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MALAYSIA'S EXPERIENCE

MR. LEE CHEE YOU
MS. IDZRIN IDZWANA ISMAIL

www.dosm.gov.my
@StatsMalaysia @DrUzirMahidin
@StatsMalaysia @Dr_Uzir

Malaysia @ a Glance

	2013	2014	2015	2016	2017
Area (km^2)	330,396	330,323	330,345	330,345	
Population (million)	30.21	30.71	31.19	31.63	32.05[e]
Average Annual Population Growth Rate (%)	2.4	1.6	1.5	1.4	1.3[e]
Gross Domestic Product (GDP)					
GDP at current prices (RM billion)	1,019	1,106	1,159	1,231	1,353
GDP at constant 2010 prices (RM billion)	955	1,012	1,064	1,109	1,174
GDP Growth (%)	4.7	6.0	5.1	4.2	5.9
GDP per capita at current prices (RM)	33,714	36,030	37,123[e]	38,887[p]	42,199[p]
Primary Energy Supply (ktoe)	**90,731**	**92,486**	**90,188**		
Natural Gas	*39,973*	*40,113*	*39,364*		
Crude Oil, Petroleum product & Others	*33,003*	*33,978*	*29,836*		
Coal & Coke	*15,067*	*15,357*	*17,406*		
Hydropower	*2,688*	*3,038*	*3,582*		
Final Energy Consumption (ktoe)	**51,584**	**52,209**	**51,806**		
Petroleum product & Others	*29,379*	*29,817*	*29,087*		
Electricity	*10,590*	*11,042*	*11,375*		
Natural Gas	*10,076*	*9,641*	*9,566*		
Coal and Coke	*1,539*	*1,709*	*1,778*		

Source: Department of Statistics, Malaysia
Energy Commission,

Energy Statistical Agencies

Energy Commission (EC)

- Custodian and focal point for Malaysia's energy data
- Regulating the energy sector particularly the electricity supply and piped gas distribution industries
- EC are responsible to give feedback by local and international parties related to energy data and statistics
- Data source: from various Ministry/Agency via **The Malaysia Energy Information Hub (MEIH) .** www.meih.st.gov.my
- Energy data compilation:
  - **National Energy Balance**
- *http://www.st.gov.my/*

Department of Statistics Malaysia (DOSM)

- DOSM collect data from primary/secondary sources relates to energy i.e:
  - coal, petroleum & petroleum products & natural gas
  - electricity, chilled water for air conditioning
  - biomass
  - imports/exports of energy commodity & products
- Energy data compilation
  - Malaysia SEEA PSUT Energy Account
  - Statistics Energy & Utility Malaysia 2015
- *https://www.dosm.gov.my/*

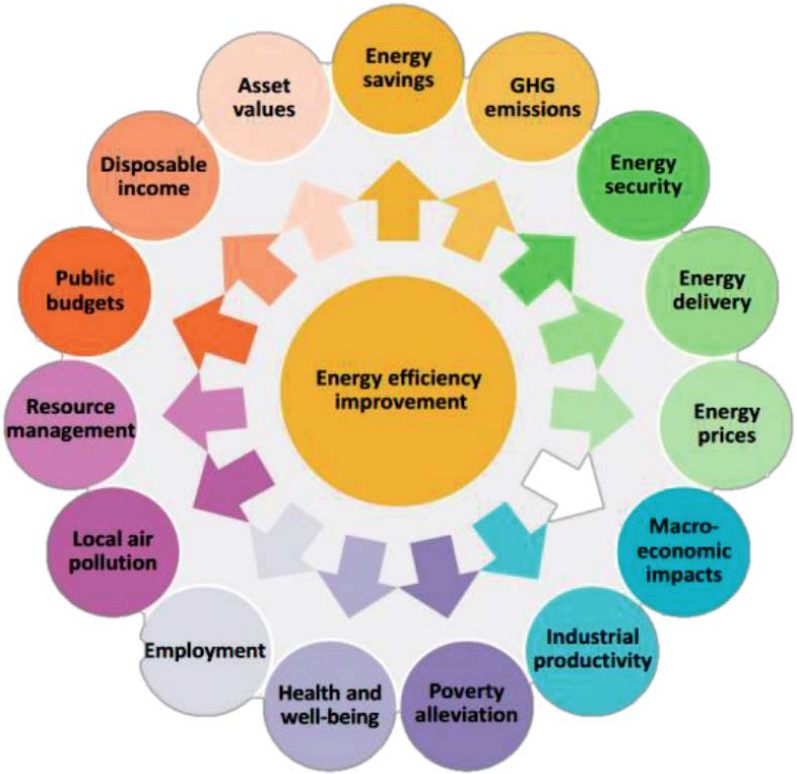
Sustainable Energy Development Authority of Malaysia (SEDA)

