



MINISTRY OF ECONOMY

National Energy Transition Roadmap

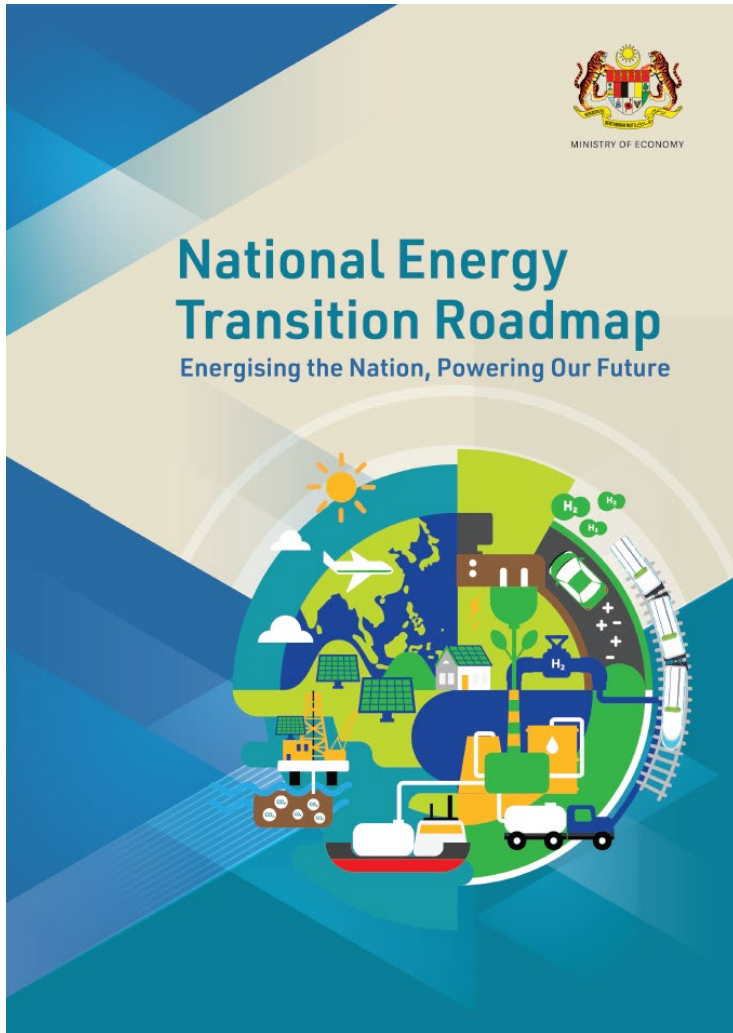
Energising the Nation, Powering Our Future



NETR Executive Summary

INTERNATIONAL RAILWAY
SYMPOSIUM 2023

6 November 2023



10

Flagship Catalyst Projects and Initiatives

Investments of more than RM25 billion, potential creation of 23,000 jobs, and reduce at least 10,000 GgCO₂ eq. annually

50

Key Initiatives and Enablers

Spurring Malaysia's green growth for climate resilience. To uplift GDP value from RM25 billion in 2023 to RM220 billion and generate 310,000 jobs by 2050

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Net-Zero GHG Emissions as Early as 2050

NETR's Responsible Transition 2050 outlines the energy sector's low carbon pathway to reduce 32% GHG emission from 259 MtCO₂eq. (2019) to 175 MtCO₂eq (2050)

Across 6 Energy Transition Levers



Energy Efficiency



Renewable Energy



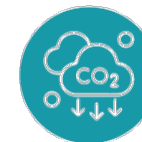
Hydrogen



Bioenergy



Green Mobility



CCUS

NETR Building Blocks

Energy Transition ambition and macro position

Macro national aspiration
Net-zero GHG emissions as early as 2050

Energy system pathway
Responsible Transition 2050 Pathway

Impact of chosen pathway
Investment opportunities, socioeconomic outcomes, projected emissions reduction



6 Energy Transition levers



Energy Efficiency (EE)



Renewable Energy (RE)



Hydrogen



Bioenergy



Green Mobility



Carbon Capture, Utilisation and Storage (CCUS)



5 Cross-cutting enablers

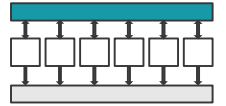
Financing & Investments

Policy & Regulations

Human Capital & Just Transition

Technology & Infrastructure

Governance & Implementation



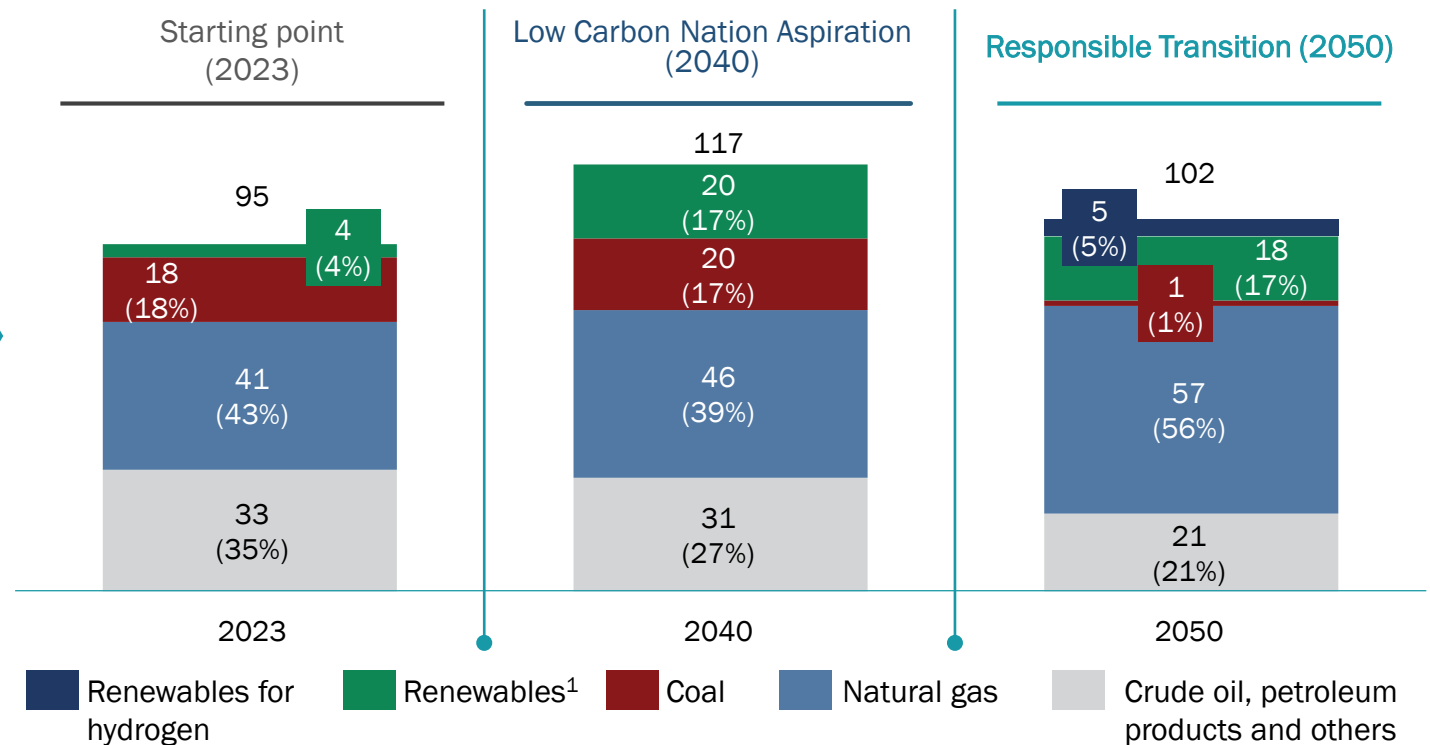
Responsible Transition (RT) Pathway 2050

