GBIC 2.0 R&I Challenge Call for Decarbonisation

Briefing

Green Building Policy and Technology Department,
Building and Construction Authority,
24 July 2024, 1400-1600hrs
Via MS Teams

Singapore Green Building Masterplan: Build our green future together

The SGBMP aims to deliver 3 key outcomes: '80-80-80 in 2030'

VISION

"A leading green Built Environment sector mitigating climate change and providing a healthy, liveable and sustainable Built-Environment for all"

80% of buildings to be green by 2030:

- ***Step up the pace*** of greening our buildings
- ***Raise the sustainability standards*** of our buildings

80% of new developments to be SLE from 2030:

- ***Mainstream Super Low Energy (SLE) performance of new buildings*** so that from 2030, large majority of new development would be achieving today's SLE energy performance standards

80% EE improvement (from 2005 levels) by 2030:

- ***Push boundaries in energy efficiency for best-in-class green buildings*** through research, innovation and implementation

Super Low Energy Building Technology Roadmap

I. Passive Strategies

II. Active Strategies

III. Energy Management

IV. Renewable Energy

Sunlight Shading

- Solar analysis
- Shading devices
- Interblock shading

Natural Ventilation

- Site planning & orientation
- Building massing
- Cross ventilation
- Induced ventilation
- Thermal comfort modelling

Facade & Daylighting

- High performance glass & wall
- Cool materials/greenery
- Air-infiltration control
- Air-con space reduction
- Daylight redirection

Air-conditioning

- High COP chiller with low lift & friction
- Non-compressor cooling
- Decoupled latent & sensible cooling with desiccant/membrane
- High temperature cooling using radiant / convective / hybrid effect

Mechanical Ventilation

- Displacement ventilation
- Personalised ventilation
- High Volume Low Speed fan
- Brushless DC motor

Lighting Technologies

- High efficiency LED
- Dimmable lighting
- Digitally addressable lighting

Building Automation

- Fault detection and diagnostics (FDD)
- Energy Management System
- Occupancy sensoring & demand control
- Weather sensing & system resetting

Smart Control

- Model predictive control
- Machine learning
- IOT integration with BMS
- Personalised control of lighting/ACMV

Plug Load Management

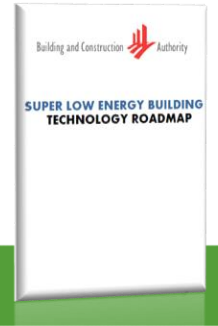
- Smart plug
- Load monitoring and tracking
- Sleep mode optimisation

Roof & Site Optimisation

- Maximising roof and façade spaces
- Site planning for solar utilization

PV Technologies

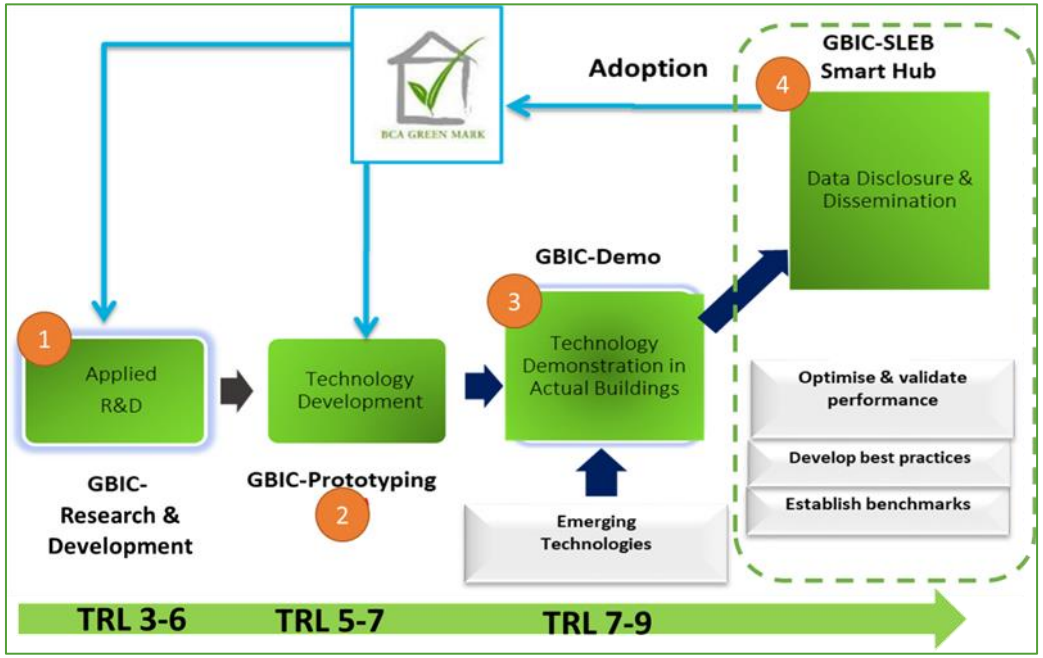
- Highly efficient module
- Anti-shading design
- Anti-degradation system
- High performance BIPV
- PV integration with greenery
- PV energy management



Find out more here!

