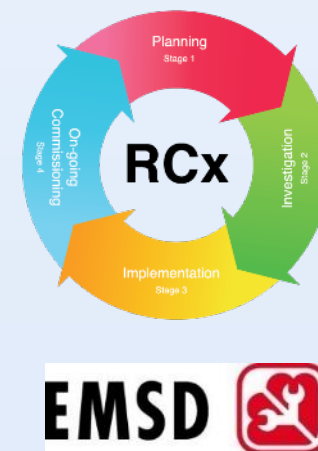
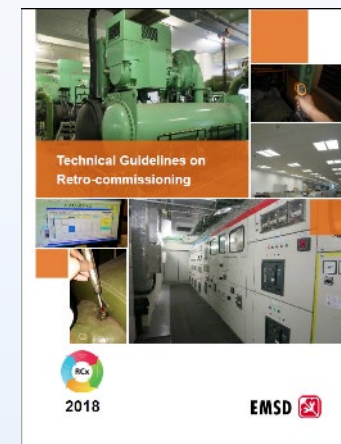


綠色校園 2.0 – 重新校驗 專業講座

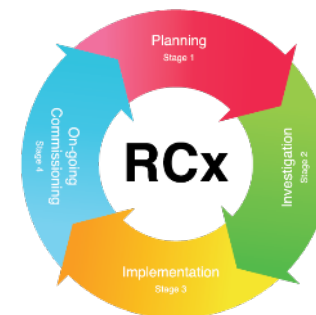
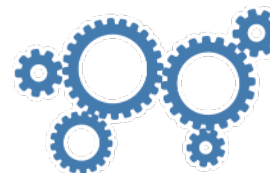
機電工程署重新校驗(RCx)技術指引簡介

2020年12月2日



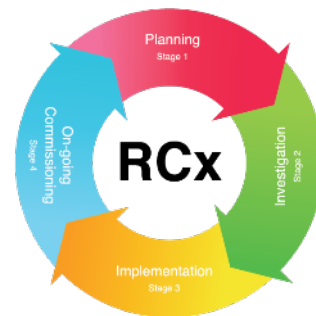
大綱

1. 在香港的背景
2. 重新校驗的發展
3. 對重新校驗的支持

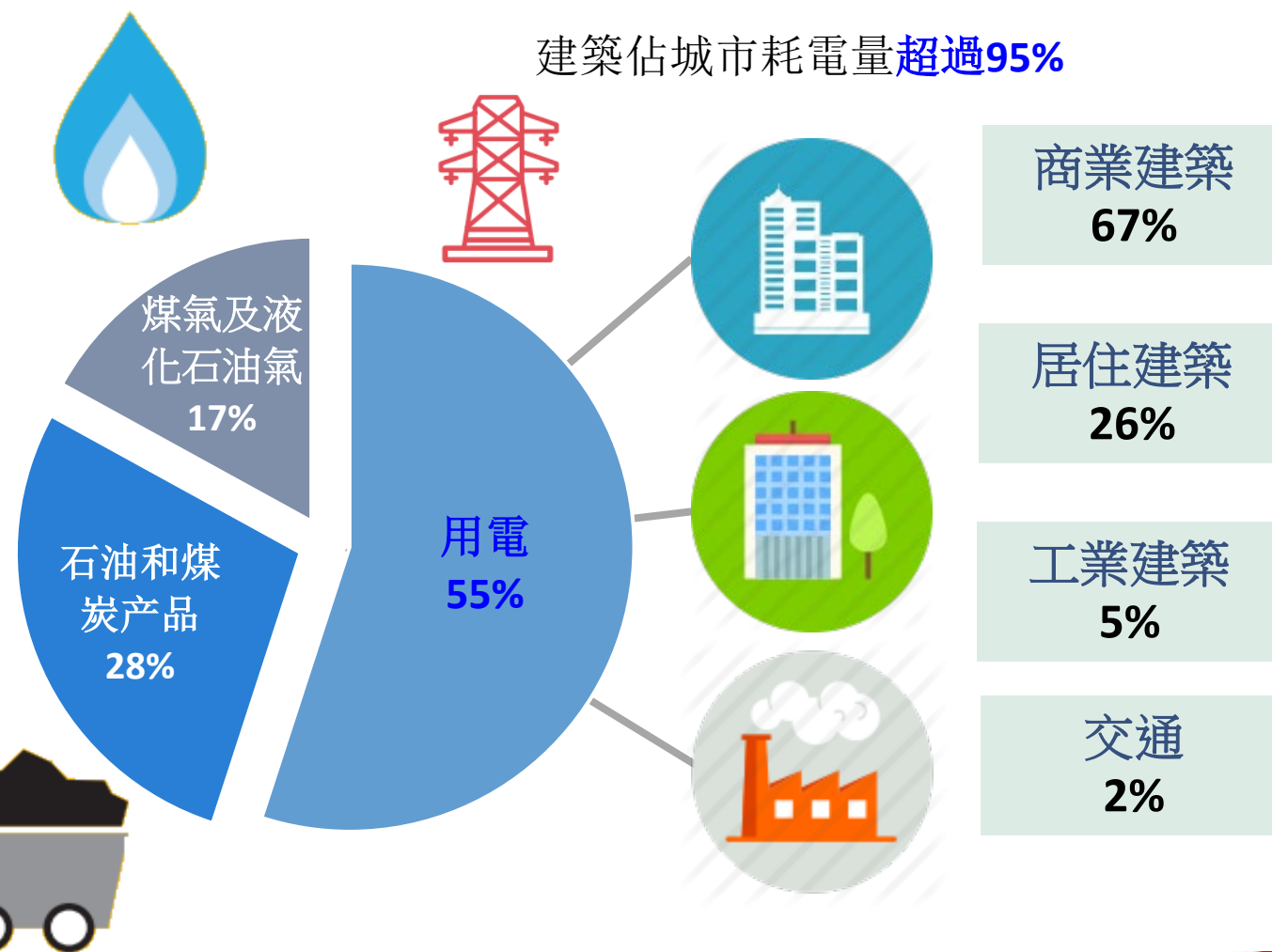
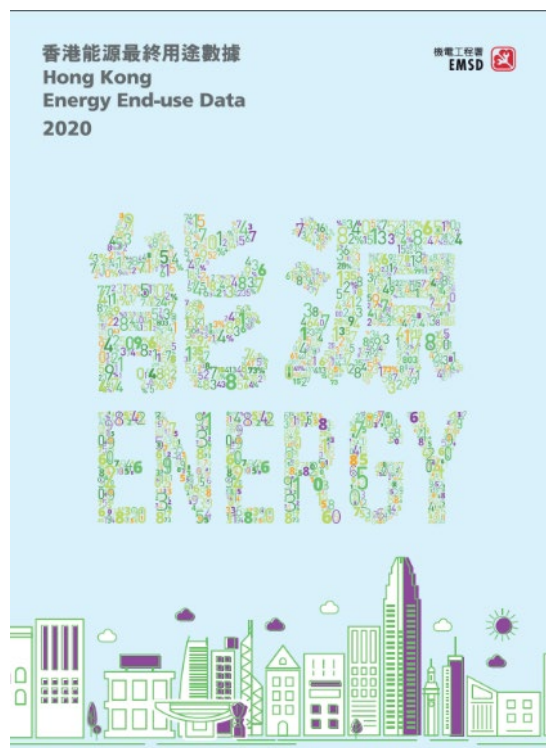


