

# Outlook for the Natural Gas Market in Japan

A horizontal bar composed of three segments: a dark blue segment on the left, a red segment in the middle, and a dark blue segment on the right.

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**27 October, 2009**

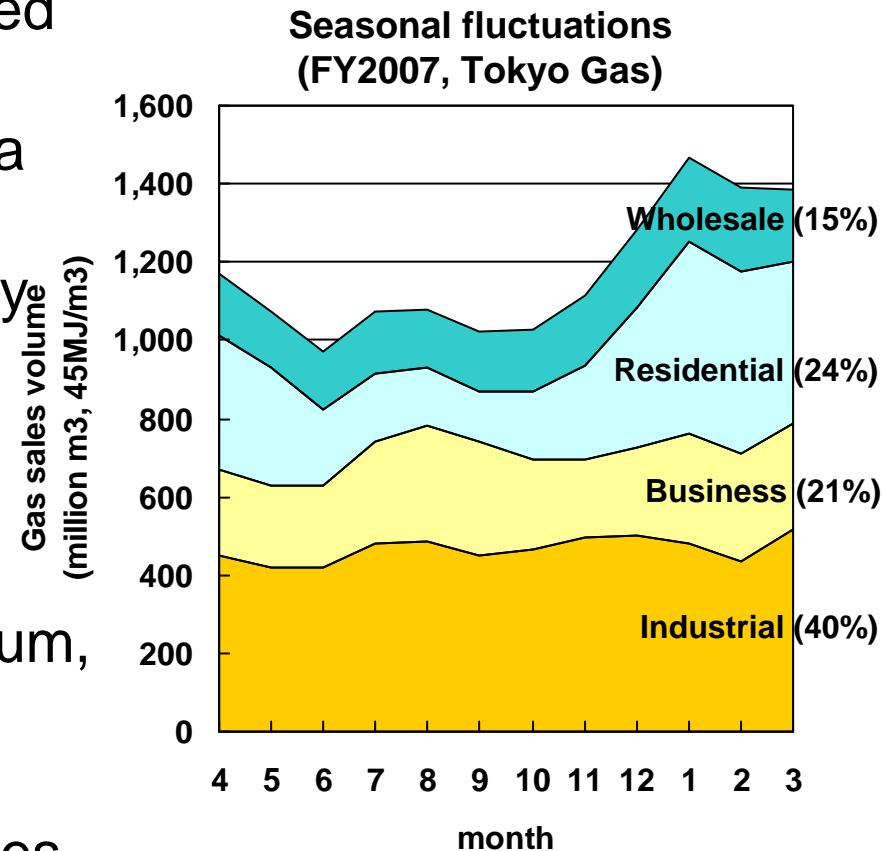
**Northeast Asia Petroleum Forum 2009 (Keidanren-Kaikan, Tokyo)**

# Role of LNG in Northeast Asia



北東アジアのLNG TOKYO GAS

- Poor indigenous resources and limited energy options
- Politically stable island and peninsula nations
- Traditionally, industry and logistics by marine transportation
- Seasonal climate, combined with economic trends and unpredictable weather (heavy winter)
- As an alternative to coal and petroleum, LNG in Japan has 40-years history since Alaska
- Joint efforts by electric and gas utilities (2:1)

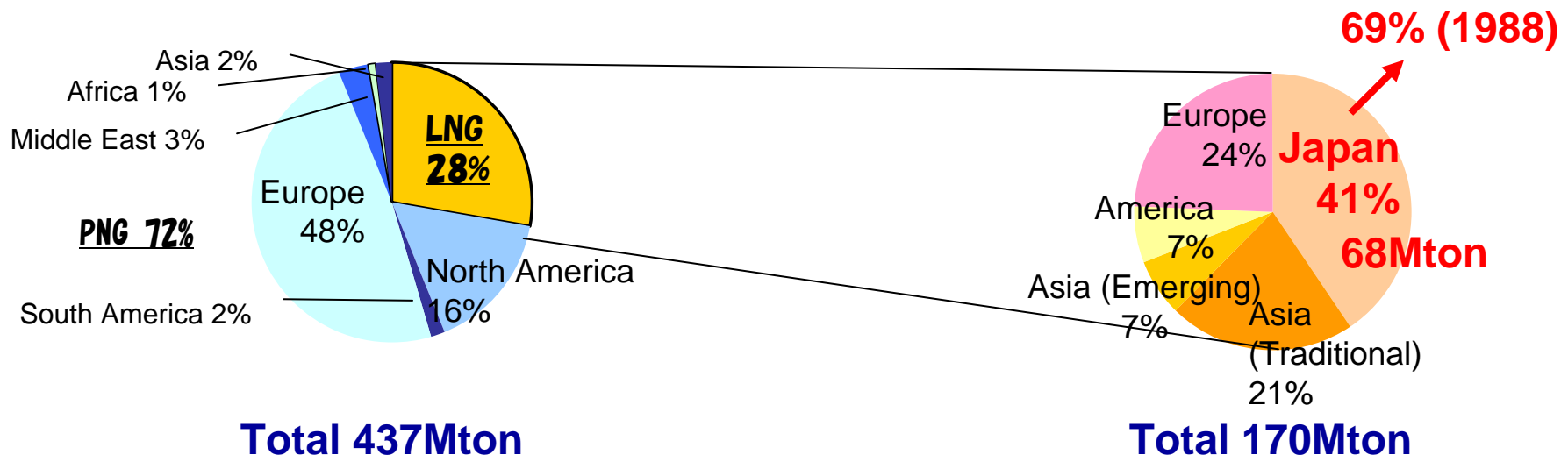


Source: Tokyo Gas

# Need for Greater Flexibility

柔軟性を求める

- LNG is much more than simple buffer/complement for nuclear power, renewable energies and pipeline natural gas (PNG) as claimed by some Western Countries
- LNG in Asia is a major player = base load energy and traded mostly under long-term base load contracts
- Contract terms by themselves cannot become the fundamental solutions in maintaining necessary flexibility



Break down of global natural gas/LNG trade (2008)

