



# Singapore Green Building Council and Research & Development

**Presentation to  
SinBerBEST Annual Meeting  
10 January 2013**



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1<sup>st</sup> Vice-President  
Singapore Green Building Council**

# The Mission of SGBC

*To propel the Singapore building and construction industry towards environmental sustainability*

## Key Focus Areas



Profile  
Singapore as a  
leading  
Sustainable  
Hub in the  
tropics



Enhance  
Professionalism  
and Knowledge  
in Sustainable  
Development



Dedicated  
Certification Body  
for Green Building-  
related Products  
and Services

*Formed in May 2009*

- 141 founding members*
- 336 corporate members (as of 26 November 2012)*

## ***Member Status***



WORLD GREEN BUILDING COUNCIL  
Established Member of the World Green Building Council



UNEP

**Sustainable Buildings  
and Climate Initiative**

Member

# Breakdown of Members

■ Products Suppliers - 171

■ Contractors - 48

■ Consultancies - 39

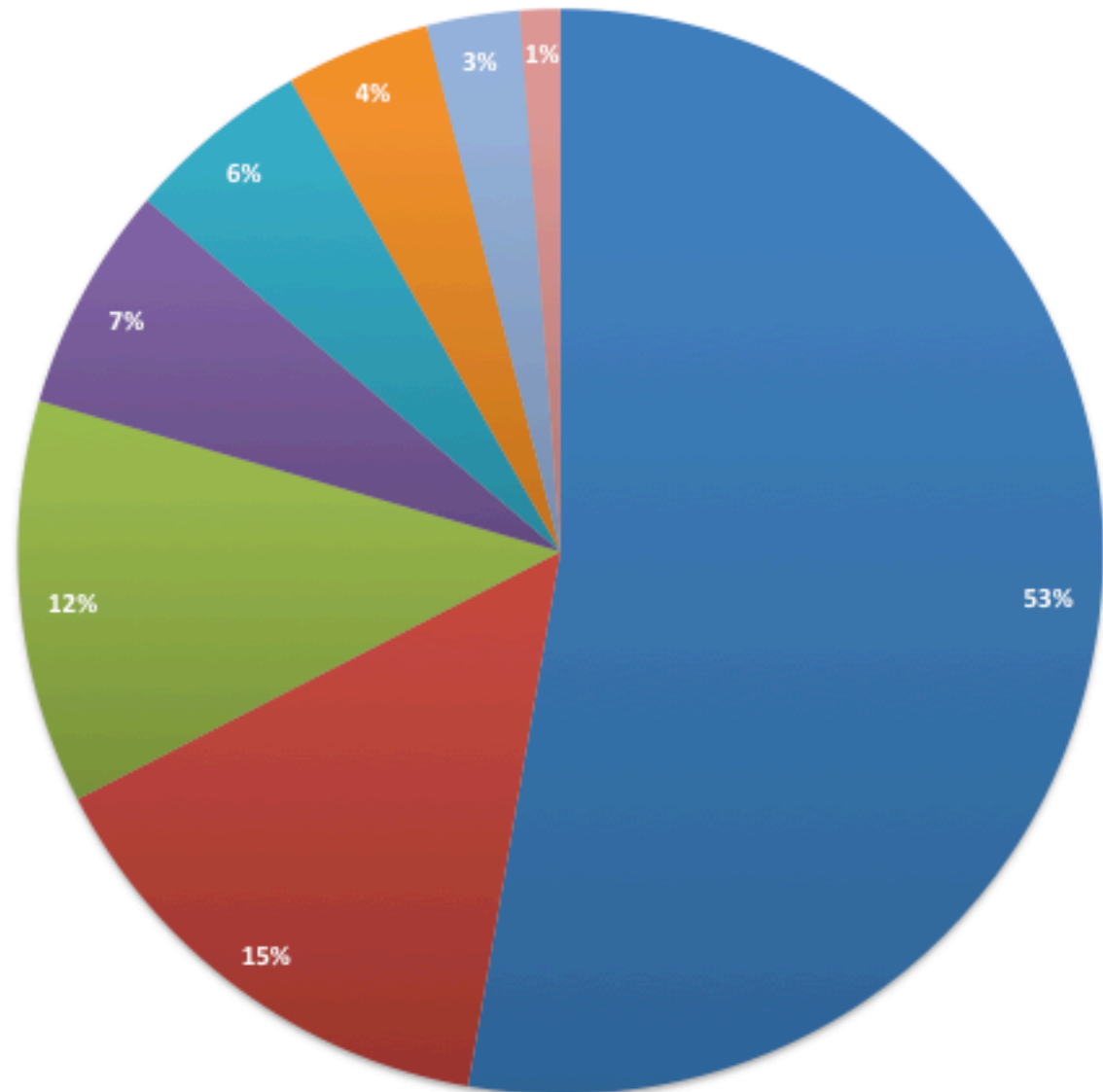
■ Real Estate Developers/Managers - 22

