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Gas Market Outlook for 2023

Shifts in LNG Markets and Increasing Importance of Stable Procurement

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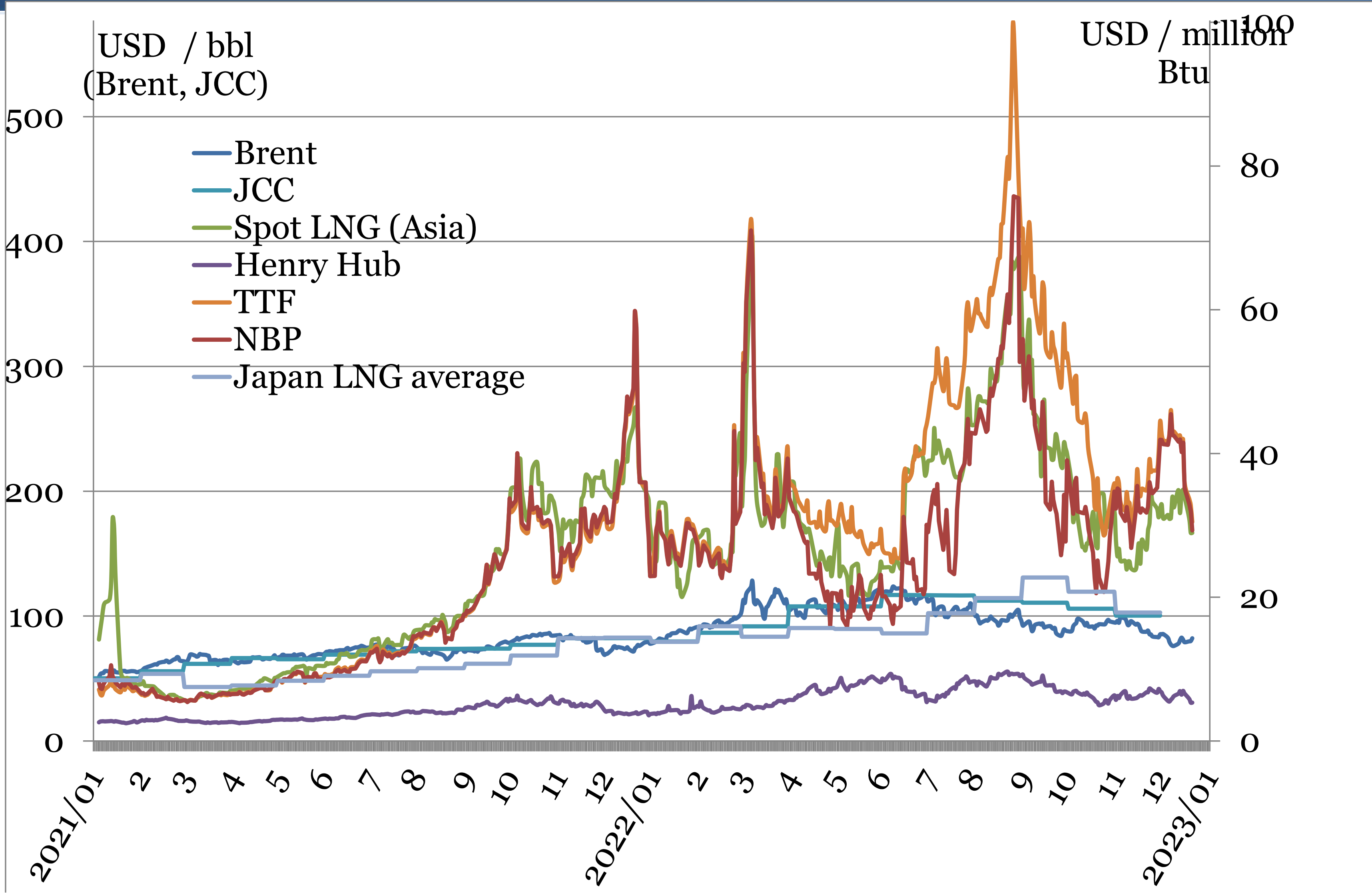
Key Points of the Report

- ✓ The average LNG import price in Japan is expected to be around USD 17.3 in 2022 and USD 16.8 in 2023, up from USD 10.13 per million BTUs in 2021. Spot LNG prices to Northeast Asia is expected to average USD 34 in 2022 and around USD 36 in 2023.
- ✓ Global LNG trade, which increased by about 5% from 372 million tonnes in 2021 to estimated 390 million tonnes in 2022, is expected to increase to 430 million tonnes in 2023. Global natural gas demand, which recovered from a 2% decline in 2020 and increased by 4.5% in 2021, is expected to remain flat or decline slightly in 2022. The pace of growth is expected to be lower than the previous outlook after 2023, subject to uncertainty, influenced by the war in Ukraine and gas prices, and the impact of the pandemic.
- ✓ Since 2021, gas prices in Europe and Asia have soared to record highs. Especially since July 2021, spot gas prices have stayed higher than crude oil equivalents. In 2022, due to the turbulent global situation, the gas and LNG market became even more destabilizing.
- ✓ Negotiations on sales contracts are more active to secure LNG supply over the medium- to long-term. Investment in new LNG production projects and the realization of policies to support them are expected play important roles.

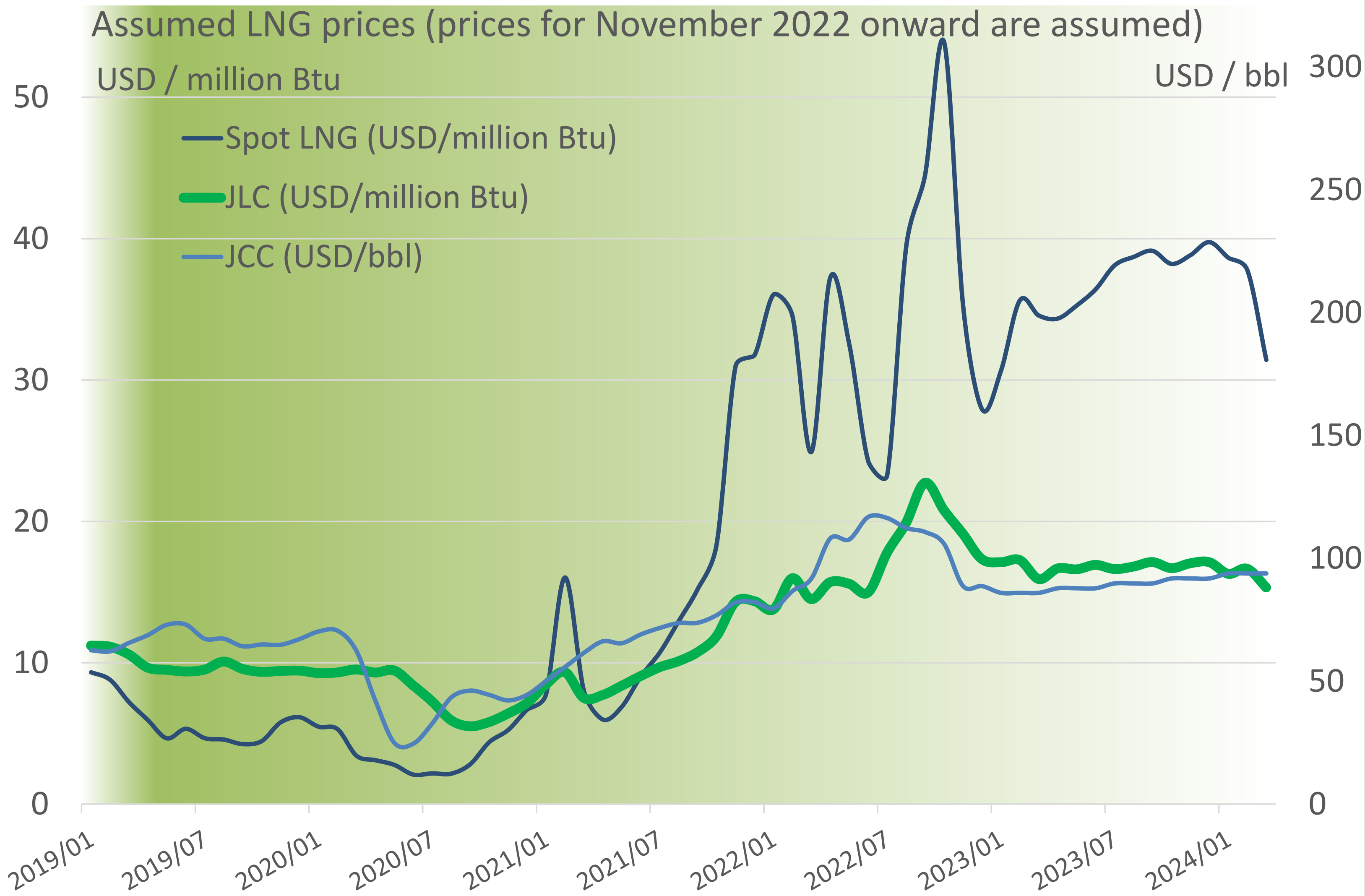
Global Gas Prices Remain at High Levels

- European TTF prices were exceptionally higher than others in the second half of 2022.
- Asian spot LNG prices tended to follow higher TTF to rise.
- Moves to set a TTF cap in the European Union - the impact of activation and the impact of introduction of the system need to be closely monitored.



