contracts with terms of up to one year. Most of these are documented under relatively

standard form master sale and purchase agreements (MSPAs). There are also, in between, short-term (one to four year) and medium-term (four to eight year) LNG sale contracts. According to statistics available from the International Gas Union (IGU), spot and short-term LNG contract volume in 2014 amounted to 27 per cent of all total gross LNG trade (but 2015 evidence suggests that this has increased to 29 per cent)¹.



Sources: IHS, IGU

As the market stands today, U.S. LNG prices tend to be set by reference to the price of natural gas at the Henry Hub (HH), European LNG prices are usually set by reference to the price of natural gas at either the National Balancing Point (NBP) in the UK or the Title Transfer Facility (TTF) in the Netherlands and Asian LNG prices are typically set by reference to the price of the Japan Customs-cleared Crude (known as the 'Japanese Crude Cocktail' or JCC)².

Historically, there have been price 'corridors' between these reference prices whereby HH prices have been lower than NBP/TTF prices and, in turn, NBP/TTF prices have been lower than Asian LNG spot prices. With the increase in global spot LNG trading activity, the market price differentials between these three geographical prices have become more important than ever. As such, the LNG spot market is highly sensitive to the price volatility in these markets. This is clearly illustrated by the spike in Asian LNG prices in 2011 in the wake of the Fukushima earthquake and the temporary reduction of nuclear power generation

¹ The IGU World Gas LNG Report – 2016 edition.

² The JCC is a monthly index, published by the Japanese government, of the average price of crude oils imported into Japan.

capacity, which had the effect of redirecting LNG cargoes from Europe to Japan. A surge of demand in Asia and supply disruptions in the Pacific basin at the beginning of the 2017 created a divergence between Asian and European spot prices. By the end of February the ANEA spot price was at US\$6.19 per MMBtu, thereby narrowing the gap between Asian spot and European spot prices while U.S. prices remained in the US\$2.51 per MMBtu range.

Besides the price corridors, on the supply side, the LNG markets can be divided into two broad geographical regions – the Pacific basin and the Atlantic basin. This reflects the land masses bordering or adjacent to, respectively, the Pacific and Atlantic oceans. Decisions regarding whether spot cargoes of LNG intended for a destination in one basin should be diverted to another basin turn on a number of economic factors, of which cost of transportation is a key one.

Historically, the width of the Panama Canal limited the size of LNG vessel that could pass through it, making the costs of transportation of LNG from the Atlantic basin to the Pacific basin a decisive factor in the diversion economics of LNG cargoes. With the completion of the Panama Canal widening project⁴, 90 per cent of LNG vessels can now make the transit, reducing the distance from the U.S. Gulf Coast to Asia by 7,000 miles and allowing a round trip from the United States in 22.8 days⁵. Although this should help reduce costs of transit, with the oversupply of LNG available to the Asian markets driving down LNG prices, such reductions may not be enough if the price differential between the Atlantic and Pacific basins continues to shrink.

The Asian LNG price (spot vs long-term supply)

Within the Asian markets there has also been a difference between the spot market price (**Asian LNG Spot Price**) and the formulaic approach used under long-term supply contracts for setting LNG purchase prices (**Average Japan LNG Price**). One measure, although not the only one, of spot LNG prices has been the daily Japan/Korea Marker (**JKM**) published by S&P

“With European hub prices above 4\$/mmbtu, and Henry Hub U.S. prices at 2 \$/mmbtu, the arb window between Henry Hub and the European hub remains wide open. Along the Henry Hub curve, the arb with Asia begins to close in December ... as Henry Hub is priced around 3 \$/mmbtu.”³

Global Platts. It is estimated that currently 40 per cent of the spot and short-term contracts are priced off the JKM. Other measures include the Argus North East Asia (**ANEA**) index⁶.

Historically, the Average Japan LNG Price moved with oil prices but with a lag of four to five months. In contrast, the Asian LNG Spot, reflecting a closer link to supply and demand forces, is usually lower than the Average Japan LNG Price. The history for the choice of the JCC for Asian LNG prices is worth noting.

