Flame 25TH ANNIVERSARY

Daigas Group

Gas Pricing Summit

Japan: gas, nuclear & price formation

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- *LNG Market Review in 2018*
- *Market Trends and Outlook: South Korea and Taiwan*
- *Market Trends and Outlook: Japan*
- *Issues and Challenges of Regional LNG Pricing*

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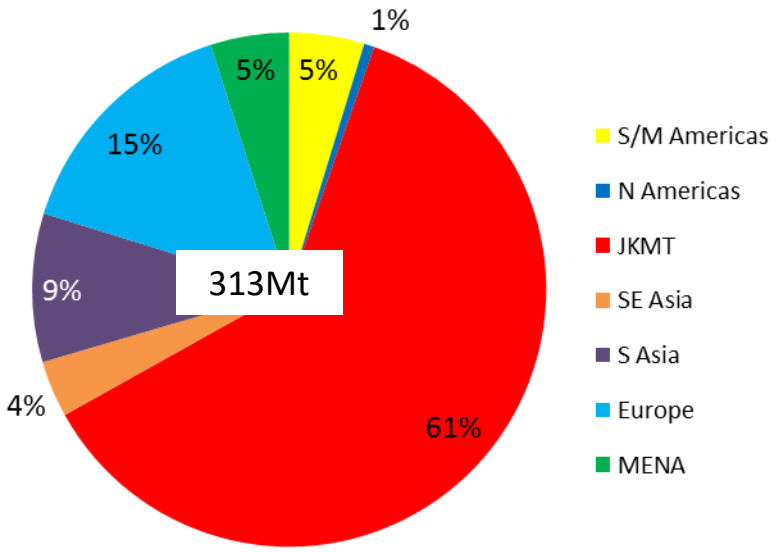
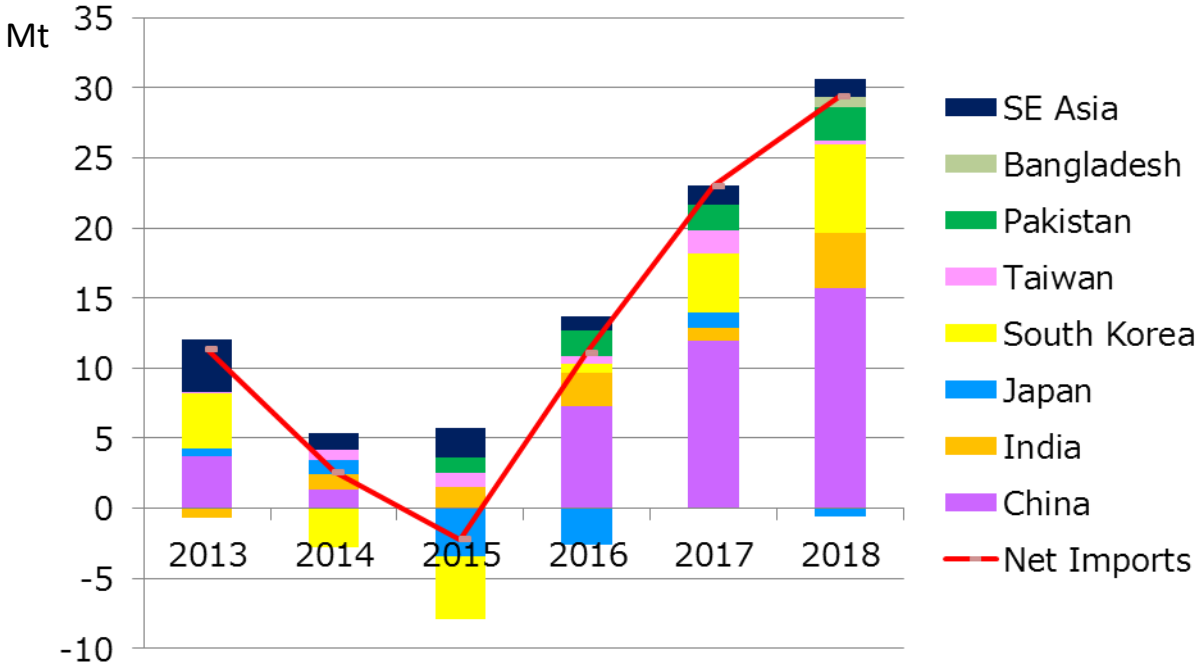
LNG Imports in the Global Market in 2018



Country	2017	2018
Japan	0.2%	-1.3%
South Korea	10.6%	16.2%
Taiwan	10.2%	1.2%
China	42.3%	38.4%
East Asia Total	10.6%	11.4%
Asia Total	10.2%	13.0%
Europe	19.5%	6.4%
N America	6.9%	15.7%
M/S America	1.6%	0.7%
Middle East/Africa	-9.1%	-42.4%
World	9.9%	8.3%



GIIGNL and other sources

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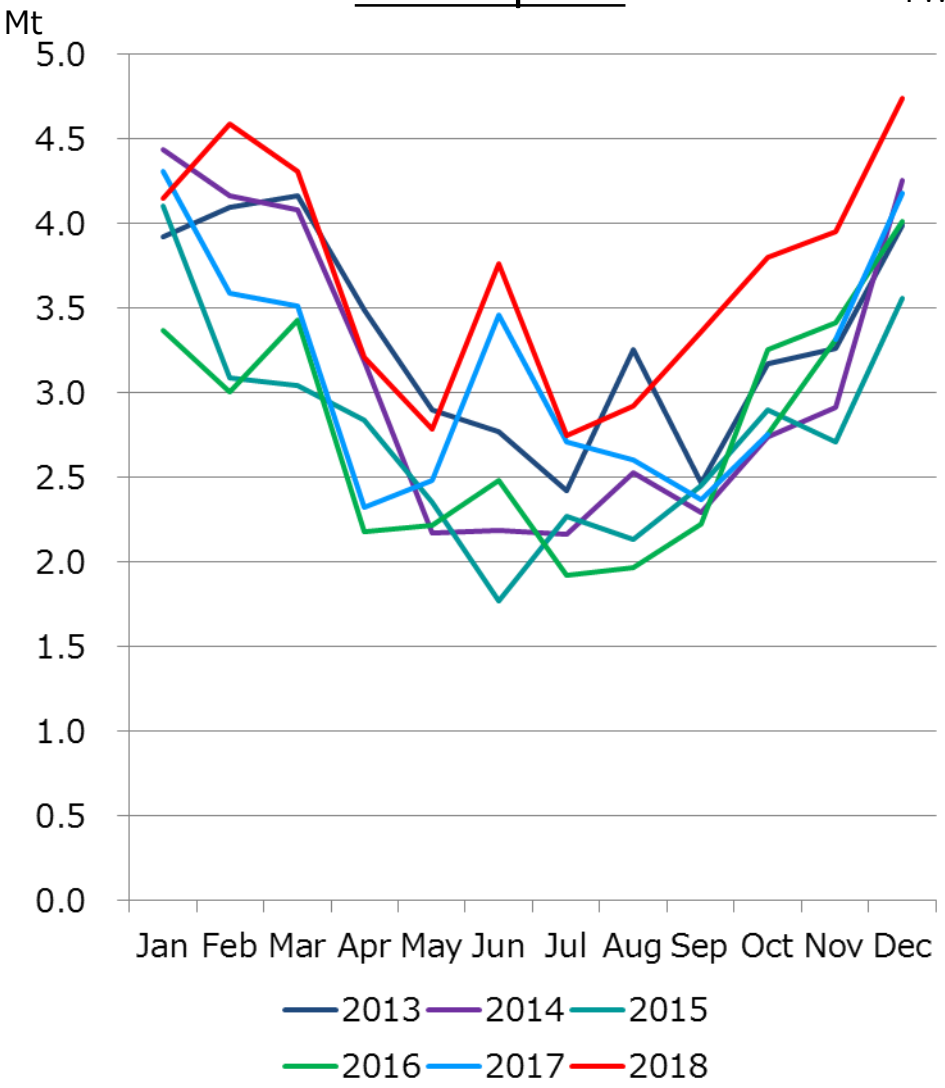
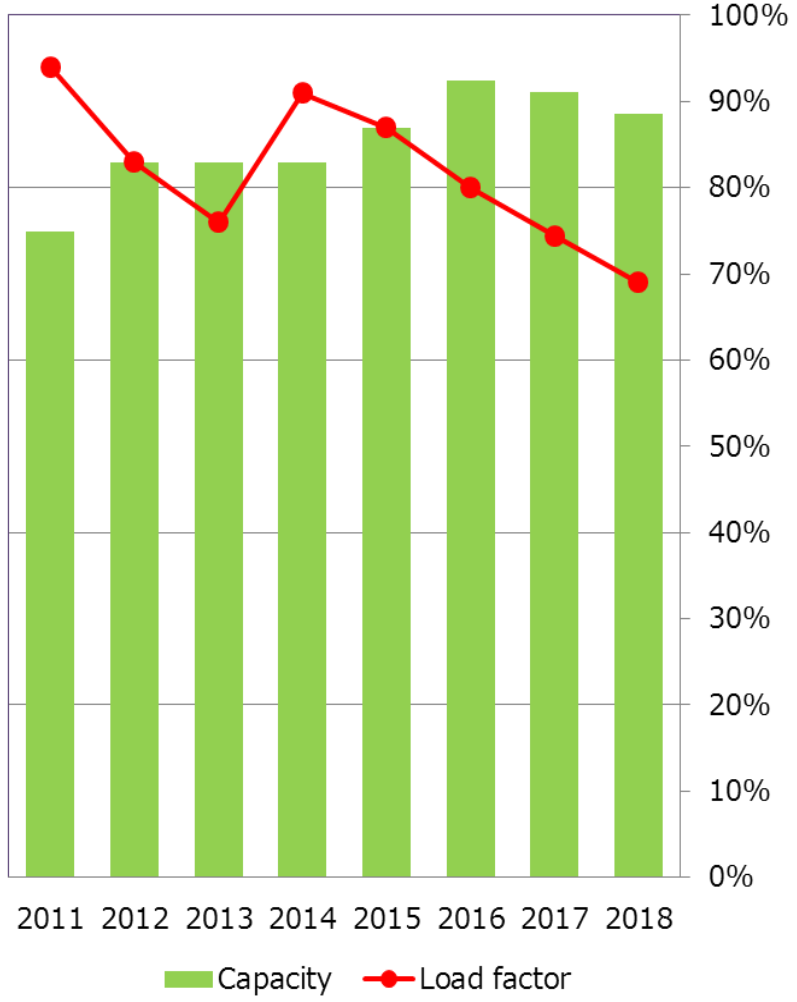
LNG Imports in South Korea

