

Drivers for Green – BEC & MEELS “Next Gen Technology to make Green Building Sustainable”

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Abstract

Hong Kong is a densely populated metropolitan city crowded with high-rise buildings. With such a unique built environment, building services installations are the major contributors of electricity consumption in buildings. To this end, the Electrical and Mechanical Services Department (EMSD) of the HKSAR published the Building Energy Codes (BEC) in 1998 to specify the minimum design standards of four key types of building services installations in buildings. In 2012, the Buildings Energy Efficiency Ordinance, Cap 610 (BEEO) was fully implemented which established both the energy efficiency standards of a building for its design and the means to evaluate its energy efficiency performance in operation. Meanwhile, the Energy Efficiency (Labelling of Products) Ordinance (Cap. 598) (EELPO) promotes energy saving by informing customers of the energy efficiency performance of products and encourage product suppliers to make available more energy-efficient products. A brief overview of the BEEO and the EELPO and their latest updates since the full enforcement will be given.

I. Introduction

With the launch of The Energy Saving Plan for Hong Kong’s Built Environment 2015 ~ 2025+, a clear energy saving target, policy and strategy has been provided to help our residents to understand energy issues better and simulate all of us to take wiser action. As buildings consume 90% of the city’s electricity usage, the BEEO and the EELPO are two of the very important drivers for engagement of practitioners and citizens to achieve energy saving in combating climate change.



Figure 1 : BEEO and energy label under MEELS

The BEEO gives a legislative foundation to continuously save energy use in building through the mandatory compliance of its BEC and Energy Audit Code (EAC). For building design, the BEC governs the minimum design standards in respect of energy efficiency of building services installations, whereas the EAC sets out the technical guidance and details in conducting energy audit of its Central Building Services Installations for building operation (CBSI, which refers to the building services installation not solely serving an individual unit of the building).

On the other hand, significant energy saving could also be achieved by using more energy-efficient appliances. The Mandatory Energy Efficiency Labelling Scheme (MEELS) was introduced through the EELPO which was enacted in May 2008. Under the EELPO, energy labels are required to be shown on all prescribed products for supply in Hong Kong to inform consumers of their energy efficiency performance.

II. The Buildings Energy Efficiency Ordinance

(A) The Ordinance

Certificate of compliance registration (COCR)

The major building services installation (BSI) in a newly constructed building, i.e. a building with the consent for superstructure construction works given after 21 Sep 2012 (full implementation date of the BEEO) should comply with the requirements in the BEC. The developer of a building is required at building design stage (within 2 months after obtaining the consent to the commencement of building works issued by the Building Authority) to submit to EMSD a "stage one declaration" to undertake BEC compliance of the building's BSIs, and the declaration has to be certified by a Registered Energy Assessor (REA). Subsequently at occupation approval stage (within 4 months after obtaining an "occupation permit" issued by the Building Authority), the developer is further required to submit a "stage two declaration" certified by a REA as well to declare the compliance with the BEC, and apply from EMSD a COCR for the building. The building owner and the responsible person of a unit of that building must maintain the BSI to a standard not lower than the edition of BEC applied in that COCR.

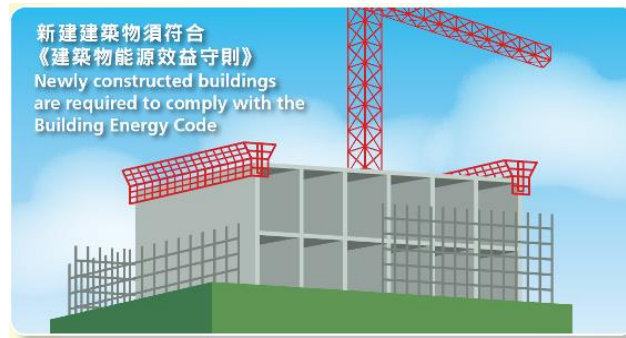


Figure 2 : BEEO applicable to newly constructed buildings

Major retrofitting works (MRW)

When Major Retrofitting Works (MRW) are involved, irrespective of newly constructed buildings or existing buildings, the owners or responsible persons are required to obtain from REA a Form of Compliance (FOC) certifying the MRW's compliance with the BEC. Indeed, MRW refers to the addition or replacement of BSI covering a works floor area aggregated to 500m² or above (under the same series of works within 12 months), or the addition or replacement of a CBSI component, that is 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. Same as that for COCR, the BSI issued with a FOC must be maintained to a standard not lower than the edition of BEC applied in that FOC.



