# NEW MECHANISMS OF LNG PRICING IN ASIA

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## Keywords

LNG Pricing, Asia, JCC, Long term contracts

## Abstract

LNG (Liquified Natural Gas) is not yet a globally traded commodity so prices can vary substantially from region to region.Currently Europe, Asia, and the U.S each have their own unique pricing mechanism. The LNG price formula is one of the most Significant factors in LNG contract negotiates. When buyers and sellers reason for different formulas during negotiates, there is no mutually agreeable way to compare these formulas with different slopes, constants, not to mention of other conditions like quantity tolerances and seasonality,into the evaluation. LNG price formulas are functions taking the crude oil price as an input and move with oil prices. Therefore, the establishment of a metric for valuing LNG formulas will lead to more efficient Talks.In Asia Pacific, higher LNG price equivalent strengthening demand, this will change as sellers are negotiating higher crude oil linkages for LNG price formulas but In this paper we survey LNG Pricing new mechanisms and to this result reaching as if be applied to S-curve formulas with linkage %50 Crude Oil, Applicable Range increased for protection of revenues supplier and buyers.evolving strategy of Asia Pacific main players as if generally lack natural gas resource and depend on LNG imports for their natural gas supply, maintain security of Supply, based on long term contract & diversification of supplier and sources. Diversion from West to East are limited by the maximum absorption capacity in the Asia Pacific.Total diversions could be 10-15 million tonnes by 2013 for Japan Korea and Taiwan and more volumes can be diverted to Singapore, China and India, if international prices are paid, but in the middle east Qatar plays a pivotal role in balancing East and West prices. It has succeeded in segmenting the market and establishing two different prices in the East and West with little direct relationship. LNG Pricing in Other important markets too Comparison and to aim, HH/NBP will continue to act as a floor and stable LNG pricing in the Asia Pacific market. At last to this result reaching a full global convergence of gas prices may not be possible before 2025. Many negotiations for long term contracts of gas sale with face deadlock therefore this paper, would help buyers and sellers to reach treaties efficiently.

## Introduction

Natural gas is not yet a globally traded commodity so prices can vary substantially from region to region.[1] Currently Europe Asia and the U.S each have their own unique pricing mechanism for example in Europe pipeline gas prices are set to compete with oil products, namely gas oil and fuel oil LNG has to be competitive with pipeline gas and therefore is generally priced on a similar basis (see Figure 1).AS show in Figure 1 LNG pricing by region concomitant implications for trade, prices, contracts. In USA henry hub linkage for Long-term LNG contracts Also LNG easily diverted to other markets and very minor variation between contracts.Atlantic Basin has been inclusive:Europe oil products or brent linkage,NBP market in UK and TTF/Zee Index.In Asia Pacific Basin we seeing which rigid long term contracts diversion difficult, Price reviews every five years approx and each contract has its own price. Asia differs from the west in that because of the lack of markets to provide price liquidity for gas,LNG is mainly bought and sold through long term bilateral contracts of over 10 years rather than on the basis of a traded market price. In negotiations for these long term contracts, the transaction price is determined by the buyer and seller agreeing to a price formula indexed to crude oil prices. The price formula is negotiated in the context of market circumstances such as the balance of supply and demand and crude oil prices, so a variety of formulas are used depending on the circumstances at the time. The formula conventionally used to be a linear formula directly proportional to crude oil prices, but from the 1990s, mainstream formulas have used S-curves with the slope determining the proportional relationship to crude oil being a gentler slope at low price bands and high price bands than at middle price bands. The use of the S-curve represents the spirit of mutual aid between buyer and seller, alleviating the seller's risk of declining earnings at low price bands and alleviating the buyer's risk of increased costs at high price bands. The buyers appreciate the need for this spirit of mutual aid in long term contracts, but in view of the recent high crude prices sellers are now calling for linear formulas to avoid the opportunity loss at the top end of S-curve. In this situation, if there were a method for comparing the values of different formulas objectively and quantitatively, it would be easier to agree on a price formula that allayed the seller's fears while maintaining the spirit of mutual aid. However, no such method of comparison has been established. Moreover, crude oil prices are subject to a great deal of fluctuation and contract lengths are long, even if they do include a mechanism for reviewing the price. These factors make it difficult to conduct negotiations on the basis of an expected price.consequently,the actual process of price formula negotiation often becomes deadlocked as buyers and sellers press their own subjective arguments. In the markets, there is active trading of crude oil derivatives, including futures and options, based on crude oil prices. These products can be utilized to fix a value for the uncertain future cash flows linked to crude oil prices.