■ Architect Firms - 18

■ Public Sectors/Academic Institute - 14

■ Associations, NGO, NPO - 9

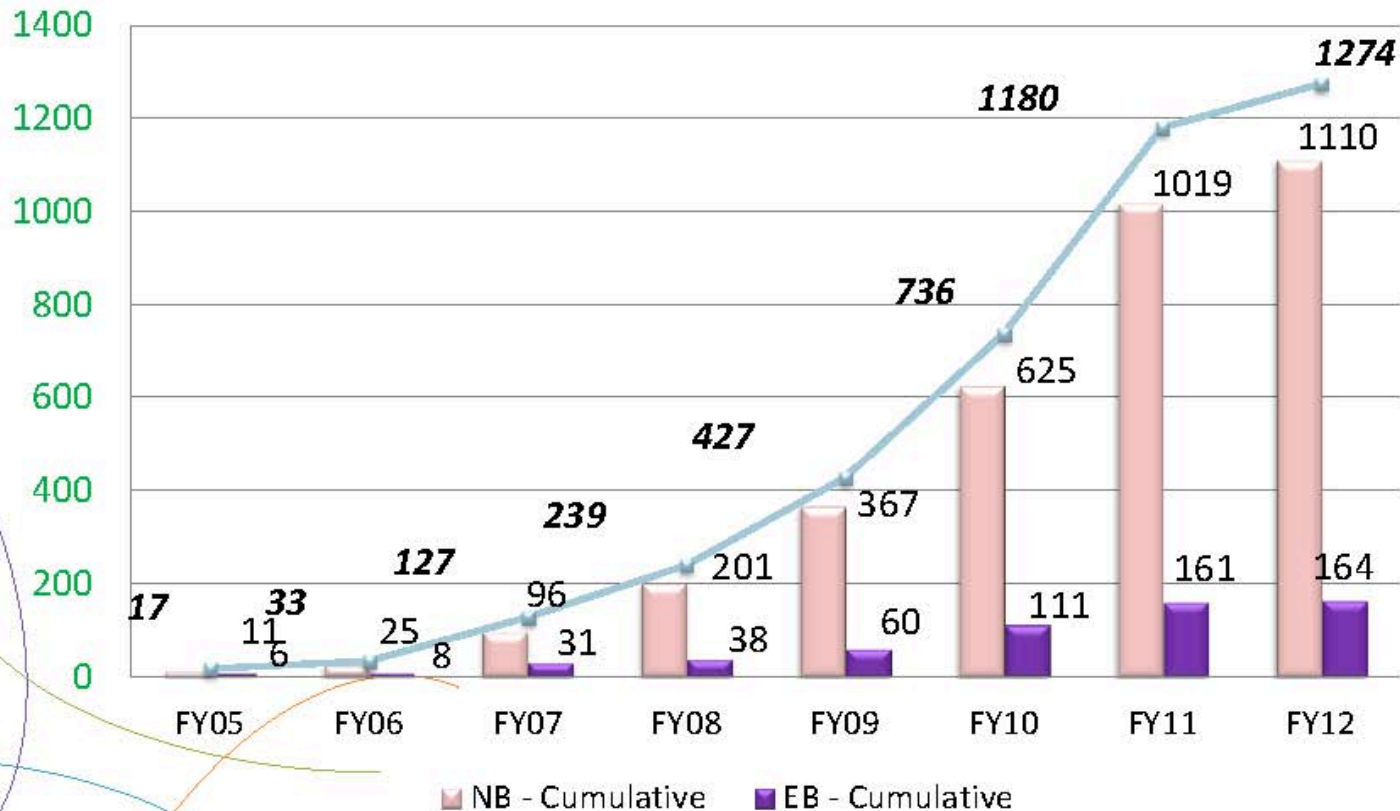
■ Others - 4



# Green Mark Building Projects

## Green Mark Building Projects in Singapore

Number of building projects



# Singapore



# Target for our Built Environment

IMCSD's Target for our Built Environment

**80%** OF BUILDINGS

**'GREEN'**

**2030**<sup>7</sup>

# Energy Efficiency Challenge





# National Challenge in Greening Our Buildings



2012 – 17%



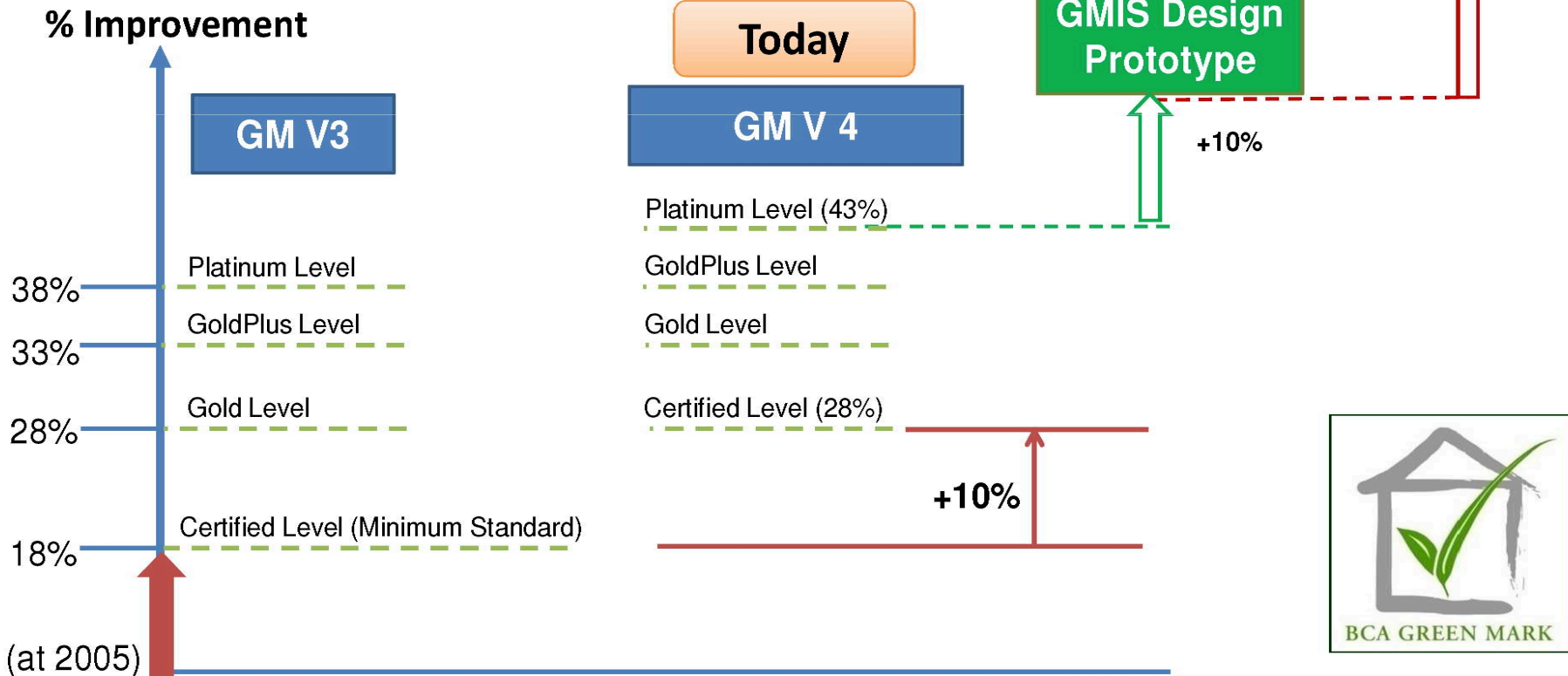
2030 – **80%**

- **80%** of buildings 'GREEN' **by 2030**
- **35%** reduction in Energy Intensity by 2030 from 2005 levels

# BCA Green Mark Scheme

## Raising Energy Efficiency Standard over 2005 design codes

### Overview of Energy Improvement



# Green Building R&D Framework



# To Address the Challenge



**6** *Strategic Thrusts*  
R&D is one key thrust

# Green Building R&D Workgroup

## MND R&D Steering Committee

### Green Building R&D Workgroup

Secretariat (BCA)

### Sustainable Urban Living R&D Workgroup

Secretariat (URA & HDB)

