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The Future of Asia's Natural Gas Market: The Need for a Regional LNG Hub

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EXECUTIVE SUMMARY

This article examines how the liquefied natural gas (LNG) market functions in Asia and argues that an opportunity exists for Asia to develop a regional trading hub for LNG.

MAIN ARGUMENT

Despite being the world's largest LNG-consuming region and the fastest-growing LNG market, Asia still lacks an LNG trading hub and associated pricing benchmark that reflect the region's gas market fundamentals and send a reliable price signal for imports. Recent changes in the LNG market have improved conditions for the emergence of one or more hub-based prices in Asia as an alternative to oil-indexation, the prevalent LNG pricing structure in the region. In addition, an oversupplied market has created a common need between buyers and sellers to find new ways to trade and finance LNG at a time of demand uncertainty and investment shortfalls. These developments not only would make the LNG market more open, transparent, and competitive by facilitating physical exchanges and hedging but also would bring broader benefits, including greater regional integration, enhanced energy security, and greener economic development. Singapore is well-positioned to serve as an LNG hub, given its geographic position; established trade, legal, and financial ecosystem; and progress toward assuming this role.

POLICY IMPLICATIONS

- Easier gas procurement through more transparent prices and open markets will boost the environmental benefits of LNG by increasing its use in large polluted cities and accelerating coal-to-gas switching.
- A trusted Asian LNG hub and price marker would make regional gas markets more efficient and responsive, which would address government concerns about supply security and help resolve the current investment paralysis among risk-averse utility companies.
- A regional LNG hub could create greater economic integration and cooperation between Asian countries as it would encourage intraregional trade and infrastructure synergies while setting a shared political agenda to make the fuel more accessible.

Asian nations increasingly rely on imports of liquefied natural gas (LNG) to satisfy their energy needs. The region already represents more than 72% of global LNG demand, and demand is projected to continue to grow strongly through 2040.¹ While the mature industrial economies (Japan, South Korea, and Taiwan) will remain important players with vested interests in reshaping the LNG markets toward greater liquidity and transparency, the future growth in demand will mostly come from the large emerging economies of China and India, as well as from the smaller but booming South Asian economies. Governments are making big bets on LNG as a relatively clean form of energy to electrify their countries, lift their populations out of poverty, and fuel their dynamic economies. As such, they are building infrastructure and implementing reforms in their domestic gas markets. But Asia is far from homogenous, and LNG will play different roles in each country.² For some, LNG is seen as a way to reduce air pollution by displacing coal in power generation and other dirty fuels in cooking, heating, and transportation; for others, it is a quick fix to reduce electricity shortages or replace declining indigenous gas supply.

While Asian countries' dependence on LNG imports is set to increase, the price and security of supplies will decide how quickly the regional market develops. LNG still faces competition as a fuel source in Asia from cheaper coal and increasingly also from cleaner renewables. As a result, LNG will need to be affordable, easy to trade, and secure. Ensuring open, competitive, and transparent LNG markets will be crucial for the fuel to play a lasting role in the region.

This article argues that the creation of an LNG hub in Asia would help achieve these aspirations and support both regional economic integration and energy security. The global LNG market has been transformed by several developments, including the exponential growth of capacity, notably from Australia and the United States, and the rising number of participants. This constitutes a historic opportunity for Asia to develop a trading hub.³

¹ BP, "BP Energy Outlook: 2018 Edition," 2018  <https://www.bp.com/content/dam/bp/en/corporate/pdf/energy-economics/energy-outlook/bp-energy-outlook-2018.pdf>.

² The Asian LNG market continues to expand rapidly. Japan has been the world's largest importer of LNG since the second oil shock in 1979, facilitating the development of major development projects in Brunei and Indonesia in the 1970s. Two other resource-poor "Asian tigers," South Korea and Taiwan, followed Japan's rapid modernization in the 1980s, and both turned to LNG to fuel parts of their growing economies. India and China emerged as major LNG importers in the 2000s, while Thailand, Indonesia, Malaysia, Singapore, Pakistan, and Bangladesh started receiving LNG cargoes this decade. Other Asian countries will likely become LNG importers in coming years, including the Philippines, Myanmar, and Vietnam.

³ Leslie Palti-Guzman, "Asian LNG Hubs: Too Important to Fail?" *Natural Gas World*, October 17, 2017  <https://www.naturalgasworld.com/ggp-asian-lng-hubs-too-important-to-fail-op-ed-56052>.

LNG hubs and their associated price references are meant to facilitate physical exchanges by providing transparent pricing and hedging for all players. One or more hubs in Asia would also help countries reap environmental gains, increase their energy security, and promote regional economic integration, and thus perhaps contribute to greater economic growth, interregional trade, and stability. The article is organized into four sections:

- ≈ pp. 4–8 provide an overview of how the Asian LNG market currently works.
- ≈ pp. 8–14 examine why there is a need for one or more LNG hubs in Asia.
- ≈ pp. 14–20 analyze the efforts by Singapore to develop an LNG hub and explain why the country is well-positioned to play this role.
- ≈ pp. 21–26 conclude by discussing the policy implications of an LNG hub emerging in Asia.

AN OVERVIEW OF THE LNG MARKET IN ASIA

Asia is the world's largest and most dynamic LNG market and offers the most promising potential for growth in demand over the next two decades.⁴ The region is already home to the largest volume of regasification capacity, with another 90 million tons (mt) of capacity under construction or planned by 2022.⁵ The environment of low oil prices from 2014 to 2017 and the return of competitive LNG prices in Asia indexed to oil, along with spot LNG prices around \$6 per million British thermal units (mmBtu), have been critical for both preserving demand from existing industrialized importers in Northeast Asia and expanding and opening new markets in the rest of Asia, including Southeast Asia (for example, Thailand).⁶ Another driver of demand growth has been policies to combat air pollution, especially in China and India, where governments have prioritized LNG as a cleaner fuel. Given the need in Asia for an environmentally sustainable way to fuel economic growth, importing countries have a vested interest in ensuring the long-term competitiveness of

⁴ According to the 2018 BP Energy Outlook, global LNG supplies will more than double by 2040, with 40% of that expansion occurring over the next five years. BP, "BP Energy Outlook: 2018 Edition," 81.

⁵ For more on LNG trade and infrastructure in Asia, see International Gas Union (IGU), "2017 World LNG Report," 2017 ≈ https://www.igu.org/sites/default/files/103419-World_IGU_Report_no%20crops.pdf.

⁶ Leslie Palti-Guzman, "The Outlook for Asia's LNG Markets," National Bureau of Asian Research (NBR), Policy Q&A, February 22, 2018 ≈ http://www.nbr.org/downloads/pdfs/eta/palti-guzman_interview_022218.pdf; and Henning Gloystein, "China Becomes World's No. 2 LNG Importer in 2017, behind Japan," Reuters, December 25, 2017 ≈ <https://www.reuters.com/article/us-china-lng/china-becomes-worlds-no-2-lng-importer-in-2017-behind-japan-idUSKBN1EK09C>.

