34th APEC EXPERT GROUP ON NEW AND RENEWABLE ENERGY TECHNOLOGIES (EGNRET)

Renewable Energy Development in Malaysia

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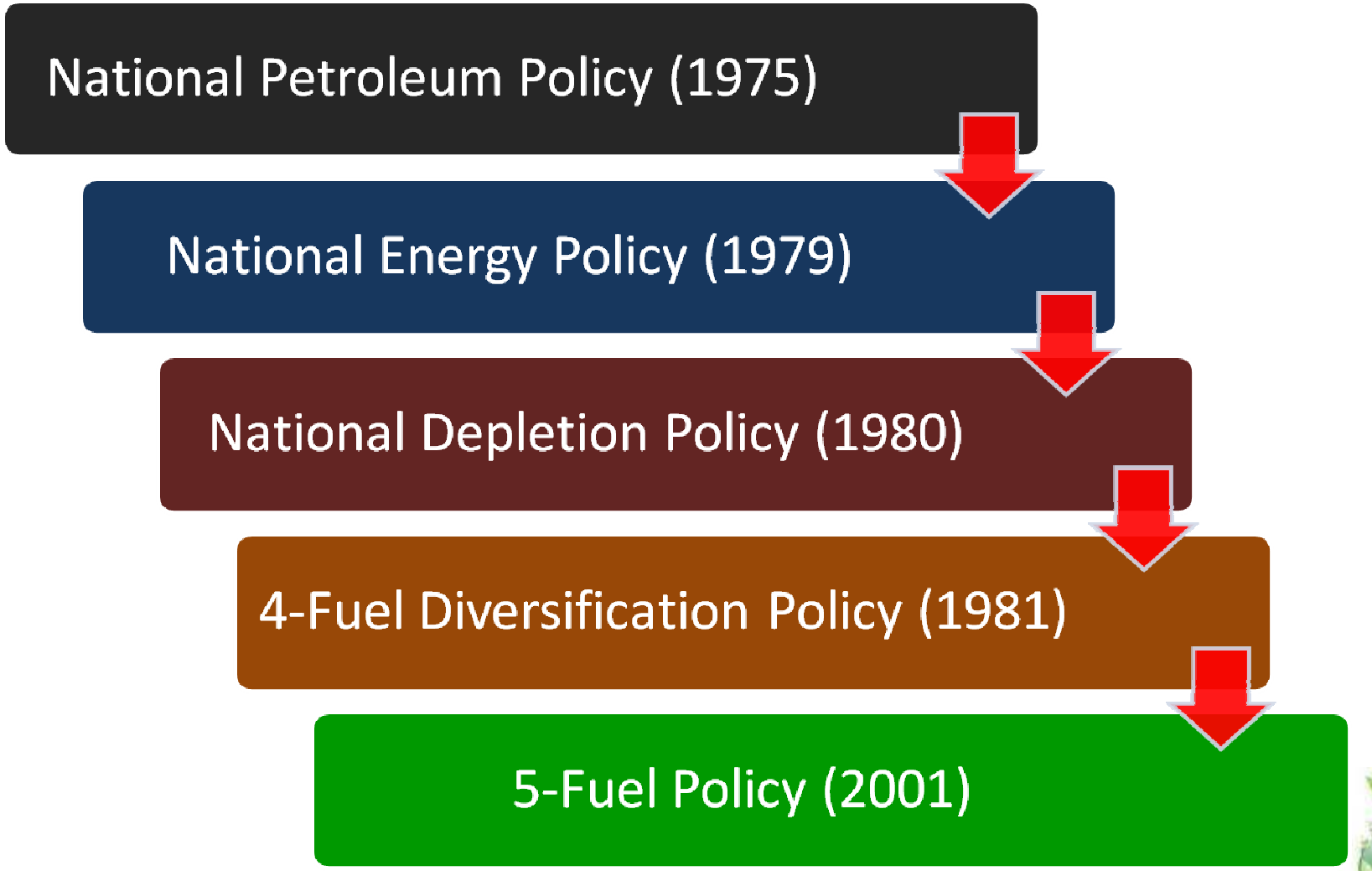
Presentation Outline

- **Background: Development of Energy Policy & Related Policies in Malaysia**
  - **Current Program and Incentives in Malaysia**
  - **Current RE Targets & Growth in Malaysia**
- **Reasons for Slow RE Development & Need for RE Policy**
- **Global Scenario**
- **National RE Policy and Action Plan**
  - **RE support Mechanism (Feed-in Tariff)**
- **Conclusion**

Background: Development of Energy Policies in Malaysia



Related Policies

- Other related policies includes
  - Science & Technology Policy, 1986 (MOSTI)
  - Environmental Policy, 2002 (NRE)
  - Bio-Fuel Policy, 2005 (KPPK)
  - Green Technology Policy, 2009 (KeTTHA)
  - Climate Change Policy, 2009 (NRE)

Malaysia: Current Renewable Energy Targets for Electricity Generation

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8th Malaysia Plan (2001 - 2005)

RE as the 5th Fuel

Implied 5% RE in energy mix

9th Malaysia Plan (2006 - 2010)

Targeted RE capacity to be connected to power utility grid:

300 MW in Peninsular Malaysia, 50 MW in Sabah

Targeted power generation mix:

56% NG, 36% coal, 6% hydro, 0.2% oil, 1.8% RE

RE capacity as of 31st December 2009:

Connected to power utility grid: **53 MW (15% of 9th Plan target)**

Off grid (private palm oil millers & solar hybrids): >430 MW

Malaysia : Current RE Programs

- **Small Renewable Energy Power Programme**
  - Launched in 2001 - small RE power producers (<10MW) eligible to sell electricity to utility
  - December 2009 – 53MW of RE connected to the grid
- **Malaysian Building Integrated Photovoltaic (MBIPV) Project (UNDP-GEF)**
  - Launched in 2005 - reduce GHG emission by reducing long-term cost of BIPV
  - December 2009 – reduce 1070 tCO_2 & produced 1884kWp of solar (PV) connected to grid
- **Biomass-Based Power Generation and Cogeneration (BiOGEN) Project (UNDP-GEF)**
  - Launched in 2002 - promote utilization of biomass (EFB) & biogas (POME) from Palm Oil Waste for power generation
  - 2 Full scale model – 10 MW biomass and 0.5MW biogas

Fiscal Incentives to Promote RE

- ***Pioneer Status (PS)*** - Exemption from income tax (25% from 2009 onwards) on 100% of statutory income for 10 years
- ***Investment Tax Allowance (ITA)*** - 100% of qualifying capital expenditure incurred within a period of 5 years can be utilised against 100% of the statutory income for each year of assessment
- ***Import Duty -*** imported machinery, equipment, materials, spare parts and consumables
- ***Sales Tax Exemption*** - locally purchased machinery, equipment, materials, spare parts and consumables
- **Exemption of import duty and/or sales tax to "Third Party Distributors (TPD)"** - for Solar (PV or thermal) Systems products

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Reasons for Slow RE Development & Need for RE Policy

Reasons for Slow RE Development

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1. Market failure exists:

The RE market "fails" as there is only one buyer which results in unequal bargaining position of the utility and RE project proponents.

The RE market is also constrained by financial and technological factors.

2. Constraints:

Inherent factors that constrain the performance of the market: Economic, Financial, Technological.

3. Absence of Legal Framework:

Market failure compounded by absence of a proper regulatory framework, which prevents proper and legal action from being taken.

4. Lack of institutional measures:

Lack of proper institutional measures to meet informational and technological needs.

