香港中文大學
The Chinese University of Hong Kong

Experience Sharing Seminar for Energy Saving Championship Scheme

Mr SM Fung, Campus Development Office
Mr Edmond Lam, Estates Management Office
Mr Kalvin Lai, Campus Planning and Sustainability Office

3 October, 2017

Overarching Strategies

T = **Technologies**

(innovation & cost-effectiveness)

E = **Engagement**

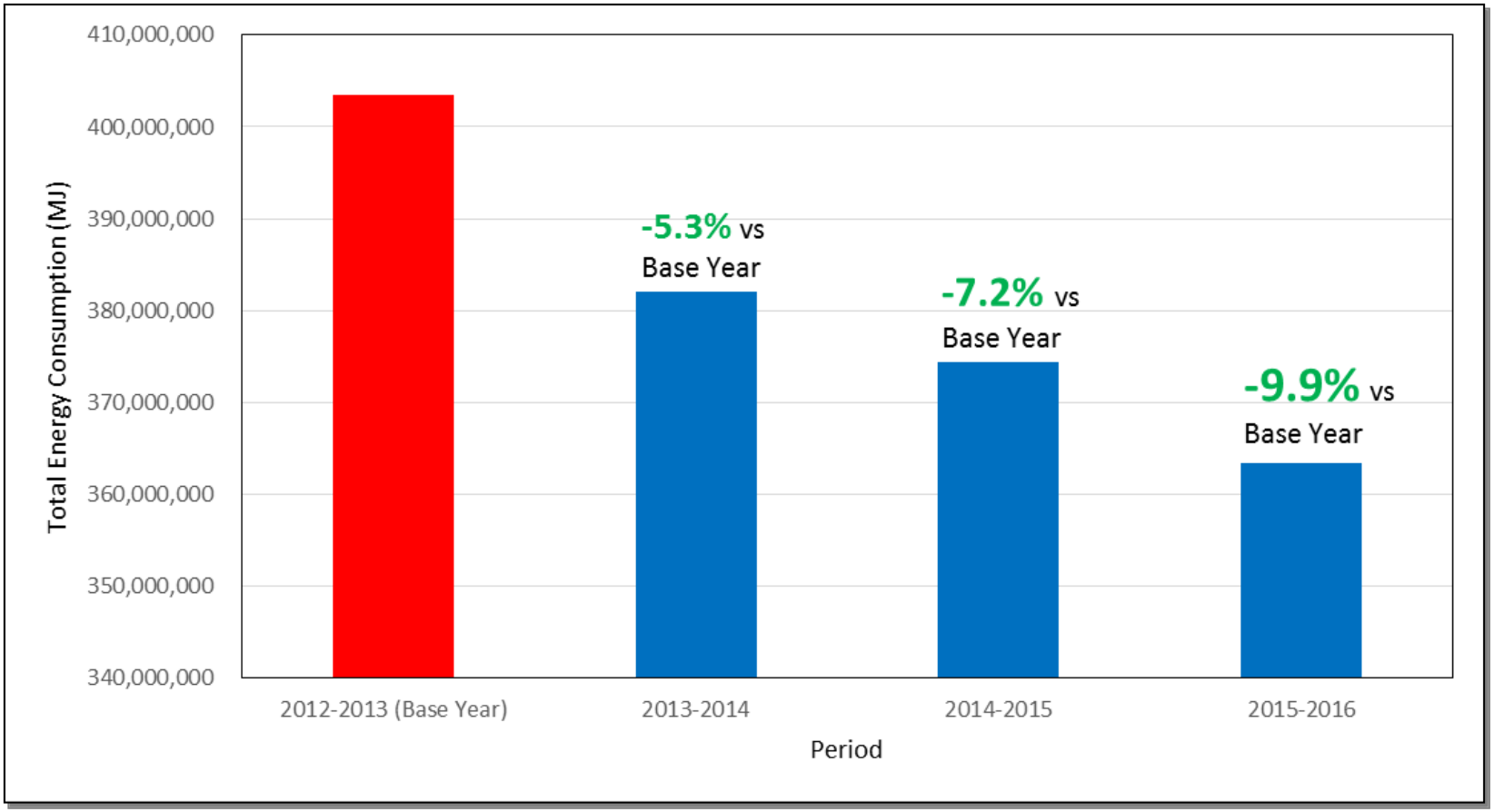
(staff, students & community)

A = **Actions**

(policies & implementation plans)

Welcome to the CUHK Green Campus

Continual Achievements in Energy Saving over the Past 3 Years



Total energy saving of **90,455,600 MJ over 3 years** (equivalent to ~ **HK$30,000,000** electricity charge)

CUHK in Context

Campus Area: 137.3 hectares (~0.05% of the HKSAR)