LNG imports

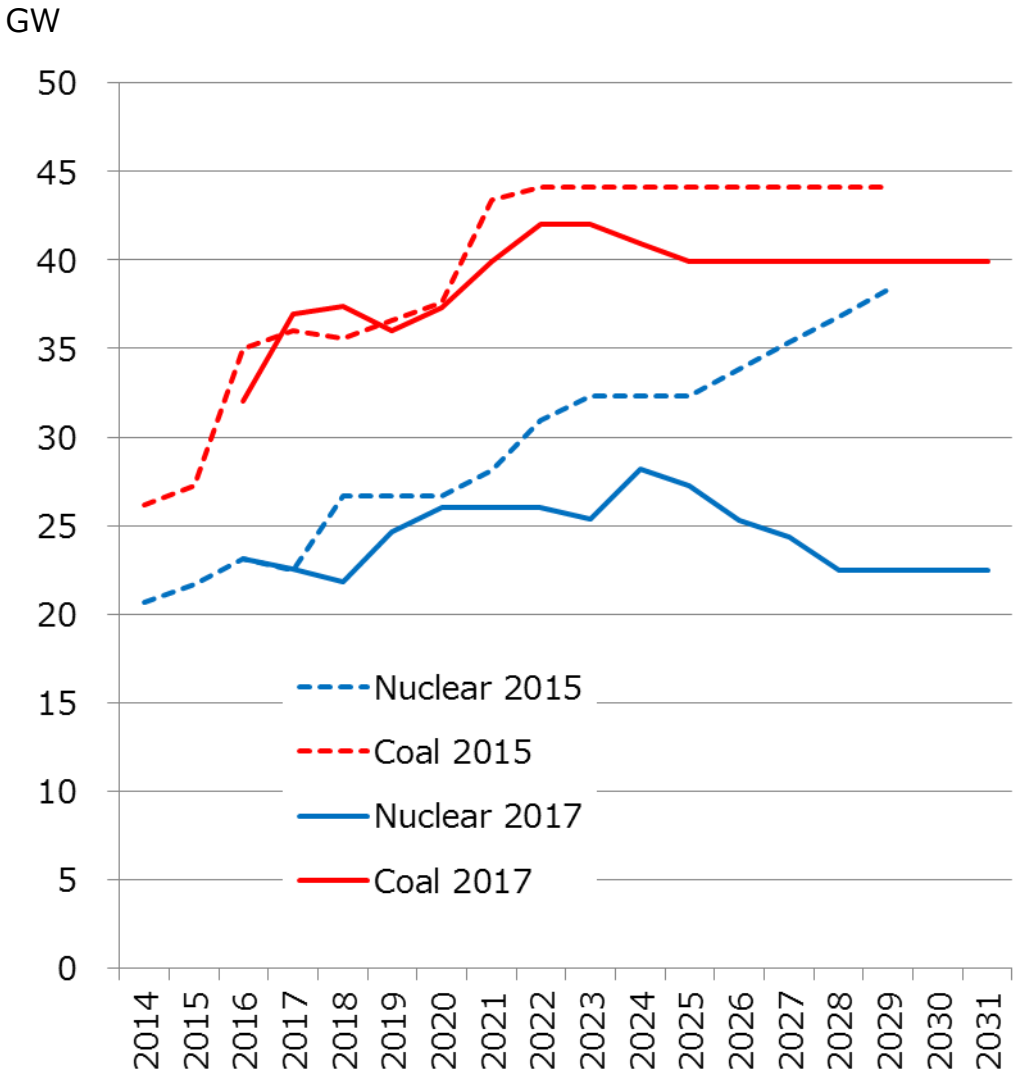


Nuclear load factor



Korea Customs, KEEI

South Korea : Outlook for Generation Capacity



- ✓ Currently five new nuclear power plants are under construction. However, because of delay, nuclear capacity is expected to be lower than the planned capacity as of 2022.
- ✓ In July 2016, the government announced that it would close 10 coal-fired power plants by 2022 and ten more between 2023 to 2030.
- ✓ The new 9th long-term power plan is expected to increase renewables and further decrease coal.

Long-term power generation plans

Taiwan : Status of Nuclear Power Plants

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The current government decided its policy on "Nuclear Phase out by 2025"
But still uncertain as a result of referendum on "the current nuclear policy"

Units		MW	Type	Start	Licensed to	Status
Chinshan	# 1	636	BWR	12/1978	12/2018	Decided to be decommissioned
	# 2	636	BWR	7/1979	7/2019	Decided to be decommissioned
Kuosheng	# 1	985	BWR	12/1981	12/2021	In operation
	# 2	985	BWR	3/1983	3/2023	In operation
Maanshan	# 1	951	PWR	7/1984	2024	In operation
	# 2	951	PWR	3/1985	2025	In operation
Lungmen	# 1	1350	ABWR	Not Yet	-	deferred
	# 2	1350	ABWR	Not Yet		

World Nuclear Association , Taiwan Power Company

Taiwan: Outlook for LNG Terminal Capacity

Demand is strong; Terminal capacity is the key to LNG supply expansion.

