Pusat Tenaga Malaysia

Sustainable Energy Development

Malaysian Financial Mechanisms for Renewable Energy (RE) & Future Direction

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Malaysia

- Population: 27.7 million (2008) (Malay, Chinese, Indian, others)
- Land size: 330,000 km2
- GNI per capita: US$7,479 (GDP: 6% - 0.1%)
- Maximum electricity demand:
  - 13.8 GW (2005)
  - 20 GW (2010)
- Installed electricity capacity:
  - 19.2 GW (2005)
  - 25.3 GW (2010)
- Electricity generation mix:
  - 2005: 70% NG; 22% coal; 6% hydro; 2% oil
  - 2010: 56% NG; 36% coal; 6% hydro; 0.2% oil; **1.8% RE**

Malaysian Electricity Supply Industry

Cabinet

Ministry of Energy, Water & Communications (MEWC)

Economic Planning Unit (EPU)
Prime Minister's Department

Ministry of Finance

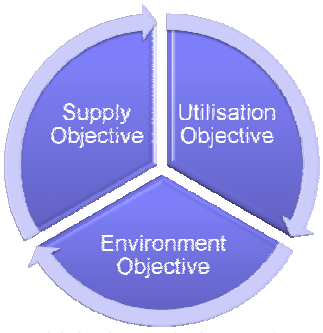
Malaysia Energy Centre (PTM)

Energy Commission (ST)

Tenaga Nasional Berhad (TNB)
Sabah Electricity Sdn Bhd (SESB)
Sarawak Energy Berhad (SEB)
Independent Power Producers (IPPs)
Co-generators

Malaysia Energy Policy

To ensure provision of adequate, secure and cost-effective energy supplies by developing indigenous energy resources , both non-renewable and renewable, using the least-cost options and diversifying supply resources within and outside the economy



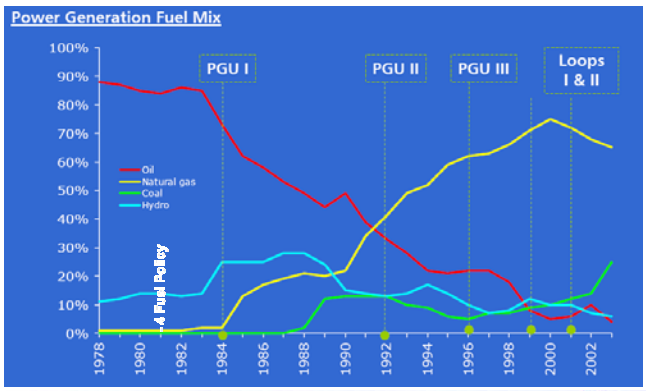
To promote the efficient utilisation of energy and the elimination of wasteful non-productive patterns of energy consumption

To minimise the negative impacts of energy production, transportation, conversion, utilisation and consumption on the environment

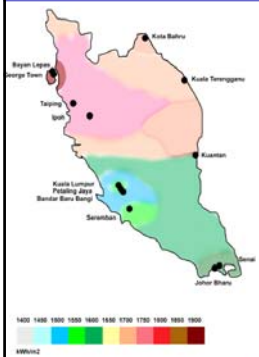
Malaysia Energy Policy

- National Petroleum Policy (1975)
- National Energy Policy (1979)
- National Depletion Policy (1980)
- 4th Fuel Diversification Policy (1981) => Natural Gas, Hydro, Coal, Oil
- 5th Fuel Policy (2001) => Natural Gas, Hydro, Coal, Oil, **RE**

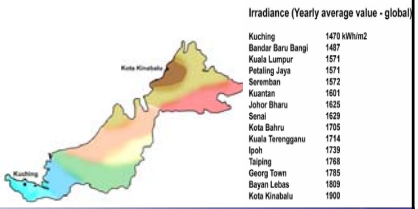
Trends of Fuel Sources for Power Generation



Untapped Potential: Solar Power



- Suitable building roof surfaces*
  >65 million m² x 100 Wp/m² = **>6,500 MWp**
  * 2.5 million houses (40%) + 40,000 commercial buildings (5%)
- PV covering 0.6% (786 km2) land of Peninsular Malaysia can provide enough electricity supplied by TNB in 2007 (86.5 TWh)



Irradiance (Yearly average value - global)

Kuching	1470 kWh/m2
Bandar Baru Bangi	1487
Kuala Lumpur	1571
Petaling Jaya	1571
Seremban	1572
Kuantan	1601
Johor Bharu	1626
Senai	1629
Kota Bahru	1705
Kuala Terengganu	1714
Ipoh	1739
Taiping	1768
Georg Town	1785
Bayan Lebas	1809
Kota Kinabalu	1900

