

**For discussion on  
28 January 2008**

**LEGISLATIVE COUNCIL  
PANEL ON ENVIRONMENTAL AFFAIRS**

**Mandatory Implementation of the Building Energy Codes**

**PURPOSE**

This paper seeks Members' views on the proposed mandatory implementation of the Building Energy Codes (BECs).

**BACKGROUND**

2. One of the issues that tops the agenda of the international community is climate change. Hong Kong is committed to doing our part in improving the regional environment and fulfilling the applicable convention and consensus. We will honor our pledge and seek to achieve the reduction goal adopted in the Asia-Pacific Economic Co-operation Leaders' Declaration on Climate Change, Energy Security and Clean Development in September 2007, i.e. to reduce energy intensity by at least 25% by 2030 (with 2005 as the base year). As Hong Kong is a commercial city with limited industrial operations, we have greater potential to improve energy efficiency and reduce our greenhouse gas emissions by promoting energy efficiency in buildings. This will also help address the growing concerns of local air quality.

3. Since 1998, the Electrical and Mechanical Services Department (EMSD) has issued five sets of BECs, covering four key types of fixed building services

installations – lighting, air-conditioning, electrical and lift and escalator, and the performance-based BEC – and has been operating the voluntary Hong Kong Energy Efficiency Registration Scheme for Buildings (HKEERSB).

4. However, voluntary compliance with the BECs does not appear to be forthcoming in Hong Kong. We consider it necessary to pursue mandatory implementation of the BECs to complement market driven changes. It is in fact a well-established international practice to require buildings to comply with minimum energy efficiency standards by means of legislation. For example, the Mainland and some overseas countries, including Australia, Singapore, the United Kingdom and the United States have implemented minimum energy efficiency requirements for buildings.

5. On 28 December 2007, the Government launched a three-month public consultation on a proposal to introduce mandatory implementation of the BEC for certain new and existing buildings, with an aim of improving energy efficiency of buildings, alleviating global warming, and combating air pollution.

6. Through the consultation exercise, we would like to seek the public and relevant stakeholders' view on different aspects of the proposed mandatory scheme, including whether Hong Kong should pursue the mandatory implementation of the BECs; what broad categories of buildings should be covered; and whether we should accept standards higher than the existing ones under the HKEERSB. The consultation document (at **Annex**) sets out the Administration's proposals on the mandatory implementation of the scheme as follows –

- (a) new commercial buildings and the communal areas of new residential and industrial buildings in both the private and public sectors as well as

major retro-fitting works in existing buildings should comply with the BECs promulgated by EMSD. The list of buildings with Certificates of Compliance issued will be made available for public inspection;

- (b) to enhance energy efficiency, energy audits are required for certain buildings once every 10 years. The results of the audits will be made available to occupants; and
- (c) to complement the proposed legislative scheme, buildings that have exceeded the minimum building energy efficiency standards by a prescribed percentage will be recognised by an energy mark through a voluntary administrative scheme.

7. It is estimated that for new buildings, the implementation of the proposals will result in energy saving of 2.8 billion kWh in the first decade, which contributes to a reduction in carbon dioxide emission of 1.96 million tonnes. An additional capital outlay in the region of 3%-5% of the building construction cost may have to be incurred in return for about 10% to 15% annual saving in energy bills. On average, the payback period for the additional capital investment is six years.

## **ADVICE SOUGHT**

8. Members are requested to comment on the proposals set out in the consultation document.

**Environment Bureau**

**December 2007**

# Consultation Paper

---

## A Proposal on the Mandatory Implementation of the Building Energy Codes



Environment Bureau  
Electrical and Mechanical Services Department  
Hong Kong SAR Government

# **CONSULTATION PAPER**

## **A Proposal on the Mandatory Implementation of the Building Energy Codes**

### **INTRODUCTION**

This document outlines the Government's proposal on introducing legislation to require the specified types of buildings to comply with the Building Energy Codes (BECs) issued by the Electrical and Mechanical Services Department (EMSD). You are invited to read this consultation document and provide your comments and views to help shape the final scheme by sending us your views on or before 31 March 2008.

### **Section 1 – The Crisis of Climate Change**

2. One of the issues that tops the agenda of the international community is climate change. Governments from around the world have been striving to formulate measures that strike an appropriate balance between economic development and the reduction of greenhouse gas emissions so as to achieve sustainable development. As the Chief Executive has outlined in this year's Policy Address, Hong Kong is committed to doing our part in improving the regional environment and fulfilling the applicable convention and consensus.

We will honor our pledge and seek to achieve the reduction goal adopted in the Asia-Pacific Economic Co-operation Leaders' Declaration on Climate Change, Energy Security and Clean Development in September 2007, i.e. to reduce energy intensity by at least 25% by 2030 (with 2005 as the base year).

3. There is a strong link between energy consumption and emissions of greenhouse gas. Over the past decades, much advancement in energy-efficient technology has been observed. Installations that offer net saving, in that the capital cost can be more than offset by the subsequent reduction in energy bills, are now widely available. Improving energy efficiency in Hong Kong's context is thus a cost-effective means to reconcile the increased energy needs to power economic growth and alleviating the adverse effect of climate change and global warming.

