BFAC Paper 1/16

Thirty-first Meeting of the Business Facilitation Advisory Committee

Agenda Item 2 : Update on the Review of Building Energy Code and Energy Audit Code

Purpose

This paper briefs members on the review of the Building Energy Code (BEC) and Energy Audit Code (EAC) under the Buildings Energy Efficiency Ordinance (BEEO) (Cap. 610).

Background

2. The Government last briefed the Committee on the Full Operation of BEEO in July 2012. In gist, BEEO was brought into full operation in September 2012. It requires new buildings and existing buildings undergoing major retrofitting, as prescribed under the Ordinance, to comply with the energy efficiency standards and requirements specified in BEC in respect of four key types of building services installation, namely, air-conditioning, lighting, electrical, and lift and escalator installations. BEEO also requires the prescribed buildings to conduct energy audits in respect of the central building services installations of the concerned building, once every ten years in accordance with EAC.

3. Section 40 of BEEO provides that the Director of Electrical and Mechanical (DEMS) shall publish code of practice to specify the building energy efficiency standards and the requirements for carrying out energy audit. The latest version of BEC and EAC (i.e. BEC 2012 and EAC 2012) were published in the Gazette in February 2012. BEC and EAC were developed, formulated and endorsed by the Technical Taskforce comprising representative organisations from the relevant professional institutions, trade associations, consultant/contractor associations, university academia and government departments. BEC and EAC were developed having regard to the prevailing international standards and practical needs of the local building and construction industry.

4. During the passage of BEEO at the Legislative Council, the Government committed to review BEC and EAC once every three years to meet public aspiration, the international trend and the latest technology development. It is expected that the standards will be progressively adjusted and improved for continuous improvement of the energy performance of buildings in Hong Kong.

Key requirements of BEEO

5. BEEO requires the developer of a newly constructed prescribed building to engage a Registered Energy Assessor (REA) to certify and submit to DEMS a "stage one declaration" (i.e. declarations at design stage) to declare that all building services installations in the building are designed and will be installed and completed according to the specified standards and requirements under BEC. The developer is also required to engage a REA to certify and submit a "stage two declaration" (i.e. declaration at occupation approval stage) to DEMS to declare that all building services installations provided by the developer in the building have been designed, installed and completed in accordance with the BEC requirements. If DEMS is satisfied with the "stage two declaration", he/she will issue a Certificate of Compliance Registration (COCR) to the developer which will be valid for 10 years.

6. For specified major retrofitting works in respect of any building services installations in a unit or the common area of a prescribed building (regardless of newly constructed or existing one), the responsible person (i.e. owner, tenant or occupier etc.) is required to engage a REA to complete a Form of Compliance to certify that the building services installations concerned have complied with BEC.

7. Owners of commercial buildings and commercial portion of composite buildings are required to engage REAs to conduct energy audits for the central building services installations of their buildings once every ten years to assess the energy performance and to identify the energy management opportunities. The energy audits should be carried out in accordance with the requirement of EAC. A specified Energy Audit Form and an energy audit report should be submitted to DEMS. The owner of a building in respect of which an Energy Audit Form is in force must exhibit a copy of the form in a conspicuous position at the main entrance of the building concerned. The schedule of the first energy audit is specified in

Schedule 5 of the BEEO, which sets out the dates when the owners of prescribed buildings should carry out energy audits as follows –

Date of issue of occupation approval	**Period within which the first energy audit must be carried out**
On or after 1 January 1988 (i.e. first batch)	12 months from the commencement of Part 4 of this Ordinance **(i.e. before 21.9.2013)**
After 31 December 1977 but before 1 January 1988 (i.e. second batch)	24 months from the commencement of Part 4 of this Ordinance **(i.e. before 21.9.2014)**
After 31 December 1969 but before 1 January 1978 (i.e. third batch)	36 months from the commencement of Part 4 of this Ordinance **(i.e. before 21.9.2015)**
On or before 31 December 1969 (i.e. the fourth batch)	48 months from the commencement of Part 4 of this Ordinance **(i.e. before 21.9.2016)**

Update on full operation of BEEO

Enforcement of BEEO

8. As of January 2016, the Electrical and Mechanical Services Department (EMSD) has received from about 900 new buildings "stage one declaration", 110 "stage two declaration", about 3 900 forms of compliance from buildings that have completed major retrofitting works and about 2 200 energy audit forms. It is estimated that about 4 000 buildings will be required to submit energy audit reports by 2016.

