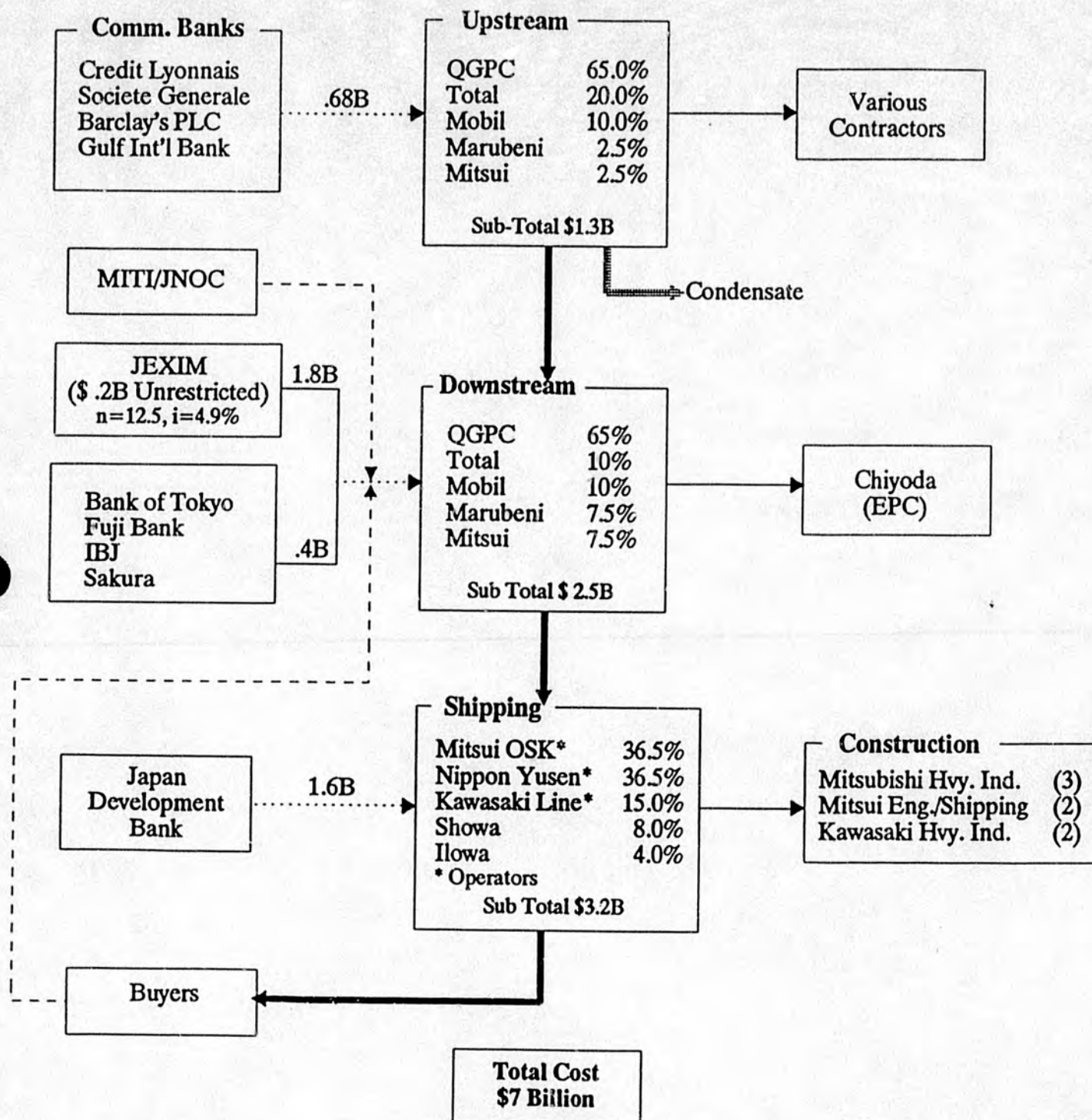


ALASKA LEGISLATURE SPECIAL COMMITTEE/SUBJECT FILES 8672

2342 SCOMM 96: HOUSE SPEC. COMM. ON OIL & GAS, 1995-1996

Qatargas Project Scheme 6 MMT



Legend

— Gas Flow	— Contracts
- - - Guarantee	 Debt

Advisors

JP Morgan - Project Wide
Citibank - QGPC

SUCCESSFUL FINANCING
OF
LNG "GRASS-ROOTS" PROJECTS
FOR THE FAR EAST MARKET

INTRODUCTION

1. BASIC PROJECT STRUCTURE
2. FINANCING SOURCES
3. RISK SHARING
4. PROJECT FINANCE FOR LNG
"GRASS-ROOTS" PROJECTS

APPENDIX FINANCING STRUCTURES OF
INDONESIA LNG PROJECTS

- (i) The First Indonesian LNG Project
- (ii) LNG Expansion Projects in Indonesia

INTRODUCTION

With the rapid increase of demand of LNG as a clean energy source in the Far East market today, many "grass-roots" projects, such as Alaska North Slope Project, Indonesia Natuna Project, Sakhalin Project, and Oman Project, are under contemplation.

Needless to say, LNG "grass-roots" projects, which consist of gas gathering units, gas treatment facilities, pipelines, liquefaction plants, LNG tankers and the other related facilities, require huge amounts of capital and involve high risks. For materialization of such a large-scale LNG "grass-roots" project, therefore, successful arrangement of the financing will be very significant. This paper, as a general study on financing of large-scale LNG "grass-roots" projects for the Far East market, examines several selected problem areas to be solved concerning project structure and financing structure for the successful financing from the lenders' viewpoint.

For your reference, financing structures of Indonesia LNG projects are set out in the Appendix.

1. BASIC PROJECT STRUCTURE

Before going to the detailed study of financing, it is very important to build up a solid basic project structure. Without this step, the process in structuring a finance scheme would become inefficient.

For designing of a basic project structure, it is necessary to make clear the roles of key players, such as gas owners, LNG buyers, governments (or governmental organizations) of the host and buyers' countries, and so on. Within this stage, key players' commitment should be confirmed in the following manner:

- (1) Gas owners should clearly show their commitment to the project including capital contribution, based on a corporate consensus, and inform of a detailed development plan including various studies on the project.
- (2) LNG buyers' commitments, in a form of Letter of Intent, should be secured.
- (3) Governmental support from the host and buyers' countries should be clearly stated.
- (4) Mutual agreements between gas producers and related parties in buyers' countries on cooperation for risk sharing in the project should be concluded.

In many LNG projects for the Far East market, Japanese Trading Companies, called "Sogo Shosha" have played a very important role, ranging from the coordinator/promoter of the project to the participant in finance, as shown in Exhibit 1. The role and the form of involvement in the project of Sogo Shosha also should be determined in this stage.

MAJOR JAPANESE TRADING COMPANIES
AND
LNG PROJECTS

TRADING COMPANY	LNG PROJECT (YEAR OF FIRST SHIP)	ROLES
MITSUBISHI CORP.	• Alaska Kenai Project(1969) • Brunei Project (1972) • Malaysia Project (1983) • Indonesia Arun Expansion Project (1984) • Australia Project(1989)	Sales Agent ("SA.") Equity Participation(25%), SA. Equity Participation(17.5%), SA. Equity Participation in Indonesia LNG(10%), SA. Equity Participation in Mi/Mi, SA.
mitsui & co., ltd.	• Abu Dhabi Project (1977) • Australia Project (1989) • Qatar Project	Equity Participation(24.5%), SA. Equity Participation in Mi/Mi, SA. Equity Participation(7.5%), SA.
NISHO IWAI	• Indonesia Project (1977)	Equity Participation in JILCO (10%), SA.
MARUBENI CORP.	• Qatar Project	Equity Participation (7.5%), SA.
C. ITOH & Co.	• Algeria Project • Sakhalin Project	Spot Sales Arrangement Equity Participation (28.828%) in SODECO
SUMITOMO CORP.	• Australia Bonapart Project.	Promoter

2. FINANCING SOURCES

As shown in Exhibit 2, most of the existing LNG projects for the Far East market depended a lot on import credit/overseas investment credit provided by The Export Import Bank of Japan (J.EXIM). It is because both credits have advantages compared to other sources in respect of cost and availability for massive amounts of funding.

Import credits are provided to Japanese corporations for the import of LNG (see the finance scheme of the First Indonesian LNG Project [Exhibit 7]), while overseas investment credits are provided to Japanese corporations for their overseas investment activities as project sponsors (see finance scheme of Indonesian Train E Project [Exhibit 8]). However, the terms in both credits will be basically the same.

Japanese commercial banks have been also involved in most of the LNG financing on both a corporate guarantee basis and a limited recourse finance basis.

In co-finance with J.EXIM, Japanese commercial banks provided their loan for 30-40% of the total amount (The share of commercial banks is determined under the Japanese Government guideline). And Japanese commercial banks sometimes participated in the special purpose company for LNG import and/or financing as equity holders.

In limited recourse finances (so called "project finance") as well, Japanese commercial banks have played leading roles and provided considerable amount of loans, which we will refer to later.

For future LNG "grass-roots" projects as well, J.EXIM and Japanese commercial banks are considered to continue to play major roles, but (i) Korean sources, and (ii) international financing institutions should also be examined as potential financing sources.

FINANCE SOURCES USED FOR EXISTING LNG PROJECTS

— For The Far East Market —

PROJECT (Year of First Ship)	JAPAN-EXIM		Commercial Syndicated Loan	Sponsors Loan/Equity	Other Sources
	Import Credit	Overseas Investment Credit			
1. Alaska (1969)				○	
2. Brunei (1972)		○	○	○	US EXIM (Export Credit)
3. Abu Dabi (1977)	○	○	○	○	
4. Indonesia - Original - (1977)	○		○ *		OECP (YEN Credit)
5. Malaysia (1983)	○	○	○	○	US EXIM (Export Credit)
6. Indonesia - Expansion - (1984)	○		○ *		
7. Indonesia - for Korea - (1984)				○	
8. Australia - Phase II - (1989)	○	○	○	○	
9. Indonesia - for Taiwan - (1990)		○	○		

* EXIM Co-Finance

(i) Korean Sources

The existing LNG projects for Taiwan and Korea have not involved their own countries' finance sources, and they were financed by international commercial banks on a limited recourse basis.

In Korea, however, there is The Export Import Bank of Korea, a governmental financing institution for international business, which is a very similar organization to J.EXIM. Through its activity for providing import credit for the purchasing of natural resources, K.EXIM might be one of the potential financing sources for future LNG projects which involves Korean LNG buyers.

(In Taiwan, there are no special governmental financial agencies to support
the international trade and business.)

(ii) International Financing Institutions

International Financing Institutions such as World Bank, IFC, ADB have never been involved in the existing LNG projects for the Far Eastern market. It is because the World Bank and ADB are historically concentrated not on natural resource development projects, but on infrastructure projects in the developing countries when the projects are not justified according to commercial investment criteria.

However, they have mentioned recently that because of both environmental and economic reasons, they have an interest in being involved in natural gas development projects and LNG projects.

3. RISK SHARING

In large-scale projects like LNG "grass-roots" projects, it is very difficult for project sponsors to fully undertake project risk in various categories. Therefore, it is significant to establish a cooperative financing structure in which the related parties, such as gas producers, gas buyers, engineering procurement and construction (EPC) contractors, ship builders, shippers, the governmental organizations and financial institutions, share the various types of project risk. As you can see in Exhibit 3, project sponsors succeeded in sharing major risks with other parties in some recent projects.

Other than project sponsors, we can identify several parties who may take project risks to some extent in LNG projects for the Far East market.

(a) Japanese Governmental Organizations

The Japanese Government has been supportive of importing natural resources which are essential for the development of the Japanese economy. Support of this kind has been provided through its financing agencies and its petroleum agencies.

As you can see in the examples described in the Appendix, such agencies have been deeply involved not only in funding but in guaranteeing for the existing LNG projects. Following is a list of Japanese governmental institutions which should be examined as prospective funding/guarantee sources for LNG projects.

- The Export Import Bank of Japan (J.EXIM)
- Overseas Economic Cooperation Fund (OECF)
- Japan National Oil Corporation (JNOC)
- Overseas Petroleum Development Co., Ltd. (JNOC's Subsidiary)
- Japan Petroleum Exploration Co., Ltd. (JNOC's Subsidiary)
- The Development Bank of Japan (For LNG tanker finance)

(As for details of these institutions, please refer to the enclosed information)

MAJOR PROJECT RISK TAKERS IN THE FINANCE FOR EXISTING LNG PROJECTS

— For The Far East Market —

PROJECT (Year of First Ship)	(A) GOVERNMENT OF BUYERS' COUNTRY*	(B) BUYERS	(C) COMMERCIAL BANKS	PROJECT SPONSORS		
				GOVERNMENT OF HOST COUNTRY*	JAPANESE (TRADING FIRMS)	OIL COMPANY
1. Alaska (1969)						○ (Phillips, Marathon)
2. Brunei (1972)				○ (Brunei Government)	○ (Mitsubishi)	○ (Shell)
3. Abu Dabi (1977)				○ (ADNOC)	○ (Mitsui)	○ (BP, TOTAL)
4. Indonesia -Original- (1977)	○	○				
5. Malaysia (1983)				○ (PETRONAS)	○ (Mitsubishi)	○ (SHELL)
6. Indonesia -Expansion- (1984)	○	○				
7. Indonesia -for Korea- (1984)						○ (Mobil)
8. Australia -Phase II- (1989)			○		○ (MIMI)	○ (Shell, BP, Chevron, BHP) Woodside
9. Indonesia -for Taiwan- (1990)			○			

*Including Governmental Organization

(b) Japanese LNG Buyers

If you review some Indonesian LNG projects, you may notice that Japanese LNG buyers played important roles as a risk taker. In these projects, Japanese buyers (most of them are utility companies) participated in the financing as equity participants of LNG importing/financing companies, as borrowers of import credit of J.EXIM, and as guarantors of limited recourse financing. Moreover, Japanese buyers almost always took a part of marketing risk by providing off-take guarantee under the long-term sales contracts, which support the establishment of a project finance structure.

(c) Commercial Banks

Japanese commercial banks took major project risks in recent LNG projects, such as the Australia North West Shelf Project and the Indonesia "Train E" Project. We will discuss the so-called "project finance" where financial institutions will take some of the project risks in the next section.

4. PROJECT FINANCE FOR LNG "GRASS-ROOTS" PROJECTS

Generally speaking, the term "project finance" is used to refer to a financing structure in which the financing is not primarily dependent on the credit support of the sponsors. But here in this paper, we would like to define it as a financing structure where commercial banks take some part of (not all of) the major project risks.

It is true that "project finance" schemes are well applied to large-scale LNG "grass-roots" projects, but there are some required conditions for commercial banks to build up a financing scheme for these projects on a "project finance" basis or a limited recourse finance basis.

The followings are deemed to be basic requirements for "project finance."

- (a) Adequate reserve should be confirmed on a recoverable basis by the reputable independent consultant.
- (b) Development and completion of the project should be guaranteed by gas producers.
- (c) LNG sales contracts including pricing formula should be concluded on the acceptable terms and conditions to the lenders. ("take or pay" clause should be required)
- (d) Project assets should be granted as a first ranked mortgage to the lenders and all rights, and benefits under the related project agreements should be also assigned to the lenders.
- (e) Adequate level of debt service coverage ratio in project cashflow projection should be secured in lenders' analysis as well.
- (f) Cash flow mechanism and cash flow priority including establishment of escrow account should be satisfactorily arranged for the lenders.

On the premise that these required conditions are fulfilled, it will be possible to employ a project financing structure for future LNG "grass roots" projects for the Far East market with the following risk sharing pattern in each risk category:

(a) Reserve Risk

If the adequate reserve of natural gas is proven on a recoverable basis by an internationally reputable consultant, reserve risk can be shared among gas producers, financial institutions including commercial banks, and possibly buyers.

(b) Natural Gas Development and Plant Construction Risk

Natural gas development and plant construction risk, such as cost overrun and delay in completion and shortfalls in expected capacity/efficiency of production, should basically be undertaken by gas producers.

However, some part of this risk (especially, completion risk of liquefaction plant) can be shared with financial institutions if terms and conditions in EPC contracts are acceptable and partial guarantees are provided by producers. In this case, it is preferable for financial institutions that turnkey lumpsum EPC contracts will be reputable and experienced.

(c) Operating and Marketing Risk

LNG buyers and financial institutions involved in the projects require reliable operating capabilities of a project company or its operating and maintenance agreement concluded with an experienced operator in technical and commercial aspects.

As for marketing risk, the financial institutions require a long-term sales contract with "take or pay" clause which is consistent with the amount and period of the debt service.

(d) Political Risk

In any cross-border financing, financial institutions will take political risk which occurs under a collapse of the existing political/legal order in the host/borrowers country, such as alternation in exchange, transfer, and tax regulations, nationalization of the project assets and so on.

Especially for projects in developing countries, financiers are more careful to study those risks. In this part, the support of both governments of LNG exporting and importing countries will be expected.

(e) Force Majeure Risk

We understand that so-called force majeure risk should basically be shared among all related parties in a sense of co-operation. The range of force majeure, however, is carefully discussed and agreed by all related parties, and those risks are particularly acute to the pre-completion phase of the project.

(f) Credit/Financial Risk

Some part of projects risk above mentioned are resorted to project sponsors (gas producers and equity participants). Therefore, financiers assess the credit worthiness and management capabilities of the sponsors that they rely on to ensure the success of the project.

In this way, project risks in LNG projects can be shared by the related parties. EXHIBIT 4 shows the summary of this.

RISK SHARING FOR FINANCING

ITEMS OF RISKS	RISK TAKERS
(a) Reserve Risks	• Gas Producers • Financial Institutions
(b) Construction and Development	• Gas Producers • EPC Contractors • Financial Institutions
(c) Operating & Maintenance	• Gas Producers • Financial Institutions
(d)/(e) Political Risks/Force Majeure Risks	• Government of Host Country • Government Agencies of Financers Country • Financial Institutions • Gas Producers
(f) Credit/Financial Risks	• Financial Institutions

APPENDIX

FINANCING STRUCTURES OF
INDONESIA LNG PROJECTS

- (i) The First Indonesian LNG Project
- (ii) LNG Expansion Projects in Indonesia

(i) The First Indonesian LNG Project

On December 3, 1973 the first Indonesian LNG sales contract was signed between Pertamina and Japanese LNG buyers, the outline of which is shown in Exhibit 5.

The project cost for the construction of liquefaction facilities and LNG tankers was more than US\$ 1 billion and it was not easy for the Indonesian government/Pertamina to procure such a huge amount. They tried to find a way to raise funds in a cooperation with Japanese LNG buyers getting support from Japanese governmental authorities and Japanese related parties.

