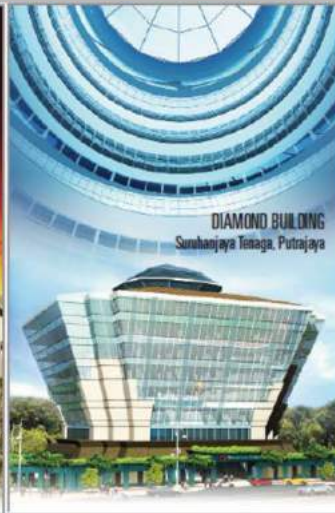
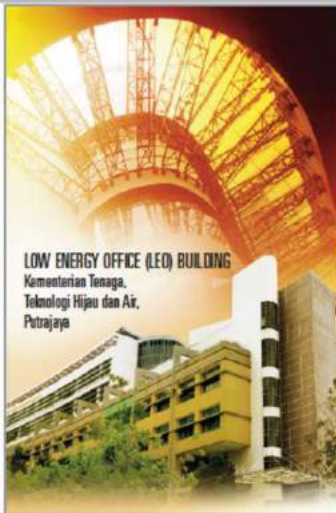
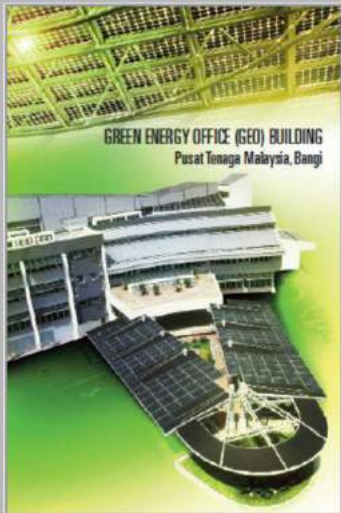


ZERO ENERGY BUILDING (ZEB) DEVELOPMENT IN MALAYSIA

(Development of ZEB Guide for Buildings in Malaysia)



30 June 2021

Ready for Zero Energy Building (Ready ZEB)
Nearly Zero Energy Building (nZEB)
Net Zero Energy Building (NZEB)



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(SEDA MALAYSIA)

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INTRODUCTION

- Zero Energy Building (ZEB) is an **advance Sustainable Energy Low Carbon Building** initiatives.
- **ZEB is different than the conventional green buildings category.**
 - It has different assessment / performance metric. Based on quantitative performance.
 - It focus mainly to building operation features that have **direct impact on total energy & operational carbon reduction**, which is the sustainable energy (EE+RE).
- It is steps ahead towards **achieving 100% RE mix** power supply to the buildings and **achieving Carbon Neutral Building** (operational carbon).
- Focus on **basic, practical & viable elements** in sustainable building (quantitative – measurable, recordable and reportable).

INTRODUCTION

- Zero Energy Building (ZEB) Program is a global race, target to make building become super energy efficient and with deployment of on site Renewable Energy technology to achieve ZEB;
 - EU Countries (by Directive), Japan, Singapore, etc.
 - Target by 2020 : All new public buildings.
 - Target by 2030 : Average new buildings (Public & private).
 - Support Net Zero Carbon program by 2050.
- Building sector contribute about 1/3 of global CO2 emission.
(Common Carbon Metric by UNEP SBCI, Page 2)
- In Low / Neutral / Zero Carbon Cities Program, building sector offer the highest chance to reduce emission at affordable cost (quick wins).
- Development of international standard of ZEB Methodology, ISO/TC 205 (in progress).



INTRODUCTION

- In 2018, SEDA Malaysia & JASE-W signed a MOU to embark on ZEB Promo and Awareness;
 - Promotion & Awareness of ZEB (including seminar and pilot/demonstration).
 - Support for development of standard methodology of ZEB in Malaysia, which aligning with current ASEAN – Japan ZEB promotion initiatives;
 - Technical knowledges and concept applications;
 - Promotion, awareness & trainings;
 - Voluntary pilot projects.

Workshop on The Dissemination and Promotion of ZEB (Zero Energy Building) and ZEB Family /Series concept.
organised & Coordinated
by METI Japan & AOTS



3-7 September 2018 @ Tokyo



SEDA MALAYSIA's VOLUNTARY INITIATIVE (MOU SEDA and JASE-W)



ZERO ENERGY BUILDING FACILITATION PROGRAM

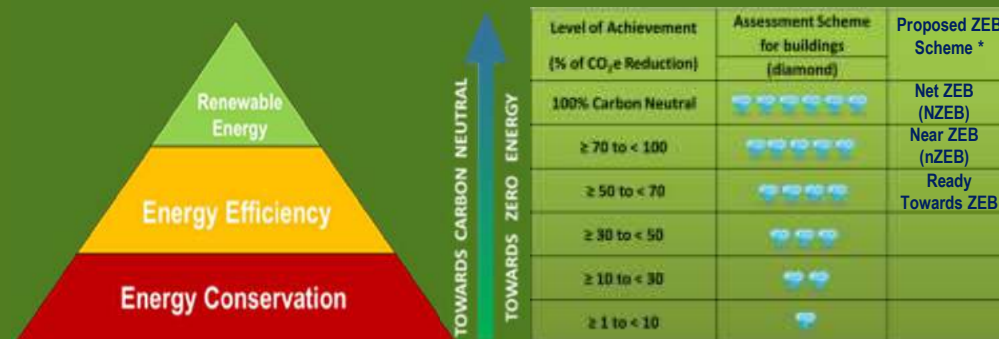
READY TOWARDS ZERO ENERGY (ZEB READY)
NEARLY ZERO ENERGY BUILDING (nZEB)
NET ZERO ENERGY BUILDING (NZEB)

- *Ready-to-go ZEB* is a beginner after achieving energy savings more than 50%.
- *Nearly Zero Energy Building (nZEB)* is an advance Low Carbon Building initiatives.
- It is a few steps ahead towards achieving *Net Zero Building (NZEB)* or Carbon Neutral Building (operational carbon)

OBJECTIVE

To promote the adoption of super low carbon green building by using alternative method focusing purely on sustainable energy practices, starting with advance energy efficiency measures in reducing overall energy demand or consumption and offsetting the balance of minimum energy needed by using on-site renewable energy.

$$\text{ZEB} = (\text{EE} + \text{RE}) \times \text{Sustainable Practices}$$



Assessment tool by SEDA Malaysia :
Adopted Construction Industry Standard (CIS-20:2012) – GreenPASS developed by CIDB Malaysia



Info at:

www.seda.gov.my/ZEB

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Tel: +603 - 8870 5841

Sustainable Energy Development Authority Malaysia (SEDA Malaysia)
Level 9, Galeria PJH, Jalan P4W, Persiaran Perdana, Presint 4, 62570 PUTRAJAYA
Tel: 03-8870 5800 Fax: 03-8870 5900
E-mail: steve@seda.gov.my hambali@seda.gov.my



