Towards a World-Class Energy Sector

Suruhanjaya Tenaga
Energy Commission

ENERGY MALAYSIA

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COVER STORY

ASEAN'S ROAD TO NET ZERO 2050

ASEAN MALAYSIA 2025
INCLUSIVITY AND SUSTAINABILITY

SPECIAL FOCUS

A Bold New Energy Vision

EXPLAINER

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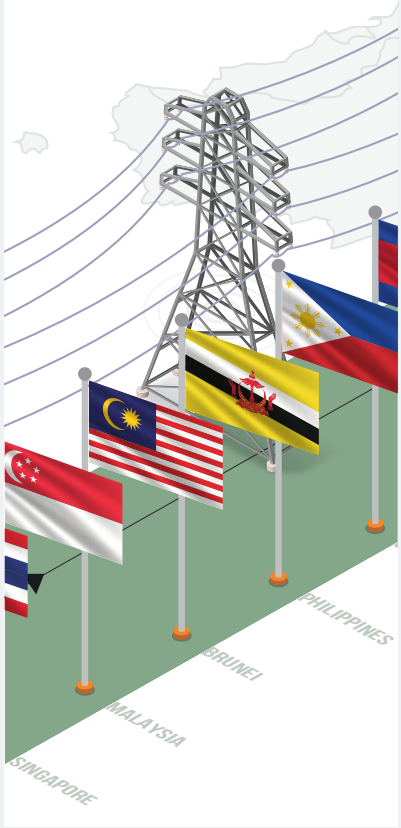

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INNOVATION

LOW CARBON CITIES: MALAYSIA'S PROGRESS REPORT

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NET ZERO 2050: POWERING AHEAD AS A NATION, AS A REGION

SITI SAFINAH SALLEH
Chief Executive Officer, Energy Commission Malaysia

More than ever, the energy industry is in the midst of rapid change as it presses ahead to meet Malaysia's international climate change commitments and national goal to be a Net Zero 2050 nation. Much has been done but much more needs to be done, when viewed within the context of the National Energy Transition Roadmap (NETR), Malaysia's Net Zero 2050 blueprint.

As a regulator, the Commission has both a strategic and operational role to ensure a just transition based on clearly defined legal parameters for various players involved in renewable energy and energy efficiency. Whether our role extends further will depend on the ongoing amendments being made to the Energy Supply Act, which defines our roles and functions in regulating the electricity and piped gas supply industry.

This issue's theme on Transitioning to Net Zero Carbon by 2050 trains a wide-angle lens onto ASEAN for two reasons. One, because Malaysia is the 2025 ASEAN Chair with the all-encompassing theme "Inclusivity and Sustainability". And two, we can make substantive progress in our national and regional agenda by understanding each other's Net Zero 2050 pathways, where out of the 11 member states, eight have set a net zero deadline.

A regional overview can help us to tackle challenges and innovate solutions as a collective force. That is the intent of our cover story "The ASEAN Road to Net Zero 2050." This story is based on authoritative sources, but the speed of events unfolding in the energy sector can be hard to keep up. Given this, we have taken every effort to be abreast with the latest developments.

We had the good fortune to secure an email interview with Malaysia's Deputy Prime Minister and Minister of Energy Transition and Water Transformation, Datuk Amar Haji Fadillah Hj Yusof. He offers his insights in the story "A Bold New Energy Vision", where he cites the NETR as the winning edge for Malaysia. The Minister is also forthright on the gaps to be addressed, and hints that Malaysia may go nuclear in the interest of energy security and sustainability.

In the side bar, my predecessor, Dato' Ir. Ts. Abdul Razib Dawood, shares "What the NETR Means to the Energy Commission". Equally forthright, he addresses pressing issues in his farewell interview with the magazine as the Commission's Chief Executive Officer. We wish him the very best in his future endeavours and thank him for his vision, leadership and wisdom that helped lift the image of the Energy Commission in Malaysia and the region.

Personally, my story inside is the Commission's new electricity tariff structure under the Regulatory Period 4 (2025-2027). It was a much-awaited announcement, and the feedback has been positive from consumer and industry groups.

Before I close, I wish to welcome our new Chairman, YBhg. Tan Sri Shamsul Azri Abu Bakar, the Chief Secretary to the Government, who joined us on 1 January 2025. He comes with extensive civil service experience that will be invaluable to help us navigate the years ahead. He replaces our Acting Chairman, Datuk Mohamad Razif Abd Mubin, whom we thank for his valuable contributions and dedicated service.

Happy reading!

"In ASEAN, we can make substantive progress in our national and regional agenda by understanding each other's Net Zero 2050 pathways, and a regional overview can help us to tackle challenges and innovate solutions as a collective force."

NEW ELECTRICITY TARIFFS: MORE TRANSPARENT, PROGRESSIVE AND FAIR

On 20 June 2025, the Energy Commission's Chief Executive Officer Siti Safinah Salleh announced the new electricity tariff schedule approved by the Government. Based on the Incentive-Based Regulation (IBR) and applicable to the Regulatory Period 4 (2025-2027) (RP4), it took effect on 1 July 2025.

"The Commission weighed up various considerations and the end result is an electricity tariff schedule that is more transparent, progressive and fair to all parties. More than 23.6 million domestic consumers in Peninsular Malaysia are expected to enjoy the new electricity rates," she said.

"Previously, tariffs were classified by sector and segmented as domestic, commercial, industrial, agriculture and mining. The new tariff structure, on the other hand, is based on voltage levels, made up of domestic and non-domestic consumers comprising low, medium or high voltage end-users. The new schedule is grounded on the "User Pays" principle. The more electricity you use, the more you pay. In the interest of transparency, electricity bills are itemised so that consumers know what they are paying for each month.

"There will be an overall average of 19% reduction in tariff rates. We have made provisions for targeted incentives to reduce electricity bills, by encouraging energy efficiency among consumers while easing the transition," she added.

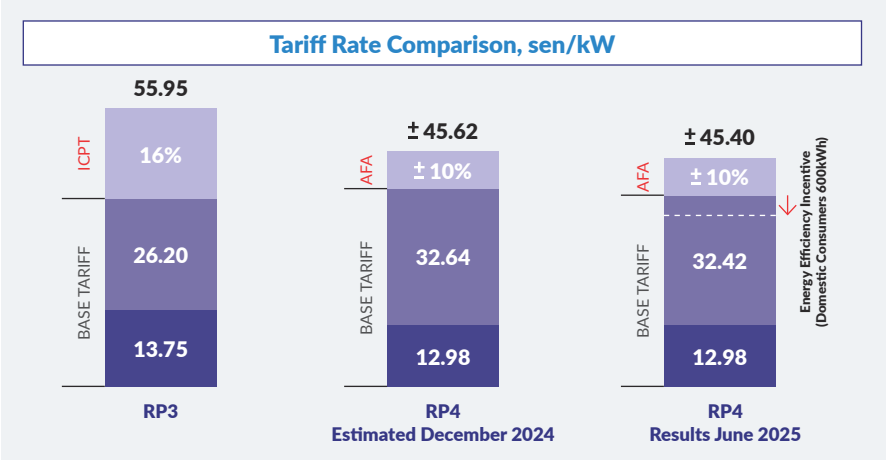
"The biggest milestone is the introduction of the opt-in Time of Use (ToU) scheme with its longer off-peak hours. Previously restricted to medium and high voltage consumers, it is now extended to domestic and low voltage non-domestic users. The off-peak hours are also much longer. Another milestone is the Automatic Fuel Adjustment (AFA) mechanism, with fuel costs adjusted monthly, instead of 6-monthly as in the past. We are encouraged by the response from across the board to the reforms introduced," she said.

New Tariff Schedule: The Three Components

The Commission's Director of Economic Regulation, Marlinda Mohd Rosli, said that the new tariff schedule consists of three components, and explained how each works.

Component #1: Average Base Tariff

This was adjusted based on the projected cost of electricity supply for RP4, and set at 45.40 sen/kWh, lower than the 45.62 sen approved by the Government in December 2024. With this adjustment, the overall average electricity tariff decreases by 19%.



Overall Average Cost Reduction of up to 19% under RP4's New Tariff Schedule

Component #2: Revised Tariff Structure with Consumption-based Categories, Itemised Bills and Incentives

Consumers are categorised by voltage level connections. The categories now are domestic and non-domestic, made up of low, medium or high voltage end-users. Generally, the majority of domestic consumers fall into the low voltage group.

Encouraging Feedback

Federation of Malaysian Manufacturers (FMM): An FMM statement said it greatly welcomes the increase in off-peak hours by 80%, from 70 hours to 128 hours per week, including the off-peak rates for weekends. It noted that the new Automated Fuel Adjustment (AFA) mechanism, which replaces the Imbalance Cost Past-Through (ICPT) mechanism, will provide a more robust and effective way to reflect energy prices in line with market conditions.

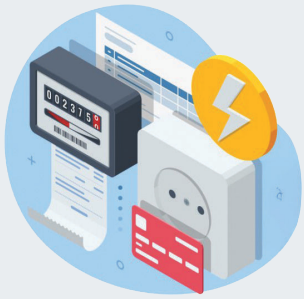
The Edge/Bernama, 24 June 2025

Federation of Malaysian Consumer Associations (FOMCA): FOMCA Chief Executive Officer Dr T. Saravanan said the new tariff, which will take effect from 1 July 2025 to 31 December 2027, under the Incentive-Based Regulation (IBR) framework, reflects a fairer and more transparent energy pricing system. "This initiative comes at a crucial time when many households are facing financial pressures due to inflation and the rising cost of living," he told Bernama.

The Edge, 20 June 2025

CIMB Investment Bank: "Malaysia's upcoming electricity tariff restructuring is expected to have a minimal impact on overall inflation, and its direct effect on headline consumer price index (CPI) is anticipated to be marginally disinflationary... With most households shielded and the current fuel costs relatively contained, we expect the inflationary impact to remain limited."

The Star, 24 June 2025



Every consumer will receive an itemised electricity bill that reflects their charges for energy capacity, network and retail. The last two items in the bill are essentially for the recovery of TNB's capital expenditure for the modernisation and maintenance of the transmission grid and distribution network.

The new tariff structure introduces several targeted incentives such as:

- **Energy Efficiency Incentive (EEI):** The itemised bill includes the EEI to encourage domestic consumers to reduce consumption. Domestic users consuming 1,000 kWh or less and low-voltage non-domestic users consuming 200 kWh or less qualify for the EEI.
- **Time of Use (ToU):** Most empowering is the opt-in Time-of Use (ToU) scheme, which enables medium and high voltage consumers to have greater flexibility on how to manage their electricity costs while promoting energy efficiency. Under this scheme, off peak hours last from 10pm-2pm on weekdays, which adds up to 16 off-peak hours per day. Weekends are an off-peak scenario – 48 hours in total. In addition, a total of 15 selected public holidays are classified as off-peak hours.

  The ToU scheme is available to domestic and non-domestic users with a smart meter, current transformer or remote meter reading installation.

  For households consuming up to 1,500 kWh/month, the peak rate is 28.52 sen/kWh and off-peak is 24.43 sen/kWh. For homes exceeding 1,500 kWh/month, the peak hour rate is 38.52 sen/kWh and 34.43 sen/kWh for off-peak hours.

  As an opt-in scheme, participants are required to pay RM10.00 as a retail charge, although this is waived if the usage stays below 600 kWh.

  Currently, the flat rate for both low and high usage homes is set at 27.03 sen/kWh and 37.03 sen/kWh respectively. It is worth noting that the ToU scheme's inflection point for domestic and low voltage consumers is 65%; meaning it is beneficial only when they use 65% of electricity during peak hours.
- **Special Tariffs:** There are special tariffs applicable for agriculture, water and sewage services and rail operators.
- **Rebates:** There is a 10% electricity rebate for registered higher learning institutions, schools, charity homes and houses of worship.
- **e-Kasih Rebates:** Low-income households and those registered with the e-Kasih system under the Prime Minister's Department will continue to benefit from the monthly subsidy of up to RM40.00 previously introduced. This assistance is in place until 31 December 2025. Any extension will be announced by the Government.

Component #3: New Fuel Cost Adjustment Mechanism

About half of power generation in Malaysia depends on imported fuel, namely coal and gas, which are subject to price and foreign exchange fluctuations. Previously, under the Imbalance Cost Pass Through (ICPT) mechanism, these costs were evaluated under the IBR framework every six months. The difference between projected and actual costs was averaged out and passed onto consumers as a rebate or surcharge.

The ICPT has been replaced by the more dynamic AFA mechanism, where these costs are evaluated every month. As such, the related rebates and surcharges will be passed onto consumers in their monthly electricity bill. This is a fairer trading practice that benefits both consumers and power producers.

Call to Action

TNB is the implementor of the new tariff schedule, which is published in its website: **https//www.mytnb.com.my/tariff.** An estimate of future monthly electricity bills can be determined by using the electricity tariff calculator, which can be accessed on this website. For further enquiries, consumers can contact TNB Careline at 1-300-88-5454; email tnbcareline@tnb.com.my or reach out to any other TNB set-up.

NEWS FROM MALAYSIA AND AROUND ASEAN

MALAYSIA

ENEGEM, Edging Closer to RE Exports

The Ministry of Energy Transition and Water Transformation (PETRA) has introduced the Energy Exchange Malaysia (ENEGEM), along with guidelines on cross-border electricity sales for the export of green electricity from Malaysia to Singapore and Thailand.

ENEGEM is the designated platform to facilitate the sale of renewable energy (RE) between Malaysia and neighbouring countries under the Cross-Border Electricity Sales (CBES) for RE scheme. It acts as the marketplace to sell green electricity through a bidding mechanism, operated by the Single Buyer.

A week earlier, PETRA announced that the maiden export of RE would kick-start with a pilot auction of 100 MW to Singapore, which is less than 2% of the nearly 7,000 MW installed RE capacity in Peninsular Malaysia, before it was expanded to 300 MW. The pilot project to export at least 100 MW of RE to Singapore is one way to test demand while ensuring ample supply to the local market.

"The Guide on Cross-Border Electricity Sales", published by the Energy Commission, confirms that the Single Buyer, the entity responsible for electricity procurement and planning in the country, will oversee ENEGEM. It also confirms that local solar plant owners will sell the RE to be exported at rates agreed upon in power purchase agreements (PPAs) with the Single Buyer. The Single Buyer will then auction the electricity to interested buyers from Singapore or Thailand. The PPAs include Renewable Energy Certificates (RECs), with the Single Buyer acting as the verifier and issuer of RECs associated with the RE export.

The Renewable Energy Supply Agreement between the Single Buyer and RE purchasers in Singapore is estimated to be a one-year contract.

The system encourages competition among purchasers while maintaining a baseline price determined by regulatory authorities, facilitating the efficient and transparent exchange of RE between Malaysia and Singapore.

Net proceeds generated from the exports will fund expansion of RE in the country, which will include system upgrades, infrastructure modernisation, technology integration and pilot trials for emerging technologies.

An Energy Exchange Committee will be set up to oversee the implementation of the RE exports scheme. The Committee will consist of representatives from the Ministry, Energy Commission, Single Buyer, Grid System Operator and other parties as may be required.

Source: The Edge Malaysia, 2 May 2024

SEA's Fastest-Growing Data Centre Hub and Impact on Renewable Energy

Malaysia's rise as Southeast Asia's fastest-growing data centre hub is poised to not only accelerate the digital economy but also play a crucial role in the country's transition to renewable energy (RE).

According to Dr Jasrul Jamani Jamian, an Associate Professor at Universiti Teknologi Malaysia's Faculty of Electrical Engineering, the increasing presence of data centre operators in Malaysia is helping the Government optimise the country's existing electricity generation

capacity. He added that this trend is expected to significantly contribute to the Government's goal of achieving 70% RE generation capacity, or 56 GW by 2050.

From 2021 to 2023, Malaysia approved RM114.7 billion in investments for data centres and cloud services. Moody's Ratings recently projected that the power demand for data centres in Malaysia will double to about 500 MW within the next two years. "It's high time for power generation using natural resources such as coal and gas, especially those that have been operational for 25 to 30 years, to be replaced with RE, which is more efficient and environmentally friendly," said Dr Jasrul.

An Energy Exchange Committee consisting of representatives from the Ministry, Energy Commission, Single Buyer, Grid System Operator and other parties as may be required will be set up to oversee the implementation of the RE exports scheme."

He pointed out that developing a large-scale battery energy storage system (BESS) with cutting-edge technology is essential to support the increasing RE capacity. BESS will ensure an uninterrupted energy supply for data centre operations and help operators reduce electricity costs by storing energy during off-peak hours and using it during peak periods.

Dr Jasrul also assured that the Tenaga Nasional Berhad's (TNB) system is highly stable and capable of meeting the needs of all consumers, including data centres, with a projected power reserve margin of 28% to 36% in Peninsular Malaysia from 2024 to 2030.

Source: New Straits Times, 1 September 2024

Grid Third Party Access for Green Energy Exports Under Consideration

Following the opening of the national grid for direct trading of electricity between renewable energy (RE) firms and corporate consumers under the Corporate Renewable Energy Supply Scheme (CRESS), the Government is looking into suggestions to open it up for green energy exports as well, said Deputy Prime Minister Datuk Amar Haji Fadillah Hj Yusof, who is also the Minister of Energy Transition and Water Transformation (PETRA).

"As such, PETRA and the Energy Commission will provide continuous improvements, including recommendations for the opening up of the grid for the sale or export of RE," he said. "Priority will be towards fulfilling electricity demand, including green energy in the country, and should Malaysia have excess green energy, it will be exported."

Malaysia is aiming to have 31% of its electricity generation capacity in the form of RE by 2025, from around 25% or over 10.4 GW at the end of last year. By 2035, it should reach 40% of Malaysia's total generation capacity, according to available Government policy documents.

The Government opened up the national grid in September as a step towards liberalising the electricity market. The programme, dubbed CRESS, is partly to support rising demand for green energy particularly from data centres booming in the country, which are expected to have 7 GW of electricity demand by 2030.

Source: The Edge Malaysia, 6 November 2024

CRESS Opened to Existing Power Consumers, Wheeling Charges Maintained Until 2027

The Government has announced enhancements to the Corporate Renewable Energy Supply Scheme (CRESS), opening third-party electricity grid access to existing power consumers and maintaining System Access Charges (SAC) at current rates for three years.

CRESS, which was launched in September as part of Malaysia's broader energy transition efforts, offers corporations access to renewable energy (RE) via third-party providers. It was previously open only to new consumers, or existing consumers but for new capacity only.

These changes, effective 1 March 2025, will ensure SAC variation rates remain capped at 15% per regulatory period, said the Ministry of Energy Transition and Water Transformation (PETRA) in a statement.

SAC charges, or wheeling charges, have been set at 45 sen/kWh to "wheel" electricity from a solar farm to its corporate consumer, or 25 sen/kWh when the arrangement is equipped with battery storage. Under the Incentive Based Regulation (IBR) imposed on the power industry, the current fourth Regulatory Period is effective from 2025 to 2027 (RP4).

The variation cap is set to foster cost predictability for RE investors, said PETRA, which expects these adjustments to encourage wider corporate adoption of RE solutions. It also anticipates the improved structure will attract significant interest from corporates looking for stable and accessible green energy solutions.

Source: The Edge Malaysia, 16 January 2025

ASEAN to Tackle Energy Transition through Regional Cooperation

The energy transition is a global challenge, and ASEAN has the capability and resources to address it collectively, said Minister of Finance II, Datuk Seri Amir Hamzah Azizan.

He emphasised that regional cooperation was essential in ensuring energy accessibility, security and affordability, noting that ASEAN's strength lies in its ability to collaborate, share expertise, and develop regional financing solutions to support sustainable development initiatives. "Malaysia is committed to strengthening ASEAN-wide partnerships and will leverage on its ASEAN chairmanship in 2025 to foster greater cooperation in sustainable economic investments," he said.

"As part of this commitment, the Ministry of Finance is actively engaged in discussions to enhance regional financial frameworks that support clean energy and socio-economic inclusivity," he added.

Source: Bernama, 12 February 2025

ASEAN

Singapore's Enhanced Energy Management System

The Energy Market Authority (EMA) is touting an enhanced system that can predict solar power across Singapore up to an hour in advance, with one of the best accuracy rates in the tropics. EMA's new solar forecasting model has an error rate of less than 10%, allowing the agency to better anticipate solar power generation that can vary in different weather conditions. This enables EMA to manage electricity supply and demand more efficiently, the Authority said in a statement.

The model is part of an enhanced energy management system, or EMS II, for the country's electricity network. The new system uses sensors, satellite imagery and machine learning to allow EMA to go beyond real-time estimates to forecast solar output an hour ahead at greater accuracy than ever before. EMS II also incorporates advanced cybersecurity features that protect the system against malicious cyber threats.

Source: Channel News Asia, 12 June 2024

Philippines Emerges as Southeast Asia's Renewable Power Pacesetter

The Philippines has leapfrogged its Southeast Asian neighbours to become a regional leader in planned clean power projects as fewer investment restrictions

and green-minded policies attract domestic and foreign cash.

Changes including allowing full foreign ownership of renewable energy (RE) projects have already helped secure a pipeline of 99 GW of wind and solar developments. That's more than enough power to supply all Philippines' households and is ahead of Vietnam at 86 GW and about five times higher than in Indonesia.

Only 3% of the Philippines' ambitious renewables pipeline is currently under construction. But it's a step toward meeting the country's goal of boosting the share of renewables in its electricity mix to more than a third by the end of the decade, from about a fifth now.

The Philippines has in recent years released an offshore wind development strategy, offered tariff and tax incentives, and opened the renewables sector to full foreign ownership. All this helped spur a 41% jump in clean energy investment to US$1.3 billion in 2022 from the year before, according to BloombergNEF.

Unlike many of its neighbours, where state-owned entities dominate power markets, the Philippines allows private firms to take part in the generation and sale of electricity. "There is no single state entity which is a dominant player, and that has allowed innovation to flourish," said Ramnath Iyer, Research Lead for Sustainable Finance in Asia at the Institute for Energy Economics and Financial Analysis (IEEFA). "Clear rules welcoming foreign investment make companies more comfortable putting money into the country," he said.

To truly accelerate its energy transition, however, the Philippines will have to surmount an array of challenges including the need to extend transmission lines to distribute power across the archipelago of more than 7,000 islands. It will also need to expand its grid capacity, boost storage and streamline the land permitting process. Despite those challenges, the policy certainty in the Philippines has helped the country "leapfrog" over regional peers, said Ramesh Subramaniam, Director General at the Asian Development Bank.

Source: Bloomberg News, 21 June 2024

Vietnam Weighs Resuming Nuclear Power Development Plans

Vietnam is considering resuming plans to develop nuclear power in order to ensure national energy security and support economic growth, according to a Government document reviewed by Reuters. A regional industrial hub heavily reliant on coal for power generation, Vietnam is also seeking to boost its clean energy production to meet its net zero target by 2050.

"The Ministry of Industry and Trade is to conduct research on the nuclear power development experience of other countries and make a proposal to develop nuclear power in Vietnam."

"The Ministry of Industry and Trade is to conduct research on the nuclear power development experience of other countries and make a proposal to develop nuclear power in Vietnam," according to the document.

The nuclear power development proposal is to be submitted to the Politburo, the country's most powerful decision making body for review. In 2009, Vietnam approved plans to develop its first two nuclear power plants, but the plans were shelved in 2016 following the Fukushima nuclear disaster in Japan and due to budget constraints.

Source: Reuters, 13 September 2024

Cambodia to Integrate Wind Power into National Grid by 2026

Wind power is set to be connected to Cambodia's national grid by 2026, adding a new clean energy source to diversify and strengthen the country's energy supply, supporting the Government's goal of making electricity more affordable and sustainable, according to the Ministry of Mines and Energy.

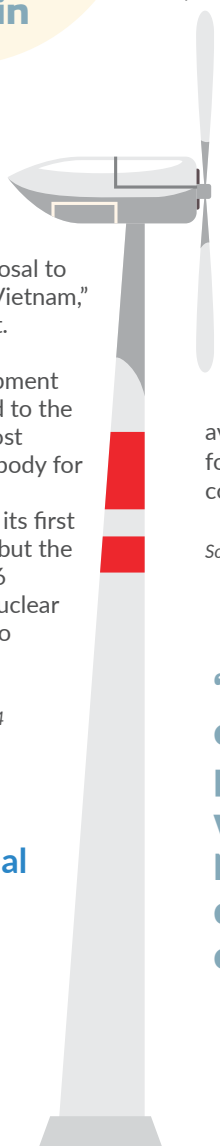
Speaking at a lecture on "Cambodia's Energy Policy" on October 4, Energy Minister Keo Rattanak revealed that the country's energy sector has made rapid progress under the Government's guidance. From having no electricity in 1979, by the end of 2023, the country had electrified 14,151 villages, equating to 99.88% of the country.

He noted that, particularly over the past 15 years, the Government has focused on attracting investors to the sector to increase the supply of clean, affordable and sustainable power.

On efforts to green the sector, Rattanak emphasised Cambodia's commitment to expanding clean energy sources, including investments in solar power and wind energy, particularly in Mondulkiri province. "Cambodia is expanding its wind power capacity with six projects in Mondulkiri, generating a total of 900 MW," he stated. He also noted that the project is slated to begin operations in 2026.

