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International Gas Market Outlook

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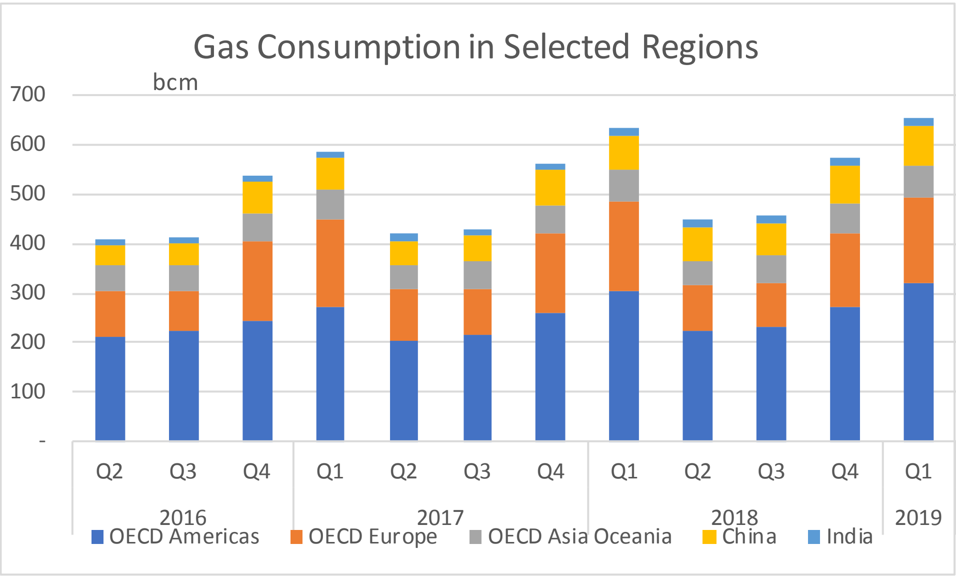
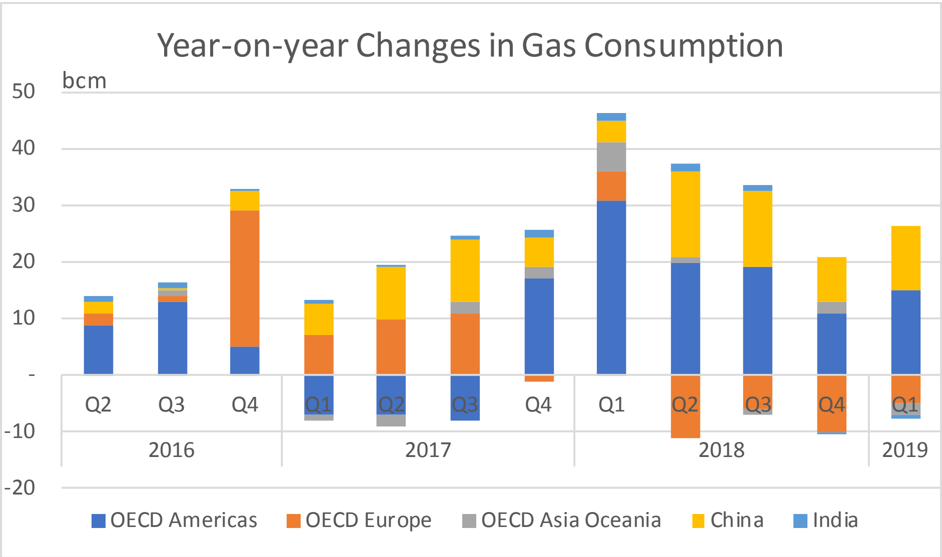
Executive Summary

- ✓ The global LNG market continues expanding pushed by increasing supply capacity in 2019, driven by incremental production facilities in the United States, Australia, and Russia. On the other hand, LNG demand in Northeast Asia, the largest LNG consuming region, has slowed down, except in China.
- ✓ With the ongoing rapid expansion of LNG supply capacity, spot LNG prices have been assessed significantly lower than those LNG prices under long-term contracts. In order to take advantage of competitive spot and short-term volumes, improving terms and conditions in LNG sales and purchase contracts is more important - diversification of pricing and flexibility in volumes and cargo destinations.
- ✓ Spot and short-term transactions of LNG are expected to grow further driven by secondary sales by portfolio players to take care of seasonal fluctuation of gas demand in China and emerging demand in Southeast and South Asia. Increasing exports of LNG from the United States encourage optimisation of transportation.
- ✓ Final investment decisions have been made on three new LNG production projects so far in 2019, representing cumulative annual capacity of 34 million tonnes. With additional projects approaching the milestone in the United States and Russia, this year is expected to be a record year of LNG FIDs.

