HOW SHORT-TERM LNG MARKET EVOLUTION WILL INFLUENCE THE MARKET DYNAMICS

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ABSTRACT
LNG short-term and spot sales have increased their share of global LNG trade significantly since 2000, and now comprise nearly 30% of the total. The LNG short-term market is more complicated nowadays, with various pricing mechanisms in different regions.

We expect short-term and spot trades will continue to be a major part of the LNG market and will become increasingly dynamic, with flexible supplies from the US, Qatar and other regions competing for sales to high-value buyers. In the medium term, US LNG capacity online will grow to 60 MMt/y, giving it a significant role in the short-term market. As oil prices recover, spot and short-term US LNG supply will become competitive into the Asia Pacific, albeit still in small volumes. Asia Pacific buyers will have a larger appetite for short-term and spot LNG, but demand will continue to be limited in comparison to the available supply in the market.

The authors simulate future short-term and spot LNG trade flows, adopting a constrained Pareto Optimal approach based on regional trading margins to allocate forecasted available supply to cover demand. The authors will discuss the interaction between buyers and sellers in different regions and test how the key elements might drive the short-term and spot trades in the near to medium term. We also briefly discuss how buyers and sellers can mitigate major risks and position themselves for success.
INTRODUCTION

LNG short-term trade is now mainstream in LNG world markets. LNG short-term and spot sales have increased their share of global LNG trade significantly since 2000, particularly after the Japanese nuclear crisis in 2011. As shown in the chart below, short-term and spot sales now comprise nearly 30% of total LNG trade. The increase of short-term and spot sales is driven by several key factors:

- Increasing uncommitted LNG volumes, particularly US LNG, flexible Qatari volumes, and aggregator portfolio volumes
- Increasing uncommitted shipping capacity
- A large amount of unused regasification capacity, inasmuch as the average utilization rate of regasification terminals worldwide is only 30%~40%.
- Increasing demand for spot volumes, particularly in Asia Pacific.

The LNG short-term market is complicated, with various pricing mechanisms in different regions. Supply for short-term and spot sales could come from:

- LNG sourced from the US, South America or Africa under contracts with destination flexibility
- Re-export cargoes from Europe, mainly UK, Belgium, Netherlands and Spain
- Middle East LNG mainly from Qatar, also with contractual destination flexibility
- LNG supply from the existing Asian LNG projects that is not locked under long-term SPAs.

As shown in the chart below, six major flexible supply regions will compete for spot sales into various markets, particularly to the higher value markets in Middle East and Asia, where LNG competes against oil derivatives. Regional prices are different because regional market structures are different from each other. At one extreme, the US gas market, at the wholesale level, generally approaches perfect competition, with many buyers and sellers, none of which have sufficiently large supply or demand to influence market prices. On the other extreme, the traditional Far Eastern market – Japan, Korea and Taiwan Region of China, have low transparency and liquidity and few alternatives to imported LNG. There are essentially no domestic or pipeline supplies. Buyers are essentially regulated monopolies. Markets with few alternative supply sources and price-insensitive demand have greater urgency when a potential shortfall in gas supply occurs and thus greater willingness, under such circumstances, to pay a premium for short-term LNG cargoes. Buyer motivated largely by security of supply and able to readily pass costs through to final consumers tend to negotiate less strongly on price than those with a more commercial orientation. Oil indexation dominates the region.
The short-term market for LNG is far from perfect in the classical economic sense of establishing a single clearing price with market equilibrium. LNG has not been fully commoditized and no one is making a market, in the sense of providing liquidity and posting quotes in exchange for a buy-sell spread. Short-term trade is a collection of bilateral deals that may cover a single cargo to many cargoes, over period ranging from a single month to over several years. Short-term and spot LNG trades are flexible and dynamic and are heavily driven by near-term supply-demand balances, LNG prices, and substitute fuel prices in the end-use market.

**METHODOLOGY**

Japan-Korea Marker (JKM) is not a deep market but a proxy for many bi-lateral deals. Prices for the actual individual deals transacted can diverge widely from JKM in any given month, as shown in the graph below. There are many factors driving actual prices moving within the range, particularly the distance between supply project and receiving terminal, buyers’ alternative fuel prices, sellers’ netback on delivery in alternative market (in Europe) and trading margins. The authors have developed a short-term model reflecting these key factors.

