

Natural Gas and Japanese Energy Market

- opportunities and challenges

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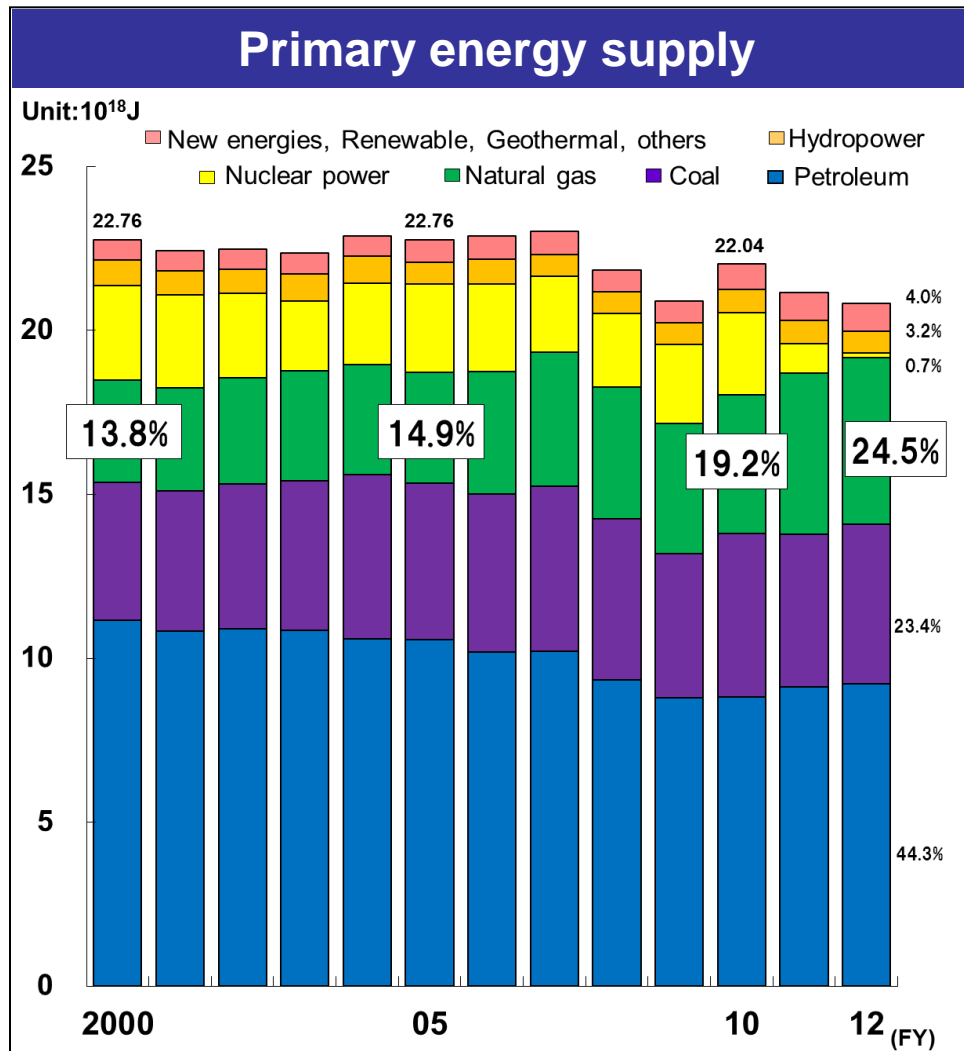
GASEX 2014
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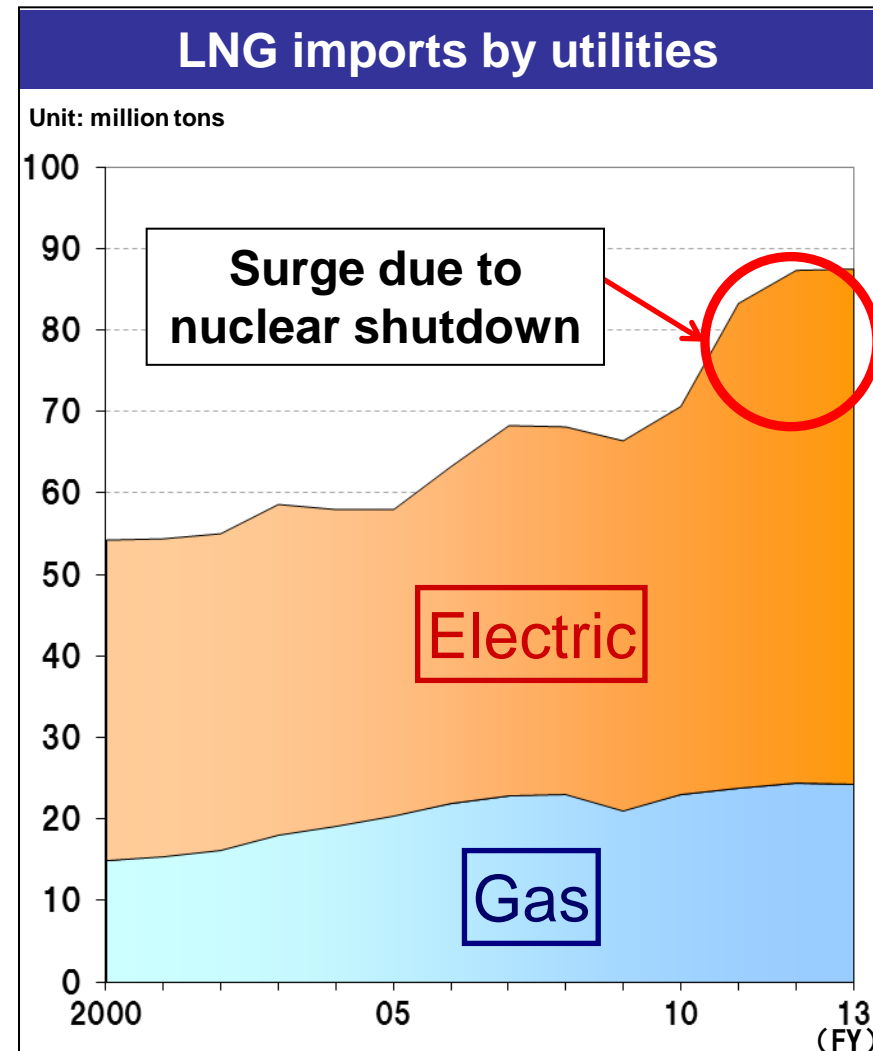
- 1. Japanese gas industry: an overview**
- 2. Changes in Energy Policy**
- 3. Deregulation of Energy Market
- opportunities**
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1. Japanese gas industry: an overview

