Natural gas is being widely considered as a key fuel of the future as more and more consumers embrace this low-polluting, affordable and available fuel to ensure energy security. As demand rises, questions are being raised about the ability of capacity – especially liquefaction capacity – to keep pace with demand. A potential shortfall in global liquefaction capacity has been identified by many market participants and consultants.

In this context, the capital and time intensive nature of building liquefaction capacity has come into focus (especially the former), as various elements of LNG market structure which used to enable long-term financing for LNG liquefaction projects undergo a change. The LNG demand hot-spots in Asian markets are moving towards commoditization as offtake contracts become shorter and involve smaller volumes, while spot trading increases steadily. Debt, in the form of project finance, has been the mainstay in driving liquefaction capacity additions across the world. Debt financiers (commercial banks, export credit agencies and others) who relied on cash flow guarantees from long-term contracts with credit worthy offtakers, are now facing greater exposure to project and market risks as a fallout of the market evolution.

In this paper we further discuss the emerging situation impacting financiers of LNG liquefaction projects (as market fundamentals change), and potential ways forward for the LNG liquefaction market in securing necessary capital for new capacity. Breaking away from historical trends, the role of equity as the driving force behind LNG liquefaction capacity additions in future is being explored.
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Chapter 1: Natural gas in the global energy supply

It is no news that the energy landscape is changing rapidly. Evidence of climate change continues to accumulate, and notwithstanding the current political environment in the United States, we foresee increasing pressure on governments, consumers and the energy industry to decarbonize the production and use of energy. The operative question is not “if” but “how” and “when,” and also “who.” These are not uncomplicated questions, and there are many unknowns. In an ideal world, we would flip a switch and the energy ecosystem would be magically transformed. Electric vehicles would instantly replace those powered by internal combustion engines, and the power necessary would be generated by solar panels and windmills.

We do not live in that world, and there are big question marks about how clean (or cleaner) energy will take shape. EY view is that natural gas, specifically LNG, will be an integral part of that equation. The technology is proven, and the resource is abundant. The EY view is that there is significant upside to current demand forecasts, particularly from the power-generation sector. Electricity will likely be the vehicle of choice for energy delivery. If climate change is to be arrested, coal cannot be burned in the volumes that it is today. Nuclear power has well-documented cost and safety issues, and it is unlikely that those problems will be solved once and for all anytime soon. Distributed, renewable energy and the companion energy storage systems are unproven at scale, and there is no financing model on the horizon for bringing those technologies to the masses. This leaves us with gas.

Most projections indicate that the share of gas in total global energy demand will increase, with the International Energy Agency (IEA) estimating an increase to 25% in 2040 from 21% in 2000. Only renewables are also expected see an increase in market share during the same period, as all other sources lose share. However, penetration of renewable energy, especially wind and solar, is currently intermittently hindered by both production cost and supply. Natural gas has the potential to offer a comprehensive solution – a relatively low-polluting, stable source of energy available at an affordable cost.

One of the main potential drivers of gas demand is the most populous countries—China and India—switch from coal to gas for power generation. Together, these countries are the largest consumers of energy and are also facing deteriorating air quality, making greater consumption of natural gas attractive. Other smaller countries are also laying the groundwork for increased consumption of natural gas to power their economies.

**Chapter 2: LNG liquefaction capacity expansion**

Within the natural gas mix, LNG is the fastest growing supply source—LNG imports are predicted to increase 123% (3.4% CAGR) between 2016 and 2040, per the BP 2018 Energy Outlook, while pipeline imports will grow only by 41% (1.4% CAGR) during the same period. The fact that LNG trade increased 12% over 2016 levels to reach 293 million tons (mt) in 2017 supports this direction of travel. This is the fourth consecutive year of incremental growth, and demand is further expected to increase to about 350 million tons per annum (mtpa).
by 2019.\textsuperscript{3} China, Japan and South Korea will continue to be major consumers of LNG, even as new consumers continue to emerge. High expected demand from existing and new demand centers will continue to push the prominence of LNG as a growing part of the energy mix.

A key enabler of the growing LNG trade is the increase in liquefaction capacity over the last decade, which reached 369.4 mtpa (nominal capacity) as of March 2018.\textsuperscript{Error! Bookmark not defined.} Rapidly growing demand for LNG must be supported by a similar increase in liquefaction capacity and shipping and regasification infrastructure.

