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SUSTAINABLE DEVELOPMENT OF URBAN ENGINEERING IN MALAYSIA

CURRENT TREND AND FUTURE PROSPECTS

DECEMBER 2024

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The Panama Canal, spanning 80 km between the Atlantic and Pacific Oceans, is a monumental engineering feat inaugurated in 1914. An audit revealed severe degradation of the concrete structures due to the aggressive marine environment.

The major challenge

The major challenge was the rehabilitation of the culverts at the Gatun, Pedro Miguel, and Miraflores Locks. Persistent water loss due to exfiltration and rough walls with exposed aggregate caused turbulence, slowing the fill-and-dump cycles. After extensive technical discussions, the engineering team opted to abandon traditional waterproofing in favor of Xypex crystalline technology.

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Due to its success Xypex Products were used on several structures of the Canal

Due to the success of the culverts' rehabilitation, Xypex products were also used for repairs and resurfacing of the walls at the Gatun, Pedro Miguel, and Miraflores Locks; the Miraflores Visitors Center; the Gatun Locks Water Treatment Plant; the Gatun and Miraflores Locks firefighters' buildings; the Gatun and Miraflores Locks' electrical distribution tunnels; and the Madden Dam tunnels. This covered over 5,800 m^2 of concrete and utilized more than 5,300 kg of Xypex Concentrate and over 630 kg of Xypex Modified.

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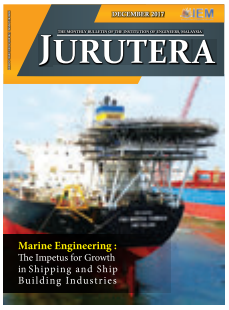

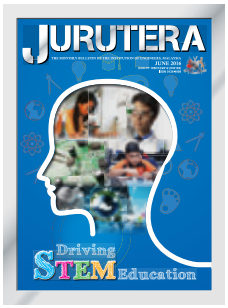

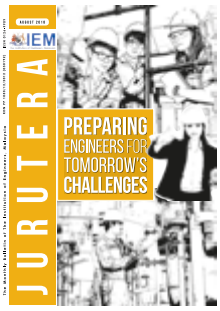

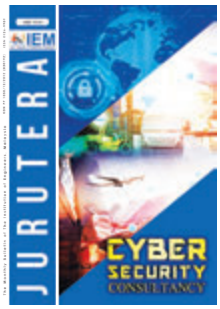

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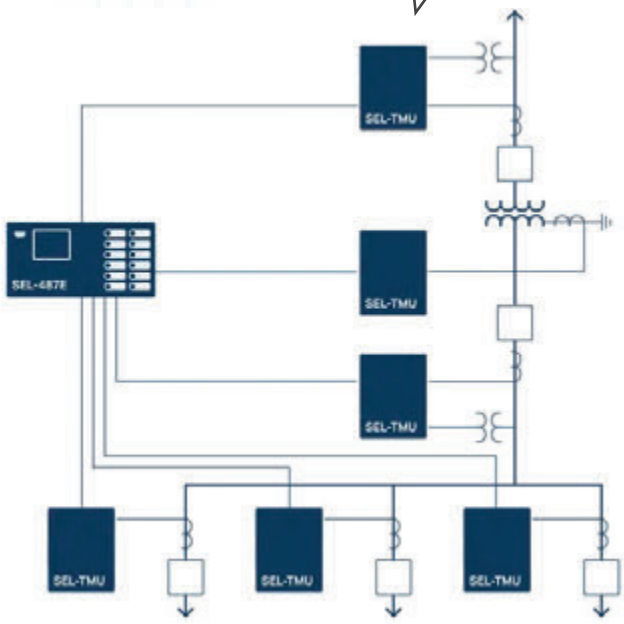

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COVER *Note*

by Ir. Lau Eng Kee
Chairman, Urban Engineering Development Special Interest Group (UEDSIG)

Building a Sustainable Future: Innovations in Urban Engineering Development in Malaysia and Beyond

Urban Engineering Development in Malaysia has started to navigate the complexities of urbanisation and the need for sustainable practices has never been more critical. In this issue of *JURUTERA*, we highlight key initiatives that exemplify our commitment to fostering an environmentally responsible urban landscape.

A prime example is the Tun Razak Exchange (TRX), a pioneering development that embodies Malaysia's vision for a sustainable urban future. TRX integrates state-of-the-art technology and sustainable design principles, setting a benchmark for urban projects across the nation. The development not only enhances the skyline of Kuala Lumpur but it also incorporates green spaces and efficient transportation links, contributing to a holistic urban ecosystem.

We also explore the evolution of GreenRE, a certification framework that encourages sustainable building practices in Malaysia. This initiative is pivotal in promoting energy efficiency, water conservation and the overall well-being of urban dwellers. Our commitment to adopting Green Building Standards has positioned Malaysia as a leader in sustainable construction practices in the region.

Furthermore, the concept of Energy Plus buildings is gaining traction, where buildings generate more energy than they consume. This innovative approach reduces our carbon footprint and fosters energy independence, aligning with global sustainability goals.

Additionally, the rise of urban farming initiatives showcases our dedication to food security and community resilience. By integrating agriculture into urban settings, we will enhance local food production while fostering biodiversity and community engagement.

As we look to the future, this issue serves as a roadmap for sustainable urban engineering in Malaysia. Together, we can drive innovation and create vibrant, resilient, sustainable cities moving forward. ■

EDITOR'S *Note*

by Ir. Alex Looi Tink Huey
Principal Bulletin Editor

Building Tomorrow's Cities Today

As we step into the final stretch of 2024, it's time to reflect on how far we've come and what lies ahead. This month's theme, Sustainable Development of Urban Engineering in Malaysia, shines a spotlight on the delicate dance between innovation and responsibility as we design cities for the future.

Urban engineering is no longer just about building towering skyscrapers or efficient infrastructure but it's also about creating ecosystems where people, technology and nature coexist harmoniously. Let's look ahead to 2025 with a renewed commitment to build smarter, greener urban landscapes – because the future doesn't just happen; engineers make it happen. Cheers to a sustainable tomorrow! ■

TRX

BLUEPRINT FOR SUSTAINABLE URBAN DEVELOPMENT

Tun Razak Exchange (TRX) stands as a beacon of sustainable urban development in Malaysia. Situated in Kuala Lumpur, this groundbreaking project aims to establish itself as the country's international financial centre. Beyond its role as a financial district, TRX embodies a visionary approach to sustainable urban development.

In an exclusive interview with Dato' Sr. Haji Azmar Talib, the Chief Executive Officer of TRX City, the Master Developer of TRX, IEM's Urban Engineering Development Special Interest Group (UEDSIG) Deputy Chairman Ir. Mike Lau Yee Leong and fellow Committee Members explore how TRX's strategic positioning can contribute to the country's economic growth while prioritising sustainability.

From its inception, TRX had set a precedent in urban engineering, aiming to not only foster economic growth but also to minimise environmental impact and to enhance community well-being. As Dato' Azmar elaborates on the TRX journey, from green building standards to advanced infrastructure solutions and community engagement, the story of TRX unfolds as a model of how modern cities can harmoniously blend progress with sustainability.

Strategic Positioning

On how TRX's strategic positioning has contributed to advancing sustainable urban engineering in Malaysia, Dato' Azmar highlights several key factors with regards to its impact on sustainable development.

"As an international financial centre, TRX is designed as not only an economic enabler but also as a district that sets global standards in urban development," Dato' Azmar says.

> "Our goal is to ensure TRX remains a beacon of sustainability, while minimising physical, functional and economic obsolescence to stand the test of time."

Collaborative Framework & Sustainability Integration

Dato' Azmar details TRX's collaborative framework, emphasising that all partners adhere to the Common Estate Agreement (CEA). This agreement meticulously outlines service types, levels, quality and costs within TRX, ensuring unified standards across the development.

Furthermore, Dato' Azmar highlights the seamless integration of sustainability into its master development planning and guidelines. "Sustainability initiatives are embedded throughout the master planning process, cascading down to plot developers via our Urban Design Guidelines and Development Code," he says. This approach ensures that environmental responsibility and long-term viability are prioritised in every aspect of TRX's growth.

Underpinning TRX's commitment to sustainable development, Dato' Azmar talks about its foundational principles. "From inception, sustainability has been ingrained across TRX, guiding every developmental decision towards minimising environmental impact and ensuring sustainability," he says.

He elaborates on the design philosophy rooted in the three pillars of sustainability. “Our objective is to create positive impacts on the planet, deliver financial returns, and enhance community well-being,” he affirms. This holistic approach informs all development strategies and decision-making processes at TRX.

Highlighting TRX’s leadership in green building standards, Dato’ Azmar explains: “All current and future office buildings within TRX are mandated to achieve at least Gold certification by GBI and/or LEED, underscoring our commitment to energy efficiency and environmental stewardship.”

Addressing mobility and carbon reduction initiatives, Dato’ Azmar pointed at TRX’s Transit-Oriented Development (TOD) model, strategically designed with the only MRT interchange station in the city, to promote public mobility and reduce carbon emissions. In addition, TRX prioritises pedestrian-friendly environments to enhance walkability and to reduce reliance on vehicular transport.

Water management at TRX is equally pivotal, says Dato’ Azmar. “Our on-site waste-water and recycling treatment plant recycles at least 80% of district-wide water usage for non-potable purposes, significantly lowering the overall water demand.”

Emphasising dedication to green spaces and urban sustainability, Dato’ Azmar notes: “The TRX Public Realm and 10-acre TRX City Park act as carbon sinks, mitigating urban heat island effects and enhancing biodiversity.”

Operational efficiency at TRX is optimised through IoT solutions. Dato’ Azmar explains: “We utilise IoT technologies to optimise energy consumption, enhance operational efficiency and minimise waste across TRX.”

Introducing TRX’s Environmental, Economic, Social & Governance (EESG) framework, Dato’ Azmar says: “This framework guides our comprehensive approach to managing our impact on the economy, environment, social responsibility and governance practices.”

In summary, Dato’ Azmar reiterates TRX’s role as a trailblazer for sustainable urban development in Malaysia. “TRX continues to set benchmarks in sustainability,” he emphasises, "demonstrating that economic growth and environmental responsibility are mutually reinforcing.”

Elevating Urban Engineering Standards

When asked whether TRX’s sustainable features align with current trends in urban development and investment, Dato’ Azmar confidently affirms their strategic approach.

“Yes, sustainable investment has become the new standard. Investors and stakeholders increasingly prioritise Environmental, Social & Governance (ESG) criteria in their decision-making processes,” he says, adding that TRX’s commitment to sustainability aligns with the expectations of leading companies and financial institutions.

“Qualities such as green building certifications, efficient water management and robust environmental policies are now essential and are critical to attract top-tier tenants and investors.”

Dato’ Azmar highlights TRX’s pivotal role in setting benchmarks for sustainable urban development, both locally and globally. “By integrating sustainable practices into our urban planning and operations, TRX not only meets current trends but also anticipates future demands for environmentally responsible and resilient developments,” he says.

He underscores TRX’s proactive stance in shaping the future of urban sustainability and investment standards, positioning it as a leader in sustainable urban engineering in Malaysia and beyond.

Enhancing Renewable Energy Integration

When asked about potential areas for further improvement within the TRX development, Dato’ Azmar outlines strategic initiatives aimed at advancing sustainability and resilience.

He says: “One key recommendation is to increase the proportion of renewable energy within the district. Integrating building facades with thin film solar photovoltaic technology can significantly reduce both individual building and district-wide carbon footprint.”

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He also addresses the importance of climate resilience measures. "Enhancing our preparedness for climate hazards, such as flash floods, is crucial," he notes. "Improving drainage systems and implementing resilient landscaping will mitigate risks and ensure long-term sustainability for the district."

Dato' Azmar emphasises the need to further reduce operational carbon emissions across all sectors within TRX. "Our objective is to achieve a net-zero (carbon emission) international financial centre comprising offices, residential buildings, hotels, shopping malls, infrastructure and public parks," he says. "This necessitates a comprehensive approach to energy efficiency and carbon reduction strategies."

