



Navigating the new world of LNG
Trends, signposts, and opportunities

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Executive summary

Growth, change, uncertainty, challenge, opportunity – these are some of the words which we used most frequently in the 2016 Deloitte research series on the new world of LNG. These words represent a recognition that the LNG market has been one of the fastest growing segments of the global energy sector over the past couple of decades, and that exciting new areas of opportunity are opening up to propel LNG forward into new markets, new applications and new supply chains over the next couple of

decades. However set against this, the industry faces some near-term headwinds in which new projects and traditionally dominant business models are being challenged. In this paper, we review the overall findings laid out in the component parts of Deloitte's LNG series¹ and attempt to characterize, in a holistic way, the status of the global LNG industry and what may lie ahead.





Growth

LNG has shown impressive long-term growth in the past 20 years, quadrupling in size since 1995² and doubling its share of global natural gas trade.³ Developers have poured in to provide new supply to meet this growth trajectory, with the build out of export capacity in Qatar being followed up by truly world-scale new capacity development in Australia and the USA, as well as other projects around the globe. More than 140 million tons per annum (mtpa) of capacity are currently under construction⁴, with significant potential remaining unsanctioned. Can this growth sustainably continue? If so, what type of developments will come forth in the future to meet that pace?



Change

The list of changes facing the industry is long. Included is the emergence of both new suppliers and new markets; new technologies like floating regasification; the rise of spot and short-term trade; the emerging potential of new applications such as using LNG to fuel both marine and terrestrial transport; and other floating and modular technologies that connect flexible liquefaction to flexible regasification and storage units. These changes are also seeding the emergence of new types of participants and new business models up and down the value chain.



Uncertainty

Of course this is an unavoidable fact of life across the whole of the energy spectrum, but takes on particular significance for LNG in the light of the huge sums of capital committed and spent on such long-lasting projects. Is global growth now playing out more slowly than anticipated? Has the fall in oil prices over the past two and a half years dealt a critical blow to project economics? Will LNG pricing mechanisms converge across regions and bring more price transparency? Can the US be a long term sustainably competitive supplier into global markets, and what would that mean for market structure, pricing and trade patterns including geopolitically sensitive, piped gas? And how has our understanding of the impact from US market entry changed in just a few short years?



Challenge

The dominant near-term challenges revolve around overcapacity in the industry, which might last for several years, with a number of new supply projects coming on stream in a short time span, thus getting ahead of the smoother path of demand growth. A number of these projects have also faced significant cost and planning pressures, particularly in Australia, which are challenging the economic returns expected by the developers and operators – and leading to some cancellations and deferrals of unsanctioned projects.⁵ Will the oversupply and heightened concerns over cost discipline lead to underinvestment in necessary capacity?



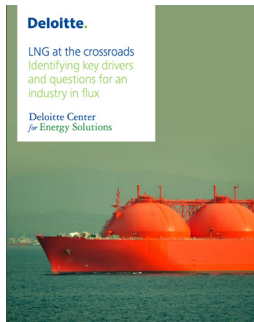
Opportunity

Natural gas is the fastest growing fossil fuel globally and expected to remain so, with LNG delivery in prime position to take a big part of this growth,⁶ serving markets with little access to indigenous gas resources; the long-term trend towards lowering the carbon intensity of the world's economies should enable LNG to remain on a favorable growth trajectory as natural gas can play an important role in lowering carbon dioxide emissions. This is particularly relevant as it displaces coal in power generation and provides an additional source of balancing capacity as intermittent renewable generation sources grow; new markets and applications continue to open up, providing more growth opportunities for LNG as a fuel; and for new and different types of companies to participate in growth up and down the value chain.

These are some of the LNG drivers which Deloitte has been exploring in a series of papers released throughout 2016 (references to LNG one to four from the Deloitte Center of Energy Solutions, and “The good, the bad and the ugly”, from Deloitte Australia). Our key overall findings are broadly positive for the future of this business,

but perhaps more importantly, they provide a framework for thinking about the future of the market, considerations for investment and risks which will need to be overcome. We expect the coming years to be an exciting and vibrant period in the long-term rise of LNG.

