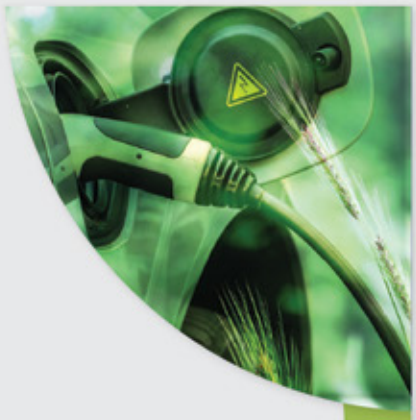
NATIONAL ENERGY POLICY 2022-2040



NATIONAL ENERGY POLICY, 2022-2040

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FOREWORD BY

PRIME MINISTER

YAB Dato' Sri Ismail Sabri bin Yaakob

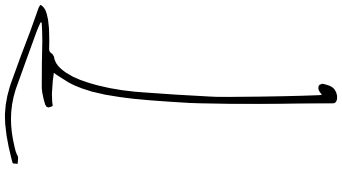
The energy sector has always been a critical engine of growth for the national economy. Over the years, it has contributed significantly to Malaysia's GDP — creating skilled jobs, playing an integral part in international trade, and all-in-all, being a major source of fiscal income for the nation's coffers. Looking ahead, the energy sector will continuously play a vital role in Malaysia's future economy - given that it is a sector of high value, built on innovation, technology, and human capital. A future-proof and competitive energy sector has far-reaching spill-over effects that are positive for the nation's entire economy, as it is a key enabler and driving factor of production for numerous major sectors of the national economy.

In addition to driving economic development, the energy sector plays a fundamental role in contributing to social outcomes that are up to par in Malaysia. For example, the energy sector has the potential to be a key catalyst for equitable regional development, where energy resources are leveraged to grow high-value downstream industries in Sabah, Sarawak, as well as rural states in Peninsular states. Expanding reliable energy access can contribute to socioeconomic empowerment in rural communities. Furthermore, if channelled correctly, the energy sector can also improve environmental sustainability – leading to improved quality of life among the *rakyat* as well as economic opportunities associated with the emerging green economy.

The National Energy Policy, 2022-2040 (DTN) strategically charts the way forward and outlines key priorities for the energy sector in the coming years. The DTN will position the energy sector as a catalyst for socioeconomic development. The DTN's progressive Low Carbon Nation Aspiration will also ensure that the energy sector takes full advantage of opportunities arising from the energy transition, as well as ensure the sector is future-proof and strategically positioned to meet subsequent challenges.

The DTN will also unlock economic benefits that contribute to strong economic recovery and hasten the country's progress to rebound from the COVID-19 pandemic. Through the DTN, new investments channelled into emerging energy sector areas and the green economy will be catalysed to spur enduring GDP growth and job creation. The growth of high value downstream industries and new sources of economic growth in the energy sector will aid in building Malaysia's momentum to break out of the middle income trap – enabling us to make our way towards becoming a prosperous high-income nation.

Implementation of the DTN requires full support and cooperation from a wide range of stakeholders in both the public and private sectors. Given the rapid pace of change and the importance of early-mover advantage, accountability and timely implementation of DTN priorities are critical. Only with focused and effective execution, will the substantial benefits of the DTN for businesses and the *rakyat* can be realised.



DATO' SRI ISMAIL SABRI BIN YAAKOB
Prime Minister
Putrajaya

September 2022

PREFACE BY

MINISTER IN THE PRIME MINISTER'S DEPARTMENT (ECONOMY)

YB Dato' Sri Mustapa bin Mohamed

A major transformation of the energy sector is currently taking place in the form of a global energy transition – a shift from fossil-based systems of production and consumption to renewable and sustainable sources of energy. A shift of this magnitude provides an opportunity for the global community to address climate change, re-design our economic policies and undergo sustained economic development, besides enhancing social inclusion, health, and energy security.

It is essential for Malaysia to successfully navigate this energy transition, whilst balancing issues such as energy security, affordability, and environmental sustainability. In doing so, Malaysia will be able to remain economically resilient while at the same time, leveraging on the economic opportunities of sustainable growth.

The introduction of the National Energy Policy, 2022-2040 (DTN) underscores the Federal Government's commitment towards energy transition. The DTN is spearheading a pragmatic move towards a cleaner energy mix by promoting enhanced demand-side management and encouraging the development, commercialisation, and adoption of green technologies – as well as the upskilling of the energy sector workforce in meeting future industry needs. Moreover, the DTN will promote an attractive investment climate, which includes increased compliance in meeting environmental, social and governance (ESG) commitments for key energy sub-sectors, such as the upstream oil and gas sector.

The successful implementation of the DTN would provide significant and widespread socioeconomic benefits for *Keluarga Malaysia*. This includes increased investments, economic multipliers, and the creation of jobs in future-proof sectors across the entire energy sector value chain.

In achieving these targets, a clear and comprehensive action plan has been developed to codify key activities, milestones, roles, and responsibilities of the various stakeholders.

The setting up of the National Energy Council will ensure that holistic planning, policy development, programme management supervision and DTN-related activities are all carried out efficiently and effectively.

The development of the DTN is the result of extensive collaboration between numerous ministries and agencies, private sector industry associations, energy sector players, and field experts. The Government looks forward to the continued cooperation and support of all stakeholders in driving Malaysia towards a greener, more sustainable future.

DATO' SRI MUSTAPA BIN MOHAMED
Minister in the Prime Ministers's Department (Economy)
Putrajaya

September 2022

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CHAPTER 1: INTRODUCTION

Introduction

Energy sector as the main driver for Malaysia's socioeconomic development

The energy sector, which acts as the main driver of growth for the Malaysian economy, and energy-intensive industries contribute 28 per cent of Gross Domestic Product (GDP) and account for 25 per cent of the total workforce. In addition, the energy sector is also a key source of national income with petroleum-related income contributing 31 per cent of fiscal income and energy exports constituting 13 per cent of total export value.

The energy sector has strongly contributed to the national socioeconomic impacts, benefiting over 10 million customers with daily access to electricity supply and is a foundational enabler for people mobility through the reliable supply of various transport fuels. Jobs and business opportunities created in the energy sector as well as economic multipliers in energy-related supply chains have also contributed significantly to the quality of life and positive socioeconomic effects for the *rakyat*.

Direct and indirect contribution of the energy sector to the national economy

Contribution of energy sector to **national GDP** (~RM400 billion)

Total **workforce** in energy sector (~4 million)

Average annual income of employees in energy sector

Number of **customers** with daily access to electricity supply

Total **export value** of petroleum and natural gas products (~RM130 billion per year)

Source: Department of Statistics Malaysia (2019)

Future-proofing the energy sector

Given the importance of the energy sector to the socioeconomic growth, it is critical that the energy sector remains future-proof to domestic and global developments. This measure is important to ensure the development of the energy sector remains sustainable and competitive moving forward.

In terms of domestic developments, the energy sector will need to be aligned and strongly positioned to support the Wawasan Kemakmuran Bersama 2030 (WKB 2030) and Twelfth Malaysia Plan, 2021-2025 (Twelfth Plan). The energy sector faces challenges in addressing demand-side management as the country experiences growing energy usage and heavy subsidy burden. Challenges also exist in supply-side aspects such as the inevitable decline in finite non-renewable sources of energy, increasing energy supply costs, complex environmental issues and fragmented energy governance.

In terms of global developments, the energy sector will need to be future-proofed in meeting megatrend challenges such as the energy transition as well as other regional and global socioeconomic, technological and geopolitical challenges that will impact the energy landscape.

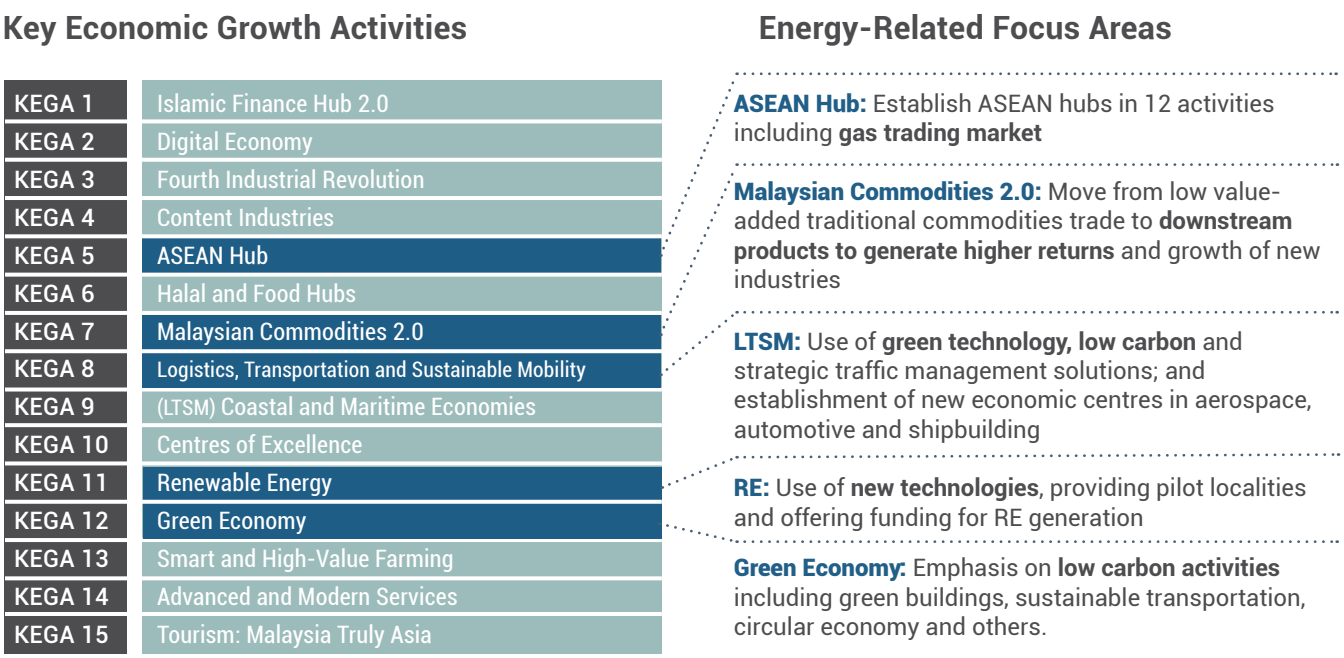
1.1 Energy Sector Alignment to National Long-Term Plan

The National Energy Policy, 2022-2040 aligns the energy sector to the country's long-term plan of Wawasan Kemakmuran Bersama 2030

WKB 2030 is the key reference point for the country's forward-looking national socioeconomic aspirations and development priorities. The primary goal of the WKB 2030 is to provide a decent standard of living to all Malaysians through development for all, addressing wealth and income disparities and by making Malaysia a united, prosperous and dignified nation. The energy sector has a key role to play in support of these objectives.

To enhance economic development and propel the country towards high-income nation status, the energy sector will need to enhance productivity, enable high value-added growth such as in downstream industries and spur new future economic sectors. Five Key Economic Growth Activities (KEGAs) are directly related to the energy sector such as sustainable mobility, renewable energy (RE) and the green economy. Spurring new energy-related sectors will also support the goal of reducing dependence on petroleum-based revenue and commodity trade, enhancing the resilience of the country's fiscal and economic position in the process.

Energy-related Focus Areas in Key Economic Growth Activities



Source: Wawasan Kemakmuran Bersama 2030

The energy sector will strengthen access to affordable, reliable and sustainable energy for all, in line with Sustainable Development Goal 7 of the 2030 Agenda for Sustainable Development (2030 Agenda) and *Aspirasi Keluarga Malaysia*. Equitable distribution of energy-related costs and benefits across income groups, ethnicities, regions, and supply chains will be given priority to support equitable regional development by leveraging the country's energy resource endowments.

The importance of harmonising socioeconomic development with the preservation of the environment and natural resources is also emphasised in WKB 2030. In particular, the need for national development through green growth, which emphasises low carbon development, resource efficiency as well as the preservation of environment and natural resource sustainability is highlighted. As approximately 80 per cent of greenhouse gas (GHG) emissions come from the energy sector, this sector has a key role in supporting the national agenda of enhancing environmental sustainability as an enabler to achieve shared prosperity.

1.2 Energy Transition and Global Megatrends

Developing a future-proof energy sector in line with the energy transition trend

Energy transition refers to a structural shift of energy systems towards cleaner sources of energy. This transition involves a shift from fossil fuel-dominated usage with high carbon emission intensity to a higher rate of RE usage and lower carbon emission intensity. Whilst energy transitions have occurred throughout history, the current energy transition is expected to occur at an accelerated pace. This is driven by rapid technological progress and strong climate change policies.

The drive for enhanced environmental sustainability through GHG emissions reduction and green economy initiatives is being spearheaded by multiple stakeholders across governments, businesses and investors. In this context, the National Energy Policy, 2022-2040 (DTN) is conceptualised to enable Malaysia to take progressive steps to future-proof and position the country to capture advantages from energy transition, including:

- establishing forward-looking targets and roadmaps on GHG emissions reduction, especially carbon emission to improve clarity for the *rakyat*, businesses, investors and the international community on the government's commitment towards a low carbon economy;
- enhancing and developing policies and regulatory mechanisms, which facilitate private sector participation in driving energy transition, including accommodating the entry of new energy technologies or innovations;
- providing catalytic incentives to encourage businesses to venture and shift to high potential green growth areas of the economy such as in low carbon mobility, low carbon cities, RE, energy storage and energy efficiency; and
- investing in the enablers and infrastructure to gain early-mover advantage into high potential green growth sectors.

Implementation priorities of environmental, social and governance standards

Investors are increasingly advocating for and factoring in environmental, social and governance (ESG) and transition risks[1] into investment decisions. The Government is mindful of the shifting global investment landscape with growing momentum for ESG-based investment, including:

- increasing stringency on ESG criteria in investment, with climate change considerations representing the largest ESG factor for investment decisions. One of the implications of this increased stringency is growing capital constraints and financing premiums for carbon-based investments such as coal power plant financing;
- increasing considerations of transition risks[1] for both greenfield and legacy investments, resulting in investments exclusion in sectors with high transition risks and enhanced shareholder advocacy for businesses to establish forward-looking plans to mitigate transition risks;
- growing shareholder demands for more stringent, comprehensive, and transparent environmental reporting and climate change commitments, including pressure for companies to implement initiatives to reduce carbon footprint.
- greater allocations for green investments including long positions taken by investors in high potential future green growth sectors, resulting in a wave of domestic direct investments (DDI) and foreign direct investments (FDI) focused on the green economy in many countries.

Embracing ESG by businesses

Businesses are faced with the heightened need to keep pace with energy transition and respond to growing ESG demands of consumers, business partners, and shareholders. Businesses have to respond to these opportunities and challenges in several ways, including:

- Improving carbon accounting, reporting transparency and setting formal commitments on emissions to ensure continued market access and to attract investment capital in response to increasing ESG demands of stakeholders;
- Enhancing environmental sustainability of businesses, including adoption of circular economy principles and optimising locations of manufacturing and operations based on ESG considerations, such as the ability to fully offtake RE sources for RE100[2] companies; and
- Reviewing and ensuring future-proofing of business strategies in the context of growing energy transition risks and gravitating towards new business models which involve stepping out beyond existing core businesses into new growth areas, such as new energy and other innovative energy solutions.

[1]Transition risks refer to expected financial return of assets due to changes and disruptions associated with high impact policy changes related to the climate agenda or technology risk.

[2]RE100 is the global corporate RE initiative bringing together large and ambitious businesses committed to 100% RE source.