在香港的背景

1



香港能源消耗狀況



氣候行動藍圖 2030+ & 節能計劃2015~2025



碳中和
從 2051 到 2100



ENERGY SAVING PLAN

Hong Kong's Built Environment
2015~2025+



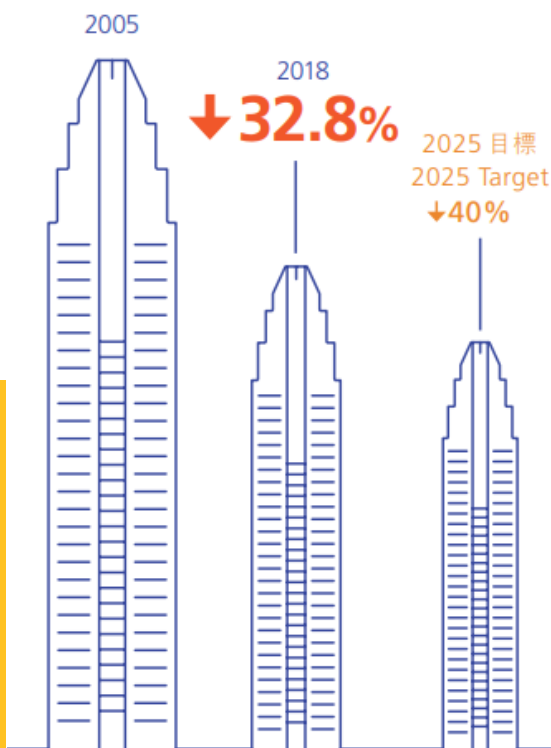
政策



Target Energy Intensity by
2025



(base year 2005)

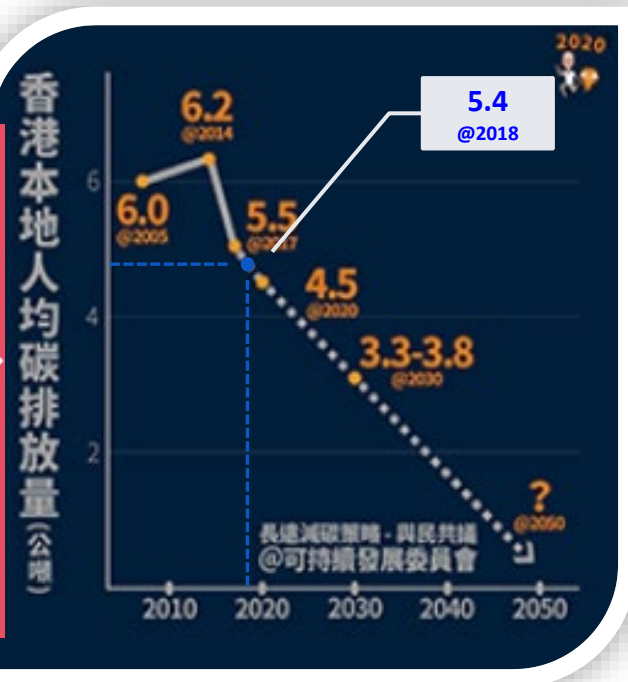
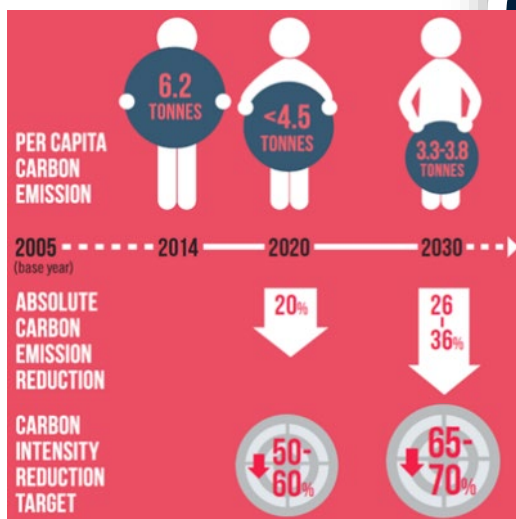


2020年施政報告- 邁向碳中和

碳排放

(以2005年為基準)

36%



行政長官2020年施政報告
The Chief Executive's
2020 Policy Address

砥礪前行
重新出發

Striving Ahead with
Renewed Perseverance

碳中和

提高新建和現有建築物
的能源效益

資料來源: <https://www.enb.gov.hk/tc/sens-blog/blog20200421.html>

2020 施政報告

氣候行動藍圖 2030+

4Ts 合作夥伴

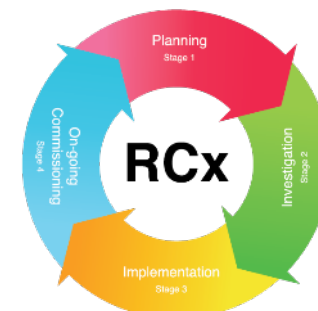
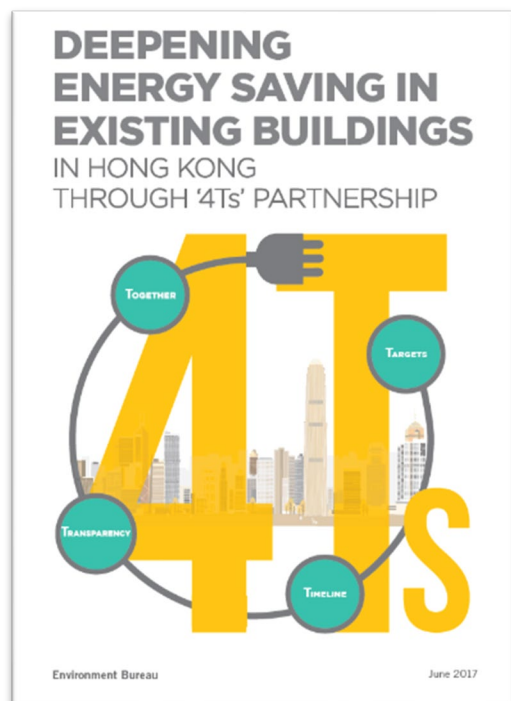
4Ts 運作框架

3. 所做的努力可以顯示為適當的指標“開放透明”

2. 制定與碳排放相關的減排“時間表”

1. 訂立與碳排放相關的減排“目標”

4. 每個人都在“共同參與”



