



# Global LNG Report 2019: A Review of Demand, Supply and Financing Issues



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# Foreword



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It is my pleasure to welcome you to our Global LNG Report.

Natural gas will still be a major contributor to world energy supply in 2040 – even in a scenario where policy-makers act determinedly to implement the targets in the Paris Agreement on climate change – and LNG will play a vital role in facilitating international trade.

LNG is expected to grow at a much faster rate than natural gas overall because of the great distances between many supply centres and demand centres, and because of its inherent flexibility compared with delivery by pipeline. The drivers are explored in our article on page 3.

Growth is expected both in some traditional markets, notably China and India, and in new markets, especially in South Asia and South-East Asia. China's LNG import growth has been spectacular since 2015 and we examine the sustainability of this trend on page 5.

LNG growth in new markets has been facilitated by the rise of enabling technologies such as floating storage

and regasification units (FSRUs). These have reduced the risks entailed in embarking on LNG imports, not least by reducing cost, which makes financing easier, and by accelerating implementation timescales.

From a supply perspective, bullish demand growth projections have encouraged numerous potential new liquefaction projects, as our article on page 7 explains.

If all the projects that could credibly reach final investment decision (FID) in 2019 were to come to fruition, we would see more than 230 mtpa of new capacity coming on stream around 2023/24. Even in the most bullish projections there is nowhere near enough demand to absorb so much LNG. Clearly there will be winners and losers.

Two regions of particular interest in 2019 will be the United States, where a "second wave" of export projects is striving to get under way, and Sub-Saharan Africa, where large onshore projects in Mozambique

and Nigeria look tantalisingly close to reaching FID.

So, what are the critical success factors that will differentiate the winners from losers? Our article on page 14 addresses the question: "What makes a successful LNG project?"

I hope that you find the report both interesting and insightful.

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# Why LNG is playing a crucial role in a Gas-Hungry World

By Kevin McGrory and Simon Collier

Natural gas is literally and often metaphorically an invisible fuel. In a post-Paris Agreement world – where policy-makers are increasingly challenged to address climate change – the role that natural gas must play in meeting growing energy demand, while contributing to decarbonisation of the global energy economy, is widely misunderstood.

Despite widespread promotion of energy efficiency policies, global energy demand is expected to continue rising over coming decades. The latest *World Energy Outlook* from the International Energy Agency (IEA) projects that primary energy demand by 2040 will be more than a quarter higher than today as population grows by 1.7 billion and as people the world over strive to improve their quality of life.

Those who assume this growth will in large part be met with zero-carbon renewables may find it surprising that natural gas – the least carbon-intensive of the fossil fuels – is projected to be one of the fastest-growing energy sources over the coming two decades. In its central New Policies Scenario, the IEA sees gas demand growing from 3.65 trillion cubic metres (tn m<sup>3</sup>) in 2016 to 5.40 tn m<sup>3</sup> in 2040, a rise of 48%.

## “LARGEST FUEL”

Even in a scenario where policy-makers take determined action to implement policies that meet the targets in the Paris Agreement, natural gas will still be a major contributor to world energy supply by 2040. In its Sustainable Development Scenario, the IEA sees gas demand growing to 4.18 tn m<sup>3</sup> by then – making it “the largest fuel in the global energy mix”.

Energy outlooks from other sources – notably major energy companies such as Shell, BP and ExxonMobil – support this view. Moreover, these companies are investing tens of billions of dollars in building and supporting new supply projects, as we see in our article on supply, starting on page 7 – a clear vote of confidence in the future of natural gas.

In its Energy Outlook to 2040, BP says: “Natural gas grows strongly, supported by broad-based demand and the continuing expansion of LNG increasing the availability of gas globally.” Its central Evolving Transition Scenario projects growth to 5.47 tn m<sup>3</sup>. BP adds: “Global LNG supplies more than double, with around 40% of that expansion occurring over the next five years.” Consequently, LNG volumes

overtake inter-regional pipeline shipments in the early 2020s.

This is despite the rapid growth of renewable energy sources, and political pressure in some regions – notably Europe – for decarbonisation. Indeed, gas, despite being a fossil fuel, has a crucial role to play in decarbonisation, especially as a substitute for more carbon-intensive coal and oil in power generation and heating.

A clear demonstration of this can be seen in the United States, where an evolving switch from coal to natural gas in electricity generation – driven more by economics than policy – has been a major contributor to falling carbon dioxide emissions.

## FLEXIBLE LNG

LNG is expected to grow at a much faster rate than natural gas overall because of the great distances between many supply centres and demand centres, and because of its inherent flexibility compared with delivery by pipeline. How else, for example, could the abundance of shale gas in the United States reach markets as diverse as Europe, India and China?

In the case of China, this assumes that it and the US are able to resolve their current differences

over trade. These have led China to impose a 10% tariff on LNG imports from the US and this tariff may yet be increased to 25% if the dispute escalates. The eventual outcome remains far from clear, but trade flows are expected to adapt to minimise the impact – a tangible benefit of LNG’s flexibility.

Growth is expected both in some traditional markets, notably the less mature markets of China and India, and in new markets. However, some traditional markets are likely to see declines, among them Japan – currently the world’s largest importer of LNG but not perhaps for much longer if China’s import growth continues at current rates.

Policy-driven LNG import growth in China has been spectacular in recent years, as we show in the article on page 5 and this growth is expected to continue over the medium term. That said, there is significant uncertainty over growth rates over the long term, given the potential for competition from domestic production and pipeline imports.

In South Asia, Pakistan, where severe energy shortages have for years been a constraint on economic growth, began importing LNG in 2015. It hopes to ramp up imports to some 30 million tonnes per year (mn t/yr) in the 2020s.

Bangladesh, another South Asian country that urgently needs more gas, became an importer last year. The nation’s own gas reserves are declining, hydro and wind resources are limited, land for large-scale solar deployment is scarce, and dependence on expensive imported liquid fuels

has been growing. A second import terminal is due to start up in the first half of this year and several more are planned.

In South-East Asia, Thailand has emerged as a promising market. It began importing LNG in 2011 at its Map Ta Phut onshore regasification terminal. A second onshore terminal is under construction and a third, floating, terminal is planned.

A somewhat surprising development, given that the Middle East is one of the world’s largest oil and gas producing regions, has been its rise as an LNG importer, with projects having been developed in Kuwait, Dubai, Abu Dhabi and Jordan. Bahrain is due to join this importers’ club in 2019 as it commissions its first regas terminal.

