



MINISTRY OF ECONOMY

National Energy Transition Roadmap

Part 1: Flagship Catalyst Projects and Initiatives




Energising the Nation, Powering Our Future

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Ministry of Economy

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Foreword

The Twelfth Malaysia Plan, 2021–2025 (Twelfth Plan) outlines the nation’s aspiration to achieve net-zero GHG emissions as early as 2050, while the National Energy Policy, 2022–2040 (DTN) lays the groundwork for transforming the energy landscape. DTN strives for an energy transition that is fair and inclusive for everyone.

Today, the global energy sector is undergoing a rapid transformation while addressing energy trilemma of security, affordability, and sustainability. There is a growing momentum both domestically and internationally to further decarbonise energy systems towards net-zero GHG emissions.

In light of this, the government is developing the National Energy Transition Roadmap (NETR) to accelerate Malaysia’s energy transition. NETR is critical for Malaysia to navigate the complexity of energy transition on a large scale, especially the shift from a traditional fossil fuel-based economy to a high-value green economy.

This document outlines our approach to effectively manage the energy transition, which requires a whole-of-nation approach involving the federal government, state governments, industry and the general public, in partnership with the international community.



NETR has two parts. This document is the **first part (Part 1)** of NETR, which outlines 10 flagship catalyst projects and initiatives based on six energy transition levers, namely: energy efficiency (EE); renewable energy (RE); hydrogen; bioenergy; green mobility; and carbon capture, utilisation and storage (CCUS).

Part 2 will focus on establishing the low-carbon pathway, national energy mix and emissions reduction targets as well as the enablers needed for the energy transition. The targets will reinforce Malaysia's commitment as a responsible stakeholder aiming to achieve its net-zero greenhouse gas (GHG) emissions aspirations as early as 2050, despite contributing 0.8% to global GHG emissions.

The Ministry has undertaken active consultation sessions to study and identify the best practices and lessons learnt, as well as existing and planned projects undertaken by policymakers, industry players, technology experts and businesses. Moving forward, NETR will provide clarity and coherence in policy planning and implementation for the energy sector to transition towards a low-carbon future.



Rafizi Ramli
Minister of Economy
July 2023



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Executive Summary

As a country committed to sustainable development, Malaysia has embarked on a transformational journey to reshape its energy landscape. Malaysia recognises the need for a bold and forward-thinking approach in reducing its fossil-fuel reliance and investing in alternative sources of energy that are clean, accessible, affordable, sustainable and reliable.

As of 2020, four energy sources dominated the national total primary energy supply (TPES) mix. Natural gas constituted the largest portion of primary energy supply at 42.4%, followed by crude oil and petroleum products at 27.3% and coal at 26.4%. Renewables, comprising mainly hydroelectric, solar and bioenergy, constitute only 3.9%.

The government has recently announced its revised RE capacity mix target, up from 40% in 2035 to 70% by 2050. Accordingly, RE capacity will be further scaled up and the existing export ban on renewables has been lifted to facilitate cross-border trade.

The government is also in the midst of developing the Long-Term Low Emissions Development Strategy (LT-LEDS) to outline its policies and actions for GHG mitigation in key economic sectors, including energy. This will further strengthen its commitment to cut 45% carbon intensity against GDP by 2030 compared to the 2005 baseline.

The National Energy Transition Roadmap Part 1 has identified 10 flagship catalyst projects and initiatives to accelerate the pace of the energy transition. These flagship projects are expected to generate an estimated total investment of more than RM25 billion, 23,000 job opportunities and a reduction in GHG emissions of more than 10,000 Gg CO₂ equivalent per year.



Introduction

Malaysia has an equatorial climate, with temperatures increasing in the range of 0.13–0.24°C per decade since the 1970s. Rainfall distribution is influenced by the topography and monsoon winds, and annual rainfall averages between 2,000 and 4,000 mm. Malaysia has consistently maintained more than 50% of its landmass as forest following its voluntary pledge at the Earth Summit in 1992. Terrestrial biodiversity is concentrated within these forests and the nation is considered to be one of the world's mega-diverse countries.



Malaysia is a small open economy with gross domestic product (GDP) and gross national income (GNI) of RM1.79 trillion and RM1.73 trillion, respectively, in 2022. Its population stood at 32.7 million people in 2022 and is expected to reach 40 million by 2050. Meanwhile, the urbanisation rate was 75% in 2020, and is expected to reach 85% by 2040. Economic and population growth, as well as rapid urbanisation, will drive a rise in energy demand, which is expected to increase by 2% annually until 2050.

The country transitioned from an agricultural and commodity-based economy towards manufacturing and services in the 1980s. It has traditionally been a producer of finite quantities of oil and gas, which contributed approximately 13% to GDP in 2021. Indigenous gas resources have ensured secure energy supply at affordable prices.

As the nation evolves and lifestyles change, environmental sustainability has gained more focus in business and policy decisions, and this has implications for people's livelihoods. Rapid urbanisation and climate change require a timely adjustment of the way we live, commute and interact with our surroundings, including the way in which we consume and produce energy.

The Domestic Energy Landscape

In 2018, the energy sector contributed approximately 28% of GDP and employed 25% of the total workforce in Malaysia. In addition, it is a key source of national income, with petroleum-related products contributing 31% of fiscal income, and energy exports constituting 13% of total export value. The energy sector also benefits more than 10 million customers by providing daily access to an electricity supply and enabling mobility through the reliable supply of transport fuels. Jobs and business opportunities created in the energy sector, as well as economic multipliers in energy-related supply chains, also contribute significantly to Malaysians' quality of life and produce a positive socioeconomic impact for the *rakyat*.

