Singapore's Green Building Journey

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Presentation Outline

- 1. Introduction to BCA Green Mark Scheme
- 2. Green Building Policies in Singapore
- 3. Going Forward Super Low Energy (SLE)



BCA GREEN MARK

Evolution of BCA Green Mark Standards



A Suite of BCA Green Mark Schemes



BCA Green Mark – Stringent M&V Standards

1) Permanent M&V Standards





Publication in ASHRAE Journal (Nov 2016)

Singapore's Green Mark System Improving Commercial Building Energy Performance

BY LEE ENG LOCK; TOH ENG SHYAN; THOMAS HARTMAN, P.E., LIFE MEMBER ASHRAE

For several decades, the building industry has been struggling with the issue of improving energy performance in commercial buildings. A number of initiatives promoted by industry organizations and government agencies have established very ambitious nearterm goals for commercial building performance. But despite some recent encouraging trends, over the last several decades the energy use intensity for U.S. commercial buildings has remained largely unchanged.¹ This trend must be dramatically changed if the industry is to meet its ambitious upcoming building energy use goals.

So the question is, what has gone wrong in our industry's effort to improve building operating efficiency, and what can be done to correct it? A decade ago, a number

The Singapore Approach

Situated within the equatorial belt and tropics, Singapore experiences hot and humid weather year-

ASHRAE

BCA Green Mark – 3 Key Attributes



Performance Verification – System Level



Performance Verification – Building Level



Performance Tracking – Sector Level

From 2008 to 2017, overall EUI for commercial buildings improved by 11%

Retail Buildings improved by 8%

Office Buildings improved by 19%

Hotels improved by 12%



Based on BCA Building Energy Benchmarking Report 2018

Business Case for New Building Developments

Green Cost Premium and Payback Periods



Business Case for Existing Buildings

Verified Energy Savings & Paybacks



Singapore's Green Building Journey since 2005



Public Sector Taking the Lead in Environmental Sustainability

Leading the Way as Building Owners



*All public sector buildings need to meet PSTLES Green Mark (GM) targets by FY2020

Public Sector Taking the Lead in Environmental Sustainability

Creating Lead Demand as an End-User

Tenancy Lease from a GM Gold^{PLUS}/Platinum building

Green Event Venues To host events only at GM certified venues



EDB and MCCY at Raffles City [GM Gold^{PLUS}] CPF at Novena Square [GM Gold^{PLUS}]



Encouraging the Private Sector

For both New Developments and Existing Buildings

Bonus GFA Incentive Scheme (GM GFA)

Platinum – Up to 2% Additional GFA Gold^{PLUS} – Up to 1% Additional GFA

For Existing Buildings

Building Retrofit Energy Efficiency Financing (BREEF) Co-share risk with Private Financial Institutions

GMIS-Existing Building (Health Check)

S\$50m Green Mark Incentive Scheme for Existing Building and Premises (GMIS-EBP)

Building Up Industry Eco System



Building Industry Capability

Structured training & accreditation programmes for greater professionalism



Minimum Standards to Establish the Green Building Ecosystem – Setting the baseline

Building Control (Environmental Sustainability) Regulations 2008

Minimum environmental sustainability standard for <u>new buildings</u>



Environmental Sustainability Measures for Existing Building Regulations (2012)



Minimum environmental sustainability standard for <u>existing buildings</u>

Three-yearly energy audit on cooling system and compliance to design system efficiency

Annual mandatory submission of building information & energy consumption data

Periodic Audit of Central Chilled Water System

Continuous commissioning benefits (illustrative)



Next Phase..... Zero Energy Building (ZEB)?

Local Building Landscape

<u>Climate</u> : Hot & Humid Land area: Scarce

Renewable Energy Options: Limited

Physical : High-rise & Dense

Roof Space: Small



Behaviour: Reliance on air-conditioners Energy consumption: High

Singapore's context: <u>High Rise High Density Urban Tropics</u>



Furthering Development of Green Buildings - SLE Journey



Passive Strategies

- Solar Shading
- Natural Ventilation
- Façade and Daylighting

Active Strategies

- State of the Art ACMV
- Mechanical Ventilation
- Artificial Lighting

Smart Energy Management

- Building Automation
- Smart Control
- Plug Load Management

Renewable Energy

- Roof and Site Optimisation
- PV Technologies



SUPER LOW ENERGY BUILDINGS ADVANCING NET ZERO IN SINGAPORE

On-site

Off-site

GM (SLE) Criteria

Super Low Energy (New bdg)

- a. Minimum Green Mark Gold Award
- b. 60% Energy Savings compared to 2005 code (10% above Platinum)
- c. <u>OR</u> Benchmark EUI requirements for Buildings

Building Type	EUI
Schools	25
Office	100
Hotel/ Retail/ Mixed Commercial	160

Super Low Energy (Extg bdg)

- a. Minimum Green Mark Gold Award
- b. Benchmark EUI requirements
- c. <u>OR</u> Demonstration of Energy Savings

Zero Energy (ALL)

- a. Minimum Green Mark Gold Award
- b. RE \geq Energy Consumption*

*Note on-site RE shall be optimised prior to use of off-site RE . Use of off-site has SLE conditions

Green Mark Super Low Energy (SLE) Programme

To encourage cost-effective and energy-efficient building designs that can achieve energy savings of at least 60% energy savings over the 2005 building codes



Green Mark Super Low Energy (SLE) Programme

Highlights of Exemplary Projects

DSTA Kranji Camp



BCA Green Mark Platinum (Zero Energy)

Project Information Total GFA: 6,866.55m² No. of storeys: 4 Estimated Energy Savings: 156,553 kWh/yr

NUS SDE4



BCA Green Mark Platinum (Zero Energy)

Project Information Total GFA: 8,525.63 m2 No. of storeys: 6 Estimated Energy Savings: 292,900 kWh/year

Home Team Academy



BCA Green Mark Platinum (Super Low Energy)

<u>Project Information</u> Total GFA: 138,813.57m² Estimated Energy Savings: 3,179,300 kWh/yr

SMU Tahir Foundation Connexion



BCA Green Mark Platinum (Zero Energy) Project Information Total GFA: 8,775m² No. of storeys: 5 Estimated Energy Savings: 458,400 kWh/yr

Aspiration

To accelerate cost effective super low energy buildings and kick start the next wave of our green building movement towards advancing net zero in the tropics

See you at International Built Environment Week (IBEW) 2019

Join us, as an advocate, on this Journey of Transformation!

Actively Participate in IBEW

to learn from among the best and enjoy the many networking opportunities

Raise the profile of your firms

through sponsorship, to enhance business opportunities and attract new talents

Do spread the word and join us!

3 – 6 September 2019 Sands Expo and Convention Centre

Register at:







Thank You