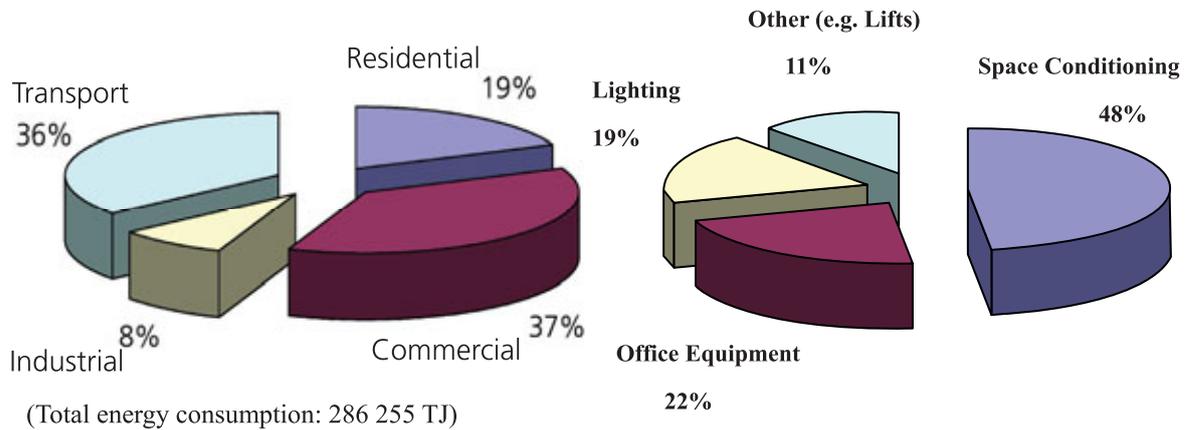
## **Section 2 – Local Situations**

4. Total energy consumption at end-use level in Hong Kong was 286 255 Terajoule (TJ). While the reduction of energy intensity<sup>1</sup> was 13% as compared with 1995, there was an average annual growth of 1.3% in absolute terms. About 50% of the energy consumed, i.e. 144 171 TJ, were electricity consumption, of which 89% were for buildings. *Figure 1* below shows the distribution of energy consumption by sector in 2005. *Figure 2* below shows the distribution of energy consumption by types of services in a typical office building. As electricity generation is the single largest source of air pollution in

---

<sup>1</sup> Energy intensity is the primary energy requirements per unit GDP.

Hong Kong, contributing to 91%, 49% and 48% of emissions of sulphur dioxide, nitrogen oxides and particulates respectively in 2005, it follows that improving energy efficiency would also help improve local air quality.



**Figure 1 – Energy Consumption by Sector in 2005**

**Figure 2 –Energy Consumption in a Typical Office Building**

5. It is evident from the foregoing energy consumption analysis that energy efficiency in buildings is an area where significant energy savings and greenhouse gas emission reduction can be made. There are thus very good reasons to make a strong push for its attainment to complement other Government’s efforts on reducing energy intensity as well as alleviating global warming and combating air pollution.

**Section 3 - The voluntary Hong Kong Energy Efficiency Registration Scheme for Buildings (HKEERSB)**

6. Considering that commercial buildings and the communal parts of

residential and industrial buildings account for a significant portion of the total energy consumption, the EMSD has since 1998 operated the voluntary HKEERSB. This voluntary scheme aims to promote achievement of energy efficiency in buildings by recognizing those that have complied with the minimum energy efficiency standards on four key types of fixed building services installations, namely, lighting, air-conditioning, electrical and lift & escalator installations set up by the EMSD. Together, they consume up to about 80% of the total electricity consumption of a typical office building. Recognition is given by way of the issue of a certificate for compliance with any of the following codes<sup>2</sup> –

<b>Title</b>	<b>Key performance standards</b>
Code of Practice for Energy Efficiency of Lighting Installations (BEC (Lighting))	<ul style="list-style-type: none"> <li>a) Luminous efficacies of various types of lamps;</li> <li>b) Power loss of lamp control gears;</li> <li>c) Lighting power densities of various indoor areas; and</li> <li>d) Number of lighting control points</li> </ul>
Code of Practice for Energy Efficiency of Air Conditioning Installations (BEC (Air Conditioning))	<ul style="list-style-type: none"> <li>a) Efficiency of air conditioning equipment;</li> <li>b) Fan power per unit volume of air flow;</li> <li>c) Frictional loss per unit length of pipe run;</li> <li>d) Thickness of thermal insulation; and</li> <li>e) Air conditioning control system</li> </ul>

<sup>2</sup> The BEC can be downloaded at: [http://www.emsd.gov.hk/emsd/eng/pee/eersb\\_pub\\_cp.shtml](http://www.emsd.gov.hk/emsd/eng/pee/eersb_pub_cp.shtml)

