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Plugs, Socket-Outlets for Industrial Purposes

LS – TYPE Plugs and Socket-Outlets for Entertainment


Plugs


Couplers

Inclined flush mounting sockets - Watertight IP67


PEW...PI 16A-32A 63A-125A

Couplers - Watertight IP66/IP67


16A-32A

Wall-mounting plugs - Watertight IP67


PEW...SM 63A

Plugs – Watertight IP66/IP67


PEW...SV 16A – 32A

Interlocked switched socket-outlets with screw type fuse carrier aluminium enclosure – splashproof IP55


(PK...PB5 125A)

Interlocked Switched Socket-Outlets


TM...SP

Plugs - Low voltage from 50V to 690V

IP44


PE...PP 16A-32A


PE...PQ 16A-32A


PE...SV 16A-32A

IP67


Couplers 16A-32A


SIPW...SV


PEW...PP 16A-32A

Multipole Connectors for Industrial Purposes

C-Type

IP Enclosure C-Type


Hoods with 2 levels


Hoods with 1 level

CNE-CSE 16 Poles


Inserts, Screw terminal connection

MIXO modular units


4 poles 40A-830V

CT – CTS 64 Poles


Terminal blocks inserts screw terminal connection

CP 6 Poles 35A-400/690V


Inserts, screw terminal connection

CKS 3 and 4 Poles


Inserts, 3 poles + connection with spring terminal


Inserts, 4 poles + connection with spring terminal

CMCE 3+2 (aux) polest


Inserts, Crimp Connections

MIXO modular units 2 poles 100A


Crimp connections

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From The Editor's Desk

The last few months have been super busy ones for The Electrical and Electronics Association of Malaysia (TEEAM).

TEEAM's 72nd Annual General Meeting 2024 was successfully conducted on 28 May 2024 at Tropicana Golf & Country Club.

The AFEEC-FAPECA Conference and Meetings 2024, which were held in conjunction with ENERtec Asia 2024 from 26 to 28 June 2024 at the Kuala Lumpur Convention Centre, were a great success!

In this issue, we highlight the various Papers which were presented during the recently concluded AFEEC-FAPECA Conference 2024. We believe that these authoritative Papers will provide you with a clear view of how to achieve zero-carbon emissions, amongst others.

Artificial Intelligence (AI) has been in the limelight so much, and so we have an important Paper presented by our local Researchers.

The meteoric advancements in AI will provide the impetus for better chips and related Semiconductor and Communications Technologies. The fast-growing need for larger Data Centres creates a positive demand for electricity generation. All these augur well for the future of TEEAM!

I hereby sincerely hope that all TEEAM Members will be able to greatly benefit from such ground-breaking opportunities, and will also be able to give their utmost in the smooth implementation and fast-track completion of all Projects entrusted to them.

Keep up the great work and always move forward with the highest standards of professionalism in all of your E&E undertakings. Congratulations to one and all!

Regards,

Ir Chew Shee Fuee, KMN
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CIDB Engagement Session with Stakeholders

On 1 August 2024, The Electrical and Electronics Association of Malaysia (TEEAM) attended the Construction Industry Development Board's (CIDB's) Engagement Session with Stakeholders. This meeting was held at the CIDB Headquarters situated at CIDB 520 in the MET Corporate Towers in Dutamas, Kuala Lumpur. During this important session, TEEAM managed to effectively engage with CIDB and various Stakeholders from the construction industry.

The primary purpose and agenda of this Engagement Session were to collect feedback and enhance the existing programmes the Board offered. Because the Stakeholders consisted of Contractors, Developers, Engineers, and Government Representatives, the scope of the topics covered was broad. This session provided its participants with a Forum to engage with each other and exchange insights into innovation and best practices in the Construction Sector.

By gathering diverse industry players, the engagement session was a good and ripe opportunity to share knowledge and establish partnerships which might result in increased efficiency and sustainability in construction practices. To that noble end, TEEAM made the most of its involvement in the meeting by pro-actively raising 3 significant points of discussion. First, TEEAM, represented by Ir. Chang Yew Cheong (President) and Dato' Andy Tan (Honorary Treasurer), urged the Government to standardise all of its Training Programmes to ensure consistency, efficiency and quality in a cohesive and coherent Syllabus for industry professionals.

Secondly, TEEAM stressed the need for the Board to focus on overseeing that local and foreign workers alike undergo rigorous training to make sure that they are adequately equipped with necessary skills and critical knowledge of best practices in Safety before they are allowed to work on projects at construction sites. This urgent and stringent requirement will contribute to the construction workers' effectiveness while maintaining a certain minimum level of standard throughout the industry. Last but not least, our esteemed Association put forth a valid suggestion that the Board propose to the Government Cabinet that the HRD (Human Resource Development) levy on Contractors be scrapped.