Fossil fuels continue to contribute the largest share of Malaysia's energy supply, and have a significant influence in shaping the country's energy landscape. As of 2020, four energy sources dominated the national TPES mix. Natural gas constituted the largest portion of primary energy supply at 42.4% of TPES, followed by crude oil and petroleum products at 27.3% and coal at 26.4%. Renewables, comprising hydropower, solar and bioenergy, constituted just 3.9% of TPES.

Historically, the power sector in Malaysia has operated as a vertically integrated monopoly system. Over time, it has undergone various stages of liberalisation. In accordance with government policy, the power sector was privatised with the aim of attracting investment as well as enhancing efficiency and productivity to ensure a sufficient supply. Additionally, the government has encouraged the involvement of independent power producers (IPPs) to improve the reliability of the electricity supply and address the shortage of generation capacity to meet demand.

Natural gas plays an important role as a transitional fuel in energy transition. The government has implemented third party access (TPA) in 2017 to provide healthy competition among industry players including the independent power producers (IPPs). This will facilitate the shift towards market-based pricing for power and non-power sector, thus ensuring reliable gas supply at competitive prices.

Similarly, the government intends to reform the power sector further by establishing a TPA framework to supply fuel sources, and access to the grid infrastructure and the retail market. In addition, the government will embark on electricity tariff restructuring initiative. These measures will ensure cost reflective prices, enable higher penetration of renewable energy and enhance Malaysia's competitive advantage.

Energy transition refers to the shift from an energy system dominated by the use of fossil fuels with high carbon emissions intensity towards a system based on clean and renewable energy sources. The energy transition process is unfolding at a swift pace due to rapid technological developments and the increasing awareness of global net-zero emissions targets.

The accelerated pace of the energy transition has also presented Malaysia with the opportunity to restructure its economy and maximise the potential for green growth. Investments supporting the energy transition create new businesses and jobs, drive innovation and enhance national competitiveness. The energy transition has also fostered greater international cooperation and strategic collaboration with other countries.

Given the importance of the energy sector to socioeconomic development, it is critical that Malaysia's energy sector remains future-proof to any domestic or global issues.

The government is mindful of challenges such as growing energy demand, the increasing subsidy burden and declining oil and gas resources, as well as rising energy costs. In addressing these challenges, the government is developing the National Energy Transition Roadmap (NETR) to accelerate Malaysia's energy transition.

Malaysia's Regional Partnership to Accelerate the Transfer of Technology and Green Financing

In March 2023, Malaysia joined the Japan-led Asia Zero Emission Community (AZEC) along with Australia, Brunei, Cambodia, Indonesia, Laos, the Philippines, Singapore, Thailand and Vietnam.

AZEC is a regional energy cooperation block that aims to drive the energy transition on the principles of cooperation.

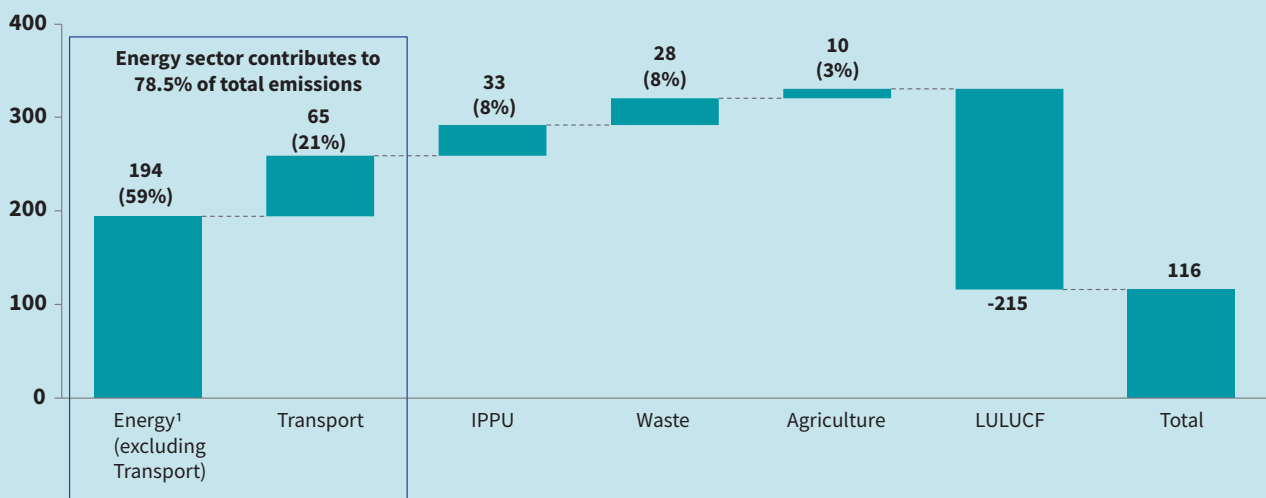
The Case for Change

Growth in the energy sector drives development in various adjacent industries, creating spin-offs through employment, capital inflows and investments, as well as supporting the energy service companies ecosystem.

However, the energy sector has been the country’s largest contributor of greenhouse gas (GHG) emissions. A summary of Malaysia’s GHG inventory in 2019, based on the Fourth Edition of the Biennial Update Report (BUR4) submitted to the United Nations Framework Convention on Climate Change (UNFCCC), is as shown in Exhibit 1:

Exhibit 1: Malaysia’s GHG Inventory in 2019

Malaysia's GHG inventory, Mt CO₂e (2019) from BUR4



¹ Refers to emissions from energy industries, manufacturing industries and construction, other sectors and non-specified energy emissions, and fugitive emissions from fuels.

