



Independent Statistics & Analysis

U.S. Energy Information
Administration

Country Analysis Executive Summary:

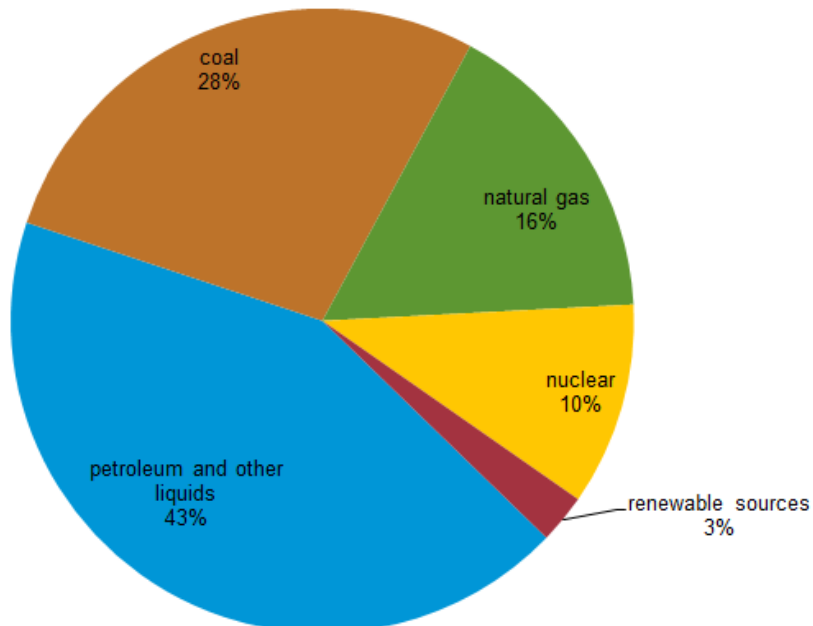
South Korea

Last Updated: October 2020

Overview

- South Korea relies on imports to meet nearly all of its fossil fuel consumption because of insufficient domestic resources.¹
- South Korea ranks among the world's top five importers of liquefied natural gas (LNG), coal, and total petroleum liquids.² South Korea has no international oil or natural gas pipelines and relies exclusively on tanker shipments of LNG and crude oil.
- South Korea was the world's ninth-largest energy consumer in 2019.³ Exports, most notably those of electronics, semiconductors, and petrochemicals, primarily to regional trading partners in Asia, fuel the country's economic growth. Real gross domestic product (GDP) slowed during the past two years from 3.1% in 2017 to 2.0% in 2019, the lowest GDP growth in a decade, as a result of weaker demand for the country's exports, the slowdown in neighboring China's economic growth, trade disputes with Japan, and weaker construction investment.⁴ The country's aging population is expected to dampen domestic energy demand and the overall economic landscape over the long term.⁵ An economic slowdown caused overall energy consumption in South Korea to decline from 2018 to 2019.⁶ Economic effects from the [2019 novel coronavirus disease \(COVID-19\)](#) pandemic have adversely affected South Korea's industrial activity and exports in the first half of 2020 and are projected to push 2020 GDP growth lower than the 2019 level.⁷
- Although petroleum and other liquids, including derivatives of coal and natural gas, accounted for the largest portion (43%) of South Korea's primary energy consumption in 2019, its share has been declining since the mid-1990s. The steady increase in natural gas, coal, and nuclear energy consumption has reduced oil use in the power sector and the industrial sector (Figure 2). In 2019, the share of nuclear energy consumption rose, while the share of coal consumption fell compared with 2018 levels. Nuclear reactors are beginning to return from extensive maintenance, and the government is restricting some coal-fired generation during winter months to lower air emissions.⁸

Figure 1. South Korea's total primary energy consumption by fuel type, 2019



Note: Petroleum and other liquids includes biofuels (ethanol and biodiesel)
Source: BP Statistical Review of World Energy 2020

Petroleum and other liquids

Exploration and production

- South Korea has a small amount of domestic oil reserves, but the country relies almost entirely on crude oil imports to meet its demand. Nearly all of South Korea's total petroleum and other liquids production of 119,000 barrels per day (b/d) in 2019 was from refinery processing gains, non-conventional liquids, and biofuels production.
- Through acquisitions of overseas companies and investments with major international and national oil companies, the Korea National Oil Corporation (KNOC) produced 125,000 b/d of oil and about 124 billion cubic feet of natural gas in 2019 in its overseas operations.⁹ As of March 2020, KNOC had invested in 20 producing blocks and had seven fields under development or exploration in several countries.¹⁰

