

Keynote Address

Presented by

Mr Ang Kian Seng
Group Director (Technology Development)
Building and Construction Authority

Agenda



01 Evolution of Green Mark

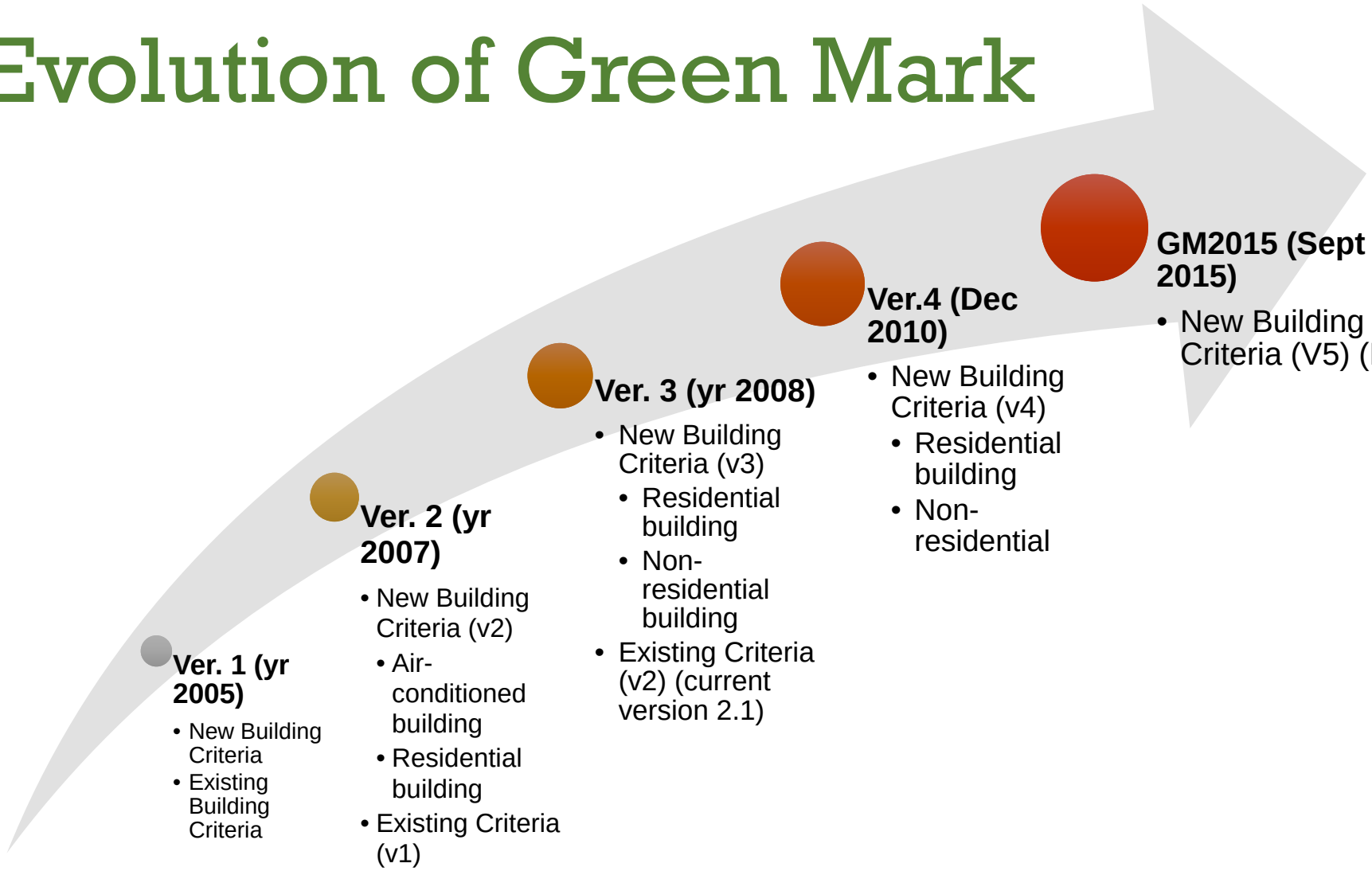
02 Key findings from BCA Building Energy Benchmarking Report 2015