Primary Energy Supply and LNG Imports



Source: Based on Agency for Natural Resources and Energy, "Energy White Paper 2014"



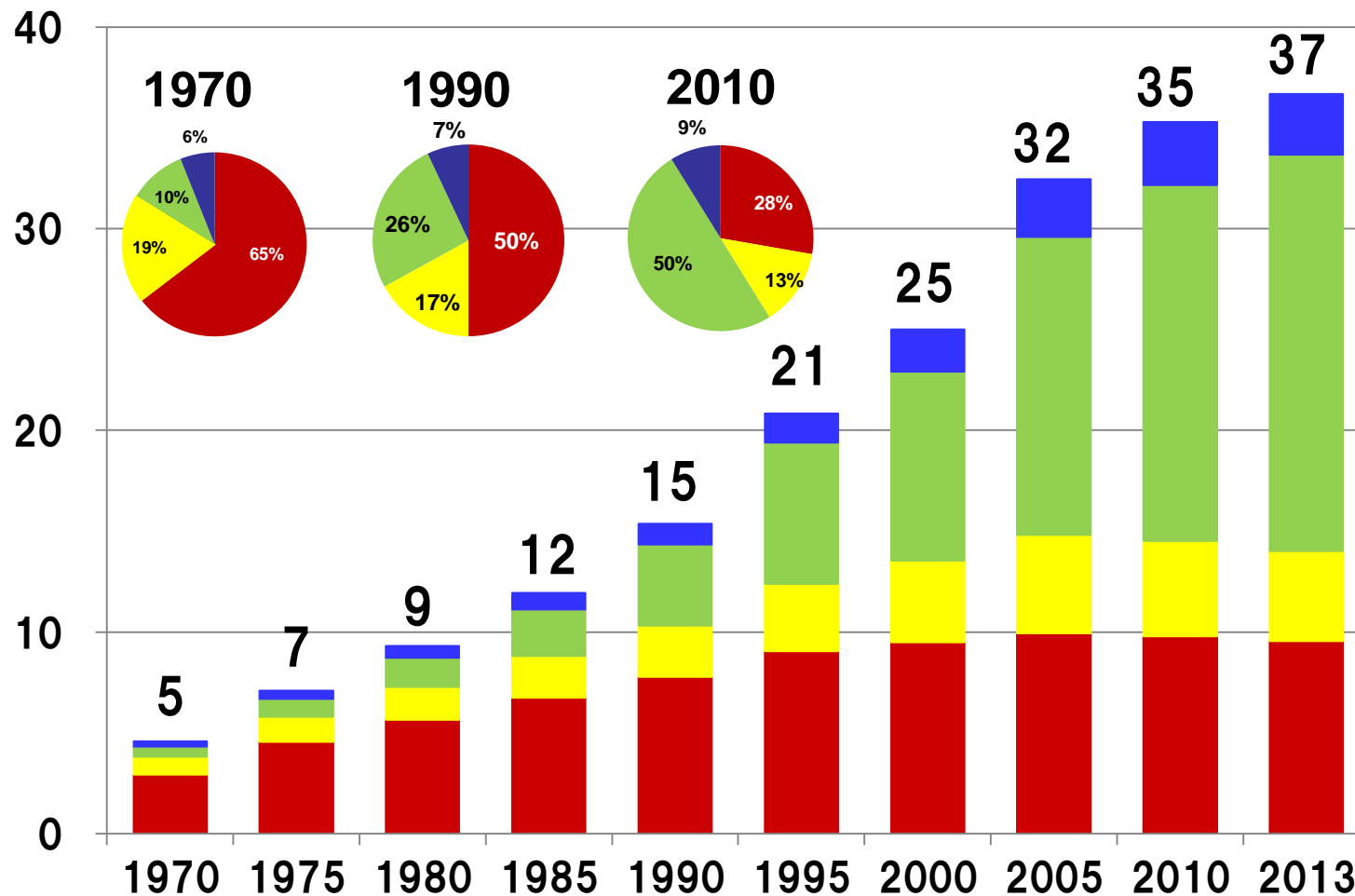
Source: Ministry of Finance, "Trade Statistics of Japan"

Trend of Gas Sales

1970 - 2013

Unit: billion m³ (41.8605MJ)

■ Residential ■ Commercial ■ Industrial ■ Other



Source: Japan Gas Association studies

New Gas Equipment for Optimum Energy Solutions

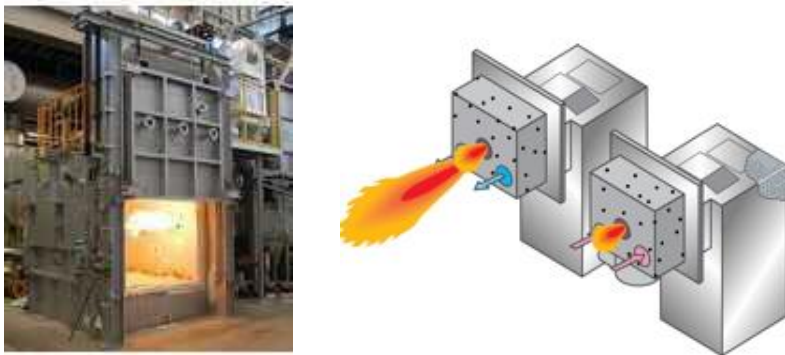
Cogeneration and fuel cells - balancing heat and electricity demand



