

# Knowledge Based Energy Management



Ir Cary CHAN

Executive Director

Hong Kong Green Building Council

4<sup>th</sup> May 2016

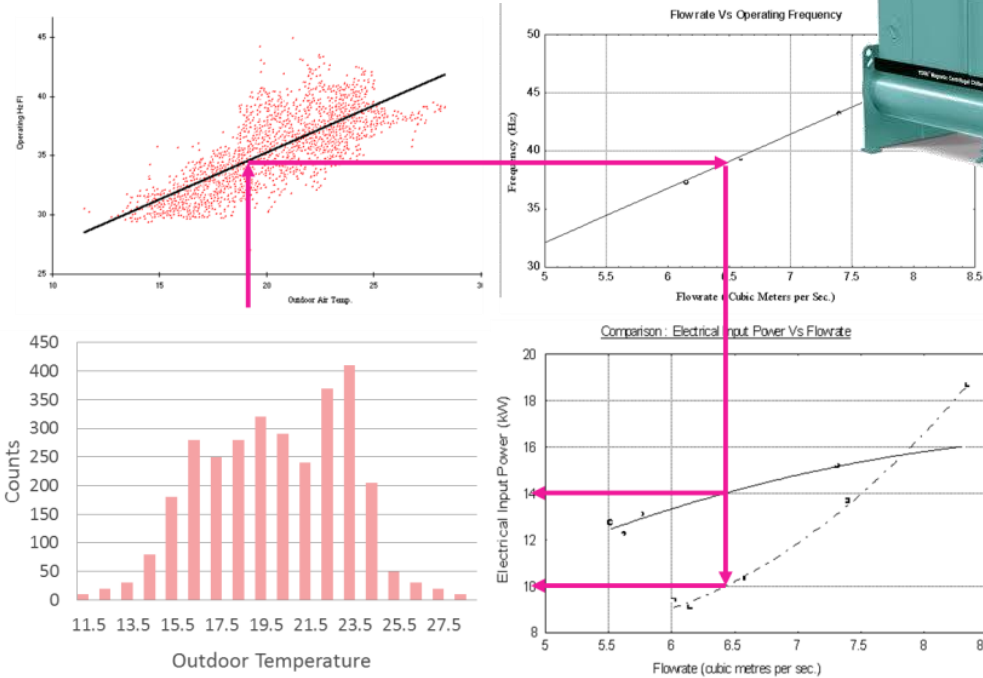
# How Efficient is Our Plant?



$$\text{Efficiency} = \frac{\text{Output}}{\text{Input}}$$



## How much can you save?

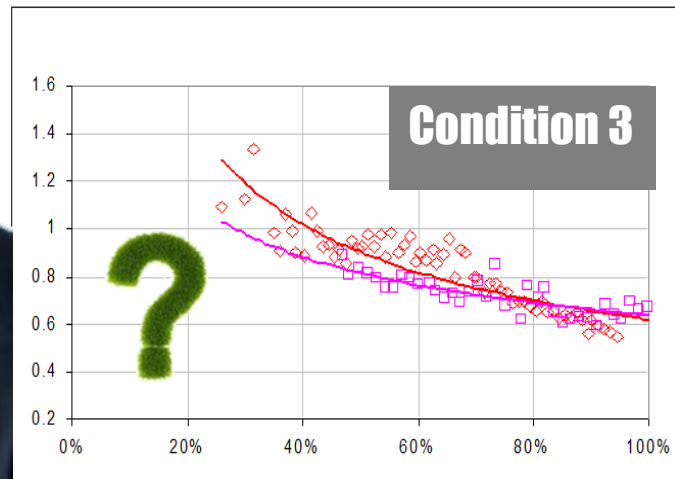
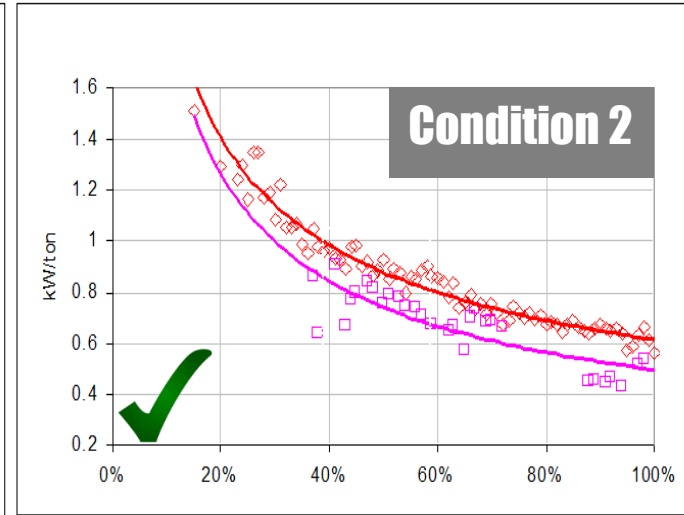
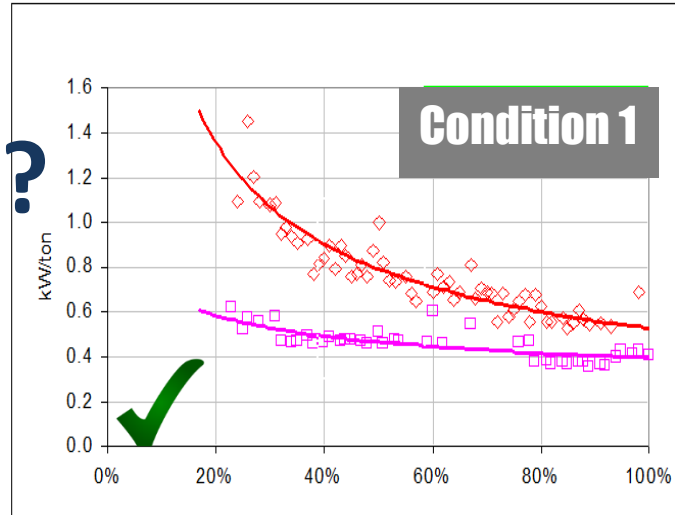


