





Hong Kong SAR

Hong Kong (Special Administrative Region of the People's Republic of China) has a land area of 1,092 sqkm. The population of 6.86 million is fully electrified. The region has no natural resources to speak of.

Industry Overview

Hong Kong relies on two private companies – CLP Power Hong Kong Limited (CLP Power) and The Hongkong Electric Company, Limited (HEC) – to provide electricity to its population of 7 million.

CLP Power, a principal subsidiary of 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 8,576 MW of installed generating capacity from its three power stations in Hong Kong and two generation facilities in the Chinese Mainland.

HEC previously supplied power to Hong Kong Island and the islands of Lamma and Ap Lei Chau. Since 1990, electricity generation has been carried out entirely at Lamma Power Station, which has a total installed capacity of 3,421MW.

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 set 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. In January 2005, the HKSAR Government launched a two-stage process of consultation on the future regulation of Hong Kong's electricity industry. The first phase solicited the public's views and ended in April 2005. The second phase, initiated in December 2005 consults the public on the Government's proposals for the post-2008 regulatory framework.

Generation

CLP Power's three power plants in Hong Kong - namely, Castle Peak, Black Point and Penny's Bay – have an installed capacity of 6,596 MW.

They are fully owned by Castle Peak Power Company Limited (CAPCO), a partnership between ExxonMobil Energy Limited (60%) and CLP Power (40%).

CLP Power 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 Power has an installed generating capacity of more than 8,500 MW with a further 312.5 MW to be fully commissioned in Hong Kong during 2006.

In 2005 local demand reached an historical peak of 6,475 MW in July and system demand achieved a high demand of 7,817MW. The reserve margin of generating capacity for local supply area fell from 30.6% previously to 27.6% in 2005.

PROFILE

| | | | |
|------------|-------------------------|------------------------|------------------|
| Capital | – | Installed Capacity | 11,683MW |
| Area | 1,092 km | Population Electrified | 100% |
| Population | 6.86 million | Main Voltages (kV) | 400, 275,132,66, |
| GDP | US\$234.5 billion | | 33,11, 0.38 |
| Currency | Hong Kong Dollar (HK\$) | Natural Resources | - |

Hong Kong does not have indigenous fuel sources (other than limited potential for renewable energy). In response to the need for reliable supply CLP Power has been diversifying its fuel mix since the mid-1990s. Currently, coal, natural gas and nuclear are the three major fuels being used to generate electricity and all are imported.

CLP Power has been supplying electricity to Guangdong in China for many years. The supply has increased significantly in recent years in support of Guangdong's phenomenal economic growth. In 2005, total export sales to Guangdong were 4,497 GWh.

The maximum demand in HEC's system has increased from 1,540MW in 1989 to 2,565MW in 2005.

HEC's Lamma Power Station has an installed generating capacity of 3,421 MW, consisting of eight coal-fired units, five gas turbine units, a CCGT unit and a wind turbine. The distillate-fired simple-cycle gas turbine units provide the necessary electric power for the black start capability of the steam generating units and serve as back-up power supply during emergencies.

The main generating units at Lamma Power Station are designed for 100% coal firing. However, to retain flexibility in fuel selection, oil-firing capability is also catered for. 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 2005, coal consumption was around 4.3 million metric tonnes.

One of the most significant developments in 2005 was the addition of the territory's first

wind turbine on Lamma Island. The 800kW grid-connected wind turbine started to generate electricity on 26th September 2005. In addition, the expansion of Lamma Power Station for housing additional CCGT units on a 22 hectares reclaimed land to the south is on schedule. Following the laying of a 93 km submarine gas pipeline from Shenzhen to Lamma Power Station in early 2006, HEC's first 335 MW CCGT unit using natural gas for electricity generation will be commissioned in August 2006. HEC does not import or export electricity to other countries.

Transmission and Distribution

Hong Kong is 100% electrified with power grids covering the majority of the population. Only population in remote areas such as the outlying islands adopt diesel generators for electricity generation.

CLP Power delivers supplies to its 2.2 million customers over 12,322km of transmission and distribution circuits comprising of:

- 554km of 400kV circuits
- 1,167km of 132kV circuits
- 274km of 33kV circuits
- 10,328km of 11kV circuits

The network involves overhead, underground and submarine cables. The CLP Power network's transmission and distribution support 210 primary substations and 12,434 secondary substations and the total rating of transformers is 55,953MVA. 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.

The fuel mix for power generation is shown in the following table:

| Fuel | % of Installed Capacity (CLP) | % of Installed Capacity (HEC) |
|----------------|-------------------------------|-------------------------------|
| Coal | 57 | 73.08 |
| Oil | 10 | 26.9 |
| Natural Gas | 16 | |
| Nuclear Energy | 12 | |
| Pumped Storage | 5 | |
| Wind | | 0.02 |



Power generated at HEC'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 2005, there were 56 cable circuits with a total circuit length of 130 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 265 km of circuits.

HEC's 22 kV/11 kV/LV network comprises cables buried directly underground. The total length of cables is about 4,996 km in 2005. HEC has 3,597 distribution substations serving 556,000 customers. The total rating of transmission and distribution transformers is 12,105 MVA.

At present, HEC has four 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 other two tunnels at Tin Wan and Cyberport, of length 1 km and 0.8 km, were completed in 1999 and 2002 respectively.

