

24 December 2020 The 437th Forum on Research Works

2021 Gas Market Outlook

The Institute of Energy Economics, Japan

Hiroshi Hashimoto, Head of Gas Group

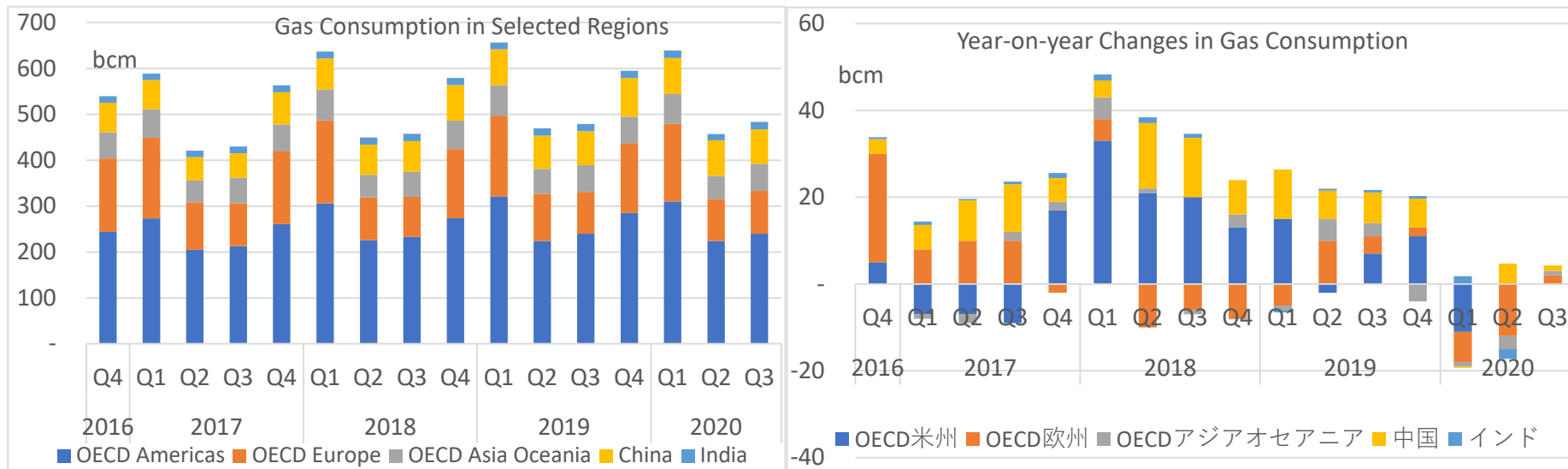
Fossil Energies and International Cooperation Unit

Executive Summary

- ✓ Japan's average LNG import price is forecast to go down to USD 7.0 - 7.3 per million Btu in 2021 from USD 7.8 in 2020. The assessed spot LNG price in Northeast Asia is forecast to be USD 8 in the first quarter, around USD 5 in the second and third quarters, and USD 6-7 in the fourth quarter.
- ✓ The global LNG trades are forecast to expand by 5% to 380 million tonnes in 2021 from estimated 362 million tonnes in 2020, backed by lower prices and expected ample supply capacity, which is forecast to continue being larger than demand at around 400 million tonnes.
- ✓ The global gas demand is expected to decline by 3% in the calendar year 2020, while some recovery trends were observed from the third quarter. Trends in demand show stark contrasts between major markets.
- ✓ Recent major fluctuation of prices has been an intense wake-up call for the LNG industry to thoroughly review LNG contracts and pricing.
- ✓ It is important to enhance liquidity in the LNG market and improve trading conditions including appropriate pricing indexes, when the industry pursues development of emerging markets in Asia. New approach will be required to address CO₂ and methane emissions.

Natural Gas Consumption in Major Regions

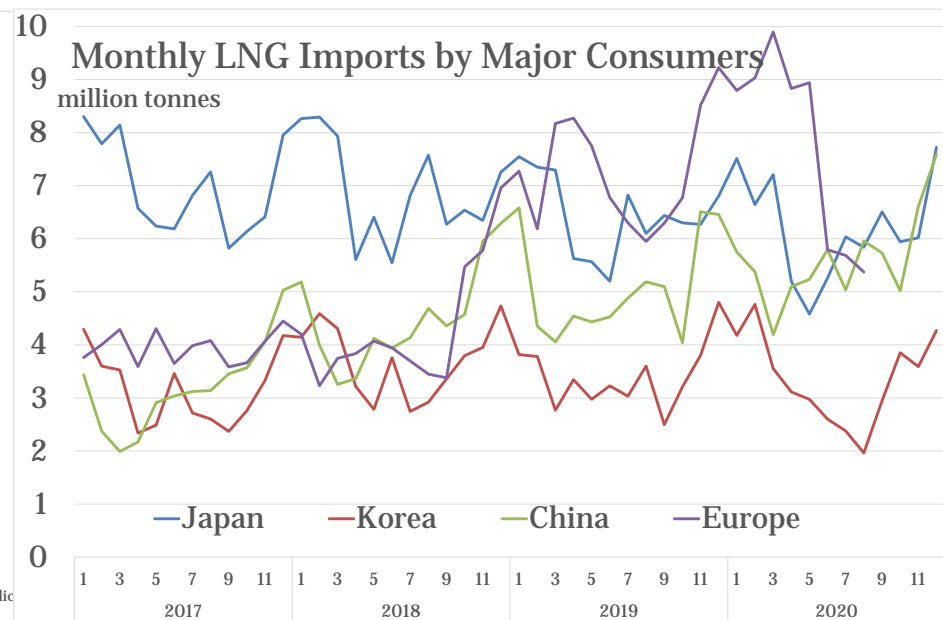
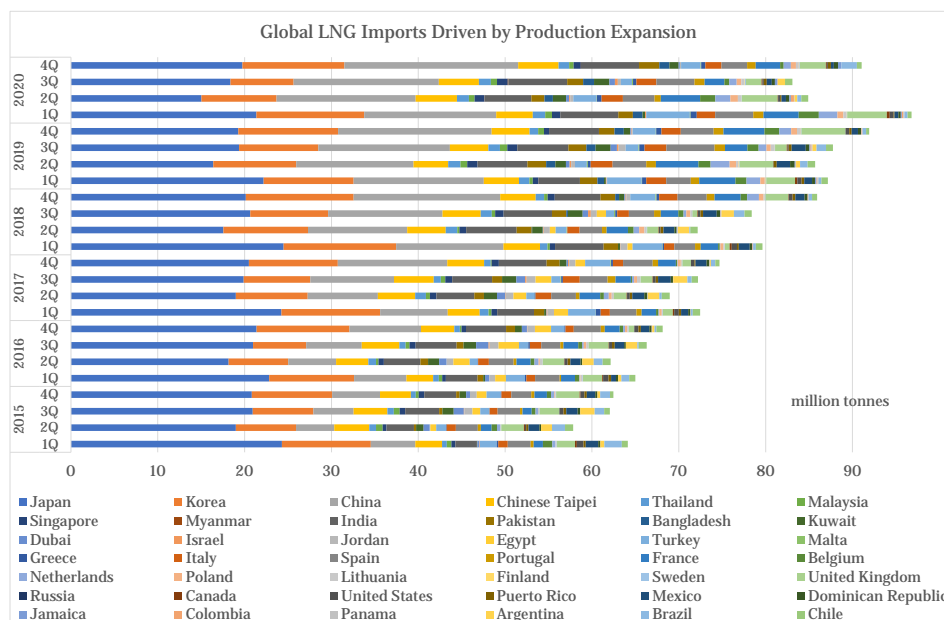
- Global gas demand shrank significantly in the first half of 2020
 - Global gas demand is expected to decline by 3% in the calendar year 2020
 - Some recovery trends were observed from the third quarter
 - Gas consumption decreased by 11 bcm year-on-year in the first quarter in North America
 - Gas consumption decreased by 19 bcm in the first quarter in OECD Europe
 - Gas consumption did not grow much in the first quarter but grew markedly in the second quarter in China
 - Gas consumption increased significantly in the first quarter then shrank markedly in the second quarter in India



