Northeast Asia Petroleum Forum 2011

Emergence of Unconventional LNG and its Implications for LNG Buyers in Asia-Pacific

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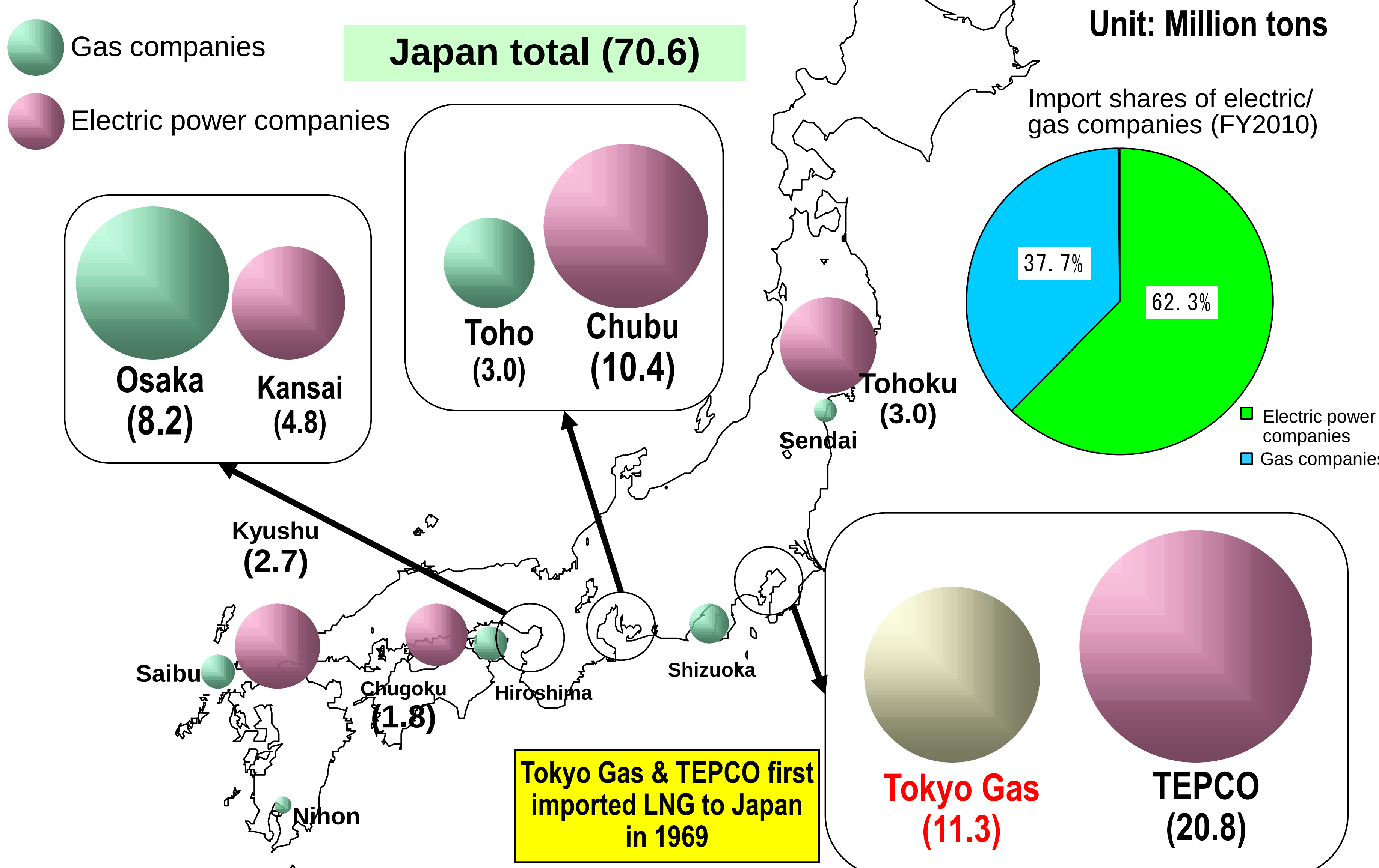
Presentation Contents

- The LNG Market in Japan
- Latest trends of Unconventional Gas
- Impact of Unconventional Gas on the Asia-Pacific Market

LNG Imports to Japan by Company (FY2010)



Source: Trade statistics, FEPC, *Sekitsu*, etc.

LNG Imports to Japan by Country (FY2010)

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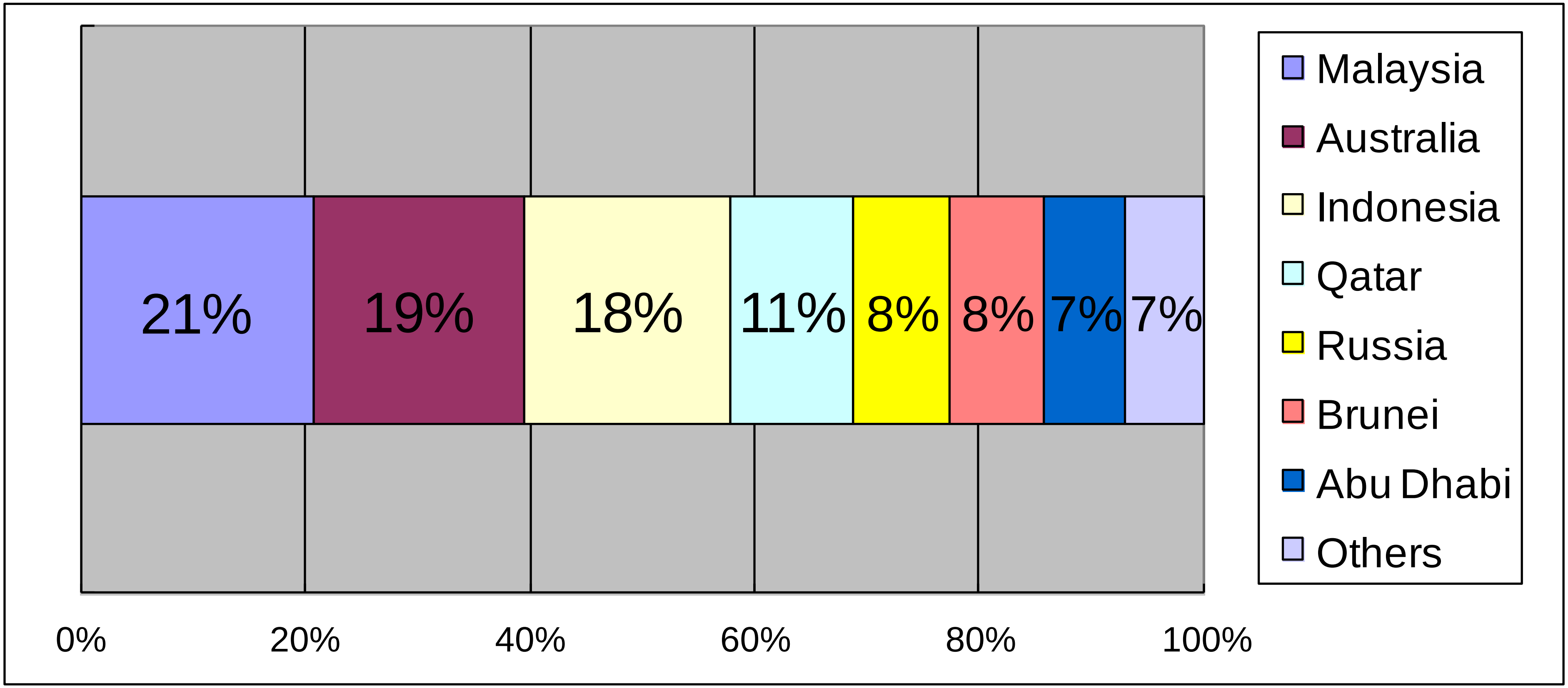
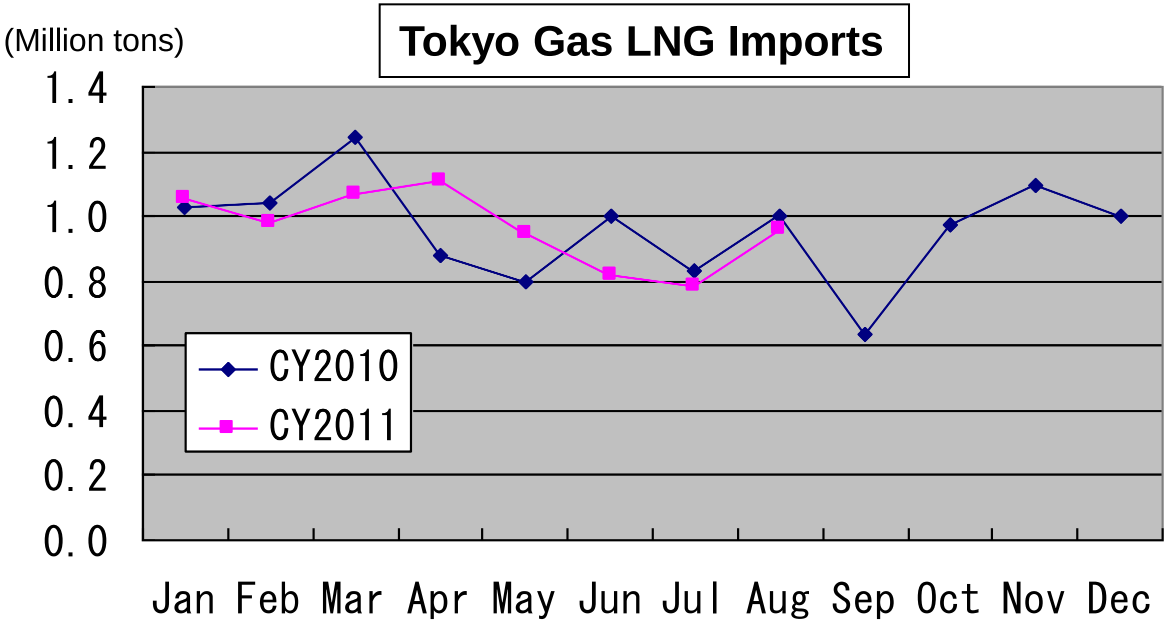
- **Imports from various countries centered on the Pacific Rim region (i.e. Malaysia, Australia and Indonesia)**
- **Imports from Middle East countries limited to 20% (10% for Gas companies)**

