



# Hong Kong SAR



Hong Kong relies on two investor-owned companies – CLP Power Hong Kong Limited (CLP) and The Hongkong Electric Company, Limited (HK Electric) – to provide electricity to its almost seven million residents.

CLP Power, a principal subsidiary of the CLP Holdings, is the larger electric utility business in the territory, supplying power to the population in Kowloon, New Territories, as well as to Lantau, Cheung Chau and most of the outlying islands. It has 8,888 MW of installed generating capacity from its three power stations in Hong Kong and two generation facilities in the Chinese Mainland.

HK Electric supplies power to both Hong Kong Island and Lamma Island. Since 1990, electricity generation has been carried out entirely at the Lamma Power Station, which has a total installed capacity of 3,756MW. HK Electric does not import electricity from or export electricity to any other country.

The two companies are connected by three 240 MVA submarine cable circuits to ensure security of supply and to achieve fuel savings through lower operating reserve requirements.

The electricity market in Hong Kong is governed by the Scheme of Control (SoC) agreements, which monitor the operations of power companies and lay out the tariff setting mechanism, the calculation of net return and the procedures for government monitoring. The current SoC was renewed in 1993 and will expire in 2008.

The HKSAR Government launched a two-stage consultation on the future regulation of Hong Kong's electricity industry in 2005/06, and is now discussing with the power companies on the post-2008 regulatory arrangements.



Photo: Bloomberg

## Generation

CLP's three power plants in Hong Kong – namely, Castle Peak, Black Point and Penny's Bay – have an installed capacity of 6,908 MW. They are fully owned by Castle Peak Power Company Limited (CAPCO), a partnership between ExxonMobil Energy Limited (60%) and CLP (40%).

CLP also obtains power from the pressurised water nuclear power station at Daya Bay and the Pumped Storage Power Station at Conghua, both in Guangdong Province in China. In all, CLP has an installed generating capacity of more than 8,888 MW in Hong Kong. In 2006, the local demand in Hong Kong was 6,435MW and system demand reached 8,318MW. In the same year, it successfully reduced its emissions by 10-20% as a result of an increased use of ultra-low sulphur coal, a new initiative pioneered by CLP.

To further achieve emissions reduction targets by 2010 as set by the Hong Kong and Guangdong Governments, the CLP has plans to retrofit its Castle Peak "B" Power Station with

## PROFILE

Capital	–	Installed Capacity	12,644MW
Area	1,092 km <sup>2</sup>	Population Electrified	100%
Population	6.86 million	Main Voltages (kV)	400, 275, 132, 66,
GDP	US\$258.6 billion		33, 11, 0, 38
Currency	Hong Kong Dollar (HK\$)	Natural Resources	–

Company	Power Stations	Generating capacity (MW)	Fuels
HEC	Lamma	3,756	8 coal-fired units and 7 gas turbine units
CLP	Castle Peak, Black Point, Penny's Bay	8,888	Coal-fired, gas-fired and diesel oil-fired units

Flue Gas Desulphurisation and NOX reduction facilities and develop an LNG receiving and storage terminal in Hong Kong. The maximum demand in HK Electric's system was 2,597MW in 2006.

HK Electric's Lamma Power Station has an installed generating capacity of 3,756MW, consisting of eight coal-fired units, five gas turbine units, a gas-fired combined-cycle unit, a combined-cycle unit converted from two industrial gas turbines and a wind turbine. The distillate-fired, simple-cycle gas turbine units provide the necessary electric power for the back start capability of the steam generating units and serve as back-up power supply during emergencies.

The main generating units at the Lamma Power Station are designed for 100% coal firing. However, to retain flexibility in fuel selection, oil-

firing provisions are also made. For economical reasons, all units burn 100% coal under normal operating conditions. Oil firing is only used during start-up, shutdown or flame stabilisation at low loads. In 2006, coal consumption was around 4.1 million metric tonnes.

The first grid connected wind turbine in Hong Kong, Lamma Winds, was officially opened by the Secretary for Environment, Transport and Works in February 2006. The turbine and its adjacent exhibition centre have since become a major landmark on Lamma Island attracting numerous visitors from professional, environmental, educational and community groups.