TEEAM suggested this proposal due to the widely-known fact that the CIDB already collects a levy from Contractors whilst providing training for them. This proposal will greatly decrease the financial strain placed upon Contractors and optimise the resources utilised within the industry as well as streamline the processes for the benefit of all Stakeholders. With those very important points tactfully raised and cordially addressed, the eventful session concluded on a productive note!

Giving credit where credit is due, CIDB must indeed be lauded and applauded for its desire to be transparent and accountable to its Stakeholders. The constructive dialogue was not only a mere exchange of ideas but also a strategic initiative to improve the Construction Industry's performance, refine industry policies and practices, maintain the industry's relevance and ultimately positively boost its competence.

Welcome Address by Tuan Hj. Razuki Ibrahim (CIDB Deputy Chief Executive 1).


(from left) Mr. Peter Tan (MACRA President), Dato' Andy Tan (TEEAM Honorary Treasurer) and Ir. Chang Yew Cheong (TEEAM President).


Ir. Chang Yew Cheong (TEEAM President) raising a question.


Good turnout at the CIDB Engagement Session.

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MITI 2025 Budget Dialogue with Industry Stakeholders

The Ministry of Investment, Trade & Industry (MITI), Malaysia, held the 2025 Budget Dialogue with Industry Stakeholders on 5 August 2024 at MITI Tower, Kuala Lumpur. The Budget Dialogue was chaired by the Honourable MITI Minister, YB Senator Tengku Datuk Seri Utama Zafrul Tengku Abdul Aziz. The Electrical and Electronics Association of Malaysia (TEEAM) was represented by Ts. Lim Sai Seong (Deputy President) and Ms. Tan Ai Peng (Council Member). The Dialogue aimed to gather inputs and ideas from various industry Associations in an effort to formulate proposals for Budget 2025 to be prepared by the Ministry of Finance (MOF). MITI's Budget Proposal is focusing on one of the Core Agendas within the framework of Malaysia's MADANI Economy (which was mooted by The Right Honourable Yang Amat Berhormat (YAB) Datuk Seri Anwar Ibrahim), which is raising the economic ceiling to create meaningful job opportunities with reasonable wages; strengthening the preparedness of the country's industry and trade in the face of changing economic landscape and global demand; and managing the supply chain more efficiently.

Ts. Lim Sai Seong took the opportunity to raise some of the issues faced by our TEEAM Members. Some 26 local industry Associations joined this very important Budget Dialogue Session.

MITI Budget Dialogue was chaired by the Honourable MITI Minister, YB Senator Tengku Datuk Seri Utama Zafrul Tengku Abdul Aziz.

TEEAM Officials together with other Industry Stakeholders posing with the Honourable MITI Minister, YB Senator Tengku Datuk Seri Utama Zafrul Tengku Abdul Aziz.

KLSCCCI BON Session 2024

Recently the Kuala Lumpur and Selangor Chinese Chamber of Commerce and Industry (KLSCCCI) joined forces with The Electrical and Electronics Association of Malaysia (TEEAM) to organise a significant Business Opportunity Networking (BON) Session on 19 July 2024. Wisma Chinese Chamber was the venue chosen to house this prestigious event. Other than facilitating ease of communication and fostering win-win collaboration amongst the participants who consisted of professionals in the Electrical and Electronics industries as well as members of the business community, the attendees from both organisations had the excellent opportunity to exchange valuable insights, explore exciting business prospects and establish strong business partnerships.

To enliven the enlightening experience, all participants were given the opportunity and time to introduce themselves and promote the products and services of the different respective companies and brands they represented. While the BON Session was one of the major Networking events, KLSCCCI has been active in frequently organising various events throughout the year to support and promote Business Development. Mr. John Chai, Deputy Chairman of the International Trade & Industry (ITI) Committee of KLSCCCI was in charge of moderating the Networking Session. Mr. Chai moderated the session after Dato' Dr. Ir. Andy Seo, Chairman of the ITI Committee of KLSCCCI, who is also TEEAM Technical Advisor, delivered his Welcome Remarks.

Ir. Chang Yew Cheong (President), Dr. Siew Choon Thye (Immediate Past President), Mr. Simon Leong (Honorary Secretary), Ms. Tan Ai Peng (Council Member), Tc. How Chee Seng (Council Member), Mr. Charles Lee (Committee Member), Mr. Jim Loo (Committee Member) and some TEEAM members attended the rewarding Business Networking Session. Everyone who participated considered the time spent together as very worthwhile!

(from left) Ms. Tan Ai Peng (TEEAM Council Member), Dr. Siew Choon Thye (TEEAM Immediate Past President), Ir. Chang Yew Cheong (TEEAM President) and Dato' Dr. Ir. Andy Seo, Chairman of the ITI Committee of KLSCCCI, who is also TEEAM Technical Advisor.

A group photo capped off the rewarding BON Session.