Owner	Terminal	2018	2020	2022	2024	2025	2027
CPC	Yongan	**10.5**	10.5	10.5	11.0	11.0	11.0
	Taichung	**5.5**	6.0	6.0	10.0	13.0	13.0
	Taoyuan			0.5	3.0	6.0	6.0
Tai Power	Taichung				0.3	1.8	3.0
	Keelung					0.9	3.0
TOTAL		**16.0**	16.5	17.0	24.3	32.7	36.0

Bureau of Energy, Ministry of Economic Affairs, Nov.24 2017 and others

CPC

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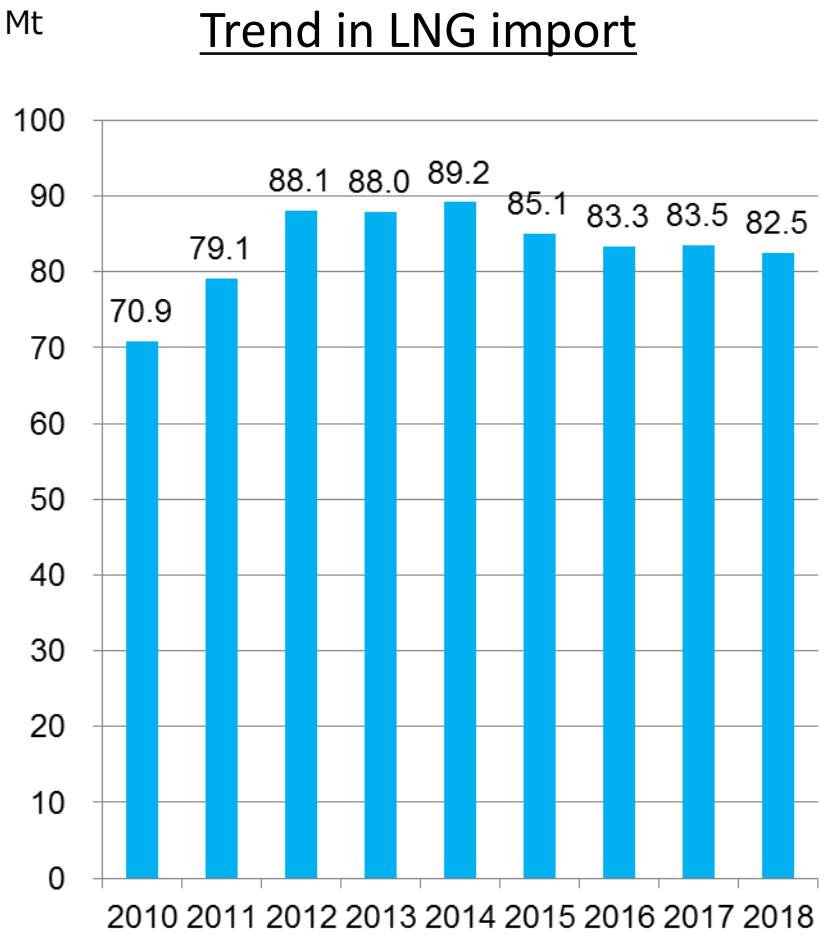
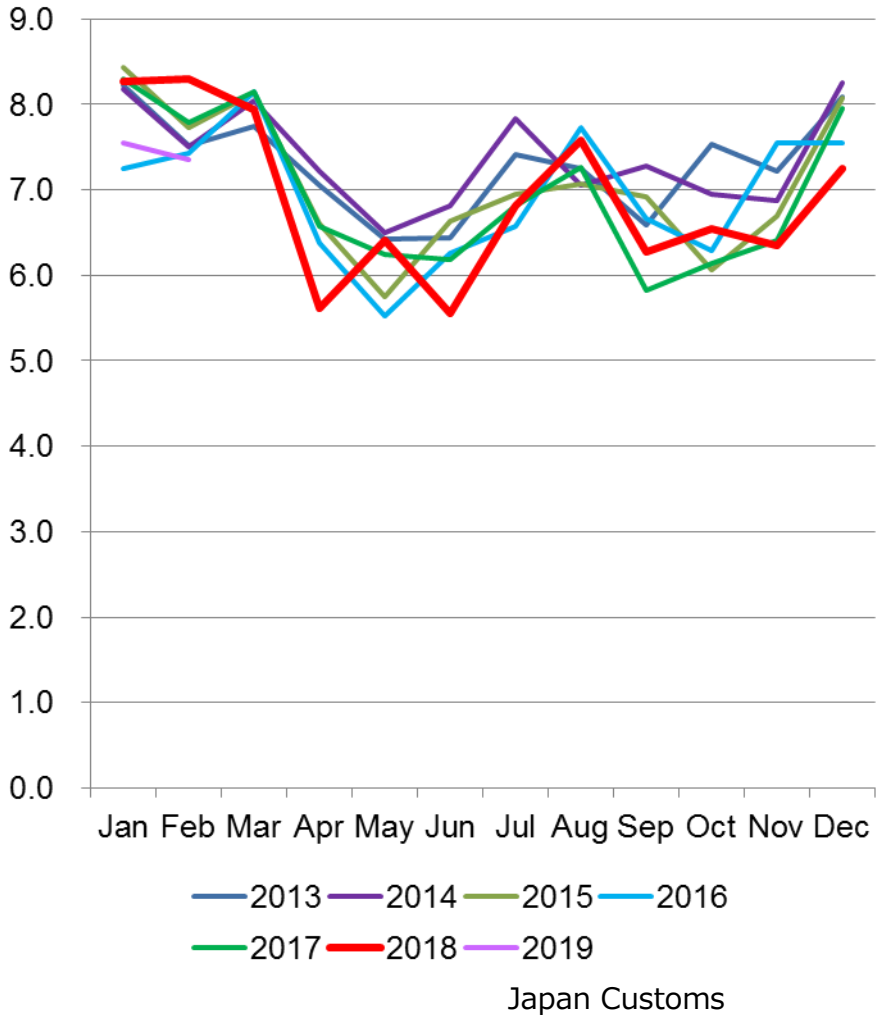
LNG Imports in Japan

