



MINISTRY OF ENERGY,  
GREEN TECHNOLOGY AND WATER  
(KeTTHA)

# NATIONAL GREEN TECHNOLOGY MASTERPLAN WITH SPECIAL FOCUS ON ENERGY SECTOR

by

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**'DAY OUT WITH CEO' 2017**

**'BERSAMA MELAKAR TRANSFORMASI INDUSTRI LEBUHRAYA'**

20<sup>th</sup> November 2017,  
Puteri Pacific, Johor Bahru





# OUTLINE

1

- Introduction

2

- Green Technology Master Plan

3

- Sustainable Energy – The Emerging New Frontier

4

- Emerging Trends in Power Sector

5

- Conclusion



# COP15

## COPENHAGEN

“... Malaysia is adopting an indicator of a voluntary reduction of up to 40 percent in terms of carbon emissions intensity of GDP (gross domestic product) by the year 2020 compared to 2005 levels ...”

**YAB Datuk Seri Najib Razak**



## COP21 PARIS, 2015

- Malaysia is aiming to cut greenhouse gas emissions for each unit of economic growth 35% from 2005 levels by 2030
- With international support, that could increase to 45%.



# GREEN TECHNOLOGY MASTER PLAN





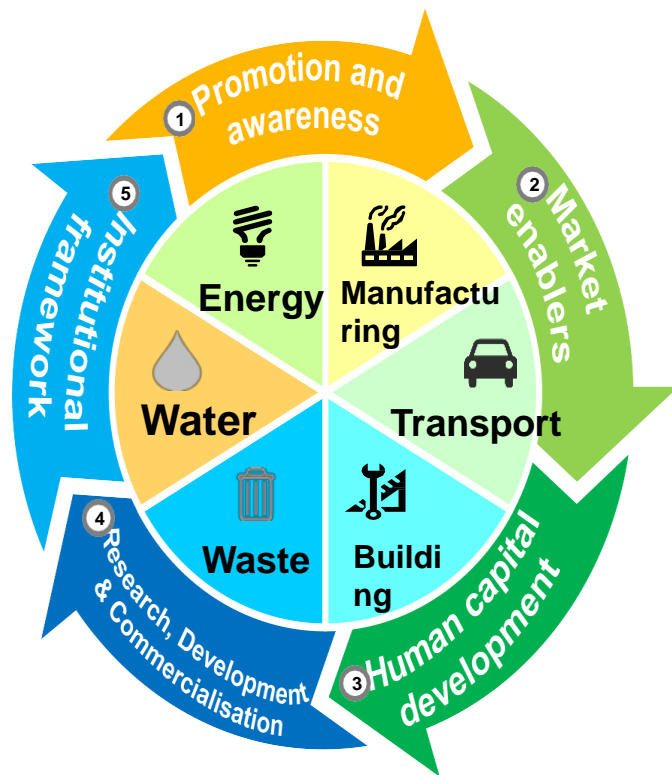
# Green Technology Master Plan outlines Key Principles & Objectives

## KEY PRINCIPLES

- Aligns the strategic goals within RMK11
- Does not overrule the existing plans and policies
- Provide guidance to leverage on green tech

## OBJECTIVES

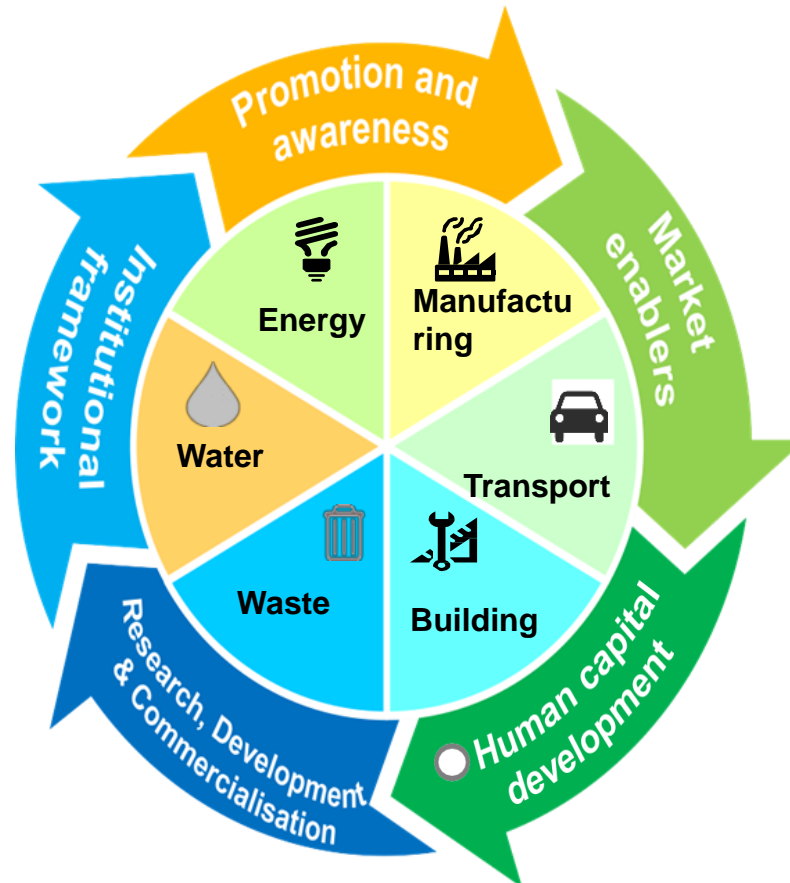
- Potential economic contributions
- Outline ways to shift from technology adoption to technology production
- Outline ways to reduce 45% GHG emission intensity by GDP by 2030





# 6 initial Key Sectors

- high potential to facilitate green growth in the country



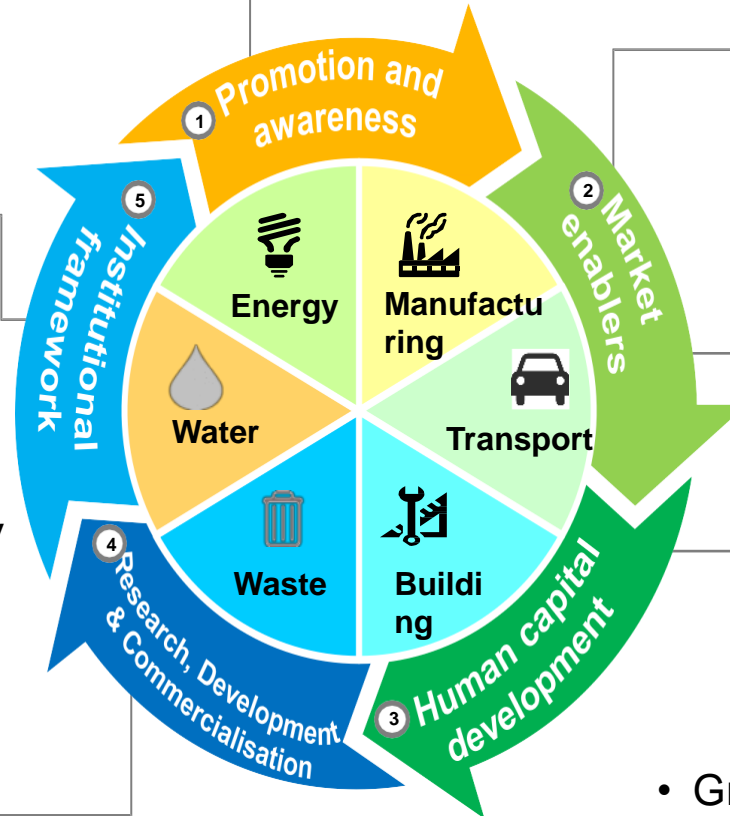


# 16 sub-sectors identified as key areas

- Electricity generation
- Energy efficiency (residential & commercial)

- Integrated river basin management
- Water treatment and distribution technology
- Water utilisation technology
- Water harvesting technology
- Wastewater treatment technology

- Waste treatment and disposal
- Resource recovery



- Industrial process efficiency

- Public transportation
- Private transportation
- Cleaner fuel

- Green building
- Sustainable construction practices
- Green building materials

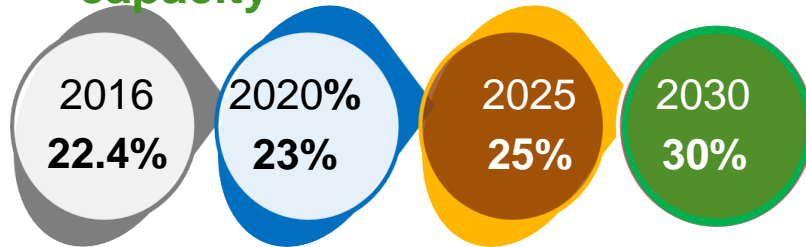




# I. ENERGY: CREATING A SUSTAINABLE POWER GENERATION MIX & ENERGY EFFICIENCY AS THE NEW SOURCE OF ENERGY

## Electricity generation and energy efficiency

### 1 RE mix in installed capacity



#### RE mix targets in selected countries by 2030

European Union	≥27%
Canada	30%
Japan	22 – 24%
Korea	11%

Source: European Commission, Alberta Government, Japan's Ministry of Economy, Trade and Industry, Korea Energy Management Corporation