Lastly, he proposes exploring natural and mechanical carbon offset solutions to achieve net-zero emissions. "Considering solutions such as urban greenery and carbon capture technologies will be essential. This balanced approach will aid TRX in meeting its sustainability targets," he says.

He reiterates TRX's commitment to continuous improvement and innovation in sustainable urban development. "These recommendations are part of our ongoing efforts to set new standards in environmental stewardship and resilience," he says, highlighting the dedication to fostering a sustainable and future-ready urban environment.

Benchmarking Against Global Financial Giants

When discussing TRX's unique positioning in sustainable development and its comparative status against global and local developments, Dato' Azmar highlights the rigorous benchmarking process undertaken by TRX City.

"We meticulously benchmarked against renowned IFCs such as Canary Wharf, Marina Bay Sands, Dubai IFC and Pudong," Dato' Azmar says. "This comparative analysis allowed us to identify best practices and areas for enhancement."

According to him, this strategic approach has enabled TRX to adopt and adapt the most effective strategies from these global IFCs, while also leveraging Malaysia's unique strengths.

"Today, TRX proudly boasts one of the highest concentrations of international companies within a single development in Malaysia, a testament to our successful integration of global best practices with local advantages," he says.

Leading the Way in ESG-Compliant Urban Development

In response to whether TRX has positioned itself as a frontrunner, locally and globally, in sustainable development, Dato' Azmar says he has confidence in TRX's achievements. "KL's new real estate benchmarks TRX as the showcase for an ESG-compliant development by DBKL," he says, noting that the project is aligned with ESG standards set by Kuala Lumpur City Hall (DBKL).

He also underscores TRX's commitment to not only meeting but also exceeding global standards in sustainable urban development, driven by a continuous learning and improvement process that draws from the successes of prominent IFCs.

Milestones in Sustainable Development & Engineering Excellence

When asked about the significant milestones that TRX has attained, Dato' Azmar proudly highlights several accomplishments.

"TRX is the first development in Malaysia to achieve both provisional Green Building Index (GBI) Platinum Township and Leadership in Energy & Environmental Design (LEED) Neighbourhood Development Gold Certifications," Dato' Azmar says.

He further elaborates on TRX's engineering accolades. "We were honoured with the ASEAN Outstanding Engineering Achievement Award for our innovative Sewerage Treatment & Plant Design for the On-site Waste-water Treatment Plant," he says.

With regards to infrastructure and real estate achievements, Dato' Azmar points out: "The Exchange TRX, our flagship retail asset, has achieved LEED Gold certification, a first in the country for a retail development."

Economic Impact & Strategic Partnerships at TRX

In terms of economic impact and corporate partnerships, Dato' Azmar highlights the vibrant ecosystem within TRX, stating: "To date, over 30,000 people are employed at TRX, with 20,000 of them in knowledge-intensive roles."

He also points out the impressive roster of partners and tenants which includes HSBC, Affin Bank, Prudential, Mulia Group, Lendlease, Principal Asset Management, Accenture, Huawei and Agoda.

All these achievements, according to Dato' Azmar, underscore TRX's transformation into a premier business and financial hub in Malaysia, driven by its commitment to sustainability and innovation as well as fostering a conducive environment for both local and international enterprises.

Shaping Sustainable Urban Futures

With regards to the roadmap ahead, Dato' Azmar emphasises TRX's role as a master developer and its commitment to setting a precedent for sustainable urban planning.

"As a master developer, we have a responsibility to lead by example in shaping sustainable and resilient cities. Our vision extends beyond physical infrastructure; it encompasses fostering a thriving ecosystem that prioritises environmental stewardship and community well-being," he says.

In terms of specific initiatives, TRX is committed to align with national and international commitments to combat climate change. "TRX will follow through with initiatives that ensure we remain aligned with Malaysia's goals and international standards," he says. "This includes our dedication to achieving UN Sustainable Development Goals

such as Industry, Innovation & Infrastructure (Goal 9), Sustainable Cities & Communities (Goal 11) and Climate Action (Goal 13)."

Dato' Azmar says TRX's strategic focus is to deliver sustainable value for all stakeholders, emphasising that sustainability is integral to their long-term vision. "Our aim is to deliver sustainable value for all stakeholders involved. This means not only economic benefits but also social and environmental gains which contribute positively to the community and broader society," he says.

In conclusion, Dato' Azmar reiterates TRX's commitment to continuous improvement and innovation in sustainable development, positioning it as a model for future urban developments in Malaysia and beyond.

Collaborative Community-Centric Sustainability

When discussing collaboration with local communities and stakeholders to align sustainable development initiatives with their needs and priorities, Dato' Azmar says there are several key approaches.

"Our partnership with DBKL has been pivotal in gathering feedback from locals to enhance neighbourhood maturity," he explains. "This ongoing dialogue ensures that our development aligns with the community's aspirations and enhances the quality of life."

He further details TRX's infrastructure initiatives, such as efforts to not only build but also to enhance infrastructure beyond district boundaries. "This approach ensures that the benefits of our development extend into surrounding areas, contributing to the overall urban ecosystem."

Dato' Azmar also shed light on the commitment to create a porous, walkable and seamlessly integrated environment. "Our design principles prioritise connectivity and accessibility which not only benefits TRX residents and businesses but also enhances connectivity to neighbouring districts, such as the Jalan Gading upgrade, improving access to Bukit Bintang," he says.

As for community outreach, Dato' Azmar cites the collaboration with Kechara Soup Kitchen as an example of community engagement efforts. "Partnering with organisations like Kechara Soup Kitchen allows us to address social needs and to contribute positively to the community from all walks of life," he explains.

Overall, Dato' Azmar emphasises that TRX's approach to sustainable development is rooted in collaboration with local stakeholders and communities. This ensures their initiatives are not only sustainable but also responsive to the evolving needs and priorities of the people they serve.

Innovating Sustainable Urban Infrastructure

In a discussion on how TRX integrates innovative technologies and green infrastructure into its urban engineering projects to enhance sustainability and resilience, Dato' Azmar highlights several strategic initiatives.

"At TRX, green building standards are the cornerstone, with a minimum Gold certification mandated for all developments," he says.

Dato' Azmar elaborates further on infrastructure innovations, noting that TRX features an on-site waste-water recycling and treatment plant to ensure efficient water management within the ecosystem.

He details how sustainability permeates every aspect of TRX's design and operations. From energy-efficient LED street-lights to solar panels in public areas, sustainability is a priority across the infrastructure.

In terms of resilience, Dato' Azmar outlines the strategy for ensuring a robust utilities supply. "We mitigate risks of disruptions by leveraging diverse sources and routes for utilities, ensuring continuity even during unforeseen events," he assures.

He adds that the TRX Integrated Management System consolidates all equipment and systems into a unified platform. "This system optimises resource use and enhances service delivery across TRX," he explains.

The implementation of smart metering systems is another innovation. "These systems provide real-time data on water and energy consumption, enabling targeted optimisation strategies to minimise waste and enhance efficiency," he explains.

An exemplary case of TRX's proactive resilience strategy involves advanced monitoring of air quality in tunnels using IoT sensors. "We monitor CO_2 and CO levels in real-time, adjusting ventilation systems accordingly to optimise energy use while ensuring optimal air quality," Dato' Azmar says.

He further stresses TRX's commitment to leveraging cutting-edge technologies and sustainable practices to foster a resilient urban environment, saying: "Our integration of innovative technologies and green infrastructure sets a new standard for urban development, promoting sustainability while enhancing the quality of life at TRX."

Navigating Challenges in Sustainable Development

When asked about potential challenges and obstacles that TRX faces in the ongoing pursuit of sustainable development, along with the strategies to address them, Dato' Azmar notes that there are several key areas of concern.

"One of the challenges we face is the fast-changing landscape of innovation in climate-resilient technologies," he says. "To stay ahead, we continuously monitor technological advancements and assess their applicability and benefits to our projects."

Agility and adaptability are important in adopting these technologies to enhance TRX's sustainability initiatives. Dato' Azmar says: "Our strategy involves integrating the latest innovations that contribute to environmental resilience and operational efficiency."

Addressing the issue of policy and regulatory changes, Dato' Azmar highlights TRX's proactive approach. "Changes in policies and regulations can impact our development plans significantly," he notes. "We maintain close communication with stakeholders and regulatory bodies to anticipate and respond to potential changes effectively."

He underscores the commitment to maintaining robust relationships with government agencies and local authorities to navigate regulatory challenges seamlessly. "By fostering strong partnerships and staying proactive, we ensure TRX remains aligned with evolving regulatory frameworks," he says.

In conclusion, Dato' Azmar says he is confident that TRX can overcome these challenges through strategic planning, innovation and collaborative engagement with stakeholders. "These challenges are opportunities for us to demonstrate our commitment to sustainable development and resilience," he adds, highlighting TRX's dedication to setting new benchmarks in urban sustainability amid dynamic external factors. ■

Dato' Sr. Azmar Talib
Group Chief Executive Officer
TRX City Sdn. Bhd.

Dato' Sr. Azmar Talib has served as Group Chief Executive Officer of TRX City Sdn. Bhd. since 2011. He has over 40 years' work experience which spans real estate, construction, banking and project turnaround. A trained valuer, he spent 7 years in the valuation profession before transitioning to a 7-year tenure in banking, focusing on project financing and corporate turnaround. His career included 18 years with the PNB Group, where he held multiple leadership roles, overseeing acquisitions, turnaround initiatives and the development of nine major townships in the Klang Valley. As CEO of TRX, he led the development of Tun Razak Exchange and Malaysia's International Business Hub at Bandar Malaysia. He also sits on various boards, including UEM Sunrise Berhad and Lembaga Tabung Amanah Melaka as well as contributes to academia and public organisations.

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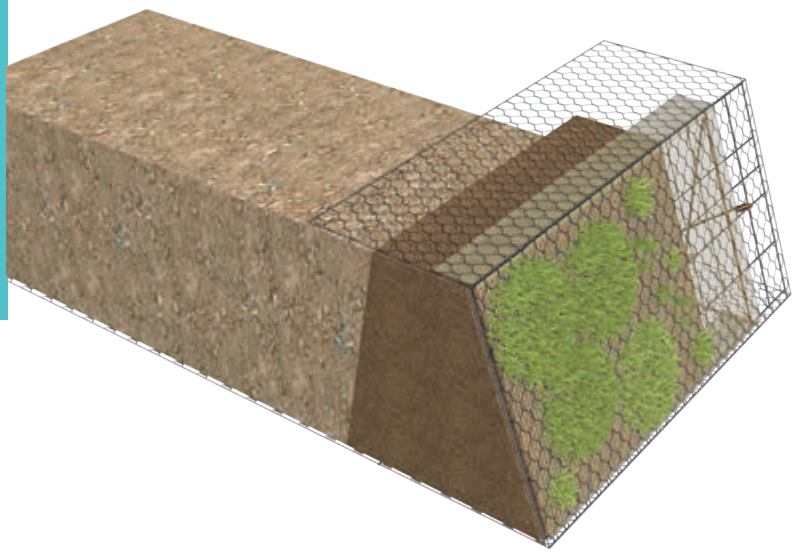

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Evolution of Green Building Standards: The Malaysian Perspective

Prepared by:

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Executive Director of GreenRE which is pushing for sustainable development through green building certification.

Ir. Lau Eng Kee

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The topic of climate change needs no introduction. The science is clear: Human-induced greenhouse gas (GHG) emissions have led to adverse climatic events. While the world struggles to mitigate emissions, we must equally plan for adaptation and resilience. Temperature rise scenarios put forward by the United Nations cannot even conclude with certainty that we have not crossed the point of no return!

As we struggle to balance the competing forces of politics, economics and science, we must keep a firm eye on the co-benefits of dealing with climate change. Environmental sustainability is not a new concept; it is aligned to our basic societal aims to improve our quality of living, generation upon generation.

The real estate sector, in particular, stands at a crucial juncture. The built environment is a major contributor to not only GHG emissions but also to environmental degradation. Globally, it is responsible for approximately 40% of energy and process-related CO_2 emissions, 50% of all extracted materials, 33% of water consumption and 35% of generated waste[1].