Code of Practice for Energy Efficiency of Electrical Installations (BEC (Electrical))	<ul style="list-style-type: none"> <li>a) Efficiency of electric motors;</li> <li>b) Power loss in electrical distribution system;</li> <li>c) Harmonic distortion in electrical system; and</li> <li>d) Provision of metering devices</li> </ul>
Code of Practice for Energy Efficiency of Lift & Escalator Installations (BEC (Lift & Escalator))	<ul style="list-style-type: none"> <li>a) Electric motor power of lifts/escalators; and</li> <li>b) Lift and escalator control system</li> </ul>
Performance-based Building Energy Code (BEC (PB))	<ul style="list-style-type: none"> <li>a) Specification of the method to derive the Design Energy value from the actual design and operational characteristics of a building; and</li> <li>b) Specification of the method to derive the Energy Budget value, which is evaluated based on a hypothetical building of the same size and shape of the building fully in compliance with the minimum requirements in the BEC (Lighting), BEC (Air Conditioning), BEC (Electrical) and BEC (Lift &amp; Escalator)</li> </ul>

7. BEC (Lighting), BEC (Air Conditioning), BEC (Electrical) and BEC (Lift & Escalator) are prescriptive in nature. An installation will be in

compliance with the respective BEC if it satisfies the minimum energy efficiency performance requirements stipulated therein. BEC (PB) sets out a means to evaluate and assess the energy efficiency performance of a building. It is introduced to offer a choice to building developers who wish to pursue and adopt innovative building design. Under this alternative approach, a building will be in compliance with the BECs provided that its Design Energy Value is smaller than or equal to the Energy Budget Value as derived from the procedures laid down in the BEC(PB).

8. The EMSD, upon receipt of an application certified by a Registered Professional Engineers of the electrical, mechanical or building services engineering discipline registered by the Engineers Registration Board of Hong Kong that an installation in a building has fulfilled the minimum energy efficiency requirements in the respective BEC, will carry out sample check of the design and verification of the results of the installation concerned. If the submission is found satisfactory, the EMSD will issue a certificate as recognition of the energy efficiency performance of the relevant installation.

## **PROPOSED MANDATORY IMPLEMENTATION OF THE BECs**

### **Section 4: Overseas Practice**

9. The useful role of mandatory compliance of minimum energy efficiency requirements in promoting energy efficiency and conservation in buildings is well established internationally. Some overseas countries, including Australia,

Singapore, the United Kingdom and the United States have implemented minimum energy efficiency requirements for buildings. The Mainland China has also put in place minimum energy efficiency requirements for buildings.

10. The minimum requirements in the Mainland and overseas mandatory schemes usually do not have retrospective effect for existing buildings unless those buildings undergo alterations, additions or change of use. Apart from requiring compliance of minimum requirements, some overseas countries also implement voluntary recognition schemes in parallel to provide recognition of best practices in achieving energy efficiency in buildings. Legislative practices of minimum energy efficiency requirements for buildings in the Mainland and overseas countries are at **Annex A**.

### **Section 5: Achievable environmental and economic gains**

11. The EMSD introduced the HKEERSB in 1998 to promote the adoption of the BECs mentioned in paragraph 6 above with the assistance of the building industry, professional institutes, trade associations and the academia. The energy efficiency standards and requirements in the BECs have taken into account local needs and circumstances and incorporated good engineering practices. Over the years, two rounds of major reviews and updates have been conducted to improve the standards by taking into account the development of energy efficiency technologies and design practices, with the latest version recently released in March 2007.

12. A comparison of the latest standards adopted in the BECs with the standards adopted by some overseas countries and the Mainland is at **Annex B**. Our standards on air-conditioning systems and electrical installations are broadly comparable to the standards adopted by other jurisdictions, whereas our standards on lighting installations are relatively less stringent to meet the general local preference for better-illuminated interior spaces. Besides, the EMSD has put in place the BEC (Lift & Escalator), unique to the built environment of Hong Kong which is dominated by high-rise buildings. We are not aware of other overseas practices that have introduced energy efficiency standards for lifts and escalators.

13. Through the reviews and updates, the minimum energy efficiency standards and requirements in the BECs have been gradually uplifted. For example, the maximum allowable lighting power density for offices has been uplifted from 25 W/m<sup>2</sup> in the 1998 edition to 17 W/m<sup>2</sup> in the 2007 edition. In terms of average energy savings achieved, the adoption of the BECs would result in an estimated annual electricity saving of about 10%-15% for a typical office building depending on the actual design of its building services installations.

## **Section 6: Need for Change**

14. As mentioned in paragraph 13 above, increasing building energy efficiency means gains for the environment. It also makes economic sense for the community as a whole to make higher upfront investment in energy-efficient installations which will be more than compensated by the subsequent saving in

electricity bills. However, since implementation of the voluntary HKEERSB, the EMSD has only issued a total of 1 981 certificates, covering 2 193 services installations in 791 building venues (as at November 2007). Of the 791 building venues, 76% are government premises. In other words, only 187 non-government premises, comprising 46 new premises and 141 existing premises, have come forward for registration over a nine-year period. The participation rate is disconcertingly low.

