

COUNTRY ANALYSIS BRIEFS

Taiwan

Last Updated: August 2008

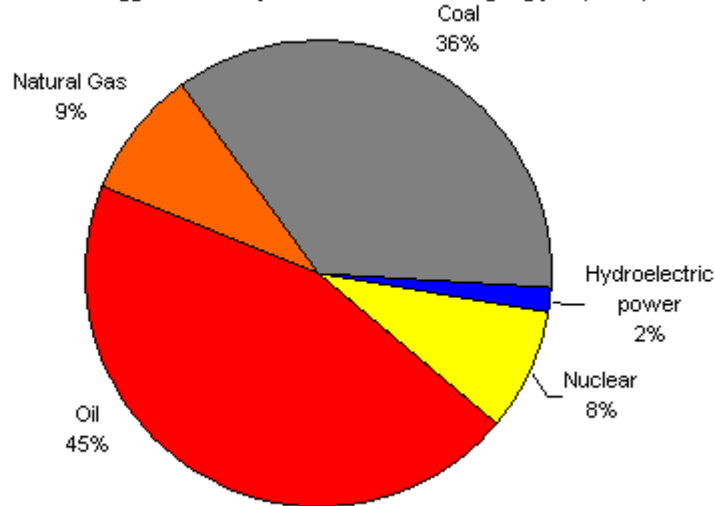
Background

Located across the Taiwan Strait from mainland China, Taiwan is an important economic and trading center, with one of the busiest ports in the world (Kaohsiung). As Taiwan lacks sufficient domestic energy sources, it is almost totally dependent on energy imports.

Taiwan does not have substantial domestic energy resources and must import the vast majority of its needs. Taiwan has encouraged investment in domestic oil and natural gas projects in light of a need to obtain a secure supply, including partnerships with mainland Chinese companies and overseas ventures. However, these efforts are unlikely to yield sufficient energy resources to reverse the island's energy import dependence.



Nearly half of total energy consumption in Taiwan is from oil (45 percent), followed by coal (36 percent), although Taiwan no longer has any domestic coal production. Since the introduction of LNG imports in the 1990s, natural gas has played an increasingly important role in the island's energy mix, accounting for 9 percent of total energy consumption in 2005.

Total Energy Consumption in Taiwan, by Type (2005)

Source: U.S. Energy Information Administration

Oil

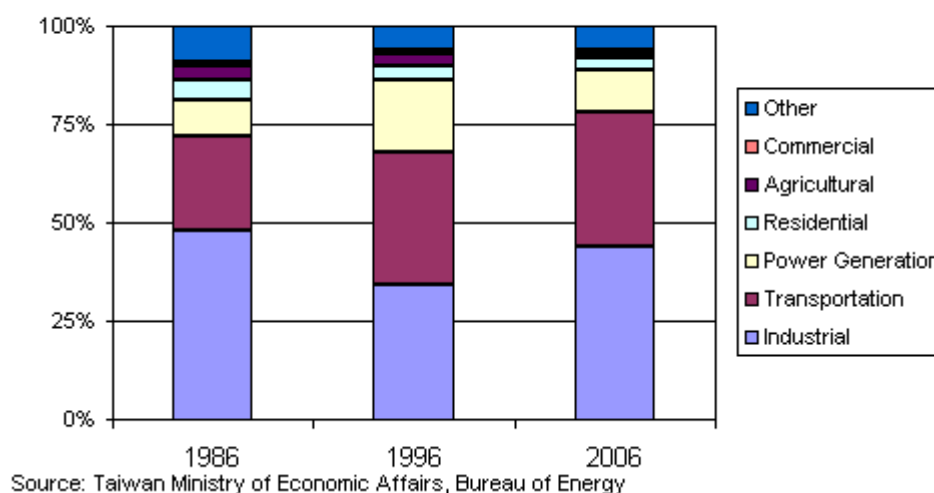
Because of its low domestic oil reserves, Taiwan meets nearly all of its oil demand through imports.