03 Proven Energy Performance

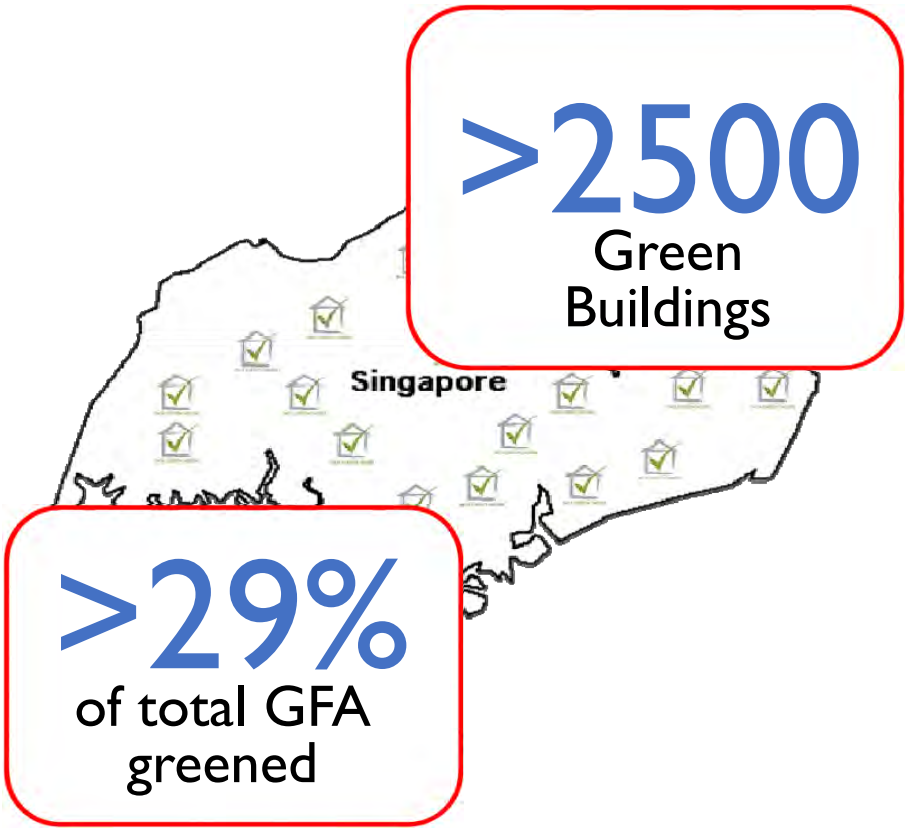
04 Moving Forward: Green Mark 2015

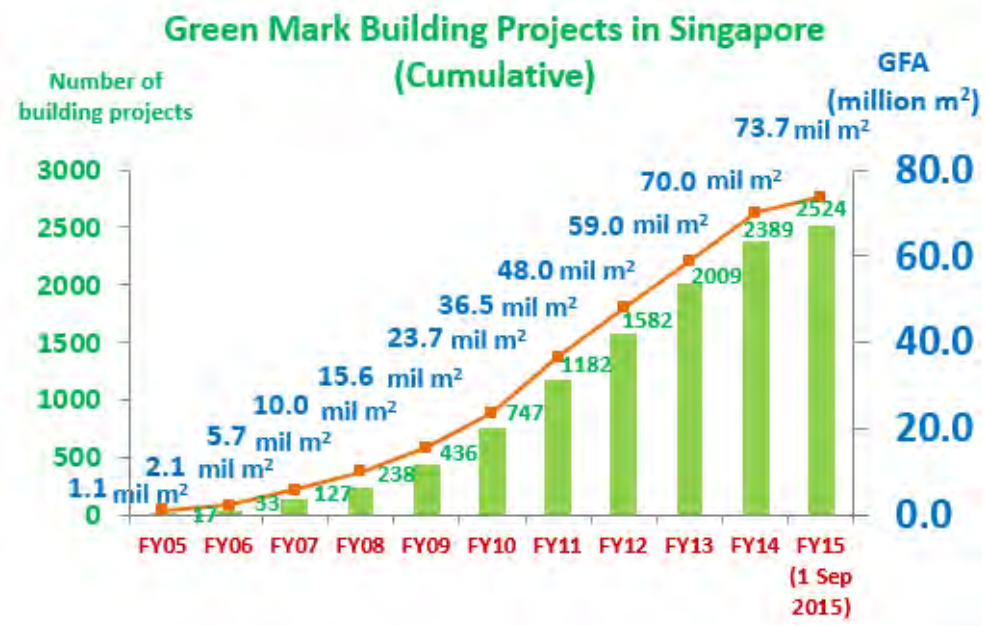
05 Conclusion

Evolution of Green Mark



Steady Increase of Green Building





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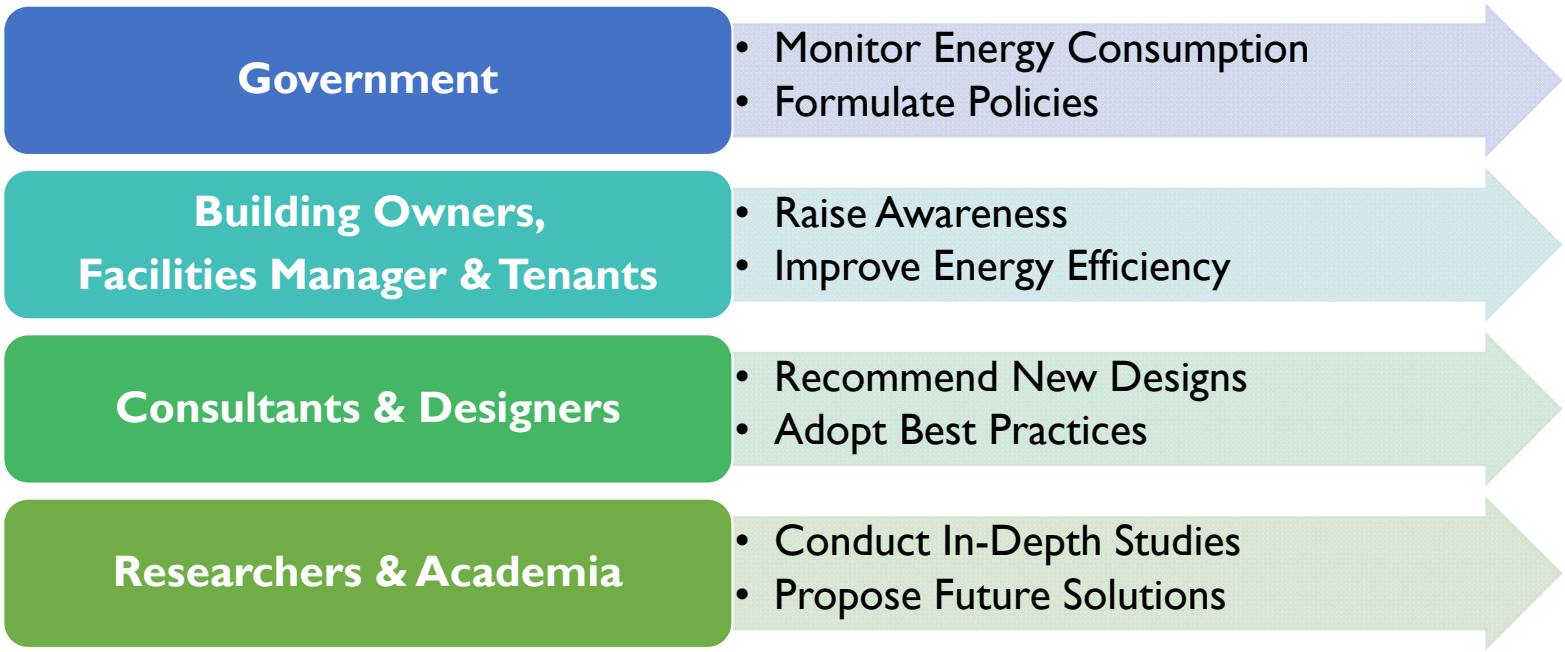
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Importance of National Building Energy Benchmarks

Benefits Various Stakeholders

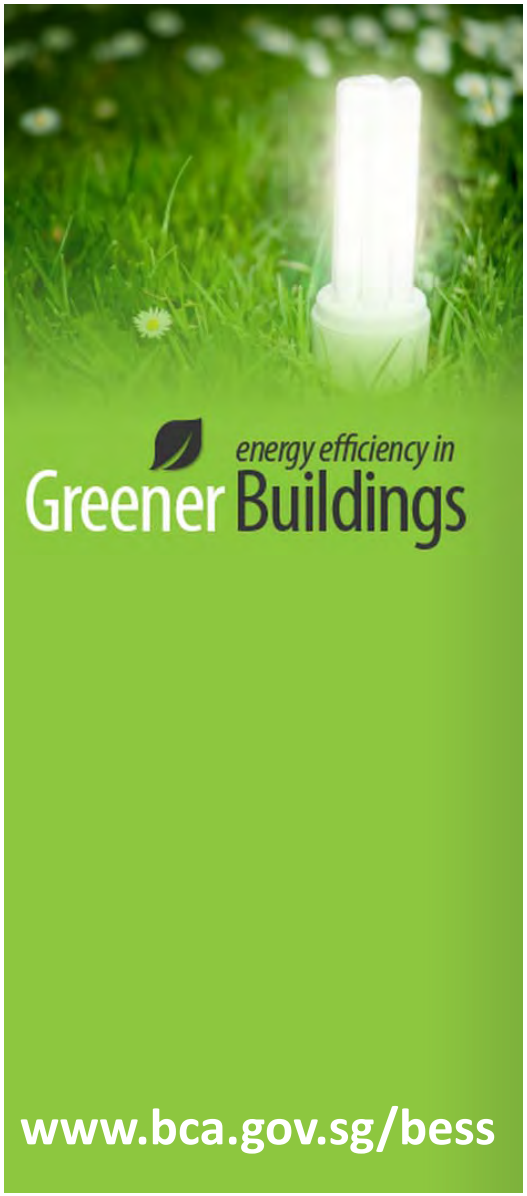


Annual Mandatory Submission

- Through Building Energy Submission System (BESS)
- Building owners of all buildings are required to:
  1. Provide energy consumption data is obtained directly from utility companies
  2. Provide basic building info such as the GFA, building activity and building systems

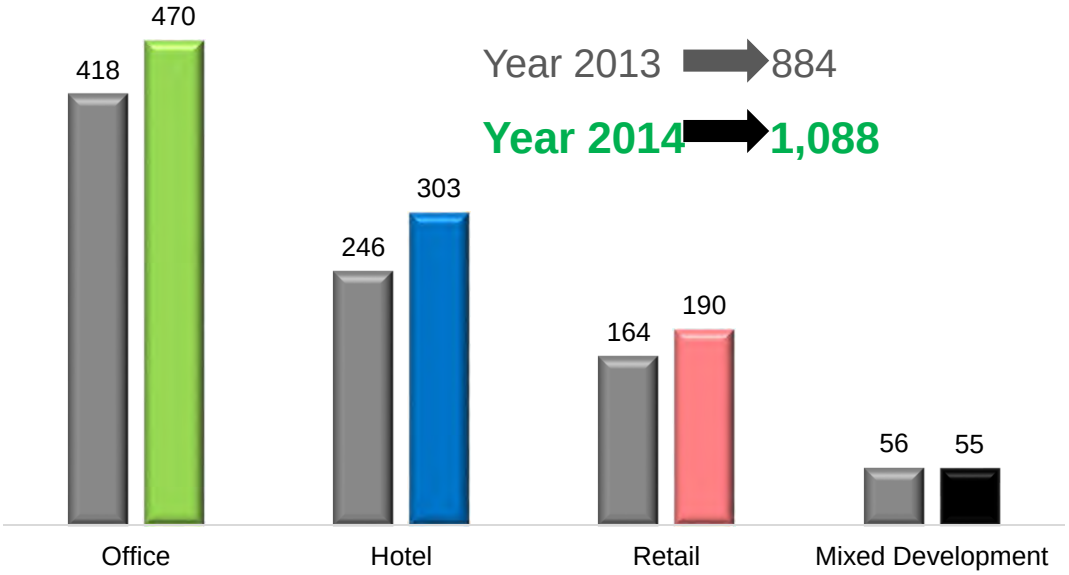
bess
Building Energy Submission System

Energy efficiency in buildings is social responsibility.
Every little effort counts to mitigate climate change.
Take action now.

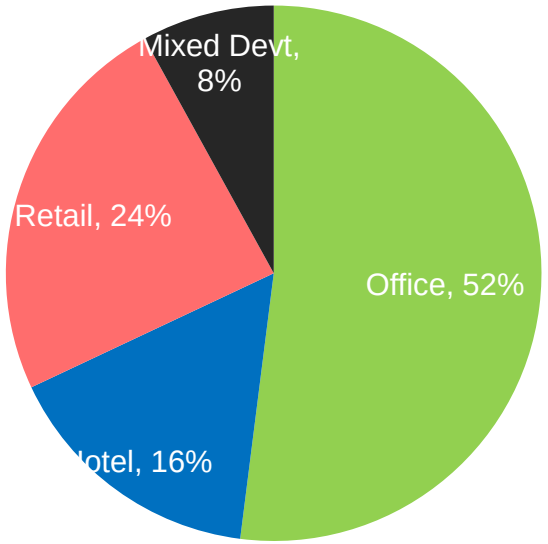


Overview of 2-year Data

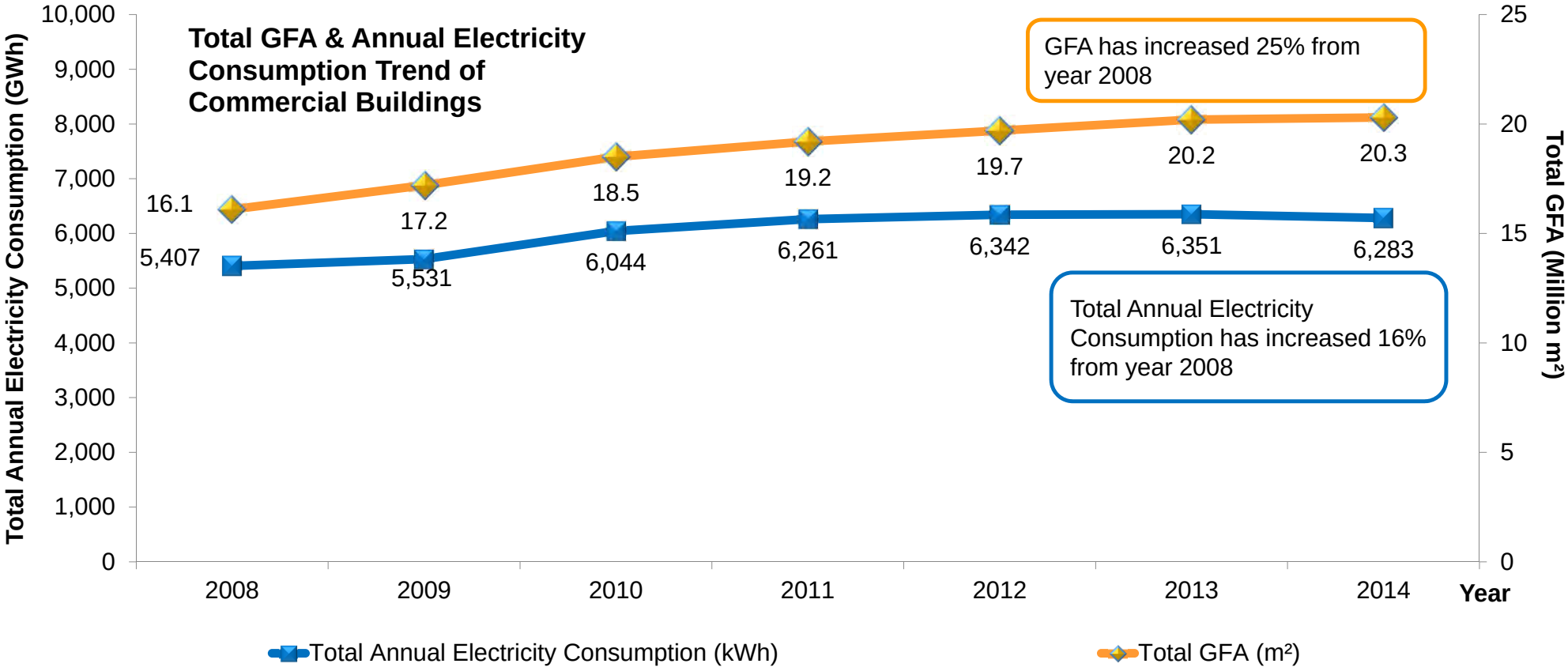
2013 vs. 2014
Total No. of Commercial Buildings Submitted