## Green Building R&D Workgroup



### Industry

- Developers; CDL, Keppel Land
- Consultants; Squire Mech, Arup

### Academia

- ERI@NTU; Solar Energy Research Institute@NUS; A\*STAR Institutes

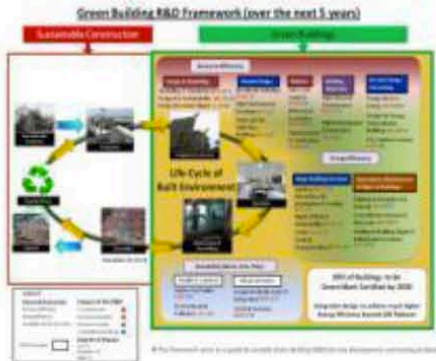
# The R&D Strategy

Applied  
R&D

Test-  
bedding

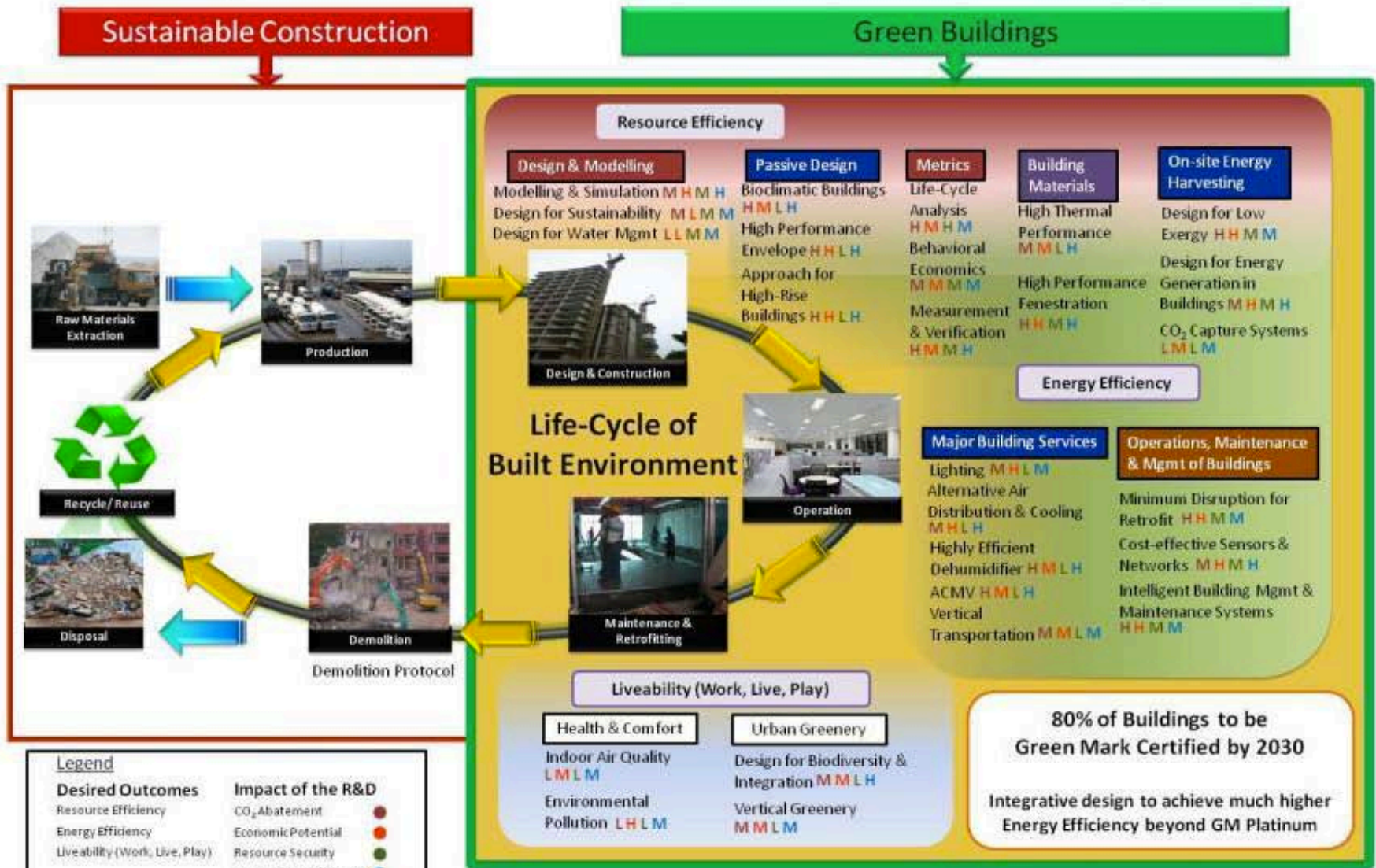
Design  
Prototype

Green Mark  
Best  
Practice



Ecosystem for Research, Test bed & Adoption

# Green Building R&D Framework



**Legend**

<b>Desired Outcomes</b>	<b>Impact of the R&amp;D</b>
Resource Efficiency	CO <sub>2</sub> Abatement ●
Energy Efficiency	Economic Potential ●
Liveability (Work, Live, Play)	Resource Security ●
	Competitive Advantage ●
	<b>Degree of Impact</b>
	Low - L
	Medium - M
	High - H
R&D Focus Area	

❖ This Framework serves as a guide for possible Green Building R&D for new developments and existing buildings

# The 3 Main Domain Areas





# A\*Star-MND Joint Green Building Grant

## Objectives:

- Promote Public Private Partnership
- Encourage more private sector R&D in Singapore

## Pilot Call:

- Two areas of interest: Building Materials & Energy Efficiency
- Awarded 9 projects

## 2<sup>nd</sup> Call:

- Area of interest: Building Façade Materials
- Rolled out R&D Grant Call in July 2012

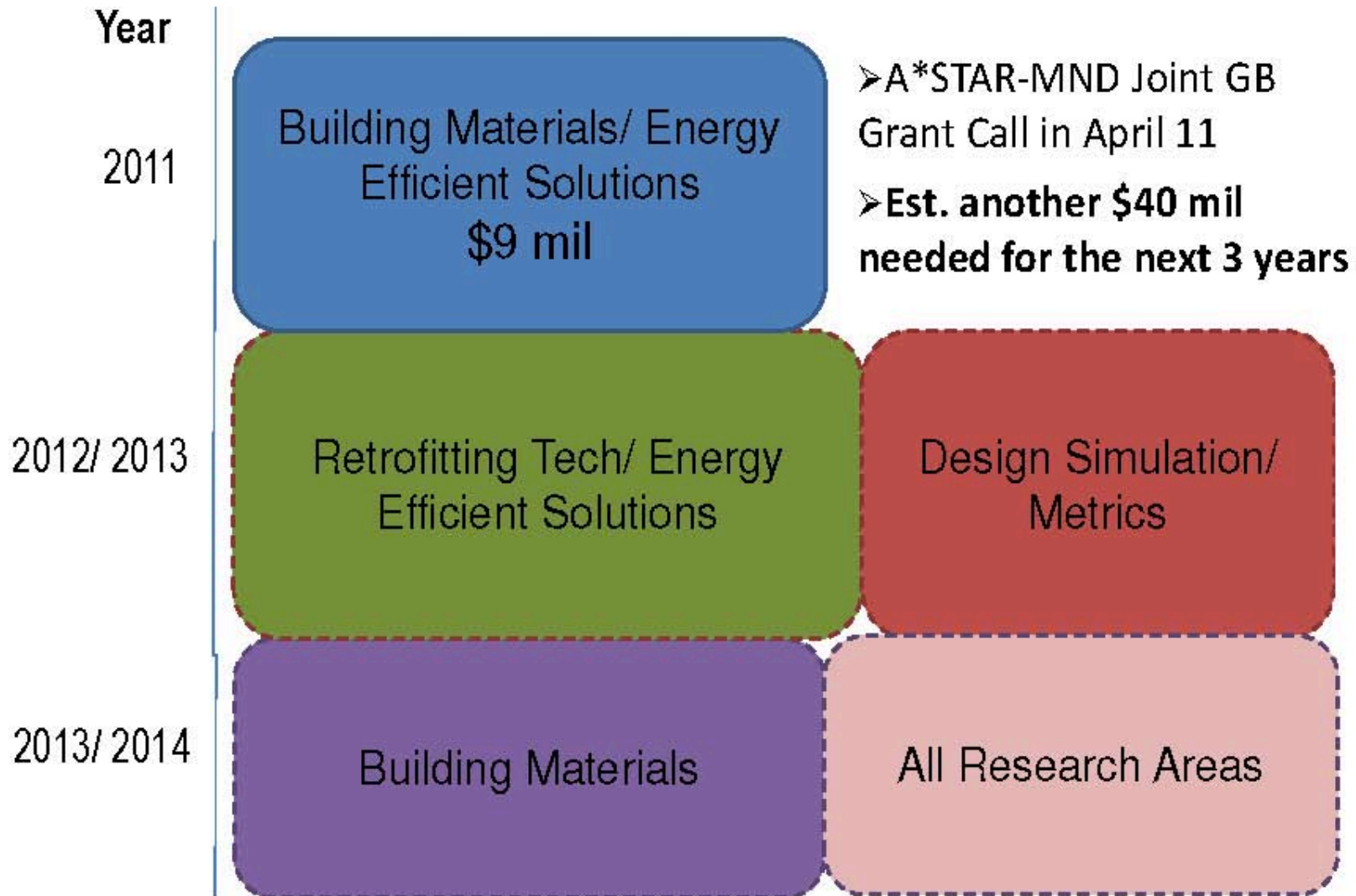
## Research & Industry Partners:



Agency for  
Science, Technology  
and Research



# Possible Subsequent RFPs



# R&D through Joint Partnership (Completed)

Up to 100% Recycled  
Concrete Aggregate Used

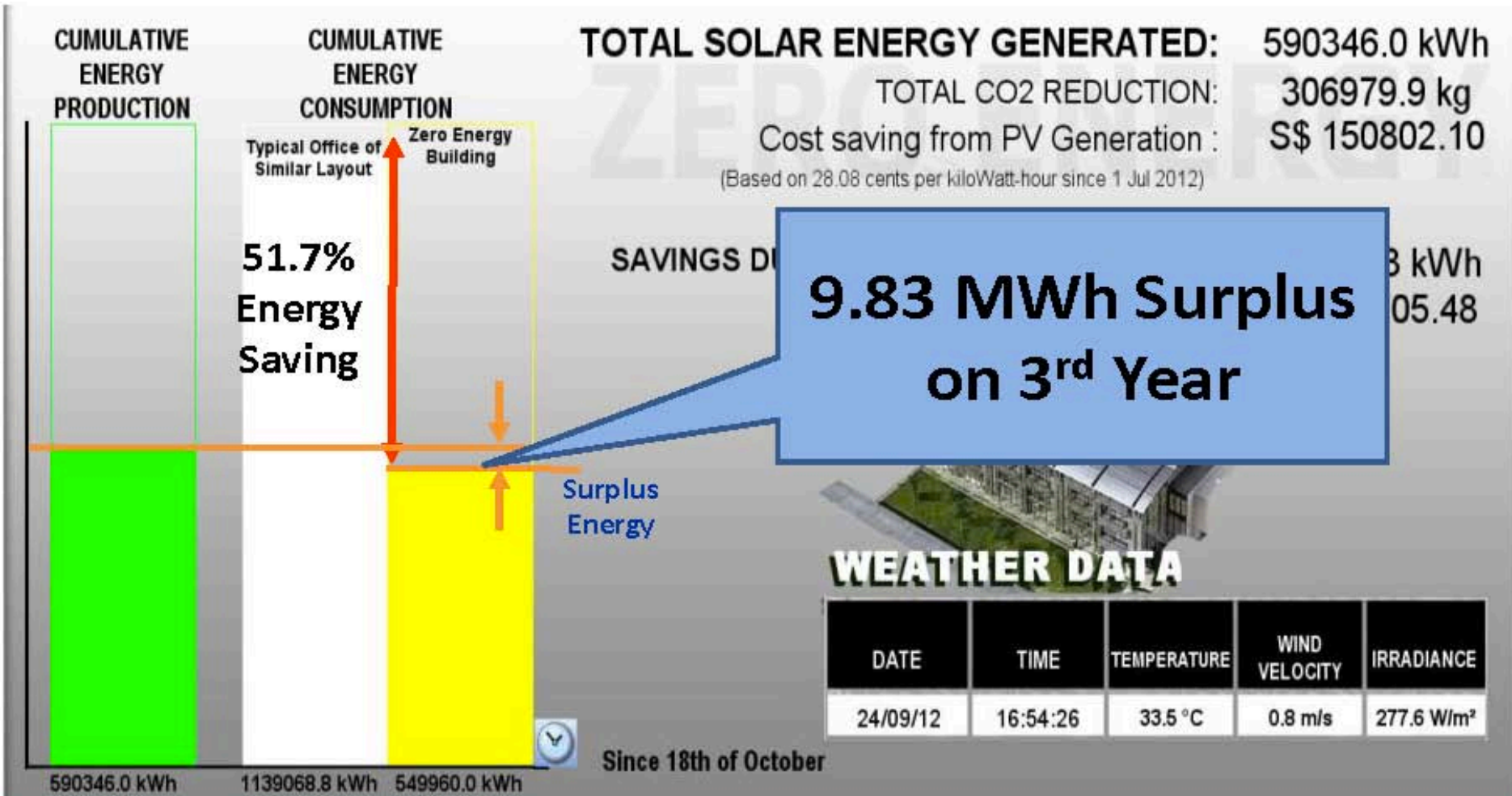
Reduced Photocatalytic  
(TiO<sub>2</sub>) Cost by 50%



- Improved performance of locally produced photocatalytic coating
- At less than 50% its imported price

