

## **LNG: Falling Price and Increasing Flexibility of Supply – Risk Redistribution Creates Contract Diversity –**

**Koji Morita**

**General Manager, First Research Department  
The Institute of Energy Economics, Japan**

### **<Research Objective>**

In the past few years, a growing number of electric and gas utilities in Japan have argued that their LNG sales contracts, which are comparatively costly and lacking in flexibility, should be reviewed, stating that otherwise, Japan's LNG demand is unlikely to increase. Under these circumstances, the media reported that cheap-priced LNG would be supplied to China. Meanwhile, the Japanese LNG importers for their part, taking every opportunity and particularly through contract renewal talks, have won concessions from the suppliers for price cuts and greater flexibility of contract volume as a result of repeated negotiations. This research analyzes the changing environment surrounding LNG and the key factors behind the changes, and then provides an estimate of the probable LNG price levels and pricing formulas in the days ahead.

### **<Major Conclusions>**

1. Although Japan-bound LNG has been long characterized by higher prices than US/EU-bound consignments and more rigid supply terms, falling prices and improving rigidity are likely from now on thanks to such factors as a loose supply-demand balance and sharply trimmed supply costs, particularly of liquefaction and hauling costs.
2. LNG prices are expected to converge into the contract price offered to China's Guangdong project, to which LNG supplies will start around 2005. When corrected by distance, the Guangdong price is equivalent to a little over \$3/MMBTU (when crude oil price is \$20/bbl) in terms of the LNG price in Japan. From now on, the strong likelihood is that the Japanese importers will demand that their prices must be lowered to the Guangdong price level during price negotiations and contract renewal talks.
3. LNG projects have been affected by risk sharing between the supply side and importers on the demand side. The importers, however, are now seriously seeking risk redistribution. This is because they are being squeezed by intensifying deregulatory moves, etc. and can no longer afford all risks, regardless of price or volume. Indeed, when renewing their contracts with Malaysia I, Tokyo Electric Power and Tokyo Gas won a price cut and effectively relieved take-or-pay (TOP), as a result of which they decided to assume part of hauling services by themselves. TEPCO and Tokyo Gas also plan participation in the whole of the LNG chain, including upstream, of the Darwin Project, Australia, which will start supplies in

2006. These developments demonstrate the emerging strategy of the Japanese importers in which, rather than just reducing conventional risks, they are now increasingly aggressive—that is, they are oriented toward optimization of LNG procurement even by assuming additional risks.

4. Risk redistribution under way creates diversity of LNG sales contracts, with a plural number of pricing formulas paired with different trading terms (e.g. long-, medium- and short-term options, varying TOP coverage, non-uniform deliveries). Already Korea Gas Corporation has given its consent to the North West Shelf project (NWS), Australia, for the signing of a medium-term (7-year) agreement, which endorsed a highly flexible supply (e.g. priority deliveries in winter seasons).

These developments enable electric utilities to realize the best power mix more easily than ever and help electricity and city gas alike to increase price competitiveness, all of which contribute to promoting natural gas use.

It will be essential for the Japanese importers to try to construct an optimal portfolio of LNG sales contracts by using the diverse options in the best combinations for meeting their demand patterns and customers' needs.