Worth noting is the diverse set of motivations that prompt countries to become LNG importers. These include:

- the need to meet growing gas demand in countries where domestic production is flat or declining;
- a desire to diversify gas supply sources, as in Poland and Lithuania, both of which felt overly dependent on Russia’s Gazprom;
- exporters who unexpectedly find themselves short of gas, such as Egypt and Argentina;
- countries seeking to transport gas between regions where pipeline infrastructure is lacking, such as Malaysia and Indonesia;
- countries wanting to switch electricity generation away from

costly and polluting liquid fuels, such as Kuwait and the United Arab Emirates; and

- governments seeking to improve their environment by switching away from coal, the most obvious example being China.

### FLOATING IDEAS

LNG growth in new markets has been facilitated by the rise of enabling technologies such as floating storage and regasification units (FSRUs). These have reduced the risks entailed in embarking on importing LNG, not least by reducing cost, which makes financing easier, and by accelerating implementation timescales.

The majority of new markets over the past decade have utilised FSRUs, or FSUs with jetty-mounted regasification, rather than much more capital-intensive onshore facilities. Of the 23 new markets that opened up between 2008 and 2018, 12 chose FSRU-based terminals for their first projects, while another three chose floating storage units (FSUs) with jetty- or shore-mounted regas facilities. Only eight opted for onshore terminals and most of these were wealthy countries, such as Canada, the Netherlands and Singapore.

One promising new market that plans to take advantage of FSRU technology is Cyprus, where a tender process is under way for an FSRU import terminal and associated infrastructure to be located at Vasilikos bay on the southern coast.

However, even FSRU projects are not without their challenges. Successful projects have mostly

happened in countries where there is an existing market to accept regasified LNG, unless the projects are directly supplying power generation facilities.

Limiting factors in other countries – for example, Ghana – have included insufficient or non-existent onshore infrastructure, a lack of institutional capacity around legislative frameworks and market regulation, and issues with putting in place sufficiently robust offtake contracts with gas/power consumers. South Africa has been struggling for years to bring its proposed LNG-to-power projects to fruition,

despite chronic and well-publicised electricity shortages.

In short, Sub-Saharan Africa has yet to live up to its promise as a major location for FSRU-based LNG import projects.

Moreover, whatever technology choices are made, market fundamentals cannot be ignored. For LNG import projects to make commercial sense, it also has to be shown that LNG can compete on price with other available sources of gas supply and/or other energy sources, after allowing for the value of benefits

such as pollution reduction as economic externalities are taken into account.

Even in markets where policy decisions encourage natural gas use – such as China – price differentials matter.

## How Sustainable is China's Spectacular LNG Import Growth?

By Carolyn Dong and Simin Yu

The Chinese government has been heavily promoting gas as a replacement for coal – which still plays an overwhelmingly dominant role in the energy mix – mainly to address chronic air pollution but also to meet its climate action pledges under the Paris Agreement. China plans to increase the share of gas in its energy mix from 7% to a range of 8-10% by 2020. Given the size of its energy economy, this is a challenging target requiring annual supply of around 330 bn m<sup>3</sup>, up from 241 bn m<sup>3</sup> in 2017.

Although Japan remains the world's largest importer of LNG for now, China has risen to second place, ahead of South Korea, importing around 54 million tonnes in 2018

– and it may not be long before it usurps Japan's position at the top of the league.

LNG import growth since 2015 has been spectacular, as the chart on page 6 illustrates. LNG imports in 2015 were 19.7 mn t. They grew by 33% in 2016, by 46% in 2017 and by 41% in 2018, reaching 54.0 mn t. In other words, they almost tripled in three years. Pipeline gas imports have also grown rapidly, from 12.5 mn t in 2015 to 36.6 mn t in 2018.

LNG import growth is expected to continue, as import and delivery infrastructure is built to avoid the bottlenecks that led to major and well publicised shortages of gas during the winter of 2017/18. Chinese importers are struggling

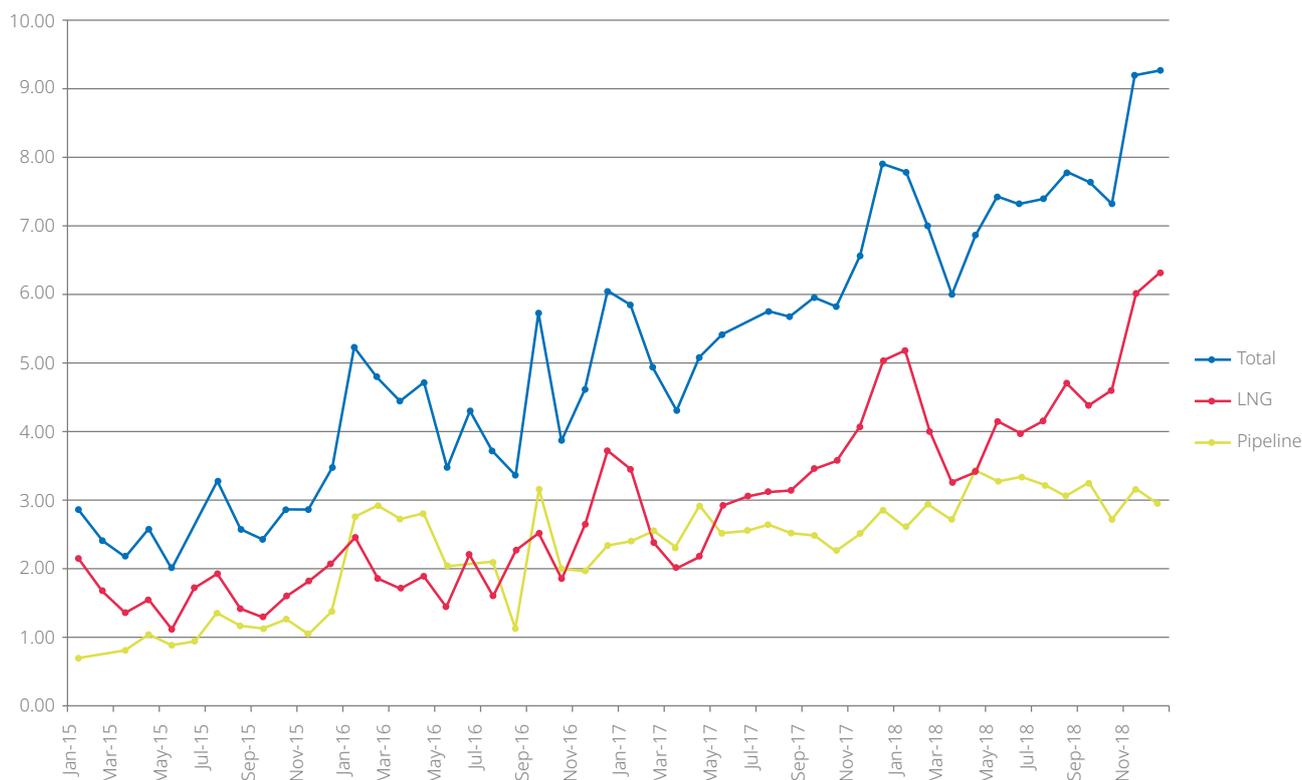
with oversupply at present because the winter of 2018/19 has been unusually warm. But the policy drivers that have been boosting gas demand remain in place.