Rattanak highlighted that many foreign investors have cited the country's reliable electric supply and availability of clean energy as key factors for relocating their factories to the country.

Source: Phnom Penh Times, 4 October 2024



"Cambodia is expanding its wind power capacity with six projects in Mondulkiri, generating a total of 900 MW of clean energy."

ASEAN MALAYSIA 2025: ENERGY INDUSTRY MEETINGS

First SOME in Langkawi

The first Special Senior Officials Meeting on Energy (SOME) 2025 and its Associated Meetings were held from 22-24 January, 2025, in Langkawi, Malaysia. Secretary General of the Ministry of Energy Transition and Water Transformation (PETRA), Dato' Mad Zaidi Mohd Karli, as the SOME Chair, led the discussion on the planning of the work plan of ASEAN energy cooperation for the year ahead.

The Meeting endorsed the Priority Economic Deliverables (PED) and Priorities of the energy sector to be implemented in 2025 under Malaysia's Chairmanship. Notably, the Meeting endorsed the text of ASEAN Power Grid (APG) Enhanced MoU including its Terms of Reference (ToR) for APG Related Bodies, as well as the ASEAN Framework Agreement for Petroleum Security, which are planned to be signed this year.

Source: ASEAN Main portal https://share.google/ycsb7emg6o4RTdohd, 24 January 2025

Second SOME Meeting in Kuching

PETRA successfully concluded a series of high-level energy dialogues at the second SOME held in Kuching from 16-18 June 2025.

The meeting brought together senior representatives from ASEAN Member States (AMS) and key dialogue partners, China, Japan and the Republic of Korea. It covered the progress of the ASEAN Plan of Action for Energy Cooperation (APAEC) Phase II (2021–2025) and explored preliminary directions for APAEC (2026–2030). Member States also shared updates on joint initiatives, particularly in renewable energy deployment, energy security and nuclear energy.

A consensus was reached on several strategic agendas to advance the regional energy sector. They included the Enhanced Memorandum of Understanding (MoU) of the Asean Power Grid (APG); and second phase of the Asean Plan of Action for Energy Cooperation for 2026-2030.

The meeting agreed on the progress in the implementation of six priorities for 2025, which include establishing the Subsea Power Cable Development Framework; signing of the Asean Petroleum Security Agreement successor deal; launching of the Asean Energy Efficiency Database; and the introduction of the Investment Platform for Buildings.

The meeting also ratified the finalisation of the Long-Term Renewable Energy Masterplan; development of the Asean Renewable Energy Certificate Framework; and Implementation Framework for Nuclear Power Plants.

All agreements reached at the SOME will contribute to the agenda of the upcoming ASEAN Ministers on Energy Meeting (AMEM), scheduled in October 2025 in Kuala Lumpur.

Sources: Bernama and the Ministry of Energy Transition and Water Transformation, 18 JUNE 2025

Meeting of 16th ASEAN Energy Regulators Network in Kuala Lumpur

The 16th ASEAN Energy Regulators Network Meeting (16TH AERN) was held in Kuala Lumpur from 9 – 11 June 2025. As the Chair of the AERN, the Commission's Chief Executive Officer, Siti Safinah Salleh, provided a status update on behalf of Malaysia which highlighted:

- Progress on AERN's 2024-2025 Work Plan, including the development of the ASEAN School of Regulation (ASR).
- Preliminary direction for AERN's post-2025 Work Plan.

The ASEAN Power Grid took centre-stage, with a host of related topics discussed. The most significant were:

- **Regulatory and Institutional Architecture** - For ASEAN Power Grid implementation.
- **ASEAN Centre of Energy** – On ASEAN Power Grid projects.
- **ASEAN School of Regulation** – A concept derived from the experiences of regulation schools in Europe and Africa.

There were also talks, presentations and roundtable sessions on pressing issues and trends in the Southeast Asian energy landscape today.

Non-ASEAN regulators were invited to share their experiences. Among them was the Australian Energy Regulator (AER) who spoke on cross-border and subsea energy infrastructure. For power trading, there was a session called "Central American Electrical Interconnection System / Regional Commission for Electric Interconnections", which highlighted power trading between countries in Central America.

With Malaysia as the 2025 ASEAN Chair, the country will continue to host a series of other high-level energy meetings the rest of the year.

Source: Energy Commission of Malaysia, 11 June 2025

The Commission's Chief Executive Officer Siti Safinah Salleh addressing ASEAN energy regulators.

ASEAN Energy Regulators Network delegates

THE LOWDOWN ON MALAYSIA'S SMART GRID

Siva Kumar Kali
Senior Vice President and Head of Smart Infrastructure, Siemens Malaysia Sdn. Bhd.

The International Energy Agency (IEA) had estimated that for every US dollar spent on renewables, roughly three US dollars will need to be spent on the grid. With this kind of investment, it is not surprising that power companies are transitioning to the smart grid that uses automation, Artificial Intelligence (AI), big data and analytics to reduce operational costs, increase efficiency and dispatch power without much wastage.

In Malaysia, the smart grid started with the Advanced Metering Infrastructure (AMI) project in 2015, when Tenaga Nasional Berhad (TNB), the owner of the national grid, announced the deployment of smart meters under the AMI programme. Siemens Malaysia Sdn. Bhd. is TNB's technology partner for the AMI roll-out.

Energy Malaysia speaks to Siva Kumar Kali, Senior Vice President and Head of Smart Infrastructure, and concurrent Head of Electrification & Automation at Siemens Malaysia, on how the smart grid is aligned to Malaysia's energy transition goals.

"There are three key steps underscoring a smart grid project," says Siva Kumar Kali, Senior Vice President and Head of Smart Infrastructure at Siemens Malaysia. "One, is to study and understand the capacity of renewables and bi-directional flow of power, and how it will affect the grid. Two, is the regulatory changes required to facilitate connections. And three, equipment that need to be upgraded or newly installed. The latter accounts for the bulk of the cost. If it is an international grid, there is additional complexity and cost involved."

Siva points out that most large-scale solar (LSS) producers in Malaysia are located in the northern region, in Kedah, Perak, as well as Kelantan and Terengganu, where there is a higher flux rate because of less cloud cover. Most of solar farms are located there since solar penetration is more efficient.

"However, the demand for renewable energy (RE) is in the southern and western part of the grid, especially by multinationals, corporates and large industries with environment-social-governance (ESG) commitments. They require as much as 20-30% of their energy consumption to be from renewables. Supply from rooftop solar installations nearby is inadequate for them. So, renewables need to be transported over hundreds of kilometres via the grid."

Grid integration is vital for transporting renewables from sources of production to sources of consumption. There have been instances of neighbouring countries with large unconnected solar farms. They were implemented without understanding the limitations of the conventional grid. Renewables are known for their intermittency, and whenever there was over production, the supply went to waste. The conventional grid with its fixed, unidirectional flow cannot support the dynamic nature of renewables. With the smart grid, there is no wastage and the RE is sold to the consumer who needs it.

Additionally, the renewable space consists of LSS farms, prosumers and battery storage system operators, among others. Power trading adds to this complexity. "All of these players need to be connected to the grid to transport supply," says Siva. "Only a smart grid can perform this function because it is bi-directional, enabling multiple energy sources to be connected to the grid.

"With the smart grid, the renewables space can also be deregulated with more retailers in the picture. As at the first quarter of 2025, the Energy Commission had introduced various initiatives to encourage RE trading, such as the Corporate Renewable Energy Supply Scheme (CRESS), Renewable Energy Certificates and the Energy Exchange Malaysia (ENEGEM) for cross-border trading. "These can only happen with a smart grid," adds Siva.

"Another trend we anticipate is a shift in peak demand, which traditionally has been during the day with demand generated by manufacturing industries. However, we expect this to change with the rise in electric vehicle (EV) ownership and increased usage of Internet-of-Things (IoT) devices. When people return home from work and plug their cars to charging ports and their devices to plug points, there will be load demand in the evening," says Siva.

He adds, "The smart grid requires heavy investments. While the main transmission lines remain intact, the smart grid incorporates advanced communication, automation and control technologies. This allows seamless integration and real-time interaction between various components of the grid, from generation to transmission, distribution and consumption. The smart grid's devices and systems can communicate, share data and respond intelligently to changes in energy supply and demand, ultimately enhancing efficiency, reliability and sustainability of the energy eco-system."

TNB's smart grid investments are aligned to the Government's Regulatory Periods, which has provisions for it to recover energy transition capital expenditure from the Government. Now into the Fourth Regulatory Period (RP4) from 2025-2027, TNB is set to invest an estimated of RM45 billion during this period.

Some of the major investment focus areas under the RP4 include grid modernisation; RE integration; connection of new generation capacity to the grid; meeting large demand growth and energy efficiency; customer service enhancements; climate and environmental resilience. RP4 is also aimed at enhancing the efficiency and reliability of electricity distribution. This includes the deployment of the Advanced Metering Infrastructure (AMI), which equips homes and businesses with smart meters, allowing for real-time energy consumption data availability for efficient network management and seamless integration of RE sources.

The integration of smart grid technologies will enhance the monitoring and management of electricity distribution, leading to fewer disruptions and faster restoration of services when issues arise. This initiative also includes the replacement of outdated equipment, reinforcement of power lines, and upgrading of substations.

Intelligent Interconnectivity

RE is a dynamic state of bi-directional energy flow that requires real-time monitoring and agile management. For this, a lot of smart devices are required for the grid to function effectively.

Benefits of a Smart Grid

A smart grid allows for RE to be integrated into the grid, and this is a benefit to utilities, consumers and overall climate change goals.

BENEFIT 1

For Utilities

It provides better transparency to the overall grid performance and operates close to the limit (greater efficiency), therefore saving costs.

BENEFIT 2

For Consumers

It allows consumers to receive new offerings such as time of use tariff, pre-payment schemes and greater granular transparency of their consumption.

BENEFIT 3

For Climate Change

The increased integration of renewables and greater efficiency greatly reduces carbon emissions from fossil fuels.

To transition from the current grid to a smart grid, the following elements are essential:

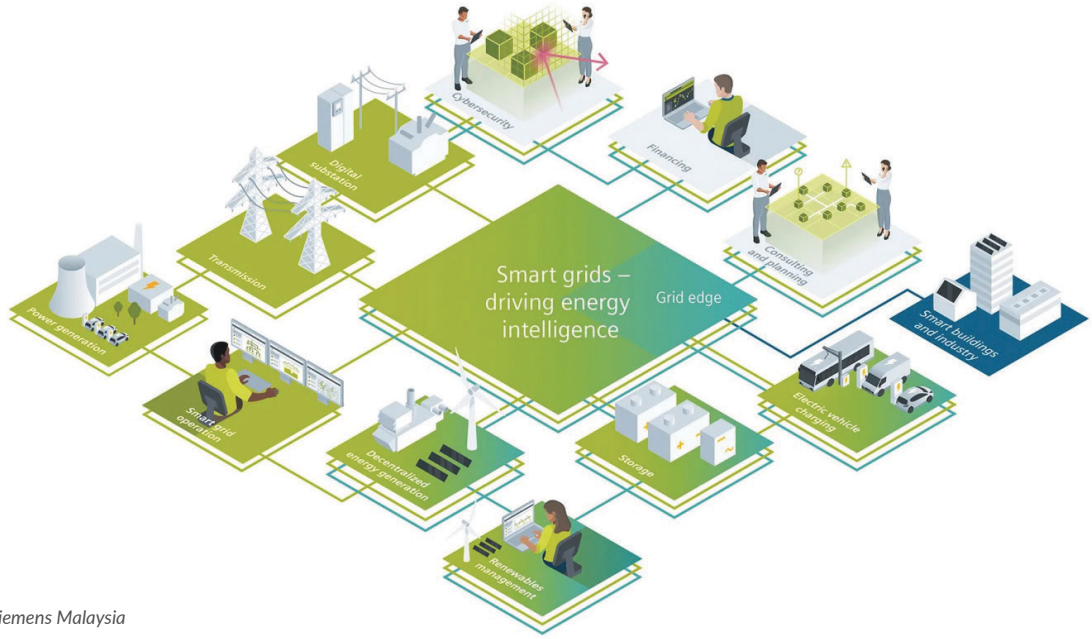
1. **Introduction of Advanced Metering Infrastructure (AMI) –** smart meters and meter data management software.
2. **Supervisory Control and Data Acquisition (SCADA) –** advanced distribution systems.
3. **Smart Grid Study –** A long-term roadmap of the energy transition and grid transformation based on the utility and national energy transition targets.

Siemens is involved in the deployment of the AMI in Malaysia and participated in TNB's pilot project. Siva explains, "The AMI consists of smart meters, multiple sensors, SCADA and various applications. The rollout of smart meters is advanced, where the target is for 9.1 million in homes, commercial and industrial premises in Peninsular Malaysia.

"At the heart of the AMI is the Meter Data Management System, a software that captures and processes smart meter data to be used for different applications by utilities. With this intelligent connectivity, there is communication between various systems in the grid."

"With this intelligent connectivity, there is communication between various systems. We can always add more applications to the system, which is scalable."

SMART GRID ENERGY INTELLIGENCE



Source: Siemens Malaysia

As of end of 2024, smart meter data was being used mainly for billing purposes, providing transparency on consumption to users and to detect and restore outages quickly. This system also alerts the utility on any outages that allows for quick action.

"We can always add more applications to the system, which is scalable," adds Siva.

Another distinctive feature of the smart grid is its flexibility, which is critical with variable energy. Unlike the conventional grid, the smart grid is responsive to changes in supply and demand. The smart grid knows where storage locations are and responds to demand accordingly. When there is an oversupply, like on sunny days, it can store the excess in a battery energy storage system (BESS), to be discharged as and when needed. Likewise, when there is a shortfall, it releases stored energy to the grid. This way, the supply is kept stable, and consumers are not compromised.

This feature is also critical to manage peak demand that is expected to shift to both day and night, especially in the age of EVs, 24-hour data centres, smart cities and IoT devices. "The smart grid understands the network in real time and has the AI and sensors in place to respond," says Siva. "It all depends on the sensors you install in the field. When you plug in the charger of an electrical equipment, it communicates with the substation, which will in turn feeds the energy required," he adds.

The smart grid can also accommodate various types of energy, from renewables to fossil fuel-based energy and nuclear energy. "It depends on the energy type preferred by the consumer, whether it is from renewables, fossil fuels or a mix of both," says Siva.

Many smart grid applications occur at substations, especially when they involve distributed energy resources (DER) where generation is close to the consumer. In Malaysia, there are incentives such as the Net Energy Metering (NEM) Nova and the upcoming Solar Accelerated Transition Action Programme (Solar Atap) targeted for roll out on 1 December, to encourage commercial and industrial rooftop solar installations for usage by consumers in the vicinity. In this instance, grid connections occur at the substation.

"In Europe, most generation occurs near consumers, who can choose whether they want a supply of RE or conventional energy. Malaysia is still not there yet in terms of DER. Our current focus is on integrating renewables at generation," he adds.

Costs and Tariffs

"Generally, RE costs more than energy generated by fossil fuels. Even in developed European Union (EU) countries such as Germany that have a longer history of renewables, consumers are paying higher tariffs for RE compared to fossil fuel-generated energy," says Siva.

In Malaysia, the production costs of solar energy have declined dramatically. According to the MIDA website, over the past decade, the Levelized Cost of Energy (LCOE) for utility-scale solar energy has dropped by more than 80%, making it one of the most affordable sources of electricity. LSS farms were launched by the Commission in 2016. However, the pressure comes from smart grid investments that are substantial. "In Malaysia, we are still investing in the grid, and they involve heavy capital expenditure," says Siva.

"When Malaysia peaks with its 70% renewables target, grid investments would start to slow and stabilise. We have to wait and see if this will lead to a lowering of RE tariffs."

"When Malaysia peaks with its 70% renewables target, grid investments would start to slow and stabilise. What happens is that capital expenditure will become operational expenditure for maintenance, upgrading and scaling-up works. We have to wait and see if this will lead to a lowering of RE tariffs," says Siva.

TNB's grid investments are partly a directive from the Government, which will subside this risk in a gradual manner, depending on the investments coming in. The fact remains that RE tariffs will be higher than conventional supply for some years. Currently, demand comes from among the ranks of public listed companies and multinationals that are willing to pay higher tariffs because they have corporate decarbonisation goals to fulfill.

Exporting Energy

As with RE and energy efficiency, the smart grid plays a central role in exporting energy across countries. The National Energy Transition Roadmap's (NETR) ambition is for Malaysia to export its green energy to ASEAN neighbours through the ASEAN Power Grid.

There are already interconnections with Singapore and Thailand to facilitate this. Tariffs in these instances are decided by Sale & Purchase Agreements between buyers and sellers. What is vital is for the smart grid to know when and where to disconnect the supply. The ground rules are for the exporter to comply with the grid specifications set by the buyer.

Siva says, "Perhaps the biggest challenge is in getting utilities and regulators to agree on the terms and conditions such as the formulation of an ASEAN grid code. The granularity of data and forecasting provided by a smart grid is an important enabler to such negotiations."

With the smart grid, the best-case scenario for Malaysia is that it can meet its renewables target and have excess to sell to ASEAN neighbours with zero interruptions. This will additionally provide the country with the economic advantage of attracting investors that require a stable power supply.

A 100% renewables scenario is a distant dream. "Even advanced countries such as Germany have only 60-70% renewables in 2025. Malaysia aims to supply an increasing amount of RE into the grid; the target is 31% by 2025; 40% by 2035; and eventually 70% as a net zero nation. It is an ambition that is achievable given the work being done on the ground now," adds Siva.

The Balancing Act

"The smart grid means different things for different people. For policymakers, it is about the New Energy Policy 2022-2040, NETR and Net Zero 2050. To the utility/grid owner, it is about cost-efficiency, profitability and customer service. For large commercial and industrial consumers, it is about renewable energy to meet their corporate commitments. Conversely, domestic customers primarily seek reliable electricity supply, often taking the underlying technology for granted," explained Marlinda Mohd Rosli, Director of Economic Regulation at the Energy Commission.

"The Commission has to balance all these priorities. Ultimately, our role is to protect consumer interests because at the end of the day, it is the consumer who pays," she adds.

An integral component of the smart grid is the smart meter, currently being deployed nationwide. The device offers significant advantages to consumers by providing direct communication and enabling users to track their electricity consumption patterns. This capability allows individuals to make informed adjustments, thereby reducing both usage and utility costs. Such improvements are essential to advancing energy efficiency, which plays a pivotal role in the ongoing energy transition. To monitor their consumption, customers are required to download the MyTNB application on their smartphones, where they can also access additional features such as the energy budget tool—a recent enhancement to the platform.

Marlinda Mohd Rosli
Director of Economic Regulation, Energy Commission

Since the smart grid operates in real-time, consumers can be notified of outages and restoration of services instantaneously. In fact, given its remote monitoring capability, the smart grid can detect weaknesses in the grid and self-heal, preventing outages. Already, there are reports of a decline in System Average Interruption Duration Index (SAIDI) due to this feature of the smart grid."

SAIDI is a metric used by utilities to measure the average duration of power interruptions experienced by customers, typically expressed in minutes per customer per year. It is an important indicator to attract investors to the country.

Recovering Investment Costs

Without doubt, the smart grid involves heavy investments, which the utility/grid services operator expects to recover costs through tariff hikes. "This is where the Commission steps in," says Marlinda. "We recognise that the smart grid is a must-have on many fronts, but we make sure that the investment is prudent, efficient and cost-effective. To spread out the cost recovery process, the Commission has adopted a phased approach to rolling out smart grid technologies."

Grid investments are recovered during the Regulatory Periods (RP), which are a part of the Commission's Incentive Based Regulation (IBR) tariff-setting system. Smart grid investments began with RP2 (2016-2020) and will continue into the future. During RP2 and RP3 (2021-2024), the focus was on the rollout of the Advanced Metering Infrastructure (AMI) and smart meters.

Under the IBR, the utility/grid owner presents to the Commission two types of proposals to recover their investment costs – one is for system improvements that are vital for an efficient and stable grid; and the other is for energy transition costs, previously called smart utility investments.

"The Commission scrutinises these costs and studies whether they are fair and justifiable. We pace out the investments proposed, based on whether the system needs them now or can be deferred," explains Marlinda.

The base tariff is made up of mainly capital expenditure for grid performance improvements and some operational expenditure. There have been instances of energy transition capital expenditure being included as well, for example, costs incurred for the Battery Energy Storage System (BESS) pilot programme. This was approved by the Planning and Implementation Committee for Electricity Supply and Tariffs (JPPPET), which is chaired by the Minister and includes high level representatives from the Ministry, the Commission and several other Ministries.

"The Commission upholds the "User Pays" principle regarding tariffs," says Marlinda. "We usually ask the utility to recover its energy transition costs with other methods. For example, a community that needs battery storage solutions can pay a premium tariff, without the implementation of tariff increases across the board," she adds.

RP4 and Value Creation

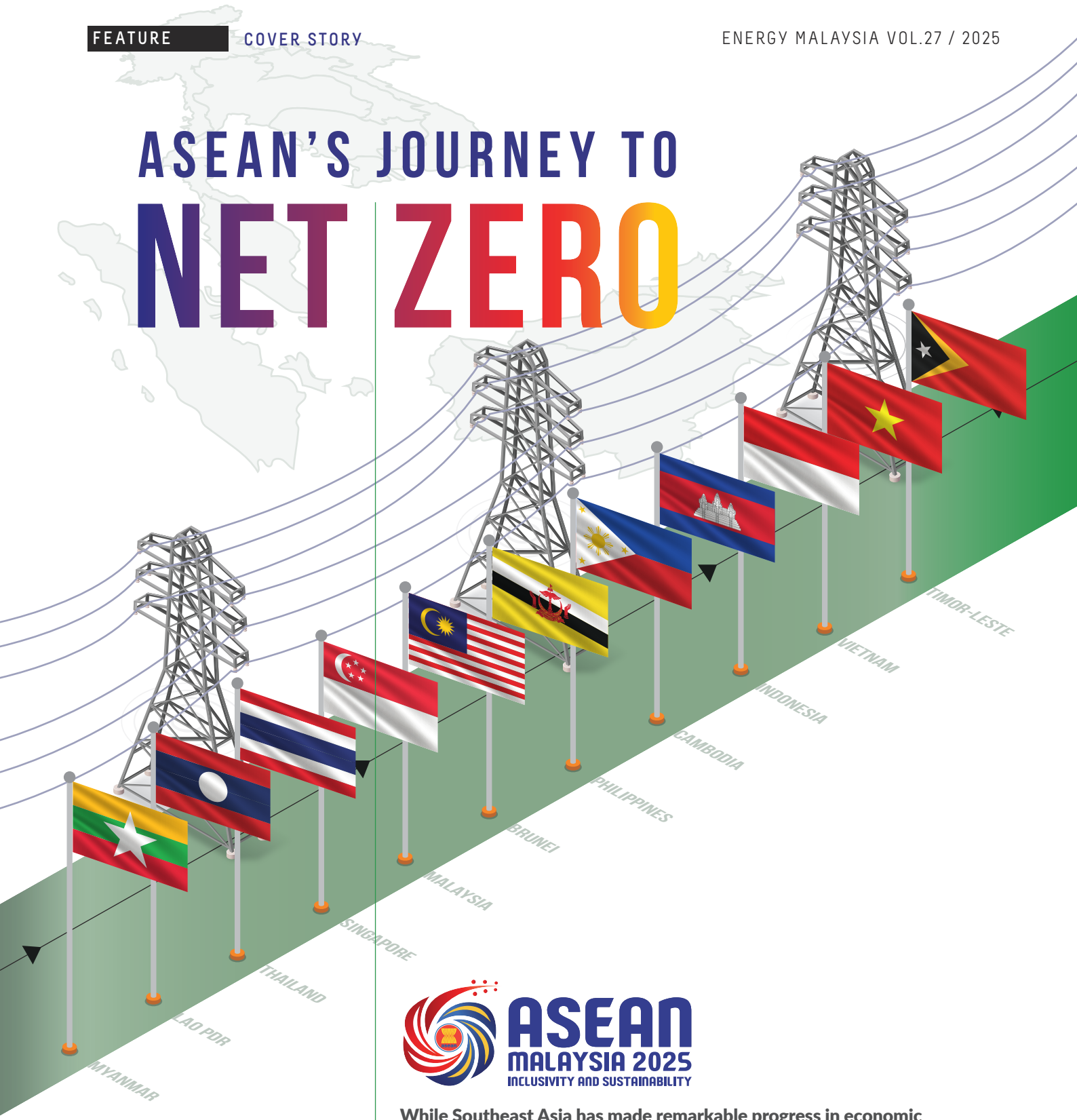
"Under RP4, which kicked off in July 2025, the focus is on value-creation," says Marlinda. "This is when stakeholders will begin to see the multiple benefits of the smart grid.

"We expect to see more renewable integration from LSS projects and energy storage systems to the main transmission system; and by consumers turned prosumers under the Net Energy Metering (NEM) or now called as SOLAR ATAP scheme, to the distribution network. Prosumers can sell their excess power generated to the grid, and this is only possible with smart meters," points out Marlinda. "The smart grid thus gives consumers an opportunity to earn extra income," she adds.

