



[After Trump Series 2] Prospects for U.S.–South Korea Cooperation in an Era of U.S.–China Strategic Competition

Liquefied Natural Gas Links the Energy Systems of China, South Korea, and the United States

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Introduction to the energy systems in China and South Korea

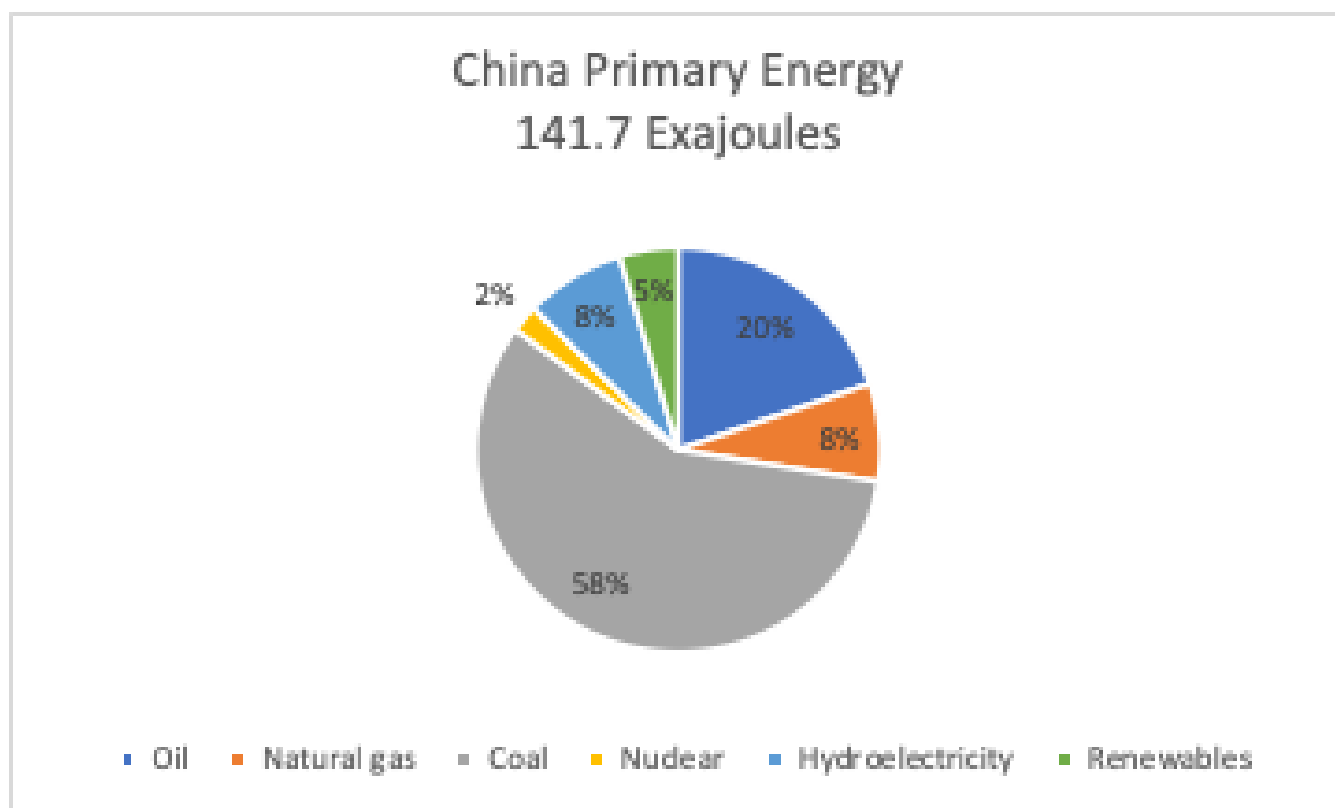
Energy security has long been an important geopolitical issue for the countries of east Asia. Rapid economic growth in the region over the past decades has only increased the prominence of the issue in the regions' international affairs. Although primary energy demand in China is more than ten times that in South Korea, the energy systems of the two countries share important characteristics. Both countries import significant shares of their fuel, although for slightly different reasons.

With a population of over 1.4 billion people,¹ China's voracious demand for energy exceeds its domestic production. China's energy imports meet 73% of oil demand and 42% of liquefied natural gas (LNG) demand. China is the world's largest coal importer, despite also being the world's largest coal producer.² Despite rapidly growing renewable electricity production, coal and oil dominate China's primary energy supply, together meeting more than three-quarters of China's primary energy demand.

