



KING & SPALDING

# The Emerging Price Offerings From Second Wave U.S. LNG Projects: Perspectives From Sellers and Buyers

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# Foreword

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In the mid-2020s it is likely that the United States will overtake Qatar and Australia to become the world's largest exporter of liquefied natural gas (LNG). Whether and when it does so will depend on how successful project developers are in bringing on stream what has become known as the “second wave” of U.S. LNG exports.

The first project of those that make up the “first wave” – Cheniere Energy’s Sabine Pass – came on stream as recently as 2016. Yet even before it produced its first drop of LNG, the imminent reality of large-scale LNG exports from the U.S. was changing mind-sets.

## WAVES OF DISRUPTION

What mattered most was not the availability of a large new tranche of supply – though that was in itself significant – but the way in which this supply was marketed. The first-wave projects challenged assumptions by disaggregating gas supply from liquefaction, indexing prices to Henry Hub, eschewing destination restrictions, and allowing buyers to choose whether or not to lift LNG, so long they paid the fixed liquefaction tariff.

Our article starting on p3 considers how all this has changed the way LNG business is done. It goes on to explore how second-wave projects promise to further disrupt the industry by giving buyers an even wider set of options.

It is not just the supply side of the industry that is transforming. The number and diversity

of buyers have grown enormously over the past decade. Between 2008 and 2018, the number of countries importing LNG grew from 18 to 42.

## THE BUYER PERSPECTIVE

“Traditional” LNG buyers – gas or electricity utilities with monopolies and good credit ratings – have been joined by new types of buyer seeking flexibility and whose credit ratings may be below investment grade; even traditional buyers are seeking flexibility as their markets are liberalized. The distinction between sellers and buyers has blurred, as intermediaries have emerged, notably “portfolio players” but also traders. We examine how the structure of the industry is evolving and how buyers are responding to U.S. LNG exports on p13.

## WHERE DO WE GO FROM HERE?

The U.S. second-wave projects face daunting challenges. The trade dispute with China has locked them out from the world’s fastest growing market, at least for now. Projects elsewhere are moving ahead, presenting credible competition for the supply-demand gap expected to open up four to five years from now. LNG is moving towards commoditization, but ventures seeking project finance still need to sign up bankable offtakers for most of their capacity.

On p18 we assess the prospects of the front-runners and ask: “How much capacity can we realistically expect from the second wave?”

# 1

## Waves of Disruption: Exporting the U.S. Shale Gas Revolution

**O**n February 24, 2016, the LNG carrier *Asia Vision* left its berth at Cheniere Energy's Sabine Pass liquefaction project in Louisiana. After navigating along the Sabine-Neches Waterway, the black, cream and green ship entered the Gulf of Mexico on its way to Brazil. On board was the first commercial cargo of U.S.-produced LNG to be exported from the Lower 48 states.

It was a historic moment, marking not just the physical arrival of a huge wave of new LNG production capacity but also the beginning of new ways of doing LNG business; even before Sabine Pass produced its first drop of LNG, the imminent reality of large-scale LNG exports from the U.S. was changing mind-sets around the world.

When construction of the first wave of LNG export projects from the Lower 48 is completed, towards the end of 2021, the U.S. will have production capacity of 72.6 mtpa (see table on p4) – making it the world's third-largest exporter after Australia and Qatar.

"In 2017 there were 19 countries that were receiving LNG shipments from the United States," said U.S. Secretary of Energy, Rick Perry, earlier this year. "Today that number has risen to 35 nations on five continents."

A second wave of projects now grappling with the challenges of reaching final investment decision (FID) is likely to see the U.S. become the world's largest exporter sometime in the middle of the 2020s. As with the first wave, the second

wave is changing mind-sets as project developers introduce new commercial/pricing models that continue to transform the LNG business – boosting liquidity and hastening the trend towards commoditization.

### OVERTURNING ASSUMPTIONS

In 2008, as the shale gas revolution in the U.S. began to make its impacts felt, it quickly became apparent that one of the first casualties would be the assumption that the nation was on its way to becoming the world's largest LNG *importer*. However, it was to be another couple of years before the realization dawned that the shale gas revolution would soon be *exported* around the world in the form of LNG.

*"In 2017, 19 countries were receiving LNG shipments from the United States. Today that number has risen to 35 nations on five continents."*

**Rick Perry**, U.S. Secretary of Energy

Cheniere Energy's applications to the U.S. Department of Energy (DoE) in the summer of 2010 for licenses to export LNG around the world set off a stampede of similar applications from a wide variety of would-be LNG exporters. They also became the focus of intense debate as various stakeholder groups argued and lobbied about the impacts that exports might have – on gas

prices, on jobs and on the environment. Surprised by the intensity of the debate, the DoE imposed a *de facto* moratorium while it commissioned various studies.

Today the debate is over. The North American shale gas revolution has proved to be more robust than many expected. U.S. gas prices have been stubbornly low for years and are expected to remain so for the foreseeable future. Technology continues to improve, lowering unit production costs and thereby making more reserves economic at lower wellhead prices. The stampede

to develop new LNG export projects continues, unimpeded by the DoE.

### FIRST-WAVE DISRUPTORS

The first-wave U.S. LNG export projects – most of which are among the largest liquefaction ventures in the world – introduced a number of radical innovations:

- Predicated on the concept that they would take their feed gas from the well-developed interstate gas pipeline network, they disaggregated gas supply from liquefaction, moving away from the traditional approach of gas production being integrated with liquefaction.
- The projects consequently mostly adopted commercial models based on tolling, or, in the case of Cheniere, sales and purchase agreements (SPAs) that effectively work like tolling agreements. In both cases the gas price

