

# Opportunities and challenges of China's LNG expansion

As China's LNG demand grows, pressure to turn domestic gas sector liberalization guidelines into policy and push for greater flexibility in international supply agreements will follow, with challenges and opportunities for all LNG stakeholders

**LNG special report**

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## OPPORTUNITIES AND CHALLENGES OF CHINA'S LNG EXPANSION

China's coal-to-gas conversion policies, GDP expansion and industrial recovery are increasing the country's gas consumption to record highs. With domestic output and pipeline imports unable to keep up, LNG is needed to bridge this gap.

In 2017, China became the largest contributor to global LNG consumption growth, surpassing South Korea as the world's second biggest LNG importer, and its share of global LNG demand is expected to converge with that of Japan by 2030.

The country's spot requirements are also growing, as its contracted obligations rise much slower than its demand projections, meaning Chinese importers will play an increasing role in global LNG market fundamentals and prices.

As the share of LNG in China's gas consumption rises, domestic competition grows, and a robust LNG benchmark emerges, the erosion of the traditional oil-linked LNG supply model becomes inevitable, in favor of deals that are shorter, smaller and more flexible, and priced not against an associated commodity but LNG itself.

### Energy mix, economy and industry driving gas demand

China's policy directives are encouraging coal-to-gas switching to combat air pollution and are set to continue driving up the share of natural gas in the country's energy mix and domestic consumption of the fuel.

As part of its 13th Five-Year Plan, the Chinese government intends to cut annual coal consumption by 160 million mt by 2020 and raise the proportion of gas in the country's energy consumption to 10% by 2020, and 15% by 2030 – up from 7% in 2017.

China's expanding economy and the revival of its industrial activity have also been key drivers of energy and gas consumption growth over the past year, and could play an even bigger role than fuel conversion programs in boosting demand looking forward.

The National Development and Reform Commission forecasts Chinese annual gas demand to nearly double from 237 Bcm in 2017 to 450 Bcm by 2030.



## Domestic production, pipeline imports and other supply constraints

Feeding China's much-increased demand was always going to be a challenge due to limited domestic production, slowing pipeline imports and distribution network bottlenecks.

Domestic gas production in 2017 grew by 11% year on year to 168.7 Bcm, below consumption, which expanded 15% year on year to 237 Bcm, according to data from China's National Bureau of Statistics.

The pace of growth in pipeline imports has also slowed, with 41.9 Bcm imported through the pipelines in 2017, only 8.8% higher than in 2016, according to data from the General Administration of Customs. This was lower than the 13.3% year-on-year growth in 2016.

The majority of China's gas imports since 2012 have been by pipeline, from Central Asia via the West-East pipeline system and from the Shwe field in Myanmar. The annual capacity of the Central Asia-China system now stands at 55 Bcm/year, while the capacity of the Myanmar pipeline is 12 Bcm/year.

Meanwhile, the Power of Siberia pipeline is slated to send 38 Bcm/year from Russia's East Siberia into China. A start-date of December 2019 had been earlier announced, but industry watchers expect this to be delayed. The timeline of the West Siberian route, or Altai, with 30 Bcm/year of capacity, is even less clear, while a third pipeline import project of 8 Bcm/year connecting Russia's gas resources off Sakhalin Island is also being considered.

China's predominantly west-east oriented gas pipeline system meanwhile means there is limited potential to solve China's supply imbalances and pipe gas from the less-congested LNG receiving terminals in the south to the peak winter demand markets of the north. Record LNG imports of 37.8 million mt in 2017 were well below the 58 million mt of nameplate capacity of China's 16 operational LNG terminals, but China's northern gas infrastructure was over utilized over the past winter season.