Deloitte's LNG series



Part one:

LNG at the crossroads: Identifying key drivers and questions for an industry in flux



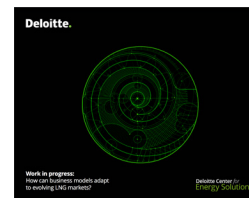
Part two:

Five years on: The outlook and impact of American LNG exports



Part three:

Building an industry: Can the United States sustainably export LNG at competitive prices?



Part four:

Work in progress: How can business models adapt to evolving LNG markets?



Australian LNG market:

The good, the bad and the ugly: The changing face of Australia's LNG production

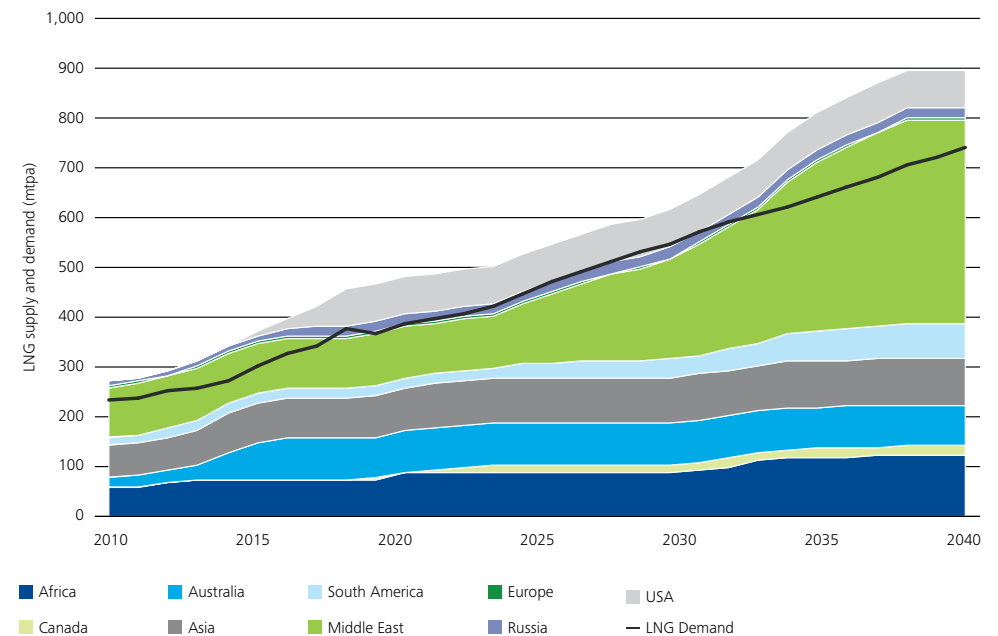
The story so far...

The technology of cooling natural gas to minus 260 degrees Fahrenheit in order to convert it from a gas to a liquid, and reducing its volume by about 600 times, created a new industry. Now so-called stranded natural gas resources could be monetized by shipping gas in special-purpose vessels to new markets which were hungry for new sources of energy to fuel growth and diversify supply. The trade began in the early 1960s, with resource-rich countries like Algeria shipping LNG to the UK, and Abu Dhabi shipping to Japan.⁷ As the viability, both technical and economic, was demonstrated, LNG trade proliferated with major supply sources like Indonesia and Malaysia jumping in to ship gas to east Asian markets in Japan, South Korea and Taiwan. The European market also opened up with France, Belgium, Italy and Spain soon joining the UK as destination markets, and even in the US several LNG regasification terminals were built and operated in the 1970s.⁸

Growth in LNG markets got a further major boost in the 2000s with the development for export of Qatar's massive North Field, potentially the single largest, non-associated gas field in the world.⁹ Nigeria and Russia also joined the LNG export club. Due to geographic location, LNG from Qatar could serve markets in Europe and Asia and it was even envisaged that trade to the US would take off in a big way, though of course before the emergence of economic US shale gas in quantities that would soon transform the country into a potential export source. At the same time, new markets began to be developed with regasification terminals constructed and commissioned in a number of Latin American nations, new locations in Western Europe, China and South and Southeast Asia.¹⁰

More recently, the current decade has seen a combination of fast growing demand, large natural gas resources and a period of high oil prices. Over a number of years, this translated by contractual linkage, into very high LNG prices in both the Asian and European markets which has brought forth a phase of very large-scale project development in Australia, with a number of these being world-scale projects, and the arrival of the US as an exporting nation, with several facilities under development. Furthermore, as demand is projected to grow steadily, new sources of LNG from a number of countries will need to be developed (figure 1).