Figure 3 : BEEO applicable to major retrofitting works

Energy audit

The BEEO requires the carrying out of energy audit for the CBSI in commercial buildings and commercial portion of composite buildings every 10 years in accordance with the scopes specified in the EAC. After the audit, the energy utilization index (EUI) of that building which reflects its energy intensity or energy performance, has to be identified and exhibited. In addition, Energy Management Opportunities (EMO) has to be identified for building owners to realize the possible savings of the building and to consider further the implementation plan by taking into account various factors including resources, pay-back period and influence to operation, etc. analyzed in the energy audit.



Figure 4 : BEEO applicable to energy audit

(B) The Implementation

Since the full implementation, the relevant statutory submissions on stage one declaration, COCR for new buildings and FOC for major retrofitting works in new and existing buildings are in good progress. Up to now, over 750 nos. of stage one declaration and 3000 nos. of FOC have been received whilst around 60 nos. of COCR have been issued.

Pursuant to the BEEO, for the first batch of buildings, over 99% of the buildings have complied with the energy audit requirements. For the second batch of buildings, energy audit reports have already been submitted for over 700 buildings. Meanwhile, outreaching programme has been conducted to the third and fourth batches of buildings to remind them to carry out the energy audit before the specified date.

In addition, publicity and outreaching programme have continuously been arranged for promulgation of the BEEO to appeal to the public and the stakeholders for observance and compliance with the Ordinance. Since 2011, over 150 nos. of presentations have been arranged for various professional institutions, district boards, developers, property management companies, government departments and various trade unions, etc. Moreover, a series of publications have been issued for the trade practitioners and public to enhance their understanding of the Ordinance.

Meanwhile, EMSD had been continuingly strictly enforcing the law and progressively taking prosecution actions to prevent any non-compliance with the BEEO. Improvement Notice (IN) will be issued to the relevant parties who have contravened the BEEO requirements such as fail to carry out the first energy audit, delay in statutory submission and non-compliance submission, etc. Prosecution action will be initiated if the remedial action required in the IN has not yet been followed within the specified period. Up to now 5 prosecution cases have been initiated against the belated energy audit. All the owners of these cases were convicted and fined, whilst the corresponding energy audits were all completed accordingly.

(C) The Review of BEC and EAC

The BEC and EAC will be reviewed at a 3-year interval since the initial edition issued in 2012 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. Undoubtedly, public aspirations will also be one of our key concerns. In order to gather the ideas for different stakeholders, different working groups and a taskforce with the participation of professions and practitioners from the industry were established.

Besides an addendum to BEC 2012 was issued in early 2014 to tighten some of the lighting standards (e.g. 13W/m² for office and 8 W/m² for corridor) to ensure the comparability with other relevant international standards, a comprehensive review of the BEC and EAC is now under way and it is anticipated that the 2015 edition would be ready for gazette by end 2015. An insight on the review is as below:-

(i) Lighting Installation

Besides tightening the prevailing design parameters, the review also introduces the use of automatic lighting control design and daylight responsive control.

- Tighten exemption criterion on the lighting power density (LPD) requirement
- Widen the coverage and tightening of LPD requirement for certain types of spaces.
- Extend the requirement of lighting control point to cover all spaces.
- Add new requirement on the provision of automatic lighting control to dim down/shut off the lighting automatically.
- Add new requirement on the provision of daylight responsive control to dim down/shut off the lighting automatically for space with fenestrations or overhead skylight.