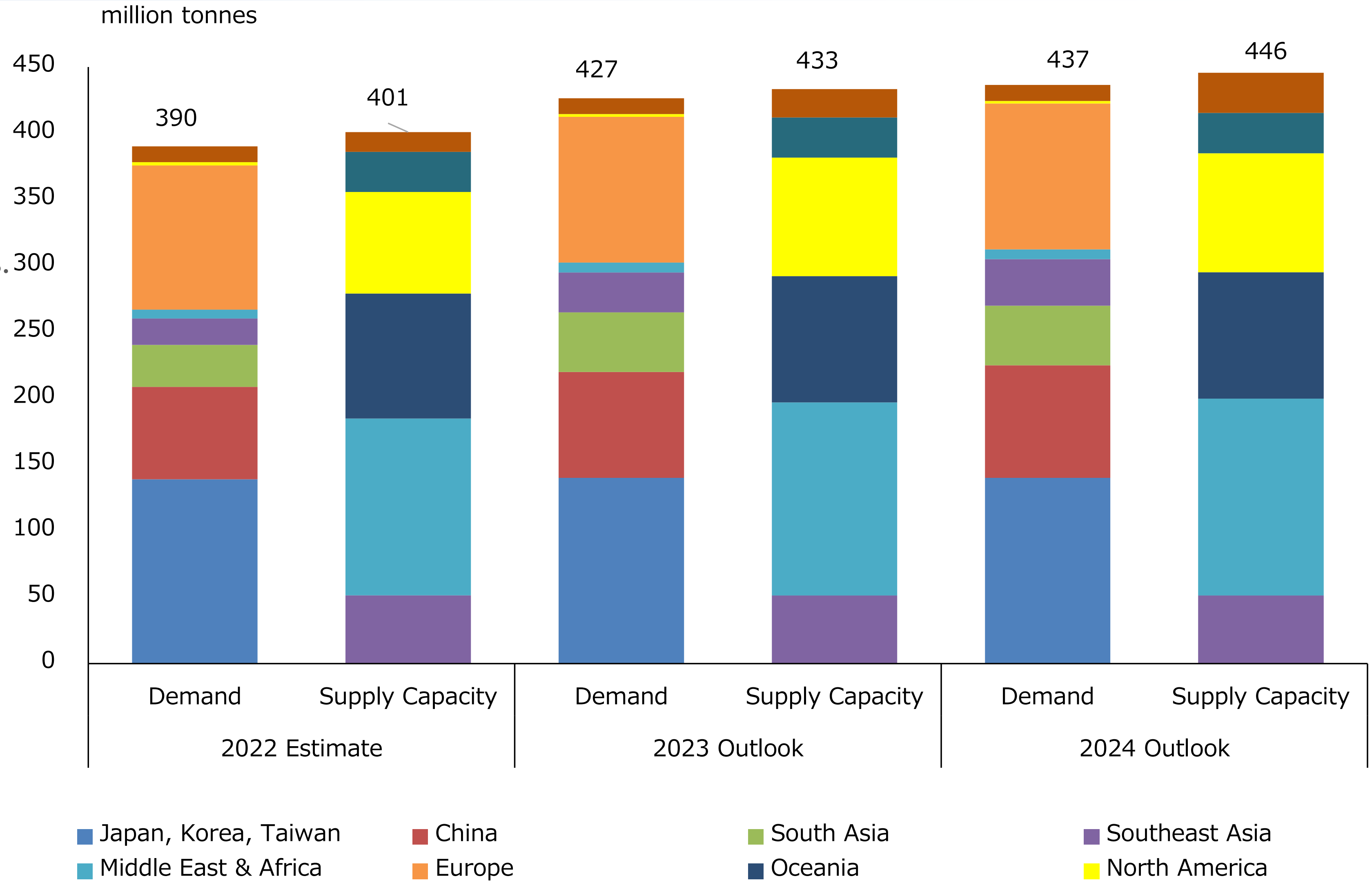
Japan's Average LNG Import Price: USD 17.3 in 2022 and USD 16.8 in 2023

- Average LNG import price in Japan has risen from USD 10.13 per million Btu in 2021
  - USD 17.3 in 2022
  - USD 16.8 in 2023
- Spot LNG prices to Northeast Asia
  - USD 34 in 2022
  - USD 36 in 2023



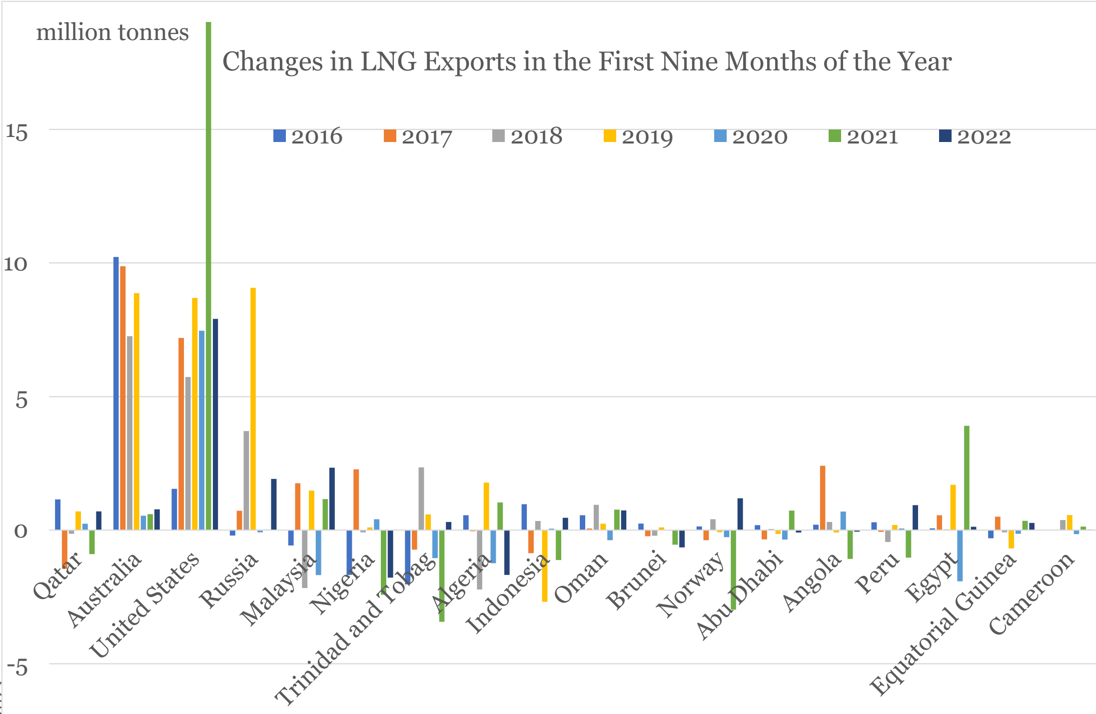
LNG Trade to Reach 430 Million Tonnes in 2023, under Tight Balance

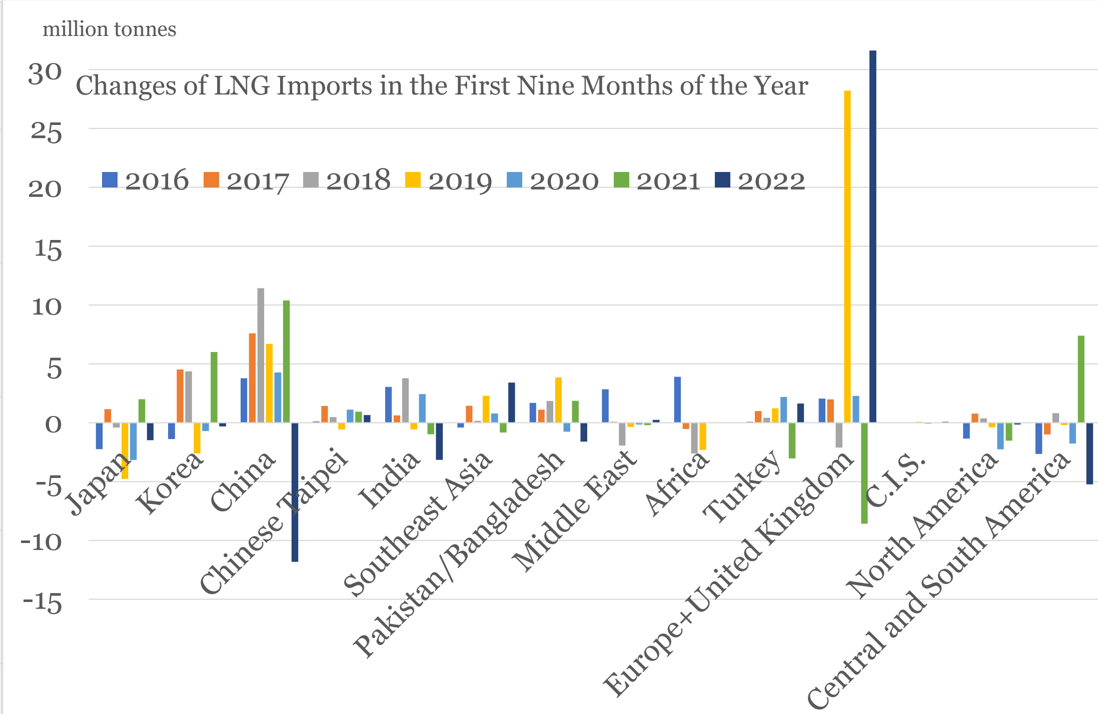
- The supply-demand balance in the global LNG market will remain tight until 2025.
- The global LNG market is expected to grow by 9% in 2023, assuming no facility and other troubles.
- As there is little margin in supply capacity, there are concerns over impediments to LNG production capacity and impacts of international conflicts.
- There are also uncertainties over potentially suppressed demand due to economic stagnation and high prices.



Global LNG Trade Up 4.7% YoY in the First Nine Months of 2022

- From January to November, Japan's LNG imports were 65.94 million tonnes, while China's were 56.93 million tonnes, making Japan the world's largest importer again.
- The United States exported 70.41 million tonnes, following Qatar's 72.55 million tonnes and Australia's 72.35 million tonnes during the same 11 months.
- Slowdowns in LNG production were observed in Malaysia, Nigeria and Trinidad.