**Saving = 9,858kWh/year**



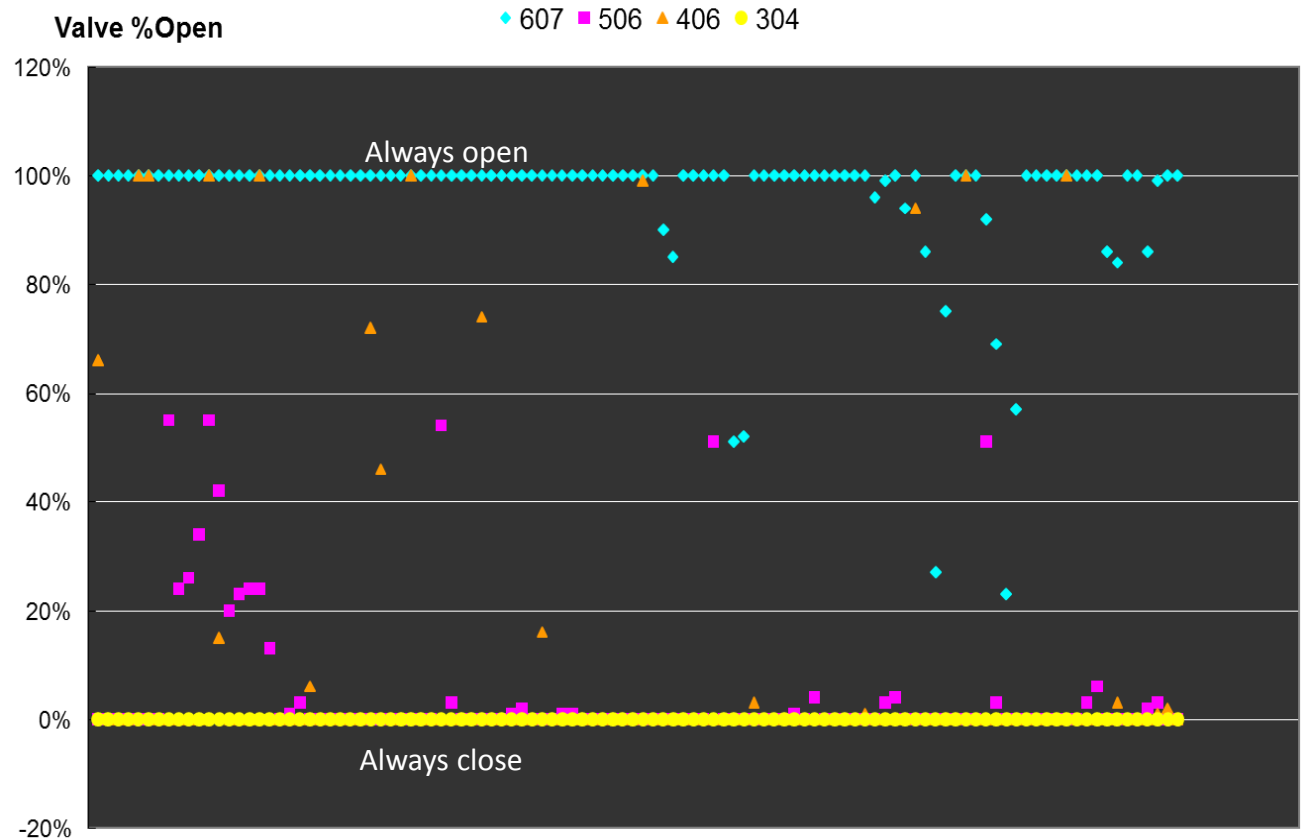
# Measurement and Verification Method

## Did it work?



# Are our systems working?

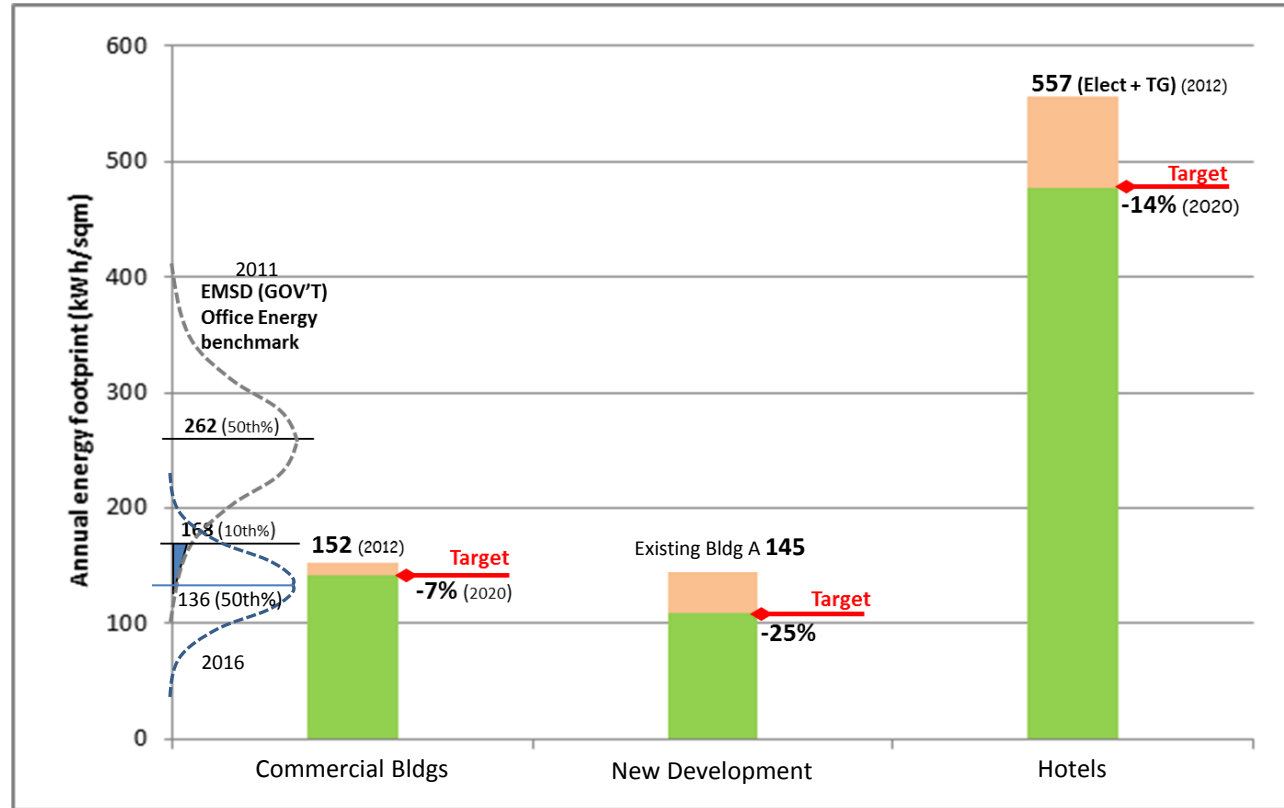
