ENERGY MANAGEMENT IN BUILDINGS

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(CREaTE)
Melaka

28 Mei 2021

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BACKGROUND

Energy-related CO_2 emissions from buildings have risen in recent years

Energy-related CO_2 emissions from buildings have risen in recent years after flattening between 2013 and 2016. Direct and indirect emissions from electricity and commercial heat used in buildings rose to 10 $GtCO_2$ in 2019, the highest level ever recorded. Several factors have contributed to this rise, including growing energy demand for heating and cooling with rising air-conditioner ownership and extreme weather events. Enormous emissions reduction potential remains untapped due to the continued use of fossil fuel-based assets, a lack of effective energy-efficiency policies and insufficient investment in sustainable buildings.

Source: Tracking Buildings 2020 (International Energy Agency, IEA)

BACKGROUND (Cont.)

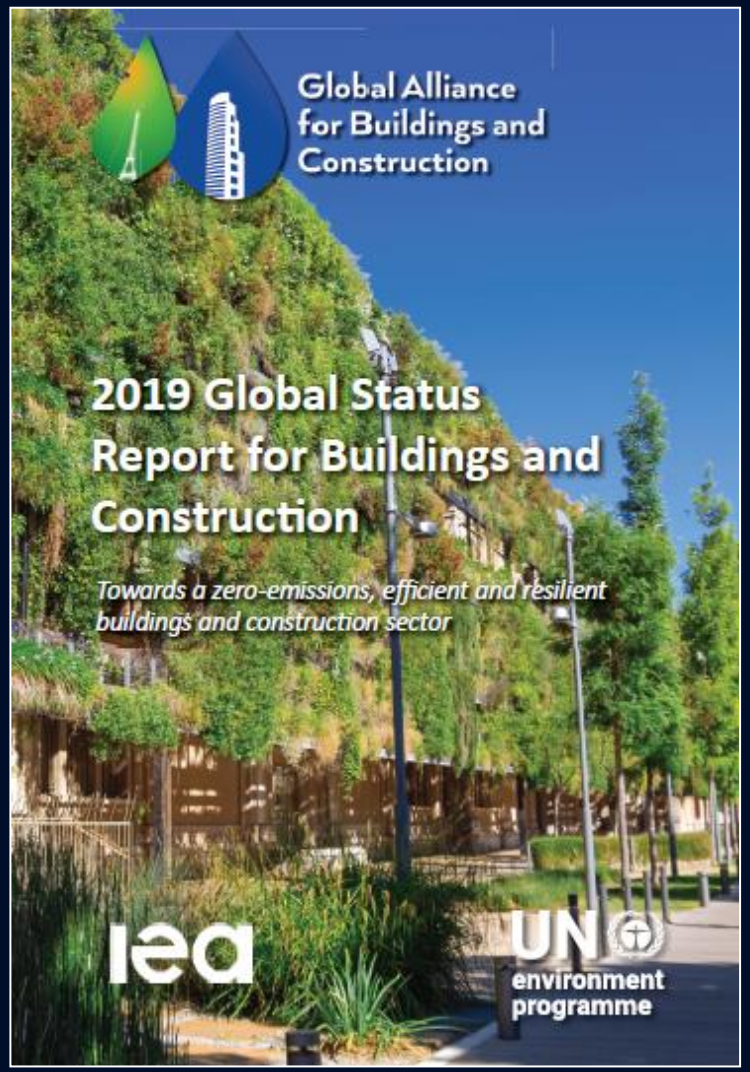
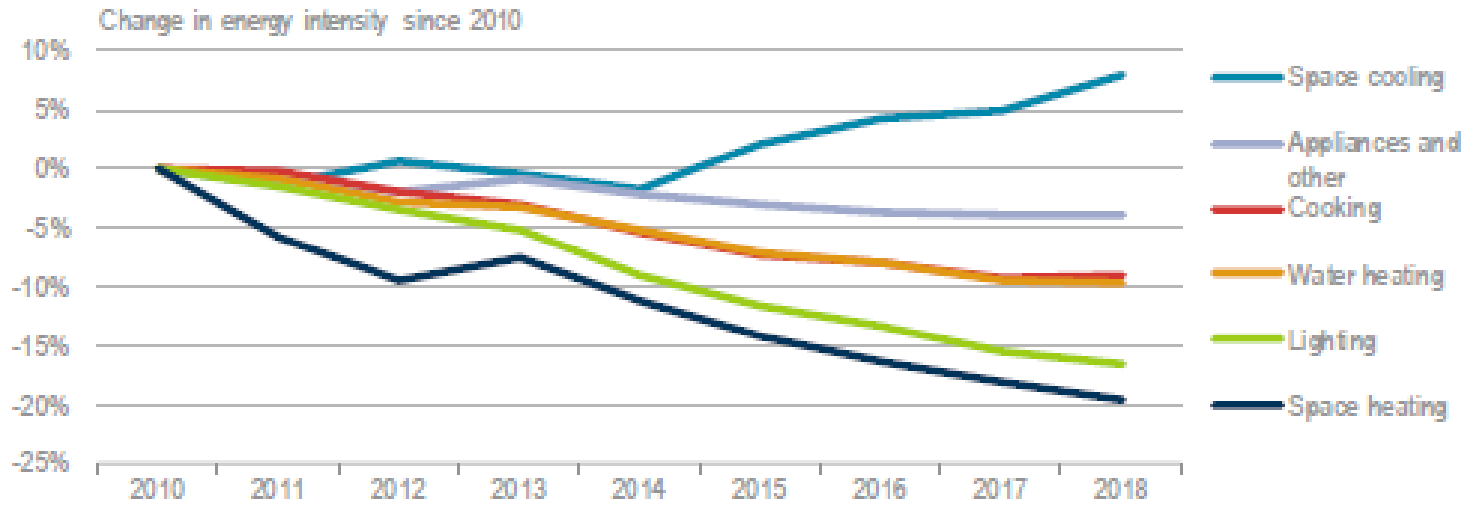


Figure 5 • Global buildings sector final energy intensity changes by end use, 2010-18



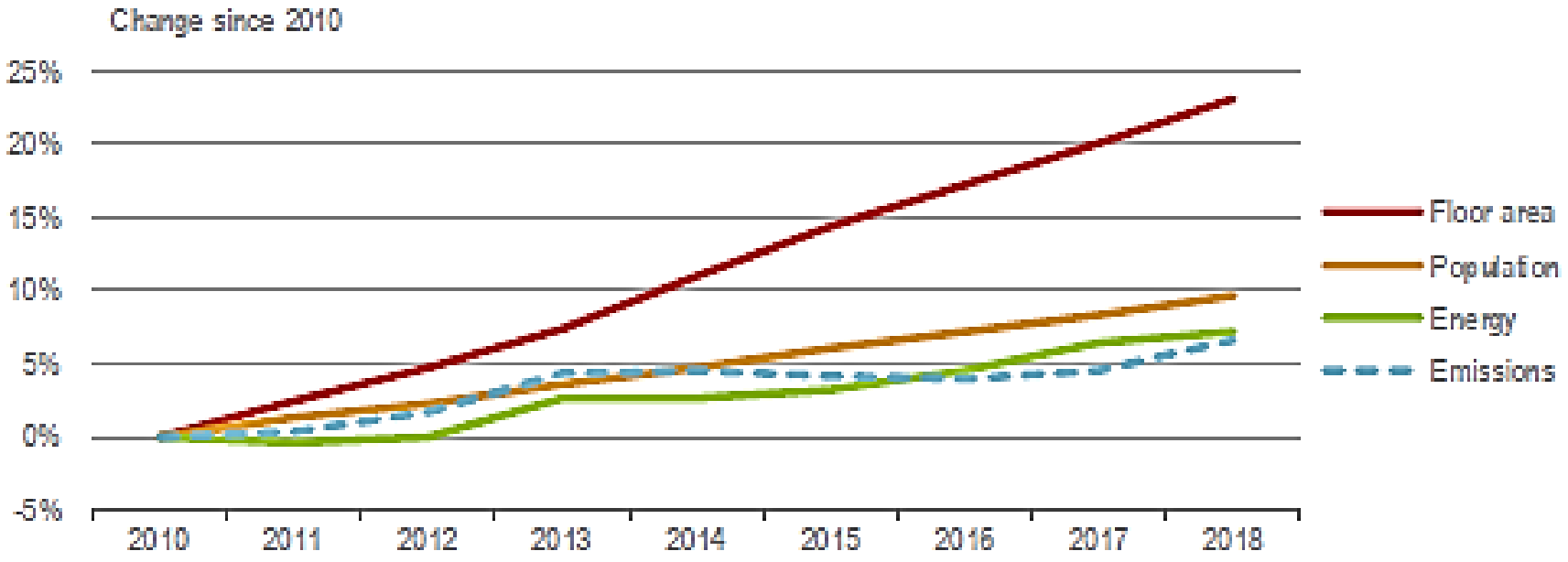
Notes: *Energy intensity* is final energy used per unit of floor area. *Appliances and other* includes household appliances (e.g. refrigerators, washers and televisions), smaller plug loads (e.g. laptops, phones and other electronic devices) and other service equipment.