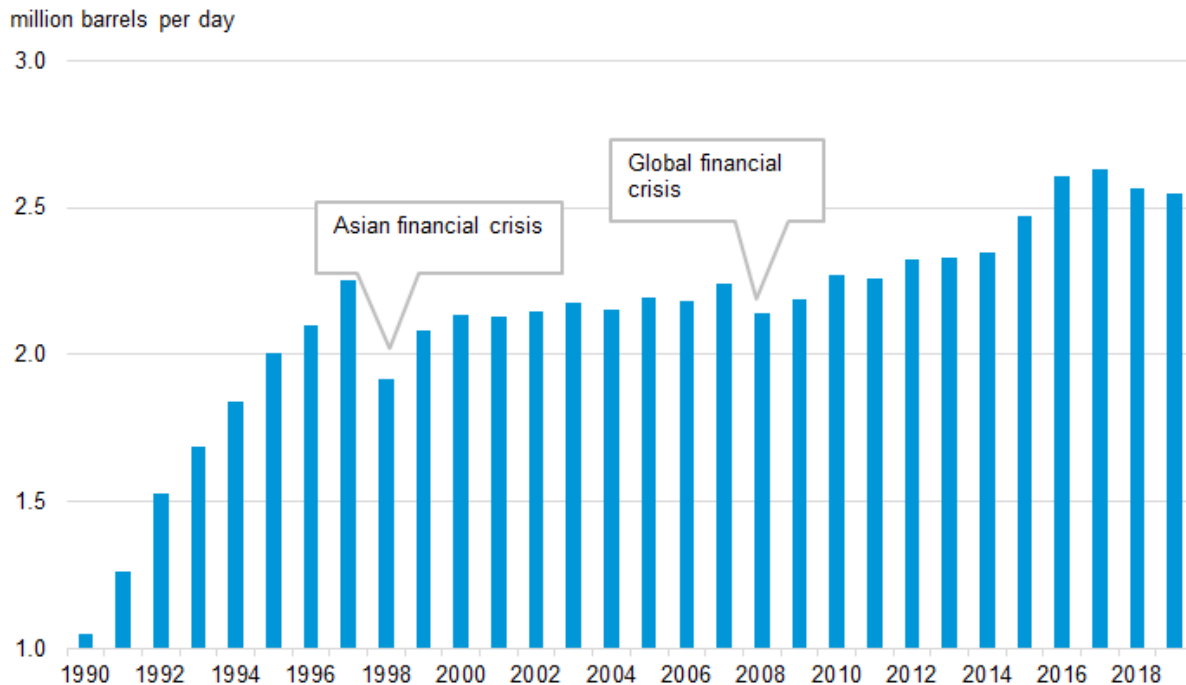
Consumption

- South Korea consumed 2.5 million barrels per day (b/d) of petroleum and other liquids in 2019, making it the eighth-largest consumer in the world (Figure 2). South Korea's oil demand rose by about 260,000 b/d between 2014 and 2016 as a result of lower crude oil prices, new petrochemical facilities that required more liquefied petroleum gas (LPG) and naphtha, and higher heavy-fuel oil consumption in the power sector that followed temporary nuclear-fired capacity shutdowns. South Korea's oil consumption growth moderated significantly in 2017. Consumption declined through 2019 after crude oil prices rose, new coal-fired electricity capacity came online displacing some oil-fired generation, fine dust emissions regulations

lowered fuel oil use in power plants, and petrochemical plants underwent extensive maintenance. Trade disputes and weaker demand from China negatively affected South Korea's oil product exports in the latter half of 2018 and 2019.¹¹

- The ongoing response to the COVID-19 pandemic may further erode South Korea's demand for petroleum products, primarily jet fuel, gasoline, diesel, and naphtha, with the most acute demand destruction occurring during the first half of 2020. Crude oil imports declined nearly 8% on an annual basis during the first half of 2020.¹² A weaker export sector as a result of lower global demand from South Korea's trading partners will reduce the country's economic and industrial growth through 2020. Other factors that are likely to drive down liquid fuel use during the next few years are fuel efficiency gains and greater use of alternative fuel vehicles in the transportation sector and fuel oil displacement in the power sector from new nuclear and coal-fired generation capacity.¹³
- By the mid-2020s, South Korea plans to commission several new petrochemical facilities that will likely boost the country's naphtha and LPG demand in the next several years.¹⁴ Naphtha demand, accounting for nearly half of total petroleum product demand in 2019, is South Korea's largest source of oil product demand. Naphtha use is likely to continue expanding in South Korea as a result of capacity additions at ethylene plants and the rising demand for plastics in Asia. South Korea also uses LPG (which accounted for 13% of the oil product demand in 2019) for its petrochemical industry, especially in propane dehydrogenation (PDH) plants and olefin facilities.¹⁵
- South Korea is a net exporter of oil products. The country exported an estimated 1.4 million b/d of refined oil products in 2019, mostly in the form of middle distillates such as gasoil, gasoline, and jet fuel. Oil product imports, accounting for almost 1.0 million b/d in 2019, were primarily naphtha and LPG.¹⁶

