

Powering Hong Kong by Sustainable Lighting

– Research Report on Lighting System in Hong Kong

The Professional Commons
March 2009

Powering Hong Kong by Sustainable Lighting Research Report on Lighting System in Hong Kong

I. Introduction¹

1. In the 2008-09 Policy Address, the Chief Executive stated that, “to promote the use of more energy-efficient lighting products, we will study the need to restrict the sale of incandescent light bulbs”². The 2008-09 Policy Agenda further proposed to “commence a study on phasing out incandescent light bulbs and replacing them with more energy-efficient lighting products and whether to introduce a statutory restriction on the sale of incandescent light bulbs.”³ It appears to be another substantial proposal from the Hong Kong SAR Government (hereafter the Government) in response to global warming and climate change. Despite the fact that the Policy Address has already been published for months, neither the Environment Bureau nor the Environmental Protection Department (hereafter EPD) has given any indication on how to advance the respective proposal. Taken into consideration the prolonged discussions in the legislative process, the recommendations of the Chief Executive might merely be a castle in the air.

2. The issue of global climate change has received a widespread concern internationally in recent years. Against this background, the Hong Kong SAR has joined the “C40 Group”, an organization comprised of 40 major cities in the world. The major responsibilities of the Group are to collaborate and coordinate policy measures concerning global climate change between the members. For the time being, 15 (including London, New York, Paris and Tokyo) have adopted measures to compact global climate change.⁴ But only as late as March 2008, did the HKSAR Government conduct a consultancy study on measures tackling global climate change, which is not yet completed.⁵ The response of the HKSAR Government on global climate change is clearly slower than many major cities in the world.

3. Lighting constitutes quite a large proportion of the overall energy consumption in Hong Kong, amounting to one sixth of the total energy consumption. In both 1996 and 2006, lighting accounted for 17% of the total energy consumption, of which the energy

¹ The Professional Commons would like to thank Professor Ron Hui Shu-yuen, Chair Professor of the Department of Electronic Engineering of the City University of Hong Kong and Dr. Robin Bradbeer, Associate Professor of the Department of Electronic Engineering of the City University of Hong Kong for their valuable advice.

² The 2008-09 Policy Address, para. 101.

³ The 2008-09 Policy Agenda, p. 28.

⁴ For details, please refer to <<http://www.c40cities.org/ccap/>>.

⁵ Consultancy study on climate change awarded, Press Releases of the Environmental Protection Department, 27 March 2008, <http://www.epd.gov.hk/epd/english/news_events/press/press_080327a.html>.

consumption of lighting in business use dropped from 17% to 15% over the same period, while the energy consumption of residential lighting increased from 7% to 11%.⁶ Hence, energy saving in lighting, especially residential lighting, could help reduce substantially the energy consumption in Hong Kong.

In this Report, the definitions of frequently mentioned lighting appliances are as follows:

- Incandescent light bulbs: include the commonly used light bulbs and halogen lamps.
- “Energy Efficient Light Bulbs” (hereafter EELBs): A popular term for “compact florescent lights” (CFL). Electrons collide with gasified mercury to produce ultra-violet radiation, and when this ultra-violet radiation is absorbed by the phosphor on the inner surface of the tube, it glows as visible light.
- “Florescent tubes”: the design and energy saving devices within the bulb are largely the same as the “EELBs”, but using different adaptors/transformers. Hence, they should be considered as “EELBs” as well.

⁶ As electricity is the main source of power for the lighting system in Hong Kong, the relevant end use of energy could be seen as the information regarding the use of electricity. See Electrical and Mechanical Services Department, *Hong Kong Energy End Use Data 2008*, p. 16, <http://www.emsd.gov.hk/emsd/e_download/pee/HKEEUD2008.pdf>.

II. Background

A. Global Trend on Banning of Incandescent Light Bulbs

1. In view of the high energy consumption of incandescent light bulbs and their damaging effects on the environment, several governments have resorted to banning the sale of the light bulbs through legislative or executive means as a strategic measure for raising energy efficiency. Even the Mainland and some other Asian countries have launched plans to ban incandescent light bulbs. The most significant developments in recent years are as follows:

- Brazil and Venezuela started to ban the use of incandescent light bulbs in 2005, and Cuba adopted similar measures in 2007;⁷
- The Canadian Government has been undertaking the gradual banning of incandescent light bulbs between 2007 and 2012;⁸
- In the Mainland, the National Development and Reform Commission passed a resolution to promote 150 million pieces of energy efficient lighting products (to the public in discount) through financial subsidies during the "Eleventh Five Year Plan" period (2006-2010), so as to achieve the gradual replacement of incandescent light and other low energy efficient products.⁹ The promotion/distribution work of 50 million pieces of high energy efficient lighting products has been launched in April 2008.¹⁰
- Ireland started to ban the sale of incandescent light bulbs on 1 January 2009. It has become the first developed nation to ban the sale of incandescent light bulbs;¹¹
- The European Union endorsed the gradual banning of incandescent light bulbs in the period of 2009 to 2012.¹² Australia and the State of California in the United States also announced the banning of the use of incandescent light bulb over the same period of time;¹³
- The President of the Philippines has also recommended the banning of incandescent light bulb starting from 2009. It would be the first Asian country to ban the use of incandescent light bulbs.¹⁴

⁷ See <http://en.wikipedia.org/wiki/Banning_of_incandescent_light_bulbs>.

⁸ Globe and Mail, 25 April 2007.

⁹ After this project has been implemented in full, 29 billion kW of electricity could be saved in the Mainland, which would reduce 29 million tonnes of carbon dioxide, and 290 000 tonnes of carbon sulphide. See <中國啓動逐步淘汰白熾燈行動>,《大公網訊》, 25 December 2008.

¹⁰ *Renmin Ribao* (People's Daily) (Overseas Edition), 9 May 2008.

¹¹ See <http://en.wikipedia.org/wiki/Banning_of_incandescent_light_bulbs>.

¹² <<http://europa.eu/rapid/pressReleasesAction.do?reference=IP/08/1909&format=HTML&aged=0&language=EN&guiLanguage=en>>.

