02 TWO IN THE 2014 CHAMPIONS LEAGUE

06 SPOTLIGHT ON GREEN FACILITIES MANAGERS

13 WHAT’S ON AT SGBW 2014?
CONTENTS

CONTINUED LEADERSHIP
02 Two In the 2014 Champions League
06 Spotlight on Green Facilities Managers

PROVEN SUSTAINABILITY PERFORMANCE
09 Why go PV?
12 Enhanced Sustainable Construction Capabilities Development Fund

WIDER COLLABORATION AND ENGAGEMENT
13 What’s on at Singapore Green Building Week (SGBW) 2014?
16 Greening IGBC Delegates Experience
17 IGBC Poster

ENERGY EFFICIENT AIRCON IN GREEN MARK BUILDING
How has BCA Green Mark promoted energy-efficient air conditioners in Singapore?
Scan the QR code
or find out more at the BCA Centre for Sustainable Buildings’ website http://www.csb.sg/publication/articles/
We concluded another successful BCA Awards Night on 22 May, recognising the best and finest in the industry. It was a memorable evening with Mr Lee Yi Shyan, Senior Minister of State for Trade and Industry and National Development as Guest-of-Honour and it included many luminaries from the built environment sector.

This year’s Awards Night was attended by 2,450 guests, the highest number of guests by far for a BCA event. The evening saw a record number of 227 Green Mark awards given out including new accolades such as the BCA Green Mark Award for Healthcare Facilities (Platinum) and the Green Facilities Manager of the Year award. The ever-increasing number of Green Mark building projects added to our skyline and ‘green collar’ professionals is testament that the built environment sector is actively pursuing our vision of creating a sustainable Singapore.

In this issue, we are pleased to share details on the Enhanced Sustainable Construction Fund to support low-CUI designs, and the business case for rooftop photovoltaic systems, which are becoming increasingly viable.

Meanwhile, BCA is gearing up for its annual green building event, the Singapore Green Building Week (SGBW) 2014 (1-7 Sep) and its anchor event, ‘International Green Building Conference’ (IGBC) (1-3 Sep) at the Marina Bay Sands. We expect more than 10,000 participants from more than 35 countries taking part in the various events during SGBW 2014.

The theme for IGBC 2014 is Build Green - Lead, Engage and Sustain, and this year’s line-up includes an impressive array of more than 80 international and local experts, policy-makers, academics, real estate developers, architects, engineers, builders and green building professionals for a congregation of ideas, collaboration and learning. Join us and be the first to hear details of the 3rd Green Building Masterplan and incentive schemes at the conference.

I look forward to seeing you at our Singapore Green Building Week in September.

Dr John Keung
Chief Executive Officer
Keppel Land Limited adopts a proactive approach towards environmental management and protection to create a sustainable future. It is dedicated to develop properties that improve the quality of life of communities across Asia through integrating sustainability into its business operations. The company is also committed to establish and maintain high standards of environmental protection, innovating continually to improve its environmental performance.

Keppel Land Limited has so far bagged 32 Green Mark awards. These include Platinum awards for its commercial buildings such as Keppel Bay Tower, Keppel Datahub2, Bugis Junction Towers and Ocean Financial Centre. Ocean Financial Centre, notable for its iconic design and large vertical garden, was in fact the first office development in Singapore’s Central Business District to achieve the Platinum rating in 2008. It also holds more than 400m² of photovoltaic capability on its roof, one of the largest for a high-rise commercial building in the country.

In its pursuit to achieve higher environmental performance for its projects, Keppel Land set a benchmark to attain at least BCA Green Mark GoldPLUS rating for all its new projects in Singapore in 2012. An additional target was set for all existing commercial buildings in Singapore to be retrofitted to meet the minimum BCA Green Mark GoldPLUS standard by 2015.