Figure 2. South Korea's petroleum and other liquids consumption, 1990-2019



Source: U.S. Energy Information Administration, *Short-Term Energy Outlook*, August 2020

Refining

- South Korea had 3.3 million b/d of crude oil distillation refining capacity at the beginning of 2020 and ranked as the fifth-largest refining capacity in the world.¹⁷ Condensate splitters account for about 0.5 million b/d of this capacity.
- Hyundai Chemical added about 40,000 b/d of condensate splitter capacity in 2019. However, no expansions or new refineries are planned to come online in the next several years.

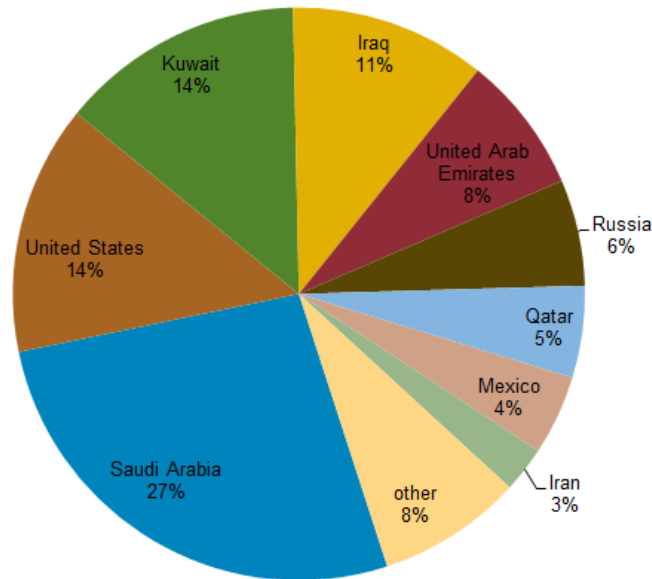
Petroleum and other liquids storage

- KNOC operates nine state-run strategic storage facilities with 136 million barrels of capacity. As of the end of 2019, KNOC held 96 million barrels of strategic reserves, not including inventories that are stored as international stockpiles under agreements between South Korea and other governments. KNOC is constructing an additional 10 million barrels of underground storage capacity at Ulsan, which should become available by June 2021.¹⁸

Trade

- In 2019, South Korea imported about 2.9 million b/d of crude oil and condensate, making it the fifth-largest importer in the world. Although South Korea imports most of its crude oil supply from the Middle East, South Korea has made strides to diversify its sources of imports. The Middle East accounted for 69% of South Korea's 2019 crude oil imports, down from more than 80% before 2018 (Figure 3).¹⁹
- To hedge against geopolitical risks and declining oil production from traditional sources in Asia, South Korea has diversified its imports and received more oil cargoes from other suppliers such as Russia, Kazakhstan, the United States, and Mexico during the past few years. South Korea extended freight rebates for its refining companies who import crude oil and condensates from countries outside of the Middle East to 2021.²⁰
- South Korea increased its crude oil imports (including condensates) from Iran in 2016, when the U.S. and European sanctions imposed on oil exports from Iran were lifted. However, South Korea's oil imports from Iran ceased by May 2019 after the United States re-imposed sanctions on Iran's oil exports and sanctions waivers expired. Iran's share of South Korea's oil import portfolio fell from 12% in 2017 to 3% in 2019. South Korea, which relies heavily on condensate imports as feedstock for condensate splitters for naphtha production, has replaced much of Iran's condensates with supplies from the United States, among other countries, and with full range naphtha imports.²¹
- Shares of oil imports from the United States rose from negligible volumes in 2016 to more than 400,000 b/d or 14% of total imports in 2019. Oil imports from Kazakhstan also rose from negligible amounts in 2016 to nearly 2% of South Korea's imports in 2019. South Korea increased purchases of light, sweet crude oil from the United States and Kazakhstan not only to replace similar Iranian grades but also to prepare for the International Maritime Organization's new low sulfur regulations on bunker fuels starting in 2020.²² South Korea significantly increased heavy, sour crude oil purchases from Mexico in 2019 after South Korea commissioned more upgrades to its refining capacity to be able to efficiently process denser crude oil grades.²³

Figure 3. South Korea's crude oil imports by source, 2019



Source: Global Trade Tracker (accessed May 2020)

Natural gas

- Although South Korea is not among the top natural gas-consuming nations, it was the third-largest importer of LNG in the world after Japan and China in 2019.