Sources: Adapted from IEA (2019a), *World Energy Statistics and Balances* (database), www.iea.org/statistics and IEA (2019b), *Energy Technology Perspectives*, buildings model, www.iea.org/buildings.

Key message • Owing to technological improvements, overall reductions have been made in energy intensity for space heating, lighting, appliances, cooking and water heating. However, space cooling energy intensity has increased as a result of greater cooling demand in hot regions.

BACKGROUND (Cont.)

Figure 9 • Changes in floor area, population, buildings sector energy use and energy-related emissions globally, 2010-18



Sources: Derived from IEA (2019a), *World Energy Statistics and Balances* (database), www.iea.org/statistics and IEA (2019b), *Energy Technology Perspectives*, buildings model, www.iea.org/buildings.

Key message • In 2018, global buildings sector emissions increased for the second consecutive year, rising by 2% from 2017 to a record high of 9.7 $GtCO_2$. This growth resulted from increases in floor space and demand for electricity, which is still primarily fossil fuel-generated.

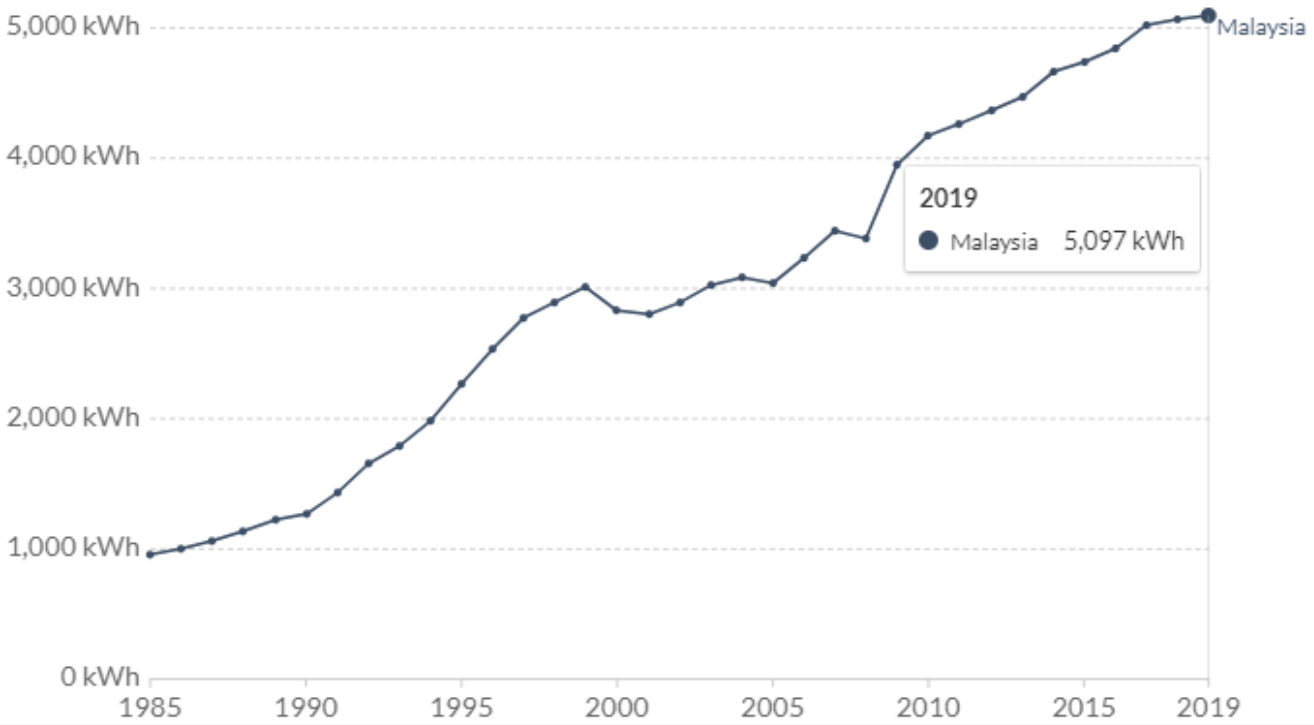
Malaysia: **Per capita**: how much electricity does the average person consume?

Per capita electricity consumption

Average annual electricity consumption per capita, measured in kilowatt-hours (kWh) per year.

Our World in Data

Add country



Electricity is often the most 'visible' form of energy that we rely on day-to-day – it keeps our lights, TVs, computers and internet running.

How much electricity does the average person in the country consume?

This interactive chart shows per capita electricity consumption.

A point to keep in mind when considering this data:

- These figures reflect *electricity* consumption, which is one component of total energy consumption. People often use the terms 'electricity' and 'energy' interchangeably, but it's important to remember that the amount of electricity we consume is just one part of our total energy demand.

ourworldindata.org/energy/country/malaysia

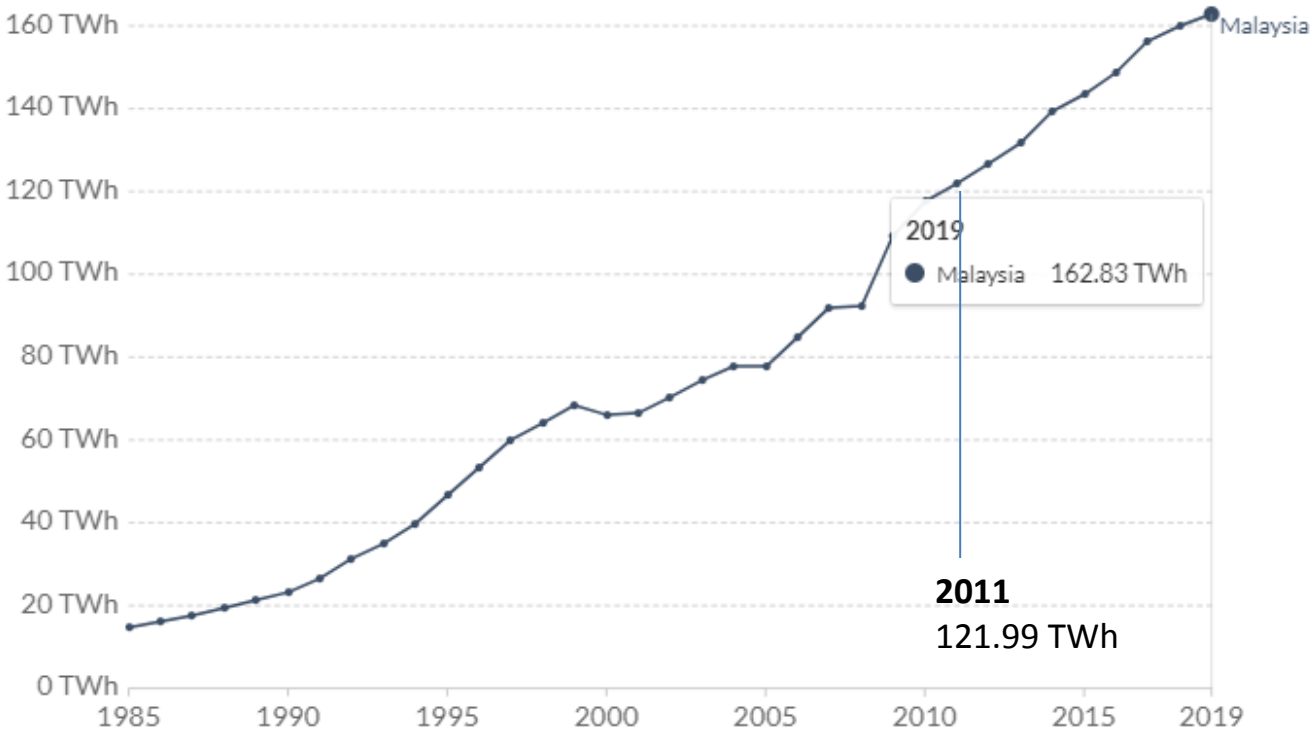
Contents | Add a country to all charts... | Malaysia ×

Malaysia: How much **electricity** does the country consume each year?

