

## Safety Regulation and the Rise of Towngas in Hong Kong

In April 2003, the question of whether Hong Kong and China Gas Company Limited – Hong Kong’s only supplier of towngas – was unfairly advantaged was raised by the Honourable Fred Li, member of the Legislative Council in Hong Kong.

*“A recent investment research report pointed that the Hong Kong and China Gas Co. Ltd (Towngas) achieved a hefty 34% return on fixed assets last year, and the firm’s share of the piped-gas market has already reached 70%. In this regard, will the Government inform this Council: ... whether it has assessed if monopoly has already existed in the domestic gas market; if the assessment result is in the affirmative, of the follow-up actions it will take... and; whether, apart from entering into an Information and Consultation Agreement with Towngas for the purpose of increasing the transparency in tariff setting mechanism and justifications thereof, it will consider regulating Towngas’s permitted level of return, gas tariff and related matters; if it will, of the details of its consideration; if it will not; the reasons for that?”<sup>1</sup>*

Mr. Stephen Ip, Secretary for Economic Development and Labour, responded:

*“The Hong Kong and China Gas Company Limited (HKCG) does not have a franchise or any exclusive right to supply gas in the territory. It operates in an open market environment and is a publicly listed company.... From the energy users’ perspective, a choice exists and there is competition among Towngas, LPG and electricity. The scale of operation or a major market share per se does not determine whether a business is anti-competitive or not. The Government has no plan to regulate HKCG’s rate of return or the tariff of Towngas.”*

Indeed, the debate on whether the Hong Kong Government should regulate or introduce greater competition in the gas industry had been going on for years, and the origin traced all the way back to 1981, when British Gas was commissioned by the Government to carry out a study and published a report entitled *Safety and Legal Aspects of Both Town Gas and LPG Operations in Hong Kong*. The Government promptly adopted the recommendations of the report and introduced policies and regulations that, on one hand, discouraged the use of

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<sup>1</sup> Gas supply by Hong Kong and China Gas in the territory, <http://www.info.gov.hk/gia/general/200304/09/0409179.htm>

*Andrew Lee prepared this case under the supervision of Dr. Ka-Fu Wong and Dr. Richard Y. C. Wong for class discussion. This case is not intended to show effective or ineffective handling of decision or business processes.*

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bottled LPG in households and banned transmission of LPG under public roads; on the other hand, encouraged the upgrading of substandard water heaters and the use of piped gas supplied by Hong Kong and China Gas Company Ltd. However, according to Dr. Pun-lee Lam, an economist specialized in government regulation and public utilities:

*“These constraints imposed by the government in the 1980s raised HKCG's competitive power and directly led to the company's success. Since the publication of the Safety Report (1981), the business of HKCG expanded rapidly and its book rate of return increased from 10.1 percent in 1981 to 28.7 percent in 1992.”*<sup>2</sup>

Meanwhile most consumers appeared to be less concerned and Towngas seemed to remain the preferred cooking and heating fuel in Hong Kong's households.

## **Historical Development of Hong Kong's Fuel and Gas Industry**

Founded in 1862 in England, Hong Kong and China Gas Company Limited was the oldest public utility company in Hong Kong.<sup>3</sup> It started supplying towngas in Hong Kong in 1864 with 24 km of gas supply mains connecting to some 500 street lamps and selected buildings. Hong Kong & China Gas Company's two plants were occupied by the Japanese during World War II, who ran them until the coal depleted. After the war, the demand for gas gradually picked up. By 1950, production at Hong Kong & China Gas Company resumed the pre-war level. Nevertheless, since most buildings at the time were not connected to towngas and that a large portion of the population was living in squatter areas or temporary housing all around Hong Kong, towngas was still out of reach of most households. In the early 1960s, Hong Kong & China Gas Company had only 15,000 customers in the early 1960.

Kerosene was the most popular fuel for domestic use in Hong Kong in the 1960s. Not only that kerosene was available from retail outlets, which provided delivery service, it was also much more efficient than using coal or firewood. Liquefied petroleum gas (LPG) cylinders were first introduced in Hong Kong in 1961.<sup>4</sup> Supplied by all the major gasoline companies, and distributed by a broad network of outlets that also provided delivery service, LPG cylinders (usually with the capacity of 10kg each) reached households that did not have access to towngas.

The 1960s and 70s saw the rapid expansion of demand for LPG and towngas. The fast growing and more affluent population and the simultaneous large-scale housing development projects provided the necessary customer base. At the same time, the rapid economic growth ensued a gradual increase in living standard, which in turned fueled the demand for clean and convenient domestic fuels, as well as the then modern gas appliances which, were far more superior than coal, firewood or even kerosene fueled appliances. With its strong smell and the inconvenient and accident-prone stove refilling process, kerosene was soon losing out to the cleaner and more convenient LPG, which became the most popular domestic fuel in the 1970s. By 1980, there were about 580,000 LPG customers in Hong Kong, while towngas came in second with about 200,000 customers.<sup>5</sup>

Sticking to its well-known laissez-faire policy, the Hong Kong Government had left the development of the LPG and towngas industry to the private sector.<sup>6</sup> Although, at one point,

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<sup>2</sup> Lam, Pun-Lee (1995). “Gas Regulation and Competition in Hong Kong” in *HKCER Letters*, Vol. 34, September 1995.

<sup>3</sup> Hong Kong and China Gas Company Limited (2003). [http://www.hkcg.com/en/abouttg/abouttg\\_03.html](http://www.hkcg.com/en/abouttg/abouttg_03.html)

<sup>4</sup> British Gas Corporation (1981). *Report on Safety and Legal Aspects of Both Town Gas and LPG Operations in Hong Kong*, Vol. 1., Government Printer: Hong Kong.

<sup>5</sup> British Gas Corporation (1981).

<sup>6</sup> British Gas Corporation (1981).

the enfranchisement of the Hong Kong and China Gas Company had been seriously considered, the idea was dropped eventually in 1976. The rationale then was that LPG was a readily available alternative and hence provided sufficient safeguard to the interest of the consumers.

Hong Kong & China Gas Company achieved quite a few milestones between 1960 and 1980. It became listed on the Hong Kong Stock Exchange in 1960. It engaged in significant service network extension including Tsuen Wan and Kwun Tong in the Kowloon Peninsula in 1964, and Chung Hom Kok and Stanley on Hong Kong Island in 1975. Another major achievement in 1975 for Hong Kong & China Gas Company was its first agreement with the Hong Kong Housing Authority to supply towngas to a public housing estate in Kowloon. To keep up with technological advancement, the feedstock that was used to produce towngas also changed twice – first in 1967 from coal to fuel oil, and then in 1977 from fuel oil to naphtha. In 1980, the company's marketing efforts, which coincided with the property development boom in Hong Kong, resulted in a 31 per cent increase in customers and the largest sales of appliances and equipment in the company's history.<sup>7</sup> By the end of 1980, the company's supply mains reached a total length of about 620 km.

