



Independent Statistics & Analysis

U.S. Energy Information
Administration

Country Analysis Executive Summary:

Japan

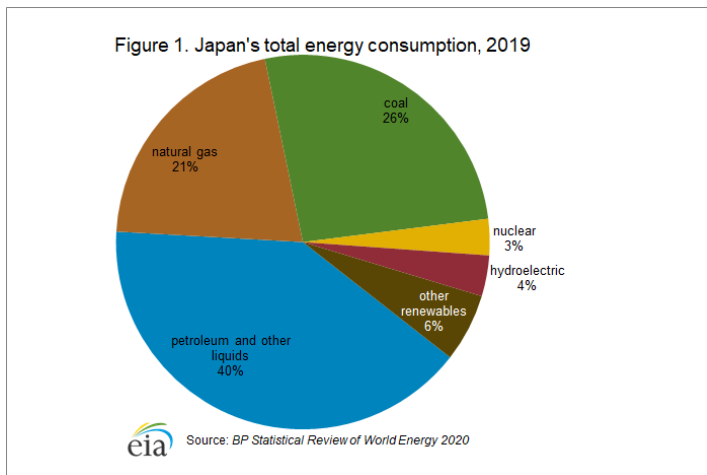
Last Updated: October 2020

Overview

- Japan was the fifth-largest oil consumer and fourth-largest crude oil importer in the world in 2019. Japan also ranked as the world's largest importer of liquefied natural gas (LNG) and the third-largest importer of coal behind China and India in 2019.¹ Japan has no international oil or natural gas pipelines and relies exclusively on tanker shipments of LNG and crude oil.
- Japan was the world's fifth-largest energy consumer in 2019, although during the past decade, primary energy consumption has gradually declined.² Japan's aging and declining population, high levels of energy efficiency and conservation, and relatively low annual GDP growth rates have suppressed the country's energy growth. Real gross domestic product (GDP) slowed during the past two years from 2.2% in 2017 to less than 0.7% in 2019, as a result of weaker global demand for Japan's exports, the slowdown in neighboring China's economic growth, trade disputes with South Korea, and lower steel production.³ The country's demographics are expected to dampen domestic energy demand and the overall economic landscape over the long term.⁴ Economic effects from the [2019 novel coronavirus disease \(COVID-19\)](#) pandemic have adversely affected Japan's industrial activity, exports, and consumer spending in the first half of 2020 and are forecast to push 2020 GDP growth to much lower than the 2019 level.⁵
- After the Fukushima nuclear accident in 2011, Japan's energy fuel mix shifted, and natural gas, oil, and renewable energy shares of total energy consumption have increased to replace some of the nuclear energy share. Oil remains the largest source of primary energy in Japan, although its share of total energy consumption has declined from about 80% in the 1970s to 40% in 2019 (Figure 1). The decline in the oil share is attributed to structural factors such as a declining and aging population, high energy efficiency measures, and an expanding fleet of hybrid and electric vehicles.
- Coal continues to account for a significant share (26%) of total energy consumption. Natural gas, however, is increasingly important as a fuel source and has been the preferred fuel of choice to replace the nuclear shortfall. The share of natural gas was 21% of total primary consumption in 2019.⁶
- Before the 2011 earthquake, Japan was the third-largest consumer of nuclear power in the world, after the United States and France, and nuclear power accounted for about 13% of the country's total energy in 2010. By 2019, the country's nuclear energy share was 3%. This share is expected to gradually increase as more nuclear reactors are restarted in the next few years. In

addition, the government's most recent energy plan, issued in 2018, intends to boost nuclear-fired power production by 2030 to reduce hydrocarbon fuel imports and to enhance the country's energy security.