Figure1: LNG Pricing by Region Concomitant Important Implications for Trade, Prices, Contracts

Refrences: Cedigaz[2], Facts Global Energy, The Institute of Energy Economics Japan

## Structure of the LNG market and that global trade

The global trade in LNG, which has increased at a rate of 7.4 percent per year over the decade from 1995 to 2005, should continue to grow substantially under all scenarios that to be analyzed in all trusty studies. The projected growth in LNG is expected to increase% 6.7 per year from 2005 to 2020.Until the mid 1990s, LNG demand was heavily concentrated in Northeast Asia consist :Japan, Korea and Taiwan. At the same time, Pacific Basin supplies dominated world LNG trade[3].Nowadays there has been dramatic increase in worldwide demand for LNG in last few years because production of natural gas in North America and Europe is not expected to keep pace with demand also increased demand (and reduced U.S and Canadian supply) has pushed equilibrium price for natural gas in United States to 3-4 \$/MMbtu range and Atlantic Basin LNG production(particularly western hemisphere production in Trinidad and prospectively Venezuela)has reduced transit time and costs[4].But further reduction of the share of the Asia Pacific in the world's total portfolio of supply, Even if all liquefaction projects scheduled to start by 2015 in the East materialize, regional producers will still cover only 80% of Asia Pacific demand. As LNG supplies In the Atlantic Basin are no longer locked to one destination and can easily be diverted. The Middle East In 2007 with leadership Qatar. Oman and Abu Dhabi alone, accounted for almost 25% of the world's LNG exports[5]. Figure 2 illustrate global LNG trade routes consist :existing,new and future flows more exports are expected as significant liquefaction capacity will be added to the current capacity of 47 million tonnes per annum(mtpa),93 mtpa is currently under construction and/or planned. from this capacity, more than half is expected to come online by 2011 with the bulk stemming from the gas rich nation of Qatar. The importance of the Middle East on the world LNG scene is enhanced by the expansion projects in Qatar and Iran will have been resolved in the 2015/2020 time frame emerges as the largest incremental supplier during that period. Figure 3 illustrate structure of the LNG Market in the end 2008, The total volume of trade equal with (191.1mt), 40% production and 64% demand for Asia pacific.In other LNG markets, a similar trend prevails[6].There are many projects under way for construction of new and expansion of existing receiving terminals in North America and Europe, and LNG demand in the Atlantic Basin is anticipated to increase rapidly over the coming ten years[7]. In the Asia Pacific market, too, LNG demand should steadily expand along with the rise in huge emerging markets such as China and India as well as continuing growth in established markets such as Taiwan, South Korea and

Japan, on the other hand total volume of trade LNG in 2015 equal with (317mt).30% production and 50% demand for Asia pacific (see Figure 4). In this situation, world LNG trade could equivalent to 1.7 times the current level (2008-2009) around 2015. In this climate of fast-paced growth, market power is shifting from the buyers, who have dominated it thus far, to the sellers. supplies are contracted to the Asia Pacific, Europe and United States, but diversion is possible if technical (acceptance of lean gas and large tankers) and economic (higher prices) requirements are met[8]. This essentially creates a real linkage between East and West and fosters the globalization of LNG prices.US and European prices were converging before unconventional plays such as Shale Gas.but not any more. While Pacific Basin prices move with oil prices. US gas prices more accurately reflect the global gas market and pricing.Pacific Basin prices are based on oil and move with oil prices. Several countries the head of that Qatar plays a pivotal role in balancing East and West prices. It has succeeded in segmenting the market and establishing two different prices in the East and West with little direct relationship. Figure 5 illustrate Possible Diversions from western markets to Asia as 6 regions at that able definite, under has been bring: 1-Potential Divertible Volumes form Asia Pacific Producers, 2-Potential Scenario of Uncontracted Supply from Planned Liquefaction Projects, 3-Uncontracted Supply from Plants Under Construction,4- Uncontracted Supply from Plants in Operation,5- Uncontracted Demand from Asian Established Markets 6-Uncontracted Demand from All Asian. LNG demand in the US more uncertain and in India, China is limited at high prices but their willingness to pay will continue to increase [9]. For LNG Supply can be said which numerous projects scheduled to start in the 2013/15 also LNG supplies not short for Asian buyers. There are plenty, but will have to be diverted from West. But Asian Prices based on Long and mid term contracts (>3 years) will remain indexed on oil prices at levels close to crude oil parity because the mid and long term outlook for LNG supply remains tight. Spot and short-term contract prices will relax significantly and settle around HH/NBP+ shipping cost differential + slight premium .But HH/NBP will continue to act as a floor and a greater linkage to those could emerge post-2015. Qatar will move beyond targeting only the most desperate buyers as Asian netbacks and Asia's relatively stable prices are attractive vis-a-vis HH and NBP. Large Asian premiums to HH/NBP will diminish due to increased competition amongst sellers, as there are many opportunities for diversions to the East. However, HH/NBP and oil prices are projected to remain high. Some Asian contracts may be linked to HH, but most will retain oil linkage. However, HH will have an increasingly large bearing on contract negotiations. Therefore LNG price trend by region as has been illustrate in Figure6.until the year 2004 higher price in Asia since then the situation the contrary and HH/NBP increasing until the year 2008, After that situation again returned to the primary rank. In extremity we conclude which LNG is still a regional market and a full global convergence may not be possible before 2025.(see Figure7).



