

Building Energy Saving Strategy in Hong Kong — “Built-in” + “Plug in”

CHAN Pak-cheung^a, CHIU Chun-ting^b, KONG Ka-wah^c, SHUM Chung-yeed^d

^aElectrical and Mechanical Services Department, Government of the HKSAR, Hong Kong SAR, pcchan@emsd.gov.hk

^bElectrical and Mechanical Services Department, Government of the HKSAR, Hong Kong SAR, ctchiu@emsd.gov.hk

^cElectrical and Mechanical Services Department, Government of the HKSAR, Hong Kong SAR, kwkong@emsd.gov.hk

^dElectrical and Mechanical Services Department, Government of the HKSAR, Hong Kong SAR, cyslum@emsd.gov.hk

ABSTRACT

Hong Kong is a densely populated metropolitan city crowded with more than 7 million people. The erection of high-rise buildings is thus essential for accommodating the residents of this small stretch of land. These buildings and the activities therein are the energy terminators which consume about 90% of the city's total electricity use. Of the 50,000 buildings and facilities in Hong Kong, commercial sector and residential sector account for around 66% and 26% respectively of the electricity share. Thus, energy saving in commercial and residential buildings is a key factor in addressing climate change and associated environmental issues of Hong Kong.

HKSAR Government has been pursuing various energy efficiency policies and initiatives to reduce energy use in buildings. In 2012, the Buildings Energy Efficiency Ordinance, Cap 610 (BEEO) came into full operation. It requires new buildings as well as existing buildings undergoing major retrofitting to comply with the energy efficiency standards and requirements specified in the Building Energy Code (BEC). Such “built-in” approach is able to regulate nearly 80% of electricity consumption in commercial buildings. Meanwhile, by specifying the energy performance of 5 types of “plug-in” domestic electrical appliances under the Energy Efficiency (Labelling of Products) Ordinance, Cap 598 (EE(LP)O) since its full implementation in 2009, about 60% of electricity consumption in residential sector can be regulated. These two pieces of legislation govern the “built-in” system and “plug-in” appliances in buildings, which together constitute over 70% of electricity consumption in Hong Kong.

An overview of the BEEO and the EE(LP)O will be given in this paper. The latest update since their full implementation, including progress of enforcement, tightening of energy efficiency standards and issuance of new Codes, will be highlighted. Besides, the way forward in enhancing energy efficiency of existing buildings through operational optimization and retro-commissioning will be addressed.

Keywords: *building energy code, Buildings Energy Efficiency Ordinance, Energy Efficiency (Labelling of Products) Ordinance, energy saving*

1. INTRODUCTION

Hong Kong consumed 289,160 TJ (about 80,000 million kWh) of energy in 2014, in which around 55% energy end-use is in form of electricity consumption. With more than 7 million people squeezed within small stretch of 1,100 km land, the fulfilment of living needs and city operation has indeed resulted in making Hong Kong the most vertical city in the world. It is thus not surprising that buildings take up about 90% of our total electricity consumption, and is roughly 50% of total energy end-use. When comparing to the global energy use in buildings of 40% of the total energy consumption, the energy footprint for buildings in Hong Kong is affirmatively on the high side. It is imperative to reduce the use of electricity in buildings to help mitigate climate change. Commercial buildings and residential buildings are the major sectors which share 66% and 26% of electricity use respectively.

To this end, the Electrical and Mechanical Services Department (EMSD), HKSAR enacted two Ordinances respectively to govern those “plug-in” electrical appliances in residential buildings and “built-in” major building services installations in commercial buildings.



Figure 1: BEEO and Energy Label under MEELS

2. THE BUILDINGS ENERGY EFFICIENCY ORDINANCE

The BEEO gives a legislative foundation to continuously save energy use in both new and existing buildings through the mandatory compliance of its BEC and Energy Audit Code (EAC). For building design, the BEC governs the minimum energy efficiency standards for “built-in” central building services installations, including air-conditioning, lighting, electrical as well as lift and escalator systems, which are about 80% of electricity consumption in buildings. Meanwhile, EAC sets out the technical guidance and details in conducting energy audit for commercial buildings.

2.1 Certificate of compliance registration

The BEEO requires the developers of newly constructed prescribed buildings to engage Registered Energy Assessors (REA) to certify and submit “stage one declaration” at design stage to declare all the major building services installations (BSI) in buildings have been designed and will be completed according to the specified standards and requirements under BEC. Subsequently at occupation approval stage, the developers are further required to submit “stage two declaration” certified by REA to declare those BSI have been installed and completed in accordance with the BEC requirements, and apply for Certificate of Compliance Registration (COCR) which will be valid for 10 years.

