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THE FUTURE OF THE SUN CONTINUES TO SHINE IN MALAYSIA

OUTLOOK AND PROSPECTS ON THE SOLAR PHOTOVOLTAIC INDUSTRY

The new Government is committed to push forward sustainable and economic growth by promoting green technology developments and renewable energy. Wong Kee Hooi, who heads our Projects, Infrastructure & Utilities Practice Group at Zaid Ibrahim & Co. (a member of ZICO Law) in Malaysia, shares her insights on the current performance of renewable energy projects, with a specific focus on solar photovoltaic, challenges, and the future outlook of renewable energy in the country.

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CURRENT OUTLOOK OF RE GENERATION IN MALAYSIA

"*Renewable Energy (**RE**) will be the solution for Malaysia's long-term energy security and affordability,*" proclaimed the newly minted Minister of Energy, Technology, Science, Climate Change and Environment (**Ministry**), Yeo Bee Yin at the Inaugural Town Hall Session with the RE industry players on 12 July 2018.

Following a change in the Government after the recent 14th General Election, the new coalition government of Pakatan Harapan seems set on continuing the previous Government's push to increase the generation of RE in the country. In line with the pledge made by Pakatan Harapan under Pillar 3 of its Buku Harapan (**Government's Manifesto**) on "Rebuilding our Nation, Fulfilling our Hopes," the new Government is committed to spur sustainable and equitable economic growth by focusing on promoting green technology development and RE. The new Government has set an ambitious plan of increasing the contribution of RE to an overall fuel mix from 2% to 20% by 2025.

Pursuant to Malaysia's ratification of the Paris Agreement adopted under the United Nations Framework in 2015, which is aimed at reducing carbon emissions by 2030, the country aims to reduce its carbon emissions up to 45% by 2030 according to Malaysia's Intended Nationally Determined Contribution (**INDC**). This reduction consists of a 35% mandatory reduction and a further 10% conditional upon receipt of climate finance, technology transfer, and capacity building from developed countries. To achieve Malaysia's INDC pledge, the Government has to date, taken various steps to increase the shares of renewables in the overall fuel mix, among others, through the implementation of programmes such as the Small Renewable Energy Programme, Malaysia Building-Integrated Photovoltaic Project, Feed-in-Tariff (**FiT**), Large-Scale Solar Photovoltaic (**LSSPV**), Net Energy Metering (**NEM**), and the development of new hydroelectric stations. Given Malaysia's location where sunshine is in abundance all year round, solar energy is naturally positioned to play a crucial role in helping to increase RE in the future energy mix of the country.

The Sustainable Energy Development Authority of Malaysia (**SEDA**) noted that the market for solar energy has shown the most growth compared to other RE sources. According to SEDA, as of July 2016, 9,406 applications out of 9,586 approved applications under its FiT programme were for solar photovoltaic (**PV**) alone. Following that, the Jawatankuasa Perancangan dan Pelaksanaan Pembekalan Elektrik dan Tariff (also known as The Planning and Implementation Committee for Electricity Supply and Tariff) has entrusted the Energy Commission (**EC**) to conduct a bidding process to invite private sector companies to build, own, and operate LSSPV plants to supply and sell energy to the utilities under long term power purchase agreements and this Large-Scale Solar (**LSS**) programme is to be implemented over a duration of four years starting from 2017 until 2020. The target capacity for the LSS programme is 1000 MWac by 2020 with annual capacity capped at 200MWac for Peninsular and 50MWac for Sabah/ Labuan for 2017, 2018, 2019, and 2020[1]. To date, the EC had conducted two rounds of bidding exercises for LSS projects and the biddings received very encouraging responses from newcomers to the RE industry and also attracted the interest of foreign international RE players. In addition, the NEM scheme was also introduced to further increase the RE generation where consumers (residential, commercial, and industrial) are allowed to produce electricity using solar PV systems for their own consumption with excess energy production being sold to distribution licensees (Tenaga Nasional Berhad or Sabah Energy Sdn. Bhd.), at a prevailing 'displaced cost'[2]. The NEM scheme involves an annual solar PV capacity quota of 90MW in Peninsula Malaysia and 10MW in Sabah, for a total of 500MW across a five-year period between 2016 to 2020.