- SEDA has all the functions conferred on it under the Renewable Energy Act 2011, and any other sustainable energy laws
- *http://www.seda.gov.my/*

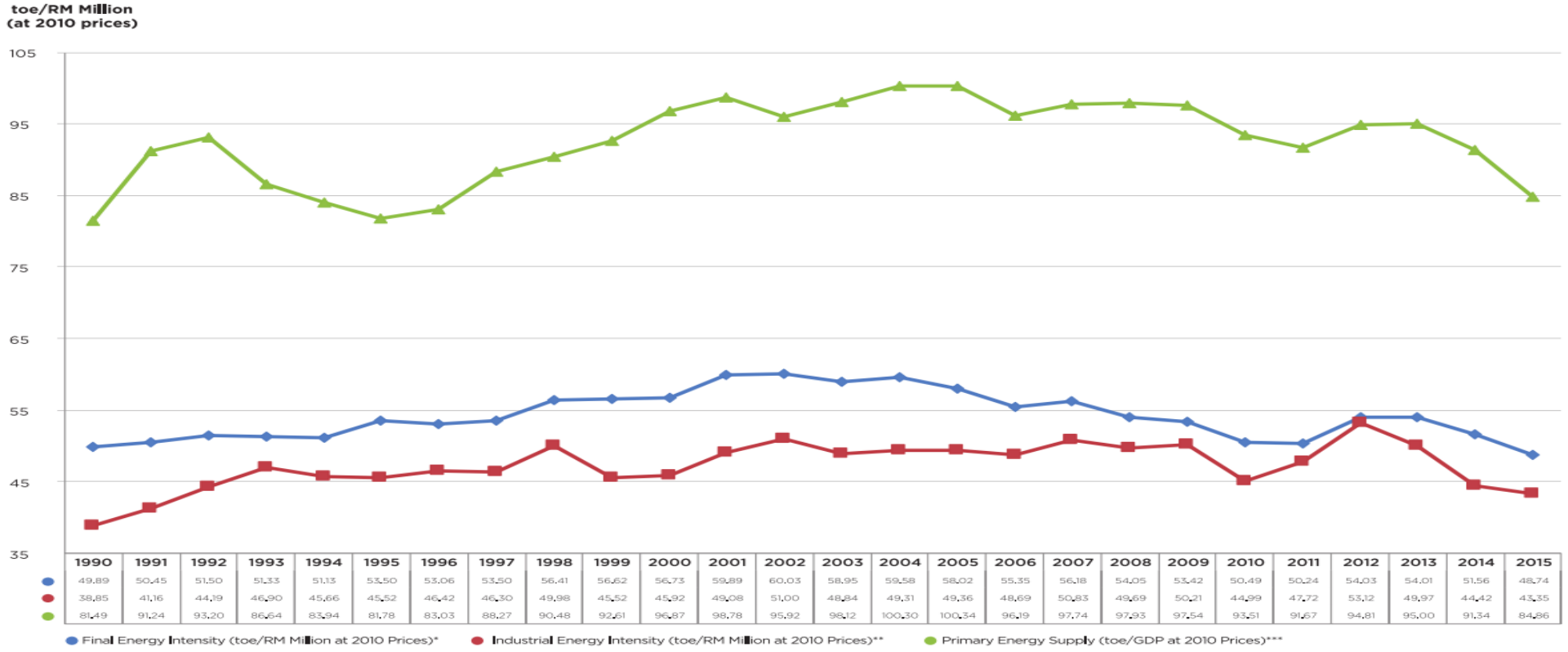
Energy Scenario in Malaysia

	2013	2014	2015
Reserves			
Oil (billion barrels)	5.850	5.792	5.907
Natural Gas (tscf)	98.320	100.662	100.413
Coal (million tonnes)	1,938.37	1,938.37	1,938.37
Production			
Oil (thousand barrels per day)	575.300	602.870	661.620
Natural Gas (MMscf/d)	6,730.54	6,592.63	6,472.71
Coal (metric tonnes)	2,893,962	2,687,764	2,559,444
Consumption			
Sales of Petroleum Products (thousand barrels)	229,559	236,761	224,726
Natural Gas (MMscf)	1,013,798	968,222	943,154
Coal (metric tonnes)	23,899,128	24,360,002	27,609,444

