

COUNTRY ANALYSIS BRIEFS

South Korea

Last Updated: June 2007

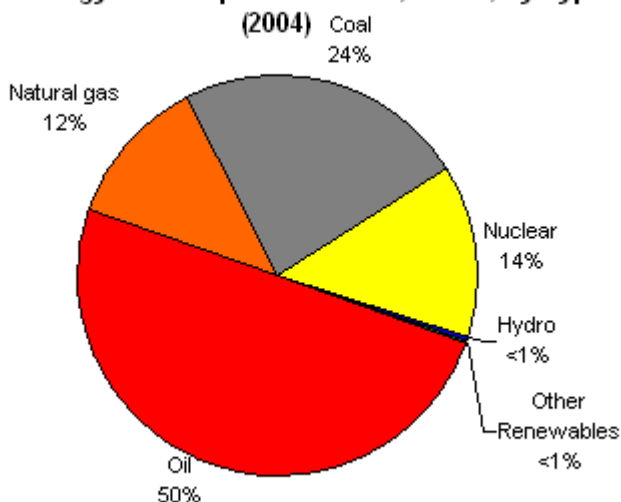
Background

South Korea is the fifth-largest net importer of oil in the world.

With limited domestic energy resources, South Korea is almost entirely dependent on imports to meet its energy consumption needs. South Korea is the fifth-largest net importer of oil in the world, and a significant importer of liquefied natural gas (LNG). Oil makes up the greatest share of South Korea's total energy consumption, though its share has been declining gradually in recent years. Oil supplied 50 percent of South Korea's total energy consumption in 2004, compared with 65 percent in 1994. This decline in oil's share in consumption reflects faster growth in natural gas and to a lesser extent coal over the period. Coal is South Korea's second-largest source, supplying 24 percent of primary energy consumption needs in 2004, followed by modest contributions from nuclear power (14 percent) and natural gas (12 percent). Hydropower and other renewable energy sources make up a small fraction of South Korea's total energy consumption mix.



Total Energy Consumption in Korea, South, by Type



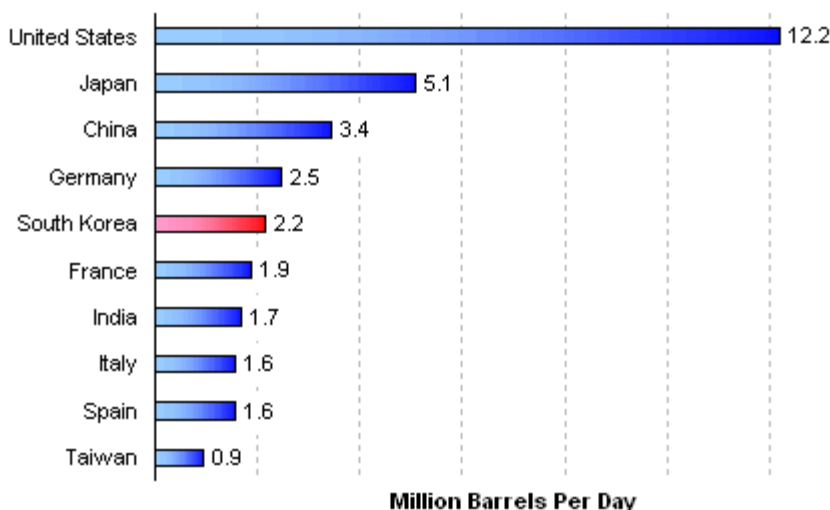
Source: EIA International Energy Annual 2004

Oil Overview

South Korea relies on imports for all of its oil needs.

South Korea has no domestic crude oil production, and is completely dependent on imports for its oil consumption needs. In 2006, South Korea's gross oil imports averaged 3 million barrels per day (bbl/d). South Korea's oil imports exceed consumption needs, as the country re-exports about a quarter of its gross oil imports as refined petroleum products, mostly to neighboring countries in East Asia. In 2006, South Korea consumed an estimated 2.2 million bbl/d of oil, making it the ninth-largest consumer of oil in the world and the fifth-largest net importer of oil.