Need for a National RE Policy

Reasons for a National RE Policy	
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

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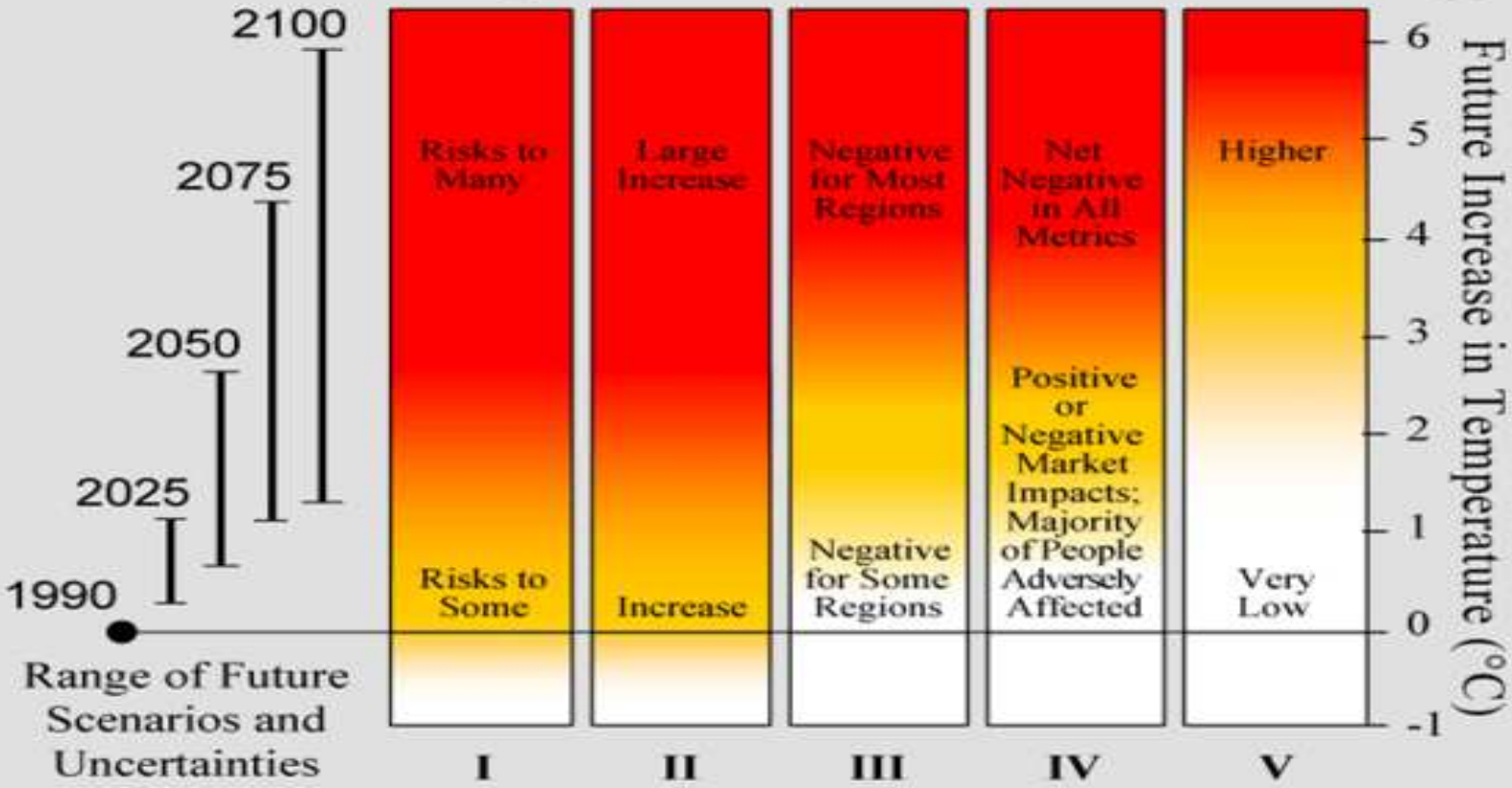
Global Scenario

Global Climate Change Scenario

- Global CO2 concentration increasing by the following trend:
  - Natural occurence (650,000 years ago): 180ppm
  - Pre-industrial era : 280ppm
  - 2005 – 379ppm (increasing continuously)
- 4th Assessment Report, IPCC analysis - critical action needed:
  - Stabilise CO2 concentration in atmosphere at 450ppm
  - Control maximum increase of global temperature at 2ºC
- Major actions to be undertaken:
  - Annex I countries: reduction of GHG emission at rate 25%-40% by 2020
  - Non Annex I: significant reduction to *baseline*

Risks and Impacts of Global Warming



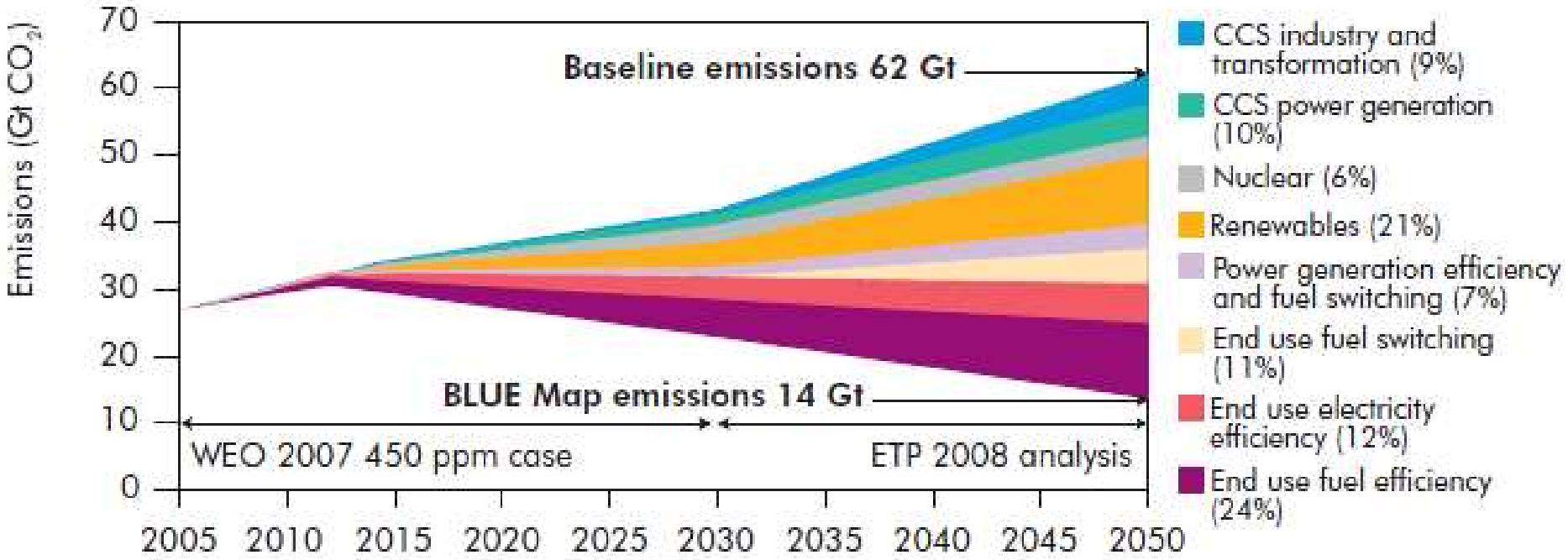
I	Risks to Unique and Threatened Systems
II	Frequency and Severity of Extreme Climate Events
III	Global Distribution and Balance of Impacts
IV	Total Economic and Ecological Impact
V	Risk of Irreversible Large-Scale and Abrupt Transitions

Sumber: *Third Assessment Report of the Intergovernmental Panel on Climate Change (IPCC)*

CO2 Mitigation

- E sector the highest contributor to GHG emission (60%)

Figure ES.2 ▶ Comparison of the *World Energy Outlook 2007* 450 ppm case and the BLUE Map scenario, 2005-2050



Sumber: International Energy Agency, Energy Technology Perspectives, 2008, www.iea.org

Global CO2 Emission Reduction Initiatives

country	targets
Europe	▪ GHG reduction : 20% to 1990 level by 2020 ➢ 20% electricity mix from RE sources by 2020
USA	▪ GHG reduction : 17% to 2005 level by 2020 ➢ No national target- only state level
Australia	▪ GHG reduction : 25% to 2000 level by 2020 (condition all parties agree to stabilise CO2 concentration below 450ppm) ➢ 20% electricity mix from RE sources by 2020
Japan	▪ GHG reduction : 25% to 1990 level by 2020
Korea	▪ GHG reduction : 30% from BAU by 2020 ➢ 21% electricity mix from RE sources by 2050
Indonesia	▪ GHG reduction : 26% to 2005 level by 2020
China	▪ GHG reduction : 40%-45% to 2005 level by 2020
Malaysia	▪ 40% GHG intensity to GDP below 2005 by 2020 as per conditions

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National RE Policy and Action Plan