# Fault Diagnosis



## How do we compare with others?



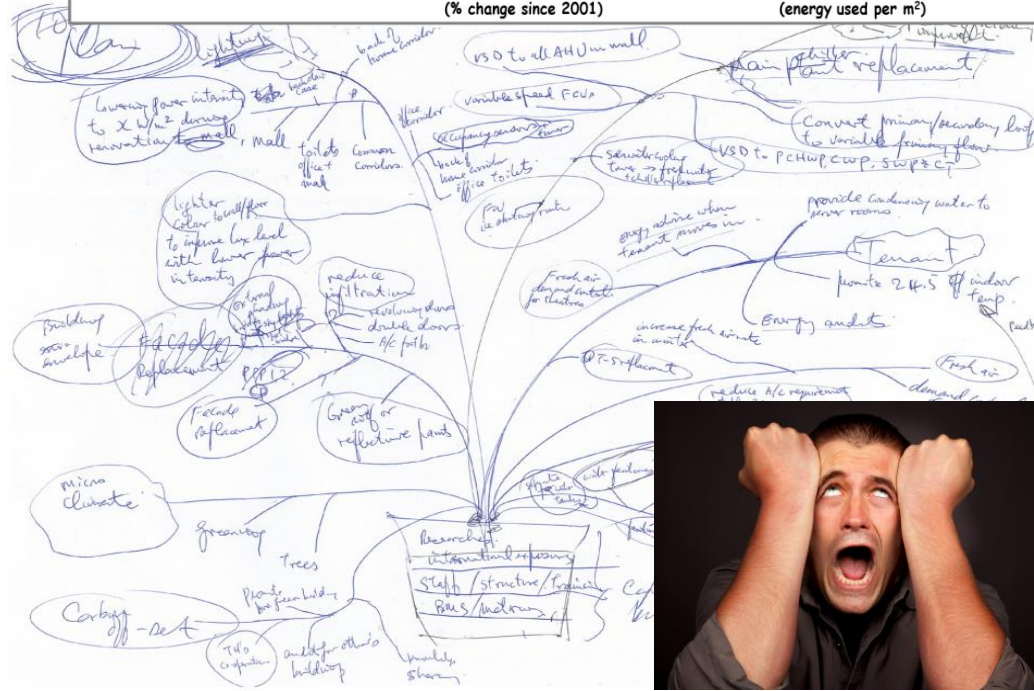
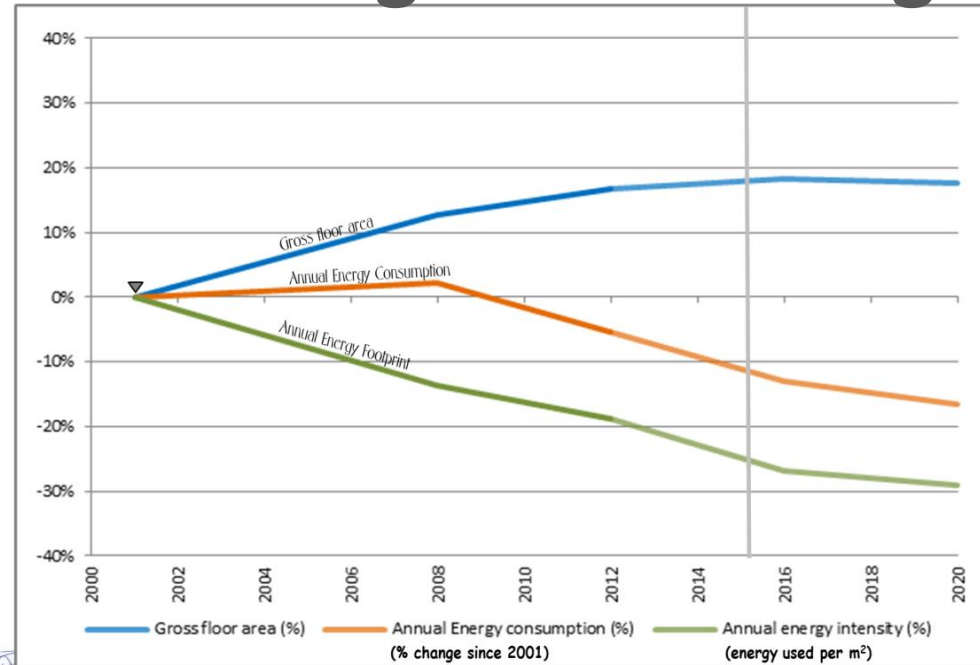
HONG KONG