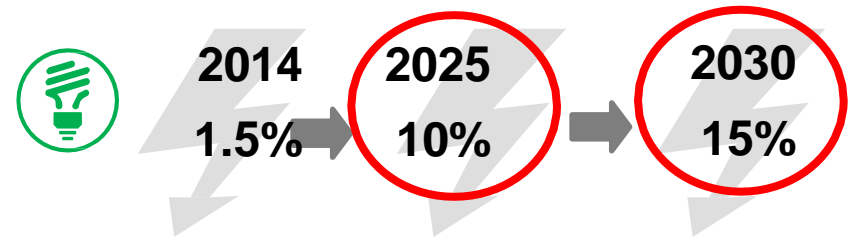
### Electricity generation diversity

Herfindahl-Hirschman Index (HHI) < 0.5

### 2 Efficiency in power generation

- Imposition of **clean coal technology requirement** for new coal-fired plants
- Encouragement of **co-generation**

### 3 Reduction in electricity consumption (Residential and Commercial)



Source: National Energy Balance Reports 2010-2014, KeTTHA



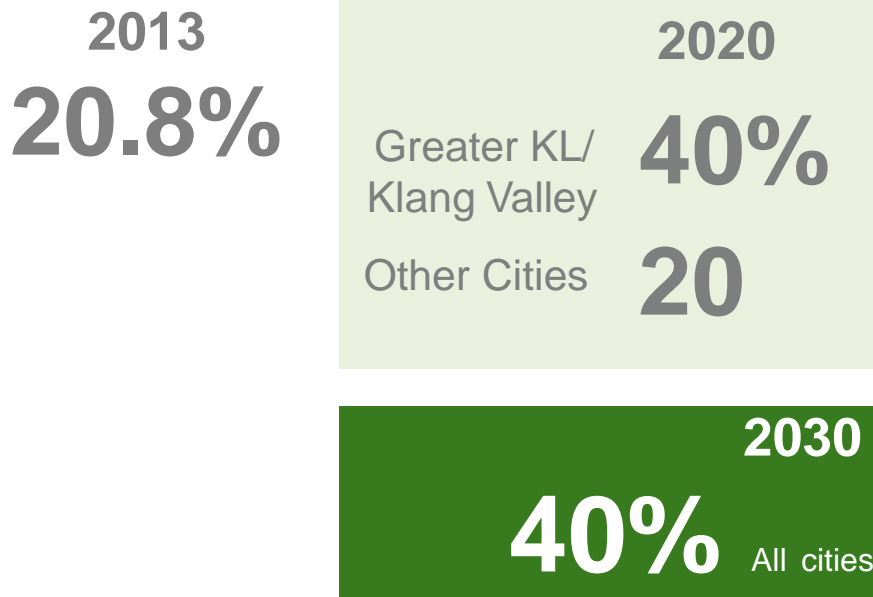




## II. TRANSPORT: 3-PRONGED APPROACH TO REDUCE CO2 EMISSION

### Public transport

#### 1 Public transport modal share

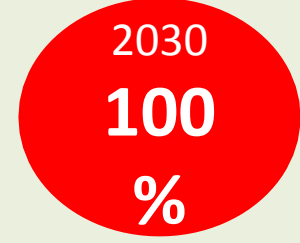
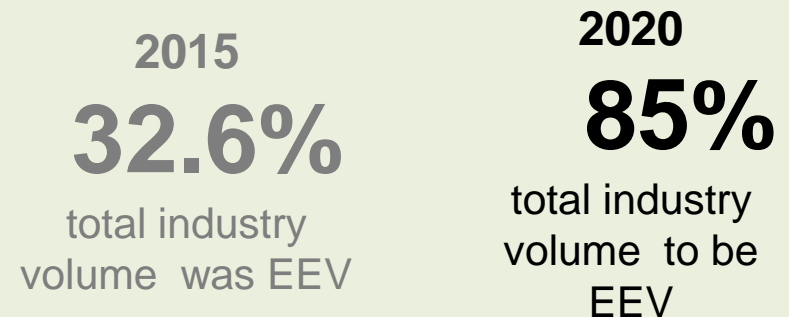


### Rail-based public transport

Emission Reduction (2013)	Target Emission Reduction (2020)
<b>214.9 ktCO<sub>2</sub>eq</b>	<b>977.5 ktCO<sub>2</sub>eq</b>

### Private transport

#### 2 Private vehicles



New car registrations to be Hybrid and Electric Vehicles

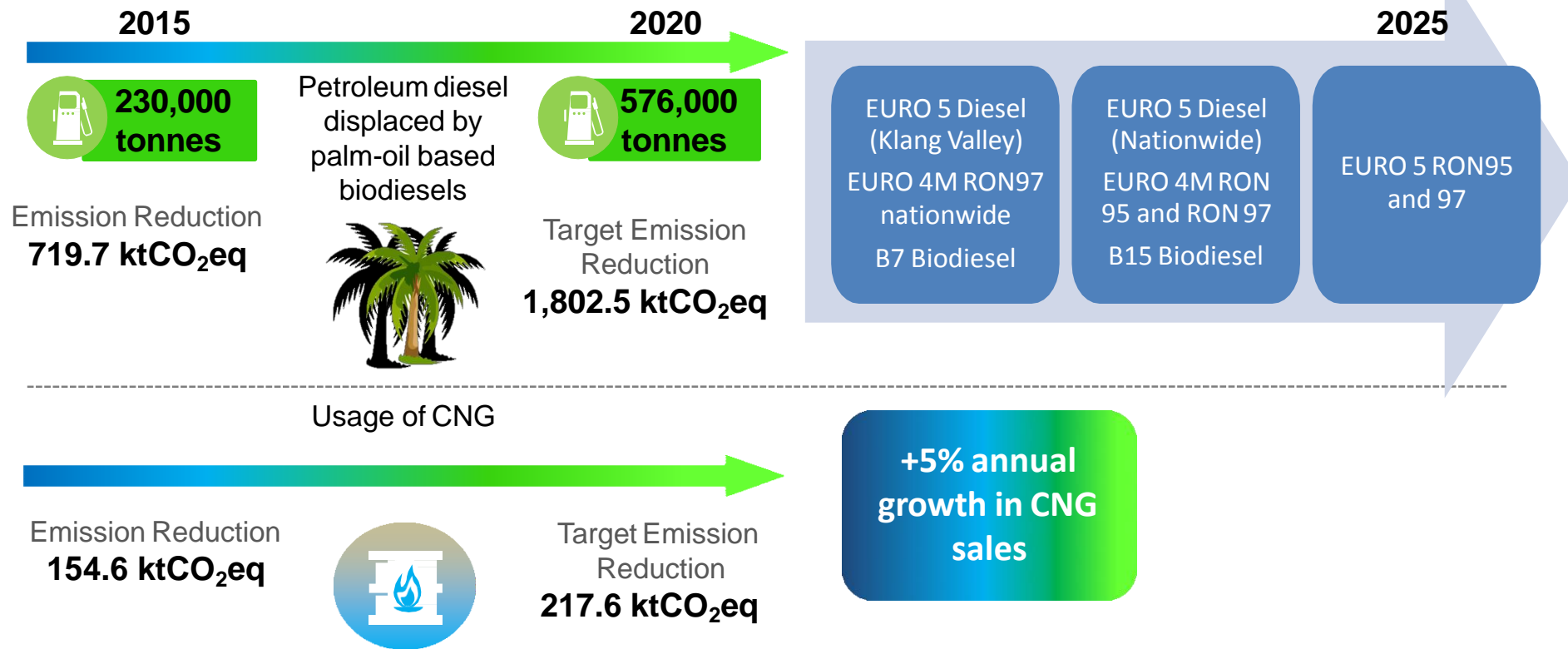
Emission Reduction (2013)	Target Emission Reduction (2020)
<b>41.0 ktCO<sub>2</sub>eq</b>	<b>199.7 ktCO<sub>2</sub>eq</b>