### FACING COMPETITION

The question over the long term is how much of the growth in gas demand will be met by LNG, given that it not only has to compete with coal and renewables, but also with domestic production and with pipeline gas from Central Asia and Myanmar.

The government is leaning heavily on domestic producers to ramp up their output of conventional and unconventional gas resources. Shale gas has been slow to take off,

### China's natural gas imports, 2015-2018 (million tonnes)



Note: 1 billion cubic metres = 0.735 million tonnes

Source: China Customs Statistics

and will miss even a revised target for 2020 output, but growth rates over the past three years have been impressive.

Against the backdrop of a warmer relationship with Russia, China is set to import more gas through pipelines from Russia, starting in December this year, when the Power of Siberia pipeline will begin bringing in gas via the “eastern route”. There has also been a revival in interest in pursuing a second pipeline from Russia via the “western route”.

So, while LNG imports are likely to continue growing strongly in the short to medium term, there is significant uncertainty around how much LNG China will need in the long term.

Meanwhile, China is investing heavily in LNG supply projects overseas, in Australia, Canada, East Africa and elsewhere. So, over time, a growing proportion of its LNG needs will come from equity offtake.

# Will 2019 see the expected stampede to sanction new supply projects?

By Dimitri Papaefstratiou and Simon Collier

It is widely expected that 2019 will be a record year for new LNG supply projects. After three years during which only a handful of projects reached a positive final investment decision (FID), there is a pent-up desire to move ahead with new ventures to exploit a perceived supply-demand gap expected to open up in the first half of the 2020s.

Numerous projects are claiming – with varying degrees of credibility – that they intend to reach FID this year. However, if all the projects that could credibly reach FID in 2019 were to come to fruition, we would see more than 230 mtpa of new capacity coming on stream around 2023/24. The most promising contenders are listed in the table on page 10.

So, what are the main challenges that these projects face? LNG liquefaction ventures are highly complex undertakings, involving numerous challenges and risks. These include sourcing sufficient gas supply over their lifetimes, permitting, funding the substantial up-front costs of equipment procurement and plant construction, getting the technology to work as intended, arranging for sufficient shipping to be available when needed, and ensuring output is sold and reliably paid for.

Amidst this complexity, three issues stand out: building a plant at a competitive cost, securing finance for its construction, and ensuring a market for its output.

## MARKET FORECASTS

Even in the most bullish market projections, there is nowhere near enough demand to absorb the LNG from all the projects in the table. In 2017 the total volume of global LNG trade was 289.8 mn t, according to the importers' group GIIGNL, an increase of 26.2 mn t, or 9.9%, on 2016 – “the strongest growth rate since 2010”. A similar increase is expected for 2018, which would take global trade to around 320 mn t.

In its 2018 five-year gas market forecast, the International Energy Agency (IEA) expects world LNG demand to reach 505 Bcm (371 mn t) in 2023 – only around 50 mn t more than in 2018. Even allowing for the fact that some of the capacity operating today will have closed by then, this does not leave much room for new plant, especially taking into account the amount of new capacity still in the construction phase.

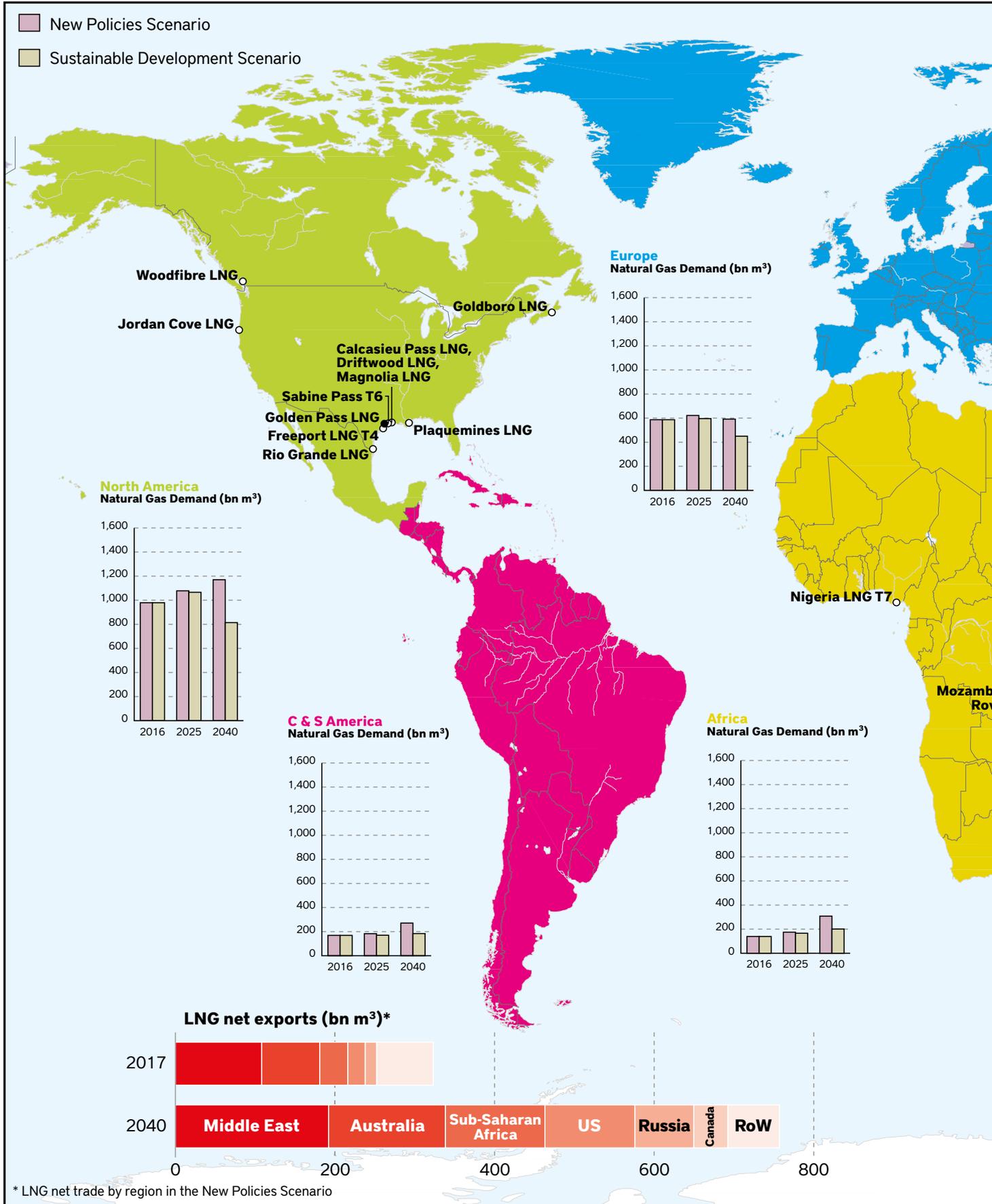
In its 2018 LNG Outlook, Shell points out that the supply-demand gap will widen over time as older plants close and new construction slows down because of the dearth of FIDs during 2016-18 – but the amount of new capacity that will be needed still falls far short of what is being proposed. Moreover, while bankers say there is no shortage of money to finance robust new LNG supply projects, these ventures will also be competing for finance, as we detail in the article starting on page 14. Clearly there will be winners and losers.