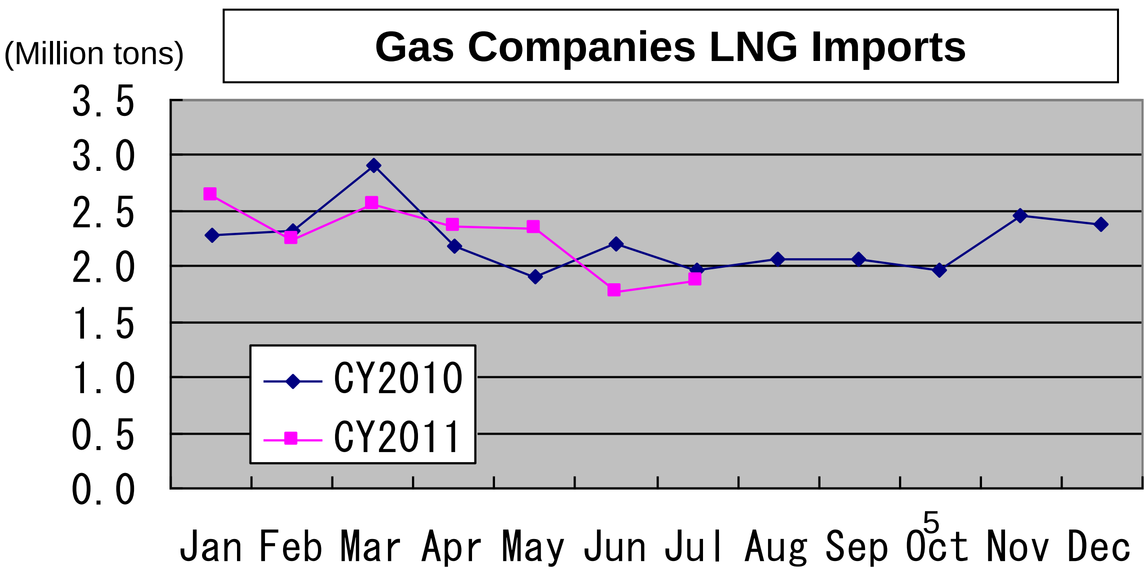
(Ref.) The Middle East accounts for about 90% of all petroleum imports

Japanese LNG Imports by Country (FY2010)



Changes in Japanese LNG Demand after the Earthquake Disaster

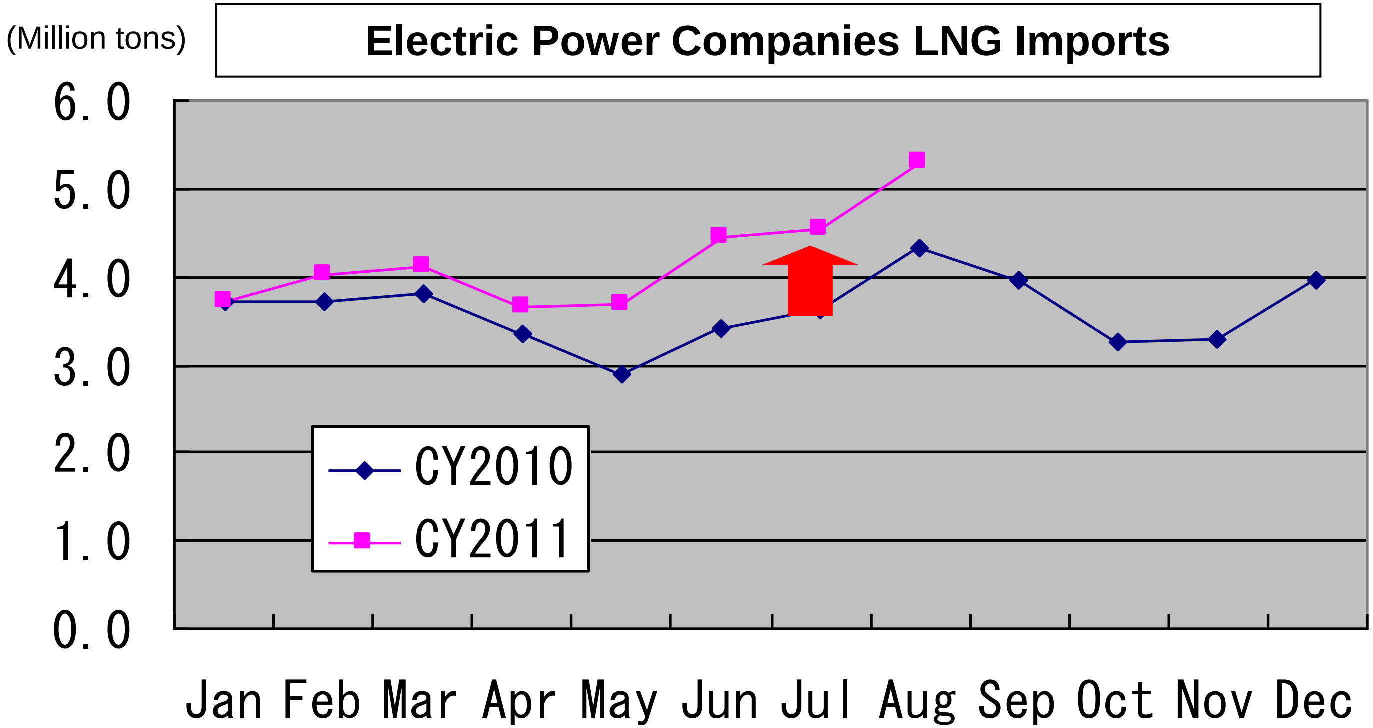




- **Increased gas demand for CGS and electric power generation**
- **Gas demand for automobile and other manufacturing declined with supply chain confusion, etc., but has been gradually recovering**
- **Declining trend in residential and commercial sector use with stronger energy conservation awareness during the summer**