# 3 Solutions for Flexibility (Hardware)

量的柔軟性創出へのハード面の3つの工夫

- Buyers, within their countries, need to make short- and long-term preparation and maximum effort:
  - (1) Emergency adjustments: self-controlled LNG tankers (19 LNG tankers in Japan) and floating
  - (2) Regular adjustments: reserves in storage tanks (27 LNG terminals, 14.6 million kL in Japan), underground storage, and pipeline connections between LNG terminals
  - (3) Demand adjustments: multi-fuel facilities and LNG-fired power plants
    - ⇒ Multi-fuel Facilities such as blast furnace
    - ⇒ Adjustment of operation hours of LNG-fired power plants including (PPS) utilizing the power market (holiday/night)

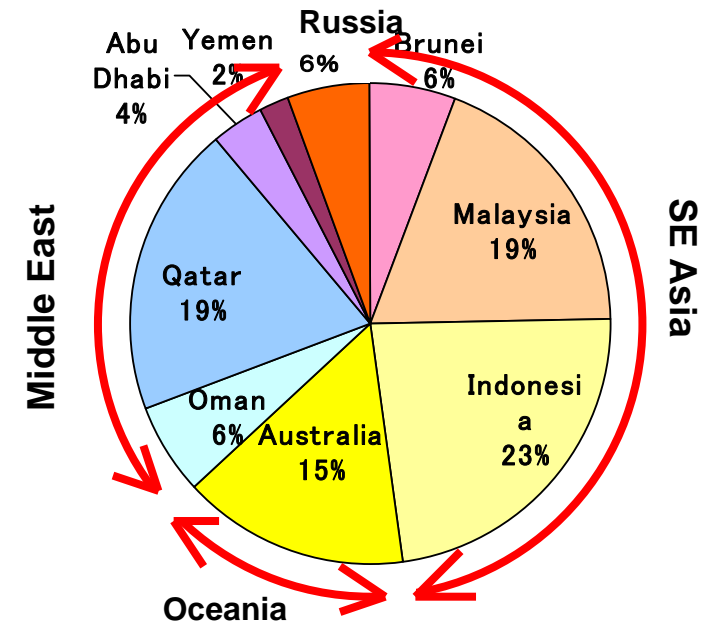
# Buyers' Portfolio (Software)

買主ポートフォリオ(ソフト面の工夫) TOKYO GAS

- Currently popular "portfolio" is not only for the sellers
  - Minimizing elements such as geopolitical risks, buyers diversify sources and utilize "spot" (substitutive LNG)
- ⇒ (country, direction, distance, climate, operator, liquefaction performance, origin of source and qualities)

- As a consequence: diversification to Southeast Asia, Oceania, the Middle East and Russia
- Cooperation among buyers for offsetting seasonal fluctuations (different demand patterns, such as between electric power and gas or between countries)
- Respecting the philosophy of long-term relationship and project start-up

Country breakdown of exports to Northeast Asia  
(2009, quantities based on long-term contracts)





# Tripolarizing LNG Markets

三極化しつつあるLNGマーケット TOKYO GAS

- Asia-Pacific, North American and Europe were the world's 3 major LNG markets
- But now actually there are 4 major regions, because the BRICs countries are rising
- In Atlantic LNG market, we should focus on the South in the day ahead

## 4 LNG regions

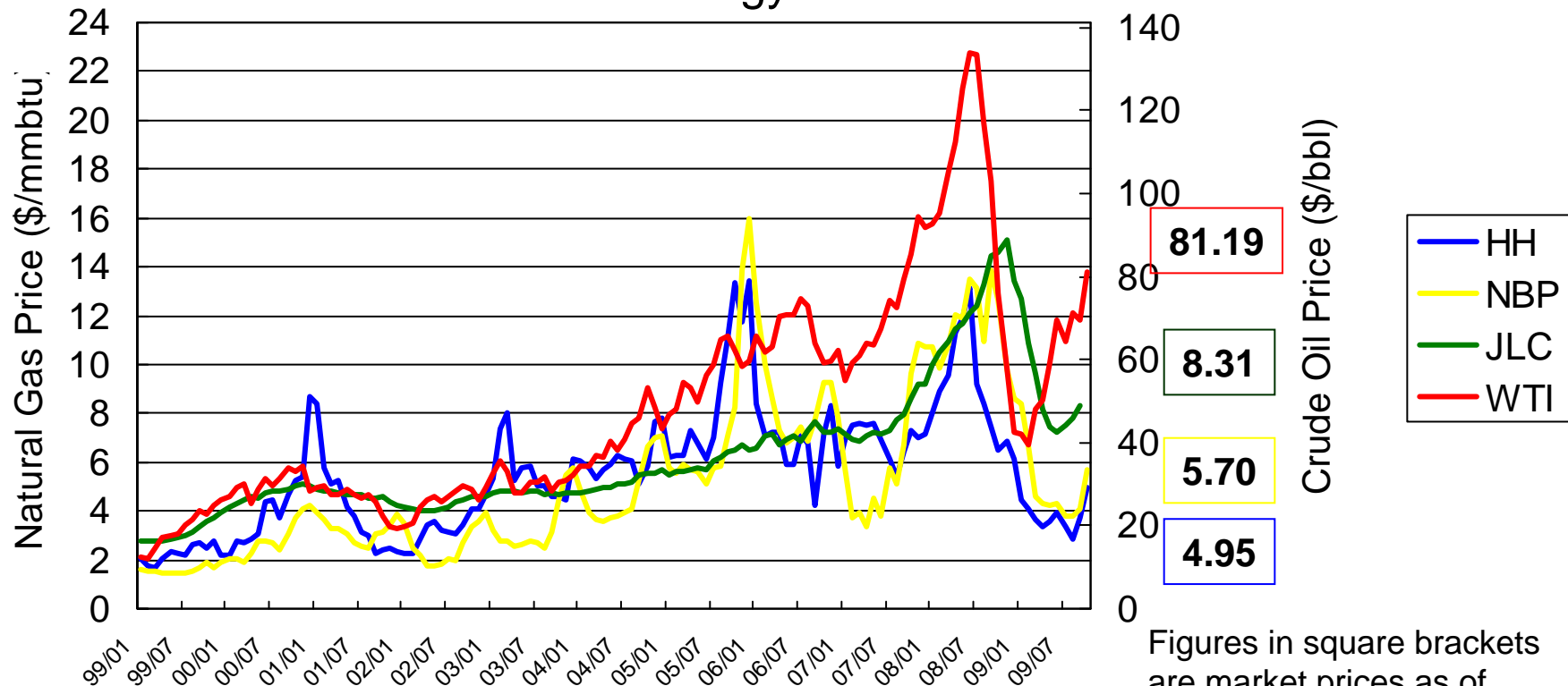
	Asia-Pacific		Atlantic	
	Traditional (Japan, Korea, Taiwan)	Emerging economies (China, India)	North America	Europe
MTA (%) (2008)	105.6 (62%)	11.4 (7%)	11.4 (7%)	41.5 (24%)
LNG growth (short-term)				
<b>Increasing complexity of global financial and economic crisis (How deep? How long?)</b>				
Option	Little domestic gas	Large domestic gas fields	Unconventional gas PNG	Diversification of sources PNG Nuclear power
Price index	JLC and others	JLC	Henry Hub	Petroleum product/NBP

