Introduction to Retro-commissioning (RCx)

Macy WONG
Mar 2018

Energy Efficiency Office

EMSD

Buildings Stock in Hong Kong

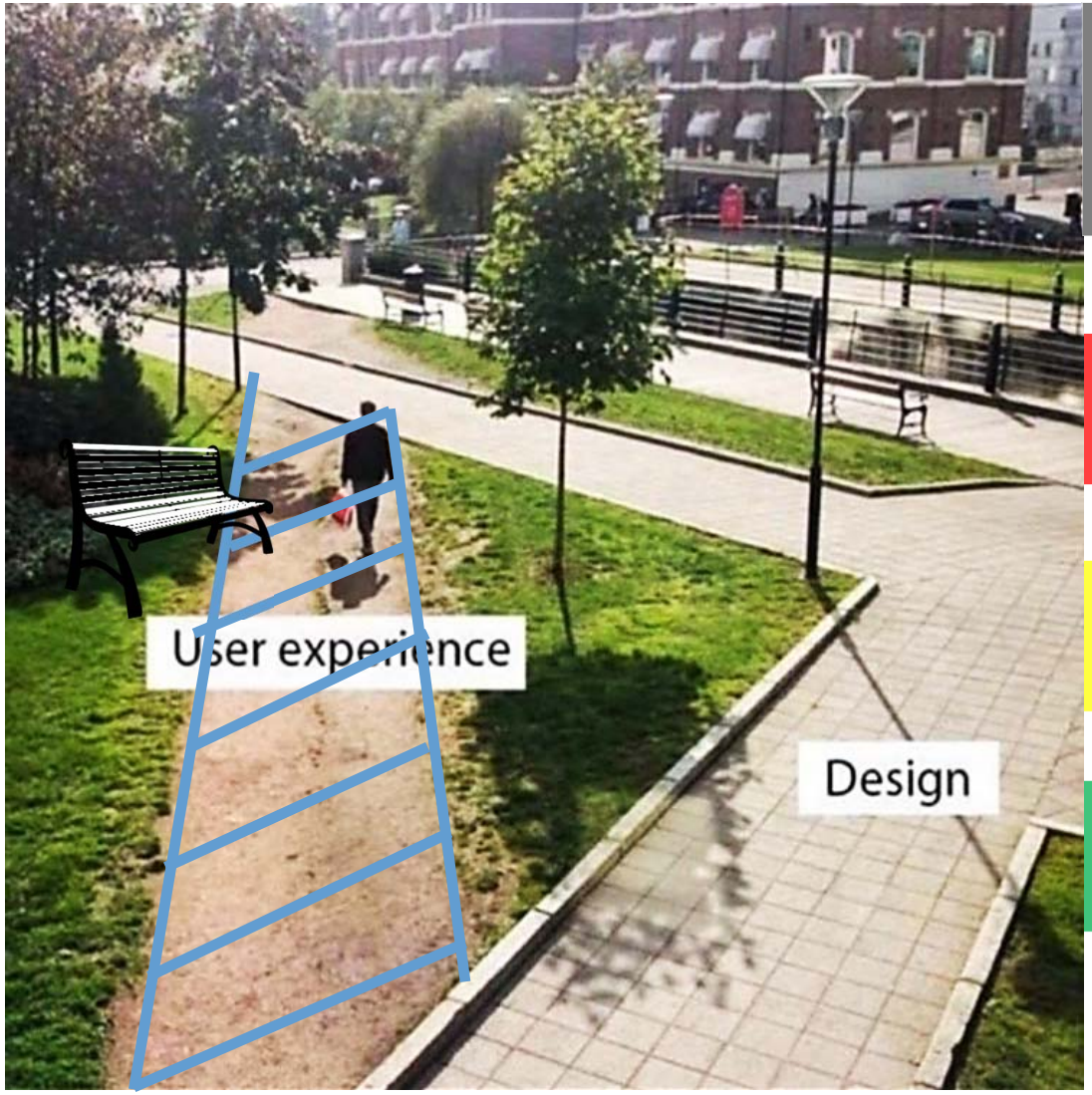
New Buildings – 500 buildings/year

Existing Buildings
~ 42,000

Buildings with age over 20 >65%

Age	No. of Buildings
<10	5814 (14%)
10-19	8569 (20.6%)
20-29	**11148 (26.7%)**
30-39	**6688 (16.1%)**
40-49	**5712 (13.7%)**
>50	**3690 (8.9%)**