Top Ten Net Oil Importers, 2006*



Source: EIA Short-Term Energy Outlook (May 2007)

*estimate

Sector Organization

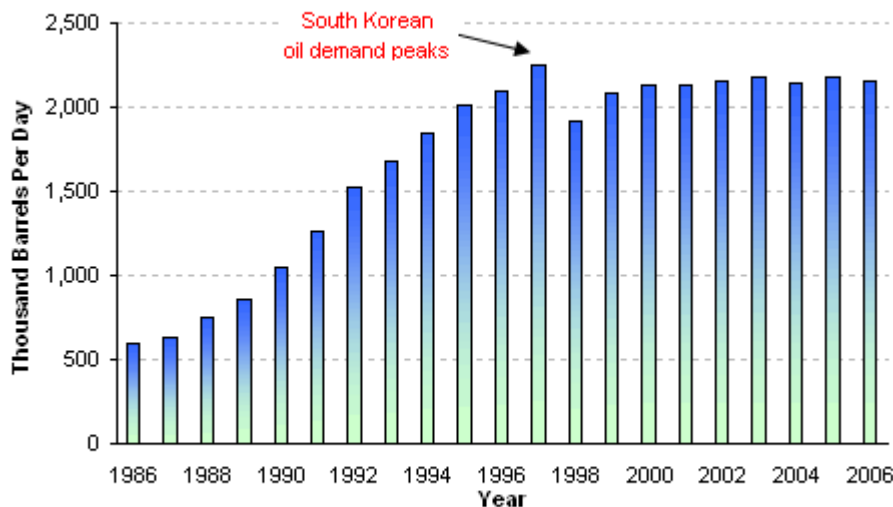
The state-owned Korea National Oil Corporation (KNOC) was established in 1979 as the country's sole upstream oil development company. KNOC is also charged with managing the country's strategic oil stockpiles. While South Korea's upstream oil sector is dominated by a single state-owned company, the downstream sector is subject to greater competition. Much of South Korea's oil pipeline network is operated by the Daehan Oil Pipeline Corporation (DOPCO), which was privatized in 2001. The refining and retail sectors are dominated by several large Korean conglomerates (known as *chaebols* in Korean), with SK Corporation holding the largest market

share. Other companies with significant downstream presence include GS Caltex (a joint-venture of Korea's LG Corporation and Chevron), Hyundai Oilbank Corporation, and S-Oil Corporation.

Oil Imports and Domestic Consumption

Oil consumption in South Korea has been relatively flat since 2000, although the country remains the ninth-largest oil consumer in the world. Oil demand peaked in 1997 at 2.3 million bbl/d, and has fluctuated between 2.1 – 2.2 million bbl/d since 2000. Although South Korea is importing less oil than in previous years, relatively higher oil prices have increased the total cost of those imports. In 2005, the Korea Petroleum Association reports that South Korea spent \$45.6 billion on crude oil and petroleum product imports, 57 percent higher than in 2003 even though import volumes for the two years were nearly equal.

South Korea's Oil Consumption, 1986-2006*



Source: EIA International Energy Annual 2004;
Short-Term Energy Outlook (May 2007)

*2006 is estimate

Import Sources

In 2006, South Korea imported 2.2 million bbl/d from Persian Gulf countries, or 75 percent of the country's total gross oil imports. This share of oil imports from the Persian Gulf has risen over the last ten years, despite concerted efforts on the part of South Korean officials to diversify the country's sources of petroleum imports. In 1996, South Korea received 64 percent of its imports from Persian Gulf countries. For 2006, Saudi Arabia was the single-largest supplier of oil imports to South Korea, accounting for about 860,000 bbl/d, or 29 percent of gross oil imports.

