



CANADIAN GLOBAL AFFAIRS INSTITUTE
INSTITUT CANADIEN DES AFFAIRES MONDIALES

LNG Trade and Market Shifts

by Geoffrey Cann
July 2019

LNG SERIES

LNG TRADE AND MARKET SHIFTS

by Geoffrey Cann

July 2019



CANADIAN GLOBAL AFFAIRS INSTITUTE
INSTITUT CANADIEN DES AFFAIRES MONDIALES

Prepared for the Canadian Global Affairs Institute
1800, 421 – 7th Avenue S.W., Calgary, AB T2P 4K9
www.cgai.ca

©2019 Canadian Global Affairs Institute
ISBN: 978-1-77397-080-6

This paper underwent a double-blind peer review.



► Glossary of Terms

Cryogenics – the branch of physics that deals with the production and effects of very low temperatures. Methane condenses to liquid form at -162F and requires specially designed vessels, pipes, valves and other infrastructure that can withstand such low temperatures.

DES – Destination Ex Ship is a trade term whereby a seller delivers goods to a buyer at an agreed port of arrival.

FOB – Free on board is a trade term whereby a seller delivers goods to a buyer at the seller's warehouse.

JKT – This is the abbreviation for Japan, Korea, Taiwan. These three nations account for the bulk of global LNG trade.

Peaking power – the point in the day when power demand peaks. Electrical power generation that can be brought into a market when power demand peaks.

Ratable – consistency of contracted supply volumes. When a shipper schedules deliveries with a pipeline, it must schedule hourly delivery of 1/24th of its contracted daily volume every hour for the supply to be ratable.

Regasification – a type of gas processing plant that converts LNG to gas by slowly raising the temperature of the LNG, handling waste heat and controlling for volume expansion.



The commercial aspects of the liquefied natural gas (LNG) industry are works in progress because of the market's unprecedented growth. New sector participants need to understand these commercial aspects and anticipate how the global trade landscape will react to shifting supply and demand.

Introduction and Context

When I was based in Australia during the build-out phase of the country's LNG industry, I was struck by the opacity of the sector's commercial side. Industry participants were notoriously close-lipped about the actual mechanical and commercial aspects of trade in LNG. Consequently, I found that the national ambition to be a global LNG powerhouse, supplier-contracting strategies and taxation policy were sharply and frustratingly disconnected from the realities of trade in this commodity. LNG was about to become the second most valuable globally traded commodity after crude oil, and few individuals seemed to grasp how the sector operated and the implications for their interests.

At the same time, the trade in LNG was adapting to the arrival of the new volumes of production from Australia and the impending delivery of massive new U.S. exports. The terms of trade for new LNG shipments were beginning to vary from legacy contracting approaches, allowing the creation of new business models, industry participants and commercial structures. Changes in national energy policies, growing demand in new markets and shifting sources of supply added further pressures and greater uncertainty to the market. New entrants into this dynamic industry, including Canada, need a more sophisticated understanding of the industry to achieve competitiveness.

LNG as a Luxury Good

The more time spent studying the LNG sector, the more one concludes that LNG behaves like a luxury good. It does not meet the strict economist definition of a luxury good – one whose demand rises more than proportionately with rises in income, or put another way, the richer you are, the more you buy of it. Luxury goods frequently have a readily available, functionally equivalent and usually lower cost alternative. In the case of LNG, the substitute is coal, but LNG buyers, once hooked on LNG, tend to buy a lot¹.

The AAA fuel

Russian exporters like to call gas the “Triple-A fuel” – available, affordable and abundant. From both a handling and emissions perspective, gas is cleaner than coal². Despite the occasional spectacular pipeline mishap, gas is very safe to handle. It delivers precise and instant heat exactly where you want it at your desired intensity. That heat is highly controllable. As nations get richer, their populations are prepared to pay for access to gas, for heating and cooling, for power generation, for high-end manufacturing, and increasingly, for cleaner air.

¹ There are multiple cases of this trend; Japan, after the Fukushima Rector incident, greatly increased their LNG consumption for multiple years (<https://www.lngworldnews.com/japans-heavyweight-lng-buyers-wrestle-more-flexible-deals-from-suppliers/>); China looks poised to out-consume Japan by 2020 (<https://www.jwnenergy.com/article/2019/7/japan-lose-top-lng-importer-position-china-2022-woodmac/>).

