

Green Buildings Innovation Cluster

Innovation Challenge Call for Advancing SLE through Alternative Cooling Technologies

11 Oct 2019

GREEN BUILDINGS INNOVATION CLUSTER



GBIC-R&D
Experiment



GBIC-Demo
Exhibit



GBIC-Repository
Exchange

Supported by:

NATIONAL
RESEARCH
FOUNDATION
PRIME MINISTER'S OFFICE
SINGAPORE

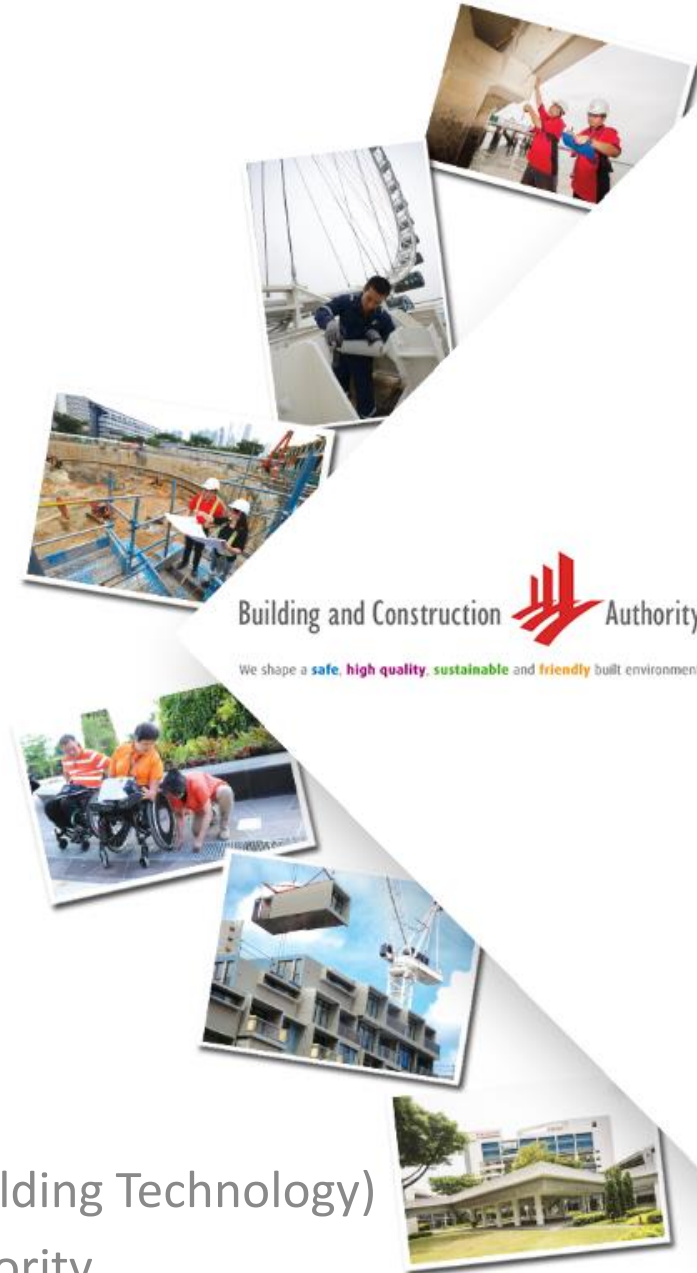
In partnership with:



Wong Ngian Chung

Principal Manager (Green Building Technology)

Building & Construction Authority



Building and Construction Authority
We shape a safe, high quality, sustainable and friendly built environment.

Outline

- **Building Energy Landscape**
- **GBIC Innovation Challenge Call for ACTs**
- **Guidance for Creation of New Companies/Institution in IGMS**