### **The Consultant's Report in 1981<sup>8</sup>**

Despite its popularity, the safety issue of the use of gas had been looming in the background. Records of the Fire Services Department showed that from 1973 to 1980 there were 9 deaths involving towngas powered water heaters, while there were 24 deaths involving LPG powered water heaters. According to the records of the Coroner's Office on accidental deaths due to carbon monoxide poisoning, from 1975 to 1980, there were seven involving towngas and 13 involving LPG. The Government, however, never took the problem seriously. It was the death of five expatriates during the 1980 post Christmas week that shook the Government, which then promptly commissioned British Gas Corporation to study the issues and publish the *Report on the Safety and Legal Aspects of both Towngas and LPG Operations in Hong Kong*. One industry observer commented,

*“There had been numerous deaths due to unsafe water heaters in previous years, but it was no big deal to Government as they only involved local Chinese. But when 5 expatriates died, all hell broke loose and the press took it up as a big campaign resulting in the consultancy report.”*

Published in late 1981, the four-volume report thoroughly looked into the status quo of both towngas and LPG operations in Hong Kong. On the outset, it found that the standards relating to manufacture, storage and distribution for towngas were generally good, which were attributable to the vertically integrated nature and management control of Hong Kong & China Gas Company. On the contrary, due to the fact that the LPG industry was much more fragmented with many different organizations handling storage, distribution, supply to users and appliance installation, standards in the LPG industry varied from the highest to unsatisfactory. And the main conclusion of the report was,

*“the gas industries in Hong Kong have now reached such a stage of development that it is necessary for the Government to take the initiative in laying down safety standards to internationally acceptable levels. It is hoped that compliance with such standards will continue to take the form of vigorous self-discipline and self-regulation within the industries but it is*

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<sup>7</sup> Hong Kong and China Gas Company Ltd. (1981). *Annual Report*.

<sup>8</sup> British Gas Corporation (1981).

*considered important that Government should take the lead in promoting this and should ensure that agreed standards are maintained.”*

### **Concerns over Substandard Heaters**

One major finding of the report was the failure of both the LPG appliance installers and the Hong Kong & China Gas Company to recognise the inadequacy of the open flues fitted to most water heaters. According to the report, such flues required a minimum height and a satisfactory position for its outlet for it to function effectively. In other cases, flueless water heaters were installed for inappropriate use. Both open flue and flueless water heaters were considered a health hazard as toxic carbon monoxide was discharged directly into the room where the heater was installed. The report recommended a series of measures to address this area of concern, including the gradual phase-out of substandard water heaters.

### **Hazards and Risks of LPG**

Among all findings, the report raised two specific issues related to the operations of LPG – piped LPG distribution in public highways and the use of LPG cylinders.

#### ***Piped Distribution in Public Highways***

Having evaluated the hazards and risks associated with piped LPG distribution in public highways, the report concluded that “LPG liquid and LPG vapour should not be distributed in public highways in Hong Kong,” and that piped LPG “should only be distributed in public highways in the form of an LPG/Air mixture.”

The safety concern with piped LPG liquid and vapour was three-fold. First, escape LPG liquid from buried pipes would freeze surrounding ground, which made detection and repair very difficult. Second, when leaked LPG liquid reached warm air the former would expand 250 times and become a large but heavy pool of highly inflammable and explosive vapour. Third, since vapourized LPG liquid or LPG vapour was 1.9 times heavier than air or 3.5 times heavier than towngas, LPG leakage would be very difficult to detect and could form pools at ground level or find its way up drainage systems and aggregate at a low point. If such escapes found a source of ignition, the repercussions would be unimaginable. On the other hand, towngas was half the weight of air. Escaped towngas from buried pipes tend to rise to the surface and disperse very easily.

The report stated that LPG/Air mixture could be distributed in public highways. However, since it was still heavier than air, it could give rise to dangerous situations under certain circumstances. As such, it was recommended that piped LPG/Air mixture required the highest safety and build standards and round-the-clock monitoring and response system.

#### ***LPG Cylinders in High Rises***

The consultants studied the way that LPG cylinders were used and found that a normal household tended to have a minimum of three cylinders, with two connected to appliances and one as reserve. Assuming that an average apartment had three cylinders with two half full and one full, total LPG storage in an apartment building with 1,000 apartments would have 3,000 cylinders and 20 tonnes of LPG. By the same token, a large housing development with 12,000 apartments would have 36,000 cylinders and 240 tonnes of LPG.

Such heavy concentration of inflammables represented a considerable concern as an incident involving one cylinder in one apartment could put other residents at risk. Due to the high population density of Hong Kong’s housing, the number at risk would be high. Hence, the report recommended to phase out LPG cylinders in existing multi-storeyed buildings and ban its use in future multi-storeyed housing development.

## Hazards and risks of Towngas

The report, in general, had much fewer negative findings on towngas. The two more significant findings were related to the gas holders and the laying of pipelines.

First, it was found that the gas holders, both in Ma Tau Kok works and Quarry Bay were surrounded by residential and commercial buildings. While these facilities were built before the residential the residential and commercial buildings, the report expressed concern on the lack of buffer space between the holders and the other buildings around them. It was recommended that a hazard survey be carried out to assess the potential hazards and consider actions to reduce risk to the holder or to the surrounding properties of incidents occurring to either.

Second, the report found that the transmission and distribution system for towngas was generally well constructed, protected and maintained. And since towngas was lighter than air, it did not pose the risk that piped LPG did. Nevertheless, to reduce the risk of escaping towngas entering into inhabited buildings, the report recommended that buildings should not be constructed over gas pipes and that pipes should enter premises above ground wherever possible.