4Ts 合作夥伴

香港建築中相關能源優先

Commercial & Institutional Buildings

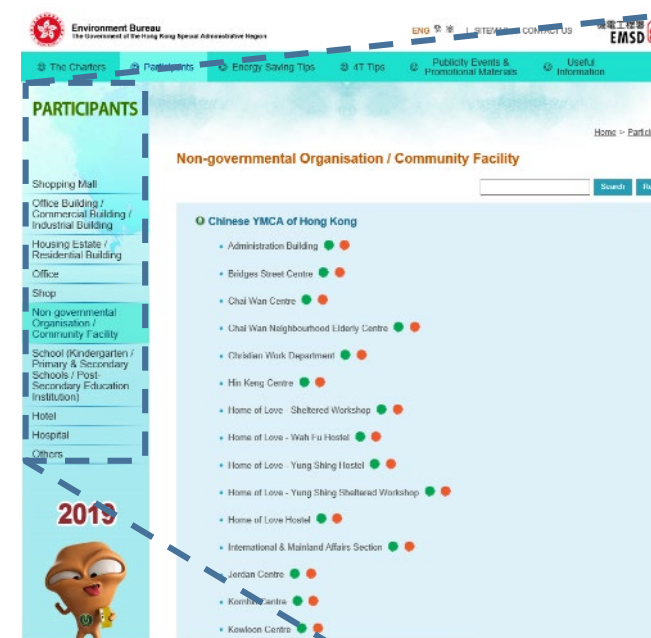
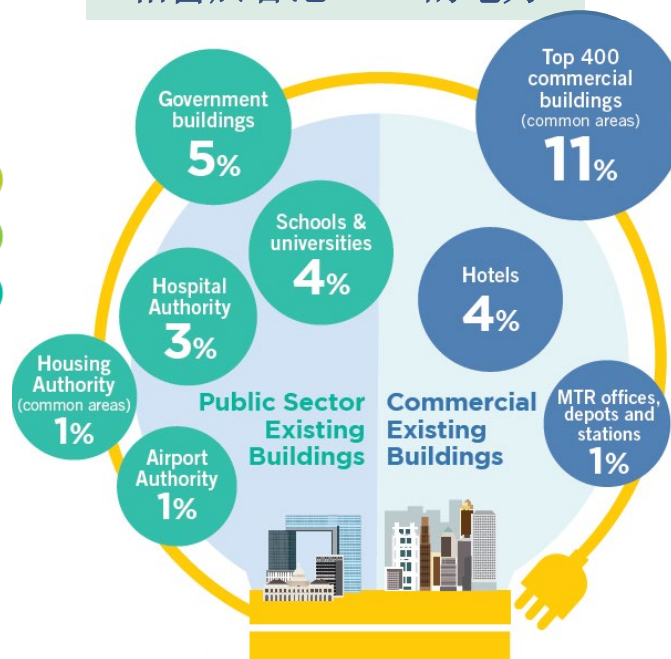
Building design and structure 1

Occupants' behaviour 2

Appliances occupants choose to use 3



相當於香港20%的電力



PARTICIPANTS

Shopping Mall

Office Building /
Commercial Building /
Industrial Building

Housing Estate /
Residential Building

Office

Shop

Non-governmental
Organisation /
Community Facility

School (Kindergarten /
Primary & Secondary
Schools / Post-
Secondary Education
Institution)

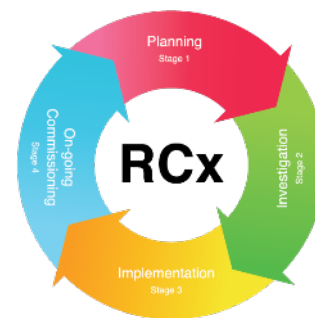
Hotel

Hospital

Others

重新校驗的發展

2



我們為什麼需要進行重新校驗?

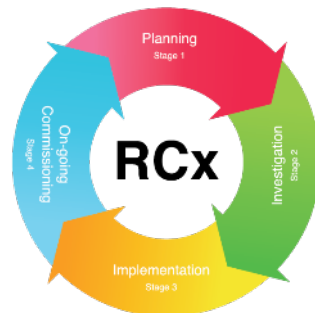


建築物經常失調...

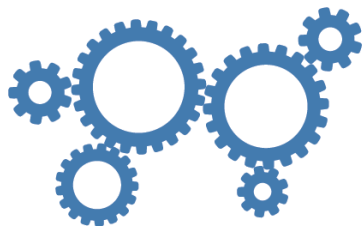
- 因增加，轉換和改善工程而引起的變更
- 逐漸遠離控制設定點
- 傳感器的準確性或靈敏度下降，維護欠佳



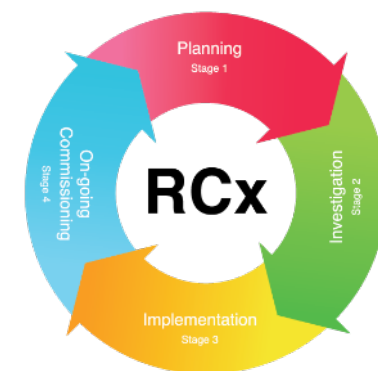
- 過時的控制系統
- 建築表現不理想
- 不必要的能源損失



什麼是重新校驗?



一個具有成本效益且系統性的過程，
可以定期檢查現有建築物的表現。



重新校驗工作階段

階段 1: 規劃



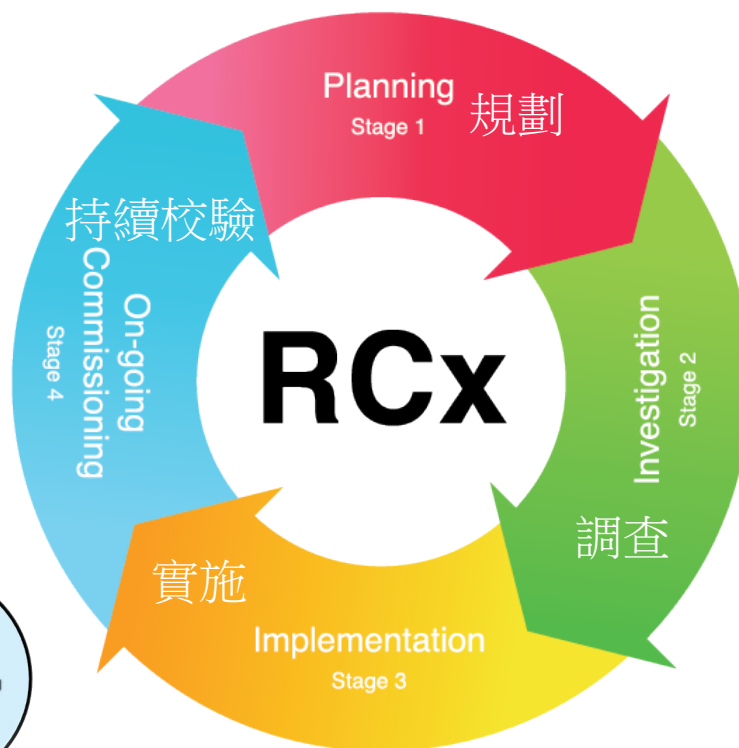
階段 2: 調查



階段 3: 實施



階段 4: 持續校驗



重新校驗工作階段

階段 1: 規劃



2021年2月4日（星期四）

收集建築的設計和運作信息

達到設備要求

進行首次建築物走查

收集耗能設備的能源信息

初步的節能機會

現場測量與數據確認計劃



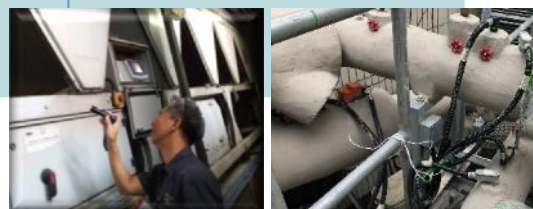
收集建築信息



設備管理部會議

- 超過規定
- 不合理狀況 [人體舒適]
- 檢查儀表/傳感器狀況 [滿足/故障]
- 檢查控制設備功能 [故障]