- Renewable energy, particularly solar power, is growing rapidly as an alternative fuel source, and it represented a little less than 10% of Japan's energy consumption in 2019. The falling cost of solar and wind power as well as economic stimulus from the COVID-19 pandemic could increase the renewable energy share in Japan in the next few years.⁷



Petroleum and other liquids

Exploration and production

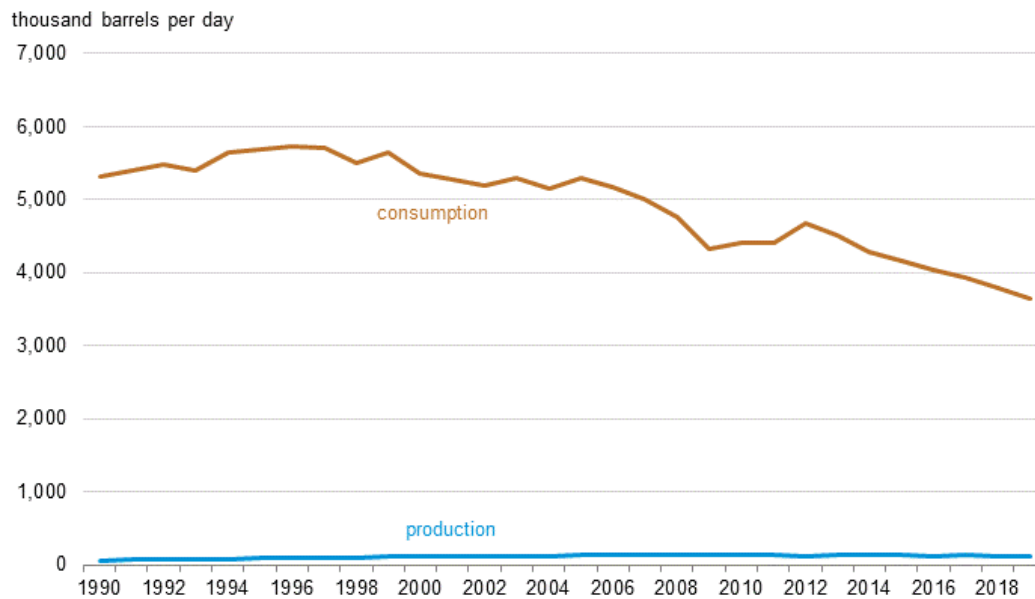
- Japan has limited domestic proved oil reserves, totaling 44 million barrels as of January 2020, according to the *Oil & Gas Journal (OGJ)*.⁸
- In 2019, Japan's production of petroleum and other liquids was an estimated 127,000 barrels per day (b/d), and only about 10,000 b/d of that total was from light crude oil and natural gas liquids (Figure 2). Most of Japan's domestic liquids supply comes from refinery gains because the country has a large petroleum refining sector.
- According to the International Energy Agency, Japan had about 388 million barrels of total strategic crude oil stocks as of June 2020. About 76% of those stocks were government stocks, and about 24% were commercial stocks.⁹

Consumption

- Japan's oil consumption was an estimated 3.7 million b/d in 2019, making it the fifth-largest petroleum consumer in the world behind the United States, China, India, and Russia. However, oil demand in Japan fell by more than 1 million b/d between 2012 and 2019 (Figure 2).¹⁰ Structural factors such as a declining and aging population, high energy efficiency measures, and an expanding fleet of hybrid and electric vehicles continue to reduce oil demand.¹¹

- In 2019, Japan’s liquid fuel consumption declined nearly 4% from 2018 as a result of fuel oil displacement in the power sector from the restart of several nuclear facilities, warmer-than-normal weather in the first few months of 2019, and a consumption tax increase imposed in October 2019 that placed downward pressure on gasoline demand.¹²
- Japan consumed most of its oil in the transportation (38%), industrial (24%), and non-energy use (16%) sectors in 2018. The power sector’s share has declined from a high of 19% in 2012 down to 5% in 2018 as the sector began to replace oil with other fuels such as coal, natural gas, and nuclear energy.¹³ Gasoline, diesel, and naphtha accounted for the country’s largest volumes of oil product demand in 2019.¹⁴
- The ongoing response to the COVID-19 pandemic is expected to further erode Japan’s demand for petroleum products, primarily jet fuel, gasoline, and diesel, and the most acute demand destruction most likely occurred during the first half of 2020.¹⁵ Crude oil imports declined 13% on an annual basis during the first seven months of 2020.¹⁶ The state of emergency imposed to slow the spread of COVID-19 in April and May slowed transportation and considerably curbed gasoline and diesel sales. Jet fuel sales remained depressed as of September 2020 because many international flights were still grounded.¹⁷ A weaker export sector as a result of lower global demand from Japan’s trading partners will reduce the country’s economic and industrial growth through 2020.