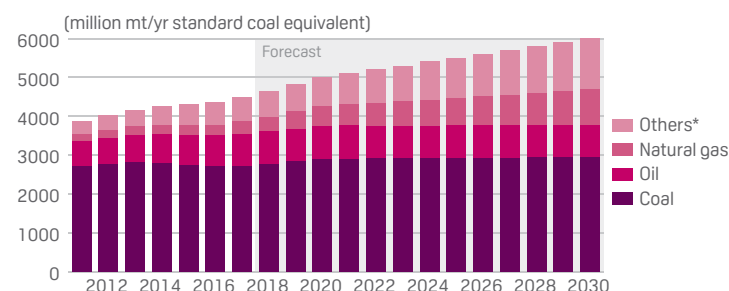
## LNG bridging gas supply-demand gap

With domestic output and pipeline imports unable to keep up with gas consumption growth, LNG will be increasingly needed to bridge the supply-demand gap, especially in the highly populated coastal regions, largely removed from gas fields and import pipelines.

China's LNG consumption jumped 47% from 25.7 million mt in 2016 to 37.8 million mt in 2017, surpassing South Korea as the world's second largest LNG importer, and becoming the largest contributor to global consumption growth.

The country's LNG demand is set to nearly double to 68 million mt/year by 2023 and its share of global LNG demand is expected to converge with that of Japan, the

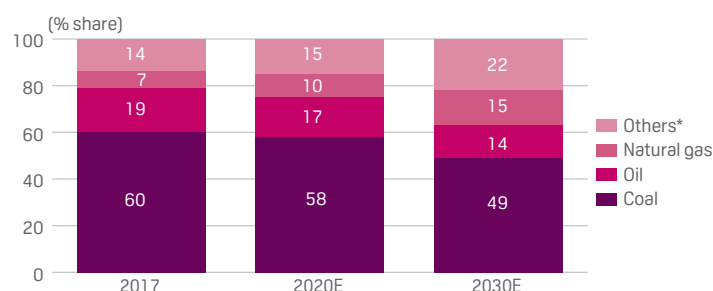
## CHINA'S ENERGY MIX 2011-2030



Source: EIA, NDRC's 13-5 year plan targets

\* Hydro, solar, wind and nuclear

## CHINA'S ENERGY MIX



Source: EIA, NDRC's 13-5 year plan targets

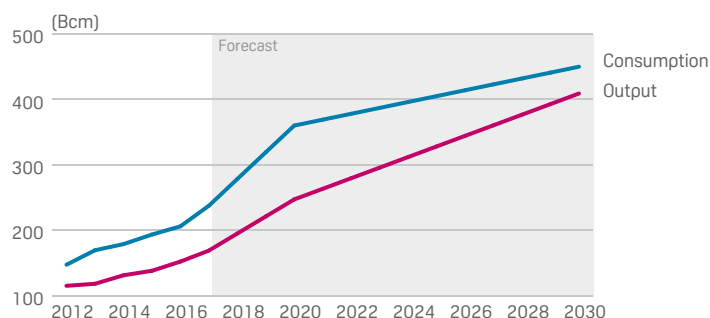
\* Hydro, solar, wind and nuclear

## EXISTING AND POTENTIAL PIPELINE GAS IMPORT CAPACITY (Bcm/year)

Existing	Central Asia	55
Existing	Myanmar	12
Planned	4th Central Asia line	30
Planned	Power of Siberia	38
Planned	West Siberia - Altai project	30
Total		165

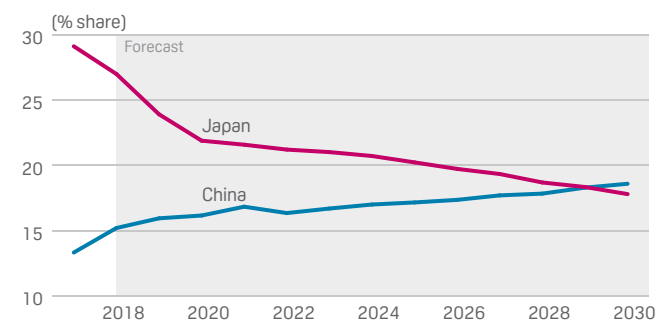
Source: S&P Global Platts

## CHINA DOMESTIC GAS OUTPUT VS CONSUMPTION



Source: National Bureau of Statistics China, NDRC's 13-5 year plan targets, others

## CHINA/JAPAN SHARE OF GLOBAL LNG TRADE SET TO CONVERGE



Source: S&P Global Platts Analytics

world's biggest consumer, by 2030, according to S&P Global Platts Analytics.

