

LNG Market in Asia

- A Japanese Perspective on the LNG Industry -

October 14th, 2016

Mizuho Bank

Industry Research Department

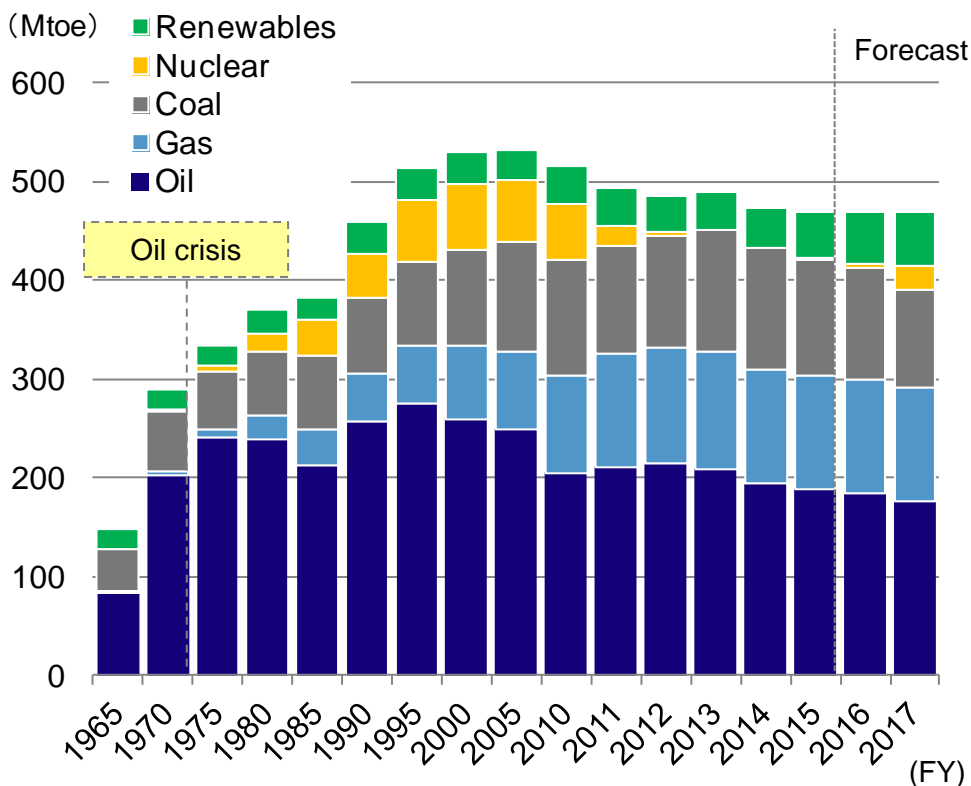
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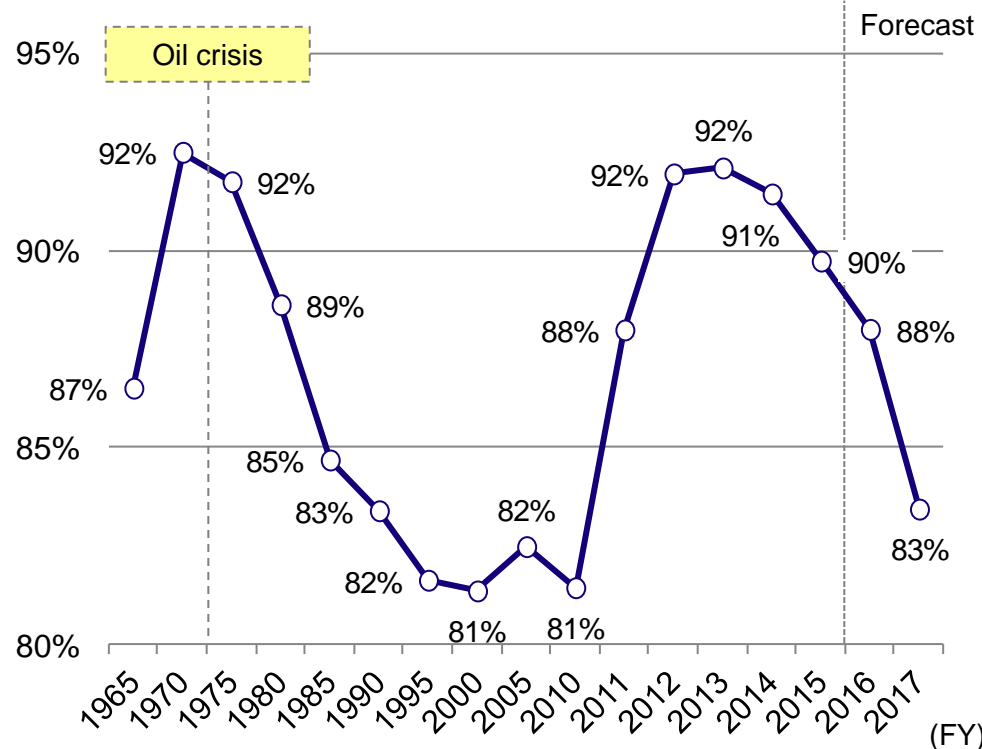
Primary Energy Supply in Japan

- ▶ In the past 40 years, Japan has gradually created a diversified energy portfolio in order to strengthen its energy security.
 - ◆ Fossil fuels account for more than 80% of primary energy supply in Japan, playing an important role.

Primary energy supply in Japan



Fossil fuels' share of primary energy supply in Japan

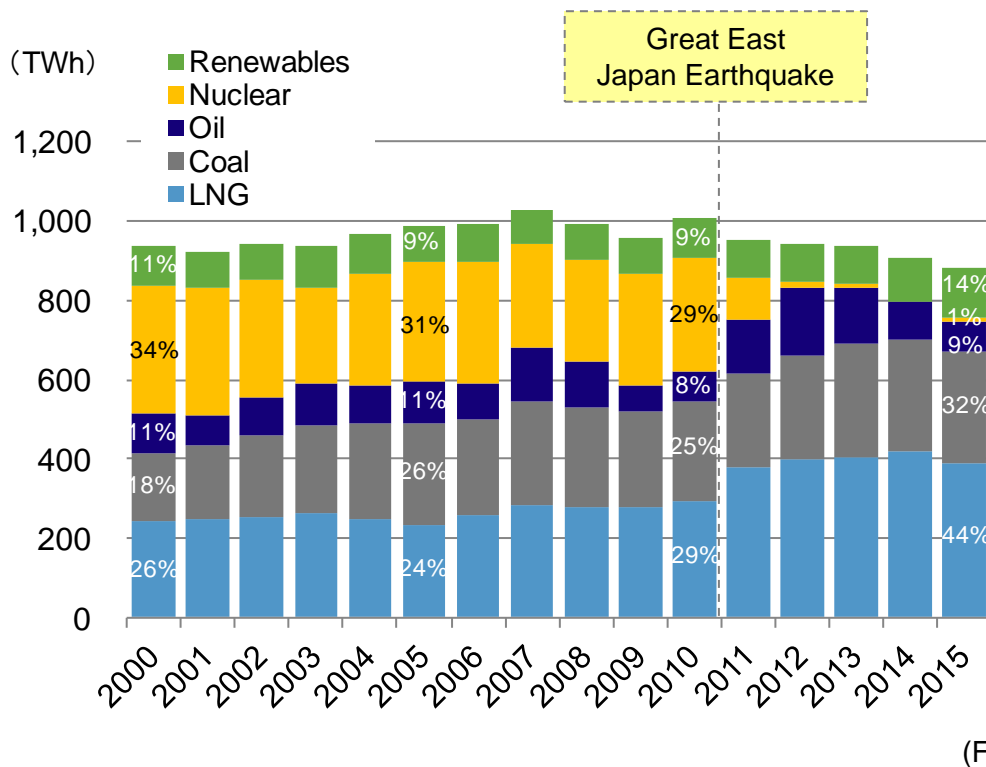


(Source) Compiled by Mizuho Bank Industry Research Department based on data from METI and IEEJ