Figure 2. Japan's petroleum and other liquids production and consumption, 1990-2019



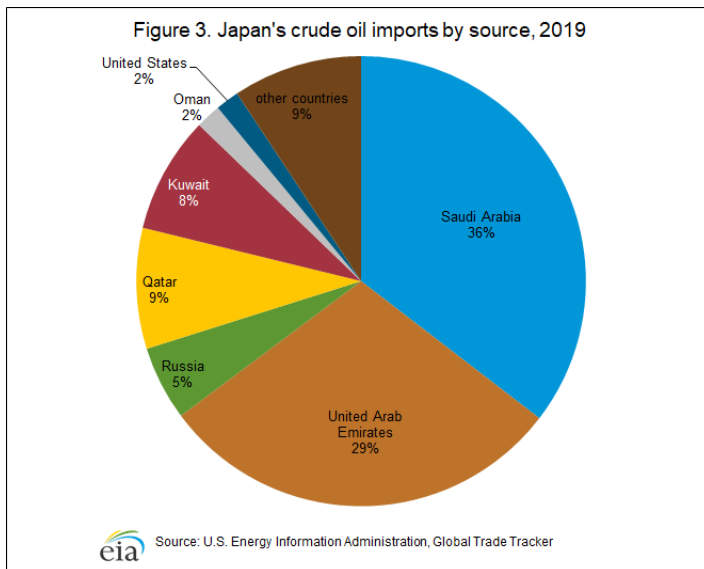
Source: U.S. Energy Information Administration, *Short-Term Energy Outlook*, September 2020

Oil imports

- Japan, the fourth-largest crude oil importer following the United States, China, and India, imported an estimated 3 million b/d of crude oil in 2019.¹⁸ The Middle East accounted for 89% of Japan’s crude oil slate in 2019 and historically has been Japan’s largest supplier of crude oil (Figure 3). Saudi Arabia and the United Arab Emirates account for the largest combined source of oil imports, exporting nearly 2 million b/d of crude oil to Japan in

2019.¹⁹ In 2019, Japan purchased lighter, sweeter (lower in sulfur content) crude oil grades from the United Arab Emirates to use in compliance with the cleaner international fuel standards for marine bunkering that began in 2020. It also purchased this kind of crude oil to reduce the yield of fuel oil that is typically used in power generation and industries.²⁰

- Japan increased its crude oil imports from Iran in 2016 when the U.S. and European sanctions imposed on Iran’s oil exports were lifted. However, Japan’s oil imports from Iran stopped by June 2019 after the United States reimposed sanctions on Iran’s oil exports and sanctions waivers expired. Iran’s share of Japan’s oil import portfolio fell from 7% in 2016 to 2% in 2019 and was replaced by other Middle Eastern crude oil grades.
- Although the Middle East remains the primary source of Japan’s crude oil imports, Japan has attempted to diversify its sources of oil imports during the past several years. Russia’s Eastern Siberia-Pacific Ocean (ESPO) pipeline, which is 2,900 miles long, runs from Taishet in Siberia to the Kozmino Bay Oil Terminal on the Pacific Ocean, where crude oil is loaded on tankers. ESPO began sending crude oil to Japan in 2009 on ships from Kozmino Bay. Russia accounted for about 9% of Japan’s oil imports in 2015. In recent years, Russia’s share, however, has declined and was only 5% in 2019.²¹
- After the United States lifted its long-term ban on crude oil exports in 2015, Japan began importing cargoes. By 2019, the United States accounted for 2% of Japanese crude oil imports.²² Japan has also purchased more imports from countries such as Mexico, Ecuador, and Kazakhstan during the past several years, although the shares from these countries remain small.



