HKUST BUSINESS SCHOOL 香港科大商學院

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Towngas and Climate Change

Gaia Suzuki looked out the window across Victoria Harbour. She could see a haze across the city, not so noticeable today as on other days, but it reminded her of her purpose in Hong Kong.

Gaia was a member of a team of internationally respected consultants invited by The Hong Kong and China Gas Company Limited, known as Towngas, to Hong Kong. Alfred W K Chan, Managing Director, had invited the consultants with this request.

> *"Climate change presents both threats and opportunities for Towngas. I invite you to propose a feasibility study and budget to consider if and how climate change might be incorporated into our business models in order to prepare Towngas for the future."*

This was an immensely complex problem. Gaia's thoughts returned to the research she had done in order to understand Towngas' business and the implications of climate change.

Climate change had been on the front cover of every major newspaper and magazine for the past year. Headlines across the world ran almost daily: "*Climate change disaster is upon us, warns UN "*[1], *"Bush rejects mandatory limits on emissions"*[2], *"Global Warming Could Trigger Economic Meltdown"*[3], *"Gore shares Nobel Peace Prize with U.N. panel"*[4], and more. China was a recurrent theme, its rapid economic growth came with corresponding gains in greenhouse gas (GHG) emissions and its dependence on coal as its primary energy source raised grave concerns.

Climate change was the "flagship issue" at the 62nd United Nations General Assembly.[5] The 1997 Kyoto Protocol limiting greenhouse gas emissions (GHG[6]) reduction was to expire in 2012 and the meeting was preparing for a post-Kyoto

[1] Guardian Unlimted, October 4, 2007
[2] Reid, T., "Bush rejects mandatory limits on emissions", The Times (United Kingdom), September 29th 2007.
[3] Donga.com, Korea, October 10, 2007.
[4] CNN, October 12, 2007.
[5] "UN Assembly wraps up annual high-level debate with calls for action - President", UN News centre, October 3rd 2007.
[6] The key greenhouse gases caused by human activity were carbon dioxide, methane, and nitrous oxide, as well as fluorinated gases such as sulphur hexafluoride, hydrofluorocarbons (HFCs) and perfluorocarbons (PFCs).

Eva Chang prepared this case under the supervision of Professor Paul Forster solely as the basis for class discussion. This case is not intended to serve as an illustration of effective or ineffective management. Copyright © Hong Kong University of Science and Technology, 2007.

agreement to be hammered out in Bali in December.[7] Immediately following the UN meeting, the U.S. White House organized a Major Economies Meeting on climate change where the Bush administration attempted to steer the conversation from mandatory policies towards voluntary benchmarks. The EU had launched an Emission Trading System in 2005 that was a large scale experiment in market regulation of carbon emissions. The Controversy amongst business, policy makers, scientists, and environmentalists was fueled by uncertainty about causes, severity and consequences as well as differences of opinion about solutions.

The Fourth Assessment Report of the United Nations Intergovernmental Panel on Climate Change (IPCC) found that levels of carbon dioxide, the most important anthropomorphic greenhouse gas was much higher in 2005 than any time in the last 650,000 years. Human contribution to carbon dioxide levels came mainly from fossil fuels which "very likely" contributed to rising methane levels. Carbon dioxide and methane along with other greenhouse gases contributed to the warming of the global climate system and the "widespread melting of snow and ice, and rising global average sea level." Eleven of twelve years between 1995 and 2006 were among the warmest twelve years on record.

Climate change was inextricably linked to energy consumption and the economic, environmental, and social needs of the 21st century. Economic growth, broad technological changes, life style patterns, demographic shifts and governance structures were part of the complex interrelationships between climate change, human and natural systems, socio-economic development and anthropomorphic emissions. The inability to manage climate change would exacerbate problems of loss of biodiversity, desertification, ozone depletion, freshwater availability, and air quality.[8] These would take a greater toll on developing economies than developed economies and had potentially disastrous economic, social and environmental consequences.

The IPCC had recommendations to stabilize and reduce carbon levels. Greenhouse gas emissions could be reduced through more efficient use of energy, increasing the share of lower carbon-emitting fossil fuels, and advanced fossil-fuel technologies and renewable energy technologies. Carbon levels could be reduced through increasing the uptake of carbon from afforestation, reforestation and better management of forests and natural carbon uptake sites. "Addressing the need for energy, while reducing local and regional air pollution and global climate change cost-effectively, requires an interdisciplinary assessment of the synergies and trade-offs of meeting energy requirements in the most economically, environmentally, and socially sustainable manner."[9] There was an increasing urgency to manage climate change. In awarding the Nobel prize to the IPCC and Al Gore, the Norwegian Nobel Committee said "Action is necessary now, before climate change moves beyond man's control."[10]

Growth in energy consumption left rapidly developing China vying with the developed economy of the United States for the dubious honor of being the largest

[7] "UN Assembly wraps up annual high-level debate with calls for action - President", UN News centre, October 3rd, 2007.
[8] UN IPCC, Climate Change 2001: Synthesis Report.
[9] Ibid.
[10] New York Times, October 12, 2007.

emitter of total carbon dioxide emissions **[**see **Exhibit 1]**. At least one study in 2007 placed China ahead in total carbon dioxide emissions for the first time with an increase in 2006 of 8.7%.[11] However, in terms of per capita emissions, United States was 5th, while China ranked 92nd in the world. While fingerpointing over carbon emissions was popular politically, things became more complicated when differences in countries' stages of development, geographical structure, economic structure, manufacturing base, fuel mix and power generation were taken into consideration. Globalization shifted production to China, and an estimated 25% of particulates in the air over Los Angeles now originated in China.[12]

TOWNGAS

Towngas or, more formally, the Hong Kong and China Gas Company Limited (HKCG) had been in operation since 1864[13] and was Hong Kong's oldest and only gas supplier. It was in operation some 26 years prior to the introduction of electricity in Hong Kong.

"Town gas", the origin of the company name, was a synthetic gas, as Hong Kong had no indigenous gas reserves. The feedstock of Towngas' "town gas" had changed over the years; originally, coal was used as the main feedstock, with conversion to fuel oil in 1967, to naphtha in the 1970s and most recently mixed with natural gas. Altering the feedstock mix was motivated by cost, energy efficiency and environmental concerns.

Natural gas was the cleanest of fossil fuels and displacement of coal or oil reduced GHG gases. Using it as a feedstock produced 40% less carbon dioxide (CO_2) than coal and 20% less than oil and naphtha. The gas also emitted less nitrogen oxides (NO_X), which was one of the pollutants causing smog-forming haze and virtually no sulphur oxides (SO_X), a source of acid rain. Purification for liquefaction, necessary for long distance transportation, meant Towngas' imported LNG had fewer impurities than normal natural gas.

Natural gas took three forms. Low pressure gas was piped directly to homes and industries. Compressed natural gas (CNG) was available at CNG fuel stations where it was compressed into high-pressure fuel cylinders to power automobiles. Liquified natural gas (LNG) was made by liquefying gas at -163C. LNG had the greatest energy storage and was suitable for transportation for long distances via ocean or rail. Natural gas contained primarily methane but also included ethane, butane, propane, carbon dioxide, nitrogen, helium and hydrogen sulfide. It was found in oil and gas fields and coal beds. Biogas sources of methane were found in swamps, landfills, sewage and manure.

[11] Netherlands Environmental Assessment Agency, 2007.
[12] "The inconvenient truth about China", Forbes.com, October 12, 2007.
[13] Towngas listed its shares on the Stock Exchange of Hong Kong for the first time in 1960, Hong Kong and China Gas Company Limited website, http://www.towngas.com (accessed October 4th 2007).

Towngas' supply of natural gas was from Australia, imported by sea and stored at the Dapeng liquefied natural gas (LNG) terminal in Shenzhen, across the Hong Kong and mainland China border, under a 25-year contract. Towngas was part of a consortium holding 3% stake of the terminal. The LNG was being used as a 50-50 split feedstock alongside naphtha, a light petroleum distillate. The company planned to eventually import up to 330,000 tonnes of LNG annually, ultimately replacing approximately 60% of naphtha feedstock. This would reduce the bills for its 1.6 million gas subscribers by 10% and create a cleaner environment for Hong Kong.

The Tai Po Plant, with a maximum daily output capacity of 8.4 million standard cubic meters, produced over 95% of town gas while the remaining gas was produced at the Ma Tau Kok Plant. At the Tai Po plant, a catalytic rich gas process was used to convert naphtha into a methane-rich gas. Part of this rich gas is further processed into a lean gas which was mixed with the remaining rich gas to produce the final gas. Carbon dioxide generated from the production process was partially recovered and recycled, reducing emissions of carbon dioxide by about 17%. Around 85% of the nitrogen oxide in fuel gas were converted into harmless nitrogen and water vapor. The final gas was 20% carbon dioxide, 3% carbon monoxide, 29% methane, and 49% hydrogen. The network coverage extended to over 3,000 kilometers and covered 85% of Hong Kong's households.

The total volume of gas sales in Hong Kong for the six months ended 30th June 2007 rose slightly by 0.2% compared with the same period in 2006. The company's residential gas sales in Hong Kong showed a decrease of 1.9% in the volume of residential gas sales in first half of 2007 compared with the same period in 2006 attributed to hotter weather and change in consumer lifestyle. On the other hand, during the first half of 2007, the volume of commercial and industrial gas sales increased by 3.2%.

Towngas served over 1.6 million residential applications primarily for cooking and heating applications. Towngas also sold appliances; TGC and SIMPA were well known Towngas brands for kitchen and water heating. Innovations in appliances and linking appliances to lifestyle had helped Towngas develop an innovative mix of products and marketing strategies. Towngas' Cooking Centre, first opened in 1977, played a significant role in promoting gourmet flame cooking and humanizing the utility for its customers. The company also served approximately 15,000 commercial and industrial customers **[**see **Exhibit 3]**. Environmental issues played a role in that superior performance and efficiency were usually synergistic with reducing environmental impact **[**see **Exhibit 4]**.

In contrast to many of its foreign counterparts, Towngas was an unregulated utility. Competition in Hong Kong between electricity, town gas, bottled and piped LPG (liquid petroleum gas) was very intense, and the government pursued a free market non-interventionist approach to the energy market although entry by mainland utilities into the Hong Kong market was restricted. However, all participants were required to fulfill stringent safety and technical requirements monitored by the Gas Standards Office. There was a voluntary "Information and Consultation Agreement (ICA)", with mutually agreed terms and conditions, entered by both parties in 1997 and extended every three years, with the objective of maintaining transparency of the company's

core gas business and gas-related activities while enjoying tariff autonomy. This allowed Towngas great freedom in developing its businesses.

Towngas had progressed considerably over the years from a monopoly selling town gas into a diversified conglomerate, including niche related businesses such as property and telecom. While gas was the primary product, the company's revenue attributed to non-gas sales jumped from 15.73% of the total revenue in 2005 to 38% in 2006. However, Towngas' managing director, Alfred W K Chan, took the view that "we are not a property developer, so property profits will support short-term growth only."[14] Towngas' chairman, Dr. Lee Shau Kee, one of the world's richest men, controlled 40.35% of the company **[**see **Exhibit 6]**. The chairman, who held the position since 1983, was "optimistic" about Towngas' profitability and saw that "Towngas was a cash cow and a trophy asset in the Henderson Land family of companies."[15]

Towngas turned its focus to the energy market in mainland China in the mid-1990s and by 2006 had invested 3.8 billion yuan[16] in 40 gas transmission and distribution projects in the mainland "targeting a return on investment of 15 percent by 2013".[17] As China's gross domestic product (GDP) had a year-on-year increase of 11.5 percent for the first half of 2007,[18] so did its demand for energy to fuel its economic engine **[**see **Exhibit 5]**.

While profitable, **[**see **Exhibit 7]**, the core business of Towngas had matured and the company entered into new ventures. Towngas leveraged its core skills to develop new investment opportunities that were synergistic with its expertise in gas supply, pipeline construction and services through subsidiaries ECO Energy, TGT, U-Tech, and property development.

ECO ENERGY

Liquid petroleum gas (LPG) was manufactured from crude oil or extracted from natural gas. It was a mix of gases, generally propane and butane, generally sold in pressurized steel bottles. With a higher caloric value than natural gas, if mixed with air it could be substituted for natural gas. Traditionally, LPG was used for cooking and heating in Hong Kong. At its peak, LPG had over 50% gas market share[19]. However, since the government encouraged the installation of a piped gas supply in new buildings back in 1982 and launched a program to encourage upgrading sub-standard gas water heaters, the picture of the LPG industry had changed. In 1987, the

[14] Tsang, D., "Supply growth and rental income lift Towngas earnings", South China Morning Post, March 20th, 2007.
[15] Tsang, D., "Lee lifts Towngas stake to 40pc, triggering privatisation talk", South China Morning Post, July 14th, 2007.
[16] US$1 = 7.51 yuan Renminbi=HK$7.76, South China Morning Post, October 6th, 2007.
[17] Anonymous, "Terminal key for Towngas", The Standard, September 28th, 2006.
[18] Li, X., "National Economy Kept Steady and Fast Growth in the First Half of 2007", National Bureau of Statistics of China, July 19th, 2007.
[19] Wu, C. and Lui, F. T., "How competitive is Hong Kong's Gas Market? Myths and Realities", Economic Analyses & Commentaries, Center for Economic Development, Hong Kong University of Science and Technology, February, 2001.

government also set a directive banning the installation of gas mains to LPG across a road and that LPG should be used only if town gas was not available.

