

LNG Market at A Turning Point and Japan's Options

Yasuhiro Koide, Researcher

Gas Group

The Institute of Energy Economics, Japan

<Study Objective>

Asian LNG market is likely to resume growing up by the economic recovery from currency crisis and emerging new markets such as India and China. However, in the midst of a broader-ever market competition driven by deregulation of gas and electric power industries, LNG buyers in Japan, South Korea and Taiwan have increasing uncertainties of their LNG demand perspectives. This study is designed to consider what options the Japanese LNG buyers can take in the Asian LNG market environment at a turning point.

<Conclusions>

1. Asian economy and energy demand is likely to bottom out from the stagnation triggered by the currency crisis in 1997. This results in resuming growth of the Asian LNG market. Yet, the emerging situation contains a few problems. First, India and China are going to import LNG though worries remain about their ability to pay for LNG imports in hard currency. Second, deregulation and spreading market competitions in Japan, South Korea and Taiwan increase the uncertainties of their LNG demand perspectives, precipitate dispersion and smaller-ever lots of LNG demand, and threaten price competitiveness of LNG against rivaling fuels. These are quite different from what has long characterized the Asian LNG market (LNG procurement by large utilities and state companies whose primary concern is a stable supply).
2. In an effort to dispel the uncertainty of future demand, LNG buyers are trying to secure demand of their own by launching into new businesses (town gas companies to start power generating business, while electric utilities to start gas supply business). However, such efforts alone are not enough for coping with their difficulties. Therefore, they need to ease the rigid Take-or-Pay clause for adjusting short-term supply/demand balance and to shorten a contract term, usually over 15 years, so that a contract volume could be reviewed from time to time for adjusting medium- and long-term supply/demand balance. Taking into account the characteristics of the finance scheme in LNG projects so called "untied loan", new contract conditions above are considered to be more acceptable in existing LNG projects than new ones, as the former has equipment already depreciated to some extent. Of existing LNG contracts held by Japan, South Korea and Taiwan, seven are slated to expire by 2010 and this could be an opportunity for buyers to negotiate with sellers for establishing new contract terms.
3. LNG sellers on their part are making various efforts: (1) To strengthen

competitiveness by cutting the cost. (2) To launch a green field LNG project (at the sellers' risks) before identifying buyers for the whole liquefaction capacity in order to shorten the lead-time from signing LNG contract to start supply. (3) To promote small-scale, low-cost projects, which can secure demand rather easily.

4. These commitments by both sellers and buyers brought about new moves. In India, for example, new moves include (1) introduction of fixed LNG pricing different from conventional one linking to the crude oil price, (2) alterable LNG destinations under the permission by the seller, and (3) selection of LNG suppliers through competitive bidding.
5. To make LNG procurement more flexible and competitive, the Japanese LNG buyers could have options worth of consideration. They are to negotiate more eased Take-or-Pay clause and a shorter contract term, employ LNG swap trading popularly in practice in the West as a means to reduce a transport distance (cost), and introduce competitive bidding that leads to price-competitive LNG procurement. On the other hand, however, increasingly flexible LNG deals and competitive bidding put mounting risk burdens on the sellers, who find it harder to start up new projects that require huge investments. Attention must be paid to a pitfall that demand/supply won't be met.

Efforts made by both buyers and sellers are important to construct a competitive LNG market resulting in a greater gas demand, with paying attention to both the opportunities and risks described above.

<Explanations>

1. Impacts of the currency crisis on the market and moves toward a recovery

The fast growing Asian economies since the second half of the 1980s have experienced a steep economic deceleration in 1998, particularly among major Asian economies like South Korea, triggered by the currency crisis trembling first in Thailand in 1997 (Fig. 1). The economic turmoil also affected energy demand in this region, and all Asian economies consumed less energy in 1998 than their previous year's records.

The moribund economy after the currency crisis influenced LNG demand in Japan, South Korea and Taiwan as well. The Asian LNG demand projection (Japan, South Korea and Taiwan) for 2010 was revised downward from pre-crisis 110 million tons to 95 million tons (Table 1).

LNG market remained sluggish due to the currency crisis. Entering 1999, however, because the South Korean economy began showing recovery signs, and because a bright economic outlook was made for 2000, some revised their LNG demand forecasts upward. In addition, since the second half of 1998, India and China started full-scale moves toward LNG imports. On these accounts, the Asian LNG market began growing up again as an underlying trend.

2. The emerging market and deregulation under way in Japan, South Korea and Taiwan

(1) Two giant markets emerging in Asia

In the second half of 1998, India and China marked significant moves, with the former signing Sale and Purchase Agreement (SPA) with Oman LNG, and the latter getting LNG imports officially suggested by Premier Zhu Rongji. Yet, worries remain about their ability to pay a large sum for LNG imports in hard currency, because the economic levels of the two countries stay much below those attained by Japan, South Korea and Taiwan by the time they started LNG imports. (Per capita GDP (in 1990 price) stands below \$1,000, compared with \$3,000 – 10,000 recorded by Japan, South Korea and Taiwan). Even if so, given regional income disparities in two countries, environmental standards to tame air pollution in metropolitan areas, and price competitiveness against rivaling fuels (coal, oil), LNG imports appear feasible for the big cities along the west coast of India and in the southern coastal area of China.