Refining

- Japan had 3.3 million b/d of crude oil distillation refining capacity at the beginning of 2020 and ranked as the sixth-largest refining capacity in the world.²³
- ENEOS Holdings (formerly JXTG Group) intends to close its 115,000 b/d Osaka refinery in October 2020 and convert it to an asphalt-fueled power station. Japan’s refinery consolidation and closures during the past decade are a result of the country’s oil demand decline and growing regional competition from massive new refineries.²⁴ Japan’s refiners

plan to transform their businesses and consolidate their refining capacities at a faster pace because the COVID-19 pandemic has accelerated Japan's oil demand decline.²⁵

Natural gas

- Because Japan is one of the top global natural gas consumers and has minimal production, the country relies on imports to meet nearly all of its natural gas demand. Japan was the largest global liquefied natural gas (LNG) importer in 2019.
- Deregulation of the natural gas retail sector began in April 2017 and has attracted a growing number of new market entrants to compete with the regional incumbent natural gas utilities. As of March 2020, approximately 13% of retail customers have switched suppliers.²⁶ The competition for customers, including reduction of natural gas prices to end users, has prompted utilities to negotiate for natural gas import contracts with lower prices and more flexible terms during the past few years. The last phase of natural gas industry deregulation, which involves separating the transmission division of each company from the generation and distribution sectors, will take effect in April 2022.²⁷

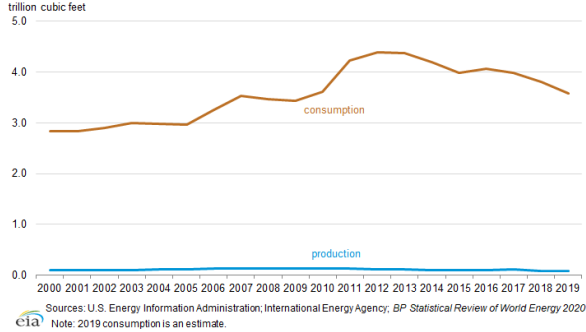
Exploration and production

- Japan had 738 billion cubic feet (Bcf) of proved natural gas reserves as of January 2020.²⁸
- In 2019, production was 76 Bcf, down from a high of about 139 Bcf in 2007 (Figure 4). Domestic production accounted for only 2% of Japan's natural gas consumption.²⁹

Consumption

- In 2019, Japan's natural gas consumption reached an estimated 3.6 trillion cubic feet of natural gas per year (Tcf/y), about 4% higher than a decade ago (Figure 4).³⁰ Although consumption for natural gas increased after the Fukushima disaster to replace the lost nuclear capacity, natural gas consumption has fallen since 2016 because several nuclear facilities have gradually returned to service and total electricity demand has declined.³¹
- The power sector was the largest consumer of natural gas and accounted for almost two-thirds of the market, followed by the industrial sector (20%) and the residential and commercial sector (13%) in 2019.³²
- EIA expects Japan's natural gas demand to decline even further in 2020, resulting from the adverse effects of the COVID-19 pandemic, especially for the industrial and commercial sectors, and the higher-than-average temperatures during the 2019–20 winter.³³
- During the next few years, natural gas demand growth will depend on the pace of nuclear facility restarts, the country's economic growth, and increasing competition from renewable energy sources.

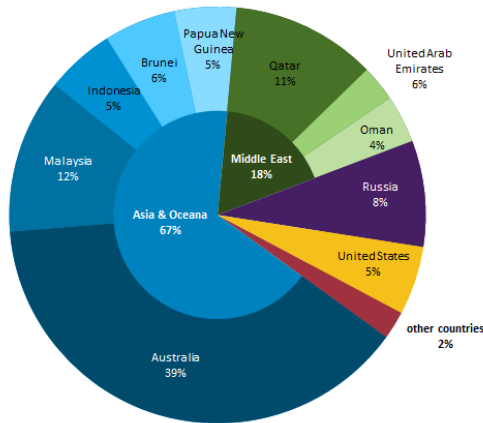
Figure 4. Japan's dry natural gas production and consumption, 2000-2019