# Comparison of Trends in Tripolarizing Gas Markets



ガス市場三極化の流れを見る TOKYO GAS

- The differences come from the availability of substitutes
- Are price differences unreasonable, or acceptable commonsense in the world of business?
- If the gap continues, gas in Asia will face be compared against and balanced with other sources of energy



Source: Trade statistics of Japan, NYMEX, etc.

Figures in square brackets are market prices as of October 23

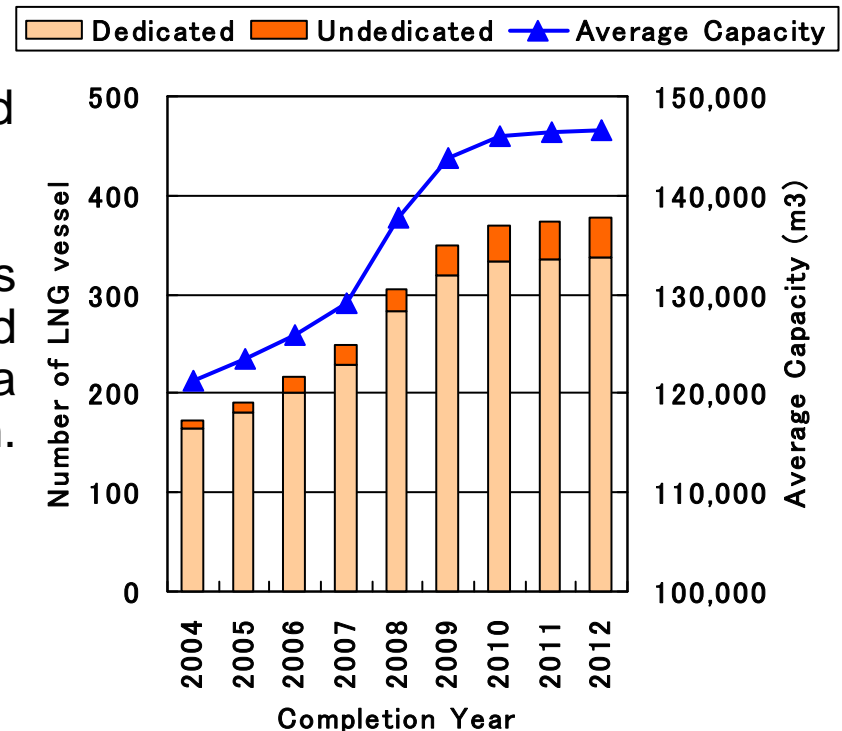


# Relaxation of Market Strain

- Local production/local consumption is normally efficient for energy and manufactured goods, however, centralized production by proficient producer can also be rational
- For normal products, generally price gap other than the difference in cost of transportation dissolve with time

## • Actions for relaxing market strain:

- ⇒ Increase of spot vessels; self-controlled LNG tankers for FOB, faster, larger and more efficient
- ⇒ The world is round (export terminals along the Pacific coast of North and South America, expansion of the Panama Canal, shipment across the Arctic Ocean. Protection from pirates)
- ⇒ New blood of entrants into the upstream, who can revolutionize distribution, are awaited