Figure 1. Both LNG supply and demand is expected to grow steadily despite headwinds



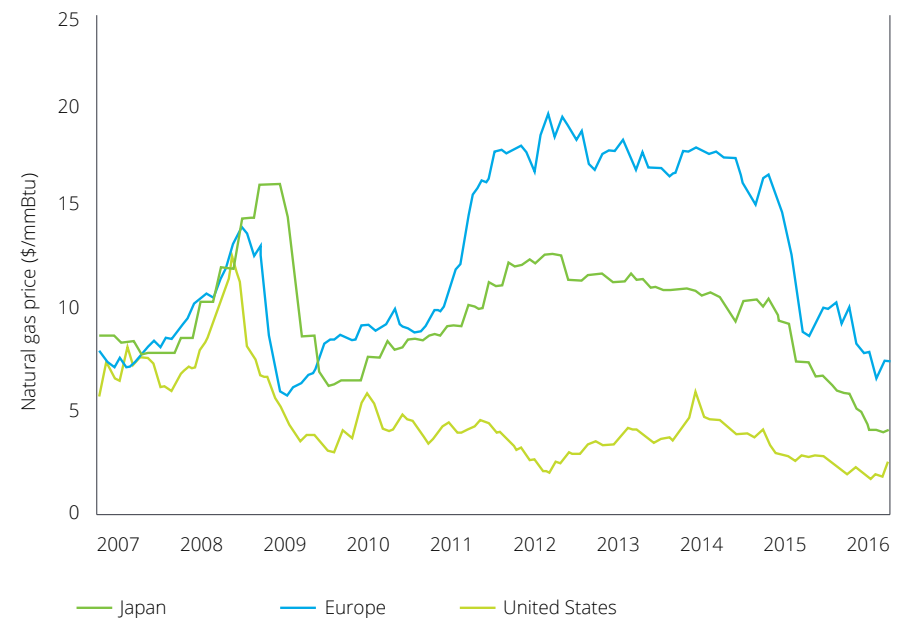
Source: Deloitte MarketPoint analysis

Despite the dynamism of the LNG business in both anticipating and delivering growth, certain features of the global market have remained relatively constant and dominant, at least thus far. For example, market structures have always been dominated by long-term, high-volume, point-to-point commercial agreements between large suppliers and large, mainly utility buyers, in developed economies. These arrangements have been the key enabling factor in securing financing for the huge, front-end loaded capital expenditures required to construct the specialized liquefaction, shipping and regasification facilities needed to operate the trade.¹¹ Twenty-plus year contracts with prices linked to oil have been the norm for the entire history of the industry. However, unlike oil markets, which tend to be globally fungible with convergent prices, LNG markets and prices have remained for the most part regional in nature (figure 2). East Asia has usually been the highest priced market with the strongest link to oil prices; Europe has been in the middle, with oil price indexation tempered by the effect of competition with Norwegian and Russian pipeline gas supplies; and North America has been the lowest priced market, with intense gas-on-gas competition usually driving gas prices down at liquid and transparent trading points, such as the Henry Hub. The recent decline in oil prices has led to compression in price differences between the ranges, but it is too early to say whether this is a precursor in itself of longer term price convergence.

From an end-use perspective, the overwhelming majority of LNG has been absorbed into the systems of large utility buyers, for use as a power generation fuel or as part of the supply portfolio into industrial and heating markets. After the regasification process, the natural gas's composition is adjusted for heat content, and other local market requirements, and is either consumed shortly thereafter, stored or sold into the broader piped gas market if accessible.

