

SUSTAINABLE ENERGY MANAGEMENT SYSTEM: A NECESSITY FOR EVERY BUILDING TO REDUCE CARBON EMISSION AND ENERGY COSTS



By

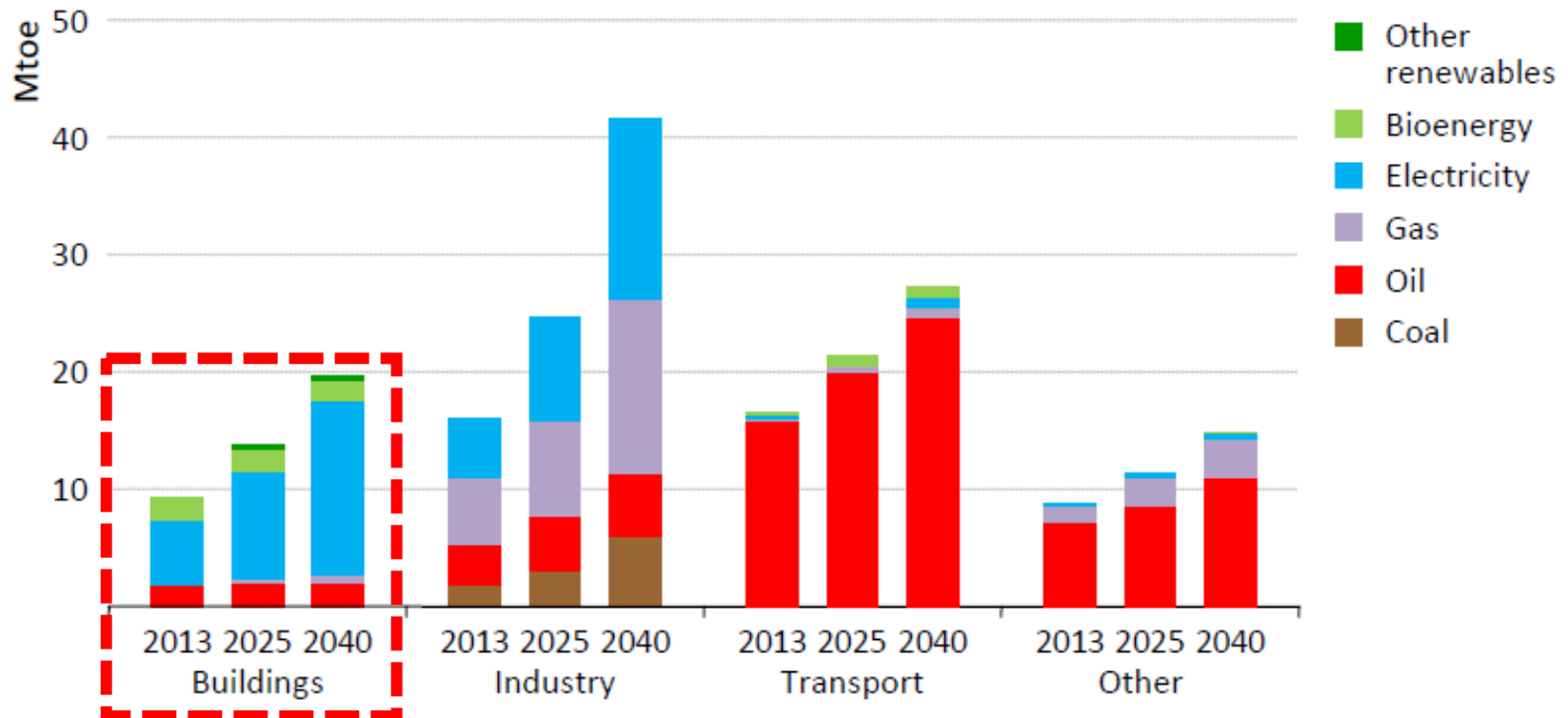
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MAESCO

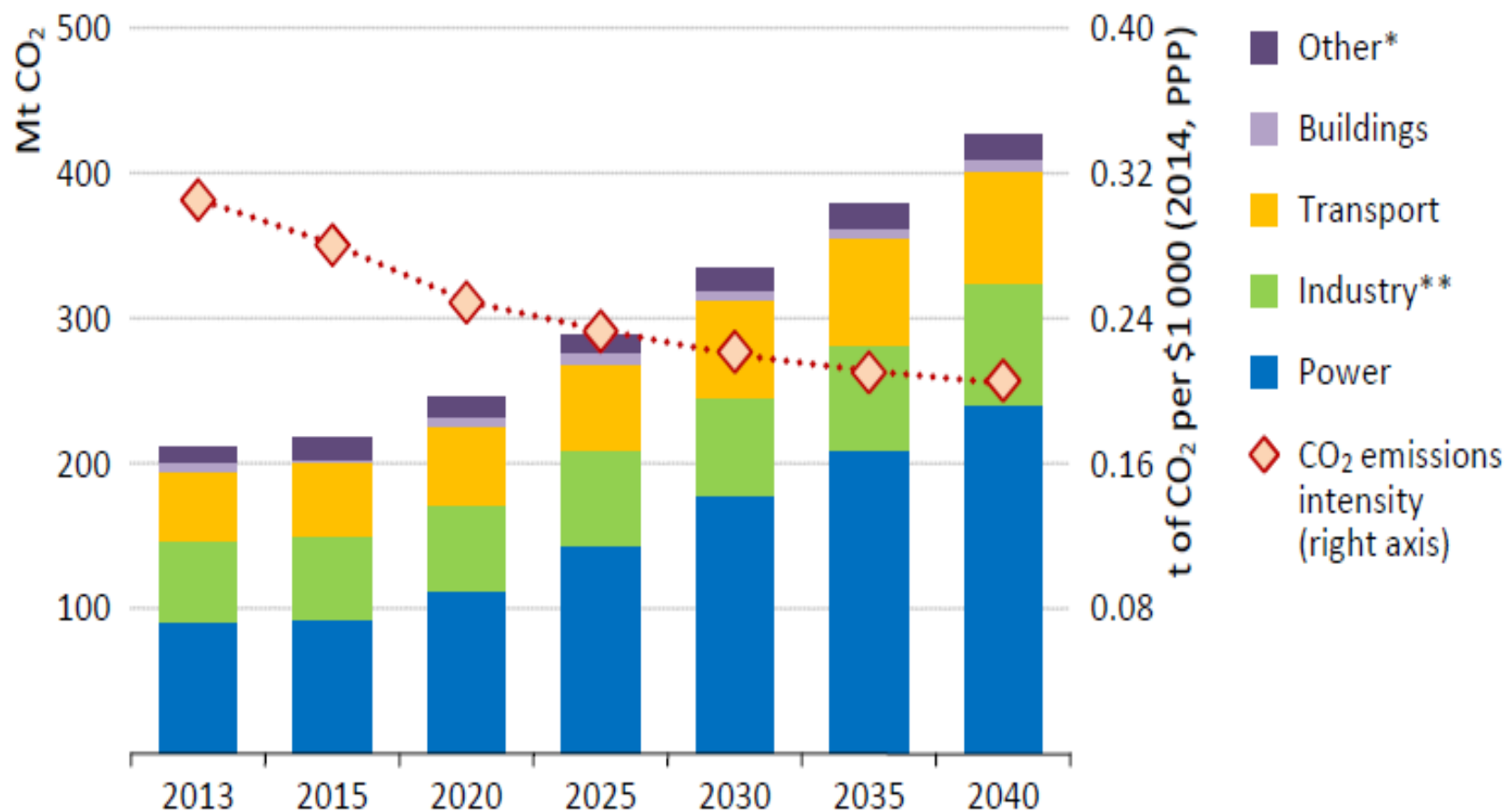
(Pertubuhan Syarikat Syarikat Perkhidmatan Tenaga Malaysia)
Malaysia Association of Energy Service Companies

TOTAL FINAL ENERGY CONSUMPTION BY SECTOR IN MALAYSIA



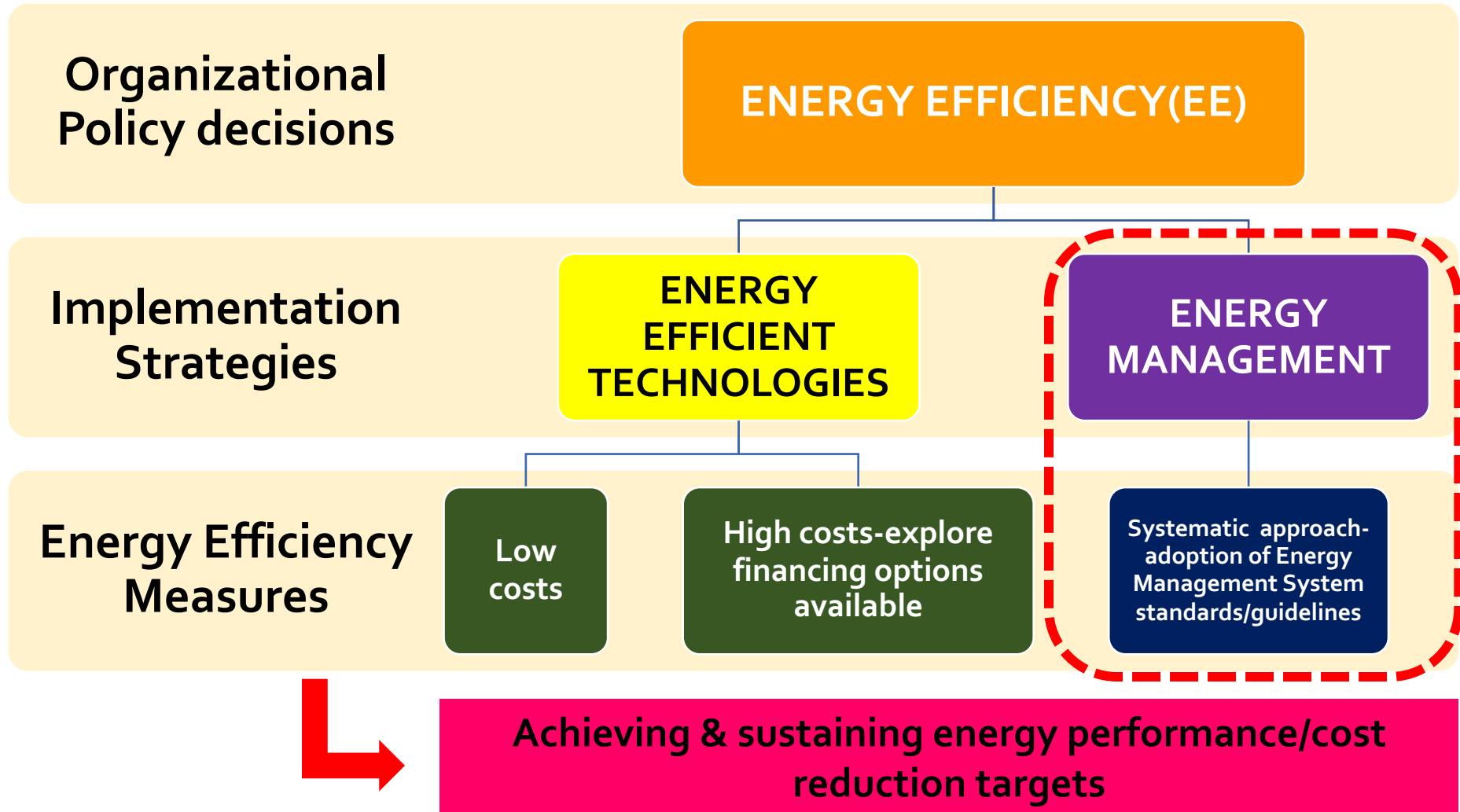
Notes: Buildings sector includes residential and services. Other includes agriculture and non-energy use. Other renewables includes solar PV and wind.