Natural Gas Consumption in Major Regions

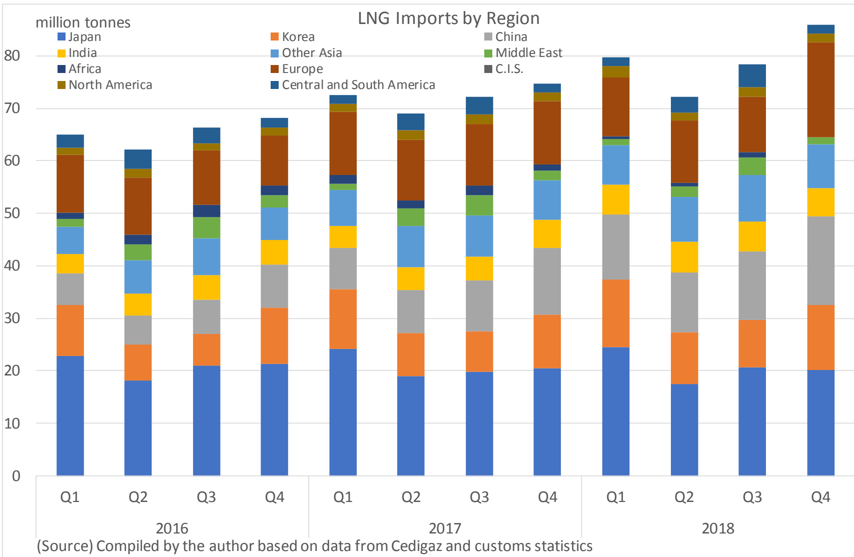


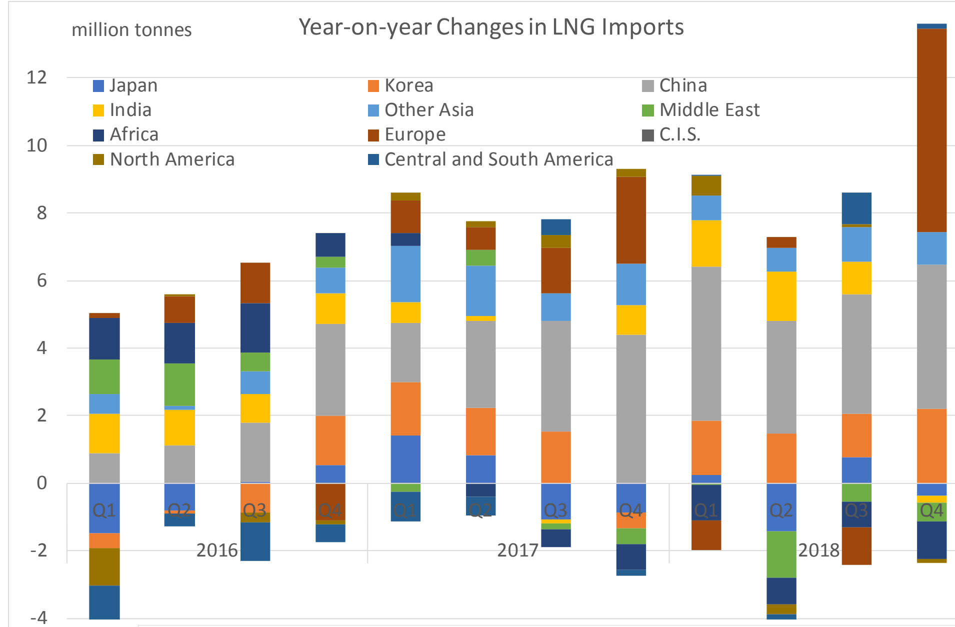


(Source) Compiled by the author based on data of IEA "Monthly Gas Statistics", China's NDRC and India's PPAC

- The combined natural gas consumption in the OECD countries, China and India – representing more than half of global total - grew by 110 bcm or 6% - higher than global average - year-on-year to 2,112 bcm in 2018, and by 18 bcm or 3% from the same period in 2018 to 652 bcm during the first quarter of 2019, respectively.
- The United States and China are expected to continue driving further demand growth in 2019 as they did in the previous years, albeit at slower growth rates compared to 2018.
- The other Asian countries also increase gas consumption modestly.

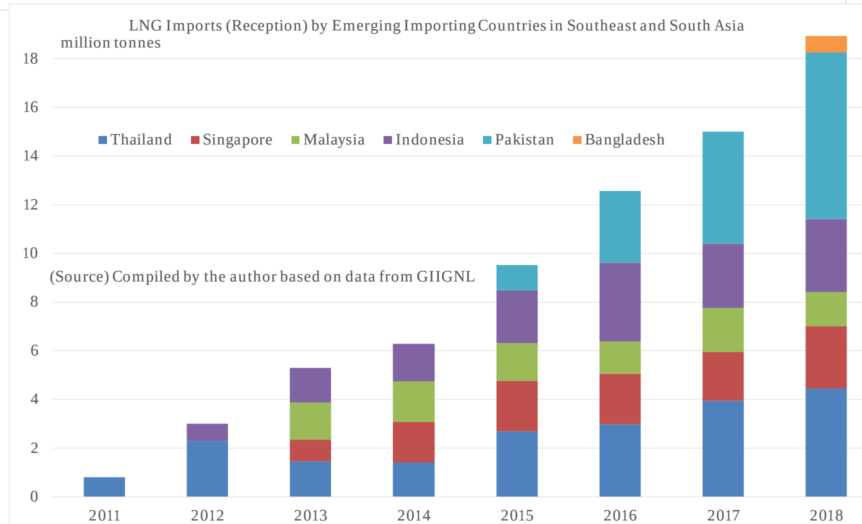
LNG Imports in the World



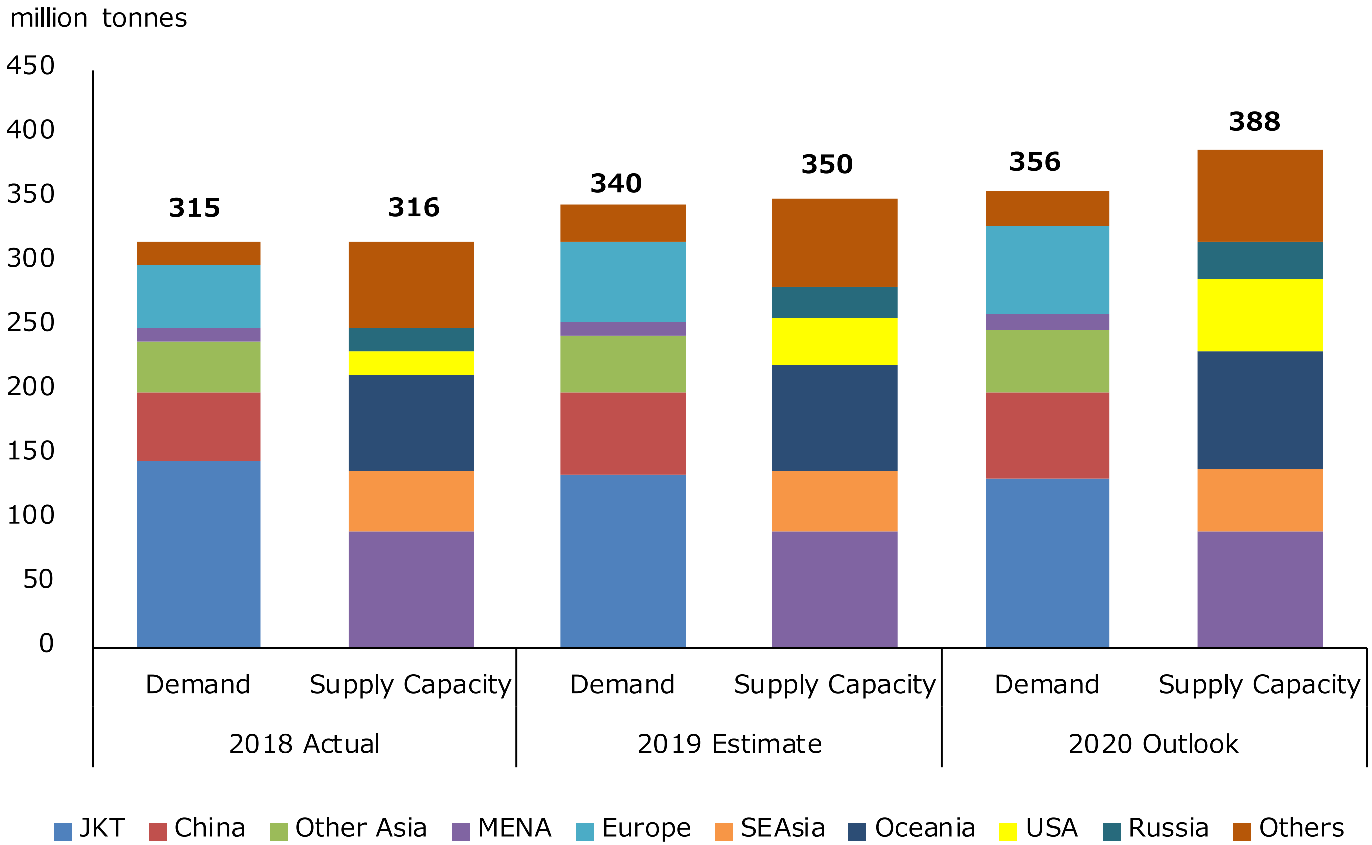


(Source) Compiled by the author based on Cedigaz LNG Service data

- Global LNG imports grew by 8.3% to 314 million tonnes in 2018
- China's LNG imports grew by 40% for two consecutive years
- Southeast and South Asia's emerging LNG importers increased volumes significantly in recent years