# 72.6 MTPA

Production capacity of first-wave U.S. projects by 2021

Figure 1

The Current Status of First Wave U.S. LNG Export Projects

Project	Location	Train	Capacity (mtpa)	Status	FID date	Actual/target start-up date
Sabine Pass Liquefaction Project	Louisiana	Train 1	4.5	Operational	August 2012	May 2016
		Train 2	4.5			October 2016
		Train 3	4.5		May 2013	March 2017
		Train 4	4.5			October 2017
		Train 5	4.5		June 2015	November 2017
Dominion Energy Cove Point LNG	Maryland	Train 1	5.25	Operational	October 2014	April 2018
Corpus Christi Liquefaction Project	Texas	Train 1	4.5	Operational	May 2015	December 2018
		Train 2	4.5			June 2019
		Train 3	4.5	Under construction	May 2018	H2, 2021
Cameron LNG	Louisiana	Train 1	5.0	Operational	August 2014	May 2019
		Train 2	5.0	Under construction		Q1, 2020
		Train 3	5.0			Q2, 2020
Freeport LNG	Texas	Train 1	4.6	Under construction	November 2014	Q3, 2019
		Train 2	4.6		April 2015	Q4, 2019
		Train 3	4.6			H1, 2020
Elba Liquefaction Project	Georgia	Trains 1-10	2.5	Under construction	November 2016	H2, 2019
Total	72.6					

Source: Company reports

## A BRIEF HISTORY OF LNG PRICING – PACIFIC VERSUS ATLANTIC BASINS

Developments in the pricing of LNG should be seen in the context of how natural gas pricing in general has evolved in recent decades in the three major gas-consuming regions. In simple terms, there has been a clear shift over time in the indexation of gas contracts from crude oil and oil products to gas-on-gas (GOG) competition.

This developed first in North America over the 1980s and 1990s, and today gas in this region is almost exclusively priced on the basis of gas market hubs and the differentials between them and long-term contracting is unusual. In contrast, long-term contracts into Asia Pacific remain dominated by oil indexation. Europe is somewhere between the two, with gas-on-gas pricing based on market hubs predominating in North-West Europe and oil-linked contracts or hybrids of oil-linkage and GOG dominant in much of the rest.

The differences are partly explained by whether markets are dominated by pipeline gas, by LNG, or have a mix of both. North America comes into the first category, Asia Pacific into the second (China being a notable exception) and Europe into the third.

The long-term contract pricing of LNG tends to reflect the characteristics of the market it is targeted at, because it has to compete on price. Most Asian markets are heavily if not totally dependent on imports of LNG for their natural gas supply (Japan, the world's largest LNG importer being a case in point) and oil indexation has persisted. Imports into Europe tend to be priced in different ways depending on which particular market they are going to.

LNG imports into North America are now minimal because of the shale gas revolution.

### On a path to commoditization

Another important trend has been the rise in short-term and spot trading of LNG as this tends to be conducted on a GOG rather than oil-indexed basis. According to the importers' group GIIGNL, around a third of LNG trade was conducted on this basis in 2018, while two decades ago it was practically non-existent.

*LNG is moving inexorably towards a more liquid and commoditized future, with growth in U.S. LNG exports being a major driver.*

Over the past three years we have seen a strong rise in what GIIGNL calls "true spot" trading, defined as transactions in which delivery takes place within three months, with all the complexities involved in booking shipping and regasification slots. In 2018 one in four cargoes were traded in this way and GIIGNL expects the proportion to rise over the coming two years.

Many within the industry see this a strong sign that LNG is moving inexorably towards a much more liquid and commoditized future, with the growth in LNG exports from the U.S. being a major driver as more and more LNG is traded on a portfolio, or aggregated, basis.

risk is passed to tollers/buyers, who pay a set fee for liquefaction capacity.

- The main difference between the Cheniere SPAs and the tolling agreements in other projects is that Cheniere has undertaken to source and transport the feed gas. Tolling requires a proactive approach by the buyer to source and supply gas, including arranging for pipeline capacity where needed. Such an approach may not suit buyers unfamiliar with the U.S. gas market.
- Buyers/tollers are exposed to U.S. gas market prices, through indexation to Henry Hub prices in the case of the Cheniere SPAs, or, in the case of tollers, because they are sourcing

gas themselves from the pipeline grid. This, of course, was a big departure from the conventional approach of generally indexing LNG prices in long-term SPAs to crude oil.

- Crucially, tollers/buyers have the option of not lifting LNG – in adverse market circumstances – so long as they pay the liquefaction tariff. Because the liquefaction tariff is a sunk cost, these projects are expected to continue producing so long as they are covering their short-run marginal costs.
- The new long-term SPAs/tolling agreements contain no destination restriction or price review clauses, of the type common in legacy SPAs.



## STANDING ON THE SHOULDERS OF GIANTS – THE SECOND-WAVE DISRUPTORS

The second wave of U.S. LNG export projects is already well under way. So far in 2019 we have seen FID on three projects, with capacity totaling 30.1 mtpa. Adding just these three projects to the first-wave capacity of 72.6 mtpa, gives a total of 102.7 mtpa. It is worth noting here that it is extremely unusual for a liquefaction project that has taken FID to not proceed to start-up.

### Golden Pass


In February, Qatar Petroleum and ExxonMobil announced they would be going ahead with Golden Pass LNG, a three-train, 15.6 mtpa facility to be located at Sabine Pass in Texas. Expected to cost around \$10 billion, it is due to come on stream in 2024. Engineering, procurement and construction (EPC) contracts have been awarded to a joint venture of Chiyoda, McDermott, and Zachry Group.

No long-term SPAs have been announced so the general assumption in the industry is that the partners will lift the LNG according to their equity interests and that they will finance the facility themselves.

### Sabine Pass, Train 6

In June, Cheniere Energy announced FID on the sixth 4.5 mtpa train at Sabine Pass, which will take total nameplate capacity at that project to 27 mtpa. To help fund the project, Cheniere Partners has entered into 5-year, \$1.5 billion senior secured credit facilities with 29 banks and financial institutions in a transaction that closed in May. Much of the required finance will come from the cash flows of the existing trains, with equity investment of over 50%.

In most recent offtake deals, Cheniere has stuck with the SPA model adopted for earlier trains (for a notable exception, see p12).



In August 2018, Cheniere Marketing signed a 25-year SPA for 2 mtpa on a delivered ex-ship (DES) basis with Taiwan's CPC. The following month it signed a 15-year SPA for 0.7 mtpa with trader Vitol. In both cases, Cheniere said: "The purchase price for LNG is indexed to the monthly Henry Hub price, plus a fee."

#### Calcasieu Pass LNG

In August, project developer Venture Global announced FID on its 10 mtpa Calcasieu Pass venture, which has been receiving a lot of industry attention over the past year, because of rumors concerning the low prices it has offered in the long-term SPAs it has signed to underpin finance. It has 20-year SPAs totaling 8 mtpa with Shell (2 mtpa), BP (2 mtpa), Italy's Edison (1 mtpa), Portugal's Galp (1 mtpa), Repsol (1 mtpa) and Poland's PGNiG (1 mtpa).