### Higher exposure to LNG spot markets

China was over-contracted by 8.65 million mt in 2016. Despite exceptional demand growth, China's total LNG imports in 2017 remained slightly below its total originally contracted volume.

However, China's exposure to the international LNG spot markets has increased substantially over the past year, as state-owned importers have replaced contracted volumes with cheaper spot deliveries.

And the pace of China's spot demand growth seems set to pick up, as its contracted obligations grow slower than its demand projections over the next five years, with more than a quarter of the country's estimated 2023 demand of 68 million mt still uncontracted.

In the international stage, China's growing reliance on spot purchases means the importer will play an increasing role in balancing the global LNG markets and moving international prices.

Domestically, higher uncontracted imports mean greater influence of spot prices versus term contracts, and a more competitive downstream sector, as demand and the number of active spot market participants continue to grow.

"China will have to rely on the spot market, which would require a significant leap of faith into the broader global LNG market – a faith that has gradually been adopted by some of Asia's most conservative LNG buyers," said Madeline Jowdy, Senior Director, Global Gas and LNG with S&P Global Platts Analytics.

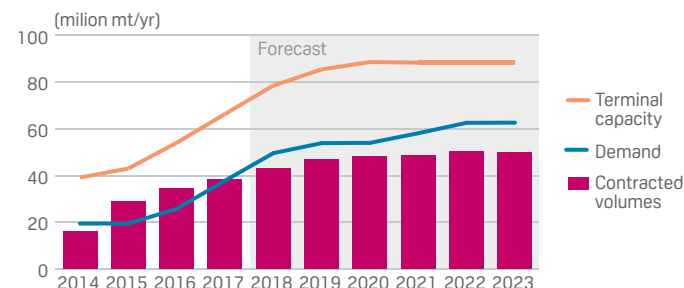
### Independent buyers elbow their way in

Growing domestic consumption and the opportunity to trade the arbitrage between low spot LNG prices and regulated gas hub prices or oil-linked LNG contracts has led to a growing number of new market entrants in China. They include gas distribution companies and city gas companies such as ENN, Guanghui, Jovo and Beijing Gas Group, as well as power utilities like Huadian, Huaneng and Guangdong Development.

A slew of term contracts have also been signed by these independent players. In 2017, long-term contracts by non-NOCs accounted for 0.5 million mt, or 1.3% of contracted volumes into China. This will rise to 4.42 million mt, close to 10% of contracted LNG in 2020.

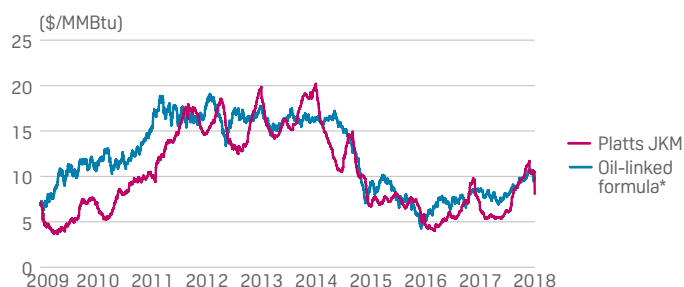
Given state incumbents' resistance to grant third-party access to existing terminals, some independent buyers are also building their own LNG import facilities, despite being hampered by high taxes and an onerous approval process. Both Jovo and Guanghui Energy have built import facilities in Dongguan and Jiangsu, respectively, while