Green Buildings Innovation Cluster (GBIC) Programme

One-stop research, development and demonstration platform for technologies and innovations that lead to highly energy efficient buildings



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Innovative Technologies

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Supported Firms

Find out more here!

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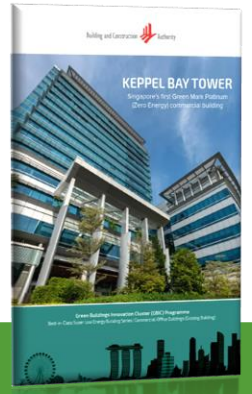

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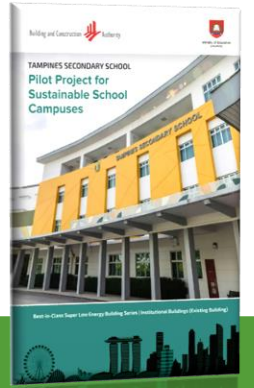
Keppel bay Tower



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Tampines Secondary School

Examples of past GBIC R&I projects

Building: Sim Lim Square
Solution provider: Ampotech Pte Ltd

A **smart energy management system** to achieved similar monitoring capabilities as the existing BMS system at approximately 3% of the solution cost and lowered the implementation time from 12 weeks to 7 days.

Building: Chinatown Point
Solution provider: Advanced Digital Sciences Center Kaer Pte Ltd

A **data-driven chiller plant optimisation system** to achieve 10-15% energy saving for chiller plants without additional hardware.

Building: Tampines Grande
Solution provider: Hitachi Asia Ltd

An **integrated smart building platform** to automate building management to achieve about 23% building energy saving.

Building: Holiday Inn Express at Orchard
Solution provider: Natflow Pte Ltd

An **Intelligent Hot Water System** estimated to save 90% of recirculation energy loss and reduce 60% hot water demand.

GBIC 2.0 R&I Challenge Call for Decarbonisation
Schemes

This Research & Innovation (R&I) Challenge Call covers two schemes:

	R&D	Product Prototyping
Intent	Support **development of high impact solution** to be ready for piloting upon completion.	Support **refinement of innovation** to be ready for piloting upon completion.
Target Group	Solution provider from private sector[1] or research institute as lead with building owner/developer as sponsor/adopter.	Solution provider from private sector[2] as lead with research institute as collaborator, building owner/developer as sponsor/adopter.
Technology Readiness Level	Start TRL: 3 End TRL: 7-8	Start TRL: 5 End TRL: 8
Funding	Up to 70% for private sector[1], 100% for IHL/RI Funding size to be reviewed case-by-case basis.	Up to 70% for private sector[2], 100% for IHL/RI Cap at S$500,000 per project.
Project Duration	Up to **two years**	Up to **one year**
Desired Outcomes	• Technologies achieve at least 30% better than current GM 2021 Platinum standards or existing best-in-class solutions, whichever is better. • Commercially viable solutions with good ROI (i.e. potential payback of 3 – 5 years)	• Technologies achieve at least 25% better than current GM 2021 Platinum standards or existing best-in-class solutions, whichever is better. • Commercially viable solutions with good ROI (i.e. potential payback of 3 – 5 years)

[1] Funding for private entities for R&D projects of total project budget >$0.5M would be conditional on collaboration with a public research performer.
[2] Funding for private entities for Product Prototyping projects of total project budget >$2M would be conditional on collaboration with a public research performer.

GBIC 2.0 R&I Challenge Call for Decarbonisation

Project Phases

The project will consist of two phases:

Phase 1: Development	Development of a working prototype of the proposed solution.
Phase 2: Performance Validation	The developed solution to be testbedded in an operational environment at actual building spaces, preferably high energy consuming building typologies such as the commercial offices, retail spaces, and hotels to validate energy saving target, thermal comfort and indoor air quality.