One of these deals was reportedly signed for a liquefaction tariff below \$2/MMBtu. However, as details of the SPAs are not in the public domain, this cannot be confirmed. Even the commercial models employed are uncertain.

When Venture Global signed its first SPA (for 1 mtpa with Shell, in February 2016), it said: "Shell will purchase LNG on a free-on-board (FOB) basis for a purchase price indexed to the monthly Henry Hub price plus a facility fee indexed to inflation." This sounds rather like the model in the Cheniere SPAs, but the company has been less forthcoming about subsequent deals.

What can be said with certainty is that Venture Global has successfully closed \$5.8 billion of project finance for Calcasieu Pass, so, despite the interest rates reportedly being a little on the high side, the lenders appear comfortable that the economics of the project are robust.

## 102.7 MTPA

Committed U.S. LNG  
liquefaction capacity

#### FRESH IDEAS

The three projects that have taken FID this year have taken tried-and-tested routes when it comes to commercial models – Golden Pass with equity lifting, Cheniere with the SPA approach it adopted for its first-wave projects, and Calcasieu Pass with its project financing based on offtake being mostly covered by long-term SPAs. It is the projects following in their wake – amongst which there is intense competition – that have been coming up with fresh ideas.

*Projects that have taken FID this year have taken tried-and-tested routes; it is the projects following in their wake that are coming up with fresh ideas.*

They are going further in diversifying price indexation, facilitating access to upstream gas supply rather than depending on just the pipeline grid for supply, and in some cases making big investments in new pipelines to connect gas basins with export projects, enhancing gas supply optionality.

#### Back to the future – indexation to Brent crude

Recognizing that some buyers find comfort in indexation to crude oil – partly because of tradition, partly because such contracts are relatively easy to hedge, and partly because portfolio players have end-users who prefer oil indexation – NextDecade, which is developing the 27 mtpa Rio Grande LNG project at Brownsville in Texas, has begun offering Brent indexation. It has reported that it plans to reach FID on the first phase before the end of 2019.

In April, at the LNG 2019 conference in Shanghai, it signed a 20-year, 2 mtpa SPA with Shell for its proposed Rio Grande LNG project, on an FOB basis, with pricing indexed to Brent for three-quarters of the volumes. It is the first time a long-term SPA for U.S. LNG exports from the Lower 48 has been indexed to oil. The remaining

volumes, it added, “will be indexed to domestic United States gas indexes, including Henry Hub.” Other U.S. indexes include Agua Dulce and the Waha hub in the Permian Basin. The company commented: “To serve the entire global market, projects must offer LNG on multiple indexes.”

#### JKM, TTF and NBP

Multiple indexes certainly seem to be the order of the day for those second-wave projects still racing to reach FID. Along with oil indexation and linkage to U.S. hubs other than Henry Hub, some projects have been signing deals based on Platts’ Japan-Korea Marker (JKM) index.

There is talk of LNG being offered on European gas market indexes, such as TTF and NBP, given that EU buyers would like a direct link to their domestic price index. There remains the question of how to manage the risk of the spread between U.S. and European prices, as most second-wave project developers are not in a position to assume this kind of risk; some project developers have been seeking support for these pricing mechanisms from producers (see p9).

Tellurian, which is developing the 27.6 mtpa Driftwood LNG project, signed a memorandum

of Understanding (MoU) with trader Vitol in December 2018 to sell 1.5 mtpa under a 15-year agreement with price indexed to JKM. Tellurian CEO Meg Gentle commented: “The LNG business is evolving into a true commodity market, which includes LNG purchases and sales based on actual LNG prices rather than indexing to other energy products. JKM has emerged as the most liquid and transparent pricing mechanism for LNG.”

*“We’re building three pipelines and investing upstream to maximize the optionality we have in sourcing gas at the cheapest available cost.”*

**Tarek Souki**, Tellurian

In July, Total and Tellurian finalized an SPA for 1.5 mtpa of JKM-indexed LNG over 15 years on an FOB basis, along with the first definitive agreement under Tellurian’s “equity interest investment” model for 1 mtpa of capacity (see p9). Tellurian hopes to reach FID on the 16.6 mtpa first phase of Driftwood LNG before the end of 2019; it has already secured the necessary



approvals from the Federal Energy Regulatory Commission (FERC) and the DoE.

### Looking upstream

There is a growing feeling in the U.S. that Henry Hub may no longer be the best indexation for natural gas supply to LNG export projects because a focus on producing shale oil associated with gas is leading to large volumes of stranded gas, much of which is being flared. This is particularly so in the Permian Basin, where the value of gas is at times negative.

Among the companies formulating strategies to take advantage of this are NextDecade and Tellurian.

NextDecade plans to construct a pipeline – the Rio Bravo Pipeline – from its Rio Grande project to the Aqua Dulce hub on the expectation that the hub will attract increasing volumes of gas from the Permian Basin and the Eagle Ford Shale as more pipeline capacity comes on stream.

Tellurian has ambitious proposals not only to build its own pipelines to access gas from the Permian Basin and the Haynesville Shale but also to invest substantially in its own upstream production.

“The reason we’re building three pipelines and investing upstream is to maximize the amount of optionality that we have in buying or sourcing gas at the cheapest available cost,” says Tarek Souki, SVP for LNG Marketing and Trading. “We plan to purchase about 15 Tcf of resource in primarily the Haynesville Shale, because it’s the closest to our terminal. We suspect that we can produce gas in the Haynesville and transport it to the plant for around \$2/MMBtu.

“We are also planning to build the much-needed infrastructure to evacuate gas associated with Permian oil production. Currently, producers are flaring excess gas, which is wasteful and harmful to the environment. With the pipeline we are proposing, the Permian Global Access Pipeline (PGAP), we can alleviate the constraint that threatens oil production and have another source of low-cost gas supply – a win-win.”

## 27.6 MTPA

Driftwood LNG's liquefaction capacity at full build-out

### Persuading buyers to take an equity position

One commercial model that has been attracting significant attention is Tellurian's “equity interest investment strategy.” Under this model, potential buyers are invited to become partners by investing \$500 million in 1 mtpa of production capacity over the life of the Driftwood LNG project. Partners are then entitled to lift LNG at the cost of gas supply, transportation and operational costs of liquefaction.