Malaysian National RE Policy

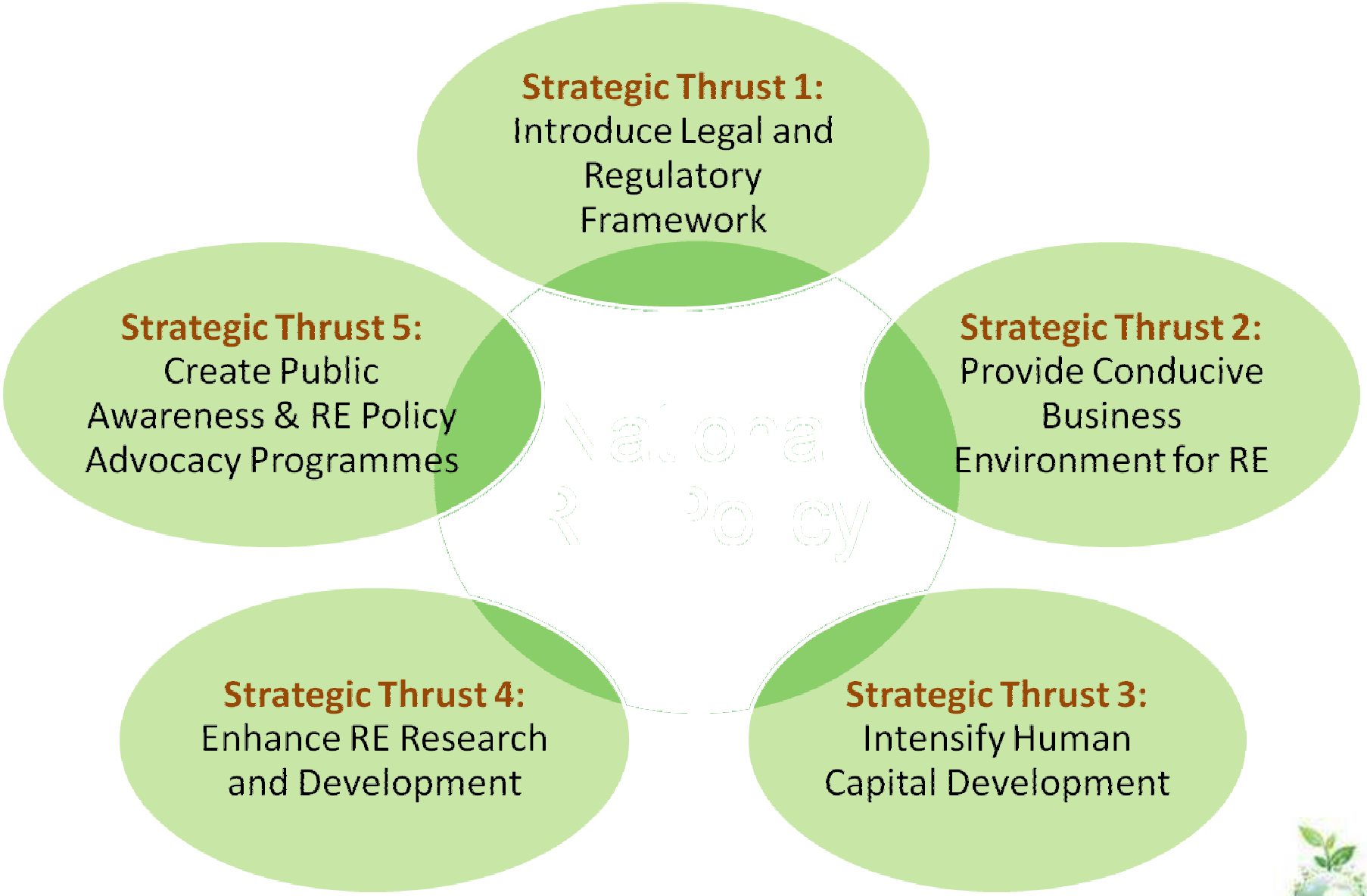
Policy Statement:

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

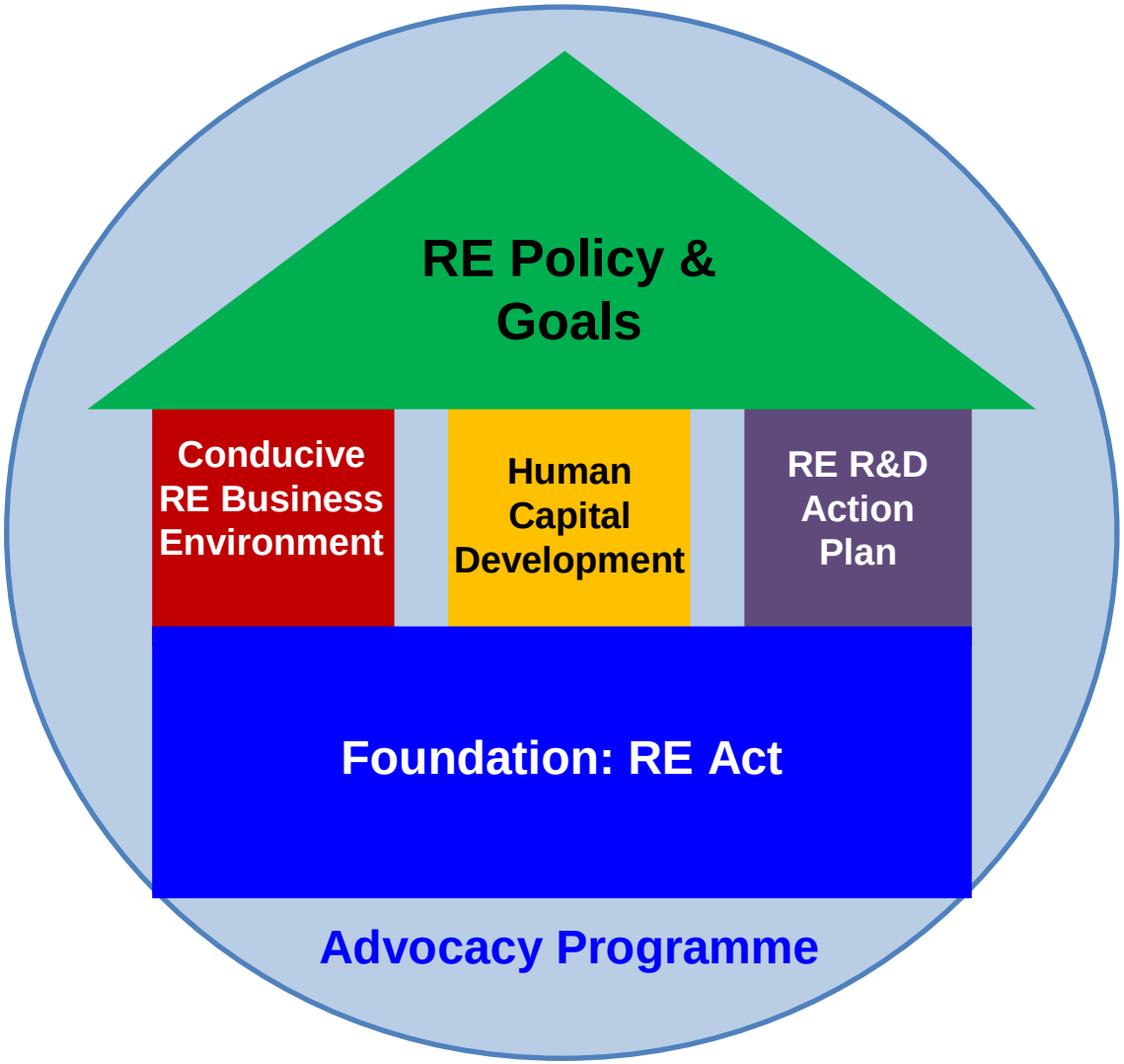
Objectives:

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

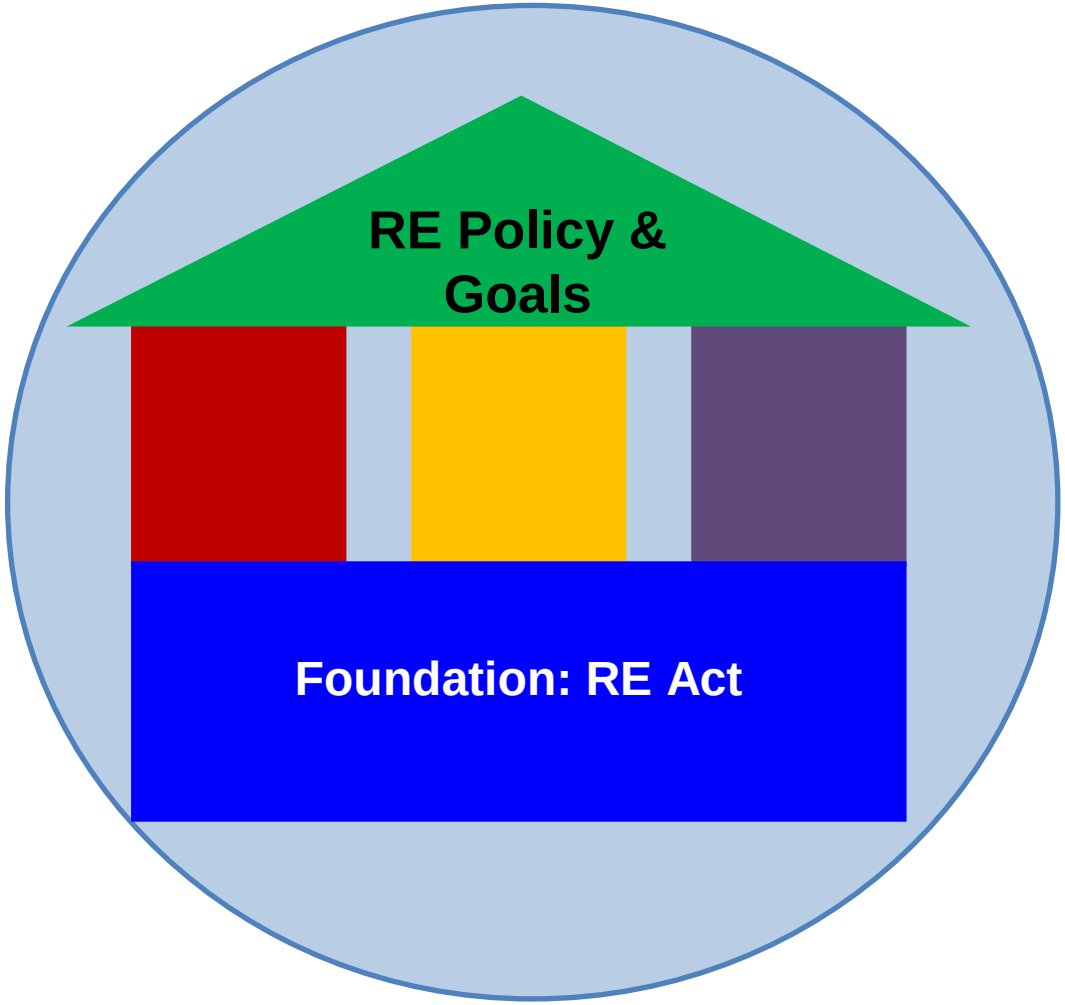
Strategic Thrusts of National RE Policy



Synergies of RE Strategic Thrusts Towards Effective Implementation



Strategic Thrust 1: Introduce Appropriate Legal Framework

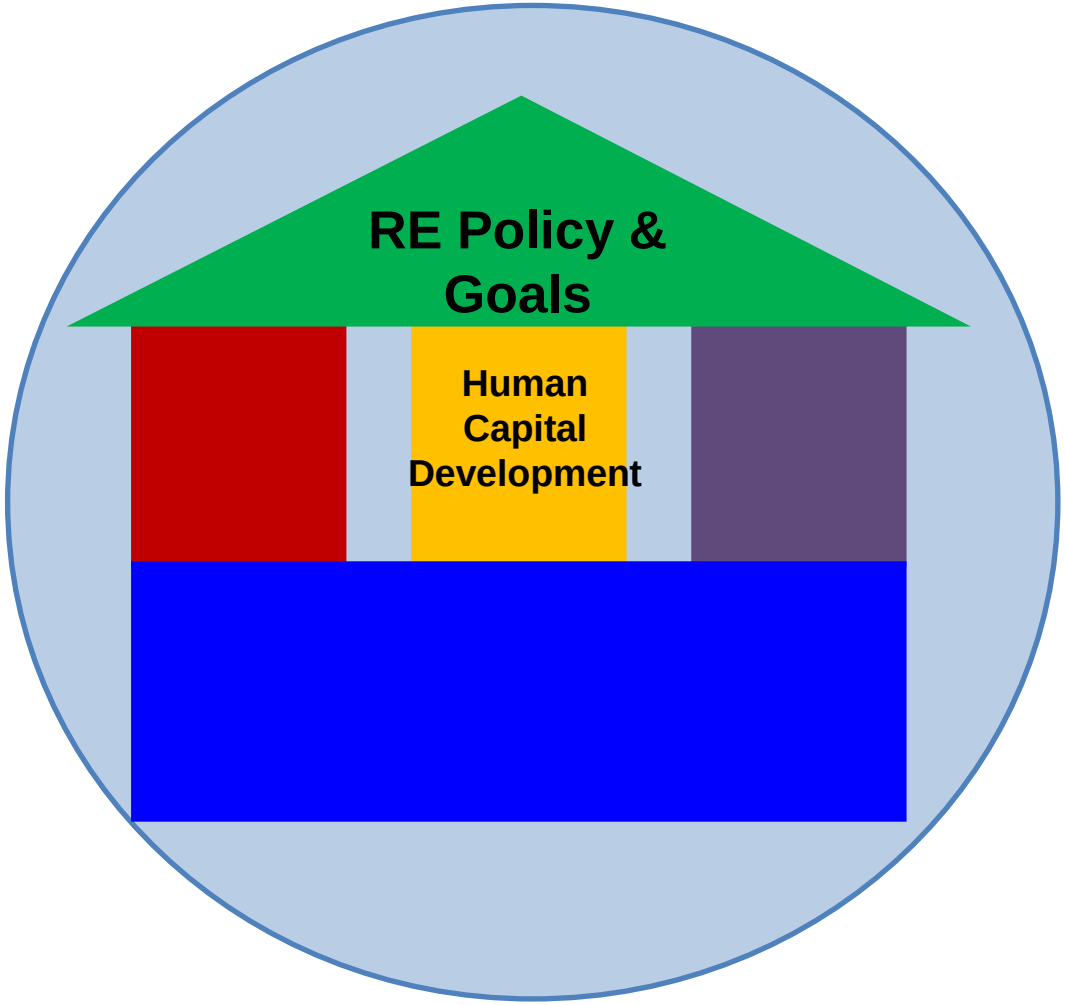


- A new RE Act
- Feed-in Tariff (FiT)
- RE Fund (Professional Fund Manager)
- FiT Implementing Agency
- Respnsibilities and obligations on power utilities and RE developers

Strategic Thrust 2: Create Conducive Business Environment for RE

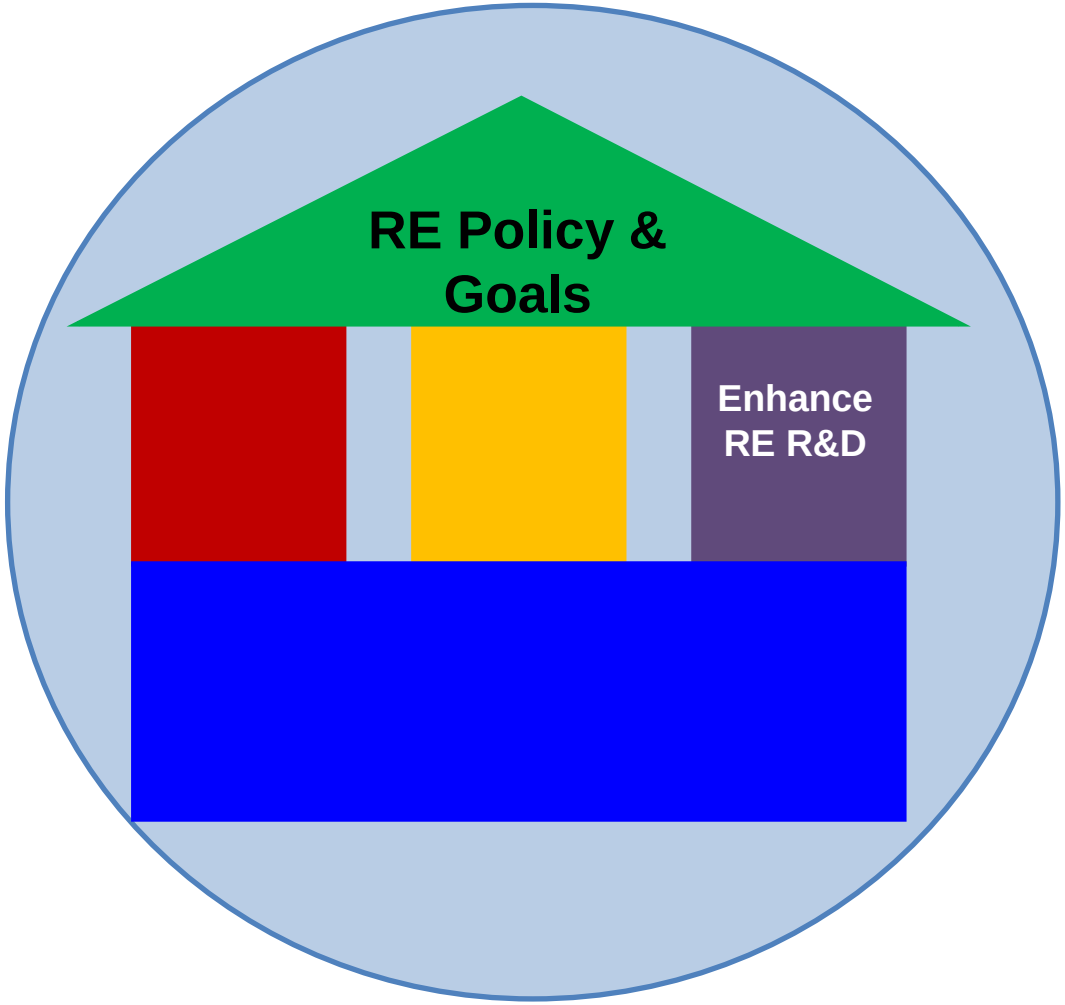
- Promote RE businesses –SME and manufacturing
- Long term low interest financing
- Standard evaluation process
- Fiscal Incentives
- Special Incentives for Locally Developed R&D
- Incentives to Promote Local Content
- RE Centre for SMEs

