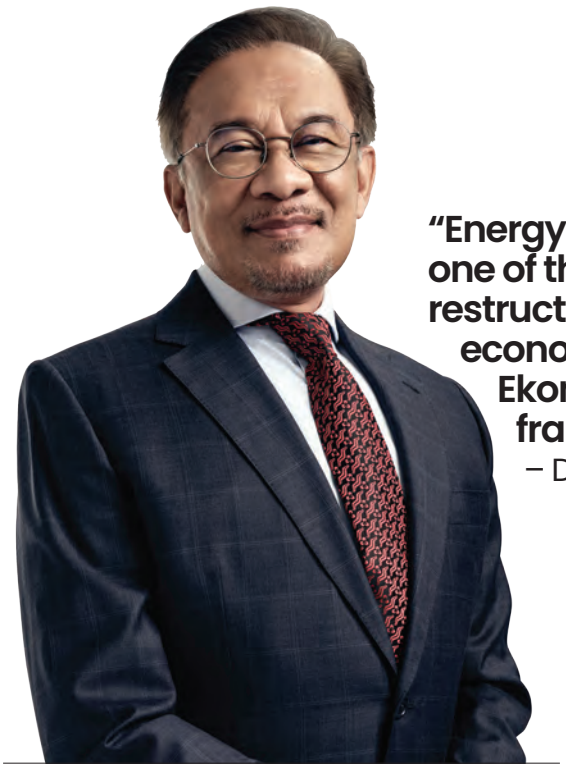
MINISTRY OF NATURAL RESOURCES,
ENVIRONMENT AND CLIMATE CHANGE
MALAYSIA

Advancing Just Energy Transition

Malaysia's Sustainable Energy Development Prospectus

Contents

Malaysia Envisages to Advance A Just Energy Transition for A Sustainable Future



"Energy transition is one of the initiatives to restructure the Malaysian economy under the Ekonomi MADANI framework."

– Dato' Sri Anwar Ibrahim
Prime Minister

"Our commitment to climate mitigation is resolute, with a clear focus on transforming our energy system into one with a lower carbon footprint. The cornerstone of our strategy lies in decarbonising our power generation and supply system through accelerating renewable energy deployment to 70 per cent in 2050."

– Nik Nazmi Nik Ahmad
Minister of Natural Resources, Environment and Climate Change

INTRODUCTION

Global Energy Landscape

GLOBAL ENERGY TRENDS SUGGEST A shift in the coming decades. Primary energy demand growth is expected to slow to approximately one per cent CAGR from 2018 to 2040 due to declining population growth in certain regions, slower economic growth, reduced energy intensity, and efficiency improvements.

Renewables and natural gas are expected to play a more significant role in primary energy supply, with renewables offering an affordable solution for global decarbonisation goals and natural gas serving as a transitional fuel in the energy transition.

Electricity is anticipated to experience the fastest growth in final energy consumption, driven by industrial electrification, transportation electrification, increased household appliance usage, and rural electrification.

Globally, renewable energy (RE) is gaining prominence in the power generation mix, with its share in generation capacity reaching 36.6 per cent in 2020. Renewables have outpaced conventional generation fuels for new installed capacity additions since 2012, accounting for 82 per cent of capacity additions in 2020.

In recent years, the pattern of investments has shifted the world towards a more electrified, renewables-rich energy system. The recovery from the Covid-19 pandemic and the response to the global energy crisis have significantly boosted global clean energy investment.

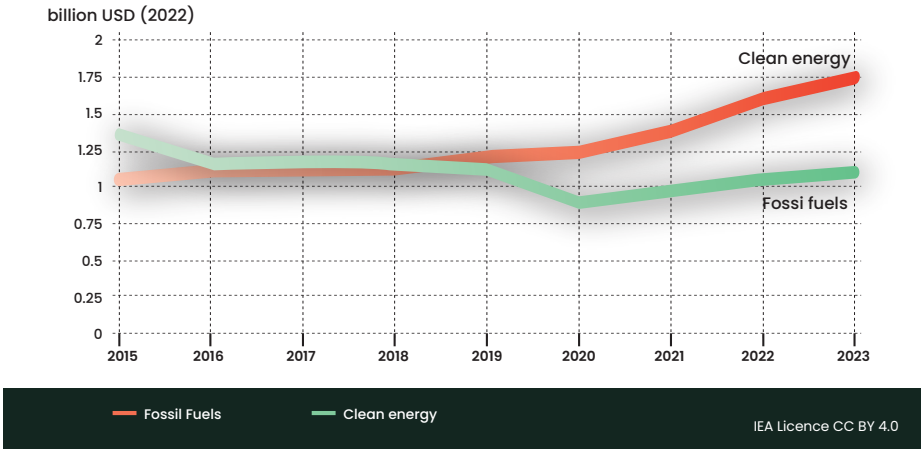
According to IRENA's World Energy Transitions Outlook 2023, the power sector has seen good progress in installed renewable capacity and generation. Renewables represented 83 per cent of capacity additions and installed power generation capacity reached 40 per cent globally in 2022, with the addition of 295 gigawatts (GW) of renewables, the largest-ever annual increase in renewable energy capacity.

The robust economic justification for renewable energy, paired with favorable policies, has led to a continuous rise in its share of the global energy mix. However, the deployment is heavily concentrated in a select few countries and regions, with China, the European Union, and the United States contributing to 75 per cent of the total capacity additions.

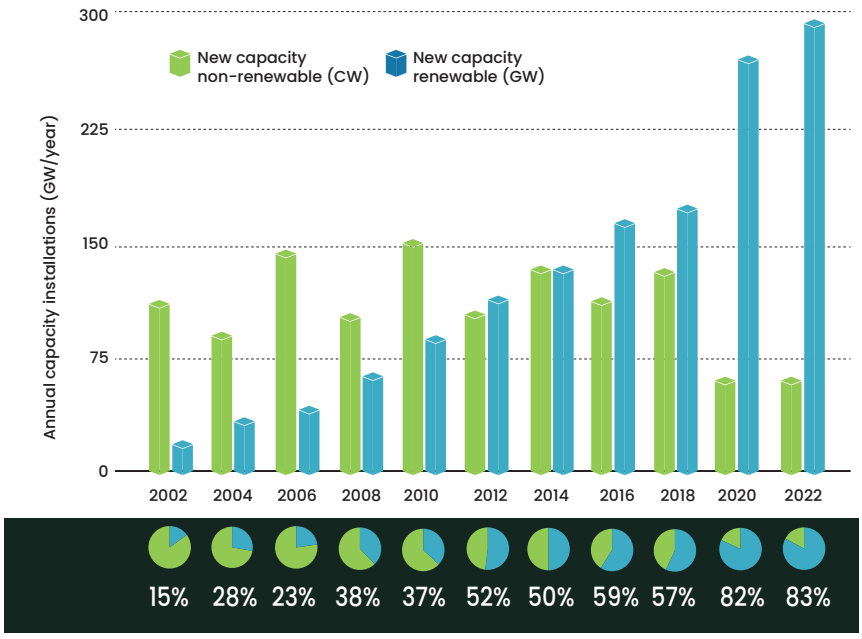
Although large-scale renewable energy deployment is typically associated with countries that have well-developed power systems, deployment must be expanded elsewhere, especially in developing nations lacking electricity access.

The new World Energy Outlook (WEO) 2023 from the International Energy Agency (IEA) reveals significant changes in the global energy landscape by the end of this decade. The rapid growth of clean energy technologies like solar, wind, electric cars, and heat pumps is transforming how the world powers everything from home appliances to factories and vehicles.

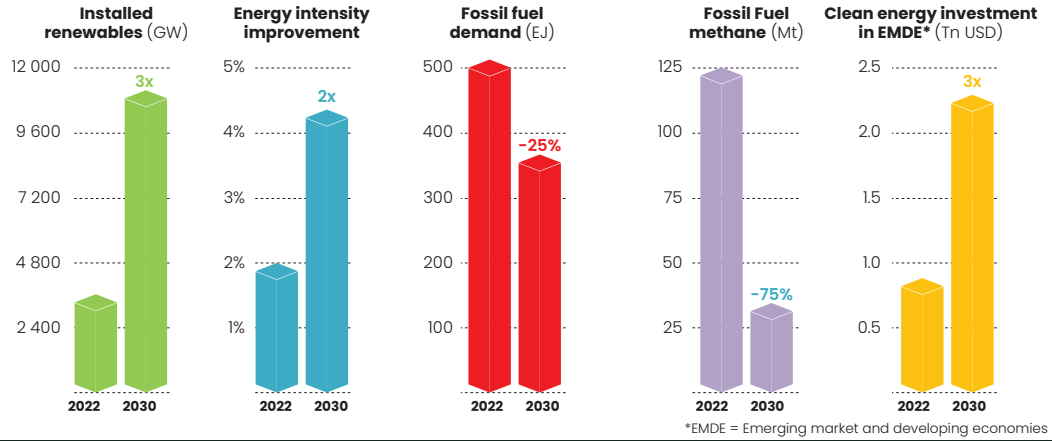
Annual investment in fossil fuels and clean energy, 2015-2023



Source: IEA



Five pillars to keep 1.5°C alive



*EMDE = Emerging market and developing economies

A comprehensive energy package for COP28 needs to drive the growth in clean energy, support emerging and developing economies in the transition, and recognise the need to fossil fuel demand

Source: IEA

The report envisions a world in 2030 with 10 times as many electric cars on the road, solar power generating more electricity than the current entire US power system, renewables accounting for nearly 50 per cent of global electricity, electric heating systems outselling fossil fuel boilers, and three times as much investment going into new offshore wind projects than into new coal- and gas-fired power plants. All these increases are based only on the current policy settings of governments worldwide.

The increasing momentum behind clean energy technologies and global economic shifts have significant implications for fossil fuels, with the first-ever visible peaks in global demand for coal, oil, and natural gas this decade based on current policies. This presents a crucial opportunity to reduce the share of fossil fuels in the global energy supply, decreasing from 80 per cent to 73 per cent by 2030, while global energy-related carbon dioxide (CO_2) emissions are expected to peak by 2025.

However, the current demand for fossil fuels remains too high to meet the Paris Agreement's goal of limiting global temperature increases to 1.5°C, posing risks of worsening climate impacts and energy system vulnerabilities.

To address this, the WEO-2023 proposes a global strategy focusing on five key pillars: tripling global renewable capacity, doubling energy efficiency improvements, reducing methane emissions, increasing clean energy investments, and ensuring a structured decline in fossil fuel use, including halting new coal-fired power plants.

The WEO-2023 is framed by conflict and uncertainty, mainly due to the situation in Ukraine and the Middle East. This instability underscores the vulnerabilities of relying on fossil fuels and the benefits of transitioning to a more sustainable energy system for energy security and emissions reduction.

The report highlights that clean energy projects face challenges in some markets, including cost increases, supply chain bottlenecks, and higher borrowing costs. However, clean energy remains the most dynamic part of global energy investment. The pace of its growth in the coming years will significantly influence the trajectory of global energy systems across different scenarios.

The global energy crisis has highlighted the importance of an affordable, reliable, and resilient energy supply, particularly in developing economies with growing energy demands. Energy transitions emphasise electrification and technologies like wind, solar PV, and batteries, emphasising electricity security and diversified clean energy supply.

Emerging markets and developing economies play a significant role, accounting for a substantial portion of global electricity demand growth across different scenarios. ●

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Just Energy Transition: A Global Call to Climate Action

ENERGY PLAYS A CENTRAL ROLE IN THE climate challenge, both a significant part of the problem and a critical part of the solution.

The issue is clear: a substantial portion of the greenhouse gases responsible for warming our planet result from our conventional energy production methods, primarily centred around the combustion of fossil fuels to create electricity and heat.

According to the Production Gap Report 2019, fossil fuels are, by far, the most significant contributor to global climate change, accounting for over 75 per cent of global greenhouse gas emissions and nearly 90 per cent of all carbon dioxide emissions.

Therefore, to avert the most severe consequences of climate change, the world must reduce emissions by almost half by 2030 and ultimately achieve net zero emissions by 2050.

To realise this imperative, it must transition away from fossil fuel and strategically invest in alternative energy sources that offer environmental responsibility alongside accessibility, cost-efficiency, sustainability, and reliability - a cleaner and sustainable energy or the renewable energy (RE).

Being naturally replenished by environmental processes, renewable energy sources emit minimal to no greenhouse gases or pollutants into the atmosphere.

Amidst escalating climate change impacts, the need for a Just Energy Transition has never been more critical. This global initiative underscores the urgent shift to sustainable energy practices, emphasising a shared responsibility to combat climate change. Embracing cleaner and renewable energy sources aligns with goals to reduce emissions and build a sustainable, low-carbon future. The Just Energy Transition calls on nations to collaborate in forging a greener, more resilient planet ●

Why Should the World Transition Towards Clean and Sustainable Energy?

1 Accessibility and Availability of Resources

a. Approximately 80 per cent of the global population, or roughly 6 billion people, reside in countries that rely on fossil fuel imports, exposing them to geopolitical vulnerabilities and crises.
b. In contrast, sustainable energy sources are accessible in all nations, with substantial untapped potential.
c. Sustainable energy provides a solution to reduce import dependence, enabling countries to diversify their economies and shield them from the unpredictable price fluctuations of fossil fuels.

2 Cost Effectiveness

a. Renewables-based electricity is now the cheapest power option in most regions, with declining technology costs.
b. Cost-effective renewables-based electricity could provide 65 per cent of the world's total electricity by 2030 and decarbonise 90 per cent of the power sector by 2050, significantly reducing carbon emissions to combat climate change.
c. Although solar and wind power costs may temporarily rise in 2022 and 2023 due to elevated commodity and freight prices, they remain competitive, especially in comparison to gas and coal, according to the International Energy Agency (IEA).

3 A Healthier Option

a. About 99 per cent of the world's population breathes air exceeding quality limits, resulting in over 13 million avoidable deaths annually due to environmental causes, including air pollution.
b. Fossil fuel-related air pollution in 2018 incurred significant health and economic costs, totalling US$2.9 trillion, or roughly US$8 billion daily. Switching to clean energy sources like wind and solar can address climate change and air pollution, improving public health.

4 Job & Employment Opportunities

a. Renewable investments create three times more jobs than fossil fuels, with an estimated net gain of 9 million jobs in the clean energy sector by 2030.
b. The transition to net-zero emissions could generate over 30 million jobs in clean energy, efficiency, and low-emissions technologies by 2030, emphasising the importance of a just transition to ensure equitable benefits for all.

5 Economic Viability

a. In 2022, approximately US$7 trillion was spent on subsidising the fossil fuel industry, while to achieve net-zero emissions by 2050, an annual investment of about US$4 trillion in sustainable energy is needed until 2030.
b. While transitioning to sustainable energy may seem costly for resource-limited countries, the benefits are significant. Reduced pollution and climate impacts alone could save the world up to US$4.2 trillion annually by 2030.
c. Efficient and reliable renewable technologies can enhance energy system resilience, reduce vulnerability to market shocks, and improve overall energy security through diversified power supply options.