### **1. What is at stake? – LNG projects cannot be affected without risk taking on the part of buyers –**

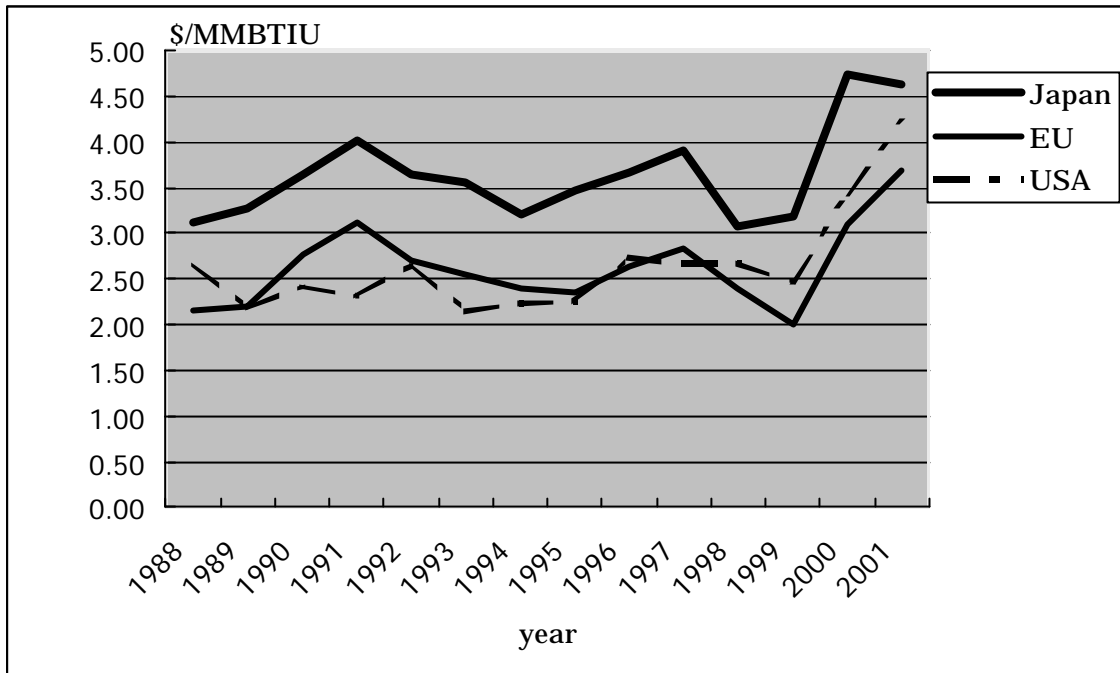
To start up an LNG project involves huge capital outlays. (For example, North West Shelf project, which shipped the first cargoes in 1989, reportedly required an investment equivalent to about one trillion yen.) To finance the staggering investment, not only the seller but also Japanese users, or the buyers, were required to bear the risks incurred in the project. In specific terms, the Japanese buyers were urged to take the risks in such forms as a sizeable contract volume, a contract term of as long as 20-25 years, the take-or-pay (TOP) clause (quantitative risk), and higher prices than those payable by their Western counterparts (price risk).

#### **(1) Higher prices than in the US/EU**

The price of LNG supplied in Japan has stayed much higher than in the United States and Europe. In 2000, for example, the CIF price of LNG averaged \$3.10/MMBTU in the EU and \$3.43/MMBTU in the U.S. compared with \$4.73/MMBTU in Japan, which represented a higher price level of 53% and 40%, respectively. In 2001, the tripartite differentials narrowed a little in reflection of natural gas price spikes in the U.S., which sent the LNG price rising to \$4.22 in the U.S., while the price in Japan stayed at \$4.64 (IEA Energy Prices & Taxes).

The differentials are still too big to be explained by differences among the consuming regions in their actual conditions, such as the availability of natural gas and alternative energy resources, hauling distance from sources and the presence of rivaling pipelined gas.

**Fig. 1 LNG Prices (Comparisons among Japan, the U.S. and the EU)**



(Source) IEA "Energy Prices & Taxes"

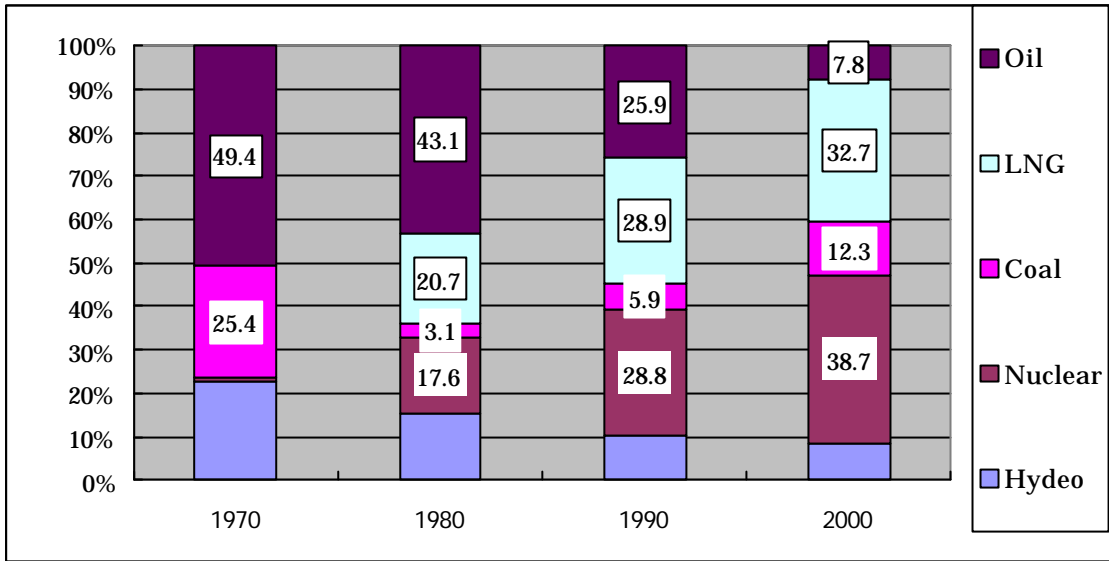
**(2) Long-term and rigid trading conditions**