Strategic Thrust 3: Intensify Human Capital Development



- RE in Technical and Tertiary Curricula
- RE Training Institutes and Centres of Excellence
- Pool of experts to fulfil local and overseas market
- Fiscal relief for RE courses
- Financial incentives for training programmes

Strategic Thrust 4: Enhance RE Research and Development



- RE Research & Development Action Plan – reduce cost of technology & promote wider application
- Coordination & co-operation in technology & economic research bet Government & private sector
- Strong linkages bet local & international research institutes
- Development of RE innovations

Strategic Thrust 5: Create Public and Stakeholder Awareness & RE Policy Advocacy Programmes

- Effective & continuous information dissemination
- Relationship with media, NGOs & private entities
- Demonstration & awareness programmes in primary & secondary schools
- Periodic monitoring & evaluation of RE

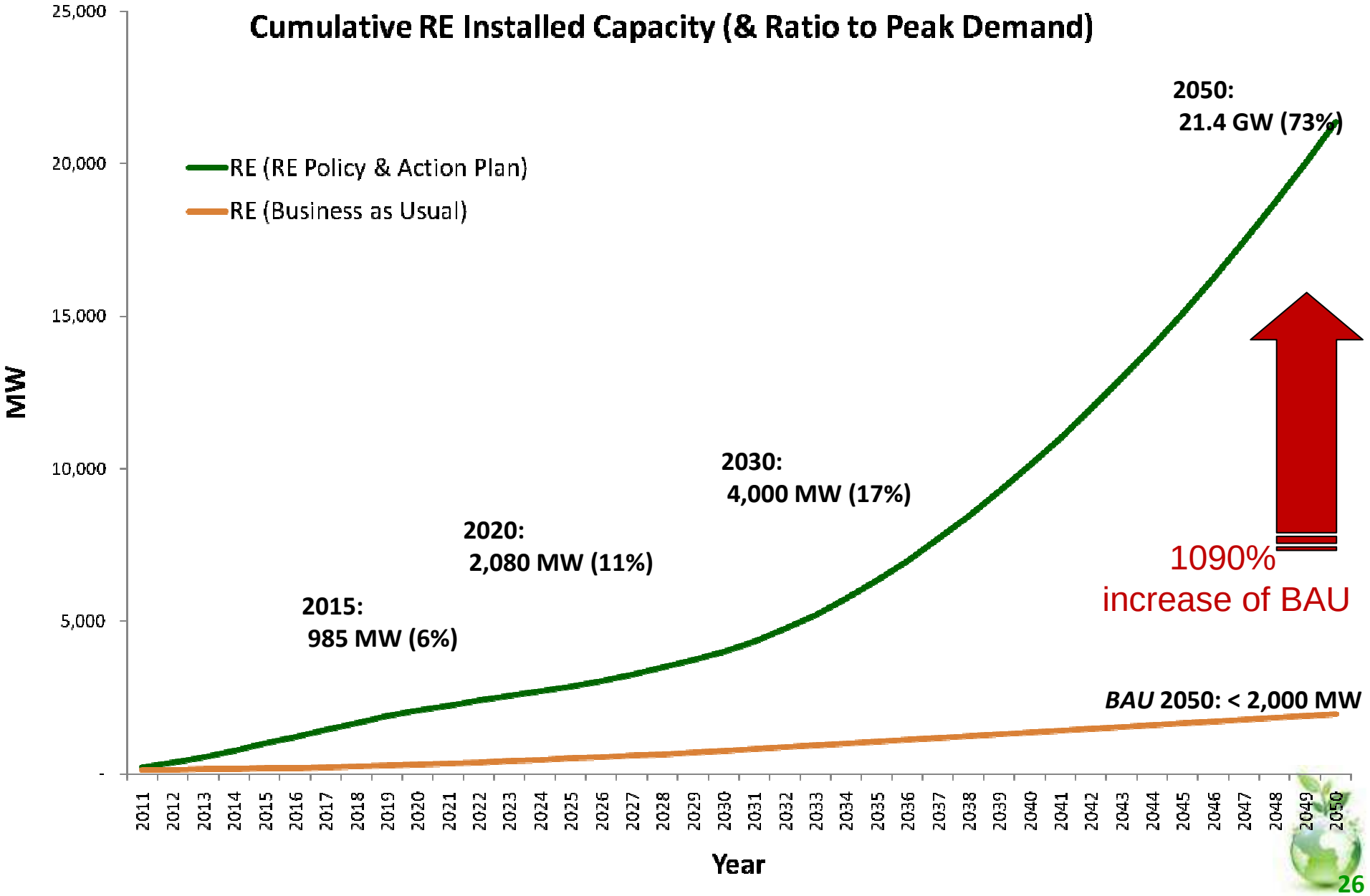
National RE Targets

Year	Cumulative RE Capacity	RE Power Mix (vs Peak Demand)	Cumulative CO2 avoided
2010	73 MW	0.5 %	0.3 mt
2015	985 MW	6%	11.1 mt
2020	**2,080 MW**	**11%**	**42.2 mt**
2030	4,000 MW	17%	145.1 mt

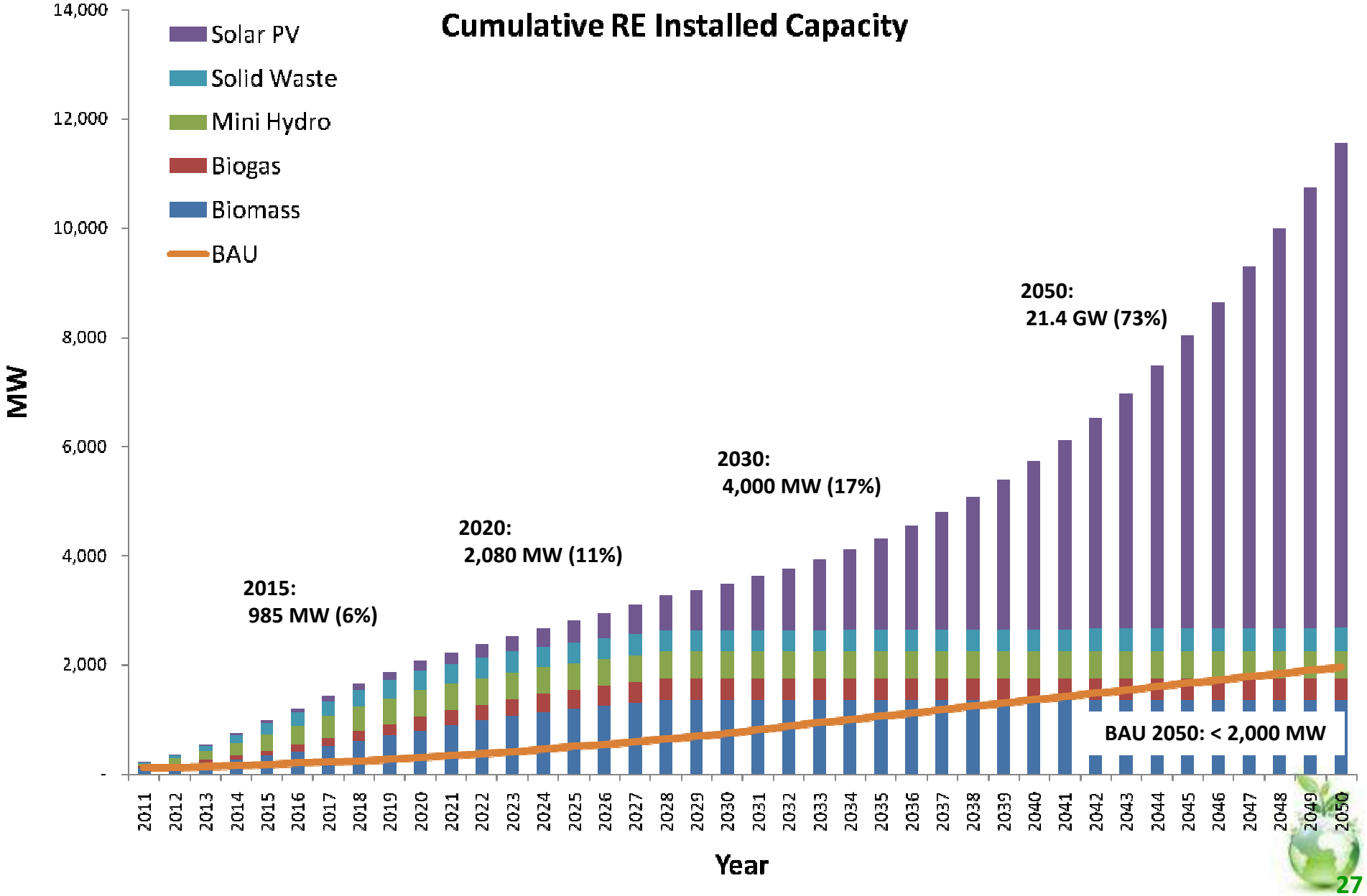
Notes: RE capacity achievements are dependent on the size of RE fund

- Assumptions:
  - Feed-in Tariff (FiT) in place
  - 15.6% compound annual growth rate (CAGR) of RE power capacity from 2011 to 2030.