For illustration purpose

# Provide Platform for Test-bedding Technologies

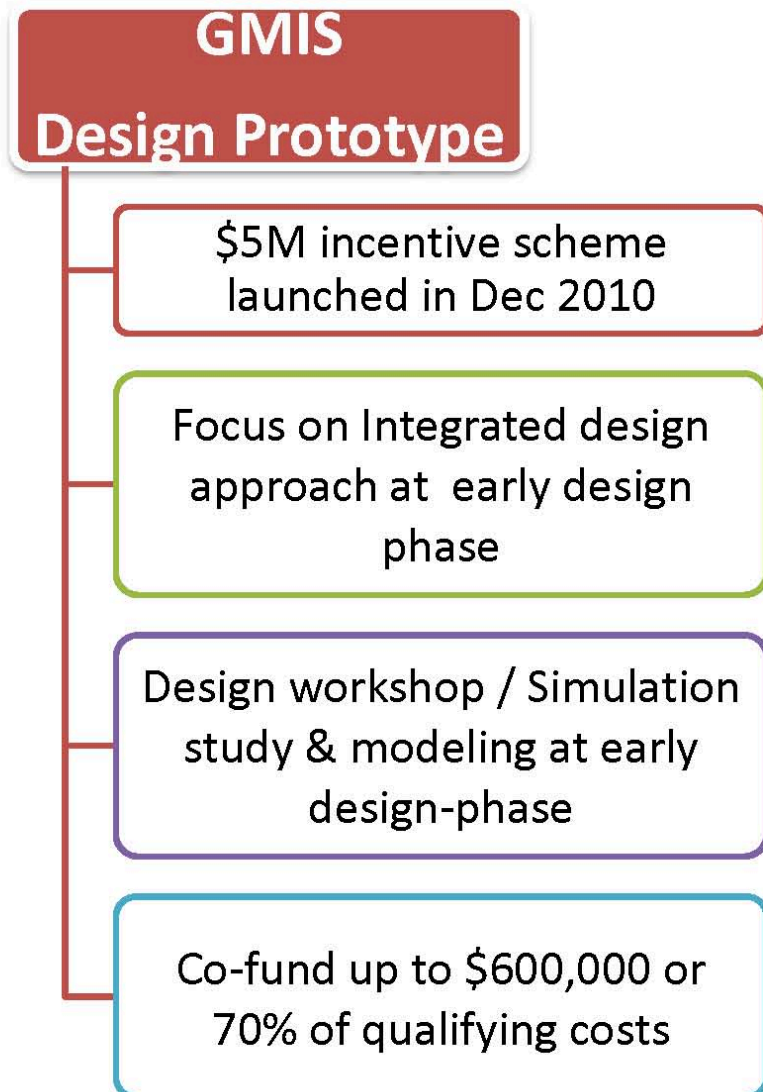


## ZEB@BCAA Still Net Positive

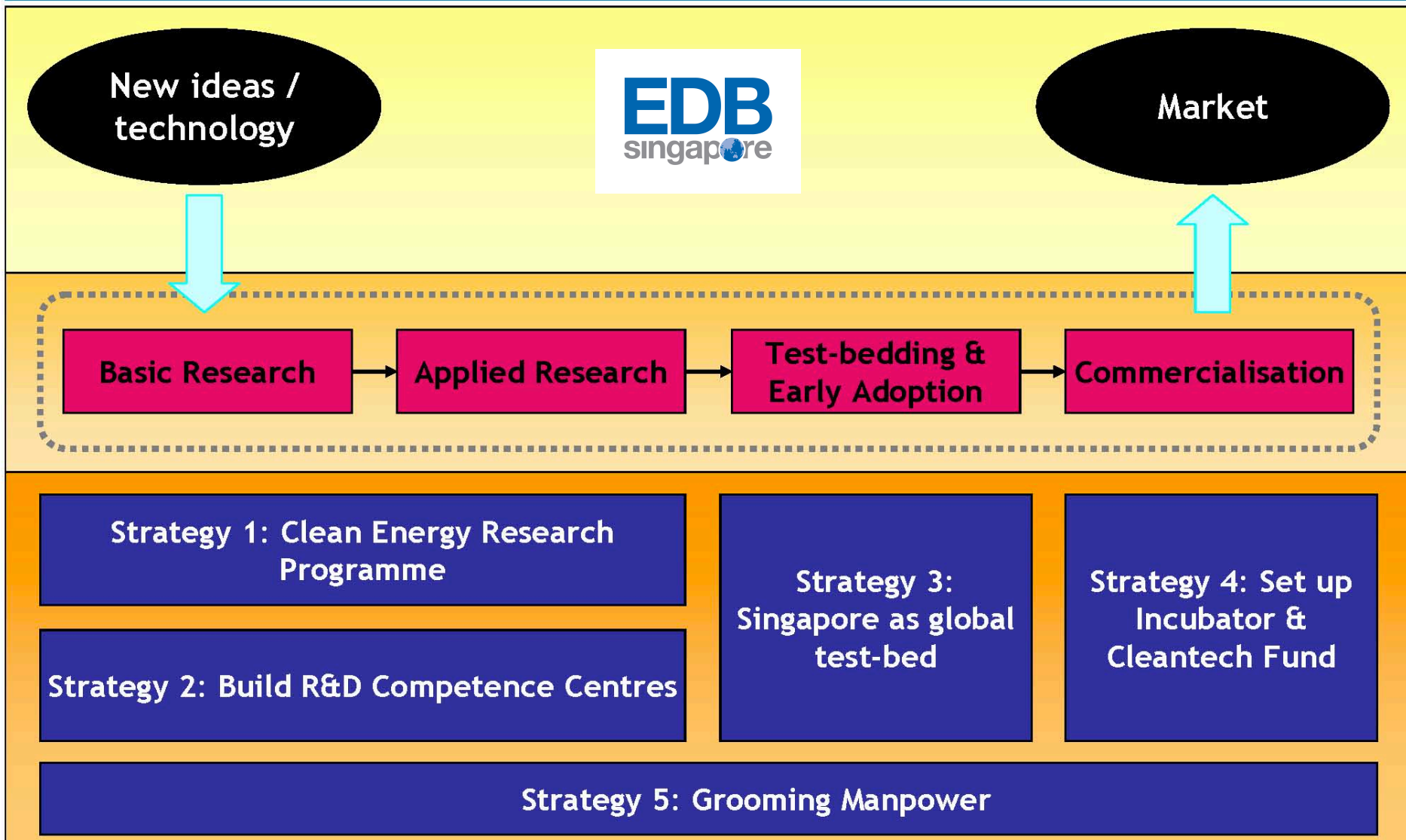
40 MWh of surplus accumulated in nearly 3 years!

# Incentive Scheme

## GMIS (Design Prototype) Scheme



# Technology Development Strategy Map



# Strategy 1: Clean Energy Research Programme (CERP)

## First Call for Proposals

- ▶ Total of 8 projects worth S\$10m awarded, out of 60 submissions in in Solar Technologies



III-V solar cells



Building-integrated photovoltaics



Distributed solar power generation



Thin-film solar cells



Solar grade silicon from MG silicon



Dye-sensitised, solid state sensitised & quantum dots (x3)

## Second Call for Proposals

- ▶ Directed call: "Novel roof-mounted Solar-harvesting Devices & Systems for the Tropics"
- ▶ Singapore as the leader in solar technologies for the tropics
- ▶ Total of 31 proposals received; 22 to enter final evaluation round



Hybrid PV Thermal Systems



Solar Concentrator PV Systems



Solar Umbrella PV Systems for tropical rooftops

## World-class Solar R&D Centre hosted by NUS

### Crystalline & Thin-film Silicon Solar Technology

### Novel Photovoltaic Devices

### Solar & Energy Efficient Buildings

### Testing & Certification

- ▶ Focused on industry collaborations (discussing with ~30 companies)
- ▶ Solar module testing & certification centre with VDE & Fraunhofer
- ▶ 30 personnel at end-2008 → 100 RSEs by 2011

### International Research Luminaries:



Professor Joachim Luther

- CEO of SERIS
- Former Director of Fraunhofer ISE from 1993 to 2006



Professor Armin Aberle

- Deputy CEO, SERIS
- Ex-Dy Dir of PV Centre of Excellence in UNSW



Dr Bram Hoex

- 2008 SolarWorld Junior Einstein Award Winner



# PV Installations

- ❑ Markets in SE Asia are still relatively small
- ❑ Singapore has ~8 MWp of installations
- ❑ Potential for 5.6 GWp in Singapore (medium-term)
- ❑ Providing 15% of electricity requirements (relative to 2011 demand)



## S\$17M Clean Energy Research and Testbedding Programme



Using solar panels and energy efficient building design, BCA is building Singapore's first **"Zero-Energy Building"**.



Solar panels will be installed for test-bedding in this HDB **"Eco-Precinct"**.



