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Study on Malaysian's Perspective towards Renewable Energy Mainly on Solar Energy

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Abstract

Malaysia, despite being known as the suppliers for oil and natural gas in the world is having a hard time fulfilling the huge demand of domestic and international energy sector. The nation's oil production has been gradually decrementing since reaching a peak of 862,000bbl/d in 2004 due to mature reservoirs. Alternative Cost as well as the maintenance that remains increasing yearly while the supply of fuels are depleting is making it hard for Malaysia to be able to sustain its oil development. This has become an important issue for the government to establish energy in the most economically worthy to ensure the sustainability in its development. This paper presents a review on Malaysian's perspective on renewable energy mainly in the solar energy sector by conducting a survey study. The survey focuses on the level of understanding Malaysian has towards renewable energy, the level of acceptance towards solar energy, the future prospect of solar energy as well as the financial perspective on solar energy in Malaysia. Study shows that renewable energy mainly in the area of solar energy receives warm welcome from many Malaysian as well as a demand for change in the conventional energy method. Malaysian is also ecologically concern as well as ready for any policies that has a solving mechanism in this energy crisis.

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1. Introduction

Malaysia is an Asian country which consists of Peninsular Malaysia, Sabah and Sarawak, in which the, later duo makes up East Malaysia. It is separated by South China Sea and has a total area of 329,847 km² with a population of 29 million till date [1] and increases consistently on an average of 1.542% [2]. Malaysia's strategic geographical location makes it an advantage because of its huge amount of the solar irradiance ranging from 1400 to 1900 kWh/m² and averaging about 1643 kWh/per year with more than 10 hours per day [3]. Even in the smallest state of Malaysia (Perlis) which is situated in the northern Malaysia region and borders Thailand, an average of 5.02 kWh/m² solar radiation is produced yearly [4]. The area in northern region of Malaysia shows denser radiation rather than the southern region. It is told that the weather condition in Malaysia is very suitable as to being photovoltaic feasible because Malaysia's weather condition is almost predictable with 10 hours of daily sunlight available. The requirement to obtain an optimum power from a PV system is 6 hours of direct sunlight with solar irradiation of 800 W/m² to 1000 W/m² [6,7] and considering that Malaysia has outwit the range is considered good for the usage of photovoltaic. Petroleum and natural gas is the strongest contributor for Malaysia's economy growth, but nowadays the Malaysian petroleum oil production has been falling gradually since its peak in 2004 and if no new oil fields are found, Malaysia would have its oil depleted around 2030 which will affect the need of energy in the country [8]. According to Tenaga Nasional Bhd (TNB)'s recent report quoted that power generation from hydro stood at only 6.3% for its financial year (FY) of 2009, while power generation from other renewable sources such as biomass and solar was almost negligible. The national utility company still had to burn fossil fuel, including gas and coal, which constituted more than 90% of its total fuel mix, to generate electricity for the country". In its last financial year, hydro contributed 17.47% to TNB's power generation fuel mix, while gas and coal contributed 54.46% and 27.96%, respectively [9]. Based on the given statement, one does ponder the level of contribution RE has on consolidating Malaysia's energy demand for the years to come.

1.1. The Demand of Energy in Malaysia

Malaysia is known as the suppliers for oil and natural gas in the world and is consistent in trying to fulfill the huge demands of domestic and international energy sector, in spite so, the national utility company is actually struggling to meet the demand as oil reserves is declining and baring the cost to sustain the electrical FiT that Malaysian are paying right now. Malaysia's oil production is 716,000 bbl/day (2010 est.) and consumption is 556,000 bbl/day (2010 est.), meanwhile its oil exports are 644,900 bbl/day (2009 est.) and oil imports are 355,300 bbl/day (2009 est.), the oil proves reserve are 5.8 billion bbl (1 January 2011 est.). On the other hand, the natural gas productions are 66.5 billion cu m (2010 est.) and consumption is 35.7 billion cu m (2010 est.). The natural gas imports and exports are 1.269 billion cu m (2009 est.) and 30.79 billion cu m (2009 est.) respectively while it's proved reserves are 2.4 trillion cu m (1 January 2011 est.) [2]. Total oil production in 2011 was estimated 630,000 barrels per day (bbl/d), compared to 716,000 bbl per day in 2010, of which about 83 percent was crude oil. Malaysian oil production has been gradually decreasing since reaching its peak at 862,000 bbl per day in 2004 due to its maturing reservoirs [10]. In addition with the costs that remains increased year to year whilst fossil fuels depleting, sustaining a stable development for Malaysia now is getting much harder. This becomes important for the government to establish energy in the most economically worthy to ensure the sustainability in development. Malaysia is in a luckily state because it is in the area which is gifted with natural energy resources such as solar, wind, hydro power electricity and biomass as well as implementing other energy resources from ocean energy, geothermal and nuclear in order to replace the conventional energy resources (oil, natural gas, coal) [11]. The potential of each type of energy resources are based on different factor and