Figure 5 : Lighting installation



(ii) Air-conditioning Installation

Besides uplifting the energy performance of various major equipment such as chiller and unitary air-conditioner, etc., new requirements on fan performance and system control are also included.

- Tighten requirement on air distribution system fan power.
- Introduce fan motor power requirement for mechanical ventilation system.
- Provide restriction on pump power at part load of pump for variable flow system
- Tighten requirement on frictional loss of water piping system.
- Upgrade the coefficient of performance for different type of air-conditioning systems.
- Provide demand control ventilation



Figure 6 : Air-conditioning installation

(iii) Electrical Installation

The review particularly focuses on the motor performance for major BSI and provision of monitoring facilities for future continuous monitoring of energy performance.

- Upgrade of motor efficiency requirement.
- Strengthen the provision requirement of Metering and Monitoring Facilities



Figure 7 : Electrical installation

(iv) Lift & Escalator Installation

With the latest technology development in the lift and escalator industry, the review includes the tightening of existing design parameters as well as introduction of new energy saving features.

- Tighten the maximum electrical power for lift & escalator installation.
- Tighten the maximum decorative load for lift.
- Add new metering requirement.
- Introduce new requirements including regenerative braking, lighting control, ventilation fan power limit, escalator automatic speed reduction, etc.

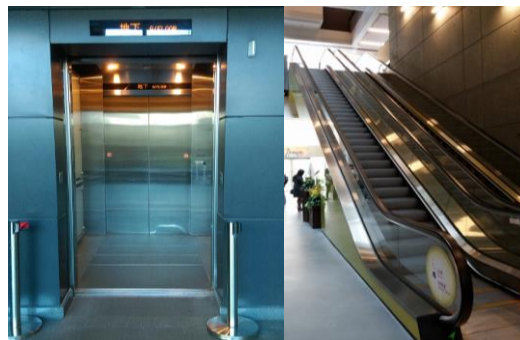


Figure 8 : Lift & escalator installation

(v) Performance-based Approach

The performance-based approach provides an alternative approach to comply with the BEC. This approach focuses on estimating the total energy consumption of a building using energy simulation software. With this approach, the energy savings from energy efficient features and renewable energy installation can be evaluated in a systematic approach and the capital cost and environmental benefits can be made known to the building owner at the building design stage for a holistic consideration and assessment. While there are only three trade-off items in BEC 2012 including lighting power density (LPD), air-conditioning equipment efficiency and system fan power, the latest review will allow for the trade-off of all the four BS installations and the threshold for the energy efficiency performance compared with the prescriptive standard will be tightened.

(D) The Way Forward

Energy Audit enables and motivates building owners to improve their building energy performance by making reference to their own past performance as well as the neighborhood buildings in similar nature. The Ordinance currently requires for the exhibition of Energy Audit Form which contains the annual Energy Utilization Index. Though the implementation of EMO identified is not mandatory at the moment, building owners can assess whether and when they would like to carry out the recommended improvement measures, taking into account the availability of their resources based on the payback analysis. The key steps ahead are how to further enhance the benefits of energy audit. Further deliberations are required on whether the implementation shall be through legislation manner or other incentive measures.

III.Mandatory energy efficiency labelling scheme

(A) The Ordinance

The MEELS was introduced through the Energy Efficiency (Labelling of Products) Ordinance (Cap. 598) (EELPO) 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 covering five types of prescribed products, namely room air conditioners, refrigerating appliances, compact fluorescent lamps, washing machines and dehumidifiers, which altogether account for about 60% of the annual electricity consumption in the residential sector.



Figure 9: Five types of prescribed products regulated under MEELS

Under the EELPO, a Code of Practice on Energy Labelling of Products (CoP) is issued to set out the practical guidance and technical details in respect of the requirements on energy labelling for the prescribed products. It specifies the relevant test standards, calculation methods and determination of energy efficiency grading levels of prescribed products, in accordance with which the energy efficiency performance of the product models are tested and assessed.