Such cooperation for financing was quite different from the past LNG projects at that time, where gas producers and/or liquefaction company had financed for the projects by themselves and sold LNG to buyers.

The scheme and main features of financing for the project are illustrated in EXHIBIT 6 and 7.

The financing for the building of LNG tankers was arranged by a shipper, named Burmast East Shipping Corp., and ship builder, General Dynamics, utilizing a guarantee facility provided by the Maritime Administration of the US Department of Commerce.

And LNG receiving terminals in Japan were build and funded by LNG buyers. Financing for the main body of the project consisted of Yen Credit of Overseas Economic Cooperation Fund, one of the Japanese government authorities, and import credit of The Export Import Bank of Japan (J.EXIM) through Japan Indonesian LNG Co., Ltd. (JILCO), which was established specially for the purpose of financing for the first Indonesia LNG project.

OECE Yen Credits are Japanese official overseas development aid and basically to be provided for the construction of infrastructure projects. It was quite exceptional that Yen Credit was provided to a natural resource development Indonesian LNG project. Such special yen credit could be provided only if a project is very significant for both the recipient country and Japan. The repayment term of the yen credit extended 25 years with a grace period of seven years and the interest rate was fixed on 3% p.a.

The co-financing of EXIM with commercial banks made loans to JILCO for this project. Import credits are usually borrowed by importers(trading firms and/or buyers of natural resources) and re-lent to exporters. In the case of the Indonesian LNG project a project company was set up, and risk-taking by the utility companies was in the form of guaranteeing the EXIM co-financing syndicate. This project was the first case where Japanese utilities companies exposed themselves to such risk-taking, although partly covered off through official support programs. Their actual assumption of risk was limited to 40%, because Japan National Oil Corporation(JNOC), a government agency, guaranteed 60% of the loans.

A project company is sometimes set up when a number of entities import products from the same overseas project. The establishment of such a company has several merits; the clerical control of the loans can be facilitated, coordination among the related parties can be easier, and importers sometimes prefer guarantees to loans when indicating their obligations on their balance sheet.

Project companies are usually set up with a small equity capital. JILCO's paid-in capital was Japanese Yen 1.5 billion. The parties that have an equity share in a project are generally importers and trading firms. In the case of JILCO, many companies other than importers cooperated because the project was of national importance.

The amount of the JILCO import credit was equal to the total cost of the construction of the liquefaction facilities (except portions covered by yen credits). This was rather unusual. The reason for EXIM's approval of the full amount was that all LNG from the liquefaction facilities was to be exported to Japan, which was in urgent need of LNG.

As a measure to ensure the repayment of JILCO loans, a certain percentage of LNG sales proceeds is credited to the escrow accounts in the US from which principal and interest are repaid. The reliability of the cash flow of this project to these accounts was enhanced by the fact that development of natural gas fields, construction and operation of the liquefaction facilities, construction and operation of LNG tankers and other activities were undertaken by parties with excellent technological know how and experience; and by the fact that the Japanese buyers themselves had concluded the take-or-pay contract.

The JILCO's loans were made in US dollars, but a certain percentage of EXIM co-finance was denominated in yen. Accordingly, JILCO took a foreign exchange risk.

The First Indonesia-Japan LNG Sales Contract

1. Buyers and their respective purchase quantity:

(thousand tonnes per year)

Chubu Electric Power Co., Inc.	1,700
Kansai Electric Power Co., Inc.	2,400
Kyushu Electric Power Co., Inc.	1,500
Nippon Steel Corporation	600
Osaka Gas Company, Ltd.	1,300
TOTAL	7,500

2. Take or Pay : Buyers assume take-or-pay obligation subject to availability.
3. Transport : Pertamina's responsibility. Title of LNG passes on delivery into a buyer's receiving facility.
4. Term : 1977-99
5. Price : Price is escalated according to the movements of Indonesian crude oils and transport costs.

Finance for The First Indonesian LNG Project

1. Share of Loan :

Exim Banks	80%
Commercial Banks	20%

2. Amounts:

ARUN	US\$523 million equivalent (mixture of yen and US dollars)
BADAK	US\$375 million equivalent (mixture of yen and US dollars)

3. Interest Rates(JILCO's funding cost):

Commercial Banks	
US Dollar	LIBOR + margin
YEN	Long-term prime lending rate + margin
EXIM	Fixed

Terms :	
ARUN	16 years
BADAK	15 years

Guarantee :	JNOC	60%
	LNG Buyers	40%

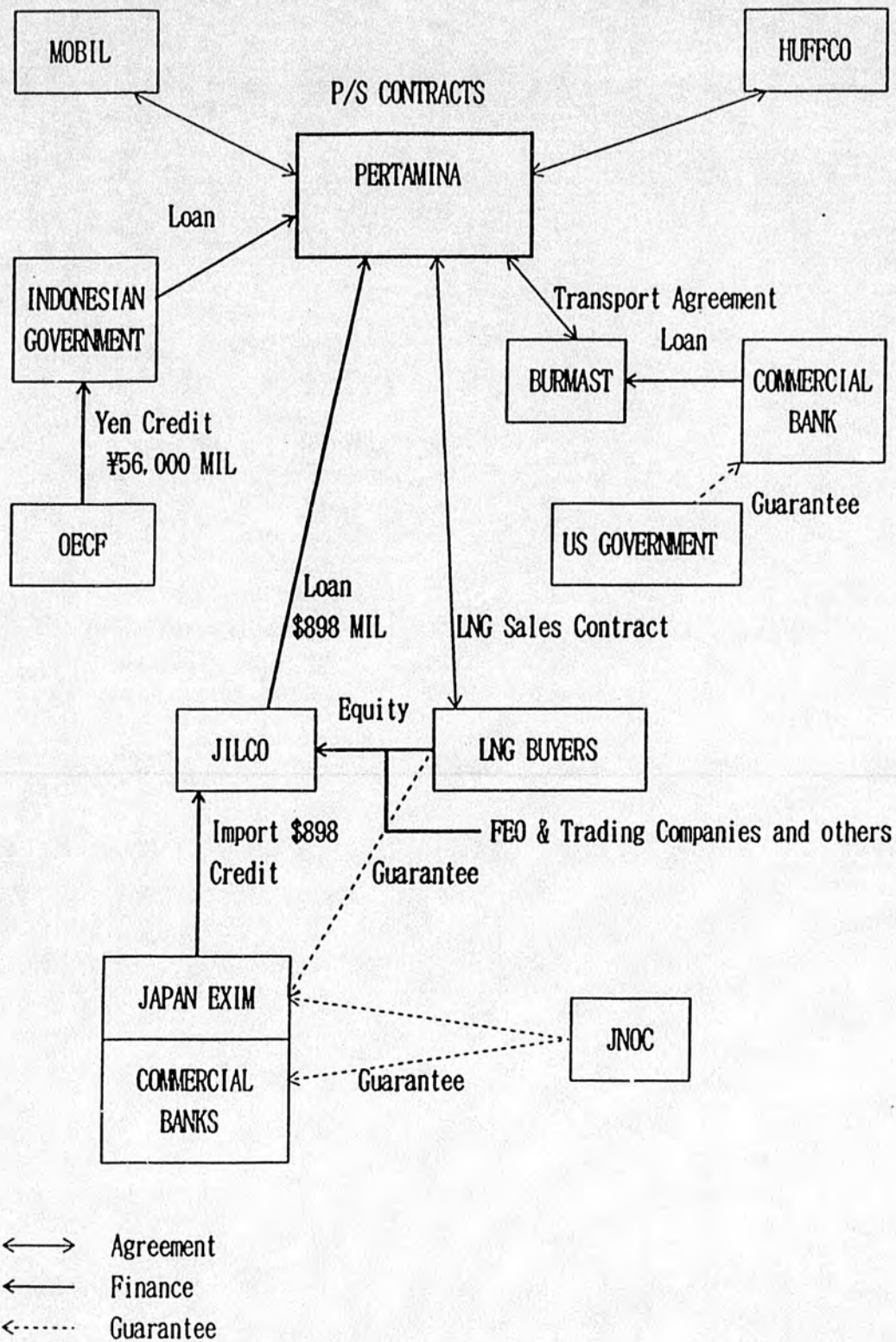
Escrow Account :	Certain percentage of sales proceeds is credited to the escrow account.
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Overseas:	Certain percentage of the loans was insured.
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Investment:	
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Insurance:	
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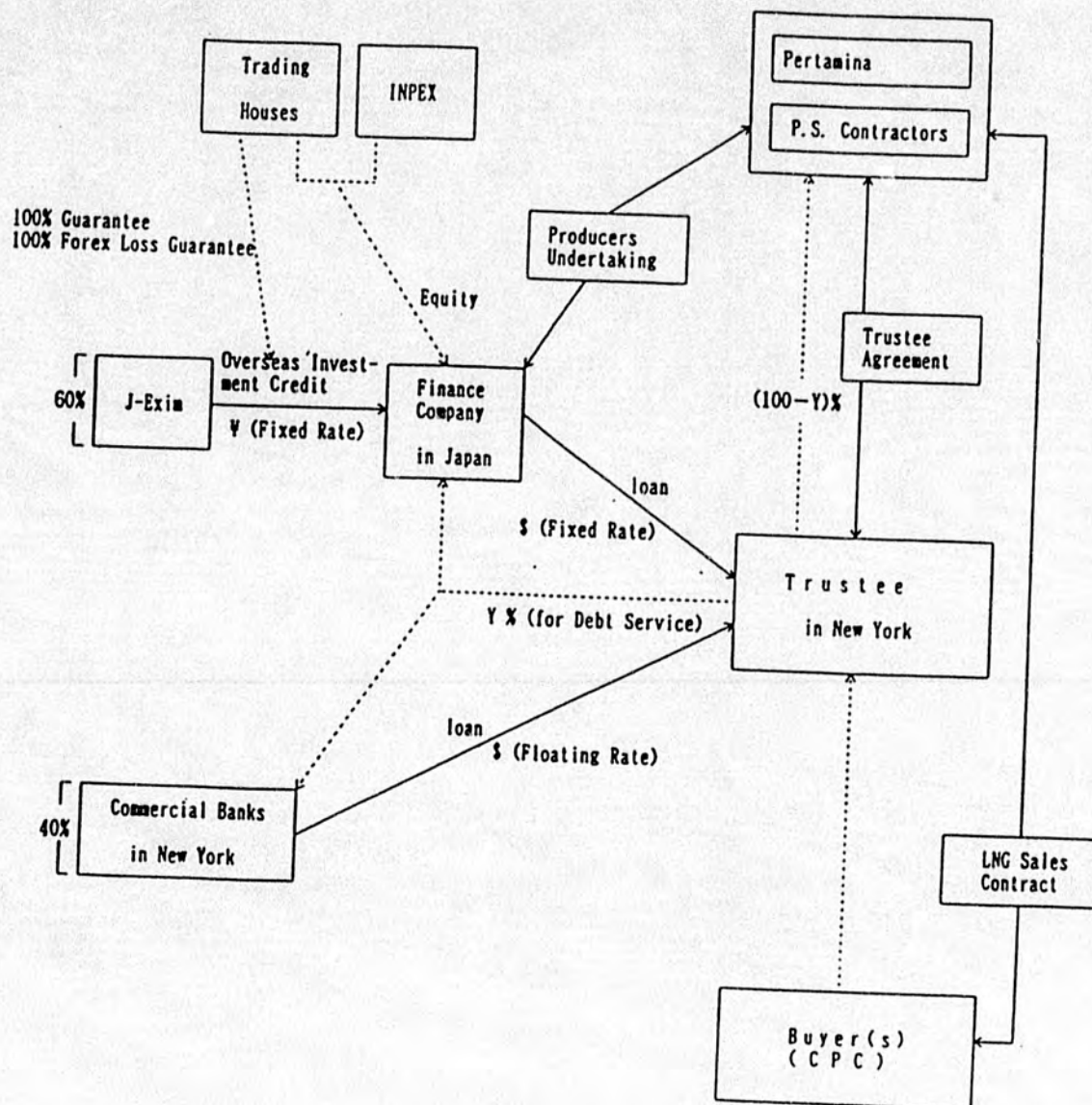
Finance Scheme of The First Indonesian LNG Project



"Trustee Borrowing Scheme" for Indonesian Train E Project

EXHIBIT 8

Trustee Borrowing Scheme



REFERENCE MATERIAL

- (1) INFORMATION OF THE EXPORT IMPORT
BANK OF JAPAN
- (2) INFORMATION OF JAPAN NATIONAL
OIL CORPORATION
- (3) INFORMATION OF THE DEVELOPMENT
BANK OF JAPAN
- (4) INFORMATION OF THE EXPORT IMPORT
BANK OF KOREA

TAGS Construction Costs and Timeline

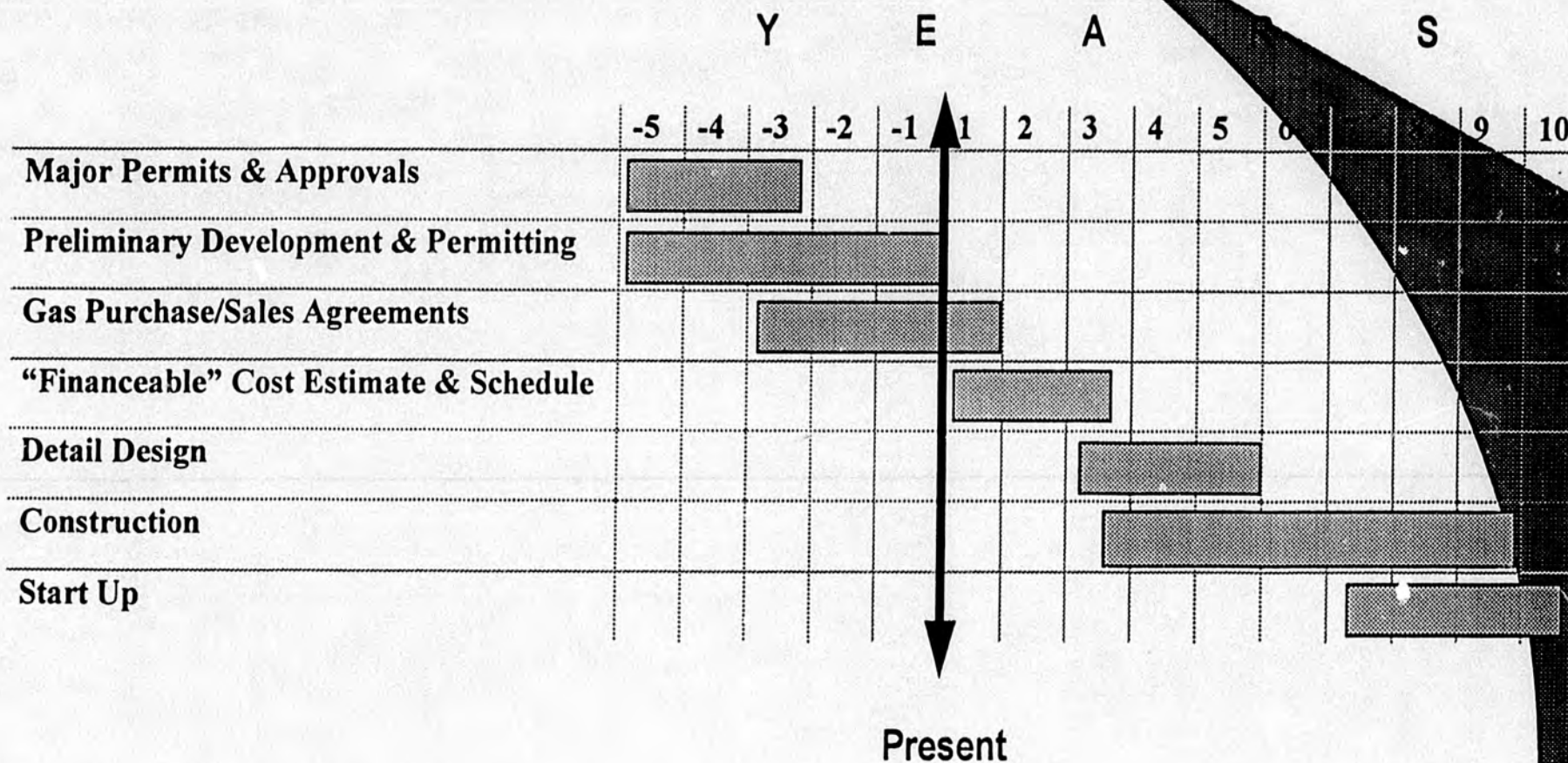


TAGS Capital Cost Estimates

(1991 \$ billions)

	<u>Total</u>
Alaska Facilities	10.0
Shipping	<u>3.4</u>
	\$13.4

TAGS Project Timetable



TAGS Competition:

Cost Comparisons



Grass Roots LNG Projects

Cost Comparison

Project	Production (MMTPA*)	Estimated Cost \$ Billions	Cost in \$ Billions per MMTPA	Capital ** per MMBTU
Alaska TAGS	15	13.6	0.91	0.70
TAGS at higher cost	15	15.0	1.00	
Qatargas	6	6.0	1.00	
Natuna Island	15	21.3	1.42	1.00
Sakhalin	6	7.9	1.32	1.00

