



**Asia-Pacific
Economic Cooperation**

2010/EMM9/005

Green Energy and Technology - Issues and Challenges

Purpose: Information
Submitted by: Malaysia



**9th Energy Ministers Meeting
Fukui, Japan
18-20 June 2010**

Green Energy and Technology Issues and Challenges

Tenaga Nasional Berhad

June 2010

CONTENT

Background

National Policy on Green Technology

TNB Initiatives/Contribution in Supporting Green Energy

Issues & Challenges

Conclusion

BACKGROUND

- 1 The world needs to reduce its dependency on fossil fuel (non-renewable energy) as it is fast depleting and due to the harmful impact to the environment – most notably 'Climate Change'
- 2 To this end, sustainable utilisation of energy is being given increasing attention in Malaysia:
 - ✓ Under the Eighth Malaysia Plan, Renewable Energy (RE) was introduced as the Fifth Fuel in the nation's energy supply mix.
 - ✓ The formation of the Ministry of Energy, Green Technology and Water in April 2009 presents another milestone in the commitment of the Government towards Green Energy
 - ✓ In July 2009, National Green Technology Policy was introduced to ensure sustainable development and conserve the environment for future generation
- Hence, Green Technology now assumes an even greater significance. TNB is fully supportive of the need to strengthen the commitment and focus required to implement
- 3 Green Technology particularly in the energy sector in Malaysia

BACKGROUND DEFINITION OF GREEN TECHNOLOGY

- 1 Green Technology is the development and application of products, equipment and systems used to conserve the natural environment and resources, which minimises and reduces the negative impact of human activities.
- 2 Green Technology refers to products, equipment or systems which satisfy the following criteria:
 - It minimises the degradation of the environment;
 - It has zero or low green house gas (GHG) emission, is safe for use and promotes healthy and improved environment for all forms of life;
 - It conserves the use of energy and natural resources; and
 - It promotes the use of renewable resources.

EXAMPLES OF GREEN ENERGY TECHNOLOGY



Renewable Technology

- solar, wind, biomass, geothermal, mini hydro



Energy Efficiency and Demand Side Management DSM



IGCC plant at Negishi, Yokohama

Clean Coal Technology (e.g. Integrated Gasification Combined Cycle (IGCC))



Niederaussem Unit K, Germany. The world's largest supercritical brown-coal fired power plant, 1000 MW

Advanced Energy Cycle Technology (e.g. More Advanced Combined Cycle (MACC), Advanced Super Critical Pressure Boiler)



Nuclear Power Plant in France

Other Alternative Energy (e.g. Nuclear, Mini Hydros)



- 4 -

CONTENT

Background

National Policy on Green Technology

TNB Initiatives/Contribution in Supporting Green Energy

Issues & Challenges

Conclusion



- 5 -

CURRENT POLICIES SUPPORTING GREEN ENERGY & TECHNOLOGY (1)

1 MALAYSIA NATIONAL ENERGY POLICY

Supply Objective

- To ensure the provision of adequate, secure and cost-effective energy supplies
- To encourage development of indigenous energy resources both non-renewable and renewable energy resources using the least cost options
- To diversify supply sources both from within and outside the country

Utilization Objective

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

Environmental Objectives

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

CURRENT POLICIES SUPPORTING GREEN ENERGY & TECHNOLOGY (2)

2 FIFTH FUEL POLICY

- Launched during the Eight Malaysia Plan period (2001 – 2005)
- Renewable Energy (RE) introduced to contribute towards the country's total energy mix
- Promotes the utilisation of renewable energy resources such as biomass, biogas, solar and mini hydro

CURRENT POLICIES SUPPORTING GREEN ENERGY & TECHNOLOGY (3)

3 NATIONAL GREEN TECHNOLOGY POLICY



Five Strategic Thrusts established to:

- Strengthen institutional arrangements to facilitate Green Technology applications
- Provide conducive environment for the growth of the Green Technology industry
- Develop skilled, qualified, competent and productive human resources for the development of Green Technology industry
- Enhance Green Technology R&D
- Change the mindset of the public on Green Technology through effective promotion and awareness program