RT Pathway 2050 is the best-fit scenario developed in consideration of current technology developments, global trends and national circumstances

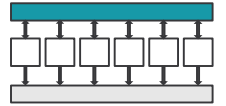
The RT pathway aims to:

- + increase RE**
Increased use of RE in the power generation mix
- + phase out coal**
Close to fully phased-out coal from the power generation mix
- + pursue EE**
Broad based energy efficiency initiatives pursued
- + expedite green mobility**
Shift to electrification and biofuels expedited in the transport sector

Total Primary Energy Supply (Mtoe), by energy source

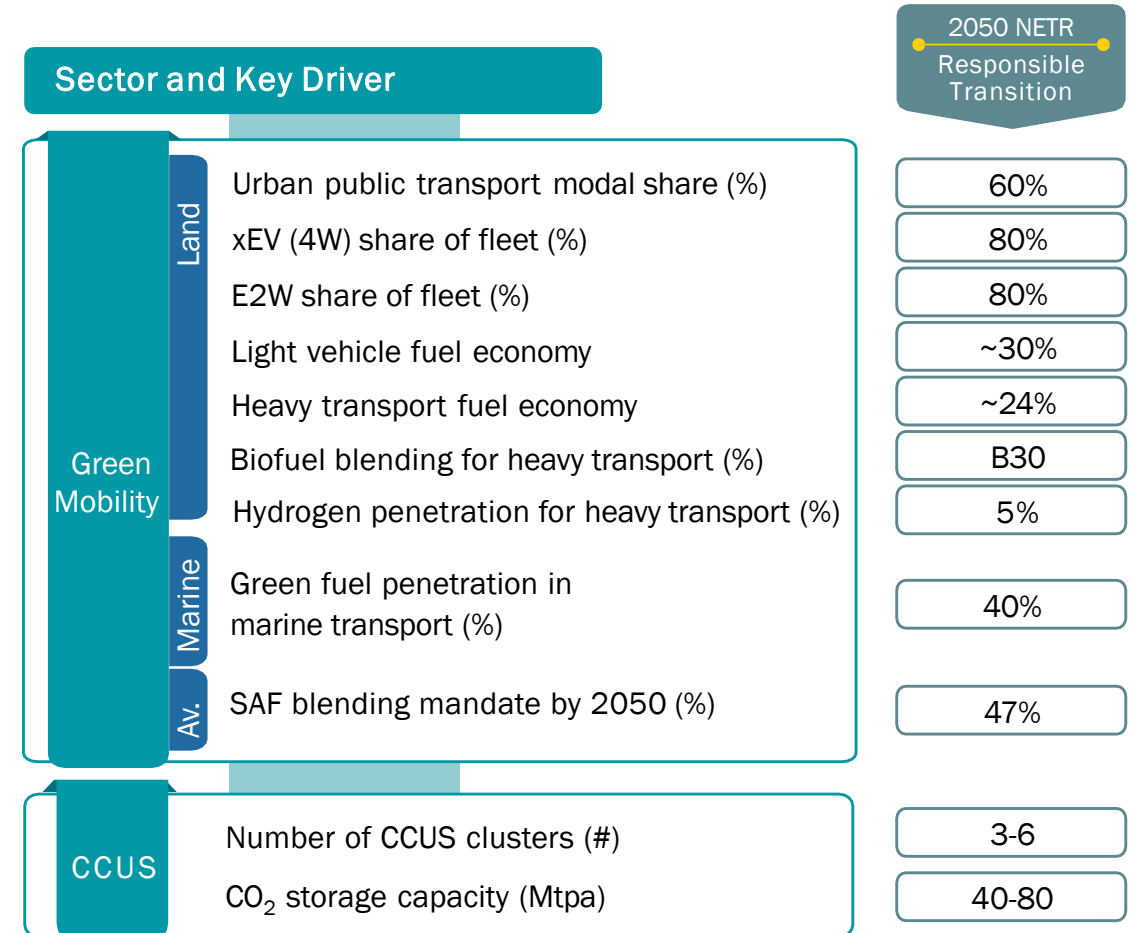
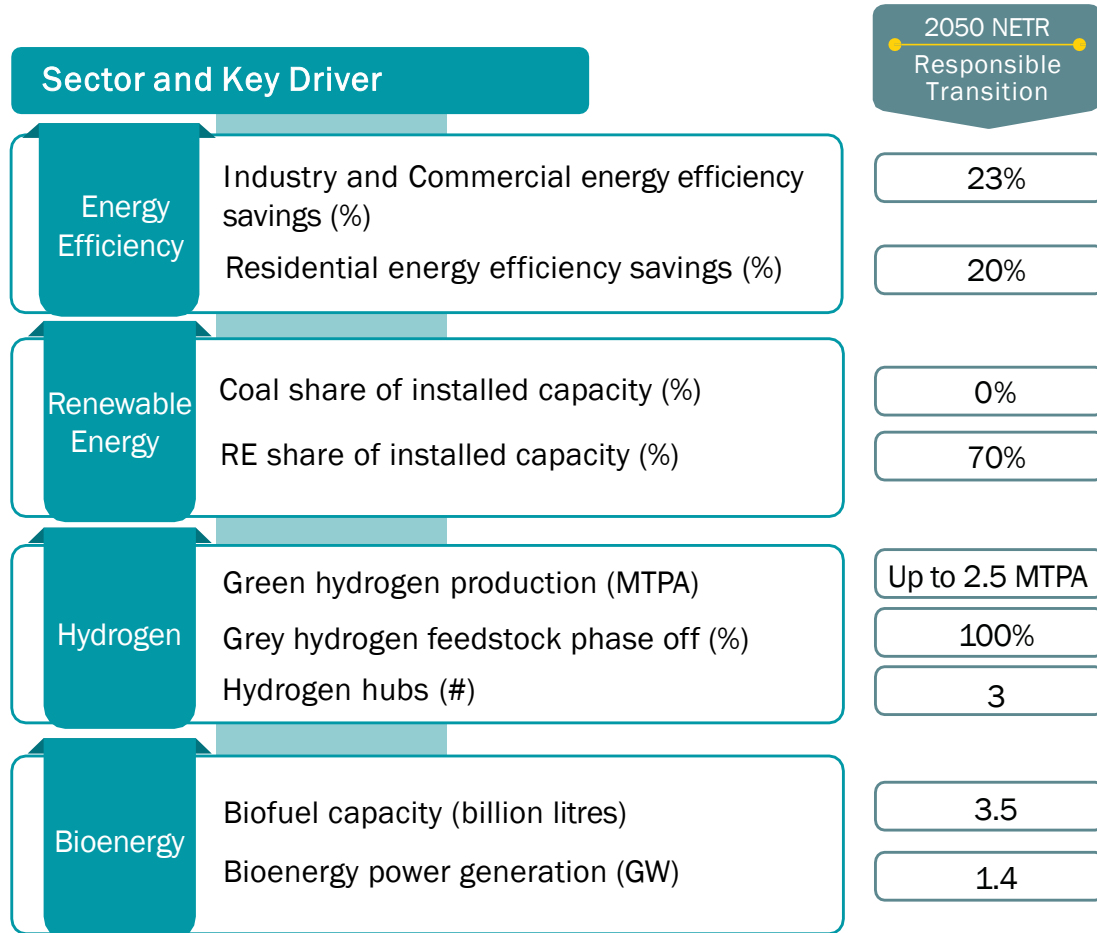


