

Changes at LNG Chain and Challenges for Japan

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Research Objectives

- Reviewing changes at LNG Chain and Players
- Analyzing the background of those Changes
- Examining the options for Japan's gas procurement
- (Based on a METI-sponsored research project)





- Process of production, transportation, regasification of LNG and distribution of regasified gas
- Integrated operation essential to mitigate the risk



 Usually IOCs, NOCs & trading houses for upsreatm players, power and gas companies for downstream players



2. Factors behind the Changes (1) Liberalisation of Power & Gas Markets Liberalisation in LNG Importers



(Remark) Liberalisation here means partial or full opening the market for competition

2. Factors behind the Changes APAN (1) Liberalisation of Power & Gas Markets

Liberalisation in Japanese Market

	G	as	Power		
	Eligibility	Market Opening %	Eligibility	Market Opening %	
1995	2MMcm <	36%			
1999	1MMcm <	40%	2,000kW <	26%	
2004	0.5MMcm <	44%	500kW <	40%	
2005			50kW <	63%	

 Liberalisation by Revised Gas Utilities Act & Revised Electric Utilities Act

2. Factors behind the Changes Japan (1) Liberalisation of Power & Gas Markets

Market Opening in the						
	Gas	Power				
Austria	100%	100%				
Belgium	90%	90%				
Denmark	100%	100%				
France	70%	70%				
Germany	100%	100%				
Ireland	86%	100%				
Italy	100%	79%				
Luxemburg	72%	57%				
Netherland	100%	100%				
Spain	100%	100%				
Sweden	95%	100%				
U.K	100%	100%				

 Full market opening by July 2007 required by Gas Directive and Electricity Directive

2. Factors behind the Changes APAN (1) Liberalisation of Power & Gas Markets

Domestic Gas Market Opening in the US



(Source) Energy Information Administration

Liberalisation process at the Federal level completed by Order 636 and Order 888. State level liberalisation taking place.

2. Factors behind the Changes(2) LNG Cost Reduction



(Source) IEA, World Energy Investment Outlook

- Initial investment for LNG project decreasing
- Higher cost for recent projects, but competitiveness of LNG itself not affected so far





Factors behind the Changes JAPAN (2) LNG Cost Reduction

Larger LNG Ships

(Number of Ships)



2. Factors behind the Changes APAN (3) Emerging LNG Importers

					(M	illion Tonnes)	
		2004	20	2010		2020	
		Demand	Low	High	Low	High	
Asia	Japan	56.8	61.0	71.0	73.0	91.0	
	Korea	22.3	23.0	26.0	26.0	37.0	
	Taiwan	6.9	10.0	11.0	12.0	14.0	
	India	2.0	8.0	9.0	15.0	17.0	
	China	-	5.0	7.0	12.0	17.0	
	Other	-	-	-	4.0	6.0	
	Sub Total	88.0	107.0	124.0	142.0	182.0	
Europe	France	7.9	8.0	10.0	10.0	14.0	
	Italy	1.5	8.0	10.0	13.0	19.0	
	Spain	13.8	19.0	22.0	28.0	30.0	
	UK	-	6.0	9.0	15.0	20.0	
	Other	6.6	9.0	11.0	13.0	15.0	
	Sub Total	29.7	50.0	62.0	79.0	98.0	
America	US	12.9	37.0	42.0	64.0	91.0	
	Canada	-	-	-	6.0	9.0	
	Mexico	-	2.5	3.5	8.0	11.0	
	Other	0.6	0.6	2.0	3.0	5.0	
	Sub Total	13.5	40.1	47.5	81.0	116.0	
Total		131.2	197.1	233.5	302.0	396.0	

 90-130 MT demand growth potential in US, UK, China and India

 Decreasing Japan's share

2. Factors behind the Changes (3) Emerging LNG Importers



Sluggish domestic production and pipeline gas growth leading to many LNG terminal projects

 NIMBY/BANANA as bottlenecks for those projects

(Source) Federal Energy Regulatory Commission

2. Factors behind the Changes (3) Emerging LNG Importers



Declining domestic production leading to many LNG terminal projects Potential oversupply?