According to Oil and Gas Journal (OGJ), Taiwan had 2.38 million barrels of estimated proved oil reserves as of January 2008. Taiwan's estimated total oil production has remained flat in recent years, averaging 10.6 thousand barrels per day (bbl/d) in 2007. Oil production in Taiwan comes from four fields: the Chingtsohu, Chinshui & Yunghoshan, Chuhuangkeng, and Tiechengshan fields, which have a total of 71 producing oil wells, according to OGJ. However, the majority of Taiwan's oil production is due to refinery gain (approximately 10,000 bbl/d), resulting from the country's large petroleum refining sector. Only 800 bbl/d of crude oil was produced in Taiwan in 2007.

Industry reports indicate that government stocks of crude oil have been built up in recent years and are estimated at around 10 million barrels. In accordance with the Petroleum Administration Law, the downstream sector is required to maintain a strategic petroleum stockpile of no less than sixty days of supply (based on the average of domestic sales and private consumption over the last year).

Taiwan consumed around 950 thousand bbl/d of oil in 2006, down from 970 thousand bbl/d in 2005, but slightly higher than the 2004 consumption level. The EIA estimates 2007 consumption at about 930 thousand bbl/d and 910 thousand bbl/d in both 2008 and 2009. However, over the long-term, oil demand is expected to rise. According to the International Energy Agency (IEA), Taiwan will account for 5.3 percent of Asian demand by 2030, up from other industry reports of 2.9 percent in 2006. Nearly all oil consumption in Taiwan is from imports and roughly 80 percent of oil imports in Taiwan come from the Middle East.

Oil Consumption By Sector, Taiwan



Sector Organization

CPC Corporation Taiwan (formerly the Chinese Petroleum Corporation), Taiwan's national oil company, is the dominant player in all sectors of the country's petroleum industry. Significant competition to CPC began in July 2000 with the opening of a refinery at Mailiao by the privately-owned Formosa Petrochemical Company (FPCC). This was made possible when Taiwan's legislature passed the Petroleum Administration Law in October 2001, which removed CPC's quasi-governmental policy implementation functions. The government has set forth plans to sell up to a 48 percent stake in CPC. In 2005, the United Arab Emirates (UAE) state-owned International Petroleum Investment Company (IPIC) reportedly offered \$5 billion for a 20 percent share in CPC, however, legislative disagreements in Taiwan caused IPIC to put the plan on hold. Many analysts expect privatization efforts to proceed in the future when greater political cohesion can be reached.

As in other Asian countries, in 2008 Taiwan took steps to deregulate its energy prices in light of the increasing international cost of oil. The government has removed some end-user subsidies as the rapid increases in the global price of oil, in combination with the government controlled pricing scheme, has resulted in substantial losses for CPC. CPC has been absorbing much of the high cost of oil imports. On May 28, 2008, the Taiwanese government allowed CPC to raise petrol and diesel prices by 13 and 16 percent respectively. Although the government had originally planned to allow CPC to raise these prices to the global market level, the government ultimately decided to absorb 20 percent of the difference between global and domestic prices of petrol and diesel while requiring CPC to absorb an additional 20 percent. The remaining 60 percent has been passed on to consumers. The price increase was also put in place earlier than originally announced in order to prevent hoarding. Deregulation had been started by the previous government, but due to inflationary concerns and political considerations, domestic oil prices were again frozen at the end of 2007. The effect that the May 2008 price increases will have on demand growth in the short and medium-term remains to be seen, although the International Energy Agency (IEA) predicts a temporary slow down in demand growth. Privately-owned FPCC was able to lift its prices earlier in 2008, but the result was excess demand for CPC's products and gasoline exports by CPC were temporarily deferred.

Exploration and Production

CPC has conducted exploration activities in Taiwan for more than 50 years; however, the country has never had significant domestic oil assets. Despite the lack of formal ties between Taipei and Beijing, Taiwan and China have developed a cooperative relationship in the energy field. CPC and Beijing's state-owned China National Offshore Oil Corporation (CNOOC) signed a deal in 1996 to jointly explore a 6,000 mile area in the Tainan Basin of the Taiwan Strait. A 50-50 joint venture project was formalized in 2002. CPC and CNOOC are expected to prolong their cooperation to 2010, having already extended the 2002 deal from 2006-08. Some estimates put recoverable oil reserves in the basin at 300 million barrels, although production has not yet taken

place. Slow progress has resulted in the drilling of only one of three planned exploratory wells, although the expected extension of the deal would involve the drilling of the remaining two wells. In addition, CPC and CNOOC also signed a draft agreement to form a joint venture exploration project in the Nanjih Islands Basin. Warming economic ties between the two countries may help rejuvenate joint cooperation in this area. CPC has also expressed interest in collaborating with mainland China's Sinopec on overseas projects.