Liquefaction capacity additions have been led by Australia, the Middle East and Africa during 2011–2017, but we expect to see the largest increase in the US and Australia (up to 2023).\textsuperscript{Error! Bookmark not defined.} As of March 2018, 92 mtpa of liquefaction capacity was under construction, while the total liquefaction capacity of proposed potential projects for delivery in the 2020s reached 875.5 mtpa.\textsuperscript{3} Most of this was in the US and Canada.\textsuperscript{Error! Bookmark not defined.} The first floating liquefaction (FLNG) project came online in Malaysia in 2017, and more
Large capital investment is required to build LNG infrastructure. Satisfying growing demand for LNG is dependent on large-scale investments in liquefaction, shipping, regasification and last-mile supply infrastructure. Liquefaction costs (which account for the highest share of the costs of an LNG export project) have risen significantly over the last decade – average liquefaction unit costs grew to US$1,005/ton in 2009–2017 compared with US$404/ton in 2000–2008. Greenfield projects accounted for most of the cost inflation.

As per industry estimates, US$236 billion will be required during 2018–2022 to fund planned investments in LNG. Of these, a large portion – 67% or US$157.5 billion – will go toward liquefaction facilities, due to the capital-intensive nature of constructing and operating an LNG train.\(^5\)

Despite the growth in liquefaction capacity, the LNG market could face a supply shortage by the mid-2020s due to underinvestment in new projects as a result of the recent commodity down cycle.

Chapter 3: LNG liquefaction project funding

The cost-intensive nature of LNG export projects often makes external capital necessary for development and completion. Consequently, debt has accounted for a far larger share (compared with equity) of the funding required for LNG export project development.\(^6\) It was a little less than two-thirds of the total funding for LNG export projects (excluding shipping and regasification terminals) during 2008–2018, which totaled US$197 billion.\(^6\)


The top LNG exporters – US, Russia and Australia – have received the bulk of the funding, accounting for more than 60% of the capital spent during the period.6

LNG debt funding sources
Project finance is the preferred debt funding mechanism

Several types of debt funders have participated in extending capital to LNG export projects, with commercial banks as the forerunners, followed by export credit agencies (ECAs) and development banks. While commercial banks worldwide participate in LNG projects, prominent ECAs involved are from Japan, US, China and Korea. In addition to debt capital for LNG projects, ECAs also provide insurance cover against debt default risk, which lowers the cost of funding. Considering the scale of funding required (tens of billions of dollars on average), project finance has been the preferred funding mechanism to insulate financiers and owners from risks associated throughout the life cycle of an LNG project.

Debt sources for LNG export projects

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In the past, buyers typically agreed to long-term contracts (15–20 years or more) that align well with the debt servicing horizon of LNG project finance.\(^8\) Financiers relied on the security offered by offtake contract structures to extend capital to LNG export project developers.\(^8\) Take-or-pay clauses agreed by creditworthy offtakers provide added security to financiers.\(^8\) Long-term, secured cash flows are one of the most important criteria for financiers to make a final financing decision for LNG projects.\(^8\)

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\(^8\) *Financing LNG in the New Era*, Poten & Partners, November 2017; EY analysis.
Sanctioned LNG export project funding dynamics

The structure of the LNG market is now changing, as buyers are seeking greater flexibility in how much, when and how they procure LNG from suppliers. Potential offtakers are unwilling to bind themselves to traditional long-term contracts that prevent them from taking advantage of prevailing market conditions, such as pricing downturns; buyers with uncertain demand requirements have increased reliance on spot, short- or medium-term contracts.\(^8\)

Japan and large LNG buyers in Asia are also increasingly seeking greater flexibility in managing their offtake volume and are unwilling to sign new contracts with destination clauses.\(^3\) Contract renegotiations on pricing and volume have also happened.\(^3\) A mismatch between the needs of LNG consumers and suppliers is increasingly apparent, especially in the Asian market.
Diverging considerations of LNG market participants

These markets – the largest LNG-consuming region worldwide – are moving toward commoditization (similar to the US) as spot purchases increase and contract durations become relatively shorter. This is indicated by the fact that 88.3 mt or 30% of total gross LNG trade in 2017 were non-long-term (contracts less than five years), doubling in volume over the last decade. **Error! Bookmark not defined.**