² World gas report 2018, page 44 (http://www.snam.it/export/sites/snam-rp/repository/file/gas_naturale/global-gas-report/global_gas_report_2018.pdf)



LNG is a remarkably complicated way to deliver fuel relative to alternatives. First, the input gas has to be purged of any impurities that might damage the refrigeration equipment. That means extra cost to remove water vapour, CO₂, nitrogen, mercury, butane and other compounds. Next, the manufacturing process needs a large amount of energy to chill the gas down to its liquid state. The manufacturing takes place using specialty steel alloys capable of handling extreme temperatures and pressures.

The LNG supply chain requires specialty insulated storage tanks at point of export and import, a fleet of cryogenic vessels that cost six times as much as equivalent oil tankers to move the gas to market, and a regasification plant to remove all the energy that went into chilling the gas. That energy is often vented or absorbed into a medium like water as waste. The utilization rate of regas plants is about 30 per cent³, as most plants run for a few months of the year, usually in the winter when the demand is high, the price is high and the customer is price-insensitive.

A game of scale

The LNG sector's stand-out feature is scale. Large companies access global capital markets to tap large stranded gas supplies using very large assets to supply large distant markets with limited fuel alternatives over very long timelines. In other words, this is a business for those with deep pockets.

Unsurprisingly, the market penetration of LNG is relatively low for a technology that is 60-70 years old. In energy terms, gas provides about 22 per cent of global energy⁴, and of that amount, pipelines deliver 89 per cent to consumers⁵. LNG makes up the balance of 11 per cent of 22 per cent or about 2.4 per cent of the global market for energy⁶. Historically, the biggest market has been the energy-poor but economically rich nations of Japan, Korea and Taiwan (JKT). Among them, these three countries have accounted for as much as 60 per cent⁷ of LNG consumption.

Despite its luxury features, the demand for gas should be strong for years to come. Gas displaces coal quickly as the baseload fuel in power generation because the power infrastructure (transmission lines, local distribution, metering) requires little upgrading. Countries that aim to reduce their carbon footprint (primarily China) will turn naturally to gas, as the U.S. already has done. Gas is also finding its way into the transportation sector as a trucking, rail and marine fuel for those countries whose carbon goals cannot be achieved solely through fuel changes in the power sector.

The Holy Trinity

Underpinning the global market for this premium energy product is the holy trinity of long-duration contracts, oil-indexed pricing and destination restrictions.

³ <https://www.mckinsey.com/industries/oil-and-gas/our-insights/lng-regas-terminals-diversification-the-way-forward>

⁴ World LNG Report 2018, page 10 (http://www.snam.it/export/sites/snam-rp/repository/file/gas_naturale/global-gas-report/global_gas_report_2018.pdf)

⁵ Figure based on the BP Energy Stats 2018, pages 29 and 35 (<https://www.bp.com/content/dam/bp/business-sites/en/global/corporate/pdfs/energy-economics/statistical-review/bp-stats-review-2018-full-report.pdf>).

⁶ Ibid.

⁷ BP Energy Stats 2014, page 28 (<http://large.stanford.edu/courses/2014/ph240/milic1/docs/bpreview.pdf>)



Long contracts

LNG trade agreements are often based on contracts of 20 years' duration or longer. This aligns banks, gas sellers and gas buyers and binds them to manage risk (financing, supply, market and revenue), from the endeavour. As a result of these lengthy agreements, LNG spot markets have been a much smaller proportion of overall LNG trade compared to crude oil. Long contracts take considerable time to finalize because of the need to align so many market participants, and incorporate many contractual elements to manage the variability that inevitably occurs in commodity markets over time.

Oil-indexed pricing

Oil-indexed pricing gives gas buyers and sellers upside and downside price exposure, access to financial markets for hedging and risk management, a recognized currency basis and the support of existing commodity analysis expertise. There is an industrial logic to pricing LNG with reference to oil – these two commodities are sometimes substitutes as fuels for power generation. Banks have a deeper and richer history banking the oil trade, and pricing relative to oil can play somewhat to that experience. Oil-indexed pricing also implies the use of the U.S. dollar as the base currency, which provides access to global currency markets.

Destination restrictions

Destination clauses prevent gas buyers from turning into gas sellers and competing with their own source of supply for markets.

The destination clause is a standard shipping term dating back to the very earliest days of international trading. The buyer of the cargo takes possession as the cargo is offloaded from the ship to the buyer's dockside facilities (called Destination Ex Ship, or DES). Up to that point, the cargo is owned by the seller, who has chartered the ship, contracted the crew, financed the journey, paid the insurance, etc. The majority of older contracts, from Qatar and Australia, are contracted DES. In practical terms, buyers rarely trans-ship the cargo onto another carrier for sale to another party because the costs to do so are too high. Freely available LNG was relatively scarce.