PERFORMANCE OF RE IN MALAYSIA

The 2016 Performance and Statistical Information on Electricity Supply Industry in Malaysia Report issued by the EC and published on 19 June 2018, reported that RE such as biomass, biogas, solar, and mini hydro had contributed a small share in electricity generation in Malaysia. Based on the reports submitted by the RE licensees to the EC, as at 5 March 2018, a total of 359.67 GWh was generated in Peninsular Malaysia and 243.06 GWh in Sabah using RE fuels (*see Figure 1 and 2*).

Figure 1: Licensed capacity and generation of RE projects in Peninsular Malaysia

Energy source	Licensed capacity (MW)	Generation (GWh)
BIOMASS	53.88	95.15
BIOGAS	49.32	94.14
MINI HYDRO	37.83	45.71
SOLAR	247.29	124.67
TOTAL	**388.31**	**359.67**

Figure 2: Licensed capacity and generation of RE licensees in Sabah

Energy source	Licensed capacity (MW)	Generation (GWh)
BIOMASS	51.00	210.62
BIOGAS	9.64	20.33
MINI HYDRO	6.50	4.69
SOLAR	24.77	7.43
TOTAL	**91.91**	**243.06**

Note: Based on the reports submitted by the licensees as of 5 March 2018. Source: Suruhanjaya Tenaga (Energy Commission), 'Performance and Statistical Information on Electricity Supply Industry in Malaysia' (2016) < https://www.st.gov.my/en/contents/files/download/99/ST-Performance_and_Statistical_Information_on_Electricity_Supply_Industry_in_Malaysia_2016.pdf > accessed 21 August 2018

RE power plants in Peninsular Malaysia are mostly powered by solar, constituting 34.66% of the total RE generation in Peninsular Malaysia followed by biomass and biogas at 26.45% and 26.17% respectively, whilst the RE power plants in Sabah are predominantly powered by biomass at 86.65% with solar constituting only 3.06%[3].

The first of the bidding exercises awarded 451MWac worth of contracts, against a target of 250MWac, with approved projects expected to achieve commercial operation by the end of 2018. The second LSS tender saw the EC awarding contracts worth 563MWac, and these projects are expected to be operational by the end of 2020 (*see Figure 3*).

Figure 3: LSS Projects Commercially Operational in 2017/2018 and 2019/2020

	2017/2018			2019/2020		
Location	**Package Type**	**No. of Shortlisted Bidders**	**Export Capacity (MWac)**	**Package Type**	**No. of Shortlisted Bidders**	**Export Capacity (MWac)**
Peninsula Malaysia	1MW to 5MW 6MW to 29MW 30MW to 50MW	3 6 7	10 115 309	1MW to 5.99MW 6MW to 9.99MW 10MW to 30MW	6 11 13	26 106 375
Sabah & Labuan	1MW to 5MW 6MW to 29MW	2 1	11 6	1MW to 5.99MW 6MW to 10MW	8 3	28 28
TOTAL		**19**	**451**		**41**	**563**

Source: · Suruhanjaya Tenaga (Energy Commission), 'Announcement of Shortlisted Bidders for the Development of Large Scale Solar Photovoltaic (LSSPV) Plants for Commercial Operation in Peninsular Malaysia, Sabah and Federal Territory of Labuan, 2017 – 2018' < https://www.st.gov.my/en/web/industry/details/2/3 > accessed 31 August 2018 · Suruhanja Tenaga (Energy Commission), 'Announcement of Shortlisted Bidders for the Development of Large Scale Solar Photovoltaic (LSSPV) Plants for Commercial Operation in Peninsular Malaysia, Sabah and Federal Territory of Labuan, 2019 – 2020,' < https://www.st.gov.my/en/web/industry/details/2/3 > accessed 31 August 2018

