Sector Thematic | Thursday, 27 July 2023

UTILITIES

***Upgrade to* POSITIVE**
(previously NEUTRAL)

Powering the Energy Transition

KEY INVESTMENT HIGHLIGHTS

- **Malaysian Renewable Energy Roadmap (MyRER) and upcoming National Energy Transition Roadmap (NETR) to layout pathways to achieve Malaysia's Paris Agreement NDC and Net-Zero 2050 ambition**
- **Decarbonising Malaysia's power system is crucial to achieve the targets - some 9GW RE capacity addition planned under MyRER, while NETR's more aggressive targets may require a massive >30GW more**
- **RE export policy to position Malaysia in the lead for regional energy trade and capitalize on low-hanging fruits**
- **We see strong re-rating catalysts from a firm policy layout and improved growth and ESG profile; as such, we turn more constructive on Utilities and raise the sector to POSITIVE from NEUTRAL**

Sealing a commitment to the energy transition. The Paris Agreement marked an important milestone in Malaysia's commitment to address climate change. As part of its NDC, Malaysia has unconditionally pledged to reduce its GHG emissions intensity by 45% by 2030 and committed to a net zero target by 2050. However, Malaysia's heavy reliance on fossil fuels is a key challenge and in the power sector, Malaysia relies heavily on coal-fueled power plants as a result of legacy policies to pursue energy diversification.

Abundant opportunity for domestic RE sector. Under the MyRER, Malaysia laid out its mid-term plan to decarbonize the power sector with a target of 31% RE capacity mix by 2025 and 40% by 2035. This provides a clear pathway to achieve the 2030 NDC and importantly, creates opportunities for domestic RE players especially in the solar and hydro space which form the bulk of the country's RE resource. By 2035, 9.5GW of RE capacity is projected to be added to the power system, more than doubling 2020 levels.

A more aggressive path to net-zero 2050. Underpinning the sector's prospects further, the new Government, as part of the upcoming NETR, is pursuing a more aggressive target of 70% RE capacity mix by 2050, almost doubling the RE mix targeted in 2035. On our estimates, this would require a massive >30GW of additional RE capacity, which we expect to come predominantly from solar. We reckon this will be accompanied by enhanced mechanisms and incentives to support growth in RE capacity.

Positioning to lead regional energy trade. To position Malaysia for future regional energy trade, the Government has lifted the RE export ban with an export framework and transparent pricing mechanisms under development. Singapore is a low-hanging fruit targeting 4GW of electricity imports by 2035, which provides domestic RE players the opportunity for capacity supply and to capitalize on higher green tariffs in Singapore.

We turn more constructive on the Utilities sector and raise our call to **POSITIVE** (from NEUTRAL), premised on a strong, multi-decade theme predicated on the NETR. In this report, we initiate coverage of RE EPCC players; **Samaiden (BUY, TP: RM1.54)**, **Sunview (BUY, TP: RM1.32)** and **Pekat (BUY, TP: RM0.57)** being beneficiaries of RE capacity expansion. We upgrade **Tenaga to BUY (TP: RM10.50)** as a key beneficiary of wheeling charges for RE exports, grid investments to accommodate increased VRE penetration and improved opportunity to decarbonize its generation portfolio. **YTL Power (BUY, TP1.54)** is a prime beneficiary of RE exports and we also like asset owners such as **Ranhill (BUY, TP: RM0.73)** given increased opportunities to expand its RE portfolio.

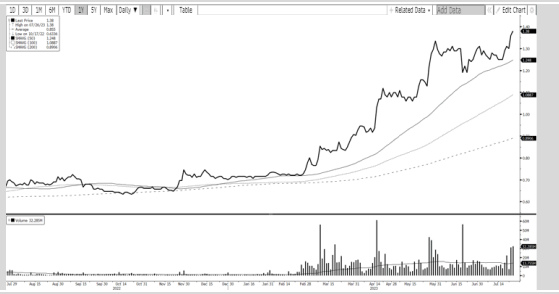
COMPANY IN FOCUS

YTL Power International Bhd

Maintain **BUY** | Unchanged Target price: RM1.54
Price @ 26th July 2023: RM1.38

- Prime beneficiary of RE export policy
- Strong balance sheet positions the group well to capture opportunities for RE capacity expansion
- Near-term, earnings & dividends to be driven by sustained recovery at Power Seraya
- Undemanding 9x FY24F PER, 5.5% yield

Share price chart



Tenaga Nasional Bhd

Upgrade to **BUY** | Revised Target price: RM10.50
Price @ 26th July 2023: RM9.60

- Firm policies to drive aggressive RE targets serves to enhance capacity growth prospects and improve Tenaga's ESG profile
- As a monopoly, Tenaga to benefit from grid investments to support higher VRE penetration and RE exports

Share price chart

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1.0 THE DRIVE FOR ENERGY TRANSITION

The Paris Agreement, adopted in December 2015 at the 21st Conference of the Parties (COP21) to the United Nations Framework Convention on Climate Change (UNFCCC), marks a significant global effort to combat climate change and pursue a more sustainable future. As a signatory to this landmark international treaty, Malaysia has committed to taking ambitious actions to address climate challenges and contribute to global efforts in limiting global warming.

Setting the 1.5-degree target. The Paris Agreement represents a landmark achievement in the global fight against climate change, bringing together nearly all countries to collectively address the urgent need for climate action. Its overarching goal is to limit the global average temperature increase to well below 2 degrees Celsius above pre-industrial levels, and ideally, to pursue efforts to limit the temperature rise to 1.5 degrees Celsius. The agreement recognizes the principle of common but differentiated responsibilities, acknowledging that countries with higher historical greenhouse gas emissions should take more significant actions to reduce emissions and support climate adaptation efforts in developing nations.

Part of the international treaty. As a responsible member of the global community, Malaysia has been actively engaged in the international climate negotiations and played a constructive role in shaping the Paris Agreement. The country recognizes the significance of collective action to address climate change and has demonstrated its commitment to align its policies and actions with the objectives of the agreement. Under the Paris Agreement, each signatory is required to submit its Nationally Determined Contributions (NDCs), outlining its climate action plans and emission reduction targets. Malaysia's NDC serves as the country's roadmap towards a low-carbon, climate-resilient economy. It outlines specific mitigation and adaptation measures that Malaysia intends to undertake to contribute to global climate goals.

Malaysia's NDC and net zero commitments. In its latest updated NDC submitted in 2021, Malaysia has pledged to an unconditional reduction of greenhouse gas (GHG) emission intensity of GDP by 45% by 2030 relative to 2005 levels. This is a 10% increase compared to its first NDC which outlines a 35% unconditional reduction and a further 10% which is conditional upon receipt of climate finance, technology transfer and capacity building from developed countries. Furthermore, the updated NDC covers seven greenhouse gases compared to only three in the first NDC. The country has also announced a target for net zero emissions by as early as 2050, as echoed in its latest National Energy Policy.

Table: 1: Summary of Malaysia's NDC

Malaysia	Updated First Nationally Determined Contribution	First Nationally Determined Contribution	Intended Nationally Determined Contribution
Type of Commitment	GHG Target	GHG Target	GHG Target
GHG Target	To reduce carbon intensity by 45% (unconditional) by 2030 compared to 2005 levels	35% to 45% reduction in GHG emissions intensity of GDP by 2030 compared to 2005 level	35% to 45% reduction in GHG emissions intensity of GDP by 2030 compared to 2005 level
Base year emissions intensity	*Not specified*	0.531 per thousand RM	0.531 per thousand RM
Base year	2005	2005	2005
GHG Target type	Intensity Target	Intensity Target	Intensity Target
Target year/period	2030	Target year: 2030, Timeframe for implementation: 10 years (2021 to 2030)	Target year: 2030, Timeframe for implementation: 10 years (2021 to 2030)
Timeframe for implementation	1st January 2021 - 31st December 2030	2021-2030	2021-2030
Adaptation included	Yes	Yes	Yes
Target year (adaptation)		2030	2030
Conditionality	Unconditional	Conditional NDC and unconditional NDC	Conditional NDC and unconditional NDC

Source: UNFCCC 2022

Heavy reliance on fossil fuels Malaysia is traditionally a producer of oil and natural gas with reserves spread across offshore waters of Peninsular Malaysia, Sabah and Sarawak hence naturally, Malaysia's primary energy mix is largely dominated by fossil fuels. In the early 2000s as part of the country's strategy to diversify away from its reliance on gas and in pursuit of a cheaper energy source, coal was added into the national energy mix. Natural gas still makes up the largest portion of total supply at 42% while crude oil & petroleum products and coal make up another 33% and 21% respectively. The rest is distributed between hydropower, bioenergy and solar. In terms of final consumption, the transport and industry sectors account for the largest share at 38% and 29% of total consumption respectively. As energy demand is expected to continue growing in the future, it is imperative that Malaysia relooks at its fossil-fuel dominated energy strategy in order to manage future carbon emission growth.

Chart 1: Malaysia's primary energy supply trend

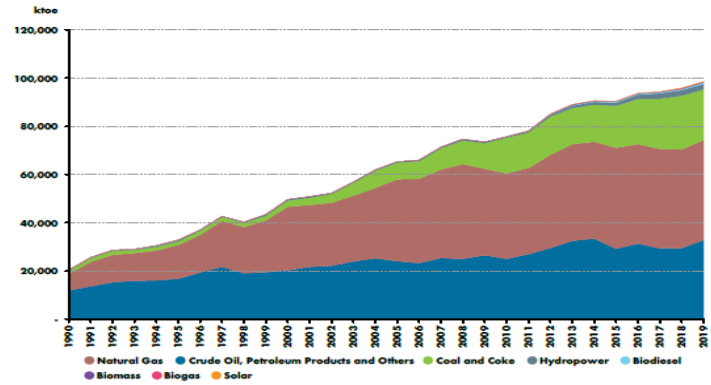


Chart 2: Malaysia's primary energy supply mix

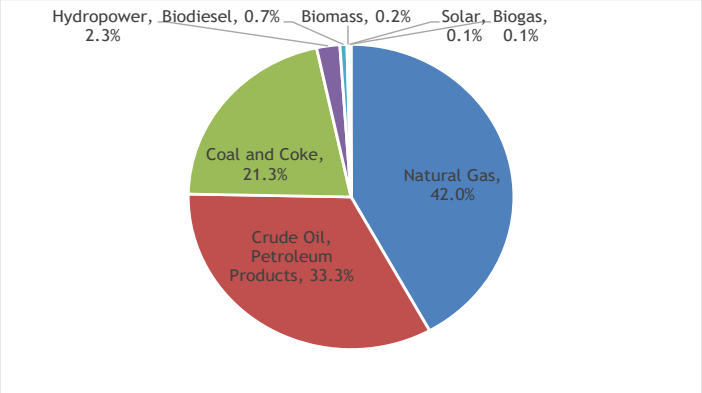


Chart 3: Malaysia's final energy consumption trend

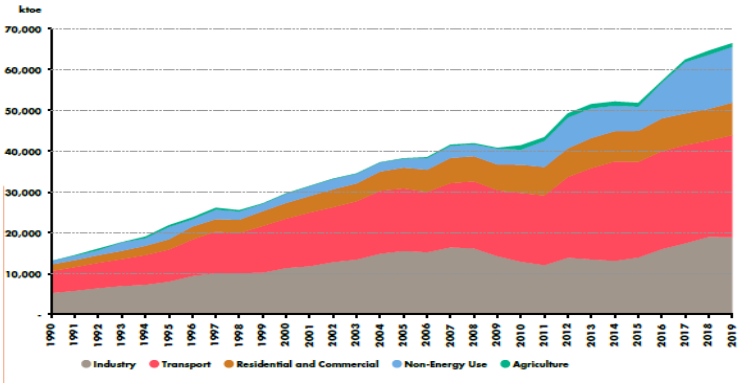
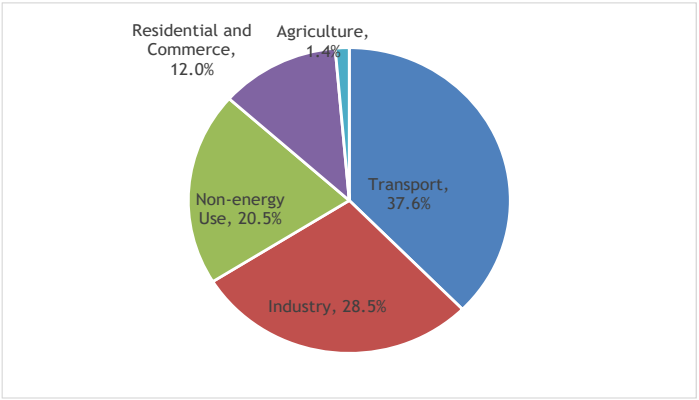


Chart 4: Malaysia's final energy consumption mix



Source: MEIH, MIDFR

Where is Malaysia's carbon emission coming from? Based on the fourth biennial update report to the United Nations Framework Convention on Climate Change (UNFCCC) in 2022, the energy industries are the largest contributor to Malaysia's carbon emissions making up half of the total with the majority coming from the electricity and heat production sub-sector. This is followed by the transport sector which makes up a quarter of total emissions. The high emissions from the electricity supply sector should not be a surprise given the domestic power system's reliance on fossil fuels, particularly coal. Coal capacity accounts for 53% of the country's power generation mix and 37% of power capacity mix.

