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Energy Transition in Malaysia: Pathways and Challenges

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Introduction

Energy Transition

Definition & Importance

Definition

Energy transition refers to the **global shift in energy production and consumption**, driven by growing demand and the need for cleaner alternatives.

Importance

The threat of climate change has pushed us to decarbonize and shift from fossil fuels to sustainable, zero-carbon sources like renewables. With energy demand expected to **double by 2040** and the sector accounting for ***89% of GHG emissions,** the need for energy transition is clear.

* ‘Global Energy Review: CO2 Emissions in 2021’, International Energy Agency

Global Trend

Fostering Effective Energy Transition

ETI 2024 ranking table

WORLD ECONOMIC FORUM

Rank	Country	ETI score (2015–2024)	2024 ETI score	SP[1] ('24)	TR[2] ('24)
1	Sweden		78.4	79.4	76.8
2	Denmark		75.2	72.0	80.1
3	Finland		74.5	70.7	80.1
4	Switzerland		73.4	76.2	69.1
5	France		71.1	74.7	65.6
6	Norway		69.9	75.2	62.0
7	Iceland		68.0	71.8	62.2
8	Austria		67.9	68.5	67.0
9	Estonia		67.8	73.7	59.0
10	Netherlands		66.7	62.7	72.7
11	Germany		66.5	65.0	68.7
12	Brazil		65.7	69.9	59.4
13	United Kingdom		65.6	66.3	64.6
14	Portugal		65.4	67.0	62.9
15	Latvia		65.2	70.1	58.0
16	Spain		64.3	64.7	63.7
17	China		64.1	66.6	60.3
18	Luxembourg		64.1	64.1	64.1
19	United States		64.0	67.3	59.0
20	Chile		63.9	67.9	58.0
21	Israel		63.8	70.4	54.0
22	Australia		63.7	63.2	64.4
23	Korea, Rep.		63.5	62.4	65.2
24	Lithuania		63.2	64.7	60.9
25	New Zealand		62.8	68.3	54.5
26	Japan		62.4	63.1	61.4
27	Canada		62.4	65.5	57.8
28	Hungary		62.1	68.5	52.4
29	Slovenia		61.9	68.2	52.5
30	Costa Rica		61.3	72.1	45.0
31	Poland		61.3	66.0	54.2
32	Vietnam		61.0	65.6	54.2
33	Uruguay		60.8	69.0	48.5
34	Belgium		60.8	61.6	59.6
35	Colombia		60.7	65.7	53.3
36	Bulgaria		60.6	66.9	51.2
37	Greece		60.5	58.9	63.1
38	Azerbaijan		60.3	68.8	47.6
39	Croatia		60.1	66.4	50.7
40	Malaysia		60.1	69.8	45.6
41	Italy		59.7	62.7	55.2
42	Paraguay		59.6	70.1	43.9
43	Albania		59.4	65.0	51.0
44	Czech Republic		59.2	67.3	47.2
45	Ireland		58.7	60.4	56.2
46	El Salvador		58.4	70.6	40.0
47	Peru		58.3	71.0	39.3
48	Romania		58.3	69.0	42.2
49	Slovak Republic		57.5	64.6	46.9
50	Qatar		57.3	60.1	53.1
51	Panama		57.1	66.4	43.2
52	United Arab Emirates		57.0	62.4	48.8
53	Mauritius		56.8	67.2	41.2
54	Indonesia		56.7	69.9	36.9
55	Cyprus		56.6	61.3	49.6
56	Georgia		56.3	63.7	45.1
57	Mexico		56.3	68.7	37.6
58	Saudi Arabia		55.9	62.8	45.4
59	Turkey		55.8	62.7	45.5
60	Thailand		55.8	63.2	44.6
61	Malta		55.6	64.9	41.8
62	Oman		55.5	58.9	50.3
63	India		55.3	63.6	42.8
64	Singapore		55.0	54.1	56.5
65	Morocco		54.9	60.5	46.5
66	Bolivia		54.8	68.1	34.7
67	Montenegro		54.6	59.9	46.6
68	Namibia		54.5	62.0	43.3
69	Sri Lanka		54.2	64.4	39.0
70	Kenya		53.6	63.8	38.4
71	Tajikistan		53.6	65.2	36.1
72	Lao PDR		53.5	54.0	52.9
73	Jordan		53.5	57.7	47.1
74	Ecuador		53.2	67.5	31.8
75	Egypt, Arab Rep.		53.0	64.3	36.0
76	Ukraine		52.9	62.6	38.3
77	Cambodia		52.9	61.6	39.9
78	Serbia		52.9	61.1	40.5
79	Armenia		52.7	60.9	40.5
80	Kyrgyz Republic		52.7	61.7	39.3
81	Macedonia, FYR		52.6	59.5	42.3
82	Argentina		52.6	64.9	34.3
83	Gabon		52.5	65.1	33.5
84	South Africa		52.4	58.0	44.0
85	Lebanon		52.0	56.9	44.6
86	Angola		52.0	67.6	28.7
87	Ethiopia		51.7	59.5	39.9
88	Bosnia and Herzegovina		51.5	55.3	45.8
89	Tunisia		51.3	57.1	42.6
90	Cote d'Ivoire		51.2	59.2	39.1
91	Algeria		50.9	65.1	29.7
92	Ghana		50.9	62.1	34.1
93	Zambia		50.9	55.6	43.7
94	Guatemala		50.8	63.7	31.4
95	Venezuela		50.4	67.6	24.7
96	Brunei Darussalam		50.3	58.4	38.2
97	Dominican Republic		50.1	56.8	40.2
98	Kazakhstan		50.1	57.3	39.3
99	Trinidad and Tobago		49.7	57.2	38.6
100	Nepal		49.6	57.8	37.3
101	Cameroon		49.2	61.8	30.2
102	Iran, Islamic Rep.		49.0	59.4	33.3
103	Bahrain		48.8	55.4	38.8
104	Kuwait		48.6	54.1	40.3
105	Philippines		48.4	59.1	32.4
106	Honduras		48.3	59.3	31.9
107	Republic of Moldova		48.1	55.3	37.2
108	Nigeria		46.9	59.4	28.2
109	Bangladesh		46.8	60.8	25.6
110	Jamaica		46.6	50.3	41.1
111	Senegal		46.6	53.3	36.5
112	Zimbabwe		46.3	50.7	39.7
113	Pakistan		46.2	55.2	32.5
114	Nicaragua		46.0	57.7	28.6
115	Botswana		45.6	54.3	32.7
116	Mongolia		45.4	55.3	30.5
117	Mozambique		45.3	57.0	27.8
118	Tanzania		44.3	49.7	36.1
119	Yemen, Rep.		43.8	55.1	26.8
120	Congo, Dem. Rep.		42.0	53.7	24.4

40 50 60 70 80

30 40 50 60 70

- Emerging and developing Europe
- Middle East, North Africa and Pakistan
- Sub-Saharan Africa
- Latin America and the Caribbean
- Commonwealth of Independent States
- Advanced economies
- Emerging and developing Asia

ETI score 2015 — 2024

2024 global average (56.5)

1 System performance 2024; **2** Transition readiness 2024 **Note:** The average score for 2024 is 56.5.

Source: World Economic Forum.

Europe continues to lead the ETI rankings, with the top 10 list for 2024 fully composed of countries from that region. **Sweden (1) and Denmark (2) Finland (3), Switzerland (4) and France (5).** These countries benefit from **high political commitment, strong investments in research and development, expanded clean energy adoption – accelerated by the regional geopolitical situation, energy-efficiency policies and carbon pricing.** France is a new entrant in the top five, with recent energy-efficiency measures reducing energy intensity in the past year

“This year’s Energy Transition Index delivers a clear message: urgent action is needed. Global decision-makers must make bold moves to regain momentum in the transition towards an equitable, secure and sustainable energy future. This is critical for people, entire economies and the fight against climate change,” said Espen Mehlum, Head of Energy Transition Intelligence and Regional Acceleration, World Economic Forum.

Fostering Effective Energy Transition

WORLD ECONOMIC FORUM

Regional scores and key insights: average scores by peer group – ETI 2024

64.8 Average score

13% | 32% | 29%

Advanced economies

Over the past decade, advanced economies, led by Nordic countries, have seen a strong 6% improvement in their average ETI scores. While they have achieved universal access to electricity and progress on decarbonization, affordability has become a challenge due to elevated energy prices in recent years. In the last year, progress has been remarkable in education and human capital and infrastructure. However, security and finance and investments saw a decline due to the energy crisis and uncertainty in energy markets.

54.1 Average score

1% | 1% | 1%

Commonwealth of Independent States

In the past decade, the Commonwealth of Independent States (CIS) has seen a 4% improvement in aggregate ETI scores. Notably, regulation and political commitment scores have increased by 32% in this period, driven by improvements in energy efficiency and renewable energy, in line with COP28 outcomes. However, there has been a recent decline in education and human capital and innovation scores, attributed to decrease in jobs in low-carbon industries and public spending on research and development. In addition, energy affordability challenges remain for consumers, exacerbated by high fuel subsidies, which experienced a 60% increase in the last year.

53.9 Average score

46% | 38% | 45%

Emerging and developing Asia

Emerging and developing Asia, including populous nations like India and China, has shown an 8% improvement in ETI scores over the past decade, mainly in reducing energy intensity. The region has also bolstered its regulation and policy framework, evident in a 16% increase in the carbon pricing score. However, progress on the sustainable front has stalled, marked by a concerning increase in carbon intensity. Despite renewable energy additions, the region remains heavily reliant on coal.

57.5 Average score

2% | 3% | 3%

Emerging and developing Europe

Emerging and developing Europe has demonstrated strong growth, with a 7% increase in ETI scores over the past decade. The group excelled in transition readiness, experiencing a 16% gain in scores, driven by advancements in regulation and political commitment and finance and investments. Over the past three years, significant progress has been made in adding renewable energy capacity and enhancing transport infrastructure, reflected in improved infrastructure scores. However, challenges remain due to high energy imports and consumer affordability concerns.

51.8 Average score

8% | 7% | 7%

Middle East, North Africa and Pakistan

Over the past decade, the Middle East, North Africa and Pakistan region has seen a 7% growth in ETI scores, which have stagnated in the last three years. The region’s heavy reliance on oil revenues poses challenges for a sustainable energy transition. While transition readiness has improved by 22% over the decade, the region has seen the most significant decline in finance and investments in the past three years.

49.6 Average score

11% | 4% | 2%

Sub-Saharan Africa

Sub-Saharan Africa has witnessed remarkable energy transition growth of 10% over the last decade, making it the strongest performer across all groups on the equitable dimension. Notably, the region has experienced the highest gain of 58% in regulation and political commitment scores, alongside advancements in education and human capital. However, the region faces challenges in attracting global investments and fostering public-private partnerships to strengthen infrastructure and diversify its energy mix.

55.2 Average score

8% | 6% | 4%

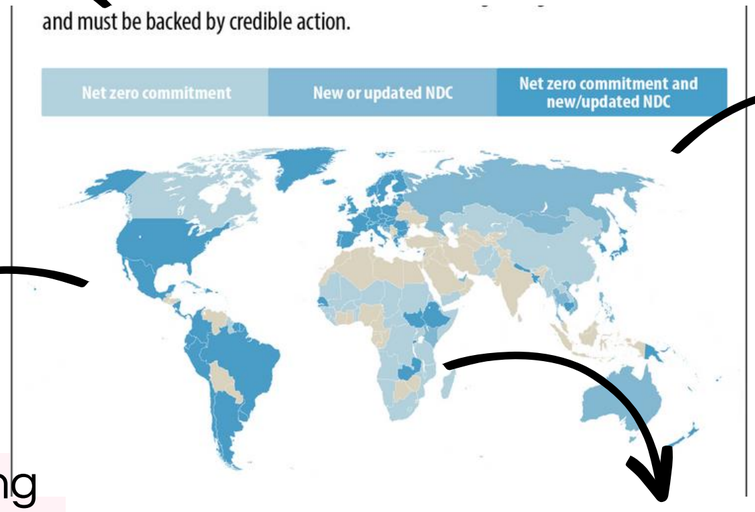
Latin America and the Caribbean

Latin America and the Caribbean has seen the slowest growth, with ETI scores increasing by only 3% over the past decade. Despite leading in the sustainability dimension, largely due to reliance on hydropower and recent expansions in solar and wind capacity, the region surprisingly saw a 70% decline in investment in renewables scores over the same period. In addition, education and human capital and innovation environment both experienced declines of 5% and 9% respectively over the past decade.

Net Zero Agenda

The concept of Net Zero refers to the goal of reducing emission levels as close to zero & offsetting the emissions that cannot be removed to prevent the addition of GHGs to the atmosphere.

More than 70 countries have set a net-zero target, covering about 76% of global emissions.