Other environmental impacts include resource depletion, air, water/land pollution and biodiversity loss. In the local construction sector, GHG emissions is driven by material selection, in particular concrete and steel, which make up more than 80% of "upfront" carbon emissions[2]. Real estate in use, comprising industrial, commercial and residential buildings, consume almost all electricity generated in the country[3].

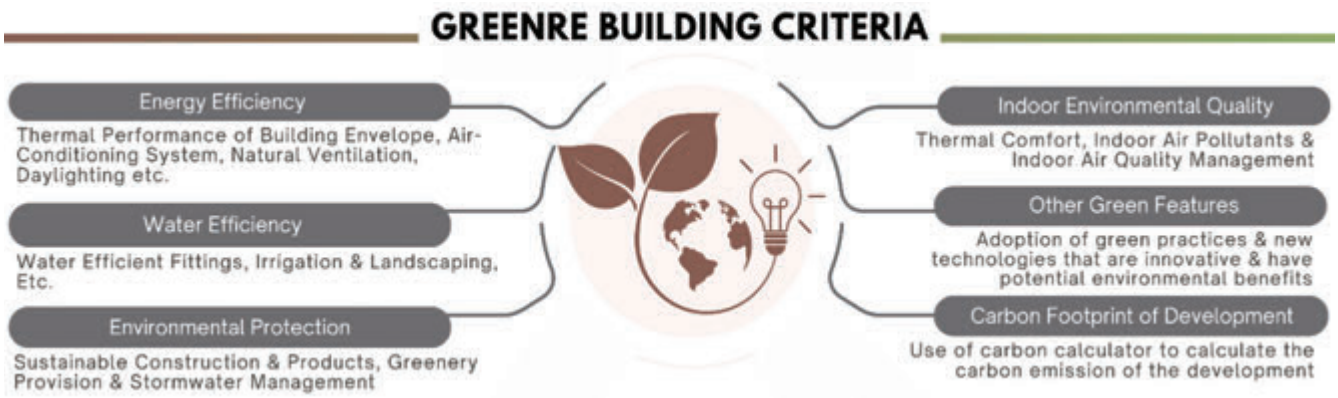
The real estate sector has the opportunity — and responsibility — to lead the charge toward greener, more sustainable practices. By embracing green building principles, it can transform the built environment and drive significant progress in the fight against climate change.

Global Perspective: Evolution of Green Building Standards

The term "green building" is broadly defined as a structure with efficient resource utilisation and is conscious towards the environment throughout its life-cycle, from planning and design to construction, operation and demolition. Green buildings also enable occupants to make use of space in a comfortable and healthy manner by providing an improved indoor environmental quality.

The World Green Building Council is a global network of national Green Building Councils (GBCs) which promote sustainable building practices and advocates for objective and transparent transition through the development of voluntary, region specific green building standards. Compliance to these standards is verified through certification which leads to the development of green building certification bodies across the world.

Building Research Establishment Environmental Assessment Method (BREEAM), the world's first green building certification system, was introduced in 1990 in the United Kingdom. In 1993, Leadership in Energy & Environmental Design (LEED) was developed in the United States and quickly became the most popular global green building rating system. These systems have not only raised awareness about the importance of sustainable building design and construction but have also pushed governments and industries worldwide to adopt more stringent regulations and incentives to promote green building practices.



GreenRE Building & Township Certification Award Pillars

Asian Perspective: Sustainable real estate practices in Asia differ from those in other parts of the world as these are often influenced by cultural and environmental factors. Asian architecture often reflects deep-rooted cultural traditions and values, which can shape sustainable design approaches. For example, Feng Shui principles in Chinese architecture emphasise harmony with nature and the environment, leading to the incorporation of natural elements and orientation strategies to optimise energy efficiency and to promote well-being.

Rapid urbanisation and population growth in many Asian cities present unique challenges. Sustainable urban planning strategies, including compact development, mixed land use and efficient public transportation systems are essential to mitigate the negative impacts of urbanisation and to promote sustainable living. In addition, initiatives such as vertical greening, rooftop gardens and green infrastructure are increasingly being adopted to enhance urban biodiversity, mitigate heat island effects and improve air quality in densely populated cities.

Recognising the unique demands of a tropical climate and a burgeoning population, Singapore's Building & Construction Authority (BCA) was the first in South-East Asia to introduce a green building certification scheme, Green Mark, in 2005. The early adoption and comprehensive approach of the certification scheme is instrumental in shaping the understanding of sustainable building practices in Asia and has become a standard for reference and influencing many other countries in the region to develop their own similar initiatives.

GreenRE, Malaysia's Leading Green Building Certification Body: In Malaysia, the Green Real Estate (GreenRE) certification scheme was established as a leading standard for sustainable buildings. Developed in 2013 by the Real Estate & Housing Developers' Association (REHDA) in collaboration with the Construction Industry Development Board (CIDB) and Singapore's BCA, GreenRE was designed specifically to cater to the unique demands of the real estate sector here.

It was launched as an independent body, governed by professionals, to drive a broad based impact across all types of buildings in the country. Closely aligned with the Green Mark, GreenRE standards have a strong focus on carbon emissions reduction, with stringent requirements for material selection and energy efficiency. The standards were developed to be in step with market capability and evolved over time to be aspirational. A green building is not static. It is a dynamic facility that prioritises continuous environmental performance improvement. Hence, a renewal process was developed to ensure alignment to design goals over the life-cycle of the building.

GreenRE strives to be at the forefront in the mission to green Malaysia's built environment. Not only does it align with the World Green Building Council's quality assurance requirements and to the UN's Sustainable Development Goals but it is also ISO certified, ensuring credibility and global recognition. GreenRE also actively fosters a culture of sustainability by offering training programmes and funding research at local universities. This holistic approach helps build a foundation of knowledge and innovation.

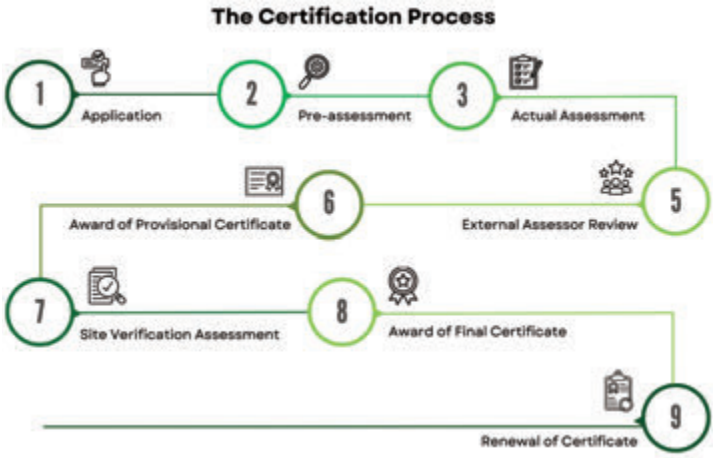
GreenRE Building & Township Certification Award Ratings

GreenRE evaluates building design and functionality across 6 key categories: Energy efficiency, water efficiency, environmental protection, indoor environmental quality, carbon emissions and green features. Projects are graded on a four-tier scale (Bronze, Silver, Gold and Platinum) which can be applied to buildings from residential apartments to industrial complexes.

The parameters and indicators established in GreenRE standards guide the design, construction and operations of buildings. The standards comprise prescriptive, performance-based and outcome-based requirements.

For new buildings, a Provisional Certificate is issued once design compliance is met. The submission for this stage is termed Actual Assessment (AA) and is ideally done once detailed design is completed and the necessary drawings and documentations are available. Once construction is completed, documentation for Site Verification Assessment (SVA) can be submitted and must be performed within a maximum period of one year after CCC (new buildings).

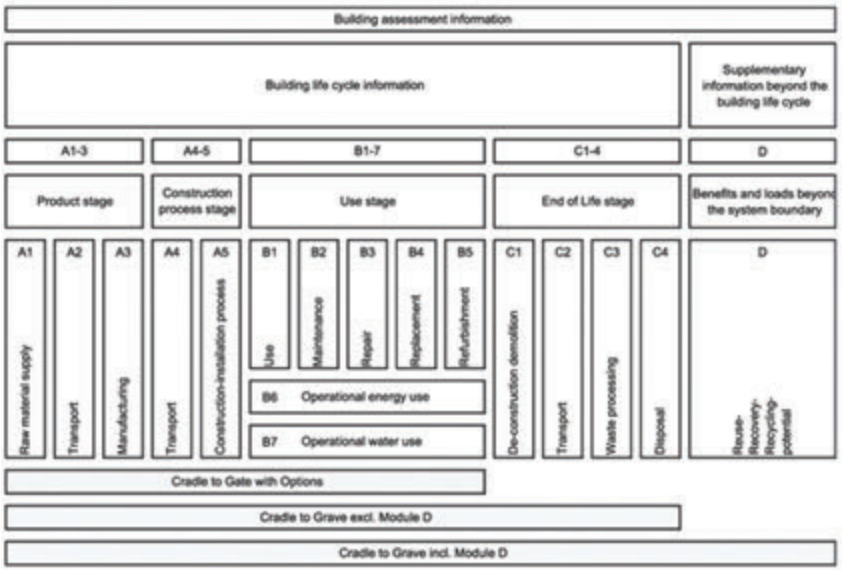
Site verification is done to confirm conformance to design commitments before a Final Certificate is issued. This is valid for only 3 years. After this period, the Renewal process should commence to validate the performance of the building, the key to outcome-based evaluation as by then, the occupancy and operating profiles will have settled. GreenRE emphasises clarity of completion of these stages. All projects are listed on its website for transparent access to certification data[4].



GreenRE Pre-Requisites: Key to Effective Green Building Rating System

GreenRE has adopted EN 15978 for assessing the environmental performance of buildings throughout their life-cycle[5]. This whole life carbon assessment (WLCA) assumes an operational lifetime of 60 years and comprises 4 stages: Product Stage (A1-A3), Construction stage (A4-A5), Use stage (B1-B7) and End of Life Stage (C1-C4). This framework allows accurate benchmarking of the carbon impact of the building at the design stage[6].

The upfront carbon in a building project comprises material selection, transport to site and construction[7,8]. This also represents approximately 25% of the carbon impact of a project across its lifetime[9]. A comprehensive report by CIDB, Technical Publication 207, performed in 2019, concluded that material selection was the governing component for embodied carbon representing almost 90% of upfront carbon emission[10]. Of this, concrete and steel were the leading contributors. To address this issue, GreenRE has stringent pre-requisites for concrete use index (CUI) and green concrete provision in a project.



EN 15978 Framework

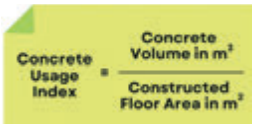


Table 1: Credits allocation for project CUI

Project CUI (m^3/m^2)	Credits Allocation
≤ 0.70	1
≤ 0.60	2
≤ 0.50	3
≤ 0.40	4
≤ 0.35	5

Table 2: Credits allocation according to replacement percentage

Replacement of Ordinary Portland Cement (OPC) by approved industrial by-products (%)	Credits Allocation
10	1
20	2
30	3
40	4
> 50	5

The operational phase impacts approximately 75% of a building's life-cycle emissions[11]. In a tropical context, the leading contributor is energy used to cool a building[12]. GreenRE has stringent requirements for the measurement and verification (M&V) devices and performance of air-conditioning systems[13]. It also aligns with energy standards of the American Society of Heating, Refrigerating & Air-Conditioning Engineers (ASHRAE).

Buildings with a centralised cooling system must provide permanent measuring instruments to monitor the efficiency of both water-cooled and air-cooled chilled water systems. The instrumentation must be capable of calculating the operating efficiency (kW/RT) with an accuracy within 5% of its true value, in line with ASHRAE Guide 22 and AHRI 550/590. A heat balance test is also mandatory for water-cooled systems to verify the accuracy of the M&V instruments.