Import Terminals

Because South Korea is a peninsular country, it relies on oil shipped by tankers for its import requirements. South Korea's major ports are Pusan, Incheon, Kunsan, Mokpo, and Ulsan. Incheon and Ulsan are the primary petroleum import terminals, while industry sources report that Pusan is the fifth-busiest container port in the world. South Korea does not have any international oil pipeline connections.

Exploration and Production

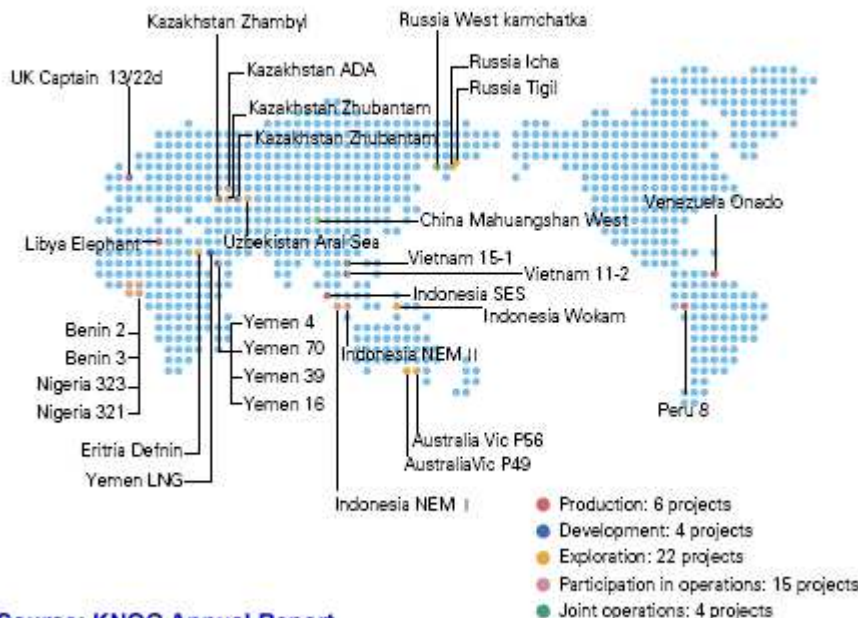
As noted above, South Korea does not currently produce any crude oil domestically. In the 1970s and 1980s, South Korea partnered with various international oil companies on exploration projects, although commercial oil deposits were never discovered. Since 1983, KNOC has engaged in numerous exploration projects, particularly in its offshore territory, although to date it has only had success in locating natural gas reserves (see the Natural Gas Section for more information). South Korea has also engaged in joint exploration projects with Japan, and KNOC remains optimistic that there are potential oil resources in Korea's continental shelf regions.

Overseas Exploration

KNOC and other South Korean firms have actively pursued investment in overseas exploration and production (E&P) projects. As of 2006, KNOC was involved in 32 E&P projects in 15 countries around the world (see map below for greater detail). Of this total, six of those projects were currently producing oil, of which KNOC's equity share averaged 40,000 bbl/d in 2005, or less than

two percent of net imports for the year. The South Korean government has set a target of raising KNOC's equity share of net oil imports to 10 percent by 2010, and in June 2006 earmarked \$7 billion for additional overseas E&P activities to help meet this goal.

Profile of KNOC's Overseas E&P Projects, 2006



Refining

According to the *Oil & Gas Journal*, South Korea had about 2.6 million bbl/d of refining capacity at six facilities as of January 2007. The largest is SK Corporation's 817,000-bbl/d Ulsan plant, which is the second-largest refinery in the world. South Korea also hosts the world's third-largest refinery, GS Caltex's 650,000-bbl/d Yosu facility (for a complete list of South Korea's refineries see the table below). At present, South Korea's refining capacity exceeds domestic oil demand, and the country exports refined petroleum products to countries in the region. While overcapacity has prevented the development of further refineries in South Korea for the last several years, S-Oil Corporation announced in July 2006 that it is considering building a 480,000-bbl/d plant at Sosan. The proposed S-Oil refinery would target export markets.