Basically flat on year-on-year basis

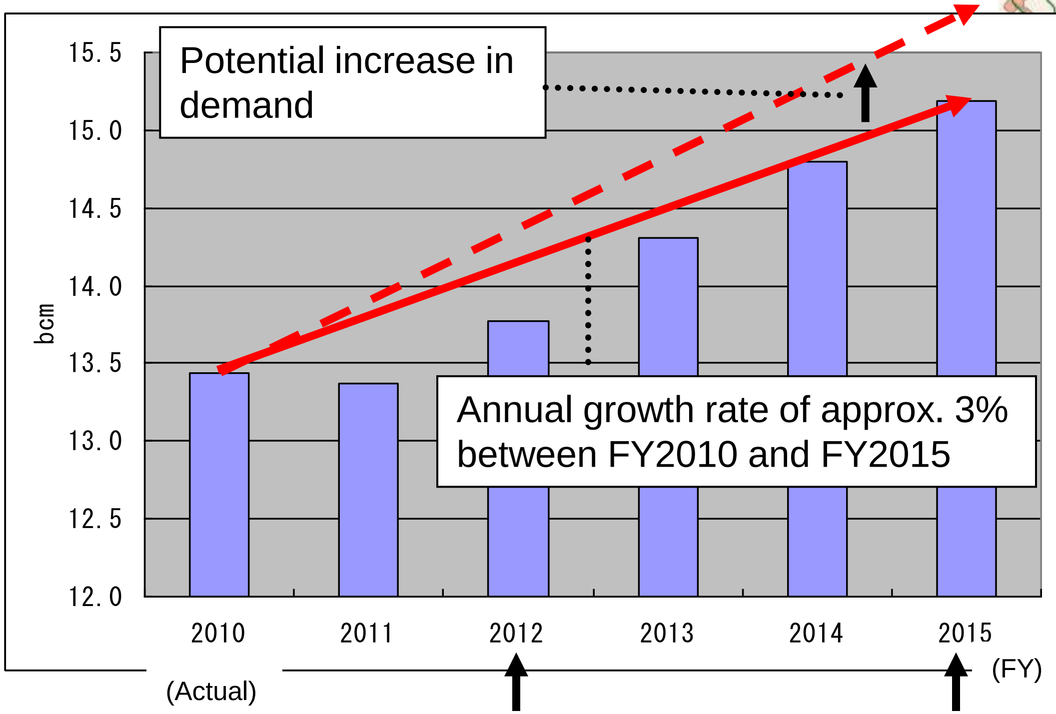
Changes in Japanese LNG Demand after the Earthquake Disaster



- Large increase in LNG consumption volume with the suspension of nuclear power operations
- As operations at existing nuclear power plants are suspended for periodic inspections, future demand will fluctuate greatly depending on when plants go back on line after stress tests