Exploration and production

- South Korea produced only 9 billion cubic feet (Bcf) of domestic natural gas in 2019, down from a high of 19 Bcf in 2010.
- The Korea Gas Corporation (KOGAS) participates in natural gas projects around the world, and as of mid-2020, KOGAS held investments in 25 projects, including exploration, production, LNG assets, and downstream facilities, in 13 countries.²⁴

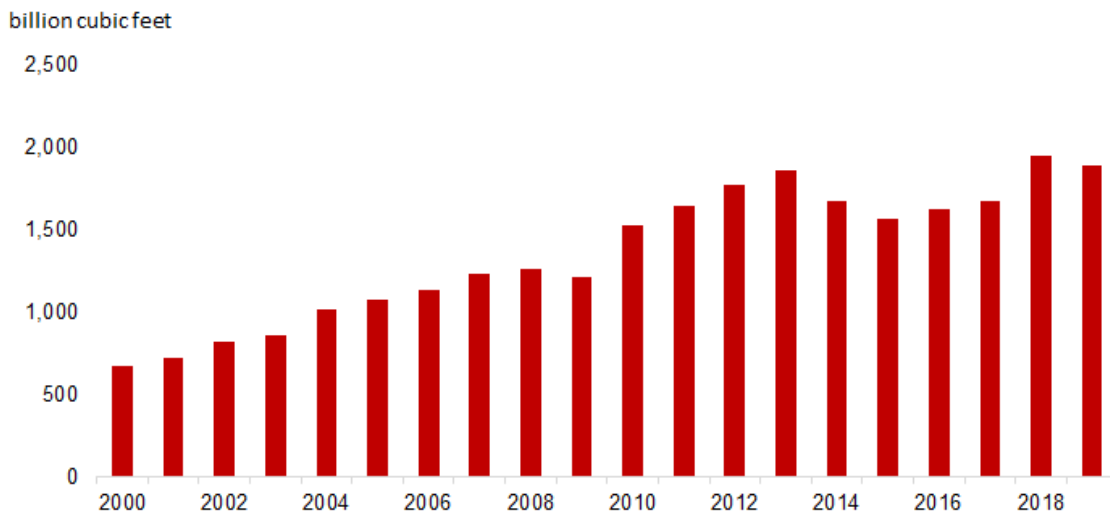
Consumption

- South Korea consumed an estimated 1.9 trillion cubic feet (Tcf) of dry natural gas in 2019, almost triple the amount consumed in 2000 (Figure 4). For the past two decades, power generation has required a growing share of South Korea's natural gas supply. Power generation companies accounted for about half of the natural gas sales in 2018. The industrial sector accounted for 18%, and the residential and commercial sectors accounted for about 29% of natural gas consumption. The transportation sector accounts for a very small portion (2%) of total natural gas consumption.²⁵
- After declining significantly between 2013 and 2015, South Korea's natural gas demand rebounded between 2015 and 2018. In 2018, natural gas demand rapidly grew more than 16% from the 2017 level. South Korea's energy ministry issued regulations to limit the operations of coal-fired and oil-fired power plants and higher-sulfur coal use, starting in 2018, to immediately

reduce fine dust emissions. The government required that power generators cap coal-fired power plant utilization to 80% and older, less efficient coal plants to stop operating during the spring months. In addition, some nuclear generators experienced extended maintenance through most of 2018. Reduced power generation from coal and nuclear sources prompted power producers to turn to higher natural gas use. Also, South Korea's extreme heat wave in the summer of 2018 caused a spike in natural gas demand for cooling.²⁶

- Natural gas consumption declined by about 3% in 2019 from a year earlier because electricity consumption was down from 2018 and nuclear generation rebounded following extended maintenance. Also, the Korean winter of 2018-19 was much milder than the year before, contributing to less natural gas demand for the residential sector and for district heating.²⁷
- The response efforts to the COVID-19 pandemic are expected to adversely affect South Korea's natural gas demand growth, especially for the industrial sector, in the first part of 2020. The coal-to-gas switching policies in the power sector for the winter of 2019-20 helped offset some of the natural gas demand decline from the other sectors during the first quarter of 2020.²⁸
- Several new coal and nuclear plants, scheduled to come online by 2024, will likely constrain natural gas demand growth until the mid-2020s. However, over the longer term, natural gas may have an advantage over coal based on South Korea's current plans to close older, less efficient coal-fired power plants or convert them to natural gas-fired units.²⁹