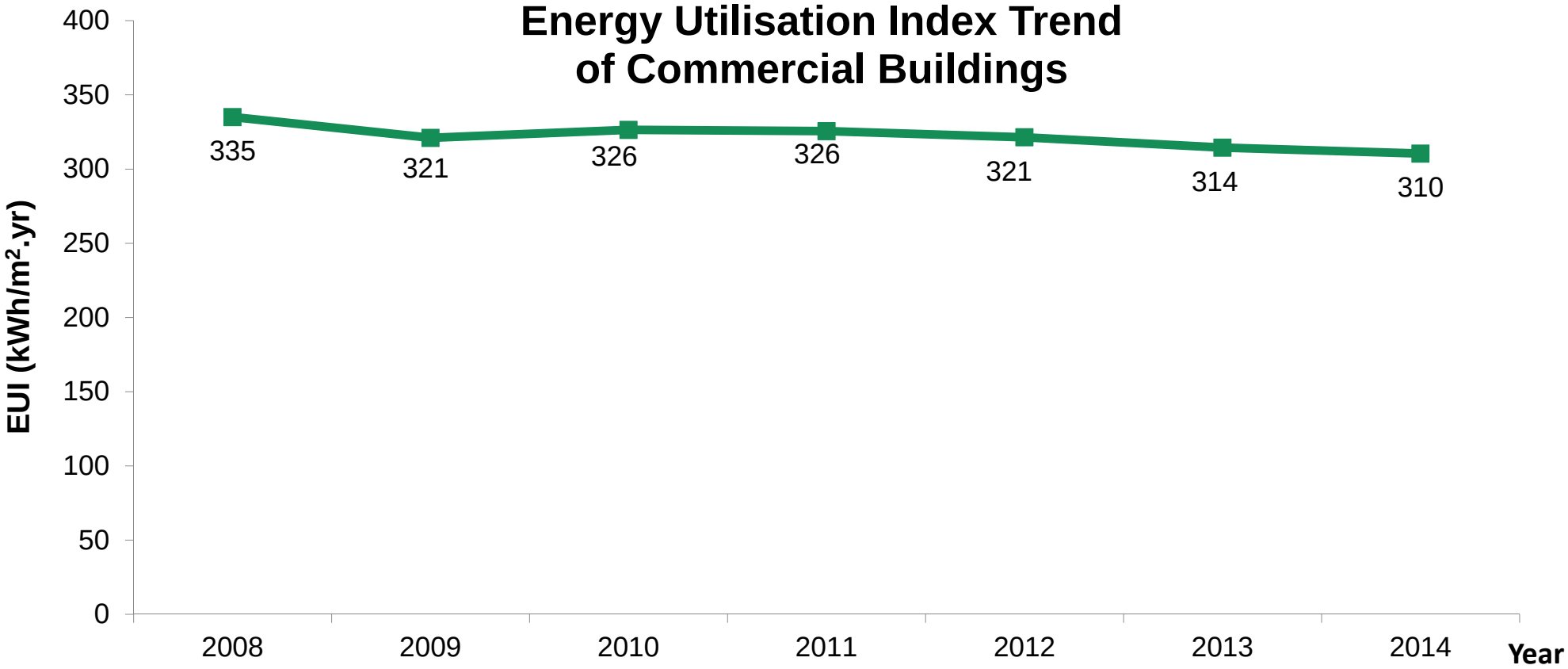
Total Gross Floor Area (GFA) Recorded in 2014 at
20.3 million m^2



Total Electricity Consumption Increase Less Than Total GFA



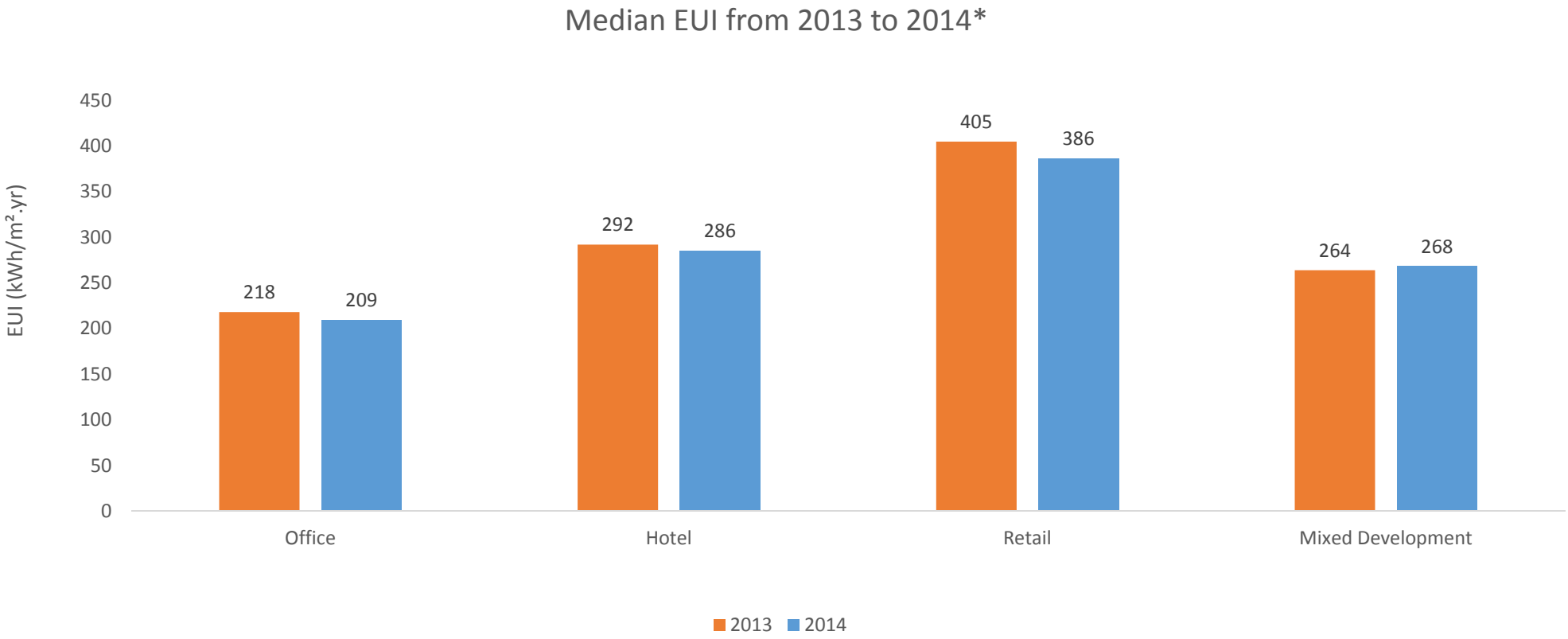
Commercial Buildings' Median EUI Improved by 7% Over 6-year Period



National Building Energy Benchmarks

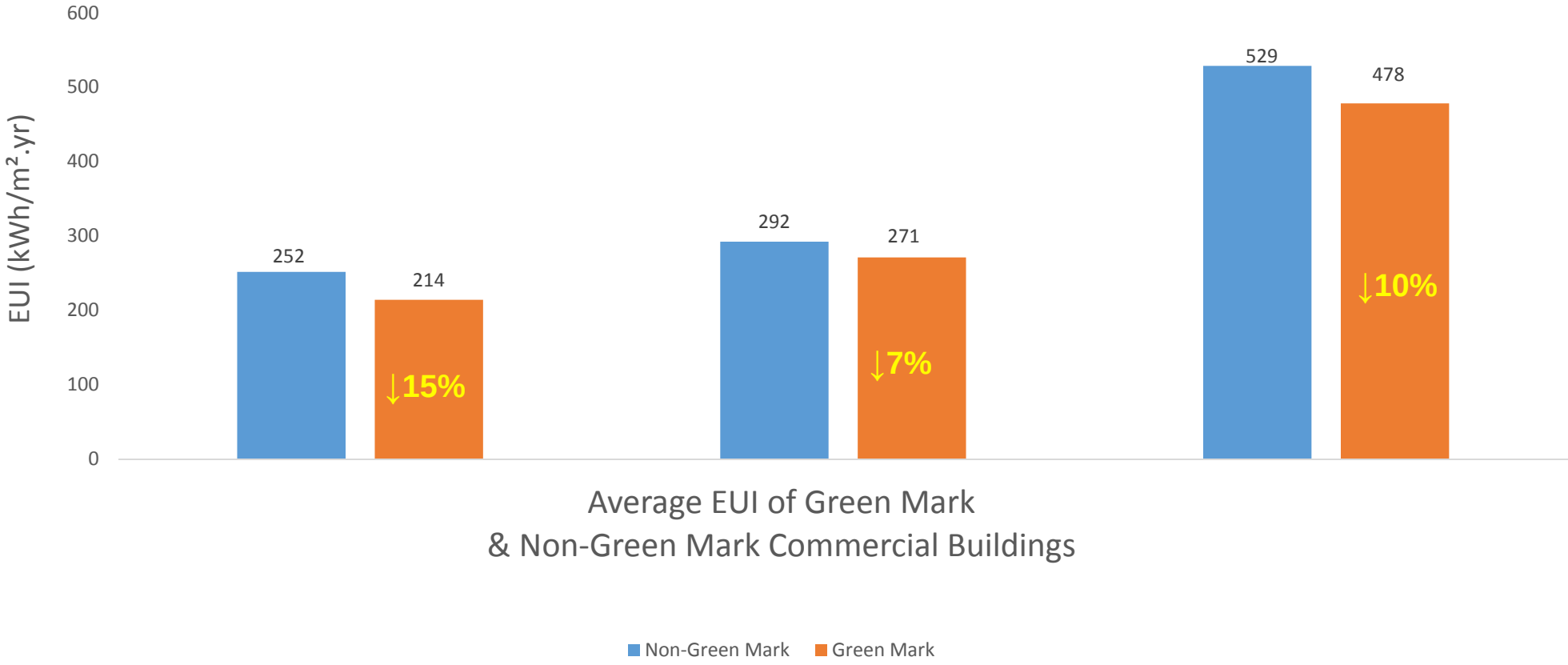
EUI (kWh/m2.yr)	Top Quartile (1 – 25%)	2nd Quartile (26 – 50%)	3rd Quartile (51 – 75%)	Bottom Quartile (76 – 100%)
Office (Large)	<172	172 - **220**	220 - 270	≥270
Office (Small)	<143	143 - **198**	198 - 267	≥267
Hotel (Large)	<242	242 - **286**	286 - 344	≥344
Hotel (Small)	<202	202 - **271**	271 - 348	≥348
Retail (Large)	<269	269 - **423**	423 - 546	≥546
Retail (Small)	<186	186 - **347**	347 - 472	≥472
Mixed Developments	<178	178 - **271**	271 - 356	≥356