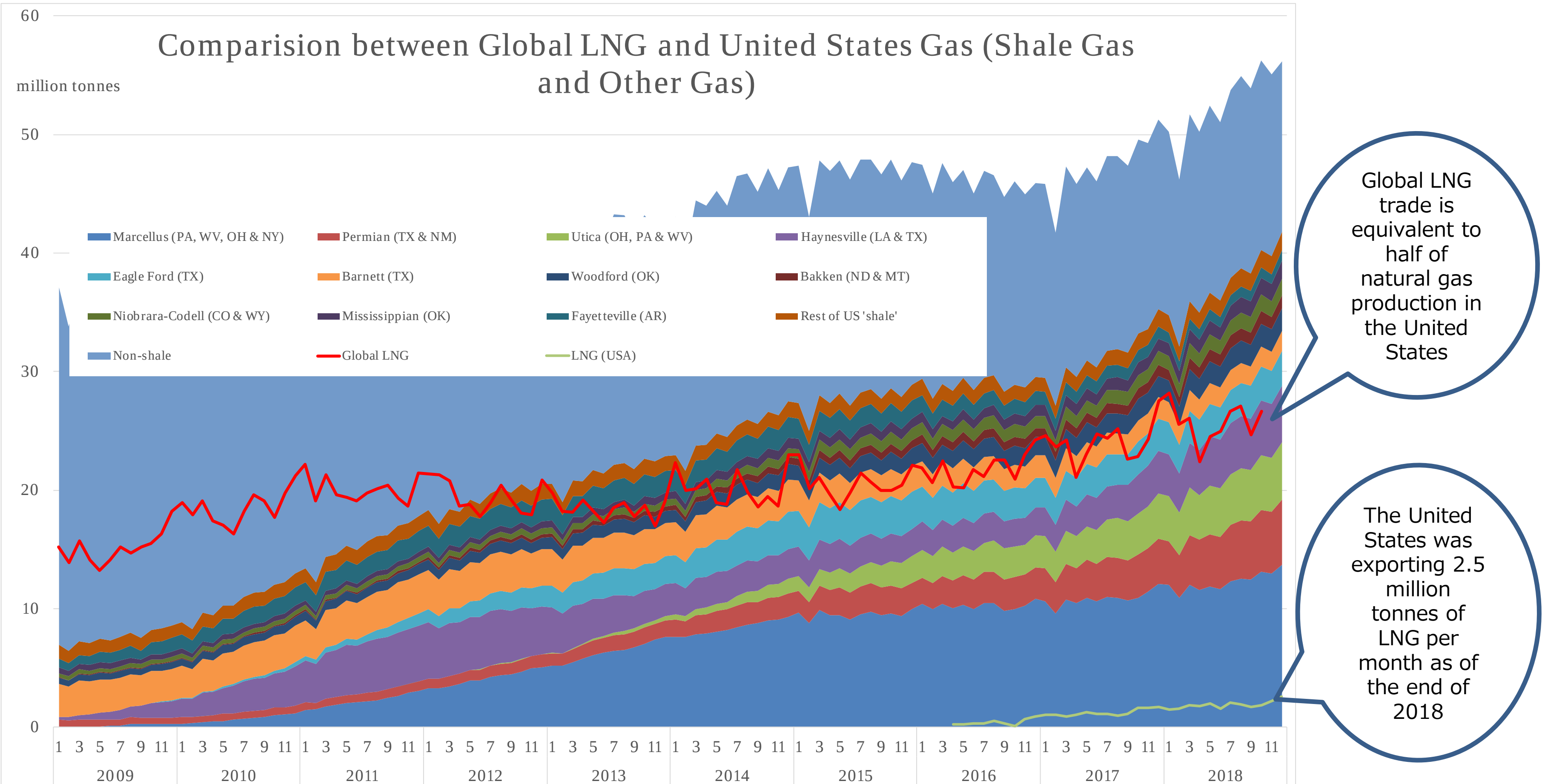


LNG Demand and Supply Outlook



- Global LNG demand is expected to increase by 25 million tonnes to 340 million tonnes in 2019
- Effective global LNG supply capacity is expected to be 350 million tonnes in 2019, taking into account of actual operation of liquefaction facilities
- Global LNG demand is expected to be 360 million tonnes in 2020, widening the gap with supply capacity
- In 2019 and 2020, China is expected to lead incremental LNG demand and the United States and Australia are expected to drive supply growth

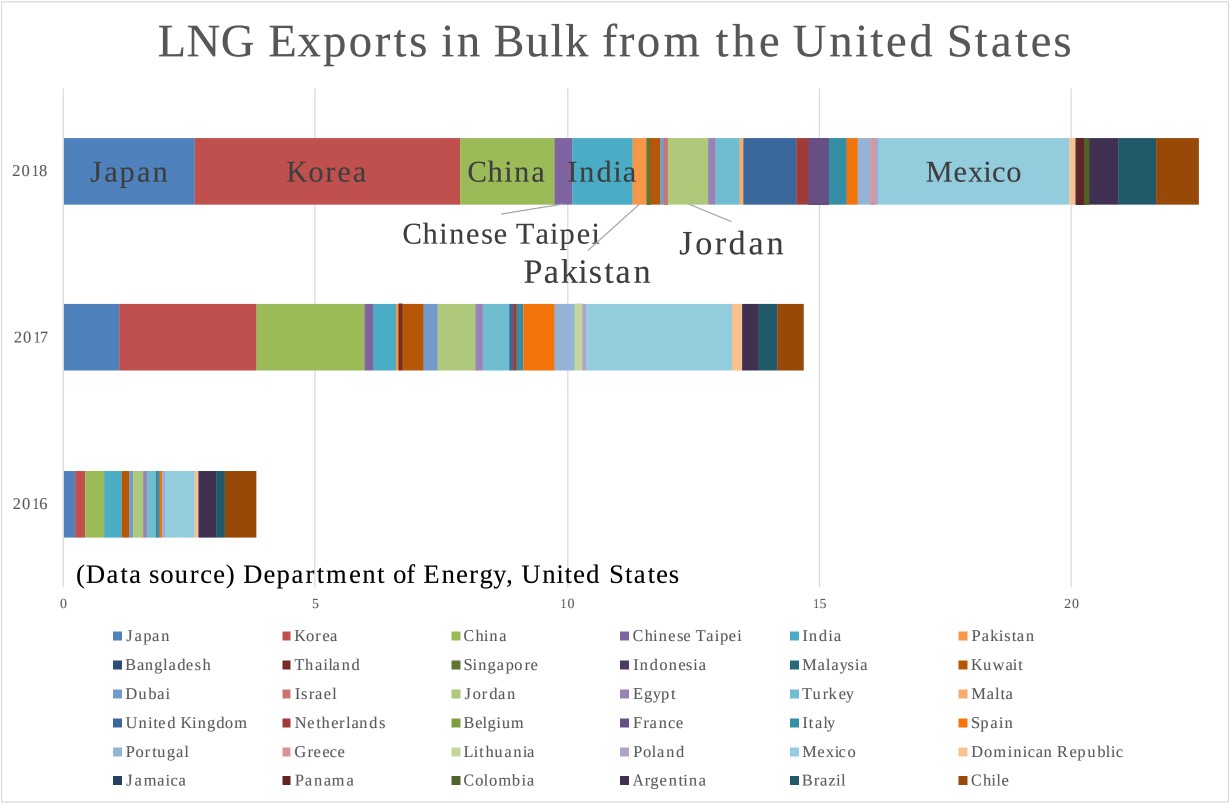
Increasing Production Makes the United States a Net Exporter of Natural Gas