CONTENT

Background

National Policy on Green Technology

TNB Initiatives/Contribution in Supporting Green Energy

Issues & Challenges

Conclusion

TWO DISTINCT CATEGORIES OF GREEN TECHNOLOGY

1. Commercially Viable Green Technology

- Hydro, Solar, Biomass, Geothermal, Thermal Energy Storage, Cogeneration, Clean Coal Technology, Energy Efficiency and DSM initiatives etc.
- Widely implemented by various energy industry players including utilities in other countries

2. Non-Commercially Viable GT (under further development and research)

- Normally implemented with explicit assistance/subsidy from either Government funding, revolving/seeding fund and/or from consumers (pass through via tariff FiT or pool prices).
- Various examples are as follows:
 - Hong Kong (DSM fund from end-use tariff)
 - Thailand (Energy Conservation Promotion Fund 0.05 - 0.25 baht per liter of sales of petroleum products, revenue 2 - 2.5 billion Baht per annum), Europe, Australia (Pass through via end use tariff/grid price) etc



- 10 -

TNB INITIATIVES / CONTRIBUTION IN SUPPORTING GREEN ENERGY (1)

1. Committed for Renewable Energy Power Purchase Agreement (REPPA) with RE developer as willing buyer with agreement terms up to 21 years (as of April 2010, a total 88.15 MW has been signed)
2. Development of 10 MW Biomass Plant Jengka (joint venture with Felda and JPower), Operation of Mini Hydro Plant 23.5 MW (TNB Energy Services and Cameron Highland/Batang Padang Hydro Electric Scheme), Jana Landfill Puchong 2 MW (TNB ES).
3. Solar Hybrid (Pulau Tinggi Mersing, Pulau Perhentian, Terengganu, Gunung Machincang Langkawi, etc).



Solar hybrid at 'Kepulauan Mersing, Johor'



Solar hybrid at 'Pulau Kapas, Terengganu'



- 11 -

TNB INITIATIVES / CONTRIBUTION IN SUPPORTING GREEN ENERGY (2)

4. Some of TNB's hydro plant schemes (1,011 MW) can be considered as RE (GT) (power density ratio $> 4 \text{ W/m}^2$ - based on UNFCC definition)
5. Continuous effort to increase plant efficiency by utilising advanced technology (e.g. SJ Tuanku Jaafar Combined Cycle running at about 50% efficiency)
6. Constant effort to improve technical system losses and equipment efficiency (embodied in its performance (KPI) requirements)



TNB's SJ Tuanku Jaafar, Port Dickson

Notes: UNFCC = United Nation Framework on Climate Change



- 12 -

TNB INITIATIVES / CONTRIBUTION IN SUPPORTING GREEN ENERGY (3)

8. TNB plays an active role to support Government National Green Technology (GT) Plan/Roadmap including the following aspects:
 - Public Awareness and information/knowledge dissemination – National Energy Awareness Campaign (e.g. SWITCH campaign with FOMCA)
 - Training and Capacity Building:
 - Centre of Excellence on RE established at UNITEN
 - Recently launched Institute of Energy Policy and Research (IEPre), UNITEN
9. In the long term, to incorporate alternative large scale energy technology with minimal carbon emission (e.g. nuclear) as GT to sustain future energy requirement hence ensuring energy security



- 13 -

CONTENT

Background

National Policy on Green Technology

TNB Initiatives/Contribution in Supporting Green Energy

Issues & Challenges

Conclusion

ISSUES & CHALLENGES

1. Intermittency of Supply & Unreliability of Fuel Resources

- ✓ Unable to secure long term fuel contract because most of Small Renewable Energy Program (SREP) developers are not owners of palm oil mill or plantation
- ✓ There is alternative usage of empty fruit bunch (EFB).
- ✓ Oil palm millers or plantation owners should be encouraged to participate in SREP program

2. Financing Renewable Energy (RE) Project

- ✓ SREP developers must have strong financial standing and able to finance RE projects through equity injection rather than relying solely or mostly from commercial loans.
- ✓ Soft loan to be given by the Government as RE Projects should be considered as national projects

3. RE Power Purchase Agreement (REPPA) Price

- ✓ TNB cannot afford to buy electricity from SREP developers at significantly higher than TNB's avoided cost of delivery. Feed in Tariff (FIT) to cater for cost differential between RE and TNB purchase price
- ✓ Price Support Mechanism should be introduced using "Polluters Pay" concept. For example, Petrol tax or "Pollution tax" which can be used to support RE development

ISSUES & CHALLENGES

4. Interconnection

- ✓ To provide access of energy supply from SREP projects to designated loads.
- ✓ TNB (and other electricity industry players) are obligated under licenses issued by Energy Commission to maintain a standard of supply to the customers.
- ✓ Interconnection facility requirements are to ensure compliance with all prevailing statutory requirements and best practices on safety, reliability and power quality of electrical installations and service to customers.