Energy use in existing building



Linkage breakdown

- Design intent
- Operational practice
- User experience

EMSD

Energy use in existing building

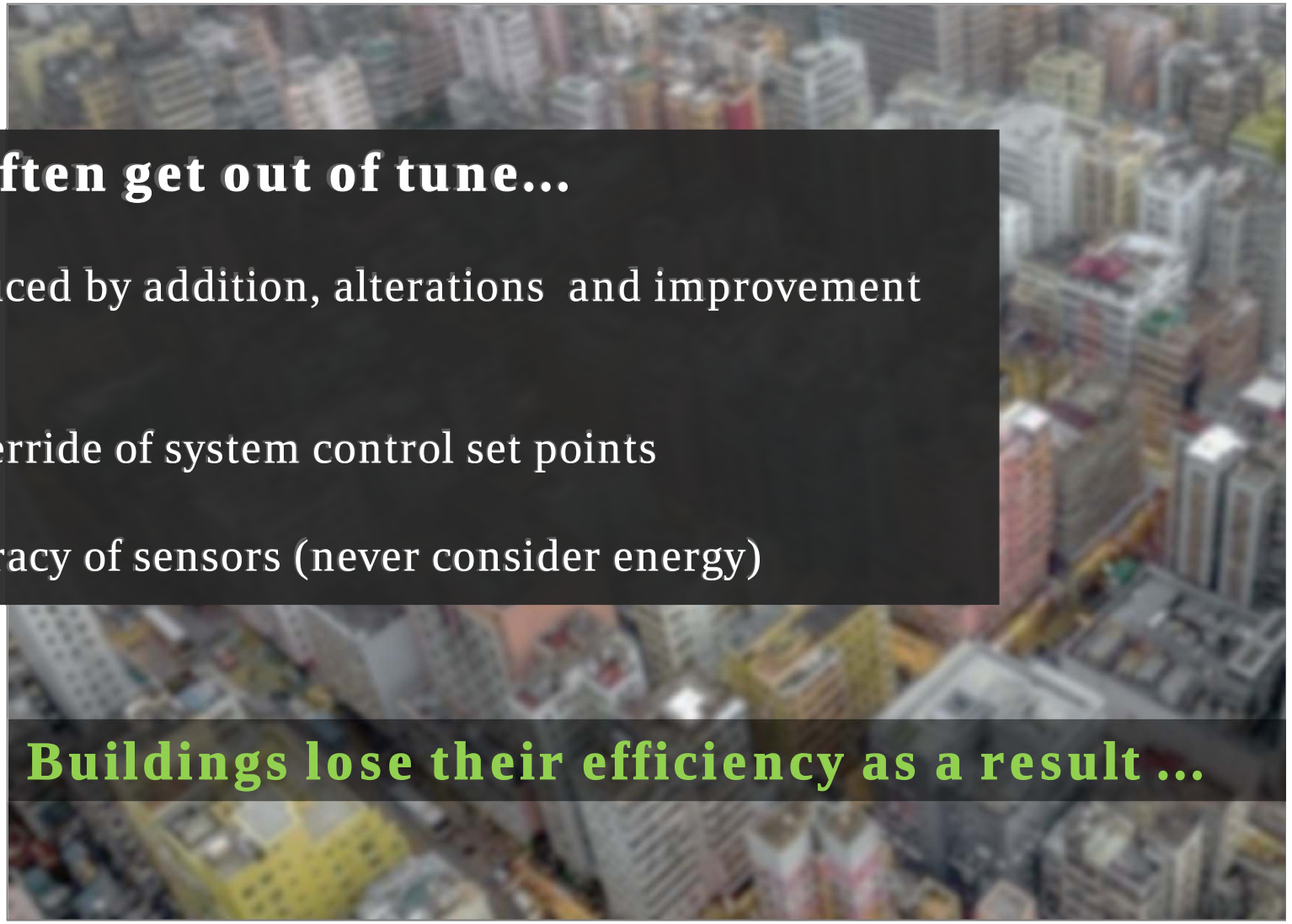
Traditional Approach

- **Routine**
- **Experience based**
- **No complaint approach**

- Operation of systems and installations
- Replacement of Equipment
- Corrective & Preventive Maintenance
- Manual override Automatic
- End-users Orientated Setting

EMSD

Energy use in existing building



Buildings often get out of tune…

- Changes induced by addition, alterations and improvement works
- Drift off / override of system control set points
- Drop in accuracy of sensors (never consider energy)

Buildings lose their efficiency as a result …

Why is retro-commissioning important?

Buildings frequently undergo **operational and occupancy changes** that challenge the mechanical, electrical and control systems, hindering optimal performance.