The smart grid has already created a more dynamic generation and retail renewables ecosystem, and the Commission remains steadfast that base tariffs should remain affordable for the majority of consumers. A marginal increase in tariffs can be justified, but for Malaysia to retain its edge as an attractive high technology investor destination, it must offer adequate clean energy supply as well as a competitive tariff structure."

"Under the RP4, which kicked off in July 2025, the focus is on value creation. This is when stakeholders will begin to see the multiple benefits of the smart grid."

ASEAN'S JOURNEY TO NET ZERO



ASEAN MALAYSIA 2025
INCLUSIVITY AND SUSTAINABILITY

While Southeast Asia has made remarkable progress in economic development, the trajectory of its energy systems has placed it on a path towards a 2.4°C warming scenario by 2050, according to a report published by S&P Global. This clashes directly with the global imperative to limit warming to well below 2°C, ideally 1.5°C, as determined by the Paris Agreement. The urgency of climate action is undeniable, and ASEAN nations are increasingly recognising the need for a fundamental shift towards net zero emissions by the middle of this century. This ambitious goal requires a transformation of the region's energy landscape, demanding coordinated efforts across multiple fronts.

Based on today's policy settings, Southeast Asia is on course to account for 25% of global energy demand growth between now and 2035, second only to India over the same period and more than double the region's share of growth since 2010. By mid-century, energy demand in Southeast Asia will overtake that of the European Union (EU).

Growth in energy demand in Southeast Asia is led by the power sector. Electricity demand in the region is set to surge at an annual rate of 4%, according to an S&P Global Report, with growing use of air conditioning amid more frequent heatwaves which is a big driver for increased electricity consumption.

The report also states that clean energy sources such as wind and solar, alongside modern bioenergy and geothermal, are projected to meet more than a third of the growth in energy demand in the region by 2035. This is a step up compared to the past, but not enough to rein in the region's energy-related carbon emissions, which are set to increase by 35% between now and 2050.

To turn this around, a major push is required to align with the outcomes during the 28th Conference of the Parties (COP28) climate change conference held in the United Arab Emirates (UAE) and meet national goals that have been set in the region, all of which would mean halving today's emissions by 2050, the report finds. Today, of the 11 member economies of ASEAN, eight have net zero emissions goals.

"Southeast Asia is one of the most economically dynamic regions of the world and is set to account for a quarter of the growth in global energy demand over the next decade as its population, prosperity and industries expand," said International Energy Agency (IEA) Executive Director Fatih Birol. "Countries in the region have a diverse mix of energy sources including highly competitive renewables. But clean energy technologies are not expanding quickly enough and the continued heavy reliance on fossil fuel imports is leaving countries highly exposed to future risks.

"While there is great progress on issues such as energy access, clean cooking and developing renewable energy (RE) manufacturing for export markets, it must ramp up efforts to deploy those technologies at home. Access to finance and investment for the region's fast growing economies will play a pivotal role in strengthening energy security and delivering their emissions reduction goals. Scaling up clean energy investments is crucial for ASEAN to reduce emissions," he added.

World's First Global Stocktake

The global stocktake is considered to be the central outcome of COP28 held in Dubai in 2023. It is a two years' process for countries and stakeholders to see whether or not they are collectively making progress towards meeting the goals of the Paris Climate Change Agreement.

It recognises the science that indicates global greenhouse gas emissions need to be cut 43% by 2030, compared to 2019 levels, and to limit global warming to 1.5°C.

The first global stocktake affirmed that the world was not on track to limit global warming to 1.5°C, and the window for meaningful change is quickly closing. It outlines bold actions for Governments and stakeholders to urgently undertake in this critical decade to keep 1.5°C within reach, securing lives and livelihoods. The global stocktake decision, provides benchmarks and outlines guidance for countries to consider in the next round of climate action plans due in 2025.

During the global stocktake, Governments, communities, organisations, businesses, the private sector and all other stakeholders come together to self-assess their efforts in implementation and how ambitious their climate change plans are. It is a collective effort. The two-year stocktake process firstly reviews information available, undertakes a technical assessment and moves to consider actions, decisions and pathways.

The findings from the global stocktake's technical assessment, outlined in the Technical Report published in September 2023, were both a stark reminder of the urgency of our situation and a call to action.

It is not the stocktake that is the game changer, it's the global response, the response by countries as Parties to the Paris Agreement that will make the difference in the form of higher ambition and accelerated action. This response is reflected by how countries have considered the outcomes of the global stocktake in their climate action plans such as Nationally Determined Contributions (NDCs) and Long-Term Low-Emission Development Strategies (LT-LEDS).

Source: https://unfccc.int/topics/global-stocktake

Currently, Southeast Asia as a whole attracts only 2% of global clean energy investment despite accounting for 6% of global GDP, 5% of global energy demand and being home to 9% of the world's population. The current level of investment will require a fivefold increase – with USD190 billion needed in 2035 – to put the region on a pathway consistent with achieving its announced energy and climate goals. Scaling up clean energy investment needs to be accompanied by strategies to reduce emissions from the region's fleet of coal-fired plants, which account for about 40% of the region's power generation.

In addition to deploying technologies such as solar and wind, building associated infrastructure is vital to providing secure and flexible electricity systems. Expanding and modernising the region's power grids to support a greater share of variable RE will require an annual investment in this space to double to nearly USD30 billion by 2035. This includes regional cooperation initiatives such as the ASEAN Power Grid as well as RE micro grids to serve islands and communities in remote areas.

"The road to Net Zero 2050 is a complex network of pathways, each tailored to the unique circumstances of individual ASEAN member states. This diversity, with varying levels of economic development, energy resources and infrastructure, calls for a unified decarbonised effort to combat climate change."

The road to Net Zero 2050 is not a smooth, well paved highway. It is a complex network of pathways, each tailored to the unique circumstances of individual ASEAN member states. This diversity, with varying levels of economic development, energy resources and infrastructure, calls for a unified decarbonising effort to combat climate change.

While some countries have set ambitious goals, others are still navigating the initial stages of planning and implementation. Across the region, however, a common theme is emerging - the need for strategic planning, technological innovation, robust policy frameworks, and regional cooperation. This journey involves a four-pronged approach:

- **Strategies:** Many ASEAN member countries are formulating long-term energy plans that prioritise RE deployment, energy efficiency improvements, and the phasing down of fossil fuels. These strategies often include targets for RE penetration, electrification of transport and industry, and the development of carbon capture, utilisation, and storage (CCUS) technologies.

  For example, Malaysia has its National Energy Transition Roadmap (NETR) with its six levers for a just transition; Singapore has unveiled its Singapore Green Plan 2030 outlining its pathway to a low carbon future, while Indonesia's National Energy Grand Strategy (KESEN) emphasises the role of RE in achieving energy security and sustainability.

- **Technologies:** The deployment of green technologies are crucial for achieving net zero. Solar photovoltaic (PV) and wind energy are rapidly becoming cost competitive offering viable alternatives to traditional fossil fuels. Smart grids, energy storage solutions and electric vehicles (EVs) are also gaining traction, enabling the integration of RE sources and promoting energy efficiency. Furthermore, research and development into next-generation technologies, such as advanced biofuels and hydrogen, are essential for long-term decarbonisation.

- **Policies and Regulations:** Supportive policies and regulations are critical to create an enabling environment for clean energy investments and drive the transition to net zero. This includes mechanisms such as Feed-in-Tariffs, RE portfolio standards, carbon pricing, and energy efficiency mandates. Clear and consistent regulatory frameworks are also essential to attract private sector investment and ensure the smooth deployment of clean technologies. For instance, the introduction of carbon taxes or emissions trading schemes can incentivise businesses to reduce their carbon footprint.

- **Regional Cooperation:** Given the interconnected nature of the energy landscape, regional cooperation is paramount. Sharing best practices, facilitating technology transfer, and coordinating energy planning can speed up the transition to net zero across the region. ASEAN itself plays a vital role in fostering dialogue and collaboration among member states.

Snapshot of Member States:

Based on research up to 2024, below is a snapshot of the energy transition strategies and plans of ASEAN member states. Some member states are also exploring nuclear energy as an option in their sustainable energy mix. According to the IEA Southeast Asia Energy Outlook 2024 report, eight ASEAN member states have net zero goals. They are Brunei Darussalam, Cambodia, Lao PDR, Malaysia, Singapore and Vietnam that have set a target date of 2050; Indonesia of 2060; and Thailand of 2065. While momentum is building for clean energy transitions across the region, far greater efforts are needed to get on track for these national goals, which would mean cutting today's emissions by almost two-thirds by 2050.

MALAYSIA

Malaysia's energy mix was composed of 47% oil and gas, 32% coal, 15% hydropower, 4% solar, and 2% bioenergy in 2024.

The National Energy Policy 2022-2040 and the NETR are the key drivers to achieve Malaysia's climate change goals. The NETR has set ambitious targets, aiming to achieve net zero emissions by 2050, calling for a gradual increase in the RE share of the energy mix, to 31% by 2025, 40% by 2035, and 70% by 2050.

All in, the NETR has identified six energy transition levers, namely Renewable Energy (RE), Energy Efficiency (EE), Hydrogen, Bioenergy, Green Mobility and Carbon Capture, Utilisation and Storage (CCUS). Several flagship projects are already on the ground, as catalysts.

The Government also has in place policies to support RE development, such as the ongoing large-scale solar (LSS), Net Energy Metering (NEM) and Feed-in Tariffs (FiT) programmes. Moving forward, it plans to establish a hydrogen manufacturing hub in Sarawak by 2030 and utilise green hydrogen for transportation and power generation locally and as exports to overseas markets, with aspirations to become a regional leader in the green hydrogen economy by 2050.

The country has ramped up efforts to attract both domestic and foreign investments in its net zero projects as part of Malaysia's green economy thrust that serves both the energy transition and economic goals.

Details on Malaysia's net zero milestones can be found in the Special Focus segment of the magazine, on page 29.

BRUNEI DARUSSALAM

Brunei's energy sector is heavily reliant on oil and natural gas. These natural resources form the backbone of the country's economy.

RE sources currently constitute a very small portion of the energy mix, though this is changing. Promoting the adoption of EVs is a key strategy to reduce emissions from the transportation sector. Efforts are also being made to reduce emissions from the oil and gas industry, including ending routine gas flaring.

Brunei is moving towards mandatory carbon emissions reporting, to better track and control emissions. Under the country's National Climate Change Policy, Brunei recognises the importance of its forests as carbon sinks and is committed to their preservation and expansion.

In 2014, Brunei adopted a strategic plan to achieve 10% share of RE in the national energy mix by 2035. The plan provides the outline to introduce RE policy and regulatory frameworks and to scale-up the market deployment of solar.

CAMBODIA

Cambodia's energy mix is about 50% RE — with about 44% of the total mix coming from hydropower, 41% coal and 8% oil.

Under its current transition plan, the Long-Term Strategy for Carbon Neutrality, the country relies on increasing the uptake of RE, decreasing the role of coal, and incentivising private sector funding for its energy transition.

It is one of the most rapidly electrifying countries in the world. Showing promise for solar and wind projects, it however lacks the grid, technical capacity and funding to increase uptake. Implementing LSS and wind projects will require robust private sector investment, which in turn needs regulatory incentives to create competitive prices and a reliable grid. Concessional financing from international partners had played a role in helping to de-risk investments in RE.

Priorities and Challenges

LAO PDR

Lao PDR's energy mix consists of 66% hydropower, 33% fossil fuels, and 1% solar.

Two components of its energy transition plan are the National Green Growth Strategy and Climate Change Strategy, which detail the country's sectors of focus.

Extremely well situated for hydropower, Lao PDR has billed itself as the "battery of Southeast Asia." There are almost 80 dams in the country, and more are planned along the Mekong River and its tributaries. More than 90% of the country's electricity is generated by hydropower, and more than 66% of its current hydropower capacity is exported. Hydropower exports are one of the top revenue-earners for the country.

Lao PDR is also looking to grow its solar, wind and geothermal capacity by 2030, but this will require significant foreign investment to avoid further coal-fired power expansion. A new wind power project that is expected to begin commercial operations in 2025 will export and sell electricity to Vietnam as Asia's first cross-border wind project.

Construction also began in 2022 on Lao PDR's first LSS farm, which is expected to supply power to the state owned utility Électricité du Laos under a power purchase agreement for 30 years.

SINGAPORE

Singapore's energy mix is heavily reliant on oil and gas (approximately 97%), with smaller contributions from bioenergy (2%), coal (1%), and solar (1%).

The Singapore Green Plan 2030 outlines the country's pathway to achieve its energy transition goals. The island nation is focusing on solar energy deployment, with one of the world's largest floating solar farms launched in July 2021; and improving energy efficiency in buildings and industry.

Another component of its energy transition plan is a national hydrogen strategy that could enable hydrogen to supply 50% of Singapore's power needs by 2050, contingent on technological developments.

The Government has implemented carbon pricing and other policies to incentivise emissions reduction and invested in research and development of clean technologies and attracting green finance.

VIETNAM

Vietnam's energy mix is 30% coal, 13% oil and gas, 28% hydropower, 24% solar and 5% wind.

Its capacity for RE shows great potential, however, renewables seem unlikely to provide a complete solution to the country's dependency on hydrocarbons as a baseload source.

Under the country's Power Development Plan 8 (PDP8), energy transition will hinge on the Government's ability to unlock international investments in RE, modernise its transmission grid, and finalise the commitments under PDP8.

With a high capacity for both solar and wind power, Vietnam is the leading RE market in Southeast Asia. In 2019 alone, Vietnam increased its installed solar power capacity by more than 47 times. But its electricity grid has lagged in development; and the intermittent nature of solar and wind calls for the development of a reliable energy storage system.

INDONESIA

Indonesia's energy mix is composed of approximately 60% coal, 21% oil and gas, 8% hydropower, 6% bioenergy, 5% geothermal, and less than 1% wind and solar. As Southeast Asia's most populous country, it accounts for 40% of the region's energy consumption.

The National Energy Grand Strategy (KESEN) plays a key role, with a focus on increasing RE's share in the energy mix. There is a significant potential for solar, wind and geothermal energy in Indonesia due to its size and vast natural resources. The Government's focus is on developing domestic RE manufacturing capacity.

The Government provides incentives to attract investments in RE projects, promote energy efficiency and develop green finance initiatives.

Net zero emissions are targeted by 2060 or sooner.

PHILIPPINES

The Philippines' energy mix consists of about 55% coal, 22% oil and gas, 11% geothermal, 7% hydropower, and 4% solar and wind.

Its current transition plan, the Philippines Energy Plan 2020–2040, calls for ambitious emissions reduction targets over the next few decades. By 2030, the country plans to reduce emissions by 75%, compared to business-as-usual projections, and increase the percentage of its RE mix to 35%.

Close to 97% of the Philippines' commitment is conditional upon external funding. Without external support, its emissions targets would be a challenge to achieve.

While there's no national net zero target, the Philippines had committed to reducing emissions. The country's Climate Change Act provides a framework for climate action.

THAILAND

Thailand's energy mix is composed of 67% oil and gas, 11% coal, 7% bioenergy, 6% hydropower, 6% solar, and 3% wind.

The country has a high potential for solar power. Under Thailand's Power Development Plan 2018–2037, solar is expected to account for more than 50% of total energy production by 2037.

The world's largest floating solar farm began operations in October 2021 in Thailand's north-eastern province of Ubon Ratchathani, the first of 16 planned facilities. Thailand also heavily promoted the Bio-Circular-Green Economy during its Asia-Pacific Economic Cooperation host year in 2022, part of which involves exploring RE sources using biomass.

Developing the electric vehicle (EV) industry is another key pillar in its energy transition plan. The 30@30 policy announced by the National Electric Vehicle Policy Committee aims for 30% of domestically made vehicles to be zero emission by 2030, and Thailand's EV market represents almost 60% of Southeast Asia's market share.

Net zero emissions are targeted by 2065.

Note: Myanmar is not included in this list because of the uncertainty over how the country's Government is implementing its net zero and climate change agenda. Timor-Leste, which was admitted as an ASEAN member state in October 2025, does not have a specific net zero target year for the time being.

Bridging Boundaries, Building Prosperity

At the first Special Senior Officials Meeting on Energy (SOME) and associated meetings held in Langkawi from 23-24 January 2025, Malaysia's Ministry of Energy Transition and Water Transformation (PETRA) launched the theme "Powering ASEAN: Bridging Boundaries, Building Prosperity". The theme emphasises the need to advance the energy agenda by strengthening relations between ASEAN member states to achieve collective prosperity. It is also aligned to the wider "Inclusivity and Sustainability" theme of Malaysia as the ASEAN chair for 2025.

PETRA Secretary General Dato' Mad Zaidi Mohd Karli, as the SOME Chair, led the discussion on the planning of the work plan of ASEAN energy cooperation for the year ahead. The Langkawi SOME proposed eight Annual Priorities (APs) for the ASEAN energy sector in 2025. There were:

1. The endorsement to sign the **ASEAN Power Grid (APG)** Enhanced Memorandum of Understanding (MoU) document and discussion of the terms of references (TOR) for the subsea power cable development framework as well as the announcement on the financing mechanism for the APG.

2. The endorsement to sign the **ASEAN Petroleum Security Agreement (APSA) Successor Agreement.**

3. The launch of the **ASEAN Energy Efficiency Database and Investment Platform (Building).**

4. The finalisation of the **Renewable Energy Long-term Roadmap (RE LTR).**

5. The initiation of the development framework for **ASEAN Renewable Energy Certificates (REC).**

6. The endorsement of the policy document on **ASEAN Plan of Action for Energy Cooperation (APAEC) 2026-2030.**

7. The initiation on the development of the framework for **Nuclear Power Plant (NPP) deployment.**

8. The adoption of two energy related Priority Economic Deliverables (PEDs) 2025 outputs, namely the signing of the **APG Enhanced MoU** and launching of the **ASEAN Plan of Action for Energy Cooperation (APAEC) 2026-2030** documents.

At the ASEAN Ministers of Energy Meeting (AMEM) held in October 2025, three regional initiatives were adopted by the Energy Ministers. They were:

1. **Enhanced Memorandum of Understanding (MoU) on the ASEAN Power Grid (APG)** to accelerate cross-border interconnections and facilitate multilateral electricity trade.

2. **ASEAN Plan of Action for Energy Cooperation (APAEC) 2026–2030,** a roadmap to deepen regional collaboration and interconnection, enhance energy security and resilience, and accelerate a sustainable and inclusive energy transition.

3. **ASEAN Framework Agreement on Petroleum Security (AFAPS)** to replace the 2009 ASEAN Petroleum Security Agreement (APSA). The framework aims to ensure mutual supply and demand stability amid volatile oil and gas markets.

ASEAN Power Grid: A Catalyst

The ASEAN Power Grid (APG) is a visionary initiative aimed at connecting the power grids of ASEAN member states. It was first mooted as far back as 1997.

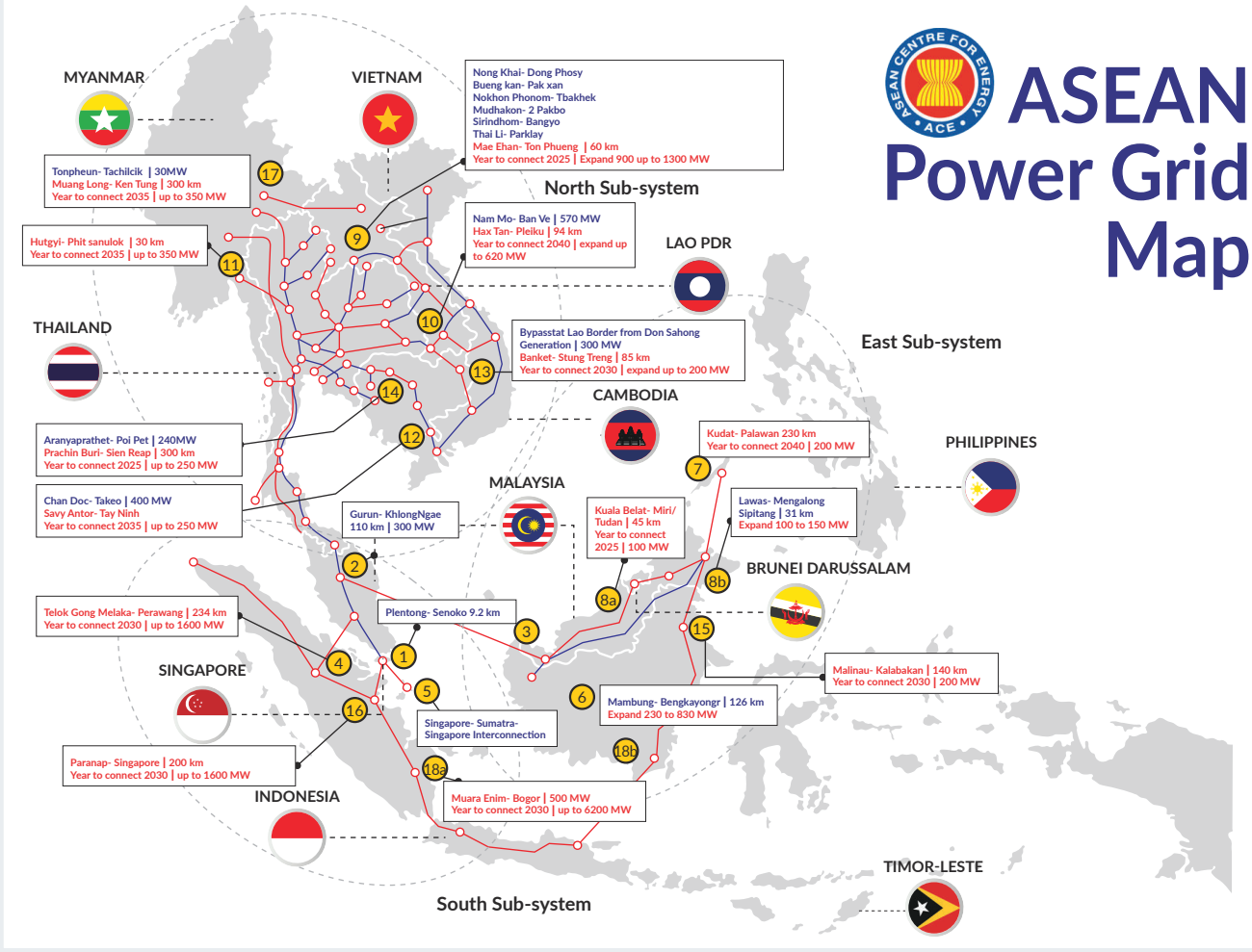
It was the outcome of recognising the critical role of efficient, reliable and resilient electricity infrastructure in stimulating regional economic growth and development. To meet the growing electricity demand, huge investments in power generation capacity will be required. Acknowledging the potential advantages to be gained from the establishment of integrated systems, ASEAN established electricity interconnecting arrangements within the region through the APG under the ASEAN Vision 2020 adopted at the Second ASEAN Informal Summit held in Kuala Lumpur on 15 December 1997.

The Heads of ASEAN Power Utilities/ Authorities (HAPUA), as the Specialised Energy Body (SEB), is tasked to ensure regional energy security by promoting the efficient utilisation and sharing of resources. The construction of the APG began on cross-border bilateral terms, then expanded to a sub-regional basis and finally to a total integrated regional system. It is expected to enhance electricity trade across borders which would provide benefits to meet the rising electricity demand and improve access to energy services in the region.

In the climate change scenario, the APG aims to drive regional power interconnectivity to help ASEAN as a regional bloc to deliver on the RE targets of member states as well as to help each other achieve their net zero goals.

A study by the U.S. Department of Energy highlights that the APG not only has the potential to address green energy shortages but can also create jobs, attract investments, and reduce pollution - providing significant social, economic, and environmental benefits to the region.

ASEAN Power Grid Map



Source: Simplified version of updated Power Development Plan (PDP) scenario under AIMS 111, 2022.

for Regional Integration

The study indicated that countries participating in regional power grid interconnections could see their economies boosted, with projected GDP growth ranging from 0.8% to 4.6%. It is expected to drive investments and create a substantial number of jobs, estimated at an annual increase of 2,000 to 9,000 positions, particularly in the RE and manufacturing sectors, including roles related to cables and equipment.

Dual Benefits

The economic reasoning for interconnectivity makes sense for ASEAN. By pooling resources, Southeast Asian countries can achieve significant cost savings, reduce the need for expensive infrastructure investments, and balance the risk of over-reliance on imported fuels. This not only enhances energy security but also positions the region as a competitive player in the global shift towards clean energy.

The United Nations Economic and Social Commission for Asia and the Pacific (UN ESCAP) contends that a fully integrated power grid for ASEAN will lower the overall cost of electricity by 8%, and that every USD1 spent on grid infrastructure will reduce system costs by USD7.40.

Environmentally, the benefits are equally sensible. Transitioning to a grid that leverages RE can significantly reduce greenhouse gas emissions. The ASEAN Centre for Energy projects that by having more cross-border interconnections under APG, the region could avoid the use of 48.8 million tons of coal, 2.1 million tons of oil and 13,607 million m3 of natural gas cumulatively by 2040. It's a strategy that aligns with global environmental goals and the region's commitment to the Paris Agreement, according to an article published by the Southeast Asia Information Platform for Energy Transition (SIPET).