Source: EC



Primary & Final Energy Intensity in Malaysia

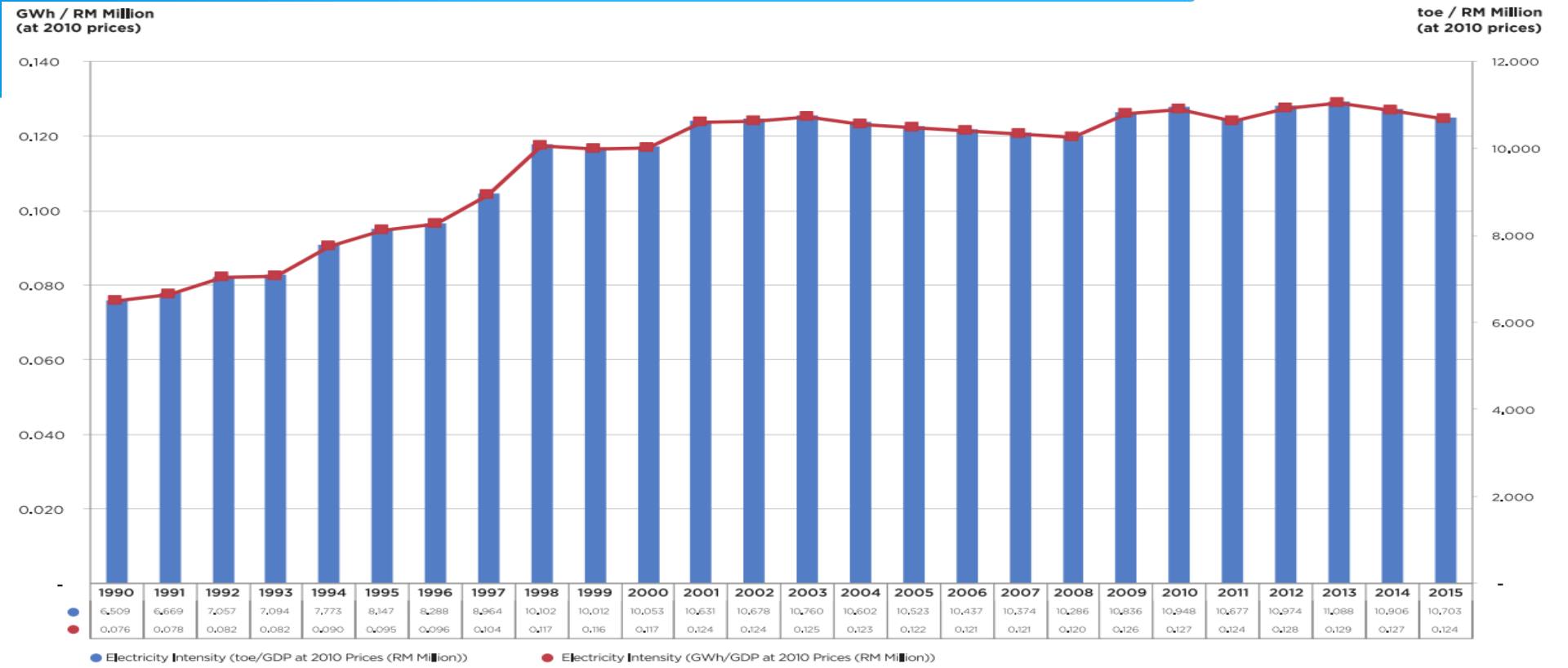


	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015
Final Energy Intensity (toe/RM Million at 2010 Prices)*	49.89	50.45	51.50	51.33	51.13	53.50	53.06	53.50	56.41	56.62	56.73	59.89	60.03	58.95	59.58	58.02	55.35	56.18	54.05	53.42	50.49	50.24	54.03	54.01	51.56	48.74
Industrial Energy Intensity (toe/RM Million at 2010 Prices)**	38.85	41.16	44.19	46.90	45.66	45.52	46.42	46.30	49.98	45.52	45.92	49.08	51.00	48.84	49.31	49.36	48.69	50.83	49.69	50.21	44.99	47.72	53.12	49.97	44.42	43.35
Primary Energy Supply (toe/GDP at 2010 Prices)***	81.49	91.24	93.20	86.64	83.94	81.78	83.03	88.27	90.48	92.61	96.87	98.78	95.92	98.12	100.30	100.34	96.19	97.74	97.93	97.54	93.51	91.67	94.81	95.00	91.34	84.86