Chart 5: Malaysia's CO2 emission source

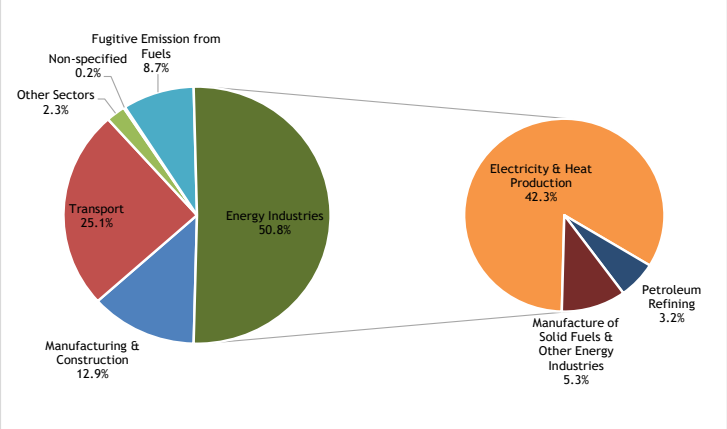
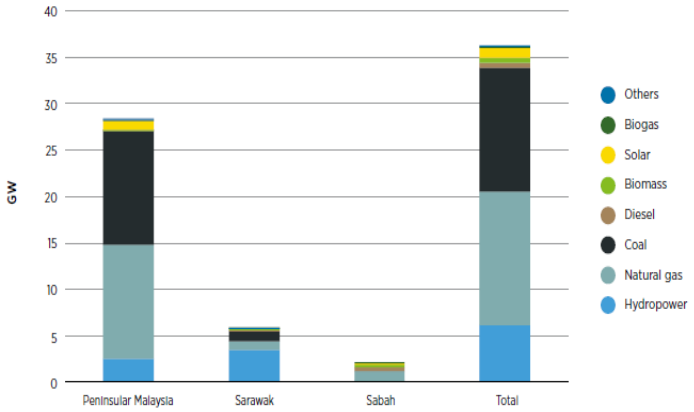


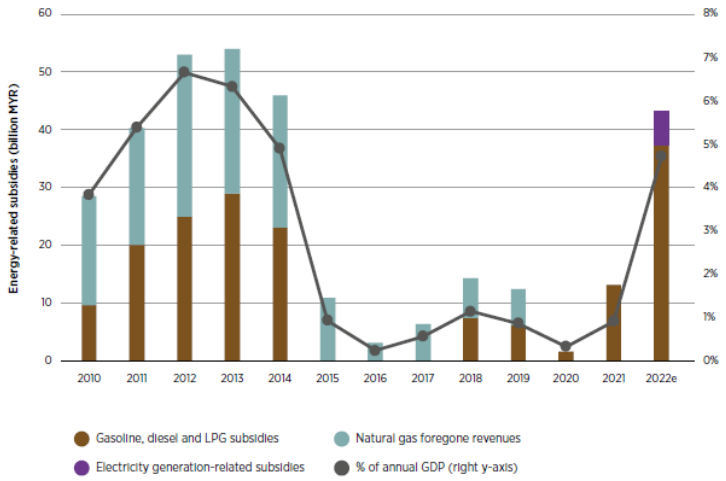
Chart 6: Malaysia installed power capacity



Source: UNFCCC 2022

No longer serving the energy trilemma? As a result of its reliance on fossil fuels, Malaysia is vulnerable to global fuel supply and price volatility, especially coal, which is largely imported. This can be seen from the recent synchronous post-Covid global economic reopening and soon after that, the Ukraine war, which drove global fuel prices skyrocketing. Thermal coal prices rose to as high as >USD400/MT, a record high. This resulted in significant fuel cost under-recovery for Tenaga Nasional (Tenaga), leading to a rise in the Government's subsidy bills to shield the local economy from the impact. As such, while coal was previously seen as a cheap energy alternative serving the affordability dimension of the energy trilemma (which encompasses energy affordability, security and sustainability), this may no longer be the case, especially considering declining investments into coal in the long run (which inevitably leads to gradually lower supply). This is coupled with higher cost of capital for such investments given ESG impact on capital flows. These factors have put into question the security of supply and affordability element of the current fossil fuel-reliant power system, beyond just the sustainability aspect.

Chart 7: Estimated energy subsidies in Malaysia



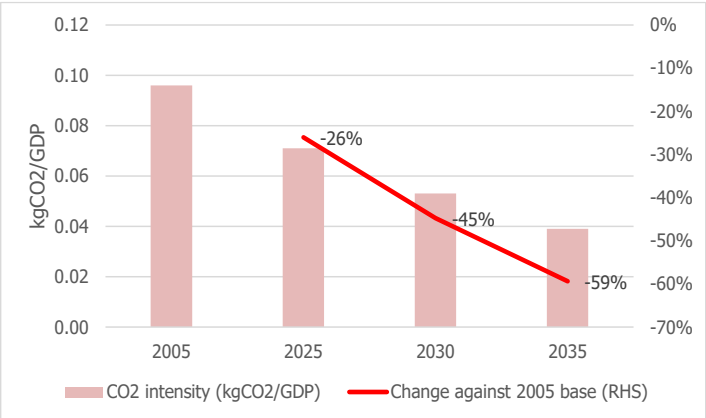
Source: IRENA, MIDFR

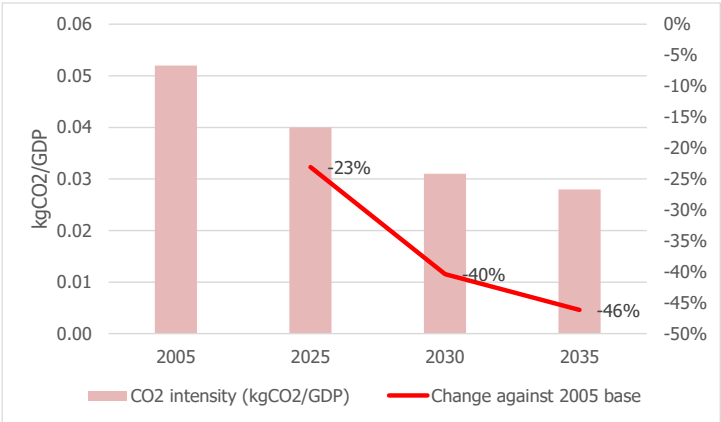
2.0 CHARTING THE PATH TO DECARBONISATION

Given that electricity demand could double or more by 2050, increasing the mix of RE in power generation capacity expansion to meet this demand is critical in managing national $C0_2$ emissions. The energy transition is premised on several key drivers: (1) Political factor: support policies driven by GHG reduction goals, (2) Economics: increasing availability of financing for RE, (3) Social: mounting public opposition to coal generation, (4) Technology: rapid decline in equipment and construction cost. Under the MyRER, some 9.5GW of incremental RE capacity is required to hit the mid-term target of 40% RE mix by 2035, while the NETR's more aggressive 70% RE mix target by 2050 is estimated to require a massive >30GW of additional RE capacity.

Medium-term plan laid out. The Malaysia Renewable Energy Roadmap (MyRER) released in 2021 lays out the mid-term RE development plan for the country. Under the MyRER, Malaysia's RE capacity mix is targeted to increase to 31% or 12.9GW by 2025 and 40% or 18GW by 2035, from an estimated 23% as at end-2020. This in turn creates the pathway for the electricity supply sector to move closer to the country's NDC with Peninsular Malaysia and Sabah's CO_2 emissions intensity projected to decline by -45% and -40% by 2030 to 0.053kgCO_2/GDP and 0.031kgCO_2/GDP respectively.

Charts 8: CO2 intensity to reduce by -45% and -40% by 2030 for Pen. Msia (left) and Sabah (right)





Source: MyRER, MIDFR

Which technologies will drive this growth? Of the 18GW RE capacity projected to be reached by 2035, 45% comprises large hydro, 40% comprises solar and 7%/6%/2% is expected to come from small hydro/biomass/biogas. The bulk of the large hydro capacity is actually made up of legacy hydropower plants – net capacity addition of large hydro of 2370MW accounts for 25% of the total RE capacity growth projected between 2020-2035, whereas the majority 60% of the growth is expected to be driven by solar with a total 5746MW projected to be added to the capacity mix. Meanwhile, small hydro/biomass/biogas are expected to contribute 7%/4%/3% to RE capacity growth (up to 2035) under the MyRER.

Chart 9: Capacity additions by type (2025)

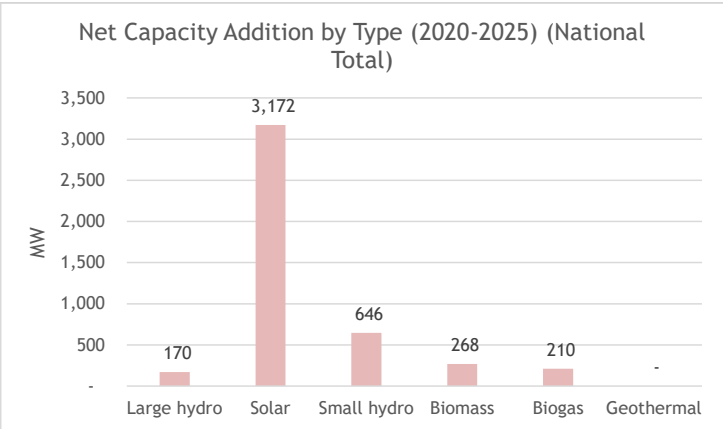
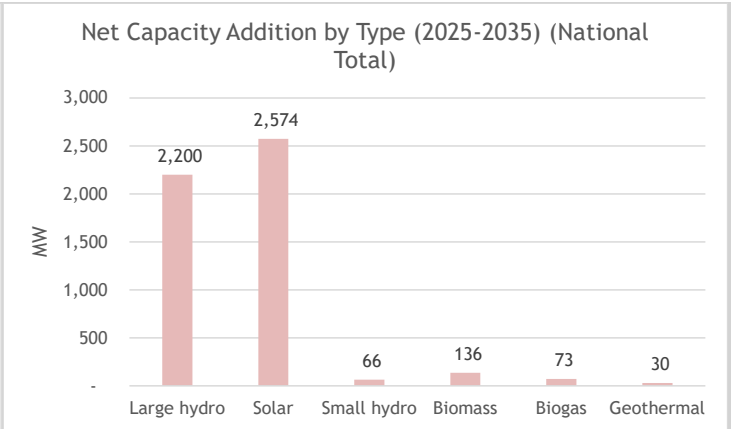


Chart 10: Capacity additions by type (2035)



Source: MyRER, MIDFR

Chart 11: Capacity additions by type/region

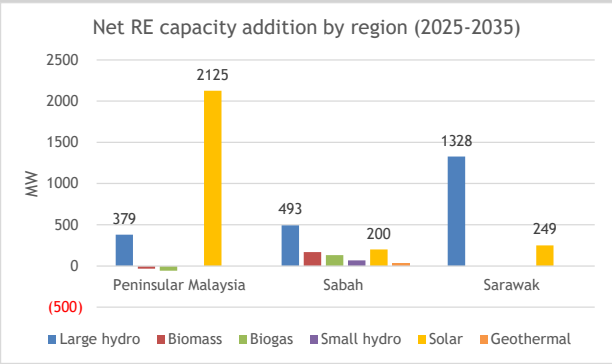
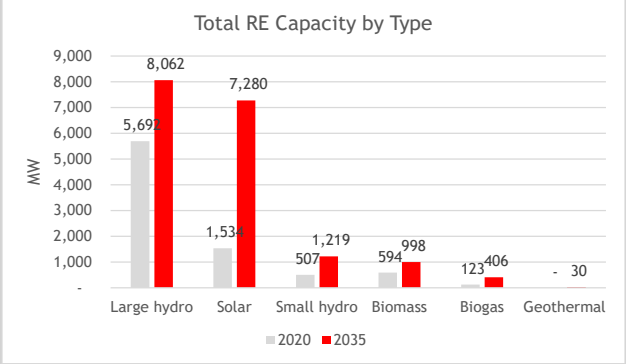


Chart 12: Projected RE Capacity by type



Source: MyRER, MIDFR

Chart 13: RE capacity mix (2020)

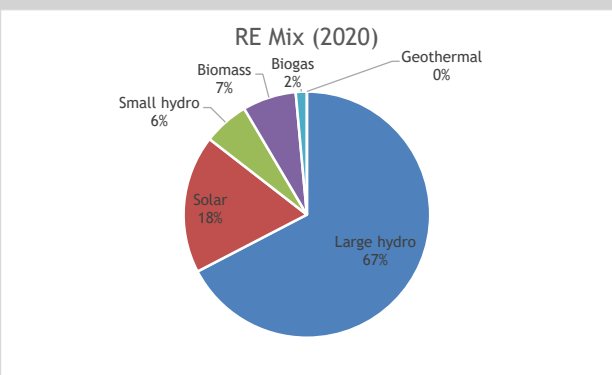
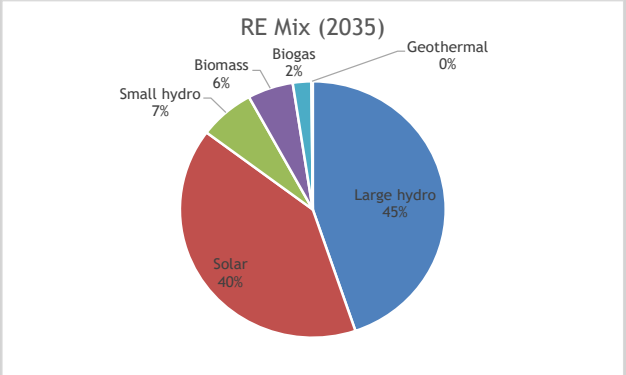


Chart 14: Projected RE capacity mix (2035)



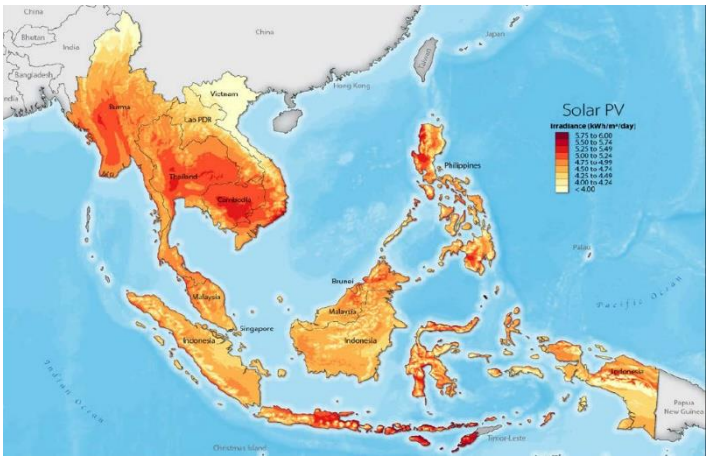
Source: MyRER, MIDFR

Peninsular Malaysia key driver, but Sabah to see largest percentage growth. Despite relatively small contribution to the national total RE capacity, Sabah is projected to register the largest growth magnitude of +226% in its RE capacity to 1,571MW between 2025 to 2035 - this will see its RE capacity contribution to the national total rise from 4% in 2025 to 9% in 2035. Of the expected growth in Sabah's RE capacity, 45% is projected to come from large hydro, 18% from solar, 15% from biomass and 12%/6% respectively from biogas/small hydro. Peninsular Malaysia is projected to see a +28% rise in RE capacity to 10,944MW during the same period (2025-2035), with the bulk of the capacity additions coming from solar (47% of total capacity additions) followed by large hydro (18% of total capacity addition). Meanwhile, Sarawak is projected to see a +40% growth in RE capacity to 5480MW driven predominantly by large hydro and solar. All in, for the 2025-2035 period, some RM22b investment is expected to be required to achieve the 40% RE target by 2035. This is on top of RM19.9b expected to be spent in the 2020-2025 period to hit the initial 31% RE capacity target.

