**Malaysia**

Climate targets

### **Climate change commitment**

**Paris Agreement – NDC target**

Based on Responsible Transition (RT) in NETR, not accounting for the use of carbon capture in the energy sector, Malaysia will achieve a 32% reduction in the energy sector’s GHG emissions compared to the 2019 baseline.

Policies in place (for inclusion in Reference and Target)

**The Twelfth Plan Malaysia’s Plan 2021-2025**

The Twelfth Plan outlines the aspiration for the nation to achieve net-zero GHG emissions as early as 2050. Twelfth Plan’s GDP target is 4.5% - 5.5%.

**National Transport Policy 2019 – 2030**

In 2019, the Ministry of Transport launched the National Transport Policy 2019 – 2030 where its vision is anchored on the principles of sustainable transport. With the aim to increase the modal share for public transport made as one of the five policy objectives, this vision is further amplified in the NEP 2040 target of 50% of urban public transport modal share by 2040.

**National Automotive Policy 2014 (NAP2014)**

National Automotive Policy 2014 (NAP2014) set the vision of Malaysia becoming a regional hub for Energy Efficient Vehicles (EEVs) by 2020 through strategic investments and the adoption of high technology. In its fourth version, NAP 2020 envisions the enhancement of Malaysia’s automotive industry through the era of digital industrial transformation. In this regard, the NEP 2040 also places a target of 38% of electric vehicle (EV) share in 2040, as compared to the current share of less than 1% and later the target was further increased in NETR 2050.

**Low Carbon Mobility Blueprint (2021)**

The objective of the Low Carbon Mobility Blueprint 2021-2030 is to assess the best options in energy and GHG mitigation planning in the transport sector, in particular land transport.

**National Biofuel Policy**

National Biofuel Policy was introduced in 2006 under the Ministry of Plantation Industries and Commodities, followed by the introduction of the Malaysian Biofuel Industry Act in 2007 to regulate the biofuel industry and to facilitate the mandatory use of palm-based biodiesel with petroleum diesel. A biodiesel program known as the B5 program (a blend of 5% palm-based biodiesel and 95% petroleum diesel) was rolled out in 2011 and up to its end period in 2014, the B5 program had successfully established more than 1,500 retail stations to serve for the biodiesel consumption for the transport sector in Peninsular Malaysia. In 2015, the B7 program continued as the successor to expand the coverage of this program nationwide, followed by the introduction of B10 program in 2019 as well as the introduction of the B7 program for the industry sector.

**Hydrogen Economy and Technology Roadmap (HETR)**

The HETR is a roadmap that provides a clear deployment pathway for decarbonization through hydrogen, including new technologies and innovation in energy transition.

**Aichi 2030 Declaration on Environmentally Sustainable Transport – Making Transport in Asia Sustainable (2021-2030)**

During the 15th Regional Environmentally Sustainable Transport (EST) Forum, the Malaysian Transport Minister Malaysia made an announcement that underscored the nation’s commitment to embracing cleaner and more energy-efficient technologies through the ability to achieve this goal by enhancing public transportation accessibility, investing in infrastructure to alleviate congestion and reduce pollution, and adopting innovative solutions7.

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Macroeconomics

The urbanization rate of Malaysia was 75% in 2020 and is expected to reach 85% by 2040. Economic and population growth, as well as rapid urbanization, will drive a rise in energy demand, which is expected **to increase by 2% annually until 2050NETR**.

Malaysia’s economy transitioned from agricultural and commodity-based to manufacturing and services in the 1980s. It continues to be a producer of finite quantities of oil and gas, which contributed to **approximately 13% of GDP in 2021.** The availability of indigenous gas resources has ensured a secure energy supply at affordable prices NETR.

NETR is rooted in Malaysia’s overarching aspirations, charting a course for the energy system that is aligned with decarbonization targets. It strikes the right balance between environmental mitigation and the need to bolster net socioeconomic values such as GDP and job creation.

Population projections follow the medium pathway from UN DESA, which show slowing growth through 2060.