LPG still had commercial application. Since 2000, in order to reduce air pollution the Government had put in different measures to encourage vehicles to switch from diesel to LPG fuel. LPG fuel had a low carbon content reducing the emission of carbon dioxide, carbon monoxide and particulates. Cleaner burning, vehicles fueled by LPG would have a longer engine life and used less lubricating oils would be consumed during operation. Government incentives included raising the diesel tax and giving grants to the city's public taxi drivers and light buses for engine conversion. The local sales of LPG rose from 143,619 tonnes in 1997 to 421,551 tonnes in 2006.[20]

The ECO Energy Company Limited, a wholly owned subsidiary of Towngas, was awarded a 21-year government contract in 2000 for the design, construction and operation of dedicated LPG filling stations. Over 6 years of operations the company invested more than HK$40 million in the five vehicle refilling stations at Chai Wan, Mei Foo, Tuen Mun, West Kowloon and Wan Chai. These stations served the majority of local taxis and public light buses that had opted to convert from diesel fuel to LPG in support of the SAR Government's initiative to improve urban air quality. The company also invested in LPG filling stations in mainland China capitalizing on its Hong Kong experience.

While promoting LPG, the government was in no hurry to open up LPG to other vehicle owners for several reasons. Geographic constraints were one issue, there had to be buffer zones between stations to meet safety requirements, the infrastructure was just not ready to serve the 350,000 private vehicles in Hong Kong in addition to the 24,000 taxis and light buses.[21] Some argued there was a strong disincentive for the Government as well. In 2005, the unleaded petrol was selling for about HK$12.60 per liter, whereas LPG, which did not attract government tax, was priced at around HK$2.60. It would be a big step for the government to forego this revenue.

ECO Energy operated Towngas' landfill gas recovery project. Hong Kong had no natural gas resources, but Towngas, through ECO Energy, began a new journey back in 1999 to produce a "semi-natural resource".[22]

The first landfill gas project was established at Shuen Wan Landfill to process the captured methane from the decomposition of waste into a useable form for heating fuel in town gas production. The process eliminated the release of methane into the atmosphere, resulting in the reduction of air pollution and GHG. The treated gas was piped to Towngas' Tai Po plant for use as fuel to produce town gas. Carbon dioxide emissions were reduced by about 4,600 tonnes annually for six years. In 2007 another HK$230 million project was commissioned jointly by Towngas and Far East Landfill

[20] Source: Hong Kong Yearbook 1997 to 2006. Original source: Industrial Production & Tourism Statistics Section (former Industrial Production Statistics Section), Census and Statistics Department, HKSAR Government.
[21] Gentle, N., "Let private vehicles use LPG, motorists urge", South China Morning Post, April 17th, 2005.
[22] Cheung, C. F., "Conversion of landfill gas for domestic use helps environment and could cut bills", South China Morning Post, June 1st, 2007.

Technologies. The implementation included treatment and conversion of gases collected from the North-Eastern New Territories Landfill and transportation to the main gas production plant at Tai Po via a 19 km pipeline. The product, a natural gas substitute, would save about 44,000 tonnes annually of naphtha over the coming 25 years. The Chief Executive of the Hong Kong SAR, Donald Tsang, quoted the project at an international climate change conference on May 31st 2007 as an example demonstrating Hong Kong's commitment to tackle climate change.

TOWNGAS TELECOM (TGT)

Towngas did not consider itself to be an R&D intensive firm, but rather a "fast adopter" of proven technologies. TGT introduced "glass-in-gas" technology, licensed from a European firm,[23] to construct a telecommunication network infrastructure piggybacking on its extensive gas pipeline network. Unavailable to other local telecommunications operators, this business enabled TGT to reduce the time to lay cable by one half[24], gaining a significant advantage over competitors. In 2004, TGT acquired the unsuccessful fixed-line business from Henderson Cyber, the technology arm of its parent Henderson Land Development, and directed its focus to providing wholesale network infrastructure. The optical fiber cables placed within the gas pipes provided high network bandwidth to various wholesale customers such as Internet service providers, data center providers, fixed network operators, international carriers, mobile phone operators, hotels, universities, government and other corporations. The optical fiber was safe within the gas pipes giving the company a natural advantage in providing a wide range of customized solutions. For example, dedicated bandwidth service, flexible wavelength service, dense wavelength division multiplexing technology and fiber level connectivity for critical access locations.[25] TGT's capital expenditures totaled to HK$50 million at the end of 2004.[26]

In 2006, TGT launched "tgconnect intelligent home services", incorporating features such as "infotainment" and access to remote control household devices[27] installing them in several premier property projects. The "diversity is very important so as not to put all our eggs in a single basket" as explained by the general manager, Jason Wong.

TGT also investigated potential opportunities with Towngas' gas and water joint ventures (JVs) in mainland China as its telecom market grew rapidly.

U-TECH

U-Tech Engineering Company Limited (U-Tech), specializing in underground utility works, was established in 1998. U-Tech provided installation, rehabilitation and replacement of underground pipes both for gas and water, driven by its advanced technology of trenchless pipeline and duct installation. The trenchless technology deployed by U-Tech reduced the need for open excavation. Consequently, this method minimized the disturbance and damage to the surroundings, noise and dust

[23] Anonymous, "Towngas signs up telecoms providers", South China Morning Post, November 27th, 2004.
[24] Anonymous, "Networking with 'glass in gas'", South China Morning Post, August 10th, 2007.
[25] Anonymous, "Networking with 'glass in gas'", South China Morning Post, August 10th, 2007.
[26] Anonymous, "Towngas signs up telecoms providers", South China Morning Post, November 27th, 2004.
[27] Anonymous, "Networking with 'glass in gas'", South China Morning Post, August 10th, 2007.

pollution, reduced waste disposal and emissions from lorries and the operation of on-site equipment, improved on pedestrian and traffic congestion and contributed to lower consumption of fossil fuels.

In 2006, U-Tech installed the building services for Grand Waterfront, a 1.2 million square feet of residential complex consisting of 1,782 apartments in five towers with a 120,000 square feet clubhouse, co-developed by Towngas and its parent company, Henderson Land Development. This above ground project further reinforced U-Tech's brand name.

U-Tech had built a reputation as an integrated utility contractor for water, drainage, sewerage, electricity and telecommunications projects and expanding its business in mainland China and Southeast Asia. Some of the latest projects included the design and installation of LPG systems for the booming hotel and casino business in Macau.

P-TECH

P-Tech Engineering Company was a subsidiary established to handle processes associated with gas and chemical plant design and the construction business. Works included the design of water recycling plant that converts effluent into industrial grade water for steam generation at the main gas production plant. It was involved in the design and construction of the landfill gas plant. Other projects included carbonation of soft drinks and dry ice production from the recovered carbon dioxide emitted from the town gas production process.

PROPERTY DEVELOPMENT

In 2005, "despite solid economic growth, residential gas sales were up only 2%. The closure of a couple of restaurant chains left commercial sales 1.5% lower."[28] Yet, Towngas managed to make HK$5,281.4 million profit after taxation attributable to shareholders in that year, in great part due to property development projects. The investments included both residential and commercial properties; various opportunities for the Towngas' other businesses emerged through these property investments. For example, the six-star hotel with serviced suite hotel complex, offices and shopping mall at the International Finance Centre (IFC), in which Towngas had approximately 15.8% interest, generated commercial gas appliances sales such as dehumidifiers and boilers for the company. Towngas' own brands of water heating and cooking appliances and TGT home automation technology facilities were installed in the company's high-end residential projects.

In 2000, analysts had mixed feelings about Towngas progressing further into a comparatively higher-risk property development industry from its lower-risk core gas and related business. Criticism painting Towngas as being "passive in the development" and "taking the role as a bank, to provide the money"[29] came after the success of the joint bidding with its parent company Henderson Land Development for the residential site in Sai Wan Ho in December 2000. Other supporters felt the company's risk profile might be "mildly increased", but it was a "better use of their

[28] Tsang, D., "Property lifts profit at Towngas as trade lags", South China Morning Post, September 8th, 2005.
[29] Leung, P., "Towngas investment query", South China Morning Post, December 16th, 2000.

money."[30] A few years on, with a better outlook for its energy related investments in mainland China, Towngas' managing director reiterated that "property sales will fuel profit growth in the near term but in the long run sustainable growth will come from our mainland investments"[31] and "we won't treat property as our core business, as China earnings will become more important going forward."[32]

Utilities Sector in Mainland China

Energy consumption and economic growth went hand-in-hand. The International Energy Outlook 2007 predicted China would continue to have an average annual growth rate of approximately 6.5% over 2004 to 2030, the highest in the world.[33] The strong economic growth correlated with China's surging demand for energy. Chinese government figures indicated that the energy consumption growth rate was 15.5 percent in 2004 and 9.5 percent in 2005.[34]

The growth in energy was necessary to sustain economic and social development. China's urbanization was unprecedented in human history. China's cities were growing 10% annually. From 1978 to 2004, the urban population grew from 17.9% to 41.8%, projected to rise to an unsustainable 75% by 2050. Of its 1.3 billion people, 540 million lived in cities. 100 of its 661 cities aspired to develop into internationalized cities suggesting massive infrastructure development. The central government recognized that "improper urban development certainly will incur losses in three aspects, namely huge waste of resources, declining quality of life for residents, and weakened competitiveness due to business cost hikes."[35]

In 2003, China began the liberalization of its enormous state-owned public utility sector. Many business practices were antiquated, originating in the old planned economy, inhibiting growth. As well, a shortage of funds accelerated the government's decision to open up the market. The Ministry of Construction actively encouraged overseas and private investors to bid for the construction and operation of water, gas and heating supplies in urban areas. The services and tariffs of these new franchises, mostly in joint ventures with state-owned enterprises, would be licensed to operate in a given time frame and scope, and monitored by local governments. The Government allowed firms to conduct trans-regional and cross-sectoral operations and was planning for further urbanization in the near future.

[30] Leung, P., "Towngas investment query", South China Morning Post, December 16th, 2000.
[31] Tsang, D., "Interest costs, lower property income cut Towngas profit", South China Morning Post, September 14th, 2006.
[32] Wang, R., "Low income from flats drags Towngas net 20pc", The Standard, September 14th, 2006.
[33] "World Energy and Economic Outlook", Chapter 1, Energy Information Administration/ International Energy Outlook, 2007.
[34] Du, J., Xinhua, "Energy consumption growth rate reduced", Gov.cn, Chinese Government's Official Web Portal, June 30th, 2006.
[35] "China's urbanization encounters 'urban disease'", Chinanews.cn, November 18, 2005.

Towngas in Mainland China

Towngas started looking for investment opportunities in mainland China in the 1990s. 12 years on from its initial joint venture project in Guangzhou's Panyu district in 1994, Towngas had managed to secure 35 gas and 3 water joint ventures businesses **[**see **Exhibit 9]** throughout the fastest growing cities and regions in the southern, eastern and northern parts of mainland China.

Towngas partnered with municipal utilities through its investment holding company, Hong Kong & China Gas Investment Limited and grew city by city, building on the knowledge gained with each new project. Regional offices were set up for some projects and senior personnel from the Hong Kong headquarters were appointed to manage projects in major cities in Beijing, Nanjing and Xi'an and to train and develop local resources in other regions.

REGULATORY CHALLENGES

There were ongoing changes in policies and regulations as the environment for piped gas distribution in China evolved. The bidding process for municipal piped gas distribution was slowly changing from a guangxi-laden process to a more transparent one. Previously, city mayors would select proposals from interested parties. Starting from 2005, the Ministry of Construction issue tendering criteria and a panel of evaluators monitored the bidding process. The evaluators considered each bidder's "financial resources, expertise and track record in constructing and maintaining gas pipelines, as well as its ability to source natural gas over the life of the concession".[36]

The legal framework surrounding regulation, policy and pricing was ambiguous and varied by province and sector. In 2006, the domestic natural gas price in Beijing was 1.9 yuan per cubic meter and other big cities such as Tianjin, Shanghai and Haikou were charging 2.2 yuan and 2.1 yuan and 2.6 yuan respectively.[37] Until the National Development and Reform Commission (NDRC) reformed its cost-plus pricing approach on natural gas to market-oriented pricing reflecting resource scarcity, natural gas pricing in China would continue to be subject to an annual year-on-year maximum adjustment of 8%, in an attempt to balance dependence on foreign imports of energy resources.