History sets a context for future development, and many of these features will remain in place. However, we also see the future diverging from the past in several ways, presenting both challenges and opportunities for players in this market. The Deloitte LNG series has sought to identify these emerging trends and assess their significance.

Figure 2: Regional natural gas price differentials have compressed, but not converged



Source: Deloitte Center for Energy Solutions analysis of International Monetary Fund data

Emerging trends and drivers

From the vantage point of 2016, when the overwhelming sense of the LNG industry is that of a paradox of long-term growth potential, but short term stagnation and turbulence, Deloitte identified seven underlying trends which will likely play a key

role in how this business develops over the next couple of decades or so.¹² These factors comprise of both challenges and opportunities, with the balance between them different for each type of player and each link in the value chain.

Slowing economic growth

European, Southeast Asian and Chinese economic growth rates have all slowed down and remained relatively low over the last couple of years, risking a knock-on effect on expected demand growth rates for LNG, most notably in Asia. The recent build out of export capacity in Australia particularly, and to some extent in the US, assumed that Asia would be a fast growing, increasingly larger and higher-premium market. More sluggish growth in these markets could extend the duration of global over capacity further into the 2020s, pushing out the period when large new supply investments will need to be made.

Increased energy efficiency

In most economies around the globe, economic growth is being achieved with less energy inputs than historically was the case. This is a result of a focus on energy efficiency in the major economies, partly for economic reasons and partly as a component of strategies to reduce greenhouse gas emissions for any given level of economic activity. Such trends can impact all energy forms, of course, but LNG might be more affected given its historically higher costs, rapid growth rates and the fact that it often competes with lower carbon energy forms, such as wind and solar, in key markets.

Surfeit of pre-foreign direct investment (FID) capacity

Not only have many major liquefaction projects become operational in the past couple of years, but there is also a lengthy list of planned new projects, both in development and awaiting project sanction or FID. The 140 mtpa of liquefaction capacity under construction¹³, along with a number of potential but yet-to-be sanctioned projects, would satisfy global growth expectations through 2035.¹⁴ These potential supply sources come from all around the world with several projects in East Africa, the Middle East and North America under consideration. However, there is therefore a significant risk that the LNG business could enter another boom and bust cycle, repeating the current over capacity situation ten years or so down the road. Investors and developers will need to pay close attention to all parameters of risk mitigation and cost control if they are to move forward in this environment.

Lower transport costs

Charter rates for specialized vessels, along with fuel consumption, comprise a significant amount of the delivered cost of LNG.¹⁵ Reducing shipping rates and distances can therefore be an important factor as reducing liquefaction costs is improving the competitive economics of LNG. Taking advantage of new, shorter routes, like via the expansion of the Panama Canal, can reduce the number of days to get from point A to point B, although the benefit is limited if you are trading across the same basin. Another potentially more impactful option, is optimizing vessel utilization through better routing. Historically inflexible, with contractual destination restrictions resulting in ships passing in the night, making two long-haul voyages when two short-haul voyages could have made the same deliveries in less time and for lower cost, the increase in number of contracts, and contract flexibility, along with more agile trading partners could reduce the length of the average trip. These flexible contracts, along with the rise of more spot and short-term trade should facilitate this optimization on a wider scale.

Access to new markets

With growth in traditional markets seen as somewhat challenged, LNG suppliers are actively pursuing smaller, so-called second tier markets – those with intermittent or limited year-round demand and less robust balance sheets. To some extent, this is being enabled by technology, with the growing deployment of floating regasification and storage units (FSRUs), but more flexible trade finance will be needed to translate technically feasible to widely affordable. An increase in short-haul trading within regions such as the Middle East, Southeast Asia and the Caribbean will expand the market for LNG and provide opportunities for smaller-scale developments on the supply side.

New types of end-users

Technology and economics are driving interest in new applications for LNG around the world as a transport fuel in heavy-duty trucks, rail locomotives, barges and large ships, as well as a fuel source for distributed power generation in emerging markets. While these markets will likely take time to build scale, over the course of a couple of decades they could begin to add up to significant new sources of LNG demand. But there is value in pursuing long-tail demand sooner rather than later since both infrastructure and new customers will likely take years to develop, particularly in energy poor parts of the world.