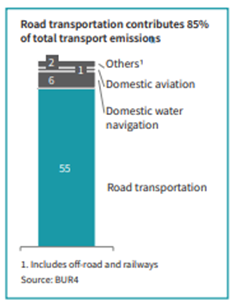
|  |  |
| --- | --- |
| Population:  UNDESA “Medium” |  |

Energy Outlooks

Ministry of Economy published NETR 2050 for Malaysia in Q3 2023 and Energy Commission (ST) published National Energy Balance (NEB) 2020. NETR includes a Low Carbon Nation Aspiration (LCNA) 2040 that originally was a national target published in National Energy Policy (NEP) 2022 and Responsible Transition (RT) 2050, both targets will be benchmarked as REF.

### **The Reference Scenario (REF)**

1. Transportation remains a prominent contributor to GHG emissions in Malaysia, primarily driven by the emissions from internal combustion engine (ICE) vehicles. In 2019, the land transport segment is a key driver of these emissions, accounting for 55 MtCO2eq, constituting 85% of total transport emissions.



The shift to electrification and biofuels (primarily biodiesel) expedited in the transport sector, gradual increase public transportation modal share for big cities. Greater adoption of Low Emission Vehicle (LEV) on 2023 onwards, EV penetration accelerates after 2025 and reaches about 80% of new car sales by 2040. Implementation of a biodiesel program and 5% freight shift to rail for heavy vehicles. Introduction of LNG in heavy vehicles and marine bunkering, and biodiesel in aviation. No hydrogen as a fuel for transportation for REF scenario.

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| --- | --- | --- | --- | --- | --- |
| **General**  **Input** | 1. Increase in population and travel needs.   2010 (40 trips) – 2030 (131 million trips), 69% increment and the trend is expected to gradually increase.   1. Increase in vehicle Total Industry Volume (TIV).   The total number of vehicles increased by 15.6% (Car – 46%, Motorcycle - 46%, Taxi – 0.4%, Hire & Drive Car – 0.3%, Buses – 0.2%, Goods Vehicle – 4% and other – 3 %) in the span of four years (2014 to 2018). The increment in registered vehicle population within the period was more than one million vehicles each year.   1. Percentage of Vehicle Kilometre Travelled (VKT), petrol cars (50%), goods vehicles (6.4%), motorcycles (41.3%) and others (2.3%)LCMBP. 2. Transport sector Final Energy Consumption (FEC).   The transport sector was the second fastest-growing sector overall in terms of energy consumption. Within the transportation sector, road transport dominates – accounting for more than 90% of energy consumption.   1. Transport sector Greenhouse Gas (GHG) emission. 87.9% originated from road transportation, 10.2% from water-borne navigation, 1.9% from aviation and 0.1% from railways. 2. Public Transport Electrification - involves electrification of first and last-mile public transport and upgrading infrastructure and electrical lines at bus depots for charging by 2030. | | | | |
| **Sector/ Areas** | **Year** | | | | |
| **2020** | **2025** | **2030** | **2040** | **2050** |
| **Land:**  **Public Transport** | 40% (Greater KL)  20% (other cities) | * Introduction of B100 * Acquirement of 150 electric buses and 3 bus depots * Construction of 5 LRT3 stations. | * 100% EEV for public transport * 40% modal share (all cities) * 1% of passengers shift from road to rail. * Adopt cleaner energy for buses: E-bus 20%, and B100 for 30% of big bus. * Adopt cleaner energy for taxi: diesel 0%, petrol 0%, NGV 0%, EV 20%, and ICE-EEV 80% | 50% modal share | 60% modal share |
| **Land:**  **Private Transport** | 85% EEV | * 10% EVLCMB * Solar PV installation for rail operation (non-traction) | * 100% EEVLCMB * Shift use motorbikes to e-bike (85%:15%) * Electric motorcycles to reach 2.8 million by 2030. * Shift use of conventional Transition from PHEV to BEV. Electric car sales are to reach 200,000 by 2030. * 15% EV share of the Total Industry Volume (TIV) by 2030LCMB. | * 50% E-2W share of fleet. * 38% - 50% EV (4W) share of fleet | * 80% EV (4W) share of fleet. * 80% E2W share of fleet. |
| **Fuel Efficiency Target** | National target of 144g CO2/km (equivalent to 6.2L/100km) for passenger vehicles | National target of 123g CO2/km (equivalent to 5.3L/100km) for passenger | National target of 95g CO2/km (equivalent to 4.1L/100km) for passenger vehicles | ASEAN Target  Follow the ASEAN and Global Fuel Efficiency Initiatives (GFEI) | ASEAN Target  Follow the ASEAN and Global Fuel Efficiency Initiatives (GFEI) |
| **Charging stations** | NA | 10,000LCMB  Implement a battery swapping system. | Organic growth  ~12,500 | Organic growth  ~15,000 | Organic growth  ~17,500 |
| **Heavy Transport** | NA | NA | 1% road freight to rail | Alternative fuel standard for heavy transport (B30 by 2040) | * ~30% light vehicle fuel economy * ~24% heavy transport fuel economy * Biofuel blending for heavy transport B30. * 5% Hydrogen penetration |
| **Marine** | NA | NA | NA | LNG as an alternative fuel for marine transport (25% by 2040) | 40% green fuel penetration |
| **Aviation** | NA | NA | NA | NA | * 47% SAF blending mandate. * Adopt ICAO’s LTAG of net-zero carbon emissions. |
| **EV Manufacturing** | NA | NA | NA | NA | 90% local xEV manufacturing. |