¹ "China," Census.Gov, <https://www.census.gov/popclock/world/ch>

² International Energy Agency, *Coal Information 2019*, (Paris, France: Organization for Economic Cooperation and Development Publishing, 2019), <https://doi-org.brookings.idm.oclc.org/10.1787/4a69d8c8-en>.

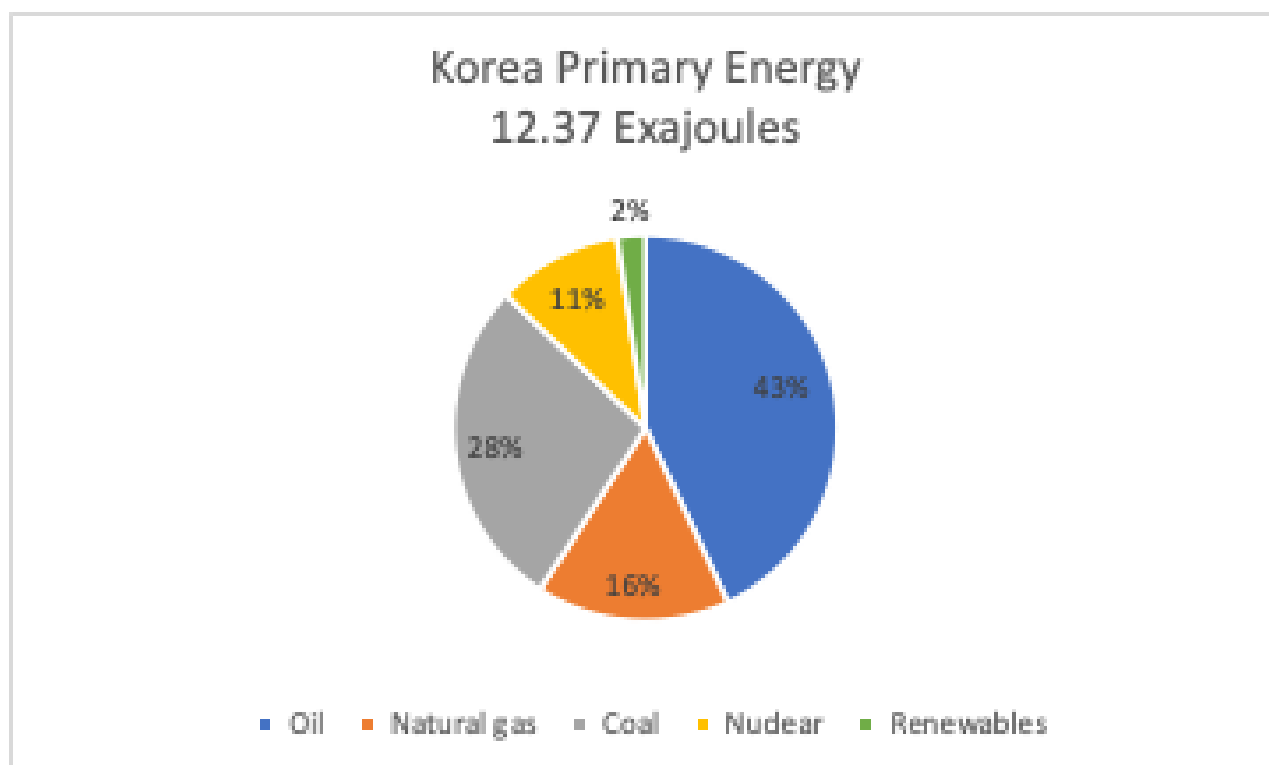
Figure 1: Chinese Primary Energy Sources



Source: BP Statistical Review of World Energy 2020

Korea has few domestic sources of fossil fuels, and thus relies on imports for nearly all of its energy needs. The country is very densely populated, with more than 50 million people in a country roughly the size of the state of Indiana. Korea's energy system is slightly more balanced than China's. Oil is the largest source of primary energy, with a 43% share, followed by coal at 28%, natural gas at 16%, and nuclear at 11%.

