

## COUNTRY ANALYSIS BRIEFS

# Japan

Last Updated: September 2010

### Background

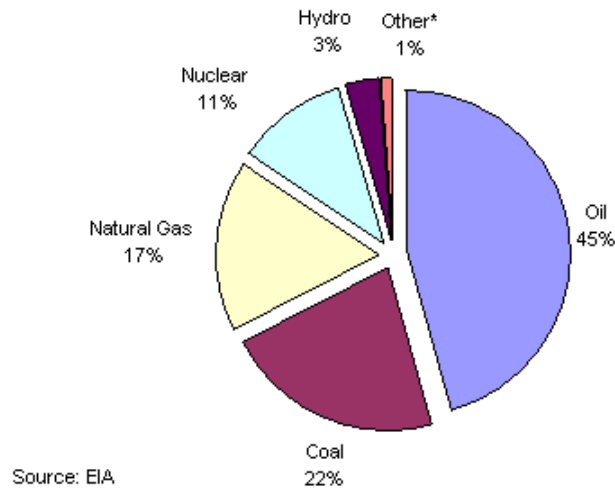
**Japan is the world's largest importer of LNG and coal and the second largest net importer of oil.**

Japan has few domestic energy resources and is only 16 percent energy self-sufficient. Japan is the third largest oil consumer in the world behind the United States and China and the second-largest net importer of crude oil. It is the world's largest importer of both liquefied natural gas (LNG) and coal. In light of the country's lack of sufficient domestic hydrocarbon resources, Japanese energy companies have actively pursued participation in upstream oil and natural gas projects overseas and provide engineering, construction, financial, and project management services for energy projects around the world. Japan is one of the major exporters of energy-sector capital equipment and has a strong energy research and development program that is supported by the government, which pursues energy efficiency measures domestically in order to increase the country's energy security and reduce carbon dioxide emissions.



Oil is the most consumed energy resource in Japan, although its share of total energy consumption has declined from about 80 percent in the 1970s to 45 percent in 2009. Coal continues to account for a significant share of total energy consumption, although natural gas and nuclear power are increasingly important sources. Japan is the third largest consumer of nuclear power in the world, after the United States and France. Hydroelectric power and renewable energy account for a relatively small percentage of total energy consumption in the country.

### Japan Total Energy Consumption, 2007



## Oil

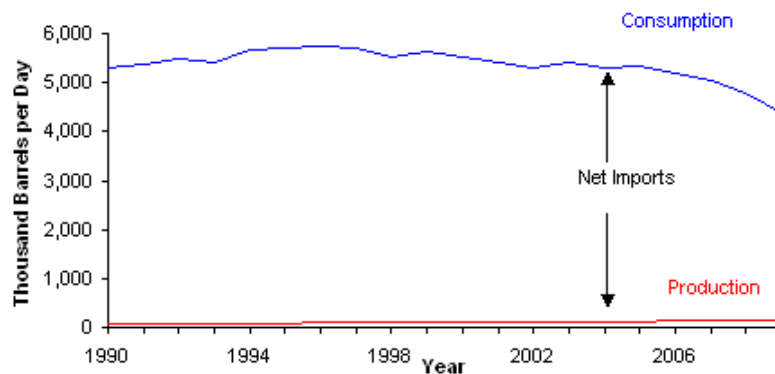
**Japan relied on oil imports to meet 45 percent of its energy needs in 2009.**

Japan has very limited domestic oil reserves, amounting to 44 million barrels as of January 2010, according to *The Oil and Gas Journal (OGJ)*, down from the 58 million barrels reported by *OGJ* in 2007. Japan's domestic oil reserves are concentrated primarily along the country's western coastline. Offshore areas surrounding Japan, such as the East China Sea, also contain oil and gas deposits; however, development of these zones is held up by competing territorial claims with China (see the [East China Sea Brief](#) for more information). While a preliminary accord was reached between the 2 governments in May 2008 over 2 fields - Chunxiao/Shirakaba and Longjing/Asunaro - in September 2010, Japan urged China to implement the agreement as tensions rise over the contested area.

Consequently, Japan relies heavily on imports to meet its consumption needs. Japan maintains government-controlled oil stocks to ensure against a supply interruption. Total strategic oil stocks in Japan were 590 million barrels at the end of April 2010, according to EIA.

Japan consumed 4.4 million barrels per day (bbl/d) of oil in 2009, making it the third largest petroleum consumer in the world, behind the United States and China. However, oil demand in Japan has been declining since 2005. This decline stems from structural factors, such as fuel substitution, an aging population, and government-mandated energy efficiency targets. In addition to the shift to natural gas in the industrial sector, fuel substitution is occurring in the residential sector as high prices have decreased demand for kerosene in home heating.