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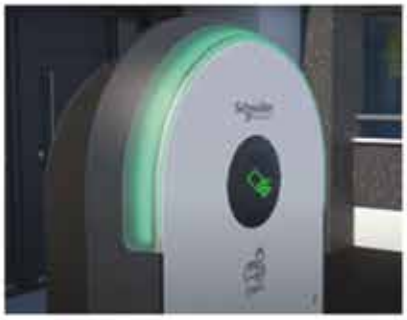

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ENERtec Asia 2024

The ENERtec Asia 2024 Trade Show, once known as ASEAN M&E, was a momentous event for all who were involved. Held from 26 to 28 June 2024 at the Kuala Lumpur Convention Centre (KLCC), Malaysia, this splendidly-organized Trade Show was well-attended with a whopping audience of 9,935 visitors! Well done! The Attendees comprised Professionals from 60 countries occupying diverse roles ranging from Technical Leaders such as CEOs, Directors, Executives, and Engineers, to Government Policy-makers and Sales Specialists, to name a few.

The ENERtec Asia 2024 Trade Show focused on Energy Transition and Technology. Innovation and Sustainability in Electrical Engineering practices are certainly a pressing need to address and tackle with the rapid acceleration of climate change worldwide amid calls for greater accountability and stricter adherence to the Environmental, Social and Governance (ESG) Framework and its principles. Introduced and organised by Informa Markets, co-hosted by The Electrical and Electronics Association of Malaysia (TEEAM), and in partnership with the Energy Industries Council (EIC), this Trade Show consisted of three main segments: TENAGA (Renewable Energy & Cleantech), REVAC (Energy Efficiency & De-carbonisation) and BATTERY & EV TECH (Energy Storage & Electric Vehicle Technology and Solutions).

The TENAGA segment focused on Renewable and Clean Energy, Critical and Back-up Power, Intelligent Energy Solutions, Smart Energy, Industrial Automation, and Energy Management Systems. The REVAC segment focused on Energy-Efficiency, Carbon Emission Reduction, Air Quality, Ventilation Systems, Refrigeration, and Building Automation. It should also be noted that REVAC is South-east Asia's largest leading HVACR Business and Innovation Platform.

The BATTERY & EV TECH segment covered Battery Management, EV Manufacturing, Critical and Back-up Power (as in the TENAGA segment), Commercial Charging Systems, and Smart Parking Systems. It is a new segment dedicated to Energy Storage and EV Technologies.

Held alongside the Trade Show were 3 other International Conferences, namely, the 2024 ASEAN Federation of Electrical Engineering Contractors (AFEEC) & Federation of Asian-Pacific Electrical Contractors Associations (FAPECA) Conference & Meetings 2024, ASHRAE Malaysia Chapter Conference, and the EIC Energy Conference. The high-value Conferences featured multiple eminent Speakers and Presenters (over 50 in number). Discourses included Keynote Addresses and Opening/Welcoming Speeches from various Government Officials and Representatives as well as from Industry Leaders and Professionals in the ever-dynamic and vibrant Electrical and Energy sectors.

Apart from the Keynote Addresses, Opening Speeches and Technical Presentations, the industry-centric Trade Show also hosted 400 Exhibitors manning numerous exhibition booths in 5 International Pavilions. There were many attractive reasons to exhibit with ENERtec Asia 2024 this year, some of which were an enormous and continuous stream of high-quality Trade Buyers and Visitors, a broad range of ENERtec Asia industry technologies and products, and ample business opportunities to showcase each one's latest products and technology, to the industry experts. Business growth was also amplified with the opportunity to generate new and high-quality business leads, increase brand presence and visibility, and also meet with Leading Distributors, Dealers, and Small & Medium Traders within the Power, Energy, Mechanical & Electrical (M&E) plus Heating, Ventilation, and Air Conditioning (HVAC) sectors.

Drawing from the currently made available visitors' reviews and from their personal feedbacks gathered and collected much earlier in 2022 regarding their overwhelmingly positive experience with the Exhibitors, ENERtec Asia 2024 is well-poised to take the Energy and Electrical Market by storm. Here are some vital statistics from the ASEAN M&E 2022 (before it was re-branded as ENERtec Asia after 2 decades of flourishing) for Exhibitors to take note of for future improvements and to gauge future engagement and potential:

- 92.25% of visitors will probably attend the event again
- 92.24% of visitors were satisfied with the event experience
- 91.38% of visitors would probably recommend the Trade Show to friends/colleagues
- 89.62% of visitors achieved their objectives of collecting market info
- 83.26% of visitors were able to source new products

On the other hand, Exhibitors in ASEAN M&E 2022 praised the event for the following five same characteristics in the form of statistical feedback:

- 97.40% of Exhibitors were satisfied with visitor quality
- 94.84% of Exhibitors were likely to attend again
- 94.83% of Exhibitors were happy with business opportunities
- 92.24% of Exhibitors were satisfied with event experience
- 91.38% of Exhibitors were likely to recommend the show

Attendees/Visitors/Participants were able to collect market information and source new products from ASEAN M&E 2022, and they could also consolidate contacts with Suppliers/Business Partners, find New Suppliers, and seek Franchisors/Principals. Peter Lundberg, one of the distinguished visitors representing Asia Pacific Urban Energy Association (APUEA) from Thailand, has this glowing but honest testimonial to say about the ASEAN M&E 2022 event:

'Well, I think it is a good platform, getting together under the umbrella of Energy. As an energy brand, sustainability being the top priority, it is vital for all of us in the energy industry to contribute to the ongoing energy transition. I think ASEAN M&E really did a good job in putting all the segments under one roof, and the Exhibition is very well-organised. You can explore a diverse array of companies and offerings, covering everything from Chillers to HVAC equipment, as well as Cables and other Energy-related products.'