(Source) Based on data of IEA "Monthly Gas Statistics", China's NDRC, India's PPAC

Global LNG Trades Expand Underpinned by Supply

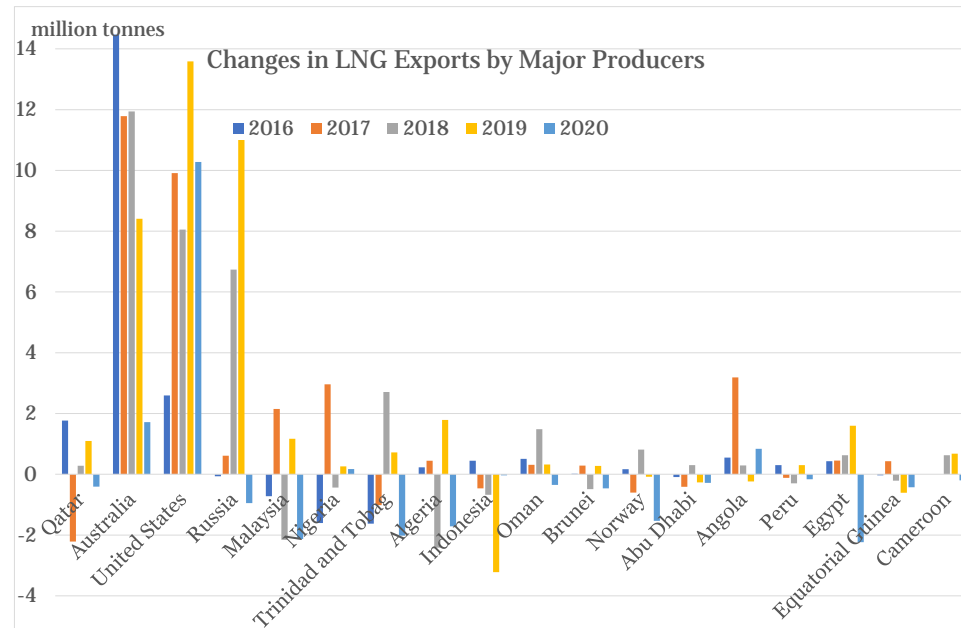
- Global LNG trades continued its growth until the first quarter of 2020
 - Although the second quarter saw a year-on-year decrease, a 2% increase is estimated for the calendar year
 - The share of Japan in the global LNG trades declined from 22% in the year 2019 to 20% in the first half of 2020
 - China imported more LNG than Japan in November 2019, May, June, August, and November 2020



(Source) Based on customs statistics and Cedigaz LNG Services data

LNG Production Growth Concentrates in the United States

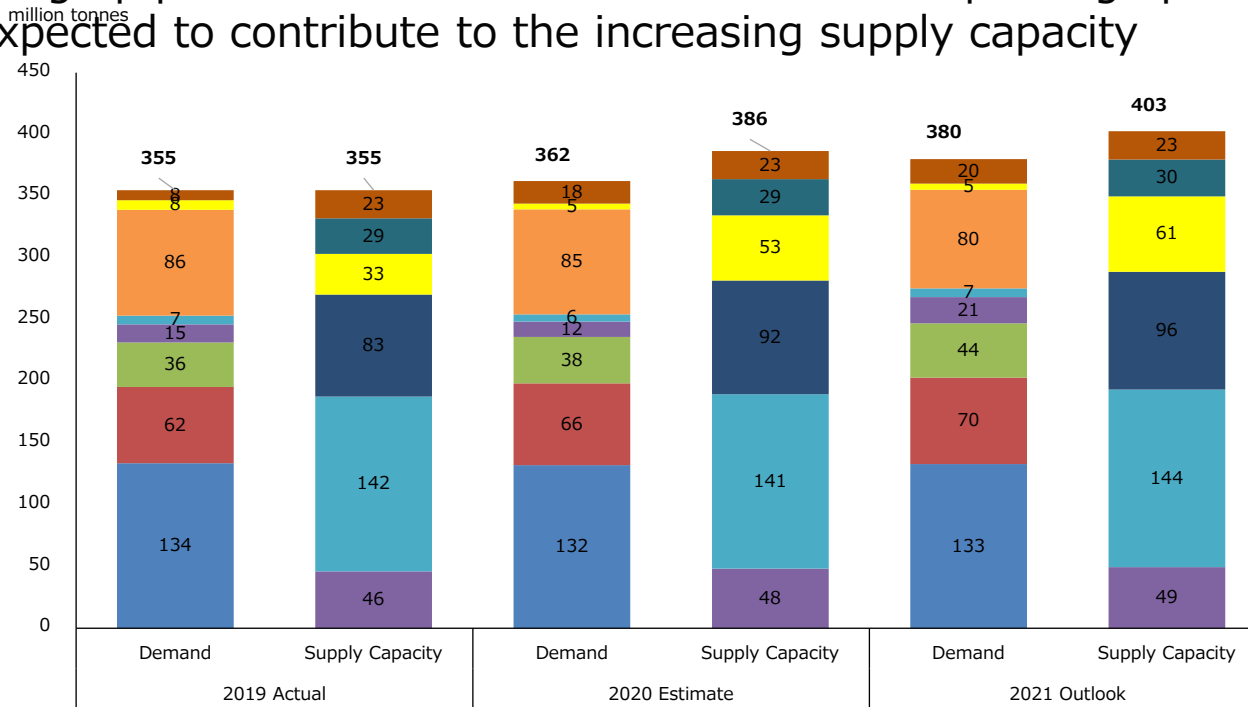
- Growth slowed in 2020
 - Exports increased by 8.4 million tonnes (12%) in Australia, by 13.6 million tonnes (64%) in the United States, by 11 million tonnes (61%) in Russia in 2019
 - The United States dominated the growth in the first half of 2020 with 9 million tonnes
 - Australia and Russia did not grow much