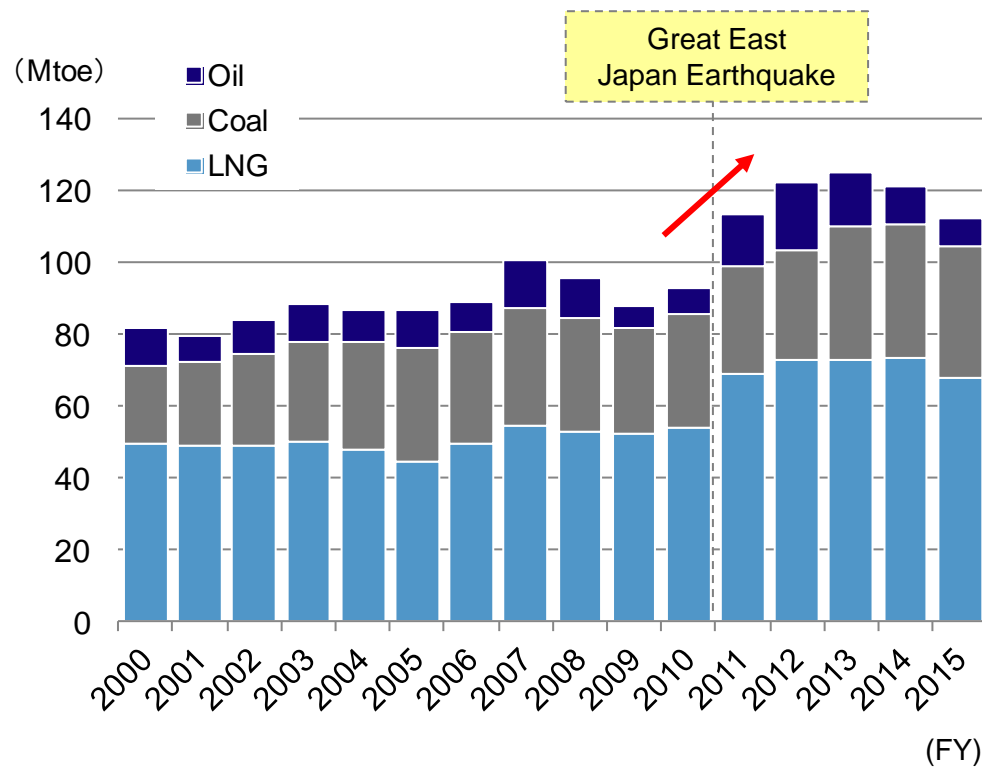
Electricity Generation by Source in Japan

- ▶ To make up for the lost power generation from nuclear plants, fossil fuel fired plants, especially LNG plants, have carried the load.

Japan's electricity generation by source



Fossil fuel consumption for electricity generation

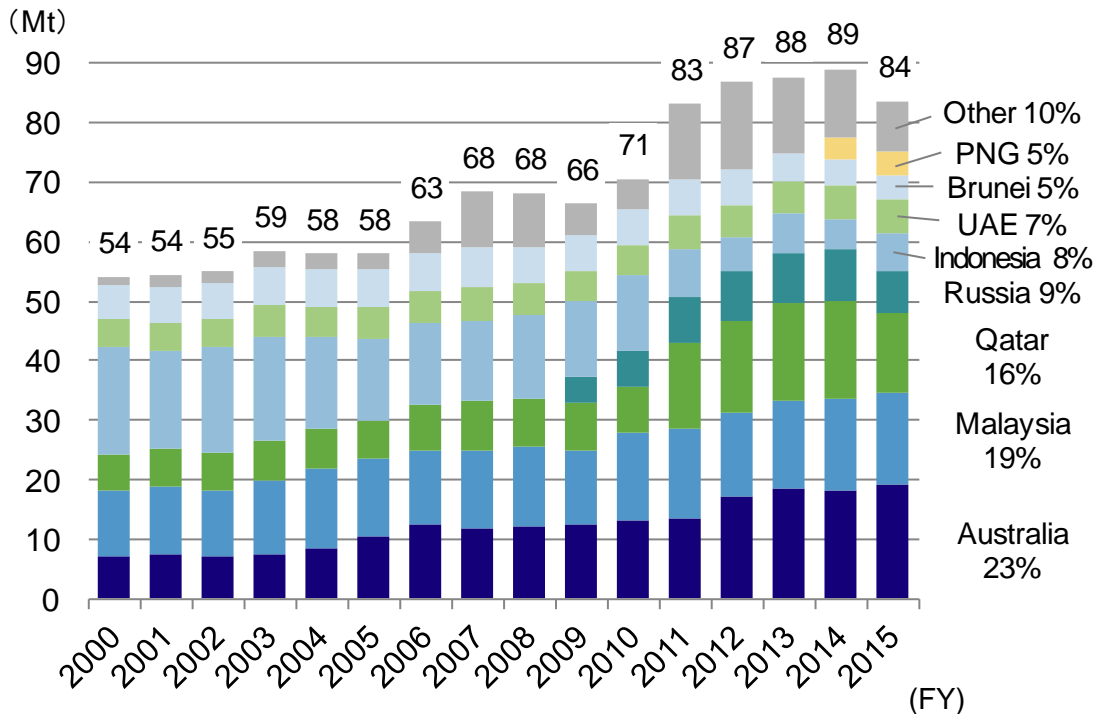


(Source) Compiled by Mizuho Bank Industry Research Department based on data from IEEJ and FEPC (The Federation of Electric Power Companies of Japan)
 (Note) Renewables include hydropower. Oil includes LPG and other oil products. Based on figures for Japan's 10 major electric power companies.

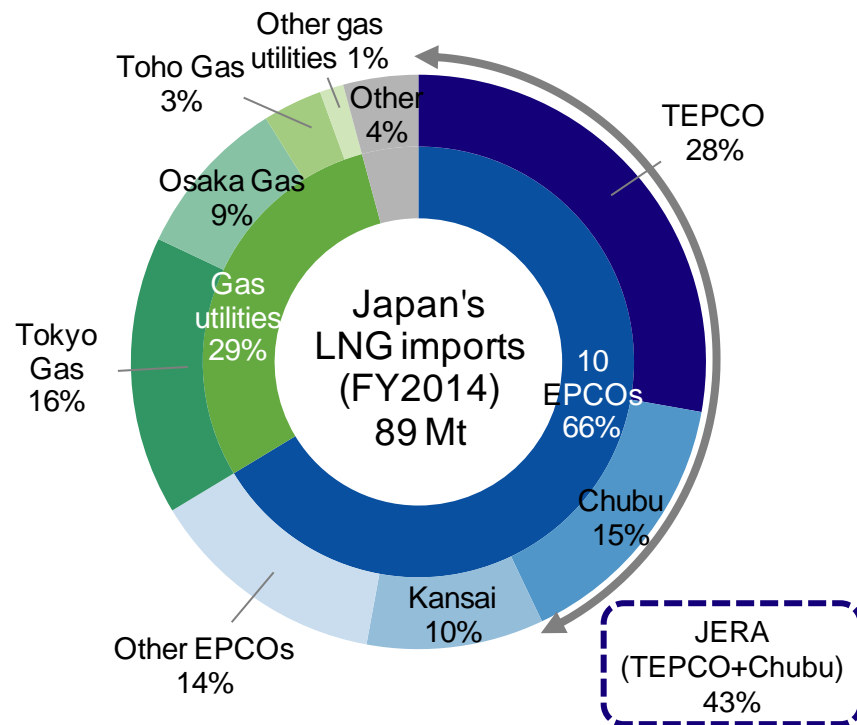
Japan's LNG Import Breakdown by Country Source and Importing Company

- ▶ Japan has gradually diversified its LNG import portfolio.
 - ◆ Australia is the largest LNG source for Japan, accounting for 23% of LNG imports in FY 2015.
- ▶ Power companies and gas utilities are major importers of LNG in Japan.
 - ◆ JERA, the JV between TEPCO and Chubu, accounted for 43% of Japan's LNG imports in FY 2014.