**Malaysia Hydrogen Economy**

NETR proposes the following targets:

* Blue Hydrogen: To completely phase out the use of grey hydrogen as a feedstock by 2050.
* Green Hydrogen: To produce up to 2.5 Mtpa of green hydrogen by 2050 from RE such as hydroelectric power and solar.
* Low-carbon Hydrogen Hubs: To establish one low-carbon hydrogen hub by 2030, and an additional two hubs by 2050, bringing the total to three hubs.

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| --- | --- | --- |
| **2030** | **2040** | **2050** |
| Establishment of  1 hydrogen hub | Establishment of  2 hydrogen hubs | Up to 2.5MTPA  local green H2 production |

|  |  |
| --- | --- |
| **Aspect** | **Details** |
| Policy | Hydrogen Economy and Technology Roadmap (HETR) 2023 |
| National Target | 2.5 MTPA by 2050 – NETR’s RT Scenario (suggested to be used as Ref)  7 MTPA by 2050 – HETR’s Ref Scenario (suggested to be used as TGT)  16 MTPA by 2050 – HETR’s Target Scenario (suggested to be used as ambitious TGT) |
| Industry Value Chain | * Production of green hydrogen in Sarawak: 130kg per day * Production of grey hydrogen - 1 MTPA |
| Achievement/  Progress | * Sarawak Energy’s Integrated Hydrogen Production Plant and Refueling Station in Kuching, Sarawak in May 2019 with a production capacity of 130kg of Hydrogen per day. * Gentari exports hydrogen to Japan in ammonia or metylcyclohexane (MCH) with a capacity of 50,000-ton H2/year. * SEDC has inked MoUs with a Japanese consortium (Sumitomo and ENEOS) that focuses on hydrogen export in the form of MCH.3,000-ton H2/year for local consumption and 50,000-ton H2/year for export * SEDC has also inked MoU with a Korean consortium (Samsung, POSCO & Lotte Chemical) that focuses on hydrogen export in the form of ammonia. * 7000ton/year of green hydrogen for Sarawak’s local use (metro public transport). * 600,000 ton/year of blue ammonia and 630,000 of green ammonia. * 460,000 ton/year of green methanol. |

1. Bioenergy

Steady growth of biofuel (biodiesel):

|  |  |  |
| --- | --- | --- |
| 2030 | 2040 | 2050 |
| * 0.6 billion litres of biofuel production * ~500MW of bioenergy installed capacity | * 1.8 billion litres of biofuel production * ~600MW of bioenergy installed capacity | * 3.5 billion litres of biofuel production * ~1,400MW of bioenergy installed capacity |