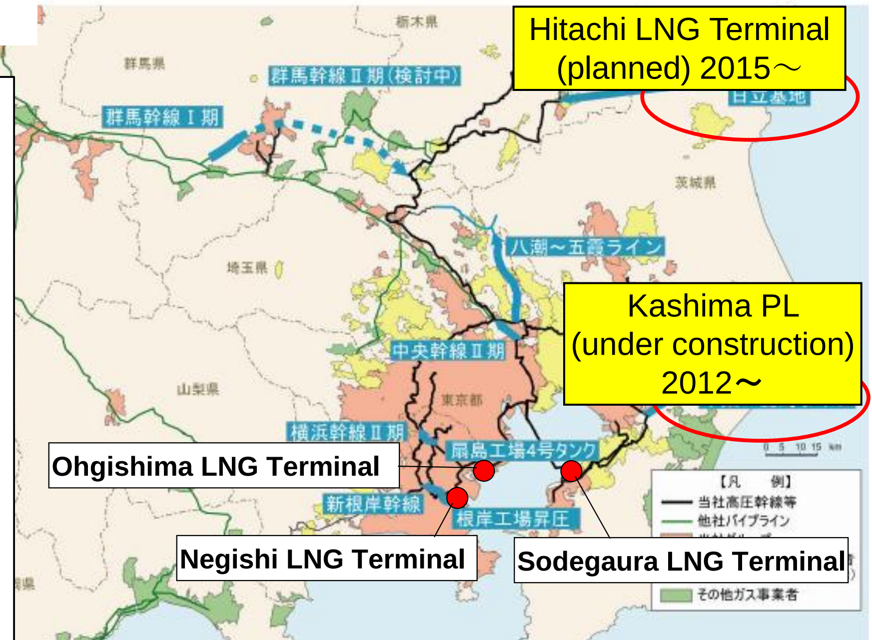
LNG Demand Outlook for Tokyo Gas

<Tokyo Gas supply plan (prior to the disaster) >



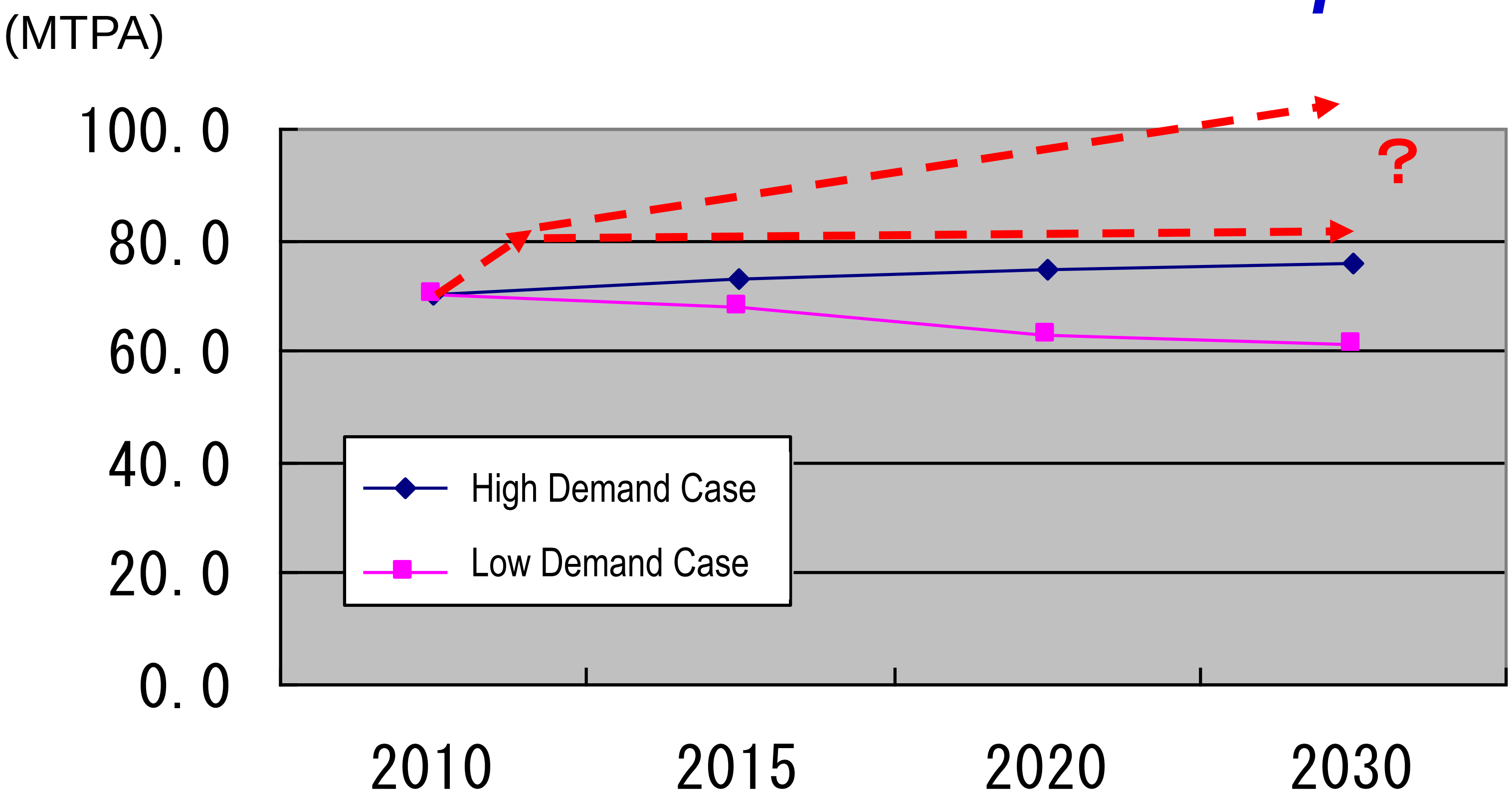
Kashima PL 2012～

Hitachi LNG Terminal 2015～



Reinforcement of infrastructure to expand LNG demand

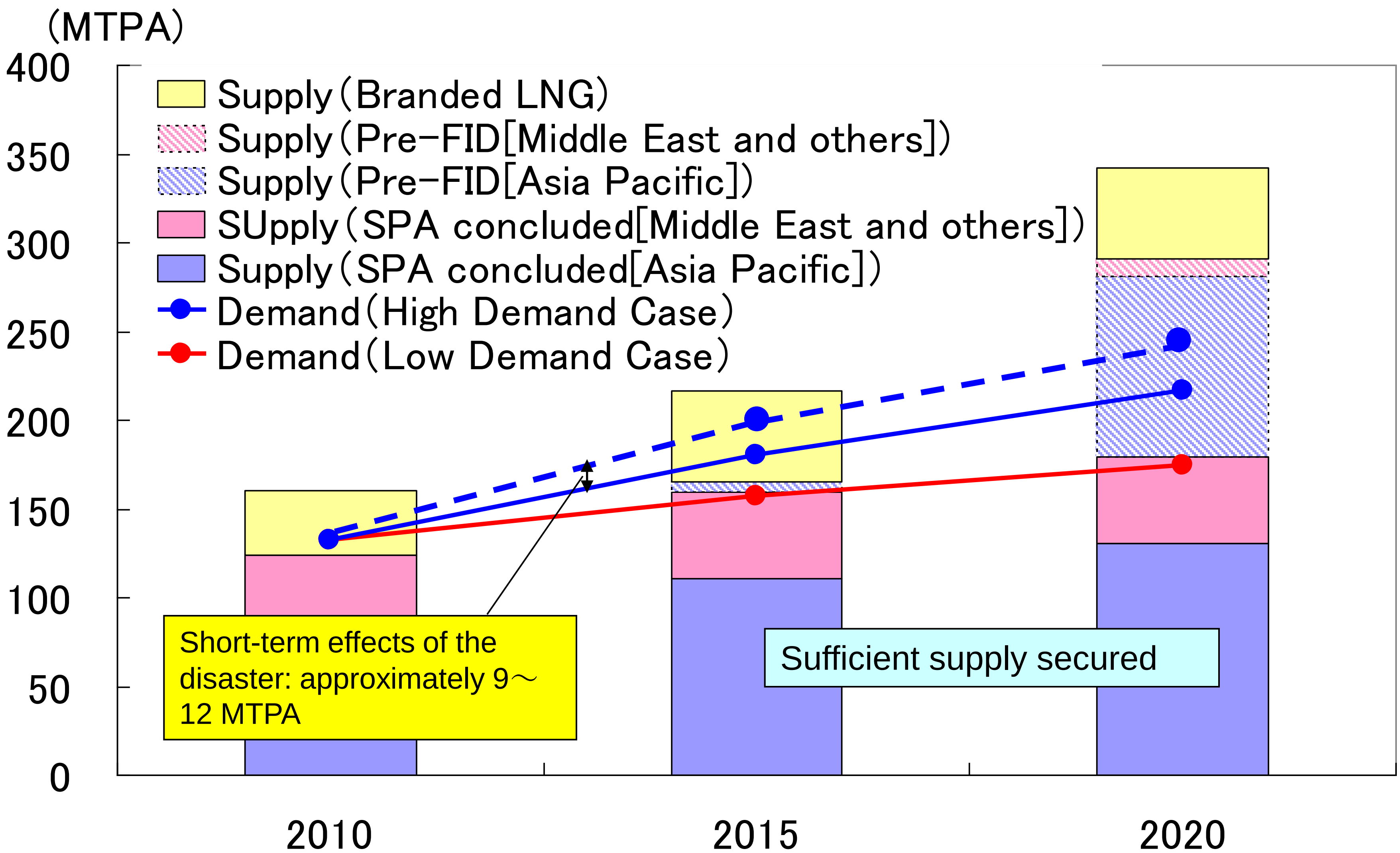
LNG Demand Outlook for Japan



Source: The IEEJ
(Prior to the disaster)

- While gas companies had assumed an increase in LNG demand prior to the earthquake disaster, the outlook is for an even larger increase from expansion in demand for CGS and gas air conditioning.
- Electric power companies had projected declining LNG demand from a shift to nuclear power prior to the earthquake disaster, but LNG demand will greatly increase in the short term. Long-term demand will fluctuate widely depending on Japan's nuclear power and energy policies.

LNG Supply and Demand Outlook for Asian and Middle Eastern Markets (Prior to the Disaster)



Source: The IEEJ

Global Natural Gas Trade and Regions (2010)

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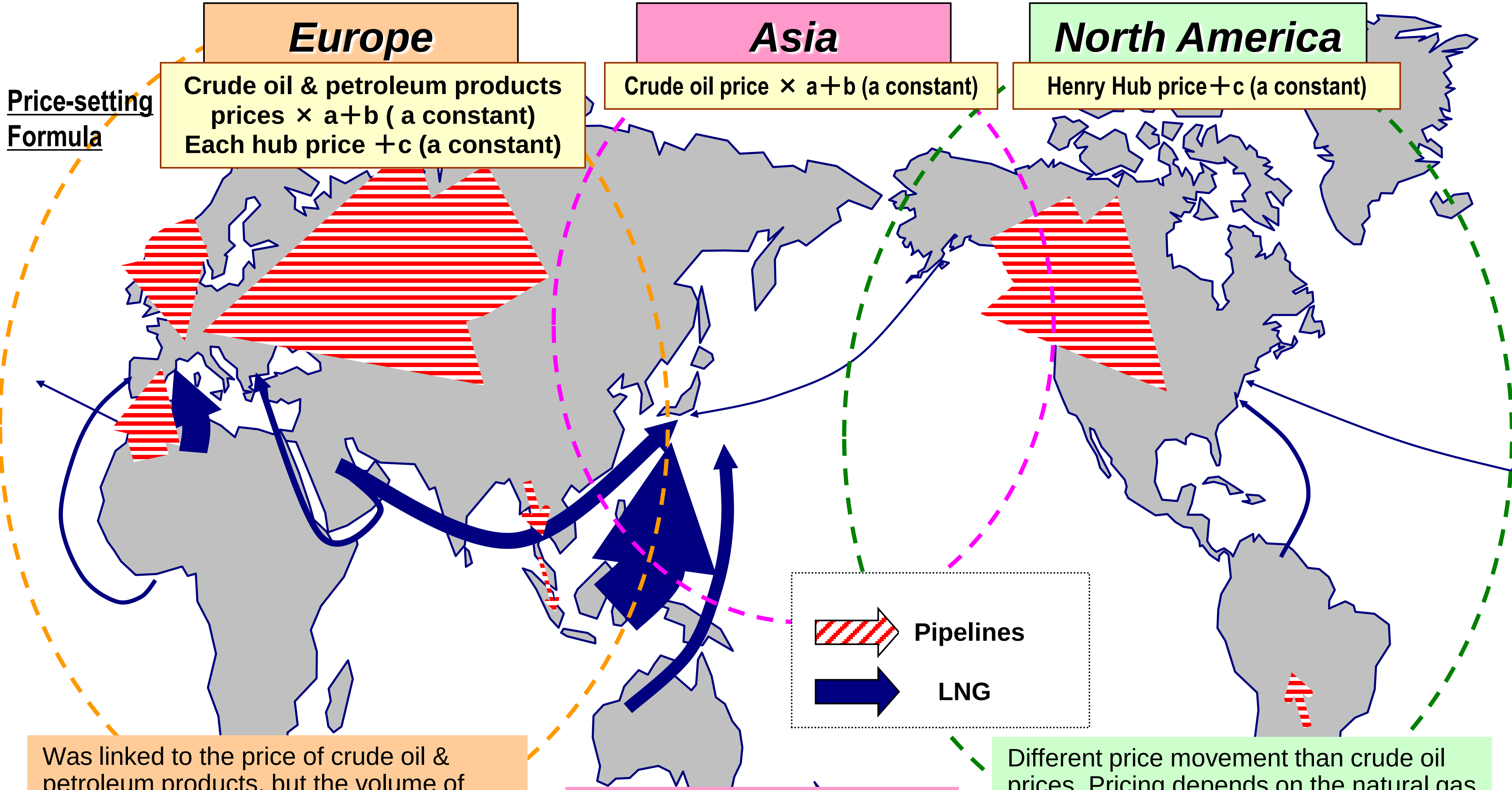
Price-setting Formula