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Malaysia's Energy Landscape

MALAYSIA'S ENERGY LANDSCAPE has long been dominated by fossil fuels, primarily oil and natural gas, which have accounted for over 95 per cent of the total energy mix. The country's reserves are dispersed across Peninsular Malaysia, Sabah, and Sarawak, with a significant reliance on imported coal for power generation.

Despite historical fuel subsidisation policies, recent reforms aim to strike a fiscal balance. Future plans include replacing aging coal and gas units with additional gas-fired plants, coupled with efforts to expand solar PV capacity. The nation is at a crossroads, contemplating whether to continue on its current trajectory or accelerate its energy transition, considering the volatility in coal and gas prices.

As of 2021, the country boasts a total installed electricity generation capacity of 33 GW, with coal and natural gas each contributing around one-third. Plans for the next decade involve replacing aging coal and gas units with additional gas-fired plants and a concerted effort to boost solar PV capacity.

In the envisioned low-cost, low-carbon future, Malaysia envisions a shift from fossil fuel dominance to deep electrification across all sectors. This includes scaling up renewable resources like bioenergy, geothermal, and hydrogen. The power sector would witness significant transformation, with scenarios exploring 100 per cent renewable energy or a mix with carbon capture and storage (CCS).“

Despite its traditional reliance on fossil fuels, Malaysia recognises the untapped potential of renewable energy. Policies since the 2010s have laid the groundwork for increased capacities, especially in solar PV. The nation aims to surpass the 40 per cent renewable energy target by 2035, extending beyond electricity generation to encompass the transport and industry sectors.

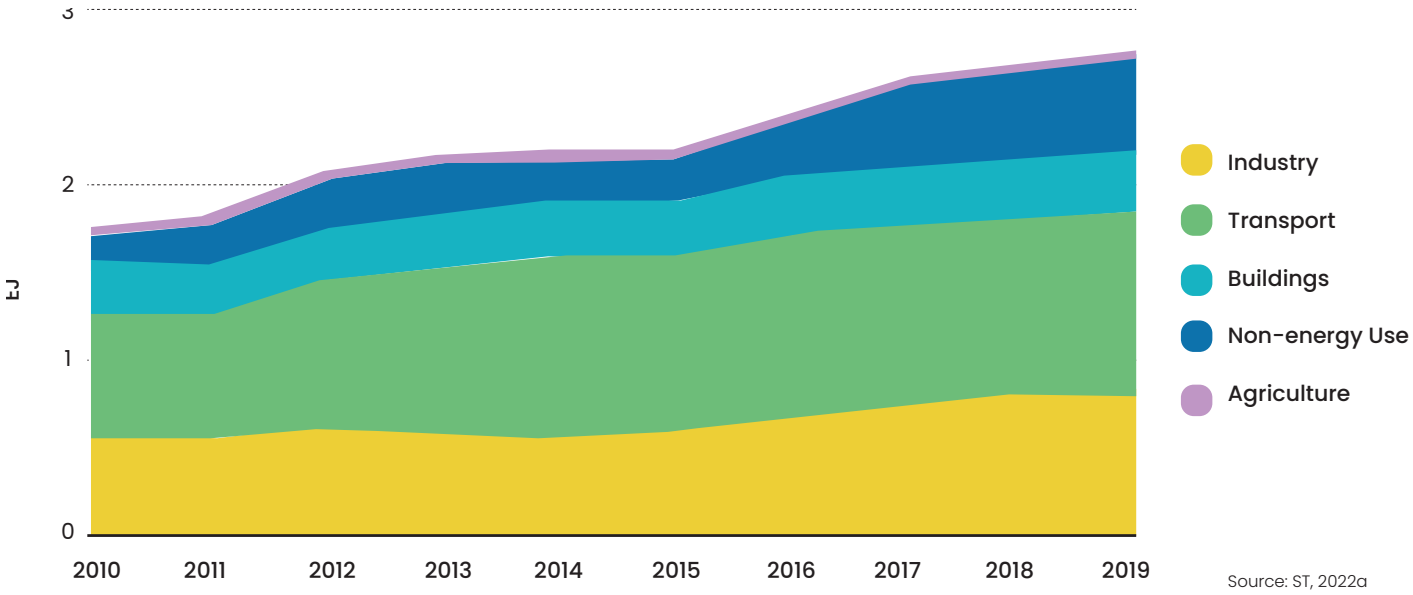
Aligning with global climate goals, Malaysia's commitment to reducing emission intensity by 45 per cent by 2030 and achieving net-zero emissions earliest by 2050 is outlined in its Nationally Determined Contribution (NDC) under the Paris Agreement.

Looking ahead to 2050, Malaysia anticipates a 60 per cent increase in primary energy supply to 6.7 EJ, driven by a growing population and nearly tripled economy. Energy demand is projected to grow by 1.4 per cent per year until mid-century.

In the envisioned low-cost, low-carbon future, Malaysia envisions a shift from fossil fuel dominance to deep electrification across all sectors. This includes scaling up renewable resources like bioenergy, geothermal, and hydrogen. The power sector would witness significant transformation, with scenarios exploring 100 per cent renewable energy or a mix with carbon capture and storage (CCS).

Current and Future Energy Trends

Between 2010 and 2019, Malaysia's total primary energy supply increased 3 per cent annually on average, driven by strong economic and industrial growth as well as rapid urbanisation.
As of 2019, Malaysia's primary energy supply was dominated by natural gas (42 per cent), followed by crude oil and petroleum products (33.3 per cent), coal (21.4 per cent), and renewables (3.4 per cent). The share of renewables, primarily hydropower, is expected to grow, reaching around 3.4 per cent by 2050.



Source: ST, 2022a

Total final consumption in Malaysia, by sector, 2010 to 2019

Long-term economic and population projections indicate that Malaysia's energy demand will continue to grow. In the past two decades, energy demand has grown by around 3 per cent per year, and growth is estimated to average around 1.4 per cent per year until mid-century. Malaysia is traditionally a fossil fuel producer with large reserves of oil and natural gas. Although it remains a net exporter of gas and oil, its coal imports have been increasing to meet the growing energy demand.

To meet rising energy demand, Malaysia faces a pivotal decision: continue relying on diminishing oil and gas resources, potentially becoming a net importer, or embrace renewable energy alternatives. Transitioning to renewable energy, as suggested by the report's 1.5°C Scenario, could save the country between USD 9 billion and USD 13 billion annually in energy, climate, and health costs.

Malaysia's total final energy consumption of 2.8 exajoules (EJ) in 2019 constitutes a significant portion of 65 per cent, of the total primary energy supply. Transport sector emerged as the largest consumer, devouring 38 per cent of the total final energy.

While heating demand and per capita electricity consumption in households were relatively low, buildings contributed around 12 per cent to the overall energy demand. Notably, a staggering 70 per cent of households owned air conditioners, emphasizing a substantial cooling demand.

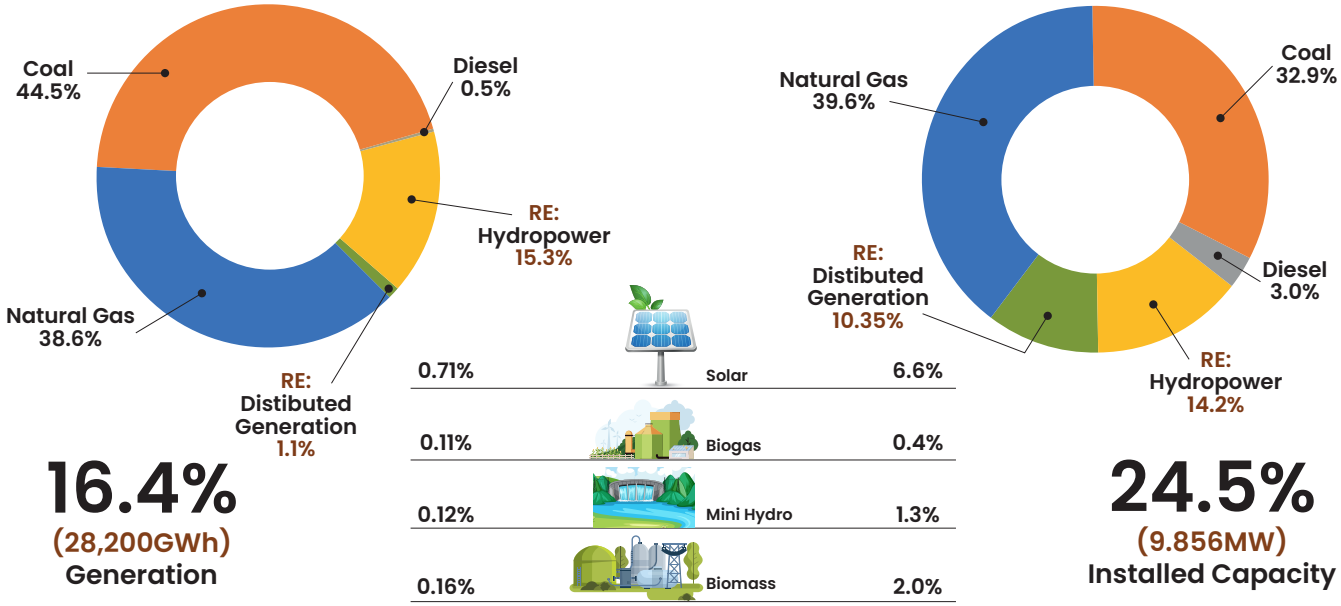
Examining energy sources, oil products took center stage in 2019, constituting 66 per cent of Malaysia's total final energy consumption. Transport emerged as the primary consumer, absorbing three-quarters of the oil, with the rest channelled into various industrial applications. Natural gas followed closely, claiming a 29 per cent share, whereas coal played a minor role at 3 per cent, primarily utilized in the power sector. Industries predominantly relied on natural gas and oil for process heat generation.

Despite Malaysia's potential for renewables, direct usage accounted for a mere 1 per cent, primarily represented by biodiesel with a 1.5 per cent share in the transport sector. Electricity, encompassing 20 per cent of total final consumption, played a pivotal role. Over 80 per cent of residential and commercial buildings relied on electricity, covering half of the nation's total electricity demand, while the remaining half fueled the industrial sector.

Malaysia's final energy consumption per capita in 2020 has expectedly reduced to 1.755 toe per capita, a reduction of 14.0 per cent from the previous year. The final energy intensity too has dropped from 46.68 toe/RM Million to 42.5 toe/RM Million. This however indicate a positive improvement in the energy efficiency. Looking ahead, Malaysia's energy consumption is anticipated to nearly double by 2050, projecting a 2.0 per cent annual growth rate, driven by urbanization and economic expansion.

Power generation and installed capacity

Total installed capacity in Malaysia for 2020 was 35,037 MW and it increased to 40,211MW in 2022. Natural gas and coal are the dominant fuel, making up



Installed capacity and generation mix

of three-quarters of the total installed capacity in Malaysia. RE capacity totalled up to 24.5 per cent in 2022, which is an increase from 23.2 per cent in 2020. This is a positive indication that we are on track to achieve our national target of 31 per cent RE in the capacity mix by 2025.

The total electricity generation (excluding self-generation plants) in 2020 was recorded at 167,742 GWh, a reduction of 2.3 per cent from 2019 level which was at 171,672 GWh. Coal is the dominant fuel used to generate electricity with its share of 53.0 per cent. This was followed by natural gas at 28.8 per cent, hydropower at 16.3 per cent, renewables at 1.6 per cent and oil at 0.4 per cent. The total electricity consumption stood at 152,250 GWh in 2020, which showed a reduction of 4.0 per cent from the 2019.

Malaysia's electricity capacity is divided between independent power producers (IPPs) and Tenaga Nasional Berhad (TNB). The nation operates three major grids in Peninsular Malaysia, Sabah, and Sarawak, each facing unique challenges and opportunities in the transition to cleaner energy. ●

Sustainable Energy Development

MALAYSIA HAS VAST UNTAPPED potential RE sources that can provide local and affordable alternatives to fossil fuels.

The nation's journey into RE began in 1999 when it was recognised as the "fifth fuel," a crucial component in diversifying its energy mix. In Peninsular Malaysia, RE encompasses solid waste, small hydropower, biomass, biogas, geothermal, and solar energy sources.

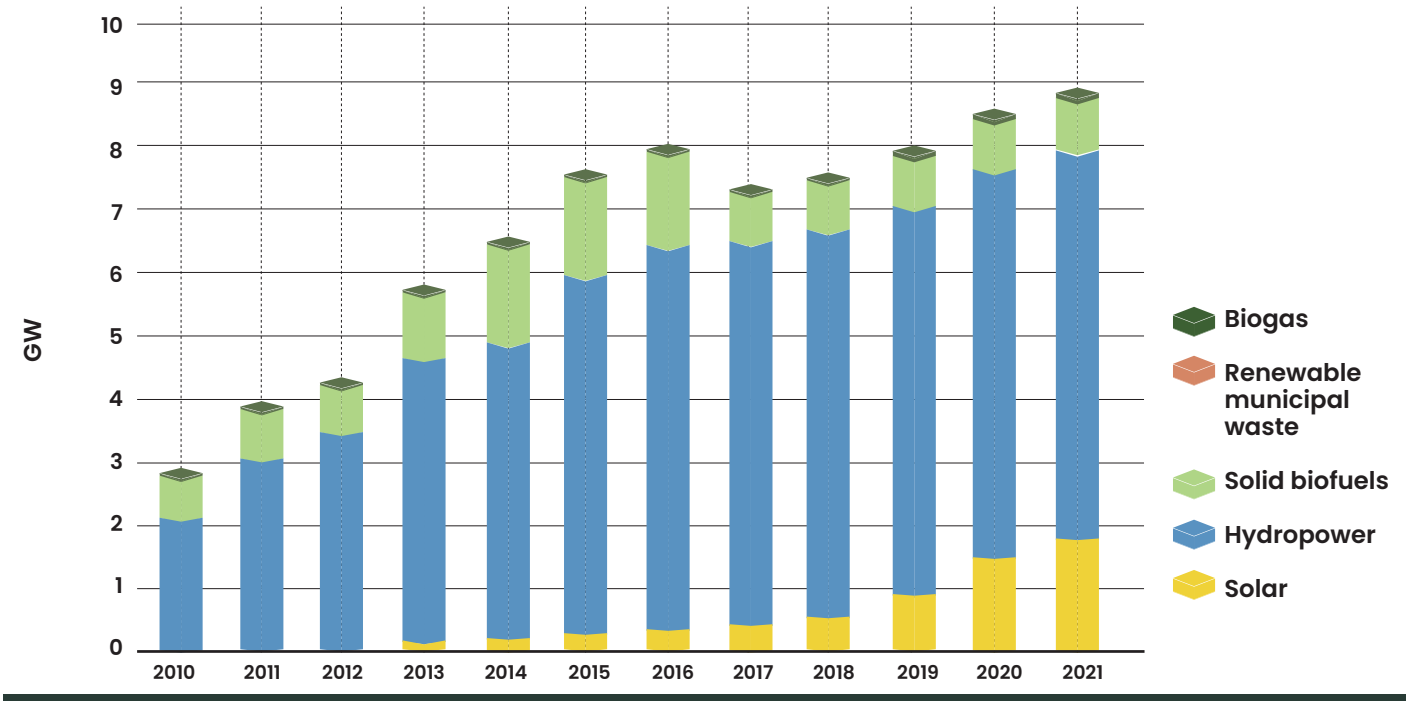
Renewable Energy Resource Potential

A review of Malaysian RE resource potential has been conducted, leading to the identification of the following resource potential:

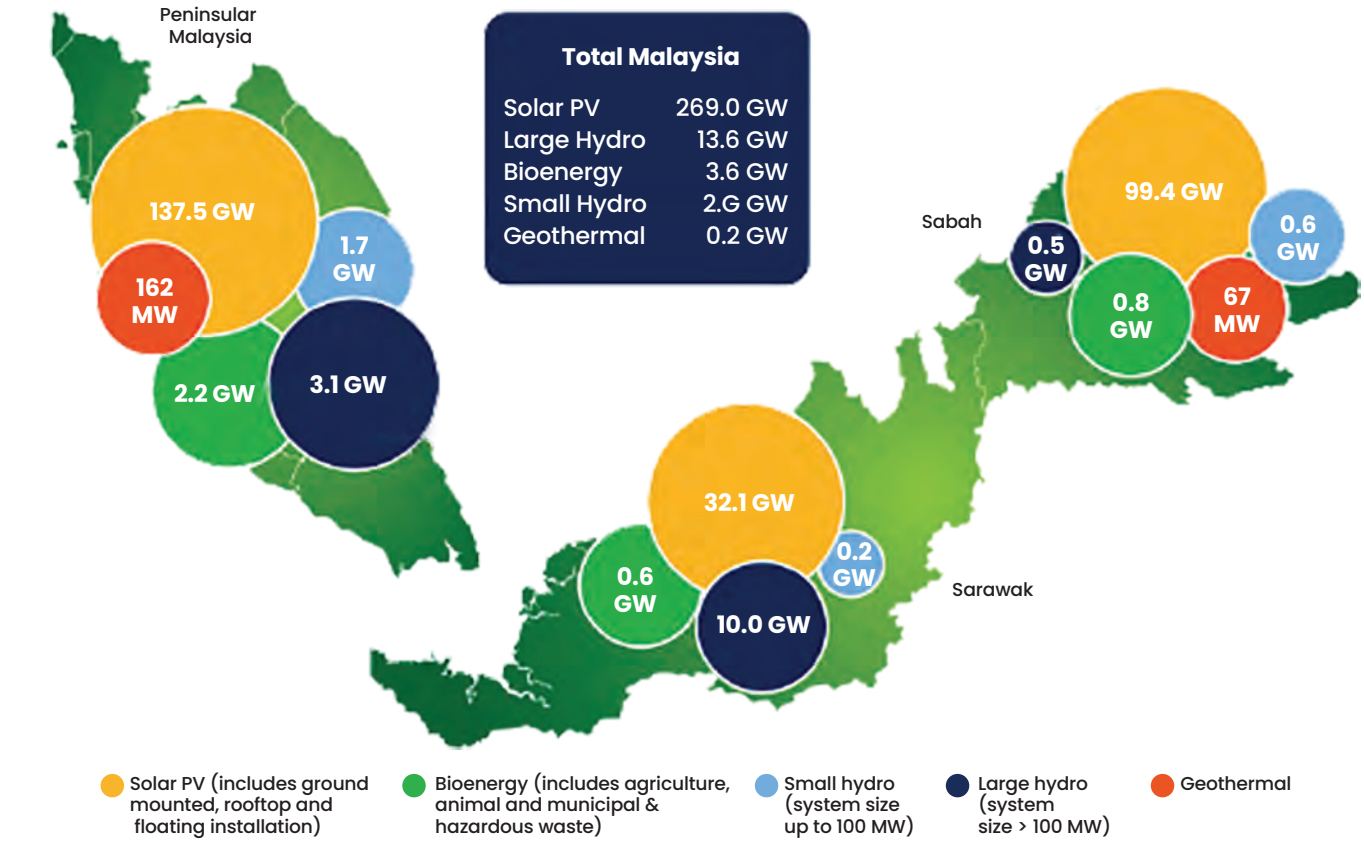
- 269 GW potential for solar PV, dominated by ground-mounted configurations (210 GW), including considerable potential from rooftop (42 GW) and floating configurations (17 GW)
- Close to 13.6 GW (13,619 MW) resource potential for large hydro (above 100MW); whereby 3.1 GW is identified in Peninsular Malaysia, 493 MW in Sabah, and 10 GW in Sarawak
- 3.6 GW resource potential for bioenergy, including biomass (2.3 GW), biogas (736 MW), municipal solid waste (516 MW)
- 2.5 GW resource potential for small hydro (up to 100 MW)
- 229 MW of geothermal resource potential

The RE technical potential assessment considered among others:

- Malaysia's advantageous geographical location offers abundance of indigenous natural resources, readily available to be utilized for RE power generation. Malaysia's proximity to the equator provides strong solar irradiance in the range of 1,575 – 1,812 kWh/m2 throughout the year, comparable to countries with more mature and developed solar PV markets;



Malaysia's total installed renewable energy capacity, 2010 to 2021



RE resource potential in Malaysia

- The potential in approximately 450 palm oil mills across Malaysia, processing an average of 95.5 million tons of fresh fruit bunch (FFB) annually, in which the waste from palm oil processing can be utilized as feedstock for bioenergy power generation, either through biomass combustion or biogas capture technologies;
- Available agricultural and husbandry residues from rice production, wood processing and animal waste which can be used for power generation;
- Growth in population and urbanization in Malaysia contributes to the increase in production of municipal solid waste, an estimated average of 9.5 million tons of solid waste were generated every year. This can potentially be used for bioenergy power generation, leveraging waste-to-energy (WTE) technologies; and
- 189 river basins which can support small hydro power generation.

Growth of Renewable Energy

Over the years, various strategies, initiatives, and programmes have been introduced, fostering the growth of RE technologies from 2001 to 2025.

Under the Eighth Malaysia Plan (2001-2005), the Small Renewable Energy Power (SREP) Programme was

introduced, along with the Biomass Power Generation and Cogen Full Scale Model Demonstration (BIOGEN) Project, leveraging the readily available oil palm-based by-products for small-scale electricity generation.

Ninth Malaysia Plan (2006-2010) recorded further progress, with the development of rooftop solar becoming prominent through the Malaysia Building Integrated Photovoltaic (MBIPV) Project. The MBIPV project focused on the policy development for gridconnected PV system, market and incentive measures and capacity building programme for rooftop solar.

The programmes and projects implemented under the 8th and 9th plan led to the subsequent development of the National RE Policy and Action Plan (NREPAP) in 2010; aiming to establish a policy guide for RE development in Malaysia. NREPAP further paved the path for RE development in the Tenth Malaysia Plan (2011 – 2015), as one of the key new areas of growth for the energy sector.

During this period, the Renewable Energy Act 2011 (Act 725) and the Sustainable Energy Development Authority Act 2011 (Act 726) were enacted, leading to the establishment of Sustainable Energy Development Authority (SEDA) Malaysia as the designated authority for RE development in Malaysia. The Feed-in Tariff (FiT) scheme was also introduced and implemented in 2011 to catalyse the growth of grid-connected RE in Peninsular Malaysia, Sabah and Labuan.

The initiative to promote RE growth progressed further under the Eleventh Malaysia Plan (2016-2020). Solar auctioning and rooftop solar quota were released for the very first time through the Large Scale Solar (LSS), Net Energy Metering (NEM) and SelfConsumption (SELCO) Programme.

By the end of the 11th Plan, the growth of RE capacity in Malaysia has been substantial, from a base of 53 MW of RE connected to the grid (without large hydro) between 2001-2009 to a total installed capacity of 1.6GW between 2011-2015. By December 2020, cumulative RE capacity had reached 2.8 GW, or 8.45 GW with the inclusion of all RE resources.

The Twelfth Malaysia Plan (2021-2025) focuses on advancing green growth as well as enhancing energy sustainability and transforming the water sector. The next five years will see a nationwide shift to more sustainable economic practices and lifestyles that value natural endowments and environmental health.

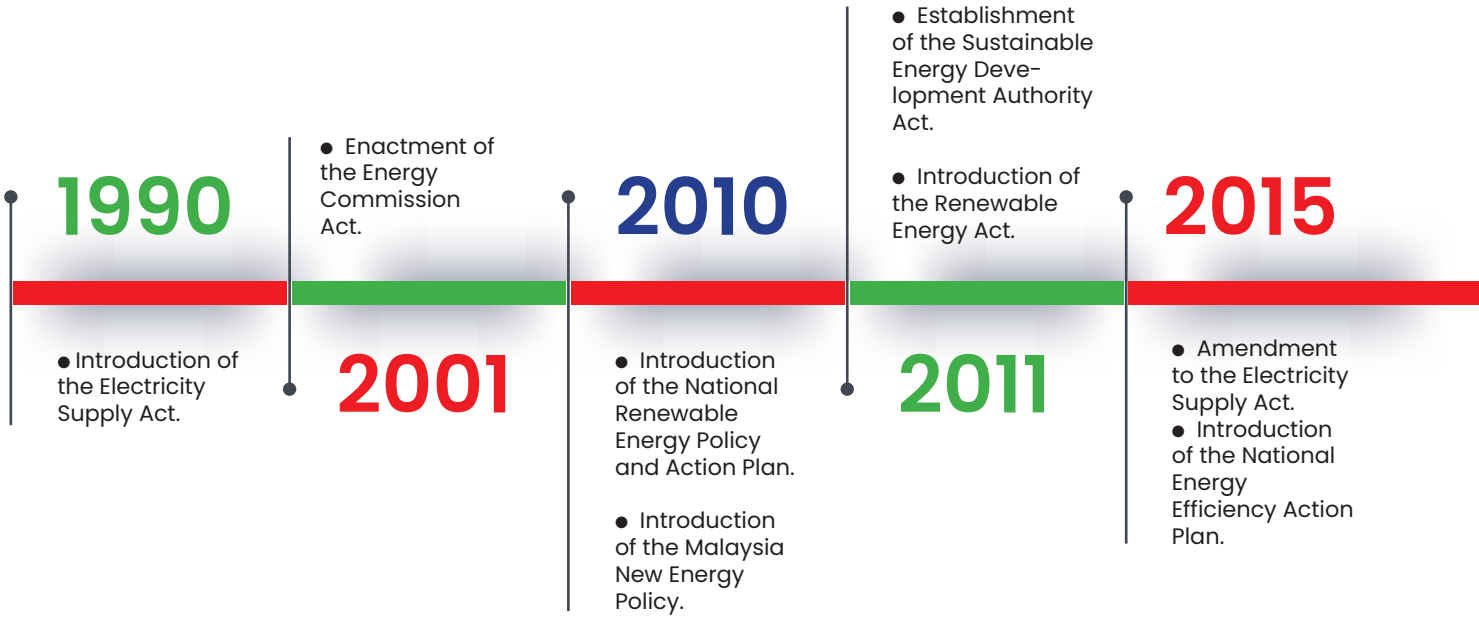
In the 12th Plan, green growth will be augmented to achieve sustainability and resilience. In this regard, the need to share responsibility in moving towards a low-carbon nation will be emphasised, while more equal benefit sharing from the utilisation of natural resources will be promoted. Energy will be managed holistically and sustainably, taking into account its supply and demand along the value chain. The energy sector will address the energy trilemma, ensuring energy security, reliability, sustainability and affordability for all.

The effective execution of policies and strategies will contribute to sustainable and resilient growth as well as the achievement of the 2030 Agenda.

Establishing robust RE policies and agencies in the 2010s has led to substantial growth in solar photovoltaic (PV) installed capacity and other renewables. However, Malaysia must further accelerate solar PV adoption to surpass the 40 per cent target for RE capacity by 2035. Additionally, it's essential to extend RE goals to sectors like transportation and industry, which continue to rely heavily on fossil fuels.

Despite the growth, renewable energy still represents only 3.4 per cent of

"The initiative to promote RE growth progressed further under the Eleventh Malaysia Plan (2016-2020). Solar auctioning and rooftop solar quota were released for the very first time through the Large Scale Solar (LSS), Net Energy Metering (NEM) and SelfConsumption (SELCO) Programme."



the total primary energy supply as of 2019, primarily driven by traditional hydropower resources.

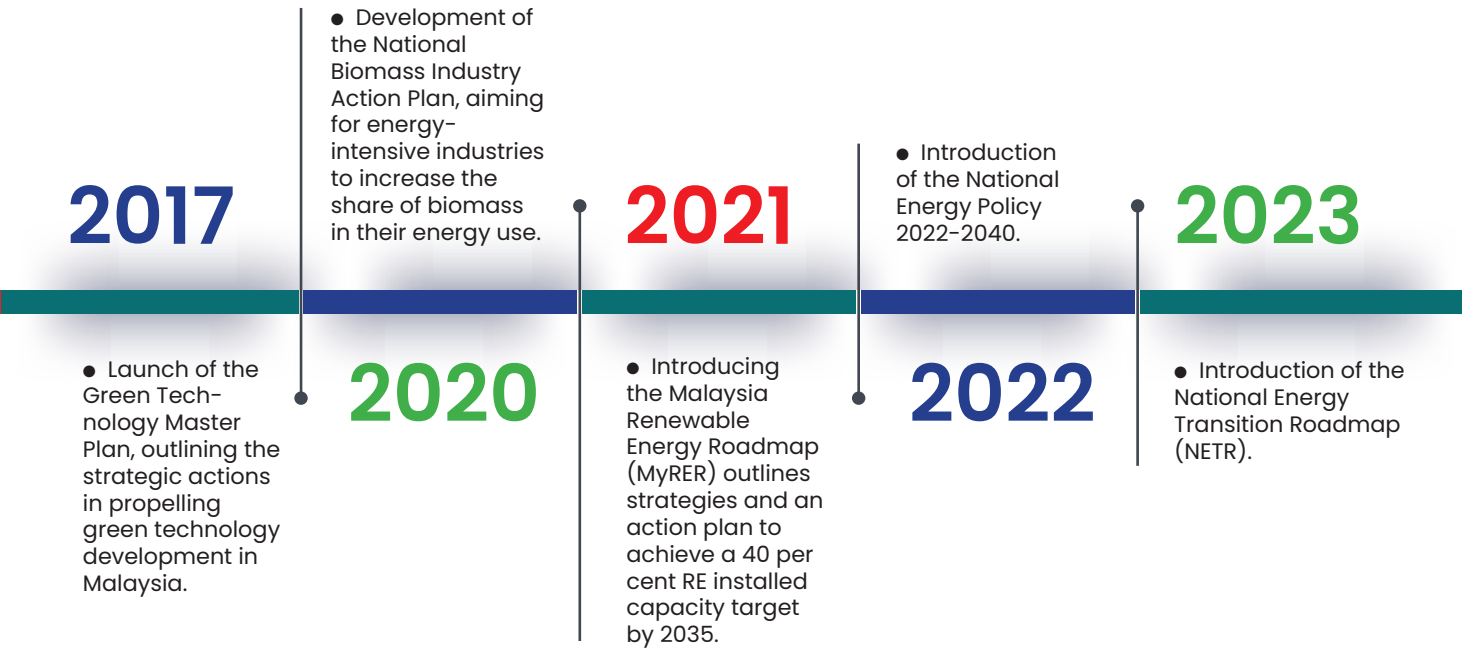
The Ministry of Natural Resources, Environment, and Climate Change (NRECC) oversees electricity supply, focusing on optimising RE and energy efficiency, shaping policies, and enforcing regulations.