Liquefied natural gas

- Japan relies on LNG imports for nearly all of its natural gas supply and ranks as the world's largest LNG importer, accounting for about 22% of the global LNG market in 2019.³⁴
- Japan's LNG imports reached a record high of 4.3 billion cubic feet per year (Bcf/y) in 2014 before falling back to 3.7 Bcf/y in 2019. LNG imports fell 10% between 2017 and 2019 when natural gas-fired power was replaced by electricity fueled by nuclear and renewable sources.³⁵ LNG imports fell by nearly 6% during the first half of 2020 from the same time period in 2019 because the mitigation efforts to stop the spread of the COVID-19 pandemic slowed domestic consumption, industrial activity, and electricity generation.³⁶
- As of mid-2020, Japan operated 37 LNG-import terminals with a total natural gas send-out capacity of approximately 10 trillion cubic feet per year (Tcf/y). Japan commissioned two regasification terminals (Soma LNG and Toyama Shinko LNG) in 2018. An expansion of the Hitachi LNG terminal and Niihama LNG, a new small terminal, are under construction and are slated to begin operations by 2022.³⁷ Japan's regasification capacity exceeds its natural gas demand, and the average terminal utilization rate was only 36% in 2019. Japan also has the largest LNG storage tank capacity in the world, or about 643 million cubic feet (MMcf) as of early 2020, which serves as a buffer during seasons of higher LNG demand.³⁸
- Japan has a relatively balanced LNG portfolio and receives supplies from various countries. LNG volumes from legacy exporters Malaysia and Indonesia are becoming more constrained, and Japan has tried to diversify its contracts and investments into other LNG ventures (Figure 5). In 2020, a consortium of Japanese utility companies decided not to renew one of the longest-running LNG contracts Japan has with Indonesia. Major deterrents to renewing the contract, which expires at the end of 2020, are the expensive fixed long-term contract prices compared with flexible contract and spot cargo prices and Japan's natural gas demand uncertainty following the onset of the COVID-19 pandemic and potential restarts of nuclear reactors.³⁹
- In 2016, Japan began importing LNG from several new export terminals in Australia under fixed and flexible long-term contracts to replace some of the volumes from Southeast Asia. In 2019, Japan sourced 28% of its LNG imports from regional suppliers in Southeast Asia and 39% from Australia.⁴⁰
- Although the United States supplied only 1% of Japan's LNG shipments in 2017 from its Sabine Pass liquefaction terminal, Japan increased the share of imports from the United States to 5% in 2019. Several Japanese utility companies signed long-term purchase contracts for LNG from U.S. Gulf Coast projects that entered service in 2018 and 2019.⁴¹

Figure 5. Japan's LNG imports by source, 2019



Source: U.S. Energy Information Administration and Global Trade Tracker
 Note: Numbers may not add to 100% because of independent rounding.

Electricity

- Although Japan has the third-highest demand for electricity in Asia, it has one of the lowest electricity demand growth rates in the region. U.S. EIA estimates net electricity generation at about 950 terawatt-hours (TWh) in 2019 and has declined overall by about 11% since 2010 (Figure 6).⁴² In 2019, Japan's net electricity generation decreased nearly 4% from the 2018 level as a result of warm winter weather and lower industrial output.⁴³
- 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 Japan's economy and export sector and a warm 2019–20 winter.⁴⁴ The first half of 2020 saw lower power consumption partly because the country was under a state of emergency to slow the spread of COVID-19 for nearly two months.

Generation

- Fossil fuels accounted for an estimated 661 TWh of Japan's net electricity generation in 2019, which represented about 70% of the total generation, up from 61% in 2010 (Figure 6). However, the share of fossil fuels has been steadily falling from a peak of 85% in 2012 as a result of restarts from nuclear reactors and exponential growth in renewable energy.
- The power sector uses coal as a baseload source for power generation. Coal's share in the power sector was an estimated 26% before the Fukushima accident and rose to 31% by 2019.⁴⁵ Although the Japanese government plans to limit the share of coal-fired capacity in the next decade, coal was more cost-effective than natural gas during the past several years because LNG purchases from long-term contracts were linked to higher international oil prices. However, more flexible LNG contracts, lower LNG prices in 2020, and Japan's commitment to mitigating carbon dioxide emissions could prompt utilities to replace more coal with natural gas in power production.
- Natural gas, which accounted for 27% of Japan's electricity generation in 2010, increased its share to 34% in 2019.⁴⁶
- Fuel oil and crude oil use in the power sector has decreased since the Fukushima accident, accounting for 5% of generation in 2019, down from 17% of Japan's power generation in 2012 and lower than the levels seen before Fukushima.⁴⁷ JERA, one of Japan's largest utility

companies, closed several older oil-fired units in early 2020, signaling more decline in the share of oil-fired generation during the next few years.⁴⁸

