25 per cent of the particular grid's total capacity. When fully established, the generating companies will bid to access the grid and the transmission company will purchase power from the generating company with the lowest bid. Also, at some time in the future, Beijing is likely to use an initial public offering to sell its ownership of the two grid companies to private investors. The sale of SPGC is rumoured to be a possibility in 2008 or 2009 but with the difficulties encountered during 2008, especially the earthquake in Sichuan, *Urandaline* does not expect this to happen before the end of 2010.

Deregulation means that reserve capacity can be reduced and the capital charge per unit of capacity will be lower

Ultimately, the government hopes to be in a position where each of the five national IPPs will offer output to one unified grid, and electricity will be accepted according to an auction process. These auctions would be conducted every half hour or so by an impartial regulator, with the lowest offer being accepted for supply. The process would mean that individual generating companies could reduce their need for reserve capacity so that a higher proportion of their total capacity would be available to the market. In developed countries that have deregulated their power systems, the increase in available capacity has resulted in an initial reduction in power tariffs. The increased plant utilisation means that capital charges, a major cost component in capital-intensive activities such as the power industry, are now spread over a wider base, so that the cost per unit of production is lower.

China needs to support sustained high levels of investment in power infrastructure

China's situation is very different from that of developed countries whose power systems have been deregulated. Countries such as the US, UK and Australia have high per capita levels of power consumption, and, prior to deregulation, each had well-developed power-generating and reticulation infrastructure. On the other hand, China's per capita consumption of electricity is only one-seventh that of the US and is increasing at a much faster rate. Unlike the US, China needs to expand essential power infrastructure, both generating and reticulation capacity, and this will require sustained high levels of investment.

The California energy crisis demonstrated the importance of setting tariffs to cover capital costs

The 2000-01 California energy crisis demonstrated that power sold at the marginal cost of production creates no incentive for suppliers to expand capacity. Over time, without additional capacity, plant reserve margins fall, and this drives up tariffs. This point is particularly relevant to China, because escalating demand requires a sustained long-term programme to build new capacity, which, under a deregulated system, can be funded only with the proceeds of tariffs collected from consumers. Current Chinese tariffs are not sufficient to cover the investment necessary to sustain

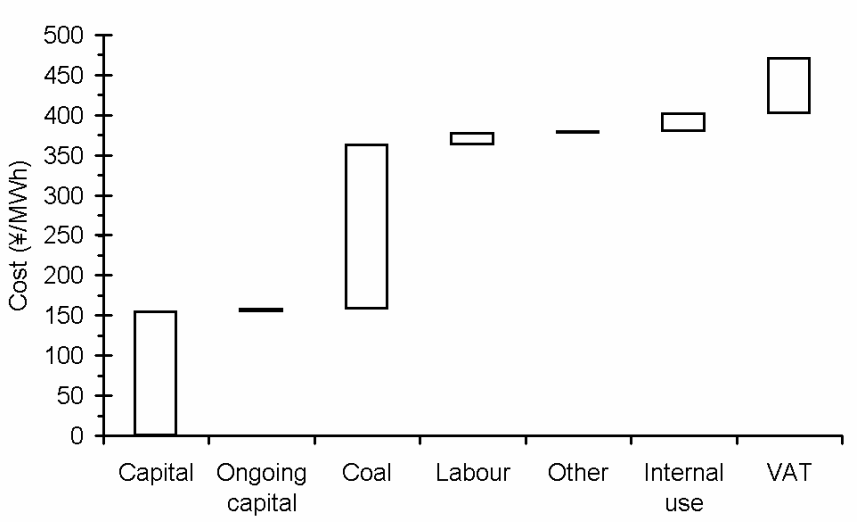
expansion of the country's generation and transmission systems.