Gas space cooling and heating - energy saving, reducing CO₂ emissions



Advanced industrial gas applications

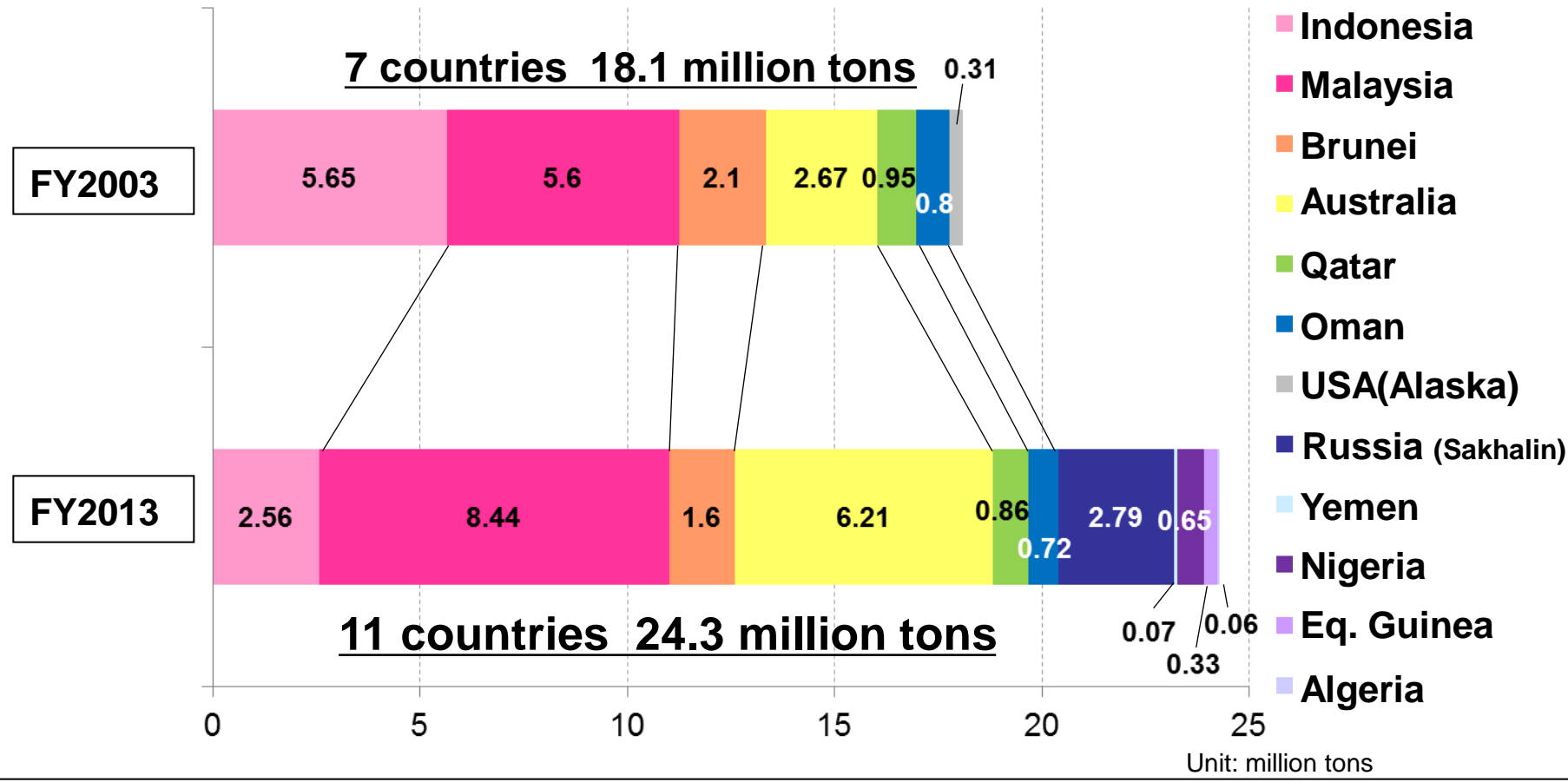


Higher comfort and safety in kitchen



LNG Imports by Gas Utilities

Diversifying supply sources



2. Changes in Energy Policy

Changes in Energy Policy

- before and after Fukushima

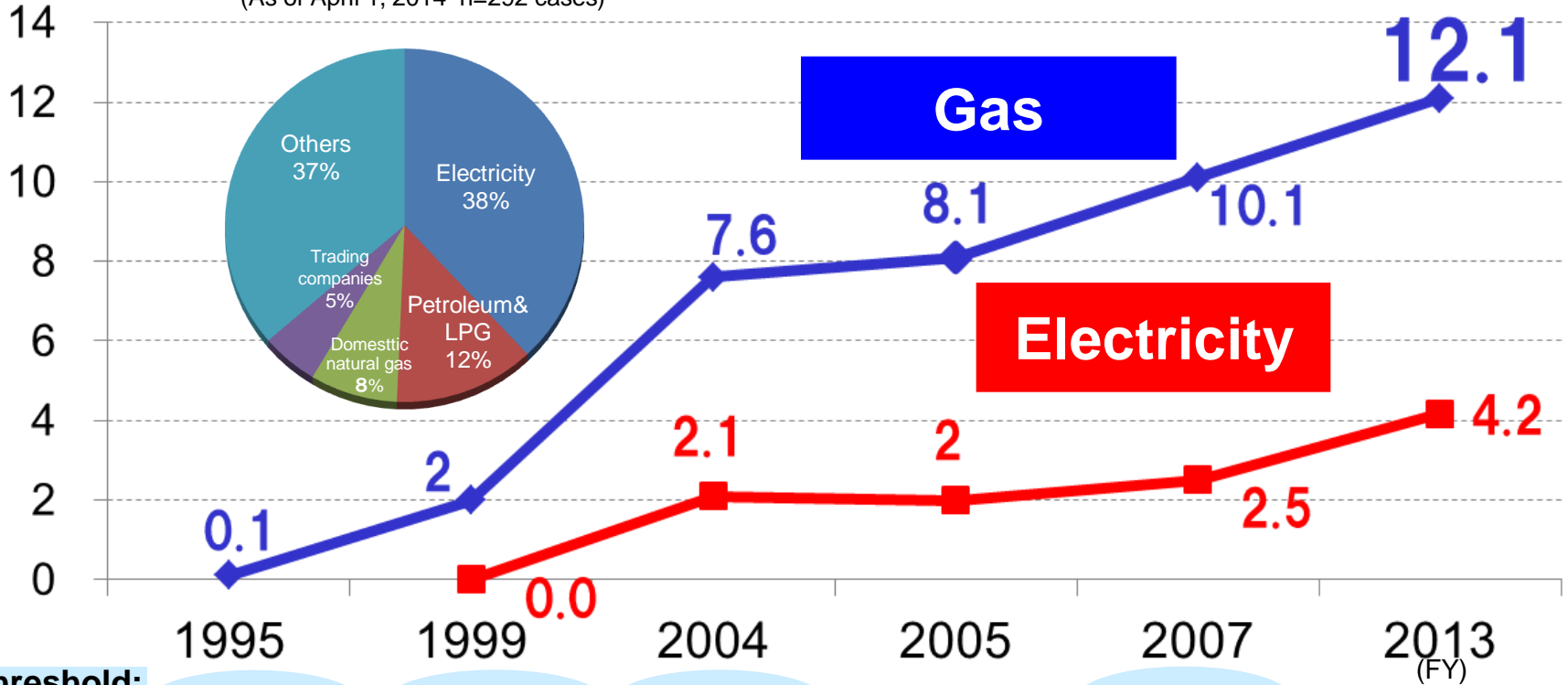
	Criteria	Policy focus
Before	<u>E</u> nergy security <u>E</u> conomic efficiency <u>E</u> nvironment	Zero-emission power: 70% Nuclear: 50% Renewables/hydro: 20%
Overcoming energy constraints		Revitalizing economy
After	<u>S</u> afety + <u>E</u> nergy security <u>E</u> conomic efficiency <u>E</u> nvironment	Diversifying power supply Increased use of natural gas + Distributed generation

3. Deregulation of Energy Market - opportunities

Development of Energy Market Deregulation

New entrants' market share (sales volume)

(%) **Breakdown of new entrants by type of business**
(As of April 1, 2014 n=292 cases)