15. We have reviewed the situation taking into account practices in the Mainland and overseas countries such as Australia, Singapore, the United Kingdom and the United States. Mandatory compliance with the BECs for promoting energy efficiency and sustainable development is widely practiced in these jurisdictions. As voluntary compliance with a higher energy efficiency standard appears not to be forthcoming in Hong Kong and amidst the growing environmental concerns, we consider it an opportune time to pursue mandatory implementation of the BECs to accompany market driven changes. In parallel, the Government will continue with our various energy efficiency initiatives, such as stepped-up publicity on the environmental and economic benefits of lifting energy efficiency by addressing the energy performance of household appliances and office equipment and thereby changing consumers' perception and encouraging them to take actions to save energy.

16. The Chief Executive has announced in his Policy Address in October 2007 that the Government will consult the public on the proposed mandatory implementation of the Building Energy Codes by means of legislation in order to improve energy efficiency and conservation in buildings.

## **Section 7: Issues to be Considered**

### **Would you accept mandatory implementation of the BECs in principle**

17. There is no disagreement that improving building energy efficiency is a cost-effective measure to address the growing concerns of global warming, local air quality and energy security. Some may however argue that as energy saving measures are cost-effective, we may and perhaps should rely on market-driven forces to achieve efficiency gain, which is in fact in line with the Government's regulatory philosophy generally. Yet, as mentioned in paragraph 14 above, such forces appear not promising over the past nine years. There are impediments to the effective operation of the market force here: the notable one being the split incentive between developers/landlords who make the capital investment and occupants who enjoy savings in the electricity bills. With the pressing environmental aspiration and needs, the community should take a view on whether the Government should mandate compliance with the BECs.

#### **Question 1:**

**Do you agree that Hong Kong should pursue the mandatory implementation of the BECs?**

## **What types of buildings should be covered**

18. There are suggestions that the Government's focus should be on commercial buildings only: they have better capability to accept additional requirements for compliance. There is no dispute that in developing the details of the proposal, it is necessary to take into account the practical considerations, such as variation in the functional use of the premises concerned, affected parties' ability to comply with the requirement, freedom of choice and enforcement issues, etc. On the other hand, excluding all other categories of buildings outright would go against the objective of achieving the most environmental benefits. There is also the issue of fairness. We welcome views on this issue, together with the rationale behind, so as to assist the formulation of balanced and practicable proposals.

### **Question 2:**

**What broad categories of buildings should be covered?**

### **Question 3:**

**Are there any specific types of functional use within the selected categories that should be exempted from the mandatory scheme, and if so, what are they?**

## **Whether existing buildings should be covered**

19. The energy efficiency measures prescribed in the BECs are only those that are cost effective in improving energy performance of the buildings, taking into account the necessary investment and the subsequent savings in electricity bills. Yet, in the case of existing buildings, compliance with the BECs may not necessarily achieve the same level of savings owing to the need to replace installations that may still be functioning. There may even be cases where the “additional” investment cannot be fully recovered, depending on the residual life of the existing installations. From the perspective of the community as a whole, we should aim for as much environmental gains as possible, on the condition that such aim would not cause undue burden to the parties concerned. On this basis, we have suggested the following alternative implementation options for consideration should legislative means to achieve efficiency gains in existing buildings be accepted.

### **Question 4:**

**Do you consider that existing buildings should also be required to improve their energy efficiency performance?**

**Question 5:**

**If your answer to Question 4 is in the affirmative, which of the following options do you consider as most appropriate –**

- **requiring compliance with the BECs after a reasonable transitional period; or**
- **requiring compliance with the BECs only when there are major refurbishment works, such as when the works involve replacement of major components of the types of installations covered by the BECs or when the coverage of the retro-fitting works exceeds a certain percentage of the building's gross floor area ; or**
- **mandating conduct of energy audits and display of the audit results.**
- **any other options?**

**Would you accept standard higher than the existing one under the HKEERSB**

20. As mentioned in paragraph 11 above, the latest version of the BECs has just been recently released in early 2007. They should thus serve as an

up-to-date reference for energy efficiency standards under a mandatory scheme. Further tightening of the standards should depend on whether there is a stronger aspiration to achieving more energy efficiency gains in buildings; and whether the community is prepared to subscribe to environmental standards more stringent than the prevailing situation, particularly with respect to lighting and air-conditioning installations. Similar to overseas practices, the EMSD will take into account climatic, local and environmental conditions, engineering and trade practices as well as cost-effectiveness etc when determining what requirements are to be made mandatory.

**Question 6:**

**As a general direction, whether we should –**

- **adopt the recently updated BECs for the HKEERSB as the mandatory standards; or**
- **incorporate a regular review system to uplift the standards with reference to the prevailing international standards as far as possible; or**
- **introduce a tiered arrangement, i.e. with the BECs issued by the EMSD as the minimum standards applicable to all covered buildings, and a higher set of standards be introduced to give recognition to buildings that achieve better energy efficiency to encourage superior environmental performance.**

## **Section 8: The Proposed Scheme**

21. Taking into account the relevant considerations set out in the preceding paragraphs, we **propose** the implementation of a mandatory scheme on the BECs through a separate legislation. With the aim at achieving as much environmental benefits as possible, the Government considers that mandatory measures should also be pursued for existing buildings, subject to variations to minimize possible practical difficulties. Key implementation details for new and existing buildings are set out in the paragraphs below –