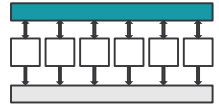
¹ includes bioenergy, solar, hydropower and hydrogen



RT Pathway 2050 Targets

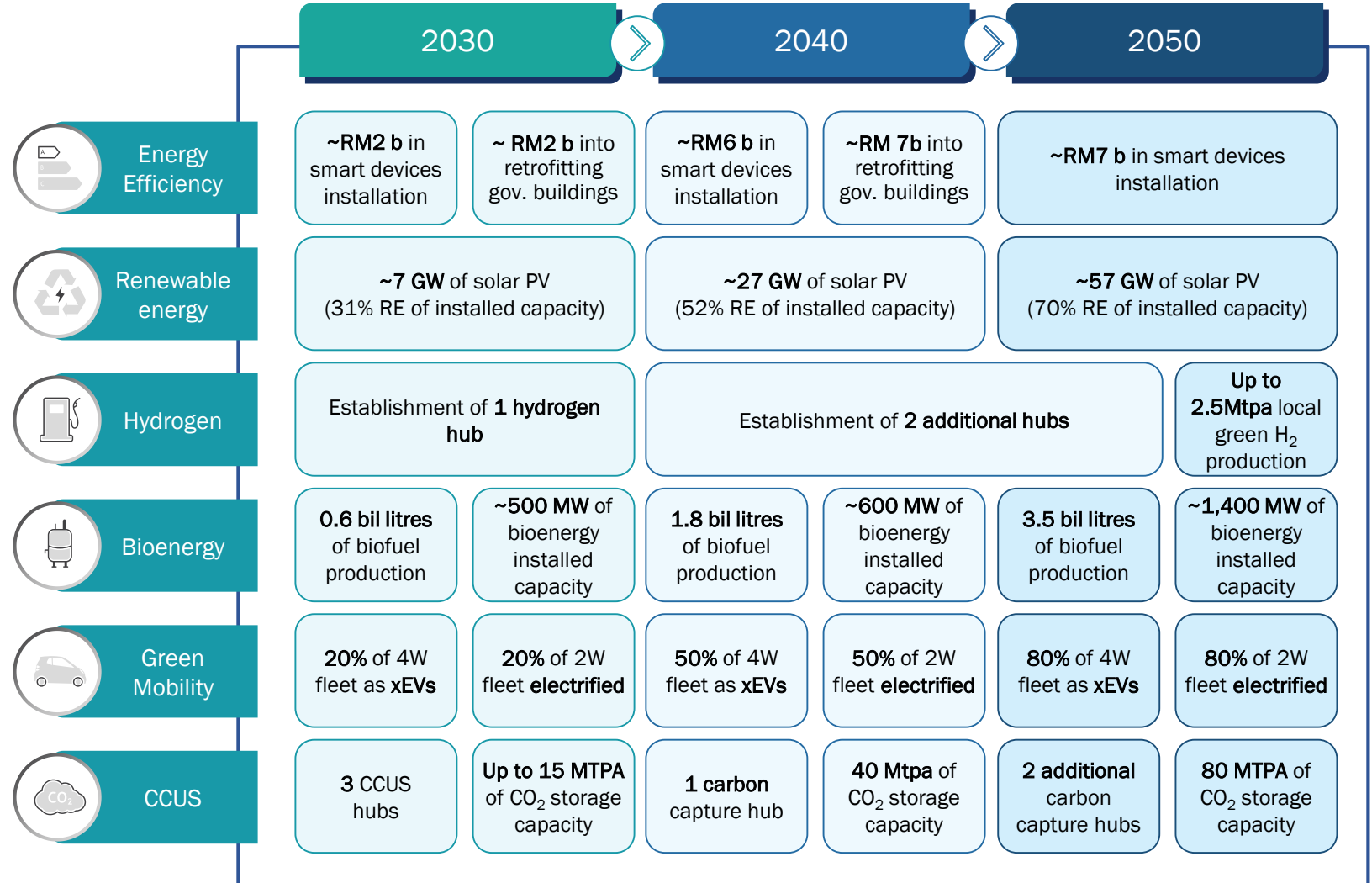
The targets will guide the nation towards the RT pathway ambition, striking the right balance between environmental mitigation and the need to bolster net socioeconomic values

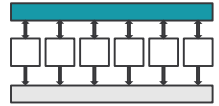




Investment Opportunities

The realisation of these investments through **blended financing and public-private partnership** will spur Malaysia's low carbon economy while ensuring climate resilience