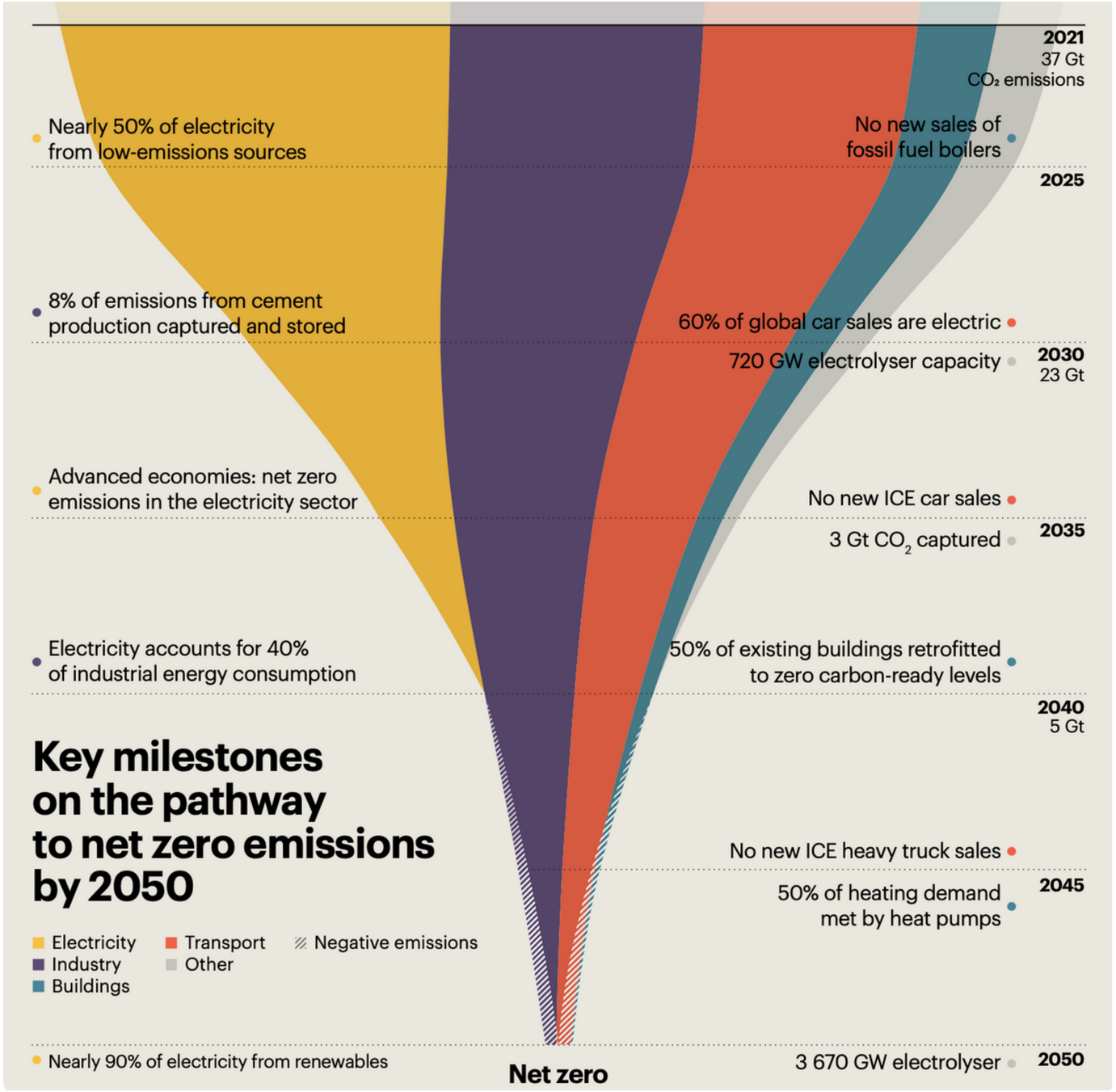


Half of the GHG emissions in 2020 were from the top 7 countries: China, USA, India, the European union, Indonesia, the Russian Federation, and Brazil.

Paris Agreement – Keep global warming <1.5°C emissions need to be reduced by 45% by 2030 and reach net zero by 2050

The energy sector is about three-quarters of GHG emissions in 2023.

Source: United Nations (2023)
https://www.un.org/en/climatechange/netzerocoalition#

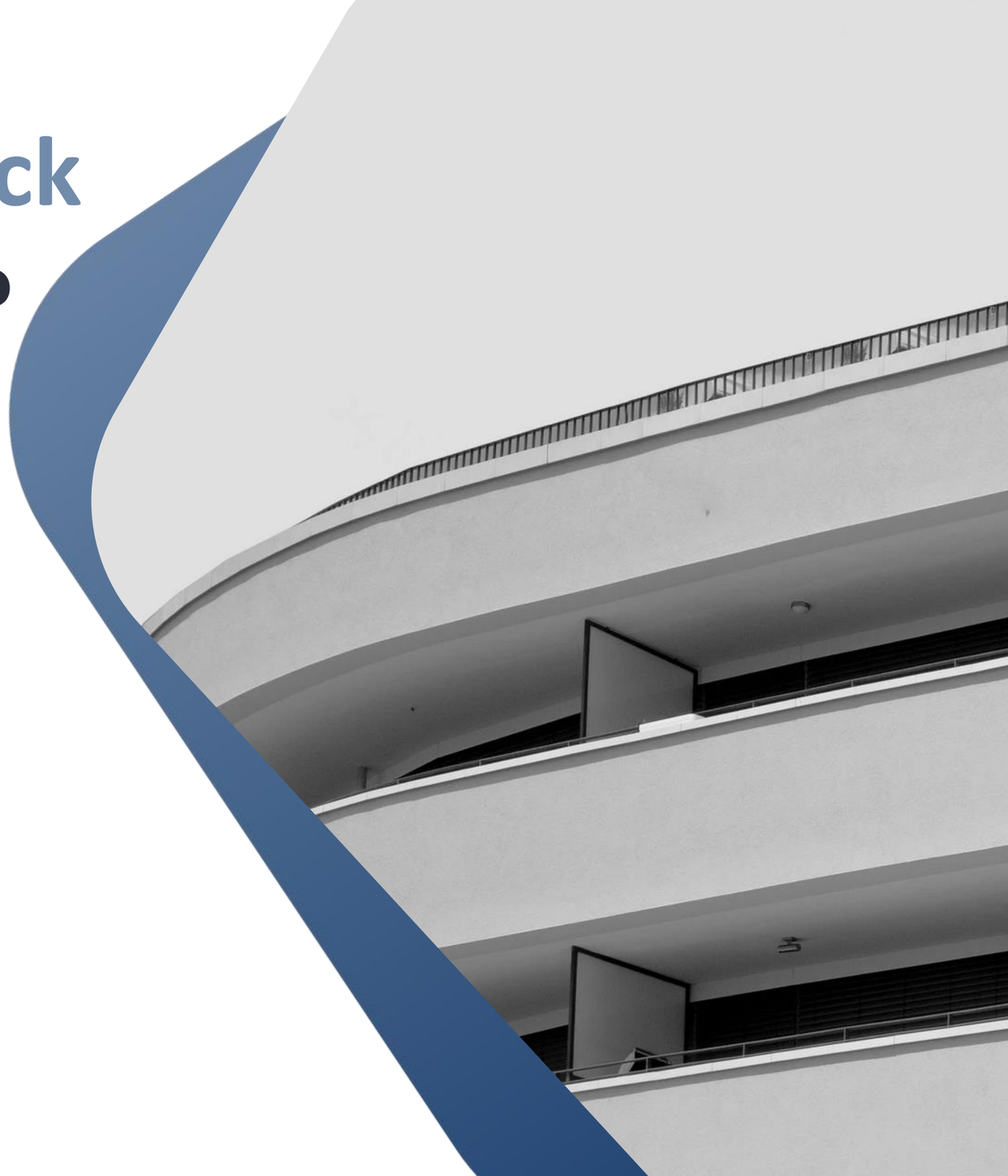


Key Milestones on the Pathway to Net Zero Emissions by 2050

Source: World Energy Outlook 2022, IEA (2022)
https://www.iea.org/en/climatechange/netzerocoalition#

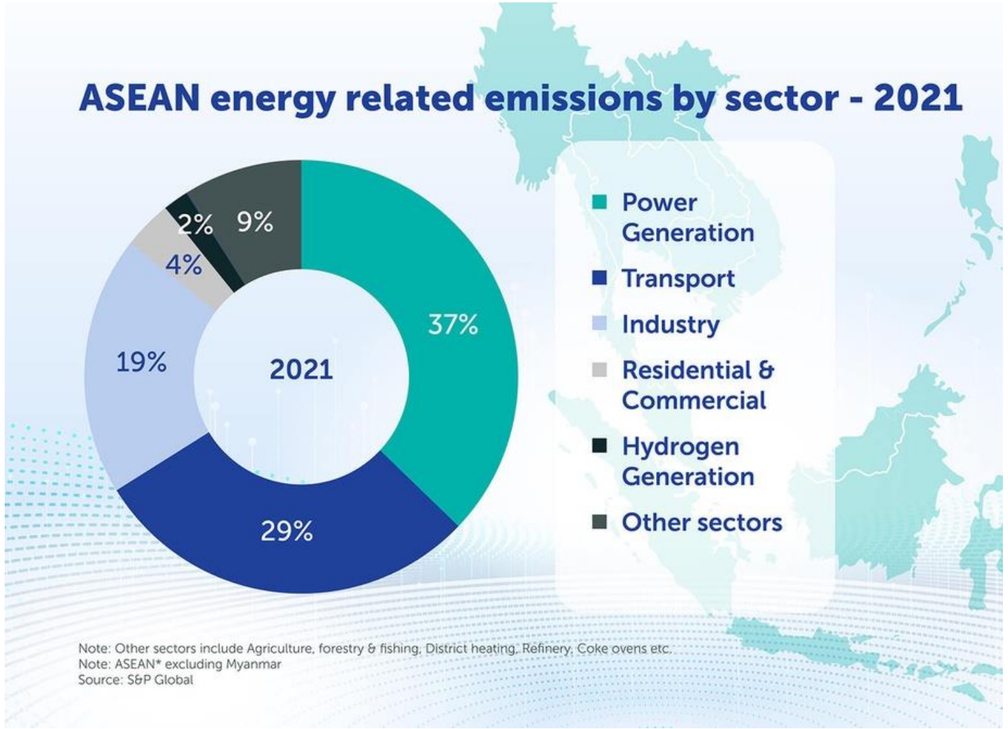
Are we on the right track to reach net zero right?

Commitments made by governments to date fall far short of what is required. Current national climate plans – for 193 Parties to the Paris Agreement taken together – would lead to a sizable increase of almost 11% in global greenhouse gas emissions by 2030, compared to 2010 levels.



Updates on ASEAN's Net-Zero Targets

The annual greenhouse gas emissions (GHG) of ASEAN reached **over 4,000 million metric tons of carbon dioxide equivalent (MTCO2e) in 2021**, and are projected to rise further in the near-term as regional development continues to accelerate. **Power generation, transport, and industry today account for 86% of total energy-related emissions in ASEAN**.



Indonesia
Target: Net zero no later than 2060
Increase unconditional emissions reduction targets against BAU from 29% to 31.89%, and to 43.20% conditional on appropriate support.

Brunei Darussalam
Target: Net zero by 2050
through energy transition and forest preservation. The country's goal of reducing GHG emissions by 20% relative to business-as-usual (BAU) levels by 2030.

Singapore
Target: Net zero by 2050
Long-Term Low-Emissions Development Strategy. Commits to reducing its emissions to around 60 MtCO2e in 2030 .This includes innovative opportunities to embrace low-carbon power through ongoing power trading agreements.

Laos
Target: Net zero by 2050
A major focus on land use and low-carbon energy. Committed to unconditionally reduce its GHG emissions by 60% in 2030 compared to the BAU scenario.

The Philippines
Target: No defined net-zero target
Committed to GHG emissions reduction and avoidance of 75% between 2020 and 2030, of which 2.71% is unconditional, for the sectors of agriculture, wastes, industry, transport, and energy. National Renewable Energy Program (NREP) to power the grid with a 35% share of RE by 2030, and 50% by 2040. It does not currently have a mandated net-zero target.

Malaysia
Target: Net zero by 2050
The 12th Malaysia Plan (12MP), the nation aims to be guided by the pillars of sustainability (economy, social and environment). Aims to reduce economic-wide carbon intensity against GDP by 45% by 2030, compared to 2005 levels.

Cambodia
Target: Carbon neutral by 2050
Decrease emissions by 41.7% by 2030, with half of that reduction in forest and land use (FOLU) and the rest largely focused on energy.

Thailand
Target: Net zero by 2065
Long-term goal of carbon neutrality by 2050, and net-zero GHG emissions by 2065. Aims to reduce GHG emissions by 30% by 2030 compared to BAU scenario, with a conditional target raised to 40% of emissions with relevant support.

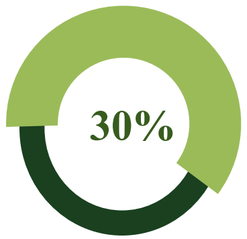
Vietnam
Target: Net zero by 2050
Under the National Climate Change Strategy, the aims to set a cap on total emissions of 185 MtCO2e in 2050. Commits to reduce its emissions by 15.8% (unconditional) and by 43.5% (conditional) by 2030 compared to BAU.

ASEAN’s Renewable Energy Target

The Asian Development Bank (ADB) projected 2018 economic growth rates of these five economies (ASEAN-5) to average at 5.5 %, slightly higher than the 5.1 % regional average.