FORMATION OF ZEB FOCUS GROUP



CLIMATE CHANGE MITIGATIONS – LOW CARBON PROGRAM



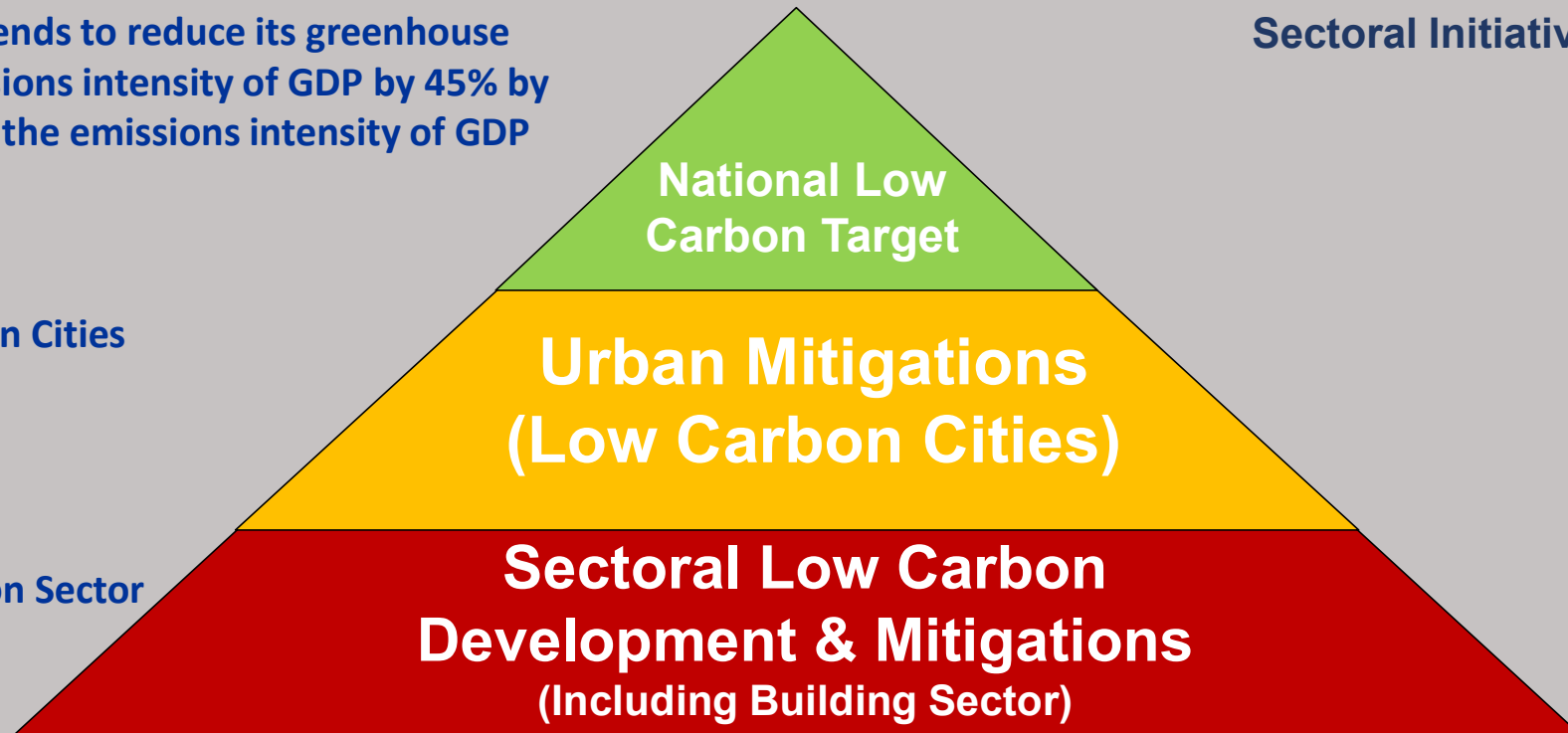
**45% GHG Intensity
Reduction by 2030**

From National Initiatives down to
Sectoral Initiatives)

“... Malaysia intends to reduce its greenhouse gas (GHG) emissions intensity of GDP by 45% by 2030 relative to the emissions intensity of GDP in 2005.”

The Low Carbon Cities
program.

The Low Carbon Sector
program.



LOW CARBON CITIES FRAMEWORK (LCCF)

PERFORMANCE CRITERIA

Base on Carbon Footprint

Elements for GHG Reductions in Cities and Townships



Urban Environment



- Site Selection
- Urban Form
- Urban Greenery & Air Quality



Urban Transportation



- Shift of Transport Mode
- Green Transport Infrastructure
- Green Vehicles
- Traffic Management



