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"Devising ways to make our society use energy efficiently and in a sustainable manner is arguably the most important of the environmental challenges we now face." (PELB, 1993)

"Saving electricity is much cheaper than making it." (Amory B Lovins)

Fact 1: Hong Kong is ignoring its international obligations to stabilise emissions of greenhouse gases

1. Scientists now agree that global climate change is happening (IPCC, 1993). Although the exact amount of warming and resulting regional effects cannot be predicted precisely the risks are substantial. Scientists believe a changing climate could have highly destabilising effects on human society with more severe droughts, stronger hurricanes and more destructive floods. Rising seas could flood many coastal cities and islands and put millions of lives at risk.
2. Asia now emits nearly as much carbon dioxide as western Europe and more than half of Asia's emissions come from China. The Pearl River Delta will be one of the areas most badly affected with serious implications for flooding and attendant problems of food and water supplies leading to refugees and epidemic disease. The flow pattern of the main rivers will be altered with adverse effects on crop production (Hulme *et al*, 1992). The alluvial flood plains of China, including the Pearl River Delta, have an average altitude of less than 10 metres and an average population density of 800 per square kilometre (Hulme *et al*, 1992). If the sea level is elevated by 50 cm 40,000 square km of land will be covered by sea, affecting approximately 32 million people.
3. Hong Kong Government clearly recognises that global climate change could have effects on the public work, since Technical Circular No. 6/90 on "Greenhouse effect - allowance in design" recommends that designs should allow for a 10mm increase in mean sea-level per year where this does not entail significant capital cost. Despite this recognition of the consequences the government is taking no preventive action to reverse this.
4. According to the Planning, Environment & Lands Branch, Hong Kong government is determined to "fully meet the obligations of the international agreements on the environment applied to Hong Kong." (PELB, 1993). One of these, The Convention on Climate Change, requires developed countries, among other actions, to adopt national policies and take corresponding measures to limit greenhouse gas emissions with the aim of returning emissions by the year 2000 to 1990 levels.
5. Hong Kong emitted 45.6 million tonnes of carbon dioxide in 1994 (EPD, 1996) equivalent to approximately 2 tonnes of carbon per person, twice the world average. The graph below shows future trends in carbon dioxide emissions. Even with the new Black Point Power Station, carbon

dioxide emissions are predicted to increase by 31% by 2000 compared to 1990 levels. Note that this is a very optimistic scenario and does not account for any new generating capacity.

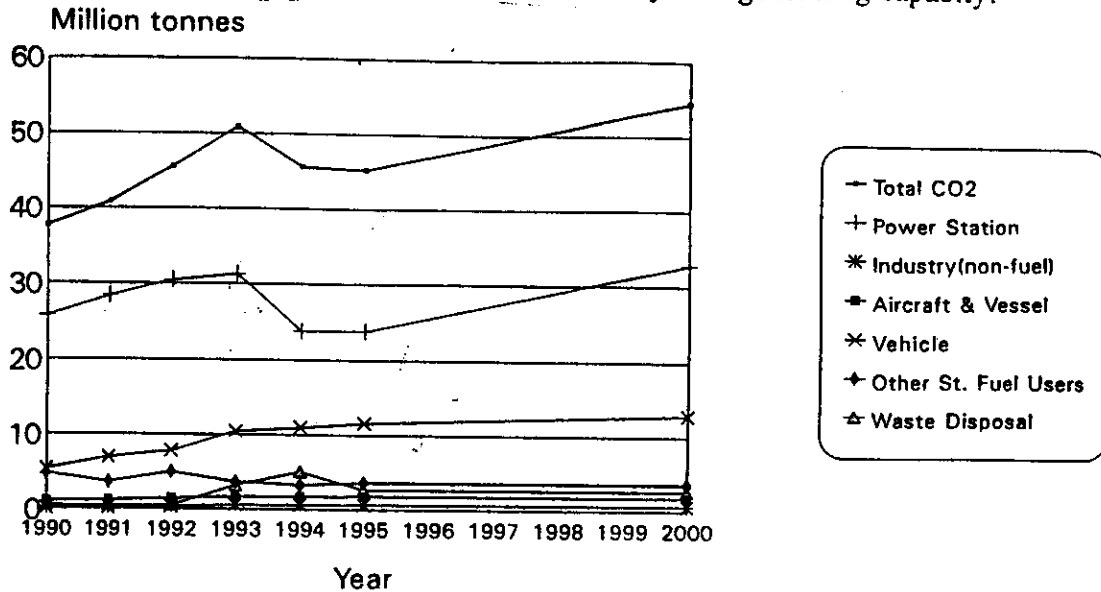


Figure 1: Carbon dioxide emission trends in Hong Kong (FoE estimates)

6. A Coordination Group on Global Climate Change (CGGCC) was set up in 1991 under the chairmanship of the Director of the Royal Observatory to coordinate action on this Convention. One of their main actions in 5 years has been to produce an inventory of greenhouse gas emissions, prepared by EPD. There has been no attempt to set targets for greenhouse gas emissions.