CONTENT

Background

National Policy on Green Technology

TNB Initiatives/Contribution in Supporting Green Energy

Issues & Challenges

Conclusion

CONCLUSION

TNB is fully committed towards the implementation of Green Technology in Malaysia:

- ✓ Embarked on a numerous Green Technology projects – e.g. solar hybrids/ PV, biomass RE
- ✓ Embarked on public awareness and information/knowledge dissemination – National Energy Awareness Campaign (e.g. SWITCH campaign with FOMCA)
- ✓ Training and Capacity Building:
 - Centre of Excellence on RE established at UNITEN
 - Established the International Energy Research and Policy Institute (IEPR), UNITEN
- ✓ Continue to support RE Power Purchase Agreement (REPPA) at higher than our avoided cost of generation (up to 21 sen/kWh)
- ✓ Continuous support for energy efficiency initiatives e.g. Thermal Energy Storage, Energy Efficiency in Buildings etc.
- ✓ RE to be integrated in future generation capacity planning
- ✓ Incorporate large scale alternative energy technology that emits minimal carbon emission – e.g. nuclear
- ✓ Prudent to treat/signal RE and EE as alternative energy resource and not a financial product with very high return



- 18 -

THANK YOU

BACK - UPS

THAILAND ESCO FUND

Energy Conservation Promotion Fund

Objective and Source of Fund

- collect small levy (0.05-0.25 baht per liter) from the sell of gasoline, diesel, fuel oil, and kerosene
- Annual Revenue around 2 – 2.5 billion baht
- Supervised by Energy Conservation Promotion Fund committee – chaired by Deputy Prime Minister
- To be used for energy conservation promotion including research, study, development, demonstration, incentives (grants/soft loan), capacity building, and policy study



LIST OF TNB HYDRO SCHEMES RECOGNIZED AS RE BY UNFCC DEFINITION

- Hydroelectric schemes with reservoir and power density more than 4W/m² could be classified as RE
- Run off river hydro is automatically classified as RE

Hydro Schemes (TNB)	Total Capacity (MW)
Major Schemes (meet UNFCCC criteria power density > 4W/m²) • Pergau, Woh, Jor, Bersia, Piah	988
Batang Padang/Cameron Highlands Scheme • Odak, Habu, Kg. Raja, Kg. Terla, Robinson Falls	11.9
Distribution Mini Hydros (connected at 11 kV) • Pahang - Sg. Pendak, Sg. Sempam, Sg. Sia, Sg. Pertang, Sg. Benus • Kelantan - Sg. Sok, Sg. Renyok, Sg. Rek, Sg. Lata Tunggil • Terangganu - Sg. Brang, Sg. Cheralak, Sg. Kemia • Perak - Sg. Bil, Sg. Kinjang, Sg. Kenas, Sg. Asa, Sg. Chempias, Sg. Temelong, Sg. Tebing Tinggi, Sg. Lawin • Kedah - Sg. Mahang, Sg. Mempelam, Sg. Tawar Besar	11.6
Total	1011.5

Notes: UNFCC = United Nation Framework on Climate Change



- 22 -

REPPA STATUS AS OF APRIL 2010

No.	Item	Nos	Capacity (MW)
1	April 2010 - REPPA signed	17	88.15
	a. Project Commissioned (COD)	6	24.7
	b. REPPA Signed	8	41.45
	c. REPPA Has Been Terminated	3	22.0
2	Project Not Signed	14	108.9
3.	Project not yet Approved by SCORE	4	30
4.	Project Rejected by EC	7	37
	Total Application	39	264.05

Source: System Planning & Development



- 23 -