Threshold: Gas

2 million m³ -

1 million m³ -

0.5 million m³ -

0.1 million m³ -

Threshold: Electricity

2,000kW -

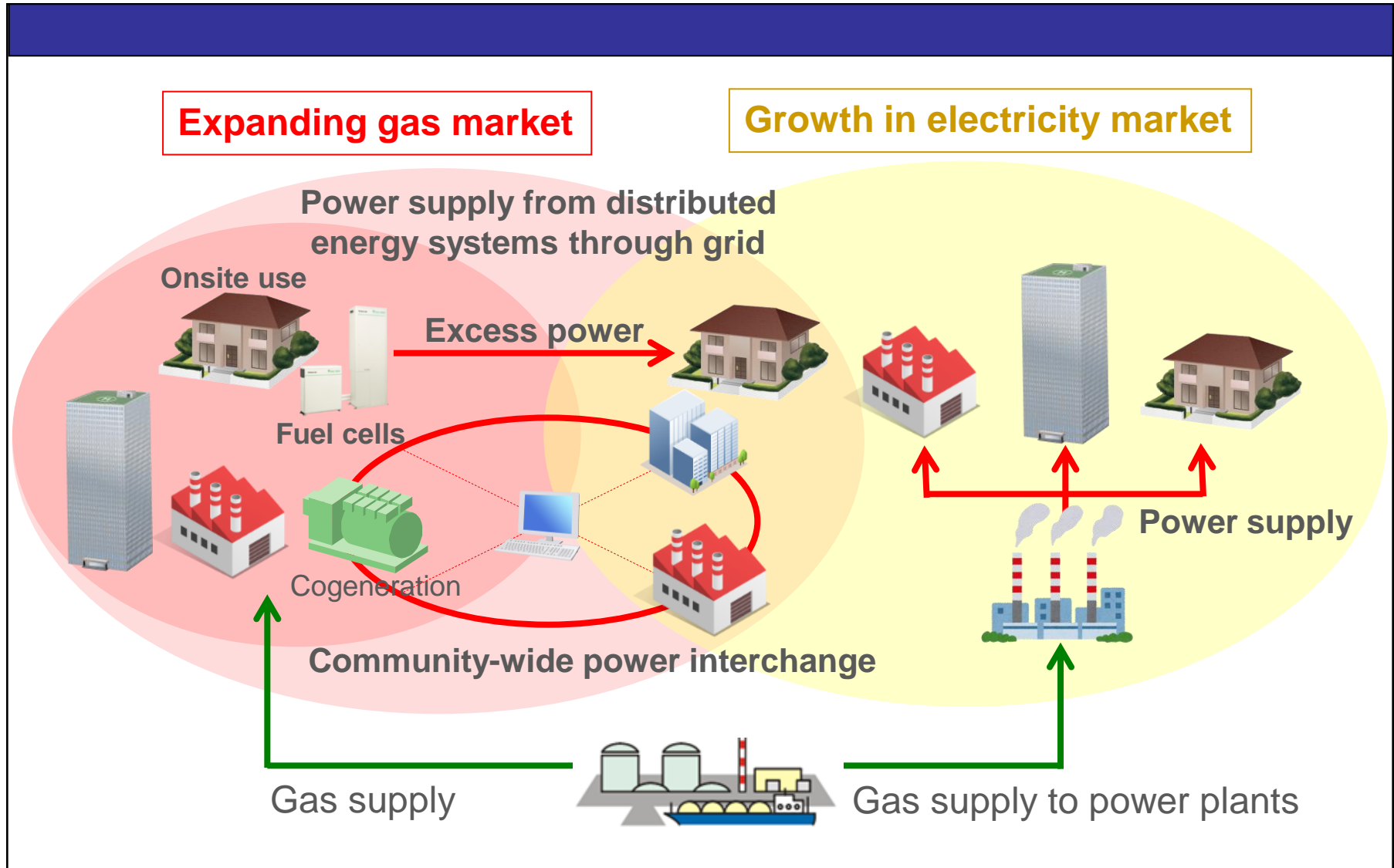
500kW -

50kW -

Source: Agency for Natural Resources and Energy

Growth in new market participants with full liberalization

Gas Business in Liberalized Energy Market



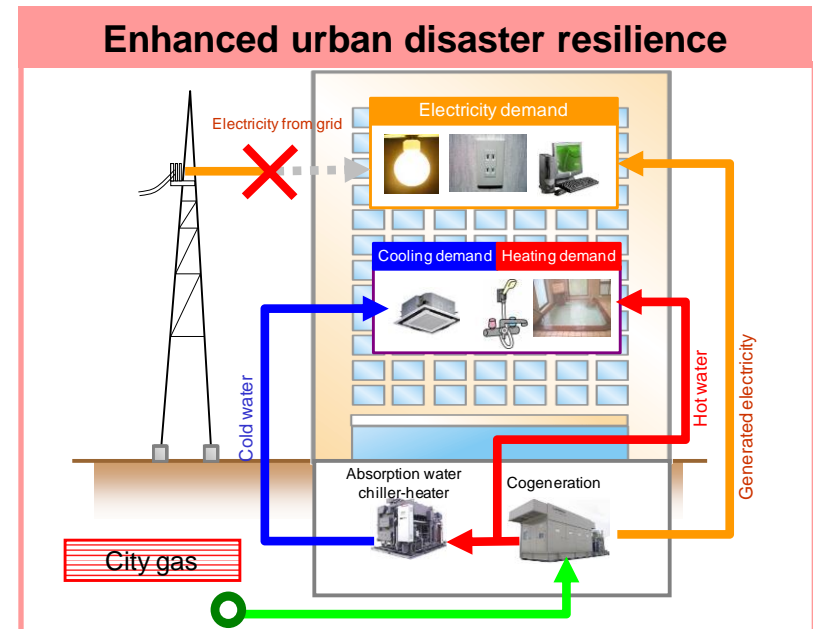
