

HONG KONG, CHINA

- *Hong Kong, China's primary energy demand is projected to grow annually at 3.0 percent over the outlook period, mostly from oil to support the strong demand for international air transport.*
- *Further improvement in living standards and increased requirements for road and air transport will boost the growth of energy demand.*
- *High dependence on road transport is fast becoming a serious concern from the point of view of air pollution and traffic congestion.*
- *Natural gas demand for electricity generation is expected to increase three-fold by 2030 to become the major fuel.*

RECENT ENERGY TRENDS AND ENERGY POLICY

Hong Kong, China's primary energy consumption has grown at 0.7 percent per year (2001-2003), while that of GDP grew at 2.0 percent per year. The decoupling of energy consumption growth from GDP growth is due to Hong Kong, China's economic structure which is dominated by the service industry.

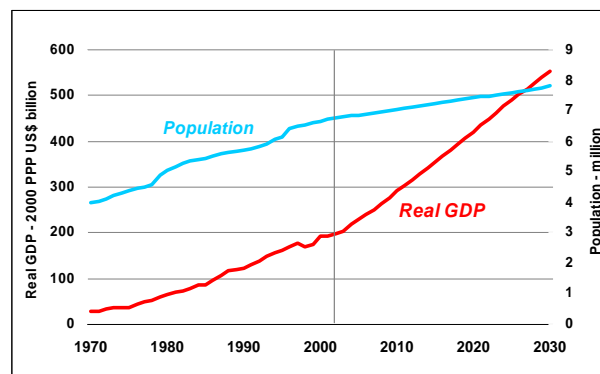
The absence of domestic energy sources has made Hong Kong, China a net importer for oil (mainly from Singapore) and natural gas (from China). Privately owned electric and gas utilities supply energy for the economy's daily requirements. Government has kept a free market economic policy and only intervenes when necessary to safeguard the interests of consumers, ensure public safety, and protect the environment. To this end, the government has encouraged the utilities to increase energy efficiency and has promoted the use of clean fuel for electricity generation. Hong Kong, China has also restricted future construction/development of additional coal-fired power plants to improve air quality and reduce CO₂ emissions. In future licensing agreements, the government will set conditions on power companies to install effective emission reduction facilities to achieve the government's emission reduction targets. The government has also introduced fuel quality and emission standards on vehicles to reduce roadside pollution.

ENERGY DEMAND DRIVERS

Hong Kong, China's economy has been constantly driven by its vibrant financial services sector. GDP is expected to grow annually by 3.8 percent over the outlook period, slower than the average annual growth rate over the past two decades. Besides the traditional financial, logistics, property, tourism and producer services, growth is supported by more knowledge-based and services industries such as fitness and beauty, theme park, business

consulting, and the environmental industry. By 2030, the share of GDP in the services sector is expected to reach more than 95 percent. Population is expected to grow slowly at 0.5 percent annually over the outlook period, reaching 7.8 million in 2030.

Figure 32 GDP and Population



Source: Global Insights (2005)

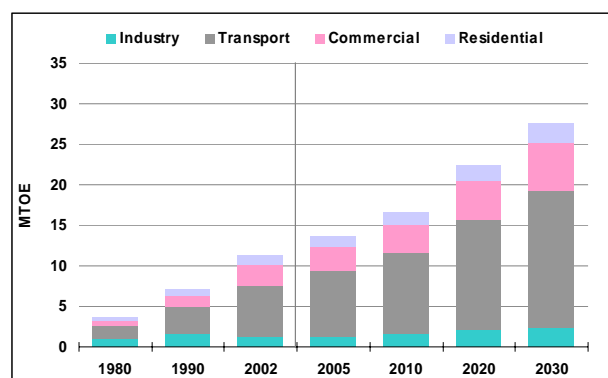
Due to limited land availability and intensive housing and building developments by government and private developers, the level of urbanisation reached 100 percent in 1995, making Hong Kong, China one of the most highly urbanised economies in the APEC region.