# Can we have a 10-year plan?

# Long Term Planning

HONG KONG





data

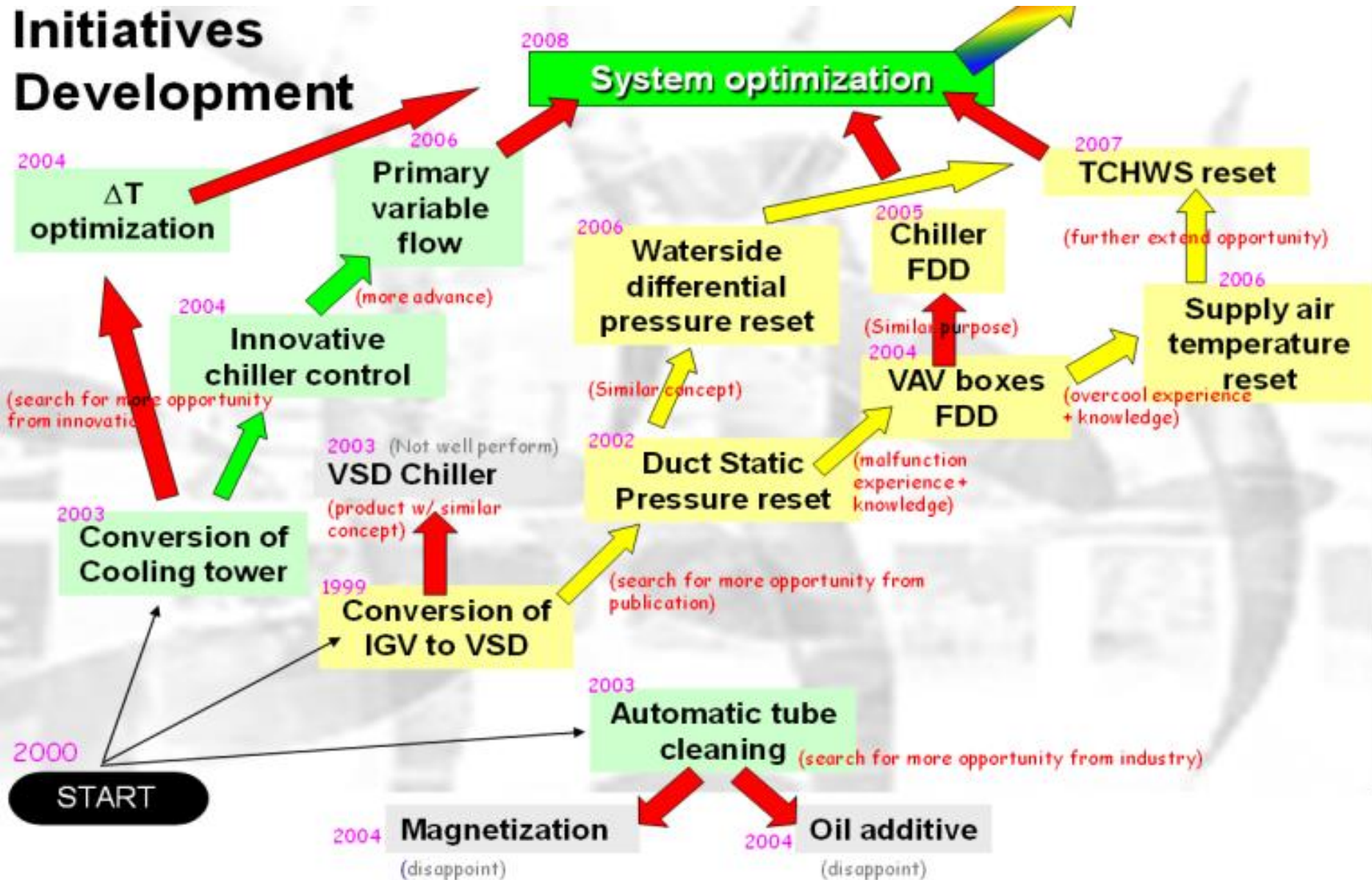
data

data



# Action Research

## Initiatives Development



## Knowledge-Based Energy Management Enables More Energy Saving Opportunities

### Achievement of A Property Management Company



Replacement of lighting and chillers **-10%**

---

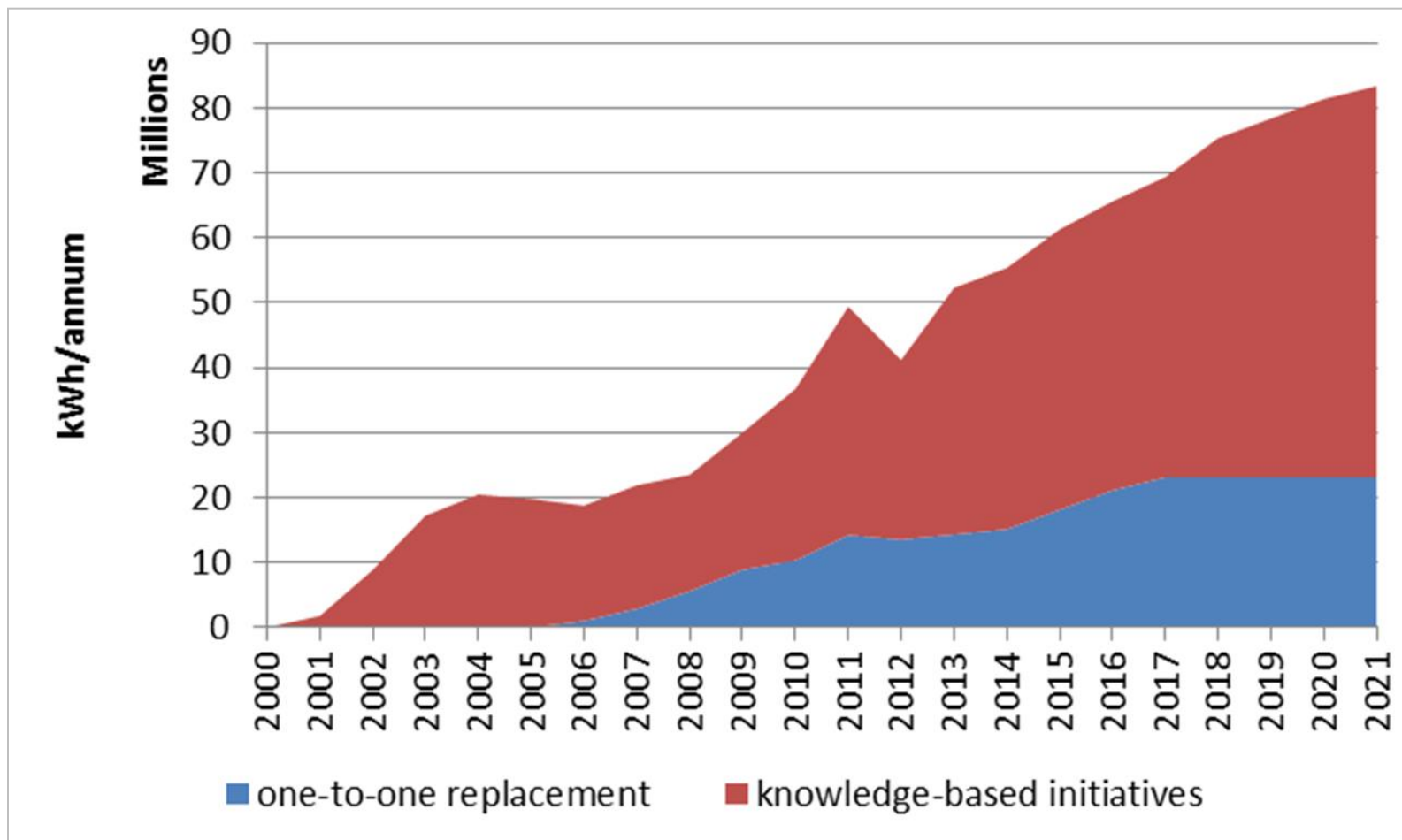
**Knowledge-Based** Driven Solution **-14%**