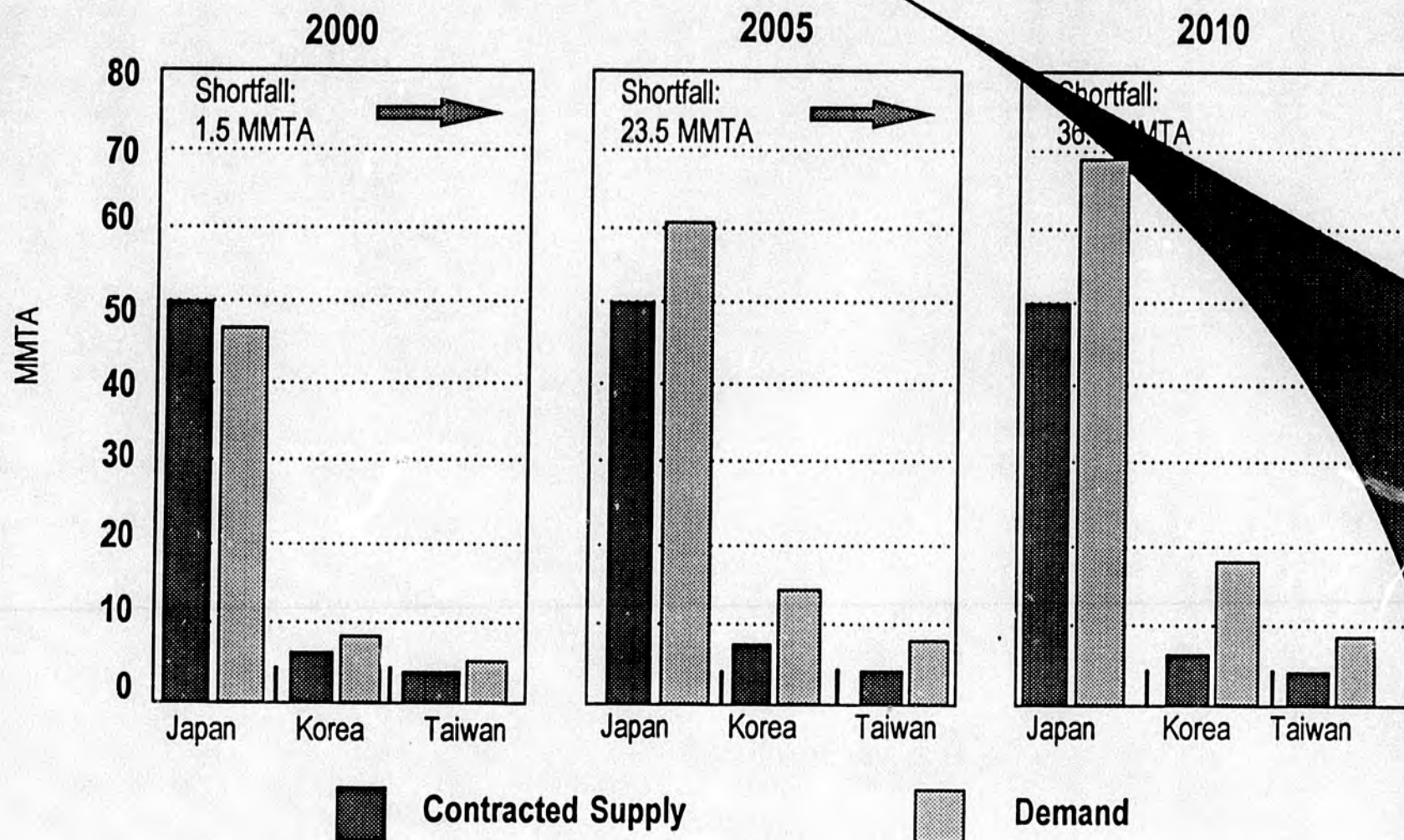
* million metric tons per annum

** does not reflect capitalized interest, cost of gas, time value of money or operating exp

Asian LNG Market: Demand Projections



Contracted Asian LNG Supply vs. Projected Demand



Financing of LNG Projects

- A Case study for Natuna Gas Development Project from a financier's viewpoint -

The Industrial Bank of Japan, Limited

IBJ

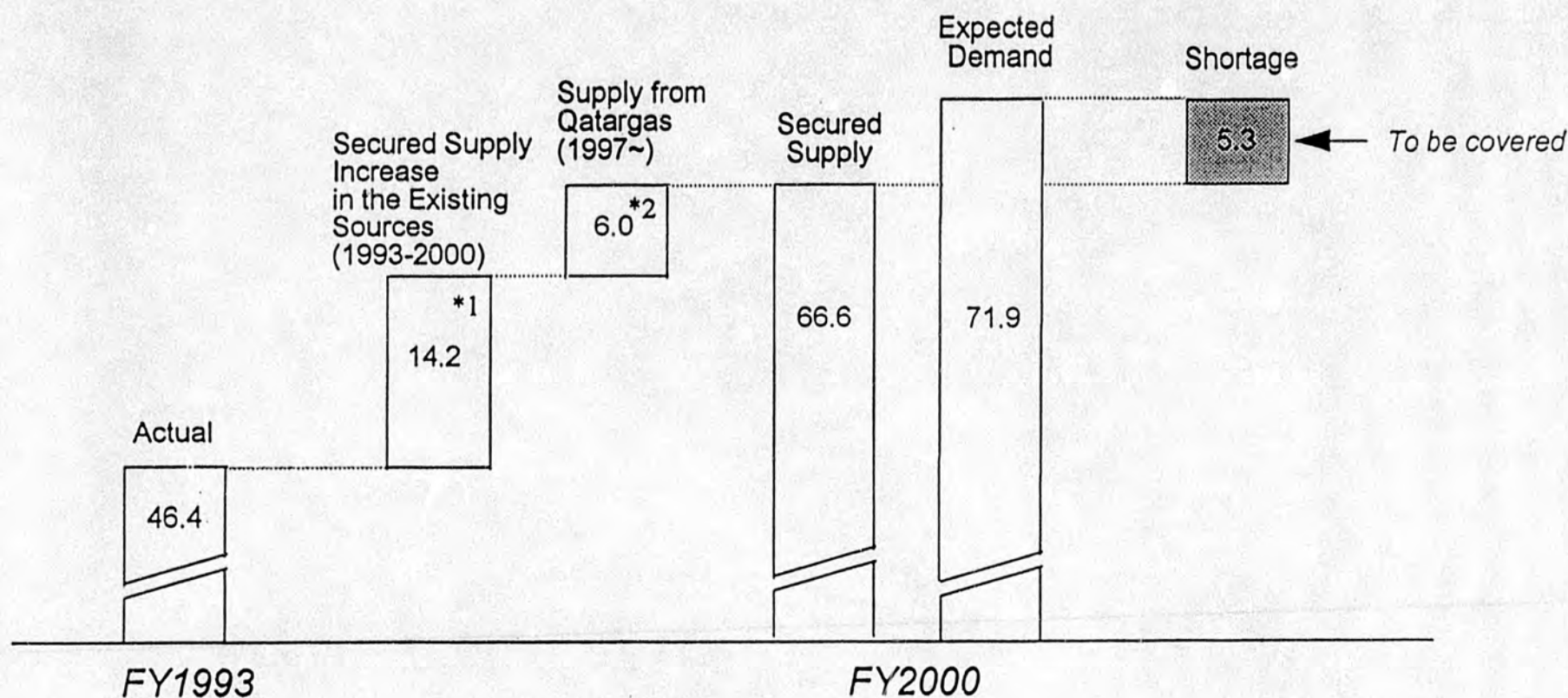
I. A Financier's view on East Asian LNG Supply and Demand

- Supply-Demand Balance Before Year 2000

- Supply-Demand Balance After Year 2001

Fig.1

LNG Demand & Supply in the Far East ***-Japan, Korea, Taiwan, FY2000- (Million Tons)***

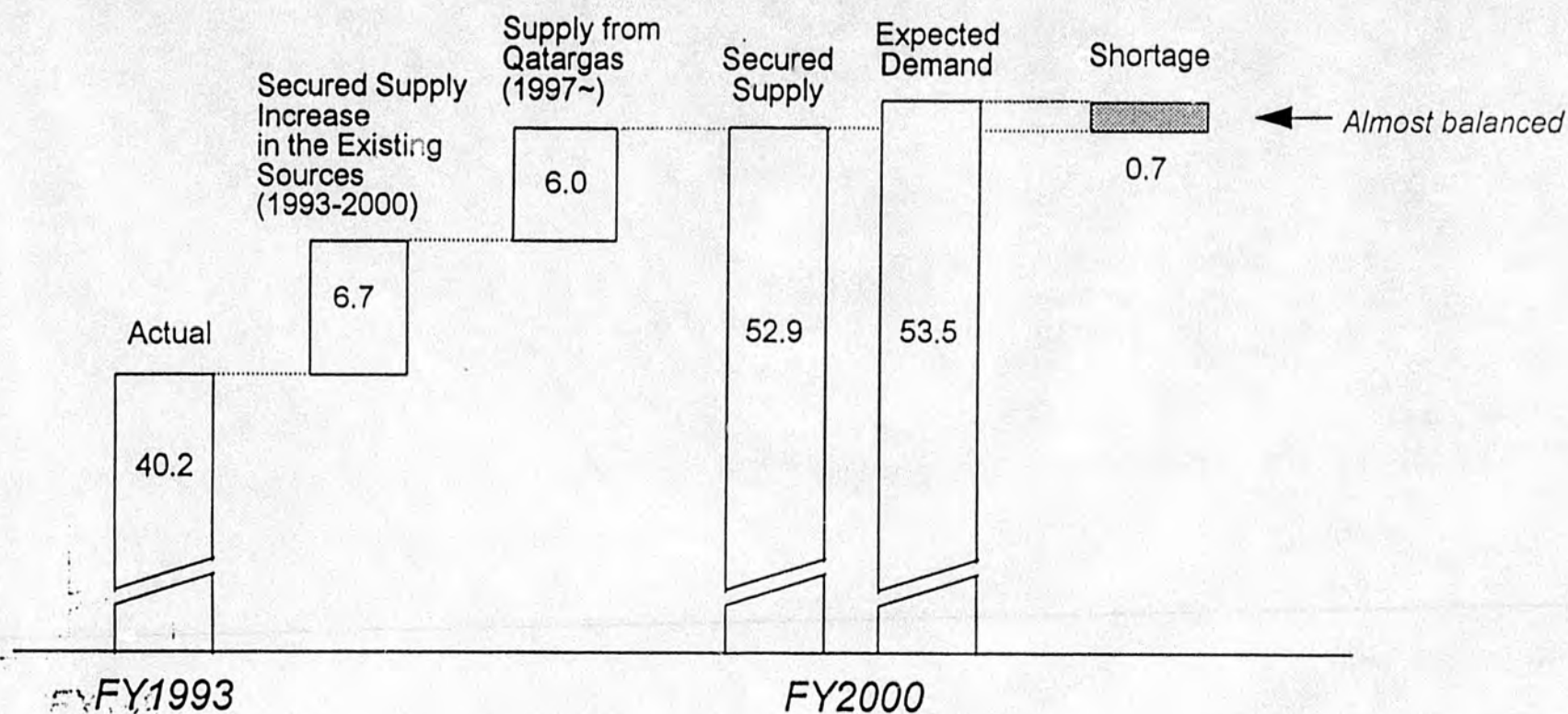


*1 Including Indonesia Badak Train H
 *2 Excluding Qatar Ras Laffan Project

<Source: IBJ Estimation>

Fig 2

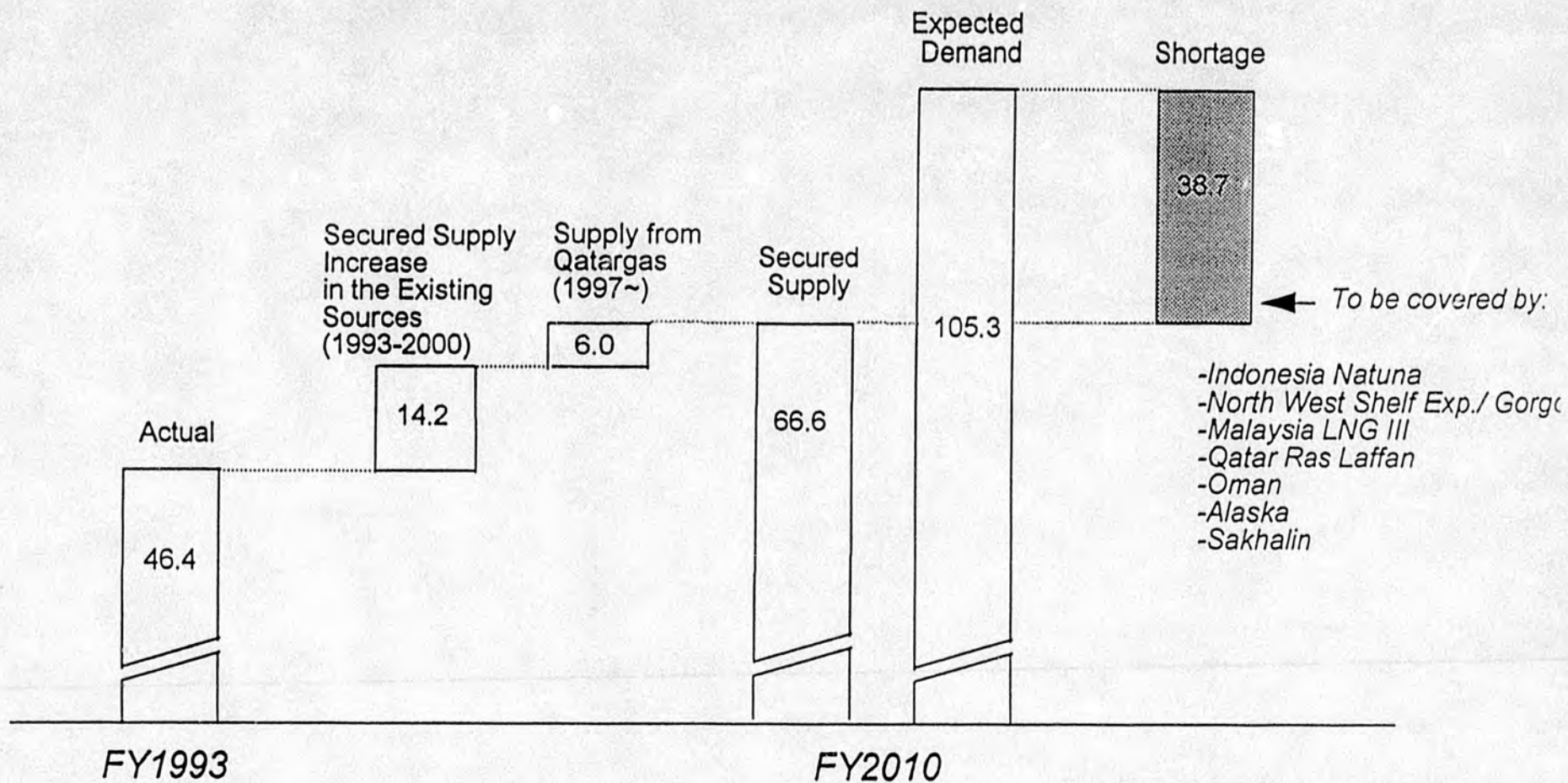
LNG Demand & Supply ***-Japan FY 2000- (Million Ton)***



<Source: IBJ Estimation>

Fig 3

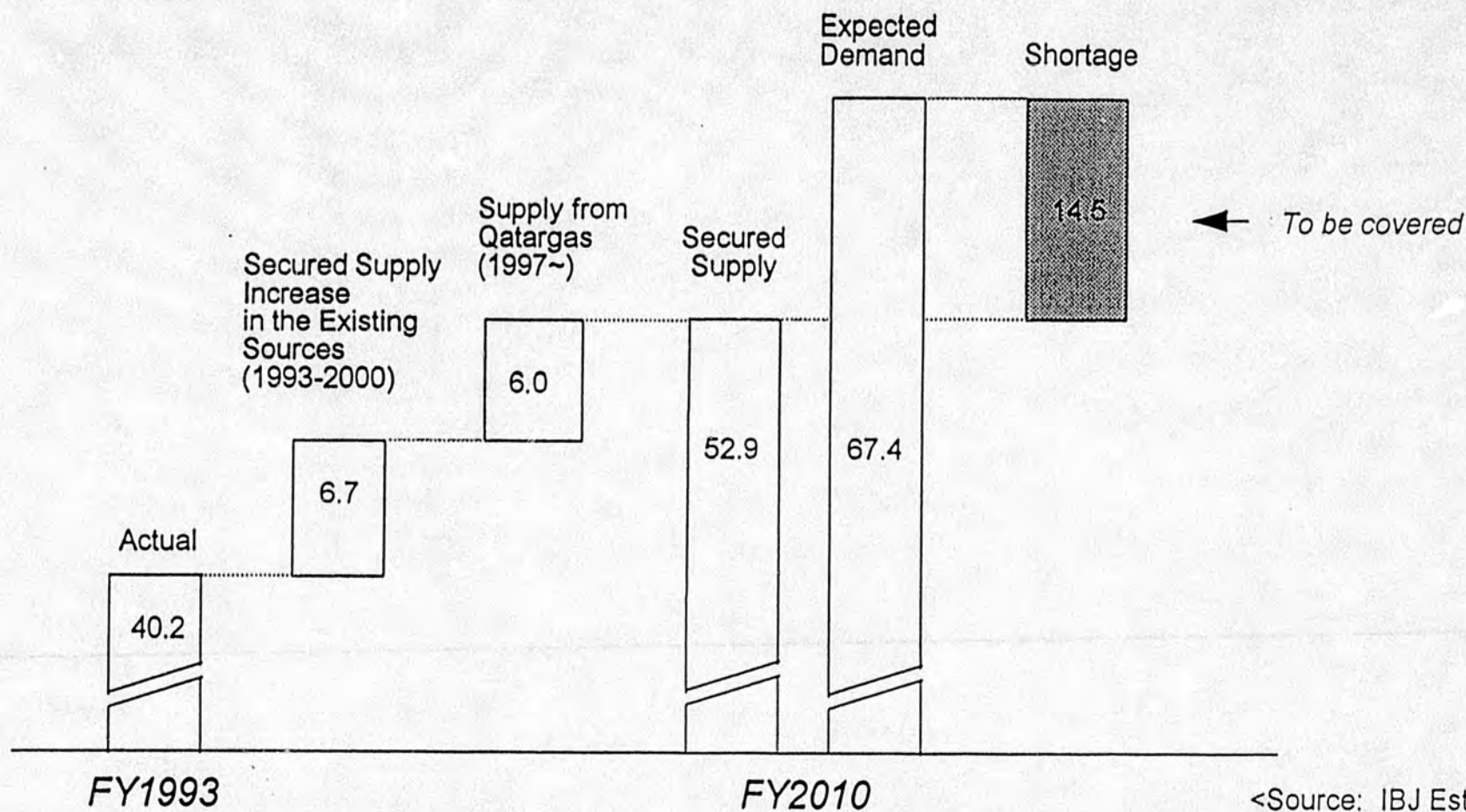
LNG Demand & Supply in the Far East ***-Japan, Korea, Taiwan, FY2010-*** (Million Tons)



<Source: IBJ Estimation>

Fig.4

LNG Demand & Supply -Japan FY 2010- (Million Ton)



<Source: IBJ Estimation>

Fig.5

Existing LNG Contracts/Commitments for 2000

As of October 1995 (Unit: Million Tons per Year)