The Energy Commission (Suruhanjaya Tenaga) in Peninsular Malaysia and Sabah manages electricity and gas issues, promotes RE use, ensures competition, and collaborates with the Sustainable Energy Development Authority (SEDA) on FiT implementation.

Malaysia aims to elevate its RE growth from 23 per cent or 8.45 GW of installed power capacity.

The Malaysia Renewable Energy Roadmap (MyRER) envisions achieving 31 per cent or 12.9 GW in 2025 and 40 per cent or 18.0 GW in 2035.

This roadmap aligns with Malaysia's commitment to reducing greenhouse gas emissions under the Paris Agreement, aiming for a 45 per cent reduction in carbon intensity by 2030 compared to 2005 levels. Realising these objectives is vital for meeting the Nationally Determined Contributions (NDC) targets established by the United Nations Framework Convention on Climate Change (UNFCCC).



Policies on Renewable Energy

The discussion on electricity market reform has been an ongoing exercise within the NRECC and related energy agencies. Specifically, the future electricity market reform can introduce competitive pricing, increase customer choice and satisfaction, and spur further economic activity in the sector.

Over the years, Malaysia has implemented significant energy policies and regulations to shape its energy landscape.

Review of Renewable Energy Policies

In line with the development of the NETR, the Ministry of Economy has also collaborated with NRECC to review and update existing policies on RE, leading to the following decisions:

- Increase the target for installed RE capacity from 40 per cent in 2040 to 70 per cent by 2050. The higher target is expected to generate new economic opportunities by attracting multinational companies, especially RE 100 companies, to operate in Malaysia
- Expand RE development based on the concept of a self-contained system to encourage investment in the RE value chain and diversify RE programmes according to the principle of willing buyer, willing seller
- Scale up the installation of solar systems in government buildings
- Allow cross-border RE trade through the establishment of an electricity exchange system.

Within the whole-of-nation approach, new policies and strategies have steadily developed to complement NETR in strengthening Malaysia's low-carbon transition.

Among others include:

- the Nationally Determined Contribution (NDC) Roadmap, Long-Term Low Emissions Development Strategies (LT-LEDS) and Future Proofing MESI by the NRECC

- the Carbon Pricing Instrument developed by the Ministry of Finance (MOF)
- the National ESG Industry Framework, the New Industrial Master Plan (NIMP) and the Chemical Industry Roadmap (CIR) by the Ministry of Investment, Trade and Industry (MITI)
- the Hydrogen Economy and Technology Roadmap (HETR) by the Ministry of Science, Technology and Innovation (MOSTI)
- the National Biomass Action Plan by the Ministry of Plantation and Commodities (KPK).

Each utility company in Malaysia has also formulated its strategic plans for the future. TNB, serving Peninsular Malaysia, has set a target to achieve 20 per cent RE capacity by 2025 and has expressed its commitment to reaching net zero emissions by 2050.

To attain this goal, TNB is implementing a sustainable approach, including a 35 per cent reduction in emission intensity and a 50 per cent reduction in coal generation capacity by 2035.

Other initiatives from the government include the use of the Incentive-Based Regulation (IBR) mechanism (a tariff price-setting mechanism for affordable and secure energy supply in a deregulated market), an optimal generation expansion plan (to improve service reliability at minimal cost), least-cost dispatch (to promote market liberalisation to reduce transmission and distribution costs) and fuel portfolio diversification (to balance affordable electricity and energy security).

Advancing Just Energy Transition: Powering Up with 70 per cent RE by 2050

MALAYSIA IS COMMITTED TO sustainable, low-carbon development, with a clear vision for reshaping its economic landscape. In line with the Paris Agreement, the nation's latest Nationally Determined Contribution (NDC) submission seeks to achieve an impressive 45 per cent unconditional reduction in emission intensity by 2030 compared to 2005 levels.

The country has set its sights on achieving net zero emissions by as early as 2050, as emphasised in its most recent National Energy Policy. It is actively preparing a Long-Term Low Emission Development Strategy (LT-LEDS) to solidify its path toward sustainability.

In pursuit of this ambitious goal to achieve net zero emissions by 2050, Malaysia is committed to prioritising low-carbon and climate-resilient measures within its development strategies to create a more efficient and sustainable economic landscape.

As part of this commitment, the country has established an ambitious RE target. MyRER is designed to craft a national strategic plan guiding Malaysia's renewable energy policy development, aiming for a 31 per cent RE share in the national capacity mix by 2025 and 40 per cent by 2035. It supports the ongoing decarbonisation of Malaysia's electricity sector, working towards the 2035 milestone. The initiative anticipates a significant reduction in GHG emissions within the power sector, aligning with Malaysia's NDC 2030 target of a 45 per cent decrease in economy-wide carbon intensity compared to the 2005 level.

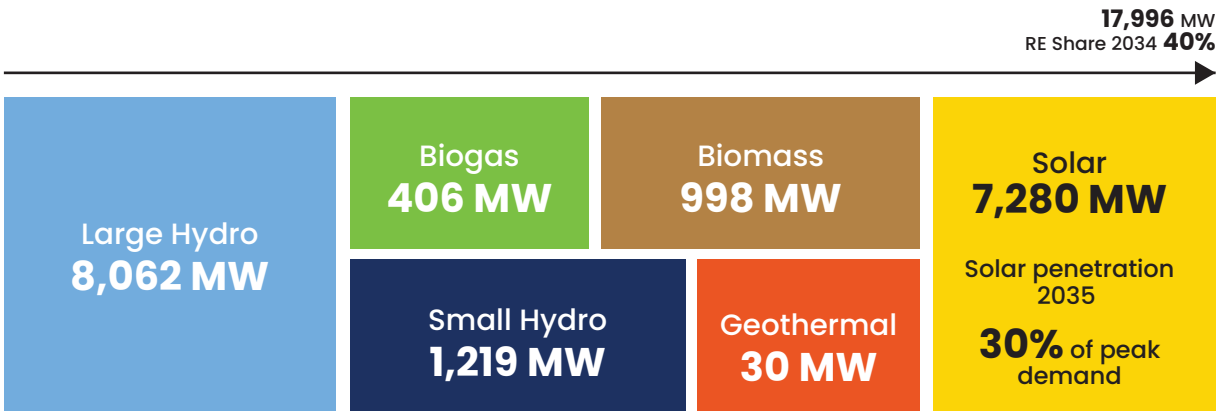
This scenario projected by MyRER is poised to create significant job and investment opportunities in the RE sector, with a cumulative investment of RM19.93 billion and 28,416 jobs projected by 2025, excluding employment related to the RE equipment manufacturing. Post-2025, the ongoing deployment of RE is expected to sustain socio-economic impacts through 2035, with an estimated cumulative investment of RM33.07 billion and 46,636 jobs in the RE sector.

The Increase of RE Target

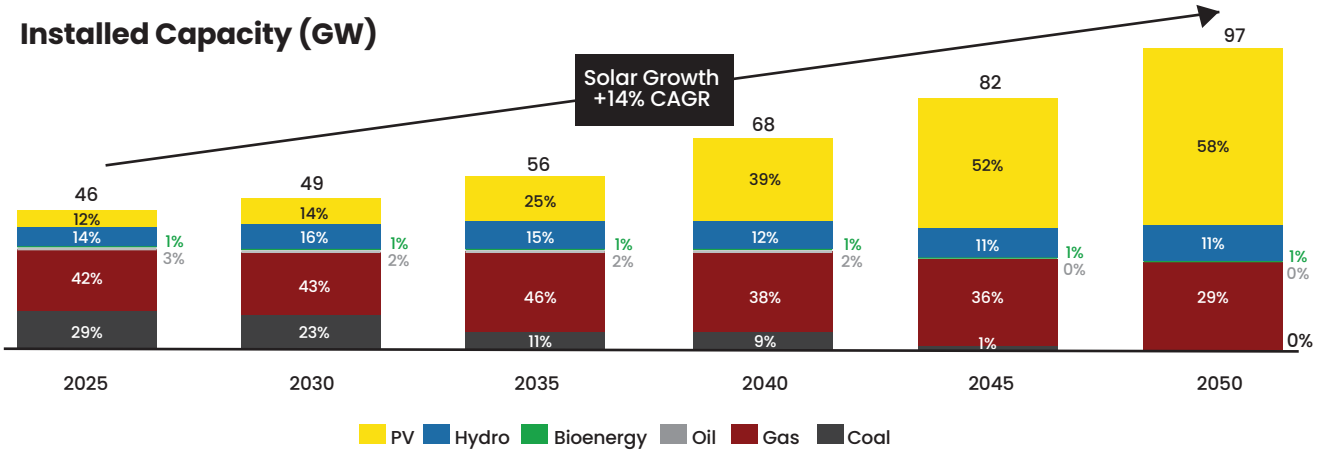
In May 2023, the government reaffirmed its commitment to unlock economic opportunities through a low-carbon transition, setting out the ambitious target to achieve 70 per cent RE installed capacity in the power mix by 2050.

The National Energy Transition Roadmap (NETR) aims to reinforce this ambition and inform an accelerated RE rollout by affirming two essential targets:

- Target 1: 70 per cent RE installed capacity share by 2050



RE Capacity Mix to achieve the target in 2035



Projected power system installed capacity mix 2050

- Target 2: No new coal power plant

In alignment with these strong RE ambitions, an accelerated pathway is needed to scale RE uptake in Malaysia over the next three decades.

With the government's strategic intent on energy transition, the dynamics of Malaysia's future power mix shall progress along this pathway:

- Renewables will constitute the majority share of installed capacity by 2050. However, the contribution of RE to the total generation mix will be comparatively lower than fossil fuels, particularly natural gas. This reflects the inherent low-capacity factor associated with solar, compared against the high-capacity factor of gas.

- The share of coal-fired power generation is expected to ramp down over time, driven by natural retirement timelines of existing coal-fired power plants. No new coal-fired power generation will be developed, leading to almost complete phase out by 2045.

- Gas is expected to act as a lower-carbon transition fuel away from baseload coal, and will be the dominant source of fuel for baseload power.

- The ambition to achieve 70 per cent RE share of installed capacity by 2050 is expected to be achieved, predominantly driven by solar PV installation. Significant solar capacity growth is required in the next three decades, with 59 GW of installed capacity by 2050.

By 2050, approximately ~200,000 jobs are anticipated to be generated within the power sector.

Sustainable Agenda and Energy Transition

Under the NETR, the government is determined to accelerate the transition to clean energy, ensuring a consistent and sustainable supply for all. This vision involves expanding renewable energy generation, the widespread installation of solar panels on government buildings, and implementing policies facilitating renewable energy trading through the electricity market system.

Areas	Investment Value (RM billion)
Capacity & Generation Development	370
Development & Strengthening of Network and Grid Infrastructure	184
Grid Energy Storage System Integration	50
Carbon Capture, Utilisation & Storage	33
Total	637

Projected Investment: Malaysia Energy Transition for the power sector in 2050

The policy on cross-border RE trading, as announced by the government in May 2023, will be executed via the government-developed electricity exchange system. This system facilitates the exchange of surplus RE generation capacity with regional neighbours, contributing to the advancement of the ASEAN Power Grid (APG).

The government is also pioneering in promoting the hydrogen economy and CCUS, offering incentives to stimulate the growth of these green technologies.

Aligned with its long-term commitment to environmental sustainability, the government will further encourage businesses to adopt Environmental, Social, and Governance (ESG) principles, enhancing their competitiveness to meet global standards.

These initiatives involve the development of essential policies and regulatory frameworks, accompanied by substantial funding to support green growth and the transition to a low-carbon economy.

Furthermore, providing accurate data and comprehensive reports is vital to assess and account for carbon emissions in line with international best practices. These collective efforts underscore Malaysia's determination to lead the sustainability agenda, positioning the country as a frontrunner among developing nations.

This strategic approach underscores Malaysia's commitment to a sustainable energy future and a significant move toward achieving its carbon reduction goals.

To realise the just energy transition in 2050, Malaysia's power sector requires a total investment of RM637 billion. This includes RM370 billion for Capacity & Generation Development, RM184 billion for the Development & Strengthening of Network and Grid Infrastructure, RM50 billion for Grid Energy Storage System Integration, and RM33 billion for Carbon Capture, Utilisation & Storage. ●

Sustainable Energy Programmes & Initiatives

KEY SUSTAINABLE ENERGY PROGRAMMES

Since 2012, sustainable energy development in Peninsular Malaysia and Sabah has been supported through several main programmes: Feed-in Tariff scheme (FiT), Large Scale Solar auction (LSS), Net Energy Metering (NEM) , Self-consumption (SELCO), Corporate Green Power Programme (CGPP) and Green Electricity Tariff (GET). The current total operational renewable energy capacity in Malaysia is 3,386.58 MW.

1. Self-Consumption (SELCO)

The SELCO scheme allows for self-generation of electricity through the installation of electrical generators based on renewable sources. Introduced in Malaysia in 2017, it enables individuals or businesses to produce electricity for their own consumption. Notably, electricity generated under SELCO cannot be exported to the grid, and owners do not receive compensation for excess energy. However, users benefit from a streamlined installation process, as power system studies are not required for systems up to 425 kWac.

As of the latest available data, the total installed capacity under SELCO for renewable energy sources in Malaysia is 321.3 MW. Biomass contributes the majority, followed by solar, biogas, and mini-hydro.

2. Net Energy Metering (NEM)

The NEM programme was introduced to continue to spur the industry. Currently on its third installation, NEM 3.0 offers three different categories to ensure equal opportunities for every sector in contributing towards reducing their carbon footprint.
NEM Rakyat for domestic consumers, NEM GoMEn for government buildings, and NEM NOVA for commercial buildings categories were launched in 2021 and have received a favourable response from the public.