* It is mainly used across the transport industry.

|  |  |
| --- | --- |
| Bioenergy Generation Potential in Malaysia (GW)MYRER | A graph of a number of people  Description automatically generated with medium confidence |

*Notes:*

1. *To simplify the scenario after a discussion with modelers.*
2. *Input for the industry is based on sub-industry energy requirements. – to confirm with the modelers.*
3. *In overall, it is anticipated that the total energy demand and supply will rise, but it may not be as high as the demand and supply seen in Outlook 8th Edition due to the projected lower GDP of Outlook 9th Edition.*
4. *A pilot phase of biomass co-firing will commence in 2024 and is expected to scale up to a minimum of 15% biomass co-firing capacity by 2027.*
5. *In Sarawak, development of a green hydrogen production plant in Kuching by 2025 for domestic use, and two plants in Bintulu by 2027, for export purposes.*

### **The Target scenario (TGT)**

TGT will be in line with NETR’s RT target, this will help Malaysia to shift from traditional, fossil fuel-based energy systems to a greener, low-carbon energy framework. With this transition, coal will be fully phased out, while RE will achieve more than NETR’s RT target (>70% installed capacity in 2050). Natural gas is set to play a significant role, accounting for more than 56% of TPES by 2050.

TGT for Malaysia is a hypothetical pathway to meet the NDC target earlier by 2030 and 70% of renewables installed capacity and the economy-wide carbon neutrality targets by 2050. Technology deployment and behavioral changes are necessary to achieve the target and are assumed to be feasible. Upstream and midstream fugitive methane emissions are also substantially reduced.

**On the demand side,**

Energy efficiency, fuel efficiency, and material efficiency improve at a higher rate to meet the climate change commitment/target. Broad based energy efficiency initiatives pursued, particularly from the demand side management that include optimizing energy consumption across key sectors, namely residential, commercial, industrial, and transport to prevent wastage and indirectly prolong the lifespan of indigenous resources.

1. In agriculture, more replacement of petroleum and diesel with biodiesel, particularly for plantation machinery and fishery.
2. In buildings, more fuel switching from LPG and natural gas to electricity, especially for cooking and water boilers at commercial premises. Electricity demand grows higher than REF and remains as primary energy for buildings. More than 8%~16%ERIA energy saving with full enforcement of the Energy Efficiency and Conservation Act.
3. In industry, CCS/CCUS and hydrogen technology become feasible for chemical and cement sub-sectors and more fuel switching from coal or petroleum products to gas and electricity. Electrification or fuel switching (including B40 biodiesel program).

Some of the continued initiatives are:

1. Improve awareness for appliances and equipment, promotion emphasizing on monetary savings instead of technical.
2. Improve existing MEPS and 5-star rating brands.
3. Enforce mandatory audits for large commercial and industrial buildings.
4. Establish green building codes for energy-intensive residential and commercial buildings.
5. Establish ESCO platform, and

Notable vague policies to be considered:

1. Deployment of large-scale CCUS solutions for hard-to-abate sectors (metal, cement, chemical and Petroleum).
2. Locally manufactured EV that will catalyze the growth of sectors such as R&D, M&E, E&E, Materials, Minerals, Digital and ICT and Energy to supply equipment, parts, infrastructure and capability to enable a local EV ecosystem, that comprises:

• Raw materials: steel, aluminium, plastic composites, etc.

• EV components: EV battery, chassis, motors, power electronics, etc.

• Charging Infrastructure: Charging stations; and

• EV services: Maintenance and repairs, EV conversion services, battery testing and

safety, battery recycling.

1. In transport, higher public transportation modal share for big cities. The shift to electrification and biofuels expedited in the transport sector. EV penetration will accelerate after 2025 and reach about 90% of new car sales in 2050. Mandatory use of B40 biodiesel and 10% freight shift to rail for heavy vehicles. Higher LNG mix in heavy vehicles and marine bunkering, and biodiesel in aviation. Hydrogen is used in light vehicles and public transportation, specifically buses.