## II. TRANSPORT: BIODIESEL, HIGHER FUEL STANDARD & COMPRESSED NATURAL GAS TO REDUCE CARBON EMISSION (CON'T)

3

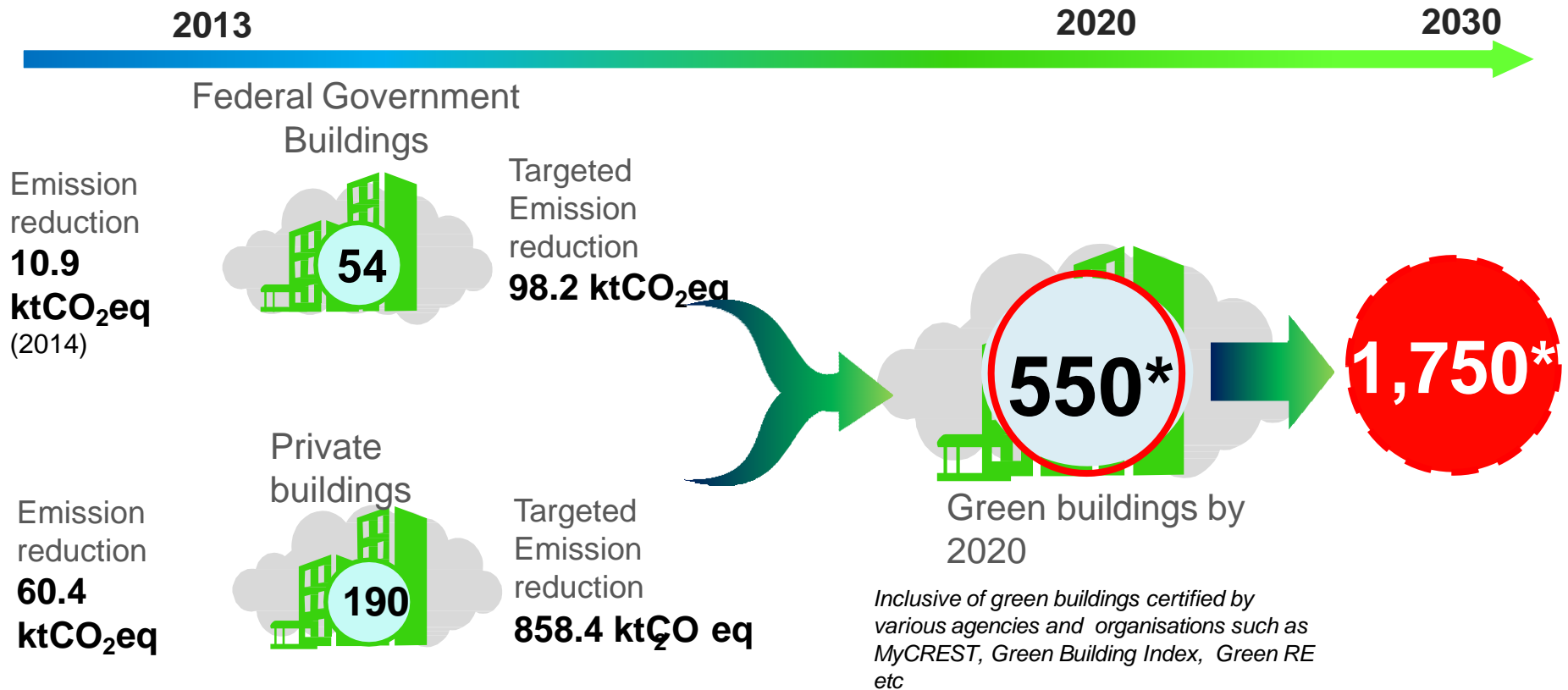
### Cleaner fuel





# III. BUILDING: GREEN & LOW CARBON BUILDING – FUTURE OF THE CONSTRUCTION INDUSTRY

## 1 Number of green buildings



Source: Malaysia's Biennial Update Report (BUR) to the UNFCCC, 2016

\*Aspirational target based on Malaysia's existing performance, dependent on the roll-out of green technology products and services in the country, and also the presence of conducive ecosystems including supporting policies and market economics (e.g. electricity tariff rate and carbon tax etc). Subject to review by 2019/2020.





# III. BUILDING: A LIFE-CYCLE APPROACH IN GREENING THE BUILDING SECTOR (CONT')

## Sustainable construction practices and green building materials

### 2 IBS Score

2013

24  
%

Percentage of **public** projects valued RM10 million & above to achieve **70 IBS score**



2020

100%

14%

Percentage of **private** projects valued RM50 million & above to achieve **50 IBS score**

100%

### 3 Green building materials

- ✓ Increased number of green building materials and
- ✓ policy amendments to allow usage of recycled materials in construction





## IV. MANUFACTURING: REDUCING THE CARBON FOOTPRINT OF THE LARGEST ELECTRICITY CONSUMER

### Industrial process efficiency

#### 1 Percentage and number of green manufacturing SMEs



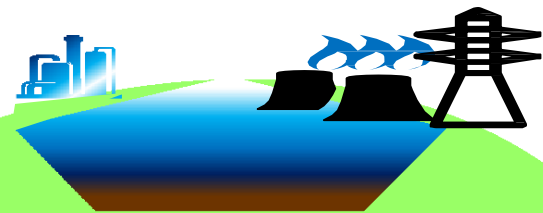


# V. WASTE: IMPROVING WASTE MANAGEMENT METHODS TO CONTAIN METHANE EMISSIONS

## Waste treatment and disposal

**1** Sanitary landfill and methane capture from landfills

**2** Waste-to-Energy thermal plants

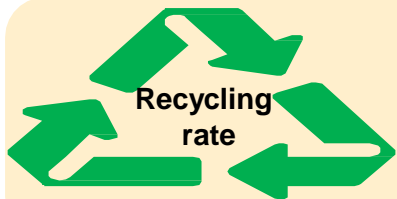


**14** sanitary landfills and **147**  
non-sanitary landfills nationwide (2016)

**23** sanitary landfills nationwide (2020)

**80%** sanitary landfills by 2030

**3** Waste to-energy thermal plants



**17.5%**  
(2016)

**22%**  
(2020)

**30%\***  
(2025)

**50%\***  
(2030)

Source: National Solid Waste Management Department

\*Aspirational targets which are benchmarked against EU, dependent on the roll-out of green technology products and services in the country, and also the presence of conducive ecosystems including supporting policies and market economics (e.g. tipping fees, and carbon tax etc). Subject to review by 2019/2020.





## V. WASTE: POME AS A RESOURCE FOR ENERGY & WEALTH GENERATION (con't)

### Resource recovery

#### 3 Biogas capture from palm oil mill effluent treatment

2013

2020



ktCO<sub>2</sub>eq biogas capture from palm oil mill effluent treatment

**71** (2013)



**89** (2016)



**500** (2020)

Number of palm oil mills with biogas capture facilities





# VI. WATER: A CLOSED WATER LOOP SYSTEM IN URBAN AREAS FOR MORE SUSTAINABLE WATER MANAGEMENT

## Integrated water management approach

### 1 Integrated river basin management

Freshwater extraction rate

2015

2%

2025

10%

2030

15%

### 2 Water treatment and distribution technology

NRW

37% 2015

25% 2025

15% 2030

### 4 Water utilisation technology

Increased number of labelled water efficient products



### 3 Water harvesting technology

60%

2020

towns in Malaysia will be installed with Rainwater Harvesting Systems

### 5 Wastewater treatment by 2030

50%

Bio-solids to be recycled

50%

Bio-solids to be recycled for electricity generation

1/3

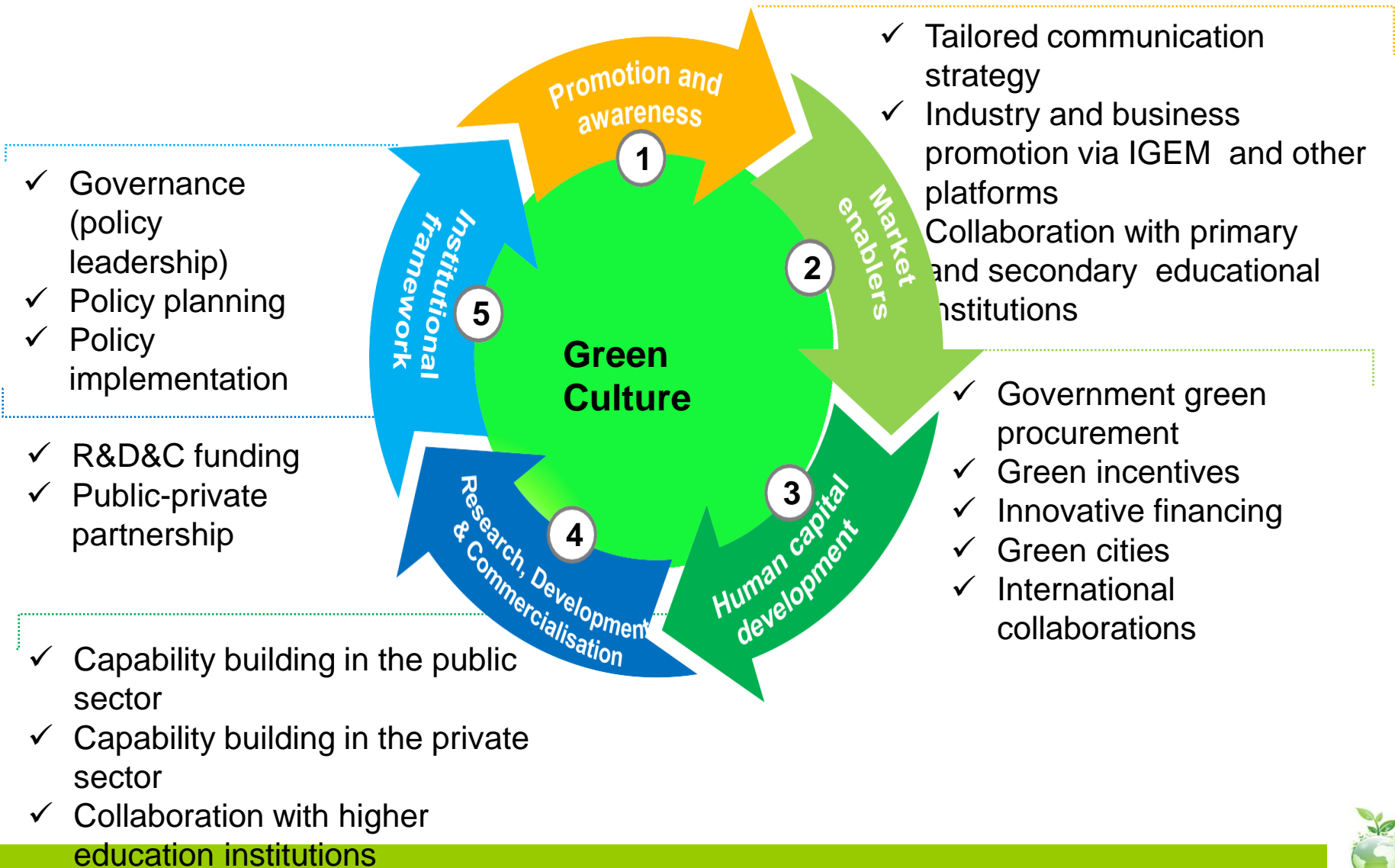
Bio-effluent to be recycled







# Creating Conducive Environment Via 5 Strategic Thrusts





# ENERGY SECTOR OVERVIEW





# MALAYSIA'S PRIMARY ENERGY SUPPLY

## Malaysia's Energy Resources

Crude oil : 5.9 bil. bbl Nat gas : 100.4 tcf

Reserve life :