There were no uniform price caps across provinces and cities. Traditionally, proposed tariff changes required government's approval, which could take six to nine months, a substantial time in a volatile global energy market. More flexibility was recently added into the system. Well-head prices were adjusted every year using a set formula of five-year moving averages of international prices of crude oil, LPG, and local coal prices. City gas distributors could automatically pass on well-head gas increases to

[36] Bacani, C., "Goodbye, Guanxi", CFO Asia, June 2006. http://www.cfoasia.com/archives/200606-01.htm (accessed October 6th 2007).
[37] (i) Xinhua, "Public hearing on Beijing gas price hike ends with few objections", People's Daily Online, December 22nd 2006. (ii) "China braces for rising gas prices", Asia Times Online, January 10th, 2007.

commercial and industrial users, but needed local government approval for residential increases.

Unclear government guidelines on who was responsible for paying the initial 2000 to 3000 yuan connection fees generated confusion to the domestic customers and created double charging problems. There were possibilities that the connection fees would be abolished in some regions in the future. Meanwhile, Towngas pursued a strategy less dependent on initial connection fees by targeting revenue on tariffs through promoting increased usage of natural gas.

COMPETITORS

Western and north central China held the country's largest reserves of natural gas. Some more natural gas fields were discovered in northeast China and southwestern province in recent years.[38] These newly discovered gas fields would be developed by big players in the industry such as Sinopec (China Petroleum & Chemical Corp), China National Petroleum Corporation (operating through its subsidiary PetroChina) and CNOOC. Estimates of domestic proven reserves of natural gas in China ranged from 53.3 trillion cubic feet (Tcf)[39] to 83 Tcf[40] as of January 2006. China consumed 1.3 Tcf of natural gas in 2004, almost doubling the level of natural gas consumption from five years prior **[**see **Exhibit 12]**[41] and it was predicted to increase by more than 15% annually for the next 20 years from 2006[42]. China also imported natural gas from other countries such as Russia and Turkmenistan. The bottleneck to development of natural gas services were not lack of reserves, but downstream transmission and distribution.

For piped distribution Towngas had both local competitors such as China Gas, China Resources, Xinao Gas Holdings, Wah Sang Gas as well as other state-owned utilities.

Newly refinanced China Gas represented a new breed of competitor in China. In just four years, China Gas signed agreements with 49 cities serving 17 million people of which 13.6% were users of piped natural gas, ahead of XinAo Gas which took almost a decade to accumulate the same market. China Gas aimed to increase its market size to 56 cities in 2007. China Gas had pursued strategic partnerships with key investors: Gas Authority of India Ltd. (GAIL) (7.4%), Oman Oil (7.4%), and Sinopec (7.4).

Each partnership was strategic for China Gas. GAIL provided expertise in providing compressed natural gas (CNG), a cleaner and cheaper fuel than gasoline, for taxis and buses. GAIL had expertise in engine conversion technologies, currently 30% cheaper

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[38] "China Energy Data, Statistics and Analysis - Oil, Gas, Electricity, Coal", Energy Information Administration (EIA), Official Energy Statistics from the U.S. Government, August, 2006.
[39] Oil & Gas Journal (OGJ) estimation of China's domestic proven reserves of natural gas, according to Energy Information Administration (EIA), Official Energy Statistics from the U.S. Government.
[40] Cedigaz's estimation of China's proven reserves of natural gas, according to Energy Information Administration, Official Energy Statistics from the U.S. Government. Cedigaz was an international association dedicated to natural gas information, created in 1961 by a group of international gas companies
[41] "China Energy Data, Statistics and Analysis - Oil, Gas, Electricity, Coal", Energy Information Administration, Official Energy Statistics from the U.S. Government, August, 2006.
[42] Anonymous, "China's energy policy focuses on maximizing local resources", Shanghai Daily, November 15th, 2006.

than current Chinese technology and this new business was far more lucrative than household distribution. "In China, one family burns only 0.5 cubic meter of natural gas a day for cooking, heating, and other activities. A taxi on an eight-hour shift burns up to 40 cubic meters; a bus uses 65 to 70 cubic meters."[43]

Oman Oil solved a problem for supply for China Gas. There was strong concern that supply of natural gas and the pipeline transmission network was unable to meet demand. PetroChina's West-East natural gas transmission pipeline saw demand in 2005 exceed forecast by 28%, but was only able to increase transmission by 16%. China Gas was partnering with Oman Oil to sell oil to PetroChina, relieving congestion and allowing greater natural gas transmission.

Sinopec assured China Gas of a stable gas supply by constructing an LNG processing plant near to its gas fields, as well as building storage facilities, an expensive proposition.

Competitor XinAo Gas served 32 million people with 59 concessions. However, only 10% of that population used piped natural gas. XinAo was slowing acquisition of new projects and focused on maximizing gas connections within its existing concessions.

A key reason the Chinese government opened the market for utilities was to improve overall management quality. Monitoring systems, accountability, and incentives were outdated and inefficient. In some cities a significant proportion of gas was siphoned off throughout the network before reaching paying users. Forced to partner, these state or municipally owned enterprises brought with them cultural challenges and resistance to change. Ruling out layoffs made training and education a key part of Towngas' strategy. In Xi'an, a 1.7B yuan project in 2006, Towngas used a strategy of using Hong Kong as a showcase for management practices, flying in mainland management and workers for training and education.

GAS PROJECTS

Natural gas in China traditionally was used to produce fertilizer and petrochemicals rather than for power generation or residential or commercial use. In 2003 the piped gas market had low market penetration, reaching only 10% of China's population.[44] The nation's natural gas demand was predicted to increase by more than 15% annually for next 20 years from 2006 [45] and the China's consumption was planned to grown from 3.5% of its energy mix in 2004 to 7% by 2010.[46]

In December 2006, Towngas strengthened its position in the mainland China market through a 45% acquisition of Panva Gas Holdings Limited, a former piped city-gas business competitor. The change of name to Towngas China Company Limited (TCCL) and the appointment of four executive directors to the board of directors,

[43] Bacani, C., "Goodbye, Guanxi", CFO Asia, June 2006. http://www.cfoasia.com/archives/200606-01.htm (accessed October 6th, 2007).
[44] Tsang, D., "Beijing opens utility sector", South China Morning Post, January 6th, 2003.
[45] Anonymous, "China's energy policy focuses on maximizing local resources", Shanghai Daily, November 15th, 2006.
[46] Lim, W., "Gas race to heat up in cities", The Standard, December 24th, 2004.

including Towngas' managing director Alfred Chan to be TCCL's chairman, confirmed a commitment to development in China **[**see **Exhibit 6]**.

China's gas producers were allowed to charge only about one-fourth of the world market price for natural gas, yet with the abundance of coal in China, gas provision was still the more expensive alternative. As income rose and standard of living improved, an increasing number of China's domestic consumers in rich cities such as Shanghai and Shenzhen were prepared to pay more for the cleaner natural gas fuel alternative to cheaper coal-derived gas for cooking and heating. However, the situation was very different in poorer rural areas. While solid fuels such as coal and wood were a source of serious indoor pollutants, the cost of conversion to gas was prohibitive.

China's natural gas consumption was restricted to local natural gas producing regions due to its fragmented system of different pipelines and distribution networks. Recently, China stepped up efforts to reform its natural gas transport infrastructure and improved the connections between regional networks **[Exhibit 8]**. The 140 billion yuan West-East pipeline running 4,000 kilometers from Xinjiang to the energy starved Yangtze River Delta was the showcase for natural gas energy. The pipeline was constructed in cooperation with international giants Royal Dutch/Shell Group, Russia's Gazprom and Exxon Mobil and was operated by PetroChina. The Government aimed to increase the gas market size to 200 billion cubic meters per annum (bcm/a) by 2020, with a 3:2 ratio split between the domestic supply and imported gas or LNG.

Towngas' piped gas strategy targeted densely populated cities with higher living standards and strong economic growth. Higher density provided more cost effective network management, higher income allowed higher conversion rates and downstream services such as appliances. Competition was also higher, and as cities usually had only a single gas distributor, as major cities became locked up, Towngas began to head west towards less prosperous and smaller cities. Municipal piped gas distribution opened up downstream growth opportunities as had been successful in Hong Kong. Towngas launched its own made-for-the-mainland gas appliances brand Bauhinia in September 2005.

Gas projects were related to natural gas, liquefied natural gas (LNG) and coal bed methane. Towngas was increasingly involved in all segments of natural gas production and distribution, from upstream exploration, extraction and processing, to midstream transportation and storage of the natural gas to the piped city-gas distribution. Towngas' natural gas activities in China grew quickly, with an increase in revenue of 45% and gas sales volume by 51% in 2006.

WATER PROJECTS

The Ministry of Water resources reported in 2002 that 108 Chinese cities faced serious water shortages and had to ration water supplies at certain times. 700-800 billion yuan was expected to be poured into the water market from social funds

including foreign sources by 2005.[47] Official statistics indicated that China's water market was worth an estimated US$120 billion.[48] It had been predicted that demand for water would grow 66% as the population increased from 1.2 billion to 1.5 billion by 2030.

Given the outdated utility infrastructure in many cities, each successful piped gas distribution projects brought opportunities to develop water utilities. Thus Towngas began to enter the piped water distribution business including pipelines construction, water supply, daily operations and maintenance. Water investment was usually more expensive and had lower returns than gas. However, given the serious potable water supply shortages in China, there were also long term opportunities. The company reserved 4.5 billion yuan annually for its water business as compared to 3 billion yuan for gas-related business between 2007 and 2008.[49] However, the water business was still potentially profitable because of its relatively lower risk.

According to Dr. Daniel Chan, VP of Business Development in China, unlike the gas and energy sector, there were few competitors in the water business in mainland China. Entering the water market also posed difficulties. Some local governments required bidders to bundle potable water supply with water treatment, requiring Towngas to venture into the business of waste water projects.

COAL BED METHANE PROJECT

Coal provided 69% of China's total primary energy consumption, and China was the largest producer and consumer of coal in the world, producing 35% of the world's coal.[50] There were over 30,000 mines, most of them small and many poorly managed.

Coal bed methane extraction used a process of drilling wells and dewatering to remove methane from coal seams, which was then compressed and piped to processing plants. While there were problems of surface discharge of water, methane extraction removed 70-85% of deadly methane from coal beds before mining, and was an affordable source of methane.

The Country had recoverable reserves of 11 trillion cubic meters of coal bed methane as of the end of 2005.[51] China intended to boost its annual coal-bed gas output from 100 million cubic meters to 10 billion cubic meters by 2010.[52] Such extraction could result in a methane supply as rich as 90% methane. The gas would take a few years to build up before commencing the extraction phase lasting for about 5 years. The company acquired one pilot coal bed methane project in 2006, a 400 million yuan joint venture involving a 30-year license to explore and process the fuel in the site in Tai Yuan, Shanxi province. The expected annual production capacity of was 100 million cubic meters planned to start in mid-2008 with expected double-digit returns.

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[47] Anonymous, "Utilities move to private sector", The Standard, July 21st, 2003.
[48] Tsang, D., "Beijing opens utility sector", South China Morning Post, January 6th, 2003.
[49] Tsang, D., "Utilities look for new power plays", South China Morning Post, September 24th, 2006.
[50] Energy Information Administration, August 2006
[51] Anonymous, "China's energy policy focuses on maximizing local resources", Shanghai Daily, November 15th, 2006.
[52] Tsang, D., "Towngas in 400m yuan gas deal", South China Morning Post, November 15th, 2006.

Towngas considered water and gas businesses as long term investments lasting at least 15 to 20 years. The company had plans "to spend a total of HK$6 billion (US$774 million) from 2006 to 2008 on expansion in China, hoping to sign agreements for 18 new projects within the period."[53] Towngas' revenue from its mainland China operations continued to increase from 11.6% of its total revenue in 2005 to 12.3% of its total revenue in 2006. The company expected revenue from its China operations to grow 50% a year in the near future as China's energy demand for natural gas increased.

TOWNGAS AND THE ENVIRONMENT

Providing the cleanest of fossil fuel energy sources, Towngas had developed a strong branding for environment especially in regard to air pollution, one of the major environmental concerns of Hong Kong. It had been reported that "the periods of reduced visibility [in Hong Kong] increased by 29% to more than 1,200 hours a year over the decade."[54] The 88% rise in complaints lodged about pollution from 1997 to 2007 indicated that Hong Kongers were becoming more aware of environment issues. Consumers' environmental concerns did not necessarily correspond to their purchasing behaviors. However, their concern translated into some pressure on Hong Kong utilities to demonstrate environmental action.

Towngas' corporate vision was to be "Asia's leading clean energy supplier and quality service provider, with a primary focus on gas". The company marketed their products and services with the slogan "*Natural gas: Igniting your Passion for Life*". Towngas received various awards in the past in recognition of its achievements in the area of environmental protection. Over the years, the company had actively participated in various awareness and outreach programs aiming to raise environmental consciousness among the public **[**see **Exhibit 11]**.