- 運作時間表
- 檢查運作範圍
- 控制參數和設定點



現場走查 & 檢查傳感器狀況



重新審核設施要求



重新校驗工作階段

階段 2: 調查



收集趨勢記錄數據和數據分析

識別潛在的節能計劃(ESOs)

設定節能機會的測量和驗證方式

選擇實施的節能機會

- 添加儀表 and 數據記錄設備
- 記錄操作模式

- 檢查不合理的操作



當前記錄器



流量計



物聯網傳感器



2020年12月11日
(星期五)



2021年2月4日
(星期四)



重新校驗工作階段

階段 3: 實施



實施所選的節能機會

執行測量和驗證

制定最終報告和持續校驗計劃

- 更換故障傳感器和執行器
- 系統微調和調節
- 設備重新安排時間表
- 增加需求控制設備

- 確保高效的運作性能
- 追蹤能源和系統性能
- 制定KPI並持續監控KPI
- 對運維人員進行培訓



系統微調和調整



更換設備傳感器



2021年2月4日
(星期四)

重新校驗工作階段

階段 4: 持續校驗



報告改進

查看/更新運維手冊

對運維人員進行培訓

持續監控並修改運維計劃以改善運作

- 更新修正 KPI
- 傳感器校準
- 更新修正控制設定點

- 根據住宿和運作的變化更新相關信息



重新校驗的常規觀察

示例 1：物聯網傳感器的溫度和相對濕度數據記錄

全天異常地製冷

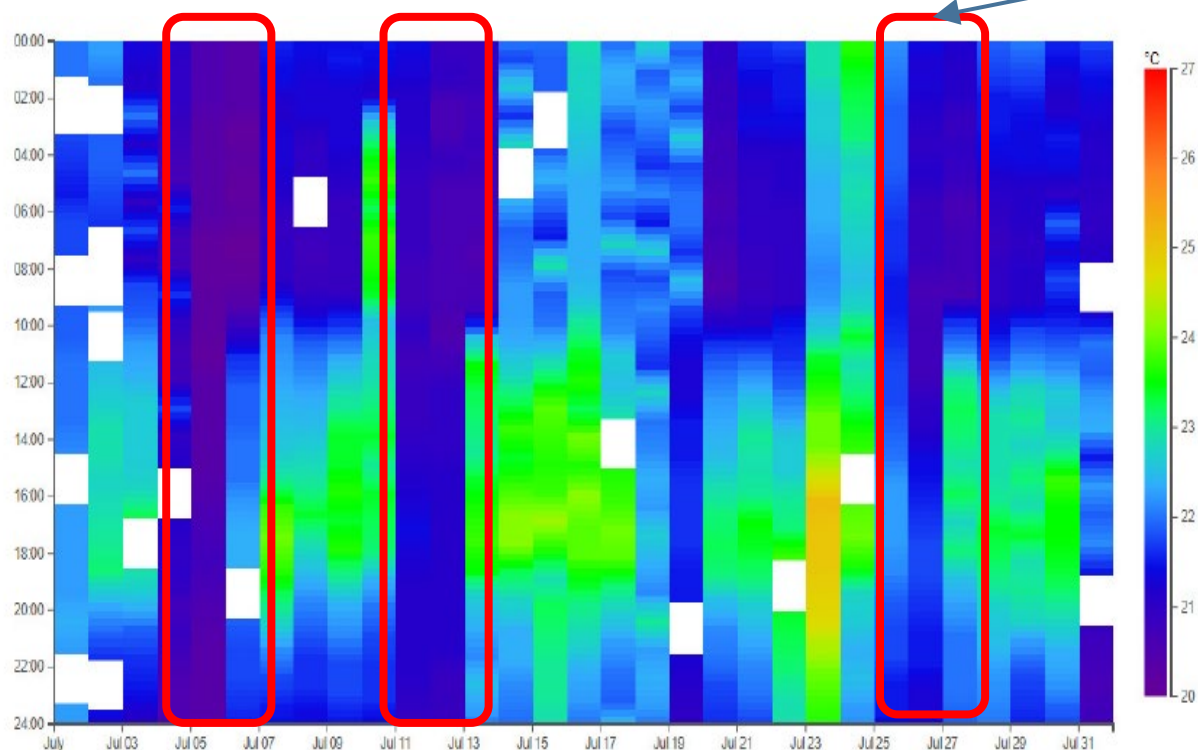


Figure. 1a Room Temperature in July

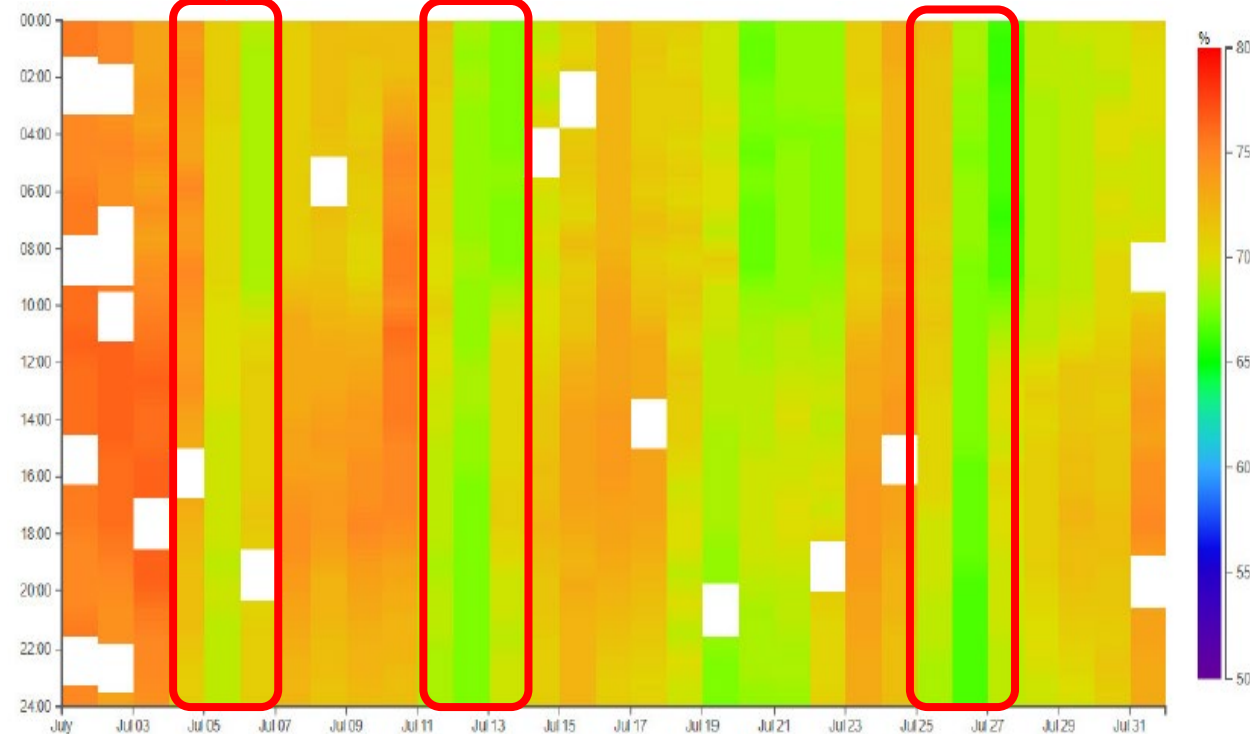
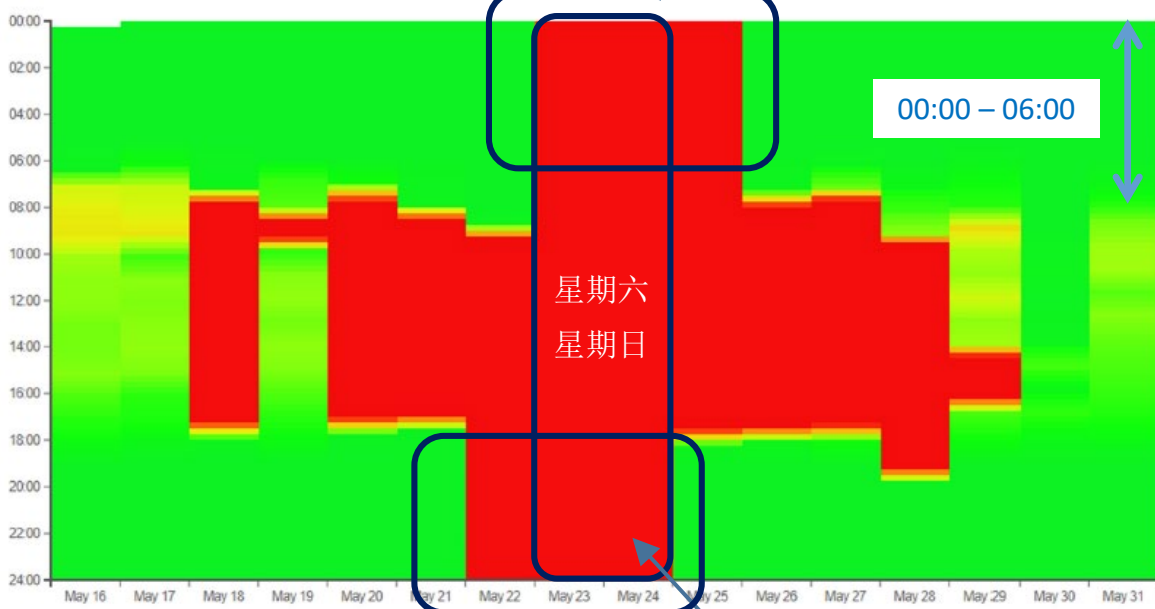