Refineries in South Korea, 2006		
Company	Location	Capacity (bbl/d)
SK Corp.	Ulsan	817,000
GS Caltex	Yosu	650,000
S-Oil Corp.	Onsan	520,000
Hyundai Oilbank Corp.	Daesan	310,000
Hyundai Oilbank Corp.	Incheon	270,000
Hyundai Oilbank Corp.	Busan	9,500
Planned Facilities		
S-Oil Corp.	Sosan	480,000
Source: Oil & Gas Journal; Global Insight		

Strategic Oil Reserves

As part of the government's energy security efforts, South Korea holds strategic oil reserves to protect against oil supply disruptions. The country's strategic oil reserve program is managed by KNOC, which reports that its system has the capacity to store 116 million barrels of oil. As of April 2007, KNOC held 76 million barrels of oil in its strategic stockpiles, of which 64 million barrels was crude oil and 12 million barrels was petroleum products. This total amounts to approximately 34

days of net import cover, according to 2006 estimates of demand. KNOC has plans to expand the country's strategic storage capacity from 116 to 146 million barrels by 2009, and to fill the emergency reserves to 141 million barrels by 2010.

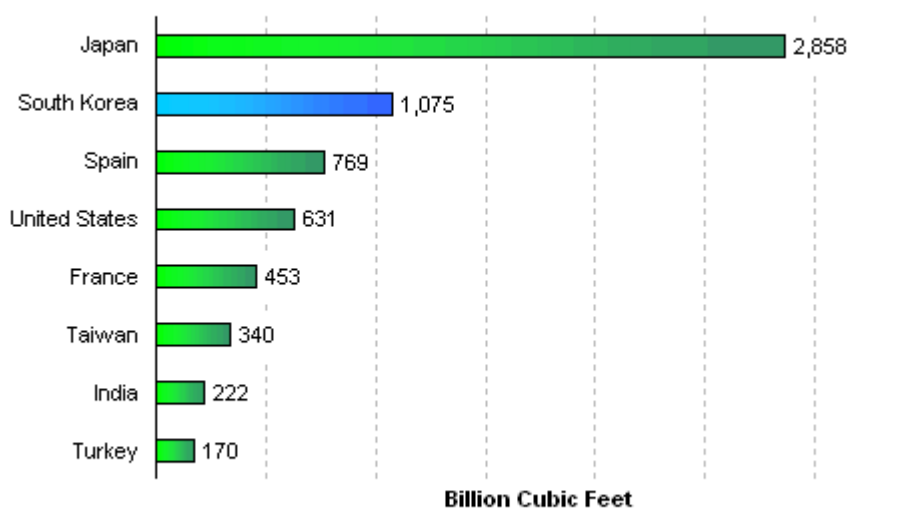
Natural Gas

South Korea is the second-largest importer of liquefied natural gas in the world behind Japan.

Overview

South Korea currently relies on imported liquefied natural gas (LNG) for most of its natural gas consumption requirements, though it began producing a small quantity of natural gas from one offshore field in early 2004. Despite limited domestic natural gas resources, consumption has grown rapidly in the last decade. Preliminary data shows that South Korea consumed 1,077 billion cubic feet (Bcf) of natural gas in 2005, while producing less than 2 Bcf. In 2005, the country imported 1,075 Bcf (22.1 million metric tons, or MMT) of LNG, making it the second-largest importer of LNG in the world. The leading sources of these LNG imports were Qatar (27 percent), Indonesia (25 percent), Malaysia (21 percent), and Oman (19 percent).