Milestones, Challenges and Solutions

Recent years have seen some progress in the development of the APG. Among the milestones are the:

1. Implementation of the **Lao PDR-Thailand-Malaysia-Singapore Power Integration Project (LTMS-PIP).**

2. Work in progress of the **Brunei-Indonesia-Malaysia-Philippines Power Integration Project (BIMP-PIP).**

These projects not only facilitate cross-border energy trade but also pave the way for a more resilient and integrated power system in the region.

Yet, the path to interconnectedness is not without its hurdles. Technical, regulatory and political challenges loom large. Different national regulations of member states, investment needs, concerns about sovereignty and energy security are among the key obstacles. Overcoming these require not just infrastructure but a framework for regional cooperation, policy harmonisation and trust-building.

Innovative solutions and collaboration are already underway. Cross-border projects within the APG framework are demonstrating the tangible benefits of interconnectivity, serving as models for broader regional integration. Furthermore, advances in technology such as smart grids and energy storage systems are making interconnected energy systems more feasible to implement and operationally reliable.

The narrative within ASEAN is shifting, with member states recognising that a successful energy transition is inextricably linked to the development of transmission infrastructure. Countries like Malaysia, Thailand and Singapore have integrated APG into their national electricity development priorities, acknowledging that interconnectivity is vital for achieving national climate targets and sustainable development goals.

For Southeast Asia, the energy transition facilitated by power interconnectivity is crucial for progress. The APG initiative is a bold step forward, but its success hinges on continued commitment, investment and shared will among ASEAN countries and their partners.

Status

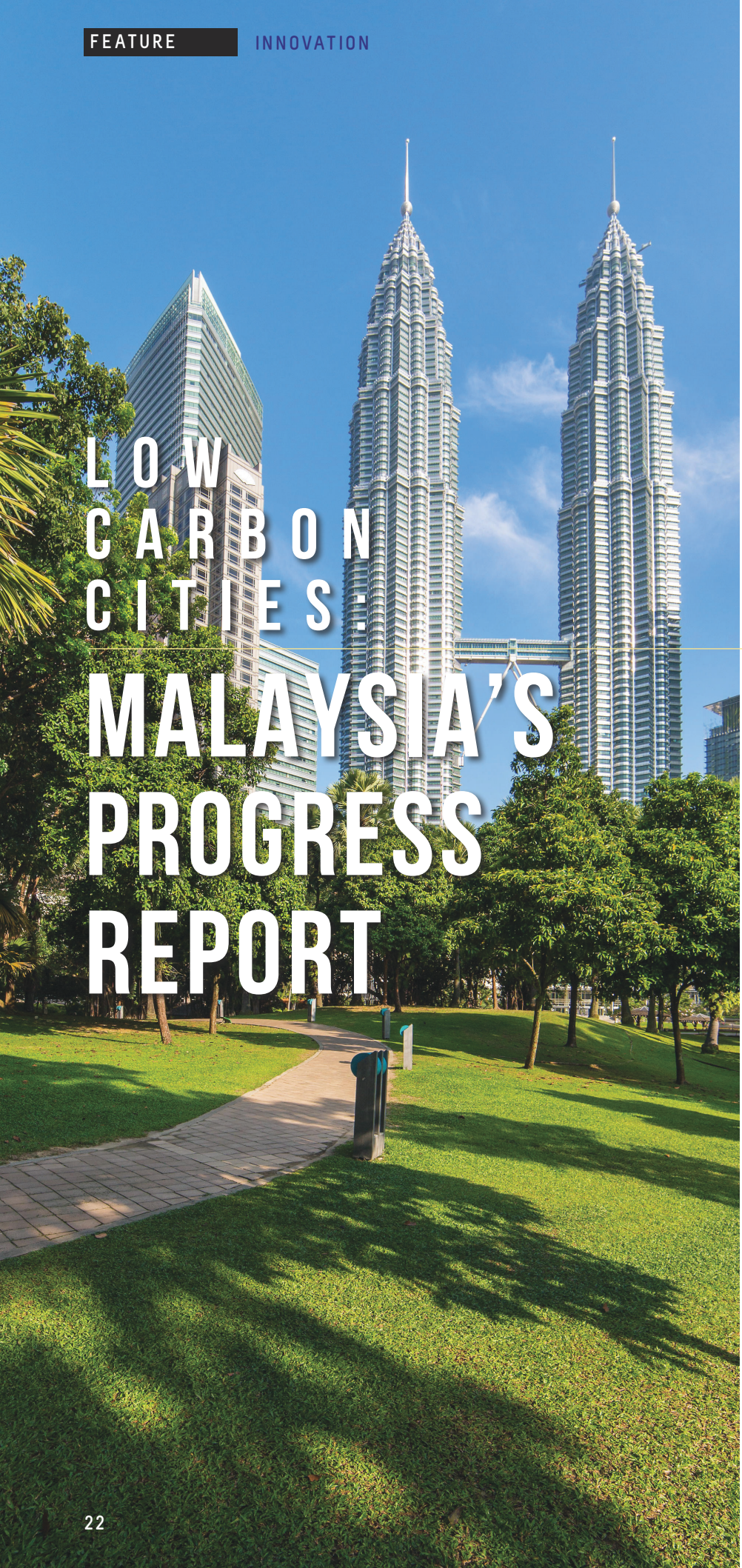
Existing
7,700 MW

On-going Projects (Up to 2025)
1,245 MW

Grand Total (Up to 2024)
17,550 MW

Legend

- Existing Interconnection
- Planned Interconnection
- Sub-systems



LOW CARBON CITIES: MALAYSIA'S PROGRESS REPORT

Saiful Adib Abdul Munaff
Acting Group Chief Executive Officer,
Malaysia Green Technology and
Climate Change Corporation

Cities account for over 70% of GHG emissions, and this has triggered the shift towards low carbon cities as a strategy for urban sustainability. At the heart of low carbon cities is the commitment to reduce greenhouse gas (GHG) emissions.

In Malaysia, the Government introduced the Low Carbon Cities Framework (LCCF) in 2011 to provide local authorities, developers and universities with the necessary tools – including city design guidelines, measurement and reporting methodology as well as an assessment and recognition programme – to implement low-carbon strategies in a systematic and impactful manner.

In 2019, the Low Carbon Cities 2030 Challenge (LCC2030C) was launched to speed up the big shift. This was followed by the National Low Carbon Cities Masterplan (NLCCM) in 2021, to take the LCCF programme up to the next level.

LCCF is implemented by the Malaysia Green Technology and Climate Change Corporation (MGTC). Energy Malaysia speaks to MGTC Acting Group Chief Executive Officer, Saiful Adib Abdul Munaff, on the progress of low carbon cities in Malaysia.

Malaysia's Low Carbon City Framework (LCCF) is an initiative to guide Malaysian cities and townships towards a low carbon future.

"We provide technical assistance to local authorities on how to transform their cities and towns into low carbon zones. LCCF has guidelines for mitigation and measurement of carbon emissions by local authorities," says MGTC Acting Group Chief Executive Officer, Saiful Adib Abdul Munaff.

"It is a systematic and technical process. The first step for those joining the LCCF programme is to quantify their carbon emissions and familiarise themselves with how LCCF works. There is a strong focus on capacity building, when participants are trained on carbon mitigation measures that they can adopt. MGTC has the Green Academy that specialises in upskilling technical personnel in the field of green technology. It offers various programmes on different aspects of managing and reducing energy consumption.

"This is followed by the implementation phase, which involves awareness initiatives, action plans and continuous improvements. To be successful, local authorities must engage and collaborate with multiple stakeholders, including the public," he adds.

"We also monitor the progress of the local authority with our carbon assessment and reporting tool, which is aligned to international standards and recognised by the Intergovernmental Panel on Climate Change (IPCC)," says Saiful Adib.

LCCF's goal is for local authorities to achieve a 45% reduction in carbon intensity by 2030, which will also achieve Malaysia's Paris Agreement commitment. "LCCF is not mandatory, and we are encouraged by the growing number of local authorities, developers and universities volunteering to join our programme," he adds.

LCCF focuses on four main areas: Urban Environment, Urban Infrastructure, Urban Transportation and Buildings.

"LCCF focuses on four main areas: Urban Environment, Urban Infrastructure, Urban Transportation and Buildings. They relate mainly to planning and mitigation efforts."

"Our four focus areas relate mainly to planning and mitigation efforts," explains Saiful Adib. "For example, in the urban environment, we recommend mixed-use developments and compact developments to avoid the urban spread of cities, that is, developments that go beyond set limits and encroach into forest areas. What we want to see is improved compatibility between the built environment and the local natural system. Under this dimension, we recommend the establishment of more pedestrian and cycling networks, planting of shade trees, and increasing the number of green and connected open spaces."

Compact, walkable neighbourhoods reduce the need for long commutes, which then cut down vehicle emissions. Green spaces and sustainable land use further contribute to the city's environmental health by improving air quality and providing natural cooling effects.

• LOW CARBON CITIES FRAMEWORK & ASSESSMENT SYSTEM •

URBAN ENVIRONMENT

- Site Selection
- Urban Form
- Urban Greenery & Air Quality

BUILDING

- Low Carbon Building
- Community Service

URBAN INFRASTRUCTURE

- Infrastructure
- Provision
- Waste
- Energy
- Water Management

URBAN TRANSPORTATION

- Reduction in Use of Private Motorised Transport on Urban Roads
- Increase in Public Transport
- Mode Shift from Private to Public Transport and Non-Motorised Transport
- Use of Low Carbon Transport
- Improvement to Level of Service of Road Links and Junctions
- Utilisation of Transit Oriented Development (TOD) Approach

Source: MGTC

For urban infrastructure, LCCF prioritises energy, waste and water management, and promotes 3R efforts (Reduce, Reuse, and Recycle) during construction, manufacturing and in households. In urban transportation, it champions public transportation systems and urges better coverage and increased ridership.

For buildings, the emphasis is on energy efficiency and use of renewable energy, particularly with rooftop solar installations. "For existing buildings, there is often a need to upgrade energy management and facility management systems. Whereas, in new buildings, we encourage local authorities to build based on the concept of low carbon buildings, which use less energy and water compared to conventional buildings," explains Saiful Adib.

Under LCCF, urban areas are divided into low carbon zones. A low carbon zone, which is designated by the local authority or developer, is typically an area that covers 50 hectares or more. What is paramount is that they meet the criteria of a low carbon city/town as defined by the LCCF. "Participants in our LCCF programme are those striving to meet the requirements of low carbon cities," says Saiful Adib.

"Since LCCF is not mandatory, there is no provision for local authorities to establish a dedicated low carbon unit to oversee the progress of their low carbon projects and employ experts should the need arise. Fortunately, there are exceptions as in the case of the Hang Tuah Jaya Municipal Council (MPHTJ) and Shah Alam City Council (MBSA)," points out Saiful Adib.

"Initially, funding was a challenge and the LCCF take-up was low. The trend changed in 2021, when the Government allocated special grants for local authorities to carry out physical projects under the Geran Pemangkin Bandar Rendah Karbon (GeRAK). With this scheme, a local authority can apply for a RM250,000 grant to kickstart its low carbon projects."

Low Carbon Cities 2030 Challenge

"MGTC launched the Low Carbon Cities 2030 Challenge that aims to establish low carbon zones in all state capitals and major urban areas. The ultimate goal is for 200 Low Carbon Zones."

In 2019, MGTCC launched the Low Carbon Cities 2030 Challenge (LCC2030C) to accelerate the shift towards a low carbon future. The Challenge aims to establish low carbon zones in all state capitals and major urban areas. The ultimate goal is for 200 Low Carbon Zones and 1,000 Low Carbon Partners in all 156 local authorities nationwide by 2030.

So far, MGTC has collaborated with authorities to create 63 low-carbon zones and 149 low-carbon partners. Under this Challenge, participants are assessed every year on their rate of GHG reduction in five areas: energy, water, waste, transport, and green spaces or carbon sequestration. They are required to fill a customised LCC2030C Data Input Spreadsheet that monitors their carbon reduction and sequestration efforts.

LCC2030C participants are also subject to audits, which are conducted every year starting in August until October. "There is no need for local authorities to be audited every year," says Saiful Adib. "However, they are recommended to request for audits whenever a carbon mitigation programme has been carried out. When the audit shows an impressive reduction in carbon emissions, we will nominate the local authority for the "Diamond Recognition" during the Annual Low Carbon Cities Award.

"LCC2030C is also a recognition programme. Every year, we organise the Low Carbon Cities Awards that celebrates local authorities who have made remarkable progress in cutting back on their GHG emissions," he adds.

LCC2030C has seen participants introducing green and smart technologies to achieve their low carbon goals. These include energy-efficient street lighting, advanced water and waste management systems, and the prudent use of resources. They also mobilise the public to participate in sustainability practices by organising recycling programmes, energy conservation tips and green community projects.

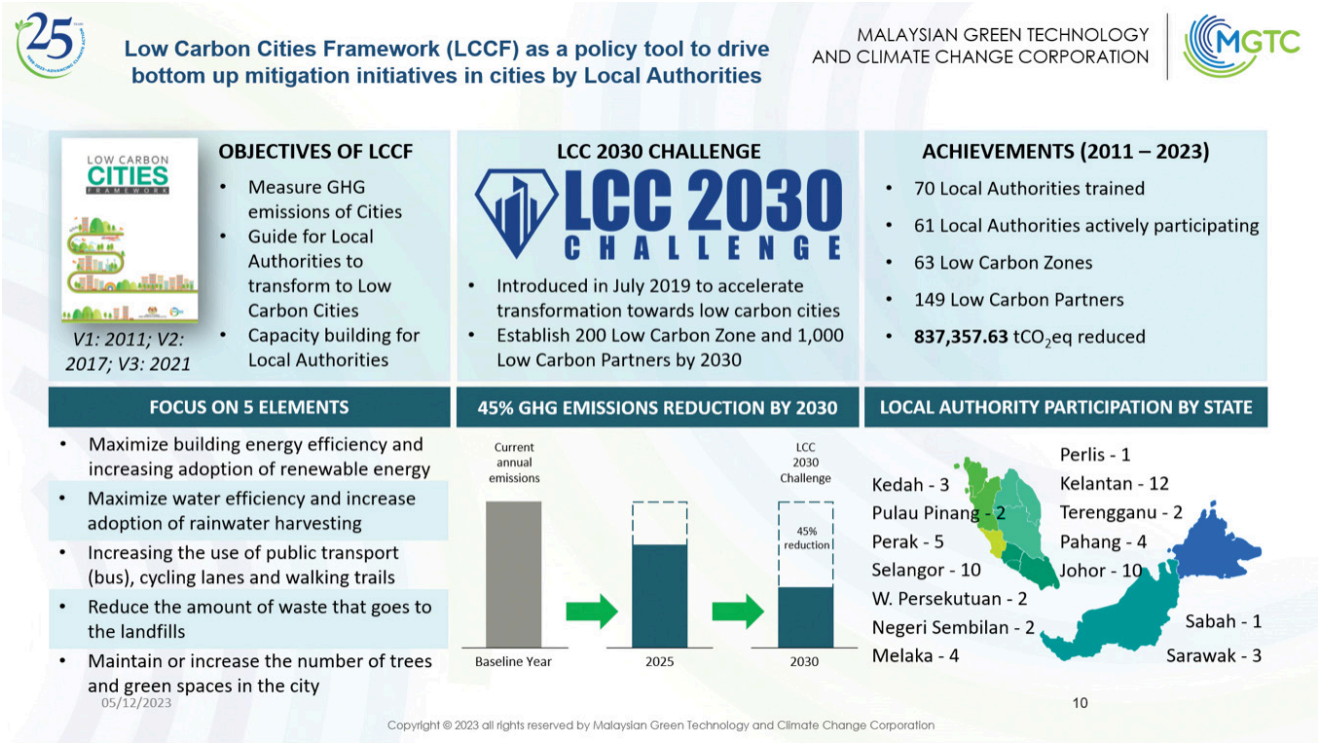
Achievements

Between 2011 and 2023, LCCF recorded a reduction of 837,357.63 tonnes of carbon dioxide equivalent and carbon absorption of 45,195.22 tonnes, akin to planting 22,063,821 trees or eliminating the annual carbon footprint of 191,044 cars on the road.

A total of 70 local authorities have been trained on carbon emission mitigation, and 61 remain active participants. A total of 63 low carbon zones have been established in Malaysia, with 149 supporting partners.

At the Low Carbon Cities Award 2023, the Shah Alam City Council was judged as the most active local authority. A total of 23 of its developments received the Diamond Recognition for their achievements in reducing carbon emissions.

"Between 2011 and 2023, 70 local authorities have been trained on carbon emission mitigation, and 61 remain active participants. A total of 63 low carbon zones have been established."



The "Highest Carbon Reduction for Partners" award was won by Texas Instruments Malaysia while the "Highest Carbon Reduction for Special Partners" award was won by Sekolah Kebangsaan Kampung Tun Razak in Melaka.

For the "Design" category, the Diamond Design Recognition was awarded to Petaling Garden Sdn. Bhd for Setia Warisan Tropika; and Setia Eco Templer Sdn. Bhd. for Setia Eco Templer. This award is given to developers planning city scale development that have the potential to reduce GHG emissions through the implementation of low-carbon city strategies at the design stage of the development.

"The participation of local authorities is increasing year to year," says Saiful Adib. "It shows they recognise that the LCCF can help their districts, towns and cities achieve a low carbon status."

National Low Carbon Cities Masterplan

When the LCCF was introduced, it was about providing technical guidance. In time, it became evident that there was a need for an overarching framework that

"The National Low Carbon Cities Masterplan is the overarching framework that provides holistic support as well as top level governance."

provides holistic support as well as top level governance. This was resolved in 2021, when the National Low Carbon Cities Masterplan (NLCCM) took effect. NLCCM acts as the central umbrella for the transformation of Malaysian cities into low carbon cities and push low carbon developments to the next level.

NLCCM was developed under the Green Technology Application for Low Carbon Cities and sponsored by the United Nations Development Programme (UNDP). The Masterplan consists of three key drivers: governance and implementation framework, urban planning and community participation – all of which are needed to effect transformative change. In addition, it consists of three key enablers: funding and capacity building, data collection and analysis, and built environment and physical infrastructure to assist in providing a more significant impact.

For the carbon reporting standard, LCCF has also moved towards using the Global Protocol for Community-Scale Greenhouse Gas Emission Inventories (GPC) as the central carbon reporting standard since 2023. "As at end 2023, we have selected two local authorities, namely, the Alor Setar City Council (Majlis Bandaraya Alor Setar), Kedah and Sepang Municipal Council (Majlis Perbandaran Sepang), Selangor and guided them on how to use the GPC Carbon Inventory Reporting Standard," says Saiful Adib. "Overall, 33 local authorities have been selected to implement the NLCCM."

These 33 local authorities have been divided into three groups, with each group given a deadline to achieve net zero carbon emissions. NLCCM is a long-term plan that supports the Malaysian Government's commitment to realise its net zero carbon aspiration by 2050.

Our Priority is the Safety of Electric Vehicles Charging Stations, says Energy Commission

Malaysia ranks as having the highest car ownership per capita in Asia. This means elevated carbon emissions by the transport sector. The Government is pushing for electric vehicles (EVs) to account for 80% share of the vehicle fleet by 2050. This also underpins the Low Carbon Cities roadmap. Currently, EVs make up about 2.3% of total registered vehicles, and are made up of Plug-In Hybrid Electric Vehicles (PHEV) and Battery Electric Vehicles (BEV).

The National Energy Transition Roadmap's (NETR's) Low Carbon Nation Aspiration is for EVs to make up 38% mobility in the country.

Multiple studies have demonstrated that consumer willingness to own EVs is heavily reliant on the density and accessibility of a regional charging network. Dubbed a "chicken and egg problem", EV charging infrastructure has to be in place to nudge consumers to shift to EVs. Recognising the importance of charging infrastructure to boost EV adoption, the Low Carbon Mobility Blueprint (2021-2030) has set a target for 10,000 EV charging stations (EVCS) by 2025. According to the MGTC's EV Charging Network Map, EV stations are to be located along highways and selected commercial buildings, namely, malls (24%), strata buildings (24%) and hotels and resorts (13%).

Under Section 50E of the Electricity Supply Act 1990 that took effect in February 2025, the Energy Commission as the licensing authority can take action against errant operators, installers and users who do not comply with the EVCS standards set by the Commission.

"For the Energy Commission, our priority is to ensure that EVs are charged safely and pose no risk to owners and the general public," says Ir. Ts. Mohammad Nor, Senior Assistant Director, Electrical and Gas Safety Development Unit. He explains that the Commission issues licences to operators who meet the regulatory and technical safety standards.

"We have published the "Guidelines on Electric Vehicle Charging System (EVCS)" that details what EVCS operators must do, which can be downloaded from the Commission's website. While the majority of EVCS are public facilities, we envisage the trend for private car and fleet owners choosing to have their own charging units. Regardless of the size and type of charging, public or private, all charging units/ stations are subject to our statutory requirements, installation standards, operational guidelines and maintenance protocols. It is a matter of safety," he adds.

In December 2023, there was an incident of an unlicensed charging station where an EV caught fire.

- **Statutory Requirements**

Electrical wiring plans must be prepared and submitted according to Regulation 65 of the Electricity Regulations Act 1994, with specific qualifications required for different rated switch gears. All electrical work must be performed by authorised personnel recognised by the Commission.

All electrical equipment used must be approved by the Commission and affixed with predetermined labels as prescribed in the guide. Meanwhile, safety compliance standards are outlined in Appendix 1 of the Guidelines on Electric Vehicle Charging System (EVCS).

Ir. Ts. Mohammad Nor
Senior Assistant Director,
Electrical and Gas Safety Development Unit, Energy Commission

MODE 1

This method of charging without a control box is **prohibited** in Malaysia because it does not meet the safety requirements as stipulated in the Energy Commission's EVCS Guidelines.

MODE 2

Portable charging with control box *(usually for low to mid-range battery capacity vehicles).*

MODE 3

Alternating Current (AC) fixed charging station that takes six to eight hours to fully charge *(usually for mid to high-range battery capacity vehicles).*

MODE 4

Direct Current (DC) fast charging station that takes four hours to fully charge *(usually for high-range battery capacity vehicles).*

- **Installation and Charging Standards**

There are four charging modes as provided by IEC 61851-1, an international standard by the International Electrotechnical Committee (IEC) for conductive EVCS that defines the general requirements for safe and inter-operable charging.

For the allowed charging modes, electric cables, connectors and adaptors must be protected from dust and water; sized appropriately; and free of joints. These charging modes must also comply with standards set by the Malaysia Standard (MS) and the IEC.

- **Maintenance Protocols**

Regular inspection and maintenance by registered electrical contractors and Competent Persons are compulsory under the EVCS Guidelines. They require the following:

Records: Detailed records of design, construction, operation, inspection, testing and maintenance.

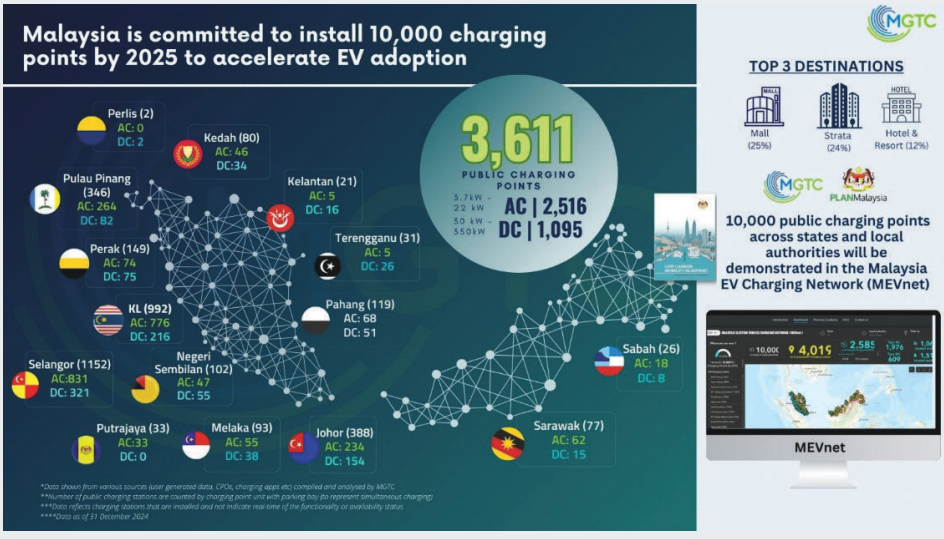
Personal Protective Equipment: Maintenance personnel must be trained in the use of appropriate Personal Protective Equipment (PPE).

Competency: Only registered Competent Persons are allowed to conduct maintenance work, with test certificates issued for each piece of equipment after testing.

As of 31 December 2024, a total of 3,611 EV charging stations have been installed, comprising 2,516 AC chargers and 1,095 DC chargers.

Industry players say charging stations can be installed quickly, with licensing and permits taking three to four months. However, there are city council and municipal requirements, which differ from one to another. In some cases, EV charging companies are subject to rental fees to turn parking lots into EV charging bays. These logistical challenges are the outcome of the absence of a clear, single legislation governing the end-to-end process of EV charging infrastructure.