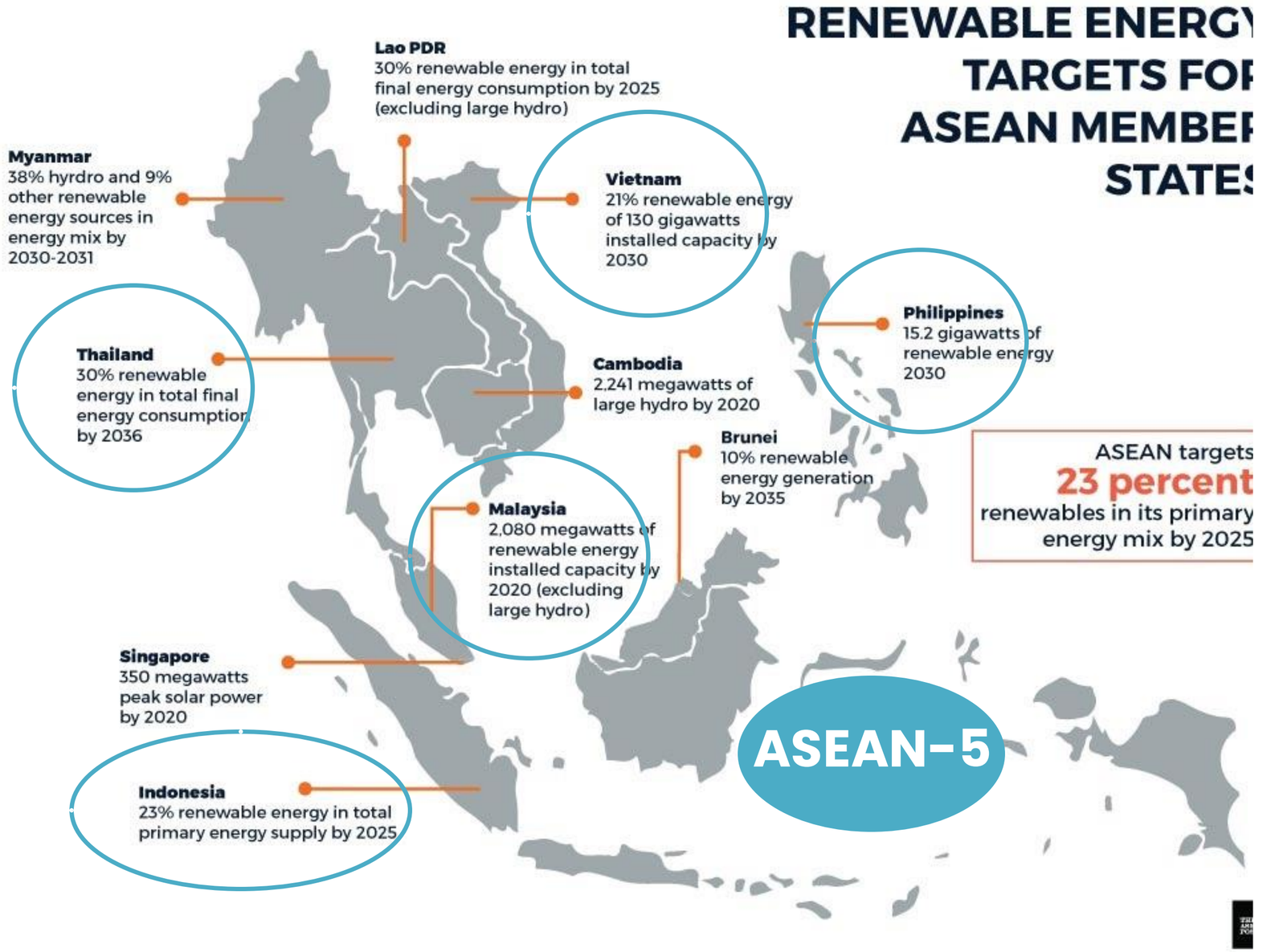
ASEAN member states
Working towards realising a common regional goal of intensifying renewable energy in the region’s primary energy mix to 23 % by 2025

ASEAN targets 23% renewable energy in its primary energy mix by 2025



ASEAN to reduce energy intensity by 30% by 2025

SDG Goal No 7: Affordable & Clean Energy by 2030



Overview of Malaysia's Energy Landscape

Malaysia Energy Landscape

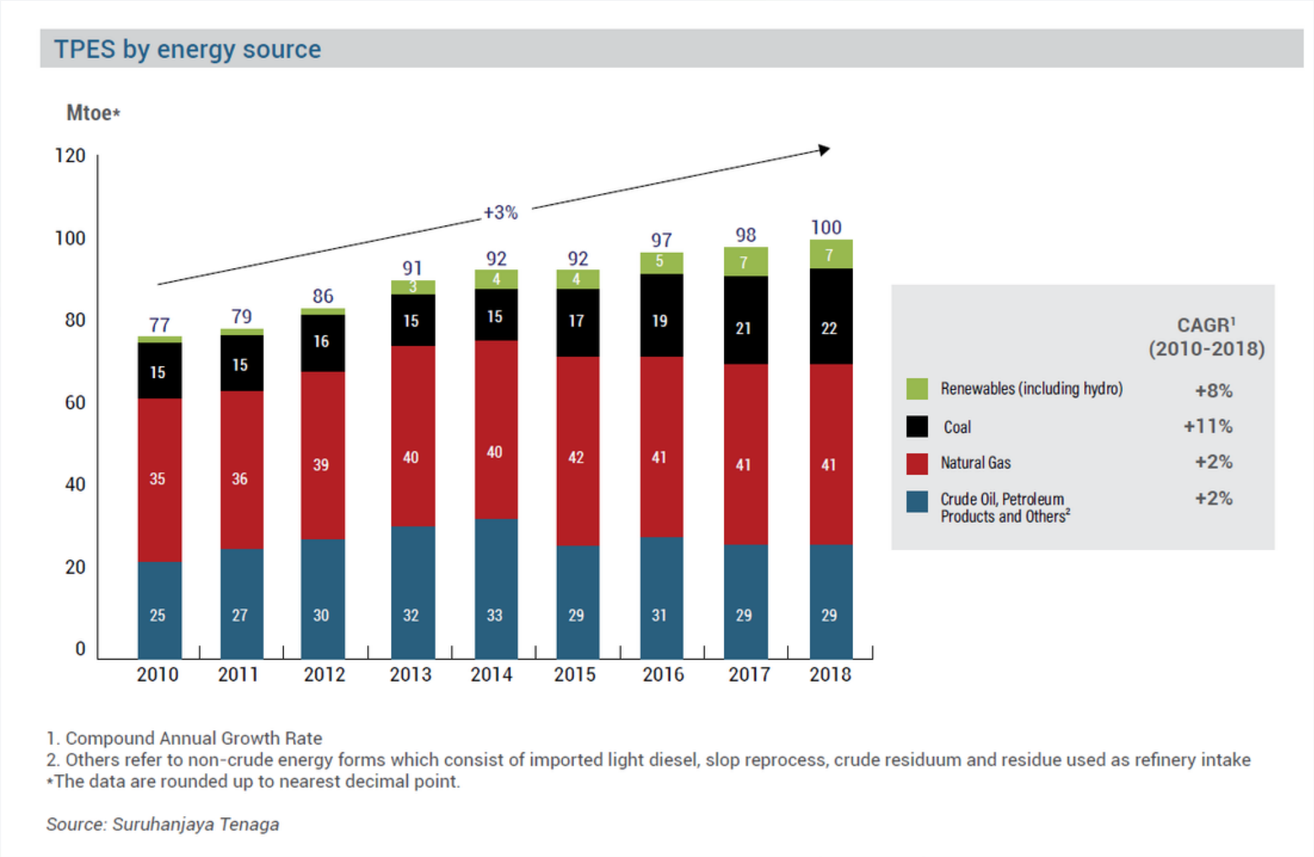


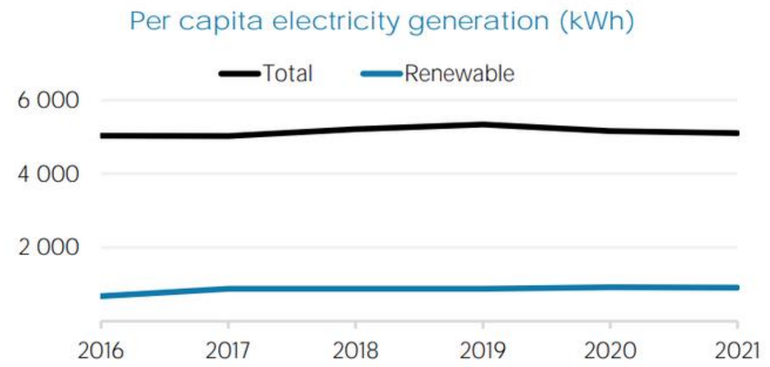
Figure: Total Primary Energy Supply (TPES) based on energy source

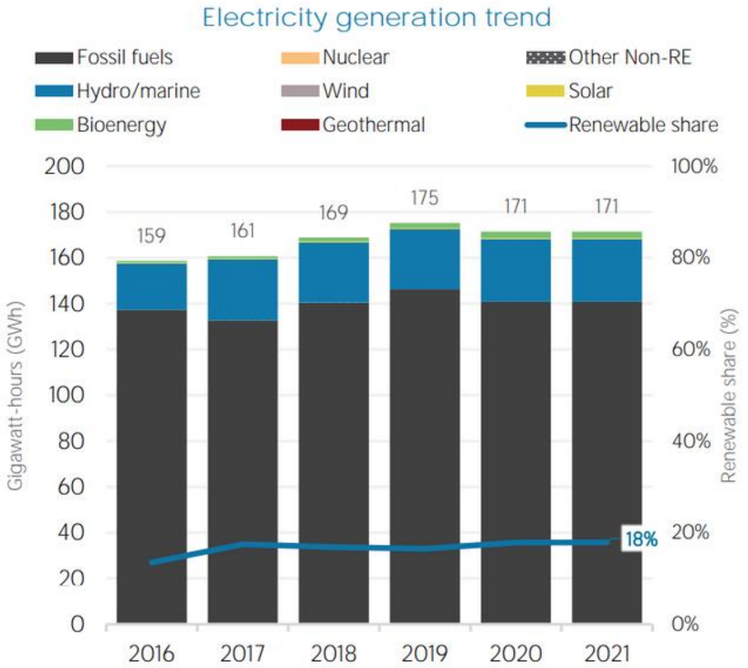
Energy Sector

- The energy sector is the main driver of growth in the economy, & energy-intensive industries contribute 28% of GDP & employ 25% of the total workforce.
- The energy sector is a significant source of national income, with petroleum-related income accounting for 31% of fiscal income and energy exports accounting for 13% of total export value.
- On the supply side, the national TPES mix is mostly made up of 41% of natural gas, 29% crude oil and petroleum products and 22% coal.
- Only 7% of TPES comes from renewable sources, most of which are hydroelectric, solar, and bioenergy (2018).
- At 11% per year, coal has the highest rate of growth. This is mostly because of demand from Peninsular Malaysia's power sector.
- Energy security and cost are the main reasons why coal is becoming a bigger part of the primary energy mix.

Malaysia Electricity Generation

Generation in 2021	GWh	%
Non-renewable	**140 882**	**82**
Renewable	**30 597**	**18**
Hydro and marine	27 302	16
Solar	430	0
Wind	0	0
Bioenergy	2 865	2
Geothermal	0	0
Total	**171 479**	**100**





LATEST POLICIES, PROGRAMMES AND LEGISLATION

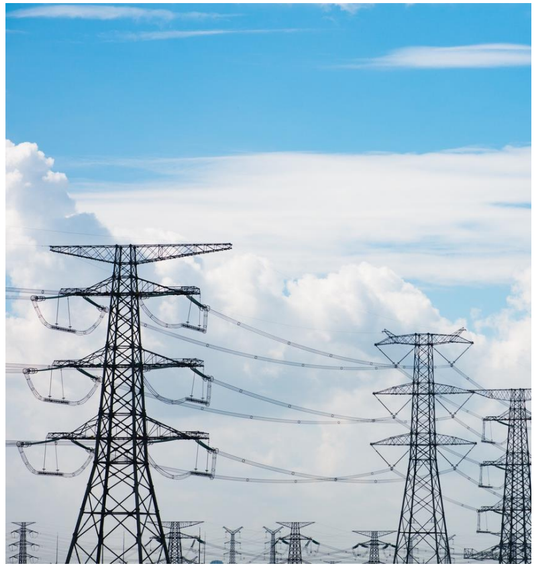
1	Tax Incentive for Carbon Capture Storage	2023
2	Tax Incentive for Company Renting Non-Commercial Electric Vehicle	2023
3	Tax Incentive for Manufacturer of Electric Vehicle Charging Equipment	2023
4	2022 Increase in petroleum product subsidies and Cooking Oil Stabilisation Scheme	2022
5	Fuel Subsidy on Electricity Bill	2022

Source: International Renewable Energy Agency (IRENA), 2022

Key Energy Challenges in Malaysia

Dependence on Fossil Fuels

- **Heavy Reliance**: ~80% of electricity is generated from coal and natural gas.
- **Challenges**:
  - Vulnerable to **price fluctuations** in the global market.
  - Significant **carbon emissions** impacting climate goals.



Grid Stability

- **Issue**: Increasing integration of **intermittent renewables** (e.g., solar, wind).
- **Challenge**: Maintaining grid reliability and **energy supply consistency**.

Energy Security

- **Risks**:
  - **Supply chain disruptions** (e.g., fuel shortages, global political instability).
  - **Dependence on imports** of fossil fuels, affecting long-term security.

Climate Commitments

- **Need to meet Malaysia's climate goals**:
  - **Net-zero emissions** by 2050 (Paris Agreement alignment).
  - **Reducing reliance on high-emission sources** while scaling up renewables.

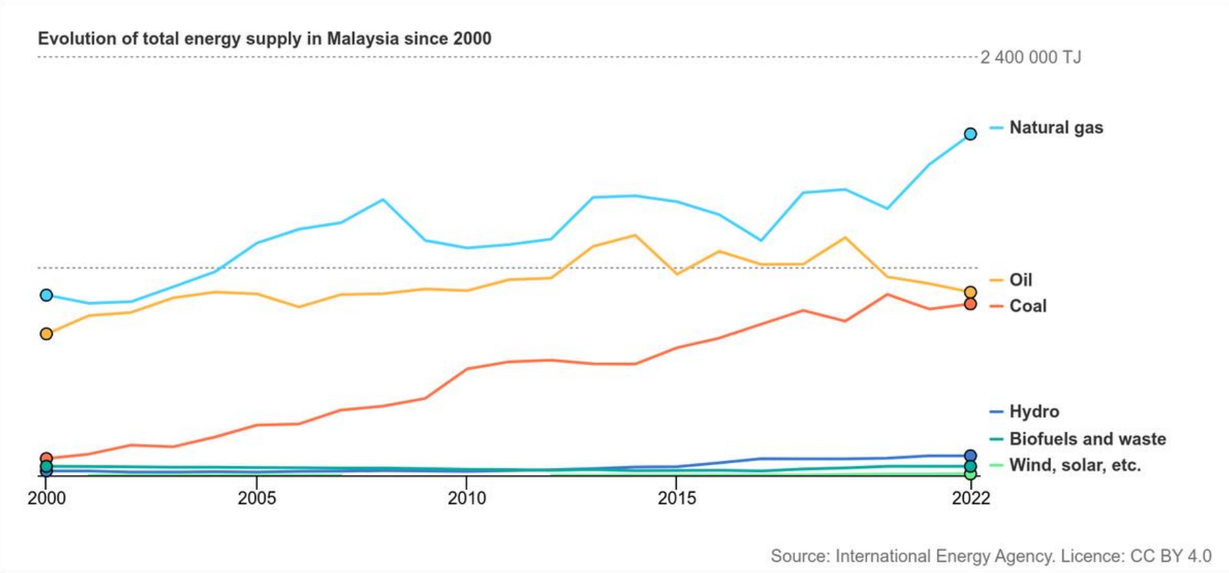
Energy Demand and Economic Growth

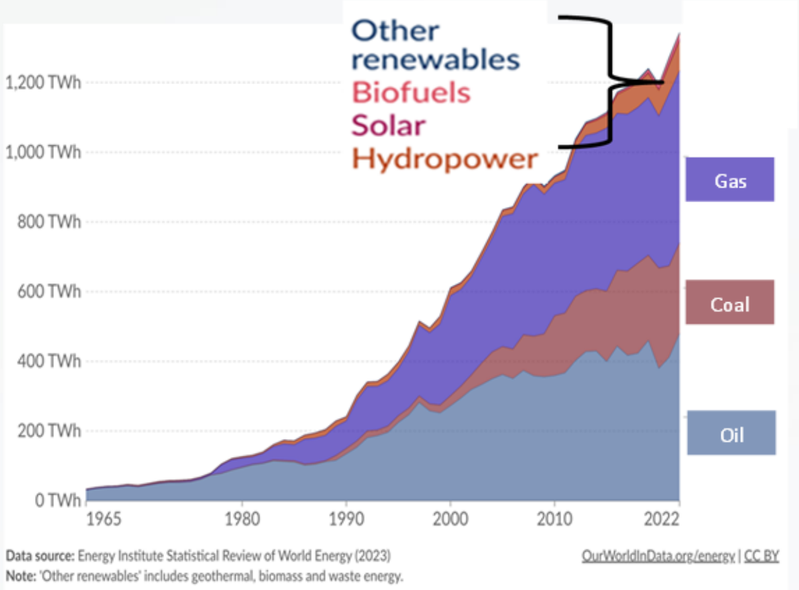
Energy Demand Projections

- **Expected Growth**: Energy demand projected to increase by **5-6% annually**.
  - Driven by **population growth** and **industrial expansion**.
  - By 2040, Malaysia's energy consumption could nearly **double**.