Electricity Generation

Our World in Data

Add country



Like total energy consumption, the amount of electricity a country consumes in total is largely reflected by population size, as well as the average incomes of people in the given country.

This interactive chart shows the total amount of electricity the country consumes in a given year.

Total generation jumped about 72 percent in the last 11 years, from 66 Terawatt-hours (TWh) in 2000 to an estimated 113 TWh in 2011.

The Malaysian government anticipates that electricity demand will grow at least 3% through 2020.

US Energy Information Administration www.eia.gov

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BACKGROUND (Cont.)

Intended Nationally Determined Contributions (INDC) to United Nations Framework Convention on Climate Change (UNFCCC):

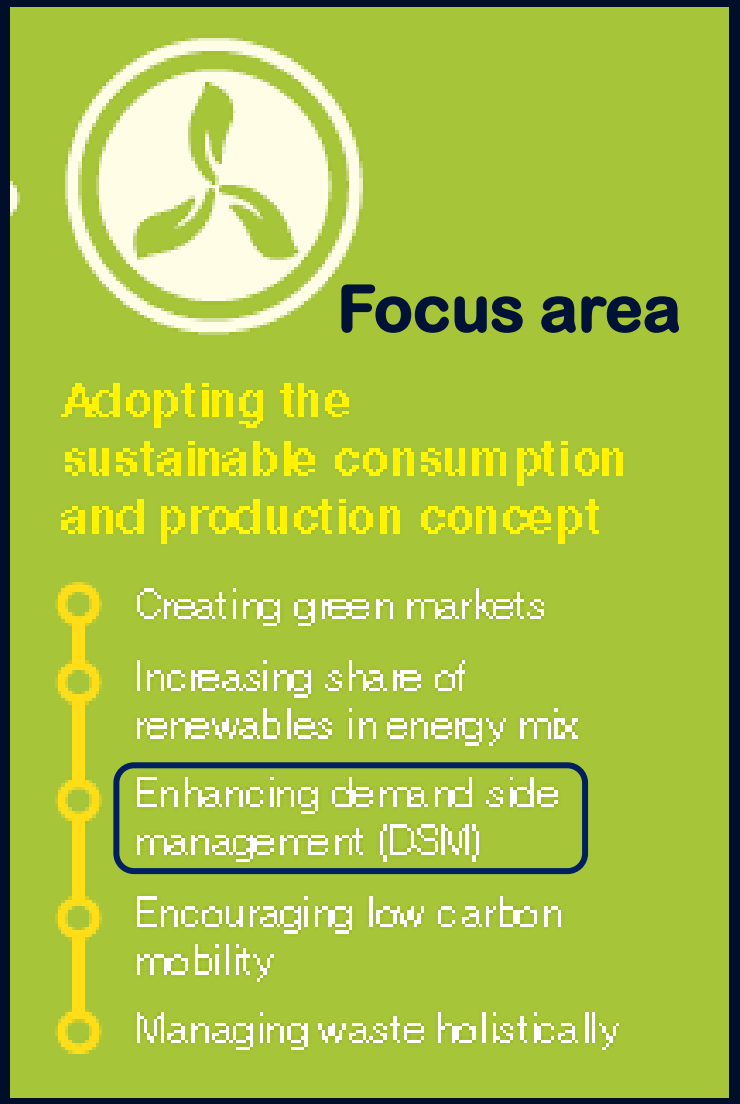
1) Reducing gas emission by **45% by 2030** (35% on an unconditional basis with a further 10% condition upon climate finance, technology transfer and capacity building)

2) Through actions in:
   - *a) Energy*
   - *b) Industrial processes,*
   - *c) Waste*
   - *d) Agriculture*
   - *e) Land, land use change and forestry (LULUCF)*

BACKGROUND (Cont.)

Source: (Eleventh Malaysia Plan)

BACKGROUND (Cont.)



- **Strategy B3: Enhancing demand side management (DSM)** by formulating a comprehensive DSM master plan and expanding DSM measures;

Expanding demand side management measures for buildings, industries and households

During the Eleventh Plan, measures will be taken to identify potential improvements and appropriate approaches to ensure efficient use of energy in buildings, industries and households. These measures include increasing competencies of energy service providers, especially Registered Electrical Energy Managers, and promoting the implementation of Energy Performance Contracting for government buildings. User awareness will be enhanced on energy labelling and the availability of standards such as ISO 50001 for buildings and MEPS for appliances will be promoted. Other specific measures will include introduction of Enhanced Time of Use (EToU) tariff scheme and gradual abolishment of the Special Industrial Tariff for energy intensive industries. Infrastructure related initiatives such as implementation of smart grids and highly efficient co-generation technologies for combined heat and power system will be promoted.

Source: (Eleventh Malaysia Plan)

BACKGROUND (Cont.)

3:50:21 pm | Tuesday, 4 April 2017

Official Portal
MINISTRY OF ENERGY, GREEN TECHNOLOGY & WATER (KeTTHA)

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Energy

- Introduction
- Policies & Acts
  - National Energy Policy
  - National Petroleum Policy 1975
  - Electricity Supply Act 1990 [Act 447]
  - Energy Commission Act 2001 [Act 610]
  - Renewable Energy Act 2011 [Act 725]
  - Sustainable Energy Development Authority Act 2011 [Act 726]
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Tenaga Energy

National Energy Policy

Tuesday, 25 Febuary - 12.10pm

The instrumental in guiding the future Energy Sector development are based on the three principal energy objectives of the National Energy Policy of 1979, namely:

i. The Supply Objective

- To ensure adequate, secure and cost-effective energy supply through developing and utilizing alternative sources of energy (both non-renewable and renewable) from within and outside the country.
- To ensure the realization of the supply objective, the focus of policy initiatives, particularly with respect to crude oil and gas, were aimed at both extending the life of domestic depletable energy resources, as well as diversifiying away from oil dependence to include other forms of fuel resources.

ii. The Utilization Objective

- To promote efficient utilization of energy and discourage wasteful and non-productive patterns of energy consumption.

To date, the Government's approach to realize this objective is through the implementation of various awareness programmes targeted at the energy industry and consumers to exercise efficiency in energy production, transportation, conversion, utilization and consumption. Demand Side Management initiatives by the utilities, particularly through tariff incentives, has had some impact on efficient utilization and consumption.

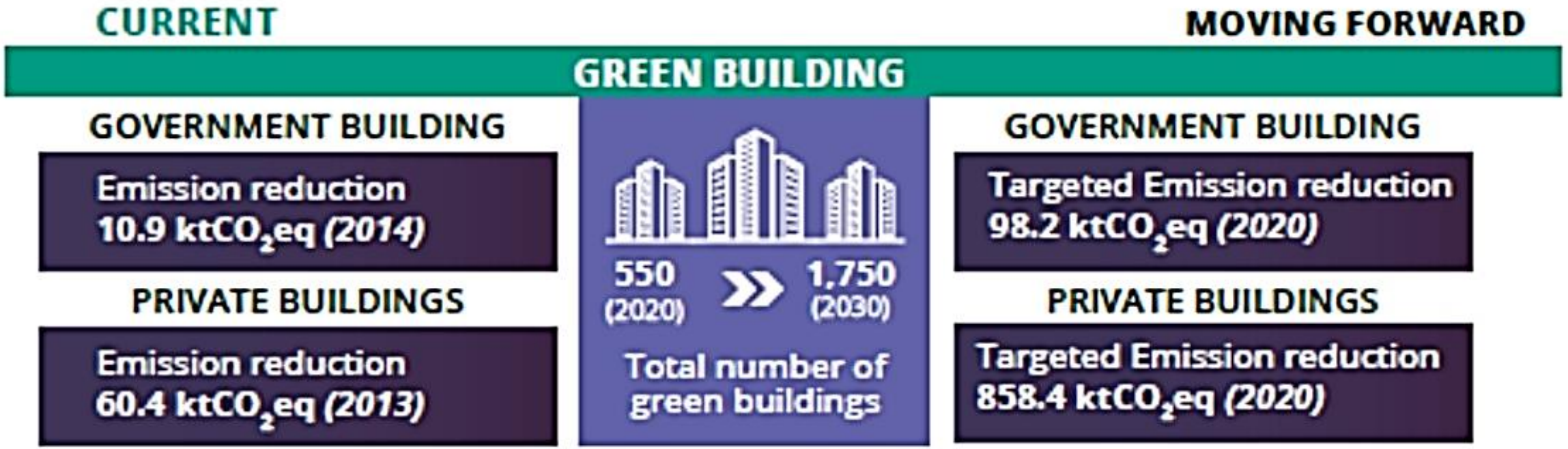
The Government initiative to encourage co-generation is aimed at promoting an efficient method for generating heat energy and electricity from a single energy source.