ENERGY RELATED CO₂ EMISSION BY SECTOR



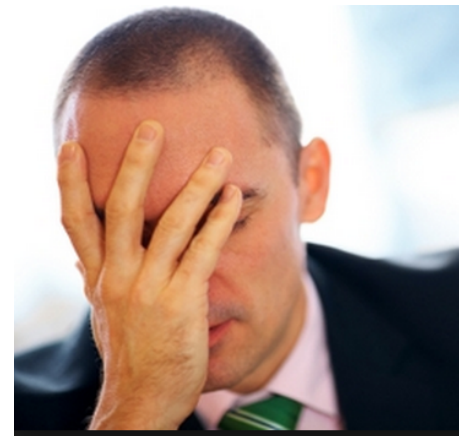
*Includes agriculture and non-energy use. **Includes transformation industries from other energy sector.

THE HOLISTIC & SUSTAINABLE APPROACH TO REDUCE ENERGY (BUSINESS/OPERATIONAL) COSTS?

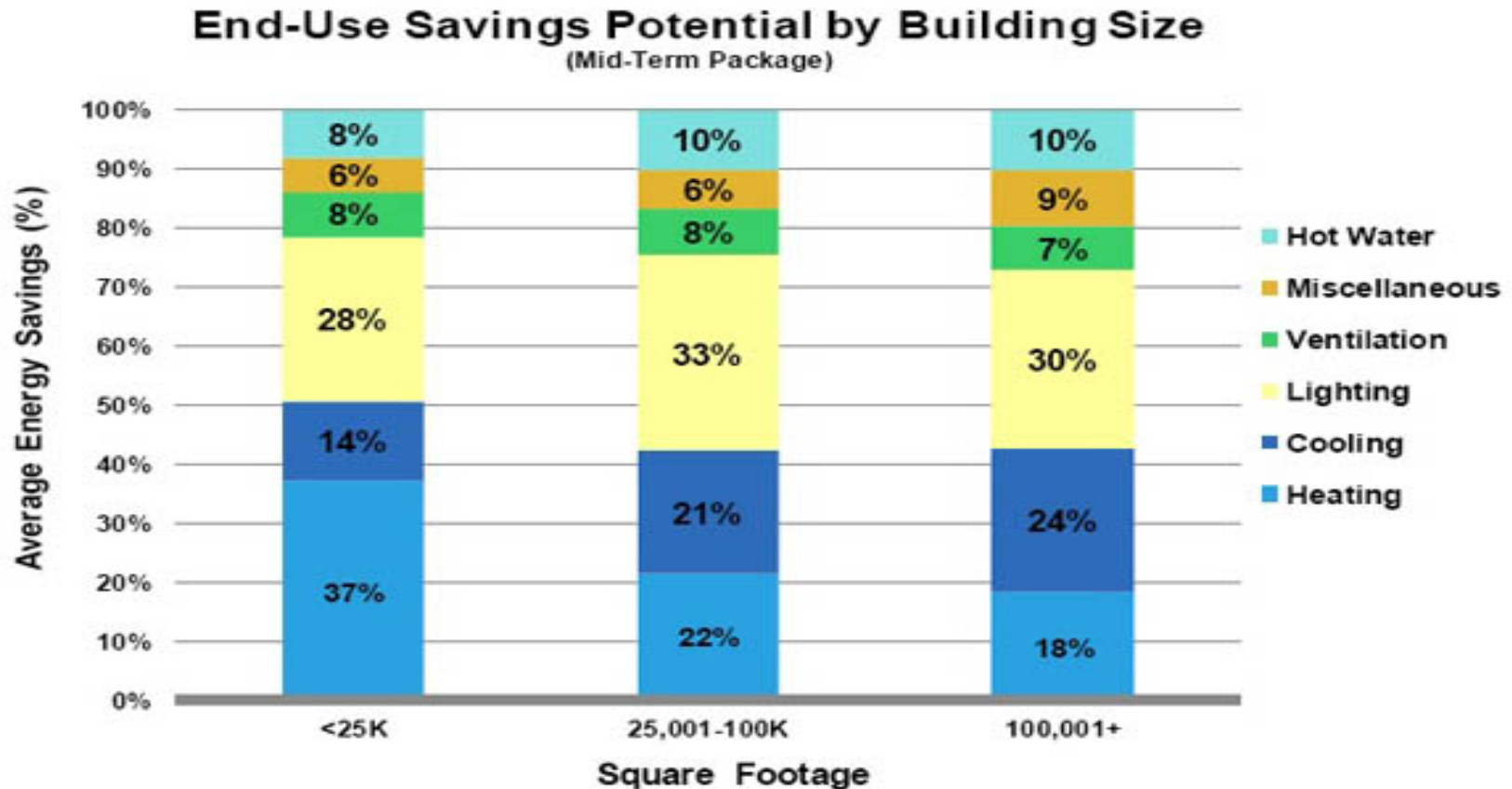


WITHOUT AN EFFECTIVE MANAGEMENT SYSTEM

- ◎ Inefficiencies in the building operations can go unnoticed
- ◎ Lost opportunities to improve energy use & reduce carbon emissions- may not be acted upon
- ◎ Unnecessary energy expenditure- erodes profits & performance



ENERGY SAVING POTENTIALS AT BUILDINGS

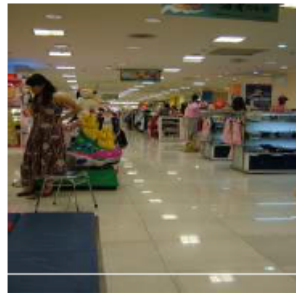


Source: Retroficiency

Buildings' energy savings potential can range from 3-41%

ENERGY CONSERVATION PROGRAM IMPLEMENTATION IN MALAYSIA

Private Commercial Shopping Complex



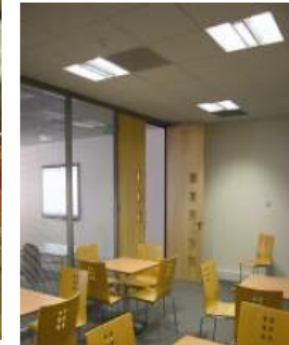
Areas of Implementation:

- 1) Transformers
- 2) Cooling System – Chillers, Cooling Towers, AHUs, CHW & CDW Pumps
- 3) Lighting System – Internal, External & Parking
- 4) Demand Controls

**Total Actual Saving Achieved
= RM 1,495,000/year**

Source: ESCO

Private Warehouse



Application Areas:

- Fluorescent Lamps
- High bay Lighting - HID

**Total annual Saving
= 42.2%
= 3,283,200 kWh,
= RM 920,000**

TREASURY BUILDING, MINISTRY OF FINANCE OF MALAYSIA
17% reduction of electricity bill in 2011
based on 2010 baseline consumption – SEDA Malaysia