Owing to the character of LNG projects, sizeable contract volume, long contract term and take-or-pay (TOP) have been seen as crucial to LNG. Also, LNG has been characterized by bilateral contracts between specified sellers and buyers and uniform/fixed-rate deliveries, among others. All of these characteristics guarantee stability of supply but, concurrently, represent rigidity.

During the initial period following introduction of LNG, LNG accounted for only a fraction of the supply mix for both electric and gas utilities alike, which meant that they had little difficulty in consuming all of the LNG they received constantly either as fuel or feedstock.

However, as a result of the increasing proportion occupied by LNG, TOP has become a heavy burden. By 1990, fuel switching to LNG in the electricity sector had advanced so much as to make LNG account for 28% of generated output by the nine electric utilities. Moreover, in the process of changing the roles of LNG from a base load source to a middle load and further to middle & peak loads, mounting constraints have hampered the elastic operation not only of LNG but also of other power sources by electric utilities.

**Fig. 2 Power Source Mix (Nine Utilities)**

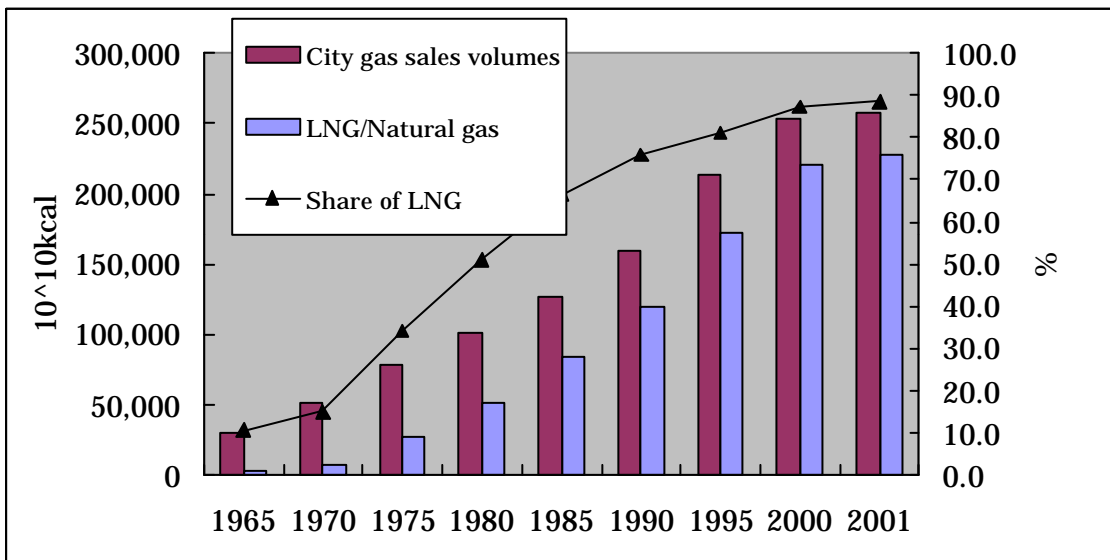


(Source)EDMC "Hanbook of Energy & Economic Statistics in Japan"

In the city gas sector, the share of LNG/natural gas in the feedstock mix had jumped from 51% in 1980 to 76% by 1990. As of the start of the 1990s, Tokyo Gas, Osaka Gas and Toho Gas had all completed switching to natural gas. By 2000 LNG share reached a high 87% nationwide.

Thus, both electric and gas utilities had their LNG shares saturated. In other words, “they reached their limits in taking the quantitative risk.”