¹³ See <http://en.wikipedia.org/wiki/Banning_of_incandescent_light_bulbs>.

¹⁴ <http://en.wikipedia.org/wiki/Banning_of_incandescent_lightbulbs> .

B. Incandescent Light Bulbs: Not Environmentally Friendly

2. The banning of incandescent light bulb is considered to be a significant measure in energy saving and the protection of environment. Given that only 5% of the energy is converted into visible light when an incandescent light bulb ignites, and the rest 95% of the energy is converted into heat, it has extremely low energy efficiency in terms of luminance.¹⁵ Even worse, the heat created by incandescent light bulb results in an increase in room temperature, and therefore requires extra energy to provide additional cooling, thus creating more greenhouse gas emission. In addition, it is obvious that the lives of incandescent light bulbs are relatively shorter than EELBs. If more incandescent light bulb are consumed and thrown away, it results in greater wastage of resources.

3. The environmental and economic inefficiency of incandescent light bulbs can be aptly reflected by making a direct comparison with EELBs:

- A household of 4 people could save up to HK\$400 of electricity each year by replacing incandescent lamps with energy efficient CFLs.¹⁶
- EELBs save 75% of the energy, and on average last 6 to 8 times longer or more.¹⁷ Although the costs of EELBs are higher, they can last longer and therefore consume less material in total.
- The net yearly import of incandescent lamps in 2006 was about 34.5 million units, which was equivalent to around 16 million installations. Assuming that 50% of them are replaced by EELBs, there will be an estimated annual saving of about 450 GWh, which is equivalent to about 1% of the total electricity consumption in Hong Kong.¹⁸
- Should each of the approximately 2 million households switch one incandescent light bulb to the EELBs, and take account of 12 watts per EELB, and a daily use of six hours, it could save 210 GWh annually, equivalent to HK\$190 million of electricity fee. More importantly, it would lead to an annual reduction of 147 000 tonnes of emissions of carbon dioxide annually.¹⁹ Should each household in Hong Kong replaces five incandescent light bulbs, and as each of the incandescent light bulbs last three years on average, a total of HK\$3.09 billion of electricity bills could be saved, and a reduction of 2 205 000 tonnes of carbon dioxide emissions could be made during the three year period.

¹⁵ “換個燈膽 慳出百萬環保電,” *Wen Wei Po*, 9 July 2008, p. C3.

¹⁶ See the pamphlet “Energy Label for a Greener Choice” from the Electrical and Mechanical Services Department, <http://www.emsd.gov.hk/emsd/e_download/pee/Leaflet_for_Consumer.pdf>.

¹⁷ *ibid.*

¹⁸ “LCQ11: Energy saving measures,” Press Releases of the HKSAR Government, 14 November 2007, <<http://www.info.gov.hk/gia/general/200711/14/P200711140114.htm>>.

¹⁹ Consumer Council, *Choice Magazine*, Vol. 371 (September 2007), pp. 38-39.

C. Two Types of Energy Saving Lamps: More Environmentally Friendly and Not So Environmentally Friendly

Energy Saving Does Not Mean Environmentally Friendly

4. Although EELBs will perform better in reduction of electricity consumption, those powered by electronic ballast (hereafter electronic EELBs) are damaging to the environment. The energy being used in the production of the electronic EELBs might offset the amount of energy being saved. Thus, the environmental hazards counterbalance the positive changes. Hence, electronic EELBs could not be categorized as environmentally friendly products. The potential environmental hazards arising from the electronic EELBs are as follows:

- The integrated design makes the electronic ballasts stick to the florescent tubes. The average lifespan of the electronic ballasts is much longer than that of the florescent tube. But no matter which part is broken, the whole light bulb will have to be thrown away. Hence, it results in the generation of a large volume of electronic waste;
- Most manufacturers use gasified mercury to manufacture light bulbs,²⁰ even though the collection process is comparatively difficult. Once the florescent tubes break, the gasified mercury leaks into the air. It is damaging to the natural environment and poses a threat to the health of the general public;
- The gasified mercury and some electronic components contain toxic substances. Even though landfills have liners, there is still a risk of polluting the soil and underground water;
- Large amount of energy will be used during the manufacturing process of electronic components, such as extracting and refining of metals;
- The electronic components would have to go through a melting process before recycling, which is quite complicated. In Hong Kong, the electronic components would still be disposed in the landfills after merely simple treatment;
- Should the electronic ballasts be improperly used, its lifespan would be drastically reduced. For example, the lifetime of electrolytic capacitors are halved if the temperature increases by 10⁰C.²¹

Comparatively speaking, the EELBs which consume less energy and produce less amount of garbage; or those which maximize the lifespan of each of the components, could be referred as being more “environmentally friendly”. The electromagnetic EELBs, as well as

²⁰ Only a few of the EELBs sold in the market currently contains solid mercury. It is due to the fact that they have higher costs in production, and their slower pace of luminary.

²¹ See Henry Shu-hung Chung et al, “Comparison of Dimmable Electromagnetic and Electronic Ballast Systems: An Assessment on Energy Efficiency and Lifetime,” *IEEE Transactions on Industrial Electronics*, Vol. 54, No. 6, December 2007, p. 3146.

detachable EELBs fall into this category.

Dangers behind the Refuse Collection Process

5. In fact, most of the general public lacks a sense of the presence of mercury in the EELBs and florescent tubes and therefore those products are disposed improperly. In most cases, the EELBs are treated as regular waste and are not specially treated. Consequently, the health of individuals, their relatives, or other unrelated individuals could be under threat, and the surrounding environment poisoned. As the structure of the tubes can easily be crushed, the collection process of the garbage can be dangerous:

- Generally speaking, the waste light bulbs are mixed with other garbage, going through the refuse shaft in the buildings to the large refuse bins on the ground;
- The garbage containing the light bulbs could be crushed by other garbage;
- It would be crushed further for the reduction of size when being transferred from the large refuse bins to the garbage trucks;
- After the garbage is dumped by the trucks, it is transferred to the refuse transfer stations for further compression;
- The garbage eventually ends up in the landfill and flattened by bulldozers.