Population: ~26,000 students & ~8,000 staff

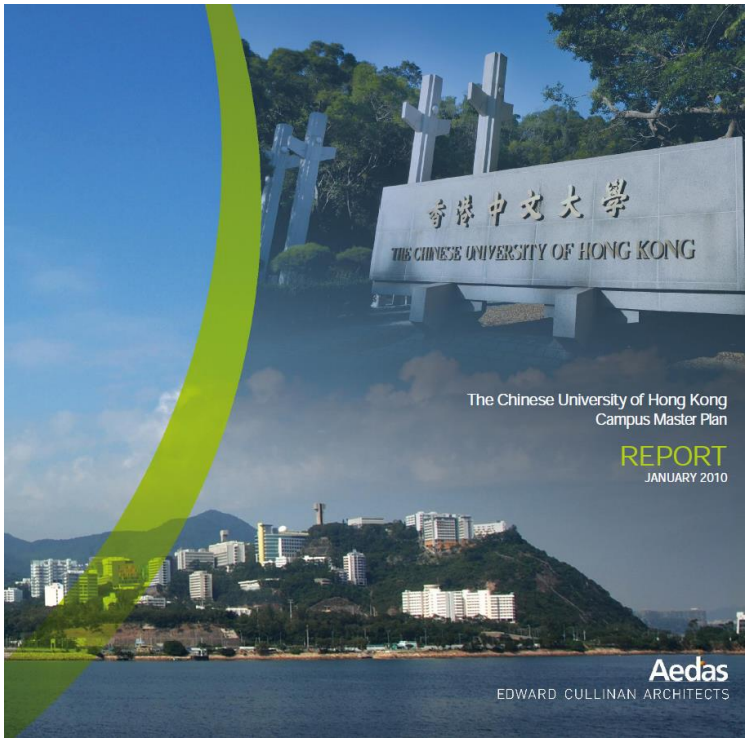
Number of Buildings: 167

Type of Buildings:
- teaching buildings
- laboratory buildings
- administration buildings
- libraries
- student hostels
- sports and amenity buildings
- staff quarters
- canteens and shops

Total Gross Floor Area: 711,255 m^2

Targets & Commitments

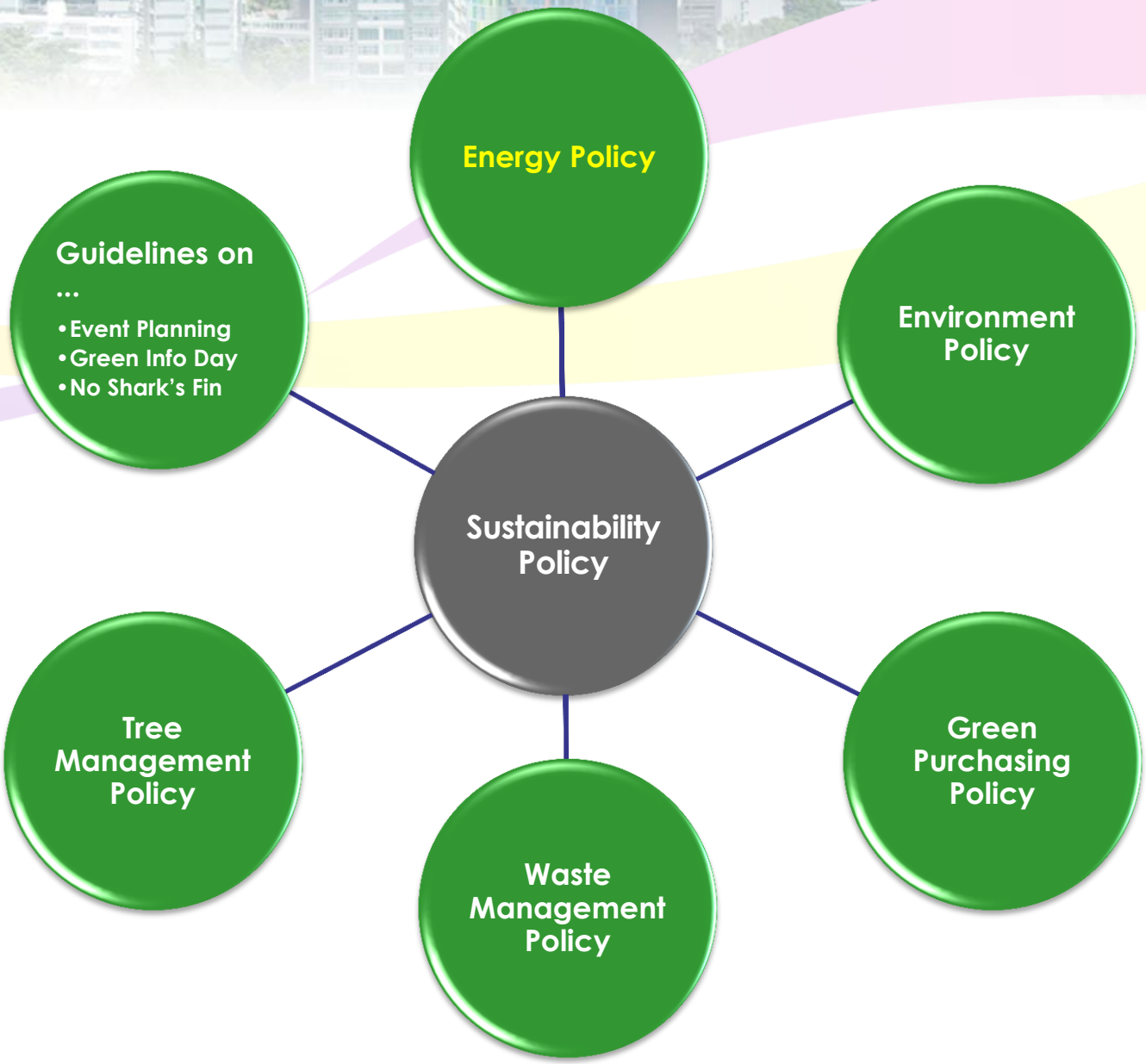
Campus Master Plan (2010)