Trend in LNG import

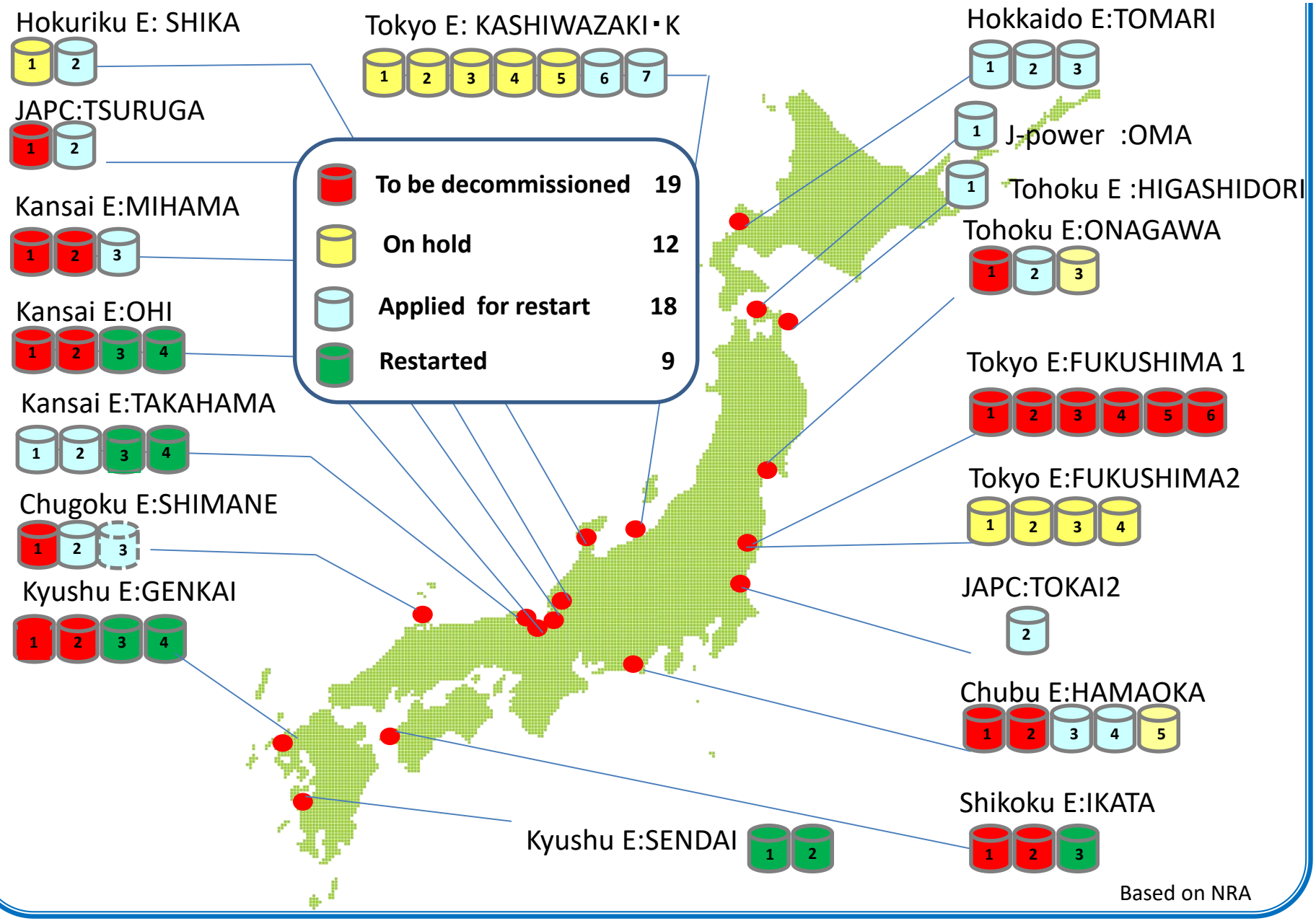


Monthly import volume



Japan Customs

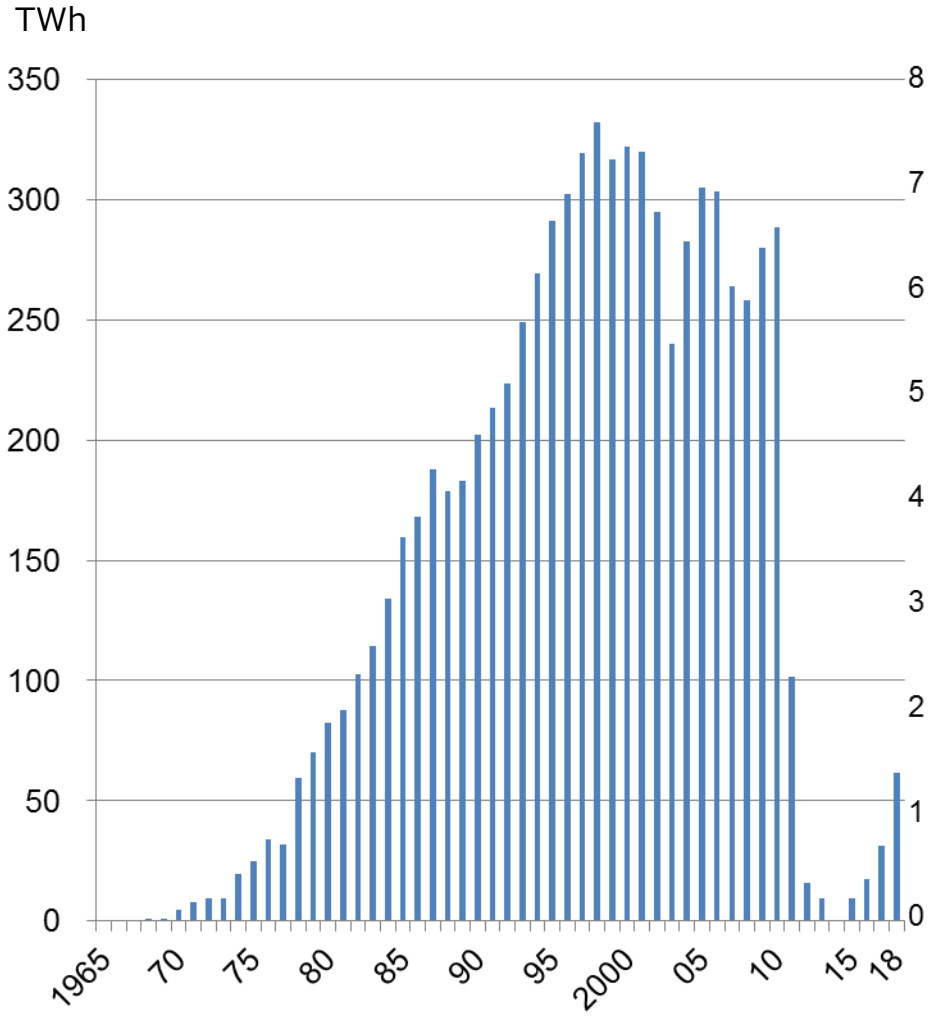
Status of Nuclear Power plants (as of Apr. 2019)



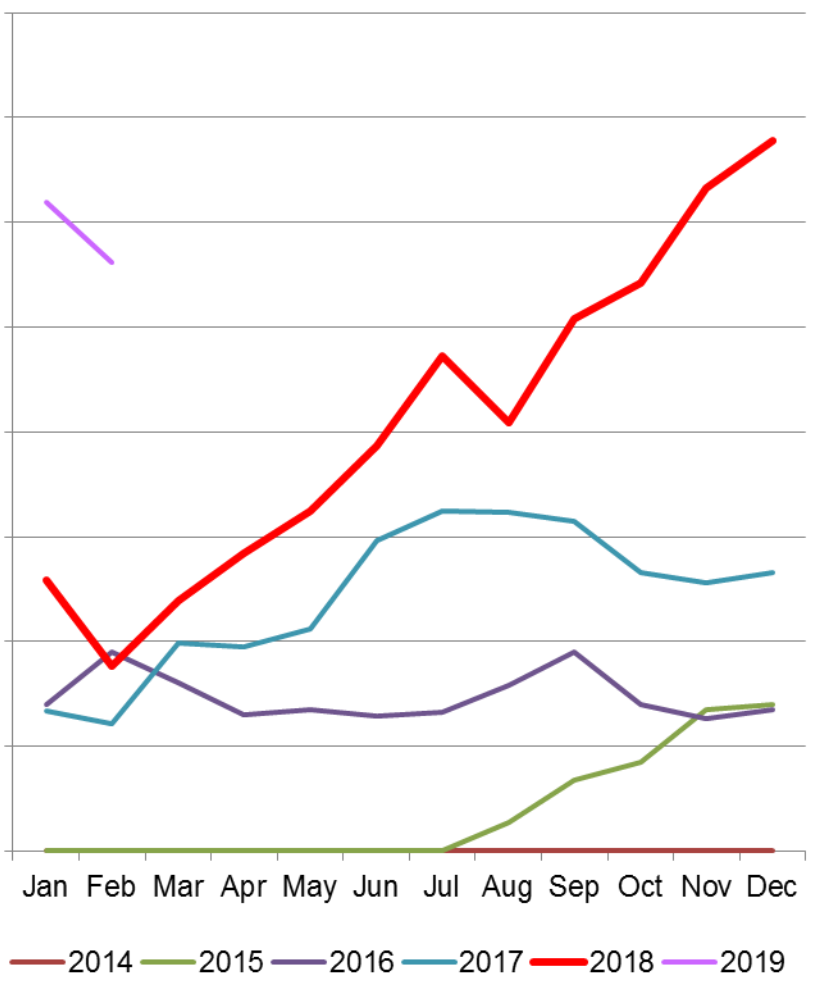
Based on NRA

Trend in Nuclear Generation Volume

Nuclear generation volume (FY)