Source: Malaysia's Fourth Biennial Update Report submitted to the UNFCCC (2022)

In 2019, the energy sector emitted 259,326.11 Gg CO₂ equivalent, or 78.5% of total emissions. This was followed by industrial processes and product use (IPPU) at 10%, waste at 9% and agriculture at 3%. The BUR4 report also listed climate mitigation actions undertaken in the energy sector, such as the use of energy efficiency (EE) measures, energy-efficient vehicles, renewable energy (RE), biodiesel and natural gas instead of coal for power generation.

The energy sector has long driven Malaysia's development and growth. Yet emissions have also increased in tandem with the country's economic growth, necessitating an urgent need to transition towards a low carbon economy. This will involve meeting the country's climate commitment to cut 45% carbon intensity against GDP by 2030 compared to the 2005 baseline.

On 29 March 2023, the United Nations General Assembly passed a significant resolution requesting that the International Court of Justice outline the legal responsibilities of states concerning climate mitigation and adaptation. The current trajectory of climate change poses a threat to the global economy, trade and financial system, with potential losses amounting to nearly 10% of GDP by 2050. A critical factor when addressing climate change is the energy sector, which, according to the International Energy Agency (IEA), is responsible for 73.2% of GHG emissions worldwide. To defend the 1.5°C frontier as outlined in the Paris Agreement, IEA's Net Zero by 2050 pathway¹ suggests that the world economy should consume 7% less energy in 2050 than at present.

In 2022, the European Union (EU) introduced the Carbon Border Adjustment Mechanism (CBAM), aimed at preventing carbon leakage² in the trade value chain. The current scope of CBAM covers industries that are important to Malaysia, such as iron, steel, aluminium, fertiliser, electricity and hydrogen. It is estimated that 57%³ of Malaysia's total exports will be affected by the implementation of CBAM. Further, the United States (US) introduced the Inflation Reduction Act (IRA) in 2022, which prioritises the production of and demand for domestically produced clean energy goods and services over foreign imports.

1 *IEA, Net Zero by 2050: A Roadmap for the Global Energy Sector.*

2 *Carbon leakage is where a company moves production from a country with stringent policies to one with more lenient policies.*

3 *Bank Negara Malaysia, Economic and Monetary Review 2022.*

The transition away from carbon-intensive systems is challenging for many countries, including Malaysia. Coal is a preferred source of energy due to its cost-effectiveness compared to alternatives such as natural gas and renewables. Additionally, 20% of Malaysia's economy comprises hard-to-decarbonise industries such as iron and steel, which rely heavily on fossil fuels⁴.

The energy transition drives an increasing demand for environmental, social and governance (ESG) compliance in investment and business decisions. This has a direct effect on the economy, including for small and medium enterprises (SMEs). ESG necessitates a shift in organisations' capacity to measure and report carbon emissions. This will be a critical factor in ensuring continued access to financing and prosperity for SMEs.

Effective energy transition management requires a whole-of-nation approach involving the federal government, state governments, industry and the general public, as well as the international community. This will ensure the coherence of policy planning and implementation in balancing the energy trilemma of security, affordability and environmental sustainability.

4 *Bank Negara
Malaysia Annual
Report 2022*

Malaysia's Policy Responses

Malaysia's five-year development plans cover socioeconomic policy planning that sets out the country's direction and growth targets as well as the allocation ceiling for development expenditure.

The Twelfth Malaysia Plan, 2021–2025 (Twelfth Plan) outlines the aspiration for the nation to achieve net-zero GHG emissions as early as 2050. The plan emphasises Malaysia's approach to effectively manage its energy transition. It recognises the complex and interconnected nature of energy systems and acknowledges the need to balance the energy trilemma. The approach not only ensures that energy policies and programmes are environmentally responsible but also takes the socioeconomic implications into consideration.

The National Energy Policy, 2022–2040 (DTN) lays the groundwork for a transformation in the energy landscape. It defines the energy transition as a structural shift in energy systems, characterised by a transition towards cleaner sources of energy, increased use of RE, and a significant reduction in carbon emissions. The energy transition is expected to occur at an accelerated pace, driven by rapid technological advances and robust climate change policies.