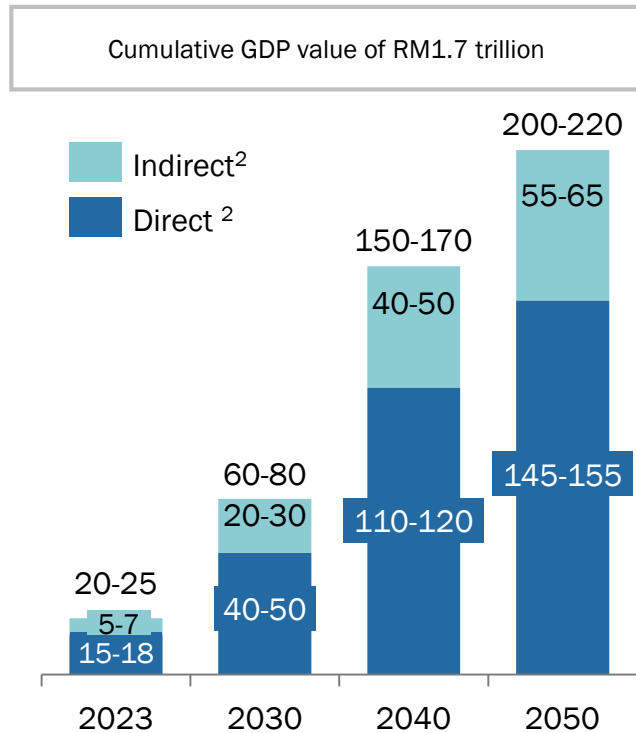




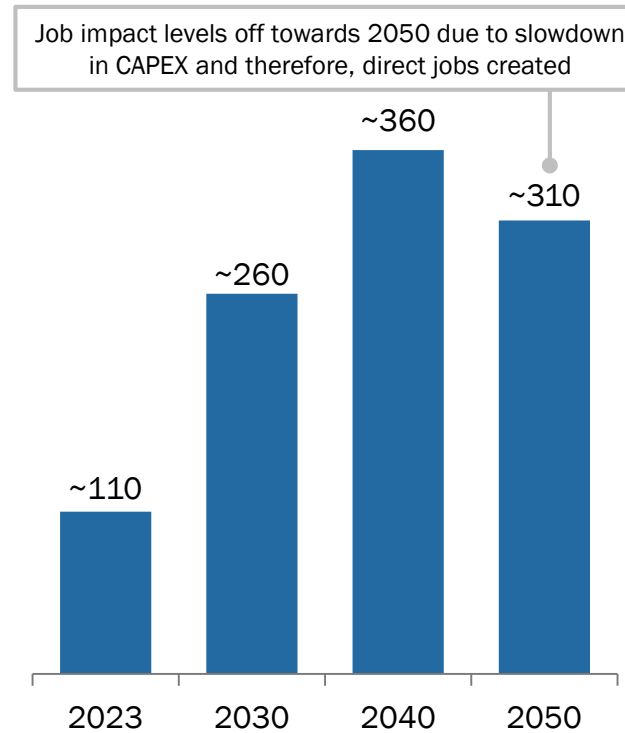
Expected Socioeconomic Outcomes

Additional RM220 billion in GDP and the creation of 310,000 green jobs, and **income gains** for the **medium- and low-income households**

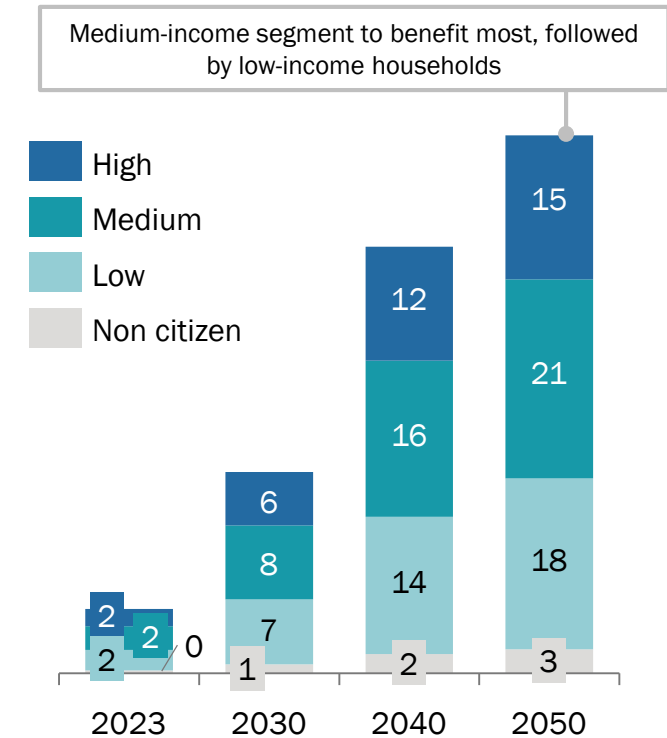
Annual GDP impact vs. 2022 baseline¹ (RM b)



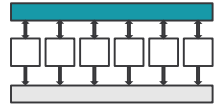
Direct jobs created vs. 2022 baseline (FTE '000)



Income impact by household segment vs. 2022 baseline (RM b)