1.3 Malaysia's Energy Landscape

In the context of the DTN, energy encompasses both electrical and thermal energy. It can be used either as fuel or feedstock domestically or for exports. The end-to-end energy value chain is covered in the DTN, encompassing energy production, primary supply, transformation and end-use demand. The DTN covers all energy sources from both renewable and non-renewable sources, including oil, natural gas, coal, hydroelectric, solar, bioenergy and other emerging energy sources. DTN also covers the final use of energy across all sectors of the economy, including the transport, industrial, residential and commercial sectors.

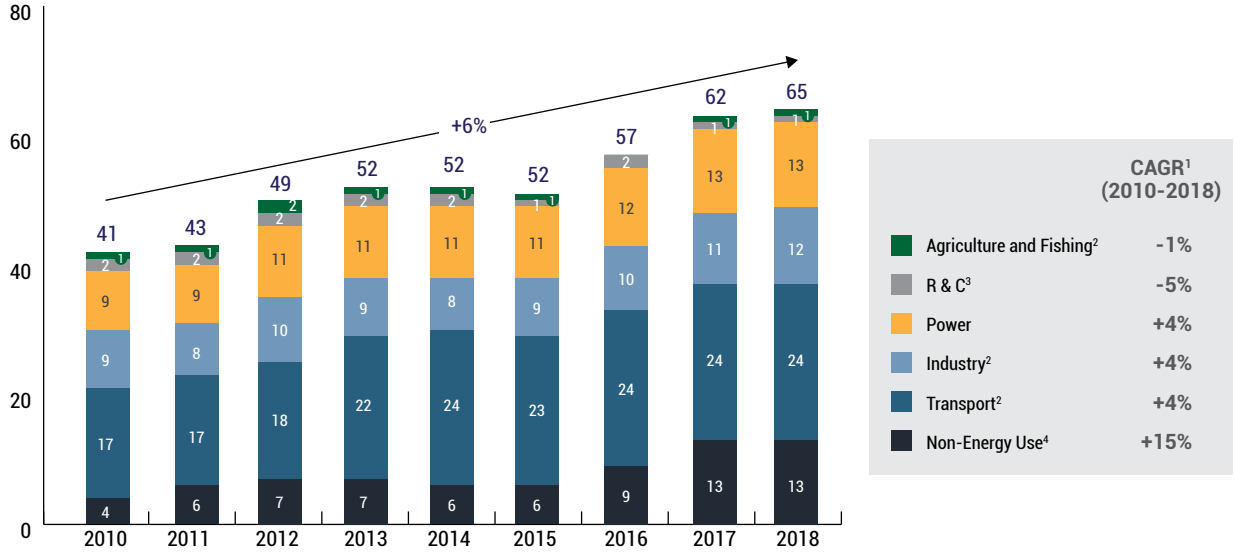
1.4 Evolution of Energy Demand-Supply Balances

Malaysia's final energy demand has been growing at an average of six per cent per annum between 2010 and 2018 and at four per cent per annum over a longer time period between 2000 and 2018. The transport, power and industry sectors represent the largest components of energy demand and collectively constitute approximately 75 per cent of total final energy demand. Energy demand from these sectors has been growing at a rate of four per cent per annum. Non-energy use, which comprises primarily of feedstock for the petrochemical industry, has been the largest driver of energy demand growth, with a growth rate of 15 per cent per annum between 2010 and 2018.

Final energy demand is expected to grow albeit at a slower pace. Lower correlations are typically observed between energy demand growth and GDP growth as economies mature and evolve from manufacturing-focused to service-based economies. Enhanced demand-side management and energy efficiency will also reduce the intensity of final energy demand across various sectors.

Final energy demand evolution by sector

Final Energy Demand by Sector (Mtoe)*



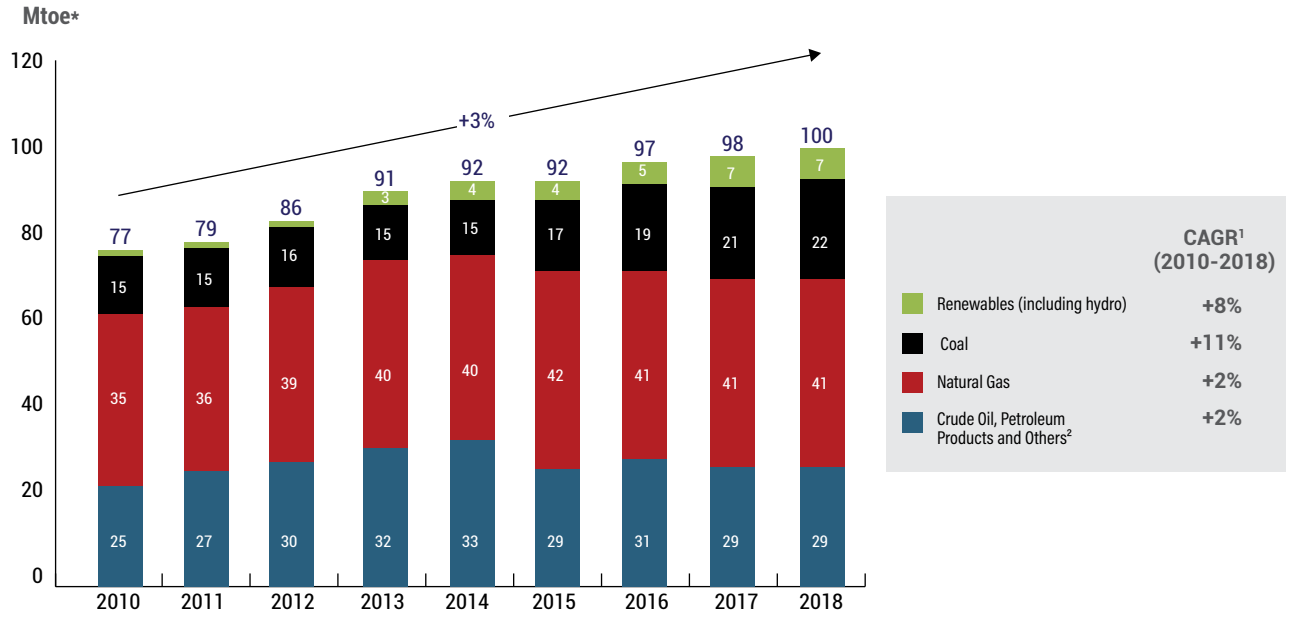
1. Compound Annual Growth Rate
2. Electricity excluded as electricity consumption of all demand sector is covered under power sector
3. Residential and Commercial
4. Use of products resulting from the transformation process for non-energy purpose (i.e., bitumen, lubricants and polymer) and as industry feedstocks

*The data are rounded up to nearest decimal point.

Source: Suruhanjaya Tenaga

On the supply-side, four energy sources dominate the national total primary energy supply (TPES) mix. Natural gas constitutes the largest portion of primary energy supply at 41 per cent of TPES, followed by crude oil and petroleum products and coal which constitute 29 per cent and 22 per cent respectively. Renewables, comprising mainly of hydroelectric, solar and bioenergy constitute seven per cent of TPES. Coal has experienced the highest rate of growth at 11 per cent per annum, driven primarily by demand from the power sector in Peninsular Malaysia. The increase in coal as a portion of the primary energy mix is mainly driven by energy security and affordability objectives.

TPES by energy source



1. Compound Annual Growth Rate
2. Others refer to non-crude energy forms which consist of imported light diesel, slop reprocess, crude residuum and residue used as refinery intake

*The data are rounded up to nearest decimal point.

Source: Suruhanjaya Tenaga

Based on forward-looking plans, the primary energy supply is expected to evolve to enable enhanced environmental sustainability. Measures to promote and increase the share of RE in line with the Five-Fuel Diversification Policy have been developed in 2000. These measures will collectively reduce overall energy sector emissions intensity and enhance domestic energy self-sufficiency as imported non-renewable sources of energy are substituted with indigenous sources of RE in the primary energy mix. Trends in fuel switching, such as the transition from internal combustion engine (ICE) vehicles to electric vehicles (EVs)[3] which will result in decreased demand for petroleum products and increased demand for electricity, are also expected to influence the primary energy mix and contribute to enhanced environmental sustainability of the energy sector.

[3] Electric vehicles refer to Battery Electric Vehicle (BEV) including cars, motorcycles and buses. Plug-in Hybrid Electric Vehicle (PHEV) refers to cars only.

1.5 Existing Energy-Related Acts and Policies

A range of existing energy-related acts and policies set the direction and guiding principles for the energy sector in Malaysia. These acts and policies have enabled the country to make balanced progress along all aspects of the energy trilemma.

The acts, supported by a series of policies provide specific stakeholders within the energy landscape with relevant authority to carry out responsibilities in alignment with energy-related Acts and Policies.

Energy-related Acts

1974

Petroleum Development Act (1974)

- To vest the **entire ownership in and the exclusive rights** for the exploration and exploitation of petroleum resource in PETRONAS.
- PETRONAS shall be subject to the control and **direction of the Prime Minister.**
- The **National Petroleum Advisory Council** is set up to advise the Prime Minister on national policy, interests and matters pertaining to petroleum, petroleum industries, energy resources and their utilisation.

1990

Electricity Supply Act (1990)

- To provide for the **regulation of the electricity supply industry.**
- Supply of electricity at **reasonable prices and licensing of electrical installation** and to promote safe and efficient systems for electricity-related operations.

1993

Gas Supply Act (1993)

- To provide for the **licensing of natural gas** supply to consumers at reasonable prices, with continuous supply and good quality.
- Ensure the **safe and efficient operation** of natural gas pipelines, installations and appliances.

2001

Energy Commission Act (2001)

- **Establishment of the Energy Commission.**
- Authorise the Energy Commission to **regulate energy supply activities** including the enforcement of energy supply laws.

2011

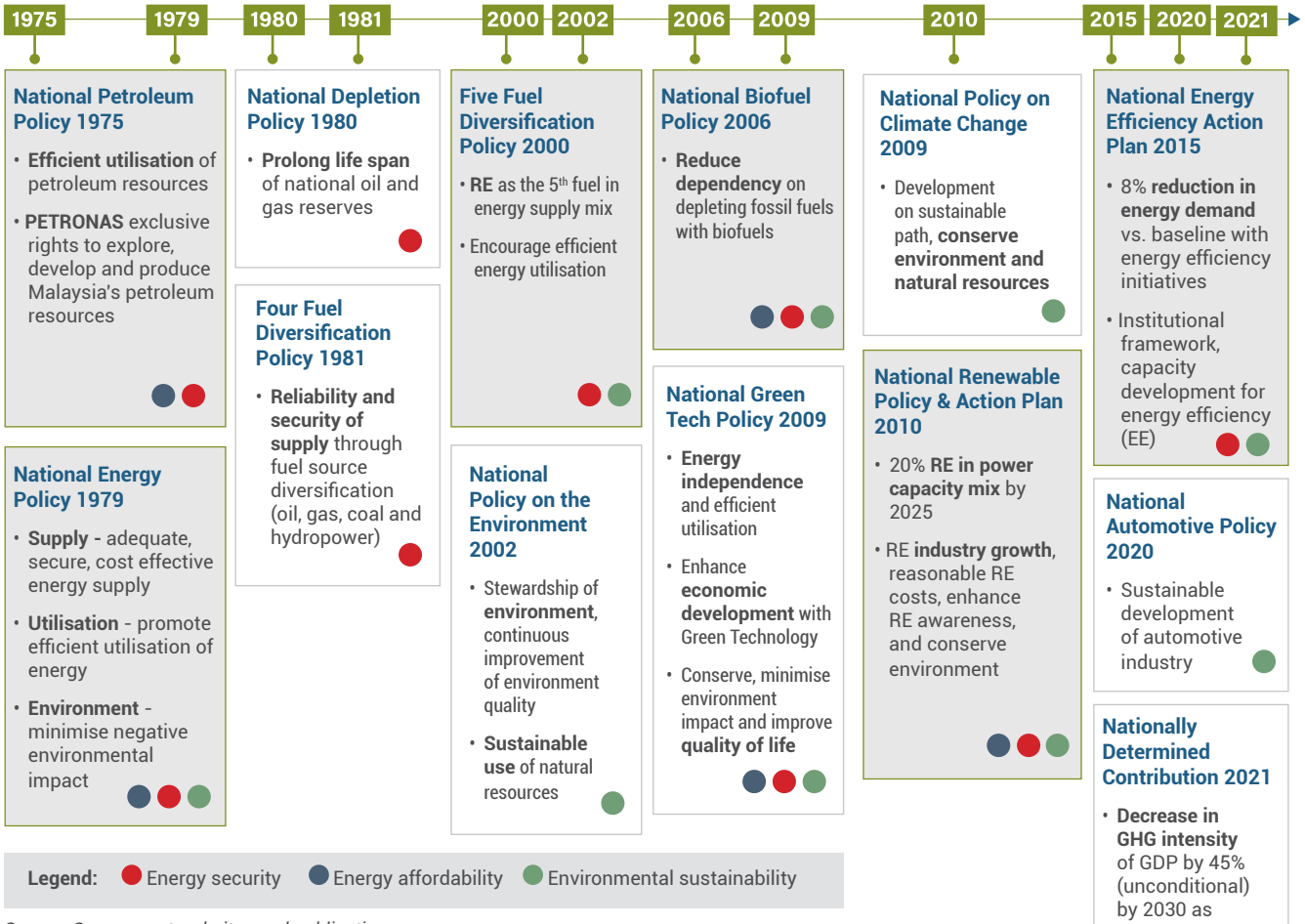
Renewable Energy Act (2011)

- To provide for the **establishment and implementation of a feed-in tariff (FiT) system** to increase electricity generation from renewable sources.

Sustainable Energy Development Authority Act (2011)

- To provide for the **establishment of the Sustainable Energy Development Authority (SEDA).**
- SEDA is responsible for **sustainable energy laws and to promote the use of sustainable energy.**

Energy-related policies



Source: Government websites and publications

In addition to the core energy-related policies listed above, various other related policies such as housing, transport and industrial policies also have significant implications on the energy sector.

Hence, there is a need for a new energy policy to:

- strengthen and harmonise existing energy-related policies for clarity of future direction and targets for the energy sector;
- ensure coordinated energy sector response in line with national aspirations and agenda, that are future-proof ready and consistent with the developments in global energy transition trend;
- establish coordinated long-term vision and action plans across various stakeholders, economic sectors and energy-related industries to address challenges as well as reap benefits from the global energy transition mega trend;
- provide latest and visionary direction for the energy sector in order to facilitate investors' and industries' long-term investment decisions, thus spurring GDP growth and job opportunities;
- strengthen energy sector enablers and governance to drive planning, development and implementation of comprehensive and integrated energy policy; and
- refine aggregate impacts from various policies and development plans in other economic sectors such as from public transportation plan, fuel economy and next-generation vehicle under the transport sector.

1.6 Energy Sector Governance

Energy sector governance and planning represent a complex and multi-faceted undertaking due to the wide scope and cross-sectoral nature of energy-related decision making. Energy demand planning intersects across key sectors of the economy and involves transport, industrial, residential and commercial sector stakeholders. For energy supply planning, consisting of multiple energy sources such as oil, natural gas, coal and RE, requires extensive cross-sector collaboration with relevant stakeholders. The energy sector is governed by ministries, agencies and regulators based on responsibilities defined in key legislative acts.