For buildings where the cooling load exceeds 500RT, the use of air-cooled systems is generally discouraged for GreenRE Gold and Platinum ratings. If air-cooled central chilled water systems or unitary air-conditioners are used, their performance must match the efficiency levels typically expected of water-cooled systems. For air-cooled systems in stratified or multi-block developments, the system efficiency will be assessed on a case-to-case basis to ensure compliance with GreenRE's stringent energy performance standards. Minimum Design System Efficiency/ Operating System Efficiency (DSE/OSE) are as follows:

- *For buildings using Water-Cooled Chilled Water Plant*

GreenRE Rating	Building Cooling Load	
	< 500	≥ 500
	Efficiency (kW/RT)	
Bronze	0.85	0.75
Silver	0.80	0.70
Gold	0.75	0.68
Platinum	0.70	0.65

- *For buildings using Air-Cooled Chilled Water Plant or Unitary Air-Conditioner*

GreenRE Rating	Building Cooling Load	
	< 500	≥ 500
	Efficiency (kW/RT)	
Bronze	1.1	1.0
Silver	1.0	1.0
Gold	0.85	Case by case
Platinum	0.78	

Energy Efficiency: The Low Hanging Fruit

The government recently introduced the Energy Efficiency & Conservation Act (EECA), aimed at institutionalising energy management practices for both thermal and electrical energy covering the industrial, commercial and residential sectors. It mandates energy audits and sets energy performance standards for appliances and equipment.

The National Energy Transition Roadmap, released in August 2023, had set a target of 23% energy savings for industrial and commercial sectors and 20% for residential sector by 2050.

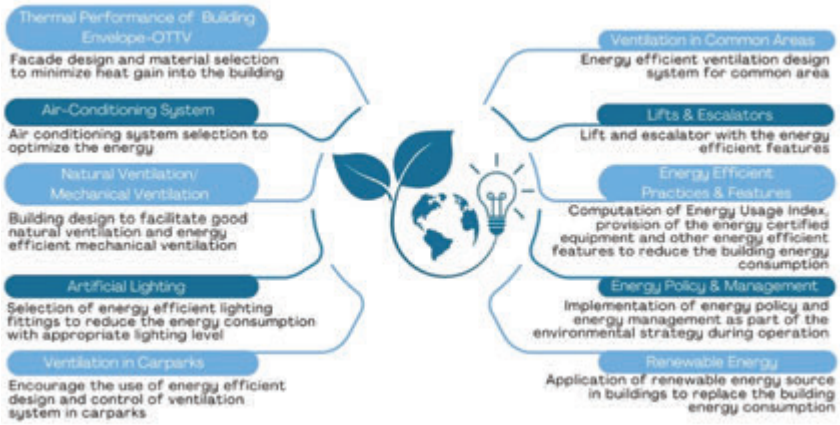
Final electricity consumption is distributed fairly evenly across the industrial, commercial and residential segments. The industrial and commercial segment offers the biggest opportunity for savings as consumption is concentrated in fewer buildings. But many remain unaware of the benefits of energy efficiency or lack the knowledge to implement effective measures. The upfront cost of energy-efficient technologies and infrastructure upgrades can be prohibitive for some small and medium enterprises. However, these also present opportunities for innovation and collaboration.

Beyond the optimal specification of design and equipment, operation and maintenance are equally important. Much like a fuel-efficient vehicle that needs to be driven right, the building occupants play a crucial role in energy efficiency. Smart technologies, such as AI-based building management systems which monitor active systems like air-conditioning and lighting and switch them off when not in use, can further assist. Measurement

and verification instrumentation can be used to monitor the efficiency of large air-conditioning systems and offer a suitable predictive and preventive maintenance regimen. Real-time monitoring of energy use through smart meters provide up-to-date information and help consumers and utilities understand consumption patterns better.

With liberalisation of the energy sector proposed as part of the Malaysian Electricity Supply Industry 2.0 (MESI 2.0), time-of-use pricing may be made available to a broader segment of consumers, encouraging shifting energy intensive activities to off-peak hours when electricity rates are lower, thereby reducing peak energy demand. Once the necessary energy efficiency enhancements are deployed, on-site renewable energy solutions such as rooftop solar can be incorporated. It is important to approach this sequentially as it will be a waste of resources to implement on-site renewable energy in an energy inefficient building.

GreenRE has developed an energy performance certificate scheme for existing buildings to set a standard for high performance buildings and to appropriately benchmark energy efficiency based on local and international best practices[14].



GreenRE Energy Certificate Rating Pillars

GreenRE Energy Certificate Award Ratings

Conclusion

Green buildings can help combat climate change and promote environmental sustainability and the government will play a critical role in promoting sustainable building practices through regulations and incentives. Green building certification helps kick-start private sector efforts by setting standards that in turn, elevate the ambition of government building codes and regulation, corporate ESG strategies and workforce training.

GreenRE rating tools will continue to push the boundaries by driving integrated design, modular construction, biophilic design and smart building technologies. By recognising and rewarding companies and organisations which operate high performance buildings, we hope to see a greater pull factor towards these goals. Through collective action and unwavering commitment, Malaysia can lead by example in the global transition towards a low-carbon and resilient built environment. ■

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Congratulations

IEM Council and Management would like to extend our heartiest congratulations to

YBhg. Academician Tan Sri Dato Seri Ir. Prof. Em. Dr Chuah Hean Teik

for being conferred the Federation of African Engineering Organisations (FAEO) "Distinguished Friend of African Engineering Award" – Platinum by FAEO at the welcome dinner of IEC 2024.

NOMINATIONS FOR ELECTION TO FILL VACANCIES FOR THE COUNCIL SESSION 2025/2026

The IEM Council had, at its 442nd meeting on 15 July 2024, decided to fill Council vacancies for the Session 2025/2026 in accordance with Article 5.2 of the Constitution. An election programme had also been approved by the Council for implementation.

The following Council vacancies will arise for Session 2025/2026 as a result of Council members retiring at the end of Session 2024/2025.

Office	No of Vacancies	Term of Office
Vice President	Four (4)	2 sessions (2025/2026 and 2026/2027)
Honorary Secretary	One (1)	1 session (2025/2026)
Honorary Treasurer	One (1)	1 session (2025/2026)
Council Member – Other Discipline	One (1)	3 sessions (2025/2026, 2026/2027 and 2027/2028)
Council Member – Ordinary Representative	Ten (10)	3 sessions (2025/2026, 2026/2027 and 2027/2028)

A notice inviting nominations for the Election of Council Member for Session 2025/2026 will be posted on the IEM Notice Board and on the website on 1 November 2024 for the information of all Corporate Members.

Nomination Forms may be obtained at the IEM Secretariat or downloaded from the IEM website *www.myiem.org.my* on and after **1 November 2024**.

All Nomination forms, duly completed, shall be sent in a sealed envelope marked "***Confidential: Nomination Paper for Session 2025/2026***" to: -

The Honorary Secretary
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Tel: 03-78900130 / 78900144

and to reach him not later than 12.00 noon on **Saturday, 7 December 2024**.

Dato' Paduka Ir. Hj. Keizrul bin Abdullah
Election Officer 2024/2025

Energy Plus Buildings: Current Trends, Future Prospects and the Path to Cleaner Environments

Prepared by:

Derek Foong

Global Head of Technology for Danfoss Malaysia Sdn. Bhd., which developed energy efficient applications for chilled water plants and HVAC systems.

Ir. Mike Lau Yee Leong

Vice Chairman of Urban Engineering Development Special Interest Group (UEDSIG) and Principal Mechanical Engineer for Duriane Professionals Sdn. Bhd.

The pursuit of sustainable urban development is increasingly focused on integrating Energy Plus buildings into smart city frameworks. Energy Plus buildings, which produce more energy than they consume, offer a promising solution for reducing reliance on fossil fuel power plants and minimising pollution.

One good example is the Danfoss UniKL Plant, the first Energy Surplus building in the country which produces more energy than it consumes and so has surplus solar energy to contribute back to the grid.

This article explores current trends and prospects in the context of Energy Plus buildings, analysing their role in achieving cleaner environments and decommissioning traditional power plants. By examining technological advancements, policy developments and practical case studies, we will illustrate how Energy Plus buildings contribute to the creation of sustainable and smart cities.

Urbanisation is driving a surge in energy consumption and environmental degradation. Traditional buildings are significant contributors to energy demand and greenhouse gas emissions. As time passes, the demand for renewable energy (RE) is increasing along with the demand and lithium cost is becoming more competitive (Figure 1). This also includes the dawning use for RE such as solar PV panels.

In response, Energy Plus buildings, designed to generate more energy than they consume, offer a transformative approach to urban sustainability. This paper investigates the role of Energy Plus buildings in smart and sustainable cities, focusing on current trends, technological advancements and future prospects. The ultimate goal is to illustrate how having more Energy Plus buildings can reduce our reliance on fossil fuel power plants, leading to cleaner air and a more sustainable future.

Understanding Energy Plus Buildings

Definition & Characteristics: Energy Plus buildings are defined by their ability to produce more energy from renewable sources than they consume over the course of one year. Key characteristics include:

- High Energy Efficiency: Incorporation of advanced insulation, high-performance windows and energy-efficient appliances.
- Renewable Energy Generation: Use of on-site RE sources such as solar panels, wind turbines and geothermal systems.
- Net Positive Energy: The building has an annual energy production that exceeds its annual energy consumption.

Benefits: Energy Plus buildings are not only intended for zero energy usage, but they also provide “energy plus”, thus yielding potential benefits such as:

- Reduced Carbon Footprint: Energy Plus buildings contribute to lower greenhouse gas emissions by generating clean energy and reducing dependence on fossil fuels.
- Economic Advantages: Decreased energy bills and potential revenue from excess energy sold to the grid.
- Enhanced Resilience: Reduced reliance on external energy sources improves resilience to power outages and supply disruptions.

Figure 1: Growing PV Farm powering up sustainable clean energy

Energy savings can be seen in the overall results after the Energy Plus building continues to reduce energy consumption (Figure 3). It can be seen that within a building, generally most of the energy is utilised for air conditioning, general machinery, lighting, elevators, computers and others. The careful design to integrate the electric vehicle and supplying surplus grid to the electrical grid will assist to lower reliance on fossil fuels and has become a major goal to decommission fossil fuel power plants, which is in line with ESG initiatives.

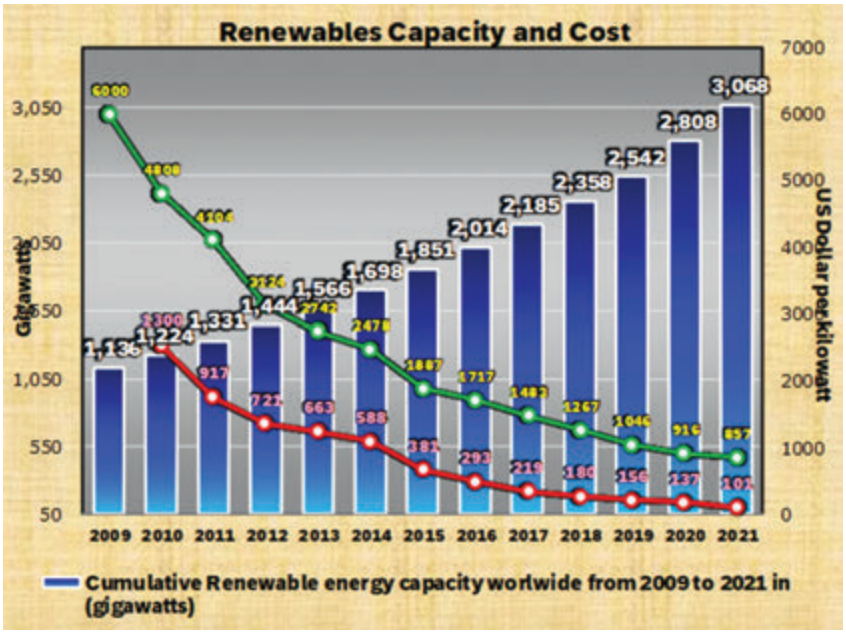

Figure 2: As capacity and demand increase, solar PV and lithium prices are becoming more competitive. (Extra Legends: The green line, labelled with values decreasing over time, likely represents the cost of RE technologies in US$ per installed megawatt (MW) or gigawatt (GW). The red line with a gradual downward trend represents the levelised cost of energy (LCOE) for renewables, measured in dollars per kilowatt-hour or another cost metric)

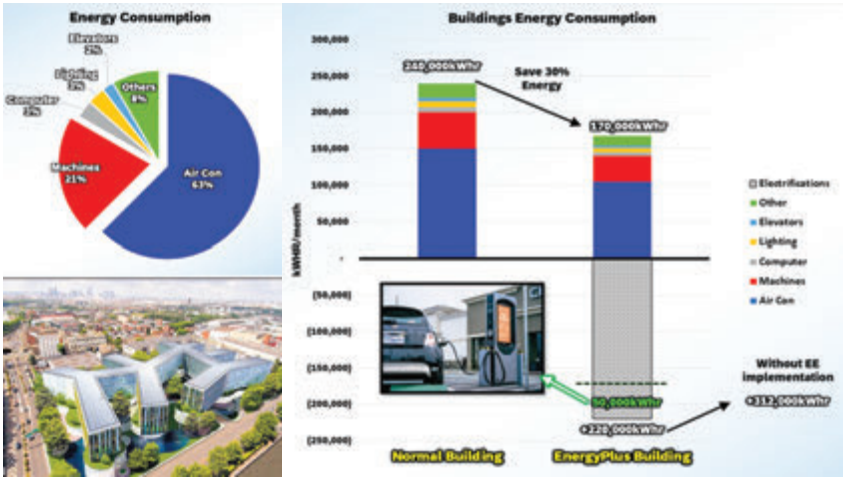

Figure 3: Example of the Energy Plus building showing the energy allocation

Current Trends in Energy Plus Buildings

Technological Advancements: It is always important to highlight the impacts of current technological advancements in Energy Plus buildings.