LNG Exports in 2016-2020: (Source) Based on customs statistics and Cedigaz LNG Services data

LNG Demand and Supply Outlook

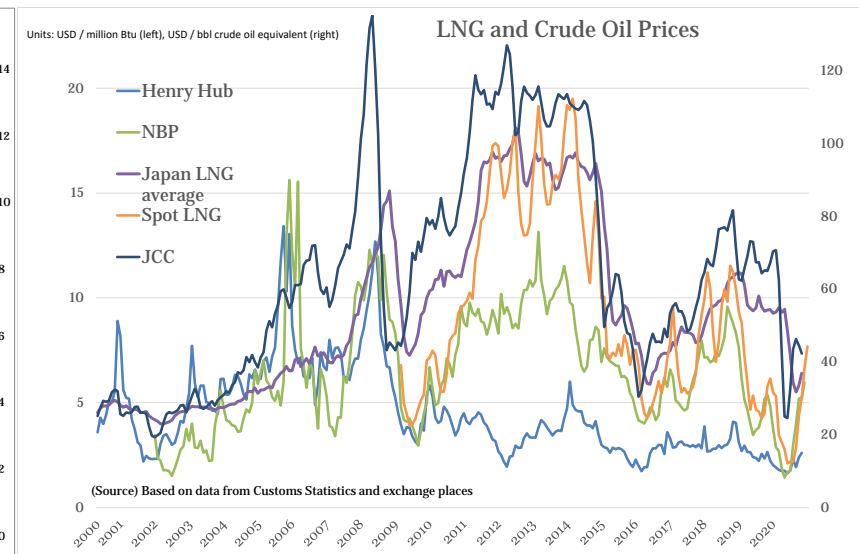
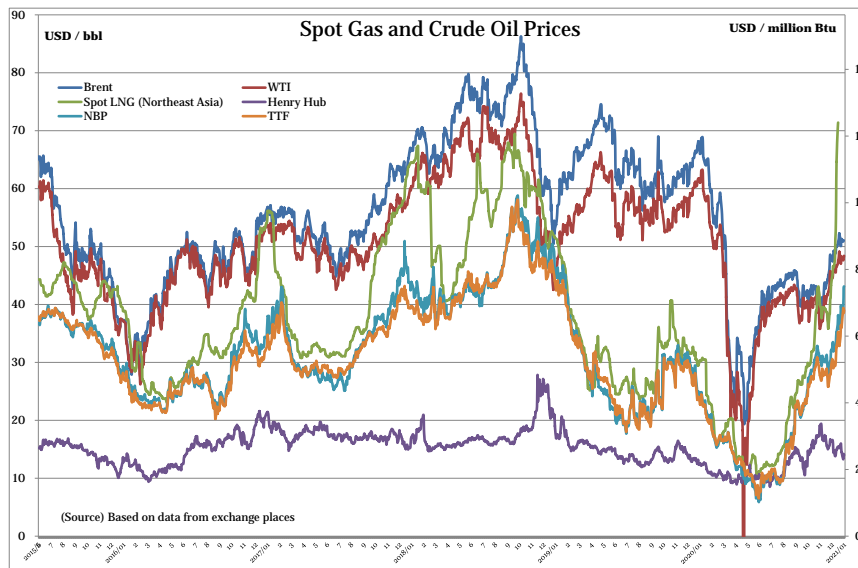
- The global LNG trade is expected to expand backed by increasing production and improving operational rates in 2021
 - 380 million tonnes is expected underpinned by ample supply capacity
 - Supply capacity is expected to remain larger than demand
 - Ramping up production in the United States and improving operational rates are expected to contribute to the increasing supply capacity



JKT China South Asia Southeast Asia Middle East & Africa Europe Oceania North America Russia Others