- Japan was the first major economy to import LNG back in the 1970s (and remains the largest Asian LNG importer today).
- In the absence of a mature natural gas market in Japan in the 1970s, the price provided in long-term LNG purchase arrangements was based on the main competing fuel to gas in power generation: oil.
- By the time other Asian purchasers, who were mostly state-owned or regulated entities, came to the market (e.g., South Korea in the 1980s and Taiwan in the 1990s), the JCC had become the established benchmark from which the exporters had little incentive to deviate.
- Although it was odd that other Asian countries should price their LNG imports based on the dynamics of crude imports to Japan, similarities to the economic dependency for oil to generate energy, the absence of a viable alternative and the old adage, ‘if it ain’t broke don’t fix it’, seemed to win the day.

However, with the increase in crude oil prices in the 2010s exceeding US\$100 per barrel, the impact on the resultant price for the Average Japan LNG Price was telling. Matters were made only worse by the Fukushima disaster, which caused a spike in demand for spot LNG supply to Japan. It is really only at this point that the Asian market seemed to focus its attention on the suitability of the JCC as the benchmark for long-term LNG supply contracts. During this stage, the Asian LNG Spot price, at times, reached levels close to the Average Japan LNG Price. At a time when U.S. and European LNG prices were falling, the higher cost of Asian LNG prices led to serious questions being asked of the justification of the continued use of oil-indexation for Asian LNG prices.

The subsequent falls in oil prices have given Asian buyers some relief, as has the availability of increased supply of LNG coming on-line following the start of production of a number of new facilities in Australia

³ Energy Aspects – Outlook: Global LNG, May 2016.

⁴ Shell-chartered LNG carrier, the *Maran Gas Apollonia* was the first LNG vessel to pass through the widened Panama Canal on 25 July 2016.

⁵ Prior to expansion, oversized LNG carriers were required to travel around South America to reach Japan and South Korea.

⁶ The JKM provides a spot-traded LNG price for the Asia-Pacific market based on DES deliveries to several delivery points in Japan and South Korea, whereas the ANEA does the same for delivery points in Japan, South Korea, Taiwan and China.

and the first LNG exports coming from Sabine Pass in the U.S. However, this may not last as production issues and delayed project implementation may cause the supply issues to balance out in a few years. Therefore, the risk of future increases in oil prices remains.

Today, it is relatively non-controversial to say that LNG prices have started to react to their own market fundamentals rather than those of oil or, in some cases, natural gas markets.

The justification for a gas-indexed Asian LNG price

A number of recent studies (e.g., the OIES 2014 Study and the IEA 2013 Study)⁷ have considered the justification of a move away from oil-indexed pricing to natural gas pricing in Asia. Without wishing to repeat the detailed arguments in these studies, for the purposes of this paper, it is sufficient to note that the conclusions of the studies are consistent with the following arguments:

- Market fundamentals in Asia have evolved and now the main competing fuel to gas in power generation (in some countries) is no longer oil but a mix of other fuels, including coal and, increasingly, renewable energy. Therefore, when oil no longer directly competes with natural gas for end-user competition, there is little justification for the link.

Figure 2: Energy Sources Competing with Natural Gas in Asia

Competing Energies	Japan		Korea	Taiwan	India	China	Asia
	FY1979	FY2006	2006	2006	2005	2005	2005/6
Coal	5.7%	49.6%	44.7%	73.2%	57.0%	57.0%	50.6%
Oil	90.9%	40.7%	45.8%	20.2%	28.4%	28.4%	40.3%
Electric Power	3.4%	9.7%	9.7%	6.6%	14.6%	14.6%	9.1%
Total	100.0%	100.0%	100.2%	100.0%	100.0%	100.0%	100.0%

Note: FY is the Japanese fiscal year, which runs from April 1 to March 31 of the respective year.

Source: Miyamoto and Ishiguro (2009), Table 2, p.14.

- Differing economic drivers and, therefore, different demand sensitivities are arising in Asian countries that are not reflected in a single Japan crude import demand statistic as a measure of Asian LNG demand. Gas demands are relatively modest in some countries. For example, the average gas share

in primary energy consumption in the Asian LNG importing countries in 2014 was:⁸

Country	Percentage
Japan	22.2%
South Korea	15.7%
Taiwan	13.8%
India	7.1%
China	5.6%