Although some cross-strait cooperation has taken place between Taiwan and China, numerous territorial disputes in the resource-rich South China Sea persist. Various countries in the Asia-Pacific region lay claim to some portion of the South China Sea, which has limited exploration and production activities in the region (please see the [South China Sea report](#) for more information).

CPC is also active in overseas oil exploration and production projects through its overseas arm, the Overseas Petroleum Investment Corporation (OPIC). OPIC currently holds equity stakes in twelve overseas oil fields in seven countries: Blocks 16 and 17 in Ecuador, the Sanga Sanga field in Indonesia, the Gulf of Paria East and West in Venezuela, the AC/P21 block in Australia, the Jaguar, Caviar, Channelview, and West Avondale blocks in the United States, the BCOIII/BCSII/BLT blocks in Chad, and CPC's most recent acquisition, the Murzuq 162 block in Libya. CPC is also considering purchasing some of CNOOC's blocks in Kenya. The projects in Ecuador and Indonesia are OPIC's largest, bringing in a combined 6.76 million barrels of crude in 2007 according to CPC figures. CPC reports that it is actively negotiating to maintain exploration and production rights in Ecuador and Venezuela in light of efforts aimed at resource nationalization in these countries.

After the January 2006 joint exploration contract was awarded to OPIC by Chad, the Chadian government suspended diplomatic recognition of Taipei. CPC officials declared however that the move will not affect OPIC's contract and the company has retained its 70 percent interest.

Downstream Activities

Prior to the construction of the Formosa Petrochemical Company's Mailiao refinery, Taiwan imported a significant quantity of refined petroleum products. Today the country's refining capacity is greater than its domestic consumption of petroleum products and Taiwan has been a net exporter of products since 2002, although it continues to import products as well. Some analysts forecast that Taiwan may return to being a net product importer in the near future. In terms of petroleum products, the country primarily exports gasoline and diesel and imports naphtha. Taiwan must import nearly all the crude oil it refines.

According to Oil and Gas Journal's (OGJ) January 2008 figures, Taiwan has 1.29 million bbl/d of crude refining capacity at four facilities: CPC's Kaohsiung (270,000 bbl/d) Ta-Lin (300,000 bbl/d) and Tao-Yuan (200,000 bbl/d) plants as well as FPCC's Mailiao refinery (520,000 bbl/d). Both CPC and FPCC are considering building additional new refineries or expanding capacity at existing plants, especially as the Kaohsiung refinery is expected to be closed in 2015 amid concerns from local area residents about pollution. A final decision on closing the refinery has not yet been made, however. FPCC announced preliminary plans in March 2008 to expand crude refinery capacity at Mailiao by an additional 150,000 bbl/d.

Petrochemicals

Taiwan has a robust petrochemical sector, which is the result of the country's strong base in petroleum refining. Taiwan must import significant levels of naphtha to meet its petrochemical production demand. CPC's petrochemical production is based at its Kaohsiung Refinery and the Linyuan Petrochemical Plant. The Linyuan site is independently operated by CPC's Petrochemical Business Division (PBD), which was established in 2000 in response to enhanced competition in the downstream sector. CPC is currently renovating and expanding its No. 3 naphtha cracker at Linyuan to increase the efficiency and safety of the system. When completed in 2013, the upgrade will give the naphtha cracker a capacity of 600,000 tons per year (t/y) of ethylene, 360,000 t/y of propylene, 100,000 t/y of butadiene, and 90,000 t/y of benzene.

CPC is currently planning a petrochemical technology park to be constructed in the Yunlin Offshore Industrial Zone. The project includes a 300,000 bbl/d refinery, a 1.2 million t/y naphtha cracking complex, 23 petrochemical units, and related transmission and storage units. CPC and several private companies, including Oriental Union Chemical and the Chang Chun Group, established the Kuokuang Petrochemical Technology Company Ltd. in January 2006 to undertake the project. CPC holds a 43 percent stake, the largest share in the joint venture project. The

completion date for the complex has been pushed back by several years to 2017 due to delays in the required environmental impact assessment studies. This may also delay the scheduled second phase of the project, which was intended to commence in 2015 and would include an additional 150,000 bbl/d of crude oil refining capacity and a 1.5 million mt/y aromatic plant. The delays could even cause the project site to be moved entirely and the expected cost of the project has risen substantially. The complex at Kuokuang would help to make up for lost capacity if Kaohsiung were to close. If both facilities were online simultaneously, Taiwan would significantly increase its exports of petroleum products.