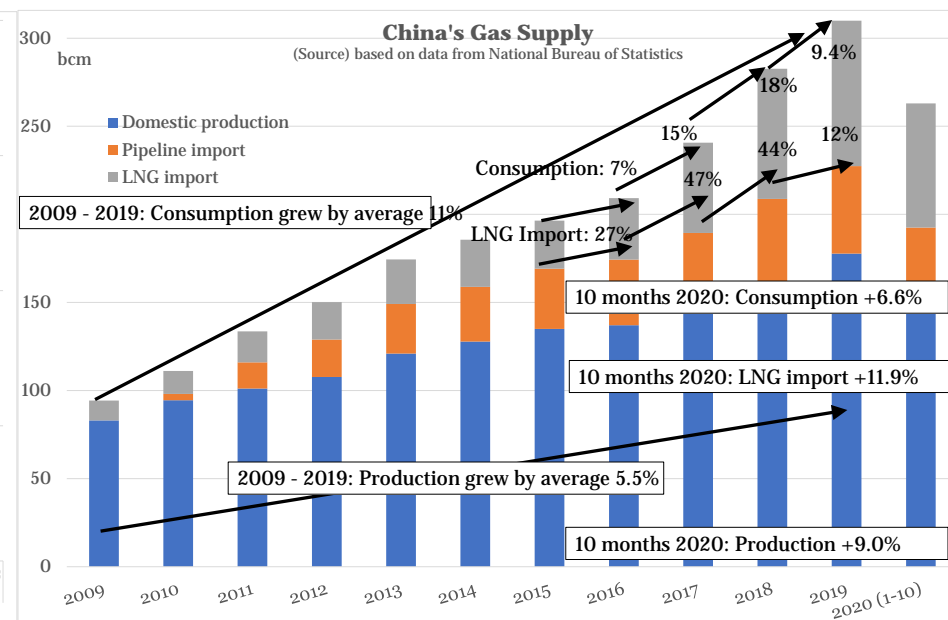
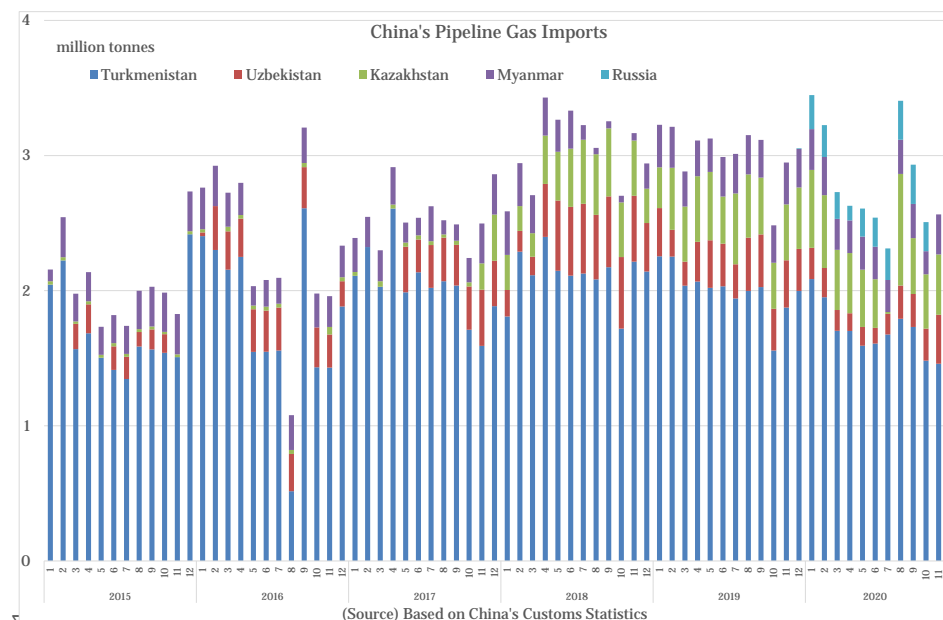
Gas Price Shocks in 2020

- Recent major fluctuation of prices has been an intense wake-up call for the LNG industry to thoroughly review LNG contracts and pricing
 - Japan's average LNG import price was below USD 6 in September. The gap between crude oil linked contract LNG prices and spot LNG prices was wider in the year.
 - Henry Hub and TTF / NBP (next month delivery) touched historical bottoms in the summer
 - Assessed spot prices surge in the winter



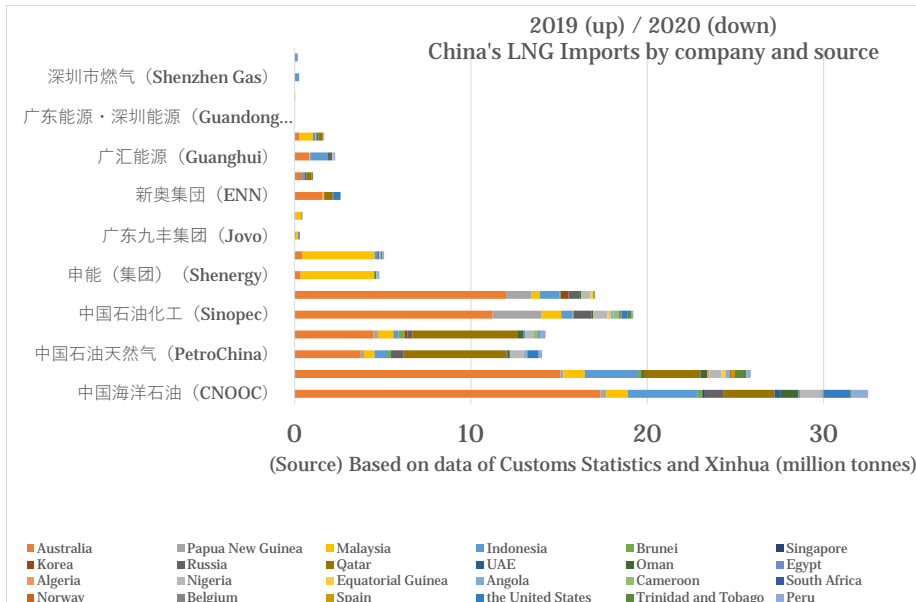
China Has Returned to Steady Growth of Gas Market

- While the growth rate of China's natural gas consumption slowed in the first quarter 2020, growth returned thereafter
 - Consumption during the first ten months of 2020 was 6.6% larger than that of the same period in 2019, after the average 11% annual growth until 2019
 - China imported 11% more LNG in 2020 (although the growth was slower than the pace observed until 2019)
 - Import from Russia, starting in December 2019, amounted to 3 - 4 bcm in the first year