- The key LNG importing Asian countries' self-declared environmental targets under the Paris Agreement will also lead to distinct differences in the growth in their demand for LNG as some reduce dependency on certain fossil fuels (e.g., coal in China) and some increase dependency on others (e.g., clean coal in India), inviting more localised pricing solutions.
- With the increased LNG supply now coming to market, the security of supply drivers that have historically led Asian importers to accept oil-indexed pricing is beginning to weaken. Asian LNG Spot Prices have started to diverge from oil prices and most recently are converging back to NBP/TTF prices.
- Interim solutions that were developed in the aftermath of the 2011 Asian LNG Spot price hikes (e.g., the weighted combination of JCC oil-indexation with a 'Henry Hub plus' formula⁹) have shown to be reactive to localised events that cause adverse consequences in unrelated regions. For example, shale-gas oversupply, combined with regulated levels of LNG exports, has pushed HH-indexed prices down. As a result, the interim pricing solutions only provide a return for fixed costs with up-side constraint because there is limited feedback from the Asian demand side that influences domestic HH prices. For producers, this will not assist with their current challenges in funding new LNG projects. Furthermore, if reliance on Henry Hub was attractive to Asian buyers, the debate surrounding the need for a local Asian price would not have continued to grow in the past few years.

In a recent LNG strategy paper (the **METI Announcement**), the Japanese Ministry of Economy, Trade and Industry (**METI**)¹⁰ said:

⁷ *Challenges to JCC Pricing in Asian LNG Markets*, Oxford Institute for Energy Studies (OIES) (February 2014); and *Developing a Natural Gas Trading Hub in Asia*, International Energy Agency (IEA) (2013).

⁸ OIES Report on 'The Impact of Lower Gas and Oil Prices on Global Gas and LNG Markets' (July 2015) (the **OIES 2015 Study**).

⁹ The price of natural gas at the Henry Hub + liquefaction and transportation costs.

¹⁰ *Strategy for LNG Market Development: Creating flexible LNG Market and Developing an LNG Trading Hub in Japan*, METI (May 2016).

"oil-fired power generation has decreased and natural gas cogeneration systems have spread. ... Under such circumstances, linking the pricing of LNG to crude oil prices is no longer necessarily justifiable."

Even if the desire in Asia to move away from oil-indexation achieves sufficient momentum, the question remains: what is the viable alternative?

The studies answer this by distinguishing between long-term and short-term solutions. In the longer term they propose an Asian LNG price based on a local gas trading hub¹¹ and, in the shorter term, more variations of the hybrid pricing model.

Why price at the gas hub?

This argument is relatively straightforward. A natural gas hub represents actual demand and, therefore, when combined with a trading market with sufficient liquidity, the best representation of the price the market is willing to pay for natural gas. Taking the U.S. market as an example, the selection of Henry Hub, a physical gas distribution hub located in Louisiana, is not regulator-driven but market-driven. In order to enable more localised pricing in other parts of the U.S., more local hubs have developed but these all trade at a price adjusted against HH¹³.

Similarly, in Europe, the liberalisation of the gas markets (particularly in Northern Europe)¹⁴ has enabled the development of both physical and virtual gas hubs which provide the necessary liquidity required to give an effective price signal for natural gas. With market integration, the prices at these hubs are beginning to converge.

Among the key advantages arising from hub-based pricing are:

- Enabling greater competition in the market by increasing the chances of new suppliers to enter the market. This also removes the competitive advantages of incumbent suppliers who have

benefitted from long-term oil-indexed supply agreements.

- Reducing dependency on long-term supply agreements because of liquid hubs, leading to fewer exclusive usage rights at key infrastructure facilities (e.g. storage sites, cross-border connection capacities and LNG terminals).
- Greater transparency for consumers as the pricing mechanism avoids the complex formulae of oil-indexed contracts and is more responsive to the supply and demand dynamics of the local market.

Within the gas hub model, there are two alternatives: a physical hub and a virtual hub. A physical hub, such as the Henry Hub or Baumgarten in Austria, is location-specific in that any trading that occurs is specific to the physical intersection of the pipeline. In contrast, in a virtual hub such as the NBP or TTF, trading occurs in the entire trans-regional zone. As a result, in a virtual trading hub, the gas can be injected into the grid at any point within the zone. However, a hub is not an exchange (i.e., it is not a platform to trade in spot and forward contracts for natural gas), although that often follows by extension. Unlike the U.S. physical hubs, the European virtual hub model is regulator-driven.