(a) India

India is planning ten and a few LNG projects, largely for power production.

Even now India produces and consumes natural gas of around 15 million tons LNG equivalent domestically. Major uses are power generation fuel and fertilizer feedstock. From now on, natural gas demand for power generation is expected to surge and reach 60 – 87 million tons LNG equivalent by FY2011. On the other hand, because indigenous natural gas production is projected to hit the ceiling, a supply and demand gap of over 40 million tons LNG equivalent is likely to surface (Fig. 2).

The problem is the financially stricken state electricity boards (SEBs), largely due to subsidization of electricity tariffs for agricultural-use, won't be able to pay power producers the price for purchased electricity. So far only three sale and purchase agreements (SPA) are concluded with a combined 10.1 million tons/year. They are those signed between Petronet LNG (a consortium of Indian public utilities) and Ras Gas (Qatar), Dabhol Power (an IPP participated by Enron, among others) and Oman LNG, and Abu Dhabi.

(b) China

Like India, China is using indigenous gas primarily in power generation and industrial uses. However, because domestic natural gas production is unlikely to catch up with rapid growing demand, a supply and demand gap seems inevitable (Fig. 3), and reach some 20 million tons LNG equivalent by 2010. In an attempt to narrow the expected supply and demand gap, under consideration are the pipeline gas import projects from Central Asia (Turkmenistan) and the Russian Far East (Irkutsk, Sakhalin)

and LNG import projects to the southern coastal areas.

LNG import project planned by the Shenzhen Special Economic Zone, Guangdong province, is expected to play a pilot-project role. China already decided its official organizer system and plans to hold competitive bidding in 2000 and select foreign firms for equity participation (Table 2).

(2) Deregulation under way in Japan, South Korea and Taiwan

(a) South Korea

In South Korea, LNG demand for town gas has been growing rapidly since the 1990s (Fig. 4). The LNG demand growth is attributable to an increasing number of consumers to be served by newly built trunk pipelines and competitive pricing, the latter linking town gas pricing to the petroleum product price.

What allows the competitive pricing of town gas is internal compensation, in practice in order to curb the price of LNG as town gas feedstock by passing the pipeline construction cost, among others, onto the price of LNG supplied to Korea Electric Power Company (KEPCO) as generating fuel. But, KEPCO positions LNG-fired power as a peak-load source, where a strong growth of LNG demand is unlikely ahead.

Moreover, the government currently considers the sale of two power plants of KEPCO, Anyang and Puchon, to private capital. An unbandling, de-merger and privatization plan of KEPCO is under consideration as well. When taken, these actions can spur competition among power generating companies, each finding it hard to purchase expensive LNG any longer (Fig. 5).

Along with privatization of KEPCO, a similar deregulation program is under examination for Korea Gas Company (KOGAS) engaged in wholesale gas supply by importing LNG single-handedly (Fig. 6). Once split and privatized, de-merged LNG importing and wholesaling companies should be exposed to competition among them and unable to forecast how much demand they can expect exactly.

(b) Taiwan

In Taiwan, Chinese Petroleum Corporation (CPC), a state-run oil and gas company, is responsible for LNG imports and wholesale gas supplies. Since LNG imports began in 1990, Taiwanese LNG demand has been growing particularly for power generation (Fig. 7). Given surging electricity demand, Taipower, a state-run electric power company, planned IPP (independent power producer) introduction to meet the extra demand and already held bidding twice. Yet, IPPs to build oil- or coal-fueled power plants have been forced to delay or cancel their construction plans due to a vehement

objection by community residents for environmental reasons (Table 3).

With fears growing for tightening electricity supply and demand, constructing new power plants is a pressing need for Taipower. Therefore, Taipower is promoting LNG-fired power plant construction. It is because LNG-fired power plants, which involve a shorter development period and a less environmental load than alternative fuels, typically coal, can arouse fewer objections among community residents. Among LNG-fired power plants under planning, a major project is Tatan power plant (4.4 GW) to be developed in the northern part of Taiwan. Fuel supplier to this power plant will be chosen by competitive bidding to be held under the Government Procurement Law enforced in May 1999.

In connection to LNG supplies to Tatan power plant, Tuntex, a Taiwanese capital, Mobil, Shell and Total Fina Elf run for the project to build the second LNG receiving terminal in northern Taiwan (Taoyuan). Among them, Tuntex signed Memorandum of Understanding (MOU) with Australia LNG, an Australian LNG suppliers' consortium on four million tons of LNG supply starting 2003. In order to realize construction of the second LNG receiving terminal and conclude an official SPA, the Taiwanese company has to win the fuel supply bidding to Tatan power plant (Table 4).

Thus, Taiwan too has an opportunity to incubate new LNG importers other than CPC. Moreover, now that Taipower, the major LNG consumer, decides its LNG suppliers through competitive bidding, individual LNG suppliers will find it hard to forecast how much LNG demand they could expect.