Key Energy-Related Ministries

Ministries with direct energy-related responsibilities

- Economic Planning Unit, Prime Minister's Department (EPU)
- Ministry of Energy and Natural Resources (KeTSA)
- Ministry of Plantation Industry and Commodities (MPIC)
- Ministry of Domestic Trade and Consumer Affairs (KPDNHEP)

Ministries related to key final energy demand sectors

- Ministry of Transport (MOT)
- Ministry of Housing and Local Government (KPKT)
- Ministry of International Trade and Industry (MITI)
- Ministry of Rural Development (KPLB)
- Ministry of Federal Territories (KWP)
- Ministry of Agriculture and Food Industry (MAFI)

Cross-cutting influence

- Ministry of Finance (MOF)
- Ministry of Environment and Water (KASA)
- Ministry of Science, Technology, and Innovaton (MOSTI)

State-specific entities

- State Economic Planning Unit (UPEN) Sabah
- State Economic Planning Unit (UPEN) Sarawak
- Ministry of Utility and Telecommunication (Sarawak)

Key Energy-Related Organisations

Power-related

- Single Buyer (SB)
- Grid System Operator (GSO)
- MyPower

Oil and gas-related

- Malaysia Petroleum Resources Corporation (MPRC)

Renewable Energy related

- Sustainable Energy Development Authority (SEDA)

Cross-cutting influence

- Malaysian Green Technology and Climate Change Corporation (MGTC)
- Malaysian Investment Development Authority (MIDA)
- Malaysia Automotive, Robotics and IoT Institute (MARii)

Key Energy-Regulators

Electricity and piped gas

- Energy Commission (ST)

Upstream Oil and Gas

- Petroliam Nasional Berhad (PETRONAS)

The energy sector governance will be further enhanced to increase efficiency and drive greater holistic planning to meet challenges and opportunities of various domestic and global developments. These include:

- strengthening collaboration and cooperation between ministries and agencies to enhance energy sector governance;
- enhancing regulatory coverage, clarity of oversight and capability building to keep pace with technological developments across various sectors; and
- streamlining and creating clarity among multiple stakeholders in key energy-related topics for enhanced accountability and implementation effectiveness.

CHAPTER 2:
NATIONAL ENERGY POLICY, 2022-2040

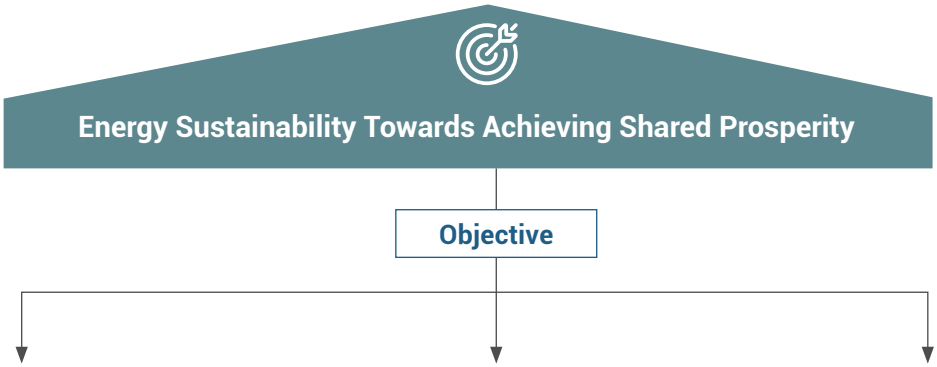
The DTN crystallises Malaysia's forward-looking aspirations, vision, objectives, strategic thrusts, and enablers to support WKB 2030 and 2030 Agenda. The policy encompasses a time horizon of between 2022 and 2040, with periodic reviews every three years. This is to ensure Malaysia keeps pace with global megatrends and capture economic opportunities from the energy transition. Malaysia will need to pursue the Low Carbon Nation Aspiration 2040 to realise strong economic benefits from energy transition in line with DTN objectives. This is also aligned to the target of Long-Term Low Emission Development Strategy (LT-LEDS) to achieve net-zero GHG emissions in 2050. A DTN Action Plan has been developed to support the implementation of key initiatives outlined in the DTN.

2.1 National Energy Policy Vision and Objectives

Energy as a catalyst for socioeconomic sustainability to achieve shared prosperity

DTN sets the vision of energy sustainability towards achieving shared prosperity, reflecting the role of energy as a significant contributor which enables other key sectors of the economy to thrive on the country's economic development. To realise this vision, progress needs to be made in three DTN objectives - enhancing macroeconomic resilience and energy security, achieving social equitability and affordability, as well as ensuring environmental sustainability.

National Energy Policy vision and objectives



Macroeconomic resilience and energy security

Catalyse strong economic growth and fiscal health anchored on continued energy security and sources of sustainable competitive advantage.

Social equitability and affordability

Ensure energy affordability, fair and equitable distribution of costs as well as benefits from energy transition.

Environmental sustainability

Drive environmental sustainability to future-proof national economy and to improve living standards for all.

The vision and objectives of the DTN are equipped with a view on the end-state vision to guide and drive the energy sector's direction.

National Energy Policy End-state Vision

DTN strategic thrusts and enablers are anchored on the end-state vision for the energy sector

- **New areas of economic growth and employment** related to energy, built on long-term competitive advantage.
- **Equitable and fair distribution of benefits and costs** from energy transition.
- Captures economic benefit and remains globally competitive by **keeping pace with energy transition trends.**
- **Affordable and reliable access to energy.**
- **A leader in environmental sustainability and green economy** in ASEAN.
- Continuous **efficient utilisation of energy and indigenous energy resources.**
- Contribute to **fiscal and trade balance health.**

2.2 Low Carbon Nation Aspiration 2040

The Low Carbon Nation Aspiration 2040 is developed based on the existing plans in the energy sector. The Government will undertake a more proactive role by identifying and developing selective leadership in the areas of low carbon economy, which will be aligned with the areas where the country has high potential and competitive advantage.

Appropriate Government incentives will be provided to attract investments in catalysing the development of low carbon technologies. This will allow the country to become a leader in high potential growth areas such as RE, energy storage, low carbon mobility, hydrogen economy and others.

The Aspiration aims to achieve various targets in the energy-related sectors covering both electrical and non-electrical components in transport, industrial, residential and commercial. It targets a higher level of urban public transport modal share, electric vehicle (EV) penetration, share of alternative lower carbon fuels in heavy vehicles and marine transport and enhanced energy efficiency in industrial and commercial as well as residential sectors. In addition, the Aspiration entails a higher level of RE penetration in the installed capacity and total primary energy supply (TPES), with no new coal power plant. The DTN aims to achieve nine selected targets as follows:

Selected targets on Low Carbon Nation Aspiration 2040 compared to 2018

Selected Targets		2018	Low Carbon Nation Aspiration 2040
1.	Percentage of urban public transport modal share	20%	50%
2.	Percentage of electric vehicle (EV) share	<1%	38%
3.	Alternative fuel standard for heavy transport	B5	B30
4.	Percentage of Liquefied Natural Gas (LNG) as alternative fuel for marine transport	0%	25%
5.	Percentage of industrial and commercial energy efficiency savings	<1%	11%
6.	Percentage of residential energy efficiency savings	<1%	10%
7.	Total installed capacity of RE	7,597 MW	18,431 MW
8.	Percentage of coal in installed capacity	31.4%	18.6%
9.	Percentage of RE in TPES	7.2%	17%

Legend: Energy security · Energy affordability · Environmental sustainability

The Aspiration is expected to create significant positive economic development impact with higher GDP and job creation. It will also spur the next wave of green growth FDI into the country. In addition, improvements are expected along each dimension of the energy trilemma, including reduction in emissions intensity.

In supporting the Aspiration, private and public investments should be made in a timely manner to facilitate the transition. The Government also has a key role to play in establishing catalytic incentives and supportive regulatory frameworks to spur investments and transition in low carbon economy growth ecosystems for the country. In addition, evolving policy and technological trends should continue to be monitored and aimed at reviewing the targets in the future.

Impact of Low Carbon Nation Aspiration 2040

Low Carbon Nation Aspiration 2040	Impact of implementation	
Emphasis on low carbon **policies and investments to increase adoption and pursue selective leadership in low carbon sectors**, such as: • Endeavour to **no new coal power plant** amid increasing renewables share • Provide financing and incentives to drive **energy efficiency practices** to meet the targets • Incentivise **adoption of EVs**, increasing public transport modal share, and fuel economy standards	**Contribution to GDP** (RM/year)	**13 billion**
	Total job creation	**207,000**
	CO_2 emissions reduction	**will be aligned with LT-LEDS targets***
	Energy self-sufficiency	**48% to 72%**
	Fiscal outlay (RM/year)	**4.3 bilion**
	Total Investments (RM/year)	**9.2 billion**

*To be finalised by the Ministry of Environment and Water by end-2022

Source: DTN Project Team Analysis

The implementation of this Aspiration is supported by various actions, which will be executed within the timeframe of the DTN to achieve the selected targets. This Aspiration will also contribute to the reduction of CO_2 emission in the energy sector in line with LT-LEDS target to achieve net-zero GHG emissions by 2050.

Key actions and targets for the DTN were set based on short-term (2021-2025), medium-term (2026-2030), and long-term (2031-2040) horizons to ensure effective implementation. These include enhancing the energy sector governance and implementing other initiatives identified in the DTN.

Implementation of LCNA 2040

Twelfth Plan (2021-2025)

- Improve rural electricity supply to achieve 99% coverage
- Implement step change in industry energy efficiency (EE) through enforcement of Energy Efficiency and Conservation Act (EECA), energy audits and Minimum Energy Performance Standards (MEPS)
- Increase usage of smart meter and smart grid as well as upgrade grid
- Improve Sabah power supply reliability
- Improve fuel economy standard for vehicle

Thirteenth Plan (2026 – 2030)

- Grow gas-based petrochemical hubs
- Thrive Third-Party Access (TPA) gas market, investments in regasification terminal (RGT) for energy security
- Increase upstream investments to develop deepwater, marginal and sour gas fields[1]
- Enhance OGSE players capacity through consolidation and international participation
- Phase down broad-based energy subsidies, move to market-based pricing
- Capture growth with LNG uptake in marine bunkering

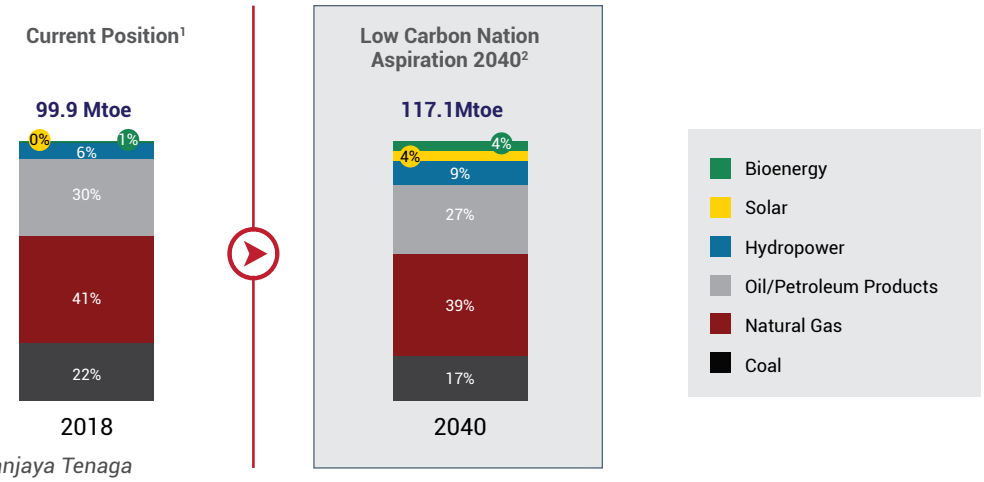
Fourteenth & Fifteenth Plans (2031 – 2040)

- Thrive domestic EV ecosystem, with at scale EV penetration
- Adopt large scale energy storage for RE
- Implement pilot and market entry programmes of hydrogen as well as next generation bioenergy
- Establish globally competitive hydrogen export hub in Sarawak
- Enhance energy efficiency with digital technology adoption
- Capture growth opportunities of biofuels in marine and aviation sectors

1. Fields with high carbon dioxide (CO_2) and hydrogen sulphide (H_2S) contents

In alignment with energy transition, the DTN will enhance the environmental sustainability by reducing the overall energy intensity, while improving the intensity of the primary energy mix through increased penetration of clean and renewable sources of energy and decreased penetration of coal and petroleum products in the primary energy mix.

Primary energy mix target of LCNA 2040

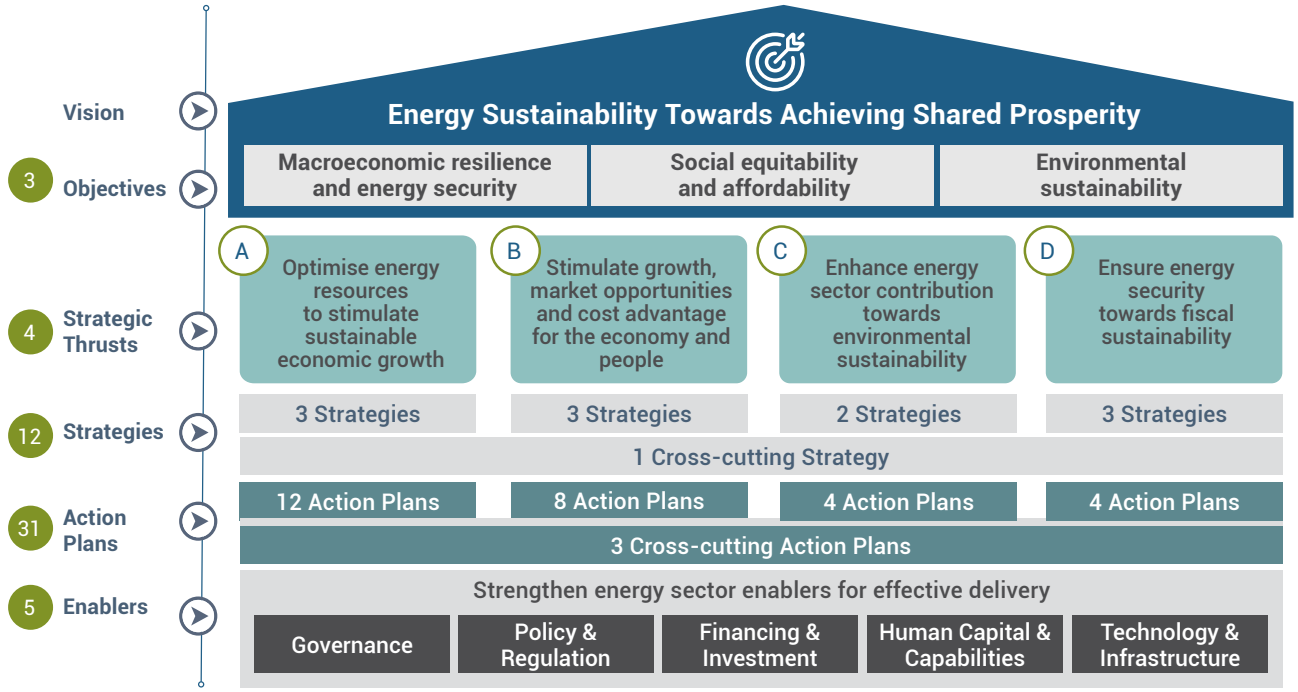


Source: 1. Suruhanjaya Tenaga
2. DTN Project Team Analysis

2.3 National Energy Policy Strategic Thrusts, Strategies and Enablers

In achieving the DTN vision, four strategic thrusts and five enablers have been identified to ensure an effective implementation of the DTN. These strategic thrusts and enablers are designed from the situational analysis of Malaysia's current position, its socioeconomic aspirations and global energy transition megatrends. These strategic thrusts are supported by 12 strategies and 31 action plans.

National Energy Policy Vision, Objectives and Strategic Thrusts



Strategies and action plans are designed to provide balanced benefits to achieve the main objectives of the DTN in accordance with the financial capability of the Government. In order to ensure that the impact on the Government's financial position is managed and rationalised accordingly, ministries and agencies shall periodically review and refine the measures to be taken.