Figure2: Global LNG Trade Routes Consist: Existing, New and Future Flows

Refrences: Gas Strategies Consulting, Total Finaelf, Beicip Franlab



Figure3: Structure of the LNG Market in the end 2008(191.1 mt)





Figure4: Structure of the LNG Market in 2015(317mt)

Data Source: International Energy Agency's (IEA) *World Energy Outlook 2006* (WEO) Energy Information Administration's (EIA) International Energy Outlook 2006 (IEO) California Energy Commission, Jensen Associate



Figure5:LNG Supply from the Asia-Pacific Region and Possible Diversions from Western Markets to Asia

Data Source: International Energy Agency, Facts Global Energy[10], BP Statistical Review 2008



Figure6: LNG Price Trend by Region:until the year 2004 higher price in Asia

Data Source: The Institute of Energy Economics, Japan IEA/ENERGY PRICES & TAXES 2005 Natural Gas Market Centers and Hubs: A 2003 Update,EIA Energy Information Administration, Natural Gas Division



Figure7: LNG is still a regional market and a full global convergence may not be possible before 2025

Refrences:Cambridge Energy Research Associates, Energy Information Administration Natural Gas Division

#### Mechanisms of LNG Pricing in Asia

The LNG price formula is one of the most critical factors in LNG contract negotiations. When buyers and sellers argue for different formulas during negotiations, there is no mutually agreeable way to compare these formulas with different slopes, constants or kink points, not to mention of other conditions like quantity tolerances and seasonality, into the evaluation. As a result, buyers and sellers adhere to subjective arguments, frequently causing negotiations to become deadlocked. Therefore, the establishment of a metric for valuing LNG formulas will lead to more efficient negotiations. In this paper, we suggest a financial engineering approach, proposing a methodology for valuing LNG price formulas utilizing the market value concept. From the standpoint that cash flows linked with future crude oil prices can be replicated by crude oil derivatives, we observed that LNG prices determined by formulas linked with crude oil prices can also be replicated by crude oil derivatives and define the market value of these derivatives as the market value of LNG price formulas [11].We then propose a valuation methodology therefore sing a well-known financial model and market data. This methodology can be applied to S-curve formulas. In Figure8 we will illustrate which changing market conditions are likely to dilute the S-curve LNG price formula that has Japan's LNG prices since 2001 under some long-term contracts.As shown in this Fig. Applying the S-formula established in 2001,term LNG prices change linearly in proportion with crude oil prices in preset price ranges approximately \$20 to \$40 per barrel. That preset range seemed likely to cover all upside oil price eventualities when they were negotiated. If the price of crude oil rises or falls outside that range, then the rise or fall in LNG prices is further dampened by the additional S coefficient that then becomes effective, providing transitional floor and ceiling LNG prices. It can also be applied to natural gas (Henry Hub) linked formulas as well as crude oil (JCC) linked formulas[12]. Our proposal would enable quantitative comparison of different price formulas according to a "market value" scale defined. It would also enable the generation of alternative price formulas that have equivalent "market value" but different shapes. This methodology would help buyers and sellers to reach agreements efficiently. This is a first step toward a new framework that allows buyers and sellers to negotiate LNG contracts according to a "market value" scale. In the markets, there is active trading of crude oil derivatives, including futures and options, based on crude oil prices. These products can be utilized to fix a value for the uncertain future cash flows linked to crude oil prices. Furthermore, the study demonstrates the application of a methodology based on this observation, evaluating the market value of LNG price formulas by breaking down the LNG price formula into crude oil derivatives.Next, this method is used for trial calculations of the market value of S-curve formulas indexed to crude oil prices, demonstrating that it enables easy comparison of the market values of different price formulas. It is also shown that utilizing this method makes it possible to evaluate not just the market value of S-curve formulas, but also the market value of a linear formula, and even the market value of formulas indexed to the North American gas price