Hence, most of the waste light bulbs would definitely be damaged during the garbage collection process. This also means that the gasified mercury in the EELBs can leak into the air in Hong Kong. In fact, the Consumer Council has already indicated in September 2007 that if they are not disposed of properly, EELBs could cause serious environmental damages.²²

In the Safety Guidelines issued by the Department of Environment in the UK in January 2008, it has suggested that individuals should leave the room for about 15 minutes when they break a EELB, so that they would not be exposed to mercury poisoning. The shades of glass from broken bulbs should not be vacuumed up, as the mercury droplets can spread around the house due to the sucking action of the vacuum cleaner. When handling the broken EELBs, individuals should wear a rubber glove, and sweep them away. They should seal it in a plastic bag, and dispose them in the collection box for used batteries.²³

6. Currently, part of the waste light bulbs and florescent tubes is considered as chemical waste and sent to the Chemical Waste Treatment Centre (hereafter the CWTC) in Tsing Yi for special treatment. Mercury contained in the tube will be recovered through

²² Consumer Council, 〈從環保角度看棄置慳電膽及光管〉, *Choice Magazine*, September 2007, pp. 38-39.

²³ See ,

<http://www.dailymail.co.uk/sciencetech/article-506347/An-energy-saving-bulb-gone--evacuate-room-now.html>

recycling, and the remaining waste is treated before being sent to the landfill for disposal.²⁴ Nonetheless, according to statistics from the EPD, the Centre can only process 850 000 mercury containing florescent tubes annually.²⁵ Compared with the large volume of consumption in EELBs and florescent tubes across the territories, the proportion being treated is relatively low. It is logical to assume that the majority of the used EELBs and florescent tubes are disposed in the landfills without proper treatment.

7. More surprisingly, the Centre focuses on assisting the disposal of EELBS and florescent tubes from the Government, such as the Electrical and Mechanical Services Department (hereafter EMSD), the Highways Department, Housing Department, Civil Engineering and Development Department, Drainage Services Department, etc. In 2006, about 336 900 waste CFLs and fluorescent tubes were collected and delivered to the CWTC for treatment by these departments.²⁶ Another 98 000 of waste EELBs and fluorescent tubes were collected through 19 organizations.²⁷ However, the Government did not step up the collection of more waste light bulbs in order to fully utilize the capacity of the Centre. Hence, this has resulted in an idle processing capacity of around 400 000 waste light bulbs, whilst adding to the toxic EELBs and florescent tubes disposed of in the landfills.

8. The fees policy and other arrangements in relation to chemical waste processing are discouraging, and with no incentives. They actually undermine the proactiveness of the people who take the initiative to collect the light bulbs for recycling. As required by the Waste Disposal Ordinance, any premises that store a significant quantity (e.g. more than 500 pieces) of used mercury containing lamps have to register with the EPD as a chemical waste producer, and arrange for proper delivery to the CWTC.²⁸ The processing fee of these tubes amounts to HK\$1,027 per tonne.²⁹ As the Producer Responsibility Scheme has not yet been implemented in products such as EELBs, there is no mandatory requirement for the collection of waste light bulbs. This has resulted in a situation in which the more socially-responsible ones get to pay more for the cost of disposal. Such an arrangement is expected to undermine the proactiveness on the participation of voluntary recycling.

²⁴ <https://www.wastereduction.gov.hk/en/household/flrp_faq.htm>.

²⁵ *ibid.*

²⁶ LCQ16: Treating of waste compact fluorescent lamps>, Press Releases of the HKSAR Government, 6 June 2007, <<http://www.info.gov.hk/gia/general/200706/06/P200706060113.htm>>.

²⁷ LCQ4: Recycling facilities in the Chemical Waste Treatment Centre, Press Releases of the HKSAR Government, 18 April 2007, <<http://www.info.gov.hk/gia/general/200704/18/P200704180137.htm>>.

²⁸ See <https://www.wastereduction.gov.hk/en/household/flrp_intro.htm>.

²⁹ LCQ4: Recycling facilities in the Chemical Waste Treatment Centre, Press Releases of the HKSAR Government, 18 April 2007, <<http://www.info.gov.hk/gia/general/200704/18/P200704180137.htm>>.

9. Not until March 2008 did the Government and the business sector collaborated on a voluntary “Fluorescent Lamp Recycling Programme”. The programme is a voluntary Producer Responsibility Scheme that is funded by 15 members of the lighting trade and supported by the EPD, and three green groups (Friends of the Earth, Green Power and Tai Po Environmental Association). It is also supported by the Hong Kong Association of Property Management Companies, Housing Authority, Housing Society, and two private companies (Sun Hung Kai Properties Ltd and Pricerite Stores Ltd), which help to set up public collection points at shopping malls and retail outlets respectively. The initial goal is to collect 400 000 waste lamps from households each year.³⁰ Should the programme become successful, the idle capacity for processing light bulbs would be fully occupied. It is obvious that no spare capacity would be available in the CWTC for growing volume of waste fluorescent lamps but the annual consumption of EELBs and florescent tubes certainly exceeds 800 000 pieces.

D. Lack of a Holistic Approach in Lighting Policy

Lack of Coordination Between Government Departments

10. The EMSD is the department responsible for providing electrical and mechanical services to the Government. It should be noted that one of its missions is to promote the efficient use of energy in Hong Kong.³¹ However, the performance of the Department in respective area is far from satisfactory. According to a Director of Audit’s Report, as at May 2007, the various departments of the Government were still using 43 000 incandescent light bulbs, and of which 28 000 could be replaced by EELBs. The replacement would only cost approximately HK\$3 million, and the electricity saved could cover the costs! In the years of 2006/07 and 2007/08, the Electrical and Mechanical Services Trading Fund has bought 13 000 incandescent light bulbs for the maintenance and replacement of lighting facilities in Government buildings.³² The EMSD indicated that the ownership and responsibilities of the incandescent light bulbs belonged to individual policy bureaux and departments. Hence, it could only provide comments and assistances to whether it should change the light bulb or not. This has reflected the fact that the Government has no uniform strategies on lighting policies, and letting the departments act according to their own agendas. The Government’s energy saving efforts are obviously contradicted by individual departments refusing to follow suit in the use of EELBs. This clearly impacts the credibility of the Government in public education. In the recently announced 2009/10 Budget, the Government suggested that it would “carry out minor works in government buildings in the next two years to install energy efficient

³⁰ See <https://www.wastereduction.gov.hk/en/household/flrp_intro.htm>.