To spread the ‘green mindset’, the ‘Go Green with Keppel Land’ outreach and ‘Tenants Go-green’ programmes aim to share and promote environmental awareness and green office practices to its building tenants and occupants. For instance, tenants receive the Green Fit-Out and Green Office Operation Guides, which encourage the use of energy-efficient lighting and fittings and provide practical tips on environmentally friendly practices in the office environment.
CONTINUED LEADERSHIP

GREEN MARK SCORECARD: KEPEL LAND LIMITED

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Keppel Bay Tower, Green Mark Platinum, 2014

Bugis Junction Towers, Green Mark Platinum, 2014

Corals at Keppel Bay, Green Mark GoldPLUS, 2013
The other Green Mark Champion, the Nanyang Technological University (NTU), has in recent years been expanding its campus as well as retrofitting its existing buildings to Green Mark standards. In fact, NTU has set itself an ambitious target to reduce 35% of its energy usage and waste by 2020.

The greening of its buildings is one way to achieve this target as buildings take up large amounts of energy. To date, 18 building projects have been Green Mark-certified, with eight attaining the Platinum status. One of its Green Mark Platinum projects, which sits as a centrepiece on NTU’s campus, is the School of Art, Design and Media, known for its signature sloping green roof.

The new eight-storey Learning Hub is another Platinum project. Due for completion this year, the building uses passive displacement ventilation, an air distribution strategy that relies on the natural convection of heat transfer to draw chilled air-conditioned air that sink to the floor up to the occupied space. This removes the need for mechanical distribution fans that are required for conventional air distribution system, and as a result saves energy and cost. In addition, NTU intends to use hydrophylic polymer for the plants as it helps increase soil absorption and distribution of moisture to eliminate the need for irrigation system.

NTU is also a leader in sustainable research, with over $1.2 billion in competitive funding. Its lush green campus is a living laboratory for sustainability. Centres at NTU conducting sustainability research include the Earth Observatory of Singapore, Singapore Centre on Environmental Life Sciences Engineering, Nanyang Environment & Water Research Institute, and Energy Research Institute @ NTU.
GREEN MARK SCORECARD: NTU

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CONTINUED LEADERSHIP

Learning Hub at South Spine, Green Mark Platinum, 2012

Residential Halls at North Hill, Green Mark Platinum, 2014

Residential Halls at Nanyang Drive, Green Mark Platinum, 2012
The role of a FM has changed significantly over the past 10 years. In the past, a FM’s primary responsibility is to manage a building in terms of its daily operations and maintenance. Now, in addition to that, a successful FM has to manage and be responsible for the building’s energy and environmental performance, taking into account long-term sustainability considerations such as reducing waste and pollution, ensuring the health and well-being of occupants and achieving a reduction in utilities costs. This includes monitoring the energy trends, identifying opportunities for improvement, as well as making recommendations to top management for major equipment upgrades, like chiller plant upgrading and lift modernisation.

The FM also has to go beyond ensuring the smooth, efficient and cost-effective operation of buildings today, to make choices guided by the principles of sustainability. Back in the early 90s, we merely skimmed the surface of the issue of global warming. The focus then was on reducing the use of greenhouse gases such as chlorofluorocarbon (CFC) - based refrigerants, which were gradually phased out to reduce negative impact to the environment. Fast forward to the present, as the general public becomes more informed and knowledgeable on such topics, efforts to address environmental issues are now more holistic, with global warming and climate change taking on more urgency on the global platform. The increasingly sophisticated real estate market is also expecting and preferring a better performing built environment.
We see that residential customers are more appreciative of the green features in our developments, especially since there is a direct impact for them in terms of utility cost savings. In the leasing market, there is a growing demand especially from multinational corporations who may have green buildings and green facilities management practices as criteria when sourcing for office space. The role of the FM must therefore evolve not only in response to these developments but anticipate what customers want.

The FM role is challenging. At the same time, it can be rewarding. For existing buildings which are older than 10 years, retrofitting works – including upgrading the chiller plant system, modernising lifts and using LED lights – can be costly but the return on investment is justifiable. For new developments, the FM also has to be involved in the early stages to review the building design to ensure that operational efficiency is taken into consideration as part of the design criteria.

I am active in the global green building scene, through my involvement in various programmes and initiatives. I participated in the formation of the inaugural World Green Building Council Corporate Advisory Board. I am also a member of the Singapore 3rd Green Building Masterplan Advisory Group and sit on BCA’s International Panel of Experts, which helps map out new and innovative directions for a sustainable built environment in Singapore.