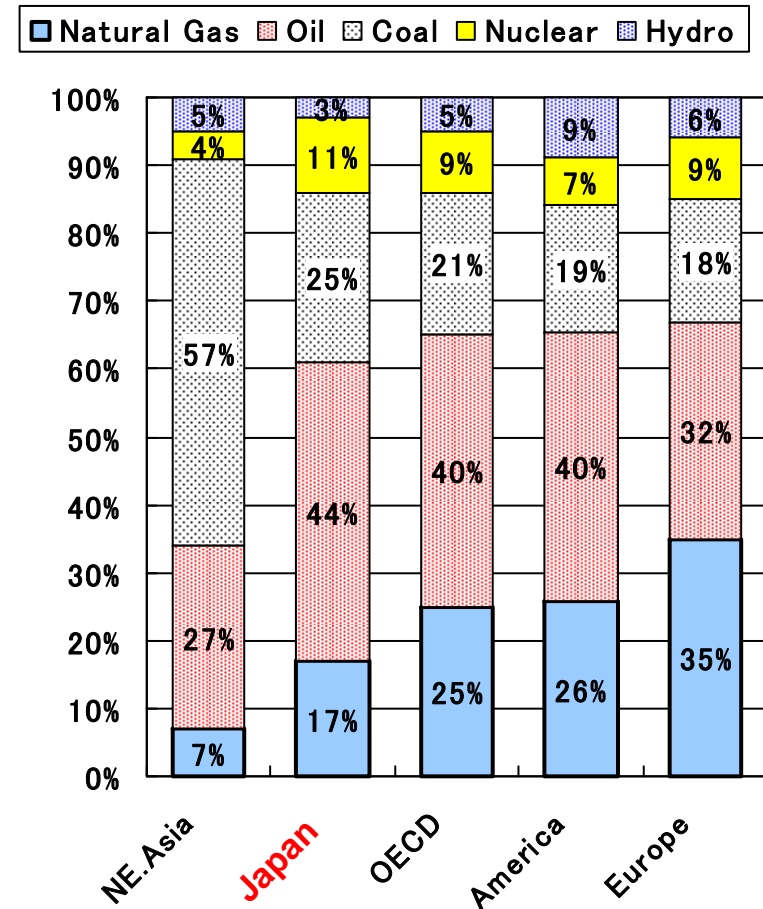


# Index Prices Linkage with Oil Unnecessary?

価格指標、石油リンクは無用か

- We had enough of local index "WTI", also anxious about GASPEC
  - Index is useful if neither complacent nor permit speculation
  - Should sellers and buyers insist on linkage with oil prices?
- ⇒ Buyers in Asia think of LNG as an oil-alternative (The share of natural gas in the total primary energy demand: 7% in Northeast Asia, while 25% in OECD)
- ⇒ Developing gas market in NE Asia vs. matured gas market in western countries that has lost substitutability
- ⇒ At the consumer end, LNG competes with hydro, nuclear and renewable energies (fixed-cost based energy), and coal and petroleum (variable-cost based energy)
- ⇒ Sellers wish to recover the cost of investment in expensive projects
- The Asian LNG market still requires "some" linkage with oil prices with S-curve

Primary Energy Consumption  
- World Comparison (2008)



Source:

BP Statistical Review of World Energy, June 2009

# Global Warming - Strong Paradigm Shift

地球温暖化...猛烈なパラダイムシフト TOKYO GAS



- There is a strong headwind against fossil fuels
- Nuclear power and renewable energies (photovoltaic, solar, wind, wave, hydro and biomass) are more CO<sub>2</sub>-friendly at LCA base
- Even though we support greater use of such energies, each alternative requires a long time for implementation (the time factor)
  - ⇒ Renewable energies vs. nature (density, lack of stability, suitability, transmission distance and cost-effectiveness)
  - ⇒ Large scale facilities can cause further damage to the environment, biomass is a trade off to food production
  - ⇒ Nuclear power: siting problem, decommissioning, and uncertainties about final disposal
- Is the next role of natural gas, after serving as an alternative to oil, a bridge until the era of renewable energies? What is the true role of natural gas?

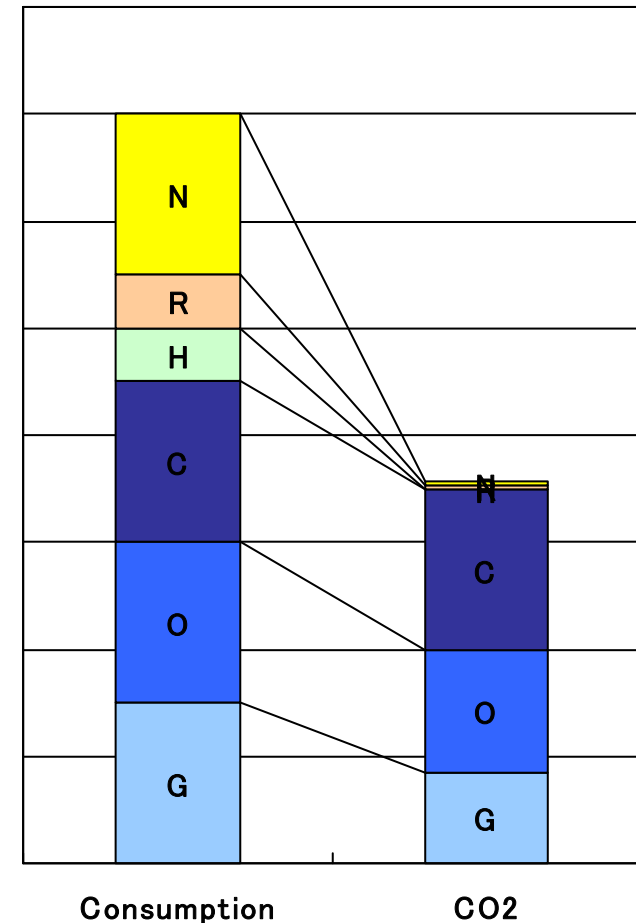
# Multi-Variable Equation on CO<sub>2</sub> Based on the Emission Factor



排出係数で作るCO<sub>2</sub>の多元方程式 TOKYO GAS

- Energy saving first and to improve the quality of life in emerging countries without lowering that in advanced countries
  - Decreasing the primary energy consumption (conserving energy resources) or reducing CO<sub>2</sub> emissions (mitigating global warming) ?
  - $1.00 \times C + 0.76 \times O + 0.56 \times G + 0.01 \times H + 0.07 \times R + 0.03 \times N = \text{CO}_2$
  - Infinite combination of solutions in case of a 25% reduction of CO<sub>2</sub>
- ⇒ However, if we set a deadline,  
 $H, R, N < \alpha, C, O > \beta$  is undeniable
- There are so few real solutions,  $G = ?$