Unusually, this wave of potential supply could come from a diverse range of countries. The key regions are North America, Sub-Saharan Africa, Qatar and Russia. Previously, new waves of LNG supply have tended to come mainly from one or two regions: Qatar during the 2000s and Australia and the US during this decade.

## GOLDEN PASS

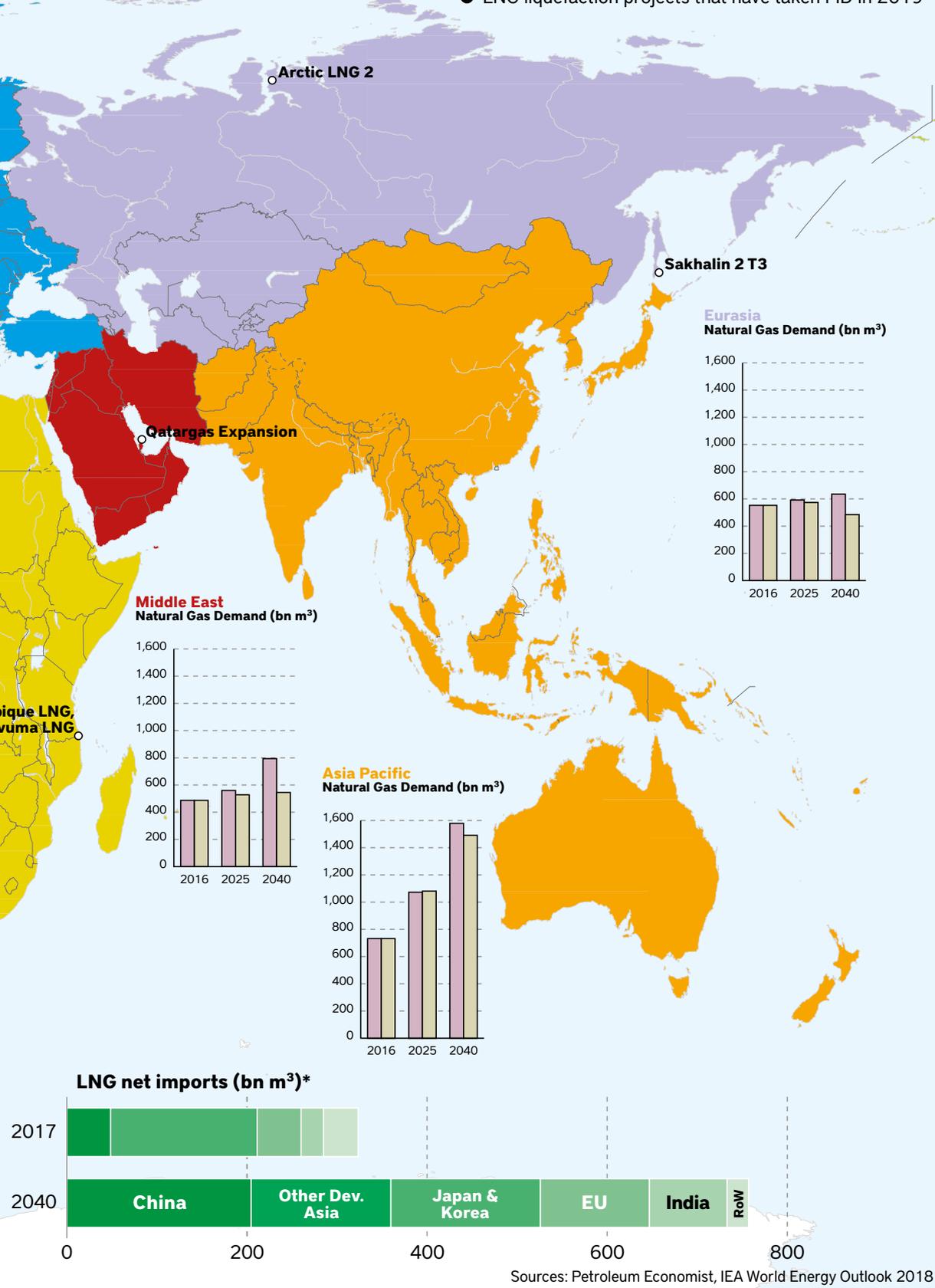
First off the blocks in 2019 has been the 15.6 mn t/yr Golden Pass project in the US. Qatar Petroleum (QP) and ExxonMobil announced in early February that they had reached a positive FID and awarded engineering, procurement and construction (EPC) contracts for the project to a joint venture of Chiyoda, McDermott and Zachry. Construction is expected to take five years, a typical schedule for a large plant, with operation scheduled for 2024.

Like most of the “first wave” of US LNG export projects – those already operational or under construction – Golden Pass, despite being a “second wave” project, has the advantage that it will use the storage and marine berth infrastructure of an existing regasification terminal, making it a “brown-field” project. This has helped to keep capital cost at what the sponsors describe as “\$10+ bn”. Intriguingly, QP, which has a 70% stake in the project, and ExxonMobil, with the remaining 30%, have not announced any



Sourced from Petroleum Economist.