**On the transformation side,**

In power,

1. Few coal-fired power plants retire earlier than stated in the PPA with the increase of renewables in the electricity generation and capacity mix.
2. Renewables installed capacity will reach more than 70% by 2050, and hydro capacity will reach at least 90% of the total potential throughout Malaysia by 2050.
3. Gas to make up the difference between the total generation required and the sum of contributions from the other sources.
4. CCS/CCUS, biomass, ammonia, and hydrogen co-firing technology become feasible and consider small modular reactors deployment in electricity generation.
5. Malaysia will continue to explore other non-carbon energy sources that include RE imports through regional interconnectors.
6. Hydrogen driven by the 20% blending of hydrogen with natural gas in power plants starting from 2030. Co-firing of coal with green ammonia starting from 2030HETR.

*Notes:*

*Electricity trade between Malaysia and neighboring economies, particularly imports is to be considered for supply security and if it is more cost-effective.*

**On the supply side,**

1. For oil and natural gas supply, the production limit for domestic oil and gas continues until the resources are fully depleted1. LNG exports continue until the expiration of existing contracts2.
2. For coal supply, dependency on imported coal for electricity generation and industry continues at a very minimal amount.
3. For renewables supply, fully rely on domestic production and Increased use of RE in the power generation mix.
4. For hydrogen supply, fully rely on domestic supply production and exporting green hydrogen.

*Notes:*

*1Oil production could be lower than the production limit due to a decrease in demand.*