Note: Spot trades are defined as LNG deliveries that occurred less than three months from the transaction date. Source: Annual Report Groupe International des Importateurs de Gaz Naturel Liquéfié (GIIGNL), 2016–2018

Source: Shell LNG Outlook 2018, Shell; EY Analysis

**Average LNG offtake contract duration and volume**

- **Average Duration (years)**
  - 2014: 10.8
  - 2015: 8.9
  - 2016: 7.9
  - 2017: 9.6
  - 2018: 15.6

- **Average Volume (mtpa)**
  - 2014: 0.8
  - 2015: 0.8
  - 2016: 0.9
  - 2017: 0.8
  - 2018: 1.3

**Average duration of long-term contracts during 2014–2018 was 10.4 years**

Source: Annual Report, Groupe International des Importateurs de Gaz Naturel Liquéfié (GIIGNL), 2014–2018; EY analysis
With steady cash flows more difficult to guarantee over the financing term, the risk exposure for project funds is also increasing. Revenue guarantees offered by long-term take-or-pay contracts are diminishing, leading to increasing volume and price risks for LNG suppliers. Ongoing pipeline construction in Europe and Asia is aiding the proliferation of short- and medium-term contracts, as China and other major buyers promote pipeline imports, which can be cheaper than importing LNG.

Increasing market risk

Low-risk/lower-cost project funding is challenged by these changing dynamics. Consequently, traditional risk-sharing frameworks are likely to need to change, as financiers look at insulating themselves from increasing project risks. This means more of the risks will revert to LNG project developers than before. External factors, such as Basel III norms that take effect in 2019, would contribute to constrained debt availability from commercial banks (the largest lending group for LNG projects) for LNG projects. Analysis of 2008–2018 data also shows a downward trend for the average share of debt in LNG project funding.

Chapter 5: More equity financing from oil and gas majors in building LNG capacity

The impact of changing market dynamics points toward a potentially growing role of equity in funding the LNG value chain of the future. New risk-sharing frameworks are likely to emerge that require project owners to assume greater market risk, in turn making it necessary for sponsors to arrange for a greater portion of the funding. Other equity participants, as shown below, could also supply more of the capital (through equity) for LNG export projects, helping in managing the risk exposure for sponsors and debt financiers.

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3 EY analysis of publicly available data.
Equity funding could be the way forward

However, the risk and reward considerations of equity investors will play a role in determining the extent – volume and duration – of their investments. In a capital-constrained environment, most of the risks associated with LNG export projects are likely to be borne by owners, with other equity providers taking strategic positions as per their specific considerations (shown below).  

Risk and return considerations for equity investors

The capital intensive nature of LNG has posed a challenge to providing returns reliable enough to support the debt loads in project financings. That situation is not likely to change. LNG, like oil, will probably have price and return
cycles. There are companies that have survived, even thrived, through those cycles and have the logistical know-how, risk management capabilities and experience marketing energy. They are today’s integrated oil companies (IOCs).

LNG project developers with large balance sheets – oil and gas majors and national oil companies – are best placed to assume greater risks across the project life cycle. They are further advantaged by their global supply chain infrastructure that imparts flexibility in managing market risks, placing independents and LNG specialists at a competitive disadvantage in equity funding LNG projects.¹⁰

An increase in the ownership of natural gas liquefaction capacity by majors is likely, and data suggests that the trend is already under way. Ownership share of majors in global liquefaction capacity witnessed a jump during 2000–2017. Error! Bookmark not defined. Analysis of the LNG project pipeline further indicates the growing dominance of oil majors in the LNG market – most of the likely LNG FIDs during 2019–2020 would involve sizeable ownership by majors.¹¹

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¹⁰ Equity Set to Play Bigger Role in LNG Financing, 27th World Gas Conference, June 2018; EY analysis.
¹¹ LNG Project Watch, HSBC, April 2018.
Consolidation of the global LNG liquefaction capacity is evident from acquisitions of independent LNG producers and greater ownership stake in LNG export projects by majors. Combined with the majors’ organic measures, their technological and financial strength, LNG production and export is likely to be driven by them, along with some of the larger NOCs.

At some point, the market structure of the global LNG market may reach the point where sufficient price risk management options exist to enable a greater availability of lower cost funding, as is the case in the US. Until that point, the likelihood is that LNG liquefaction will continue to be dominated by the majors outside of the US market.