2. Factors behind the Changes(3) Emerging LNG Importers



Many projects due to energy demand growth and environmental advantages of natural gas Higher LNG price affects feasibility of LNG import projects

2. Factors behind the Changes (3) Emerging LNG Importers



- Gas demand expansion backed by GDP growth
- Dahej, Hazira terminals in operation
- Higher LNG Price resulting in LNG procurement difficulty



2. Factors behind the Changes



■ LNG market expansion ⇒ LNG flow diversification

2. Factors behind the Changes (4) Tighter LNG Demand Supply Balance

(Million Tonnes) 7<mark>8.4</mark>5 78.45 132.51 130.51 130.5 12<mark>4.</mark>96 103.22 94.79 105.26 102.60 Λ Λ 🗖 Existing, Under Construction, SPA/HOA Signed 🧮 Planning 🗕 High Demand 🗕 Low Demand

 Tight balance towards 2010
 Emerging importers being a big factor for the balance after

2. Factors behind the Changes

(4) Tighter LNG Demand Supply Balance

- Demand Factors
 - Japan: Lower load factor for nuclear
 - Continental Europe: More demand for power generation
 - US & UK: High gas prices attracted spot cargoes
- Supply Factors
 - Decreasing Indonesian export
 - Delay of new projects



2. Factors behind the Changes

(1) Liberalisation of Power & Gas Markets
 Importance to procure competitive LNG with flexible delivery terms

(2) LNG Cost Reduction

 Competition among upstream projects, Necessity to react for better returns

(3) Emerging Markets

• Influential for demand supply balance, Necessity of regasifcation terminal, Seeking new business models

(4) Tighter LNG demand supply balance

Importance of supply security

⇒These factors will form the future LNG chain





More players entering new fields

3. Future LNG Chain & Players (1)Upstream Players for Downstream

- Main Examples
 - IOCs: ExxonMobil,Shell,BP
 - NOCs: Qatar Petroleum, Petronas
 - Trading Houses: Mitsubishi, Mitsui, LNG Japan
- Main Aims
 - Access to emerging markets
 - Upstream assets monetization
 - New business opportunities

3. Future LNG Chain & Players (1) Upstream Players for Downstream Example 1 ExxonMobil



 Investing in terminals or securing regas capacity for access to US/UK markets and monetizing upstream assets

3. Future LNG Chain & Players (1) Upstream Players for Downstream Example 2 Shell



 Investing in terminals or securing regas capacity for access to US/UK markets and monetizing upstream assets

3. Future LNG Chain & Players (1) Upstream Players for Downstream **Example 3 Mitsubishi** Long Sakhalin II Beach Freeport Qalhat Brunei MLNG NWS Liquefaction **Regasification**

- Capacity at Freeport to access the US market
- Establishing Celt with Tokyo Electric for flexible LNG delivery from Qalhat

3. Future LNG Chain & Players

(2) Downstream Players for Overseas Downstream

Examples

- Gaz de France, Tokyo Gas, Osaka Gas, Endesa, etc
- Main Aims
 - Access to emerging markets
 - New business opportunities

3. Future LNG Chain & Players (2) Downstream Players for Overseas Downstream Example 1 Gaz de France



 Securing regas capacity at Isle of Grain and investing in Dahej and Kochi terminals for new business opportunities and access to those markets

July 2006 3. Future LNG Chain & Players (2) Downstream Players for Overseas Downstream Examples 2 Gas Natural



 Securing regas capacity at Panigalia and investing in Trieste and Tarrant terminals for new business opportunities and access to the Italian market

3. Future LNG Chain & Players (3) Downstream Players for Upstream

- Examples
 - Union Fenosa, Gaz de France, Tokyo Gas, Tokyo Electric, Osaka Gas, etc
- Main Aims
 - LNG procurement cost reduction
 - New business opportunities
 - Supply security

3) Downstream Players for Upstream Example 1 Union Fenosa



 Investing in Damietta and Qalhat projects for better LNG procurement terms

3. Future LNG Chain & Players (3) Downstream Players for Upstream Example 2 Tokyo Gas



 Investing in Darwin, Gorgon and Pluto projects for stable and competitive LNG procurement

3. Future LNG Chain & Players (4) China & India for upstream

- Examples
 - China (CNOOC, SINOPEC, CNPC)
 - India(ONGC, GAIL)
- Main Aim
 - Supply security

3. Future LNG Chain & Players (4) China & India for Upstream Example 1 CNOOC



Investing in NWS and Tangguh projects for supply security

[®]3. Future LNG Chain & Players

(5) New Entrants

Examples

- Regas terminal operators
- Japanese oil companies
- Financial Institutions
- Main Aim
 - New business opportunities

3. Future LNG Chain & Players (5) New Entrants Example 1 Cheniere Energy



 Building regas terminals in the US for capacity lease for third parties

3. Future LNG Chain & Players (5) New Entrants Example 2 Excelerate Energy



Onboard regas tankers to avoid NIMBY/BANANA



²⁰⁰⁶ 4. Challenges and Countermeasures for Japan (1) Challenges for Japan's LNG procurement