Economic Growth Context

- **Energy Consumption**: Rapid industrialization, urbanization, and rising standards of living contribute to **higher energy demand**.
- **Energy Efficiency**: Emphasize the need for improving **energy efficiency** to manage growing consumption and **reduce waste** in industrial, commercial, and residential sectors.

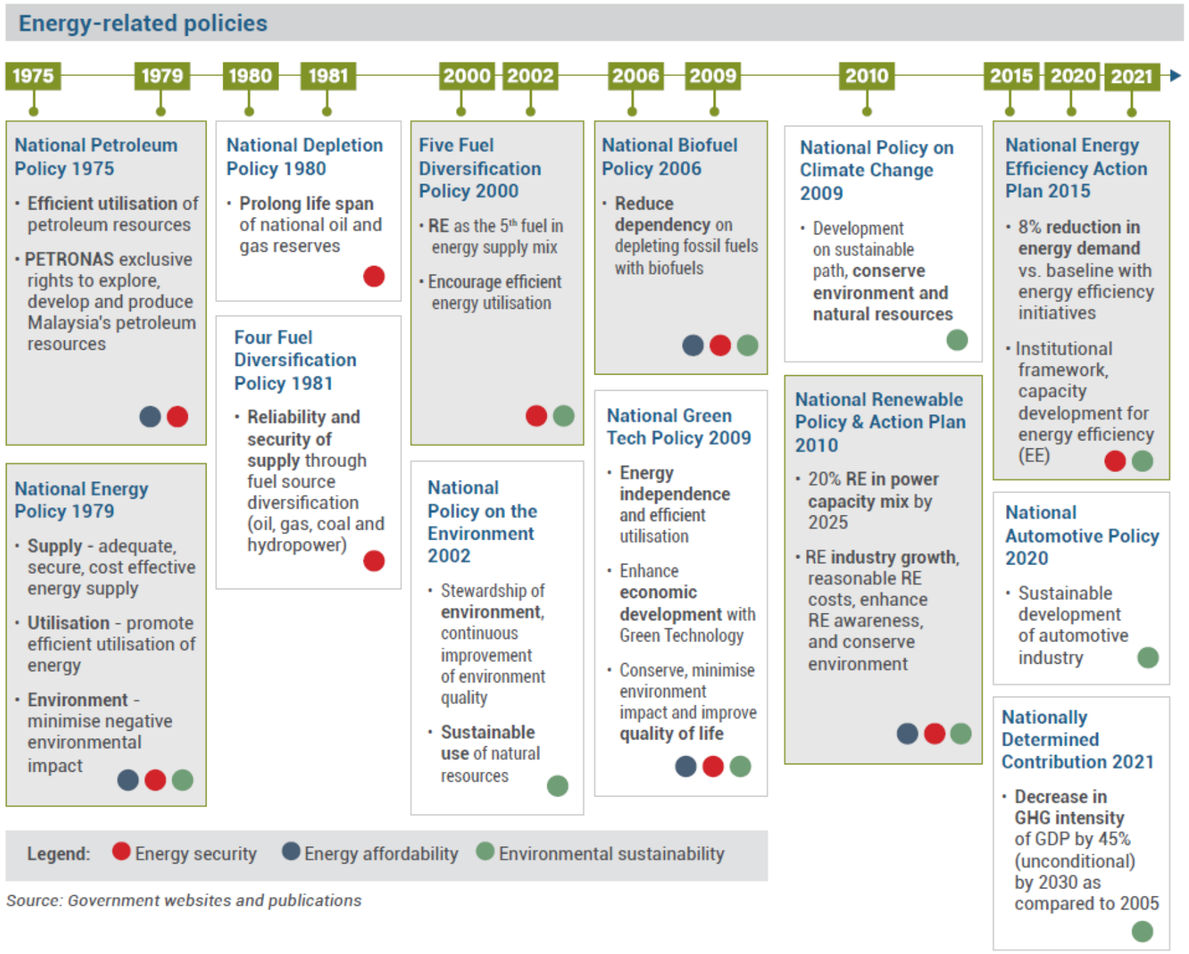




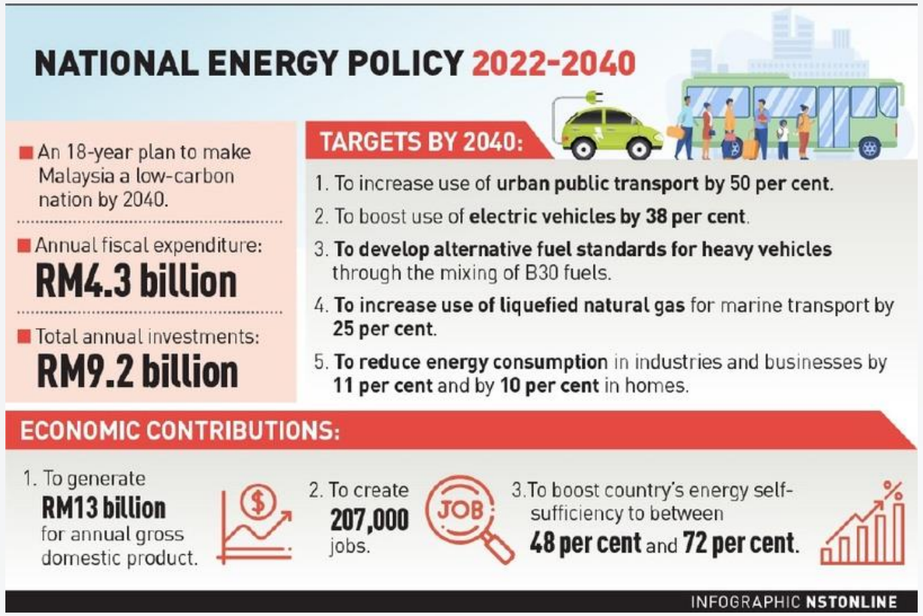
Source: Energy Consumption by source, Malaysia (Energy Institute Statistical Review of World Energy (2023).

National Energy Transition Plan

Overview of Key Policies Supporting the Transition



Source: Government websites and publications

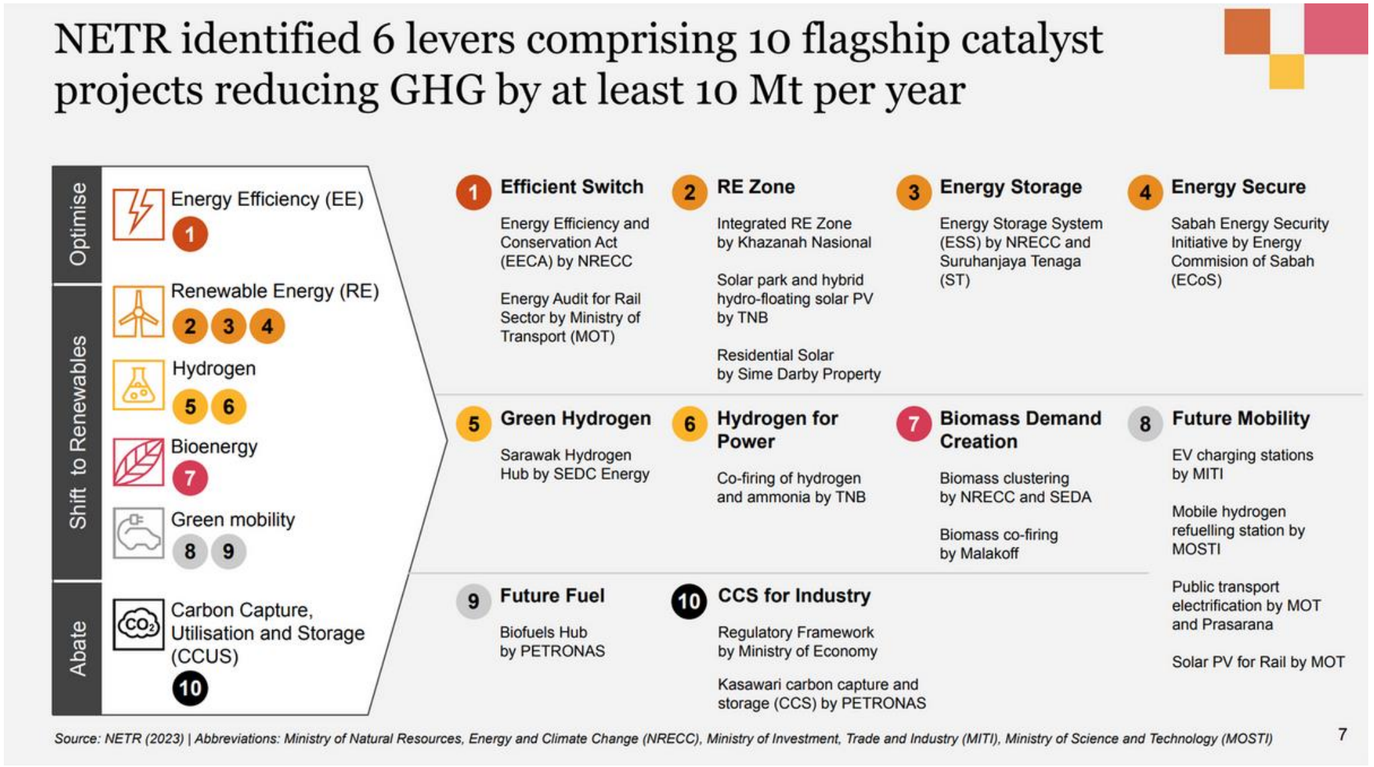


- The National Energy Policy (DTN) 2022-2040 was launched in September 2022 to demonstrate the Federal Government's commitment to energy transition.
- The DTN aims to improve economic resilience and ensure energy recovery while achieving equality and universal access and ensuring environmental sustainability using energy-based hydrocarbons and renewable energy sources.

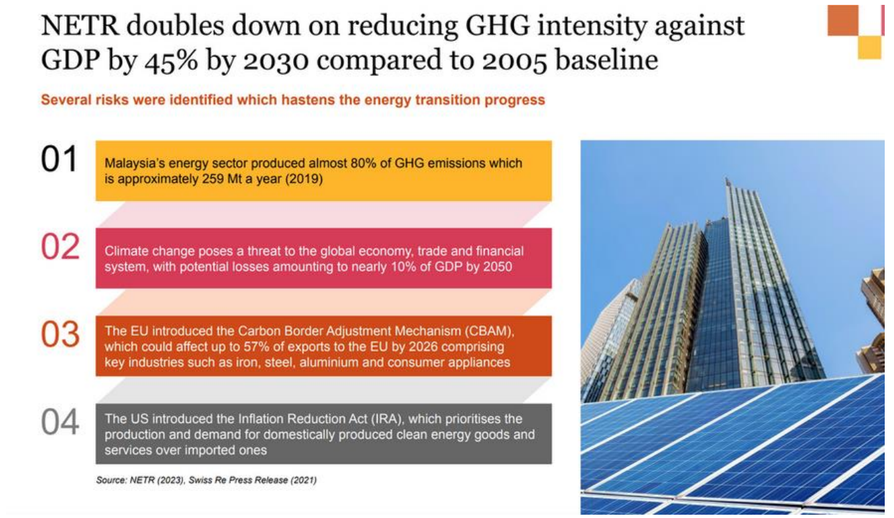
National Energy Transition Roadmap (2023)

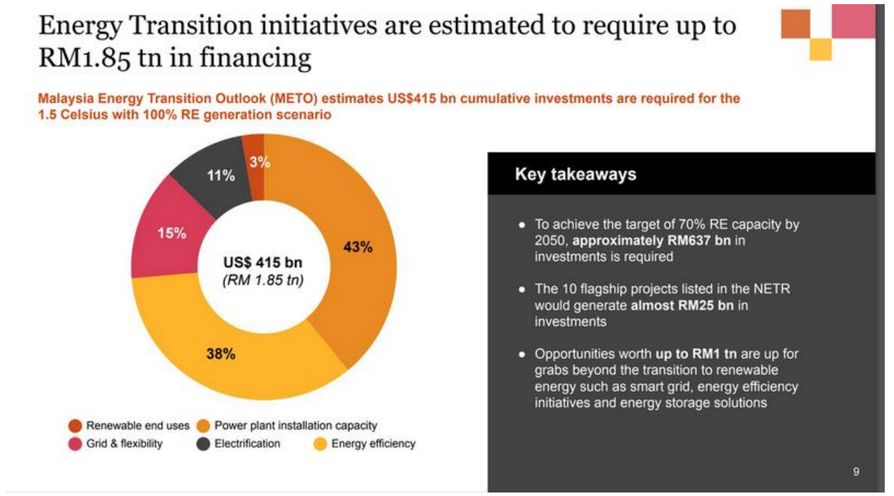
- The roadmap is also crucial in navigating the complexity of energy transition on a large scale, especially the shift from a traditional fossil fuel-based economy to a high-value green economy.
- NETR doubles down on reducing GHG intensity against GDP by 45% by 2030 compared to 2005 baseline

NETR identified 6 levers comprising 10 flagship catalyst projects reducing GHG by at least 10 Mt per year



Several risks were identified which hastens the energy transition progress:





Energy Transition initiatives are estimated to require up to RM1.85 tn in financing

Hydrogen Economy and Technology Roadmap

Vision for Hydrogen Economy

- **Strategic Role**: Hydrogen positioned as a **key energy vector** for decarbonization.