(Source) Compiled by the author based on data from EIA and global trade data

- Natural gas production in the United States during the first four months of 2019 was 13% larger than one year earlier
- Growth of natural gas production has been driven by shale basins in recent years
- Since September 2017, the United States has been a net exporter of natural gas on monthly basis

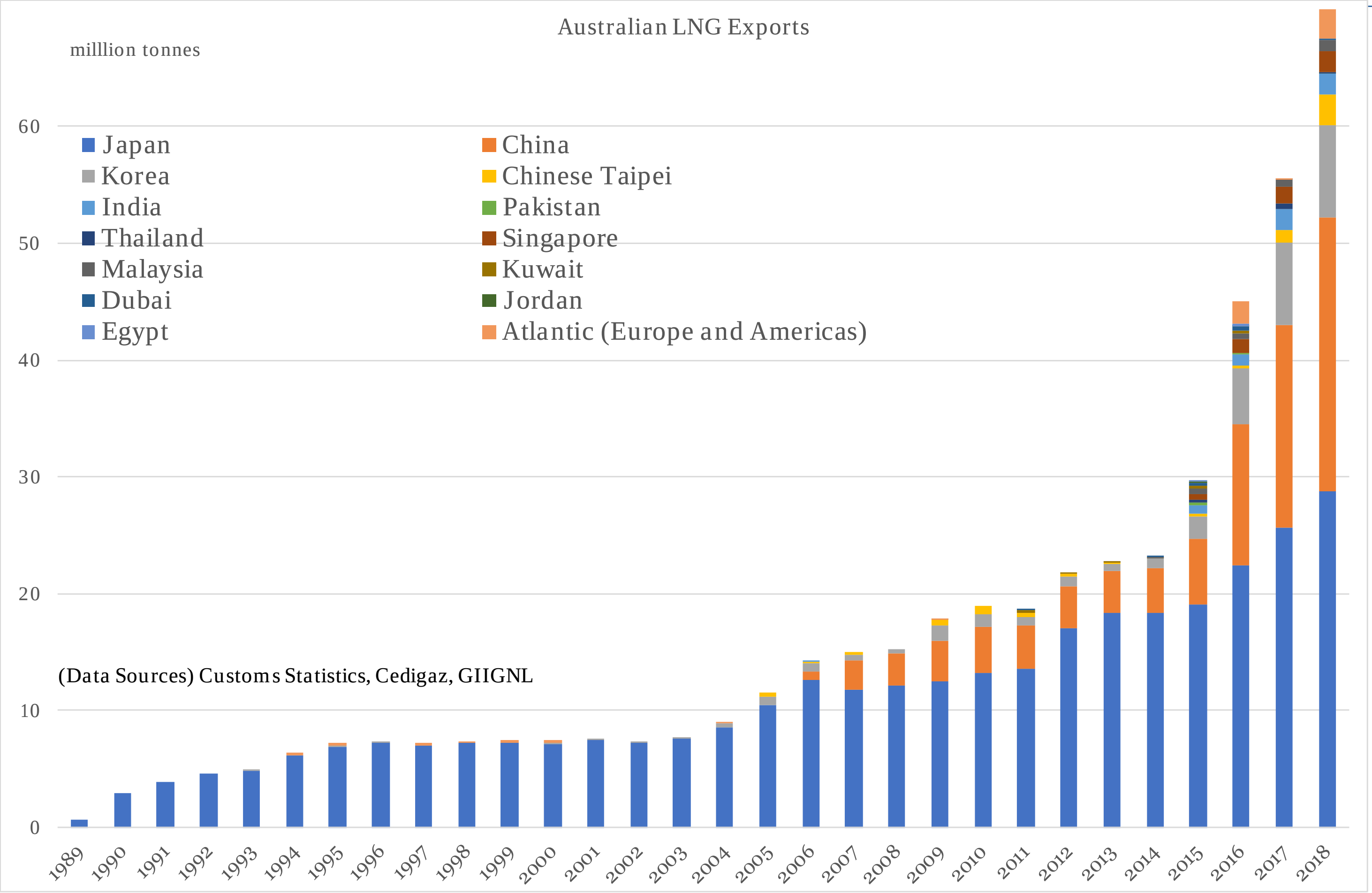
Over Half of LNG Exports from the United States Come to Asia



(Source) Compiled by the author based on data from the DOE

- LNG exports amounted 13.15 million tonnes during the first five months of 2019, representing a 51% increase from one year earlier
- New LNG export capacity additions continue

LNG Exports from Australia Continue Increasing Significantly



(Source) Compiled by the author based on customs statistics of importing countries, Cedigaz and GIIGNL data

- Australia exported 37 million tonnes of LNG during the first half of 2019, a 17.5% increase year-on-year
- The Ichthys project continues ramping up production since late 2018
- Prelude FLNG shipped out its first LNG cargo in June from the country's first floating LNG production unit