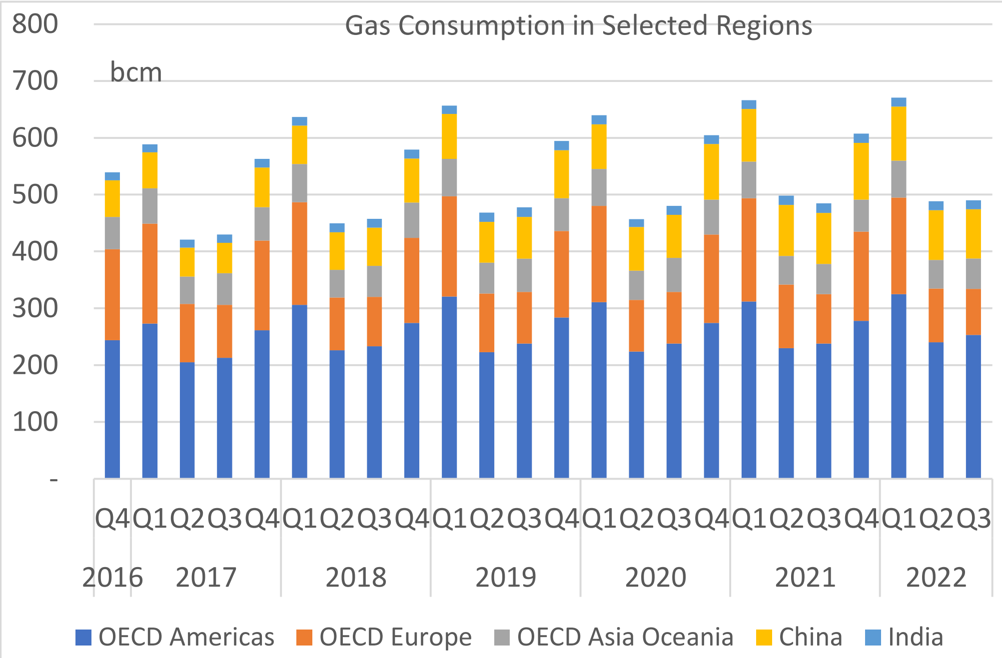


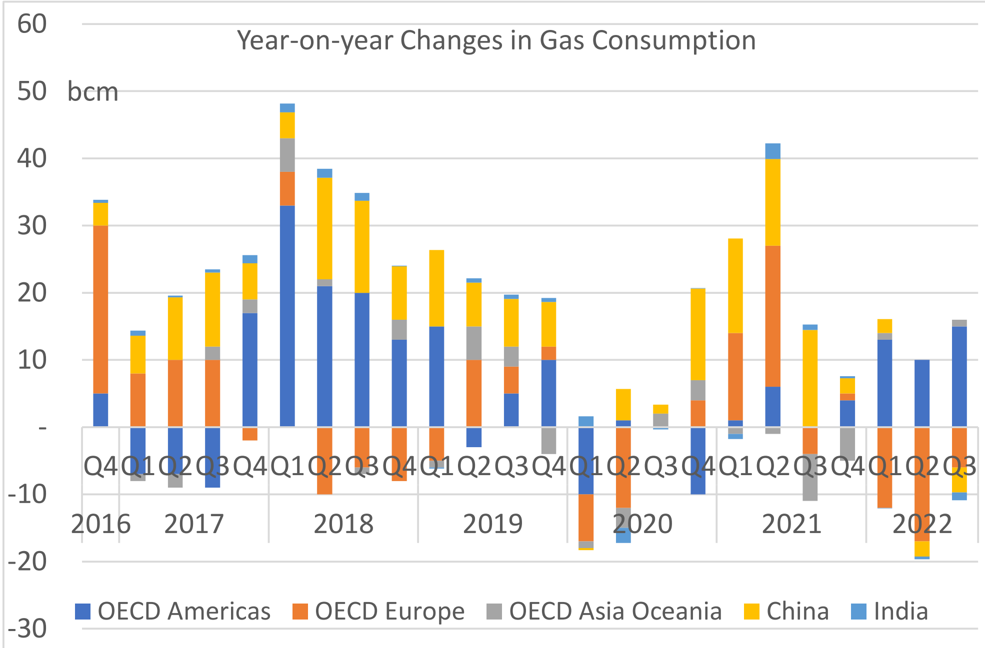


(Source) based on customs statistics and data of Cedigaz LNG Service

Global Gas Demand Slowed its Growth in 2022

- While the OECD, China, and Indian gas markets, which account for 3/5 of the global gas demand, quickly recovered from the previous year's decline in demand in the first half of 2021, but North America almost dominated the increase in 2022.
- Q4 2021 and first half of 2022 slowed from flat to negative year-over-year.
- In 2022, increases in North America and declines in Europe largely offset each other.
- Global gas demand growth from the second half of 2022 to 2025 is expected to be slower.

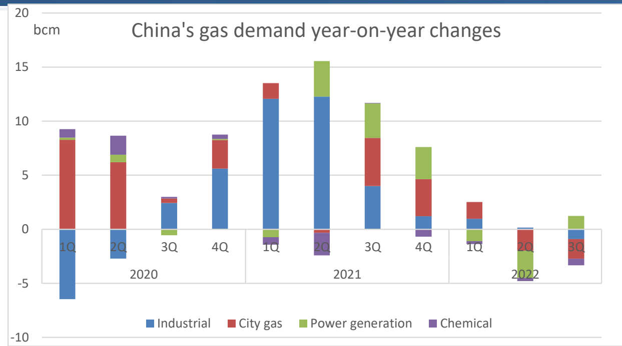


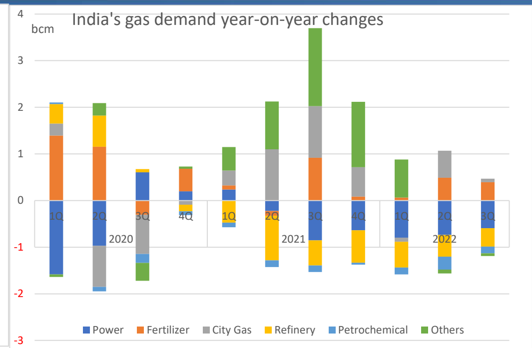


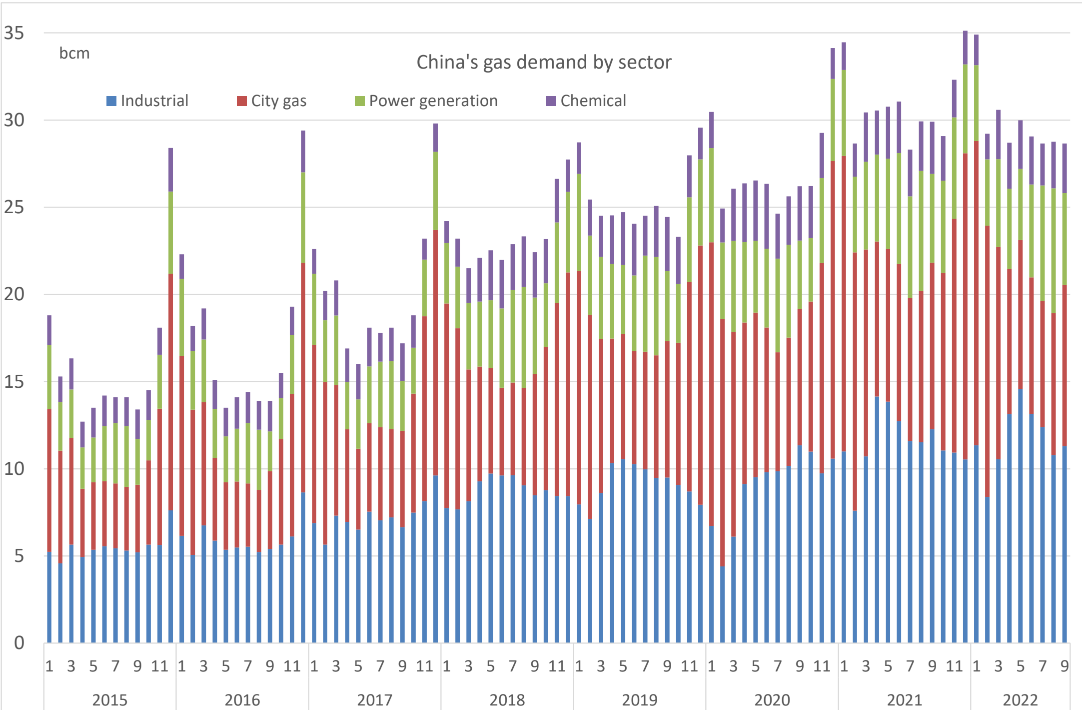
(Source) Based on data of IEA's Natural Gas Monthly, National Statistics Bureau of China, and Ministry of Petroleum & Natural Gas of India

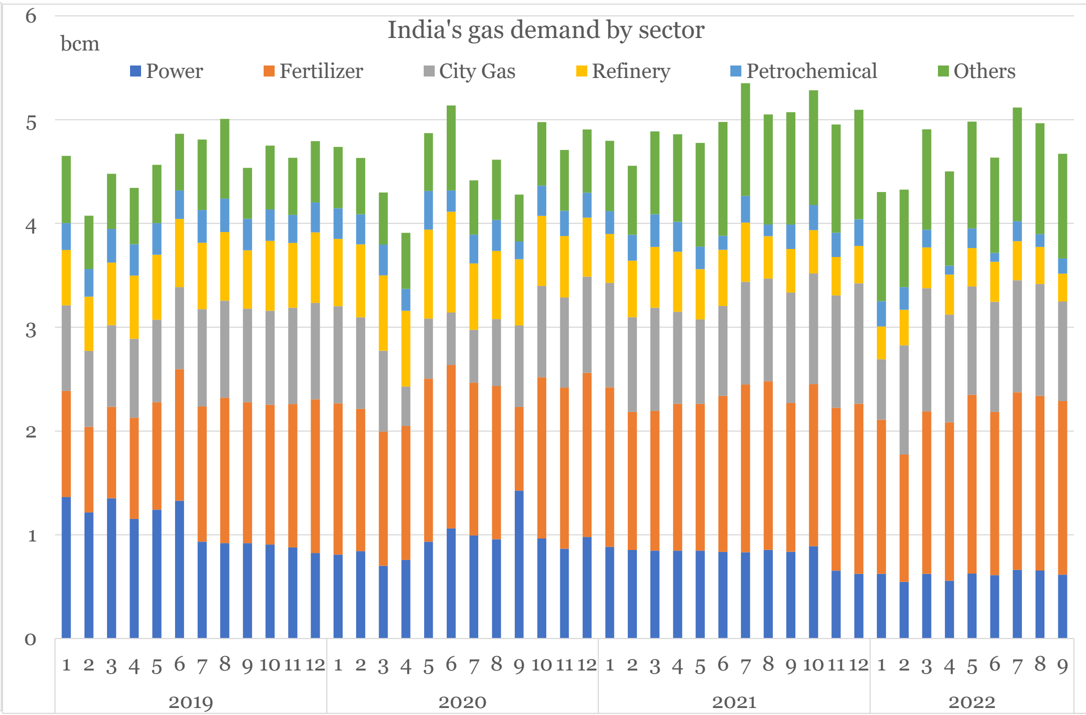
Gas Consumption in China and India Declined in 2022

- China saw a decrease in gas consumption by 2.0% (5.5 bcm) and India by 4.33% (1.9 bcm) in the first quarter of 2022.
- The decrease is significant for power generation in both countries.