**Fig. 3 City Gas and LNG**



(Source)EDMC "Handbook of Energy & Economic Statistics in Japan"

This is the reason why a growing number of electric and gas utilities have become outspoken about TOP. They contend that the TOP coverage should be limited to, say, 70-80% of the contract volume, instead of the conventional 100%, although they still acknowledge the significance of the take-or-pay clause as an element of vital importance in effecting LNG projects.

## **2. What things are changing? – New times and trends affecting conventional structure of risk distribution –**

### **(1) Waves of liberalization flowing over LNG importers**

The Electric Utility Industry Law and the Gas Utility Industry Law as amended and re-amended in 1995 and 1999 freed about 30% of both electricity and city gas sales. Moreover, during the current session, the Diet is expected to amend the two industry laws again, thus further expanding the scope of liberalization.

Naturally, neither the electric nor the gas utilities have much choice but to seek LNG at the lowest possible price. In addition, they are finding it increasingly difficult to set fuel/feedstock procurement targets due to growing uncertainties that make electricity/city gas demand more volatile than ever. Furthermore, finding customers on the freed markets requires not only good economics but, more importantly, flexible supplies that can best match customers' demand patterns. Thus, the electric and gas utilities are being forced to diversify their fuel/feedstock procurement.

One solid fact unchanged since the early period of LNG introduction is that the Japanese importers have materialized the necessary investments for effecting LNG projects by taking “price risks” and “quantitative risks.” In fact, the Japanese LNG importers have been able to pass on the greater part of the risks to final consumers, since these have been authorized monopolistic electricity/city gas services. This approach, however, is rapidly being eroded by the widening scope of liberalization.

In the midst of the changing environment, the concept of LNG procurement is apparently varying on the demand side. In other words, shifts are being made from conventional principles—i.e., preferring long-term contracts for supply security reasons to economics and flexibility of supply (by accepting TOP and higher prices than in the US/Europe).

### **(2) Jostling new projects on supply side and drastic cost cuts**

At the start of the 1990s, large numbers of new construction/capacity expansion projects were announced one after another.

These include the start-up of Malaysia II and a plan of the third project (TIGA)

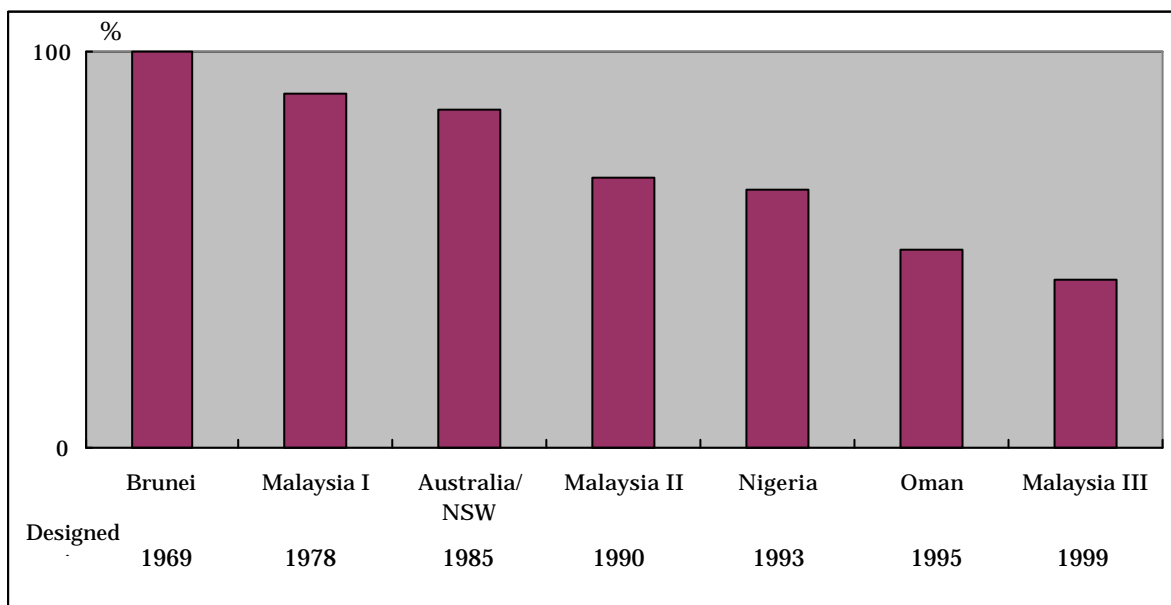
announced by Malaysia, capacity expansion of the fourth train (liquefaction unit) planned by a North West Shelf project, Australia, and additional trains planned and installed by the Bongtang terminal, Indonesia. Among others, new LNG projects were announced, including Tanguh (Indonesia) and Sakhalin I & II.