Abundant resources to underpin RE growth. Malaysia is blessed with abundant resources readily exploitable for RE generation. A study by SEDA identified a total 289GW of RE potential in the country - in comparison, only 8.45GW of RE capacity was commissioned as at end-2020, meaning just 2.9% of the country's RE resource has been utilized suggesting huge potential for further growth in RE capacity. Peninsular Malaysia accounts for half of the country's RE resource followed by Sabah and Sarawak at 35% and 15% respectively.

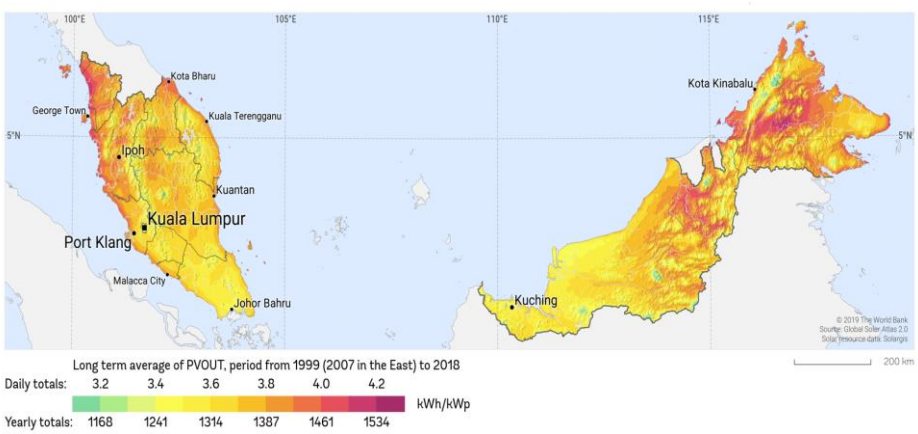
Vast untapped potential from solar. Solar PV resource of 269GW makes up the bulk of the national total accounting for 93% of the country's total RE resource. Thanks to its location near the equator, Malaysia receives 1575-1812kWh/m² of solar irradiance, close to the average 1500-2000 kWh/m² for South-East Asia. In Peninsular Malaysia, the North-West region receives the best solar irradiance while in East Malaysia, Sabah receives the highest irradiance. Peninsular Malaysia accounts for 51% of the country's total solar resource, Sabah makes up 37%, while Sarawak accounts for the remaining 12% respectively. Even at the projected 7.28GW solar capacity in 2035 under the MyRER, this implies just a 2.7% utilisation of the total solar resource available, suggesting still vast potential to develop solar as an RE source for national power generation beyond 2035.

Exhibit 1: Map of ASEAN solar irradiance



Source: SolarGIS, MIDFR

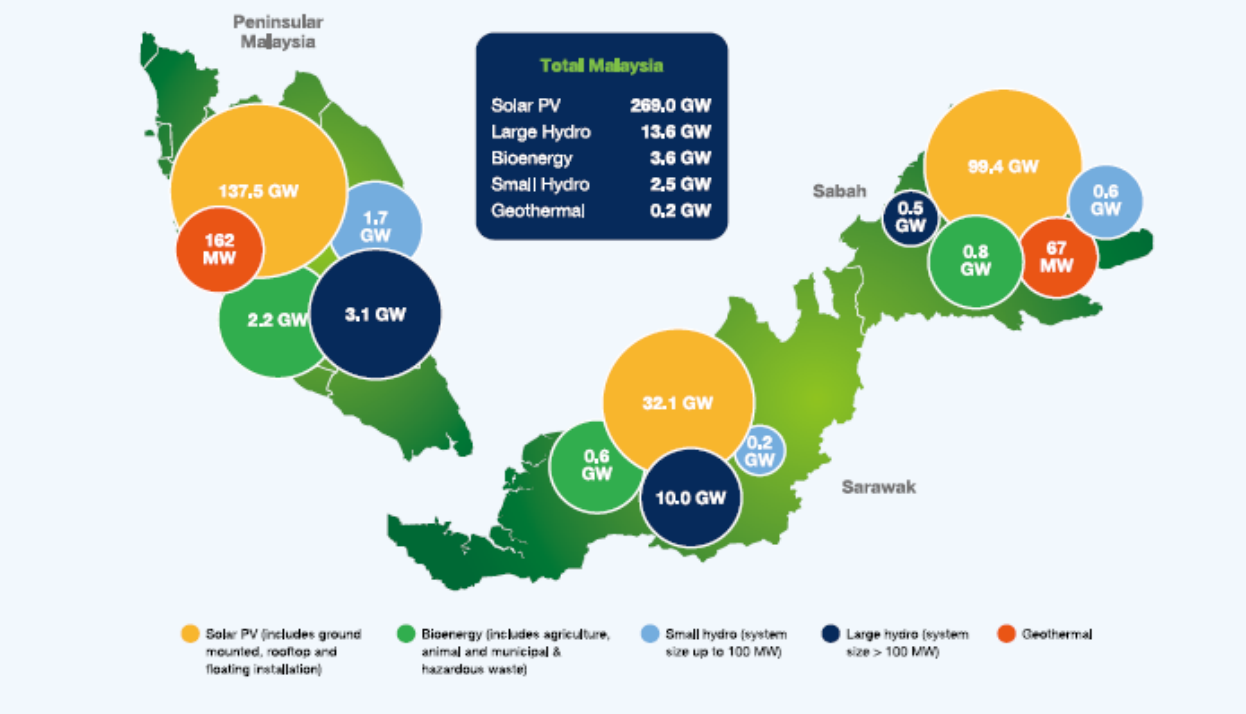
Exhibit 2: Map of Malaysia solar irradiance



Source: SolarGIS, MIDFR

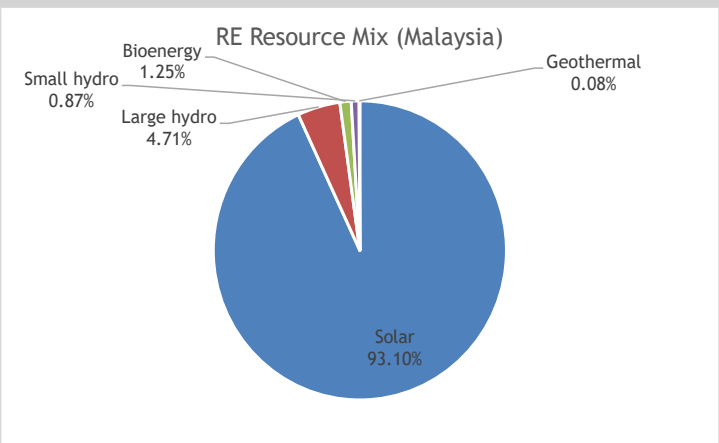
Large hydro is the second largest resource accounting for 4.7% of Malaysia's total RE resource with a particularly heavy concentration in Sarawak – the Sarawak state alone accounts for 74% of the country's large hydro resource followed distantly by Peninsular Malaysia (23%). Sabah has the smallest large hydro resource accounting for 4% of the national total. Bioenergy, small hydro and geothermal make up the remaining RE resource potential, accounting for 1.2%, 0.9% and 0.1% of Malaysia's total RE resource. While hydropower is an attractive proposition given its reliability, the untapped hydropower potential that is mostly concentrated in Sarawak is distant from the key national load centres in Peninsular Malaysia, where much of the hydro potential has already been developed. This implies that any significant reliance on hydropower nationally would need to be in conjunction with deep national power system integration.

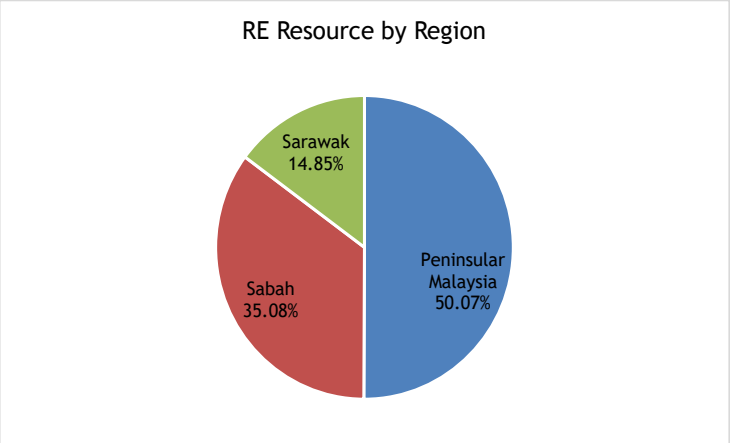
Exhibit 3: Map of Malaysia's RE Resource



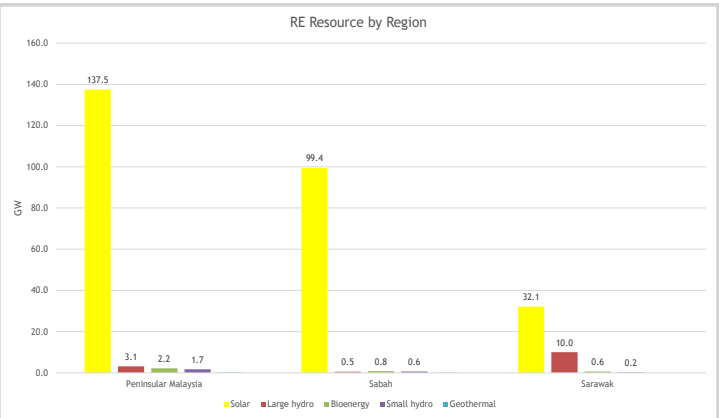
Source: MyRER, MIDFR

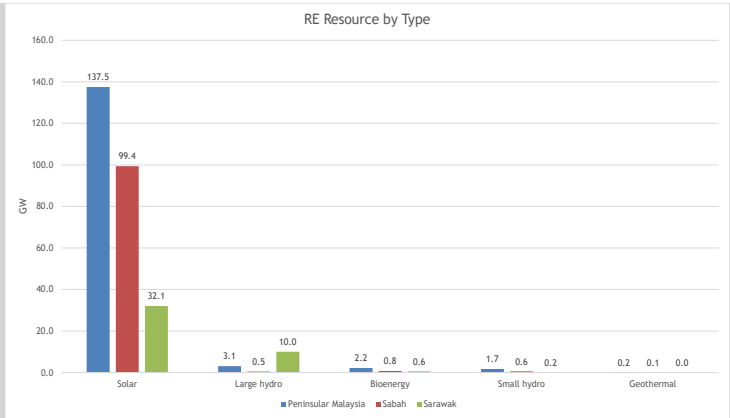
Charts 15: Malaysia RE resource by type and region





Source: MyRER, MIDFR



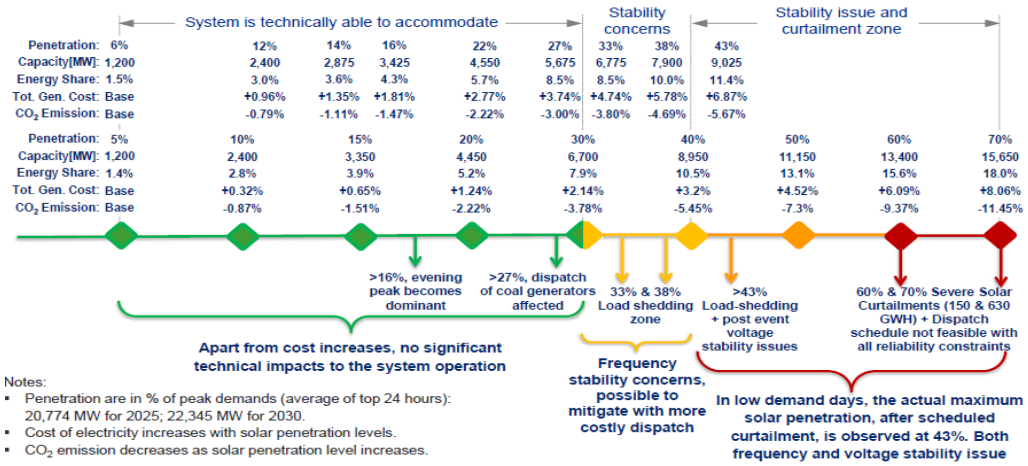


Source: MyRER, MIDFR

Are there issues with high VRE penetration in the mid-term plan? Given the intermittent nature of variable RE (VRE) sources (such as solar and wind), there are limitations to the grid's ability to accommodate VRE capacity. An assessment was carried out by DNV-GL on the VRE penetration limit for Peninsular Malaysia's grid, which was evaluated on three aspects namely grid reliability (i.e., system frequency stability), affordability (incremental cost of electricity) and environment

sustainability (CO2 emission reduction). It was concluded that a VRE penetration level of 20% brings the most benefits, although the Peninsular grid system is able to accommodate penetration of up to 30%, which promotes further environmental sustainability. The VRE mix targets under the MyRER remains within these limits i.e., solar penetration level of 24% of peak demand at the 2025 target and 30% of peak demand at the 2035 target. Based on the Power Generation Development Plan 2021-2039, pilot deployment of energy storage systems (ESS) is expected to take place from 2030 onwards to accommodate further VRE growth, with a total 500MW ESS to be installed by 2034.