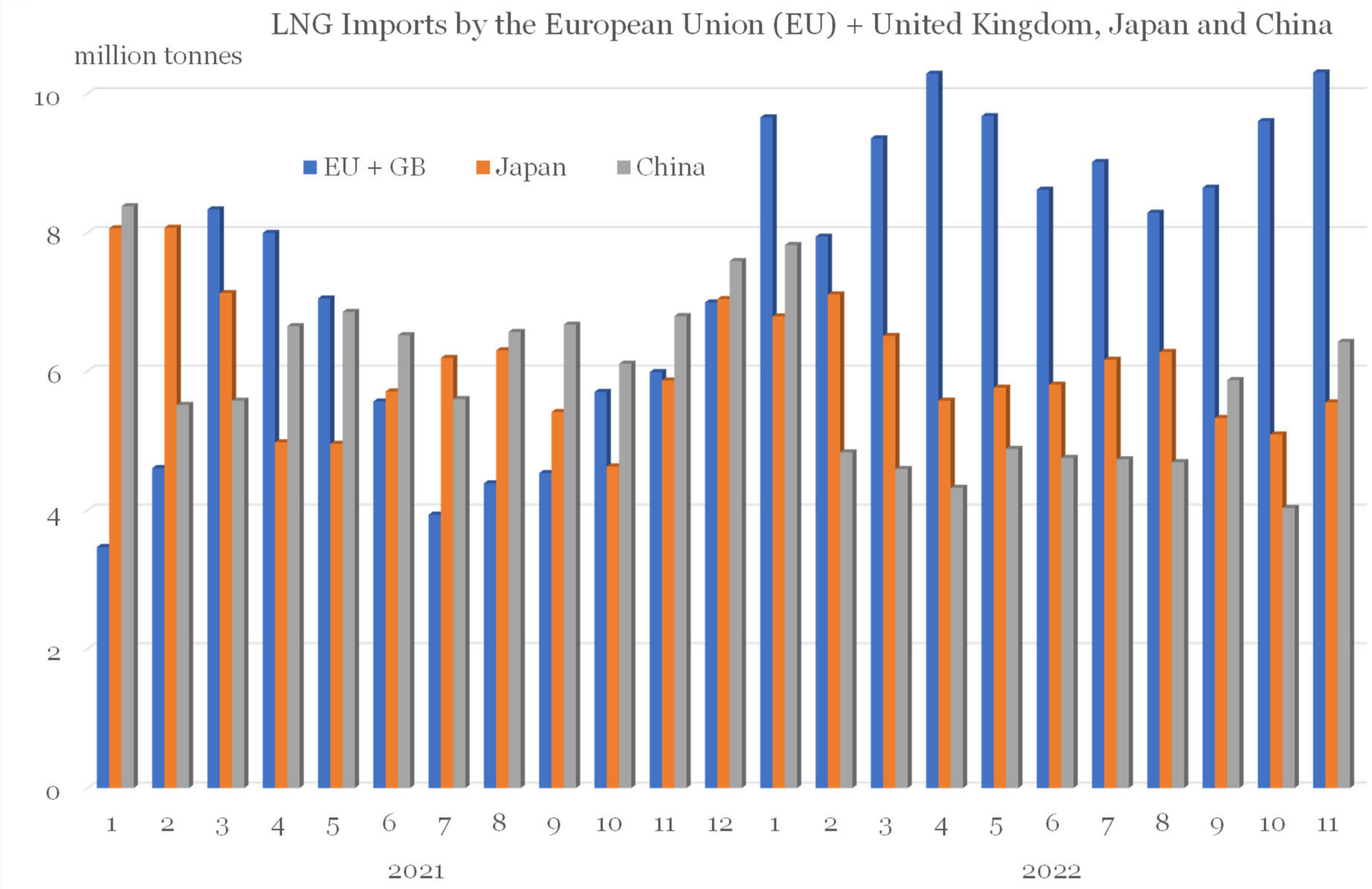




(Source) Based on data of National Statistics Bureau of China, and Ministry of Petroleum & Natural Gas of India

Europe's Share in the Global LNG Market Has Increased

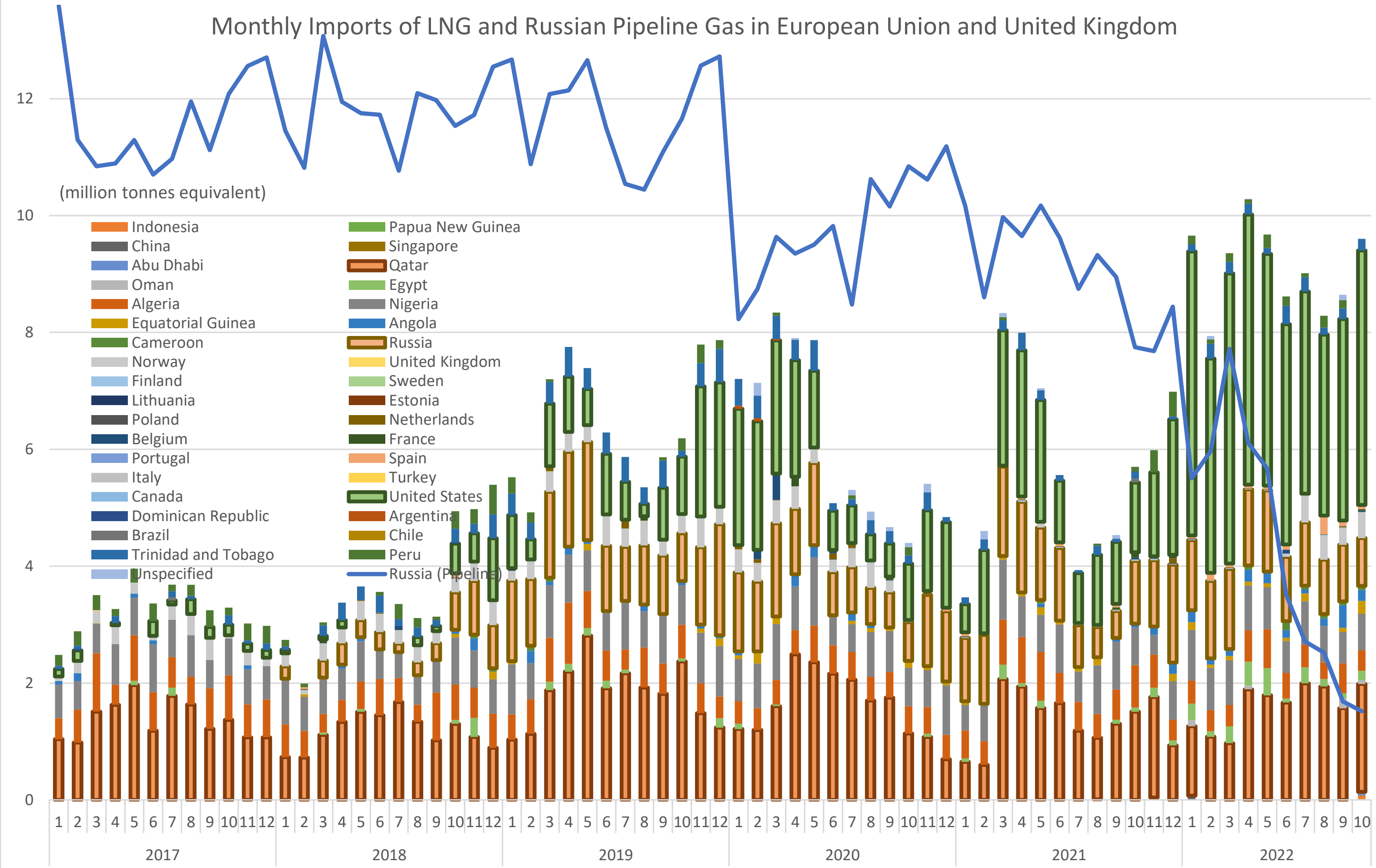
- Looking at the global LNG import situation over the past two years, Europe (the European Union and the United Kingdom combined in the chart) has increased its imports. On the other hand, Japan's and China's purchases have declined.
- In particular, LNG produced in the United States has shifted from Asia to Europe, including incremental production.



