In collaboration with
Khazanah Nasional Berhad,
Khazanah Research Institute
and Accenture

WORLD ECONOMIC FORUM

Mobilizing Investments for Clean Energy in Malaysia

COMMUNITY REPORT

SEPTEMBER 2023

Images: Getty Images, Unsplash, World Economic Forum

Contents

Executive summary

Malaysia has the ambitious vision to achieve net-zero greenhouse gas (GHG) emissions as early as 2050, and to reduce GHG emissions intensity of its gross domestic product (GDP) by 45% by 2030 relative to 2005 levels. This vision calls for a rapid transformation of the country's energy landscape, as outlined by the recently revised target of reaching 70% of renewable energy (RE) capacity in the country's energy mix by 2050. The associated investment requirements are immense, amounting to an estimated MYR 637 billion, or USD ($) 140 billion by 2050.

During the first half of 2023, the World Economic Forum, supported by Accenture, collaborated with Khazanah Nasional Berhad and the Khazanah Research Institute to surface key challenges and solutions for Malaysia to attract clean energy finance at the scale and pace needed to realize its ambition. Together, they established a public-private working group of Malaysian and international stakeholders from industry, finance and academia to explore solutions to unlock capital for clean energy investments in the country. The working group selected four key focus areas for investment: solar and storage, coal retirement projects, transmission and distribution, and carbon capture, utilization and storage (CCUS).

This report summarizes the key findings of the working group, including recommendations for improving the regulatory and policy environment, as well as non-policy solutions to facilitate clean energy investment. The overarching aim is to support net-zero targets while accelerating deployment of RE and making progress on recently announced plans such as the National Energy Transition Roadmap (NETR).

TABLE 1 **Summary of policy messages and non-policy solutions identified by the working group**

Policy opportunities to advance clean energy investment in Malaysia	**Policy message #1: Policy planning and implementation** Enable proactive policy planning backed by effective implementation measures.
	Policy message #2: Regulatory environment Remove regulatory barriers and implement stable frameworks to facilitate the uptake of renewable energy.
	Policy message #3: Renewable energy tariff regime and incentive mechanisms Create a level playing field for renewable electricity to compete fairly with fossil fuel-based electricity.
	Policy message #4: Power purchase agreement (PPA) practices Improve the existing market conditions for direct trade between corporate buyers and renewable electricity suppliers.
Non-policy solutions to accelerate financing for Malaysia's clean energy sector	**Solution 1: Renewable energy zones (REZ)** Develop large, integrated and sustainable RE zones to facilitate the flow of finance into RE projects, to grow RE demand and to overcome barriers to investment typically linked to the construction and development of grid infrastructure for renewables.
	Solution 2: Residential solar subscriptions Aggregate small residential solar projects under a subscription lease model creating a critical mass of projects and providing homeowners with more flexible financing terms.
	Solution 3: Harnessing new pools of capital for clean energy Tap into international climate finance and dynamize capital deployment for existing sustainable funds currently managed by institutional investors.
	Solution 4: Carbon capture, utilization and storage (CCUS) hubs Create national hubs to capture, transport and store carbon dioxide from various emitting sources, such as heavy industries and power, as a way to channel investment for decarbonization.

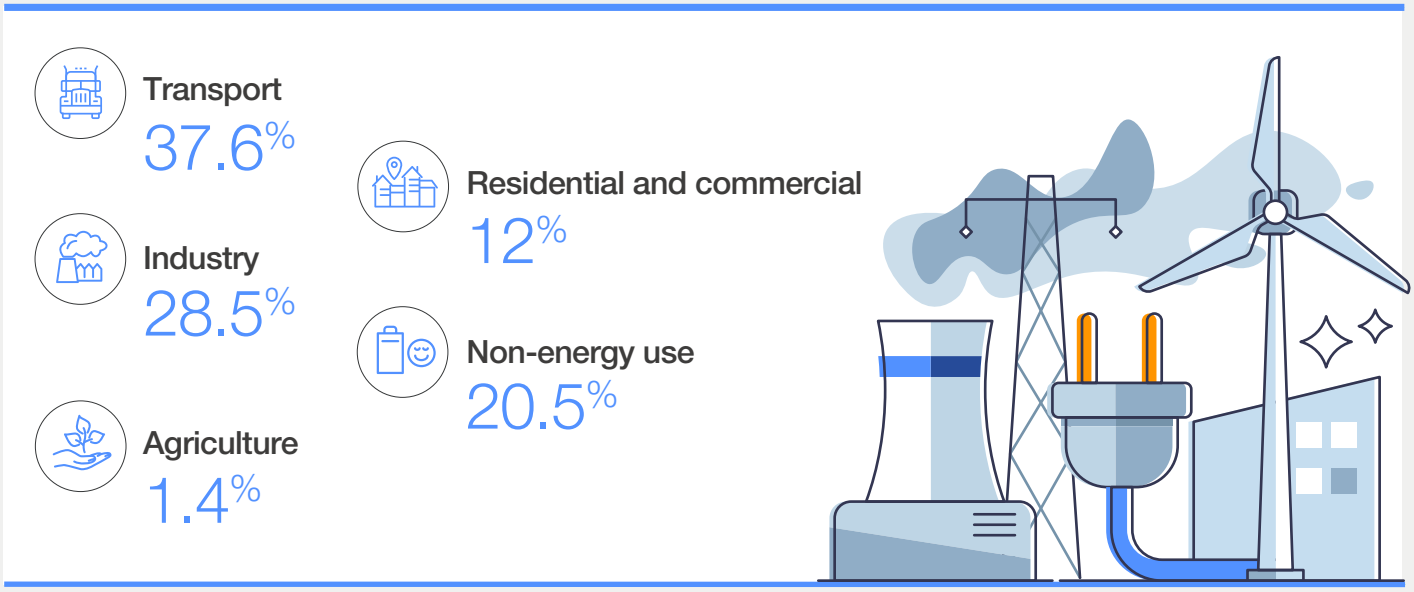
1 Overview of Malaysia's energy sector

Malaysia, strategically located in Southeast Asia, is a culturally diverse nation. The country has experienced rapid economic growth over the past decades, with its final energy consumption in 2019 reaching 2.8EJ (exajoule),[1] equivalent to 67% of the total primary energy supply. As the country has evolved from an agricultural and commodity-based economy towards a manufacturing powerhouse, transport is now the largest sector in terms of energy consumption, followed closely by industry, accounting for 37.6% and 28.5% of final energy consumption, respectively.[2]

Malaysia's electricity generation is primarily based on fossil fuels, which account for more than 80%. In 2020, coal and natural gas were the leading sources, making for 50.9% and 30.8% of total generation, respectively.[3]

FIGURE 1 **Malaysia's final energy consumption by sector (2019)**

Consumption by sector (%)



Source: Malaysia Energy Statistics Handbook, 2021.