ENERGY EFFICIENT TECHNOLOGIES

: DESIGNING & SUSTAINING THE PERFORMANCE OF ENERGY EFFICIENT BUILDINGS



The gap between design and performance



Commissioning building systems



Metering and monitoring systems



Building refurbishment



Control systems

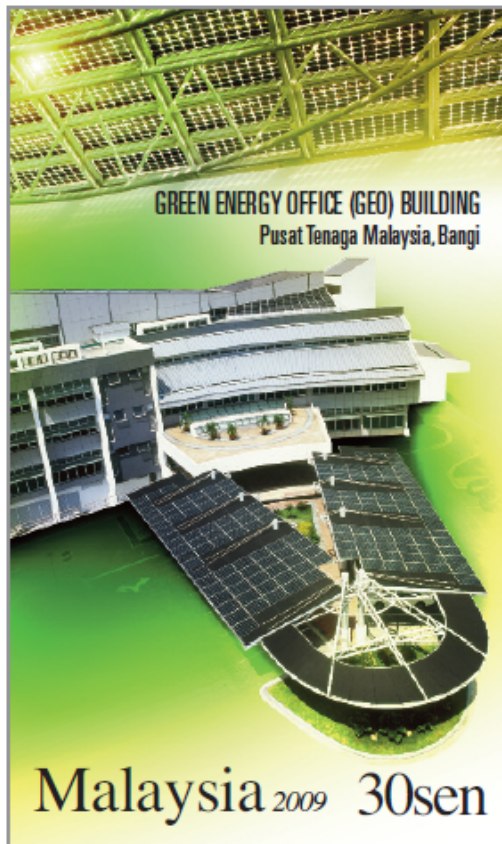


Photovoltaics



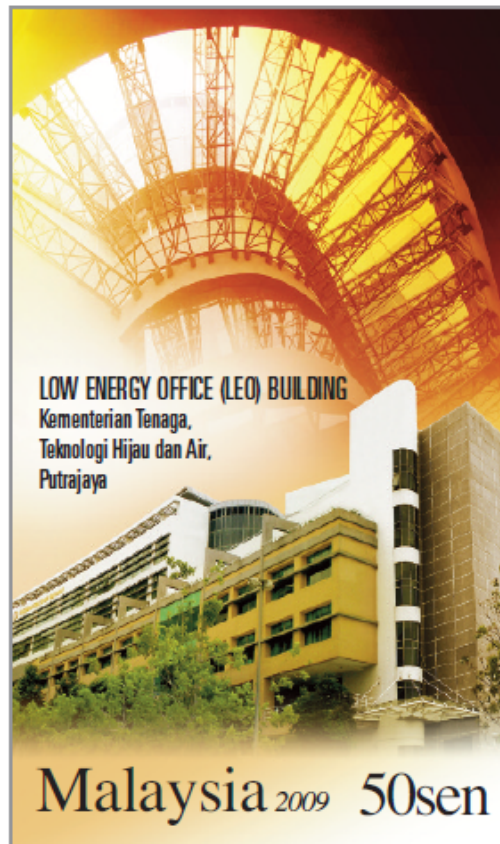
ENERGY EFFICIENT BUILDINGS IN MALAYSIA –LEAD BY EXAMPLE BY THE GOVERNMENT

2007



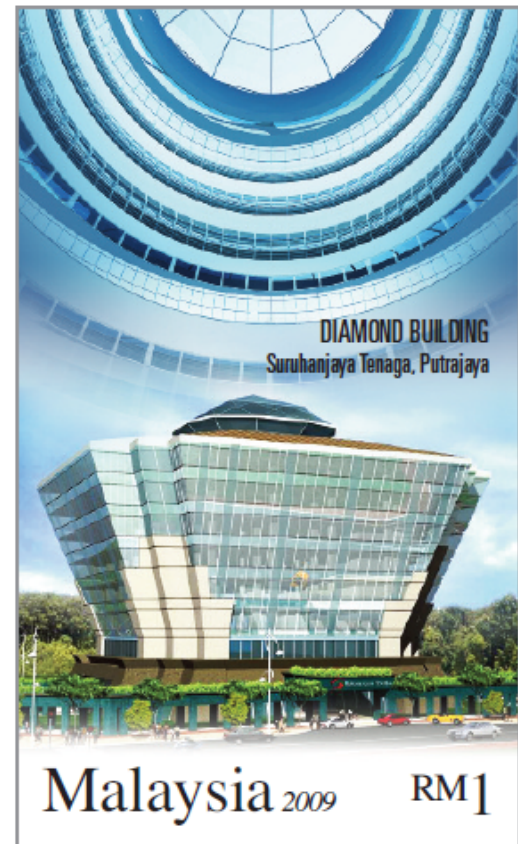
Net BEI = 30 (86% reduce)
65 TonCO₂/year
GBI : Certified (2009)
ASEAN EA : 2009/2010/2011

2004



Net BEI = 114 (59% reduce)
1,490 TonCO₂/year
GBI : Silver (2011)
ASEAN Energy Award : 2006

2010



Net BEI = 63 (70% reduce)
637 TonCO₂/year (**To verify)
GBI & GreenMark : Platinum (2011)
ASEAN EA : 2012

ENERGY MANAGEMENT, ENERGY MANAGEMENT SYSTEM & STANDARD

ENERGY MANAGEMENT

All activities to ensure efficient use of energy in the organization

STANDARD

Systematic approach for the management of energy use

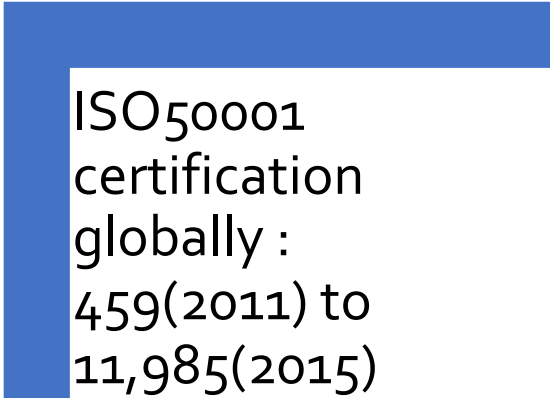
SUSTAINABLE ENERGY MANAGEMENT SYSTEM

- ☐ The process of managing the energy use in the organization
 - ✓ to ensure that energy is used efficiently
 - ✓ adopting a system
 - ✓ to achieve desired results & for continual improvement
- ☐ Involved the **people & equipment** in the daily operation

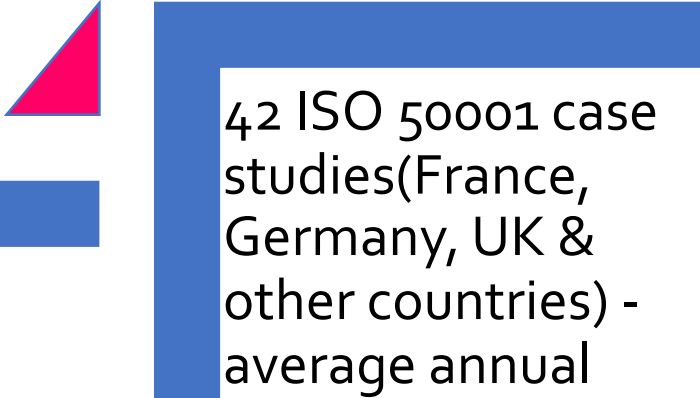
KEY REFERENCES IN ENERGY MANAGEMENT SYSTEM DEVELOPMENT AND IMPLEMENTATION

NO.	STANDARD AND SCOPES
1	ISO50001:2018 Energy Management Systems-Requirements with guidance for use
2	ISO 50002:2014 Energy Audits-Requirements with guidance for use
3	ISO50004:2014 Energy Management Systems-Guidance for the implementation, maintenance & improvement of an energy management system
4	ISO50006:2015 Energy Management Systems – Measuring Energy Performance using energy baseline (EnB) & Energy Performance Indicator(EnPI)
5	ISO50015:2015 Energy Management Systems – Measurement & verification of energy performance of organisations
6	ISO50047: Energy savings-Determination of energy savings in organizations
7	MS1525:2014 Energy efficiency and the use of renewable energy guidelines for non-residential buildings

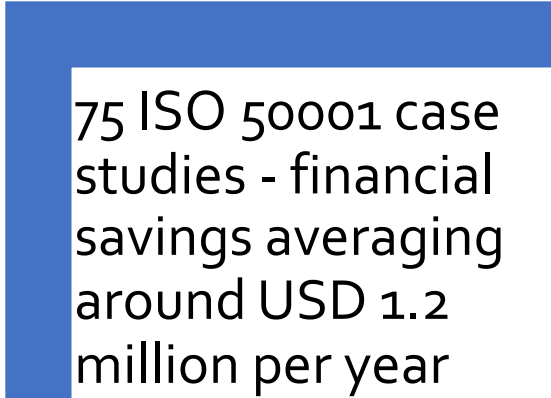
THE ADOPTION & IMPACTS OF ENERGY MANAGEMENT SYSTEM IS GROWING GLOBALLY



ISO50001
certification
globally :
459(2011) to
11,985(2015)