- Power and gas market liberalisation leading to intensifying competition
- Tight LNG demand/supply & higher price
- Emerging LNG importers
- ⇒Taking above into account, challenges are;
- Supply security
- Bargaining power

²⁶4. Challenges and Countermeasures for Japan (1) Challenges for Japan

 Supply Security (Dealing with short-term challenges such as supply disruption)

- Supply security is often discussed in terms of physical supply
- However, the term supply security includes not only physical supply but economic efficiency

4. Challenges and Countermeasures for Japan

(1) Challenges for Japan

- Bargaining Power (Dealing with mid/long term challenges)
 - Enhancing Japan's gas bargaining power in situation whereby Japan's market share decreases and exporters sell more LNG to the Atlantic market
 - Increasing presence of Japanese and Asian market needed for better bargaining power





Countermeasures at each stage

^{1EEJ: July 200}**4.** Challenges and Countermeasures for Japan

(3) Risk for supply security and bargaining power





Long Term
Contract

Flexible Take

or Pay terms

- Diversification as principle measure
- Higher equity LNG rate (12% at present) desirable. But, not a perfect solution
- Importance of JBIC financing
- Long term contract with flexiblity
- Buyers consortium not a must
- Comprehensive relationship with exporting countries
- These are not quick solutions

^{IEEJ: July 20}**4. Challenges and Countermeasures** for Japan

3) Risk for supply security and bargaining power

Equity LNG projects

- **Existing Projects**
- Indonesia: Bontang and Arun
- Australia: NWS
- Abu Dhabi: ADGAS
- Malaysia: Tiga
- Qatar: Qatargas
- **Future Projects**
- Russia: Sakhalin II
- Indonesia: Tangguh
- Australia/East Timor: Greater Sunrise
- Australia: Ichthys

4. Challenges and Countermeasures for Japan (3)Countermeasure for the Risk

Diversification



Further Diversification Expected & Desirable

4. Challenges and Countermeasures for Japan (3) Countermeasures for the Risk

Russian Pipeline Gas Export Projects



(Source) The Institute of Energy Economics, Japan

4. Challenges and Countermeasures for Japan (3)Countermeasures for the Risk



Transportation



 Relationship with transport
 route countries
 Flexible
 Transportation
 Scheme

- Looser destination restriction
- More flexible domestic LNG transportation by transhipment & multiple discharging
- Cooperation (B to B, G to G, B to G)
- Possibly quicker solutions than in Upstream measures







²⁰⁰⁶ 4. Challenges and Countermeasures for Japan (3) Countermeasures for the Risk

Downstream

Regasification Distribution



- Infrastructure development to deal with supply uncertainty and to enhance gas trading liquidity
- Ability to receive larger ship such as Q-Flex effective for short/mid term demand/supply tightness
- Demand Side Management such as interruptible contract, dual fuel and energy saving
- Certain lead time required for infrastructure development



4. Challenges and Countermeasures for Japan Japan (3) Countermeasure for the Risk

ANGAS: Advanced Natural Gas Storage



 Potential underground storage system in Japan
 CNG & LNG satellite stations also considerable





5. Government Role (1)Upstream

- Diversification
 - Sakhalin resource development especially important
- Strengthening comprehensive relationship with exporting countries
 - In terms of economics, diplomacy and environment etc
- More support for upstream development





- Strengthening relationship with transport route countries
- More flexible domestic LNG transportation (transshipment, multiple discharging)
- Downstream
 - Developing infrastructures (especially pipelines and underground storages)

Not only upstream equity, but more flexible supply system on mid & downstream sectors needed



- Changing role of LNG players
- Changes at LNG chain and tighter LNG demand/supply are the challenges for Japan to achieve supply security and bargaining power
- No single perfect countermeasure for those challenges
- Portfolio of countermeasures needed

- Diversification of supply as principle measure in upstream. Upstream equity important, but not perfect solution
- ⇒Reexamining economics and technological cooperation with exporting countries needed
- ⇒Promoting Sakhalin development necessary to enhance diversification & bargaining power

- Flexible transportation scheme needed in midstream
 - ⇒Looser destination clause & cooperation with Asian buyers essential to adjust demand-supply and deal with emergencies
 - ⇒Establishing partnership with Atlantic players desirable for demand-supply adjustment

 Infrastructure development as main measure in downstream

⇒Pipeline network and storage development needed not only for gasification but security of supply



Issues to Be Considered

- Cost & lead time for each countermeasures
 - Upstream equity
 - Pipeline network
 - Underground storage
- Buyers cooperation
 - Adjusting seasonal demand fluctuation
 - Accommodating LNG cargoes in emergency
 - Partnership with Asian and Atlantic players







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