LNG, while exporters will have better odds to sell their cargo if LNG remains affordable and becomes easier to trade.

The Persistence of Old Market Features

A new LNG order has emerged in the last few years—characterized by an abundance of supply, the rise of new players, weak prices, and uncertain demand from Asia—that has led to a rethinking of the way LNG is sold, bought, and priced.⁷ Buyers have taken advantage of this market to renegotiate existing contracts or negotiate new ones with more favorable terms, including greater flexibility, softened commitments, lower slope of oil-indexation (to protect against sharp oil price swings and reduce the LNG price level) or hybrid prices (a mix of indexes), and shorter-duration contracts.⁸ Mature, industrialized Asian economies such as Japan and South Korea are playing a key role in reshaping LNG markets.

Although this ongoing transformation has encouraged the global LNG market to become increasingly liquid, integrated, and creative in its contractual arrangements, some vintage features that have been the backbone of the industry have so far remained in place, especially in Asia. Long-term contracts remain a pillar of LNG project financing. Most of Asia's LNG is supplied under long-term deals that ensure supply security for buyers, while producers obtain demand security and a revenue stream to pay back their billions of dollars of capital investment. Lenders still require that large investors pre-sell a significant portion (60%–75%) of their LNG under long-term sale and purchase agreements to a dedicated market, which are known as destination clauses. Until now, these relatively inflexible conditions have been necessary to justify multibillion-dollar upfront investments.

Another vintage feature is oil-indexation for long-term prices. These long-term contracts are often still pegged to oil prices, especially when contracted with Asian buyers. In Asia, the share of oil-indexation in LNG imports remains above 70%, while it has dropped below 60% in Europe.⁹ Historically, crude oil appeared the best reference point for pricing imported natural gas. Oil indexation initially made sense in Asia because there was

⁷ Anne-Sophie Corbeau and David Ledesma, eds., *LNG Markets in Transition: The Great Reconfiguration* (Oxford: Oxford University Press, 2016).

⁸ Mark Tay, "LNG Sellers, Asian Buyers Spar as Contract Fight Brews amid Supply Glut," Reuters, May 31, 2017 ~ <https://www.reuters.com/article/us-asia-lng-singapore-legal/lng-sellers-asian-buyers-spar-as-contract-fight-brews-amid-supply-glut-idUSKBN18S3J9>.

⁹ IGU, "Wholesale Gas Price Survey: 2016 Edition," May 2016 ~ http://www.igu.org/sites/default/files/node-news_item-field_file/IGU_WholeSaleGasPrice_Survey0509_2016.pdf.

substantial competition between crude oil and natural gas in the region's largest LNG consumer, the Japanese power sector. In addition, by the 1980s the oil market had become a deep and liquid global market with relatively reliable price signals and was much less susceptible to manipulation than the nascent LNG market. Oil indexation thus provided an element of price certainty in the absence of LNG storage and physical liquidity.

The Japan Crude Cocktail (JCC) oil price index—more formally known as Japan Customs-cleared Crude—emerged as the main Japanese price reference in the 1980s.¹⁰ For lack of a better alternative, other Asian importers adopted the JCC-linkage in their gas contracts in subsequent decades as they began importing LNG. The pricing formulas' so-called S-curves and the three-to-five-month moving average were designed to protect both exporters and importers from sudden swings in oil prices, but Asian utility companies were not especially concerned with prices for imported gas because they could pass the price risk entirely to their customers. They regarded the rigid long-term oil-linked contracts as the price to be paid for secure natural gas supplies in a region that sorely lacks indigenous energy resources.

Even though pricing exposure and contract types are gradually diversifying (notably with the rising share of U.S. LNG exports), oil-linked long-term LNG contracts will still dominate in the region for the foreseeable future in the absence of market-based Asian LNG prices.¹¹ As a result, the overwhelming majority of the gas sold in Asia will continue to be affected by the fluctuations of oil prices, while short-term and spot purchases represent less than 30% of global LNG imports (77 mt in 2017), with Asia receiving 60% of global spot supplies.¹² These long-term oil-indexed prices, which are not easily renegotiable, cannot accurately reflect gas market fundamentals over an extended period of time, given the dissociation of global oil market fundamentals from gas market dynamics in Asia.

A key outcome of this market structure is price opacity. The fact that sales of LNG remain largely negotiated on a contract-by-contract basis means that prices are confidential and concealed from the rest of the market.

¹⁰ Vlado Vivoda, *Energy Security in Japan: Challenges after Fukushima* (Burlington: Ashgate, 2014), 85.

¹¹ The spread of Henry Hub-linked LNG pricing will have a significant impact on pricing mechanisms in Asia but will only be considered by buyers as a transitional price marker before more widely used Asian pricing indexes emerge. As buyers look to hedge the risks of price volatility, imports of Henry Hub-linked supply are another way to diversify pricing exposure.

¹² "The LNG Industry GIIGNL Annual Report 2018," International Group of Liquefied Natural Gas Importers, April 24, 2018 ~> https://giignl.org/sites/default/files/PUBLIC_AREA/Publications/reportannuel-2018pdf.pdf.

Another reason for opacity in prices is the lack of a dominant exchange that can provide spot prices or future contract prices.

Establishing an LNG Hub

Gas exchanges already exist in the United States and Europe, but none apply to either the global or the Asian LNG market. The existing hubs in the United States and Europe are contractual points where buyers and sellers execute transactions, and they have developed on the basis of a constant flow of imported pipeline and domestically produced gas. Some of these hubs are notional, such as the National Balancing Point in the United Kingdom and the Title Transfer Facility in the Netherlands, while others are physical, such as the Henry Hub in the United States and the Zeebrugge terminal in Belgium. But whether notional or physical, the objective is the same: to give buyers access to various suppliers so that they can negotiate terms and prices.

An LNG hub is thus broadly defined as a market center where demand and supply meet (ownership of the LNG can be both in papers and in physical delivery), facilitated by an exchange that provides administrative services. One of the main outcomes is price discovery.¹³ The price of LNG in a hub-based system is driven by regional gas market fundamentals, as an alternative or complement to traditional oil-linked prices.

In Asia, liquidity in the LNG futures market will be essential for the establishment of a LNG trading center and the associated pricing benchmark that will be used for spot trading, long-term contracts, and hedging. Asian hubs will achieve such liquidity through the increased flow of LNG within the region rather than through gas pipeline integration or domestic production (unlike the hubs in the United States and Europe). The greater the volume of LNG transactions around these hubs, the faster the new price indexes will gain acceptance from buyers and sellers. Through the creation of a hub, the Asian gas market would come to rely less on the opaque bilateral transactions that have impeded the pace of liberalization and price competition.

At a time of structural oversupply, growing market flexibility, and downstream liberalization, the traditional business structure for trading LNG will remain under threat, and the emergence of an Asian hub would stress this system further. The forecast for a well-supplied market at least through

¹³ Hubs provide customers with receipt or delivery via two or more LNG routes or sources, facilitate transportation between these points, and offer administrative services that support the movement or transfer of LNG. James Tobin, "Natural Gas Market Centers and Hubs: A 2003 Update," in *Fundamentals of Natural Gas Processing*, ed. Arthur J. Kidnay, William R. Parrish, and Daniel G. McCartney (Boca Raton: CRC Press, 2003).