- LNG liquefaction projects hoping to reach FID in 2019
- LNG liquefaction projects that have taken FID in 2019



## LNG Liquefaction Projects Hoping to Reach FID<sup>1</sup> in 2019

Project	Country	Capacity (mn t/yr)	Liquefaction technology
Arctic LNG 2	Russia	19.8 (3 x 6.6)	Linde's MFC
Calcasieu Pass LNG	US	10 (18 x 0.6)	GE Oil & Gas' Modular SMR
Driftwood LNG	US	27.6 (20 x 1.4)	Chart's IPSMR
Freeport LNG, Train 4	US	5.1	Air Products' C3MR
Goldboro LNG	Canada	10 (2 x 5)	Air Products' C3MR/SplitMR
Golden Pass LNG <sup>2</sup>	US	15.6 (3 x 5.2)	Air Products' C3MR
Jordan Cove LNG	US	7.8 (5 x 1.6)	Black & Veatch's PRICO
Magnolia LNG	US	8.8 (4 x 2.2)	LNG Limited's OSMR
Mozambique LNG	Mozambique	12.9 (2 x 6.4)	Air Products' C3MR
Nigeria LNG, Train 7 <sup>3</sup>	Nigeria	8 (2 x 4)	Air Products' C3MR
Plaquemines LNG, Phase 1	US	20 (36 x 0.6)	GE Oil & Gas' Modular SMR
Qatargas Expansion	Qatar	31.2 (4 x 7.8)	Air Products' AP-X
Rio Grande LNG	US	27 (6 x 4.5)	Air Products' C3MR
Rovuma LNG	Mozambique	15.2 (2 x 7.6)	Air Products' AP-X
Sabine Pass LNG, Train 6	US	4.5	ConocoPhillips' Optimised Cascade
Sakhalin 2, Train 3	Russia	5.4	Shell DMR
Woodfibre LNG	Canada	2.1	Air Products' C3MR
<b>Total capacity</b>		<b>231</b>	

<sup>1</sup> Final Investment Decision

<sup>2</sup> Project sponsors Qatar Petroleum and ExxonMobil announced FID on Golden Pass in early 2019

<sup>3</sup> The expansion project known as "Train 7" will consist of two 4 mn t/yr trains

offtake contracts for Golden Pass, nor indicated precisely how it will be financed. That said, comments by QP's CEO, Saad Al-Kaabi, at the Washington signing ceremony suggest that Qatar will fund its share of the project directly. ExxonMobil could certainly afford to do the same.

Overall, US projects account for more than half of the production capacity in our table – 126.4 mn t/yr – but many more less credible projects have been proposed. We look at developments in the US in more detail on page 12.

### QATAR EXPANSION

One of the most credible projects in the table is Qatar's proposal to construct another four 7.8 mn t/yr "mega-trains", taking its existing nameplate capacity of 77 mn t/yr to almost 110 mn t/yr. Qatar is about to lose its leading LNG producer title to Australia but this expansion would re-assert its lead by the middle of the 2020s.

FID is not expected until around the end of this year as Qatar is still in the throes of negotiations with potential project partners – the clear favourites being the international oil and gas majors already involved in its existing 15 liquefaction trains: ExxonMobil, Total, Shell and ConocoPhillips.

As with Golden Pass, nothing has yet been said about offtake contracts having been agreed. There has been speculation that offtake will be one of the conditions for participation by potential partners.

### SUB-SAHARAN AFRICA

Another keenly watched region in 2019 will be Sub-Saharan Africa, where three projects totalling capacity of 36.1 mn t/yr could conceivably reach FID before the year's end.

One is an 8 mtpa expansion at Nigeria LNG, the region's first export project, which currently has a nameplate capacity of 22 mtpa, making it one of the world's largest liquefaction plants. Expansion has been on the cards for over a decade.

The other two are in Mozambique, where a 3.4 mn t/yr floating LNG project, Coral South FLNG, was sanctioned in 2017. Both are large onshore projects. Together with Coral South, they would make Mozambique a major player in the international LNG business. We look at Sub-Saharan Africa in more detail on page 13.

### RUSSIA

The Novatek-led Yamal LNG project in Russia has performed impressively, coming on stream well ahead of schedule, despite the challenging physical and political environment in which it was financed and constructed. The second train started up six months ahead of schedule, the third train a year ahead, and in December Novatek said all three trains had reached full capacity.

Novatek is now moving ahead with its second large project, the 19.8 mn t/yr Arctic LNG 2. It hopes to reach a positive FID this year, despite not yet having announced any offtake contracts for its output. It has however begun awarding contracts for long-lead items and for parts of the construction.

Unlike Yamal LNG, which was built on permafrost, Arctic LNG 2 will be built on gravity-based structures and will employ a different liquefaction technology, Linde's Mixed Fluid Cascade process, rather than Air Products' C3MR. The aim is to reduce construction costs and do as much of the work as possible within Russia.

We could also see expansion by a third train, with capacity of 5.4 mn t/yr, at Sakhalin 2, Russia's first liquefaction plant. If both Sakhalin 2 and Arctic LNG 2 are able to reach a positive FID in 2019, Russia production capacity will grow by 25.2 mn t/yr.

### CANADA

Our table of FID hopefuls includes two Canadian projects hoping to follow in the wake of LNG Canada, the Shell-led project that reached FID last October, making it the first large onshore liquefaction project to reach FID in over three years, and the first Canadian LNG export project to be sanctioned.

Project sponsor for the 10 mn t/yr Goldboro LNG project, to be located on the east coast, is Canada's Pieridae Energy, which received a permit to proceed with construction last October. The project has a 5 mtpa offtake contract with European utility Uniper and a Heads of Agreement for 2.5 m t/yr with Swiss trader Axpo, but has already experienced delays.

Woodfibre is one of the smaller plants in the table, with capacity of 2.1 mn t/yr. It has signed non-binding offtake agreements with potential Chinese buyers but like Goldboro LNG has already been delayed.

**BRAVE NEW WORLD?**

Despite the general feeling of optimism around how many FIDs we may see in 2019, and the tentative revival that took place in the signing of long-term offtake contracts during 2018, one notable aspect of the projects in our table is how few have yet signed offtake contracts for most of their output.

If 2019 is to turn out to be a bumper year for the sanctioning of new projects, either we will have to see a sharp upswing in the number of long-term offtake contracts being signed by end-users, portfolio players and traders, or more projects will need to proceed on the basis that the sponsors will be assuming

market risk by lifting their own LNG. The latter would represent a significant change of direction for the industry – and we are already seeing the first signs of that.

## US hopefuls line up for a second wave of export capacity

By Jack Langlois and Glenn Reitman

US LNG exports continue to ramp up as projects in the “first wave” progressively start up. 2019 will be a major year for several of these projects as they complete commissioning and begin producing.