(c) Japan

In Japan, where the Gas and Electric Utility Industry Laws were amended in 1995, deregulation of gas and electricity has continued by further amending the Laws in 1999 and 2000, respectively. Under the Gas Utility Industry Law as amended, gas supplies are freed to large industrial users who consume more than 1 million m³ of gas. And town gas companies (the three major suppliers + Saibu Gas) are required to prepare specific wheeling rules for the third party who hopes to use their pipelines. As a result of this deregulatory action, city gas companies and other business operators are now launching into city gas supply to large consumers.

On the other hand, the Electric Utility Industry Law as amended introduced IPP operation and wholesale wheeling. Further amendment also partly freed electricity retailing. As a result, foreign firms, trading houses and large industrial users, among others, are reportedly moving toward electricity retailing business.

Along with mushrooming entrants into the deregulated business, LNG buyers are

now confronted with such problems as dispersion and smaller-ever lots of LNG demand, growing uncertainties of their LNG perspectives, and price competitiveness of LNG against rivaling fuels. These are in sharp contrast to what characterizes the conventional Asian LNG market, that is, the presence of major buyers whose primary concern in LNG procurement has been stable supply.

This change in the market environment produces a grave impact on the startup of green field LNG projects. After deregulation, the buyers claim to start up a project in small lots with a shorter period. However, green field LNG project requires long leadtime, and train size is becoming larger in order to pursue the economy of scale. In this way, gaps are emerging between what are demanded by LNG buyers and sellers (Fig. 8).

These problems having occurred in Japan over LNG procurement are likely to surface in South Korea and Taiwan as they are deregulated more than now. How the sellers and buyers will handle the problems cited here is an important issue on the Asian LNG market ahead.

3. The Asian LNG market at a turning point and Japan's options

Given the emergence of the Indian and Chinese markets, plus the business recovery of the East Asian economies, Asia's LNG demand is likely to keep growing and outrun 100 million tons as of 2010 (Table 5). On the other hand, when combined, liquefaction capacities of existing LNG projects and those under construction or planning amount to some 190 million tons, much larger than the projected demand (Fig. 9). It is noted that, unlike oil market, too much excess capacity will not exist because buyers' commitments to purchase LNG are required to develop new LNG project.

Amid a growing uncertainty of future LNG demand, largely due to deregulation, LNG buyers are entering new businesses in an effort to tap new demand of their own. Typical examples are power generation business started by town gas companies and gas supply service initiated by electric utilities (Tables 6 & 7). But, these efforts alone are too feeble to blow up the hanging clouds over future LNG demand. LNG buyers need to increase flexibility in Take-or-Pay clause of LNG deals to adjust short-term supply and demand, as well as to shorten a contract term, usually 15 years or longer, so that a contract volume can be reviewed swiftly when necessary for adjusting medium- and long-term supply and demand. Considering that a LNG project is popularly financed under a fund raising scheme with its expected earnings from LNG sales in pledge (untied direct loan), the buyers can hardly win favorable contract terms from any new LNG project. Rather, they can get such favorable terms in existing LNG projects with

their debt services are already finished. By 2010 seven among existing LNG contracts are slated to expire. By taking advantage of the buyer's market, LNG buyers are expected to renew their contracts that reflect their requests better than ever.

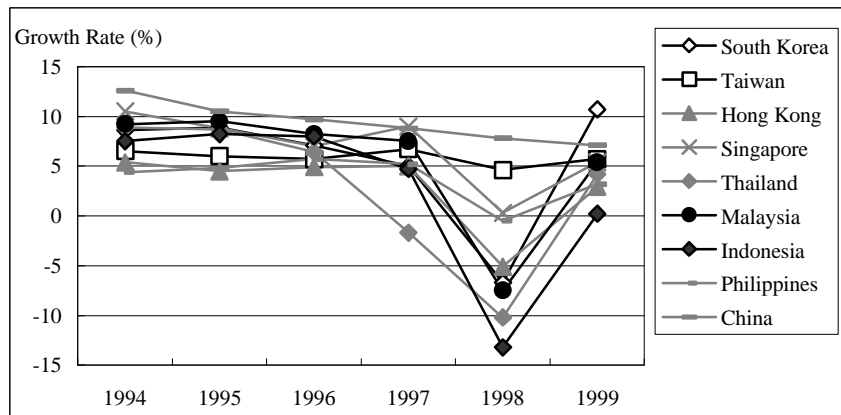
In starting up new projects, LNG sellers are making various efforts as well. (1) They are trying to strengthen competitiveness through cost reduction efforts. (2) Like Oman LNG (committed 4.06 million tons/year alone out of a total liquefaction capacity of 6.6 million tons/year) and Malaysia Tiga (committed 3.10 million tons/year out of 6.8 million tons), they initiate LNG projects (at their own risk) before identifying sufficient buyers to their whole liquefaction capacity. (3) They carry out small-scale, low-cost projects (each having a capacity of 3 million tons/year and involving an investment of around \$800 million), because demand can be secured more easily than otherwise.

Among others, under the united efforts of the buyers and sellers, new moves toward LNG contracts are evolving now. In specific terms, India realized (1) employment of LNG fixed pricing without linked to the crude oil price, (2) changes in destinations of LNG supplied from Malaysia under the agreement with the seller, and (3) selection of suppliers through competitive bidding (Fig. 10).