### Japan's Oil Production and Consumption 1990-2009



The Japanese government's 2006 New National Energy Strategy emphasized increased energy conservation and efficiency. The government aims to reduce the share of oil consumed in its primary energy mix as well as the share of oil used in the transportation sector. Oil as a percentage of total primary energy demand has fallen from roughly 80 percent of the energy mix in the 1970s to 45 percent in 2009, made possible by increased energy efficiency and the expanded use of nuclear power

and natural gas. Among the large developed world economies, Japan has one of the lowest energy intensities, as high levels of investment in research and development of energy technology since the 1970s has substantially increased energy efficiency.

### Sector Organization

Although Japan is a minor oil producing country, it has a robust oil sector comprised of various state-run, private, and foreign companies. Until 2004, Japan's oil sector was dominated by the Japan National Oil Corporation (JNOC), which was formed by the Japanese government in 1967 and charged with promoting oil exploration and production domestically and overseas. In 2004, JNOC's profitable business units were spun off into new companies in order to introduce greater competition into Japan's energy sector. Many of JNOC's activities were taken over by the Japan Oil, Gas and Metals National Corporation (JOGMEC), a state-run enterprise charged with aiding Japanese companies involved in exploration and production overseas and promoting commodity stockpiling domestically. New companies were formed, of which the 2 largest are Inpex, now Japan's largest oil and gas company, and the Japan Petroleum Exploration Company (Japex). Both companies carried out successful initial public offerings on the Tokyo Stock Exchange, although the Japanese government maintains an equity stake in each firm.

Private Japanese firms dominate the country's large and competitive downstream sector, as foreign companies have historically faced regulatory restrictions. But over the last several years, these regulations have been eased, which has led to increased competition in the petroleum-refining sector. Chevron, BP, Shell, and BHP Billiton are among the foreign energy companies involved in providing products and services to the Japanese market as well as being joint venture partners in many of Japan's overseas projects.

### Domestic Production and Exploration

In 2009, Japan's total oil production was roughly 132,660 bbl/d, of which only 5,330 bbl/d was crude oil. The vast majority of Japan's oil production comes in the form of refinery gain, resulting from the country's large petroleum refining sector. Japan has 145 producing oil wells in 13 fields, according to *The Oil and Gas Journal*. The pace of the domestic exploration program slowed in 2009-2010, reportedly due to the low rate of production compared with exploration costs.

### Overseas Exploration and Production

Because of the country's lack of domestic oil resources, Japanese oil companies have sought participation in exploration and production projects overseas with government backing. The government's 2006 energy strategy plan encourages Japanese companies to increase energy exploration and development projects around the world to secure a stable supply of oil and natural gas. The Japan Bank for International Cooperation supports upstream companies by offering loans at favorable rates, thereby allowing Japanese companies to bid effectively for projects in key producing countries. Such financial support helps Japanese companies to purchase stakes in oil and gas fields around the world, reinforcing national supply security while guaranteeing their own financial stability. The government's goal is to import 40 percent of the country's total crude oil imports from Japanese-owned concessions by 2030, up from the current estimated 19 percent.

Japan's overseas oil projects are primarily located in the Middle East and Southeast Asia. Japanese oil companies involved in exploration and production projects overseas include: Inpex, Cosmo Oil, Idemitsu Kosan Co., Japan Energy Development Corporation, Japex, Mitsubishi, Mitsui, Nippon Oil, and others. Many of these companies are involved in small-scale projects that were originally set up by JNOC. However, many are involved in high-profile upstream projects involving major investments in overseas ventures in recent years.

Some of the major upstream projects that Japanese companies are involved in overseas are:

#### Middle East and Africa

- Kuwait and Saudi Arabia Neutral Zone: Khafji and Hout fields - Japanese-owned Arabian Oil Company (AOC) once held a 40% stake in exploration for the Khafji and Hout oil fields in Kuwait and the Neutral Zone. Subsequent concession expirations have left the AOC with a limited, technical role and a 100,000 bbl/d purchase contract from Khafji field until 2023.
- United Arab Emirates (UAE): Adma Block - Japan Oil Development Co. (JODCO), a wholly-owned subsidiary of Inpex, holds a 12% stake in 4 of the fields and a 40% stake in a fifth field. JODCO is involved in developing the fields, which began producing in 1982. Development is continuing to maintain and expand output. Additionally, offshore UAE and Qatar, Mubarraz and 2 other fields are 100% staked by the consortium of Nippon Oil, Cosmo Oil, Tokyo Electric, Chubu Electric, and Kansai Electric. Crude oil produced is exported under the name Mubarraz Blend.
- Egypt: West Bakr Block - A joint venture between Inpex and Mitsui with 100% interest in exploration and development, oil production began in 1980; the contract extends to 2020.
- Algeria: El Ouar 1 and 2 Blocks - Inpex holds a 10% working interest in these onshore fields containing oil, gas, and condensates. Development is continuing in conjunction with Sonatrach.
- Congo: 11 offshore oil fields - Inpex holds a 32% stake. Production began in 1975; the contract was extended to 2023. Production remains stable due to ongoing development.