China Sees More LNG Importers

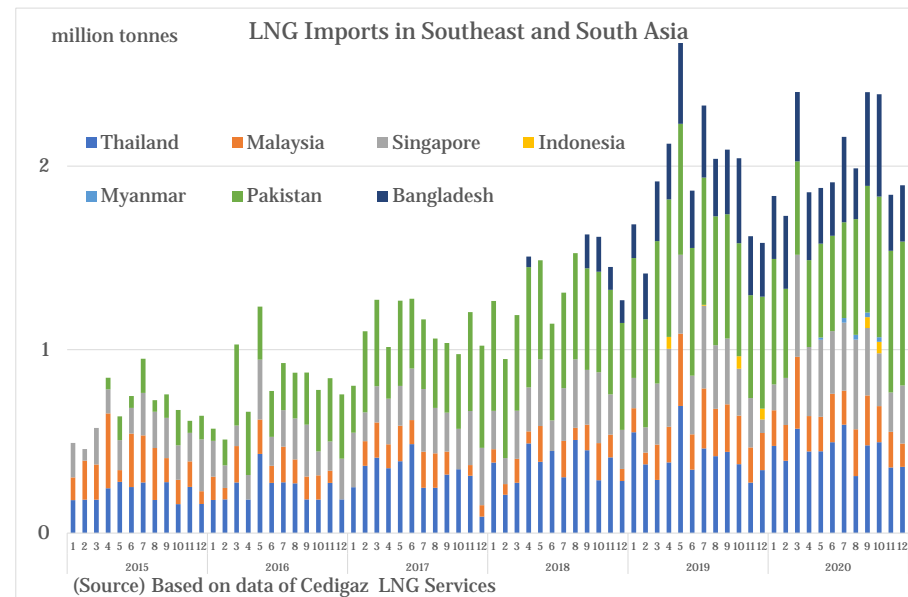
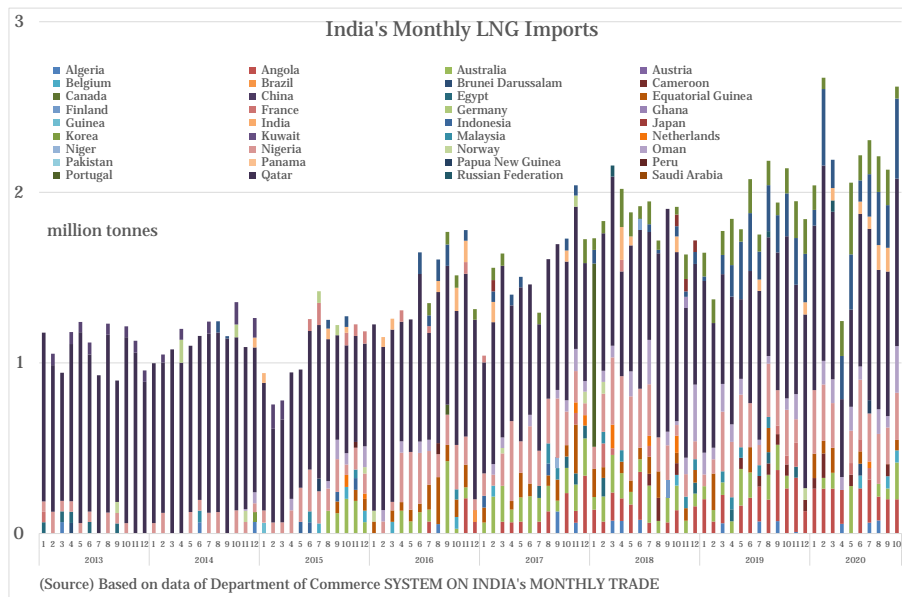
- Reforms of infrastructure operation encourage city-gas and electric power companies to participate in LNG import business
 - CNOOC started LNG imports in 2006 and PetroChina started pipeline gas imports in 2009. PetroChina in 2011 and Sinopec in 2014 started LNG imports at their respective terminals
 - While some large city-gas companies have their own LNG receiving terminals, others have had access to terminals owned by the national giants
 - Third-party access is promoted at terminals transferred to PipeChina
 - There was a fire incident at the Beihai terminal in the south



Fire incident at Beihai Terminal
(Source) China News Service

India, South and Southeast Asia

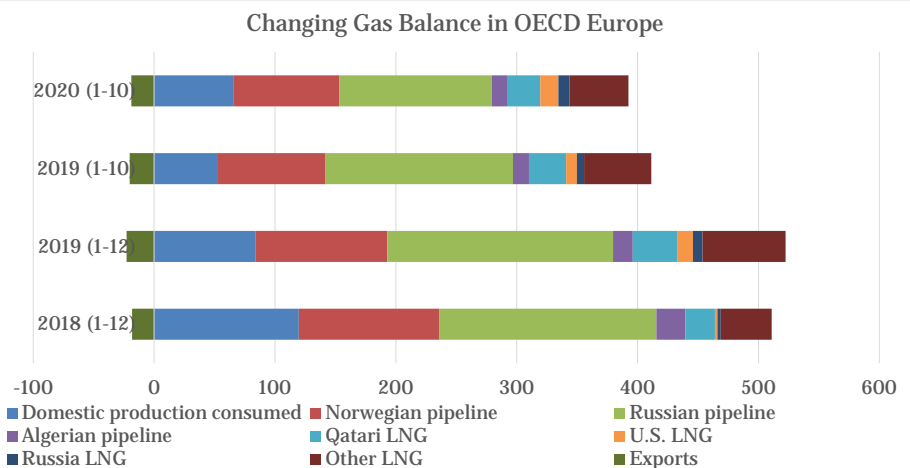
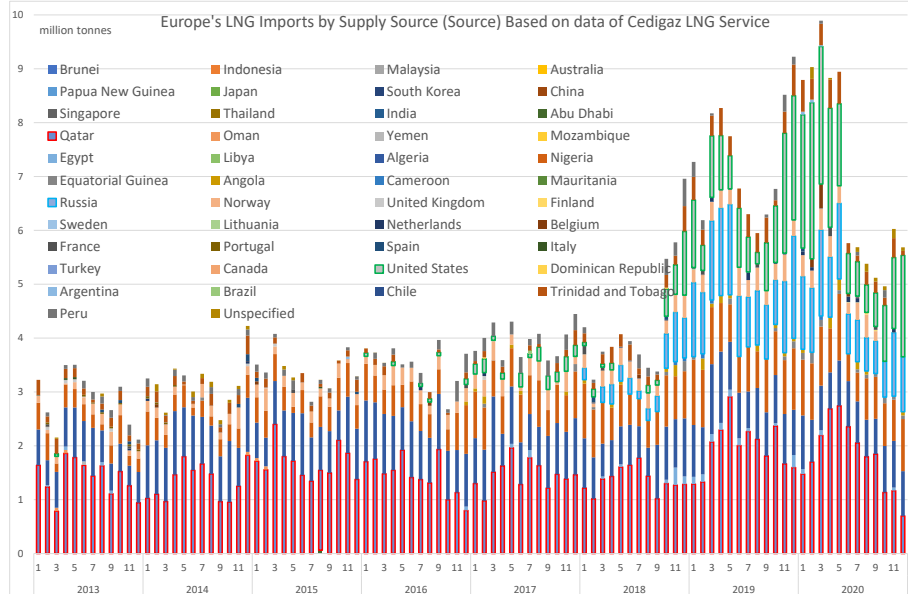
- More demand is expected in India and other emerging markets in Asia
 - While India imported 19 million tonnes of LNG during the first nine months of 2020, 15% more than the same period in 2019, its gas consumption as a whole declined by 2%. After a 29% year-on-year decrease in April, LNG imports increased by 15% to 25 million tonnes in 2020. The government promotes city-gas distribution and natural gas vehicles
 - Other South and Southeast Asian countries increased LNG imports by 4% in 2020