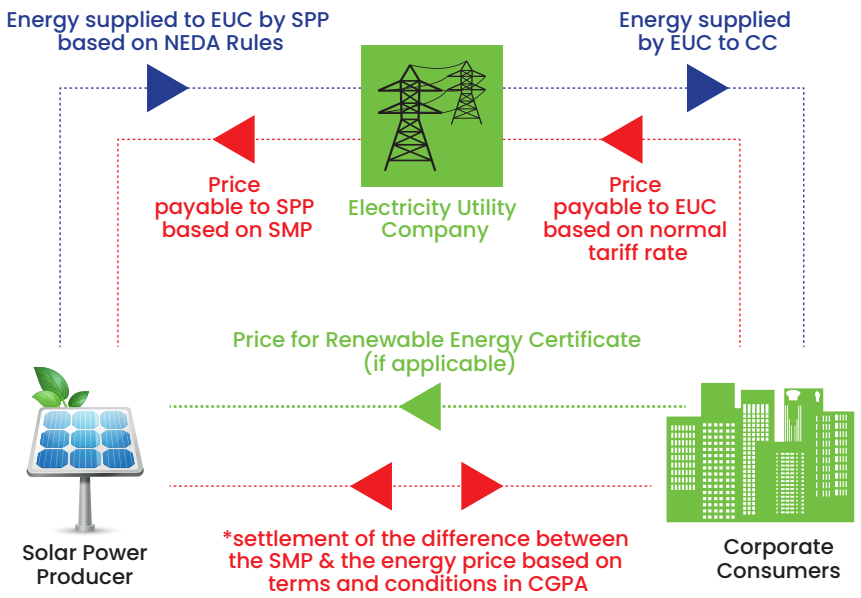
As of December 31, 2022, 11,505 projects with an installed capacity of 518.28MW were approved. Eighty-three per cent of the installed capacity was contributed by applications from the NOVA initiative with 430.01MW, followed by NEM Rakyat with 59.68MW and NEM GoMEn with 28.59MW. 46.2 per cent of the approved projects are now fully commissioned, proving the feasibility of the solar project's installation and signalling the shift towards a greener Malaysia.

3. Large Scale Solar (LSS)

The introduction of LSS auction in 2016 has resulted in the addition of 857 MW or 56 per cent 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 1-100 MW capacities in Malaysia.

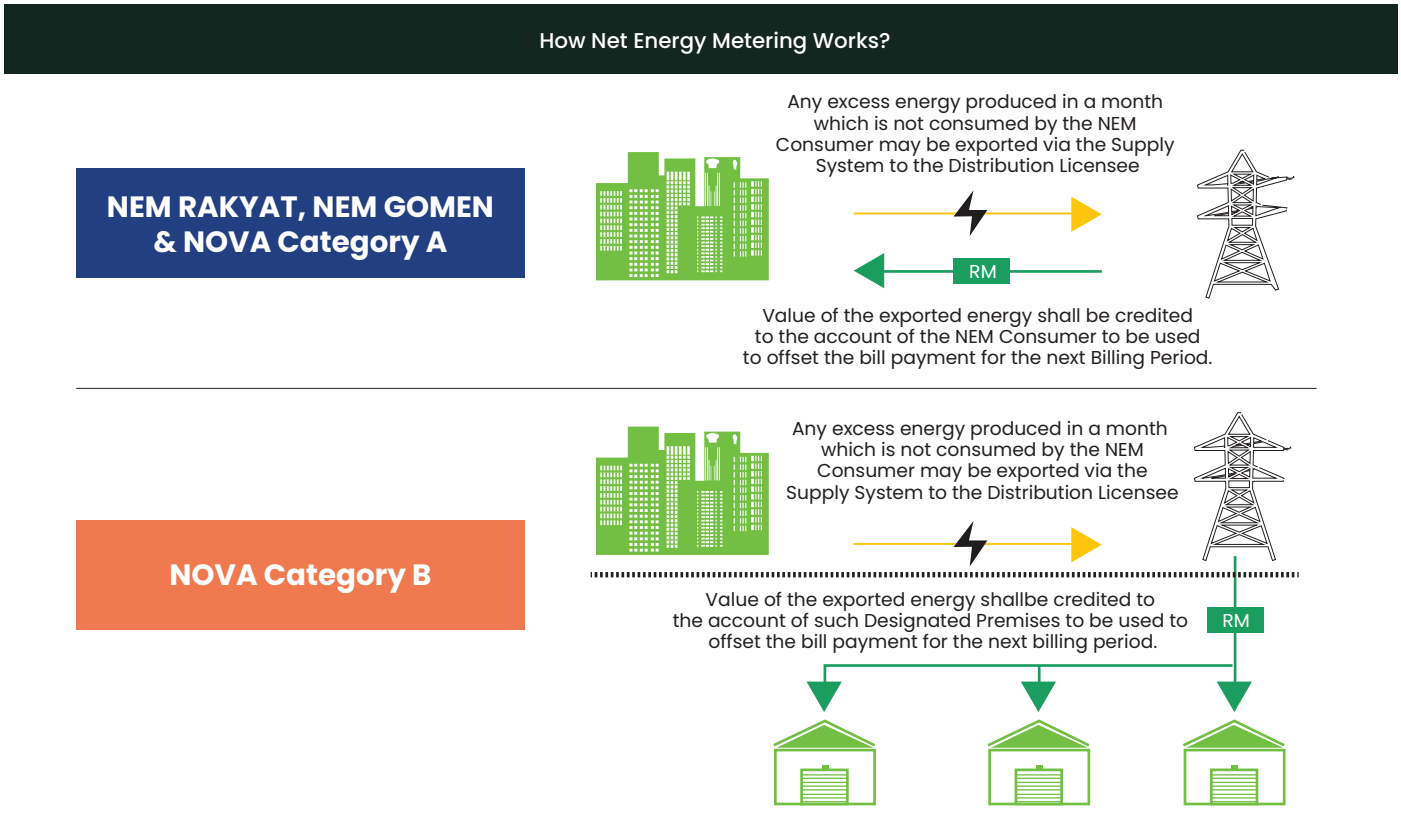
The scheme uses a reverse auction system to award LSS rights based on the lowest bid for off-take prices. The minimum system capacity of LSS plants is 1 MW, while the maximum system

Corporate Green Power Programme (CGPP)



*SMP > Energy Price	Solar Power Producer pays to Corporate Consumer
*SMP < Energy Price	Corporate Consumer pays Solar Power Producer

EUC	Electricity Utility Company (TNB)
SPP	Solar Power Producer
CC	Corporate Consumer
NEDA	New Enhanced Dispatch Arrangement
SMP	System Marginal Price
CGPA	Corporate Green Power Agreement



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 per cent between 2016 and 2017. Solar prices may soon reach grid parity or even lower levels if this trend continues.

Before LSS auctions, 250 MW of LSS projects were awarded through a fast-track mechanism.

As of the third quarter of 2023, Malaysia has awarded a total capacity of 2,445.372 MW for LSS projects. The operational capacity stands at 1,492.122 MW, with an additional 953.25 MW in progress, reaching an overall completion rate of 61 per cent.

Since 2016, Malaysia has conducted four LSS auctions:

- LSS 1 was held in 2016 for 371 MW, with the lowest bid submitted at MYR 0.39 / kWh69;
- LSS 2 was held in 2017 for 526 MW, with the lowest bid submitted at MYR 0.34 / kWh, a 13 per cent reduction from LSS 1;
- LSS 3 was held in 2019 for 490.88 MW, with the lowest bid submitted at MYR 0.17 / kWh, a 50 per cent reduction from LSS 270; and
- LSS 4 was held in 2020 for about 1,000MW with the lowest bid at MYR 0.1399 / kWh, a 18 per cent reduction from LSS 3.

4. Feed-in Tariff scheme (FiT)

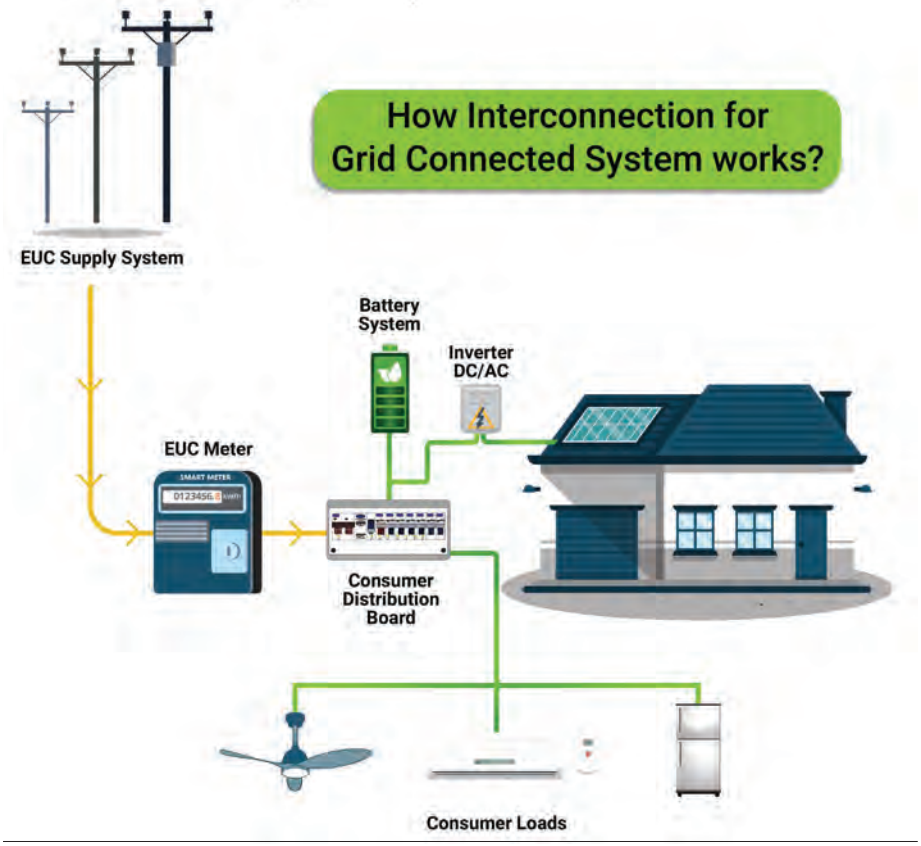
The FiT scheme was introduced on December 1, 2011, to boost RE uptake by ensuring that Distribution Licensees (DLs), such as TNB, purchase electricity produced from renewable resources at a special rate for a fixed period. The FiT mechanism was initially available for all the primary RE resources (biomass, biogas, small hydro, and solar PV). Due to the rapidly decreasing costs, new mechanisms, such as LSS auctions, NEM and SELCO, have been introduced, replacing the FiT mechanism for solar PV68.

As of 2022, 1,463.06MW was approved under the FiT mechanism, which equals 10,505 projects for solar, biogas, biomass, and small hydropower resources. With its positive impact in developing the sustainable energy market and reducing the carbon footprint in the electricity sector, the Government continues to open more quotas for biogas, biomass, and small hydropower resources with 187.00MW in 2022 via e-Bidding. SEDA Malaysia received 68 applications and has approved 32 projects equivalent to 111.407MW in November 2022.

5. Corporate Green Power Programme (CGPP)

Corporate Green Power Programme (CGPP) is an initiative by the Government to provide opportunity for business entities to participate in the promotion and use of renewable energy in their business operation. The programme supports the growing

Self Consumption (SELCO) of Solar Energy



number of electricity consumers that aspire to achieve the Environmental, Social and Governance (ESG) target.

CGPP is essentially a mechanism of virtual power purchase agreement, which is implemented using the existing New Enhanced Dispatch Arrangement (NEDA) framework.

In CGPP, three essential parties play distinct roles in the energy delivery and transaction process. The Solar Power Producer takes charge of developing, owning, and operating the solar power plant, exporting the generated energy through the electricity supply system of the Electricity Utility Company as per the NEDA Rules. Simultaneously, the Corporate Consumer receives electricity supply from the Electricity Utility Company, with the option to engage in a virtual power purchase agreement for solar energy with the Solar Power Producer. The Electricity Utility Company facilitates the export of energy from the solar power plant through its electricity supply system, compensating the Solar Power Producer based on the Actual System Marginal Price (SMP) in accordance with the NEDA Rules.

6. Green Electricity Tariff (GET)

To enable electricity consumers to reduce their carbon footprint in electricity consumption, the government has introduced the Green Electricity Tariff (GET) to offer low carbon electricity supply to all consumers. Customers with GET subscription will pay Normal tariff for monthly electricity consumption plus GET blocks subscription.

Through the GET Programme implementation, customers gain the flexibility to acquire a low-carbon electricity supply without the need to install personal solar rooftops or other renewable energy installations. The renewable energy resources for the GET Programme are harnessed from solar power plants operating under the LSS Programme, as well as TNB's and/or its subsidiary's hydropower stations and any other approved renewable energy plants regulated by the Commission. Customers enrolled in the GET Programme will receive Malaysia Renewable Energy Certificates (mRECs) at the conclusion of each calendar year. ●

Green Incentives to Advance Energy Transition

> **GTFS 4.0 will also continue to provide the 60 per cent to 80 per cent government guarantee on the green component cost financed by Participating Financial Institutions (PFIs) as well as the rebate of 1.5 per cent per annum on interest/profit rate."**

Green Technology Financing Scheme (GTFS)

Under the GTFS, the Government provides a rebate of 2 per cent per annum on the interest fees charged for loans by financial institutions for the first seven years of the loan and guarantees 60 per cent of the green components cost.

This applies to producers of green technology (RE generators), green technology users, and energy efficiency-related projects.

Uptake of the GTFS scheme has been positive, resulting in the extension of RM2 billion of funds during Budget 2019. Following the positive uptake of the GTFS scheme, the Ministry of Finance launched GTFS 3.0 in 2021 to support the RE projects further, followed by GTFS 4.0 in 2023.

The government continues to support the development of green businesses with the reinstatement of the GTFS 4.0 up to RM1.0 billion for the period until December 31, 2025. The financing scheme will continue its support to six key sectors which include Energy, Manufacturing, Transport, Building, Waste and Water.

GTFS 4.0 will also continue to provide the 60 per cent to 80 per cent government guarantee on the green component cost financed by Participating Financial Institutions (PFIs) as well as the rebate of 1.5 per cent per annum on interest/profit rate.

One of the main enhancements of GTFS 4.0 is the inclusion of Housing Developer and Low Carbon Mobility Infrastructure to be eligible for financing investments related to Building and Transportation projects.

The Housing Developer and Low Carbon Mobility Infrastructure is eligible to obtain a maximum financing of RM100 million and RM50 million respectively. The financing scheme continues supports other categories such as Producer, User and ESCOs which have been introduced in the scheme previously.

