

HKGBC ACT-Shop Concept and Progress

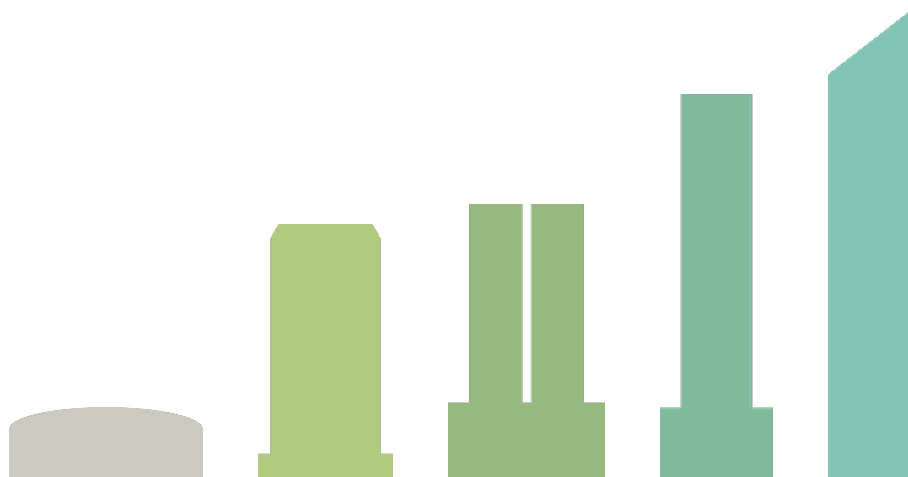
24 JAN 2017



Content

1. Concept and Objective of ACT-Shop
2. Progress Update
 - a) Case Sharing
 - b) Survey Findings
3. Way Forward & Timeline

Idea of ACT-Shop



- Knowledge-based
- Buildings as living laboratories
- HKGBC as facilitator
- Learning from peers
- Building up in-house competence



Together

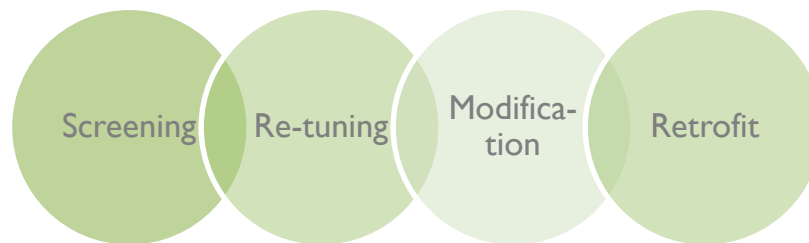
Objectives

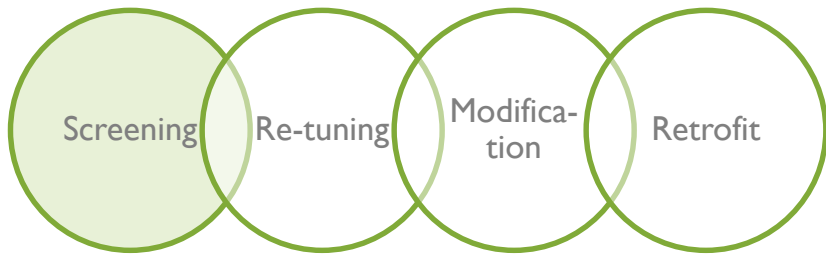


- Actively supporting HK gov's Climate Ready@HK
- Building up the competence for the industry on retro-commissioning through
 - developing the data/knowledge base
 - developing a systematic approach for retro-commissioning
 - demonstrating the value of retro-commissioning
 - transferring the knowledge and skills to the industry
 - establishing a practical operation & management system
- Promoting the adoption of best practices to the industry