Figure 2: South Korean Primary Energy



Source: BP Statistical Review of World Energy 2020

Coal is a crucial part of both countries' electricity supply. We hear a great deal about China's reliance on coal, but Korea also relies on coal for more than 40% of its electricity generation,³ and is the world's fourth largest coal importer.⁴ Both countries aim to reduce the prevalence of coal in their power sectors, replacing it with renewable power and natural gas. In Korea, the 8th Basic Plan for Long-term Electricity Supply and Demand, issued in December 2017, also focuses on reducing the share of nuclear power, which today provides 26% of its electricity.⁵

As both China and Korea work to decrease the prevalence of coal, natural gas will become an increasingly important part of their energy portfolios. Liquefied natural gas (LNG) is an important area where the energy fortunes of China, Korea, and the United States intersect. Chinese demand and U.S. supply are both growing fast, with implications for Korea's long-standing LNG market.

³ "Distribution of electric power generation in South Korea in 2018, by energy source," Statista, <https://www-statista.com/statistics/884559/south-korea-electricity-generation-by-energy-source/>

⁴ International Energy Agency, *Coal Information 2019*.

⁵ Korean Ministry of Trade, Industry and Energy, "The 8th Basic Plan for Long-term Electricity Supply and Demand (2017 - 2031)," (Nam-myeon, Sejong, South Korea, December 2017), <https://policy.asiapacificenergy.org/sites/default/files/8th%20Basic%20Plan%20for%20Long-term%20Electricity%20Supply%20and%20Demand%20%282017%20-%202031%29.pdf>

LNG: China and Korea are important buyers in a growing market

China and Korea are the world's second and third largest importers of LNG, respectively. (Japan is the leading importer.) LNG is Korea's only source of natural gas, as it has negligible domestic production and no source of pipeline supply. On the other hand, China has significant natural gas production, but not enough to meet demand. In 2019, LNG comprised 28% of China's natural gas supply while pipeline gas supplied 16%. However, this supply mix is changing fast. China's pipeline gas has historically come almost entirely from Central Asia: from Turkmenistan, Uzbekistan, and Kazakhstan. However, the Power of Siberia pipeline from Russia delivered its first gas at the end of 2019.⁶ This pipeline will deliver 38 billion cubic meters (bcm) of gas annually, an 80% increase in pipeline gas supply. Nonetheless, China's growing appetite for natural gas means that LNG imports will continue to grow.

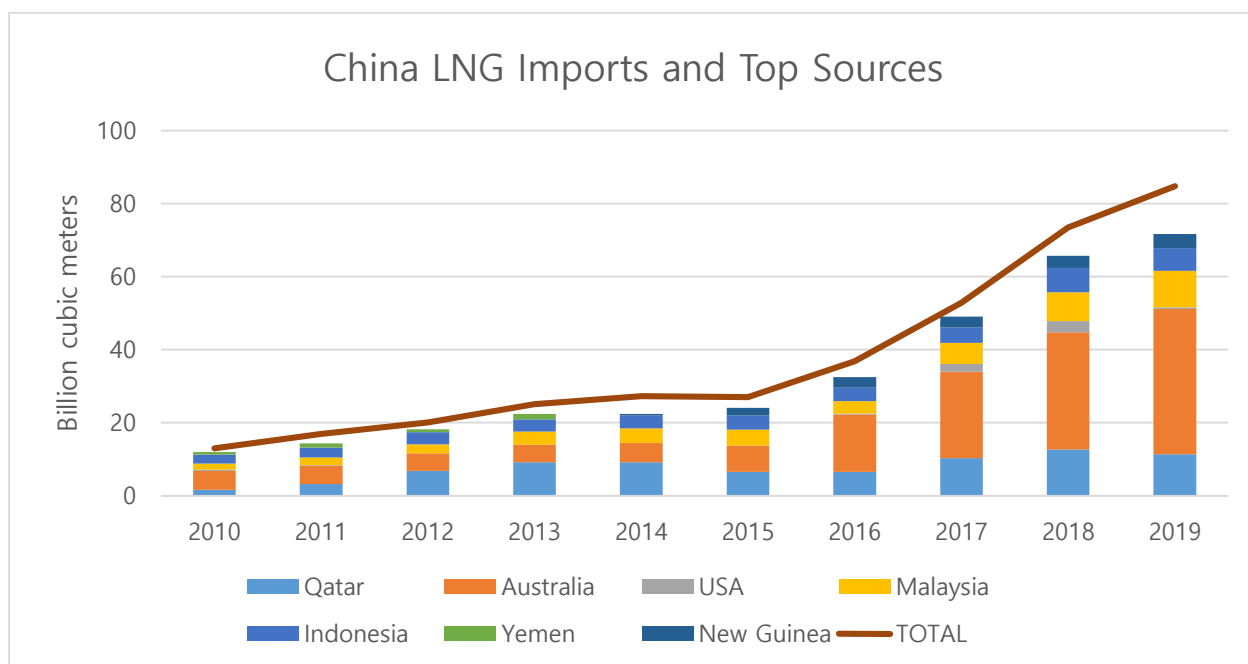
China's LNG imports have expanded rapidly over the last decade, growing from 13.0 bcm in 2010 to 84.8 bcm in 2019. Korea has long been an important importer of LNG, with much smaller demand growth than that seen in China over the past decade. Along with Japan and Taiwan, Korea was an important early customer for LNG in Asia, importing LNG since 1986.⁷