Monthly nuclear generation volume



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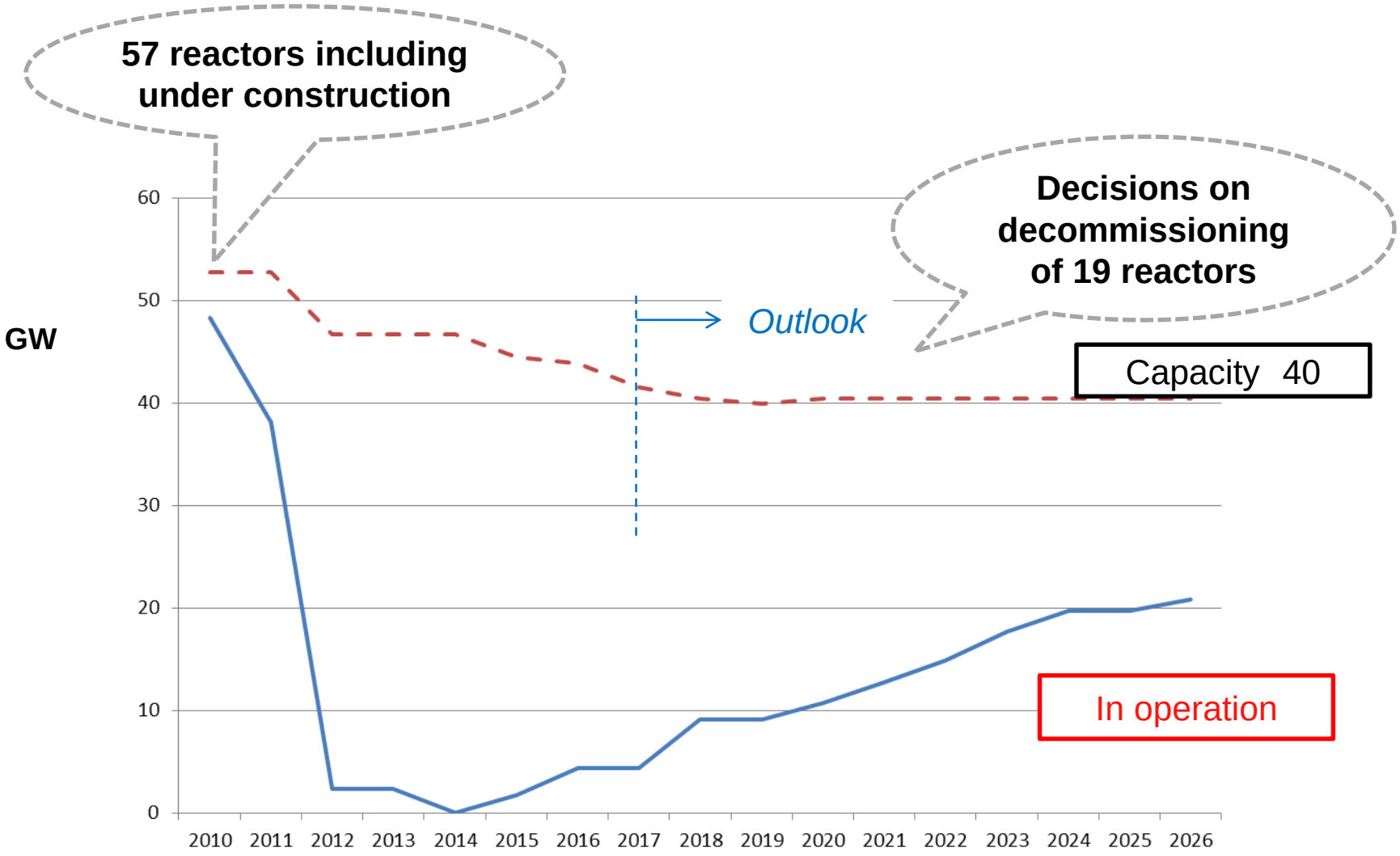
Outlook for Nuclear Power Generation in Japan



As of Apr.2019

Trend in Coal-fired Generation Volume

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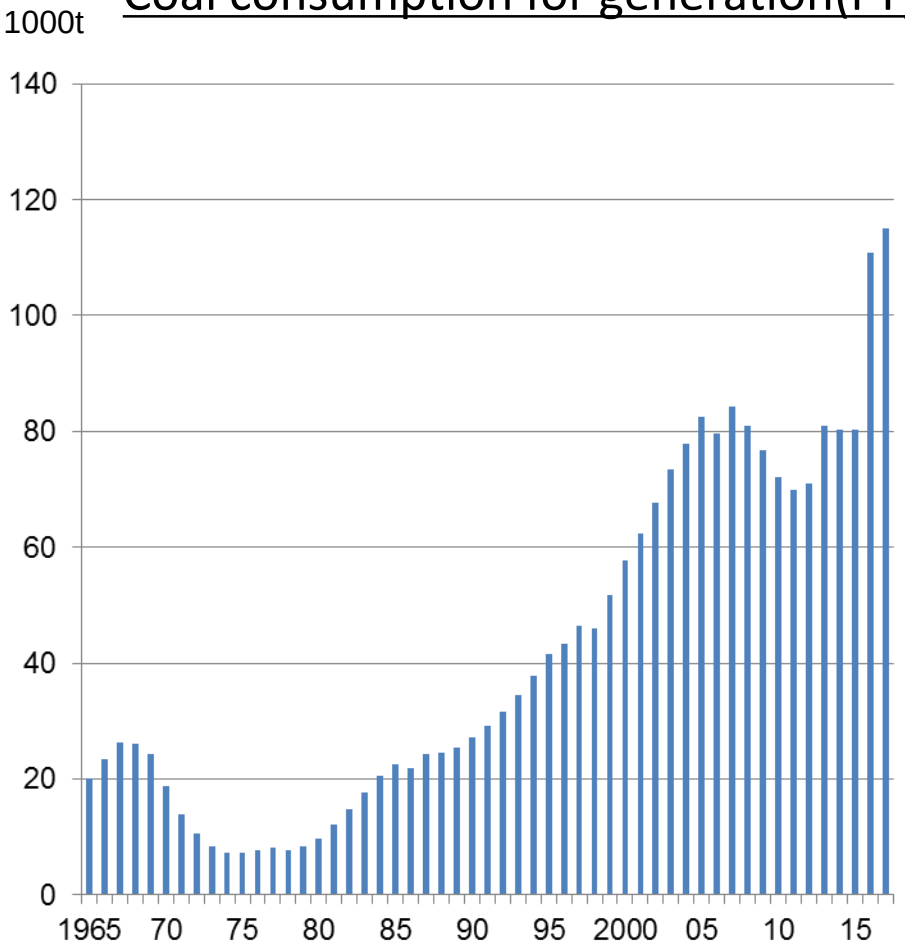
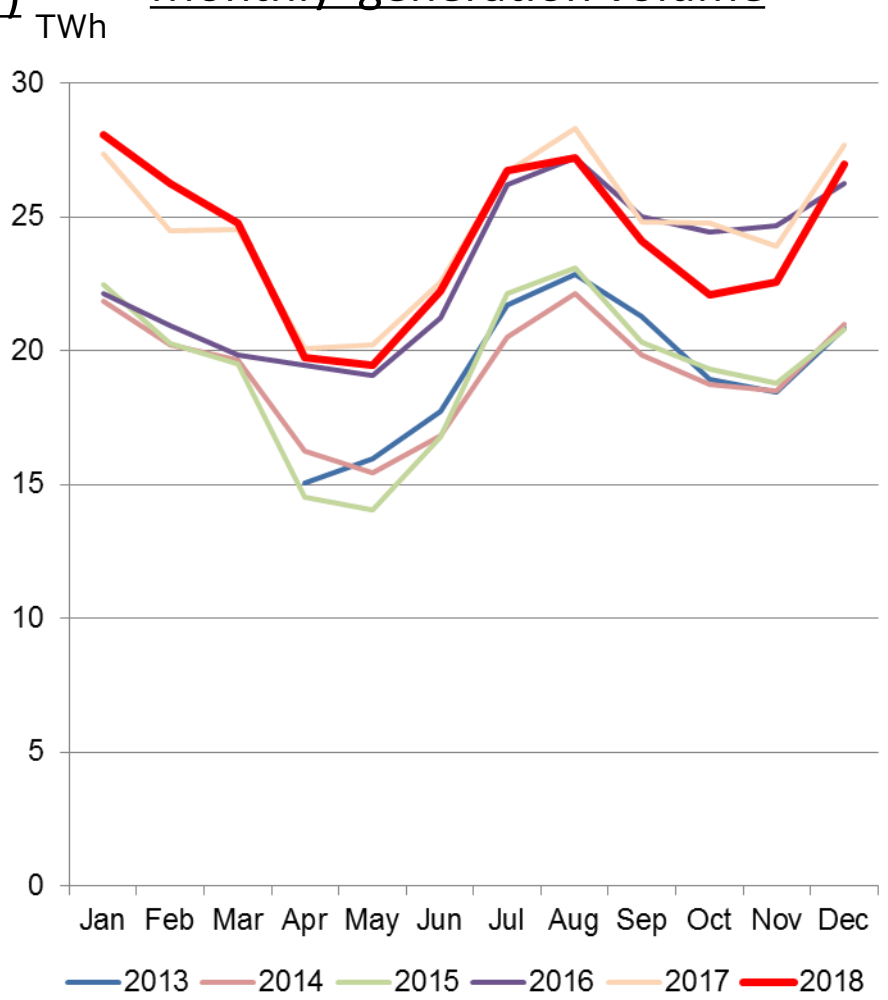
Coal consumption for generation(FY)