In addition, the Lamma Power Station Unit 9, the first combined cycle gas turbine adopting the cleaner liquefied natural gas as fuel for firing, was put into commercial operation in October 2006. Natural gas is delivered to site from the Shenzhen LNG Terminal via a 92 km submarine gas pipeline, construction of which was completed in June 2006.

### Transmission and Distribution

Hong Kong is 100% electrified with power grids covering the majority of its population.

CLP Power delivers supplies to its 2.24 million customers over 12,958km of transmission and distribution circuits comprising of: 554km of 400kV circuits; 1,255km of 132kV circuits; 171km of 33kV circuits; and 10,978km of 11kV circuits

The network involves overhead, underground and submarine cables. The CLP Power network's transmission and distribution support 208 primary substations and 12,623 secondary

Photo: Bloomberg



2006	CLP	HK Electric	Total	%
Coal	4,108	2,500	6,608	52.26
Oil	300	920	1,220	9.65
Gas	2,500	335	2,835	22.42
Nuclear	1,380	0	1,380	10.91
Pumped Storage	600	0	600	4.75
Renewables	0	0.8	0.8	0.01
Total	8,888	3,756	12,644	100
2005	CLP	HK Electric	Total	%
Coal	4,108	2,500	6,608	55.08
Oil	300	920	1,220	10.17
Gas	2,188	0	2,188	18.23
Nuclear	1,380	0	1,380	11.5
Pumped Storage	600	0	600	5
Renewables	0	0.8	0.8	0.01
Total	8,576	3,421	11,996	100

substations and the total rating of transformers is 55,769MVA. Using the latest gas-insulated switchgear, the size of these substations has been greatly reduced to about one-tenth of the similar facilities elsewhere in the world.

Power generated at HK Electric's Lamma Power Station is transmitted at 275 kV to switching stations on Hong Kong Island, where it is stepped down to 132 kV before it is merged with the 132 kV transmission network, or stepped down directly to 11 kV or 22 kV for distribution. 275 kV submarine cables have been laid below the East Lamma Channel with a 40 m water depth. This installation is one of the highest capacity submarine cable networks in the world.

Up to 2006, there were 58 cable circuits with a total circuit length of 141 km, 11 switching stations and five zone substations in the 275 kV transmission network. For the 132 kV network, there were 12 switching stations, 21 zone substations and 266 km of circuit lengths.

HK Electric's 22 kV/11 kV/LV network comprises cables buried directly underground. The total length of these cables is about 5,039 km. HK Electric has 3,617 distribution substations serving 559,000 customers. The total rating of transmission and distribution transformers is 12,198 MVA.

At present, HK Electric has six 275 kV cable tunnels in its transmission system. The first tunnel,

completed in 1988, is the 3.1 km Wah Fu-Bowen Cable Tunnel. The second tunnel, completed in 1993, is the 5.7 km Nam Fung-Parker Cable Tunnel. The third tunnel, completed in 1999, is the 0.8 km Tin Wan-Wah Fu Cable Tunnel. The fourth tunnel, completed in 2002, is the 0.8 km Cyberport-Wah Fu Cable Tunnel. The other two tunnels, both completed in 2006, are the 0.2 km Yung Shue Wan Cable Tunnel and 0.1 km Pak Kok Tsui Cable Tunnel.

### Tariffs

The process for determining tariffs is included as part of the Scheme of Control (SoC) until 2008, between the Hong Kong Government and the two power companies. The power companies are allowed to charge tariffs which recover their operating costs and earn a permitted return on their investment.

A tariff review is also conducted annually in October and November to agree on tariff adjustments for the following year. Tariff charges are calculated based on a cost-plus profit approach. The profit is determined by a unanimously accepted permitted rate of return on the average net fixed assets of the electric businesses in Hong Kong.

CLP has not increased its tariffs since 1998 and in 2006 the company announced that tariffs would again be frozen during 2007. CLP has rebated more than \$3 billion to its customers since 1999, despite fuel price surges in recent years. This is equivalent to a 3.7% tariff reduction in the respective years.

CLP has four tariffs: Domestic, General Service (for consumption that is not solely domestic), Bulk (for customers with monthly consumption of not less than 20,000 kWh), and Large Power (applicable to customers with demand not less than 3,000 kVA). CLP offers a concessionary tariff for those who are over 60 years of age, who live alone or with other similarly qualified elderly to assist, and who rely on or are entitled to social security assistance.