**Gardens by the Bay**, a world-class garden showcase, will install solar panels and co-generation systems.



**Marina Barrage**, a model of water and environmental sustainability, to deploy solar panels.



**Singapore Polytechnic** developing new green building which includes solar.

## Eligibility

- ▶ New buildings in the private sector that attains a minimum Green Mark Gold Status
- ▶ Minimum 10kWp system

Lead Users of  
Solar Technologies



Offset up to 40% of  
total installed cost

Build Capabilities in Ecosystem

- Building Developers
- Architects
- Engineers
- System Integrators
- Master Planners
- Technology Providers
- Financiers

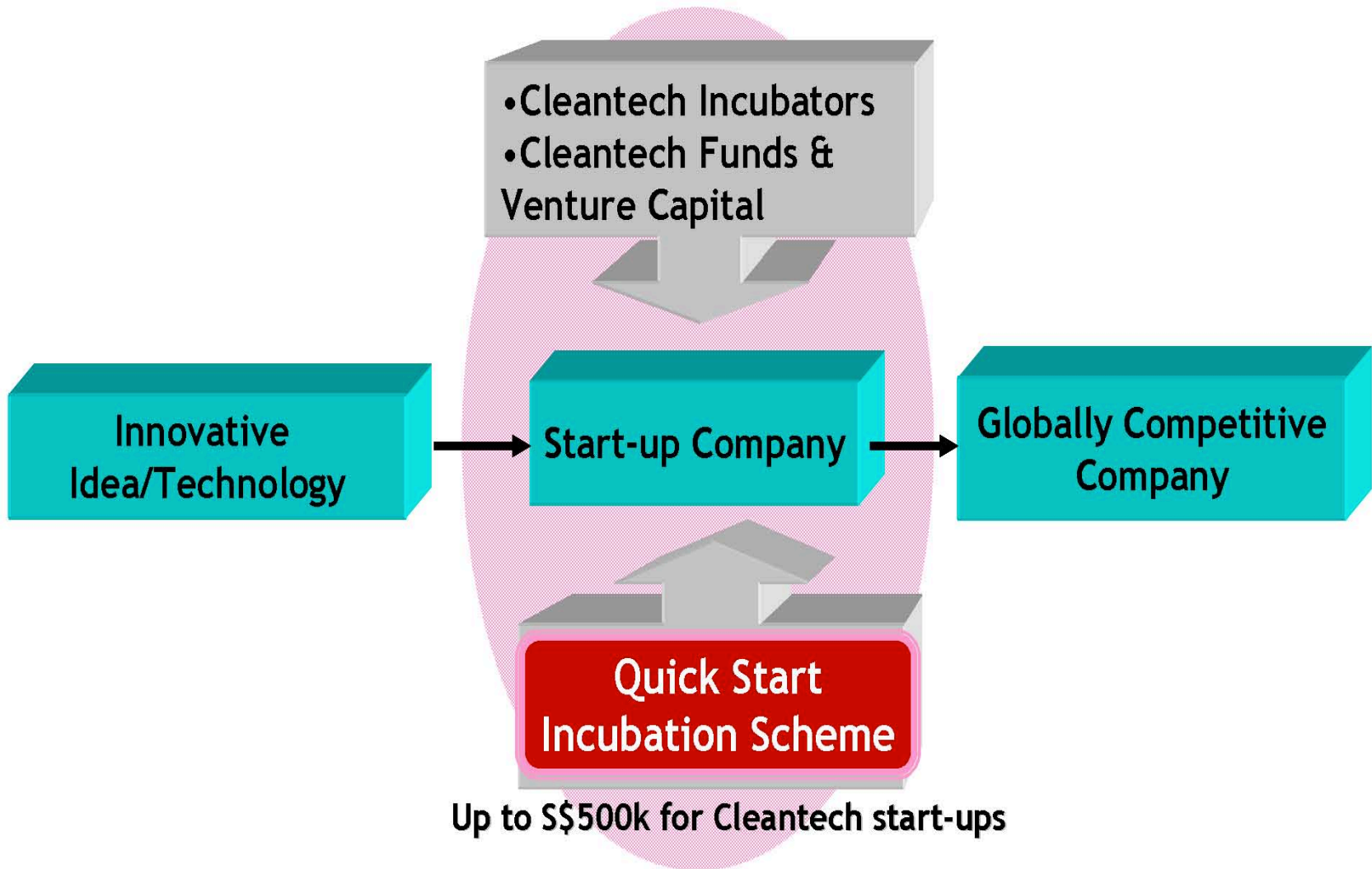
INNOVATION

DESIGN




SKILL  
DEVELOPMENT

EFFECTIVENESS

# Strategy 4: Establishing & Attracting Cleantech Incubators and Funds

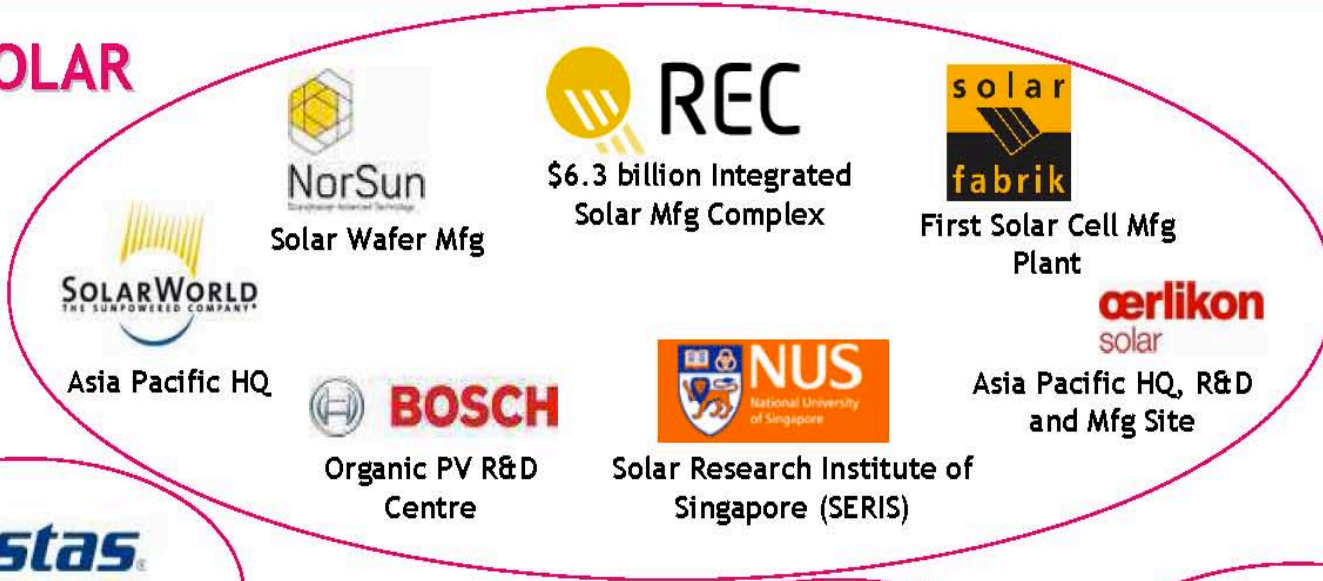


# Strategy 5: Specialist Manpower Development

Programme	Supply	Educational Institutes (Examples)
<p><b><u>Postgraduate Scholarships</u></b></p> <ul style="list-style-type: none"> <li>▪ NRF Clean Energy Postgraduate Scholarships (S\$20m)</li> <li>▪ NRF Clean Energy Company Scholarships (S\$5m)</li> </ul>	<p>50</p> <p>70</p>	
<p><b><u>Universities</u></b></p> <ul style="list-style-type: none"> <li>▪ Specialist Manpower Programme (SMP) in Clean Energy</li> </ul>	<p>100 / yr</p>	
<p><b><u>Polytechnics</u></b></p> <ul style="list-style-type: none"> <li>▪ Clean Energy Diploma</li> <li>▪ Specialised electives for final-year students</li> </ul>	<p>200 / yr</p>	