PROGRESS UPDATE

CASE SHARING

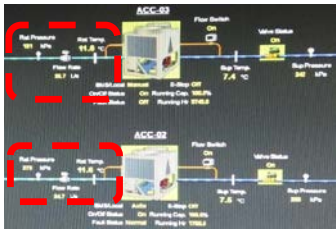




Case Sharing

On-site screening

Data inconsistency



Malfunctioned plants



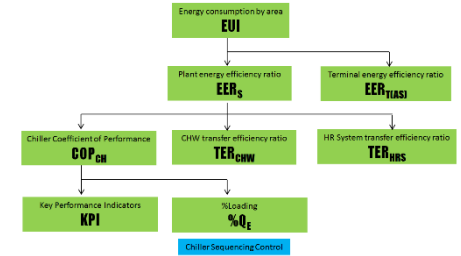
Fault readings from control panel



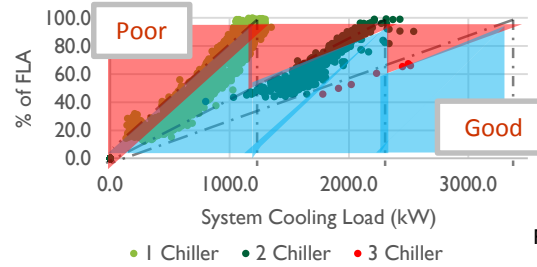
Data availability

Parameters	ICEB	Holiday Int.	Micrologger	New Tech Plaza	HK Park, Cause
SCADA	*	*	*	*	*
BMS/PLC	*/N/A	*/N/A	*/N/A	*/N/A	*/N/A
Chiller	*/N/A	*/N/A	*/N/A	*/N/A	*/N/A
Water Pump	*/N/A	*/N/A	*/N/A	*/N/A	*/N/A
OT (Temp./Flow)	N/A	N/A	N/A	N/A	*/N/A
OT (Pressure)	N/A	N/A	N/A	N/A	*/N/A
Chiller (COP)	N/A	N/A	N/A	N/A	*/N/A
Chiller (TER)	N/A	N/A	N/A	N/A	*/N/A
Chiller (HR)	N/A	N/A	N/A	N/A	*/N/A
Chiller (Seq)	N/A	N/A	N/A	N/A	*/N/A
Chiller (Load)	N/A	N/A	N/A	N/A	*/N/A
Chiller (Temp)	N/A	N/A	N/A	N/A	*/N/A
Chiller (Flow)	N/A	N/A	N/A	N/A	*/N/A
Chiller (Pressure)	N/A	N/A	N/A	N/A	*/N/A
Chiller (Status)	N/A	N/A	N/A	N/A	*/N/A

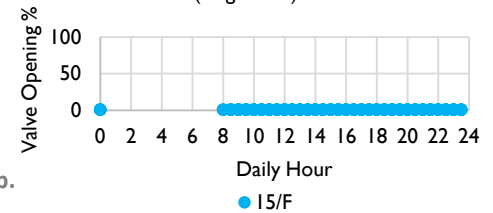
Data screening



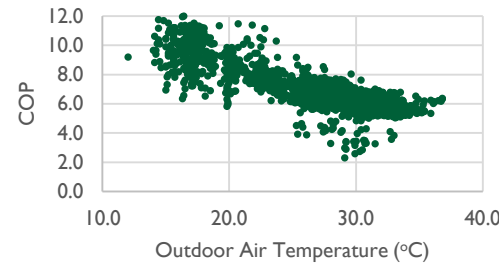
Sequencing Profile

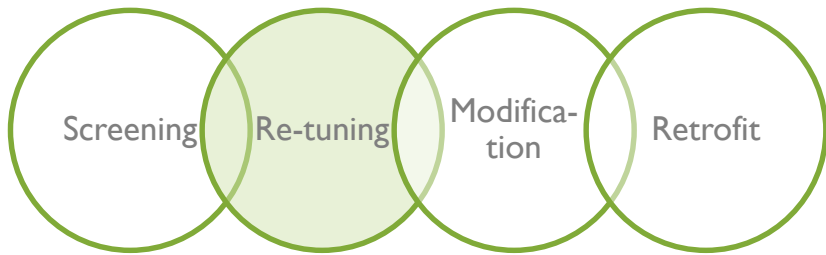


PAU Coil Valve Status Profile (Aug 15-20)

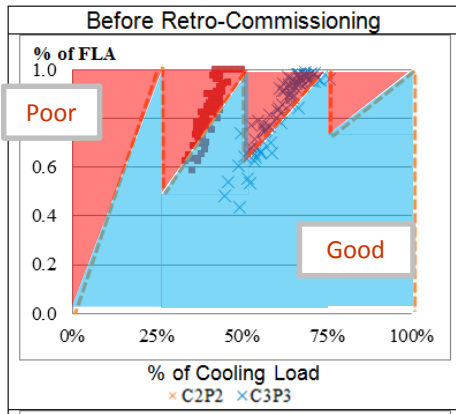


System COP vs Outdoor Temp.