(Source) Based on customs statistics and Cedigaz LNG Services data

Europe Observes Structural Shifts in Gas Supply

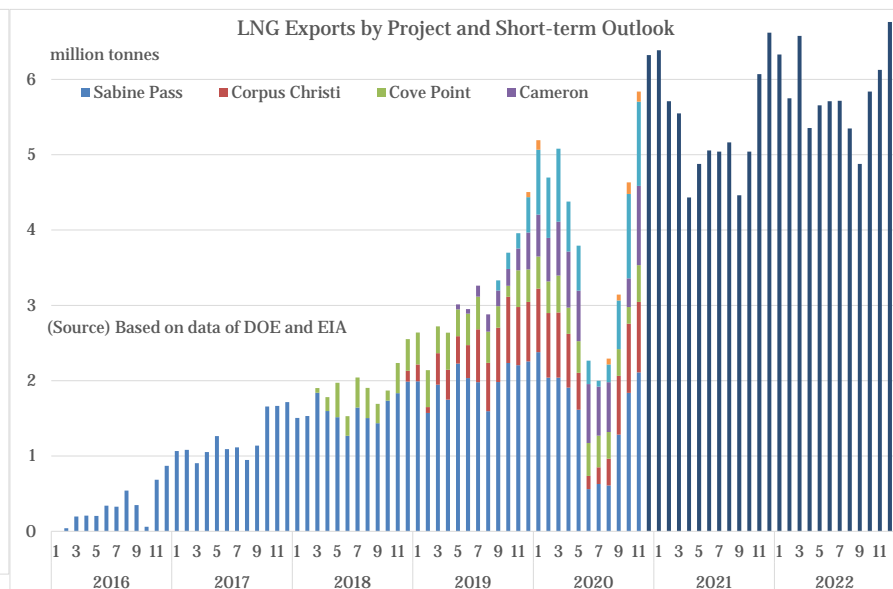
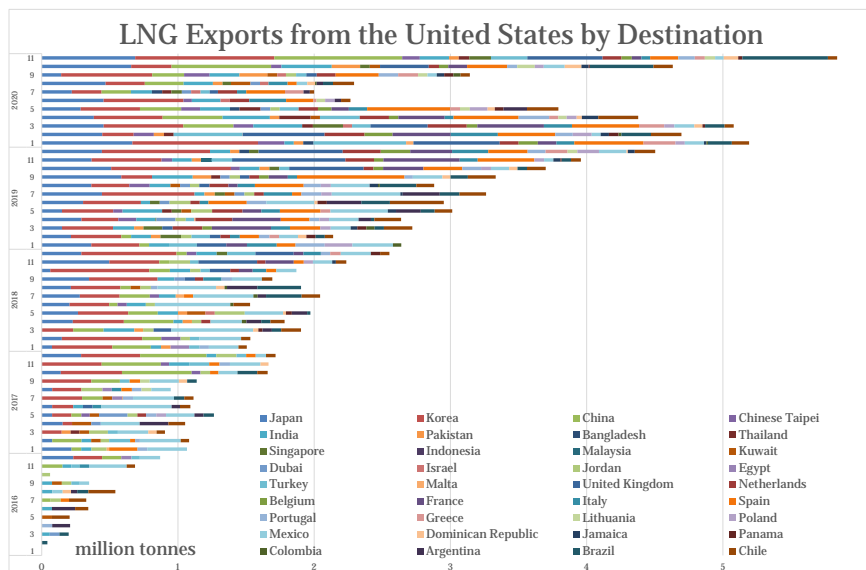
- Europe sees less gas production and more LNG imports
 - Natural gas consumption declined by 4.6% and LNG import increased by 1.4% year-on-year during the first three quarters of 2020 in OECD Europe, while pipeline gas imports from other regions shrank by more than 20% during the same period
 - During the rise of LNG imports in the last several quarters, more LNG was imported from the United States and the Russian Arctic region
 - In October 2020, the European Commission announced its Methane Strategy, including initiatives to manage and regulate methane emissions from natural gas production and other activities. Its impacts on suppliers from other regions should be closely observed



(Source) Based on data of IEA Natural Gas Monthly (Unit) bcm

LNG Exports from the United States Recover from 4Q 2020

- LNG exports from the United States respond to regional prices around the world
 - Monthly export of LNG from the United States declined by more than 50% from a January peak by July 2020. However, the U.S. Energy Information Administration (EIA) has estimated that monthly volumes again started registering record highs from November
 - In 2021, production is expected to ramp up from those facilities that started operation during the past two years