## Policies and Effects

The Hong Kong Government responded positively to the report, and adopted many of the interim measures and the longer-term recommendations. In 1992, the Gas Standards Office was established to improve the safety standards of gas in Hong Kong. Since then, the Government had begun a programme to phase out and upgrade sub-standard gas water heaters.<sup>9</sup> Simultaneously, the Government adopted a piped gas policy that encouraged the installation of piped gas supply and discouraged the use of cylinder LPG in multi-storied residential buildings by making the choice of gas supply an important decision in the early stage of the design of any property development.<sup>10</sup>

In April 1991, the Gas Safety Ordinance came into effect to further safeguard the general public. This ordinance and its subsidiary regulations covered all aspects of fuel gas importation, manufacture, storage, transport, supply and use of gas. From then onwards, no sub-standard gas water heaters were allowed to be sold or installed. The Gas Safety (Gas Supply) Regulations also prohibited the transmission of LPG along or across public roadways. For a housing development to have central LPG supply, a special storage depot must be built in the vicinity of the development. In addition, no residential structure should be built on top of or within a fixed distance from the storage depot. The legislation was later amended in 1996 to require periodic examination of gasholders, deter damaging of underground gas pipes, improve safety requirements for the maintenance of gas installations, and prohibit the importation and sale of certain types of disposable LPG containers.

The piped gas policy successfully reduced the use of cylinder LPG. By 1997, the percentage of domestic dwellings using cylinders fell to less than 29 per cent, accounting for about 59 per cent of all LPG sales. The rest was supplied in centralised piped LPG. The market share between towngas and LPG was 74 and 26 per cent respectively. This represented a complete reversal of the market situation in 1980. One industry observer suggested that it was the various constraints imposed by the Government on LPG that led directly to this reversal.<sup>11</sup>

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<sup>9</sup> Hong Kong SAR Government. (1997). "Lands, Public Works and Utilities" in *Hong Kong Yearbook 1997*.  
<http://www.info.gov.hk/yearbook/1997/index.htm?yearbook/1997/econtent.htm>

<sup>10</sup> Buildings Department. (1994). "Gas Supply Installations" in *Practice Notes for Authorized Person and Structural Engineer*.  
[www.info.gov.hk/bd/english/documents/pnap/Pnap164.pdf](http://www.info.gov.hk/bd/english/documents/pnap/Pnap164.pdf)

<sup>11</sup> Lam, Pun-Lee. (1997). *Competition in Energy*. Hong Kong: City University of Hong Kong Press.

## **The Growth of Towngas : From Early 1980s to Late 1990s<sup>12</sup>**

Despite a slow start in 1981 due to the lacklustre private property market, the total number of customers of Hong Kong & China Gas Company passed in the quarter-of-a-million mark in December 1982. The same year also marked a watershed for the company as the transfer of corporate registration to Hong Kong was also completed. To promote the use of the towngas, there were show rooms and sales centres all around Hong Kong. The Towngas Centre also offered course and demonstration classes in cookery.

To meet the increasing demand, Hong Kong & China Gas Company successfully negotiated with the Hong Kong Government in 1983 to purchase a piece of land in Tai Po Industrial Estate to build new gas plants, which began operation January 1987. By 1989, the Tai Po plant produced 85 per cent of the total gas supplied. Hong Kong & China Gas Company's supply network also continued to expand, with much focus on new town developments in the New Territories. By 1989, the total length of its distribution network reached 1,500 kilometres, and was nearly three times its length in the 1980, coinciding the concomitant increase in new development projects (see **Exhibit 3**). Nevertheless, the government had to allow Hong Kong & China Gas Company to provide substitute natural gas to Yuen Long and Tuen Mun in the western part of the New Territories as an interim measure until high-pressure transmission lines of towngas reached these two new towns.<sup>13</sup>

Hong Kong and China Gas Company was keen on getting a long-term and economical supply of gas to Hong Kong. Since the late 1980s, it had been discussing with China National Offshore Oil Corporation for the supply of natural gas from a newly discovered field in off Hainan<sup>14</sup>. But it lost the bid to China Light and Power Company Limited, the larger of the two electricity companies in Hong Kong, which bought the exclusive right to import natural gas from Hainan and used it for electrical power generation.

Hong Kong and China Gas Company had continued to develop and grow in the 1990s. In pursuit of better quality and efficiency, the Superior Quality Service Programme was launched in 1992 to encourage all employees to find and adopt better ways to meet customer needs. Within four years, over 60 per cent of its staff had taken part in improvement projects or received training in problem-solving and teamwork skills. Another milestone for the company was the achievement of ISO9002 certification for all its production plants in 1994.

The failure to import natural gas from the Chinese Mainland did not dampen China & Hong Kong Gas Company's interest to invest in the gas industry in the Chinese Mainland. In 1994, the company concluded joint venture contracts with Panyu and Zhongshan in the nearby Pearl River Delta. With an investment of about US\$30 million per venture, each project included the construction of an LPG/Air mixing plant and pipeline systems to supply to domestic, commercial and industrial users. The Panyu Joint Venture commenced operation in 1995, and the Zhongshan Joint Venture, in 1996.

The company also embarked on a HK\$500 million project since early 1990s to lay transmission pipelines to supply future demand for towngas at the new airport and the new town developments nearby, which was slated to open in 1997. The second phase expansion at Tai Po was completed in 1992 and was fully operational in 1993, providing additional capacity of 5.6 million cubic metres and doubling the supply capability. By 1996, the Tai Po plant produced some 98 per cent of total gas supplied. In the same year, the total length of Hong Kong & China Gas Company's distribution network was 2050 kilometres, bringing towngas within the reach of about 83 per cent of all Hong Kong households.

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<sup>12</sup> Hong Kong and China Gas Company Ltd. (various issues). *Annual Report*.

<sup>13</sup> Lam, Pun-Lee & Silvia Chan (2000). *Competition in Hong Kong's Gas Industry*. Chinese University Press: Hong Kong.

<sup>14</sup> Hainan is the largest island and the smallest province of Mainland China located in the South China Sea.

## Competition and Regulation

Ever since the onset of the 1981 consultant's report, the towngas's market share had been expanding at the expense of LPG's. By 1993, towngas had a commanding share of 66 per cent, rising from about 41 per cent in 1981. On the other hand, cylinder LPG and central LPG had only 27 per cent and 7 per cent respectively in 1993, falling from about 50 per cent and 9 per cent shares in 1981. The situation raised some eyebrows in the community, and in 1995, the Consumer Council issued a report entitled *Assessing Competition in the Domestic Water Heating and Cooking Fuel Market*, which triggered a series of responses and another consultant's report commissioned by the Government.

### Consumer Council's 1995 Report<sup>15</sup>

Aimed at examining the domestic water heating and cooking fuel supply industry and its implications on consumers' interest, the report "revealed evidence of imperfect competition among the different energy suppliers in the market" and elaborated such imperfection from two perspectives – competition among gas suppliers, and competition between towngas and electricity.

