Building and Construction Authority

GREEN MARK INCENTIVE SCHEME FOR EXISTING BUILDINGS (UPGRADING AND RETROFITTING)

APPLICATION GUIDELINES

GUIDELINES FOR APPLICATION OF
GREEN MARK INCENTIVE SCHEME FOR EXISTING BUILDINGS, GMIS-EB
(UPGRADING AND RETROFITTING)

1.0 OBJECTIVE

1.1 The Green Mark Incentive Scheme for Existing Buildings (GMIS-EB) 'Upgrading and Retrofitting' (the "Scheme") aims to encourage building owners to undertake Upgrading or Retrofitting works involving the installation of equipment approved by BCA in their buildings to achieve substantial improvements in energy efficiency. It provides a cash incentive amounting to up to 35% (subject to a cap as set out below) of the costs of equipment installed for the purposes of energy efficiency improvements in existing buildings.

1.2 The Scheme is targeted mainly at energy intensive buildings such as shopping malls, hotels, office buildings, hospitals and other buildings with central chilled water air-conditioning plants or which will be upgraded to have central chilled water air-conditioning plants.

2.0 DEFINITIONS

In these Guidelines:-

'Actual Energy Savings' shall mean the actual energy savings derived from the Energy Efficiency Index computations before and after the Upgrading or Retrofitting Works based on the actual energy consumptions from the utility bills.

'Approved Equipment' shall mean the equipment set out in Annex C hereto.

'Building' shall refer to the building in which Upgrading or Retrofitting works are to be carried out.

'Energy Efficiency Index' shall mean the total energy consumption of the Building based on the utility bills for 12 months, divided by the gross floor area of the building and normalized by relevant parameters if required. Please refer to Annex D and Annex E for details. Its abbreviation is EEI and unit of measure is kWh/m²/year.

'Projected Energy Savings' shall mean the anticipated energy savings derived from the Energy Efficiency Index computations before the Upgrading or Retrofitting Works, and Energy Efficiency Index computations which are anticipated to be made after the Upgrading or Retrofitting Works.

'Upgrading or Retrofitting Works' in relation to a Building shall mean upgrading or retrofitting works involving the installation of Approved Equipment and aimed at improving the energy efficiency of the Building.

3.0 ELIGIBILITY CRITERIA

3.1 Building owners will be eligible to apply for participation in this Scheme if their Building meets the following criteria:

a. the Building must be an existing non-residential development with a Gross Floor Area of at least 2,000 square metres; and

b. the Building must have attained a Green Mark rating which is still in its validity period preceding the application; or
the Building owner must, at the time of application, have applied for Green Mark certification in respect of the Building and the Green Mark assessment has not commenced or been completed, or the outcome of the Green Mark assessment has not been conveyed to the Applicant; or
the Building owner must, at the time of application, be applying simultaneously for Green Mark certification in respect of the Building

provided that the Building owners must furnish documentary proof of the Building meeting the above criteria at the time of application for participation in this Scheme, and comply with the requirements of paragraph 3.2 below.

3.2 Application forms should be duly completed, with Building owners stating if they wish to have the Projected Energy Savings and Actual Energy Savings determined or calculated based on the total Building consumption or the total landlord's consumption, and accompanied by the following documents and written information:

(a) A table showing the details of the proposed Upgrading or Retrofitting works, Projected Energy Savings (in kWh and $), costs of the Approved Equipment proposed to be installed, costs of installation of the said Approved Equipment, the cumulative total of the aforesaid two sets of costs, and the payback period. If the Building does not already have a central chilled water air-conditioning plant, the Upgrading or Retrofitting works must involve the installation of a central chilled water air-conditioning plant in the Building.

(b) A detailed calculation of the Projected Energy Savings for each of the Approved Equipment to be installed.

(c) Documents from the intended vendor(s) substantiating the Building owner's calculation of the Projected Energy Savings.

(d) A detailed calculation of the Energy Efficiency Index based on utility bills issued during the 12 months preceding the application (Please note that this will be the baseline for the energy savings calculation).