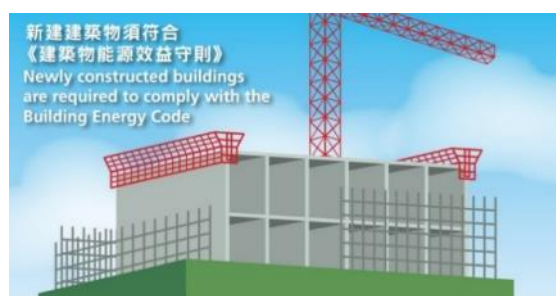


Figure 2: BEEO applicable to newly constructed buildings

2.2 Major retrofitting works

When Major Retrofitting Works (MRW) are involved, irrespective of newly constructed buildings or existing buildings, the owners or responsible persons are required to obtain a Form of Compliance (FOC) from REA certifying the MRW's compliance with the BEC. MRW refers to the addition or replacement of BSI covering a works floor area aggregated to 500m² or above, or the addition or replacement of a CBSI component, including an electrical circuit at rating 400A or above, a chiller/ air-conditioner at 350 kW cool/ heat capacity or above, or a motor drive plus mechanical drive of a lift or escalator.



Figure 3: BEEO applicable to major retrofitting works in existing buildings

2.3 Energy audit

Owners of commercial buildings are required to engage REAs to conduct energy audits for the CBSI of their buildings once every 10 years. The energy audits should be carried out in accordance with the requirement of EAC. After the audits, energy audit forms which contain the energy utilization index (EUI) of buildings must be exhibited in conspicuous positions at the main entrance of the buildings. Energy Management Opportunities (EMO) should be included in the energy audit report for building owners to realize the possible savings of the building and to consider further the implementation plan in the future.



Figure 4: BEEO requires commercial buildings to carry out energy audit

2.4 Implementation of the Building Energy Efficiency Ordinance

Upon full implementation of the BEEO in Sep 2012, around 1,200 "stage one declaration" have been received and over 220 COCR have been issued. As for major retrofitting works, about 5,200 FOC have been recorded for completion of work in prescribed buildings. It is also expected that about 4,000 commercial buildings are required to comply with the energy audit requirements. In respect of enforcement actions against any non-compliance with BEEO, prosecution action will be instigated if relevant parties fail to comply with the statutory requirements. On the other hand, briefings and presentations have continuously been conducted for all stakeholders including developers, building owners and tenants etc. to promote the statutory requirements of BEEO.

2.5 Continuous review of the codes

The BEC and EAC will be reviewed at a 3-year interval since the initial edition was issued in 2012 so as to further tighten the energy efficiency standards. In each review, reference will be made to the latest worldwide technological development as well as the updated international standards and public aspirations. The review was conducted by a Technical Taskforce with members drawn from the relevant professional institutions (including green groups), trade associations, consultant or contractor associations, university academia, and government departments. Six Working Groups were formed under the Technical Taskforce to help provide expert advice on the possible improvements to the energy efficiency standards and requirements under BEC and EAC.

The first comprehensive review was conducted in Sep 2014 and completed in mid-2015. The updated version of the BEC and EAC (i.e. BEC 2015 and EAC 2015) were gazetted with a press release in Dec 2015. Having taken into account the past practice and the operational need of relevant trades, grace periods of six-month and nine-month respectively have been provided for COCR and FOC submission respectively. The revised energy efficiency standards are expected to bring around 10% energy saving in buildings as compared to those under BEC 2012.

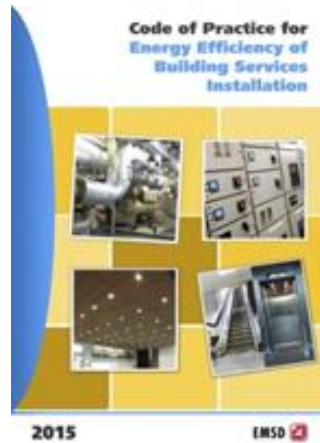


Figure 5: BEC 2015 Edition

3. ENERGY EFFICIENCY (LABELLING OF PRODUCTS) ORDINANCE

3.1 The Ordinance

The Mandatory Energy Efficiency Labelling Scheme (MEELS) was introduced through the Energy Efficiency (Labelling of Products) Ordinance (Cap. 598) [EE(LP)O] which was enacted in May 2008. The MEELS was implemented in phases. The initial and second phases were fully implemented on 9 November 2009 and 19 September 2011 respectively. Currently, five types of prescribed products, namely room air conditioners, refrigerating appliances, compact fluorescent lamps, washing machines and dehumidifiers are covered that altogether account for about 60% of the annual electricity consumption in the residential sector.