OUTLOOK

FINAL ENERGY DEMAND

Over the outlook period, final energy demand is projected to grow at 3.2 percent per year, slower than the 5.3 percent annual growth rate in the past two decades. In 2030, the transport sector will maintain the largest share at 61 percent, followed by commercial (21 percent), residential (9 percent), and industry (9 percent).

Figure 33 Final Energy Demand



Source: APERC Analysis (2006)

Industry

Energy demand in the industrial sector is projected to grow at an average annual rate of 2.1 percent until 2030, faster than its average annual growth of 1.0 percent over the past two decades. After peaking in 1999, Hong Kong, China's industrial energy consumption has plummeted at an annual rate of 16.8 percent, due mainly to the decline in industrial production. Energy demand however is projected to recover and grow slowly over the outlook period, reflecting the expected increase in industrial production³⁸ and higher emphasis on exports to Mainland China. But demand would not surpass the 1999 peak until after 2025. Petroleum products are the dominant fuel used in industrial production processes, and subsequently demand is projected to grow at 2.4 percent per year. Diesel will account for almost all of the industrial oil demand.

Transport

Transport energy demand is projected to more than double from 6.2 Mtoe in 2002 to 16.8 Mtoe in 2030. Much of the growth will come from the demand for jet kerosene for international air transport, accounting for more than 80 percent of the incremental transportation energy demand over the outlook period. The rest of the projected incremental transportation energy demand will come from the road transport sub-sector. Due to the rise in fuel requirements for international air transport, per capita transport energy demand will increase substantially from 0.92 toe in 2002 to 2.2 toe in 2030.

Hong Kong, China's international airport has been ranked the biggest in Asia in terms of passenger handling capacity since 2003. It serves as a regional aviation hub, as well as the gateway to the Pearl River Delta of Mainland China. Over the outlook period,

Mainland China's greater integration into the global economy is expected to further spur the growth of passenger air travel between Hong Kong, China and Mainland China. Globalisation of economic activities has increased the freight volume of air transport, and the trend is expected to continue, with Hong Kong, China's international airport serving as a logistical hub for international freight. As a result of these factors, the demand for jet kerosene is projected to increase at an annual rate of 4.6 percent over the outlook period.

Diesel demand for freight trucks is projected to grow at an annual rate of about 1.5 percent. Freight trucks will continue to serve as an important means of transporting manufactured products from the Pearl River Delta of Mainland China to the port of Hong Kong, China, with diesel consumption taking more than 80 percent of the energy demand for road transport.

The further rise in income and sprawling suburbs will increase vehicle ownership from 59 vehicles per 1,000 population in 2002 to 102 vehicles per 1,000 population in 2030, resulting in the two-fold increase in gasoline demand. Despite the substantial growth, per capita gasoline demand in Hong Kong, China will remain low at 0.11 toe in 2030 – about one-third of APEC average in 2030.³⁹

Residential and Commercial

Energy demand in the residential sector is primarily driven by the requirements for space cooling, water heating and cooking, which accounts for about 70 percent of the total energy demand in this sector. The other major uses of energy are lighting, refrigeration, and operation of appliances and other equipment. Thus, electricity and city gas are the two major fuels for the residential sector. Over the outlook period, residential energy demand is expected to grow at 2.6 percent per year in parallel with income growth⁴⁰ and improving living standards. Electricity is projected to maintain the largest share of total residential energy demand, accounting for 68 percent in 2030. With increasing energy demand for space cooling, demand for electricity is expected to grow at 2.4 percent per year, which is much slower than the 7.3 percent annual growth in the past three decades. City gas, which consists of LPG and town gas, will maintain the second largest share of total residential energy

³⁸ Value-added of Hong Kong, China's industrial sector is projected to grow at an average annual rate of 2.2 percent between 2002 and 2030.

³⁹ In 2003, more than 89 percent of the commuters in Hong Kong used public transport. Reliance on public transport for commuting is expected to continue in future.

⁴⁰ APERC projects that the income would grow by 3.0 percent annually.