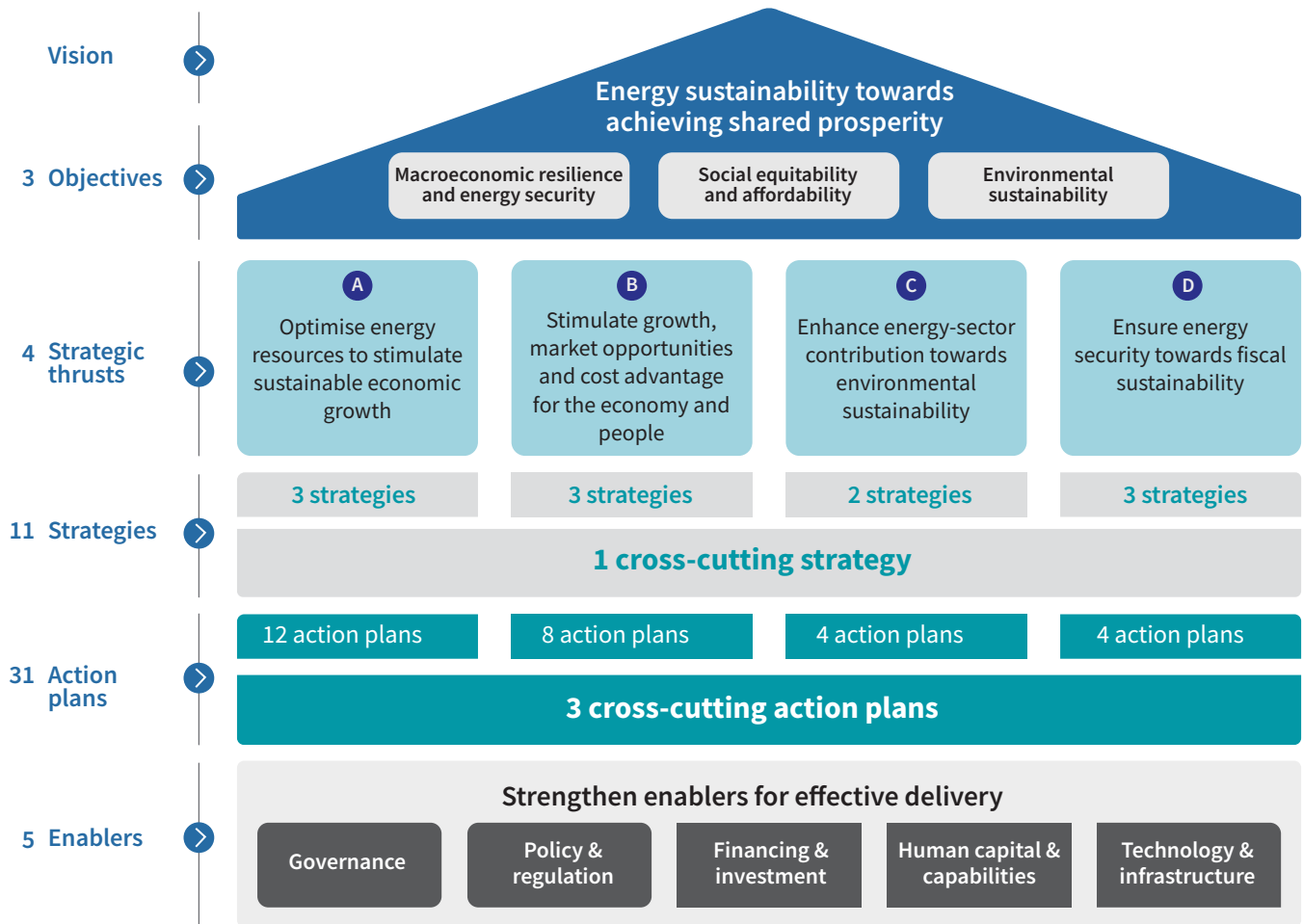
The DTN's Low Carbon Nation Aspiration 2040 (LCNA 2040) seeks to transform the primary energy supply, moving to cleaner, RE sources. LCNA 2040 emphasises low-carbon policies, including:

- Restricting the development of new coal power plants while the renewables share is being increased
- Driving energy efficiency practices
- Encouraging the adoption of electric vehicles (EVs)
- Increasing public transport's modal share
- Improving carbon footprint accounting and sustainability reporting

These progressive aspirations will ensure the energy sector is resilient to future challenges and in a good position to seize the opportunities arising from the energy transition. The DTN is supported by four strategic pillars, 12 strategies, 31 action plans and five enablers, as shown in Exhibit 2.

Exhibit 2: The DTN Framework

Framework of National Energy Policy, 2022–2040 (DTN)



Malaysia is an ardent proponent of an energy transition anchored on just, inclusive and orderly principles. The government desires to develop a green economy that is fair and inclusive for everyone, creating decent work opportunities for all.

Just Energy Transition (JET): What It Means and What Needs to Be Overcome

What it means: Just transition means greening the economy in a way that is as fair and inclusive as possible for everyone, creating decent work opportunities and leaving no one behind.

What needs to be overcome: Energy transition brings significant challenges and risks to the livelihood of workers and communities, especially in high-carbon sectors, and increased energy costs through transition investments.

National Energy Transition Roadmap (NETR)

The Ministry of Economy leads the development of the NETR with invaluable support from the Steering Committee and the Technical Committee. These committees comprise representatives from ministries, agencies and private sector (Exhibit 3) to help ensure a collaborative and comprehensive approach to the development process. In addition, the Project Team includes representatives from the Energy Commission (ST), Sustainable Energy Development Authority (SEDA), Malaysian Green Technology and Climate Change Corporation (MGTC), PETRONAS and Tenaga Nasional Berhad (TNB) to leverage the diverse expertise in ensuring NETR's strategies and plans meet the needs of the wider stakeholders.

Exhibit 3: The NETR Steering Committee and Technical Committee members



To ensure inclusive participation in the development of NETR, the Ministry of Economy organised a workshop on 17 April 2023 as a platform for discussions and information exchange between ministries, agencies, the private sector and industry associations, including those from Sabah and Sarawak.

The ministry has also undertaken more than 40 engagements and consultations to gather feedback and ensure the accuracy and validity of the NETR data and initiatives. This feedback has helped to shape the scoping of the roadmap and refine the NETR's flagship catalyst projects and initiatives.