*2Possibility of export restriction for domestic use.*

## **Key Assumptions for Malaysia**

|  | Reference | Target |
| --- | --- | --- |
| Macro | * **Population: UNDESA “Medium”**   Reason: The UNDESA projected population in 2040 is almost similar to the projected population calculated using the annual growth rate of 0.8% (estimated annual growth rate released in 2019 by DOSM, with the latest estimated population in 2022 as a base year)1  Note:  1[*DOSM Malaysia*](https://v1.dosm.gov.my/v1/index.php?r=column/ctheme&menu_id=L0pheU43NWJwRWVSZklWdzQ4TlhUUT09&bul_id=Y3kwU2tSNVFDOWp1YmtZYnhUeVBEdz09) *& NDC & MY BUR4 2022* | |
| Agriculture (including Fishery) | 1. By 2030, double the global rate of improvement in energy efficiency. 2. Reduction of electricity intensity from 1.5% in 2014 to 10% in 2025 and 15% in 2030 3. Palm-oil-based biodiesels displace petroleum and diesel. From 230,000 tonnes in 2013 to 576,000 tons in 2020. Similar pattern continues. 4. Fuel switching/enhancement:   In 2015: EURO 5 Diesel (Klang Valley), EURO 4M RON97 (nationwide), B7 Biodiesel.  In 2020: EURO 5 Diesel (nationwide), EURO 4M RON95 & RON97, B15 Biodiesel.  In 2025: EURO 5, RON95 & RON97.   1. Overall, increase production efficiency/optimization of energy consumption while maintaining the positive projection of agrofood sector3   *Source:*  *Green Technology Masterplan 2017-2030*  *Green Practices Guideline for Agriculture Sector (2022)*  *3National Agrofood Policy 2021-2030* | * Energy efficiency, fuel efficiency, and fuel switching trends continue. * Energy efficiency and fuel efficiency improve more than REF (2%). * Electrification or fuel switching more than REF (2%). * Optimize or reduce fertilizer application. * Agrofood industry aims to reduce GHG emissions, continual dev. of agrofood while maintaining and strengthening conservation of forestry and biodiversity3. |
| Buildings | * Energy efficiency, fuel efficiency, and fuel switching trends continue. * Electricity and LPG remain as the highest users. * All government buildings use solar power1. * National Energy Policy (2022-2040)  1. Industrial and commercial energy efficiency saving (11% by 2040) 2. Residential energy efficiency saving (10% by 2040)  * National Energy Transition Roadmap. By 2050, achieve energy savings of 22% compared to a business-as-usual scenario, specifically:  1. Residential: 20% 2. Industrial and commercial: 23%  * Alignment with National Energy Efficiency Action Plan 2016-2025 (NEEAP) and Green Technology Masterplan Targets  1. Reduction of electricity consumption by 8% by 2025 in 3 sectors (residential, commercial & industry sectors). Continue the trend beyond 2025 until LCN and RT 2. Increase the number of green buildings from 550 in 2020 to 1,750 in 2030.  * Rural electricity supply to achieve 99% coverage by 2025 and 100% by 2030. * Solar PV installation (30%) of rooftop area for new development starting 2023 for Kuala Lumpur   *Source:*  *Green Technology Masterplan 2017-2030*  *National Energy Efficiency Action Plan 2016-2025 (NEEAP)*  *Malaysia’s Twelfth Plan 2021-2025*  *Energy Efficiency and Conservation Act*  *1* <https://readnow.isentia.com/Temp/112297-1014896983/MY0056194574_20241029.pdf> | Broad-based energy efficiency initiatives pursued.   * Energy efficiency and fuel efficiency improved more than REF (10%). * Electrification or fuel switching more than REF (10%). * More electricity/energy savings by 2060 (10%). |
| Industry | Energy efficiency, fuel efficiency, material efficiency, and fuel switching trends continue.   * Alignment with National Energy Efficiency Action Plan 2016-2025 (NEEAP) and Green Technology Masterplan Targets.  1. Reduction of electricity consumption by 8% by 2025 in 3 sectors (residential, commercial & industry sectors). Continue the trend beyond 2025.  * Biofuel Program  1. B7 (palm biodiesel) is mandatory for industrial applications since 20191 2. To promote B102. 3. Implementation plan for B20 or B30 is not available (as of the end of 2022).  * Coal consumption trend3   2019: 2.71 million tonnes (8.1% of total coal consumption).  2018: 2.87 million tonnes (8.1% - Most of the coal and coke was consumed by cement manufacturers at 88.2%, while the remaining 11.8% was consumed by iron and steel manufacturers).  2017: 2.86 million tonnes (8.7% of total coal consumption).   * Trendof energy use by sub-industry: Status quo market structure  1. Iron & steel: Organic growth in production. 2. Cement: Organic growth in production. 3. Pulp & paper: Organic growth in production. 4. Chemical & petrochemical: Growth is relatively low, and energy demand will increase according to RAPID project’s requirement. 5. Food, beverage & tobacco: Organic growth in production.  * Sabah Maju Jaya (2021-2025) Electricity demand for Sabah is expected to increase 5% till 2030. * New industrial area at Sipitang Oil & Gas Industrial Park, Kudat, Tawau, Sapulut and Kinabatangan. * Regional Processing and Logistic Hub & International Fishery Hub at POIC, Lahad Datu. * Increase cement production. * Gas requirement in Sabah: 120mmscfd additional gas allocated for Sabah under Sabah Gas Masterplan for industry and commercial use4.  