Local Building Landscape

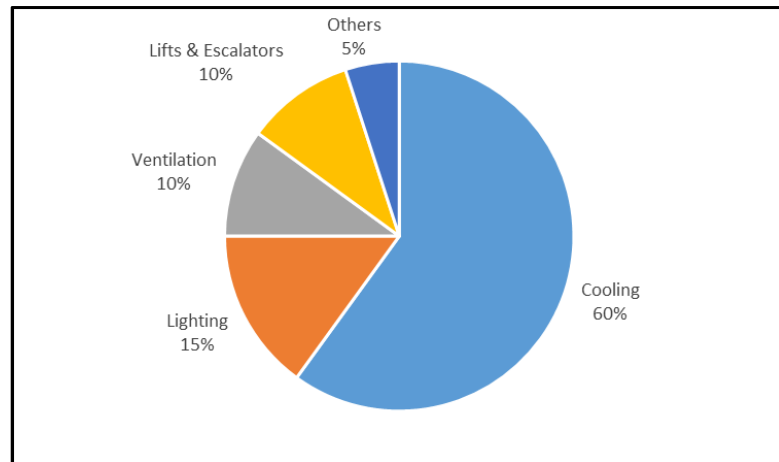
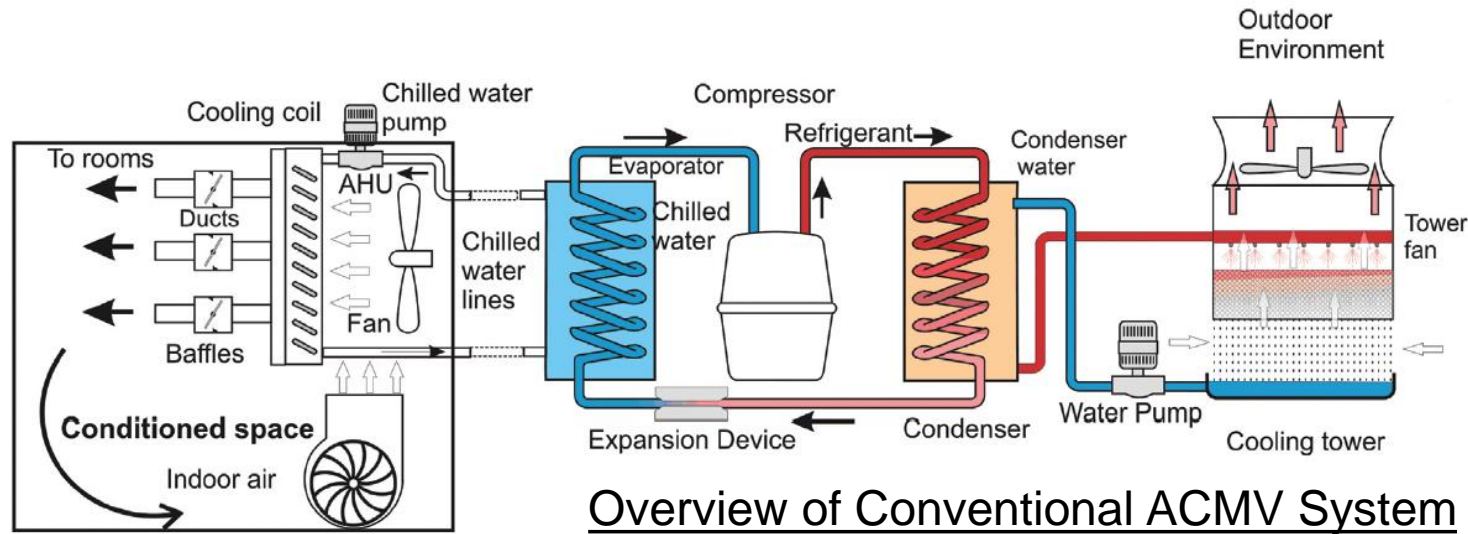