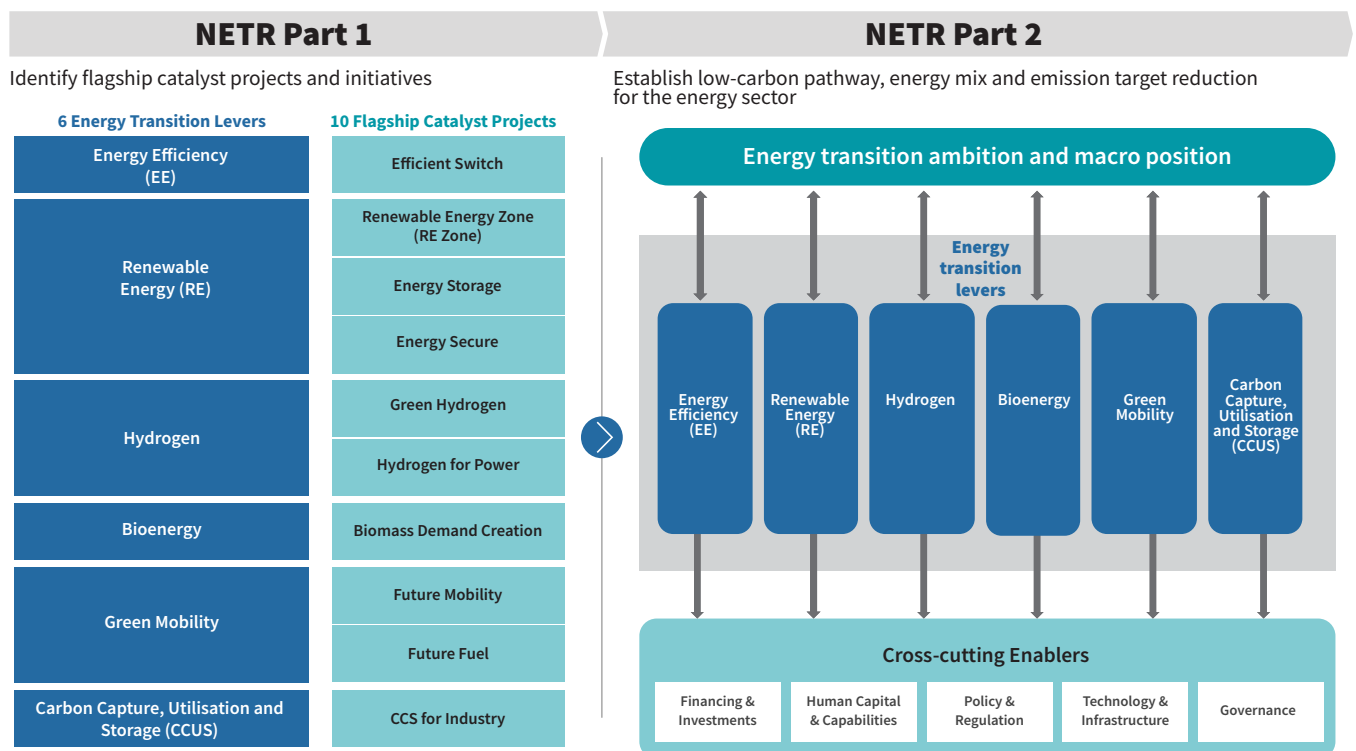
The Project Team undertook a comprehensive scoping and stocktaking process of macro and sectoral policies, including the Twelfth Malaysia Plan, the DTN, BUR4, the National Energy Efficiency Action Plan (NEEAP), Malaysia Renewable Energy Roadmap (MyRER), Malaysia Energy Transition Outlook (METO), National Low Carbon Cities Masterplan, Green Technology Master Plan Malaysia 2017–2030, Low Carbon Mobility Blueprint, and GHG emissions reduction plans from the state governments and private sector.

The team also consults and collaborates with the Ministry of Finance (MOF), Bank Negara Malaysia (BNM) and Securities Commission (SC) to explore suitable energy transition financing.

The development of the NETR is divided into two parts (Exhibit 4). Part 1 outlines the 10 flagship catalyst projects and impact initiatives based on six energy transition levels, namely: EE; RE; hydrogen; bioenergy; green mobility; and CCUS. The six levels are further supported by five enablers: governance; policy and regulation; finance and investment; human capital and capabilities; and technology and infrastructure.

Part 2 will focus on establishing the low-carbon pathway, energy mix and emissions reduction targets needed for the energy sector. The NETR will further explore the provision of technology transfer and green financing through bilateral and multilateral cooperation. Targeted investments, people strategies and international cooperation planning, as well as policy and regulatory frameworks, will be strengthened to develop the infrastructure, technology and talent needed to scale up and sustain decarbonisation efforts.

Exhibit 4: Parts 1 and 2 of the NETR



Guiding Principles

There are four guiding principles behind the NETR (Exhibit 5). The first principle highlights the importance of aligning the energy sector with the country's aspirations and commitments to sustainable development.

The second principle emphasises that the energy transition must be just, inclusive and cost-effective. It acknowledges the challenges that exist for low-income and vulnerable populations. The NETR aims to ensure that the benefits and opportunities from the energy transition trickle down to every segment of society, leaving no one behind.

The third principle stresses the need for effective governance and a whole-of-nation approach. Collaboration with state governments is crucial to create a vibrant energy industry ecosystem that supports sustainability and facilitates the transition to a low-carbon economy.

The fourth principle highlights the significance of creating high-value employment for people and generating high-impact economic opportunities for SMEs.