9. For the first batch of buildings that were required to carry out energy audits before 21 September 2013, all of these buildings have complied with the energy audit requirements. As for the second batch of buildings, over 950 of the buildings concerned have complied with the

energy audit requirements. Enforcement actions are being taken against the some 95 building owners that failed to carry out energy audits as required by BEEO. The deadline for the third batch of the some 600 building owners has reached (21 September 2015), EMSD will monitor compliance and where necessary take enforcement actions against the non-compliant cases. Outreaching programme has been implemented to remind building owners of the fourth batch of buildings to carry out the energy audit before the specified date.

10. In respect of enforcement actions against any non-compliance with BEEO, EMSD will issue Improvement Notice to the relevant owners who have contravened the BEEO requirements. Prosecution action will be initiated if the building owner failed to take remedial actions within the specified period as set out in the Improvement Notice. So far, five prosecution cases have been initiated against building owners that failed to meet the statutory requirements for carrying out energy audits. All the owners of these cases were convicted and fined, and had completed the outstanding energy audits upon the issue of summonses.

Publicity

11. Various publicity measures, such as leaflets, pamphlets, internet platform, seminars, briefing sessions, TV and Radio announcements of public interest, have been implemented to inform the general public and relevant stakeholders of both the private and public sectors about the requirements of BEEO, BEC and EAC.

12. Since 2011, over 150 briefings and presentations with more than 15 000 participants have been conducted to promote the statutory requirements of BEEO.

First comprehensive review of BEC and EAC

13. BEC and EAC will be reviewed once every three years from the first edition issued in 2012 in tandem with the latest technological development. The first comprehensive review of the codes commenced in the third quarter of 2014, with an aim to tighten the energy efficiency standards under BEC and review the energy audit requirements of EAC.

14. The review was conducted by a Technical Taskforce with members drawn from the relevant professional institutions (including green groups), trade associations, consultant/contractor associations, university academia, and government departments. Membership of the Technical Taskforce is at **Annex 1**. 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.

15. The review was conducted with reference to the data collected from the submissions under BEEO, feedback and suggestions from the relevant trades and operators through the Working Groups, as well as standards adopted by internationally-recognised bodies such as ASHRAE and other established authorities in the United States, Europe and the Asia-Pacific region, etc. The revised energy efficiency standards are expected to bring around 10% energy saving in buildings as compared to those under BEC 2012. A summary of the key changes to BEC is at **Annex 2**.

16. The revised EAC gives more clarity to the energy audit requirements of BEEO by improving its consistency with BEC such as the adoption of consistent terminologies (e.g. definition of lighting power density). Clarification has also been made to the coverage of certain types of air-conditioners, application of exemption criteria and the use of on-site measurement data, etc. in order to help improve the consistency and accuracy of the energy audit reports. Building owners are also required to provide greater precision of the energy performance data in the energy audit reports (e.g. provision of overall COP of chiller plant to include power of cooling tower(s) and condensing water pump(s)) to ensure accuracy of data collected and facilitate EMSD's analysis of the performance of buildings.

Implementation of revised BEC and EAC

17. The revised BEC and EAC (i.e. BEC 2015 and EAC 2015) were approved by the Technical Taskforce in September 2015 and then gazetted with press release on 11 December 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 owners of new buildings and existing buildings to make preparation for the implementation of BEC 2015. BEC 2015 for newly constructed buildings

and existing buildings will take effect in June 2016 and September 2016 respectively. As for EAC 2015, a six-month grace period has been provided to owners of existing buildings to make adjustments to the tightened data collection requirements. EAC 2015 will take effect in June 2016.

18. EMSD has uploaded the revised Codes onto the designated BEEO webpage. The Codes have also been issued to the relevant trades and professional bodies for information and early preparation for implementation. Briefing sessions are arranged for various stakeholder groups, including REAs to help them familiarise with the new and revised requirements of the Codes.