China's average on-grid tariff does not cover generation and transmission

Urandaline estimates that China's average on-grid tariff, including value added tax (VAT) paid to generating companies, is around ¥350 per megawatt hour (MWh), which is much less than what is required to amortize investment in new generation capacity.[19] Using China's average thermal coal price for June 2008, Exhibit 3.7, which summarises the capital and operating costs for a 600-MW ultra-supercritical Chinese coal-fired power generator located in Shanxi, demonstrates that the full on-grid cost for generating capacity alone (i.e., excluding transmission and distribution) is ¥450 per MWh – ¥100 per MW below the average tariff.

Exhibit 3.7: Capital and operating costs for a 600-MW coal-fired generator

Capital charges and the cost of coal are the main cost elements in producing electricity



Source: *Urandaline* analysis.

Thirty-eight per cent of China's power generation plants report they are losing money and the 62 per cent of profitable generators have a 9.6 per cent net profit margin

The fact that 38 per cent of China' power generation plants report they are losing money and the fact that the 62 per cent of profitable generators have a mere 9.6 per cent net profit margin suggests the analysis in Exhibit 3.7 is reasonably accurate. Further evidence comes from Datang Power Group, which reported that of the 74 plants it owned in 2006, 40 (54 per cent) were profit-making, while the remaining 34 (46 per cent) were loss-making.[20] In 2008, IPPs expect to pay at least an additional 10 per cent for their coal and this increase will deepen their financial losses, and, as will be seen later in this chapter, the losses affect their ability to sustain a reliable supply of electricity.

[19] *Annual Development Report of China's Power Industry* (2006) p 53 and company annual reports.
[20] *China Power Sector*, Deutsche Bank, 8 September 2005, p 92.

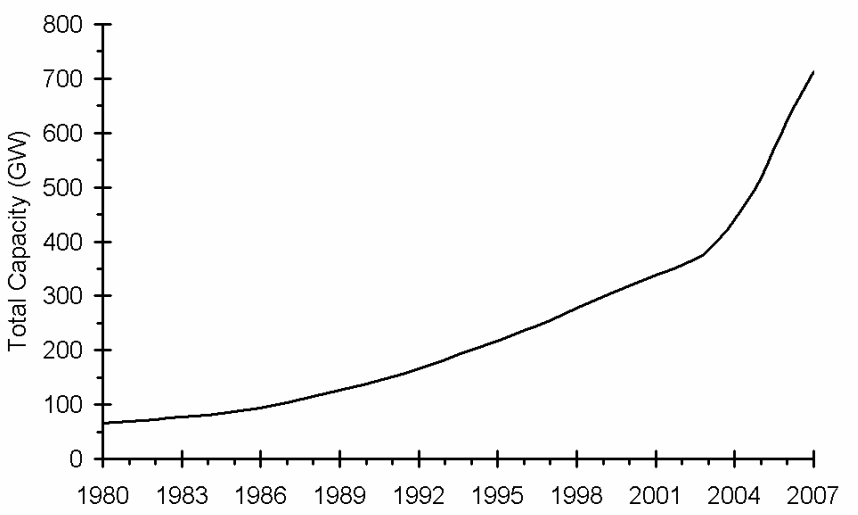
Supply of electricity

China is the world's second-largest power producer

Since 1980, China has added an average of 23 GW per year to its generating capacity, which has increased installed capacity to 713 GW (Exhibit 3.8). In 2007 China produced 3,256 terawatt hours (TWh) of electrical power, making it the second-largest power-producing country in the world after the United States, which produced around 4,090 TWh.