Tariffs

The process for determining tariffs is included as part of the Scheme of Control (SoC), which is in place 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 adjustment for the following year. Tariff charges are calculated based on a cost, plus profit approach. The profit is determined by an agreed permitted return on the average net fixed assets of the electric businesses in Hong Kong.

CLP has not increased its tariffs since 1998

and in 2005 the company announced that tariffs would again be frozen during 2006. CLP has rebated more than \$3 billion to customers since 1999, despite fuel price surges in recent 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 to 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.

HEC has three tariffs – Domestic Tariff, Commercial, Industrial & Miscellaneous Tariff and Maximum Demand Tariff. HEC's electricity rates include a basic charge and a fuel clause adjustment. The basic charge is used to recover 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 it is higher or lower than the standard rate. The special rebate is sometimes used to reduce the increase in electricity rate in order to alleviate the pressure on customers.

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 Power is a pioneer in Hong Kong in adopting measures to protect the environment. It 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 40%-80% despite an 81% increase in total electricity demand since 1990.

The company's 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 our coal fired operation, CLP Power is undertaking additional emission reduction measures involving the retrofitting of Flue Gas Desulphurisation and Selective Catalytic Reduction equipment to its coal-fired power plant at Castle Peak. Upon completion in 2011, the measures will reduce SO₂ by 90% and NO_x by 80%, bringing the plant into line with the best international environmental standards.

CLP Power continues to focus on improvements to increase the thermal efficiency of its power plants. In 2005, the total energy saved at CLP Power's power plants was 38.1 GWh.

In the area of renewable energy, CLP Holdings has voluntarily committed to sourcing 5% of its group generating capacity from renewable energy sources by 2010. It has actively invested in renewable energy projects in the Asia Pacific region, including nine small hydro power plants and five wind farms in the Chinese Mainland, as well as two wind farms in Australia. In Hong Kong, CLP Power has short-listed two sites for the development of a commercial scale wind turbine demonstration pilot.

CLP is also involved in a feasibility study into the development of a 150MW offshore wind farm near Sai Kung. Pre-feasibility work established an area off the coast of Sai Kung as the most appropriate for offshore wind generation. The work is being undertaken in concert with Wind Prospect, a leading international vertically integrated wind farm development, construction and operation company.

CLP Power conducts research, resource assessment, technology assessment, community projects and public education on environmental topics.

Public education programmes on energy efficiency and advisory services are offered to customers help reduce electricity consumption, and ultimately reduce the environmental impacts arising from the use of energy. CLP's "PowerWise" is an energy efficiency education

programme that has reached tens of thousands of students, families and businesses since 1993. ElectriCity, an interactive exhibition centre located in CLP's Castle Peak Power Station, receives 20,000 visitors annually. The company is also a sponsor of the energy efficiency centre at Hong Kong's Science Museum that gives tens of thousands of visitors each year new insights into energy conservation and environmental protection. The CLP Energy Innovation Fund, launched in 2003, has funded HK\$3m to 28 community projects in energy efficiency and renewable products.

To explore the use of renewable energy in Hong Kong, HEC commissioned 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 is established in the Wind Turbine premises, which has become a distinct landmark and attraction for local students and visitors.

In order to further reduce emissions from power generation, HEC is in the course of implementing the retrofit, by 2010, of two more coal-fired units with FGDs and Low NO_x burners. Natural gas from an LNG receiving terminal in Shenzhen is now available at Lamma Power Station extension, in time for commissioning of the first gas-fired combined cycle unit in 2006. It is HEC's intention that after 2010 more than 90% of our generation will be from gas-fired units and five coal-fired plants with low emissions of SO₂, NO_x and particulates.

To continue its efforts on energy efficiency and conservation promotion, HEC'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 earlier years of the Campaign, HEC also carried out energy audit for schools and advised them on ways to conserve energy.

In early 2006, HEC 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.



*The consultation results are available at the government website <http://www.edlb.gov.hk/edb/eng/papers/electricity/>

(The Following figures are for HEC only; the CLP details are included above)

What is the length of the installed network in circuit kms. and how much is of high, medium and low voltage?

| Voltage Level (in circuit Kms.)* | Dec 1981 # | Dec 1991# | Dec 2001# | Dec 2004 # | Dec 2005 # |
|--|------------|-----------|-----------|------------|------------|
| HVDC | 0 | 0 | 0 | 0 | 0 |
| 400 KV | 0 | 0 | 0 | 0 | 0 |
| 275kV/132kV | 177 | 275 | 370 | 393 | 395 |
| 33/22 KV/11kV/LV Distribution lines | 908 | 2824 | 4543 | 4933 | 4996 |

There are currently no plans by either the government or private companies to install more transmission lines and facilities.

| Sub stations | | | | | |
|---------------------------|--------|--------|--------|--------|--------|
| Step up sub stations | 2001 | 2002 | 2003 | 2004 | 2005 |
| Step down Sub stations | | | | | |
| (a) Number | 25 | 26 | 28 | 26 | 26 |
| (b) Agg. Capacity | 4500 | 4620 | 4900 | 4800 | 4860 |
| Distribution Transformers | | | | | |
| (a) Number | 5036 | 5121 | 5242 | 5295 | 5337 |
| (b) Agg. Capacity | 6810.2 | 6954.4 | 7117.7 | 7190.2 | 7245.3 |