Note:

Applicants could still submit their proposals before the closing date if they have not identified the building spaces for testbedding. Applicants can update BCA on the identified building spaces for testbedding, before the commencement of the Project Evaluation Panel meeting tentatively scheduled in Oct/Nov 2024.

GBIC 2.0 R&I Challenge Call for Decarbonisation
Focus Areas

GBIC 2.0 is pushing the next bound of decarbonisation through passive, active and smart strategies through 3 broad areas:

Innovative Cooling Technologies | Data-Driven Smart Building Systems | Advanced Building Ventilation Solutions

Scope (at least one of the scope):

- Develop cost-effective, compact non-vapour compression cooling system and evaporative cooling system (using water as refrigerant) with good dehumidification control suitable for large building indoor applications for tropical climate environment conditions.
- Review various possible combination of multiple modes of hybrid AC and natural ventilation systems that could address air momentum, condensation, low cooling capacity and humidity control challenges.
- Solutions developed are required to be compact, durable, cost effective and low maintenance with high energy efficiency, Indoor Air Quality (IAQ), and thermal comfort performance.

Examples (non-exhaustive):

- Non-vapour compression technologies
- Integrated advanced dehumidification system with evaporative cooling
- Advanced energy recovery technologies for building applications

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Innovative Cooling Technologies	**Data-Driven Smart Building Systems**	Advanced Building Ventilation Solutions

Scope (at least one of the scope):

- Understand the impacts of multiple Distributed Energy Resources (such as solar PV) and to co-optimise demand flexibility for the grid and building owners and occupants to improve building EE and support better integration of renewable energy, energy storage, etc. through smart technologies like advanced sensors and controls and data analytics.
- Explore how cutting-edge smart building technologies can be interoperable integrated across different smart systems and building sub-systems to achieve greater energy savings with lower cost by sharing information and data.
- Innovation in sensing technologies (e.g. IoT based digital solutions) to more accurately sense the room thermal condition felt by occupants and change in activity level for control and monitor the system efficiency and health under the fluctuating conditions.
- Study the daylight use and optimally balance the lighting energy performance and cooling load, occupants' behaviour and total energy consumption.
- Establish innovative M&V tools to quantify and qualify the benefits of energy-efficient smart solutions in a simple, credible, and cost-effective way.

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Innovative Cooling Technologies	**Data-Driven Smart Building Systems**	Advanced Building Ventilation Solutions

Examples (non-exhaustive):

- Grid-interactive efficient building solutions
- Interoperability & integration of smart systems and building sub-systems
- Smart occupant ventilation system integrated with AI to provide adaptive cooling and ventilation

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Innovative Cooling Technologies	Data-Driven Smart Building Systems	**Advanced Building Ventilation Solutions**

Scope (at least one of the scope):