I play an instrumental role in driving green initiatives among Keppel Land’s various stakeholders. Managing about 2.5 million square feet of commercial space in Keppel Land’s buildings, I strive to constantly influence stakeholders to take into account environmental considerations during day-to-day decision-making.

The FM should have an environmental operations plan in place, which sets out measurable targets for individual buildings, with progress being monitored closely. The scope of the plan should include energy performance, reduction of water usage, sustainable procurement and capability building, among others. FMs play an especially important role during the design development stage during which decisions made have significant long-term impact on the operational life cycle of the building.

In Keppel Land, over and above ensuring that our developments and buildings are achieving the best sustainable performance, the FM engages tenants and residents and inculcates in them the mindset that they should live, work and play sustainably.

I had come up with a 10-year green programme for chiller plant upgrading in various buildings to achieve an average chiller system efficiency of below 0.65kW/RTon. To date, all of CDL’s 15 investment properties have achieved the BCA Green Mark accolade, including 10 Green Mark Platinum awards and one Green Mark GoldPlus award. The total energy savings achieved amounted to 14.06mil kWh/year, equivalent to cost savings of S$3.6mil/year. We also achieved ISO 50001 Energy Management System certification this year.

I would like to share with you some of your recent achievements?

WOULD YOU SAY CUSTOMERS ARE CONSCIOUSLY CHOOSING GREEN BUILDINGS NOW?

WHAT IS THE FM’S ROLE TODAY, AND WHAT MAJOR CHALLENGES DO YOU FACE?

CONTINUED LEADERSHIP

BCA

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Having said that, the FM team should constantly undergo training and development to upgrade competencies to operate and maintain systems at their optimal efficiencies. Our role in CDL also includes educating suppliers on our standards and stringent requirements in environmental performance, green equipment and technologies, so that they keep abreast of developments in this field.

COULD YOU SHARE WITH US SOME OF YOUR RECENT ACHIEVEMENTS?

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Tenants’ support is very important for a sustainable performance in building operations. Our own efforts alone will have limited impact on the environment. We seek to influence as many individuals as possible, and make a significant difference together. Environmental sustainability is not just the preserve of governments, policy makers or greenies; everyone has a part to play. As FMs, we are greatly challenged to actively engage and involve all stakeholders ranging from building owners to service providers and occupiers.

I believe more can be done still to educate stakeholders on the benefits of environmental sustainability, and I am working on various projects to increase awareness among the community-at-large.

Indeed, it would. It is already enriching to have industry sharing sessions where peers and industry partners can share success stories and challenges with one another. As more industry players get more acquainted with developments and best practices in the FM field, the overall standards can only be raised, for the benefit of the built environment. Our team at CDL will continue to manage our properties in a cost and energy efficient manner, and actively engage stakeholders across our supply chain to inculcate an eco-conscious mindset among them.

My advice to the young peers is to dare to explore. Technology is ever-changing; you have to constantly enrich yourselves to take on new challenges. Remember, “If you can dream it, you can achieve it!”

With the “can do!” spirit, FM has an important role in supporting progressive developers and building owners to achieve a greener built environment.
PHOTOVOLTAIC (PV) SOLAR PANELS CONVERT LIGHT ENERGY INSTANTANEOUSLY INTO GREEN ELECTRICITY. UNTIL 2012, THE ELECTRICITY SAVINGS ALONE WERE SELDOM ENOUGH TO JUSTIFY INSTALLING ROOFTOP PV SYSTEMS IN SINGAPORE. WAS 2013 THE LONG ANTICIPATED TIPPING POINT FOR PV AS AN ATTRACTIVE INVESTMENT HERE?

Christophe Inglin, Vice Chairman of SEAS and Chairman of SEAS Clean Energy Committee

PV - An Attractive Investment?
The laws of supply and demand, combined with relentless economies of scale, have driven down the cost of PV over the last dozen years. PV has now become competitive against conventional electricity in many markets, without the need for subsidies.