- System Conversion
- Control Strategies
- Fine Tuning & Optimisation

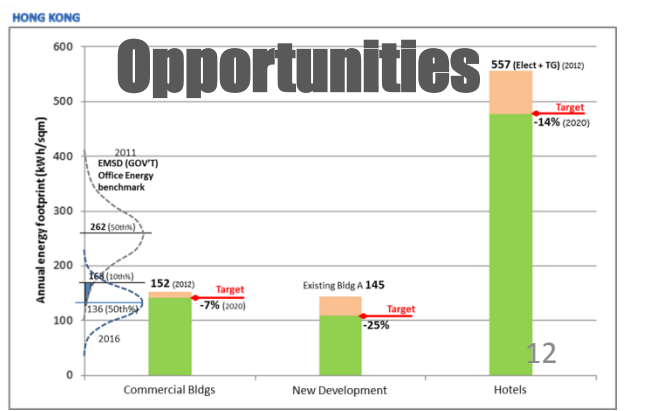
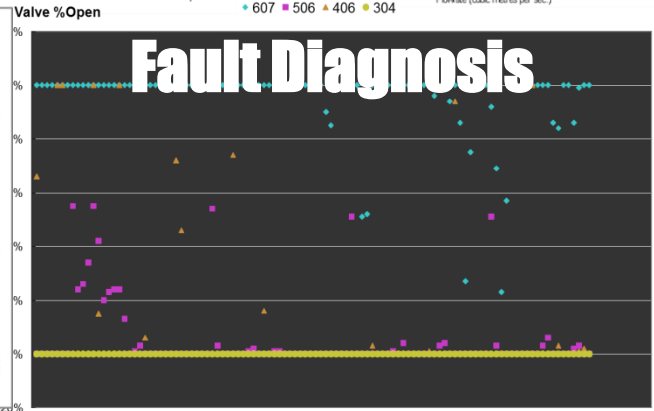
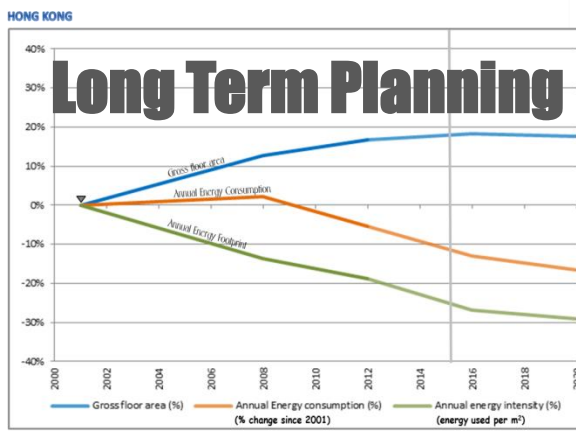
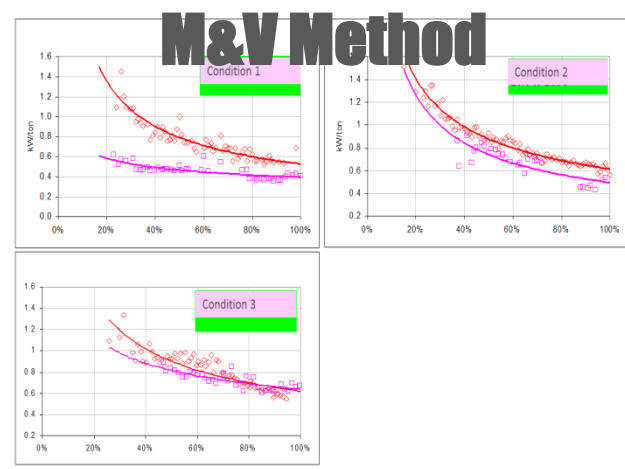
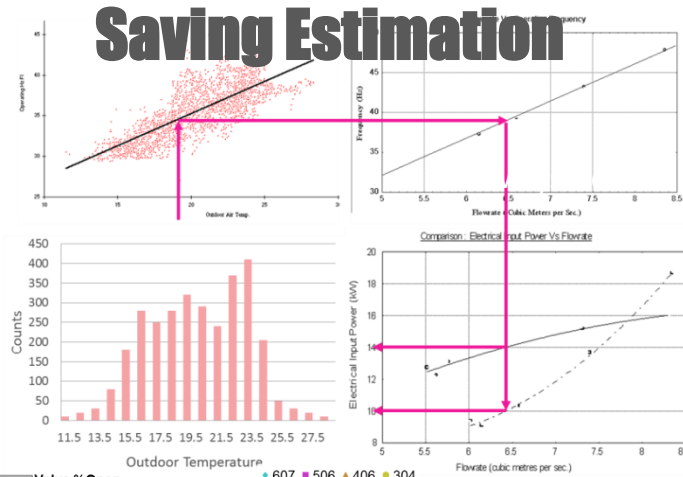
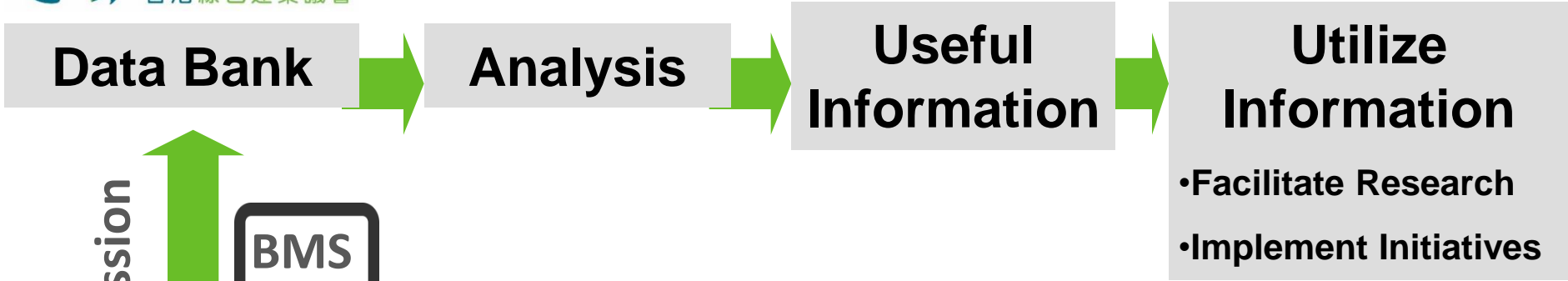
**-24%** by 2015