Commercial buildings achieved better energy performance in 2014 as compared to 2013



*Year 2013's 783 benchmarked buildings were used for data comparison

Green Mark commercial buildings sustained better energy performance



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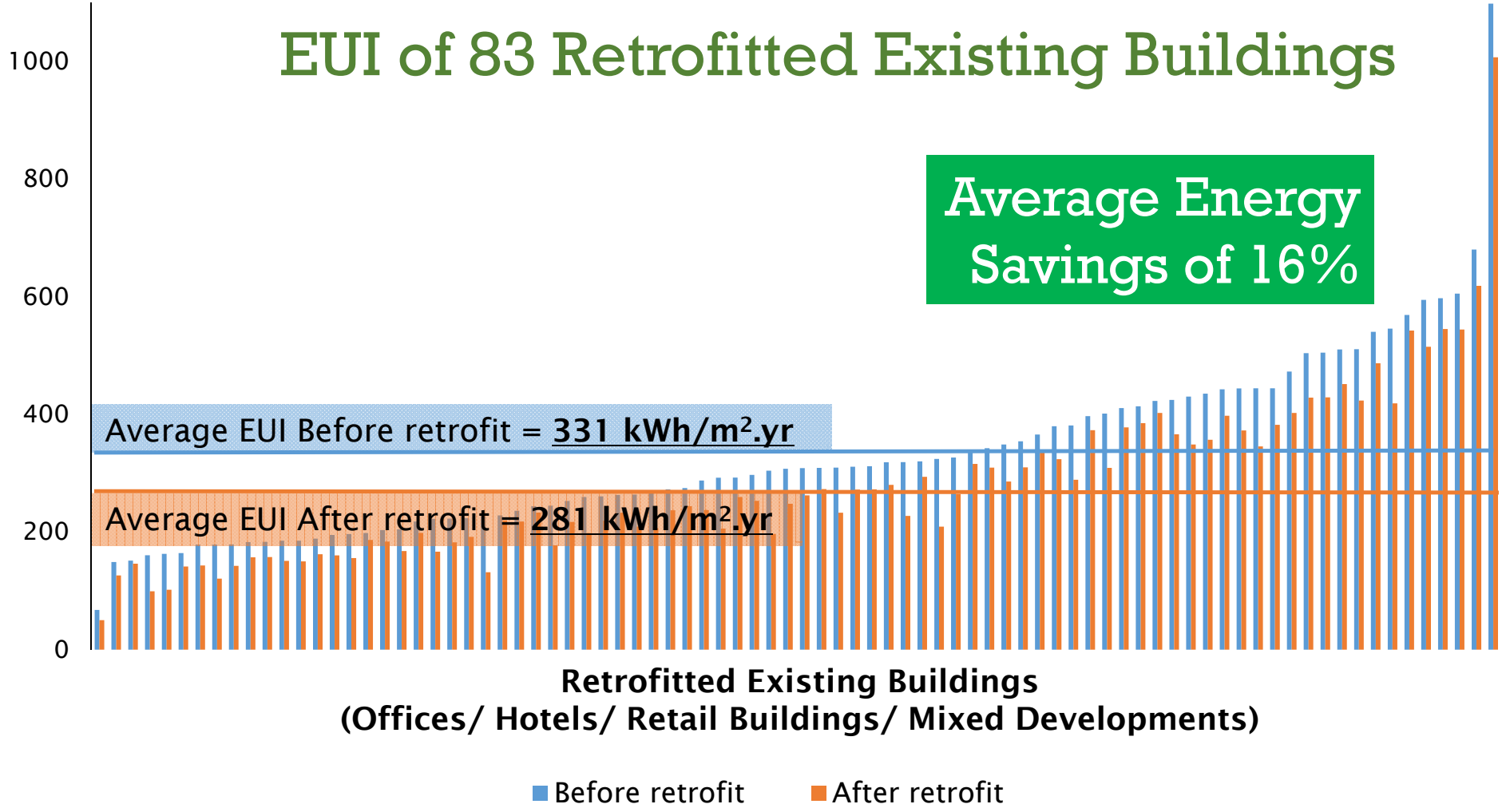
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EUI of 83 Retrofitted Existing Buildings



Graph is available in BCA Benchmarking Report 2015

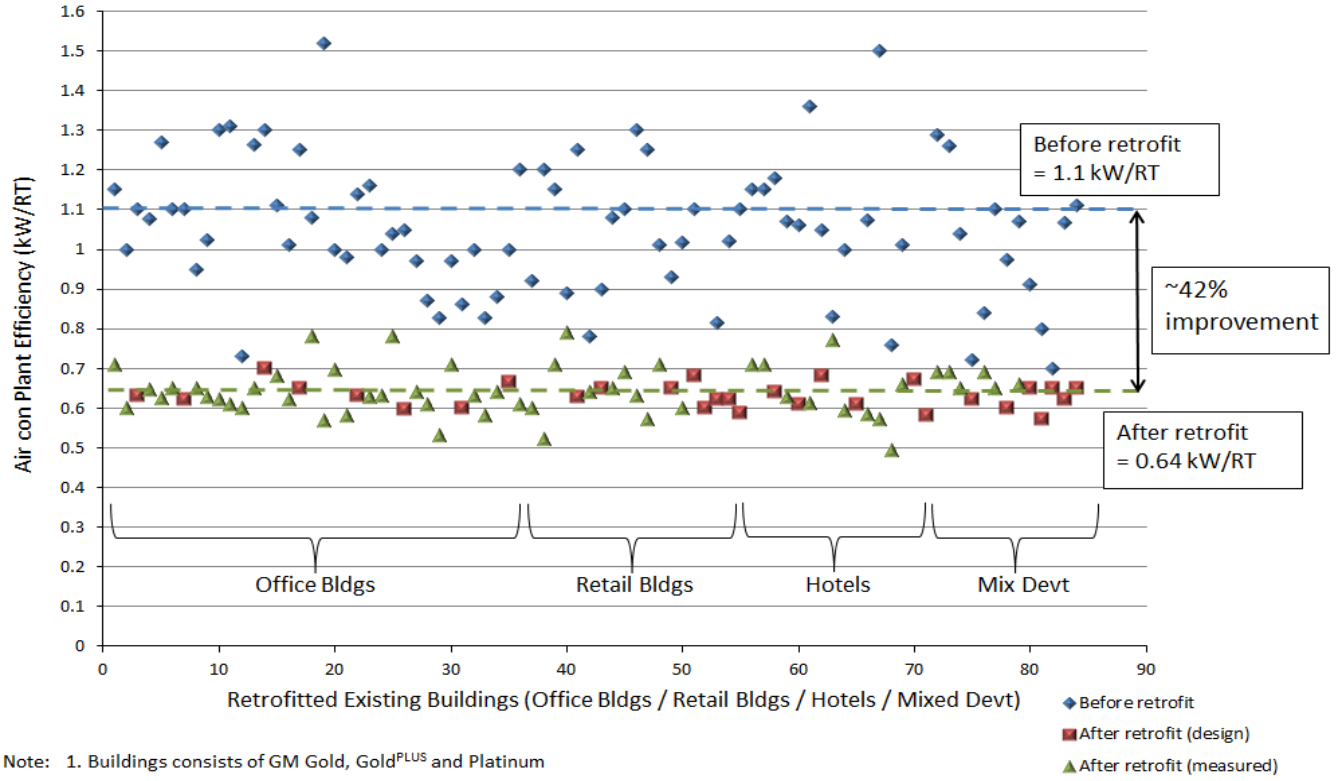
Annual Findings From Past 3 Studies

	2015	2014	2013
Building Stock	83	54	40
Average EUI Savings from Retrofits	50	49	53
Average % Savings	16%	16%	16%
Electricity Savings	165 GWh	120 GWh	90 GWh
Cost Savings @ 25 cents	$ 41.25 M	$ 30 M	$ 22.5 M

Energy Utilisation Index by Building Type (2015)