Oil – 24 yrs Gas – 42 yrs

Coal : 1,279 mil tonnes (low grade)

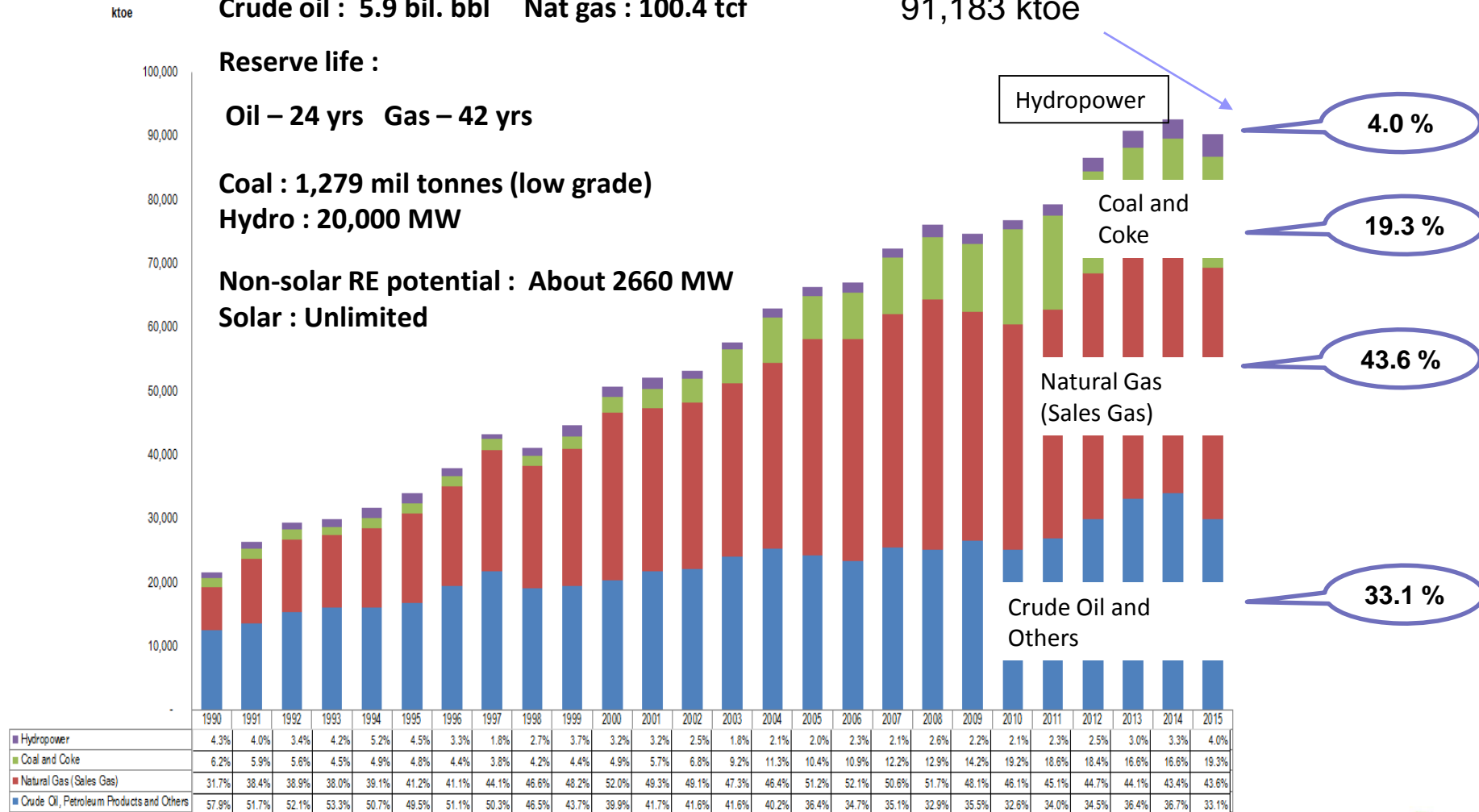
Hydro : 20,000 MW

Non-solar RE potential : About 2660 MW

Solar : Unlimited

Total Primary energy  
91,183 ktoe

Primary  
Energy Mix



Source: National Energy Balance 2015



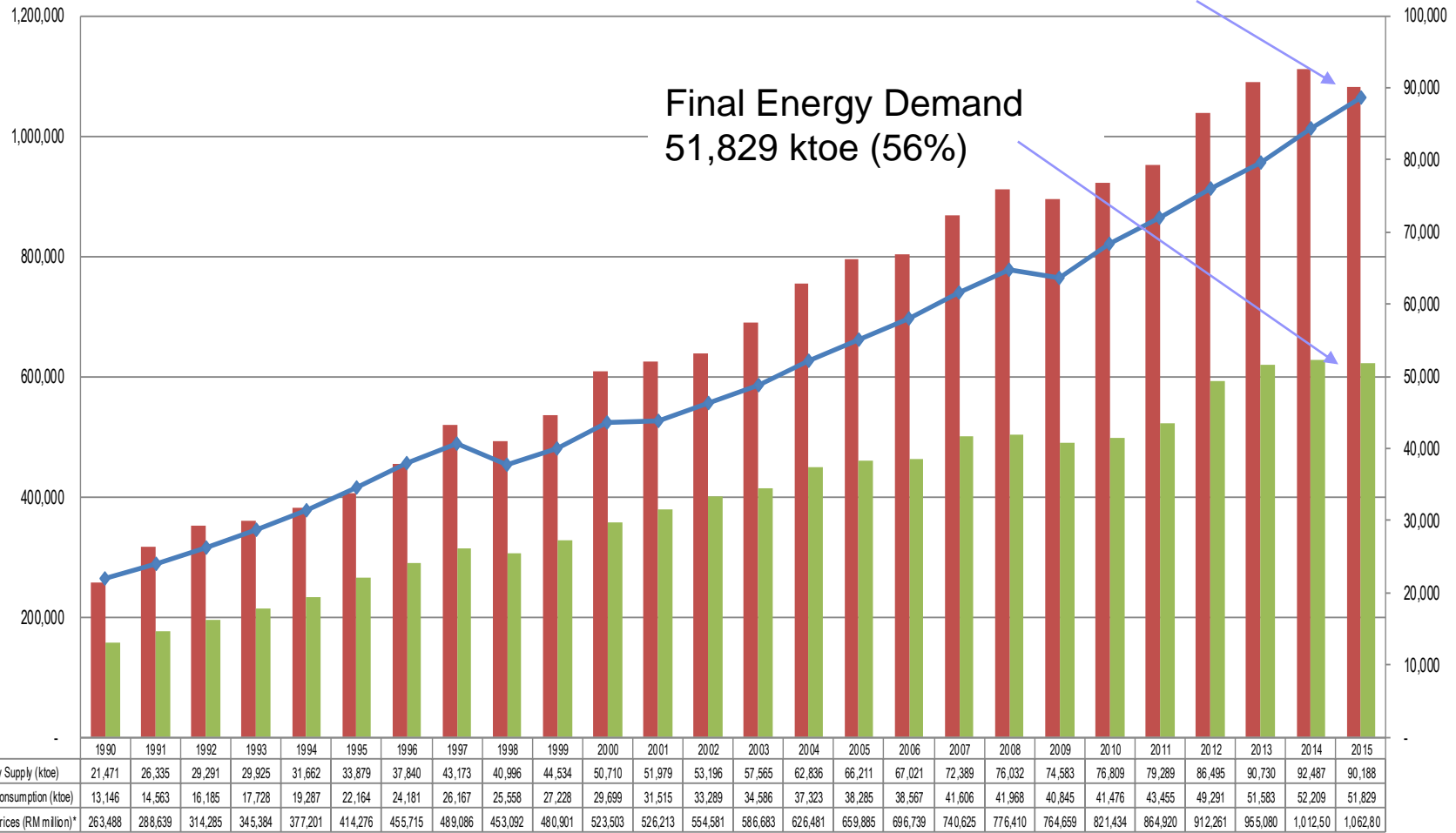


# ANALYSIS ON PRIMARY ENERGY SUPPLY VS FINAL ENERGY DEMAND

RM Million (at 2010 prices)