Exhibit 5: The four guiding principles of NETR



Based on national aspirations and commitments



Just, inclusive and cost-effective



Effective governance and whole-of-nation approach

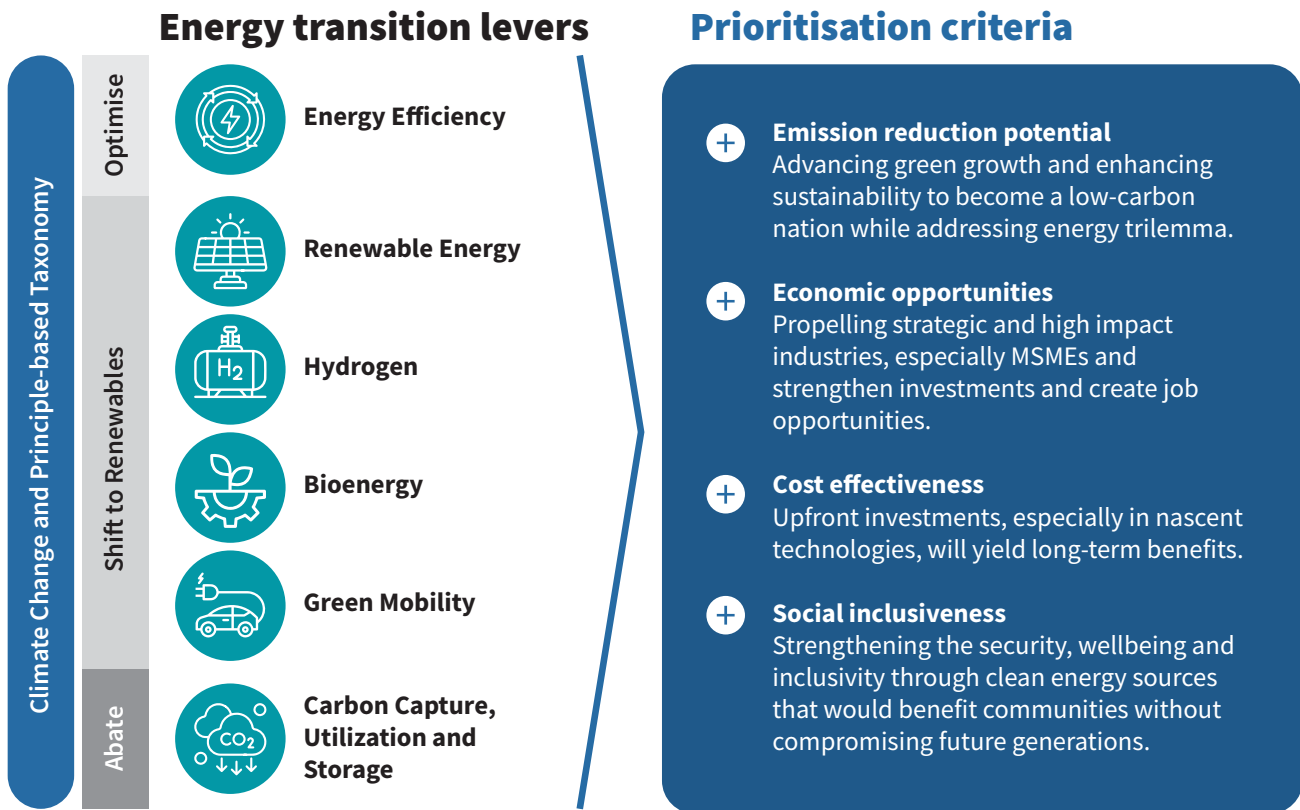


High-impact job opportunities, SME involvement in the ecosystem

In terms of project evaluation, the NETR subscribes to the Climate Change and Principle-Based Taxonomy defined by BNM. In addition, the proposals are further assessed in accordance with the themes of the Twelfth Plan, namely: resetting the economy; strengthening security, well-being and inclusivity; and advancing sustainability. Projects and initiatives are also evaluated based on their potentials to reduce GHG emissions, provide economic opportunities, promote cost-effective solutions and deliver benefits to the *rakyat*.

Based on the roadmap design, six energy transition levers have been identified namely EE, RE, hydrogen, bioenergy, green mobility and CCUS (Exhibit 6).

Exhibit 6: Energy transition levers



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% in 2035 to 70% 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.

The establishment of RE exchange system will position Malaysia as a regional hub for RE while giving added impetus to, and building on, the ASEAN Power Grid (APG) initiative. Malaysia is currently one of the key members participating in the Lao PDR-Thailand-Malaysia-Singapore Power Integration Project (LTMS-PIP), the pathfinder to advance cross-border power trade among ASEAN Member States, and the APG initiative in the long-run.

The government is also cognisant of the need to bolster the national power grid to accommodate higher RE uptake. This may come in the form of future-proofing Malaysia Electricity Supply Industry (MESI) elements including introducing smart grid features and enabling the grid for third party access.

Complementary Plans

Within the whole-of-nation approach, there has been a steady development of new policies and strategies to complement NETR in strengthening Malaysia's low-carbon transition. Among others, these include the Nationally Determined Contribution (NDC) Roadmap and Long-Term Low Development Strategy (LT-LEDS) as well as Future Proofing MESI from 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) and the National Biomass Action Plan by the Ministry of Plantation and Commodities (KPK).

Natural gas will continue to play a pivotal role in Malaysia's energy landscape as the nation moves towards a low carbon economy. To this end, the ministry is in the midst of developing the Natural Gas Roadmap (NGR) to optimise the value of indigenous natural gas resources, increase the domestic use natural gas use, enhance the security of supply and access to cost-competitive natural gas, and position natural gas to support Malaysia's energy transition.