The FPCC Mailiao refining complex has a substantial petrochemical production capacity. The company's No. 6 naphtha cracker project at Mailiao contains a variety of petrochemical facilities, including 60 downstream plants and an industrial harbor. There are currently three naphtha crackers with a combined ethylene output of 2.9 Mmt/y at Mailiao. Additional investment to increase capacity further is reportedly planned.

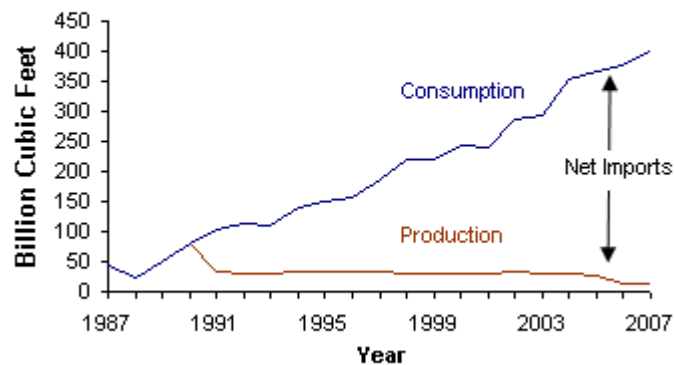
Natural Gas

In 2006, Taiwan was the third largest importer of liquefied natural gas in Asia.

Taiwan has very limited domestic natural gas reserves. According to Oil and Gas Journal (OGJ), Taiwan had 220 billion cubic feet (Bcf) of proven natural gas reserves as of January 2008, down from 297 Bcf in January 2007. As in the petroleum sector, state-owned CPC dominates Taiwan's natural gas activities.

In 2007, Taiwan consumed an estimated 399 Bcf of natural gas while only producing 14 Bcf. Natural gas consumption in Taiwan has consistently trended upwards, rising from 352 Bcf in 2004 to 368 Bcf in 2005 and 375 Bcf in 2006. CPC anticipates an increase in natural gas demand and rising liquefied natural gas (LNG) imports due to the construction of additional natural gas-fired power plants and environmental concerns.

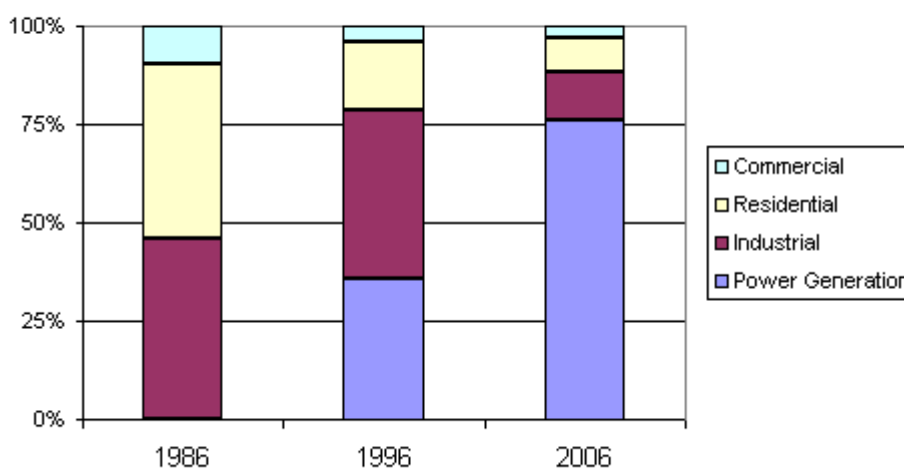
Taiwan's Natural Gas Production and Consumption, 1987-2007



Source: U.S. Energy Information Administration

Although natural gas was primarily consumed in the residential and industrial sectors in the mid-1980s, today the majority of natural gas goes towards power generation. Nearly 80 percent of natural gas consumed in Taiwan in 2006 was in the electric power sector.