Urban Infrastructure



- Infrastructure Provision
- Waste
- Energy
- Water



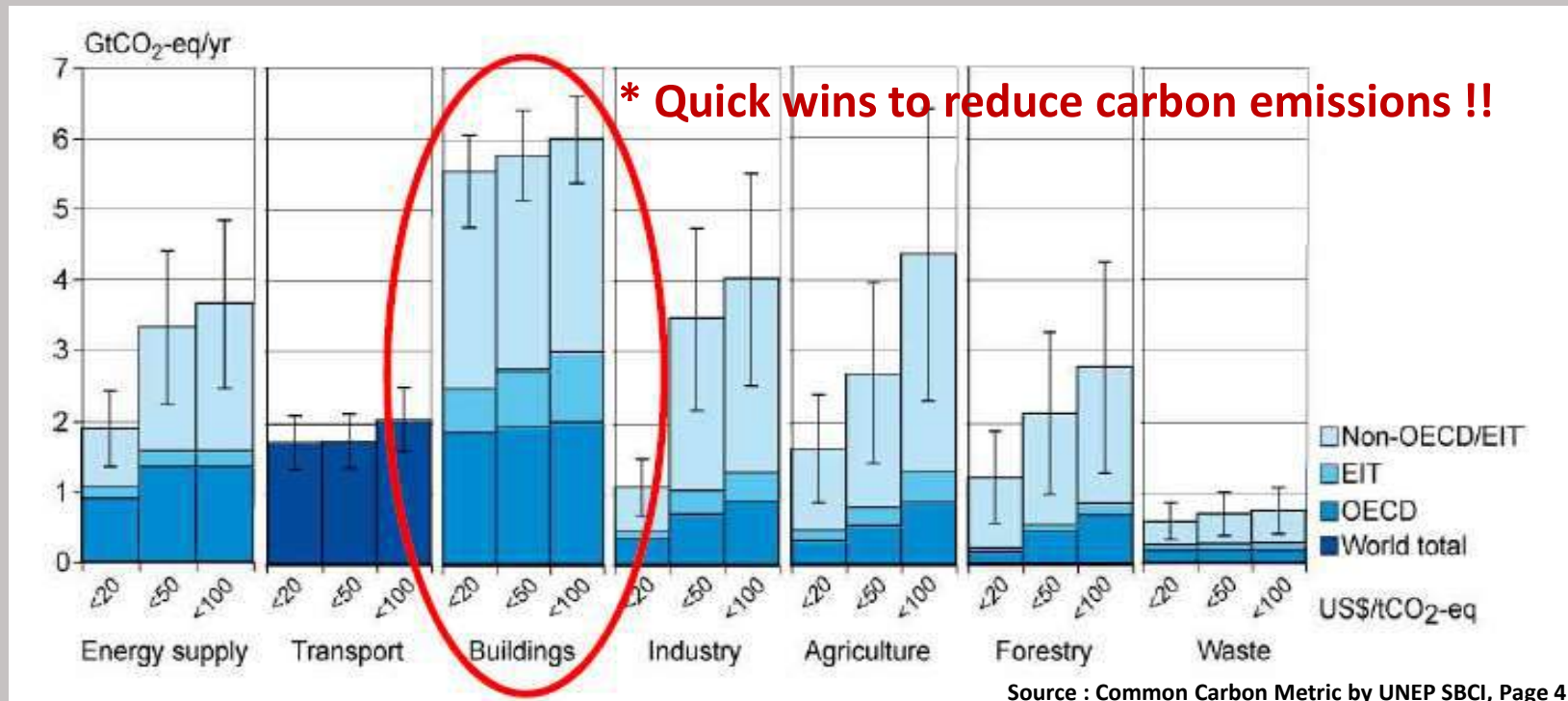
Buildings



- Low Carbon Building (operation carbon)
- Community Service

** ZEB = High performance Low Carbon Building

FACT : CHANCES TO REDUCE CARBON EMISSIONS (report by IPCC)



Building sector has the **higher chances** to reduce carbon emission (over \$\$ spending) in a township. States & Local Government / PBTs that keen to have low carbon cities program **MUST give attention** to this key and important fact.

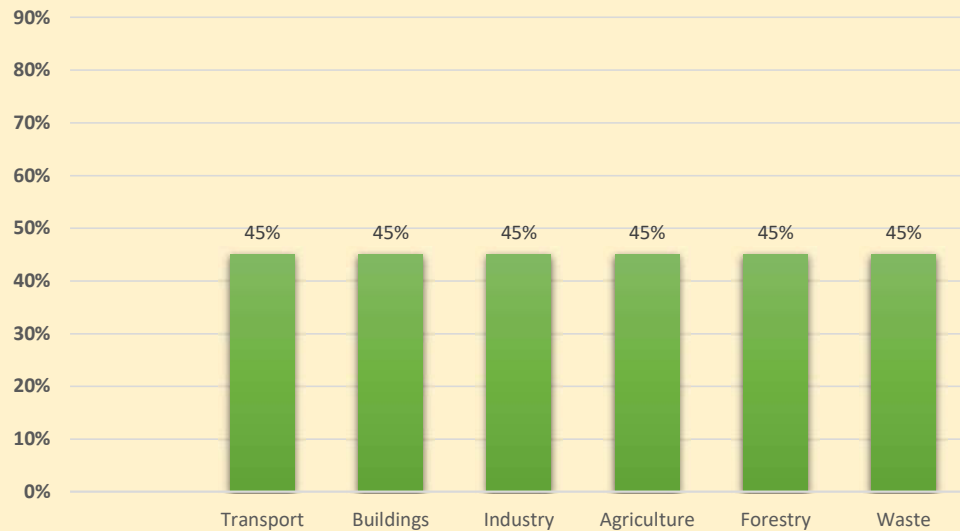
Should maximise the potential of carbon reduction in building sector – By moving towards Zero Energy Building



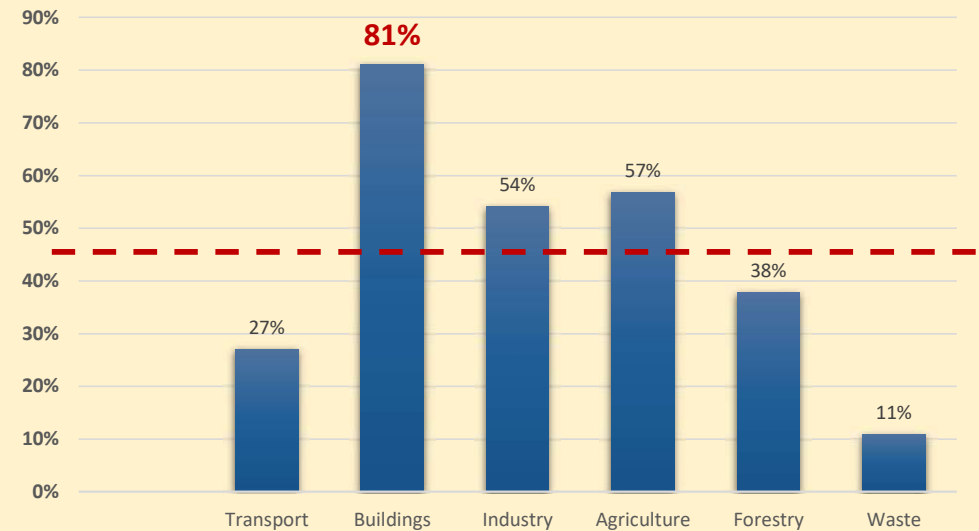
FACT : CARBON REDUCTION TARGET

(Example, Targeting 45% CO2 Intensity reduction)

Target 45% CO2 Intensity Reduction
(Perfect Scenario)



Target 45% CO2 Intensity Reduction
(In reality to achieved average target - Example)