To make LNG procurement more flexible and competitive, the Japanese LNG importers have options worth of consideration. In specific terms, they can introduce more increasing flexibility in Take-or-Pay clause and a shorter contract term, LNG swap trades popularly in practice in the West for reducing a transport distance (cost), and competitive bidding that leads to price-competitive LNG procurement (Fig. 11). On the other hand, however, it should be noted that growing risk burdens on the seller as a result of increasingly flexible LNG deals and competitive bidding can increase difficulties in starting up capital-intensive green field projects, thus posing a pitfall that demand won't be met.

Efforts made by both buyers and sellers are important to construct a competitive LNG market resulting in a greater gas demand, with paying attention to both the opportunities and risks described above.

Fig. 1 Economic Growth of Major Asian Economies



(Source) Prepared from Sanwa Research Institute, "Economic Outlooks for Major Asian Economies."

Table 1 LNG Demand Forecasts Before and After Asia's Currency Crisis

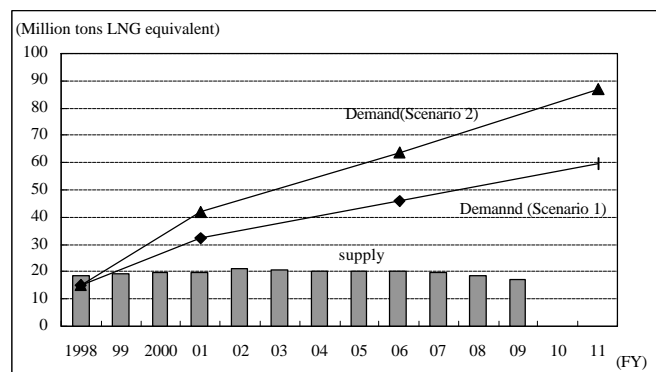
(Unit: 10,000 tons)

		1995	2010	Growth/year	Forecast by	Forecast in
Pre-crisis	Japan	4,725	6,800	3.1%	IEEJ	Dec. '95
	Korea	710	2,942	9.9%	KOGAS	Dec. '96
	Taiwan	290	1,349	10.8%	Energy Commission	Sep. '94
	Total	5,275	11,091	5.1%		
Post-crisis	Japan	4,275	6,300	2.6%	IEEJ	Dec. '98
	Korea	710	2,245	8.0%	KOGAS & KEPCO	'98
	Taiwan	290	947	8.2%	CPC	'98
	Total	5,275	9,492	4.0%		

(Note) The post-crisis forecast for Taiwan is for FY2009. The forecast figures by CPC include its in-plant consumption (500,000 tons/year)

(Source) Prepared from various reference materials.

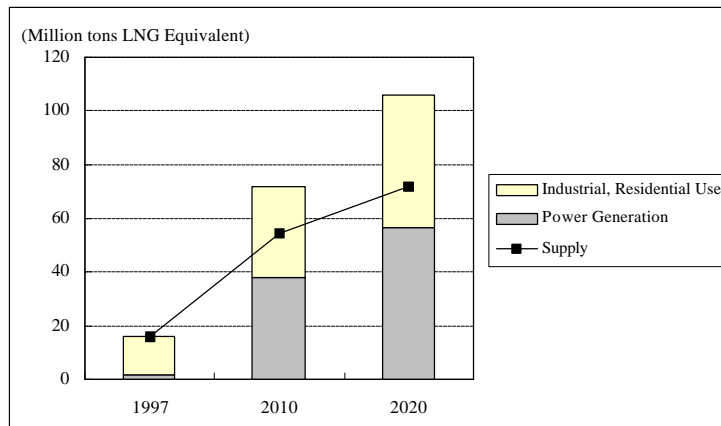
Fig. 2 India's Natural Gas Supply and Demand Outlook



(Note) Scenario 1 assumes the burner tip price of natural gas at \$4/MMBTU, while Scenario 2 at \$3/MMBTU.

(Source) Supply outlook made by Oil & Natural Gas Corp., and demand outlook by a special team dedicating to the Premier.

Fig. 3 China's Natural Gas Supply and Demand Outlook



(Source) Prepared from various reference materials.

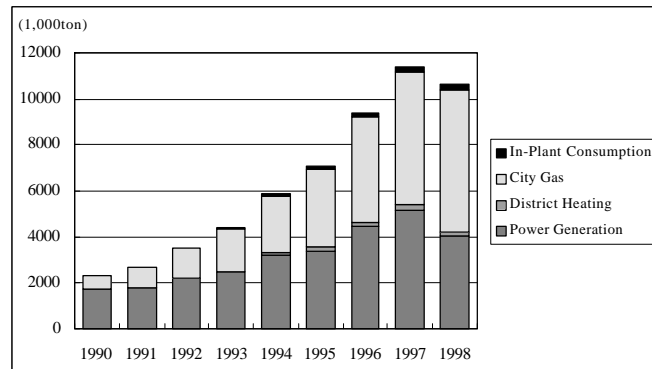
Table 2 Outline of China's Pilot LNG Project (Shenzhen)

General descriptions	To construct a LNG receiving terminal of 3 million tons/year in Shenzhen Special Economic Zone, Guangdong. To install a 400 km-long pipeline to supply gas to the power plants around the terminal, industrial users, and a LNG-fired power plant to be built in Huizhou. 3 million tons/year during 1st phase. Planned capacity expansion to 5 million tons/year.	
Terminal put on stream	By 2005	
Project participants	China Offshore Oil Corporation (CNOOC)	36% -- 31%
	Shenzhen Investment Management Corp.	10%
	Guangdong Power Bureau	14%
	Guangzhou Gas Corp.	5%
	Foreign firms (to be selected by competitive bidding)	35-- 30%
Required investments	\$500 million for constructing the receiving terminal + a 400 km-long pipeline.	