Conceptual illustration



# Realistic Solution on the Supply Side

サプライサイドでのリアリティのある解決



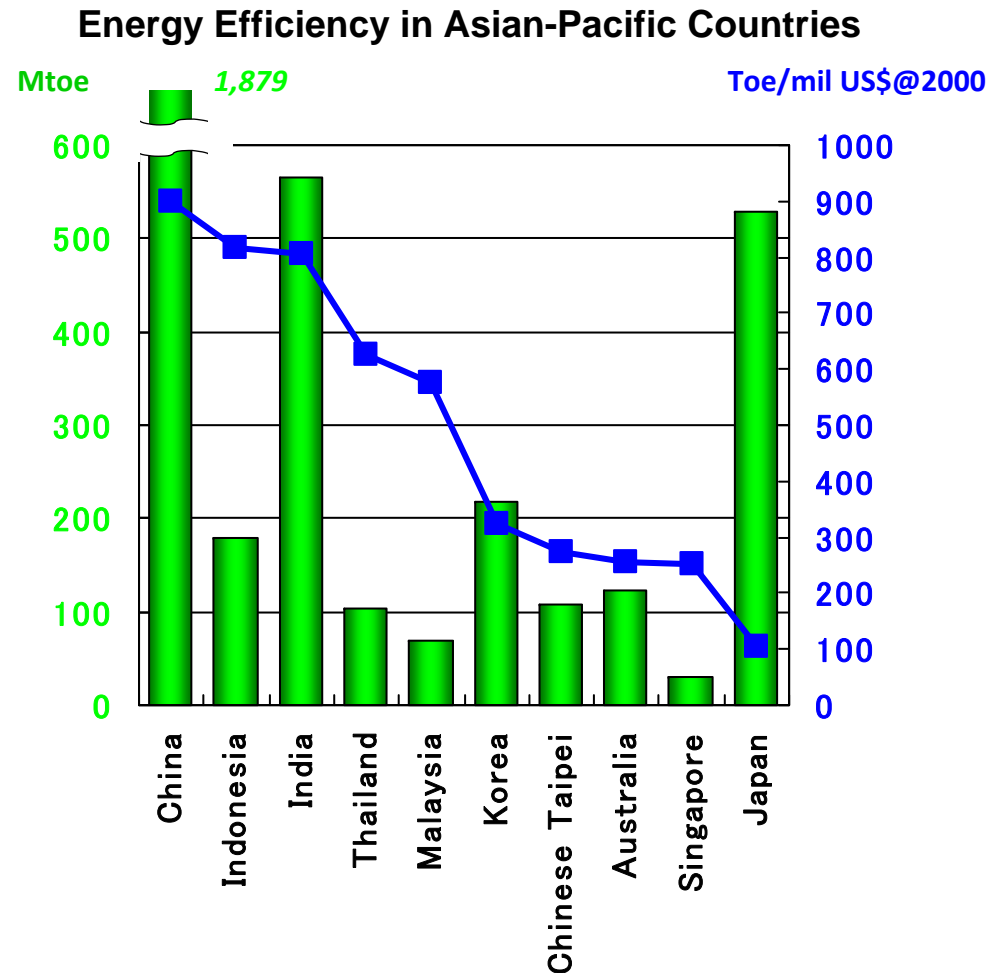
- Since efforts to expand the use of renewable energies and nuclear power take much time, fossil fuels cannot be abandoned
  - ⇒ Coal is abundant at low prices, will draw more attention with the realization of CCS
  - ⇒ Petroleum will decline, but will remain having the transport sector as its core. With the domestic reserve storage capacity (6 months), the quick availability and the substitutability, petroleum still useful for utility business
  - ⇒ With relative cleanliness, transportability and quick response, natural gas is important for supporting the networks of distributed power generators and compensating for unstable outputs from renewable energies
- How should we best manage presently-available resources?
- Natural gas holds “casting vote” because it has the smallest CO<sub>2</sub> emission factor among fossil fuel options

# Energy-saving Potential on the Demand Side = A New Resource



デマンドサイドでの省エネ、もうひとつの資源 TOKYO GAS

- Large energy consuming countries have the hidden treasure
- Buyers should actively encourage efficient and advanced use of energy at the consumer end
- Success depends greatly on how well Japan's advanced energy-saving technologies spread worldwide



Blue line: Primary energy consumption per GDP

Green column: Primary energy consumption

Source: IEA Key World Energy Statistics, 2008

# Real Potential of Energy Conservation

省エネの底力



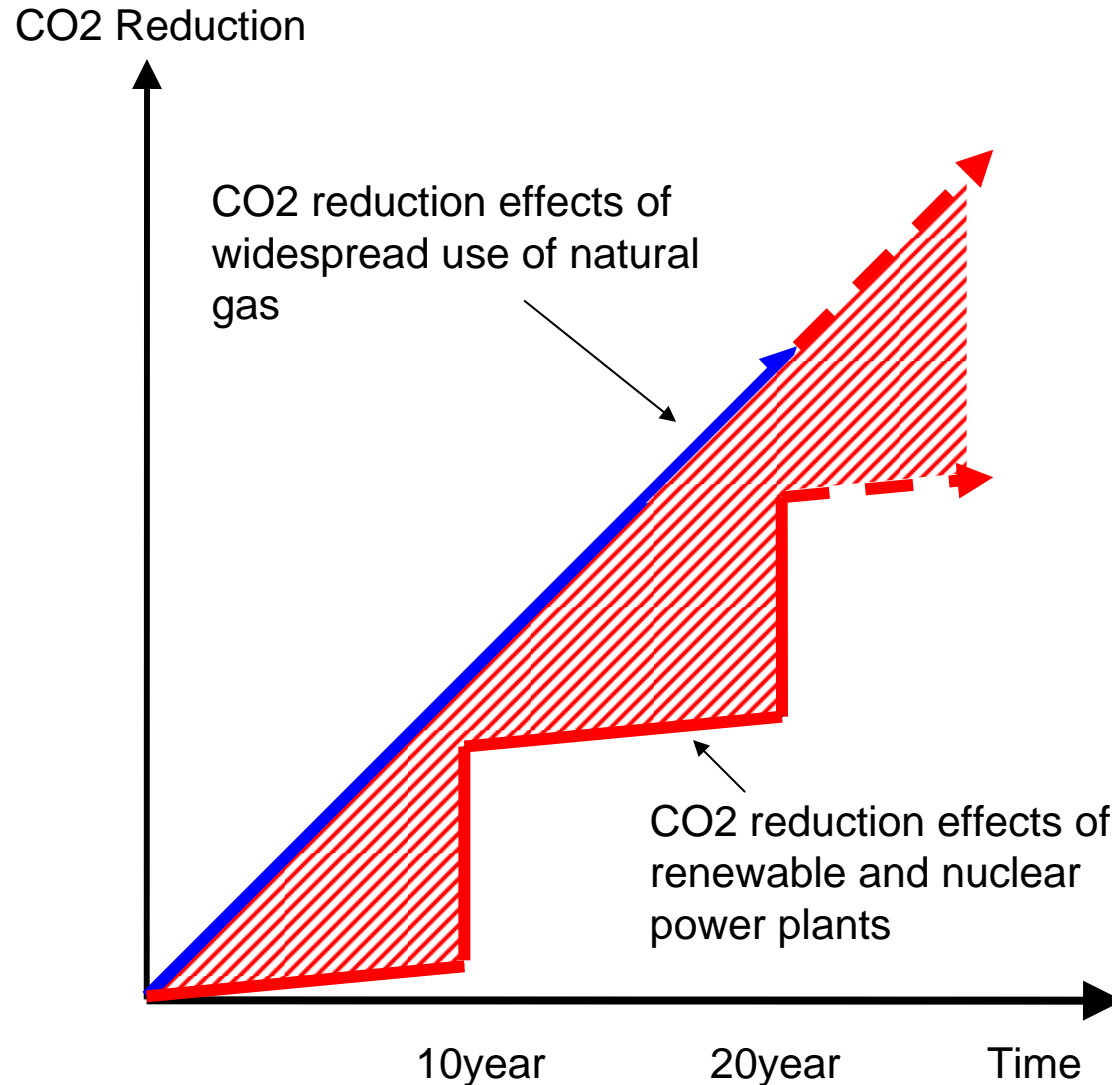
- Promote the use of energy-efficient appliances and spreading of distributed generator networks with renewable energies
- Examples of remarkable progress: fuel efficiency of automobiles, power generation efficiencies, COP (coefficient of performance) of appliances, innovation of fuel cell
- Calorific value adjustment in city gas improves quality and energy conservation in Japan
- The CO<sub>2</sub> emission factor of natural gas is usually reported as 0.56. However, considering that switching to natural gas results in an energy conservation of at least 10% (both for power generation and for direct combustion), the real CO<sub>2</sub> emission factor is 0.5 or less.