Top LNG Importers, 2005



Sources: EIA Natural Gas Monthly (Aug. 2006);
IEA Natural Gas Information 2006; CEDIGAZ Natural Gas in the World 2005

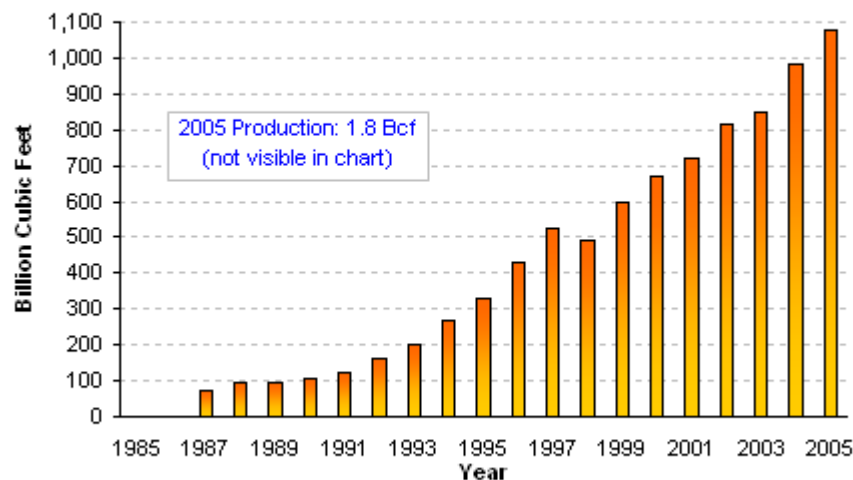
Sector Organization

The Korea Gas Corporation (KOGAS) is the leading player in South Korea's natural gas sector. KOGAS is the sole importer and distributor of natural gas in South Korea and the largest purchaser of LNG in the world. KOGAS operates three LNG import terminals as well as the country's natural gas pipeline system. As in the oil sector, KNOC is the primary company involved in exploration and production of natural gas, although domestic natural gas reserves contribute only a small fraction of the country's consumption requirements. KOGAS has plans to become a fully-integrated energy company and is increasingly involved in upstream activities overseas. KOGAS is 27 percent-owned by the government, 25 percent-owned by the state-controlled Korea Electric Power Corporation (KEPCO), with the remaining equity split among local government and institutional investors.

Exploration and Production

In 1998, KNOC discovered South Korea's first natural gas deposits at the offshore Donghae-1 field, which holds proven reserves of 250 Bcf, according to the company. KNOC began producing natural gas from the field in 2004, and average production in 2005 stood at 50 million cubic feet per day (MMcf/d). While this find was significant for South Korea, 2005 production supplied less than two percent of the country's total natural gas consumption. KNOC followed up the Donghae-1 find with the discovery of natural gas reserves in the Gorae-8 and Gorae-14 structures in 2004 and 2005, respectively. KNOC estimates that Gorae-8 holds 25 Bcf of recoverable natural gas reserves, making it a relatively small find. KNOC continues to explore South Korea's offshore territories for natural gas deposits, but for the foreseeable future the country will remain heavily dependent on imports.

South Korea's Natural Gas Consumption, 1985-2005*



Source: EIA International Energy Annual 2004; CEDIGAZ

*2005 is preliminary

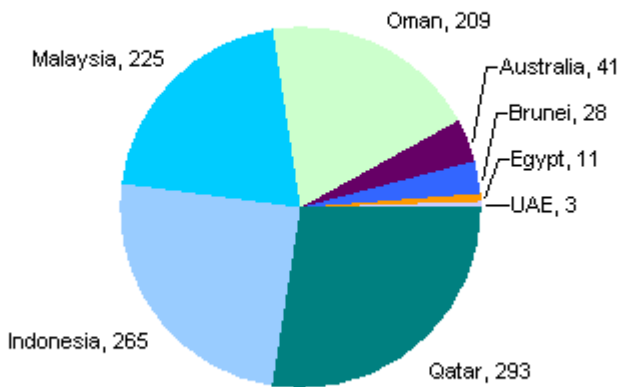
Overseas Investments

As in the oil sector, South Korean companies are actively involved in overseas E&P projects. In addition to KNOC's overseas investments, KOGAS formed the International Projects Group in 2001 to expand its overseas investments. To date, KOGAS has invested in several foreign LNG projects that send supplies to South Korea, including a 5 percent equity stake in Oman LNG, a 5 percent stake in Qatar's Ras Laffan LNG Co. Ltd. (known as the RasGas project), and a 6 percent stake in Yemen LNG (see the [Oman](#), [Qatar](#), and [Yemen Country Analysis Briefs](#) for more information). In addition, KOGAS has invested in natural gas projects in Burma and Vietnam (see the [Vietnam Country Analysis Brief](#) for more information).