# Vibrant Clean Energy Landscape

## SOLAR



## Vestas

World Class Wind Energy R&D Centre

## WIND

## TEMASEK POLYTECHNIC

Fuel Cell R&D Centre and Incubator

## FUEL CELLS

## ATLANTIS RESOURCES CORPORATION

Global HQ, R&D and Mfg Site

## TIDAL



Food Waste to Energy Plant

## BIOMASS

## Asia Carbon Global

Asia's 1<sup>st</sup> Carbon Exchange

## CARBON

# Research & Development

## Master Lab for R&D Clusters (Centre of Building Research)

Integrated Labs  
for new developments

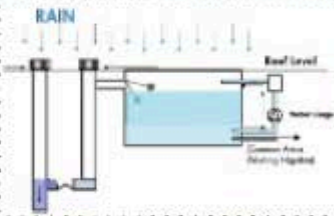
Live-in Labs  
for existing developments

### Focus Areas

Energy



Water



Waste



Living  
Environment



Construction  
Productivity



Greenery



### Desired Outcomes

- Sustainability
- Productivity
- Maintainability
- Cost Effectiveness



HOUSING &  
DEVELOPMENT  
BOARD

## TREELODGE @ PUNGGOL

- Singapore's first environmentally friendly public housing development
- The guiding design principle: To harness wherever possible the elements of nature (e.g. Wind)
- Capitalise on Clean Energy technologies e.g. roof-mounted solar panels, to help promote energy conservation
- 2.9 Ha, 7 Residential Blocks - to be opened up to testbedding of innovative residential Green Bldg





# Punggol Eco-Town



**Improves quality of life. Enhance Living Environment. Create eco-friendly culture in the community**

# Solar Deployment Roadmap



**Energy SAVE  
Precincts  
(Serangoon  
North &  
Wellington  
Circle)**

**1<sup>st</sup> HDB Solar  
Test-bedding**



**HDB Eco-Precinct  
TreeLodge@Punggol**

**Precinct integrated  
with Solar;  
Net-zero energy for  
common services**



**Solar Capability  
Building for  
Public Housing**

**Large Scale Test-  
bedding;  
Building Solar  
Capabilities**



**Punggol Eco-Town**

**Full Implementation;  
To increase to 350MWp  
nationwide**

# Turning Grey to Green

## Sky-rise Greening

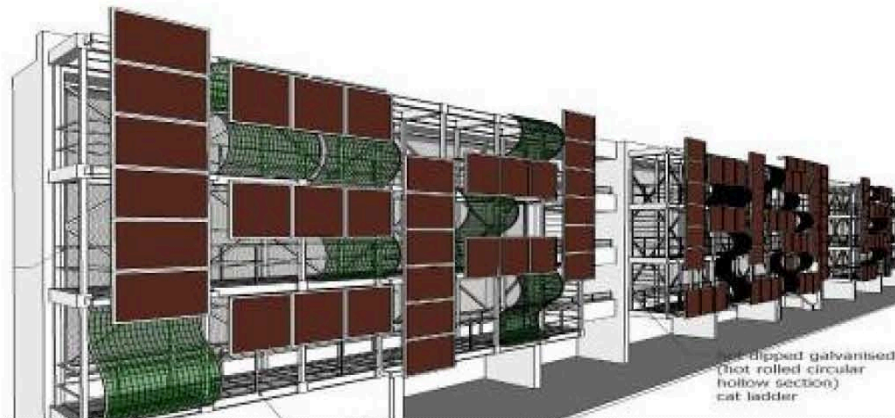


Multi-Storey Carpark

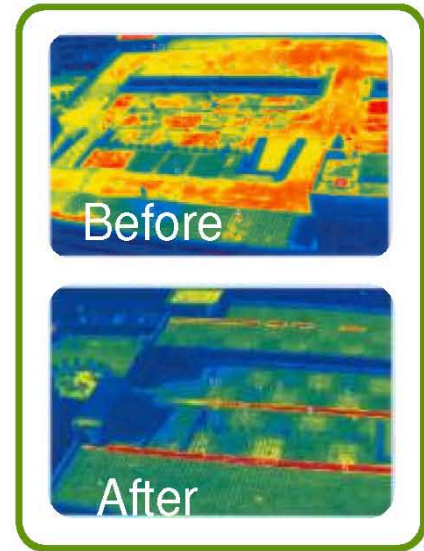
Residential Blocks

Lightweight, Modular,  
Easy to install and replace  
"Instant Green"