FIGURE 2 | **Installed capacity and generation mix in Malaysia (2020)**

	Installed capacity (megawatt)	Generation mix (gigawatt-hour)
Natural gas	14,403 (39.9%)	52,850 (30.8%)
Coal	13,284 (36.8%)	87,282 (50.9%)
Hydro	6,190 (17.1%)	27,301 (15.9%)
Diesel	577 (1.6%)	738 (0.4%)
Solar	996 (2.8%)	
Biomass	441 (1.2%)	3,285 (1.9%)
Biogas	146 (0.4%)	
Others	84 (0.2%)	
Total	36,121	171,456

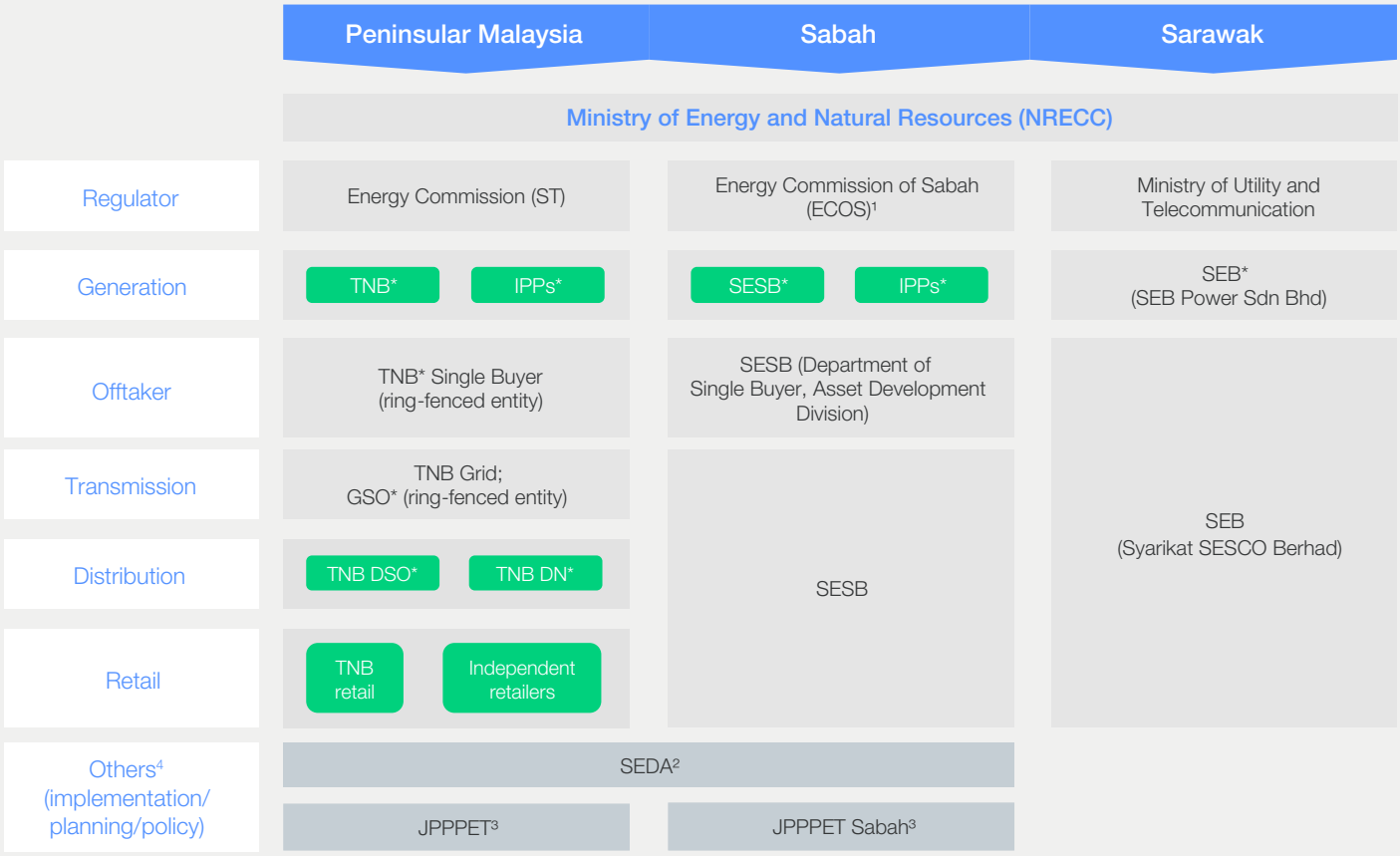
Source: Malaysia Energy Statistics Handbook, 2021.

1.1 Malaysia's electricity market structure

Malaysia's electricity market regulator is the Energy Commission (Suruhanjaya Tenaga), which oversees the generation, transmission and distribution of electricity for Peninsular Malaysia and Sabah, while the Ministry of Utility and Telecommunication does the same for Sarawak. (At the time of writing, Sabah's regulatory authority for electricity supply and RE is being transferred to the Energy Commission of Sabah (ECOS); the transfer is expected to be completed by January 2024.)

The market is a combination of regulated monopoly and competitive structures, Tenaga Nasional Berhad (TNB) being the largest vertically integrated power utility in Peninsular Malaysia, while Sabah Electricity Sdn Berhad (SESB) operates in Sabah and Sarawak Energy Berhad (SEB) in Sarawak.

FIGURE 3 **Malaysia electricity market structure**



***Abbreviations:** TNB: Tenaga Nasional Berhad; IPP: Independent Power Producer; SESB: Sabah Electricity Sdn Bhd; SEB: Sarawak Energy Berhad; GSO: Grid System Operator; DSO: Distribution System Operator; DN: Distribution Network; SEDA: Sustainable Energy Development Authority; JPPPET: Jawatankuasa Perancangan dan Pelaksanaan Pembekalan Elektrik dan Tarif (JPPPET, the Planning and Implementation of Electricity Supply and Tariff Committee).

Notes:

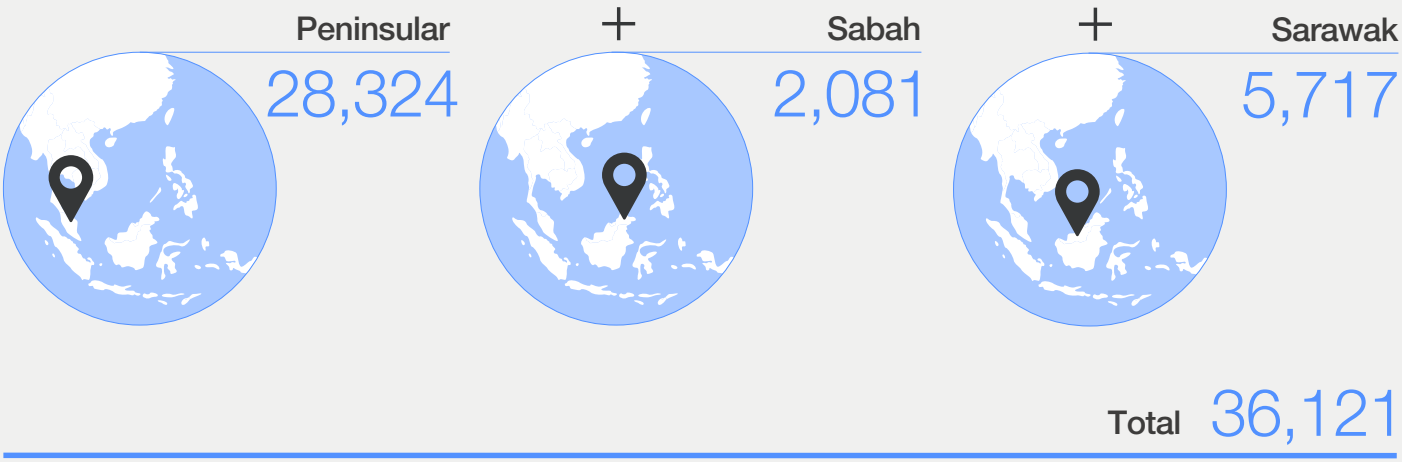
1 The transition of regulatory authority for electricity supply and renewable energy for Sabah from ST to ECOS is expected to be completed by January 2024.

2 SEDA is responsible for sustainable energy development in Peninsular Malaysia and Sabah including the implementation of the feed-in-tariff mechanism.

3 JPPPET and JPPPET Sabah are responsible for the planning, coordination and identification of electricity supply and demand in Peninsular Malaysia and Sabah, respectively.

4 The Ministry of Economy is involved through the 12th Malaysia Plan, National Energy Policy (NEP) and National Energy Transition Roadmap (NETR).

FIGURE 4 | **Total installed capacity (megawatt) in Malaysia (2020)**



Source: Malaysia Energy Statistics Handbook, 2021.

The generation sector is liberalized, with independent power producers (IPPs) and TNB licensed to play a significant role in electricity generation. In peninsular Malaysia, the power generated is procured via the Single Buyer, which is the entity authorized to procure electricity from IPPs and TNB Generation to meet demand at least cost. In Sarawak, this is managed by SEB, while SESB is responsible for Sabah. Transmission and distribution remain regulated, with TNB, SEB and SESB controlling the respective networks in their areas. The national grid in Peninsular Malaysia is connected to Thailand's grid to the north and to the Singapore grid to the south.

1.2 Renewable energy in Malaysia

The Malaysian Renewable Energy Roadmap (MyRER) is the key strategic framework for the development and promotion of RE in the country. It aims to increase the share of RE in the national energy mix while improving energy security and reducing GHG emissions.

MyRER's target is 31% of RE in the national installed capacity mix by 2025. This is aligned with Malaysia's global commitment to reduce its economy-wide emissions intensity (against GDP) to 45% in 2030 compared to 2005 levels. In addition, the government has since revised the RE target to 70% by 2050,[4] with the National Energy Transition Roadmap rolling out strategic initiatives in 2023.

FIGURE 5 **Renewable energy installed capacity (megawatt) in Malaysia (2020)**

	Hydro	Solar	Biomass	Biogas
Peninsular **Total 3,788**	2,642	894	158	94
Sabah **Total 465**	90	102	221	52
Sarawak **Total 3,520**	3,458	-	62	1
Malaysia **Total 7,773**	**6,190**	**996**	**441**	**146**

Source: Malaysia Energy Statistics Handbook, 2021.

1.3 Current electricity supply-demand dynamics

As of 2020, Malaysia's total installed capacity was around 36.0 gigawatt (GW),[5] with fossil fuels (coal and natural gas) making up 76.7% of the total. Hydropower maintains the largest share in RE supply at 17.1% of total installed capacity and 79.6% of total installed RE capacity. The rest of the installed renewables capacity is a combination of grid-connected, co-generation and self-generation projects, and installations under the feed-in-tariff (FiT) and large-scale solar programmes.

The Malaysian government has implemented several key schemes to help facilitate the growth of renewables:

1. **The FiT scheme** was one of the primary initiatives introduced to boost renewables by guaranteeing RE injection into the grid at an above-market price for a fixed period.

2. **The net energy metering (NEM)** mechanism allows self-consumption of renewables and export of excess electricity to the grid at a fixed rate for domestic consumers and at the system marginal price (SMP) for non-domestic consumers.

3. **The Self-Consumption (SELCO)** scheme allows an entity to generate electricity from its own solar photovoltaic (PV) system to offset or reduce its electricity bills. SELCO allows for consumption of all the electricity generated by an individual solar project but does not allow any excess to flow into the utility grid.[6]

4. **The Large Scale Solar (LSS)** programme is designed to support the uptake of utility-scale solar PV systems with capacities of 1-100 megawatts (MW). The programme uses a reverse auction system to award LSS rights based on the lowest bid for offtake prices.

5. **The Corporate Green Power Programme (CGPP)** enables off-site RE procurement via a virtual power purchase agreement (PPA) through a contract for difference (CfD) mechanism on the New Enhanced Dispatch Arrangement (NEDA) market to enable entities to use RE for their operations. The price settlement is against the half-hourly SMP.

In parallel with renewables development programmes, the government has also introduced financial incentive schemes including a Green Technology Financing Scheme currently in its fourth round with a total of MYR 3.0 billion committed up to 2025, a green investment tax allowance and a green income tax exemption.

Malaysia's accelerating industrialization and urbanization are boosting its electricity demand, with total energy consumption increasing by an annual average of 3%, reaching 158,603 gigawatt-hour (GWh) in 2019.[7] The current reserve margin in Peninsular Malaysia reached 32% in 2020 and 42% in 2021.[8] Peninsular Malaysia's masterplan aims to reduce this to 21% by 2039.[9] Conversely, Sabah's reserve margin stood below its 30% optimum level at 19% in 2021. Of course, 2020 and 2021 peak demands were affected by the Covid-19 lockdown. Parts of Malaysia also face accessibility issues. For instance, Sabah has a significant rural population (38.8%) with over 120,000 people without access to reliable and affordable electricity.

The Twelfth Malaysia Plan, 2021-2025, outlines Malaysia's national aspirations to achieve carbon neutrality as early as 2050, while the National Energy Policy, 2022-2040, lays the groundwork for transforming the energy landscape and achieving a fair and inclusive energy transition. Most recently, the government launched the National Energy Transition Roadmap (NETR) to accelerate Malaysia's energy transition and set the country off on a transformational journey to reshape its energy landscape.

1.4 Clean energy finance requirement

Accelerating the installation of RE capacity can significantly bolster Malaysia's energy security and reduce its reliance on fossil fuel imports. In addition to helping Malaysia meet its climate targets, it also promises job creation, innovation and socio-economic benefits.