RE Policy & Action Plan: Targets



RE Targets


Cumulative RE Installed Capacity
Solar PV
Solid Waste
Mini Hydro
Biogas
Biomass
BAU
MW
14,000
12,000
10,000
8,000
6,000
4,000
2,000
-
2015:
985 MW (6%)
2020:
2,080 MW (11%)
2030:
4,000 MW (17%)
2050:
21.4 GW (73%)
BAU 2050: < 2,000 MW
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RE SUPPORT MECHANISM
FEED IN TARIFF

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

Choices of RE Support Mechanism for Malaysia

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Policy	Description
Net metering	Any amount above what is consumed in the building is exported to the grid. Any amount below what is consumed in the building is imported from the grid (usually for PV produced electricity in home/building)
Direct capital support	Cash rebate on a portion of grid-connected RE system costs
Feed-in tariffs (FIT)	Premium price for electricity grid-connected paid to system owners by utility or regulatory body. Price typically guaranteed for 20 years.
Renewable Portfolio Standard (RPS)	Mandatory portion of grid-connected RE power in the generation mix. Tradable certificates represents power that is produced.
Green Pricing	Voluntary schemes where consumers pay a premium for grid-connected power from utility or other electricity retailers.
Tax Incentives	Reduction or elimination of tax paid in purchase of RE systems, deduction of total cost of portion of system cost from business or personal tax

FiT Advantages:
- To address local barriers

Advantages	Barriers Removal
▪ Viability of investment	Fixed tariff prices for specific duration (contract & license)
▪ Security for investment	Access and obligation to purchase (priority) by utility
▪ Improves cash flow	Long loan period (≥15 years) at commercial interest rate
▪ Less requirement for other fiscal incentive and soft loan	FIT revenue pays for bank loan & investment
▪ Encourages energy production and quality system	Revenue derives from FIT: requires system to continuously operate
▪ Reduces cost of (new) technology	Degression rate encourages system cost reduction

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 RE"
- Ernst & Young Report: Renewable Energy Country Attractiveness Indices:
  - "Feed-in Tariffs are cheaper than Trading System"
- Traditional RPS country/state moving towards Feed-in Tariff:
  - Japan started by 1st Nov 2009, UK to implement Feed-in tariff by 2010. Feed-in Tariff in USA: Gainesville (2009), Vermont (2009), SMUD (2010). South Africa implemented Feed-in Tariff in 2009.

Comparison between FiT and Quota System

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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

Critical Elements for Effective FiT Mechanism Legal Framework

FiT must be guaranteed via the **RE Act**, whereby:

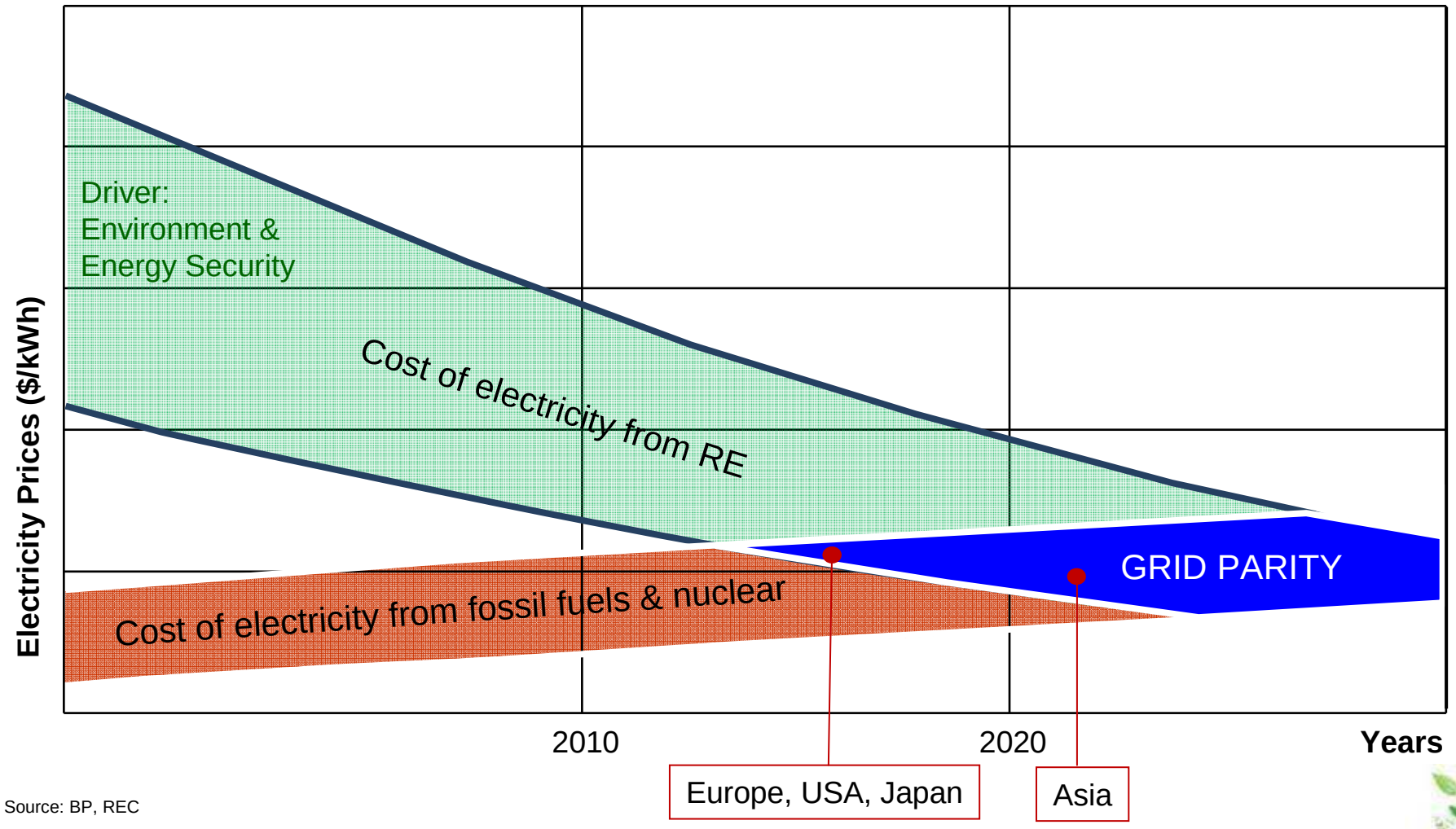
- Access to the grid is **guaranteed** – utilities legally obliged to accept all electricity generated by RE private producers.
- Local approval procedures are **streamlined and clear**.
- FiT rates must be **high enough** to produce a ROI plus reasonable profit (not excessively) to act as an incentive.
- FiT rates will be **fixed for a period** (typically 20 years) to give certainty and provide businesses with clear investment environment.
- Adequate "**degression**" for the FiT rates to promote cost reduction to achieve "grid parity"
- Adequate **fund** is created to pay for the FiT rates (incremental cost) and guarantee the payment for the whole FiT contract period.
- Implementation by a competent agency in a professional manner that includes constant **monitoring, progress reporting and transparency**.