#### **Competition among Gas Suppliers**

The report pointed out that the Gas Safety regulations that prohibited transmission of LPG under public roadways were the key factor attributable to the competitiveness of different gas suppliers. For a housing development to have central LPG supply, land had to be earmarked for a special storage depot. However, since land in Hong Kong commanded a high premium, the LPG option made little economic sense and LPG suppliers often had to pay developers to compensate for the loss of space.

Similarly, in the public housing sector, the Housing Authority of Hong Kong had a policy that favoured Hong Kong & China Gas Company as the energy source since 1987. The Housing Authority justified it on the grounds of "safe, continuity of supply, land space and planning requirements, and costs." Although an attempt was made in 1993 by the Housing Authority to allow towngas and LPG to compete for the supply and distribution of gas in public housing estate, the authority gave up citing the difficulty to meet the Gas Safety Ordinance requirements for the location of the LPG storage depot. Nonetheless, Appendix 4 of the report included a table which showed that, from 1988 to 1992, the share between towngas and LPG in properties developed by private developers was 90/10, whereas in properties developed by the Housing Authority and the Housing Society was 70/30.

Once the decision was made at the development stage, switching from towngas to LPG was practically impossible, as it required a complete overhaul of the transmission system. Therefore, according to the report, towngas and piped LPG could not be considered as substitute from consumer's perspective. Even though cylinder LPG provided a feasible alternative to centralized gas, its inconvenience, bulkiness and requirement of storage space made it an impractical choice.

#### **Competition between Towngas and Electricity**

The report examined electricity as an alternative to towngas for water heating and cooking, but cited technical and cultural factors as hindrance. For water heating, two types of electric water heaters were available – the storage type and the instantaneous type. The storage type was more common. However, since the amount of heated water depended upon the storage capacity, it was not comparable to gas water heaters, which provided continuous supply of

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<sup>15</sup> Consumer Council. (1995). *Assessing Competition in the Domestic Water Heating and Cooking Fuel Market*. Consumer Council: Hong Kong.

heated water. The instantaneous type electrical water heater overcame that shortcoming, but it required three-phase electrical installation, which was not required for common uses in most households in Hong Kong. The use of electricity for cooking was mainly confined to electrical kettles, rice cookers and microwave ovens. As flame cooking was considered essential for Chinese cuisine preparation, electric stoves were extremely uncommon in Hong Kong, especially since the majority of the population was ethnic Chinese.

### **The Conclusion and Recommendations**

*“Due to the lack of effective competition in the market, HKCG [Hong Kong & China Gas Company] has attained a position of market dominance in the residential water heating and cooking fuel supply market. HKCG’s market share is likely to continue to expand as a result of the constraints faced by its competitors. In the absence of competing forces, HKCG has been extremely successful in maximising its profits. Evidence indicates that charges tend to be higher than justified.”*

- Consumer Council

To rectify the situation, the report gave five recommendations. First, the Government should proactively open up the gas distribution network in the form of a “common carrier system,” so that the same type of gas produced or bought by other companies could enter into the market with a lower entry barrier. Second, the Government should encourage companies to import natural gas to Hong Kong. Third, Hong Kong & China Gas Company should be under some forms of regulatory control, which should be fair and equitable to both the consumers and Hong Kong and China Gas Company. Fourth, the Government should require developers to provide infrastructures that allowed consumers to switch between energy sources. Fifth, an Energy Commission should be established to monitor and regulate the energy sector and put forth energy policy.

### **The Response from the Academia**

The Consumer Council’s report sparked discussions in the academia on the subject of whether Hong Kong & China Gas Company had exploited its dominant position and whether it should be subject to some form of regulation. Later in the year, two academics aired their views in the HKCER Letters – a monthly publication of the Hong Kong Centre for Economic Research.

Dr. Pun-Lee Lam of the Hong Kong Polytechnic University contended that the “constraints imposed by the government in the 1980s [on LPG transmissions] raised HKCG’s competitive power and directly led to the company’s success,” which was exemplified by the phenomenal increase in its book rate of return from 10.1 per cent in 1981 to 28.7 per cent in 1992.<sup>16</sup> Lam suggested, “HKCG should separate its production, as well as its supply business from transportation.” “New suppliers of gas should be able to get equal access to HKCG’s pipelines, contract with gas producers (can be other than HKCG’s production plants) and then make contracts on HKCG’s transportation services by paying a non-discriminatory price.” Furthermore, the government could encourage existing LPG distributors and site operators to provide storage facilities and make use of HKCG’s network to distribute towngas or natural gas.

Dr. W. David Walls from the University of Hong Kong presented a different perspective.<sup>17</sup> On the outset, Walls posed two questions: whether Hong Kong & China Gas Company exercised monopolistic power and how the market institution could be organised to promote

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<sup>16</sup> Lam, Pun-Lee. (1995). “Gas Regulation and Competition in Hong Kong” in *HKCER Letters*, Vol. 34, September 1995. <http://www.hku.hk/hkcer/articles/v34/rtowngas.htm>

<sup>17</sup> Walls, W. David (1995): “Competition in Hong Kong’s Water Heating and Cooking Fuel Industry,” *HKCER Letters*, Vol. 33, July 1995. <http://www.hku.hk/hkcer/articles/v33/rwalls.htm>



efficiency and competition. To address the first question, he demonstrated that the empirical evidence presented in Consumer Council's report did not support the claim that Hong Kong China Gas had and exploited monopoly power. He then began addressing the second question by describing the deregulation experience in the US. The alternative form of market organisation was one whereby the ownership of pipeline capacity was decentralised and transportation became a fully tradable right. By decentralising the ownership of capacity, the monopoly problem would be eliminated without regulatory control as transport rights holders competed with each other to supply transportation to the market. Walls, however, disputed Consumer Council's common carrier proposal as the control of the pipelines would still be in the hands of the one company, which would then require regulatory control.

### **The Response from the Government**

In its response to Consumer Council's report issued in February 1996, the Government stated that it had found no evidence that Hong Kong & China Gas Company was abusing its dominant market position, and that its prices and rates of return were in line with those of the two regulated electricity companies. As such, there was no need to impose any formal price or return control on Hong Kong & China Gas Company.<sup>18</sup> The government's response also maintained that since that price gap between town gas and electricity had been narrowing, the electricity companies represented competitive pressure on Hong Kong & China Gas Company.