## Vertical Greening



2-in-1 Building Integrated Solar Photovoltaic with Vertical Greening





# Examples of Technologies to be Test-bedded



**Motion Sensor /  
LED lighting**



**Solar Cell Panel**



**LED Block Signage**



**Shutting down of one  
lift after midnight**



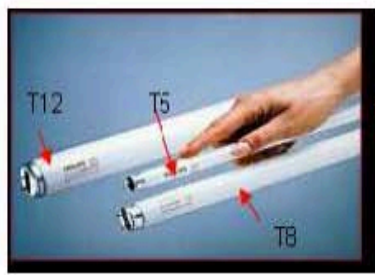
**Power Saving Device (PSD)**



**Target: 40% reduction in Energy**



**LED lift car lighting**



**Fluorescent Lamps**



**Photocell / Timer  
Sensor**



**Recycling Effort**



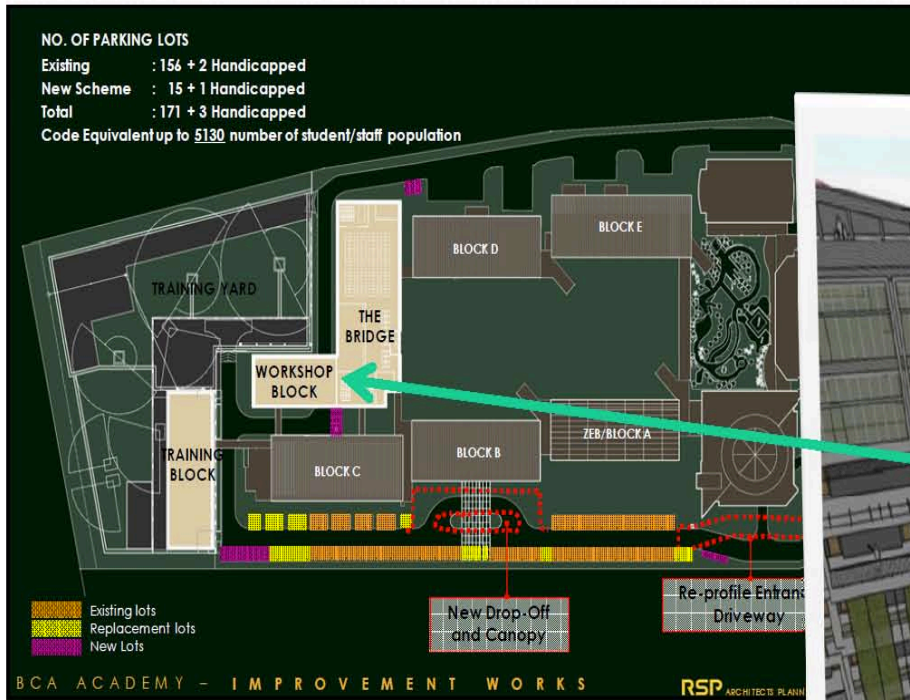
**Fuel cells**

# Cleantech Park as a Developmental Platform

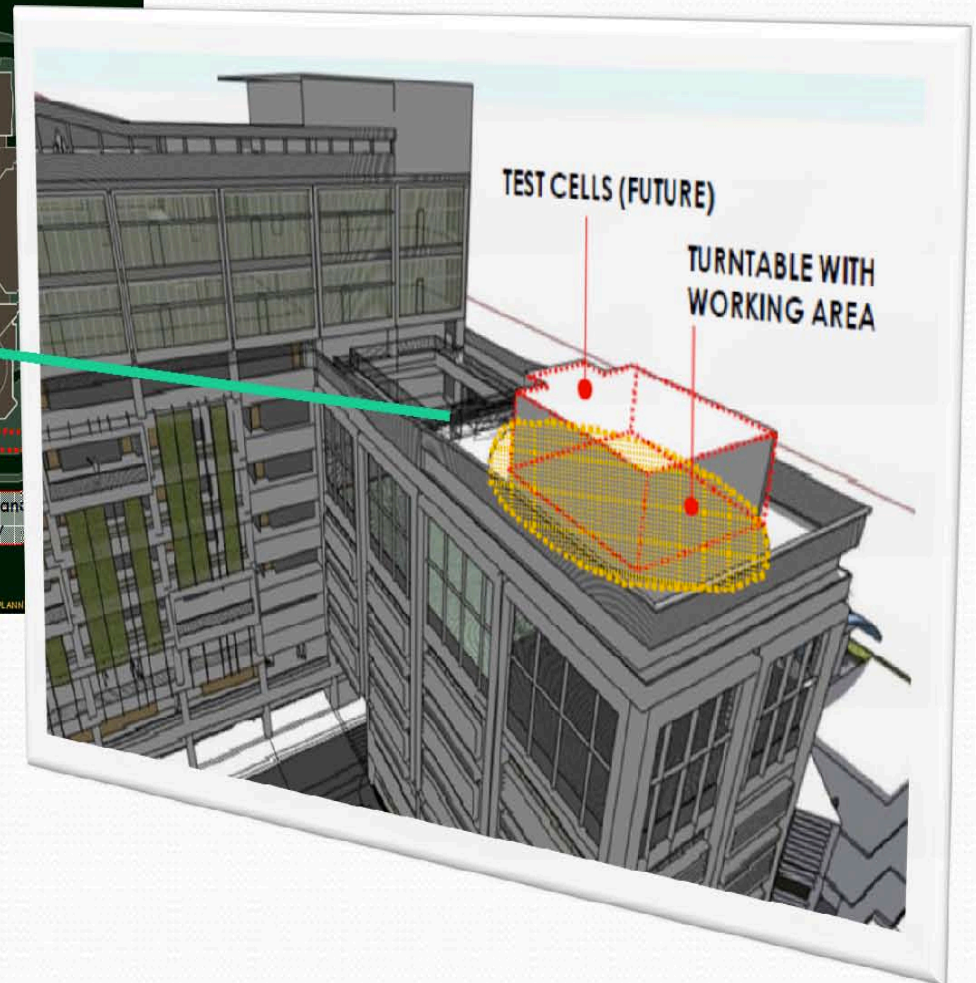


- ▶ Globally distinctive business park: Cutting-edge sustainable development features that are replicable & scalable for tropics
- ▶ 55 ha to be developed over 20 yrs; Phase 1 (10 ha) catered to Cleantech activities in R&D, testbedding & prototyping
- ▶ Technological goals: Low energy, low carbon, low waste, low water benchmarks

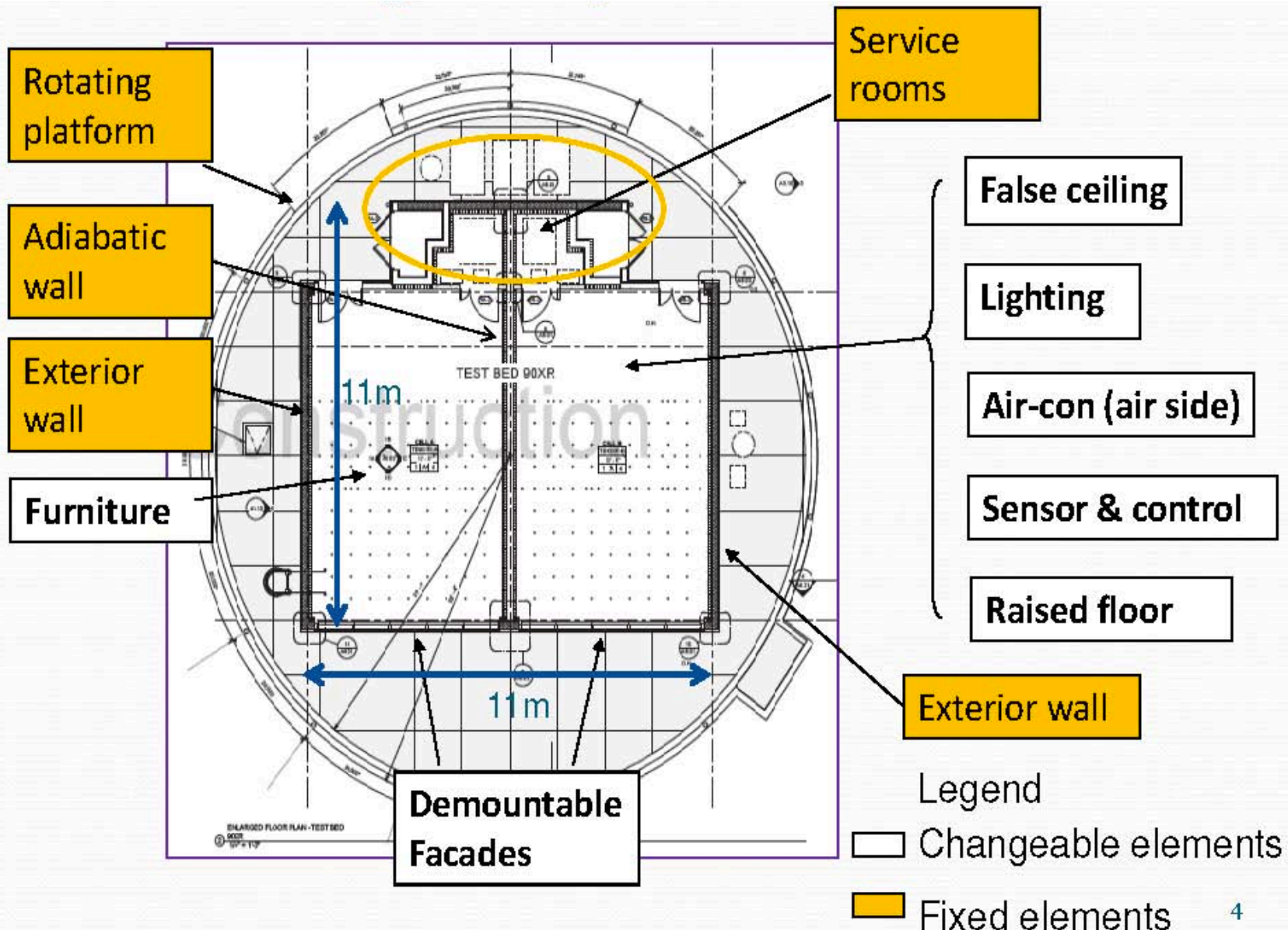
- Simulation and validation of efficient building technologies
- Building systems integration
- Thermal insulated facades
- Windows, daylighting & lighting control
- Ventilation and Indoor environmental quality
- Computerised building simulation tools
- Building sensors, controls & communications
- High-albedo material coatings
- Data acquisition and management



Rooftop of the new workshop block



# Plug & Play Concept







*Thank  
You*



[www.sgbc.sg](http://www.sgbc.sg)