In the Middle East, ADGAS of Abu Dhabi introduced an additional train, which increased the company’s export capacity to 4.30 million tons from 1994 onward. In 1997, Qatar managed to initiate supplies to a Japanese-buyer consortium led by Chubu Electric Power. Later, the second project (Ras Rafan) of Qatar started supplies almost simultaneously with an Omani project. Among others, Yemen and Iran announced their candidacies as LNG suppliers.

As a result, with the projects still at the F/S stage included, LNG supply capacities available for Asia have increased remarkably during the 1990s.

Simultaneously supply cost was reduced to a considerable extent.

**Fig. 4 Image of Falling Costs at Liquefaction Plants**



(Source)Royal Dutch Shell Homepage

The primary contributors are technological innovations, introduction of large plants (typically liquefaction units) and very large tankers, and price competition triggered by multiplying entrants.

The per-ton construction cost of LNG liquefaction plants continued to fall steadily from the 1970s through the 1990s. For instance, an Omani project on stream in 2000 announced that its per-ton construction cost was 50% of a Brunei plant having started

supply in 1972.

Meanwhile, the cost of transporting LNG is much higher than that of moving crude oil and LPG because of a characteristic of LNG—that is, its ultra-low temperature (-162°C). Particularly during the early 1990s, the cost of building the-then standard LNG tanker of 130,000 m<sup>3</sup> skyrocketed to more than \$250 million.

Later, however, the construction cost took a downward turn and briefly plunged to around \$150 million, largely due to an orders-receiving race triggered by the plural number of Korean shipyards launching into LNG tanker construction. In addition, the introduction of very large tankers contributed greatly to slashing the unit construction cost.

The realities of the falling costs of liquefaction plants and LNG tankers are beneficial in two ways: making start-ups of new projects easier, and enabling such start-ups without 100%-assured outlets. In other words, conspicuously excessive capacities larger than contracted volumes are beginning to emerge in the Asia/Pacific region.

### **(3) Asia-bound LNG priced cheaper**

In August 2002, an Australian LNG consortium (North West Shelf) finally succeeded in getting a supply agreement signed with China for its first LNG receiving terminal situated in Guangdong. The contract term is reported to be 25 years from 2005-2006, and the contract volume 3.30 million tons imported yearly.

In the following September, Indonesia's Tangguh project won a supply contract to another LNG terminal to be built in Fujian. Under the contract, 2.60 million tons a year will be exported over 25 years. With its construction commencing in 2004, the receiving terminal is scheduled to start operation in 2007.

The cheapness of LNG is very surprising. The LNG price in Guangdong is reported to be around \$3/MMBTU, while crude oil is priced at the level of \$20/bbl. Correcting the Guangdong price by distance puts the LNG price in Japan at a little above \$3. In comparison, the ex-ship price of LNG imported from NSW to Japan stays within the latter half of the \$3/MMBTU mark when linked to \$20/bbl of crude oil (estimated from customs clearance statistics and others). Hence, if the reported Guangdong price is correct, the resultant differentials amount to as much as 20%.

Also, in August 2002, India's Petronet project reached an agreement with RasGas of Qatar on the price offered to the Daheji LNG terminal. This project will receive LNG in the amount of 5.00 million tons a year. The LNG price, basically linked to JCC, is designed to limit its volatility to within the range from \$2.03 (\$16/bbl of crude oil) to \$3.04 (\$24/bbl) by virtue of pre-set ceiling and floor prices ("Arab Oil & Gas" dated

September 9). The contract price appears to be very cheap even when account is taken of the short hauling distance between Qatar and the West Coast of India.

### **3. Risk redistribution on the rise – falling price and increasing flexibility of supply**

–

#### **(1) “New risk distribution model” with lower price and flexibility incorporated**

In March 2002, the Malaysia I project had its 20-year contract term matured. Since 1983, this project has supplied to TEPCO and Tokyo Gas the entirety of their contract volumes – 4.80 million tons and 2.60 million tons a year, respectively – under ex-ship arrangement (under which the seller is obliged to deliver goods to a port named by the buyer). The renewal talks yielded a two-tiered contract term, with some of the contract volume (TEPCO 700,000 tons, Tokyo Gas 500,000 tons) included in a short-term four-year contract. The portion of the long-term contract was shortened to 15 years as well. The newly incorporated short-term contract, combined with greater flexibility embedded in the conventional long-term contract portion, is expected to increase the flexibility of contract volumes by around 20%. This means effective easing of TOP.