- Nuclear generation rose to 7% of Japan's electricity production slate in 2019, up from no output in 2014. Japan's government stated that nuclear power should be a baseload power for the long term and intends to bolster production to 20%–22% of total generation by 2030.⁴⁹
- Japan removed all nuclear reactors from service following the Fukushima accident. The country's nuclear generation dwindled to nothing by September 2013 and remained at zero for almost two years. As of September 2020, restart applications for the 25 existing reactors and applications for the new Ohma and Shimane 3 reactors, which are under construction, have been filed with the Nuclear Regulatory Authority (NRA). Nine of these reactors, including four reactors that were recommissioned in the first half of 2018, were brought back online and account for 8.7 gigawatts (GW) of net electricity capacity, or 27% of the country's current nuclear operating capacity. The NRA approved the first stage of compliance for an additional seven reactors, accounting for 6.8 GW, which could restart operations as early as 2021 (Table 1).⁵⁰ However, Japan's nuclear facilities have faced delays and interruptions in restarting as a result of local opposition in some regions, long maintenance periods, and stringent safety requirements. In 2019, the NRA reported that they will not extend the deadlines set for utilities to construct backup emergency control rooms in case of a terrorist attack. Four reactors have had to suspend operations for several months in 2020 because their utilities missed the construction deadlines for the backup facilities.⁵¹
- By September 2020, Japan had 33 operable nuclear reactors with a total installed net generating capacity of about 32 GW, down from 54 reactors with 47 GW of capacity before the Fukushima accident in 2011.⁵² Between 2015 and 2020, Japanese utilities decommissioned 10.7 GW of capacity from 15 reactors because they were older than 40 years or the cost to upgrade these facilities to comply with the new regulations outweighed the cost of closing them.⁵³
- Similar to nuclear power, hydropower is a source for baseload generation in Japan because of the low generation costs and a relatively stable supply. Net hydroelectric generation accounted for about 8% of Japan's total net generation mix in 2019.
- Renewable energy, except for hydroelectricity, accounted for 6% of Japan's total energy consumption and more than 15%, or 146 TWh, of the country's total electricity generation in 2019.⁵⁴ Most renewable capacity growth during the past decade was from solar energy as a result of heavy investment in large-scale solar photovoltaic units and financial incentives from the government's electricity buy-back program and feed-in tariff (FIT) program. At the end of 2019, Japan's solar generation capacity reached 62 GW, 10 times higher than the capacity in 2012.⁵⁵ Although the FIT program ends in 2020, a new feed-in premium program will likely replace the FIT scheme and reduce the costs for end users.⁵⁶ Japan determined that renewable energy is an important fuel source for long-term energy security and for emissions reductions, and it intends to increase total renewable energy to 22%–24% of total generation by 2030.⁵⁷

Figure 6. Japan's net electricity generation by fuel, 2000-2019
terawatthours (TWh)