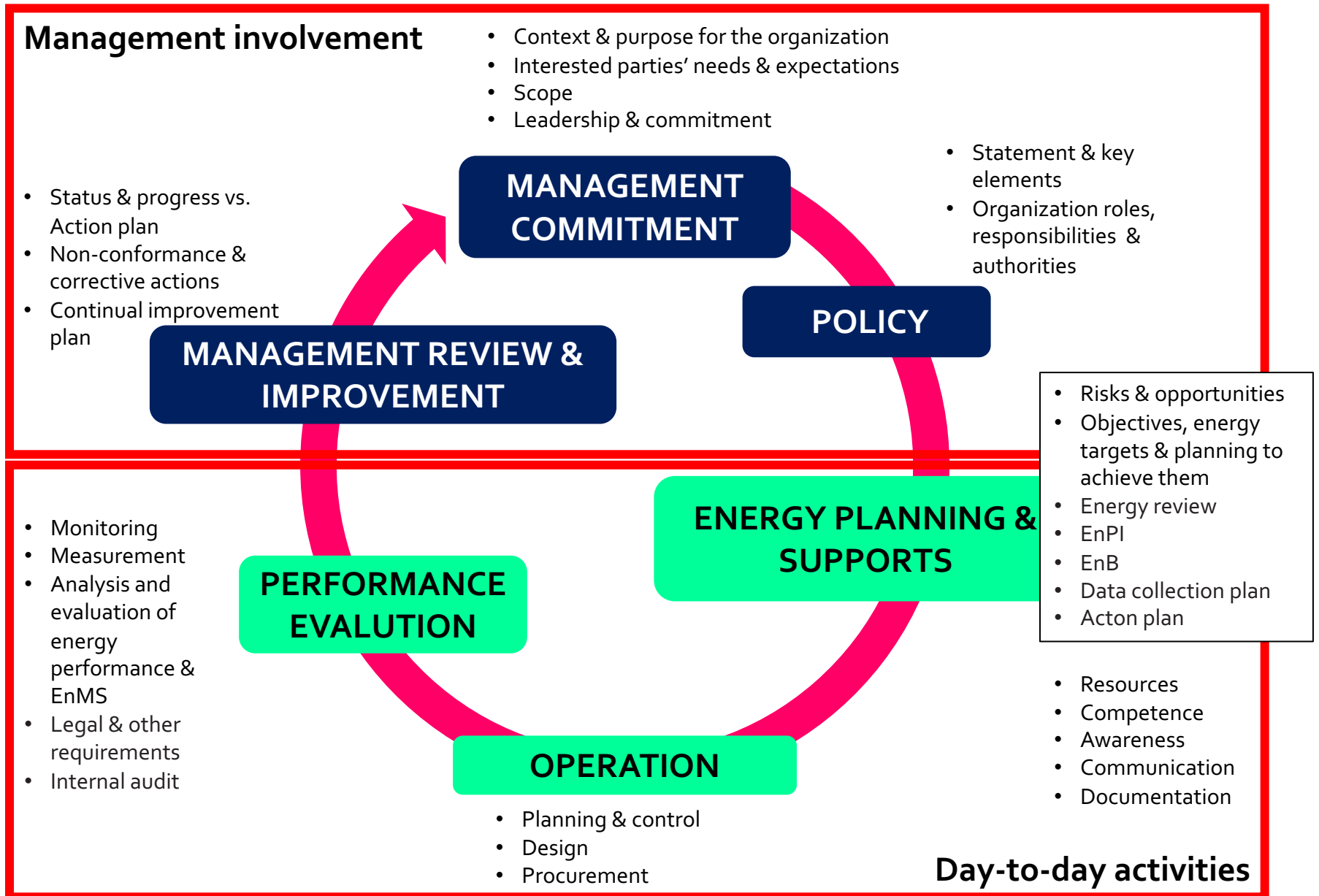


42 ISO 50001 case
studies(France,
Germany, UK &
other countries) -
average annual
energy savings of
26%

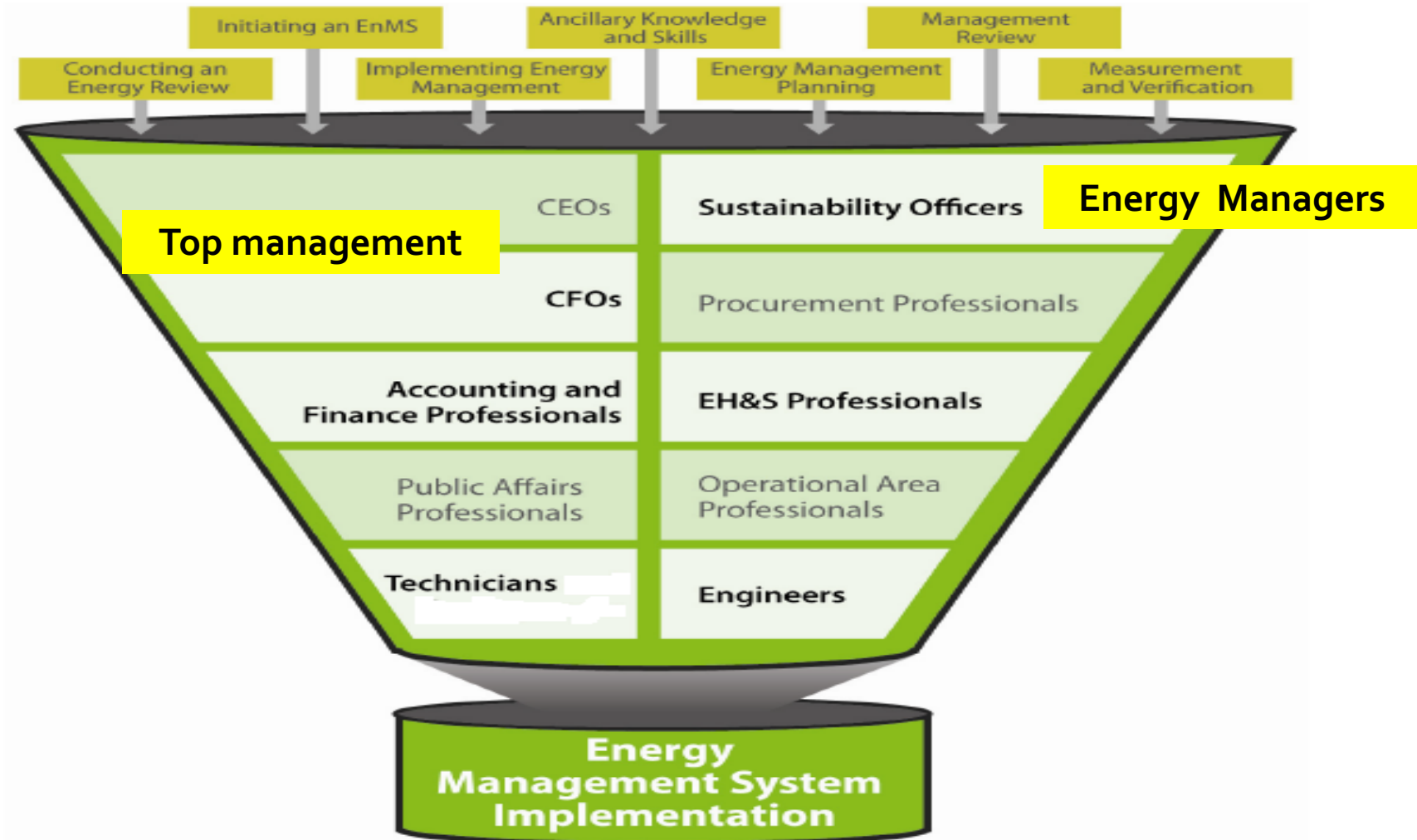


75 ISO 50001 case
studies - financial
savings averaging
around USD 1.2
million per year
(Waide Strategic
Efficiency, 2016;
CEM, 2017b)

Sustainable Energy Management System Framework



EFFECTIVE ENERGY MANAGEMENT SYSTEM IMPLEMENTATION:WHO ARE INVOLVED?



GLOBAL SUCCESS STORIES AT BUILDINGS FROM ENERGY MANAGEMENT SYSTEM IMPLEMENTATION ADOPTION AND PRACTICES

ISO 50001 Energy Management Systems Implementation Case Study
London South Bank University



LSBU saw a

10%

reduction in energy use



Conclusion

"Taking a positive proactive approach, incorporate future energy and environmental management university's sustainability. Basic energy management implemented without an energy manager or ensuring clear auditable records and the conservation processes. Once a system is in place maintain being required if consumption or business change."

"We believe that our decisive actions today can indeed lead to a better tomorrow."

—Michael Crochon, Executive VP Strategy & Technology



Figure 1 - Schneider Electric's Clovis, CA Facility – an ISO50001 and SEP Platinum certified facility

Business Benefits Achieved

Schneider Electric has realized many benefits from implementation of ISO50001 including:

TNT CHILE

Has reduced systematically the consumption, achieving 15% improvements in last 10 years



Case Study Snapshot

Industry	Freight Transportation
Location	Chile
Energy Management System	ISO 50001
Product/Service	Express Cargo

Energy Performance Improvement (%)	7%
Annual energy cost savings	USD 262,790
	USD 21,507
	USD 333,209
	17 Months

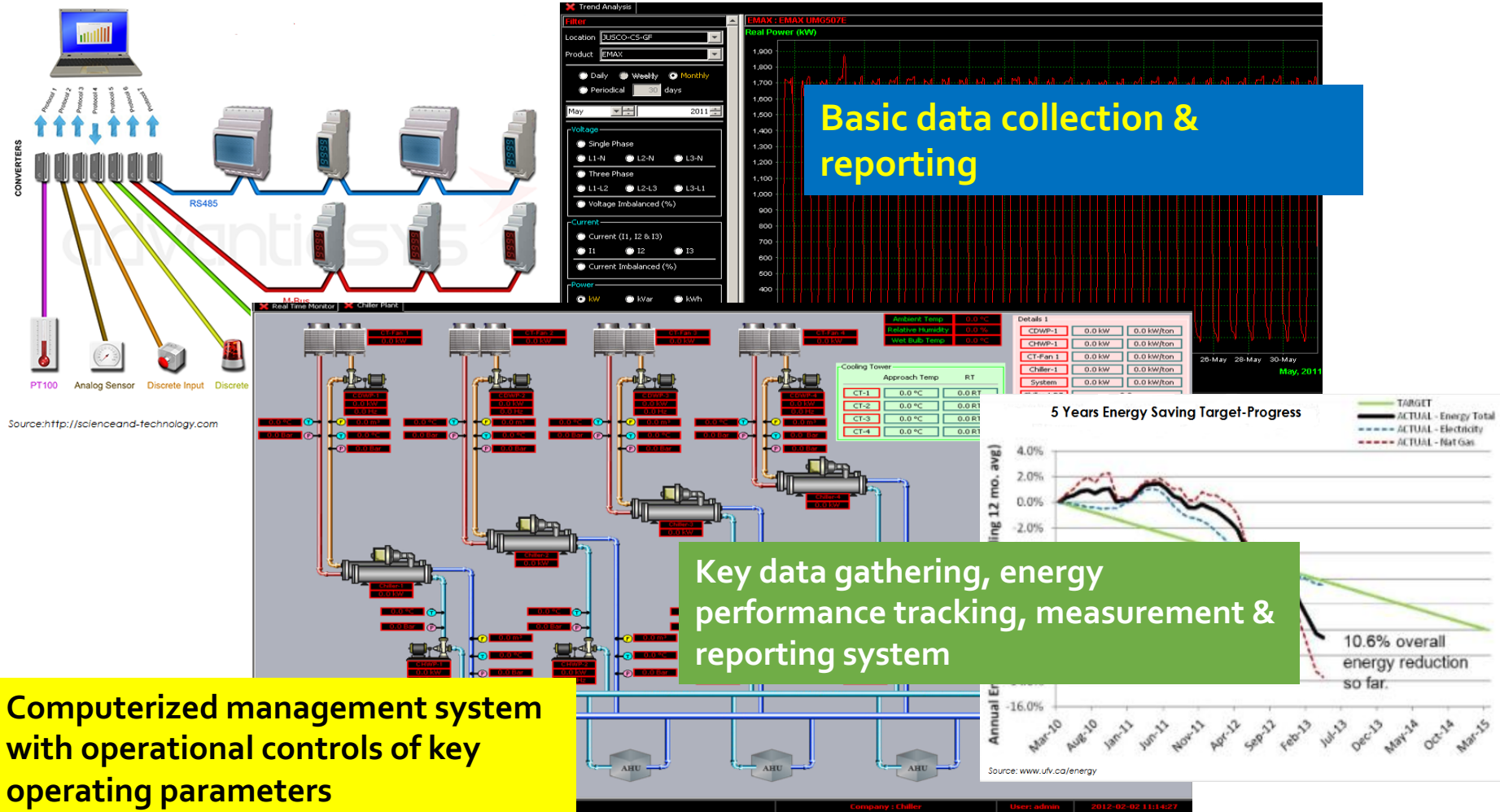
includes cost to implement ISO 50001 (training programs) and the cost of improve (improvements and new engines).

