



China



In 2002, the Chinese government dismantled the monopoly State Power Corporation (SPC) into separate generation, transmission, and services units. Since the reform, China's electricity generation sector has been dominated by five state-owned holding companies, namely China Huaneng Group, China Datang Group, China Huadian, Guodian Power, and China Power Investment. These five holding companies manage more than 80 percent of China's generating capacity. Much of the remainder is operated by independent power producers (IPPs), often in partnership with the privately-listed arms of the state-owned companies. Deregulation and other reforms have opened the electricity sector to foreign investment, although this has so far been limited.

During the 2002 reforms, SPC divested all of its electricity transmission and distribution assets into two new companies: the Southern Power Company and the State Power Grid Company. The government aims to merge SPC's 12 regional grids into three large power grid networks, namely a northern and northwestern grid operated by State Power Grid Company and a southern grid operated by the Southern Power Company. Chinese officials hope to achieve an integrated national electricity grid by 2020. Also in 2002, the State Electricity Regulatory Commission (SERC) was established, which is responsible for the overall regulation of the electricity sector.



Photo: Bloomberg

According to one industry study conducted at the end of 2005, over 120 gigawatts (GW) of generating capacity is currently under construction in China. Rapid growth in electricity demand has spurred significant amounts of investment in new power stations. Although much of the

PROFILE

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| Capital | Beijing | Installed Capacity | 384,500MW |
| Area | 9.6 million km ² | Population Electrified | 97.9% |
| Population | 1.3 billion | Main Voltages (kV) | 500, 330, 220, 110, 66 |
| GDP | US\$9,904 trillion | Natural Resources | coal, petroleum, natural gas, uranium, hydropower potential (world's largest) |
| Currency | Yuan | | |



Photo: Bloomberg

new investment has been earmarked to alleviate electricity supply shortages, some independent analysts forecast the possibility of oversupply as an assortment of new projects are scheduled to come online between 2007 and 2009. To ward off a possible supply glut, Chinese government officials have made an effort to approve new projects at a steady and measured rate.

Demand

Energy consumption grew by almost 6% a year in the first half of the 1990s, but slowed towards the end of the decade, actually shrinking in 1997-99. The pace of demand did not start picking up again until 2002, with total energy consumption increasing by an average of 13.7% between 2003 and 2005. The consumption of electricity has increased more rapidly than overall energy demand throughout the reform era, with growth averaging 15.5% a year in 2003-05. While the link between GDP growth and demand for energy and power has not been totally clear, possibly because of statistical problems, there is a broad correlation. Consequently, energy consumption is estimated to have risen substantially again in 2006, in line with estimated GDP growth of 10.5%.

Supply

China's immediate power crisis, which saw 24 out of 31 provinces suffering from power shortages in 2004, has been resolved. Indeed, in 2006 only

three provinces, Guangdong Zhejiang and Yunnan, had to resort to scheduled blackouts, and in 2007 China's overall energy needs should again be in surplus.

Problems first started to emerge in 2004, when soaring economic growth led to a largely unforeseen increase in energy demand. The government became concerned when problems with power supply started to affect businesses in some of the key manufacturing areas, such as Shanghai and Guangzhou. This prompted the central government, which had previously been dragging its feet on approving new power stations, to give the go-ahead to start building a new set of generators. As a result of this vast programme of power station construction, China's total power generating capacity is forecast to reach 675GW by the end of 2007, the equivalent of a one-quarter increase in just two years. There are even some concerns that the sector may experience another bout of severe oversupply, comparable to that seen in the late 1990s.

Although conventional thermal sources accounted for around 74% of electricity generation in 2004, hydropower and nuclear energy are rapidly expanding. Hydroelectric sources accounted for 16% of the subtotal and are seen as one of the most attractive options in the effort to diversify away from coal. China has an estimated 328GW of exploitable hydropower, the second-largest in the world behind Canada. Many

sites however would be hard to develop and are located in the west of the country, far from the main demand centres on the east coast. The Three Gorges project remains the largest hydroelectric plant, with 14 of its planned 26 generators running. As of October end 2006, it had a capacity of 9.8GW. By the time of its completion, scheduled for 2009, its capacity will be 18.2GW. Another large hydropower project involves a series of dams on the upper portion of the Yellow River in Shaanxi, Qinghai and Gansu provinces; the planned 25-generator project will have a combined installed capacity of 15.8gw.