instead of to crude oil prices, thereby showing that it can be utilized for the comparative evaluation of a variety of price formulas with different forms and different price indexes[8].LNG price formulas are price functions taking the crude oil price as an input. The JCC price (average CIF price for imports of crude oil to Japan) is used as an input for all LNG except Indonesian LNG, which uses REP (the realized export price for Indonesian crude oil)[13]. Thus LNG trading contracts employ different price formulas, which are rarely disclosed. Therefore, there is no choice but to surmise. And yet, to the author's certain knowledge, demarcated by a certain price level, the formula reportedly results in a cheaper LNG price than crude oil when the crude oil price is high, and a dearer price when the crude oil price is low. These can be put to the following formula.P<sub>LNG</sub>=  $b + a \times JCC(m-3)$  where, b:Non-JCC factors, a: degree of indexation to JCC price in most contracts." a" is given in order to prevent the LNG price from falling below a certain level, so that huge capital costs can surely be recovered by taking project investors risk avoidance into consideration. It provides a mechanism to prevent the LNG price from rising 100% in reflection to its link to the crude oil price, when skyrocketing, for consumers' interests.then,which of suppliers' or consumers' interests are taken into consideration stronger depends on where a kink(cross)point (K) of  $P_{LNG} = JCC$  and  $P_{LNG} = b + a \times JCC(m-3)$ is located.also, as already explained, the magnitudes of "a" and "b" are correlated to suppliers and consumers interests.(see Figure 9). during the 1970s, when the crude oil price set upward, an underlying trend was to put "b" near 1, and "a" liable to slide. During the 1980s, when the crude oil price set downward, the underlining trend reportedly changed, with "a" raised and "b" lowered. From the 1990s through 2001, except around 1998 when the crude oil price plummeted, crude oil has been priced rather high. So, in order to take advantage of rising pressures of the high price, an underlying trend was to raise "b" and lower "a," which reportedly worked favorably for suppliers. In addition, the kink(cross)point (k) of P<sub>LNG</sub> = JCC and P<sub>LNG</sub>= b + a × JCC(m-3)is estimated at around 25\$/bbl, thus showing LNG prices tended to remain high despite a rather oversupply. In 2007 negotiations LNG suppliers are looking to significantly extend preset price range or to abandon the S-curve formula.(Please again see Figure 8).In below optimal condition for coefficients a, b to has been discussion.b:0.7- 0.9 (Ex-ship),a:0.1485 or 0.1558, high degree of Indexation (≈90%) to JCC prices,LNG price is vulnerable to JCC price fluctuation, here P<sub>LNG</sub> is a LNG price. But recent changes in contracts the form is under: b became Larger, a became Less smaller than conventional Ones, Indexed to JCC price about 50% conclude, a: 0.066, b=1.34, be applied to S-curve formulas with linkage %50 crude oil, applicable range increased for protection of revenues supplier and buyers. IF Indexed to JCC price about 30% then a:0.05 and result, lower price and stable structure. The old formula would appear to be an upper bound under any circumstances(Basic Formula 1986 -2000, PLNG=0.1485JCC + b,b between 0.7 and 0.9\$/MMBtu), but anew formula probably represents a sensible lower bound. Importantly, the new formula applies for contracts that have just or are yet to come into force, with Guangdong having just received its first shipment and the new Korean contracts not due to begin supply until 2008. Although average contract lengths are declining, these contracts are typically for terms of 15-20 years. In table1 has been compared pricing mechanisms in the new contracts Asia. Be applied to S-curve formulas with linkage %30 crude oil, applicable range increased for protection of revenues buyers but shows this fact which power of sellers to buyers will be shift. Also, in practice, LNG price formulas index to the crude oil prices for several months ahead, but for the purpose of simplification, only the price for the current month is considered. Also, it was assumed that the S-curve would only have 2 kink points. With these simplifications the LNG price formula is modeled as shown in Figure 9.k<sub>1</sub> is called the lower kink point, and  $k_2$  is called the upper kink point. Also,  $a_1$  is called the low price band slope, a<sub>2</sub> is called the middle price band slope and a<sub>3</sub> is called the high price band slope.Figure9 shows the concept of the price formula, not a formula utilized in an actual contract .In this study, the market value of an LNG price formula is defined as the swap price indexed to the LNG price as determined by the price formula.Swap transactions are financial transactions that exchange a pre determined fixed price for the value of the fluctuating index price at a specific point in the future, and the swap price refers to that fixed price. Swapping a fixed price for a varying price may only occur once, or it may occur at a number of predetermined points within a certain period. For example, if the arrangement is to swap each month over a 3-year period, the swap buyer pays the same price each month for 36 months, and receives in exchange the index price, which varies from month to month. The market value of a LNG price formula for a 3-year contract is the fixed price for 3 years of swap transactions indexed to an LNG price determined according to the price formula. The LNG price formula shown in Figure8 can be broken down into the components shown in Figure9 these can be expressed mathematically as Equation(1). Noting that the second term and third term in Equation(1) represent the cash flow of put options and call options, and taking into consideration the fact that the option price is defined as the current value, the LNG swap price can be broken down into crude oil derivatives as shown in Equation (2). A long term LNG swap price can similarly be broken down as shown in Equation (3). The first term in Equation (3) is the crude oil swap price, calculated directly from the (Henry Hub) futures price for up to 7 years ahead. In contrast, the second term and third term can use the (Henry Hub)option prices for up to 1 year ahead directly as the price for the crude oil options, but for the option prices over the long term a model calculation is necessary using financial engineering techniques. LNG price formulas employed so far have been advantageous for suppliers or gasproducing countries. Thus, Asia Premium on LNG produces even larger differentials than Asia Premium on crude oil.Hence, a pricing formula capable of reflecting a true competitive market is crucially in need of. To