Increases in market liquidity

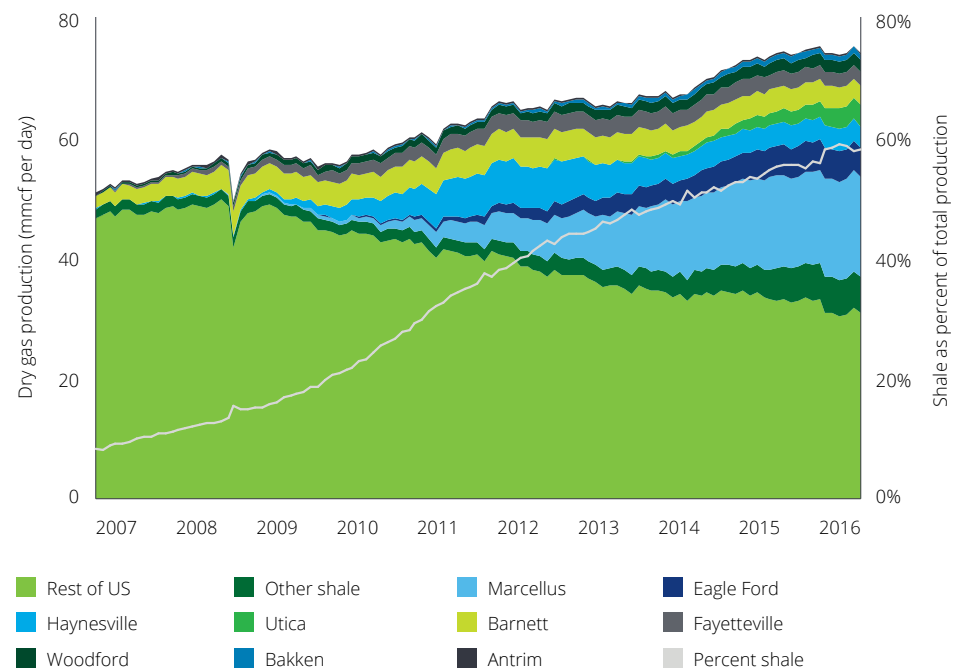
The growth of spot and short-term trade to about 30 percent of global trade opens up increasing opportunity for trading, shipping optimization, price transparency and portfolio management, both for sellers and buyers. As such, these trends should be a positive factor for LNG market growth by reducing complexity and transaction costs. It is unlikely that the LNG market could ever match the global oil market in terms of fungibility and price transparency, but progress is being made. Moreover, advances in technology or more widespread availability of shipping, finance or markets, will all continue to improve liquidity, thus lowering costs of both investing in capacity and servicing limited or niche markets, leading to a self-reinforcing cycle.

The recent emergence of the US as an LNG supplier has rightly been noted as a landmark moment in global LNG trade, with the country becoming a sustained net exporter of natural gas in November 2016.¹⁶ Just a few years after conventional wisdom saw the US becoming a major LNG import nation, the shale gas revolution saw huge quantities of low cost gas developed, giving US gas suppliers a platform from which to build LNG export capacity, and accelerate some of the global trends described above.

The US resource profile gives the country the ability to be competitive in global markets in the long-term, while opening up opportunity to test and develop new types of contracting, commercial arrangements and value-chain positioning. Buyers can now have greater choice over sources of supply and types of contract, spreading their risk through diversification. At the same time, the development cost of US-based liquefaction facilities has been kept very competitive by using brownfield facilities previously destined for regasification, and by being located on the US Gulf Coast in close proximity to infrastructure and to a readily available skilled labor force.