Working together, the holy trinity has helped maintain a small but lucrative market for this premium, high-quality product.

Market Shifts and Pressures on the Trinity

Global energy markets have experienced several pronounced shifts that exerted, and continue to exert, pressures on LNG and the three sisters of the holy trinity.

Customer demands for flexibility

In the first instance, the run-up in oil prices from 2006 to 2014 laid bare the pricing risk to buyers whose contracts were priced with reference to oil prices. At one stage, Japan's annual LNG import bill topped US\$66.67 billion⁸, creating huge pressures on the national current account. Pakistani

⁸ <https://www.lngworldnews.com/japans-2014-lng-imports-climb/>



buyers simply tore up their contracts for Qatari gas and forced a new pricing basis. Asian customers are now wary of volatility in oil prices and the vagaries of international oil politics. They seek more flexibility in the market to allow a different pricing basis, free-on-board (FOB) shipping and shorter contracts.

Worries about energy security

Energy-importing customers value energy security, and the holy trinity delivers security of supply. However, over-reliance on long contracts with single suppliers can create critical risk, as Europeans learned on two occasions when Gazprom suspended gas shipments to Europe because the transit nation, Ukraine, had not paid for its gas purchases. By leveraging a flexible contracting model in the continental North American market, the U.S. has deftly avoided an over-reliance on Canada as a gas and oil supplier, and reaps the benefits of lower energy prices.

While Canada brands itself as a highly reliable supplier, LNG customers will want more frequent and smaller cargoes with a broader range of suppliers to manage supply risk.

Shorter contracts

Next, the adoption of renewable energy sources stimulates demand for stand-by power facilities, with gas being the logical fuel choice over coal – due to lower capital cost, faster cycle time and cleaner, more potential optionality. Battery technology is moving quickly into the peaking power market, and early evidence from a Tesla power supply agreement in Australia using large industrial-grade stand-by batteries suggests batteries will begin to take market share⁹. However, the long supply contracts and DES terms that characterize LNG tend to block the development of markets that have shorter terms, such as supplying for renewable intermittency.

Deregulated markets

Third, market deregulation is now a feature in key markets. Japan, facing long-term population decline, restructured its power and gas markets, creating new domestic competition for customers. Tokyo Gas and Osaka Gas merged their fuel supply businesses to create JERA, the world's largest customer for LNG with 40 per cent of Japan's total purchases.¹⁰ China deregulated city gas markets in key locations to enable more private investment in gas imports, creating demand for more flexible supplies. Prior to this, city gas markets were dominated by the state energy companies (Sinopec, CNOOC and CPNC) who were unenthusiastic about enabling third-party access to their gas infrastructure. Markets will continue to deregulate.

New technology

Changing technology contributes to pressure on the trinity. Floating regasification facilities, instead of large fixed on-shore plants, open up new markets faster. These facilities are built en masse in yards, floated to sites and quickly integrated into domestic gas infrastructure. Independence, a floating regasification plant in Lithuania, allowed this former Russian state to import LNG in addition to gas supplies from Russia. By creating head-to-head competition for the domestic market, Lithuania forced Russian gas prices to fall. Most of Russia's gas sold to

⁹ <https://electrek.co/2018/01/23/tesla-giant-battery-australia-1-million/>

¹⁰ <https://www.japantimes.co.jp/news/2019/03/29/business/corporate-business/lng-focus-energy-giants-chubu-electric-tepco-deepen-ties-jera-venture/#.XTtkz-hKhhE>



European customers is on long contracts which cannot be readily undone, but at the margin, customers seek more flexible supply.

New uses

Regulation plays its role. Maritime fuel specifications are triggering significant new investment in cleaner shipping fuels in ports around the world, and LNG is a leading contender to supply this market. Other transport markets, such as rail and long-haul trucking, are also exploring alternative fuels, including battery technology and LNG, as a replacement for diesel. These new uses are very different from LNG's traditional role as a base fuel for gas and power utilities.

New business models

Business models are shifting, beginning with the U.S. suppliers. In the North American market, continental gas prices are a reflection of overall supply and demand, where the price of gas allows suppliers to cover their costs and make a small profit. The new U.S. LNG export facilities (not quite new – most are conversions of former import facilities) tap into the massive available U.S. gas supply and liquefy gas for a fee, in a tolling model.