5th Fuel Policy: RE Potential & Status Quo





Solar PV	Biomass	Biogas	Small Hydro	MSW
Potential: > 6,500 MW Status: 1 MW -MBIPV Project (SURIA 1000, Demo, Showcase Incentives & SURIA for Developers) -yearly average irradiance 1,400-1,900 kWh/m²	**Potential:** 1,340 MW by 2030 Status: Total 53 MW under construction as of end Dec'08 -13 MW to be commissioned by end March -BioGen Project -Palm oil waste (EFB), other agricultural waste (woodchips, paddy husks, etc)	**Potential:** 410 MW by 2028 Status: Total 3.75 MW under construction as of end Dec'08 -500 kW to be commissioned by end March -Palm oil mill effluents (POME), cassava waste, livestock, agro, industrial waste water	**Potential:** 490 MW by 2020 Status: Total 17.8 MW under construction as of end Dec'08 -Run of the river with minimum impounding -Capacity < 30 MW	**Potential:** 360 MW by 2022 Status: 8 MW (5 MW to be exported to grid) to be commissioned end Mar'09 -waste collected in Malaysia approximately 21,000 tonnes/day

RE Support & Promotion Mechanisms

Support Mechanism
- Approvals & licenses
- REPPA: RM/kWh 0.21 (biomass, biogas); 0.17 (hydro), net-meter (PV)

Promotion Mechanisms
- Pilot projects & case studies
- Capacity building & lessons
- Financing & policy developments

SREP (Small Renewable Energy Power) Programme
- Launched in 2001
- Objectives: To encourage production of RE by small power generators (10MW) and allow the sale of generated electricity to utilities
- Status: 10 MW grid-connected power from Biomass; 2 MW grid-connected power from Biogas

UNDP-GEF Biomass Power Generation & Demonstration (Biogen) Project
- Launched in 2002
- Objectives: To demonstrate biomass and biogas grid-connected power generation projects
- Status: 13 MW (export 10 MW) and 500 kW (FELDA Sorting) power plants will be grid connected and commissioned in April 2009. ~700 MW off-grid electricity produced by private palm oil millers.

UNDP-GEF Malaysia Building Integrated Photovoltaic (MBIPV) Project
- Launched in 2005
- Objectives: To reduce unit cost of solar PV technology by 20% and increase capacity by 350% via PV applications in buildings
- Status: ~ 1MW of cumulative grid-connected PV installations; PV system unit cost has dropped by 16% average.

Fiscal incentives (<2011): Pioneer Status or Investment Tax Allowance; import duties and sales taxes exemption

Key Issues Affecting RE

Needs for a New RE Policy & Action Plan

Reason 1	To address current market failure
Reason 2	To provide long term sustainability (avoid start and stop policy)
Reason 3	To stimulate a new growth industry
Reason 4	To recognise the importance of the environment as an economic growth contributor
Reason 5	To develop human capital resources particularly in the field of R&D in RE technologies
Reason 6	To improve the coherence of current policy

New RE Policy & Action Plan

Vision

Enhancing the utilisation of indigenous renewable energy resources to contribute towards national electricity supply security and sustainable socio-economic development

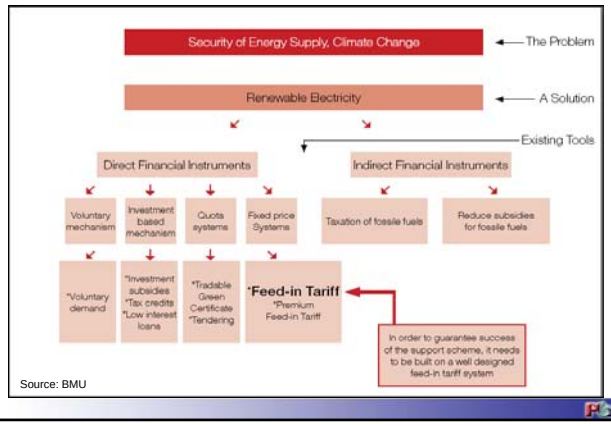
Objectives

1. To increase RE contribution in the national power generation mix;
2. To facilitate the growth of the RE industry;
3. To ensure reasonable RE generation costs;
4. To conserve the environment for future generation; and
5. To enhance awareness on the role and importance of RE.