### Northern Europe

- Norway: North Sea offshore - Idemitsu Kosan currently produces 28,000 barrels of oil equivalent per day (boe/d) from its interests in 5 producing fields in Norway's North Sea (Snorre, Tordis/Vigdís, Statfjord East, Sygna, Fram), and was awarded 2 exploration licenses in September 2009 in a joint venture with Osaka Gas for 2 additional blocks near currently producing Snorre and Fram fields, in which Idemitsu Kosan also holds shares.
- U.K.: North Sea offshore - Idemitsu Kosan acquired Petro Summit Investment UK from Sumitomo Corp. in November 2009, and is producing 5,000 boe/d from 9 fields. It is also involved in exploration and development of 4 licensed blocks west of the Shetland Islands, having discovering crude and gas in mid-2009. Additionally, Nippon Oil has stakes from 2% to 45% in the North Sea offshore Magnus, Brae, Andrew, Blane, and other fields. Its net production is currently 12,600 boe/d.

### Caspian Sea

- Azerbaijan: Azeri-Chirag-Guneshli Project (ACG) - Inpex has a 10% stake in ACG, which is now producing an estimated 1 MMbbl/d.
- Kazakhstan: North Caspian Sea project, Kashagan oil field - Inpex has a 7.56% stake. Initial production is projected at 450,000 bbl/d at end-2014. Peak production target is 1.5 MMbbl/d by the end of the decade.

### Russia

- Sakhalin-1 - The Sakhalin Oil and Gas development Company (SODECO), a consortium of public and private Japanese oil companies, holds a 30% interest. Sakhalin-1 oil production reached 250,000 in February 2009.
- Sakhalin-II - Mitsui and Mitsubishi have a combined interest of 22.5% in the oil field; estimated reserves are 1 billion barrels.

### Asia

- Indonesia: Offshore Mahakam Block and Attaka unit - Inpex has a 50% stake in each project and production-sharing contracts lasting to 2017 with the Indonesian government. Crude and condensate are shipped mainly to oil refineries and power utilities in Japan. Negotiations are underway to extend the contracts. Additionally, Nippon Oil and JOGMEC in joint venture own a 17% stake, currently under exploration and development, in the Berau Block integrated area.
- Australia: Van Gogh and Ravensworth oil fields - Inpex has a 47.5% interest in Van Gogh, which started up in first quarter 2010 with a 150,000 bbl/d capacity, and a 28.5% interest in neighboring Ravensworth, which started up in September 2010 as part of the 96,000 bbl/d Pyrenees project. Additionally, Nippon Oil has a 25% stake in the NW Shelf Mutineer and Exeter fields. Its net production is currently 1,500 Boe/d, and it also has 5 other fields in various stages of development.
- Vietnam: Nam Rong/Doi Moi offshore oil fields - Idemitsu Kosan has a 15% stake in these fields, which began production February 2010 at 20,000 bbl/d; Idemitsu's portion is 1,500 bbl/d. Idemitsu, together with Nippon Oil and Teikoku Oil, holds interests in 2 other offshore fields currently under exploration.
- Papua New Guinea: onshore blocks at Kutubu and Moran - a consortium of Nippon Oil, Mitsubishi, and the Japanese government own interests in various fields under exploration, development, production.

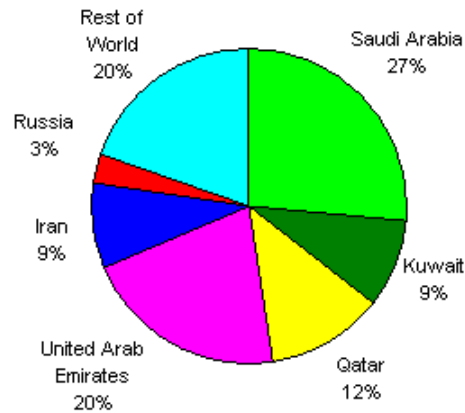
### The Americas

- Brazil: Frade block, Northern Campos Basin - a joint venture of Inpex, JOGMEC, and Sojitz Corp hold 18.3% interest in this offshore block. Production began in 2009; peak production of 90,000 bbl/d is projected for 2011.
- Canada: Alberta oil sands syncrude project - Nippon Oil has a 5% stake. Production capacity was 350,000 bbl/d in 2006. Nippon's share was 14,000 bbl/d in 2009.
- Canada: Athabasca oil sands project, Alberta - Japex is involved in this project, its share in 2007 production was 7,000 bbl/d.

### Imports

Japan was the second-largest net importer of oil in the world after the United States in 2009, having imported about 4.7 million bbl/d. The country is primarily dependent on the Middle East for its oil imports, as roughly 80 percent of Japanese crude oil imports originate in the region, up from 70 percent in the mid-1980s. Japan is currently looking towards Russia, South East Asia, and Africa to geographically diversify its oil imports.