At the same time, TEPCO and Tokyo Gas each put 1.20 million tons and 600,000 tons under an FOB (free-on-board) contract (under which goods are delivered at a port situated in the producer’s area), which would be hauled by themselves using their captive LNG tankers.

Some press news articles also reported that an agreement was reached on a price cut of around 5%. Thus, both price and quantitative risks were redistributed.

From the importers’ perspectives, however, the latest contract renewal was more significant than a simple reduction of the risks they have borne. It enabled them to seek returns for a new risk which they dare to assume by launching into the hauling services hitherto offered by suppliers. In other words, the significance of the “new risk distribution model” as redistribution of profits must not be overlooked.

TEPCO and Tokyo Gas also announced and outlined their participation in the Darwin project, Australia, to be commissioned in 2006. TEPCO and Tokyo Gas will receive 2.00 million tons and 1.00 million tons a year, respectively, for 17 years under an FOB contract, with the entirety of contract volumes to be hauled by LNG tankers chartered by the utilities. Of particular interest is the fact that the both companies invested in Darwin LNG, the supplier. This means that TEPCO and Tokyo Gas are the sellers, transporters and buyers. A plausible interpretation is that, in return for taking new risks by participating in the entire LNG chain, they obtain a new opportunity of profit sharing and head for optimization of LNG procurement. This move can be highly evaluated as the evolution



of a “new risk distribution model.”

## **(2) Expanding spot trading contributes to increasing flexibility of supply**

Spot trading of LNG, which is a yardstick of flexibility, is increasing at a rapid rate. Transactions under short-term contracts (less than a year and inclusive of spot trading) in 2001 recorded a tenfold increase over 1992 levels and reached a hefty 8% of total trade (IEA, “Flexibility in Natural Gas Supply and Demand”). Above all, conspicuous rises were noted in spot-traded LNG destined for the US.

In order to expand their LNG sales, the oil majors, among others, are no longer remaining idle in the position of investors, interest holders and/or suppliers of LNG in the upstream sector. They are adopting the strategy of becoming LNG buyers themselves and are collecting the surplus capacities of many projects, while tapping new demand. The colossal U.S. market (consuming ten times more natural gas than Japan) can easily digest such moves. This is why the US-bound LNG spot trading is ballooning so rapidly.

This concept is becoming real in the Atlantic market, as demonstrated by expanding spot transactions. In the Asia/Pacific market too, introduction of a similar strategy is under consideration. LNG terminal construction projects and commercialization of on-board gasification technology on the U.S. West Coast, among others, all point to this concept.

Expanding spot trading is beneficial to both suppliers and consumers, since it enables the former to put their surplus capacities fully in operation and the latter to gain more flexibility in LNG procurement.

## **(3) Price options ready, contract renewal talks imminent**

In 2003, several projects are going to enter an official round of price negotiations. Looking further to 2010, the plural number of projects will have their contract terms matured and involve negotiations if their renewal is being considered.

After the renewal talks, the LNG price is likely to go down and the so far rigid contract terms will probably improve, as in the cases of Malaysia I and Australia’s Darwin project, in such forms as a shortened contract term and increased flexibility of supply.

The above guesses are grounded on the suppositions that:

1. The supply-demand balance will remain loose in the medium term.
2. The costs of construction of liquefaction plants and LNG tankers have dropped.
3. The investment recovery of most of the existing projects is complete.
4. Expanding spot trading leads to greater influence of the US price.
5. Cheapness of the LNG price payable by the Guangdong project is well known among the LNG importers in Japan and the rest of Asia.

To what level can the price be expected to drop?

The strong likelihood is that importers will demand a price cut to the same level as the price offered to the Guangdong project in China, the differentials of which are poorly grounded (partly due to the fact that little information is available), that is, to \$3-plus /MMBTU in Japan. As a result, it appears reasonable to expect that the LNG price in Japan will converge into the Guangdong level.

Many observers expect drastic price cuts to result from the price negotiations scheduled this year. However, the process of winning a drastic price cut to the Guangdong level can be very time-consuming. Perhaps it will not be achieved before 2005, when China actually receives LNG from the North West Shelf and Tangguh projects, or around 2008, when renewal talks start on agreements of the NSW and the Indonesian first projects.