Growth rates have been spectacular. Consider that in the decade from 2000 to 2010, the annual manufactured quantity of PV grew one hundred fold. And since 2010, global PV output has continued to grow at roughly 30% per year.

The rapid plunge in costs from 2010 to 2012 has now given way to a much steadier and gentler decline, making pricing more predictable. In Singapore, 2013 was widely considered as the year in which rooftop PV became a compelling investment, based on tangible electricity savings alone. See Figure 1.

Low Risk, High Returns
Simple payback periods have dropped below eight years for large commercial and industrial rooftop installations. While eight years might seem long compared to some energy efficiency investments, we need to consider the long working life of 20-30 years for a PV system. This means that the internal rate of return (IRR) works out to a very attractive 9-13%.

PV modules come with 25-year power output warranties, while the input ‘fuel’ of sunshine seldom varies by more than ±10% per year. The biggest risk for a rooftop PV system is future shading from neighbouring buildings. In most cases, the returns are disproportionately high compared to this risk, more so when compared with prevalent interest rates that hover near zero.

Accelerated Growth in PV Installation
Published data from SP Services (Figure 2) show the capacity of PV installations connected to the grid jumping noticeably from Q1-2014. The annualised Q1-2014 figure is over 2.5 times the capacity installed in 2013. Almost all the Q1-2014 installations were contracted in 2013, the year in which rooftop PV achieved commercial viability.

Figure 1 - Since 2007 the installed cost per watt of PV systems in Singapore has fallen by a factor of five, leading to payback periods of as low as six years, including maintenance costs. This results in project internal rate of returns (IRRs) of above 12%.

Prices from GeBiz tenders and Phoenix Solar commercial projects. Prices at time of final offer (not at installation). Bubble size in proportion to project size (kWp). Payback period at 2014/Q1 retail tariff (SGD0.2573/kWh)

Figure 2 - Annually installed PV capacity grew steadily through to 2013, then took off in 2014, after PV established commercial viability.

Data: SP Services. 2014 forecast pro-rated from 2014/Q1 figure of 3.35MWp. The year 2008 includes all installations from prior years.
Many developers and investors are still basing decisions on old data that lead them to mistakenly conclude that PV is not yet viable. As they become more aware of the attractive IRR for rooftop PVs, installation rates could grow even faster.

In January 2014, the Sustainable Energy Association of Singapore (SEAS) published a white paper on renewable energy that conservatively predicts 2 gigawatts peak (2GWp) of installed PV capacity in Singapore by 2025, contributing nearly 5% of project total energy demand then.

**How to Get Into PV?**

There are many ways for people to invest in a rooftop PV system and participate in the economic returns. One obvious means is outright ownership, in which the owner contracts with a PV installer to design and build a turnkey PV system, then to undertake periodic maintenance.

After several rounds of tendering for turnkey installations, the Housing Development Board pioneered power purchase agreements (PPAs), more popularly known here as leasing contracts, where an investor owns and operates the PV system, selling the power to town councils at a discount to the prevailing electricity tariff.

Leasing contracts offer a lot of contractual flexibility and cashflow advantages for the building owner, in exchange for giving up a large share of the IRR to the financial investor.

![Figure 3](image3.png)

**Figure 3** - Classic turnkey installation model, where the building owner acquires the PV system outright from an Engineering, Procurement and Construction (EPC) or Operation and Maintenance (O&M) contractor.

![Figure 4](image4.png)

**Figure 4** - Power Purchase Agreement (PPA) or leasing model, where the building owner simply buys solar electricity from a financial investor, who pays for and owns the PV system.

Typically, no down-payment is required, so the building owner need not worry about capital or budgets or operating expense. The negotiated solar tariff can be:

- a fixed price for the PPA duration (typically 20-25 years)
- a fixed price that starts lower but rises each year (e.g. at 2% per year)
- indexed to retail tariff, (e.g. 10% below prevailing tariff or a fixed number of cents below tariff)
- indexed to retail tariff but subject to a floor and a ceiling cap.

A leasing contract is quite complex. Besides the above variables, it must regulate what happens in case the building owner wants to change anything on the roof or decides to move out of the building or in case the system under- or over-performs. Shading conditions could also change, whether due to the building owner or a third party.