### CHINA IMPORTS PROJECTIONS VS CAPACITY



Source: S&P Global Platts Analytics

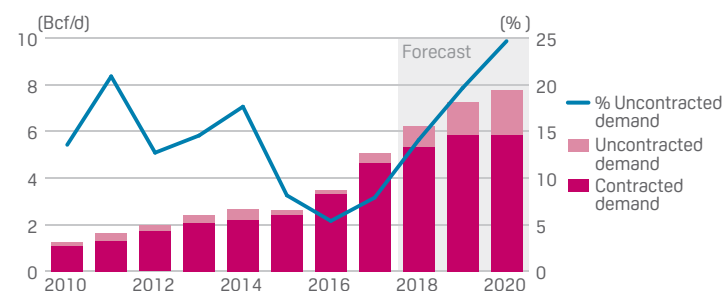
### ASIAN LNG SPOT PRICES VERSUS OIL-LINKED CONTRACTS



Source: S&P Global Platts

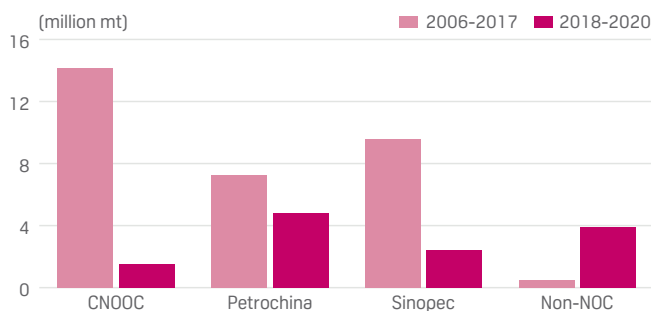
\* Formula is based on 14.5% of JCC plus a 50-cent constant

### CHINA'S GROWING SHARE OF UNCONTRACTED DEMAND



Source: S&P Global Platts Analytics

### CHINA'S LNG CONTRACTED VOLUMES BY BUYER



Source: S&P Global Platts Analytics



ENN's Zhoushan terminal and Shenzhen Gas' import facility in Guangdong are scheduled for commissioning in 2018.

### Domestic market policies under pressure

Beijing has initiated domestic market reforms affecting LNG on three key fronts: boosting third-party access to LNG terminals, liberalizing domestic gas pricing and promoting a trading hub.

Progress has so far been limited. But this could change, as the share of LNG in total Chinese gas supply increases, and more transparent pricing mechanisms are developed in the LNG industry.

**Third party access:** As China's gas demand continues to increase, state-owned companies will be under mounting pressure to free up terminal and pipeline infrastructure to more end-users. By turning guidelines into law, and setting achievable targets for NOCs to allocate capacity, China could boost LNG terminal capacity utilization from around 65% in 2017, improve end-user cost efficiency, diversify LNG supply sources, and enhance security of supply.

**Domestic gas price liberalization:** As the share of LNG in total Chinese gas supply increases and the traditional oil-linked LNG supply model erodes in favor of LNG indexation, there will be a political imperative to inject domestic pricing formulas that more closely reflect LNG market fundamentals. Since 2011, the Chinese government has sought to reform domestic gas pricing by linking city gate prices to a basket of competing fuels including fuel oil and LPG, in order to ensure gas price competitiveness. But the prices often contain an extensive time-lag that can span several months for both LNG and pipeline gas relative to oil prices. A major change took place in November 2016 in which suppliers and buyers negotiated the city-gate price within a 20% range of the baseline price for each trade.