This can in addition contribute to a reduction in the costs of conversion.

To enhance the realization of the Utilisation Objective, the regulatory approach has to be in place to

BACKGROUND (Cont.)

GREEN TECHNOLOGY MASTER PLAN MALAYSIA
2017 - 2030

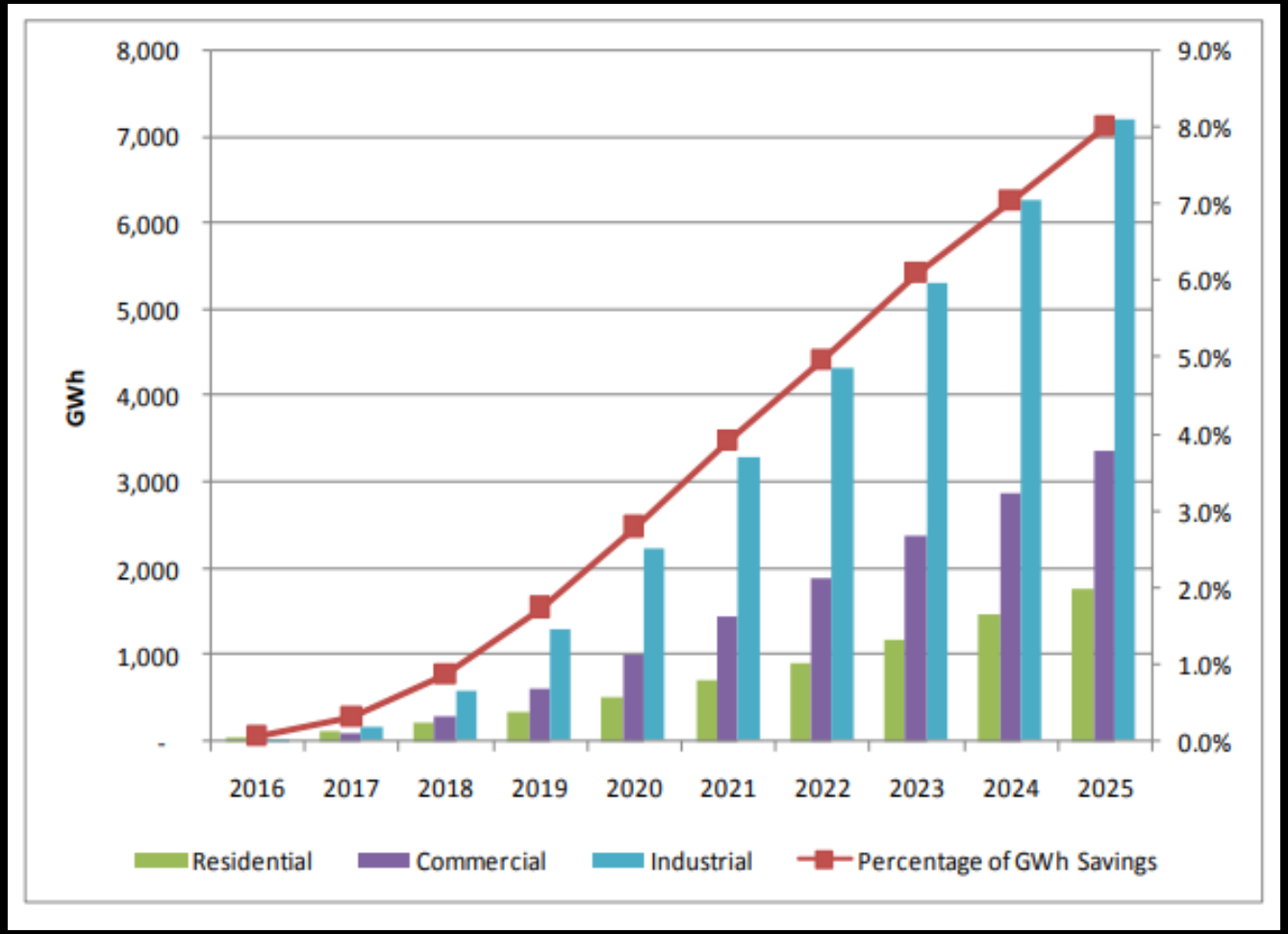


BACKGROUND (Cont.)

NATIONAL ENERGY EFFICIENCY ACTION PLAN (2015 – 2025)

INITIATIVE:

1) Energy Audit and Energy Management in Buildings and Industries
2) Energy Efficient Building Design



BACKGROUND (Cont.)

EFFICIENT MANAGEMENT OF ELECTRICAL ENERGY REGULATIONS 2008

REGULATION 3: APPLICATION

Application

3. (1) These Regulations shall apply to -

(a) any installation which receives electrical energy from a licensee or supply authority with a total electrical energy consumption equal to or exceeding 3,000,000 kWh as measured at one metering point or more over any period not exceeding six consecutive months; or

(b) any installation which is used, worked or operated by a private installation licensee with a total net electrical energy generation equal to or exceeding 3,000,000 kWh over any period not exceeding six consecutive months.

EnMS JOURNEY

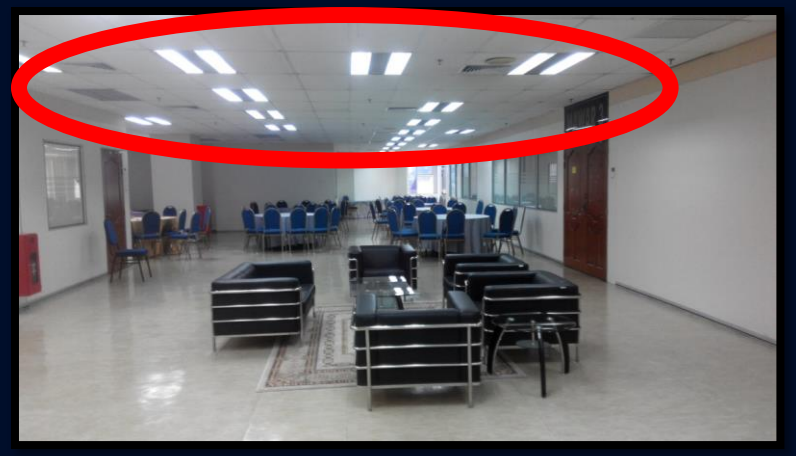
Conduct energy audit:

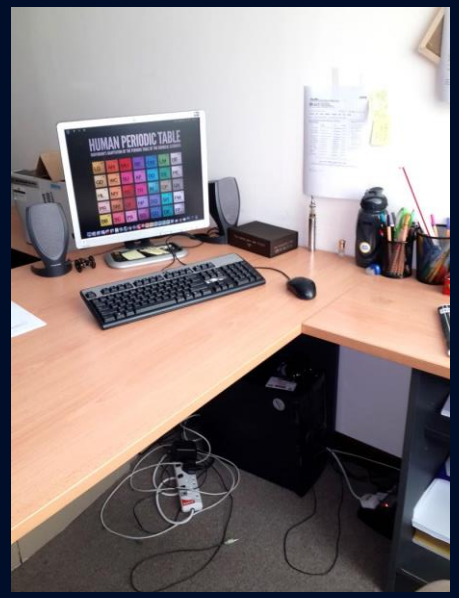
a) Done internally or by appointing expert (ESCOs)

b) Site survey (drawings,energy supply, services)

c) Survey appraisal (cost, potential energy/cost savings, payback period, risk, lifetime of measures)