The company worked with stakeholders to develop sustainable strategies. Towngas extended training to contractors' employees on health, safety and environmental standards. Suppliers were advised about environmental friendly packaging and products designed to meet international standards and local market requirements. The public was able to share their views during the environmental impact assessment (EIA) stage carried out for major infrastructure projects. Environmental monitoring data during construction phase was made available for public inspection. In 2003, the company invested approximately HK$17.1 million in its environmental initiatives.

CLP, Towngas' major competitor in Hong Kong, had also taken measures to address air pollution and climate change issues. In its CLP Group Climate Strategy framework, it planned to increase renewable energies, improve power-efficiency, place voluntary caps on its emissions, adopt measures to measure its GHG inventories, and seek a UN designation for several projects as Clean Development Mechanisms (CDM). Activities included importation of liquefied natural gas (LNG)

[53] Poon, A., "Corporate News: Utility looks to mainland; Hong Kong gas firm allots $774 million, envisions 18 projects", The Wall Street Journal Asia, Hong Kong, May 22nd, 2006.
[54] Anonymous, "How green is my future?", South China Morning Post, July 1st, 2007.

for power generation, a wind farm in Guangdong[55], and investments in high-efficiency power generation. In 2007 it launched a HK$1 million CLP Energy Innovation Fund for community-initiated projects on energy efficiency and renewable energy.

Internally, Towngas's environmental policy and objectives were centered around 5 Rs: "Reduce, Replace, Recover, Recycle, Reuse". An ISO 14001 certified Environmental Management System (EMS) **[**see **Exhibit 10]** had been implemented to identify, evaluate and manage significant environment issues associated with the Company's operations. The EMS headed by the Board of Directors was supported by the Executive Committee and the Environmental Working Committee (EWC), initially set up in 1992, comprising 12 functional Environmental Sub-committees and several Departmental Safety Committees. The EWC formulated, implemented, monitored and reviewed the Company's environmental performance, and encouraged staff to participate in environmental activities. Towngas' corporate values encompassing accountability, creativity, leadership, open communication, recognizing achievements, respect and integrity, continuous learning, teamwork and entrepreneurial spirit were communicated to all employees in Hong Kong and mainland China, throughout the six business categories of energy, infrastructure, public utility, consumer services, dangerous goods (handling and transportation of gas, LPG, etc.) and environmental protection.

Towngas conducted pilot programs for recycling such as the collection of used gas appliances for metal recycling and the powering of station instruments by solar power. Cooling water from the compressor for the cooling tower had been collected, diverted and reused, resulting in an annual saving of 100,000 m^3 of water and simultaneously avoiding the discharge of 100,000 m^3 of wastewater. Spent lubrication oil was also collected and recycled by a local licensed oil recycler. More recycling initiatives included recycling of toner cartridges, waste paper and polyfoam packaging material were implemented for administration activities.

The company received awards and recognition for its awareness programs. In 2007 it received an ECO-Service Enterprise Award from Next Magazine, the Green Council's Green Purchasing Charter endorsement, and the Hong Kong General Chamber of Commerce Clean Air Charter endorsement in 2005.

China and Climate Change

In 2007, attitudes towards climate change varied across countries and demographics. A global study of 47 countries found that concern about global warming more than doubled across the world from October 2006 to April 2007. Hong Kong ranked 13th with 20% of Hong Kong consumers listing global warming as their top one or two concerns in the next six months; China ranked 36th with 7% of respondents placing

[55] "CLP Group Issues Manifesto on Air Quality and Climate Change and Announces Joint Venture on Wind Farm in Changdao, China", CLP Holdings Media Release, December 3rd, 2004.

climate change in their first two concerns.[56] Consumers felt that governments should be the ones to make greater contribution to climate change than individuals by restricting companies' carbon emissions and pollutants and by investing in research to find solutions.

The majority of Asian companies were "'largely oblivious' to the risks posed by climate change issues to their business models and the environment". A 2007 study of corporate governance found that that 40% of respondents failed to answer any questions on green issues, down from 60% in 2006. Indonesian companies showed the lowest response rate (22%), followed by China (31%) and Hong Kong (38%). The study found that while climate change was at the top of the political agenda outside Asia, Asian companies lagged far behind US and European companies. The survey found that a common response from Hong Kong companies was that "they should not be subject to scrutiny because they did not produce emissions". The report concluded, "Given China's rapid growth, driven by investments and industrial output… the lack of awareness to climate change is alarming". Researchers found that the power and gas industries were amongst the most attuned to climate change issues. [57]

In China, the annual average air temperature had increased by 0.5°C to 0.8°C during the past 100 years, with the majority of the increase happening in the last 50 years. 20 consecutive warm winters were recorded nation-wide from 1986 to 2005. Extreme weather conditions such as drought and severe flooding were experienced in many parts of the country. The annual average growth rate of GHG emissions in China from 1994 to 2004 was 4% and the share of CO_2 in total GHG emissions increased from 76% to 83%.[58] Chinese experts believed that only about 10% of environmental laws were enforced. The Chinese government agreed on the importance of addressing climate change and energy at the Asia-Pacific Economic Cooperation (APEC) 2007 forum, held in Australia in September 2007.[59] President Hu Jintao stated in a press conference that "The Chinese Government takes the tackling of climate change very seriously."[60]

While most would agree that China was not ready for measures such as emission cap and trade, there was general consensus that GHG emissions in Asia, particularly China, were a serious problem. China was the second largest consumer of energy in the world. 93% of China's energy use was from fossil fuel, of which only 2% was natural gas.[61] China argued that the GHG emissions in per capita terms were relatively low, pointing out that, in 2004, its per capita carbon dioxide emissions were

[56] "Global Nielsen Survey: Consumers Look to Governments to Act on Climate Change", June 5th 2006. It was a global study of almost 27,000 online users across 47 countries done by The Neilsen Company and Oxford University's Environmental Change Institute.
[57] Carbon Disclosure Project Report 2007 - Asia ex-Japan (CDP5)", Carbon Disclosure Project, 2007.
[58] "China's National Climate Change Programme", National Development and Reform Commission People's Republic of China, June, 2007.
[59] Prime Minister of Australia, "Australia and the People's Republic of China Climate Change and Energy", APEC Media Release, September 6th, 2007.
[60] Street, P., "Interview Transcript of the Australian Prime Minister Howard's Joint Press Conference with the President of the People's Republic of China, His Excellency Hu Jintao", September 6th, 2007.
[61] "Is China ready for Carbon Emissions Trading?", AsrIA/BEC Energy Market Development Conference, Prospects for Asia-Emerging Carbon Markets, Association for Sustainable & Responsible Investment in Asia, March 24th, 2003.

"3.65 tons, compared to a world average of 4.20 tons and an average of 10.95 tons for the Economic Co-operation and Development (OECD) countries."[62]

Rapid growth in GHG on the mainland was mainly caused by heavy reliance on coal for its energy supply, especially in the heavy industry sector which accounted for 70% of China's energy consumption.[63] In 2005, China's energy mix was 68.9% coal, 21.0% oil, and 10.1% natural gas, hydro-, nuclear, wind and solar power. In comparison, the world primary energy consumption was 27.8%, 36.4, and 35.8% respectively. China had launched various economic policies to mitigate GHG, mainly focusing on improving energy efficiency and promoting the use of renewable energy.

The country was using external partnerships to develop initiatives. Jointly with Australia, the Asia Pacific Partnership on Clean Development and Climate (APP) aimed to address the challenges of climate change by working with business community to develop, deploy and transfer cleaner, more efficient technologies. The Joint Coordination Group on Clean Coal Technology aimed to achieve a long-term stabilization of greenhouse gas levels in the atmosphere, by deploying carbon dioxide capture and storage (CCS) technologies to improve the environmental performance of coal used in Australia and China, two of the world's largest producers, exporters and consumers of coal. The Methane to Markets Partnership encouraged development and implementation of cost-effective, near-term methane recovery projects and the use of methane, from sources such as agriculture, coal mines, landfills, oil and gas systems, as a valuable clean energy source.[64]

China unveiled its first national plan on climate change in June 2007. The National Climate Change Plan (NCCP) aimed to cut GHG emissions by 20% by 2010 and increased the amount of renewable energy it produced from 7% to 10%. It outlined the use of more wind, nuclear, and hydropower, as well as more efficient coal-fired power plants. The plan promised to adopt administrative, economic, and legislative measures to increase power efficiency, promote renewable energy, and enlist local authorities' support to cut GHG emissions.[65]

The central government planned to spend "two trillion yuan (US$266.7 billion) during the 2006-2020 period" to "increase the country's use of renewable resources to 15% of total energy consumption by 2020."[66] A new policy was drawn up in August 2007 to prioritize natural gas consumption in order to increase the natural gas percentage of total primary energy consumption from 2.8% in 2005 to 5.3% in 2010.[67] City gas consumption was favored while projects using natural gas as feedstock for methanol production were forbidden; the use of natural gas in other petrochemical projects would be limited; gas-fired power-generation plants was banned in certain coal-rich

[62] "National plan to address climate change", Gov.cn, Chinese Government's Official Web Portal, June 4th, 2007.
[63] Lewis, J. I., "China's Climate Change Strategy", China Brief, Volume VII, Issue 13, June 27th, 2007.
[64] "Joint Statement on Climate Change and Energy between the People's Republic of China and The Commonwealth of Australia", APEC Australia 2007 Forum, September 6th, 2007.
[65] "China's National Climate Change Programme", National Development and Reform Commission People's Republic of China, June, 2007.
[66] Anonymous, "China pledges to raise renewable energy use ", Shanghai Daily, September 5th, 2007.
[67] Fu, C., "Policy on natural gas streamlined", Shanghai Daily, September 4th, 2007.

regions[68] and LNG production had been confined to small, marginally economic gas fields. Such measures prevented methanol producers exhausting the country's scarce natural gas resource and allowed more efficient pipeline distribution to be utilized at large fields.[69]

However, along with all the plans and policies came a strong message that China was not prepared to sacrifice economic development for climate change. "The international community should respect the developing countries' right to develop," said Ma Kai, chairman of China's National Development and Reform Commission. Yet, to reassure those who were concerned over greenhouse effect and global warming, Ma said the country had a huge potential for clean energy, too, such as generating power from water, wind and the sun."[70] China had plans to spend 1.5 trillion yuan (US$189 billion) between the years 2007 and 2022 to expand renewable energy use such as solar and wind power to 16% of the country's total supply from 7% in 2006.[71]

Climate change was also having impact on water resources over China. The "blue oil" was as necessary to China's development as energy. According to the Chinese Ministry of Water Resources in 2004 60 percent of China's largest 660 cities – 170 with over 1 million residents - were facing water shortages, and 110 facing extreme water shortages.[72] In formulating the course of action for sustainable development in China, the government wanted to enhance water resources management, to optimize water resources allocation and to strengthen infrastructure construction. Wastewater treatment was another item on the agenda. Only 20% of domestic water was treated, compared to 80% in the developed world.

In China, venture capital investment in clean technology, covering solar, wind and biomass energy generation, water and wastewater, agriculture and materials, was estimated at HK$580 million in 2007 growing to HK$720 million in 2008, compared with HK$170 million and HK$420 million for 2005 and 2006, respectively.[73] Some predicted that the water and wastewater sector comprised of water resource management, wastewater treatment and recycling would be the next big boom.

Scattered throughout China there were innovative projects in almost every area of renewable and non-renewable energy. In Beijing, the Ministry of Science & Technology purchased from Daimler-Chrysler three hydrogen-powered, Mercedes-Benz Citaro fuel cell buses to market fuel cell technologies in China. China was first in the world in off-grid wind turbine generators and was tenth in in-grid wind power capacity. Eco-cities such as Dongtan outside Shanghai were models of sustainable cities. China was the world's largest producer and consumer of solar power producing 40% of the world total in solar heat panels. Volkswagen was partnering with Shanghai

[68] Fu, C., "Policy on natural gas streamlined", Shanghai Daily, September 4th, 2007.
[69] Ng, E., "Beijing slaps ban on new gas-fed methanol plants to cut pollution", South China Morning Post, September 4th, 2007.
[70] Li, F., "Energy use 'no threat' to the world", China Daily Hong Kong Edition, March 8th, 2007.
[71] Anonymous, "China's energy policy focuses on maximizing local resources", Shanghai Daily, November 15th, 2006.
[72] "Effective measures urged to save water", People's Daily, June 9, 2004.
[73] Chen, J., "Venture capital for green start-ups on the rise", China Daily Hong Kong Edition, August 10th, 2007.

Automotive to produce 500 Touran hybrid electric cars for the 2008 Beijing Olympics. While these initiatives were tiny in the context of China's total energy profile, some wondered if China had the potential to leapfrog past Western energy production and consumption models, or was going to repeat their mistakes.