(Note) The rumor runs that a bidding to select foreign firms will be held late May 2000. At the same time, the share offered to foreign firms was slashed.

(Source) Prepared from various reference materials.

Fig. 4 South Korea's LNG Demand Trend



(Source) The Ministry of Commerce, Industry and Resources & the Energy Institute of Korea, "Statistical Yearbooks of Energy"

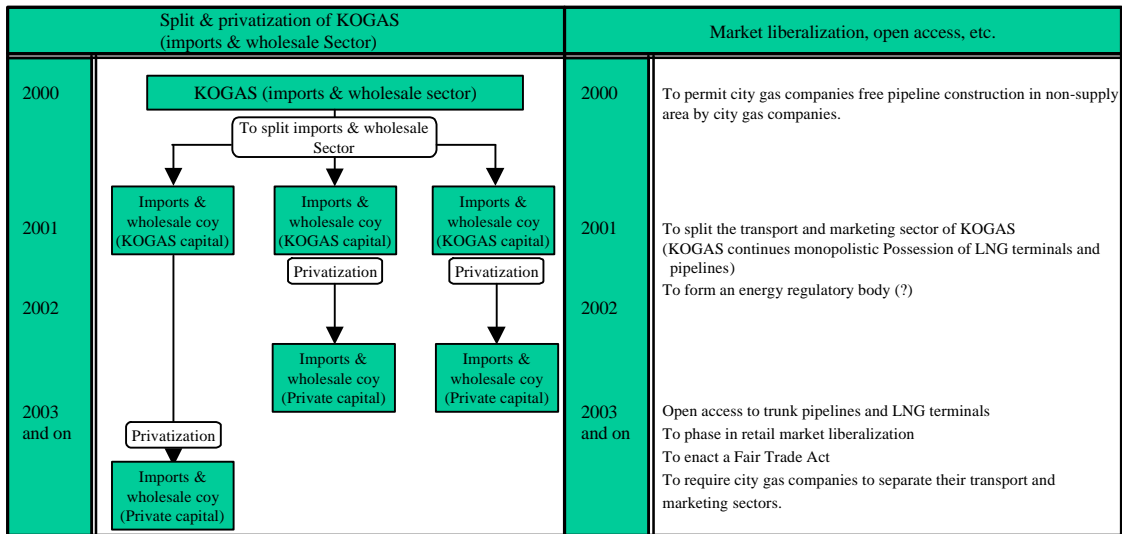
Fig. 5 Plans for KEPCO Privatization and Electricity Deregulation (Unveiled September 1999)

- 1st phase (1999/1 – 1999/12)**
- To establish relevant laws and regulations.
 - To secede the power production sector as a subsidiary.
- 2nd phase (1999/10 – 2002)**
- Complete separation of the power production sector (= to make power production business fully competitive)
 - To secede the distribution sector as a subsidiary.
 - To form an independent regulatory body.
 - To permit direct sale to large industrial users.
- 3rd phase (2003 – 2009)**
- Complete separation of the distribution sector
 - Open access to transmission networks (= to introduce competition into wholesale business)
- 4th phase (2009 -)**
- Open access to distribution networks (= to introduce competition into retail business)

(Note) Given that the National Assembly delays in passing the two bills on privatization, the actions will be behind the schedule described above.

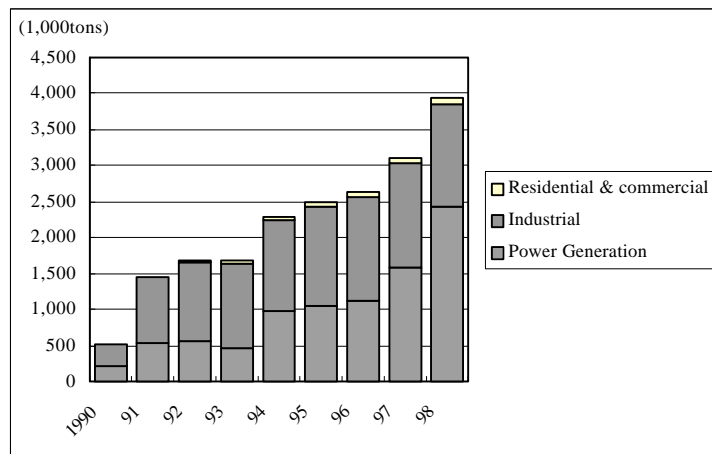
(Source) Prepared from relevant materials of the Korea Electricity Society.