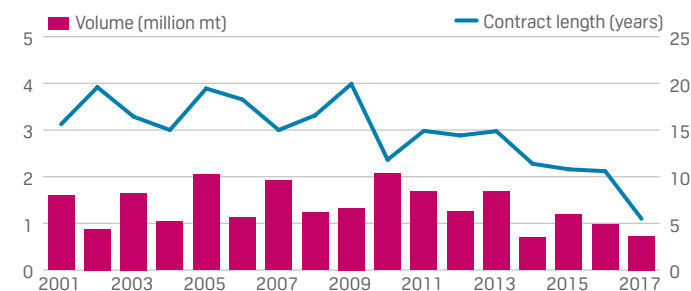
**Shanghai trading hub:** Shanghai, with its well-developed interconnecting regional pipelines, as well as access to several LNG terminals along the east-coast, has been

### TERM CONTRACTS SIGNED BY INDEPENDENTS SINCE 2015

Buyer	Seller	Contract Type	Signing Year	Contract Start	Duration	Volume
ENN	Chevron	SPA	2016	2018	10	0.65
ENN	Total	HOA	2016	2018	10	0.50
ENN	Origin	SPA	2016	2018	5	0.28
Guangzhou Gas	Woodfibre LNG	HOA	2016	2020	25	1.00
Huadian	BP	SPA	2015	2020	20	1.00
Huadian	Chevron	HOA	2015	2020	10	1.00
JOVO	Petronas	SPA	2016	2017	6	0.70
JOVO	Chevron	Key Term Agreement	2016	2018	10	0.50

Source: S&P Global Platts, company reports

### AVERAGE CONTRACT LENGTH AND VOLUME OVER TIME



Source: S&P Global Platts Analytics

### CHINA'S AVERAGE TERMINAL UTILIZATION IN 2017

65%

“China will have to rely on the spot market, which would require a significant leap of faith into the broader global LNG market – a faith that has gradually been adopted by some of Asia's most conservative LNG buyers,”

– Madeline Jowdy, Senior Director, Global Gas and LNG with S&P Global Platts Analytics

### CHINA LNG TERMINALS

Receiving terminals	Capacity (million mt/yr)	Operator	Province	Region	Status	Commissioning date
Guangdong Dapeng LNG	7.0	CNOOC	Guangdong	South	Operating	2006
Shanghai Yangshan LNG	3.0	CNOOC	Shanghai	East	Operating	2008
Fujian Putian LNG	6.3	CNOOC	Fujian	South	Operating	2009
Jiangsu Rudong LNG	6.5	PetroChina	Jiangsu	East	Operating	2011
Dalian LNG	5.5	PetroChina	Liaoning	North	Operating	2011
Zhejiang Ningbo LNG	3.0	CNOOC	Zhejiang	East	Operating	2012
Dongguan LNG	1.0	JOVO	Guangdong	South	Operating	2012
Tangshan Caofeidian LNG	6.5	PetroChina	Hebei	North	Operating	2013
Tianjin FSRU	2.2	CNOOC	Tianjin	North	Operating	2013
Zhuhai Gaolan LNG	3.5	CNOOC	Guangdong	South	Operating	2013
Qingdao LNG	5.0	Sinopec	Shandong	North	Operating	2014
Hainan Yangpu LNG	3.0	CNOOC	Hainan	South	Operating	2014
Guangxi Beihai LNG	3.0	Sinopec	Guangxi	South	Operating	2016
Jiangsu Qidong LNG	0.6	Guanghui	Jiangsu	East	Operating	2017
Yuedong LNG	2.0	CNOOC	Guangdong	South	Operating	2017
Tianjin Binhai LNG	3.0	Sinopec	Tianjin	North	Operating	2018
Zhoushan LNG	3.0	ENN	Zhejiang	East	Due to start up	2018
Shenzhen Gas LNG	0.8	Shenzhen Gas	Guangdong	South	Due to start up	2018
Shenzhen Diefu LNG	4.0	CNOOC	Guangdong	South	Due to start up	2018

identified as an obvious candidate to establish a regional market hub, able to reflect the interaction of prices and volumes between China's pipeline gas and LNG imports. The initiative has failed to fulfill the two initial stages of market hub development as outlined by the US Energy Information Administration (EIA): gas price deregulation and sales unbundling, and third-party access to terminals. However, bilateral trade liquidity and price transparency are steadily growing amid rising gas consumption.