	Europe	Asia	North America
Price-setting Formula	Crude oil & petroleum products prices × a+b (a constant) Each hub price +c (a constant)	Crude oil price × a+b (a constant)	Henry Hub price+c (a constant)

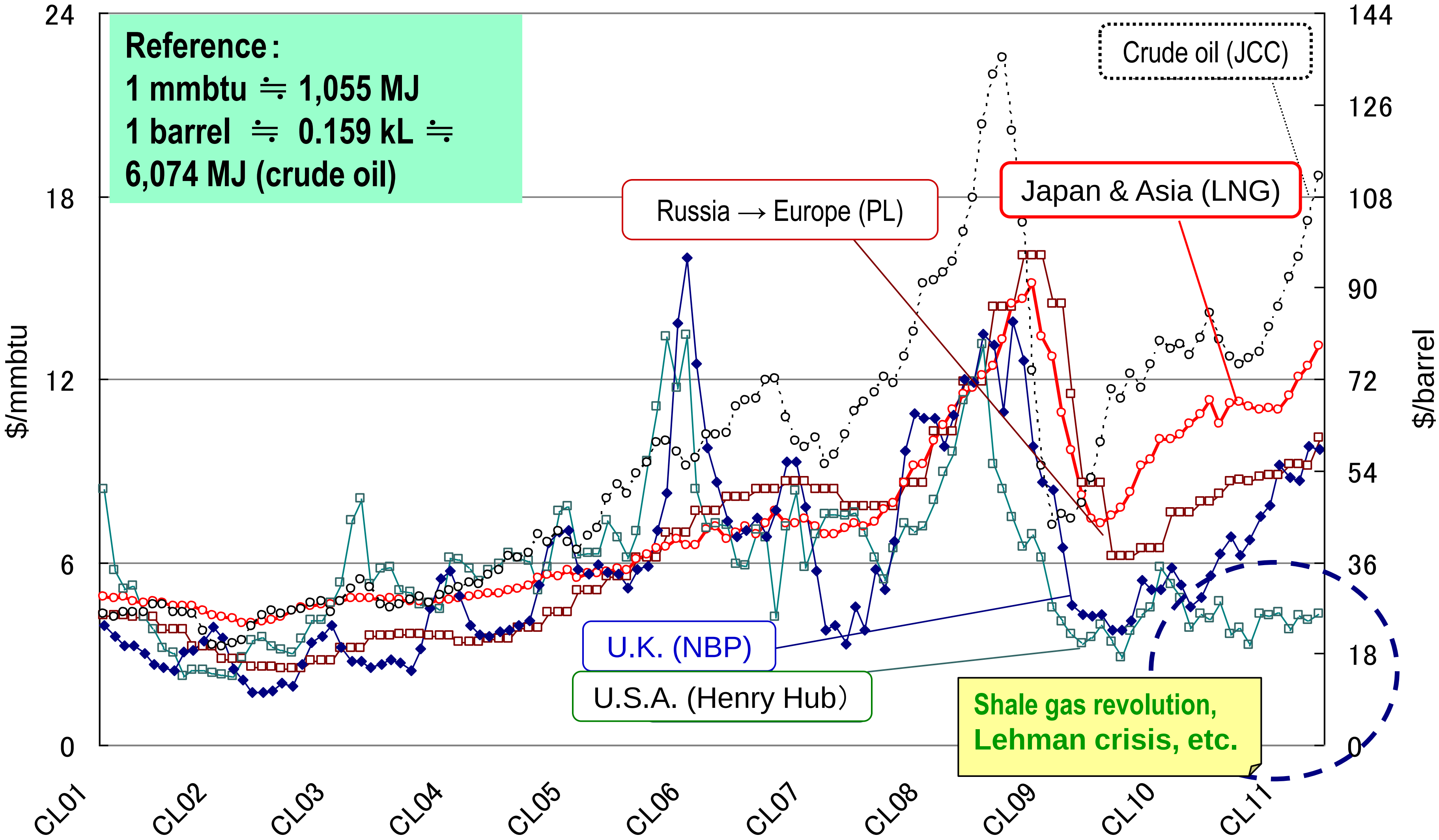


Was linked to the price of crude oil & petroleum products, but the volume of hub price gas spot trading increased from the late 1990s centered on the U.K., and from 2010 some hub prices are reflected in pipeline prices.

No competition with pipeline gas prices; LNG price linked to the price of crude oil.

Different price movement than crude oil prices. Pricing depends on the natural gas (pipeline) supply and demand. The prices shot up higher than crude oil prices in 2006 from a tight supply-demand balance, but have since remained low with progress in shale gas development.

World Natural Gas Prices



Source: WGI, Trade Statistics of Japan

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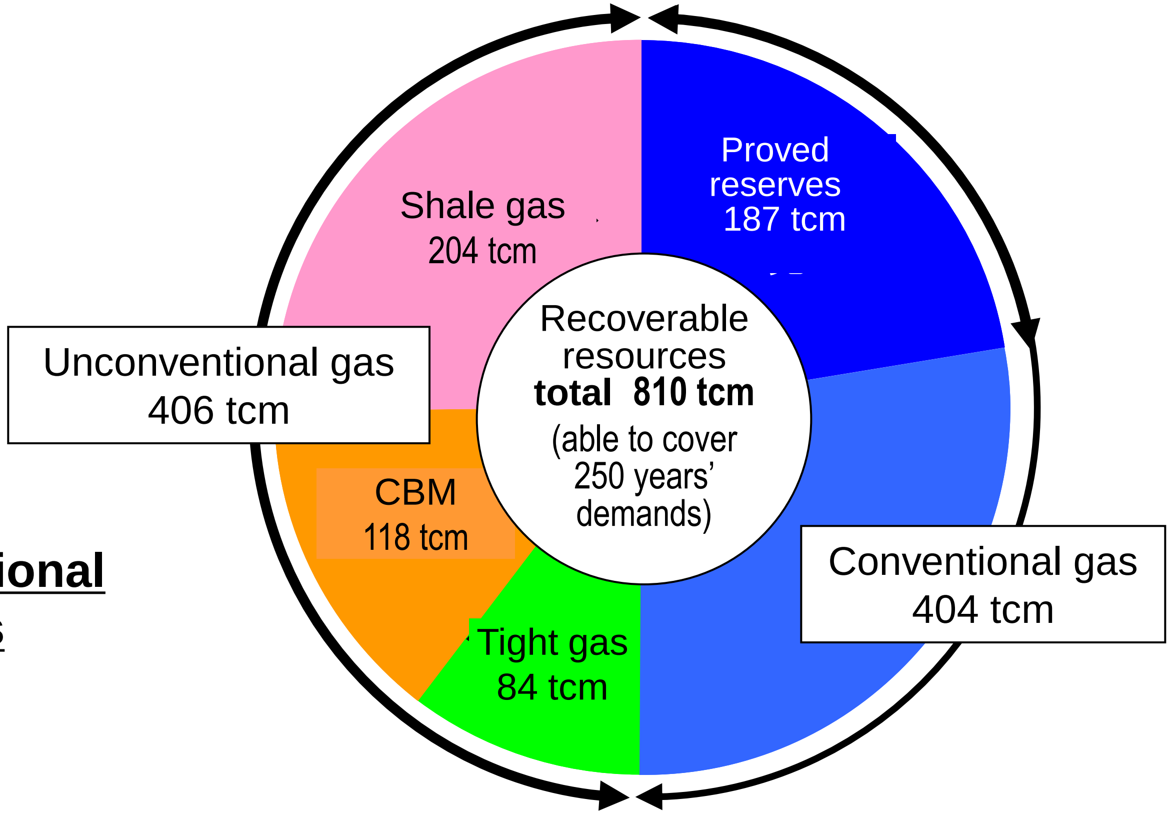
Natural Gas Resources