Japan's LNG imports by source country



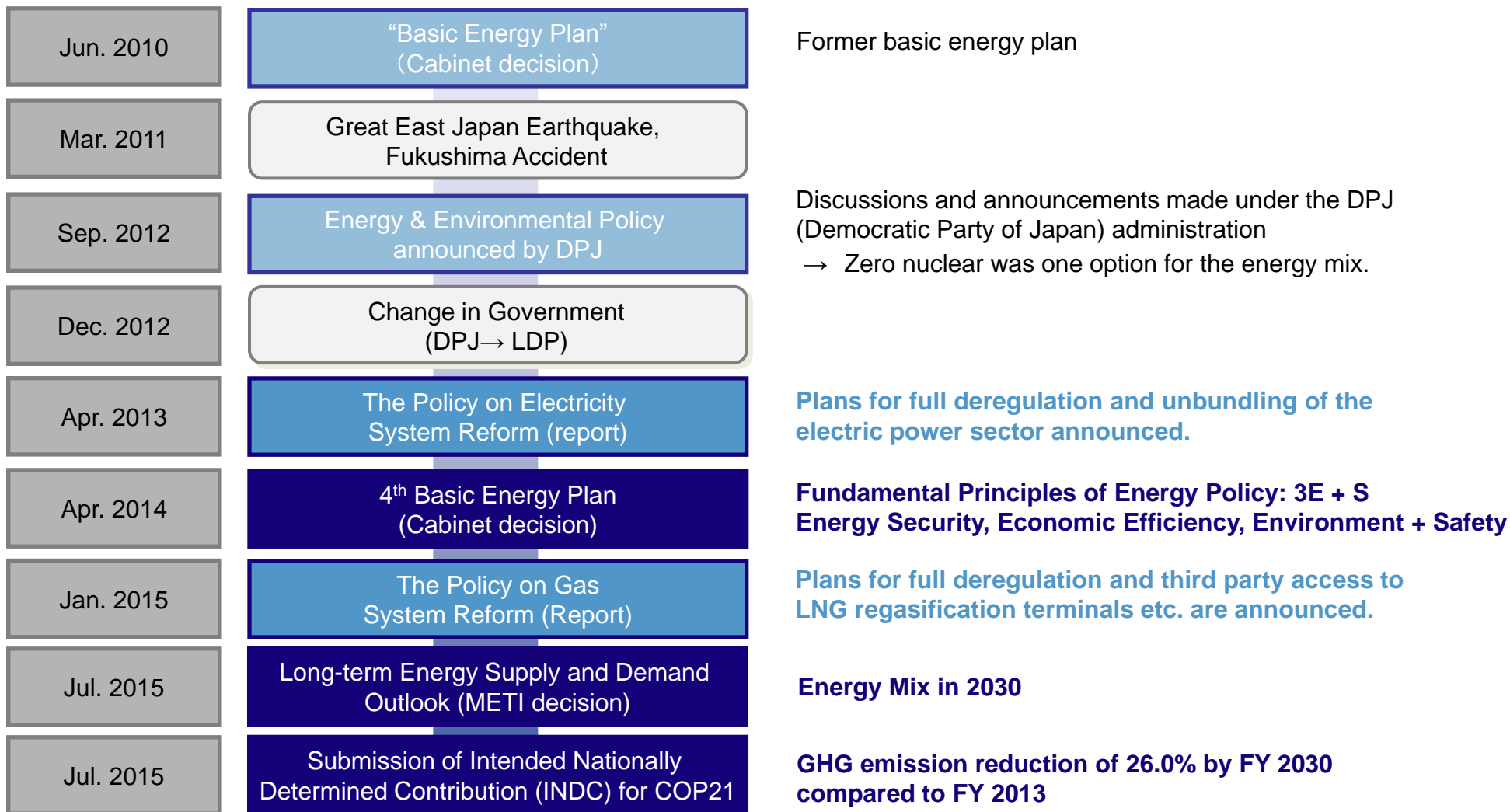
Japan's LNG imports by company



(Source) Compiled by Mizuho Bank Industry Research Department based on data from the Trade Statistics of Japan (FEPC; The Federation of Electric Power Companies of Japan) and Tex Report

(Note) EPCOs: Electric Power Companies

Japan's Energy Policy Developments

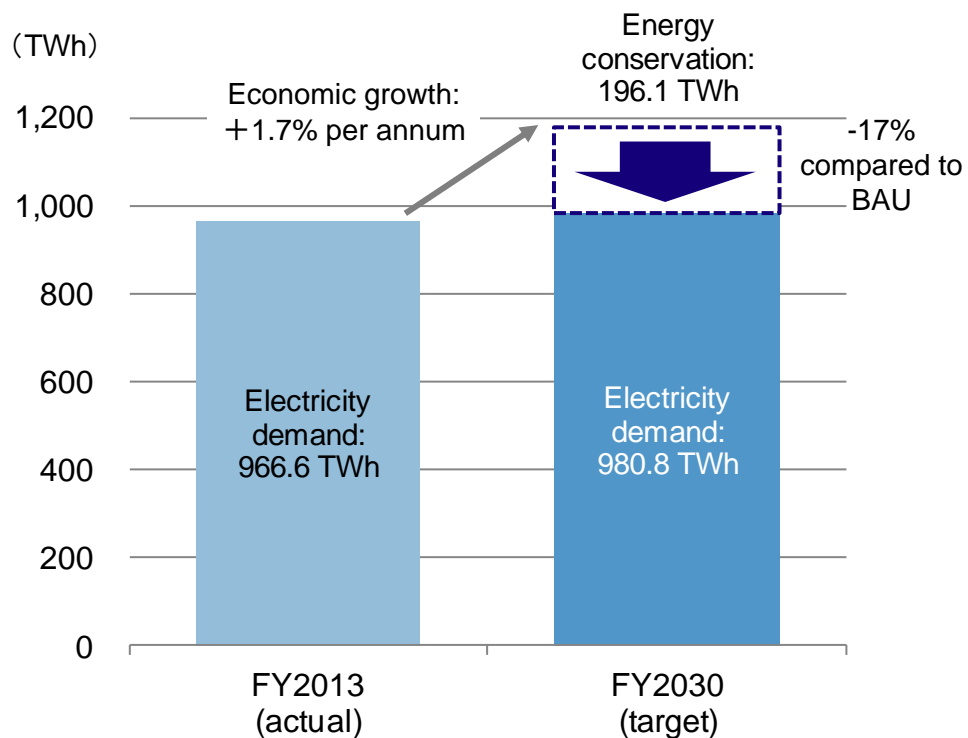


(Source) Compiled by Mizuho Bank Industry Research Department from government documents