7. However, even a stringent application of the Climate Change Convention's goals is far from adequate. Stabilising the earth's atmosphere will require sharp cuts in industrialised country's emissions. Hong Kong is located in an area vulnerable to natural disasters resulting from global climate change and can no longer afford to be complacent in its efforts to stabilise greenhouse gas emissions.

8. Investments in energy conservation and tree planting can be highly cost effective means of reducing net greenhouse gas emissions. However, to offset the increase in carbon dioxide emissions since 1990 Hong Kong would need to plant 31,524 square kilometres of trees a year, an area 30 times the size of Hong Kong (based on a sink of 250t carbon dioxide per square kilometre of young forest). It is clear that planting trees will never offset Hong Kong's carbon dioxide emissions completely and that the answer lies in increased energy efficiency and developing non-fossil fuel sources of energy.

Fact 2: Non-renewable energy sources degrade the quality of life and the environment with their wide range of pollutants

9. The real costs of using fossil and nuclear fuels includes their damage to human health and the environment. Power stations are the largest emitters of sulphur dioxide and nitrogen dioxide, which cause acid rain and add to background levels of air pollution in Hong Kong.

10. Oil, coal, natural gas and uranium are being depleted and these fuels are only economical because the full environmental costs are not accounted for. There are many external costs of extracting, transporting and utilising these fuels which are not included in the cost to the consumers. These include air pollution, solid waste (fly ash, bottom ash), radioactive waste, high voltage transmission lines, oil spills, mining wastes etc. The environmental impacts associated with the construction and operation of a new power station and the transmission of electricity are considerable. There are few remote and non-sensitive areas in Hong Kong where a new power station could be sited without considerable damage to the environment, together with the pollution such generating capacity would cause. Society is paying the external costs with a reduction in the quality of life.

Fact 3: Hong Kong has little or no incentives for energy efficiency and conservation

11. Hong Kong is very wasteful in terms of its energy usage with one of the highest per capita energy consumption levels in the world. However, despite this profligate waste and the failure of power companies to seriously address Demand Side Management (DSM) (see Appendix 1), there are proposals by HEC for further generating capacity under consideration by Government.

12. Government's Scheme of Control Agreement (SCA) with HEC and CLP, which links the permitted returns of the power companies to their fixed capital assets, means that there is every incentive to invest in additional generating capacity, but no incentive to reduce energy demand. This SCA has resulted in unnecessary capacity expansions (high capital debts), leading to very low capacity factors (inefficiency) and no incentive for energy management (large peak demand). The Government repeatedly approves financial plans for both utilities in which spending on fixed assets outstrips corresponding demand increases (Loh, 1995). Since 1990, CLP has increased the value of its asset based by 50% while electricity demand has only increased by 21%. HEC in the same period has increased fixed assets by 73% while demand has increased only 26% (Loh, 1995) As CLP candidly states "CLP is committed to high standard of environmental care whilst responsibly promoting the wider use of electricity." (CLP, 1996)

13. At least 50% of Hong Kong's electricity is used by air conditioning and cooling appliances resulting in peak power demand during midday summer. Since buildings account for the largest proportion of electricity produced, there are overwhelming arguments in favour of having these buildings designed, built and operated to be optimally energy efficient (Allender, 1995). However, few of Hong Kong's buildings have come anywhere near their optimal energy consumption potential. There are many reasons for this, including

- Developers are not the ones who occupy the building so there is no incentive to introduce energy-efficient designs, particularly if these cost more to build. Developers produce what is most expedient i.e. low cost and quickly-built structures that are cosmetically attractive but which neglect long-term operating efficiencies.
- The relative magnitude of energy costs appears low compared with total operating costs of a building. This also gives little incentive to incorporate energy efficient design features.
- Mechanical and Electrical Engineers often set their fees based on a percentage of the cost of the installed equipment and plant. This also gives no incentive to design smaller, efficient systems.