In today's complex buildings, **systems are highly interactive**, with sophisticated controls that can create a trickle-down effect on building operations

It’s like…

Basic checking

For safety

RCx

Professional tuning

For racing

Retro-commissioning is not common in Hong Kong

Building owners not familiar

Value not fully demonstrated

Insufficient local guidelines

Limited experienced staff and service providers

Lack of building information

Pilot Study

Pilot Study for 6 Government Buildings (QGO, NPGO, NTSRPH, SMSB, HHMSB, KTESC)

Collaborate with HKGBC on "ACT-Shop" programme 1st batch for 5 private commercial buildings

Collaborate with RCx Pioneers in industry Swire Properties, The Links

Pilot Study

Pilot study for 6 government buildings	
No. of government buildings	6
Floor areas	230,000 m^2
Age	10 ~ 30
RCx programme (Planning & Investigation)	2016Q3 ~ 2017Q2
No. of Energy Saving Opportunities (ESO)	~100
Payback	~ 3 years in average

EMSD

RCx Technical Guideline

- 4 Work stages of RCx
- Sample Technical Approach of RCx
- Forms or checklist for RCx

Search: TG RCx HK

RCx Technical Guideline

RCx Framework

- Stage 1: Planning
- Stage 2: Investigation
- Stage 3: Implementation
- Stage 4: On-going Commissioning

Examples of RCx Scope

Stage 1: Planning

- Gathering of building information,
- Meeting & site walk
- facility requirement

Stage 2: Investigation

- Site inspection
- Quick fix for instrument
- Replacing out of calibration control
- Add meters and data logging facilities as necessary
- Take logs on the operation patterns
- Diagnostics for improvement proposal

COP						
Load (kW)	Entering Condensor Temperature					Custom
	15	20	25	30	35	32
190	6.51	4.41	2.69	1.66	1.09	1.40
380	11.56	8.47	5.46	3.46	2.30	2.92
570	13.94	11.00	7.66	5.10	3.47	4.35
760	14.28	11.89	8.93	6.34	4.49	5.51
950	13.60	11.71	9.35	7.06	5.24	6.27
1140	12.56	11.01	9.20	7.33	5.71	6.64
1330	11.46	10.14	8.75	7.28	5.91	6.71
1520	10.44	9.28	8.17	7.08	5.92	6.57
1710	9.53	8.48	7.57	6.67	5.79	6.32
1900	8.73	7.76	7.00	6.28	5.58	6.00

Examples of RCx Scope

Stage 3: Implementation

- Replacing faulty sensors and actuators
- System tuning and adjustment;
  - Chiller plant control sequence;
  - Chilled water temperature re-set control;
  - Heat rejection side cooling tower control sequence;
  - Boiler burner turning;
  - Equipment start-stop scheduling
- Adding demand control facilities
  - CO2 sensor and variable speed drives to adjust fresh air supply
  - Pressure sensor and variable speed drives to adjust air conditioning supply air
  - Automatic lighting control to adjust lighting level
  - Improvement works for better operation efficiency;

EMSD

Examples of RCx Scope

Stage 4: Ongoing commissioning

- Report improvement
- Conduct training
- Revised O&M plan for improved operation

Energy Saving Opportunities (ESO)

ESO	Saving	Cost
Adjust the chilled water flow of Chilled Water Pumps across the night mode Chiller		$
Setback supply chilled water temperature during night mode operation		$
Reset chilled water supply temperature from 7 deg c to 9 deg C for all chillers in non hot season		$
Review set-point of room temperature of VAV in office area		$
Review timer or operation schedule in CCMS of different installation		$

EMSD

Energy Saving Opportunities (ESO)

ESO	Saving	Cost
Review chiller sequencing to utilize better part load efficiency of VSD chillers.		$
Adjusting condenser water returning temperature back to chiller based on a monthly basis. This will work in conjunction with the new cooling tower configuration.		$
Fine tuning boiler combustion efficiency		$
Install measuring meter for continuous monitoring of key parameter.		$

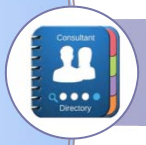
EMSD

Setting up Online RCx Resources Centre

Latest international and local RCx guidelines

Common RCx technical tips

Latest RCx seminars/ trainings



Directory of RCx Service Providers

Successful RCx cases

Useful links

FAQ

Professional Development

機電工程署 EMSD

HKGBC 香港綠色建築議會

Building Services Operation and Maintenance Executives Society 屋宇設備運行及維修行政人員學會

aee The Association of Energy Engineers

HKIE THE HONG KONG INSTITUTION OF ENGINEERS 香港工程師學會

ASHRAE

Active training	RCx Chamber Training	CBCP Training	RCx Training & Seminar	Training BCxP