Key Success Factors for National RE Policy

The success of the National RE Policy and goals can be achieved when the following factors are put in place:

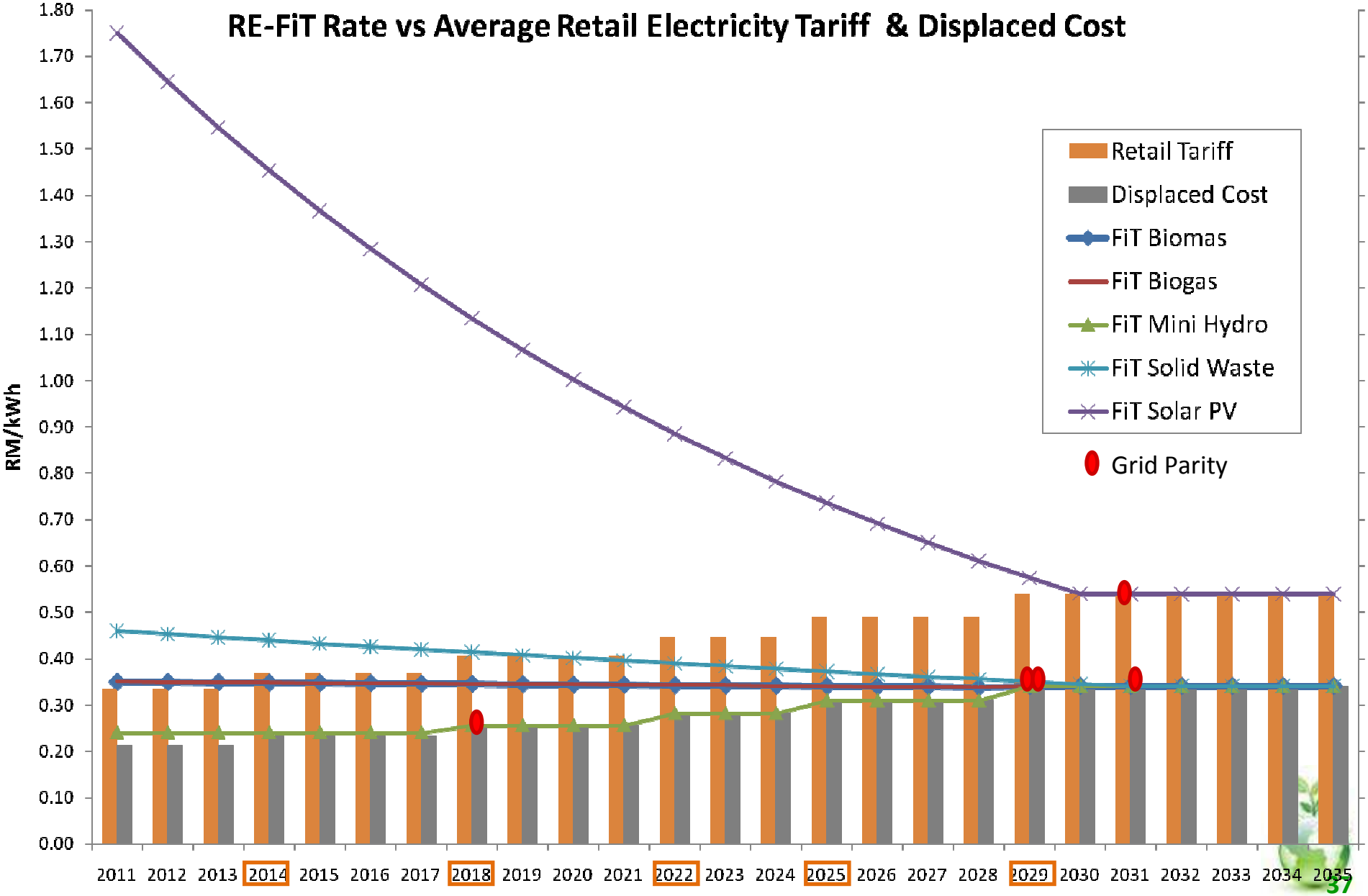
- RE Act which implements the Feed-in Tariff mechanism
- RE Fund to cover the cost of Feed-in Tariff (FiT) mechanism
- Source of RE Fund which is derived from electricity consumers at a nominal percentage
- Establishment of a dedicated Implementation agency

Grid Parity



Source: BP, REC

FiT Degression: Towards Grid Parity



Proposed Source of Fund for FiT

- A small percentage of one-off inclusion into electricity tariff
  - ✓ Will not affect low income consumers (<200 kWh/mth)
  - ✓ Polluters pay concept
  - ✓ Encourages EE and DSM

- RE fund only covers for incremental cost of FiT where TNB will bear the value of displaced cost of electricity supply.
- The **size of RE fund** will determine the **RE target** for Malaysia.

Management of FiT Mechanism & RE Fund

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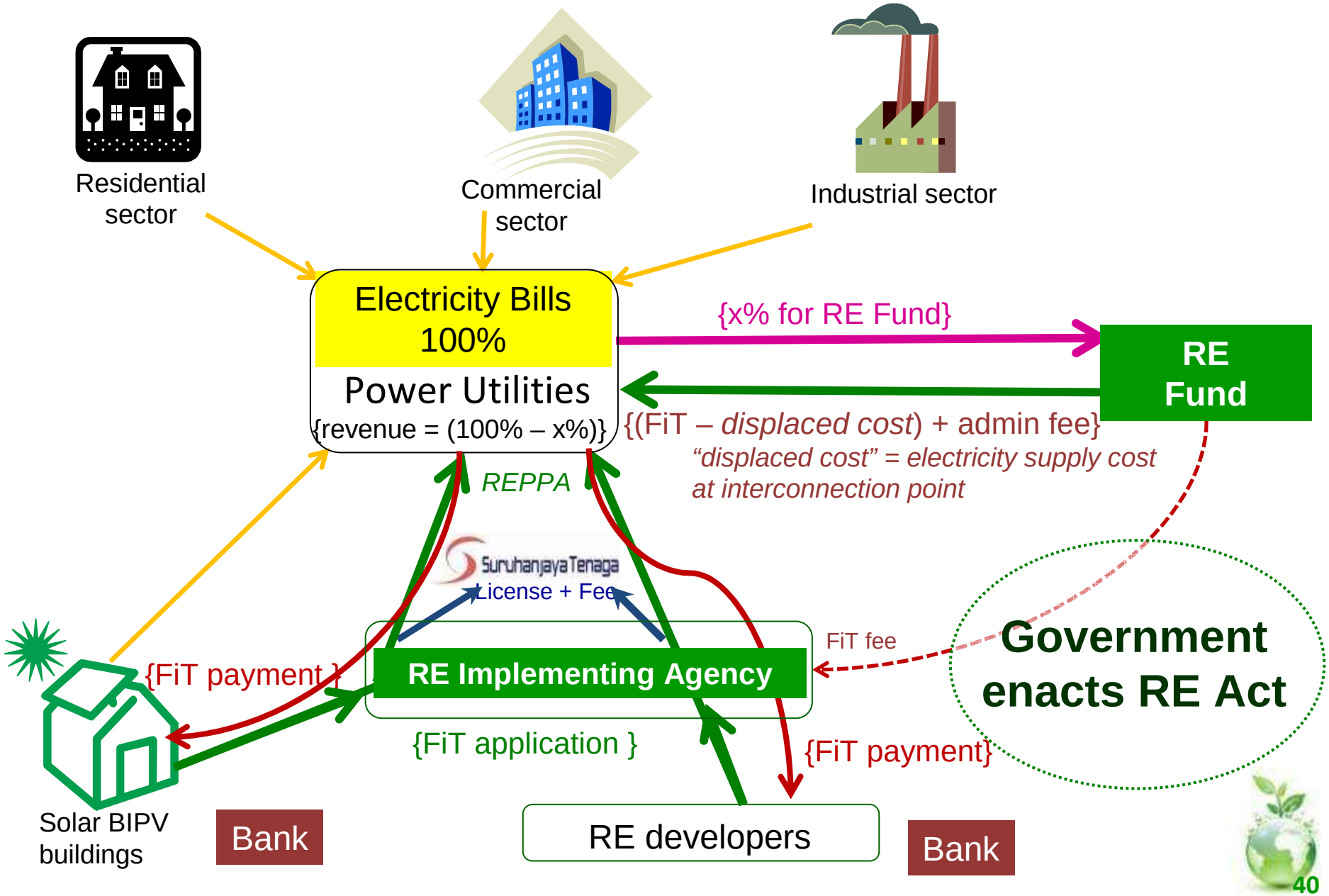
RE Implementing Agency:

- Implementation and managing of RE Feed-in Tariff and reviews to be undertaken by a **Government agency with proper expertise and strong understanding of the FiT**
- The structure of Agency will be determined by the Government
  - Proposed statutory body with legal powers

RE Fund Manager:

- RE Fund is to be managed by a **professional fund manager** according to a procedure as determined by Government
- The administrative cost in managing the fund and other related transactional cost shall be paid from the interest generated from the RE Fund as determined by the Government
- The disbursement from the fund shall be efficiently and expeditiously managed

FiT Mechanism for Malaysia



Potential Impact of National RE Policy by Year 2020

- Minimum **RM 2.1 billion savings of external cost** to mitigate CO2 emissions (total 42 million tonnes avoided from 2011 to 2020, on the basis of RM 50 per tonne of external cost);
- Minimum **RM 19 billion of loan values** for RE projects, which will provide local banks with new sources of revenues (at 80% debt financing for RE projects);
- Minimum **RM 70 billion of RE business revenues** generated from RE power plants operation, which can generate **tax income of minimum RM 1.75 billion to Government;**
- > 50,000 **jobs created** to construct, operate and maintain RE power plants (on the basis of 15-30 job per MW).