Smart City Project: advanced use of cogeneration

Nihonbashi Smart City in Tokyo

- 30% reduction in energy use and CO₂ emissions
 - Improved resilience against natural disasters
- Essential electricity supply for business continuity program (BCP) at blackout



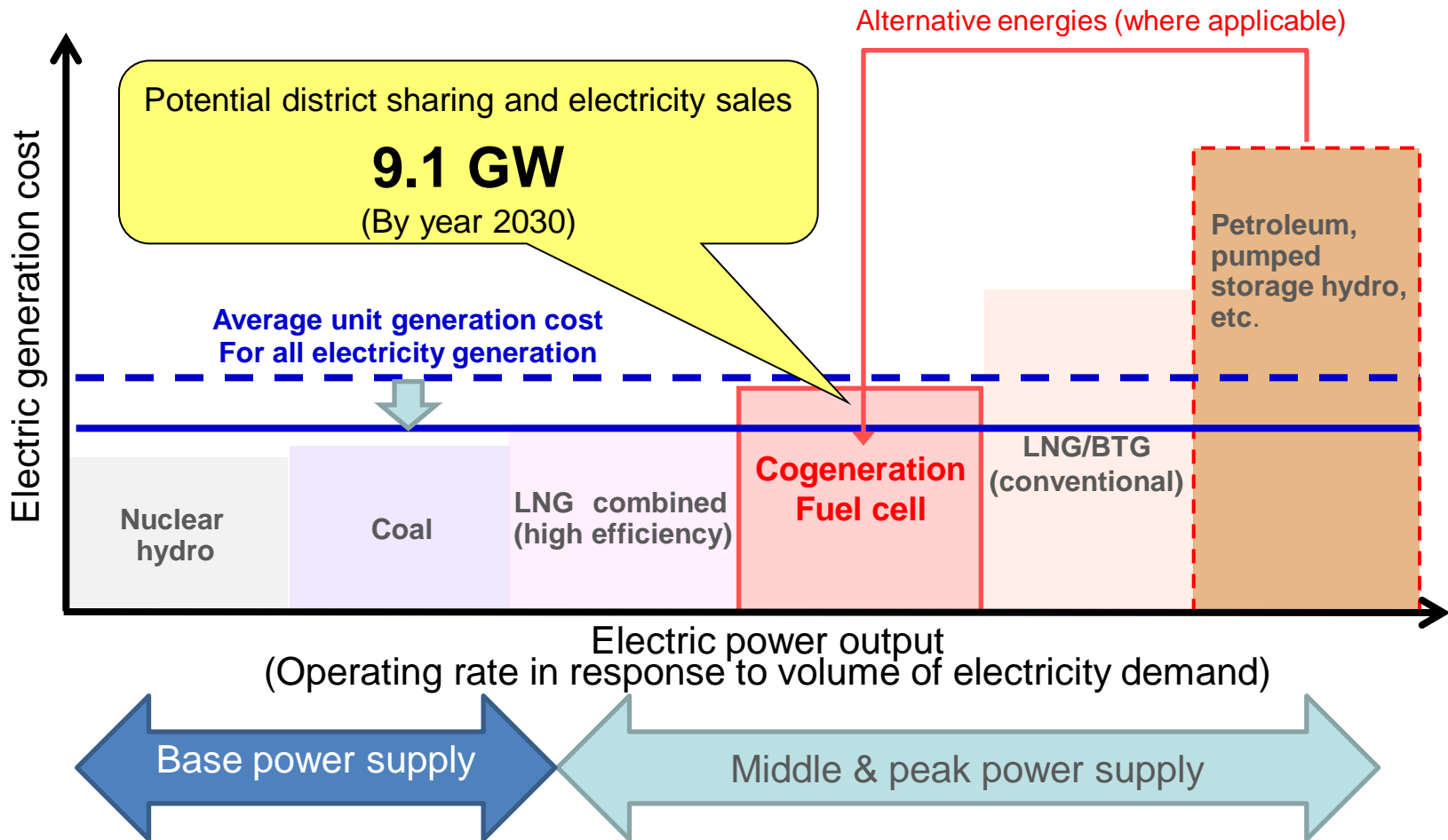
Source: Mitsui Fudosan Co., Ltd. website