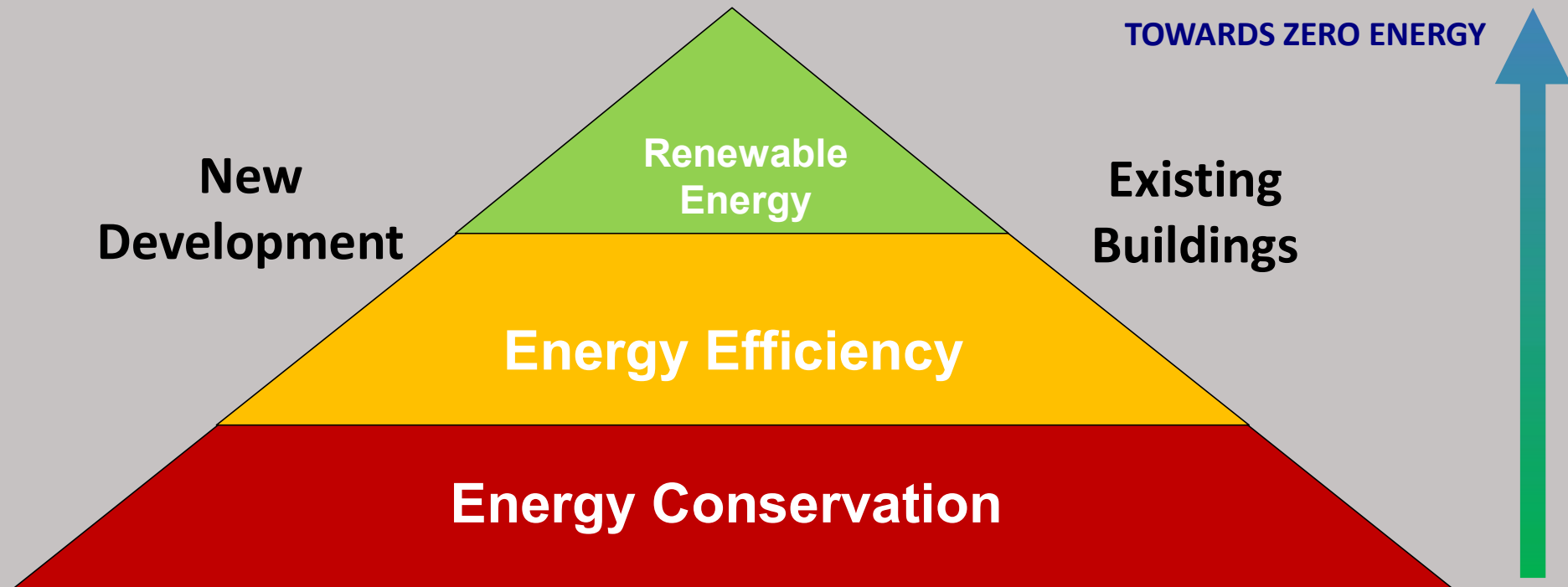


Building sector need to **target higher reduction** to help other sectors that have difficulties to reduce carbon emission.

PRACTICAL APPROACH to achieve Zero Energy Building (ZEB)



$$\text{ZEB} = (\text{EE} + \text{RE}) \times \text{Sustainable Practices}$$



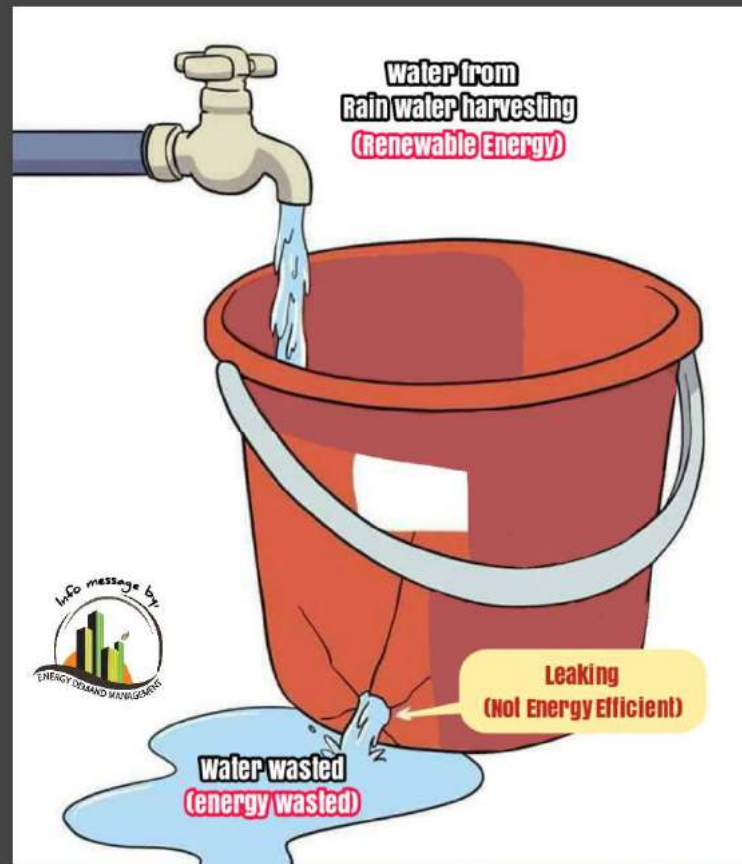
SUSTAINABLE ENERGY PYRAMID !!

BASIC PRINCIPAL FOR SUSTAINABLE ENERGY & LOW CARBON PROGRAM



PRACTICAL APPROACH to achieve Zero Energy Building (ZEB)

WASTE OF RESOURCES



(ENERGY EFFICIENCY & CONSERVATION)

STOP WASTAGE FIRST !!

PERFORMANCE STANDARDS ON EE AND RE IN MALAYSIA (Minimum performance)



❑ DESIGN & RETROFITTING PHASE:

- ✓ **BUILDING ENERGY STANDARD - MS1525** – Code of Practice in Energy Efficiency & Use of Renewable Energy for Non-residential Buildings.
- ✓ **MS1837** - Installation of Grid Connected Solar PV System.
- ✓ **MS2680** - Code of Practice in EE & RE for Residential Buildings.

❑ OPERATION AND USE PHASE:

- ✓ **ISO 15001** – Energy Management System.
- ✓ **AEMAS** Energy Management System.



ADOPT THE PROPOSED STANDARDISATION OF ZEB METHODOLOGY (ISO TC 205 WG)



1) At Planning Stage:

- Have **clear 'policy' or 'need statement'** to achieve ZEB.
- Step-by-step (Ready to go ZEB , Nearly ZEB & Net ZEB).

2) At Design Stage:

- To **select proper strategy** to achieve ZEB.
- Translate design to specifications : Design, materials, equipment certified by local / international standard.

3) At Construction stage:

- **According to specification.**
- To install the right selected materials / equipment.

4) At Commissioning stage:

- Commissioning **according to performance** requirement.

5) At Monitoring & Verifications stage:

- To **inspect the actual energy consumption.**
- To inspect the actual and compare to design energy consumption target.