	Tohoku Electric	Tokyo Electric	Chubu Electric	Kansai Electric	Chugoku Electric	Kyushu Electric	File. Cos. Total	Tokyo Gas	Osaka Gas	Toho Gas	Saibu Gas	Medium City	Gas Cos. Total	Nippon Steel	Japan Total	Korea	Taiwan	Grand Total	Expiration of S'A
Alaska		0.82					0.82	0.27					0.27		1.09			1.09	Mar-04
Brunei		3.72					3.72	1.14	0.68				1.82		5.54			5.54	Mar-13
Abu Dhabi		4.45					4.45						0.00		4.45			4.45	Mar-19
Indonesia	3.22	0.51	3.80	3.45	0.00	1.56	12.54	0.92	3.01	0.92	0.00	0.29	5.14	0.60	18.28	5.30	4.15	27.73	
(Badak/Aruni, Badak Y/G)			2.15	2.57		1.56	6.28		1.30	0.25			1.55	0.60	8.43			8.43	Dec-10
(Badak II)			1.65	0.88			2.53		0.44	0.55			0.99		3.52			3.52	Mar-11
(Arun II)	3.22	0.51					3.73						0.00		3.73			3.73	Dec-04
(Arun III)							0.00						0.00		0.00	2.30		2.30	Nov-06
(Badak III/E)							0.00						0.00		0.00		2.25	2.25	Dec-09
(Badak IV/F)							0.00	0.92	1.27	0.12			2.31		2.31			2.31	Dec-13
(Korea II)							0.00						0.00		0.00	2.00		2.00	Jun-14
(Hiroshima/Nihon)							0.00					0.29	0.29		0.29			0.29	2016
(Badak VI/II)							0.00						0.00		0.00	1.00	1.90	2.90	2019
Malaysia	0.50	4.80	0.00	0.42	0.00	0.00	5.72	3.55	0.60	0.28	0.27	0.38	5.08		10.80	2.00	2.25	15.05	
(MLNG I)		4.80					4.80	2.75			0.21		2.96		7.76			7.76	Dec-03
(MLNG II)	0.50			0.42			0.92	0.80	0.60	0.28	0.06	0.38	2.12		3.04	2.00	2.25	7.29	Mar-15
Australia		1.05	1.05	1.05	1.05	1.05	5.25	0.68	0.68	0.21			1.57		6.82			6.82	Dec-08
Qatar (Qatargas)	0.52	0.20	4.00	0.29	0.12		5.13	0.35	0.35	0.06			0.76		5.89			5.89	Dec-21
TOTAL	4.24	15.55	8.85	5.21	1.17	2.61	37.63	6.91	5.32	1.47	0.27	0.67	14.64	0.60	52.87	7.30	6.40	66.57	

Fig. 7

Major Gas Development and LNG Projects with IBJ Involvement

Project (year / country)	Major Promoters	IBJ's Involvement
Indonesia LNG (Original) (1974, US\$1,547M)	Pertamina, JILCO (Kansai Electric Power, Chubu Electric Power, Kyushu Electric Power, others)	-Managing bank of J-EXIM joint finance for JILCO
Indonesian LNG expansion projects:		
-Badak (1981, US\$996M)	JILCO, Pertamina	-Managing bank of J-EXIM joint finance for JILCO
-Arun (1981, US\$840M)	INALCO (Tohoku Electric Power, Tokyo Electric Power, Mitsubishi Corp.), Pertamina	-Managing bank of J-EXIM joint finance for INALCO
-Badak Capital Investment (Phase I & II) (1986-87, US\$200M)	Pertamina	-Agent and lead manager of syndicated project loan
-Badak, Train E (1988, US\$316M)	Pertamina, Huffco, Total, INALCO	-Arranger and lead manager of the trustee borrowing scheme
Malaysia LNG (Sarawak LNG) (1980, US\$1,233M)	Petronas, Shell, Mitsubishi Corp.	-Financial advisor for Petronas -Financial advisor for Malaysia LNG Sdn. Bhd. -Managing bank of J-EXIM joint finance for Petronas -Participated in J-EXIM joint finance for Mitsubishi Corp.
North West Shelf Gas (Phase I) (1981, Australia, A\$2,000M)	Woodside Petroleum Ltd. (WPL), BHP, Shell, BP, Chevron	-Lead manager of Euro-syndicated project loan for WPL
North West Shelf Gas (Phase II) (1985, Australia, A\$10,000M)	Woodside Petroleum Ltd. (WPL), BHP, Shell, BP, Chevron, Mitsui/Mitsubishi	-Lead manager of Euro-syndicated project loan for WPL -Lead manager of EXIM co-finance syndicated project loan for MIMI (Mitsui/Mitsubishi)
Thailand B Structure (1991, US\$500M)	Petroleum Authority of Thailand (PTT), Total, British Gas	-Arranger and lead manager of Euro-syndicated project loan for PTT
Malaysia LNG Dua (1994, US\$2,513M)	Petronas, Shell, Mitsubishi Corp., Sarawak State Gov.	-Lead arranger and coordinator
Qatargas (1994, Qatar, US\$2,850M)	QGPC, Total, Mobil, Mitsui & Co., Marubeni	-Core bank and lead manager

Fig.5

Existing LNG Contracts/Commitments for 2000

As of October 1995 (Unit: Million Tons per Year)

	Tohoku Electric	Tokyo Electric	Chubu Electric	Kansai Electric	Chugoku Electric	Kyushu Electric	Ele. Cos. Total	Tokyo Gas	Osaka Gas	Toho Gas	Saibu Gas	Medium City	Gas Cos. Total	Nippon Steel	Japan Total	Korea	Taiwan	Grand Total	Expiration of S/A
Alaska		0.82					0.82	0.27					0.27		1.09			1.09	Mar-04
Brunei		3.72					3.72	1.14	0.68				1.82		5.54			5.54	Mar-13
Abu Dhabi		4.45					4.45						0.00		4.45			4.45	Mar-19
Indonesia	3.22	0.51	3.80	3.45	0.00	1.56	12.54	0.92	3.01	0.92	0.00	0.29	5.14	0.60	18.28	5.30	4.15	27.73	
(Badak I/Arun I, Badak V/G)			2.15	2.57		1.56	6.28		1.30	0.25			1.55	0.60	8.43			8.43	Dec-10
(Badak II)			1.65	0.88			2.53		0.44	0.55			0.99		3.52			3.52	Mar-11
(Arun II)	3.22	0.51					3.73						0.00		3.73			3.73	Dec-04
(Arun III)							0.00						0.00		0.00	2.30		2.30	Nov-06
(Badak III/E)							0.00						0.00		0.00		2.25	2.25	Dec-09
(Badak IV/F)							0.00	0.92	1.27	0.12			2.31		2.31			2.31	Dec-13
(Korea I)							0.00						0.00		0.00	2.00		2.00	Jun-14
(Hiroshima/Nihon)							0.00					0.29	0.29		0.29			0.29	2016
(Badak VI/II)							0.00						0.00		0.00	1.00	1.00	2.00	2019
Malaysia	0.50	4.80	0.00	0.42	0.00	0.00	5.72	3.55	0.60	0.28	0.27	0.38	5.08		10.80	2.00	2.25	15.05	
(MLNG I)		4.80					4.80	2.75			0.21		2.96		7.76			7.76	Dec-03
(MLNG II)	0.50			0.42			0.92	0.80	0.60	0.28	0.06	0.38	2.12		3.04	2.00	2.25	7.29	Mar-15
Australia		1.05	1.05	1.05	1.05	1.05	5.25	0.68	0.68	0.21			1.57		6.82			6.82	Dec-08
Qatar (Qatargas)	0.52	0.20	4.00	0.29	0.12		5.13	0.35	0.35	0.06			0.76		5.89			5.89	Dec-21
TOTAL	4.24	15.55	8.85	5.21	1.17	2.61	37.63	6.91	5.32	1.47	0.27	0.67	14.64	0.60	52.87	7.30	6.40	66.57	

Fig.7

Major Gas Development and LNG Projects with IBJ Involvement

Project (year / country)	Major Promoters	IBJ's Involvement
Indonesia LNG (Original) (1974, US\$1,547M)	Pertamina, JILCO (Kansai Electric Power, Chubu Electric Power, Kyushu Electric Power, others)	-Managing bank of J-EXIM joint finance for JILCO
Indonesian LNG expansion projects:		
-Badak (1981, US\$996M)	JILCO, Pertamina	-Managing bank of J-EXIM joint finance for JILCO
-Arun (1981, US\$840M)	INALCO (Tohoku Electric Power, Tokyo Electric Power, Mitsubishi Corp.), Pertamina	-Managing bank of J-EXIM joint finance for INALCO
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A SELLER'S VIEW OF ASIA-PACIFIC
LNG MARKET BY 2010

by

H. BAHARUDDIN

**Senior Vice President
Director Corporate Affairs
PERTAMINA
Jakarta, Indonesia**



FIRST DOHA CONFERENCE ON NATURAL GAS

PANEL SESSION 2 - March 13, 1995

PRESENTATION BY MR H. BAHARUDDIN
PERTAMINA - INDONESIA**"A SELLER'S VIEW OF ASIA-PACIFIC LNG MARKET BY 2010"**

Thank you very much for giving me the opportunity to exchange a few ideas with you today on the future of Asia-Pacific LNG market. You will not be surprised if I start my remarks today by saying that I anticipate a bright future for LNG exports as far as we can see forward, that means between today and 2010.

I. A BRIGHT FUTURE FOR LNG EXPORTS

LNG merits in terms of economics and environment are being recognized by a growing number of government planners and industrial investors in this part of the world. I therefore believe that at least 3 countries - China, Thailand and India - will soon follow the example of Japan, Korea and Taiwan, and become LNG importers in a very near future.

LNG demand forecast in Asia-Pacific

Japan will remain by far the biggest LNG buyer in the world. 14 Japanese companies are or will soon be importing LNG. In 1993, Japanese LNG imports came close to 40 million tons, 47% of which supplied by Indonesia.

To assess future demand, we can use MITI's long term plan which seems to me rather on the low side when it comes to LNG : 53 to 54 million tons in the year 2000 and 58 to 60 million tons in 2010. These projections assume a 2% per annum growth in LNG demand for power generation and a 4% per annum growth in LNG consumption by city gas companies.

One major Japanese trading company is sharing the same view regarding city gas while expecting a higher growth - above 3% per annum - in power generation LNG use. This, I believe, is a more likely demand scenario : 61 or 62 million tons in 2005 and 70 million tons in 2010.

The second biggest LNG importer in Asia-Pacific region is Korea. Korea Gas Corporation is using itself 2 demand scenarios which appear very reliable. These scenarios are running until 2006 and therefore need some extrapolation. The forecast is as follows : 11 to 13 million tons in the year 2000, 14 to 17 million tons in 2005, and maybe 18 to 21 million tons in 2010.

Assessing Taiwan future demand is more difficult due to the uncertainty regarding new power plant projects. LNG, coal, nuclear, what will be their respective shares in the year 2000 is still unclear. If we exclude any new LNG-fired power plant after 1999, Taiwan LNG imports could rise to 6 or 7 million tons and remain at this level. However, based on existing development plans for LNG-fired power plants, the forecast could reach much higher figures : 9 million tons in 2005, and 12 in 2010.

Among the new LNG customers in Asia-Pacific, China probably offers the biggest potential. Up to 2 million tons of LNG could be imported in the Southern provinces as early as in the year 2000, rising to 4 to 8 million tons in 2005 and 8 to 16 million tons in 2010. Uncertain forecast, indeed, but looking at the current economic growth and the huge size of its population, China is deemed to become a big LNG player.

Thailand's LNG requirement will obviously depend on the availability of domestic gas resources and pipeline alternatives. Imports are planned to start in 2001 and could reach 3 to 5 million tons in 2005, 6 to 10 million tons in 2010.

In India, a number of LNG projects is reported but LNG development needs to be compared with the economics of importing gas by pipeline from the Middle-East. The minimum case could see no LNG import until 2010, while the maximum case could be 4 million tons in 2005 and 10 in 2010.

In summary, I would assess Asia-Pacific LNG imports as follows:

- between 70 and 75 million tons in the year 2000,
- about 85 up to 105 million tons in 2005, and
- a wide range of approximately 100 to 140 million tons in 2010.

It means a lot of potential ... and also a lot of uncertainty!

However, demand figures cannot be discussed independently from supply forecast. Demand does not depend only on consuming countries' plans but also on the availability of reliable and economical resources on producers' side.

Supply and demand gap

Based only on existing capacity and taking into account the possible depletion of some gas fields, the supply from the 6 existing Asia-Pacific LNG producing countries should remain around 50 million tons over the period 1995 - 2010.

The most economical way to reduce the gap with demand is probably through the expansion of existing capacity. Such plans are underway or under review and could add another 14 million tons in the year 2000, increasing to about 21 million tons through the period 2005 - 2010.

It gives us, over the period 2000 - 2010, a total Asia-Pacific LNG supply between 65 and 70 million tons from the existing plants including their projected expansion.

This will not be sufficient to meet the rising demand. With expansion projects only and without grass-root projects, our forecast shows that the supply and demand gap would reach 4 to 9 million tons in the year 2000. This gap would then further increase to a range of 15 to 35 million tons in 2005 and 30 to 70 million tons in 2010.

These figures are big and challenging for the LNG industry. It is clear that several grass-root projects will have to be developed in the coming years to overcome the supply and demand gap. No less than 10 grass-root projects are in today's picture, some of which are mega-size projects, such as Natuna and Qatar.

I am not here to discuss the comparative chances of all expansion and grass-root projects in the world. I shall leave this task to independent analysts.

As for Indonesia, our aim is to balance the increase of our LNG exports with the satisfaction of growing domestic gas requirements. I would like to give you now a very brief overview of our current LNG development plans.

Indonesian projects

First, we plan to expand the capacity of our Bontang LNG plant on the Eastern coast of Kalimantan. This expansion, supported by the increase of our gas reserves in this area, will enable us to extend our first two long term contracts with Japan.

Then, our next challenge will be to extend all our other long term contracts and to supply new markets in and outside Indonesia. For this, we plan to build a new LNG plant on Natuna Island with a capacity of 15 million tons. This project is very ambitious, specially in terms of financing requirements and technological innovations. We are planning a start-up in 2005, at a right time to ease the growing supply and demand gap.

In any case, the success and timing of development for any grass-root project will depend on what slice of demand it can secure, and when. What is certain today is that all these new projects will require a lot of efforts and imagination from the part of their developers in order to be both economically viable and competitive.

II. THE VIABILITY OF NEW LNG CHAINS

Rising cost and increased value

My intention here is not to enter into the detail of a subject well known by all the participants: the rising cost of new LNG projects and the increased value of LNG in the market.

These discussions tend to be usually one-sided, sellers claiming that they are justified to seek a price increase and buyers stressing the necessity for LNG to remain competitive versus other sources of energy.

Obviously, in this debate, everybody is right to a certain extent. What really matters is to seek the optimum price which can satisfy both parties' concerns. But the negotiation of a higher price is necessarily limited. Imagination and a spirit of innovation are also required, in order to explore new areas.

JAPAN LNG DEMAND

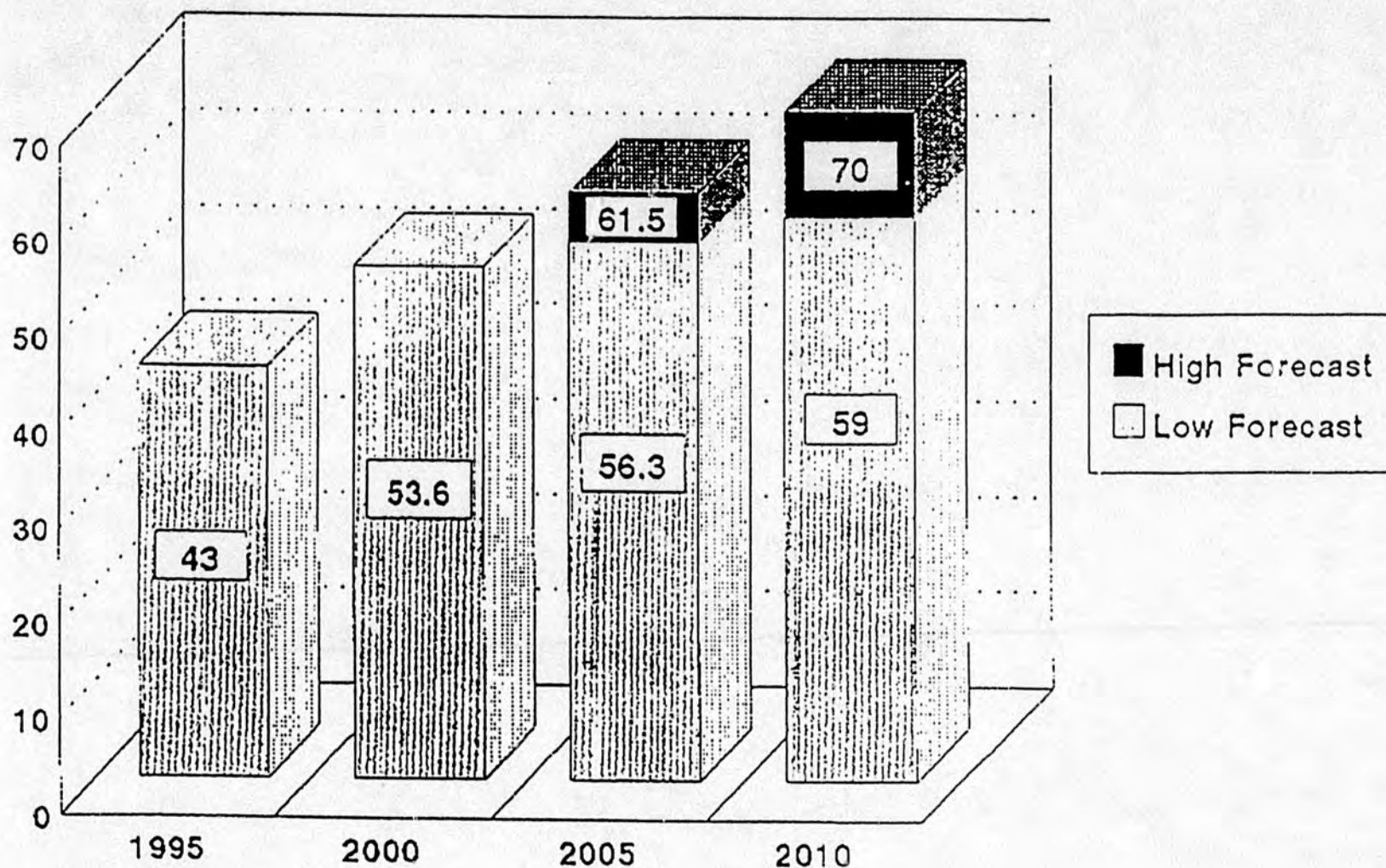
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Million Tons