Monthly generation volume



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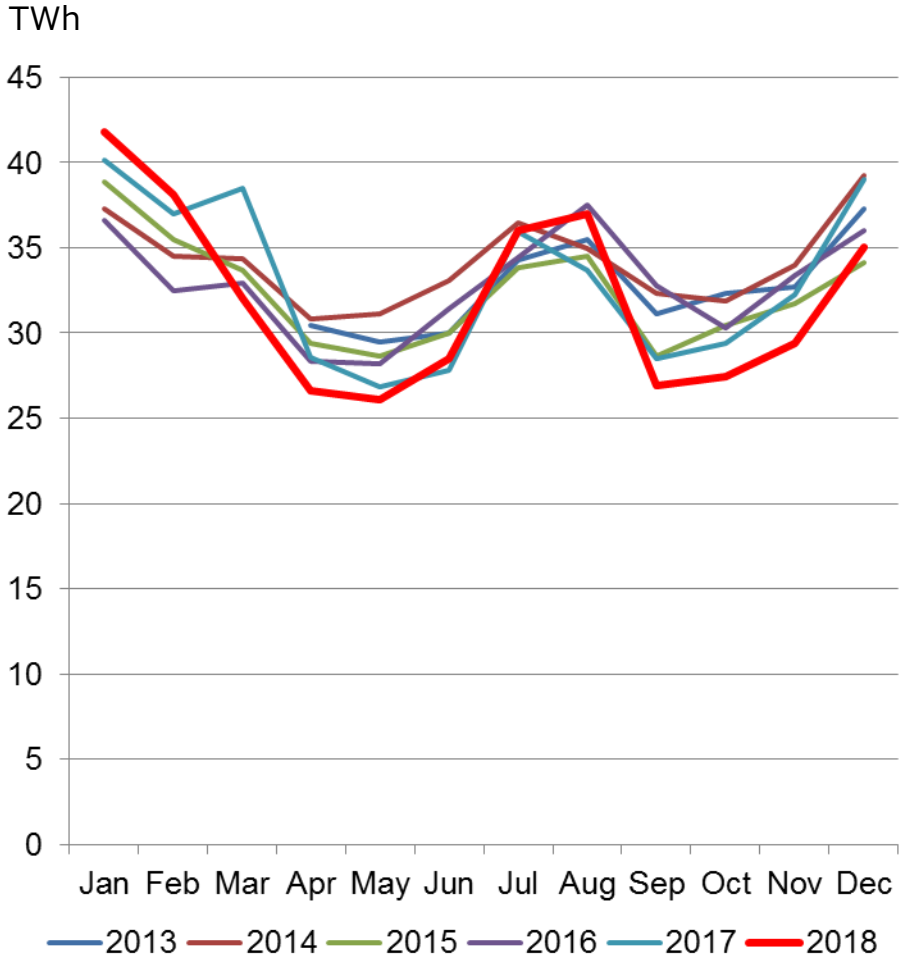
Status of New Coal Power Plants

Some of new plans facing difficulties on its economics

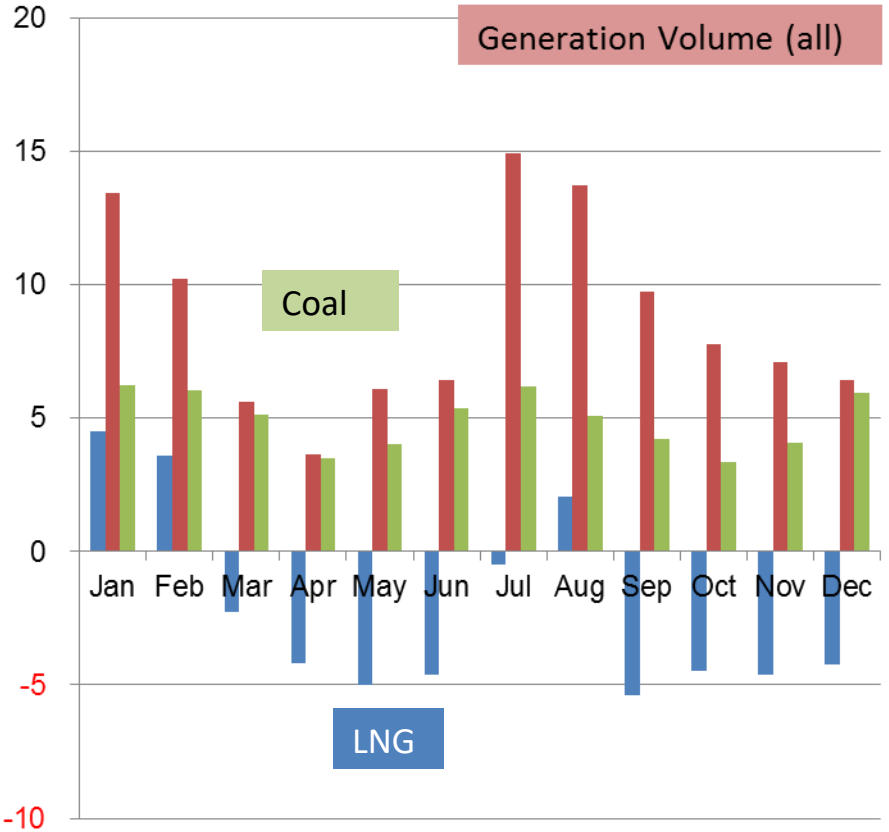
Power Plant	Capacity/ GW	Start operation	Current status	Type
Matsuura II	1	2019.Dec	Under construction	USC
Noshiro III	0.6	2020.Jun	Under construction	USC
Kashima II	0.645	2020.Jul	Under construction	USC
Takehara	0.6	2020.Sep	Under construction	USC
Nakoso	0.54	2020.Sep	Under construction	IGCC
Hirono IGCC	0.54	2021.Sep	Under construction	IGCC
KOBE III IV	1.3	2021/2022	Under construction	USC
Misumi II	1	2021.Nov	Under construction	USC
Taketoyo V	1.07	2022.Mar	Under construction	USC
Yokosuka I II	1.3	2023/2024	Under planning	USC
Saizyo I	0.5	2023.Mar	Under planning	USC
Akita-kou I II	1.3	2024.Mar	Under planning	USC
Nishi Okinoyama I II	1.2	2026.Apr/Oct	Under planning	USC
Akou I II	1.2	2020	Cancelled / to FO?	SC
Takasago I II	1.2	2021/2027	Cancelled	USC
Soga	1.07	2024	Cancelled/ to LNG?	USC
Ichihara	1	2024	Cancelled	USC
Sodegaura I II	2	2025/2026	Cancelled	USC

Trend in LNG-fired Generation Volume

Monthly generation volume



Changes in generation volume (2018 Vs. 2014)