Total, already a shareholder in Tellurian, is firmly on board, having signed up for 1 mtpa for \$500 million. Tellurian is currently in talks with other potential partners and hopes to attract investment of \$6 billion through this route for its first phase.

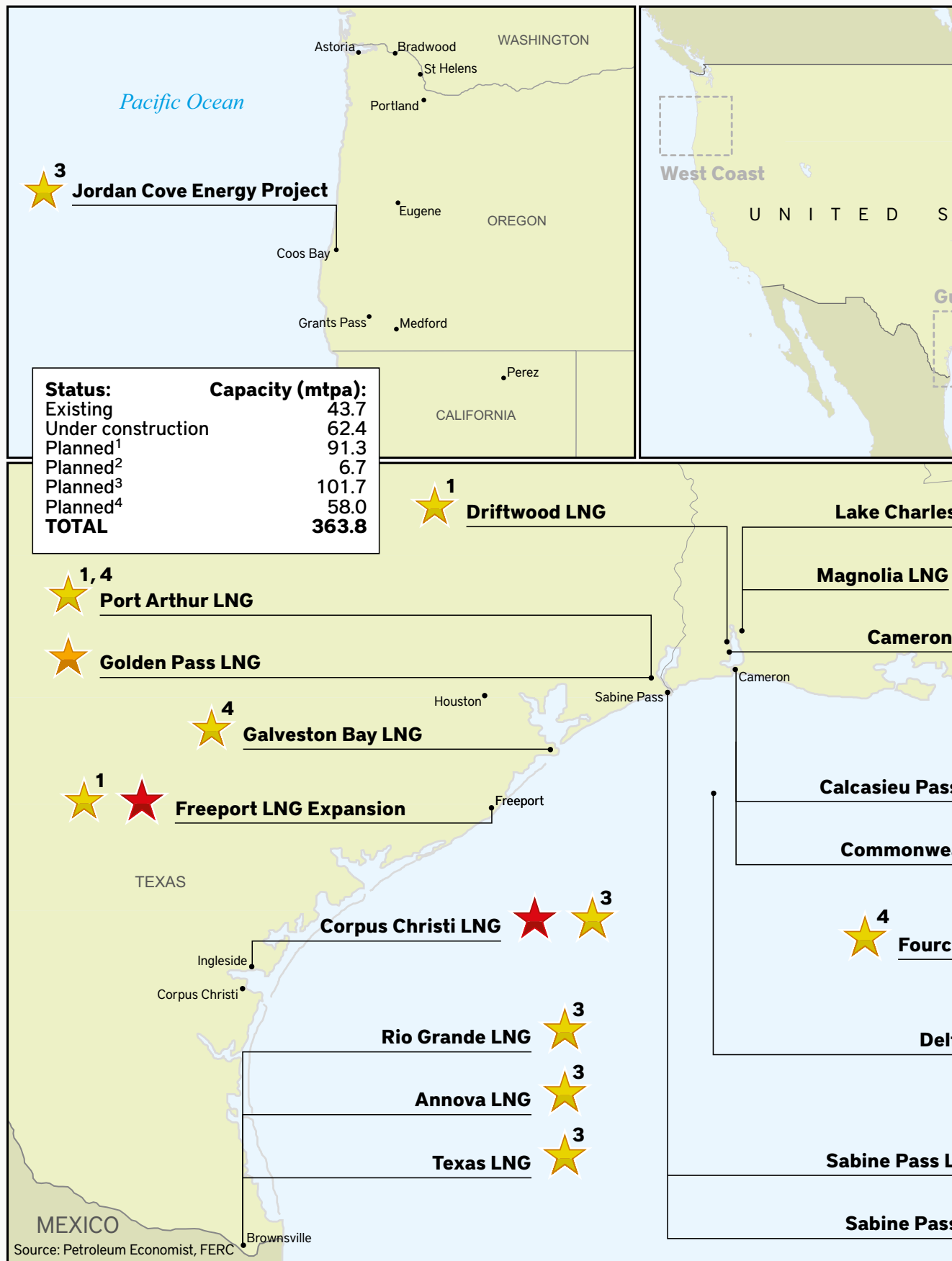
Another transaction that has attracted widespread industry attention is Semptra's recent Heads of Agreement (HoA) with Saudi Aramco, which involves negotiation of a 20-year SPA for 5 mtpa of LNG from the 11 mtpa first phase of the Port Arthur project, currently under development, and a 25% equity investment in the first phase. Port Arthur LNG is now seen by some as a contender for FID in 2019. The project already has the necessary FERC and DoE approvals.