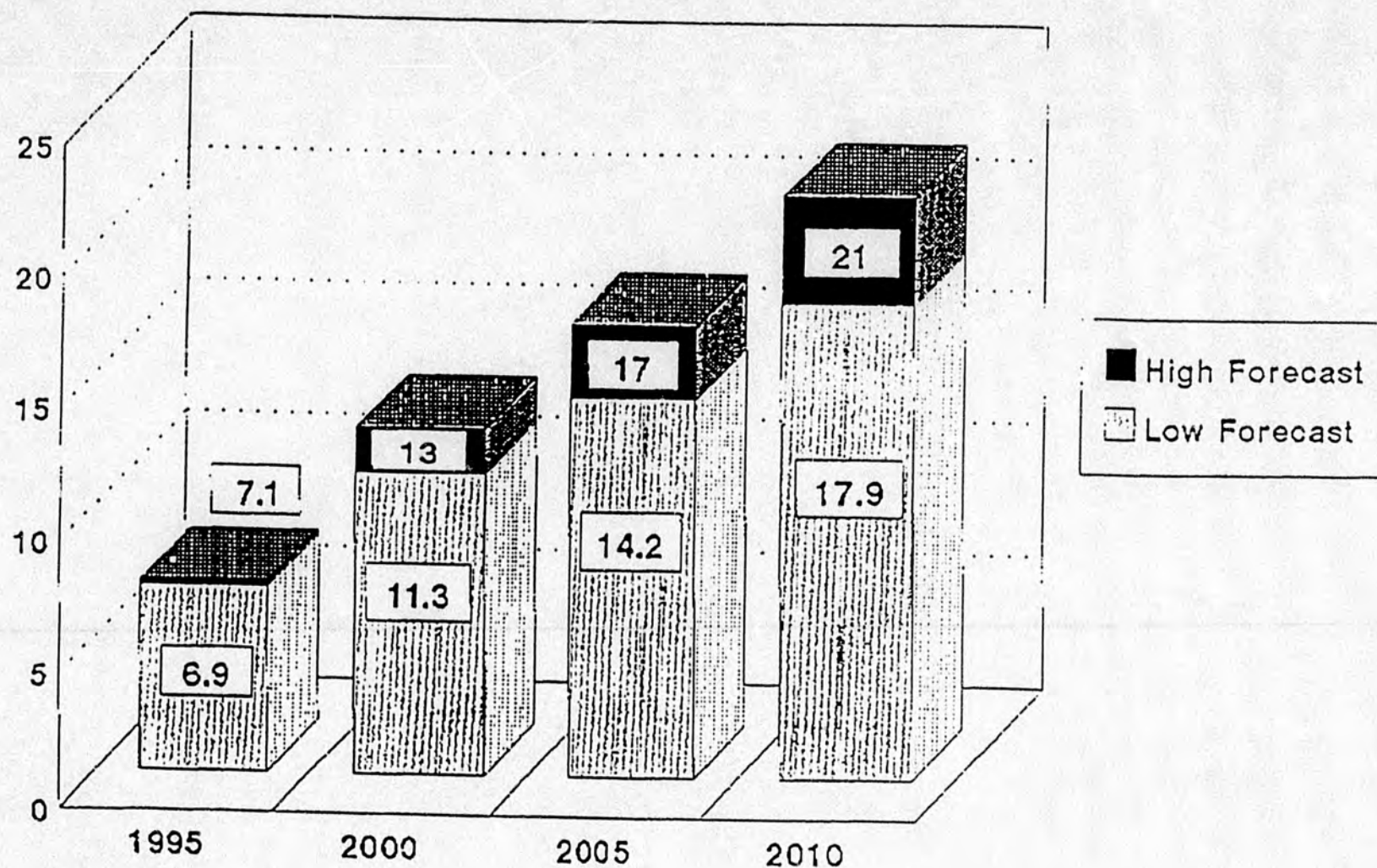


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March 1995

KOREA LNG DEMAND

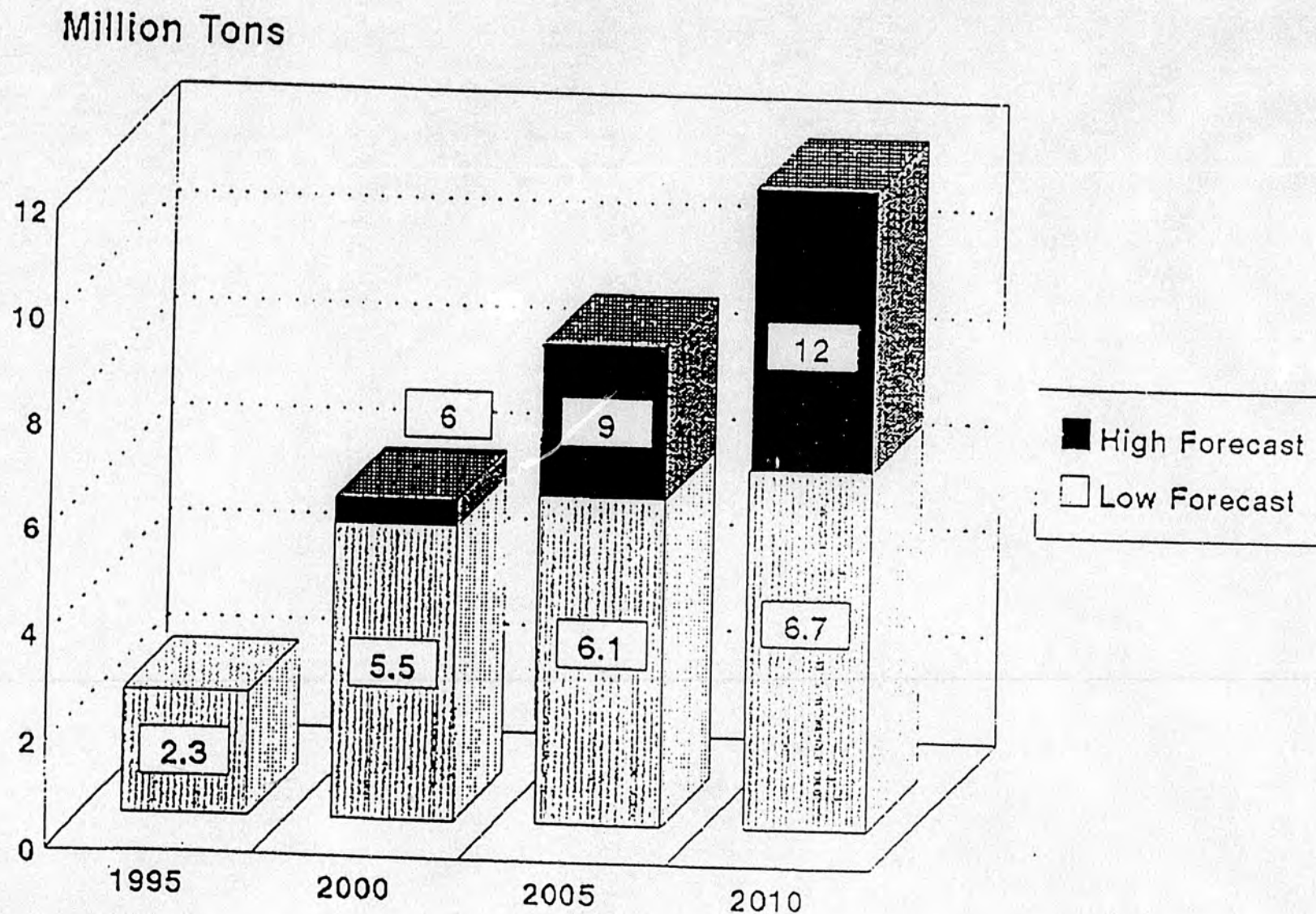
Million Tons



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TAIWAN LNG DEMAND

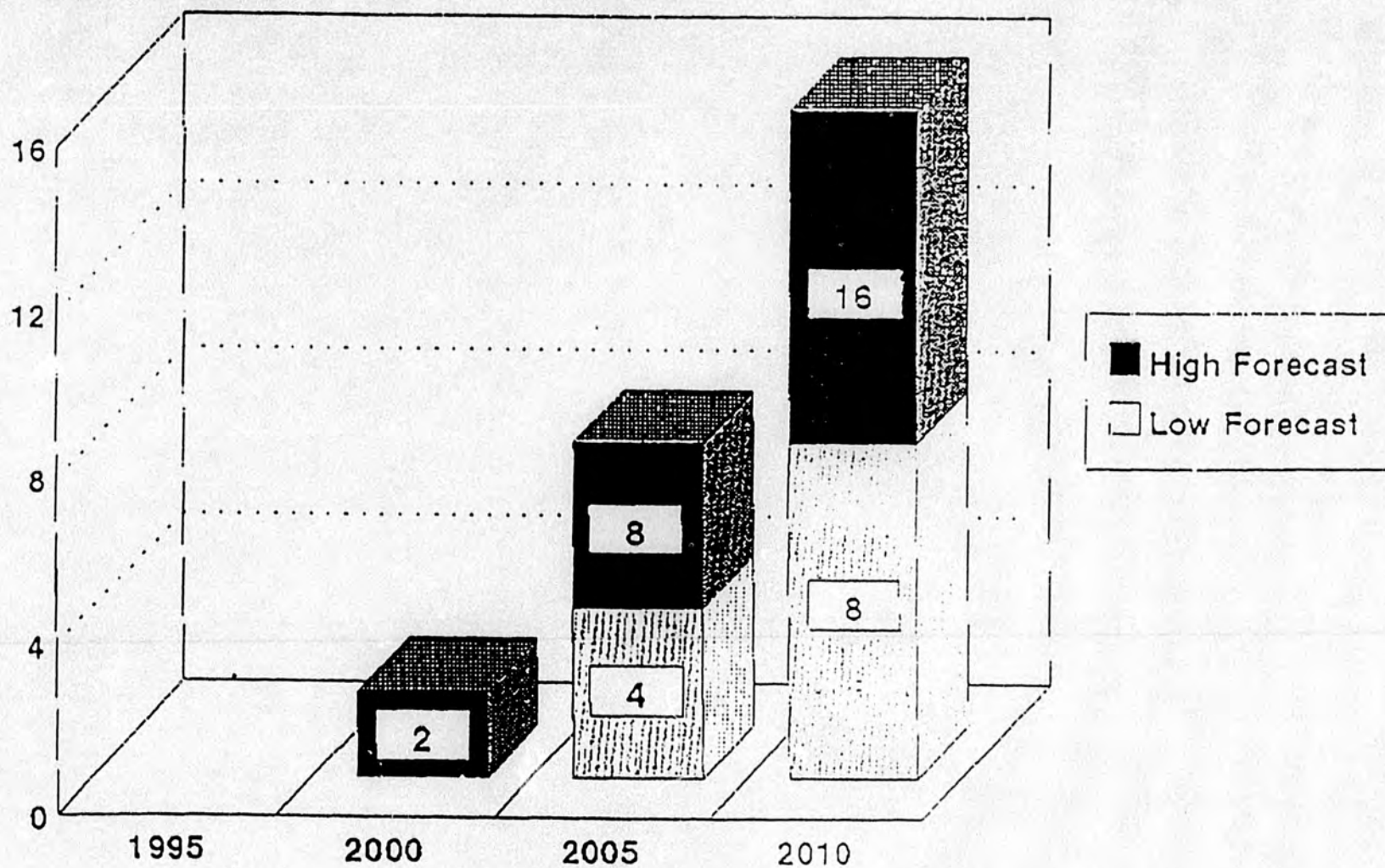


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CHINA LNG DEMAND

Million Tons



PERTAMINA

March 1995

TABLE 1
ANALYSIS OF ASIA-PACIFIC LNG MARKET BY 2010

	Low Demand				High Demand			
	1995	2000	2005	2010	1995	2000	2005	2010
Probable Demand								
Japan	43.00	53.60	56.30	59.00	43.00	53.60	61.50	70.00
Korea	6.90	11.30	14.20	17.90	7.10	13.00	17.00	21.00
Taiwan	2.30	5.50	6.10	6.70	2.30	6.00	9.00	12.00
China			4.00	8.00		2.00	8.00	16.00
Thailand			3.00	6.00			5.00	10.00
India							4.00	10.00
Total Demand	52.20	70.40	83.60	97.60	52.40	74.60	104.50	139.00
Firm Capacity								
Abu Dhabi	4.30	4.30	4.30	4.30	4.30	4.30	4.30	4.30
Alaska (Kenai)	1.20	1.20	1.20	1.20	1.20	1.20	1.20	1.20
Australia	7.00	7.00	7.00	7.00	7.00	7.00	7.00	7.00
Brunei	5.50	5.50	5.50	5.50	5.50	5.50	5.50	5.50
Indonesia	26.00	26.00	22.00	18.00	26.00	26.00	22.00	18.00
Qatargas		6.00	6.00	6.00		6.00	6.00	6.00
Malaysia	10.50	17.00	17.00	17.00	10.50	17.00	17.00	17.00
subtotal	54.50	67.00	63.00	59.00	54.50	67.00	63.00	59.00
Net Demand/(Excess Supply)	-2.30	3.40	20.60	38.60	-2.10	7.60	41.50	80.00
Possible Expansions & Grass-Roots Projects								
Expansions								
Australia (Perseus)			2.00	2.00			2.00	2.00
Indonesia - Badak		2.60	5.00	5.00		2.60	5.00	5.00
Qatargas		4.00	4.00	4.00		4.00	4.00	4.00
Grass-Roots Projects								
Alaska (TAGS)			6.00	14.00			6.00	14.00
Australia (Peter/Tern)			2.00	2.00			2.00	2.00
Malaysia III			6.00	6.00		6.00	6.00	6.00
Natuna			6.00	15.00			6.00	15.00
Oman			6.00	6.00		6.00	6.00	6.00
Qatar-Ras Laffan			6.00	10.00			6.00	10.00
Sakhalin I			6.00	6.00			6.00	6.00
Sakhalin II				6.00				6.00
Yemen				5.00				5.00
Possible Supplies	0.00	6.60	49.00	81.00	0.00	18.60	49.00	81.00
Excess Capacity	2.30	3.20	28.40	42.40	2.10	11.00	7.50	1.00

Norway's landing operations, but their utilization of pipeline capacity of under 50% is far lower. Originally designed to land gas from major gathering pipelines jutting into the North Sea, the three principal terminals are part of a plan that aims to stimulate offshore development, but could also be harnessed, albeit with substantial investment, as yet another beach head for spot gas sales from the North Sea. For now, though, potential producers claim that monopoly customer Gasunie's price terms are too low to warrant increased exploration and production, and no plans to connect additional UK sector fields are currently near fruition (WGI Nov.10,p4). Last year sales through the three principal terminals totaled 2.5-bcm, representing only 40% of capacity. The system brings Wintershall's Windermere gas from the southern UK North Sea to the Continent. The Uithuizen terminal serves the 36-inch

NOGAT gathering pipeline owned partly by Occidental. The Callantschoog terminal serves the NGT and WGT gathering lines and a 24-inch pipeline from the K-15 field. The Maasvlakte terminal serves Amoco's offshore P-15 oil and gas assets.

While pale in comparison to the potential influence of Norway, the Netherlands, and the UK, Denmark's facilities near Nypro in Jutland are also being expanded to accept additional Danish gas. Chances for imports from other countries are considered remote but still possible. Expansion of terminal facilities at Nypro to nearly 10-bcm/yr should be completed by Jan. 1997 to take new flows from the Harald and Trym fields. Purely a standby treatment facility and metering point, the Nypro plant is tailored for production on the Danish continental shelf, which stood at 4.6-bcm/yr, or 450-million cf/d, in 1994.

Korean LNG Demand Surges Beyond Expectations

In what is a most welcome development for aspiring liquefied natural gas producers worldwide, rapidly expanding urban gas use and burgeoning electric power needs are powering South Korea's LNG demand well beyond previous expectations. State Korea Gas Corp., now preparing its biennial forecast, is expected to show a substantial rise

in LNG imports to more than 15.5-million tons a

year by 2000 — almost

double 1994 consumption

levels. Only two years ago

KGC predicted, as a mid-

point case, that Korean gas

use would rise to 12.1-

mmt/yr by 2000, based solely

on LNG imports. The

company is now revising its

figures in a report that is to

be formally released by end-

year, and the preliminary

conclusion from this crystal-

ball gazing exercise shows a

substantial increase in the

country's potential gas

demand. State utility Korean

Power, a key incremental

buyer, has yet to add its

final input, but the message

is clear — the potential gas

needs of South Korea are far

outstripping most previous

predictions by LNG analysts.

From

1990's level of 2.33-mmt, imports

more than doubled by 1994

to 5.86-mmt. By 2000, they should

more than double from

year's estimated 6.86-mmt to 15.5.

The new forecast is some 28% above

levels predicted in

1993 and exceeds that year's "high

growth" scenario by 1-

mmt/yr. It is remarkable that for the first time ever, this year's city gas use, which is mainly residential but also commercial, almost equals South Korea's gas consumption for power generation. According to Korean analysts, city gas should account for 53.5% of all gas use by 2000. What is notable about the consumption boom is that resi-

dential city gas use, under

a massive government

program to substitute oil

with piped gas for space

heating, still has further

room to expand. While

power generation should

soon be replaced as the top

use for LNG, future incre-

mental demand growth

should also begin to develop

in non-traditional consump-

tion sectors. Korea Gas

Union General Secretary

Ho-Kyong Kim, in a recent

paper presented in Jakarta,

predicted that non-power

gas use would continue to

rise, supported by the need

for further air conditioning

during Korea's torrid sum-

mers and the expansion of

gas use for transport in

order to cap Korea's grow-

ing urban air pollution problems.

In 1994, city gas accounted

for 41.8% of Korea's 5.86-mmt/yr of gas demand.