Malaysia aims to become a **regional leader** in hydrogen production, leveraging its renewable resource by 2050

Key Focus Areas of the Roadmap

1.Green Hydrogen Production:

1. Utilize **renewable energy** (solar, wind) for green hydrogen via **electrolysis**.
2. Pilot projects for **small-scale production** by 2030.

2.Infrastructure Development:

1. Build **storage, distribution, and refueling stations**.
2. Integrate hydrogen into **energy grids** for stability and resilience.

3.Sectoral Integration:

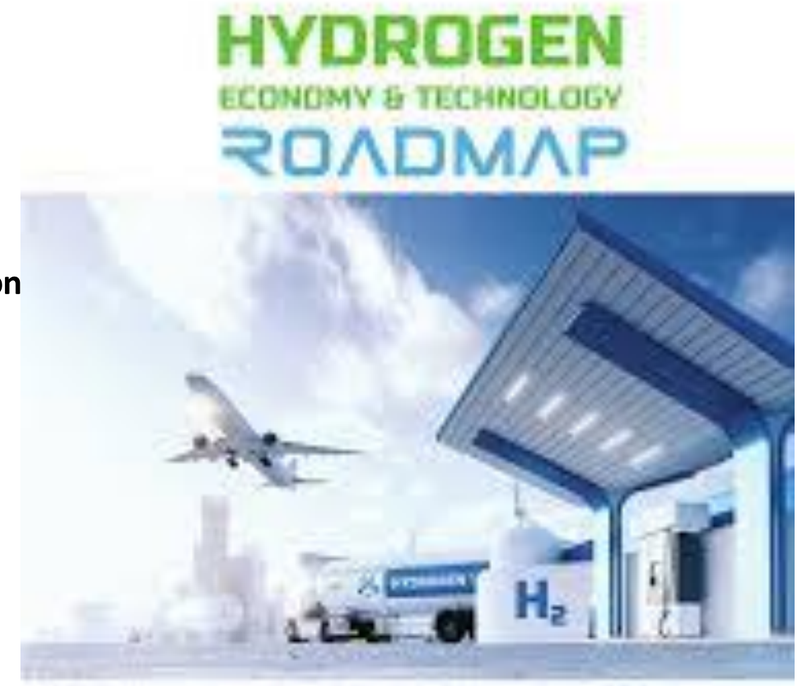
1. Use in **transportation** (hydrogen fuel cells for vehicles), **heavy industries**, and **power generation**
2. Potential to decarbonize **industrial sectors** (steel, chemicals).

Milestones and Policy Framework

- **2030 Goals**:
  - Establish hydrogen clusters for production and application.
  - Focus on **R&D, partnerships**, and **pilot projects**.
- **2050 Vision**:
  - Fully developed **hydrogen export market**.
  - Regional partnerships with **Japan, South Korea** for hydrogen trade.

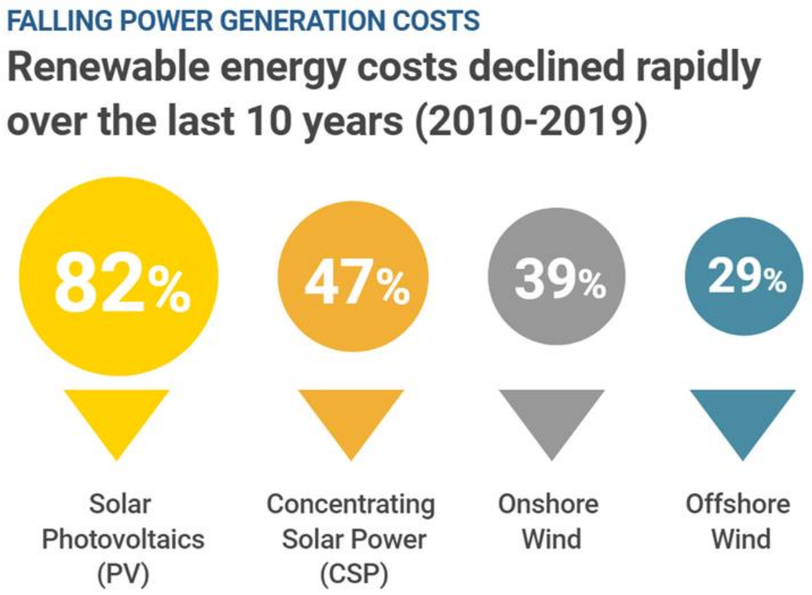
Enabling Policies

- **Public-Private Partnerships**: Government incentives for hydrogen technology development.
- **Research & Innovation**: Support for hydrogen **R&D** and commercialization.

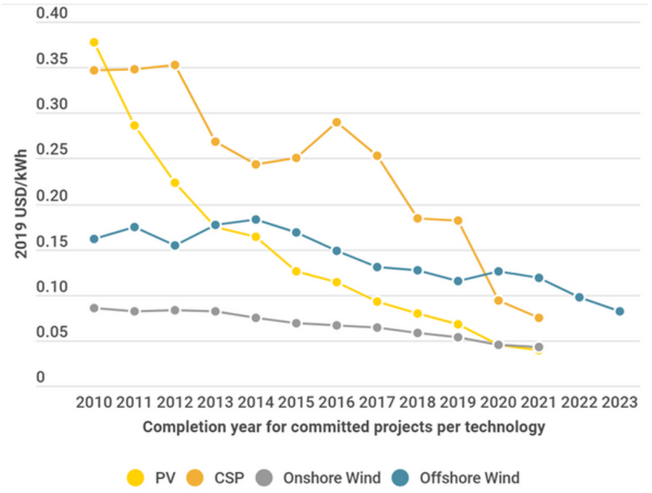


Renewable Energy Growth

How Falling Cost Make Renewables a Cost-Effective Investment



- **Renewable energy costs continue to fall** and **renewable power generation is increasingly** becoming the default source of least cost new power generation.
- Renewable power generation technologies are not just competing head-to-head with fossil fuel options without financial support, but increasingly undercutting them, in many cases by a substantial margin.



Renewable power is increasingly cheaper than new and existing fossil fuel-fired plant

56%

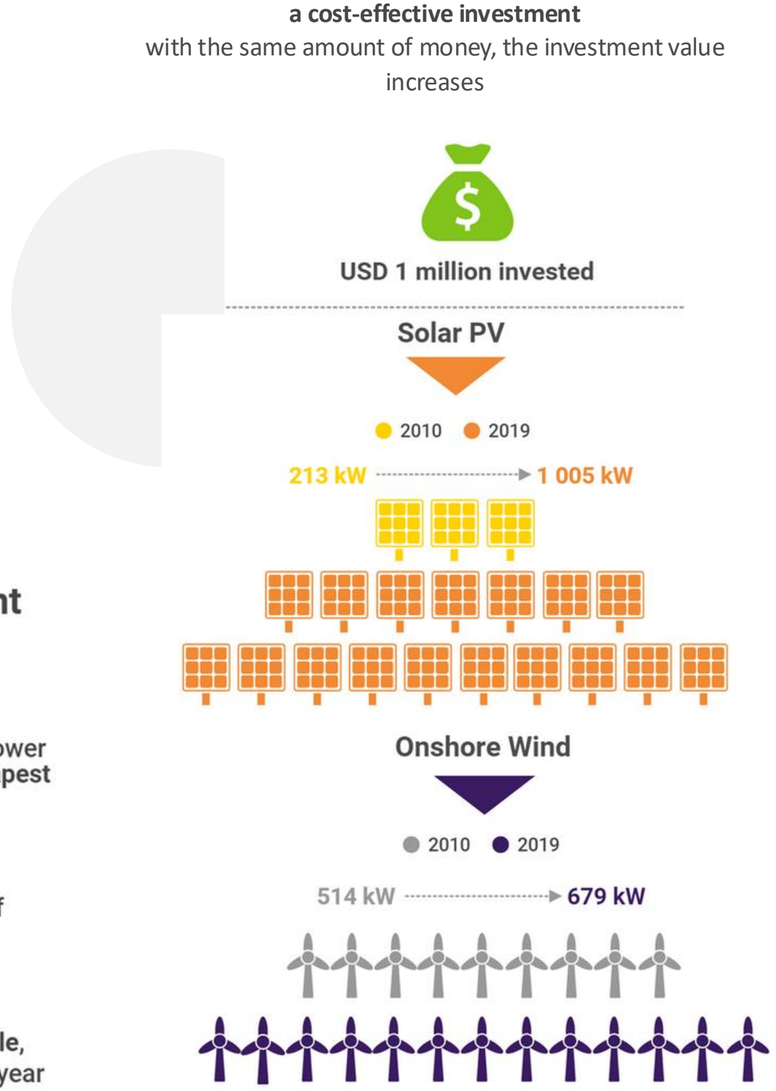
of capacity additions for utility-scale renewable power in 2019 achieved lower electricity costs than cheapest new coal plant

23 billion

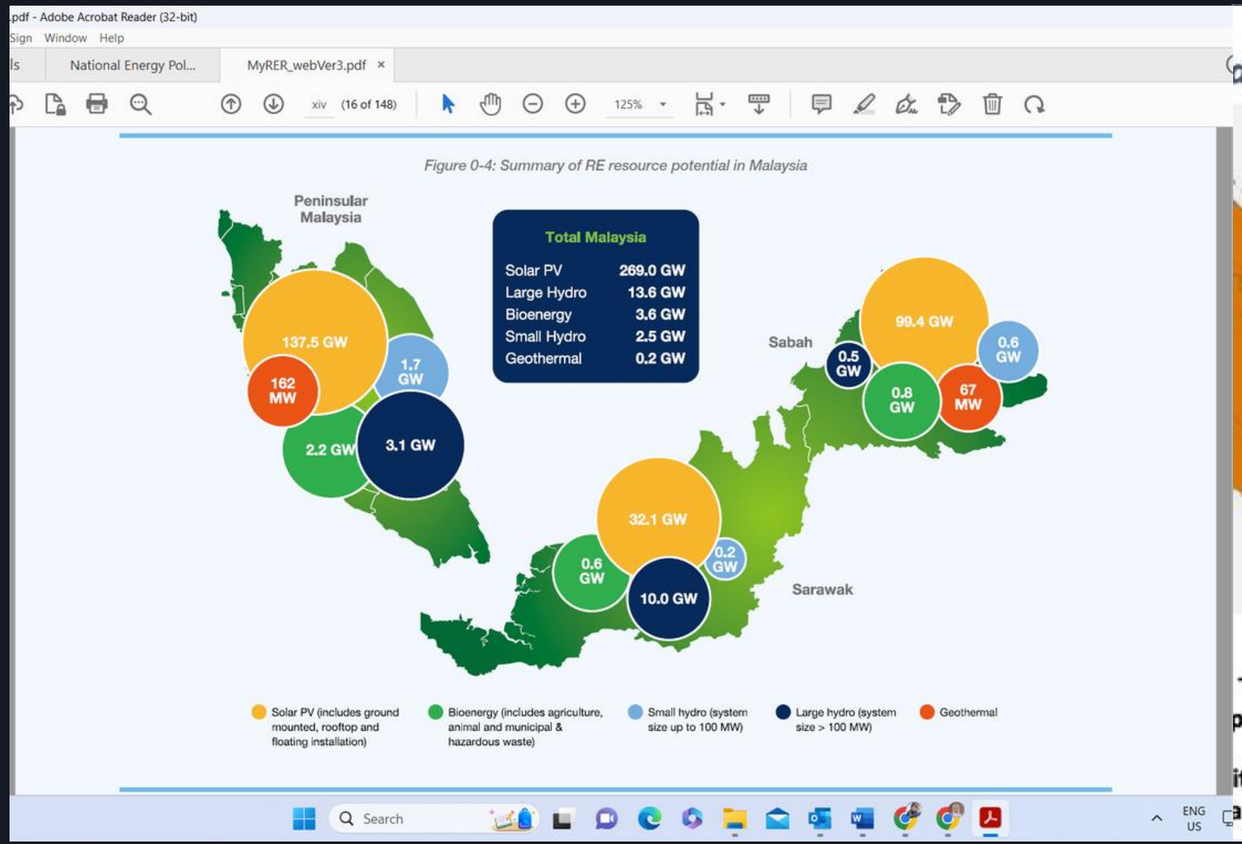
annual potential savings if the costliest 500 GW of existing coal were replaced by solar and wind

1.8 gigatons (Gt)

of carbon dioxide (CO_2) reduction annually possible, equalling to 5% of total global CO_2 emissions last year