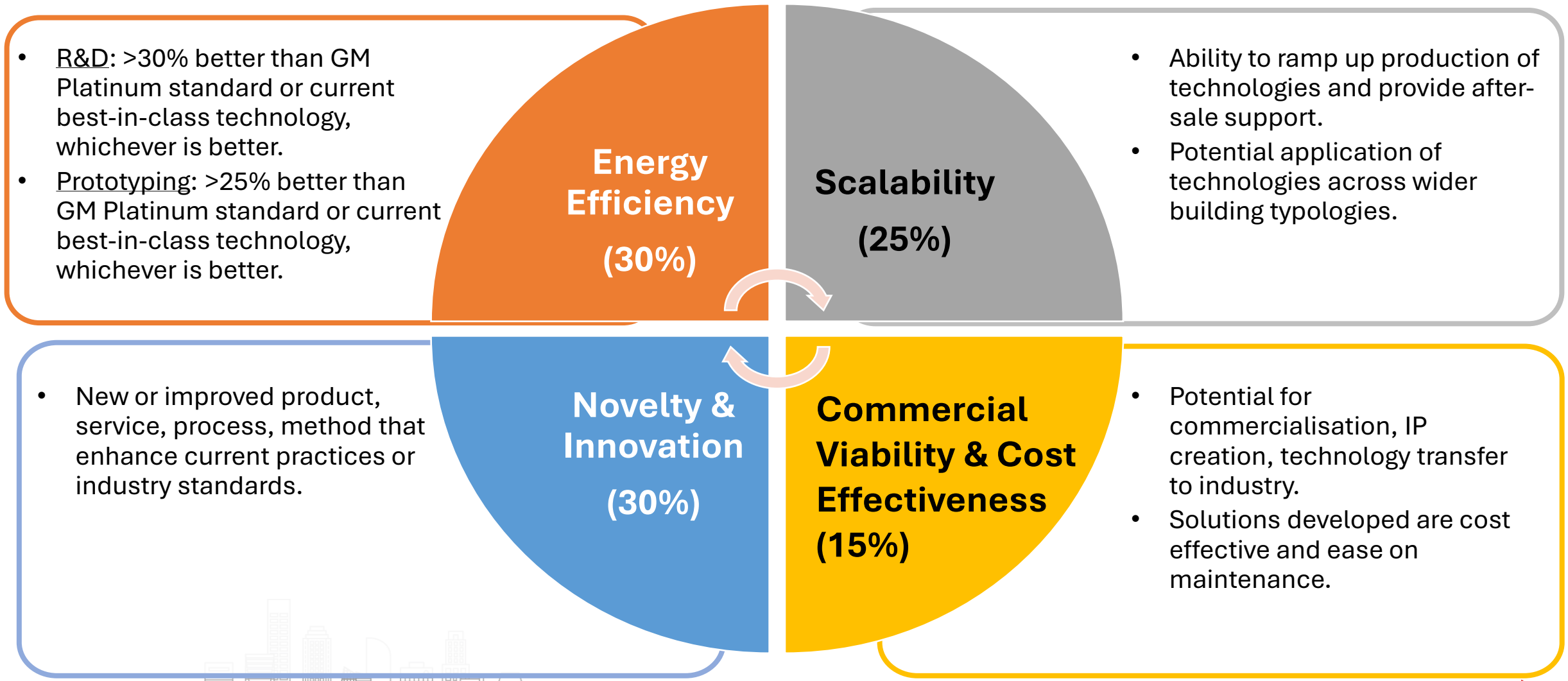
- Develop novel, cost effective materials and designs, such as permeable facade and breathing facades which will reduce indoor humidity within the building using porous materials.
- Study the integration between the façade as a building skin with other building systems e.g. ACMV, BMS, to achieve greater energy savings.
- Study the occupant ventilation system relying on improved monitoring of occupancy conditions (i.e. presence, comfort, and adaptive behaviour) and incorporation of these parameters into control strategies in a timely fashion to reduce unnecessary energy usage.
- Review and identify the key factors of aerodynamic fans combining with natural ventilation (NV) and evaluate the effectiveness of the solutions including energy efficiency and ventilation effectiveness.

Examples (non-exhaustive):

- Smart ventilation system based on climate-responsive solutions
- High energy efficient air filtration system
- Advanced building envelope system that incorporates fresh air intake into façade systems reducing cooling load and improving humidity control & IAQ.

GBIC 2.0 R&I Challenge Call for Decarbonisation

Evaluation Criteria for R&I



- R&D: >30% better than GM Platinum standard or current best-in-class technology, whichever is better.
- Prototyping: >25% better than GM Platinum standard or current best-in-class technology, whichever is better.

- Ability to ramp up production of technologies and provide after-sale support.
- Potential application of technologies across wider building typologies.

- New or improved product, service, process, method that enhance current practices or industry standards.

- Potential for commercialisation, IP creation, technology transfer to industry.
- Solutions developed are cost effective and ease on maintenance.

GBIC 2.0 R&I Challenge Call for Decarbonisation
Submission Timeline

Submission:
Please submit through the Integrated Grant Management System (IGMS) at https://www.researchgrant.gov.sg/ with the supporting documents by **13 Sep 2024, 2355 hours** (Singapore time).

Important
Applicants can download the required documents from the SLEB Smart Hub.
In the event of technical difficulties with the IGMS platform, submissions can be made via email to BCA_Challenge_Call@bca.gov.sg while the issues are being addressed.

https://go.gov.sg/decarbonisationchallenge

For more information on the Challenge Call, please visit https://www1.bca.gov.sg/buildsg/buildsg-transformation-fund/green-buildings-innovation-cluster-gbic-programme

Any question, please write to BCA_Challenge_Call@bca.gov.sg.