2022 has created a common need between buyers and sellers to find new ways and platforms to trade LNG. With buyers more eager to buy spot cargoes than to commit to long-term contracts, and sellers desperate to offload some of their surplus of uncommitted volume, hub-priced spot transactions are increasingly attractive to both sides. In addition, many new players have entered the market, looking for opportunities to either buy or sell LNG.¹⁴ In sum, the Asian market has matured and is ripe for additional changes, in particular to pricing mechanisms.

THE NEED FOR AND BENEFITS OF AN ASIAN LNG HUB

Timing Is Everything

Asian countries' interest in an LNG hub and associated pricing opportunities has not been linear. The impetus behind the ongoing hunt for a new pricing mechanism has varied for at least a decade, depending on factors such as the outlook for oil and gas prices, dynamics of supply and demand, geopolitical events, and countries' sense of energy security. This wavering interest in creating one or more LNG hubs and associated benchmarks illustrates the competition between short-term and long-term priorities: reducing gas prices versus changing price formation, combating price volatility versus hedging price risks, and diversifying pricing exposure through existing indexes versus pursuing a regional benchmark (see **Table 1** for an overview of these competing priorities).

LNG-consuming nations in Asia found their coffers hard hit in 2010 by the rise in oil prices, which resulted in higher prices for oil-indexed LNG. The following year, spot LNG prices rose when Japanese demand spiked after the accident at the Fukushima Daiichi nuclear power plant resulted in the rapid shutdown of all of Japan's nuclear reactors. Asian buyers thus paid a premium (known as the "Asian premium") for LNG imports relative to buyers in North America and Europe, which had a negative impact on their region's industrial competitiveness and trade balance. Asian governments began to search for a way to eliminate this premium and ensure competitive LNG prices in the long run, thereby increasing interest in the establishment of liquid and transparent

¹⁴ Historical LNG buyers are now competing with exporters in Asia as they are looking to resell their over-contracted supply. As such, they are strategically interested in opening new markets and financing regasification infrastructure in Southeast Asia. For example, the Japan Bank for International Cooperation (JBIC) has launched a \$10 billion initiative to build LNG terminals and power plants in the region. See "Japan to Offer \$10bn Plan for Asian LNG Infrastructure," *Nikkei Asian Review*, October 16, 2017.

trading hubs that could offer price signals reflecting the fundamentals of supply and demand.

As noted in the previous section, oil-indexation made more sense when crude oil and LNG were in direct, widespread competition in the power sector. But crude oil and natural gas no longer compete in power generation and have very limited interchangeability in most jurisdictions around

TABLE 1
Short- and Long-term Considerations for Asian LNG Hubs

	Short-term: Asian LNG hub plans could lose momentum	Long-term: Players see benefits to pursuing Asian LNG hubs
Asian gas premium vs. price formation	Without the Asian premium, price formation matters less. The return of competitive oil-indexed prices in Asia has reduced buyers' appetite for diversifying away from oil prices.	Asian buyers are aware that oil price increases and a tightening of the LNG market in the next decade could end the current low-price environment, supporting a preemptive change to price formation.
Pricing diversification vs. Asia's own benchmark	Henry Hub pricing will accelerate Asian price diversification in the 2016–20 time frame.	Increasing pricing exposure with alternative indexes (such as Henry Hub) cannot be substituted for an LNG price that reflects Asian supply and demand fundamentals. The use of Henry Hub is a transitional step before an Asian hub is established and trusted.
LNG market liquidity vs. transparency	The Asia-Pacific spot market for LNG is undergoing a growth spurt in terms of volumes, participants, and flexibility, even without mature physical hubs.	Greater liquidity does not mean more transparency. Liquidity alone cannot create a level playing field.
Price volatility vs. price formation	Both buyers and sellers take comfort in oil-indexation because of the perception that it will guarantee more stable LNG prices.	Volatility is not necessarily bad as it indicates that prices are adjusting rapidly to the value changes and it might be preferable to a rigid pricing mechanism. An Asian LNG price derivative will allow hedging against price risk, which mitigates price volatility. Oil prices are likely to be more volatile than in the past, which will make oil-indexed gas prices also unstable.

Source: GasVista, 2018.

the world. Oil is now predominantly consumed in the transportation sector, and regasified LNG is still primarily used in electricity generation. In Japan, for example, oil's share of power generation dropped from 60% in the mid-1970s to 9% in 2017.¹⁵

Furthermore, the decoupling of oil-indexed and spot LNG prices has heightened interest in finding ways to link Asian LNG prices to gas market fundamentals. The supply and demand dynamics of the two markets are very different, with global oil market dynamics now permanently divorced from those of gas markets in Asia. For example, during the past three years oversupplied oil markets have pitted producers from the Organization of the Petroleum Exporting Countries (OPEC) against U.S. shale oil producers in competition for market share. Yet while this issue is one of the most critical factors influencing oil trade, it has little to do with the LNG market apart from oil-indexed pricing. Indeed, looking back on 2016, for example, shows how spot LNG markets and oil markets can diverge. In the first half of that year, oil prices steadily recovered, while spot LNG prices fell, reaching record lows at the end of April. By July, oil had its most bearish prices of the year, while LNG had its most bullish prices. From September to December, oil and LNG followed a similar trajectory slightly upward due to LNG outages and higher demand that tightened the market, causing spot LNG prices to spike.

The past three years, however, have shown that the transition from one index to another will not be smooth and straightforward. The environment of low oil prices from 2014 to 2017 and the return of competitive oil-indexed prices in Asia removed some of the urgency to diversify away from oil pricing and bring hub-based pricing to the region. In recent contract renegotiations, buyers have successfully reduced prices through a lower oil slope (i.e., contracts are now signed with a slope coefficient closer to 11%–12%, whereas the slope was closer to 14%–15% in past years).¹⁶ New oil-indexed contracts for more than 11 mt of LNG were signed in 2017.¹⁷

But this approach of entering into competitive oil-indexed LNG contracts while oil prices are low may prove to be a shortsighted miscalculation if oil prices rise again in the medium term. Gains for buyers will be unsustainable unless the pricing structure is changed. Oil prices are likely to fluctuate more than they did

¹⁵ Aoshima Momoko et al., "Economic and Energy Outlook of Japan through FY2018," Institute of Energy Economics, Japan, July 25, 2017 ~ <https://eneken.iecej.or.jp/data/7532.pdf>.

¹⁶ For example, the price of oil-indexed Indonesian LNG exported to Japan fell from \$11.00 per mmbtu in 2015 to \$7.44 per mmbtu in 2016 and \$6.80 per mmbtu in the first half of 2017. "IMF Primary Commodity Prices," International Monetary Fund ~ <https://www.imf.org/external/np/res/commod/index.aspx>.

