Factsheets

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Annex A

Update on Singapore Green Building Masterplan

1   At COS 2021, the latest edition of the Singapore Green Building Masterplan (SGBMP)[1] was launched under the Energy Reset pillar of the Singapore Green Plan 2030. The SGBMP was co-created by BCA and the Singapore Green Building Council in collaboration with the industry and community. It charts our transition towards a more sustainable and low-carbon Built Environment.

2   Over the past year, we have made the following progress towards the three key targets of the SGBMP, or "80-80-80 in 2030":

  a. 80% of buildings by Gross Floor Area (GFA) to be green by 2030

      i.   To date, more than 49% of our buildings (by GFA) have been greened.
      ii. In December 2021, the minimum energy performance requirements for new buildings and existing buildings undergoing major retrofits were raised.[2]
      iii. The revised Green Mark (GM) scheme was launched in September 2021, to set higher energy efficiency standards and emphasise other sustainability outcomes, such as maintainability and climate resilience.
      iv. A new Green Mark Incentive Scheme for Existing Buildings 2.0 (GMIS-EB 2.0) was launched at MND COS 2022 to help building owners undertake retrofits to achieve higher energy efficiency and sustainability standards.

  b. 80% of new developments by GFA to be Super Low Energy (SLE) buildings from 2030

      i.   Over the past year, close to 7% of new buildings (by GFA) have been certified as SLE buildings.
      ii. The requirements for public sector buildings under GreenGov.SG, which was launched in July 2021, have been raised. New buildings and existing buildings undergoing major retrofits must now meet GM Platinum SLE standards.
      iii. The Built Environment Transformation GFA Incentive Scheme was launched in November 2021 to encourage new private developments to achieve GM Platinum SLE certification, among other requirements.

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[1] More information on the SGBMP can be found at https://go.gov.sg/SGBMP.
[2] New buildings and existing buildings undergoing major retrofits are now required to achieve 50% and 40% improvement in energy efficiency over 2005 levels respectively, up from 30% and 25% previously.

iv. Requirements for developments on new Government Land Sales (GLS) sites have been enhanced. The new requirements include GM Platinum SLE certification with Maintainability Badge and will take effect from 2Q2022.

c. <u>80% improvement in energy efficiency (compared to 2005 levels) for best-in-class green buildings by 2030</u>

    i. The best-in-class green buildings have achieved 65-70% improvement in energy efficiency over 2005 levels.
    ii. The Green Buildings Innovation Cluster (GBIC) programme will continue to push the boundaries of energy efficiency through technology development and demonstration. To this end, $45 million of additional funding has been obtained for the enhanced GBIC 2.0

Green Mark Incentive Scheme for Existing Buildings 2.0

3   Buildings account for over 20% of Singapore's emissions. Greening our buildings is hence a key strategy to achieve our sustainability ambitions under the Singapore Green Plan, and to meet our international commitments on climate change.

4   To raise the energy performance of existing buildings and step up the pace to green 80% of our buildings by 2030, BCA will launch a **$63 million incentive scheme**, GMIS-EB 2.0, to help building owners lower the upfront capital cost of energy efficiency retrofits. Under this scheme, building owners can receive grants based on the emissions reduction achieved through retrofitting, subject to a cap for each project (<u>Table 1</u>). Building projects that pursue higher standards of energy performance (e.g. Super Low Energy or Zero Energy) will be eligible for higher rates of funding support. The scheme will be available from 2Q2022.

<p align="center">Table 1: Funding factor and grant cap</p>

Qualifying Criteria (GM Rating)	Funding Factor	Funding Cap
GM Platinum	$25/tCO$_2$e	$600,000 or up to 50% of qualifying cost, whichever is lower
GM Super Low Energy	$35/tCO$_2$e	$900,000 or up to 50% of qualifying cost, whichever is lower
GM Zero Energy	$45/tCO$_2$e	$1,200,000 or up to 50% of qualifying cost, whichever is lower

5   GMIS-EB 2.0 will be available to privately-owned buildings with GFA exceeding 5,000 m^2 that undergo retrofitting works to improve their energy efficiency:

a. Commercial and institutional developments (e.g. hotels, offices, retail buildings, healthcare facilities, community institutions);
b. Light industrial buildings, excluding energy savings from manufacturing, industrial and commercial processes; and

    c. Residential buildings (energy savings from common areas / services).[3]

6   Building owners will have the flexibility to employ appropriate design strategies and technologies, based on a list of works approved by BCA,[4] to improve the energy efficiency of their buildings. Some examples include:

    a. Retrofits to cooling systems, lighting and lifts;
    b. Installation of solar photovoltaics or other renewable energy sources;
    c. Installation of building automation systems and sensors; and
    d. Redesigning spaces to incorporate natural ventilation or hybrid cooling.