Exhibit 4: DNV-GL's analysis of Peninsular Malaysia's solar penetration limit



Source: DNV-GL, MIDFR

Advancing the net-zero ambition with the NETR. Beyond the 2030 NDC and in a bid to move closer to the country's net zero 2050 aspiration**,** the Government is making another big push for the energy transition, laying out a more aggressive 70% RE capacity mix target by 2050 (almost double the 40% RE mix targeted in 2035 under the MyRER) in a latest policy update in May 2023. On our estimates, this would require a massive>30GW of additional RE capacity to be added to the power system. The expansion of RE capacity is also expected to enable surplus RE generation capacity to be exchanged across borders with regional neighbors. Based on estimates by IRENA and NRECC, some RM637b investment is estimated to be required to achieve the new RE target up till 2050, involving investments in RE generation sources, strengthening of grid infrastructure, energy storage system integration and grid system network augmentation. We believe the new RE target and measures to achieve this will feature prominently in the soon-to-be launched National Energy Transition Roadmap (NETR), which will play an integral role in the Government's effort to shift the country to a "green economy". The first phase of the NETR is expected to include strategic projects and initiatives such as solar farms, hydrogen and RE special zones, involving collaboration with companies actively involved in these areas. The second phase which is to be announced in August 2023 is expected to involve enablers such as legislative reforms, incentives and funding to accelerate the energy transition.

Chart 16: RE mix targets

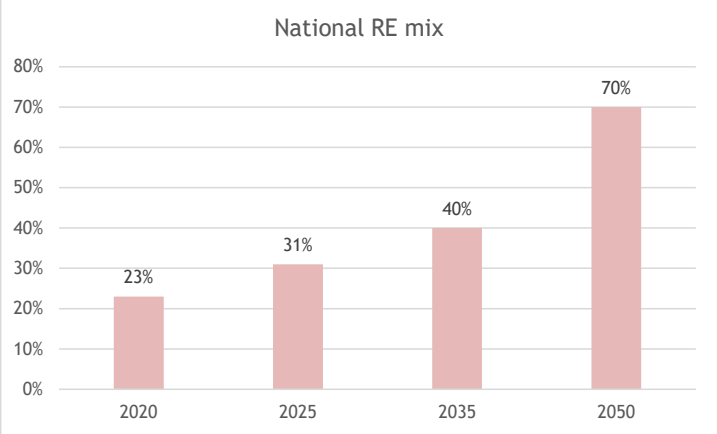
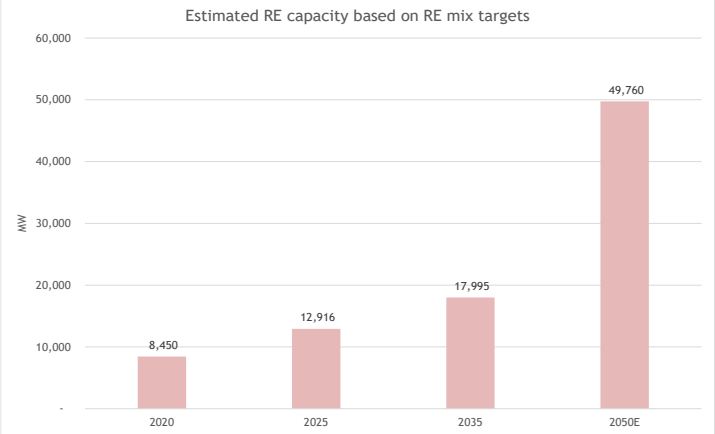


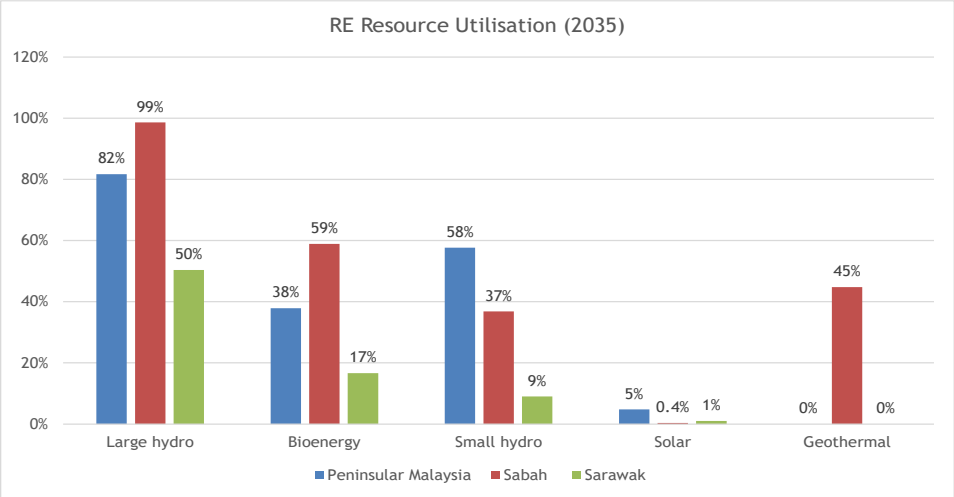
Chart 17: Estimated RE capacity



Source: MyRER, NRECC, MIDFR

Solar likely to play a more prominent role in achieving the NETR's 2050 target. Based on MyRER's RE capacity targets, we forecast that the majority of large hydro resources in Peninsular Malaysia and Sabah would have been utilized by 2035, with some remaining expansion potential for bioenergy and small hydro (See Chart 18). In contrast, despite being one of the key drivers of the RE capacity growth between 2020 to 2035, the abundance of solar resource means there would still be vast potential for solar capacity expansion beyond 2035. Based on our projections, only 5% of Peninsular Malaysia's solar resource would have been utilized, while for Sabah and Sarawak, only 0.4% and 1% of its respective solar resources would have been utilized up till 2035. This suggests that solar will account for an even larger share of RE capacity additions beyond 2035 to advance the RE capacity mix to the targeted 70% by 2050 under the NETR.

Chart 18: Projection of RE resource utilisation by 2035 – substantial development potential remains in solar



Source: MyRER, MIDFR

Energy storage as a future enabler. While the 70% RE target by 2050 looks very ambitious (which is coupled with the fact that Malaysia's RE resource is tilted heavily towards solar which is intermittent), we believe it will be supported by larger adoption of grid-scale energy storage systems (ESS) in the future. ESS is expected to be one of the key enablers of the adoption of larger VRE capacity in the grid given its ability to address the intermittence issues from VRE generation e.g., given that solar is only able to generate ~4 hours/day in Malaysia, 6MW of solar capacity is required to displace 1MW of coal capacity, in which excess generation is stored into ESS to be discharged during solar's non-generating hours. ESS also serves to mitigate issues with grid frequency stability in low demand days when excess solar generation can cause baseload plants to shut down. ESS is used to mitigate this by: (1) Avoiding reduction in conventional generation, therefore ensuring sufficient spinning reserves, complemented by synthetic inertia to mitigate any frequency drops, (2) To mitigate sharp evening ramp-up as ESS will bring down evening peaks and ease the ramping requirement of conventional generation.

What is grid-scale ESS? Grid-scale ESS plays a crucial role in modern power systems, enabling the integration of RE sources, improving grid stability, and enhancing energy reliability. As the world transitions towards a more sustainable and decarbonized energy landscape, ESS technologies are gaining increasing attention due to its ability to store excess energy during periods of low demand and release it during peak demand or when renewable sources are unavailable.

Types of Grid-Scale ESS:

(1) Pumped Hydro Storage (PHS): PHS is one of the oldest and most mature grid-scale energy storage technologies. It involves pumping water to an elevated reservoir during periods of low electricity demand and releasing it through turbines to generate electricity during high demand. PHS offers large-scale storage capabilities and long-duration discharge, making it highly reliable.

(2) Lithium-Ion Batteries: Lithium-ion batteries have become a popular choice for grid-scale energy storage due to their high energy density, fast response time, and scalability. It is widely deployed for short- to medium-term energy storage, often complementing renewable energy sources like solar and wind.

(3) **Compressed Air Energy Storage (CAES):** CAES systems store energy by compressing air and storing it in underground caverns. During peak demand, the compressed air is released and expanded through turbines to generate electricity. CAES is known for its relatively long discharge duration and high energy storage capacity.

(4) **Flow Batteries:** Flow batteries store energy in liquid electrolytes housed in separate tanks. During charging and discharging, the electrolytes flow through the electrochemical cell, generating electricity. Flow batteries are valued for their ability to decouple power and energy capacity, allowing for flexible scalability.

(5) **Thermal Energy Storage (TES):** TES systems store energy in the form of heat or cold. Molten salt, hot water, or chilled water can be used as storage media. TES is commonly used in conjunction with concentrated solar power plants and district cooling systems.

Common ESS technology today is based on batteries, but hydrogen is increasingly being considered as an alternative considering that it is one of the most abundant elements on earth and given its ability to store energy for longer periods and in larger volumes compared to battery ESS. Essentially excess RE generation is used to generate hydrogen (via electrolysis of water), which is stored and converted back into electricity when required (by reacting it with oxygen again with only water as a by-product). Battery ESS is more suited for storage within a short time scale (in hours rather than days), whereas hydrogen can store energy for much longer periods (weeks or months), suitable for seasonal storage, scalability and storability. There are various methods of grid-scale hydrogen storage:

(1) **Underground Hydrogen Storage:** This method involves storing hydrogen in underground geological formations, such as salt caverns, depleted gas reservoirs, or aquifers. Hydrogen is injected and withdrawn from these storage sites as needed, providing flexibility and large storage capacities.

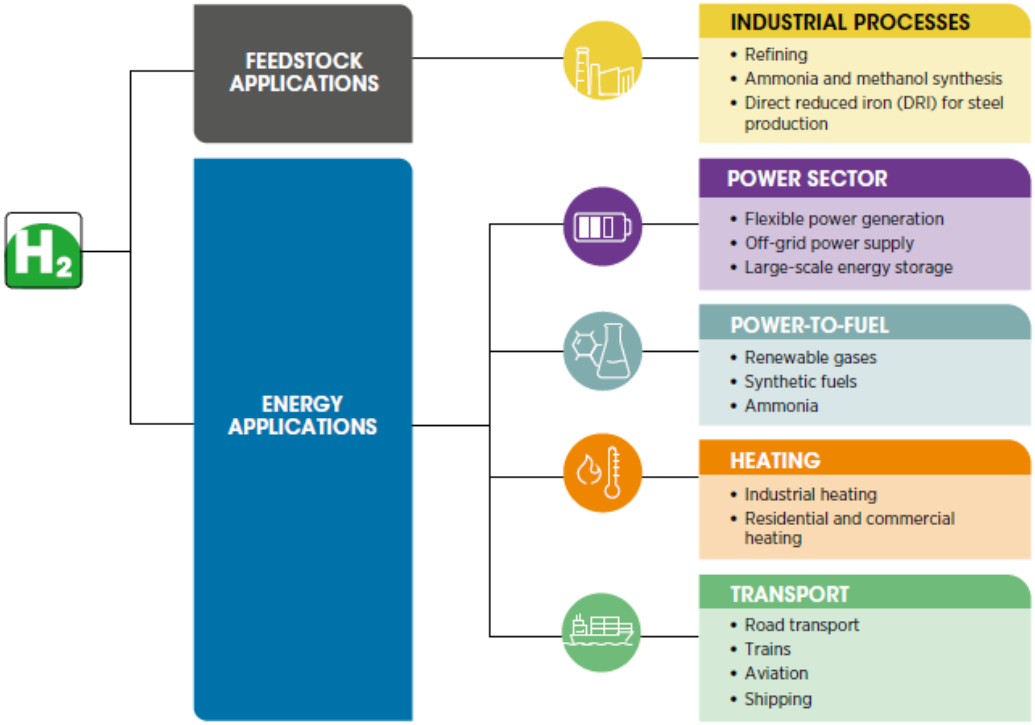
(2) **Liquid Hydrogen Storage:** Liquid hydrogen can be stored in large tanks at cryogenic temperatures. While this method requires specialized infrastructure and energy for liquefaction, it offers high energy density and extended storage durations.

(3) **Chemical Hydrogen Storage:** This approach involves chemically bonding hydrogen to other materials, such as metal hydrides or chemical compounds. The hydrogen can be released by specific reactions, enabling on-demand hydrogen generation and storage.

(4) **Compressed Hydrogen Storage:** Hydrogen can be compressed and stored in high-pressure tanks. Although this method requires a significant amount of energy for compression, it is suitable for short- to medium-term storage applications.

A key challenge for both battery-based and hydrogen-based storage is their high cost. At this point, it is still uncertain which technology will eventually take off to generate the required economies of scale and eventually make them a viable solution for large scale VRE integration. Other than use cases for energy storage and grid balancing, both battery and hydrogen offer decarbonisation potential for the transport sector and the latter, for certain hard-to-abate industrial processes as well.