Primary energy  
91,183 ktoe

ktoe

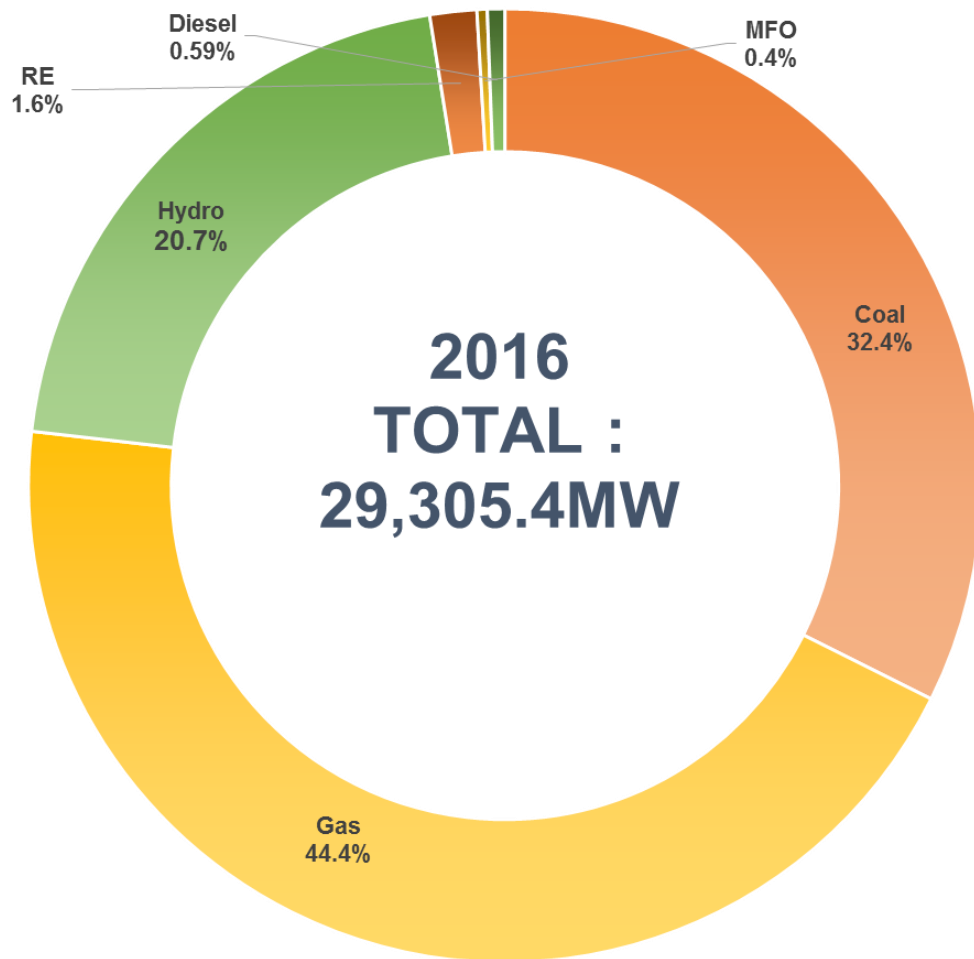


Sources: National Energy balance 2015





## CURRENT INSTALL CAPACITY & MAXIMUM DEMAND

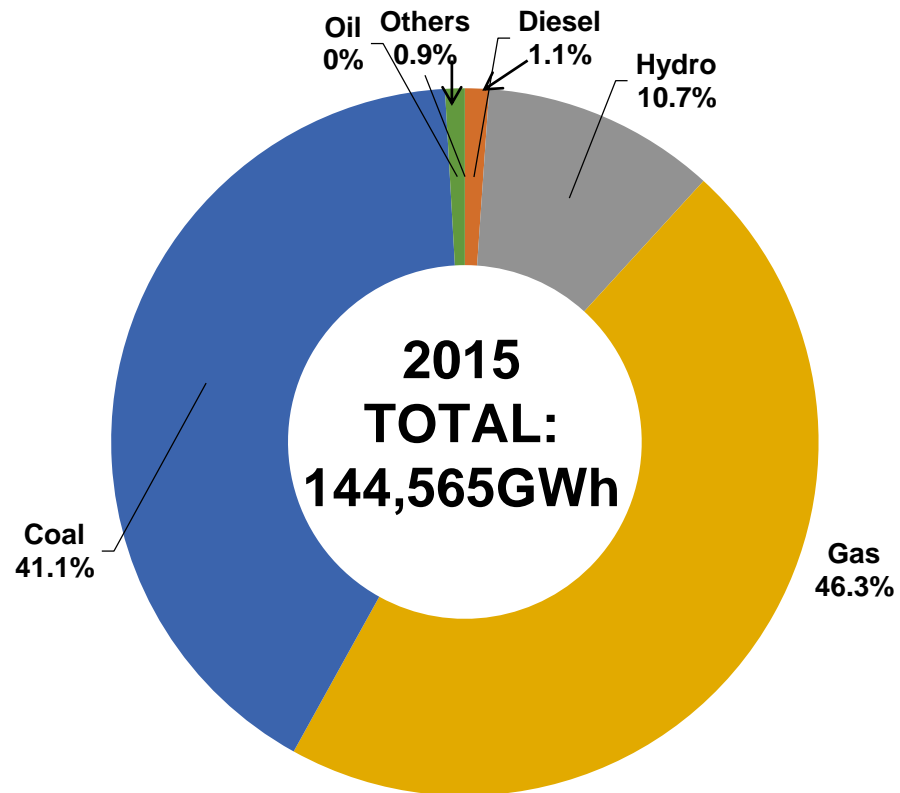
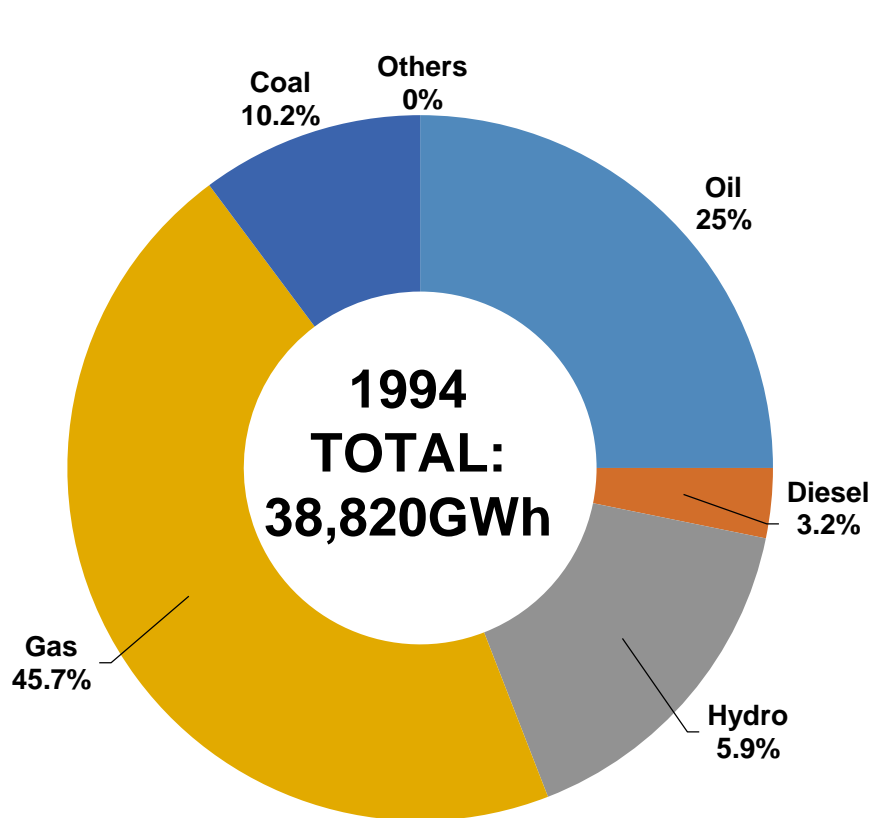