7   The grant will be disbursed in two tranches: (i) 30% of the estimated grant quantum upon commencement of retrofitting works to reimburse upfront expenses,[5] and (ii) the remaining 70% upon attaining GM certification, with the intended energy savings validated. To validate the energy savings, building owners will be required to take baseline measurements of their buildings' energy performance prior to retrofitting, and to submit a post-project verification report to BCA upon completion.[6]

8   Building owners are also encouraged to tap on green financing, such as the Building Retrofit Energy Efficiency Financing (BREEF) scheme and MAS's Green and Sustainability-Linked Loans Grant Scheme,[7] for their retrofitting works.

Green Buildings Innovation Cluster (GBIC) 2.0

9   Established in 2014, GBIC is intended as a one-stop research, development, and demonstration programme for technologies and innovations that lead to highly energy efficient buildings. To date, the Government has committed $72 million to GBIC, and the programme has supported the development of more than 60 innovative technologies from more than 50 firms. The GBIC programme comprises four initiatives:

    a. <u>GBIC Research & Development (GBIC-R&D)</u>. GBIC R&D aims to build deep R&I capabilities for the industry and academia. It supports research projects that are nascent but lead to significant improvements in energy efficiency with high potential for adoption.

    b. <u>GBIC Prototyping</u>. GBIC's Product Prototyping scheme supports the development of market-ready prototypes that are applicable to our local context. GBIC also has a Design Prototyping Scheme that helps developers and building owners conduct design studies and simulations to test-bed new technologies.

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[3] Common areas include circulation areas, lifts, and shared recreational amenities (e.g. function rooms).
[4] BCA will also review if other items that are not in the list can be eligible for funding.
[5] The first disbursement amount will be based on 30% of the estimated grant quantum or the interim amount paid out for retrofitting works, whichever is lower.
[6] Building owners will be required to install permanent measurement and verification instruments (e.g. temperature sensors, power meters). Building owners are also encouraged to adopt Smart Facilities Management (FM) remote monitoring systems to ensure that their buildings continue to operate efficiently throughout their lifespan.
[7] Please refer to: http://mas.gov.sg/schemes-and-initatives/green-and-sustainability-linked-loans-grant

c. <u>GBIC Demonstration (GBIC-Demo)</u>. GBIC Demo is a scheme that facilitates the demonstration of innovative technologies in operational buildings. This allows the technologies to be validated prior to wider deployment and commercialisation.

d. <u>GBIC Super Low Energy Building (SLEB) Smart Hub</u>. SLEB Smart Hub is a national database for technologies and solutions that improve energy efficiency. Its online portal and embedded resource tools allow for the creation and dissemination of actionable knowledge to the industry and research community.

10   To further push the boundaries of energy efficiency, BCA will enhance funding for the GBIC programme with a further $45 million. The enhanced programme (GBIC 2.0) will focus on three key areas. These areas were identified through technology reviews, road mapping, test bedding and industry consultations,[8] and have high potential to generate significant energy savings and be widely adopted by the industry:

a. <u>Alternative Cooling Technologies (ACTs)</u>: Air conditioning accounts for 40-60% of a building's energy consumption. GBIC 2.0 will fund R&D in novel cooling technologies that can be adapted to Singapore's tropical climate and yield at least 20-30% improvement over GM Platinum standards. Research areas include evaporative cooling[9] and reducing the use of hydrofluorocarbon (HFC) refrigerants[10].

b. <u>Data-Driven Smart Building Solutions</u>: There is significant potential to improve building energy performance through the use of Internet of Things (IoT) devices and the data they generate. GBIC 2.0 will look into solutions to integrate across different smart building systems, and to manage a building's energy demand in response to input from the electrical grid and renewable energy sources.

c. <u>Advanced Ventilation Technologies</u>: GBIC 2.0 will increase emphasis on ventilation technologies that can improve energy efficiency and contribute to better public health outcomes. This includes R&D on aerodynamic fans, building facades that improve the quantity and quality of fresh air, and ventilation systems that are calibrated according to building occupancy patterns.

11   BCA will put out a grant call for the GBIC 2.0 R&D programme and open applications for the prototyping and demonstration schemes from 2Q2022.

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[8] BCA worked with the industry and academics to develop the Building Energy Efficiency R&D Roadmap and the Super Low Energy Buildings Technology Roadmap in 2014 and 2018 respectively.
[9] Evaporative cooling relies on the evaporation of water to reduce air temperature, consuming less power than conventional compressor-based air conditioning.
[10] HFCs are a class of chemicals that are commonly used as refrigerants in air conditioning equipment. When emitted into the environment, HFCs are much more potent than carbon dioxide in contributing to global warming.