The US passed a major milestone in 2016 when the first train at Cheniere Energy’s Sabine Pass LNG project in Louisiana started up – the first of a new wave of LNG export projects from a nation that a decade earlier was expecting to become a major importer of LNG.

The shale gas revolution that began to become apparent in 2008 changed all that. Thanks to the discovery of massive reserves in the Marcellus and Utica shale regions, technological advances in the Haynesville and Eagle Ford shales, and the increasing availability of associated gas in the Permian Basin, the US is awash in natural gas.

By the end of 2018, five 4.5 mn t/yr trains were operating at Sabine Pass. The year also saw the start-up of the single train at Dominion Energy’s Cove Point plant in Maryland, and the first commissioning cargo at the first of two trains at Cheniere’s Corpus Christi project in Texas.

As Corpus Christi ramps up output during 2019, two more projects will start up: Elba Island in Georgia and Freeport LNG in Texas.

Numerous other projects are hoping to reach FID this year (see table on page 10), with Golden Pass having announced FID in early February. It remains to be seen how many more will take the plunge. Among the more credible are the expansion projects: Train 6 at Sabine Pass and Train 4 at Freeport.

Some of these “second-wave” projects have opted for new liquefaction configurations, such as

the use of multiple, modular mid-scale trains in large-scale projects to “de-risk” investments for project sponsors and allow for a phased investment to match LNG offtake in smaller increments than in the past. Examples include the Venture Global projects, Calcasieu Pass LNG and Plaquemines LNG, and Tellurian’s Driftwood LNG. That said, we have yet to see such a project reach FID.

Crucially, new business models adopted by US projects are helping to transform the way LNG business is done, paving the way to greater liquidity and commoditisation, with global impacts.

# Is Sub-Saharan Africa's LNG promise about to be fulfilled?

By Dayo Idowu and Simon Collier

Sub-Saharan Africa is already a significant exporter of LNG from projects in Nigeria, Equatorial Guinea, Angola and Cameroon – but 2019 could see the region promoted to a higher league with an 8 mtpa expansion of Nigeria LNG (NLNG) and two major onshore projects in Mozambique, on the eastern coast of the continent. Together these three projects would add capacity of some 36 mn t/yr.

The Nigeria LNG project currently has six trains in operation, with a combined production capacity of 22 mn t/yr. The Train 7 expansion – which will actually consist of two 4 mn t/yr trains – would take total capacity to 30 mn t/yr.

FEED contracts were awarded last year to two consortia: the B7 JV Consortium, made up of KBR, TechnipFMC and Japan Gas Corporation; and the SCD JV Consortium, comprising Saipem, Chiyoda and Daewoo. This competitive process will lead to the basic engineering design and price

determination for the engineering, procurement and construction (EPC) contract.

One of the project's strengths is the participation of three major international oil and gas companies: Shell, which has a stake of 25.6%, Total 15%, and Eni 10.4%. The remaining 49% is held by the Nigerian National Petroleum Corporation (NNPC).

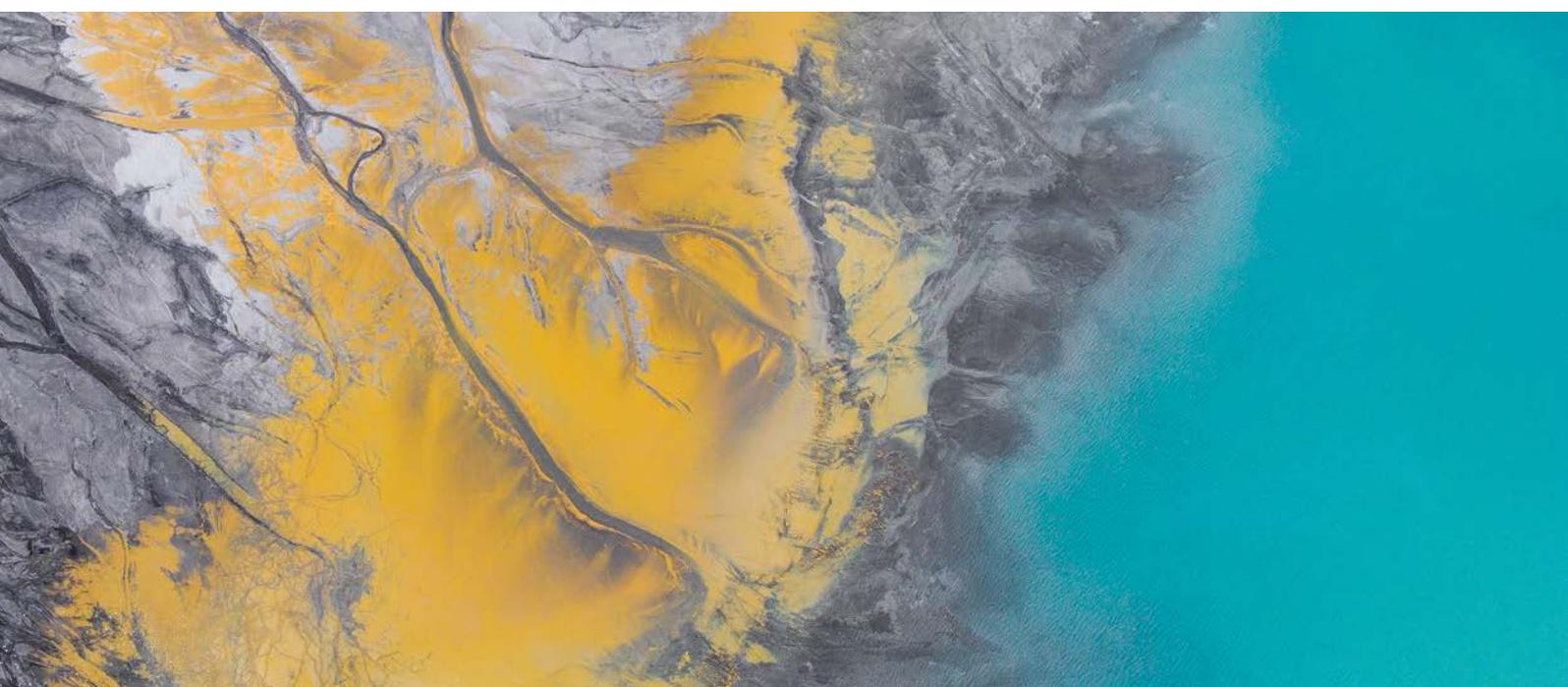
In Mozambique, a consortium led by Anadarko is hoping to reach FID on a 12.9 mn t/yr project, while a consortium led by Eni and ExxonMobil is pursuing a 15.2 mn t/yr project. Both would be located at the proposed onshore Afungi LNG Park in the north of the country.

