

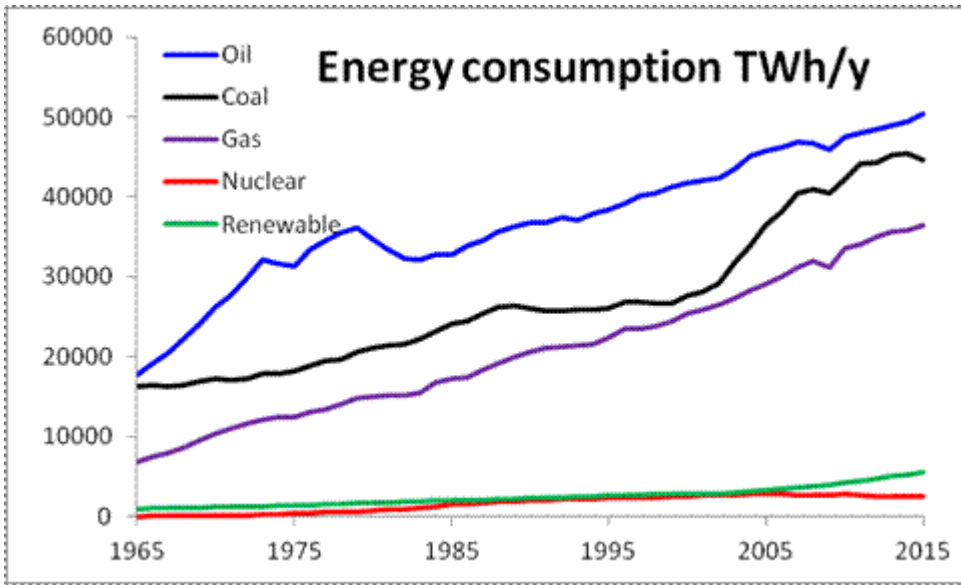
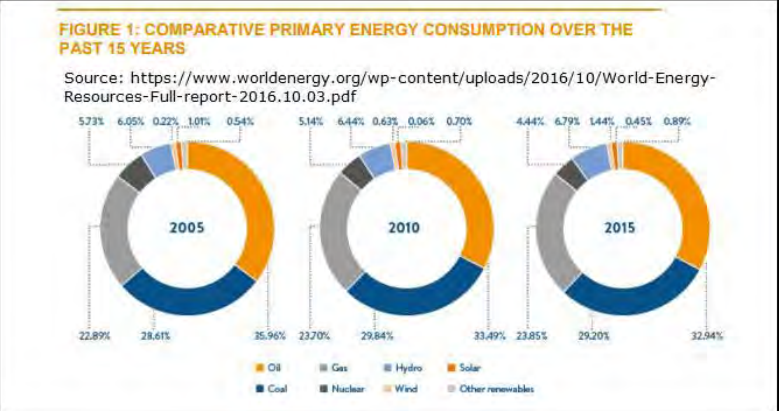
Renewable Energy: Is Malaysia Doing Enough?

Agenda

- Introduction: Present Energy Resources, Sustainability & Climate Change
- What is Renewable Energy?
- What are the current and projected global & regional energy trends?
- Types of Renewable Energy
- What is our Malaysian Government Doing so far?
- Conclusion

Introduction: Present Energy Resources

How are
global energy
needs
supplied?



The top 3 (Oil, Coal & Gas) are Fossil Fuels and Non-Renewable. These will be depleted in the near future. Number 4 Nuclear is arguably controversial and **"Dangerous"**. **Renewable is the way forward** but is way short of its desired levels of development & consumption.

Source: BP: Statistical Review of World Energy, Workbook (xlsx), London, 2016

Present Energy Resources

- Fossil fuels - coal, oil, gas are all of limited amounts and cannot be replaced. Will be depleted in the foreseeable future.
- Nuclear fuels – **considered “Controversial” and “Dangerous”**, there are limited amounts of uranium for nuclear fission reactors, nuclear wastes disposal is problematic. Nuclear accidents in the past, most recently in Japan, is deterring its development.
- Difficult to estimate how long the above fuels will last - but they are not sustainable economically or environmentally.