# Immediate Effect of Shifting to Natural Gas

天然ガスシフトの即効性



- Cumulating CO<sub>2</sub> emission is an urgent issue for the global warming
- Natural gas, together with nuclear power, presently plays a key role in energy
- With its excellent compatibility with renewable energies, natural gas will remain an invaluable partner
- Natural gas is not just a bridge to renewable energies, but a continuous road and will not disappear after 50 years.



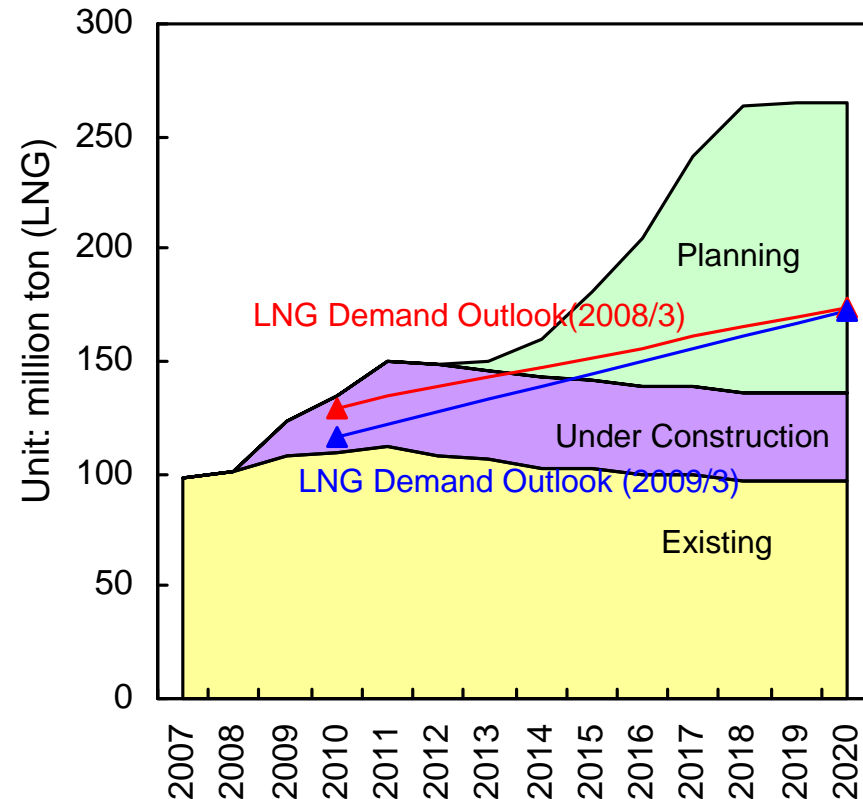
# Achieving Healthy LNG Supply-Demand Balance



LNG需給バランス健全化に向けて TOKYO GAS

- Anxieties about supply-demand and the turbulence in prices will cool down consumers' appetite and drive them to alternative options (not necessary bad)
- Technological progress is creating an expectation for a breakthrough in the expanded use of renewable energies
- The economic crisis, caused by energy and financial sectors, seems to have normalized the supply-demand balance for the moment
- Globalization of distribution and finance tends to lead to simultaneous economical growth or recession, which are difficult to manage
- Unless action is taken, a crisis in LNG prices will easily happen again