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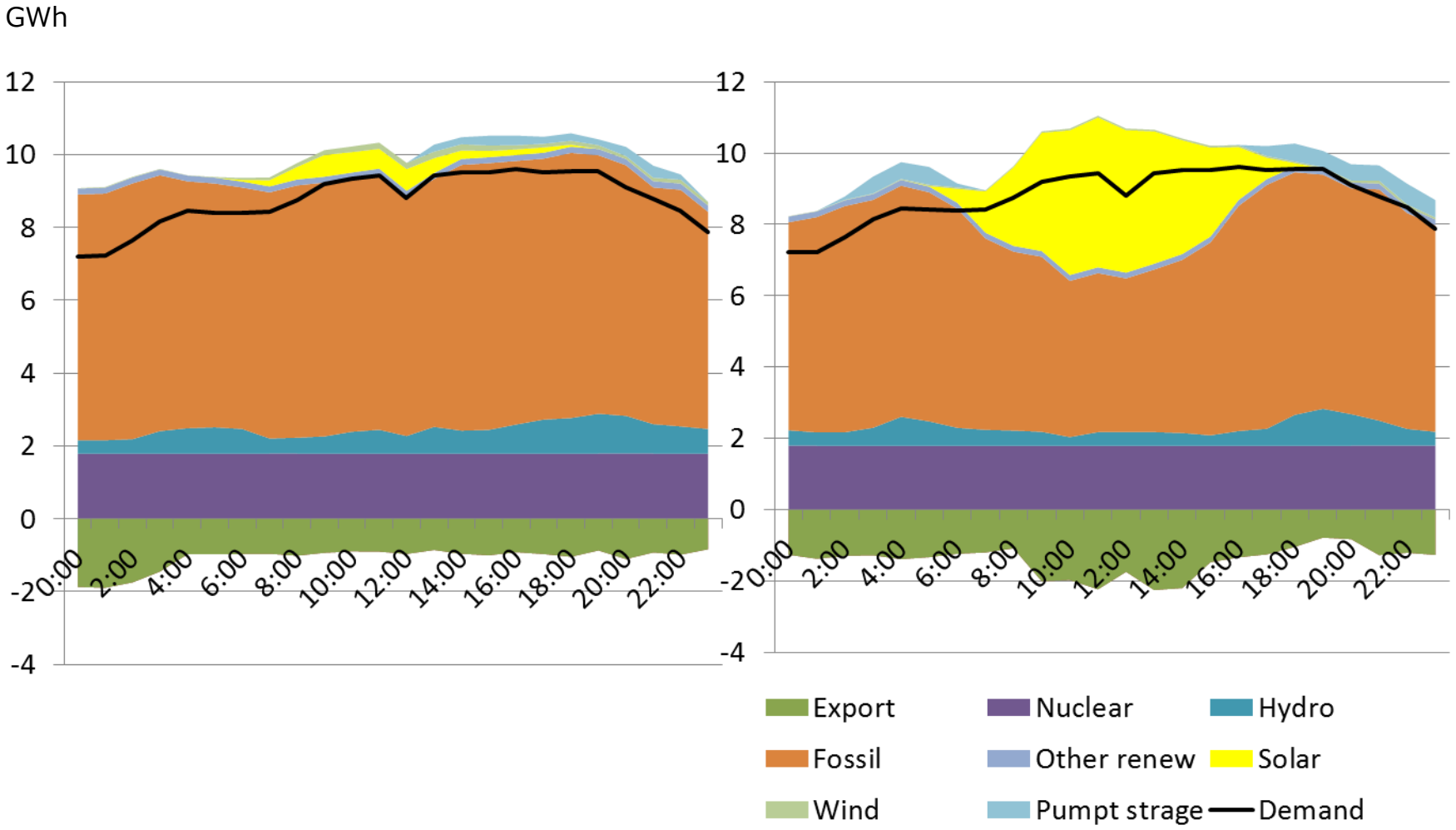
Impact of PV on LNG Generation Volume

Duck curve creates a new challenge of power plant operation



as of May, 2017 at Kyusyu E

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Price Trends of LNG to Japan

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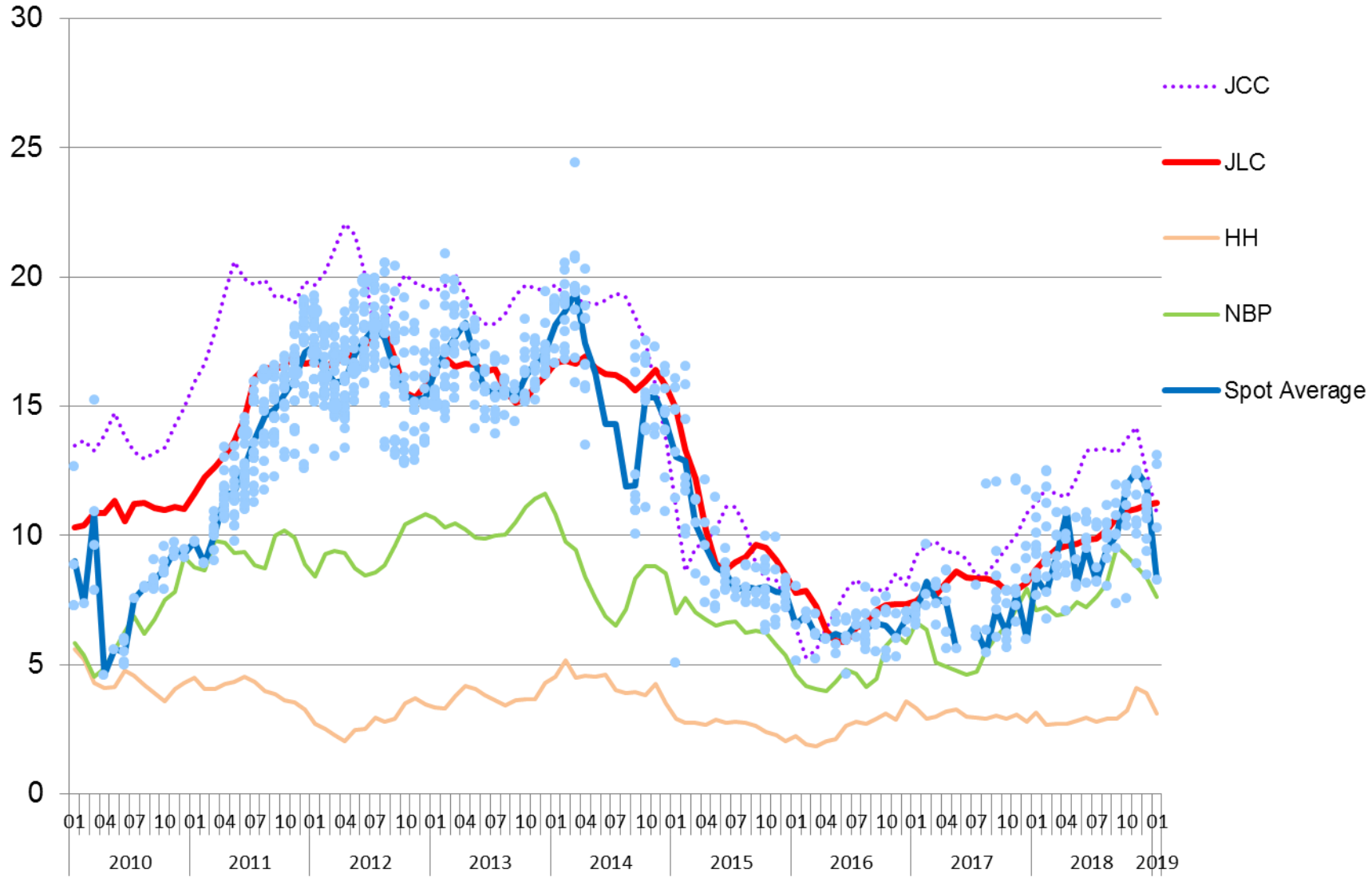
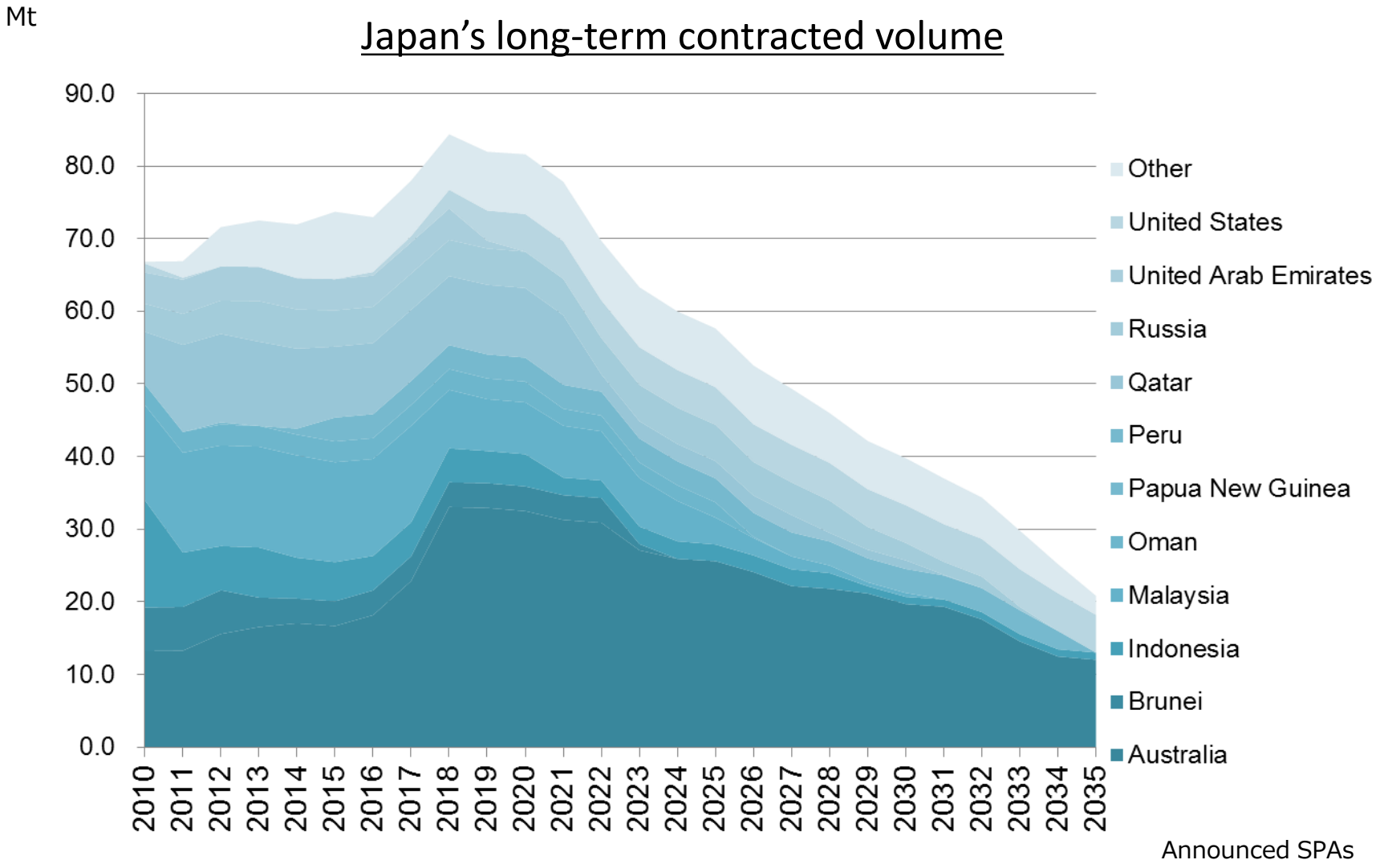
$/mmbtu