6) At Reporting stage:

- To analyse the actual and design target energy system performance report, by simulation, etc.
- To **report the actual performance and ZEB achievement.**

**Six Core Elements
for Standardisation
(ISO)**

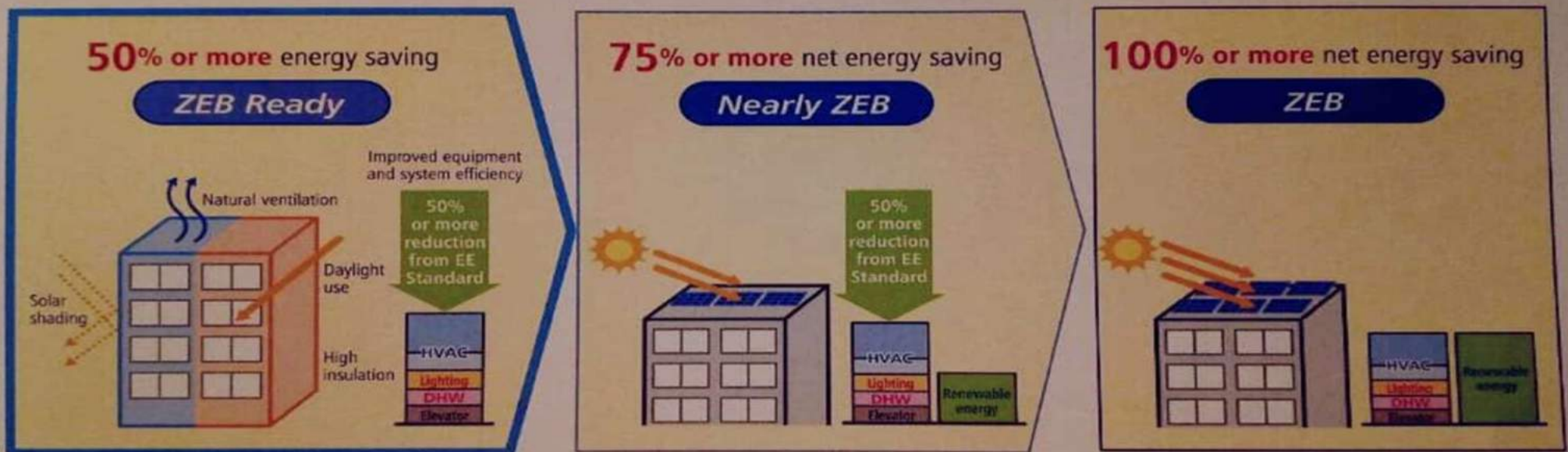


DEFINITION OF ZEB

ZEB METHODOLOGY STANDARD UNDER DEVELOPMENT BY THE ISO TC 205 WG

Definition of ZEB

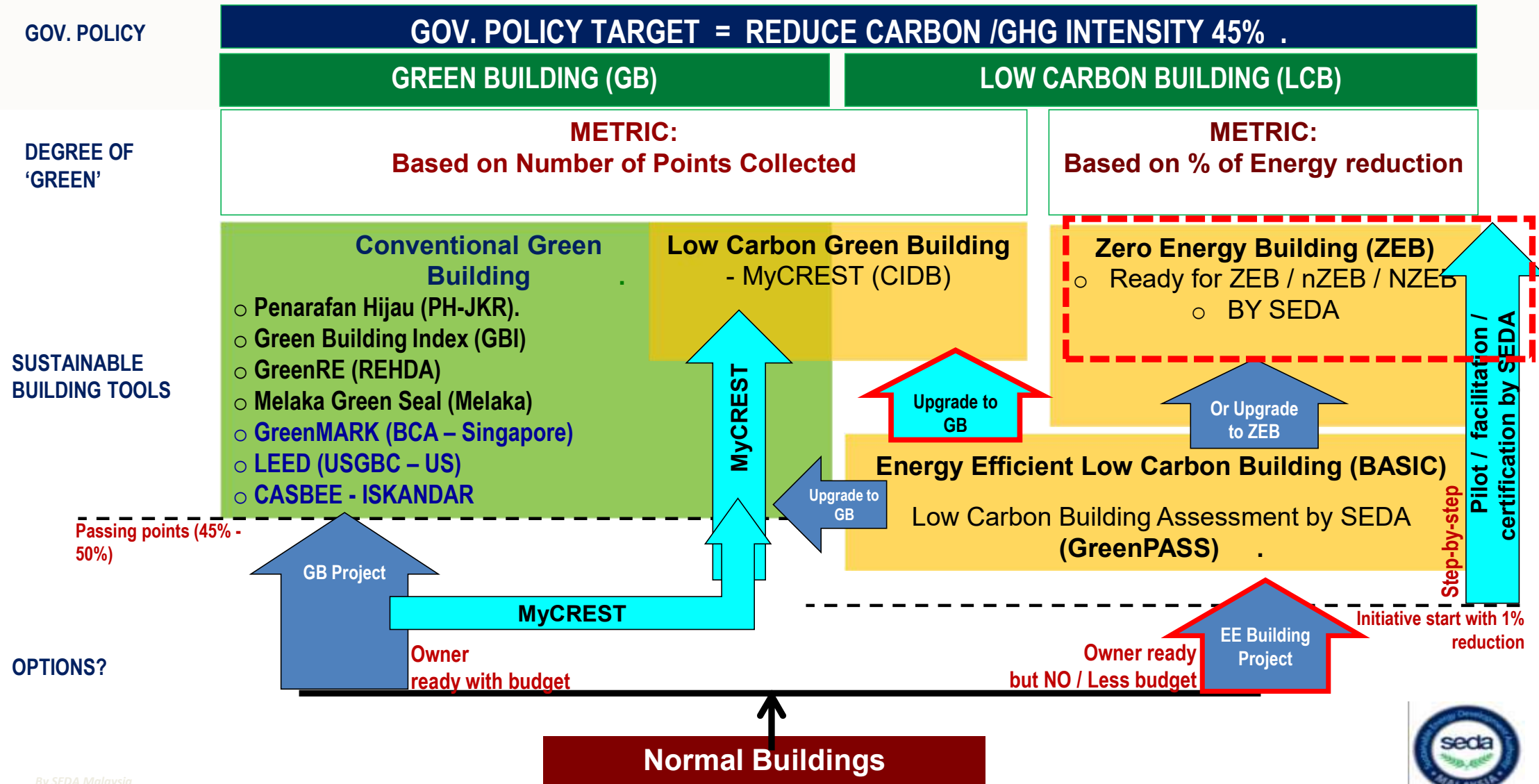
The concept of ZEB has been expanded to the "ZEB Series" which can be aimed for according to actual for conditions. The first step is to aim for super-low energy buildings which are defined as "ZEB Ready", and then aim for "Nearly ZEB" and above.



ZERO ENERGY BUILDINGS (ZEB) SERIES

(Malaysia adopted the Japanese definition on ZEB with minor changes to suit local scenario)
initiative by SEDA Malaysia, collaboration with JASE-W Japan

SUMMARY / MAPPING OF GREEN BUILDING / LOW CARBON BUILDING / ZEB



Source : Sustainable Low Carbon Building Guide by SEDA Malaysia

Assessment using Existing Tool (No need to develop new assessment tool)

Compiled by SEDA Malaysia

Sustainable Tools in Malaysia (by chronology)

1. GreenMARK (BCA – Singapore)
2. Green Building Index (GBI)
3. LEED (USGBC – US)
4. GreenRE (REHDA)
5. Melaka Green Seal (Melaka)*
6. CIS 20:2012 – GreenPASS
(Developed by CIDB, now adopted by SEDA)* - For Low Carbon Building & Zero Energy Building
7. Penarafan Hijau (PH-JKR)*.
8. MyCREST (CIDB-JKR)*.
9. CASBEE Iskandar (IRDA-Japan)

STANDARDS

- MS 1525
- ISO 50001
- ISO 14000



* **Government tools**

*** **The underlined are tools made in Malaysia.**

Notes:

- GreenPASS is based on 100% CO2 reduction assessment.
- MyCREST is based on partially CO2 reduction assessment.