### ***New buildings***

#### Coverage

- (a) Commercial buildings and the communal areas of residential and industrial buildings should comply with the building energy efficiency standards promulgated by the EMSD, subject to certain exclusions to cater for genuine compliance difficulties. Types of buildings (including both the private and public sectors) proposed to be covered are at **Annex C**;

#### Energy Efficiency standards

- (b) The EMSD should adopt the latest version of the BECs on lighting, electrical, air-conditioning and lift and escalator installations as basis, and introduce changes as appropriate having regard to the community

aspirations and comments gathered during this consultation exercise;

- (c) A tiered-system should be introduced –
  - (i) all covered buildings are required to comply with the standards under paragraph 21(b) above;
  - (ii) building developers and owners may choose to satisfy the requirements under paragraph 21(c)(i) above by way of complying with the BEC (PB), so as to accommodate innovative designs of their buildings;
  - (iii) building developers and owners may choose to attain a higher energy efficiency standard for the covered buildings, and to complement the proposed legislative scheme and as with some overseas practices, recognition through a voluntary administrative scheme in the form of an energy mark will be given to buildings that have exceeded the minimum building energy efficiency standard by a prescribed percentage such as 15% or 20%, using the BEC (PB) as an assessment tool;

#### Compliance procedures

- (d) To simplify the compliance procedures, a self-declaration arrangement will be adopted. The self-declaration will be certified by professionals (e.g. Registered Professional Engineers of the electrical, mechanical or

building services engineering discipline registered by the Engineers Registration Board of Hong Kong) recognized by the EMSD (hereinafter referred as recognized professionals);

- (e) The developers of those new buildings set out at Annex C are required to submit a self-declaration, certified by recognized professionals, to the EMSD upon the approval of building plans by the Building Authority, to declare that the approved building plans and other plans have provided for suitable design provisions to meet the building energy efficiency standards promulgated by the EMSD. No later than two months after the issue of occupation permits by the Building Authority or within such extended period as approved by the EMSD, the developers for those new buildings set out at Annex C should be required to submit to the EMSD for verification a final self-declaration certified by recognized professionals, together with the necessary proof such as the supporting documentation and test reports to demonstrate that the completed installations meet the energy efficiency standards;
  
- (f) The EMSD will issue a Certificate of Compliance upon receipt of the final self-declaration, the supporting documentation and the test reports. The EMSD will conduct sample checks to ensure that correct and valid energy performance information are included in the submissions. Sample inspections of completed installations will also be carried out. The list of buildings issued with Certificates of Compliance will be made available for public inspection;

### Continued compliance

- (g) For those buildings set out at Annex C, the building owners (or Incorporated Owners where applicable) and the property management companies should ensure continued compliance with the BECs. Renewal of the Certificate of Compliance through the submission of a suitable form and supporting information (including the results of energy audits) by the management companies on behalf of the building owners (or Incorporated Owners where applicable) should be required once every 10 years to ensure continued compliance with the BECs applicable to the last declaration and to prevent deterioration of energy performance.

### Enforcement

- (h) The EMSD will monitor the submission of self-declarations for those new buildings. For those new buildings covered by Annex C, a penalty system will be introduced against those developers who fail to obtain the Certificate of Compliance within the specified period, and against building owners (or Incorporated Owners where applicable) and the property management companies who fail to renew the Certificate of Compliance within the specified period;.
- (i) The EMSD will conduct sample checks to ensure that correct and valid energy performance information is included in the submissions. Sample inspections of completed installations will also be carried out to

ensure that they are in compliance with the BECs. Appropriate regulatory actions will be initiated against the developers in respect of the first issue of the Certificate of Compliance and against the building owners (or Incorporated Owners where applicable) and the property management companies in respect of renewal of Certificate of Compliance, if irregularities are found either from the submitted materials or during the inspections;

### ***Existing buildings***

- (j) All major retro-fitting works in commercial buildings and the communal areas of residential and industrial buildings in both the private and public sectors should comply with the relevant building energy efficiency standards, as in economic terms the biggest opportunity is in coupling measures for energy efficiency performance with retro-fitting works. Typical examples of major retro-fitting works include replacement of major components of the types of installations covered by the BECs or retro-fitting works being carried out for more than 50% of the gross floor area of the building or the communal areas in the case of residential and industrial buildings. Similar to the arrangement for submission of final self-declarations for new buildings, a self declaration together with supporting document should be submitted to the EMSD within two months after completion of the works;
  
- (k) Building owners (or the Incorporated Owners where applicable) and the property management companies should arrange energy audits by

recognized professionals for commercial buildings with a cumulative floor area over 500 m<sup>2</sup> once every 10 years and make available the audit results to occupants or potential occupants. Commercial buildings with Certificates of Compliance should also be required to have energy audits conducted once every 10 years so that opportunities for energy savings can be identified. A copy of the audit results should be submitted to the EMSD for record. Building owners (or the Incorporated Owners where applicable) and the property management companies should keep the audit reports for inspection by the EMSD. Building owners (or the Incorporated Owners where applicable) and the property management companies are encouraged to implement the recommended energy saving measures in the energy audits where applicable;