Plans Advance to Export Natural Gas and LNG from Russia

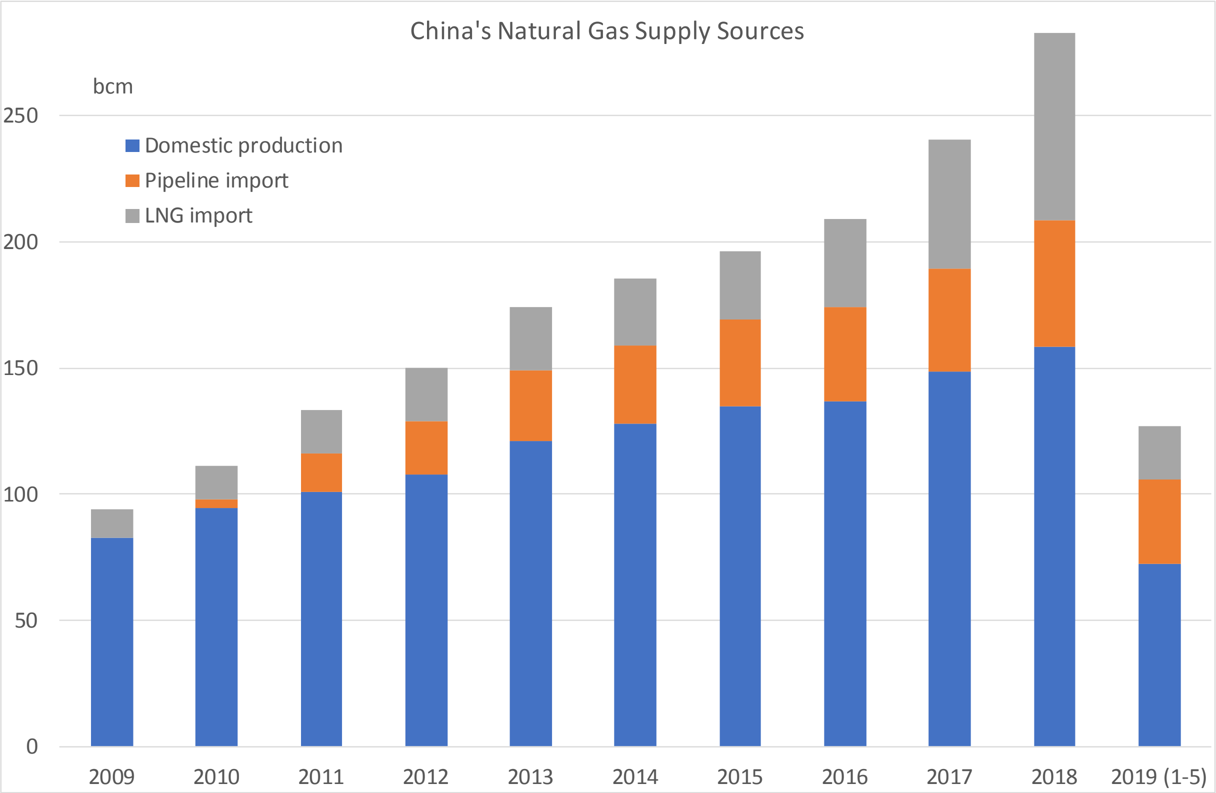
Sponsor	Project	Capacity*	Notable progresses in 2019
Gazprom	Sakhalin 2	9.6 mt	Operating
	Sakhalin 2 T3	5 mt	
	Ust-Luga (Baltic LNG)	13 mt	An integrated project to produce LNG, ethane and LPG with RusGasDobycha as a partner
	Power of Siberia	38 bcm	First gas expected in December 2019
	Nord Stream 2	55 bcm	First line to be operational in 2019
	TurkStream	31.5 bcm	First line to be operational in 2019
Novatek	Yamal LNG	17.4 mt	Operating
	Cryogas-Vysotsk	0.6 mt	Production started in April from JV with Gazprombank
	Arctic LNG 2	19.8 mt	With 10% each participation by Total, CNOOC, CNPC, and Mitsui/JOGMEC, EPC awarded to TechnipFMC
	Ob LNG	4.8 mt	Planned with Russian proprietary technology
	Kamchatka Transshipment		
	Murmansk Transshipment		

*Annual capacity

(Source) Compiled by the author based on company announcements and statements

- Yamal LNG has ramped up production, starting dividend distribution, making first delivery to Japan
- Arctic LNG 2 advances to a possible FID in 2019 and first production in 2023, after agreeing with equity partners
- Power of Siberia, Nord Stream 2, and TurkStream are expected first gas in 2019

China Increases Natural Gas Demand and Import Dependence

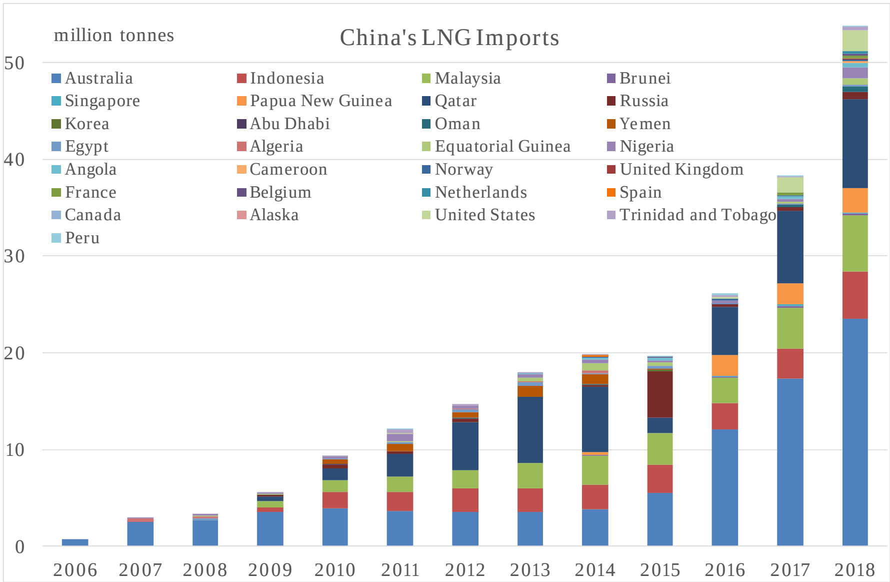


(Source) compiled by the author based on data from NDRC and customs statistics

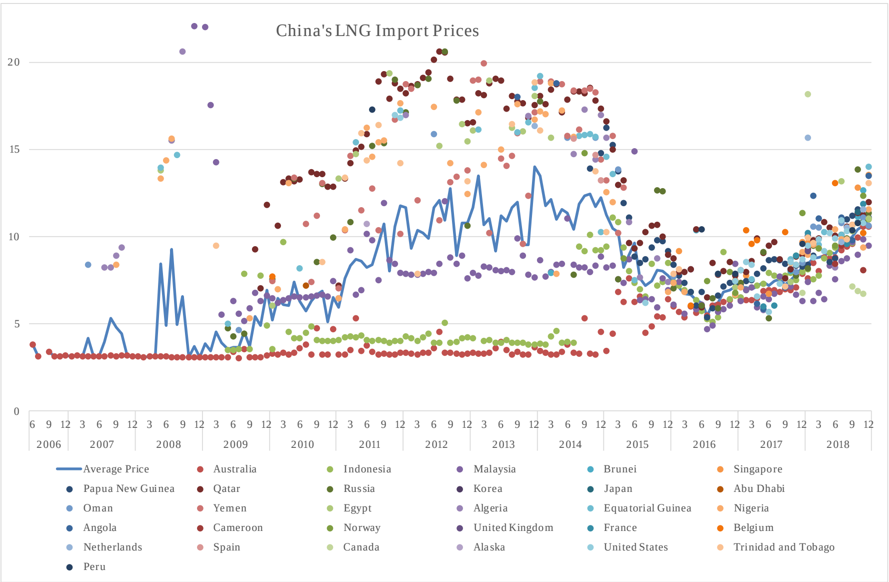
- China consumed 126 bcm and produced 73 bcm of natural gas during the first five months of 2019, 13 bcm, or 12%, and 7 bcm, or 10%, more than it did one year earlier, respectively
- China also increased LNG imports by 4 million tonnes, or 20%, to nearly 24 million tonnes during the first five months of the year
- China became the largest spot and short-term LNG importer in the world, replacing Japan in 2018
- Dependence on imports surpassed 40% in 2018