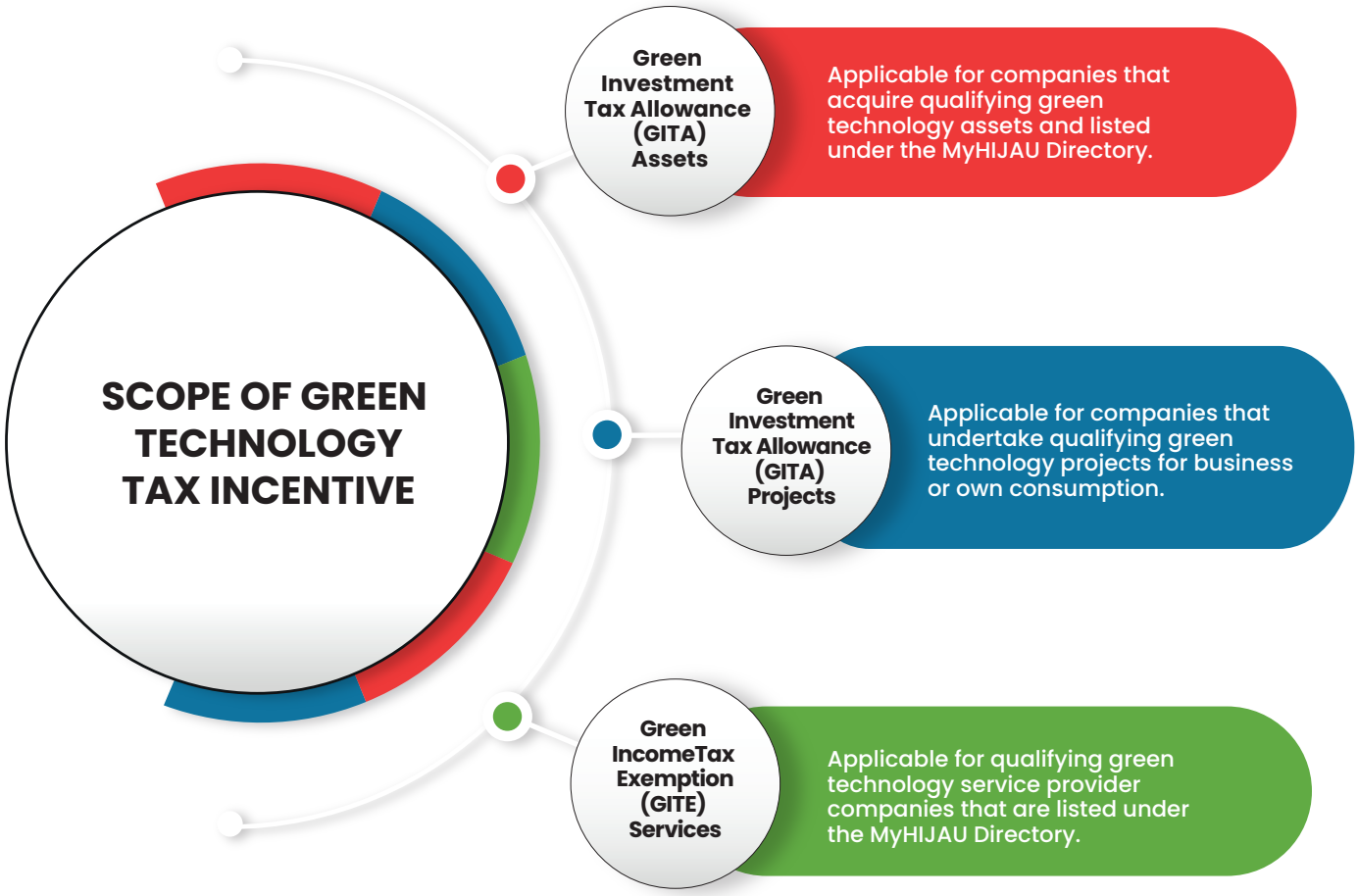
GTFS 4.0 serves distinct purposes for each sector:

- Producers of Green Technology: Obtain financial support for green product manufacturing, excluding large-scale solar projects and rooftop solar PV systems.
- Users of Green Technology: Secure financing for investments or assets related to energy-efficient projects and/or energy performance contracting, with exclusions for projects falling under Net Energy Metering (NEM) and Self-Consumption (SELCO).
- Energy Services Companies (ESCOs): Secure funding for investments or assets linked to energy efficiency projects and/or energy performance contracting.
- Housing Developers: Secure financial assistance for constructing green buildings, with a specific focus on residential development, ensuring the selling cost does not exceed RM350,000.
- Low Carbon Mobility Infrastructure: Obtain funding for electric vehicle charge point operators.

The implementation of GTFS 4.0 is important to ensure green technology-based projects continue to receive support, which will directly contribute to the growth and development of the green technology industry and also catalyst to the Climate Change policy.

Projects eligible for the scheme must align with government policies and targets addressing climate change, biodiversity, and environmental concerns. Key nationally determined contributions relevant to businesses include:

- Renewable Energy: Achieve a 31 per cent renewable energy installed capacity mix by 2025 and a 45 per cent reduction in emissions from the power sector by 2030 compared to the 2005 level.
- Energy Efficiency: Attain savings of 52,233 GWh of electricity from 2016 to 2025, equating to an eight per cent reduction in electricity



demand by 2025 across residential, commercial, and industrial sectors, with a further 15 per cent reduction in electricity consumption by 2030.

- Waste Management: Target a 28 per cent recycling rate by 2030.
- Manufacturing: Increase the number of green manufacturers to 17,000 by 2030.
- Building: 1,750 green buildings certified by 2030.

Green Technology Tax Incentives

Introduced since 2014 during the government's Budget announcement, the Green Investment Tax Allowance (GITA) and Green Income Tax Exemption (GITE) align with the Malaysian government's commitment to fostering the growth of Malaysia's green economy. Managed by the Malaysian Green Technology and Climate Change Corporation (MGTC), these initiatives aim to achieve several objectives:

i. Encouraging investment in the green technology industry on a project basis, whether for business purposes or self-consumption, and promoting the adoption of green technology by selected services/ system providers.
ii. Encouraging companies to acquire/ purchase assets verified as green technology assets by MGTC, listed under the MyHIJAU Directory.
iii. Widening the coverage of green services to include solar leasing activities.

These incentives fall into two main categories: Green Investment Tax Allowance (Asset & Project) and Green Income Tax Exemption (Service Provider).

GITA: GITA is accessible to companies that own registered assets used in their Malaysian business operations. These assets must be listed in the MyHijau directory and approved by the Ministry of Finance through MGTC confirmation. Upon approval, a validation letter is issued, allowing companies to claim a 100 per cent offset of qualifying capital expenditure against 70 per cent of statutory income in the assessment year. The claimed amount is then included in the tax return form.

GITE: The eligibility is extended to qualifying green technology service providers listed in the MyHIJAU Directory.

To qualify, check if the purchased asset is listed in the MyHijau directory, and if not, request the supplier to register for the MyHijau mark. Applicants must complete the relevant form, pay the RM1,000 processing fee, and upon approval, MGTC will issue a validation letter. This letter must be submitted with the tax form to declare the exemption.

The Energy Audit Conditional Grant

The Energy Audit Conditional Grant (EACG 2.0) is an energy efficiency programme outlined in the 12th Malaysia Plan (12MP) for the implementation period from 2021 to 2025. Allocated grants for this programme are intended to support commercial and industrial sectors during this period, encouraging collaboration with registered local ESCOs under the Energy Commission (ST) to conduct energy audits in their buildings. This governmental grant is disbursed on a first-come-first-serve basis, contingent upon application approval.

Objectives of the Programme:

- Provide financial assistance to building/installation owners for energy audits, facilitating the implementation of energy-saving measures at their premises.
- Promote energy audit exercises to establish current energy consumption baselines and identify potential energy savings.
- Create a platform for assistance and facilitation to commercial building and industrial installation owners for systematic energy-saving implementation.
- Build capacity in energy management within the commercial and industrial sectors.
- Foster awareness about the importance of energy management among commercial and industrial premises owners in Malaysia to reduce energy consumption, ultimately saving operational costs.

Any commercial building or industrial installation with a minimum energy consumption of 100,000 kWh/month is eligible to apply. Entities that have not previously received the EACG under 11th Malaysia Plan (11MP), are also eligible to participate.

Benefits of the programme:

- OWNERS: Operational cost energy consumption reduced after implementation of potential Energy Saving Measures (ESM) advised in Energy Audit report.
- SUSTAINABLE ENERGY INDUSTRY: Capacity development for ESCOs to fulfil the current and future demand of energy management in industrial and commercial sector.
- GOVERNMENT: Promoting the energy saving, low carbon and sustainable energy initiatives indirectly assisting Malaysia in achieving carbon reduction targets.
- ENVIRONMENT: Reduces the demand for electricity generation, and therefore reduces carbon emission.

Building on the EACG programme under the 11MP, there were 108 applications received for commercial buildings, resulting in a total of 71,694,374 kWh in energy savings in 2021. Simultaneously, the industrial segment had a total of 109 buildings participating, achieving energy savings of 273,037,874 kWh in the same year. ●

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New Energy and Other Alternatives

WITH MALAYSIA AIMING FOR 70 PER cent renewable energy by 2050, the government and other energy stakeholders are actively exploring technologies such as green hydrogen and Carbon Capture, Utilisation, and Storage (CCUS) to propel the energy sector forward.

Hydrogen, especially green hydrogen produced from renewable energy sources, is seen as the future fuel. By 2050, the dependence on gas is anticipated to decline, with interconnection and hydrogen assuming more significant roles.

In alignment with the National Energy Policy 2022-2040 (NEP) and Malaysia's objective of integrating more sustainable energy sources into the generation mix, battery storage becomes crucial for ensuring the reliability of the nation's grid.

Hydrogen Potential in Malaysia

The Ministry of Science, Technology and Innovation (MOSTI) created the Hydrogen Economy and Technology Roadmap (HETR) to guide the development of Malaysia's hydrogen economy, acting as a supporting document to NEP. Both the NEP and the HETR are living documents, which shall pave the way to achieving environmentally sustainable, long term energy security for Malaysia, driven by technological innovation.

According to HETR, annually, a minimum of 168 million tonnes of biomass waste is generated in Malaysia. In general, palm oil waste accounts for 94 per cent of biomass feedstock while the remaining contributors are agricultural and forestry by-products, such as wood residues (four per cent), rice (one per cent), and sugarcane industry wastes (one per cent).

Based on the data from the Malaysia Palm Oil Board for 2020, the amount of solid biomass waste generated from palm oil industry in Malaysia accounts for a total of 98.1 million tonnes. Palm Oil Mill Effluent (POME) and Empty Fruit Bunch (EFB) generated from mills in Malaysia amount to 58 million tonnes per year and 20 million tonnes per year respectively (MPOB 2020). Biohydrogen production from POME and EFB through dark fermentation, gasification process and various treatment methods has shown a promising route for green hydrogen production at pilot-scale.

Additionally, Malaysia is blessed with the geography to accommodate hydropower dams which in turn provides electricity to produce green hydrogen. Overall, the total gross hydropower potential documented is about 414,000 GWh per year of which about 123,000 GWh per year is the technical potential for development. About 87,000 GWh (70 per cent) of this energy potential is in Sarawak, 20,000 GWh in Sabah and 16,000 GWh in Peninsular Malaysia.

This scenario will potentially unlock a revenue of RM7.7 billion coming from hydrogen demand through the power generation sector in 2050. The potential economic benefits from hydrogen under a Business-as-Usual (BAU) and Emission-Driven Scenario (EDS) will be able to generate a revenue of RM 560.63 billion and RM 776.63 billion, in 2050 respectively.

Grey, Blue and Green Hydrogen in Malaysia

In Malaysia, a significant amount of grey hydrogen is currently produced through various processes within the oil and gas industry, relying on hydrogen supplied from fossil fuels. However, this approach comes with the drawback of greenhouse gas (GHG) emissions, making it an unsustainable option for the future. The imperative for a cleaner hydrogen source is evident, leading to the potential classification of grey hydrogen as blue hydrogen through the application of CCUS technology. The global production cost for blue hydrogen ranges between US$ 1.5/kg H2 and US$ 4/kg H2, while green hydrogen, another cleaner alternative, has a production cost between US$ 4/kg H2 and US$ 6/kg H2.

In the short to long term, Malaysia is committed to prioritising blue hydrogen

SUMMARY OF HETR

	Short term (2022-2030)	Mid term (2031-2040)	Long term (2041-2050)
Grey H2=USD 1.5/kg Blue H2=USD 3/kg Green H2=USD 6/kg **Hydrogen production cost**	Grey Hydrogen: To be phased out Blue Hydrogen: US$3.71/kg Green Hydrogen: US$4.82/kg (Solar) US$2.50/kg (Hydro) US$1.72/kg (Biomass) US$1.35/kg (Biogas)	Blue Hydrogen: US$4.64/kg Green Hydrogen: US$2.63/kg (Solar) US$2.25/kg (Hydro) US$1.72/kg (Biomass) US$1.30/kg (Biogas)	Blue Hydrogen: US$ 5.62/kg Green Hydrogen: US$ 1.45/kg (Solar) US$ 2.11/kg (Hydro) US$ 1.72/kg (Biomass) US$ 1.25/kg (Biogas)
	Long-term strategic goal is to utilise Green Hydrogen		
Environmental contribution	BAU: 0.4% GHG reduction EDS: 1.3% GHG reduction	BAU: 3% GHG reduction EDS: 8% GHG reduction	BAU: 6% GHG reduction EDS: 15% GHG reduction
Revenue generation	● BAU: Industrial Use (Non-Energy and Heat) RM 7.4 billion ● EDS: Industrial Use (Non-Energy and Heat) RM 12.1 billion ● Capturing 10% of the hydrogen demand from Japan, South Korea and Singapore resulting in revenue of RM20 billion	● BAU: Industrial Use (Non-Energy and Heat) RM 37.1 billion ● EDS: Industrial Use (Non-Energy and Heat), Power and Mobility RM 151.8 billion ● Potential and competitive hydrogen export hub generating revenue of RM219 billion	● BAU: Power, Mobility and Industrial Use (Non- Energy and Heat) RM 151.7 billion ● EDS: Power, Mobility and Industrial Use (Non-Energy and Heat) & Marine RM 497.2billion ● Position Malaysia to be a major exporter in APAC and generate revenue of RM409 billion
Technology agenda	● Available technologies to demonstrate, scale-up and deploy first (Build Some) ● Complementary external technologies & solutions to be procured (Buy Some)	Increase in the targeted conversion efficiency of the technologies across the hydrogen economy value chain	Mass deployment in targeted renewable energy sectors (e.g.: solar, hydroelectric, biomass, OTEC)
Infrastructure and utilisation	● Export terminal technologies and hydrogen transport technologies between production sites and export terminals ● To pilot utilisation of hydrogen as co-blended fuel	● Hydrogen used as energy storage in addressing the deployment of variable renewable energy (VRE) ● Utilise hydrogen as co-blend fuel for power generation and mobility	Utilise hydrogen in the mobility, industry (non-energy and heat), commercial and domestic sector
Job creation	Business-As-Usual: 168,000 Emission-Driven: 211,680		

as its main focus, aiming to convert its significant oil and gas sector into a Hydrogen Economy. Despite the challenge of high capital expenditures hindering the commercial availability of CCUS technologies, strategic investments facilitated by both foreign and domestic direct investments become more practical when other stakeholders from fossil-based sectors are engaged. Moreover, various CO2 capture technologies, including membrane and absorption methods, offer feasible options for efficient CO2 capture, achieving levels below 1 kgCO2/kg H2.