Application and Evaluation Process for Challenge Call

Key Timeline

15 Jul 24 — Launch of Challenge Call

24 Jul 24
- Briefing on Challenge Call
- New applicants to apply for IGMS account

13 Sep 24
- Close of R&I proposal submission
- *Proposals are to submitted via IGMS*

Oct - Nov 24
- Shortlisted applicants will be notified and will be required to present to Project Evaluation Panel for evaluation.
- Applicants are to update BCA on identified building spaces for testbedding (if the submitted proposal have not identified the building)

Mar 25
- Notification on award of proposal

Thank you

@BCASingapore

Any other questions, please email to us at BCA_Challenge_Call@bca.gov.sg

Table 1: Technology Readiness Level Descriptions

The Technology Readiness Level (TRL) is widely used indictor of the degree of development or a technology toward deployment, measured on a scale of 1-9.

Level	Definition	Description
TRL 1	Basic principles observed and reported	Lowest level of technology readiness. Scientific research begins to be translated into applied research and development. Examples might include paper studies of a technology's basic properties or experimental work that consists mainly of observations of the physical world.
TRL 2	Technology concept and/or application formulated	Once basic principles are observed, practical applications can be formulated. Applications are speculative and there may be no proof or detailed analysis to support the assumptions. Examples are limited to analytic studies.
TRL 3	Analytical and experimental critical function and/or characteristic Proof of Concept	Active research and development is initiated. This includes analytical studies and laboratory studies to physically validate analytical predictions of separate elements of the technology. Examples include components that are not yet integrated, or representative tested with simulants.
TRL 4	Component and/or system validation in laboratory environment	The basic technological components are integrated to establish that the pieces will work together. This is relatively "low fidelity" compared with the eventual system.
TRL 5	Laboratory scale, similar system validation in relevant environment	The basic technological components are integrated so that the system configuration is similar to (matches) the final application in almost all respects. Examples include testing a high-fidelity, laboratory scale system in a simulated environment.
TRL 6	Engineering/pilot-scale, similar (prototypical) system validation in relevant environment	Engineering-scale models or prototypes are tested in a relevant environment. This represents a major step up in a technology's demonstrated readiness. Examples include testing a prototype in a high-fidelity laboratory environment or in simulated operational environment.
TRL 7	Full-scale, similar (prototypical) system demonstrated in relevant environment	Prototype near or at planned operational system – Represents a major step up from TRL 6, requiring demonstration of an actual system prototype in an operational environment.
TRL 8	Actual system completed and qualified through test and demonstration.	The technology has been proven to work in its final form and under expected conditions. In almost all cases, this TRL represents the end of true system development.
TRL 9	Actual system operated over the full range of expected conditions.	The technology is in its final form and operated under the full range of operating conditions.

Table 2: R&I Challenge Call Targets

	GM 2021 Platinum Standard	Product Prototyping Target (25% better the GM Platinum standard or existing best-in-class solutions, whichever is better)	R&D Target (30% better the GM Platinum standard or existing best-in-class solutions, whichever is better)
Chiller plant system efficiency (kW/RT)	0.56	0.420	0.392
Air side efficiency (kW/RT)	0.18	0.135	0.126
Total AC system efficiency (including water side and air side) (kW/RT)	0.74	0.555	0.518
Lighting (W/m^2)			
- Office/Meeting Room	5.5	4.125	3.85
- Hotel Guest Room	7.0	5.250	4.90
Mechanical Ventilation (W/CMH)			
• > 4kW	0.28	0.210	0.196
• < 4kW	0.17	0.128	0.119
Reduced Heat Gain (ETTV) (W/m^2)			
- Office Building	38	28.5	26.6
- Hotel	40	30.0	28.0

Definition of Various Enterprise Segments & Funding Support

S/N	Type	Criteria	Max funding support
1	All non-SG private sector entities	• <30% local shareholding, determined by the ultimate individual ownership	30%
2	Large Local Enterprises (LLEs)	• ≥ 30% local shareholding; and • More than $100M in annual turnover	50%
3	SG Small and Medium Enterprises (SMEs)	• Have group Annual Sales Turnover of not more than $100M, or maximum employment of 200 employees • To qualify as an SG entity, they must also have at least 30% local shareholding, i.e. local equity held directly or indirectly by Singaporean (s) and/or Singapore PR(s)	70%
4	SG Start-ups	• Registered for less than 5 years at time of grant application • Has individual ownership of more than 50% at reference year; and • Employs at least 1 worker • To qualify as an SG entity, they must also have at least 30% local shareholding	
5	SG Not-for-profits	• Registered as a public Company Limited by guarantee, society or charity trust • Main purpose is to support or engage in activities of public or private interest without any commercial or monetary profit, and are prohibited from distributing monetary residual to their own members • To qualify as an SG not-to-profit, the entity must meet all 3 of the following criteria: (1) Registered and physically present in Singapore; (2) Core funding (i.e. excl. competitive grant funding) is derived entirely/mostly from SG entities; (30 Managed by a Board, which is at least half appointed by SG entities.	