Figure 5 and Figure 6 compare the economics of outright ownership and a 25-year leasing contract for a medium-sized commercial rooftop system costing $1.1 million. Notice that in both cases, the operating expenses, covering maintenance and insurance, are the same. The ‘profit’ in each case comes from the delta between the retail electricity tariff and the effective cost per kWh of solar electricity.

![Figure 5](image5.png)

**Figure 5** - The economics of outright ownership of a PV system. The IRR accrues fully to the system owner.

- Parameters used for this example (but note each case is unique): Utility tariff escalates at 2%, O&M escalates at 3% ignores tax effects

![Figure 6](image6.png)

**Figure 6** - The economics of leasing a PV system. The IRR is shared between the financial investor and the building owner.

- Utility tariff escalates at 2%, O&M escalates at 3% ignores tax effects PPA fixed for 25 years, financial investor IRR = 8.8%
A building owner who buys a turnkey PV installation uses that delta to amortise the turnkey cost over the first 7.2 years, after deducting operating expenses. Once fully amortised, the building owner enjoys free solar electricity for the rest of the system’s useful life.

In a leasing contract, the building owner is cash-flow positive from the start, by saving money on retail electricity tariffs. The financial investor owns and operates the PV system, taking care of all operating expenses, and aims to secure an IRR of approximately 8%.

**Other Financing Models**

As banks, investment funds and other financial institutions gain familiarity with PV technology, we can expect more financing innovation in the sector. Pension funds like the very low risk of PV assets. Investment funds are keen to acquire PV assets, which they can aggregate into solar energy trusts and float on the stock exchange. We can also expect crowd funding as an alternative to bank loans to finance rooftop PV projects.

All of these developments will bring down the cost of financing rooftop PV systems, making them even more attractive to building developers and owners. But none of this financial innovation would take place without the fundamental premise that the rooftop PV is already an attractive investment in Singapore today. PV - until quite recently considered an expensive exception - will soon become a standard feature on buildings in Singapore.

The Sustainable Energy Association of Singapore (SEAS) represents the interests and provides a common platform for companies in Renewable Energy, Energy Efficiency, and Financial Institutions to meet, discuss, collaborate and undertake viable projects together. SEAS plays a strategic role in realising Singapore’s vision to be a global centre for sustainable energy, where products and solutions are developed and exported. For more information about what the Association does and its services, please visit www.seas.org.sg

Photography courtesy of Phoenix Solar Pte Ltd
**ENHANCED SUSTAINABLE CONSTRUCTION CAPABILITIES DEVELOPMENT FUND**

To support building projects with low Concrete Usage Index (CUI) - a design-focus drive to incentivise structural engineers.

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Grant quantum of up to 50% of the total qualifying cost or $250,000, whichever is lower.

Incremental efforts required by **structural engineers** in seeking new solutions to achieve low CUI building projects.

Applicants must be **structural engineering consultants** physically present and registered in Singapore. Collaborators can be either **builders or developers**.

Approved structural plans of the project must be submitted together with the application for the fund.

The date of the first approved structural plan should be on or after 15 April 2014.

Please visit our website for more details:
http://www.bca.gov.sg/Professionals/GovAsst/govasst.html

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**APPLYING FOR THE ENHANCED SUSTAINABLE CONSTRUCTION CAPABILITIES FUND**

- Preliminary discussion for advice on eligibility and evaluation criteria
- Applicant submits **formal application** to BCA
- BCA awards funding support to applicant
- Applicant accepts funding offer & commence project
- 1st 50% disbursement of funds upon commencement of superstructure works
- Final 50% disbursement of funds upon TOP
- Outreach for exemplary low CUI projects

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**FOCUS ON DESIGN AND INNOVATION**

**Design (70%)**

Emphasis on **upstream design** by advocating **design for optimal usage of concrete** therefore optimizing the use of building materials and natural resources.