They also lament over the cost of installation, which is between RM20,000.00 - RM25,000.00 for AC charging stations and about RM50,000.00 for DC charging stations. These are high upfront costs that companies struggle with, especially since the responsibility of installation rests with the private sector. Some charging point operators have urged for subsidies to help to defray these upfront costs, according to an article from Fulcrum (ISEAS - Yusof Ishak Institute) on 6 June 2024.



Pioneer Low Carbon Cities

A few cities around the world serve as examples of successful low carbon city planning and development by their respective Governments and city councils. These cities demonstrate various approaches to reduce carbon emissions.

COPENHAGEN

Denmark's capital is pedalling its way to a carbon-neutral future. By 2025, Copenhagen aims to be the world's first carbon-neutral capital, and it's well on its way. The city's love affair with bicycles is legendary. With over 350 km of dedicated cycle lanes, more than 50% of Copenhageners commute by bike daily. The city's "cycle superhighways" make it possible to traverse long distances safely and efficiently on two wheels.

But Copenhagen's green ambitions don't stop there. The city's district heating system, covering 98% of households, significantly reduces energy waste. Offshore wind farms dot the horizon, powering much of the city's electricity needs.

AMSTERDAM

This Dutch city is making waves in the world of sustainability, with its circular economy strategy. It aims to halve the use of raw materials by 2030, reimagining how a city produces and consumes.

Electric vehicles (EVs) are getting prioritised here. An extensive charging network and attractive tax benefits are making EVs an increasingly common sight on Amsterdam's narrow streets. The city is also turning from grey to green, with its innovative rooftop programme. Substantial subsidies encourage residents to install vegetation on their rooftops, creating a network of elevated gardens that improve air quality and biodiversity.

STOCKHOLM

Stockholm was an early adopter of congestion charges, reducing inner-city traffic by 20% since implementation. This not only cuts emissions but also makes the city more liveable for its residents. For resource efficiency, Stockholm converts sewage and food waste into biogas, which then fuels much of its public transportation. It's a closed-loop system that's both innovative and practical.

OSLO

Norway's capital is taking bold steps towards a car free future. Oslo is gradually removing parking spaces and promoting pedestrian zones in its city centre, reclaiming streets for people rather than vehicles.

In a world first, Oslo has included CO_2 emissions in its annual budget. This "climate budget" ensures that carbon reduction is considered in every municipal decision, setting a new standard in city governance.

VANCOUVER

Vancouver's Greenest City Action Plan is a comprehensive strategy targeting zero waste and clean energy.

The city's green building code sets strict energy efficiency standards for new construction, ensuring that Vancouver's skyline is as eco-friendly as it is beautiful. The city has planted nearly 150,000 trees by 2020, increasing its canopy cover to 30% by 2050.

SAN FRANCISCO

The City by the Bay is making waves with its zero-waste programme. By diverting 80% of waste from landfills through extensive recycling and composting initiatives, San Francisco is setting the bar for urban waste management.

In a region prone to drought, San Francisco is also leading the way in water conservation. The city has implemented state-of-the-art water recycling systems, ensuring every drop counts.

TOKYO

Tokyo is the first city to implement a cap-and-trade programme for buildings, using market forces to drive down emissions.

To combat the urban heat island effect, Tokyo has mandated cool roofs with reflective surfaces on new buildings. It is a simple yet effective way to reduce energy consumption and improve comfort. The city is also at the forefront of smart energy systems, utilising artificial intelligence (AI) to optimise energy distribution and consumption across its vast urban expanse.

SINGAPORE

This city-state is proving that urban density and lush greenery can coexist. Singapore's innovative approach to vertical gardens is integrating nature into its high-rise landscape, reducing heat absorption and improving air quality.

Water scarcity is becoming a non-issue here, thanks to NEWater, Singapore's advanced water reclamation system that meets 40% of the city's water demand. It's a model of resource efficiency for water stressed regions worldwide.

CURITIBA

This southern Brazilian city has long been a pioneer in sustainable urban planning. Curitiba's Bus Rapid Transit system, which moves two million passengers daily has inspired similar systems worldwide.

The city's green exchange programme allows residents to trade recyclables for fresh produce, incentivising recycling while addressing food security. Curitiba has also taken an innovative approach to flood control, converting flood-prone areas into lakes and recreational spaces.

MELBOURNE

Melbourne's urban forest strategy aims to increase the city's canopy cover from 22% to 40% by 2040, creating a cooler, more liveable city. Melbourne's green building retrofit programme is upgrading existing buildings for energy efficiency, proving that old structures can learn new, greener tricks.

Sources: Getaway Magazine and Sustainable Review

A BOLD NEW ENERGY VISION

In September 2021, Malaysia announced its ambition to become a net zero carbon nation by 2050 at the tabling of the 12th Malaysia Plan (2021-2025). It was the first ASEAN nation to make this commitment.

This was followed by the launch of the National Energy Policy (2022-2040) and National Energy Transition Roadmap (NETR). Acknowledging that the energy and transportation sectors are the largest contributors to global warming in Malaysia, the National Energy Policy outlined the Government's priorities for a low carbon future.

The NETR went one step further. Wider in scope, it is a comprehensive framework for Malaysia's transformation to a green economy, supporting national development plans and the National Energy Policy (2022-2040).

Launched in July 2023, the NETR provides a clear pathway to achieve Malaysia's Net Zero 2050 goals. It is premised on a just and inclusive energy transition that will reduce dependency on fossil fuels and attract new investments, new industries and new jobs. It also seeks to position Malaysia as a regional climate leader.

Energy Malaysia had an email interview with Datuk Amar Haji Fadillah Hj Yusof, Deputy Prime Minister and Minister of Energy Transition and Water Transformation (PETRA), to find out what lies ahead as Malaysia pushes forward with its Net Zero 2050 goals.

The Minister started with the endgame, painting a bold new vision of Malaysia's energy landscape in 2050.

"Malaysia's energy landscape is poised for a profound transformation when we achieve our net zero carbon emissions in 2050. By then, renewable energy sources will dominate installed power capacity, with solar, bioenergy, hydro and possibly emerging technologies such as energy storage playing a pivotal role in power generation. Our reliance on fossil fuels will diminish significantly, leading to a cleaner and more sustainable energy mix," he said.

"There will also be a wide deployment of smart grid technologies, enabling efficient energy distribution and management. Energy storage solutions will be advanced, ensuring stability in the grid despite intermittent renewable sources. Electric vehicles will be ubiquitous, supported by a well-established charging infrastructure powered by renewable energy.

"The workforce will witness a shift towards green jobs, with opportunities arising in renewable energy production, energy efficiency efforts, sustainable infrastructure development, and environmental conservation.

"Overall, Malaysia's energy landscape in 2050, upon the realisation of its net zero carbon emissions targets, will be greener, more resilient and technologically advanced. We believe that we will then be on track with an ecosystem, where energy security, energy affordability and environmental conservation are well-balanced to ensure a sustainable energy future for generations to come," says the Minister.

Regional Climate Leadership Ambition

Malaysia is a forerunner in ASEAN's climate change agenda. The Minister points out that Malaysia's early commitment to net zero emissions by 2050 and the creation of national plans like the NETR and the National Energy Policy (2022-2040)

Datuk Amar Haji Fadillah Hj Yusof
Deputy Prime Minister and Minister of Energy Transition and Water Transformation.

provide it with a clear vision, specific goals and targets to achieve. "These are living documents, to be refined with the emergence of new trends, technologies and concerns," he adds. "We are already closely monitoring the progress of our energy transition initiatives and projects, those on the ground and those being planned. We are also prepared to change course when it is based on evidence-based facts. As I see it, Malaysia has a strong energy foundation and the resilience to manage shifts.

"Like most ASEAN nations, Malaysia has abundant natural resources such as solar, biomass and hydro to provide a strong foundation for the energy transition, and it is matter of policy and priority on how the potential of these resources are harnessed," says the Minister.

"Sarawak's abundant hydropower resources, for example, are a perfect fit for green hydrogen production. Its commitment to hydrogen as a clean transportation fuel showcases the benefits of embracing new technologies early on. This not only positions Sarawak as a hydrogen hub in Malaysia but also allows it to learn and refine its approach as the technology matures.

"This strategy highlights the importance of capitalising on existing strengths when crafting a sustainable energy mix. Other regions in Malaysia, even other parts of ASEAN, can identify their own natural resources and explore possibilities for clean energy generation," added the Minister.

At the same time, the Minister remains realistic. "Translating these plans into action is key. Implementing effective policies and regulations, including reducing dependence of fossil fuels, fostering collaboration between the Government, businesses and the public are crucial steps."

In Malaysia, there is the hurdle of having three separate regulatory bodies for electricity and piped gas supply – one each for Peninsular Malaysia, Sarawak and Sabah. These regions are also at different stages of the energy transition, resulting in an uneven pathway towards achieving 2050 targets.

A discussion between delegates from Malaysia and Thailand during the first Senior Officials Meeting on Energy (SOME) held in Langkawi, from 22-24 January 2025. It is one of three SOME meetings scheduled during the year, when Malaysia is the ASEAN Chair.

"To overcome such disparities, the NETR and National Energy Policy (NEP) have adopted an all-of-nation approach that addresses disparities between regional regulations and provides for a more coordinated effort," explains the Minister. "Additionally, these roadmaps incentivise knowledge sharing between policymakers and the authorities in Peninsular Malaysia, Sabah and Sarawak to accelerate the energy transition in all three regions. A more synchronised approach across the three regulatory bodies is crucial for Malaysia to achieve our net zero goals.

He adds, "Another challenge is the fragmented energy governance. Malaysia's energy sector is governed by various ministries, agencies and regulators whose responsibilities are defined by their respective legislations. We thus have energy demand planning intersecting across key economic sectors, namely transport, industrial, residential and commercial. Cross sector collaboration with relevant stakeholders is needed for energy supply planning covering multiple energy sources such as oil, natural gas, coal and renewable energy (RE).

"To overcome inefficient energy planning due to the existing fragmented governance, the NETR provided for the establishment of the National Energy Council (MTN) chaired by the Prime Minister, with the Ministry of Economy as the Secretariat. There is also the National Committee on Energy Transition (NCET), also chaired by the Prime Minister, with PETRA as the secretariat. These two entities are the "sword and the shield", taking to task as well as protecting the interests of the multiple stakeholders involved in Malaysia's energy transition."

The Minister is confident that how the country moves forward with its energy transition goals and manages challenges can help Malaysia's solidify its leadership role and inspire other ASEAN nations to embrace the green growth pathway associated with net zero.

He says, "We are proud that Malaysia was recognised as the best country in Southeast Asia in the Energy Transition Index 2023 by the World Economic Forum. Prime Minister Dato' Seri Anwar Ibrahim has also stressed that Malaysia will take on a more decisive and leadership role in climate action and all socioeconomic matters in line with the nation's inclusive principles.

"We believe that the strong signal from the Government coupled with our progressive policies will naturally attract investments to facilitate climate action and energy transition. This will benefit not just Malaysia but can also lead other ASEAN member states to achieve a common aspiration," he adds.

NATIONAL ENERGY TRANSITION ROADMAP

Driven by the Ministry of Economy, the National Energy Transition Roadmap (NETR) adopts a whole of nation approach for a just and inclusive energy transition. It brings together in a cohesive manner ongoing sustainable projects by various Ministries and Government Agencies. and introduces new catalyst projects to push forward Malaysia's green growth agenda. The NETR is a specific plan centred around six levers, each its own strategies, goals and targets. It also outlines catalyst projects on the ground and those at planning and exploratory stages to make good Malaysia's net zero 2050 ambition.

SIX LEVERS AND TARGETS

ENERGY EFFICIENCY

- To achieve energy savings of 21% by 2040; and 22% by 2050, by raising standards of existing initiatives and introducing new initiatives.

RENEWABLE ENERGY

- To achieve 31% renewables in installed fuel capacity by 2025, 40% by 2035, and 70% by 2050.
- No new coal-fired power plants.

HYDROGEN

- To tap the potential of hydrogen as evidenced in Sarawak that has two hydrogen projects aligned to Sarawak's Hydrogen Economy Roadmap.
- To establish one low-carbon hydrogen hub by 2030; and two more hubs by 2050.
- To phase out grey hydrogen as feedstock by 2050.
- To produce up to 2.5 million tonnes per annum (MTPA) of green hydrogen by 2050 from RE such as hydroelectric power and solar.

BIOENERGY

- To capitalise Malaysia's strong bioenergy potential, namely agriculture related bioenergy and non-agriculture waste such as used cooking oil (UCO) and municipal solid waste (MSW) as sources of bioenergy.
- To use bioenergy as an alternative fuel for power generation and as a means for rural electrification via local microgrids.
- To increase usage of biofuels in transportation, industrial applications and power generation.
- To increase biorefinery capacity to 3.5 billion litres by 2050.
- To increase biomass and biogas power generation capacity to 1.4 GW by 2050.

GREEN MOBILITY

Transportation remains a prominent contributor to GHG emissions in Malaysia, primarily driven by emissions from internal combustion engine (ICE) vehicles. Land transportation segment constitutes about 85% of total emissions from this sector.

- To build on existing national targets outlined by the Low Carbon Mobility Blueprint (LCMB) and National Energy Policy 2022-2040. By 2050, NETR targets are:
  - To elevate public transport modal share to reach 60%.
  - To accelerate the penetration of electric vehicle (EV) share of vehicle fleet to 80%.
  - To accelerate the penetration of electric two-wheelers' share of the vehicle fleet to 80%.
  - To foster robust local EV manufacturing capabilities to achieve 90% local EV manufacturing.
  - To continue improvements in ICE fuel economy.

CARBON CAPTURE, UTILISATION AND STORAGE (CCUS)

CCUS will help Malaysia meets its net zero aspiration by reducing carbon emissions, especially in hard-to-abate industries.

- **By 2030:** To develop three CCUS hubs (two in Peninsular Malaysia, one in Sarawak, with total storage capacity of up to 15 MTPA.
- **By 2050:** Develop three carbon capture hubs with a total storage capacity of 40-80 MTPA.

Source: Extracts from the National Energy Transition Roadmap published by the Ministry of Economy Malaysia.

NATIONAL ENERGY POLICY (2022-2040)

The National Energy Policy (NEP) positions the energy sector as the main driver of Malaysia's socio-economic prosperity. Aligned to long-term national development plans, it aims to future-ready the energy sector and be in sync with energy transition trends. Its primary goal is for Malaysia to become a low carbon economy by 2040.

KEY ECONOMIC GROWTH ACTIVITIES (KEGA)	
KEGA 1	Islamic Finance Hub 2.0
KEGA 2	Digital Economy
KEGA 3	Fourth Industrial Revolution
KEGA 4	Content Industries
KEGA 5	**ASEAN Hub**
KEGA 6	Halal and Food Hub
KEGA 7	**Malaysian Commodities 2.0**
KEGA 8	**Logistics, Transportation and Sustainability Mobility (LTSM)**
KEGA 9	Coastal and Maritime Economies
KEGA 10	Centres of Excellence
KEGA 11	**Renewable Energy (RE)**
KEGA 12	**Green Economy**
KEGA 13	Smart and High-Value Farming
KEGA 14	Advanced and Modern Services
KEGA 15	Tourism: Malaysia Truly Asia

ENERGY-RELATED FOCUS AREAS

- **ASEAN Hub:** Establish ASEAN hubs in 12 activities, including a gas trading market.
- **Malaysian Commodities 2.0:** Move from low value-added traditional commodities trade to downstream products to generate higher returns and growth of new industries.
- **LTSM:** Use of green technology, low carbon and strategic traffic management solution; and establishment of new economic centres in aerospace, automotive and shipbuilding.
- **RE:** Use of new technologies, providing pilot localities and offering funding for RE generation.
- **Green Economy:** Enphasis on low carbon activities including green buildings, sustainable transportation, circular economy and others.

Source: Extract from the National Energy Policy document published by the Economic Planning Unit, Prime Minister's Office.

"No" to Coal, "Yes" to Gas

Like other ASEAN countries, Malaysia must carefully balance its energy transition away from coal. "Our decision to not build new coal plants is a significant step toward a lower carbon footprint. However, a complete shift away from coal poses many challenges," says the Minister.

He adds, "Coal is now a substantial part of Malaysia's economy and energy mix, generating around 60% of its electricity. A just and gradual transition from coal is essential. This involves embracing RE while acknowledging the current reliance on coal. Alongside renewables, cleaner transitional fuels like gas and the responsible utilisation of biomass are crucial for a sustainable energy future."

The NETR sees natural gas as a bridge towards a low carbon future in Malaysia, providing a cleaner and more reliable source of energy than coal while renewables develop further. It also acknowledges the need to address gas price volatility and emissions through various initiatives.

The case for gas is:

- **Less Emissions:** Compared to coal, natural gas burns cleaner, emitting less greenhouse gases (GHG). This makes gas the transitional fuel in a system with high capacity renewables.
- **Reliability and Flexibility:** Variable renewables like solar are subject to weather conditions. For a reliable supply of energy, gas-fired power plants are recommended. They can be quickly ramped up or down to meet fluctuations in electricity demand.
- **Well Developed Infrastructure:** Malaysia has a well developed natural gas infrastructure for power generation and industry. Utilising this existing network makes the transition more cost effective.

The case against gas is:

- **Dwindling Reserves:** At current production rates, Malaysia's reserves are projected to last for at least another 36 years. Now a net exporter of gas, the tables may turn, and Malaysia may become a net importer of gas, which are subject to price volatility.

- **Long-Term Contracts and Blends:** There is a need to explore ways to secure gas supply through long-term contracts; another consideration is to blend gas with lower-carbon alternatives like hydrogen.

Serious About Nuclear

Although Malaysia had earlier declared "No to Nuclear", it is now seriously considering nuclear power plants. Whether they are to be full scale power plants or small modular reactors (SMRs) is left to be seen.

The unfortunate truth is that the continued dependence on coal and natural gas as electricity demand increases will result in higher emissions of carbon dioxide (CO_2) and other GHGs. This will reverse gains made so far to reduce GHG emissions intensity of GDP by 45% by 2030 relative to 2005 values, as pledged in the 2016 Paris Agreement.

At the sidelines of the Summit of the Future of Energy Security jointly organised by the United Kingdom (UK) and the International Energy Agency (IEA) in London in April 2025, Datuk Amar Haji Fadillah was reported by the New Straits Times (24 April 2025) to have asked the IEA to assist Malaysia in studying the use of nuclear energy.

The Minister had said, "During the meeting, I shared the view that we need IEA support in terms of technical advice on this form of stable energy supply, how it can provide technical support and also for us to develop policies and strategies."

The nuclear option has been making its rounds for the past couple of years, as a clean baseload fuel for power generation to offset the variability of renewables. According to PETRA, nuclear energy is a low carbon option capable of producing large amounts of baseload electricity. And it can play a dual role by helping diversify Malaysia's fuel mix while reducing emissions from the energy sector.

Concerns over radioactive waste and spent fuel are being allayed by research

"Malaysia needs the support of the International Energy Agency to study nuclear energy for power generation, in terms of technical advice and also for us to develop policies and strategies."

that shows that these are relatively small in volume and can be safely contained without being hazardous to the environment. Arguments over cost are being countered by proponents of nuclear energy who say that it will be cost competitive against existing baseload coal and combined cycle gas turbine (CCGT) power plants.

PETRA's findings show that although the initial capital cost for nuclear energy is higher, a nuclear power plant can produce large amounts of electricity for a much longer period of time compared to baseload fossil fuels plants. Moreover, modern nuclear power plants have a design life of at least 60 years, almost double that of coal and natural gas plants.

There are also economic benefits in going nuclear, says PETRA. During the development and construction phases (assuming a duration of 13 years), a 2 x 1000 MW nuclear power plant project in Peninsular Malaysia is projected to generate in total about RM21.9 billion in gross domestic product (GDP), RM6.8 billion in disposable income, RM56.6 billion in production output, and create about 172,000 jobs.

Power Trading Competition and Collaboration

The economic benefits of the energy transition extend to power trading, with Peninsular Malaysia and Sarawak looking to export their surplus RE. The Minister notes that Peninsular Malaysia and Sarawak eyeing Singapore as a potential buyer is an interesting situation. He says, "Competition is possible, with both regions eyeing for market share. However, collaboration holds promise too.

He adds, "Peninsular Malaysia's strength in solar could complement Sarawak's hydropower solution, creating a well rounded energy mix for Singapore. The Ministry can play a key role by facilitating joint marketing efforts and highlighting their combined strengths. Additionally, with a standardised regulatory framework across the regions, we can streamline power trading, making Malaysia a more attractive option for Singapore.

"By fostering collaboration and ensuring efficient regulations and infrastructure, the Ministry can transform potential competition into a win-win. This will allow Malaysia to capitalise on power trading opportunities and establish itself as a reliable regional supplier of RE," he explains.

Power trading between Peninsular Malaysia and Singapore commenced in December 2024, with a Renewable Energy Supply Agreement (RESA) between Tenaga Nasional Bhd. (TNB) and Sembcorp Power Pte Ltd. (Sembcorp Power). They are utilising the existing interconnection network between the two countries.

This pioneering supply involved a bidding process conducted by the Energy Exchange Malaysia (ENEGEM) in June 2024. ENEGEM, which is implemented by the Commission, enables the purchase and delivery of green electricity from Malaysia's power supply system through a competitive auction process.

In Sarawak, there are plans to export hydropower to Singapore through a submarine power cable, a project that is due to become operational by 2031. It is estimated to supply up to 1 GW of power to enhance energy security in Singapore, while positioning Sarawak as a leading green energy supplier.

There is strong potential for power trading in the region, via the ASEAN Power Grid (APG) that aims to integrate electricity grids across Southeast Asia. It began with the implementation of the Lao PDR-Thailand-Malaysia-Singapore Power Integration Project (LTMS-PIP). Described as a pathfinder project, LTMS-PIP facilitated multilateral cross border transfer of electricity from Lao PDR to Malaysia in 2018 and Singapore in 2022 through existing interconnections.

LTMS-PIP's capacity of electricity trade has doubled since then. The next stage of APG is focused on integrating RE sources and promoting a more resilient and interconnected energy system within the region. It covers Phase 2 of the LTMS-PIP project as well as exploring new interconnections, like the Brunei Darussalam-Indonesia-Malaysia-Philippines Power Integration Project (BIMP-PIP).

The BIMP-PIP aims to study cross-border power trade and could lead to future interconnections. Several bilateral interconnections are also being explored, including subsea cables between Singapore and Vietnam, Singapore and Cambodia, as well as an overland connection between Lao PDR and Vietnam.

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"Energy and climate transition are two intertwined and complex issues, which involve balancing energy security with affordability, integrating renewables into the grid, and ensuring a just transition for all stakeholders," says Datuk Amar Haji Fadillah. "It is clear that the road ahead will not be easy. There will be setbacks, unexpected developments, and moments of doubt. However, I am confident that with the unwavering determination of the Government and private sector, we can make this strategic intent a reality," he adds.

What the NETR Means to the Energy Commission

The Energy Commission was a part of the working group that formulated the National Energy Transition Roadmap (NETR). "We advised on two of the six levers of the NETR, namely, energy efficiency (EE) and renewable energy (RE)," says the Commission's Chief Executive Officer Dato' Ir. Ts. Abdul Razib Dawood. "We weighed up both climate change and energy security priorities, to ensure that we are not dependent on fossil fuels or vulnerable to the price fluctuations of imported fuels."

For energy efficiency, the Commission advised on the development of the National Energy Efficiency Action Plan 2.0 (NEEAP 2.0) to replace the first NEEAP that expires in 2025. The catalyst was the Energy Efficiency and Conservation (EECA) Act that took effect on 1 January 2025, to monitor large consumers.

For RE, the focus is on paring down emissions from the energy sector (including oil & gas and transportation), which accounts for about 60% of the national share.

"There is a timeline set for the roll out of electric vehicles (EV), where the Commission is the licensing authority for EV charging stations. The game changer is battery energy storage systems (BESS) to increase solar energy penetration, address RE intermittency and grid stability," says Dato' Ir. Ts. Abdul Razib.

In November 2024, the Commission called for a Request for Qualification from BESS service providers to participate in a competitive bidding exercise to install BESS projects. Each project is to have a capacity of 100 MW / 400 MWh at the grid level. To be operationalised in 2026, the tender will see an overall BESS capacity of 400 MW / 1,600 MWh.

Dato' Ir. Ts. Abdul Razib says, "Other clean energy sources are also on our radar. They include smaller scale nuclear power plants to generate baseload fuel. What can be considered are small modular reactors (SMRs). Currently, the baseload fuel comes from coal-fired power plants. Under the NETR, there will be no more new coal-fired power plants and expiring coal power purchase agreements will not be renewed.

"Malaysia is witnessing a surge in investments in data centres, semiconductor manufacturing and other industries that never sleep. They need non-stop electricity supply. Nuclear is a viable option to fill the shoes of coal. It is a low-carbon, relatively stable and a potentially sustainable energy source and when guided by knowledge, values and responsibility, it can be a catalyst for a more sustainable, innovative and competitive future.

"Gas, which can be switched on and off based on demand is better as a transition fuel," points out Dato' Ir. Ts. Abdul Razib. "It can be used to address the intermittency of RE, alongside BESS. The hard truth is that Malaysia, a net exporter of gas, has dwindling gas reserves. Gas prices in the open market

Dato' Ir. Ts. Abdul Razib Dawood
The Commission's Chief Executive Officer at the time of writing.