Nevertheless, the Government proposed that a feasibility study on introducing a common carrier system in Hong Kong should be commissioned and that an Energy Advisory Committee should be formed to advise the Government on energy policy and other related matters. In addition, to ensure that consumers' interests were protected, the response also considered it was time for the Government and the Hong Kong & China Gas Company to enter into some form of a consultative arrangement to increase the transparency of the company's tariff-setting mechanism and its justification for tariff increases.<sup>19</sup>

Subsequently, Hong Kong & China Gas Company agreed voluntarily to enter into an Information and Consultation Agreement with the Government. After extensive discussion, the agreement was finalized on 3 April 1997. In accordance with the agreement, Hong Kong & China Gas Company agreed to the disclosure of certain corporate information not previously available to the public and a voluntary process of consultation with the Government, through which the HKCG should:

*“consult the Government and, upon request, provide briefings to the Energy Advisory Committee and the Panel on Economic Services of the Legislative Council on any tariff adjustments, major system additions or changes in the Fixed Monthly Service Charge. It will also undertake, when so requested, to brief the Energy Advisory Committee and the Economic Services Panel of the Legislative Council on matters concerning the provision of gas to the public.”*

### **Feasibility Study on a Common Carrier System<sup>20</sup>**

Following its response to the Consumer Council report, the Hong Kong Government commissioned a consortium of consultants consisting of DNV Technica, Coopers & Lybrand and British Gas, to study the feasibility of a common carrier system for gas supply. In June 1997, the Electrical and Mechanical Services Department published a public consultation

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<sup>18</sup> Lam, Pun-Lee & Silvia Chan (2000).

<sup>19</sup> Economic Development Branch. (1997). *Hong Kong and China Gas Co. Ltd. Information and consultation Agreement*, <http://www.edlb.gov.hk/edb/eng/papers/panel/041997a.htm>

<sup>20</sup> Electrical and Mechanical Services Department. (1997). *Report on Feasibility Study of Introducing a Common Carrier System for Gas Supply in Hong Kong: A Public Consultation Paper*. Hong Kong: Electrical and Mechanical Services Department.

paper entitled *Report on Feasibility Study of Introducing a Common Carrier System for Gas Supply in Hong Kong*.

According to the report, technically, the existing towngas network was designed to transport towngas as well as natural gas. Nonetheless, since it would be impractical and unsafe to mix towngas and natural gas in the same pipes, the system would need to be sectionalised. Consumers could only receive a continuous supply of either towngas or natural gas and it would not be up to the individual to choose between the two. Existing appliances were required to be converted to be able to consume natural gas.

The report did raise that, without major industrial users of gas, it would be difficult to attract natural gas to Hong Kong at economic prices. Potential sources, such as piped natural gas from new fields in the South China Sea, Mainland China or Liquefied Natural Gas (LNG) from SE Asia, were cited. The consultants, however, reckoned that the lead-time for gas to arrive in Hong Kong would be between 2 to 10 years. In addition, the conversion of the gas network would take 4 to 8 years after natural gas had arrived in Hong Kong. (Natural gas purchase contracts typically contained “take-or-pay” clauses whereby the buyer agreed to pay for a set amount of gas, e.g., around 70 per cent of a gas field’s deliverable amount, at a given price over a set period of time in order to ensure disposal of the amount of gas under contract. Even if the buyer did not take the full contracted amount, it was still obligated to pay the full contract price.)<sup>21</sup>

Thus, the report “recommended that market based arrangements be put in place to encourage competition between producers to bring natural gas to Hong Kong, and for competition to be used to determine when it is economic [sic] for natural gas to displace towngas.” The key elements of such arrangements should include (1) the accounting separation of HKCG’s gas transmission and distribution activities from its other activities, (2) the derivation and disclosure of charges for use of the gas transmission and distribution network, and (3) the provision of Third Party Access of the HKCG network after conversion.

In a statement issued in June 1998 upon the conclusion of the consultation, the Government declared: “in principle, a common carrier system based on natural gas merits further consideration as a means of promoting competition in the gas supply sector.”<sup>22</sup> Nevertheless, due to uncertainties such as the availability and security of natural gas supply, the potential benefits to the consumers, and the attractiveness of the small local market to new entrants, a spokesperson for the Government stated that it was “not possible to conclude at this stage that that the common carrier system will be a practical and effective means of promoting competition in the gas supply sector.”<sup>23</sup> Yet, to prepare for the possible introduction of natural gas, “the costs of HKCG’s gas transportation activities should be identified and, in due course, made available to the public.”

To promote competition between LPG and towngas, the Director of Electrical and Mechanical Services had issued a guidance note on the technical and safety requirements for the laying of LPG pipes under public roads (previously forbidden by the Gas Safety Regulations). All LPG suppliers companies, the Housing Authority, the Real Estate Developers Association, and the Hong Kong Institute of Architects were informed of the

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<sup>21</sup> Wu, Changqi and Francis T. Lui. (2001). “Should Hong Kong Introduce a Gas Common Carrier System?” in *Economic Analyses and Commentaries*, Center for Economic Development, Hong Kong University of Science and Technology. [http://www.bm.ust.hk/~ced/nw\\_gas2.htm](http://www.bm.ust.hk/~ced/nw_gas2.htm)

<sup>22</sup> Economic Development Bureau. (1998a). *Statement of the Government’s Position: Feasibility Study of Introducing a Common Carrier System for Gas Supply in Hong Kong*. Hong Kong SAR Government. <http://www.edlb.gov.hk/edb/eng/papers/press/08061998.htm>

<sup>23</sup> Economic Development Bureau. (1998b). “Government to promote more competition in gas market” in *Daily Information Bulletin*. Hong Kong SAR Government. <http://www.info.gov.hk/gia/general/199806/08/0608137.htm>

guidance note. But the Government ruled out the creation of exclusive supply areas for one type of piped gas, dismissing it as not in the interest of promoting competition.

### **Electricity as an Alternative to Gas**

Despite the cultural preference over flame cooking for Chinese cuisine preparation, electrical appliances had been gradually finding their way into the local households. In the past, cooking was done purely on flames stoves. However, with the advent of electrical appliances, the burden of cooking was increasingly shared by rice cooker, slow cooker, electrical oven, electrical kettle, and microwave. By late 1990s, many of these appliances were commonplace in local households and were complimented by the other electrical appliances such as mixer, blender, etc. While domestic gas consumption increased at a much faster rate than domestic electricity consumption from 1970 and 2002 (30 folds for gas compared to 10 folds for electricity), in 2002, domestic consumption of electricity was more than double of that of gas, and the overall consumption (domestic, commercial and industrial) of electricity was more than five times of that of gas [see **Exhibit 2**].