Residential demand made up

two-thirds of city gas use

in 1994, and of that total some

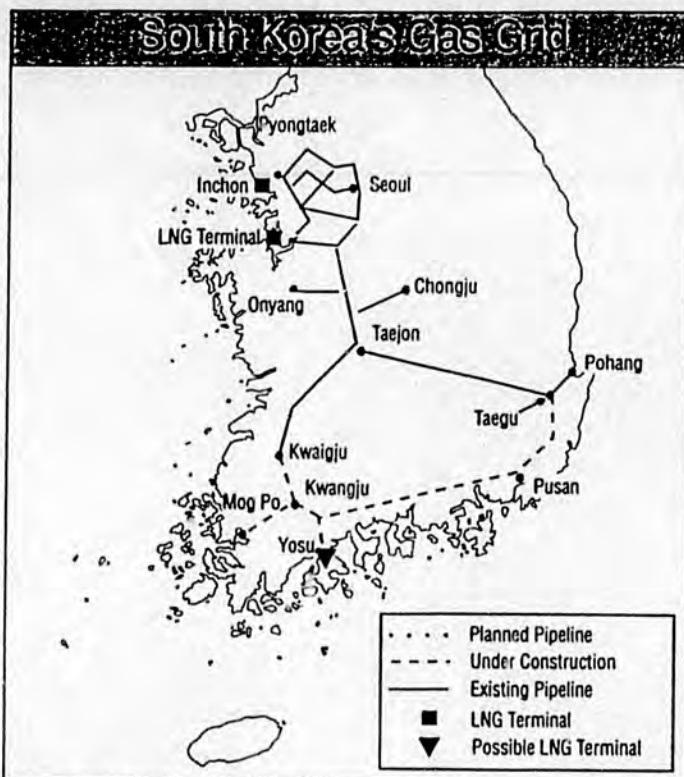
80% was used for home

heating. But Korean authorities

do not believe this repre-

sents a mature market now

that nearly one-half of urban



outrunning most previous predictions by LNG analysts. From 1990's level of 2.33-mmt, imports more than doubled by 1994 to 5.86-mmt. By 2000, they should more than double from year's estimated 6.86-mmt to 15.5.

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ing urban air pollution problems. In 1994, city gas accounted for 41.8% of Korea's 5.86-mmt/yr of gas demand.

Residential demand made up two-thirds of city gas use in 1994, and of that total some 80% was used for home heating. But Korean authorities do not believe this represents a mature market now that nearly one-half of urban

households have access to gas by pipeline. The KGU predicts "a great increase in city gas demand in chilling" for office air conditioning (all new office buildings must be led with gas) and ice storage. Further, Kim points out, as pollution controls become ever more severe, natural gas powered vehicles will have to be encouraged to improve air quality levels. Presently, Korea already uses only unleaded gasoline and is reducing diesel sulfur levels to 0.1% in 1996, and 0.05% by 1998. The government is expected to promote natural gas vehicles actively in metropolitan Seoul by 2000 in order to maintain cleaner air standards.

The boom in gas use reflects a concerted government emphasis on building gas transport, storage, and utilization infrastructure. Construction of Korea's second LNG receiving terminal is under way, and completion of a further expansion of the national pipeline network is now slated for 1998. A three-tank expansion is ongoing at KGC's Pyongtaek LNG terminal near Seoul, and another berth is under construction. This should comfortably allow for the annual import of up to 8-mmt of LNG. A second LNG terminal, at Incheon, also near the capital, should be completed by end-1996 and allow for an additional 4-mmt of imports. A third terminal, long under consideration, is now being mulled over for Yosu, at the southern tip of the peninsula.

The original nearly 1,600 kilometer national gas transmission system should be completed by 1996, and small but substantial additions to the original plan are scheduled to be finished by 1998. They include a high pressure foot diameter pipeline to the northern part of metropolitan Seoul, where incipient gas demand already has outstripped supplies. In addition, a similar high-pressure line to Taegu in the southeast is planned as well as one to Kwangju at the southwestern end of the peninsula (see map). Some 25% of South Korean households in the countryside are presently sold an LPG/air mixture in a tank, which is likely to be grad-

ually phased out as the natural gas pipeline system is completed. South Korea has built a national gas pipeline system in less than a decade, under original cost estimates, across rugged terrain, and has coped with extreme seasonal climate variations — a feat that compares quite favorably to any other country's efforts in Asia.

Swinging The Balance Of Buying Power

With such ambitious growth plans spreading throughout Korea, the balance of LNG buying power is shifting away from Tokyo and toward Seoul. This presents KGC with both opportunities and problems. The state gas company finally must move to secure further long-term base supply and cannot content itself with trolling for cheap spot LNG cargoes. The sustained buildup of Korean LNG use has been nothing short of spectacular. Growth rates in the next decade are less certain, but if LNG imports were to increase by only 50% through 2005, Seoul would already be importing more than 23-mmt. In 1993, KGC's 3.9-mmt/yr of imports represented slightly under 10% of Japanese consumption. If Mitsubishi's forecast of Japanese demand in 2000 is accurate and Tokyo imports 50-mmt — which some forecasters think is optimistic — Korean purchases would still be nearly one-third of those made to Tokyo.

Korea is gaining so much critical mass that it should soon be able to guarantee the purchasing baseload needed to launch substantial capacity increases in LNG facilities. Yet KGC must change its thinking if it is to achieve this goal. Even if all present memorandums of understanding result in firm supply contracts and if present forecasts of Korea's gas needs for 2000 are correct, KGC needs to commit to at least one new 2.5-mmt/yr train immediately, and a second one of similar capacity by 2000. That's a tall order for any company.

Monopolistic Gazprom Pushes For Competitive Markets In Europe, On Its Own Terms

When forming a list of Europe's biggest proponents of market liberalization, Russia's Gazprom, which is the world's largest gas monopoly and is determined to stay that way, hardly seems a likely catalyst for change. But with an aggressive campaign to expand its downstream, Gazprom has surprisingly emerged as one of the most important drivers of the seemingly relentless march toward gas-on-gas competition in Europe. Although the firm is making some sacrifices in terms of prices, its aggressive push into Western Europe through new pipeline infrastructure, joint-venture marketing, and co-sponsorship of the UK-Belgium Interconnector shows that in a perfect Russian world, this high-risk ploy of choosing me over price will help Gazprom dominate the European gas market. Competitors Algeria and Norway have taken a much different approach, trying to expand the

status quo by signing up more and more long-term take-or-pay contracts. However, the much-heralded Interconnector linking the deregulated, low-priced UK gas market with continental Europe is expected to bring further competitive pressure to bear on continental gas markets when it comes on stream in 1998 (p7). Gazprom's eagerness to develop direct access to as many delivery points as possible in Europe implies the firm's recognition that even under a more liberal market, being there from the beginning is a distinct advantage.

As US and UK experience has shown, the most profitable role to play in an increasingly competitive environment is that of marketer. With that in mind, Gazprom has decided to bite the bullet by teaming up with new players to compete head-on with established European buyers — many of which have long-term sales contracts with the Russian giant. In the past five years, Gazprom has set up

Session 1

**Diversification of Gas Supply
- A View from Korea**

**Hyun Bum Sunwoo
Daellim Group
Korea**

Diversification of Gas Supply - A view from Korea

- 1. Natural Gas Demand Outlook In Korea**
- 2. New Environment for LNG Industry In Korea**
- 3. LNG Import and Contract Status**
- 4. Potential Export LNG Projects**
- 5. Trans-Asian Natural Gas Pipeline Study**
- 6. Conclusion**

1. Natural Gas Demand Outlook In Korea

Since natural gas was introduced to the Korean energy market, the natural gas demand has been increased rapidly over the years. The main consuming sectors are power generation and residential use owing to the government's strong commitment to environmental protection. In the industrial sector, consumption of natural gas is expected to increase steadily with the extension of the supply pipelines and intensified regulations for environmental protection.

Korea is continuing the construction and expansion of new LNG receiving terminal and the nationwide transmission pipeline network for natural gas transportation covering most of the nation's territory as its supply zones. By 2000 when the network is completed, the nation will see that almost all the city gas distribution is provided with natural gas. This conversion from manufactured city gas to natural gas will be the main cause of the acceleration of demand growth in natural gas during the remaining years of the century.

After completion of the nationwide pipeline network, increased demand of natural gas will be foreseen in the sectors of direct heating/cooling systems for commercial buildings and co-generation for plants and business buildings. In parallel with the construction of pipeline network, Korea will continue to construct large scale combined cycle gas turbine power plant. Thus the increased demand of natural gas will be expected in the power generation sector as well.

As shown in the table 1, The role of natural gas in primary energy supply of Korea will be steadily increased and take a share of about 10.5% of the total energy market by 2010 from the current share of 3.9% over the period. The share of oil, which currently occupies a predominant position in the structure of the nation's primary energy consumption, will be lowered to 53%.

Due primarily to the government's policy of lowering Korea's dependence on oil and its move towards increased use of gas as a fuel for power generation for environmental reasons, the gas consumption is expected to increase over the foreseeable future.

Table 1. Outlook for Primary Energy Mix in Korea

Fuel	Year 1992 (Actual)	1997	2000	2010	Growth rate of yearly average '90-'00 '01-'10	
Oil, MM Bbl	514.2 (61.8%)	704.5 (50.8%)	768.9 (58.4%)	905.1 (53.0%)	5.2%	1.7%
LNG, MM ton	3.5 (3.9%)	9.9 (7.9%)	13.9 (8.8%)	21.6 (10.5%)	17.2%	4.4%
Coal, MM ton	26.2 (14.9%)	42.2 (17.2%)	48.4 (17.3%)	59.9 (16.5%)	8.8%	2.2%
Anthracite, MM ton	13.6 (5.4%)	5.5 (1.5%)	3.6 (0.9%)	1.2 (0.2%)	-15.7%	-10.4%
Nuclear, MM kWH	56.5 (12.2%)	72.4 (11.2%)	97.4 (13.2%)	171.4 (17.9%)	7.0%	5.8%

Source : KEEL, Long-term Energy Outlook, April 1994.

Note : () is the component ratio.

As seen previously, the share of natural gas out of Total Primary Energy Supply (TPES) is forecasted to grow from 3.5 million tons (or 3.9 percent of TPES) in 1992 to 21.6 million tons (or 10.5 percent of TPES) in 2010. The growth rate of yearly average is expected 17.2 % over the period 1992 - 2000 and 4.4 % over the period 2000 - 2010.

The high growth of natural gas share will mainly depend on both of the extension of nationwide transmission pipeline network and the environmental concerns and policies that will make it difficult to use oil and coal for electricity generation.

The baseline projection in Table 2 and Figure 1 shows that natural gas demand is expected to grow up to 11.4 million tons in 1998 and 13.9 million tons in 2000, then to 17.9 million tons in 2006.

Table 2. Natural Gas Demand Outlook

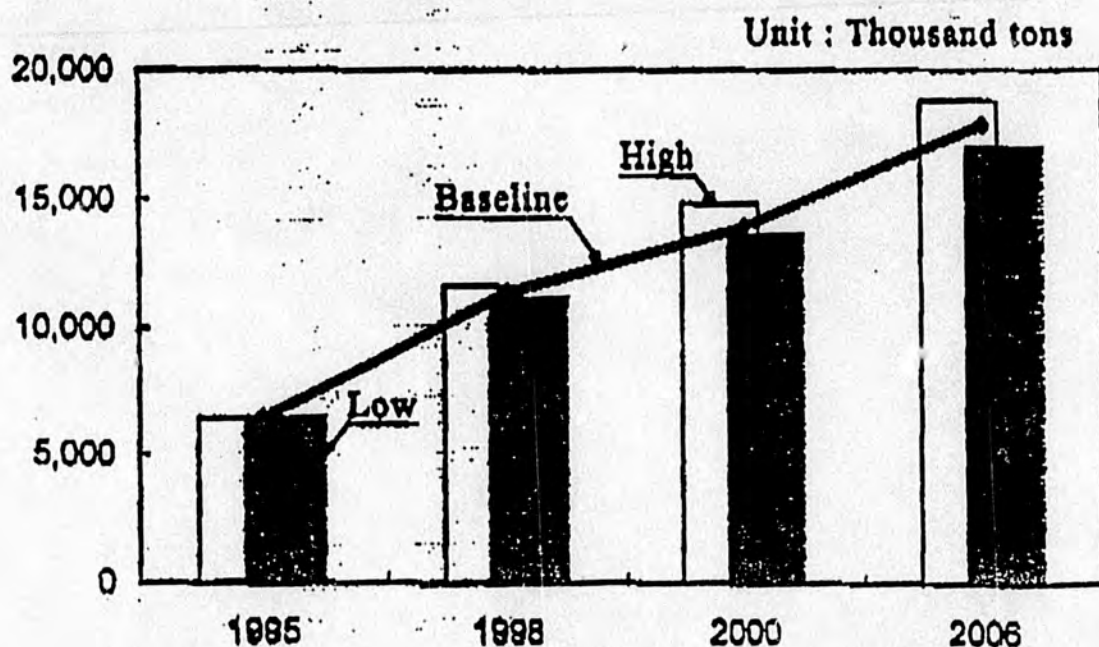
Unit: Thousand tons

	1995	1998	2000	2006
Baseline projection	6,453	11,410	13,950	17,900
Low demand scenario	6,453	11,170	13,600	17,000
High demand scenario	6,453	11,640	14,840	18,800

Source : Korea Gas Corporation.

2010
21.6 = 3.7
month
1.25%

Figure 1. Natural Gas Demand Outlook



The baseline projection represents the compromised results of current trends in city gas consumption and the technical allowances for the construction periods of planned gas-fired power plants. The high and low projections then represent the progressive and conservative estimates respectively, for the period.

2. New Environment for LNG Industry in Korea

In 1993, the Korean government established a new economic development plan that will allow participation of the private sector in Social Overhead Capital (SOC) projects such as natural gas supply and electric power generation. The Government has made related decrees and regulations for the implementation of SOC projects by private sector.

The Government also amended the regulations of foreign capital inducement law to allow the foreign investors will participate in the SOC projects, including LNG import and private power generation. (Only joint investment is allowed in case of power generation)

On the occasion of private sector's participation in SOC projects, private enterprises will enter into the LNG industry, such as the construction and operation of LNG receiving terminal and regasification facilities and electric power industry as well, to become new independent power producers.

Though Korea Gas Corporation is the only LNG importer currently operating in Korea, private enterprises, such as Daelim, will become the potential importers under new business environment for LNG industry in Korea, who are planned to construct and operate the integrated LNG receiving terminals and combined cycle gas turbine power generation plants. Korea Electric Power Corporation (KEPCO) is another potential importer, who has been purchased the required natural gas from Korea Gas Corporation. KEPCO consumed some 2.5 million tons of natural gas in 1994 for gas-fired power generation and they are going to increase the use of natural gas for combined cycle gas turbine power plant, and in some existing oil-fired power plant that were and will be changed the fuel oil by natural gas.

3. LNG Import and Contract Status

Table 3 shows Korea's LNG import for each year since the first import in 1986. Korea imported 5.93 million tons of LNG from three countries in 1994. Some 5.37 million tons were imported from Indonesia under two long-term contracts. 291 thousand tons were imported from Malaysia under a short-term contract while 271 thousand tons of LNG were purchased on a spot order basis from Brunei.

Table 3. LNG Imports by Sources

Unit : Thousand tons

From	'86	'87	'88	'89	'90	'91	'92	'93	'94
Indonesia	117	1,682	2,063	2,014	2,291	2,642	3,191	4,108	5,366
Malaysia						58	117	290	291
Australia								56	
Brunei									271
Total	117	1,682	2,082	2,014	2,291	2,700	3,308	4,454	5,928

In 1995, Korea plans to import 6.4 million tons in a total of 118 shipments. This will consist of 4.93 million tons from Indonesia, 840 thousand tons from Malaysia, 728 thousand tons from Brunei under each contract summarized in Table 4 LNG Contract Status and 112 thousand tons will be imported from Australia and other countries.

Table 4. LNG Contract Status

From	Quantity	Period	Remarks
Indonesia	2.3 million ton/year	'86 - 2007	CIF
	2 million ton/year	'94 - 2014	FOB
Malaysia	2 million ton/year	'95 - 2015	FOB
Brunei	1.68 million ton/year	'94 - '96	CIF

The summary of long-term and short-term contracts for LNG imported to Korea is presented in the above Table 4.

The first long-term (20 years) contract for the procurement of LNG to be imported to Korea was concluded in August 1983 with Pertamina of Indonesia. It was for the importation of 2.3 million tons of LNG annually over the period 1986 - 2007 and the LNG is supplied from sixth train at Arun, Indonesia. A further contract for an additional 2 million tons per year from Indonesia over the period 1994-2014 was signed in May 1991.

In addition, another contract was executed to import 2 million tons of LNG annually from Malaysia over the period 1995 - 2015. The price terms of the first contract is based on CIF, while the latter two contracts are based on FOB. Korea also made with Brunei a short-term contract for 1.68 million tons of LNG during 3 years (1994-1996).

As shown in Table 5 below, the contracted volumes are almost keep up with the import requirements of LNG until 1998. However, Korea's projected LNG requirements of 13.9 million tons in 2000 are well excess of contracted volumes of 8.3 million tons from Indonesia, Malaysia and Brunei. In the long term, additional contracted volumes from grassroots LNG projects are necessary to keep up with the increased LNG import requirements of Korea.

Table 5. Contracted volumes and Import requirements

Unit : Thousand tons

Year	'96	'98	'99	2000
Import requirements	9,198	11,057	12,627	13,512
Contracted volumes				
- Indonesia	5,812	6,364*	6,812	5,300
- Malaysia	2,428	3,299*	2,786	2,000
- Brunei	700	700	1,000	1,000
Balance to be contracted	258	694	2,029	5,212

Note : * marked volumes included about 1.5 million tons of LNG import under short-term contract from Indonesia and Malaysia.

Source : Ministry of Trade and Industry, 1995

4. Potential Export LNG Projects

There are a number of potential LNG projects under consideration. However, The question of when the new projects will be materialized and realize the production will depend on the interplay of many factors, especially delivery cost and reserves.

Table 6 shows the potential export LNG projects that will be able to export to Korea. I briefly review the potential LNG projects from the standpoint of diversification of natural gas supply to Korea.

Table 6. Potential Export LNG Projects

Project	Type of project	LNG Plant Capacity MM ton/Y	Year of First Production	Distance km
ASIA-PACIFIC				
Australia				
Gorgon	Grassroots	4 - 6	2005	7,200
North Shelf	Expansion	2.5 - 5	2000	7,200
Bonaparte	Grassroots	5	2015	7,200
Indonesia				
Badak G	Grassroots	2.5	1997	4,400
Natuna	Grassroots	7 - 14	2002	4,400
Malaysia				
MLNG III	Expansion	5	2000	4,200
Brunei				
Brunei	Expansion	2.5	2003	4,200
Papua New Guinea				
Gulf of Papua	Grassroots	5	2010	
Russia				
Sakhalin II	Grassroots	6	2005	2,200
MIDDLE EAST				
Qatar				
Qatargas	Grassroots	4 - 6	1997	11,500
Ras Laffan	Grassroots	6 - 10	1999	11,500
Oman				
Oman LNG	Grassroots	6	2003	11,300
NORTH AMERICA				
Alaska				
TAGS	Grassroots	7 - 14	2005	7,300

Recently, Korea Gas Corporation committed to purchase 2.4 million tons of LNG annually based on FOB basis over 25 years starting 1999. It is reported the price terms are not concluded yet. There is another option for another 2.5 million tons a year proposed by Qatar.