Proved reserves

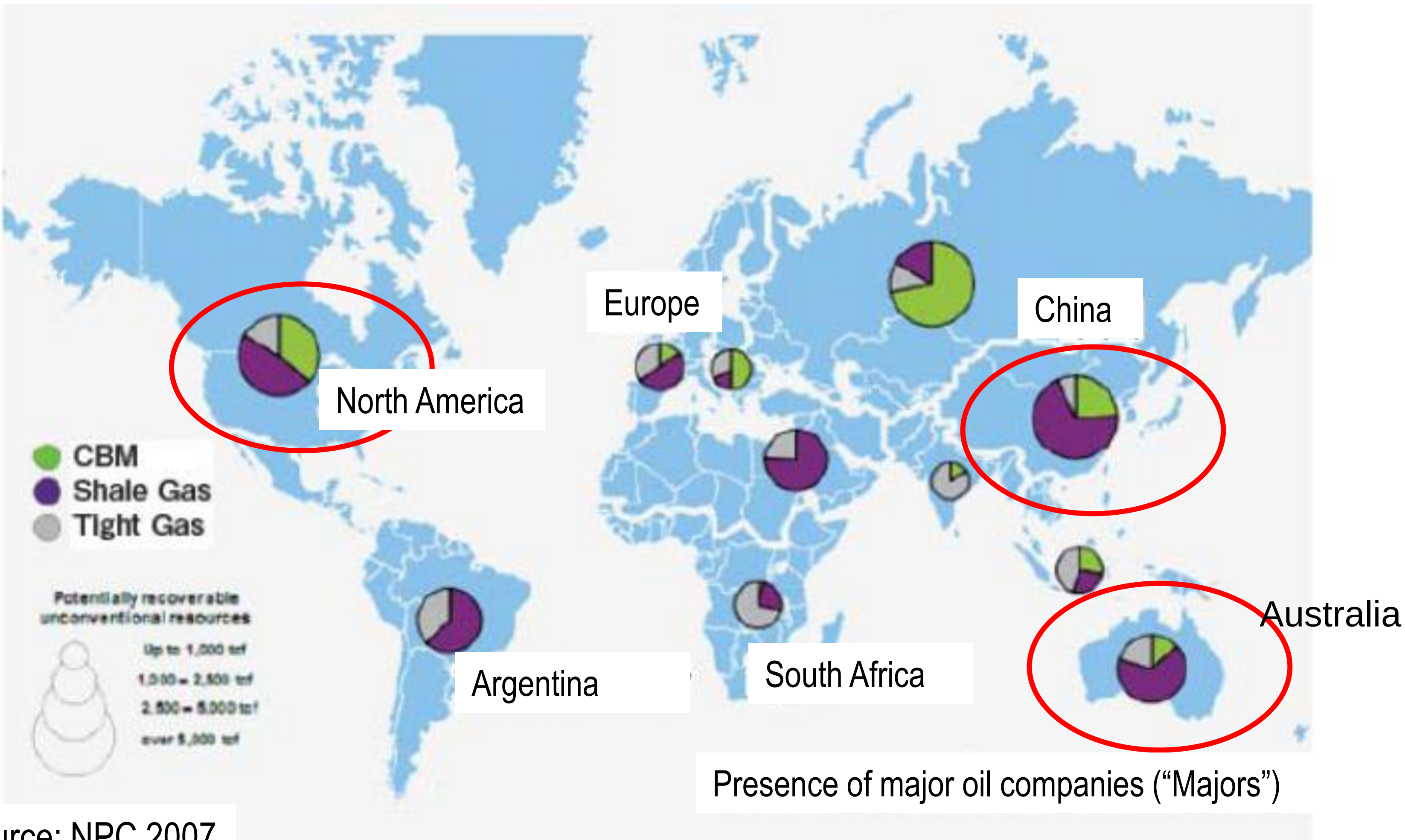
Approximately 4 times

Conventional + unconventional recoverable resources



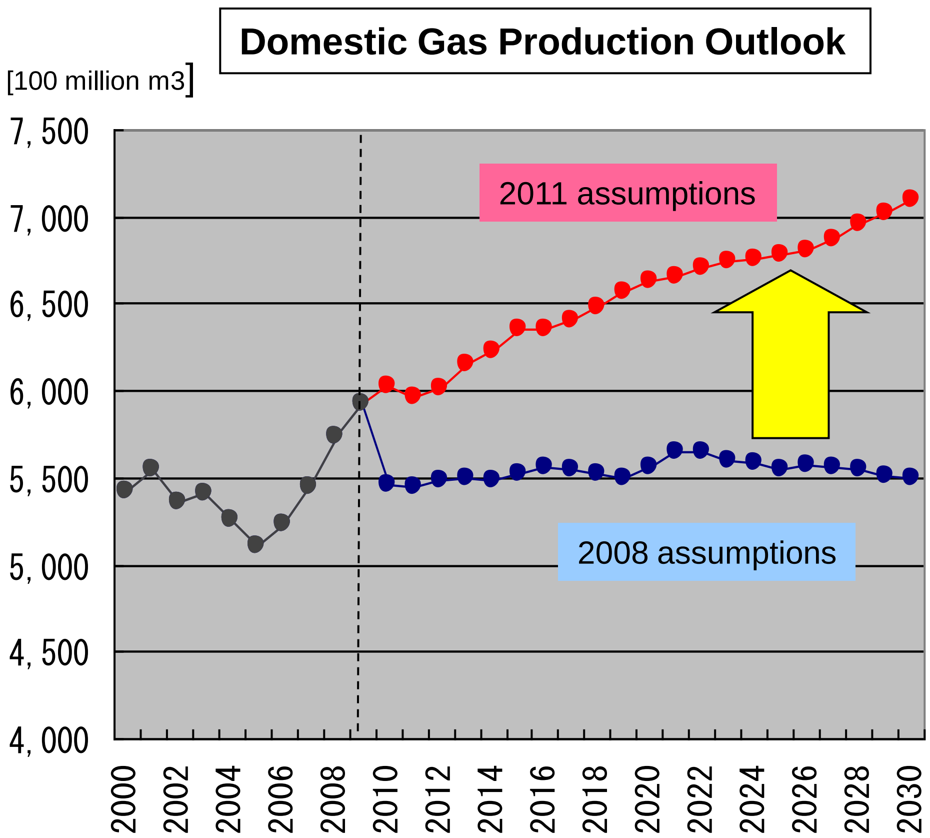
Source: IEA "World Energy Outlook 2010 and 2011 (Are we entering a golden age of gas?)"; "BP Statistics 2010"; EIA "Shale Gas and the U.S. Energy Outlook"

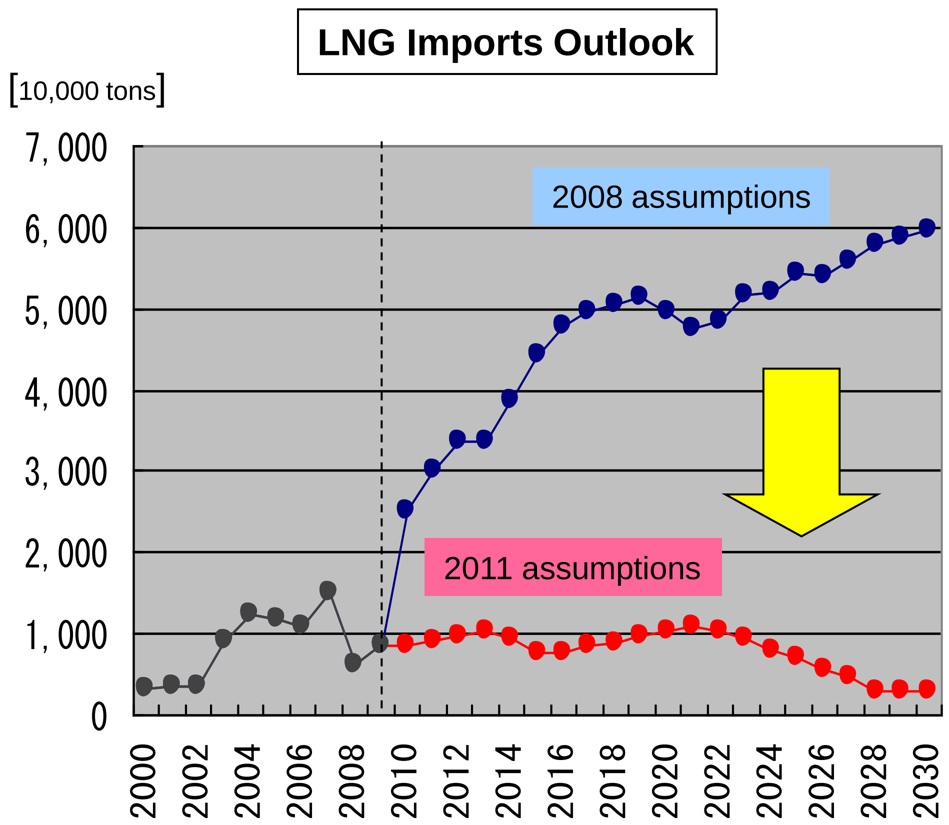
Global Unconventional Gas Distribution



Source: NPC 2007

U.S. Gas Production and LNG Imports Outlook





※Actual results through 2009

- Large upwards revision in U.S. domestic gas production outlook, mostly from increased shale gas and other unconventional gas production (Unconventional gas production share increase from 54% at present to 73% in 2030).
- Large downwards revision in LNG imports outlook along with increased domestic gas production.