Building Type	No. of Buildings	Percentage Improvement	Average percentage Improvement	Average yearly Payback (Based on $0.25/kWh)
Hotels	16	4-37%	21%	4.0
Retail Buildings	17	5-42%	16%	5.4
Mixed Developments	13	6-23%	13%	6.1
Offices	37	3-38%	15%	6.2

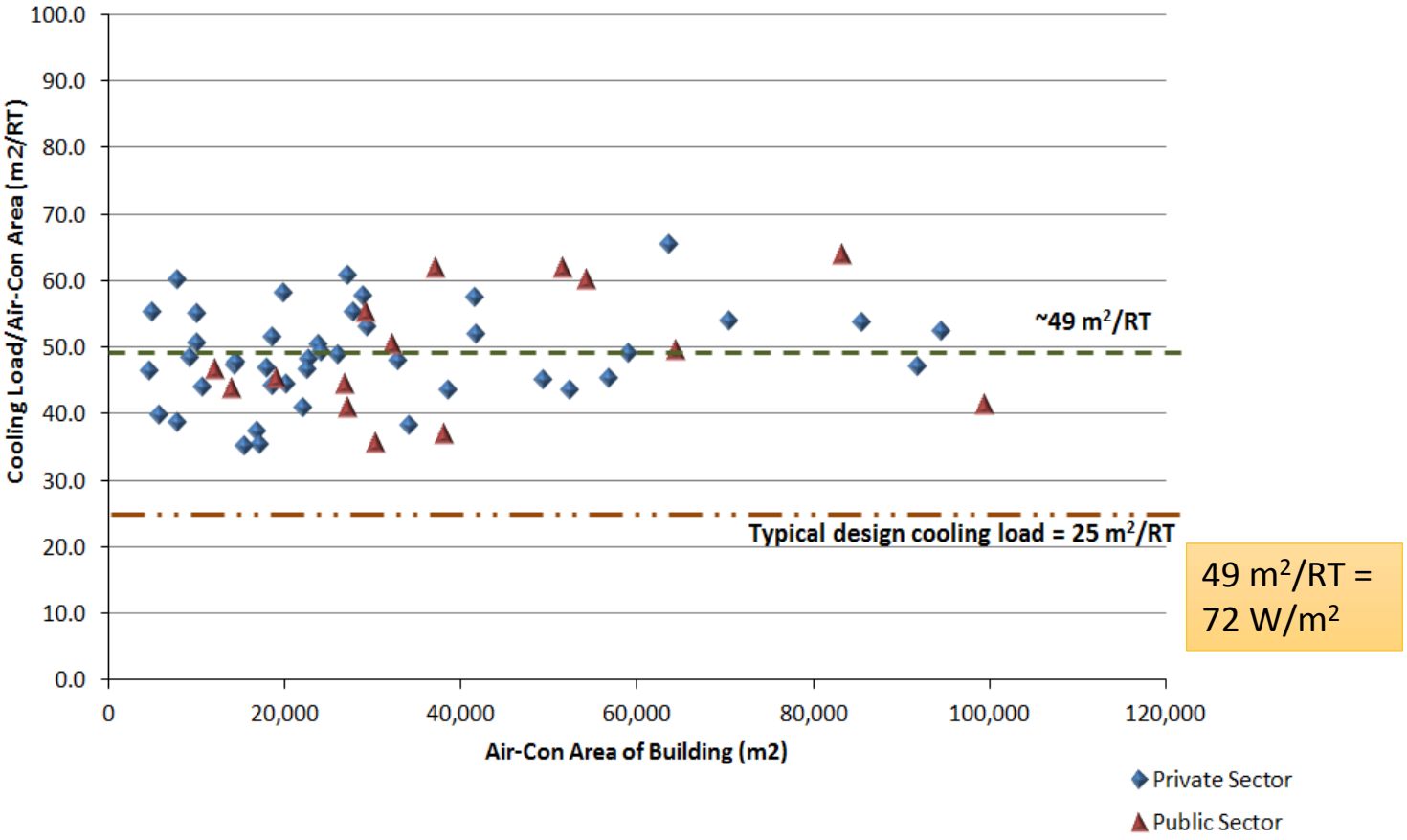
Plant Efficiency of Retrofitted Existing Buildings (kW/RT)



Note: 1. Buildings consists of GM Gold, Gold^{PLUS} and Platinum

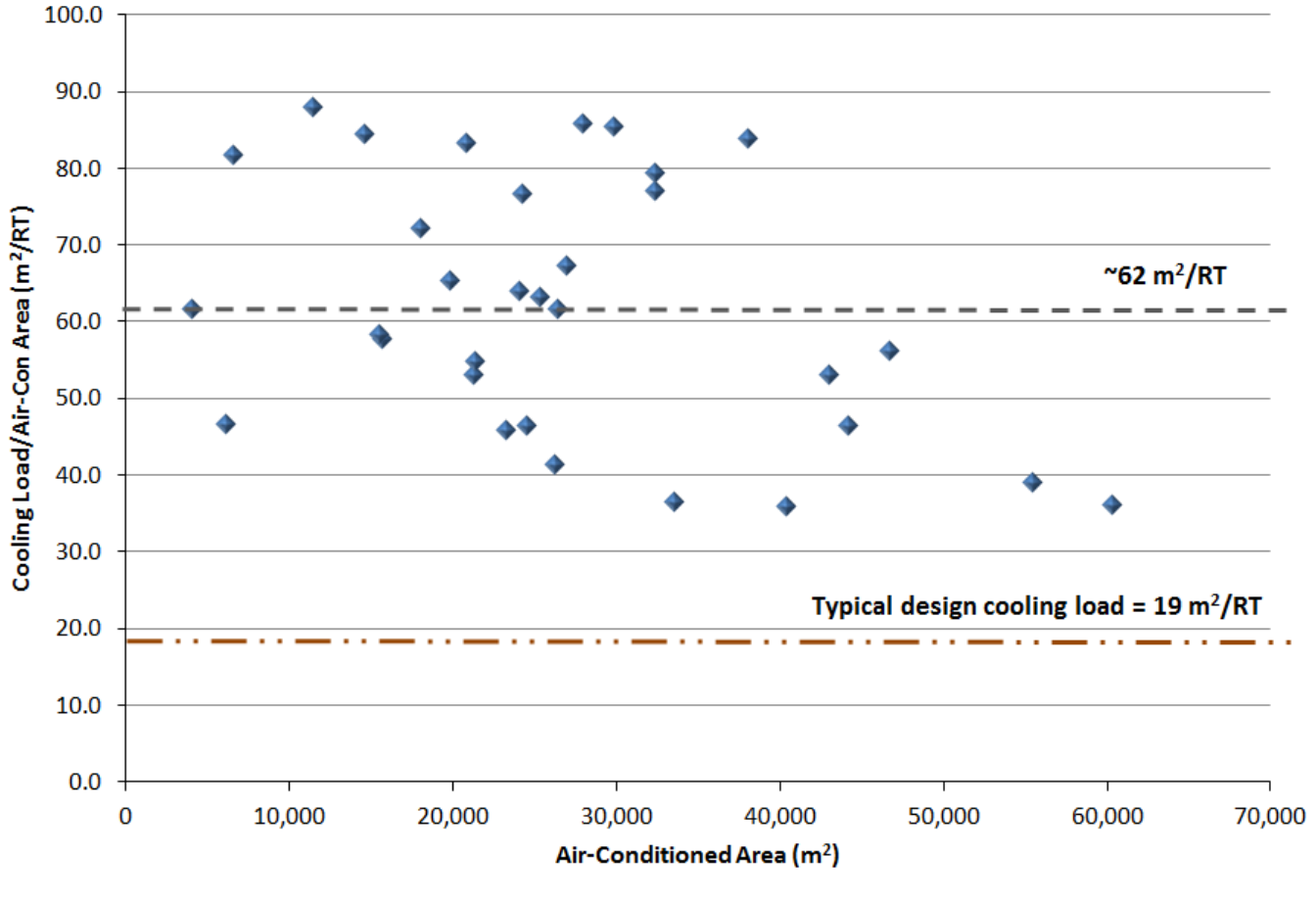
Quantum Leap in Technology Improvement (40-50%)