✓ Korea has recently signed a letter of intent for the purchase of 3 million tons of LNG annually from Oman. Production is expected to come from non-associated gas discoveries in central Oman and 7 Tcf of proven gas reserves have been dedicated to this project by Oman government. A two train liquefaction plant to produce 6 million tons per year is expected to be built near Muscat.

✓ Korea has signed a memorandum of understanding with Yukon Pacific Corporation to take 2 million tons annually with a second 2 million tons option from the Alaskan TAGS(Trans-Alaska Gas System) pipeline and LNG export project. North Slope has 37 Tcf of proven natural gas reserves and TAGS will export 14 million tons of LNG annually from liquefaction plant located at Anderson Bay, near Valdez. Yukon Pacific announced the estimated project cost for the entire facility at \$13.4 billion(US/1991). The TAGS project has received major necessary statutory and regulatory approvals from US federal government. This project, however, could be realized when joint purchasing of the produced LNG is agreed and committed by LNG buyers of Asian countries such as Korea, Japan and others.

Indonesia (Natuna) and Malaysia have potential gas reserves to support grassroots LNG plants. These reserves, however, may be used to feed existing LNG export facilities. Meanwhile, the third Malaysian LNG project is expected to start up in the late 1990s. Deliveries to Korea are projected to begin soon after 2000.

Australia's Gorgon project is expected on stream by 2005, serving Korea. A volume of 2.5 million tons annually to Korea may be anticipated by 2010. There is another small gas reserves sufficient to support a 2 million tons per year LNG project which is located in offshore areas of Bonaparte Gulf. This project will be realized beyond 2015.

Interest in Papua New Guinea offshore resources has revived recently. Considerable work is needed to develop the fiscal and organizational regime needed to support an LNG project within the country. This project is assumed to come on-line by 2010.

Recent indications of substantial gas reserves offshore of Sakhalin Island could be at least partially used to supply a new grassroots LNG project, which could be exported to Korea and Japan. The LNG export from Sakhalin II project are assumed to begin 2005.

Korea has established a Korea-Russia consortium in order to carry out a preliminary feasibility study on developing gas fields in Yakutsk, East Siberia, with the aim to supply natural gas to Korea by trans-continental pipeline. As an alternative way of supply, the study may include a scheme that the produced gas could be delivered to liquefaction plant which will be assumed the location near Vladivostok harbour by 4,000 km pipeline. The proven natural gas reserves is 35 Tcf and the completion of this project is assumed beyond 2010.

Iran, with the second largest natural gas reserves in the world, will become another possible future LNG exporter in the Middle East, although Iran has made several exports deals by pipelines. Iran is carrying out a joint feasibility study with Gaz de France on the economical method of delivering natural gas to Europe, either pipeline or LNG. Iran has 730 Tcf of proved natural gas reserves.

5. Trans-Asian Natural Gas Pipeline Study

As previously explained, Korea is carrying out the preliminary feasibility study to develop Yakutsk gas field and import the natural gas by trans-continental pipeline or combination of pipeline and LNG ship transportation. Korea also reviews a scheme to transport the natural gas by means of pipeline passing through North-Korea as a part of so-called Trans-Asian Natural Gas Pipeline Network. This scheme is prepared as one of long-term security plans of natural gas supply to Korea for the coming century.

The "Trans-Asian Natural Gas Pipeline Network" has been studied by Japan for the purpose of increasing the use of undeveloped large natural gas reserves in the Asia-Pacific region including Siberian Russia and central Asia.

Besides the enormous project cost, there are many technical difficulties to be overcome including the politics of pipelines crossing several international borders. Thus it is important to make a consensus on the role of energy supply and demand between the countries in the region for the development of the Trans-Asian Natural Gas Pipeline Network. I think it is necessary to establish an international forum, in cooperation with all the countries in the region, in order to undertake the study of construction for the Trans-Asian Natural Gas Pipelines.

The development of the Trans-Asian Natural Gas Pipeline Network will promote the natural gas industry in the region, and will also play a important role in securing the natural gas supply for the countries currently importing LNG beyond 2010.

6. Conclusion

As long as current trends of energy market continue, Korea will make its effort to promote the use of natural gas as an alternative to oil and coal in the power generation, residential and commercial sectors, and as a clean energy to improve the environment. To this end, Korea keep on the construction works for expansion of LNG receiving terminals and nationwide pipelines, as well as building new facilities.

Energy security as it applies to natural gas is being taken increasingly seriously, because natural gas supply to Korea currently depends on imported LNG under long-term and short-term contracts from LNG projects in three ASEAN countries. Thus, Korea needs making efforts to diversify the sources of natural gas importation.

In view of long-term stable supply of natural gas, Korea will promote new export LNG projects dedicated to Korea. The Korean private enterprises, who newly enter into LNG business and become the potential importers, will also take the leading role in developing new LNG project. Furthermore, Korea is now making a great efforts into the study of preliminary feasibility on the development of gas field in Yakutsk and trans-continental gas pipelines lead to Korea.

In realizing these projects, Korea needs to collaborate with the countries in the Asia-Pacific and Middle East regions, especially Japan, in all phases of the project development in order to take maximum advantage of synergy and to solve any technical difficulties, political and financing matters.

While trying not to be over optimistic, the author believes that the Korea gas industry holds the capability to meet the challenge, and go forward by coping with the effective market.

TAGS Competition:

**Projects, Start-up
Dates, Annual Volumes**



TAGS Competition is Other Undeveloped Gas Fields in:

	<u>Start-up Date</u>	<u>Annual Volume</u>
▲ Qatar (Qatargas & Rasgas) - Mobil	2005	6-10 MMTA
▲ Indonesia (Natuna Island) - Exxon	2004	15 MMTA
▲ Sakhalin (Russia) - Exxon x2, Marathon/Shell	2004	15 MMTA
▲ Yemen - Exxon	??	15 MMTA
▲ Papua New Guinea - BP	??	15 MMTA
▲ Oman - Shell	2005	6 MMTA
▲ Australia - Shell, BP	2003	16 MMTA

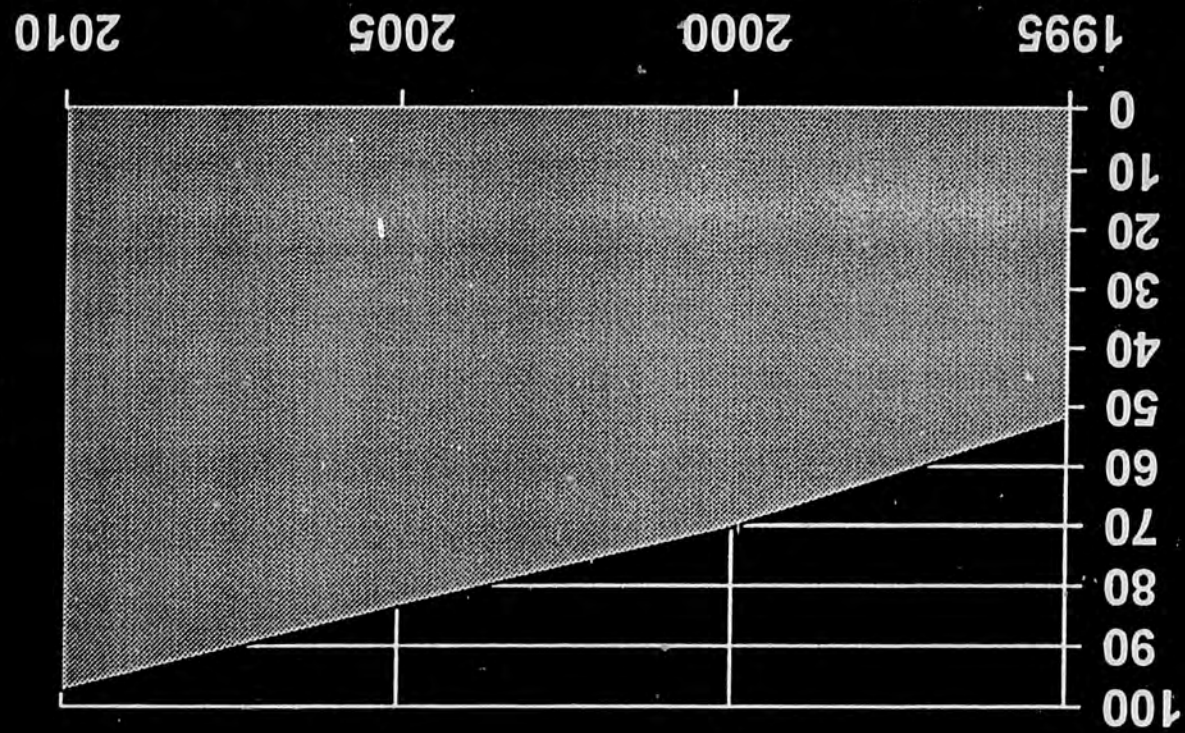
Each host country (together with the private gas producers shown above) is actively promoting its project as the next post-2000 LNG supplier to Asia.

The Post-2000 Demand Window:

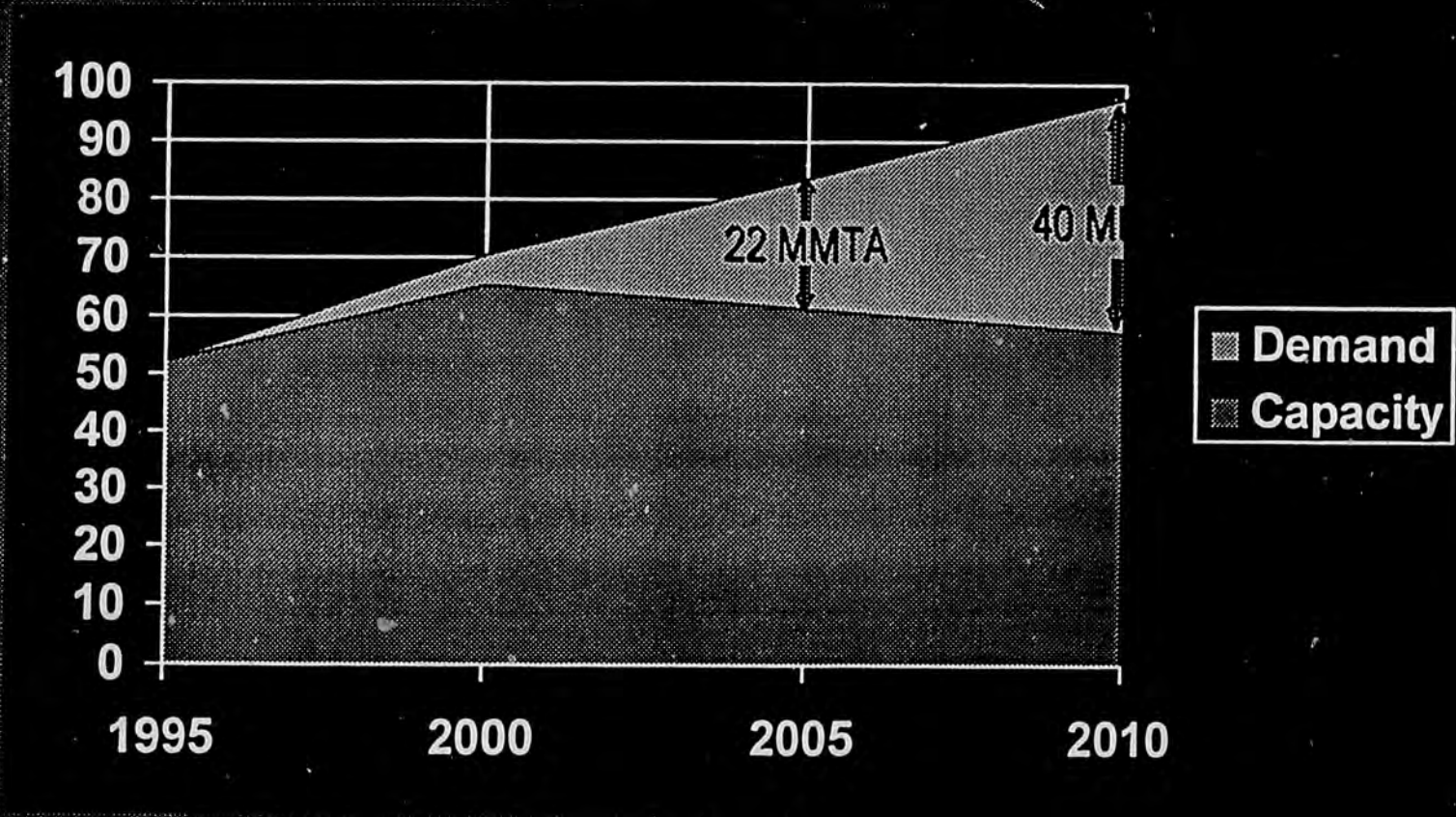
The Effects of
Competition on an
Alaskan Project