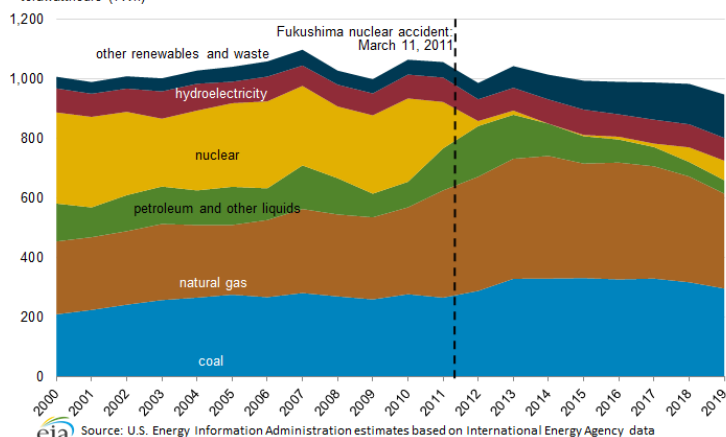
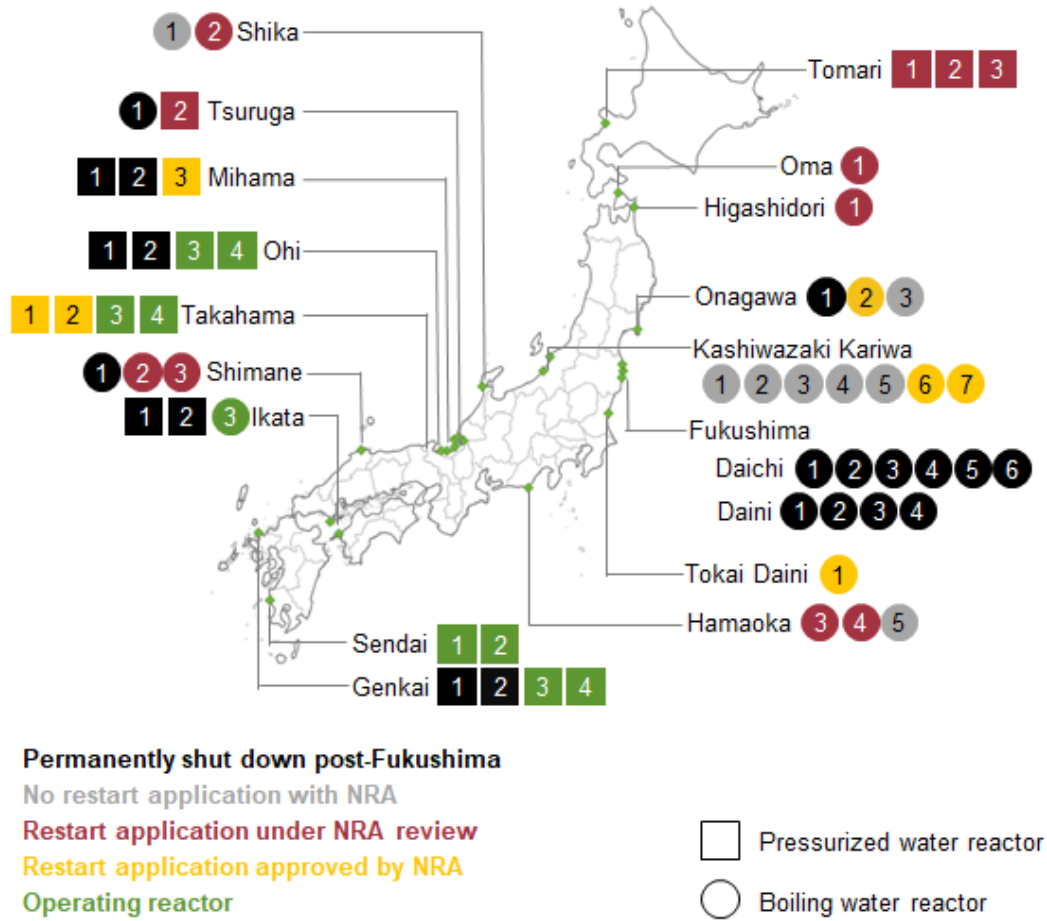


Table 1. Japan's nuclear reactors

Owner/Utility	Reactor	Capacity (gigawatts)	Date of restart or Nuclear Regulatory Authority (NRA) approval
Restarted			
Kyushu	Sendai 1	846	August 2015
Kyushu	Sendai 2	846	October 2015
Kansai	Takahama 3	830	January 2016
Kansai	Takahama 4	830	February 2016
Shikoku	Ikata 3	846	August 2016
Kansai	Ohj 3	1,127	March 2018
Kansai	Ohj 4	1,127	May 2018
Kyushu	Genkai 3	1,127	March 2018
Kyushu	Genkai 4	1,127	June 2018
NRA approved			
Kansai	Takahama 1	780	April 2016
Kansai	Takahama 2	780	April 2016
Kansai	Mihama 3	780	October 2016
Tepco	Kashiwazaki-Kariwa 6	1,315	December 2017
Tepco	Kashiwazaki-Kariwa 7	1,315	December 2017
JAPC	Tokai 2	1,060	September 2018
Tohoku	Onagawa 2	796	February 2020
Nuclear capacity online		8,706	
Nuclear capacity NRA approved		6,826	