# Knowledge-Based Energy Management Enables More Energy Saving Opportunities

## Cumulative Savings



# Knowledge-Based Energy Management



# Technical Challenges

BMS

BMS

BMS

BMS

BMS

BMS

BMS

BMS

BMS

## Quality of Data

- Accuracy

- Right Form

- Accessibility

BMS

BMS

BMS

BMS

BMS

BMS

BMS

BMS

BMS



BMS

BMS

BMS

BMS

BMS

BMS

BMS

## Problems:

- Missing data

- Incorrect form of data

- Huge data volume and scale

BMS

BMS

BMS

BMS

BMS

BMS

BMS

BMS

BMS

BMS

BMS

BMS

BMS

BMS

BMS

BMS

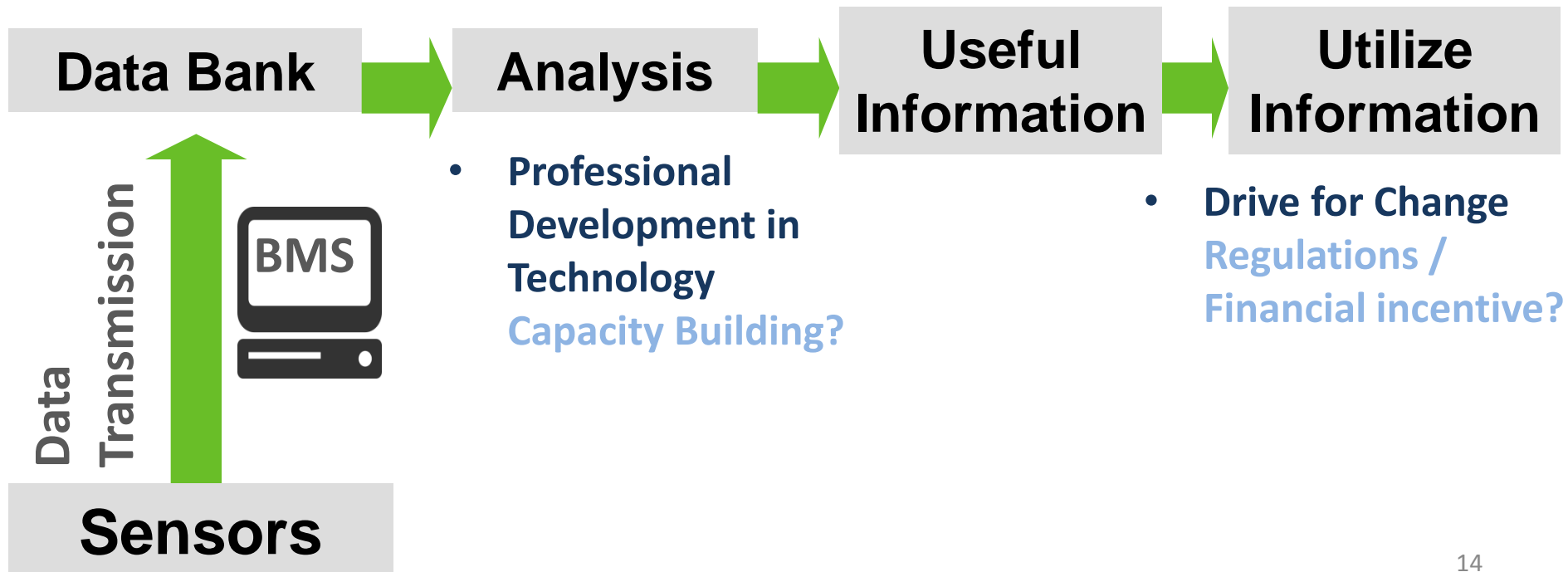
BMS

BMS

- Incompetence in analysis

# Challenges of Knowledge-Based Energy Management

- **Capital Investment**  
Value for Information Unknown?
- **Technology Development / Investment**  
Who to Specify?
- **Full Understanding of Users**  
Operator Involvement in Design?



# Current Practice of the Industry

Knowledge-Based Practice

Adopt Best Practice

Maintenance Requirement

Continuous Improvement



Basic Need

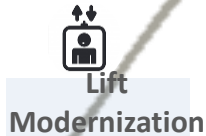


Knowledge transfer

Retro-Cx

Metering

Optimization



Retrofit



Early Replacement



General Practices & Regulatory Compliance

Routine Inspection

Routine Maintenance

House keeping

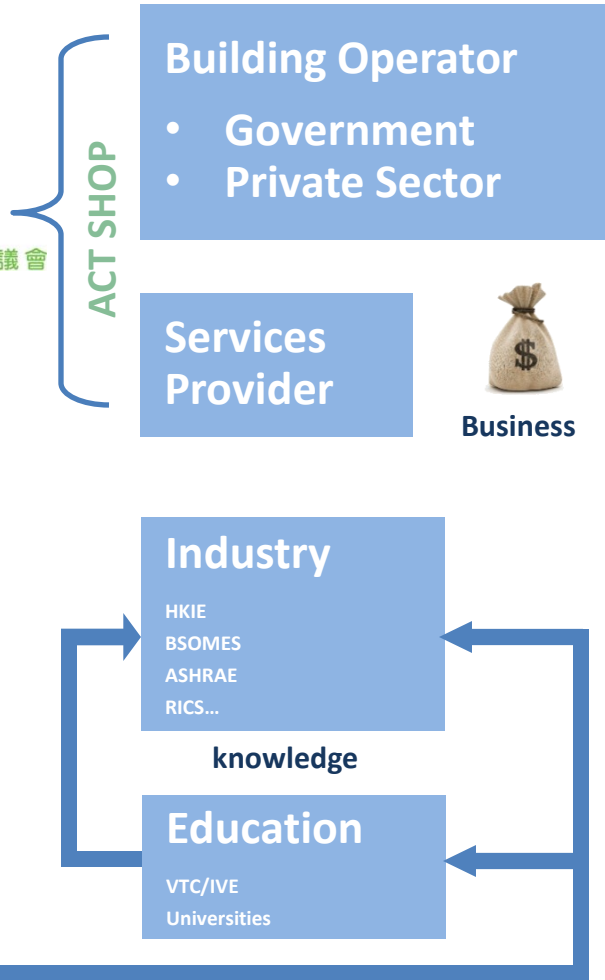
OUT OF ORDER

Run to Life

Saving >24%

Saving ~17%

# Establish Knowledge Sharing Platform



Saving



In-house Competence



e-O&M Manual



Business

Develop & drive the products / services markets

- Detailed databank
- Develop industry competence
- Standardise energy analysing method / format
- Raise next energy audit standard
- Robust benchmarking system