Figure. 1b Relative Humidity in July

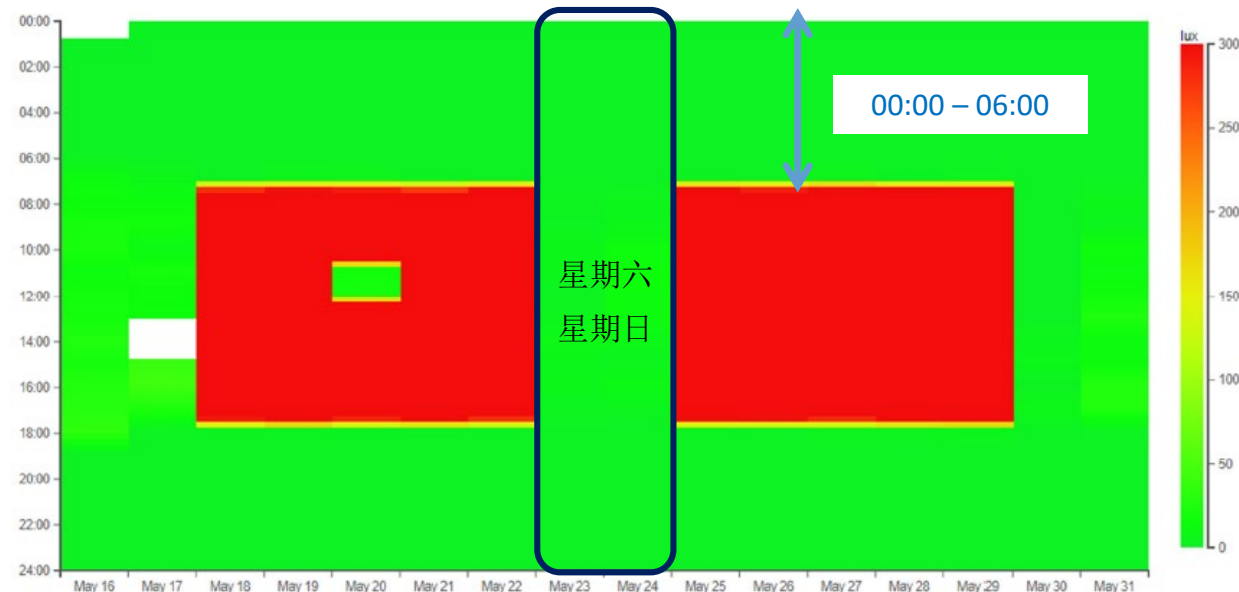
重新校驗的常規觀察

示例 2：物聯網傳感器的照度水平數據記錄

夜間異常運作

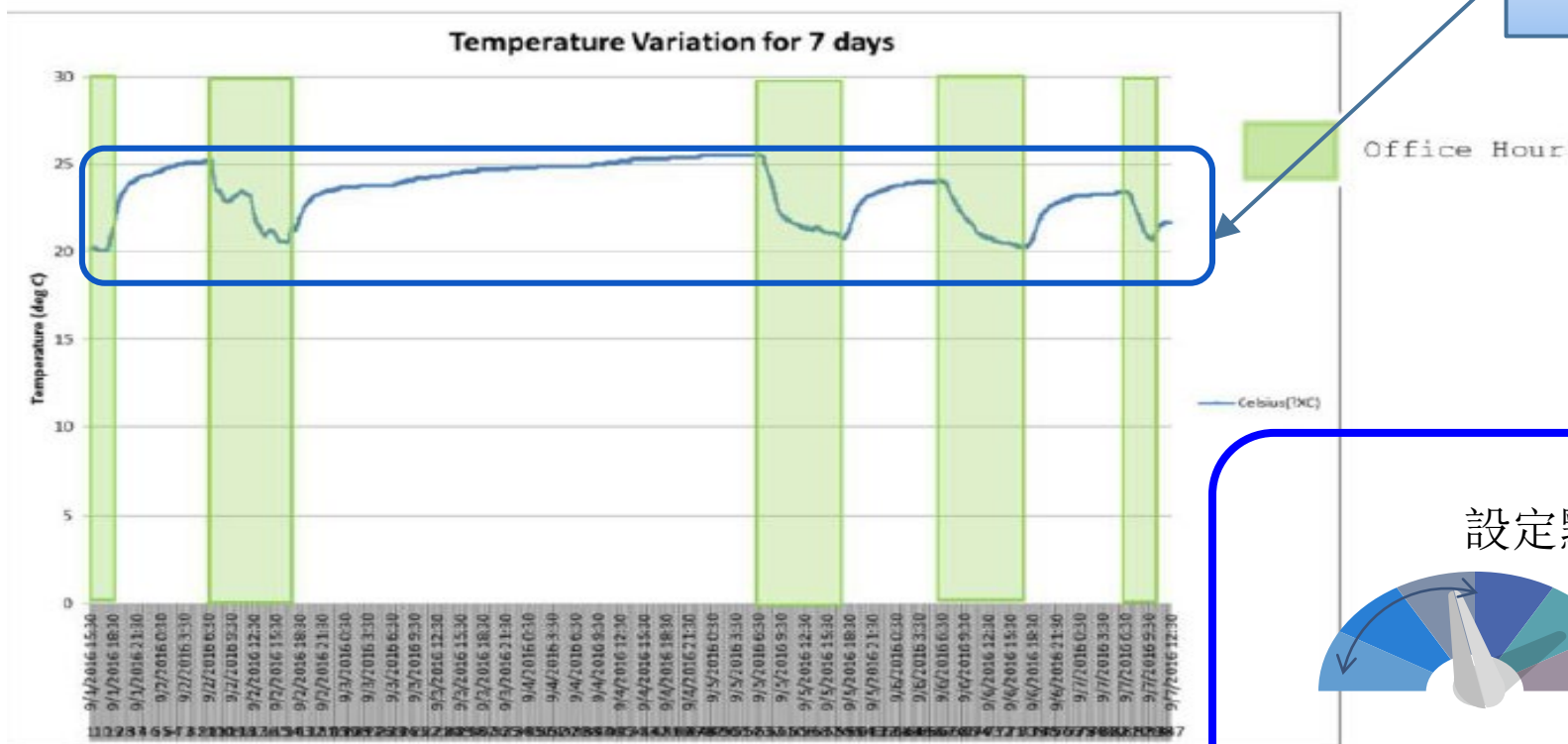


週末異常運作



重新校驗的常規觀察

示例 3：房間溫度數據記錄



辦公時間室溫偏低

設定點



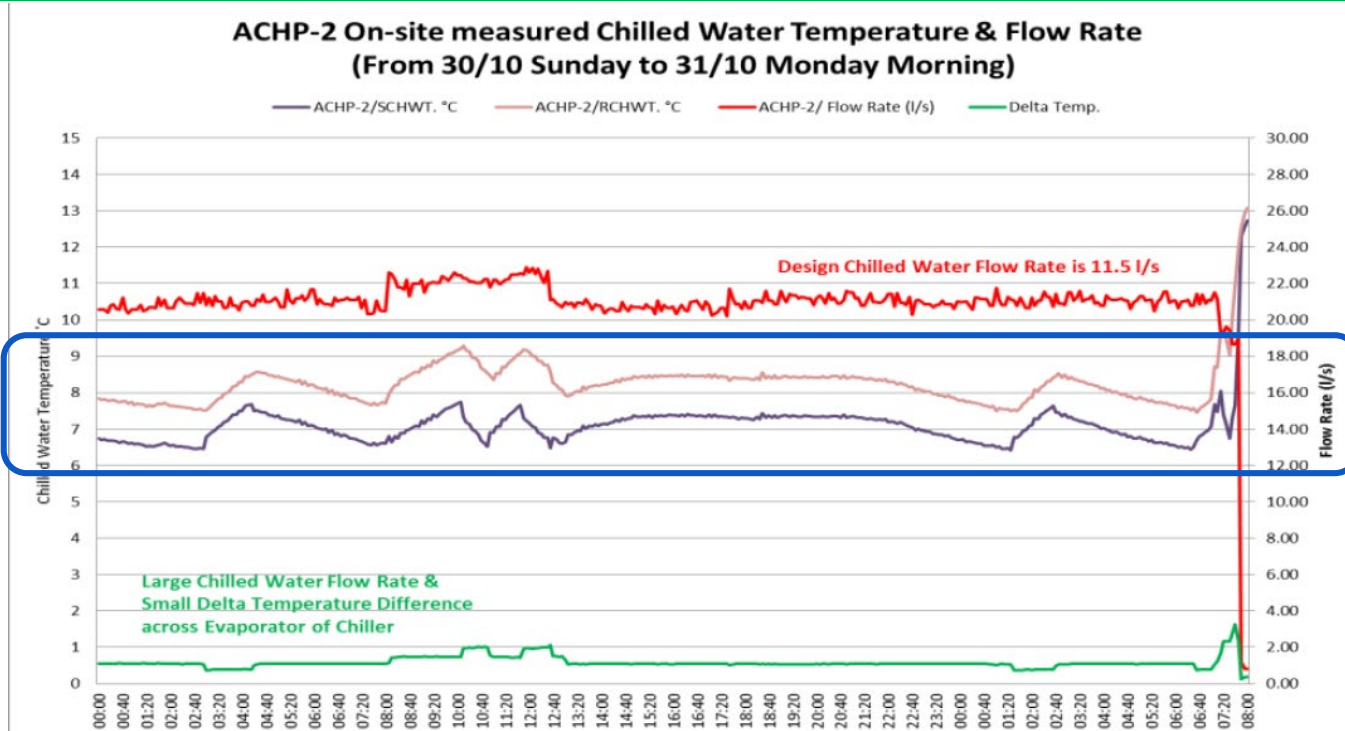
調整設定點以滿足操作和人員的需求

重新校驗的常規觀察

示例4：冷凍水流量與溫度數據記錄

冷凍水供水溫度與回水溫度之間的溫差小
非辦公時間的冷凍水流量是固定的（部分負荷情況）

根據環境溫度設定製冷機開/關時間表



Predicted Load. Ambient (°C)	≤ 700 Tons						> 700 Tons To ≤ 1800 Tons					
≥ 26.0 °C	2	4	3	1A	1B	5	4	2	3	1B	1A	5
≥ 15.0 °C To < 26.0 °C	1A	1B	3	4	2	5	2	4	3	1A	1B	5
< 15.0 °C (Winter Mode)	1B	1A	2	4	3	5	1B	1A	2	4	3	5

重新校驗的益處

低費用或零費用
(短期回報)