(e) Copies of all utility bills in respect of the Building issued during the 12 months preceding the application. Building owners should provide utility bills showing the total Building consumption if they wish to have the Projected Energy Savings and Actual Energy Savings determined or calculated based on the total Building consumption, and utility bills showing the total landlord's consumption if they wish to have the Projected Energy Savings and Actual Energy Savings determined or calculated based on the total landlord's consumption.

(f) A detailed calculation showing the anticipated Energy Efficiency Index after the completion of the Upgrading or Retrofitting works.

(g) Quotations, tender or contract documents and such other documents showing the details and anticipated costs of each of the Upgrading or Retrofitting Works.

(h) Schedule or timelines for the Upgrading or Retrofitting Works.

(i) Energy audit report- the energy audit shall be performed by an accredited Energy Services Company (ESCO) or M&E Professional Engineer and the report format shall comply with the requirements set out in Annex A of the Health Check (EB) Audit Report Guidelines.

3.3 The Scheme is not applicable in relation to any Upgrading or Retrofitting works or any equipment which had already commenced or already been installed before the time of application for participation in this Scheme.

3.4 BCA shall be entitled to reject any application at its discretion notwithstanding the Building owner's compliance with this paragraph 3.0 without assigning any reason.

If BCA accepts the Building owner's application, BCA will issue a formal letter of offer incorporating and / or modifying the terms herein and / or setting out further terms, and by which BCA offers the Building owner participation in the Scheme. BCA shall also determine the Projected Energy Savings in relation to the Building and set out the same in the letter of offer. BCA's determination of the Projected Energy Savings shall be conclusive and shall apply for the purposes of paragraph 4.1 below. If the Building owner wishes to accept the offer, the Building owner should sign and return the letter of acceptance appended to BCA's letter of offer within a month from the date of BCA's letter of offer. Please refer to Annex A for the submission and evaluation process for GMIS-EB incentive scheme.

4.0 OBLIGATIONS

4.1 Within 24 months from the date of BCA's formal letter of offer (request for extension of time will be considered on case-by-case basis), the Building owner:-

(a) shall complete the Upgrading or Retrofitting works (including testing and commissioning works) as proposed pursuant to paragraph 3.2 above; and

(b) shall procure and submit the following documents to BCA:-

(i) Green Mark certificate issued in respect of the Building if the same was not furnished at the time of application;
(ii) testing and commissioning reports showing, to BCA's satisfaction, that the Upgrading or Retrofitting works have been completed; and

(iii) invoices, purchase orders and / or such other documents that BCA may require showing the actual costs of Approved Equipment installed.

Thereafter, subject to:-

(a) the completion of the Upgrading or Retrofitting Works;

(b) BCA's receipt of the abovementioned documents;

(c) the award of a Green Mark rating on the Building, and

(d) the system efficiency of the central chilled water air-conditioning plant ("Aircon System Efficiency").being determined by BCA as 0.7 kW/RT or better,

BCA shall determine, on a provisional basis, the category that the Building owner qualifies for (the "Provisional Category"), and disburse the first tranche of the cash incentive (the "First Tranche") in accordance with the categories set out in Table 1 below. The First Tranche shall be a percentage of the actual costs of the Approved Equipment installed, and be subject to a cap as indicated in Table 1. It shall also be based on the Projected Energy Savings as determined by BCA and set out in its letter of offer, the Aircon System Efficiency to be determined by BCA, and the Green Mark rating of the Building. For the avoidance of doubt, BCA shall not in any way be responsible for any consequence or loss sustained by the Building owner as a result of any delay in the award of the Green Mark rating.