(Source) Based on customs statistics and data of Cedigaz LNG Service

Europe's Shift from Russian Pipeline Gas to LNG

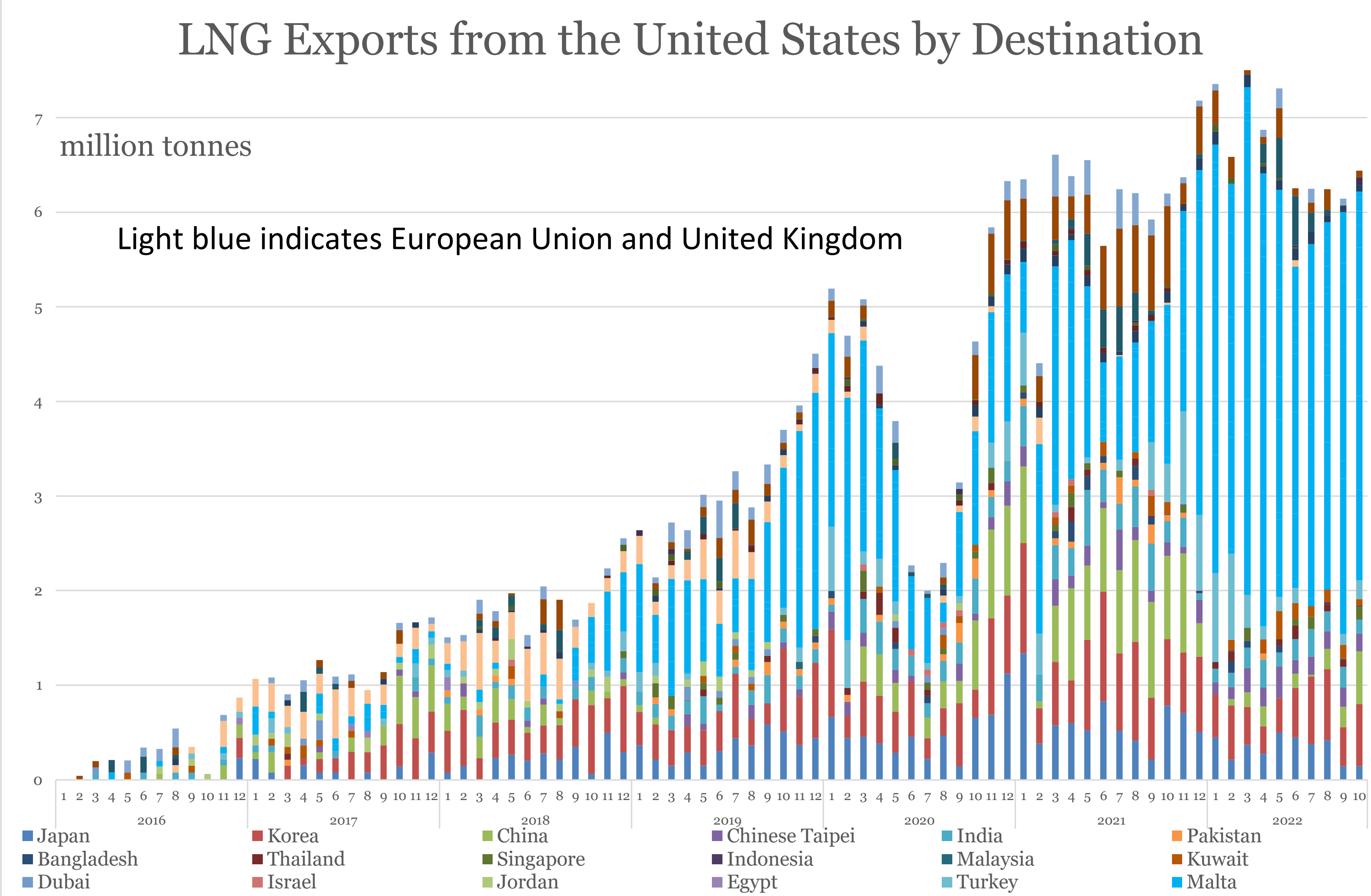
- Exports of Russian pipeline gas to the European Union declined sharply in 2020, from more than 10 million tonnes per month until 2019.
- Strong gas demand in 2021 in Europe (decrease in domestic gas production in Europe), sluggish increase in production on the Russian side, and stronger domestic gas demand in Russia changed the trend.
- Russian pipeline gas also lagged behind in terms of price compared to the increasing LNG from the United States.
- Russian pipeline gas supply declined further in 2022, due to European measures to cut dependence on Russia and intentional supply cuts from the Russian side.



(Source) Based on data of Cedigaz LNG Services, Eurostat, Trade Stats of GB, Gazprom flow figures

LNG Shipments from the United States have shifted from Asia to Europe

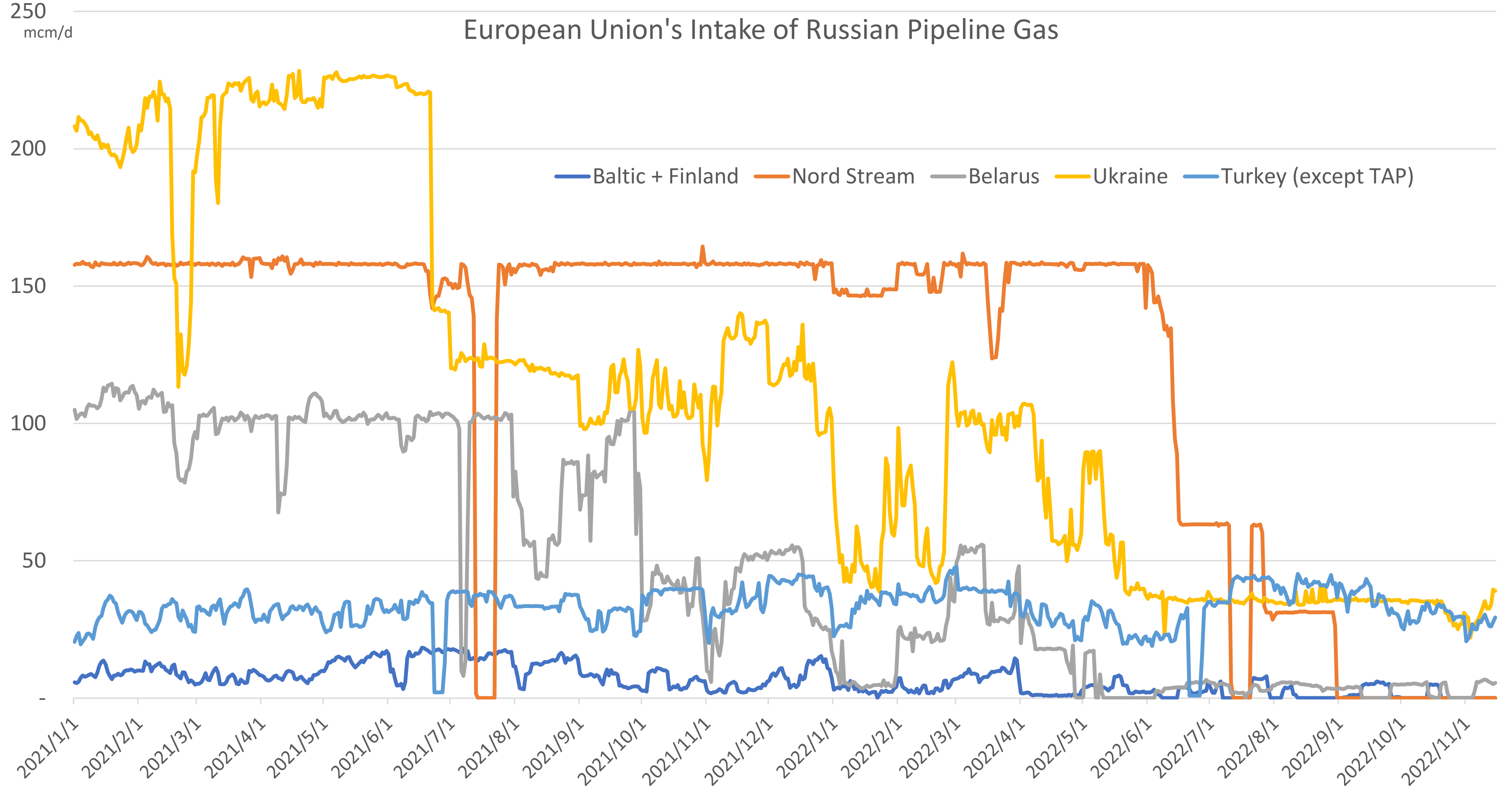
- The share of the European Union and the United Kingdom combined in the LNG exports from the United States increased from 26% in Q1-3 2021 to 63% in Q1-3 2022.
- The share of Asia in the LNG exports from the United States declined from 50% to 23%.