"Nuclear is a viable option to fill the shoes of coal. It is a low-carbon, relatively stable and potentially sustainable energy source, and when guided by knowledge, values and responsibility, it can be a catalyst for a more sustainable, innovative and competitive future."

are subject to price volatility, and this will influence the cost of generation, which in turn affects tariffs and the cost of doing business in the country. This is a disincentive for investors."

Other RE sources in the pipeline are low speed wind turbines, geothermal, waste-to-energy systems and ocean thermal energy conversion (OTEC). "These are still at an exploratory stage. For now, the focus is on solar energy and to some extent, bioenergy from biomass produced by agricultural, household and industrial waste," he adds.

New Laws and Modernising Existing Laws

"For the successful implementation of the NETR, there is a need for new laws and modernisation of existing ones," says Dato' Ir. Ts. Razib. "The NETR levers relating to carbon capture, utilisation and storage (CCUS) and hydrogen need regulatory frameworks to guide operations. CCUS is championed by the Ministry of Economy while hydrogen comes under the ambit of the Ministry of Science, Innovation and Technology. The CCUS bill was passed in Parliament in March 2025; the Hydrogen Bill is still being drafted. The Ministry of Natural Resources and Environmental Sustainability, meanwhile, is drafting the Environment Act, also to be tabled soon.

"Meanwhile, the Commission is amending the Energy Supply Act 1990 that governs it, with regard to the Single Buyer that procures electricity from all power producers and distributes to consumers. Currently, the Single Buyer is a ring-fenced entity within Tenaga Nasional Bhd (TNB). With the proposed amendment, it will be a legal independent entity that can win the confidence of investors.

"The independent entity will also be regulating the green attributes of electricity supply. It will set standards for Renewable Energy Certificates (RECs), Green Energy Tariffs and the like. The goal is to prevent greenwashing by unscrupulous bodies or individuals," says Dato' Ir. Ts. Abdul Razib.

Bankability of Projects, Tax Pressure

Besides economic, technical and safety regulation, the Commission also advises the Government on policies relating to electricity and piped gas supply. "We have a lot of data and simulation models to run tests and affirm the feasibility of policies. These are shared with the Government, and when a policy is finalised, the Government hands it back to the Commission to develop the regulatory framework and guidelines.

"An example is the Corporate Renewable Energy Supply Scheme (CRESS) that the Government introduced in October 2024. The Commission developed the regulatory framework, which included costs, internal rate of return and other information based on real data. We made sure CRESS is green enough and bankable enough to attract investors. This is our approach to take the electricity and gas supply business to the next level," he added.

Capitalising on ASEAN Power Grid

Dato' Ir. Ts. Abdul Razib says, "The ASEAN Power Grid has a lot of unrealised potential in energy integration. For example, Lao PDR which produces plenty of hydro power, can earn revenue by selling it to its ASEAN neighbours, who may find it cheaper than developing their own renewable assets. An integrated grid system can also enhance energy security to cope with rising demand resulting from population growth, rapid industrialisation, urbanisation and electric vehicles."

In 2024, Malaysia started exporting surplus RE to Singapore under the Cross-Border Electricity Scheme (CBES). The sale was conducted via the Energy Exchange Malaysia (ENEGEM), a power trading platform with a bidding mechanism operated by the Single Buyer. ENEGEM conducted a pilot auction to export 100 MW of RE to Singapore that was sold at a premium. It was one way to test demand while ensuring adequate supply in the local market. The sale is to be expanded to 300 MW in the future, and the price difference is to be ploughed back to boost the RE space in Malaysia.

Dato' Ir. Ts. Abdul Razib adds, "ASEAN is an informal grouping that operates on the principle of consensus and shared prosperity. It has the open skies policy that allows regional carriers to fly to ASEAN destinations based on common rules of engagement. A similar concept can be viable for the transportation of power between members states.

"What may be needed is a Grid System Operator, to oversee grid stability, transmission standards and fair-trade practices between buyers and sellers. Should this happen, hopefully in the near future, there can be a win-win regional energy integration that brings member states closer towards achieving their individual net zero goals," he adds.

This was Energy Malaysia's last interview with Dato' Ir. Ts. Abdul Razib Dawood as the Chief Executive Officer of the Energy Commission; he has left the Commission to join the ASEAN Centre of Energy as its Executive Director.

DECARBONISING ELECTRICITY SUPPLY: THE COMMISSION'S MILESTONES

Renewable energy and energy efficiency initiatives are not new to the Commission. In the past two decades, they have been the twin pillars to decarbonise the electricity supply industry and stimulate green growth.

2008

- *Efficient Management of Electrical Energy Regulations (EMEER)*
- *Registered Electrical Managers (REM)*
- *Monitoring Performance of Energy Usage in 105 Government Buildings (based on EMEER)*

2009

Incentives for Energy Efficient Projects

2011

Feed-in Tariff (FiT)

2013

- *Monitoring Energy Performance Contracting (EPC)*
- *Monitoring 24°C Air-conditioning Policy in Government Buildings*

2014

- *Energy Efficiency (EE) Challenge for schools*
- *Minimum Energy Performance Standards (MEPS) label for electrical appliances*

2015

- *New Enhanced Dispatch Arrangement*
- *Smart Meter roll out begins*

NATIONAL GOALS

Renewable Energy Generation

70% Renewable Energy in Capacity Mix by 2050

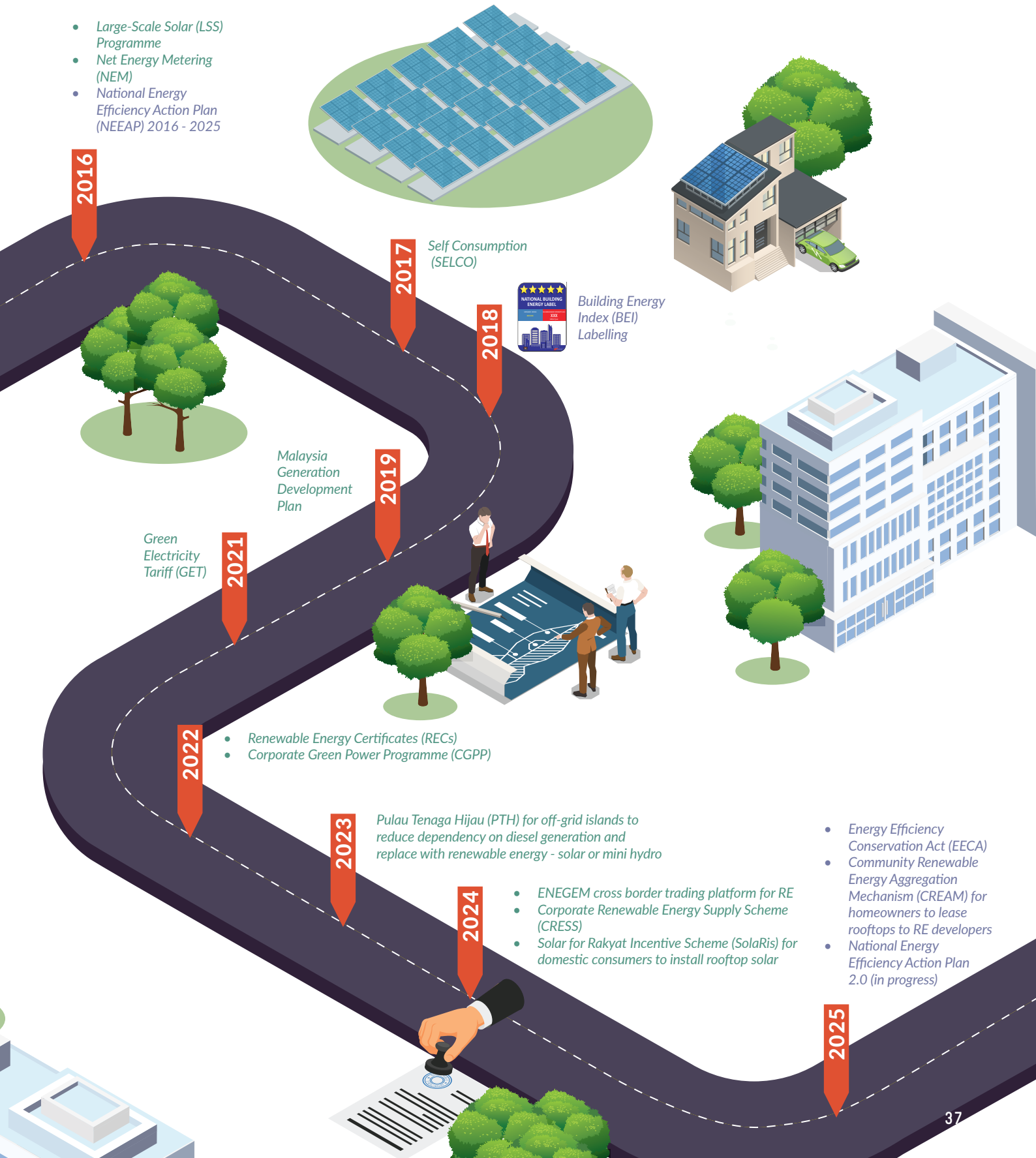
Energy Efficiency

45% Reduction of carbon emissions by 2030, based on 2005 level

KEY DRIVERS

Malaysia's Climate Change Pledges since Rio Earth Summit 1992 → *Malaysia's Five Year Development Plans on Green Growth* → *2015 Paris Agreement* → *National Energy Efficiency Action Plan 2016-2025* → *National Energy Policy 2022-2040 (NEP 2022-2040)* → *2023 National Energy Transition Roadmap (NETR)*

With the 2015 Paris Agreement, National Energy Policy (2022-2040) and National Energy Transition Roadmap, the pace has quickened, mainly to incentivise industrial and commercial consumers to increase their intake of renewable energy and reduce consumption. This has seen the birth of new green industries and business opportunities, including for micro-businesses and households.



BIOMASS CO-FIRING: GREENING COAL-FIRED POWER PLANTS

Dr Mohamad Lutfi Samsudin
Head of Engineering, Malakoff Power Berhad

With surging energy demand, Asia cannot afford to phase out coal-fired power plants altogether and immediately in its move towards energy transition.

On their part, some coal-fired power plants are adopting biomass co-firing technology to reduce coal's negative impacts on the environment.

Malaysia's largest independent power producer Malakoff Corporation Berhad, which owns two coal-fired power plants, is championing biomass co-firing technology demonstration and implementation for the country.

Energy Malaysia speaks with Dr Mohamad Lutfi Samsudin, Head of Engineering, Malakoff Power Berhad on the opportunities for biomass co-firing and its progress so far.

Q Malakoff Corporation Berhad has been reported to be a champion of biomass co-firing. If so, why?

A Malakoff Corporation Berhad is indeed championing biomass co-firing technology implementation in Malaysia. Last year, we embarked on this green initiative together with the Ministry of Plantations and Commodities under Malaysia's National Energy Transition Roadmap (NETR).

We own two coal-fired power plants, that is, the 2,100 MW Tanjung Bin Power Plant (TBPP) and the 1,000 MW Tanjung Bin Energy Power Plant (TBEPP). Both are in Johor. Our ultimate goal is to achieve a 30% GHG emissions reduction by 2031, compared to levels in 2019.

The company is supporting one of the six energy transition levers outlined in the NETR, which is bioenergy through the biomass co-firing initiative at TBPP. Under this initiative, the plan is to burn coal together with a certain percentage of biomass fuel in pelletised form inside its boiler in the process of generating power for dispatch to the national grid. The sources of biomass fuel include empty fruit bunch (EFB) waste, wood chips, bamboo, coconut husk and rice husk.

In December 2022, we had successfully conducted a trial burn of 0.5% biomass co-firing in one of the three generating units of the TBPP. Following this, a second trial burn of 2% biomass co-firing was conducted in the second quarter of 2024, which showed promising results that could allow for a higher co-firing ratio in the future.

At a national level, our project aligns itself well with Malaysia's aspiration for 40% renewable energy (RE) in the total energy mix by 2035 and 70% by 2050. TBPP's co-firing initiative is one of 10 flagship projects identified by the NETR, launched in 2023 as a catalyst for similar projects.

Q Why is this technology considered as one of the more viable options to decarbonise coal-fired power generation?

A It is viable for two reasons. Firstly, by replacing coal with biomass, it can reduce the amount of biomass waste in plantations, which in turn can significantly reduce methane gas emissions that have a higher impact on the environment compared to carbon emissions. Secondly, biomass combustion is carbon neutral, thus reducing emissions when it is used as a blend in coal-fired power plants.

There is a strong case to adopt this technology in Malaysia for the following reasons:

- **Widely Available Biomass Feedstock** – For now, Malakoff uses EFB waste and wood pellets for its biomass source. The EFBs we procure are from plantations in Gambang, Pahang while the wood pellets are from Kapar, Selangor. As we ramp up our co-firing efforts, we will be looking to new sources, most likely within the vicinity of our two coal-fired power plants.

Malaysia is the second largest producer of palm oil in the world, and there are many large plantations and smallholdings in the country, which can be the source of biomass feedstock. When utilising EFBs as biomass fuel for power generation, we are also playing a part in waste management, as a cog in the wheel of the circular economy of plantations and smallholdings. In addition, procuring EFBs and wood pellets, especially from smallholdings, means we can become another source of revenue for them. That is why the Ministry of Plantations and Commodities is also involved in this green initiative.

- **Reduced Emissions** – Co-firing involves partially substituting coal with biomass in coal-fired power plants. During combustion, it generates less sulphur dioxide and nitrogen oxide emissions, causing less environmental pollution compared to coal. By doing so, it directly reduces coal combustion, leading to less carbon dioxide being emitted by the plant.
- **Maintains Efficiency** – Compared to a 100% biomass-fired power plant, biomass co-firing in large coal-fired power plants produces steam at higher pressure and temperature, thereby achieving higher efficiency in power generation with a reduced consumption of fuel.

Q Is it also applicable to other sectors, for example, heavy industries?

A Yes, if they are using coal as their primary source of fuel in their boilers. However, it is essential that a review is made to assess the risk of co-firing with biomass fuel. This is due to the fact that there are some compositions of biomass fuel that could be detrimental to the boiler components, leading to its failure and production downtime. While desktop review will help in assessing the risk and impact on equipment, a trial-burn with biomass fuel in the plant is also important to observe any changes to the operating parameters and emissions and any deposition to the boiler components, especially those that could shorten their service life.

Q When did biomass co-firing technology start? Has it been implemented elsewhere, and what are the results achieved?

A The concept originated in the 1990s, driven by the need to reduce emissions from traditional coal-fired power plants. Subsequently, it was commercially implemented worldwide as a quick and relatively cost-effective introduction of green energy in the utility sector, starting in the United Kingdom (UK) and European Union (EU) since the early 2000s. Several European countries and the United States of America (USA) have implemented biomass co-firing as part of their RE strategy. Emerging economies like China and India, with abundant biomass resources and rapid growth in coal-fired capacity, are also exploring co-firing options.

Some examples of biomass co-firing that have been successfully implemented include Drax Power Station and Lynemouth Power Station in the UK, Amer 9 Power Plant in the Netherlands and Shin Onoda Power Plant in Japan.

Our application of the biomass co-firing concept in Malaysia is very much different from those applied elsewhere around the world. Some of the countries highlighted above are importing biomass from international suppliers who planted energy crops specifically to be harvested later as biomass fuel.

Transportation of biomass fuel across the globe contributes to carbon emissions, thus it is less preferred. In Malaysia, it is hoped that the abundance of agricultural waste, such as palm oil waste, within the country can be harnessed domestically as biomass fuel for local consumption, thereby reducing carbon emissions from the transportation of the fuel.

Q How does this technology compare with other clean coal technologies such as Integrated Gasification Combined Cycle (IGCC), High Efficiency Low Emission (HELE), and Carbon Capture, Utilisation and Storage (CCUS), among others?

A Clean coal technology refers to a collection of technologies and methods aimed at reducing the environmental impact of coal being used in power generation. It looks at reducing emissions of pollutants, improving the efficiency of coal combustion, and enabling the capture and storage of carbon dioxide. Among the applicable technologies include CCUS, IGCC, coal gasification, electrostatic precipitator (ESP), flue gas desulfurization (FGD), low nitrogen oxides (NOx) burner, coal washing and others. Most modern power plants, including have already adopted these technologies.

While incorporating these clean coal technologies when a power plant is already in its operating phase involves huge capital expenditure (CAPEX), we see biomass co-firing as a more cost-effective, more viable, faster and cheaper alternative that would achieve equally the same purpose - which is to reduce the impact of coal combustion on the environment. With its proven track record, it would also serve better as an energy transition fuel in reducing coal consumption in the future.

Q Is Malakoff using any country or model as a benchmark for its biomass co-firing initiative?

A We are referring to the 3.9 GW Drax Power Station in England and 603 MW Amer 9 Power Plant in the Netherlands as benchmarks. For these plants, the biomass co-firing was done progressively with increasing ratio and close monitoring. Reviews are also being done to ensure that there is no major impact to the equipment and plant operations. They have demonstrated that they can ramp up biomass co-firing capabilities and do it efficiently and safely.

Q What are the outcomes of the project?

A We had operated the plant with 2% biomass co-firing using wood and washed EFB pellets for a period of three months. The fuels were delivered to the plant continuously on daily basis by road. A custom-designed feeding

system was used to feed the biomass fuel onto the existing coal conveyor to mix with the coal supply to the boiler. The plant had the ability to seamlessly switch between biomass co-firing and full coal firing, thus its existing obligation for power supply is not impacted. During the co-firing operations, the boiler parameters remain stable without any impact to steam production and power generation and supply to the grid.

With 2% biomass co-firing, approximately 500 tons of coal per day is replaced by biomass consumption for three units in the plant. It contributes to a CO_2 emission reduction of 755,000 tons per year.

Q What are the challenges in deploying this technology?

A The main challenge is finding adequate and sustainable sources of suitable biomass feedstock, preferably within the country, to generate electricity. The other challenge is the current fluctuating cost of biomass feedstock. It currently costs 90% more to produce energy from biomass as compared to coal. Since the biomass fuel has a lower calorific value than coal, more volume of biomass fuel is required to produce the same energy output as with coal.

Most biomass fuel suppliers prefer to have a binding engagement as a means to lock the fuel prices as opposed to transaction purchases that would lead to price fluctuations. A firm direction from the Government on the continuation of

"We see biomass co-firing as a more cost-effective, more viable, faster and cheaper alternative that would achieve equally the same purpose as other clean coal technologies."

biomass co-firing would help to keep this long-term engagement with these suppliers, thereby keeping the price stable. In addition to this, the lack of factories producing biomass fuel in pelletised form contributes to the low supply that affect its prices. With the Government's incentives on this, it is hopeful that more investments can be made for more factories in the country to increase the supply of this biomass fuel.

Malakoff continues to collaborate with universities and agencies to conduct research in these areas, especially in optimising the production and logistics of biomass fuel and the reuse and recycling of ash generated from the power plant.

Q What is Malakoff's roll out plan for biomass co-firing in its coal fired plants?

A There are two coal-fired power plants in Malakoff's portfolio – both in Tanjung Bin, Johor. We have set three clear targets for them in relation to our aspiration towards biomass co-firing, and thus far we are on track in achieving all of them:

- A 12-day trial burn for 0.5% biomass co-firing was completed in December 2022 as a proof of concept for its application for the boiler in TBPP.
- A 3-month demonstration of 2% biomass co-firing with wood and EFB washed pellets was completed between April and June 2024, to check on the availability and supply of the biomass fuel and to verify on any impact to TBPP operations.
- Scalable commercial operations with a minimum biomass co-firing of 15% for power generation in TBPP in 2027 onwards.

Q Will Malakoff be pursuing collaborations with energy technology companies to continuously upgrade this technology?

A Yes definitely. Currently, Malakoff is actively exploring state of the art Japanese and European technologies in biomass co-firing and handling equipment to maximise efficiency during the commercial phase of operations.

We are exploring several storage options and strategies for storing large volumes of biomass fuel, in addition to considering the use of biomass torrefied pellets. These advancements have the potential to improve the handling of biomass fuel, ensure safe operations and uninterrupted supply of electricity from our power plants, reflecting our commitment to adopting new technologies for sustainable energy solutions.

Q Can biomass co-firing technology be deployed with other carbon-neutral feedstock to reduce emissions from power plants?

A Yes, biomass co-firing technology can indeed be deployed alongside other carbon-neutral feedstock to reduce emissions from power plants. However,

WHAT ARE TORREFIED PELLETS?

Torrefied pellets are created through a process called torrefaction which is a thermochemical pretreatment process to improve its fuel quality. The biomass is roasted, ground and afterwards pelletised. One of the main reasons for torrefaction is the increase of the energy content. Further advantages of torrefied pellets are:

1. Improved combustion properties (energy content, heating value).
2. Increased grindability (requires less energy during processing).
3. Increased resistance to water absorption (outdoor storage is possible).
4. Reduced biological activity (avoid problems with decomposition of biomass during storage).
5. Increased energy density (reduces transport costs).

Hence, the benefits of torrefaction may outweigh the additional costs for the torrefaction process in many cases.

The common raw material for torrefied pellets is woody biomass, but every raw material which can be pelletised can also be torrefied before or after pelletizing. It is also possible to use low quality feedstocks, like bark. However, the use of alternative raw materials, for example, hay or straw can cause operational difficulties.

Source: ETIP Bioenergy, European Technology and Innovation Platform

prior review needs to be done to eliminate any risk of incurring detrimental effects to plant equipment.

Biomass sources for power generation in Malaysia that have the potential to be considered are palm oil plantation residue, paddy cultivation residue, coconut residue, napier grass and wood pellets.

Q The New Energy Policy 2022 – 2040 states that no new coal-fired power plant will be built after the expiry of existing Power Purchase Agreements (PPAs) with coal power producers. How will this affect Malakoff's portfolio of coal-fired power plants?

A The company is still exploring the potential PPA extension of expiring PPAs via engagement with the relevant parties. Alternative options being considered are to decommission expiring plants and to sell the asset's equipment to potential buyers, and to pursue the redevelopment for selected existing plants such as the Kapar Power Plant.

To reduce our carbon footprint, we also see potential expansion opportunities such as:

- Repowering and building new plants in strategic locations.
- Exploring possible partnerships and collaborations with other players and investors.
- Acquiring new and existing RE projects.
- Intensifying our efforts in the RE sector, especially in high growth sub-sectors such as large-scale solar (LSS), rooftop solar, small hydro, biogas, and Waste-to-Energy (WtE) projects.

Q Do you think that with various clean coal technologies being continuously developed, coal-fired plants should not be written off as yet?

A Yes, I think they should not be written off just yet. Coal-fired power plants in Malaysia are still new and have many useful years ahead of them, beyond the PPA expiry. It would be a waste of huge investments if they have to retire while they can still produce power for the country. Coal is still the cheapest resource used to generate power, and with surging demand for power in Malaysia and the rest of the world, we still need it to keep electricity safe, reliable and affordable.

Particularly pertinent in Malaysia is the absence of nuclear power plants to replace the generating capacities of coal power plants for baseload power. Given this, the country should re-look at the over-reliance on natural gas as the key fuel to meet power demand. In the interest of energy security, which is crucial, it would be preferable to have another reliable fuel source alongside natural gas.

Modifications to existing thermal plants can contribute to a secure and affordable energy transition. For instance, coal power plants can be retrofitted to co-fire alongside biomass sources for consistent and reliable electricity supply.

The rapid and widespread adoption of clean coal technologies will most likely make energy more affordable. Additionally, by diverting biomass to coal-fired power plants, such technologies also relieve the pressure on landfills for waste management, which in turn will benefit the environment and communities.

BUILDING ENERGY INTENSITY LABELLING PROGRAMME

STAR RATING GOVERNMENT BUILDINGS

In 2018, the Energy Commission introduced the Building Energy Intensity (BEI) labelling programme that uses stars to rate the energy efficiency of buildings. Estimates suggest that an increase of one star above the initial level could lead to a combined energy savings of 521 GWh or RM190 million.

The programme was launched with the tagline "Government Leads by Example" and targeted 800 Government buildings. As at end 2024, 498 buildings were star-rated. With the enforcement of the Energy Efficiency and Conservation Act (EECA) in 2025, there is now pressure for purpose-built office buildings with 8,000m² and above of gross floor area to label their buildings with the Energy Intensity Label and to reduce their energy intensity. How does this impact on the BEI labelling programme?

Energy Malaysia speaks to Ir. Ts. Zulkiflee Umar, the Commission's Director of Energy Efficiency and Conservation, on how the BEI labelling programme works, challenges in implementing it, and its future outlook in the light of the EECA.

According to the International Energy Agency (IEA), the building sector is one of the largest energy consumers in the world, accounting for one third of greenhouse gas (GHG) emissions. In Malaysia, the building sector is a significant consumer of energy and contributor to GHG emissions. While efforts are being made to improve energy efficiency in the construction and operation of buildings, rapid urbanisation and economic development have led to increased energy consumption and emissions in this sector.