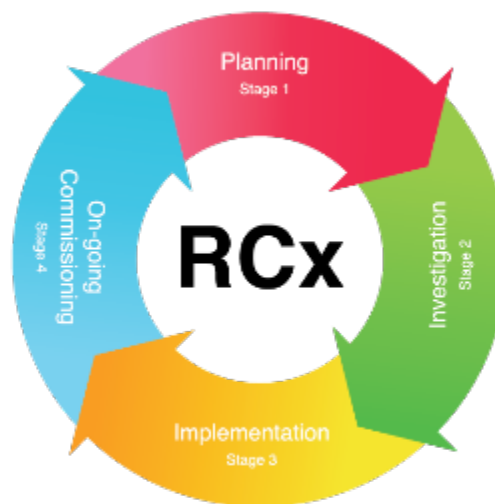
增加建築性能



增加建築系統能效並
提高設備使用壽命



減少維修花費



為維修人員提供合適的培訓



增加系統可靠性



增加人員的舒適度
生產率



重新校驗實施階段

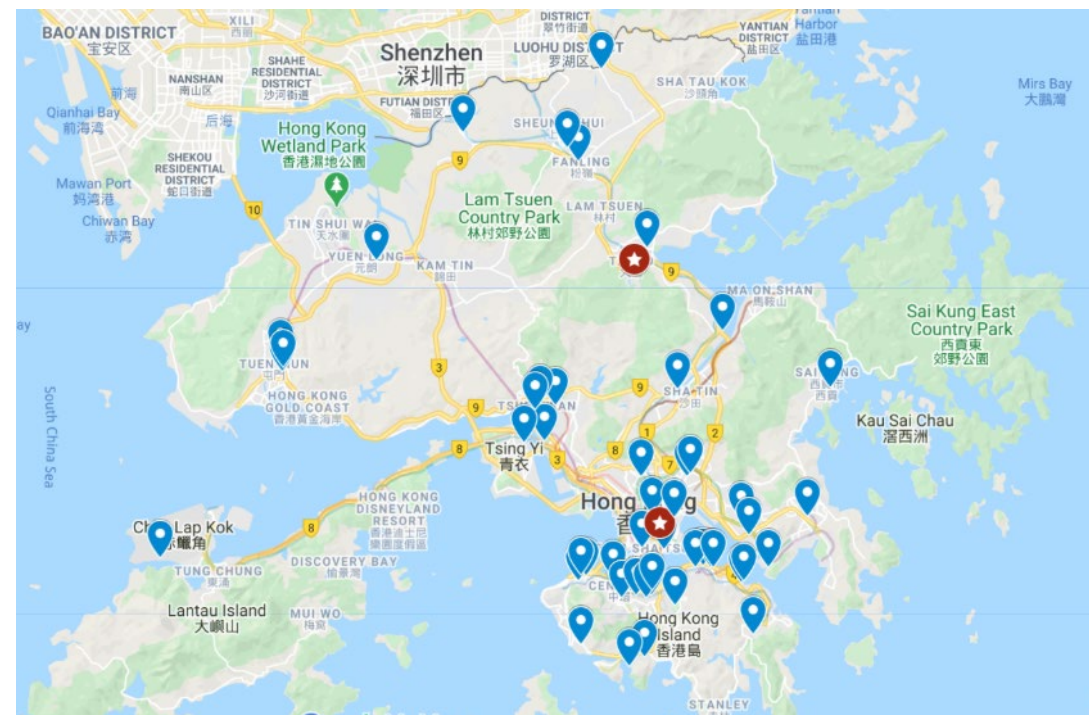
政府工程項目



超過200個

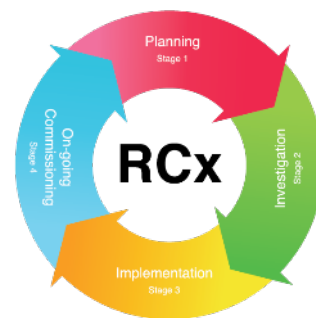
歷時7年(從2019起)

1. 市政大樓
2. 政府合署
3. 游泳場館
4. 市政廳
5. 公共圖書館等



對重新校驗的支持

3

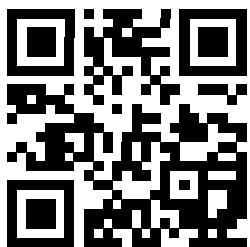


重新校驗綠色校園 2.0 – 簡介會 & 講座



綠色校園 2.0
重新校驗

Register NOW!



專業講座

日期：2020年12月11日（星期二）（1小時）

1. 介紹運行數據的應用
2. 介紹智能技術對重新校驗的促進

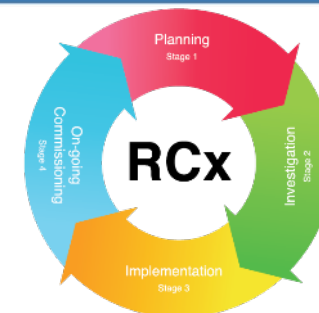
日期：2020年12月15日（星期二）（1小時）

1. 香港綠色建築議會重新校驗培訓和註冊方案
2. 公用事業基金計劃

研討會

日期：2021年2月4日（星期四）（1小時）

1. 線上示範錄像
 - 重新校驗現場評估
 - 實施節能措施、測量和驗證過程
2. 重新校驗業界服務和成品分享
3. 問答環節



重新校驗資源中心



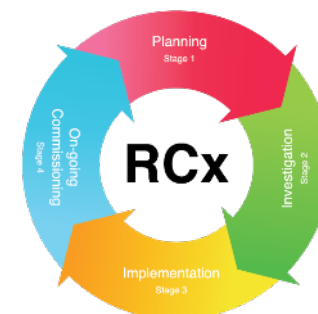
The screenshot shows the website of the Retro-Commissioning Resources Centre (RCx). The header includes the RCx logo, the name of the center, and logos for the EMSD and the Government of the Hong Kong Special Administrative Region. A navigation bar contains links for 'GovHK 香港政府一站通', 'ENGLISH 简体版', a search bar, and links for 'A A A' and '網頁指南'.

The main content area is divided into a left sidebar and a main content area. The sidebar contains links for '簡介', '最新消息', '技術指引', '大灣區合作備忘錄', '能源節約機會 (ESO) 提示', '培訓活動', '講座', '有用鏈結', '重新校驗成功個案', '常見問題', '聯絡我們', '重新校驗 - 短片', and '網頁指南'. The main content area features a large image of industrial equipment with the text '重新校驗' and '簡介'. Below this is a paragraph of text and a section titled '最新消息' with a small image and the text '技術指引'.

節能機會(ESO)

有用鏈結

成功個案



<https://www.rcxrc.emsd.gov.hk/tc/>

全民節能 – 獲獎 & 成果

獲獎 & 成果



AWARDS (ORGANISATION CATEGORY)	
Award	Name of Organisation
Hanson Grand RCx (Implementation) Award	Electric Tower
Outstanding RCx (Implementation) Award	One Island East
	One, Two Three Exchange Square and the Forum
	Pacific Place
Outstanding RCx (Proposal) Award	Gateway II
	Great Eagle Centre
RCx Continuous Enhancement Merit	Towngas Headquarters Building
	Lippo Centre
RCx Special Challenge Merit	Belilios Public School
RCx Technical Approach Merit	Three Garden Road
RCx Merit Award	Cathay City
	Milkiki
	Ocean Centre
	Ocean Terminal Extension
	Sun Hung Kai Centre





The Environment Bureau and the Electrical and Mechanical Services Department jointly organized the "Energy Saving Championship Scheme 2019" through application of innovations and technologies, the energy saving and conservation in buildings in the community are targeted to be further enhanced. There are two categories of the Championship Scheme this year: the organisation category and the student category. The organisation category is to encourage concerted efforts of organisations in different sectors to adopt "Retro-commissioning" (RCx) as a cost effective measure to enhance energy efficiency of existing buildings. The student category is to inspire the creativity of young people in energy saving and the application of renewable energy.

The response was overwhelming, with over 80 applications and over 200 applications respectively from organisations and students.