Saving Plan	Timeline	Target
Long-Term	2005 - 2025	-25% per capita
Medium-Term	2012 - 2017	-8% per capita

We have **achieved the medium-term target ahead of schedule** (**-9.6% per capita as of 2016**), and are setting our new medium-term target in 2017

Sustainability Policy



Smart & Green Building Design and Technologies

PROVISIONAL PLATINUM NB V1.2 2016
HKGBC BEAM Plus

BEAM 建築環保評估協會

This is to certify that the
評 估 證 書

EXTENSION TO UNIVERSITY LIBRARY
The Chinese University of Hong Kong

大學圖書館擴建項目
香港中文大學

IN ACCORDANCE WITH THE BUILDING ENVIRONMENTAL ASSESSMENT METHOD (BEAM) FOR NEW BUILDINGS (4/04 VERSION), ACHIEVING THE RATING OF
就新建樓宇的設計及建造，按建築環境評估法(4/04版)進行，已獲評定為以下級別

HK-BEAM ECO BUILDING 環保建築

PLATINUM STANDARD
白金級別

Mr John Herbert, 許約翰先生
Chairman, Technical Review Panel of BEAM Society Limited
建築環保評估協會技術評審委員會主席

ISSUE DATE: 11th September 2013
簽發日期: 二零一三年九月十一日

BUSINESS ENVIRONMENT COUNCIL 商界環保協會

環境保護署 ENVIRONMENTAL PROTECTION DEPARTMENT

HKAS

Indoor Air Quality Certificate (Excellent Class)
室內空氣質素檢定證書《卓越級》

Valid period 有效日期: 22 January 2014 to 到 21 January 2015

I hereby certify that the indoor air quality of the following location(s) has fully complied with the Excellent Class of the Indoor Air Quality Objectives.
本人證明下列地點的室內空氣質素完全符合「卓越級」室內空氣質素指標。

Name of building 建築物名稱: 香港中文大學大學圖書館擴建項目 Extension to University Library, The Chinese University of Hong Kong
Address 地址: Central Campus, The Chinese University of Hong Kong, Shatin, N.T. 新界沙田香港中文大學中央校園
Certified location(s) 已檢定地點: Whole Building 全幢

Approved HKIAS IAQ Signatory
香港認可處核準室內空氣質素簽署人員

Name 姓名: Yeung Siu On
IAQ Certificate Issuing Body 室內空氣質素證書簽發機構: PIT Limited
Signature 簽署:
Date of issue 簽發日期: 22 January 2014
Certificate No. 證書編號: 3579046201401(2014)

PIT LIMITED IAQ Inspection Body

Organisation Chop 機構印鑑

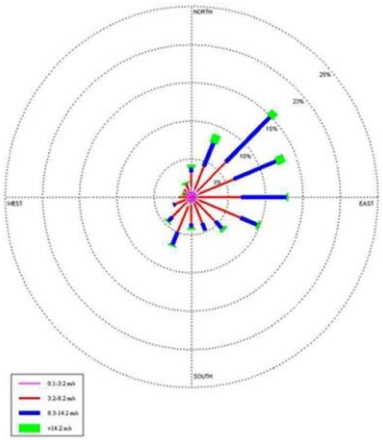
(This certificate is issued based on the results of the HKIAS endorsed inspection report no. IR(A)1311/00002)
(此證書是根據香港檢驗機構認可計劃檢驗報告編號 IR(A)1311/00002 所得之結果發出)

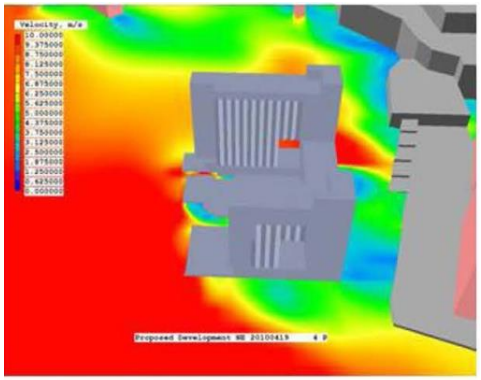
Indoor Air Quality Certification Scheme for Offices and Public Places
辦公室及公眾場所室內空氣質素檢定計劃