Under the FiT system, solar PV constitutes approximately 66.54% of the total cumulative installed capacity of commissioned RE installations (*see Figure 4*). In terms of annual power generation for commissioned RE installations for 2018, solar PV dominates with a total generation capacity of 190,457.39MWh (*see Figure 5*). It is apparent from the statistics, that solar PV has the highest

Figure 4: Installed Capacity (MW) of Commissioned RE Installations

Year	Biogas	Biogas (Landfill/Agri Waste)	Biomass	Biomass (Solid Waste)	Small Hydro	Solar PV	Geothermal	Total
2012	2.00	3.16	36.90	8.90	11.70	31.53	0.00	**94.19**
2013	3.38	3.20	0.00	0.00	0.00	106.66	0.00	**113.24**
2014	1.10	0.00	12.50	0.00	0.00	64.90	0.00	**78.50**
2015	0.00	5.40	12.00	7.00	6.60	60.32	0.00	**91.32**
2016	0.00	15.46	19.50	0.00	12.00	77.66	0.00	**124.62**
2017	0.00	22.54	0.00	0.00	0.00	35.34	0.00	**57.88**
2018	0.00	3.60	0.00	2.45	0.00	0.28	0.00	**6.33**
Cumulative	**6.48**	**53.36**	**80.90**	**18.35**	**30.30**	**376.69**	**0.00**	**566.08**

Figure 5: Annual Power Generation (MWh) of Commissioned RE Installations

Year	Biogas	Biogas (Landfill/Agri Waste)	Biomass	Biomass (Solid Waste)	Small Hydro	Solar PV	Geothermal
2018	6613.01	80675.88	82234.50	4093.71	33214.25	190457.39	0.00
2017	14798.17	178284.34	237951.31	19303.86	74831.27	412843.18	0.00
2016	14582.31	65670.74	155427.93	36751.74	47798.28	308198.87	0.00
2015	16988.66	41122.39	192372.22	18090.07	55406.38	262932.18	0.00
2014	19772.25	31844.44	226196.38	4347.83	64549.65	181961.40	0.00
2013	12962.68	9804.10	209407.59	11144.25	79081.75	50672.72	0.00
2012	98.11	7465.40	101309.87	3234.52	25629.78	4720.16	0.00

Source for Figure 4 and 5: Sustainable Energy Development Authority of Malaysia, 'Sustainable Energy Development Authority Malaysia' < http://seda.gov.my/ > accessed 21 August 2018

uptake by RE generators given that the RE source from the sun has no constraints. Solar PV also constitutes the largest pay out from the RE Fund, which is 81.60% and this is in line with the high proportion of solar PV projects that have achieved commercial operations[4] (*see Figure 6*).

Figure 6: Breakdown of Recovery of Moneys (RM) by RE

RE Resources	2012 (RM)	2013 (RM)	2014 (RM)	2015 (RM)	2016 (RM)	Total (RM)	% of Total
Solar Photovoltaic (PV)	1,163,453.41	39,062,678.04	138,914,026.64	222,895,582.81	210,493,640.06	**612,529,380.96**	**81.60%**
Biomass	10,592,928.50	26,431,822.10	18,047,158.40	16,471,458.85	28,191,355.36	**99,734,723.21**	**13.29%**
Biogas	-	4,725,821.26	6,939,862.79	9,741,899.60	10,095,768.95	**31,503,352.60**	**4.20%**
Small Hydro	361,460.50	4,436,556.15	1,471,365.45	423,445.64	209,930.95	**6,902,758.69**	**0.92%**
Total	**12,117,842.41**	**74,656,877.55**	**165,372,413.28**	**249,532,386.90**	**248,990,695.32**	**750,670,215.46**	**100.00%**