Source: GDP data from Department of Statistics Malaysia

Note:
1. Measurement on ktoe is based on Energy Commission calculation
2. Intensity = Quantity of energy required per unit output or activity
3. (*): Final Energy Consumption (including non-energy use) / GDP at 2010 prices
4. (**): Industrial Energy Consumption / Industrial GDP at 2010 prices
5. (***) Primary Energy Supply / GDP at 2010 prices

Electricity Intensity in Malaysia



	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015
Electricity Intensity (toe/GDP at 2010 Prices (RM Million))	6.509	6.669	7.057	7.094	7.773	8.147	8.288	8.964	10.102	10.012	10.053	10.631	10.678	10.760	10.602	10.523	10.437	10.374	10.286	10.836	10.948	10.677	10.974	11.088	10.906	10.703
Electricity Intensity (GWh/GDP at 2010 Prices (RM Million))	0.076	0.078	0.082	0.082	0.090	0.095	0.096	0.104	0.117	0.116	0.117	0.124	0.124	0.125	0.123	0.122	0.121	0.121	0.120	0.126	0.127	0.124	0.128	0.129	0.127	0.124

Sources: 1. *GDP data from Department of Statistics Malaysia*
2. *TNB, SESB, SEB and IPPs*

Note: 1. *Measurement on ktoe is based on Energy Commission calculation*
2. *Intensity = Quantity of energy required per unit output or activity*
3. *(*): Electricity Intensity (toe/RM Million GDP at 2010 prices)*
4. *(**): Electricity Intensity (GWh/RM Million GDP at 2010 prices)*

Government Commitment

Prime Minister of Malaysia

15th Conference of Parties (COP-15)
17 Dec 2009

ACTS, REGULATIONS & MASTER PLANS

- ✓ Electricity Supply Act 1990
- ✓ Energy Commission Act 2001
- ✓ Efficient Management of Electrical Energy Regulation (EMEER) 2008
- ✓ National Renewable Energy Policy and Action Plan (2009)
- ✓ Renewable Energy Act 2011
- ✓ Sustainable Energy Development Authority Act 2011
- ✓ Minimum Energy Performance Standard (MEPS)
- ✓ National Energy Efficiency Action Plan (NEEAP) 2016-2025
- ✓ Energy Efficiency Program under 11th National Plan 2016-2020
- ✓ Building Code on Energy Efficiency: Section 38 of the Uniform Building by Laws (UBBL)

Programs

Year	Program	Year	Program
1996-2000	Energy efficiency promotion in the Seventh Malaysia Plan	2011	Competitive bidding for new generation capacity plant-ups
1999	UNDP-GEF Malaysian Industrial Efficiency Improvement Programme (MIEEP)		UNDP-GEF Building Sector Energy Efficiency Project (BSEEP)
2001	Fiscal incentives for EE	2012	MS 1525 provisions in Uniform Building By-Laws
	Development of Malaysian Standard MS 1525	2013	Minimum energy performance standards (MEPS) regulations
2002	DANIDA Capacity building on EE and DSM for key institutions		Minimum energy performance standards (MEPS) regulations
	Energy audit on government buildings		UNIDO-GEF industrial energy efficiency project
	EE and RE in education curriculum and university courses		Energy Performance Contracting (EPC) for government buildings
2004	Energy efficient building demonstration projects	2014	Incentive-based tariff regulation
2006	Development of EE guidelines for Malaysian industries		5% energy reduction target for government buildings
2008	Efficient Management Of Electrical Energy Regulations	2016-2020	Energy audit & energy management in industrial sector
2009	Green Building Index (GBI)		Energy audit, energy management and retrofit program in government sector
	EE rating and labelling of equipment		Energy audit 7 management in commercial sector
2010	Green Technology Financing Scheme	*Note*	*KeTTHA, EC, SEDA*

Fiscal And Financial Incentives for Energy Efficiency

Companies Providing Energy Conservation Services

- ✓ Pioneer Status or
- ✓ Investment Tax Allowance

Companies Incurring CAPEX For Conserving Energy For Own Consumption

- ✓ Investment Tax Allowance or
- ✓ Import duty and sales tax exemption

Owners Of Buildings Awarded With The GBI Certificate

- ✓ Tax exemption equivalent to 100% of the additional
- ✓ capital expenditure incurred to obtain the GBI Certificate