HK Electric has three tariffs – Domestic Tariff, Commercial, Industrial & Miscellaneous Tariff and Maximum Demand Tariff. Electricity tariffs include a basic charge and a fuel clause adjustment. The basic charge is used to recover



Photo: Bloomberg

total operating costs with fuel costs at a standard rate and the net return for shareholders. The fuel clause adjustment is to pass through the difference in fuel costs when the actual rate is higher or lower than the standard rate.

A 60% discount is given for the first 200 units of electricity consumed each month by the following categories of domestic customers eligible for Comprehensive Social Security Assistance:-

- Elderly of 60 or above (single or living with similar elderly)
- Applicant or family member receiving disability allowance
- Single-parent family
- Unemployed

### Environment

CLP was the first in the Asia Pacific region (except Japan) to use natural gas in power generation in 1996. This, complemented by the introduction of nuclear power from Daya Bay and various emissions reduction measures, has reduced the emissions by 50%-80% despite an 82% increase in total electricity demand since 1990. The company plans to bring Liquefied Natural Gas (LNG) to Hong Kong as another major step to meet the growing demand for a cleaner energy supply. In addition to using ultra low sulphur coal in their coal fired operation, CLP is undertaking additional emission reduction measures involving the retrofitting of Flue Gas Desulphurisation and NOx reduction facilities to its coal-fired power plant at Castle Peak. Upon completion in 2011, these measures are expected to reduce SO2 and NOx content significantly.

The company has also invested in renewable energy projects in the Asia Pacific region, including nine small hydro power plants, seven wind farms and one biomass project in the Chinese Mainland, one wind farm in India, as well as three wind farms in Australia. In Hong Kong, CLP Power has completed the study of a land-based wind turbine pilot demonstration, and is currently involved in a feasibility study of the development of a 150-200MW offshore wind farm in the Eastern Waters of Hong Kong. The CLP Holdings has voluntarily committed to sourcing 5% of its group generating capacity from renewable energy sources by 2010.

CLP's "PowerWise" is an energy efficiency education programme on energy efficiency and advisory services that are offered to customers to help reduce electricity consumption (since 1993), and ultimately reduce the environmental impacts arising from the use of energy. The CLP Energy Innovation Fund, launched in 2003, has funded HK\$4m to more than 28 community projects in energy efficiency and renewable products.

HK Electric, on the other hand, had embarked on the retrofit of a Flue Gas Desulphurisation (FGD) Plant to one of its 350MW generation units at Lamma Power Station as early as in 1993, in order to minimise the negative impact of electricity generation on the environment. It is the first power company in Southeast Asia, and still the only one in Hong Kong, to have installed FGD for reducing Sulphur Dioxide (SO<sub>2</sub>) emission during power generation. Until 2006, it had three coal-fired units with FGDs.

HK Electric introduced the use of renewable energy for power generation in Hong Kong by commissioning an 800 kW wind turbine at Tai Ling on Lamma Island in February, 2006. An exhibition centre on the development and application of various forms of renewable energy for education purpose was built in the Wind Turbine premises, which has become a distinct landmark and attraction for residents and visitors alike. Building on the success of Lamma Winds, HK Electric is currently conducting an environmental impact assessment of a 100MW offshore wind farm on Hong Kong water.

In order to further reduce emissions from power generation, HK Electric is in the process of



Photo: Bloomberg

implementing the retrofit of two more coal-fired units with FGDs and Low NO<sub>x</sub> burners by 2010. Natural gas from an LNG receiving terminal in Shenzhen is now available at Lamma Power Station extension, for operation of the first gas-fired combined cycle unit (L9) commissioned in 2006. The L9 CCGT unit is the most efficient and environmentally friendly generating unit operating in Hong Kong.

To strengthen its efforts on energy efficiency and conservation promotion, HK Electric's Smart Power Campaign took renewable energy as its theme for the year 2005/2006. Various activities including workshops, exhibitions, radio programmes, thematic competitions and open days were held to promote public understanding of renewable energy, its benefits and limitations.

In early 2006, HK Electric launched a Clean Energy Fund, which is open to all schools in Hong Kong, to promote better understanding and application of renewable energy in Hong Kong. Apart from these initiatives, HK Electric also produced a web-based energy efficiency education kit for secondary schools and continued its sponsorship of the Energy Efficiency Centre at Hong Kong's Science Museum.