There was some indication that awareness of climate change was greatest amongst the youth of China. The China Youth Daily ran a survey in 2007 on climate change. When asked about urban air pollution, 84% considered car exhaust the main cause, however, when asked if they would buy a car 27% said "definitely" and 49% said "possibly". Asked about lifestyle, Chinese youth corresponded closely to the goals of young British consumers: to own a large home (38%), to travel abroad (21%) and to own a car (12%). 77% of respondents believed there were not enough energy-saving products on the Chinese market.[74]

Hong Kong was influenced by climate change by the formation of urban heat islands where temperatures were higher than their surroundings.[75] To combat the situation, the Hong Kong government launched schemes to encourage manufacturers, importers, wholesalers, retailers and other waste producers to take responsibility for avoiding, recovering and recycling their waste.[76] The Hong Kong and Guangdong governments were in co-operation to reduce air pollution to below 1997 levels by 2010, through monitoring and regular reviews. Hong Kong mainly focused on reducing emissions from power plants, the major local source of sulphur dioxide pollution, as well as other polluting sources. Results were mixed. One study claimed that Guangdong had outperformed Hong Kong in cutting air pollution.[77]

In assessing Asian business action on climate change, the Climate Disclosure Project found high variability in the extent to which top Asian management was addressing issues of climate change reporting and strategy. While several companies in Hong Kong and China had a "developed investor dialogue covering emissions trends, strategic choices, and renewables and CDM (Clean Development Mechanism) initiatives, the report concluded that most Asian utilities were "hiding under a cloud".[78]

Climate Change and Business Models

> *"Periodically, major new forces dramatically reshape the business world—as globalization and the information technology revolution have been doing for the past several decades. Climate change, in its complexity and potential impact, may rival them both. While many companies may still*

[74] China Youth Daily Economy and Life Editorial Office, "Cooler living for China's youth?", China Youth Daily, August 30th, 2007.
[75] Leung, Y. K., Yeung, K. H., Ginn, E. W. L. and Leung, W. M., "Climate Change in Hong Kong", Hong Kong Observatory, February, 2004.
[76] "Environmental Impacts of Policies and Programmes - Chapter 6", Environmental Performance Report 2007, Environmental Protection Department, HKSAR Government.
[77] Hu, F.Y., Guangzhou beating HK in smog battle, SCMP, Oct 9, 2007.
[78] Carbon Disclosure Project Report 2007 - Asia ex-Japan (CDP5)", Carbon Disclosure Project, 2007.

> *think of global warming as a corporate social responsibility issue, business leaders need to approach it in the same hardheaded manner as any other strategic threat or opportunity."*
>
> - Michael E. Porter[79]

A Yale University report synthesized the thoughts of 100 leaders and thinkers on climate change.[80] From the report findings, climate change posed some difficult problems for business. Climate change challenged firms to make it "real", going beyond public relations, to internalize climate change into their organizations, and externalize it through profitable strategies with specific timelines.

Most large firms already had internal environmental groups and engaged in environmental reporting, some for many years. However, this mindset on environmental issues also limited their perspective of the opportunities from climate change, placing it into the same box as traditional environmental concerns. While there were clearly elements of corporate and social responsibility in acting on climate change, there were also new creative opportunities that created potentially new businesses or changed existing business models. Most firms wanted to do good, but no good would come if there were not sustainable and profitable business models.

Peter Senge, guru of organizational learning, spoke of a new business logic to build sustainable enterprises connecting industry, society and the environment. "Industrial-age managerial practice has always been about increasing efficiency…However, focusing on eco-efficiency may distract companies from pursuing radically different products and business models – changes that require shifts in mental models, not just shifting attention within existing mental models." Contemporary production systems were highly inefficient, converting less than 10% of inputs into usable products. Industrial systems that conformed to natural principles would be circular systems rather than linear. They would also invest in regenerative processes. Companies applying natural principles would "learn how to live on our energy income [solar, wind, hydrogen] rather than off our principle [oil and gas]." Industrial systems in the future would need an alignment between sound economic models and sound ecological models. Drawing on examples such as BP, Electrolux, Toyota, Honda, Xerox, Interface, Senge and Carstedt found that a "new environmentalism is emerging, driven by innovation, not regulation – radical new technologies, products, processes and business models."

Gaia understood why Towngas had asked them to come. Fresh faces, fresh ideas. How might climate change impact Towngas' value propositions, market segments, value chain, and strategies? What should be their priorities and timing? She took one last glance at the spectacular harbor view, gathered her thoughts and walked to the conference room with Towngas' goal at the back of her mind.

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[79] Porter, Michael E. and Forest L. Reinhardt, A Strategic Approach to Climate. Harvard Business Review, October, 2007.

[80] Abassi, Daniel R., Americans and Climate Change: Closing the Gap Between Science and Action, Yale School of Forestry and Environmental Studies, 2006.

Towngas aspires to be Asia's leading clean energy supplier.[81]

- Alfred W K Chan
Managing Director,
Towngas, The Hong Kong and China Gas Company Limited

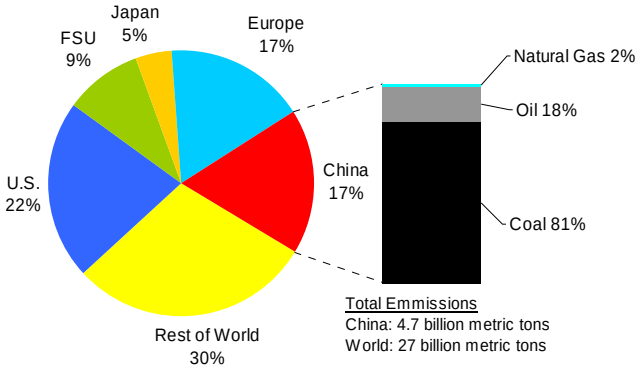
[81] Hong Kong and China Gas Company Limited Sustainability Report 2005/2006 (Draft), August 2007.

EXHIBIT 1 - WORLD CARBON DIOXIDE EMISSIONS FROM ENERGY ACTIVITIES, 2004

(Million Metric Tons Carbon Dioxide)

Region	CO_2
Rest of World	7,957.81
U.S.	5,912.21
FSU	2,550.75
Japan	1,262.10
Europe	4,653.43
China	9725.059

FSU - Former Soviet Union



Source: "China Energy Data, Statistics and Analysis - Oil, Gas, Electricity, Coal", Energy Information Administration (EIA) International Energy Annual, Official Energy Statistics from the U.S. Government.

EXHIBIT 2 - TOWNGAS' NETWORK IN HONG KONG



Source: Hong Kong and China Gas Company Limited Annual Report 2006, Hong Kong Core Business.

EXHIBIT 3 -

LIST OF TOWNGAS' COMMERCIAL AND INDUSTRIAL PRODUCTS

Restaurant & Catering	Gas appliances, gas-fired catering equipment for steaming, baking, grilling, deep-frying, shallow frying and rice cooking. Dishwashing and grease extraction equipment and commercial customisation.
Food & Beverage Processing	Food processing applications for preparing a variety of foods from dim sum, oyster sauce, roast pig to Chinese herbal medicine or confectionery items. Provision of carbon dioxide to carbonate soft drinks. Manufacture of dry ice and provided assistant for industrial cleaning operations in food processing plants.
Bakeries	Town gas-fired oven, the water vapour released after combustion improved the quality of our baked products, and the oven insulation greatly improved the bakery's workspace.
Health Clubs & Beauty Salons	Created a water heater which solve the problem of water temperature fluctuation in traditional water heaters.
Recreation Clubs	Provided gas-fired central hot water systems for heating pools and showers in recreation clubs. Installed indirect water heaters in pools and showers to control temperature. Provided gas-fired dehumidifier in indoor swimming pools to control relative humidity and provide an even comfort zone.
Hotels	Supplied hotels' hot water for dishwashers and boilers and steam for central hot water service and gas dryers. Provided dehumidifier to control relative humidity, especially in indoor swimming pools and special function rooms.
Hospitals	Provided a continuous, reliable and cost-effective supply of energy for hospitals. Reduced the risk of electrical failure during peak hours. Provided a full line of gas support for institutional style kitchens. Provision of gas-fired incinerators enabling efficient and hygienic disposal of waste materials.
Laundries	Provided cost-effective, safe, user-friendly and powerful burners meeting the full spectrum of laundry equipment requirements, including hot water, washers, dryers, steam irons and presses, and vacuum controlled ironing tables.
Textiles	Serviced a wide range of processes for the textile and garment industries, including dying, singeing, setting, baking and printing.
Printing	Provided gas-fired equipment for drying which remained precise and constant and was used in the manufacturing of paper cartons. Provided perfect relative humidity (RH) environment for storing paper with gas humidifier, solving the air moisture problem that typically reduced paper quality.
Other Industrial Applications	• Warehouse - provided products to control humidity in maintaining material stability. • Laboratories - provided bunsen burners widely used in chemical, college and institutional test laboratories. • Jewellery making - the furnaces used in casting and heat treatment of metal, and the burners used for drying engraved material. • Car spraying - use of gas-fired burners to provide the required uniform heat flow and stable temperature for the drying process. • Food - provided the required uniform heating effect for drying tobacco, peanuts and coffee beans. • Toy manufacturing - gas-fired blow-moulding machines used in making plastic toys. • Light bulb and vacuum flask manufactures - specially designed Towngas equipment. • Photographic processing, cleaning operations in chemical industry - using gas-fired water heaters. • Crematoria - gas-fired incinerators enabled efficient and hygienic procedures.

Source: Towngas website, Commercial and Industrial Services, Industrial Products, http://www.towngas.com (accessed August 28th 2007).

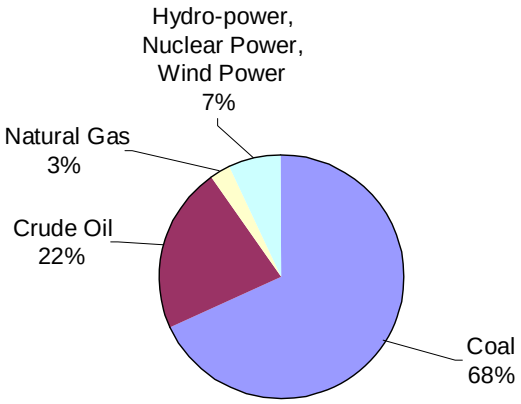
EXHIBIT 4 - ENVIRONMENTAL FRIENDLY PRODUCTS BY TOWNGAS

The Residential Market
All new models of pilotless water heater are ignited by a spark generator instead of a pilot flame, thereby reducing gas consumption.
Our condensing boilers improve thermal efficiency by more than 15% compared with conventional boilers, while greatly reducing heat discharge through the chimney.
Intelligent cooking appliances feature a timer function and thermostatic control for boiling water, cooking rice or deep-frying, thereby reducing the amount of energy used.
Our gas clothes dryer and 2-in-1 washer/gas dryer are both designed with a sensor which automatically shuts off the supply of gas used for drying once the clothes are dry, eliminating any unnecessary energy consumption.
Our hot-filled dishwasher uses less water than washing by hand, and the residual heat drying function reduces the possibility of bacterial growth normally present during hand washing.
Packaging for our gas appliances now makes minimal use of non-degradable materials such as polystyrofoam and plastic bags.

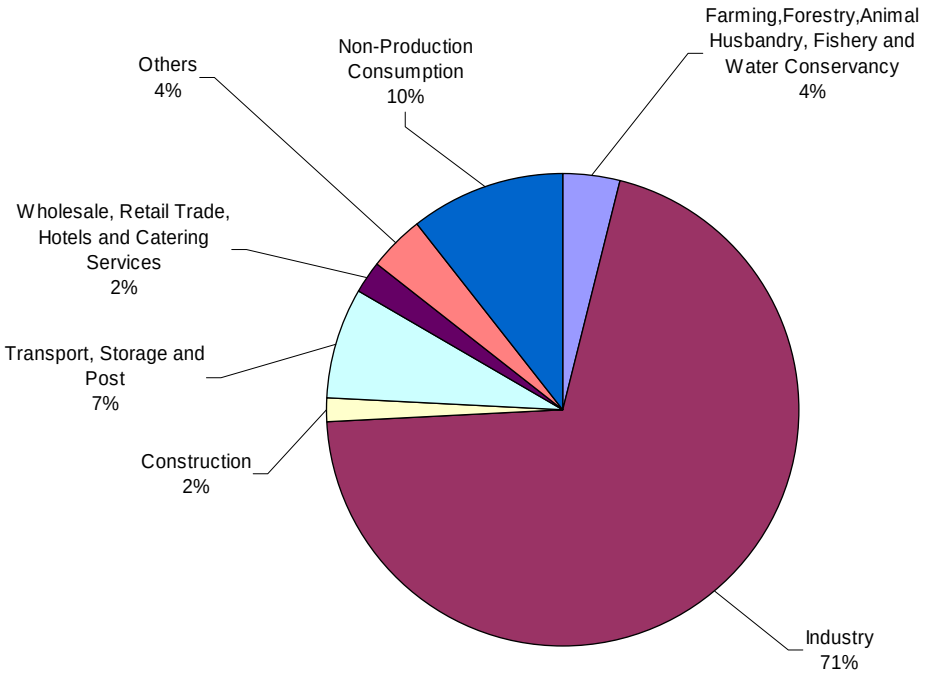
The Commercial and Industrial Market
Condensing boilers contribute 15% energy savings to end users when compared with traditional water boilers.
Gas-fired desiccant dehumidifiers do not use ozone-depleting refrigerants. The desiccant wheel extracts moisture directly from the air during the dehumidification process, before dry fresh air is supplied to the conditioned space. This system significantly improves indoor air quality, as the low humidity prevents the growth of bacteria and fungi.
Our whole range of new generation Chinese food steamers are equipped with pre-aerated burners and high-efficiency steam generator, and are designed for low-noise operation. Steam cabinets are fitted with heat recovery system. When compared with traditional steamers, their efficiency increases by 30%

Source: Towngas website, Safety and Environment, Environmentally-Friendly Products, http://www.towngas.com (accessed August 28th 2007).