Source: Sustainable Energy Development Authority, 'SEDA Annual Report 2016' (SEDA, 2016) < http://www.seda.gov.my/?omaneg=000101000000010101010001000010000000000000000000000&s=6312 > accessed 31 August 2016

OBSTACLES AND CHALLENGES

It is no easy feat for RE generation to reach the targeted 20% mark in the overall fuel mix by 2025. The Government is already on the right track by identifying solar PV as the RE source that helps increase the RE capacity in the shortest time, by promoting the development of LSS power plants, given its short development gestation period. However, it has to be recognised that in the push to increase RE generation, particularly solar energy generation, more efforts need to be put in by all stakeholders - both the Federal and State Governments - to help solar power plant developers deal with issues, which could impact the development of solar power plant projects (**Solar Projects**) in Malaysia.

We have identified below some of the major issues, which, in our view, currently affects the development of Solar Projects in Peninsular Malaysia:

01. Inconsistent approach by different State Governments on category of land use requirement for development of Solar Projects

The key challenge faced by most solar power plant developers, is the uncertainty on the State Government's requirement in respect of the category of land use for the development of Solar Projects. Given the need for large open areas, most of the land identified for Solar Projects are agricultural land. Pursuant to the National Land Code, there are restrictions on erecting buildings on land which has been registered under the category of "agriculture," unless it is for the purpose of undertaking agricultural activities or for purposes that the State Authority may think fit. Different states seem to have different requirements – some states allow for Solar Projects to be undertaken on land that is categorised under "agriculture," while other states require the land category of "agriculture" to be converted to the category of "industry" for the purpose of undertaking Solar Projects. Although conventional power plants are required to be constructed on land that is categorised as "industry," there could be a different treatment when it comes to solar power plants, given that such solar power plants do not pose major environmental and social issues to the surrounding environment. As only solar panels are installed on the land together with some ancillary buildings, no environmental impact assessment is required.

As large areas of open land are required for the development of Solar Projects, such Solar Projects are actually competing with agriculture for land. To optimise and maximise the use of land, there is a recent drive for installation of solar panels and the planting of food crops to be combined on the same land. The National Renewable Energy Laboratory (**NREL**) which funds research on the impact of native and crop plants grown in solar farms, reported that solar development is happening on a massive scale as lands are being converted from agricultural land or unused land into Solar Projects. This represents a great opportunity to improve the agriculture and improve food security while developing energy at the same time. NREL further reported that pilot projects for mixing crops with solar panels, referred to as "dual-use" farms in USA, Germany, China, Croatia, Italy, Japan, and France have proven to be extremely successful, because they have shown that you can grow crops and make electricity at the same time. Honey producers in USA keep bees at three solar farms where developers seed native plants underneath and around panels. More than half of the 4,000 acres of solar farms built in 2016 and 2017 feature native plants that not only benefit pollinators but also beautify the site[5]. Universities in the United States, Germany, and elsewhere are also testing the concept of "dual-use farming," where crops grow below canopies of solar panels and it was found that the crops grow just fine — and, in some cases, better than crops in full sun[6].

In fact, one of the key principles of the LSS Framework as set out in the Guidelines on LSS Photovoltaic Plant for Connection to Electricity Networks (Version 2) issued by the EC of Malaysia on 17 February 2017, has provided that the usage of land to be used for LSS power plants may also be optimised for other economic activities, such as agriculture. Hence, it is clear that the EC had also intended for agricultural activities to be undertaken in solar farms, which supports the argument for land under the category of agriculture to be permitted for use to develop Solar Projects. The conversion requirement will negatively impact the progress of development of Solar Projects as this will result in an increase in the costs of developing Solar Projects, which effectively means a higher tariff in addition to prolonging the time for the completion of Solar Projects. As such, there should not be a requirement for such land conversion and new solar power plants should be encouraged to combine electricity production with food production as this offers all kinds of benefits to the facilities' primary aim of reducing carbon emissions and expanding RE.