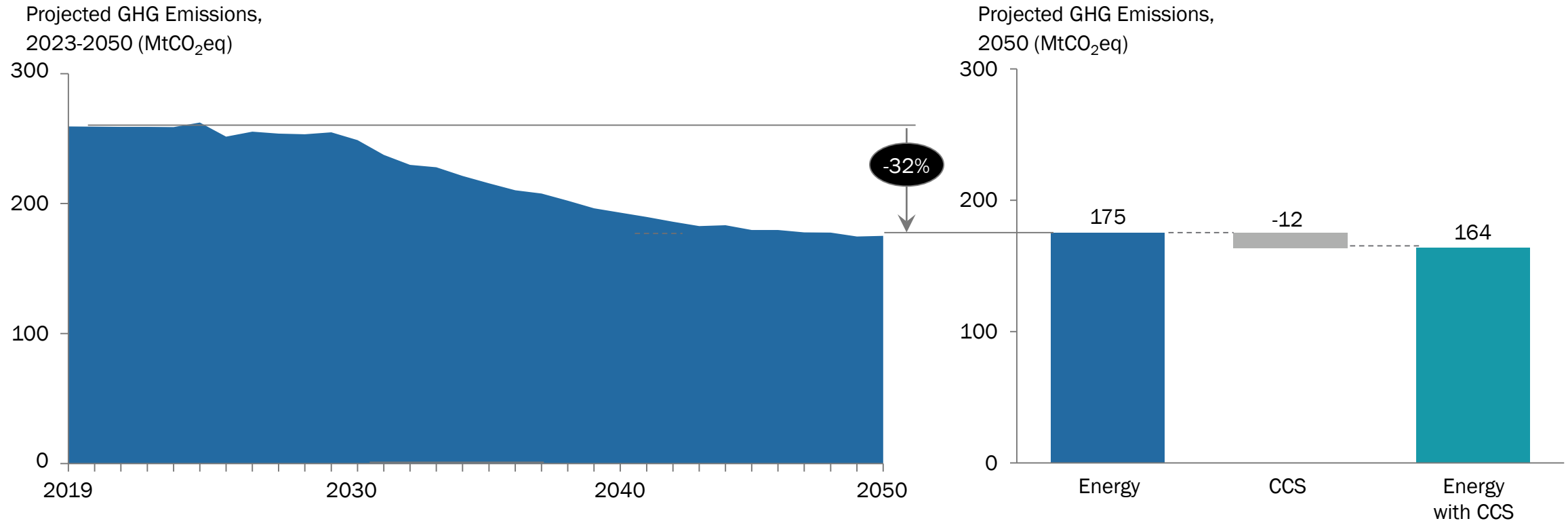


1. Cumulative GDP for 2023-2029, 2030-2039 and 2040-2050 are ~RM115 b, ~RM520 b and ~RM1,030 b totaling up to ~RM1,700 b by 2050; 2. Indirect impact includes induced (resulting increase in incomes to households due to the increased labor and capital demand from the direct and indirect effects) and indirect effects (subsequent ripple effects in the interlinked sectors of the economy resulting from changes in demand and production induced by the initial direct shock on the primary sector)

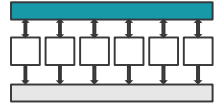


Projected GHG Emissions Reduction

Projected **32% reduction of GHG emissions** for the energy sector from 259 MtCO₂eq. (2019) to 175 MtCO₂eq (2050)



Note: Emissions pathway is estimated by multiplying primary fuel source in TPES to emissions factor by primary source. The emissions factor is sourced from the 2006 IPCC Guidelines for National Greenhouse Gas Inventories. The objective of this method is to provide directional guidance on policy decisions and is not intended as a submission to UNFCCC nor any other international bodies.



Overview of Benefits



Rakyat

- Addition of **310,000 jobs** in future-proof sectors across the country
- Balanced economic outcomes with **70% of income** gains to benefit **medium- and low-income households**
- **Better quality of life** and **health outcomes** with lower emissions
- **Greater empowerment** to reduce carbon footprint
- **Up-skilling support** for just transition



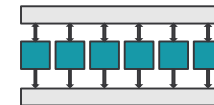
Business

- **RM120-180 billion investment opportunities** in co-funded government facility for energy transition
- **Investment opportunities** for green growth across energy transition value chain, up to **RM1.2-1.3 trillion**
- Lower carbon footprint with cleaner **energy mix** and **energy efficiency** to future-proof trade and investment position
- **Enhanced talents** with up-skilling of the workforce



Government

- **10-15% uplift** in GDP value with spurring of new growth areas
- **32% reduction in energy sector emissions**, supporting climate change commitments
- Enhanced **energy self-sufficiency**
- Enhanced **diversification of fiscal income** with new growth
- Carbon footprint reduction to **future-proof industries** and generate **Green FDI**



Flagship Catalyst Projects and Initiatives

The catalyst projects and initiatives **champions** will showcase varying **modalities** in accelerating Malaysia's energy transition journey

EFFICIENT SWITCH

- EE Energy Efficiency and Conservation Act (NRECC)
- Energy Audit for Rail Sector (MOT)

RENEWABLE ENERGY ZONE

- RE Integrated RE Zone (Khazanah)
- Solar Park (TNB)
- Hybrid Hydro-Floating Solar (TNB)
- Residential Solar (Sime Darby Property)

ENERGY STORAGE

- RE Energy Storage System (NRECC, ST)

ENERGY SECURE

- RE Sabah Energy Security Initiative (ECoS)

GREEN HYDROGEN

- H₂ Sarawak Hydrogen Hub (SEDC Energy)

HYDROGEN FOR POWER

- H₂ Co-firing of Hydrogen and Ammonia (TNB)

BIOMASS DEMAND CREATION

- Bio Biomass Clustering (KPK, NRECC, SEDA)
- Biomass Co-firing (KPK, Malakoff)

FUTURE MOBILITY

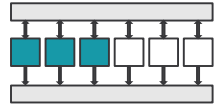
- GMob EV Charging Stations (MITI)
- Mobile Hydrogen Re-fuelling Station (MOSTI)
- Public Transport Electrification (MOT, Prasarana)
- Solar PV Installation for Rail Operations (MOT)

FUTURE FUEL

- GMob Biofuels Hub (PETRONAS)

CCS FOR INDUSTRY

- CCS Regulatory Framework (KE)
- Kasawari and Lang Lebah CCS (PETRONAS)



Key Initiatives and Enablers



Energy Efficiency

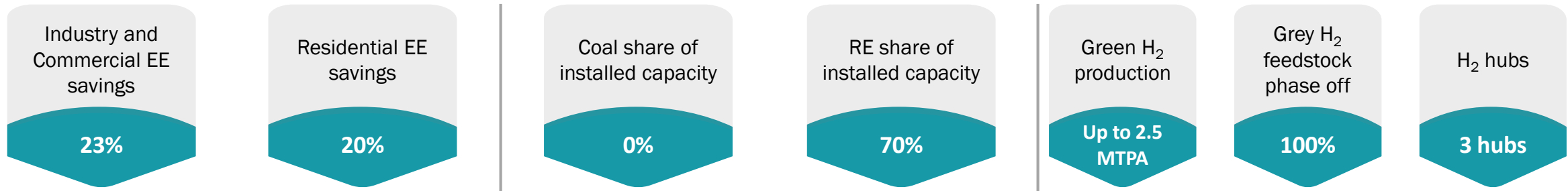


Renewable Energy



Hydrogen

RT Pathway 2050 Targets

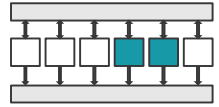


Key Initiatives

- EE1 Improve EE awareness
- EE2 Improve existing MEPS and 5-star rating bands
- EE3 Enhance mandatory audits for large commercial and industrial buildings
- EE4 Establish green building codes for energy-intensive residential and commercial buildings
- EE5 Establish an ESCO platform
- EE6 Launch a major EE retrofit initiative amongst government buildings

- RE1 Establish solar parks for accelerated deployment of utility-scale solar
- RE2 Promote floating solar and agrivoltaic technology
- RE3 Expand virtual aggregation model for rooftop solar
- RE4 Develop plan for accelerated investments of transmission and distribution
- RE5 Develop TPA framework for sourcing of RE
- RE6 Set up RE exchange hub to enable cross-border RE trading

- HY1 Establish low-carbon hydrogen standards and regulations
- HY2 Develop domestic green electrolyser manufacturing capabilities
- HY3 Reduce Levelised Cost of Hydrogen (LCOH) for low-carbon hydrogen
- HY4 Stimulate demand for low-carbon hydrogen