Outlook for LNG supply in Asia-Pacific Region



Source: IEEJ, Tokyo Gas

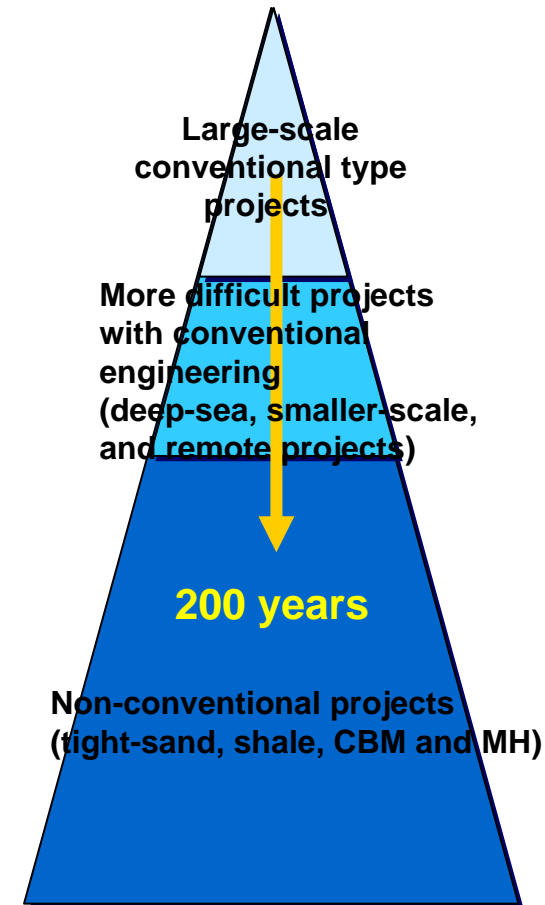


# Encouragement of Upstream Development



上流開発をエンカレッジする TOKYO GAS

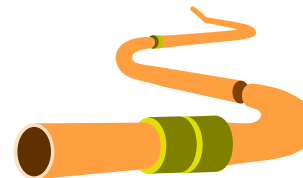
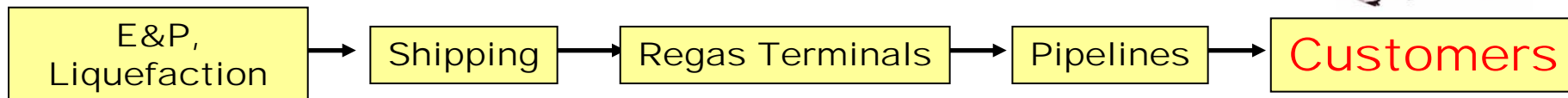
- Easy gas is disappearing and upstream development will be characterized by higher costs and greater difficulties
- Existing reserves are decreasing while the need for domestic gas is increasing
- Buyers will encouraged development of small-scale, deep-sea and remote offshore projects and consequently extend the R/P years
- Expectation for LNG-FPSO and small-scale liquefaction
- Expectation for new sources and unconventional
  - ⇒ The US may quickly meet 50% of the demand with tight-sand, shale and CBM
  - ⇒ Unconventional resources exist in various countries, the development of which will soon offer 200 R/P years, and LNG from unconventional are also under review
  - ⇒ Japan has high expectations for indigenous methane hydrate



# Involvement in the Value Chain

バリューチェーンへの進出 TOKYO GAS

- Sellers and buyers must come to mutual agreements that are justifiable and clearly understood by both parties
  - ⇒ Development of projects cannot be actualized if buyers simply demand lower prices without taking risk
  - ⇒ Additional demand will not be cultivated if the sellers expect exceptionally high profits
- Increase buyers' advancement into the value chain (transportation, upstream) to take on an appropriate share of risk and increasing flexibility
- Buyers must always remember the need for demand-side management.

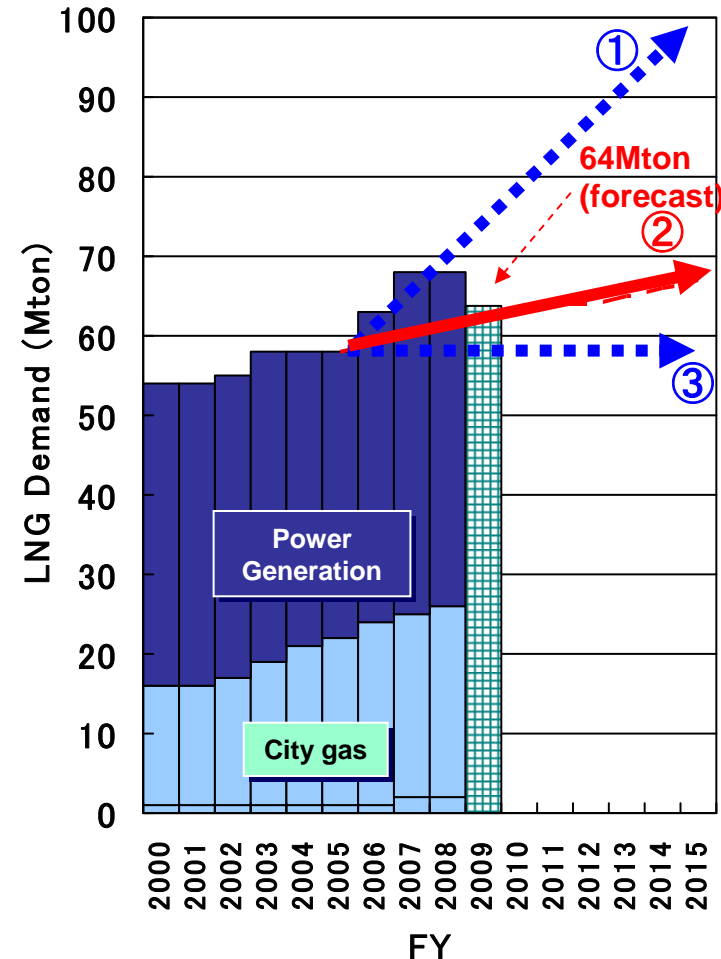


# Impartial Outlook on the Trend for Japan's LNG Trade



日本LNGトレンドの正しい見方

- Predictions during bubble (①) and after recession (③) are often strongly psychologically biased (Where is the reasonable middle?)
- We should not be misguided by uninformed interpretation of statistics
  - ⇒ The 20% drop in demand from the previous year reported for the first half of FY2009 is largely because of a comparison against the bubble period in the first half of FY2008
  - ⇒ A similar comparison between the second halves of these fiscal years will give a very different impression
- Maximum share of spot will be 10% or lower
- What is the most impartial prediction? We shall carefully examine how past trends can be extrapolated into the long-term future (②)



Source: Our estimation based on the Trade statistics of Japan, etc.

# Japan's Strategy for Growth

日本の成長戦略



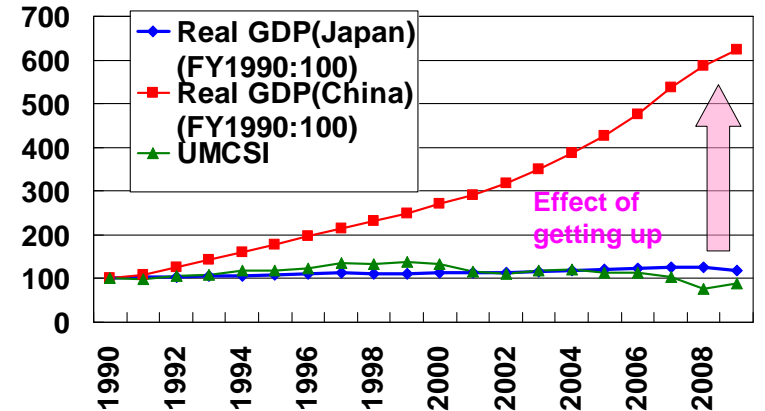
- The trend in China, as a leader in industrial growth, and in USA, as the major. Both are indispensable for the growth of Far East (especially, Japan).