● Government requirements for standard designs are also a hindrance to design innovation. For example the Water Supplies Department does not allow the use of water in cooling towers, for the good reason that scarce potable water resources should not be used for this purpose. However if other sources of water (e.g. recirculated treated effluent) could be used, then the energy and cost savings compared to electrical cooling would be significant.

Fact 4: Government follows instead of leading energy research and lacks a long term energy policy

14. In comparison to other developed nations, Hong Kong lacks legislation, strategies, incentives and education on energy conservation and efficiency. Currently responsibility for energy policy resides with many different government departments resulting in fragmented control and lack of leadership in energy planning (see Appendix 2). Whilst there have been some initiatives for promoting energy efficiency and conservation, the table shows that these have been few in number and have concentrated on voluntary approaches.

Fact 5: Integration of renewable energy resources is essential

15. Hong Kong is not only reliant on fossil and uranium fuels but also lacks any official plan towards integration of renewable energy sources. If our energy-based lifestyles are to exist in the future, Figure 2 needs consideration.

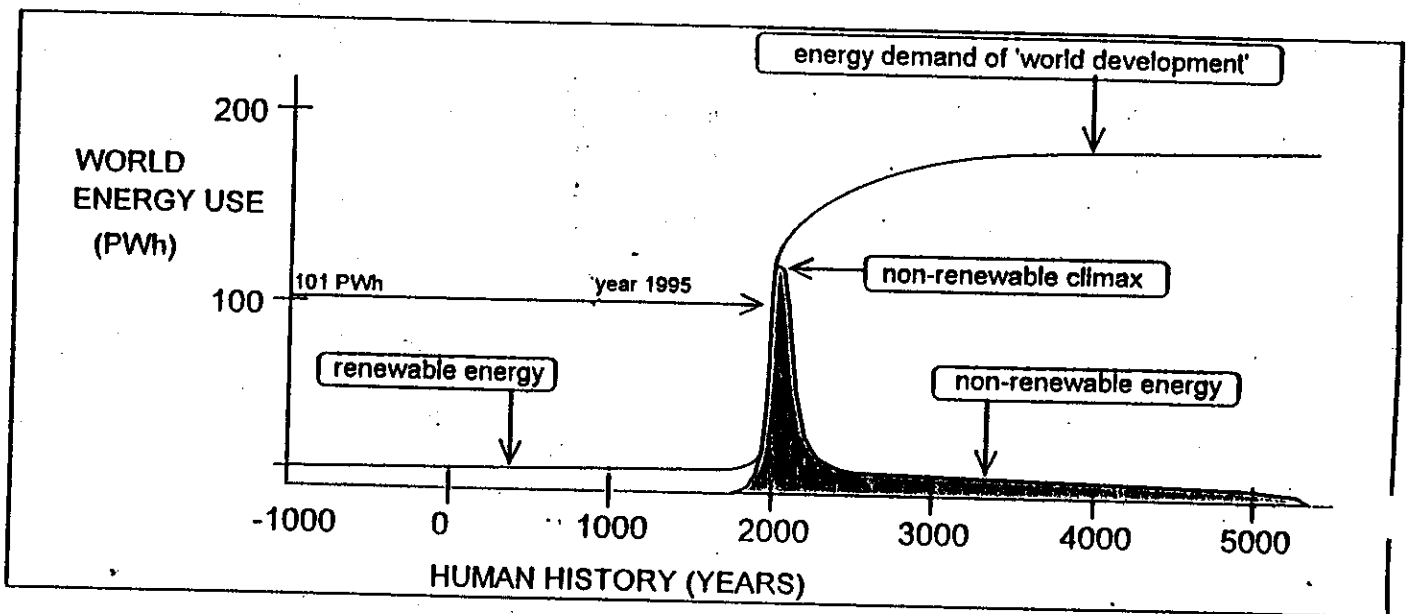


Figure 2: Transition to Sustainable Energy Economy (Grob, 1996)

The figure illustrates two main ideas:

- Only renewable energy sources can meet future energy demands
- Present renewable energy capacity is far below what will be needed in the near future

16. There is a common fallacy that Hong Kong has no natural energy sources. There are several promising renewable energy technologies available which would be appropriate for Hong Kong and the region, including solar energy, off-shore wind energy, landfill gas, municipal waste, biomass. Even 5% of energy generated from renewable sources means 5% less energy from fossil fuels and 5% less pollution. Sustainable energy systems are vital for continued prosperity but the transition to these energy systems takes decades. Hong Kong should take this challenge as seriously as her Asian neighbours and world trading partners who have all undertaken renewable energy research in recent years.