Strategic Thrust 1:
Optimise energy resources to stimulate sustainable socioeconomic growth

Objective:
Leverage and optimise the use of energy resources to support economic development and equitable distribution of benefits to the *rakyat*.

Strategies:
1) Optimise position of petrochemicals.
2) Optimise country value-add in energy sector.
3) Enhance demand-side management.

Overview of the Action Plans:
This strategic thrust will be driven through the following initiatives:

- Expanding energy access to drive towards nationwide rural electrification aspirations and unlocking natural gas access for industry clusters built on sustainable competitive advantage to enhance equitable development across all regions;
- Enhancing demand-side management and energy efficiency across all sectors and usage of energy types, such as expanding from electricity-focused energy efficiency to also include energy efficiency from thermal energy sources and in the transport sector;
- Increasing the value-add of indigenous energy resources through optimised use such as in high-value industries and downstream petrochemical clusters; and
- Enhancing supply-side measures such as driving private investments, competitiveness and industry development of high potential indigenous energy sources including oil and gas, and RE such as hydroelectric, solar, bioenergy and other emerging alternative energy sources.

A. Optimise energy resources to stimulate sustainable socioeconomic growth		
Strategy	**Action Plan**	
Strategy 1 Utilise the location of petrochemical hubs and gas infrastructure. **Strategy 2** Optimising value-add from oil and gas, bio-based energy, solar, hydroelectric and new clean energy sources. **Strategy 3** Improving energy demand management with enablers in the industrial, residential and commercial sectors.	**A1**	Continue progress towards nationwide rural energy access
	A2	Optimise value-add of indigenous oil and gas resources
	A3	Optimise strategic positioning of petrochemical hubs across the country
	A4	Optimise plans and execute gas infrastructure build-out for industry cluster development
	A5	Optimise indigenous oil and gas production
	A6	Enhance and unlock potentials of indigenous bio-based energy resources
	A7	Enhance and unlock potentials of indigenous solar resources
	A8	Enhance and unlock potentials of indigenous hydroelectric resources
	A9	Explore high potential nascent new energy sources
	A10	Enhance demand-side management in the industrial sector
	A11	Enhance demand-side management in the residential and commercial sector
	A12	Support scale-up of demand-side management initiatives with strengthened enablers

Strategic Thrust 2:
Capture growth, market opportunities and cost advantage for the economy and people

Objective:

Create benefits for both the economy and the people by capturing the benefits of rapidly evolving technology and global policy megatrends driven by energy transition and nurturing energy-related innovation to unlock new value pools and growth opportunities.

Strategies:

1) Capture domestic market opportunities.
2) Comply with and capture market opportunities from international regulations.
3) Optimise power generation mix.

Overview of the Action Plans:

This strategic thrust will be driven through the following initiatives:

- Transforming and spurring high potential new growth sectors related to energy transition and other megatrends including low carbon mobility, power generation, energy storage and new energy such as hydrogen. It is also expected to enhance the export competitive advantage of the automotive industry with the development of manufacturing capabilities and automotive supply chain to support EV manufacturing;

- Ensuring readiness for the country to comply with international regulations on emissions in the marine and aviation sectors in a phased and effective manner. This will support the aspiration of the national aviation industry to become an air cargo hub in the Asia Pacific region; and

- Leveraging on cost advantages by keeping pace with energy transition developments such as the rapidly falling costs of renewable power generation, energy storage and low carbon mobility, whilst balancing across various energy trilemma dimensions.

B. Capture growth, market opportunities and cost advantage for the economy and people		
Strategy	**Action Plan**	
Strategy 1 Seize opportunities in the environmentally friendly light and heavy vehicle market. **Strategy 2** Seize market opportunities from the implementation of international regulations such as clean fuel for ships and aircrafts. **Strategy 3** Optimising the mix of energy generation sources.	**B1**	Unlock opportunities from mobility trends in the light vehicles segment
	B2	Unlock opportunities from mobility trends in the heavy vehicles segment
	B3	Comply and capture value pools in line with international marine bunkering fuel regulations
	B4	Comply and capture value pools from international aviation fuel regulations
	B5	Optimise power generation mix based on the energy trilemma, factoring in rapid technology progress
	B6	Implement physical and regulatory enablers to accommodate power system advancement
	B7	Enhance and optimise regional and international grid system interconnectivity
	B8	Unlock opportunities and long-term competitive advantage in the emerging hydrogen economy

Strategic Thrust 3:
Enhance energy sector contribution towards environmental sustainability

Objective:

Improve energy sector contribution to environmental sustainability to support the country in meeting international climate change obligations and ambitions, as well as to ensure the Malaysian economy remains attractive for international investments and is competitively positioned, given global ESG investing trends.

Strategies:

1) Implement strategic enablers.
2) Enhance carbon footprint tracking.

Overview of the Action Plans:

This strategic thrust will be driven through the following initiatives:

- Enhancing environmental sustainability by implementing bold solutions to drive carbon emission reduction across the energy sector;
- Enabling businesses to enhance reporting and increase transparency on carbon footprint by incorporating ESG trends to drive environmental sustainability in order to be future-proofed; and
- Creating clarity on overall energy sector GHG emission reduction targets in alignment to the goals set at national and international levels.

C. Enhance energy sector contribution towards environmental sustainability

Strategy	Action Plan	
Strategy 1 Promote the use of clean fuels in industries and determine GHG emissions reduction target in energy sector. **Strategy 2** Encourage businesses to implement carbon footprint accounting, reporting and certification as well as access to RE.	**C1**	Enhance environmental sustainability by focusing on high GHG emission areas
	C2	Enhance carbon footprint accounting, reporting and certification in businesses
	C3	Determine and enforce energy sector GHG emission reduction targets
	C4	Enhance platform for businesses to access RE in line with ESG trends

Strategic Thrust 4:
Ensure energy security towards fiscal sustainability

Objective:

Contribute to fiscal stability by optimising fiscal inflows and outflows in the energy sector, whilst ensuring continued security of energy supply.

Strategies:

1) Conduct rationalisation of energy subsidies.
2) Ensure smart and timely investments.
3) Establish energy supply boundary conditions.

Overview of the Action Plans:

This strategic thrust will be driven through the following initiatives:

- Rationalising energy subsidies and moving towards market-based pricing with the right timing and to ensure energy affordability for low income households;
- Driving smart public and private investments for large energy infrastructure development, including investments needed to facilitate energy transition and to meet growing energy demand of the country; and
- Enhancing energy security by creating clarity on boundary conditions and safeguards as well as effective advanced planning for energy infrastructure build-out.

D. Ensure energy security towards fiscal sustainability

Strategy	Action Plan	
Strategy 1 Rationalise energy subsidies.	**D1**	Rationalise energy subsidies towards market-based pricing
Strategy 2 Ensure smart investments in energy infrastructure development.	**D2**	Ensure effective, targeted and cost effective investments in energy infrastructure
Strategy 3 Establish boundary conditions and implement safeguards to enhance national energy security.	**D3**	Establish energy supply boundary conditions by giving priorities to national energy security
	D4	Timely build-out of new energy import infrastructure to safeguard security of supply

Cross-cutting Strategy
with three Action Plans

Objective:

Enhance governance and increase energy sector competitive advantage and value-add, whilst ensuring a fair energy transition.

Enablers:

1) Governance.
2) Policy and Regulation.
3) Financing and Investment.
4) Human Capital and Capabilities.
5) Technology and Infrastructure.

Overview of the Action Plans:

This strategic thrust will be driven through the following initiatives:

- Improving energy sector governance for improved planning, policy development and regulation for public sector efficiency and effectiveness including DTN monitoring and implementation coordination;
- Increasing competitive advantage and value-add of energy players with improved localised technological ability to seize opportunities from energy transition and domestic energy resources; and
- Ensuring a fair energy transition for the workforce in affected sectors through effective and holistic workforce demand-supply planning.

Cross-cutting strategy		
Enablers	**Action Plan**	
Governance Policy and Regulation Financing and Investment Human Capital and Capabilities Technology and Infrastructure	**E1**	Establish a National Energy Council for holistic planning, policy development and implementation coordination
	E2	Determine national level energy technology priorities and ensure stakeholders deliver the priorities
	E3	Conduct strategic workforce planning and enhance future-proof skills across energy sector workforce

Enabler:
Strengthen energy sector for effective delivery

The strategic thrusts are supported by five enablers, namely:

- **Governance:** Strengthen governance structure for holistic energy sector planning, policy development and implementation orchestration through the establishment of a National Energy Council chaired by the Prime Minister. In addition, close collaboration between public and private sectors will be enhanced to enable conducive market environment and sustainable investment;

- **Human Capital and Capabilities:** Implement long-term strategic workforce transition planning to facilitate equitable transitions in skills and jobs as new sectors grow and existing sectors change and transform in line with energy transition. In addition, enhance skills of the energy sector workforce for digital, analytics, automation, and advanced technologies, and encourage competency and capability building to drive research, development, commercialisation and innovation (R&D&C&I) in the energy sector;

- **Policy and Regulations:** Develop action plans to shape energy markets in driving efficiency gains, exploring new business models as well as streamlining regulations and standards. This is crucial to facilitate growth and development of new trends in emerging energy-related aspects. Strengthening the governance and regulatory framework for increased transparency will also be important to ensure continued energy sector growth and enhanced innovation alongside evolving competition and market dynamics;

- **Technology and Infrastructure:** Facilitate conditions to foster innovation and new technology applications to create technological advantages across the energy sector. In addition, the scaling up of major energy infrastructure investments will be considered to safeguard energy security, improve energy access and enhance environmental sustainability. Support will also be needed to encourage innovation especially for technologies at early stages of the maturity curve, but with high potential benefits and scalability; and

- **Financing and Investment:** Promote timely capital and investment required to support implementation of initiatives, including optimising public and private funding to meet investment requirements in energy transition. These include promoting green financing and sustainable investing in line with increasingly important ESG standards and criteria required by investors.

2.4 Capitalising Emerging Technologies

Technology plays a critical success factor in exploring opportunities and new value pools in energy transition in a wide range of areas including RE, low carbon mobility and nascent new energy such as hydrogen. Technology will enable countries to capture first-mover advantage in energy transition and increase speed of value realisation domestically from energy transition and technology-driven exports.

National energy sector technology priorities should be identified to set direction for stakeholders. These will ensure an integrated and coordinated effort towards energy transition. The technology focus areas, among others, should be oriented to where Malaysia has opportunities for long-term competitive advantage and value creation for the country.

Oil and Gas

The oil and gas sector continues to face unique challenges, which requires technology analytics, development, adoption and commercialisation to optimise the lifespan of indigenous oil and gas resources. These include technologies for deepwater and ultra-deepwater fields, technologies to ensure economical and environmentally sustainable production in sour gas fields as well as enhanced oil recovery technology for mature fields. In addition, efforts to develop advanced technology and enhance technology adoption in growing demand areas such as sustainable exploration and production will be key, which can be leveraged to build regional leadership in the sector.

Technologies to drive efficiency in operations will be enhanced such as the digitalisation adoption across the oil and gas value chain. These include the use of data analytics; artificial intelligence (AI) and machine learning (ML); integrated carbon capture, utilisation and storage (CCUS) facilities; as well as harnessing the potential of internet of things (IoT) to enhance value creation and cost-competitiveness of domestic oil and gas production.

Hydroelectric

Hydroelectric will be a key technology focus area, driven not only by its potential as an electricity generation source but also as a key enabler towards increasing green hydrogen competitiveness. This includes continuous technology development to improve the operational efficiency of power generation from hydroelectric such as technologies to improve electro-mechanical component efficiency, enhance generator design, adopt digital technologies and enhance flow stability.

In addition, technologies to enhance hydro resources as a source of energy storage will be explored, which includes increasing the flexibility of hydraulic turbines and enhancing variable speed hydroelectric generation in areas such as pumped hydro. Meanwhile, technologies to improve the efficiency and uptime of mini-hydro resources will be critical to enhance cost-competitiveness and economic feasibility of the project. Technology developments on potential breakthrough including Restoration Hydro Turbine (RHT) will also be explored for its cost-competitiveness and applicability.

Apart from utilising efficiency-driven hydro technologies and optimising energy generation, focus will also be given on minimising socioeconomic and environmental impacts of hydroelectric project throughout the lifecycle of a plant. This includes continuous measures in protecting local communities, wildlife species and heritage sites.

Solar Ecosystem

Solar energy has high potential to increase its share in the installed capacity of RE in line with rapidly decreasing levelised cost of energy (LCOE). One key focus area of technology is to further increase environmental sustainability and reduce the environmental impact of large-scale solar farms. In addition, suitable crops and other methods will be identified to enhance dual-use of land on solar farms, based on the local characteristics. This will enable further increase in competitiveness with alternate revenue streams, while improving the utilisation and quality of land throughout the lifespan of solar electricity generation. Efforts to ensure continued preservation of biodiversity will also be promoted to further complement the environmental sustainability through contribution of solar resources.

Investments to develop and adopt technologies in areas such as floating solar will be further explored given the large complementary synergies between solar and hydroelectric resources. Technology development and adoption to harness potentials of rooftop solar and other solar-related technologies should also be focused on, in accordance with local characteristics.

Bio-Based Energy

Malaysia is the second-largest palm oil producer globally and has large potential to harness bioenergy from agricultural products for circular economy benefits as well as improve environmental sustainability and domestic energy security. The need to develop technologies suited to domestic bio-based resources will be critical for future competitive advantage.

For first and second generation bioenergy technologies, efforts will be given towards the objective of driving cost-effectiveness of energy generation on the supply-side, as the country has large feedstock advantages, especially from the palm oil industry. These efforts include technology development and adoption to reduce feedstock aggregation and transportation costs as well as enhance pre-treatment technologies to increase the range of viable feedstock inputs.

Research, technology development and adoption will be conducted on the demand-side to enhance technical and commercial viability in emerging end-use sectors such as the utilisation of hydrotreated vegetable oil (HVO) for aviation and marine to enable higher blends of biofuels in transport and industrial use. Other end-use applications that should be focused on for technology development and adoption are the use of biogas in Bio-Compressed Natural Gas (BioCNG) as well as potential use of bio-based solid fuels to substitute fossil fuels in power generation and as feedstock for industry.

Strategic development of third and fourth generation bioenergy will be considered with a focus on areas that have potential to create technological advantage compared to global peers. This includes localisation and customisation of technologies that are developed globally, such as optimising the utilisation of algae-based technology in the production of biofuel.

Energy Efficiency Smart Devices

Energy efficiency technologies have been gaining significant traction with the use of digital and smart devices related to the Fourth Industrial Revolution (4IR) in residential and commercial appliances, driven by energy transition and the push for increased environmental sustainability. Malaysia has an enduring legacy in the electrical and electronics (E&E) industry, thus presenting itself huge opportunities in producing more value-added energy efficient products. Given the rapid technological advancement globally, focus will be given to technology scanning, customisation and localisation as well as adoption of energy efficiency technologies that are in line with 4IR and MyDigital policies. Support for local players such as energy service company (ESCO) will be provided to keep pace with global trends on energy-efficient smart devices, creating awareness of the highest potential technologies and developing these technologies to ensure relevance in local context.

In terms of technology R&D, a strategic and specific approach is the way forward in deciding the focus areas where there is a potential to establish global leadership and where Malaysia is best poised to leverage and adapt as a strategy. Deliberate decision-making is important to avoid low returns on investments in developing technologies where other countries have had a significant head start.