In order for a gas hub to operate as a functioning wholesale market there are certain key enabling features that must exist. These reflect, in the context of most Asian countries, a need to transition from a non-competitive (monopolistic) market, to an increasingly deregulated or developing market and finally to a truly competitive market. This transition may be illustrated as below:

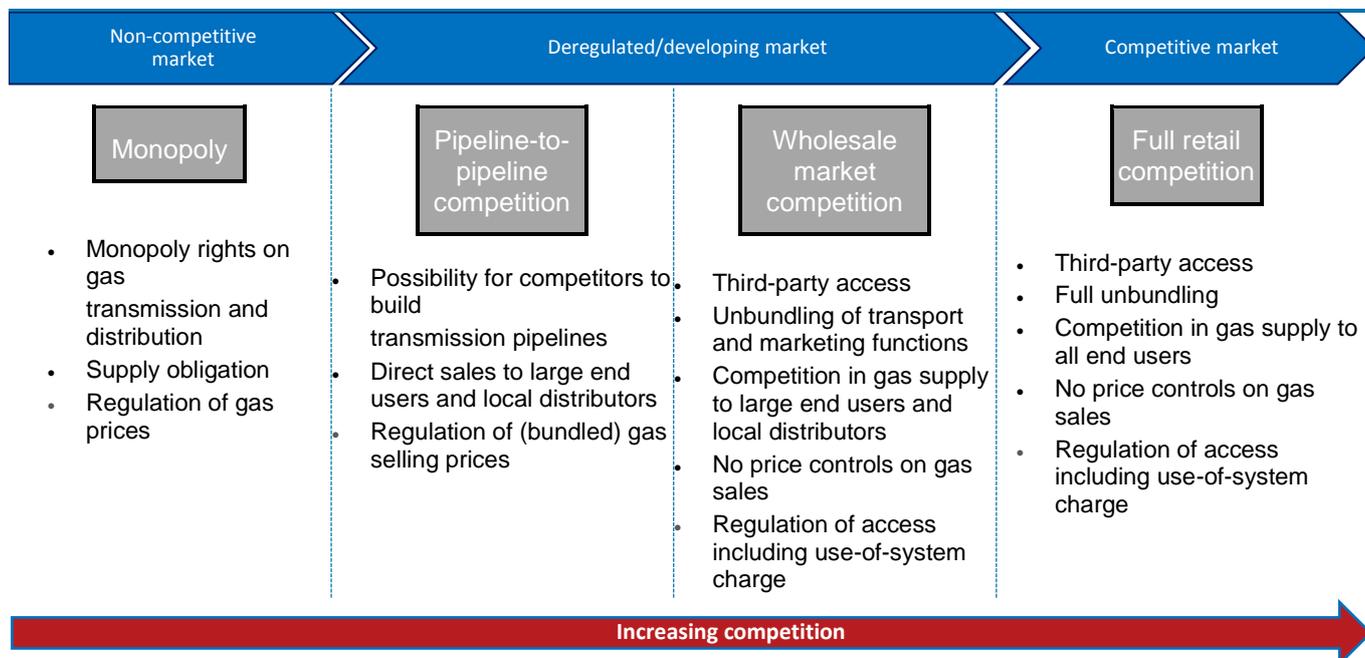
"in every country that switched away from oil-indexation to a hub model, the price of natural gas for the end-consumer declined significantly"¹²

¹¹ A natural gas trading hub is a platform that facilitates the physical or financial trading of natural gas by allowing trading and other services (transport, storage, etc.) specifically designed to support the trading activity.

¹² Benedict de Meulemeester, "How hub-based pricing is reshaping the EU gas market – even Spain" at www.energypost.eu.

¹³ For example, Cove Point can access natural gas at a US\$0.5/MMBtu discount to Henry Hub.

¹⁴ Even in those parts of Europe (e.g., Spain or Portugal) where oil-indexation has survived longer than in other parts, due to either a lack of geographic interconnectivity with other parts of Europe or local peculiarities such as the greater distances between hub injection-point and end-customer.



Source: IEA (1998).

The absence of an Asian gas hub

As the authors of the IEA 2013 Study determined, there is a long way to go in each of the key LNG importing countries before a natural gas hub has all of the necessary institutional and structural requirements in place for a hub to operate. The study identified the following as the necessary ingredients for a successful natural gas hub:

Institutional Requirements	Structural Requirements
A hands-off government approach to natural gas markets	Sufficient network capacity and non-discriminatory access to networks
Separation of transport and commercial activities	Competitive number of market participants
Wholesale price deregulation	Involvement of financial intermediaries

When the study tested the development stages of the three most likely sources for future LNG demand in Asia (Japan, South Korea and China) as well and compared it against a smaller but more liberalised market such as Singapore, it summarised the outcome as follows:

Institutional/Structural Requirements	Japan	Korea	China	Singapore
A hands-off government approach to natural gas markets	-	-	-	+
Separation of transport and commercial activities	-	-	-	+
Wholesale price deregulation	+	-	+/-	+
Sufficient network capacity and non-discriminatory access	-	-	-	+
Competitive number of market participants	+/-	-	-	+/-
Involvement of financial institutions	+/-	-	-	+

Note: "+" = currently contributing towards a competitive natural gas market; "-" = currently not contributing towards a competitive natural gas market; "+/-" = currently unclear.