Case Study Snapshot

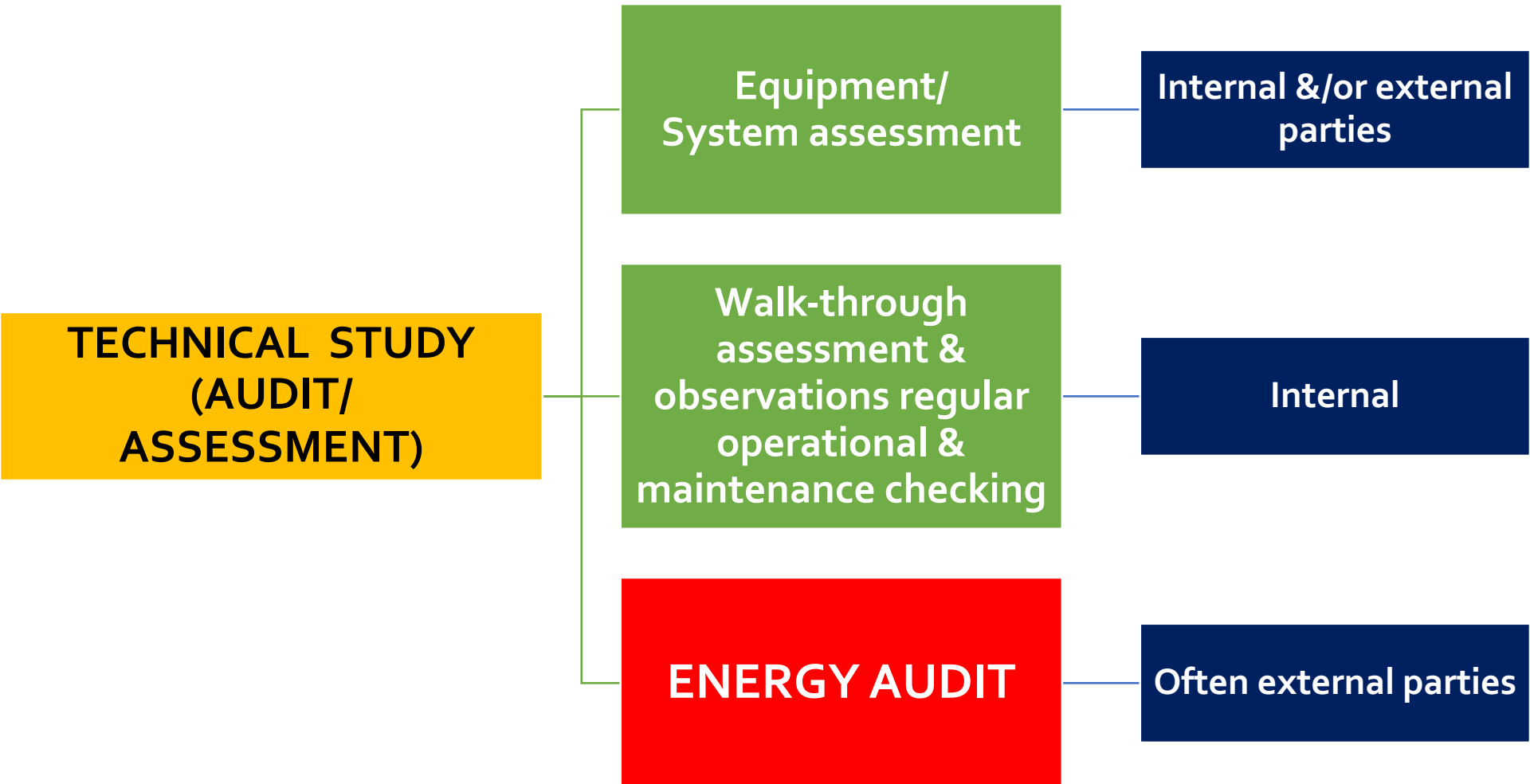
Industry	Energy and Energy Management Products and Services
Location	North America
Energy Management System	ISO 50001 & SEP
Product/Service	Electrical components, energy controls, and energy management tools and services

Energy Performance Improvement (%)	11%
Total Certified sites in North America	20
Total SEP Certified Sites	Platinum - 6 Gold - 4 Silver - 6
Total energy savings	25,600 MWh

THE ADOPTION OF IoT APPLICATIONS EFFECTIVE ENERGY MANAGEMENT SYSTEM TECHNOLOGIES FOR ENERGY PERFORMANCE RECORDS & MONITORING



To Determine Current Energy Performance - often require the technical study





Overview Of
common
potential areas
for Energy Saving
Measures (ESMs)
at buildings

Air Conditioning Systems : Energy efficient variable air volume system design



Chilled Water Temperature/ Refrigerant Temperature



Part Load Operation & Humidity Control



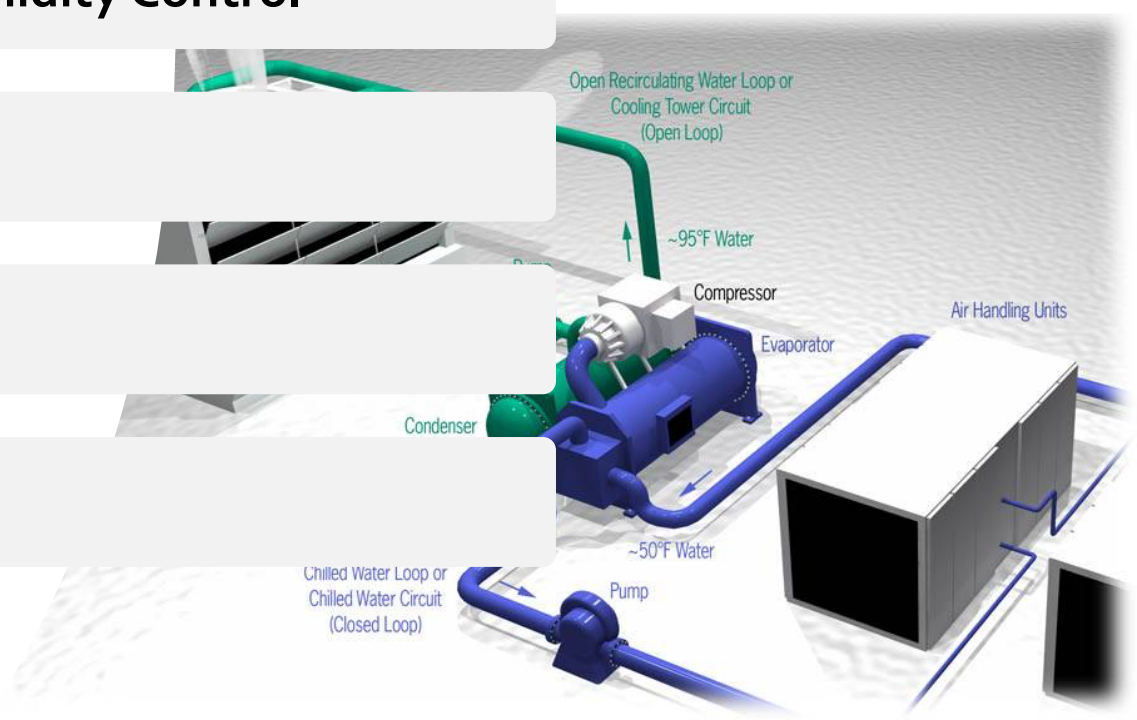
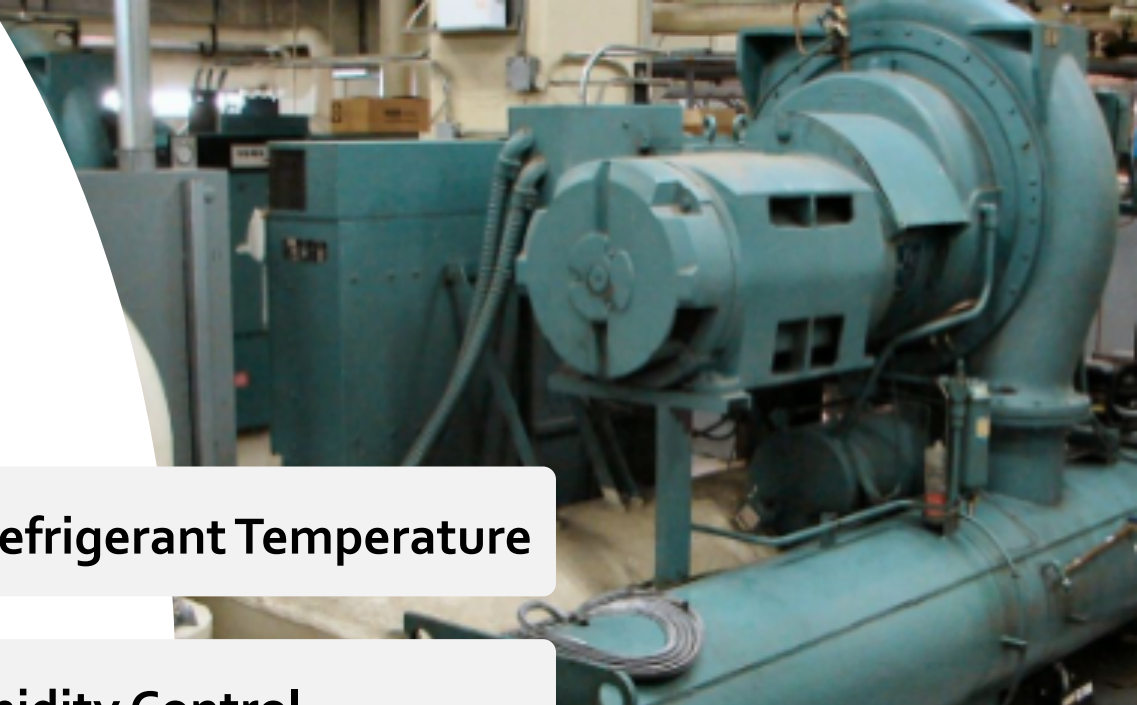
Overall System Sizing