³¹ See <http://www.emsd.gov.hk/emsd/eng/about/ovm_reg.shtml>.

³² “Government electricity consumption,” Director of Audit’s Report No. 51, October 2008, p. 35.

lighting systems.”³³ It is hoped that the incandescent light bulbs that are suitable for replacement could all be replaced by EELBs at that time.

Poor Promotion

11. Despite the fact that the Government has conducted a tremendous amount of work in promoting energy saving on lighting as well as the use of EELBs, it could not be considered as successful. Incandescent light bulbs are predominant in the light bulb market in Hong Kong. The market share of EELBs is only 20% of the total, in which the proportion of the residential and commercial users constitutes roughly 50% each.³⁴ According to the estimation from scholars, 10 million EELBs are disposed in Hong Kong annually, together with an import of 20 million fluorescent tubes.³⁵

The Government entered into a three-year Demand Side Management (DSM) Agreement with the two power companies from 2000 to 2003. One of the measures is the “Non-residential Energy Efficient Lighting Rebate Programmes”. The Programme is aimed at encouraging non-residential users to invest in energy efficient lighting equipment, and set up devices to shift part of the electricity demand to non-peak hours. The total estimated costs of the entire DSM programme were about HK\$139 million as at end October 2003.³⁶

These programmes reduced a certain level of energy consumption. In the five years between 2000 and 2004, the energy consumption for commercial premises from lighting are 15 112, 15 556, 15 737, 15 726 and 15 697 terajoules, but a rising trend has been recorded in the past few years.³⁷

E. Practical Factors Hindering the Use EELBs by the General Public

12. There are many practical reasons have been hindering the general public from switching to EELBs. It is unfair to blame the public for not possessing a sense of environmental concern. Hence, it would be advisable to note the real life issues facing the public, for example:

³³ The 2009/10 Budget, para. 79, <<http://www.budget.gov.hk/2009/chi/budget33.html>>.

³⁴ See

<<http://jump.mingpao.com/cfm/JobArticle1.cfm?PublishDate=20071207&TopicID=L5&Filename=research.txt>>.

³⁵ Consumer Council, 〈從環保角度看棄置慳電膽及光管〉, *Choice Magazine*, Vol. 371 (September 2007), p. 38.

³⁶ “LCQ11: Govt's effort in managing energy demand,” Press Releases of the HKSAR Government, 10 December 2003, <<http://www.info.gov.hk/gia/general/200312/10/1210162.htm>>.

³⁷ See Electric and Mechanical Services Department, “Hong Kong Energy End Use Data 2008,” pp. 17-18.

- There are many kinds of products claiming to be EELBs. Nonetheless, many of them are poor in quality which led to short lifespan. Most of the general public is incapable of distinguishing the difference in quality. Hence, those who have bought the substandard EELBs might not be unwilling to use them anymore.
- Most of the ordinary citizens also lack the knowledge on the correct use of EELBs, even electricians would possibly not understand the importance of these issues. For example, they would not be aware that the lifetimes of electrolytic capacitors in EELBs will be halved if the temperature increases by 10°C .³⁸

F. Producer Responsibility Scheme

13. In July 2008, the Legislative Council passed the “Product Eco-responsibility Ordinance”, setting a legislative framework for “producer responsibility scheme”.³⁹ The main contents of the Ordinance are as follows:

- The product items covered include: vehicle tyres, plastic shopping bags, electrical and electronic equipment, packaging materials, beverage containers, and rechargeable batteries;
- Introduce Producer Responsibility Schemes, schemes based on the “polluter pays” principle, or other measures, including:
 - ◆ A product take-back scheme;
 - ◆ A deposit-refund scheme;
 - ◆ A recycling fee; and
 - ◆ The imposition of an environmental levy.⁴⁰

The Producer Responsibility Scheme generally involves one or several of the following core elements:

- **Product take-back:** The producers, importers and/or retailers are required to take back the products they sold for proper waste management. They can fulfill the requirements either individually or collectively. For the latter case, it usually takes the form of an industry organization established by statute.
- **Deposit-refund system:** Consumers are required to pay a deposit when purchasing a product. The deposit will be refunded when the consumer returns the used product to designated collection points.

³⁸ Henry Shu-hung Chung et. al. , “Comparison of Dimmable Electromagnetic and Electronic Ballast Systems: An Assessment on Energy Efficiency and Lifetime,” *IEEE Transactions on Industrial Electronics*, Vol. 54, No. 6 (2007), p. 3146.

³⁹ The full text of the legislation can be read on <http://www.legco.gov.hk/yr07-08/english/ord/ord032-08-c.pdf>.

⁴⁰ See “Producer Eco-responsibility Bill”, 2(1) and (2).

- **Advanced recycling fee:** It is levied on the sale of a product, and is usually channelled to a fund set up by the relevant statute to finance the post-consumption management of the product.
- **Product tax or levy:** Its main objective is to discourage the use of a particular product, through economic disincentives.⁴¹

14. The Producer Eco-responsibility Ordinance has provided a relatively strong policy tool for the Government. However, it is uncertain whether the Government would make use of the ordinance to regulate mercury containing EELBs. In response to a flourishing community view demanding producers and suppliers assume greater responsibility on recycling, the business sector, however, is generally against the mandatory collection through legislative means. Alternately, some business players have initiated voluntary recycling plans on individual products as a compromise measure. Products which have voluntary recycling schemes in place include batteries and computers, and the latest one is the EELBs and florescent tubes recycling plan commenced last year. Nonetheless, the effectiveness of several current voluntary recycling schemes is far from satisfactory; their specific situations are as follows:

- In terms of the recycling of rechargeable batteries, the plan could meet the target recycling rate of 10% in 2005, and the Government planned to raise the recycling rate to 15% and 20% in the subsequent two years.⁴² However, these targets are in fact significantly low.
- In 2008, less than 20 000 computer products (apart from the main computer, this includes printers, scanners and other computer-related appliances) were collected through the Computer Recycling Scheme organized by local computing industry, 60% less than the anticipated 50 000 pieces.⁴³ The scale of the recycling plan is small compared with the annual number of products sold. Even worse, its targets cannot be reached.