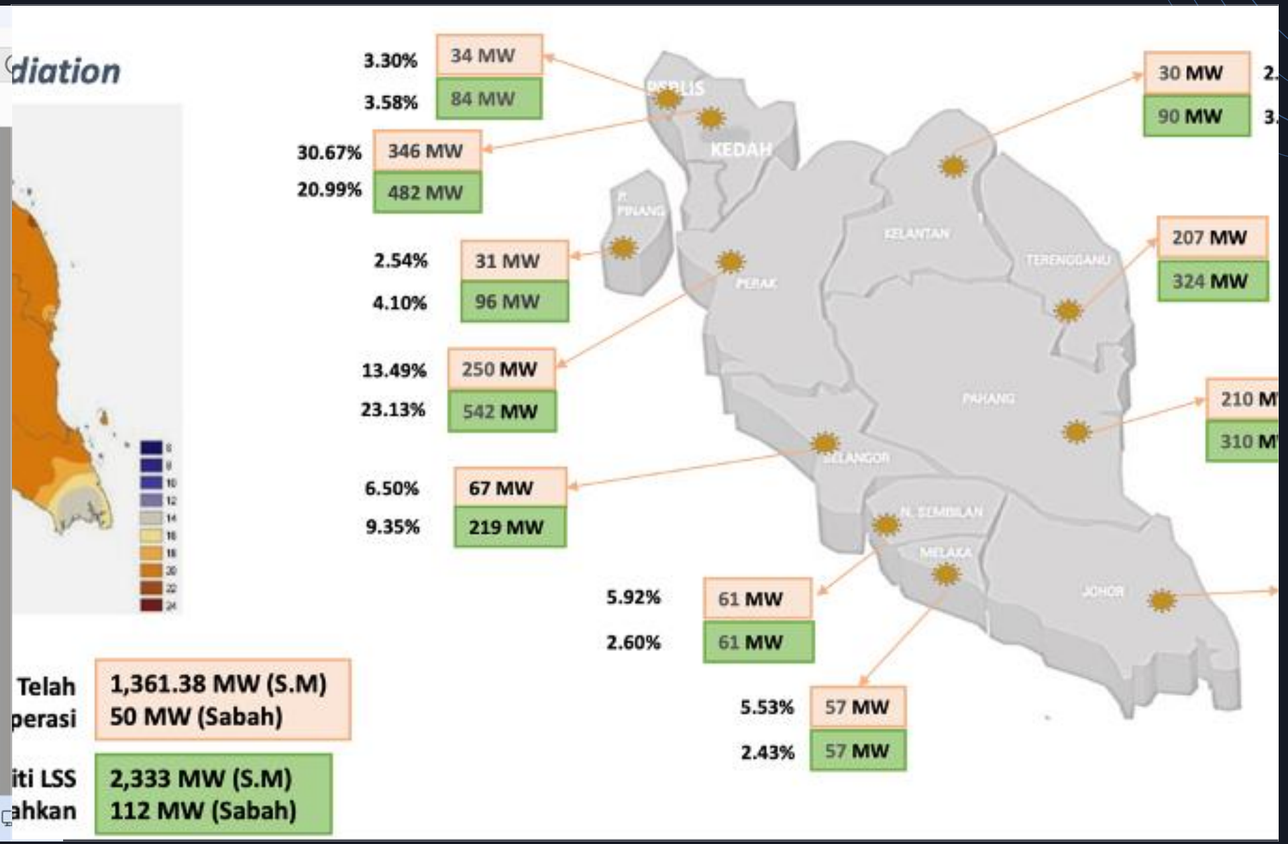


RE Development in Malaysia



Summary of renewable energy resource potential in Malaysia.

Malaysia's advantageous geographical location provides an abundance of indigenous natural resources that are readily available for use in RE power generation



Operational and awarded LSS Capacity by states in Malaysia

Operational: 250 MW (13.49% contribution to the grid)

Awarded: 542 MW (23.13% contribution to the grid)

(Energy Commission Malaysia, 2023).

RE Market Scenario

- Solar energy leads the market, with NEM programs allowing consumers to sell excess electricity.
- Feed-in tariffs and tax incentives support solar PV investment.
- Malaysia extended power purchase agreements for large-scale solar projects from 21 to 25 years in 2022, allocating 823.06 MW in LSS4.
- Technological advancements have boosted solar panel efficiency and reduced costs.
- Solar PV capacity increased by over 8% between 2021 and 2022, with 1,160 MW operational by June 2022.
- Therefore, based on the factors above, the utility sector is expected to dominate the Malaysian renewable energy market during the forecast period.

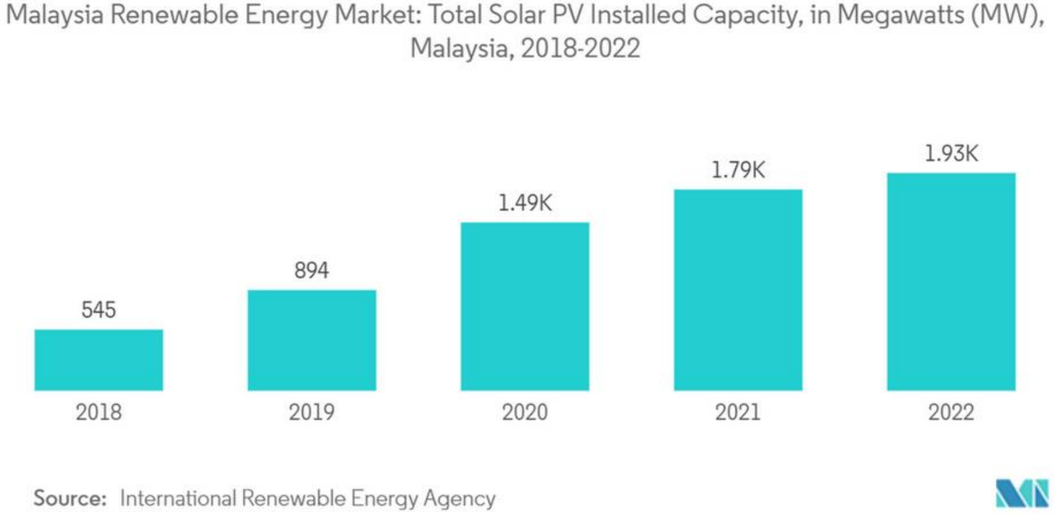
Share

Study Period	2019- 2028
Base Year For Estimation	2022
Market Volume (2023)	9.68 gigawatt
Market Volume (2028)	12.04 gigawatt
CAGR (2023 - 2028)	4.45 %
Market Concentration	Medium

Major Players

CSWIND, SOLARVEST, PLUS XNERGY, CanadianSolar

*Disclaimer: Major Players sorted in no particular order



Malaysia Green Technology Incentives

INCENTIVES/ DESCRIPTION	GREEN INVESTMENT TAX ALLOWANCE	GREEN INCOME TAX EXEMPTION	
		Green Technology Services	Solar Leasing Activities
Qualifying activities	Renewable Energy Energy Efficiency Green Building Green Data Centre Integrated Waste Management	Renewable Energy Energy Efficiency Electric Vehicle (EV) Green Building Green Data Centre Green Certification and Verification Green Township	Solar leasing activities
Quantum/ Period	**100%** of qualifying capital expenditure for **three (3) years** from the date of the first qualifying capital expenditure (CAPEX) incurred; offset against **70% of statutory income** in the year of assessment	**70%** on statutory income for qualifying green services where the period of incentive is for **three (3) years** starting from assessment year of the first invoice related to green technology services issued	**70%** on statutory income for solar leasing activity for a period of up to **ten (10) years** of assessment based on the **capacity**: Capacity / Incentive Period >3MW- ≤10MW / 5 years >10MW- ≤30MW / 10 years

Green Income Tax Exemption (GITE) Solar Leasing

GITE's scope has also been expanded to include companies carrying out solar leasing activities under the Net Energy Metering (NEM) Program, also known as the Registered Solar PV Investor (RPVI) with SEDA Malaysia. GITE Solar Leasing programme is now open for applications until December 31, 2023.

Green Technology Financing Scheme 2.0 (GTFS 2.0)

GTFS is a financing scheme available to investors that is backed by the government, which provides a 2% p.a. interest/profit rate subsidy for the first seven years and a 60% government guarantee of green component costs to financial institutions.

Extension Of Green Investment Tax Allowance (GITA) & Green Income Tax Exemption (GITE) until 2023

The government announced that the Green Investment Tax Allowance (GITA) for the purchase of green technology assets and the Green Income Tax Exemption (GITE) for the use of green technology services would be extended until 2023.

Key Projects and Initiatives

Large-Scale Solar (LSS) Programs

Objective: Achieve **low-cost solar energy** and contribute to the **renewable energy target** of 31% by 2025.

- **Key Phases**:
  - **LSS1 (2017)**: 450 MW awarded.
  - **LSS2 (2018)**: 563 MW awarded.
  - **LSS3 (2021)**: 500 MW capacity expansion.
  - **LSS4 (2023)**: Competitive bidding for new solar projects.
- **Impact**:
  - Increases **solar energy production** capacity.
  - Promotes **private sector participation** in renewable energy.

Net Energy Metering (NEM) Scheme

- **Key Phases**:
  - **NEM 2.0 (2019)**: Allows **1:1 offset** for energy exported, benefiting residential and commercial users.
  - **NEM 3.0 (2021)**: Introduced **three initiatives**:
    - **NEM Rakyat** (residential).
    - **NEM GoMEn** (government buildings).
    - **NEM NOVA** (non-residential, for commercial and industrial use).
- **Impact**:
  - Promotes **rooftop solar** adoption.
  - Encourages **energy savings** and return on investment for consumers.

Overall Impact

- Both programs support Malaysia's **renewable energy goals** and help reduce the carbon footprint by increasing solar PV adoption.

Case Study - Malaysia

LSS Photovoltaic Plant by TNB

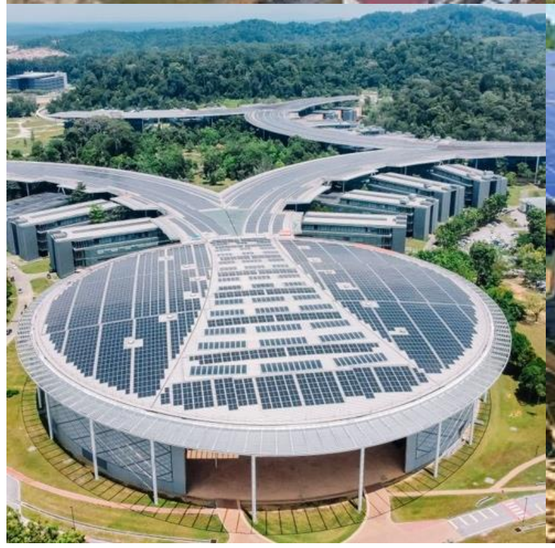
Size	50 MW
Area covered	243 acres
Year Operation	2018

LSS Floating Solar by TC Sunergy

Size	31.23 MW
Area covered	~46 acres
Year Operation	2024

Largest single solar rooftop at UTP

Size	7.5 MW
Area covered	410,837 sqft
Year Operation	2022



Agrivoltaic by MajuPerak

Size	1.5 MW
Area covered	3 acres
Year Operation	2017

Emerging Technologies in Malaysia

1. Floating Solar

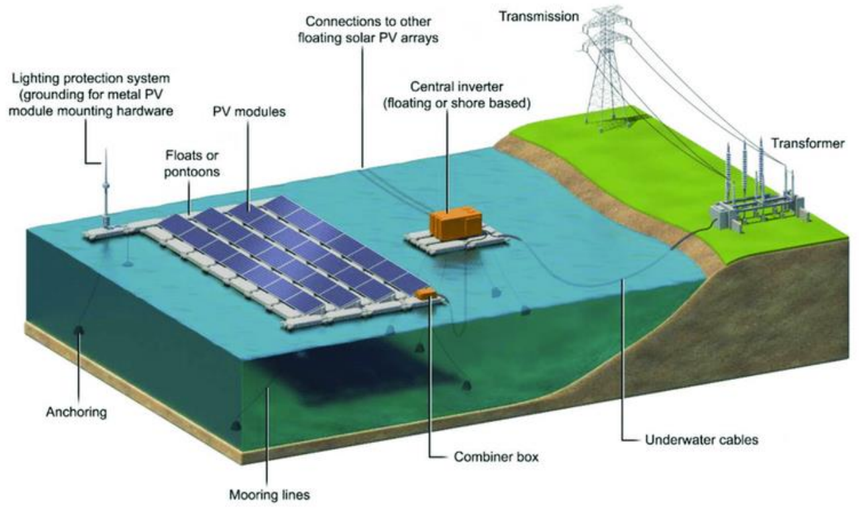
- **Overview**: Solar panels deployed on **water bodies** (lakes, reservoirs).
- **Benefits**:
  - **Land use efficiency**: Maximizes energy generation without using land.
  - **Cooling effect**: Water naturally cools solar panels, improving efficiency.
  - **Potential**: Malaysia's abundant water bodies (e.g., **hydropower reservoirs**) offer opportunities for large-scale implementation.

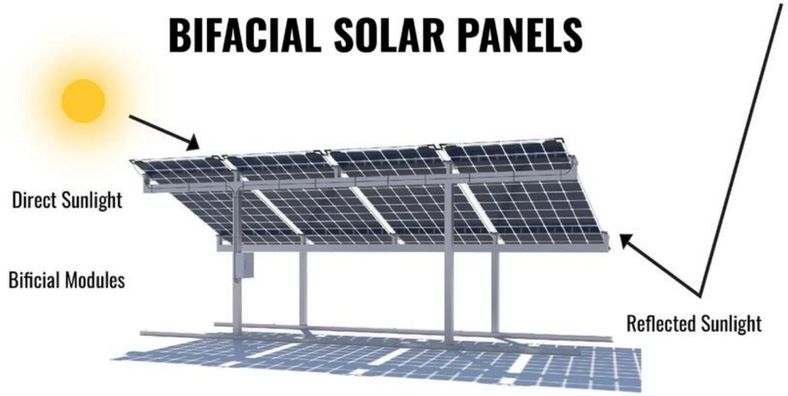
2. Bifacial PV Technology

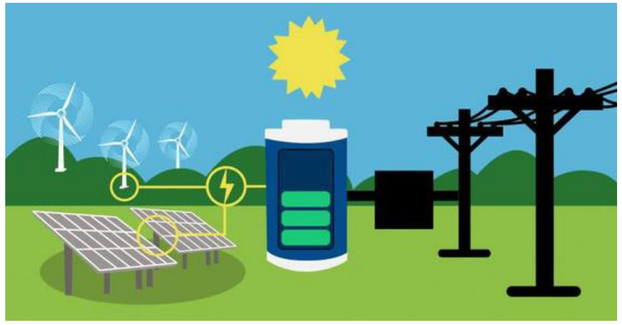
- **Overview**: Solar panels that can **capture sunlight** on both sides (front and rear).
- **Advantages**:
  - Increases **overall energy yield** by **up to 30%** compared to traditional panels.
  - **Durable** and performs better in **low-light conditions**.
- **Use Case**: Suited for **open areas** with reflective surfaces, such as **rooftops** or **parking lots** in Malaysia's tropical climate.