Much of the new LNG originating in the U.S. is sold FOB, meaning the buyer takes title as the gas is loaded onto the ship the buyer has chartered. FOB gives the buyer more flexibility to either bring the cargo to their home market or to find an alternative market. U.S. LNG disrupts the market because it is available FOB, priced partially with reference to the domestic price and not necessarily tied to long contracts.

The combination of FOB terms and tolling models creates new business concepts. Shell treats its LNG sector as a portfolio, where it optimizes the supply of LNG from its various facilities with customer demand. Traders with no facility ownership, such as Glencore with their enormous customer reach and established credit facilities, enter into the sector. Japan's JERA becomes both a buyer and a seller of fuel.

The Future of LNG Markets

The LNG marketplace cannot change overnight. Existing long-duration contracts cannot be easily unwound. Joint venture project owners value DES restrictions to reduce pricing pressures on specific projects. Recent lower oil prices moderate the demands for changes to the pricing basis. Demographic shifts, such as Japan's aging and shrinking population, take decades to unfold. New projects take many years to bring on stream.

It is unlikely that the LNG sector will transition completely from its moorings as a premium luxury fuel and take on the trappings of the more pedestrian crude oil industry. For one, the product degrades over time – it needs the constant addition of energy to keep it in a liquid state. It does not inventory well. Shippers face heightened pressures to move cargoes quickly to a customer. There are far fewer customers and suppliers in the industry, which limits optimization potential. The specialized ships needed to move LNG number in the hundreds and are costly.

However, the signposts of the future LNG market are clear.



Market Flexibility

The market will become more flexible. Contracts will be shorter in duration, with more options to reopen them for renegotiation. More volumes will have destination flexibility.

Pricing Flexibility

Pricing will be more dynamic. Asian customers will seek exposure to as many pricing bases as available so as to hedge risk. North American sellers will incorporate a component of their domestic market into pricing, rather than sticking exclusively to the oil index. This should not be viewed as a disadvantage, but as a distinct advantage over the incumbents unwilling or unable to alter legacy contract terms.

Fragmented Markets

There will be more and diverse players. Large, integrated LNG projects will share the market with new importing utilities, second-tier Asian cities, island economies, ports, portfolio players, traders and banks. JKT may continue to dominate the market, but a sizable fragmented second market will emerge. New applications in transportation, and new infrastructure such as hubs and floating regasification, will grow, driving demand beyond the traditional incumbents. Complex markets will favour sophisticated players with better-than-average analytics.

Competing Supply

New projects will compete with the expansion potential of existing projects. Australia has recently completed the construction of nine export facilities, most of which were designed to be expanded at attractive terms. Qatar has announced expansion of its industry. The competitiveness of the local construction industry is suddenly a differentiator in determining if a project can expand.

Rising Uncertainty

The level of uncertainty in the market is likely to increase. With the stabilizing influence of the holy trinity eroding in the face of a growing spot market, customer pressures for more flexibility, new market entrants and new pricing models, this formerly cozy and predictable market is becoming more like other pure commodity markets. The market may well change in multiple unanticipated ways as participants stake out their respective positions.

Improving Canadian Competitiveness

Canada stands well placed to succeed as a new entrant supplier to the global LNG sector. The country is blessed with a superior gas resource, proximity to global markets and a track record in continental reliability as a gas supplier. Nevertheless, market participants should be mindful that LNG's status as a luxury good is transitioning.

Superior market intelligence

The LNG market is dramatically more complex and uncertain than in its earliest days –more participants, fragmenting markets, shorter contracts, destination flexibility, pricing variety, greater volumes and more overall optionality. The level of uncertainty in the market, stabilized by



the influence of the holy trinity, is rising. The winners in this industry will have superior market intelligence and deep understanding of global gas supply and demand. Major importing nations devote enormous resources to the study and analysis of gas markets, in the form of think tanks, research houses, conferences and academic institutes.

Canada has no track record in truly international gas markets, and does not presently supply any markets beyond the U.S. As was the case with Australia, the country will benefit by stepping up its analysis and understanding of global gas markets so as to be best positioned to meet new supply opportunities. Deepening the national understanding of international risks and uncertainties related to supply and demand, geopolitics and energy usage will be a significant asset. Maintaining active relationships with the Asian importing region and an enduring presence in Asian trade circles will contribute to market intelligence.