Figure 4. South Korea's natural gas consumption, 2000-2019



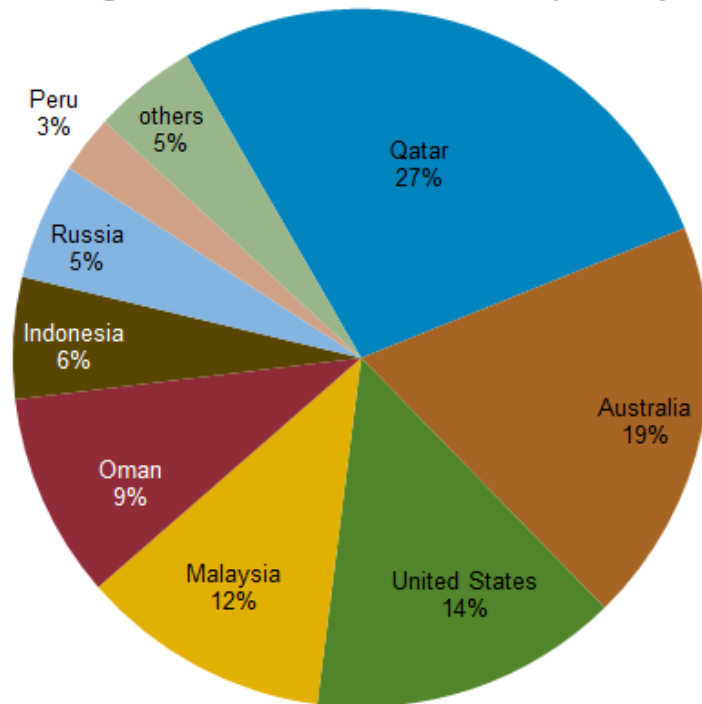
eia Source: U.S. Energy Information Administration

Liquefied natural gas

- After China surpassed South Korea in LNG imports in 2017, South Korea ranked as the third-largest global importer of LNG following Japan and China. South Korea purchased almost half of its 2019 LNG imports from Qatar and Australia (Figure 5). However, the share of imports from Qatar have declined during the past few years. Imports from the United States have risen dramatically since 2017 when KOGAS signed a long-term contract with the U.S. firm Cheniere to purchase LNG from the Sabine Pass terminal. LNG shares from the United States rose from 1% in 2016 to 14% in 2019. KOGAS signed another long-term contract to purchase LNG from the U.S. Freeport LNG terminal starting in 2025, which will likely further increase U.S. import shares.³⁰

- Higher domestic natural gas demand, new long-term LNG contracts, higher volumes imported by private-sector natural gas companies, and storage refilling by KOGAS contributed to the robust growth in South Korea's LNG imports in 2017 and 2018.³¹ In 2019, South Korea's LNG imports fell to less than 2 Tcf, a 5% decrease from 2018 levels, as a result of lower natural gas demand and higher nuclear fuel use in power generation. South Korea's LNG imports during the first half of 2020 were higher than during the same period in 2019 because of the government's strict coal-to-gas switching policy in the winter. However, the economic decline caused by the effects of the mitigation efforts of the COVID-19 pandemic will likely slow the LNG import levels in the second half of the year. In April, KOGAS tried to defer some LNG cargoes as inventory levels filled.³²
- South Korea currently has seven LNG-regasification facilities with a peak capacity of 6.1 trillion cubic feet (Tcf) per year and an average estimated utilization rate of 31%. KOGAS operates five of these facilities, which account for most of the current capacity. The smallest terminal was added in late 2019 and serves power production on Jeju Island. The other two terminals are privately owned and have small capacities.³³ However, these private operators were key contributors to the rise in South Korea's LNG imports since 2017. Because of KOGAS's monopoly power and high LNG resale prices, private industries have a greater incentive to invest in regasification capacity and purchase less expensive LNG on the global market.³⁴

Figure 5. South Korea's LNG imports by source, 2019



Source: Global Trade Tracker (accessed May 2020)