(Source) Based on data from Department of Energy, United States

Russian Pipeline Gas to Europe Declined Dramatically

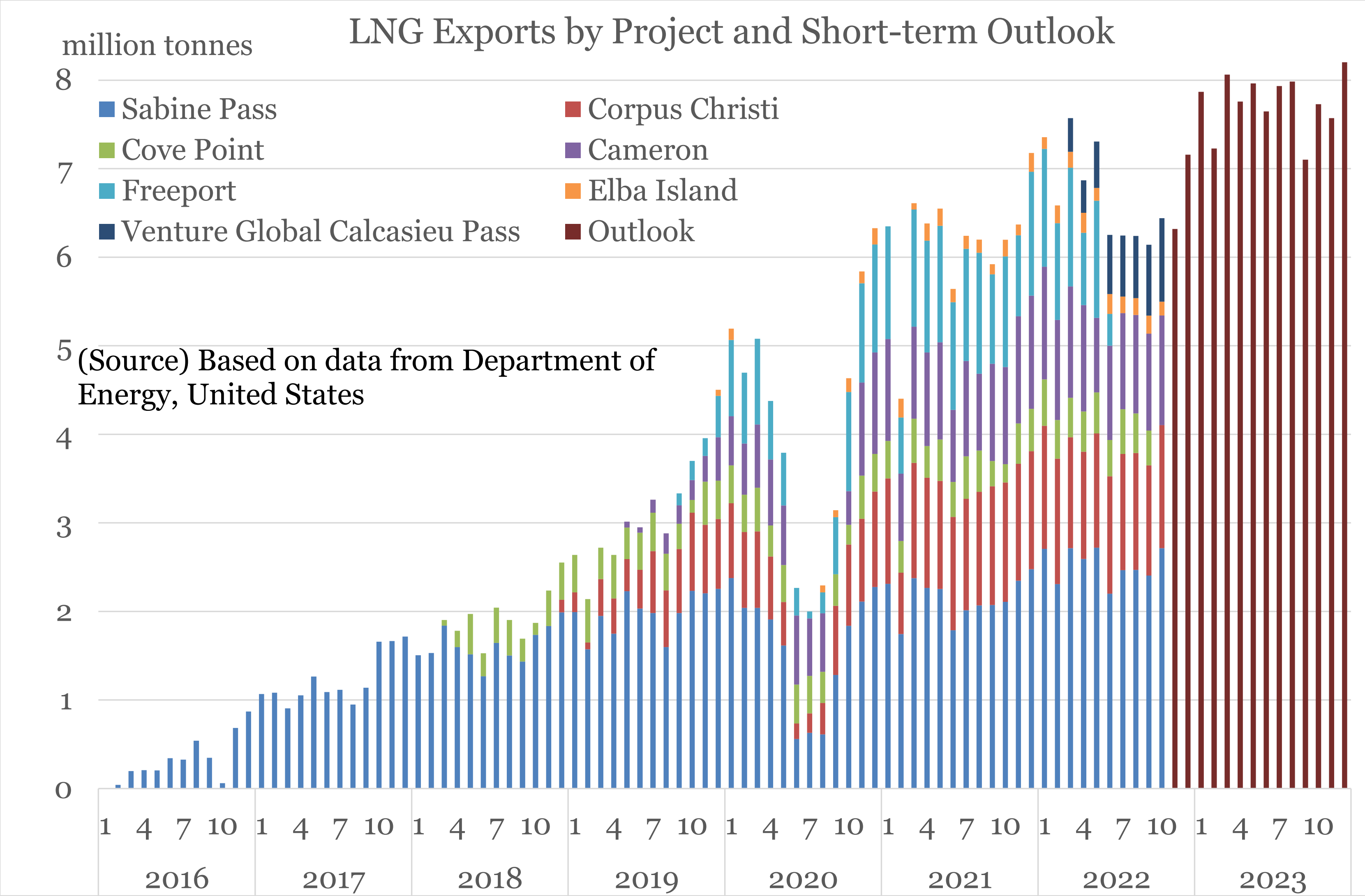
- Along with the decrease in supply of Russian pipeline gas to Europe in 2021, the use of supply routes became selective.
- Transportation via Ukraine decreased significantly from the second half of 2021 due to a decrease in contracted capacity.
- Transit via Belarus and Poland became inferior due to sales and transportation contract disputes
- Nord Stream pipeline flows decreased due to delayed compressor repair in June 2022 and shut off in September.
- Europe's shift to LNG for alternative procurement has had a significant impact on the global LNG market.



(Source) Based on data of ENTSOG

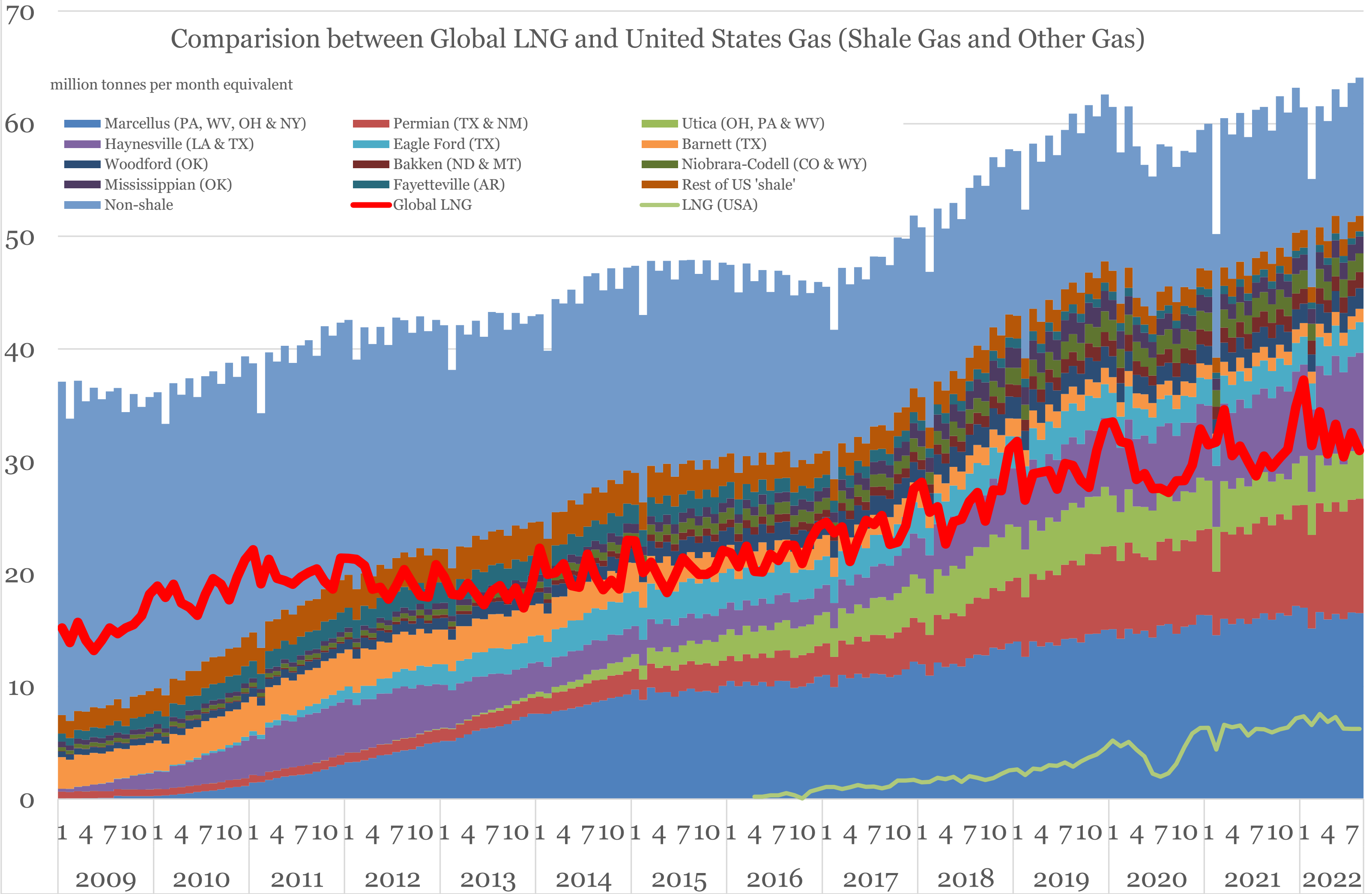
Notes on LNG from the United States

- While LNG export from the United States came close to those from Australia and Qatar in 2022, it slowed down slightly in the second half.
- LNG consumers in the world hope stable production in at a high level in the United States in 2023.
- U.S. Gulf of Mexico has become one of the most important LNG Hubs in the world.
- As the reduction in Freeport LNG production has already been factored in, attention must be paid to stable supply in the future.



While Shale Gas Production Has Risen Moderately in Recent Years, LNG Export Has Surged in the United States

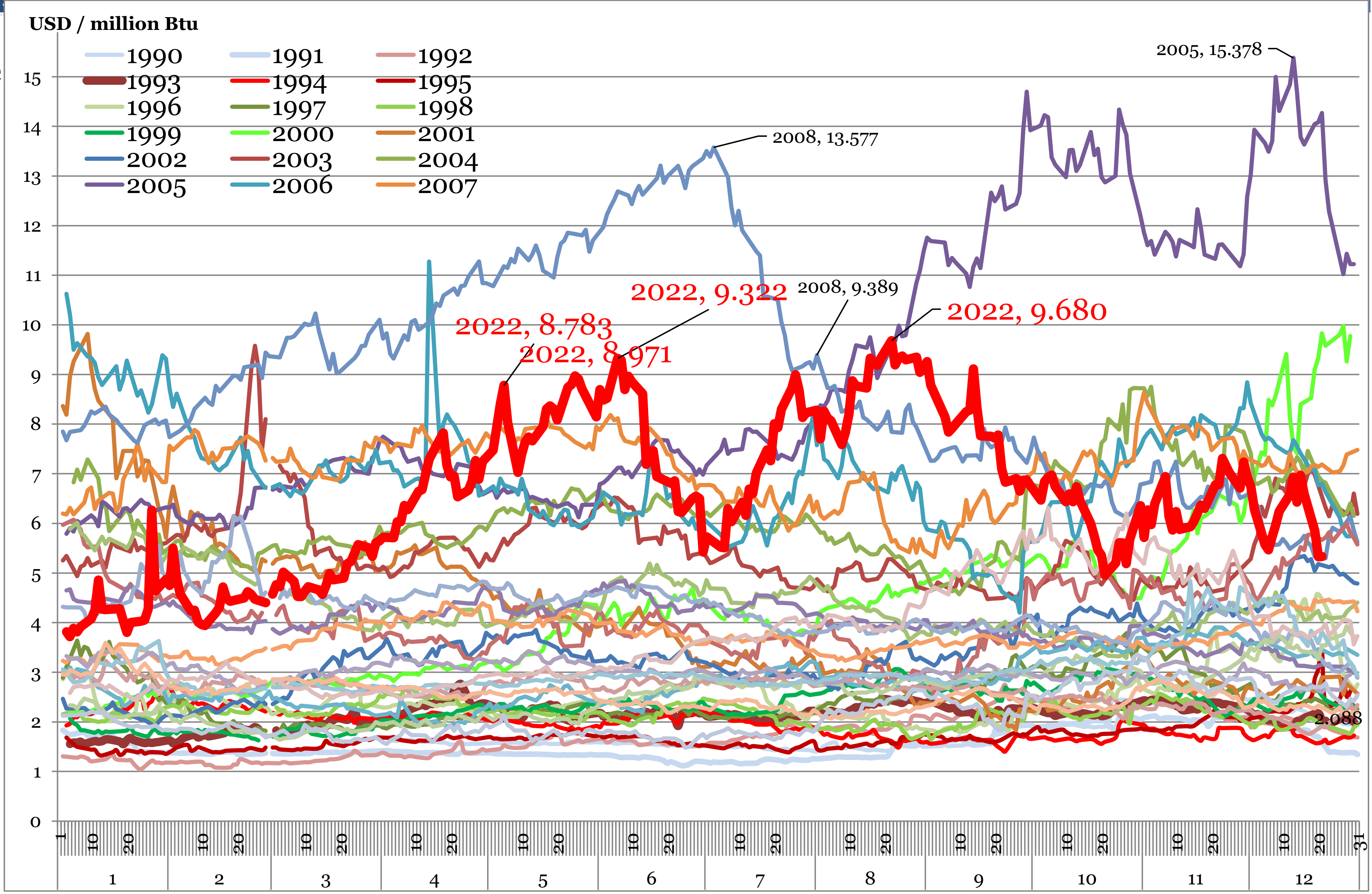
- Shale gas production expanded from 20% in 2009 to 80% in 2022.
- The gas market in the United States remains about twice the size of the global LNG market.
- LNG export from the United States has grown to represent 12% of the country's gas production.