Electricity was supplied by two regional monopolists, China Light and Power, and Hong Kong Electric. Unlike Hong Kong and China Gas, China Light and Power (since 1964) and Hong Kong Electric (since 1979) were regulated by the Government under a Scheme of Control, which allowed them “to earn a return which is reasonable in relation to the risks involved and the capital invested in and retained in their business, and in return, the government has to be assured that service to the consuming public continues to be adequate to meet demand, to be efficient and of high quality, and is provided at the lowest cost which is reasonable in the light of financial and other considerations.”<sup>24</sup> Effectively, the permitted profit level of the two electricity companies was a function of the fixed rate of return on their capital investment. Thus, it had been argued that the Scheme of Control actually encouraged the companies to expand their capacities beyond the optimal level or invest excessive in new technology so as to increase calculation base.<sup>25</sup>

## **Gas Industries Liberalisation Elsewhere**

### **The US Experience**

The United States natural gas industry consisted of thousands of natural gas producers, over a hundred interstate pipeline companies, intrastate pipeline companies, local distribution companies, and natural gas marketers.<sup>26</sup> Since the passage of the Natural Gas Act in 1938, the industry was regulated at both the federal and the state levels. Before 1985, pipeline companies sold bundled products to local distribution companies, which in turn sold them to the consumers. In 1985, the Federal Energy Regulatory Commission (FERC) issued Order 436, requiring natural gas pipelines to provide open access to transportation services, hence enabling consumers to negotiate prices directly with producers and contract separately for transportation. In 1992, the FERC issued Order 636 that mandated the unbundling of sales services from transportation services. From then on, pipeline companies could only provide transportation services, making pipeline transportation capacity into a fully commercially tradable commodity.

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<sup>24</sup> The Schemes of Control Agreement 1992.

<sup>25</sup> Wu, Changqi and Francis T. Lui. (2001). “How Competitive is Hong Kong’s Gas Market? Myths and Realities” in *Economic Analyses and Commentaries*, Center for Economic Development, Hong Kong University of Science and Technology. [http://www.bm.ust.hk/~ced/nw\\_gas.htm](http://www.bm.ust.hk/~ced/nw_gas.htm)

<sup>26</sup> Massey, William L. (2000). *Natural Gas and Electricity Deregulation in the United States*. <http://www.ferc.gov/news/speeches/commissionersstaff/masstokyo.pdf>

With complete unbundling, consumers could choose their own gas supplier, although the local distribution company still provided local transportation and distribution services.<sup>27</sup> The status of deregulation and restructuring of the natural gas industry varied by states and by types of customers. While large commercial and industrial customers were more likely to have the choice option of purchasing natural gas separately from transportation and other services, implementation of choice programmes for residential and smaller-volume commercial customers had been slow. By end of 2001, total liberalization was achieved only in six states, while partial liberalization, in seven. In addition, there were voluntary pilot programmes in eight states initiated by the local distribution companies.<sup>28</sup> Nevertheless, according to William Massey, Commissioner of FERC, deregulation had resulted in a decline in wellhead prices of over 40 per cent from 1992 to 2000.<sup>29</sup>

## The UK Experience

The United Kingdom's experience represented a very different path towards market liberalisation. Until the 1990s, British Gas had a national monopoly for transporting and supplying gas in the UK.<sup>30</sup> The first step towards liberalising the market was the Gas Act of 1986, which obliged the privatisation of British Gas. From the late 1980s through to the early 1990s, British Gas entered into bilateral agreements for third party access to its systems with a number of producer-owned gas marketing companies. However since these companies had limited statutory rights and that British Gas had all the long term supply contracts, British Gas remained a vertically integrated monopoly even after the privatisation.

Stronger liberalisation initiatives since late 1980s fell into three categories – sourcing, distribution, and selling.<sup>31</sup> On the sourcing side, a report by the Monopolies and Mergers Commission in 1988 recommended that British Gas be permitted to purchase no more than 90 per cent from a new field, with the option to purchase the rest after two years, thus allowing room for potential competitors. With regards to distribution, a Network Code, developed in the 1993 report of the Monopolies and Mergers Commission and implemented in April 1996, called for fairness, equality and transparency in running the transportation network. Liberalisation on the selling side came in stages. First, the market for contract customers (large volume users) was opened for competition in 1992. Meanwhile, British Gas was allowed to serve the tariff market or that for the small volume users as a regulated monopoly until April 1996. The tariff market was then gradually opened for competition.

By mid-1997, about 25 per cent of customers in regions opened for competition switched suppliers. And by end of 1998, all of Britain's gas consumers could choose their own gas suppliers. Since 1997, British Gas had gone through corporate restructuring a few times.<sup>32</sup> BG Group plc was formed in 1999, and the Lattice Group plc was spun off from it in 2000. By 2000, Transco, owned by Lattice Group plc, owned, operated and developed the significant majority of the gas transportation system in the UK. Meanwhile, Centrica, the storage and trading company owned by BG Group plc, had about 71 per cent of domestic gas market.

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<sup>27</sup> NORESKO. (unknown). *Industry Updates*. [http://www.noresko.com/site/content/info\\_industry\\_updates.asp#Anchor-Natural-38908](http://www.noresko.com/site/content/info_industry_updates.asp#Anchor-Natural-38908)

<sup>28</sup> Hasegawa, Hideo. (2001) *Liberalization of Gas Industries in Europe and the U.S.: LNG Terminal's third party access in Europe and the U.S., and state-by-state status of gas industries in the U.S.* <http://eneken.ieej.or.jp/en/data/pdf/169.pdf>

<sup>29</sup> Massey, William L. (2000).

<sup>30</sup> KPMG. (2002). *The Natural Gas Industry of United Kingdom*.

[http://www.superbuild.gov.on.ca/userfiles/page\\_attachments/Library/2/Study7-Vol2-UK\\_Gas.pdf](http://www.superbuild.gov.on.ca/userfiles/page_attachments/Library/2/Study7-Vol2-UK_Gas.pdf)

<sup>31</sup> Lam, Pun-Lee & Silvia Chan (2000).

<sup>32</sup> KPMG. (2002).