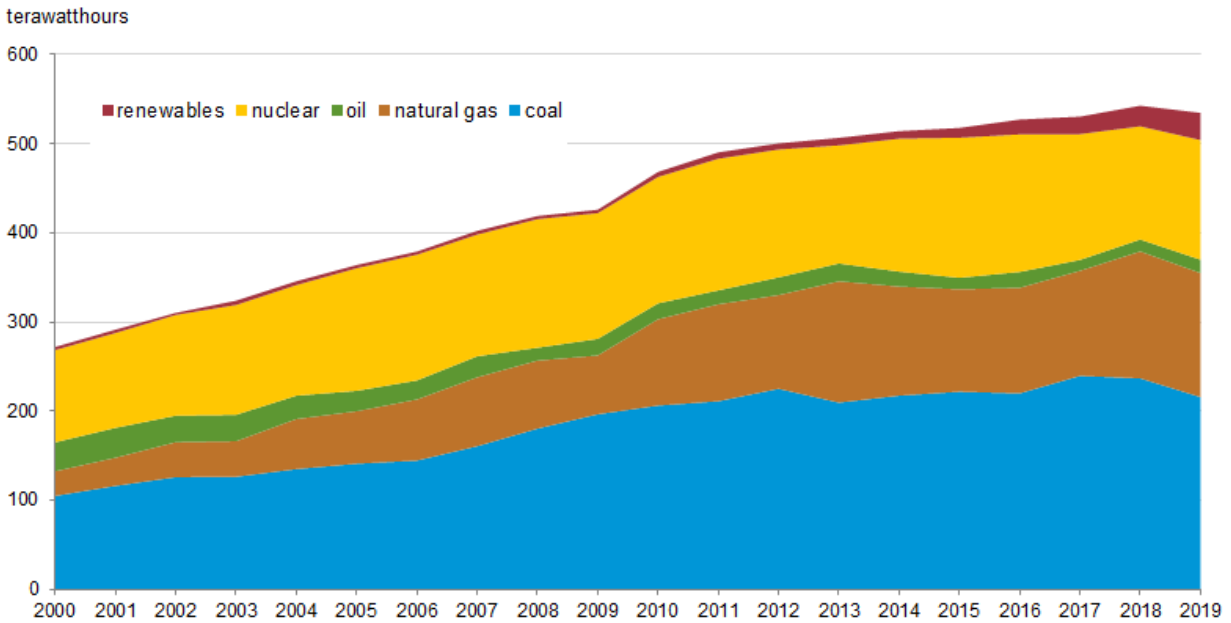
Electricity

- South Korea's energy-intensive industrial sector, mostly steel and petrochemical production, drives the country's electricity consumption. In 2019, about 54% of electricity consumption came from industries, 26% from commercial and service sector enterprises, 14% from the residential sector, and 7% from other sectors such as transportation and agriculture.³⁵ The government intends to reduce its power consumption by 14% by 2030 through energy efficiency measures.³⁶

Generation

- South Korea generated 543 terawatt-hours (TWh) of net electricity in 2018, more than 2% higher than 2017 levels. The unusually hot summer in 2018 increased the use of electricity for cooling in the residential and commercial sectors.³⁷ Low energy efficiency rates in the industrial and commercial sectors have bolstered South Korea's power consumption during the past few decades. According to the Korea Energy Economics Institute (KEEI) data, South Korea's annual electricity output fell in 2019 for the first time in two decades by 1.5% because of the economic downturn and mild weather.³⁸
- Further erosion of electricity demand growth is set to occur in 2020 as a result of the effects of global COVID-19 containment measures on South Korea's economy and export sector.
- Fossil fuel sources accounted for about 69% of South Korea's electricity generation in 2019, and the share of nuclear power accounted for 25% (Figure 6). Coal-fired power, which is a baseload source, is the dominant fossil fuel used to generate electricity (40%), and natural gas-fired capacity is the second-largest source (26%).³⁹ Nuclear power, also a baseload source, will increase capacity and production in the near term from plants that are already under construction.
- Renewable energy, albeit a small source of power production, is set to grow in the long run, based on government incentives and power plan targets. Renewable generation accounted for nearly 6% of the total 2019 generation portfolio, steadily rising from about 1% in 2010. The government intends to raise the share of renewable energy to 20% of total power generation by 2030 and at least 30% by 2040 through several government policies announced in the past few years to limit coal-fired and nuclear generation.⁴⁰