**** FACTS : No single tool can provide fair assessment to all types of buildings. That is why more tools have been created and adapted to different assessment methods for the combination of various elements of sustainability (usually the final evaluation in the form of accumulated marks) or only subject to a single sustainability metric (such as GHG, Carbon, water or ecology index).**

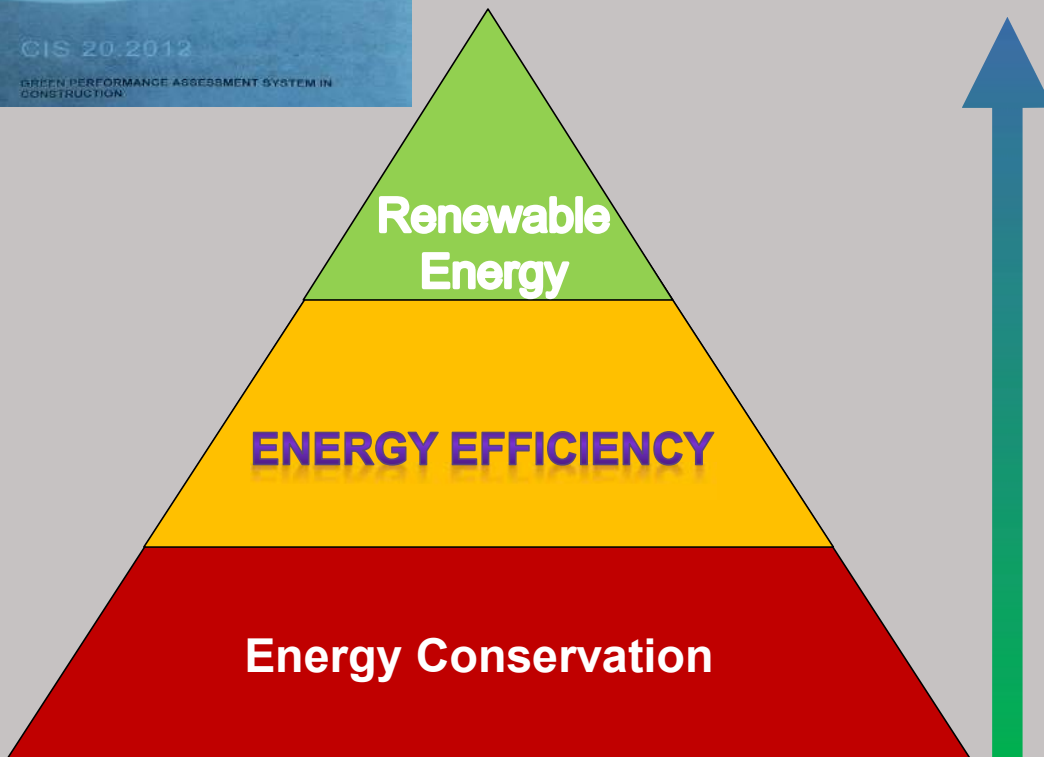
Low Carbon Building / Zero Energy Building Assessment Tool by SEDA Malaysia.

* Adopted the CIDB's Construction Industry Standard (CIS-20:2012) – GreenPASS Operation



TOWARDS ZERO ENERGY

$$\text{ZEB} = (\text{EE} + \text{RE}) \times \text{Sustainable Practices}$$



Level of Achievement % Energy reduction	Assessment Scheme for buildings	ZEB Certification Scheme *
	(diamond)	
100% or more	★★★★★	Net ZEB (NZEB)
≥ 70 to < 100	★★★★	Near ZEB (nZEB)
≥ 50 to < 70	★★★	ZEB Ready
≥ 30 to < 50	★★	
≥ 10 to < 30	★	
≥ 1 to < 10		



* Note : Aligning to Japan ZEB Scheme Concept





CURRENT ECO SYSTEM TO SUPPORT ZERO ENERGY BUILDING (ZEB)



**READY ASSESSMENT TOOL
for ZEB / LCB by SEDA
adopted CIDB's CIS20:2012
- GreenPASS (Operation)**

**Low Carbon Cities
Framework (LCCF)
: Low Carbon
Building**

**STANDARDS on Sustainable
Energy:
MS1525, MS2680, MS1837,
ISO15001 / AEMAS**

**Guidelines & References
Cases**

**Existing professional NGOs
& experts in Malaysia
(government & private)**

**Energy Efficient products
ready in Malaysia (ST
MEPS)**

Supporting ZEB program in Malaysia

**EE & RE Trainings &
Capacity Building Program
by agencies / private.**

**INCENTIVES:
Current incentives on
sustainable energy &
financial facilities (EPC)**

**R & D Experts for local
universities on Sustainable
Energy**

**NET ENERGY METERING
(NEM) Program by SEDA :
To off-set further balance
of energy needed by RE.**

**SEDA's Low Carbon Building
/ ZEB Facilitation Program:
PBTs, Gov Agencies &
Private**

**Existing Sustainable Energy
Service Provider
(ESCOs & Solar PV /
thermal Service Provider)**

**Affordable Online Energy
Monitoring System (by
SEDA, etc)**



COST OF IMPLEMENTATION (Research by SEDA Malaysia) (For Low Carbon Building / ZEB)



ENERGY MANAGEMENT / ENERGY EFFICIENCY

- **USD 0.14 to USD 0.95 investment** per kWh reduction
(RM0.60 to RM4.00 per kWh reduction)

(payback within 3 – 8 years)

** Based on several energy auditing, retrofitting and low carbon buildings at commercial, industries and residential buildings in Malaysia by SEDA Malaysia.*



RENEWABLE ENERGY – RE (Solar PV)

- **USD 1.6 – USD 2.00 investment** per kWh reduction.
(RM 6.70 to RM 8.40) per kWh reduction

** Based on installation of solar PV on roof pricing (USD 1.55k – 2.3k/kWp / RM6.5k – 10k/kWp)*



LEARN FROM PAST INTEGRATED EE BUILDING DESIGN PROJECT (ZERO ENERGY BUILDING IN MALAYSIA)