Recommendations

1. Government needs to reiterate its commitment to reducing greenhouse gas emissions in accordance with the UN Convention on Climate Change and to actually set targets for those reductions.
2. Energy conservation options should be evaluated based on their avoided costs before any new capacity is pursued.
3. Government needs to establish an energy department with a comprehensive and long term sustainable energy policy.
4. Government needs to review the Scheme of Control Agreement to include a requirement for demand side management. The most effective and efficient way of achieving this would be to make the electricity saved count as an increment of capacity i.e. the reduction in megawatts generated to count as fixed assets.
5. Government needs to legislate or to provide incentives to developers to design and build energy efficient buildings e.g. legislation to require existing buildings to meet energy standards or provide rebates to developers or existing building operators for meeting energy standards.
6. Government needs to integrate renewable energy sources into its long term energy planning.

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Appendix 1: Demand-Side Management measures adopted by the power companies

China Light & Power (Reference: CLP 1995 Annual Report, CLP Facts and Figures, 1996)

1. *Public Education & Information*
 - PowerWise Secondary School Education Programme
 - Energy Efficiency Corner in CLP DeLight Centre
 - Power Wise Elementary School Education Program
 - Energy Efficiency Centre at Hong Kong Science Museum
2. *Tariff Review*
 - Higher demand (but not energy) charges only for Bulk and Large Tariff customers during daily peak
 - Lower night tariff for select Bulk Tariff customers only
3. *Testing of Electric Vehicles*
4. *Load Research*
 - over 10 years of study on load characteristics of various tariff classes
5. *Ice Storage Air Conditioning Systems*
6. *Customer Advisory Services*
7. *Pilot Programs*
 - 200 person-hours spent promoting compact fluorescent lamps (CFL)
 - survey of CFL use in commercial buildings
8. *Support to Government*

Hong Kong Electric Company (Reference, HEC 1995 Annual report, pers. comm.)

1. *Public Education and Information*
 - establishing energy efficiency centre
 - promoting energy efficiency education
2. *Tariff Review*
 - Restructured their tariffs since 1993 to discourage excessive consumption and reduce peak load requirement
 - Domestic customers not using more than 700 units or less than HK\$600 a month will see no increase in their 1996 bills
3. *Pilot programmes*
 - promoting energy efficient lighting in public housing/schools
4. *Support to Government*

Appendix 2: Government departments responsible for energy policy and actions taken

Government Department	Responsibility	Actions
Electrical & Mechanical Services Dept - Energy Efficiency Office	<p>Compile energy use data</p> <p>Energy codes</p> <p>Energy labelling scheme</p> <p>Energy audit</p> <p>Education</p>	<p>Commissioned consultancy on energy use data base</p> <p>Drafting a code on lighting, air conditioning</p> <p>Established for refrigerators</p> <p>Conducted audits on 30 buildings since 1994. HK\$6 million to improve energy efficiency of 20 buildings over 3 years</p> <p>distribution of leaflets, lectures</p>
Economic Services Branch	<p>Demand Side Management</p> <p>Review applications for new power stations</p> <p>Administer Scheme of Control</p>	<p>Commissioned consultancy on demand-side management, due to be completed July 1996</p> <p>Commissioned consultancy to review future energy demand</p>
Environmental Protection Department	<p>Compile inventory on greenhouse gases</p> <p>Education - ECC</p> <p>Set air pollutant emission limits</p>	<p>Compiled inventory</p> <p>Campaigns on energy efficiency, leaflets</p>
Royal Observatory	<p>Chair Co-ordination Group on Global Climate Change since 1991</p>	<p>Emission inventory (see EPD)</p> <p>Energy efficiency & conservation policy being pursued by Government (see PELB)</p>
Planning, Environment & Lands Branch	<p>Chair Energy Efficiency Advisory Committee</p> <p>Formulate policy on energy efficiency and conservation</p>	<p>EEAC set up since 1991 -</p> <ul style="list-style-type: none"> a. launched education campaign b. distributed advisory notes on good housekeeping c. surveys on energy consumption patterns of commercial buildings d. developing energy efficiency display at Science Museum f. energy labelling developed for refrigerators <p>Introduced regulations on control on OTTV of buildings</p> <p>Establishing energy codes for buildings</p>