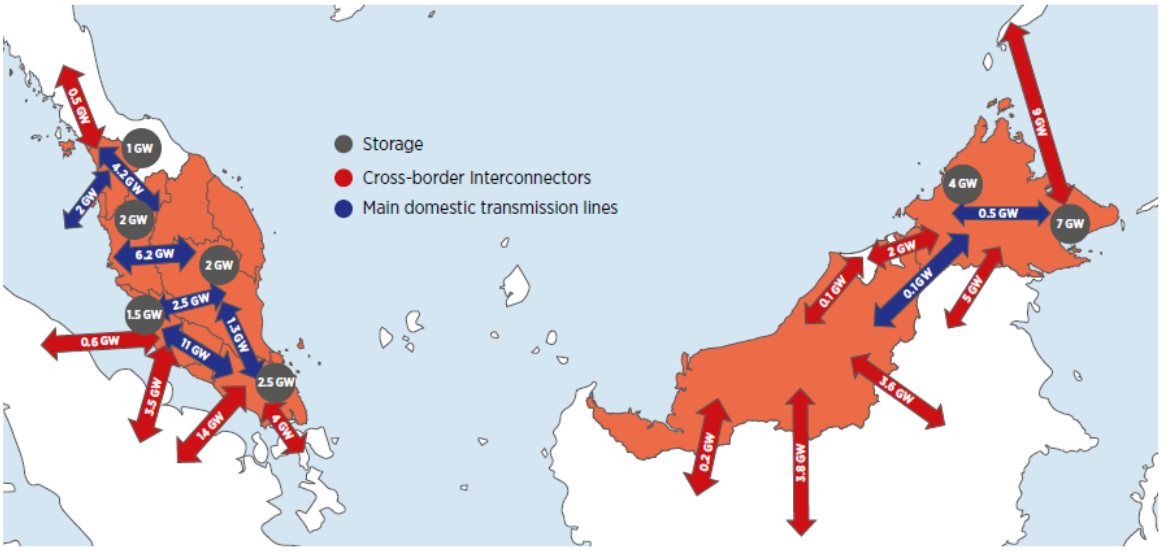
Exhibit 5: Green hydrogen and its applications



Source : IRENA, MIDFR

Supporting an RE-dominated power system. Based on the IRENA Malaysia energy transition outlook's 1.5-degree scenario (which entails a 90% RE mix projection), some 20GW of storage is projected to be required in the power system to accommodate VRE in the capacity mix. Projected ESS deployment is substantially in Peninsular and Sabah, whereas Sarawak has abundant hydropower reservoirs to act as storage and therefore other technologies are not needed (See Exhibit 6). IRENA also foresees regional interconnections playing a role in stabilizing the grid via electricity import/export. Peninsular Malaysia is projected to become a net importer of power by 2050, primarily from Sumatera, while the East Malaysian states are expected to turn net exporters to the Philippines, Brunei and Kalimantan.

Exhibit 6: Transmission line and ESS mapping based on IRENA's 2050 projection for Malaysia



Source : IRENA, MIDFR

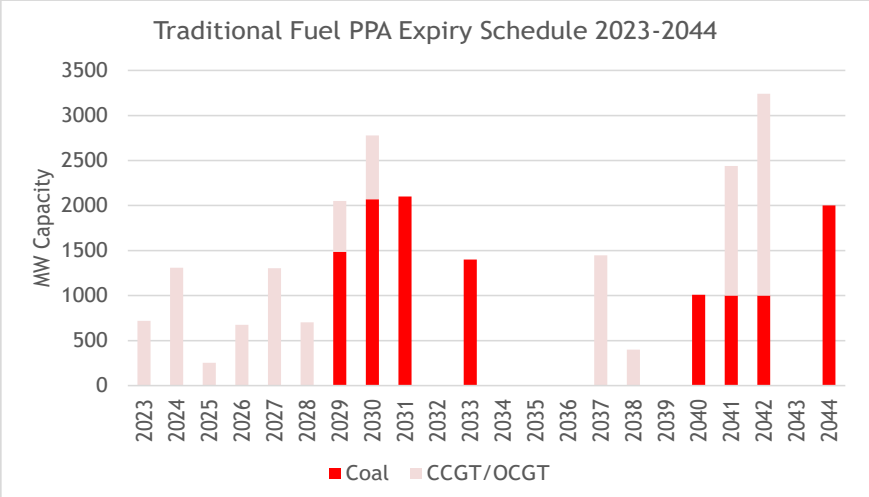
Table 2: Summary of regional RE targets – Malaysia is one of the most aggressive

	Malaysia	Indonesia	Philippines	Thailand	Vietnam	Singapore
Latest RE Policy	MyRER (upcoming: NETR)	National Energy Roadmap	Sectoral Energy Plan & Roadmap	Power Development Plan	Power Development Plan	Singapore's Energy Story
Year of latest RE policy	2023	2017	2017	2019	2019	2019
Overall RE targets	31% RE installed capacity by 2025, 40% by 2035, 70% by 2050	RE installed capacity of 45GW by 2025, 168GW by 2050, 31% of national primary energy supply in 2050	RE installed capacity of 20GW by 2040	33% RE installed capacity by 2037 with RE mix as following: (1) Solar: 6GW (2) Biomass: 5.57GW, (3) Wind: 3GW, (4) Hydropower: 3.3GW, (5) Biogas: 0.6GW, (6) MSW: 0.5GW	32% RE installed capacity by 2030, 45% by 2050	At least 2GW of solar by 2030 and energy storage deployment target of 200MW post-2025

Source : MyRER, MIDFR

Complemented by coal capacity retirement. The growth in RE capacity is expected to be complemented by a reduction in coal capacity mix i.e., from 37% in 2020 to just 18% by 2035. A large chunk of the existing coal capacity is expected to fall off the grid between 2029-2033, while another batch of coal capacity is expected to expire from 2040 onwards with the final coal PPA from Jimah East's 2000MW plant scheduled to expire in 2044 (See Chart 19). These are expected to bring the domestic power sector closer to its net zero target by 2050. Additionally, there are plans by Tenaga to repower some of its existing power plants with green technology such as hydrogen co-firing at selective CCGT plants and ammonia co-firing for coal generation plants to accelerate decarbonisation of the grid.

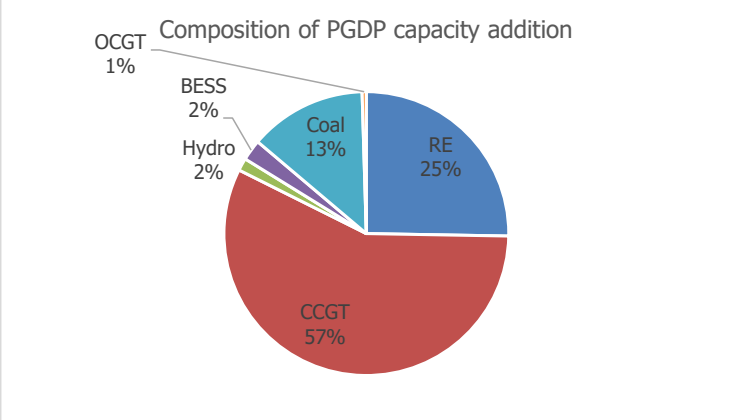
Chart 19: Significant coal capacity retirement from 2029 onwards with the last in 2044

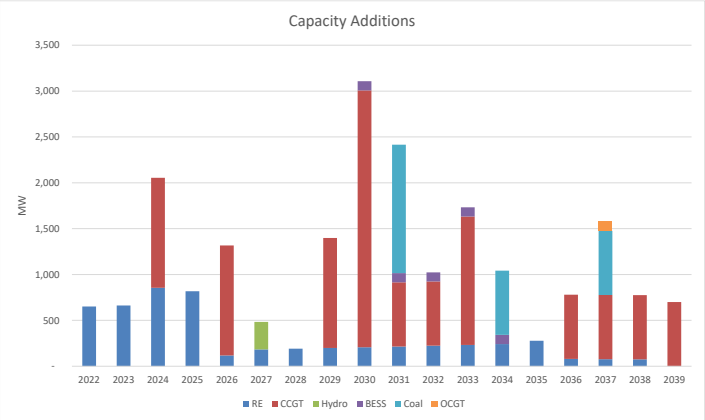


Source : Energy Commission, MIDFR

Gas capacity to remain relevant. Importantly, gas is still expected to remain one of the key fossil fuel sources in the power mix, making up 40% of total capacity in 2035. Gas is a cleaner fossil fuel source compared to coal and also functions as back up capacity for VRE. Under the power generation development plan, more than half of capacity additions are expected to come from CCGT (combined cycle gas turbine) power plants, while RE makes up about a quarter of capacity additions in the same period. Although thermal power plants will make up a smaller proportion (at 58%) of total capacity mix in 2035, it is still crucial in order to maintain system stability until ESS becomes a more viable solution.

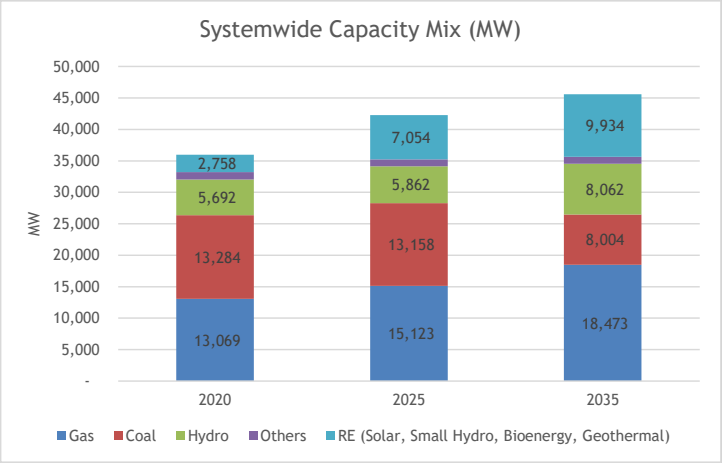
Charts 20: Systemwide capacity additions under the Power Generation Development Plan 2021-39

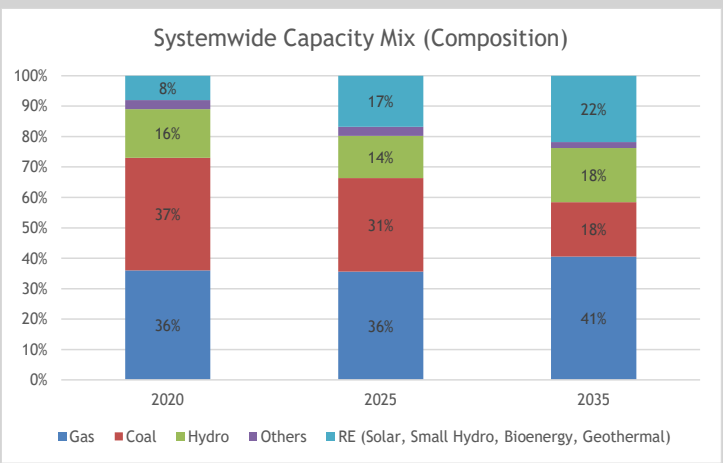




Source: IRENA, MIDFR

Charts 21: Coal contribution to systemwide capacity mix expected to reduce markedly in 2035





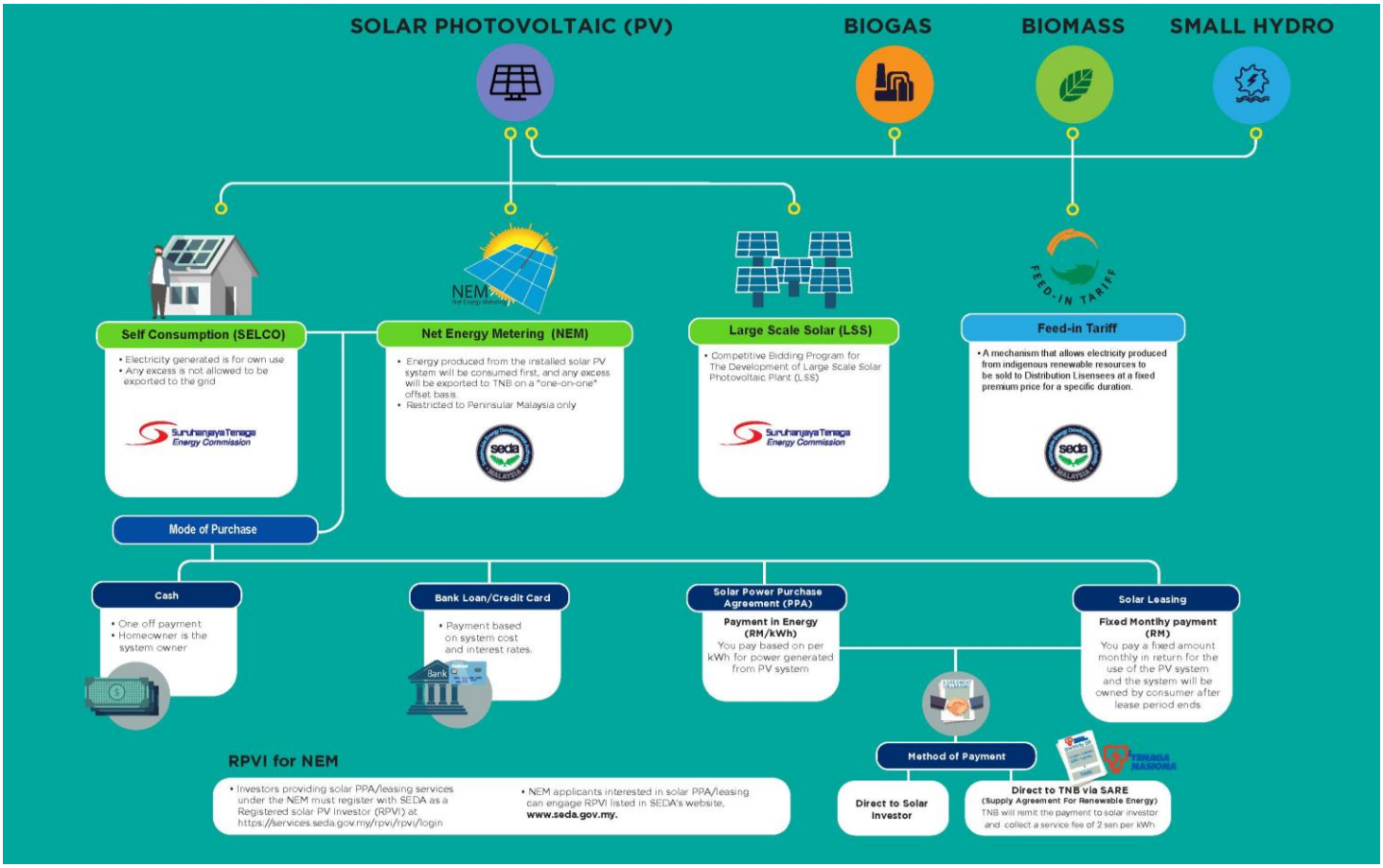
Source: IRENA, MIDFR

2.1 Current mechanisms for RE rollout in Malaysia

Since 2012, RE development in Peninsular Malaysia and Sabah has been supported through four main programs entailing quota-based and eventually evolving into auction-based mechanisms. These are: (1) Feed-in Tariff scheme (FiT), (2) Large Scale Solar auction (LSS), (3) Net Energy Metering (NEM) and (4) Self-consumption (SELCO).