It is estimated that transitioning to RE will save Malaysia between $9 billion and $13 billion annually by 2050 in avoided energy, climate and health costs.[10] Malaysia is endowed with 423 gigawatts of renewables production potential, but less than 10% of its solar and offshore wind potential and only 10-50% of its biomass and hydropower potential is currently realized.[11] Energy transition efforts can also foster greater international cooperation. Malaysia, as a key member of the Lao PDR-Thailand-Malaysia-Singapore Power Integration Project and with the impetus of the Association of Southeast Asian Nations (ASEAN) Power Grid (APG) initiative, is well-positioned to tap into its strong renewables supply potential and become a regional clean power hub.

To achieve the target of 70% renewables in its installed capacity mix by 2050, Malaysia will need an estimated MYR 637 billion, or $140 billion, in investment.[12] After careful analysis of the country's context and the different needs to close financing gaps, the working group identified key policy aspects and a series of non-policy solutions, which, if implemented, would create a conducive environment for clean energy finance to flow into the country at this scale.

2 Policy opportunities to advance clean energy investment in Malaysia

The working group identified four key areas for taking action to improve Malaysia's current regulatory and policy environment. Its recommendations are in line with the RE100 global policy message.[13]

2.1 Policy planning and implementation

Situation

The working group found discrepancies in planning and policy considerations in documents published by various national agencies, such as the National Energy Policy (NEP), Malaysia Renewable Energy Roadmap (MyRER) and 12th Malaysia Plan. These differences create complexity for investors and project developers in designing investment plans and project pipelines.

Malaysia also has room to ramp up its national RE targets, as the International Renewable Energy Agency (IRENA) highlighted in its Malaysia Energy Transition Outlook (METO).[14] In the wake of METO's release, Malaysia increased its long-term RE targets from 40% of the power mix by 2035 to 70% by 2050.

While the NETR highlights the investments required for transmission and distribution infrastructure, little visibility has been given as to the overall strategy for its development to accommodate more RE.

In some instances, a gap exists between policy enactment and implementation, which likely discourages RE uptake. This includes reforms of the Malaysia electricity supply industry, third-party access framework, and uncertainties around the future of the NEM mechanism.

Lastly, the role of decarbonization enablers in the national energy transition – such as battery storage and CCUS – is difficult to ascertain due to the lack of targets and regulatory frameworks surrounding these technologies.

Policy message #1

Enable proactive policy planning backed by effective implementation measures.

Malaysia should consider the following measures to enable effective policy planning and implementation:

- Clarify targets for future regulations and RE capacity addition as well as complement them with short-, medium- and long-term implementation plans. Define industry-wide decarbonization strategies including key implementation milestones, especially for high-emitting sectors.
- Formulate more aggressive RE targets at the national level in line with the overall national emissions reduction goals, as well as create rules surrounding new technologies (e.g. energy storage, floating solar and CCUS).
- Increase coordination in energy policy making and regulation so that multiple planning bodies issue coordinated plans; ensure coordination among key industries; establish proactive rule making, backed by effective and firm implementation measures and mechanisms (for instance, defining the roles of various agencies at both federal and state levels to enhance investment certainty).
- Develop policies around mini-grids as key enablers of rural electrification and catalysts for economic development in under-served regions.

2.2 Regulatory environment

Situation

Malaysia presents one of the most advanced regulatory frameworks in the ASEAN region. Following the announcement of the 70% RE capacity target by 2050, the National Energy Transition Roadmap has proposed strategic policy improvements as well as key initiatives to facilitate investments in clean energy. However, certain areas need further policy and regulatory improvement. For example, an energy storage policy or guidance is necessary to overcome intermittency concerns.

Additionally, while the government announced a no-new-coal policy in 2021,[15] and the NETR[16] plans for coal to represent 0% of the country's total installed capacity by 2050, very few policy signals are visible beyond the phase down efforts.

Policy message #2

Remove regulatory barriers and implement stable frameworks to facilitate the uptake of renewable electricity.

The following measures could help Malaysia remove existing regulatory barriers to RE and reinforce the stability of its regulatory framework:

- Large Scale Solar (LSS): Remove the one-bid-per-company restriction and increase the capacity of LSS projects, allowing large players to scale their solar portfolios; introduce a pre-qualification mechanism for bidders to demonstrate their financial and technical capabilities; facilitate interconnection to the grid; improve the regularity and periodicity of new LSS bidding rounds to boost investor confidence; open the programme to foreign participation.
- Self-Consumption (SELCO): Enable provisions to allow ground-mounted plants under SELCO.
- Net energy metering (NEM): Provide clarity on the future of NEM after the current NEM 3.0 regime expires in 2023.
- Green Technology Financing Scheme: Explore blended financing mechanisms to reduce the domestic fiscal burden; simplify the application and approval processes; introduce more consistency to the scheme to offer more certainty to developers.
- Coal repurposing/retirement: Establish clear national mandates for coal repurposing/retirement; in setting those mandates, consider the benefits of co-firing and capacity swap practices.

CASE STUDY 1

Indonesia's policy efforts to reduce coal dependence

In recent years, Indonesia has taken a proactive approach to coal retirement. Indonesia's Presidential Regulation 112 of 2022 committed to early retirement of coal power plants while also acting as a moratorium on new coal plants (with the exception of nationally strategic projects). This regulation followed Indonesia's new Electricity Business Plan (RUPTL) 2021-30, which includes a roadmap for the state-owned power company, PLN, to achieve net-zero emissions by 2060.

This new regulatory framework marked a turning point in the country's energy transition and sent a strong signal to international investors. Since then, international support towards coal retirement has come in the form of a Just Energy Transition Partnership (JETP), while Indonesia has made new national announcements under an Energy Transition Mechanism (ETM) scheme.

1. The JETP between Indonesia and its international partners calls for RE to comprise 34% of Indonesia's power generation by 2030. Over the next three to five years, the partnership intends to mobilize an initial $20 billion to help Indonesia phase out coal energy and invest in RE infrastructure, thus putting the country on a trajectory to reach net-zero emissions in the power sector by 2050, while reaching peak emissions by 2030, seven years ahead of the previous schedule. Fifty percent of the JETP scheme will be financed by international support, coming mostly from the Group of Seven (G7) countries combined under the International Partners Group (IPG), while the other half will be provided by financial institutions under the Glasgow Financial Alliance for Net Zero (GFANZ). Indonesia's JETP will consist of a mix of concessional loans, market-based loans, grants, guarantees and private investments from public and private entities. Concessional loans and grants, though unlikely to make up the majority of the finance mobilized, are important for a country such as Indonesia that faces increased costs of borrowing on the international market.
2. The Energy Transition Mechanism (ETM) is an innovative programme being developed by the Asian Development Bank (ADB) to accelerate the retirement and repurposing of existing coal power plants and to fund clean energy replacement capacity across Asia, with an initial focus on Southeast Asia. The ETM fund will comprise of two facilities:

– A Carbon Reduction Facility (CRF) to fund the early retirement or repurposing of coal-fired power plants (CFPPs) while keeping in mind the replacement capacity of clean energy projects.