Key Initiatives and Enablers



Bioenergy

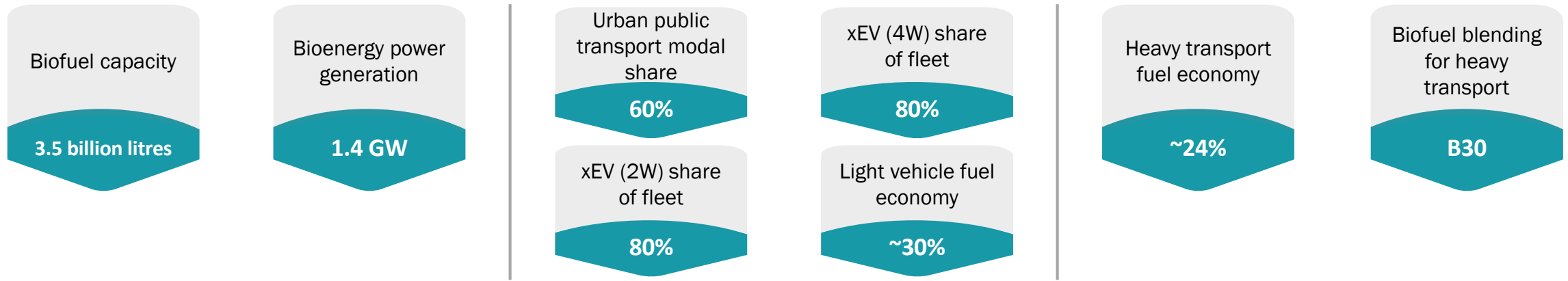


Green Mobility (Light Vehicle)



Green Mobility (Heavy Vehicle)

RT Pathway 2050 Targets

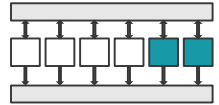


Key Initiatives

- BI-1 Explore alternative bioenergy feedstock
- BI-2 Enhance attractiveness of palm oil biomass
- BI-3 Address challenge of supply security
- BI-4 Catalyse local demand for bioenergy
- BI-5 Improve solid waste management policies

- GM-LV1 Drive public transport modal share shift to 40% by 2040 and 60% by 2050
- GM-LV2 Improve light vehicle fuel economy
- GM-LV3 Accelerate electrification of light vehicles segment (E4W)
- GM-LV4 Accelerate electrification of light vehicles segment (E2W)

- GM-HV1 Enhance demand-side management with fuel economy
- GM-HV2 Implement B30 biodiesel blending mandate
- GM-HV3 Introduce future powertrains for heavy vehicles



Key Initiatives and Enablers



**Green Mobility
(Aviation)**

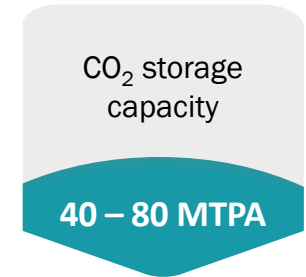
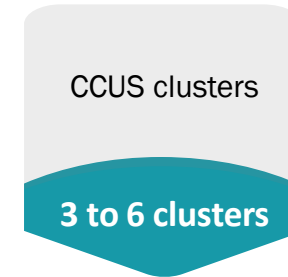
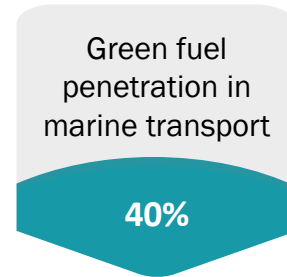
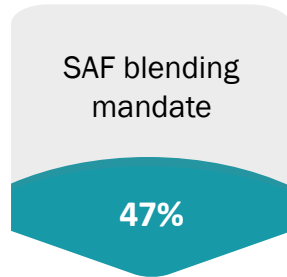


**Green Mobility
(Marine)**



CCUS

RT Pathway 2050 Targets

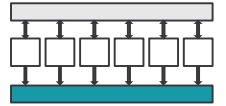


Key Initiatives

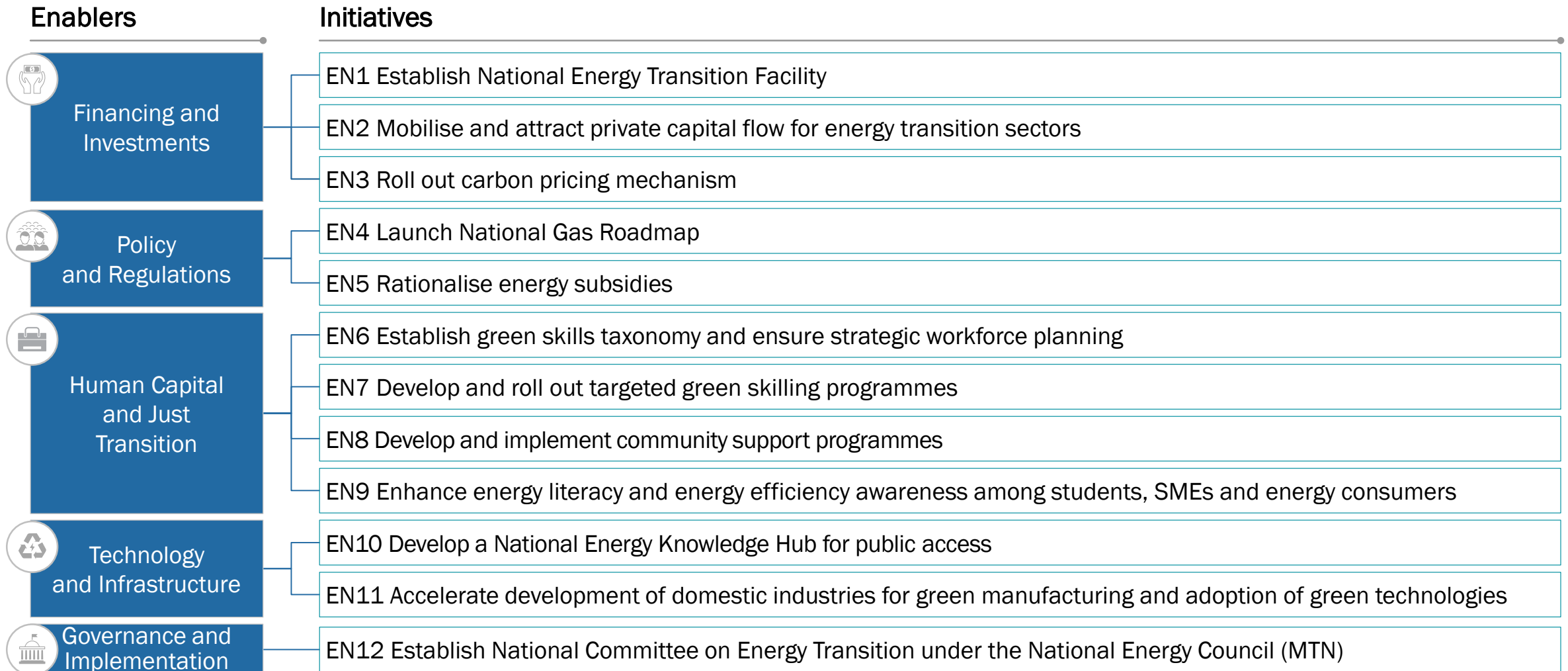
- GM-AV1 Establish overarching aviation decarbonization roadmap
- GM-AV2 Implement SAF blending mandate
- GM-AV3 Undertake palm oil-feedstock emissions study