IAQ Indoor Air Quality Information Centre
室內空氣質素資訊中心

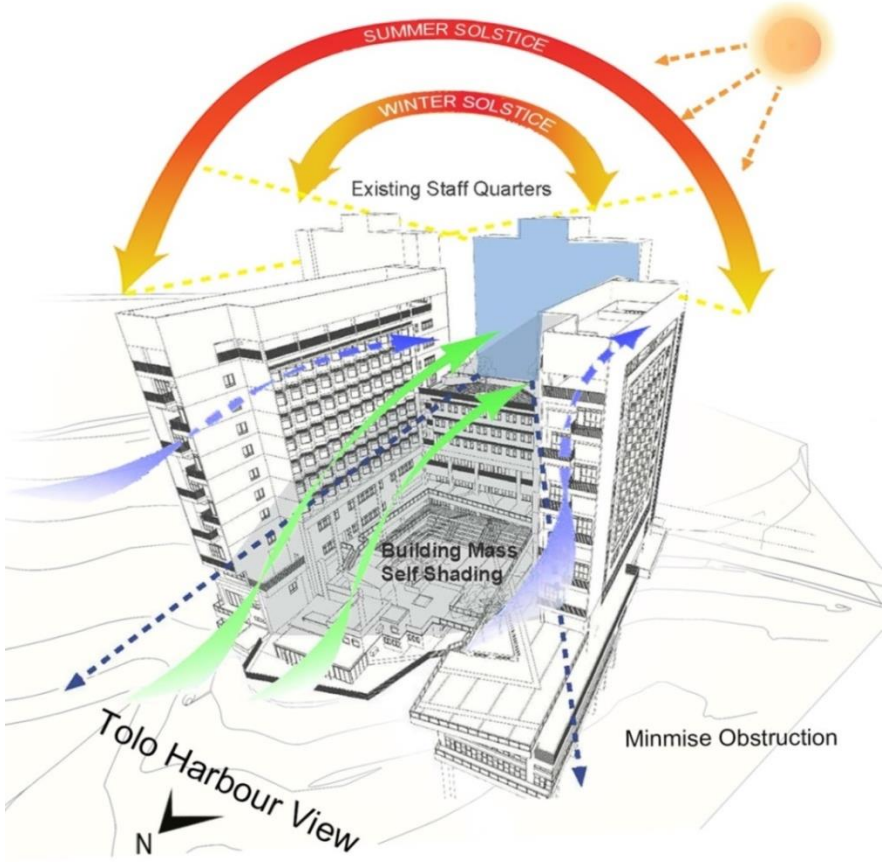
Design Principles
Echoing with Nature

Site Planning, Orientation, Day Light, Heat, Ventilation, Renewable Energy





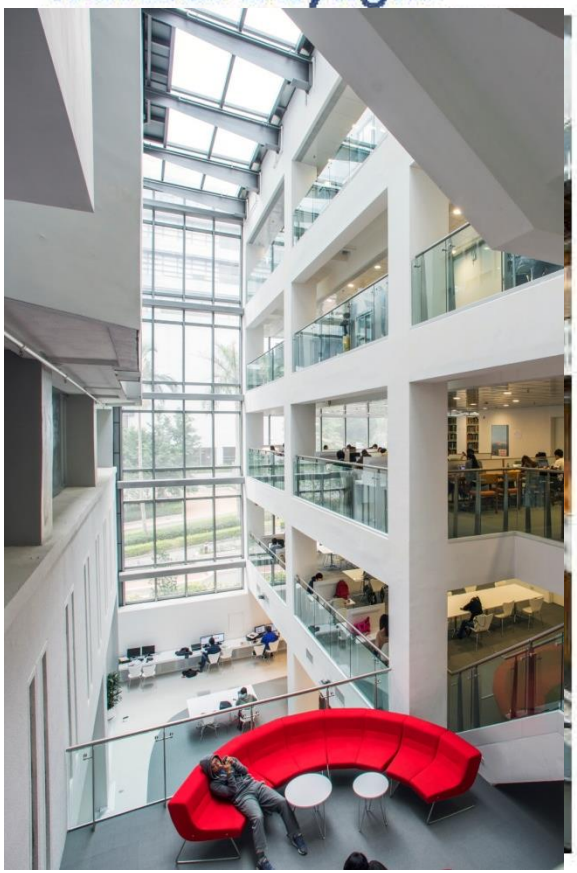
Wind velocity contour (viewing from west) at prevailing wind direction