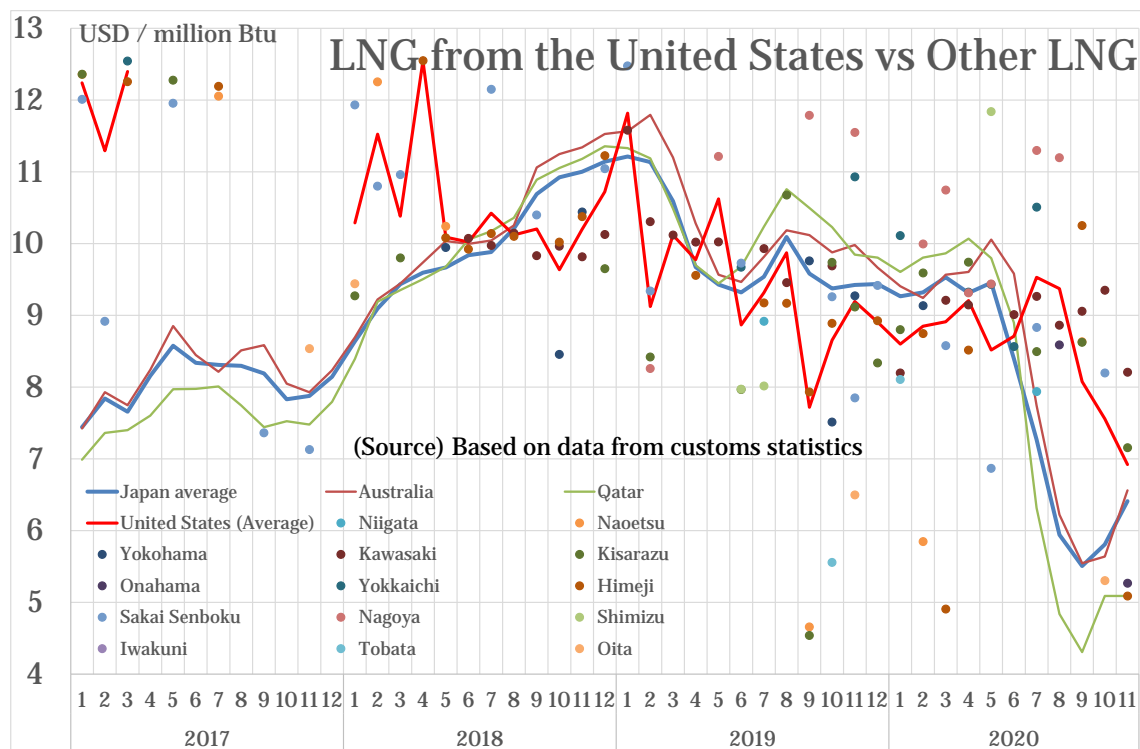


(Source) based on data of U.S. Department of Energy (DOE) and Energy Information Administration (EIA)

Competitiveness of LNG from the United States

Changes from Time to Time

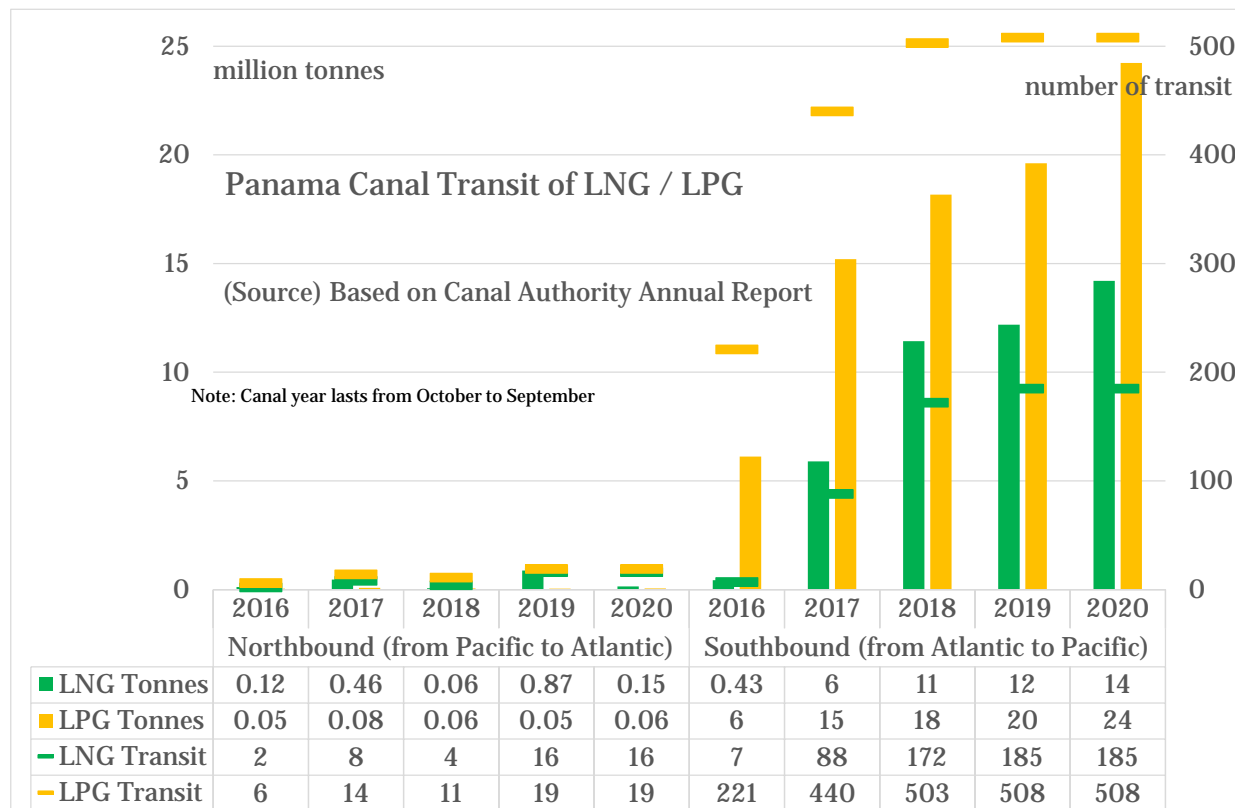
- The year 2020 observed issues related to price competitiveness of LNG from the United States
 - LNG from the United States has had price advantages when crude-linked LNG prices went up in 2018 and crude-linked prices did not come down swiftly in 2019-2020
 - Not competitive when other LNG prices were low after March 2020



- Cost down and supply stability are important
 - DOE extends export authorizations throughout 2050
 - Cost reduction through modularization and standardization and CO₂ and methane emission management

Panama Canal - Critical Junction

- Panama transit is the preferred route from GOM to Asia
 - LNG and LPG transits have expanded quickly after canal expansion
 - Nearly one laden LNG transit per day lately
 - The authority has expressed intension to expand LNG traffic



FID / Project Delays Are Observed

- Many potential new LNG export projects in the United States and other regions postponed investment decisions due to uncertainties over future demand
- Only one FID was announced in the world in the year, from a project on the Pacific Coast of Mexico in November
- Close eyes should be on those projects on which investment decisions have been made as to whether they proceed as planned