15. Even though the Government is willing to include EELBs in its regulation, it would take a prolonged period to accomplish. For instance, the introduction of environmental levy on plastic shopping bag, through the legislative process till the implementation date, took 3 years to complete. Although the levy has already been scheduled to implement in mid-2009, it is still possible for it to face a backlash. The Liberal Party has recently suggested postponing the implementation of the levy in view of

⁴¹ Environmental Protection Department, "Proposed Legislation for Implementation of Producer Responsibility Schemes," Paper Submitted to the LegCo Panel on Environment, 24 April 2006, (LegCo Paper No.: CB(1)1300/05-06(04)).

<<http://www.legco.gov.hk/yr05-06/english/panels/ea/papers/ea0424cb1-1300-4-e.pdf>>.

⁴² See <http://www.epd.gov.hk/epd/emglsh/news_events/press/press_070525b.html>.

⁴³ 〈電腦回收率 少預期六成〉, *Ming Pao*, 14 January 2009, p.A8.

current economic crisis. It is worrying that the pending Producer Responsibility Scheme could be further delayed.⁴⁴ Upon the request of legislators of the Liberal Party, the House Committee of Legislative Council has established a “Subcommittee on Product Eco-responsibility (Plastic Shopping Bags) Regulation” in late January 2009 to further examine the details of the Regulation.⁴⁵ The Environment Bureau thus has to withdraw the concerned regulation for passage in the Legislative Council, which was originally scheduled on 4 February 2009.⁴⁶

G. Labeling of Energy Efficient Products

16. According to the “Energy Efficiency (Labelling of Products) Ordinance” passed in May 2008, three kinds of products (namely room air conditioners, refrigerating appliances and EELBs) have been included in the first stage of the “Mandatory Energy Efficiency Labeling Scheme”. The deadline of the grace period is on 8 November 2009.

17. The current energy efficiency labels are by no means a comprehensive benchmark at all. The general public will have to make comparison on their own based on their lifespans, degree of energy efficiency and luminance. The pamphlet from the EMSD entitled “Energy Label for a Greener Choice” lists out the following information :

- Average lifespan of light bulb: Grade 1 products are most efficient (green) and have an average lamp life of 8 000 hours or more. Grade 5 products have an average lamp life less than 6 000 hours (red);
- For the percentage of energy saving, grade 1 products would be more efficient than grade 3 by 14%, and be 18% more energy efficient than grade 5;
- Luminous efficacy of the lamps: A larger number indicates that the product is more efficient.⁴⁷

18. In sum, the energy efficient labels can partially reflect the life cycle efficiency only, but fail to cover information regarding environmental efficiency.

⁴⁴ 〈自由黨提修訂倡延至明年初環保團體促如期徵膠袋稅〉, *Hong Kong Economic Journal*, 2 January 2009, p.6.

⁴⁵ 〈政府撤回膠袋稅表決 等候立會委員會審議〉, *Ming Pao*, 3 February 2009, p. A7.

⁴⁶ 〈政府撤議案 膠袋費 7 月恐難推〉, *Hong Kong Economic Times*, 3 February 2009, p. A13.

⁴⁷ Electrical and Mechanical Services Department, “Energy Label for a Greener Choice” Pamphlet,

III. “Sustainable Lighting System”: Basic Principles in Planning a Territorial Wide Lighting System

1. The Government is going to formulate a new policy concerning the banning of incandescent light bulbs. Such a move provides a valuable opportunity for the development of sustainable lighting in Hong Kong. It could also bring about contributions to global climate change. However, it is important to note that the replacement of incandescent light bulbs is not equivalent to environmentally friendly lighting. The Professional Commons regarded that Hong Kong should put in place a comprehensive “sustainable lighting system”, and the specifications are as follows::

- Systematically analyze the life cycle of light bulbs, and to formulate respective measures to tackle problems arising from different life stages of the light bulbs in accordance with the three principles of energy efficiency, reduction of waste from the source, and recyclability. The issues which shall be tackled include: the materials in the manufacturing of light bulbs, the means of production, the collection process, the recycling process, the responsibilities between the producers and the consumers...etc.
- It is the right moment to ban the sale of incandescent lights decisively, after years of environmental education;
- Promoting the more environmentally friendly EEBLs, which would facilitate waste reduction from the source and reduce greenhouse gas emissions;
- Short term measures should be introduced before the banning of the sale of incandescent light bulbs to help improve environmental qualities in Hong Kong in the near term;
- Not only the energy consumption when the light bulb is lighted up should be considered when calculating the energy efficiency of a light bulb, it should cover the total energy consumption of the light bulb throughout its life cycle.. That includes the energy consumption during the production process, extra air conditioning costs as a result when the light bulbs are heated up, and the energy consumed during the collection and recycling process.
- The Government should have the foresight to avoid creating a large amount of electronic rubbish from the electronic EELBs. Both policy measures and governmental actions should be employed to promote environmentally more friendly products;
- The existing legal and regulatory structure should be put into better use, and the Producer Responsibility Scheme should be promoted further, ensure the producers, suppliers and consumers to share the responsibilities on the environmentally friendly production, reduction, collection and recycling systems through the Producer Responsibility Scheme.

- To revise the current energy saving labels through the three principles of energy efficiency, reduction of waste from the source and recyclability.