Table 1- First Tranche of Cash Incentive

Provisional Category	Green Mark Rating	Aircon System Efficiency (kW/RT)	Projected Energy Savings		First Tranche	Cap on the First Tranche
			Based on total building consumption	Based on total landlord's consumption		
1.	Certified or better	0.7 or better	20% or better	25% or better	10% of the price of Approved Equipment	$75,000
1a.	Gold or better		15% or better	20% or better		
2.	Gold^{Plus} or better	0.65 or better	30% or better	35% or better	15% of the price of Approved Equipment	$250,000
3	Platinum	0.6 or better	35% or better	40% or better	17.5% of the price of Approved Equipment	$750,000

4.2 From the time that the Upgrading or Retrofitting Works commence until the expiry of 12 months from the date of the testing and commissioning reports, the Building owner shall permit BCA's designated staff to enter the Building for the purposes of inspecting the Upgrading or Retrofitting Works or the installed Approved Equipment,

provided that BCA shall give 1 week's written notice of its intention carry out such inspection.

4.3 After 12 months but not more than 14 months from the date of the testing and commissioning reports, the Building owner shall submit the following:-

(a) all utility bills in respect of the Building issued in the 12 months following the month in which testing and commissioning reports are dated; Building owners who have opted to have the Projected Energy Savings and Actual Energy Savings determined or calculated based on the total Building consumption should provide utility bills showing the total Building consumption, and Building owners who have opted to have the Projected Energy Savings and Actual Energy Savings determined or calculated based on the total landlord's consumption should provide utility bills showing the total landlord's consumption;

(b) a detailed calculation of the Energy Efficiency Index based on all utility bills in respect of the Building issued in the 12 months following the month in which testing and commissioning reports are dated;

(c) a detailed calculation of the Actual Energy Savings according to the formula set out in paragraph 4.6 below; and

(d) energy audit report verifying the Aircon System Efficiency -.the energy audit shall be performed by an accredited Energy Services Company ("ESCO") or M&E Professional Engineer and the report format shall comply with the requirements set out in Annex A of the Health Check (EB) Audit Report Guidelines.

4.4 After the abovementioned documents have been submitted, BCA shall determine at its sole discretion if the calculations by the Building owner of the Energy Efficiency Index and the Actual Energy Savings, and the Aircon System Efficiency as stated in the energy audit report, are accurate. BCA shall be entitled to substitute its calculations for those by the Building owner if it is of the view that the Building Owner's calculation(s) is / are not accurate. BCA shall also be entitled to substitute the ESCO's or M&E Professional Engineer's determination of the Aircon System Efficiency with its own if it is of the view that the Aircon System Efficiency figure(s) as stated in the energy audit report is not accurate. BCA's determination of the Energy Efficiency Index, the Actual Energy Savings and the Aircon System Efficiency shall prevail and be conclusive. The determination by BCA of the Aircon System Efficiency shall supersede its previous determination as mentioned in paragraph 4.1 above.

4.5 BCA shall then determine the permanent category that the Building owner qualifies for (the "Permanent Category"), and disburse the second tranche of the cash incentive (the "Second Tranche") in accordance with the categories set out in Table 2 below. Thereafter, the Building owner's participation in the Scheme shall end. For the avoidance of doubt, the Permanent Category shall supersede the Provisional Category

for the purposes of the Second Tranche. The Second Tranche shall be derived or calculated as follows:-

(i) the Second Tranche shall be the positive difference between the Total Incentive Sum as indicated in Table 2 and the First Tranche already disbursed;

(ii) the Total Incentive Sum represents the cumulative total amount of cash incentive to be disbursed, inclusive of the First Tranche;

(iii) the Total Incentive Sum shall be based on the categories set out in Table 2 and be subject to the corresponding caps; and

(iv) the Total Incentive Sum shall be based on the Actual Energy Savings and Aircon System Efficiency as approved or determined by BCA, and on a percentage of the actual price of Approved Equipment installed and paid for, as indicated in Table 2.

If the Total Incentive Sum is less than the First Tranche already disbursed, the Building owner:-

(a) shall not be entitled to the Second Tranche; and

(b) shall pay to BCA the difference between the First Tranche and the Total Incentive Sum forthwith upon written demand as a debt.