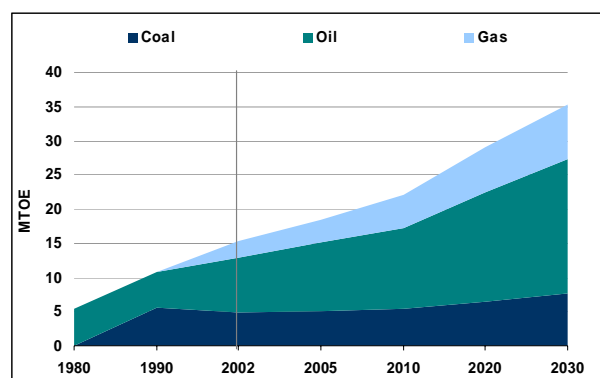
demand.⁴¹ As city gas replaces kerosene for cooking in households, new residential projects, and the development of gas pipeline distribution networks⁴², gas demand is expected to grow further at 3.3 percent per year over the outlook period.

Economic growth is the main driver influencing energy demand in the commercial sector, with space cooling and lighting being the primary uses of electricity.⁴³ Commercial energy demand is projected to grow at an annual rate of 2.9 percent, with over half of the growth resulting from increased use of electricity. The share of electricity in total commercial energy demand will increase from 78 percent in 2002 to 85 percent in 2030, maintaining the largest share of this sector. With sustained growth in the services industry⁴⁴, demand for electricity is projected to grow by 3.2 percent annually. LPG and city gas will account for the remainder of the total commercial energy demand both for cooking and water heating. Between 2002 and 2030, LPG is projected to grow by 2.0 percent per year and city gas by 0.6 percent per year.

PRIMARY ENERGY DEMAND

Total primary energy demand is projected to grow at an annual rate of 3.0 percent over the outlook period. Oil will maintain the highest share in the total primary energy demand, increasing from 51 percent in 2002 to 55 percent in 2030, supported by strong demand growth in the transport sector. Natural gas is expected to increase the fastest at 4.3 percent per year as new electricity generation will be met by natural gas-fired generation. Therefore the share of natural gas will increase from 16 percent in 2002 to 22 percent of total primary energy demand in 2030. In addition from the last quarter of 2006, natural gas will be used as feedstock for city gas production for residential and commercial sectors. Consequently, the share of coal will decrease from 30 percent in 2002 to 21 percent in 2030.

Figure 34 Primary Energy Demand

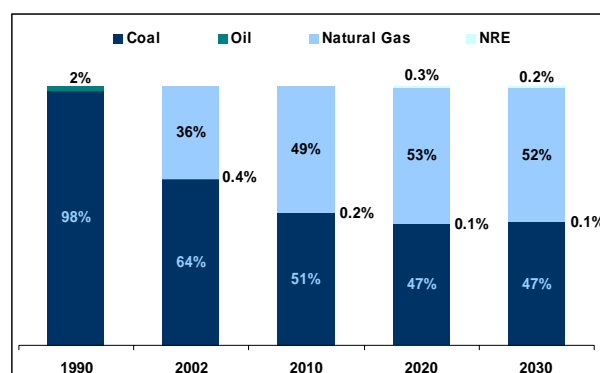


Source: APERC Analysis (2006)

ELECTRICITY

Hong Kong, China's electricity demand is projected to increase from 3.3 Mtoe in 2002 to 7.2 Mtoe in 2030, with an average annual growth rate of 2.8 percent per year over the same period. In 2030, the per capita electricity demand of Hong Kong, China is expected to reach 10,222 kWh, which is relatively low compared with other developed economies in the APEC region, such as 10,940 kWh toe for Japan and 16,188 kWh for the US.

Figure 35 Electricity Generation Mix



Source: APERC Analysis (2006)

Due to the government's decision not to permit the construction of additional coal-fired power plants, new capacity additions over the outlook period will be dominated by natural gas-fired combined-cycle units, consequently increasing the share of natural gas in the electricity generation mix from 36 percent in 2002 to 52 percent in 2030. Coal on the other hand, will decrease from 64 percent to 47 percent over the same period. Due to strong public opposition in relation to nuclear and limited land availability, nuclear power plants are not expected to be constructed over the outlook period. Hong Kong, China will however continue to import electricity from the Guangdong Daya Bay Nuclear

⁴¹ Natural gas will take 32 percent of the total residential energy consumption in 2030.

