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RENEWABLE ENERGY RESEARCH IN MALAYSIA

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ABSTRACT

Malaysia is one of the most developing ASEAN countries, with a GDP of US$14,700 per capita (PPP basis), and steady GDP growth of 5.5 in 2008. Malaysia is in the midst of an era of vigorous industrial growth brought about by strong domestic demand together with its significant science and technology development. To cope with the economical and industrial growth, the demand of energy is growing very rapidly. In this paper the energy related policies of Malaysia have been discussed. The present status of renewable energy in Malaysia has been also discussed in the paper as well. It has been found that among all the renewable energy sources, solar energy is the most prospective one in Malaysia.

Keywords: Renewable, Malaysia, Wind, Solar

1. INTRODUCTION

According to the estimation of international Energy Agency, 53% global energy consumption will be increased by 2030, with 70% of the growth in demand coming from developing countries (Oh *et al.*, 2010). Malaysia is one of the most developing countries among ASEAN countries next to Singapore, with GDP of US$15,400 per capita (PPP basis), and steady GDP growth of 4.6% in 2009 (IMF, 2010). Malaysian economy grew at 5% in 2005 and overall energy demand is expected to increase at an average rate of 6% per annum (Saidur *et al.*, 2009). In parallel with Malaysia's rapid economic development, final energy consumption grew at rate of 5.6% from 2000 to 2005 and reached 38.9 Mtoe in 2005. The final energy consumption is expected to reach 98.7 Mtoe in 2030, nearly three times the 2002 level. The industrial sector will have the highest growth rate of 4.3 percent. Industrial sector accounted for some 48% of total energy use in 2007 which represents the highest percentage. It is estimated that the natural gas reserve is expected to last for around 70 years, while oil is expected to be depleted in 16 years at current rate of usage (Shigeoka, 2010).

The crucial challenge facing the power sector in Malaysia is the issue of sustainability that is to ensure the security and reliability of energy supply and the diversification of the various energy resources. The question of security and reliability of supply is critical, to ensure smooth implementation of development projects to spur economic growth in Malaysia while diversification of energy resources is critical to ensure that the country is not dependent only on a single source of energy. In Malaysia, green technology application is seen as one of the sensible solutions which are being adopted by many countries around the world to address the issues of energy and environment simultaneously. In Malaysia, there seems to be renewed impetus in promoting the growth of an indigenous "green economy." Not only does the country face the threat of climate change and pollution but the Government also has to find new sources of growth and move up the value chain (Leo, 1996; Oh *et al.*, 2010). Therefore, in this paper the numerous energy policies which have been adopted so far and the renewable energy development in Malaysia have been discussed as well.

2.0 ENERGY POLICIES IN MALAYSIA

Malaysia's energy sources primarily comprise oil, natural gas, hydro power and coal, although renewable energy (RE) sources such as solar power and biomass are currently being exploited (Poh and Kong, 2002). For the past 60 years, Malaysian government has formulated quite a number of energy-related policies to ensure sustainability and security of energy supply. But over the last three decades, pragmatic energy

policies have facilitated a more environment-friendly energy development path. The national Energy Policy, the more significant policy was actually introduced in 1979 with three primary objectives; supply, utilization and environmental. The fuel diversification policy in Malaysia is reviewed from time to time to ensure that the country is not over dependent on main energy source. The policy was further revised in 1999 with the announcement of the Five-Fuel Diversification Strategy. Renewable energy (RE) was made the fifth fuel in the energy supply mix in the Eighth Malaysian Plan with the target to contribute 5% of the country's electricity demand by year 2005. In order to meet this goal, the Small Renewable Energy Program (SREP) was launched in May 2001 under the initiative of the Special Committee on Renewable Energy (SCORE) aimed to support the government's strategy in intensifying the development utilization of RE as the fifth fuel resource in power generation. The development pace of RE in Malaysia is rather slow and still at its nascent stage, with its current contribution at around 1% only of the total energy mix, even though the fifth fuel policy had been announced a decade ago (Oh *et al.*, 2010; Saidur *et al.*, 2010).

In the 9th Malaysian Plan (2006-2010), the emphasis on energy efficiency is intensified to address the nation's energy challenge in line with the sustainable development agenda. The establishment of the Ministry of Energy, Green Technology and Water to replace the Ministry of Energy, Communications and Multimedia earlier in 2009 reflects Malaysia's seriousness in driving the message that 'clean and green' is the way forward towards creating an economy that is based on sustainable solutions. The launch of the new National Green Technology Policy in April 2009 by the current Prime Minister, Datuk Seri Najib Tun Razak, that follows shall provide guidance and create new opportunities for businesses and industries to bring a positive impact to the economic growth. The objectives of the National Green Technology Policy are as follows (GT, 2010):

- To minimize growth of energy consumption while enhancing economic development;
- To facilitate the growth of the Green Technology industry and enhance its contribution to the national economy;
- To increase national capability and capacity for innovation in Green Technology development and enhance Malaysia's competitiveness in Green Technology in the global arena;
- To ensure sustainable development and conserve the environment for future generations; and
- To enhance public education and awareness on Green Technology and encourage its widespread use.

While fossil fuels are expected to remain the dominant source of energy for decades to come, RE such as wind, solar, biomass, biofuel and geothermal heat are expected to double between now to year 2030, although their share in the energy mix is most likely still be around 5.9% of the total energy demand by 2030 (Najib, 2009).