IV. Policy Recommendations

A. Short-term Measures

1. In the “Fairness, Forward-looking, Development: Research Report on Better Use of Fiscal Surplus” Report published by the Professional Commons in early 2008, we have proposed to ban the import of incandescent light bulbs by energy saving lamps.⁴⁸ The Professional Commons also reiterated the recommendation on subsidies for the replacement of incandescent light bulbs, in the Report “Beyond Conventional Wisdom: Steps to Diversified Development: Submission for the 2008-09 Policy Address” published in September 2008.⁴⁹

2. To avoid further delays, the Government should promulgate a subsidy scheme in the short-run to speed up the replacement of incandescent light bulbs by EELBs. The details are as follows:

- The Government should replace all replaceable 28 000 incandescent light bulbs in government premises with more environmentally friendly EELBs during the next fiscal year;
- The Government should provide every adult of the population with a coupon amounting to HK\$200 to change the light bulbs to EELBs.

B. Medium to Long-term Measures

Banning the Sale of Incandescent Light Bulbs

3. Out of the many policy options, the Professional Commons recommended the banning of incandescent light bulbs (including halogen lamps) through legislative means, as well as to formulate an action plan. We consider that these measures would most fit the current situation in Hong Kong. If the Government does not take decisive action and proactively formulate a “sustainable lighting system”, Hong Kong will lag behind other countries. It would also undermine our reputation as a member city in the “C40 Group” as well as our status as “Asia’s World City”. The rationales for such a resolute decision are as follows:

- The banning of incandescent light bulb currently appears to be an international trend;
- Even the Mainland has put forward the banning of incandescent light bulbs.

⁴⁸ The Professional Commons, “Fairness, Forward-looking, Development: Research Report on Better Use of Fiscal Surplus,” January 2008, para. 40.

⁴⁹ The Professional Commons, “Beyond Conventional Wisdom: Steps to Diversified Development: Submission for the 2008-09 Policy Address,” September 2008, para. 86.

4. In view of local experiences, the public education on energy saving that has been implemented for years failed to bring fruitful results. It would be the right time for the Government to change the policy direction and adopt more forceful measures as policy tools. In fact, the formulation of major policies and legislation related to public health and environmental concerns experienced similar pattern of development in recent years, i.e. adopting mandatory measures through legislative means after unsuccessful promotion and education in the last couple of years. A similar road map applied to the following cases: the banning of smoking in indoor areas, the introduction of a Producer Responsibility Scheme, and the ban on switching on the idle engines. Hence, the Government should initiate the legislative process as soon as possible.

Replacement Lighting Devices

5. Hong Kong is an open society. Members of the community should have the rights to choose the replacement energy efficient lighting devices, if the banning of the incandescent light bulb really happens. Hence, the availability of good substitutes would be crucial to ensure the banning of incandescent light bulbs would effectively reduce energy consumption. Generally speaking, living a modern lifestyle, the general public would switch to other means of electricity-powered lighting device. Nonetheless, a set of supporting measures shall also be implemented. (see Chapter Five).

6. There are many kinds of replacement lighting device across the territory which could meet the purpose of energy saving. Among various kinds of EELBs, there are great differentiation in their performance in terms of the environmental concerns and market popularities, for example:

- EELBs powered by electric ballasts: They are of smaller size and use lesser amount of raw materials. Its outer shell is composed of plastic that does not require chemical treatment.⁵⁰
- EELBs powered by electromagnetic ballasts: There is only one iron core and a set of copper wires in the ballast, and no electronic components at all. It has a higher life span of 30 years. Not only could it reduce a large amount of electronic waste and the relevant processing fees, the iron core and the copper wire could be recycled, and therefore totally avoid the creation of electronic waste.⁵¹

⁵⁰ Megaman Lighting (Hong Kong) Limited, 〈採用電子鎮流器 節能與環保兼備〉, *Today's Building Services and Environment Protection*, Vol. 8, December 2006.

⁵¹ Prof. Ron Hui Shue-yuen, 〈「節能」與「環保」的概念混淆及照明應用常見的誤解〉, *Today's Building Services and Environment Protection*, Vol. 8, December 2006, and 〈學者倡引入環保慳電膽〉, *Ming Pao*, 10 September 2007, p. A8.

- Light-emitting-diodes (LED): Lighting products which are becoming more available in the consumer market. They are even more energy efficient and produce a brighter beam of lights than EELBs. But recent studies have indicated that the heat generated from LED light bulbs would be higher than the EELBs at the same level of luminance. Hence, more air conditioning would be required to lower the room temperature in which LED light bulbs were used. As a result, the energy saved from a LED light bulb would be offset by the additional amount of air conditioning used. It might be more a loss than gain.⁵² Even worse, the current price of a LED light bulb is 30 times of a typical EELB, which is far beyond the reach of most households.⁵³
- EELBs with detachable components: The light tube and the adapter can be separated to facilitate the replacement of damaged components, so as to maximize the designed lifespan of each component.

7. In our opinion, it should be up to the general public and market mechanism to decide which replacement lighting device should be used in the future. The reasons are as follows:

- The Government should pay due respect to the consumption choices of the general public;
- In view of the ever changing technology scene, adequate policy flexibility should be provided to facilitate new products to enter the market. For example, there is a company overseas claiming that they have designed an EELBs without any form of mercury and would be on sale within this year;⁵⁴
- The comparative advantages of replacement lighting devices in respect of costs and the prices would be affected by the overall lighting policy. The Government could encourage the general public to use more environmentally friendly lighting devices, through the differentiation of levies imposed along with the different levels of environmental friendly materials used in manufacturing the light bulbs.

Green Procurement Policy

8. The Government could help increase the market share of the more environmentally friendly products and shape the consumption behaviour of the general

⁵² There is an example of the switch of LED light bulb, the MTR has spent HK\$4 million for the installation of LED light bulbs in three trains, replacing the traditional light tube currently used at MTR trains, for a trial run of six months. See 〈港鐵四百萬換車廂 LED 燈〉, *Ta Kung Pao*, 13 February 2009, p. K6.