Source: Based on data from the U.S. Energy Information Administration (EIA)

Henry Hub Prices Experienced the Highest Level after the Shale Revolution

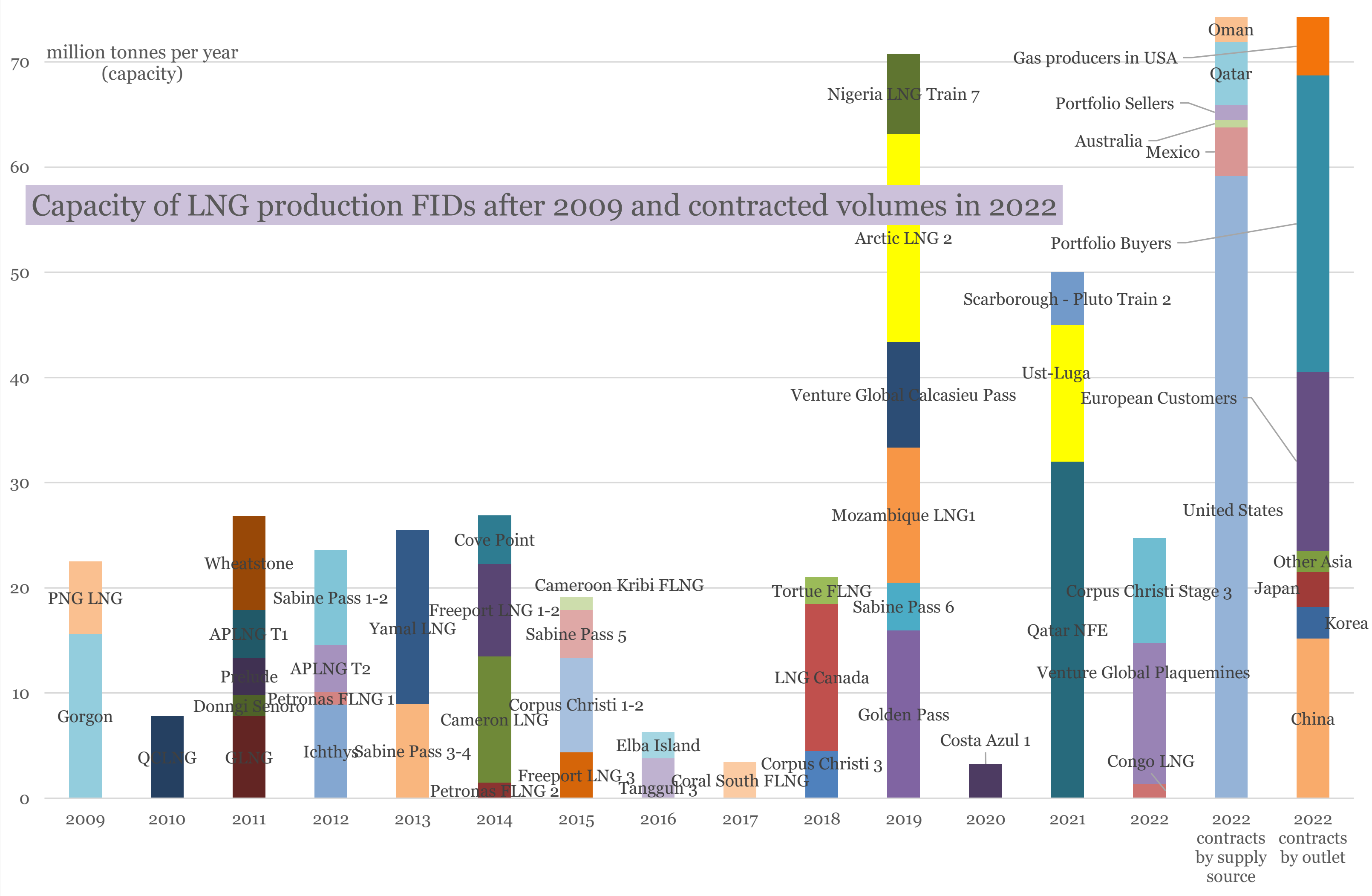
- Despite the highly liquid gas market in the United States, Henry Hub prices rose to the highest levels after the shale revolution in 2022.
- While the prices have been impacted by the significant increase in demand for gas for power generation, increased impacts from the international LNG market has been also felt.
- Hence, after the Freeport incident, the prices softened for some time.



(Source) Based on data of exchanges

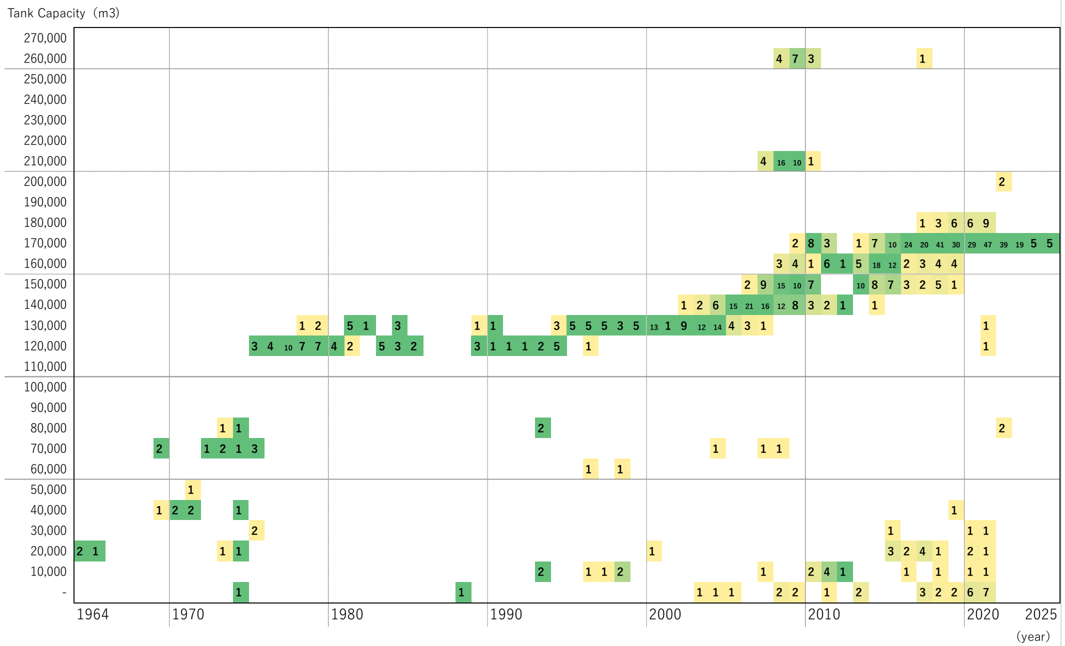
The World Needs More LNG Investment with Increasing Term Contracts to Underpin Investment

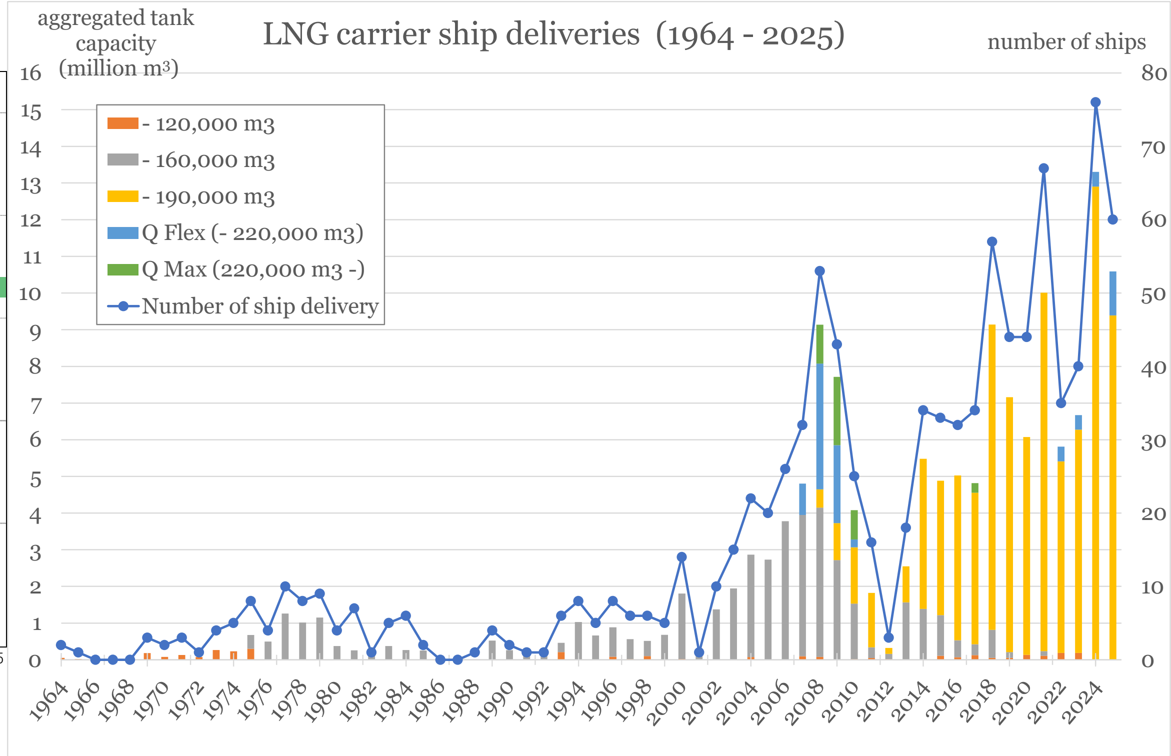
- LNG FIDs and construction activities are expected to increase (although the project boom may lead to higher EPC prices).
- Among the projects from past investment decisions, the realization of Russian projects is unclear.
- Projects in other regions also require attention to the progress toward their realization.