### Japan's Crude Oil Imports by Major Sources 2009



Sources: EIA, Global Trade Atlas, Japanese Government Sources

For a consumer of its size, Japan has a relatively limited domestic pipeline transmission system. Crude oil and petroleum products are delivered to consumers mainly by coastal tankers and tank trucks, as well as railroad tankers and pipelines.

Russia's Transneft, backed by the Russian government, is building the Eastern Siberia-Pacific Ocean pipeline (ESPO), a 2,900 mile pipeline from Taishet, Siberia to Nakhodka on the Pacific Ocean, to export Russian oil to the energy hubs of the Asia-Pacific region. In August 2010, the first section of the pipeline was completed, running from eastern Siberia to China's northeastern frontier. The remainder of the pipeline is still under construction, to be completed in 2012, and is expected to transport up to 1.6 million bbl/d, about one-third of Russia's current oil exports, to China, Japan, and South Korea.

#### Downstream/Refining

According to *OGJ*, Japan had 4.6 million bbl/d of oil refining capacity at 29 facilities as of January 2010, and has the second-largest refining capacity in the Asia-Pacific region after China. In recent years, the refining sector in Japan has been characterized by overcapacity as domestic petroleum product consumption has fallen and is forecast to continue to fall due to the contraction in industrial output and the decline in transportation fuel demand since blending with ethanol has become mandatory. Japanese refiners aim to shut down 600,000 bbl/d of capacity by 2012. Currently, private refiners in Japan are required to maintain petroleum product stocks equivalent to at least 70 days of consumption, which imposes large additional costs to these companies.

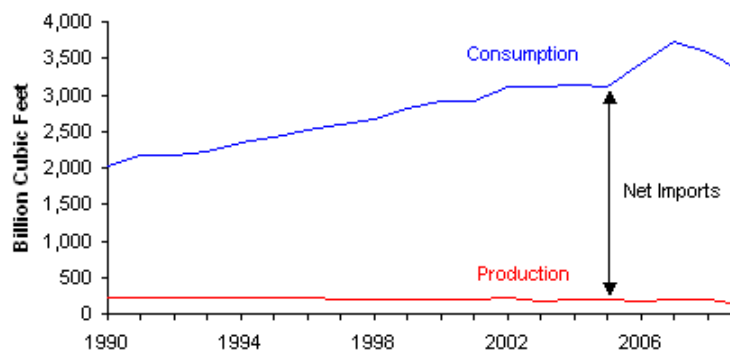
Refiners are increasingly looking abroad for markets for their surplus petroleum products and some analysts predict that Japan may become a significant exporter of refined products in the long term. In addition to selling products abroad, Japanese refiners are directly investing in refinery projects overseas. For example, in November 2006, Idemitsu Kosan and Cosmo Oil each acquired a 10-percent equity stake in a new refinery project located in Qatar. The facility has a refining capacity of 146,000 bbl/d and was Japan's first overseas refinery investment, coming online in 2009.

#### Natural Gas

**Japan relies on LNG imports for virtually all of its natural gas needs.**

According to *The Oil and Gas Journal (OGJ)*, Japan had 738 billion cubic feet (Bcf) of proven natural gas reserves as of January 2010. Natural gas proven reserves have declined since 2007, when they measured 1.4 trillion cubic feet (Tcf). Most natural gas fields are located along the western coastline.

### Japan's Natural Gas Production and Consumption, 1990-2009



Source: EIA

#### Sector Organization

Inpex and other companies created from the former Japan National Oil Company are the primary actors in Japan's domestic natural gas sector, as in the oil sector. Inpex, Mitsubishi, Mitsui, and various other Japanese companies are actively involved in domestic as well as overseas natural gas exploration and production. Osaka Gas, Tokyo Gas, and Toho Gas are Japan's largest retail natural gas companies, with a combined share of about 75 percent of the retail market. Japanese retail gas and electric companies are participating directly in overseas upstream LNG projects to assure reliability of supply.

Although Japan is a large natural gas consumer, it has a relatively limited domestic natural gas pipeline transmission system for a consumer of its size. This is partly due to geographical constraints posed by the country's mountainous terrain, but it is also the result of previous regulations that limited investment in the sector. Reforms enacted in 1995 and 1999 helped open the sector to greater competition and a number of new private companies have entered the industry since the reforms.

#### Production and Exploration

Japan produced 125 Bcf of natural gas in 2009. Japan's largest natural gas field is the Minami-Nagaoka on the western coast of Honshu, which produces about 50 percent of Japan's domestic gas. Discovered by Inpex in 1979, field exploration and development are still ongoing. The gas produced is transported via an 808-mile pipeline network that stretches across the region surrounding the Tokyo metropolitan area. Inpex is building an LNG terminal with a 73 Bcf/y capacity at Naoetsu port in Joetsu City which will connect its domestic pipeline infrastructure with its overseas assets by the end of 2013.