Natural Gas Consumption By Sector, Taiwan



Source: Taiwan Ministry of Economic Affairs, Bureau of Energy

Exploration and Production

Taiwan has nine onshore natural gas producing fields on the western side of the island, as well as three offshore platforms in the CBK 1-3 natural gas fields. Despite limited production and discovery of natural gas reserves to date, CPC continues to conduct exploration activities, particularly in offshore areas. During 2005, CPC reported that it discovered 5.4 Bcf of additional proven natural gas reserves in the southeastern section of its Guantian natural gas field. In July 2005, Taiwan's legislature approved a CPC plan to explore and develop the offshore F Structure near Kaohsiung, which the company estimates holds 211 Bcf of natural gas. CPC is currently looking into delaying development at the F Structure, however, due to heavy costs associated with high crude oil prices and expensive offshore development equipment. CPC is also engaged in cross-strait cooperation with China's CNOOC in the Tainan basin in the Taiwan Strait, which CPC estimates to hold 41.7 trillion cubic feet (Tcf) of natural gas reserves. Initial drilling in the Tainan basin has not led to any commercial gas production as of yet (see the [South China Sea report](#) for more information).

Liquefied Natural Gas

Taiwan is the sixth-largest importer of liquefied natural gas (LNG) in the world and the third largest in Asia. Without significant domestic natural gas reserves, Taiwan must resort to LNG imports to meet energy demand on the island. Taiwan had net imports of 372 Bcf of LNG in 2006, nearly 13 percent more than in 2005. Indonesia and Malaysia are Taiwan's largest suppliers of LNG, having delivered 151 Bcf and 154 Bcf of LNG respectively in 2006. Taiwan also receives shipments of LNG from Trinidad and Tobago, Algeria, Egypt, Nigeria, Oman, Qatar, Australia, and small spot cargoes from Equatorial Guinea. Taiwan receives LNG through spot, short-term, and long-term cargoes. The Taiwanese government hopes to increase imports of LNG to help meet the country's increasing energy needs, reduce carbon dioxide emission levels, and increase gas-fired power generation. CPC expects LNG demand to rise by 25 percent by 2010.

Concerns have grown over Taiwan's LNG supply security, particularly after Indonesia's Pertamina canceled ten LNG cargoes to Taiwan in late 2004. In addition, in light of concerns about falling output, Indonesia does not intend to renew a LNG contract with Taiwan that is currently set to expire in 2009. Another major contract between the two countries is set to expire in 2017. CPC is currently pursuing alternative long-term LNG contracts in order to diversify and ensure an adequate and reliable supply. As a result, CPC signed a 25-year LNG purchase agreement for 3 million tons per year (146 Bcf) with Ras Laffan Liquefied Natural Gas Company Ltd II (RasGas II) of Qatar to begin in July 2008. In August 2006, Japan's NYK-Mitsui joint venture won a 25-year contract to ship the LNG from Qatar to Taiwan. In 2008, CPC and Australia's Woodside Petroleum Ltd signed a deal for 2 to 3 million tons per year (97 to 146 Bcf/y) of LNG supplied from the Browse LNG project off Western Australia for a term of 15-20 years. The deal represents one of the largest trade deals ever for Australia and is scheduled to begin between 2013 and 2015.

CPC owns and operates Taiwan's only LNG receiving terminal at the Yungan township of Kaohsiung, which has a capacity of 7.4 million tons per year (360 Bcf/y of natural gas). The terminal was completed in 1990, thereby beginning Taiwan's importation of LNG. The terminal underwent several expansion projects to reach its current capacity and also includes a long-distance undersea pipeline connecting the terminal to the town of Tonghsiao to the north. To meet rising demand, CPC is also constructing a new LNG import terminal in Taichung, which is expected to come online in August 2008. The start-up date was postponed from January 2008 due to delays in the construction of a pipeline connecting the terminal directly with the state-owned utility Taipower's Tatan Power Station. The project will add 3 million tons per year (146 Bcf/y) of LNG import capacity. CPC signed a 25-year contract in 2003 to supply the Tatan plant with 1.68 million tons per year (82 Bcf) of LNG via the Taichung terminal beginning in 2008. In addition, reports indicate that Taipower is seeking government approval to import LNG independently of CPC, either by building its own import terminal or leasing facilities from CPC. Taipower currently buys its natural gas from CPC.

