RENEWABLE ENERGY RESOURCES AND TECHNOLOGIES PRACTICE IN MALAYSIA

S. Mekhilef

Dept. of Electrical Engineering, University of Malaya
50603 Kuala Lumpur, Malaysia
Tel: +60379676851, Fax: +60379675316
e-mail: saad@um.edu.my

ABSTRACT: Malaysia is endowed with vast renewable energy resources such as biomass and solar. Besides, hydro and wind power can be considered as potential renewable energy resources. Harnessing these resources appears to be a promising solution for improving the life quality of rural villagers. The government and many non-governmental organizations (NGOs) have tried to comprehend and have strived to address the problem of energy. The depleting gas and oil sources is also a problem which the government never took for granted as a number of energy-related policies was proposed since six decades ago to ensure the sustainability and efficiency in energy supply. The overall approach in examining this issue will focus on the ongoing renewable energy projects, energy policies for promoting RE as one of the energy supply, technologies used as well as the future direction of the renewable energy sector. This paper reviews the renewable energy resources and renewable energy technologies (RETs) practicing in Malaysia in terms of its implementation, research and development activities.

Keywords: Energy sector, Renewable energy in Malaysia, Energy policies and technologies

1. INTRODUCTION

1.1 Geographical and other information for Malaysia

Malaysia sits on the South China Sea and it lies between 1° to 7° in North latitude and 100° to 120° in East longitude [1]. Malaysia is crescent-shaped which consist of Peninsular Malaysia (West Malaysia) and the island of Borneo, namely Sabah and Sarawak (East Malaysia).The total land area is about 330,000 sq km (329,750 sq km in exact) of which almost 60% is made up of the island of Borneo and the balance of 40% made up the Peninsular Malaysia [2]. However, the majority of the population is concentrated in Peninsular Malaysia comprising about 76% of the total population. In 2009, the birth rate is 22.2/1000 while the infant mortality rate is 15.8/1000. Life expectancy is 73.3 with a growth rate of 1.7% and the density per sq km is 76 [3]. The town in the cities had experienced a seasonal climate change which is dominated by monsoon season.

During the raining seasons, the monsoon winds occurred twice in a year. There are two common types of monsoon, namely Northeast monsoon and Southeast monsoon. Northeast monsoon occurs when the wind blows from central Asia to South China Sea through Malaysia and move on to Australia during the month of November to March. Meanwhile, the Southeast monsoon occurs when the wind blows from Australia across the Sumatra Island and move to the Strait of Malacca during the month of May to September. Inter-monsoon occurs during the month of April to October [1] and between September to December, West Malaysia experience the heaviest rainfall during September until December with the measurement of 2,500 mm of rain per year, whereas in the east Malaysia, the rain's measurement are approximately 5,080 mm of rain per year with the load usually focus on October until February [1,2].

Malaysia's climate is relatively high level of humidity, so do the temperature. The humidity varies from 80% to 90% except for highland [2]. Throughout the year, the temperature ranges between 20°C to 30°C (70°F to 90°F) and the average daily temperature is 26.5°C [1,2]. The monthly solar radiation in Malaysia is approximately around 400MJ/m2 up to 600MJ/m2 in total [1]. It goes higher during the Northeast monsoon duration and lower during the Southeast monsoon.

1.2 Energy status

Currently, Malaysia is adopting the 5th Fuel Diversification Policy (FDP) which was introduced in 1999. FDP defines that the energy mix is contributed by 5 main resources which are gas, coal, oil,

hydro and renewable energy. Coal is the cheapest and easily available resources to generate energy and thus the most attractive solution compare to the other resources. The usage of coal in energy consumption is increasingly at the rate of 9.7% per year since 2002 [4].

Table 1: Peninsular Malaysia Generation Fuel Mix, 2000-2010

Year	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010
Gas	81.8	77.8	75.8	74.9	70.9	65.6	58.1	59.0	58.8	59.1	56.2
Coal	6.7	11.9	14.5	16.2	23.2	28.9	36.1	34.9	35.3	35.0	38.6
Hydro	7.9	6.9	6.4	6.0	5.4	5.0	5.5	5.8	5.5	5.0	4.5
Oil	3.6	3.4	3.3	2.8	0.6	0.5	0.4	0.3	0.4	0.9	0.7
Total (%)	100	100	100	100	100	100	100	100	100	100	100

Source: energy scenario in Malaysia

For electricity generation, the consumption of coal is projected to grow from 12.4 million tons by 2005 to 36 million tons in 2020. However, due to the uncertain future supply and the issues of volatile fossil fuel prices, the government has been looking forward to the usage of nuclear power as the next power generation source to ensure the sustainability of energy supply [4].