Negotiations will not be easy, and the above-mentioned grounds can easily be contended.

Firstly, the looseness of the supply-demand balance can be undermined by rapid expansion of the Atlantic market. Exports to the US/Europe have doubled in the latter half of 1990's. The loose supply-demand balance on the Asia/Pacific market will not be sustainable in the event of massive LNG inflows from the more or less capacity-glutted Pacific into the LNG-thirsty Atlantic.

Secondly, despite the solid facts that plant/tanker costs fell sharply and investment recovery of many projects was completed, LNG price negotiations naturally consider not merely "cost-based" aspects but also on-going market conditions. It remains uncertain to what extent the importers can utilize the fact of shrinking cost on the supply side as a justification for a price cut.

The market-based price in the U.S. is highly volatile. So far the price has rarely surpassed \$3/MMBTU, but since 1999, in reflection of crude oil price spikes and others factors, the LNG price has stayed high, and is not always so low in the U.S. either.

#### **(4) Consideration of pricing-formula options**

Options of future "pricing formula" are summarized below.

- Fixed pricing (stated by a PETRONAS vice president for gas at SPEC 2002; oriented toward a crude oil price-free mechanism)
- Quasi-fixed pricing by setting a small figure for "a" in the formula,  $P = aX + b$  (adopted by China/India; oriented toward lower price and stability)
- Raising the ratio of fixed elements while lowering the ratio of the crude oil-linked portion (proposed by a Japanese importer at the World Gas Congress 2000; oriented toward lower price and stability)

- The retail price of coal/coal-heavy fuel oil-crude oil/electricity, etc. taken as price indicators (prevailing on the European Continent; to help LNG-fired power retain/stabilize its competitiveness against rival power sources)
- Petroleum products such as heavy fuel oil and kerosene taken as price indicators (prevailing on the European Continent; to help LNG-derived city gas retain/stabilize its competitiveness against rival fuels)
- LNG pricing linked to NYMEX/IPE futures (in order to reflect on-going market conditions)
- Making the contract two-tiered, with a flexible delivery portion (to better meet seasonal demand) and a fixed delivery portion (separation of price and flexibility)

Many options of pricing formula will be available in the future. It is also possible to arrange a wide variety of LNG contracts by pairing different pricing formulas with various trading patterns, each having flexibility of its own (e.g. long, medium and short contract terms, varying TOP coverage, non-uniform deliveries).

The Japanese importers are most likely to favor LNG procurement based on as many LNG contracts as necessary for meeting their demand patterns and customers' needs. In fact, Korea Gas Corporation, when signing a new contract with NSW, reached an accord that ensured a medium-term (seven-year) highly flexible supply (widely variable deliveries, mostly concentrating on winter seasons).

Naturally, there will be less need for all importers to organize a consortium and buy LNG priced according to a uniform formula. In other words, there will be an increasing number of LNG procurements, each made by a single importer or a group consisting of a few buyers.

### **Conclusion – Risk redistribution creates contract diversity –**

Carefully watching the two Chinese projects as well as India's Petronet, the Japanese LNG consumers are waiting for the start of second- and third-round negotiations to push forward little by little the "new risk distribution model," first proposed during the Malaysia I contract renewal talks. Further evolution of the "new risk distribution model" is very likely.

The evolution of the "new risk distribution model" means that the importers not only demand that the suppliers bear some of the risks they have taken, but also that they have started aggressively seeking new profits in return for the additional risks they assume by launching into an entire LNG chain.

The evolution of a "new risk distribution model" is expected to spur the rise of diverse LNG contracts, with pricing terms (e.g. price level, variable range) combined with various trading terms. This allows the electric utilities to lower generating costs and

realize the best power mix more easily than ever, which will ultimately lead to expansion of electricity demand. Likewise, the gas utilities can improve the competitiveness of city gas against rival fuels. In addition, there will be great hopes for the promotion of natural gas use and expansion of LNG demand in Japan.

It is a matter of vital importance for the Japanese importers to endeavor to create an optimal portfolio of LNG contracts by pairing different pricing formulas with different trading terms so that they can best match their demand patterns and customers' needs.

Contact: [ieej-info@tky.iej.or.jp](mailto:ieej-info@tky.iej.or.jp)