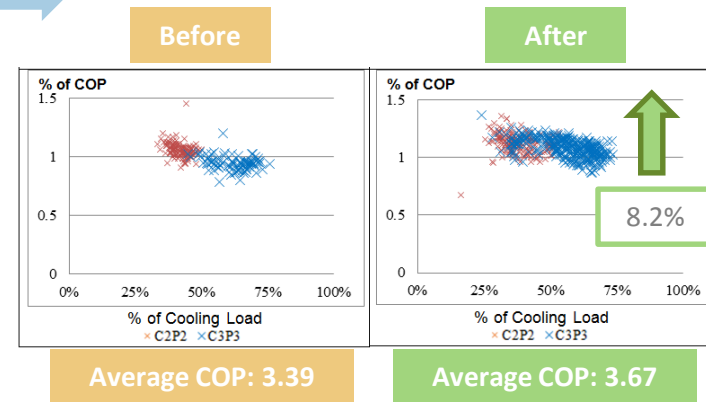
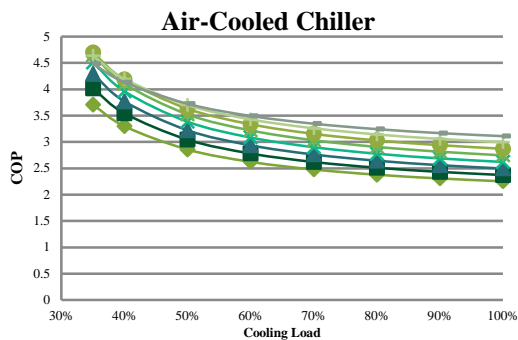
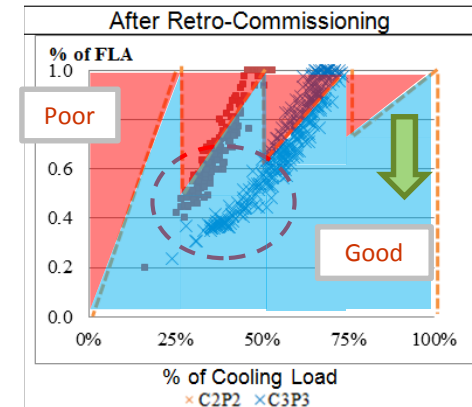


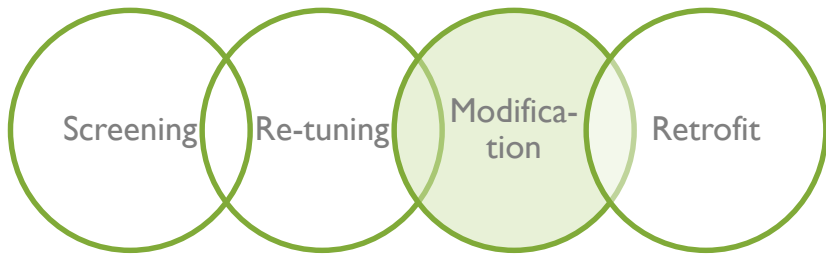
Case Sharing



Action:
Operate 3 chillers within 25%-50% loading range

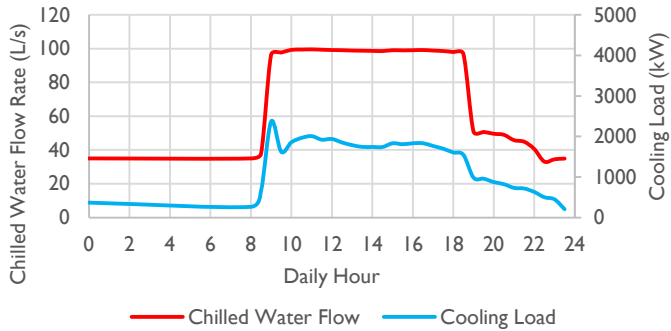
Verified Results:
Annual energy saving 226,000 kWh (4.75%)





Case Sharing

Cooling Load Profile (15-Aug)