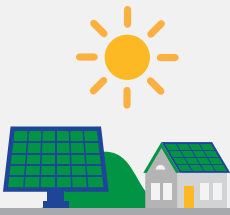
Flagship Catalyst Projects and Initiatives

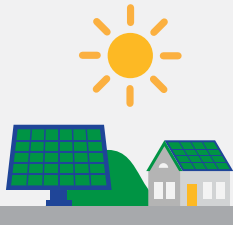
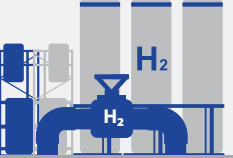
The Ministry of Economy has received an extensive list of proposals for energy transition projects and initiatives from ministries and businesses. Based on the evaluation process and guiding principles established by NETR, 10 flagship catalyst projects and initiatives were identified. These flagship projects are expected to generate an estimated total investment of more than RM25 billion, create 23,000 job opportunities and reduce GHG emissions of more than 10,000 Gg CO₂ equivalent per year.


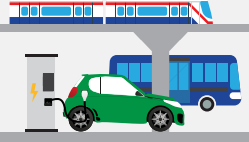
The implementation of the flagship projects and initiatives will be supported by the expansion of the Malaysia Energy Literacy Program (MELP) under TNB to advocate and foster the *rakyat's* understanding of energy issues, especially the energy transition and the challenges of the energy trilemma. Other support measures will be identified in Part 2 of NETR.

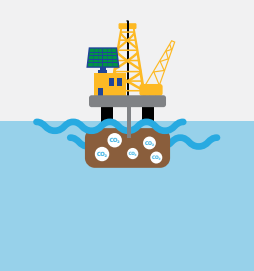
The flagship catalyst projects and initiatives will have several modalities to demonstrate the varying level of technology and solutions needed to address energy transition. As such, each modality will be championed by different entities displaying their unique approach in supporting Malaysia's energy transition advancement. The 10 flagship catalyst projects and initiatives and their implementation modalities are outlined in Exhibit 7:

Exhibit 7: NETR 10 flagship catalyst projects and initiatives and implementation modalities

Energy Transition Levers	Flagship	Modalities	Champion
Energy Efficiency (EE) 	Efficient Switch	Energy Efficiency and Conservation Act (EECA) The Energy Efficiency and Conservation Bill to regulate energy-intensive users, buildings and products will be tabled in Parliament in the fourth quarter of 2023.	NRECC
		Energy Audit For Rail Sector Railway operators to perform energy audit exercise under the Energy Audit Conditional Grant (EACG 2.0) aimed at establishing the current energy consumption baseline, identifying potential energy savings in their premises and lowering utility costs.	MOT
Renewable Energy (RE) 	Renewable Energy Zone (RE Zone)	Integrated RE Zone A large-scale, integrated sustainable development spanning the entire energy supply chain, from generation and energy storage to efficient demand management and consumption, will be created. A pilot RE Zone will be established encompassing an industrial park, zero-carbon city, residential development and data centre.	Khazanah Nasional Berhad
		Solar Park Centralised large-scale solar (LSS) parks co-developed by TNB, in partnership with SMEs, cooperatives, and state economic development corporations. These parks will consist of 100 MW deployment per site across 5 sites in several states.	TNB

Energy Transition Levers	Flagship	Modalities	Champion
	Renewable Energy Zone (RE Zone)	<p>Hybrid Hydro-Floating Solar PV (HHFS) Development of 2500 MW HHFS potential at TNB hydro dam reservoirs will increase RE generation close to 24-hour availability. The hydro plant acts as energy storage by conserving the water in the reservoir during peak hours and discharging it during non-peak, while providing quick response to the duck curve. Reduce investment by utilising existing hydro infrastructure as compared to BESS + solar PV. Potential scaling up for future green hydrogen feedstock in collaboration with other hydrogen producers such as Gentari as the green electron offtaker.</p>	TNB
		<p>Residential Solar The construction of 4.5 MW solar capacity across 450 homes in City of Elmina and Bandar Bukit Raja. Up to 10 kW solar capacity per house through rooftop leasing with offtake within the township by high-demand users from the commercial or industrial sector.</p>	Sime Darby Property
	Energy Storage	<p>Energy Storage System (ESS) Development of utility-scale ESS to enable higher penetration of variable RE in Malaysia.</p>	NRECC Energy Commission (ST)
	Energy Secure	<p>Sabah Energy Security Initiative An integrated initiative is underway to secure the long-term energy supply and support the socioeconomic development of the state. This includes: the development of large-scale solar (LSS) and small hydropower plants; the formulation of policy and regulatory framework on biowaste to ensure a consistent supply of feedstock; and the feasibility of geothermal for power generation.</p>	Energy Commission of Sabah (ECoS)
	Green Hydrogen	<p>Sarawak Hydrogen Hub Implementation of three integrated projects to produce green hydrogen will propel Sarawak as a regional green hydrogen hub. These projects involve the development of a green hydrogen production plant in Kuching by 2025 for domestic use, and two plants in Bintulu by 2027, mainly for export purposes. Sarawak State Government through SEDC Energy is collaborating with strategic partners to develop the state into a green hydrogen hub.</p>	SEDC Energy
	Hydrogen for Power	<p>Co-Firing of Hydrogen and Ammonia Green hydrogen and ammonia co-firing in collaboration with PETRONAS to decarbonise TNB generation plants.</p>	TNB