Strategic Thrusts

Thrust 1: Introduce and Implement Appropriate Regulatory Framework
Thrust 2: Introduce Conducive Stimulus Package for RE Businesses
Thrust 3: Intensify Human Capital Development
Thrust 4: Enhance RE Research and Development
Thrust 5: Design and Implement an RE Advocacy Programme

Choices: RE Support Mechanism



Source: BMU

Feed-in Tariff (FiT): The Choice for RE Regulatory Framework

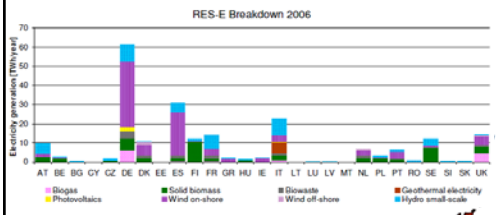
- A mechanism that allows electricity that is produced from RE resources to be sold to power utilities at a fixed premium price and for specific duration.
- Provides a conducive and secured investment environment which will make financial institutions to be comfortable in providing loan with longer period (> 10 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 costs while maintaining quality
  - Disadvantage: does not address first cost barrier

Verifications of FiT Effectiveness (selected)

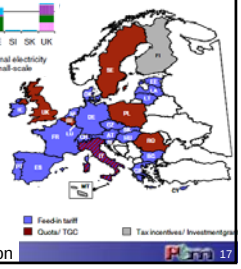
- Stern Review Report:
  - Sir Nicholas Stern stated that "Comparisons between deployment support through tradable quotas and feed-in tariff price support suggest that feed-in mechanisms achieve larger deployment at lower costs."
- UNDP-GEF Report: Promotion of Wind Energy - Lessons Learned From International Experience and UNDP-GEF Projects
  - "Feed-In tariff policies have been very effective in Germany, Spain and Denmark, leading to the world's first, second and fifth installed wind energy capacities."
- International Energy Agency: Deploying Renewables - Principles for Effective Policies
  - "Feed-in Tariffs are more effective and cheaper than quotas for Renewable Energy"
- Ernst & Young Report: Renewable Energy Country Attractiveness Indices:
  - "Feed-in Tariffs are cheaper than Trading System"

Evidences of FiT Effectiveness

Breakdown of RES-E generation in the EU-27 Member States in 2006



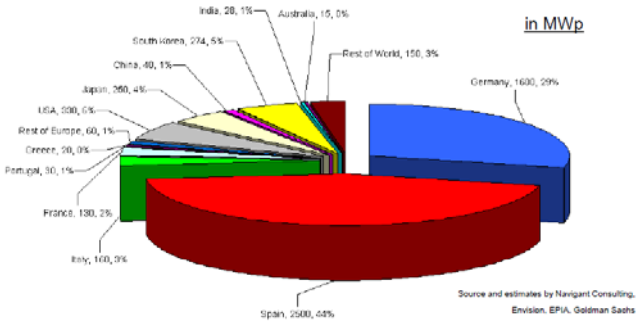
Source: Fraunhofer



- Germany revolutionised RE deployment with the implementation of EEG (RESA) in 2000
- Germany records exponential RE growth since 2000 (due to no limit of annual capacity)
- By 2007, Germany's FiT model replicated by 20 EU Member States
- By 2007, EEG generates national economic benefits equivalent to Euro 9.4 billion VS cost of Euro 3.3 billion

FiT Effectiveness: Example of Solar PV

Total installed PV capacity in 2008: ~5.6 GWp > 80% in Feed-in Tariff markets



Critical Factors for an Effective FiT Mechanism

- Access to the grid must be guaranteed. Utilities must be legally obliged to accept all electricity generated by RE private producers.
- FiT rates must be high enough to produce a return on investment plus a profit (not excessively) to act as an incentive.
- FiT rates must be fixed for a long enough period (typically 20 years) to give certainty and provide businesses with clear investment environment.
- There must be adequate "degression" for the FiT rates to promote cost reduction to achieve "grid parity", where an annual stepwise reduction in tariffs by a certain percentage is mandated.
- Adequate fund is created to pay for the FiT rates (or the incremental cost) and guarantee the payment for the whole FiT contract period.
- There must be constant monitoring and progress reporting.