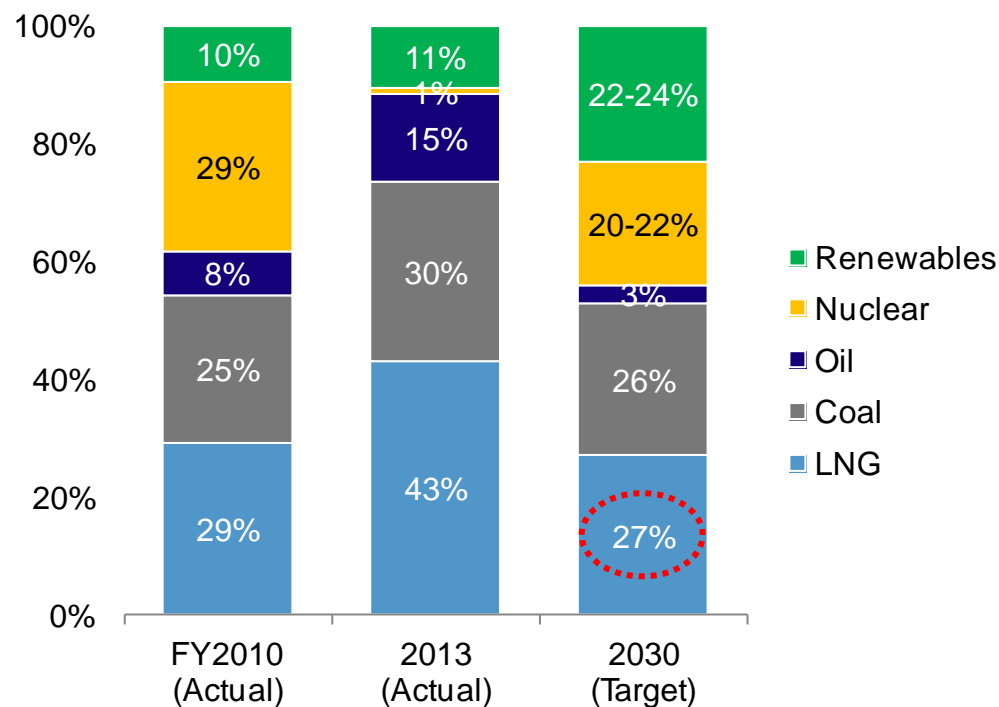
Power Generation Mix in FY 2030

- ▶ To achieve 3E+S, the government will promote energy conservation, the increase in renewable energy, and the improvement in thermal power efficiency.

Electricity demand in FY 2030



Generation mix targeted in FY 2030



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Japan's Intended Nationally Determined Contribution (INDC) for COP21

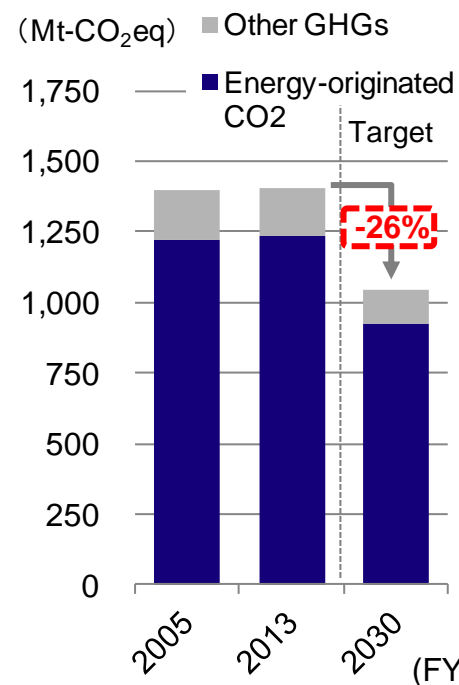
- ▶ Japan's INDC for FY 2030 is to reduce total GHG emissions by 26.0% compared to FY 2013.
 - ◆ Energy-originated CO₂, which accounts for approximately 90% of GHG emissions in Japan, will be reduced by 25.0% compared to the FY 2013 level.

Overview of Japan's INDC

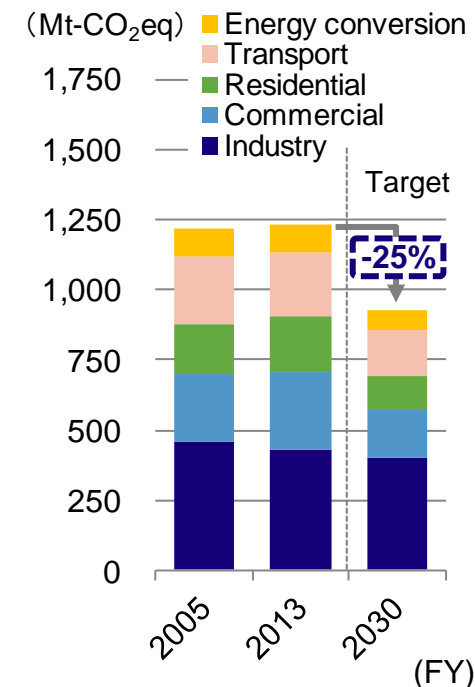
Base years	<ul style="list-style-type: none"> • FY 2013 and FY 2005 – FY 2013 is the base year mainly used for presenting Japan's INDC
Target year	<ul style="list-style-type: none"> • FY 2030
Total GHG emission	<ul style="list-style-type: none"> • -26.0% compared to FY 2013 • -25.4% compared to FY 2005
Energy-originated CO ₂	<ul style="list-style-type: none"> • -25.0% compared to FY 2013 • -24.0% compared to FY 2005
Non-energy-originated CO ₂	<ul style="list-style-type: none"> • -6.7% compared to FY 2013 • -17.0% compared to FY 2005
Methane	<ul style="list-style-type: none"> • -12.3% compared to FY 2013 • -18.8% compared to FY 2005
Nitrous oxide	<ul style="list-style-type: none"> • -6.1% compared to FY 2013 • -17.4% compared to FY 2005
Fluorinated gases (HFCs, PFCs SF ₆ , and NF ₃)	<ul style="list-style-type: none"> • -25.1% compared to FY 2013 • +4.5% compared to FY 2005