Audited Cooling Load - Office



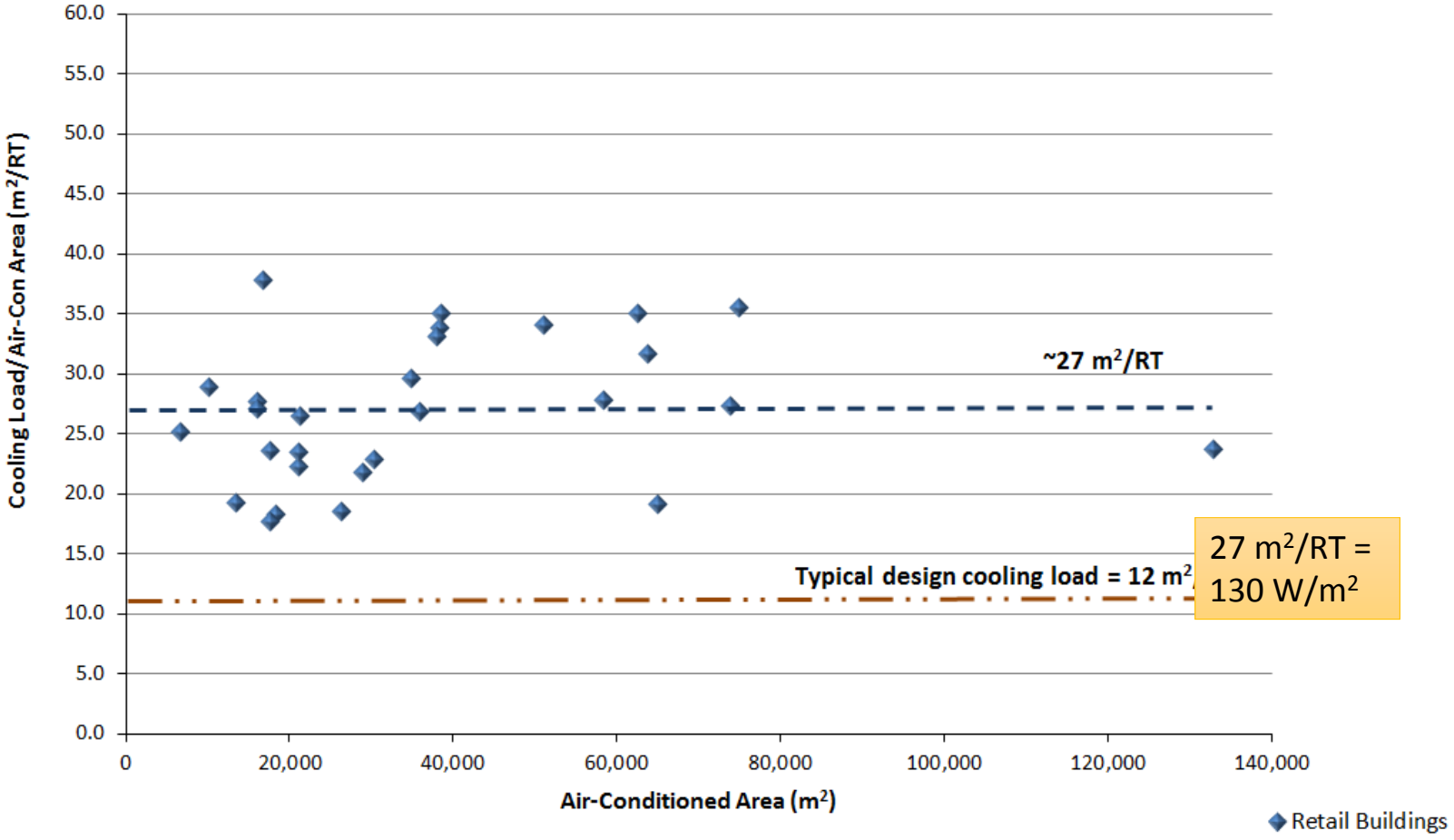
49 m^2/RT = 72 W/m^2

Audited Cooling Load - Hotel

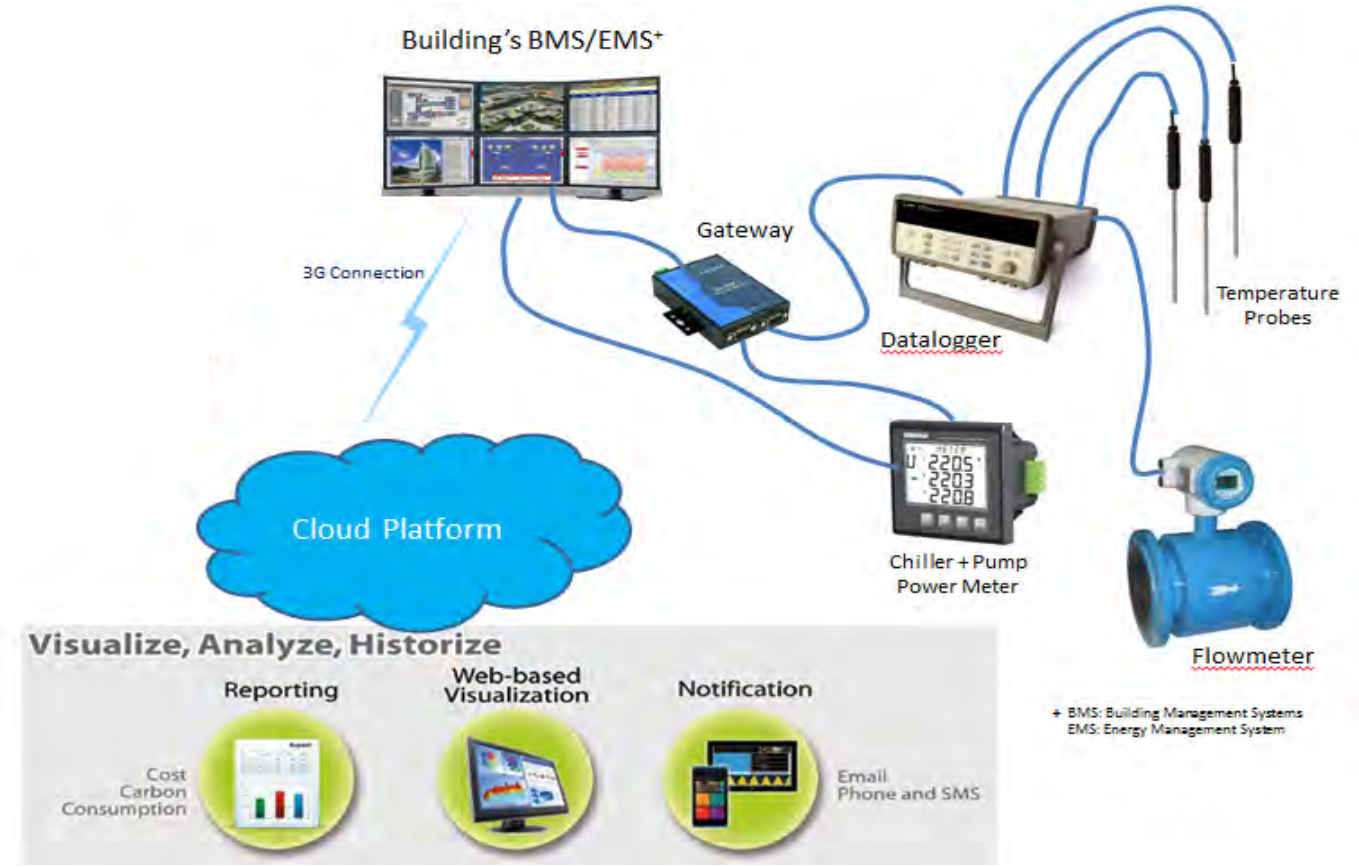


49 m^2/RT = 57 W/m^2

Audited Cooling Load - Retail

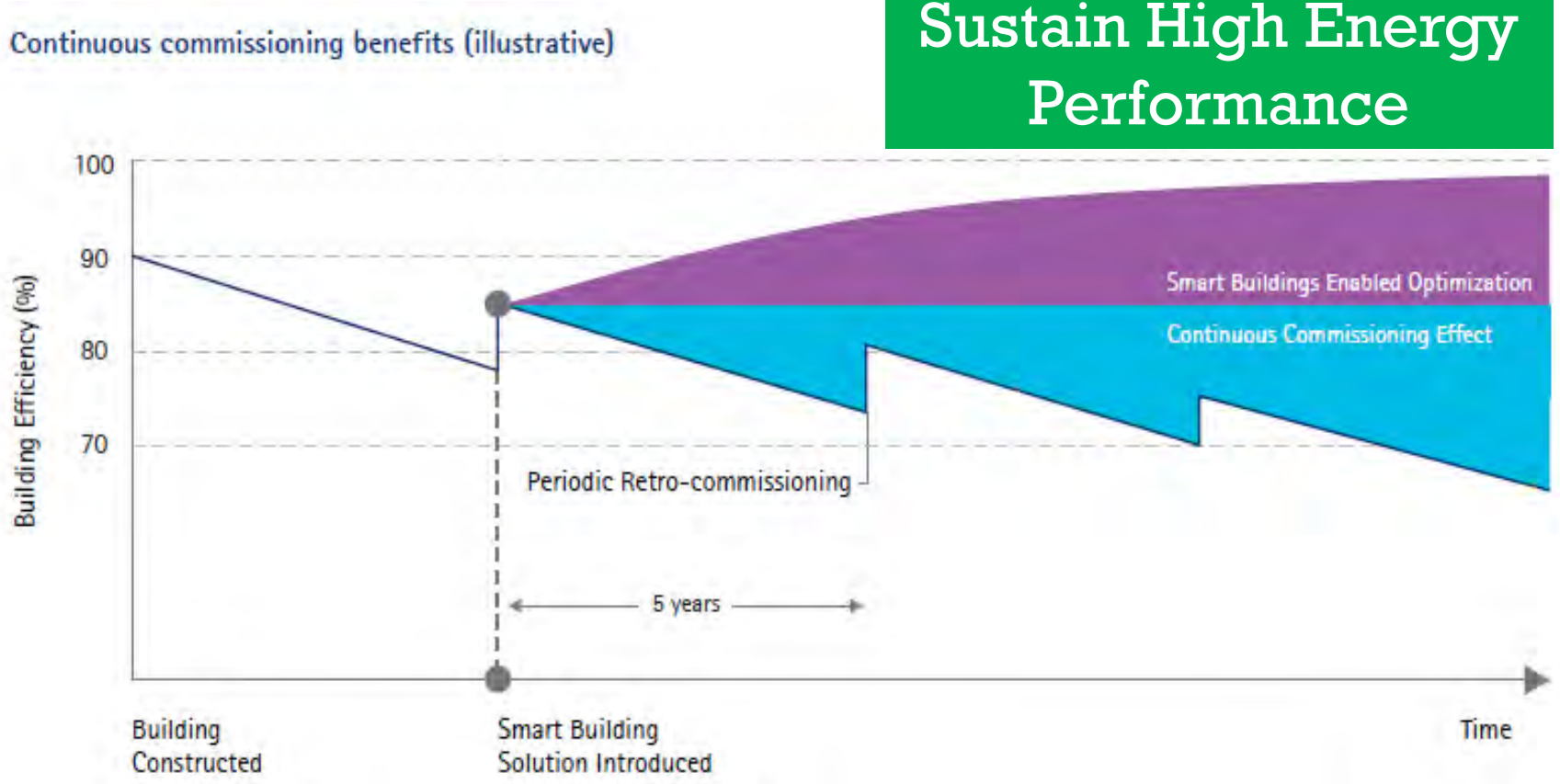


Permanent M&V Sensors

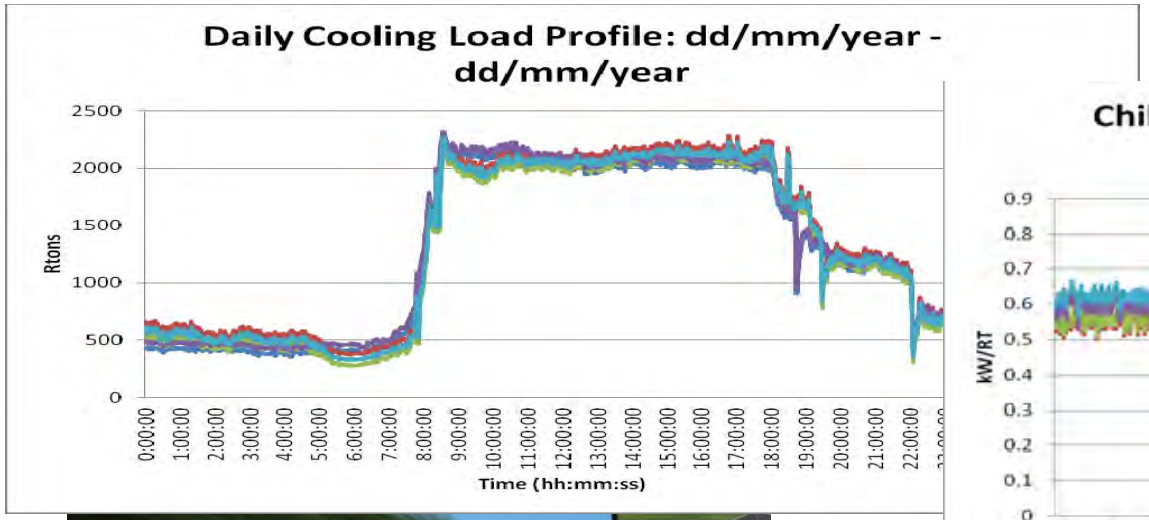


Continuous Monitoring

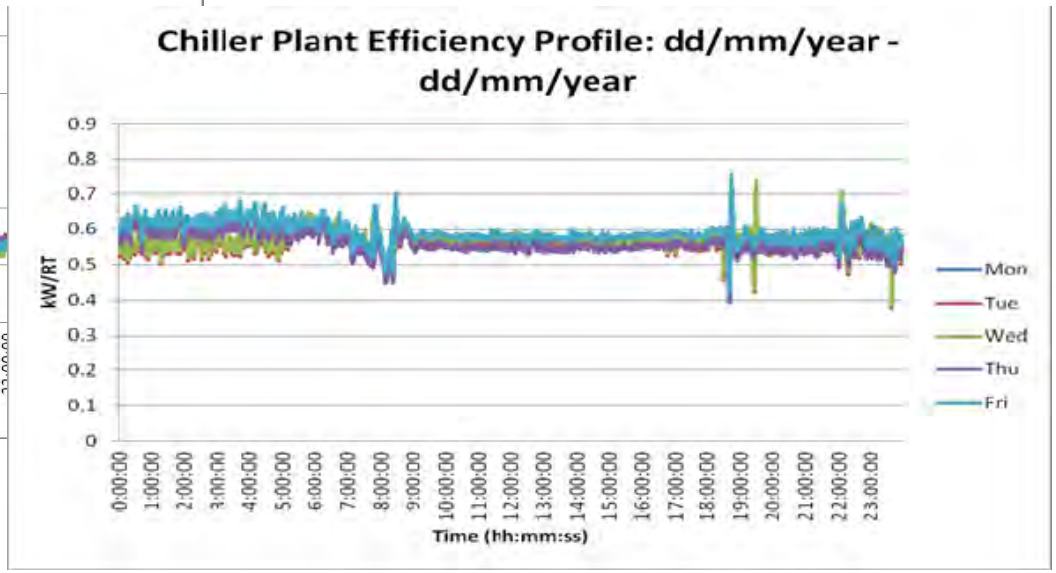
Sustain High Energy Performance



3 Yearly System Efficiency Audit







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Green Mark 2015 New Buildings (Non Residential)

- To further **stretch outcomes of sustainability** and therefore structures the criteria around this