Among the top 15 countries from which the attendees came to the 2024 exhibition were the nearby ASEAN member countries such as the Philippines, Singapore, Vietnam, Indonesia, Thailand and of course not forgetting the host country Malaysia, on to the most populous countries such as China in East Asia and India in South Asia – even to countries as far as Türkiye, which uniquely straddles the two continents of Europe and Asia. Apart from their afore-mentioned profiles of being Technical Leaders and Government Policy-makers among other diverse roles and key positions, the attendees represented divisions such as Administration, Business Development, Marketing, Project Management, Purchasing/Procurement, and Research/Development. These departments spanned various industries from Consultants and Contractors to Food & Agriculture and Hospital/Healthcare to Power/Utilities and Building Service & Maintenance, which are by no means an exhaustive list.

The event also highlights initiatives for energy transition in Malaysia. These such initiatives are the National Energy Transition Roadmap (NETR) with catalytic projects aiming for an upshift in renewable energy contributions, Malaysia's Industrial Master Plan (NIMP) 2030 focusing on ESG practices, and encouraging, promoting and raising awareness of clean energy solutions through ENERtec Asia's A-class innovations and technologies.

As for Malaysia's energy landscape, the NETR has ambitious but plausibly achievable goals for RE (Renewable Energy), which are to: increase the installed capacity of Renewable Energy to 70% by 2050. The initiative also has lucrative projects of which there are investment opportunities (projected to be) worth a whopping RM1.85 trillion by 2050 and include major solar and hydrogen projects.

NIMP 2030's long-sighted aim and vision for Malaysia are to transform it into a high-tech industrialised nation by 2030. This vision is reflected in its apt name. EV Ecosystems, Carbon Capture, and Circular Economy Frameworks are just some of NIMP 2030's key focus areas. Its mission is to strive as hard as possible for Net Zero by placing heavy emphases on Carbon Emission Reduction (otherwise known as De-carbonisation), Energy Efficiency, and New Green Growth sectors.

Nevertheless, the global and ASEAN energy markets present both challenges and opportunities, respectively. The energy markets' global challenges are energy crises and geo-political conflicts which underscore the crucial need for sustainable and profitable energy solutions. Conversely, the ASEAN region presents opportunities in the energy sector in increasing measure in the form of rising demand for EV Technology, Renewable Energy Sources, and Sustainable Industrial Practices.

The ASEAN member countries also anticipate sizeable growth in HVAC Systems, EV Markets, Renewable Energy, and Bio-energy. This growth will likely be driven by technological advancement, infrastructural development, and growing environmental consciousness and awareness.

As for the Market Outlook, here are six of the eight points (with statistics) of TENAGA's market outlook:

- Hydrogen demand in ASEAN set to surpass 11 million tonnes by 2050.
- Bio-energy in ASEAN to increase to 7.6 EJ from 2.7 EJ in 2018.
- ASEAN Electric Vehicle Market forecasted to reach USD 2,665.3 million by 2027.
- South-east Asia's renewable energy market to install 117.17 GW by 2027.
- 44 million by 2027.
- Space Cooling to grow from 17% share in 2018 to almost half in 2050.

REVAC's market outlook predicts that the South-east Asia HVAC market will also grow, with a big focus on cooling equipment. The REVAC Expo event also highlights the growth of Smart Technologies in being incorporated into over 25 billion devices by 2020, the need for more HVAC Technicians – the industry being short of over 138,000 Technicians by 2022, and last but not least, a 15% rise in jobs within the HVAC sector by 2026!

Malaysia was host to ENERtec Asia 2024 and it was an ideal country venue for the Conferences and Trade Show due to its strategic location between China and India; excellent connectivity comprising 6 international airports, 16 domestic airports, and efficient transportation infra-structure; world-class state-of-the-art facilities, competitive pricing, vibrant economy, politically stable environment, freedom from the threat of natural disasters (unlike in some other countries), and English language proficiency that smoothens and simplifies business transactions. The next edition is set for 3 to 5 June 2026 in Kuala Lumpur. See you there!