Note: KeTTHA, EC, SEDA

Energy Efficiency Fiscal Incentives

Local Manufacturer

- **Sales Tax Exemption for 5 Star Rated Products**

Note: KeTTHA, EC, SEDA

Importer

- **Duty Import Exemption for energy efficient products which are not available in the local market**

Industry player & ESCO

- **Investment Tax Allowance or Pioneer Status for companies embarking on energy conservation or energy efficiency projects**

Incentive-based Regulation (IBR) of Electricity Tariff

IBR is a mechanism or framework for setting electricity tariff with built-in incentives to improve efficiency without sacrificing quality of service

Main Features of IBR

- Structured tariff regulatory process:
  - Regulatory period from 2014 – 2017
  - Establishment of regulatory accounts and reporting mechanism
- Separation of accounts of TNB business units
- Determination of reasonable return to TNB (WACC of 7.5%)
- Imbalance cost pass-through mechanism for uncontrollable costs (changes in forecast vs. actual cost of generation)
- Setting of performance targets with incentive/penalty mechanism by regulator
- Efficiency sharing between TNB and consumers in the next tariff review

Building blocks to establish revenue requirement

Aggregate Revenue Requirement = WACC (Return) x *Regulated asset base* (RAB) *Return on Assets* + OPEX + Depreciation + Tax + Efficiency carryover amount

Additional building block for calculating revenue requirement for the second regulatory period

Note: KeTTHA, EC, SEDA

Program - Energy Efficiency Buildings

Low Energy Office LEO

- 1st showcase model completed in 2004 (GBI-Silver)
- demonstrate the feasibility of EE design standards as implied in MS1525 :2001 Code of Practice on EE & Use of RE for Non-Residential Buildings
- Building Energy Index – **100 kWh/m² annually**
- **CO2 reduction 56%**

Green Energy Office GEO

- 1st certified green building in Malaysia (GBI-Certified).
- Demonstrate advance EE and RE design for commercial building- 2007
- Building Energy Index - **65kWh/m² annually**
- Solar Energy - 35kWh generated
- **CO2 reduction 86%.**

Diamond Building

- Improved from both LEO & GEO building experience.
- Platinum certificate, from Malaysia's Green Building Index (GBI) and Singapore's Green Mark.
- Building Energy Index- **85 kWh/m² annually**

Note: KeTTHA, EC, SEDA

Program - Labeling & Rating

- 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)

Note: KeTTHA, EC, SEDA

- Refrigerators
- Wall mounted split unit air conditioners
- Domestic fans (standing, ceiling, table)
- Television

The list is available at **www.st.gov.my**

Sustainability Achieved Via Energy Efficiency (SAVE)

Type of Appliances		Fridges	Air - Conditioners	Chillers
				
Allocation	Target # of Units	100,000 units	65,000 units	72,000RT
	Offered Rebates Per Unit	RM200	RM100	RM200
	Total Budget	RM20mil	RM6.5mil	RM14.4mil
Savings[1]	Energy	24.9GWh	48.75GWh	53.6GWh
	Cost	RM5.4mil	RM10.6mil	RM16.8mil
	CO_2 (tons/year)	17,181	33,638	36,992
	Estimated Lifetime Savings[2]	RM38mil	RM74.4mil	RM252mil

Energy Efficient 5 Cekap Tenaga

SAVE Program

Expected Total Energy Savings[2] : 1,319.6GWh (equivalent to RM364.2mil)

[1] Target energy and cost savings at current tariff rate

[2] Lifetime saving for fridge and air conditioner in 7 years; for chillers in 15 years

Note: KeTTHA, EC, SEDA

National Energy Efficiency Action Plan (NEEAP)

52,233 GWh (3.8%) savings

CO_2 reduction :37,702 $ktCO_{2eq}$

NATIONAL ENERGY EFFICIENCY ACTION PLAN (NEEAP) 2016-2025

Strategic Thrust 1 :
Implementation of Energy Efficiency Plan

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

Strategic Thrust 3 :
Establishment of Sustainable Funding Mechanisms To Implement Energy Efficiency Initiatives

Strategic Thrust 4 :
Promotion of Private Sector Investment in Energy Efficiency Initiatives