Figure 6: Five types of prescribed products regulated under MEELS

Under the EE(LP)O, the manufacturers or importers are required to submit relevant forms, test reports and associated product information to EMSD for assignment of reference number for the product models and attach energy labels in the prescribed formats as specified in the EE(LP)O before supplying these products in Hong Kong. All local suppliers (including wholesalers and retailers) cannot supply the specified products without any energy labels.

As at the end of August 2016, over 7,800 product models have been listed under the MEELS. Consumers can check the information of these product models in the thematic website namely Energy Label Net.

Since the enactment of the EE(LP)O, the MEELS has been effective in –

- Promoting energy saving by informing potential customers of the energy performance level of the products and facilitating customers in choosing the more energy-efficient models;
- Encouraging product suppliers to make available more energy-efficient products to meet customers' demand; and
- Increasing the penetration rate of energy labels through the introduction of legislation to mandate the display of energy labels.

3.2 Review of MEELS

Any regulatory system has to move with times. The scope and grading standards of MEELS are kept under regular reviews to ensure that the grading standards will not lag behind technological advancement. The scope of MEELS is also regularly reviewed to cover more products and hence increase the penetration rate of products bearing energy labels.

3.2.1 Review of grading standards

A review of the grading standards of room air conditioners, refrigerating appliances and washing machines was completed in late 2014. In reviewing the grading standards of these products, due consideration has been given to the distribution of the appliances among various existing grades; grading systems adopted overseas; development of testing standards; technological development and potential energy savings arising from further tightening of the grading standards, etc.

The energy efficiency grading standards of these 3 products have been tightened and promulgated through issuance of a revised Code of Practice on Energy Labelling of Products (CoP). The revised CoP stipulating the new grading standards was published by gazette in October 2014. Full implementation took place on 25 November 2015, after which the three products to be supplied into the market must bear energy labels under the new energy efficiency grading standards.

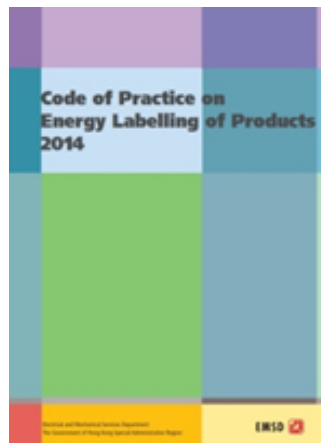


Figure 7: CoP on Energy Labelling of Products 2014 Edition

3.2.2 Proposed third phase of MEELS

In order to capture further energy saving potential, a review of the scope of the MEELS has been conducted with a view to expanding the coverage of the scheme. Having considered the comments received during a 3-month consultation conducted in the second quarter of 2015 and other factors such as overseas practices, availability of test standards and testing laboratories, as well as energy consumption and energy saving potential of the products, it was proposed to include more products such as televisions, storage type electric water heaters and induction cookers in the MEELS. In addition, the existing coverage of room air conditioners and washing machines will also be extended. The Legislative Council Panel on Environmental Affairs was consulted in January 2016, and was supportive of the proposal. The preparation of legislative amendment of the EE(LP)O is underway.

4. PROMOTION OF ENERGY SAVING IN BUILDING – GOING FORWARD

With the full implementation of BEEO and EE(LP)O, 80% of electricity consumption of "built-in" central building services installation in commercial buildings as well as 60% of electricity consumption of "plug-in" domestic electrical appliances can be effectively regulated. By combining the effect of these Ordinances, over 70% of electricity consumption in Hong Kong can be governed.

While the energy intensity and carbon intensity of Hong Kong has been the lowest among the APEC economies, we should continuously strive for further improvement towards energy efficiency to help mitigate climate change. To this end, a first-ever "Energy Saving Plan for Hong Kong's Built Environment 2015 ~ 2025+" was launched in May 2015 by HKSAR to address the necessity on reducing energy consumption in Hong Kong and a new target

of reducing Hong Kong's energy intensity by 40% by 2025 has been set. With this ambitious vision, the whole community has to endeavour further effort to achieve energy conservation with concrete supporting measures.