$GDP_{Japan} \propto GDP_{China} + UMCSI^* \Rightarrow$   
gradual recovery of the Japanese economy.

\*: University of Michigan Consumer Sentiment Index

- Domestic demand, which is one of the two pillars of the economy in Japan, is not expected to grow much
- However, Japan still has high potential need for natural gas as an alternative to other fuels.
- For the maximum deployment case of nuclear power plants, the government's energy supply-demand outlook predicts a drastic decline in the demand for natural gas.

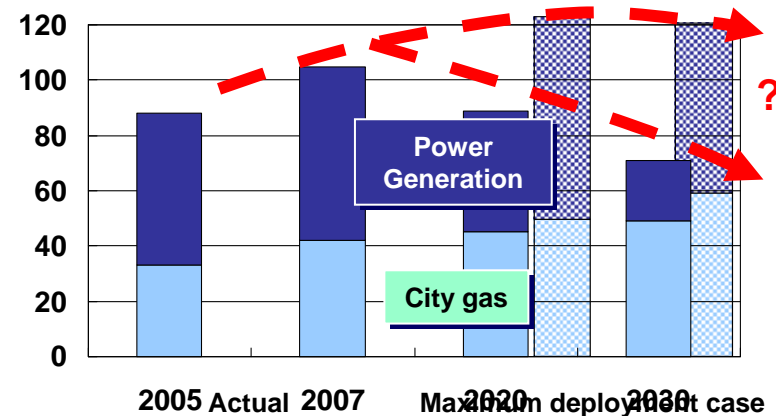
Evolution of substantial GDP in Japan and China, and the index of buying interest of U.S. consumers



Outlook for LNG Demand in Japan

Unit: million oil-equivalent KL

Business-as-usual case



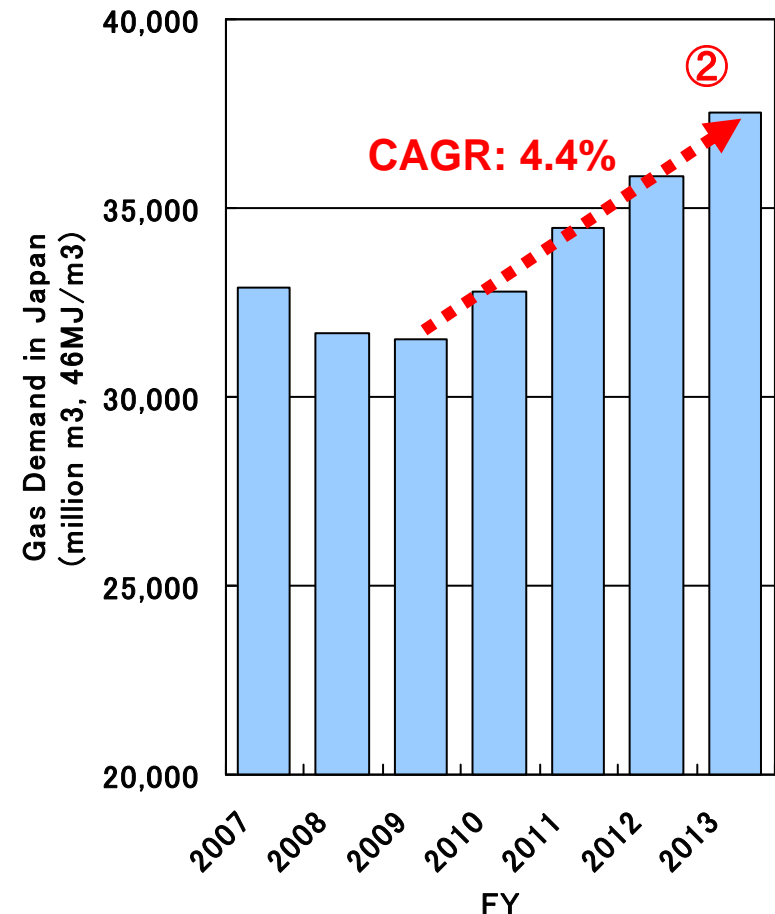
Source: Our estimation based on the proposed revision to the Long-Term Energy Supply and Demand Outlook, August 2009



# Japan's Near-term Recovery

- A surprising V-shaped recovery is unlikely and the actual pattern of recovery is expected to be almost L-shaped
- Even if gas demand grow by an average of 4.4% annually from FY 2009, recovery to the peak demand (observed in the second half of FY2007 and the first half of FY2008) is expected to take at least 4 years
- The tightening of environmental regulations in Japan and other advanced countries may become meaningless if it causes industries to migrate to other countries

Gas supply plan in Japan (City gas business)



# Preparing for Recovery

回復への準備

- The mountainous topography of Japan makes transportation between cities difficult. For bulk transportation, marine transportation has historically enjoyed dominance.
- While the demand for natural gas is expected to grow, we face many challenges, not only with securing supply sources but also constructing pipelines in Japan
- As a quick measure, we are expanding the use of transportation by trucks and coastal vessels
- As a result, Japan has as many as 27 LNG terminals in its relatively small territory, and there are still many plans to construct additional LNG terminals (mostly small- to medium-scale)





# We are all in “the same boat”

正しいメッセージ: 皆同じ船に乗っている

- Considering the whole situation, sellers and buyers should cooperate to establish stable supplies and surely increase the value of natural gas
  - Players in energy markets should understand the urgency of conserving resources and taking environmental actions, and should intelligently manage available resources
  - Buyers in the Asian market, traditionally seen as less vocal, should show greater presence and begin to speak out more on behalf of their customers.
- ⇒ Countries with a long history of LNG trading should assert themselves based on their proven achievements and creditworthiness
- ⇒ Emerging countries should assert themselves based on their purchasing power and growth potential
- Sellers should make proposals that capture the needs of buyers
  - A business axiom in Japan is that we must ensure “benefits to three”「三方良」, that is, benefits to society, benefits to the business partner, and benefits to oneself in this order. Sun Tzu in China once said that even bitter enemies sometimes find themselves in the same boat (forgetting the conflicts and together tackle the crises at hand) 「吳越同舟」