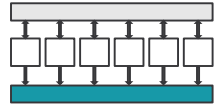
- GM-MA1 Unlock market opportunities of biofuel in marine bunkering
- GM-MA2 Unlock market opportunities of future fuels in marine bunkering

- CC1 Develop CCUS-specific policies and regulations
- CC2 Strengthen CCUS adoption through provision of incentives across all relevant sectors and facilitate hub development
- CC3 Facilitate CCUS hub infrastructure development
- CC4 Establish transboundary CO₂ agreement
- CC5 Promote local utilisation of CO₂ in industry



Key Enablers

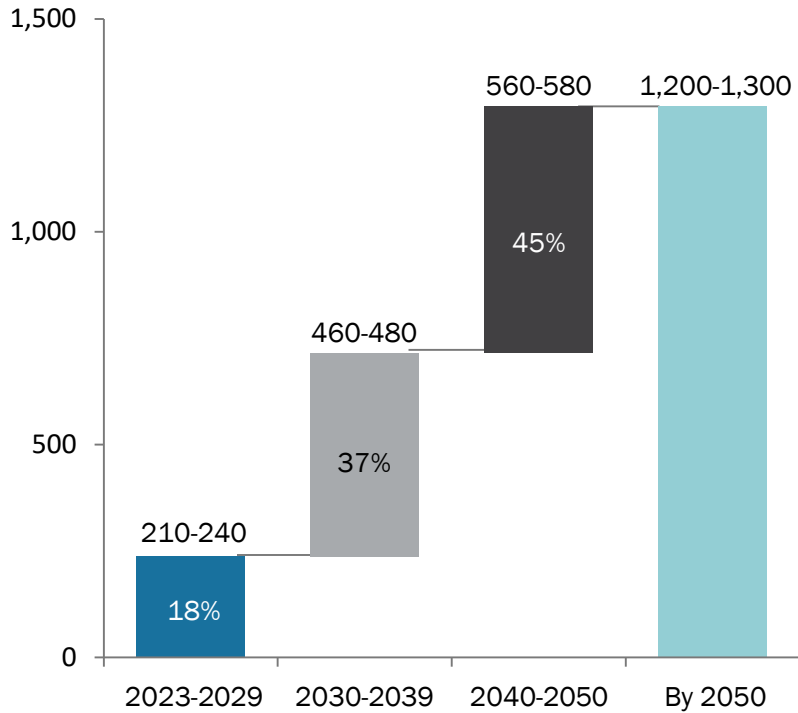




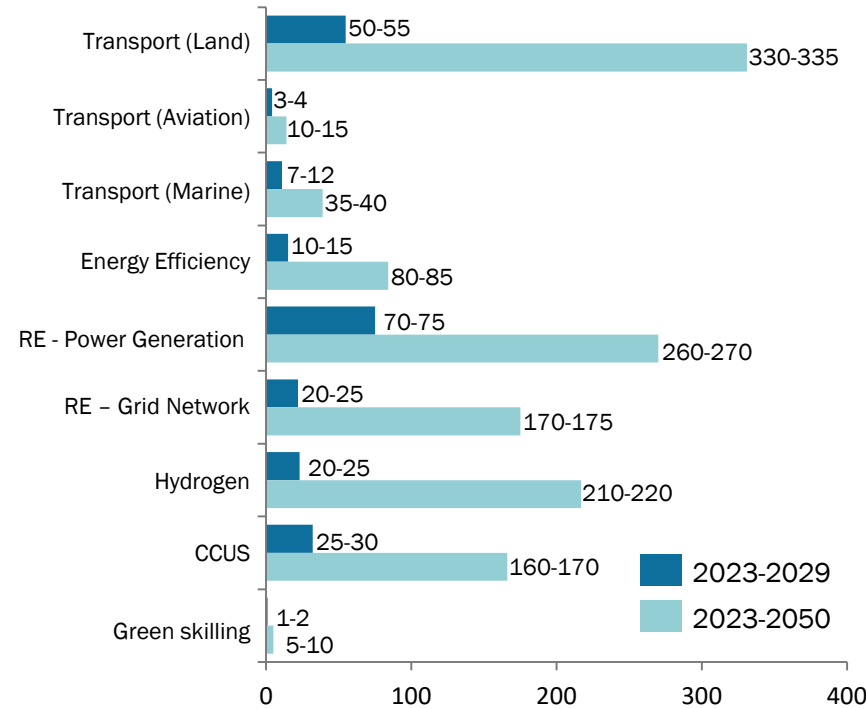
Energy Transition Financing Needs

Required investment between **RM1.2 trillion to RM1.3 trillion by 2050**. A National Energy Transition Facility (NETF) will be launched to expedite mobilisation of capital

By decade, RM billion



By categories, RM billion

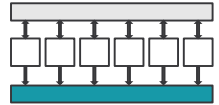


Key Initiative EN1

Launch a National Energy Transition Facility (NETF)

- Launch initial seed fund amounting to RM2 billion
- Explore the catalytic blended finance platform