1. **Renewable Energy Technologies:** To spearhead the prominence of Energy Plus buildings, recent innovations in RE technologies are becoming more pivotal such as the following:
   - Advanced Photovoltaics: Development of higher efficiency solar panels and building-integrated photovoltaics (BIPV). The wind and solar macroeconomics favour the implementation of smart and sustainable cities to allow even electric vehicles to charge from the surplus energy generated in the building (Figure 4).
   - Energy Storage: Improvements in battery storage technologies enable the better management of generated energy.
   - Smart Building Technologies: Integration of smart grids and energy management systems to optimise energy use and generation.

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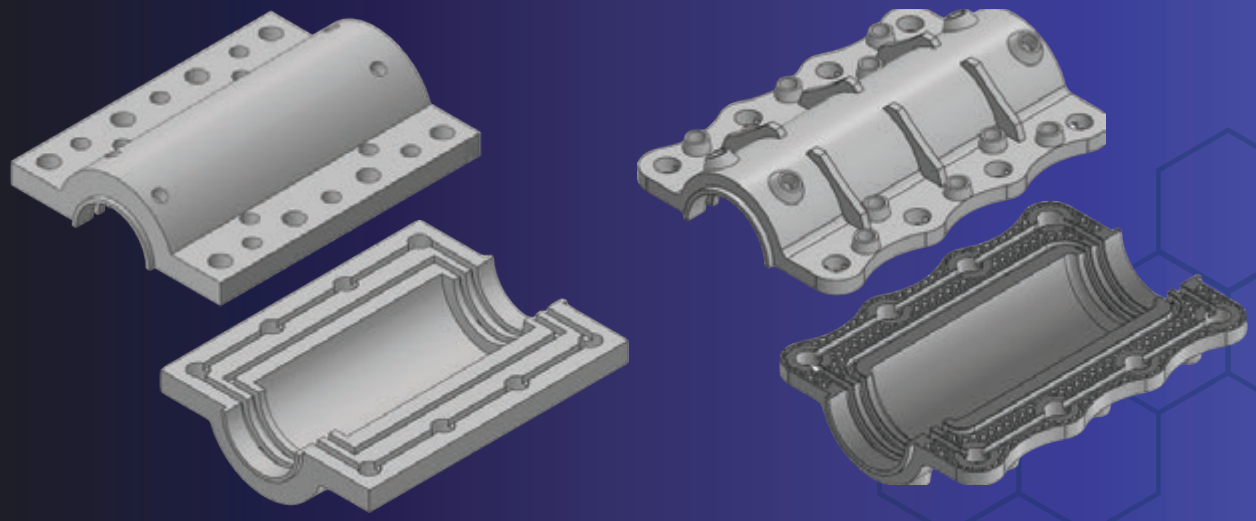

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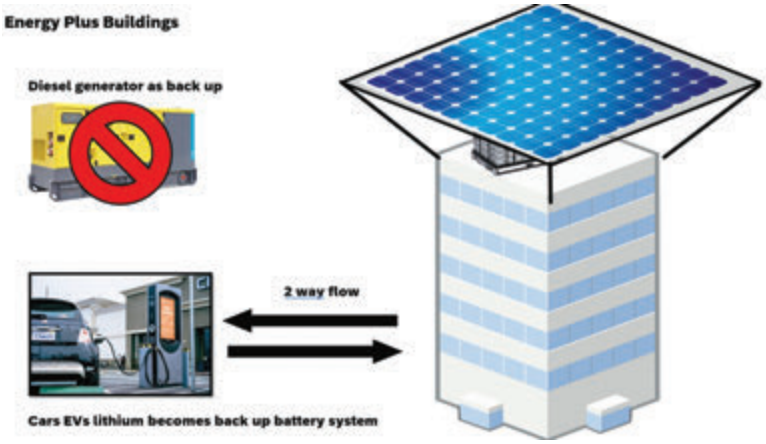

Figure 4: The Energy Plus building contains a solar PV panel that is sized larger than the demand of the electrical energy it requires. Cars or electrical vehicles provide a two-way battery back-up system, thus oil generation is no longer needed for cleaner energy and is integrated into the building

2. **Energy Efficiency Improvements:** Besides RE technological advancements in building design and construction, enhanced energy efficiency technologies can also be highlighted as a growing trend. The improvements in energy efficiency are as follows:
   - High-Performance Insulation: New materials and techniques improve thermal insulation and reduce energy loss.
   - Smart HVAC Systems: Advanced heating, ventilation and air conditioning systems are adjusted based on real-time data to optimise energy use. For example, multiple technologies have been making advancements to scale district cooling plants to achieve high energy efficiency over the past decades. This comprises (Figure 5):
   - Variable Speed Drives for pumps and fans.
   - Oil-free magnetic compressors that are 30-50% more efficient than traditional compressors. Some common phrases are magnetic bearing chillers and magnetic levitation compressors.
   - Pressure Independent Balancing and Control Valves to balance the system and allow optimisation.
   - Danfoss also has refrigerant components that will keep the chillers running efficiently.

As highlighted above, air conditioning remains the biggest consumer of energy within the building, so any improvement to save energy related to air conditioning will lead to enhancing the Energy Plus trend.

Policy & Regulatory Developments

Next, with newer and improved technology, policies and regulations must be set out to support such energy supportive trends.

- **Green Building Certifications:** Green building standards and certifications, such as LEED (Leadership in Energy & Environmental Design) and BREEAM (Building Research Establishment Environmental Assessment Method) drive the adoption of Energy Plus principles by providing guidelines and benchmarks for sustainable construction. Green Building certifications allow developers to align and ensure that construction strictly follows green building standards and guidelines, which have many pointers leading to "green" methods and energy saving systems.

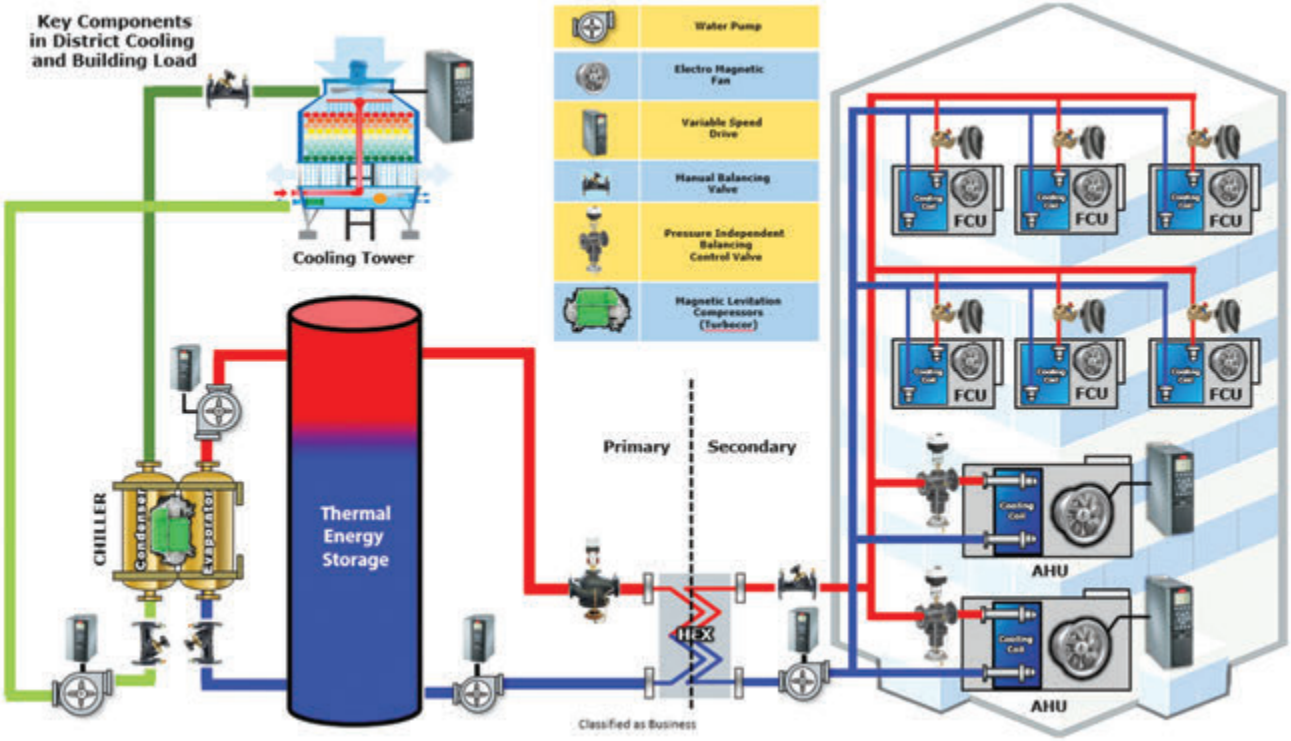

Figure 5: District Cooling Plant with complete Danfoss component and heavy equipment from water to air applications

- **Government Incentives:** Incentives such as tax credits, grants and subsidies support the development of Energy Plus buildings by reducing the financial burden of developers and homeowners. Malaysia provides tax incentives to new buildings such as the Green Investment Tax Allowance (GITA) and Gren Income Tax Exemption Services (GITE).

3. **Practical Applications & Case Studies.** Here are some international examples listed below.

- The Edge, Amsterdam West: Known for its energy efficiency and sustainability, including solar panels and advanced energy management systems. It features over 6,000 sq metres of solar panels, underground thermal storage and glass-replacing hatches which act as vents that allow 106,000 cubic metres of air per hour to ventilate in 2 scenarios, on demand ventilation and summer night cooling.
- BedZED, London: An eco-village with a focus on energy efficiency, RE and sustainable living practices. The general basic principles comprise of solar energy, reduction of electricity and gas consumption, ample parking spaces, water saving appliances and fittings and having high housing densities with private and shared outdoor spaces.
- Zero Energy Building (ZEB), Singapore: Designed to produce more energy than it consumes through a combination of RE technologies and energy-efficient design. The ZEB integrates more than 30 innovative technologies, ranging from passive to active systems, such as the solar assisted natural ventilation, mirror duct, Single-Coil Twin Fan (SCTF), displacement ventilation, smart lighting control, building integrated photovoltaics (BIPV) and many more.

Future Prospects for Energy Plus Buildings

Urban Planning & Development: From the above examples, we can see that it is possible to integrate Energy Plus buildings into urban planning as it involves:

- Designing Sustainable Districts: Creating neighbourhoods or districts with a high concentration of Energy Plus buildings to maximise energy efficiency and sustainability. It is not as simple as on a macro scale as one must align many common interests to create such a district and community. Sacrifices will have to be balanced.
- Retrofitting Existing Buildings: Upgrading older buildings to meet Energy Plus standards through energy-efficient retrofitting. A lot of buildings in Malaysia are currently having systems decades in running and have not been updated and upgraded with the latest technologies. It is very common for building operators to continue running their HVAC systems inefficiently, thereby consuming way more energy than necessary.