1.2.1 Energy supply and demand situation in Malaysia

Recently, the Malaysia's Renewable Energy potential consists of 22,000 MW of hydropower, 500MW of mini-hydro, 1,300 MW biomass and biogas from palm oil mill waste, 400MW of municipal solid waste (MSW), and 6,500MW for solar installation [5].

The sum of energy supply has been increased from 359,444 GWh up to 665,278 GWh in 1995 and 2005, respectively [6]. It can be predicted that the production and the consumption of oil will increase sharply, including hydroelectric and coal. The following table summarises the electric generation from year 1991 to 2000.

Table 2: Electric generation from 1991 to 2000 (million kilowatts hour-kWh)

Type	*1991*	*1992*	*1993*	*1994*	*1995*	*1996*	*1997*	*1998*	*1999*	*2000*
Steam station	14,307	14,871	15,609	14,130	14,373	15,000	14,965	14,094	13,586	12,531
Diesel station	1,585	1,368	1,554	1,538	2,009	2,134	1,600	2,093	1,995	2,209
Hydro station	4,444	4,357	4,925	6,521	6,166	5,139	3,917	4,799	7,460	6,835
Gas station	7,999	11,290	13,491	17,725	23,715	30,138	37,871	38,879	38,874	44,444

Source: DOE [7]

1.3 Energy Policy

In business planning, framework is required to plan and execute marketing strategy to ensure success of a business. The same framework is required to ensure the development and sustainability of energy sector in the country. In 1975, Malaysia's National Petroleum Policy was introduced to ensure the optimal use of petroleum resources, regulation of ownership and management of the industry and economic, social and environmental safeguards in the exploitation of this valuable resource. Subsequently, in 1979, the National Petroleum Policy was enhanced to achieve supply, utilization and environmental objectives. Following this, in 1980, the Malaysia's National Petroleum Policy was formulated as a major step to safeguard against over exploitation of oil and gas (extension). By 1981, the Malaysian government noticed that Malaysia needs to be independent from oil and gas exploitation. With this awareness, the Four Fuel Diversification Policy (FDP) was introduced where focus was on fuel diversification i.e. to avoid over-dependence on oil and aimed to emphasis on gas, hydro and coal.

Malaysia began to recognize the potential of biomass, biogas and other renewable energy resources in the Fifth Fuel Policy in 2000. By 2006, National Bio-fuel Policy was introduced to focus on extensive development of the bio-fuels industry. Indeed, for 7th Malaysia Plan (1996-2001), 8th Malaysia Plan (2001-2005) and 9th Malaysia Plan (2006-2010) emphasis were made on energy efficiency and on generation of energy from renewable sources in an effort to reduce the rapid depletion of other fuel sources. [8]

The Government of Malaysia is fully committed to environmental sustainability and was about to establish renewable energy policy. Recently, the government had introduced the Green Technology (GT) Policy which was formulated in 2009 in order to ensure the sustainability development for future generation.

In order to fast track the development of renewable energy in Malaysia, renewable energy programmes were implemented such as Small Renewable Energy Power (SREP) programme, Suria 1,000 programme. Hybrid Solar Photovoltaic Systems for rural electrification and PTM-UNDP BioGen Project.

1.3.1 Segregation in Energy sector

For the policy and planning, the Economy Planning Unit KeTTHA is responsible to formulate economic policy planning and technical policy planning. Petronas was given the responsibility to manage the resource. In term of transportation, the Ministry of Transport will be in charge. Meanwhile for the electricity industry, Energy Commission, Tenaga Nasional Berhad (TNB), Sabah Electricity Sdn. Bhd. (SESB) and Syarikat SESCO Bhd. which was formerly known as Sarawak Energy Supply Corporation (SESCO) are responsible to regulator supplier of electricity. Last, but not least, the monitoring of pollution is undertaken by Department of Environment (DOE) [9].

2. RENEWABLE ENERGY RESOURCES AND TECHNOLOGIES PRACTICE

2.1 Biomass Sources

There are a variety of biomass energy resources such as agricultural wastes, forest residues and urban wastes table 3 summarises the biomass resources in Malaysia.