China's Imports Prices Converge as It Increases LNG Imports

LNG Imports in China



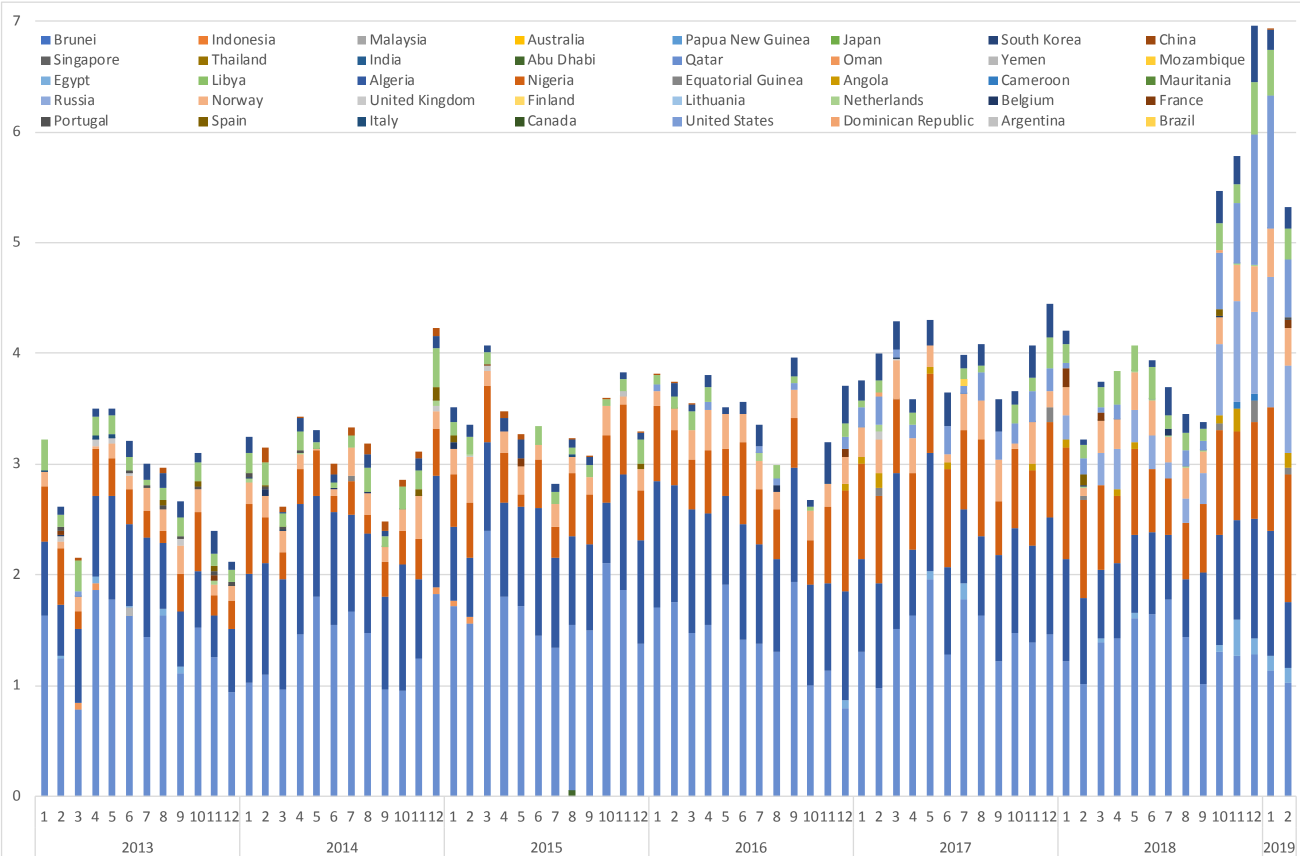
LNG Import Prices in China



(Source) compiled by the author based on data from customs statistics

- China's LNG imports grew by 40% year-on-year in both 2017 and 2018
- China has diversified its LNG import sources
- China's LNG import prices tend to converge after discounted long-term deals cease

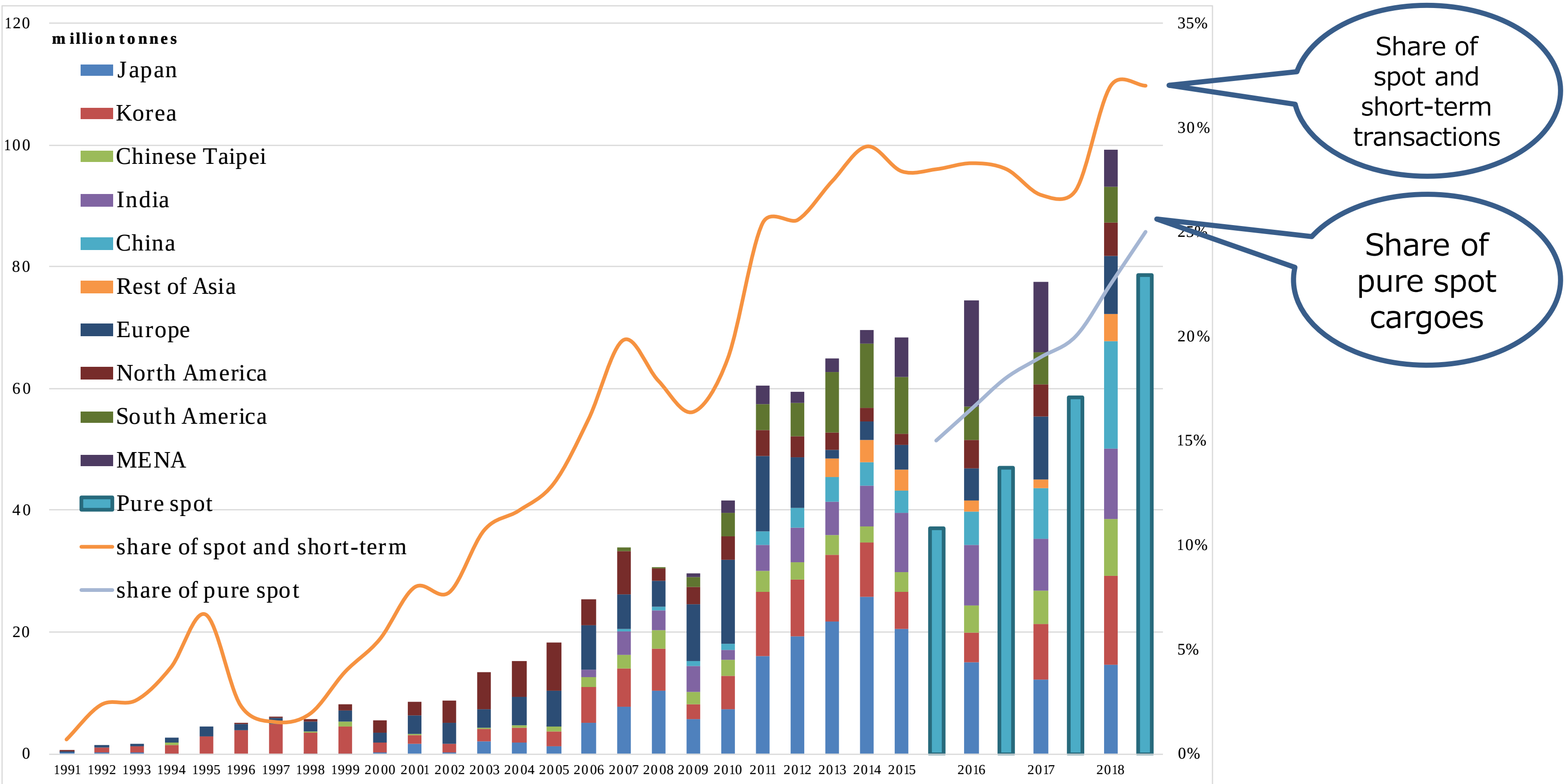
Europe Increases LNG Imports With Slightly Smaller Natural Gas Use