make up for these deficiencies, the forward curve model was developed, taking the forward curve to be an exogenous variable. For simplification, this study utilizes the single-factor forward curve model shown in Equation (4) made use of the fact that the forward delivery price at the maturity date is the spot price, derived the spot price model in Equation (5) from Equation (4). Further, by using the risk-neutral evaluation method, showed that call option prices that use the spot price as the underlying asset can be expressed by the calculation shown in Equation (6). Put option price equations can be expressed in a similar manner[11].

 $P_{LNG}(t) = a_2 \times JCC_t(m-3) + b_2 + (a_2-a_1) \times max[P_1 - JCC_t(m-3)] - (a_2-a_3) \times max[JCC_t(m-3) - P_2]$ (1)

(2)

$$\sum_{t=s,T} (1/e^{rt}) \times F[P_{LNG}(t)_{S,T}] = \sum_{t=s,T} \{ (1/e^{rt}) \times (a_2 \times F[JCC_t(m-3)] + b_2) \} + (a_2 - a_1) \times \sum_{t=s,T} Put[JCC_t(m-3), P_1]$$
(3)

$$\{dF(t,T)/F(t,T)\} = \sigma e^{-\alpha(T-t)} dZ(t)$$
(4)

 $dlogS_t = (\theta_t - \alpha logSt)dt + \sigma \varepsilon_t$ 

 $\theta_{t} = \{ (dlogF_{0,T})/dt + \alpha logF_{0,T} + (1-e^{-2\alpha t}) \times (\sigma^{2}/4) - (\sigma^{2}/2) \}$ (5)

 $c(t,F_t,K,T)=P(t,T)[F_tN(h)-KN(h-w^{1/2})]$ 

h=[(InF(t,s)/K)+w/2]/w<sup>1/2</sup>  $w = (\sigma^2/2\alpha) \{1 - e^{-2\alpha(T-t)}\}$ (6)

PING(t):LNG price at time t

JCCt(m-3): Crude oil price at time t but Japan Crude Cocktail (\$/bbl) price with a 3 month time lag. F [X]:Swap price indexed to Xt, F [Xt,T]:Swap price for start S and term T indexed to f

Put  $[X_t, P]$ :Call option price for a strike price P indexed to X Call  $[X_t, P]$ :Put option price for a strike price P indexed to X

S: LNG contract start date, T: LNG contract maturity date, r: Risk-free interest rate

σ: Volatility, α: Mean reversion rate, dz: Weiner process

S: Spot price at time t,F (t,T): Forward delivery price at end of contract T

 $\dot{C}(t, F_t, K, T)$ : Call option price for strike price K at end of term T

P (t,T): Discount rate for end of contract T,

N: Cumulative probability density distribution function for standard normal.