Liquefied Natural Gas

In 2005, South Korea imported 1,075 Bcf (22.1 MMt) of LNG, the second-highest in the world behind Japan (see the [Japan Country Analysis Brief](#) for more information). LNG imports have increased by an average of 10 percent per year during 2001-2005. South Korea currently gets most of its LNG from Qatar, Indonesia, Malaysia, and Oman, with smaller volumes coming from Australia, Brunei, Egypt, and the UAE. KOGAS purchases the bulk of its LNG supplies under long-term supply agreements, although the company also purchased 21 spot cargoes of LNG in 2005. KOGAS operates three LNG import terminals in South Korea (Pyongtaek, Incheon, Tongyeong) with a combined sendout capacity of 2 trillion cubic feet (40.7 MMt) per year. In July 2005, Pohang Iron and Steel Corporation (POSCO) and Japan's Mitsubishi started commercial operations at South Korea's fourth LNG import terminal, located at Kwangyang. The plant is the country's first privately owned LNG receiving facility and has an annual capacity of 83 Bcf (1.7 MMt).

South Korea's LNG Imports by Source, 2005 (Bcf)



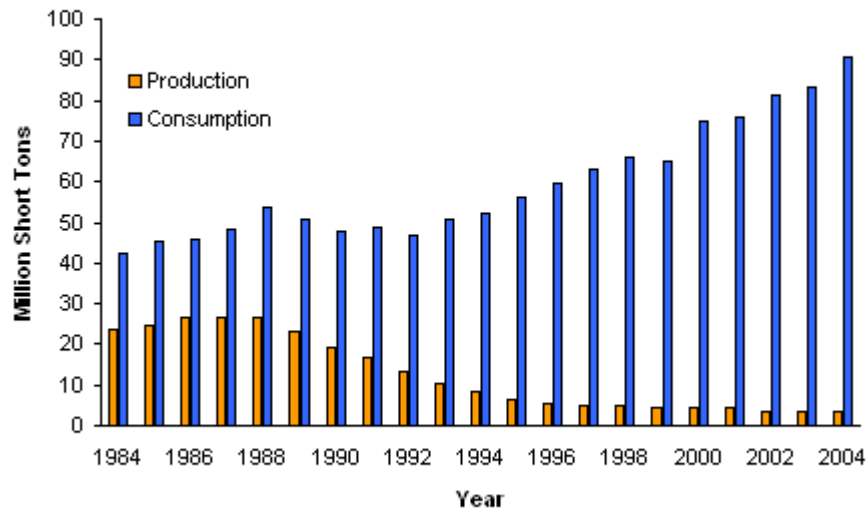
Source: CEDIGAZ, Natural Gas in the World 2005

Coal

South Korea imports the bulk of its coal requirements, due to lack of high-quality domestic coal reserves.

South Korea holds 88 million short tons (MMst) of recoverable coal reserves, a relatively small amount compared to the country's consumption requirements. In 2004, South Korea consumed 90.6 MMst of coal, of which only 3.5 MMst (about 4 percent) was produced domestically. As a result, South Korea imports the bulk of its coal supplies. Most coal imports come from Australia and China, with smaller amounts coming from the United States (see the [Australia](#) and [China Country Analysis Briefs](#) for more information).