The same large suppliers are important to both countries. Qatar, Australia, Malaysia, and increasingly, the United States are important sources of LNG for both countries. Australia is a particularly important supplier for China. China's LNG demand was growing rapidly just as Australia's projects were looking for contract commitments. The countries thus became important partners. Australia was the source of China's first LNG imports in 2006 and in 2019 accounted for 47% of China's total LNG imports. In contrast, Korea has been an important customer for US LNG from the beginning and was the United States' largest customer in 2019 with 7.2 bcm of imports.

⁶ Anna Galtsova and Jenny Yang, "The era of Russian pipeline gas supply to China begins," IHS Markit, December 2, 2019, <https://ihsmarkit.com/research-analysis/the-era-of-russian-pipeline-gas-supply-to-china-begins.html>

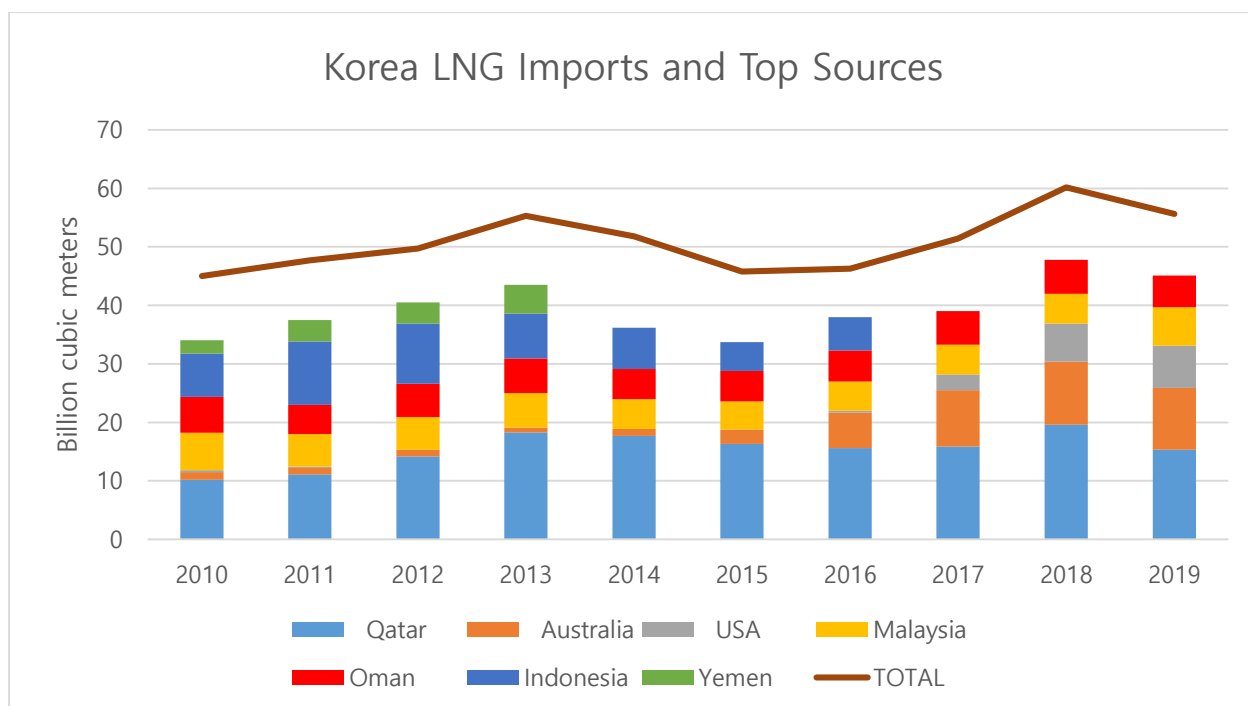
⁷ International Energy Agency, "LNG Market Trends and Their Implications," (Paris, France, June 2019), <https://www.iea.org/reports/lng-market-trends-and-their-implications>

Figure 3: Top Sources of Chinese Natural Gas Imports



Source: BP Statistical Review of World Energy, 2011 through 2020

Figure 4: Top Sources of Korean Natural Gas Imports



Source: BP Statistical Review of World Energy, 2011 through 2020

Events in the United States brought changes to the global LNG market

The United States has had an overwhelming impact on global gas markets in the last decade. In the early 2000s, gas production in the United States was falling and the United States was expected to become a significant importer of LNG. Important market players, notably Qatar, made investments intending to serve the emerging U.S. market.