Excellent Indoor Environmental Qualities

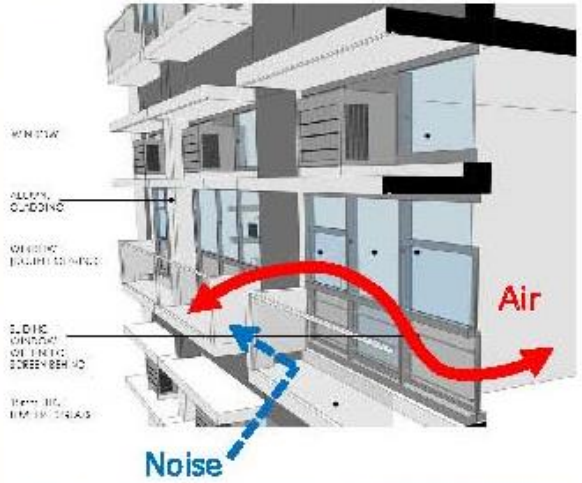
- Low-E insulated glass and sunscreens to reduce heat gain
- Lighting Zoning for flexible space usage
- A/C Zoning with CO_2 Sensors for Fresh Air Control and Energy Saving
- PV Panels for Renewable Energy

Natural Daylight



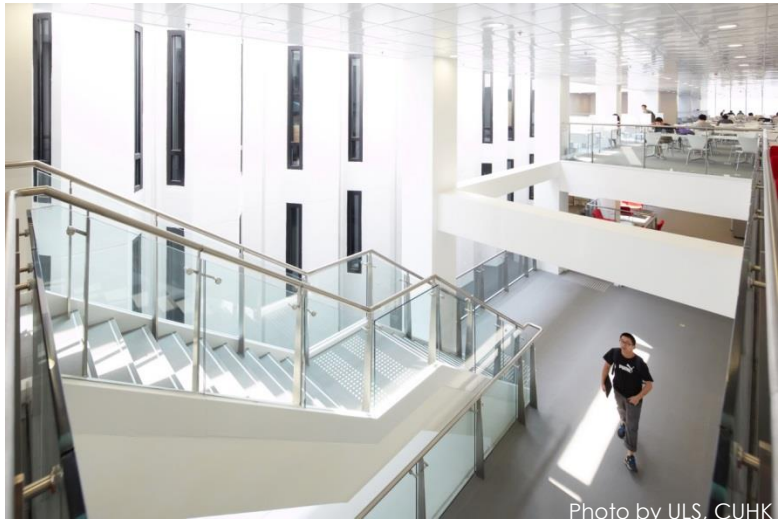
Indoor Air Quality

Acoustics & Ventilation

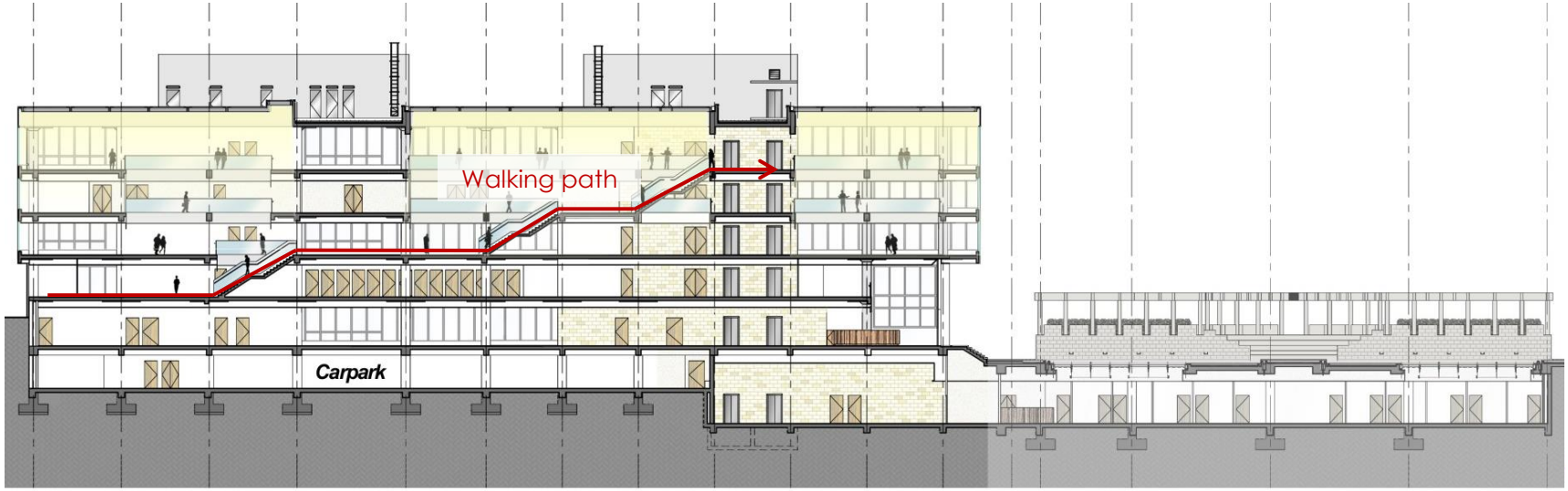


User-Friendly Buildings

Voids and Grand Stairs to connect and encourage walking between floors



Reduce the use of mechanical services and energy consumption



Renewable Energy

PV Panels, Hot Water Pre-Heating, and Electric Vehicles

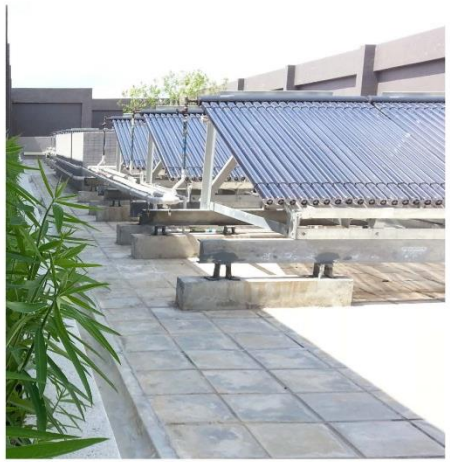
Total renewable energy generation from PV panel, solar hot water panel and solar landscape lighting is ~2.8% of building energy use.

Reduction in Greenhouse Gas Emission
- Provision of **Charging Points for Electric Vehicles**

Solar Landscape Lighting

PV Panel

generate electricity
grid connected
to city power



Solar Hot Water Panel

for hot water showering at student hostels
35 buildings completed,
1 in progress

Charging Points for Electric Vehicles