⁴² The government has encouraged the installation of piped gas supply in new buildings to discourage further growth in the use of LPG cylinders in domestic dwellings.

⁴³ Among energy consumption in commercial sector, the percentage of energy consumption in space conditioning was 20 percent, while that of lighting was 16 percent in 2002.

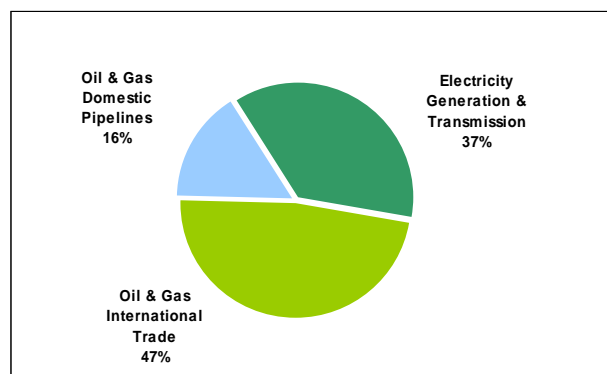
⁴⁴ APERC projects that value added in services industry would grow at 4.0 percent per year throughout the outlook period while increase its share in the total GDP from 90 percent in 2002 to 95 percent in 2030.

Power Station, which will continue to supply 9,800 TWh of electricity to the economy in 2030.⁴⁵

INVESTMENT REQUIREMENTS

The total energy investment requirements necessary to finance the infrastructure needed to meet Hong Kong, China's modest energy growth will reach between US\$11.8-16.5 billion by 2030. The majority of investment, at about US\$5.0-7.8 billion is earmarked for the expansion of the economy's oil and gas international trade facilities which include a natural gas pipeline connection between Hong Kong, China and the LNG receiving terminal in Guangdong, Mainland China.⁴⁶ Additional electricity generation units, upgrading transmission and distribution systems, and grid interconnection to Mainland China would likewise require about US\$4.9-6.0 billion in new investment. Other investments to improve energy efficiency, abatement of air pollutants, and development of alternative fuels for transport programs will be pursued both through government and private funding.

Figure 36 Investment Requirements



Source: APERC Analysis (2006)

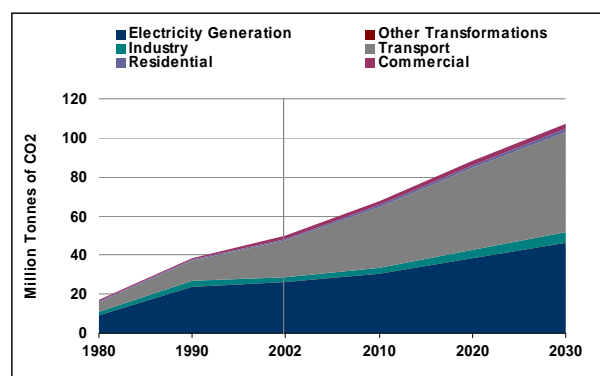
CO₂ EMISSIONS

CO₂ emissions from the energy sector are expected to increase by 2.8 percent annually through to 2030. Transport will remain the largest contributor to total emissions with the share projected to increase to 48 percent in 2030 from 38 percent in 2002, mainly from increased energy demand in the international air transport sub-sector. The share of CO₂ emissions from electricity generation is projected to decrease by 8.0 percent over the outlook period as less carbon intensive natural gas is utilised for new power plants.

⁴⁵ Once power supply agreement with Daya Bay expires in 2013, Hong Kong, China will have to continue sourcing electricity supply from Mainland China.

⁴⁶ Installation of submarine gas pipelines from Guangdong LNG receiving terminal to Hong Kong, China was completed in 2005.