Fan Volume Control



Room Air Distribution



Cooling & Air Conditioning Systems: Operation & Maintenance

❑ Reducing the heat gains

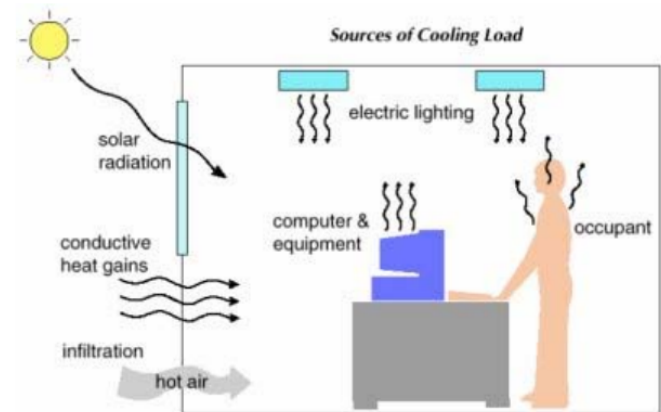
- Periodic inspections of air conditioning systems
- What are the control set point temperatures?
- Where are the sensors located?
- What is the control strategy?
- Are there manual overrides?
- Are windows open?
- Is the heating on at the same time?
- How are the occupants dressed?

❑ The operation of centralized chiller system/air conditioning unit

- Is it running when not required?
- Is it running excessively?
- Is it constantly cycling on and off?
- Is there conflict between the cooling requirement & cooling system?

❑ Maintenance reviews

- Blocked pipes/ducts
- Insulation



Motors & Driven Systems :Variable Speed Drives(VSDs) Applications

❑ Variable speed drives for pumps & fans

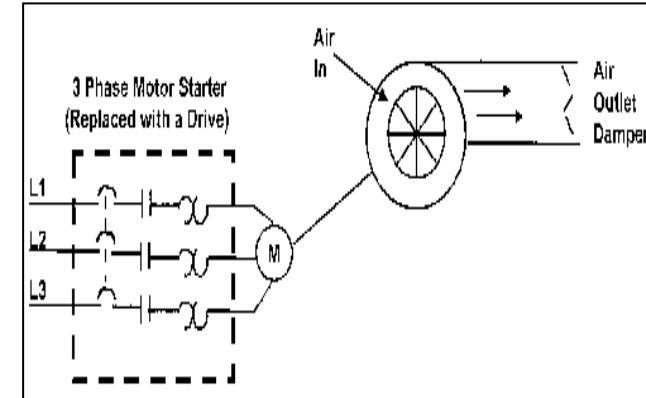
- ✓ Control the speed of AC motors
- ✓ Control the motor shaft load of variable loads.
- ✓ allow variable flow control without the energy losses associated with control valves & dampers

❑ Correctly designed VSD systems can reduce energy consumption between 20% and 70% (ABB 2009)

❑ Variable torque loads -power consumed varies with the cube of the motor speed

- any speed reduction on the part of the motor will result in large energy savings
- A 20% reduction in motor speed can result in a 50% power saving

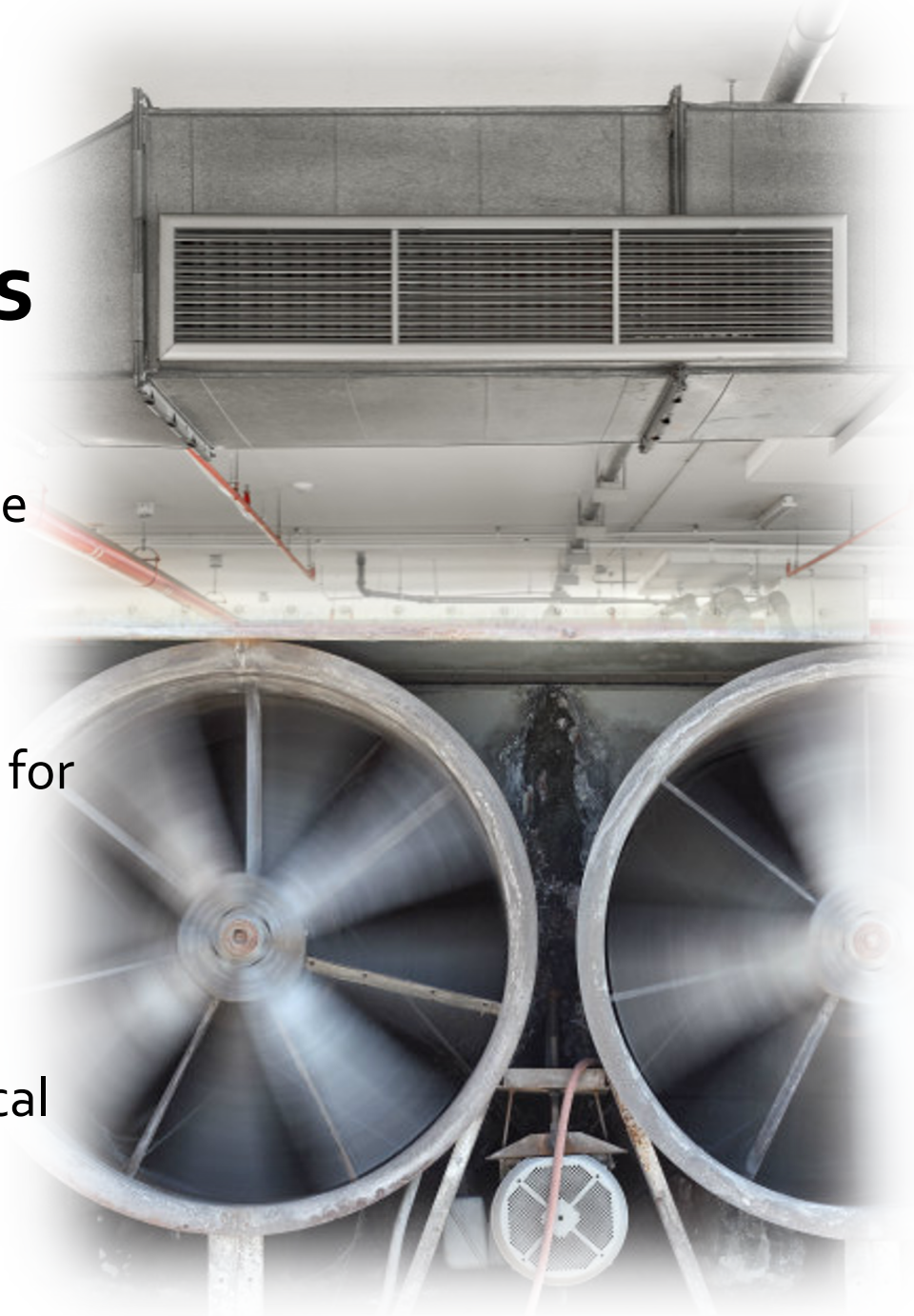
❑ Soft start of AC motors



Ventilation Systems

□ Things to look for

- ✓ Cleanliness to deliver the same quantity of air?
- ✓ Any potential for heat recovery?
- ✓ Can the system be used for night purging or free cooling?
- ✓ Is there any natural ventilation used?
 - If so, does mechanical ventilation operate simultaneously?





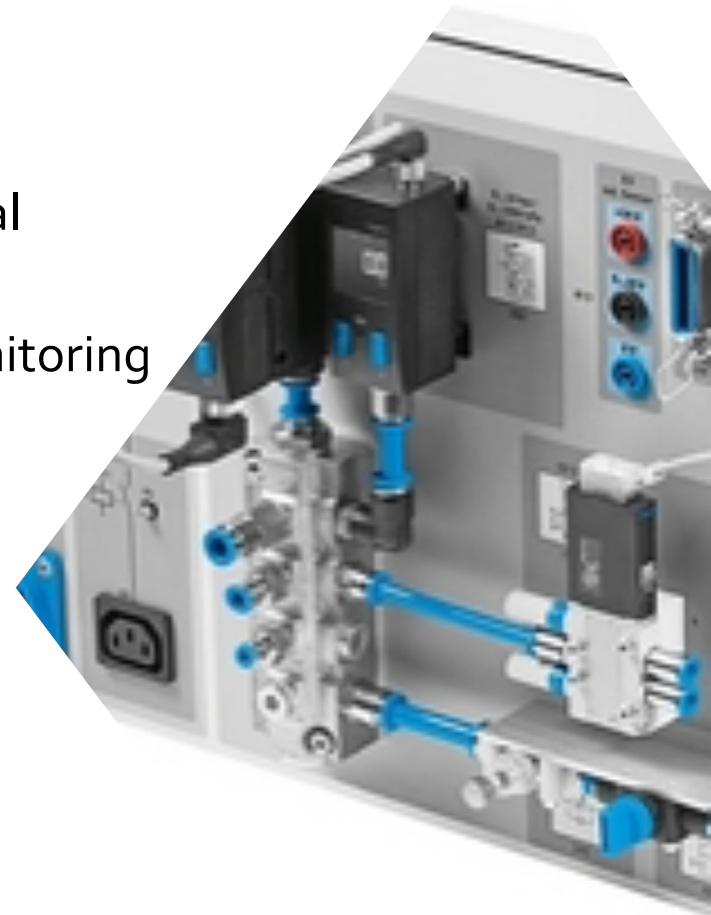
Lighting Systems

- Not all areas of a building are occupied all the time
-
- Automatic controls & sensors to match lighting needs
 - Reducing the lighting levels where there is over lamping (follow MS1515 requirements)
 - Day lighting potentials
 - Implementing more energy-efficient lamps -T5,LED technologies
 - Ballasts-Low loss types
 - Luminaries