Beyond Standard



# ACT-SHOP

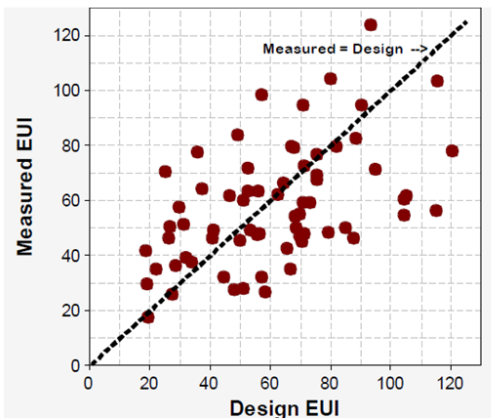


Learn from

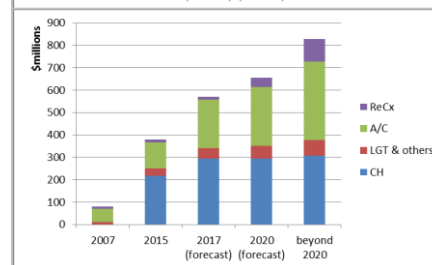
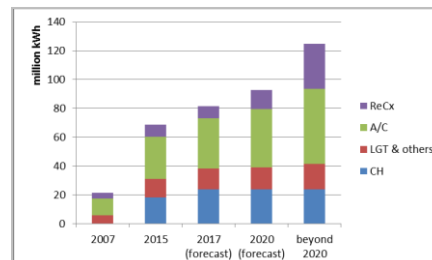
- Peer
- Tutors
- Real time practical support

→ Derive knowledge

→ Effective in influencing the industry



**Measured EUI  $\neq$  Design EUI**



## What if...

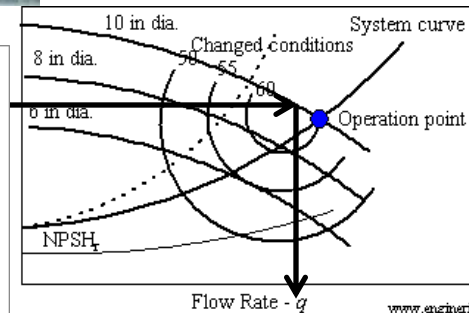
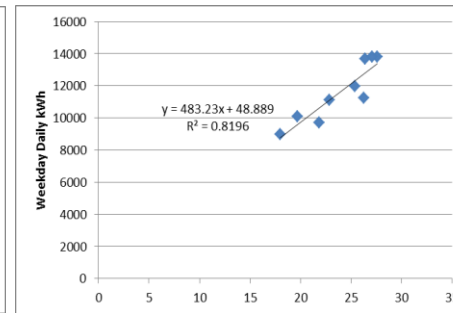
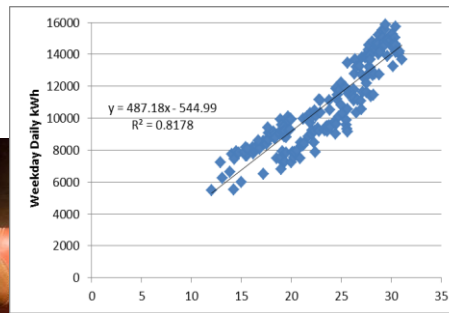
- We don't have enough data
- Not enough meters/sensor

.....

## Alternative...

- We can use less data first
- We can do measurement

.....