Fig. 6 Korea's Gas Industry Restructuring Plan (Unveiled November 1999)



(Source) Prepared from various reference materials

Fig. 7 Taiwan's LNG Demand by Sector



(Source) The Energy Commission, the Ministry of Economy

Table 3 Taiwan Progress Report on Definite IPP Projects

IPP plan	Fueled by	Installed capacity (MW)	In operation by
1st bidding (held in 1995)			
Changsheng	LNG	900	Commissioned in 1999/6
Chiafui	LNG	670	2002/1
Mailiao	Coal	1,800	Commissioned in 1999/6
Hidoer	Coal	990	2000/7
Huatung	Coal	1,000	2001/7
Hoping	Coal	1,297	2002/4
Miaoli	Orimulsion	600	2000/7
2nd bidding (held in 1996)			
Hsintao	LNG	600	2002/1
Full Power Fortune	Coal	550	Canceled
Fubao	Oil	600	Canceled
Changoung	Orimulsion	1,500	Canceled
Total (8 projects)		7,857	

(Source) Prepared from various reference materials.

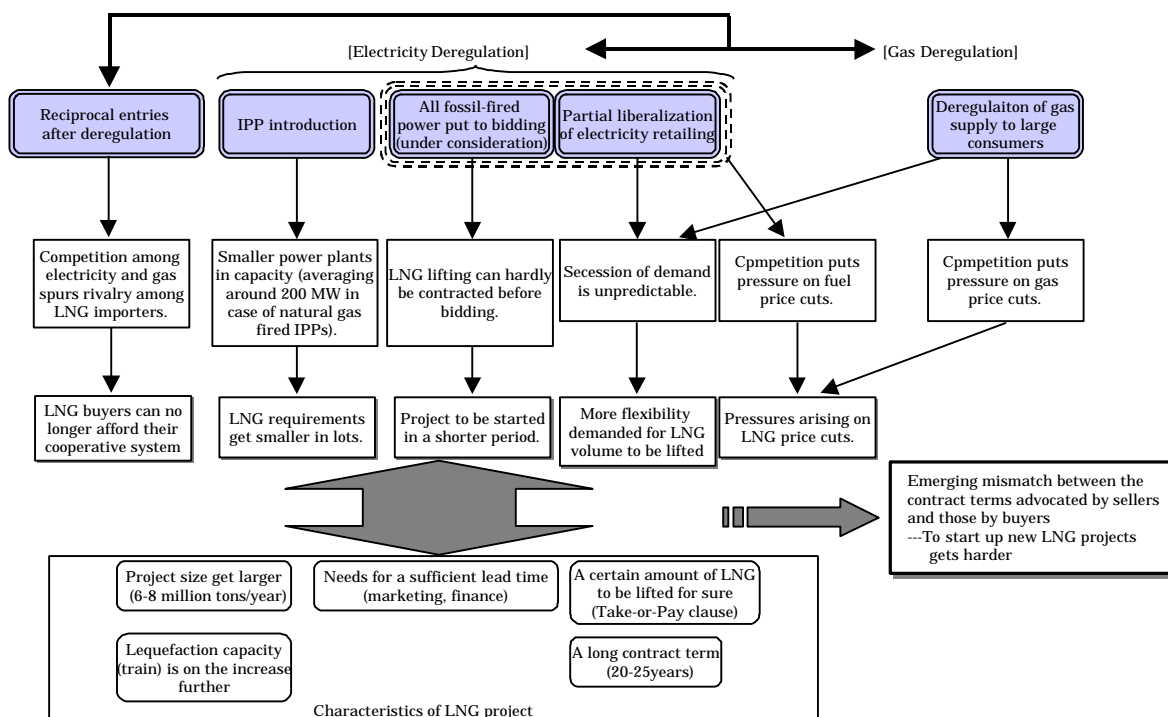
Table 4 Tuntex Gas's 2nd LNG Receiving Terminal Construction Project

Proposed site for construction	Kuantan Industrial Park (Taoyuan in northern Taiwan)												
Site area	1,174 ha.												
LNG tanker berthing capacity	Capable of berthing 137,000 m ³ tankers.												
LNG receiving capacity	3 million tons/year (2003) -- 4 million tons/year (2007 yearend) -- 7 million tons/year												
Required investment	\$1.25 billion (Some put it at \$3 billion with the cost of the industrial park construction included.)												
Investors	<table> <tr> <td>Tuntex Group</td> <td>37.5%</td> </tr> <tr> <td>Uni-President Group, Mitsubishi Corp.</td> <td>12.5%</td> </tr> <tr> <td>China Development & Industrial Bank,</td> <td></td> </tr> <tr> <td>CPC, Taipower</td> <td>7.5%</td> </tr> <tr> <td>Arco</td> <td>5.0%</td> </tr> <tr> <td>Shing-Kong Group</td> <td>2.5%</td> </tr> </table>	Tuntex Group	37.5%	Uni-President Group, Mitsubishi Corp.	12.5%	China Development & Industrial Bank,		CPC, Taipower	7.5%	Arco	5.0%	Shing-Kong Group	2.5%
Tuntex Group	37.5%												
Uni-President Group, Mitsubishi Corp.	12.5%												
China Development & Industrial Bank,													
CPC, Taipower	7.5%												
Arco	5.0%												
Shing-Kong Group	2.5%												
LNG supply contracts	In November 1999 a Memorandum of Understanding (MOU) was signed with Australia LNG (of Australia) to supply LNG of 4 million tons/year from 2003 onward. Yet, if or not this agreement takes effect depends on the outcome of competitive bidding to select LNG supplier to Datuan power plant.												