Conclusion

The success of the National Renewable Energy Policy and goals can be achieved when the following factors are put in place:

- **RE Act** which implements the Feed-in Tariff mechanism
- **RE Fund** to cover the cost of Feed-in Tariff (FiT) mechanism
  - source of RE Fund which is derived from electricity consumers at a nominal percentage
- Establishment of a dedicated **Implementation agency**
- Malaysia to roll-out FiT in 10th Malysia Plan - Q1 of 2011

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Thank You

RE Policy: Projected RE Growth

Year	Cum Biomass (MW)	Cum Biogas (MW)	Cum Mini-Hydro (MW)	Cum Solar PV (MW)	Cum SW (MW)	Cum Total RE, Grid-Connected (MW)
2011	110	20	60	7	20	217
2012	**150**	**35**	**110**	**15**	**50**	**360**
2015	**330**	**100**	**290**	**55**	**200**	**975**
2020	**800**	**240**	**490**	**175**	**360**	**2,065**
2025	**1,190**	**350**	**490**	**399**	**380**	**2,809**
2030	**1,340**	**410**	**490**	**854**	**390**	**3,484**
2035	**1,340**	**410**	**490**	**1,677**	**400**	**4,317**
2040	**1,340**	**410**	**490**	**3,079**	**410**	**5,729**
2045	**1,340**	**410**	**490**	**5,374**	**420**	**8,034**
2050	**1,340**	**410**	**490**	**8,874**	**430**	**11,544**

Assumptions:

1. RE Technical potential:

   Biomass (EFB, agriculture): **1,340 MW** will be reached by 2028.
   Biogas (POME, agriculture, farm): **410 MW** will be reached by 2028.
   Mini-hydro (not exceeding 30 MW): **490 MW** will be reached by 2020.
   Solar PV (grid-connected): **unlimited**.
   Solid waste (RDF, incineration, sanitary landfill): **378 MW** will be reached by 2024 (at 30,000 tonne/day of Solid Waste as projected by KPKT, followed by 3% annual growth post 2024).

RE Electricity & CO_2 Avoidance

Year	Annual Biomass GWh	Annual Biogas GWh	Annual Mini-Hydro GWh	Annual Solar PV GWh	Annual SW GWh	Annual RE Electricity (GWh)	Annual CO2 Avoidance (tonne/yr)	Cum Total RE (MW)
2011	675	123	300	7.7	123	**1,228**	**846,975**	217
2015	2,024	613	1,450	60.5	1,223	**5,374**	**3,707,825**	975
2020	4,906	1,472	2,450	192.5	2,208	**11,227**	**7,746,837**	2,065
2025	7,297	2,146	2,450	438.9	2,330	**14,662**	**10,117,015**	2,809
2030	8,217	2,514	2,450	939.4	2,392	**16,512**	**11,393,197**	3,484
2035	8,217	2,514	2,450	1,845	2,453	**17,479**	**12,060,165**	4,317
2040	8,217	2,514	2,450	3,387	2,514	**19,082**	**13,166,594**	5,729
2045	8,217	2,514	2,450	5,911	2,575	**21,668**	**14,950,810**	8,034
2050	8,217	2,514	2,450	9,761	2,637	**25,579**	**17,649,620**	11,544

Assumptions:

1.No loss of RE plant capacity (old plants are replaced or upgraded).

2.RE electricity generation:

- 1 MW Biomass (25,000 tonne/year/MW), Biogas generates 6,132 MWh/year (**70%** capacity factor)
- 1 MW mini-hydro generates 5,000 MWh/year (**57%** capacity factor).
- 1 MW PV generates 1,100 MWh/year (**13%** capacity factor – expected to significantly improve in future).
- 1 MW SW (100 tonne/day/MW) generates 6,132 MWh/year (**70%** capacity factor).

3.1 MWh RE avoids **0.69** tonne CO2.

Growth of RE (Solar PV) Industry in Malaysia

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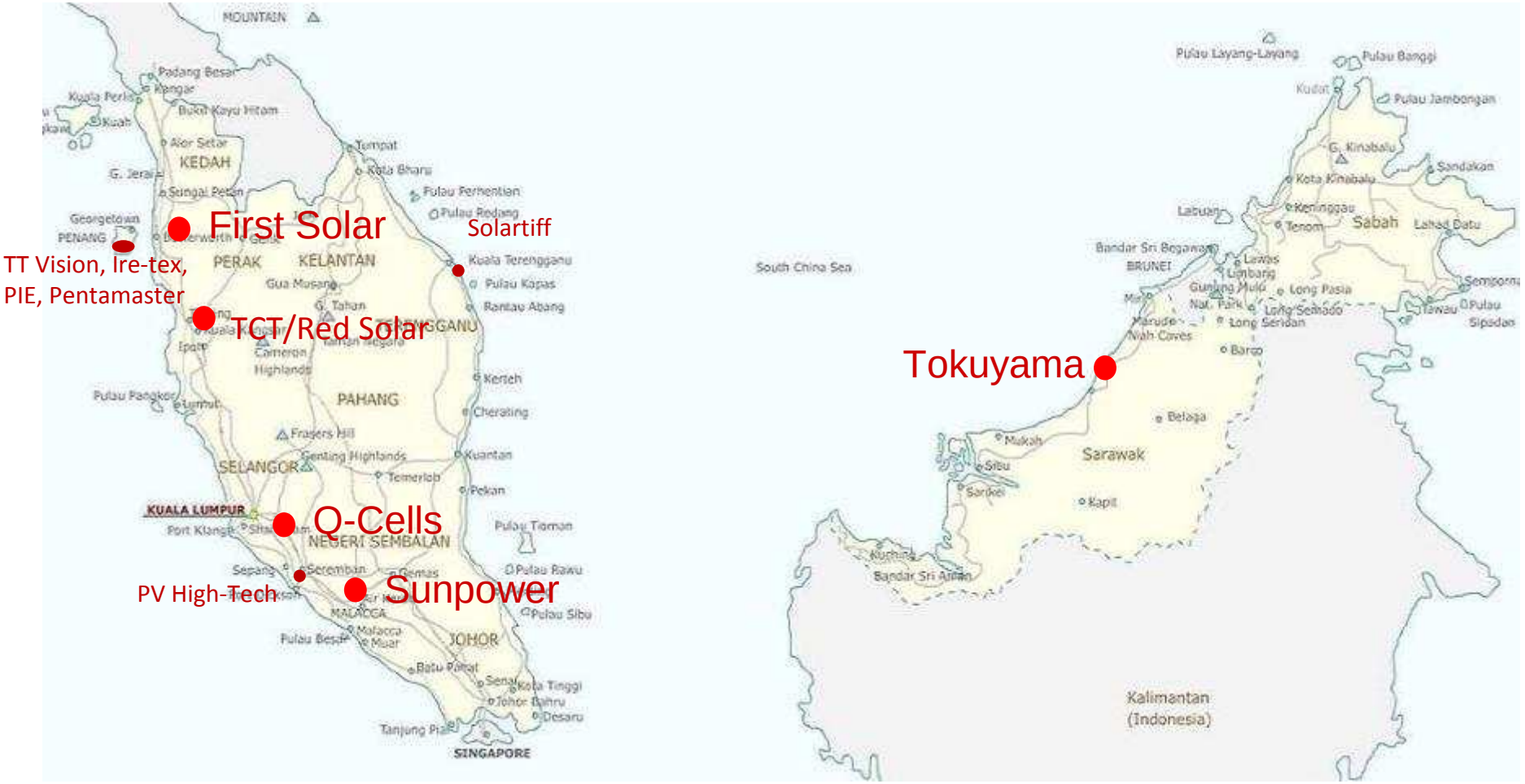

- Impact of FDIs: RM 13.8 billion (in 2 years), 10000 jobs, indirect values to transport and infrastructure sectors, port and shipping industries, etc.
- FDIs provide 'next door' business opportunities to local industry.