GHG reduction target in Japan's INDC

【Total GHG emission】



【Energy-originated CO₂】

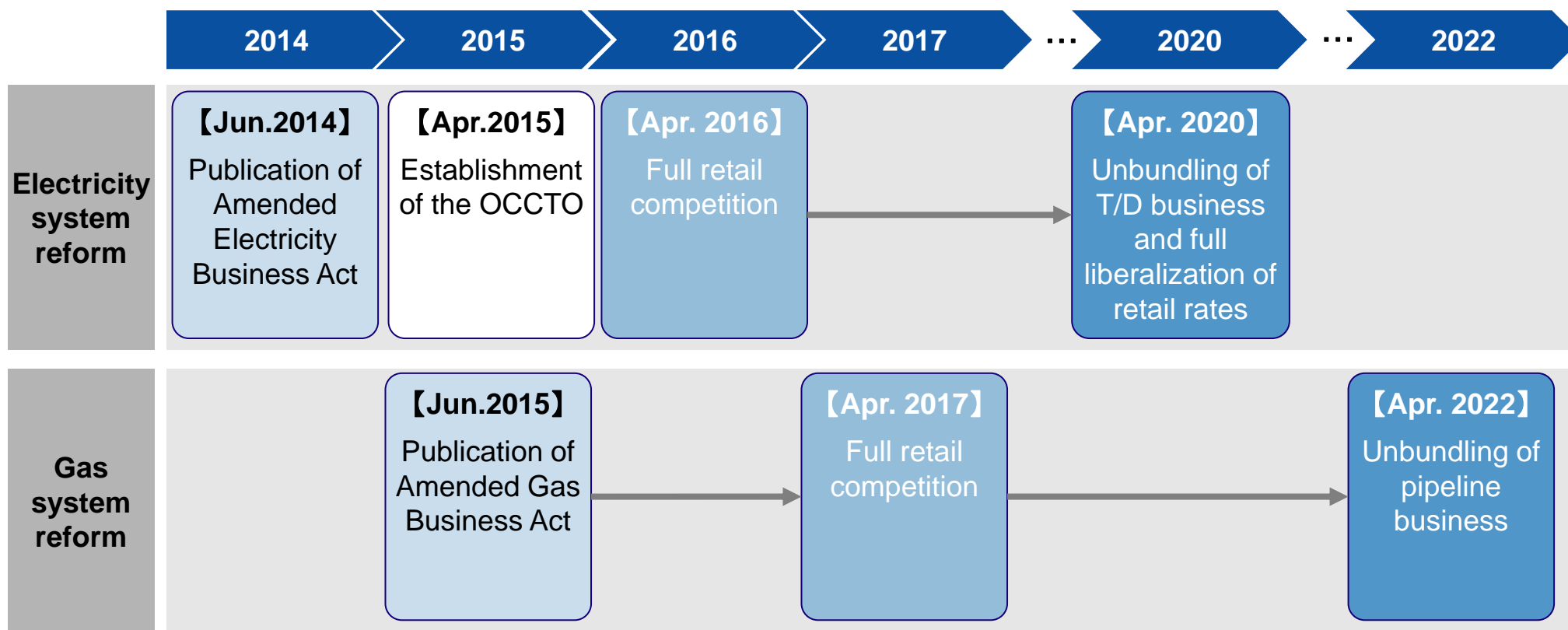


(Source) Compiled by Mizuho Bank Industry Research Department from the government's "Submission of Japan's Intended Nationally Determined Contribution (INDC)"
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Deregulation of the Power and Gas Industry in Japan

- ▶ Through electricity and gas system reform, the Japanese power and gas utility sectors will be gradually deregulated.

Chronology for Japan's power and gas industry deregulation



(Source) Compiled by Mizuho Bank Industry Research Department from government documents

(Note) OCCTO: Organization for Cross-regional Coordination of Transmission Operators

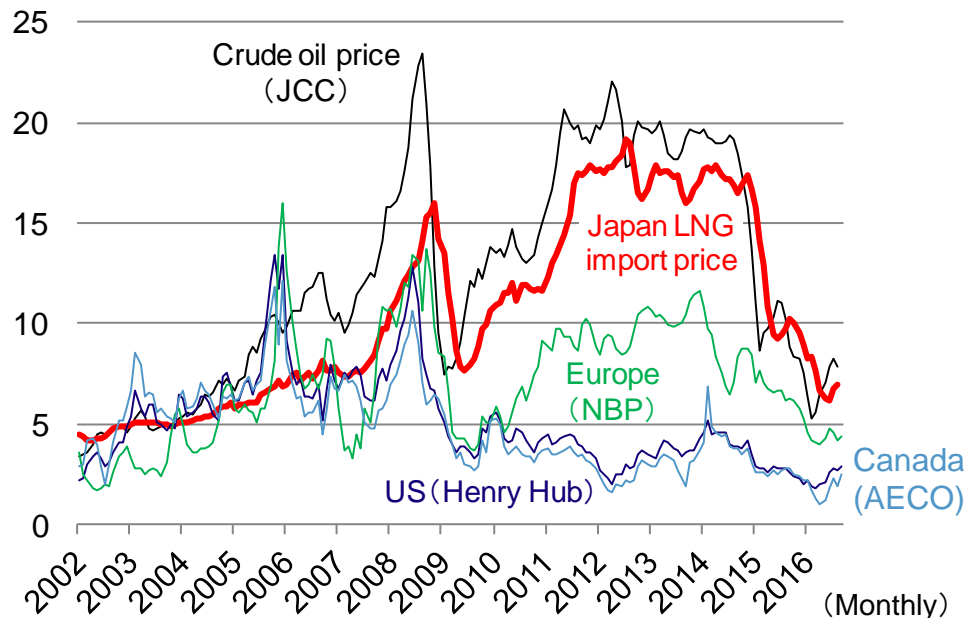
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LNG and Natural Gas Prices

- ▶ Japan's LNG import price has been higher than the natural gas prices in Europe and the U.S.
 - ◆ In particular, the natural gas price in the U.S. remains at a low level due to the production increase of shale gas.
- ▶ The LNG spot price has seen a downtrend since 2014, and decreased to less than \$5/MMBtu in March and April 2016.
 - ◆ One of the reasons for this decline may be looser demand/ supply conditions due to the start of production at new LNG projects.

LNG, natural gas and crude oil prices

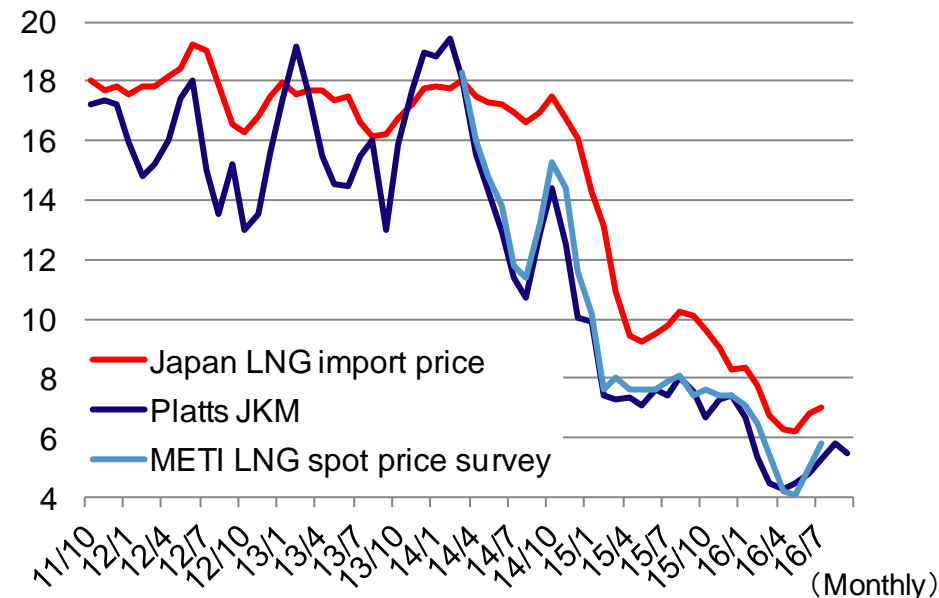
(USD/MMBtu)



(Source) Compiled by Mizuho Bank Industry Research Department based on data from EIA and the Trade Statistics of Japan

Japan's LNG Import Price and Spot Price

(USD/MMBtu)

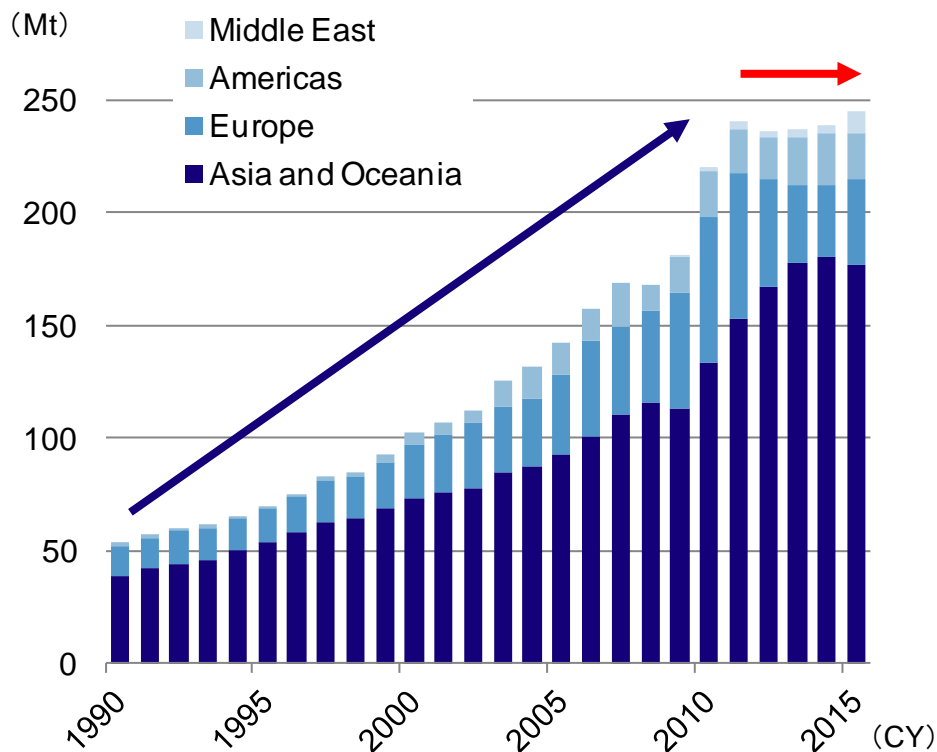


(Source) Compiled by Mizuho Bank Industry Research Department based on data from EIA, the Trade Statistics of Japan, Platts and the METI's LNG spot price survey