(Note) The Taiwanese Administration approved this project late March 2000, but so far no press coverage has reported that the investors became definite.

(Source) Prepared from various reference materials.

Fig. 8 Impacts of Electricity & Gas Deregulation on LNG Procurement (Japan)



(Source) Prepared by IEEJ.

Table 5 Asia's LNG Demand Outlook

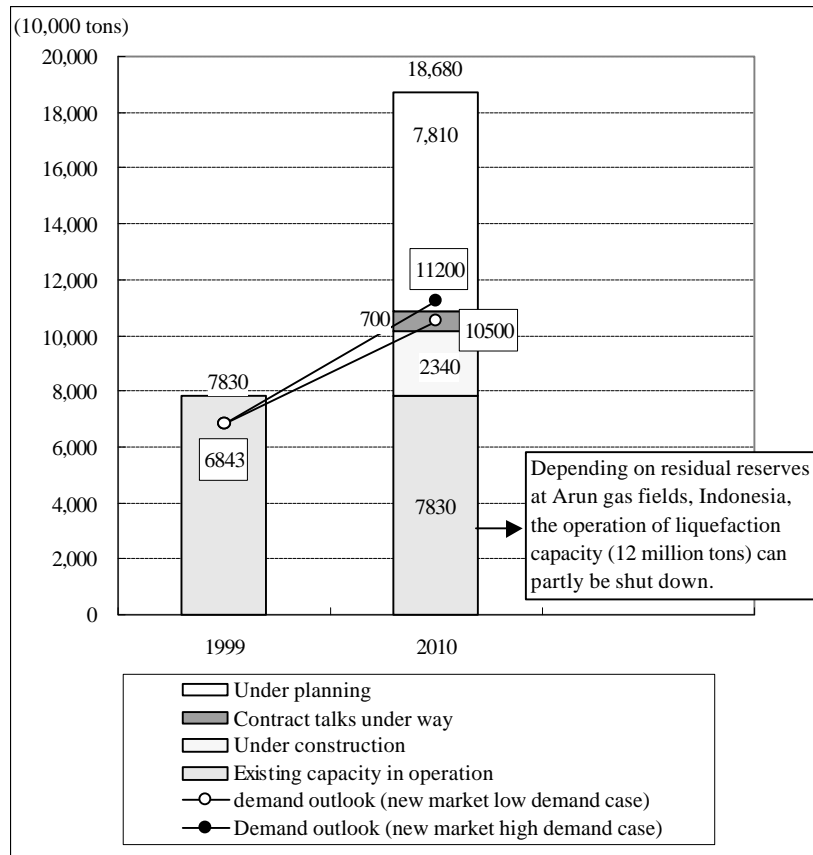
(10,000 tons)

	1999 (actual)	2010	Annual average growth (%)
Japan	5,130	6,400	2.0
South Korea	1,297	2,200	4.9
Taiwan	416	1,100	9.2
Sub-total	6,843	9,700	3.2
India	0	500-1,000	-
China	0	300-500	-
Total	6,843	10,500-11,200	4.0-4.6

(Note) The forecast figures for South Korea include in-plant consumption (about a million tons) by POSCO, a steelworks in Pohang.

(Source) Prepared from various reference materials.

Fig. 9 LNG Supply and Demand Balance Outlook for Asia/Pacific



(Source) Prepared from various reference materials.

Table 6 Gas Companies Launching into Electricity Business

Gas company	Project	General descriptions
Tokyo Gas	Cogeneration	Plans to supply electricity (42 MW) and heat (about 16,000 freezing tons) to a re-developed district (covering an area of 11 ha. with a total floor space of 715,000 m ²) in Roppongi 6-chome, Tokyo.
	Electricity retailing	Incorporates a planning firm, preferably in June 2000, jointly with NTT Facilities and Osaka Gas. To launch into electricity retail business.
Osaka Gas	Wholesale electricity supply (IPP)	Won an IPP bidding offered by Kansai Electric Power in FY1996. To start wholesale electricity supply of 140 MW (utilization factor 30%) from FY2002. LNG-fired power.
	Electricity retailing	Incorporates a joint venture with NTT Facilities and Tokyo Gas (see above).