Japex has been involved in locating new domestic reserves in the Niigata, Akita, and Hokkaido regions of Japan, targeting structures near existing oil and gas fields. However, the pace of the domestic exploration program is reportedly set to slow in fiscal year 2009-2010 due to the low rate of production when compared with exploration costs.

#### Liquefied Natural Gas Imports

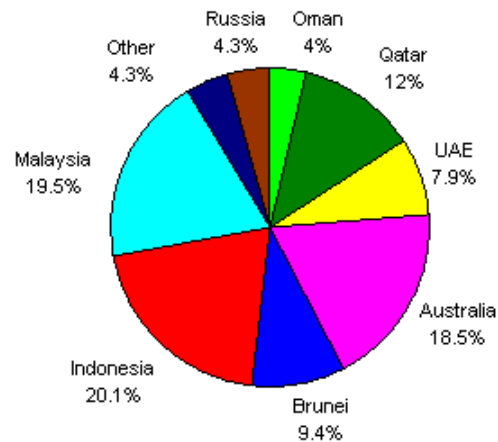
Because of its limited natural gas resources, Japan must rely on imports to meet its natural gas needs. Japan began importing LNG from Alaska in 1969, making it a pioneer in the global LNG trade. Due to environmental concerns, the Japanese government has encouraged natural gas consumption in the country and Japan accounted for about 36 percent of global LNG imports in 2009, according to Cedigaz. In 2009, Japan consumed some 3.3 Tcf of natural gas, importing about 3.0 Tcf of LNG by tanker.

The power sector is the largest consumer of LNG, followed by the industrial sector. Increased use of natural gas within these sectors has been one of the main drivers of growth in natural gas demand in Japan.

Japan has over 40 operating LNG import terminals with a total throughput capacity well in excess of demand in order to assure flexibility. The majority of LNG terminals are located in the main population centers of Tokyo, Osaka, and Nagoya, near major urban and manufacturing hubs, and are owned by local power companies, either alone or in partnership with gas companies. These same companies own much of Japan's LNG tanker fleet.



Japan LNG Imports by Source, 2009



Source: Cedigaz

Japanese regulations permit individual utilities and natural gas distribution companies to sign LNG supply contracts with foreign sources, in addition to directly importing spot cargoes. The largest LNG supply agreements are held by Tokyo Gas, Osaka Gas, Toho Gas, Chubu Electric and TEPCO, primarily with countries in Southeast Asia and the Middle East. Many of Japan's existing LNG contracts date from the 1970s and 1980s, and are set to expire over the next decade. Some industry analysts suggest that this is driving Japanese firms' interest in acquiring equity stakes in foreign LNG projects, in an effort to guarantee future supply. In addition to long-term contracts, Japan receives a significant number of spot cargoes.

Contracted imports remain vital to the country, however, which has led to the renegotiation of long-term supply deals, especially with Japan's largest LNG supplier, Indonesia. New supply contracts are also being made as various overseas LNG projects, in which Japanese companies have interests, come online.

#### Overseas Exploration and Production

Japanese companies have actively sought participation in natural gas exploration and production projects abroad. Some of the major overseas upstream projects that Japan is involved in are:

##### Australia

- Ichthys Project, Browse Basin, Western Australia - Inpex holds a 76% stake in this offshore LNG project, which is projected to come onstream in 2016. It is expected to produce 377 Bcf/y of LNG, most of which is reportedly intended for export to Japan.
- Mimia Project, Browse Basin - Inpex has a 60% stake. In 2008, Inpex announced that it made a new natural gas discovery in the Mimia-1 well, WA-344-P block. Total owns 40 percent. The companies are considering linking the development of the Mimia field to the Ichthys project as they are in fairly close proximity.
- Pluto LNG Project - Tokyo Gas and Kansai Electric each acquired a 5-percent stake in Woodside's Pluto LNG project and signed a deal for 182 Bcf/y of LNG for 15 years. The first train is expected to come online in March 2011, with estimated new capacity of 200 Bcf/y of LNG.
- Timor Sea Joint Petroleum Development Area, including Bayu-Undan gas field - Inpex, Tokyo Gas, and TEPCO combined own 20%. An LNG sales agreement was signed in 2005 for annual supply of 146 Bcf/y; first shipment began February 2006.
- Darwin LNG Terminal - Inpex, TEPCO, and Tokyo Gas hold a combined 20.5 percent stake in the 170 Bcf/y Darwin LNG terminal, which came online in 2006. TEPCO and Tokyo Gas have contracts totaling 146 Bcf/y for a period of 17 years.