EXHIBIT 5 - CHINA ENERGY CONSUMPTION BY FUEL TYPE, 2004

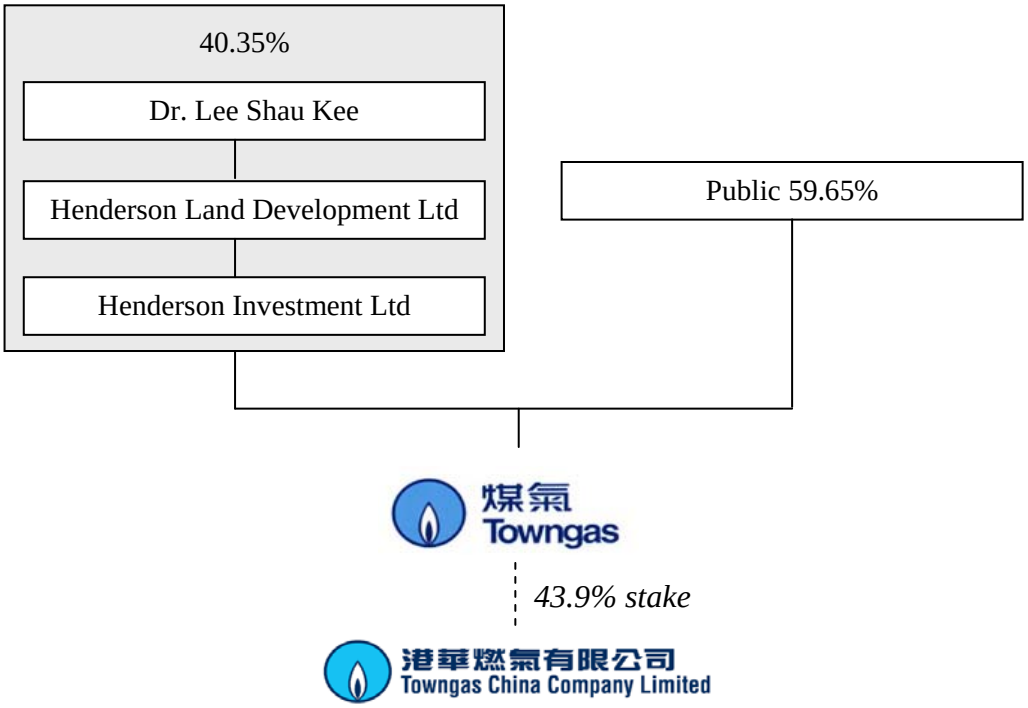


CHINA ENERGY CONSUMPTION BY SECTOR, 2004



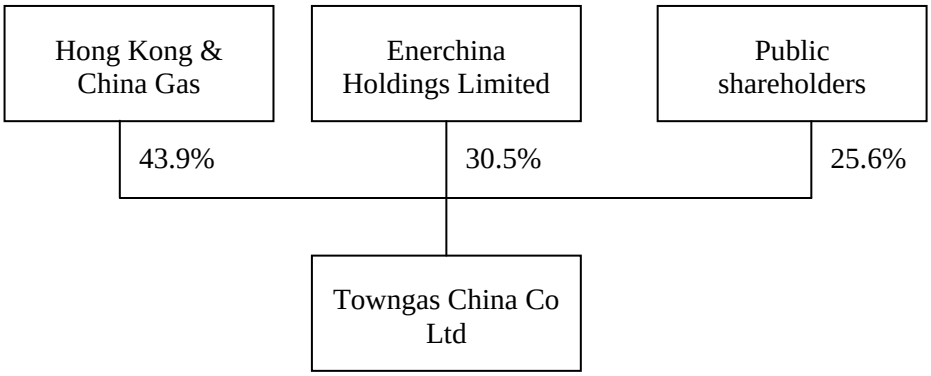
Source: National Bureau of Statistics of China, October 4th 2007

EXHIBIT 6 - TOWNGAS OWNERSHIP STRUCTURE



Source: Hong Kong and China Gas Company Limited, September 2007.

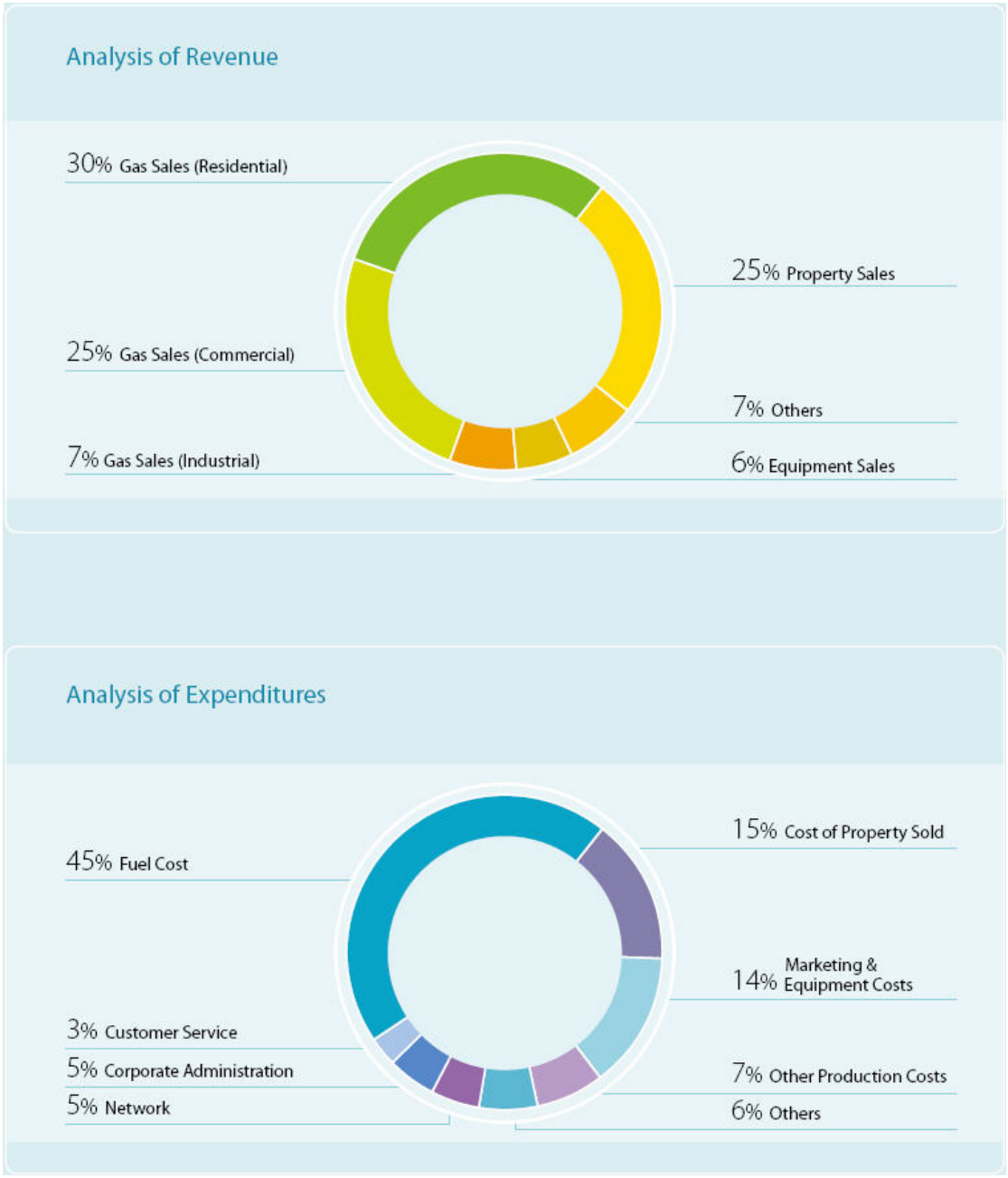
MAJOR SHAREHOLDERS OF TOWNGAS CHINA



Source: Wong, C., Oldfield, S., Huang, D., "UBS Investment Research, Chinese Gas Utilities Sector", UBS Securities Asia Ltd., July 6th 2007.

EXHIBIT 7

TOWNGAS 2006 FINANCIAL ANALYSIS

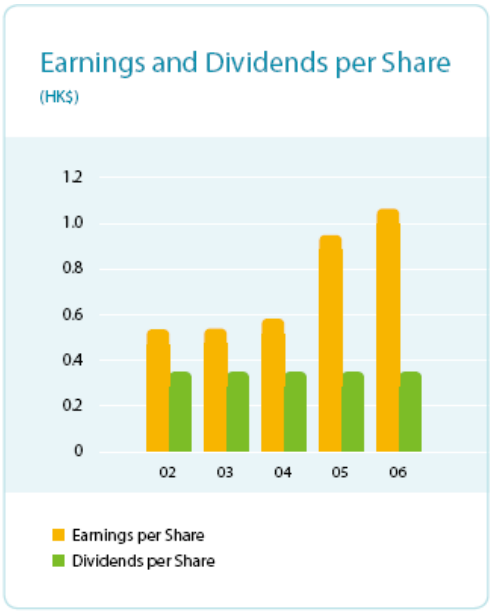


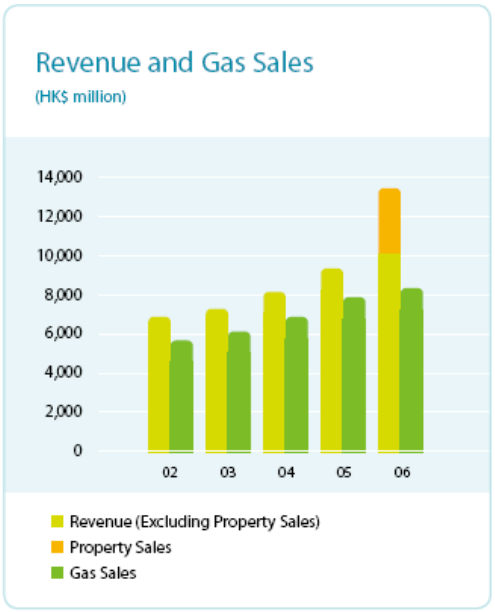
Source: 2006 Towngas Annual Report

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EXHIBIT 7 (CONT'D)

TOWNGAS 2006 FIVE YEAR FINANCIAL STATISTICS









Source: 2006 Towngas Annual Report
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EXHIBIT 7 (CONT'D) TEN-YEAR COMPARISON