Please refer to **www.onlinepact.org** (World Future Council)

Determining FiT Rates (Malaysia)

Biomass	▪ Capex (investment cost) ▪ Loan: rates (8.8%), period (15 years) ▪ Fuel: requirement (250,000 t/yr), prices, transport charges ▪ Costs: O&M, depreciation, insurance ▪ Revenue: FiT rates, duration (16 yrs), capacity factor (70%), other revenue ▪ Annual cost increment (3%): fuel, transport, O&M, insurance ▪ IRR, SPB, cash-flow
Solid waste	▪ Capex (investment cost) ▪ Loan: rates (8.8%), period (15 years) ▪ Fuel: requirement (1,000 t/day), prices, transport charges ▪ Costs: O&M, depreciation, insurance ▪ Revenue: FiT rates, duration (21yrs), capacity factor (70%), other revenue (tipping fee, recycling) ▪ Annual cost increment (4%): fuel, transport, O&M, insurance ▪ IRR, SPB, cash-flow
Solar PV	▪ Capex (investment cost – RM22/Wp avg) ▪ Loan (80%): rates (6%), period (15 years) ▪ Costs: O&M, depreciation, insurance ▪ Revenue: FiT rates, duration (21yrs), capacity factor (13%) ▪ Annual cost increment (3%): O&M, insurance ▪ SPB, (IRR), cash-flow

FiT Rates = Empirical Values

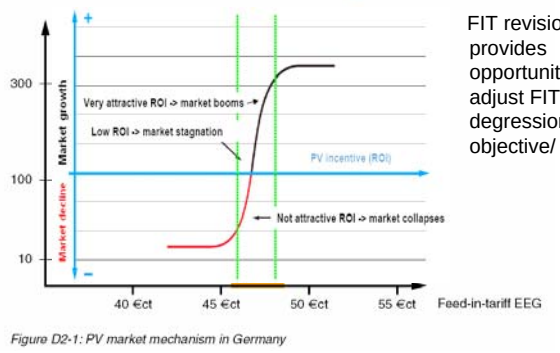


Figure D2-1: PV market mechanism in Germany

FIT revision: provides opportunity to adjust FIT prices & degression towards objective/ target

Source: BMU

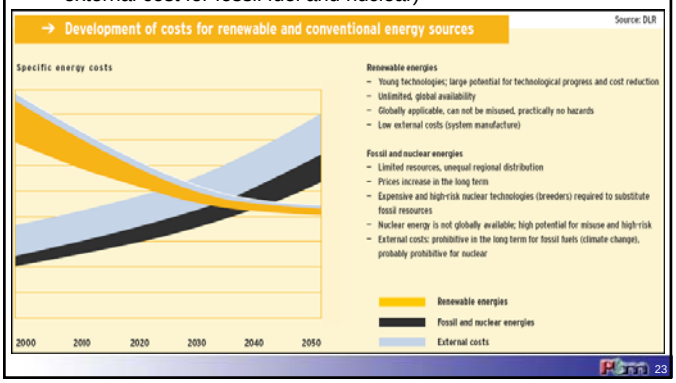
FiT Rates: Comparison

RE Technologies	FiT Rates		
	Germany 2007	Italy 2009	Malaysia 2009/2010
Retail Electricity Tariff (average)	0.28 US$/kWh	0.24 US$/kWh	0.08 US$/kWh **(Subsidised)**
Solar PV	2.4 x retail	2.7 x retail	5.5 x retail
Wind	0.4 x retail	1.7 x retail	1.1 x retail
Biomas	0.5 x retail	1.2 x retail	1.1 x retail
Biogas	0.4 x retail	1.0 x retail	1.1 x retail
Mini-hydro	0.5 x retail	1.2 x retail	0.8 x retail
Cost to consumers (% of retail tariff)	4.8%	7.8%	2% (proposed)

Source: BMU, GSE

Grid Parity

- FiT changes to net-metering when grid-parity is achieved (real cost + external cost for fossil fuel and nuclear)



Important to prepare local RE industry prior to start of FiT regulatory framework

Towards benefiting local industry
Promotes quality & cost reduction
Meeting expectation
Healthy growth

MBIPV Project (2005 - 2010)
Objective: To reduce GHG emission by reducing long-term cost of BIPV technology via development of a sustainable BIPV market

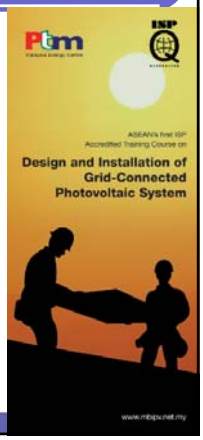
- Component 1: BIPV information services, awareness and capacity building programme
- Component 2: BIPV market enhancement & infrastructure development programme
- Component 3: BIPV policies and financing mechanisms programme
- Component 4: BIPV industry development and technology localisation programme

Competency Training

- ISP accredited training
- 10 days: theory, practical, exam







Approved Service Provider Scheme

- License valid for 1 year with annual review.
- Only for companies.
- Staff passed ISP training.
- Use certified electrician.
- Company shall be financially sound.
- Company shall have workers insurance and public liability insurance.
- Company shall follow APVSP Industry Best Practice Guidelines.
- Company shall abide by the APVSP Code of Conduct.