criterion. Presently the price of fossil fuels are now distorting despite being gradually increasing, government are now taking serious action to focus on establishment of energy mix in Malaysia based on different resources apart from conventional fuels [12-14].

1.2. Solar Power Scenario in Malaysia

Till date, Solar energy have been popular among other renewable energy sources mainly because of its 'plug and play' features, unlike other resources which needs mechanical support such as motors or generators (hydro, wind, wave) or chemical support (bio fuels) which are mostly circumstances oriented. Solar technology is new and developing on a linear rate. Solar technology has been popularized since its application as an alternative energy source for a pocket calculator. Now solar panels are being used along the north-south highways, telecommunication towers, and even for street lighting. The massive advertisement and popularity of solar technology have been the cause for people to wrap around their business on solar technology. Even though one might be clouded by the popularity of solar technology but the bitter fact remains that solar technology have been overrated. People have lack of understanding about the solar panels contribution towards providing high energy sources. Malaysia's hydro or nuclear seems more prominent compare to other RE sources in being the aid of alternative energy sources, as to delay the nation oil depletion and energy crisis. Solar technology for one is expensive and has relatively high capital cost in which an average of 19K/kW, it also has low production ratio and 15% in cash flow despite Malaysia being 2nd largest country in PV production. To implement a solar farm for instance, ample of space is needed to place the solar arrays, take for instance the 11MW Serpa solar power plant in Portugal which needed 90 acres of land to place all the solar panels in which it shows a ratio of 5 Football fields per MW [15]. The reason for this is that solar cells efficiency is still at lower percentage with a minimum efficiency of 15% for crystalline silicon solar cell to at least 43% by using tandem solar cells and it gets expensive as the efficiency increases. People based more research on solar application rather than towards the solar cell research by itself. Many are reluctant because health issue is in jeopardy as hazardous chemical are involved. At present solar energy application are mostly oriented towards lighter loads because cost is at stake and higher load such as domestic hot water system, water pumping, drying of agricultural product which needs several PV modules that can be expensive and longer ROI period. Fig 2 shows Multinational (MNC) and Local (L) investor on PV manufacturing in Malaysia. Notice that Malaysia is open to foreign as well as local companies in PV production which is the cause of the nation being ranked no 2 in PV production around the world.

1.3. Feed-In Tariff (FiT) for Solar PV by SEDA

On 2010, the Minister of Energy, Green Technology and water Datuk Seri Peter Chin Fah Kui said that renewable Energy act in feed in tariff will be established to fulfil the government aim to produce 2,080MW from RE alone by the year 2020 [16]. Based on the SEDA portal, the applicable FiT rate based on Table 1 will depend of four factors such as:

- a) Types of renewable energy resources used in which justification for selection includes proven technologies and technical potential under the local environment.
- b) Installed capacity of the renewable energy (RE) installation-Maximum installed capacity of all eligible RE installations is 30MW unless special approval from the Minister is obtained. The FiT rate is lower as installed capacities increase, due to cost optimization from economies of scale.