Peak Demand	(MW)
Peninsular	17,788
Sabah	944.9
Sarawak	3,315





# ELECTRICITY GENERATION MIX

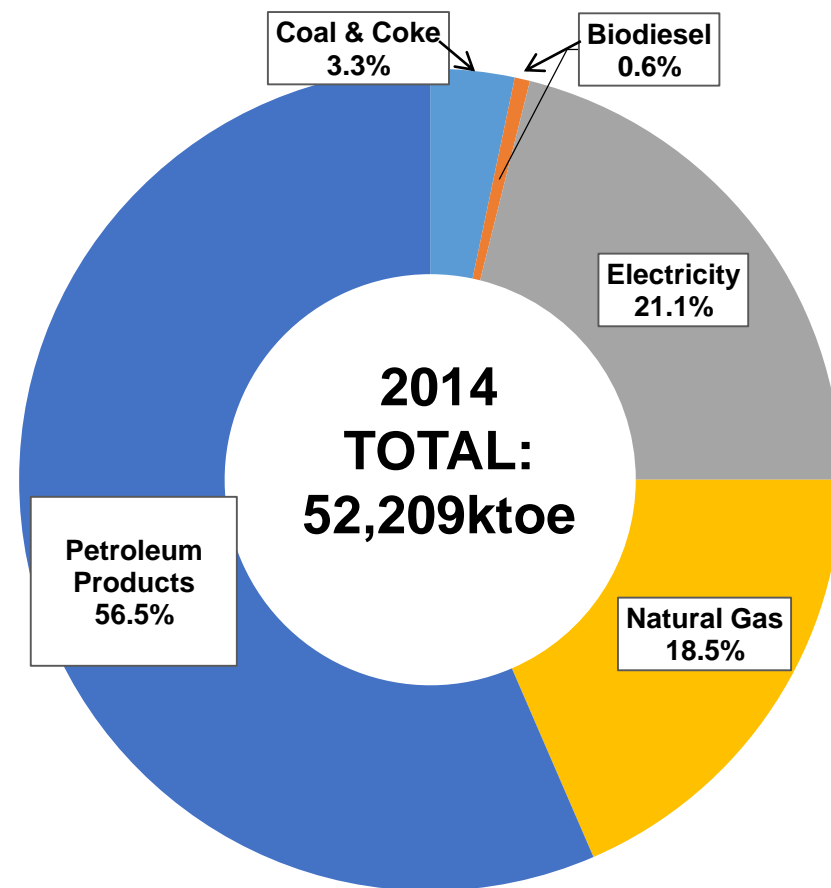
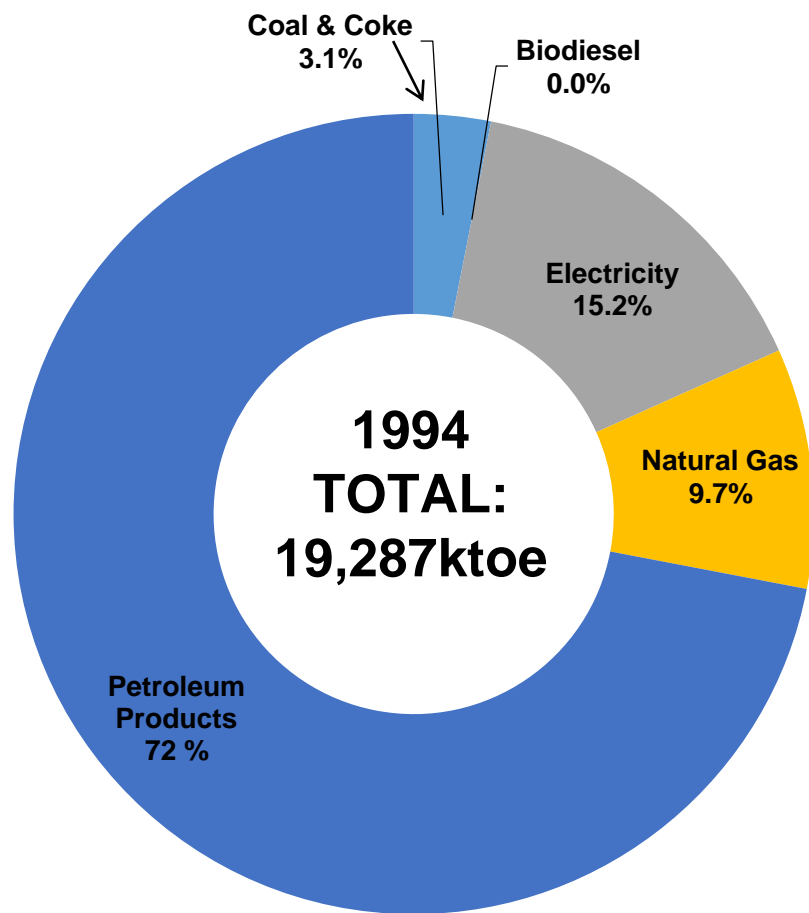


Source : Energy Balance 2016





## FINAL ENERGY CONSUMPTION BY FUEL

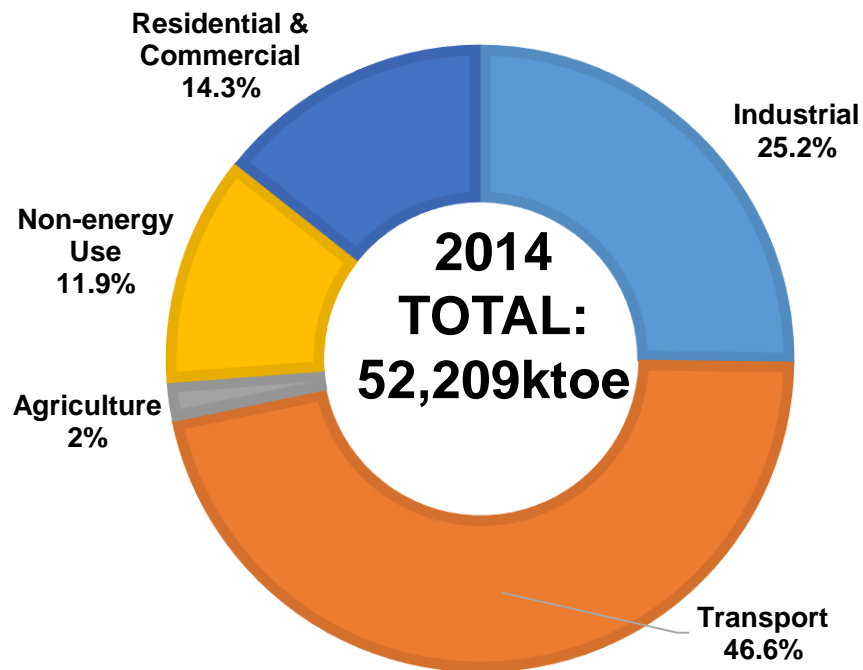
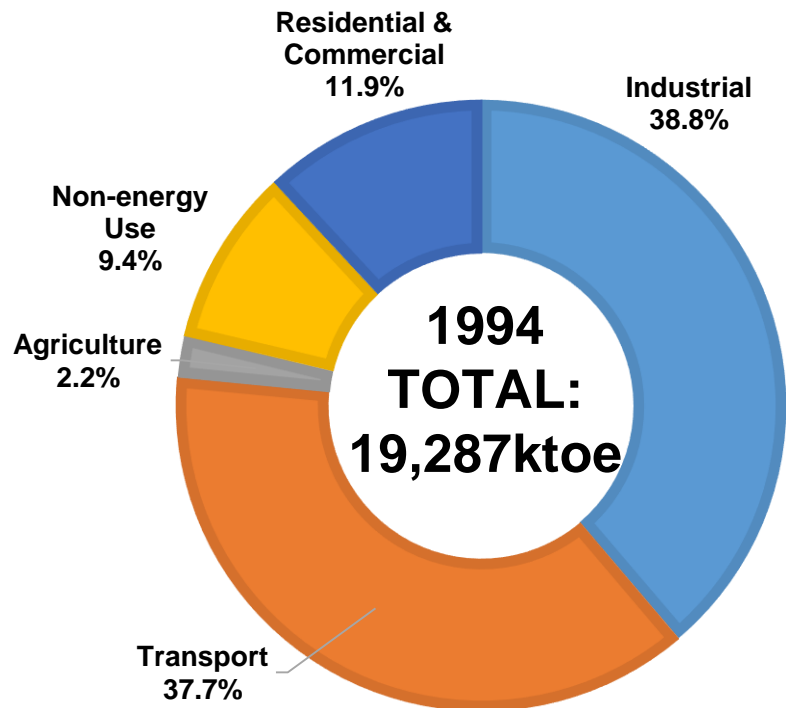


Source : Energy Balance 2016





## FINAL ENERGY CONSUMPTION BY SECTOR



Source : Energy Balance 2016







# SUSTAINABLE ENERGY – THE EMERGING NEW FRONTIER





# I. RENEWABLE ENERGY

## LARGE SCALE SOLAR FAST TRACK



**CAPACITY FOR FAST TRACK PROJECTS  
TO COD IN 2017**

**150 MW Peninsular  
50 WM Sabah/Labuan**

- Earliest to start commercial operation in Sept 2017, 2MW in Kudat, Sabah





## LARGE SCALE SOLAR - CYCLE 1



### CAPACITY AWARDED FOR CYCLE 1 (COD 2017/2018)

384MW Peninsular + 16MW Sabah and Labuan

	Capacity of Plant	Capacity Awarded
Peninsular Malaysia	1MW – 5MW	10.5 MW
Peninsular Malaysia	6MW – 29MW	114.5 MW
Peninsular Malaysia	30MW – 50MW	259.0 MW
Sabah / Labuan	1MW – 5MW	10.9 MW
Sabah / Labuan	6MW – 10MW	6.0 MW





## LARGE SCALE SOLAR - CYCLE 2



### CAPACITY ALLOCATED

COD 2019/2020

360MW Peninsular + 100MW Sabah and Labuan

Package	Range of Capacity for Each Package (Mw <sub>ac</sub> )	Capacity Allocated	Total Export
Package P1 (Peninsular)	1.00 MW <sub>ac</sub> to 5.99MW <sub>ac</sub>	36MW <sub>ac</sub>	360MW <sub>ac</sub>
Package P2 (Peninsular)	6.00 MW <sub>ac</sub> to 9.99MW <sub>ac</sub>	144MW <sub>ac</sub>	
Package P3 (Peninsular)	10.00 <sub>ac</sub> MW to 30.00MW <sub>ac</sub>	180MW <sub>ac</sub>	
Package S1 (Sabah/Labuan)	1.00 MW <sub>ac</sub> to 5.99MW <sub>ac</sub>	20MW <sub>ac</sub>	100MW <sub>ac</sub>
Package S2 (Sabah/Labuan)	6.00 MW <sub>ac</sub> to 10.00MW <sub>ac</sub>	80MW <sub>ac</sub>	





## II. NET ENERGY METERING

The objectives :

- To encourage broader community involvement and growth of decentralized Solar Photo Voltaic (PV) systems.
- To encourage job creation in the downstream Solar PV market segment.
- To provide further impetus for the growth of solar industry in the Malaysia.
- To reduce carbon emissions.