Using the Electric Power Supply Capacity of Distributed Energy Systems

Reducing total electric power generation cost and electricity bill

■ Use of low cost power sources to control generation costs



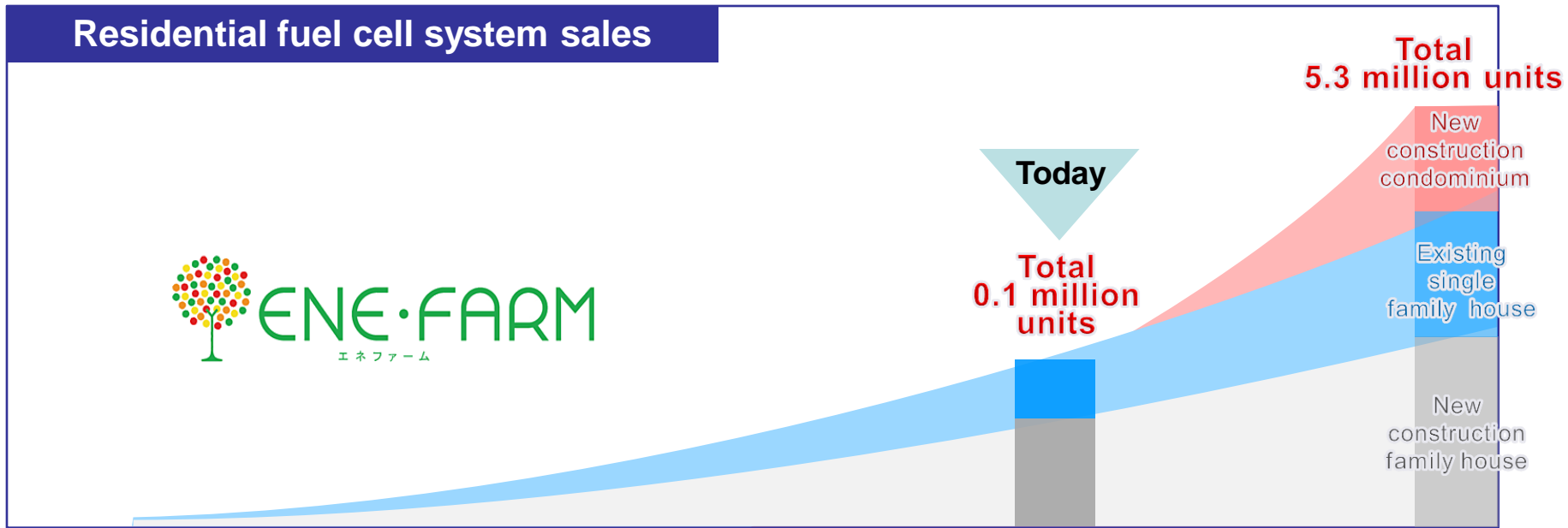
Gas Vision 2030: expanded use of natural gas 1

Steps to be taken by 2030	
2012	2030
1. Cogeneration 4.82 GW	6x → 30 GW
2. Gas airconditioning 13 million RT	2x → 26 million RT
3. Industrial heat demand 11.5 %	2x → 25.0 %
4. Residential fuel cell 40,000 units	125x → 5.3 million units <small>*Including LPG</small>
5. Natural gas vehicle (NGV) 40,000 units	12x → 0.5 million units

Expected benefits
<p>【Electric power supply stability】</p> <p>15% of annual electricity demand</p>
<p>【Energy reduction effects】</p> <p>Energy conservation: 8.26 million kloe/year</p>
<p>【CO₂ reduction】</p> <p>62 million tons-CO₂/year</p>

Source: Japan Gas Association, "Expand Natural Gas Use to 2030." Revised since October 27, 2011 release

Disseminating Fuel Cells for the Home



Polymer electrolyte fuel cell (PEFC) sales launch

Generating efficiency 35.0%



Solid oxide fuel cell (SOFC) sales launch

Generating efficiency 46.5%



More compact

Higher generating efficiency

Lower cost

Next-generation fuel cells (under development)