Way forward

19. Members are invited to note the contents of the paper and offer comments, if any.

Environment Bureau
Electrical and Mechanical Services Department
March 2016

Annex 1

Membership of the Technical Taskforce for Mandatory Implementation of Building Energy Code

Chairperson

Electrical and Mechanical Services Department

Professional institutions

ASHRAE Hong Kong Chapter
Asian Institute of Intelligent Buildings
CIE (Hong Kong)
Energy Institute (Hong Kong Branch)
HK-BEAM Society
Hong Kong Association of Energy Engineers
Institution of Mechanical Engineers HK Branch
The Chartered Institution of Building Services Engineers Hong Kong Branch
Professional Green Building Council
The Hong Kong Institution of Engineers – Building Services Division
The Hong Kong Institution of Engineers – Electrical Division
The Hong Kong Institution of Engineers – Gas and Energy Division
The Hong Kong Institution of Engineers – Mechanical, Marine, Naval Architecture and Chemical Division
The Institution of Engineering and Technology Hong Kong
The International Association of Elevator Engineers (HK-China Branch)
Engineers Australia HK Chapter

Trade associations, consultant/contractor associations, etc.

Building Services Operation and Maintenance Executives Society
Business Environment Council
Estates Offices / Facilities Management Offices of universities
Hong Kong Electrical Contractors' Association
Hong Kong Hotels Association – Engineers Committee
The Association of Consulting Engineers of Hong Kong
The Hong Kong Federation of Electrical and Mechanical Contractors Ltd
The Hong Kong Air Conditioning and Refrigeration Association Ltd
The Hong Kong Association of Property Management Companies Ltd
The Hong Kong Institute of Facility Management
The Lift and Escalator Contractors Association
The Real Estate Developers Association of Hong Kong
The Registered Elevator and Escalator Contractors Association Ltd

Government

Architectural Services Department
Housing Department

Academia

The Hong Kong Polytechnic University
The Hong Kong University of Science and Technology
The University of Hong Kong

Annex 2

Key Improvements made in BEC 2015

BEC sets out the energy efficiency standards and requirements for the four key types of building services installations, namely, air-conditioning, lighting, electrical and lift and escalator installations. Key improvements made to BEC 2015 as compared with BEC 2012 are set out below –

1. Lighting Installation

Key Improvements	**BEC 2012**	**BEC 2015** *(compared with BEC 2012)*
Estimated energy saved	**-**	**4% - 4.5%**
a. Tightened exemption from lighting power density (LPD)[1] requirement	Does not exceed 100W	Does not exceed 70W
b. New LPD standards for additional space types	Not specified	Six additional space types[2]
c. Tightened LPD standards of existing space types	10 – 14 W/m^2 (5 space types[3])	8 – 13 W/m^2 (5 space types)
d. Lighting Control Point	Office use	All space types
e. Automatic lighting control	Not specified	Dim down or shut off lighting automatically in some specified spaces
f. Daylight response control	Not specified	Dim down or shut off lighting automatically for space with fenestrations or overhead skylight

[1] LPD represents the load of any lighting equipment in any defined area or the watts per square meter of the lighting equipment.

[2] The six new space types to be subject to LPD requirements are: computer room / data centre, court room, passenger terminal building, refuge floor, school hall and server room / hub room.

[3] The tightened LPD standards for the five space types include: classroom / training room, loading and unloading area, office, plant room / machine room / switch room and workshop.

2. Air-conditioning Installation

Key Improvements	BEC 2012	BEC 2015 *(compared with BEC 2012)*
Estimated energy saved	**-**	**4% – 6%**
a. Minimum allowable coefficient of performance (COP)[4] of chiller	2.6 to 2.9 (air-cooled)	2.8 to 3.2 (air-cooled)
	4.1 to 5.7 (water-cooled)	4.2 to 5.8 (water-cooled)
b. Minimum allowable COP of variable speed drive (VSD) chiller	Not specified	3.6 to 4.0 (75% load) (air-cooled)
	Not specified	6.1 to 7.2 (75% load) (water-cooled)
c. Part load VSD pump power	≤ 55% full load power at 50% flow	≤ 30% full load power at 50% flow
d. Water pipe sizing (> 50mm diameter)	3.0 m/s	2.5 m/s at non-variable flow portion
e. Demand control ventilation	Not specified	Carpark ventilation; conditioned space with fresh air rate ≥ 1400 L/s.
f. System fan power of mechanical ventilation	Not specified	≤ 1.1 W per L/s