In the overriding interest of reducing carbon emissions and increasing RE generation in the country, there is a need for the Federal Government to consult, engage, and agree with all the State Governments in Peninsular Malaysia and Sabah on providing a clear position on allowing agricultural land to be used for the purpose of developing Solar Projects. This will provide certainty to solar power plant developers on the applicable requirements in respect of the category of land use for Solar Projects. It is to be noted that we have not included the state of Sarawak in this discussion as it has its own Electricity Ordinance that separately regulates its electricity regime.

02. Restriction and limitation on RE participation

In the second bidding exercise for the LSS programme, bidders are not allowed to undertake a Solar Project or multiple Solar Projects exceeding the aggregate capacity of 30MW. Whilst we understand the rationale for such restriction is to allow for more RE players to participate in Solar Projects, such restriction will also limit the Government from getting capable and experienced RE players to contribute more in helping to increase the RE generation. This is more so, given that we have the target of having RE contribute up to 20% of the overall fuel mix by 2025.

What the Government could perhaps consider is to divide the LSS programme into two categories where:

(1) RE players with considerable RE experience and financial strength can participate in the bid for higher capacity plants; and

(2) new RE players with less financial strength and experience can participate in the bid for lower capacity plants.

With such arrangement, the Government could promote more investments into the development of Solar Projects in the country and expedite the increase of RE generation in meeting the 20% of the overall fuel mix target.

03. Standardised regulation and requirements for implementation of Solar Projects

To expedite the implementation of Solar Projects, there is also a need for regulatory authorities, particularly at the State Government levels to have clear regulations on the relevant requirements, permits, and licenses, which are applicable specifically to Solar Projects. These regulations should be standardised across all states in Peninsular Malaysia and Sabah, where their electricity regime is under the purview of the Federal Government. It is proposed that a RE council comprising members from the Ministry and each of the State Governments in Peninsular Malaysia and Sabah, be established to coordinate the actions and requirements of the Federal, State, and Local Governments to address the challenges and issues of undertaking Solar Projects in Malaysia.

FUTURE OUTLOOK

According to the 'Q4 2017/Q1 2018 Solar Industry Update' by NREL[7] in May 2018, the global PV installations reached 415 GWDC at the end of 2017, an annual increase of 98 GWDC from 2016. China, the USA, Japan, India, and Europe were the leading five markets in cumulative and based on annual PV installations at the end of last year. While most analysts estimate an increase in PV installations in 2018, projections range from 87 GW to 111 GW and analysts expect China (~50 GW), the USA (~10 GW), and India (~8 GW) to remain the three largest markets.

At the home front, Malaysian Investment Development Authority (**MIDA**) had earlier this year noted that Malaysia is well positioned to benefit from the spillover effects of growing solar power usage worldwide. Between 2014 and 2018, Asia would see the installation of another 37 GW in PV capacity. Both developed and developing nations are increasingly looking at moving away from nuclear power and fossil fuels and toward solar, wind, and other renewables. This gives producing countries, such as Malaysia, an opportunity to grow in the market. The country has the necessary solar ecosystem to obtain a market share of the growing solar power business in the region. Ranked as the world's third largest producer of PV cells and modules, Malaysia has an ecosystem comprising 250 companies involved in upstream activities such as polysilicon, wafer, cell and module production, and downstream activities such as inverters and system integrators[8].

All the initiatives by the Ministry thus far, to spur the RE generation should be applauded – (1) from passing the RE law to implementing the FiT system; (2) formulating the NEM to manage the impact of LSS on electricity networks; and (3) forming working groups under the Grid Code and Distribution Code Committees to study amendments required to the Codes to ensure clear definition of roles and responsibilities, and proper procedures for the safe operation of the Grid system.