Decommissioning Fossil Fuel Power Plants: Most importantly, a very realistic goal the world can aim for is to slowly but surely decommission fossil fuel power plants. With all the technologies being explored, it is beneficial to head towards a carbon free target:

- Reduced Dependence on Fossil Fuels: By generating surplus energy, Energy Plus buildings decrease the demand for fossil fuel-generated power. Achieving Net Zero Carbon and ESG are all in line with this practice.
- Lower Pollution Levels: The reduction in fossil fuel use leads to decreased greenhouse gas emissions and improved air quality.

Further Advancements in Building Technologies: Future developments may include:

- Next Generation Renewable Energy Systems: These are emerging technologies that further enhance energy generation and storage capabilities.
- Enhanced Energy Management Systems: More sophisticated systems for optimising energy use and integration with smart grids.

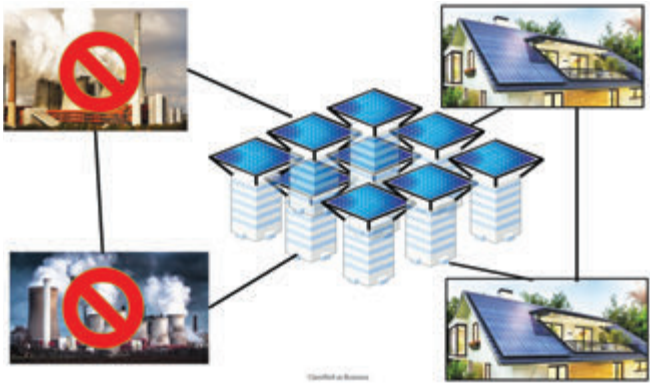

Figure 6: The final goal – sustainable and smart cities result in a clean environment for the future. As more Energy Plus buildings are added to the grid, it will mean fewer fossil power plants, thus reducing pollution and having cleaner air for future generations

Policy and Regulatory Support and Changes: Aside from the current changes, government or corporation policies and governance will see a change in future trends with the benefits of Energy Plus buildings. As we adopt new incentives, we also change the way things operate, such as:

- Strengthening Building Codes: Updating Malaysian building codes and standards to mandate or incentivise the inclusion of Energy Plus features. It is common for Green Building Standards to be applied as mandatory requirements in Building Guidelines.
- Expanding Financial Incentives: Increase in funding and subsidies for Energy Plus projects to make them more accessible financially.
- Increasing government support: Enables the government to be more involved in activating the use of Energy Plus buildings in the country, allowing for faster construction, smoother approvals and providing incentives.

Challenges & Barriers

Financial Constraints: Although there are great benefits, Energy Plus buildings also come with a high index of planning and costs.

- High Initial Costs: The upfront investment for Energy Plus buildings can be significant, posing challenges for widespread adoption.
- Long-Term Return on Investment: The financial benefits of Energy Plus buildings, such as energy savings, may take years to materialise.

Technological and Infrastructure Challenges: Assessing the current available network and infrastructure may prove alarming as rebuilding everything from the ground up will require much rework, demolition and planning.

- Integration with Existing Systems: Retrofitting existing buildings to Energy Plus standards and integrating new technologies can be complex and costly.
- Technology Availability: Limited access to advanced technologies and materials in some regions may hinder the adoption of Energy Plus buildings. Currently, the most prominent are solar and, more recently, chemical (lithium ion).
- Safety: Greater access to new components, some of which are chemical, may prove hazardous so new protection services must be assessed and provided to ensure safety when using such complex systems. Authorities will need to issue new guidelines with regards to the protection of complex buildings in case of fires (especially for batteries).

Policy and Regulatory Issues: With much support in terms of policy and regulations, also come challenges. Overlapping cost and new technologies require time and money as well as the need to convince the public that it will actually be feasible.

- Insufficient Incentives: The lack of adequate financial incentives and support for Energy Plus buildings can slow down their adoption.
- Regulatory Barriers: Outdated regulations may not support the integration of Energy Plus principles into building practices.

Conclusion

Energy Plus buildings represent a key component of smart and sustainable cities, offering significant benefits in terms of energy efficiency, reduced greenhouse gas emissions and enhanced resilience. By generating more energy than they consume, these buildings contribute to reducing reliance on fossil fuel power plants and improving air quality.

Current trends and technological advancements are paving the way for the broader adoption of Energy Plus principles, while policy and regulatory support will be crucial to overcome challenges and accelerate progress. As the number of Energy Plus buildings increases, their impact on creating cleaner urban environments and decommissioning fossil fuel power plants will become increasingly significant, contributing to a sustainable and healthy future for generations to come. ■

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Energy Integration Platform Enabling Visibility & Connectivity of Distributed Energy Resources for Distribution Network TNB

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As we embark on the journey to build a better Malaysia and to achieve sustainable energy, the government has set a proper plan to accelerate the energy transition agenda with a target to increase renewable energy (RE) penetration by 40% in 2035 and 70% in the power mix by 2050. The National Energy Transition Roadmap (NETR) outlines strategies to boost RE integration and penetration, supporting Malaysia's commitment to reduce carbon emissions.

However, managing higher RE penetration presents challenges, including grid instability and variability in the energy supply. To mitigate these issues, TNB Distribution Network (DN) has developed a distributed energy resources management system (DERMS) via the Smart Energy Management Infrastructure (SEMI), an integrated energy platform to enhance the visibility and control of RE sources, ensuring efficient energy distribution and stability. This approach promotes a more resilient and sustainable energy ecosystem, aligning with Malaysia's green energy goals and Net Zero 2050 aspiration.

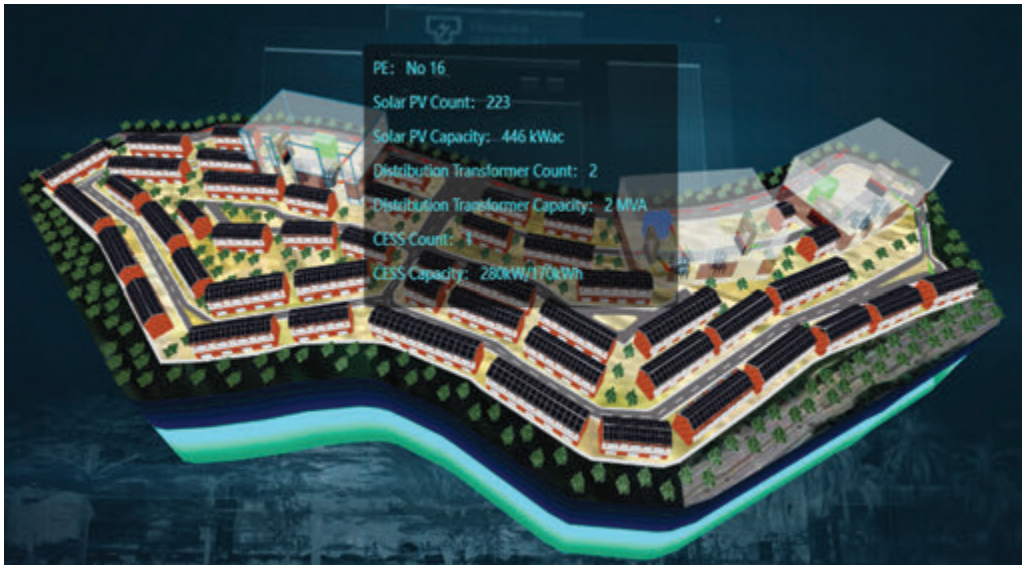

Figure 1: Elmina's RE Visibility and Control via SEMI-EIP

Smart Energy Management Infrastructure Platform

SEMI's initial focus is on establishing foundational capabilities for distributed energy resources (DER) monitoring and visibility. It will then expand to more advanced functionalities, such as a flexibility market. SEMI aims to achieve the following objectives:

1. Increase network reliability and grid control in a dynamic and complex distribution system.
2. Increase integration of distributed energy resources.

The development of the Energy Integration Platform (EIP) started in mid-2023 to address issues TNB was facing with increasing DER penetration in the low voltage (LV) network. Challenges like reverse power flow and high voltage at feeder ends were well-known. The rise in DER penetration, especially at the LV level, raised concerns about TNB's ability to manage and mitigate reliability and resilience issues effectively.

The EIP is designed to tackle DER connection issues in the LV network. It provides users with visibility of DER connections in the LV network, allowing for the study of DER interconnections and real-time effects on the grid. The EIP platform offers real-time data through complex "smart substation assets" such as Online Feeder

Pillars (OFP), Low Voltage Regulating Distribution Transformers (LVRDT) and Community Energy Storage System (CESS) as shown in Figure 1.

The need for TNB's own DERMS system becomes more evident with growing housing developments like Elmina, which are pre-installed with solar rooftops. Such developments transform green energy from an option to a necessity.

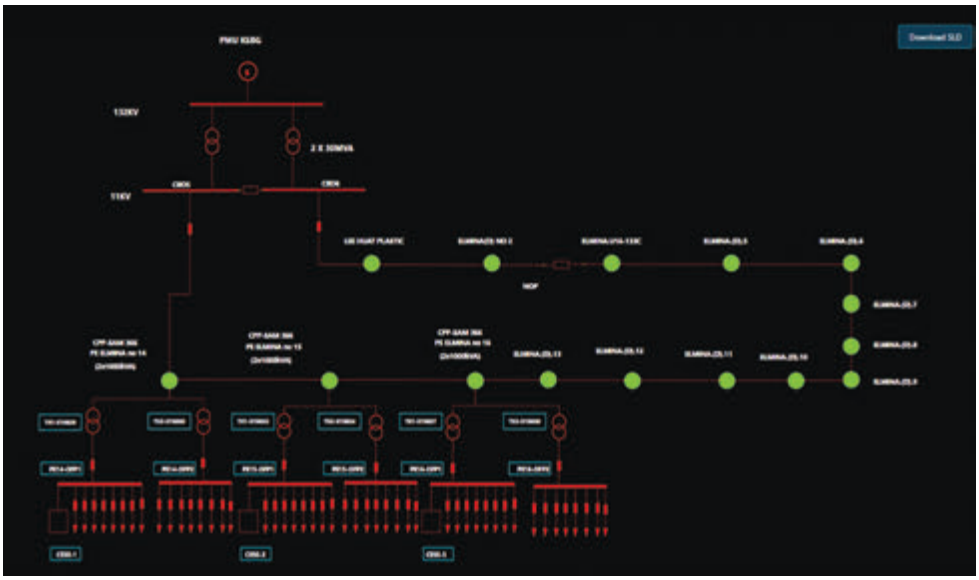

Figure 2: Single line diagram of Elmina housing development

Sime Darby's Elmina housing development, especially Ilham Residence 3, consists of 513 houses installed with 2kW roof top solar under Net Energy Metering (NEM) scheme. This brings a total of 1022kW of solar total installed capacity. Supply to the 513 houses comes from 3 distribution transformers. The EIP project is particularly to study the impact of high penetration solar from the solar roof panel to TNB's LV distribution network.

Figure 2 explains the single line diagram (SLD) of Ilham Residence 3, consisting of 3 substations, namely PE Elmina 14, 15 and 16. The SLD highlights the connectivity of the network from Main Intake (PMU) up to LV network for the 3 substations.

The graphical user interface (GUI) is interactive with all the equipment and can be clicked to view further. Smart assets such as VRDT, CESS and OFP, can display the real-time demand curves.