LNG Import Volume

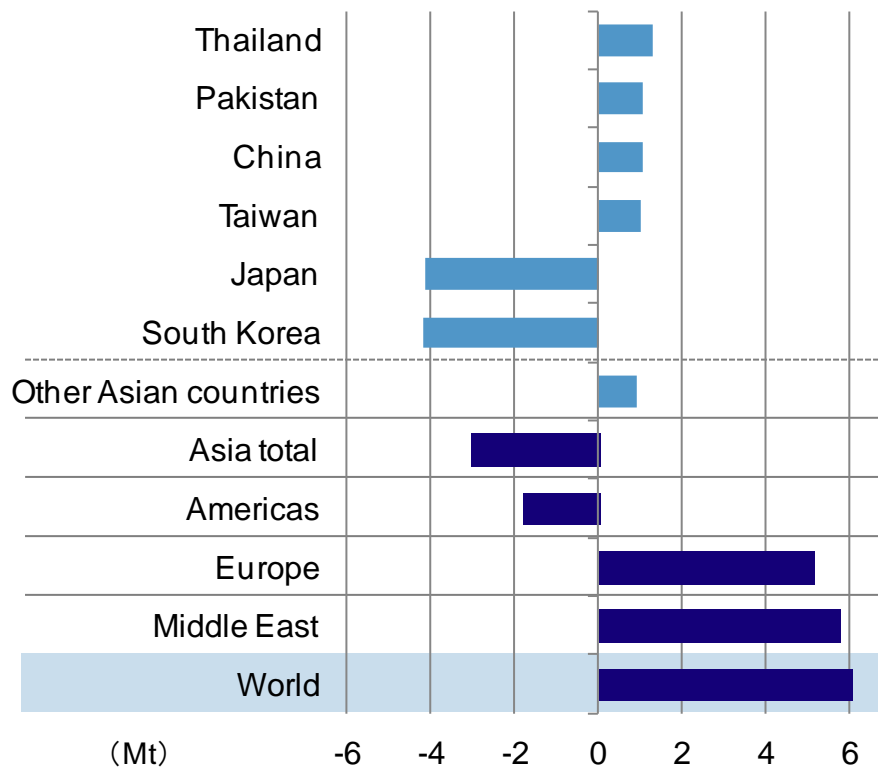
- ▶ Global LNG import volume has increased with growing natural gas demand.
 - ◆ However, world LNG imports have remained fairly flat the past few years.

Global LNG import volume



(Source) Compiled by Mizuho Bank Industry Research Department based on data from GIIGNL and Cedigaz

Change in LNG import volume (2015 vs 2014)



(Source) Compiled by Mizuho Bank Industry Research Department based on data from GIIGNL

LNG Import Volume by Country

LNG import volume by country

【1990】

Country	Volume	Share
Japan	35.2	66.4%
France	6.8	12.9%
Spain	3.3	6.2%
Belgium	2.9	5.4%
South Korea	2.3	4.3%
US	1.8	3.4%
Taiwan	0.7	1.3%
UK	0.04	0.1%
Italy	0.02	0.04%
Total	53.0	100.0%

【2000】

Country	Volume	Share
Japan	53.4	52.9%
South Korea	14.5	14.4%
France	7.3	7.2%
Spain	6.1	6.0%
US	4.7	4.7%
Taiwan	4.4	4.4%
Italy	3.6	3.5%
Belgium	3.1	3.0%
Turkey	3.1	3.0%
Greece	0.3	0.3%
Puerto Rico	0.3	0.3%
Portugal	0.2	0.2%
Total	100.8	100.0%

【2010】

Country	Volume	Share
Japan	70.9	32.2%
South Korea	32.6	14.8%
Spain	20.6	9.4%
UK	14.2	6.4%
Taiwan	11.2	5.1%
France	10.4	4.7%
China	9.6	4.4%
India	9.0	4.1%
US	8.2	3.7%
Italy	6.7	3.0%
Turley	5.6	2.6%
Belgium	4.4	2.0%
Mexico	4.3	1.9%
Chile	2.2	1.0%
Portugal	2.2	1.0%
Brazil	2.1	1.0%
Kuwait	2.0	0.9%
Argentina	1.3	0.6%
Canada	0.9	0.4%
Greece	0.7	0.3%
Dominican Rep.	0.6	0.3%
Puerto Rico	0.5	0.2%
UAE	0.1	0.05%
Total	220.2	100.0%

【2015】

Country	Volume	Share
Japan	85.1	34.7%
South Korea	33.4	13.6%
China	20.0	8.2%
India	14.6	6.0%
Taiwan	14.5	5.9%
UK	10.1	4.1%
Spain	8.8	3.6%
Turkey	5.4	2.2%
Mexico	4.9	2.0%
Brazil	4.8	1.9%
France	4.4	1.8%
Italy	4.3	1.8%
Argentina	4.1	1.7%
Kuwait	3.0	1.2%
Chile	2.7	1.1%
Thailand	2.7	1.1%
Egypt	2.6	1.1%
UAE	2.2	0.9%
Indonesia	2.2	0.9%
Singapore	2.1	0.8%
Belgium	1.9	0.8%
Jordan	1.9	0.8%
US	1.7	0.7%
Malaysia	1.5	0.6%
Puerto Rico	1.2	0.5%
Portugal	1.1	0.4%
Pakistan	1.1	0.4%
Dominican Rep.	0.9	0.4%
Netherland	0.6	0.3%
Canada	0.5	0.2%
Greece	0.5	0.2%
Lithuania	0.3	0.1%
Sweden	0.3	0.1%
Israel	0.1	0.0%
Total	245.2	100.0%

68% of
world LNG
imports

(Mt)