Instead, the U.S. shale gas revolution brought rapid increases in U.S. natural gas production. The combination of horizontal drilling and hydraulic fracturing allowed production of gas resources in the United States that were not profitable with previous technology. The turnaround began in 2007, the same year that U.S. LNG imports peaked.⁸ U.S. gas production has nearly doubled since then, and, beginning in 2015, the United States became an LNG exporter.

These events in the United States catalyzed important changes in the global LNG market, which evolved based on long-term contracts (10 years or more) with very strict terms. The high capital costs of projects meant that strict and stable long-term contracts were necessary to support the development of LNG liquefaction projects. These conditions supported the development of stable supply and relationships between producers and consumers. However, they also resulted in a rigid, inflexible LNG market.

U.S. LNG development proceeded along a different path than the other large LNG exporters. Most LNG projects are based on large gas fields without a viable market reachable by pipeline. The exploration and development costs are part of the development of the LNG project. In the United States, on the other hand, LNG exports are based on a well-established, deep, and liquid gas market at Henry Hub, rather than a single project or projects. LNG exporters are buying gas in this market rather than bearing the development costs themselves. Additionally, U.S. LNG liquefaction facilities are located on brownfield sites—converted regasification facilities that were built before the U.S. gas production boom. These sites already had LNG storage tanks and cargo vessel berths. For these reasons, U.S. LNG plants have the lowest capital costs in the world.⁹

The source of the gas and the lower capital costs have allowed U.S. LNG facilities to offer more flexible contract terms than other LNG projects. Before U.S. entrance into the market, LNG

⁸ “Natural Gas explained,” U.S. Energy Information Administration, <https://www.eia.gov/energyexplained/natural-gas/liquefied-natural-gas.php>

⁹ International Energy Agency, “LNG Market Trends and Their Implications,” (Paris, France, June 2019), <https://www.iea.org/reports/lng-market-trends-and-their-implications>

contracts generally had strict take-or-pay provisions, meaning that buyers had to accept the contracted level of shipment, whether they needed the gas or not. Contracts also had destination clauses, meaning that cargoes could not be resold to another buyer if needed. Buyers thus had very little flexibility in the amount of gas purchased. U.S. LNG contracts do not have destination clauses, opening up opportunities for resale of gas and providing welcome flexibility.

Pricing for U.S. LNG is also different from other suppliers in Asia. LNG is typically sold at prices indexed to crude oil prices, because there is no gas trading hub in the region with the depth and liquidity needed for robust price discovery. Asia's initial important markets—Japan, Korea, and Taiwan—have no source of pipeline gas and thus rely on LNG. Oil indexation developed to price LNG at a fair price compared to locally competing fuels, rather than in comparison to other sources of gas. Since the main three early markets had similar transportation costs from major producers, the same pricing scheme across them made sense. In 2017, 70% of Asian gas sales were still subject to oil price indexation.¹⁰

U.S. LNG is not linked to oil prices and is instead priced based on Henry Hub gas prices plus fees for liquefaction and transport. This pricing strategy allows Asian buyers a way to tap into the abundant and low-priced North American natural gas market. Prices for U.S. LNG will not always be lower than those for oil-linked LNG, but provide an important source of diversification in pricing.

Finally, the U.S. gas boom and emergence as an LNG exporter has assisted in the breakdown of the rigid relationship between LNG producers and buyers. The unexpected increase in U.S. natural gas production meant that gas intended for the United States needed another buyer. The LNG market became oversupplied and more of a buyers' market, allowing buyers to push for looser contract terms. The market has become more global, with more trading among regions and more LNG cargoes available on a spot basis, rather than only through long-term contracts. The shutdown of Japan's nuclear generation after the Fukushima disaster in 2011 accelerated this trend, as LNG cargoes came to Japan from around the world to meet its growing demand for gas for power generation. The spot market now makes up nearly one-quarter of global LNG trade.¹¹