South Korea's Coal Production and Consumption, 1984-2004

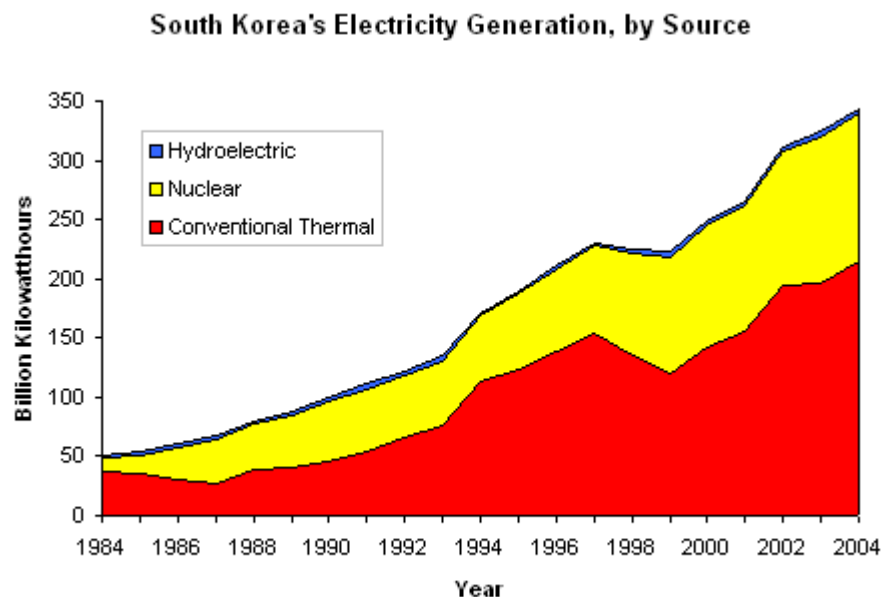


Source: EIA International Energy Annual 2004

Electricity

Plans to privatize the state-owned electric utility have stalled.

South Korea had 58.8 gigawatts (GW) of installed electricity generating capacity in 2004. In that same year, the country generated 343 billion kilowatthours (Bkwh) of electricity, of which 63 percent came from conventional thermal sources, 36 percent came from nuclear power, and a small amount came from hydropower stations.



Source: EIA International Energy Annual 2004

Sector Organization

South Korea's government intends to privatize the country's power sector, although these plans have proceeded slowly due in part to tepid investor response, public concerns about rising power prices, and reluctance on the part of the government to sell some power sector assets. In 2001, state-owned Korea Electric Power Generating Corporation (KEPCO) was broken up into six separate power generation companies ("gencos") in preparation for privatization. Of these six, South Korea's government will retain control of one genco, the Korea Hydro & Nuclear Power Company (KHNPC), which operates the country's nuclear and hydroelectric power stations. The remaining five are to be auctioned off, although the planned sales have been repeatedly delayed since 2002. Current plans call for the government to sell majority stakes in the gencos to private companies and offer minority stakes through public stock issues. Foreign ownership is limited to 30 percent of any single division. The bidding process will be managed by the Korea Power Exchange (KPX), which was established in 2001.

Generation Structure

As noted above, South Korea gets the majority of its electricity supplies from conventional thermal sources (mostly coal and natural gas, with a small amount coming from oil-fired power plants). However, nuclear power is playing an increasingly prominent role in South Korea, steadily increasing its share of the country's net electricity generation for the past two decades. All told, KHNPC owns four nuclear power stations totaling 20 nuclear reactors, with two additional plants currently planned or under construction (see table below). Investment in new conventional thermal power plants has subsided in recent years as a result of uncertainty surrounding the planned privatization process.

South Korea's Nuclear Power Plants, 2006			
Name	Unit No.	Capacity (MW)	Start-date
Kori	1	587	1978
	2	650	1983
	3	950	1985
	4	950	1986
Wolsong	1	679	1983
	2	700	1997
	3	700	1998
	4	700	1999
Yonggwang	1	950	1986
	2	950	1987
	3	1000	1995
	4	1000	1996
	5	1000	2002
	6	1000	2002
Ulchin	1	950	1988
	2	950	1989
	3	1000	1998
	4	1000	1999
	5	1000	2004
	6	1000	2005
Planned or Under Construction			
Shin-Wolsong	1	1000	2009
	2	1000	2010
Shin-Kori	1	1000	2008
	2	1000	2009
	3	1000	2010
	4	1000	2011

Source: Korea Hydro & Nuclear Power Co., Ltd.