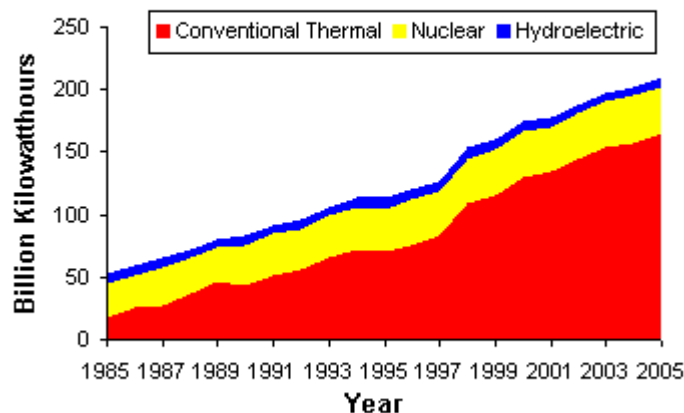
To facilitate supply and expand the use of natural gas in Taiwan, CPC has constructed a transmission and distribution network along the country's west coast, which includes a 1,100-mile trunkline and 36 regional distribution stations.

Electricity

In the mid-1980s, nuclear power represented nearly half of the electricity generated in Taiwan. In 2005, however, nuclear power comprised only 18 percent of Taiwan's total electricity generation.

In 2005, Taiwan had nearly 38 gigawatts (GW) of installed generation capacity, from which it generated 210.3 billion kilowatthours (Bkwh) of electricity. The majority of electricity in Taiwan is generated from conventional thermal sources. In 2005, 165 Bkwh of electricity came from conventional thermal (roughly 78 percent of total electricity generated) while 8 Bkwh (3.7 percent) was from hydroelectric power, and 38 Bkwh (18.1 percent) was nuclear. In the mid-1980s, nuclear power comprised roughly half of the total electricity generated in Taiwan. However, the growth of fossil fuel-based power stations has decreased the share of nuclear power in Taiwan's energy mix.

Taiwan's Electricity Generation by Source, 1985-2005



Source: EIA International Energy Annual

Sector Organization

State-run Taiwan Power Company (Taipower) currently dominates Taiwan's electricity sector. Taipower's monopoly status technically ended after 1994, when the Taiwanese government encouraged the formation of independent power producers (IPPs). Today, IPPs own roughly one quarter of Taiwan's generating capacity, although independent producers are required to sign power purchase agreements with Taipower, which maintains a monopoly in transmission and distribution activities. After joining the WTO in 2001-2002, foreign firms were permitted 100 percent ownership of firms in the sector. Plans to privatize Taipower are being discussed, although this process has been rather slow.

Taipower posted substantial net losses in 2007 as a result of the high cost of crude oil and coal, according to the company. Part of Taipower's poor financial performance stems from a freeze on energy rates. In an effort to bring prices in Taiwan more in line with international levels, in July

2006 Taipower raised electricity rates by 5.8 percent, which was the first time prices had been raised in more than 20 years. However, Taipower requested additional price hikes and the government ultimately allowed a 12.6 percent average increase in prices in July 2008. Another increase is scheduled for October.

Conventional Thermal

Conventional thermal sources comprise the bulk of Taiwan's installed generating capacity. The fastest growth has been in natural gas-fired electricity generation, owing to government incentives that have encouraged new projects to use natural gas. Still, natural gas-fired plants only account for about 20 percent of electric capacity in Taiwan. Taipower is currently building a large 4,300-megawatt (MW) natural gas-fired power station at Tatan, to be fueled by LNG delivered from Qatar (see Natural Gas section). Taiwan heavily relies on coal for power generation and according to Taiwan's Ministry of Economic Affairs, 77 percent of the coal Taiwan consumes is for power generation purposes. Oil is declining as a share of power generation.

Nuclear

Taipower operates three nuclear power plants with a total capacity of 4,900 MW. The construction of Taiwan's fourth nuclear plant has been controversial, as has been nuclear power on the island in general. After coming into office in 2000, former President Chen cancelled the construction of the 2,700-MW Kungliao nuclear reactor at Lungmen with a vision of a "nuclear-free homeland". However, in February 2001, this decision was overturned by the legislature and development was continued. Recently the new KMT government has urged a speedier completion of the plant citing carbon dioxide emission concerns in power generation. Opponents to nuclear power express concerns over the storage of nuclear waste and the safety of nuclear power plants. Currently, the Kungliao project is scheduled to start commercial operations at its first unit in 2009, with the entire plant to be completed by 2012.