- c) If the RE installation meet the criteria entitling it to obtain additional bonus FiT rates-Additional FiT rates are eligible to those RE installations that meet the criteria which qualifies it to additional bonus FiT rates.
- d) Punctual RE installation when it is completed and connected to the grid in which it is ready to produce RE for commercial sale i.e. the FiT Commencement Date-The FiT rates for all renewable resources (except for small hydropower) will decrease with time according to their respective annual depression rates. The depression occurs at the start of each new calendar year from 2013 onwards. The degressed or reduced FiT rate for each RE installation is determined by the applicable rate at the time of its FiT Commencement Date. Thus RE installations that are completed in later years will have a lower FiT rate. However, the rate will not be reduced any further once the FiT Commencement Date has been achieved. The basis of the depression rate is that the costs of the RE technologies just like any other technologies are expected to drop as the technologies mature. The depression rate therefore reflects the maturity and the existing cost reduction potential of all renewable resources (except for small hydropower) [17].

Table 1. FiT rates for Solar PV [17] (Source obtain from SEDA MALAYSIA Portal till date)

Description of qualifying renewable energy installation	Fit Rates (RM per kWh)		
	2012	2013	2014
a)Basic FiT rates having installed capacity of:			
i)up to and including 4kW	1.230	1.1316	1.0411
ii)above 4kWand up to and including 24kW	1.200	1.1040	1.0157
iii)above 24kW and up to and including 72kW	1.180	1.0856	0.9988
iv)above 72kW and to and including 1MW	1.140	1.0488	0.9649
v)above1MW and up to and including 10MW	0.950	0.8740	0.8041
vi)above10MW and up to and including 30MW	0.850	0.7820	0.7194
b)Bonus FiT rates having the following criteria (one or more)			
i)use as installation in building or building structures	+0.2600	+0.2392	+0.2201
ii)use as building materials	+0.2500	+0.2300	+0.2116
iii)use of locally manufactured or assembled solar PV modules	+0.0300	+0.0276	+0.0254
iv)use of locally manufactured or assembled solar inverters	+0.0100	+0.0092	+0.0085

2. Malaysian Perspective on RE

This topic presents a study on Malaysian views on renewable energy in general and the prospects of solar energy. It is based on survey conducted on Malaysians ranging from different discipline such as those from RE industries, non RE industries, Learning Institution, Students and also the common public. The survey was conducted on the basis that each category of peoples could produce variance in their answer as to study their understanding on current issues regarding renewable energy in Malaysia. The scopes of the question are to test on;

- a) The choices of renewable energy in Malaysia
- b) The level of understanding towards renewable energy in Malaysia
- c) The level of acceptance on solar energy in Malaysia
- d) The future prospect of solar energy in Malaysia.
- e) Financial perspective on solar energy

A total of 6,450 Malaysians answered the survey which is then analyse in terms of the scopes provided to them. Based on analysis, one could conclude whether the understanding of Malaysian's towards RE are solely based on knowledge or has been highly propagated commercially which could influence the output of the answer.

2.1. Malaysian Preference of RE

Malaysians were ask on their choice on Renewable energy sources in which they were given choices such as solar, wind, geothermal, bio fuel, biomass, wave energy and others. Based on Fig 1; it shows that 72.22% of Malaysian have chosen solar energy as their preferred RE source, it is than followed by wind and biomass with 7.6% and 7.3% respectively. Bio fuel came in with 4.03% as favorites and finally less people in Malaysia which accounts to 5.43% wanted some other resources as an alternative energy. To strengthen the decision from Malaysian community on solar energy, a question was asked again on the reliability of this particular renewable energy towards sustaining energy in which based on Fig 2; it shows that 89 % acknowledged its reliability and 11 % choose to differ. This shows that, not only does the public were able to receive solar energy as an alternative source aside from other energy resources but did specifically chose Solar Energy as a reliable source. On question regarding the stability and efficiency of solar energy, the public based on Fig 3, shows that 72% agreed that it is efficient and stable while 27% disagreed. This answer may be due to the strategically geographical location of Malaysia that has huge amount of the solar irradiance ranging from 1400 to 1900kWh/m² [18] and averaging about 1643kWh/m² per year with more than 10 hours per day. Even though it is said to be efficient and stable, many Malaysian which accounts to 84 % believes that solar energy is still expensive despite government incentives and policies to urge its development. 16% of respondent feels that it is not expensive.