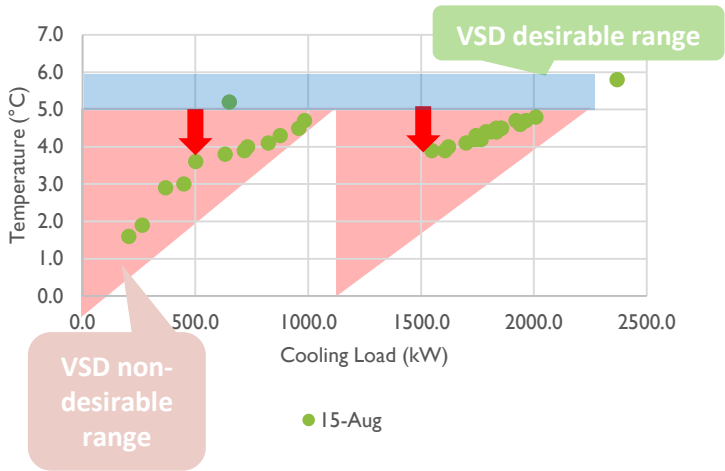


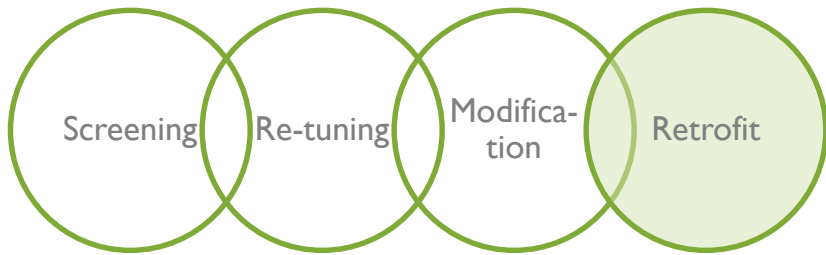
Action:
Installation of pressure sensor at critical path for pump flowrate control

Progress:
Installation of pressure sensors in progress

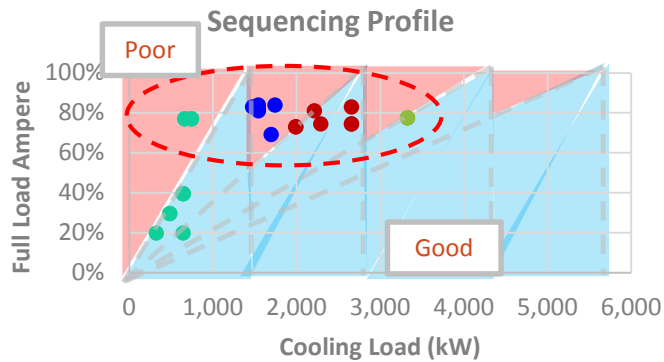
Potential Saving:
Annual pump power saving = 70,000 kWh (40%)

Differential Temperature of water variation with demand





Case Sharing



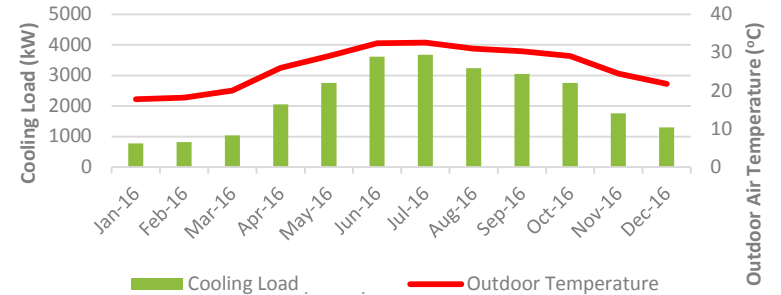
● 1 Chiller ● 2 Chiller ● 3 Chiller ● 4 Chiller



Unable to meet chilled water supply temperature set-point

Action:
Evaluate options for chiller replacement

Estimated Cooling Load Profile



	Original	Option 1	Option 2	Option 3
Chiller	4 x 400 TR Air-cooled (VSD)	3 x 400 TR Air-cooled (VSD)	2 x 400 TR Air-cooled (VSD)	2 x 450 TR Air-cooled (VSD)
Estimated Payback	9-10 years	8 years	6 years	5.5-6 years
Annual Saving (kWh)	1,365,000	1,365,000	1,210,000	1,490,000
ROI @10 th year	10%	32%	74%	79%
IRR @10 th year	3%	7%	13%	13%

P.s. Variable Speed Drive (VSD)



Saving Summary of Re-tuning/Modification

Suggested Re-tuning Work	Bld A	Bld B	Bld C	Bld D	Bld E
Chillers					
Reduce chiller operation (N-1) to achieve higher overall COP	5-6% <1 year		3-5% 3-5 year		3-5% <1 year
Increase Tcws	1-3% <1 year		1-3% <1 year		1-3% <1 year
Max. demand shedding	0-1% <1 year	1-3% <1 year	0-1% <1 year	1-2% <1 year	0-1% <1 year
Pumps (chilled water flow)					
Re-tune bypass valve setting			1-3% <1 year	1-3% <1 year	1-3% <1 year
Install differential pressure sensors at the critical path	1-3% <1 year				1-3% <1 year
Install VSD on the existing chilled water pumps	N/A	3-5% 3-5 year	3-5% 3-5 year		N/A
Cooling towers					
Reactive cooling tower (CT) optimisation	N/A	N/A	1-3% <1 year	N/A	1-3% <1 year