Exhibit 3.8: Growth in power-generation capacity

With 23 GW added each year since 1980, China's power generation capacity now exceeds 713 GW



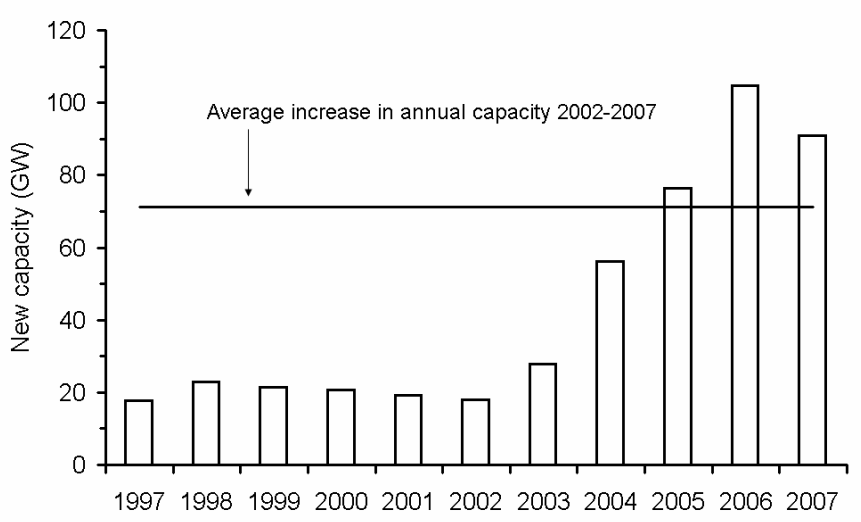
Source: China Statistical Yearbook (various years).

In each of the past five years, China has added the equivalent of a UK or an Italy to its generating capacity

Since 2002, China has added 356.4 GW of new generating capacity, equivalent to an annual average increase of 71.3 GW (Exhibit 3.9). The UK's generation capacity is 78 GW, as is capacity in Italy. Thus, in each of the past five years, China has added the equivalent of a UK or an Italy to its generating capacity – truly a massive undertaking. Looked at in another way, China's increase in electric power generation has averaged 324 TWh in each of the past five years. This annual average increase is 70 per cent more than Hydro-Quebec's annual production of electricity.

Exhibit 3.9: Annual new generating capacity

A new wave of capacity expansion began in 2004 when China was suffering severe power shortages



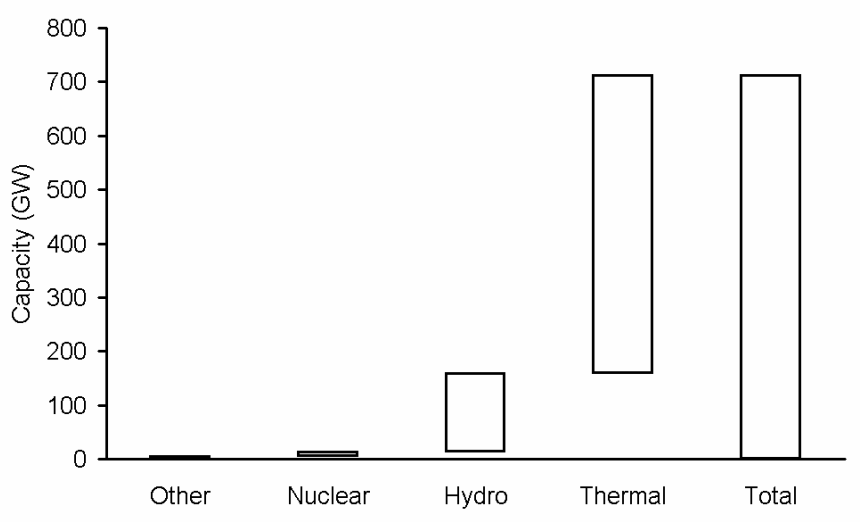
Source: China Statistical Yearbook (various years).

Most of China's electricity is produced from coal-fired power stations

Thermal power, principally coal-based, accounts for three-quarters of China's power-generating capacity, with hydropower making up most of the balance (Exhibit 3.10)[21]. A small amount of capacity, 9.1 GW, is powered by nuclear energy and 4.47 GW runs on alternative energy such as biomass, wind and solar power.

Exhibit 3.10: Structure of generating capacity

Generating capacity is basically thermal and hydropower



Source: CIEC (2008).

.

[21] Included in the thermal capacity is 9.6 GW of oil-based capacity and 14.7 GW of gas-fired capacity.