(B) Energy Labelling Requirements

The manufacturers or importers are required to submit relevant form, test report and associated product information to EMSD for assignment of reference number for the product model and attach energy labels in the prescribed formats specified in the EELPO before supplying these products in Hong Kong. All local suppliers (including wholesalers and retailers) cannot supply the specified products which do not bear the energy labels.

As at the end of August 2015, over 6,800 product models have been listed under the MEELS. Consumers can check the information of these product models in the Energy Label Net.

Since the launch of the MEELS, the MEELS has been effective in –

- (a) 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;
- (b) Encouraging product suppliers to make available more energy-efficient products to meet customers’ demand; and
- (c) Increasing the penetration rate of energy labels through the introduction of legislation to mandate the display of energy labels.

The screenshot shows the Energy Label Net website interface. At the top, there is a search bar and navigation links. Below the header, a banner reads "Mandatory Energy Efficiency Labelling Scheme" and "Look for the Energy Label Save Electricity, Save Money". A navigation menu includes "ABOUT MEELS", "UNDERSTANDING THE LABEL", "PRODUCT LISTS", "HOUSEHOLDS", "SUPPLIERS' CORNER", "PROXIMITY & FIND", and "FAQS". The "PRODUCT LISTS" section is active, showing a "RECORD OF LISTED MODELS" for "Room Air Conditioners". A table lists various models with their specifications.

Brand	Model	Reference No.	Year of Assignment	Annual Energy Consumption (kWh)	Cooling Capacity (kW)	Energy Efficiency Ratio (EER)	Refrigerant	Energy Efficiency Grade (1 to 5)	Information Provider	Product Sample Information Provided	Supplier
Airewell	AS1012200111 R410A	C100212	2010	1004	4.83	3.04	R410A	2	Airewell	No	No
Airewell	AS101220012 R410A	C100210	2010	1326	3.07	2.79	R410A	2	Airewell	No	No
Airewell	AS101220013 R410A	C100209	2010	1261	2.05	2.94	R410A	2	Airewell	No	No
Airewell	AS101220014 R410A	C110200	2011	1110	2.49	2.66	R410A	1	Airewell	No	No
Airewell	AS101220015 R410A	C110208	2011	1110	2.75	2.99	R410A	1	Airewell	No	No
Airewell	AS101220016 R410A	C110138	2011	1400	3.38	2.82	R410A	1	Airewell	No	No
Airewell	AS101220017 R410A	C110208	2011	1474	3.66	3.00	R410A	1	Airewell	No	No
Airewell	AS101220018 R410A	C110138	2011	2098	5.15	2.95	R410A	1	Airewell	No	No
Airewell	AS101220019 R410A	C110208	2011	2129	5.44	3.07	R410A	1	Airewell	No	No
Airewell	AS101220020 R410A	C110140	2011	2854	8.45	2.71	R410A	1	Airewell	No	No
Airewell	AS101220021 R410A	C110208	2011	2398	6.08	3.04	R410A	1	Airewell	No	No

Figure 10 : Energy Label Net

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 regard has been given to such factors as 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 the three products have been tightened and promulgated through issuance of a revised CoP (figure 11). The revised CoP was published in gazette in October 2014. Full implementation will take 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 11: Revised CoP (2014 Edition) and promotional poster for new energy efficiency grading standards

IV. Conclusion

Since 2008 and 2012, with the implementation of the EELPO and BEEO that 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 brought about by energy consumption of electrical products and buildings. This mandatory approach reinforces the roothold of the energy efficiency grading standards in MEELS as well as minimum energy efficiency standards in the BEC, the minimum energy audit requirements in the EAC, and paves the way for further enhancement of the standards. EMSD will continuously review and tighten the energy efficiency standards at suitable time intervals and lead Hong Kong to a new round of improvement in the pursuit of enhancing the energy efficiency and reducing greenhouse gases emission.

V. 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 Upgrading of the Grading Standard under the MEELS in offering their advice and support in the development of the new grading standards.

VI References

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