3. Energy Storage Systems (ESS)

- **Role**: Store excess electricity generated from solar systems.
- **Types**: Batteries (e.g., **lithium-ion**), pumped hydro, thermal storage.
- **Benefits**:
  - Supports **grid stability** by managing intermittent renewable energy.
  - Enhances **energy security** and **reduces peak demand** costs.
  - **Future Outlook**: Integration with solar PV systems to create **self-sustaining microgrids** for residential and commercial sectors.







Role of Solar Energy Research Institute (SERI), UKM in Driving Innovation and Collaboration

Global and National Collaborations Related to Energy and Sustainability

PETRONAS
Project Grant: 2.0 Million

Flexible, Sustainable, and Efficient Energy Harvesting PV Panels

MIMOS Berhad
Project Grant: 8.0 Million

High Efficiency Solar Panels Using Advanced Materials

Economic Research Institute for ASEAN and East Asia (ERIA)
Capacity Building Programmes for ASEAN Community (Laos and Cambodia)

International Atomic Energy Agency (IAEA)
Potential and Optimization of Distributed Small Modular Nuclear Reactor-PV Hybrid Energy Systems in Malaysia

Asia-Pacific Economic Cooperation (APEC)
Economic and Life Cycle Analysis of Solar Photovoltaic System in APEC Region towards Low-Carbon Society

Hospital Canselor Tuanku Muhriz UKM (HCTM)
Energy Efficiency Action Plan for UKM Medical Centre (UKMMC)

Institute Darul Ridzuan (IDR), State of Perak
Circular Economy Potential for Energy, Transportation and Agriculture Sectors in Perak

Verdant Solar Sdn Bhd
Green Home Low Investment for UKM's Employees

British Council
Gender Inequality in Cooling Access in Malaysia

H2 Energy
Feasibility Study of Solar-Hydrogen

National, Regional and International Engagement

Challenges and Opportunities in Energy Transition

Key Barriers in Energy Transition

Policy and Regulatory Challenges

- Inconsistent policies hinder renewable energy growth.
- Permitting delays slow project implementation.
- Regulatory framework needs improvement for private sector and grid modernization.

Financing and Investment

- High upfront costs for solar, storage, and hydrogen projects.
- Limited access to affordable green financing.
- Renewable energy is seen as high-risk by financial institutions.

Technology Integration

- Grid stability issues with intermittent solar and wind.
- Limited energy storage for balancing supply and demand.
- Outdated infrastructure needs modernization for smart grids.

Workforce Skills Gap

- Shortage of specialized skills in advanced renewable technologies.
- Need for training programs to upskill the workforce.

Regional Collaboration Opportunities in Energy Transition

Synergies with Japan

- Technology transfer in hydrogen and smart grids.
- Joint R&D on carbon capture, solar efficiency, and storage.
- Japanese investment in Malaysia’s renewable projects.

ASEAN Collaboration

- Participation in ASEAN Power Grid for cross-border renewable trade.
- Shared policy development for green energy and climate resilience.
- Capacity building and skill exchange within ASEAN.

Global Partnerships

- Bilateral agreements on solar, green hydrogen, and offshore wind.
- Access to global climate funds and green bonds.
- Knowledge sharing through global forums on sustainability.

Potential for Green Investment and Jobs in Malaysia's Renewable Energy Sector

Green Investment Opportunities

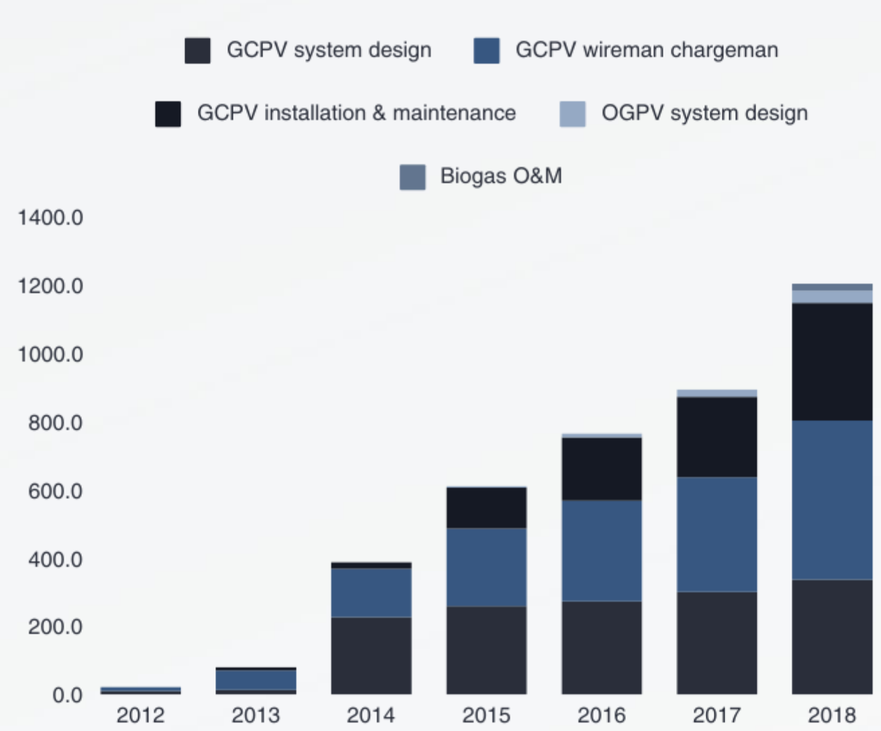
- Solar, wind, biomass, and hydro projects attract FDI and domestic funding.
- Investment growth driven by the National Energy Policy 2022–2040.
- Access to green bonds and climate funds for energy storage, smart grids, and green hydrogen.
- LSS and NEM initiatives boost private sector investments.

Job Creation in Renewable Energy

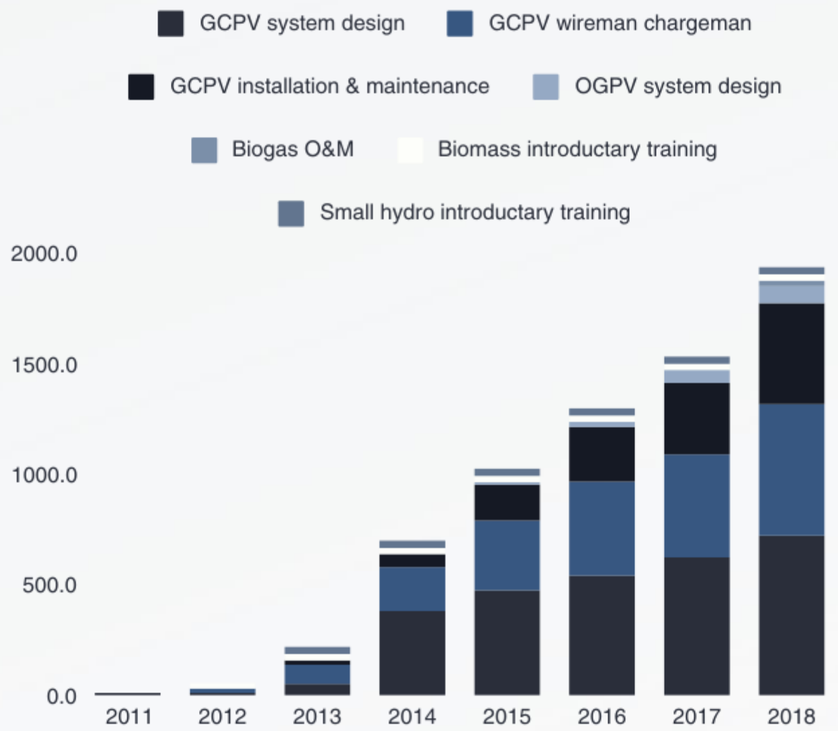
- Solar industry growth creates jobs in installation, maintenance, and engineering.
- Jobs in energy storage, grid modernization, and efficiency projects.
- Green hydrogen sector offers roles in R&D and production.
- Sustainable infrastructure development drives employment in construction and tech sectors.
- Training programs address skills gaps in renewable technologies.

SOCIAL BENEFIT

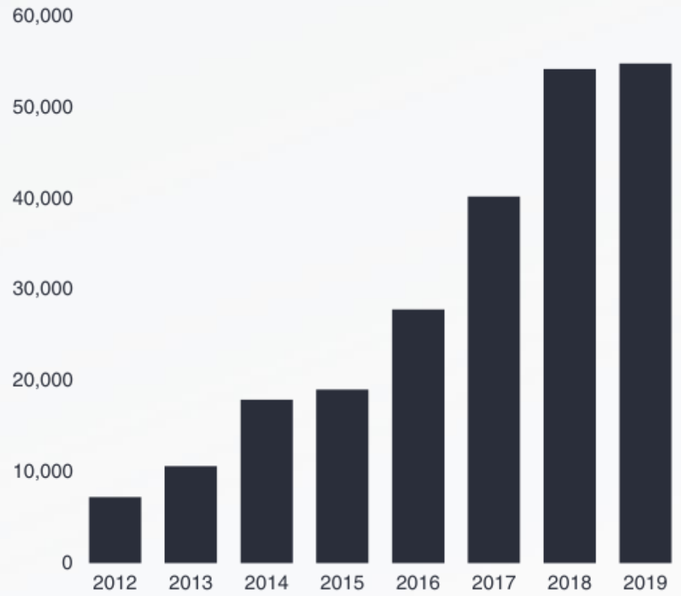
- Renewable energy development has tremendous potential in diversifying a country's human resources, boosting its industrial growth and supporting societies in achieving their broad developmental goals.
- Therefore, job creation is critical in any measure of socioeconomic success. Furthermore, well-paying employment enable people to make purchases, resulting in a constant demand for goods and services, which aids in the development of national economies.



Cumulative renewable energy qualified persons in Malaysia



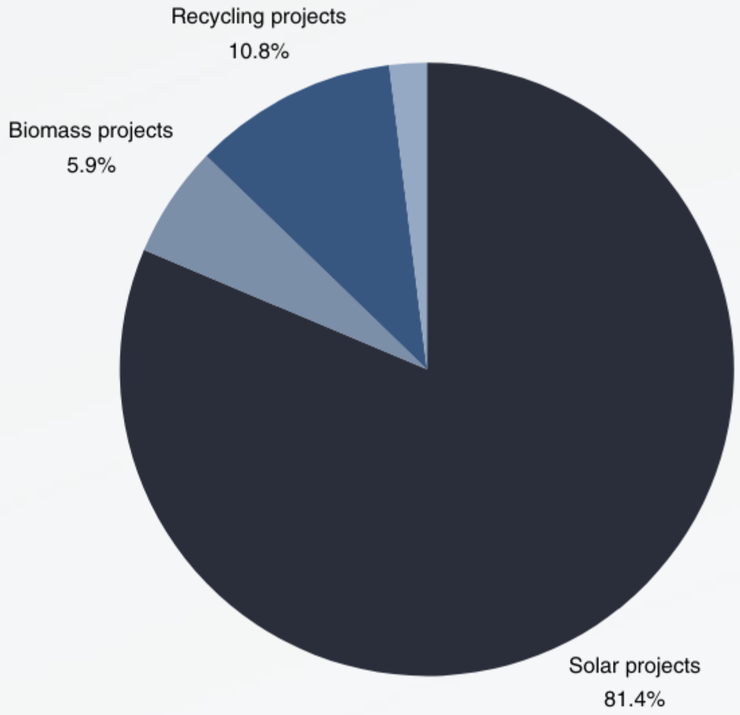
Cumulative renewable energy trained persons in Malaysia



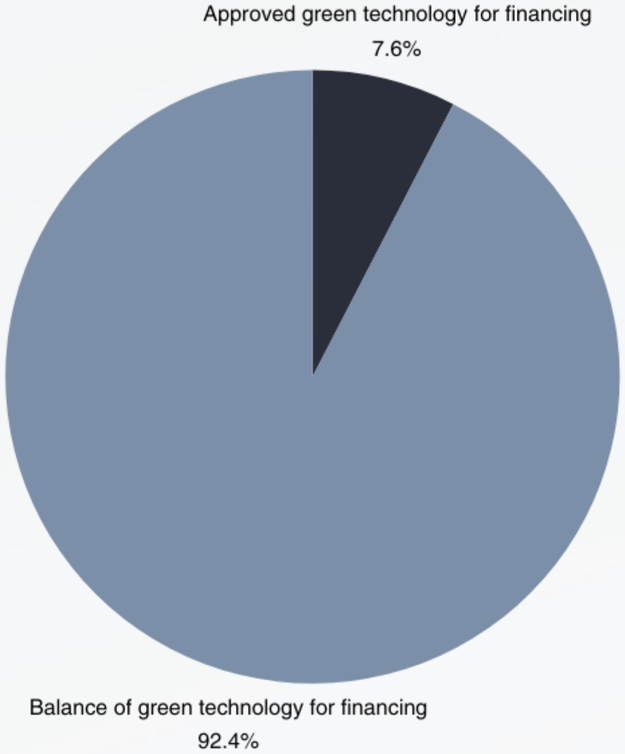
The trend of solar PV employment in Malaysia

ECONOMIC BENEFIT

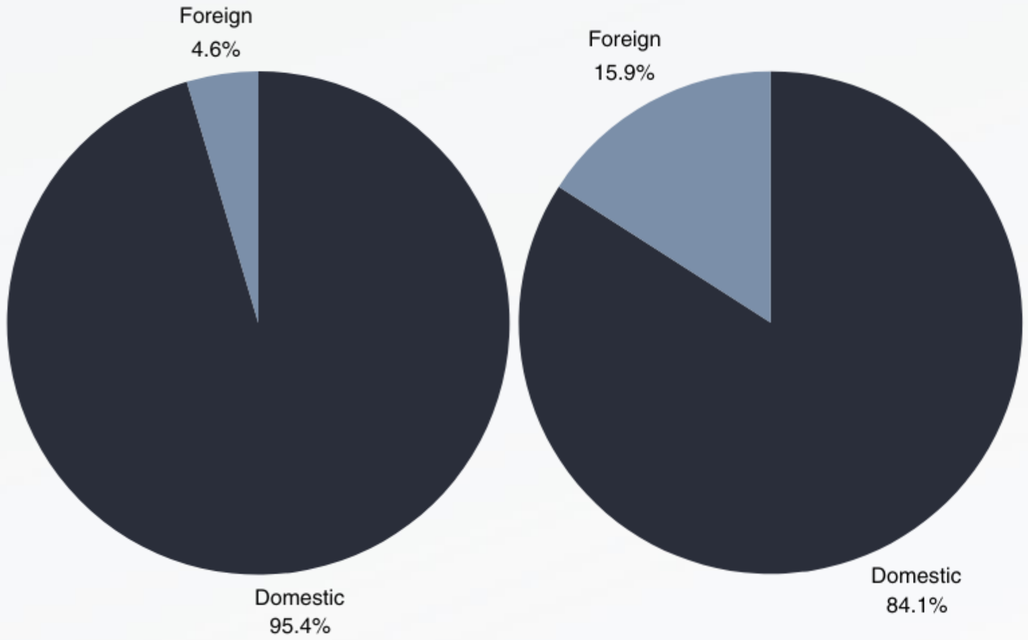
- Accelerating renewable energy development will boost economic growth, increase the renewables industry's cost competitiveness, and give new chances for governments to alter their energy systems.
- Increased investments in renewable energy installations, which have rippling effects across the economy, account for most of these positive GDP effects.