..... Continue ENERtec Asia 2024

Snapshots of ENERtec Asia 2024

..... Continue ENERtec Asia 2024

Snapshots of ENERtec Asia 2024

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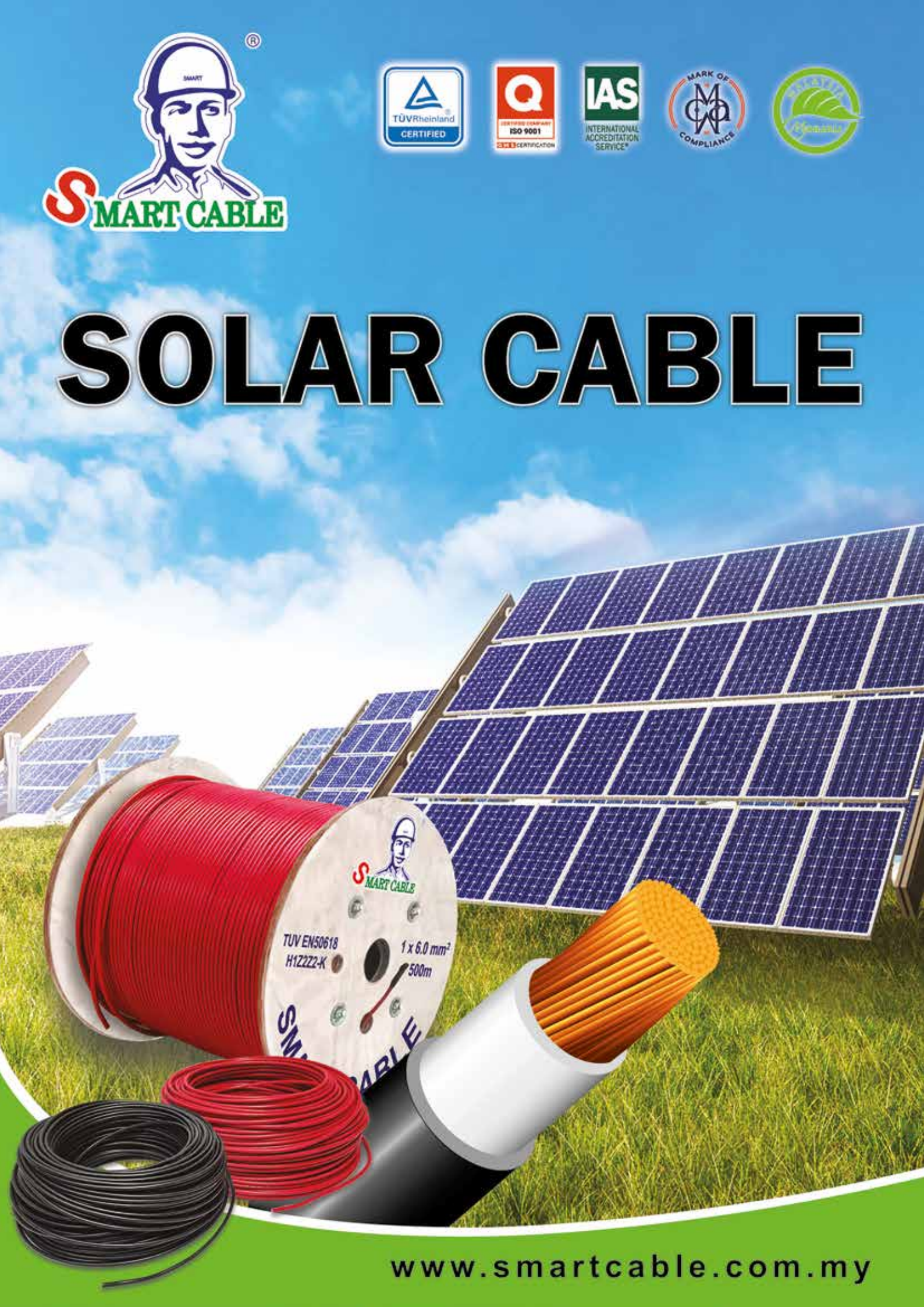

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AFEEC-FAPECA Conference & Meetings 2024

The first day of the AFEEC-FAPECA Conference & Meetings 2024 got off to a roaring start when the distinguished Delegates assembled at their respective hotel lobbies at 7:45 am early in the morning and then proceeded to walk over as a sizeable group to the Kuala Lumpur Convention Centre (or KLCC, for short, as it is commonly known). Some of the popular hotels which were within walking distance to KLCC are the Traders Hotel, Impiana KLCC Hotel and Novotel. It was mandatory for them to be either clad in formal attire complete with a coat or dressed in their national costumes.