Low Carbon Mobility

Energy transition trends have accelerated low carbon mobility which offers large and growing value pool opportunities. Malaysia has several key foundational advantages that should be harnessed in technological development for low carbon mobility. The country has a legacy of automotive manufacturing capabilities, including partnerships with global automotive manufacturers who have vast experience in EV manufacturing. In addition, advantages can be harnessed from a strong E&E industry with adjacencies in components and supply chain required to manufacture EV parts.

In order to build technology advantage, effective technology adaptation and adoption supported by technology transfer from established automotive players globally will be critical to driving cost-competitive EV production for domestic markets and capturing international market demand. Attractive incentives should be provided to encourage foreign participation and technology transfer for local companies to increase national competitiveness. Focus areas for supply chain development should also be defined.

Other efforts in low carbon mobility such as the promotion of Next-Generation Vehicles (NxGV) and Energy Efficient Vehicles (EEVs) beyond EVs should be continued but reviewed using a portfolio perspective to ensure efforts are not diluted and are focused in order to increase the chances of success.

Hydrogen

Hydrogen has a large opportunity for the country based on its domestic use and export potential. Malaysia's indigenous resources in natural gas and renewables such as hydroelectric, solar and bioenergy, positions the country effectively for the competitive production of blue and green hydrogen.

A key technology focus area for Malaysia would be technology scanning, development and adoption of green hydrogen production and transportation technologies. This is aligned to the national long-term potential to be an export hub for green hydrogen due to competitive advantages, especially for local hydroelectric. Technology partnerships and technology transfer from international players will be critical on a range of topics including electrolyser technologies, export terminal technologies, and hydrogen transport technologies between production sites and export terminals. Sub-focus areas will also be identified in hydrogen technologies such as reducing electrolyser capital costs, increasing electrolyser conversion efficiency and utilisation potential.

In determining the optimal conversion for long-range transport, options using carriers such as ammonia, liquid hydrogen, liquid organic hydrogen, or metal hydride will be considered for export. Technologies to enhance safety and reduce operational costs such as terminal handling costs will also be important to enhance end-to-end hydrogen value chain competitiveness.

2.5 Benefits of the National Energy Policy

The timely and effective implementation of the DTN initiatives will realise large benefits for the country. This includes economic development benefits such as increased GDP, job creation and FDI inflows. The benefits of economic development are expected to accrue to a wide range of stakeholders including businesses in the energy sector and supply chains, in energy-intensive industries and broader economic impact through induced multiplier effects. The economic development impact will also be sustainable over time, beyond the period of DTN, given the focus on new future-proof growth sectors.

In addition to economic development, benefits are expected along all dimensions of the energy trilemma over time. In terms of energy security, greater domestic energy self-sufficiency and fuel diversification will support a more resilient energy sector and enable enhanced control over energy as a key strategic resource for the country. Benefits from energy affordability include enhanced energy reliability and access. Significant improvements are expected in terms of energy sector environmental sustainability, which aligns to global megatrends of enhanced ESG focus and supports enhanced quality of life with lower in-country emissions.

National Energy Policy Benefits Across Economic Development and Energy Trilemma

Economic Development

Increase contribution to GDP
1.0% – 1.5% added to GDP totaling ~RM260b

Job creation
207,000 added jobs, majority in green economy sectors

New FDIs
Prospects and growth sector opportunities related to low carbon economy

Energy Security

Lesser reliance on energy import
Increased penetration of indigenous energy sources

Fuel diversification
Enhanced energy source diversification and lower Herfindahl-Hirschman Index (HHI) of primary energy mix (HHI of 0.5 in 2020 and HHI of 0.3 in 2040)

Energy Affordability

Wider energy access
Continuity of rural electrification programme

Environment Sustainability

Less CO_2 emissions
CO_2 emissions reduction, based on NDC and LT-LEDS, in support of climate change commitment

Greater RE penetration
17.0% of renewable penetration in primary energy mix from 7.2% in 2018

Economic opportunities from DTN will also enhance social outcomes for Malaysians, such as providing secure future-proof jobs and promoting balanced regional development. Focus will be given towards safeguarding the energy affordability of low-income households and enhancing rural electrification.

The combination of these benefits is expected to strongly position the energy sector as a catalyst for socioeconomic sustainability to achieve shared prosperity, in line with long-term national aspirations. These benefits will be jointly shared across various stakeholders including the *rakyat*, businesses and the government.

National Energy Policy Benefits to Stakeholders

Rakyat

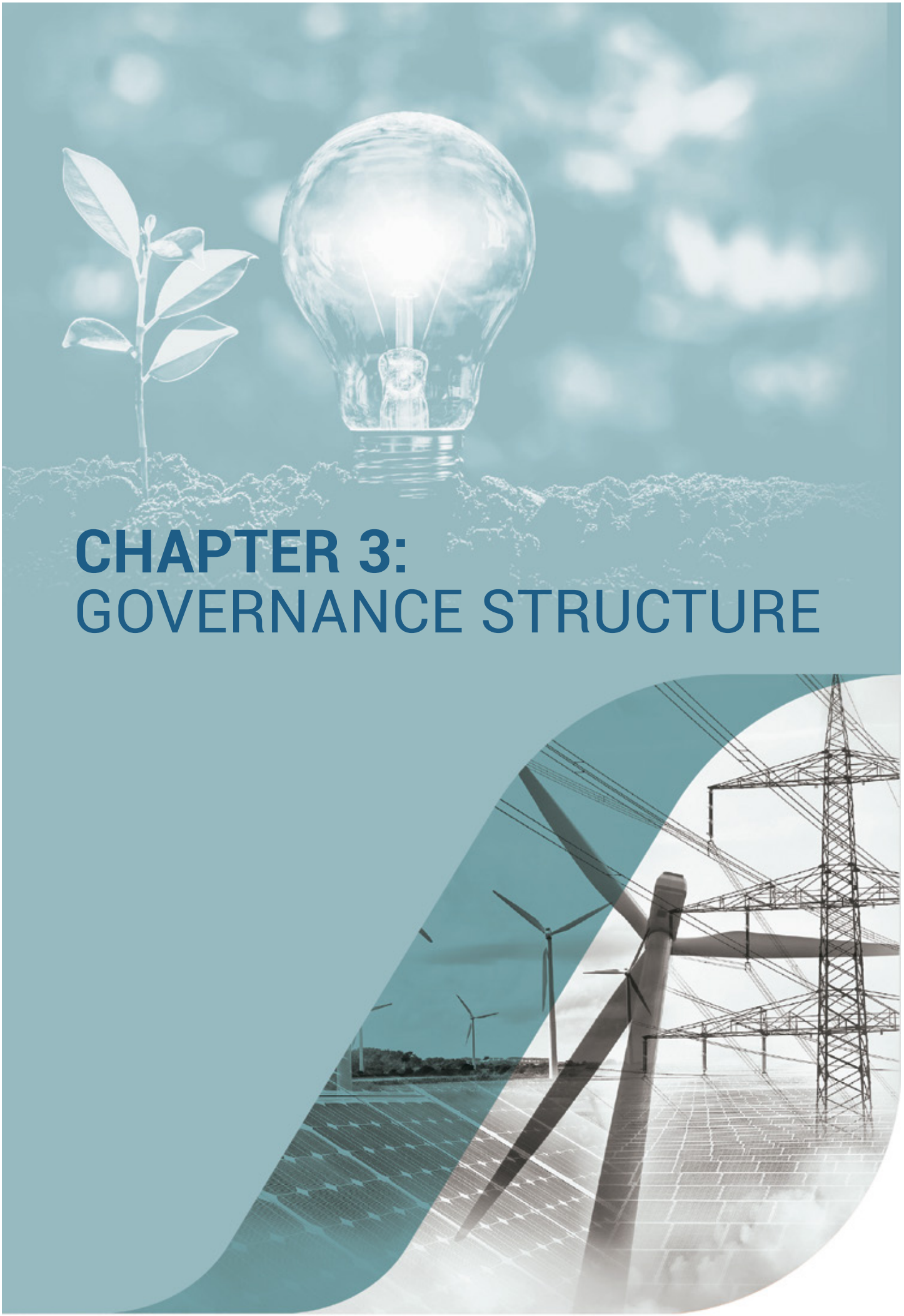
- Additional 207,000 new jobs, majority in green economy sectors.
- Increase in quality of life outcome with lower carbon emissions.
- Socioeconomic empowerment of rural communities with electrification.
- Energy cost competitiveness by keeping pace with cost-reducing technology trends.

Business

- Enhanced energy access for high potential industry.
- Lower carbon footprint with cleaner energy mix and energy efficiency for future trade and investment.
- Support capture of new value pools with catalytic incentives and infrastructure.
- Building long term capacity of local companies that are active in energy sector.
- Enhanced human capital with upskilling of the workforce.

Government

- Integrated, holistic and better coordination of energy sector.
- 1.0% – 1.5% GDP uplift, with spurring of new growth areas.
- Enhanced energy security and energy self-sufficiency.
- Enhanced diversification of fiscal income with new growth opportunities.
- Lower CO_2 emission, guided by NDC and LT-LEDS, supporting climate change commitments.



CHAPTER 3:
GOVERNANCE STRUCTURE

3 Governance Structure

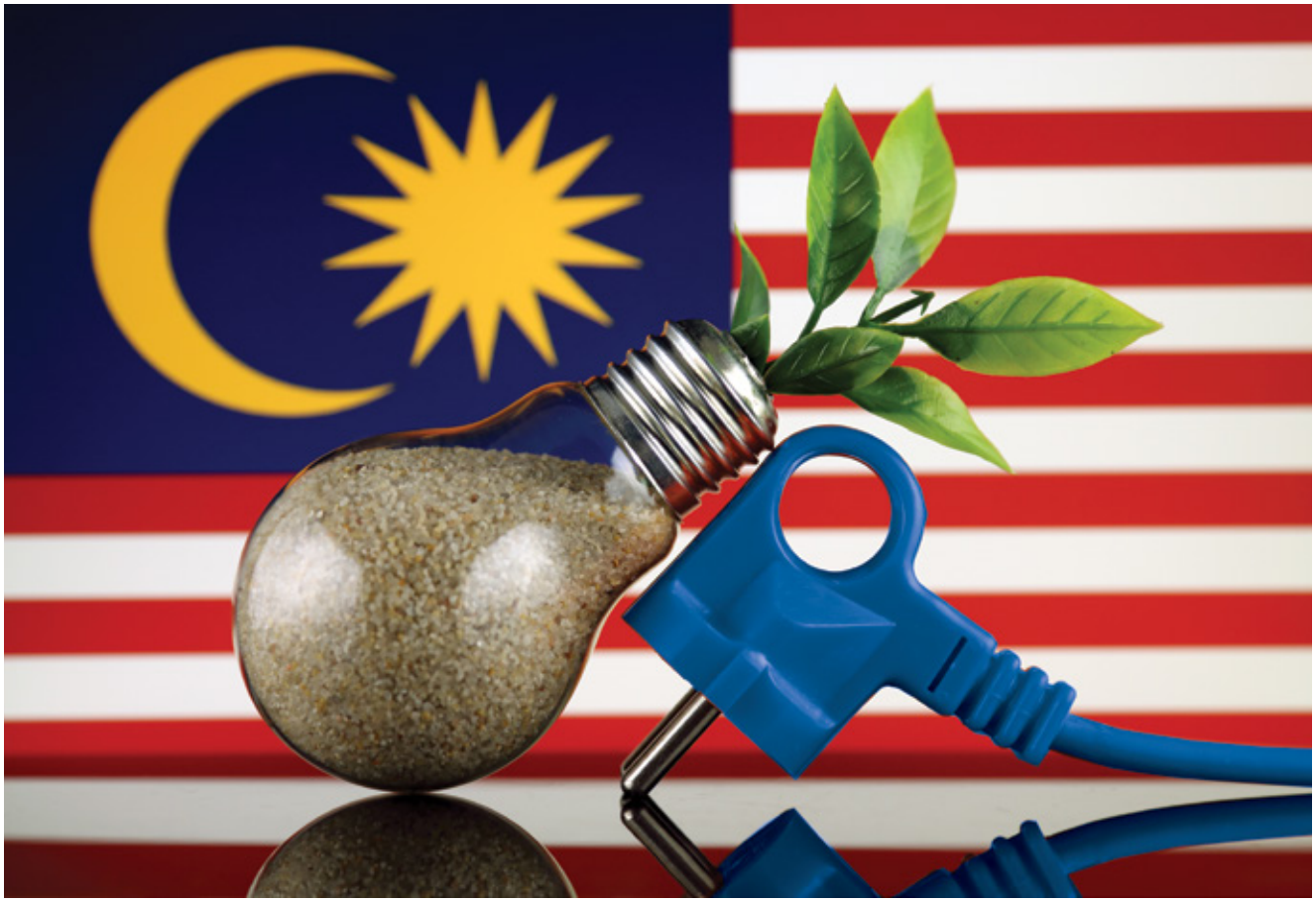
Effective and timely implementation of initiatives are critical in order to realise the objectives of the DTN. Given the high degree of interconnectedness of the energy sector with other sectors, and multiple energy-related stakeholders, implementation of the DTN will need to be effectively coordinated to ensure optimised impacts.

Strengthening the energy sector governance structure is needed to ensure effective implementation of the DTN. The energy governance structure needs a clear line of authority. The enhanced energy governance structure is expected to strengthen monitoring and overall energy sector growth.

A National Energy Council will be established to steer and guide energy sector strategic decisions. It is important in ensuring strong accountability of relevant ministries and agencies in implementing DTN initiatives. The Council will be chaired by the Prime Minister, to be represented by all ministries and agencies related to energy sector with Economic Planning Unit, Prime Minister's Department (EPU) being the *Secretariat*.

EPU will coordinate the review of the DTN every three years taking into account the latest internal and external developments. Views of energy-related stakeholders from public and private sectors including civil society organisations will be accommodated to further enhance and refine DTN initiatives.

CONCLUSION



Conclusion

The DTN sets the overarching strategic policy direction for Malaysia's energy sector encompassing a time horizon of between 2022 and 2040. Successful implementation of the DTN will ensure a future-proof energy sector which is aligned with the long-term national aspirations of WKB 2030 and the 2030 Agenda. The DTN will also enable the country to effectively navigate challenges and capture large opportunities associated with energy transition and other global megatrends, towards achieving Low Carbon Nation Aspiration 2040.

The DTN will position the energy sector as a key catalyst for socioeconomic sustainability to achieve shared prosperity. Large economic benefits will be unlocked with the development of new growth areas which will uplift GDP contribution, create jobs, attract FDI, and strengthen economic and fiscal sustainability of the country. The energy sector will also progress across the energy trilemma dimensions as well as ESG elements, while reaping socioeconomic benefits in line with the spirit of *Keluarga Malaysia*.

APPENDIX
- ACTION PLAN

A1 Continue progress towards nationwide rural energy access

KEY OBJECTIVES

- Improve **access** for rural communities as a foundation for socioeconomic development in line with Sustainable Development Goal 7 of the 2030 Agenda.
- Enhance **energy equity** of providing rural electricity access by exploring innovative solutions such as micro grid.
- Unlock socioeconomic benefits and **create source of income** from renewable energy (RE) sources (for instance, biogas and biomass).

DESCRIPTION OF INITIATIVES

- Expand rural **electrification access** in line with targets, optimising main grid connectivity or alternative micro grid.
- Continuous optimisation of **cost effectiveness in providing rural energy access**, including strategically weighing across various rural energy access provision options such as electricity grid access expansion and use of micro grid.