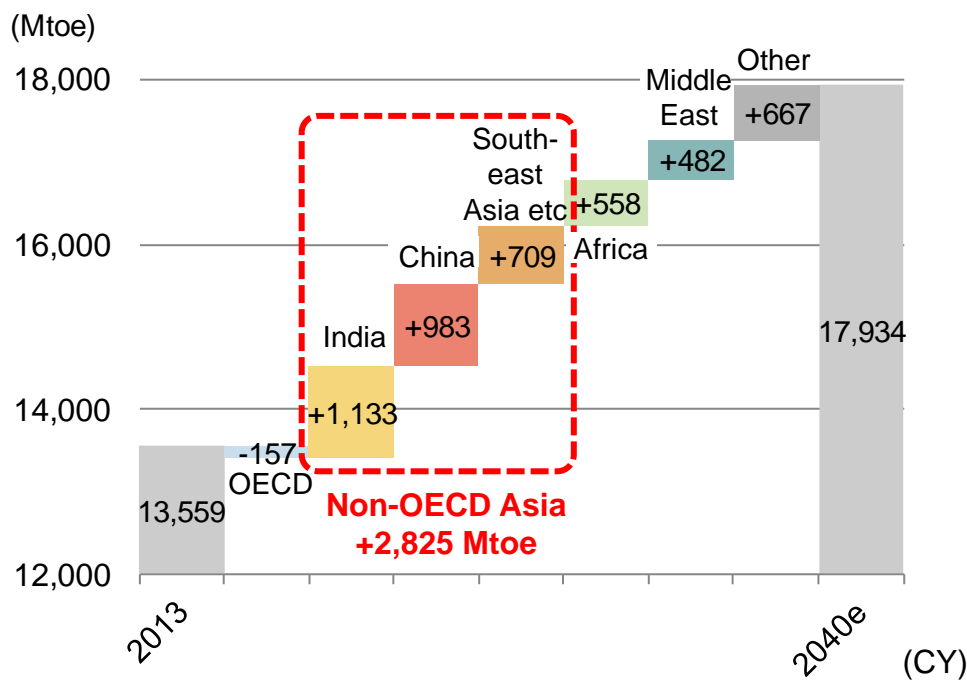
- ▶ The number of countries that import LNG has more than tripled in the past ten years.
- ▶ The top 5 LNG importing countries are all in Asia.
 - ◆ Combined LNG imports to Japan, Korea, China, India and Taiwan accounted for 68% of global LNG demand in 2015.

(Source) Compiled by Mizuho Bank Industry Research Department based on data from GIIGNL, BP and Cedigaz

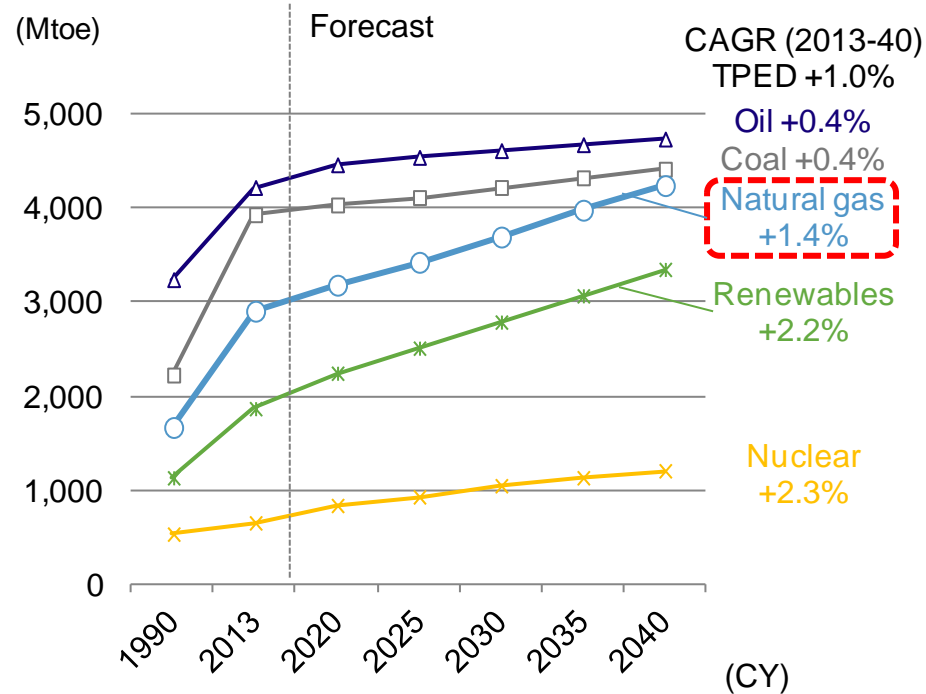
Global primary energy demand outlook

- ▶ World primary energy demand is forecast to increase mainly due to growth in Asia.
- ▶ Global natural gas demand is forecast to grow at 1.4% per annum through 2040.
 - ◆ Growth in natural gas demand is expected to be highest amongst fossil fuels.

World primary energy demand by region (IEA)



World primary energy demand by source (IEA)



(Source) Compiled by Mizuho Bank Industry Research Department by IEA "World Energy Outlook 2015"

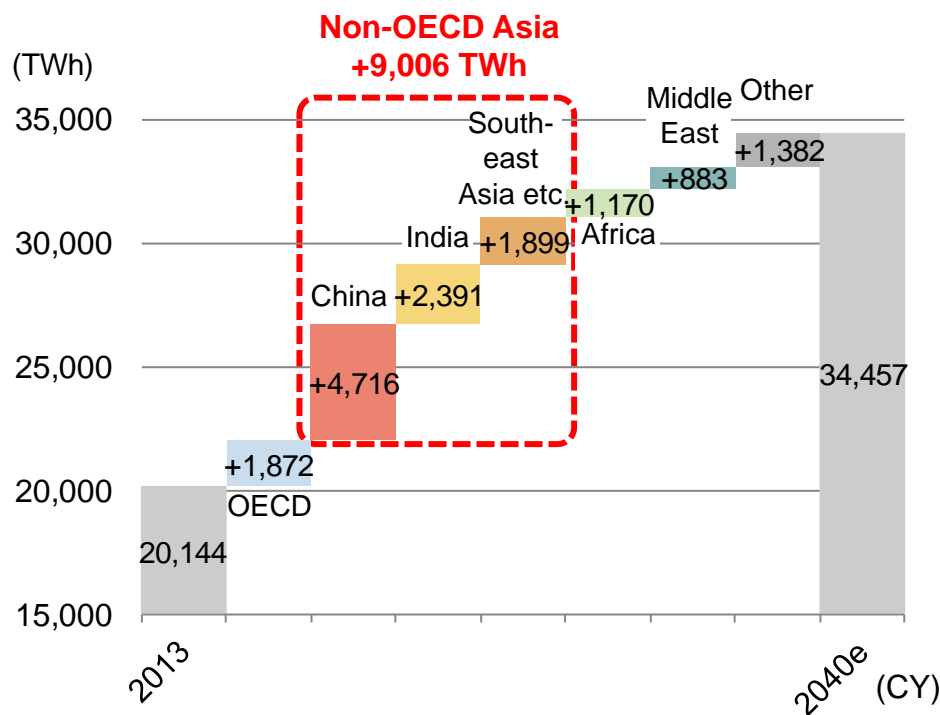
(Note) TPED: Total Primary Energy Demand
Forecasts in New Policies Scenario

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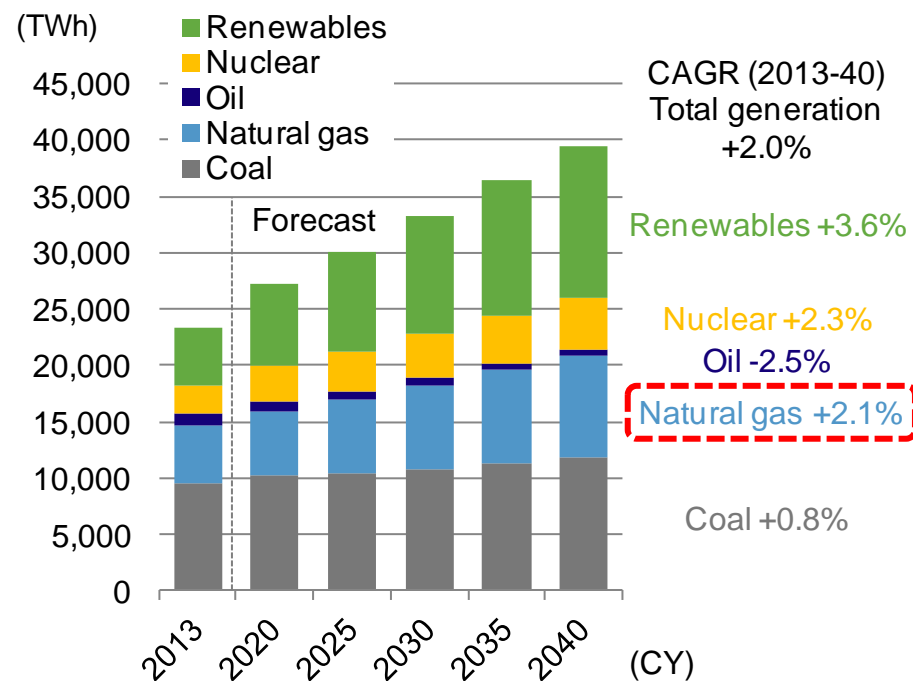
Global electric power demand outlook

- ▶ Asia’s electricity consumption expansion will contribute to global power demand growth.
- ▶ As demand expands, natural gas-fired power generation is expected to increase at +2.1% per annum through 2040.