– A Clean Energy Facility (CEF) to develop and fund new RE generation projects, energy storage infrastructure and requisite grid upgrades. CEF will provide finance, technical assistance and know-how to the host country to accelerate RE capacity addition, build storage and upgrade power grids.

In 2022, ADB signed a memorandum of understanding (MoU) with an IPP, Cirebon Electric Power (CEP), to explore early retirement of its 660 MW coal power plant in Western Java and its replacement with renewables. Once a definitive agreement is reached, ADB is expected to provide an early retirement facility in the form of senior debt (prioritized for repayment) on the condition that the tenure of the PPA between CEP and PLN be shortened.

Sources: European Commission, Indonesia and International Partners Secure Groundbreaking Climate Targets and Associated Financing, https://ec.europa.eu/commission/presscorner/detail/en/ip_22_6893; ADB, Energy Transition Mechanism, https://www.adb.org/what-we-do/energy-transition-mechanism-etm; ADB, Update on ETM, April 2023, https://www.adb.org/news/features/update-energy-transition-mechanism-april-2023#:~:text=In%202021%2C%20ADB%20launched%20the,in%20Asia%20and%20the%20Pacific.

2.3 Renewable energy tariff regime and incentive mechanisms

Situation

Malaysia has among the lowest electricity tariffs in the ASEAN region[17] on account of a highly subsidized fossil fuel-based power generation mix and legacy tariff schemes inherited from the 1990s that distort electricity market prices. As of 2022, the government continued to subsidize electricity bills using "Imbalance Cost Pass-Through (ICPT)" rates for all customers despite rising fuel prices and generation costs.[18] The ICPT was used to reflect changes in the cost of electricity generation – specifically fuel costs – every six months. Malaysia currently subsidizes fossil fuel-based power generation and provides tariff subsidies to different consumer categories. Nationally, fossil fuel and electricity subsidies for consumers amounted to ~$6 billion in 2022.[19]

In contrast, few subsidies are available for RE or for technologies enabling decarbonization of the energy system (e.g. battery storage and CCUS), which places them at a disadvantage vis-à-vis fossil fuels.

Policy message #3

Create a level playing field for renewable electricity to compete fairly with fossil fuel-based electricity.

The following measures could help Malaysia create a level playing field for RE:

- Introduce structural pricing reforms to enable cost-reflective electricity tariffs, including extending the time-of-use (ToU) mechanisms beyond high voltage (HV) industrial customers to low voltage (LV) customers. This would allow market players to arbitrage on the differential in tariffs and incentivize the uptake of energy storage systems.
- Create a level playing field for all energy sources by exploring the viability of subsidies for targeted, underdeveloped RE sources or technologies.
- Ensure that the open auctions already in place factor in the execution capabilities of developers to ensure timely project delivery.
- Establish and implement fiscal mechanisms such as tax credits and incentives to improve the economic viability of clean energy generation and/or enabling technology (like battery storage); supplement this with RE credits (RECs) or carbon credits where eligible; in the medium to long term, use tax credits to liberate the fiscal space by relieving the government of the burden of subsidising fossil fuels in the face of global price increases, while fostering the expansion of the clean energy industry and reaping associated benefits such as corporate tax revenue and industrial spillovers.
- Establish incentive mechanisms for technologies that can act as enablers of the national energy transition; implement the CCUS incentive mechanisms that have been presented in parliament.

CASE STUDY 2

Fossil fuel subsidy swap in India

India's subsidies for fossil fuels, such as coal, oil and gas, have dropped by 72% to $8.5 billion between 2014 and 2021. Coal subsidies have also fallen from $2.8 billion in Financial Year (FY) 2014 to $1.6 billion in FY 2021. Oil and gas subsidies fell from ~$28 billion in FY 2014 to $6.9 billion in FY 2021.

The lowering of fossil fuel subsidies was accompanied by a gradual increase in subsidies to renewables (from ~$600 million in 2014 to $1.5 billion in 2022). When possible, subsidies included programmes incentivizing access to clean energy, as exemplified by the Saubhagya Scheme introduced in 2017 to provide free electricity connections to poor families with a total budget of $2.3 billion. The scheme offered remote, rural households a solar battery pack (200 to 300 watt-peak (Wp) with a battery bank), five LED (light-emitting diode, more efficient than incandescent) lights, a direct-current (DC) fan and a DC power plug. This off-grid connection also included repair and maintenance for five years.

The government also launched the Pradhan Mantri Kisan Urja Suraksha evam Utthaan Mahabhiyan (PM-KUSUM) in 2019 to improve farmers' income through solar-powered irrigation at a total outlay of $4 billion. The scheme consists of three components:

- Component 1: 10,000 MW of solar capacity through installation of small solar power plants of capacity up to 2 MW each.
- Component 2: Installation of 2 million standalone solar-powered agricultural pumps.
- Component 3: Solarization of 1.5 million grid-connected agricultural pumps.

As of May 2023, the scheme has contributed to the installation of 106 MW solar capacity, sanctioning of ~5 GW capacity and installation of 0.2 million solar-powered pumps.

Sources: IISD, Fossil Fuel to Clean Energy Swaps, https://www.iisd.org/system/files/publications/fossil-fuel-clean-energy-subsidy-swap.pdf; Climate Scorecard, India's subsidies for fossil fuels have dropped by 72%, however they are still nine times higher than RE subsidies, https://www.climatescorecard.org/2023/05/indias-subsidies-for-fossil-fuels-have-dropped-by-72-however-they-are-still-nine-times-higher-than-renewable-energy-subsidies/; IISD, Mapping India's Energy Policy 2022, December 2022 update, https://www.iisd.org/story/mapping-india-energy-policy-2022-update; MNRE, https://mnre.gov.in/solar/schemes; PM-KUSUM, https://pmkusum.mnre.gov.in/landing.html.

2.4 Power purchase agreement (PPA) practices

Situation

Malaysia follows a single-buyer electricity model and while the government is reviewing third-party access, current regulations do not allow for power-wheeling and third-party access to the grid. This prevents consumers from directly procuring power produced from renewable sources, and applies to commercial and industrial (C&I) consumers increasingly setting ambitious clean energy procurement targets. This is considered a key impediment for RE investments in the country, especially in the solar segment.

While the Corporate Green Power Programme (CGPP) is considered a significant enabler of direct procurement of clean energy in the country, currently it only allows corporations to procure up to 100% of their sanctioned load, which does not accurately reflect actual consumption levels. CGPP is currently also restricted to 30 MW projects.

Policy message #4

Improve the existing market conditions for direct trade between corporate buyers and renewable electricity suppliers.