Project	Sponsors	Capacity	Production	FID
United States				
Golden Pass	Qatar Petroleum, ExxonMobil	15.6	2024→2025	2019
Plaquemines	Venture Global LNG	20	2023→2024	2020→2021
Freeport (T4)	Freeport LNG	5	2022→2024	2020→
Lake Charles	Energy Transfer	16.45	2025→	2020→
Port Arthur (T1-2)	Sempra Energy	13.5	2024→2025	2020→2021
Rio Grande	NextDecade	27	2023→2024	2020→2021
Magnolia LNG	LNG Limited	8	2022→	2020→
Driftwood LNG	Tellurian	27.6	2023→	2020→
Texas LNG Brownsville	Texas Brownsville LNG	2	2023→2025	2020→2021
Jordan Cove	Pembina Pipeline	7.8	2024→	2020→
Gulf LNG Pascagoula	Kinder Morgan	11.5	2024→	2020→
Port Arthur (T3-4)	Sempra Energy	13.5	-	2021→
Mexico				
Energía Costa Azul Phase 1	Sempra Energy	3.25	2024→2024	2020 1Q→4Q
Canada				
Kitimat	Chevron, Woodside	18	2029→	2022→
Woodfibre LNG	Woodfibre Natural Gas	2.1	→2025	2020→2021
Goldboro	Pieridae Energy Canada	10	2025→2026	2020→2021
Qatar				
North Field East	Qatar Petroleum	32	2024→2025	end 2020
Australia				
Pluto Train 2	Woodside	5	2025→2026	2020→2021
Mozambique				
Rovuma LNG	ExxonMobil	15	2024→	2020→
Mauritania / Senegal				
Tortue FLNG	bp	2.5	2022→2023	2018
Indonesia				
Tangguh Train 3	bp	3.8	2021→2022	2016

(Note) Green shaded are those projects after investment decisions

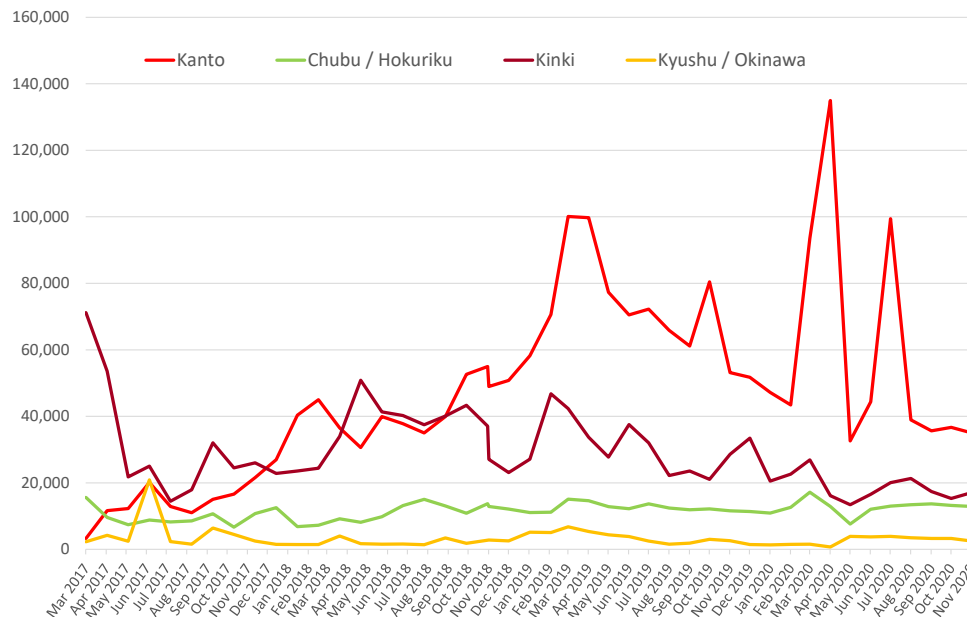
LNG Bunkering and Small-Scale LNG Gain Speed

- IMO's tougher sulfur regulation triggers the boom
 - In addition to business development in Japan, Japanese companies have participated in LNG bunkering projects in different countries
 - Road transportation is another promising area

	LNG Bunkering Facilities and Bunkering Vessels	LNG Powered Ships
Japan	LNG bunkering by truck has been done in Osaka and Nagoya LNG bunkering vessels to be operational in the fiscal year ending March 2021 in the Ise and Tokyo Bays	Car transportation, ferries, coal transportation vessels are under construction Two tugboats are in operation
Korea	The government announced support to LNG bunkering vessel construction KOGAS, port authority and other companies mull LNG bunkering JV	
China	Three LNG bunkering bases are already in operation International LNG bunkering facility is planned	Estimated 300 small vessels in operation VLCC (LNG powered) has been ordered
Singapore	LNG bunkering by truck has been conducted multiple times 7,500 m ³ and 12,000 m ³ LNG bunkering vessels are expected in operation in 2021 with Japanese companies involved Additional LNG bunkering license is expected	Ten LNG-powered crude tankers have been ordered
Malaysia	Southeast Asia's first LNG bunkering vessel was deployed in October 2020 Marine Department Malaysia (MDM) through Petronas started LNG bunkering operation in Johor in November 2020	
Europe	LNG bunkering has been conducted multiple times in the Baltic, Atlantic, and Mediterranean areas Belgium, Spain, Sweden, and Finland have already operated LNG bunkering vessels The largest LNG bunkering in the world started operation in the Netherlands in October 2020	Crude oil tankers in North Sea, container vessels, car transportation vessels have been ordered
North America	Small-scale LNG facilities in Florida and West Coast of Canada supply LNG	

City-Gas Liberalisation Developments in Japan

- 35 new entrant companies have started or plan to start supplying residential customers since the retail liberalisation was introduced in April 2017 (out of 82 registered companies) (As of 20 October 2020)
- In the liberalised Japan's city-gas industry, 3.94 million retail customers (15.5% of the total customers) had switched suppliers as of August 2020. More than 2 million customers (15.9% of the total) had switched suppliers in the Kanto region at that time
- developments to promote competition in those areas where customer switchings have not happened should be also watched [Retail customer switchings by region]



(Source) Based on data of METI

Notable Issues to Consider

- Upstream and LNG procurement
 - Next generation of LNG production project development - to meet requirement in late 2020s
 - Liquidity in LNG market, pricing index, enhanced flexibility and examination of different terms and conditions of LNG transactions
 - Addressing environmental issues - CO₂ / methane emission management and international cooperation in the area
 - Positioning LNG in energy transition
- Development of LNG demand in Asia and role of flexible LNG
 - Enhancing price competitiveness of LNG and expanding flexible supply
 - Transparent regulatory and investment frameworks in Asian importing countries
- How Japan should view natural gas
 - Competition and frameworks of city gas business
 - Natural gas' contribution to decarbonisation throughout the value chain
 - Solidify companies' business strategies and resiliency of gas system