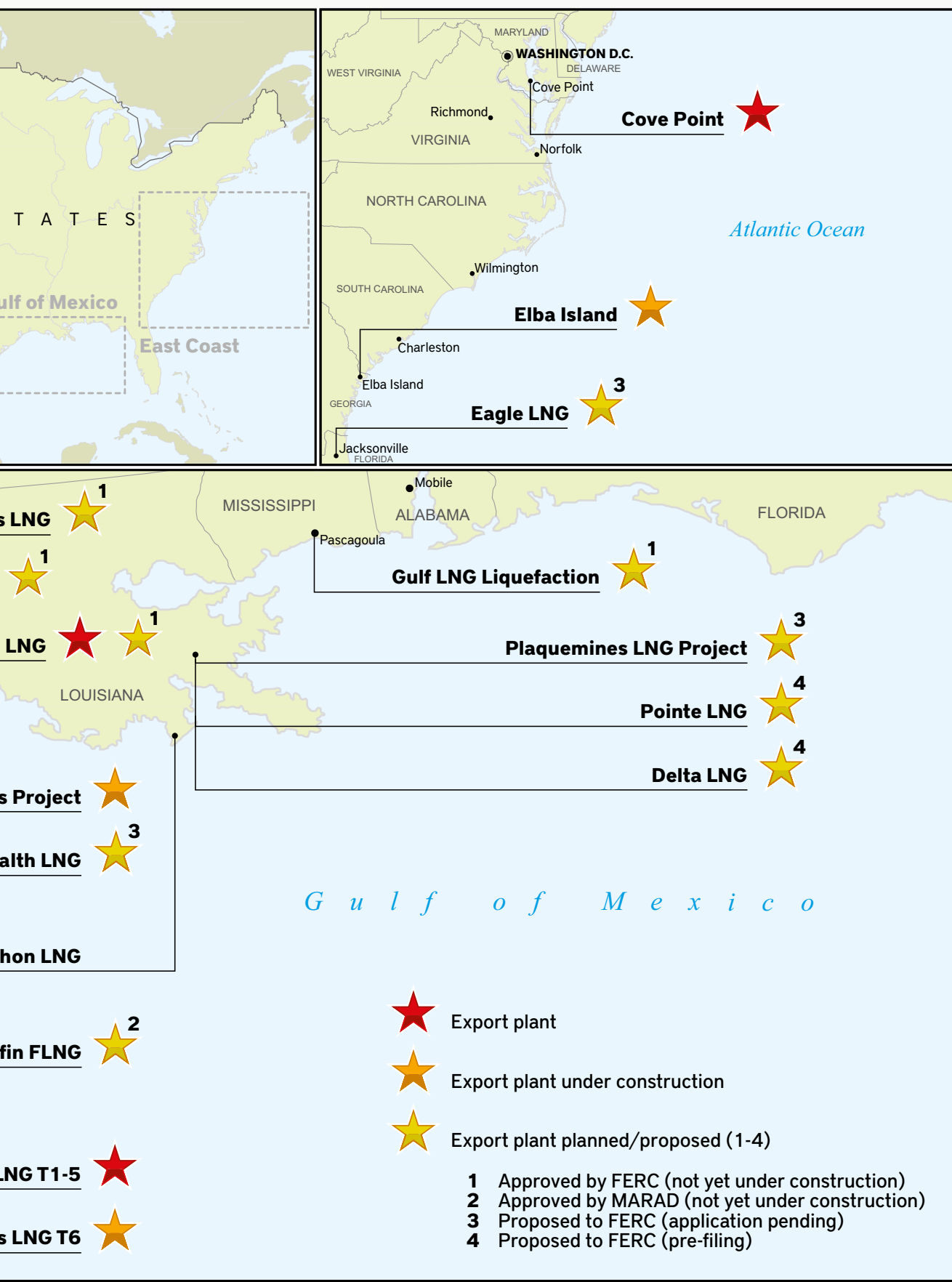
### Giving U.S. gas producers access to global LNG pricing

Yet another eye-catching deal was announced in June by Cheniere. It has signed a Gas Supply Agreement (GSA) with Apache for Corpus Christi, Stage 3 that would enable the producer to access global LNG pricing without having to invest in a liquefaction project.

“Apache will receive an LNG price, net of a fixed liquefaction fee and certain costs incurred by Cheniere,” said Cheniere. CEO Jack Fusco said the

## The Stampede to Export LNG From the United States







15-year GSA “represents a commercial evolution in the U.S. LNG industry.” The company says the “core principles” are: to generate a take-or-pay style fixed liquefaction fee, similar to a standard Henry Hub-linked LNG deal; and to secure supply for Stage 3 by leveraging Cheniere’s access to global gas market prices.

There is a widespread view that this deal could set a precedent as other producers attempt to access more attractive prices for their gas than they are likely to realize in the oversupplied U.S. domestic market.

We have yet to see how much take-up there will be on these various options but the picture will

*“Apache will receive an LNG price, net of a fixed liquefaction fee and certain costs incurred by Cheniere,” said Cheniere.*

become clearer over the coming twelve months as projects do or not reach FID. As we discuss on p19, the clock is ticking as competing projects elsewhere in the world continue to move ahead. One point worth noting is that so far the uptake has been mainly on the part of portfolio players and traders rather than end-consumers – in other words, entities that are well-placed to manage a diversity of risk exposures.

**Figure 2**

**How the Cheniere-Apache transaction would work**



Source: Cheniere Energy

## 2

# The Buyer Perspective: Searching for Flexibility and Pricing Diversity

**W**hile, on the supply side of the business, there has been strong, more or less exponential growth in the volumes of LNG produced,

there have been fundamental changes on the demand side of the business – not just growth in the number of buyers but also in their diversity.

Between 2008 and 2018, the number of countries importing LNG grew from 18 to 42, while the volume of LNG traded grew from 172 million tonnes (Mt) to 314 Mt, according to importers group GIIGNL (LNG trade volume statistics can vary significantly from source to source because of the different methodologies used). In its latest LNG Outlook, Shell expects demand to reach about 384 Mt in 2020.

Growth is being driven in particular by China where determined policies to address air pollution and climate change have led to astonishing growth in demand for LNG (see p17). The supply glut being experienced in markets around the world would have been much more severe had it not been for China.

Other countries exhibiting strong demand growth include India, Pakistan, Bangladesh, Thailand, Indonesia, Singapore, Poland and the Netherlands.

### MARKET LIBERALIZATION DRIVING UNCERTAINTY

Two decades ago the typical LNG buyer was a gas or electricity utility, with a monopoly and therefore captive customers, and a strong credit rating. The emphasis was on reliable supply rather than cost-competitiveness as costs could generally be passed on to customers.

Today even big utility customers are facing competition in their home markets and have become much more price-sensitive as a result. They also face volume uncertainty as competition for market share intensifies. Increasingly, utilities are having to compete for volumes against indigenous NOGCs – a big shift that requires significant market-side reform.

Japan – still the world's largest buyer of LNG, though not perhaps for much longer (see p17) – is a prime example. It has been liberalizing its

electricity and gas markets for two decades. Full liberalization of retail sales was completed in April 2016 for electricity and in April 2017 for gas. Traditionally, Japan's electricity and gas utilities were regional, vertically integrated monopolies. This structure is now breaking down and reforms have been accelerated by the impacts of the Fukushima nuclear accident in 2011 and the imperatives of the Paris Agreement on climate change, signed in 2015.

*The challenges of opening up new LNG markets, even with the benefits of FSRUs, should not be underestimated. Even markets desperate for more gas have seen their hopes dashed.*

Japan's drive to promote competition was primarily to reduce costs to consumers and increase their service options. It has inevitably had the effect of reducing demand certainty for gas and power utilities. Whereas previously they were comfortable buying LNG on contracts with terms of 20-30 years, they are now understandably

reluctant to do so. This reluctance – reflected in other countries that have liberalized their energy markets – has had major implications on the sanctioning of new LNG supply projects around the world.