The energy related policies which are contrived so far are given below:

- Establishment of Petroliam Nasional Berhad (PETRONAS) 1974
- National Petrolium Policy (1975)
- National Energy Policy (1979)
- National depletion Policy (1980)
- Four-Fuel/ Diversification Policy (1981)
- Fuel Mix in electricity Generation, 1995-2005
- Renewable energy as the Fifth Fuel Policy (2000)
- Energy efficiency (EE) Eighth Malaysia Plan, 2001-2005
- Incentives for the Energy sector
- Ninth Malaysia Plan, 2006-2010

3.0 RENEWABLE ENERGY (RE)

Rapid depletion of fossil fuel reserves as well as climate change has driven the world towards RE sources which are abundant, untapped, and environmentally friendly. Aforementioned, RE was added as the fifth source of energy when the Five-Fuel

Diversification Policy replaced the four-fuel policy back in 1999 with the target to contribute 5% of the total energy mix by 2010 in the eight Malaysia Plan (2001-2005). The development pace of RE in Malaysia is rather slow and still at its infancy. Hereafter the status of RE will be discussed.

3.1 Hydro

Though hydro power is one kind of RE, it is placed separately in the energy mix as hydro power is expected to play a more prominent role in the generation mix. It is expected that its share will increase from 5% in 2008 to 35% in 2030 for Peninsular Malaysia. The state government of Sarawak has recently announced plans to develop several large hydroelectric projects under the Sarawak Corridor of Renewable Energy. The development spanning over a period of 22 years has the potential to generate 28,000 MW of electricity once fully developed. The Bakum dam in Sarawak, one of the largest dams in South-East Asia, is expected to finally complete by 2010 with a capacity of 2400 MW (Oh *et al.*, 2010). Amongst the projects which are already identified to be developed are the Murum dam (940 MW), Baleh dam (950 MW) and Pelagus dam (770 MW) in the upper reaches of the Rejang river in Sarawak. The Sarawak state Government has awarded the construction of the Murum dam to a successful bidder with an expected completion date by 2013. Whereas, for the Baleh and Pelagus dams feasibility studies are being conducted (Mansur, 2008).

3.2 Solar

Solar power has been identified and incorporated into SREP as one of the Res in 2003 but most of the solar power used in Malaysia is domestic level only and large scale commercial use is not significant yet. Solar power in Malaysia or also known as photovoltaic (PV) system is estimated to be four times the world fossil fuel resources (Hitam, 1999). In 2005, the 5-year Malaysian Building Integrated Photovoltaic Technology Application Project (MBIPV) was launched. This project is jointly funded by the Government of Malaysia, the Global Environment Facility (GEF) and the private sector. The project has several demonstration PV projects in various sectors including residential houses and commercial building. The most significant recent project is the Green Energy Office (GEO) building, an administration-cum-research office for PTM. Another national MBIPV program that is SURIA-1000 program initiated in 2007, targeting the residential and commercial sector to establish the new BIPV market and provide direct opportunities to the public and industry in RE initiatives.

3.3 Wind

In Malaysia, wind energy conversion is a serious consideration. In present technology, wind energy in Malaysia is not suitable to generate electricity commercially or wind is not particularly good in Malaysia as compared to the UK or Denmark, but islands like Perhentian can definitely gain a lot of power especially when wind turbine is jointly equipped with solar panels–which Malaysia is rich in. In the day, when there will be less wind, the solar panels will cover the extra load and at night, the wind turbines will be the ones generating more power. A more recent research in 2005, a 150 kW wind turbine in Terumbu Layang-Layang was demonstrated with some success by a team from UKM. However, the availability of wind resource varies with location. The station located at Mersing (seaside) has the greatest potential with a mean power density of 85.61 W/m^2 at 10 m above sea level (Sopian *et al.*, 1995).

3.4 Hydrogen fuel cells

Being the most abundant element on earth, hydrogen (H_2) has been identified as one of the most viable and long term renewable alternatives to fossil fuel after solar. The fuel cell is an electrochemical cell, which produces electricity directly from hydrogen and air (oxygen), without the production of GHG. In principle, although a fuel cell operates like a normal battery, it does not run out nor requires charging as long as fuel is supplied to it. At the moment, research and development is being carried out to harness hydrogen to be used in fuel cells for transportation purposes. Hydrogen and fuel cells are identified as priority research by the Ministry of Science, Technology and Innovation (MOSTI) after solar, with RM7 million (US$2 million) funded on hydrogen production and storage technologies between 2002 and 2007 and RM34 million (US9.7 million) on the national fuel cell research and development from 1996 to 2007 as

applications of fuel cells are viewed as one of the more important energy conversion devices in the future.

4.0 CONCLUSION

Malaysia Government has promoted a variety of energy related policies and tried to sustain the energy demand. In the Eight Malaysia Plan Malaysian Government fixed a target of 5% renewable energy of total energy mix in 2001-2005 but achieved only around 1%. Again in 2006, the Government declared the 9th Malaysian Plan having the target of 5% renewable energy of total energy mix. But it is also quiet impossible to achieve this target as the implementation of the policies are not so pragmatic. However, the policies and various programs by the Government of Malaysia has increased the awareness of the importance of the role of renewable energy in a sustainable system, for achieve the target non-government agencies and public will have to take a more proactive step to coordinate, promote and use energy generated based on renewable resources before we can see a wider utilization of renewable energy in Malaysia.

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