Total tax incentive approved for green projects for 2016-2017



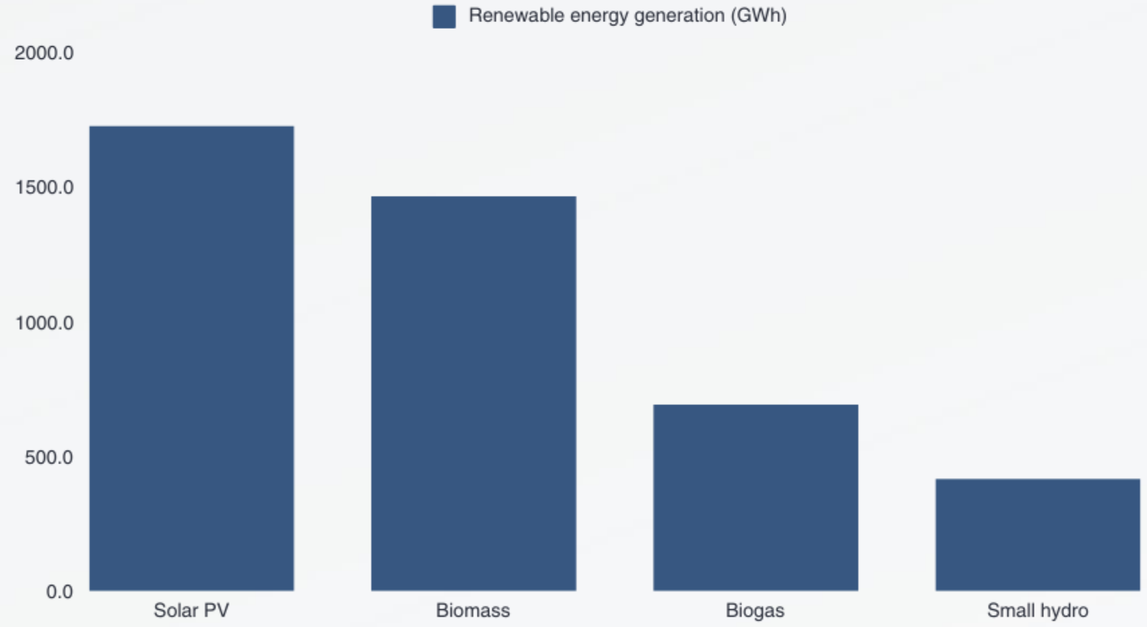
Approved Green Technology for financing



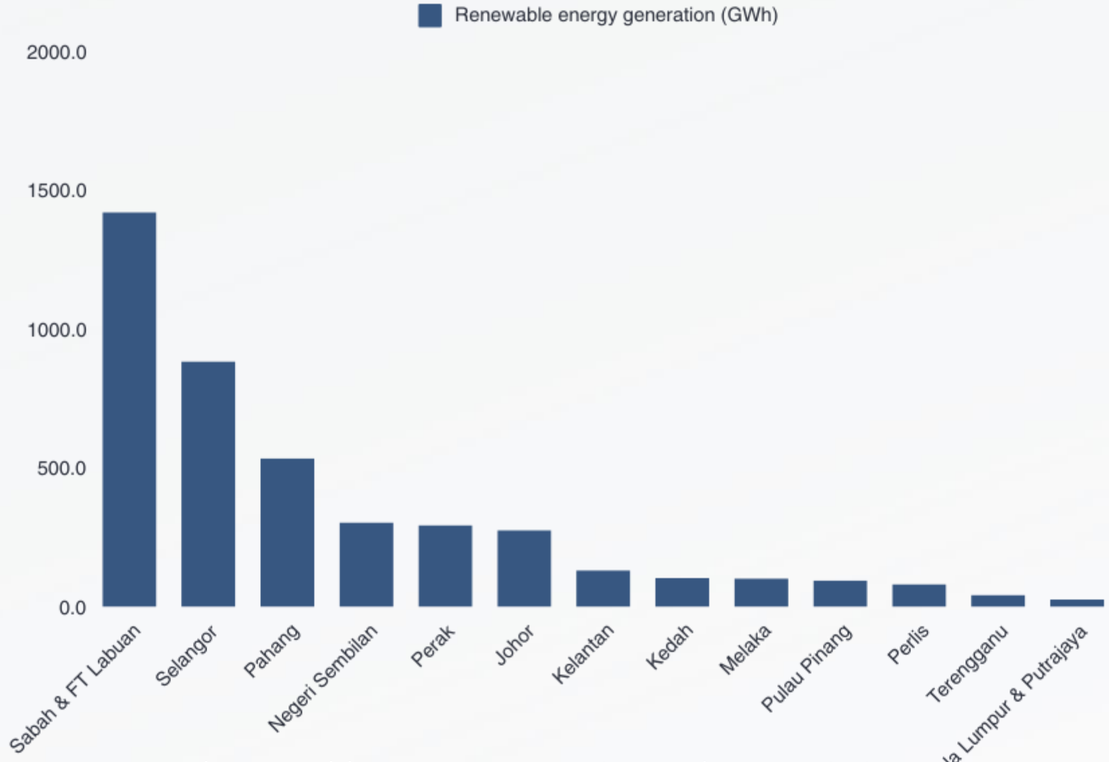
GITA and GITE investors in 2018

ENVIRONMENTAL BENEFIT

- Renewable energy development is a promising way to reduce GHG emissions whilst meeting the growing demand for energy services.
- Renewable energy has the potential to substantially lessen negative environmental and public health consequences if properly deployed.



Total renewable energy generation and CO_2 reduction from renewable energy generation from 2012-2018

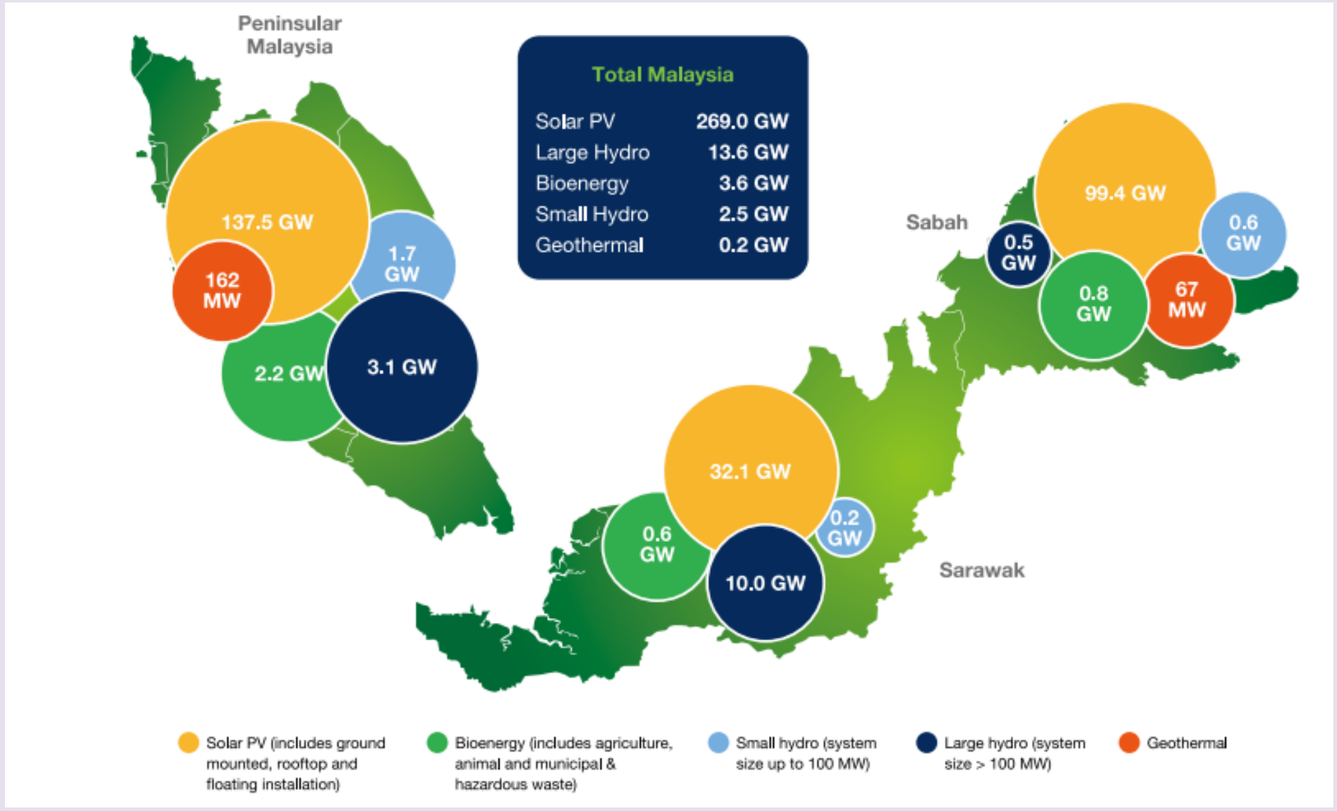


Total renewable energy generation and CO_2 emission reduction according to states from 2012-2018

Way Forward

The Way Forward for Energy Transition in Malaysia

RENEWABLE ENERGY IN MALAYSIA (2024)



Accelerating the Energy Transition

- Invest in renewable technologies, energy storage, and grid modernization.
- Foster innovation hubs and strengthen R&D in solar, hydrogen, and energy efficiency.
- Promote public-private partnerships for large-scale renewable projects and tech advancement.

Role of Industry and International Collaboration

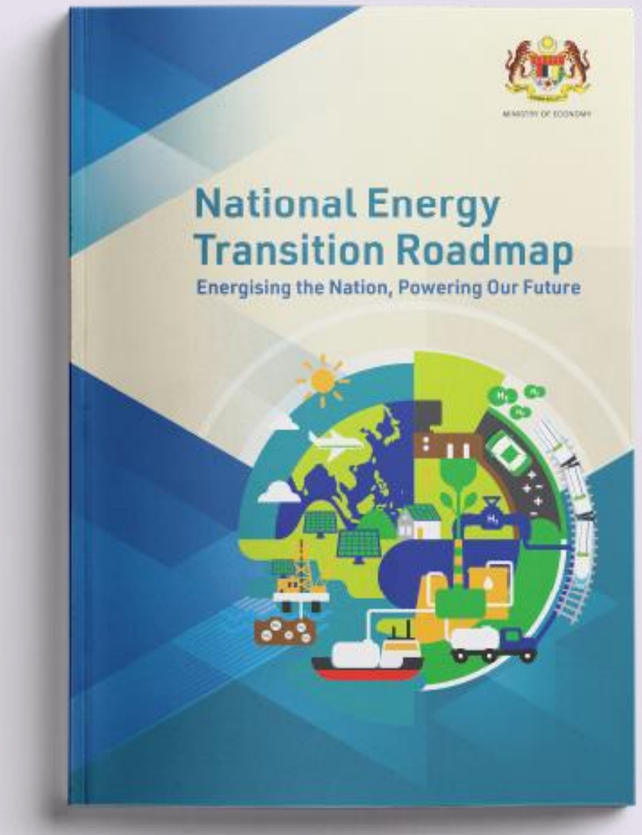
- Private sector key to scaling solar, energy storage, and hydrogen projects.
- International collaboration, like the UK-Malaysia Circular Solar Economy Project, drives tech transfer and policy development.

Call to Action

- Stronger global ties for knowledge exchange and technological progress.
- Align with global climate goals for a low-carbon future.
- Continuous international partnerships ensure a sustainable energy future.

Prioritizing innovation and collaboration will position Malaysia as a leader in the regional energy transition.

Supportive Government Policies to Drive the Market



- The government offers feed-in tariffs and power purchase agreements to encourage long-term investment in renewable energy.
- Malaysia aims to source 70% of its energy from renewables by 2050, requiring RM637 billion in investments.
- The 10 flagship projects under NETR are expected to attract nearly RM25 billion, with broader opportunities worth up to RM1 trillion in smart grids, energy efficiency, and storage.
- Private financing is encouraged, with support from government schemes like the Green Technology Financing Scheme and tax incentives.
- Renewable energy capacity grew over 20% from 2018 to 2022, aided by a streamlined regulatory framework reducing barriers for developers.

Conclusion

- **Malaysia’s Progress**: Significant strides in renewable energy deployment through programs like **LSS** and **NEM**, along with policy frameworks such as the **National Energy Policy 2022–2040**
- **Opportunities**: Growth in **solar energy**, **hydrogen economy**, and **energy storage** presents promising investment and job creation opportunities.
- **Challenges and the Need for Innovation**: Overcoming **fossil fuel dependency**, ensuring **grid stability**, and meeting **climate commitments** require continuous **innovation**, **R&D**, and **policy reforms**.
- **Regional and Global Partnerships**: Collaborative efforts with **Japan**, **ASEAN**, and global partners will be essential in achieving energy transition goals.

Malaysia is at a pivotal point in its energy transition journey, with strong potential for innovation and growth. By leveraging **regional partnerships** and global collaborations, we can create a **sustainable energy future** for Malaysia and the world.

THANK YOU

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