Stakeholders
Lead Entity: KPLB **Core Stakeholders:** MPIC, SEDA, UPEN (Sabah), UPEN (Sarawak), Ministry of Utility and Telecommunication (Sarawak), SEB, SESB, TNB **Supporting Stakeholders:** EPU, KeTSA, KPKT

Implementation Timeline	Initiative Type
2022-2030	Continuous

A2 Optimise value-add of indigenous oil and gas resources

KEY OBJECTIVES

- Strengthen **economic contribution and value-add of indigenous oil and gas** resources to national economy through Gross Domestic Product (GDP) contribution, job creation and fiscal contribution.
- Leverage natural gas resources to **spur high value downstream industries and industry clusters** with sustainable competitive advantage to enhance regional socioeconomic development.

DESCRIPTION OF INITIATIVES

- Optimise **value creation to the country from indigenous oil and gas resources** through exports and domestic uses including industry, petrochemicals and power generation based on long-term business case, sustainable input pricing, as well as GDP and jobs contribution impact.
- Mandate **a joint working group to focus on current natural gas allocations** and domestic natural gas demand aspirations of Sabah and Sarawak.

Stakeholders
Lead Entity: EPU **Core Stakeholders:** MITI, UPEN (Sabah), UPEN (Sarawak), Ministry of International Trade, Industry and Investment (Sarawak), and representatives in JCC (Sarawak) and JCC (Sabah), PETRONAS **Supporting Stakeholders:** MIDA, PETROS, SEC

Implementation Timeline	Initiative Type
2022-2040	New

A3 Optimise strategic positioning of petrochemical hubs across the country

KEY OBJECTIVES

- Strengthen **long-term competitive advantage and value-add of petrochemical hubs** to enhance GDP contribution, job creation and export income.
- **Capture spillover effects of petrochemical hubs** to local supply chains and communities to enhance socioeconomic development.
- Ensure **continued feedstock security of supply** for petrochemical hubs based on outlook of indigenous oil and gas resources for energy security.

DESCRIPTION OF INITIATIVES

- **Build Sabah and Sarawak petrochemical hubs** to optimise natural gas advantage, such as the Bintulu Petrochemical Hub and Sipitang O&G Industrial Park (SOGIP), factoring in the demand-supply outlook for gas feedstock.
- **Optimise position of Peninsular petrochemical hubs**, such as the strategic positioning of Kerteh Integrated Petrochemical Complex (KIPC), Pengerang Integrated Petroleum Complex (PIPC), Gebeng Integrated Petrochemical Complex (GIPC), factoring in the demand-supply outlook for gas and naptha feedstock.

Stakeholders
Lead Entity: MITI **Core Stakeholders:** EPU, UPEN (Sabah), UPEN (Sarawak), UPEN (Terengganu), UPEN (Johor), Ministry of International Trade, Industry and Investment (Sarawak), PETRONAS, SEDC, PETROS, SOGDC, and representatives in JCC (Sarawak) and JCC (Sabah) **Supporting Stakeholders:** MIDA, MATRADE

Implementation Timeline	Initiative Type
2022-2030	Continuous

A4 Optimise plans and execute gas infrastructure build out for industry cluster development

KEY OBJECTIVES

- Leverage gas access to enhance **economic competitiveness of industrial clusters** built on sources of long term sustainable competitive advantage.
- **Strategic, timely, and cost-effective build out of gas infrastructure** based on firm and sustainable demand requirements, optimising across range of options including physical and virtual pipelines to provide reliable gas supply for end users.
- Enhance **environmental sustainability** with petroleum product to gas switching.

DESCRIPTION OF INITIATIVES

- Ensure natural gas infrastructure build out is supported by **industry demand built on sustainable, long-term competitive advantage** to support natural gas input market pricing.
- **Timely build out of natural gas infrastructure**, including physical or Virtual Pipeline Systems (VPS).

Stakeholders
Lead Entity: EPU **Core Stakeholders:** MITI, ST, UPEN (Sabah), UPEN (Sarawak), Ministry of Utility and Telecommunication (Sarawak), SEC, PETRONAS, GMD and gas infrastructure owners **Supporting Stakeholders:** PETROS

Implementation Timeline	Initiative Type
2022-2040	New

A5 Optimise indigenous oil and gas production

KEY OBJECTIVES

- Enhance **upstream investment attractiveness** for continued development of upstream oil and gas sector for GDP, job and fiscal income contribution.
- Enhance **competitiveness of upstream oil and gas sector** for competitive breakeven production costs, meeting challenges of increasingly challenging domestic fields.
- Contribute to **energy security** through indigenous resource production to reduce energy imports.

DESCRIPTION OF INITIATIVES

- **Optimise fiscal regime and government take** on a periodic basis factoring in evolving basin characteristics, to ensure competitiveness in attracting upstream investments.
- **Enhance Oil & Gas, Services and Equipment (OGSE) sector competitiveness** to reduce breakeven costs and to improve resilience and regional competitiveness.
- **Define national oil and gas technology priorities** based on specific challenges of Malaysia basins including high CO_2 and high H_2S fields, marginal, maturing and deepwater fields and coordinate across stakeholders to invest, develop, adopt and commercialise these priority technologies.
- **Enhance operational efficiency to lower breakeven costs** including driving greater standardisation and modularisation, unlocking cross-operator operational synergies and establish strategic supplier relationships in the oil and gas sector.

Stakeholders
Lead Entity: EPU, PETRONAS **Core Stakeholders:** MOF, MPRC, PETROS **Supporting Stakeholders:** MOSTI, MOGSC

Implementation Timeline	Initiative Type
2022-2040	Continuous

A6 Enhance and unlock potential of indigenous bio-based energy resources

KEY OBJECTIVES

- Enhance RE penetration to increase **fuel source diversification**, enhance domestic **energy self-sufficiency** and **environmental sustainability.**
- Enhance **long-term cost competitiveness** of energy production from bio-based resources.
- Promote **circular economy** and strengthen revenue streams for the agriculture sector by unlocking advantages of abundant bio-based feedstock resources.

DESCRIPTION OF INITIATIVES

- Define **strategy of bio-based resources** use across energy (including solid, liquid, gas fuels) and non-energy uses (including bio-chemicals, bio-fertiliser, bio-products, others.) to optimise value-add of bio-based resources.
- Optimise the **role of bioenergy for power generation** including exploring opportunities where bioenergy (such as through biomass or biogas plants) can support cost-effective rural electrification through micro grid.
- Optimise the role of **biofuels penetration in existing transport and industry uses**, factoring in impact of Palm Oil Gas Oil (POGO) on fiscal costs of enhancing biodiesel blending.
- Invest to build local capabilities and technology advantage to unlock high potential emerging areas of biofuel use such as in marine bunkering and aviation, biogas and biomethane (such as, BioCNG) in industry, supported by early-stage funding and grants to encourage early-mover adoption.
- Explore and implement measures to structurally **drive down costs of bioenergy production**, such as reducing cost of upstream feedstock, enhancing scale and supply security of feedstock, efficiency of energy conversion and identifying focus areas to localise capabilities or equipment production.
- Research and evaluate feasibility and economic implications of co-firing generation plants which leverage **solid biomass pellets.**

Stakeholders
Lead Entity: MPIC **Core Stakeholders:** EPU, MOT, MAFI, MPOB, SEDA **Supporting Stakeholders:** MITI, KeTSA, KPLB, MIDA, ST, SEC, SESB, SEB, Ministry of Utility and Telecommunication (Sarawak), industry players from agri-commodity, automotive, marine and aviation sectors

Implementation Timeline	Initiative Type
2022-2040	New

A7 Enhance and unlock potential of indigenous solar resources

KEY OBJECTIVES

- Enhance RE penetration to increase **fuel source diversification**, enhance domestic **energy self-sufficiency** and **environmental sustainability.**
- Enhance **cost-competitiveness** of energy production from solar resources to improve energy affordability, reduce environmental impacts of solar land use.
- Unlock **synergies with solar PV manufacturing industry** and new solar-related value pools and business models such as solar leasing, peer-to-peer (P2P) trading and others.

DESCRIPTION OF INITIATIVES

- **Long-term pipeline of Large Scale Solar (LSS) projects** to spur industry capability building, with indicative total package and lot sizes, optimised between large solar parks and smaller scale packages.
- **Incentivise dual-use agri-voltaic solar farms** to increase land productivity and environmental sustainability.
- Further explore high potential **floating solar,** including synergies between hydro and solar resources.
- Increase **availability and competitiveness of private capital for solar investments**, with optimisation of equity holding rules and by strengthening due diligence during bid evaluation process.
- Extend **Net Energy Metering (NEM)** to continue encouraging industry development, before transitioning to other forms of compensation such as compensation on displaced cost rates as industry gains maturity.
- Increase **capital access for distributed** solar with rooftop solar aggregation and unlock attractiveness of distributed solar with P2P and virtual Power Purchase Agreements (PPAs).
- Identify ecosystem opportunities to **unlock synergies across the solar value chain**, between upstream manufacturing and downstream development.

Stakeholders
Lead Entity: KeTSA **Core Stakeholders:** ST, SEDA, Ministry of Utility and Telecommunication (Sarawak), TNB, SB, GSO, SEC, SESB, SEB **Supporting Stakeholders:** MITI, MOSTI, KASA, KPKT, TNB, state governments, solar industry players and financial institutions

Implementation Timeline	Initiative Type
2022-2025	New

A8 Enhance and unlock potential of indigenous hydroelectric resources

KEY OBJECTIVES

- Enhance RE penetration to increase **fuel source diversification**, enhance **domestic energy self-sufficiency and environmental sustainability.**
- Enhance **cost-competitiveness** of energy production from hydro resources to improve energy affordability and reduce environmental impact of hydro plants development.
- Position hydro resources to support power system needs of the future with the balance between power generation and **energy storage** contribution.

DESCRIPTION OF INITIATIVES

- Optimise **utilisation of hydro resources in the country** factoring in the environmental impact perspective and the overarching requirement of state governments with regards to water and land use.
- Enhance **efficiency of small-scale hydro resources**, through technology and sharing of best practices to optimise plant performance and efficiency, as well as access to attractive financing.

Stakeholders
Lead Entity: EPU, KeTSA, UPEN (Sarawak) **Core Stakeholders:** KASA, ST, SEDA, UPEN (Sabah), Ministry of Utility and Telecommunication (Sarawak), SB, GSO, SEB **Supporting Stakeholders:** MOSTI, TNB, SESB, SEC

Implementation Timeline	Initiative Type
2022-2040	New

A9 Explore high potential nascent new energy sources

KEY OBJECTIVES

- Enhance renewable energy penetration to increase **fuel source diversification**, enhance domestic **energy self-sufficiency and environmental sustainability.**
- Enhance **commercial viability and competitiveness of alternative energy sources** to achieve technical and commercial viability, as foundation for scale-up.
- Build **competitive position and unlock value pools** with early-mover technology advantage in high potential nascent alternative energy sources.

DESCRIPTION OF INITIATIVES

- Conduct **targeted feasibility studies to identify the potential of alternative energy supply sources** in Malaysia, focusing on high potential energy sources such as waste-to-energy, third-generation bioenergy, solar thermal, and ocean thermal energy conversion (OTEC).
- Support **private sector investments with matching government grants** particularly in early proof-of-concepts as well as deployment and scale-up phase for high potential alternative energy supply sources.
- Conduct **highly selective study of geothermal and wind** energy potential in specific high potential targeted regions.

Stakeholders
Lead Entity: EPU **Core Stakeholders**: MOSTI, KeTSA, MPIC, MAFI, KPKT, ST, SEDA, SB, Ministry of Utility and Telecommunication (Sarawak), UTM-OTEC **Supporting Stakeholders**: MOHE, MGTC, research and academic institutions, SEC, SESB, SEB

Implementation Timeline	Initiative Type
2022-2040	New

A10 Enhance demand-side management in the industry sector

KEY OBJECTIVES

- Reduce energy intensity to realise benefits of **environmental sustainability**, enhanced **resource conservation**, and domestic **energy self-sufficiency.**
- Contribute to **industry competitive advantage** by lowering costs of energy inputs, with NPV positive measures.
- Support **growth and development of local energy efficiency industry** for GDP contribution and job creation, and unlock synergies with 4IR efforts.

DESCRIPTION OF INITIATIVES

- Establish and enforce a **long-term roadmap for mandatory Minimum Efficiency Performance Standards (MEPS)** for a range of electrical and thermal energy-intensive industrial equipment.
- Enforce **mandatory energy audits for large and medium industry players** above selected energy consumption threshold.
- Encourage and incentivise cost-benefit analysis to be carried out for large industrial facilities on **co-generation as well as combined heat and power (CHP) adoption** for industry new builds or major refurbishment, with adoption of measures based on results of cost-benefit analysis.
- Establish supporting **regulatory framework for thermal** energy use (i.e., heat and steam), as a pre-requisite to the implementation of regulations targeted at energy efficiency from CHP.
- Incentivise, increase awareness and promote **adoption of 4IR digital technologies to drive energy efficiency** across industry players and energy service companies (ESCO).

Stakeholders
Lead Entity: ST, Ministry of Utility and Telecommunication (Sarawak) **Core Stakeholders:** EPU, KeTSA, MITI, MOSTI **Supporting Stakeholders:** MIGHT, MIDA, industry associations

Implementation Timeline	Initiative Type
2022-2040	Continuous

A11 Enhance demand-side management in the residential and commercial sector

KEY OBJECTIVES

- Reduce energy intensity to realise benefits of **environmental sustainability,** enhanced **resource conservation** and domestic **energy self-sufficiency.**
- Contribute to **household and commercial energy affordability** by lowering costs of energy inputs, with Net Present Value (NPV) positive measures.
- Support **growth and development of local energy efficiency industry** to improve GDP contribution and job creation and unlock synergies with smart city efforts.

DESCRIPTION OF INITIATIVES

- Expand coverage and establish a **long-term roadmap for mandatory MEPS** for a range of energy-intensive household appliances and commercial equipment.
- Expand equipment coverage of **energy efficiency labelling**, review five-star rating scale for products that have already reached the five-star mark and enhance information provided on energy efficiency label.
- Enforce **mandatory energy audits for large and medium commercial players** with sizable energy consumption.
- Modify or allow exceptions in public procurement process to **facilitate Energy Performance Contract (EPC)** adoption in public sector buildings, to enable the scale-up of energy efficiency in the public sector.
- **Harmonise various Green Building Indices** on energy efficiency.

Stakeholders
Lead Entity: ST, Ministry of Utility and Telecommunication (Sarawak) **Core Stakeholders:** EPU, KeTSA, KPKT, JKR, MGTC, SEDA **Supporting Stakeholders:** REHDA, malaysiaGBC, CIDB, state governments

Implementation Timeline	Initiative Type
2022-2040	Continuous

A12 Support scale-up of demand-side management initiatives with strengthened enablers

KEY OBJECTIVES

- Increase awareness and **support effective realisation of demand-side management initiatives** in industry, residential and commercial sectors.
- **Promote healthy energy efficiency ecosystem,** unlocking synergies between manufacturing, service providers, financial institutions and others to enhance value-add, GDP contribution and job creation.

DESCRIPTION OF INITIATIVES

- Pass **Energy Efficiency and Conservation (EEC) Bill** to accord regulatory oversight of Energy Commission (ST) over electrical and thermal energy efficiency.
- Support **increased adoption of EPC** by developing national standard EPC templates and measurement and verification (M&V) guidelines to increase confidence and reduce transaction costs between client and ESCO.
- Establish **knowledge sharing platform** for industry and commercial players and ESCO to share information about energy efficiency measures and returns, to increase confidence for energy efficiency.
- Enhance **capabilities and capacity of ESCO players** on the technical side by creating awareness of latest energy efficiency technologies and on the financial side by consolidation and improving creditworthiness.
- **Optimise Energy Audit Conditional Grant (EACG) funding target recipients** as energy audits are made mandatory for energy-intensive industries.
- Continue Green Technology Financing Scheme (GTFS), enhance awareness and ability of banks to evaluate energy efficiency projects to unlock private financing. Push towards **sustainable private sector led financing for energy efficiency investments,** by building strong banking sector support for ESCO EPC.