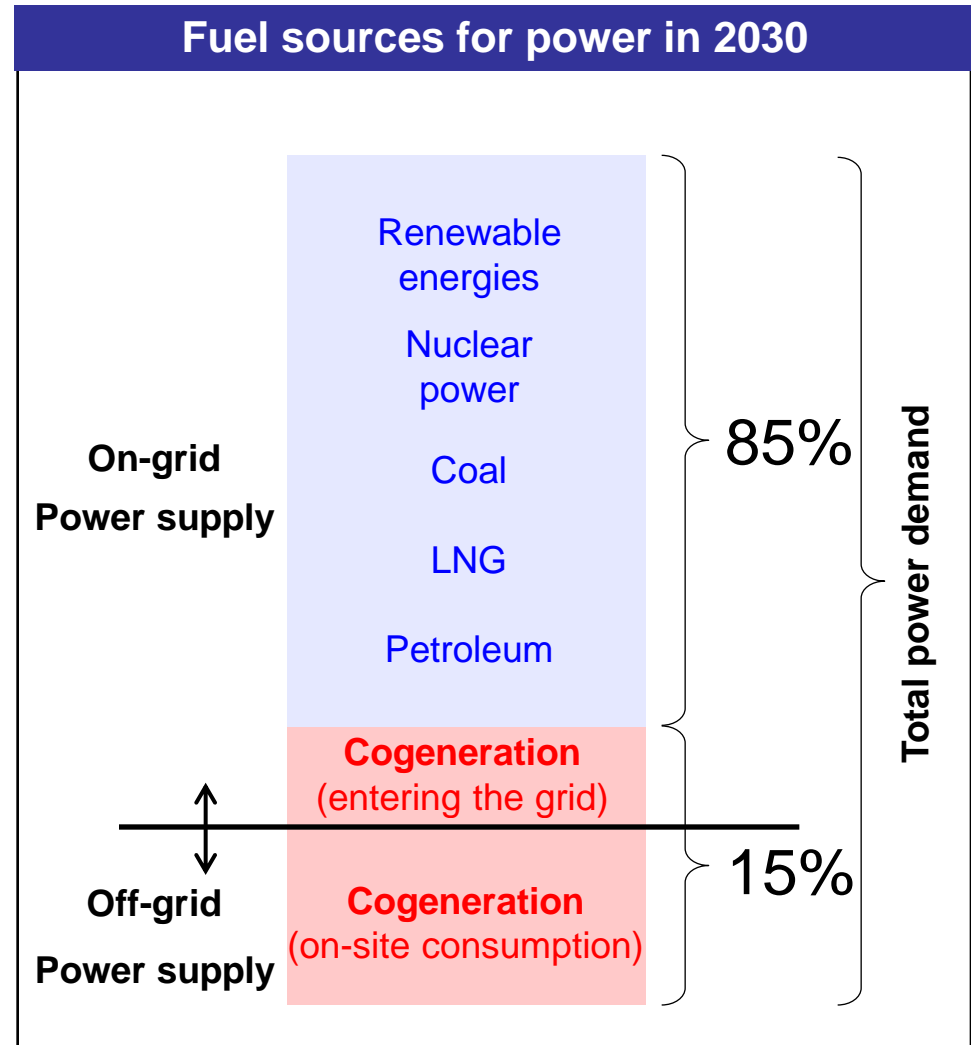
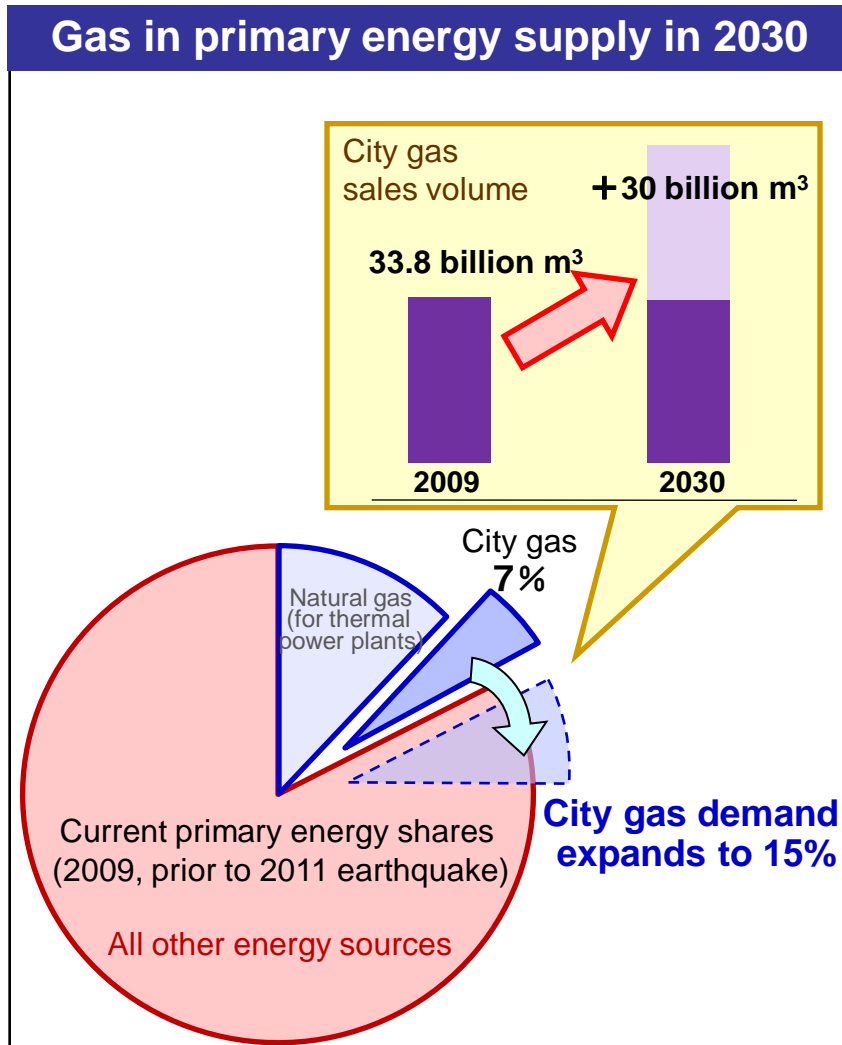