Energy Transition Levers	Flagship	Modalities	Champion
<p>Bioenergy</p> 	<p>Biomass Demand Creation</p>	<p>Biomass Clustering Development of potential biomass clusters with a centralised plant using aggregated feedstock from multiple neighbouring mills. Biomass clustering is expected to improve economies of scale as well as securing larger and more reliable feedstock.</p> <hr/> <p>Biomass Co-firing Co-firing initiative at the existing 2100MW Tanjung Bin Power Plant by burning biomass along with coal. Biomass sources include Empty Fruit Bunch (EFB) pellets, wood chips, wood pellets, bamboo pellets, coconut husk and rice husk. A pilot phase of co-firing will commence in 2024 with a view to scale up to a minimum of 15% biomass co-firing capacity by 2027.</p>	<p>NRECC SEDA</p> <hr/> <p>Malakoff</p>
<p>Green mobility</p> 	<p>Future Mobility</p> <hr/> <p>Future Fuel</p>	<p>EV Charging Stations Installation of 10,000 EV charging stations by 2025 along highways and at selected commercial buildings in collaboration with strategic partners, among others, TNB, Plus Malaysia Berhad (PLUS), Permodalan Nasional Berhad (PNB), Gentari and Sunway Group.</p> <hr/> <p>Mobile Hydrogen Refuelling Station Introduction of the first mobile hydrogen refuelling station for transportation in Peninsular Malaysia, in collaboration with NanoMalaysia Berhad, PETRONAS, United Motor Works (UMW) and the MGTC.</p> <hr/> <p>Public Transport Electrification This project involves electrification of first and last mile public transport and upgrading infrastructure and electrical lines at bus depots for charging, with maintenance, repair and overhaul (MRO) opportunities for local SMEs.</p> <hr/> <p>Solar Photovoltaic (PV) Installation for Rail Operations The Rail Sector Energy Management and Renewable Energy (EMRE) Action Plan entails the installation of Solar Photovoltaic (PV) systems for non-traction electricity usage in rail operations such as stations and depots.</p>	<p>MITI</p> <hr/> <p>MOSTI</p> <hr/> <p>MOT Prasarana</p> <hr/> <p>MOT</p> <hr/> <p>PETRONAS</p>

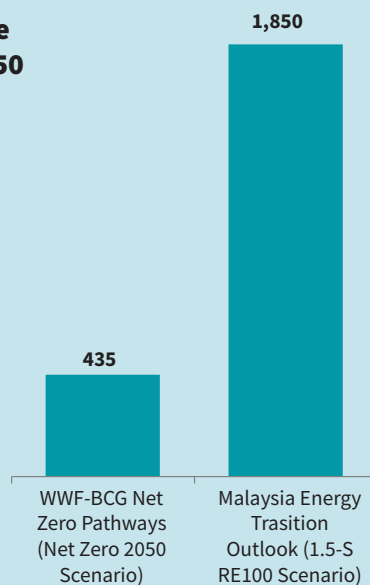
Energy Transition Levers	Flagship	Modalities	Champion
CCUS 	CCS for Industry	Regulatory Framework Development of policy and regulatory framework to facilitate the implementation of CCUS projects, including transboundary carbon movement.	Ministry of Economy
		Kasawari and Lang Lebah CCS Implementation of carbon capture and storage (CCS) catalyst projects for Kasawari and Lang Lebah high-CO ₂ gas fields, which are expected to be in operation by 2026 and 2028 respectively. CCS technology will be used to capture CO ₂ from the gas production field and store it in the depleted fields.	PETRONAS

Energy Transition Financing Requirement

METO 2023 and WWF-BCG report *Securing Our Future: Net Zero Pathways for Malaysia* indicated that the cumulative investment needed for Malaysia’s energy transition to achieve net-zero by 2050 ranges from RM435 billion to RM1.85 trillion (Exhibit 8).

Exhibit 8: Cumulative investments required for Malaysia to achieve net-zero by 2050

Estimated cumulative investments until 2050 (RM Billion)



To achieve the target of 70% RE in installed capacity mix by 2050, approximately RM637 billion is needed, which consists of investment in solar capacity as well as transmission grid and distribution network reinforcement.

The implementation of 10 flagship projects and initiatives under Part 1 of the NETR is expected to generate investment of approximately more than RM25 billion through a combination of private and public funding.

Meanwhile, Bursa Malaysia launched its voluntary carbon market, called the Bursa Carbon Exchange (BCX), to enable voluntary purchases of carbon credits from climate-friendly projects and solutions. The BCX Inaugural Auction took place on 16 March 2023 to facilitate price discovery.

Carbon trading in Malaysia is still at initial stage, where the Ministry of Finance in collaboration with World Bank is currently conducting a feasibility study for carbon pricing instrument (CPI). The study is focusing on the viability of Partnership for Market Implementation (PMI) and PMI Readiness Support Plan (RSP) in Malaysia. The study is expected to complete in 2025 to determine the carbon pricing instrument suitable for implementation in Malaysia.

Conclusion

There is no one-size-fits-all model to meet growing global energy needs and reduce GHG emissions. The NETR is critical if Malaysia is to navigate the complexity of energy transition on a large scale, especially the shift from a traditional fossil fuel-based economy to a high-value green economy. It will also reinforce the country's commitment as a responsible stakeholder aiming to achieve its net-zero GHG aspirations as early as 2050, despite contributing 0.8% to global GHG emissions.

Future energy pathways will be nationally determined and based on the country's unique circumstances and priorities. Over the next two decades, Malaysia will focus on driving clean energy through a whole-of-nation approach, improving energy efficiency, reducing carbon and methane emissions, and accelerating innovation to commercialise hydrogen technology. These actions will be accompanied by strategies to unlock capital flows in support of the energy transition.

The NETR Part 1 projects and initiatives will set the agenda and signal to the market the intended direction of the Malaysian government in exploring new energy sources, developing future capabilities and shaping market demand in the green economy. This further supports Malaysia's commitment to a Just Energy Transition that protects the *rakyat*, creates opportunity and supports technological innovation through a coordinated whole-of-nation approach.

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