- (l) A penalty system will be introduced for building owners (or Incorporated Owners where applicable) and the property management companies who fail to arrange the required energy audits within the given time frame or without any reasonable excuse fails to produce the audit reports for inspection by the EMSD;
- (m) Review of the results of the mandatory implementation of the BECs in existing buildings should be conducted, taking into account the reduction in energy consumption, acceptance of the community and the trades. Subject to the results, we may pursue tighter requirements for application to existing buildings; and

### *Future uplifting of the energy efficiency standards*

- (n) The EMSD will review and update the BECs at least once every five years with the following objectives –
  - (i) to address the community aspiration and comments received during the implementation of the mandatory scheme;
  - (ii) to take advantage of new energy efficiency technologies and capture prevailing good engineering industry and trade practices; and
  - (iii) to uplift the minimum energy efficiency requirements with reference to the development trend worldwide.

### **Transitional Arrangement**

22. To enable the building industry to make the necessary preparations for the transition from the voluntary HKEERSB to the mandatory scheme, we **propose** that the mandatory implementation of the BECs will be applied to new buildings (as listed in **Annex C**) for which the building plans have not been approved by the Building Authority at the time relevant legislation is enacted, and for certain existing buildings after a certain grace period. Subject to the comments received in the public consultation, a grace period may be incorporated to ensure smooth run-in of the energy efficiency requirements under

the new legislation for certain existing and new buildings.

### **Section 9 – Costs and Benefits**

23. It is estimated that implementation of the proposal will result in energy saving of approximately 2.8 billion kWh in the first decade of implementation. The estimation is based on the information from Hong Kong Property Review 2007 issued by the Rating and Valuation Department on the projected floor areas for commercial/residential/industrial buildings, the average energy saving gains for new building designs on the basis of Hong Kong experiences and other relevant information in respect of the new floor areas of those buildings set out at Annex C. In terms of reduction in carbon dioxide emission, it will be in the region of 1.96 million tonnes in the first decade. The figures have only taken account of savings that may be achieved from improved energy efficiency in new buildings.

24. An additional capital outlay in the region of 3%-5% of the building construction cost may have to be incurred in return for about 10 to 15% annual saving in energy bills. On average, the payback period for the additional capital investment is six years.

### **Section 10 – Sustainability Assessment**

25. A preliminary sustainability assessment shows that the proposed

mandatory implementation of the BECs should contribute positively to energy conservation, reduction of anthropogenic greenhouse gases emissions, and alleviation of air pollution. The proposal will help moderate the growing trend of energy consumption. It is in line with the sustainability principles of promoting the sustainable use of natural resources, avoiding environmental problems for present and future generations, seeking to find opportunities to enhance environmental quality, and providing a living environment which promotes and protects the physical health of the people of Hong Kong. The proposal will help meet the objective of increasing and sustaining conservation of energy in order to reduce the growing trend of energy use, which has been laid down in the Government's First Sustainable Development Strategy of Hong Kong.

## **WAY FORWARD**

26. In addition to this public consultation exercise, we will actively initiate discussions with key stakeholders, such as environmental groups, building developers, building professionals and installation contractors. We will finalize the details of the proposal after taking into account comments and views received from the community and the key stakeholders during this public consultation. Subject to the views received and the finalization of the proposals, we plan to introduce the legislative proposal into the Legislative Council within the 2009/10 legislative year.

## YOUR VIEWS

27. We invite your views and comments on the proposed mandatory implementation of the BECs. A list of key consultation points is set out at **Annex D**. Please send in your comments to us before 31 March 2008 by mail, electronic mail or facsimile to the following:

Address - Energy Division (2)  
Environment Bureau  
46/F, Revenue Tower  
Wan Chai  
Hong Kong

E-mail address - [bec\\_consult@enb.gov.hk](mailto:bec_consult@enb.gov.hk)

Facsimile - 2123 9438

Website address - [http://www.enb.gov.hk/bec\\_consult.html](http://www.enb.gov.hk/bec_consult.html)

28. When returning by mail, you can make use of the postage paid questionnaire at the centre pages of this consultation document.

29. Please note that the Government would wish, either in discussion with others or in any subsequent report, whether privately or publicly, to be able to refer to and attribute views submitted in response to this consultation document. Any request to treat all or part of a response in confidence will be respected, but if no such request is made, it will be assumed that the response is not intended to be confidential.

**Legislative Practices of Minimum Energy Efficiency Requirements for  
Buildings in the Mainland and Overseas Countries**

**Australia**

The Building Code of Australia (BCA) is a national standard stipulating the minimum energy efficiency requirements together with other health and safety requirements for buildings. Other than the minimum energy efficiency requirements, the BCA also requires that all residential buildings should achieve a specified energy benchmark. The BCA is adopted by the State and Territory building legislation as the technical standard for the construction of buildings. Subject to the actual legislative requirements in each State and Territory such as the Australian Capital Territory's Building Regulations, all new building works in new and existing building development have to comply with the BCA prior to the issuance of relevant occupation permit by the authority. The BCA does not have retrospective effect and is generally not applicable to existing buildings unless those building undergo alterations, additions or changes of use to an extent that the authority may require them to be upgraded to meet the above-mentioned standards.