Based on the statistics issued by the EC and SEDA, it is evident that LSS has strong potential to contribute effectively to RE capacity in Malaysia (*see Figure 7*). According to the EC's projection based on several assumptions such as solar output intermittency as well as its distinctive output profile, the initiatives to harvest energy from the sun with an installation of 200MW per year under the LSS programme integrates solar into the grid system with a share of 0.14% during its first year in 2017 and increased up to 0.5% by the year 2020 (*see Figure 8*).

Figure 7: Cumulative Installed Capacity (MW) of Commissioned RE Installations

Biogas	Biogas (Landfill/Agri Waste)	Biomass	Biomass (Solid Waste)	Small Hydro	Solar PV	Geothermal
6.48	53.36	80.90	9.45	30.30	376.68	0.00

Source: Sustainable Energy Development Authority of Malaysia, 'Sustainable Energy Development Authority Malaysia' < http://seda.gov.my/ > accessed 21 August 2018

[1] Suruhanjaya Tenaga (Energy Commission), 'Guidelines on Large Scale Solar Photovoltaic Plant For Connection to Electricity Networks' < https://www.st.gov.my/en/contents/publications/guidelines_electricity/2017/Guidelines%20on%20Large%20Scale%20Solar%20Photovoltaic%20Plant%20for%20Connection%20to%20Electricity%20Networks_Feb2017.pdf <https://www.st.gov.my/en/contents/publications/guidelines_electricity/2017/Guidelines%20on%20Large%20Scale%20Solar%20Photovoltaic%20Plant%20for%20Connection%20to%20Electricity%20Networks_Feb2017.pdf> > accessed 19 September 2018

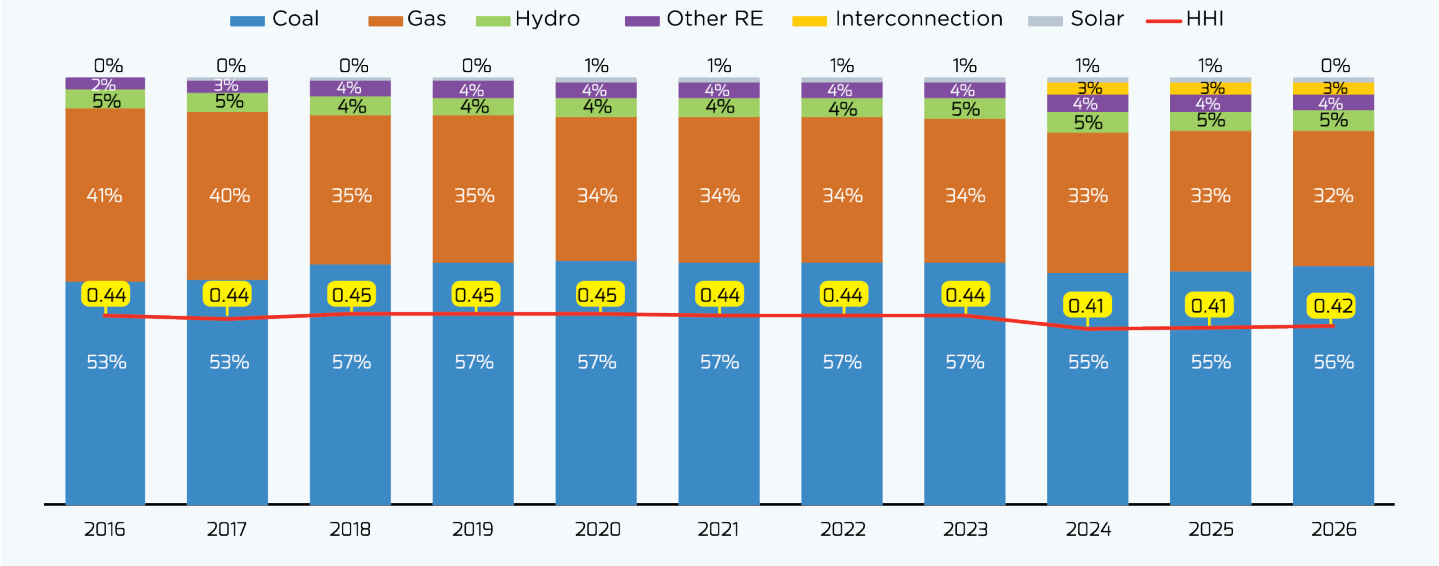
[2] "Displaced cost" refers to the average cost of generating and supplying one kilowatt hour of electricity from resources other than renewable resources (i.e. fossil fuels) through the supply line up to the point of interconnection with the RE installation.