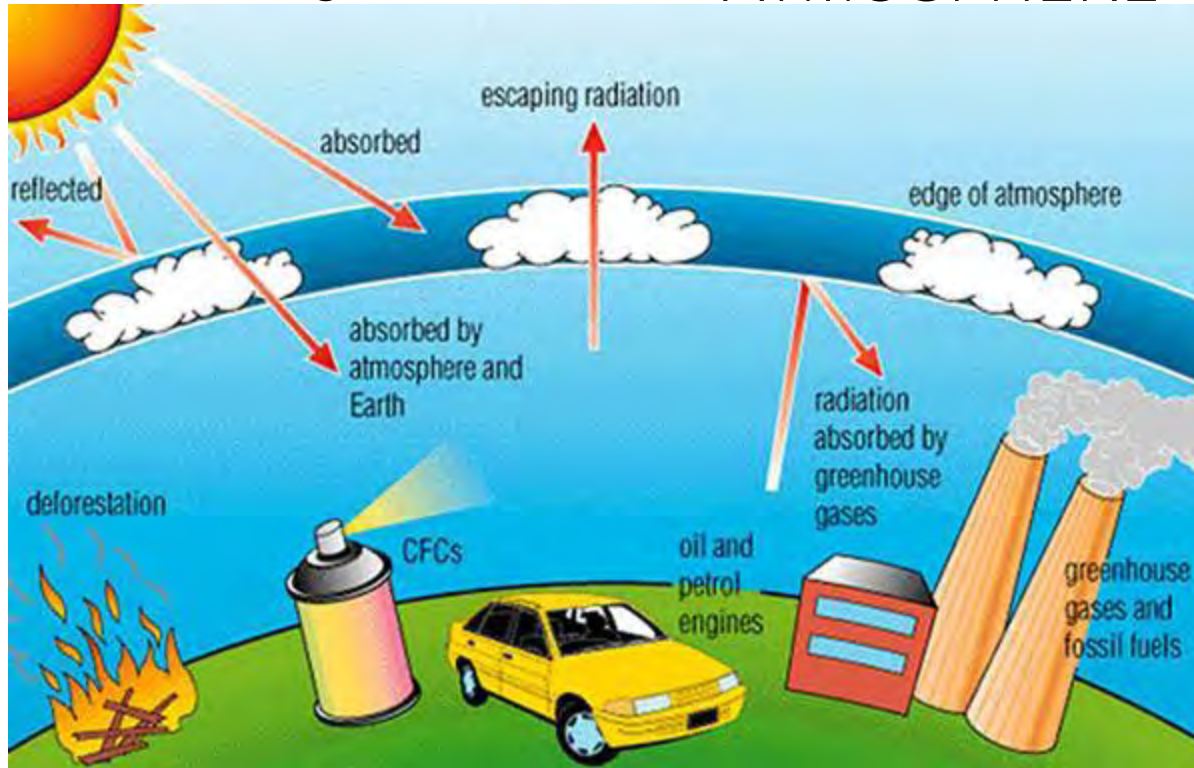
Fossil fuel	Time left
Oil	50 years
Natural gas	70 years
Coal	250 years

ENERGY USE & CLIMATE CHANGE

- According to climate scientists worldwide, especially those from the Intergovernmental Panel for Climate Change (IPCC), climate change is real and is largely caused by anthropogenic activities. What is more alarming is that it is happening now (not in 50 years time) and has reached an irreversible point now (2017).
- Climate change is now seen in proofs of rapidly increasing temperatures worldwide, extensive melting of ice caps on both spatial and temporal levels, and contributing to the world's rising sea levels (which is expected to flood many coastal cities).
- Global warming is the increase of Carbon Dioxide in the atmosphere. CO₂ traps solar energy (in the form of heat energy) from the Sun during the day and stops terrestrial energy from the Earth from escaping to space at **night. So, there is a "Double Whammy" of sorts resulting in high** temperatures. Much of CO₂ is caused by humans using of fossil fuels.
- The transportation sector is said to be the main contributor of CO₂ (and other Greenhouse gases – a greenhouse gas is one that absorbs a lot of solar energy much like CO₂). Humans demand for energy is not only limited to the transportation sector, but also in the homes, offices, huge buildings like the Petronas Twin Towers, aeroplanes, ships, buses, trains etc. Humans reliance on fossil fuels is to be blamed for global warming. **Fossil fuels are not renewable energy, but can be classified as "Non-renewable Polluting Energy"! Hence, we need renewable energy to replace fossil fuels if we are to address climate change and global warming.**