World electricity demand by region (IEA)



World electricity generation by source (IEA)



(Source) Compiled by Mizuho Bank Industry Research Department by IEA "World Energy Outlook 2015"

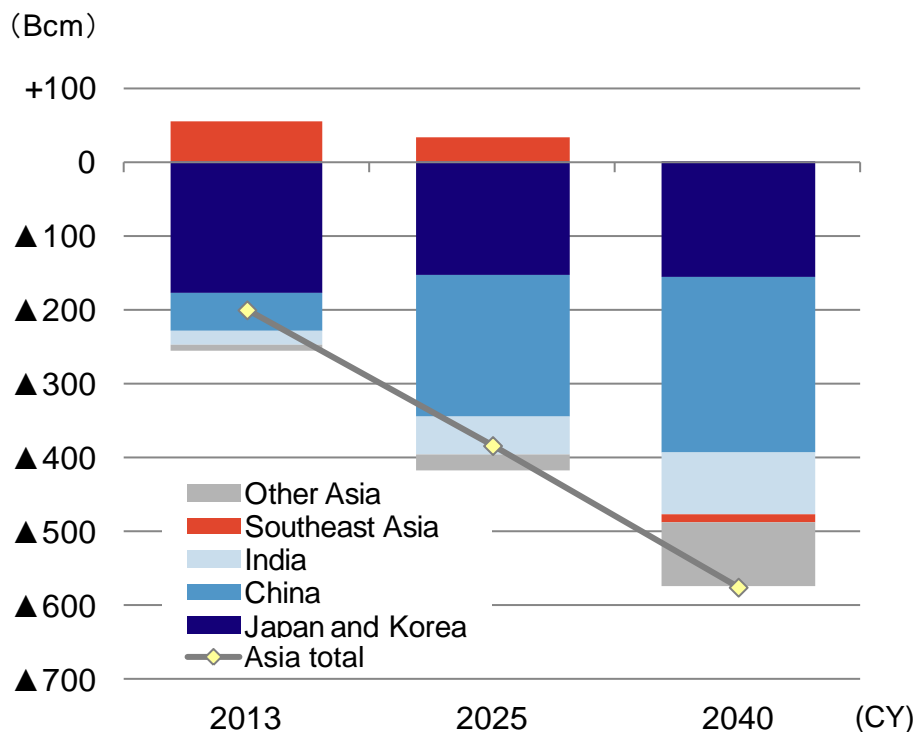
(Note) Forecasts in New Policies Scenario

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Natural Gas Demand in Southeast Asia

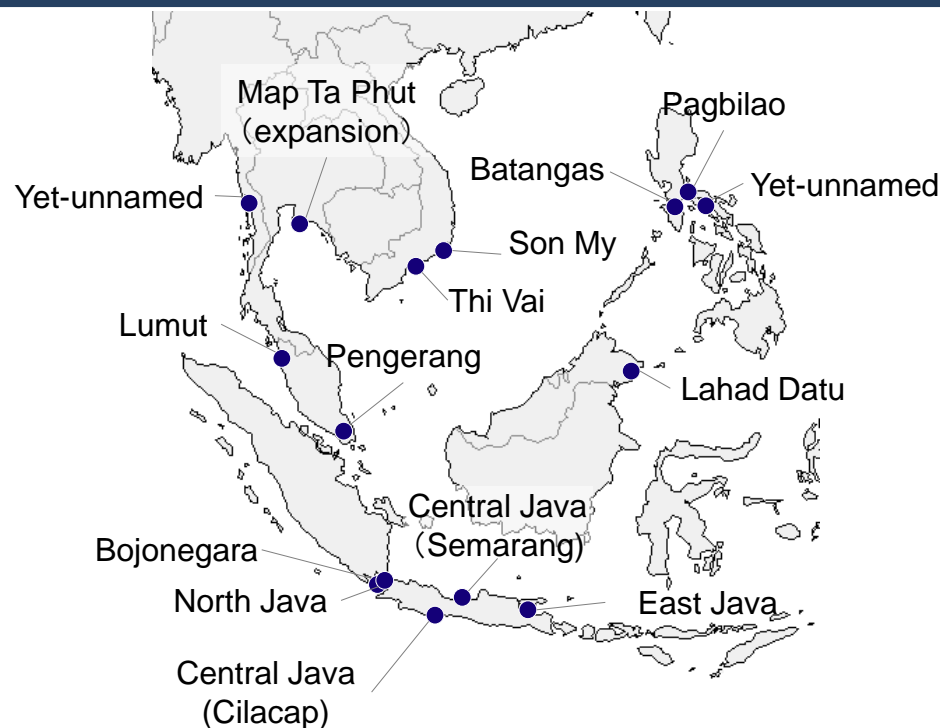
- ▶ Global natural gas demand is expected to increase 1.4% per annum until 2040.
 - ◆ Non-OECD Asia is expected to be a center of this demand growth.
- ▶ In Asia, natural gas net import volume is going to increase.
 - ◆ Southeast Asia, which is currently a net gas exporter, is expected to become a net gas importer by 2040.

Asian natural gas net trade outlook (IEA)



(Source) Compiled by Mizuho Bank Industry Research Department from the IEA's "World Energy Outlook 2015" report

LNG regasification plant projects in Southeast Asia



(Source) Compiled by Mizuho Bank Industry Research Department from IR and JOGMEC materials

Actions for Natural Gas Hub Development in Asia

- ▶ Recently, natural gas hub development has been discussed in Asia.
 - ◆ The discussions have centered on Japan, the largest LNG importer, and Singapore, a commodity trading hub.

Actions for natural gas hub development in Asia



Japan

- At LNG Producer-Consumer Conference 2012, Minister of Economy, Trade and Industry brought up concept of LNG futures market
- From Nov 2012 to Mar 2013, Ministry of Economy, Trade and Industry held **“Conference for LNG futures”**
- In Sep 2014, Japan OTC Exchange launched **LNG Non-Deliverable Forward Market**
- At Energy Ministerial Meeting in May 2016, Japanese government released **“Strategy for LNG Market Development”**
 - Goal: to give Japan status of **an internationally recognized hub by the early 2020s.**

Singapore

- In May 2013, **SLNG received its first commercial cargo** and commenced business operations
- In Jan 2016, **SGX launched futures and swaps** linked to its index of spot LNG prices “SLinG”

Conclusion

- ▶ Last year, the Japanese government released its Long-term Energy Supply and Demand Outlook. In the target “Energy Mix” therein, natural gas and LNG remain positioned as strategically important sources for Japan.
- ▶ Global LNG demand is expected to grow from a medium- to long-term perspective, led by Asian countries’ demand growth.
- ▶ With various LNG trade flows and LNG transaction types expected to emerge, international collaboration is necessary to create a healthy LNG market in the future.
- ▶ Japan will cooperate with both LNG consumers in Asia and LNG producers worldwide, in order to deal with the potential structural changes in the LNG market.

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