Anadarko and its partners aim to monetise gas reserves in the offshore Area 1 Golfinho/Atum fields and have been working to sign up fully-termed sales and purchase agreements (SPAs) for at least 8.5 mn t/yr. Having had a flurry of successes in recent weeks – signing SPAs with CNOOC, Tokyo Gas, Centrica and Shell – the

project now has 7.5 mn t/yr signed up, so FID does not look too far away. Work is now under way on arranging project finance.

Meanwhile, ExxonMobil and Eni recently announced they had secured “sufficient offtake commitments from affiliated buyers of the co-venture parties to move towards a final investment decision for the Rovuma LNG project”. These commitments “will provide a foundation to secure project financing”. Gas will come from offshore Area 4 and first LNG is expected in 2024.

In neighbouring Tanzania, where Equinor and ExxonMobil hold the licence for Block 2 and Shell and Ophir for Blocks 1 and 4, President John Magufuli has indicated that he will support the development of a proposed onshore LNG project but, in a competitive global market, his government's perceived antipathy to foreign investors has dampened sentiment and a positive FID seems some way off.



# Critical success factors in making an LNG project bankable

By Charles Morrison and Rob Tims

The years since the oil price crash of 2014 have not been easy ones for the sponsors of LNG liquefaction projects. Confidence has since been returning and, as we have seen in the previous article, in 2019 numerous liquefaction projects are hoping to get the green light. It is however a crowded field and projects face a number of structural challenges. These go well beyond the cash flow crisis that resulted from the oil price collapse.

The capital expenditure required for a major liquefaction plant escalated rapidly over the decade from 2004 to 2014. Australian projects sanctioned in the early 2010s came with price tags of tens of billions of dollars. Project sponsors, equipment suppliers, engineering contractors and oilfield services companies have been working hard to bring unit costs down, with notable success.

## SOURCING FINANCE

Despite the progress in getting capital expenditure under control, today's liquefaction projects are large complex multi-billion-dollar ventures. Raising sufficient capital means calling on many sources of finance.

Woodside's 1981 North West Shelf LNG project financing set the template for projects accessing the financing markets. Developments in the LNG and bank-lending markets have since made this model increasingly hard to replicate.

Until relatively recently, project sponsors and lenders were able to progress projects because their cash flow was underpinned by long-term, take-or-pay contracts with creditworthy

investment-grade offtakers – mostly regulated gas and electricity utilities in Japan, South Korea and Taiwan with captive markets. Lenders were thus comfortable taking LNG price risk, often indexed to oil through an S-curve formula. They would stress-test project economics against a conservative oil-price scenario, and sponsors would underpin the construction phase risk with completion guarantees.

## EVOLVING PROJECT STRUCTURES

As projects have become larger and more expensive, the universe of lenders has evolved from the simple equity and commercial bank debt of the early deals. The mix is now more likely to include export credit agency (ECA) direct lending, multilaterals and sponsor co-lending. Occasionally this has broadened to include sovereign wealth funds (as in Yamal LNG) or project bonds (as in RasGas 2 and 3).

This evolution away from simple long-term direct sales from seller to buyer has transformed the offtake side of the project structure.

Much of the new demand for LNG is driven by China, India and other emerging Asian economies, impacting the average credit rating of offtakers. Before 2013 almost all long-term offtake contracts were with investment-grade buyers. By 2016-17 almost half of new long-term contracts were being signed with sub-investment-grade buyers.

Meanwhile, the market is demanding greater flexibility. Over the past five years: average contract length has fallen from 13 to 7 years; average contract size has halved from 1.5 mtpa

to about 0.75 mtpa; and the market share of spot cargoes has doubled from about 12% to 25%.

This flexibility has been facilitated by the rise of portfolio players and traders prepared to sign up for term offtake contracts, thereby acting as intermediaries between producers and consumers. These intermediaries today account for almost half of contracted volumes.

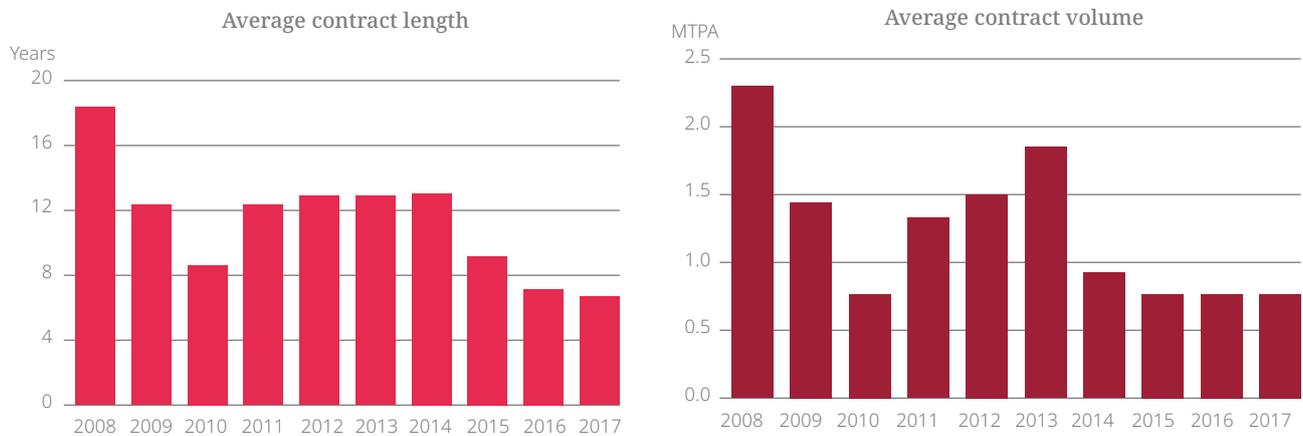
## DOMESTIC NEEDS VERSUS EXPORTS

Yet another potential challenge to liquefaction projects comes from the expectations of host governments. There is often a tension between the desire to monetise gas resources through exports, to bring in much-needed hard currency, and the need to allocate gas resources to the domestic market to fuel economic development.