## Let's evaluate the performance



Current Energy Audit Code (EAC) Requirement

$$\text{Intensity} = \frac{\text{Input}}{\text{Area}}$$

**Energy intensity**

**Cooling intensity**

Beyond current Energy Audit Code (EAC) Requirement

$$\text{Efficiency} = \frac{\text{Output}}{\text{Input}}$$

**Air conditioning efficiency**

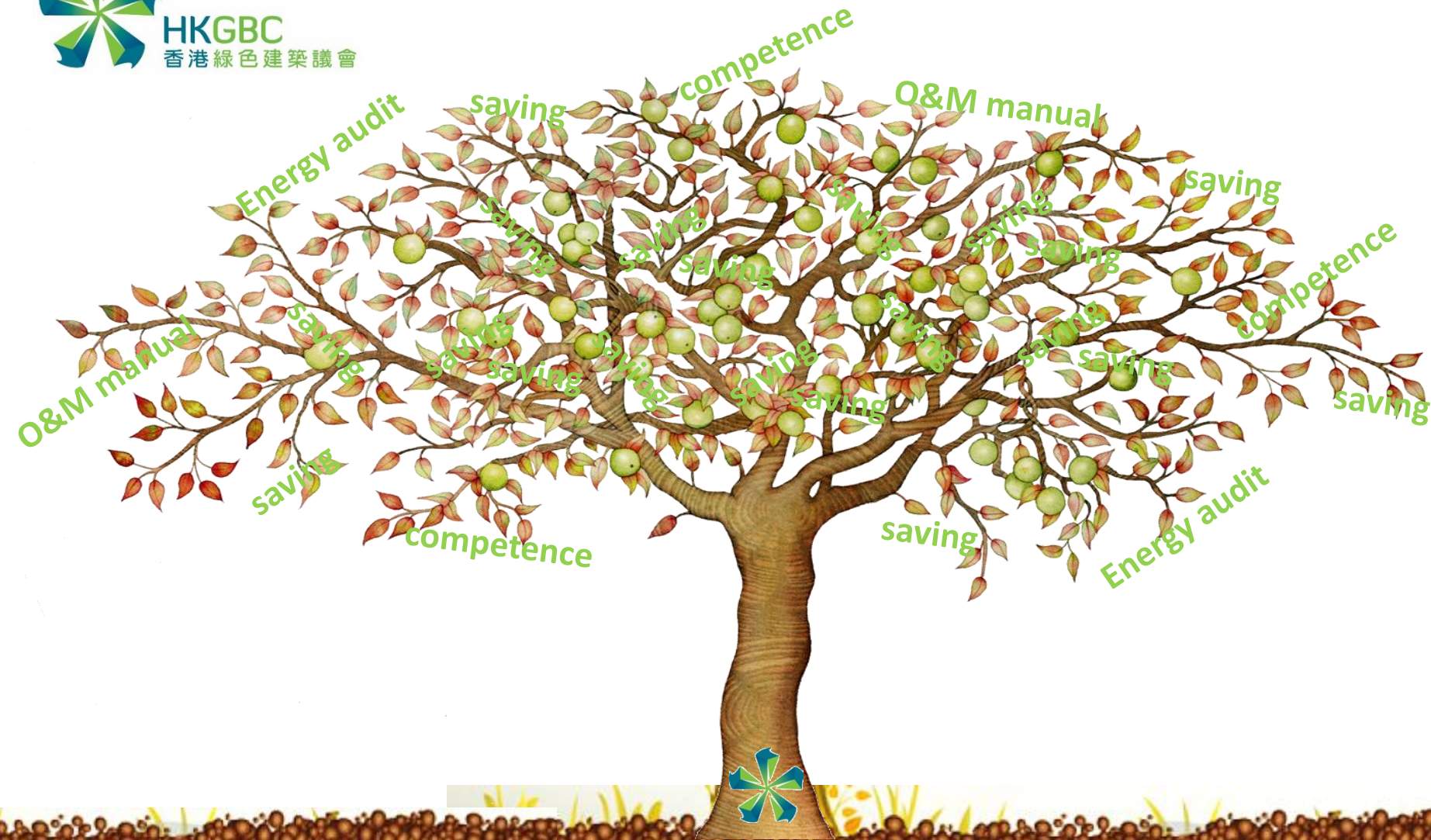
**Chiller Plant efficiency**

**Airside efficiency**

**Chiller efficiency**

**A/C Pumps efficiency**

**Heat Rejection efficiency**



Competence  
Databank  
Best Practice



Make the most out of the  
next Energy Audit

---

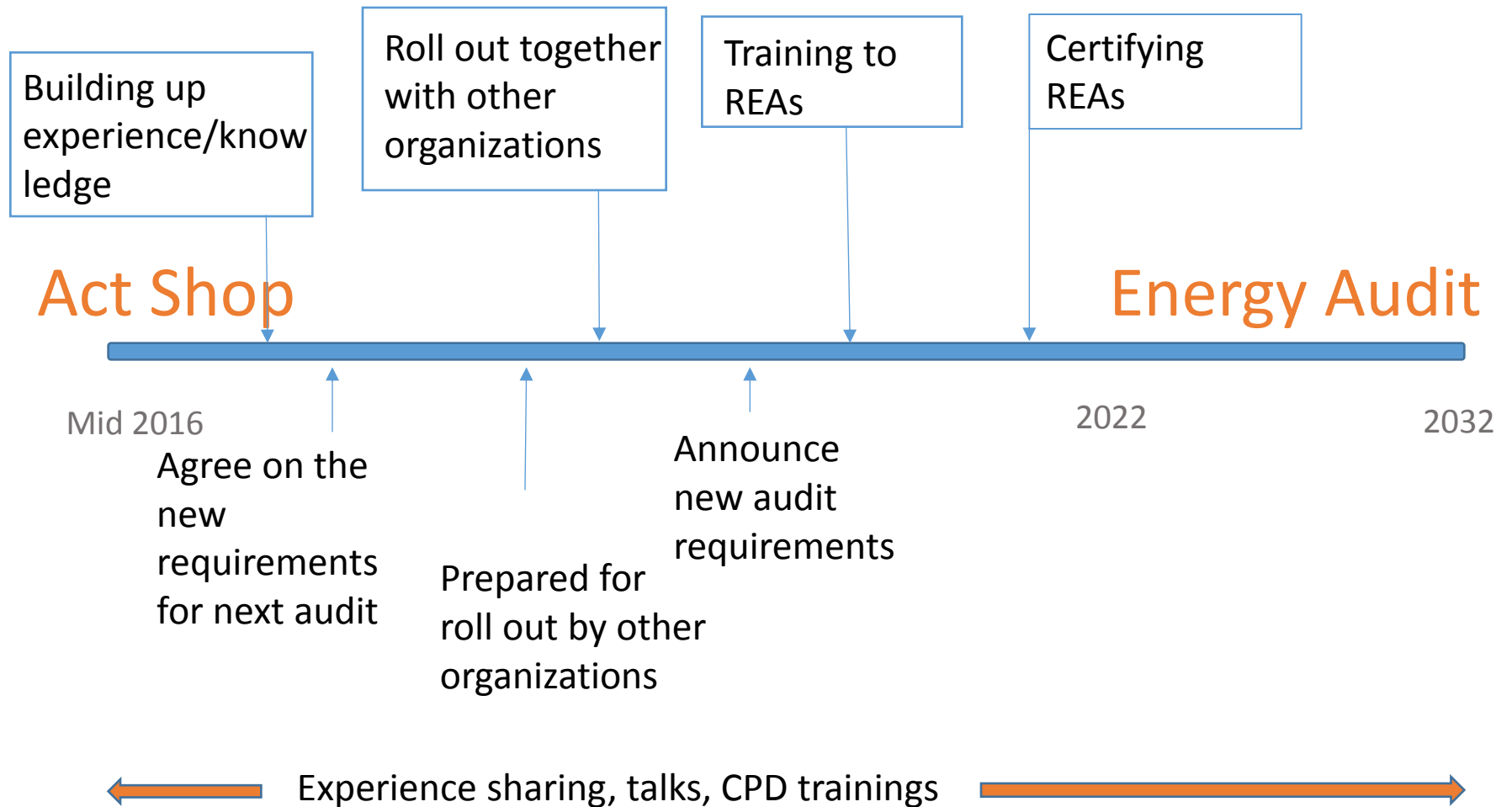
From Act -Shop to the next  
Energy Audit

Mid 2016

**TIME**frame

2022

# Road Map





- Mandatory energy audit
- Act Shop
- Access to funding & loan
- Credits for BEAM plus
- Other recognitions





# make the most out of the next Energy Audit



## *Review and identify improvements needed from last audit :*

Quality of measurement , methodology , robustness of data , value of data, readiness of building operators and REA..etc

Learn where to focus



## *Setting a foundation for the future :*

New requirements for data and information for future management, tracking and analysis ( for buildings, industry and government)

Useful O&M manual

Benchmarking

Building capacity ( building provisions, knowledge , specially trained REA.. )

Central data center

Setting up energy management systems



THANK  
you!