Table 3: Biomass resources

Types	Quantity (ktons)	Ratio	Source	Source (ktons)	MC (% wt)	DW (ktons)
Oil palm fronds	46,837	0.572	Oil palm FFB	81,920	60.0	18,735
EPFB	18,022	0.220			65.0	6,308
Oil palm fibers	11,059	0.135			42.0	6,414
Oil palm shells	4,506	0.055			7.0	4,190
Oil palm trunks[a]	10,827	-			75.9	2,609
Paddy straw	880	0.400	Replanting Paddy	-	11.0	783
Rice husk	484	0.220		2,375	9.0	440
Banana residues	530	2.000	Banana	265	10.7	473
Sugarcane bagasse	234	0.320	Sugarcane	730	50.0	117
Coconut husk	171	0.340	Coconut	505	11.5	151
Pineapple waste	48	0.700	Pineapple for factories	69	61.2	19
Logging residues	2,649	1.000	Logs	2,649	12.0	2,331
Plywood residues	2,492	1.000	Plywood	2,492	12.0	2,193
Sawmill residues	1,160	0.818	Sawn timber	1,418	12.0	1,021
Organic waste	4,653	0.690	MSW	6,744	57.5	1,978

2.1.1 Agricultural Wastes

Malaysia is blessed with tropical and humid climate which is suitable for agricultural industry. As one of the most important agricultural countries over the world, Malaysia exports include palm oil, cocoa, rubber. However, the major agricultural resources are oil palm and rubber with the land area over 330,000 km^2. Oil palm or its scientific name *Elaeis guineensis* is the most important species in *Elaeis* genus which belongs to the family of Palmae. The major used of exported palm oil are basically for manufacturer of food products and as well as used for fuel in bio-diesel market.

Table 4: Area under oil palm by states (mature and immature), 2007 (hectares)

State	*Mature*	*Immature*	**Total**
Johor	595,524	75,117	670,641
Kedah	71,934	3,162	75,096
Kelantan	79,146	20,617	99,763
Melaka	45,816	3,297	49,113
Negeri Sembilan	149,879	20,964	170,843
Pahang	563,809	77,643	641,452
Pulau Pinang	13,010	294	13,304
Perak	323,535	27,448	350,983
Perlis	258	2	260
Selangor	120,563	8,752	129,315
Terengganu	135,911	25,376	161,287
Peninsular Malaysia	**2,099,385**	**262,672**	**2,362,057**
Sabah	1,151,698	126,546	1,278,244
Sarawak	513,306	151,306	664,612
Sabah/Sarawak	**1,665,004**	**277,852**	**1,942,856**
MALAYSIA	**3,764,389**	**540,524**	**4,304,913**

Source: MPOB

Table 5 shows the total land areas of crops planting and their annually production in Malaysia in 2007. From the table, its clearly said that the major production in agricultural sector is oil palm with the area of planting 4,304,914 hectares followed by rubber with 1,229,940 hectares of planting areas.

Table 5: Land area of crops planting and annual production in Malaysia for year 2007

	Area of planting (Ha)	*Production (MT)*
Oil palm[a]	4,304,914	26,120,754
Rubber[b]	1,229,940	1,119,553
Paddy	676,111	2,375,604
Fruits	287,327	1,871,262
Vegetables	42,832	694,811
Field crops	12,979	129,302
Herbs	495	890
Pepper	4,896	43,932
Flowers	1,895	154,974,350
Coconut	117,650	504,824
Coffee	7,100	30,550
Sugarcane	14,670	733,500
Tea	2,784	5,540

Source: [Bio-ethanol]
[a] MPOB, 2009a (production of oil palm including all palm-based products).
[b] MRB, 2008

2.1.3 Forest residues

Malaysia produced a large volume of wood mass in the region. Currently, wood residues become the largest renewable energy potential. However, only 60% to 65% of the residues were harvested for energy [10]. The remaining percentage is left to rot or burn. In Malaysia, there exist 4 types of forest residue which are logging residues, saw milling residues, plywood and veneer residues and the secondary processing residues.

Logging residues are generated during the various phases of logging operations in the form of bark, stumps, tops, branches, broken logs and injured standing trees. For the saw milling residues, it is generated within the processing activities in saw mill in the form of sawdust, off-cuts, slabs, shavings and bark in which 65% to 70% of total trees biomass harvested end up as residues [10]. Meanwhile, in plywood mills processing residues in the form of veneer cores, defective ends and irregular pieces of veneer sheets were generated. During the process of planning mills, moulding plants, furniture factories and others, secondary processing residue will be produced in the form of sawdust, plane shavings, a small pieces of lumber trimming, edging, bark and fragments.