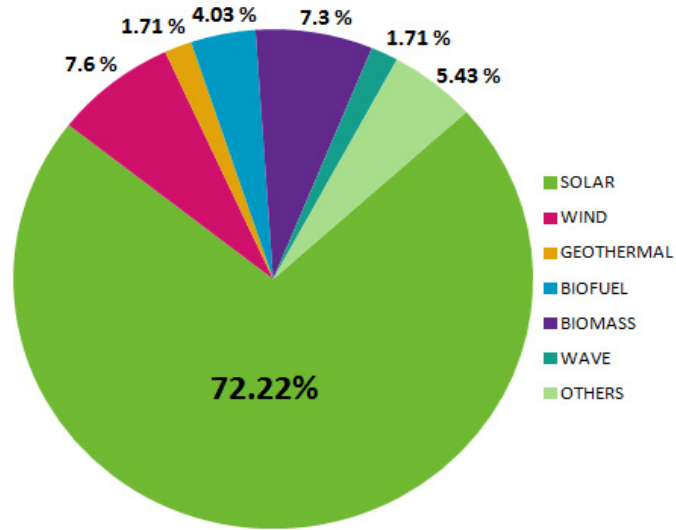


Fig. 1. Choices of Renewable Energy Sources for Malaysian

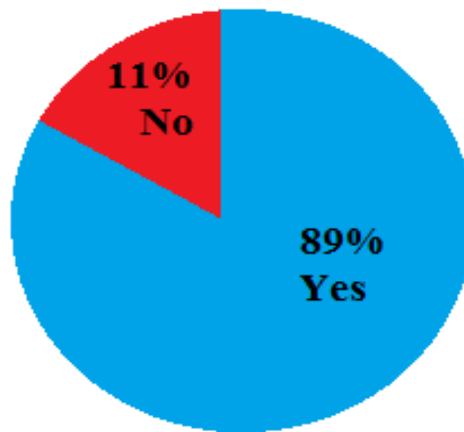


Fig. 2. Reliability of Solar Energy

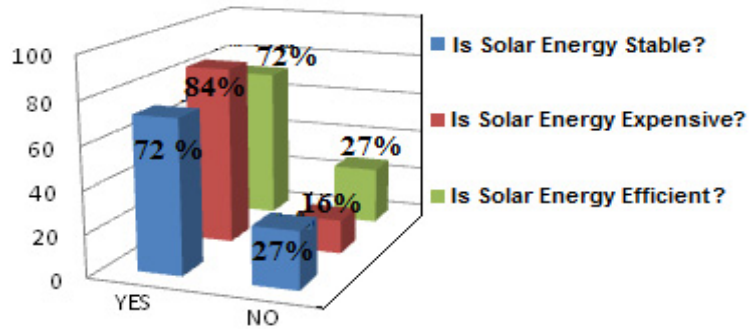


Fig. 3. Level of Acceptance on Solar Energy in Malaysia

2.2. Application of Solar Energy in Malaysia Homes

Malaysian was asked whether they would associate source from solar energy with the utility provider as their home electrical supply, 68% based on Fig 4 agreed for a change to associate conventional energy with solar energy while 32 % are still sceptical. The result shows that almost 4380 respondent agreed to a change which accounts to a ratio of 2.1:1 compared to the sceptics. The government had established several policies and programs in order to cater the energy demand in the country. In Malaysia, the government has introduced renewable energy fund and feed in tariff scheme in order to encourage more implementation on Renewable Energy sources [17].