- Pre-requisite criteria of min. **CUI** value 0.5 or below (50%)
- Use of recycled / alternative materials (20%)

**Innovation (30%)**

Encourage global technology scanning & approaches undertaken in the areas of adoption of new materials/technologies, capable of **reducing/replacing overall concrete usage**

- Innovative practices/approaches in use of new materials / methods / technologies
WHAT'S ON
AT SINGAPORE GREEN BUILDING WEEK 2014?

THE COUNTDOWN HAS BEGUN FOR THE SINGAPORE GREEN BUILDING WEEK (SGBW) 2014, HOSTED BY BCA. FROM 1 TO 7 SEPTEMBER, EXCITING EVENTS HAVE BEEN LINED UP TO APPEAL TO INDUSTRIES, PROFESSIONALS, ACADEMICS AND THE COMMUNITIES. THIS YEAR, THE THEME ‘BUILD GREEN – LEAD, ENGAGE, SUSTAIN’ SEEKS TO MOTIVATE CONTINUAL LEADERSHIP IN GREEN BUILDING ADVANCEMENT; TO ENGAGE STAKEHOLDERS AND ENCOURAGE COMMUNITY INVOLVEMENT, AND TO FACILITATE A PLATFORM FOR THE SHARING OF INNOVATIONS AND BEST PRACTICES THAT DEMONSTRATES SUSTAINED BUILDING ENERGY PERFORMANCE. MARK YOUR CALENDARS NOW!

International Green Building Conference (IGBC) 2014
1 - 2 Sep 2014, 09.00am – 06.00pm and 3 Sep 2014, 09.00am – 01.00pm
Marina Bay Sands Expo and Convention Centre, Level 3

IGBC 2014 is organised by BCA as the anchor event of the Singapore Green Building Week. It will play host to international green building experts, policy-makers, academics and built environment practitioners, for a congregation of ideas, collaboration and learning to achieve a shared vision of a greener planet through the green building movement. IGBC 2014 brings together 90 speakers from 17 countries across Asia Pacific, Europe and North America.
Build Eco Xpo (BEX) Asia 2014
1-2 Sep 2014, 10.00am – 07.00pm and 3 Sep 2014, 10.00am – 06.00pm
Marina Bay Sands Expo and Convention Centre, Level 1

Held alongside IGBC 2014, BEX Asia 2014 is Southeast Asia’s premier business platform for the sustainable built environment. It will feature about 350 exhibiting companies, providing a one-stop sourcing solution for cutting-edge technologies in green building design and architecture that will enhance a business’s competitive edge in the world of Build Green. This year’s BEX Asia is also co-located with designinteriors 2014 and Lighting Asia.

BCA Breakfast Talk for CEOs (By invitation only)
3 Sep 2014, 08.15am – 10.30am

Over 200 CEOs and senior management from major developers, building owners, valuers, leasing executives and building tenants will gather to catalyse a change in modus operandi through sustainable energy consumption behaviour and practices. The event will be graced by Mr Lee Yi Shyan, Senior Minister of State for the Ministry of National Development and the Ministry of Trade and Industry, with key prominent speakers from the built environment to share their valuable insights and engage in constructive discourse over initiatives that businesses can adopt to reap both profits and environmental benefits.

1st Inaugural Green Mark Refresher Course:
1 – 2 Sep 2014, 12.00pm – 02.00pm

Since the launch of the BCA Green Mark Scheme in Jan 2005, several revisions have been made to the Green Mark criteria. To ensure that the industry practitioners remain relevant and up-to-date, this half-day Green Mark Refresher Course will keep industry practitioners abreast with the latest development and updates of the Green Mark scheme and related initiatives.
WIDER COLLABORATION AND ENGAGEMENT

BCA-SIA-SGBC International Tropical Architecture Design Competition 2014 for Institutes of Higher Learning

Prize presentation on 1 Sep, 06.30pm – 08.30pm

The competition this year welcomed innovative designs from students that demonstrated the essentials and key constituents of a green residential building in a metropolitan city, under the theme “Our Urban Green Home”. With the aim of nurturing future architects and leaders in tropical green building designs and to promote awareness of the need for sustainable living in the region, this annual competition is jointly organised by BCA, the Singapore Institute of Architects (SIA) and the Singapore Green Building Council (SGBC) and is open to institutes of higher learning from around the world.