<https://www.energysaving.gov.hk/eschampion2019/en/awards/index.html>

JUDGING PANEL

Organisation Category	Student Category
Legislative Council	Ir Dr Hon WK LO (Chairman)
The Hong Kong Institution of Engineers - Building Services Division	Ir Brian WL CHENG
Chartered Institution of Building Services Engineers (Hong Kong Branch)	Ir Dr Raymond KL CHAN
American Society of Heating, Refrigerating and Air-Conditioning Engineers (Hong Kong Chapter)	Ir Jacky CL NG
Association of Energy Engineers (Hong Kong Chapter)	Ir Dr Conson KH YU
Building Services Operation and Maintenance Executives Society	Ir Chris TING
Hong Kong Association of Energy Engineers	Ir HO Sai King
Energy Institute (Hong Kong Branch)	Ir YEE Kwong Fai
LEAPS	Ir Ambrose CHEN
Hong Kong Green Building Council	Ir Colin CL CHUNG (Chairman)
The University of Hong Kong	Ir Prof Dennis YC LEUNG
City University of Hong Kong	Ir Prof Michael KH LEUNG
Hong Kong Productivity Council	Ir Raymond CL FONG
CLP Power Hong Kong Limited	Ir Eric PC CHEUNG
The Hongkong Electric Company Limited	Ir TC YEE
The Hong Kong and China Gas Company Limited	Ir Duncan WO WONG
LEAPS	Ms Kate KWOK

Awards (Organisation Category)

Hanson Grand RCx (Implementation) Award
Electric Tower, HK Electric
Located at Ap Lei Chau, Electric Tower is one of the operation hubs of The Hongkong Electric Co., Ltd. (HK Electric), monitoring real-time the generation and distribution of electricity from Lamma Power Station to its customers. The team has been adopting Retro-commissioning (RCx) to identify and implement various Energy Saving Opportunities (ESOs) in the building, including the use of AI-based system for analysis and reduction of power consumption in data centre air-conditioning, continuously reviewing the operation and optimising the existing MVAC systems, use of T5 LED lamps in some areas with smart controls, etc. With the team's excellent efforts in implementing the RCx strategies from Year 2013 to 2019, HK Electric's Electric Tower has achieved a significant reduction of electricity use of 30%.

Outstanding RCx (Implementation) Award
One, Two Three Exchange Square and the Forum
Pacific Place
Gateway II
Great Eagle Centre
Towngas Headquarters Building

RCx Continuous Enhancement Merit
Lippo Centre

RCx Special Challenge Merit
Belilios Public School

RCx Technical Approach Merit
Three Garden Road

RCx Merit Award
Cathay City
Milkiki
Ocean Centre
Ocean Terminal Extension
Sun Hung Kai Centre

Awards (Student Category)

Secondary and Post-secondary School Category:
Hanson Grand Award
St. Stephen's Girls' College
Install the "Save N More" to your tap, it can instantly heat water directly to a preset temperature. With a temperature-controlled valve at the outlet, water is released only after reaching a designated temperature. This can help reduce energy loss in tanks and pipes. In addition, water will not be wasted during temperature adjustment. The infra-red sensor installed in the tap or shower head allows water to flow only when necessary. Water consumption data recorded by its built-in water meter will be transferred via IoT to one's mobile phone app which facilitates the user to properly plan one's water usage. In addition, this device considers the use of wastewater to generate electricity for energy recovery.

Primary School Category:
Hanson Grand Award
PLK Dr. Jimmy Wong Chi-Ho (Tin Sum Valley) Primary School (Chan Hoi Chun)

Other Awards:
City University of Hong Kong (Wan Ho Ching)
Shun Tak Fraternal Association Yung Yau College (Cheung Wing Yin, Tong Wai Yan, Wong Tsz Yau)
St. Teresa Secondary School (Chan Cheuk Yu, Chow On Yuet, Li Hs YI, Sue Gai)
The University of Hong Kong (Kwok Yu Ho, Zhang Yingguang)
City University of Hong Kong (Shek Hoi Ying)
HKUGA College (Chau Man Shan, Chan Hoi Lai, Kandas, Lee Tsz Hoi, Leung Wing Kai)
HKUSPACE Community College (Ma Yik)
Ng Yuk Secondary School (Ma Shi Lun, Chung Tin Oi, Lau Kai Kin, Tse Sum Yi)
City University of Hong Kong
St. Teresa Secondary School
City University of Hong Kong (Shek Hoi Ying)
St. Matthew's Lutheran School (Saw Mau Ping)
St. Paul's Primary Catholic School (Chau Wai Kiu, Atza)
Tai Koo Primary School (Lam Wing Ki, Rachel)
PLK Horizon East Primary School (Saw Mau Ping)

我們已經做到什麼？



風櫃 (AHU)
送回風
溫度重設



風櫃
靜壓重設



使用光電管和
佔用傳感器



根據停車場通風需求使用
CO傳感器



通過低運作頻率來優化冷凍水泵
的運行數量



對解耦器系統製冷機組二級泵的
優化
(一級和二級冷凍水流量平衡)

我們已經做到什麼？



將老化的風冷冷凍水機
升級為水冷



基於AI系統的數據收集，
分析和系統控制



製冷機組的屋宇管理系
統數據收集，分析和系
統控制



對空氣側和水側設備（風櫃 /
泵/風扇等）使用變速驅動
（VSD）控制



EC插頭風扇用於風櫃



可變電壓變頻（VVVF）系統進
行電梯現代化改造

... 和更多!



www.energysaving.gov.hk/eschampion2019/en/awards/index.html

重新校驗培訓與註冊計劃

- 於2019年11月26日推出
- 由香港綠色建築議會主辦
- 機電署及其他專業團體的支持
- 從業人員三層級：-
 - 重新校驗從業員等級1
 - 重新校驗從業員等級2
 - 重新校驗專家





15 Dec 2020 (Tue)



公用事業基金計劃

智「惜」用電樓宇基金 (SPBF)



合格 建築

- 居住建築
- 教育、福利與社區組織
- 工商業建築



樓宇基金
BUILDING
FUND



能源效率提升項目

- 屋宇設備改造安裝屋宇設備改造安裝
- 重新校驗
- 基於建築的智能技術



2020年12月15日
(星期二)

公用事業基金計劃

綠適樓宇基金



合格 建築

- 居住建築
- 商業建築
- 工業建築

能源效率提升項目

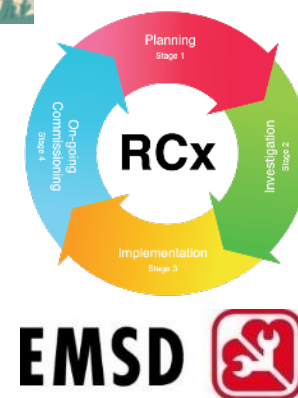
- 屋宇設備改造安裝屋宇設備改造安裝
- 重新校驗
- 基於建築的智能技術



2020年12月15日
(星期二)



讓我們一起為了節能作出貢獻



An aerial photograph of Hong Kong, showing the dense urban landscape of the Kowloon Peninsula in the foreground, the Victoria Harbour in the middle ground, and the New Territories in the background. The sky is blue with some clouds. A semi-transparent blue rectangle is overlaid in the center of the image, containing the Chinese characters '感謝' (Thank you) in white.

感謝