The authors have modeled short-term and spot LNG trade flows across a panel of 84 routes (12 supply regions and 7 demand regions) to determine Pareto optimal outcomes, subject to logistical and commercial constraints, for the period 2015 to 2022. The trading margin motivates trades, with the trade route with highest trading margin notionally going first in any given period, followed by the next highest marginal route, until no supply is left or demand unmet for the period in question. This paper estimates the trading margin based on the four key elements:
Buyer’s alternative fuel
- Premium / discount factors applied to buyer and seller
- Seller’s netback on delivery in Europe
- LNG shipping cost

**Figure 4. Influence Diagram to Model Short-Term LNG Trade**

Short-term LNG does not behave as an economically efficient, fully commoditized market. Economics is important, but only one of several factors driving short-term trade. Reliability, flexibility and diversification are also key drivers. Key constraints on pure economic efficiency were introduced in our model to calibrate results to actual historical data. Counterparties do not just focus on most efficient trades, but rather maintain a portfolio of trades and multiple relationships, considering track records for reliability. We reflect this reality by setting ceilings on trade from particular supply regions to any demand region. For example, a maximum of 50% of total short-term volume is allowed to shift from LNG projects in Australia and Southeast Asia to any given demand region, reflecting that these supply projects target LNG sales mainly to Northeast East Asia and other nearby regions. But the maximum is only 25% for the Middle East, North Africa and West Africa, since these supply projects target short-term volumes worldwide, to Asia Pacific, Europe, and Americas, rather than purely in Asia Pacific.

The authors have also calibrated prices and volumes against historical data, particularly on Northeast Asia. The following graph is a snapshot of the comparison between historical monthly average LNG prices and our modeled short-term/spot LNG prices for eight different supply regions into Northeast Asia. Small variations exist in the different routes, but the model has been well calibrated with historical short-term/spot prices.

The authors can also vary inputs for several major parameters to conduct sensitivity analyses and review major market opportunities and risks for buyers and sellers as per any specific cases.

**RESULTS**

**1. Short-Term Market Dynamics**

In the near term, Qatar will continue playing a critical role in the short-term LNG market with abundant flexible LNG volume. The US starts to show its influence in the short-term market from 2018, but mainly in the Atlantic Basin inasmuch as the US LNG does not have a very competitive price in Asia Pacific under the current low oil price environment. The Far East has limited appetite for short-term or spot LNG since buyers there have secured a large amounts of LNG under long-term LNG contracts in recent years, which reduces their need to secure short-term and spot LNG from the market.
In the medium term, US LNG capacity online will grow to 60 MMt/y, giving it a significant role in the short-term market. As oil prices recover, spot and short-term US LNG supply becomes competitive into the Asia Pacific, albeit still in small volumes. Qatar continues to make spot and short-term sales into both Asian and Atlantic Basin markets, but with a smaller volume than the US, at least if/until its announced increase in total production capacity to 100 MMt/y occurs. Asia Pacific buyers will have a larger appetite for short-term and spot LNG demand, but it will continue to be limited in comparison to the available supply in the market.

Since Northeast Asia is a market of primary interest for LNG suppliers, the authors focus on the near-term trend of short-term/spot LNG supply to Northeast Asia as an example to demonstrate how the short-term market could evolve in a specific region. Using the short-term model together with forecasts of oil and gas prices derived from other proprietary econometric models, the authors have modeled how the short-term flow could evolve in Northeast Asia, as shown in the graph below. Middle East, Southeast Asia and Russia are expected to be the major short-term LNG suppliers for Northeast Asia in the near term. There is increasing short-term supply from West Africa, a knock-on effect of new US LNG going into Europe, which displacing short-term European supply from Africa. In the early years of the next decade, it is expected that US LNG will begin to compete aggressively into Northeast Asia, with HH-linked supplies becoming quite competitive against oil-linked supplies. Short-term supply from the US will increasingly compete with short-term LNG supply from Qatar (including debottlenecking volumes) and West Africa. Short-term African LNG supply should continue to shift away from Europe to Northeast Asia.
A main finding of our analysis is that sensitivities to key drivers must be viewed systemically. For example, if you wish to test a high oil price case, it is far more useful to ask why oil price is high and what the implications of that reason are for other factors impacting on LNG trade. If the oil price increase is because of higher demand, that demand is likely to center in Asia, particularly China and India, and be associated with additional LNG demand. We therefore find that the most useful insights come from developing full and robust scenarios to test trading strategies with mutually consistent assumptions. Such scenarios should be developed with the particular situations and concerns of the individual companies that are active in or affected by the markets. A full demonstration is beyond the scope of this paper. However, given that predominant fact impacting short-term markets will be surging US supply, we briefly discuss how short-term LNG flows and prices might interacted with rising US volumes.

Figure 8. Example of Three Possible Scenarios

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2. Market Opportunities

Poten does not forecast short-term trade flows with this degree of rigor just for the challenge of it. Rather, it is because of the opportunities that short-term trade provides. Opportunities arise from a fundamentally more dynamic and responsive world LNG market, and ultimately from more reliable and economically efficient supply to all LNG importers. Buyers have the ability to purchase cargoes from the spot and short-term market to manage seasonality, volatility and uncertainties in the long-term outlook for demand that make traditional SPA terms risky. Sellers can reliably place cargoes produced in excess of long-term contractual commitments, or secure cargoes to back up their firm commitments in case their primary supply source becomes unavailable. Cycles in the LNG market, such as the current buyers’ market, can be managed with the least amount of waste and dislocation. Full
value can be derived from the growing flexibility and diversity of LNG contracts: volume flexibility, destination flexibility, diversity in buyers, and diversity in pricing mechanisms.