2.1.2 Municipal, commercial and industrial wastes

These days, Municipal Solid Waste (MSW) Management in Malaysia post the biggest environmental problem following the improved living standard in the country, especially extensive usage of plastic bags. The amount of solid waste is on the rise every year due to increasing in population, accelerated of urbanization and industrialization process. In 2006, it is estimated that 7.34 million tonnes of solid wastes were generated. Based on data from the Statistic Department (SD), in 2007 Kuala Lumpur's with a population of 1.604 million, is a leading contributor of solid waste which generated from 2,620 tonnes in 1995 to 3,070 tonnes in 2000. Kuala Lumpur alone produces about 4,000 tonnes of solid waste per day in 2000 [11].

Under the governed of the Federal government and states, public health and sanitation has been dealt with under the list of 9th schedule. Furthermore, collection, transportation, treatment and disposal of waste had been managed by Local Authorities. Basically, Solid Waste Management can be defined as a discipline to co-ordinate the control and disposal of solid waste. Despite the drastic economic development in Malaysia, solid waste management is relatively poor. Waste minimization is control the strategy to achieve the UN Agenda 21 [11]. Table 5 below shows solid waste composition of selected area in peninsular Malaysia.

Table 5: Solid Waste Composition of Selected Locations in Peninsular Malaysia

Waste Composition	*Kuala Lumpur*	*Shah Alam*	*Petaling Jaya*
Garbage	45.7	47.8	36.5
Plastics	9.0	14.0	16.4
Bottles/ glass	3.9	4.3	3.1
Paper/ cardboard	29.9	20.6	27.0
Metals	5.1	6.9	3.9
Fabrics	2.1	2.4	3.1
Miscellaneous	4.3	4.0	10.0

Source: [11,12]

MSW is buried at a landfill and undergoing an anaerobic process which produce landfill gas (LFG)-methane (CH_4) , carbon dioxide (CO_2) and greenhouse gases (GHG) [kiv].

2.2 Solar energy

Solar has strongest potential for growth due to Malaysia's location which is situated at the equatorial region and basically it is ideal for large scale solar power installations. Malaysia has all-year-round sunshine where potential to be a leader in Solar Power market. Below is a table on solar radiation in Malaysia throughout the year.

Table 6: Solar Radiation in Malaysia (average value throughout the year)

Irradiance	*Yearly average value (kWh/m^2)*
Kuching	1470
Bandar Baru Bangi	1487
Kuala Lumpur	1571
Petaling Jaya	1571
Seremban	1572
Kuantan	1601
Johor Bahru	1625
Senai	1629
Kota Baru	1705
Kuala Terengganu	1714
Ipoh	1739
Taiping	1768
George Town	1785
Bayan Lepas	1809
Kota Kinabalu	1900

Source: PTM facts and figures. [13]

From the table 6 above, it can be seen that Kota Kinabalu, Bayan Lepas and George Town is the 3 highest level of solar radiation in Malaysia.

2.2.1 Installation of photovoltaic (PV) in Malaysia

Malaysia's first grid-connected photovoltaic was installed in 1998 on the rooftop of College of Engineering, Universiti Tenaga Nasional (UNITEN) with the system capacity of 3.15 kilowatts peak

(kWp), installed by Tenaga National Research (TNR) Sdn. Bhd. In the same year, two grid-connected photovoltaic systems were installed. One of them was installed at a BP petrol station along the KESAS highway with the capacity of 8 kilowatts peak (kWp) by BP Malaysia [14]. Meanwhile, the other was one was installed at Solar Energy Research Park in Universiti Kebangsaan Malaysia (UKM) with the system capacity of 5.5 kilowatts peak (kWp).

First Malaysian Building Integrated Photovoltaic (BIPV) system was installed at a TNB senior officer's house which is located in Port Dickson with the capacity of 3.15 kilowatts peak (kWp). In the year 2000, another BIPV system was installed in Shah Alam with the capacity of 3.34 kWp. For the following year, 2001, another BIPV system was installed in Subang Jaya with the capacity of 2.8 kWp [14]. The installations were basically installed on the top of existing roof tiles. For the BIPV system installed in Subang Jaya, the system was fine since its commissioning without any problem in maintenance.

2.2.2 Technology practice for solar energy

Malaysia has 4 sub-markets in solar power sector consist of off-grid domestic, off-grid non-domestic, grid-connected distributed and grid-connected centralized. However, only grid-connected BIPV has the reliable data, albeit off-grid PV unofficially installed from 5MWp up to 6MWp. For the total BIPV installed capacity by the end of year 2006, there are 486 kWp capacity with 20 installation altogether. The largest capacity was installed at the Enterprise Four Building at Technology Park Malaysia for 361.9kWp which simply 74.5% of the total BIPV installed [15].