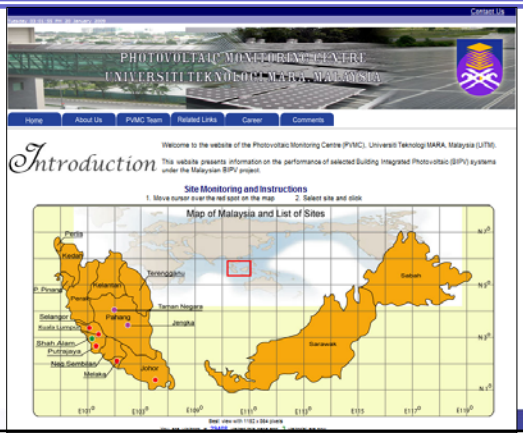
Complemented by Quality Assurance Scheme

Quality Control Centres

Inverter Quality Control Centre

Mounting Structure Quality Control Centre

Performance Monitoring

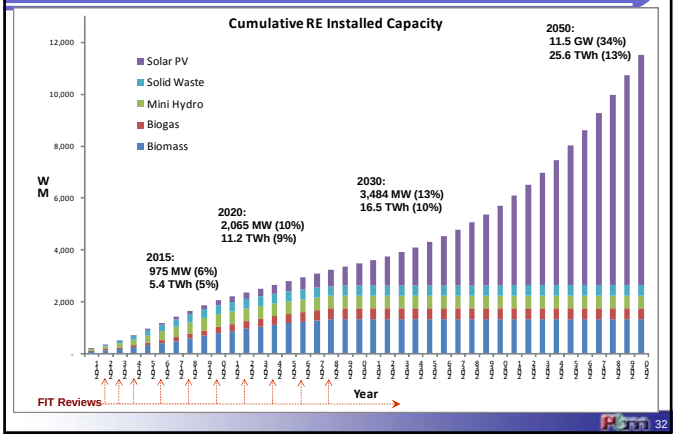


Communicate Internationally

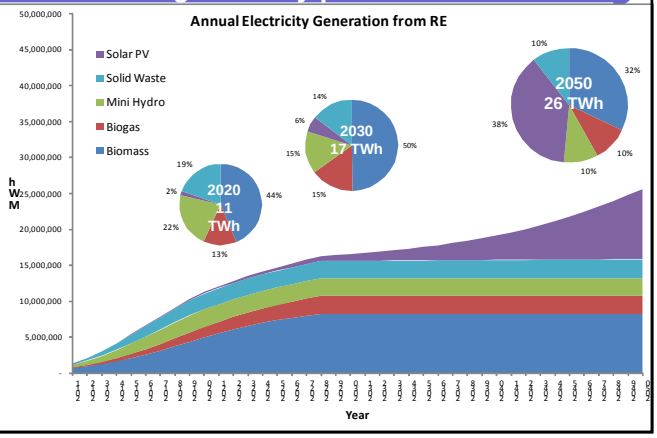
- Exchange of knowledge & lessons learned
- Accelerate learning process & minimise mistake
- Friendship

Awareness & Understanding – Most Critical

Towards achieving RE Targets



RE Generation Mix: PV expected to contribute significantly post 2030



Thank you

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Comparison between FiT and Quota System

Feed-in Tariff (FIT)	Renewable Portfolio Standards (RPS)
▪ Proven to be the cheaper option ▪ Performance based incentive - encourages reliable operation ▪ Provides long-term investment security and returns ▪ Creates stable and predictable revenue to pay for cost of investment ▪ Degression and periodic reviews allow and stimulate price reductions due to technological advances (e.g. solar PV) ▪ Simple to implement – specific RE developments and FiT costs can be pre-determined and planned in advance ▪ Encourage smaller and distributed power producers and new industries – greater number of jobs	▪ Less successful in achieving targets (e.g. UK, Sweden) ▪ Involves tradable green certificates which are unpredictable in prices ▪ Must have a penalty system ▪ Requires strong enforcement mechanisms ▪ No clear identification of source of funds to meet additional costs ▪ Unpredictable RE prices and costs because of bidding and trade ▪ Usually only one RE technology would be promoted ▪ Usually only bigger company (with resources) would be interested to become developers