Source: World Nuclear Association; International Atomic Energy Agency, Power Reactor Information System; Japan Nuclear Safety Institute.

Figure 7. Current status of Japan's nuclear reactor fleet, September 2020



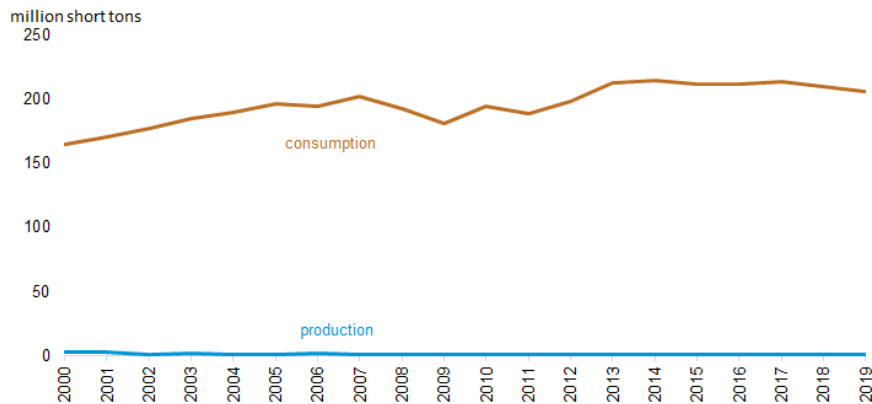
Source: U.S. Energy Information Administration, Nuclear Regulation Authority Japan, and Japan Nuclear Safety Institute

Coal

- Japan's coal demand was more than 200 million short tons (MMst) in 2019 (Figure 8).⁵⁸ Power generation, an important driver of coal use, accounted for 60% of coal consumption in Japan in 2018. The country's sizeable steel and iron ore industry accounted for the rest of the coal consumption.⁵⁹

- The slow progress of nuclear reactor restarts and new coal-fired capacity supported coal imports and demand through 2019. However, the restart of several nuclear plants and the government’s plan to replace older, inefficient coal-fired plants with higher efficiency coal-fired plants to meet its emissions goal could be downside risks for coal demand in the next few years.⁶⁰ Coal is likely to remain a key part of Japan’s power generation portfolio despite these limiting factors. An additional 8 GW of new coal-fired generation is under construction and expected online between 2020 and 2023. Some of this capacity is slated to replace older units.⁶¹
- Japan’s coal demand is expected to decline in 2020 as a result of the mitigation efforts from the COVID-19 pandemic and the downside effects on energy and industrial demand.
- Domestic coal production is negligible, and Japan relies almost solely on imports. Coal imports grew to 202 MMst in 2019 from 193 MMst in 2011, after more coal-fired generation capacity came online. Japan was the third-largest global coal importer in 2019 behind China and India.⁶²
- Australia continues to provide most of Japan’s coal imports (60% in 2019), followed by Indonesia (15%), Russia (11%), and other countries (14%).⁶³ Australian coal is a high-quality grade that is suitable for Japan’s modern, efficient coal-fired power plants.⁶⁴ Japan began to diversify its sources of coal imports in 2018, and the United States, Russia, and Canada took larger shares of the overall portfolio.

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



Source: U.S. Energy Information Administration, *BP Statistical Review of World Energy 2020*
 Note: 2019 is an estimate.

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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- ²¹ U.S. Energy Information Administration based on Global Trade Tracker data (accessed September 2020).
- ²² Reuters, “[Japan to import U.S. crude in May, second cargo since export ban lifted: sources](#),” March 16, 2016.
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