Warning - According to International Energy Agency (IEA), in order to keep the world below an average 2°C temperature increase (which has catastrophic consequences), we need to leave 80% of all fossil fuels in the ground.

USE OF ENERGY (MOSTLY FOSSIL FUELS) RELEASES GREENHOUSE GASES THAT ABSORBS SUNLIGHT DURING DAYTIME & PREVENTS RELEASE OF TERRESTRIAL RADIATION AT NIGHT, LEADING TO WARMING OF THE ATMOSPHERE



MAJOR SECTORS EMITTING GHGs:

Energy

- Electricity & heat (24.9%)
- Industry (14.7%)
- Transportation (14.3%)
- Other fuel combustion (8.6%)
- Fugitive emissions (4%)

Agriculture (13.8%)

Land use change (12.2%)

Industrial processes (4.3%)

Waste (3.2%)

Definition of Renewable Energy Resources

Renewable Energy Sources: Fuels that can be easily made or "renewed." We can never use up renewable fuels. Types of renewable fuels are hydropower (water), solar, wind, geothermal, and biomass.

Is Renewable Energy Sustainable?

- Renewable energy is sustainable as the sources are natural and what is used can be replenished
- If Renewable energy resources are being replaced / generated at the same rate that they are being utilised, it will be sustainable
- The best thing about Renewable Energy is that they will last indefinitely.
- Unfortunately, global energy use currently not sustainable since 78 % of the energy is non-renewable. Only 22 % of energy use worldwide is Renewable Energy!

Renewable Energy

- What is renewable energy?
- What forms does it take?
- Why is it needed?
- Targets exist for renewable energy to generate 10% of electricity by 2010 and 20% by 2020!
- Can these be achieved?
- What forms of renewable energy will deliver these targets?