2. Other than the BCA, Australia also implements a voluntary Australian Building Greenhouse Rating (ABGR) Scheme, which is developed in 2005 to provide market recognition and a competitive advantage for low greenhouse emitters and energy efficient performers, and to encourage best practice to

minimize greenhouse emissions in commercial buildings. The Scheme is administered nationally by the New South Wales Department of Environment and Climate Change and locally by leading state greenhouse agencies. The ABGR Scheme rates buildings from one to five stars and helps building owners and tenants across Australia benchmark the greenhouse performance of their buildings.

## **Singapore**

3. Singapore Standard SS 530 – Code of Practice for Energy Efficiency Standard for Building Services and Equipment is the national standard stipulating the minimum energy efficiency performance requirements for building services installations in Singapore. Under the Building Control Regulations of its Building Control Act, all new buildings in Singapore have to satisfy the minimum energy efficiency performance as stated in the Approved Document – Acceptable Solutions issued by the Building and Construction Authority, which requires that the requirements in SS 530 have to be satisfied. The energy efficiency requirements have to be complied with prior to the issuance of relevant occupation permit by the authority. The requirements in SS 530 do not have retrospective effect and are generally not applicable to existing buildings unless these buildings undergo alterations, additions or changes of use to an extent that the relevant authority may require them to be upgraded to meet the above-mentioned requirements.

4. On the other hand, the Building and Construction Authority has launched in 2005 a voluntary Green Mark Scheme, which is a green building rating system to evaluate factors affecting the environmental impact and performance of a building. The Scheme aims to encourage the incorporation of environmentally friendly and energy saving features in buildings and to raise environmental awareness among developers, designers, and building professionals. Buildings will be awarded a Certified, Gold, Gold Plus or Platinum rating depending on the points scored on the key criteria including energy efficiency. It has also been planned that starting from 2008 onwards, all new buildings and existing buildings undergoing major retrofitting works with gross floor area above 2000 m<sup>2</sup> must meet the Certified standard or above of the Green Mark Scheme.

#### **England and Wales, The United Kingdom**

5. The minimum energy efficiency requirements for buildings are included in the Approved Document L1 – Conservation of fuel and power in dwellings and Approved Document L2 – Conservation of fuel and power in buildings other than dwellings issued by the Secretary of State. All buildings have to comply with the mandatory functional requirements set out in the Building Regulations under the Building Act, which are also supported by the practical guidance in the Approved Documents to cover the common building design, with compliance of the relevant British Standards as an alternative approach to cover the more complex situations. The energy efficiency requirements have to be complied with prior to the issuance of relevant occupation permit by the authority. The requirements do not have retrospective effects and are generally not applicable to

existing buildings. The Approved Documents give practical guidance for new buildings as well as existing buildings involving alterations, additions or change of use, etc. for compliance of the Building Regulations.

6. Apart from the above-mentioned legislative requirements, the United Kingdom introduced the Energy Performance of Buildings (Certificates and Inspections) (England and Wales) Regulations of the Building Act in 2007. The new Regulations require that an Energy Performance Certificate, which gives the building a grading ranging from A to G for its energy efficiency performance, shall be produced whenever the building is constructed, sold or rented. The Certificate shall be displayed in large buildings occupied by public authorities and certain public institutions.

### **The United States**

7. Each State in the United States has acts and regulations on their own to govern the energy efficiency performance of buildings. The regulations normally refer to codes and standards developed by non-government bodies such as the American Society of Heating, Refrigeration & Air-conditioning Engineers (ASHRAE). The ASHRAE Standard 90.1 – Energy Standard for Buildings Except Low-Rise Residential Buildings has been recognized as the American National Standard governing energy efficiency performance for buildings. In the Energy Policy Act, States are requested to adopt ASHRAE Standard 90.1 or equivalent as the state-wide energy code for commercial buildings. For example, the California Building Standard Code administered by the California Building Standards Commission is developed based on ASHRAE Standard 90.1.

Other than new buildings, the California Code is applicable to existing buildings whenever the buildings change tenancy or ownership.

### **The Mainland**

8. The minimum energy efficiency requirements for buildings are stipulated in the national standard GB 50189 – 《公共建築節能設計標準》, with which the design of buildings has to comply. The 《民用建築節能管理規定》 of the 《中華人民共和國建築法》, which came into force on 1 January 2006, requires that the planning, design, construction and operation of both residential and public buildings have to comply with the requirements covering various energy efficiency and conservation measures as stipulated in the Regulation. The requirements are applicable to new buildings as well as alterations and additions to existing buildings.