3. Electrical installation

Key Improvements	BEC 2012	BEC 2015 *(compared with BEC 2012)*
Estimated energy saved	**-**	Saving covered by relevant installations
a. Minimum allowable motor efficiency[5] standards for motor rated output ≥ 7.5kW (2-pole and 4-pole motors)	IE2 motor (88.1% to 95.1%)	IE3 motor (90.1% to 96.0%)

[4] COP measures the ratio of the amount of heat removed divided by the amount of power input. It is a measurement of efficiency. The higher the number, the more efficient the system is.

[5] Motor efficiency is the ratio of mechanical energy output divided by the electrical energy input. The higher the number, the more efficient the installation is.

Key Improvements	BEC 2012	BEC 2015 *(compared with BEC 2012)*
b. Metering and monitoring	Feeder circuit exceeding 200A to be provided with metering device	Each of the central buildings services installations to be provided with metering device

4. Lift and Escalator Installation

Key Improvements	BEC 2012	BEC 2015 *(compared with BEC 2012)*
Estimated energy saved	**-**	**1.5%**
a. Maximum allowable electrical power [6] of lift and escalator installations	Maximum electrical power limits (kW) allowed for a lift or escalator carrying a rated load (9 ranges) at a rated speed (13 ranges)	Tightened by 2 to 5 %
b. Maximum allowable decoration load in a lift	Capped by a specified load limit (kg) or in terms of a specified % of the lift rated load (kg), whichever is smaller	Tightened by 10%
c. Regenerative braking	Not specified	For lifts: $\geq$ 3.0 m/s and $\geq$ 1000 kg
d. Ventilation fan power limit	Not specified	$\leq$ 0.7W per L/s
e. Lighting control in lift car after idling for 15 minutes	Not specified	Dim down or shut off the lighting automatically
f. Escalator automatic speed reduction	Not specified	Switching provision allowing activation of automatic speed reduction mode
g. Metering and monitoring	Provision of measurement also allowed.	Provide permanent metering devices only.

[6] The electrical power (kW) of the motor drive of a lift or escalator system carrying a rated load at a rated speed shall be equal to or less than the maximum allowable values (kW) specified in table 8.4.1 of BEC. The lower the value, the more efficient the installation is.

5. Performance-based approach

The minimum energy efficiency standards of corresponding components and systems under BEC are prescriptive in nature. To encourage energy efficient designs and good practices that exceed the minimum standards and the use of on-site renewable energy and energy recovery installations, BEC also provides a performance-based approach as an alternative approach to improve energy performance of buildings. The performance-based approach considers the interrelation of various components of building energy consumption and allows trade-off among them to provide room for innovative design.

Key changes to the performance-based approach under BEC 2015 are set out below –

Key Improvements	BEC 2012	BEC 2015
a. Trade-off item allowed[7]	LPD, chiller COP and system fan power only	Extend to all four central building services installations (i.e. lighting, air-conditioning, electrical installations and lift and escalators)
b. Upper limit of contribution from better Overall Thermal Transfer Value (OTTV) performance than statutory requirement	Maximum allowable trade-off is limited to 5% of energy saved above the statutory requirement	Limitation removed
c. Upper limit of contribution from on-site recovery / renewable energy	Maximum allowable trade-off is limited to 5% of total energy use	Limitation removed
d. Minimum performance of a trade-off item	Not specified	Should not fall below 15% of the prescriptive standards

[7] Trade-offs are allowed between components of building energy consumption with good performances (e.g. better OTTV, on-site recovery/renewable energy measures and alternative design features, etc.) and those with less desired performances as permitted by the BEC (i.e. the energy efficiency standards for the four central building services installations in the BEC 2015). The trade-off requires that the overall good performance effects should outweigh the less desirable performance effects.