Singapore's context: High Rise High Density Urban Tropics

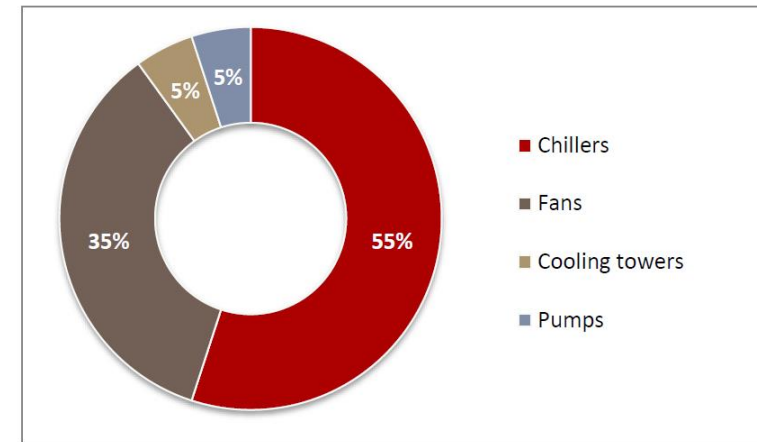


Solar as
Renewable Energy source

Typical Commercial Building Energy Usages



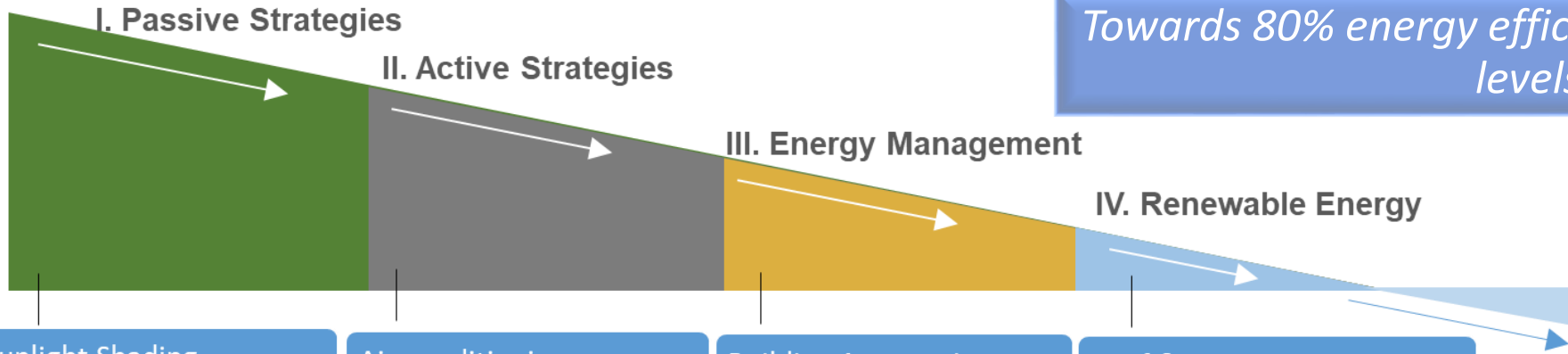
- ❑ Cooling takes up significant energy (up to 60% of total energy uses)



- ❑ Chiller (which comprises compressor, evaporator, condenser) takes up 55% for the cooling energy

SLE Buildings Technology Roadmap

Towards 80% energy efficiency improvement over 2005 levels by 2030



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 sensing & 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

Eg. Alternative Cooling Technologies (ACTs):

- Passive Displacement Cooling
- Hybrid Cooling System
- Decoupling of Latent & Sensible Cooling System
- Evaporative Cooler System

Possible challenges for current ACTs *(not exhaustive)*

Current Situations

1. Air momentum control with heat-source interaction (for passive displacement cooling/radiant cooling)
2. Humidity control and Indoor air quality challenges (for hybrid cooling)
3. Limited cooling capacity (for indirect-evaporative cooling)
4. Maintenance and operation issues due to extending the chilled water pipes into tenant spaces (for passive displacement cooling/radiant cooling)
5. Lack of understanding of design concept, installation & testing methodology

BCA-CoolestSG Joint Innovation Challenge Call - “Alternative Cooling Technologies for the Tropics”

Key Features

Industry-led

Novel technologies close to market adoption

Demonstration in an operational environment in actual buildings

Desired Outcomes

Close Collaboration & Partnership with Industry

- Address industry challenges
- Clear business model

High Technical Merit Research & Innovation







- Lead to breakthrough results
- >20% energy savings over best-in-class; good IEQ

Economic Benefits

- Potential scale up for market adoption
- Potential spin-off, licensing



Matching Industry Players with Researchers

Technology Provider	Research community	Building owners
     	    	    

Two-Phase Approach

a) **Phase 1: Development**

- i. Research & Development of working prototype
- ii. Technology Readiness Level (TRL 6) when completed

b) **Phase 2: Performance Validation**

- i. Developed prototypes should be tested in a high-fidelity testbed environment
- ii. Developed solutions should be demonstrated in an actual building (TRL 8).

Project duration should not be more than 2 years for both the development and performance validation phases.