¹⁷ Jonathan Stern, "LNG Prices Will Remain a Pick and Mix for Now," *Financial Times*, October 9, 2017.

in the past due to the waning influence of OPEC, the rise of U.S. shale oil, and geopolitical turmoil, especially in the Middle East. LNG exporters have justified oil-indexation as a way to limit price volatility and ensure predictability, but the return of an oil boom-and-bust cycle would increase price instability for oil-indexed gas.¹⁸ Concerns over the volatility of oil markets have thus intensified the hunt for a new pricing mechanism in Asia.

The Benefits of Hosting a Hub

Despite mixed opinions about the timing and priorities of efforts to develop an LNG hub in Asia, there is a consensus that Asia would reap broad benefits from the establishment of at least one hub. The following discussion examines the most important benefits (see **Table 2** for an overview).

Competitive and transparent gas pricing. Hubs are expected to bring sustained competitive gas prices for end-users because of open competition in the marketplace.¹⁹ In addition, lower hub-based gas prices can apply downward pressure on long-term contracts in an oversupplied market, adding pricing competition and negotiating leverage. They transmit a reliable price signal and would guarantee that prices adjust promptly to supply and demand shifts over the long term.²⁰

Hubs can also contribute to transparency about price formation by issuing a benchmark that can support market-based pricing and derivatives markets, notably for spot purchases. As discussed earlier, the current Asian spot market is opaque and bilateral, with many participants mistrusting existing benchmarks such as the Japan Korea Marker (JKM) because they believe these are vulnerable to manipulation. Once enough market participants feel comfortable that the formation of prices accurately reflects the value of LNG, prices will achieve an equilibrium based on supply and demand. The risks of market manipulation or price control also diminish with a sufficient pool of suppliers. In addition, market-based prices would force suppliers to provide a breakdown of costs at various points in the value chain rather than giving only the final price to customers, which leaves room for arbitrary premiums

¹⁸ Robert McNally, *Crude Volatility: The History and the Future of Boom-Bust Oil Prices* (New York: Columbia University Press, 2017).

¹⁹ This forecast assumes that governments ensure that utilities will pass on the benefits of lower gas prices to end-users.

²⁰ There will be times when hub prices are higher than oil-indexed prices, especially when crude oil prices are falling or when LNG supply is tighter. In other words, Asian hub prices will not necessarily be the lowest prices. Volatility, however, is not necessarily bad, as it indicates that prices adjust rapidly to changes in LNG value, which is preferable to rigid pricing mechanisms.

TABLE 2
Profile of Asian LNG Hubs

Goal	Wide acceptance and use of hub-based Asian LNG reference prices that reflect liquidity as well as regional supply and demand fundamentals
Economic theory	Hub prices will indicate the real value of the fuel (i.e., the long-run marginal cost of LNG and long-term equilibrium price)
Location	Singapore and Japan
Key stakeholders	Governments, LNG industry (producers, consumers, and traders), financial institutions, clearing houses, and international organizations
Time frame	Success or failure will be apparent within the next 2–6 years
Anticipated results	Decline of oil-indexation, pricing transparency, and sustained affordable LNG prices; suppliers will price spot trade and contracts using new Asian indexes and lenders will finance projects using new Asian hub benchmarks

Source: GasVista, 2018.

and hidden margins. Buyers would thus have a better understanding of the true value of the gas and what they are paying for.

A common misconception is that greater liquidity automatically translates into greater transparency. The Asian spot market for LNG is forecast to grow exponentially in terms of volume, participants, and flexibility, even without a mature physical hub.²¹ But while increased spot trading and flexibility are prerequisites to create a physical hub, they do not eliminate the need for a robust and transparent pricing benchmark and derivatives market. The danger is that the integrated companies and portfolio players that control the LNG value chain will have an incentive to encourage flexibility and short-term purchases while they themselves remain nontransparent. Traders thrive on identifying opportunities arising from short-run inconsistencies.²²

²¹ With the supply overhang anticipated to persist through at least 2022, the amount of uncommitted supply is also increasing quickly and is the result of destination-free U.S. LNG, changes to shorter-duration contracts, fewer destination clauses, expiring legacy contracts, over-contracted markets, new project capacity that is unsold, and commissioning cargoes.

²² In Europe, the incumbents also opposed the increased pricing transparency offered by hubs. Russia and Norway used to have a duopoly on the hubs, and they tried to protect their influence over the pricing of spot supplies. It took more than a decade for Europe to introduce more players and increase transparency, and the long journey toward full transparency is far from over.

Hedging. Players in the Asian LNG market are still looking for alternative ways to hedge LNG agreements on the derivatives market in order to reduce exposure to price volatility as well as volume risks. In today's market, LNG buyers and sellers can hedge their purchase with futures of oil from Henry Hub, the UK's National Balancing Point, or the Netherland's Title Transfer Facility, as these price markers all offer long-term possibilities. But none of these options is Asia-specific due to the absence of a gas futures market in the region. The emergence of a successful Asian hub-based price and associated futures, with an increased number of players trading LNG derivatives linked to this new benchmark, would facilitate hedging and portfolio optimization by increasing the range of financial instruments available to manage supply risk and price volatility.

Energy security. Once it achieves a critical mass of users and transactions, an Asian hub would contribute to more open, transparent, liquid spot LNG trade, which in turn would enhance energy security. In a well-functioning market, producers should be able to quickly signal a supply disruption, allowing buyers to find extra LNG by paying a higher price rather than relying on special relationships with a single supplier. For example, the sudden rise of Southern France hub prices during the 2016–17 winter attracted additional LNG cargoes to French shores (albeit with some delays) in response to the signal of a price premium. Supply security will further increase as the regional market hub reduces connectivity issues, optimizes shipping, increases storage use, and better anticipates bottlenecks in national grids.

This component of energy security was at the heart of the U.S. government's support for Asian gas and LNG hubs under the Obama administration. The Bureau of Energy Resources in the State Department has worked to foster transparent trade and supply diversification to promote economic stability, integration, and prosperity. The bureau considers the current LNG-glutted market as a unique opportunity for Asian countries to gain momentum in establishing the necessary infrastructure to counter supply disruptions, increase supply alternatives, and create regional interdependency. Given that the region cannot rely on pipelines alone for gas market integration, an LNG hub could be a common project that triggers energy security cooperation through joint infrastructure development. The Trump administration has favored continuity on this matter and promoted the goal of creating open and efficient markets in strategic bilateral energy discussions with U.S. allies such as Japan and Australia.

An end to investment paralysis. Current investment shortfalls in upstream gas development and LNG liquefaction are partly a result of the ongoing

disagreement between buyers and sellers on how LNG should be priced.²³ The creation of an Asian LNG hub with an index other than oil or Henry Hub could enable new long-term contracts for Asian buyers and alter the way multibillion-dollar upfront investments are justified. A new regional pricing benchmark is thus a win-win for suppliers and buyers at a time of stagnant investment and uncertain demand and would help reform project financing and unlock investment decisions for new long-term projects.