#### Rigid LNG contracts face headwinds

There is an inherent risk in pricing long-term LNG against a different commodity, as it creates a disparity between expected delivered prices when the contracts are signed and market prices when deliveries begin.

The risk increases when the contracted LNG is delivered, not into regulated monopolies, but increasingly

competitive downstream markets with growing exposure to international spot fundamentals and prices.

This is accelerating the erosion of the traditional LNG supply model, in favor of deals that are shorter, smaller and more flexible, and priced not against an associated commodity but LNG itself.

The Chinese market is familiar with this trend. The struggle of state-owned companies to absorb take-or-pay, oil-priced volumes in recent years has shifted attention to new supply sources. The most recent term contract signed between CNPC and Cheniere for 1.2 million mt/year and a price linked, not to oil, but US Henry Hub, reflects such trend.

State-owned Chinese buyers have also started transacting short-term deals against the Platts JKM, the daily spot price benchmark for LNG deliveries into Japan, South

## The stats you need to know


Chinese gas demand is expected to surge on a fast-growing economy, environmental concerns and market liberalization

**10%**   
OF CHINA'S  
ENERGY DEMAND TO BE BASED ON GAS  
BY 2020: OFFICIAL TARGET

**160** million mt/year  
OF COAL CONSUMPTION TO BE CUT  
BY 2020: OFFICIAL TARGET

**360**  Bcm  
CHINA'S DOMESTIC GAS DEMAND  
IN 2020: OFFICIAL TARGET

**247**  Bcm  
CHINA'S DOMESTIC GAS PRODUCTION  
IN 2020: OFFICIAL TARGET

**54** million mt   
CHINA'S ESTIMATED LNG DEMAND  
FOR 2020: PLATTS

**25%**   
OF CHINA'S ESTIMATED LNG DEMAND  
FOR 2020 REMAINS UNCONTRACTED: PLATTS

**10%**  
OF CHINA'S 2020 CONTRACTED LNG VOLUME  
SIGNED BY INDEPENDENT BUYERS: PLATTS

**1.83** million mt  
OF JKM DERIVATIVES CLEARED THROUGH EXCHANGES  
IN JANUARY: PLATTS

Korea, China and Taiwan, and have become increasingly active in JKM derivatives.

### Managing risk re-allocation

This transition in LNG supply increasingly shifts the focus of risk from buyers to sellers. The question then becomes how to mitigate this new risk, and the answer lies, as in other markets, in the development of greater transparency and a more robust financial architecture.

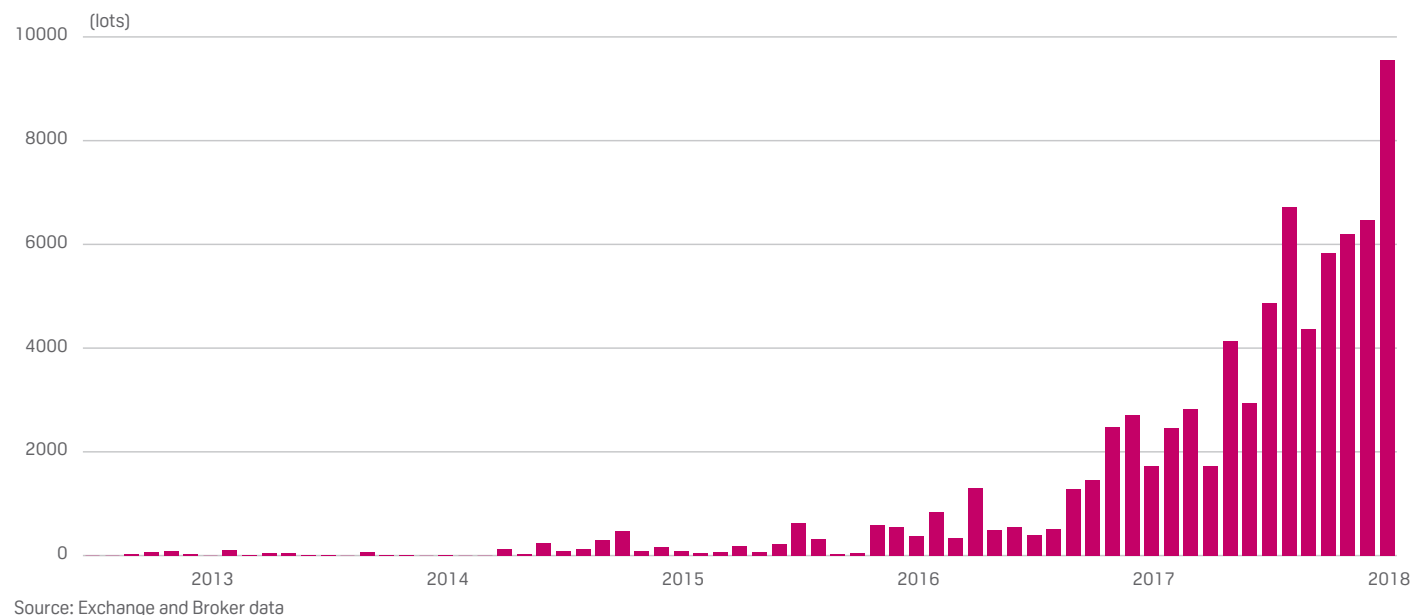
That is one that more closely reflects the increasingly pivotal role of spot markets, with robust pricing benchmarks strengthening the market's hedging capabilities.