Effective Control Systems

**Dampen variation in energy consumption
& allow a process to operate closer to its
designed control limits**

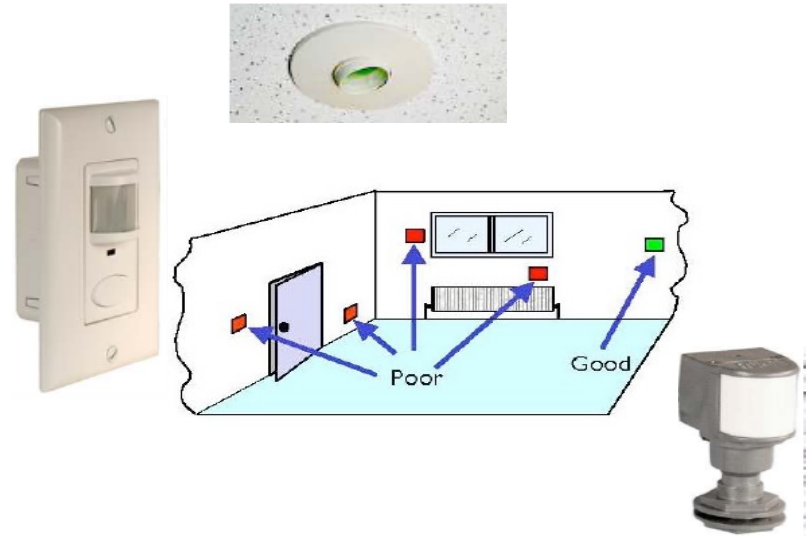
- Temperature control limits for air conditioning systems
- Matching the most efficient machine with actual demand
- Using preventive maintenance & condition monitoring to predict and prevent equipment failures
- Reducing excess flows
- Reducing blow down
- Using variable speed drives
- Monitoring the performance of key plant items



Control Systems -The Use Of Sensors

❑ Common types

- Temperature
- Humidity
- Carbon dioxide
- Movement
- Day light



❑ The location

- to provide a representative the closet indication of reading value for the space/area

❑ Periodically checked & calibrated

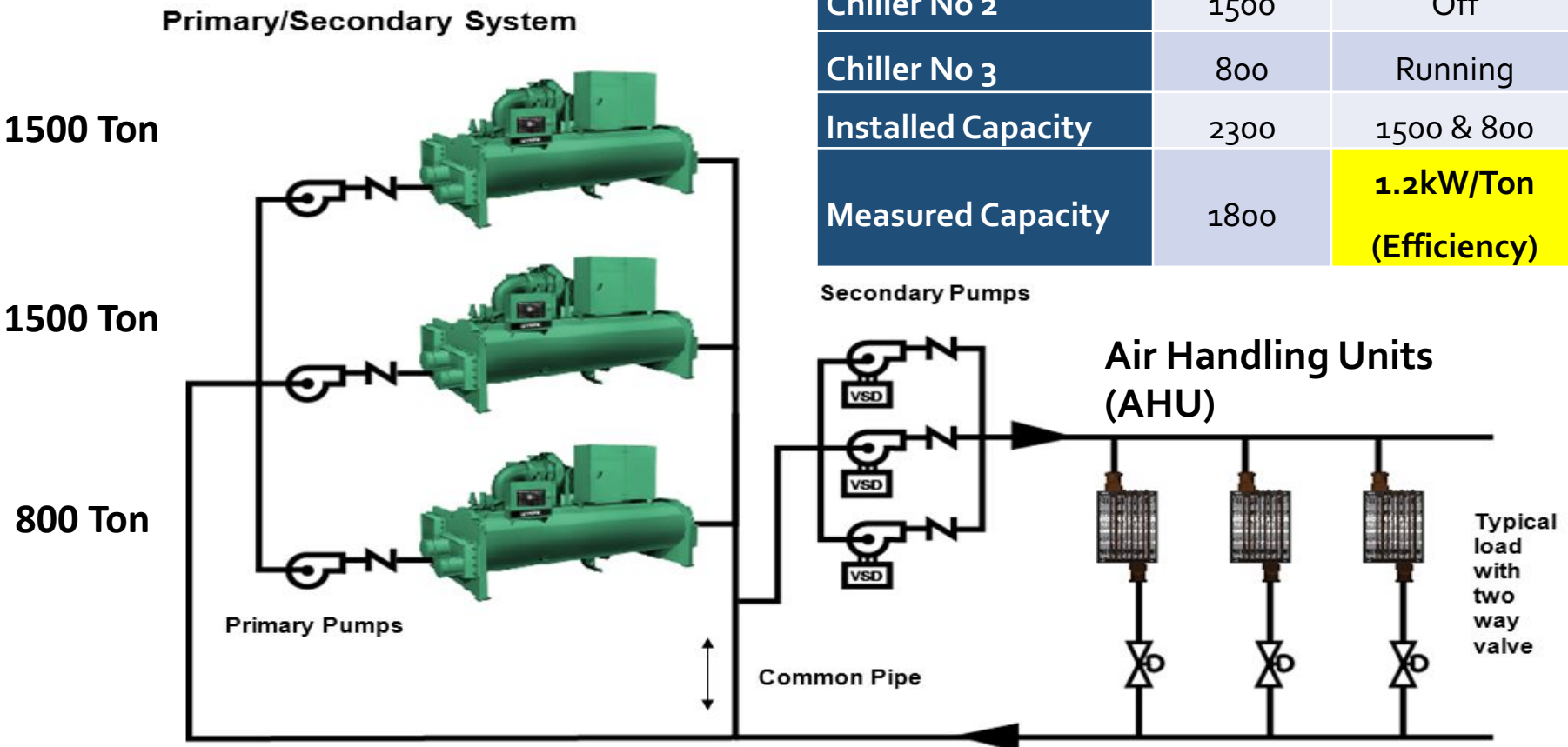
- to ensure reliable data

CASE STUDY : CHILLER RETROFITTING PROJECT IN MALAYSIA

BY E-EYE SDN BHD(MAESCO MEMBER)

BEFORE: EXISTING CHILLER PLANT OPERATION

Main Chiller Plant	Chiller Capacity	Chiller Operation
Chiller No 1	1500	Running
Chiller No 2	1500	Off
Chiller No 3	800	Running
Installed Capacity	2300	1500 & 800
Measured Capacity	1800	1.2kW/Ton (Efficiency)