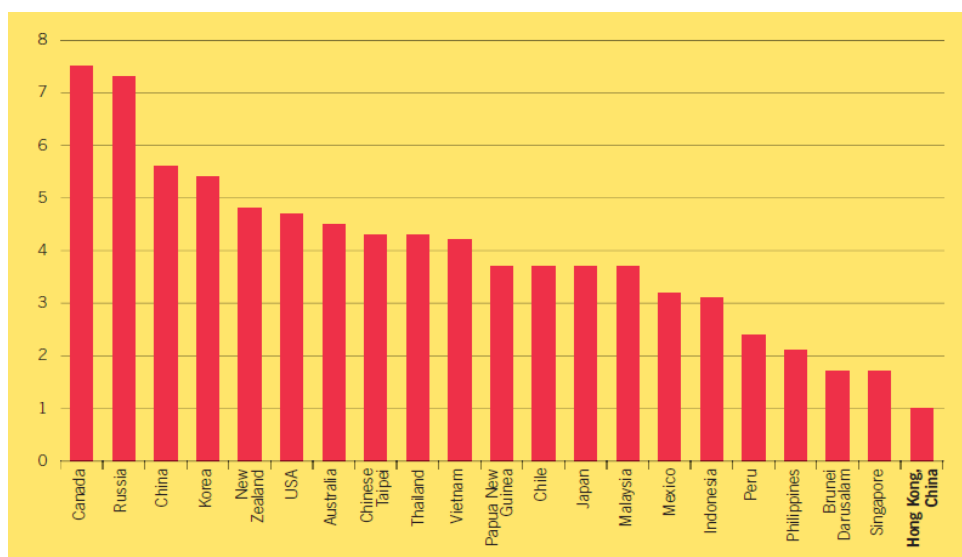


Figure 8: APEC energy intensity ranking, 2012

The Government is leading by example. In particular, we have set a new target of 5% saving in the electricity consumption of government buildings in the next five years from 2015/ 16 to 2019/ 20. With other green building initiatives being rolled out in full steam and relevant energy efficiency regulations being continuously enforced with further tightened requirements, various energy saving initiatives have been readily in place. However, there will still be a gap to achieve the energy saving target. It is therefore important to trigger contribution from private sector towards the energy saving target. A dialogue platform has been established to forge closer partnership with key stakeholders to foster energy efficiency in the community, especially for the private buildings, as foreshadowed in the Energy Saving Plan. Other initiatives including Retro-commissioning (RCx) will be promulgated by developing a Technical Guidelines for RCx and taking the lead to conduct pilot RCx projects in government and private buildings.

5. CONCLUSION

HKSAR has made a very deliberate move to regulate the energy performance of buildings and electrical appliances. Through the implementation of BEEO and EE (LP)O on “built-in” central building services installations in commercial buildings and “plug-in” domestic appliances in residential buildings, over 70% of electricity consumption in buildings can be regulated. Since the implementation of the EE(LP)O and BEEO, which serve as the key drivers of product and building energy efficiency, Hong Kong has taken the very major step forward in addressing to the impacts of climate change by the reduction of energy consumption of electrical products and buildings. This mandatory approach reinforces the roothold of the energy efficiency of electrical appliances in MEELS as well as minimum energy efficiency standards in the BEC, and paves the way for further enhancement in energy efficiency and relevant energy efficiency standards by means of periodic review.

While the Government has put lots of effort by tightening the regulations, enhancing the codes and reducing government energy consumption, the gap to achieve the energy saving target would require the collaboration with the private sector and the community. Therefore, to mobilise stakeholders and the entire community to understand energy efficiency issues better and thus contribute in energy saving is of paramount important. Through the implementation of RCx to trigger private stakeholders to gauge the energy saving potential in existing buildings, we are on the right track to reduce the total electricity consumption in buildings and hence to meet the target of 40% energy intensity reduction by 2025.

6. ACKNOWLEDGEMENTS

Sincere thanks are extended to members (including representatives from ASHRAE, CIBSE, HKIE & PolyU) of the Technical Taskforce on Mandatory Implementation of the BEC and its working groups in offering their expertise advice and support in the development of the BEC and EAC, as well as the members of the Taskforce on the MEELS in offering their advices and support in the development of the new grading standards as well as proposed new product types.

REFERENCES

- [1] HKSAR Government, 2010. Buildings Energy Efficiency Ordinance (Cap. 610).
- [2] HKSAR Government, 2008. Energy Efficiency (Labelling of Products) Ordinance (Cap. 598).
- [3] The Electrical and Mechanical Services Department, 2015. Code of Practice for Building Energy Audit 2015.
- [4] The Electrical and Mechanical Services Department, 2015. Code of Practice for Energy Efficiency of Building Services Installation 2015.
- [5] The Electrical and Mechanical Services Department, 2014. Code of Practice on Energy Labelling of Products.
- [6] The Electrical and Mechanical Services Department, 2010. Code of Practice on Energy Labelling of Products.
- [7] The Electrical and Mechanical Services Department, 2016. Technical Guidelines on Code of Practice for Building Energy Audit 2015.
- [8] The Electrical and Mechanical Services Department, 2016. Technical Guidelines on Code of Practice for Energy Efficiency of Building Services Installation 2015.