## Hong Kong & China Gas Company: At the Turn of the Millennium

The years before and after the new millennium continued to see the expansion and diversification of Hong Kong & China Gas Company. Locally, the company had pipelaying projects lined up through 2004, supporting developments such as the Science Park in the New Territories, the Cyberport complex in Telegraph Bay, and the Hong Kong International Theme Park in Penny's Bay, Lantau. To secure its position as the preferred choice of residential fuel, the TGC brand was established for its line of towngas based home appliances. Its wholly owned subsidiary, U-Tech Engineering Company, had evolved from being a subcontractor for pipelaying to an integrator of utility services, and helped establish the ECO stations – LPG filling stations for LPG powered motor vehicles. Furthermore, it took part in property development, launched the Towngas Card, a credit card issued in association with a local bank, and formed iCare.com providing Internet-based services and IDD services.

Hong Kong & China Gas Company had continued to expand its investment portfolio of gas projects in the Chinese Mainland. The projected numbers of joint ventures rose from 12 in 2002 to 20 by 2005. Hong Kong & China Gas Investment Limited was established in 2002 to act as the holding company and management arm of the company's mainland ventures. Major projects that the company was involved included the Guangdong Liquefied Natural Gas Receiving Terminal and Trunkline Project, and the West-to-East pipeline project linking the Tarim Basin of Xinjiang to the Eastern China market. The former, when commissioned in 2006, might allow Hong Kong & China Gas Company to introduce natural gas to the Hong Kong Market. Meanwhile, Hong Kong & China Gas Company enjoyed an enviable profit margin and return on its assets (see **Exhibit 1**).

## Outlook of Hong Kong's Gas Industry

By 1999, Hong Kong had about two million gas customers.<sup>33</sup> While six oil and gas companies are supplying LPG in Hong Kong, Hong Kong & China Gas Company remained the sole supplier of towngas in Hong Kong. The gap between towngas's share and LPG's share of the market widened to 80 per cent and 20 per cent respectively. About 59 per cent of total LPG sales were supplied in cylinders, and the rest was through centralised piped gas supply. Nevertheless, as Hong Kong was coming to terms with its severe air pollution, LPG was introduced as a motor fuel for a trial run of 30 LPG taxis. By 2001, there were more than 14,000 LPG taxis in Hong Kong. LPG's share of the total gas market rose to 32.5 per cent, while towngas's share fell to just 67.5 per cent. About 34 per cent of the total LPG sales was supplied in cylinders, about 23 per cent was distributed through piped LPG supplies, and the remaining 43 per cent was supplied to filling stations as fuel for the LPG taxis. Meanwhile, there was still no sign of any potential new entrants to Hong Kong's gas industry. It had been suggested that China Light and Power (CLP) had surplus supply of natural gas that could be diverted to uses other than power generation,<sup>34</sup> but CLP had not shown much interest in venturing into the gas supplier business. And the only company that was planning to bring natural gas to Hong Kong for domestic and commercial use was Hong Kong & China Gas Company. Despite Legislator Fred Li's query in April 2003, the Government seemed to be satisfied with its Information and Consultation Agreement with Hong Kong & China Gas Company. In fact, the Government considered a choice already existed among Towngas, LPG, and electricity, and had no plan to regulate the rate of return or the tariff of Hong Kong & China Gas Company.

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<sup>33</sup> Hong Kong SAR Government. (1999). "Lands, Public Works and Utilities" in *Hong Kong Yearbook 1999*. [http://www.info.gov.hk/yearbook/1999/eng/13/13\\_30.htm](http://www.info.gov.hk/yearbook/1999/eng/13/13_30.htm)

<sup>34</sup> Lam, Pun-Lee & Silvia Chan (2000).

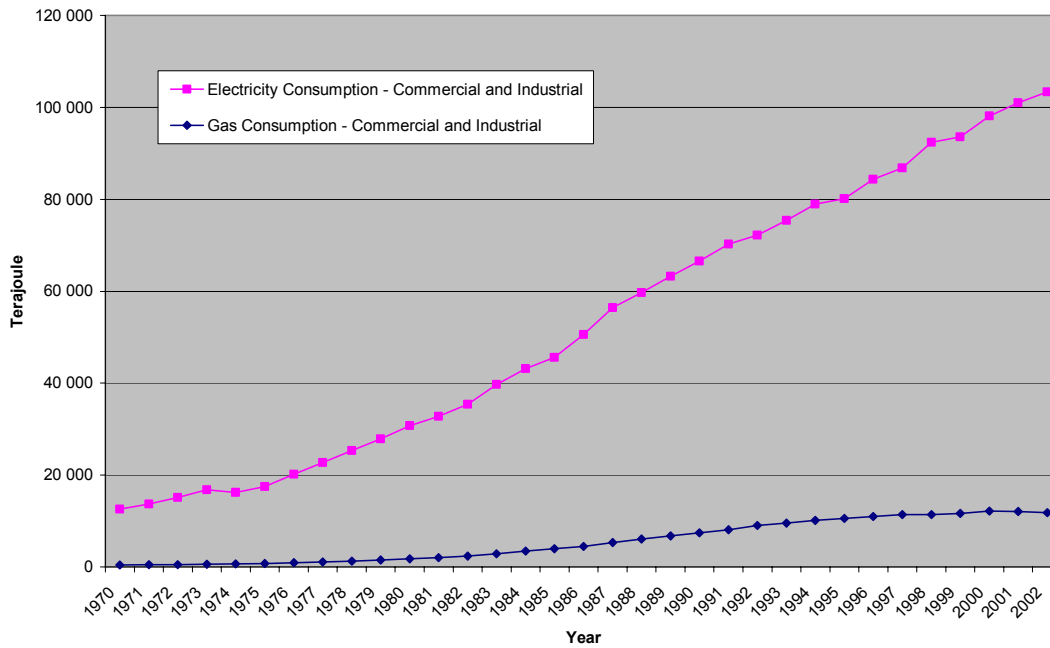
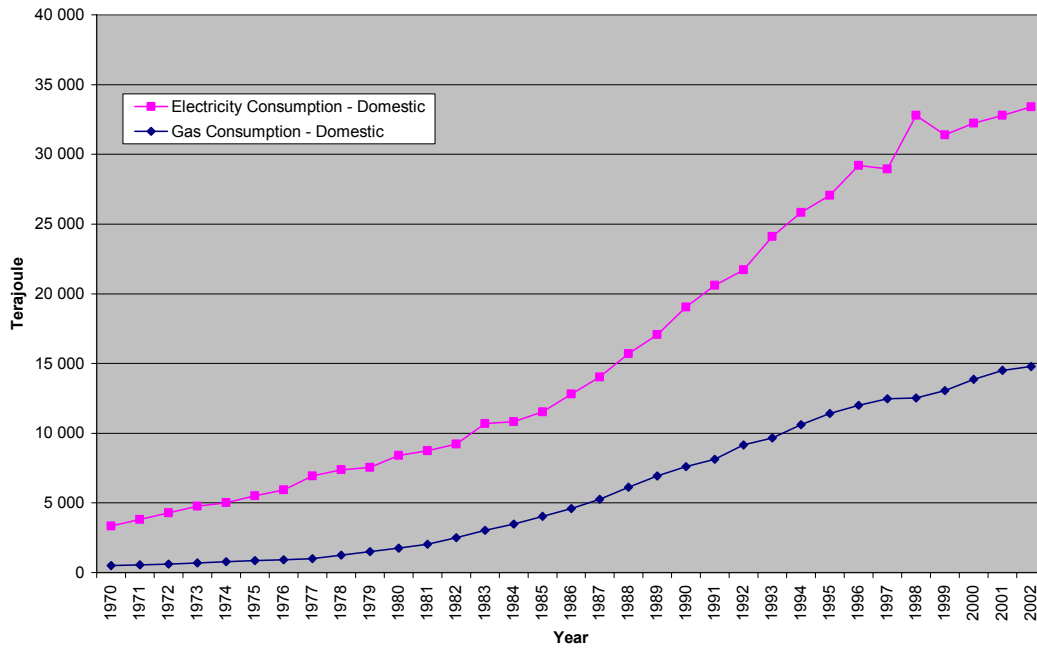
**EXHIBIT 1 HONG KONG AND CHINA GAS COMPANY LTD – SELECTED FINANCIALS/STATISTICS**