Japan's LNG import price



Japan Custom

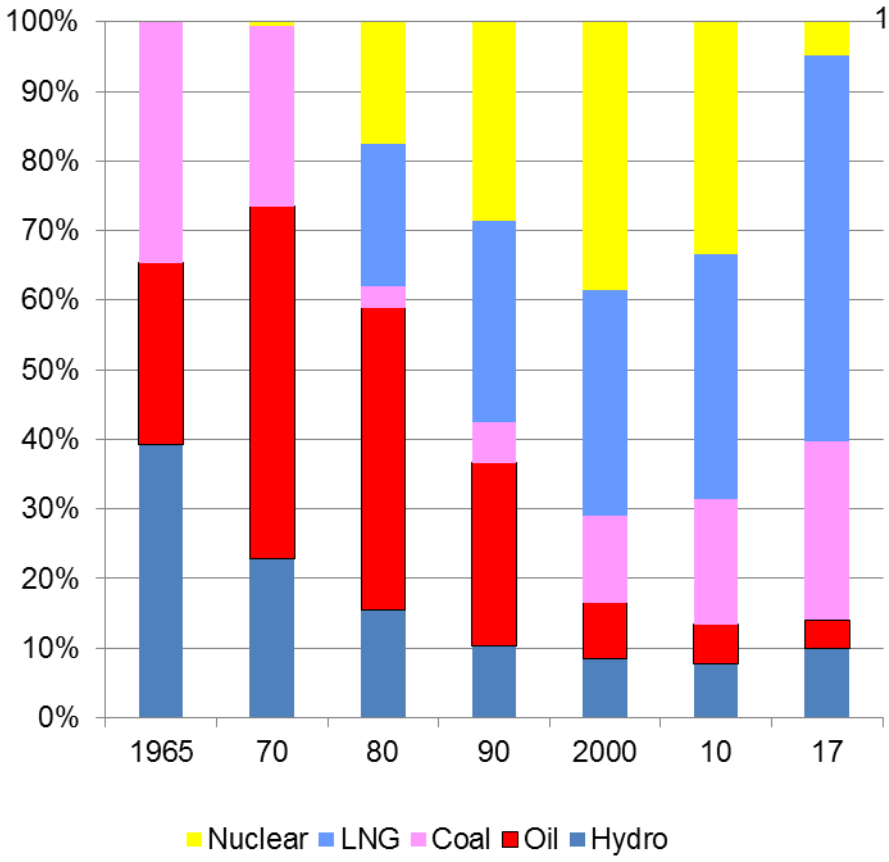
JLC is determined by Long term contracted price; which occupies large part of LNG imports and this trend will continue by around 2025



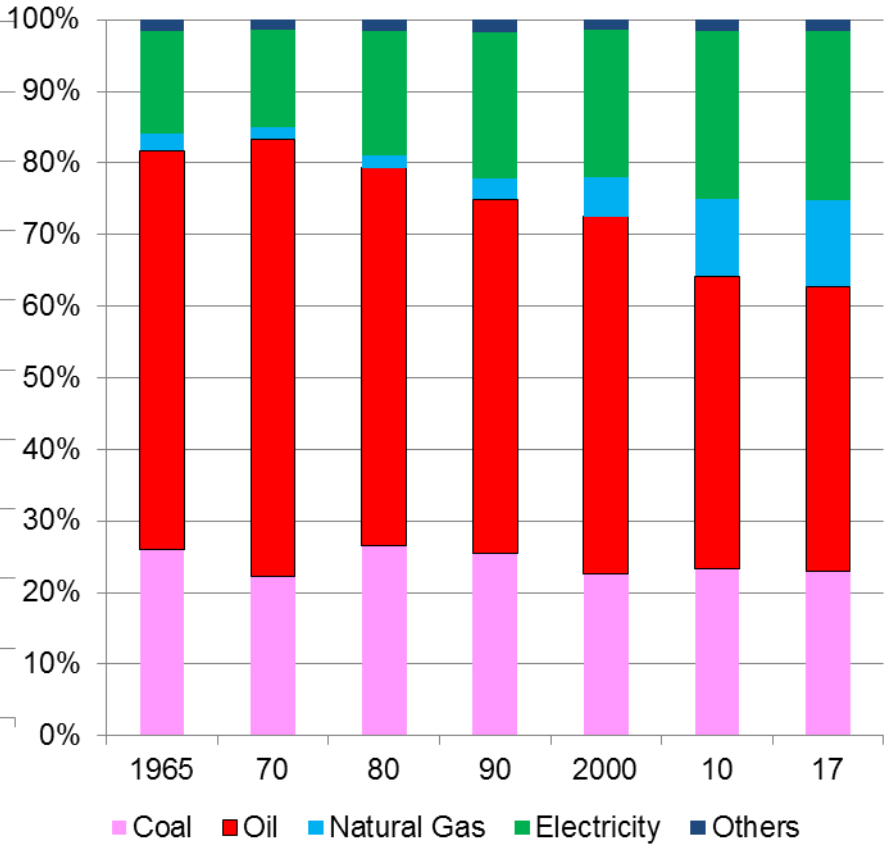
What is a Reasonable Price to 'Domestic Market'?

The situation suggests that oil is no longer the competing fuel against gas

Energy mix in generation sector



Energy mix in industrial sector



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Is there alternative pricing scheme to oil-linked pricing?

- *Netback/linked to power price or JEPEX?*
- *Discount to JLC price?*
- *Coal price linked?*
- *Using reference price like JKM?*
- *LNG Hub?*
- *Domestic gas hub?*

✓ The recent changes and expansion of the LNG market have created opportunities for Asian players to choose several options for LNG pricing method.

✓ In coming years, we may see price differences being generated between new contracts and existing contacts, spot prices and contracted prices and between HH price and oil linked prices.

✓ The oversupply LNG market situation will allow Asian players to test several new pricing schemes and that may change the market.

Thank you!