The following measures could be considered for Malaysia to improve its current PPA practices:

- Enhance structural market design reforms to enable competitive, market-driven PPAs beyond the current CGPP and NEDA mechanisms.
- Implement power-wheeling guidelines to allow IPPs to access TNB's grid infrastructure to supply power to businesses. This would increase investor appetite for renewables and substantially improve grid accessibility for clean energy producers.
- Explore amending the current CGPP to remove the cap on project size and the restriction for procurement of up to 100% of sanctioned load.
- Develop policy mechanisms clarifying who is responsible for the retirement of fossil-fuel assets currently under long-term PPAs. This would help overcome concerns about stranded assets and help channel more investment for coal transition projects or a combination of both coal transition and RE projects.

CASE STUDY 3

Corporate RE power purchase agreements in India

In 2019, India was the second largest growth market for corporate RE PPAs (it added 1.4 GW capacity in 2019). Its corporate PPA market has grown significantly over recent years, allowing it to host the biggest RE capacity for direct procurement in the Asia-Pacific, totaling 5.2 GW to date.

Large consumers (>1 MW load) can procure electricity from third parties through direct PPAs or can set up their own captive generation plants. Consumers can use the state's transmission and distribution infrastructure to procure this power for a short term (up to a month), medium term (three months to three years) or long term (12-25 years).

The policies and regulations that have enabled this include:

1. Open-access regulations: The procedures and charges for wheeling power from an offsite power plant (using the public grid) to the consumption site of the corporate buyer are managed at the state level, albeit under an overarching national framework.
2. Power banking: When a generator wheels electricity from an offsite RE plant, it can "bank" the electricity for consumption at a later time. Accounting methods enable the virtual banking of electricity. Banking provides RE developers a mechanism to use excess generation later and encourages higher uptake of RE PPAs among businesses.
3. Renewable purchase obligations (RPO): RPOs mandate all electricity distribution licensees to purchase or produce a minimum specified percentage of their energy requirements from renewables, as specified by the respective state governments. This pushes them to streamline processes for granting open access so third parties can fulfil their RPOs.

Sources: Mercom, India Leads Corporate Renewable Procurement market in Asia-Pacific, 2021, https://mercomindia.com/india-corporate-renewable-asia-pacific-report/; CEEW, Streamlining open access – An Alternative to Scaling Renewables in India?, 2020, https://www.ceew.in/cef/masterclass/analysis/streamlining-open-access-alternative-to-scaling-renewables-in-india; WBCSD, Corporate Renewable PPAs in India: Market and Policy Update, 2021, https://www.wbcsd.org/contentwbc/download/11241/165820/1.

3 Solutions to accelerate financing for Malaysia's clean energy sector

The working group calls on Malaysian stakeholders and government entities to use the recommendations in this paper to create an enabling environment for RE in Malaysia.

On top of the above-mentioned policy enablers, the working group identified four non-policy solutions to scale clean energy investments in Malaysia. These solutions are aligned with the recently released National Energy Transition Roadmap, and are designed to help fast-track clean energy investment in Malaysia.

In the coming months, local institutions identified as leads for each of the proposed solutions will put these into practice as per the implementation plans defined by the working group.

Solution 1 Renewable Energy Zones (REZ)

These are large, integrated, sustainably developed areas incorporating the entire energy supply chain, from generation and storage to demand management and consumption.

REZs have huge potential in the Malaysian context – they can facilitate finance for clean energy by concentrating RE projects and demand/offtake while overcoming the barriers to investment typically linked to the construction and development of grid infrastructure for RE. At present, an RE plant takes 12 months to three years to build, whereas the planning, permitting and construction of new high-voltage transmission infrastructure can take 10 years or longer.[20]

REZs can be easily replicated subject to topography, demand and supply in a dedicated zone, and can prove vital for Malaysia's energy transition goals.

Their key benefits can be summarized as follows:

- Policy-makers, regulators and grid planners can promote and ensure higher utilization of enhanced or new grid infrastructure connected to a dedicated REZ, ensuring commercial feasibility of grid investments.
- RE owners/developers have more certainty on the access and timeline of planned infrastructure to improve bankability of RE projects.
- Industry players looking to procure RE or adopt sustainable practices can opt to operate within REZs for easier access to clean energy.
- Policy-makers, planners and industry actors including the RE100 companies can use REZs to meet national and state RE targets and in other economic activities.

The first Malaysian REZ will be piloted by a group of Malaysian partners led by Khazanah Nasional Berhad. The pilot is envisaged as encompassing an industrial park, a zero-carbon city, a residential development and a sustainable data centre on the demand side. On the supply side, ground-mounted and rooftop solar will be installed, in combination with enhanced transmission and distribution infrastructure. The REZ planning process should achieve alignment between key stakeholders (federal and state governments, regulators, grid and distribution operators and developers, RE developers, industries, etc.) to accelerate energy transition across the supply chain.

CASE STUDY 4

Illawarra REZ attracts over AUD 43 billion in potential investments

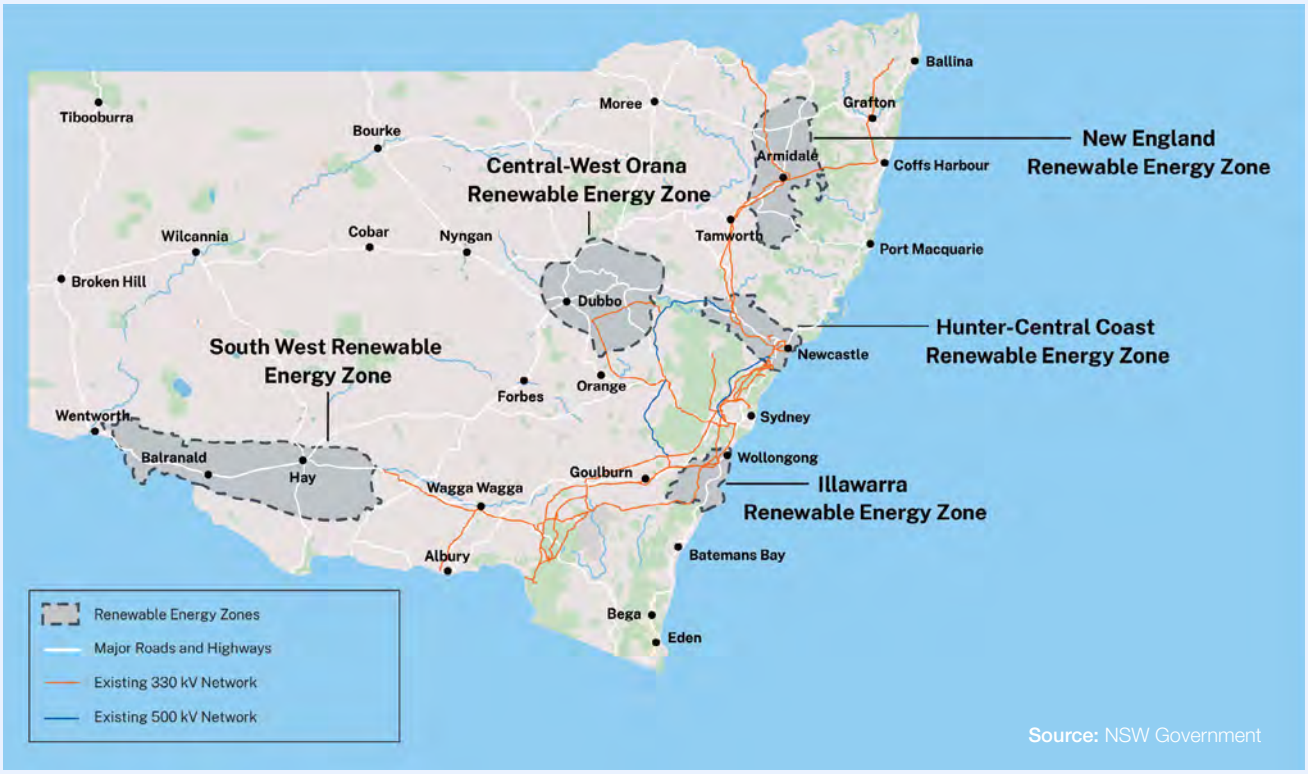
In Australia, the state of New South Wales has identified the first five REZs, as reflected in the map below.