Delegates were also required to register for the ENERtec Asia 2024 Opening Ceremony at Conference 2, Level 2, KLCC at 8:30 am. The significant Trade Show was held concurrently with the AFEEC-FAPECA Conference & Meetings 2024 event. 9:15 am marked the arrival of distinguished Guest-of-Honour,

Deputy Minister of Energy & Environmental Sustainability Sarawak, The Honourable, YB Datuk Dr. Haji Hazland Bin Abang Hipni who delivered their Keynote Addresses after the Welcome Remarks which were given by Tan Sri Abdul Rahman Mamat, Chairman of ENERtec Asia 2024 and of Informa Markets Malaysia; Ir. Chang Yew Cheong, President of The Electrical and Electronics Association of Malaysia (TEEAM); and Mr. Stuart Broadley, Chief Executive Officer of the Energy Industries Council (EIC) of the United Kingdom.

At 10:15 am, the official visit of ENERtec Asia 2024 in Halls 1 to 5 began with an exciting bang as the participants were also given a tour of the expansive exhibition grounds. They then left to have their luncheon at Conference 1, Level 3, KLCC. After the participants had their sumptuous fill plus networking, the AFEEC Council Meeting was held at the Conference Zone, Hall 5 of KLCC's ground floor. They then adjourned for their coffee break to re-charge and be refreshed.

The FAPECA Board Meeting then began at 4:00 pm at the same Conference Zone venue where the AFEEC Council Meeting was held. It ended at 5:30 pm after which the Delegates made their way back to the Banquet Hall at Level 2 of Impiana KLCC Hotel for the Welcome Dinner preceded by a Welcome Cocktail. The attire requirement for the formal occasion was the same as that of the beginning of the day.

After the Delegates and Guests were cordially asked to take their seats, the esteemed Emcee appointed for this Grand event heartily welcomed everyone and did a roll call of the AFEEC/FAPECA Associations. He subsequently introduced the Diamond Sponsor, Smart Cable (M) Sdn Bhd. The Ocean Live Band then gave a great music performance as food and drinks were served to the participants.

While they were having their Dinner, the Organising Chairman, Ir. Lee Kok Chong delivered his Welcoming Speech at 7:50 pm followed by a Speech from TEEAM President, Ir. Chang Yew Cheong about 5 minutes later. The TEEAM President's Speech was then followed by the AFEEC-FAPECA President, Mr. Boonsak Kiatjaroonlert's Speech 10 minutes thereafter. At 8:15 pm, a toast was proposed by all the AFEEC and FAPECA Head of Delegates.

The Ocean Live Band then resumed performing their music repertoire for the night. Half an hour later, the Diamond Sponsor played a video, and a Token of Appreciation was presented to the Diamond Sponsor for their substantial monetary contributions. Similarly, a Token of Appreciation was also presented to the Gold and Silver Sponsors for their praiseworthy generous contributions to the successful realisation of this Grand event.

A presentation followed the giving of the Tokens of Appreciation to the Sponsors and then the AFEEC-FAPECA Head Delegates cordially exchanged gifts with each other. These two events were followed by a video presentation delivered by the Diamond Sponsor. The Ocean Live Band then performed their final number before the Welcome Dinner finally concluded and the Delegates returned to their respective hotels.

On the next day of June 27, the same early morning routine started with the Delegates again gathering at their hotel lobbies to walk over to KLCC with the same mandatory outfit requirements. Conference registration started at 8:00 am and the Welcome Address was given by the Organising Chairman, Ir. Lee Kok Chong an hour later. 10 minutes later, the TEEAM President, Ir. Chang Yew Cheong gave his Opening Address.

Special Guest, Mr. Xu Ningning, the Chairman of RCEP Industry Co-operation Committee (RICC) and Executive President of the China-ASEAN Business Council, then delivered his Keynote Address to the Delegates. His address was followed by the Keynote Address of Guest-of-Honour , Datuk Hanafi Sukri who is the current Ministry of Investment, Trade and Industry (MITI) Deputy Secretary-General. He then officiated the Conference. 10:15 am saw the Guest-of-Honour being given a VIP tour of the enormous exhibition complex while the Delegates had their Morning Coffee Break.

Session 1 of the AFEEC-FAPECA Conference 2024 with its theme this year of 'Energy Transition – Path to Net Zero' then commenced with Introductory Remarks by Session Chairman, Ir. Dr. Ng Kok Chiang who is TEEAM Vice President. These introductory remarks were followed by Dr. Sulaiman Shaari of TEEAM presenting his talk. The topic of his talk was 'Malaysian Energy Transition Roadmap: Ways the Industry Can Help'. This was followed by 'Energy Transition in Indonesia: Target, Projection, Strategy and Challenges' by Dr. Herman Darnel Ibrahim of the Association of Indonesian Electrical and Mechanical Contractors (AKLI).

Ir. Dr. F. C. Chan of Hong Kong Electrical Contractors Association (HKECA) then delivered his presentation on 'A Holistic Approach to Zero Carbon Emission' 20 minutes later. Ir. Dr. Chan's presentation was followed by Dr. Shinyoung Kim of Korea Electrical Contractors Association (KECA) giving her presentation on the 'Development of Korean Smart City Platform Standards'.