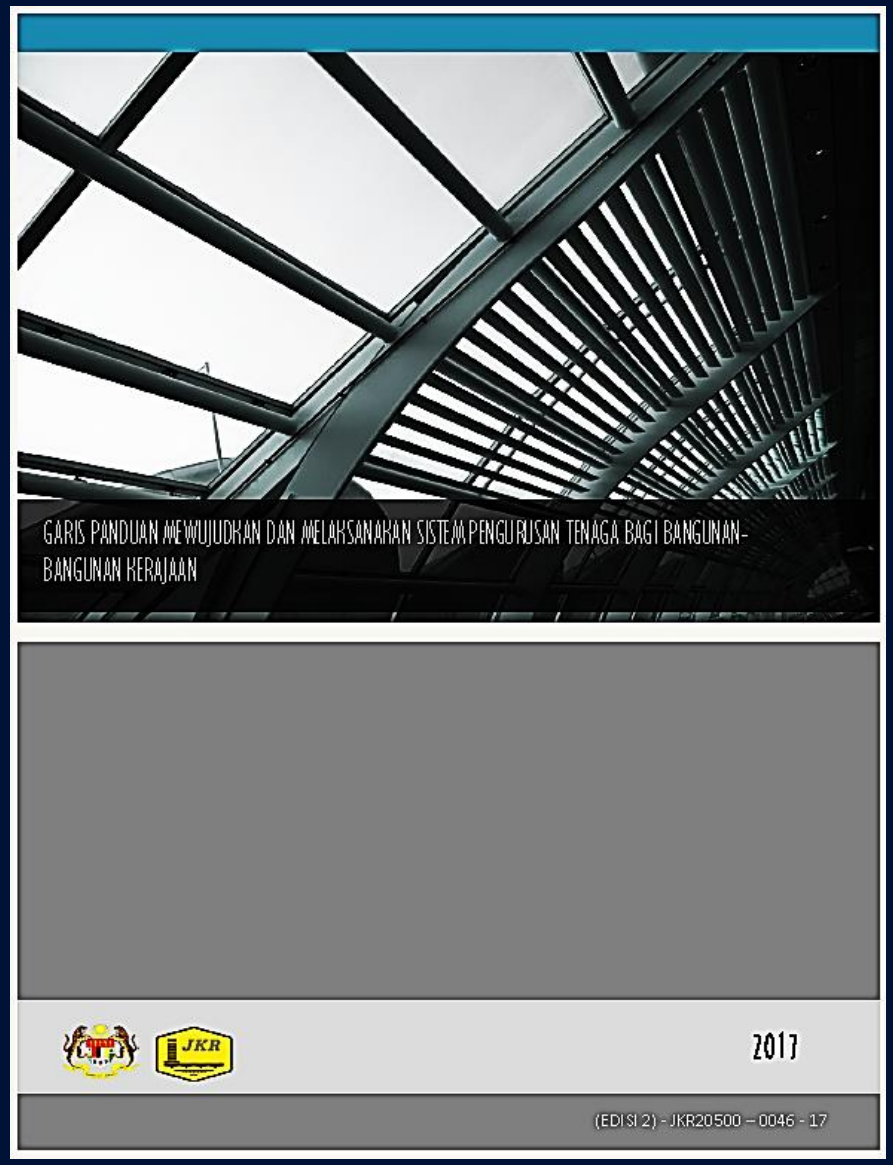
d) Investment appraisal (equipment cost, installation cost, maintenance)



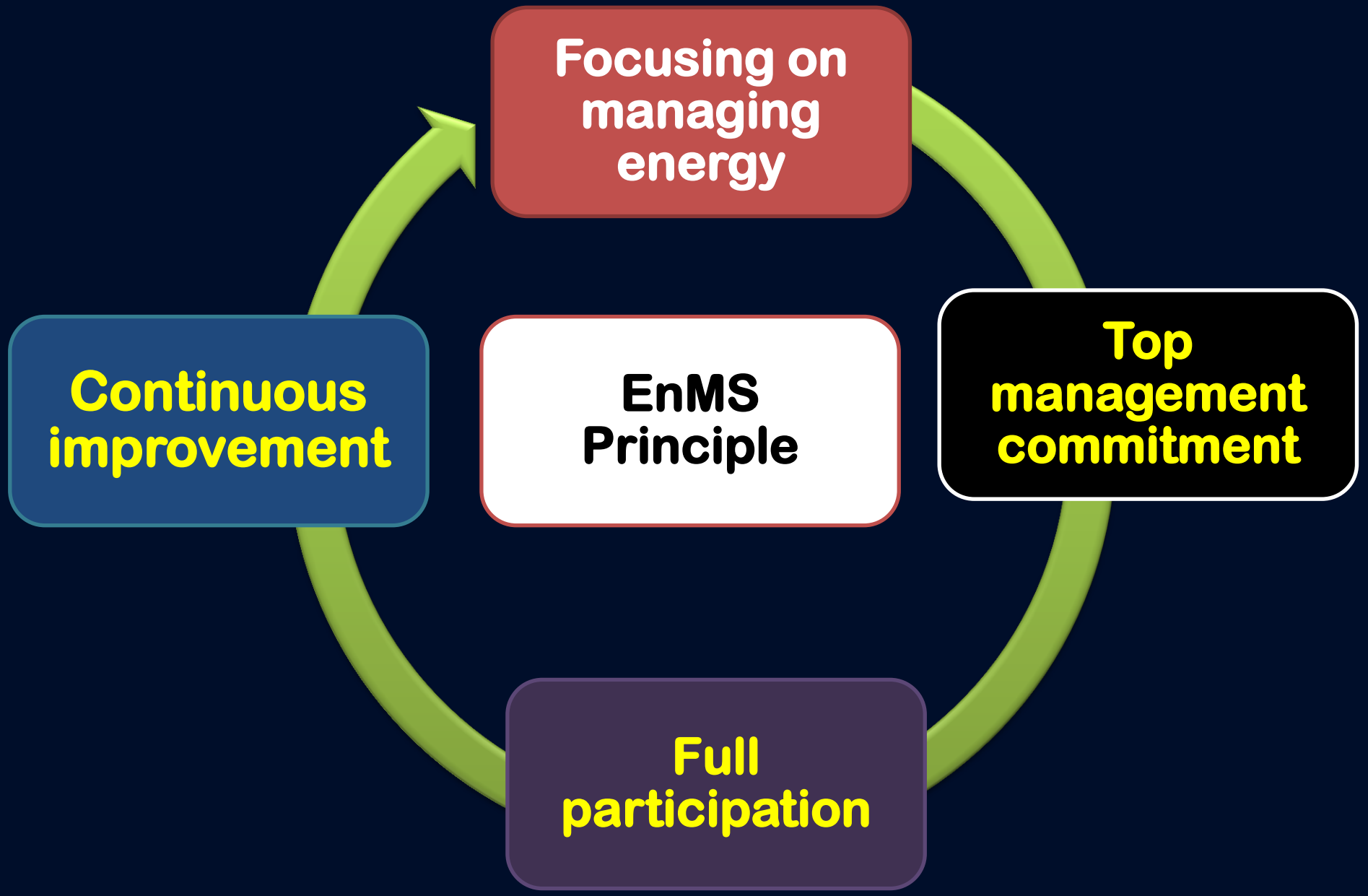


EnMS JOURNEY (Cont.)

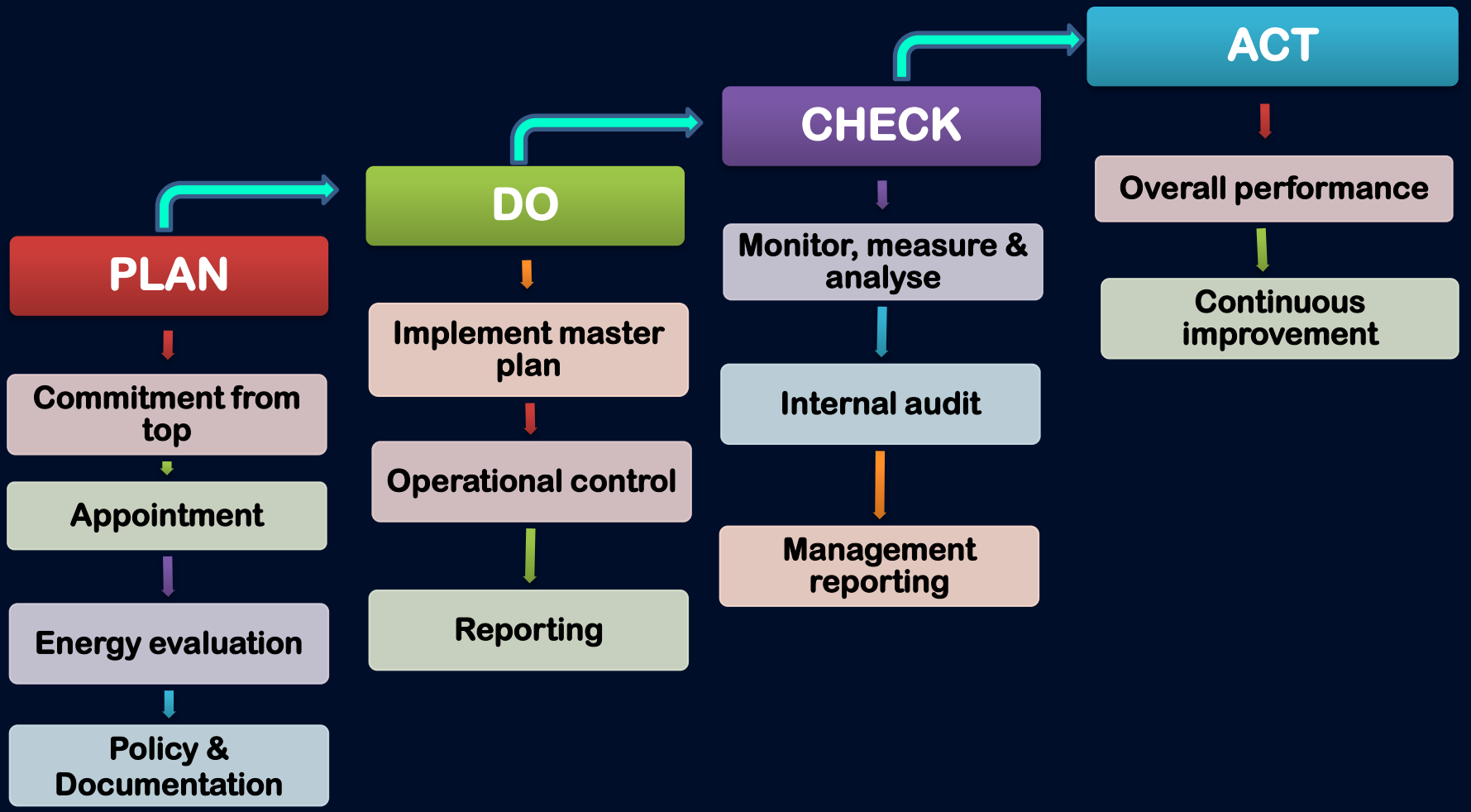
JKR EnMS Guideline for Government Buildings (2nd Edition)