Although nuclear power generated just over 2% of national power output in 2004, installed capacity has been rising sharply in recent years, from 2GW in 2002 to around 15GW in mid-2005. Existing stations are located at Ling'ao and Daya Bay in Guangdong province, Tianwan in Jiangsu (also known as Lianyungang), and Qinshan in Zhejiang. Future plans include an additional facility at Daya Bay and another at Yangjiang (also in Guangdong). Concerns over safety are high, given the proximity of China's nuclear power stations to the major commercial centres of Shanghai, Guangzhou and Hong Kong especially since the first plant at Daya Bay was forced to close 13 times in its first year of operation in response to safety fears. Nevertheless, Chinese officials have been keen to expand the sector to diversify energy sources, especially as uranium can be obtained from relatively stable suppliers, such as Australia. The target is to achieve around 40GW of production by 2020, but even at this level it would account for less than 5% of national capacity.

Conventional thermal

Conventional thermal sources are expected to remain the dominant fuel for electricity generation in the coming years, with many power projects under construction or planned that will use coal or natural gas. As with coal mining, the Chinese government is looking to shut down or modernize many small and inefficient power plants in favor of medium-sized (300 to 600 MW) and large (1,000 MW and up) units. China's eleventh five-year plan, covering the period 2005-2010, calls for the country to increase the share of natural gas and other cleaner technologies into



Photo: Bloomberg

the country's energy mix.

There are several examples of China's effort to bring new natural gas-fired power stations online. In July 2006, Huaneng Power International, which is China's largest listed electricity generation company, started operations at a new natural gas-fired power plant in Shanghai. The facility has a capacity of 1,200 MW, making it China's largest natural gas-fired power station. Construction is also underway at the 2,000-MW Huizhou power plant near Shenzhen that will use 560,000 metric tons of liquefied natural gas (LNG) per year from the new Guangdong terminal. Also in Guangdong, at least six other 300-MW natural gas-fired units are planned or under construction, and 1.8 GW of other existing coal and oil-fired power plants are being converted to run on natural gas. The first natural-gas fired plant in Beijing started operations in July 2006. The new unit has a capacity of 150 MW, and several companies are working to open additional larger natural gas-fired generators in Beijing before the 2008 summer Olympics.

Although many analysts forecast that natural

gas will see the greatest percentage rise in installed electricity generation capacity over the next decade, coal is expected to show the largest increase in absolute terms. In the first half of 2006, the continued uncertainty over future Russian natural gas supplies and the rising costs of planned LNG imports may push China even more toward coal for its future energy needs. China has vast coal reserves, much of which have yet to be developed, and coal projects tend to be much cheaper than natural gas or other sources.

Hydroelectric

In 2004, China was the world's second-largest producer of hydroelectric power behind Canada. In the same year, China generated 328 billion kilowatt-hours of electricity from hydroelectric sources, representing 15.8 percent of its total generation. This figure is likely to increase given the number of large-scale hydroelectric projects planned or under construction in China. The largest power project under construction is the Three Gorges Dam, which will include 26 separate 700-megawatt (MW) generators, for a total of 18.2 gigawatts (GW). When completed, it will be the largest hydroelectric dam in the world. The Three Gorges project already has several units in operation, but the project is not expected to be fully completed until 2009.

Another large hydropower project involves a series of dams on the upper portion of the Yellow River. Shaanxi, Qinghai, and Gansu provinces have joined to create the Yellow River Hydroelectric Development Corporation, with plans for the eventual construction of 25 generating stations with a combined installed capacity of 15.8 GW.

Nuclear

China is also actively promoting nuclear power as a clean and efficient source of electricity generation. Although it makes up only a small fraction of China's installed generating capacity, many of the major developments taking place in the Chinese electricity sector recently involve nuclear power. EIA and independent sources forecast that China will add between 15 and 30 GW of new nuclear energy capacity by 2020, but even with this expansion, nuclear power will only represent between 2.5 and 4.5 percent of total

installed generating capacity. As of mid-2006, China had eight new nuclear power plants under construction, the biggest of which is a 6-GW nuclear complex at Yangjiang in Guangdong province, set to begin commercial operation in 2010.

Environment

China's rapid economic growth over the last two decades has also brought with it several energy-related environmental problems. Environmental pollution from fossil fuel combustion is damaging human health, air and water quality, agriculture, and ultimately the economy. Many of China's cities are among the most polluted in the world. China is the world's second-largest source of carbon dioxide emissions behind the United States. EIA forecasts predict that China will experience the largest growth in carbon dioxide emissions between now and the year 2030.

China is a non-Annex I country under the United Nations Framework Convention on Climate Change, meaning that it is not bound to any greenhouse gas (GHG) emissions reduction targets set under the Kyoto Protocol. The Chinese government has taken several steps to improve environmental conditions in the country. Chief among these is the new Law on Renewable Energy, which took effect on January 1, 2006. The new law seeks to promote cleaner energy technologies, with a stated goal of increasing the use of renewable energy to 10 percent of the country's electricity consumption by 2010 (up from roughly 3 percent in 2003).