The contrast with LNG project development in Australia is quite marked. Australia is becoming the largest global exporter of LNG, with the completion of large projects in Western Australia and Queensland, and yet these projects have been burdened with high and rising costs, schedule delays and competition for scarce resources. These projects have had the further misfortune of coming to market at a moment when LNG prices had fallen dramatically, both as a consequence of the fall in oil prices and because of LNG oversupply.¹⁷ With insight, the Australian experience provides a compelling case study of the pitfalls and perils of developers and regulators not cooperating on planning, infrastructure build, human capital development and project scheduling. LNG projects in Western Canada may face many similar issues as did those in Australia, but it is to be hoped that the Australian lessons can be learnt.

Figure 3: Success in shale plays has led to the US becoming a net exporter of natural gas



Source: Deloitte Center for Energy Solutions analysis of US Energy Information Administration data

What does the future look like?

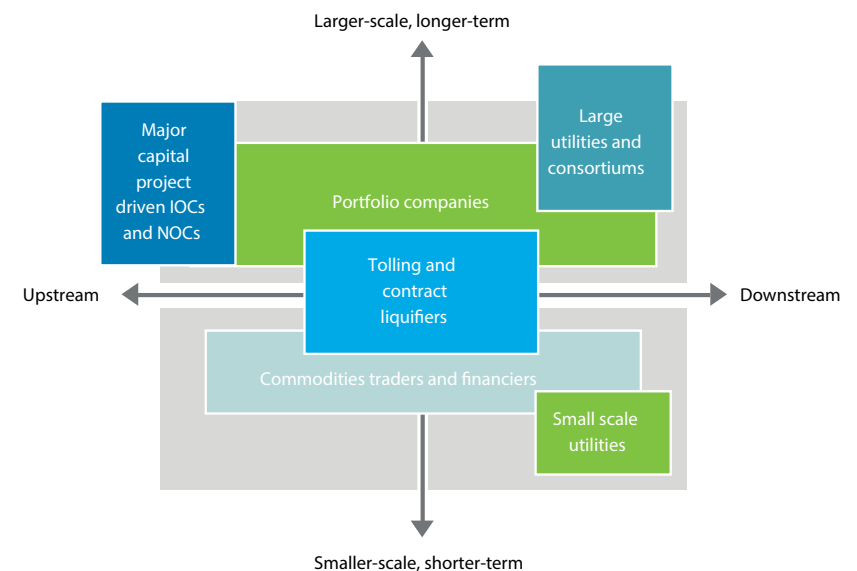
Despite near-term headwinds, the prospects for long-term growth for LNG look positive, to serve its traditional markets, to expand into new destination countries and to develop into new applications and end-uses. This growth and diversification of demand is driving further growth and diversification of supply sources, and not just geography of that supply but also of types of participants, business models, commercial terms, pricing mechanisms, shipping options and supporting services that ties the market together. It will be a more complex world, for certain, but one where flexibility and optionality can create value for buyers, sellers and increasingly, participants in the middle of the market providing liquidity, trade finance, storage, pricing hubs, physical and financial trading, and specialized services aimed at new user types.

The current business model structure is too limited to fully take advantage of the potential (figure 4). Today, the market is mainly large producers and larger buyers with few intermediaries or smaller players. In the future, portfolio suppliers and traders will become more important, buyers will have an increasing ability to re-sell, swap or trade cargoes, trading and market hubs may emerge and new business models will be developed to meet new and expanding market needs. The era of the dominant, large-scale, long-term bilateral supply contract may be coming to an end, leading the traditional big players in this space to reinvent their LNG strategies.

Technology opens the door to new types of supply development – whether it is floating liquefaction allowing access to more remote sub-sea natural gas resources; or small modular liquefaction units designed for smaller resource size; or floating regasification providing a lower cost route to supply new geographical markets. Technology on the demand side is opening up new end-uses for various modes of transportation, as well as new power generation applications.

Lessons from the past are important, and past trends have led to the current status of the global LNG business, having seen impressive growth over an extended period of time. That growth trajectory can be repeated in the future, but the building blocks to make that happen are beginning to look quite different from the dominant models of the past. LNG developers, buyers, traders, shippers and users all face new challenges and exciting opportunities in this new world of LNG.

Figure 4: Further integration and collaboration to supply an increasing complex market



Source: Deloitte Center for Energy Solutions

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