One initiative under consideration that could solve the ongoing pricing debate and investment paralysis is the creation of an LNG hub in Singapore, which will be discussed in the next section. Other options include the creation of hubs in producing countries (e.g., on the U.S. Gulf Coast) or in other importing regions (for example, the Middle East) and the use of fixed-price contracts. Although these other initiatives need not directly compete with an Asian LNG hub, they could slow progress toward creating one by decreasing the urgency and partly undermining the rationale.

Environmental gains. A market-based LNG price could stimulate regional gas demand from emerging importers. The ability to trade LNG at competitive prices would encourage governments to promote the switch from coal to gas in the power and residential sectors of heavily polluted Asian cities. Air pollution concerns in India and China have already motivated governments to implement policies that will increase the use of natural gas or LNG for heating, cooking, and transportation on roads and inland waterways. Rising pollution levels have prodded both countries to promote natural gas or LNG as a cleaner alternative fuel to meet rising urban energy demand. For smaller buyers with similar concerns, affordable LNG that is simpler to trade would further stimulate their appetite for this alternative fuel.²⁴ The development of a hub is thus critical for the future of the LNG industry at a time when demand is uncertain and suppliers are proactively trying to open new markets.

AN LNG HUB IN SINGAPORE: A JOURNEY IN THE MAKING

Given the potential economic and geopolitical benefits, the government of Singapore has been a critical force pushing for a regional LNG benchmark.

²³ The current low oil and gas prices are also factors in the investment paralysis stalling new LNG projects. There were very few final investment decisions in 2015–17 to launch new liquefaction plants.

²⁴ Leslie Palti-Guzman, “Asia’s LNG Prospects: Finally Entering a Golden Age,” in “Asia’s Energy Security amid Global Market Change,” NBR, Special Report, no. 63, December 2016, 33–51.

While Asian LNG hub initiatives are currently underway in both Singapore and Tokyo, Singapore's is the most advanced. Its ultimate success, however, will depend on acceptance and recognition by stakeholders, including governments, industry, and the financial community.

Singapore has worked hard to overcome the structural weakness of being a small market with little infrastructure.²⁵ It now offers some of the key physical trading services, including an onshore regasification terminal for 6 million tons per annum (mtpa) of LNG, with associated storage capacity, reload capability, and third-party access to multiple users. The terminal was expanded to 11 mtpa in 2018, and is adding a fourth tank to increase total storage capacity to 800,000 cubic meters.²⁶ Singapore is also in the process of developing more innovative services, including transshipment, LNG bunkering, and bulk breaking, that will improve its attractiveness as a physical regional hub.²⁷

Singapore is betting on the use of LNG as a transportation fuel and is advancing its ambitions to serve as an LNG hub by incentivizing the expansion of the Port of Singapore's LNG-bunkering capabilities, specifically via regulatory and financing incentives. Despite market skepticism about Singapore's future as a hub given limited progress over the last two years, the country is aggressively pushing to establish itself as a regional LNG-bunkering center to attract more traffic and greater liquidity—two required components of a viable LNG hub (see **Table 3** for actions to date). Singapore's Maritime and Port Authority has adopted regulatory and financing strategies to build confidence in the future of LNG as a bunker fuel, including co-funding new LNG-fueled vessels, waiving their port fees for five years, and making technical and operational standards public well ahead of International Maritime Organization implementation in 2020. Singapore is likely to be successful in its efforts to position itself as a strategically located LNG-bunkering port, especially after 2025 as ports increasingly offer such services and the fleet of LNG-fueled vessels continues to grow.

²⁵ Singapore imported only 2 mtpa of LNG in 2017, which pales in comparison to other importers in the region like Japan (83 mtpa), China (39 mtpa), and South Korea (37 mtpa). See "The LNG Industry GIIGNL Annual Report 2018."

²⁶ Andrea Soh, "SLNG Terminal Has Enough Capacity to Replace Piped Gas If Necessary: CEO," *Straits Times*, January 22, 2018.

²⁷ Over time, however, the size of LNG storage in Singapore may not be relevant when it comes to contract terms and the nature of settlement. To draw a parallel with the iron trade, for instance, even though the volume of exchanges in China is huge compared with the rest of the world, the main iron contract is traded in Singapore and the delivery is settled in a half dozen Chinese ports.

TABLE 3

Recent Singapore LNG-Bunkering Developments

Date	Companies	Type	Details
April 2017	Total, Pavilion Gas	Supply deal	Total and Pavilion Gas signed an memorandum of understanding that Pavilion will supply LNG-bunker fuel to Total Marine Global Solutions.
April 2017	Maritime and Port Authority of Singapore (MPA)	Regulatory	MPA released technical and safety standards for LNG bunkering in the Port of Singapore for multiple modes of transfer (ship-to-ship, truck-to-ship) and is developing a reliable and transparent framework for operations.
April 2017	Singapore LNG, MPA	Infrastructure	Singapore LNG and MPA jointly launched the country's first LNG truck-loading facility.
May 2017	MPA	Regulatory	To encourage LNG bunkering by local vessels, MPA will waive five years of port dues for new LNG-fueled ships that register with MPA between October 2017 and December 2019.
August 2017	Singapore LNG, Pavilion Gas	Storage and reloading services	Terminal operator Singapore LNG appointed Pavilion Gas to set up LNG storage and reloading services on Jurong Island.
September 2017	FueLNG, Keppel, Shell	Truck-to-ship loading	FueLNG (a joint venture between Keppel and Shell) completed the first commercial LNG bunker transfer in Singapore.
December 2017	PSA Marine	Infrastructure	PSA Marine awarded contracts for two dual-fuel LNG harbor tugs; vessels scheduled for delivery in 2019.
December 2017	Pavilion Gas, PSA Marine	Supply deal	Pavilion Gas to supply LNG bunker fuel from 2019 to PSA Marine's dual-fuel LNG harbor tugs.
December 2017	MPA	Financing	MPA injects approximately \$9 million to boost LNG bunkering in the Port of Singapore, which will be used to co-fund construction of new LNG-bunker vessels that facilitate the development of ship-to-ship LNG bunkering.

Source: GasVista, 2018.

Why Singapore Is Well Positioned

Singapore's competitive edge in the race to build an Asian LNG hub is already well documented.²⁸ One of its key advantages is that it already possesses an established trade, legal, and financial ecosystem. As a hub for trading other commodities in Asia (e.g., oil, coal, and iron), Singapore has an existing network of bankers, traders, lawyers, shippers, and educated human capital. Its reliable legal, regulatory, and administrative framework inherited from the British also explains why some players want to see the country become an LNG hub.²⁹

As important is Singapore's potential to develop physical delivery futures contracts that serve as pricing benchmarks for trading LNG cargo. Positioned at one of the busiest crossroads between Qatar, India, Australia, Indonesia, Malaysia, China, Japan, and South Korea, Singapore intends to emphasize the opportunities for physical optimization and hedging due to its strategic geographic location. It already offers LNG derivative contracts, but the assessments need to go further out in time (five to ten years rather than just two months) to allow viable hedging against price risk and serve as a price index for long-term contracts. Singapore has several ongoing initiatives to boost liquidity, including through infrastructure investments and bunkering services. Multiple regional LNG players are considering the possibility of unloading and storing cargoes in the country.