Our short-term model is, in a way, an invitation for new buyers and sellers to enter the spot and short-term space. We see that a tool that provides such a robust and systemic view of the trading can demystify it, giving new players confidence that the spot and short-term market can meet their needs, and that they can work in it without exposing themselves to unacceptable risks. Short-term supply is not just a game for major players anymore.

The model is also a tool for LNG players with growing experience to make their business more successful. It is an invitation for them to consider their own existing and potential positions and exposures, testing them against a range of scenarios that reflect their market views and particular concerns, but also with stress tests and contrarian thinking. It allows them to benchmark deals with much greater certainty and granularity than a simple comparison to JKM can offer. It lets them realistically assess how much cover hedging instruments such as JKM swaps, oil or NBP options truly afford. It provides a tool and a focal point for generating new strategies, providing answers to such basic questions as What are the most profitable trades, and why? and What are the key constraints that limit arbitrage across the market regions? What can be done to overcome those constraints?

The model, like all LNG, is at heart an exercise in economic geography, which we have boiled down, for purposes of this paper, to world maps with trade flow of varying thicknesses, proportional to the volumes traded, between supply and demand regions. Behind the flows there is—will be—an enormous investment of capital, steel, men and skill in the LNG carriers that will physically move the volumes. The ton-miles required to move the LNG will determine the relative tightness or looseness of demands on the world’s LNG carrier fleet, and ultimately the availability of short-term charters and charter rates. Add-ons to our model extend its scope from trade flows to shipping availability and rates, allowing sophisticated players to develop integrated shipping and trading strategies.

3. Market Risks and Challenges

In addition to market opportunities discussed above, there are also several risks and challenges for both buyers and sellers to deal with. In this paper, authors will mainly focus on three major risks and challenges:

- Commodity price risks
- Shipping capacity optimization
- Organization capability development

The global gas and LNG market continues to experience regional differences in pricing mechanisms. Asia remains a predominantly oil-linked LNG market with some HH-linked deals signed but not yet active while Continental Europe moves towards a more liquid market dominated by a gas hub price. The UK and North America have established gas-on-gas market pricing mechanisms (National Balancing Point and primarily HH) that set prices for gas and LNG in these markets.

**Figure 9. Global LNG and Natural Gas Pricing Indexation**
Amidst this fragmented landscape, commodity price risk has become a key consideration for both buyers and sellers. Each price index is driven by varying factors and performs differently ways, as shown from the historical price graph below. There are some correlations, but they are imperfect.

![Graph showing gas and oil price history](image)

**Figure 10. Gas and Oil Price History (Jan 2004 – Oct 2018)**

The most common cross-commodity that LNG players seek to mitigate are:
- Oil-linked price vs. HH-linked price
- Term contract vs. Spot
- Long-term vs. medium-term vs. short-term

While detailed analysis of the above pricing mechanisms and cross-price risk is out of our scope, sound portfolio design is a basic consideration. It is always important to decide where is the main market and try to finalize the contract price with the same mechanism. This is to help mitigate majority of price risk. Then players could start considering alternative pricing to gain additional flexibility or opportunity. As the player's footprint grows, a great many supply portfolios are possible, with varying combinations of risk and expected return. Only a relatively small number in in range of the efficient frontier of risk-reward trade-offs. Following is one example in which the authors analyzed a set of over 60 portfolios with mixes of different pricing mechanisms. The mix of spot and short-term, flexible and firm volumes within the total portfolio is critical. Each player will have a different optimum portfolio reflecting its risks, financial strengths, legacy contracts, geographical location, business model and growth trajectory.

![Diagram showing optimized LNG portfolio](image)

**Figure 11. Optimized LNG Portfolio**
CONCLUSIONS

Short-term and spot trades will continue to be a major part of the LNG market and will become increasingly dynamic, with flexible supplies from the US, Qatar and other regions competing for sales to high-value buyers. The authors simulate future short-term and spot LNG trade flows, adopting a constrained Pareto Optimal approach based on regional trading margins to allocate forecasted available supply to cover demand. The simulation model can be used to assess how short-term LNG flows are likely to respond to changes in market conditions and the price environment, such as dampened LNG demand in Asia or additional supply from Qatar.

The authors have demonstrated that surging US LNG will play a key role in the short-term/spot market in the near term, with other supply regions that had previously targeted sales into Europe forced to divert more volume to Asia Pacific. The authors suggest that it is important to develop full scenarios to test trading strategy across the robust sensitivities with mutually consistent assumptions.

In addition, the authors also briefly introduced several key market opportunities for LNG players in the short-term/spot market and discuss briefly the importance of rigorous modelling and analysis to capture those opportunities. In the end, the paper briefly introduces cross-commodity price risks, building on forecasting of trade flows and prices to the construction of optimum portfolios to manage risk and profit. Further analysis could address other opportunities and risks that LNG players face in the short-term/spot market.