Feed-in-Tariff. The FiT scheme was introduced on 1st December 2011 to boost RE uptake by ensuring that Distribution Licensees (DLs), such as TNB, purchase electricity produced from renewable resources at a premium rate for a fixed period. The FiT mechanism was originally available for all the main RE resources (biomass, biogas, small hydro and solar PV). Due to the rapid decreasing costs, new mechanisms, such as LSS auctions, NEM and SELCO, have been introduced, replacing the FiT mechanism for solar PV. As of the end of 2020, 574 MW of RE capacity have been installed under the FiT programme, majority of which has been taken up by solar PV (323 MW), while biomass, biogas, and small hydro have a combined cumulative installed capacity of 252 MW.

Exhibit 7: Overview of RE mechanisms in Malaysia



Source: SEDA, MIDFR

Large Scale Solar. The introduction of LSS auction in 2016 has resulted in addition of 857 MW or 56% to the total solar PV installed capacity as of the end of 2020. LSS is designed to support the uptake of utility-scale solar PV systems with capacities of 1-100 MW in Malaysia. The scheme uses a reverse auction system to award LSS rights based on the lowest bid for off-take prices. The minimum system capacity of LSS plants is 1 MW, while the maximum system capacity has varied depending on the auction tranche, ranging from 30 MW to 100 MW. As a result of the reverse auction system, competition between developers has pushed off-take solar prices down by 13% between 2016 to 2017. Prior to LSS auctions, 250 MW of LSS projects were awarded through a fast-track mechanism.

Net Energy Metering. Malaysia introduced the NEM scheme in November 2016, with a 500 MW quota. Through NEM, RE owners are allowed to sell excess electricity generated from RE to DLs. Besides outright purchase of solar PV systems, NEM participants can install solar PV systems through power purchase agreements (PPA) or leasing with a Registered Solar PV Investor (RPVI). Under the leasing/PPA mode of purchase, little to no upfront investment is required, which is expected to boost NEM uptake. Additionally, Tenaga introduced the Supply Agreement for Renewable Energy (SARE) which integrates leasing payments with Tenaga's electricity bills, offering one-stop billing process for consumers thereby reducing counter party risk for the RPVIs. The NEM scheme is not limited to rooftop solar PV but is also open to ground- mounted solar within its own premise and the approval is on a case-by-case basis.

Self-consumption. The SELCO scheme introduced in 2017 is available for solar PV system owners who intend to use the electricity generated for self-consumption purposes. Electricity generated from SELCO cannot be exported to the grid, limiting owners from securing compensation of excess energy generated. However, SELCO users benefit from the shortened installation process as the power system study is not required for system sizes up to 425 kWac. As of December 2020, 93 MW capacity has been installed under the SELCO scheme.

Unlike other RE schemes, the large hydro scheme is not available for application by the public or private developers. Due to its high development costs and technical requirements, all large hydro power plants in Malaysia are developed by regional utilities and the development plans, as endorsed by JPPPET.

Exhibit 8: Key RE programs in Malaysia

Mechanism	Year Started	Lead Organization	Program Specification	Key Insights
Feed-in Tariff (FiT) - Solar	2011	SEDA	• MYR 0.50 - 1.77/kWh • 4 kW - 30 MW • 21 years	• Discontinued in 2017 and replaced by both LSS, SELCO and NEM • Only P. Malaysia and Sabah
Large-scale Solar (LSS)	2016	Suruhanjaya Tenaga Energy Commission	• MYR 0.17 - 0.45/kWh • 1 - 100 MW • 21 years	• 3 auctions completed • 4th LSS released in 2020 with system size capped at 50 MW • Only P. Malaysia and Sabah
Solar Net Energy Metering (NEM)	2016	SEDA Suruhanjaya Tenaga Energy Commission	• Based on consumers retail tariff • Up to 5 MW per applicant subjected to respective sectors • 10 years (one to one offset)	• Cumulative of 1 GW capacity to promote rooftop solar market • Revision of compensation rate to 'one-on-one offset' for 10 years in 2020 to induce uptake • Implementation of VNM allowing excess energy to be exported to designated premises under wholly owned subsidiary company • Only P. Malaysia
Solar Self-consumption (SELCO)	2017	Suruhanjaya Tenaga Energy Commission	• Tariff not applicable for SELCO • 75% of max demand / 60% of fuse rating • No tenure period	• Regulation began in 2017 but activity started before 2017 • SELCO replaced NEM in Sabah starting 2019
Feed-in Tariff (FiT) - Biomass	2011	SEDA	• MYR 0.27 - 0.31/kWh • Up to 30 MW • 21 years	• Includes agriculture residues: palm oil and rice husk and straw • PPA revised to 21 years from 16 years in December 2019
Feed-in Tariff (FiT) - Biogas	2011	SEDA	• MYR 0.27 - 0.32/kWh • Up to 30 MW • 21 years	• In 2019, PPA tenure period extended from 16 years to 21 years • FiT rate offered for agriculture waste and landfill waste
Feed-in Tariff (FiT) - Waste To-Energy (WTE)	2011	SEDA	• MYR 0.27 - 0.31/kWh • Up to 30 MW • 21 years	• Effective 2019 new WTE projects who wishes to apply for FiT can apply under Biomass FiT (w/o use of solid waste as fuel source bonuses) • Government to implement auction/bidding system for WTE projects started in 2020 by KPKT
Feed-in Tariff (FiT) - Small Hydro	2011	SEDA	• MYR 0.23 - 0.29/kWh • Up to 30 MW • 21 years	• No degression rates due to long gestation period • FiT rate for low head and high head introduced in 2019

• FiT rate / ave. winning bid / tariff rate • System size • Tenure / period

Source: SEDA, MIDFR

2.2 What else could be in the pipeline?

A new mechanism via VPPA. A virtual power purchase agreement (VPPA) is a contractual arrangement between a renewable energy project developer and a buyer, typically a corporation, municipality, or other large energy consumer. In a VPPA, the buyer agrees to purchase a specified amount of renewable energy from the project developer over a fixed period, often ranging from 10 to 20 years. The key characteristic of a VPPA is that it is a "virtual" agreement. This means that the buyer does not physically consume the electricity generated by the renewable energy project. Instead, the electricity is typically delivered to the grid, and the buyer receives financial benefits based on the contracted price and the market price of electricity. The primary purpose of a VPPA is to enable corporations and organizations to procure renewable energy directly from renewable energy projects, supporting their sustainability goals and reducing their carbon footprint. By entering into a VPPA, the buyer is essentially "virtually" offsetting its electricity consumption with renewable energy, even if the physical power does not directly flow to its facilities.

Maiden VPPA program launched. The Government announced maiden introduction of a VPPA framework via the Corporate Green Power Program (CGPP) back in November 2022. A total of 600MW quota was allocated under the CGPP program initially, but it was later expanded to 800MW. The CGPP was opened for applications up till 31st December 2023. However, the quota was fully taken up within the first few days of launch, signaling very strong demand. Given that the CGPP quota was fully taken up much earlier than expected, we opine the decision on the winning bids could be announced sooner rather than later – prior indications were for the EC to finalize bids within 2 months of closing of applications.

How does it work? The CGPP essentially involves three parties: (1) Solar Power Producer (SPP) (2) Corporate Consumer (CC) (3) Utility company namely Tenaga. The SPP enters into a Corporate Green Power Agreement (CGPA) with the CC at a pre-agreed CGPA tariff. Power generated by the SPP is not physically channeled to the CC, but rather is supplied to the grid

via the NEDA wholesale market at system marginal price (SMP). Meanwhile, the CC procures its physical electricity via the grid through Tenaga at normal market tariff. The difference between the CGPA tariff and SMP is then settled between the SPP and the CC. If the SMP is higher than the CGPA tariff, the SPP will pay the CC the differential and vice versa if the SMP is lower than the CGPP tariff.

Among the key conditions of the CGPP program:

(1) Solar power plant

- Only new solar power plant projects with an export capacity from five MW to 30 MW are eligible to participate in the CGPP. The solar power plant is required to be completed and operational by 2025.
- The solar power plant shall ensure compliance with the legal and regulatory requirements related to the development and operation of solar power plant and the technical requirements of Electricity Utility Company.
- Solar power plants with battery energy storage system (BESS) installed are likely to stand a higher chance to be selected for the CGPP, provided that the BESS is able to support at least 1 hour of full export capacity.

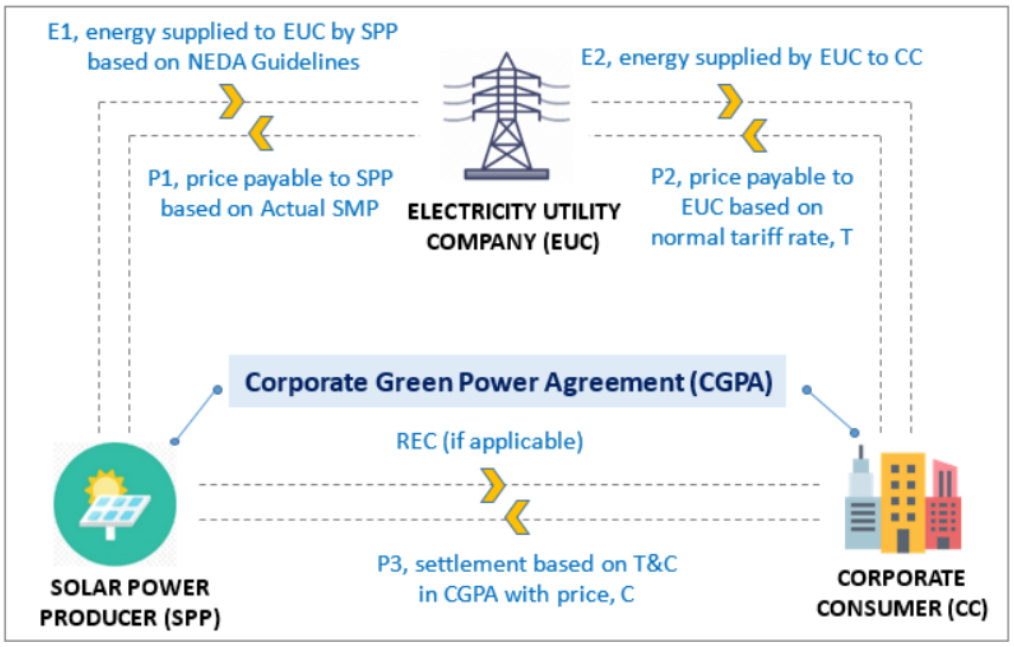
(2) Solar developer

- Foreign equity of up to 49% is permitted.
- The applicant(s) must have an asset of at least RM10 million, and in the case of a consortium, a paid-up capital of not less than RM 1 million for each of the consortium member.
- The applicant(s) must have at least three years of relevant experience in financing, development, implementation and operation of large solar PV plant with capacity not less than 1 MW.
- The applicant(s) shall have identified the site of the project and the route of interconnection facility and with documentation proof on the right to use the lands or project sites.
- A solar developer may only have up to three corporate consumers.

(3) Corporate consumer

- The corporate consumer must be a company operating in the manufacturing or service industry in Peninsular Malaysia with credible financial position for the last three years.
- If the corporate consumer is a company planning to establish and operate in Peninsular Malaysia within the next two years, it is required to have proven documentation from the authority (i.e., Ministry of International Trade and Industry) and a projected annual revenue of not less than RM 10 million.
- The energy demand of the corporate consumer shall not be less than 1 MW.

Exhibit 9: Overview of the CGPP framework



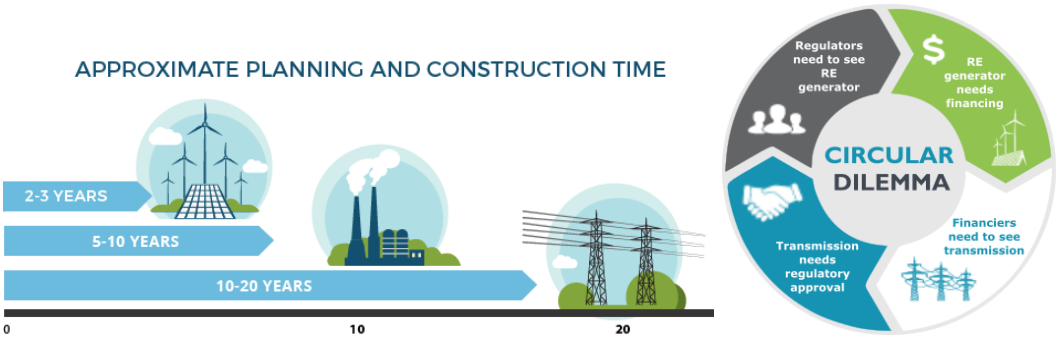
*Source: Energy Commission, MIDFR *REC: Renewable Energy Certificate*

Is CGPP better than LSS for market players? The LSS is done via an auction mechanism where SPPs bid to supply to a single buyer, which is Tenaga. This has resulted in a significant decline in LSS tariffs over the years. While the decline in tariff was partly driven by declining underlying cost, it also came at the expense of returns given stiff competition to supply to a single buyer, which has led to thinning margins and leaves little room for buffer in costing. The recent spike in panel cost during the Covid pandemic for example, has caused many LSS4 projects to be delayed given cost overruns and inability to reach financial close. In the CGPP program, it is up to SPPs to procure their own offtaker, essentially eliminating the buyers' market element in the LSS program, while CGPA tariffs are directly negotiated between the SPP and offtaker. We opine that the CGPP could lead to much better tariffs and returns while at the same time, allows pricing of environmental attributes (i.e., Renewable Energy Certificates) of the solar generation to be reflected. The profile of the offtaker would perhaps be important in the CGPP as this would affect bankability and risk of the project. However, our recent rounds of meetings with the EPCC players suggest most have negotiated with offtakers comprising large corporates or MNCs which are of good financial standing, in submitting their bids.