Figure 6. South Korea's net electricity generation by fuel type, 2000-2019

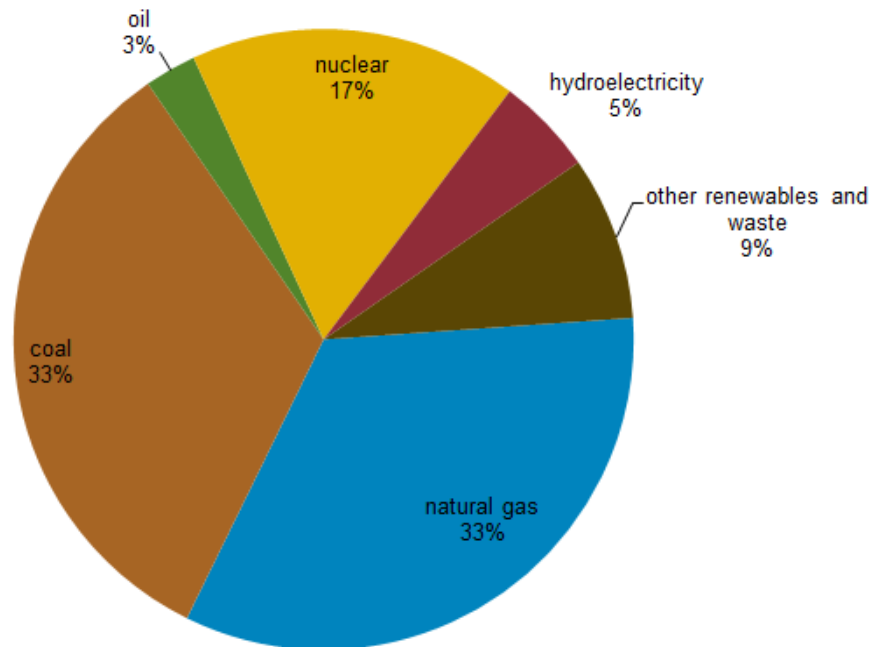


Source: U.S. Energy Information Administration, based on information published by EIA and International Energy Agency
 Note: 2019 data are estimates.

Capacity

- According to the International Energy Agency, South Korea's net generating capacity in 2018 was 127 gigawatts (GW).⁴¹ Fossil fuels accounted for most of the country's installed capacity, which consisted of 88 GW of coal-fired and natural gas-fired power plants in 2017, or about 67% of the total capacity (Figure 7).⁴²
- Nuclear reactors accounted for about 17% of installed generating capacity in 2018.⁴³ As of mid-2020, South Korea ranked sixth highest for nuclear generation capacity in the world with 23 GW.⁴⁴ One nuclear reactor became operational in early 2019, and four reactors with a combined 5.4 GW of net capacity are under construction and scheduled to come online by 2024. The government has placed a moratorium on all further nuclear plant construction. Meanwhile, about 12.5 GW of nuclear capacity is scheduled to close by 2040 under the government's policy not to renew licenses for older nuclear reactors.⁴⁵