2.2.3 Solar Thermal Systems technology.

The applications of solar thermal systems in Malaysia are being used for solar drying and solar water heating, In solar drying systems, there are 2 types of direction. The first one is a simple, low power, short life with low efficiency drying system. The other one is a high power, long life and high efficiency system, but yet expensive. There are 3 categories of solar assisted drying systems - solar assisted drying system with the V-grove collector (used for drying chillies and green tea) , solar assisted drying systems with the double pass collector (for oil palm fronds-an agricultural waste of the oil palm tree) and solar assisted dehumidification system (for medicinal herbs).
Besides, the additional solar dryer has been tested. It is a natural convective solar dryer which provide a low cost drying system for agricultural and marine products used.

2.3 Hydropower

Due to the scarcity in fossil fuel supply as well as the ensuing high prices caused by resource nationalism around the world, hydro power is expected to play a more important role in the generation mix. Its share in the generation mix is expected to increase from 5% in 2008 to 35% in 2030 for Peninsular Malaysia [16]. Table 7 shows the expected power generation by mini-hydro power plants in Malaysia. Hydropower is a well-established technology and due to this fact, current research and development in the field does not generally receive the same amount of attention as other energy technologies. However, it is a technology that depending on scale which has significant negative environmental effects, a reason as to why the government is focusing on small hydropower projects to minimize the harmful impact towards the ecosystem. Table 8 indicates mini-hydro projects status in Malaysia until July 2009.

Table 7: Power Generated by mini-hydro in Malaysia

Year ending	Cum Mini-hdyro (MW)
2011	60
2015	290
2020	490
2025	490
2030	490(3)
2035	490(3)
2040	490(3)
2045	490(3)
2050	490(3)

The largest ongoing hydroelectric project to be built in Malaysia is the Bakun Hydroelectric Power Plant, also known as the "Three Gorges Project in Southeast Asia". This project was first

implemented the beginning of 1990 and was shelved in 1997 due to the Asian Economic Crisis. It was resurrected in the year 2000 [17].

The project is situated on Balui River, Sarawak. The project comprises the construction of a 2,400MW hydroelectric dam, the transmission of its electricity, and the building of related infrastructure including access roads [7]. Estimates of the amount of electricity Bakun will actually generate vary considerably, but the present official figure is that it would operate at an average output of 1,770 MW. At least 70% of this will be transmitted to Peninsular Malaysia, across some 1,500 kms of overland wires and three or four 650-km-long undersea cables [18]. It includes a 205-high-meter Concrete Face Rockfill Dam (CFRD) with a crest length of 740 m, and width of crest and base of 12 m and 573 m. Table 3 shows the power generated by mini-hydro in Malaysia

Table 8: Mini hydro Project Status

	Number of Projects	MW
Licensed projects	5	15.8
Approved projects	10	61.5
Total	15	77.3

Source: [5]

2.4 Wind Power

Wind energy is considered a green power technology because it only has minor impacts on the environment. Wind energy plants produce no air pollutants or greenhouse gases. The potential for wind energy generation in Malaysia depends on the availability of the wind resource that varies with location. The Northeast and Southwest monsoons blow alternately during the course of the year, in which the Northeast monsoon blows from approximately October until March, and the Southwest monsoon blows between May and September. Table 9 below shows the monthly and yearly wind speed and their standard deviation along 2005 until 2006.

Table 9: Monthly and yearly wind speed and standard deviation, 2005-2006 [19]

Years	**2005**		**2006**		**Whole year**	
Parameters	**V_m**	**σ**	**V_m**	**σ**	**V_m**	**σ**
January	4.442	1.111	7.736	21.240	6.089	11.176
February	3.474	1.885	9.613	20.436	6.544	11.161
March	3.161	0.901	5.131	14.054	4.146	7.478
April	2.536	0.357	4.663	12.548	3.600	6.453
May	2.244	0.279	4.296	11.755	3.270	6.017
June	2.251	0.248	4.441	11.946	3.346	6.097
July	2.183	0.382	4.130	11.306	3.157	5.844
August	2.133	0.283	4.280	11.713	3.207	5.998
September	1.913	0.550	2.168	0.396	2.041	0.473
October	2.403	0.802	2.141	0.377	2.272	0.590
November	2.383	0.789	2.122	0.788	2.253	0.789
December	4.579	1.424	4.404	2.989	4.492	2.207
Yearly	**2.809**	**0.751**	**4.594**	**9.962**	**3.701**	**5.357**

3. Discussion on Renewable Energy in Malaysia

3.1 The benefits from Renewable Energy enforcement in Malaysia

Malaysia plays an important role in fulfilling the growing global demand for oils. The advantage of palm oil production for bio-diesel is that every part of the trees is being used for a good purpose. The empty bunches whereby produced after processing is turned to be biomass that can be used as vehicle's fuel.