Session 1 was then wrapped up with a Dialogue Session and appreciation was accordingly shown to all of the Speakers for the First Session as well as to the Session Chairman. The participants adjourned to their Lunch Break at Conference 1 on Level 3.

Session 2 (on the same day) commenced at 2:30 pm with Introductory Remarks by Session Chairman. Ir. Chew Shee Fuee KMN who is the Past President of TEEAM. He was TEEAM President for 8 years non-consecutively. Mr. Edward Kway of the Singapore Electrical Contractors and Licensed Electrical Workers Association (SECA) subsequently presented a Case Study titled 'Singapore Food Security Solutions Inside Eco-Ark' – a high-tech fish farm in Singapore. The Case Study was followed by a discourse providing updates on the One Meralco Sustainability Project by Engr. Redel M Domingo of The Society of Philippines Electrical Constructors and Suppliers (SPECS).

Prof. Chun-Lien Su representing the Taiwan Electrical Contractors Association (TECA) then talked about 'Energy Transition in Taiwan Towards Low-Carbon and Resilient Energy System'. Session 2 was the final session of AFEEC-FAPECA Conference 2024 agenda. The session concluded with Assoc. Prof. Dr. Werachet Khan-ngern of the Thai Electrical & Mechanical Contractors Association (TEMCA) presenting his findings on 'Micro Modular Reactor, MMR for Future Energy & Carbon Neutrality'.

A Dialogue for Session 2 subsequently ensued after which the host expressed its appreciation towards the Speakers, the Session Chairman and the Delegates. Refreshments were provided at 4:45 pm which marked the end of the AFEEC-FAPECA Conferences 2024. Fifteen minutes later, the Delegates visited the ENERtec Asia 2024 Exhibition. They checked out the various booths on display showcasing the latest and greatest products spanning a variety of innovative electrical and energy solutions.

ENERtec Networking Nite, a fun and meaningful occasion to mingle and make connections, launched at 6:30 pm. The location was Conference 1 & 2 of KLCC's Level 3. As usual, the attire requirement was formal garb accompanied by a coat or national costume. The networking event formally closed its doors at 10:00 pm and the Delegates departed for their respective hotels for the rest of the night.

The last day of the eventful 3-Day programme started with the Delegates doing their usual routine of getting ready by 8:00 am to assemble at their hotel lobbies. However, what was different for the final day of the programme was that there were two events of which the Delegates could choose from to participate.

The first event was to pay Technical Visits to PNB Merdeka 118* and DNB Experience Centre at the Tun Razak Exchange (TRX), [*Currently the 2nd tallest building in the world. Source: Sunday Star, 15-09-2024]. This time around, the Delegates were allowed to wear smart casual attire -- the only condition being that the Delegates had to dress appropriately and with proper shoes. Skirts, shorts, leggings, sleeveless shirts and slippers were prohibited.

The Delegates arrived at the prescribed venue at 9.00 am to register. Welcome Remarks were given half an hour later followed by a Technical Presentation and a tour of the 118 Tower and the Experience Centre. The exciting visit concluded at 11:30am and a light lunch was served to the participants.

The second event was a much-anticipated Golfing Session for those who were interested. For those who chose to golf, they were required to gather at their hotel lobbies at 8:30 am to be transported to the Tropicana Golf & Country Resort, Petaling

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Jaya. There were different pick-up times for Delegates who stayed at different hotels.

Those who stayed at Novotel and Impiana were given a lift at 8:30 am. As for those who stayed at Traders and Dorsett, they were picked up at 9:00 am. Everyone who was present at the golfing event was required to register their attendance upon arrival. Additionally, they were given a score card and goodies to collect. They were also encouraged to wear the golf T-shirts sponsored by Pekat. The golfers had an early lunch at 11.00 am.

The golfing session for the day began proper with the tee-off at 12pm. All the golfers hung up their putts at 5:30 pm which marked the end of their game. They then departed for the Welcome Dinner Cocktail Reception at Ballroom 3 of Tropicana Golf & Country Resort, where they were encouraged to wear the exquisite batik print polo T-shirts generously sponsored by TEEAM.

The host presented a video at 6:30pm and the Farewell Dinner that marked the end of the 3-day programme commenced. A Welcome Address was delivered by the TEEAM President, Ir. Chang Yew Cheong. His address was followed by the AFEEC-FAPECA President, Mr Boonsak Kiatjaroonlert's Speech.

The 'famished' Delegates were then served with sumptuous food and watched a video presentation 15 minutes later. A fun-filled and thrilling Karaoke Session reverberated throughout the night. They returned to their respective hotels after a long and packed day. Despite the busy 3-day programme, the Delegates all had a great time of learning and laughing together with mutual respect and camaraderie. TEEAM was greatly honoured to host this highly value-added 3-day AFEEC-FAPECA Conference & Meetings 2024 Programme and wishes to record its heartfelt appreciation and sincere thanks to all the generous Sponsors, namely, Diamond Sponsor -- Smart Cable (M) Sdn Bhd; Gold Sponsors – Messe Dusseldorf Shanghai/Messe Dusseldorf Asia and Tenaga Nasional Berhad (TNB); Silver Sponsors – Abbaco Controls Sdn Bhd, Afrima Consulting Engineer Sdn Bhd,

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Footnote:

Here's to the next grand and exciting event-filled AFEEC-FAPECA Conference & Meetings 2025, which will be hosted by the Association of Indonesian Electrical and Mechanical Contractors (AKLI) on 24 & 25 September 2025 in Bali, Indonesia. See you there!