TNB expects that the increasing DER integration at LV level can potentially lead to excess energy flow from the residential solar to the LV network. High excessive energy flowing in a reverse direction poses additional challenges to the network operators. Firstly, it creates intermittency issues where reverse power flow creates inaccurate data to perform a network system study and to forecast future supply and demand. Secondly, the current network operation is catered for conventional power flow, thus there is a lack of visibility on DER connectivity. Therefore, through the SEMI-EIP platform, the DER connectivity at LV level is more visible. The data captured from these smart assets is near real-time, with polling cycle of every minute and is expected

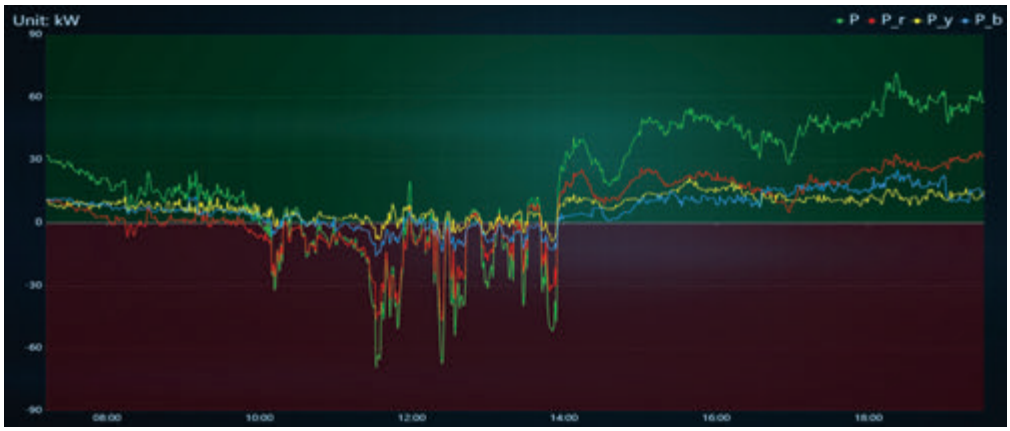

Figure 3: Active power readings captured from the Online Feeder Pillar (OFP)

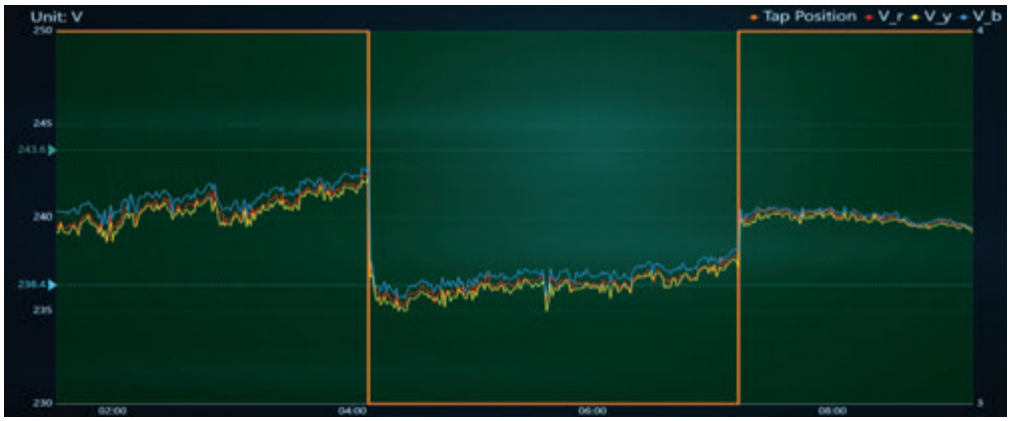

Figure 4: Voltage readings captured from the Voltage Regulated Distribution Transformer (VRDT)

to help TNB analyse extensively the impact of DER. Samples of snapshots from the SEMI-EIP platform are included in the upcoming part. The snapshots are from the OFP and VRDT, explaining the behaviour of these equipment caused by higher DER penetration.

Figure 3 shows data from Online Feeder Pillar (OFP) of the EIP platform. The graph here shows the active power flow by phases, indicated by red, yellow and blue and total active power value in green. Key points to note from here are the bidirectional flow of power from grid to consumer and vice versa. This is a good example of the term prosumer where the consumer sells excess energy from residential solar back to the grid. The reverse power flow is indicated by negative values and this occurs mostly during daytime from 10.00 a.m. to 2.00 p.m. when the solar power peaks.

Figure 4 shows the values obtained from VRDT. The voltage values from the transformer are marked on the y-axis. Any variation from the nominal values will be adjusted by the on-load tap changing actions by the VRDT. The orange line shows the tap changing operation from the transformer to adjust the voltage accordingly. The high penetration from solar increases the voltage at Point of Common Coupling (PCC), thus the tap changing actions become frequent.

Conclusion

The proactive initiatives by TNB DN, including the development of SEMI-EIP, are crucial for managing the challenges associated with increased RE penetration. By enhancing grid stability and integrating distributed energy resources, these efforts are key to achieving Malaysia's ambitious energy transition targets and commitment to a sustainable, net-zero future by 2050. ■

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Current Trends in Real Estate Industry: Challenges from the Perspectives of Engineering & Construction, Planning, Government Policy and Sustainability

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Ir. Lam Foo Chee

On September 7, 2024, the Urban Engineering Development Special Interest Group (UEDSIG) held a forum with Datuk Ir. Ho Hon Sang, President of the Real Estate & Housing Developers Association (REDHA), to discuss key trends and challenges shaping the Malaysian real estate industry. The discussion spanned engineering, urban planning, government policy and sustainability, which are crucial for navigating this evolving sector.

Economic Impact of the Real Estate Sector

The Malaysian real estate industry plays a significant role in the nation's economic growth and is closely linked to 180 related industries. It provides employment for 1.4 million people, with an annual salary payout of RM40 billion. The nation's housing stock stands at 6.48 million units, largely meeting demand. However, the industry still faces considerable challenges.

Challenges in Township Development

Township planning is complex, particularly in terms of infrastructure provision. Many parcels of commercial precincts are being allocated and provision of water and sewer requirements have been duly designed for. These are also more complicated in the case of serviced apartments where provision of water and sewer services are much higher. This means an extensive upgrading of existing water and sewer infrastructure may be required.

In line with the Environmental, Social & Governance (ESG) agenda and zero carbon emission, the use of Industrialised Building System (IBS) and Building Information Modelling (BIM) should be seriously encouraged although the feedback from the industry indicates that higher costs are incurred as well as lack of design competency and shortage of skilled labour. Sustainability is becoming more critical in urban planning, focusing on reducing site clearance, managing erosion and maintaining retention bodies. Strong project management is essential to implement preventive rather than reactive solutions to ensure long-term success.

The MS IEC 62305 – Lightning Protection System, mandated by the Energy Commission, introduces both safety and aesthetic challenges. These regulations, while crucial to safety, increase costs and can detract from the visual appeal of structures while placing a financial burden on both developers and end users or building occupants. Another concern is slope development in township planning. Current guidelines, such as those from Hong Kong and Penang, place emphasis on a safety-first approach. Improved slope management practices are necessary to mitigate risks associated with developments on inclines.

Government Policies & Legal Framework

During the discussion, we also touched on the balance between judicial prudence and commercial acumen. It is essential to protect the rights of property purchasers while ensuring the housing industry remains vibrant. The Ang Ming Lee case, for example, highlights the complexities involved in navigating these legal landscapes.

Under the Housing Development (Control & Licensing) Act (Act 118), purchasers can claim liquidated damages from the date of payment of booking fees, regardless of the amount paid. While this protects the buyers, it also increases the liability of developers.

We also discussed a proposal on the urban renewal act. It was proposed that the threshold be reduced to 80% for buildings up to 30 years old and 75% for those older than 30 years.

Land Development & Planning Issues

Land available for development has decreased to around 40% due to stricter planning requirements, including the allocation of land for schools and amenities. The shift has forced developers to explore the building of higher priced products in order to overcome the higher compliance cost. The over-allocation of sites for schools has resulted in wasted resources, with some sites remaining unused. This leads to unnecessary compliance costs which, in turn, ultimately drive up housing prices. REDHA has proposed basing school requirements on the actual population of school-aged children in developments in order to optimise land use and reduce costs.

REDHA also suggests eliminating the requirement for back lanes in landed residential developments. By removing back lanes for terrace houses, developers can increase the number of units, lower construction costs and reduce housing prices. In addition, revisiting front setback requirements for car parking will better meet modern housing needs.

Technological Advancements: e-Tanah

The e-Tanah system, an integrated electronic platform for land administration, is aimed at streamlining land-related processes. However, a survey of REDHA members in Selangor revealed that 55% of users experienced technical difficulties with the system, indicating the need for ongoing improvements to achieve its intended efficiency.

Sustainability in Real Estate

Sustainability is increasingly seen as essential to the future of real estate. Developers are recognising that profitability and sustainability can coexist, driving the adoption of greener practices.

Education and awareness play a crucial role in advancing sustainability within the industry. Green building certification programmes encourage energy-efficient designs, water conservation strategies and the use of sustainable materials. Waste reduction and recycling programmes, as well as locating developments near public transportation hubs, contribute to more sustainable townships. Sustainable property management practices further support these efforts, helping to align environmental and financial goals.

Conclusion

The forum highlighted the intricate challenges in balancing engineering, urban planning, government policies and sustainability in Malaysia's real estate sector. Datuk Ir. Ho's insights offered valuable perspectives on how to address these challenges to foster a more sustainable and resilient future for the industry. ■

Upcoming Activities

Webinar on Lessons Learnt from Injection Pile Foundation		
Date	:	12 December 2024 (Thursday)
Time	:	3.00 p.m. - 5.00 p.m.
Venue	:	Digital Platform
Approved CPD	:	2
Speaker	:	Ir. Tan Teng Hau
Pre-AGM Webinar Talk on Peninsular Gas Utilization (PGU): Managing The Artery of Energy Supply to Industrial Development in Malaysia		
Date	:	14 December 2024 (Saturday)
Time	:	9.00 a.m. - 11.00 a.m.
Venue	:	Digital Platform
Approved CPD	:	2
Speaker	:	Ir. M. Nasahie B. Akbar Ali
34th Annual General Meeting Oil, Gas and Mining Technical Division, IEM		
Date	:	14 December 2024 (Saturday)
Time	:	11.00 a.m. - 1.00 p.m.
Venue	:	Digital Platform
Approved CPD	:	2
Carbon Emission Reduction in Energy Saving Projects Based on Financial Modelling		
Date	:	16 December 2024 (Monday)
Time	:	9.00 a.m. - 1.00 p.m.
Venue	:	Digital Platform
Approved CPD	:	4
Speaker	:	Ir. Noor Iziddin Abdullah bin Ghazali
Virtual One-Day Course on "ESG and Sustinable Reporting"		
Date	:	17 December 2024 (Tuesday)
Time	:	9.00 a.m. - 5.30 p.m.
Venue	:	Digital Platform
Approved CPD	:	6
Speaker	:	Ir. Ts Wong Chee Fui
Physical One-Day Course on "Words That Project Mind. How to Master Influencing Language Using the LAB Profiles Approach"		
Date	:	19 December 2024 (Thursday)
Time	:	9.00 a.m. - 5.30 p.m.
Venue	:	Wisma IEM
Approved CPD	:	6
Speaker	:	Ir. Al-Khairi Mohd Daud
Webinar Talk on Sustainability and Solar Energy Storage		
Date	:	20 December 2024 (Friday)
Time	:	3.00 p.m. - 5.00 p.m.
Venue	:	Digital Platform
Approved CPD	:	2
Speaker	:	Dr Ravi Kumar Sharma

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Visits to MIGHT Partnership Hub and Harvestin Urban Farm

Prepared by:

Ir. Azhar Azmi

Ir. Ts. Khaw Yao Shun

Participants posing for a group photo

Urban farming or urban agriculture refers to the cultivation, processing and distribution of food in urban areas. Cities are not usually associated with agriculture but with growing concerns over urban sustainability and food security, urban farming is getting serious consideration today.

For the 2023/2024 session, the Urban Engineering Development Special Interest Group (UEDSIG) organised site visits to two urban farms in the Klang Valley. These were The Malaysian Industry-Government Group for High Technology (MIGHT) Hub (Urban Farm Project Using Alternative System) in Cyberjaya and Harvestin (Urban Farming – Farm to Plate in Malaysia) in Bandar Sierra.

The first visit took place on 6 December 2023. Participants were welcomed by Encik Mahalil Amin Abdul Malek, the Vice President of MIGHT, a government agency which facilitates technological partnerships on both local and international levels, including industry, government and academia.

Digital Content

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https://bit.ly/3CnOlXv

The briefing on the technology used in the urban farm revealed the use of energy efficiency technology. The urban farm facility, named as an Innovative Controlled Environment (ICE) Greenhouse, was based on modular energy efficiency concepts, harnessing energy alternatives and creating complementary Liquid Natural Gas energy options.