1. Sarawak Gas Roadmap5 – aims to localise 1,200 mmscfd by 2030. To further industrialize Sarawak in the next five to 10 years for Sarawak to increase its high-value downstream economic activities.   *Source:*  *National Biofuel Policy (NBP)*  1*Biofuel Programme*  2*12th Malaysia Plan*  3*National Energy Balance*  4*Pelan Pembangunan Sabah Maju Jaya 1.0 (2021-2025)*  5*Sarawak Gas Roadmap - Microsite is only accessible to prospective investors who have signed a confidentiality agreement with PETROS.*  *6NETR*  *7HETR* | * Energy efficiency and fuel efficiency improve more than REF (2.2%) * Electrification or fuel switching (including B40 biodiesel program) more than REF (1.5%) * More electricity/energy savings by 2060 * CCS deployment in the year 2025 in the energy industry   - Utilizing carbon capture and storage (CCS) in the energy sector and deliver an additional 5% reduction in GHG emissions.   * Hydrogen co-firing in year 2030 for industry. * Fertiliser, chemicals, and methanol. For the short term, the target to replace 5% of natural gas use in non-energy to be replaced with hydrogen produced from NG-CCUS and slowly increase to 20% by 20507 |
| Transport | As per description in REF scenario | As per description in TGT scenario |
| Power and heat | * Increased use of RE in the power generation mix. * “No new coal-fired power plants” Policy * Fossil fuel sources still dominate the national power landscape. * Coal plants, coal-firing with hydrogen, ammonia, biomass, and coal area will be started in 2025 for Jimah East power plant (2000MW), KEV (2,200MW), and Janamanjung (4,080MW). * Installed capacity is according to NEP and NETR. * Consideration of Biomass Clustering and biomass co-firing (2024). * No Hydrogen demand is planned for electricity generation until 20501. * Considering the use of CCS/CCUS, ammonia, and hydrogen co-firing and small modular reactor (SMR) in electricity generation.   *1 Report on Peninsular Malaysia Generation Development Plan 2020 (2021-2039), published by Suruhanjaya Tenaga (Energy Commission) in March 2021* | * Few coal power plants **retire earlier** than the contract period (close to fully phased-out coal from the power generation mix). * Renewables installed capacity will reach more than 70% by 2050, and hydro capacity will reach at least 90% of the total potential throughout Malaysia by 2050. * Gas to make up the difference between the total generation required and the sum of contributions from the other sources. * Development of utility-scale ESS to enable higher penetration of variable RE in Malaysia.   **Hydrogen**  Driven by the 20% blending of hydrogen with natural gas in power plants starting from 2030. Co-firing of coal with green ammonia starting from 2030HETR. |
| Total Primary Energy Supply | A graph of energy sources  Description automatically generated  Ref: According to NETR’s projection.  TGT: Higher penetration of RE resources. Higher CCUS adoption. Zero energy supply from Coal. | |
| Hydrogen Supply | Ref: According to NETR’s projection target.  TGT: Higher penetration of H2 resources parallel with HETR’s target.  A graph showing the growth of a company  Description automatically generated with medium confidence  HETR’s BAU Target  A graph of a growing graph  Description automatically generated with medium confidence  HETR’s Ambitious Target | |
| Fossil Fuel Supply | * Oil, gas production and exports to meet domestic and global demand. * Reduce fugitive methane emissions by 50% by 20301. * Zero Routine Flaring by 2030 Initiative2. * CCS catalyst projects for Kasawari and Lang Lebah high-CO2 gas fields in collaboration with the Sarawak Government, which are expected to be in operation by 2026 and 2028. * 100% imported coal for electricity and almost 100% for industry   *1https://readnow.isentia.com/Temp/1122971014269884/MY0056176196\_20241026.pdf*  *2Petronas’ pathway to Net Zero Carbon Emissions 2050* | Natural gas is set to play a significant role.   * Oil, gas production and exports to meet domestic and global demand (lower than REF). * Reduce fugitive methane emissions by 100% by 2050.   By 2030:   * Develop 3 CCUS hubs (2 in Peninsular Malaysia, 1 in Sarawak) * Total storage capacity up to 15 Mtpa   By 2050:   * Develop 3 carbon capture hubs. * Total storage capacity between 40 to 80 Mtpa |
| Renewable supply/Bioenergy | * Self-sufficient for renewables supply. * Malaysia exports biodiesel  1. Increase biorefinery capacity to 3.5 billion liters by 2050. 2. Increase biomass and biogas power generation capacity to 1.4 GW by 2050. 3. In 2021, Malaysia exported 380 million liters of biodiesel in 2021 and 410 million liters in 2022 (estimated). | * Self-sufficient for renewables supply. * Malaysia exports more biodiesel.   The total capitalization of Malaysia’s strong bioenergy potential, with a focus on two key segments, namely agriculture-related bioenergy (palm oil) and non-agriculture waste such as UCO and MSW. |
| Climate | * NDC and NETR’s emission reduction target will be used as a guideline. * Net-zero energy sector not realized by 2050 | Net-zero energy sector realized by 2050 when relying on negative emissions (not modeled). |

*Notes:*

*The target for energy efficiency, fuel efficiency, and material efficiency in TGT’s key assumption is to be aligned with regional/global technological development trend.*