Singapore has already launched a physical commodity benchmark designed to represent the spot price of LNG cargoes locally, which constituted an important step on the road to becoming a hub. In September 2014 the Singapore Exchange unveiled the FOB (free on board) Singapore SLInG (Singapore Exchange LNG Index Group) index using

²⁸ See, for example, Xieli Lee, "Singapore Could Still Thrive as Regional LNG Hub," ICIS, March 22, 2018 ~ <https://www.icis.com/resources/news/2018/03/22/10205049/singapore-could-still-thrive-as-regional-lng-trading-hub/?redirect=english>; Wong Kay Yi, "Singapore the Preferred Location of Future LNG Trading Hub: Deloitte," *Business Times* (Singapore), May 25, 2018 ~ <https://www.businesstimes.com.sg/energy-commodities/singapore-the-preferred-location-of-future-asian-lng-trading-hub-deloitte>; "Singapore Earmarked as Future LNG Trading Hub," Deloitte, Press Release, May 3, 2017 ~ <https://www2.deloitte.com/sg/en/pages/energy-and-resources/articles/sg-future-lng-hub-press-release.html>; Andrea Soh, "S'pore to Gain Importance as Trading Hub as LNG Becomes Commoditised (Amended)," *Business Times* (Singapore), May 8, 2017 ~ <https://www.businesstimes.com.sg/energy-commodities/spore-to-gain-importance-as-trading-hub-as-lng-becomes-commoditised-amended>; and Amos Hochstein, "Regional Natural Gas Market Hub: Singapore Leads the Way," *Straits Times*, October 27, 2015 ~ <https://www.straitstimes.com/opinion/regional-natural-gas-market-hub-singapore-leads-the-way>.

²⁹ Singapore is also eager to become Asia's key LNG arbitration center. See Mark Tay, "LNG Sellers, Asian Buyers Spar as Contract Fight Brews," CNBC, May 31, 2017 ~ <https://www.cnbc.com/2017/05/31/reuters-america-lng-sellers-asian-buyers-spar-as-contract-fight-brews-amid-supply-glut.html>.

a distinctive methodology.³⁰ Since then, efforts have been made to try to increase the likelihood of widespread acceptance of SLInG. But thus far the use of the index to price LNG transactions has not picked up, in part because physical liquidity is still lacking.³¹

A strong company presence in Singapore is an important indicator of the attractiveness of the hub and its potential success in reaching a critical mass of participants. About 40 companies have already established LNG operations out of Singapore, representing buyers, sellers, and traders, including Woodside Energy, Statoil, Trafigura, China Huadian, Exxon, Cheniere Energy, and several Japanese utilities and trading houses.³² Only 23 of them are believed to be participating in SLInG's price assessment. Companies are carefully monitoring the evolution of the hub, taking a wait-and-see approach before using SLInG as a price reference in transactions.

For now, participants have shied away from using SLInG due to the lack of physical and transparent spot trade to back up paper trade (in contrast with physical trade). The global LNG market is not yet mature enough to rely solely on paper trade—liquidity has to come first, and once there it will drive the formation of Asian prices. Other Asian reference prices, such as the JKM index, face similar issues, even ones that have existed for a while. To be successful, FOB Singapore SLInG futures will require a critical mass of physical transactions, meaning increased liquidity, for a reliable forward curve to develop.³³

Toward Regional Cooperation

The emergence of the hub in Singapore could enhance regional cooperation and market integration. The free flow of LNG within the region

³⁰ For further information on SLInG methodology and guidelines, see “Methodology and Specifications Guide,” Energy Market Company ~ https://www.emcsg.com/f1415,99779/Sling_Methodology_and_Specifications_Guide.pdf.

³¹ Interestingly, because SLInG was conceptualized as a reference price, traded cargoes do not have to physically pass through the Port of Singapore, and Singapore does not have to be the place where cargoes are received or originated. The FOB SLInG price of these cargoes can be converted to any departure ex-ship throughout Asia by simply adding freight cost. Over time, the Singapore Exchange may consider publishing a net-forward freight price assessed from and reported by the same group as SLInG, fostering the use of the index as a regional reference point.

³² Miwa Naruse and Mayuko Tani, “Singapore Realizing LNG Hub Dreams as Trading Houses File In,” *Nikkei Asian Review*, April 7, 2017 ~ <http://asia.nikkei.com/Business/Trends/Singapore-realizing-LNG-hub-dreams-as-trading-houses-file-in>.

³³ A forward curve is a series of sequential prices either for future delivery of an asset or for expected future settlements of an index. See “A Look Forward: Understanding Forward Curves in Energy Markets,” Platts, Special Report, May 2012 ~ https://platts.com/IM.Platts.Content/ProductsServices/Products/RKSR004_0512_SpecialReportUnderstandingForwardCurvesEnergyMarkets.pdf.

could persuade Southeast Asian countries to set aside historical rivalries and allow commercial interests to prevail over political differences. LNG trade constitutes an opportunity for regional players to promote existing and new joint initiatives to boost cooperation. While prominent LNG producers such as Malaysia and Indonesia have been reluctant in the past to accept the idea of Singapore as a hub, both countries' opinions could change as they become net LNG importers as a result of declining domestic production and increased consumption due to growth in GDP, population, and electricity demand. The development of joint LNG infrastructure would encourage greater regional trade and cooperation while saving countries time and money as they optimize their intraregional LNG trade.

The volume traded in Singapore could be larger with the participation of its neighbors. As Singapore builds more LNG regasification and storage capacity than is needed for its own domestic consumption, neighboring importers will be able to use this infrastructure (either to complement or as an alternative to building their own). A good example of this type of arrangement is Europe's Gate import terminal in Rotterdam, which is used by German utilities to send regasified LNG to their domestic market via pipeline, as Germany does not have its own LNG import terminal. Similar to Rotterdam, Singapore is eager to position itself as one of the world's physical hubs (handling all sizes of reload, truck loads, transshipment, LNG refueling, cargo parking, and blending) to dispatch gas and LNG throughout the region.³⁴ Several new importing countries in Southeast Asia and the Indian subcontinent (India, Pakistan, and soon Bangladesh and Sri Lanka) are becoming more reliant on LNG and will likely contribute to making the Singapore hub even more vibrant by increasing spot transactions and liquidity.

Malaysia's involvement, in particular, would be a significant boost to Singapore's hub given the country's strategic location, access to supply, and relations with key LNG buyers. As Malaysia becomes a net LNG importer rather than exporter, it would benefit from using the infrastructure and mechanisms that Singapore already has in place to create greater synergy between both markets and connect their grids.³⁵ Working with Singapore on LNG-bunkering services and small-scale initiatives could advance cooperation between the two countries. However, at present Malaysia has

³⁴ Karen Thomas, "Gate Terminal Handles First LNG Transshipment," *LNG World Shipping*, April 8, 2016 ~ http://www.lngworldshipping.com/news/view,gate-terminal-handles-first-lng-transshipment_42500.htm.