Market development support

Next-generation markets for LNG will include new entrants, fast-growing but unrecognized Asian cities, island economies and less credit-worthy nations. They will also be unfamiliar with the LNG trade, and will contribute to the level of contracting risk and uncertainty in the market. There may be an opportunity for Canada to bring its export development capabilities to bear in novel ways to enable these new market participants to de-risk their involvement.

Stability and reliability

Stability and reliability in this industry are assets. Buyers generally do not inventory LNG, but convert it quickly into gas and feed it directly into their domestic energy markets. In cold winter months, reliable supply is highly valued. Canada's political system, subject to social pressures, runs on election cycles at odds with decision making in LNG buyer circles, and the nation is not well served with tax and regulatory changes that impact reliable supply. Examples include the country's recent experience with oil markets, including blocked pipeline developments and production curtailment.

To build global confidence in Canada's ability to supply demanding markets, successive governments need to resist the urge to tinker with this sector. Changing royalty regimes, adjusting land taxes and imposing additional onerous regulations do not instill confidence in investors or customers. Instead, governments should demonstrate Canada's seriousness about this growth industry by supporting trade missions, promoting the industry internationally and funding the research required to understand global gas markets on behalf of the emerging LNG export industry.

Construction performance

While Canada has considerable experience in building large complex energy infrastructure in demanding locations, including gas processing facilities, it has no track record yet in the global LNG sector. The recent LNG construction track record in Australia, a nation with similar political, fiscal, legal and regulatory regimes, is not encouraging. Almost all of the projects were delivered over budget, late or both. Notably, none of Australia's recent projects has been sanctioned for expansion.

To avoid the fate of Australia's stranded expansion potential, Canadian companies and labour should commit to the construction of the LNG facilities following the most efficient construction



programs possible. The potential gains from the use of digital tools to improve the productivity of the capital projects should be aggressively explored.

Conclusion

The demand for gas looks strong for decades to come, and it is not too late to be a new entrant into the global LNG sector. However, the status of the LNG sector, its historic behaviour as a luxury good purchased by rich Asian nations and its underlying commercial features, are changing. New entrants should be mindful of these changes and prepare to innovate their business models accordingly.

► About the Author

Geoffrey Cann is an author, broadcaster, publisher and consultant to the oil and gas industry. Following an early career with Imperial Oil, he became a partner at the world's largest professional services firm where he carried out hundreds of consulting assignments in Canada, the U.S., Korea, Japan, Hong Kong, China, Australia and the Caribbean over a 30 year career. From 2012 to 2016 he was based in Brisbane, Australia and focused on the LNG sector, working on such projects as Arrow Energy, QGC, GLNG, and APLNG. Today, he specializes in digital innovation in oil and gas, produces a weekly article and podcast on digital issues in energy, and has published his first book, **Bits, Bytes and Barrels: The Digital Transformation of Oil and Gas**, in January 2019.

► **Canadian Global Affairs Institute**

The Canadian Global Affairs Institute focuses on the entire range of Canada's international relations in all its forms including (in partnership with the University of Calgary's School of Public Policy), trade investment and international capacity building. Successor to the Canadian Defence and Foreign Affairs Institute (CDFAI, which was established in 2001), the Institute works to inform Canadians about the importance of having a respected and influential voice in those parts of the globe where Canada has significant interests due to trade and investment, origins of Canada's population, geographic security (and especially security of North America in conjunction with the United States), social development, or the peace and freedom of allied nations. The Institute aims to demonstrate to Canadians the importance of comprehensive foreign, defence and trade policies which both express our values and represent our interests.

The Institute was created to bridge the gap between what Canadians need to know about Canadian international activities and what they do know. Historically Canadians have tended to look abroad out of a search for markets because Canada depends heavily on foreign trade. In the modern post-Cold War world, however, global security and stability have become the bedrocks of global commerce and the free movement of people, goods and ideas across international boundaries. Canada has striven to open the world since the 1930s and was a driving factor behind the adoption of the main structures which underpin globalization such as the International Monetary Fund, the World Bank, the World Trade Organization and emerging free trade networks connecting dozens of international economies. The Canadian Global Affairs Institute recognizes Canada's contribution to a globalized world and aims to inform Canadians about Canada's role in that process and the connection between globalization and security.

In all its activities the Institute is a charitable, non-partisan, non-advocacy organization that provides a platform for a variety of viewpoints. It is supported financially by the contributions of individuals, foundations, and corporations. Conclusions or opinions expressed in Institute publications and programs are those of the author(s) and do not necessarily reflect the views of Institute staff, fellows, directors, advisors or any individuals or organizations that provide financial support to, or collaborate with, the Institute.