[3] Suruhanjaya Tenaga (Energy Commission), 'Performance and Statistical Information on Electricity Supply Industry in Malaysia' (2016) < https://www.st.gov.my/en/contents/files/download/99/ST-Performance_and_Statistical_Information_on_Electricity_Supply_Industry_in_Malaysia_2016.pdf > accessed 21 August 2018

[4] Sustainable Energy Development Authority, 'SEDA Annual report 2016' < http://www.seda.gov.my/press_release.html?omaneg=000101000000010101010001000010000000000000000000&s=6312 > accessed 31 August 2018

[5] Frank Jossi, 'Solar Farms Produce Power—and Food' (Scientific American, 6 June 2018) < https://www.scientificamerican.com/article/solar-farms-produce-power-and-food/ > accessed 12 September 2018

Figure 8: Generation Mix in Peninsular Malaysia



Source: Suruhanjaya Tenaga (Energy Commission), 'Peninsular Malaysia Electricity Supply Outlook 2017' (Suruhanjaya Tenaga, 2017) < https://www.st.gov.my/en/contents/publications/outlook/Peninsular%20Malaysia%20Electricity%20Supply%20Outlook%202017.pdf > accessed 31 August 2018

The National Renewable Energy Policy & Action Plan (**NREPAP**) has long recognised the need to design a more convergent and forward-looking RE policy. The NREPAP has laid out a forward-looking plan with five clear RE objectives (*see Figure 9*) that are aimed at enhancing the utilisation of indigenous RE resources to contribute towards national electricity supply security and sustainable socio-economic development. If such RE policy and objectives set out in the NREPAP are followed through and implemented, the new Government's ambition of increasing the contribution of RE generation to the overall energy mix up to 20% by 2025 will be within reach.

Figure 9: RE objectives set out in the NREPAP

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**	**To enhance awareness on the role and importance of RE**

Source: Sustainable Energy Development Authority, 'National Renewable Energy Policy and Action Plan (2009)' < http://seda.gov.my/?omaneg=000101000000010101010001000010000000000000000000000&s=31 > accessed 31 August 2018

Given that the new Government's Manifesto has set out clear action plans on RE, the country is certainly moving towards increasing RE generation. As Minister Yeo Bee Yin puts it succinctly, "RE is something that the government wants to move towards, so that in the long term whatever happens outside the country, we are secured. That is the reason why we need to start [developing RE] today." She added further that the Government remains committed to increasing its current 2% RE power-generation mix to 20% by 2025.

With the strong commitment from the new Government towards increasing the RE generation, particularly using solar PVs, the future of the sun in Malaysia certainly looks brighter!

[6] Frank Jossi, 'Energy and food together: Under solar panels, crops thrive' (Scientific American, 8 June 2018) < https://www.pri.org/stories/2018-06-08/energy-and-food-together-under-solar-panels-crops-thrive > accessed 12 September 2018

[7] David Feldman, Jack Hoskins, and Robert Margolis, 'Q4 2017/Q1 2018 Solar Industry Update by National Renewable Energy Laboratory' (National Renewable Energy Laboratory, May 2018) < https://www.nrel.gov/docs/fy18osti/71493.pdf > accessed 12 September 2018

[8] Joy Lee, 'A growing solar industry' (The Star, 19 June 2017) < https://www.thestar.com.my/metro/smebiz/focus/2017/06/19/a-growing-solar-industry/#mygAcRA7b8Iq4yhg.99 > accessed 31 August 2018

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