### Comparison of Hong Kong BECs with standards in other jurisdictions

#### (A) Lighting Power Density for typical areas

Areas	Maximum Allowable Lighting Power Density (W/m <sup>2</sup> )					
	Hong Kong BEC	Australia BCA	Singapore SS 530	US ASHRAE 90.1	Europe (e.g. UK Approval Document L2)	Mainland GB 50034
Open Plan Office / Cellular Office	17	7-10	15	11.8 - 16.1	Not less than 40 luminaire- lumen per circuit watt	11 - 18
Retails	20	25	25	18.3	No specific requirement	11 - 20
Restaurant	23	20	15	15		13
Atrium / Foyer	25	10	10	-		-

#### (B) Coefficient of Performance<sup>3</sup> of typical air-conditioning chillers

Type/Rating of air- conditioning Chiller	Coefficient of Performance					
	Hong Kong BEC	Australia BCA	Singapore SS 530	US ASHRAE 90.1	Europe (e.g. UK Approval Document L2)	Mainland GB 50189
Air cooled, scroll / screw	2.7 – 2.9	2.2 – 2.5	2.80	2.80	Requirement is set on overall air- conditioning system performance instead of on coefficient of performance for chillers	2.40 – 2.60
Water cooled, screw, 500 – 1000kW	4.6	4.5	4.45 – 4.90	4.90		4.30
Water cooled, screw, >1000kW	5.5	5.5	4.90 – 5.50	5.50		4.60
Water cooled, centrifugal, 500 – 1000kW	4.5	4.5	5.00 – 5.55	5.55		4.70
Water cooled, centrifugal, >1000kW	5.7	5.5	5.55 - 6.10	6.10		5.10

<sup>3</sup> Coefficient of performance means the ratio of the rate of heat removal to the rate of energy input for air-conditioning chillers.

**(C) Electrical Motor Efficiency**

<b>Motor (4-pole) Rating, P (kW)</b>	<b>Minimum Efficiency (%)</b>					
	<b>Hong Kong BEC</b>	<b>Australia BCA</b>	<b>Singapore SS 530</b>	<b>US ASHRAE 90.1</b>	<b>Europe (e.g. CEMEP<sup>4</sup>)</b>	<b>Mainland GB 50189</b>
$1.1 \leq P < 5.5$	76.2 – 84.2	<i>No specific requirement</i>	83.8 – 88.3	84.0 – 87.5	76.2 – 84.2	<i>No specific requirement</i>
$5.5 \leq P < 22$	85.7 – 90.0		89.2 – 92.2	89.5 – 92.4	85.7 – 90.0	
$22 \leq P < 55$	90.5 – 92.5		92.6 – 93.9	92.4 – 93.6	90.5 – 92.5	
$55 \leq P < 90$	93.0 – 93.6		94.2 – 94.7	94.1 – 94.5	93.0 – 93.6	
$P \geq 90$	93.9		95.0	94.5	93.9	

Remarks :

- (a) BCA - “Building Code of Australia” is the national standard for buildings in Australia;
- (b) SS 530 - “Energy Efficiency Standard for Building Services and Equipment” is the standard adopted in Singapore;
- (c) ASHRAE 90.1 - “Energy Standards for Buildings Except Low-Rise Residential Building” issued by the American Society of Heating, Refrigeration and Air-conditioning Engineers is the standard adopted in U.S.A.;
- (d) Approval Document L2 - “Conservation of fuel and power in buildings other than dwellings” is the standard document adopted in England, U.K.
- (e) CEMEP - European Committee of Manufacturers of Electrical Machines and Power Electronics represents the European manufacturers on electrical machines and provides classification of electrical motors according to their efficiencies;
- (f) GB 50034 - 《建築照明設計標準》 is the standard for lighting design in the Mainland; and
- (g) GB 50189 - 《公共建築節能設計標準》 is the standard for energy efficiency of buildings in the Mainland.

<sup>4</sup> The motor efficiency figures represent the major market share of electrical motors in European countries.

**Types of buildings to be covered under the Proposed  
Mandatory Implementation of the Building Energy Codes**

- A. Commercial buildings, which mean those parts of the buildings which are constructed to be used or are being used for non-domestic purposes, such as –
- Office
  - Hotel
  - Shopping complex
- B. Communal areas of residential buildings
- C. Communal areas of industrial buildings

**List of Key Consultation Points**

The Government would like to hear the views of the public on the following issues –

**Question 1:** Do you agree that Hong Kong should pursue the mandatory implementation of the BECs?

**Question 2:** What broad categories of buildings should be covered?

**Question 3:** Are there any specific types of functional use within the selected categories that should be exempted from the mandatory scheme, and if so, what are they?

**Question 4:** Do you consider that existing buildings should also be required to improve their energy efficiency performance?

**Question 5:** If your answer to Question 4 is in the affirmative, which of the following options do you consider as most appropriate –

- requiring compliance with the BECs after a reasonable transitional period; or

- requiring compliance with the BECs only when there are major retro-fitting works, such as when the works involve replacement of major components of the types of installations covered by the BECs or when the coverage of the retro-fitting works exceed a certain percentage of the building's gross floor area ; or
- mandating conduct of energy audits and display of the audit results.
- any other options?

**Question 6:** As a general direction, whether we should –

- adopt the recently updated BECs for the HKEERSB as the mandatory standards; or
- incorporate a regular review system to uplift the standards with reference to the prevailing international standards as far as possible; or
- introduce a tiered arrangement, i.e. with the BECs issued by the EMSD as the minimum standards applicable to all covered buildings, and a higher set of standards be introduced to give recognition to buildings that achieve better energy efficiency to encourage superior environmental performance.