EnMS JOURNEY (Cont.)



EnMS JOURNEY (Cont.)



CASE STUDY: JKR COMPLEKS KUALA LUMPUR

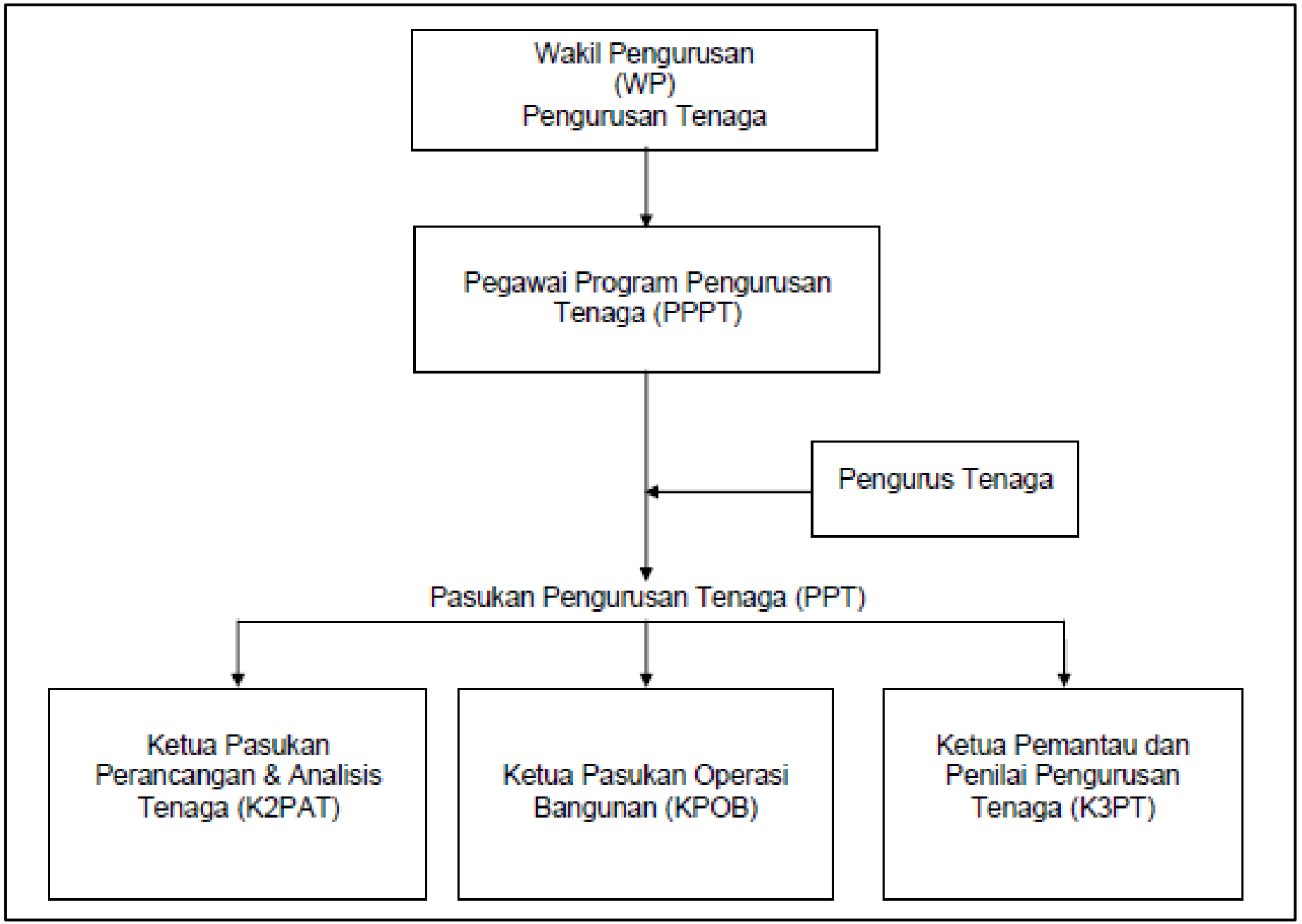
BLOCK	Air-Conditioned Areas (m^2)
A	1,836
B	1,836
C	1,836
D	1,836
E	1,020
F	22,629
TOTAL	**30,993**

A Block (4 storeys)

B Block (4 storeys)

C Block (4 storeys)

D Block (4 storeys)


Wakil Pengurusan
(WP)
Pengurusan Tenaga
Pegawai Program Pengurusan
Tenaga (PPPT)
Pengurus Tenaga
Pasukan Pengurusan Tenaga (PPT)
Ketua Pasukan
Perancangan & Analisis
Tenaga (K2PAT)
Ketua Pasukan Operasi
Bangunan (KPOB)
Ketua Pemantau dan
Penilai Pengurusan
Tenaga (K3PT)

CASE STUDY (Cont.)

NO-COST ENERGY – SAVING MEASURES FOR JKR COMPLEX KUALA LUMPUR

a) Switching off 80% of lighting during lunch time;
b) Air-conditioning system operating hours (7.30 am–4.30 pm), except for Prayer Rooms (12.00 pm–5.00 pm);
c) Switching off plug loads & individual lighting and individual air-conditioning after working hours;
d) Conducting awareness campaign for building owners & appointed level officers.

CASE STUDY (Cont.)

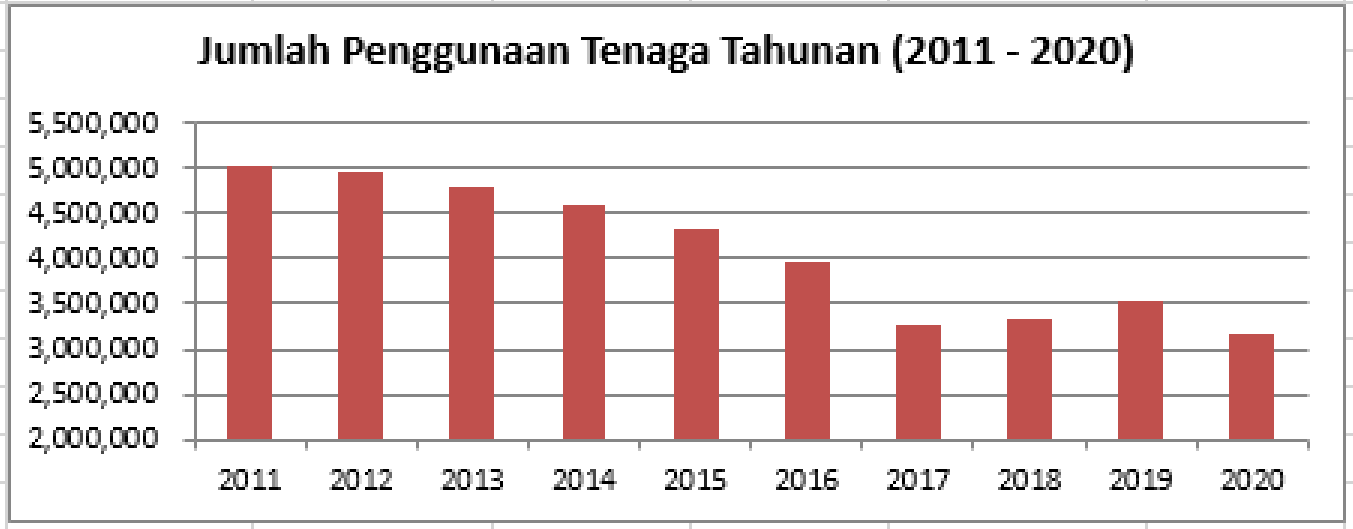
PLANNED WITH-COST ENERGY – SAVING MEASURES FOR JKR COMPLEX KUALA LUMPUR

1) **F Block:**
   a) *Chiller, cooling tower and pumps retrofit*
   b) *LED lighting*
   c) *Air-conditioning ducting replacement (in planning phase)*