Stakeholders
Lead Entity: ST, Ministry of Utility and Telecommunication Sarawak **Core Stakeholders:** EPU, KeTSA, MITI, JKR, MGTC, SEDA **Supporting Stakeholders:** MIDA, MIGHT, REHDA, MGBC, CIDB, BNM, state governments, financial institutions, industry associations, academic institutions

Implementation Timeline	Initiative Type
2022-2040	Continuous

B1 Unlock opportunities from mobility trends in the light vehicle segment

KEY OBJECTIVES

- Unlock c**onsumer benefits and value pools for domestic auto industry** by keeping pace with rapid technology trends in electrification of light vehicles.
- Position **auto industry for export competitive advantage** with build-up of auto manufacturing capabilities and supply chain to support electric vehicle (EVs) manufacturing.
- Enhance **energy conservation and environmental sustainability** with public transport, fuel economy and electrification of light vehicle.

DESCRIPTION OF INITIATIVES

- Establish **clear responsibility and governance** for the coordinated delivery of fuel economy and fuel of the future initiatives across stakeholders.
- Implement **minimum fuel economy standard requirements** on automotive OEMs and enforce vehicle fuel economy labelling to achieve ASEAN fuel economy target.
- Continuously **promote energy efficiency** by enhancing public transport modal shares, shared mobility, alternative carbon free mobility and facilitating the entry of digitally enabled carpooling.
- Recognise **EVs as the focus of the future in light vehicles** to achieve required level of scale in infrastructure and auto-manufacturing. Support with investments, financing and capability building to **enhance local EV manufacturing and supply chain ecosystem.**
- Conduct strategic planning and support with early stage public-private funding to support **charging infrastructure** build out and other relevant physical enablers to accommodate EV penetration.
- Establish **regulations to support EV adoption** such as regulation on vehicle, battery and infrastructure attributes.

Stakeholders
Lead Entity: MITI **Core Stakeholders:** EPU, MOT, KASA, KeTSA, MOSTI, MPIC, ST, MGTC, MARii **Supporting Stakeholders:** NanoMalaysia, MIMOS, MAA, TNB, PETRONAS, SEB, SESB

Implementation Timeline	Initiative Type
2022-2040	New

B2 Unlock opportunities from mobility trends in the heavy vehicles segment

KEY OBJECTIVES

- Enhance **energy conservation, reduce congestion and enhance environmental sustainability** with more efficient demand-side management, enhanced fuel economy and switching towards cleaner fuels in heavy transport.
- Enhance **synergies between the domestic agricommodity industry and the transport sector** with biofuels penetration, and capture new value pools from other emerging high potential fuels of the future in the heavy transport segment.

DESCRIPTION OF INITIATIVES

- Implement **minimum fuel economy standard requirements** on automotive OEMs and enforce vehicle fuel economy labelling to complement other demand-side management programmes such as green freight and eco-driving programme.
- Support timely execution and **shifts to alternative modes of transport for freight.**
- **Keep pace with developments in fuel of the future** including hydrogen, Liquefied Natural Gas (LNG), biodiesel and heavy EVs with deliberate decision made to prioritise fuel of the future before at-scale build out of infrastructure enablers.

Stakeholders
Lead Entity: MITI **Core Stakeholders:** EPU, MOT, KASA, MPIC, MGTC, MARii, MOSTI, UPEN (Sabah), UPEN (Sarawak), SEB, SEC, PETRONAS **Supporting Stakeholders:** NanoMalaysia, MIMOS, auto-industry players

Implementation Timeline	Initiative Type
2022-2040	New

B3 Comply and capture value pools in line with international marine bunkering fuel regulations

KEY OBJECTIVES

- Ensure **optimised national response** to International Maritime Organization (IMO) sulphur cap standards compliance in the near term and decarbonisation compliance in the longer term.
- Capture **new value pools related to marine fuels of the future** such as low sulphur fuel oil, LNG and biofuels leveraging fuel of the future advantages to increase ports competitiveness.

DESCRIPTION OF INITIATIVES

- Position Malaysia as a **regional LNG bunkering hub** for long-term advantage, with supporting port incentives and policies.
- **Optimise fuel mix and encourage investments in refineries** for residue desulphurisation and low-sulphur crude topping units to enhance domestic supply of Low Sulphur Fuel Oil (LSFO) to meet IMO requirements and encourage take-up of LSFO in domestic ports.
- Invest and **build technology advantage in biofuels** used in marine bunkering as a high potential fuel of the future and explore adoption of biofuels for onboard energy use and for diesel-powered vessels.

Stakeholders
Lead Entity: MOT **Core Stakeholders:** EPU, MPIC, KASA, PETRONAS, port authorities **Supporting Stakeholders:** UPEN (Sabah), UPEN (Sarawak), MGTC, MITI, MOSTI, NanoMalaysia, MIMA, maritime players, domestic refineries

Implementation Timeline	Initiative Type
2022-2040	New

B4 Comply and capture value pools from international aviation fuel regulations

KEY OBJECTIVES

- Ensure optimised national response to **Carbon Offsetting and Reduction Scheme for International Aviation (CORSIA) emission standards compliance**, supporting country aviation industry aspirations.
- Capture new value pools through **early mover advantage in fuels of the future**, such as leveraging advantages of domestic bio-based feedstock for biofuels.

DESCRIPTION OF INITIATIVES

- Track **developments in international CORSIA regulations**, invest and build technology advantage in biofuel use for aviation industry as well as demand-side management measures.
- Invest and encourage pilot projects to build technology advantage in the use of indigenous bioenergy sources to **produce biofuels for use in aviation industry.**
- Track developments and factor in energy-related impact of new **air-based mobility technology.**

Stakeholders
Lead Entity: MOT **Core Stakeholders:** EPU, MPIC, KASA, CAAM, MAHB **Supporting Stakeholders:** MOSTI, MGTC, NanoMalaysia, domestic airlines, aviation fuel suppliers

Implementation Timeline	Initiative Type
2022-2040	New

B5 Optimise power generation mix based on the energy trilemma, factoring in rapid technology progress

KEY OBJECTIVES

- Enhance power system energy security, affordability and environmental sustainability by optimisation of power capacity development plans.
  - Enhance **energy security** by improving fuel source diversification, domestic energy self-sufficiency and energy storage for system stability.
  - Enhance **energy affordability** by keeping pace with tech trends influencing relative competitiveness of various power generation sources.
  - Enhance **environmental sustainability** by moving to cleaner energy sources.

DESCRIPTION OF INITIATIVES

- **Optimisation of power capacity mix** across coal, natural gas, and renewables to achieve energy trilemma objectives, factoring in rapidly evolving global policy and technology trends.
- **Enhance conversion efficiency** to improve fuel input to electricity generated.

Stakeholders
Lead Entity: KeTSA **Core Stakeholders:** ST, SB, TNB, GSO, SEDA, SESB, Ministry of Utility and Telecommunication (Sarawak) **Supporting Stakeholders:** EPU, KASA, MITI, SEB, SEC, MGTC, UPEN (Sabah), UPEN (Sarawak)

Implementation Timeline	Initiative Type
2022-2040	Continuous

B6 Implement physical and regulatory enablers to accommodate power system advancement

KEY OBJECTIVES

- Enable benefits of **energy security, affordability and environmental sustainability** to be realised from power system of the future, such as accommodating increase in EVs and variable RE generation.
- Unlock **competition, new business models, innovation** in the power sector and to enhance international competitiveness in attracting investors.
- Cost **effective implementation of enablers** with support of private investments.

DESCRIPTION OF INITIATIVES

- Invest in **grid infrastructure upgrades and energy storage** in a timely manner to support future mix with greater variable RE penetration, supported by strong regulatory frameworks.
- Invest in **digitalisation and modernisation of the power system** including roll-out of smart grid infrastructure.
- Enhance country value capture by **developing local capabilities and industries across the RE value chain** and in enablers such as smart grid, smart energy management systems and other innovations associated with the modernisation of the electricity sector.
- Study and implement measures to **accommodate greater penetration of variable renewable energy (VRE) and EVs** by enhancing grid infrastructure and installing energy storage facilities.
- Facilitate **entry of green virtual PPAs,** to increase electricity offtake choice required to attract environmental, social and governance (ESG) investments.
- **Study potential to enhance electricity sector with market reforms** such as considering electricity market liberalisation and transparent, equitable and well-designed grid Third-Party Access (TPA) schemes.

Stakeholders
Lead Entity: KeTSA, Ministry of Utility and Telecommunication (Sarawak) **Core Stakeholders:** ST, SB, TNB, GSO, SEDA **Supporting Stakeholders:** MITI, MGTC, MARii, MOT, MyPower, SEB, SESB, SEC, UPEN (Sabah), UPEN (Sarawak)

Implementation Timeline	Initiative Type
2022-2040	Continuous

B7 Enhance and optimise regional and international grid system interconnectivity

KEY OBJECTIVES

- Leverage Sabah-Sarawak interconnectivity to benefit Sabah with enhanced energy security from **wider network access, improved fuel diversification, sharing of reserve margins and energy affordability** by leveraging Sarawak hydropower.
- Leverage ASEAN interconnectivity to benefit country with enhanced **energy security** from the integrated network systems and sharing of indigenous reserve margins as well as enable **regional power trading.**

DESCRIPTION OF INITIATIVES

- Establish **regional grid connectivity between Sabah and Sarawak** to enhance power system stability, enable sharing of backup capacity and to unlock the benefits of hydropower in Sarawak.
- Leverage **ASEAN power grid interconnectivity** to enhance power system stability, to optimise reserve margins and explore potential electricity sales to neighbouring countries.

Stakeholders
Lead Entity: KeTSA, Ministry of Utility and Telecommunication Sarawak **Core Stakeholders:** ST, SB, TNB, GSO, SESB, SEB, UPEN (Sabah), UPEN (Sarawak)

Implementation Timeline	Initiative Type
2022-2040	Continuous

B8 Unlock opportunities and long-term competitive advantage in the emerging hydrogen economy

KEY OBJECTIVES

- Unlock **new value pools, GDP contribution and job creation** from hydrogen economy, keeping pace with technology development in various end uses.
- Enhance **export income**, which contributes to socioeconomic development from hydrogen production for exports.
- Support **carbon emission reduction** efforts with hydrogen, in line with increasing commercial viability of hydrogen relative to substitutes.

DESCRIPTION OF INITIATIVES

- Nominate a lead government entity to spearhead and oversee the end-to-end development of **hydrogen economy roadmap** for Malaysia.
- Develop **long-term hydrogen roadmap** which optimises hydrogen production pathways across green, blue and grey hydrogen.
- Determine **national strategy to optimise hydrogen production locations** for optimised competitive advantage, such as positioning Sarawak as a green hydrogen production hub targeted for export markets.
- Build up a **domestic hydrogen ecosystem** supported by research and development (R&D), technology deployment and commercialisation capabilities across targeted areas along the hydrogen value chain of production, distribution and end-use application.
- **Develop regulation** to ensure safe, secure and equitable roll-out of hydrogen production, transport and end-use applications.

Stakeholders
Lead Entity: MOSTI, UPEN (Sarawak), UPEN (Sabah) **Core Stakeholders:** EPU, MITI, PETRONAS, SEB, MGTC, SEDC Energy, SB, NanoMalaysia, Department of Standards

Implementation Timeline	Initiative Type
2022-2040	New

C1 Enhance environmental sustainability by focusing on high GHG emission areas

KEY OBJECTIVES

- Enhance **environmental sustainability** to improve standard of living and reduce national greenhouse gas (GHG) emissions.
- **Focus efforts** on highest return areas where significant emission reductions can be obtained and where cost of emission reduction is viable.

DESCRIPTION OF INITIATIVES

- Set **national limits and commit to zero continuous flaring and venting** emissions to reduce upstream GHG emissions.
- Identify commercially viable solutions to **reduce coal use in the cement sector,** such as fuel switching to biomass and waste-to-energy, optimising clinker-to-cement ratios, and enhancing plant capacity for energy efficiency.
- Identify viable opportunities to drive **diesel to natural gas or biogas switching in industry use,** including considering VPS solutions to enable natural gas access to facilitate switch.

Stakeholders
Lead Entity: EPU **Core Stakeholders:** MITI, KASA, ST, PETRONAS **Supporting Stakeholders:** Sector stakeholders (e.g., industry associations, oil and gas operators, etc.)

Implementation Timeline	Initiative Type
2022-2040	Continuous

C2 Enhance carbon footprint accounting, reporting and certification in businesses

KEY OBJECTIVES

- Enable businesses to **increase competitiveness in export markets** where ESG and production carbon footprint are increasingly important factors in decision-making.
- Encourage **consumers to factor in ESG considerations** into purchasing decisions with ESG transparency that enables market activation for business shifts.
- Create **transparency to inform strategic measures** to reduce carbon footprint, to meet national commitments.

DESCRIPTION OF INITIATIVES

- Enhance **accuracy and comprehensiveness of nationwide GHG accounting standards,** such as establishing country-specific emission factors.
- Adopt internationally recognised standards, encourage, and gradually mandate **private sector carbon footprint accounting and reporting.**
- Enable mechanisms which allow for local firms to **voluntarily certify carbon footprint position** through endorsed certification entities.

Stakeholders
Lead Entity: KASA **Core Stakeholders:** MITI, MOT, KeTSA, Bursa Malaysia, Companies Commission (SSM), Securities Commission (SC), BNM

Implementation Timeline	Initiative Type
2022-2030	New

C3 Determine and enforce energy sector GHG emission reduction targets

KEY OBJECTIVES

- Align energy **sector targets on GHG emissions** to national commitments, to ensure accountability in achievement of targets.
- Unlock positive spillover benefits of environmental sustainability on **health and quality of living.**
- Leverage strong position on environmental sustainability as a form of competitive advantage to **attract investors and to benefit from multilateral development support.**

DESCRIPTION OF INITIATIVES

- Determine **the targets for key energy subsectors** including transport, power and industry in line with the country's GHG emissions commitments.

Stakeholders
Lead Entity: KASA **Core Stakeholders:** EPU, KeTSA, MOT, MITI, ST, SB, PETRONAS

Implementation Timeline	Initiative Type
2022-2025	New

C4 Enhance platform for businesses to access RE in line with ESG trends

KEY OBJECTIVES

- Attract **foreign investments** and retain current domestic investments by catering to specific ESG requirements of global investors, such as the RE100.
- Keep pace with changing and increasingly **stringent ESG and RE requirements of investors** to achieve competitive advantage.
- Benefit from **spillover effects** such as GDP contribution and job creation from entry of foreign investments.

DESCRIPTION OF INITIATIVES

- Enhance mechanisms for industries to **offtake electricity from renewable energy sources,** including additionality requirements by selected RE100.
- Enable offtake of renewable energy and selection of energy source based on various ESG factors through **virtual Power Purchase Agreement (PPA)** enabled by structural reform and supported by a comprehensive technical, commercial and regulatory framework.
- **Market ability for companies to offtake RE** in order to attract FDI and corporations to Malaysia.

Stakeholders
Lead Entity: KeTSA **Core Stakeholders:** EPU, MITI, MIDA, UPEN (Sabah), UPEN (Sarawak) **Supporting Stakeholders:** KASA, SEDA, Ministry of International Trade, Industry and Investment (Sarawak)

Implementation Timeline	Initiative Type
2022-2025	Continuous

D1 Rationalise energy subsidies towards market-based pricing

KEY OBJECTIVES

- Enhance **fiscal sustainability and reduce economic distortions** with move towards economics-driven market-based pricing.
- Ensure **safeguard of energy equity for low-income households** with targeted support.
- Ensure **smooth transition and advanced notice** for subsidy rationalisation, through clear communications, with timeline and adjustment period credibility as well as timely execution of actions.