Feedback to Designers

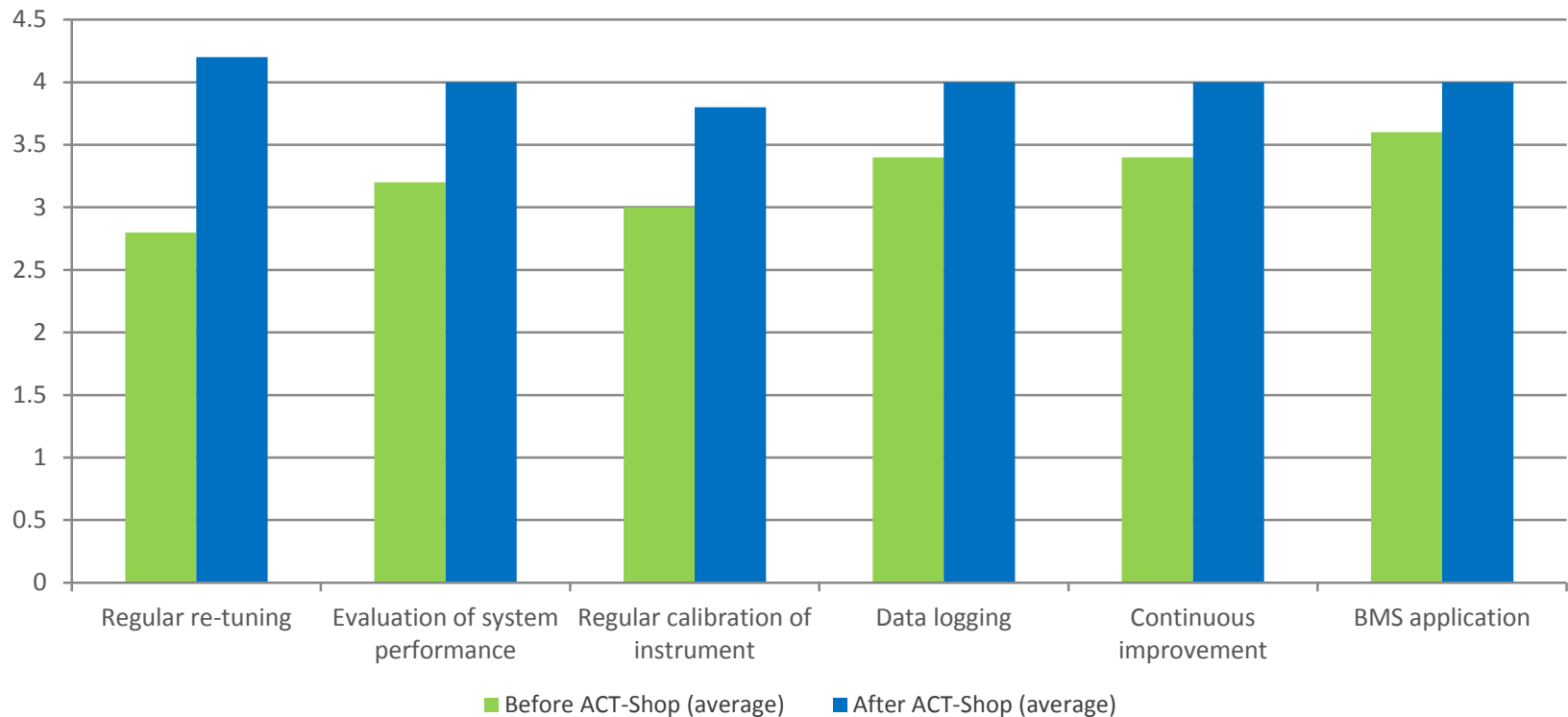
- Provide a separate system for data centre/24-hour A/C premises
- Plant sizing making reference to existing buildings
- Plant & equipment design for part-load efficiency
- Adequate instrumentation (Industrial grade)
- Capability of BMS to suit operators' need
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PROGRESS UPDATE