With regard to the chances of China, South Korea or Japan being the most likely location for the eventual Asian natural gas hub, the IEA 2013 Study eventually concludes that because of where each of those countries presently is in its approach to some of the institutional and structural requirements listed above, neither

"does the Asian market accept the status quo for the next five-plus years ... or can they look to or develop an alternative LNG reference price?"

is likely to be the location for a competitive natural gas hub in anything other than the long term. Although the IEA 2013 Study does not put a timeframe on this, another report in 2015¹⁵ places this timeframe at 10 – 15 years.

However, in the Japanese context, this development may be accelerated as a result of the METI

¹⁵ The OIES 2015 Study.

Announcement. METI aims to adopt a three-pronged approach of (i) enhancing trade, (ii) creating a proper price discovery mechanism, and (iii) providing open access to facilities with a view to creating more market flexibility and developing an LNG trading hub. Although the path of having a policy and the actual implementation of that policy is often longer than imagined, the government of Japan has already announced¹⁶ its plans to complete the liberalisation process of the retail gas markets by 2017 and, more recently, has supported the launch of the RIM Index for DES deliveries to Japan.

So the question is: does the Asian market accept the status quo for the next five-plus years pending the development of a physical gas trading hub or can they look to or develop an alternative LNG reference price? We explore this in the remainder of this paper.

The case for an Asian virtual LNG hub

Would a national hub price work for all of Asia?

Even if a natural gas hub can be developed in Japan, China, South Korea or Singapore, should that local price automatically equate to a price for the rest of Asia? After all, if HH can be a proxy for the U.S. and NBP/TTF a proxy for Europe, why should a Japanese natural gas price not automatically translate into a price for the rest of Asia?

The answer to this question may lie in the conclusions that can be drawn from the following observations:

- Although the U.S. hub follows the physical hub model and the European hubs the virtual hub model, they nonetheless have one thing in common – they are all mature pipeline markets providing geographical interconnectivity with limited reliance on LNG. As such the price of LNG in those markets may more reasonably be assumed to reflect genuine demand for gas across the geographical range of pipeline connectivity.
- Geographical interconnectivity¹⁷ between Japan, South Korea, Taiwan, China and India (or between Singapore and its ASEAN partner-countries) is unlikely to arise and if it did, it may not facilitate the creation of a cross-border market with sufficient deregulation, liberalisation, integration and liquidity. Therefore, most likely, localised (i.e., not cross-border) markets may, at best, arise but would not correlate to each other.
- A trading hub should, in theory, signal a price where the difference between an exchange-traded futures

price and a spot price, at the point in the future where the two markets meet, should converge. If so, this uninterrupted price signal will enable the forward curve to be created, which, in a liquid market, will in turn give enough confidence to price long-term supply arrangements. This must be the target for what needs to be built.

- Concerns expressed by the IEA 2013 Study regarding the lack of liquidity¹⁸ and transparency in the JKM spot assessment price are not to be taken lightly. In a market where there is apathy towards change in certain quarters (both buyers and sellers), it is all too easy to resist the change towards a gas-based benchmark on the grounds of illiquidity, an absence of transparency and a lack of hedging tools.
- Recent market shifts of cargoes from North-East Asia towards the Middle East demonstrate how new technology, such as FSRUs or FLNG, can have a greater impact on market dynamics than the existence of a natural gas hub. It also challenges the case that any one Asian country or region can or should set the price for the rest of Asia. The logical inference from this is that a greater regionalisation of LNG prices for Asia could materialise. In turn, this fragmentation will impact on liquidity, which is already sparse.
- Competition between, among others, Japan and Singapore to develop a natural gas trading hub, competition between pricing benchmark providers and competition between large market stakeholders, all of whom are seeking to take advantage of the transition away from oil pricing, will, in the short term, fragment the little liquidity that exists in the Asian LNG spot markets. New additional LNG spot Asian benchmarks are being launched¹⁹ regularly which simply further fragments liquidity.
- An alternative to having its own Asian reference price may be to use U.S. or European reference prices, with the differential of cost of transport. However, as previously mentioned, this means that Asian supply and demand dynamics will have no direct influence on the Asian LNG spot price.