(Source) Compiled by the author based on data of Cedigaz LNG Service

- Natural gas consumption in OECD Europe decreased by 22 bcm, or 4%, in 2018 to 507 bcm and by 5 bcm, or 3%, in the first quarter of 2019 to 175 bcm, respectively, from one year earlier
- As natural gas production in the region continues decreasing, the region continues absorbing excess LNG cargoes that are not received in other parts of the world

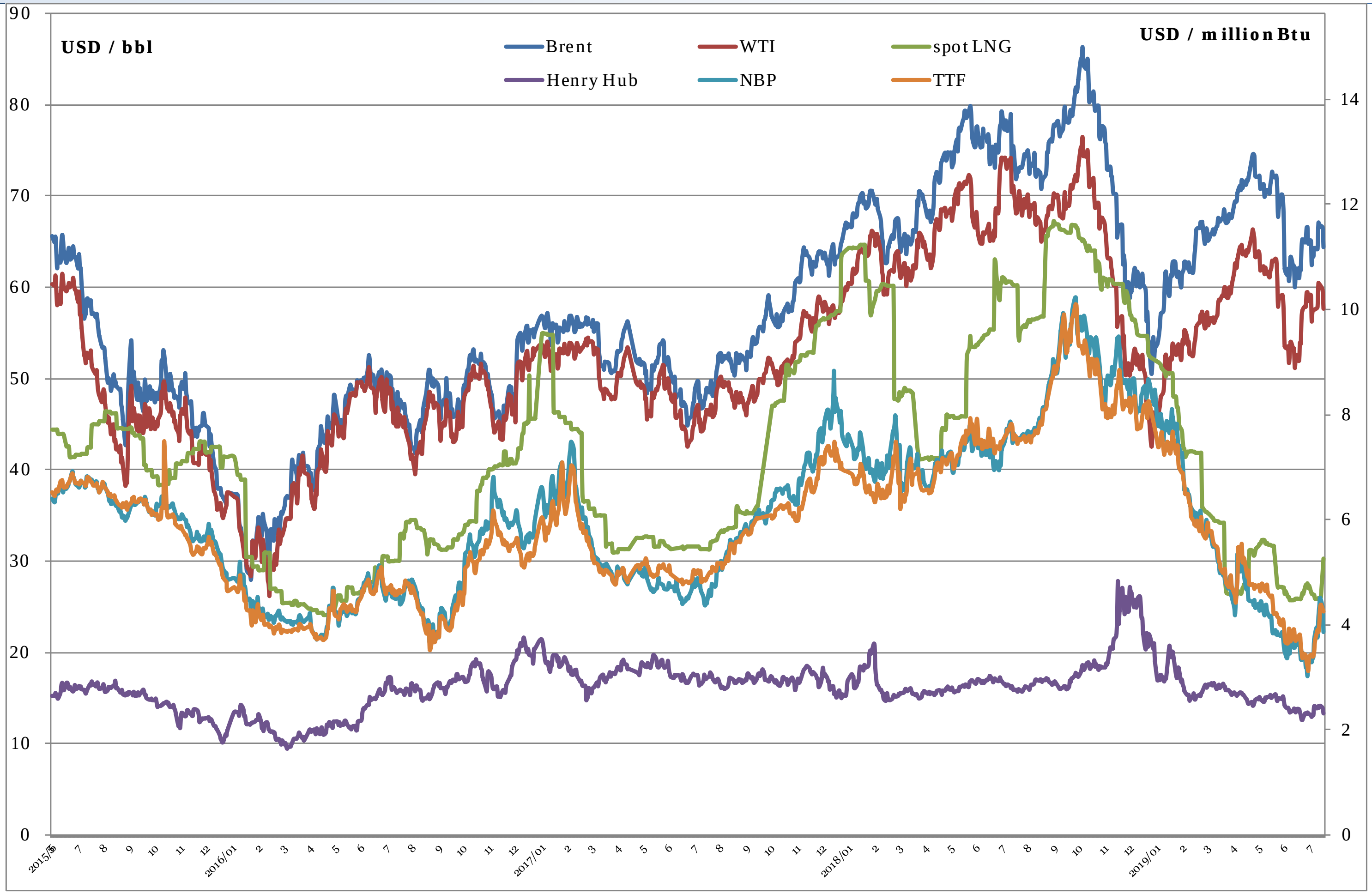
Increasing Spot LNG Encourages More Liquidity and Optimisation



(Source) Compiled by the author based on data from GIIGNL

- Volumes of LNG traded on spot basis reached 78.70 million tonnes in 2018, representing 25% of the total global LNG trades
- Spot and short-term transactions of LNG are expected to grow further driven by secondary sales by portfolio players to take care of seasonal fluctuation of gas demand in China and emerging demand in Southeast and South Asia
- As increasing exports of LNG from the United States encourage optimisation of transportation, flexibility of terms and conditions in LNG sale and purchase contracts will be more important.

Spot LNG and Crude Oil Prices



(Source) Compiled by the author based on data from exchange places

- Assessed spot LNG prices have moved in a range between European gas hub and crude oil equivalent prices, while moving near the bottom of this range in 2019
- LNG buyers need to secure better terms and conditions in LNG purchase contracts - including diversification of pricing and flexibility in volumes and destinations - in order to take advantage of the improved short-term LNG market