A Common List of Renewable Energy Resources

Wind, Wave and Hydro Power

Photovoltaics Active Solar Heating

Municipal and General Wastes

Landfill Gas Geothermal

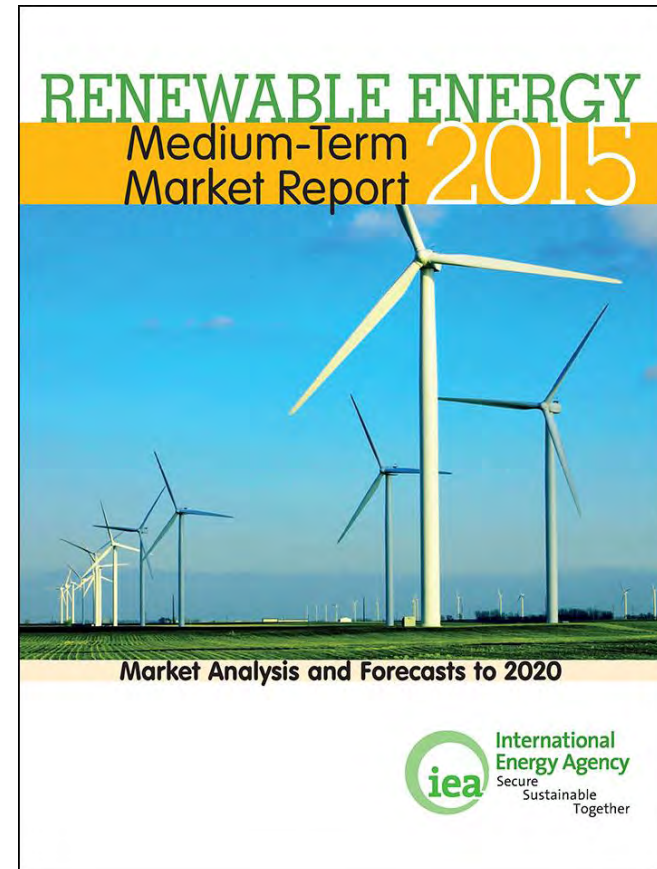
Agricultural and Forestry Wastes

Energy Crops Fuel Cells

According to the International Energy Agency



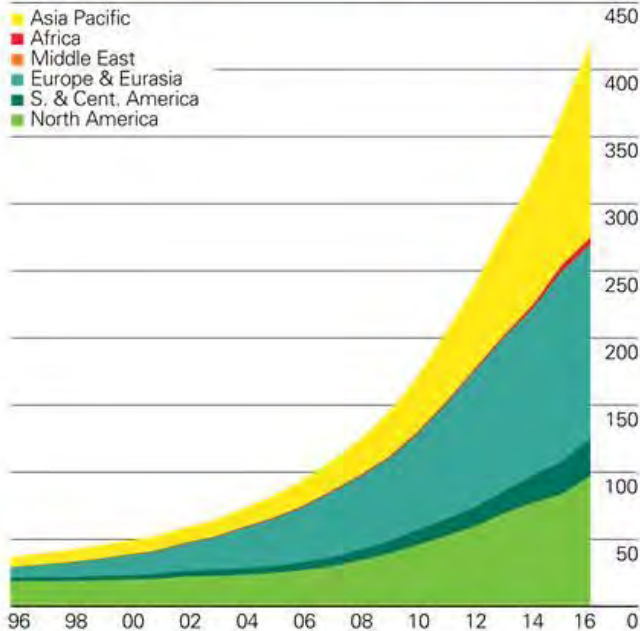
- In 2012, the world relied on renewable sources for around 13.2% of its total primary energy supply.
- In 2013 renewables accounted for almost 22% of global electricity generation
- The IEA [Medium-Term Renewable Energy Report 2015](#) foresees that share reaching at least 26% increase in 2020.



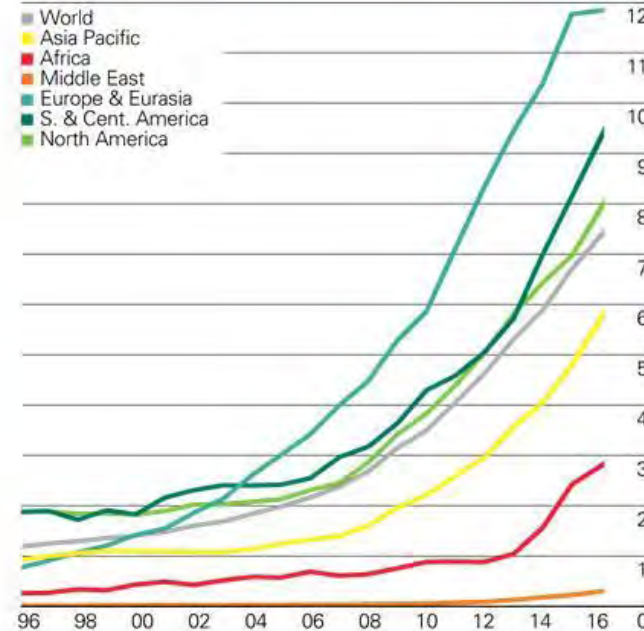
Renewable energy consumption/share of power by region



Other renewables consumption by region
Million tonnes oil equivalent



Other renewables share of power generation by region
Percentage



IT CAN BE SEEN THAT EUROPE & EURASIA LEADS THE USE OF RENEWABLE ENERGY IN THE WORLD, BUT THE MAXIMUM ACHIEVED IS 12 % OF TOTAL ENERGY CONSUMPTION

BP Statistical Review of World Energy 2017
© BP p.l.c. 2017

<http://www.bp.com/en/global/corporate/energy-economics/statistical-review-of-world-energy/renewable-energy.html>

Forms of Renewable Energy

- All sources of energy ultimately come from the sun.
- This is particularly obvious in the case of renewable energies.



