



# GM SLEB

## Green Mark for Super Low Energy Buildings

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Revision	Description	Date Effective
R0	Launch for Implementation	05/09/2018
R1	Definition of Positive Energy Building EUI Revision Alignment of New and Existing Building Criteria	10/12/2020

## Definition and Categories under Green Mark SLEB

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GM SLEB refers to the following 3 performance categories of buildings:

### **Super Low Energy Building (SLEB)**

“The best-in-class energy performing Green Mark Building that achieve at least 40%<sup>[1]</sup> energy saving based on prevailing code”

*[1] Note: This refers to 60% energy saving above 2005 building codes.*

### **Zero Energy Building (ZEB):**

“The best-in-class energy performing Green Mark Building with all of its energy consumption, including plug load, supplied from renewable source<sup>[2]</sup> (both on-site and off-site).”

*[2] Note: Building development should maximise the on-site renewable source first before exploring off-site renewable sources.*

### **Positive Energy Building (PEB):**

“The best-in-class energy performing Green Mark Building with all of its energy consumption, including plug load, supplied from renewable source (on-site) and achieves an energy surplus.”

## Assessment Process

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The BCA Green Mark SLEB Certification Process is as follows:

### **Application**

- Submittal of application with relevant supporting documents for certification upon finalisation of building design.
- Upon acceptance of application and fee payable, a BCA Green Mark Assessor will be assigned for the duration of the project.

### **Pre-Assessment (Optional)**

- Conducted to aid the project team in understanding the criteria and evaluation of the award level sought.

### **Assessment**

- To be conducted when design and documentary evidences are ready.
- Comprises design and documentary reviews to verify if the building project meets the intents of the criteria.
- A presentation to BCA panel for evaluation is required.

### **Verification**

- To be conducted upon project completion.
- Includes review of delivery records, updated documents on building energy performance data. Site inspection and measurement will be conducted.

## Green Mark SLEB Award

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As an annex of Green Mark assessment framework, SLEB projects are awarded for improving sustainable design in terms of energy efficiency and adoption of renewable energy. Depending on the level of building energy efficiency performance, the building development will be eligible for award under one of the ratings namely BCA Green Mark Gold, Gold<sup>PLUS</sup>, or Platinum (SLEB/ZEB/PEB).

In Preparation for the forthcoming Green Mark 2021, we have edited the prevailing GM SLEB document in anticipation of these changes. This provides greater options for projects to demonstrate performance and is built upon the work and data analysis ongoing within the Singapore Green Building Masterplan Taskforce.

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## Residential Buildings (To Be Available for Pilot in early 2021)

## Green Mark SLEB Performance Requirements

### Performance Requirements Non-Residential Buildings

**P.1** To ensure the SLEB building meets a good level of holistic environmental sustainability, the project must be able to obtain, or hold a valid Green Mark certificate at Gold level of award or above.

SLEB Energy performance must be achieved before the project can be certified as a ZEB or PEB

**P.2** For SLEB, the project must be able to demonstrate at least 60% energy saving\* This can be demonstrated through two parallel pathways:

#### **PATHWAY 1: Energy Use Intensity**

See Table 1.

Based on annual energy consumption, measured, or modelled.

Additional Notes:

- Minimum Total System Efficiency of cooling systems 0.9kW/RT
- On-Site Renewable Energy is included in EUI (net off)
- EUI for Existing Buildings and for verification shall be based upon a minimum occupancy of 60% or more
- Electrical Vehicle Charging stations / infrastructure excluded from building EUI

#### **PATHWAY 2: Energy Savings**

The energy savings shall be demonstrated by using the energy modeling framework set out in [Green Mark Non- Residential buildings NRB: 2015](#) Appendix C: Energy Modeling Methodology and Requirements.

See Table 2 for differences between the Energy Modelling methodology in Green Mark 2015 and GM SLEB

**P.3** For ZEB, where offsite energy is used, SLEB performance must be achieved and onsite renewables maximised. SLEB performance shall be demonstrated through either Pathway 1 (EUI) or Pathway 2 (Energy Savings).

\* 60% Energy savings refers to the % energy savings from an approximate 2005 code compliant building.