- Add a **layer of accountability and integrity** to the projects teams in **aiding Corporations in business sustainability reporting**

Key Enhanced Areas



Climatic responsive passive design
- Leadership
- Site Context
- Building Fabric



Enhanced Solar PV adoption
- On-site generation
- Renewable energy



Greater user-centricity
- Health & Well-being
- Indoor Environmental Quality



Sustainable Construction
- Green Products
- Alternative Building Method

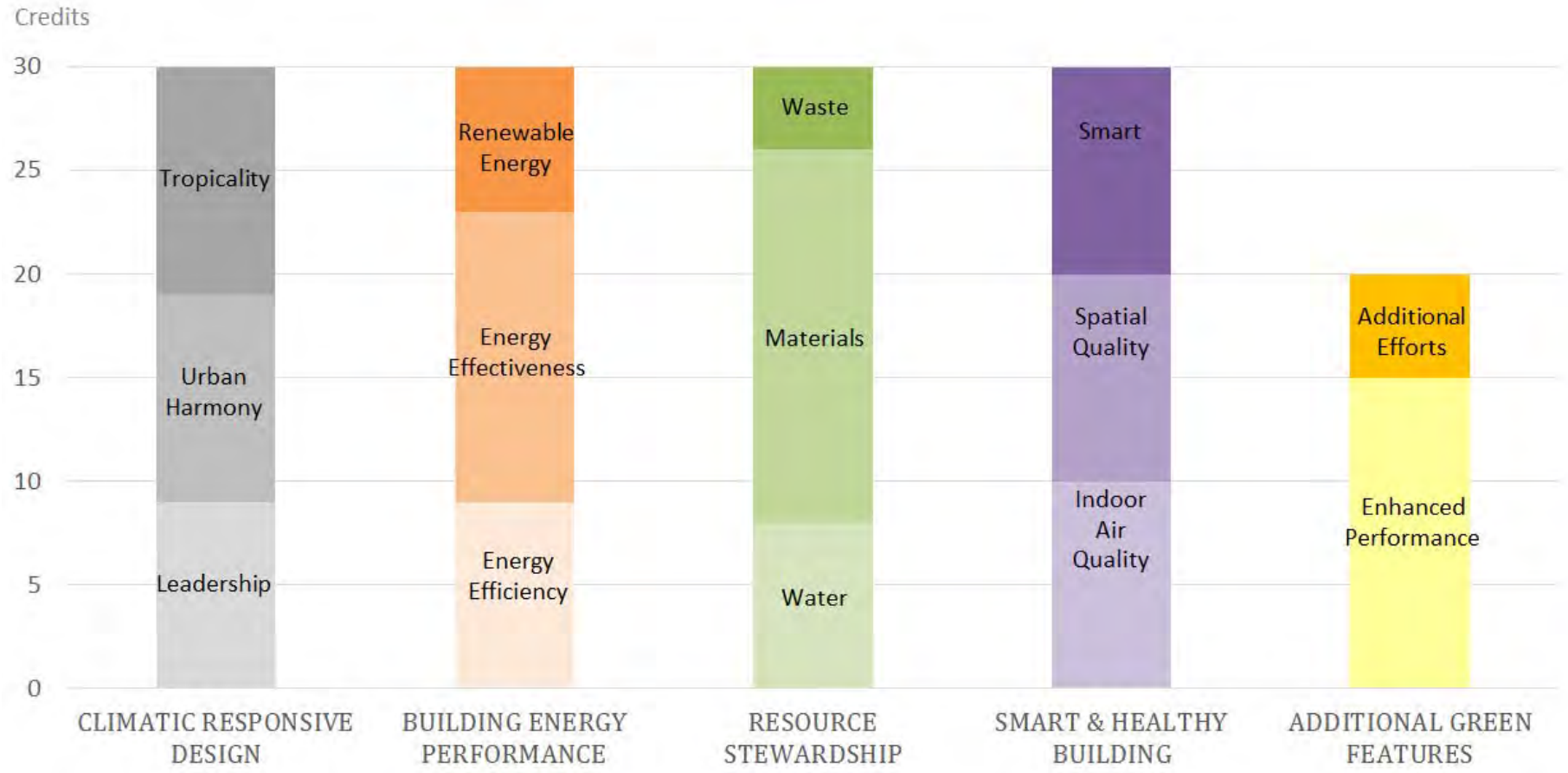


Energy Effectiveness
- Energy Efficiency
- Energy Consumption

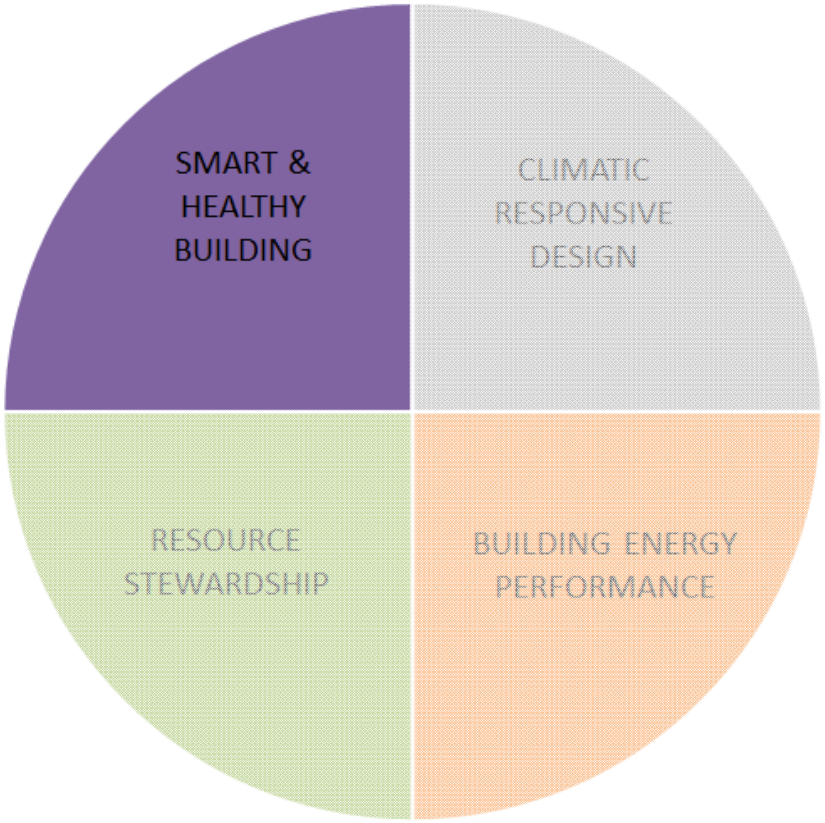


Smarter Buildings
- Integration of Technologies
- Automation
- Optimisation of Technologies