Source: EIA Annual Energy Outlook

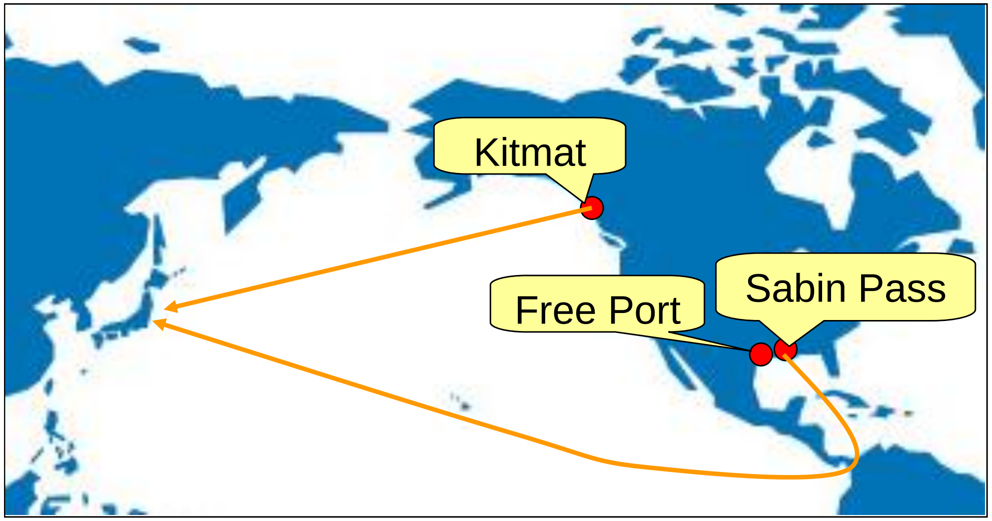
Participation in Canadian Shale Gas Development

■ Possibilities to export shale gas to Japan as LNG from Canada and the U.S.

North America LNG Export Plan

- Multiple projects are being advanced to liquefy North American natural gas and export it to Asia and Europe.

  - Kitimat (Canada)
    Apache (GN, KOGAS, MC)
    10 MTPA; to begin supply in 2015
  - Shell (Canada)
    Partner (CNPC, KOGAS, MC)
  - Sabin Pass (Louisiana, U.S.; in operation as an LNG receiving terminal)
  - Free Port (Texas, U.S.; in operation as an LNG receiving terminal)



* The U.S. was only allowing gas exports to countries that have an FTA with the U.S., but Sabin Pass received permission for exports on May 20.

Expansion of the Panama Canal

- A wide canal parallel to the existing canal is scheduled to be built <u>by August 2014</u>

- The new canal will accommodate passage of LNG carriers and other large vessels (up to 366m length, 49m width, 15m draft)

→ Vessels will no longer have to travel around the Cape of Good Hope, Africa

Participation in CBM-LNG Projects in Australia

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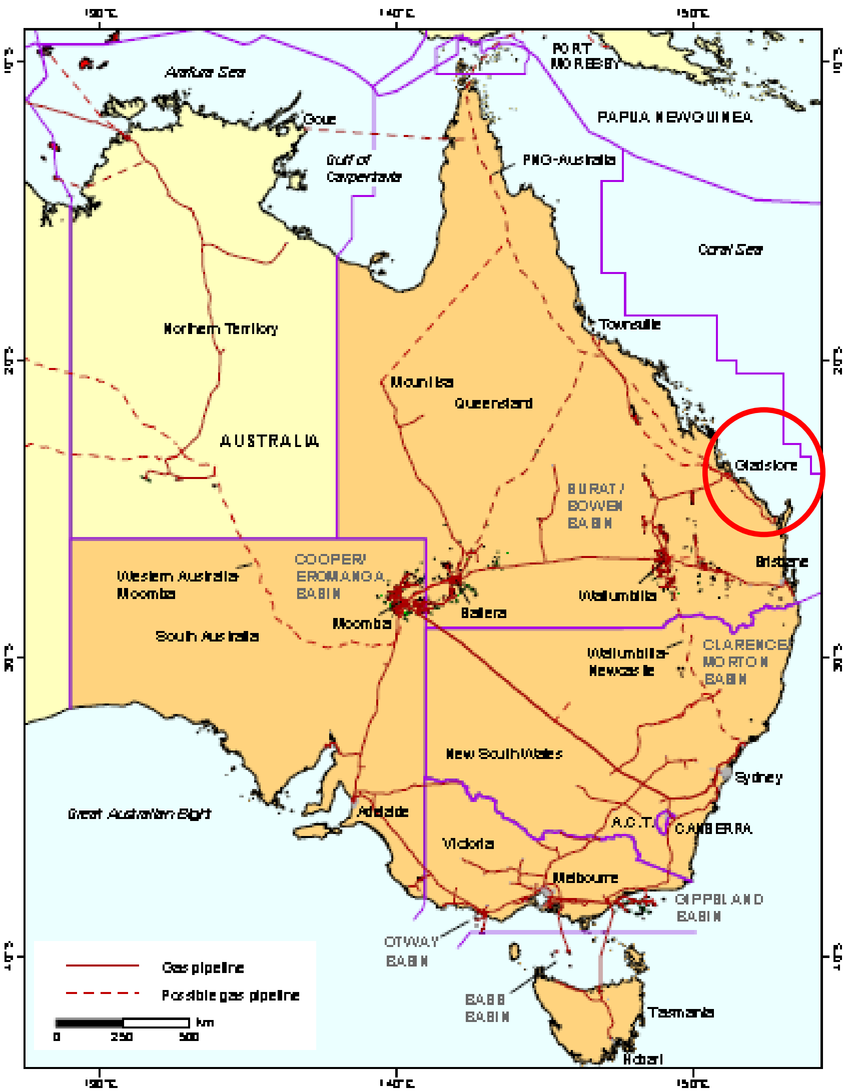


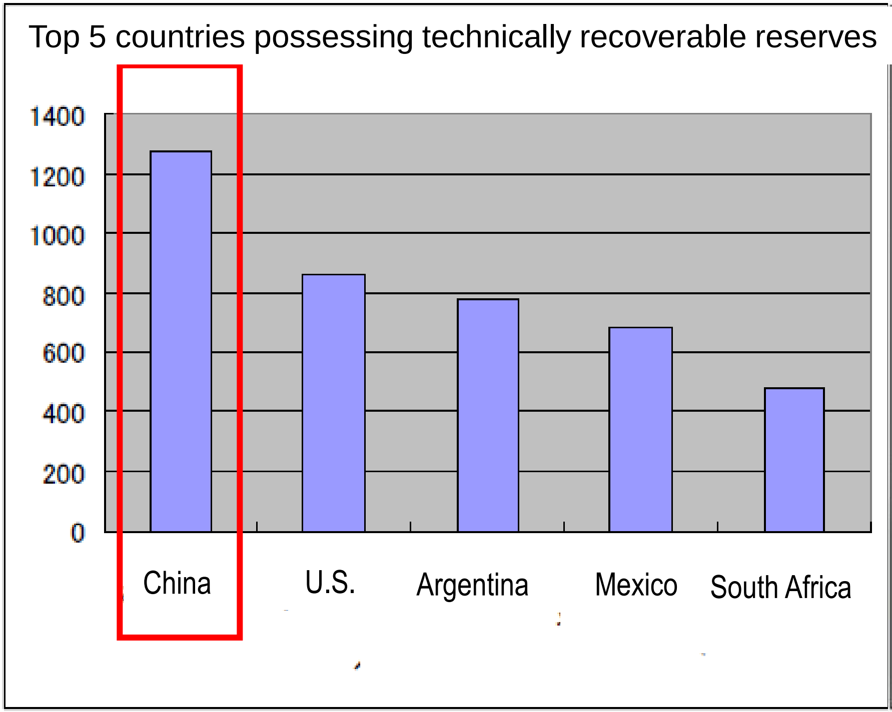
- Several CBM-LNG export projects are currently underway in Queensland.
- Potential production volume of 50 MTPA after 2014.
- SPA for Queensland Curtis LNG with BG Group plc. (March 2011)
- Tokyo Gas is **the first Japanese CBM-LNG buyer**.