The Illawarra REZ has significant RE potential (solar and wind), hosts major energy, port and transport infrastructure, and is supported by a skilled workforce. This, coupled with strong future demand for hydrogen and green steel production in the region makes it an ideal location for an REZ.

Illawarra is vulnerable to fluctuations in demand for coal exports, and coal-fired power plants are expected to close down over the next 10-15 years. With the state government prioritizing economic resilience and adaptability of local industries, the REZ could serve as a bulwark.

During a registration-of-interest process in 2022, investors registered potential investments of over AUD 43 billion in 44 projects (involving offshore wind, solar, storage and hydrogen) totaling 17 GW in generation and storage capacity.

Sources: Illawara Renewable Energy Zone, https://www.energyco.nsw.gov.au/ilw-rez; Illawarra to become a RE powerhouse, https://www.australianresources.com.au/illawarra-to-become-a-renewable-energy-powerhouse/.



Source: NSW Government

Solution 2

Residential solar subscriptions

Aggregating small/residential solar projects into a pool can create a critical mass, allowing homeowners to seek better and more flexible financing terms, such as under a subscription lease model. By enabling lower-income groups to come together and access clean energy, this model could yield significant social benefits.

The working group suggests that under this model, the solar developer could retain ownership of the installation, and generate additional revenue from RECs from the bundling of small projects, thereby improving the project's profitability. The developer could also redistribute revenues from RECs by slashing customers' energy bills, making the project more affordable for them.

Such business models have been adopted successfully in New Zealand (as exemplified by the SolarZero case study in Box 5) where they have helped increase penetration of residential solar, addressed creditworthiness and lowered the default risk of individual homeowners.

Gentari, alongside partner SOLS Energy on the one hand, and TNB, through GSPARX on the other hand, have proposed themselves as key implementers of this solution to increase solar PV penetration among residential customers in Malaysia.

CASE STUDY 5

Solar-as-a-Service

SolarZero, an RE service provider in New Zealand, has developed a solar leasing programme with a fixed fee and no upfront costs. Consumers get the benefits of solar power without having to purchase a solar installation. The following process is typically followed for new installations:

- SolarZero installs solar panels on roofs at no upfront cost.
- The customer uses the power generated for self-consumption. Any excess power is fed into the grid.
- If the customer needs additional power, it is supplied by grid partners at a capped price.
- SolarZero guarantees that service fees will not increase for a duration of 20 years.

SolarZero's service provides consumers with multiple benefits including zero upfront costs, guaranteed savings in electricity consumption and thus bills, grid price protection, and real-time monitoring of energy consumption and generation to enable consumers to maximize solar energy generation.

Source: SolarZero, https://www.solarcity.co.nz/solarzero.

Solution 3

Harnessing new pools of capital for clean energy

International finance

Malaysia has historically not needed to rely heavily on the international finance market due to readily available domestic borrowing. However, with rising fiscal constraints, especially post COVID-19, international finance can help the country fund its clean energy transition.

Global institutions such as the World Bank, Asian Development Bank and Green Climate Fund (GCF) have different financing mechanisms. For instance, GCF, set up by the United Nations Framework Convention on Climate Change (UNFCCC) to support developing countries' transition to low-emissions, climate-resilient economies, has a portfolio of $45 billion to deploy in country-specific programmes aimed at market creation. Working together with governments and Nationally Designated Authorities, GCF offers multiple financing instruments such as loans, guarantees, equity investments and grants that countries can choose depending on their contexts and requirements.

The working group has suggested that Malaysia identify suitable institutions to get accredited with GCF to help channel funds into the country through relevant RE projects and programmes.

Dynamic capital deployment

Members of the Organisation for Economic Co-operation and Development have used venture capital funding as a World Trade Organization-consistent industrial subsidy to support technological upgrading of industry.

The existing clean energy and sustainable funds currently managed by institutional investors could be outsourced to local private sector actors in Malaysia, who, in partnership with international partners, may be able to help deploy capital more dynamically.

This structure would help to:

- Surface investment opportunities that may not currently be on the radar of institutional investors.
- Unlock foreign capital, potentially through a joint-venture approach between local private sector actor(s) and a renowned international investor.
- Build local skills and investment capabilities in Malaysia.

The following steps are suggested to implement this solution:

- Assess the size of the potential capital allocation available between various stakeholders.
- Conduct market landscaping to identify potential local and foreign actors who may be suitable participants.
- Have institutional investors conduct a competitive tender/request for proposals process and due diligence, to shortlist prospective candidates.

Solution 4

Carbon capture, utilization and storage (CCUS) hubs

CCUS may be critical for Malaysia's future gas supply by enabling the management of carbon emissions. An initial 2.4 bn tonnes potential for carbon storage has been identified for Malaysia.

A CCUS hub takes carbon dioxide (CO_2) from several emitting sources, such as heavy industries or power, and transports and stores it using common infrastructure. CCUS hubs lower unit costs, reduce risks and improve partners' ability to standardize and scale up faster than they could individually.

A few critical factors must be addressed to scale CCUS in Malaysia:

- Provide clarity (to emitters and other countries) on carbon accounting for emissions reduction.
- Reach agreement on government-to-government regulatory compliance mechanisms.
- Establish clarity around environmental permitting regimes (site selection, approvals required, etc.) for CCS.
- Create a fit-for-purpose risk profile specific to CCUS projects.
- Create a supportive ecosystem to encourage investments in the sector.
- Ensure clarity on the legalities of international trans-shipment of liquefied CO_2.

PETRONAS has identified three suitable locations (two in Peninsular Malaysia and one in Sarawak) and is now in the process of assessing exact geological conditions for storage. On completion of these studies, PETRONAS will seek to establish the very first national CCUS hub in Malaysia.

CASE STUDY 6

HyNet North West industrial cluster

HyNet North West is a decarbonization project implemented by industrial players co-located in the northern part of Wales, United Kingdom.