Introduce stand alone operate systems during blackouts

Introduction of fuel cells for condominiums



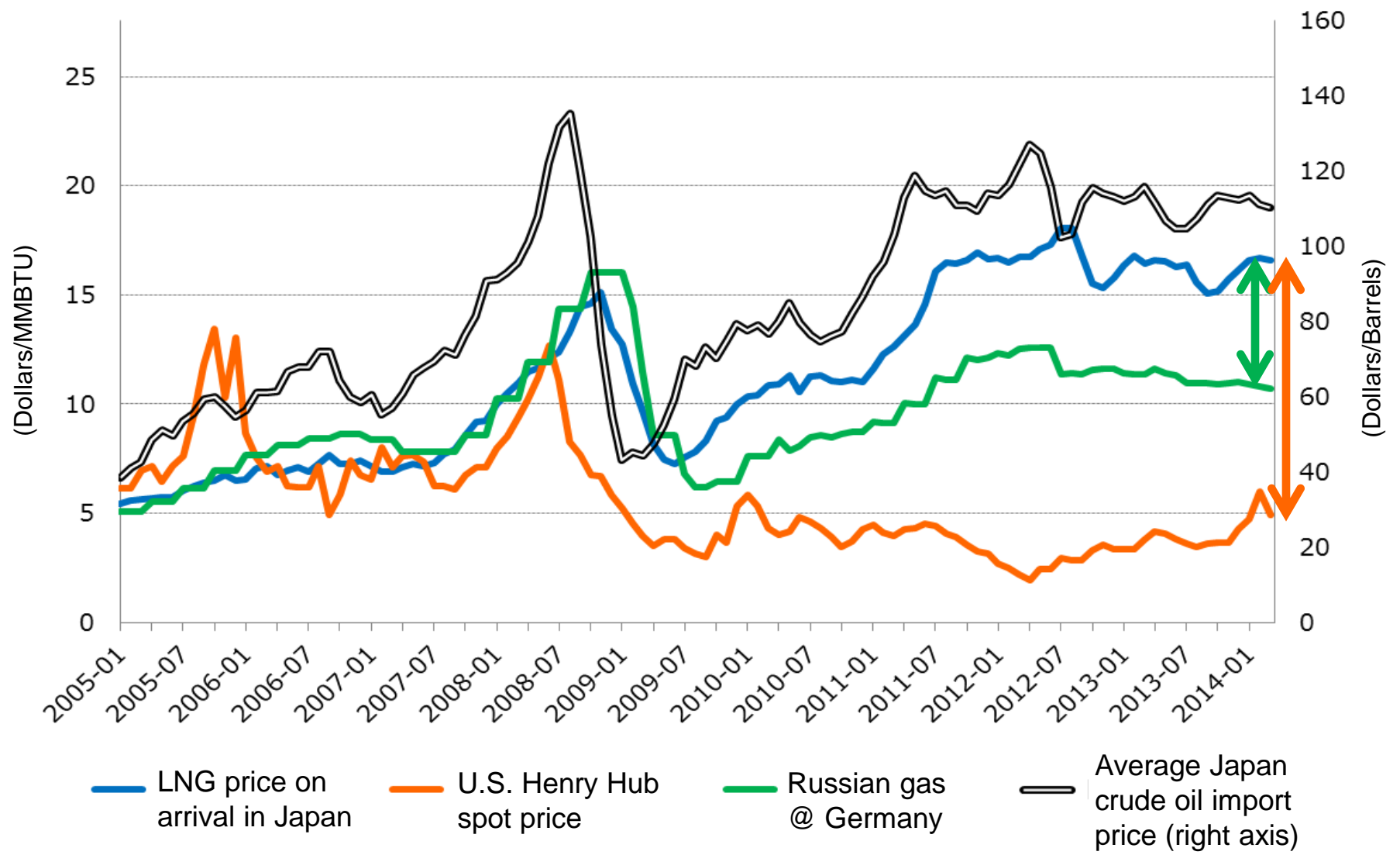
Gas Vision 2030: Expanded Use of Natural Gas 2



Source: Adapted from Ministry of Economy, Trade and Industry, "Comprehensive Energy Statics"

4. Challenges

Soaring "Asian Premium"



Securing Economical and Stable LNG Supply

Diversification

Supplies

- USA, Canada, Mozambique, etc.

Pricing

- Introducing US and European pricing
- Formation of futures market and Asia market

Delivery systems

- International pipeline: Russia to Japan, Russia via China and South Korea

Resources

- Developing methane hydrate

Import of US LNG

(Contract volume of gas utilities)

Freeport (2018-)

Osaka Gas: 2.2 mtpa

Cove Point (2017-)

Tokyo Gas: 1.4 mtpa

Cameron (2018-)

Tokyo Gas: 0.52 mtpa

Toho Gas: 0.3 mtpa

Towards Commercialization of Methane Hydrate

Japan's methane hydrate development program

Phase 1 2001-08

- Basic research
- Resource survey in Japan's EEZ
- On-shore production tests in Canada

Phase 2 2009-15

- Offshore production tests in Japan's EEZ
- Long-term on-shore production tests in Alaska

Phase 3 2016-18

- Preparations for commercial extraction
- Comprehensive evaluation
(e.g. economic viability, environmental impact)



World first gas extraction from ocean floor methane hydrate (March 2013)

Thank you.