	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991
<b>Customer Base</b>	210,110	252,295	303,263	353,381	406,734	477,532	543,579	616,935	685,159	759,162	829,292
<b>Turnover (million HK\$)</b>	438.5	558.7	721.0	873.7	994.0	989.0	1,309.0	1,526.0	1,816.0	2,226.0	2,654.0
<b>Profit before Tax (million HK\$)</b>	44.7	73.3	105.7	146.4	214.9	235.0	321.0	424.0	535.0	648.0	779.0
<b>Net Profit Margin</b>	10.2%	13.1%	14.7%	16.8%	21.6%	23.8%	24.5%	27.8%	29.5%	29.1%	29.4%

	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002
<b>Customer Base</b>	899,436	926,036	990,660	1,044,799	1,095,910	1,149,441	1,206,236	1,265,354	1,329,161	1,407,408	1,470,738
<b>Turnover (million HK\$)</b>	2,960.5	3,259.6	3,718.4	4,252.7	4,796.9	5,583.8	5,426.6	5,842.3	6,650.9	6,857.4	6,878.0
<b>Profit before Tax (million HK\$)</b>	1,066.5	1,194.6	1,520.5	1,835.1	2,224.8	2,639.1	3,074.6	3,322.0	3,579.1	3,656.9	3,581.0
<b>Net Profit Margin</b>	36.0%	36.6%	40.9%	43.2%	46.4%	47.3%	56.7%	56.9%	53.8%	53.3%	52.1%
<b>Return on Assets (fixed &amp; current)</b>	19.0%	10.7%	11.7%	12.3%	12.6%	15.7%	16.6%	18.2%	17.7%	22.5%	22.7%

Source: *Hong Kong and China Gas Company Ltd. Annual Reports* (various issues).

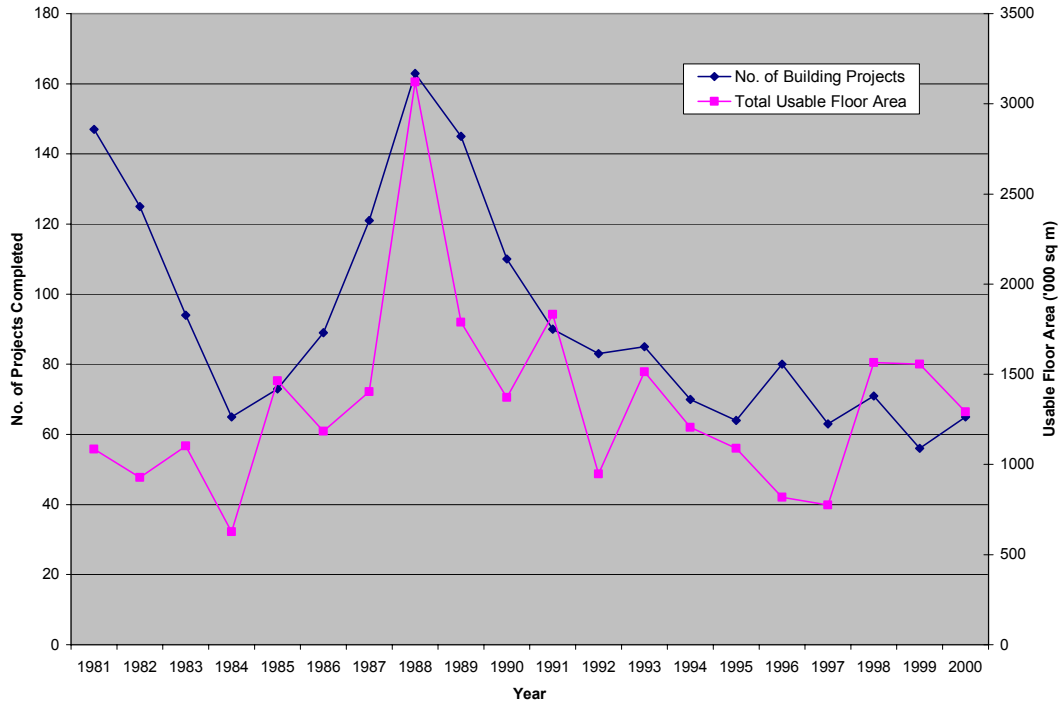
**EXHIBIT 2      COMPARISON OF GAS AND ELECTRICITY CONSUMPTION**



**Source: Census and Statistics Department. (2003). *Local Consumption of Gas by Type of Users and Electricity Consumption.***

**[http://www.info.gov.hk/censtatd/eng/hkstat/fas/energy/gas\\_consum.xls](http://www.info.gov.hk/censtatd/eng/hkstat/fas/energy/gas_consum.xls);  
[http://www.info.gov.hk/censtatd/eng/hkstat/fas/energy/elect\\_consum.xls](http://www.info.gov.hk/censtatd/eng/hkstat/fas/energy/elect_consum.xls).**

**EXHIBIT 3 STATISTICS OF RESIDENTIAL BUILDING DEVELOPMENT PROJECTS**



Source: Census and Statistics Department. *Hong Kong Annual Digest of Statistics* (various issues).