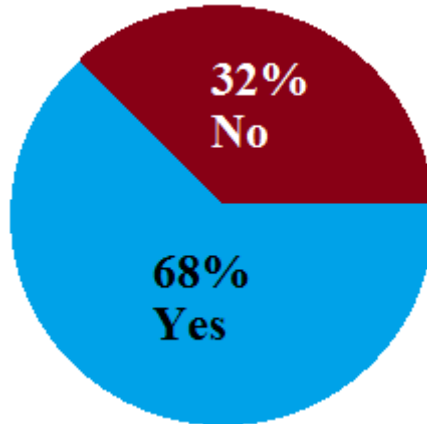


Fig. 4.Application of Solar Energy together with National Utility Provider for Houses in Malaysia

Malaysians were asked if they are willing to accept an increase in FiT on their monthly billing if the national utility provider associates renewable energy as an energy source provider to their homes, based on Fig 5, 58% refuses the hike while 40% shows support on this implementation. Although this result seems to damper the possibility of RE being implemented, it is actually positive in the sense that 40 % were willing to go for a change and this result were actually neck in neck between those who agreed and disagreed.

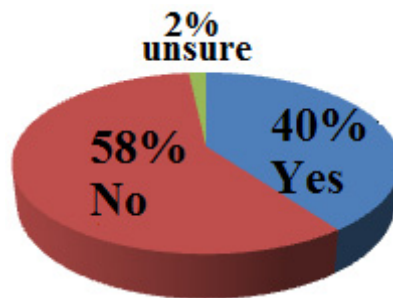


Fig. 5.Willingness to pay extra if RE is used by Utility Companies.

2.3. Prospect in Solar Energy in Malaysia

A question were asked on the seriousness of the government on RE issues in which based on Fig 6, it shows that 68% of respondent agreed that the government is serious in developing green technology, 31% of respondent is skeptical on the government effort. Besides that, the levels of prospects for solar energy in Malaysia in terms of financial and economy growth was asked in which based on Fig 7, 33% respondent answered that it is in a good path and 63% says is fair, and only 3% stated that it is in a worse condition. A total of 96% accounts to a positive remark on the government’s efforts on promoting solar technology in Malaysia.

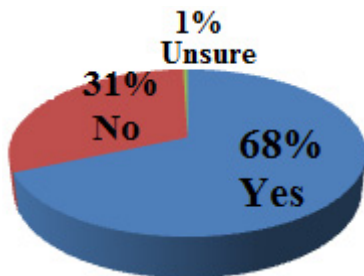


Fig. 6. Government view in promoting green technology

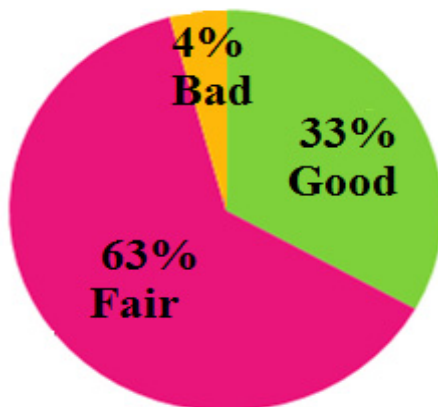


Fig. 7. Prospects for Solar Energy in Malaysia in terms of financial and economy Growth

Finally when prompt a question whether the government should make solar power development a national priority, 92% of respondent have agreed to it and only 8 % refuses by saying no to solar power being a priority of the nations and when a question of government funding towards Solar energy is asked, 61% agreed that the government has provided sufficient funding towards RE sources while 39% beg to differ stating that is it still insufficient as to more funds should be allocated.

Conclusion

On the contrarily side, based on the 8th Malaysia Plan the nation is only able to achieve 1% from the fixed targeted 5% of RE energy mix and the same happened on the 2006 9th Malaysian Plan. Many fixed target from the policies are far from being reached. However on the bright side, Renewable Energy has a huge

potential in Malaysia despite its strategically geographical location. With the support from various government agencies in terms of R&D and FiTs as well as from its policies, RE domination in Malaysia is set to have a strong hold in which solar power which has started initially is boosting up since the year 2000 on a rapid growth and is now a major part of renewable energy sources for electricity generation in Malaysia. Thanks to various efforts from Petronas, TNB, EC, KeTTHA, SEDA, PTM as well as many institutes of higher learning whom have become a key players in setting the importance in the nation's energy development as well as making the public aware of the predicament faced by these agencies. Malaysia has also played an important role in propagating the idea of reduction of emission caused by energy related. Overall Malaysian has shown positive attitude towards the implementation of renewable energy particularly the solar energy field in sustaining the energy development for years to come.

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