The Energy Commission's BEI labelling programme with the tagline "Government Leads by Example" is seen as a positive step in this direction. By showcasing the Government's commitment to energy performance monitoring, it sets the stage for other stakeholders to follow suit. The BEI labelling programme plays a critical role in promoting energy efficiency, one of the six levers identified in the National Energy Transition Roadmap (NETR) launched in 2023. Even before the NETR, the Government was already tackling this issue. Back in 2018, there was a directive that made it compulsory for Government buildings that met certain criteria to participate in the BEI labelling programme.

As at end 2024, 498 Government buildings were BEI labelled, and awarded stars based on their energy consumption data from the previous year.

Breakdown of Star-Rated Government Buildings

★★★★★
158 buildings

★★★★☆
97 buildings

★★★☆☆
96 buildings

★★☆☆☆
111 buildings

★☆☆☆☆
36 buildings

The stars represent energy intensity ratings, with each star representing a different level of energy intensity in the building. As a general rule, buildings with a higher star rating are more energy efficient

To assist building owners and managers, the Commission had published a set of Guidelines to determine a building's energy intensity performance. These guidelines can be used to assist the owner or person in charge of a building to understand the criteria and specifications of buildings that require the BEI label, and the formula used by the Commission to issue the value of energy intensity for such buildings.

Up until December 2024, monitoring the progress of BEI in buildings was not within the Commission's jurisdiction; it only issued the star-rated label based on their annual energy consumption. This is set to change with the Energy Efficiency and Conservation Act (EECA) that came into force on 1 January 2025. Under the EECA, the Commission will monitor the progress of BEI labelled buildings, and owners/managers will be required to take appropriate measures if their building is not achieving the minimum BEI requirements. Furthermore, under the EECA, the BEI requirements are not only for Government buildings but also mandatory for private buildings as listed in the Third Schedule under the Act.

What the Stars Mean

One Star - A building rated with one star typically indicates high energy intensity. These buildings consume a significant amount of energy per unit of floor area. They may have inefficient heating, ventilation, and Heating, Ventilation and Air Conditioning (HVAC) systems, poor insulation, outdated lighting or other factors contributing to high energy consumption.

Two Stars - Buildings with two stars have relatively high energy intensity but may show some improvements compared to buildings with one star. They may have implemented basic energy saving measures such as upgraded HVAC systems, improved insulation or lighting retrofits. However, there is still ample room for further enhancements.

Three Stars - Buildings with three stars represent moderate energy intensity. They are more energy efficient compared to lower-rated buildings but still have room for improvement. These buildings may have undergone significant energy retrofits or upgrades, incorporating more efficient HVAC systems, advanced lighting controls, better insulation and other energy saving measures.

Four Stars - Buildings rated with four stars have relatively low energy intensity. They are considered to be quite energy efficient and may have achieved significant reductions in energy consumption compared to lower rated buildings. Buildings rated with four stars often feature state of the art energy-saving technologies, efficient building systems and smart controls.

Five Stars - Buildings rated with five stars represent the lowest energy intensity. They are exceptionally energy efficient, consuming the least amount of energy per unit of floor area among the other star-rated options. These buildings typically feature the most advanced energy-saving technologies, optimal building designs, renewable energy integration and superior building envelopes.

Energy Intensity vs Energy Efficiency

Energy Intensity is measured by the quantity of energy required per unit output or activity, so using less energy to produce a product reduces the intensity.

Energy Efficiency improves when a given level of service is provided with reduced amounts of energy inputs or services are enhanced for a given amount of energy input.

Source: US Department of Energy

EECA is a legislation passed in Parliament in June 2024, which aims to regulate energy efficiency and promote energy conservation across a broad range of sectors. It sets out guidelines and standards to ensure the sustainable use of energy in the country.

"With the enforcement of the Energy Efficiency and Conservation Act, the Commission will be monitoring the progress of BEI labelled buildings, and owners / managers will be required to take appropriate measures when their buildings do not achieve the minimum BEI requirements."

Push Factors

According to Ir. Ts. Zulkiflee, the push factors for building owners and managers to reduce energy intensity are as follows:

1. **Regulatory Compliances:** To comply with energy efficiency regulations and standards established by the Commission.
2. **Policy Goals:** To meet the energy efficiency targets set by the Government as part of broader environmental and sustainability policies aimed at reducing carbon emissions and mitigating climate change.
3. **Market Transparency:** To improve market transparency by providing standardised information on a building's energy performance, enabling tenants, buyers and investors to make more informed decisions.
4. **Benchmarking and Improvement:** To benchmark their energy performance to implement continuous improvements in energy efficiency that will deliver tangible benefits such as reduced energy bills.

Regardless of whether participation is voluntary or compulsory, building owners and managers can also benefit from increased property value, reduced operating costs, improved tenant satisfaction and a more sustainable built environment. Energy efficient buildings also contribute to resilience against rising energy costs and regulatory changes related to environmental protection.

"Whether participation is voluntary or compulsory, owners and managers can benefit from increased property value, reduced operating costs, improved tenant satisfaction and a more sustainable built environment."

Challenges

Data shows that when buildings are retrofitted, their energy consumption declines thereby reducing energy intensity. Examples of retrofitted measures include changing of chiller systems, using low energy usage lights such as LED bulbs, and energy efficient air conditioning systems. Since the management of most Government buildings is outsourced to external property management companies, there is benchmarking and sharing of best practices among each other.

While this is encouraging, the BEI labelling has its share of challenges. They are:

- **Data Availability and Accuracy:** Obtaining accurate and comprehensive data on energy usage for buildings can be difficult. Many buildings may not have detailed energy usage records, or their records may be incomplete or inaccurate.
- **Standardisation**: Developing standardised metrics for measuring and comparing energy intensity across different types of buildings can be complex. Without standardised metrics, it is difficult to ensure consistency and fairness in the labelling process.

Ir. Ts. Zulkiflee Umar
Director of Energy Efficiency and Conservation, Energy Commission

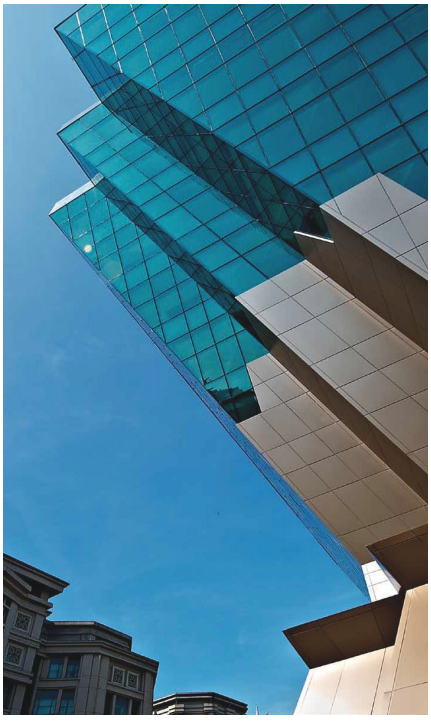
- **Lack of Awareness:** Many building owners and occupants may not be aware of the benefits of energy labelling or the importance of energy efficiency. Increasing awareness and education about the programme's objectives and potential benefits is essential for its success.
- **Enforcement and Compliance:** Ensuring compliance with labelling requirements can be challenging, especially when there is a lack of awareness about the importance of savings, both from a cost and environmental perspective.
- **Privacy Concerns:** Collecting detailed energy usage data for buildings may raise privacy concerns among occupants or building owners. It is essential to address these concerns and ensure that data collection and labelling processes are conducted in a transparent and responsible manner.
- **Incentives and Rewards:** Without adequate incentives or rewards for energy efficient buildings, some building owners may have little motivation to improve energy performance or participate in the BEI labelling programme. Implementing financial incentives or recognition programmes can help encourage participation and drive energy efficiency improvements.

"In the light of the NETR and the EECA goals, the Commission is planning to move forward with new strategies for its BEI labelling programme."

Addressing these challenges requires a coordinated effort involving Government Agencies, building owners, industry stakeholders and the public to develop effective policies, standards and incentives that promote energy efficiency and support the successful implementation of Building Energy Intensity labelling programmes.

The Future of the BEI Labelling Programme

Moving forward, efforts to mitigate energy consumption and GHG emissions in Malaysia's building sector include initiatives such as promoting energy efficient building designs, adopting renewable energy sources, implementing building energy codes and standards, and encouraging building owners to take up green building certification programmes such as the Green Building Index (GBI), GreenRE and Leadership in Energy and Environmental Design (LEED).



The BEI labelling programme complements these initiatives. Additionally, in the light of the NETR and the EECA goals, the Commission is planning to ramp up its BEI labelling programme by implementing a few new strategies. They are as follows:

Expansion and Enhancement

The programme may be expanded to cover a broader range of buildings, including residential, commercial and industrial. Additionally, enhancements to the labelling criteria and methodologies may be introduced to ensure accuracy and relevance to current energy efficiency standards.

Regulatory Support

The Government may provide regulatory support to mandate BEI labelling for certain categories of buildings, such as new buildings under construction or those undergoing major renovations. This would help drive widespread adoption and compliance with energy efficiency standards.

Public Awareness and Education

The Commission will intensify efforts to raise public awareness about the benefits of energy efficiency and the significance of BEI labelling. Education campaigns targeting building owners, developers and occupants can help foster a culture of energy conservation and sustainability.

Incentives and Rewards

The Commission is to advise the Government to introduce incentives or rewards for buildings that achieve high BEI ratings, such as tax incentives, rebates, or recognition schemes. These incentives can attract investments in energy efficient technologies and practices.

Monitoring and Evaluation

The Commission is to continuously monitor and evaluate the BEI labelling programme's effectiveness to assess its impact on energy savings and emission reductions. Feedback mechanisms are to be implemented to help identify areas for improvement and optimisation.

International Collaboration

The Commission is to foster international collaborations and partnerships to exchange best practices, technologies and expertise in building energy efficiency. Learning from successful programmes implemented in other countries can aid in the development and refinement of Malaysia's BEI labelling initiative.

The future outlook of the BEI labelling programme is likely to involve a combination of policy support, stakeholder engagement, and technological advancements to drive energy efficiency improvements in the building sector, thereby contributing to the country's energy transition and environmental sustainability goals.

"Learning from successful programmes implemented in other countries can aid in the development and refinement of Malaysia's BEI labelling initiative."

EECA's Mandatory Energy Audits: A Booster Shot for ESCOs

Under the Energy Efficiency and Conservation Act (EECA), large energy consumers – commercial, industrial businesses and office buildings – will be required to perform mandatory energy audits. They are those who consume more than 21,600 gigajoules of energy per year, approximately equivalent to an annual electricity bill of RM2.4 million or a natural gas bill of RM1 million.

Mandatory energy audits are seen as a booster shot for energy service companies (ESCOs), who play a crucial role in helping large energy consumers achieve their building energy efficiency targets. The ESCO market has seen a steady growth globally as businesses and Governments increasingly prioritise energy efficiency and sustainability.

ESCOs offer a range of services such as energy audits, feasibility studies, design and implementation of energy efficient solutions, financing options, project management and ongoing monitoring and verification of energy savings.

One attractive solution is Energy Performance Contracts (EPCs). Under an EPC arrangement, the ESCO assesses the energy performance of a facility, identifies energy saving opportunities, and proposes energy efficiency measures. The ESCO then implements these measures, often funding the upfront costs, and guarantees a certain level of energy savings over the contract period. The client pays the ESCO from the savings generated by the reduced energy consumption, typically over a specified term.

"ESCOs that embrace innovation and leverage cutting edge technologies are well positioned to meet the evolving needs of their clients and drive market growth."

Engaging an ESCO can offer several benefits. Firstly, it allows large consumers to achieve energy efficiency improvements without the need for significant upfront capital investment, since the ESCO often covers initial costs. Secondly, ESCOs bring expertise and experience in identifying and implementing energy saving measures, optimising energy systems, and ensuring ongoing performance monitoring. Finally, energy savings realised through ESCO projects can contribute to overall cost savings, enhance competitiveness, and reduce the company's environmental impact.

Government policies and incentives can further stimulate the growth of the ESCO market. Measures such as tax incentives, grants, subsidies and favourable financing options can encourage businesses to engage ESCOs and invest in energy efficiency projects. Clear and supportive regulatory frameworks that promote energy performance contracting and remove barriers to ESCO participation can also drive market expansion.

Advances in technology, including smart building solutions, Internet of Things (IoT) devices, data analytics and renewable energy integration, present opportunities for ESCOs to deliver even more sophisticated and effective energy efficiency solutions. ESCOs that embrace innovation and leverage cutting edge technologies are well positioned to meet the evolving needs of their clients and drive market growth.

Overall, the trend of appointing ESCOs by large energy consumers to meet energy efficiency targets is likely to continue growing, driven by the pursuit of cost savings, regulatory compliance, and sustainability objectives.

MALAYSIA'S FIRST DIGITAL ENERGY PLATFORM

Malaysia now has its first one stop centre for all information and vital statistics in the energy sector. The MyEnergyStats digital platform, launched by the Commission on 16 January 2025, is to serve as an open data gateway to spearhead the digitalisation of the country's energy data and to ensure that strategic information is more easily accessible to various stakeholders such as policymakers, corporations, businesses, researchers and power consumers.

"MyEnergyStats was redeveloped to ensure that it remains relevant, user friendly and on par with international energy data platforms."

In his address during the launch, Deputy Prime Minister and Minister of Energy Transition and Water Transformation, Datuk Amar Haji Fadillah Hj Yusof said that MyEnergyStats was redeveloped to ensure that it remains relevant, user friendly and on par with international energy data platforms, such as those developed by the International Energy Agency (IEA) and the International Renewable Energy Agency (IRENA).

"For policymakers, the MyEnergyStats is an important tool that provides real data and analyses to formulate strategic policies. For the industry, this platform offers important information to make strategic investment decisions," he said.

MyEnergyStats offers a variety of latest features and solutions such as more attractive data visualisation, dynamic Sankey diagrams, interactive maps and more systematic data collection capabilities. The mobile application can also be accessed on various platforms and downloaded through iOS, Android and HarmonyOS users.

An additional feature is the Adiwira ST microsite, which includes interactive and easy-to-understand content and supports the syllabus of the Ministry of Education Malaysia.

Datuk Amar Haji Fadillah added that MyEnergyStats can help the private sector identify opportunities during the energy transition, including new technologies that support the country's green agenda. This not only strengthens the industry's competitiveness but also supports public-private collaboration towards sustainable energy development.

Some notable features of MyEnergyStats are:

1. Data published is used in **reporting GHG emissions and preparing Malaysia's Biennial Transparency Report (BTR),** in line with the Paris Agreement.

2. Data is also used to **support the development of the National Energy Policy and related implementation plans** such as the Malaysia Renewable Energy Roadmap (MyRER) and the National Energy Transition Roadmap (NETR).

3. Information and key data on Malaysia are **featured in the "APEC Energy Demand and Supply Outlook Report 2024",** produced by the Asia Pacific Energy Research Centre and the **"ASEAN Energy Outlook Report 2024",** produced by the ASEAN Centre for Energy.

Enhanced Corporate Renewable Energy Supply Scheme

The Government announced enhancements to the Corporate Renewable Energy Supply Scheme (CRESS) effective 1 March 2025. The announcement was made at the launch of the MyEnergyStats portal on 16 January 2025.

CRESS, which commenced in September 2024, aims for eligible renewable energy (RE) generators and corporate companies to transact green energy through an open grid access system whereby third parties can supply or purchase electricity via the grid network system at a predetermined system access charge.

To further enhance the programme, the Ministry of Energy Transition and Water Transformation (PETRA) announced key improvements that are effective 1 March 2025. The key highlights are:

HIGHLIGHT 1

Opening participation in CRESS to existing electricity users seeking direct green electricity supply from RE generators.

HIGHLIGHT 2

Maintaining the System Access Charge (SAC) for three years under the Regulatory Period (RP) of the Incentive Based Regulation (IBR).

HIGHLIGHT 3

Limiting SAC variation rates to a maximum of 15% during RP4 (2025-2027) to ensure long-term cost stability for investors.

SAC charges or wheeling charges have been set at 45 sen/kWh to "wheel" electricity from a solar farm to its corporate consumer (intermittent supply), or 25 sen/kWh when the arrangement is equipped with battery storage (continuous supply).

The power industry's tariff-setting IBR entered the three year term of its RP4 in 2025. The variation cap aims to make electricity costs from renewable energy more stable and encourage more corporate consumers to use renewable energy for their power needs. PETRA also anticipates that the improved structure will attract significant interest from investors in the Malaysian renewables landscape.

Two green electricity supply agreements have already been signed under CRESS – one is between UEM Lestra Bhd and logistic properties management firm ESR Group Ltd; and the other is between Tenaga Nasional Bhd (TNB) and Bridge Data Centre. Under the scheme, UEM Lestra has committed to supply renewable electricity to ESR through third-party grid access, while TNB Renewables has secured a 400 MW agreement with Bridge Data Centre. Both agreements represent the early successes of the CRESS initiative that commenced on 20 September 2024.

PETRA said that the enhancements announced in January will likely attract more corporate interest and provide assurance with long term renewable electricity costs being more predictable.

TVET Students to be Upskilled for Malaysia's Energy Transition

On 26 August 2024, the Energy Commission launched the Technical and Vocational Education Training (TVET) Initiative themed "TVET ST Competent Energy Transition Catalyst". The initiative represents a renewed focus to strengthen TVET students' core competencies and prepare them for the energy transition, especially with skills needed in the electricity and piped gas industries. This initiative also serves to build productive relationships with Regulatory Agencies and Government Institutions to enable them to offer strong support for TVET programmes, in line with the advancement of green technologies.

With the country's push towards decarbonisation of the economy, industrial and commercial businesses are gradually weaning away from using energy from fossil fuel based sources and adopting more renewable energy (RE). To complement this shift, highly competent technicians and engineers are needed to support these businesses with technical solutions based on the use of RE.

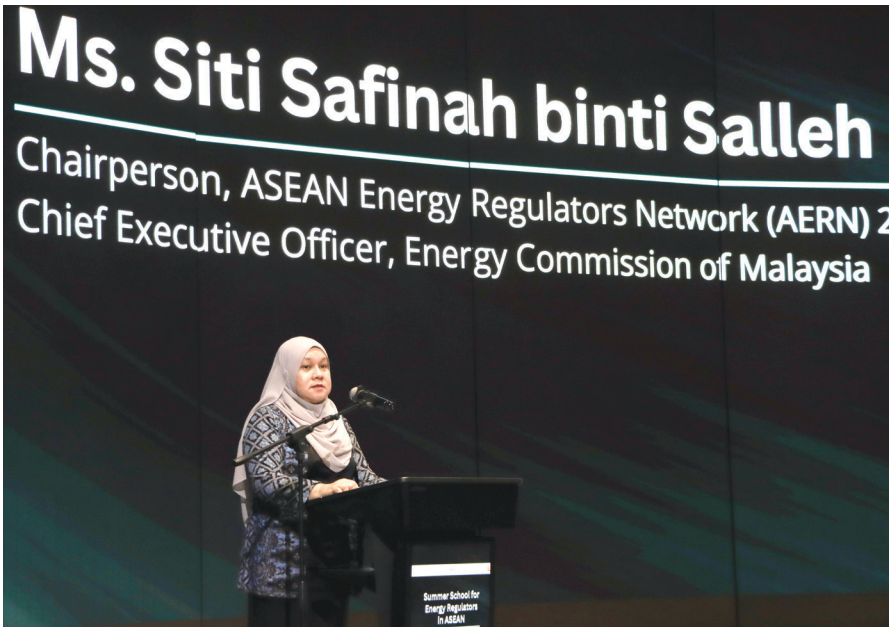
The event was officiated by the Deputy Prime Minister and Minister of Energy Transition and Water Transformation, Datuk Amar Haji Fadillah Hj Yusof, who said that there will be a newly set up TVET Competent ST Council to ensure that institutions that offer electrical and piped gas courses are accredited by ST, in addition to ensuring that the industry appoints Competent Persons specialised in electrical and piped gas fittings and systems.

The aim of the initiative is to empower the TVET Competent ST programme to further increase awareness among institutions to prioritise aspects of electrical and piped gas safety in line with the Code, Instructions and Guidelines issued by the Commission. The Minister added that the implementation of the TVET Competent ST Programme will also create a strong framework for competency development, certification and accreditation that are aligned with Government policies and energy transition initiatives.

Datuk Amar Haji Fadillah added that based on the projected increase in energy transition technology, the country needs 62,000 skilled people to help mobilise RE generation of up to 70% (projected 56 GW capacity) into the power grid by 2050.

Since August 2024, 140 institutions in Malaysia have been accredited to conduct electricity and piped gas competency courses in Malaysia. Apart from that, an MOU between ST and the Energy Commission of Sabah (EcoS) was also sealed today, to further strengthen collaboration between the two regulatory bodies.

Energy Commission launches Summer School for ASEAN Energy Regulators



As the Chair of the ASEAN Energy Regulators Network (AERN), the Commission hosted the Pilot Summer School for ASEAN Energy Regulators from 22-26 September 2025. Described as the first of its kind in the region, it was modelled after the long standing and reputable Summer School on Regulation held annually in Florence.

Held over five days, the inaugural Summer School brought together 35 mid-level professionals from regulatory bodies and utilities across ASEAN, including representatives from the newest member state, Timor-Leste. Its goal is to strengthen regulatory capacity, exchange best practices and prepare for the establishment of the ASEAN School of Regulation.

The opening ceremony was officiated by the ASEAN Energy Regulators Network (AERN) 2025 Chair and the Commission's Chief Executive Officer, Siti Safinah Salleh, on behalf of the Chief Secretary to the Government and the Commission's Chairman, Tan Sri Shamsul Azri Abu Bakar. Siti Safinah said that the Summer School represents a milestone in building the region's regulatory capacity, supporting the ASEAN Power Grid and in advancing ASEAN's shared energy transition goals.

The programme was organised in collaboration with the Southeast Asia Energy Transition Partnership (ETP), the United Nations Economic and Social Commission for Asia and the Pacific (UNESCAP), in partnership with the Florence School of Regulation (FSR), European University Institute, with support from the ASEAN Secretariat and the ASEAN Centre for Energy (ACE).

EE Challenge 2024 Achieves Milestone in Total Energy Savings

The Energy Efficiency Challenge 2024 (EE Challenge 2024) organised by the Commission managed to save RM840,446.00 in energy bills, out of 1,585 entries from students in schools all over Malaysia.

The annual competition, which is in its 11th iteration since its introduction in 2014, aims to establish an energy efficient culture among youths and to encourage energy savings and practise safety when using electricity and gas.

In his address to the winners at the prize giving event, Deputy Prime Minister and Minister of Energy Transition and Water Transformation, Datuk Amar Haji Fadillah Hj Yusof said that the involvement of young children in the competition shows their concern and interest in energy efficiency as a way to preserve our natural resources.

This is aligned to the Energy Efficiency and Conservation Act (EECA) that was enforced on 1 January 2025. EECA represents Malaysia's commitment to regulating the use of energy in an efficient and sustainable manner by big consumers.

Datuk Amar Haji Fadillah added, "The energy saved over the past 11 years since EE Challenge started adds up to a total of 1,568,025 kWh, and prevented as much as 1,207 tonnes of greenhouse gas emissions from being released into the atmosphere."

Winners were chosen for their creativity in expressing how energy efficiency can be implementedd at home, at school and within the community in four categories: Poster Drawing Challenge, Storytelling Challenge, Video Challenge and Most Energy Efficient School Challenge.

ST DATASHARE

1 January - 30 June 2025

ELECTRICITY AND PIPED GAS SUPPLY

Total Energy (GWh):
70,596 GWh

Peak Demand (MW):
21,049 MW [28 Jun 2024]

Installed Capacity (MW):
26,780 MW

Reserve Margin (%):
27.20%

*This data only covers Peninsular Malaysia's grid system.