##### Russia

- Sakhalin-II - Mitsui and Mitsubishi hold stakes of 22.5 percent combined. Although Shell was originally the main operator of Sakhalin-II, in April 2007 Gazprom became the majority shareholder and the holdings of Shell, Mitsui, and Mitsubishi were reduced to 27.5, 12.5, and 10 percent respectively. In June 2008, the Japan Bank for International Cooperation (JBIC) and a consortium of international commercial banks pledged \$5.3 billion in project financing. Sakhalin II went online in February 2009. At its peak, Sakhalin-II is expected to produce 468 Bcf/y and approximately 60 percent of the project's LNG will be sold to Japan, with 9 Japanese companies as customers.
- Vladivostok LNG terminal - In July 2010, Japan and Russia signed a preliminary agreement to build an LNG terminal with liquefaction capacity of 244 Bcf/y by 2017. The agreement is expected to be signed when President Medvedev attends the APEC summit in Tokyo in November 2010.

## Indonesia

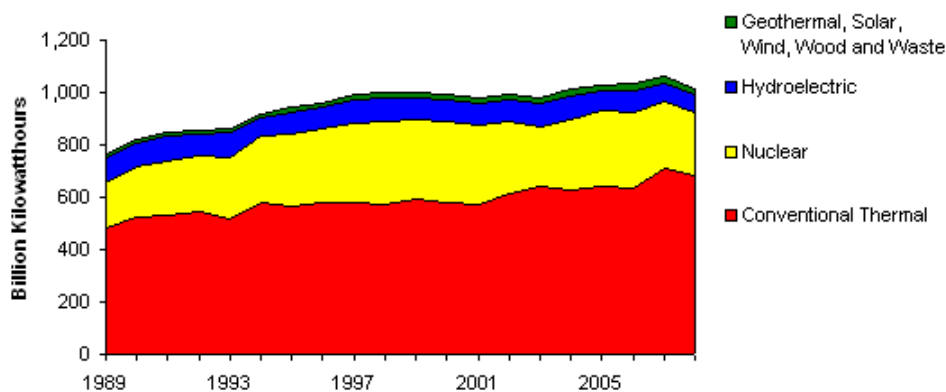
- Masela Block, Abadi gas field, Timor Sea - Inpex holds a 100% stake in this field, which it estimates holds over 10 Tcf of natural reserves. Inpex is planning to build a floating LNG plant with a 220 Bcf/y capacity, and the project is expected to be online and shipping 150-250 Bcf/y of LNG to Japan and elsewhere in 2016.
- Senoro LNG plant, Sulawesi - Mitsubishi holds 51 percent equity. The Senoro gas field is estimated to hold 1.5 Tcf of reserves. Mitsubishi is building a 97 Bcf/y LNG plant and will be the sole buyer of LNG from the plant, which is scheduled to come onstream in 2012.
- Mahakam Block and Attaka Unit, Offshore Kalimantan Island - Inpex and Total each hold 50 percent equity. These fields began producing in 1972, and a number of other gas and oil fields were discovered and included in the project. Most of the natural gas is sent to Indonesia's Bontang liquefaction plant before being shipped to Japan as LNG. Inpex has a 20-year contract extending to 2017 and is currently negotiating to extend it further.
- Berau Block, Tangguh LNG Project, Papua Province - A joint venture between Inpex and Mitsubishi has a 22.9% interest in the Berau Block and a 16.5% interest in the Tangguh Project. Reserves are estimated at 14.4 Tcf. The first cargo of LNG was shipped in July 2009. China, South Korea, and North America have long-term sales agreements for the 363 Bcf/y of production.
- North Belut gas field, South Natuna Sea - Inpex has a 35% interest in this project, which is led by ConocoPhillips. The field came online December 2009 at 97 Bcf/y; the gas is shipped to Malaysia under contract.

## Electricity

**Japan is the world's third largest producer of nuclear power.**

In 2007, Japan had 279 gigawatts (GW) of total installed electricity generating capacity, the third largest in the world behind the United States and China. During 2007, Japan generated 1,058 billion kilowatthours (Bkwh) of electric power and consumed 1,007 Bkwh. Of the country's total 2008 electric power generation of 1,015 Bkwh, 67 percent came from conventional thermal sources, 24 percent came from nuclear sources, 7 percent from hydroelectric sources, and 2 percent from other renewables. Although Japan accounts for the most electricity consumption in OECD Asia, it has one of the lowest electricity demand growth rates in the region, projected at an average of 0.7 percent from 2007 through 2018 by the Federation of Electric Power Companies of Japan.

### Japan's Electricity Generation by Source, 1989-2008



### Sector Organization

Japan's electricity industry is dominated by 10 privately-owned, integrated power companies that act as regional monopolies, accounting for about 85 percent of the country's total installed generating capacity. The remainder is generated by industrial facilities. The largest power company is the Tokyo Electric Power Company (TEPCO), which accounts for 27 percent of total power generation in the country. These companies also control the country's regional transmission and distribution infrastructure. Japan's electricity policies are managed by the Agency for Natural Resources and Environment, part of the Ministry of Economy, Trade and Industry.