Table 2- Second Tranche of Cash Incentive

<table>
<tr><th rowspan="2">Permanent Category</th><th rowspan="2">Green Mark Rating</th><th rowspan="2">Aircon System Efficiency (kW/RT)</th><th colspan="2">Actual Energy Savings</th><th rowspan="2">Total Incentive Sum</th><th rowspan="2">Cap on the Total Incentive Sum</th></tr>
<tr><th>Based on total building consumption</th><th>Based on total Landlord's consumption</th></tr>
<tr><td>1.</td><td>Certified or better</td><td rowspan="2">0.7 or better</td><td>20% or better</td><td>25% or better</td><td rowspan="2">20% of the price of Approved Equipment</td><td rowspan="2">$150,000</td></tr>
<tr><td>1a.</td><td>Gold or better</td><td>15% or better</td><td>20% or better</td></tr>
<tr><td>2.</td><td>Gold^{Plus} or better</td><td>0.65 or better</td><td>30% or better</td><td>35% or better</td><td>30% of the price of Approved Equipment</td><td>$500,000</td></tr>
<tr><td>3.</td><td>Platinum</td><td>0.6 or better</td><td>35% or better</td><td>40% or better</td><td>35% of the price of Approved Equipment</td><td>$1,500,000</td></tr>
</table>

4.6 Actual Energy Savings shall be based on actual energy consumption before and after the Upgrading or Retrofitting works, and shall be determined using the formula set out below. The Energy Efficiency Index formulae for offices, hotels and retail malls are spelt out in Annex D and Annex E.

$$\% \text{ of Energy Savings} = \frac{EEI_{\text{before retrofit}} - EEI_{\text{after retrofit}}}{EEI_{\text{before retrofit}}} \times 100\%$$

Baseline or the EEI before Upgrading or Retrofitting Works shall be calculated based on one year's energy data (actual utility bills). The EEI after Upgrading or Retrofitting Works is based on the energy bills for the 12 months following the month in which testing and commissioning reports are dated.

4.7 Please refer to Annex B hereto for illustrations pertaining to this Scheme.

5.0 SUBMISSION PROCEDURES

5.1 All applications should be made in the format found in GMIS-EB (Upgrading and Retrofitting) Application Form and sent to:

Deputy Director
Green Building Policy Department
Green Mark Cash Incentive Scheme (GMIS-EB)
c/o Building and Construction Authority
5 Maxwell Road
#17-00 Tower Block MND Complex
Singapore 069110

6.0 MISCELLANEOUS

6.1 The Annexes hereto form an integral part of these Guidelines. In the event of any inconsistency between the contents of the Annexes and the contents of this main document, those of this main document shall prevail.

6.2 Without prejudice to the rights of BCA at common law, in the event:-

(a) of any failure by the Building owner to discharge its obligations set out in paragraph 4 above; or

(b) that BCA shall determine, at any time after the Building owner has accepted BCA's offer for participation in the Scheme, that any information supplied to BCA by the Building owner arising from or in connection with the Building owner's participation in the Scheme, whether in the application form or elsewhere, is false or misleading,

then BCA:-

(i) shall, if the Second Tranche has not been disbursed or the Permanent Category of Building owner has not been determined, be entitled to terminate the Building owner's participation in the Scheme and shall be under no obligation to make further payments which would otherwise be paid; and