⁵³ The price of a typical incandescent light bulb is amounted to HK\$31 (US\$4), and the price of a LED light bulb is around HK\$936 (US\$120). See *National Geographic*, March 2009, p. 154.

⁵⁴ For details, see <<http://www.vu1.com/>>.

public, through a wider application of green procurement principles. It is under the discretion of the Government to promote a wider use of more environmentally sustainable EELBs in public facilities and Government properties, and even provide material subsidies to the general public (through direct distribution of EELBs). Such a move can further increase the contributions of these policies in tackling global climate change.

Utilization of the Producer Responsibility Scheme

9. The Government should extend the coverage of the “Producer Eco-responsibility Ordinance” passed in 2008 to EELBs, and incorporate these policy tools to realize the environmental policy objectives. The specific measures are as follows:

Policy Objectives	Policy Tools
Encouraging the use of raw materials which incurs the least damages to the environment, or material that could be easier to recycle	Collect a levy from the manufacturers under which the more the light bulbs are made from environmental friendly materials or easier for recycling, the less the levy shall be
Encouraging the consumers to return the waste light bulbs	Introduce a deposit-refund system
Establishing a full scale collection system	<ul style="list-style-type: none"> ● Implementing a collection scheme demanding the manufacturers or importers to provide direct collection services; or ● Introduce a levy to cover the cost of collection
Establish a recycling system	Introduce a levy to cover the processing cost of the collected materials

Collecting and Recycling of EELBs

10. Greater importance should be attached to the environmental and health hazards arising from the mercury present in the EELBs. The Government should launch a territorial wide recycling system as soon as possible. It would be important to incorporate the newly established recycling system with the Producer Responsibility Scheme. By doing so, there should be a clear delineation on the responsibilities of the suppliers: whether they should pay the costs of collection or recycling, or they should be directly responsible for the collection process. In addition, the Government should encourage the consumers to return the waste light bulbs through a deposit-refund system incorporating

both material incentives, as well as clear designation of responsibilities. We also recommend the Government to expand the network of collection boxes for the collection of EELBs used for recycling, and call for the general public to put the EELBs in those collection boxes.

11. As we have suggested in the preceding chapter, the processing capacity in the CWTC in Tsing Yi would not be enough in the short term. As the CWTC only has an annual processing capacity of 800 000 EELBs, there will not be any spare capacity after processing the stable supply of approximately 400 000 EELBs annually from the Government departments, as well as 400 000 light bulbs from the Fluorescent Lamp Recycling Programme, a collaboration effort between the Government and the business sectors since 2008. The Government should make early preparation and raise the capacity in the treatment and recycling of waste light bulbs through the following ways:

- Gradually increase the capacity of mercury recycling so as to proactively prepare for the coming of the “EELB age”;
- Improving the processing capability in order to increase the ratio in recycling electronic and metal components of EELBs.

From Energy Efficiency Labels to Eco-labels

12. To facilitate the implementation of a “sustainable lighting system”, the Government should improve the existing energy efficiency labels, and transform it into a comprehensive eco-label system. The areas for reforms include:

- The creation of a comprehensive label which reflects a wide range of environmental attributes of light bulb for the easier comparison. These attributes should cover various quality of the light bulbs, include lifespan, energy efficiency, raw materials used, recyclability, amount of toxic materials, and the level of energy consumption during the production process;
- A finer classification of EELBs in terms of their performances in energy efficiency shall be made, so as to provide an incentive for manufacturers to further improve their products, and to encourage the importers to introduce EELBs of higher energy efficiency into Hong Kong;
- In view of advancement in technologies, the technology levels of EELBs will experience substantial improvement in the future. The Government shall take account of the developments, and to update the relevant benchmarks on a more frequent basis.

V. Supporting and Transitional Arrangements

1. It is expected that there would be many problems if the banning of incandescent lights was not well thought out. As electrified lighting devices have become a necessity nowadays, should the new policies fail to be properly designed and implemented, not only it would affect the daily lives of the general public, the business environment of Hong Kong would be adversely affected and Hong Kong's hard-earned reputation be damaged. In view of this, the Government should adopt a holistic approach considered all the relevant specifications. Furthermore, there should be a set of supporting measures to ensure a smooth implementation of the new policy.

2. The Government has not released any information related to the study on banning of the incandescent light bulbs to date. It is obvious that consensus building as well as the legislative process would be time consuming. It would not be a surprise should the official banning of the sale of incandescent light bulbs be realized in several years time. Hence, it is important for the Government to put in place some transitional measures, so as to reduce the energy consumption on lighting in a short period of time.

Against the Fake and Poor Quality EELBs

3. In order to prevent the scamming of the general public by unscrupulous businessmen engaging in the sale of fake and poor quality EELBs, and to raise public confidence on the EELBs, the Customs and Excise Department and the EMSD should strengthen its inspection exercises, and to put those dishonest merchants into justice.

Consumer Education

4. Promotion and education are of equally importance. In addition to promoting the benefits of environmental and energy efficiency, public education on the appropriate means to use an EELB should be strengthened, and to educate the electrician on the correct means to install light fixtures fitting the EELBs. It would be helpful to avoid the reduction of the life of light bulbs due to overheating. By doing so, it might help relieve the concerns of the public, and ensure that they could enjoy the genuine benefits from using EELBs.

Advance Treatment of the Problems in the Sectors

5. There are adaptability problems in some sectors in switching to the EELBs. It is noted that a fashion chain store had recently collaborated with a manufacturer of EELBs

under which the latter assisted the installation of energy efficient lighting systems in certain selected stores of the former. At first, some managerial personnel of the fashion chain store held reservations on the renovation. It was not until that they have seen that the decorative effects were not affected, did they retreat from their reservations.⁵⁵ In light of this, it would be important that different practical problems facing by different sectors shall be investigated, and solutions to be mapped out before the banning of the incandescent light bulbs. Otherwise, many cases of exemptions would be required.