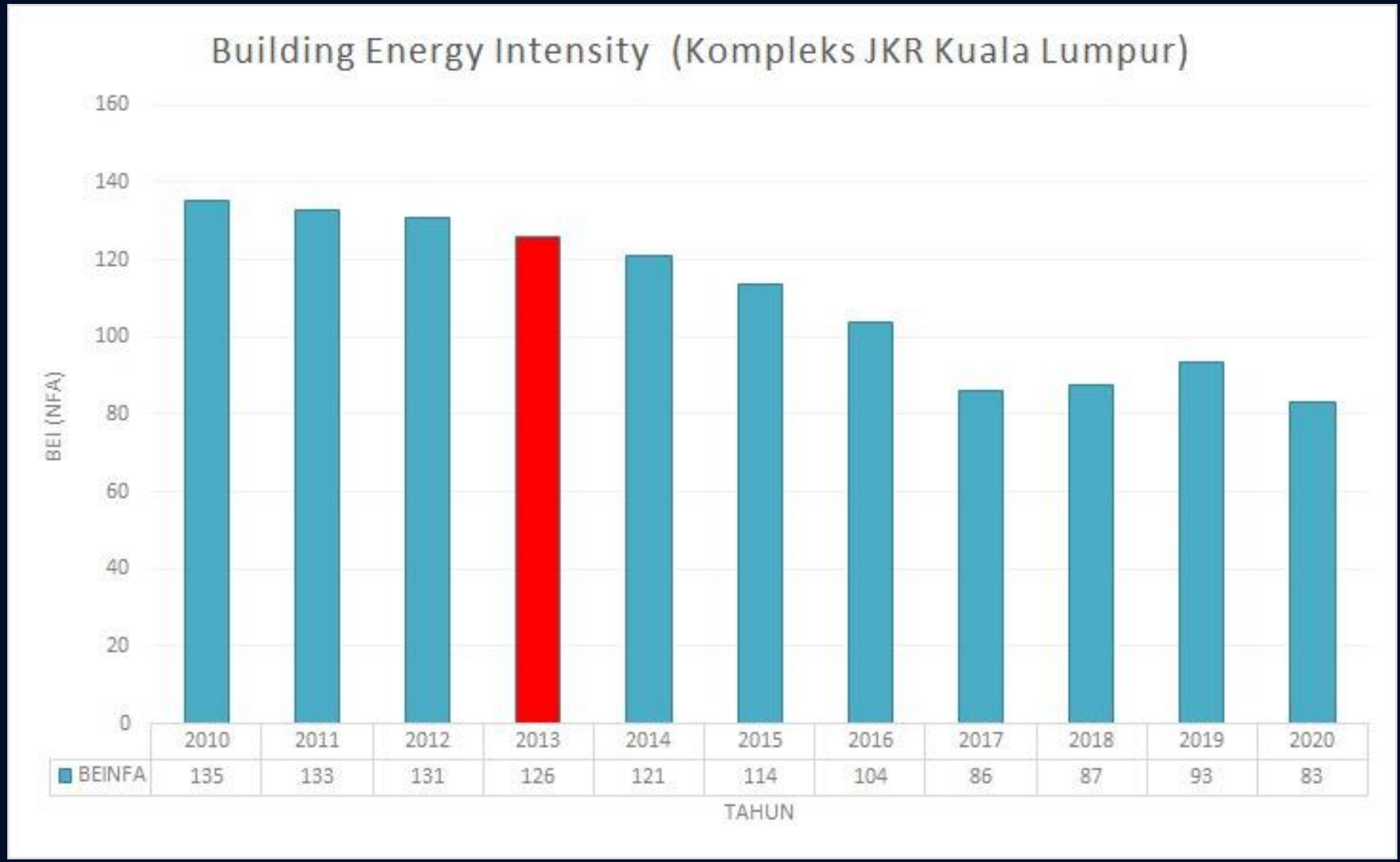
2) **D Block:**
   a) *Air-cooled package retrofit*

3) **All blocks:**
   a) *Digital power meter installation / On-line monitoring*

Bulan	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
Januari	419,253	400,852	401,393	354,286	364,815	340,922	278,004	259,140	300,745	302,548
Febuari	357,403	373,527	351,352	349,679	310,767	315,903	254,652	234,727	250,971	288,457
Mac	464,044	431,991	421,196	386,590	394885	384,952	301,653	289,568	306,248	239,349
April	439,116	407,827	431,605	395,051	398932	371,046	267,865	289,875	319,360	124,161
Mei	442,083	436,697	413,899	391,643	363,075	360,463	292,644	254,832	299,357	226,992
Jun	445,058	427,084	390,088	403,987	372011	350,000	249,296	263,670	263,852	302,894
Julai	428,623	440,435	425,819	388,429	362,033	282,584	288,644	303,942	317,391	308,553
Ogos	420,856	392,827	374,961	386,762	372,427	348,050	279,785	292,824	306,071	280,708
September	393,268	396,156	391,827	381,975	346,541	306,561	240,403	252,563	276,491	287,939
Oktober	413,660	445,428	426,079	399,070	352,769	300,518	282,524	311,510	308,875	279,712
November	395,106	411,492	381,144	372,131	327,280	306,742	278,796	285,583	300,757	260,765
Disember	415,514	411,060	376,106	375,899	347,533	293,070	250,580	281,487	296,384	265,893
Jumlah	5,033,984	4,975,376	4,785,469	4,585,502	4,313,068	3,960,811	3,264,846	3,319,721	3,546,502	3,167,971



Source: (Jabatan Kerja Raya Malaysia)



Source: (Jabatan Kerja Raya Malaysia)

CASE STUDY (Cont.)

SIRIM QAS

SIJIL

SIRIM QAS dengan ini mengesahkan bahawa

JABATAN KERJA RAYA (JKR) MALAYSIA
KETUA PENGARAH KERJA RAYA
IBU PEJABAT JKR
TINGKAT 33, BLOK G
JALAN SULTAN SALAHUDDIN
50480 WILAYAH PERSEKUTUAN KUALA LUMPUR
MALAYSIA

telah melaksanakan Sistem Pengurusan Tenaga yang menepati

ISO 50001:2018

ENERGY MANAGEMENT SYSTEM – Requirements with Guidance for Use

Skop Pensijilan

OPERASI DAN PENYENGGARAAN BANGUNAN (BLOK A, B, C, D, E, DAN F) DI IBU PEJABAT JKR, JALAN SULTAN SALAHUDDIN, KUALA LUMPUR.

Tarikh dikeluarkan	:	**24 Julai 2020**
Tarikh asal pensijilan	:	**12 Jun 2015**
Tarikh luput	:	**18 Jun 2023**
No. pensijilan	:	**EnMS 00111**

Mohd Azanuddin Salleh
Ketua Pegawai Eksekutif
SIRIM QAS International Sdn. Bhd.