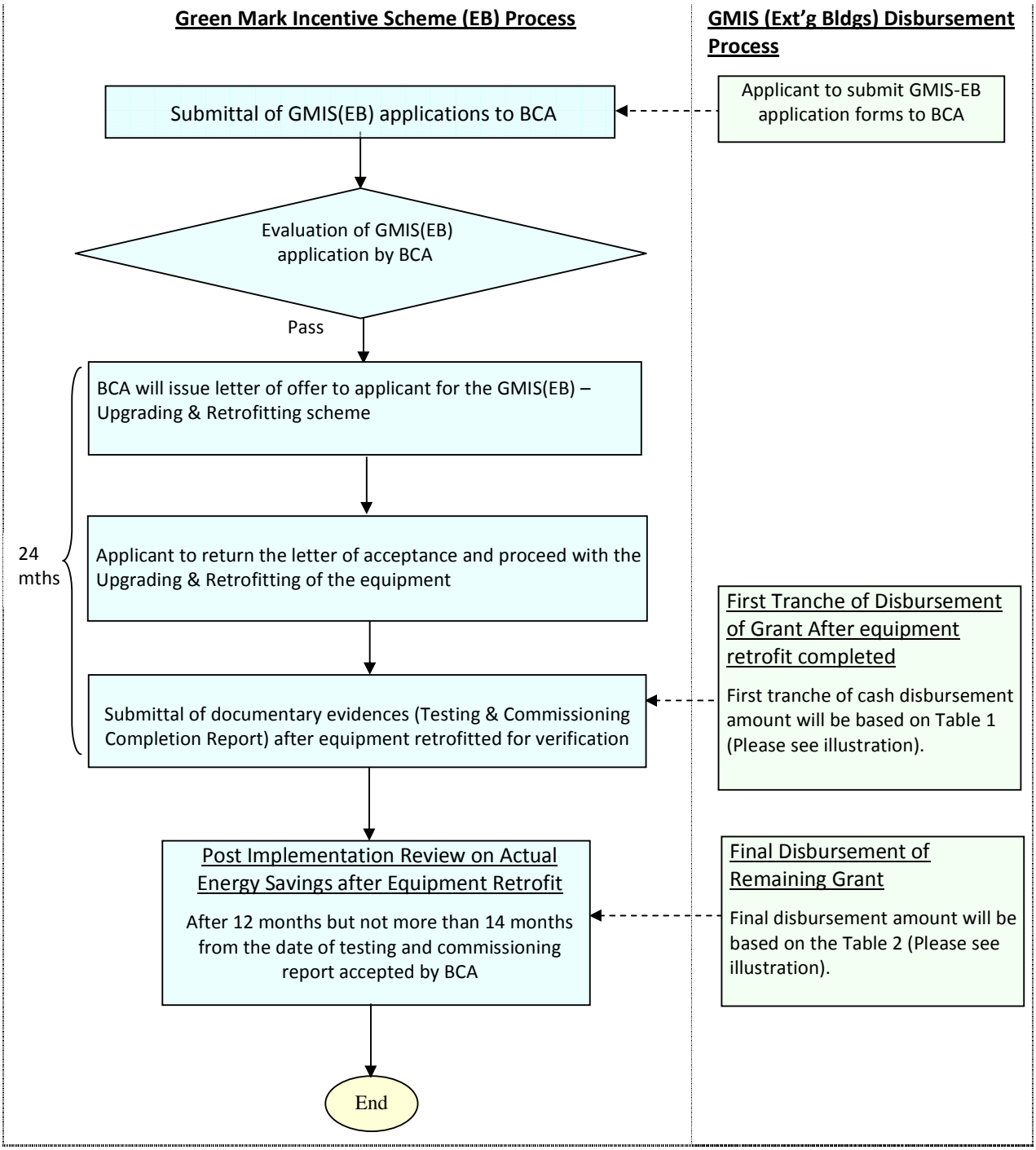
(ii) shall, whether or not the Second Tranche has been disbursed and whether or not the Permanent Category of the Building owner has been determined, be entitled to recover from the Building owner all monies disbursed.

7.0 ENQUIRIES

For enquiries on the application, please contact the officers listed in BCA's website: http://www.bca.gov.sg/GreenMark/gmiseb.html

Figure 1 – Flowchart for GMIS-EB Process

Note:- The following diagram is for illustrative purposes only. In the event of any inconsistency between the contents of the following diagram and the contents of paragraphs 1 to 6 of the Guidelines, the contents of paragraphs 1 to 6 of the Guidelines shall prevail.



ILLUSTRATIONS Annex B

Note:- The following illustrations are for purposes of guidance only and **the energy consumption is based on total Building consumption.** In the event of any inconsistency between the following illustration and the contents of paragraphs 1 to 6 of the Guidelines, the contents of paragraphs 1 to 6 of the Guidelines shall prevail.