Strategic solar farms or dedicated RE zones. The Minister of Economy (which is the principal ministry in charge of rolling out the NETR) had indicated recently that the 1st Phase of the NETR encompasses strategic projects and initiatives which includes among others, strategic solar farms and RE special zones (REZ). REZs are essentially geographic areas with high-quality variable RE resources (such as solar and wind), suitable topography and land use designations for development, and demonstrated interest from project developers. These areas can be used to identify new transmission lines that enable the development of cost-effective, grid-connected RE. In short, REZs are essentially a renewables-based equivalent of a power station, combining generation, transmission and storage to ensure the energy system is secure, affordable, clean and reliable. Governments typically use REZs as a planning tool to ensure new renewables can be coordinated with transmission and demand.

What's the benefit of REZ? The REZ process is a proactive transmission expansion planning which applies to RE expansion that is constrained by a lack of existing transmission. Traditional transmission planning may be ill-suited to the characteristics of renewable energy development as transmission planning decisions need to be made well in advance of RE development. For example, windy and sunny areas, which are often far from load centers but attractive for wind and solar power development, may require 5–10 years for planning and construction of new transmission infrastructure. This results in a timescale misalignment as wind and solar projects only require 1–3 years to construct. This timescale misalignment leads to a common circular dilemma in transmission planning. Financing for remote generation projects is not available without transmission access, but transmission lines cannot be built without a demonstrated need for service and certainty for cost recovery. Siting for conventional generation (such as coal) is seldom as constrained. RE planning that does not consider transmission expansion may limit power systems to RE development that is less economically attractive.

Exhibit 10: Timescale misalignment in RE development

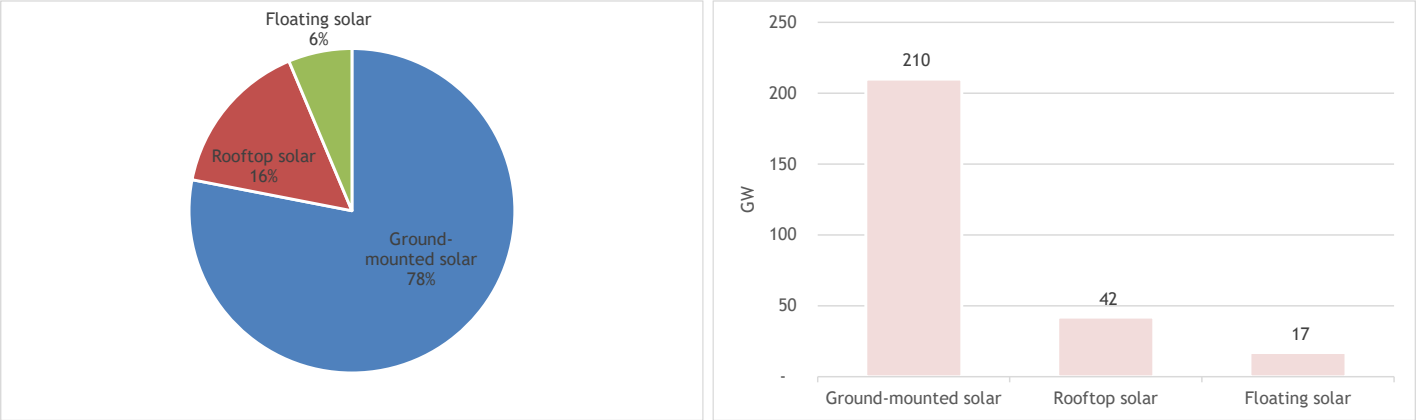


Source: Energy Commission, MIDFR

Unleashing the potential of rooftop solar and distributed generation. We believe policies to further drive development of rooftop solar could feature prominently in the upcoming NETR as part of efforts to unlock the vast solar potential in the country. Of the country's 269GW solar resource potential, a considerable 42GW comes from rooftop potential (the majority 210GW is dominated by ground-mounted configurations, while floating solar makes up the remaining 17GW).

Unlike ground-mounted solar, rooftop solar is likely to be located close to existing distribution networks, eliminating the need for costly new connections. Additionally, when combined, a set of rooftop solar can function as distributed generation (essentially power generation that is located close to demand centers hence only requires connection to the distribution network). However, a potential challenge for rooftop solar is the fact that rooftops are essentially individually-owned, especially for residential - not all households would have the financial means to install solar given income disparity while those with small consumption would find it difficult to justify such an investment. At our recent roundtable dialogue with NRECC, the Minister acknowledged these challenges and indicated that the Government is considering potential incentives to encourage B40 households to adopt solar rooftop. A rooftop leasing mechanism is also being explored, which we believe could drive utilisation of rooftops for solar by independent developers while incentivizing premise owners to allow usage of their rooftop assets given leasing income that can be generated. Additionally, the Government had in May 2023, announced a special allocation of RM50m for solar infrastructure installation on rooftops of Government facilities across the country for 2HCY23 with a larger sum expected to be allocated in the upcoming development expenditure.

Charts 22: Malaysia's solar RE resource by type of installation – rooftop solar forms a reasonable chunk



Source: MyRER, MIDFR

A clean alternative amid subsidy rollback. Electricity subsidy in the country has been progressively rolled back, initially for non-domestic consumers in the 1H23 ICPT review and more recently for high consumption domestic consumers in the latest 2H23 ICPT review. To recap, medium to high voltage non-domestic consumers saw their ICPT surcharge increase by >5-fold to 20sen/kwh from 3.7sen/kwh in the 1H23 review (subsequently adjusted slightly lower to 17sen/kwh in the 2H23 review given lower generation fuel prices). Meanwhile, high consumption domestic consumers (defined as >1500kwh consumption/month) saw them being slapped with an ICPT surcharge of 10sen/kwh from a -2sen/kwh rebate previously. These drove significant increase in effective tariffs for the affected consumers, which indirectly drove take-up of RE installations via NEM and SELCO to reduce the impact of the higher electricity cost. Complementing the increased demand for RE, the Government recently announced relaxation of conditions for NEM (Net Energy Metering) and SELCO (Self-Consumption) programs by: (1) Increasing allowable capacity to 85% of consumption from 75% previously, (2) Allowing participation of non-domestic high voltage consumers in the SELCO program (previously, only allowed for low to medium voltage consumers in the non-domestic sector).

TPA as enabler to corporate PPAs. The Government is also understood to be working on third party access (TPA) to the grid, which could support further development of corporate PPAs (whereby RE power producers essentially sell electricity generated directly to the offtaker at pre-negotiated tariffs and PPA tenure). The unbundling of Tenaga's tariff back in 2014, which breaks down transmission, distribution and grid system operation charges, paves the way for the upcoming TPA implementation. Similar to CGPP, we believe direct corporate PPAs could entail improved tariffs and returns (compared to LSS) for RE asset owners, especially if RECs are taken into consideration, and should appeal to large corporates and MNCs which have pledged to carbon reduction and net zero targets.

What about carbon pricing? In our opinion, a key missing ingredient in the nation's decarbonisation drive is carbon pricing, be it in the form of carbon tax or a cap & trade system. As per the Minister's indications at our dialogue session however, we reckon the Government would be reluctant to introduce carbon pricing in the near future, with near term focus concentrated mainly on RE capacity development and outright decarbonisation efforts instead. While a voluntary carbon

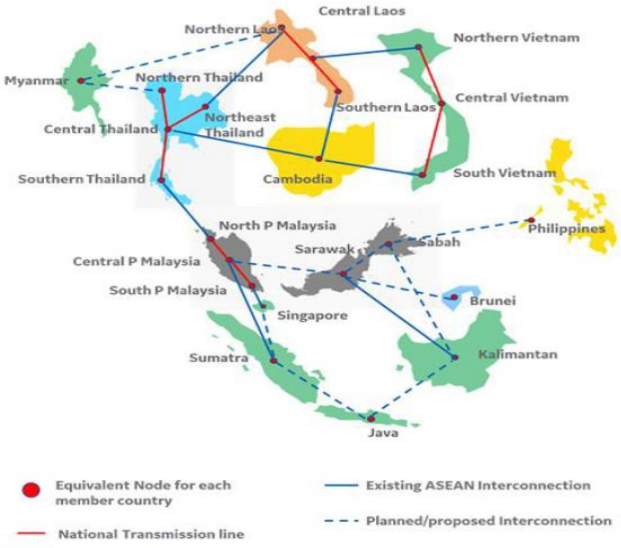
market has been launched, we believe a carrot-and-stick approach will eventually be embraced in order to send the right signals to the market in regards to the Government's stance on carbon emissions. A National Carbon Policy is in the works, but based on indications so far, this is to facilitate carbon trading at state levels with implementation targeted by the end of the year.

3.0 SOWING THE SEED FOR FUTURE ENERGY TRADE

Strategic policy development. A key policy development recently was the lifting of the RE export ban and the development of an electricity exchange system to enable cross-border RE trading. This is expected to allow domestic RE capacity to grow at a faster and larger scale capitalising on rising regional RE demand. A low hanging fruit is Singapore which lacks the land size to accommodate RE generation and houses the region's RE100 MNCs - RE100 is a global initiative involving companies that are committed to 100% RE across their operations. Malaysia has an advantage here given proximity to Singapore and an existing interconnection. As RE-sourced electricity in Singapore commands much higher tariffs, this could also drive investments into solar+BESS projects which may have not been feasible previously at local tariffs. Retail "green electricity plans" in Singapore range from SGD0.32-0.45/kwh (RM1.07-1.50/kwh) relative to Malaysia's base tariff of RM0.40/kwh (RM0.57/kwh including ICPT surcharge for medium-to-high voltage non-domestic customers). Returns from these RE exports could then be ploughed back into scaling up domestic solar+BESS capacity. In the long run, the new policy on RE trade aims to position Malaysia at the centre of the regional electricity trade, riding on the ASEAN grid interconnection initiative. The move aims to capitalize on the ample RE resource in the country and its strategic geographical location at the centre of the region.

Realising the ASEAN power grid. The ASEAN Power Grid (APG) is an initiative to construct a regional power interconnection to connect the region, first on cross border bilateral terms, and to gradually expand to sub-regional basis and subsequently leading to a total integrated South East Asia power grid system. As one of the physical energy infrastructure projects in the Master Plan of the ASEAN Connectivity, the APG project is expected to enhance electricity trade across borders that would provide benefits to meet the rising electricity demand and improve access to energy services in the region. Seven of the 16 power interconnection projects have been completed thus far. In the long run, we believe a comprehensive ASEAN interconnection will enable ASEAN member countries to leverage one another's resource advantages to achieve the regional decarbonisation targets and assist in meeting power supply requirements.

Exhibit 11: Existing and proposed ASEAN interconnections



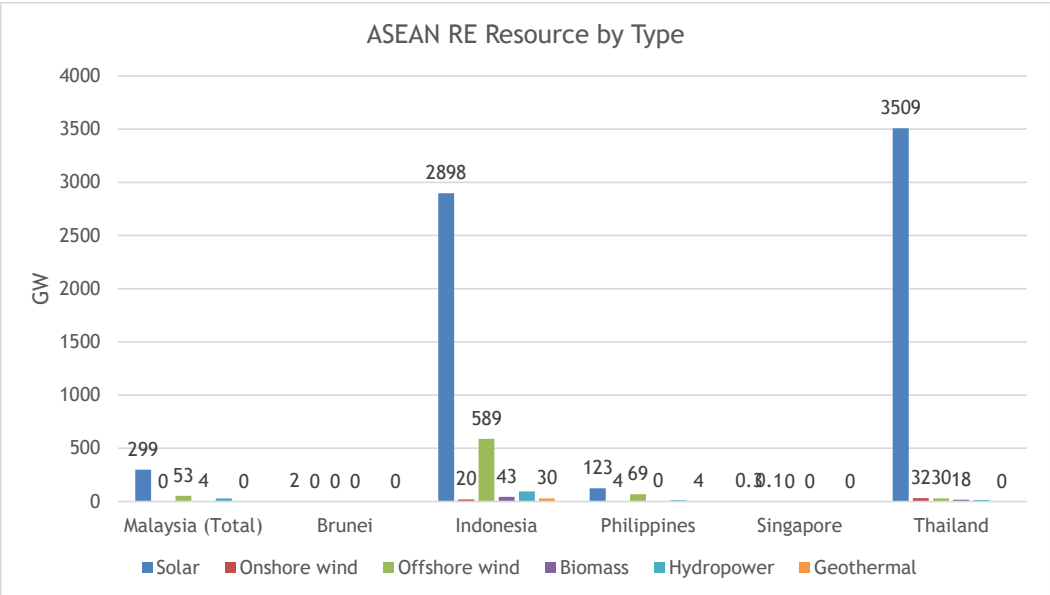
Source: ASEAN Centre for Energy MIDFR

Table 3: Summary of ASEAN member NDCs

	Malaysia	Singapore	Thailand	Indonesia	Vietnam	Philippines
Type of Commitment	GHG Target	GHG Target	GHG Target	GHG target and non-GHG target	GHG Target	GHG Target
GHG Target	To reduce carbon intensity by 45% (unconditional) by 2030 compared to 2005 levels	Singapore's NDC is an economy-wide absolute GHG emissions limitation target to peak its GHG emissions at 65 MtCO2e around 2030. Singapore's GHG emissions in 2030 are expected to amount to no higher than 65 MtCO2e.	20% (unconditional) up to 25% (conditional) reduction in GHG emissions by 2030 compared to the BAU scenario	29% (unconditional) and up to 41% (conditional) by 2030 compared to the business as usual scenario; 26% (unconditional) reduction in GHG emissions by 2020 compared to business as usual scenario	"Unconditional contribution: With domestic resources, by 2025 Viet Nam will have reduced total GHG emissions by about 7.3% compared to the BAU scenario (equivalent to 52.9 million tonnes of CO2eq), and by 2030 Viet Nam will have reduced total GHG emissions by about 9% compared to the BAU scenario (equivalent to 83.9 million tonnes of CO2eq)." "Conditional contribution: The above-mentioned 9% contribution can be increased to 27% by 2030 (equivalent to 250.8 million tonnes of CO2eq)"	75% reduction in GHG emissions compared to the BAU scenario of 2000-2030, of which 2.71% is unconditional and 72.29% is conditional
Target year/period	2030	2030	2030	2030	2025 and 2030	2020-2030
GHG Target type	Intensity Target	Trajectory target	Baseline scenario target	Baseline scenario target	Baseline scenario target	Baseline scenario target
More ambitious NDCs under COP26?	Yes	No	No	No	Yes	No
Net Zero commitment	By 2050	As soon as viable in the 2nd half of the century				