Criteria for GM2015



Criteria for GM2015



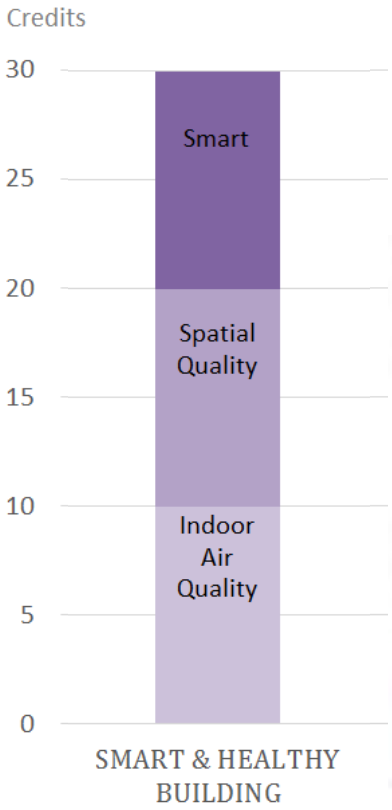
Green Mark 2015 Overview

- **4 Sustainability Outcomes**
- **5 Sections and Pre-requisite**
- **16 Criteria**
  - 4 New Areas
- **70 Indicators**
- **120 Credits**
  - 16 New + 100 Enhanced

Green Mark V4.1 Overview

- **5 Sections and Pre-requisite**
- **28 Criteria**
- **104 Sub-Criteria**
- **190 Credits**

Smart and Healthy Building



3 Criteria
10 Indicators
30 Credits

Look deeper into Smart control strategies and indoor environmental quality management





Smart
Optimise Equipment Processes
Influence Behavioural Practices

Indoor Air Quality
Filtration
Good Practices

Spatial Quality
Daylight
Acoustical Performance
Well-Being

Smart Building Operations

- Encourage the use of **automation and data and behavioural science** that enable building operators to boost and maintain energy efficiency by optimising equipment and related processes for **energy reduction and comfort requirements**



Level 1:
Energy Monitoring



Level 2:
Demand Control



Level 3:
Integration and Analytics



Level 1:
Energy Monitoring

- **Tracking building's energy**
  - Through BAS or BMS and controllers with Open Protocol to facilitate exchange of data
- **Engage building occupants in managing energy consumption**
  - Energy Portal or Dashboards for better presentation and visualisation of data (energy consumption by area or use, trend, cost, target, benchmark)
  - Web or Mobile Applications for accessibility



Level 2:
Demand Control

- **Smart control systems** for regulation of lighting and ACMV system at applicable transient and occupied areas
  - Installation of sensors: binary or occupancy based
  - At least 80% of applicable area covered by relevant sensors
  - Transient Areas: *Pantries, Toilets, Staircases, Corridors, Lift Lobbies, Carparks*

    Occupied Areas: *Offices, Meeting rooms, Classrooms, Theatres*

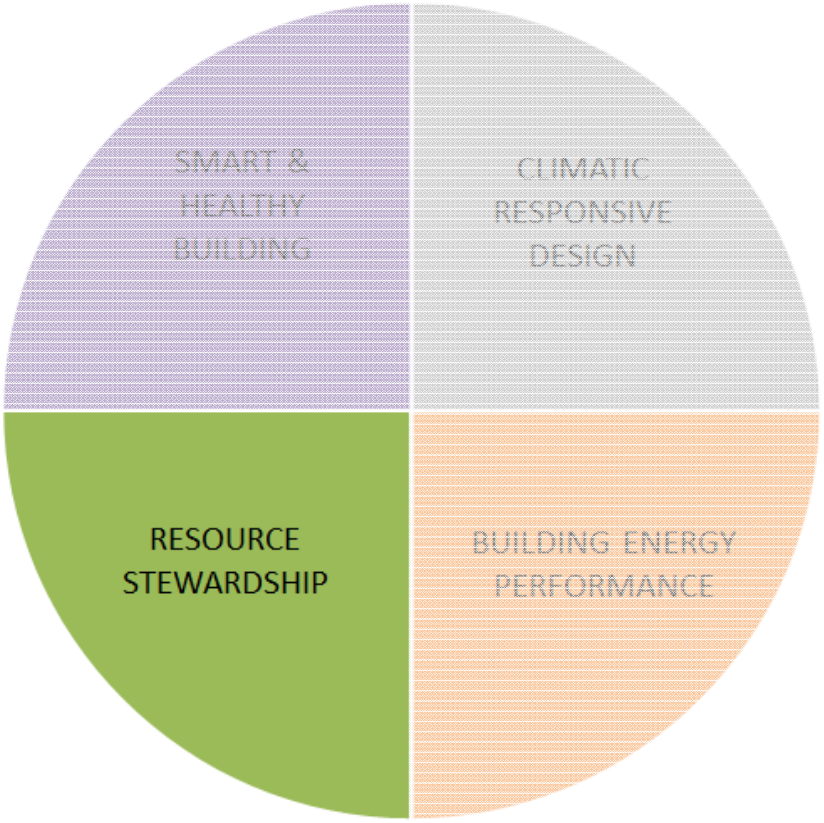


Level 3:
Integration and Analytics

- **Basic Integration and Analytics of sensor data to optimise and operate building effectively**
  - Basic Fault Detection and Diagnostics (FDD) of sensors
  - Basic adaptive control algorithm
  - Equipment exceptions monitoring

- **Advanced integration and analytics to provide enhanced efficacy in lower energy use, raise staff productivity and asset reliability, and improve user experience**
  - Advanced FDD of network of equipment
  - Integration of access system with hot-desking scheme
  - Demand Response Control
  - Use of BIM or similar applications that provide location-based visualisation of the building's state

Criteria for GM2015



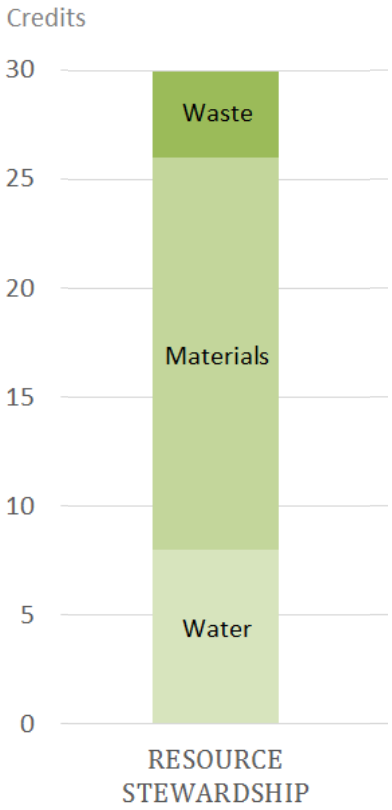
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Resource Stewardship



3 Criteria
10 Indicators
30 Credits

Acknowledges the project team's effort to reduce environmental impact (Resource)



Water
Water Saving Strategies

Materials
Sustainable Construction
Sustainable Products

Waste
Recycling systems

Singapore Green Building Product (SGBP) Labelling Scheme



Singapore Green Building Product (SGBP) Labelling Scheme

Example of Johnson Controls' Product that received SGBP Certification



YMC2 Series Centrifugal (?528kW to <1055kW)

Category: 20000000 - Ventilation, Exhaust & Air Conditioning Installation > Chillers

Company Name: Johnson Controls (S) Pte Ltd

Rating: ✓ ✓

Certificate Number: SGBP 2013-239

Certificate Period: 29 Oct 2013 to 31 Oct 2015

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Sustainable Outcomes

GM2015 aims to drive sustainability outcomes for a high quality built environment and sustainable growth for our current and future generations.

Climate Responsiveness



Conservation of Ecological Systems





Resource Stewardship



Health and Wellbeing

IGBC 2015

BUILD GREEN,
LIVE SMART

Organised by the Building and Construction Authority of Singapore and into its seventh run from 31 Aug – 6 Sep 2015. This year's theme was 'Build Green, Live Smart'. This theme calls for both the buildings and their end users to go 'green' and 'smart'.

Learning Outcomes of International Green Building Conference 2015:

Pushing Boundaries of Sustainability through stronger leadership, better engagement, passive design and active system, case studies on optimising existing building performance, renewable energy and cutting edge technologies supported by strong R&D

Entering the Smart Era by changing our understanding and management of buildings, adopting smart sensors and control systems, leveraging of data analytics, applying IoT in creating a smarter workforce and workplace

Engaging Tenants and Communities through smart technologies to empower behavioural changes, improve their lives and alleviate environmental impact



What is in store for IGBC 2016?

Working theme of IGBC 2016

Build Green: The next decade

- **Smart**
- **Sustainable**
- **Liveable**



International Green Building Conference (IGBC) 2016
Sands Expo and Convention Centre
Marina Bay Sands
Singapore

10 Bayfront Avenue, Singapore 018956

CALL FOR PAPERS 

IN JAN 2016

Indicate your interest to speak at IGBC 2016, via our website www.sgbw.com.sg/igbc2016_speaker


Thank you.
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Mr Ang Kian Seng
Group Director (Technology Development)
Building and Construction Authority