Run by a consortium consisting of Cadent, CF Fertilisers, Eni UK, Essar Oil UK, Hanson UK, Inovyn, Progressive Energy and the University of Chester, the industrial cluster plans to use a combination of hydrogen and CCUS to decarbonize the facilities it houses. The various stakeholders working collectively have enabled the cluster to ramp up investments for CCUS. The UK government has also been playing an active enabling role by providing fast-track approvals and incentives.

The project involves the construction of two hydrogen production plants at the Stanlow Refinery. The plants will convert gas and fuel gas from the refinery into low-carbon hydrogen, with the CO_2 produced during the process captured and transported by new and pre-existing repurposed pipelines to an offshore storage area in the nearby Liverpool Bay.

A number of companies have shown interest in storing CO_2 with HyNet, including CF Fertilisers (which aims to capture 400,000 tonnes annually), Hanson UK (800,000 tonnes annually) and waste management firm Viridor (950,000 tonnes annually).

HyNet North West is expected to store 10 million tonnes (Mt) CO_2/year by 2030, delivering ~50% of the UK's 10 GW low-carbon hydrogen target for transport, industry and homes by that date. It is estimated to generate £31 billion in economic growth for the UK by 2050 and create 6,000 jobs every year.

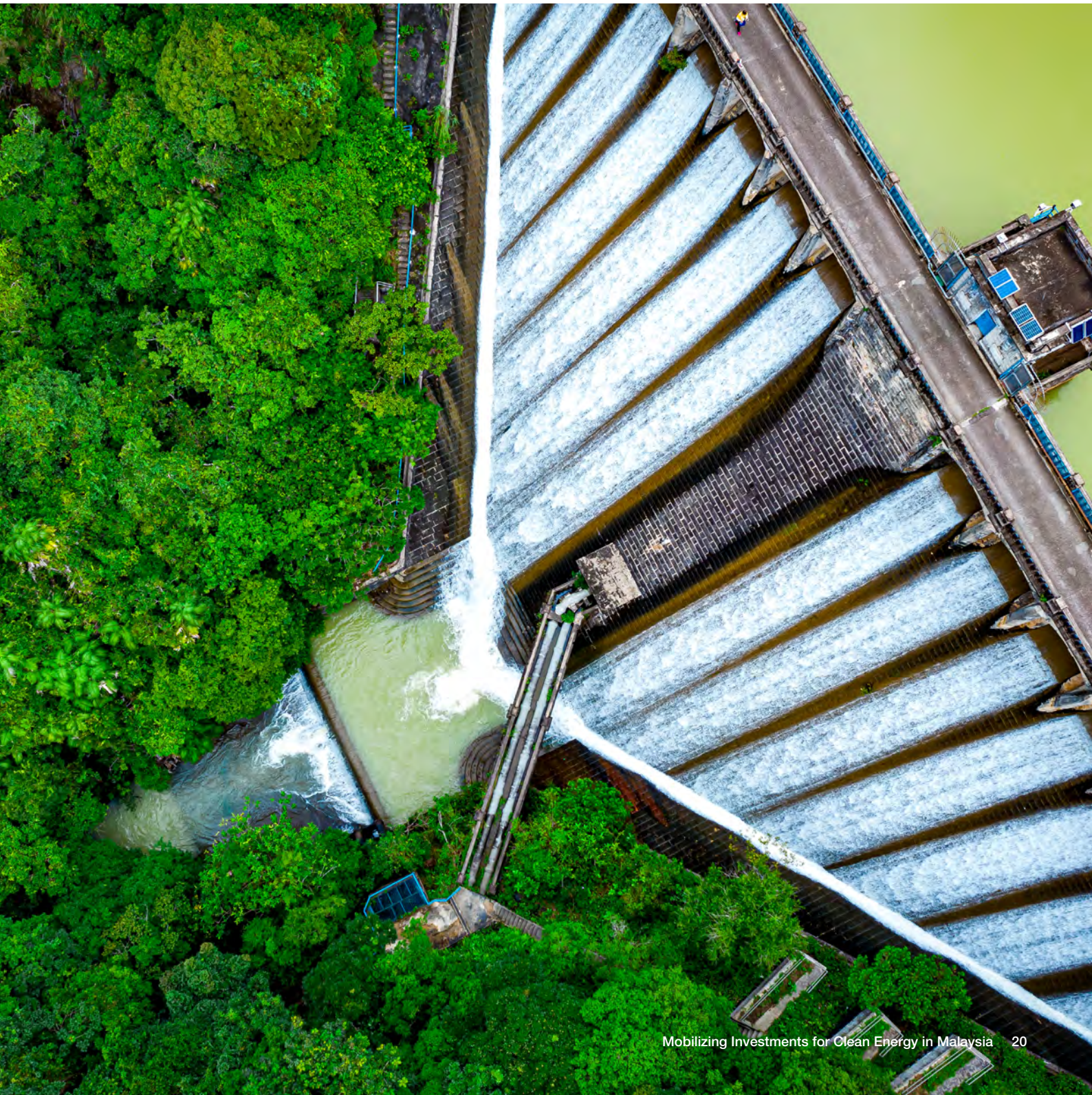
Sources: HyNet North West, https://hynet.co.uk/; OGCI, CCUS Hub, HyNet North West, https://ccushub.ogci.com/focus_hubs/hynet-north-west/.

Conclusion

The working group calls on Malaysian stakeholders and government entities to reflect on the recommendations made in this paper and take steps to create an enabling environment for clean energy investments in the country.

Over the coming months, local institutions identified as leads for each of the proposed solutions will take action as per the implementation plan, supported by the recently-established Malaysia Centre for the Fourth Industrial Revolution.

The working group hopes that insights from this exercise can support additional decarbonization and energy transition efforts in Malaysia. Accelerating the country's energy transition will strengthen Malaysia's role as a regional clean power hub in the ASEAN Power Grid (APG) initiative, tapping into both the RE supply and demand potential in the ASEAN region.



Key abbreviations

APG – ASEAN Power Grid

ASEAN – Association of Southeast Asian Nations

CGPP – Corporate Green Power Programme

CCUS – Carbon capture, utilization and storage

ECOS – Energy Commission of Sabah

ETM – Energy Transition Mechanism

FiT – Feed-in-tariff

GCF – Green Climate Fund

GDP – Gross domestic product

IPP – Independent power producer

JETP – Just Energy Transition Partnership

LSS – Large Scale Solar

METO – Malaysia Energy Transition Outlook

MyRER – Malaysia Renewable Energy Roadmap

NEM – Net energy metering

PPA – Power Purchase Agreement

REC – Renewable Energy Certificate

REZ – Renewable Energy Zone

SEB – Sarawak Energy Berhad

SESB – Sabah Electricity Sdn Berhad

SMP – System marginal price

SELCO – Self-Consumption

TNB – Tenaga Nasional Berhad

UNFCCC – United Nations Framework Convention on Climate Change

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