DESCRIPTION OF INITIATIVES

- **Rationalise transport fuel subsidies,** with only targeted exception-based for low-income households.
- **Rationalise LPG subsidy leakages** and move towards market prices in line with post COVID-19 fiscal rationalisation, with only targeted exception-based for low-income households.
- Establish supporting enablers such as developing a **strong database of vulnerable groups** which ensures data consistency across ministries and is consistently updated, to enhance targeted support for low-income households.
- **Time energy subsidy rationalisation** with overall fiscal consolidation plans of government following the COVID-19 recovery.

Stakeholders
Lead Entity: MOF, EPU **Core Stakeholders:** KPDNHEP, MPIC, KeTSA, MITI, ST, UPEN (Sabah), UPEN (Sarawak)

Implementation Timeline	Initiative Type
2022-2025	Continuous

D2 Ensure effective, targeted and cost effective investments in energy infrastructure

KEY OBJECTIVES

- Achieve timely build out of energy infrastructure to **facilitate energy transition** and **safeguard energy security,** whilst ensuring fiscal sustainability.
- Manage large energy sector-related direct or contingent liabilities to ensure **continued fiscal sustainability.**
- Unlock full potential and **avoid "crowding out" of private investments,** such as through well-designed public-private partnership models.

DESCRIPTION OF INITIATIVES

- Ascertain continuous and consistent forward planning and accountability to **ensure demand-led and cost-efficient large energy investments,** such as power plants, grid and natural gas infrastructures, which will lead to impactful private sector investment and public-private partnership options.
- Mitigate large future energy-sector liabilities such as **oil and gas decommissioning costs,** through early planning and proactive actions.

Stakeholders
Lead Entity: EPU, MOF **Core Stakeholders:** KeTSA, MOT, KASA, SB, GSO, MGTC, ST, UPEN (Sabah), UPEN (Sarawak), PETRONAS, GMD

Implementation Timeline	Initiative Type
2022-2040	Continuous

D3 Establish energy supply boundary conditions by giving priorities to national energy security

KEY OBJECTIVES

- Ensure **continued energy security** with safeguards on energy security of supply and compliance to various energy security metrics such as domestic self-reliance, fuel source and energy import source diversification.
- Ensure **cost effective safeguards**, such as exploring innovative public-private partnerships to enable enhanced security of supply.

DESCRIPTION OF INITIATIVES

- Establish and enforce **boundary conditions on key energy security metrics,** such as fuel source diversification, domestic energy self-reliance and energy import source diversification.
- **Enhance energy stockpiles** for energy security and identify paths to enable cost-effective stockpiles and energy security.

Stakeholders
Lead Entity: EPU **Core Stakeholders:** KeTSA, ST, PETRONAS, TNB **Supporting Stakeholders:** MITI, MOT, KPKT, KPDNHEP

Implementation Timeline	Initiative Type
2022-2025	New

D4 Timely build-out of new energy import infrastructure to safeguard security of supply

KEY OBJECTIVES

- Ensure continued energy security with the **timely build-out of relevant energy import infrastructure** to improve security of supply.
- Ensure **cost-effective build out of import infrastructure** leveraging private investments enabled by TPA and timing build-out in line with accurate demand requirements to prevent underutilisation of infrastructure.

DESCRIPTION OF INITIATIVES

- Invest into **timely expansion of energy import infrastructure** based on outlook of energy demand-supply balances.

Stakeholders
Lead Entity: EPU, ST **Core Stakeholders:** PETRONAS, UPEN (Sabah), UPEN (Sarawak), licensed energy infrastructure players **Supporting Stakeholders:** MITI, KeTSA, GMD

Implementation Timeline	Initiative Type
2022-2040	New

E1 Establish a National Energy Council for holistic planning, policy development and implementation coordination

KEY OBJECTIVES

- Strengthened energy sector governance for **holistic** planning, policy development and energy policy implementation coordination.
- Enhance **public sector efficiency and effectiveness** in planning and implementation of energy related policies and key projects.
- Ensure **effective oversight and orchestration for implementation of the DTN.**

DESCRIPTION OF INITIATIVES

- Establish a **National Energy Council** as a forum chaired by the Prime Minister for executive decisions related to energy policy, given the cross-cutting impact of energy policy decisions on the overall economy.

Stakeholders
Lead Entity: EPU **Core Stakeholders:** MOF, PMD, KeTSA, KASA, KPDNHEP **Supporting Stakeholders:** ST, PETRONAS

Implementation Timeline	Initiative Type
2022-2023	New

E2 Determine national level energy technology priorities and ensure stakeholders deliver the priorities

KEY OBJECTIVES

- Effectively develop, commercialise and scale energy technologies required to **capture opportunities from energy transition** and indigenous energy resources.
- Enhance **competitive advantage and increase value-add** of energy sector players with enhanced localisation of technology capabilities, contribution to GDP, job creation, and technology export income.
- Improve **effectiveness of technology development** efforts by unlocking synergies and creating ecosystem focus, promote higher return on technology funding.

DESCRIPTION OF INITIATIVES

- Prioritise and define **national-level energy technology focus areas** and sub-areas, aligned to where country has potential to create sustained technology competitive advantage.
- Prioritise areas of **energy-sector technology funding and financing** by adopting strategic portfolio view to public sector technology investments.
- **Orchestrate stakeholders to push technology priorities** in a structured manner and unlocking synergies through ecosystem-wide collaboration.
- Ensure **alignment of academic and research institutions** towards technology priorities.

Stakeholders
Lead Entity: EPU, MOSTI **Core Stakeholders:** KeTSA, MPIC, ST, MGTC, MARii, PETRONAS **Supporting Stakeholders:** MOHE, MITI, MIDA, MPRC, SEB, research and academic institutions

Implementation Timeline	Initiative Type
2022-2025	New

E3 Conduct strategic workforce planning and enhance future-proof skills across energy sector workforce

KEY OBJECTIVES

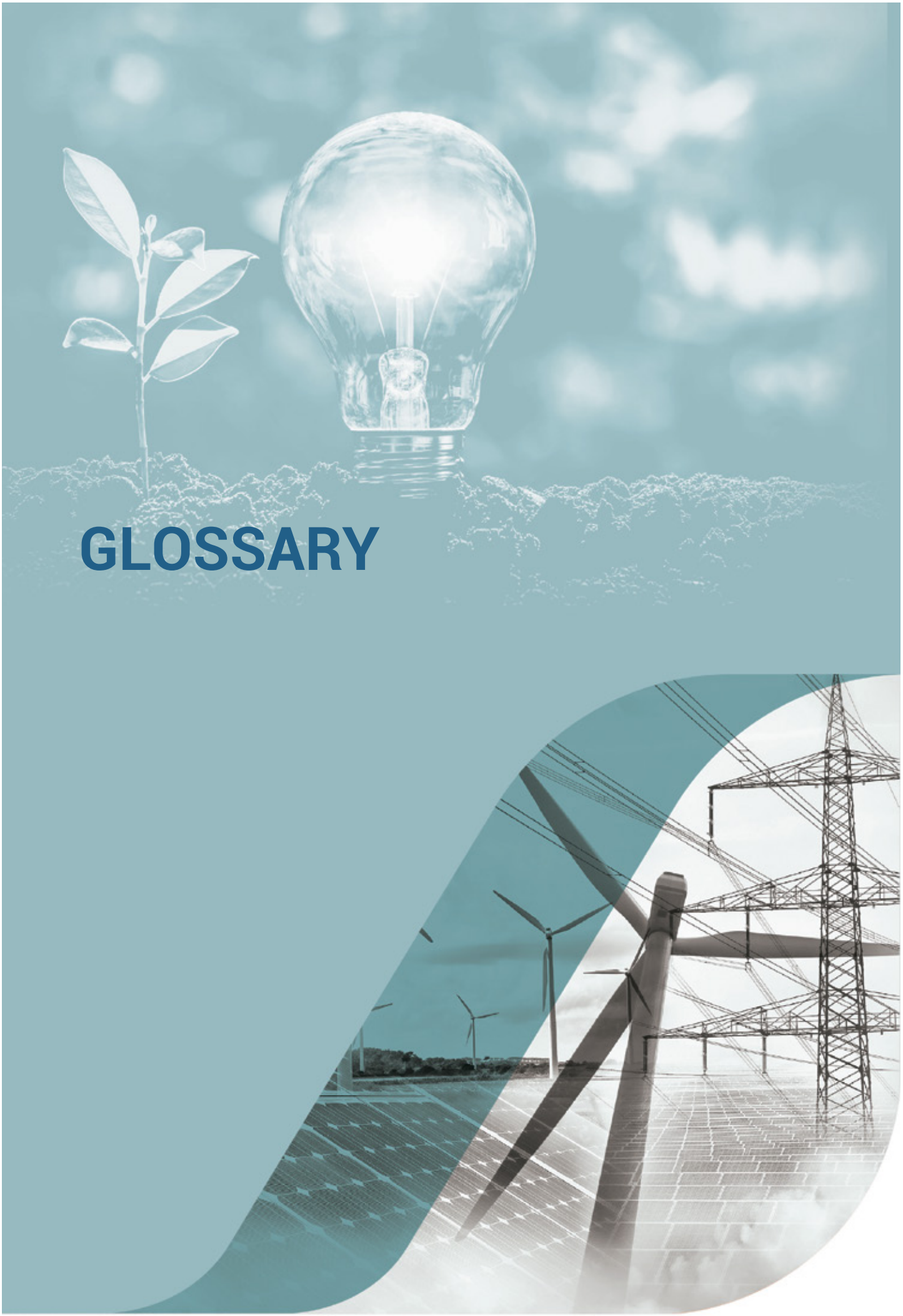
- Ensure **equitable energy transition for the labour force** and protect workers impacted by the energy transition.
- Effective and holistic workforce demand-supply planning, which meets future energy sector needs and increases **employability and value-add of workforce.**
- Create people and capability competitive advantage for the energy sector, unlocking productivity benefits, value-add and export income potential.

DESCRIPTION OF INITIATIVES

- Engage key academic and Technical and Vocational Education and Training (TVET) institutions to **update and future-proof academic syllabi and training courses** in line with future skills identified in the strategic workforce planning exercise.
- Develop sub-sector specific packages to support the **equitable and smooth transition of workforce** in line with the energy transition.

Stakeholders
Lead Entity: EPU, MOHR **Core Stakeholders:** MOHE, MOE, MQA, DSD, academic institutions and TVET entities, state governments **Supporting Stakeholders:** MOF

Implementation Timeline	Initiative Type
2022-2040	New



GLOSSARY

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2030 Agenda	2030 Agenda for Sustainable Development
4IR	Fourth Industrial Revolution
AI	Artificial Intelligence
ASEAN	Association of Southeast Asian Nations
BioCNG	Bio-Compressed Natural Gas
BNM	Bank Negara Malaysia
CAAM	Civil Aviation Authority of Malaysia
CAGR	Compound Annual Growth Rate
CCUS	Carbon capture, utilisation and storage
CHP	Combined heat and power
CIDB	Construction Industry Development Board
CO_2	Carbon dioxide
CORSIA	Carbon Offsetting and Reduction Scheme for International Aviation
DDI	Direct Domestic Investment
DTN	National Energy Policy, 2022-2040
E&E	Electrical and electronics
EACG	Energy Audit Conditional Grant
EE	Energy efficiency
EECA	Energy Efficiency and Conservation Act
EEV	Energy-efficient vehicle
EPC	Energy Performance Contract
EPU	Economic Planning Unit, Prime Minister's Department
ESCO	Energy service company
ESG	Environmental, Social and Governance
EV	Electric vehicle
FDI	Foreign Direct Investment
GDP	Gross Domestic Product
GHG	Greenhouse Gas
GMD	Gas Malaysia Distribution Sdn Bhd
GSO	Grid System Operator
GTFS	Green Technology Financing Scheme
H_2S	Hydrogen sulphide
HHI	Herfindahl-Hirschman Index
HVO	Hydrotreated vegetable oil
ICE	Internal Combustion Engine
IMO	International Maritime Organization
IoT	Internet of Things
JCC	Joint Coordination Committee
JKR	Public Works Department
KASA	Ministry of Environment and Water
KEGA	Key Economic Growth Activities
KeTSA	Ministry of Energy and Natural Resources
KPDNHEP	Ministry of Domestic Trade and Consumer Affairs
KPKT	Ministry of Housing and Local Government
KPLB	Ministry of Rural Development
KWP	Ministry of Federal Territories
LCOE	Levelised cost of electricity
LNG	Liquefied Natural Gas
LT-LEDS	Long-Term Low Emission Development Strategies
LTSM	Logistics, transportation and sustainable mobility
LSFO	Low Sulphur Fuel Oil
LSS	Large Scale Solar
M&V	Measurement and Verification
MAA	Malaysia Automotive Association
MAFI	Ministry of Agriculture and Food Industries
MAHB	Malaysia Airports Holdings Berhad
malaysiaGBC	Malaysia Green Building Council
MARii	Malaysia Automotive Robotics and IoT Institute
MATRADE	Malaysia External Trade Development Corporation
MEPS	Minimum Energy Performance Standards
MGTC	Malaysian Green Technology and Climate Change Corporation
MIDA	Malaysian Investment Development Authority

MIGHT	Malaysian Industry-Government Group for High Technology
MIMA	Maritime Institute of Malaysia
MITI	Ministry of International Trade and Industry
ML	Machine learning
MOF	Ministry of Finance
MOGSC	The Malaysian Oil, Gas & Energy Services Council
MOSTI	Ministry of Science, Technology, and Innovation
MOHE	Ministry of Higher Education
MOHR	Ministry of Human Resource
MOT	Ministry of Transport
MPIC	Ministry of Plantation Industries and Commodities
MPOB	Malaysian Palm Oil Board
MPRC	Malaysia Petroleum Resources Corporation
Mtoe	Mega Tonnes of Oil Equivalent
MW	Megawatt
NDC	Nationally Determined Contribution
NEEAP	National Energy Efficiency Action Plan
NEM	Net Energy Metering
NPV	Net Present Value
NxGV	Next-generation vehicles
OEM	Original equipment manufacturer
OGSE	Oil & Gas, Services and Equipment
P2P	Peer-to-Peer
PETRONAS	Petroliam Nasional Berhad
PETROS	Petroleum Sarawak Berhad
POGO	Palm Oil Gas Oil
PPA	Power Purchase Agreement
R&C	Residential and Commercial
R&D	Research and Development
R&D&C&I	Research, development, commercialisation and innovation
RE	Renewable energy
REHDA	Real Estate and Housing Developers' Association Malaysia
RGT	Regasification terminal
RHT	Restoration Hydro Turbine
SB	Single Buyer
SEB	Sarawak Energy Berhad
SEC	Sabah Energy Corporation Sdn Bhd
SEDA	Sustainable Energy Development Authority
SEDC	Sarawak Economic Development Corporation
SESB	Sabah Electricity Sdn Bhd
SOGDC	Sabah Oil & Gas Development Corporation Sdn Bhd
ST	Energy Commission
TNB	Tenaga Nasional Berhad
TPA	Third-Party Access
TPES	Total primary energy supply
TVET	Technical and Vocational Education and Training
Twelfth Plan	Twelfth Malaysia Plan, 2021-2025
UPEN	State Economic Planning Unit
UTM-OTEC	Universiti Teknologi Malaysia - Ocean Thermal Energy Centre
VPS	Virtual Pipeline System
VRE	Variable renewable energy
WKB 2030	Wawasan Kemakmuran Bersama 2030

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