#### NEW PLAYERS

“Traditional” LNG buyers have been joined by new types of end-buyer, some of which require only small volumes and whose credit ratings may be below investment grade. Some are particularly price sensitive and require the flexibility to modulate volumes according to market circumstances.

In general, there have been downward trends over the past decade in the volumes sought in long-term contracts and their durations – though there was a rebound in new long-term contracting in 2018. There has been a general decline in average creditworthiness.

The rise in the number of end-buyers has undoubtedly been facilitated by the growth of floating regasification technology; Floating Storage and Regasification Units (FSRUs) are quicker and cheaper to deploy than onshore regas terminals. They also lend themselves to temporary supply, as they can be used for a period of just a



few years and then re-deployed elsewhere.

That said, the challenges of opening up new LNG markets, even with the benefits of FSRUs, should not be underestimated. Even markets with well-developed gas industries and desperate for more gas have seen hopes of rapid growth dashed. They include Pakistan, Bangladesh and Thailand – and even India, a long-established importer, has seen import capacity grow much less quickly than hoped.

The relatively slow pace of new LNG market development, particularly in South and South-East Asia, is causing some exporters to work on new value-chain business models to stimulate new demand or incremental demand growth, and/or to look to more mature markets that are themselves re-aligning their energy mix, for example in China and the Middle East.

### RISE OF THE AGGREGATORS

Meanwhile, the distinction between sellers and buyers has blurred, as intermediaries have emerged, notably “portfolio players” but also

traders. Large portfolio players such as Shell and Total have been aggregating portfolios of supply contracts and sales contracts with end-buyers, putting them in a good position to offer flexibility and diversity to those buyers seeking it. Portfolio players are also taking a greater role in getting supply projects to FID, either through agreeing substantial SPAs or by taking equity and lifting LNG according to their equity shares.

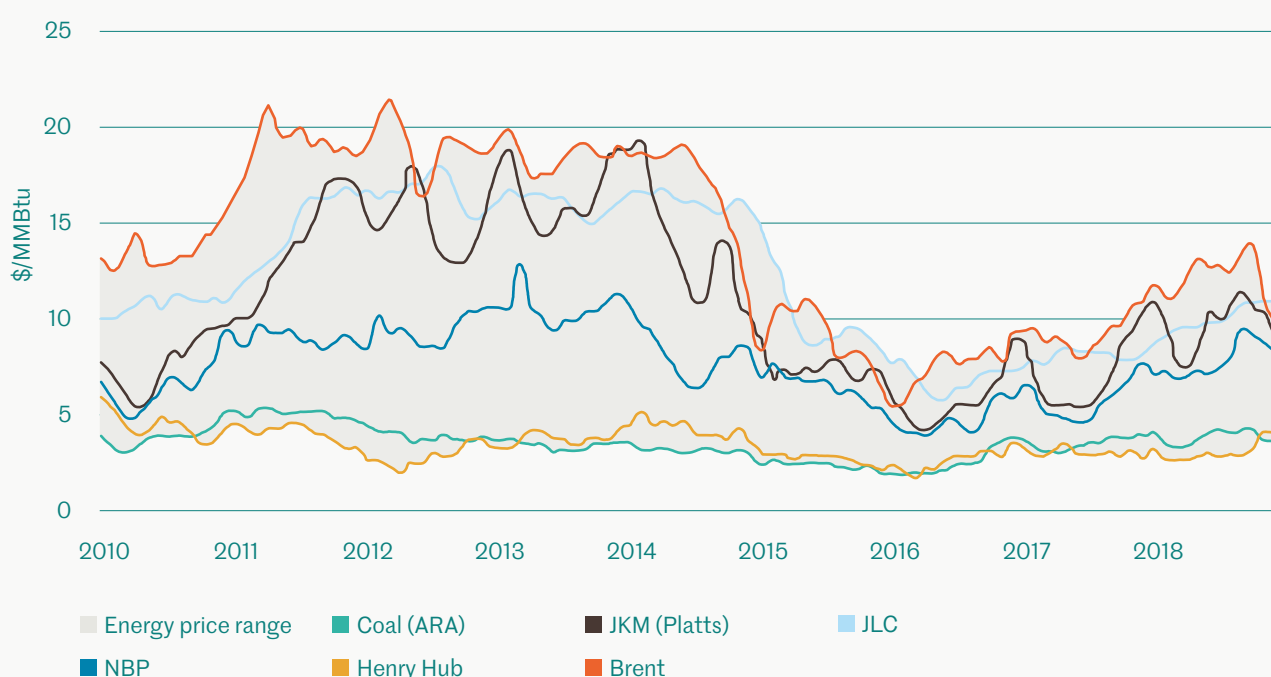
There has been growing involvement in LNG on the part of energy traders – such as Vitol, Trafigura and Gunvor – who increasingly have been taking long-term supply positions (see p8), encouraged by the growth in spot and short-term trading (see p5) and the general direction of travel towards greater commoditization.

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The number of LNG-importing countries in 2018

Figure 3

Global Energy Prices, 2010-2018



Source: Shell LNG Outlook 2019

### THE SEARCH FOR PRICE DIVERSITY

We have already seen (on p5) that long-term LNG contracts into Asia tend to be priced on the basis of indexation to oil whereas gas imports into Europe, whether by pipeline or LNG, can be hub-based, oil-based or a mixture of the two, depending on which market they are going into.

*Asian buyers made clear their frustration at the “Asian premium” and began seeking pricing diversity and an end to destination restrictions in contracts.*

During 2011-2014, when oil prices were mostly north of \$100/barrel, there was a wide divergence in the average prices paid by gas consumers in the three main gas regions, with prices in Asia Pacific much higher than those in Europe, which again were higher than those in North America, where the shale gas revolution has made gas cheap and abundant. Not surprisingly, this led to a ramp-up in cross-basin arbitrage and trade between the Atlantic Basin and the Pacific Basin.

During this period, some Asian buyers made clear their frustration at what became known as the “Asian premium” and began seeking more diversity in pricing mechanisms and an end to

destination restrictions in LNG contracts. They were therefore attracted to the imminent large-scale exporting of LNG from North America, mainly the United States, which offered Henry Hub linkage and no destination restrictions. Some even took upstream positions in North America.