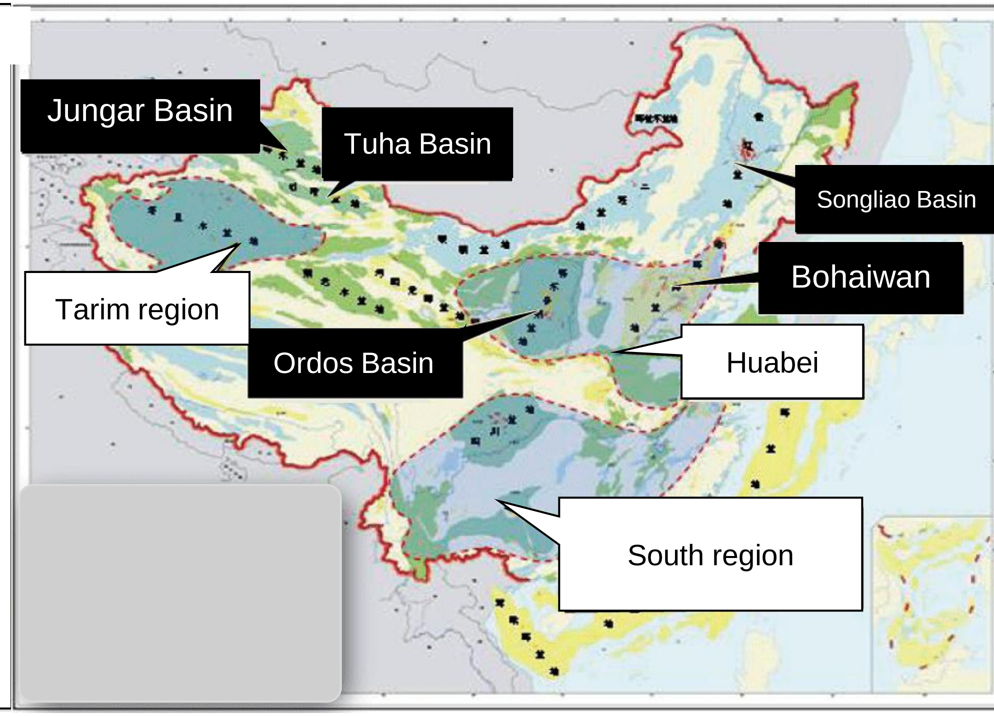
Source: Wood Mackenzie, JOGMEC

CBM-LNG Projects in Australia

	Ownership	Scheduled start of operations	Capacity (MTPA)
QC LNG	BG 93.75%, CNOOC 5%, TG 1.25%	2014	8.5
GLNG	Santos 30%, Petronas 27.5%, Total 27.5%, Kogas 15%	2015	7.8
AP LNG	CoP 42.5%, Origin 42.5%, Sinopec 15%	2015	9.0
Arrow Energy LNG	Shell 50%, PetroChina 50%	2017	8.0
Fisherman's Landing	LNG Ltd 100%	2014	3.0

Shale Gas in China





Source：EIA

- China has recoverable reserves (in Sichuan and the Tarim Basin) of 1,275 tcf (36 tcm), surpassing those in North America

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Impact of Unconventional Gas on the Asia-Pacific Market

- Progress of shale gas and CBM development in East Asia
- Start-up of many CMB projects in Australia

Large role in easing the supply-demand balance in the Asia-Pacific market

Impact of Unconventional Gas on the Asia-Pacific Market

North American shale gas LNG export plan

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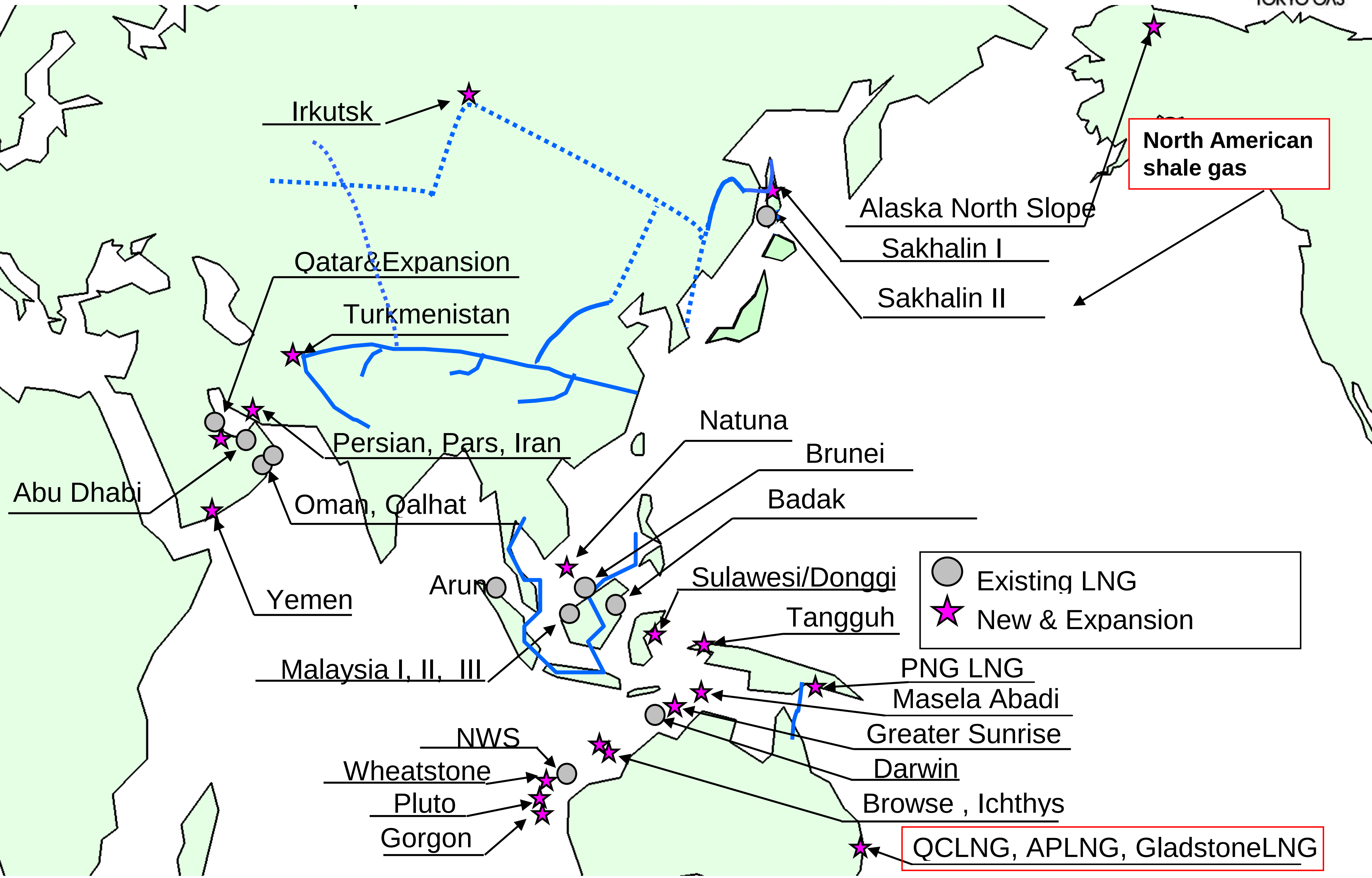
- Impact on traditional LNG price in the Asia-Pacific market
- Enhancement of liquidity in the spot market

New Natural Gas Projects in the Asia-Pacific Region



Future East Asian Market

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- Declines in reserves and increases in domestic gas consumption in Malaysia, Brunei and other countries
- High cost of new LNG projects in Australia, etc.

Efforts to change the structure of the Asian market

Single framework among East Asian buyers (Both conventional gas and unconventional gas)

Efforts by Asian buyers to break the Asia premium

■ Share of risks and returns

■ Forming a price downtrend by taking on new challenges

The "Energy Horizon" (new LNG carrier christened July 6)