Other significant operators in the electricity market are the Japan Atomic Power Company, the first Japanese company to build a nuclear reactor in 1960, which currently operates 4 nuclear power plants with 2.6 GW total and sells electricity to the local power companies, and the Electric Power Development Company (J-Power), formerly a state-owned enterprise that was privatized in 2004. J-Power operates 16 GW of hydroelectric and thermal power plants. It has also been involved in consulting services for electricity production and environmental protection in 63 countries, mainly in the developing world, since 1960.



## Electricity Generation

### *Conventional Thermal*

In 2007, Japan had about 177 GW of conventional thermal electric generating capacity. According to Japan Electric Power Information Center, there are currently 60 thermal power plants, and 5 more are under construction: 2 using LNG and 3 using coal for generation. The country's aging oil-fired power plants are used primarily as extra capacity to meet peak demand, and less than 10 percent of electricity produced currently is oil-generated. The number of natural gas-fired power stations is increasing in Japan and roughly 30 percent of electricity is natural gas-fired. Coal remains an important fuel source and accounts for roughly 25 percent of electricity generation. Domestic coal production came to an end in 2002 and Japan imported 206 million short tons in 2008, for which Australia was the main supplier. New, clean coal technologies are being pursued in the power sector, however, in efforts to meet environmental targets.

### *Nuclear*

Japan currently has 54 operating nuclear reactors with a total installed generating capacity of around 49 GW, making it the third-largest nuclear power generator in the world behind the United States and France. EIA preliminary data shows that Japan produced 244 BKwh of nuclear-generated electricity in 2008. The government plans to increase nuclear's share of total electricity generation from 24 percent in 2008 to 40 percent by 2017 and to 50 percent by 2030, according to the Ministry of Economy, Trade and Industry.

Japan has a full fuel cycle setup, including enrichment and reprocessing of used fuel for recycling. Japan has promoted nuclear electricity over the years as a means of diversifying its energy sources and reducing carbon emissions, emphasizing safety and reliability. Reportedly, there are currently 3 nuclear plants under construction and another 10 in advanced planning stages. According to the Federation of Electric Power Companies in Japan, nuclear power makes a great contribution to Japan's energy security by reducing its energy imports requirement by approximately 440 MMbbl/d per year and, because nuclear energy emits no CO<sub>2</sub>, it reduces Japan's CO<sub>2</sub> emissions by about 14 percent per year.

### *Hydro and Other Renewables*

Japan had installed hydroelectric generating capacity of 47 GW in 2007, accounting for about 9 percent of total capacity, compared with 22 GW in 2005. The Japanese government has been promoting small hydropower projects to serve local communities through subsidies and by simplifying procedures. There are also a number of large hydropower projects under development, including the 2,350-MW Kannagawa plant due online in 2017 and the 1,200-MW Omarugawa plant due online in 2011.

Wind and solar power are being actively pursued in the country and installed capacity from these sources has increased in recent years to about 1.5 GW in 2007, up from 0.8 GW in 2004. However, they continue to account for a relatively small share of generation at this time.

## Profile

### Energy Overview

<b>Proven Oil Reserves (January 1, 2010E)</b>	44 million barrels
<b>Oil Production (2009E)</b>	132,660 barrels per day, of which 5,330 barrels per day were crude oil.
<b>Oil Consumption (2009E)</b>	4.4 million barrels per day
<b>Crude Oil Distillation Capacity (2010E)</b>	4.6 million barrels per day
<b>Proven Natural Gas Reserves (January 1, 2010E)</b>	738 billion cubic feet
<b>Natural Gas Production (2009E)</b>	125 billion cubic feet
<b>Natural Gas Consumption (2009E)</b>	3,343 billion cubic feet
<b>Recoverable Coal Reserves (2009E)</b>	355 million short tons
<b>Coal Production (2009)</b>	None
<b>Coal Consumption (2009E)</b>	204 million short tons
<b>Electricity Installed Capacity (2007E)</b>	279 gigawatts

<b>Electricity Production (2008E)</b>	1,058 billion kilowatt hours
<b>Electricity Consumption (2008E)</b>	1007 billion kilowatt hours
<b>Total Energy Consumption (2007E)</b>	22.5 quadrillion Btus*, of which Oil (45%), Coal (22%), Natural Gas (18%), Nuclear (11%), Hydroelectricity (3%), Other Renewables (1%)
<b>Total Per Capita Energy Consumption (2007E)</b>	176 million Btus
<b>Energy Intensity (2007E)</b>	5,559 Btu per \$2005-PPP**