Solar Radiation

- solar heating panels/passive
- solar power generation
- solar cells / photovoltaic cells

Solar cells

- convert light into a small electrical output - milliwatts output.
- need a bank/array of cells for useful output.
- cost of cells is high but reducing.
- efficiency of cells is up to 23%/ improving.

Solar Panels

- are situated on roof of building.
- absorb heat in the form of radiation from sun.
- basically system is like a domestic central heating radiator painted black/insulated.
- **provides “topping up” of domestic hot water.**

Photovoltaics on Buildings

- PV arrays, generating around 54kW (peak) with a total area of 430m², form the sloping glazed roofs of the atrium spaces in the four main buildings.
- Ove Arup has designed the system to match the annual electricity demand of the supply and extractor fans, effectively providing zero-energy ventilation systems.



Solar Roof tiles

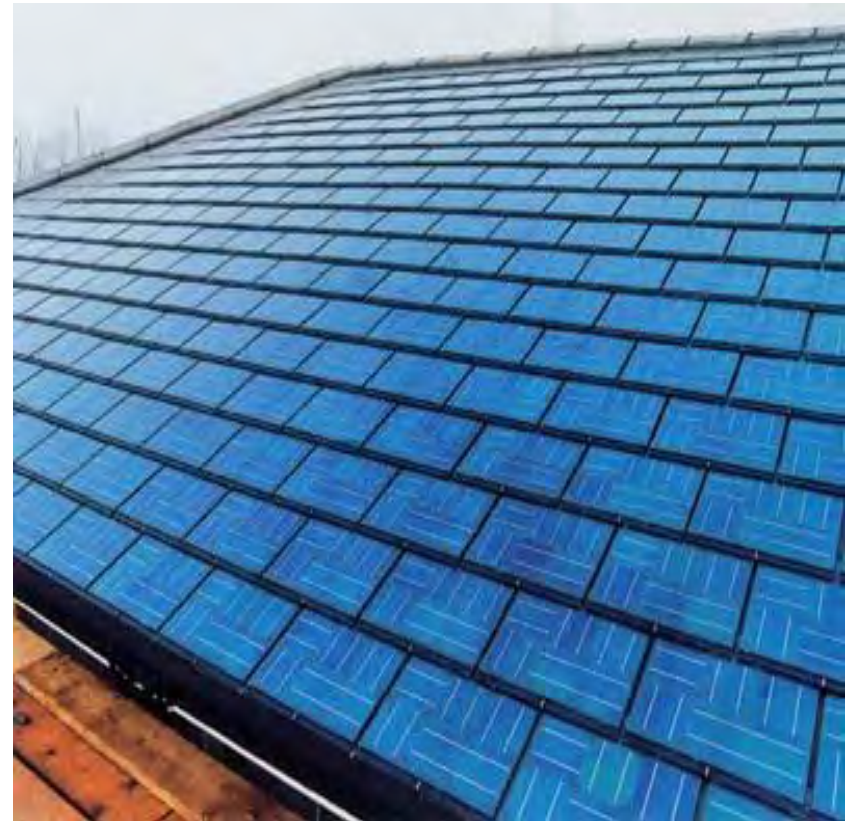
(Solar Grants now available)



Roof mounted solar panels (Solar century)



Integrated solar tiles installed by Solar Century on a current development in Milton Keynes by English partnership and Bloor homes



Innovative SunSlates installation by Solar century for Liang Homes

Solar Power Generation

- located in desert/high intensity/long sunlight hours
- **parabolic mirrors reflect/focus sun's rays onto** metal water pipe located along focal axis of mirrors.
- High temperature produced - steam - electrical power generated

Wind Turbines



Windpower

- Each windturbine can produce between 1/4 and 2 MW of electrical power.
- Windfarm needs to be located where there is a relatively high average wind speed.
- Advantages?
- Disadvantages?



Calculation of number of households supplied by a windfarm

- Assume 24 windturbines each generating 0.25 MW for 70% of time.
- In a year this amounts to 3.66×10^7 kwhr.
- If this figure is divided by average amount of electricity used by a consumer ie 10,607 kwhr in a year,
- Answer is 3600 consumers.
- But 166 of these wind farms = 1000Mw power station!