Energy Efficiency and Saving

Energy management for lift (lighting and ventilation)

VRV MVAC systems for podium

Occupancy Dependent Lighting Control

Daylight Dependent Lighting Control

Energy Saving Appliance

- energy efficient appliances with efficiency Grade 1 under EMSD Energy Efficiency Labelling Scheme

Air Conditioner

Fridge

Washing Machine

Green Features for Energy Efficiency

Natural Lighting and Photo sensors

along perimeter of the building

Perimeter zone Lighting off during daytime. The measured lux level is over 1000 lux during daytime in general even lightings are off.

Solar landscape lighting

Energy Management

Lighting off during unoccupied condition

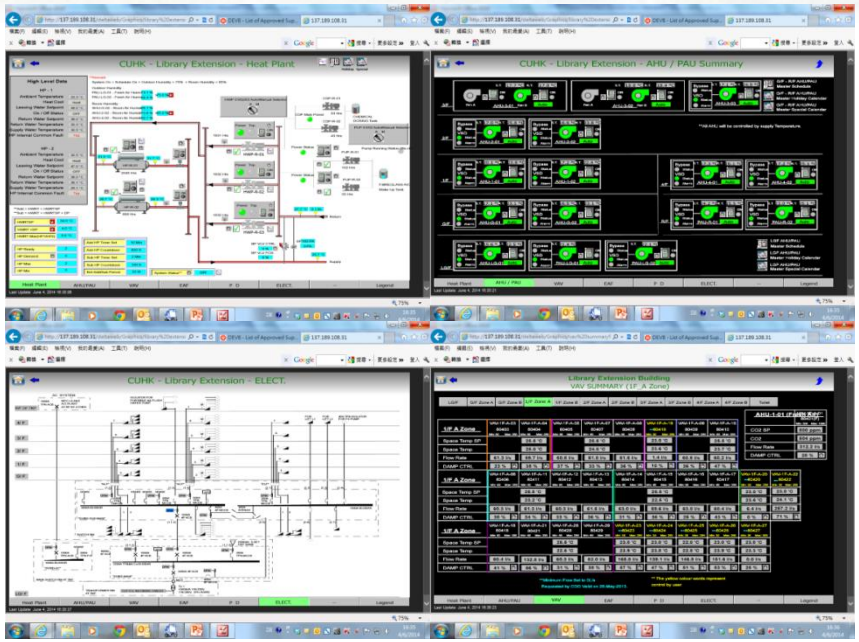
Lighting on when people walk-in

Motion sensors
along bookshelves

Motion sensors
inside toilets

LED spotlights

Energy Management



Web-based Building Management System for effective control and monitoring of M/E services ; provides flexibilities to fine tune performance zones and modes

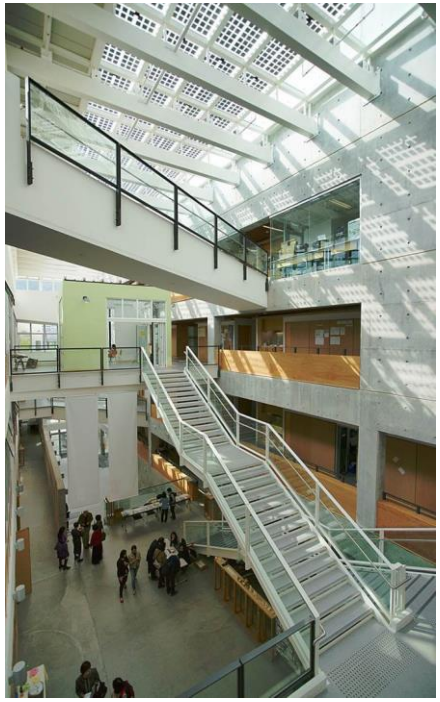
Web-based energy meters to monitor power consumption:
- for major sub-main distributions
- for air-conditioning plants