## Green Mark SLEB: Criteria

### Non-Residential Buildings

#### 1.1 New Buildings and Existing Buildings Pre-retrofit

Project targeting Green Mark SLEB certification shall demonstrate the stipulated performance through energy modelling/ or detailed calculations.

For Buildings using Pathway 1 - Benchmark EUI (Table 1) a detailed calculation (Existing buildings) or energy model (new buildings) shall be used to calculate and justify the design EUI.

For Pathway 2 (Energy Savings) the % savings over the reference model shall be demonstrated using the energy modelling framework set out in [Green Mark Non- Residential buildings NRB: 2015](#) Appendix C: Energy Modeling Methodology and Requirements

Certification	Requirement
SLEB	To achieve at least 40% of energy saving through adopting energy efficient measures and onsite renewable energy.
ZEB	Use of onsite and off-site renewable energy to generate more than 100% of energy needed for building operation, note SLEB performance shall be achieved first
PEB	Use of onsite renewable energy to generate more than 115% of energy needed for building operation.

The energy modeling for evaluating the energy performance of a building shall be carried out in a prescribed manner to quantify the potential savings based on energy efficiency measures and improvements that reduce cooling load requirement over the Reference Model.

During design or pre-retrofit stage, the expected renewable energy generated percentage and the total annual electricity consumption of the development shall be calculated. Technical product information of the renewable energy system and detailed drawings showing the location of the system shall be provided.

#### 1.2 New Building Verification Stage and Existing Buildings in Operation

When the building awarded Green Mark SLEB has completed construction or its retrofit, a verification audit shall be carried out. For Buildings in operation, not undergoing retrofit the assessment would be based upon its operational data.

**Stage 1 Verification (New Buildings):** The Green Mark verification shall demonstrate the implementation of the design stage strategies and note any deviance from these and their effect on the ability of the project to achieve SLEB/ZEB/PEB.

**Stage 2 Verification and Existing Buildings:** The building shall demonstrate compliance to the committed energy saving or EUI which resulted in the certification with deviance less than 5% using 12-months of actual data.

Where Renewable Energy has been utilised the generated renewable energy, using 12-month actual operation data will be audited.

For ZEB, the building shall demonstrate compliance to the committed 100% net replacement through onsite and/or off-site renewable sources.

For PEB, the building shall demonstrate compliance to the committed 115% net replacement through onsite renewable sources.

Table 1: PATHWAY 1 – Benchmark Energy Use Intensity Requirements

Building Type	Category	Benchmark EUI (kWh/m <sup>2</sup> /year)
<b>Commercial</b>		
Office Buildings	Large (GFA > 15,000 sqm)	115
	Small (GFA < 15,000 sqm)	100
Hotels	Large (GFA > 15,000 sqm)	180
	Small (GFA < 15,000 sqm)	130
Retail Buildings		160
<b>Educational</b>		
IHL (University, Polytechnics and ITE)		90
Private Schools and Colleges		80
Junior Colleges (MOE)		40
Secondary Schools (MOE)		30
Primary Schools (MOE)		30
<b>Healthcare</b>		
Hospitals (Private and General)		300
Community Hospitals		185
Polyclinic		120
Nursing Home/ Youth Homes		70
<b>Other Non-Residential</b>		
Mixed Developments		By GFA Mix
Community Centres		110
Civic Buildings		60
Cultural Institution		120
Sports and Recreation Centres		50
Religious/ Place of Worship		N.A
<b>Industrial</b>		
High Tech Industrial		N.A
Light Industrial		N.A
Warehouses, Workshops and Others		N.A
<b>Residential</b>		
Multi Residential (HDB, Executive Condominiums, Condominiums, Private apartments)		N.A
Cluster Housing		N.A
Landed Housing		N.A

\* Benchmark EUI in Table 1 are still in refinement as part of our data analysis process. Building types not shown in Annex A will be assessed on a case-by-case basis.

Table 2: PATHWAY 2 – Energy Savings differences between GM 2015 and GM SLEB.

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Energy Saving	GM NRB: 2015 Energy Modelling Framework	GM SLEB Approach
Passive Design Features	A cap of 3% of additional energy savings from passive design features over its Reference Model can be considered	No cap
Renewable Energy	A cap of 3% of additional energy savings from passive design features over its Reference Model can be considered	No cap