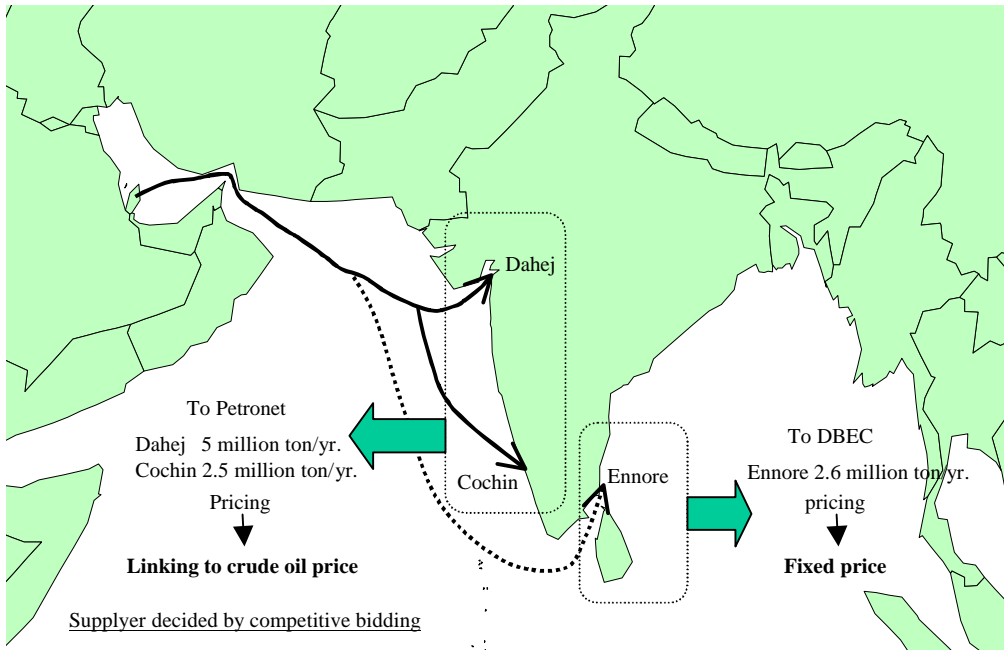
(Source) Prepared from various reference materials.

Table 7 Electric Utilities Launching into Gas Supply Services

Electric utility	Project	General descriptions
Tohoku Electric Power	Gas supply to large industrial users	Incorporated a joint venture, "Tohoku Natural Gas," with Japan Petroleum Exploration. Supplying gas to large industrial users, like Sony and Sapporo Breweries.
	General gas business	Announced the company's will to join bidding slated for June 2000 and acquire a prefecture-run gas company that Yamagata Pref. considers to sell to a private firm.
Tokyo Electric Power	Wholesale gas supply	Starts wholesale gas supply to Ohtaki Gas from Jan. 2001 and on. Will supply 35 million m ³ /year or more (approx. 30,000 tons LNG equivalent) within three years since FY2001 (under a contract signed July 21, 1999).
Chubu Electric Power	Gas supply to large industrial users	Forms a joint venture with Iwatani Industry within April-June 2000. Announced an entry into LNG retail business.
Kansai Electric Power	Gas supply	Forms a joint venture with Iwatani Industry within April-June 2000. To construct new LNG receiving terminal (2.7 million tons) by 2005 with Iwatani Industry, Ube-Kosan and Cosmo Oil. Announced an entry into LNG retail business.
Chugoku Electric Power	Wholesale gas supply	Starts September 2000 wholesale gas supply from a LNG receiving terminal of the company's Yanai Plant to Yamaguchi Godo Gas (1,200 tons LNG equivalent in FY2000 -- about 90,000 tons in FY2004).
Kyushu Electric Power	General gas business	Announced the company's will to acquire a municipal gas company by joining bidding slated this year by Nakatsu City, Ohita Pref.

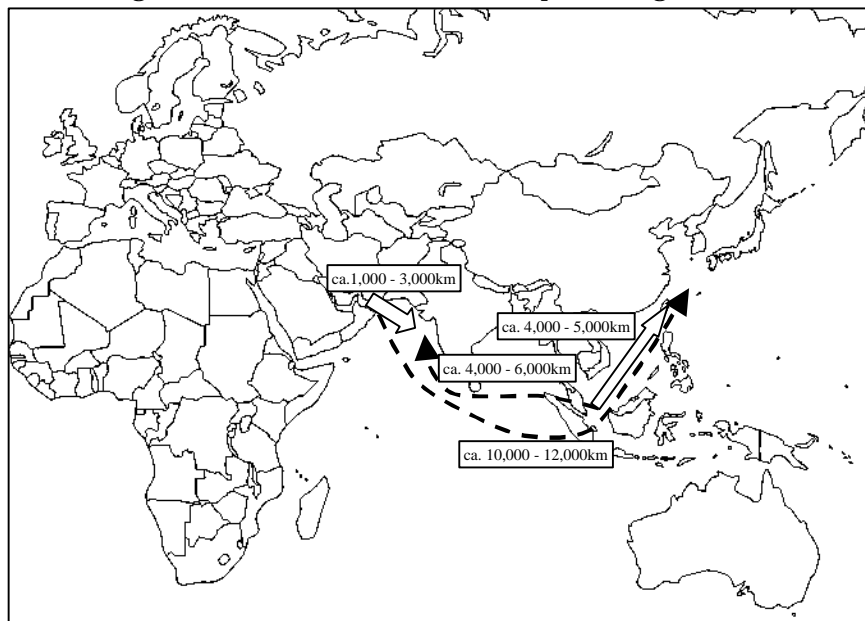
(Source) Prepared from various reference materials.

Fig. 10 LNG Supply Terms and Pricing from Qatar (RasGas) to India



(Source) prepared by IEEJ

Fig. 11 Possibilities of LNG Swap Trading in Asia



(Note) The dotted arrows show transport routes specified in contract, and the blank arrow does those based on swap trading.

(Source) Prepared by IEEJ.