Annex B

Integrated Facilities Management and Aggregated Facilities Management Grant

1   BCA will introduce a $30 million Integrated FM and Aggregated FM (IFM/AFM) Grant to support projects with up to 70% of the qualifying costs[11] in the adoption of progressive FM procurement, processes, and technologies. The grant will support around 10-15 projects, with at least 3 buildings per project.

2   The Grant aims to:

   a. Provide service buyers and FMCs with greater confidence to adopt IFM and AFM through successful use cases across a wide range of building typologies (e.g. commercial offices, retail malls, hotels, IHL campuses, light industrial, healthcare, and retail buildings);
   b. Foster greater collaboration between Facilities Management Companies (FMCs) and service buyers to deliver multiple Smart FM services in an integrated manner; and
   c. Enhance sustainability and productivity by getting service buyers and FMCs to explore retrofitting existing buildings to address maintainability gaps.

3   Applications for the IFM/AFM Grant will start in 3Q2022, and will look at the following assessment criteria:

   a. <u>Design</u>: Service buyers and FMCs should leverage the criteria for the Maintainability Section of the revised Green Mark framework, and identify gaps in Design for Maintainability (DfM) for existing buildings to be addressed in next retrofitting cycle.

   b. <u>Technology</u>: Service buyers and FMCs should adopt highly integrated Smart FM solutions for at least 3 FM disciplines (e.g. cleaning, security, energy management), for a portfolio of at least 3 or more buildings.

   c. <u>Capability Building</u>: FMCs should demonstrate commitment to build workforce capabilities in DfM and Smart FM.

   d. <u>Procurement</u>: Service buyers should adopt IFM/AFM contracts, alongside outcome-based contracting with longer contract terms.
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[11] Some examples of qualifying costs include professional/consultancy services, physical equipment and software of proposed technology solutions, manpower and other operating expenditure for proposed technology solution

Annex C

Cities of Tomorrow Programme

1   Launched in 2017, the Cities of Tomorrow (CoT) programme is a multi-agency effort led by Ministry of National Development (MND) to identify and address challenges faced by cities through R&D solutions. The vision of CoT is to establish Singapore as a highly liveable, sustainable, and resilient city of the future, and as a vibrant urban solutions hub that features cutting-edge urban solutions. Under RIE2025, this vision will be achieved through the development of integrated R&D solutions in 5 key verticals, namely a) Advanced Construction, b) Resilient Infrastructure, c) New Spaces, d) Greater Sustainability, and e) City in Nature. These are supported by 3 enabling horizontals of Urban Environment Analytics, Complexity Science for Urban Solutions, and Smart & Advanced Facilities Management (FM).

2   BCA will be the implementing agency for around $46 million of the research funds approved under the research vertical of Advanced Construction and research horizontal of Smart & Advanced FM. This will complement BCA's role in leading and shaping the Research and Innovation (R&I) efforts and transform the BE sector to become highly productive and sustainable.

3   The vision and key research focus areas for Advanced Construction vertical and Smart & Advanced FM horizontal are as follows:

Vertical / Horizontal	Vision	Key Research Themes
Vertical 1 - Advanced Construction	To develop a highly productive, integrated and technologically advanced construction sector that can build faster and more sustainably, while optimising manpower and resources	• **Additive manufacturing** such as 3D printing technology to allow more complex structures to be built faster and more effectively using less manual labour through automated manufacturing-like processes. • **Robotics and automation** – Develop technologies and facilitate robotics deployment to streamline Design for Manufacturing and Assembly (DfMA) processes on-site and off-site to achieve greater productivity in the construction process. • **Advanced Materials for the Built Environment** – Develop cost-effective and sustainable construction materials with enhanced materials properties • **Safe and productive construction** – Drive development of innovative technologies and systems to enhance safety and improve construction productivity

		• **Advanced project management** – Enhance coordination across the construction value chain and optimise resource utilisation by leveraging smart/digital technologies
Horizontal 3 – Smart & Advanced Facilities Management (FM)	To build a high-quality facilities management sector for the built environment through the integration and efficient execution of FM disciplines (e.g. security, landscape, cleaning etc.)	• **Centralised Network Intelligence and Coordinated Deployment of Robotics for Optimal FM Operation** – Develop intelligent platform capable of centrally monitoring several FM services (e.g. cleaning, security etc.) within and across buildings, to allow building/estate-level predictive maintenance, and deployment of FM robotic fleets for improved productivity in FM services.