Eligibility

- Open to all private & public entities
- IHLs, Research Institutes to collaborate with the private sector companies to jointly submit proposals

Funding Criteria

- Private sector companies: up to 70%
- IHLs, research institutes, public sector agencies and not-for-profit organizations: up to 100%
- R&I activities carried out in Singapore
- Supported project qualifying cost based on NR Fund Guide

Evaluation Criteria



- **High Technical Merit Research & Innovation**

- Novel & internationally competitive
- Address industry challenges
- Lead to breakthrough results



- **Economic Benefits**

- Potential scale up for wider adoption
- Potential spin-off



- **Close Collaboration & Partnership with Industry**

- Excellent execution plan by experienced project team with a good track record and expertise
- Clear business model for the proposed innovation

Indicative Timeline

Activities	Timeline
Launch Innovation Challenge Call	3 Oct 2019
Closing of Innovative Challenge Call	18 Nov 2019
Peer Review of Proposals	Dec 2019
Evaluation of Proposals	Jan 2020
Award of Innovation Challenge Call	Feb 2020

Application Details

Proposal Submission

Opening Date: 3 Oct 2019

- Submit proposals via NRF's Integrated Grant Management System (IGMS) at <https://researchgrant.gov.sg/>
- Enquiries to BCA_Challenge_Call@bca.gov.sg
- For enquiries on IGMS system, please email IGMS helpdesk at Helpdesk@researchgrant.gov.sg .

Closing Date: 18 Nov 2019, 2355 hrs (Singapore time)

BCA SkyLab

World's First High-Rise Rotatable Laboratory for the Tropics



Objectives:

- To enhance Singapore's R&D capabilities in building energy efficiency
- To provide a lab with flexible testing capability for the industry
- To offer the industry more opportunities to research and innovate, and eventually change the way we build
- For comparative new individual or integrated technology testing with reference to common technology, codes or standards

BCA SkyLab's capabilities and features:

Comprehensive Plug and Play
Testing Capabilities

Rotatable Outdoor Facility in
Real-World Condition

200 High Precision Sensors for
Performance Study

Testing Services:

Energy Performance

Daily energy generation
Daily lighting energy consumption
Daily cooling energy consumption
Percentage change w.r.t reference cell

BIPV Performance

Daily average conversion efficiency
Daily performance ratio

Thermal Performance

Predicted Mean Vote (PMV)
Predicted Percentage Dissatisfied (PPD)
Solar transmittance (τ)
Real time solar heat gain co-efficient
Comparison of surface temperature of façade and reference DGU

Visual Performance

Daylight Glare Probability (DGP)
Daylight autonomy
Colour Rendering Index (CRI) *(for daylight entering through façade)*
Relationship between Illuminance and Correlated Colour Temperature (CCT) of the façade for the day

Interested to find out more?

Drop us an email at
[BCA Skylab@bca.gov.sg](mailto:BCA_Skylab@bca.gov.sg)

Or
Scan QR Code below





Thank You

For more info on latest GBIC challenge calls & collaboration opportunities, please access:

<https://www.sleb.sg/Context/ContentDetails/8/11> or scan the QR code:



For enquiries on the Challenge Call, please email:

BCA_Challenge_Call@bca.gov.sg

Guidance for Creation of New Companies/Institution in IGMS

Step 1 (Lead PI):

- Send an email to [BCA Challenge Call@bca.gov.sg](mailto:BCA_Challenge_Call@bca.gov.sg) with the following details:
 - Subject: *Creation of new Company/Institution in IGMS for GBIC Innovation Challenge Call for Alternative Cooling Technologies*
 - Details to include:
 1. Full name of company
 2. Local company or foreign company?
 3. Public company or private company?
 4. UEN or Unique Identifier?



Step 2 (Lead PI):

- The company/institution will need to nominate a HI Admin. The HI Admin will need to set up his/her CorpPass account (www.CorpPass.gov.sg) and Open Researcher and Contributor ID (ORCID) account (<https://orcid.org>).
- HI Admin will need to login to IGMS using CorpPass account to register/update the profile inside IGMS with the ORCID
- IGMS would grant the Principal Investigator (PI) role by default.
- After registration, HI admin will notify BCA with the following information:
 1. Full name of HI admin
 2. E-mail Address of HI Admin
 3. Designation of HI Admin in his/her company

Step 3 (Lead PI):

- BCA will arrange with IGMS to change the role of the person from a Principal Investigator (PI) to a HI Admin
- After the role has been updated from Principal Investigator (PI) to HI Admin in IGMS, BCA will inform the company/institution.
- HI Admin can proceed to assign relevant roles (e.g. DOR, ORE, etc.) to various users within the organisation



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



Guidance for Co-PI

- Use CorpPass to register for IGMS after the company/institution has been registered on IGMS
- Set up Open Researcher and Contributor ID (ORCID) account
- Update the user profile on the IGMS system with ORCID
- Lead PI will be able to add the Co-PIs' name in the IGMS