Other Sources

Hydroelectric power accounts for 12.1 percent of installed generating capacity, although in 2005 only 3.7 percent of Taiwan's total electricity generation came from hydroelectric sources. In addition, the government of Taiwan encourages the use of renewable energy sources in power generation, including wind power, solar energy, and biomass, however these sources accounted for less than one percent of electric capacity in Taiwan in 2005 and minimal power is generated from these sources.

Profile

Energy Overview

Proven Oil Reserves (January 1, 2008E)	2.38 million barrels
Oil Production (2007E)	10.6 thousand barrels per day
Oil Consumption (2006E)	950.5 thousand barrels per day
Crude Oil Distillation Capacity (2008E)	1.29 million barrels per day
Proven Natural Gas Reserves (January 2007E)	220 billion cubic feet (OGJ); 2.5 trillion cubic feet (Cedigaz)
Natural Gas Production (2007E)	14 billion cubic feet
Natural Gas Consumption (2007E)	399 billion cubic feet
Recoverable Coal Reserves (2003E)	1 million short ton
Coal Production (2004E)	None
Coal Consumption (2007E)	72.7 million short tons
Electricity Installed Capacity (2005E)	37.4 gigawatts
Electricity Production (2005E)	210.3 billion kilowatt hours
Electricity Consumption (2005E)	201.58 billion kilowatt hours
Total Energy Consumption	4.4 quadrillion Btus*, of which Oil (46%), Coal (35%), Natural Gas (9%), Nuclear

(2004E)	(9%), Hydroelectricity (1%), Other Renewables (0%)
Total Per Capita Energy Consumption (2005E)	198.1 million Btus
Energy Intensity (2005E)	8,532 Btu per \$2000-PPP**

Environmental Overview

Energy-Related Carbon Dioxide Emissions (2005E)	284.4 million metric tons, of which Coal (52%), Oil (40%), Natural Gas (8%)
Per-Capita, Energy-Related Carbon Dioxide Emissions (2005E)	12.53 metric tons
Carbon Dioxide Intensity (2005E)	0.54 Metric tons per thousand \$2000-PPP**
Environmental Issues	air pollution; water pollution from industrial emissions, raw sewage; contamination of drinking water supplies; trade in endangered species; low-level radioactive waste disposal

Oil and Gas Industry

Organization	CPC Corporation, Taiwan dominates all sectors of the oil and gas industry. Significant competition began in 2000 with the opening of the Mailiao refinery by the privately-owned Formosa Petrochemical Company (FPCC).
Major Oil/Gas Ports	Kaohsiung, Keelung, Hwalien, Taichung, Suao
Foreign Company Involvement	BP, ExxonMobil
Major Refineries (capacity, bbl/d)	CPC's Kaohsiung (270,000), Ta-Lin (300,000), and Tao-Yuan (200,000) refineries and FPCC's Mailiao refinery (520,000)

* The total energy consumption statistic includes petroleum, dry natural gas, coal, net hydro, nuclear, geothermal, solar, wind, wood and waste electric power. The renewable energy consumption statistic is based on International Energy Agency (IEA) data and includes hydropower, solar, wind, tide, geothermal, solid biomass and animal products, biomass gas and liquids, industrial and municipal wastes. Sectoral shares of energy consumption and carbon emissions are also based on IEA data.
 **GDP figures from OECD estimates based on purchasing power parity (PPP) exchange rates.

Links

U.S. Government

[American Institute in Taiwan](#)
[CIA World Factbook – Taiwan](#)
[U.S. Department of State - Consular Information Sheet - Taiwan](#)
[U.S. Department of State - Taiwan Background Notes](#)

Foreign Government Agencies

[Government Information Office – Taiwan](#)
[Ministry of Economic Affairs \(MOEA\) –](#)
[Taipei Economic and Cultural Representative Office \(TECRO\) in the United States](#)

Oil and Natural Gas

[Chinese Petroleum Corporation \(CPC\)](#)
[Formosa Petrochemical Corporation](#)

Electricity

[Taiwan Power Company \(Taipower\)](#)

Sources

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