The LNG Ship Construction Market is Booming

- A record 68 newly-built LNG carriers were delivered in 2021. 700 LNG carriers were in operation.
- The average capacity of LNG carriers delivered in 2021 was 174,897 m³, reflecting the design of the Panamax hull type as a standard vessel.
- The number of new orders reached 111 in 2021 and more than 170 in 2022 (record highs).
- The cumulative capacity of LNG carriers is expected to increase by 28% from 2021 to 2025.





Shifts in the Global LNG and Gas Markets

1. LNG flows shifting to Europe

1) LNG flows to Europe have increased mainly from the United States
   - LNG export from the United States in the first quarter of 2022 was 22 million tonnes, the largest ever exported volume by a single country in a single quarter.
   - The share of the European Union and the United Kingdom combined in the LNG exports from the United States increased to 63% in Q1-Q3 2022.

2) LNG imports declined in Japan and China, the world's two largest importers.

3) In March-October 2022, LNG imports from sources other than Russia in the EU plus the United Kingdom increased by 65% or 25 million tonnes year-on-year to 64.5 million tonnes. On the other hand, imports of Russian (LNG and pipeline) gas decreased by 51% or 42 million tonnes to 40 million tonnes
   - Thanks to increasing LNG supply from March onward, the filling rate of the EU's underground gas storage went up from 26% at the end of March to 93% at the end of November and to 84% at the end of 2022.

2. Prices staying at high levels

1) European natural gas market prices and spot LNG prices in Asia have risen sharply since August 2021 and have reached all-time highs since October 2021.
   - The recovery rate of production was slower than the recovery in demand.
   - Construction and investment were not keeping pace with requirement
   - There were problems with existing LNG production facilities

2) Prices are expected to stay high throughout 2023
   - EU's policy to phase out dependence on Russian supply with replacement
   - Other markets face challenges to secure stable natural gas supply

3) Japan's LNG prices were the highest in JPY in the history (April, May, July, August, and September).

4) Henry Hub Futures prices surpassed USD 9 on 6-7 June, from 16 August to 1 September and 14 September in the United States, supplier to the global LNG market.
   - With relatively slow pace of increase in gas production, demand for power generation and LNG exports is strong in the United States

3. Procurement of LNG under long-term contracts and investment activities gathering pace

1) Venture Global LNG announced an FID on the first phase of Plaquemines LNG for 13.33 million tonnes per year on 25 May 2022.

2) Cheniere announced an FID on Corpus Christi Stage 3 for 10 million tonnes per year on 22 June 2022
   - Cheniere also started regulatory process for Midscale Trains 8 & 9.

3) LNG procurement activities have accelerated mainly from those LNG production projects in North America
   - Deals (SPAs/HOAs) amounting to 64 million tonnes per year of North American LNG production were announced.
   - Chinese companies' procurement represented 15 million tonnes per year
   - European customers procured 17 million tonnes per year.
   - Japanese companies announced deals in December

4) New LNG production projects emerged in Argentina, Congo, Suriname, and Guyana

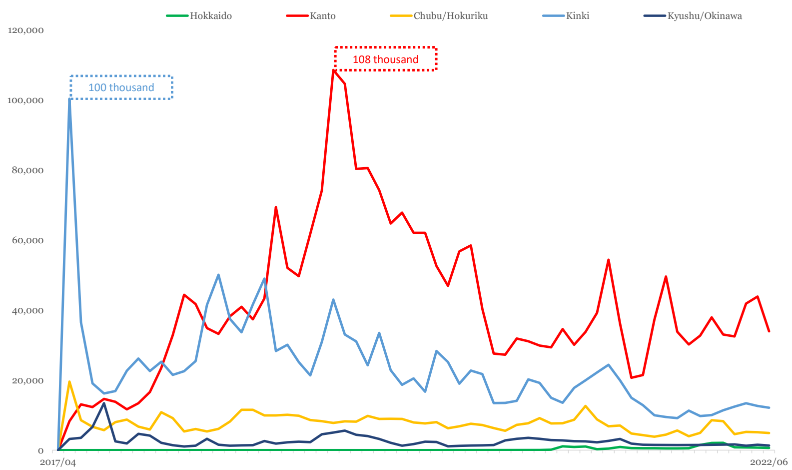
5) Qatar's NFE/NFS expansion projects selected five international partners.
   - 12 million tonnes per year was allocated to the international partners out of 48 million tonnes per year in total from NFE and NFS.
   - Long-term deals announced for China and Germany.

➢ Japanese companies' commitments and their international partnerships, as well as policy support, are essential to meet demand in Japan and Asia in the latter half of 2020s.

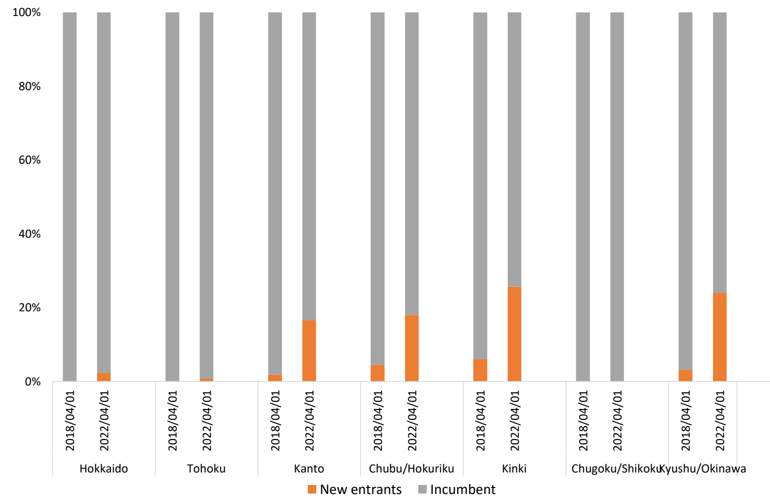
Japan's Domestic Gas Market: Developments after the Full Liberalization of the Gas Retail Market

- Former incumbent electric utilities and LP gas companies have entered the gas retail business. Since the start of liberalization, 41 companies have started or plan to start supplying household consumers (number of registered retail operators: 95) (as of 20 July 2022)
- As of June 2022, the cumulative number of contract changes for households has steadily increased to approximately 4.84 million. The Kanto region has the largest number of monthly contract changes.
- The share of new retailers' subscriptions has increased year by year, reaching 25.9% in the Kinki region.
- Pipeline divisions of three major city gas companies (Tokyo Gas, Osaka Gas, and Toho Gas) were legally separated in April 2022.

Number of monthly household contract changes by region

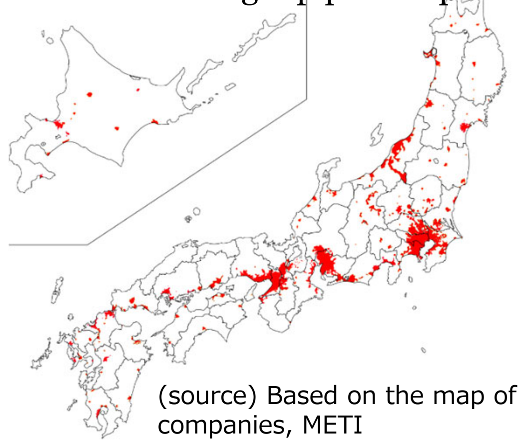


Share of new retailers in household contracts



(source) Based on data of the government

Areas of gas pipeline operators



(source) Based on the map of gas companies, METI

Household customers and operators

	Household customers	Operators
City gas	26.62 million*1	270*2 (193)*3
LP gas	22.19 million*4	16,825*5
Total households	59.76 million*6	-

*1: June 2022, Electricity and Gas Market Surveillance Commission
*2 and *3: April 2022
*4: March 2022, LP Gas Annual Report, Facts and Figures 2022
*5: December 2021, METI
*6: January 2022, Ministry of Internal Affairs and Communications

Securing LNG: Medium- to Long-Term Measures

- Medium- to long-term measures of LNG procurement
  - Until 2025, short-term supply should be secured from projects outside Russia, portfolio players, and flexible surplus volumes from Chinese players, as well as cooperation between domestic and overseas players including joint procurement.
  - From 2026 onwards, securing long-term LNG contracts with non-Russian supply sources is critical.
  - It is important to recognise the importance of investment in LNG production projects and take measures to promote them
  - Brownfield projects and small- and medium-sized projects are likely to advance.
- New development projects in Russia are slowing down, and the road to restoring confidence in Russia in the future as an investment destination and procurement source is far away
  - The European Union's policy to phase out Russian gas is different from Japan. While EU countries were excessively dependent on Russian natural gas, one of the motivations for introducing Russian LNG by Japan was diversification of supply sources.
  - Japan's participation in and procurement of LNG production projects in Russia should be maintained as legitimate rights, also as a potential strategic asset for the future.
  - Measures against Russian gas after conflict resolution - options for procurement and development - should be considered.
- Future LNG project development requires cleaning endeavours and clarification of long-term government policies
  - LNG production project development requires long-term commitments, and to make this possible, it is essential to clean the LNG production projects themselves.

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