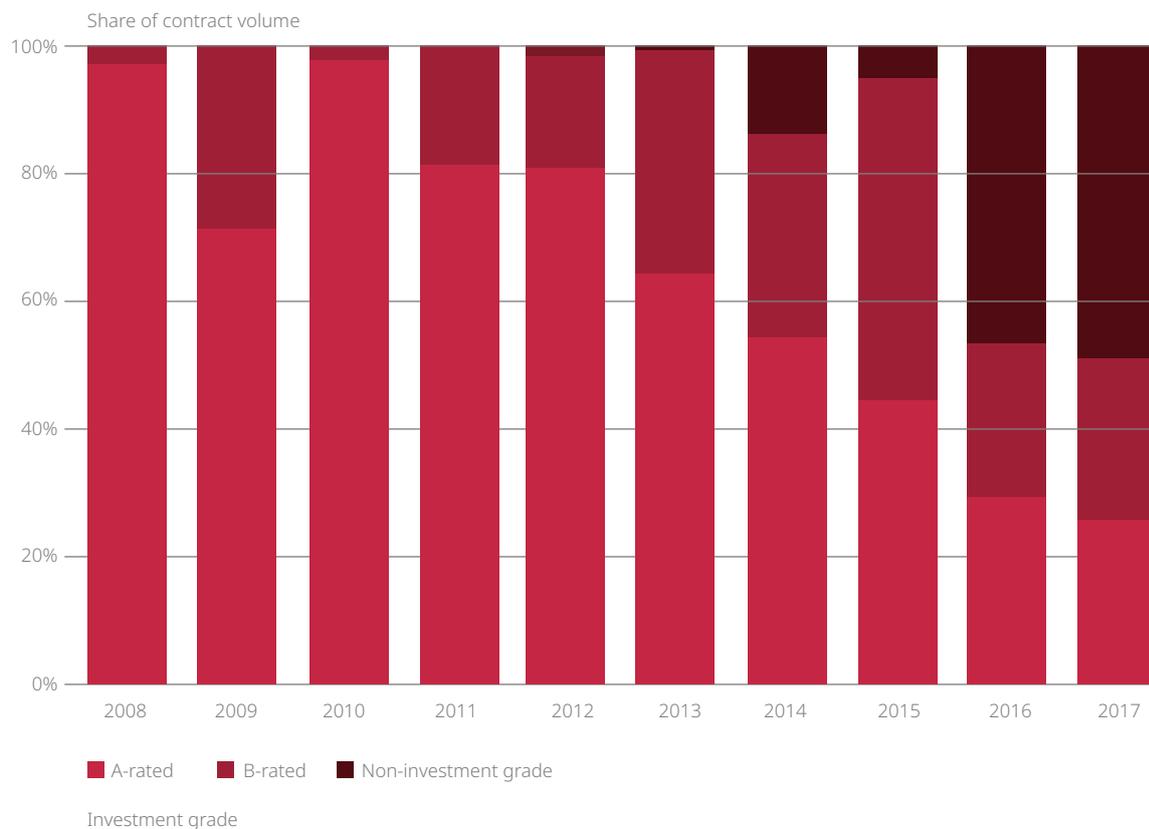
Egypt is a prime example of this. A decade ago it was exporting gas by pipeline through the Arab Gas Pipeline and in the form of LNG from two liquefaction plants on the Mediterranean Coast: Idku and Damietta. However, a lull in exploration success combined with rapid domestic demand growth to create shortages and the government decided to divert gas supply from LNG to the domestic market and exports by pipeline ceased.

As shortages became more severe, Egypt had to resort to importing gas through two floating storage and regasification units (FSRUs). Fortunately, new discoveries – notably

## LNG buyers signing shorter and smaller contracts



## New long-term contract credit rating



Source: Shell interpretation of HIS Markit Q4 2017, Moody's and Fitch data

the Zohr field – are once again boosting gas supply and Egypt is resuming exports, by pipeline and LNG.

### CHANGES TO THE BANK LENDING MARKET

Following the 2008 financial crisis, it was recognised that the regulation, supervision and risk management of the banking sector needed to be strengthened. These changes first appeared in the 2010 Basel III rules in the form of Enhanced Capital Requirements and Leverage, Liquidity and Net Stable Funding Ratio Tests.

Further changes in 2017 affecting the Risk Weighted Asset calculations for loan portfolios will increase banks' equity capital requirements. An additional capital requirement for the largest institutions (Global Systemically Important Banks) could disproportionately affect some of the more significant lenders.

It is generally expected that the increase in equity capital required – and therefore higher funding costs – will make it less attractive for commercial banks to retain long-term project finance loans on their balance sheets.

### LESS CREDITWORTHY BUYERS

The shift to shorter term offtake contracts and a less creditworthy LNG buyer universe is the toughest challenge that sponsors have faced since the advent of LNG project financing. Without the comfort of investment-grade, long-term, take-or-pay contracts to back up the cash flows, only those projects with the strongest sponsors will move forward.

It is, of course, possible for project financing to be structured against a portfolio of long-term and short-term contracts, with a mix of investment-grade and sub-investment-grade buyers – but each case will be judged on its own merits. It is currently impossible to predict whether and when a new consensus methodology will emerge from the commercial bank market.

As a result of these changes, the achievable debt:equity ratio for projects will fall from the typical 2:1 ratio we have seen in the past. This is because lenders will risk the value of contracts with sub-investment-grade buyers, and reduce the tenor of debt so that it does not extend beyond the period for which there is certainty of offtake.

For lenders who can get comfortable, any perceived increase in risk will result in higher loan pricing even without the impact of the regulatory changes that could have additional knock-on implications for financing costs.

The combined impact of changes to the LNG and lending markets means that commercial bank financing is likely to play a less significant role in the financing of future LNG projects. So, for projects to be successful over the next few years, this funding will need to come from other sources. Initially this funding gap will probably be made up with increased equity, subordinated shareholder loans, and/or sponsor co-lending.

### ADAPTING TO NEW REALITIES

There is widespread agreement that the LNG industry is moving towards a more commoditised and flexible future, but presently the market remains in transition. Increasingly, new types of player are emerging with the ability to accommodate the needs of both project developers, who still need long-term certainty of offtake if they are to raise finance, and end-buyers looking for greater flexibility.

Portfolio players, such as Shell and Total, are able to aggregate supply and demand positions, positioning themselves between producers and sellers. Traders – such as Gunvor, Trafigura and Vitol – are moving from simple trading to taking long-term offtake positions by signing SPAs with producers. Some of the largest buyers have been developing trading capabilities and some now have the stated ambition of becoming portfolio players.

Increasingly, the divisions between buyers, portfolio players and traders are getting blurred. We are also seeing a trend towards projects being structured in such a way that project sponsors agree to lift their own equity LNG, especially when these sponsors are major LNG buyers or portfolio players.

The rise of the portfolio player, alongside the move towards destination flexibility, promises to transform the way that LNG is traded, with a consequent impact on how supply projects are structured. Only those projects with the strongest sponsors, some lifting their own LNG volumes, have a good chance of proceeding to FID.