SURVEY FINDINGS

Survey Findings

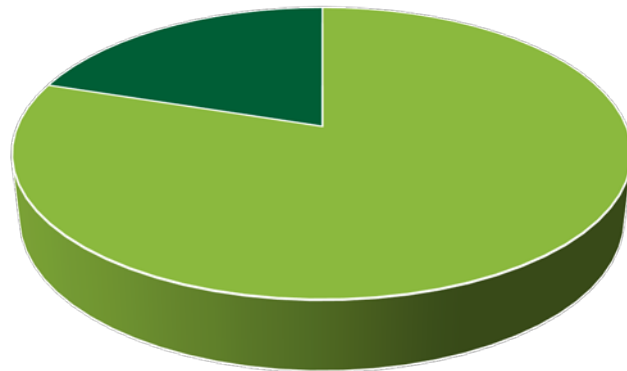
Knowledge Gain on Retro-Commissioning:



Survey Findings (con't)

Time spent:

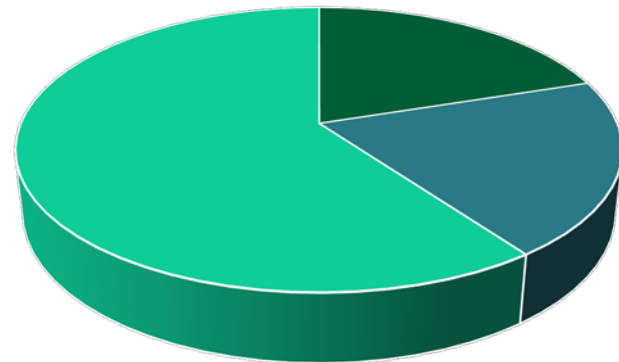
Extra Time Spent in ACT-Shop



■ <10% ■ 20% ■ 30% ■ >40%

Most participant spent less than 10 % of time

Suggested ACT-Shop Programme Period



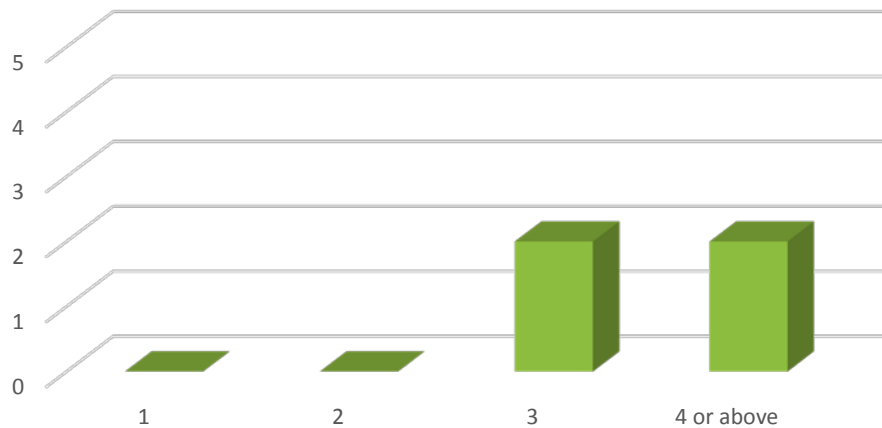
■ 3 months ■ 6 months
■ 1 year ■ more than 1 year

Participants prefer lasting for one year or longer.

Survey Findings (con't)

Future Training Programme:

Suggested Training Sessions



At least 3 training sessions are required

Suggested Training Items



All training items are important

WAY FORWARD & TIMELINE

ACT-Shop Series (Short & Medium Terms)

ACT-Shop

- Building up knowledge & competence for participating building operators/services providers
 - Target
 - At least one building of the 20+ large commercial building owners + a few other pilots
 - On-going knowledge up-dating
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Active Training