Source: ASEAN Centre for Energy, MIDFR

Table 3: ASEAN RE resource by type/country



Source: IRENA, MIDFR

Brief background on development of Malaysia/ASEAN interconnection

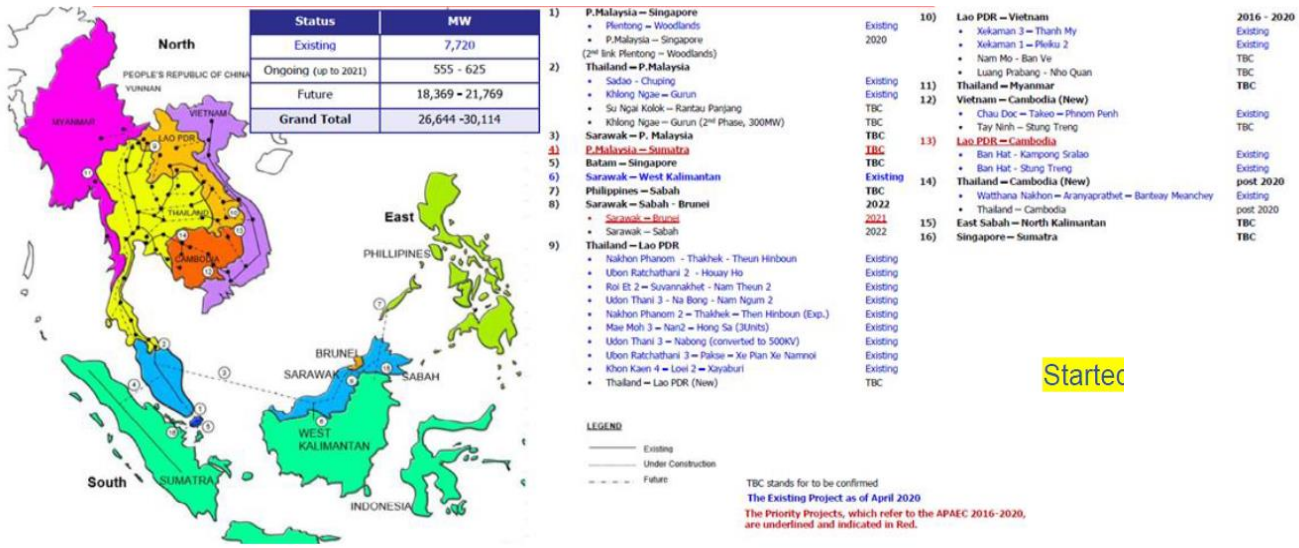
The national grid is connected to Thailand's grid to the north with a total capacity of 380 MW commissioned in 2002), comprising a 300 kV high-voltage DC line with 300 MW capacity from Gurun to Khlong Ngae and a 132 kV AC line with 80 MW capacity from Bukit Ketri to Sadao. There is also interconnection to Singapore's main grid to the south with a total capacity of 450 MW (commissioned in 1985) that has since been upgraded to two 550 MVA of high-voltage AC. The total interconnection capacity of Malaysia is only around 2% of the total installed capacity.

The ASEAN Interconnection Masterplan Study (AIMS) III covering the period until 2040 updates the previous version and emphasises that around 20 GW of interconnection capacity would be needed by 2025 in the Southeast Asia region. In September 2014, the governments of Laos, Malaysia, Thailand and Singapore released a joint statement to initiate a pilot project for facilitating cross-border electricity trade. Power would flow from Laos to Singapore via Thailand and Malaysia. The four countries agreed to form a working group to assess the viability of trading up to 100 MW through the existing interconnector capacity.

The commitment to the implementation of the joint statement plan was reaffirmed in November 2020. Phase 1 commenced on 1 January 2018. Malaysia purchased electricity from Lao PDR through Thailand as a wheeling country based on a predefined price and quantity. The second phase expanded Lao PDR's electricity export from 100 MW to a maximum of 300 MW. Commenced on 23 June 2022, Singapore signed power purchase agreement with Lao PDR, that will allow import up to 100 MW of renewable hydropower from Lao PDR to Singapore via Thailand and Malaysia using existing interconnection. As the only multilateral power trade agreement in the Southeast Asia region, the pilot project demonstrated that such trade in the region is possible.

Thailand and Malaysia are conducting a joint study to increase the capacity of interconnection between the two countries. One option they are considering is developing two new interconnections: a 300 kV line with a total power transfer capacity of 300 MW and a 132/115 kV line with a total capacity of 100 MW. In addition, a new 600 MW interconnection line with Indonesia has been proposed and was expected to be commissioned after 2021, although the project was postponed as Indonesia decided to focus on its domestic priorities. Sarawak Energy Berhad has plans to expand transmission towards the hydro resource rich regions of Baleh and Murum. This expansion would create an opportunity for electricity trade with Indonesia and Brunei Darussalam.

Exhibit 12: ASEAN Interconnection Projects (as at April 2020)



Source: ASEAN Centre for Energy, MIDFR

Singapore is RE-hungry. Singapore, being a key economic powerhouse in ASEAN, houses a large number of RE100 MNCs, which are hungry for clean energy sources in order to meet their 100% RE pledge. However, Singapore's small physical size (733.1sq.km), high population density and land scarcity limits its potential for large scale RE deployment. These physical constraints also limit the safe deployment of nuclear power. As such, Singapore is turning towards clean energy imports in an effort to decarbonise its grid, which currently relies predominantly on imported gas. The EMA has announced that it is looking to import a total 4GW of clean electricity by 2035. 2035 (i.e., 300-500MW by 2025, 2200-2500MW by 2030 & 3500-4000MW by 2035), which is expected to make up around 30% of Singapore's electricity supply then. Following this, the EMA has issued another RFP for 1.2GW of imports to begin in 2027, with a submission deadline on 29th December 2023. The RFP has attracted 20 proposals from 4 countries namely Malaysia, Indonesia, Laos and Thailand. Importantly, while the RFP requires non-intermittent supply, the EMA acknowledges the cost of generation and storage technology for variable RE and is willing to consider lower load factor (vs. requirement of 75%) in the initial years of supply. The EMA had earlier approved a 2-year 100MW trial import of electricity from Malaysia via the existing interconnectors, in which it appointed YTL Power Seraya as the importer, whereas export of electricity from Malaysia is undertaken by Tenaga utilizing its Johor-based CCGT plant. The initial 100MW trial import is mainly to test the existing interconnection capability and refine the technical framework.

Singapore's Energy Switch. To achieve its net zero emissions target by 2050, Singapore has outlined the "four switches" of natural gas, solar power, electricity imports and low carbon alternatives for its electricity supply mix. Electricity imports is expected to play a significant role, accounting for a minimum 25% and rising up to a maximum of 60% of its supply mix depending on the three different technology scenarios that it projects by 2050. Electricity import contribution is projected to be highest (at 60%) in a scenario where "countries band together for climate action in a supportive geopolitical environment but where technology advancement is slow". In contrast, in a scenario where "the world is fragmented geopolitically, but clean technology development accelerates", electricity import reliance is lower at 25% of Singapore's supply mix, albeit still making up the 2nd largest chunk of total supply after hydrogen.

Developing the mechanisms for RE export. The Energy Commission is working on a mechanism for an energy exchange which will enable cross border RE trade, where essentially, all the RE which is to be exported will be traded via this exchange. We reckon this could take the form of a wholesale market for RE with tariffs determined by market forces and operated by a single market aggregator. We learnt in a recent briefing session with the Minister of Economy, that grid charges and wheeling charges will also be considered as part of the cost for RE exports to take into account transmission cost and grid upgrade requirements to accommodate incremental RE capacity. It is currently uncertain, if the role of RE market aggregator will be kept with the Government, retained by Tenaga as an extension of its current role as the single buyer for domestic electricity supply, or alternatively, if the role is opened up to a new party. In any case, we believe the role will require a reasonable balance sheet size to bear working capital for wholesaling and capex burden for grid upgrades.

4.0 PLAYS INTO THE RE THEME

We upgrade the utilities sector to POSITIVE (from NEUTRAL previously) premised on a strong, multi-decade theme driven by the Government's strong support for the energy transition and predicated on the National Energy Transition Roadmap. We see a strong re-rating catalyst for the sector from constructive policy layout as well as improved growth and ESG profile.

RE export play. In the immediate term, we believe **YTL Power (BUY, TP: RM1.54)** is a prime beneficiary of potential RE exports to Singapore, having an advantage of existing generation and retail operations in the Singapore market – YTL Power could benefit from both RE export margins from Malaysia and at the other end, sale of green electricity to the Singapore market. Furthermore, YTL Power attains a sizeable balance sheet that can support expansion in its RE capacity for exports, which was beefed up by the RM3b proceeds from sale of its 33.5% stake in Electranet recently, coupled with rising cash flows from a strong recovery in Power Seraya earnings.

EPCC plays. We believe solar EPCC players stand to benefit in the near-to-mid-term given improved orderbook expansion prospects from more aggressive RE capacity build-up (particularly for solar) in the country in keeping with the aggressive RE targets under the upcoming NETR. In this report, we initiate coverage of **Samaiden Group Berhad** (**BUY, TP:**

RM1.54), Sunview Group Berhad (**BUY**, **TP: RM1.32)** and **Pekat Group Berhad (BUY, TP: RM0.57)**, premised on their established track record in the solar EPCC industry, strong orderbook and gradual expansion into asset ownership.

Asset ownership plays. We also like RE asset owners as potential plays into the theme. **Tenaga (BUY, TP: RM10.50)** has a large balance sheet to take advantage of potential growth in domestic RE capacity. The potential expansion in RE capacity could serve to accelerate its ambition to double its RE capacity to 8.3GW by 2025 and more importantly, to decarbonize the grid and improve its ESG profile. Additionally, Tenaga is a key beneficiary of wheeling charges in the envisioned regional power trade and grid investments to support higher VRE penetration given its monopoly of the national grid. We also like **Ranhill (BUY, TP: RM0.73)** as an asset ownership play. Ranhill is the largest IPP in Sabah via its 380MW CCGT capacity but has been making inroads into the RE space from its 50MW LSS4 solar plant win, which is on track for completion by year-end. The group is looking to further expand its RE presence having submitted a bid for the CGPP quota. In the mid-term, Ranhill is targeting to expand its total generation capacity and RE capacity to 1000MW and 300MW respectively from 430MW and 50MW currently. With an established track record in the power sector, we believe Ranhill could capitalize on the expected expansion of RE capacity in the country, including for RE exports.

Table 4: Sector Valuation Summary

			Shr Price	EPS (sen)		PE (x)		ROE	Div Yield	Market Cap
Companies	**FYE**	**Rating**	**(RM)**	**FY23F**	**FY24F**	**FY23F**	**FY24F**	**(%)**	**(%)**	**(RMm)**
Ranhill Utilities	Dec	BUY	0.570	3.6	3.5	15.8	16.3	5.9	5.3	728.5
Tenaga Nasional	Dec	BUY	9.600	83.2	85.6	11.5	11.2	7.0	4.5	54,888.2
YTL Power	Jun	BUY	1.380	13.6	15.2	10.1	9.1	8.0	5.5	9,560.6
Samaiden	Jun	BUY	1.220	2.9	5.9	42.3	20.6	19.3	0.0	480.7
Sunview	Dec	BUY	0.875	2.8	4.7	31.4	18.6	17.5	0.0	411.8
Pekat	Dec	BUY	0.440	1.9	2.3	23.2	19.1	9.5	0.0	283.8
Average						***22.4***	***15.8***			

Source: Companies, Bloomberg, MIDFR

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MIDF AMANAH INVESTMENT BANK : GUIDE TO RECOMMENDATIONS	
STOCK RECOMMENDATIONS	
BUY	Total return is expected to be >10% over the next 12 months.
TRADING BUY	Stock price is expected to *rise* by >10% within 3-months after a Trading Buy rating has been assigned due to positive newsflow.
NEUTRAL	Total return is expected to be between -10% and +10% over the next 12 months.
SELL	Total return is expected to be <-10% over the next 12 months.
TRADING SELL	Stock price is expected to *fall* by >10% within 3-months after a Trading Sell rating has been assigned due to negative newsflow.
SECTOR RECOMMENDATIONS	
POSITIVE	The sector is expected to outperform the overall market over the next 12 months.
NEUTRAL	The sector is to perform in line with the overall market over the next 12 months.
NEGATIVE	The sector is expected to underperform the overall market over the next 12 months.
ESG RECOMMENDATIONS* - source Bursa Malaysia and FTSE Russell	
☆☆☆☆	Top 25% by ESG Ratings amongst PLCs in FBM EMAS that have been assessed by FTSE Russell
☆☆☆	Top 26-50% by ESG Ratings amongst PLCs in FBM EMAS that have been assessed by FTSE Russell
☆☆	Top 51%- 75% by ESG Ratings amongst PLCs in FBM EMAS that have been assessed by FTSE Russell
☆	Bottom 25% by ESG Ratings amongst PLCs in FBM EMAS that have been assessed by FTSE Russell

* ESG Ratings of PLCs in FBM EMAS that have been assessed by FTSE Russell in accordance with FTSE Russell ESG Ratings Methodology