JLL 仲量聯行

SWIRE PROPERTIES

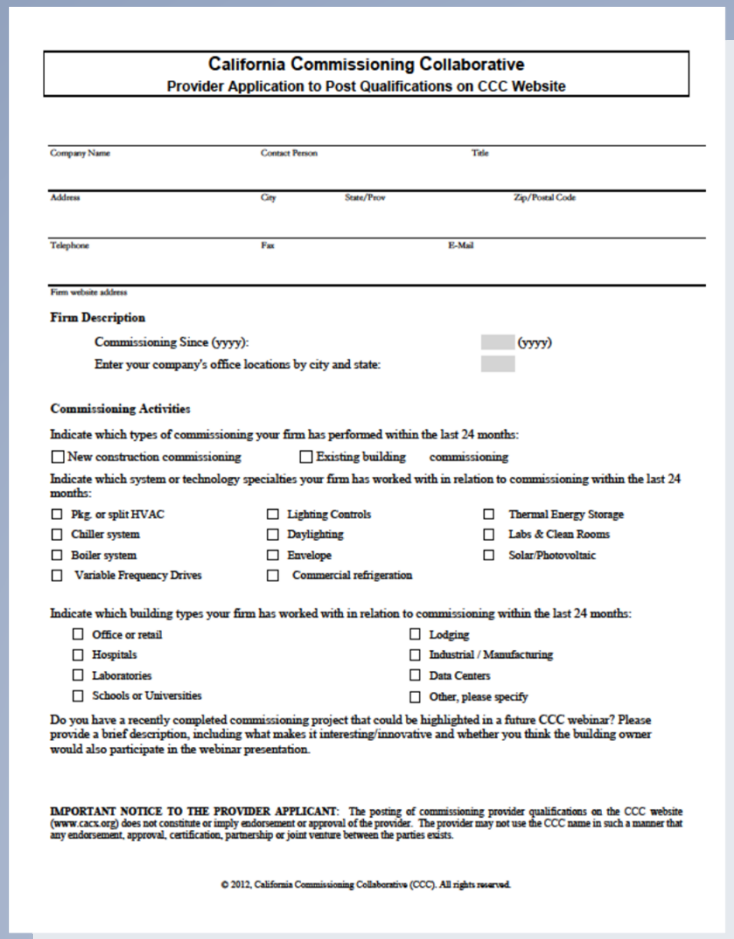
HK

領展 LINK

Successful Case Sharing

Setting up a Directory of RCx Services Providers

- Company Profile
- RCx Experience
- Staff Resources
- Specialized Areas
- Available Calibrated Instruments



California Commissioning Collaborative
Provider Application to Post Qualifications on CCC Website

Company Name | Contact Person | Title

Address | City | State/Prov | Zip/Postal Code

Telephone | Fax | E-Mail

Firm website address

Firm Description

Commissioning Since (yyyy): (yyyy)

Enter your company's office locations by city and state:

Commissioning Activities

Indicate which types of commissioning your firm has performed within the last 24 months:

☐ New construction commissioning ☐ Existing building commissioning

Indicate which system or technology specialties your firm has worked with in relation to commissioning within the last 24 months:

☐ Pkg. or split HVAC ☐ Lighting Controls ☐ Thermal Energy Storage
☐ Chiller system ☐ Daylighting ☐ Labs & Clean Rooms
☐ Boiler system ☐ Envelope ☐ Solar/Photovoltaic
☐ Variable Frequency Drives ☐ Commercial refrigeration

Indicate which building types your firm has worked with in relation to commissioning within the last 24 months:

☐ Office or retail ☐ Lodging
☐ Hospitals ☐ Industrial / Manufacturing
☐ Laboratories ☐ Data Centers
☐ Schools or Universities ☐ Other, please specify

Do you have a recently completed commissioning project that could be highlighted in a future CCC webinar? Please provide a brief description, including what makes it interesting/innovative and whether you think the building owner would also participate in the webinar presentation.

IMPORTANT NOTICE TO THE PROVIDER APPLICANT: The posting of commissioning provider qualifications on the CCC website (www.cacx.org) does not constitute or imply endorsement or approval of the provider. The provider may not use the CCC name in such a manner that any endorsement, approval, certification, partnership or joint venture between the parties exists.

EMSD

Role

Technicians

Ensure data availability, sensor accuracy and understanding plant characteristic

Engineers

Carry out data analysis based on Engineering knowledge,

translate to simple house rules for Technicians to follow

Owners

Provide top management supports including authority, resources, time,

investment on monitoring devices/ tools/ trainings, etc.

機電工程署 EMSD