	2006	2005	2004	2003	2002	2001	2000	1999	1998	1997
Highlights (Company)										
Number of Customers as at 31st December	**1,622,648**	1,597,273	1,562,278	1,520,166	1,470,738	1,407,408	1,329,161	1,265,354	1,206,236	1,149,441
Town gas Sales, million MJ	**27,034**	27,261	27,137	27,002	26,641	26,564	26,057	24,687	23,943	23,906
Installed Capacity, thousand m^3 per day	**12,260**	12,050	11,210	11,000	11,000	11,000	11,000	11,000	11,000	11,000
Maximum Daily Demand, thousand m^3	**6,279**	6,614	6,694	5,848	5,695	5,530	5,650	5,786	5,164	4,687
Revenue & Profit	**HK$'M**	HK$'M	HK$'M	HK$'M	HK$'M	HK$'M	HK$'M	HK$'M	HK$'M	HK$'M
Revenue	**13,465.3**	9,350.9	8,154.0	7,288.8	6,878.0	6,857.4	6,650.9	5,842.3	5,426.6	5,583.8
Profit before Taxation	**6,804.2**	5,920.4	3,922.7	3,799.7	3,581.0	3,656.9	3,579.1	3,322.0	3,074.6	2,639.1
Taxation	**(914.6)**	(628.6)	(623.0)	(735.2)	(523.7)	(470.0)	(445.8)	(423.3)	(422.9)	(362.9)
Profit after Taxation	**5,889.6**	5,291.8	3,299.7	3,064.5	3,057.3	3,186.9	3,133.3	2,898.7	2,651.7	2,276.2
Minority Interests	**(27.0)**	(10.4)	(12.9)	(13.6)	(9.6)	(4.2)	(2.3)	(0.2)	4.2	7.1
Profit Attributable to Shareholders	**5,862.6**	5,281.4	3,286.8	3,050.9	3,047.7	3,182.7	3,131.0	2,898.5	2,655.9	2,283.3
Dividends	**1,928.1**	1,935.7	1,966.7	1,975.2	1,991.8	1,830.5	1,798.1	1,642.4	1,511.9	1,384.4
Assets & Liabilities										
Property, Plant, Equipment & Leasehold Land	**12,864.7**	11,067.0	8,969.9	9,644.3	9,324.2	11,862.6	11,635.9	11,439.8	11,265.9	11,160.7
Intangible Asset	**48.6**	45.8	–	–	–	–	–	–	–	–
Associated Companies	**3,457.0**	2,060.9	1,206.7	2,703.8	2,539.8	2,460.2	2,440.1	2,625.5	2,337.0	1,989.3
Jointly Controlled Entities	**5,815.0**	5,197.5	1,709.5	2,558.9	241.6	208.7	25.0	–	–	–
Available-for-Sale Financial Assets	**848.5**	768.0	624.3	861.3	1,651.9	1,490.2	627.7	446.2	414.5	383.5
Other Non-Current Assets	**100.7**	–	–	–	–	–	–	–	–	–
Current Assets	**13,028.2**	10,457.7	8,584.0	5,991.4	6,420.0	4,398.4	8,546.2	6,802.4	7,203.3	5,649.7
Current Liabilities	**(7,141.0)**	(8,182.5)	(4,182.6)	(3,203.7)	(2,539.3)	(2,194.5)	(2,122.3)	(1,050.6)	(1,947.0)	(870.8)
Non-Current Liabilities	**(7,803.5)**	(4,570.1)	(2,022.9)	(1,852.0)	(1,688.1)	(896.3)	(1,025.4)	(960.7)	(914.2)	(1,072.1)
Net Assets	**21,218.2**	16,844.3	14,888.9	16,704.0	15,950.1	17,329.3	20,127.2	19,302.6	18,359.5	17,240.3
Capital & Reserves										
Share Capital	**1,377.2**	1,377.2	1,403.7	1,410.9	1,422.7	1,300.9	1,284.4	1,177.1	1,079.7	984.4
Share Premium	**3,907.8**	3,907.8	3,907.8	3,907.8	3,907.8	4,037.1	4,165.5	4,283.2	4,334.7	4,431.2
Reserves	**14,141.7**	9,863.9	8,001.0	9,864.8	9,189.2	10,665.7	13,445.7	12,712.2	11,908.3	10,864.8
Proposed Dividend	**1,267.0**	1,267.0	1,291.4	1,298.0	1,308.9	1,196.9	1,181.6	1,082.9	993.5	905.6
Shareholders' Funds	**20,693.7**	16,415.9	14,603.9	16,481.5	15,828.6	17,200.6	20,077.2	19,255.4	18,316.2	17,186.0
Minority Interests	**524.5**	428.4	285.0	222.5	121.5	128.7	50.0	47.2	43.3	54.3
Total Equity	**21,218.2**	16,844.3	14,888.9	16,704.0	15,950.1	17,329.3	20,127.2	19,302.6	18,359.5	17,240.3
Earnings per Share, HK Dollar	**1.06**	0.95	0.58	0.54	0.54	0.53	0.51	0.47	0.42	0.38
Dividends per Share, HK Dollar	**0.35**	0.35	0.35	0.35	0.35	0.32	0.29	0.26	0.24	0.22
Dividend Cover	**3.04**	2.73	1.67	1.54	1.53	1.74	1.74	1.76	1.76	1.65

Source: 2006 Towngas Annual Report

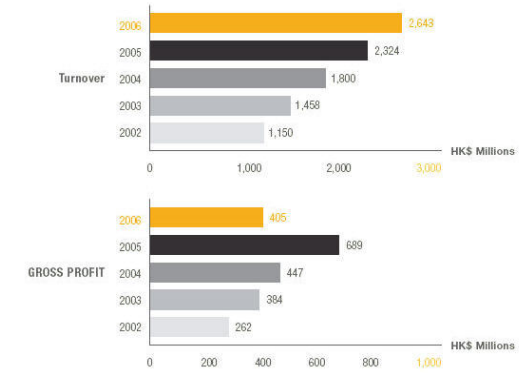
Reproduced with kind permission of The Hong Kong and China Gas Company Limited.

EXHIBIT 7 (CONT'D) TOWNGAS CHINA LIMITED

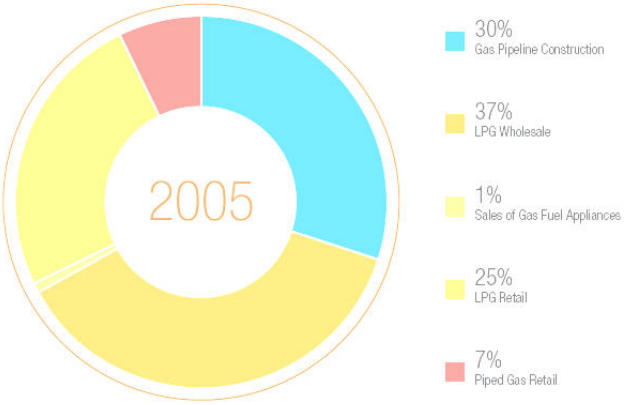
港華燃氣 Towngas

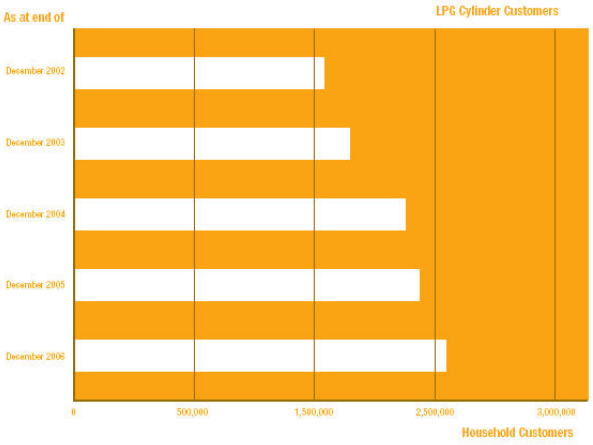
Towngas China Company Limited
(Incorporated in the Cayman Islands with limited liability)
(Formerly known as Panva Gas Holdings Limited)

Financial Highlights

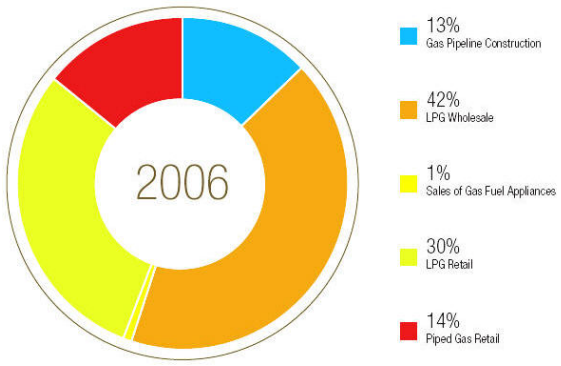


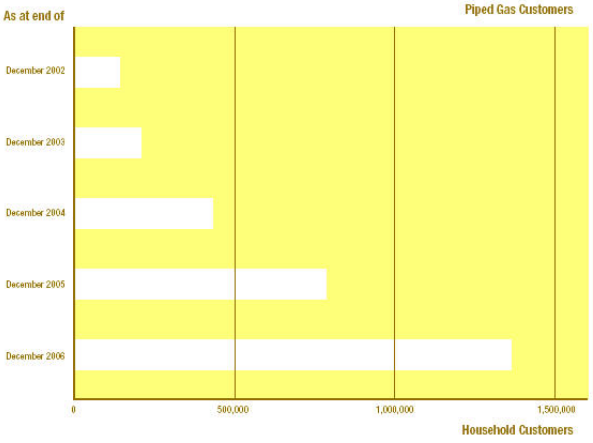
	2006 HK$'millions	2005 HK$'millions	Increase/ (Decrease)
Turnover	2,643	2,324	13.7%
Gross Profit	405	689	(41.2%)
(Loss) Profit for the year	(247)	206	N.A.
(Loss) Profit attributable to equity holders of the Company	(256)	156	N.A.
Total equity	2,039	2,032	0.3%
Total assets	4,777	4,922	(2.9%)
	2006 HK Cents	**2005 HK Cents**	**Increase/ (Decrease)**
(Loss) Earnings per share	(27.13)	16.53	N.A.
Net asset value per share	212.77	215.69	(1.4%)





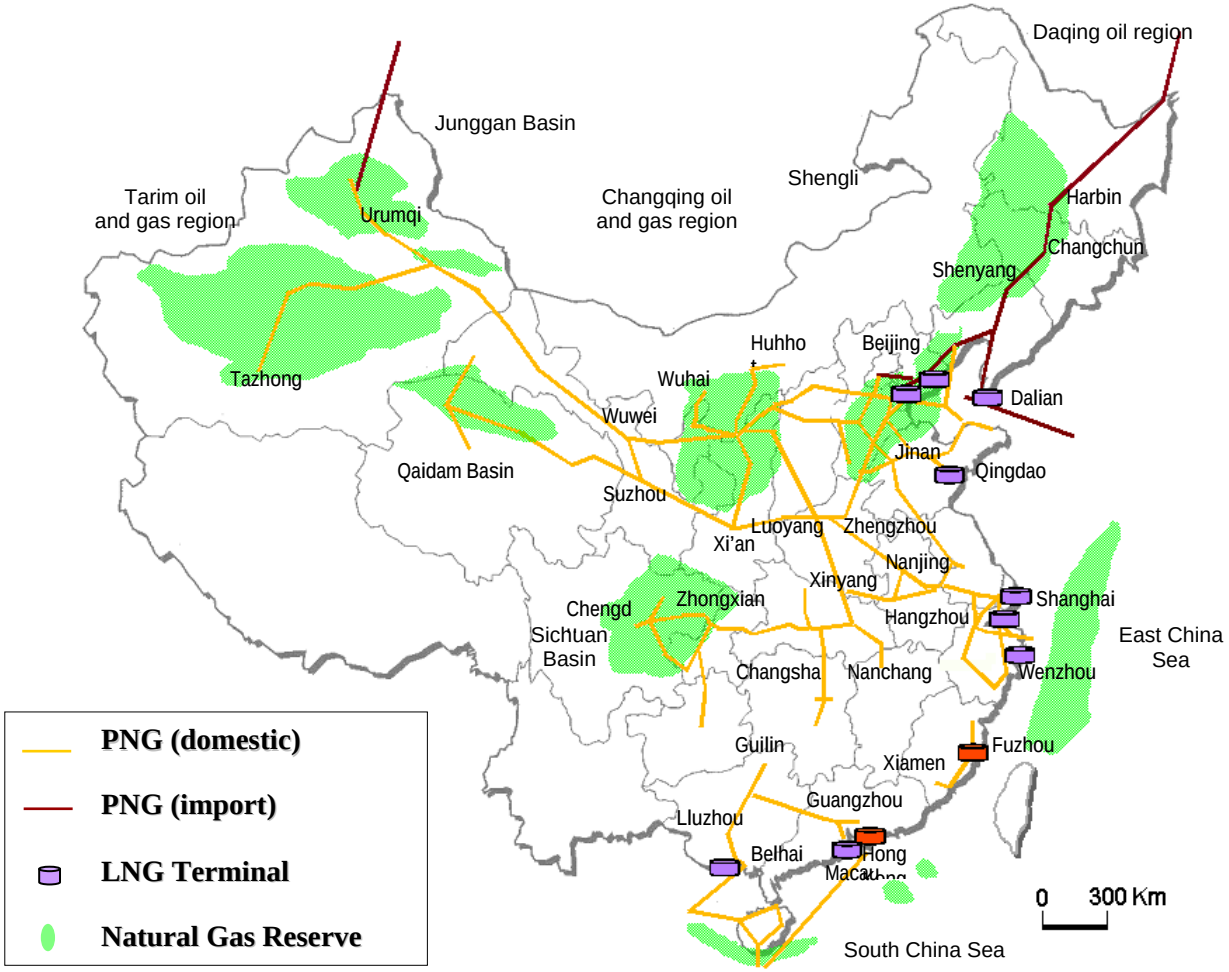
Breakdown of Turnover





Source: http://www.irasia.com/listco/hk/towngas/finhigh.htm
Reproduced with kind permission of irasia.com and Towngas China Limited.

EXHIBIT 8 – GAS PIPELINE NETWORKS IN MAINLAND CHINA



Source: Hong Kong and China Gas Company Limited, September 2007.