Offshore Wind Turbines



Hydroelectric

- Currently largest source of electricity from renewables.
- Needs guaranteed supply of water.
- Galloway-West of Scotland - series of lochs and rivers-cascade of flowing water.
- Kinetic energy of water rotates turbines which generate electricity.

Tidal Power

- Located at some coastal sites - usually estuaries and bays with large tidal range.
- Shape of coastal site above and below sea level determines range eg Bay of Fundy, Severn.
- At high tide reservoir of water is created which is allowed to ebb through turbines located in dam.
- Expensive construction.

Wave Power



Land Installed
Marine Powered
Energy
Transformer on
Islay, West Coast
of Scotland.

Wavegen Co.

LIMPET provides 500kW of electricity
for the National Grid

Three floating wave power
stations at Lewis/1 MW each

Biomass/Biofuel

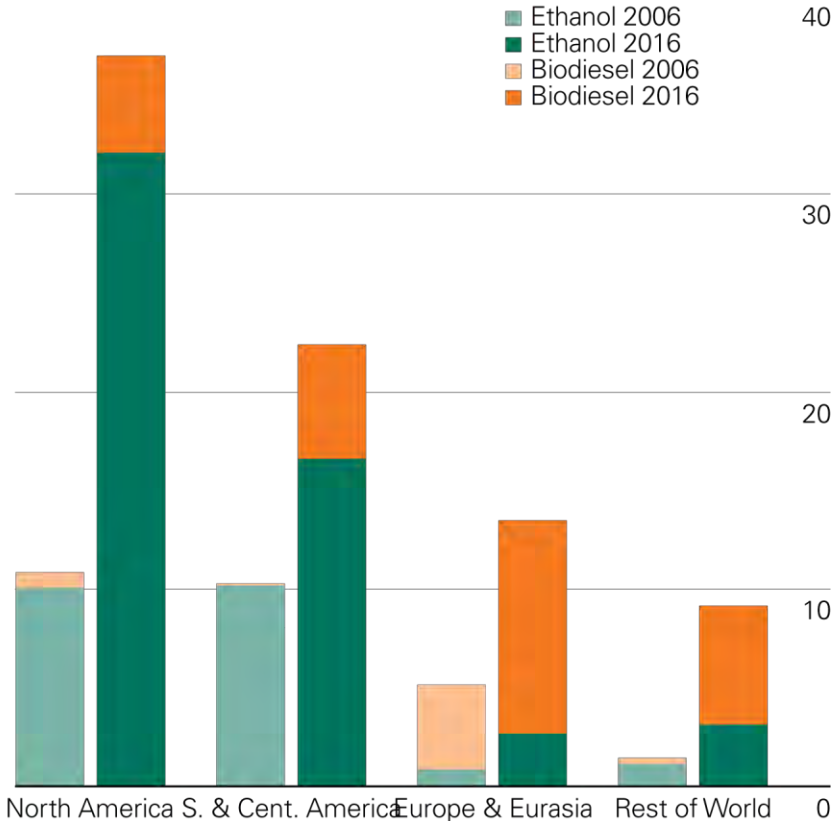
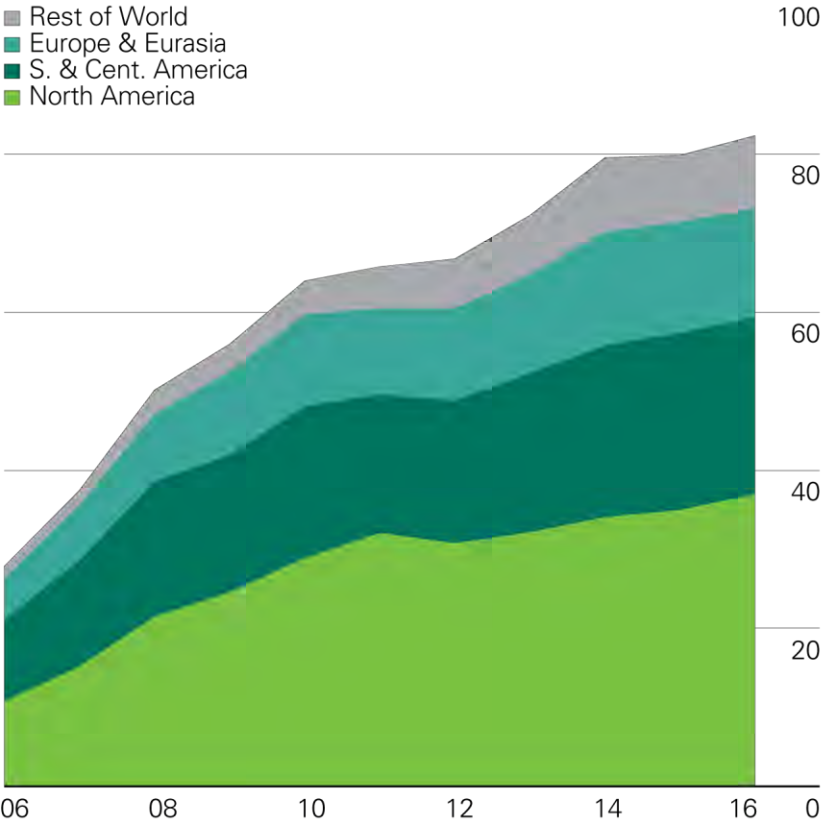
- cycle of sunlight - photosynthesis - plant growth - absorption of CO_2 - emission of O_2 .
- combustion of wood - heat
- some plants – alcohol (Brazil uses sugar cane to produce ethanol. It is the world's 2nd largest producer of ethanol fuel [a biofuel]. Brazil and the United States lead the industrial production of ethanol fuel, together accounting for 83.4 % of the world's production).
- Oil palm – a potentially good biofuel in Malaysia as the country is one of the largest producers in the world.