## Environmental Overview

<b>Energy-Related Carbon Dioxide Emissions (2008E)</b>	1,214.2 million metric tons, of which Oil (53%), Coal (34%), Natural Gas (13%)
<b>Per-Capita, Energy-Related Carbon Dioxide Emissions ((Metric Tons of Carbon Dioxide) 2008E)</b>	9.5 metric tons
<b>Carbon Dioxide Intensity (2008E)</b>	0.26 Metric tons per thousand \$2005-PPP**
<b>Environmental Issues</b>	air pollution from power plant emissions results in acid rain; acidification of lakes and reservoirs degrading water quality and threatening aquatic life; Japan is one of the largest consumers of fish and tropical timber, contributing to the depletion of these resources in Asia and elsewhere
<b>Major Environmental Agreements</b>	party to: Antarctic-Environmental Protocol, Antarctic-Marine Living Resources, Antarctic Seals, Antarctic Treaty, Biodiversity, Climate Change, Climate Change-Kyoto Protocol, Desertification, Endangered Species, Environmental Modification, Hazardous Wastes, Law of the Sea, Marine Dumping, Ozone Layer Protection, Ship Pollution, Tropical Timber 83, Tropical Timber 94, Wetlands, Whaling

## Oil and Gas Industry

<b>Organization</b>	The Japanese government began breaking up former state-owned enterprise Japan National Oil Corporation (JNOC) in 2001. Japan's oil and natural gas sectors are open to foreign involvement, although the government still plays a small role in the industry.
<b>Major Refineries (capacity, bbl/d)(2010E)</b>	Cosmo Oil (Chiba - 228,000; Sakai - 76,000; Sakaide - 114,000; Yokkaichi - 147,250); Fuji Oil (Sodegaura - 192,000); Idemitsu Kosen (Aichi - 152,000; Chiba - 209,000; Yamaguchi - 114,000; Hokkaido - 133,000); Japan Energy (Okoyama - 194,940); Kashima Oil (Ibaragi - 180,500); Kyokuto Petroleum (Chiba) 171,500); Nansei (Okinawa - 100,000); Nippon Oil (Negishi - 340,000; Muroran - 190,000; Oita - 160,000; Mizushima - 250,000; Sendai - 145,000; Osaka - 115,000; Yamaguchi - 127,000); Okinawa Oil (Okinawa - 100,000); Seibu Oil (Yamaguchi - 111,000); Showa Co. (Yokkaichi - 193,000); Taiyo Oil (Ehime - 120,000); Toa Oil (Kawasaki - 65,000; Kawasaki - 110,000) Tonen General (Kawasaki - 296,000; Sakai - 139,500; Wakayama - 160,000).

\* The total energy consumption statistic includes petroleum, dry natural gas, coal, net hydro, nuclear, geothermal, solar, wind, wood and waste electric power.

\*\*GDP figures from Global Insight estimates based on purchasing power parity (PPP) exchange rates.

## Links

### EIA Links

[EIA - Country Information on Japan](#)

### U.S. Government

[CIA World Factbook](#)

[Library of Congress Country Study on Japan](#)

[U.S. Embassy in Tokyo](#)

[U.S. State Department Background Notes on Japan](#)

### Foreign Government Agencies

[Japanese Agency for Natural Resources and Energy](#)

[Japanese Ministry of Economy, Trade and Industry](#)

[Japanese Ministry of Foreign Affairs](#)

### Oil and Natural Gas

[Cosmo Oil](#)

[Idemitsu Kosan Co., Ltd.](#)  
[Inpex Corporation](#)  
[Japan Oil, Gas and Metals National Corporation \(JOGMEC\)](#)  
[Japan Petroleum Exploration Co., Ltd. \(Japex\)](#)  
[Mitsui Oil Exploration Co., Ltd.](#)  
[Nippon Oil Corporation](#)  
[Chubu Electric Power](#)  
[Electric Power Development Company \(J-Power\)](#)  
[Federation of Electric Power Companies \(FEPC\)](#)  
[Japan Atomic Power Company \(JAPC\)](#)  
[Kansai Electric Power](#)  
[Nuclear Safety Commission of Japan](#)  
[Tokyo Electric Power Company \(TEPCO\)](#)

## Sources

Asia Pulse  
BMI Asia Pacific Oil and Gas Insights  
Business Monitor International  
Federation of Electric Power Companies of Japan  
Chevron Corp.  
Global Insight  
Idemitsu Kosan  
Inpex  
Institute of Energy Economics , Japan  
IntelAsia  
International Energy Agency  
International Oil Daily  
Japan Atomic Power Co.  
Japan Electric Power Development Co.  
Japex  
LNGpedia.com  
Oil & Gas News  
Nippon Oil  
Platts Oilgram News  
Reuters  
RTT News  
Sakhalin Energy Corp.  
TendersInfo  
Upstream  
U.S. Energy Information Administration  
World Gas Intelligence

## Contact Info

[cabs@eia.gov](mailto:cabs@eia.gov)  
(202)586-8800  
[cabs@eia.gov](mailto:cabs@eia.gov)