Annex: Guidance for Creation of New Companies/Institution in IGMS

Creation of New IGMS Account

Step 1: Registering the Host Institution (HI)

- For the creation of **new** Host Institution (HI) in IGMS, please provide the following details and in email to BCA_Challenge_Call@bca.gov.sg:

- *"Subject: Creation of new Company/Institution in IGMS for GBIC 2.0 R&I Challenge Call for Decarbonisation"*

  Details of the New HI:

  - *Full Name of Company:*
  - *Indicate Local Company or Foreign Company:*
  - *Indicate Public Company or Private Company:*
  - *UEN (for local company) or Entity ID (for foreign Company):*

For Foreign Company, please provide the screenshot from Corppass profile page indicating the Entity ID (for Foreign Company), for verification purpose. Refer to Appendix A.

For foreign company users who have an existing IGMS account via "For overseas users without Singpass", please refer to the Notes below.

For enquiries pertaining to IGMS system, please email IGMS helpdesk: Helpdesk@researchgrant.gov.sg.

Creation of New IGMS Account

Step 2: Creation of users under HI

i. The company will need to nominate a HI Admin.

ii. The **HI Admin** will need to have their Corppass account setup. Please refer to Corppass website for more info (www.corppass.gov.sg) on Corppass account matters.

iii. The **HI Admin** will need to log in to IGMS via "**For Business Users**" to register an account and update their profile in IGMS. Please note that the IGMS would grant them the **Principal Investigator (PI)** role by default.

*For foreign company users who have an **existing IGMS** account via "**For overseas users without Singpass**", please refer to the Notes below.

iv. After the **HI Admin** has been successfully registered in IGMS, the **HI Admin** will notify BCA in email with the information below, to change the role of the person from a **PI** to a **HI Admin**:

- *Full Name of HI Admin:*
- *E-mail Address of HI Admin:*
- *Designation of HI Admin in the company:*

v. Once granted the role as a **HI Admin**, companies can proceed to assign the relevant roles (e.g. Office of Research (ORE), Director of Research (DOR), PI, etc) to the various users within the organisation.

For enquiries pertaining to IGMS system, please email IGMS helpdesk: Helpdesk@researchgrant.gov.sg.

Creation of New IGMS Account

Notes:

For **existing** foreign company users who have an IGMS account registered via "**For overseas users without Singpass**" route.

- Users should contact Corppass to register for and obtain a Corppass account. Please refer to Corppass website (www.corppass.gov.sg) and their FAQ section (go.gov.sg/corporate-login) for more info.
- Since the company had registered in IGMS before, once the Corppass account has been obtained, please follow Step 1 (Registering the Host Institution) above, to **update** your company with the **newly issued Entity ID (for Foreign Company)** in IGMS, before proceeding further.
- After Step 1 is completed, when registering in IGMS via "**For Business Users**", ensure to register using the **same email address** that was used for the existing IGMS account.

  [Important!] In order to continue accessing past transactions in IGMS, it is important the above steps are done to (i) update the new Entity ID in IGMS, and (ii) to register via "**For Business Users**" with the same email address.
- The rest of the steps under Step 2 (Creation of users under HI) remains the same.

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Creation of New IGMS Account

Role of HI Admin

- To complete a proposal submission, **3 distinct roles** are required from any company or institution to endorse the proposal, namely:
    1. Lead Principal Investigator (PI)
    2. Office of Research (ORE) and
    3. Director of Research (DOR)
- The HI Admin will manage the roles of the users in their company or institution and can concurrently hold the role of Lead PI.
- HI Admin will be able to select different profiles upon login to IGMS:
    - Login as HI Admin – to maintain institution & user profiles
    - Login as PI – to apply for grant call

"Host Institution" means the body or institution or administering organisation named in the Letter of Award as the "Host Institution" as the body responsible for undertaking and managing the Research.

"Lead Principal Investigator" means the Investigator identified in the Letter of Award as the overall lead in the conduct of the Research.

"Office of Research" means the office established by the Host Institution to facilitate administering and coordinating all matters relating to the Research.

"Director of Research" means the person identified as leading the Office of Research.