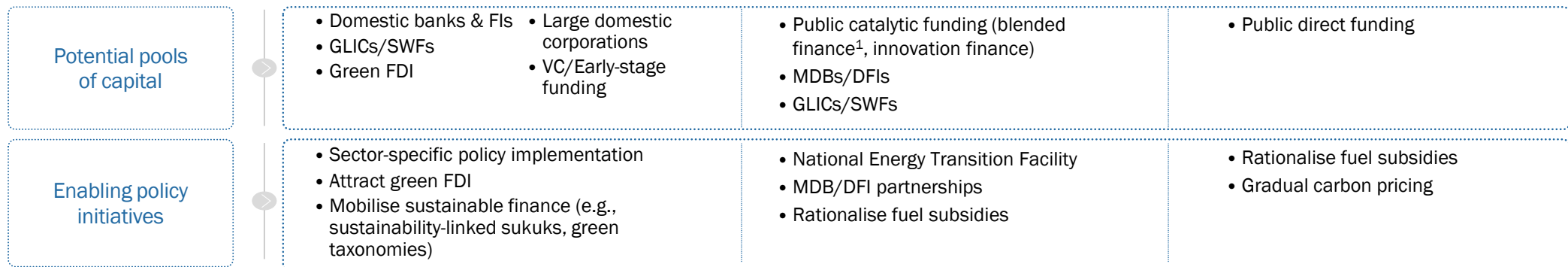
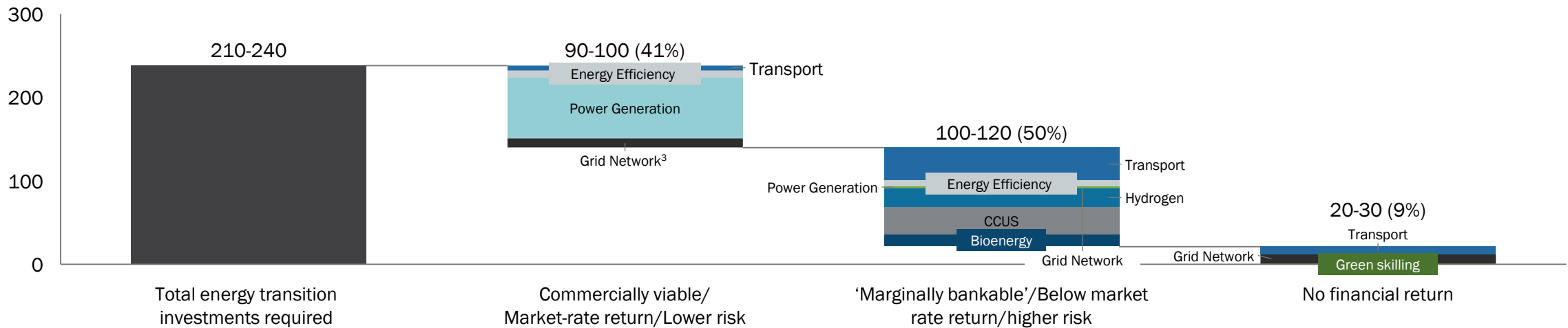
Note: NETR financing needs are additive and do not include business-as-usual investment required or projects already being financed (e.g. transmission and distribution, ongoing public transport projects) Source: PLEXOS, NETR team analysis

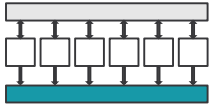


Energy Transition Financing Needs

Diverse capital pools will be used to support energy transition projects based on their financial returns and funding type

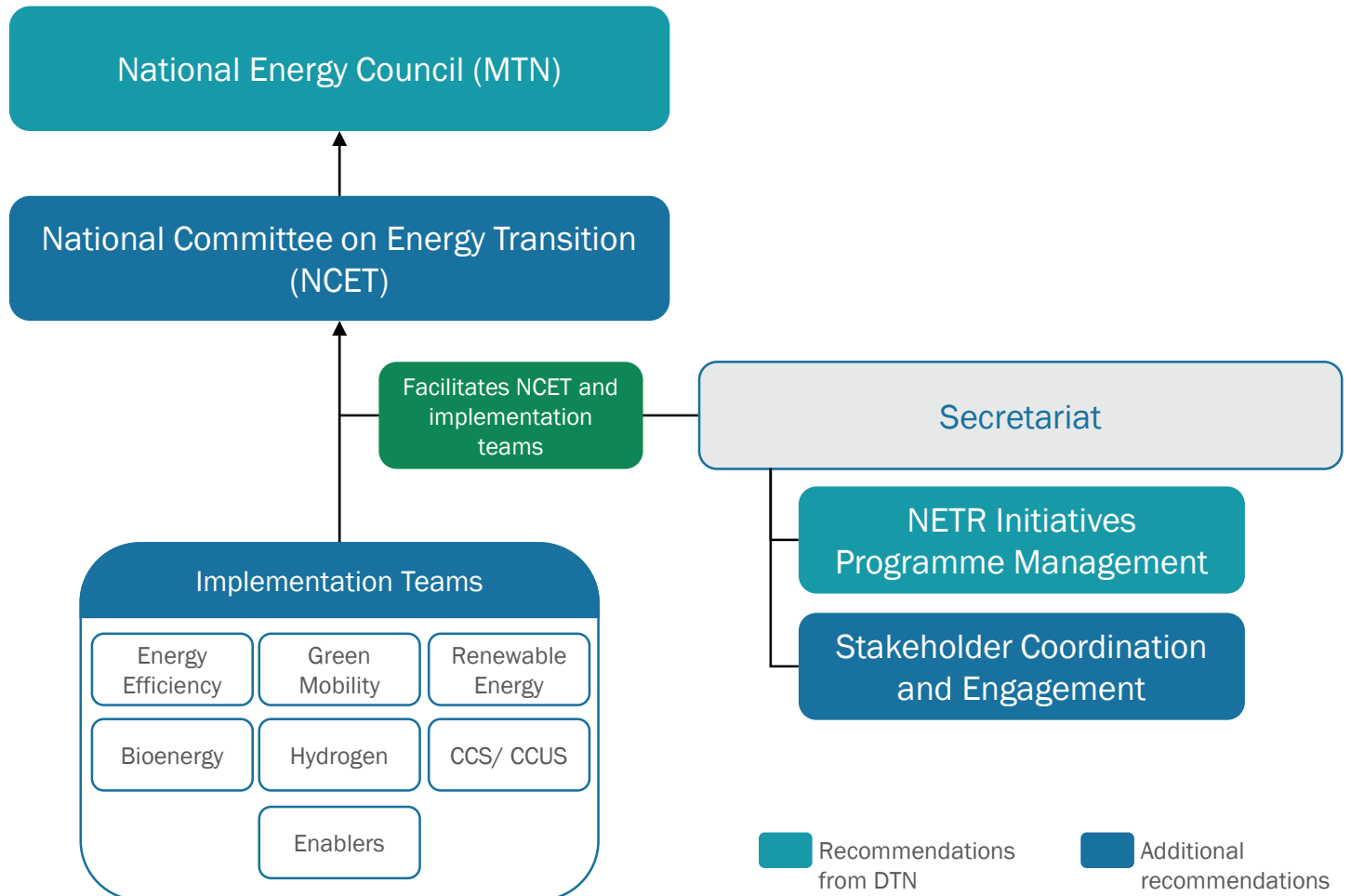
Est. investments required (2023 – 2029), RM billion





Governance and Implementation

YAB Prime Minister will chair the **National Energy Council (MTN)** to oversee Malaysia's energy sector planning and development. The National Committee on Energy Transition (NCET) will monitor the implementation of NETR and report to MTN



TERIMA KASIH