BCA Green Building Exhibition (Open to Public)

5 – 7 Sep 2014, 11.00am – 08.00pm
Bugis+, Level 2

Members of the public can visit the BCA Green Building Exhibition at Bugis+ for an educational and interactive experience of a Green Home and Office. Apart from finding out how to reduce their monthly utilities bills, they can take part in fun activities to win free gifts and prizes. They can also join the highly anticipated Liberty Hunt at www.libertyhunt.com.sg, which will be launched on 5 September. Admission is free.
GREENING IGBC DELEGATES EXPERIENCE

THE INTERNATIONAL GREEN BUILDING CONFERENCE 2014 (IGBC 2014) WALKS THE TALK BY PUTTING MEASURES IN PLACE TO REDUCE ITS CARBON FOOTPRINT AND TO GIVE DELEGATES A GREENER EXPERIENCE.

**Venue**
Marina Bay Sands is a green building certified to BCA's Green Mark Gold standards. Designed to promote sustainability, it operates with an active engagement in the 3Rs of Reducing, Reusing and Recycling. The venue is easily accessible by public transport, via the MRT train and bus services.

**Energy**
The indoor air-conditioner will be set at 25 degree Celsius to reduce energy consumption for this event.

**Attire**
The recommendation to dress light, instead of dressing in coat and tie, will help delegates beat Singapore’s tropical climate and help to cut back on the need to cool the conference and exhibition halls to a lower temperature.

**Water Points and Tumblers**
The IGBC tumbler replaces bottled water at the event. Water points are located at various locations, featuring cornware cups, instead of paper cups.

**Eco-Friendly Printing**
Only recycled or FSC Certified paper stocks were selected for print materials used for programme booklets and brochures.

**Going Digital**
Delegates can receive the latest updates on the go through the IGBC 2014 Web App, which can be downloaded at www.sgbw.com.sg/app.

**Reusable Lanyard**
The event will make use of a simple lanyard with no logo prints, which can be reused for subsequent events. Delegates are encouraged to return all lanyards after the last session of the conference at the exit of the conference hall.

**Train/Walking Green Mark Tour**
This year introduces the first-ever Train/Walking Green Mark Tour. A route has been planned using the MRT train and walking routes for delegates to tour Green Mark sites. More information can be found on the event’s Green Mark Tour site.
**WIDER COLLABORATION AND ENGAGEMENT**

**BUILD GREEN**
**LEAD, ENGAGE & SUSTAIN**

**REGISTER NOW FOR ATTRACTIVE RATES!**
www.sgbw.com.sg

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<td>Spotlight Session</td>
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<td>GM Refresher Training</td>
<td>Green Mark Tours</td>
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<td>Tech Talks (Smart Building)</td>
<td>Five routes to choose from</td>
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<td>Thematic Tracks</td>
<td>Thematic Tracks</td>
<td>(Only 38 seats available on each route, on a first come first served basis)</td>
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Featuring **90 speakers from 17 countries**

- Stephen Selkowitz, Lawrence Berkeley National Laboratory
- Dr. John Leung, BCA
- Mark Carroll, Renzo Piano Building Workshop
- Alastair Guthrie, Arup
- Andrew Grant, Grant Associates
- Jason Pomery, Pomery Studios
- Lisa Bate, B+H Architects
- Weng Kading, World Bank
- Thomas Hartman, The Hartman Company
- Luke Leung, SOM LLP
- Uma Maheswaran, Jurong Consultants
- Romby Maduw, Green Building Council of Australia
- Bertil Andersson, KTH Royal Institute of Technology

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**International Green Building Conference 2014**
**1 – 3 SEPTEMBER 2014**
**MARINA BAY SANDS, SINGAPORE**

Organised by:
- Building and Construction Authority
- Mitsubishi Electric
- BCA Breakfast Talk for Office Eco Champions
- Daikin
- Strategic Partners
- Green Source
- Reed Exhibitions
PERCENTAGE OF GREEN BUILDINGS IN SINGAPORE

AS AT JULY 2014

2014 | 25.5%

2004 | 0%

2030 | 80% (Target)