Exemption Clauses

6. It would be advisable for the Government to explore with relevant sectors in the near future on the areas in which the use of incandescent light bulbs are necessary (for example: Places in which special lighting effects is required, some facilities and equipments). The exemption clause should also be specified in the legislation, so different sectors could be aware of them.

According to a Director of Audit's report, out of the 43 000 units of incandescent lamps being used in government premises; 15 000 units (35%) were not suitable for replacement owing to the need of special lighting effects for art performances and exhibits.⁵⁶

Voluntary Eco-label for Electronic Products

7. Modifications of the energy efficiency labeling system and the incorporation of EELBs into the Producer Responsibility Scheme could not be reached in one step. The Government could take reference of the concerned measures in the European Union, and to promote a voluntary "eco-label award scheme" as a transitional measure. The Non-Governmental Organizations in Germany have advocated a "Blue Angel" (Blauer Engel) product labeling scheme⁵⁷, covering areas not only on energy efficiency, but also on life cycle efficiency, as well as environmental efficiency. The relevant mechanism is conducted on a voluntary basis. Manufacturers and suppliers could choose whether they want to join the scheme or not. It should consider the provision of subsidies to the NGOs in establishing that labeling scheme, and shall introduce this scheme to lighting product on a trial basis. The Scheme could be extended to other electronic products, depending on the prevailing situation. In the long run, the Government could take reference to the EU directives of "The Restriction of the use of Certain Hazardous Substances in Electrical and Electronic Equipment" (the RoHS Directive) and

⁵⁵ Interview with the executive personnel of the manufacturer of the EELBs concerned, October 2008.

⁵⁶ "Government electricity consumption," Director of Audit's Report No. 51, October 2008, p. 51.

⁵⁷ For details, see <http://ec.europa.eu/environment/ecolabel/index_en.htm>; <<http://www.blauer-engel.de/>> °

“Waste Electrical and Electronic Equipment Directive” (the WEEE Directive), for the regulation of electronic waste and the disposal of used electronic goods.⁵⁸

The Blue Angel is started by volunteers in Germany since 1978. The programme aims at promoting the concerns of both environmental protection and consumer protection. The products that could be awarded the Blue Angel label include toilet paper, stationery, paper carton box, paints, wallpaper, flat screens.....etc.⁵⁹

Energy Efficient Stores Labels

8. Before the official banning of the sale of incandescent lamps, the Government should promote information regarding the promotion of energy efficient lighting to the business sector (especially the retail and catering sectors). It would also be advisable to establish a reward scheme, which could be entitled as “energy efficient lighting stores label”, to encourage stores to adopt energy efficient lighting.

Solving the Problem of the Lack of “bayonet” cap

9. In view of the shortage of EELBs that can fit on bayonet cap in the market, the Government should explore the feasibility with the light bulb sector to increase the supply of the bayonet capped light bulbs in order to extend the usage of EELBs to domestic households, including those in public housing estates.

Comparing the Pros and Cons of Electronic EELBs and Electromagnetic EELBs

10. In view of the ever advancement in technologies, the life of incandescent light bulbs running on magnetic ballasts could last as long as 20-30 years, and 95% of the materials is recyclable. More importantly, it would help reduce the same proportion of waste. On the other hand, most of the materials of the electronic ballasts could not be recycled.

11. The Government shall pay serious attention to the claim from academic and engineering experts that although electronic EELBs are energy efficient, they are not environmental friendly. As Hong Kong is a knowledge-based society, government

⁵⁸ Directive 2002/95/EC of the European Parliament and of the Council of 27 January 2003 on the restriction of the use of certain hazardous substances in electrical and electronic equipment 和 Directive 2002/96/EC of the European Parliament and of the Council of 27 January 2003 on waste electrical and electronic equipment (WEEE).

⁵⁹ See < <http://www.blauer-engel.de/en/index.php>>,
<http://www.blauer-engel.de/en/products_brands/survey_basic_award_criteria.php>.

decisions shall be backed up by a sound knowledge base. Therefore, the Government should conduct comparative studies on the two types of light bulbs, in view of the fact that the EELBs without the presence of mercury are yet to be available in the market. Should the research results indicate that the energy efficiency between the two sets of light bulbs are similar, and if they have indicated that the electromagnetic EELBs perform better in terms of environmental efficiency, the Government could make use of the policy tools under the Producer Responsibility Scheme, such as the reduction of environmental levy to the light bulbs with a longer lifespan and using more recycling materials. By doing so, it could indirectly increase the competitiveness of the environmental friendly products and subsequently encourage the general public in adapting to these products.

10. It is worthwhile to consider a wider application of detachable EELBs in which different components of the light bulb could be separated from each other, as its components can be used for the fullest extent. Such design should be adopted whether the EELBs are driven by electronic or magnetic ballasts. For the maximization of the results in waste reduction, the Government should study the feasibilities for the promotion of detachable light bulbs.

The Professional Commons
March 2009

Fact Sheet on Economic and Social Benefits from the Policy Recommendations

A. Financial Resources From the Government:

The Government could directly invest a total of HK\$1.12 billion on the provision of subsidies for changing the light bulbs to every adult population

B. Creation of Employment

At least 1 000 jobs could be created, including the additional staff for the procurement, distribution and sales of the EELBs in the market, transportation works, and other administrative workers (such as those who distribute the subsidies of EELBs).

Waste Reduction

Should all incandescent light bulbs are replaced by EELBs, it would led to a reduction of 34.5 million light bulbs annually (it weights around 724.5 tonnes, which weighted the equivalent of 72 000 bags of rice of 10 KG each).

C. Reduction of Emissions of Greenhouse Gases , Energy and Electricity Bills

Should all 2.2 million households in Hong Kong switch their incandescent light bulbs to five EELBs of a similar luminance,

- As each of the incandescent light bulbs last three years on average, **a total of HK\$3.09 billion of electricity bills could be saved, and a reduction of 2 205 000 of carbon dioxide emissions could be made during the three year period.**
- Each domestic household customer of the Hong Kong Electric Company could save approximately HK\$140 annually as a result
- Each domestic household customer of the China Light and Power could save approximately HK\$110 annually as a result.