NEEAP KEY INITIATIVES

Equipment Programme Initiative	Industrial Programme Initiative	Buildings Programme Initiative
1. Promotion of 5-Star Rated Appliances	1. Energy Audits and Energy Management in Industries	1. Energy Audits and Energy Management in Buildings
2. Minimum Energy Performance Standards (MEPS	2. Promotion of Co-generation	2. Energy Efficient Building Design

Source: Ministry of Energy, Green Technology and Water (KeTTHA),

Summary of Estimated Saving for Energy Efficiency Program under the 11th Malaysia Plan

No	Energy Efficiency Program		Estimate Energy Saving (kWh) for a period of RMK-11 (2016 - 2020)	Estimate Cost Saving (RM) for a period of RMK-11 (2016 - 2020)*
1	Industry (Conditional Energy Audit Grant)		2,620,800,000.00	947,419,200.00
2	Commercial (Conditional Energy Audit Grant)		628,800,000.00	301,320,960.00
3	Energy Audit, Management & Retrofit for Government facilities	Government Office Buildings	4,497,030.96	2,154,977.24
		Government Hospital	13,638,898.88	6,535,760.34
TOTAL			3,267,735,929.84	1,257,430,897.58

Source: KeTTHA

* Based on current tariff

Net Energy Metering (NEM) Program

- Commencing 1st November 2016 until 2020 with 100MW capacity limit a year in Peninsular Malaysia and Sabah.
- The NEM is a solar photovoltaic (PV) programme
- This is to complement the current Feed-in Tariff (FiT) mechanism and encourage the deployment of renewable energy (RE).
- Sustainable Energy Development Authority (SEDA) Malaysia is the agency responsible to the implementation of NEM.
- As the world wide cost of solar PV system continues to fall significantly each year, the energy consumer can benefit by generating their own energy using solar PV via net metering scheme.

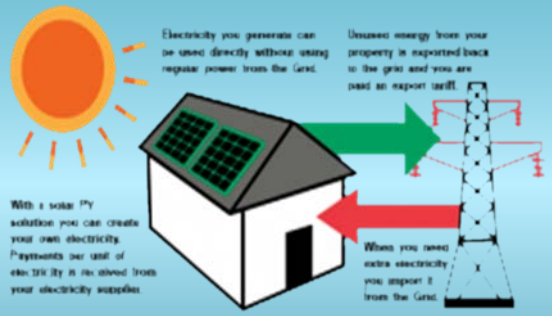
Benefits

- ❖ Encourage consumers to play an active role in renewable energy generation, which addresses climate agenda and national energy security
- ❖ Reduction in greenhouse gas emissions
- ❖ Hedge against any possibility of future electricity tariff increase
- ❖ Availability of power for consumer during grid failure (if energy storage system is incorporated)

Feed-in Tariff (FiT)

- A mechanism that allows electricity that is produced from indigenous RE resources to be sold to power utilities at a fixed premium price and for specific duration.

- Provides a conducive and secured investment environment which will make financial institutions to be comfortable in providing loan with longer period (>15 years).
  - Provides fixed revenue stream for installed system
  - Only pays for electricity produced: promotes system owner to install good quality and maintain the system
  - With suitable degression rate, manufacturers and installers are promoted to reduce prices while enhancing quality



Annual Power Generation (MWh) of Commissioned RE Installations

RE Generation

Year	Biogas	Biogas (Landfill / Agri Waste)	Biomass	Biomass (Solid Waste)	Small Hydro	Solar PV	Total Generation
2016	12,709	62,033	155,428	36,752	47,798	307,141	621,861
2015	16,989	41,122	192,372	18,090	55,406	262,822	586,802
2014	19,772	31,844	226,196	4,348	64,550	181,955	528,665
2013	12,963	9,804	209,408	11,144	79,082	50,661	373,062
2012	98	7,465	101,310	3,235	25,630	4,720	142,458

Source: SEDA

CO^2 Avoidance

Year	Biogas	Biogas (Landfill / Agri Waste)	Biomass	Biomass (Solid Waste)	Small Hydro	Solar PV	CO^2 Avoidance (tonne)
2016	43,146	107,924	633,369	50,762	188,068	558,783	1,582,052
2015	34,377	65,121	526,124	25,404	155,087	346,856	1,152,968
2014	22,655	36,746	393,387	12,921	116,857	165,509	748,075
2013	9,012	14,774	237,312	9,921	72,317	39,960	383,296
2012	68	8,009	92,820	2,232	17,751	5,004	125,883

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