¹⁰ International Energy Agency, "LNG Market Trends and Their Implications," (Paris, France, June 2019), <https://www.iea.org/reports/lng-market-trends-and-their-implications>

¹¹ International Energy Agency, "Global Gas Security Review 2019," (Paris, France: International Energy Agency, October 2019), <https://www-oecd-ilibrary-org.brookings.idm.oclc.org/docserver/9744bc3e-en.pdf?expires=1599590463&id=id&accname=ocid44008324&checksum=CAF46B82D075E8D0E913CA36702F7857>

China's LNG demand growth and U.S. supply growth can be helpful to Korea

The emergence of U.S. LNG supply is clearly good for both China and Korea, increasing the amount of LNG on the market, providing supply on more flexible terms, and introducing a new pricing scheme to diversify purchases. Less obvious is the effect of China's rapid LNG demand growth on Korea.

Generally, one would think that the emergence of China as a huge LNG market in the neighborhood would be problematic for Korea, increasing competition for gas and thus prices. However, China's emergence has helped establish more liberal contract terms, and China provides a viable secondary market for times when Korea needs less gas than it has contracted, for newer contracts where resale is allowed.

China and Korea are now the world's number two and three LNG importers, respectively, but their demand patterns are different. LNG is Korea's only source of gas, while China has indigenous gas production and pipeline gas supply from Central Asia and Russia. For this reason, China has more ability to be opportunistic in its gas purchases, to trade off among suppliers, and to be more price-sensitive. China's rapid demand growth has also left it without enough long-term contracts in place to meet its demand. China is thus an active participant in the spot market and in buying LNG for shorter contract lengths. China's rapid growth has made it an attractive market for LNG, but its diversity of supply makes it a discerning customer, able to push for looser contract terms and favorable prices.

China - United States trade war interrupts energy trade

China and the United States have been engaged in a trade war since July 2018, when the United States imposed a 25% tariff on around \$34 billion of Chinese imported goods. An escalating series of tit-for-tat moves ensued. China imposed a 10% tariff on U.S. LNG in September 2018 and raised the tariff to 25% in June 2019, when it also imposed a 5% tariff on U.S. crude oil.

The tariffs have greatly reduced Chinese purchases of U.S. LNG. In 2018, China bought 3 bcm of U.S. LNG, which decreased to 0.4 bcm in 2019. Oil exports to China were also impacted, but to a lesser extent than LNG. Before the trade war, China was the second-largest market for U.S. oil exports¹², although only 2.3% of Chinese oil imports were from the United States. After the tariffs,

¹² Clifford Kraus. "U.S. Energy Industry Looks for Clarity in China Trade Deal," The New York Times, <https://www.nytimes.com/2020/01/15/business/energy-environment/china-trade-deal-energy.html>

U.S. oil was diverted to other markets, including Korea, where U.S. oil made up 6% of imported oil, by value.¹³

In a deal reached on January 15, 2020, China agreed to purchase greater amounts of U.S. energy products--\$25.3 billion in 2020 and \$40.7 billion in 2021, as part of a plan to purchase about \$200 billion of additional U.S. goods and services over two years. However, China did not reduce the tariffs as part of the deal.

The goals for China's purchase of energy goods were always ambitious, especially with the tariffs in place, as Chinese energy demand growth was slowing even before the COVID-19 pandemic. The pandemic has made compliance even less likely, given that energy prices have fallen as the pandemic has reduced global demand. Since the goals are in dollar amounts rather than quantities, lower prices make them more difficult to achieve.

The ongoing trade war is pushing apart countries that should be natural partners in energy trade. China's market for gas is growing rapidly as it aims to replace coal-fired power generation to improve air quality and reduce greenhouse gas emissions. The United States has ample gas supply and is even flaring gas associated with oil production in some cases, due to low prices and insufficient infrastructure to move the gas to market. Additionally, the contract terms for U.S. LNG are favorable for the Chinese market.

Korea's energy market could potentially benefit in the short term from diverted U.S. supply. But ultimately, policies that interrupt the free flow of energy could be detrimental to the Korean economy, as well as those of China and the United States. If the ongoing trade war delays the final investment decision on further U.S. LNG projects, or worse, if some projects do not come to fruition because of uncertainty in the world's fastest growing LNG market, all parties stand to be harmed. U.S. LNG, with its more flexible contract terms, has been a positive development for all three countries. We can only hope that trade politics don't put a damper on this effect.

¹³ World Trade Organization. "Bilateral Imports by Detailed HS Code 2709," <https://data.wto.org/>

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