Generation Mix (%)

Coal: **59.70%**
Solar: **2.40%**
Gas: **32.70%**
Others: **0.50%**
Hydro: **4.70%**

SAIDI (Minutes / Customer / Year)

Peninsular Malaysia:
23.56 (30 June 2025)
Minutes / Customer / Year

Labuan:
31.99 (30 June 2025)
Minutes / Customer / Year

ENERGY SUSTAINABILITY

Electricity Savings under NEEAP (%)*:

6.39%
9,848 GWh i.e.,
equivalent to
RM2.56 billion

*This savings is as of 30 June 2025

RE Installed Capacity (%)

Hydro **41.60%**
Biomass **3.50%**
Solar **52.60%**
Biogas **2.30%**

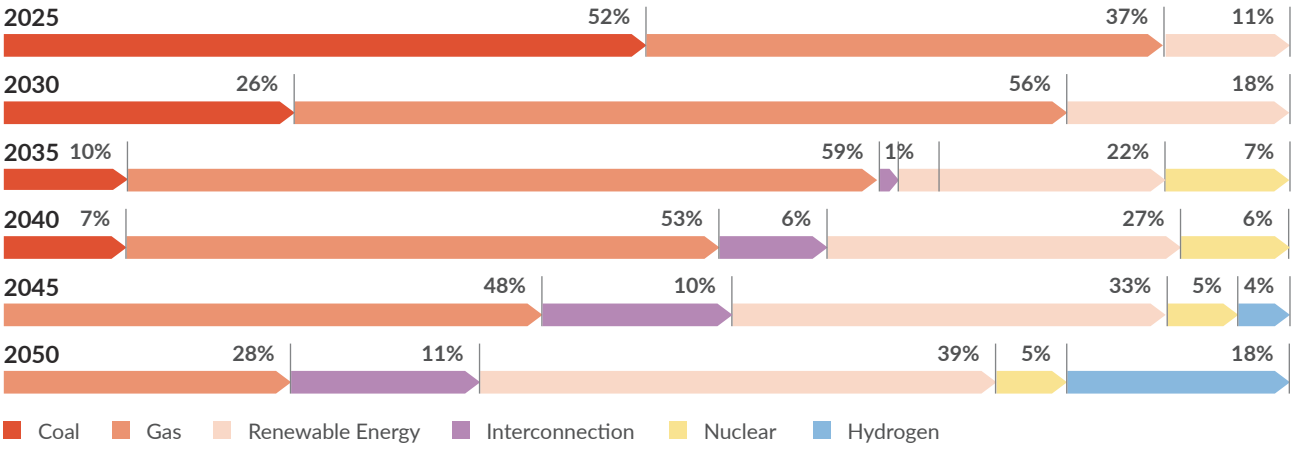
Covers Peninsular Malaysia
- Data sources are TNB, IPP, Single Buyer, SEDA, MGTC, OAS and ECOS.
- Self-gen with "other" fuel is excluded.
- Total hydro includes mini hydro capacity.
- Refers to renewable energy installed capacity in 2023

POWER PLANTS FOR COMMISIONING

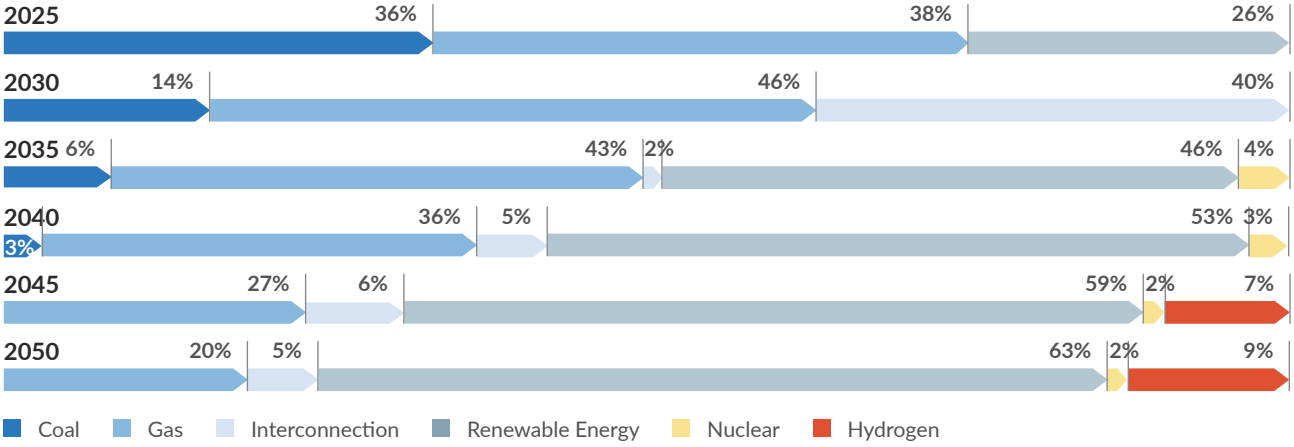
Cypark Estuary Solar Sdn. Bhd.
Danau Tok Uban, Kelantan
30.00 MW

Cove Suria Sdn. Bhd.
Danau Tok Uban, Kelantan
30.00 MW

PROJECTED ENERGY MIX OF PENINSULAR MALAYSIA, 2025-2050



PROJECTED CAPACITY MIX OF PENINSULAR MALAYSIA, 2025-2050



ECONOMIC EFFICIENCY

Regulatory Period:

RP4 (2025-2027)

Average Base Tariff Rate for Peninsular Malaysia:

45.40 Sen / kWh

Tariff Adjustment under ICPT Mechanism for 1 January to 30 June 2025:

- Domestic Consumers
  - Usage of 600 kWh & below: **Rebate 2 sen/kWh**
  - Usage of 601 – 1,500 kWh: **No surcharge/rebate**
  - Usage of 1,500 kWh and above: Surcharge **of 10 sen/kWh**
- Non-Domestic Consumers under the B, D, H, H1 & H2 and Water & Sewerage Operators Categories: **Surcharge 2.7 sen / kWh**
- Local Government Street Lights: **Surcharge of 9.0 sen/kWh**
- Other Non-Domestic Consumers: **Surcharge of 16.0 sen/kWh**

The Government had allocated **RM2.2 billion** (KWIE fund) for the implementation of ICPT from the period of January to June 2025

REGULATORY QUALITY

Number of Complaints Received:

718
Complaints

Number of Complaints Resolved:

633
Complaints

Number of Complaints Under Investigation / For Further Action:

85
Complaints

SAFETY

PRIMARY CAUSES OF ACCIDENTS

ELECTRICITY
- Non-compliance with safe work procedures.
- Improper installation / maintenance.

PIPED GAS
None

PRIMARY ACCIDENT LOCATIONS

ELECTRICITY
Utility Electrical Substations.

PIPED GAS
None

Number of Electrical Accidents:
21 Cases

Number of Piped Gas Accidents:
0 Cases

COMPETENCY & CONTRACTORS

Total Number of Electrical Certificates of Competency Issued:
3,030 Certificates

Number of Electrical Contractor Registrations (ERC, EC, ESC, ESIC, SBM, PWU):
8,154 Contractors

Total Number of Institutions Accredited to Facilitate Electrical Competency Examinations:
138 Institutions

Total Number of Gas Certificates of Competency:
182 Certificates

Number of Gas Contractor Registrations:
44 Contractors

Total Number of Courses Accredited to Facilitate Gas Competency Examinations:
0 Courses

ERC: Electrical Repair Contractor
ESIC: Electric Sign Contractor
EC: Electrical Contractor
SBM: Switchboard Manufacturer
ESC: Electrical Service Contractor
PWU: Private Wiring Unit

CERTIFICATES OF APPROVAL

Number of Certificates of Approval for Electrical Equipment:
5,980 New Certificates of Approval
3,743 Renewals

Number of Certificates of Approval for Manufacturers and Importers for Electrical Equipment:
672 New Certificates of Approval
430 Renewals

Number of Certificates of Approval for Gas Fittings, Appliances and Equipment:
761 Certificates of Approval

Number of Certificates of Approval for Manufacturers, Assemblers and Importers for Gas Equipment:
111 Certificates of Approval

Number of ATI and ATO
1,038 ATI and **905** ATO

ELECTRICAL AND GAS LICENCES

Number of Electrical Licences:
6,072 Licences

Number of Third Party Access Licences:
42 Licences

Number of Private Gas Licences:
4,823 Licences

Number of Retail Gas Licences:
704 Licences

INVESTIGATION PAPERS

Number of Investigation Papers Opened for Legal Action:
64 Investigation Papers

Number of Prosecution Cases:
8 Cases

Number of Compounds:
19 Compounds

Amount of Compounds Paid:
RM129,500.00

BUILDING A VIABLE VCM TRADING ECOSYSTEM AND FOSTERING GROWTH WITHIN ASEAN

Dato' Fad'l Mohamed
Chief Executive Officer, Bursa Malaysia

In December 2022, Bursa Malaysia launched the Voluntary Carbon Market (VCM), with the first auction of carbon credits to establish price discovery in March 2023, followed by renewable energy certificates (RECs) in 2024. The Bursa Carbon Exchange (BCX) is the world's first Shariah-compliant carbon exchange.

Bursa Malaysia's Chief Executive Officer Dato' Fad'l Mohamed shares the achievements and challenges faced by BCX, and urges multilateral cooperation and collaboration with other markets and stakeholders, highlighting initiatives forged among ASEAN member exchanges.

"

The year 2024 was a promising and productive one for the BCX. During the year, we were proud to welcome Malaysia's first carbon credit project, and expanded to offer RECs products on our trading platform, showcasing Malaysia's tremendous potential to support an active carbon exchange.

On 25 July 2024, BCX held the auction of its first Malaysian nature-based carbon credit from the Kuamut Rainforest Conservation Project ('Kuamut Project') in Sabah. As one of the highest-rated improved forest management (IFM) projects in the world, the Kuamut Project serves as a lighthouse project for local forestry based carbon credits, and paves the way for other states in the country to look into preserving their forests and natural resources using the carbon markets as a financing mechanism.

Kuamut marked BCX's expansion into Malaysian carbon credits besides global ones. The auction attracted participation from eight Malaysian businesses and organisations, and achieved a clearing price of RM50.00 per credit. Interestingly, over 80% of the participants were from the oil and gas and finance sectors.

"Carbon credits allow countries or companies to pay for projects anywhere on the planet to reduce their carbon emissions or remove it from the atmosphere, and use the credits generated by those projects to offset their own emissions."

Voluntary Carbon Market, a Pathway to Achieve Nationally Determined Contributions

Voluntary Carbon Market (VCM) is a powerful tool in climate change mitigation. According to an article published by the World Economic Forum, it is considered one of the most effective means to address greenhouse gas (GHG) reductions.

Significantly, the VCM supports Paris Agreement host countries, especially developing economies with the mechanism being a source of climate financing, even if their carbon credits are sold to foreign corporates outside of their countries.

Carbon credits allow countries or companies to pay for projects anywhere on the planet to reduce their carbon emissions or remove it from the atmosphere, and use the credits generated by those projects to offset their own emissions.

In Malaysia, the 2022 Budget made provisions for the establishment of a VCM. The responsibility of operating the VCM has been entrusted upon Bursa Malaysia, which formed the Bursa Carbon Exchange (BCX) for this purpose.

Key Developments in Carbon Markets

One of the biggest breakthroughs in carbon markets took place at the 29th Conference of the Parties (COP29) climate summit held on November 2024 in Baku, Azerbaijan. After years of stalemate, a consensus was reached on Article 6.4 of the Paris Agreement. Article 6.4, also known as the Paris Agreement Crediting Mechanism (PACM), which establishes a United Nations Framework Convention on Climate Change (UNFCCC) backed mechanism for trading GHG emission reductions between countries.

The landmark decision lays the framework for voluntary international collaboration. It enables countries to work together to achieve their climate goals, as well as unlock financial support for developing countries. This is done with the transfer of carbon credits earned from the reduction of GHG emissions projects to reduce their nationally determined contributions (NDCs). Under Article 6.2, emission reductions that have been authorised for transfer by host country may be sold to another country, but only one country may count the emission reduction for its NDC to avoid double counting through the accounting mechanism known as "corresponding adjustment".

At BCX, we welcome this news because it provides renewed confidence in carbon markets to drive meaningful climate action. It is also timely as Malaysia prepares for the National Carbon Market Policy (DPKK), which includes national arrangements for Article 6 trading. Immediately after COP29, Malaysia signed the first Article 6 Memorandum of Understanding (MOU) with South Korea on 25 November 2024, followed by a second MOU with Singapore on 7 January 2025, after Malaysia began its Chairmanship of ASEAN.

In the meantime, we are pleased with the significant efforts made to enhance market integrity in the global VCM ecosystem. Since our inception in 2023, much has been happening, and we anticipate better governance and more rigorous carbon standards as we forge ahead.

Malaysia's Potential for High-Quality Carbon Credits

Malaysia is uniquely positioned to play a significant role in the global VCM market, especially given our potential to supply high-quality carbon credits. Our key carbon credit opportunities include:

- **Extensive forest and tree cover**, which stands at 54% as reported in Malaysia's First Biennial Transparency Report (BTR1) in December 2024. This vast area represents a significant potential for carbon sequestration projects, upholding the nation's commitment to maintain at least 50% of Malaysia under green cover, a pledge made during the Earth Summit in 1992.
- We have **substantial abandoned oil and gas reservoirs that are ideal for carbon capture and storage (CCS) projects.** There are 46 trillion cubic feet (TCF) available in Malaysia, with 30 TCF in Sarawak and the remaining 16 TCF in Peninsular Malaysia. They are viable carbon credit projects.
- In addition, there are "low hanging fruit" projects such as **methane recovery from palm oil mill effluent (POME), landfills and industrial wastewater.** Malaysia's palm oil sector, with approximately 450 mills, offers significant biocarbon opportunities. These projects can leverage on existing talent pools, while harnessing the circular economy potential of our palm oil industry.
- There is also **the potential for carbon projects from green hydrogen in Sarawak and green mobility initiatives.** Both have been identified as levers for energy transition by the National Energy Transition Roadmap (NETR).

"By focusing on price discovery and transparency, we are able to reduce reliance on broker-centred deals, offering corporates an easily accessible and additional avenue to purchase RECs."

Our ultimate goal is to establish a conducive ecosystem that facilitates the mentioned opportunities to become high quality carbon credit projects that can be traded by Malaysian and global companies on the BCX.

Multi-Environment Product Exchange

In June 2024, BCX introduced a new product: RECs, issued under the I-REC Standard, a globally recognised standard body that adheres to the International Attribute Tracking Standard managed by I-TRACK Foundation. BCX is the first REC trading platform operator in Malaysia accredited by the I-TRACK Foundation, and one of only eight globally with this accreditation.

RECs are energy attribute certificates that represents the environmental attributes of the generation of a one megawatt hour (MWh) of energy produced by renewable sources such as hydropower, bioenergy, solar photovoltaic installations and small hydros. BCX targets corporates with Scope 2 emissions reduction commitments which can be met through utilisation of RECs. Scope 2 covers indirect GHG emissions from purchasing electricity, steam, heat and cooling by a company.

In Malaysia, there is a higher demand for RECs compared to carbon credits because the REC market is relatively mature compared with the carbon market. By diversifying into RECs, BCX aims to expand into a multi-environmental product exchange. By focusing on price discovery and transparency, we are able to reduce the reliance on broker-centred deals, offering corporates an easily accessible and additional avenue to purchase RECs.

We believe BCX is well-placed to operate a transparent and multi-environmental product exchange as a neutral party that does not own any RE assets for trading. In addition, it can leverage on Bursa Malaysia's track record of operating a fair and orderly market. Our vision is to support a voluntary REC market in Malaysia, one that is healthy, open and neutral. We introduced Malaysian RECs in 2024 and plan to expand our offering to include global RECs in 2025.

Establishing a Viable Trading Ecosystem

As with any nascent market, BCX had a slow start, much like the RE industry, which now has a thriving marketplace. During its formative years, Malaysia's RE industry moved slowly. By introducing initiatives for capacity and capability building, educating financial institutions and learning from failed and successful policies and incentive programmes such as the Feed-in-Tariff (FiT), the RE industry over time grew organically. Once, its achievements were measured in kilowatts (kW) of RE installed. This progressed to megawatts and today, RE installations in Malaysia are measured in gigawatts (GW).

The challenges we face in administering and operating BCX require creative solutions and strong collaboration with partners. To ensure liquidity in the carbon market, there is a need for a vibrant ecosystem, which is characterised by a robust supply of domestic carbon credits and equally strong demand signals.

Over the next few years, BCX will focus on building a VCM ecosystem to achieve three key objectives. One, is to introduce carbon pricing instrument (CPI) first through a VCM followed by a compliance carbon market (carbon tax or emissions trading scheme). Two, is to prepare corporations for CPI, by requiring them to understand, and to start reducing and mitigating their carbon emissions in anticipation of future regulatory requirements. Three, is to develop the VCM ecosystem and enhance Malaysia's low-carbon economy.

BCX has made various resources available to prospective participants. We have worked closely with Malaysian Green Technology and Climate Change Corporation (MGTC) to develop the VCM Handbook and VCM Directory, as reference tools to support interested parties to navigate the market more effectively. Additionally, we have jointly proposed a tax deduction guideline for carbon projects, which was announced during the tabling of national Budget 2024 and subsequently approved by the Ministry of Finance (MOF) on 23 May 2024.

"There is a need for a vibrant ecosystem, which is characterised by a robust supply of domestic carbon credits and equally strong demand signals."

This guideline allows for a tax deduction of up to RM300,000.00 on expenses related to development and measurement, reporting and verification (MRV) and activities related to the development of carbon projects. The deduction applies to carbon credit income from trading on BCX and application window for this incentive is effective from 1 January 2024 to 31 December 2026.

Furthermore, our other ecosystem-building initiative includes industry roundtables, as well as awareness and capacity building sessions conducted at conferences, workshops, webinars, and media interviews. In 2024, we actively engaged in nearly 50 speaking engagements, and organised or participated in over 70 ecosystem-building activities, sharing our insights.

Bursa Malaysia is very pleased with the interest shown in our flagship Malaysia Carbon Market Forum. Held for the first time in 2023, it has grown from a half day event to a full fledged conference in 2024, with multiple closed door meetings leading up to the conference held on 8 August 2024. We look forward to the third edition of the forum this year which will be held in conjunction with the IGEM 2025, and preparations have already begun for it. Ultimately, we understand that the success of the VCM depends on the development and nurturing of a vibrant local ecosystem that brings together key actors and players.

Preparing for Carbon Pricing Instrument

During the tabling of Budget 2025, the Government announced that it plans to implement a carbon tax on the iron, steel and energy industries by 2026. The deadline is almost upon us.

Based on our engagements as well as international findings, the need for carbon intensive sectors to decarbonise is due to:

1. **Increasing ESG pressures** from financial institutions, investors and customers for these companies to reduce their emissions.
2. **Implementation of CPI** in the form of a carbon tax or emissions trading system (ETS).
3. **International levies** such as the European Union's (EU's) Carbon Border Adjustment Mechanism (CBAM), and other similar mechanisms, which impose carbon pricing on imported goods based on their carbon footprint.

According to the International Emissions Trading Association (IETA) 2023 survey, power utilities are typically the first to be targeted as compliance entities. Taking the cue from Sarawak's passing of its Environment (Reduction of Greenhouse Gas Emissions) Bill 2023, compliance entities listed under the Act will include both the oil & gas and power utility sectors. However, for carbon tax implementation, at the point of writing this article, the type of industries within the energy sector subjected to compliance has yet to be announced.

In addition to preparations for specific sectors, key financial regulatory bodies such as Bank Negara Malaysia and the Securities Commission Malaysia have pioneered joint efforts to transition the country to a lower carbon economy through initiatives such as the Joint Committee on Climate Change (JC3) and are encouraging the industry to follow suit.

The aviation sector is also preparing for the compliance of Carbon Offsetting and Reduction Scheme for International Aviation (CORSIA), where Phase 1 has

What is Carbon Pricing Instrument?

Carbon pricing is a market instrument that seeks to influence the behaviour of businesses to reduce their GHG emissions by placing a price tag on emissions. Following the "polluter pays" principle, it creates financial incentives for businesses to lower their carbon footprint by internalising the cost of emissions, and making them accountable for the environmental cost of their emissions. The World Bank under their Partnership for Market Implementation (PMI) initiative is providing readiness support to the Government of Malaysia in its policy decisions over its CPI design, assessment of the economic impacts of proposed CPIs, establishment of the institutional framework and assistance with capacity building and stakeholder engagement. The technical support is expected to conclude by 2025.

begun in 2024. As Malaysia is a signatory to this scheme, a National CORSIA Taskforce has been established of which Bursa Malaysia is a member of this taskforce. The objective of the task force is to identify gaps in Malaysia's net zero roadmap and to provide recommendations to the Civil Aviation Authority of Malaysia (CAAM) on strengthening Malaysia's State Action Plan (SAP), an obligation imposed by the International Civil Aviation Organisation (ICAO) on carbon emission reduction for international aviation.

Given these developments, it is crucial for Malaysian businesses to be ready for CPI as soon as possible. There is also an urgency for European exporters, stemming from external pressures such as the EU's CBAM that entered the transitional phase on 1 October 2023. For now, its scope covers the importation of cement, iron and steel, aluminium, fertilisers, electricity, and hydrogen products, and is expected to expand to include more products in the future. Another point to note is that by implementing carbon tax in Malaysia, we can keep our money within the country rather than paying to the EU.

"By implementing the carbon tax in Malaysia, we can keep our money within the country rather than paying to the EU."

Local, Regional and Global Collaborations - an Imperative

As we reflect on the BCX's key takeaways and outcomes from COP29, one message is clear – it is imperative to foster collaborations with the various players in the carbon ecosystem.

There is an interconnectedness among various players, who share a common vision and net zero goals. They include governments, policymakers, the investment and financial community, carbon-intensive industries and environmental product owners. There is also a strong case for collaboration with other VCMs, with the sharing of lessons and acquisition of new knowledge.

With this in mind, on 3 July 2024, the Malaysia Carbon Market Association (MCMA) was formed. The MCMA is an initiative proposed by Bursa Malaysia and this non-profit organisation is a consortium of key carbon market players drawn from Malaysia's private sectors. MCMA will focus on several key areas, including promoting a vibrant VCM; contributing towards national carbon market policies; enhancing talent development; and fostering collaborations with domestic and international carbon market partners.

Another proposal by Bursa Malaysia is the ASEAN Common Carbon Framework (ACCF), which aims to develop the ASEAN carbon market ecosystem by increasing the supply of high quality carbon projects and

"Global climate change cannot be resolved by one exchange or country alone. It requires multilateral cooperation with other Governments and corporates to achieve the Paris Agreement's target to cap global warming at 1.5°C."

improving demand signals through interoperable carbon markets. Aligned with ASEAN's commitment to addressing climate change and the vision of the ASEAN Strategy for Carbon Neutrality, ACCF looks to accelerating the growth of carbon projects and attract both local and international credit buyers to the region.

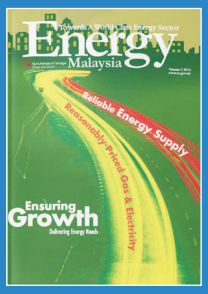
A Memorandum of Collaboration (MOC) for ACCF was exchanged among five carbon market associations in the ASEAN region during COP29 on 18 November 2024. The purpose of the MOC is to operationalise the ACCF.

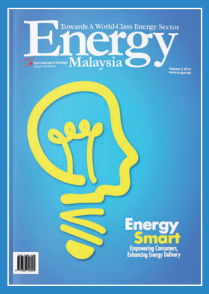
Today, ACCF joins the suite of priority initiatives championed by ASEAN-BAC of Malaysia as Malaysia chairs the ASEAN-BAC in 2025, and Bursa Malaysia is proud to be part of the Working Group on Carbon Market to deliver this initiative with our partners and key stakeholders.

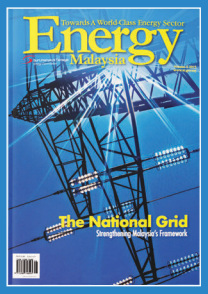
Global climate change cannot be resolved by one exchange or country alone. It requires multilateral cooperation with other Governments and corporates to achieve the Paris Agreement's target to cap global warming at 1.5 degrees Celsius. We hope that the ACCF will be a meaningful contributor to this ambition, by creating a vibrant ASEAN carbon market capitalising on the resources available in each ASEAN member state.

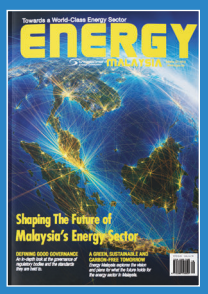
ENERGY MALAYSIA

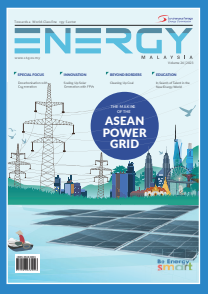
For comprehensive insights and information on the energy industry in Malaysia and what is trending in tomorrow's energy landscape.

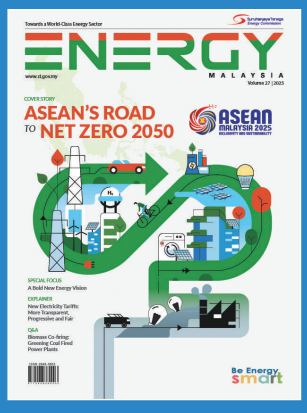












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Suruhanjaya Tenaga
Energy Commission

ORDERLY SUPPLY AND USE OF ENERGY

Suruhanjaya Tenaga (ST), a statutory body established under the Energy Commission Act 2001, is responsible for regulating the energy sector, specifically the electricity supply and piped gas supply industries in Peninsular Malaysia and the Federal Territory of Labuan.

THE ENERGY COMMISSION

ADVISES
Ministers on all matters concerning the national policy objectives for energy supply activities, the supply and use of electricity, the supply of gas through pipelines and the use of gas.

REGULATES
electricity and piped gas tariffs and the quality of supply services, as well as promotes competition and prevents misuse of monopoly power.

PROMOTES
good practices, as well as research, development and innovation in the electricity and piped gas industries.

PLANS AND DEVELOPS
laws, regulations, rules, guidelines and programmes for the orderly development and functioning of the electricity and piped gas industries.

LICENSES AND CERTIFIES
electricity and piped gas suppliers, competent electricity and gas personnel, training providers, contractors, equipment and installations, energy service companies and energy managers.

MONITORS AND AUDITS
performance and compliance of licensed and certified suppliers, service providers, installations, equipment importers, manufacturers and retailers.

INVESTIGATES
complaints, accidents, offences and industry issues; and enforces compliance.

Suruhanjaya Tenaga (Energy Commission of Malaysia) · st_malaysia · ST_Malaysia · Portal ST · st_malaysia

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