The agricultural wastes production seems to be attractive based on the bio-resource sustainability, environmental quality and economic consideration. Oil palm residues have a huge potential in power generation. The efficiency of technology implemented can be improved in further.

For solar energy sector, it saves money as the energy derived from the sun is practically free and doesn't required any fuel to generate the electricity. The use of solar energy indirectly will reduce the health costs as it is environmentally friendly. Solar energy is a clean, renewable and sustainable energy which does not pollute our environment. Furthermore, the low maintenance made it a favourable energy to be used in the future. [20]

3.2 The barrier and challenge that Malaysia had to face

Even-though the use of Renewable Energy Resources has a lot of benefits, there are still many challenges. First to be concerned is that the development of technology used. Secondly, the high cost of Renewable Energy. Small Renewable Energy Power (SREP) programme has been launched in order to develop small grid-connected renewable energy plants whereby not exceed more than 10MW in capacity. The programme had targeted to contribute 5% as equivalent to 600MW of the country's electricity generation by 2005, but despite various fiscal incentives. Only 2 plants in total capacity 2MW have been commissioned. The major challenges are in securing project funding from financial institutions and fuel supply security issues.

Thirdly, there are lacks of available information on the potential supply on renewable energy at the national level. Furthermore, the low demand for energy from Renewable Resources is also hindering the utilization of Renewable Energy [21].

The upfront cost of initial cost is the main disadvantage of PV installation in solar energy sector [21,22]. Some other reason is that the solar panels needed quite a large area for installation to achieve a good level of efficiency.

3.2.1 Financial

The high initial capital and lack of suitable support mechanisms make the BIPV technology is economically inapplicable. The technology price in Malaysia can only be reduced if there is a sustainable BIPV market, but a sustainable market cannot be established if the economics of the technology are poor. To date, there are no financial incentives provided for BIPV, so a customized financial incentive program for BIPV will be necessary to encourage development of PV.

Another barrier that restrain the implementation of RE is the electricity sales price. Most of the investors are not interested with the RE power project due to the sales prices of RE electricity. The present recommended sales price of RE electricity at 17 cent per kWh that is based on a study done by DANIDA is obviously unacceptable to investors.

3.2.2 Limitation of resources

The availability of the supply is uncertain as the contributors are not committed to have a long term agreement with the renewable energy project developers. For example, the reliability of the fuel supply is dependent on the mills capacity and operation. Moreover, we are not certain about the actual volume and quality of the waste or the empty fruit bunches (EFB) from the mills and seasonal nature of the palm oil mill operations. The competition with non-energy uses of the palm oil residues should be taken into consideration too.

3.2.3 Market

One market barrier in Malaysia is the high import duties that can apply to renewable energy technology. Generally, equipment used in the generation, transmission and distribution of electricity attracts import duties of up to 45 per cent and sales tax of 10 per cent. However, import duties can be zero for some items. In addition, some equipment requires an import license.

4. Concluding remarks

Generally, Malaysia energy sector is still dependent on conventional energy such as fossil fuels and natural gas. Among the various Renewable Energy Sources, biomass seems to be a very promising option for Malaysia. The main application is not limited to traditional domestic sector and small-scale industries only, but also being used in modern system for cogeneration and power generation. However, the rapid growth of greenhouse gas (GHG) has caused the Mother Nature to suffer drastically. The other option for seeking energy resources is solar energy. Solar energy is the most promising renewable energy as it has become another favourable RES. However, in 2009, it has been stated that there is possibility of utilizing nuclear energy in future prospective. In the energy sector, the emission of Greenhouse Gas (GHG) is leading to the global climate change issues. A study has been done and found nuclear power will have a potential in reducing the environmental impacts due to the contribution of greenhouse gasses mitigation. Therefore, the government must be ready in looking for other alternatives energy source like nuclear energy and photovoltaic in order to conserve the energy sustainability and utilizing the environmental friendly energy sources.

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