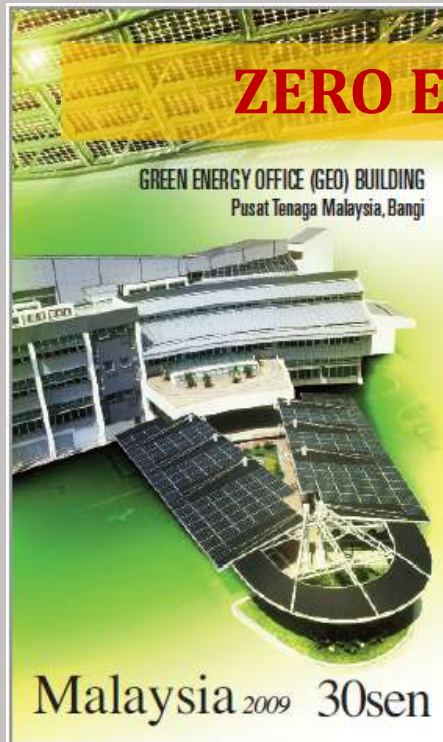


2007

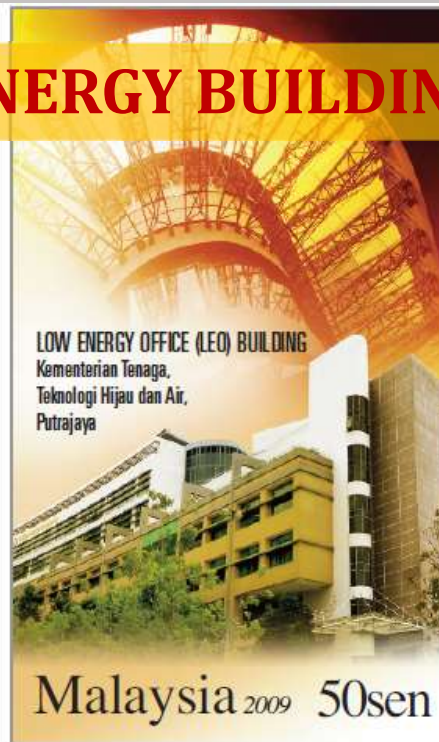
2004

2010

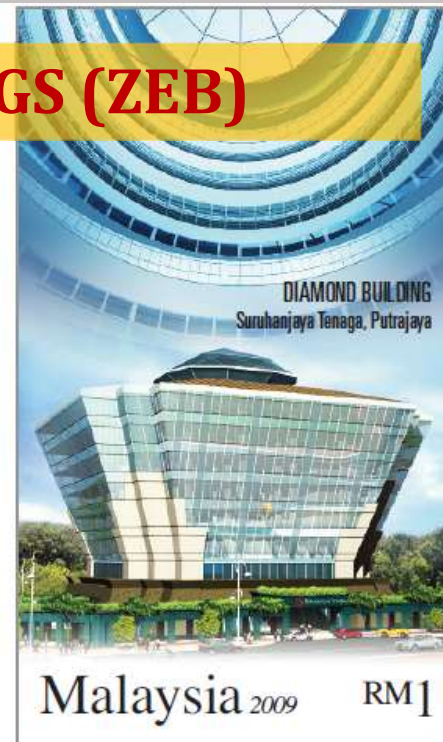
ZERO ENERGY BUILDINGS (ZEB)



Net BEI = 30 (86% reduce)
65 TonCO₂/year
GBI : Certified (2009)
ASEAN EA : 2009/2010/2011



Net BEI = 114 (59% reduce)
1,490 TonCO₂/year
GBI : Silver (2011)
ASEAN Energy Award : 2006



Net BEI = 63 (70% reduce)
637 TonCO₂/year (**To verify)
GBI & GreenMark : Platinum (2011)
ASEAN EA : 2012



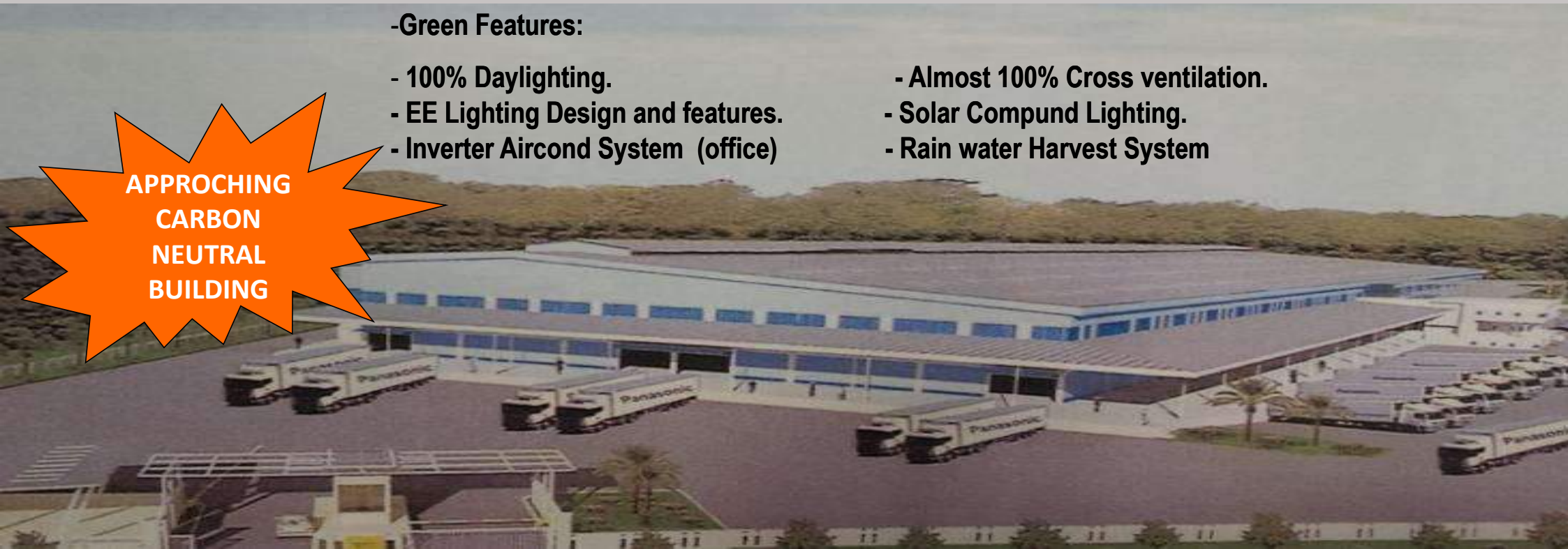
2011 ESB – PANASONIC GREEN WAREHOUSE in SHAH ALAM



-Green Features:

- 100% Daylighting.
- EE Lighting Design and features.
- Inverter Aircond System (office)
- Almost 100% Cross ventilation.
- Solar Compund Lighting.
- Rain water Harvest System

APPROCHING
CARBON
NEUTRAL
BUILDING



- Net BEI = 15.6kWh/m2/year (more than **70% energy reduced**)
- 384.2 TonCO2/year
- SME Green Award 2012
- ASEAN Energy Award : 2012 : 1st Runner-up Tropical Buildings