KEY SUCCESS FACTORS (KSF) & CHALLENGES

a) KSF

- Top management support
- Energy Manager
- Structured and clear energy management plan
- Constant communication & awareness
- Close tracking and monitoring
- Continuous improvement
- Technology

b) CHALLENGES

- Buy-in from management
- Human behaviour
- Available funding
- Competency
- Incentives

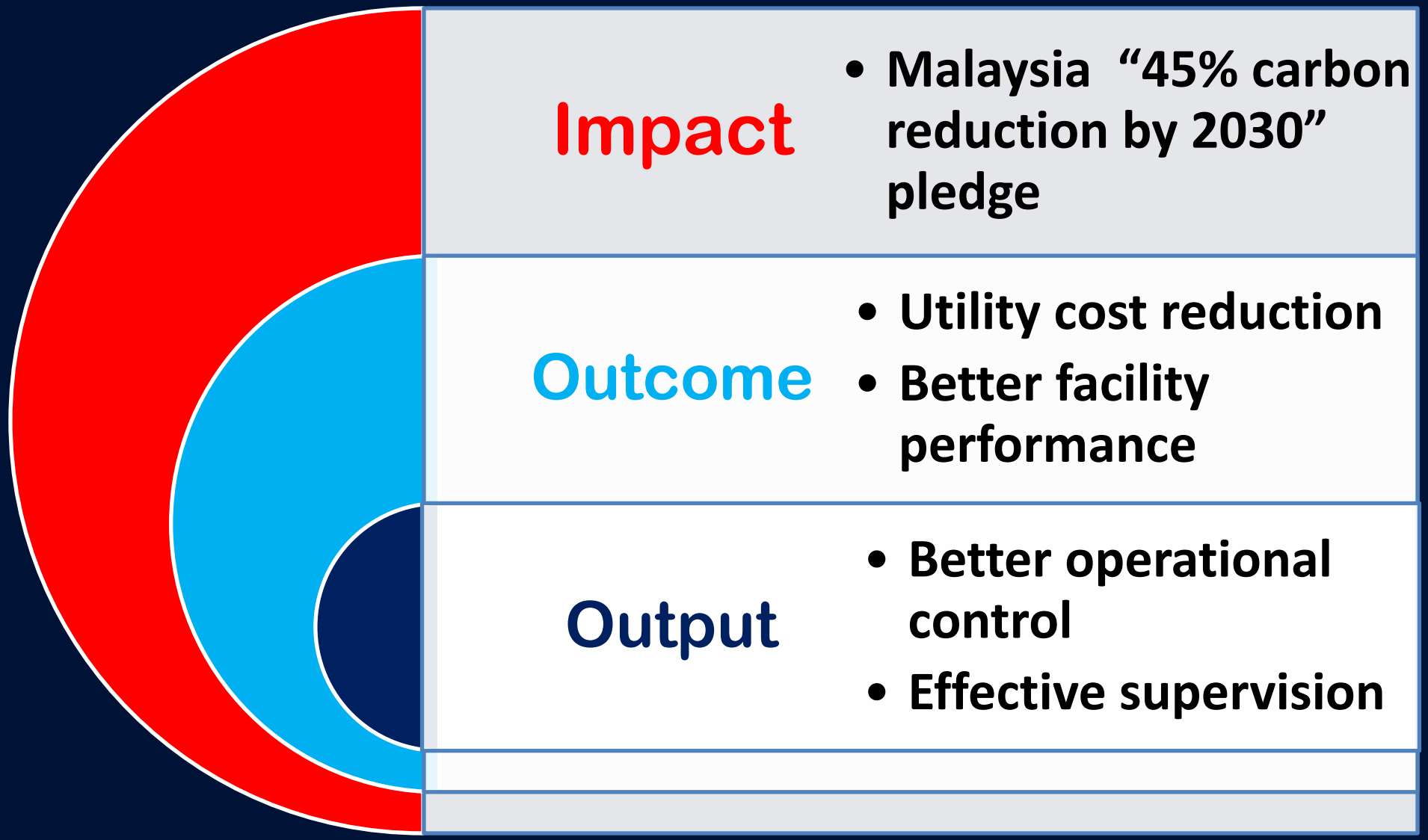
Building operations

Better energy management tools and operational capacity-building can reduce the amount of operating energy needed and, hence, emissions. While delivering efficient and resilient low-emissions new or renovated buildings is essential, it is equally important to manage existing buildings efficiently. Key actions to improve the energy management of buildings include:

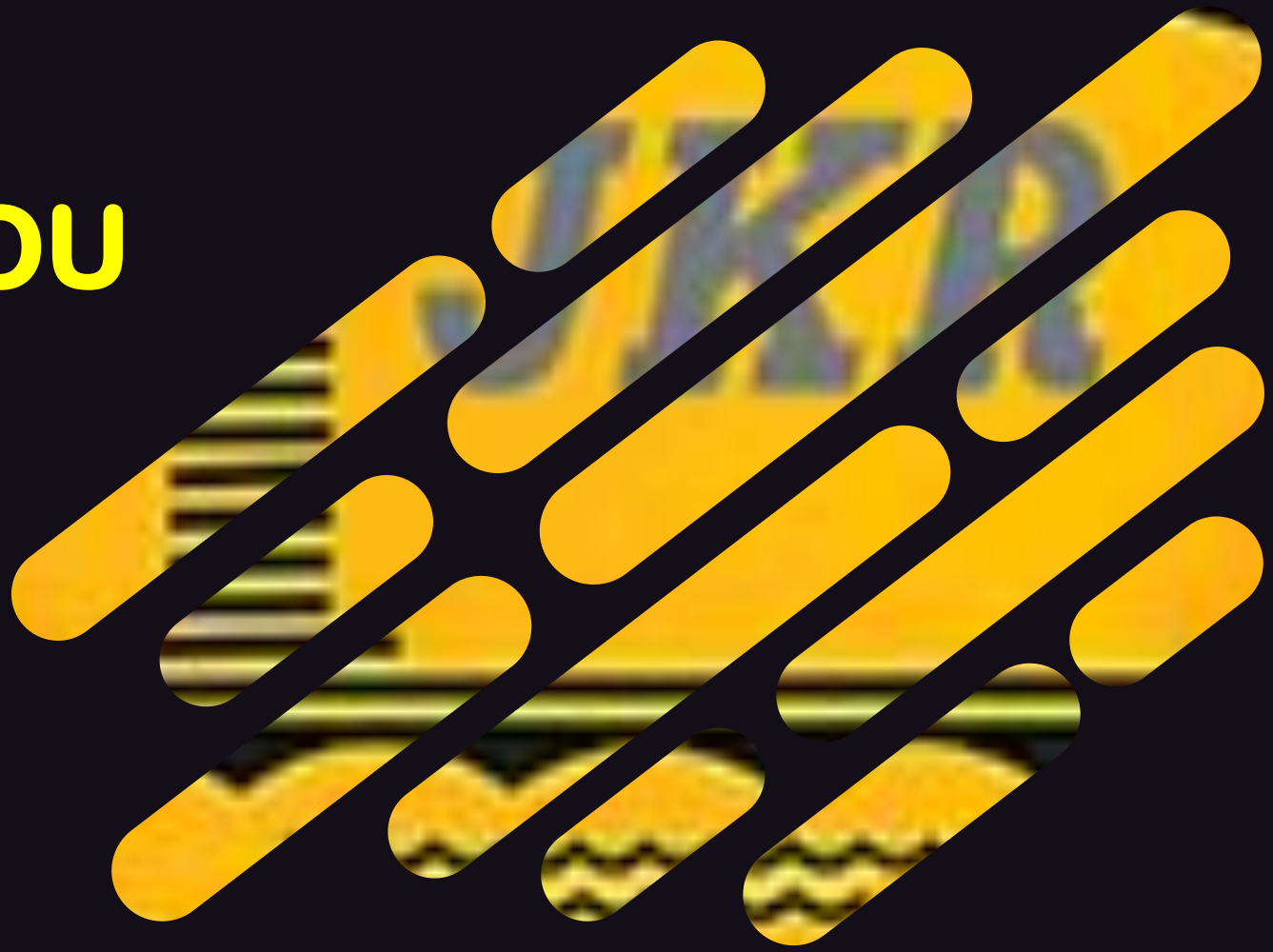
- Installing energy management systems. Offer training in energy management systems and use energy management processes in all buildings, particularly non-residential ones.
- Strengthening human resources. Hire sustainability and energy managers and support capacity-building among them.
- Using smart controls. Deploy temperature, lighting and ventilation system controls and sensors as well as energy metering.
- Making information accessible. Provide data and information that will help building operators and occupants make better decisions.

Source: IEA 2019 Global Status Report for Buildings and Construction

CONCLUSION


Impact
• Malaysia "45% carbon reduction by 2030" pledge
Outcome
• Utility cost reduction
• Better facility performance
Output
• Better operational control
• Effective supervision

THANK YOU



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