LIST OF LNG TERMINALS IN MAINLAND CHINA

Facility	Effective capacity (m tons per annum)	Owner	Status	Start-up
Dapeng LNG, Guangdong	3.7	CNOOC 33%, BP 30%, Guangdong Sponsers* 31%, Hong Kong Electric 3%, Hong Kong & China Gas 3%	Operational	2006
Fujian LNG	2.6	CNOOC 60%, Fujian Investment & Development 40%	Under construction	2008
Shanghai LNG	3	CNOOC 45%, Shenenergy 55%	Proposed	2009
Zhejiang LNG	3	CNOOC 51%, Local Partners 49%	Proposed	2010
Hainan LNG	2	CNOOC 65%, Hainan Government (Dev. Co.) 35%	Proposed	Uncertain
Zhuhai LNG, Guangdong	3	CNOOC, Guangdong Power	Proposed	Uncertain
Hong Kong LNG	2.6	ExxonMobil 60%, CLP Holdings 40%	Proposed	Uncertain
Rudong LNG, Jiangsu	3.5	PetroChina, Singapore RGMI, Jiangsu Guoxin Group	Proposed	Uncertain
Caofeidian LNG, Hebei	6	PetroChina 51%, Beijing Enterprise Holdings Ltd 29%	Proposed	Uncertain
Liaoning LNG	3	PetroChina and Dalian Government	Proposed	Uncertain
Shandong LNG	3	Sinopec and China Huaneng Group	Proposed	Uncertain
Total	**35.4**			-----
Equivalent to bn cubic meter	**49**			-----

Source: Wong, C., Oldfield, S., Huang, D., "UBS Investment Research, Chinese Gas Utilities Sector", UBS Securities Asia Ltd., July 6th 2007.

EXHIBIT 9 - TOWNGAS' JOINT VENTURES IN MAINLAND CHINA (PIPED CITY-GAS AND WATER BUSINESSES)



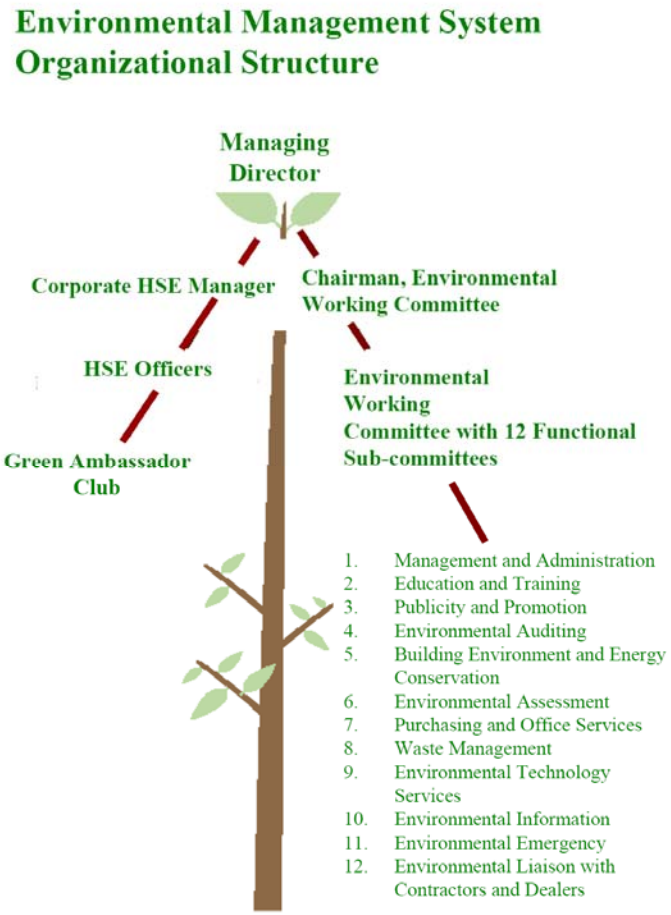
	Year of Establishment	Project Investment Rmb million	Registered Capital Rmb million	Equity Share
GAS PROJECTS				
Guangdong Province				
1 Panyu	1994	260	105	80%
2 Zhongshan	1995	240	96	70%
3 Dongyong	1998	132	53	80%
4 Jianke	2002	45	23	100%
5 Shenzhen	2004	2,316	772	30%
6 Shunde	2004	200	100	60%
Central China				
7 Wuhan	2003	1,200	420	50%
Eastern China				
8 Suzhou Industrial Park	2001	245	100	55%
9 Yixing	2001	246	124	80%
10 Taizhou	2002	200	83	65%
11 Changzhou	2003	248	166	50%
12 Nanjing	2003	1,200	600	50%
13 Zhangjiagang	2003	150	60	51%
14 Wujiang	2003	150	60	80%
15 Xuzhou	2004	245	125	80%
16 Danyang	2004	150	60	80%
17 Tongxiang	2003	83	58	76%
18 Huzhou	2004	200	87	95%
19 Maanshan	2003	248	108	50%
20 Anqing	2004	182	73	50%
21 Jintan	2006	150	60	60%
22 Tongling	2006	240	100	70%
23 Yuhang	2006	240	160	50%

	Year of Establishment	Project Investment Rmb million	Registered Capital Rmb million	Equity Share
GAS PROJECTS				
Shandong Province				
24 Jimo	2001	37	19	90%
25 Laoshan	2002	60	30	60%
26 Zibo	2002	240	106	50%
27 Longkou	2002	84	42	100%
28 Weifang	2003	241	140	50%
29 Jinan	2003	410	390	50%
30 Weihai	2003	245	99	50%
31 Taian	2004	200	80	50%
Northern China				
32 Jilin	2005	247	100	63%
33 Beijing Economic-Technological Development Area	2005	111	44	50%
34 Yingkou	2006	80	40	100%
Northwestern China				
35 Xi'an	2006	1,668	1,000	49%
WATER PROJECTS				
8 Suzhou Industrial Park	2005	3,500	2,123	50%
14 Wujiang	2005	1,500	300	80%
36 Wuhu	2005	700	300	75%

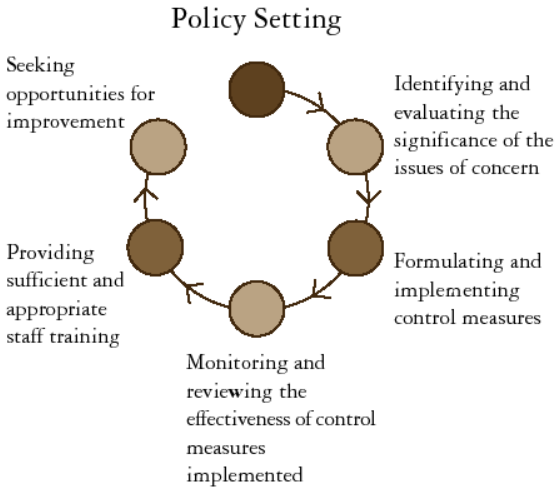
Source: Hong Kong and China Gas Company Limited Annual Report 2006**.**

EXHIBIT 10

ENVIRONMENTAL MANAGEMENT SYSTEM (EMS) STRUCTURE



MANAGEMENT SYSTEM FRAMEWORK



Source: "Health, Safety and Environmental Report 2003", Hong Kong and China Gas Company Limited.

EXHIBIT 11

TOWNGAS' ENVIRONMENTAL AWARDS AND PROGRAMMES

Selected Awards

1999

- Tai Po Plant was certified to ISO 14001 standard.
- "Excellent" rating for the Operations Building in North Point in accordance with the requirements of the Hong Kong Building Environmental Assessment Method. [This successful energy-saving program generated an annual saving of HK$1million since 2001].

2001

- Business Environment Council's Environmental Performance Award in the Hong Kong Awards for Industry program.
- BEC Environmental Performance Award.

2002

- BEC Environmental Performance Award
- Green Office Award (Large Organisations) - Grand Award in the 2002 Hong Kong Eco-Business Awards.
- Gold Wastewi$e Logo from the Environmental Protection Department in recognition of our commitment to sustainable development and waste reduction.

2003

- Registered as an Energy Efficient Building for the North Point Headquarter under the EMSD's Hong Kong Energy Efficiency Registration Scheme for Buildings.
- Awarded the Best Environmental Report by the Association of Chartered Certified Accounts (ACCA).
- Hong Kong Eco-Business Gold Award – Best Environmental Reporting Category

2004

- Received the Hong Kong Awards for Industry - Environmental Performance Grand Award.
- Awarded Platinum rating of the Hong Kong Building Environmental Assessment Method.

2006

- Green Participant - One Factory-One Year-One Environmental Project Programme organized by Federation of Hong Kong Industries..

2007

- ECO-Service Enterprise Award in the Top Service Awards 2007, Next Magazine.

Selected Awareness Programmes

- First commerical organisation in Hong Kong to launch a Green Partnership Program with the Environmental Protection Department and five green groups to help educate the public with respect to care for the environment. Activities included printing of educational booklets on the Energy Crisis and Alternatives of Fuel (Green Power); organisation of an EPS Recycling Program (Friends of the Earth); establishment of an Inventory of Eco-tourism Resources in Hong Kong (Conservancy Association); establishment of a Hong Kong Marine Life Centre at Hoi Ha Wan (WWF Hong Kong);
- Participation in tree planting campaigns and sponsored the Corporate Afforestation Scheme from 2001 through 2003.
- Platinum Sponsor of the Better Air Quality Conference, the largest regional event on air quality in Asia, with over 600 senior policy makers and stakeholders in attendance, in December 2002.
- Supporter of the Environmental Campaign Committee's annual "World Environment Day" and "Environmental Protection Festival" to enhance public awareness of the need for environmental protection.
- Participated in the 5th Solar Cart Race, organised by Friends of the Earth (HK) and gained the Artistic Design Award (Advanced Team) Gold Award, the Earth Design Award (Advanced Team) Gold Award and The Best Team Spirit Award (Advanced Team) Silver Award.
- Green Purchasing Charter endorsement in October 2007. Organized by the Green Council.
- Clean Air Charter endorsement in November 2005. Launched by the Hong Kong General Chamber of Commerce and the Hong Kong Business Coalition on the Environment.

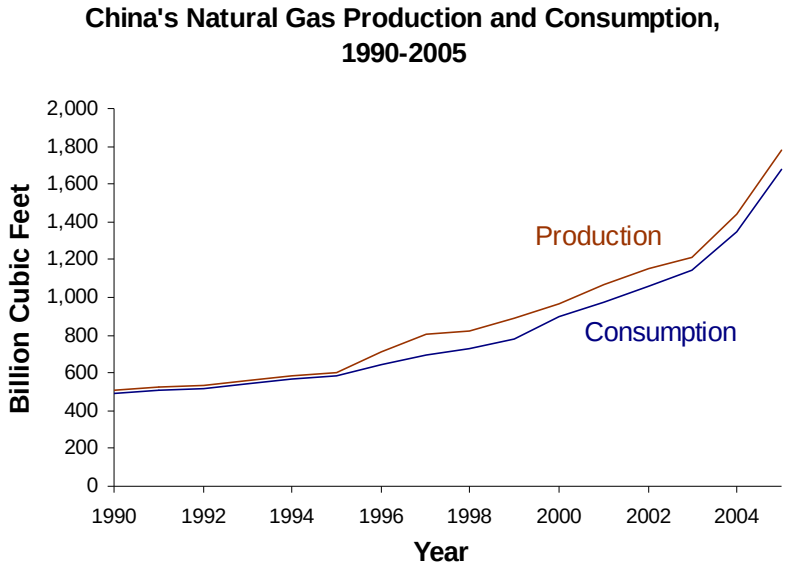
Sources:

Towngas website, Safety and Environment, http://www.towngas.com (accessed August 28th 2007).
Providing for a Green Future, Hong Kong and China Gas Company Limited, February 2003.

EXHIBIT 12

CHINA'S NATURAL GAS PRODUCTION AND CONSUMPTION, 1994-2004

Year	Consumption (Bcf)	Production (Bcf)	Production (Tcf)
1990	494	508	0.508
1991	511	526	0.526
1992	517	533.2565	0.533
1993	541	558.33	0.558
1994	569.9	588.7	0.589
1995	581.5	601.4	0.601
1996	646.0	711.8	0.712
1997	697.3	801.3	0.801
1998	724.7	821.6	0.822
1999	782.4	889.3	0.889
2000	902.4	962.3	0.962
2001	974.2	1,070.4	1.070
2002	1,061.3	1,152.7	1.153
2003	1,143.4	1,211.3	1.211
2004	1,350.5	1,439.8	1.440
2005	1,674.4	1782.69	not available



Source:

1990-2004: EIA; 2005: FACTS, Inc China Oil and Gas Monthly, "China Energy Data, Statistics and Analysis - Oil, Gas, Electricity, Coal", Energy Information Administration (EIA), Official Energy Statistics from the U.S. Government, August 2006.