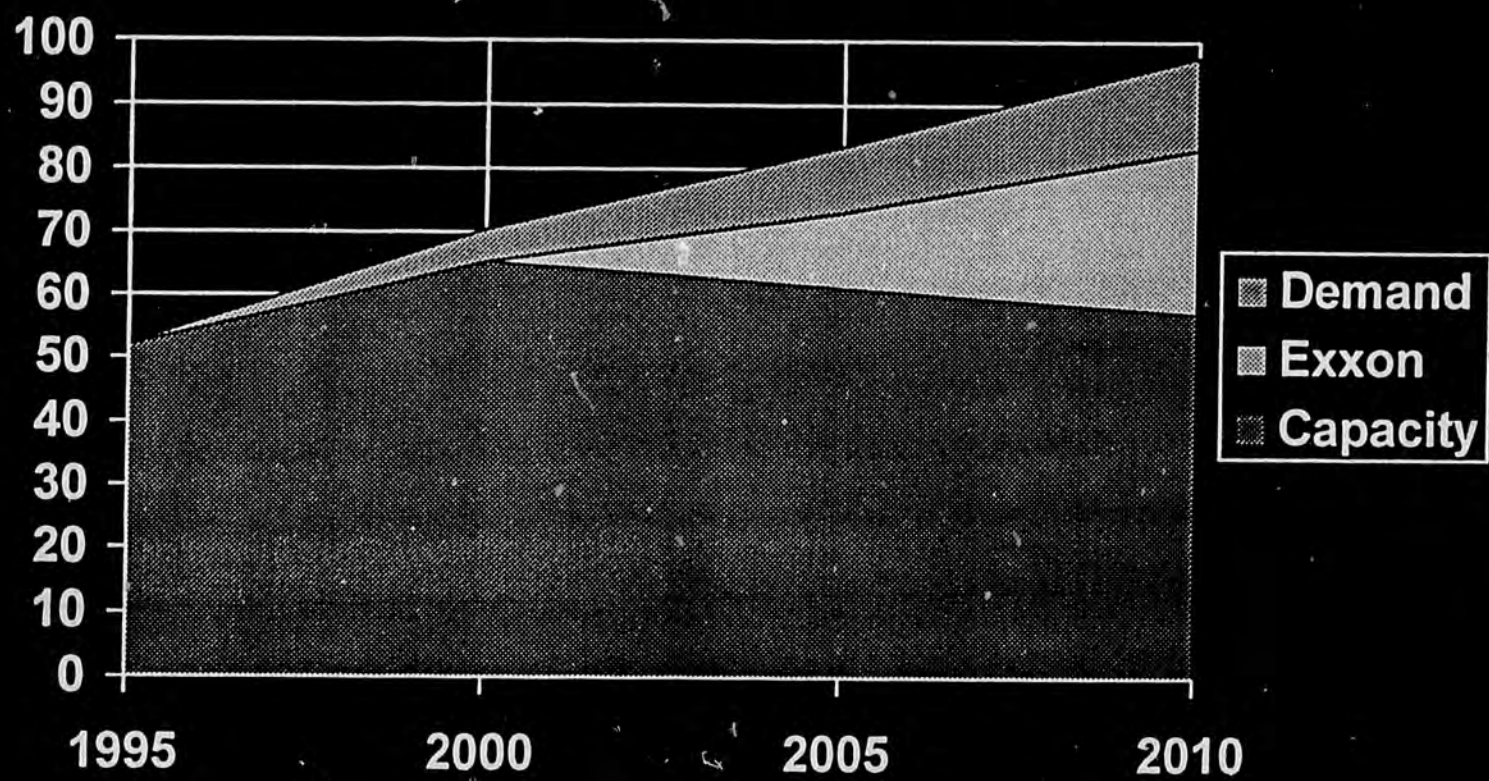


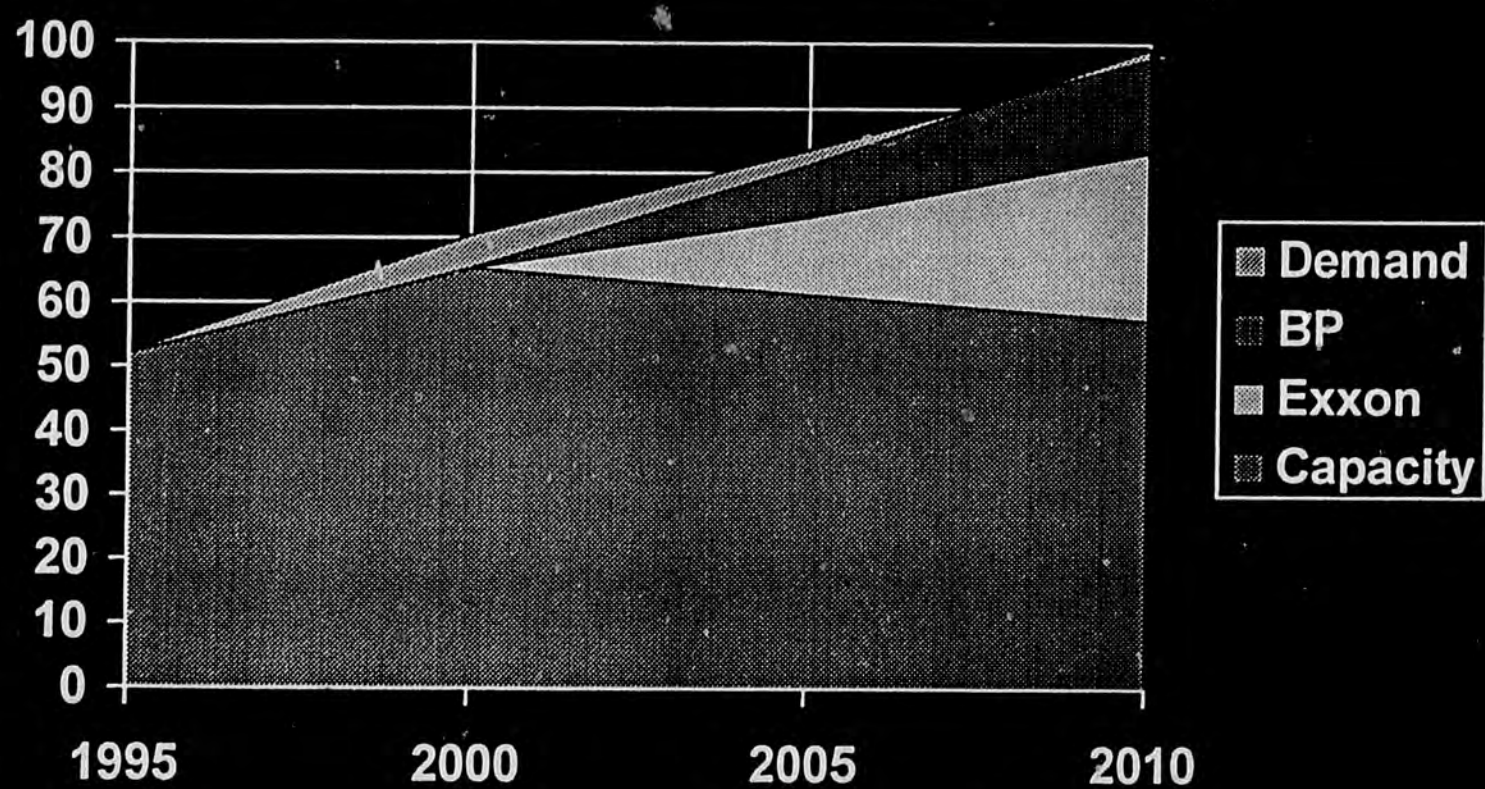
■ Demand



Asia Market



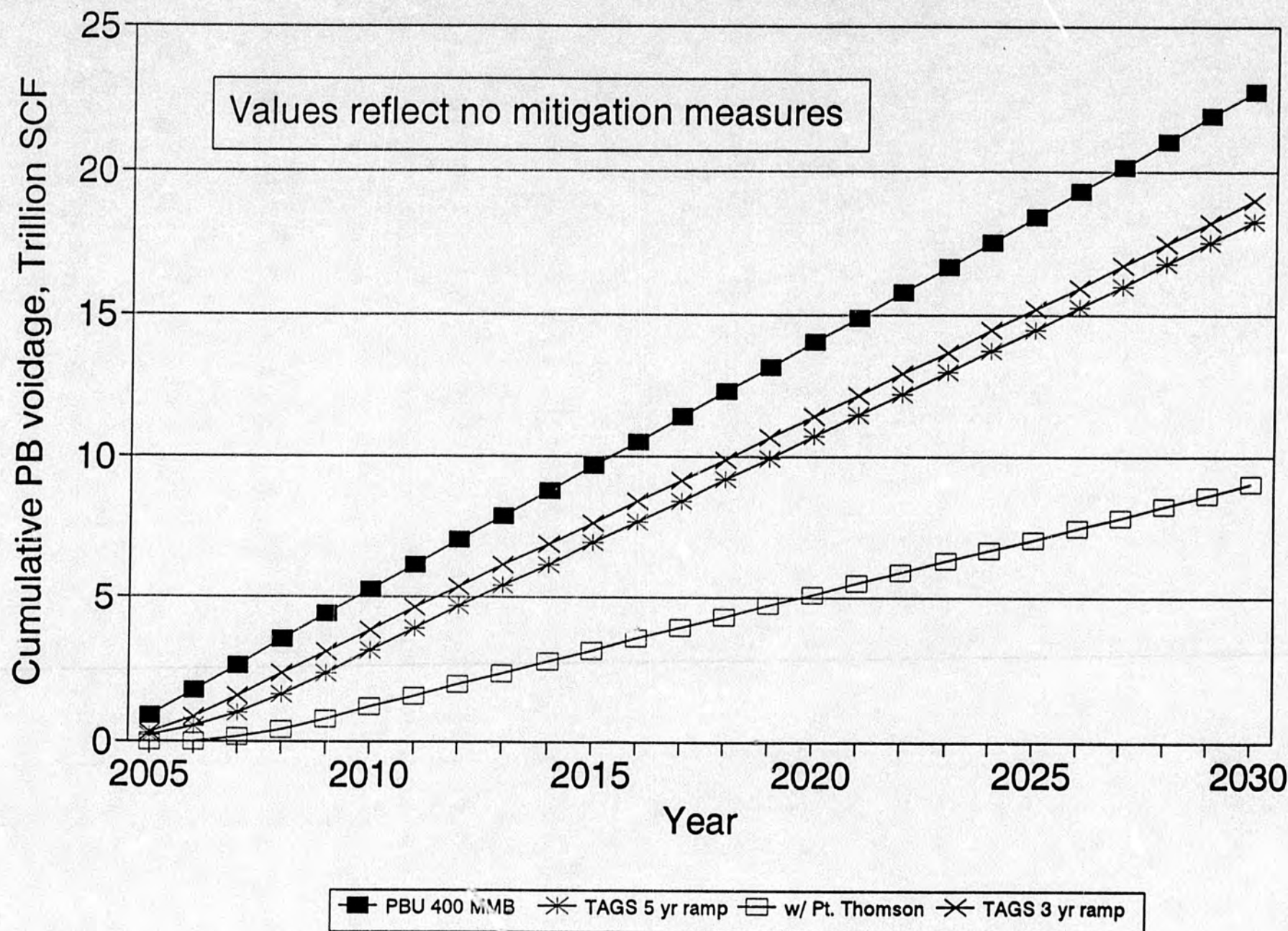


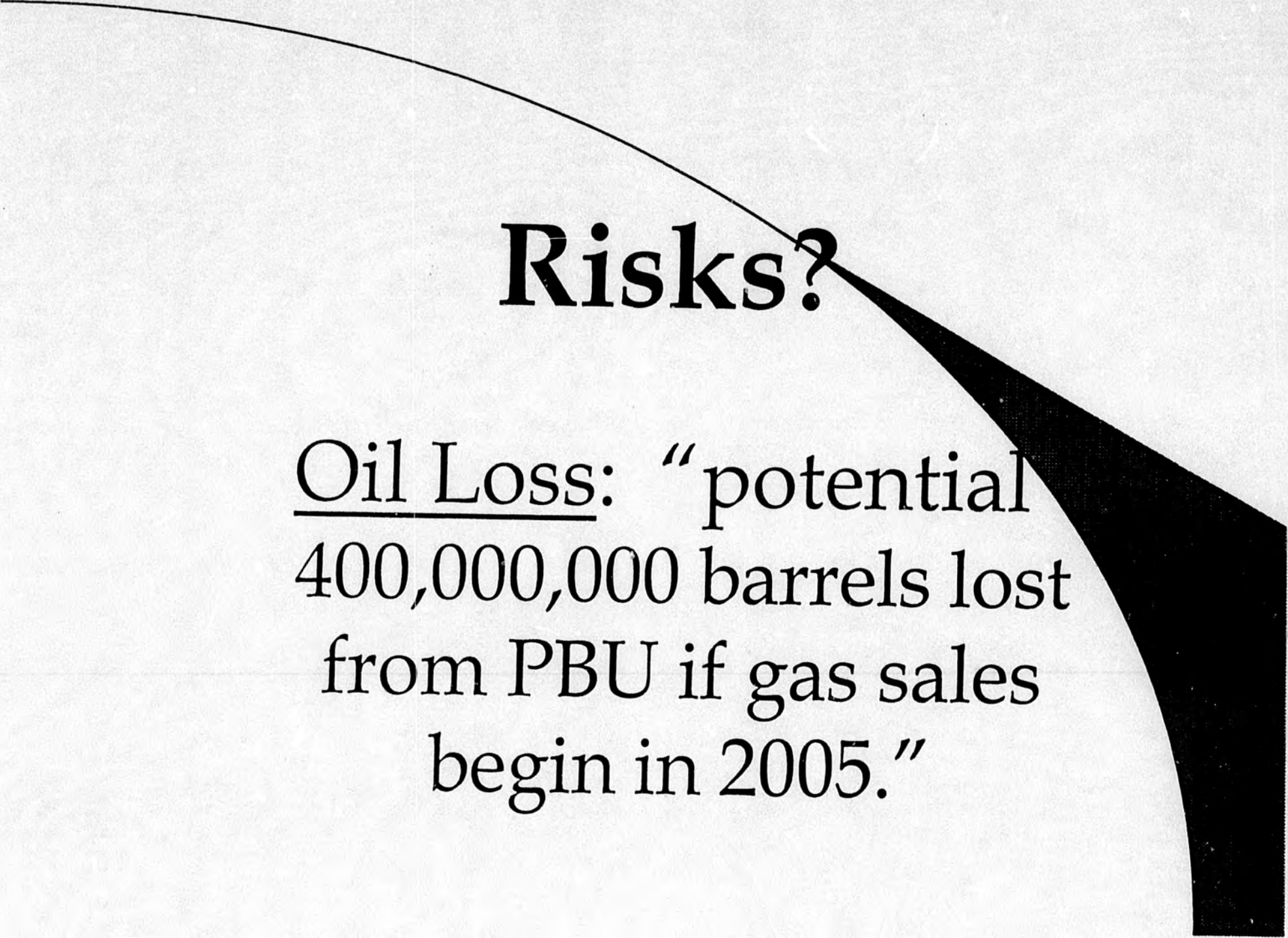




Oil Loss vs. Gas Sales

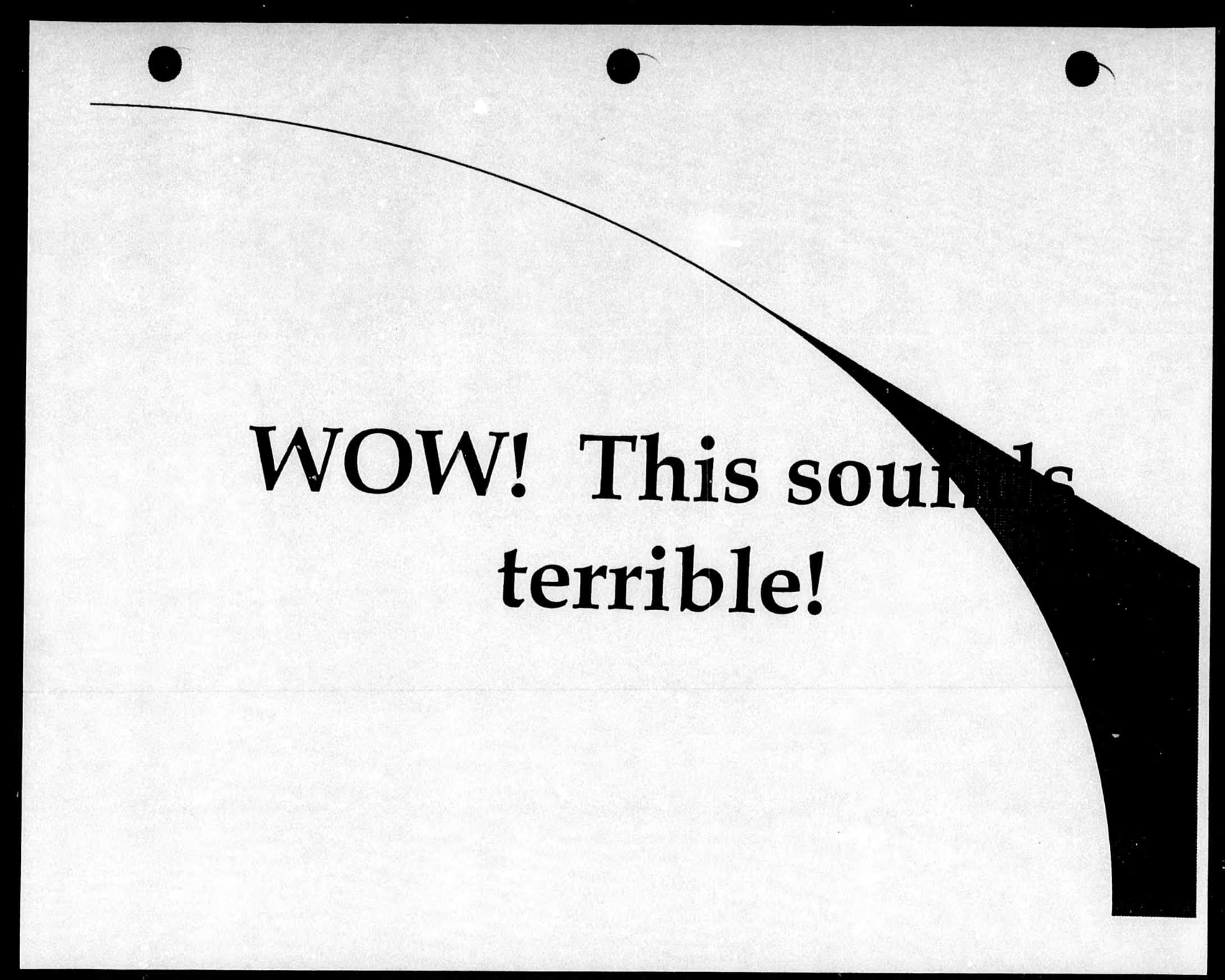
PBU Oil Pool, Cumulative Reservoir Voidage Due To MGS Scenarios





Risks?

Oil Loss: “potential
400,000,000 barrels lost
from PBU if gas sales
begin in 2005.”



**WOW! This sounds
terrible!**

Not Really.

Gas revenues *more* than offset
any "potential" oil loss...which
is "uncertain" at best.

Oil Loss?

Key Questions:

- ▲ What is the schedule of loss-i.e. *when does it occur?*
- ▲ What gas "ramp up" rate is used?
- ▲ What mitigation can be used to minimize on oil?
- ▲ When does TAPS shut down?
- ▲ What are the PBU economics supporting viability through 2030 without gas sales?
- ▲ Can Point Thomson gas solve the PBU problems?

Oil Loss?

Extremely "Uncertain":

"...Commissioners, in any forecasting process when you go out and look at the future, as one steps out in time uncertainty grows, asymptotically -- or exponentially, I should say.

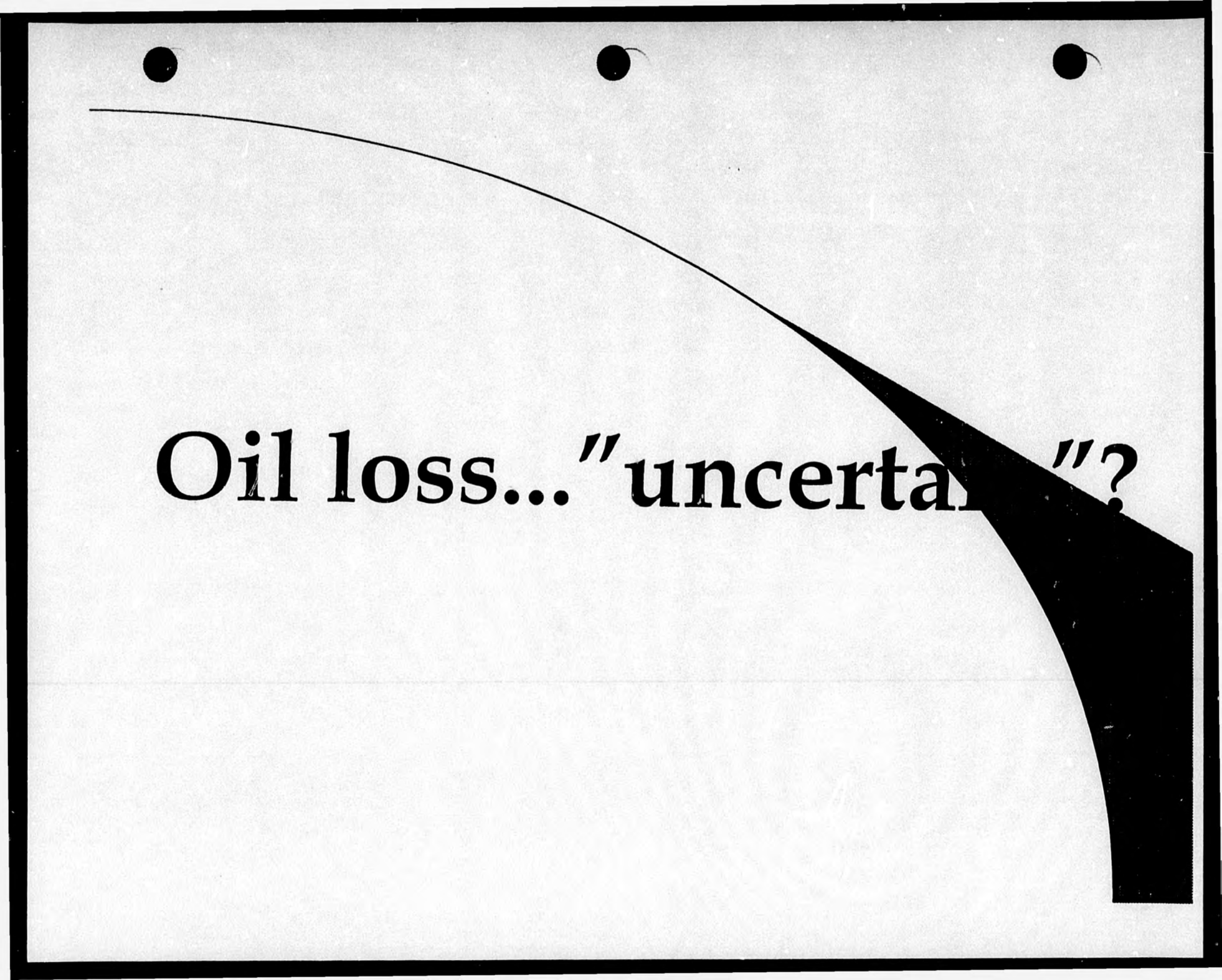
Do we have a forecast for the year 2020?

Yes. Do we have a lot of faith in it?

There's a lot of uncertainty there...."

PBU's 1991
Legislative
Testimony

Oil loss at PBU is *highly*
"uncertain" but the loss of both
Point Thomson *and* Prudhoe
gas revenues without a gas project
is *absolutely certain!*



Oil loss..."uncertain"?

Gas revenues are certain!

- ▲ Gas revenues are set by contract for 25 years (i.e., no risk).
- ▲ BP says, "Money flows to the gas offering the greatest returns for lowest risks."

We agree!
Gas sales = lowest risk.
Hands Down