- Reinforcement and Extending to Industry
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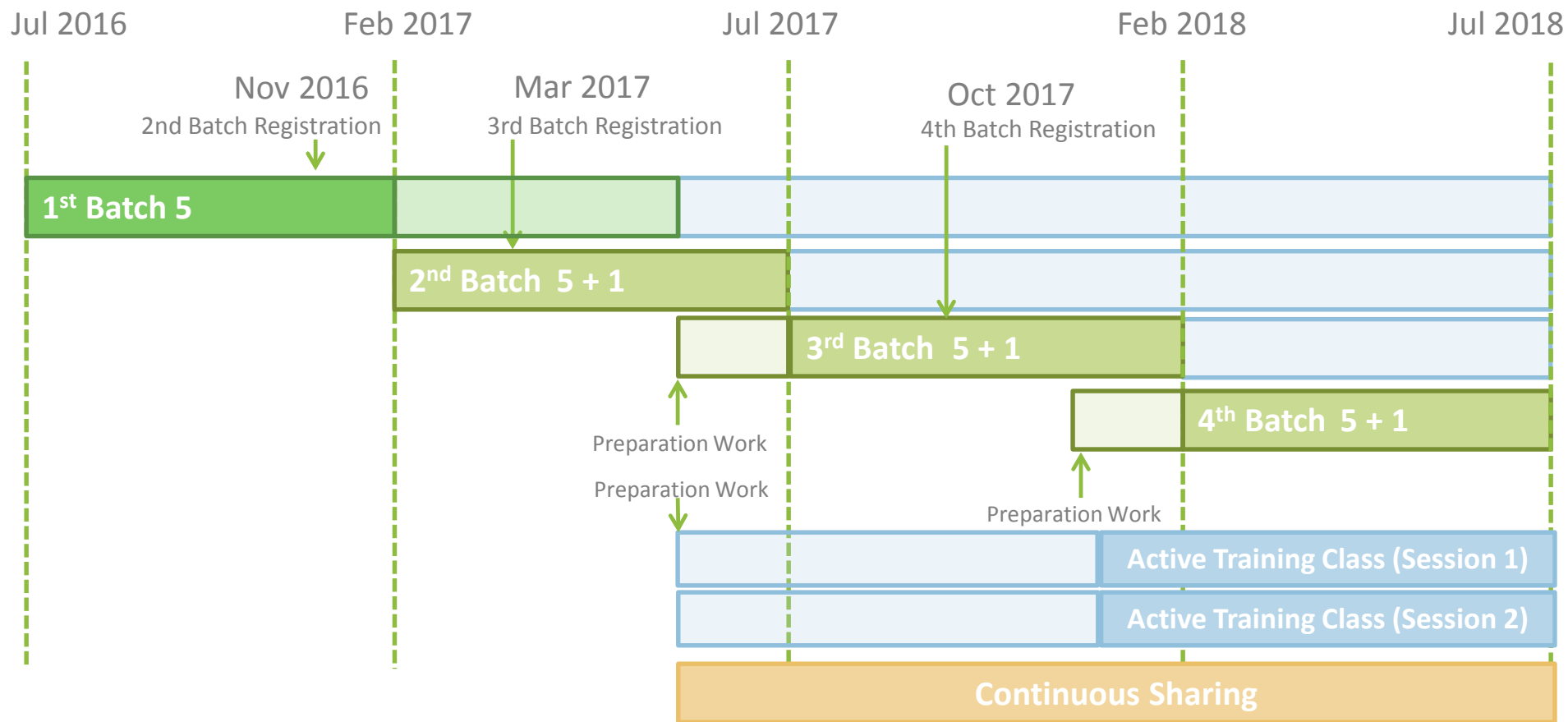
Continuous Sharing

- Forums
 - Experience sharing with EMSD & Industry
 - Best Practice Notes
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Active Training