Building owner of an existing office building with GFA > 2000 m² applies for Green Mark assessment and the GMIS-EB (Upgrading and Retrofitting) incentive for the energy improvement retrofits.

Assume the cost of approved equipment for the retrofitting works is **$1,200,000**.
(Equipment from the approved listing in Annex B)

Assume that building owner is targeting for Green Mark **Platinum rating** with a **potential total building energy savings of 35%.** Based on these targets, the owner is eligible for **Total Incentive Sum of 35% and a cap of $1,500,000** as per Table 2.

Upon completion of Green Mark assessment and installation of all approved equipment

Assume that after the Green Mark assessment, the building attains the Green Mark Platinum rating with a potential energy savings of 35% over its baseline standard.

First disbursement of cash grant will be based on the First Tranche of 17.5% and a cap of $750,000 as stated in Table 1 subject to the corresponding cap amount, whichever is lower.

First disbursement	=	First Tranche x Total Cost of Approved Equipment
	=	17.5% x $1,200,000
	=	$210,000 (capped at $750,000)

Scenario 1 : Upon completion of the post implementation review, the actual total building energy savings is equal or better than the targeted savings

Assume that the actual total building energy savings of 35% after the Upgrading and Retrofitting Works are verified and can be realized from the utility bills and EEI computation.

Based on the achieved Green Mark Platinum rating and verified energy savings of 35%, the Total Incentive Sum is 35% of the cost of approved equipment and a cap of $1,500,000 apply as shown in Table 2.

Total Incentive	=	Incentive Rate x Total Cost of Approved Equipment
	=	35% x $1,200,000
	=	$420,000 (capped at $1,500,000)

Second disbursement	=	Total Incentive Sum subject to Cap – First Disbursement
	=	$420,000 – $210,000
	=	$210,000

Scenario 2 : Upon completion of the post implementation review, the actual total building energy savings is less than the targeted savings but the Total Incentive Sum subject to its corresponding cap is MORE the First Tranche disbursement

Assume that the actual total building energy savings is only 30%, which is less than the targeted savings of 35%.

Based on the verified total building energy savings of 30%, the Total Incentive Sum is 30% of the cost of approved equipment and a cap of $500,000 applies as shown in Table 2.

Total Incentive Sum = Incentive Rate x Total Cost of Approved Equipment
= 30% x $1,200,000
= $360,000 (capped at $500,000)

Second disbursement = Total Incentive Sum subject to Cap – First Disbursement
= $360,000 – $210,000
= $150,000

The achievable and verified energy savings of 30% is less than the targeted savings of 35%. However, the owner is entitled for the Second Tranche (i.e. $150,000) since the achieved Total Incentive Sum subject to its corresponding cap is higher than the First Tranche.

Scenario 3 : Upon completion of the post implementation review, the actual total building energy savings is less than the targeted savings and the Total Incentive Sum subject to its corresponding cap is LESS than the First Tranche disbursement

Assume that the actual total building energy savings is only 25%, which is less than the targeted savings of 35%.

Based on the verified total building energy savings of 25%, the Total Incentive Sum is 20% of the cost of approved equipment and a cap of $150,000 applies as shown in Table 2.

Total Incentive Sum = Incentive Rate x Total Cost of Approved Equipment
= 20% x $1,200,000
= $240,000 (capped at $150,000)

The Total Incentive Sum is capped at $150,000.

Second disbursement = Total Incentive Sum subject to Cap – First Disbursement
= $150,000 – $210,000
= (- $60,000)

The verified total building energy savings of 25% is less than the targeted savings of 35%. Since the Total Incentive Sum subject to its corresponding cap is lower than the First Tranche, the owner is not entitled for the Second Tranche and shall pay to BCA the difference between the First Tranche and the Total Incentive Sum subject to its corresponding cap. In this illustration, the amount payable to BCA is $60,000.