Sellers and Buyers are discussing upper kink point and high price band slope. Modeling LNG price formulas in this paper shown in Figure 10.As shown in this Fig.Lower kink point equal 20, slopes consist: 4,7 and the last slope must acquire. variation of S-curve formulas, As shown in Figure 11, we choose three formulas for Simulations and demonstrator relative level among different formulas varies along crude oil price. In Figure 12 shown which difficult to negotiate on an expected crude oil price. As a result, sellers and buyers press their own subjective arguments. Finally, price formula negotiation often becomes deadlocked.drawing equivalent line chart from results as shown in Figures 13,14,15 and 16.

# Figure8: Changing market conditions are likely to dilute the S-curve LNG price formula that has Japan's LNG prices since 2001 under some long-term contracts.



Data Source:Osaka Gas Co.Ltd,David Wood & Associatess

Formula	Seller	Buyers	Landed LNG Price (\$/MMBtu)	The price of oil(\$/bbl)
0.1485xJCC(m-3)+0.81	USA(Alaska)	Japan	7.22	43.17
0.1364xICP + 1.12	Arun/Bontang (Indonesia)	Japan/Korea/ Taiwan	6.58	ICP=40 Indonise crude price
0.0525xJCC(m-3)+1.55	NW Shelf (Australia)	China Guangdong to method (FOB)	2.33-2.86 3.81	15 <jcc<25 JCC=43.17</jcc<25 
0.0525xJCC(m-3)+ 1.55+0.5 shipping	Tangguh (Indonesia)	China Fujian to method (FOB) [14]	2.83-3.36 4.045 4.316	25\$/bbl celling price was increased to 38\$/bbl in mid 2006 and outset 2009, 43.17\$/bbl
0.127JCC	Ras Gas Qatar	India Dahej to method (FOB)	2.28-2.79 5.482 (This price for Indian buyers is not cceptable)	18 <jcc<22 JCC=43.17</jcc<22 

Table1:Compared	pricing	mechanisms	in the	new	contracts	Asia
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Figure10: Modeling LNG price formulas in this paper



Figure9: S-curve formula can be decomposed into oil derivative











Figure13: Drawing equivalent line chart from results.







Figure16: Drawing equivalent line chart from results



## Conclusion

Energy is crucial to Asian economies and LNG will play a crucial role in meeting the needs of many countries (although varying by country).majority of global LNG trade is likely to remain based on long-term contracts Asian linked to JCC and other appropriate benchmark crudes. although still require long-term committed offtake, but some conditions provide more flexibility. Increased tendency for plants to have surplus capacity(available for spot sales). In fact short term contracts will become more important, but will only account for a limited share of LNG market.commitment terms,15 to 20 years with pricing provisions possibly valid for only 3 to 5 years. In Asia LNG prices are generally higher than elsewhere in the world.As China is breaking the past trend and new Japanese contracts will track. Goal of this paper, develop a methodology for evaluating market value of LNG price formula objective and quantitative methodology to compare different formulas would make it easier to agree between sellers and buyers. Thereupon need not all legacy contracts to be renegotiating sellers will have to accept more price risk in the future and shows this fact which power of sellers to buyers will be shift we have established a methodology of evaluating market value of LNG price formulas by breaking down it into crude oil derivatives. This methodology makes it possible to compare different price formulas, for example, S-curve formula indexed to JCC price, linear formula indexed to oil price. S-Curve protects against low oil price in exchange for upside, most contracts still of this form this methodology is for comparative evaluation of different price formulas, not for judgment on the appropriateness of the market value level for a price formula.Next step is to establish a methodology of evaluating market value of LNG contract clauses other than price such as flexibility in take-up quantity. Finally, we would like to establish all-encompassing market value evaluation for LNG contracts. Japan's LNG pricing will be even more influenced by short-term LNG trades linked to U.S.gas price movements.During periods of high global LNG demand and rising prices, markets should to be diverted to countries willing to pay the highest prices. Flexibility and diversification of supply sources are undeniably major assets for the LNG option. Should demand for LNG grow according to plans. supply will very likely be tight in some periods.

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