Besides focusing on natural gas + CCUS, the co-product hydrogen from existing processing plants that meets certain certification standard or low carbon based on life cycle assessment of carbon footprint may be regarded as blue hydrogen.

In IEA's Net Zero scenario, blue hydrogen is projected to contribute nearly 40 per cent of the total global hydrogen supply by 2050. This aligns with the Hydrogen Council's findings in the Hydrogen Decarbonisation Pathways, where 60 per cent of the market will be served by green hydrogen, and 40 per cent will be supplied by blue hydrogen.

Malaysia is strategically aiming for green hydrogen, produced from renewable sources like solar, hydropower, and wave energy, in the long term. This shift is crucial for maintaining Malaysia's status as a major energy exporter, prompting a swift transition to green hydrogen.

Malaysian green hydrogen production price stands at USD 6/kg, being the second most expensive next to turquoise hydrogen. Regarding the cost competitiveness, the supply of both blue and green hydrogen is needed for Malaysia to meet the projected demand for clean hydrogen to achieve decarbonisation targets by 2050.

Green Hydrogen Development

The 2021 pre-feasibility study concluded that the collaborative effort of SEDC Energy Sdn Bhd with other stakeholders in the green hydrogen and ammonia project is anticipated to yield significant results. The project aims to produce 7,000 tons/year of green hydrogen for local use in Sarawak, along with 600,000 tons/year of blue ammonia, 630,000 tons/year of green ammonia, and 460,000 tons/year of green methanol. The H2biscus Project is poised to become a benchmark on the international stage, showcasing renewable energy trading and hydrogen transportation between South Korea and Malaysia.

Furthermore, ENEOS has entered into a Memorandum of Understanding (MoU) with SEDC Energy Sdn Bhd and Sumitomo Corporation to establish a CO2-free hydrogen supply chain. This innovative approach involves converting hydrogen into methylcyclohexane (MCH), providing an efficient mode of transportation to Japan. The feasibility study envisions 3,000 tons of hydrogen per year for local consumption and 50,000 to 100,000 tons per year for export in the form of MCH.

A recent joint feasibility study conducted by PETRONAS/Gentari and ENEOS of Japan for a commercial hydrogen production and conversion project in Kerteh, Terengganu, anticipates a total hydrogen production and conversion capacity of up to 50,000 tons per year by 2027. The intention is to export the hydrogen in the form of MCH to Japan. This initiative is expected to stimulate Malaysia's economy through supply and demand dynamics, while also attracting the essential investments needed to establish a robust hydrogen infrastructure in the country.

At an industrial scale, Sarawak Energy Berhad (SEB) has begun exploration into hydrogen business through electrolysis demonstration project for fuel cell electric vehicles (FCEVs).

When it comes to new energy and alternative, Malaysia's main utility company, TNB's strategy involves upgrading retired coal and gas plants with hydrogen-ready combined-cycle gas turbines (CCGTs). To secure a sustainable and economically viable supply of green hydrogen, TNB is researching efficient electrolysers to lower the cost of production.

To expedite the decarbonisation process in the energy sector, TNB has entered into an MoU with PETRONAS, marking a collaborative effort to explore innovative green technologies. The initial focus under this MoU involves a joint study on developing a green hydrogen ecosystem and CCUS, utilising TNB's power plant assets. The objective is to generate green hydrogen fuel for power generation and intensify collaborative efforts to establish a green hydrogen ecosystem, offering cleaner energy solutions for Malaysia and international markets.

The Outlook Towards 2050

According to IRENA's Malaysia Energy Transition Outlook 2003, a significant shift in Malaysia's fuel demand is expected by 2050. Approximately one-fifth of the demand for fuels in the 1.5-S scenario will be renewable-based, including bioenergy, renewable direct-use (e.g., solar thermal), and hydrogen. This marks a substantial increase from the current one per cent reliance on renewables. The report envisions electricity constituting up to 40 per cent of final energy consumption, driven by the increased demand for electricity in the transport sector and green hydrogen production.

To explore alternatives to continued fossil fuel reliance in power generation, the report outlines two highly decarbonised pathways for the Malaysian power system: a 100 per cent renewables system (1.5-S RE100) and one around 90 per cent renewable, with the remainder relying on carbon capture and storage (1.5-S RE90). These scenarios showcase potential approaches to achieve a low-carbon system based on available technology. Solar PV is a key component in all scenarios, requiring significant expansion and a substantial increase in battery storage, reaching around 21 GW by 2050 in the 100 per cent renewables case.

Energy storage deployment will be substantial, particularly in Sabah and Peninsular Malaysia. In Sarawak, hydropower reservoirs serve as storage, eliminating the need for other technologies. This has implications for spinning reserves, where both hydropower and storage can meet 10 per cent of the load without fossil-fuel-based provision.

Bioenergy is expected to contribute around 16 per cent to Malaysia's energy transition by 2050, primarily as biofuel for aviation and as a substitute for fossil fuels in sectors such as iron and steel, and cement. Strengthening

inter-institutional coordination and developing a strategy that incorporates bioenergy into the energy transition is crucial, addressing sustainability and industrial concerns to scale up potential resources.

Hydrogen is poised to play a complementary role in Malaysia's climate objectives. Green hydrogen is anticipated to comprise up to five per cent of total final consumption by 2050 in the 1.5-S scenario, contributing to decarbonising industrial sub-sectors and meeting the growing demand for green hydrogen in the Asia-Pacific region.

A Game Changer for Energy-intensive Industries

Transitioning to new and alternative energy sources is crucial, especially for challenging sectors like steel, cement, and iron production. These industries have long been major contributors to carbon emissions due to their energy-intensive processes. Recognising the significance of adopting new energy solutions is key to achieving global climate objectives.

Many studies suggest that low carbon hydrogen is required for the emission avoidance in the hard-to-abate sectors such as metal and steel industry, oil and gas refining industry and the chemicals industry such as for ammonia and methanol production.

In sectors like steel manufacturing, where traditional methods heavily rely on carbon-intensive blast furnaces, exploring alternatives such as hydrogen-based direct reduction can substantially cut down carbon emissions. Similarly, the cement industry, known for its substantial carbon dioxide output, can benefit from adopting alternative materials and processes to reduce its environmental impact. Utilising bioenergy as a substitute for fossil fuels in sectors like iron and steel, as well as cement, can play a pivotal role in achieving both environmental sustainability and industrial efficiency. ●

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Interconnection and Regional Cross-border Power Integration

> **Therefore, the Grid of the Future strategy, embedded in TNB's Energy Transition Plan, seeks to modernise and digitise the grid and distribution infrastructures, facilitating increased integration of distributed generations and renewables."**

The ASEAN Power Grid (APG)

A ROBUST AND DEPENDABLE electricity infrastructure is essential to foster regional economic growth and facilitate the integration process. The ASEAN Power Grid (APG) stands as a pivotal initiative aimed at establishing a regional power interconnection.

Initially, the focus is on bilateral connections across borders, with a gradual expansion to sub-regional levels, ultimately leading to the establishment of a fully integrated power grid system for Southeast Asia. Positioned as a key project within the Master Plan of the ASEAN Connectivity, the APG project anticipates facilitating cross-border electricity trade, addressing the escalating demand for electricity, and enhancing access to energy services throughout the region.

According to PwC's "Regional Electricity Trade in ASEAN" report, the establishment of an integrated ASEAN power grid is poised to yield substantial advantages. Key benefits include cost reduction and the opportunity to harness various renewable sources from countries with resource advantages, supplying power to nations with fewer resources. Additionally, the integrated power grid enables more efficient balancing of power loads by accessing required power from sources across the region. This diversification results in a more stable power supply, minimising the impact of plant failures on the overall region and optimising both resources and costs by reducing reserve margins. In the current scenario, ASEAN countries engage in regular electricity export and import, albeit in relatively small quantities. Countries in Southeast Asia generate 1,053 TWh of electricity annually, and export 36 TWh of the generated electricity to other ASEAN countries. These flows tend to be bilateral and unidirectional –between two countries, where one country exports and the other imports.

Currently, Laos, boasting surplus electricity generation, serves as the primary exporter of electricity within Southeast Asia. Other countries, including Malaysia, Thailand, Vietnam, and Myanmar, also participate in electricity exports.

Malaysia's Readiness to Become ASEAN RE Hub

The Malaysian government has lifted the ban on exporting renewable energy (RE) to enhance the country's green economy policy. This decision is expected to boost the potential of local RE companies by enabling cross-border exports. The reversal of the ban is anticipated to allow firms to expand their renewable power generation capacity and tap into the high demand from neighbouring countries. The government will facilitate the cross-border sale of RE through an electricity exchange system. This proactive move highlights Malaysia's readiness to become ASEAN RE Hub for multilateral power trading.

For instance, Malaysian utility company, TNB, has made substantial progress in reinforcing connections with ASEAN peers. It advocates for stronger interconnections to expedite the energy transition, ensuring greater energy security and facilitating a quicker decarbonisation process for the region.

Malaysia believes there is untapped potential in realising the APG and encourages ASEAN member countries to collaborate in fully integrating Southeast Asia's power grid system.

Therefore, the Grid of the Future strategy, embedded in TNB's Energy Transition Plan, seeks to modernise and digitise the grid and distribution infrastructures, facilitating increased integration of distributed generations and renewables.

The emphasis is on optimising interconnections with other countries to enhance the reliability and efficiency of the distribution network in delivering

ASEAN Power Grid Initiative

services to customers. This entails improved management of distributed generation, creating opportunities for beneficial cross-border collaborations.

A significant achievement in our interconnection journey in 2022 was the successful upgrade of the electricity interconnector linking Malaysia and Singapore. First established in 1983, this interconnector has allowed mutual energy exchange between both countries during power outages.

After 40 years, the upgraded interconnector accommodates bidirectional electricity flows of around 1,000 megawatts, doubling its earlier capacity. This interconnector is crucial in the Lao PDR-Thailand-Malaysia-Singapore Power Integration Project (LTMS-PIP), facilitating cross-border power trade and contributing to the broader APG objective.

The LTMS-PIP led to a historic agreement between Singapore and Lao PDR,

enabling the import of 100 MW of hydropower from Lao PDR to Singapore through Thailand and Malaysia. This marks the first instance of four ASEAN nations engaging in multilateral cross-border electricity trade. The government intends to explore interconnection collaborations with countries like Thailand and Indonesia.

In Sarawak, the installed capacity under Sarawak Energy totals approximately 5,600 MW across Sarawak, with 3,500 MW of hydropower. Some of this renewable energy is anticipated to develop domestic industry under the Sarawak Corridor of Renewable Energy (SCORE) initiative in Samalaju Industry Park, intended to attract energy-intensive heavy industries.

Given the deep potential for hydropower production in this region, Sarawak is also looking to export its energy to surrounding countries which include Indonesia, Brunei, and Singapore. There is currently one export link to export 200 MW to West Kalimantan (Indonesia), and there are early discussions on building transmission lines to export to other industry centres in Borneo. ●

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Skilled Workforce

Robust education system

Malaysia's economic growth finds its cornerstone in a skilled and diverse workforce bolstered by a robust educational system. According to MIDA, the country hosts numerous public and private tertiary institutions, along with a vast network of technical and vocational education and training colleges (TVET).

Malaysians often speak multiple languages, with a high level of English proficiency, coupled with a minimum of 11 years of formal education among school leavers entering the workforce.

Enrollment in public higher education institutions surpasses 500,000, with a notable increase in emphasis on science and technical disciplines.

With a significant labour force primarily composed of young individuals aged 25 to 29 years, accounting for nearly 18 per cent of the population, the demographic strength extends to those aged 30 to 34 and 35 to 39 years, making up 14.8 per cent and 13.7 per cent, respectively.

Source: MIDA

The quality of Malaysia's labour force stands out in the region, thanks to consistent government efforts in human resource development across all sectors.

Noteworthy efforts by the government to shape industry-ready talent have earned Malaysia an improved position in the Global Talent Competitiveness Index 2022 (GTCI 2022), a joint study by INSEAD University, Google, and Adecco. The country's ranking rose to 45th among 133 countries, underlining its commitment to fostering a competitive and skilled workforce.

The private sector in Malaysia plays a substantial role in fortifying the educational landscape, complementing the government's endeavours to nurture a more extensive body of professionals and semi-professionals. Numerous private colleges nationwide offer twinning degree programmes in collaboration with overseas higher learning institutions.

Collectively, these educational institutions contribute to a substantial pool of professionals with degrees and postgraduate qualifications.

Energy Management And Climate Change Programme (EMCP)

Human capital acts as the engine to drive Malaysia's green technology progressively forward. It mandates having specialised skills and competency to harness this technology and ensure sustainable energy management for innovation and performance.

A skilled workforce is vital for leveraging innovation. Energy management is a pivotal area to meet the needs of the rapidly evolving environment.

MGTC's Green Skills Centre (GSC) is dedicated to cultivating these abilities and has designed the Energy Management And Climate Change Programme (EMCP), consisting of three specialised categories:

1. Certification and Professional Programme (CPP)
2. Non-Certification and Awareness Programme (NCP)
3. Short-Course Programme (SCP)

EC recognises the programmes and claimable under the Human Resources Development Corporation. CPP's Energy Manager Training Course (EMTC) has also been accorded due recognition by the ASEAN Center for Energy for the ASEAN Energy Management and Accreditation Scheme Programme (AEMAS) since 2014.

The training has been influential, with over 7,000 participants benefiting from MGTC's initiatives by December 2021. ●

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Logistics

INVESTING IN MALAYSIA HOLDS numerous advantages, particularly when considering its infrastructure, electricity reliability, and RE availability and potential.

Infrastructure

Malaysia boasts a well-developed infrastructure that spans transportation, telecommunications, and utilities. Its strategic location within Southeast Asia and extensive network of highways, ports, and airports make it a hub for regional and international connectivity. This infrastructure supports domestic logistics and acts as a vital channel for global trade routes.

Extensive land connectivity
Malaysia's land mass is connected via 3 major expressways spanning a road network of 250K + KM

International airports
6 international and 16 domestic airports handling over 100 mil + passengers in 2018

Global sea connections
7 globally reconised ports with an efficient network handling 90% of Malaysia's trade

Source: MITI

Electricity Reliability

The country maintains a highly reliable electricity grid. Its consistent and stable energy supply ensures operational continuity for businesses. This reliability provides a solid foundation for integrating RE sources into the existing power grid, offering a smooth and dependable transition toward sustainable energy use.