Figure 7. South Korea installed net electricity capacity by type, 2018



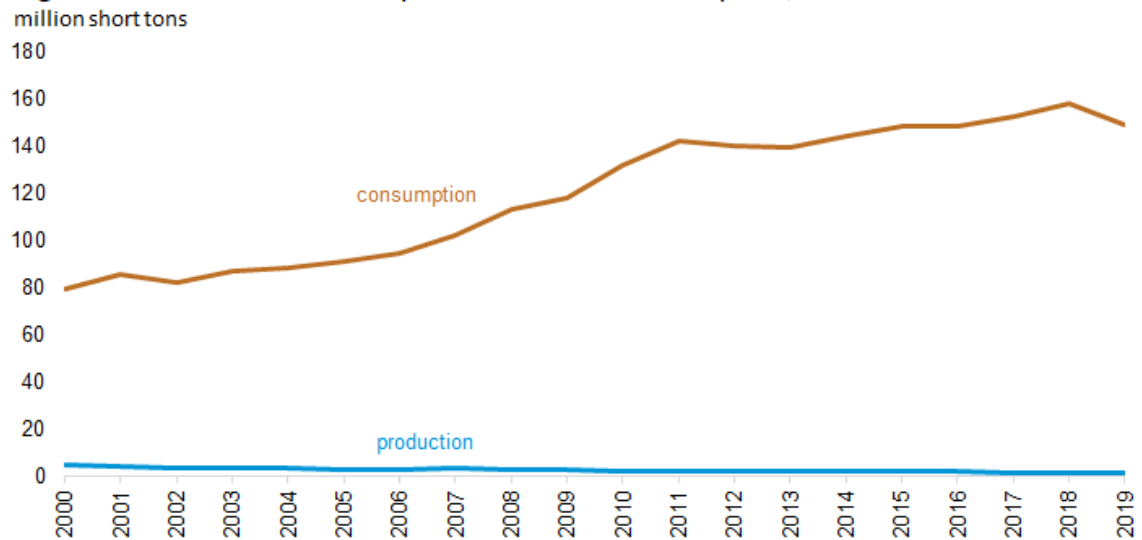
Source: International Energy Agency

Coal

- Rising coal consumption in South Korea and minimal domestic production resulted in the country relying heavily on coal imports during the past few decades. In 2019, South Korea was the fourth-largest global coal importer, following China, India, and Japan.⁴⁶
- South Korea produced an estimated 1.2 million short tons (MMst) of coal from its anthracite reserves, which was a small fraction of its estimated primary coal consumption of 150 MMst in 2019 (Figure 8).⁴⁷
- South Korea's coal consumption, which increased by an estimated 26% between 2009 and 2019, primarily followed growing demand from the electric power sector. The electric power sector accounted for 64% of the country's coal consumption, and the industrial sector (primarily steel and cement) accounted for most of the remaining coal demand in 2019, according to KEEI.⁴⁸
- Imports have also risen in the past decade, from 114 MMst in 2009 to an estimated 164 MMst in 2019, as a result of the temporary shutdowns of some nuclear plants.⁴⁹ Several large coal-fired plants came online in 2016 and 2017, adding nearly 10 GW of incremental capacity, and South Korea's industrial sector strengthened during this time.⁵⁰ These factors contributed to an 11% annual increase in South Korea's coal imports in 2017.⁵¹
- By 2019, coal imports were flat and demand dropped an estimated 6% from 2018 because of the country's weaker economic growth and a government-required shutdown of the most inefficient coal-fired power plants during the winter and spring seasons to reduce fine dust pollutants.⁵² South Korea's coal demand will likely be low in 2020 as well following the effects of efforts to mitigate the COVID-19 pandemic on energy and industrial demand and stringent antipollution policies.⁵³

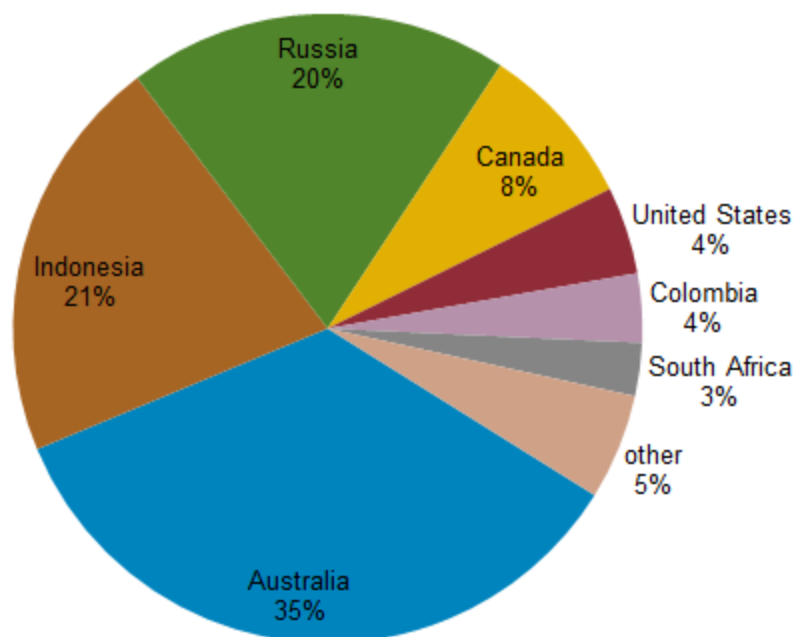
- EIA expects more coal-fired power generation capacity to come online in the near term, with companies adding 7.3 GW of capacity between 2021 and 2024.⁵⁴ Although the government plans to retire 2.8 GW of coal capacity from old power plants by 2022 (or convert several of these plants to use natural gas), a net positive of coal capacity will be coming online in the next few years.⁵⁵
- Historically, Australia and Indonesia accounted for most of South Korea's coal imports (57% in 2019). Russia, Canada, and Colombia have increased market shares in South Korea's coal imports during the past few years, and together accounted for nearly one-third of coal imports in 2019 (Figure 9).⁵⁶
- At the end of 2017, to reduce air pollution and environmental emissions, South Korea suspended plans for new coal-fired capacity not already under construction, and the government plans to retire all plants older than 30 years. The government also increased the coal consumption tax by 28% while it reduced the consumption tax for natural gas by 75% in May 2019. The government also reduced the LNG import taxes by 85%, which makes natural gas much more competitive with coal for power generation.⁵⁷ South Korea's current environmental policies could further dampen coal demand in the electricity sector over the longer term.

Figure 8. South Korea's coal production and consumption, 2000-2019



Source: U.S. Energy Information Administration and Korea Energy Economic Institute
 Note: 2019 is an estimate.

Figure 9. South Korea, coal imports by source, 2019



 Source: Global Trade Tracker (accessed May 2020)

Notes

- In response to stakeholder feedback, the U.S. Energy Information Administration (EIA) has revised the format of the Country Analysis Briefs. As of December 2018, updated briefs are available in two complementary formats: the Country Analysis Executive Summary provides an overview of recent developments in a country's energy sector, and the Background Reference provides historical context. Archived versions will remain available in the original format.
- Data presented in the text are the most recent available as of October 2020.
- Data are EIA estimates unless otherwise noted.

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