The LNG derivatives markets is experiencing exponential growth, driven by two key factors: demand for risk management solutions as the industry transitions from the inflexible supply agreements of the past into a more versatile industry, and support for the only liquid LNG financial instrument, the JKM Swap.

Exchanges cleared a record high volume of 9,523 lots of the Platts JKM Swap contract in January, the equivalent of 1.83 million mt of LNG, compared with the last record high of 6,720 lots in August 2017, according to exchange and broker data.

### JKM™ SWAPS CLEARED THROUGH ICE AND CME

- Clip size: 10,000 MMBtu per lot, began in 2012. Trades are OTC, can be cleared via ICE or CME
- Bid-offer on the ICE curve extends to Calendar 2020
- January 2018 was a record month, with 9,523 lots traded on ICE and CME, equivalent to over 31 cargoes
- 2017 saw more than 50,000 lots cleared on ICE and CME, around 161 cargo-equivalent or over 9.66 million mt of LNG.
- If the JKM Swaps market was an importing country, it would be the world's seventh largest

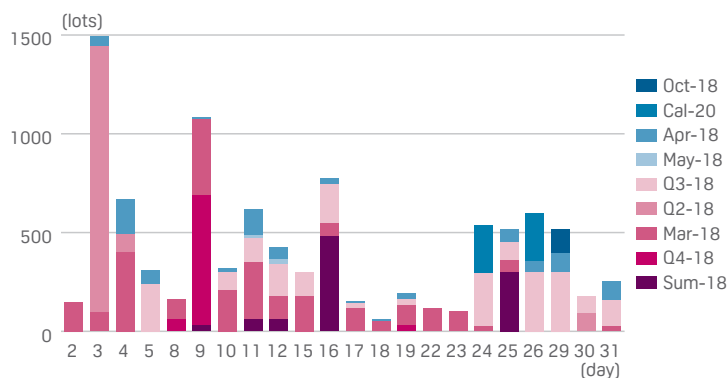


“Over the past 12 months, we have seen a surge in the volume of JKM LNG futures traded, as the contract is increasingly seen as the benchmark contract for LNG in Asia.”

“The growth in volume and the resulting increase in liquidity can be attributed to a number of factors around the changing dynamics of the LNG market, including the potential for the globalization of natural gas markets and the need for a more specific price benchmark for LNG and for the region's energy supply and production.”

– Gordon Bennett, managing director for utility markets at the Intercontinental Exchange

### SWAP LIQUIDITY FOR JANUARY



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