HKBEAM Achievements

Platinum rating for 6 new building projects
Gold rating for 4 new building projects

BEAM Plus

Provisional Platinum rating for 1 new building
Provisional Gold for 1 new building

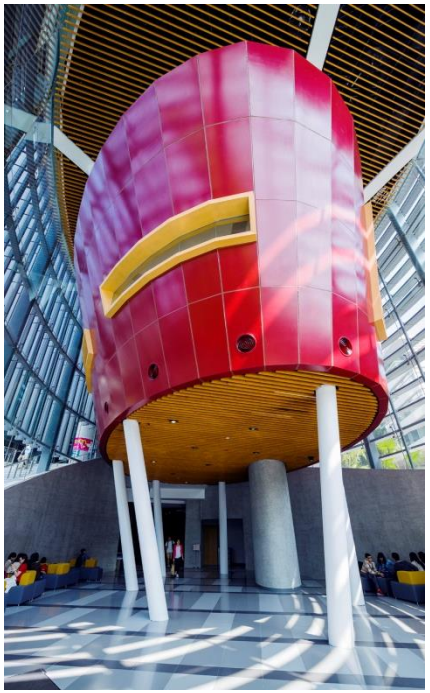


An Integrated Teaching Building

HKJC Postgraduate Halls

C.W. Chu College

University Library Extension



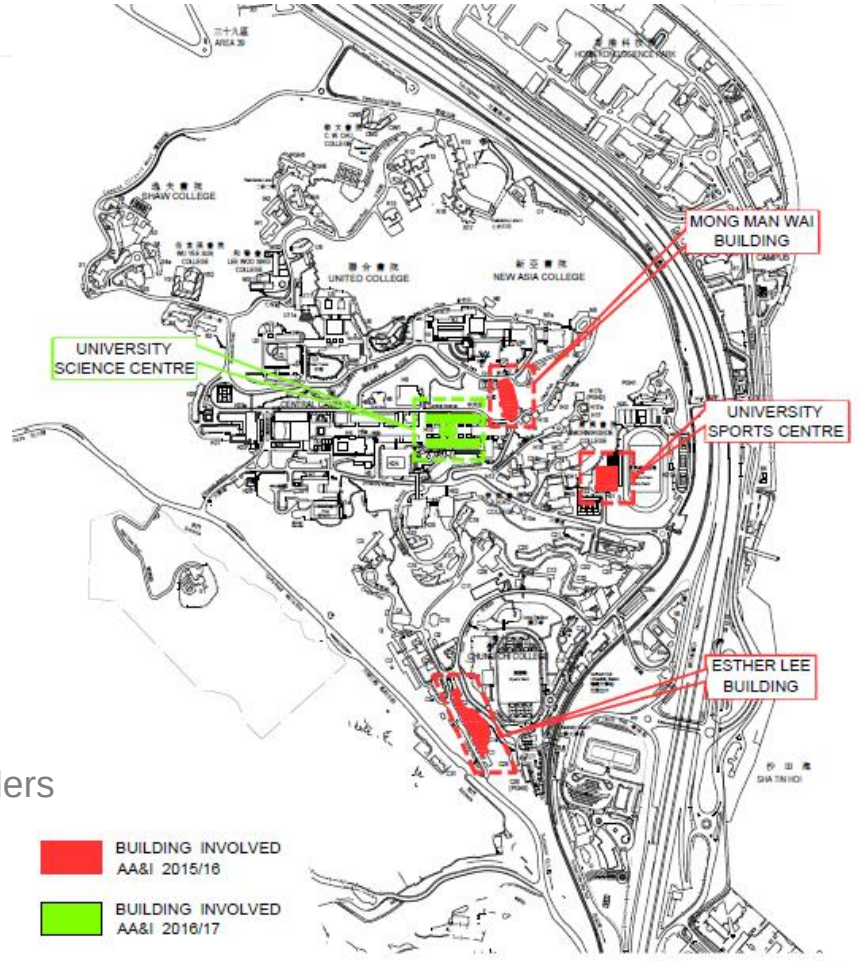
Yasumoto International Academic Park

PROVISIONAL PLATINUM NB V1.2 2016 HKGBC BEAM Plus

Continuous Effort in Campus Enhancements

Existing Chiller Plant

Upgrading / Replacement of Air Cooled Chillers to High Efficiency Oil-free Water Cooled Chillers



- 7x24 Operation Plants and Laboratory Buildings
- 10% energy saving compared with conventional chillers
- 7 nos completed, 9 nos in progress

District Cooling Design for Energy Efficiency

- **Shared the cooling capacity** of the chiller plant system from adjacent buildings
- **Diversify the loading profile** via utilizing different operation schedule of buildings
- **Reducing the peak electricity demand**
- **15% energy saved as compared with conventional system**

3 plants completed for clusters of laboratory buildings, libraries and lecture/classrooms buildings

Energy Conservation Incentive Scheme

- Leadership commitment (Vice-Chancellor and the senior management)
- Involvement of all Dept/Unit Heads
- Appointment of Energy Warden (EW) in each Dept/Unit