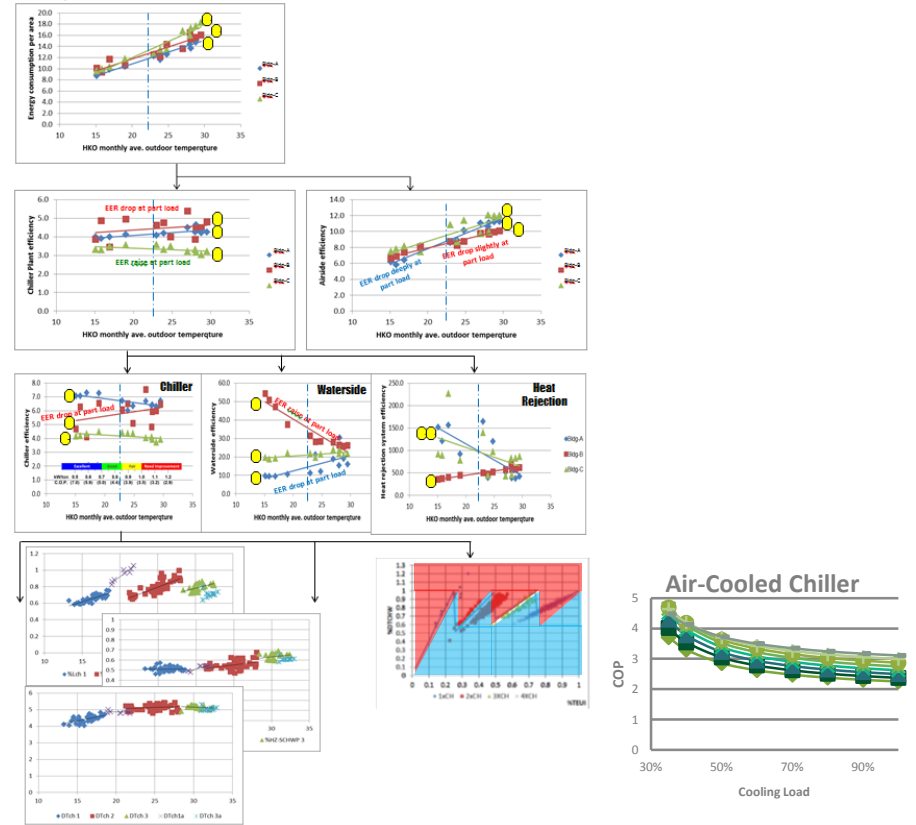
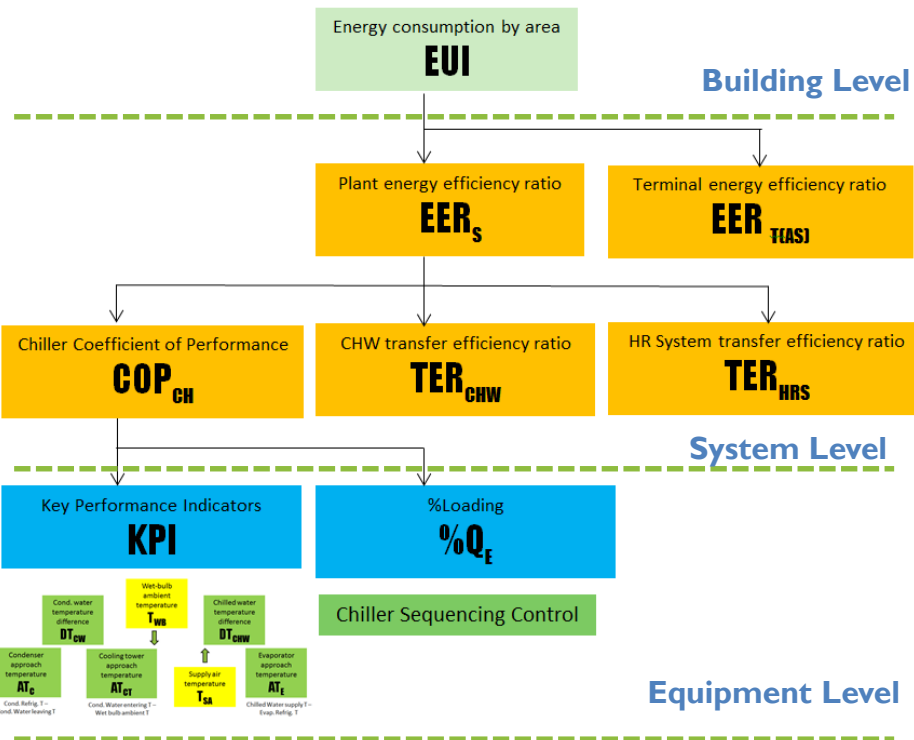
- Target Participants
 - Individual involves in managing / operating a building
 - Service providers / equipment / system providers / contractors
 - Encourage operator/building manager to come with services provider
- Mode of training
 - Semi-ACT-Shop
 - Gone through the essential process of retro-commissioning
 - Exercise using data from participants' buildings
 - Pilot project on an energy saving project from participants
- Participants expected to be able to:
 - Have in-depth knowledge and know how on proper retro-commissioning
 - lead in-house team or service provider to carry out proper retro-commissioning
 - Specify requirements to service providers when contract out the process

Programme Timeline – ACT-Shop Series



e-O&M Manual + Benchmarking

Purposed e-O&M Manual:



*Thank
you*



Active Training (Q&A)

- Module Structure
- Theory
 - Basic theories on HVAC relating to energy efficiency
 - Basic mathematical and analytical methods used during the training
- Knowledge based retro-commissioning based on real case and data
 - Data collections, screening and data analysis,
 - Identifying opportunities
 - Saving estimates and evaluation
 - Practical methods on implementing improvements
 - Measurement and verification
 - Exercises with participants' data
- Technology sharing by suppliers
 - Performance characteristics of major equipment/BMS/services/design
 - New technologies
- Industry updates
 - Government, other institutions or other speakers
- Group or individual project (optional)
 - An energy saving project report demonstrating what has learnt (saving estimation, implementation, measurement & verification)
- Future modules on knowledge based energy management
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