Biofuels production by region

Million tonnes oil equivalent

World biofuels production



Woodburning Electricity Generation



ARBRE is the first commercial wood-burning plant of its type in Europe.

It produces enough electricity for 33,000 people from clean and sustainable wood fuel sources.

The plant has a 10MW electricity generating capacity and 8MW is exported to the local grid.

The fuel for the plant is wood chips from forestry and short rotation coppice.

Coppice harvesting



First Renewables
Ltd

Short rotation coppice harvesting for ARBRE wood-fuelled power station. As trees grow they store energy from the sun in their biomass. **At ARBRE's power plant the energy stored in the biomass is converted to electricity.**

Straw Burning Power Plant



Lorry leaving
plant after
delivering straw

- Elean Power station near Ely, Cambridgeshire generates 36MW of electricity and is the worlds largest such facility. It supplies 80,000 homes with electricity.

Biomass Plant in Fife



Plant burns poultry litter and produces 10MW of electricity and fertiliser



Fluidised bed boiler ensures efficient burning and low emissions

Landfill Gas



1MW generator at
Buckden- Biogas
Association



- Landfill gas, Dorset

Government Commitment

MALAYSIA'S RENEWABLE ENERGY COMMITMENT

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

YAB Dato' Sri Mohd Najib Tun Abdul Razak
Prime Minister of Malaysia

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



Renewable Energy Development in Malaysia

8th Malaysia Plan (2001 – 2005)

- RE as the 5th fuel
- 5% RE in energy mix

9th Malaysia Plan (2006 – 2010)

- **Targeted RE capacity to be connected to power utility grid:**
 - 300 MW - Peninsular Malaysia;
 - 50 MW - Sabah
- **Targeted power generation mix:**
 - 56% natural gas, 36% coal, 6% hydro, 0.2% oil, 1.8% Renewable Energy
- **Carbon intensity reduction target: 40% lower than 2005 levels by 2020**

RE as of 31 Dec. 2013

- Connected to the utility grid (as of 2013): 149.78 MW
- Off-grid: >430MW (private palm oil millers and solar hybrid)