Potential LCB-GreenPASS on ZEB
Assessment



Nearly ZEB



2010 – LOW CARBON HOUSE P14 @ PUTRAJAYA (A Net Zero Energy Home)



Only need 2 – 3 kWp Solar PV to make zero energy house

Since 2010 – Nearly Zero Energy Home (nZEB)
In 2017 – Net Zero Energy Home (NZEB)

- The Green Features:

- East-West building orientation.
- Landscape to absorb heat (IR and UV).
- Natural cross ventilation & Daylighting.
- Energy efficient light & appliances.
- Energy efficient Interior Design.
- Waste management.
- Awareness and Green Practice.
- $EE (61.4\%) + RE (38.6\%) =$



$EE (61.4\%) + RE (38.6\%)$
 $= 100\% \text{ reduction}$
 $\text{Net BEI} = 0 \text{ kWh/m}^2/\text{year}$

Potential LCB-GreenPASS on ZEB
Assessment



VOLUNTARY PILOT ASSESSMENT & CERTIFICATION



Level of Achievement (% of CO ₂ e Reduction)	Assessment Scheme for buildings (diamond)	ZEB Certification Scheme *
100% Carbon Neutral		Net ZEB (NZEB)
≥ 70 to < 100		Near ZEB (nZEB)
≥ 50 to < 70		Ready Towards ZEB
≥ 30 to < 50		
≥ 10 to < 30		
≥ 1 to < 10		



Initiatives taken:

- Energy management, finetuning building system operation (aircond & lighting).
- Install dedicated split unit air-condition / retrofitting to EE systems.
- Energy & operational carbon reduced more than 50% (without renewable energy).

ZEB certification by SEDA for existing building

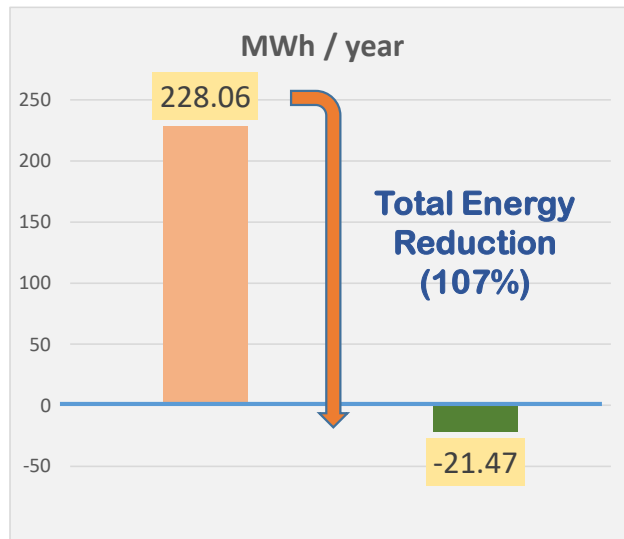




UniKL-BMI Living Lab

SEDA RE Training Partner

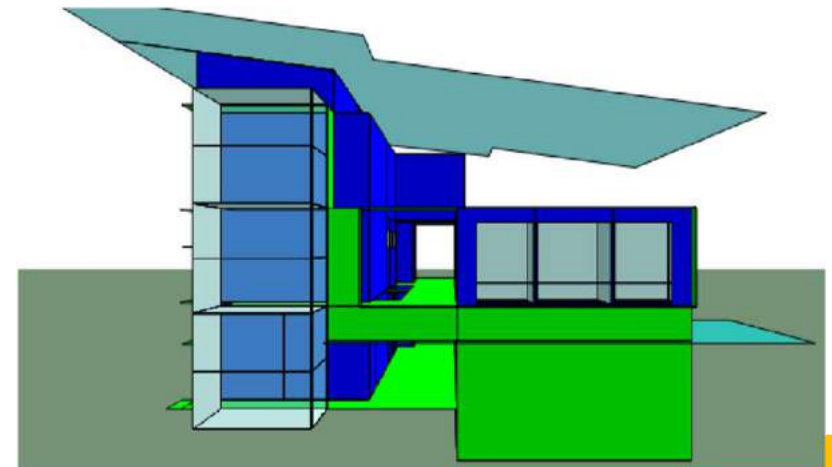
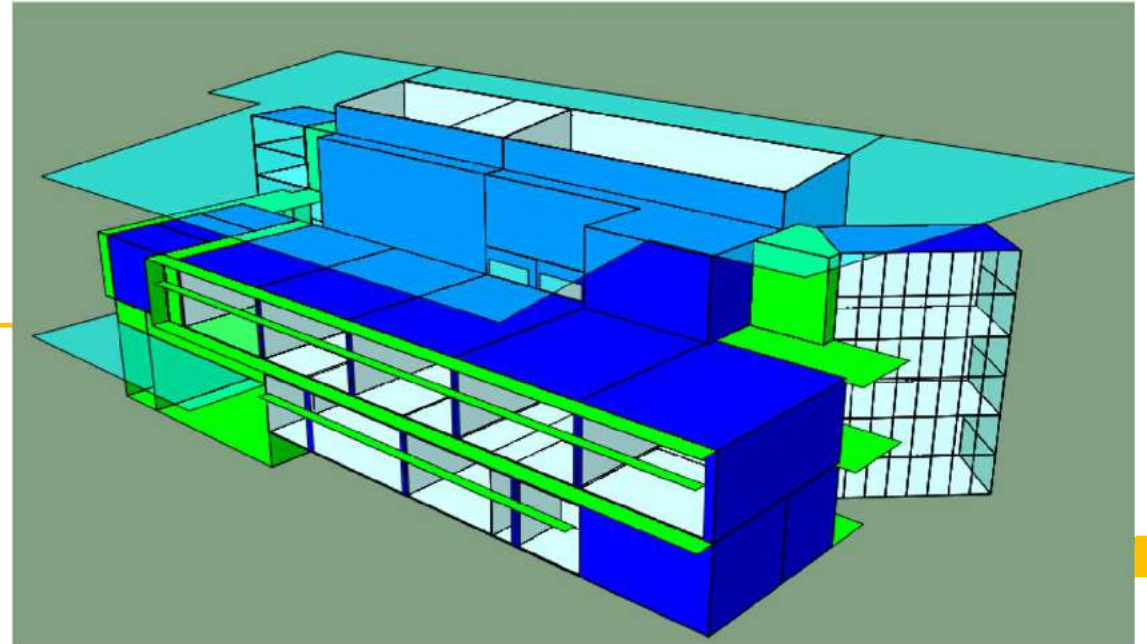
A Positive Zero Energy Building (Net ZEB Category)



Potential LCB-GreenPASS on ZEB Assessment



VOLUNTARY PILOT PROJECT



Thank you for your attention



FACILITATION ON LOW CARBON BUILDING / ZEB PROGRAM?
Call / text +6019 2829102 / +603 88705800
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+

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