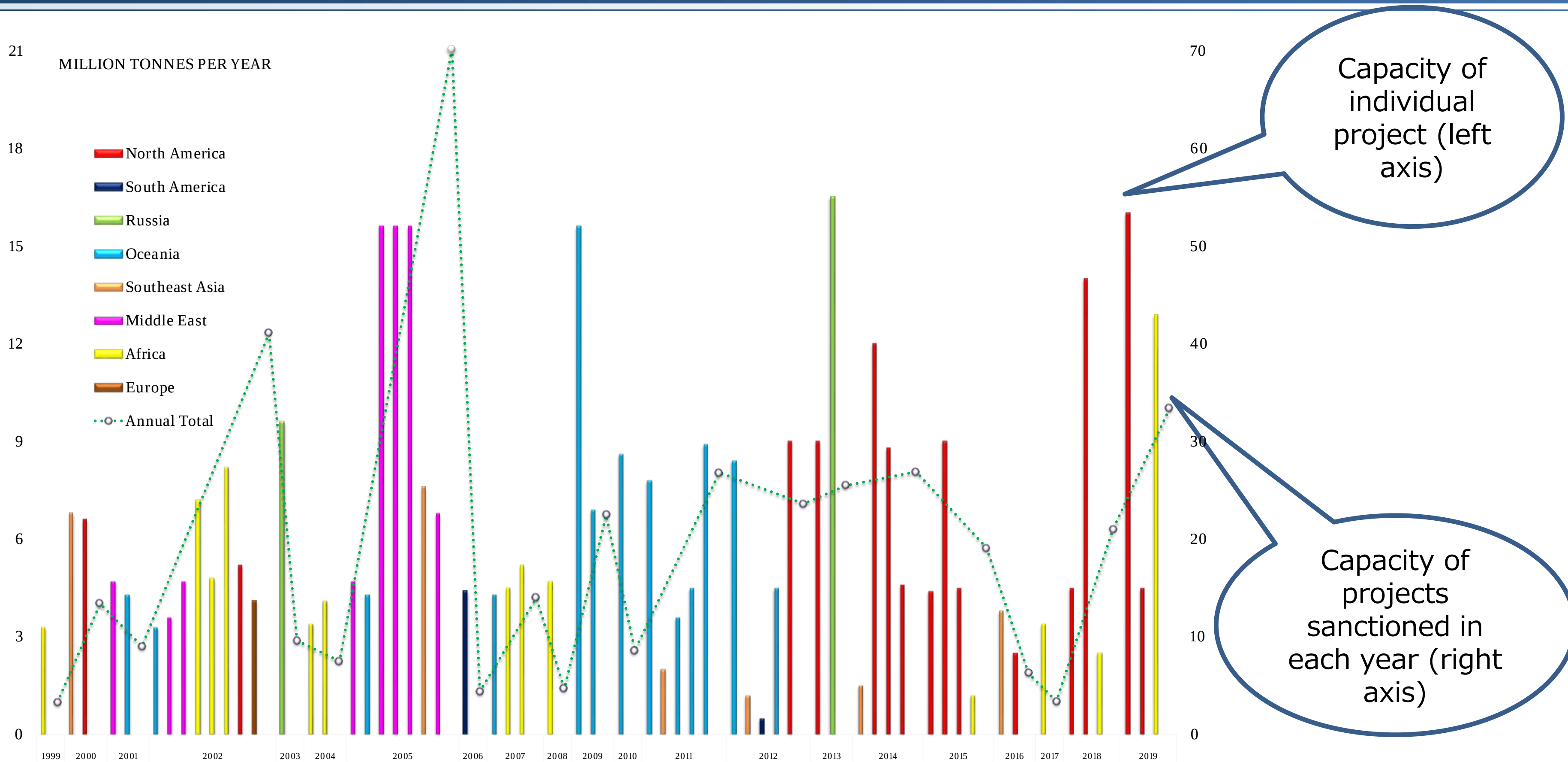
Selected LNG Sales Agreements Announced Recently

Supply source	Seller	Market	Buyer	Volume (mt/year)	start	Ys	Note	Status
LNG Canada	DGI (Mitsubishi)	Japan	JERA	1.20	2024	15	DES	HOA
Portfolio	Shell		Tokyo Gas	0.50	2020	10	DES / partial coal index	HOA
PNG LNG	PNG LNG	China	Sinopec	0.45	2019	4	Incremental sale	SPA
Portfolio	Total		Guanghui Energy	0.70	2019	10		SPA
	Woodside		ENN	1.00	2025	10	Subject to Scarborough	HOA
Arctic LNG 2			CNPC	2.00	2023		Equity lifting	
			CNOOC	2.00	2023		Equity lifting	
			Mitsui & Co.	2.00	2023		Equity lifting	
	Novatek	Iberian Peninsula	Repsol	1.00	2023	15	DES, non binding	HOA
		Buyer's portfolio of marketing	Vitol	1.00	2023	15	FOB, Murmansk / Kamchatka	HOA
Commonwealth LNG	Commonwealth LNG		Gunvor	1.50	2024	15		HOA
Driftwood	Tellurian		Total	1.00	2023	15	FOB / JKM index	HOA
				1.50	2023	15		HOA
Rio Grande	NextDecade		Shell	2.00	2023	20	3/4 Brent linked	SPA
Mozambique LNG1	Mozambique LNG1			2.00	2024	13		SPA
		Japan / Chinese Taipei	JERA / CPC	1.60	2024	17		SPA
		Japan / Europe, etc.	Tokyo Gas / Centrica	2.60	2024	20		SPA
		Japan	Tohoku Electric	0.28	2024	15		SPA
		China	CNOOC	1.50	2024	13		SPA
Port Arthur	Sempra	Saudi Arabia	Saudi Aramco	5.00	2023	20		HOA
Plaquemines	Venture Global LNG	Poland	PGNIG	1.50	2023	20		SPA

(Note) The table includes notable LNG sales deals announced in 2019
(Source) Compiled by the author based on company announcements

- New projects seek outlets before investment decisions
- Some volumes are sold and purchased on portfolio basis
- Terms and conditions have diversified in terms of pricing and flexibility

Investment Decisions on LNG Export Projects



(Source) Compiled by the author based on company announcements

- Two projects in the United States and one in Mozambique have cleared the milestone so far in 2019, representing 34-million-tonne-per-year capacity
- With additional projects approaching the milestone in the United States and Russia, this year is expected to be a record year of LNG FIDs

Initiatives by Japan's Public and Private Sectors Toward a Better LNG Market

■ LNG Market Strategy

The strategy has four main goals: to enhance flexibility in LNG transactions (including elimination of destination restrictions and enhanced measures to support upstream investment); to establish a price index that reflects LNG's own supply and demand balance; to have more open and sufficient infrastructure; and to promote more LNG demand in and out of Japan.

■ LNG Producer-Consumer Conference

Japan has hosted annual LNG Producer-Consumer Conference since 2012 to continue high level dialogues between major LNG producing and consuming countries, as it is important to maintain a global perspective in the LNG market, to express Japan's view to the world, and to continue communication with international actors. The idea has been developed under a new circumstance of heavier burdens of LNG procurement, along with an expanding global LNG market with increasing producing and consuming countries and companies.

■ Initiative to enhance flexibility in the LNG market

The Japanese government has expressed its views that traditionally rigid terms and conditions in LNG transactions should be improved through various dialogues including the LNG Producer -Consumer Conference, G7 meetings, and other bilateral and inter-regional dialogues (e.g. the Model Clause via Japan - EU initiatives). The Japan Fair Trade Commission published a report on its investigation into LNG contracts in June 2017, which has resulted in better terms in new procurement contracts by Japanese companies. Further efforts are expected to enhance cooperation with emerging LNG importers in Asia and European counterparts, as well as to improve conditions in existing contracts.

While the top-tier major players in the global LNG industry further enhance their presences in those projects, Japanese companies should also play proactive roles in the new projects, including offtake commitments, equity participations in the projects, and demand creation in emerging markets in Southeast and South Asia.