LIST OF COMMONLY APPROVED ENERGY EFFICIENCY EQUIPMENT LIST (UPDATED)

1) Regenerative drives for lifts
2) Variable Speed Drives (VSD)
3) Chillers
4) Chilled Water Pumps
5) Condenser Water Pumps
6) Cooling Towers
7) Chiller Plant Energy Optimization System
8) Chiller Auto Condenser Tube Cleaning System
9) Building Automation System (BAS)
10) Energy Efficient Lighting e.g. T5/T8, PLC etc
11) Electronic Ballast
12) Lighting Control System
13) Light Emitting Diodes (LED) Lightings
14) Energy Saving Lighting Controllers
15) CO2 Sensors for AHU System
16) CO Sensors for Carpark Ventilation Control System
17) Photo Sensors
18) Motion Sensors
19) Heat Pipe & Energy Recovery Wheel
20) Energy Efficient lifts and escalators
21) Solar Energy or other renewable energy sources
22) Solar Film
23) Building façade/envelope that improves the Envelope Thermal Transfer Value (ETTV)
24) Permanent instrumentations (e.g. flow meters, temperature sensors, power meters, BTU meters) for monitoring central chilled water plant system efficiency. The measurement accuracy shall be within ± 5% of the true value, in accordance with AHRI 550 and ASHRAE Guideline 22. The monitoring system shall be capable of verifying the accuracy using heat balance.

Note: Any other equipment not in the above common list will be subject to review and approval from BCA.

ENERGY EFFICIENCY INDEX FOR CALCULATING ENERGY SAVINGS BASED ON TOTAL BUILDING CONSUMPTION

FOR OFFICE BUILDINGS

$$EEI = \left\{ \frac{TBEC - DCEC - CPEC}{GFA - CPA - DCA} \right\} \times \frac{55}{OH}$$

TBEC = Total building annual energy consumption (kWh/year)
DCEC = Data Centre energy consumption = 3216 x DCA
CPEC = Car park energy consumption
GFA = Gross floor area including car park
CPA = Car park area (above ground + under ground)
DCA = Data Centre area
OH = Actual operating hours per week

FOR HOTEL

$$EEI = \left\{ \frac{TBEC}{GFA - CPA} \right\} - 167.97\,X + 138.91$$

TBEC = Total building annual energy consumption including electricity, gas & diesel (conversion factor for diesel is 10.05 kWh/liter)
GFA = Gross floor area including car park
CPA = Car park area (above ground + under ground)
X = Dummy variable (1 for 4 or 5-star and 0 for others)

FOR RETAIL MALL

$$EEI = \left\{ \frac{TBEC}{GFA - (GLA \times (FLVCR/100))} \right\} - 292.51X_1 - 1179.09X_2 - 1203.06X_3 + 276$$

TBEC = Total building annual energy consumption excluding other consumption e.g. car park consumption etc, if separately metered
GFA = Gross floor area excluding car park & other areas whose energy consumption not included in the above TBEC.
GLA = Gross Lettable Area
FLVCR = Floor Vacancy rate %
X_1 = Fraction of retail area by gross floor area (RTA/GFA)
X_2 = Fraction of F&B area by gross floor area (FNBA/GFA)
X_3 = Fraction of cinema area by gross floor area (CINEA/GFA)

ENERGY EFFICIENCY INDEX FOR CALCULATING ENERGY SAVINGS BASED ON LANDLORD'S CONSUMPTION (OPTION 2)

FOR OFFICE BUILDINGS

$$EEI = \left\{ \frac{TLEC}{GFA - CPA} \right\} \times \frac{55}{OH}$$

TLEC = Total Landlord annual energy consumption (kWh/year)
GFA = Gross floor area including car park
CPA = Car park area (above ground + under ground)
OH = Actual operating hours per week

FOR RETAIL MALL

$$EEI = \frac{TLEC}{GFA - (GLA \times (FLVCR/100))}$$

TLEC = Total Landlord annual energy consumption
GFA = Gross floor area excluding car park
GLA = Gross Lettable Area
FLVCR = Floor Vacancy rate %