### CONVERGENCE AND DIVERGENCE

The oil price crash of 2014 led a re-convergence of prices in the main markets, as the chart above illustrates. Oil-indexed LNG contracts suddenly looked much cheaper, calling into question the desirability of exposure to Henry Hub, especially given the fixed liquefaction tariff involved and the transportation costs incurred in getting LNG from the U.S. Gulf of Mexico into Asia Pacific market.

Today the situation has again changed because of the LNG glut that has manifested over the past twelve months. Long-term oil-indexed LNG contracts are now looking two to three times more expensive than gas sourced on a spot basis with prices linked to JKM, currently at around \$4.65/MMBtu, or TTF, at around \$4.20/MMBtu. That compares with an average import price into Japan (which includes some spot) of around \$9.50/MMBtu. Not surprisingly, some buyers are exercising the flexibility options in their long-term contracts and topping up with spot gas. Some are building in a price hedge with multi-tiered pricing in a single SPA.



All this helps to explain why LNG project developers in the U.S. are doing all they can to make their offers look attractive. As for the response from end-buyers, it is currently difficult to judge because for the most part negotiations are still under way and we have yet to see how

popular all the new options will turn out to be. So far, the main response (see p15) has been from portfolio players and traders, who are clearly finding pricing diversity attractive. The picture should become clearer as we approach the end of 2019.

## FUELLING THE GAS-HUNGRY DRAGON

Natural gas consumption growth in China is unprecedented. Between 2015 and 2018 it grew from 195 Bcm to 283 Bcm. That increment of 88 Bcm would on its own constitute the world's tenth-largest gas market – on a par with Germany, which consumed 88.3 Bcm in 2018.

Growth has been driven by policies put in place under president Xi Jinping to bring back blue skies to heavily polluted cities and to meet climate change action pledges under the Paris Agreement. Central to these policies has been a determined switch from coal to gas, in heating and in electricity.

In the winter of 2017/18, over-enthusiastic application of these policies led to major gas shortages during the height of winter. China quickly learnt its lessons from this experience and was much better prepared last winter.

China meets its gas demand through domestic production and imports by pipeline and in the form of LNG.

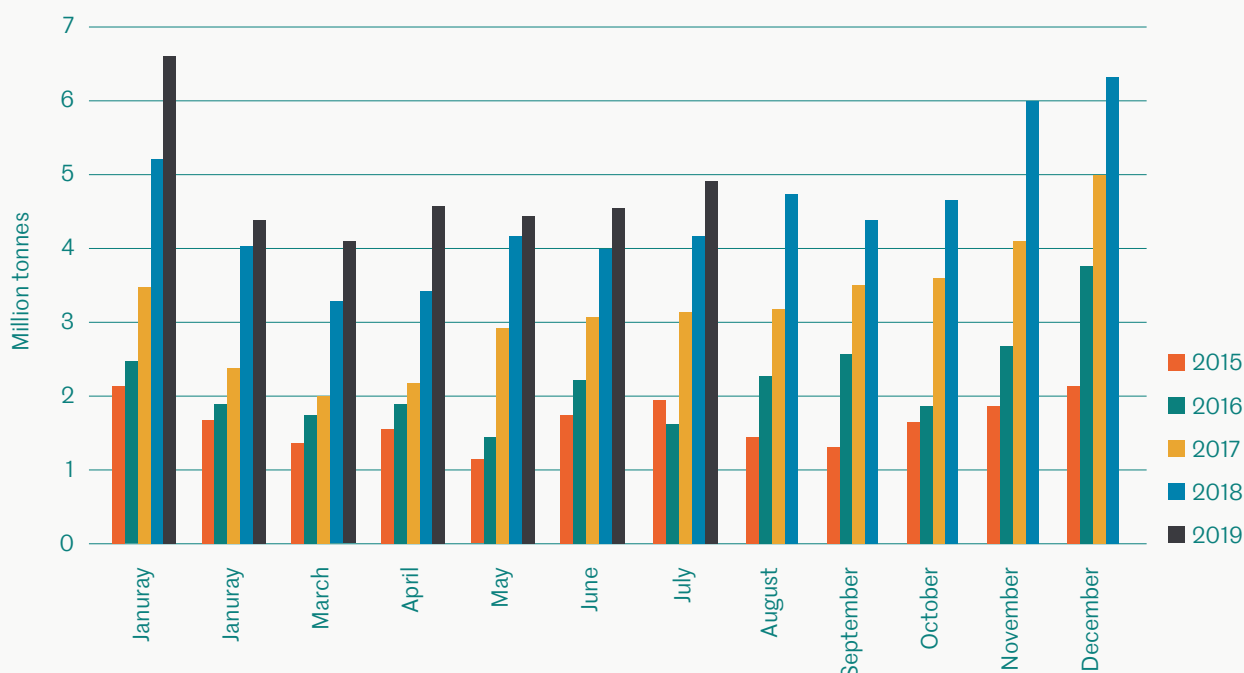
However domestic production has grown only slowly, so imports have skyrocketed. Growth has been particularly strong in LNG as the chart below demonstrates.

Between 2015 and 2018 LNG imports grew from 19.7 Mt to 54.0 Mt, a rise of 275%. Over the past twelve months the annual growth rate has been slowing, from a peak of 46% in 2017, and is currently running at around 18% year-on-year. If that growth rate were to be maintained, demand would grow to 88 Mt in 2021, more than enough to put China ahead of Japan as the world's largest LNG consumer. Japan consumed 82.5 mtpa in 2018 and its imports are expected to decline.

It is therefore a matter of some concern for U.S. LNG export projects striving to reach FID that the worsening trade dispute with China currently locks them out of the world's fastest-growing and soon-to-be-largest LNG market (see p19).

Figure 4

China's Astonishing LNG Import Growth, 2015-2019 (million tonnes)



Source: China Customs Statistics

### 3

## Where Do We Go From Here?

With the LNG market in a state of rapid transition, the future is shrouded in considerable uncertainty, but the expectation is that commoditization and liquidity will continue to grow as the industry matures – and that both first-wave and second-wave U.S. LNG export projects will help drive these trends. So, how much capacity can we realistically expect from the second wave?