Figure 37 CO₂ Emissions by Sector



Source: APERC Analysis (2006)

MAJOR ISSUES

FUTURE FUEL FOR ELECTRICITY GENERATION

The government is expected to impose more stringent environmental regulations on electricity companies, which will eventually change the electricity generation mix. In anticipation of these new environmental regulations, electricity companies have started to introduce less carbon-intensive natural gas-fired generation since as early as 1996. Hong Kong Electric Company Limited (HEC) has signed a long-term gas supply contract with the China National Offshore Oil Corp. (CNOOC) for the supply of natural gas from the Guangdong LNG receiving terminal with the first delivery expected at the end of 2006. CLP Group – the other incumbent electricity company – has been importing natural gas from the Yacheng gas field of Mainland China since 1996. As natural gas reserves in the Yacheng gas field are expected to deplete over the next decade, the CLP Group is considering building an LNG receiving terminal in Hong Kong, China to ensure the long-term supply of natural gas.

As an alternative measure to improving air quality, renewable energy for electricity generation has been considered by the two electricity companies. For example, in February 2006, HEC started operation of the first commercial-scale wind turbine on Lamma Island with an installed capacity of 800 kW, however, this only accounts for less than 1 percent of the total electricity generation capacity of HEC. The CLP Group also plans to develop renewable electricity generation capacity by 2012, accounting for approximately 5 percent of the company's existing total electricity generation capacity.

AIR QUALITY IMPROVEMENT

Hong Kong, China is only a small emitter of GHGs, accounting for approximately 0.2 percent of

global emissions. In 2003, the emissions per capita were 5.94 tonnes of CO₂, which was much lower in comparison with other APEC economies (10.85 tonnes of CO₂ for Chinese Taipei and 8.98 for Singapore). At present, 60 percent of total GHG emissions in Hong Kong, China come from electricity generation, and mitigation of these emissions will remain a major challenge for the government. For example, the government has encouraged the power companies to further improve the efficiency of their coal-fired units, reducing carbon intensity. The government has also considered mandating the phase out of inefficient industrial boilers and industrial technologies and equipment. In addition, the government is promoting the use of alternative cooling technologies such as water-cooled air-conditioning systems in commercial buildings, which can save approximately 20 to 30 percent of electricity compared with traditional technologies.

The government has been implementing measures to reduce air pollution from road transport and trans-boundary air pollution. As an example of road transport measures, as of January 2006, Euro IV emission standards have been imposed on newly registered vehicles. In addition, the government has initiated the reduction of emissions from local vehicles by replacing diesel powered taxis and light buses with that of LPG or electric-driven vehicle types.⁴⁷ In relation to trans-boundary pollution from industrial and commercial operations in the Pearl River Delta (PRD) region, the government in conjunction with the Guangdong Provincial Government reached an agreement to reduce the trans-boundary air pollutants by 20 to 55 percent in 2010, using 1997 as the base year.

IMPLICATIONS

Electricity tariffs are expected to increase, if CLP Group builds an LNG receiving terminal as a means to secure natural gas supply, because of the high cost nature of the LNG supply chain and the present institutional setup. The electricity market currently lacks incentives to lower electricity tariffs since electricity is supplied by the two independent, vertically integrated power companies each of which has their own distinct territories. Unless the government implements market reform to introduce competition between the two companies, there is little chance that electricity tariffs will decrease.

To combat serious air pollution problem, arising from road transport, the government may need to consider the implementation of comprehensive measures in addition to existing regulations. For example, following the case of Singapore, Hong Kong, China could consider instituting a quota system for car ownership, and electronic road pricing. These measures will reduce road traffic volume and limit the growth of vehicle ownership, and consequently reduce the air pollution from the road transport.

To cope with the trans-boundary air pollution problems, the government could further cooperate with the Guangdong Provincial Government. For example, common motor fuel standards could be implemented as the current motor fuel standards of Hong Kong, China are higher than that of Guangdong Province. Recently, due to the higher fuel price in Hong Kong, China, drivers of freight trucks refill gasoline or diesel oil in Guangdong Province and use the fuel in Hong Kong, China, leading to worsening air quality of Hong Kong, China.

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⁴⁷ As of 2004, almost all taxis in Hong Kong, China are LPG vehicle type, and about 2,400 diesel light buses, representing over 80 percent of the newly registered public light buses, have been replaced with LPG vehicle type.