The grid infrastructure is pivotal in the country's energy supply, fostering economic growth and rapid development. Continuous investments in the grid network guarantee customers reliable access to energy through a modern and efficient grid.

RE Availability & Potential

Malaysia benefits from conducive conditions and robust government backing, promoting the expansion of RE resources. The country's commitment to sustainability, complemented by an extensive infrastructure, facilitates easier access to RE sources. Advancements in solar, wind, and hydroelectric power have increased availability and effectiveness in harnessing these resources to meet energy demands.

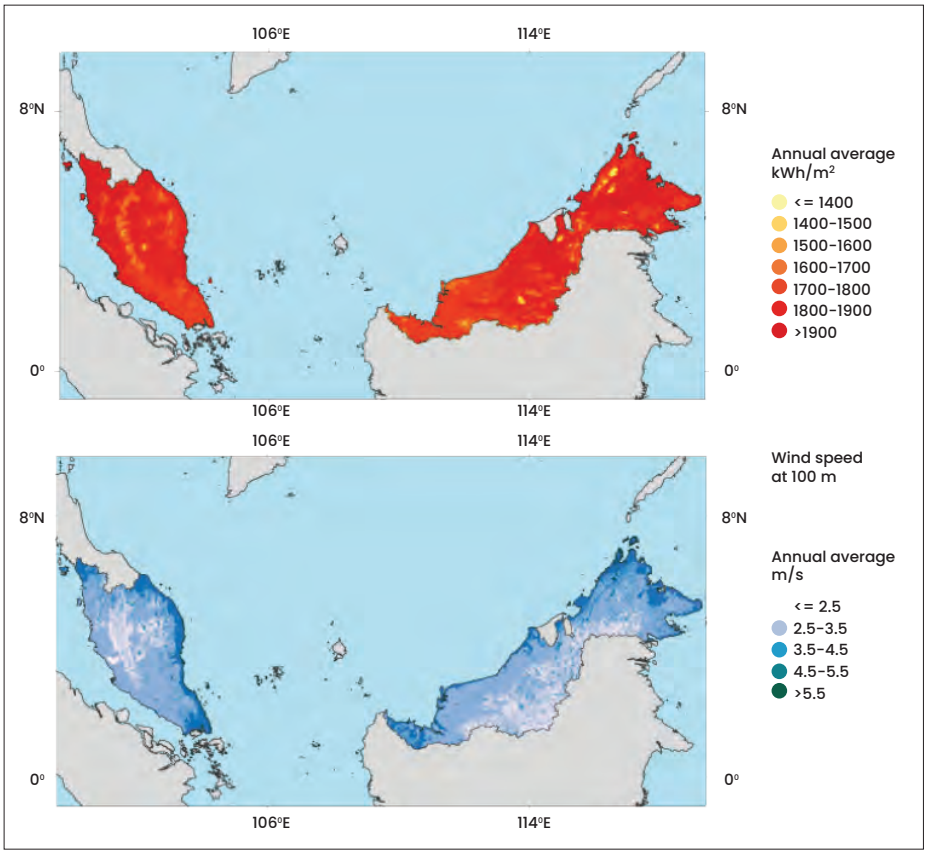
Located near the equator, Malaysia boasts high solar irradiation all year round, with Kota Kinabalu leading at 1,900 kWh per square metre (m^2). Wind speed varies between regions, offering good potential near the Indian Ocean and South China Sea, making areas like Mersing, Kudat, and Sabah promising for wind energy.

Hydropower potential is significant due to the country's high rainfall and abundant water resources, with small hydropower plants contributing substantially.

With vast oil palm plantations expanding over the years, Malaysia has emerged as a prominent global biofuel supplier. However, despite the significant role of biomass in the country's energy mix, it faces constraints in achieving its full potential due to supply uncertainties and other technical, financial, and policy barriers.

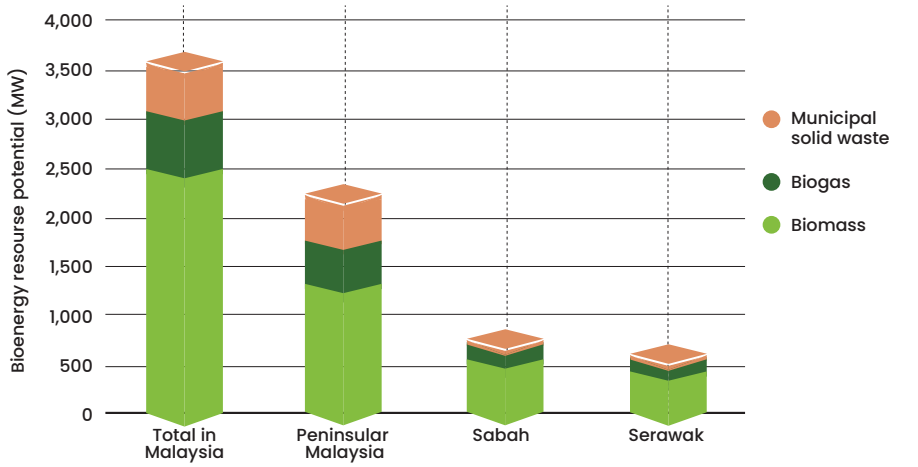
Biogas from various sources, including municipal solid waste and palm oil mill effluent, notably shows significant potential. Biomass resources, especially in Peninsular Malaysia, Sabah, and Sarawak, hold the largest capacity, with biogas and municipal solid waste also presenting substantial potential for energy generation. ●

Malaysia's RE resource potential



Disclaimer: This map is provided for illustration purposes only. Boundaries and names shown on this map do not imply the expression of any opinion on the part of IRENA concerning the status of any region, country, territory, city or area or its authorities or concerning the delimitation of frontiers or boundaries. Source: ESMAP, 2019; DTU, 2015. Also available on the IRENA Global Atlas for Renewable Energy web platform: https://globalatlas. irena.org/

Overview of bioenergy resources availability in Malaysia



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ACCOMPLISHMENTS OF SUSTAINABLE ENERGY PROJECTS

Success Stories

Self-consumption (SELCO)

Malaysia Marine and Heavy Engineering Holdings (MMHE) Berhad
The MMHE Project, located at West Yard in Pasir Gudang, Johor, Malaysia, boasts a capacity of 8.3 MW. Representing Malaysia's largest rooftop solar installation within a single compound, the project was executed by M+ by PETRONAS under an agreement set to extend for 21 years, lasting until 2042.

(Credit: M+ by PETRONAS).

MMHE Project, Pasir Gudang, Johor.

Leveraging the SELCO scheme, this initiative incorporates 18,720 units of solar PV panels covering a total area of 440,496 sq ft. This solar infrastructure is designed to power eight buildings at MMHE West, generating an estimated 10,000 MWh of clean energy annually. Over the 21-year agreement period, this production will facilitate a reduction of approximately 132,000 tonnes of carbon emissions - an equivalent environmental impact to planting 2 million trees.

Net Energy Metering (NEM)

Perusahaan Otomobil Nasional Berhad (PROTON) - 12,055.440 kWp
PROTON unveiled its solar power initiative at its Tanjung Malim plant in March 2022. This project was designed to aid the national carmaker in reducing its CO2 emissions by 11,536 tonnes annually while providing utility cost savings. It comprises Malaysia's largest parking lot bi-facial solar panel facility, along with solar panels mounted on its factory rooftop. The combined power generated is 12MWp, sufficient to meet up to 25 per cent of the plant's power consumption.

Covering 23.4 acres, PROTON's motor pool car park offers parking spaces for 2,880 cars. It serves as a transit point for cars produced at Tanjung Malim before distribution to dealers and outlets nationwide. The area now hosts 20,544 bi-facial solar panels, which derive energy from both direct sunlight on top and reflected sunlight from the ground and the cars parked beneath the panels. These panels also offer shaded car storage, protecting newly produced cars from the elements.

Built and commissioned by Pekat Group and its associate MFP Solar, the parking lot solar panel facility can generate 9MWp. It is the largest in Malaysia and for any car manufacturer. It allows PROTON to save up to RM4.39 million a year on its energy bill, with a further saving of RM1.46 million available via the 3MWp generated by the factory roof-mounted panels.

PROTON's solar panel facility is part of the company's green initiative as the company takes up the challenge to help Malaysia meet the government's target of becoming a carbon-neutral nation by 2050.

Xinyi Solar (Malaysia) - 29,666.635 kWp
One of the world's largest solar glass manufacturers, Xinyi Glass Holdings Ltd, launched its large-scale solar photovoltaic (PV) project in Melaka in January 2020 through its subsidiaries, Energy Smart (Malaysia) Sdn Bhd and Xinyi Solar (Malaysia).

PROTON Tanjung Malim, Perak.

The first and second phases of the project were completed at the time of the launch, boasting an installed capacity of 19MWp.

Malaysia is a strategically important market for Xinyi Group as it continues growing its business there. The Group is committed to giving back and creating a sustainable impact in its communities.

Approximately RM60 million will be invested in installing a 31MWp rooftop solar PV system across its facilities in Jasin, Melaka. This project is estimated to reduce carbon emissions by 39,649 tonnes annually.

The Group looks forward to powering up its operations with the environmentally friendly energy generated from this project. Additionally, it anticipates approximately RM15.9 million in annual savings on its electricity costs through this initiative.

Large Scale Solar (LSS)

Samaiden Group Berhad

Samaiden, an ASEAN Energy Award 2017 recipient, is a clean energy provider established in 2013. The company primarily engages in the engineering, procurement, construction, and commissioning (EPCC) of solar PV systems and power plants. Utilising comprehensive industry knowledge and domain expertise, it is dedicated to delivering high-quality RE solutions and ensuring customer satisfaction.

The company's portfolio encompasses several LSS projects, including:

- *Type*: LSS1
  Company: Fairview Equity Sdn Bhd
  Capacity: 9.99 MWac
- *Type*: LSS1
  Company: Fairview Equity Sdn Bhd
  Capacity: 5 MWac
- *Type*: LSS1
  Company: UiTM Pasir Gudang, Johor
  Capacity: 25 MWac
- *Type*: LSS2
  Company: Kuala Terengganu, Terengganu
  Capacity: 6.15 MWp

Feed-in Tariff (FiT)

Solar: Gading Kencana Sdn Bhd

Gading Kencana initiated its business by retailing solar-powered garden lights as early as 2000. Progressing from solar garden lights, the company transitioned to solar-powered street lighting.

It soon garnered the expertise by training its staff in Germany to design and construct Stand-alone (off-grid) Solar PV systems. These solar PV systems were installed in Orang Asal villages, remote settlements, and schools in Sabah and Sarawak. Gading Kencana takes pride in two notable projects: the SURIAku and the Wakaf Solar Masjid.

The SURIAku project involved an installation of 4KWp solar PV systems in the houses of 20 underprivileged families in the Arau district, Perlis, under the FiT scheme. This initiative significantly improved the families' income stability, transforming their previously modest and irregular income into a more regular one.

The Wakaf Solar Masjid project emerged

UITM Pasir Gudang, Johor.

(Credit: Samaiden Group Berhad)

Gading Kencana 8MW Solar Farm, sprawling 17.17 acres in Melaka.

as a combined effort between the office of the Member of Parliament of Johor Bahru and Gading Kencana. Around 25 mosques and suraus were equipped with solar rooftop PV systems of varied capacities under the FiT scheme. This project ensured that these places of worship received a regular income to maintain their premises instead of relying on irregular contributions from their congregations.

Biogas: Concord Group

The Concord Group, a prominent player in Malaysia's biogas industry, has made substantial advancements through the FiT quotas it obtained from SEDA Malaysia. These quotas facilitated the establishment of several biogas plants in Pahang, Johor, and Terengganu, contributing to Malaysia's sustainable energy initiatives.

The Concord Group currently operates at various biogas plant locations:

- Lepar Hilir Biogas Plant, Pahang (commissioned in December 2018)
- Keratong 2 Biogas Plant, Pahang (commissioned in February 2019)
- Lok Heng Biogas Plant, Johor (commissioned in June 2019)
- Adela Biogas Plant, Johor (commissioned in June 2019)
- Kemaman Biogas Plant, Terengganu (expected initial operation date (IOD) December 2021)
- Sungai Tong Biogas Plant, Terengganu (expected IOD December 2021)
- Ulu Keratong Biogas Plant, Pahang (expected IOD August 2022)

Their efforts have significantly created employment opportunities in rural areas, particularly in FELDA estates and Kuala Lumpur (HQ). About 90 per cent of the on-site staff were recruited from the local plantation communities, previously involved in odd jobs in the area. These individuals were absorbed into Concord Group's workforce upon receiving training and job exposure.

As one of the pioneering project developers in Malaysia, the Concord Group has reaped benefits from the well-defined FiT scheme conducted by SEDA Malaysia. The framework's accessibility and business feasibility have remained consistent over the past decade, attracting other project developers and financial institutions to enter Malaysia's biogas industry.

Biomass: Tenaga Sulpom Sdn Bhd

With the burgeoning landscape in the RE sector, Tenaga Sulpom Sdn Bhd emerged, led by HS Yap, Director of TSSB, and the team. This entity oversees operations at an integrated 7MW biomass power plant under SEDA Malaysia's FiT scheme.

Its core team actively participates in diverse projects, collaborating closely with various stakeholders to expand the RE industry into a substantial market in Malaysia. They provide counsel and collaborate with government agencies, shaping innovative industry concepts while extending support for government and private RE developments.

Hydro: Amcorp Power Sdn Bhd

Amcorp Power Sdn Bhd initiated its inaugural RE project under the Small Renewable Energy Power Programme (SREP) scheme, wherein TNB would

A 7MW biomass plant at Tenaga Sulpom Sdn Bhd, Dengkil, Selangor.

Adela Biogas Plant.

purchase the generated RE at a fixed tariff of RM0.167/kWh for a concession period spanning 21 years.

In 2011, the SREP transitioned to the FiT scheme, facilitated by establishing SEDA Malaysia, leading to an increased tariff of RM0.24/kWh. This transition significantly bolstered Malaysia's small hydropower sector, resulting in approximately 53 hydro plants awarded under SEDA Malaysia's FiT scheme, boasting a combined capacity of 589MW.

Benefitting from the shift to the FiT scheme and the raised tariff, Amcorp undertook several RE expansions. This included enhancing its 4MW mini hydropower plant in Bentong, Pahang, boosting its capacity to 6.6MW, and developing a 20MW mini hydropower plant in Raub, Pahang.

Amcorp operates as a wholly-owned subsidiary of Amcorp Properties Berhad (Amprop), a privately held company incorporated and domiciled in Malaysia. Embarking on their maiden RE project in 2009, Amcorp has progressively accumulated an RE installed capacity of 36MW in small hydropower and solar power plants. ●

Amcorp Liang 20MW Mini-Hydro Power Plant, Raub, Pahang.

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