Open to residential, commercial & industrial customers.

Location		Peninsular					Sabah				
Year		2016	2017	2018	2019	2020	2016	2017	2018	2019	2020
Category of consumers	Domestic/Residential, MW	20	20	20	20	20	4	4	4	4	4
	Commercial, MW	35	35	35	35	35	4	4	4	4	4
	Industrial, MW	35	35	35	35	35	2	2	2	2	2
Sum, MW		90	90	90	90	90	10	10	10	10	10
Total, MW		450					50				

Malaysia is implementing 500 megawatts (MW) capacity for NEM beginning 2016 until 2020.





### III. ENERGY EFFICIENCY

1996-2000

- Energy efficiency promotion in the 7<sup>th</sup> Malaysia Plan

1999

- Malaysian Industrial Efficiency Improvement Programme (MIEEP)

2001

- Fiscal incentives for EE
- Development of Malaysian Standard MS 1525

2002

- Capacity building in the Energy Commission and related key institutions on energy efficiency and Demand Side Management

2002

- Energy audit on government building
- EE & RE in school curriculum & university courses





### III. ENERGY EFFICIENCY (con't)

2006

- Development of EE guidelines for Malaysian Industries

2008

- Efficient Management Of Electrical Energy Regulations

2009

- Green Building Index (GBI)

2012

- Green Pass

2013

- Minimum Energy Performance Standards (MEPS)

2016

- National Energy Efficiency Action Plan (2016-2025) and Implementation of EE Projects during 11<sup>th</sup> Malaysia Plan (2016-2020)
- Malaysian Carbon Reduction and Environmental Sustainability Tool (MyCrest)





### III. EFFICIENT ENERGY MANAGEMENT REGULATIONS OF ELECTRICAL (EMEER) 2008

- ✓ **Generator** - Installation worked/ operated by a private installation licensee & generate equal or exceeding **3,000,000 kWh in 6 consecutive months;**
- ✓ **Consumer** - Any installation which Consume equal or **>3,000,000 kWh in 6 consecutive months;**
- ✓ To submit reports:
  - Policy for Efficient management of Electrical energy;
  - Accounts & Document on efforts;

### IV. MINIMUM STANDARD ENERGY PERFORMANCE (MEPS)

- ✓ introduced for 5 domestic electrical appliances :
  - Refrigerators
  - Air-conditioners
  - Televisions
  - Fans
  - Lightings (Fluorescent, CFL, LED)



- Energy rating 1 to 5-Star
- Appliance energy rating (equals the number of stars)
- Model information
- Energy consumption (in kWh/year)
- Energy saving compared to an average 3-Star model (in percentage)







# V. NATIONAL ENERGY EFFICIENCY ACTION PLAN (NEEAP)

52,233 GWH (8.0%) savings

CO<sub>2</sub> reduction :37,702 ktCO<sub>2eq</sub>

## NATIONAL ENERGY EFFICIENCY ACTION PLAN (NEEAP) 2016-2025



**Strategic Thrust 1 :**  
Implementation of Energy Efficiency Plan



**Strategic Thrust 2 :**  
Strengthen Institutional Framework, Capacity Development & Training for Implementation of EE Initiatives



**Strategic Thrust 3 :**  
Establishment of Sustainable Mechanisms Implement Initiatives  
Funding for EE



**Strategic Thrust 4 :**  
Promotion of Private Sector Investment in EE Initiatives

### NEEAP KEY INITIATIVES

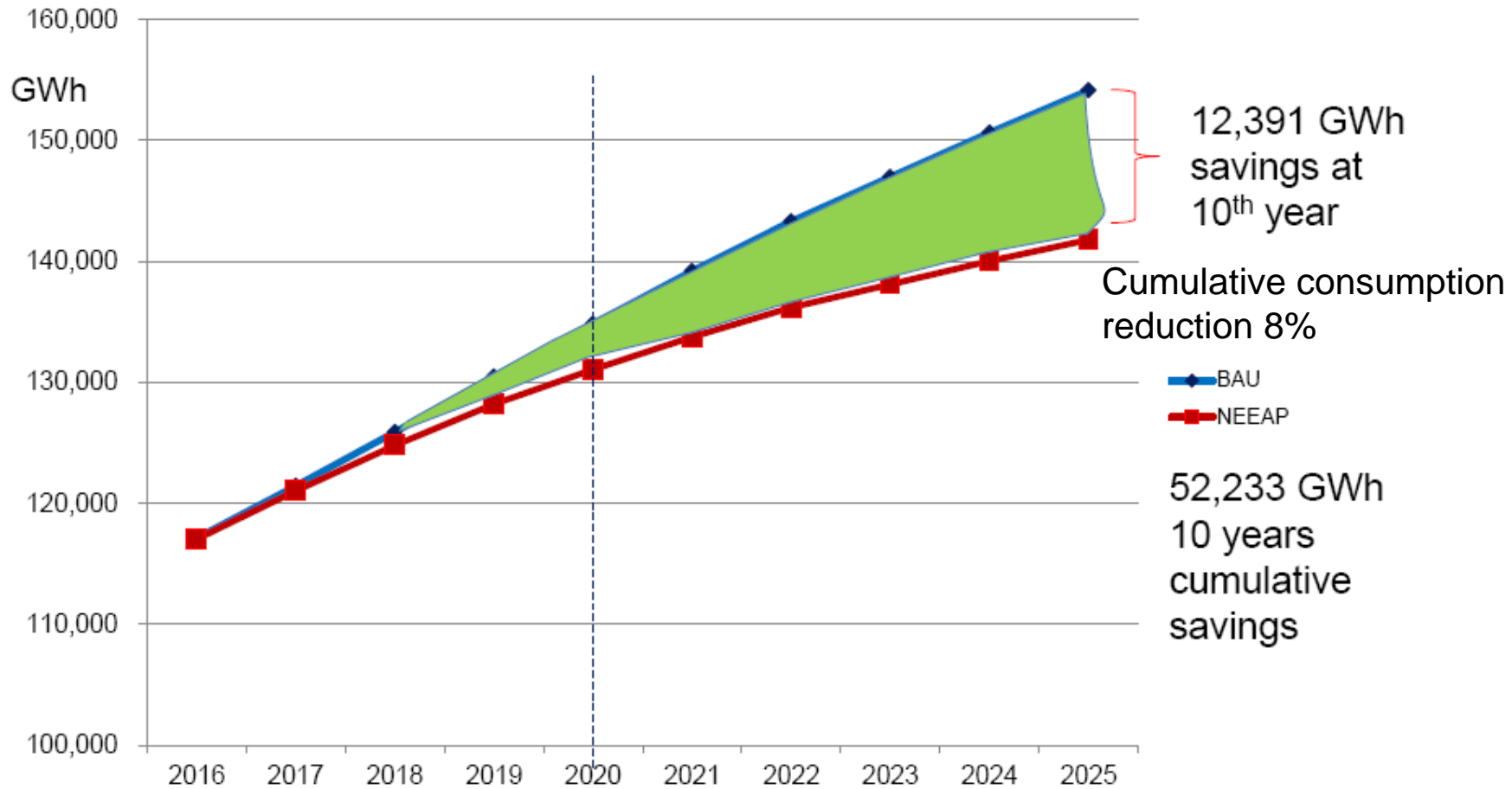
Equiment Programme Initiative	Industrial Programme Initiative	Buildings Programme Initiative
<ol style="list-style-type: none"> <li>Promotion of 5-Star Rated Appliances</li> <li>Minimum Energy Performance Standards (MEPS)</li> </ol>	<ol style="list-style-type: none"> <li>Energy Audits &amp; Energy Management in Industries</li> <li>Promotion of Co-generation</li> </ol>	<ol style="list-style-type: none"> <li>Energy Audits &amp; Energy Management in Buildings</li> <li>Energy Efficient Building Design</li> </ol>





# V. NATIONAL ENERGY EFFICIENCY ACTION PLAN (NEEAP) (con't)

## ENERGY DEMAND : BAU vs NEEAP





# 11<sup>th</sup> MALAYSIA PLAN (2016-2020) : EE INITIATIVES

**Key objective: Expanding demand side management measures**

## Buildings

- Achieve 700 Registered Electrical Energy Manager (REEM)
- Extend Energy Performance Contracting (EPC) to other government buildings
- New government buildings to adopt energy efficient design
- Retrofit 100 government buildings

## Industries

- Introduce Enhanced Time of Use (EToU) with 3 time zones
- Abolish Special Industrial Tariff (SIT)
- Install 4 million smart meters
- Increase on-grid co-generation capacity of 100 MW or more by reviewing utility standby charges