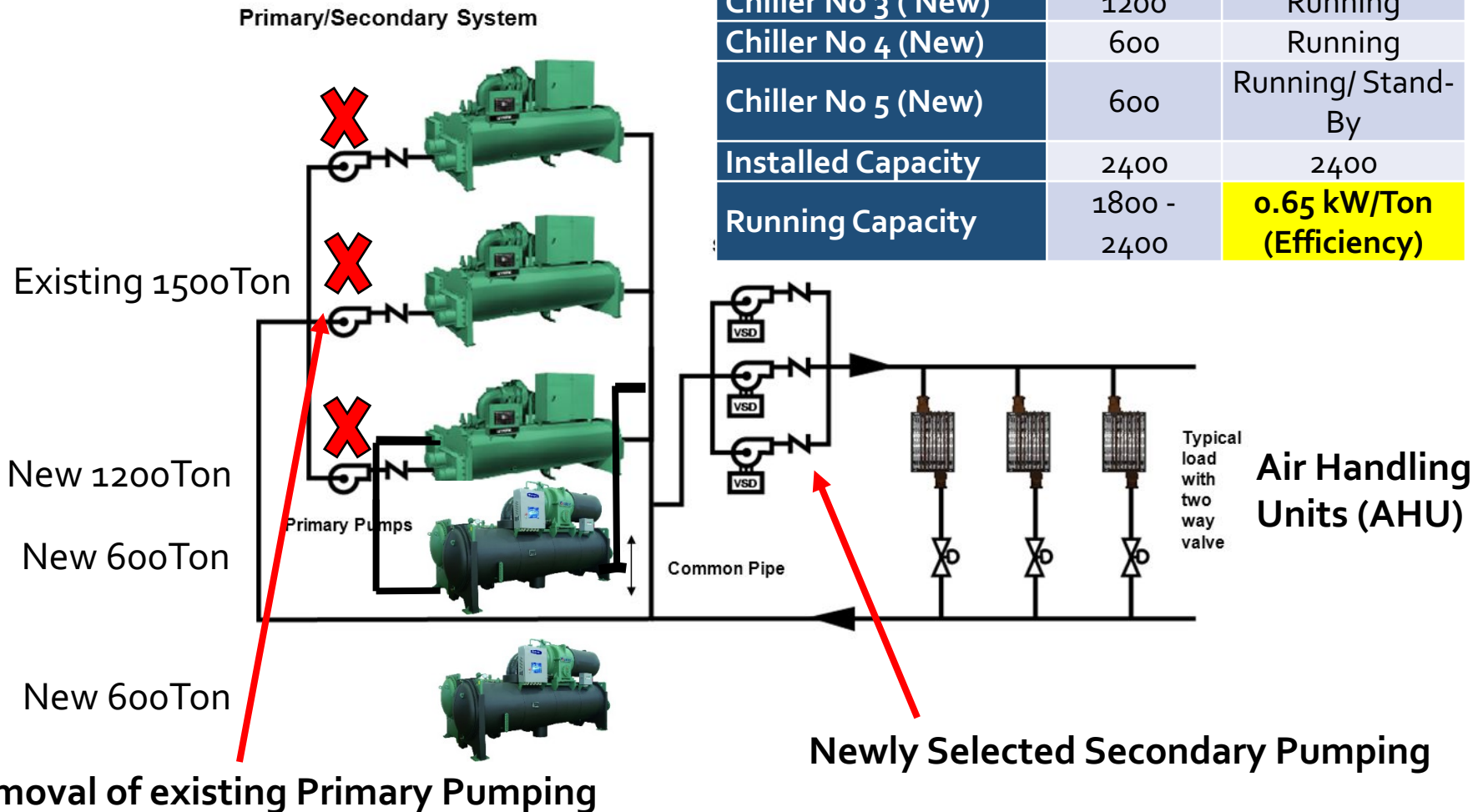


CASE STUDY : CHILLER RETROFITTING PROJECT IN MALAYSIA

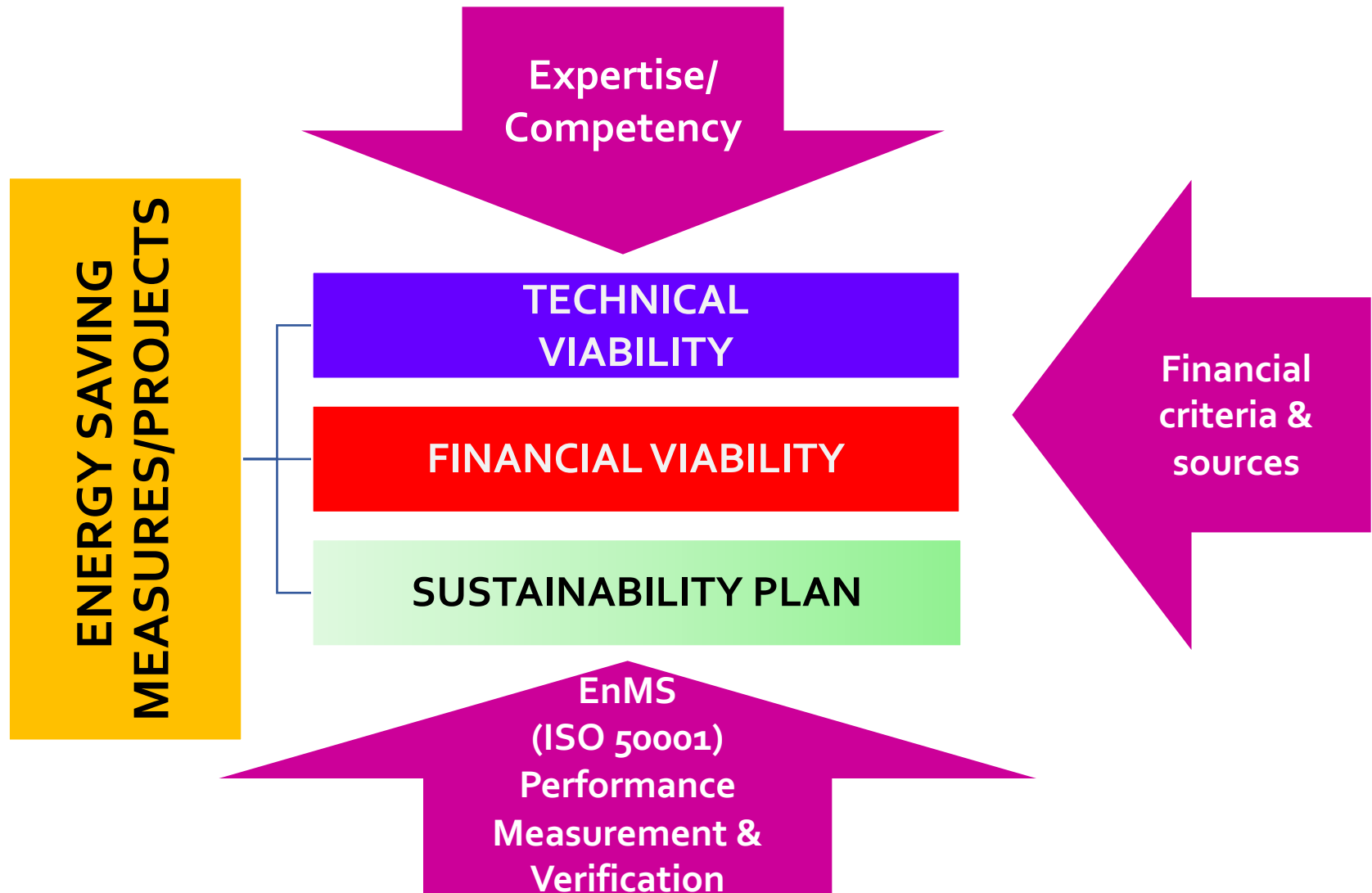
BY E-EYE SDN BHD(MAESCO MEMBER)

AFTER : NEW CHILLER PLANT OPERATION

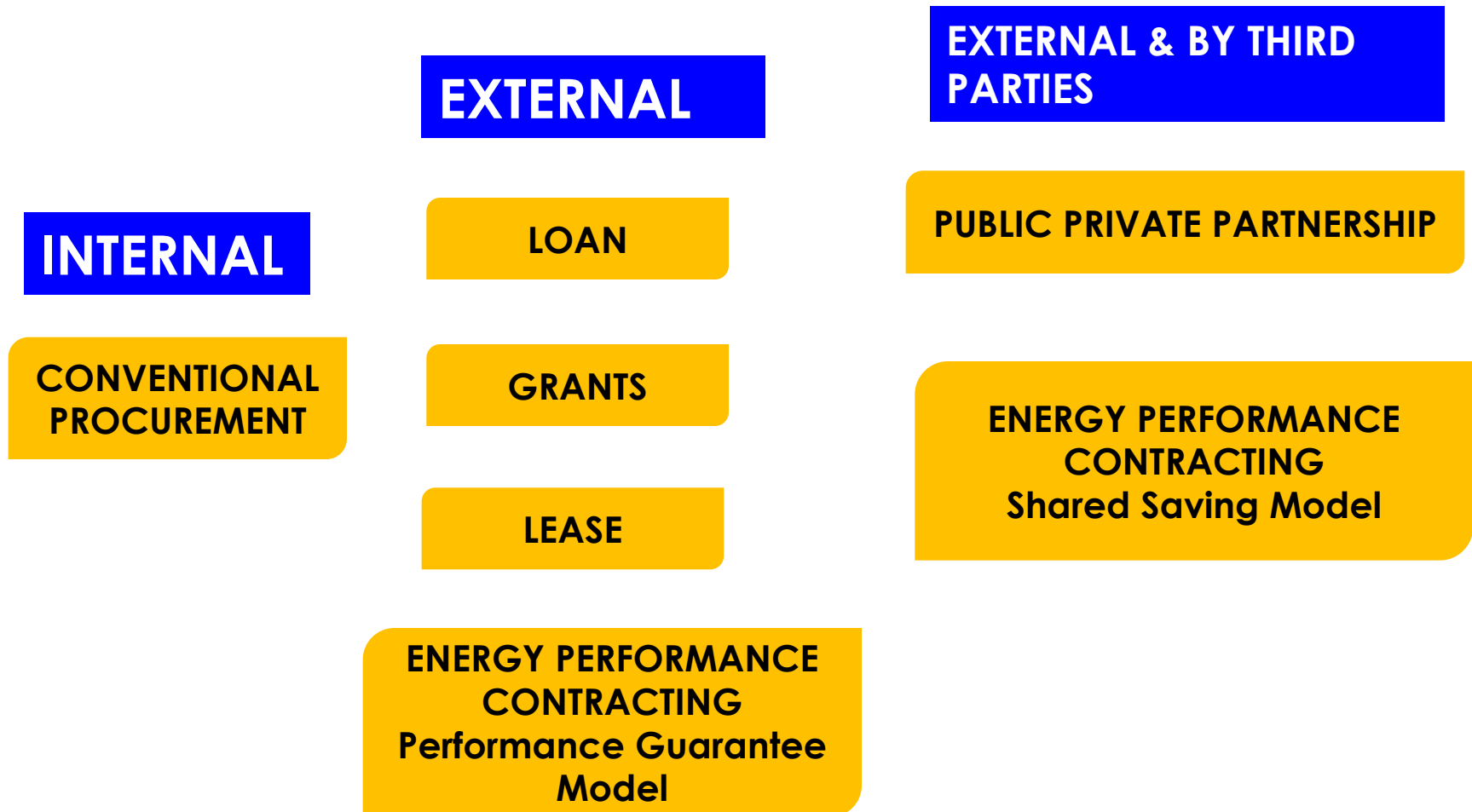
Main Chiller Plant	Chiller Capacity	Chiller Operation
Chiller No 1 (Existing)	1500	Stand-By
Chiller No 2 (Existing)	800	Stand-By
Chiller No 3 (New)	1200	Running
Chiller No 4 (New)	600	Running
Chiller No 5 (New)	600	Running/ Stand-By
Installed Capacity	2400	2400
Running Capacity	1800 - 2400	0.65 kW/Ton (Efficiency)



KEY EVALUATION CRITERIA – WHEN LARGE SCALE INVESTMENT NEEDED



FUNDING OPTIONS TO IMPLEMENT ENERGY SAVING PROJECTS?



WHAT'S NEXT?



**To go ahead & secure
/maintain commitment
from the top
management**

**Carry out the energy
review & planning steps**

**Carry out the
implementation &
operation of Energy
Management Program**

**To continue supports from
the top management with
performance improvements
& energy cost savings
achieved**

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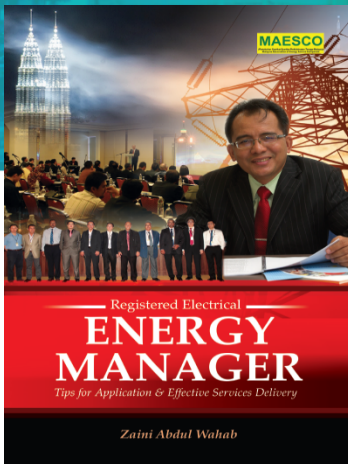
THANK YOU

Energy Management Consultant

Specializing in reducing your operational cost & maximizing your profits

Let Me Introduce Myself

See How I Can Help



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**Facebook page :
Zaini4ee**

-End of Session-

The logo for MAESCO, featuring the word "MAESCO" in bold green capital letters on a yellow rectangular background.

(Pertubuhan Syarikat Syarikat Perkhidmatan Tenaga Malaysia)
Malaysia Association of Energy Service Companies

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