Profile

Energy Overview

Proven Oil Reserves (January 1, 2007E)	None
Oil Production (2006E)	7,400 barrels per day, all of which was refinery gain
Oil Consumption (2006E)	2.2 million barrels per day
Crude Oil Distillation Capacity (January 1, 2007E)	2.6 million barrels per day
Natural Gas Production (2004E)	None
Natural Gas Consumption (2004E)	983 billion cubic feet
Recoverable Coal Reserves (2004E)	88 million short tons
Coal Production (2004E)	3.5 million short tons
Coal Consumption (2004E)	90.6 million short tons
Electricity Installed Capacity (2004E)	58.8 gigawatts
Electricity Production (2004E)	343 billion kilowatt hours
Total Energy Consumption (2004E)	9.0 quadrillion Btus*, of which Coal (24%), Hydroelectricity (<1%), Oil (50%), Natural Gas (12%), Nuclear (14%), Other Renewables (<1%)

Total Per Capita Energy Consumption (2004E)	185.5 million Btus
Energy Intensity (2004E)	12,567 Btu per \$2000-PPP**

Environmental Overview

Energy-Related Carbon Dioxide Emissions (2004E)	496.8 million metric tons, of which Coal (39%), Oil (49%), Natural Gas (12%)
Per-Capita, Energy-Related Carbon Dioxide Emissions (2004E)	10.3 metric tons
Carbon Dioxide Intensity (2004E)	0.69 Metric tons per thousand \$2000-PPP**
Environmental Issues	air pollution in large cities; acid rain; water pollution from the discharge of sewage and industrial effluents; drift net fishing
Major Environmental Agreements	party to: Antarctic-Environmental Protocol, Antarctic-Marine Living Resources, 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 signed, but not ratified: none of the selected agreements

Oil and Gas Industry

Organization	Korea National Oil Corporation(KNOC); Korea Electric Power Company (KEPCO); Korea Gas Corporation (KOGAS)
Major Ports	Pusan, Incheon, Kunsan, Mokpo, Ulsan
Major Refineries (capacity, bbl/d)	Ulsan (817,000 bbl/d); Yosu (650,000); Onsan (520,000 bbl/d); Daesan (310,000 bbl/d); Incheon (270,000 bbl/d)

* 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 – South Korea Country Energy Profile](#)

U.S. Government

[CIA World Factbook - South Korea](#)

[U.S. State Department Background Notes - South Korea](#)

[U.S. Consular Information Sheet - South Korea](#)

[U.S. Library of Congress Country Study - South Korea](#)

[U.S. Embassy in South Korea](#)

Foreign Government Agencies

[South Korea - Ministry of Foreign Affairs and Trade \(MOFAT\)](#)

[South Korea - Ministry of Commerce, Industry, and Energy \(MOCIE\)](#)

Oil and Natural Gas

[Daehan Oil Pipeline Corporation \(DOPCO\)](#)

[GS Caltex Corporation](#)

[Hyundai Oilbank](#)

[Korea Gas Corporation \(KOGAS\)](#)

[Korea Gas Union](#)

[Korea National Oil Corporation \(KNOC\)](#)

[Korea Petroleum Association](#)

[SK Corporation](#)

[S-Oil Corporation](#)

Electricity

[Korea Electric Power Corporation \(KEPCO\)](#)

[Korea Electricity Commission \(KOREC\)](#)

[Korea Hydro & Nuclear Power Company](#)

[Korea Power Exchange](#)

Sources

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Contact Info

cabs@eia.doe.gov

(202)586-8800

cabs@eia.doe.gov