Source: KeTTHA

Malaysian National RE Policy and Action Plan 2010

Strategic Thrusts

Strategic Thrusts of the National RE Policy & Action Plan

Strategic Thrust 1

Introduce **Legal and Regulatory Framework**



Strategic Thrust 2

Provide **Conducive Business Environment** for RE



Strategic Thrust 3

Intensify **Human Capital Development**



Strategic Thrust 4

Enhance RE **Research & Development**



Strategic Thrust 5

Create **Public Awareness & RE Policy Advocacy Programs**



Malaysian National RE Policy and Action Plan 2010

- Objectives:

- a) To increase RE contribution in the national power generation mix;
- b) To facilitate the growth of the RE industry;
- c) To ensure reasonable RE generation costs;
- d) To conserve the environment for future generation; and
- e) To enhance awareness on the role and importance of RE.

What is our Malaysian Government Doing so far?

- The National Renewable Energy Policy and Action Plan has been in place since 2011. Malaysia aims for a total of 11% of our energy sources to be from renewable sources by 2020. This has been **achieved as in 2017, the country's RE usage was already 22 %**.
- The Renewable Energy Act 2011 was passed by Malaysia's Parliament, paving the way to establish and implement a special tariff system to ensure that the development of that energy sector is well governed from the start. It provides for a Feed-in Tariff (FiT) System regulated by the Sustainable Energy Development Authority of Malaysia (SEDA) to provide strong regulatory support to ensure renewable energy produced in this sector is purchased, distributed and utilised effectively.
- Malaysia is still a developing country and should not be compared to developed countries who are major powerhouses.
- Considerable progress has been made in Malaysia when it comes to renewable energy, but there are some implementation of clean energy.



- Way back in 2010, our New Economic Model already shows that the government wants the nation to be able to take a leadership role in the implementation of renewable energy. Amongst ASEAN countries, Malaysia is consider a leader.
- A BMI Research in February 2017 places Malaysia among the top three countries **for renewal energy investment. BMI's "Asia Renewables RRI: Investment Opportunities" report published in early 2017 lists Malaysia, Singapore and Australia as the best countries such investments.**
- **Malaysia's Renewables Sector is gaining momentum following the country's National Renewable Energy Policy and Action Plan and the government's feed-in tariff scheme.** These supportive energy policy, alongside relatively good access to finance and well-**developed grid infrastructure results in Malaysia's risks profile outperforming the regional average as well," BMI's report states.**
- Both Federal Government and State Governments and private corporations play their roles in in moving the country towards its renewable energy goals.
- For example, the Sabah State Government has rejected plans for a new coal fired power plant in 2010 but opted for the country's first geothermal power plant to be developed in Apas Kiri, Tawau in August 2016.
- Private Corporations like the Berjaya group, who had funded plenty of renewable energy projects in the past, and will continue to do so in the future.
- FELDA also is one of the main proponents of Biomass energy, which counts as one of our biggest contributors to sustainable energy growth.
- Malaysia has all the legislation, policies and incentives in place for renewable energy. But the government needs to convince Private Companies/Factories to make the jump to renewables.

Showcase Energy-Efficient 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**

Conclusions

- Fossil Fuels cannot be relied on as they are non-renewable, will be depleted in the near future and are environmentally damaging
- Nuclear energy is also not favourable due to its controversial and dangerous nature.
- Malaysia has already achieved 22% of renewable energy usage amongst its energy sources in 2017. It should go further to 30% by 2030
- Biodiesel has great potentials in Malaysia as the country is one of the largest oil palm producers in the world
- Wind Energy is limited as the country does not have strong enough winds. Offshore and Onshore windfarms/clusters
- Biomass/wood (rainforests), straw (padi), etc also has potential
- Solar Energy has great potentials as the country has sunlight 12 hours a day 365 days a year. The Ministry of Energy, Green Technology and Water (KeTTHA) has targeted to produce 2,500 megawatts (MW) or 10 % of its electricity requirements from Solar Energy by 2020.
- Geothermal Energy also has great potentials in Malaysia.

To Reduce its Carbon Footprint, Malaysia also needs to improve Energy Efficiency

- Implement National Energy Efficiency Action Plan (NEEAP)
- Energy audit and Retrofit in Government Buildings in 2014
- A 5% saving for electricity bill for all Government agencies

THANK YOU