As we have seen (on p3), the first wave of LNG exports projects continues to ramp up production as construction is completed on new trains and they start up, taking capacity to 72.6 mtpa by 2021/22. The three FIDs on second-wave projects – Golden Pass, Sabine Pass T6 and Calcasieu Pass – add another 30.1 mtpa to the first-wave total, make it pretty certain that in four to five years from now the U.S. will have export capacity of at least 103 mtpa.

A crucial question is how well that capacity will be utilized, given the supply glut that has emerged over the past twelve months. There has been much talk of U.S. projects having to shut in capacity, though little evidence of that so far.

Beyond the 103 mtpa of capacity already committed, the projects striving to reach FID this year and next face challenges. That said, there are several credible contenders:

- NextDecade desires to reach FID on Rio Grande LNG by the end of 2019, leaving a few months to secure enough offtake contracts to underpin the finance it will need. Advantages for this project include closest proximity to the prolific

Permian Basin and a competitively priced, signed EPC agreement with Bechtel.

- Tellurian has made progress during 2019 with Driftwood LNG and has said it wants to take FID before the end of the year. But, like NextDecade, it needs to make significant progress with its strategy in a tight timeframe. In its latest company presentation, it does not set out a firm FID target date but insists that start-up is still expected in 2023.

*The picture will become clearer as second-wave U.S. LNG projects either reach FID – or find their windows of opportunity begin to close.*

- Sempra Energy has its HoA with Saudi Aramco for Port Arthur LNG. But that still needs to be firmed up and on its own will not be enough to underpin significant project financing. Also waiting to be firmed up is a 20-year 2 mtpa SPA with Poland's PGNiG. The fact that the project already has the necessary FERC and DoE approvals is certainly a point in its favor. It remains to be seen whether the project can firm up enough bankable offtake for FID to happen in 2019. In its second-quarter financial results, Sempra did not commit to a firm FID date.
- The second-wave project with arguably the most credibility is Cheniere's Corpus Christi, Stage 3, because of the cash flows being generated by its existing projects, because it is an expansion project, and because of Cheniere's proven track

record in marketing. Also, it has more flexibility in the size of the project, due to using smaller trains and scalability. The project has yet to complete the permitting process and, while it has its GSA with Apache (see p9), it will likely be seeking more offtake before taking FID. Cheniere recently said it expects FERC approval before the end of 2019; it received a positive Environmental Assessment from the FERC in March.

There are numerous other projects in the second-wave with varying degrees of progress, as our map on pages 10-11 illustrates. They include the following:

- The sponsors of the 16.5 mtpa Lake Charles LNG project, Shell and Energy Transfer, have just asked the FERC to extend the date by which the project should be completed to the end of 2025. The earliest that the project is now expected to reach FID is the end of 2020.
- The 8 mtpa Magnolia LNG project being developed by LNG limited (LNGL) has yet to secure sufficient tolling agreements or SPAs to proceed and has been delayed several times. It has secured all the necessary permits, so offtake and financing remain the stumbling blocks.
- The 8.4 mtpa Commonwealth LNG project anticipates taking FID in the fourth quarter of 2020, having agreed an HoA with trader Gunvor for 1.5 mtpa over 15 years. The FERC has just accepted the project's filing application.

### CHINA CRISIS

The big challenge facing most of the contenders is that, while LNG is moving towards commoditization, ventures seeking project finance still need to sign up bankable offtakers for most of their capacity. It is therefore extremely unhelpful that the trade dispute with China has locked them out from the world's fastest-growing market, at least for now.

When the trade dispute first flared up, over a year ago, LNG export projects put on a brave face and shrugged their shoulders, perhaps hoping it would soon be over. Many false dawns later, there is little sign of a respite; if anything the dispute

is worsening. Chinese buyers have not signed any long-term contracts with U.S. projects since early 2018 – when Cheniere firmed up two SPAs running until 2043 for a total of 1.2 mtpa with PetroChina – and even spot cargoes to China seem to have dried up.

China at one point imposed 10% tariffs on LNG imports, later raising them to 25%. But politics, rather than tariffs, now seems to be the driving factor. The geopolitical issues are further complicated by the possibility that Beijing may yet intervene in the escalating public protests in Hong Kong. So far, it has not.

### COMPETITION FROM OTHER PROJECTS

Moreover, there is considerable competition for the supply-demand gap expected to open up four to five years from now, from credible projects in Qatar, Russia, Africa and elsewhere, and indeed from other second-wave projects in the U.S..

So far in 2019 we have seen the 12.9 mtpa Mozambique LNG project take FID in June. Novatek's 19.8 mtpa Arctic LNG 2 project has been under construction for some time and reached a formal FID September 5, as this report was going to press. Qatar's 30+ mtpa expansion is widely regarded as certain to go ahead, with FID expected in early 2020.

These projects alone amount to 63 mtpa of new capacity likely to begin coming on stream by 2024/25, in addition to the 30.1 mtpa of U.S. second-wave capacity. More FIDs are likely in 2019, including perhaps the Rovuma LNG project in Mozambique and the "Train 7" project in Nigeria.

### A RACE AGAINST TIME

It remains to be seen which of the new U.S. commercial/pricing models will be successful but the picture will become clearer over coming months as second-wave U.S. LNG projects either reach FID – and move into their construction phase – or find that their windows of opportunity begin to close as other projects move ahead. What looked at first sight like a stampede is in reality more of a race. The clock is ticking.

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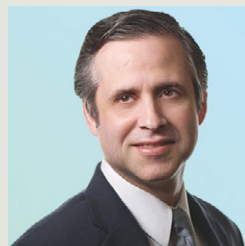
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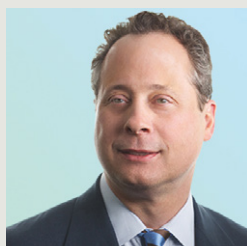
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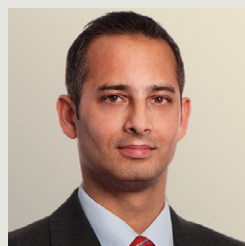
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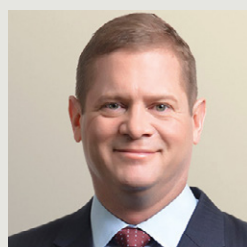
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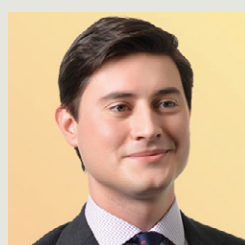
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