³⁵ In addition, Kuala Lumpur's endorsement would likely trigger the participation of Thailand and other countries in the region. Malaysia's Petronas is already involved in key regional markets, including through small-scale initiatives and downstream integration.

remained reluctant to use the Singapore hub because Kuala Lumpur wants its own hub to take advantage of the growing liquidity in Southeast Asia.³⁶ But this position could evolve rapidly as Malaysia's long-term contracts expire and the need to hedge larger amounts of flexible supply intensifies.

In contrast, Japan has come to understand that a successful hub in Singapore—along with other regional initiatives—could benefit its own efforts to establish a hub by increasing the transparency of prices and physical movement of LNG in the region. With greater liquidity, the Japanese believe that the trading mentality will change and trust in new Asian indexes will likely grow.³⁷ Rather than competing to become the one and only Asian LNG hub, Singapore could materialize as the leading hub in Southeast Asia, while Tokyo over time could become the leading Northeast Asian hub. In addition, with the current supply glut, overcommitted Japanese utilities have a vested interest in stimulating trade in South Asia to resell their surplus cargoes. A hub in Singapore would facilitate the sale of excess spot LNG to South Asia. There will be greater opportunities for cooperation and increased linkages between Tokyo and Singapore in the years to come.

New South Asian LNG importers have closely watched Singapore's progress and are likely to become active participants in the hub sooner rather than later. Small emerging buyers with less procurement experience are reluctant to enter into long-term contracts with sophisticated exporters as long as they cannot predict oil prices during the span of the contract. However, as Singapore gradually grows as a commercial hub with many companies opening LNG desks there, it will make sense for these new South Asian players to follow suit.

The main challenge to overcome for Singapore is to bring neighboring countries onboard at a time when they may prefer to wait and see how alternatives shape up in the region, while also focusing on their own strategic interests rather adopting a regional perspective. Singapore's 2018 chairmanship of ASEAN and the East Asia Summit will provide meaningful settings to make progress on winning government support for gas market principles and concrete projects that will help build momentum behind hubs.

³⁶ Kuala Lumpur perceives that the Singapore hub goes against the interests of Petronas, which sees itself as the best-positioned regional player to capitalize on the shifts in the LNG market toward a more global commodity.

³⁷ Japan's Ministry of Economy, Trade and Industry (METI) has stated: "It goes without saying that LNG trading hubs may not be limited to Japan. We welcome any other initiatives to create LNG hubs in Asia. Multiple LNG hubs which are well linked with each other can have a positive effect on realizing our goals by creating healthy competition and thus establishing more sophisticated Asian LNG price indices." METI (Japan), "Strategy for LNG Market Development," May 2, 2016, 7.

POLICY IMPLICATIONS FOR THE REGION

Historically, the most important consideration for gas procurement in Asia has been security of supply rather than competitive price formation, but this is on the cusp of change. Two main developments will improve energy security in the region. First, more liquid and transparent markets facilitated by the emergence of an Asian LNG hub will provide a new sense of energy security. Second, convincing the financial community to rethink how LNG projects are financed will limit the threat of investment shortage and associated supply risks.

Increased Energy Security

Although growing dependence on LNG imports makes Asian utilities more risk-averse, greater liquidity could provide a new notion of gas security. This, however, will require trust in a well-functioning market.³⁸ Although the growing flexibility of LNG cannot give the kind of supply security that rigid long-term contracts used to provide, in a functioning and transparent gas market cargoes will respond to price signals. As a result, consumers with critical or emergency needs will have to pay the highest price to secure the needed spot cargoes. In addition, big players are mitigating their risks by managing a diversified portfolio that integrates both short-term and long-term contracts. In the case of smaller buyers that do not have the capacity to manage such a portfolio, they may ask for support from the larger players to coordinate and aggregate supply. Other emergency responses could include fuel switching (e.g., temporary restarts of coal power plants).

One way to mitigate the risk of supply disruptions and alleviate security concerns could be to regionally optimize aboveground LNG storage or underground gas storage.³⁹ As these options are not available in all countries, regional organizations should think about ways to optimize storage across borders through regional preventive action and emergency plans (as part of public or private partnerships). Storage is a tremendous asset because it also enables commercial flexibility (i.e., the ability to acquire the commodity when it makes the most sense). The problem is that storage is expensive and the

³⁸ The perception is that the LNG trade is less reliable than a long-term pipeline marriage. Asian utilities, along with their governments, are still unsure that the LNG market can address their gas supply security, as there is no guarantee that they could obtain cargoes in times of dire need, especially in a seller's market.

³⁹ Few regasification terminals propose stand-alone access to LNG storage, meaning access to a storage service without the need to contract full berthing and regasification services.

market does not reward the security-of-supply benefits of gas stored for crisis situations. While cargoes earmarked as strategic reserves are permanently removed from the market, a storage obligation requires market participants to place and hold a minimum level of gas in storage at specific points in time (winter or summer). Singapore, for example, could make some volume available to its neighbors under a storage obligation and offer some physical guarantees. The problem then becomes the transportation risk, and LNG has a relatively long response time. The distance between points of production and consumption means that cargoes can take over a month to be delivered. International organizations such as the International Energy Agency (IEA) are likely to become more involved in mitigating the risks of LNG disruption. The IEA is working on a gas security plan, which along with the EU's strategy for LNG and storage and Japan's strategy for LNG market development, will strengthen global natural gas markets, providing greater transparency and flexibility. During the 2016 G-7 summit at Ise-Shima, the world's top leaders reasserted their commitment to the goal of advancing a strategic view of the global LNG supply chain.⁴⁰

The Role of Financial Institutions in Ensuring Supply and Demand Security

Reforming financing requirements for LNG projects. Lending institutions will play an important role in supporting the success of LNG hubs in Asia. LNG project financing has occurred along the same lines for decades and has not taken into account changes in the market that make some of the financing requirements obsolete. Relatively inflexible commitments (e.g., long-term contracts and destination clauses) were formerly necessary to justify the multibillion-dollar investments upfront. While these provisions remain essential to secure financing for large liquefaction projects, challenges loom due to spot trading by buyers who are increasingly reluctant to commit to long-term volumes and want to move away from oil-indexed prices. Asian lenders know that the industry is in transition and will require an overhaul of the way projects are financed. Japan's Ministry of Economy, Trade and Industry (METI) suggested in its May 2016 LNG strategy paper that "it would

⁴⁰ "G7 Ise-Shima Leaders' Declaration," Press Release, May 27, 2016 ≈ <https://www.whitehouse.gov/the-press-office/2016/05/27/g7-ise-shima-leaders-declaration>.

be advisable for financial institutions to positively review their financing policy in response to current and future...changes.”⁴¹

As the motor of demand growth, Asia is well placed to launch the debate on the reform of LNG financing and assume responsibility for the organization of discussions between the main stakeholders. One of the key topics should be the role of long-term contracts. They are likely to remain the backbone of LNG liquefaction project financing in the medium term, but lenders should update financing requirements to reflect the diminished importance of long-term contracts as the volume of uncommitted supply to be sold on hubs increases. With a functioning Asian hub and its associated price reference for spot trades, lenders may one day reduce these strict requirements and support the growth of uncommitted or orphan projects (projects that are not dedicated to one specific market and may have most of their volume sold on a short-term basis).