The technology, developed by Wasavé Sdn. Bhd. in collaboration with MIGHT, was implemented as a highland-to-lowland food security innovation exercise and included a versatile energy system for cooling a modern greenhouse.

Participants in the greenhouse facility

The modularity and versatility of this technology enables deployment across various sectors and facilities of industry, such as data centres, cold storage for food and vaccine industries, green district cooling and heating system and for controlled-environment temperate farming, such as strawberry, tomato, salmon and tuna.

The ICE Greenhouse facility was officially launched in September 2023. There are 600 thriving strawberry plants which yield an impressive 4kg of strawberries weekly. With the facility's smart farming technology, precision monitoring and control of the environment is ensured.

After the briefing session, we went to the greenhouse farm located just outside the office. We were introduced to the energy efficiency system as well as the smart farming technology. We also had the opportunity to taste the strawberries grown at the facility. The visit ended at around 12.30 p.m. with the presentation of a souvenir to Encik Mahalil Amin.

The second urban farm visit was to Harvestin on 14 September 2024. It started with a welcome address by Ir. Mike Lau on behalf of the organising committee of the event.

At 9.45 a.m., a representative from Harvestin, Mr. Hor Chee Fei, briefed us on climate control farming or sustainable agritech towards acute weather environment carbonisation energy transition. He then showed us how it was possible to utilise narrow spaces in an urban environment for the planting of vegetables. Self-reliance will no longer a dream for city folks as technology has enabled effective crop plantation and maximum harvesting.

During the visit, we discussed a wide spectrum of topics, including botanic, plantation, soil mechanics, weather, business, marketing, agriculture and technology. Among the things we learnt were which plants could thrive in certain soil and weather conditions, the time required for plants to grow before they were harvested, the number of plants one could grow in a certain plot of land and ways to market the vegetables. With the lively interaction between the engineers and the farm owner, both parties came away with a better understanding of each other's roles.

Then the technology provider and system integrator provided us with an insight into the use of sensors, processor unit, network, algorithms and GUI to enhance productivity of the crops.

Sensors can detect various parameters of soil and weather conditions. During the dry season, it will transmit signals to activate the automated watering mechanism. All the trend logs will be processed and the farmers will be informed on the average conditions within a time period. Then, the farmers will take reflective actions to improve the soil condition or to determine the type of vegetables to plant next.

During the briefing at MIGHT

In short, the technology allows effective data collection which helps minimise human efforts in agriculture. A lot of discussion has been held on the potential of future technology in improving current practices.

IOT, blockchain and AI were discussed during the visit. Of course, all the technological usage is to incorporate Environment, Social & Governance (ESG) in the agriculture.

The visit ended at 12:30 p.m. with the presentation of a souvenir and certificate of appreciation to Mr. Hor. There are plans in the pipeline to organise visits in future to other urban farms managed by Harvestin. ■

NOTICE ON NOMINATION PAPERS FOR COUNCIL ELECTION SESSION 2025/2026

A notice inviting nominations for the Election of Council Members for Session 2025/2026 will be posted on the IEM Notice Board and IEM website by 1 November 2024 for the information of all Corporate Members of IEM. Following the close of nominations on 7 December 2024, the election exercise will proceed. All Corporate Members residing overseas are requested to take note of the requirements of the Bylaw, Section 5.17, as shown below.

> *The voting paper (in hardcopy or electronic form) shall, not less than twenty-eight (28) clear days before the date of the Annual General Meeting, be sent by post or in electronic mail or message to all Corporate Members. The voting paper (in hardcopy or electronic form) shall be returned or submitted online and in turn notified to the Honorary Secretary in a sealed envelope or electronically encrypted format so as to reach him by a specified date not less than seven (7) days before the Annual General Meeting.*

Electronic Ballot Papers will be sent to all Corporate Members by **3 March 2025**.

Thank you.
Election Officer, IEM

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TIMELINE

The dragon fruit plant belongs to the cactus family. Researchers have traced its origin to a plant that's native to Southern Mexico and Central America. It is called *pitahaya* and *pitaya roja* by the Mexicans and Americans respectively.

The fruit has a unique appearance, with spikes that resemble a fire ball and scales that look like dragon skin as mentioned in the Chinese mythology. Due to this, many people think the dragon fruit originates from China. But this is incorrect.

According to Sepang District Agricultural Office Deputy Director Rozman Sumiati, dragon fruit was first cultivated in Malaysia in the late 1990s. The locals called it *buah naga* or *buah mata naga*.

Prepared by:

Ir. Dr Oh Seong Por

The Chairman of IEMNS and Director of Samsung SDI Energy (M). Sdn. Bhd.

World's Largest Dragon Fruit-Shaped Structure

In Malaysia, the hometown of dragon fruit is Sepang, including Sungai Pelek and Salak. By 2022, some 404ha of dragon fruit plantations in the Sepang District were producing a monthly harvest of 1,000 tons which fetched an annual revenue of RM300 million.

At the Hong Long (HL) Dragon Fruit Eco Farm in Sepang is the world's largest dragon fruit-shaped structure. It stands at 9.3m tall and measures 9.4m wide. The entire structure is supported by four concrete columns and covered with a concrete wall crafted with spikes and scales to resemble the skin of the dragon fruit. It is painted in the purplish red and green colours of the dragon fruit.

This structure was the brainchild of farm owner Chia Boon San who started its construction in 2020. When it was completed, it earned recognition in the Malaysia Book of Records as the largest dragon fruit-shaped structure in Malaysia. In 2023, it made it into the Guinness World Records as the World's Largest Building in the Shape of a Dragon Fruit.

Hong Long Farm is located near Kuala Lumpur International Airport (KLIA) and there, one can also enjoy close-up views of low cruising airplanes with their landing gears fully lowered. These make awesome scenes for photography.

In June this year, my family and I had an enjoyable outing at the farm. We admired the dragon fruit structure, learnt about the farming process and enjoyed fresh dragon fruit juice. ■

Digital Content

SCAN ME!

https://bit.ly/3NSS023

Construction progress of the structure

Date: 22 November 2024

To all Members,

LIST OF CANDIDATES ELIGIBLE TO SIT FOR THE PROFESSIONAL INTERVIEW FOR THE YEAR 2024

The following is a list of candidates who are eligible to sit for the Professional Interview for the year 2024.

According to the IEM Bylaws, Section 3.8, the names listed below are published as eligible candidates to become Insitution Members, provided that they pass the Professional Interview in 2024.

If there are any Corporate Members who have objections against any candidate deemed unsuitable to sit for the Professional Interview, a letter of objection can be submitted to the Honorary Secretary, IEM. A letter of objection must be submitted within one month from the date of publication.

Ir. Prof. Dr Tan Chee Fai
IEM Honorary Secretary

NEW APPLICATION

NAME	QUALIFICATION
CIVIL ENGINEERING	
CHAM KHAR JUNN	BE HONS (NTU) (CIVIL, 2003)
ELECTRONIC ENGINEERING	
SHAHRUL AMIN BIN HASHIM	BE HONS (UITM) (ELECTRICAL, 2008)
ELECTRICAL ENGINEERING	
AHMAD FAIZAL BIN BASRI	BE HONS (UNITEN) (ELECTRICAL POWER, 2009)
MOHD FUAD BIN ABDUL LATIP	BE (UM) (ELECTRICAL, 2001)
MECHANICAL ENGINEERING	
ZULHUSMI BIN MOHD NOOR	BE HONS (ADELAIDE) (MECHANICAL, 2013)

APPLICATION FOR CORPORATE MEMBER

NAME	QUALIFICATION
CIVIL ENGINEERING	
LIM TEIK HUI	BE HONS (UTM) (CIVIL, 2008)
MECHANICAL ENGINEERING	
AHMAD HAZIM BIN MAHADZIR	BE HONS (UNIKL) (MECHANICAL, 2019)

MEMBER TRANSFER

MEMBERS NO.	NAME	QUALIFICATION
CIVIL ENGINEERING		
104220	KATHRINA BINTI ABDUL LATIF	BE HONS (UPM) (CIVIL, 2005)
87380	SYARIZAD BIN SALIM	BE HONS (UTM) (CIVIL, 2015)
69117	NOOR ASYIQIN MOHD SIDEK	BE HONS (UITM) (CIVIL, 2015) MSc HONS (UITM) (SCIENCE & STRUCTURAL, 2017)
108054	HASRUL BIN MOHD ARIFIN	BE HONS (UITM) (CIVIL, 2007) ME HONS (UITM) (CIVIL, 2020)
108031	LEE WEI LOON	BE HONS (SEGI) (CIVIL, 2013)
89158	'AMMAR TAQI BIN BORHAN	BE HONS (UNITEN) (CIVIL, 2017)
ELECTRICAL ENGINEERING		
40144	ABDUL RAHMAN BIN KAMARUDDIN	BE HONS (UTM) (ELECTRICAL, 2012)
114731	LOO PIN LIKH	BE HONS (INTI) (ELECTRICAL, 2013) ME HONS (UTAR) (ELECTRICAL, 2019)
119090	NORAZMAN BIN ABU HASSAN	BE HONS (UITM) (ELECTRICAL, 2012) ME HONS (UITM) (ENGINEERING MANAGEMENT, 2017)
COMMUNICATION ENGINEERING		
108272	DEVAKUMARAN A/L SUBRAMANIAM	BE HONS (UNIMAP) (COMMUNICATION, 2015) MSc HONS (COMMUNICATION, 2015)
MECHANICAL ENGINEERING		
27621	FAIZAL BIN ROSDI	BE HONS (UTHM) (MECHANICAL, 2005)
53783	NORADILA BINTI ABDUL LATIF	BE HONS (UTHM) (MECHANICAL, 2008) ME HONS (UKM) (MECHANICAL, 2010) PhD (UKM) (2015)
MECHATRONICS ENGINEERING		
114906	LIAN WEN XUN	BE HONS (APU) (MECHATRONICS, 2020) PhD (UM) (2019)

TRANSFER TO CORPORATE MEMBER

MEMBERS NO.	NAME	QUALIFICATION
CIVIL ENGINEERING		
102984	AIRIL YASREEN BIN MOHD YASSIN	BE HONS (UTM) (CIVIL 2000) MSc HONS (UTM) (STRUCTURE, 2003) PhD (IMPERIAL COLLEGE) (2007)
108132	ZAID ISKANDAR BIN JARAIEE	BE HONS (UTHM) (CIVIL 2008)
37140	MOHD KHAIRUL ANUAR BIN YUSOFF	BE HONS (UTHM) (CIVIL 2011)
93852	CLIFF JUDE ZEHNDER	BE HONS (SWINBURNE) (CIVIL, 2015)
55816	WAN MOHD AMZAR BIN WAN MANAN	BE HONS (KLIUC) (CIVIL, 2011)
35713	MOHAMED FAIRUZ BIN HUSSIN	BE HONS (UTM) (CIVIL, 2010)
37137	GOH WAN INN	BE HONS (UTHM) (CIVIL, 2011) PhD (UTHM) (2015)
45563	CHUA YIE SUE	BE HONS (USM) (CIVIL, 2012) PhD (NUS) (2017)
99385	TANG SENG HOE	BE HONS (UTAR) (CIVIL, 2013)
ELECTRICAL ENGINEERING		
53711	SEZU PATHY A/L MUTHU KARIPPEN	BE HONS (UTM) (ELECTRICAL, 2011)
52789	MUHAMMAD IRSYARUDIN BIN ALI	BE HONS (UMP) (ELECTRICAL, 2012)
MECHANICAL ENGINEERING		
111606	MOHAMAD BIN MOHAMAD YUSOFF	BE HONS (UTM) (MECHANICAL, 2019)
84497	BRYAN CHAI YEN BOON	BE HONS (UTM) (MECHANICAL, 2019)
93851	JAYEE A/L SREETHARAN	BE HONS (UTM) (MANUFACTURING, 2010)
MECHATRONICS ENGINEERING		
21672	RAFIUDDIN BIN ABDUBRANI	BE HONS (UNIMAP) (MECHATRONIC, 2010) MSc HONS (USM) (ELECTRONIC SYSTEM, 2012)

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