¹⁶ In January 2015.

¹⁷ Although technically it would be possible to link China–Taiwan and Japan–South Korea, politically this remains unlikely. Although Singapore is already linked to Malaysia and Indonesia, this is currently on a one-way (import) flow to Singapore.

¹⁸ ICE Futures Europe lists a JKM LNG futures contract that traded more in the first four months of 2016 than it did in the whole of 2015, suggesting that the liquidity of exchange-traded contracts is rapidly increasing. However, the actual number of underlying transactions which are settled bilaterally or through a broker remains unclear (see S&P Global Platts, 27 May 2016).

¹⁹ Until recently, the main three launches were the RIM DES Japan index, SGX/EMC's North Asia SLInG and Argus's Middle East–India index. But more have since been announced.

The conclusion that may be drawn from the above is that it is necessary and appropriate for Asia to develop and adopt its own gas-based market reference price for LNG. However, this does not simply mean following the U.S. or European approach of a physical or virtual natural gas hub. Instead, perhaps, what is needed is a 'made in Asia for Asia' solution for LNG pricing.

What might a 'made in Asia' solution look like?

In order to identify the right solution for Asia, it is first worth identifying some basic principles of what needs to be achieved and when.

What is needed is a reference price source that:

- is capable of providing an indicative price signal for the demand for LNG in the Asian market;
- has sufficient liquidity to provide confidence in its accuracy;
- is achieved with transparency that enables users to understand what the price actually reflects; and
- is not so geographically 'national' so as to be unacceptable for other Asian users.

In terms of when the reference price source is needed:

- It should be available in time for the next significant swathe of long-term supply contracts to be renewed or replaced (it is understood that many such contracts will need to be renewed or replaced in the next two to three years).
- Given the natural amount of time it takes for spot indices to provide the clarity of a future curve (starting with three- to six-month curves which extend to a year and then three-year curves), clearly the reference price source should be in place as soon as possible. With one eye on the long-term supply renewals/replacements that are forthcoming, this could not be soon enough.
- A solution that will be available in five-plus years' time may be helpful to a future spot market but would not be relevant to the swathe of long-term supply contracts that must be replaced before then.

If these basic principles are accepted, then a logical solution begins to offer itself.

The need for liquidity can be achieved by the market focusing its attention on a single benchmark price. This will not be easy given the different interests that presently exist between buyers and sellers who are portfolio optimisers, pure traders, SOEs and IOCs.

However, consensus can be built in a number of ways. For example:

- The development of an Asian LNG industry body that brings together a wide range of market participants to promote good industry trading practices.
- The (long overdue) standardisation of spot industry contracts (e.g., MSPAs) which will have the effect of increasing OTC trade in spot LNG and, therefore, trigger the need for greater hedging. If other commodity products, such as oil, coal and iron ore, can have industry standard contracts, why cannot LNG?
- Ensuring the benchmark works in the first place (e.g., DES vs. FOB, right vessel size, quoted regularly, etc.) would be key. This begs the question as to whether the right benchmark already exists or an entirely new one is still needed.

Perhaps the hardest point to resolve is: what delivery (DES) or collection (FOB) location in Asia is most likely to meet the needs of the entire Asian market? The honest answer is that there is no one single location that will satisfy everyone, although there may be one or two that satisfy most. Ultimately, a compromise location will be required.

As with all other commodities, at some point, whether by design or by commercial convenience, one or two geographical locations concentrate the world's attention for price determination (e.g., London for base and precious metals, New York for Brent and sugar, etc.). In the context of Asian LNG, the traditional assumption is that, as per the U.S. and EU models, this should be where the most open and liquid Asian physical or virtual natural gas trading hub is located – hence, the competition between Singapore and Japan to meet that requirement. However, Singapore will always lack liquidity because of low consumer demand and Japan will not achieve the required market until a few years down the line.

Perhaps, therefore, the solution is not in a traditional physical hub or a traditional virtual (i.e., regulated) hub for natural gas but in a virtual LNG hub.

In the second of our papers, we explore what a virtual LNG hub may look like and we consider the suitability of some of the current Asian LNG Spot benchmarks in view of the criteria we have discussed above.

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