## Energy Audit & Energy Management in :

- ✓ Industrial Buildings;
- ✓ Commercial Buildings;
- ✓ Government Buildings



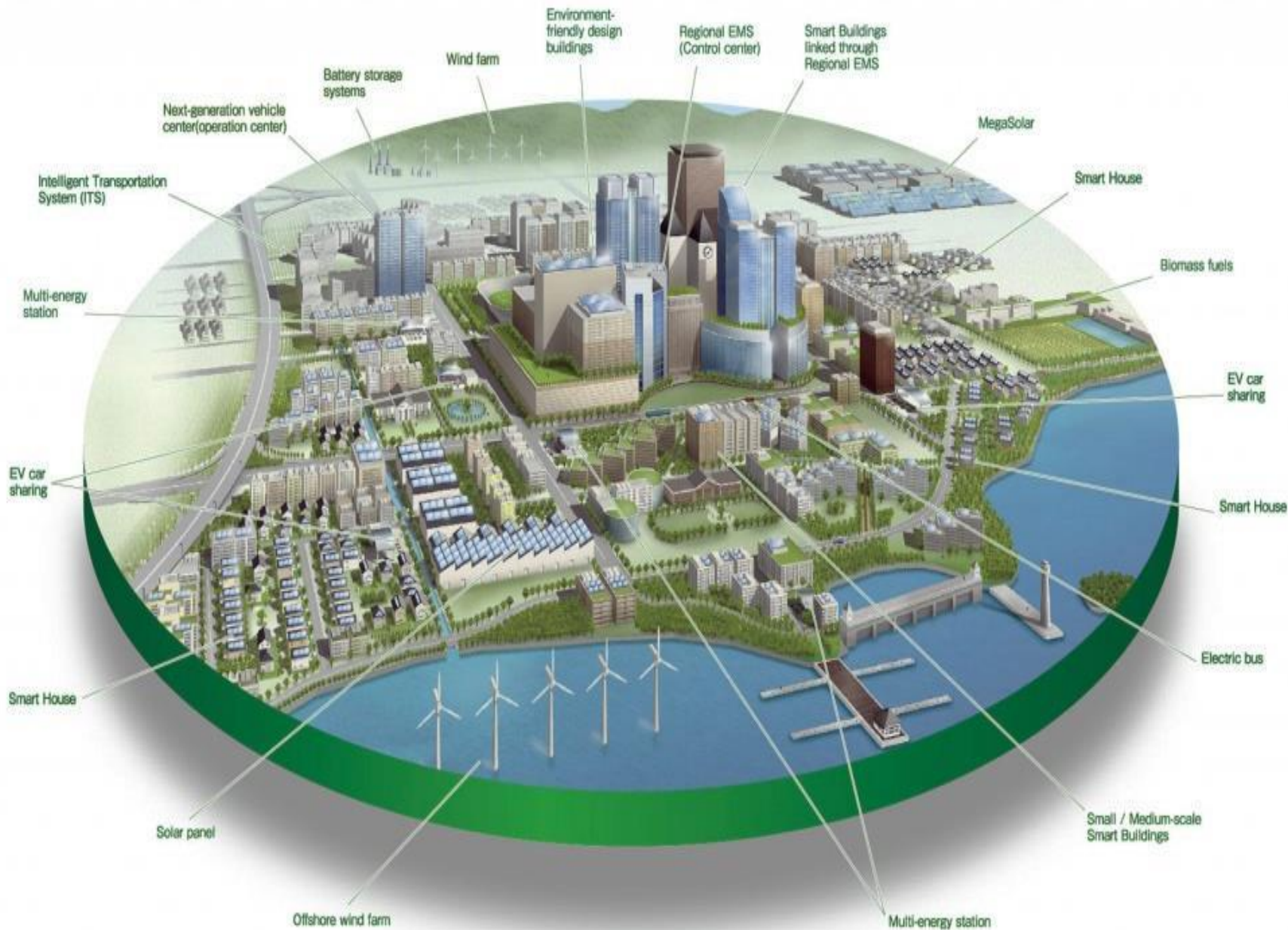


# EMERGING TRENDS IN POWER SECTOR





# ELEMENTS OF SMART CITY





## 4 ELEMENTS FOR GHG REDUCTIONS IN CITIES AND TOWNSHIPS



- Site Selection
- Urban Form
- Urban Greenery & Air Quality



### Urban Transportation

- Shift of Transport Mode
- Green Transport Infrastructure
- Green Vehicles
- Traffic Management



### Urban Infrastructure

- Infrastructure Provision
- Waste
- Energy
- Water



### Buildings

- Low Carbon Building
- Community Service

Elements  
Contribute to GHG  
emission

13 Performance  
Criteria\*

35  
Sub-Criterias

\*Performance Criteria are **measurable strategies** to reduce carbon emission through: Policy control, technological dev., better process & product management, change in procurement system, carbon capture, consumption strategies & others.





# CONCLUSION





# PRIORITIES & DIRECTIONS FOR MALAYSIAN ENERGY SECTOR

## Economic Efficiency, Supply Security, Social & Environmental Goals

### Market Pricing

- Gradual phasing-out of blanket subsidies for energy:
  - Natural gas
  - Electricity
- Decoupling of subsidy from energy use

### Supply Side

- Diversified energy portfolio
- Increase use of renewable resources & sustainable technologies
- Maintain depletion policy

### Energy Efficiency

- Minimum Energy Performance Standards
- Fiscal and financial incentives
- Support for cogeneration
- Institutionalize energy management

### Governance

- Performance-based regulation
- Improve transparency
- Increase competition
- Option for full-market opening
- Improve economic performance

### Change Management

- Manage orderly implementation of initiatives
- Proper sequencing to achieve objectives
- Integrated approach







# CONCLUSION

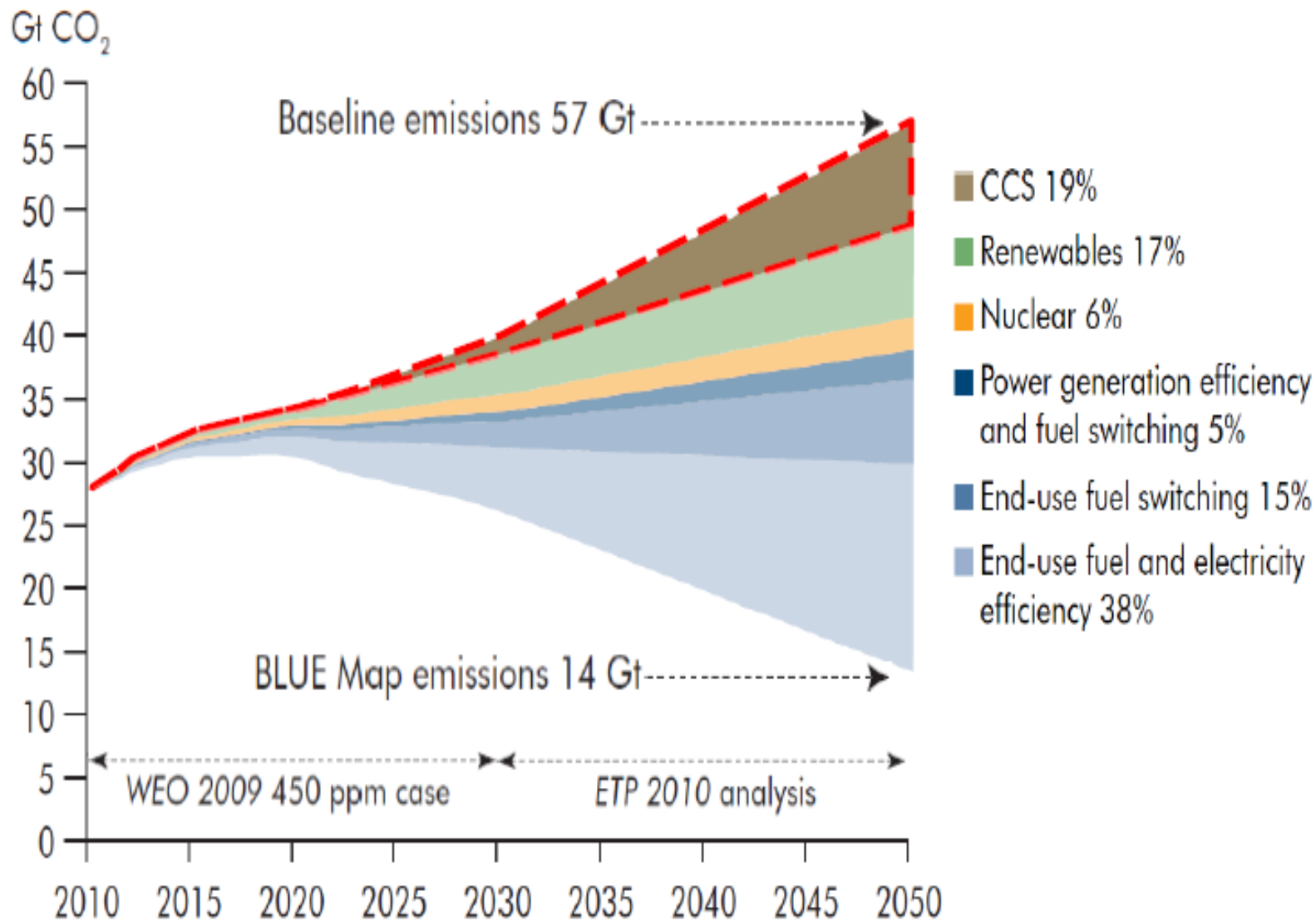
**Energy is the cornerstone of any economy & must be managed efficiently ensuring:**

- ✓ Malaysia's commitment to COP21 Pledges;
- ✓ Address the Energy Trilemma – economic, social & environment;
- ✓ Ensuring energy supply adherent to reliable, secure and cost-effective principles





## Mitigation of CO<sub>2</sub> emission in energy sector





# THANK YOU