Another important matter that financial stakeholders should discuss is the financing of projects whose long-term physical supply will be indexed to a new trusted Asian marker (rather than being oil-indexed or linked to other established indexes). The rise in liquidity facilitated by a transparent Asian price benchmark could encourage more hybrid formulas that include an element of oil-indexation and hub-indexation for term contracts to Asia. Partially indexing new projects—dedicated to Asian customers—to an Asian hub price could solve many issues in ongoing pricing negotiations, accelerate investment decisions for new projects, and revolutionize LNG financing. However, before using an alternative index as a complement or substitute, lenders must clearly understand the new index and its hedging instruments in order to quantify the associated risks. Increasingly, lenders will adopt the best approach for each project and customer rather than impose a one-size-fits-all financing requirement.

If these reforms do not take place, a key risk is that the LNG market in Asia will tighten over the next decade due to a lack of final investment decisions, which could result in supply shortages and higher prices. The approval of new projects lagged in 2015–17, partly due to the period of low oil prices, but also due to pricing disagreements and a sentiment of supply abundance. As a result, many pre-final investment decisions stalled. Companies are taking a close look at demand, costs, prices, and timing before launching new projects.

⁴¹ METI (Japan), *Strategy for LNG Market Development* (Tokyo, May 2, 2016), 11 ~ http://www.meti.go.jp/english/press/2016/pdf/0502_01b.pdf.

Sharing the financing burden to ensure the security of demand. State-owned financing will play an increasingly important role in driving sustained LNG demand and will become indispensable for financing LNG projects all along the value chain.⁴² In the United States, the Treasury, the Overseas Private Investment Corporation, and the Export-Import Bank are all reviewing ways to foster gas markets through financing.⁴³ Similarly, in Japan, METI, the Japan Bank for International Cooperation (JBIC), Nippon Export and Investment Insurance, and the Japan Oil, Gas and Metals National Corporation have all been considering ways to adapt their financing to the new global gas order. Buyers will likely continue to boost their participation in equity to share risks with suppliers, which would in turn alleviate their financial burden and facilitate new investments. Asian buyers have increasingly taken equity stakes in liquefaction projects thanks to the support of state-owned banks such as JBIC, the Export-Import Bank of Korea, and the Korea Trade Insurance Corporation. U.S. LNG projects have been important beneficiaries of Japanese financing.⁴⁴ Chinese state-owned money will also increasingly contribute to several global LNG projects currently looking for financing. Investments can be made all along the value chain: upstream, downstream, and in transportation.

Multilateral banks can also help secure the value chain, especially by opening up new demand centers through financing and guarantees to less creditworthy LNG importers. Another area of financing that multilateral banks could explore is credit support for countries to purchase fuel. The World Bank is bolstering LNG-to-power projects in Africa, Asia, and Central America to promote decarbonization away from coal. The International Financial Corporation (the World Bank's private-sector lending arm) has

⁴² A telling illustration is the sanctioning of the \$34 billion Ichthys project in Australia in 2012, which benefited from more than \$11 billion of direct and covered export credit agency loans from countries as diverse as South Korea, Japan, France, China, and Australia. Without the export credit agencies' involvement, project financing would probably not have succeeded.

⁴³ The U.S. Export-Import Bank, which has been politicized in U.S. domestic politics, along with other U.S. agencies, could play a critical role in supporting LNG demand growth in emerging countries and the next wave of export projects. Since 2009, the bank has signed almost \$34 billion worth of loans and guarantees to build fossil fuel projects abroad and is currently considering proposals to finance power plants in Egypt, Pakistan, and Saudi Arabia, as well as an onshore LNG liquefaction plant in Mozambique. Meanwhile, other U.S. agencies such as the U.S. Trade and Development Agency and U.S. Agency for International Development (USAID) offer technical assistance and training to facilitate these investment decisions in emerging markets.

⁴⁴ For instance, Japanese banks have been instrumental in raising the \$7.5 billion in debt that the Cameron LNG export project has contracted. JBIC has approved a \$2.5 billion direct loan. Among the 31 lenders that will provide the remaining \$5.0 billion, there are 11 private Japanese financial institutions and Nippon Export and Investment Insurance is covering \$2.0 billion. The remaining \$2.5 billion needed to finance the full \$10 billion project will come from equity. After the Fukushima disaster, the Japanese government encouraged utility companies to form consortia to buy upstream equity in LNG liquefaction projects abroad.

invested around \$2 billion in various midstream and downstream LNG and gas projects over the past two years. The growing role of the Asian Development Bank and the Asian Infrastructure Investment Bank will also stimulate further LNG and gas demand in Asia's emerging economies. Meanwhile, international institutions such as the International Monetary Fund could lead efforts to increase transparency and knowledge in the global gas market by publishing at least one of the new Asian indexes (similar to its free monthly publication of Henry Hub prices).

Conclusion

The creation of one or more LNG hubs in Asia would structurally change the system of gas pricing in the region in useful ways. Whether located in Singapore or Tokyo, an Asian LNG hub and associated price marker would disrupt the current system of transactions, which is largely private, bilateral, and controlled by dominant players. This new system could establish a competitive free market by setting prices that reflect gas market fundamentals and sending a reliable signal of the true value of LNG. With a price for Asian LNG that is independently formed—i.e., not linked to oil—industry actors would be in a better position to confidently buy, sell, and invest in new projects.

The formation of an efficient and open LNG market in Asia would augment energy security. Increased liquidity would enable importers to respond quickly to demand or supply shocks by relying on more available spontaneous LNG purchases through the hubs. In addition, a hub would produce broader economic and environmental benefits. The freer flow of LNG would create new opportunities for regional integration and cooperation between neighbors, while enabling countries to switch from coal and oil products to cleaner fuels.

Singapore has worked hard to overcome the limitations of its small size and is positioning itself to serve as an LNG hub, but the inertia of the market is such that its efforts will have to be persistent. To be successful, Singapore's market-based price reference still requires a critical mass of physical trades to gain the confidence of players. That said, in this buyer's market, lines can move faster than in the past. A large buyer, trading company, or supplier could change the situation by being the first market-mover, while regulatory changes could also move the needle.

It is important to remember that Asian governments, financial institutions, and players in the LNG market will need to exercise patience,

while at the same time recognizing that market forces alone will not be sufficient for an Asian hub to succeed. The creation of a hub is an evolutionary process, as price markers have a history of failing and being quietly delisted. Since the LNG market is undergoing a historic transition, only time will tell whether Singapore will realize its ambition to be an LNG hub. In the event that attempts to establish a hub fail, the current status quo of artificial pricing will continue at the risk of darkening the future of LNG as a fuel in Asia. With Asia as the driver of global growth in LNG demand, the resolution of this pricing issue will influence not only the region but the global outlook for LNG. ♦