Energy Conservation Incentive Scheme

- **Carrot and Stick Approach** – sharing of saving and cost in electricity consumption, by 2 phases:
  - **Phase 1** (2014 & 2015) – 4% reduction target. If saving > 4%, Dept/Unit may share the saving. If saving < 4%, Dept/Unit need not share the cost
  - **Phase 2** (2016 & 2017) – 8% reduction target. If saving > 8%, Dept/Unit may share the saving. If saving < 8%, Dept/Unit need to share half of the cost (max 4%)
- Set the baseline – average annual consumption in the past 3 years for comparison

Energy Conservation Incentive Scheme

Assistance provided to Depts/Units:

- Energy Manager in Estates Management Office walks through the venues with EW of each Dept/Unit Recommendations are provided to each Dept/Unit
- Give funding supports to the recommended energy conservation measures (ECM)
- Share monthly electricity consumption information with Dept/Unit heads and EWs
- ECM will not affect the core activities in buildings

Energy Conservation Incentive Scheme

Recommended Energy Conservation Measures:

- Install motion / photo sensors for lighting control
- De-lamp in areas where the lighting is over-provided
- Replace inefficient lighting by T5 fluorescent / LED lamp
- Avoid over-sizing A/C installations on campus
- Minimize round-the-clock A/C / chiller plant operations
- Install timer to control exhaust fans / water boilers etc.
- Install solar film on window glass to block solar radiation
- Install mosquitos mesh on window to allow natural ventilation in cooler seasons

Estimated annual saving from these measures is up to **2,200,000 kWh p.a.**

Energy Conservation Incentive Scheme

Pilot scheme:

1. 20 buildings with electricity consumption nearly half of total consumption on campus was selected as pilot scheme.
2. Phase 1 completed in 2015. 13 buildings have achieved the 4% reduction target (ranging from -4.2% to -23.9%), and 5 buildings reduced 1.5 – 3.5% electricity consumption. Only 2 buildings failed to reduce electricity consumption due to operational constraints.
3. Total energy saving of these 20 Buildings in 2014 & 2015: 6,500,000 kWh.
4. Phase 2 of these 20 buildings is on going……
5. Phase 1 of the second lot buildings will be commenced in 2018.

Other Energy Saving Measures

- Replace sodium-vapour street lamps by LED street lamps

- Shut down certain lifts on holidays and off peak hours on week days

- Set indoor temperature at 25.5 ^{o}C

- Impose energy surcharge on classroom bookings on Sundays/public holidays

Engagement of Staff and Students in Energy Saving Measures

Green O'Camp Sponsorship (**13,000+** freshmen & **>8,700** student leaders since launch in 2013)

~180 green offices, involving 8,000+ staff

Green Student Society Scheme (**11,000+** members of participating societies)

>1,600 CU Green Buddies (staff & students)

記 (Before 7/10)
No Air Con Night 2016 Individual Pledge (7/10前)
「香港無冷氣夜」是環保觸覺一年一度的全港節能活動，中大亦是其中一個支持機構。現誠邀各位作個人登記，承諾今年10月7日晚不開冷氣，日常也減少使用空

Example of Creative and Practical Energy Saving Practices

- An incentive programme to encourage staff and students to reduce reliance on fuel-based vehicles
- Students and staff record their walking trips by tapping their CU Link cards at card readers to receive walking credits
- Points earned by students can offset some PE requirements in the academic curriculum
- **>176,000** walking trips have been logged since 2013 launch

Engagement of Community & Schools in Energy Saving Measures

Museum of Climate Change (MoCC): **150,000+** visitors since opening in 2013

Go Green Community – Carbon Reduction Partnership Program: **71,000+** participants from schools & NGOs

Conferences, Photo Contests, Drama, Green Mini Movies, Forums & Fairs: 88,000+ participants

Way Forward

- Refinement of existing practices
  - Expand ECIS scope to **involve 20+ more buildings** on campus
  - Aim to achieve **Platinum-level certification** under BEAM Plus for all new buildings
- Selected projects in the pipeline/ planning stage
  - Set up **more oil-free chiller** in chiller plants running round-the-clock operation to improve the efficiency
  - Collaboration with HKSTP in the **development of Smart Region**

Full Alignment with the Government's 4Ts Framework

TARGETS

- Set long-term target under CMP in 2010
- Establish medium-term target in 2012

TIMELINE

- 20 years (long-term target)
- 5 years (medium-term target)

TRANSPARENCY

- Communicate the energy saving efforts & performance on quarterly e-newsletters
- Regular progress update to various committees & task forces

TOGETHER

- Various engagement programmes (GO!, SO Green!, Green Buddies)
- Share the monthly electricity consumption information with Dept/Unit Heads & Energy Wardens

Video Screening

Video links:
http://www.cpr.cuhk.edu.hk/cutv/detail/888?t=cuhk-the-energy-saver

https://youtu.be/OudfyBz_8xM (with higher resolution)

Thank You