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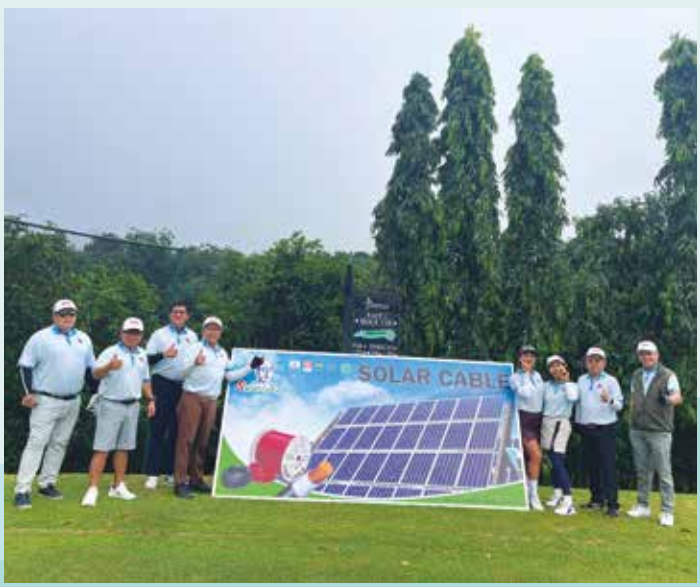
Snapshots of AFEEC Conference & Meetings 2024

Snapshots of AFEEC Conference & Meetings 2024

Snapshots of AFEEC Conference & Meetings 2024



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ST & TEEAM Electrical Safety Programme 2024

The Suruhanjaya Tenaga (ST) or Energy Commission of Malaysia and The Electrical and Electronics Association of Malaysia (TEEAM) collaborated to organise an Electrical Safety Programme at the Kuala Lumpur Convention Centre (KLCC) during HOMEDEC 2024 Exhibition, which was held from 2 to 5 May 2024. This event saw the public receiving and being enlightened by various critically important electrical safety and energy-saving tips and tricks. The TEEAM Exco, Council & Committee were all present at the site to lend and extend moral support to ST's capable, diligent and energetic team during the informative 4-day event.

TEEAM 72nd Annual General Meeting 2024

The Electrical and Electronics Association of Malaysia (TEEAM) successfully held its 72nd Annual General Meeting (AGM) on 26 May 2024, which was a Sunday, at the Tropicana Golf & Country Club in Petaling Jaya, Selangor. A total of 53 members were present at the meeting. TEEAM President, Ir. Chang Yew Cheong kick-started the AGM by delivering a customary Opening Address. His Opening Remarks were followed by the proposal for acceptance of the minutes of the previous AGM, which Mr. Derrick Wong proposed and was seconded by Tc. How Chee Seng.

Subsequently, TEEAM Honorary Secretary, Mr. Simon Leong presented the Annual Report on the various activities TEEAM had organised for 2023. Mr. Charles Lee then proposed the Annual Report for acceptance which was subsequently seconded by Ms. Carol Ong. Thereafter, Dato' Andy Tan who is the TEEAM Honorary Treasurer tabled the Audited Accounts for the end of the year 31 December 2023. Ir. Alex Looi proposed the Audited Accounts for acceptance and it was then seconded by Mr. Louis Loo. As there were no other issues raised by the members present, to be discussed and addressed, the AGM ended early with time for a vibrant Networking Session. A Buffet Luncheon prepared for the attendees followed after the engaging session.

Snapshots of TEEAM 72nd Annual General Meeting 2024

TEEAM Academic Excellence Awards 2023

Apart from The Electrical and Electronics Association of Malaysia's (TEEAM's) 72nd Annual General Meeting, TEEAM proudly organised its Academic Excellence Awards for the year of 2023 at the same venue of Tropicana Golf & Country Club on 26 May 2024. This special occasion was one worth celebrating as TEEAM lovingly planned this event to joyously reward the children of TEEAM members and the children of the members' employees for achieving outstanding results in their respective examinations. Those examinations included the Sijil Pelajaran Malaysia (SPM) – also known as the Malaysian Certificate of Examination (MCE) in the English language, International General Certificate of Secondary Education Ordinary-Level (IGCSE O-Level) and Cambridge Advanced Level or more popularly and commonly known by its abbreviation Cambridge A-Level.

Ir. Chang Yew Cheong, TEEAM President, accompanied by TEEAM Deputy President, Ts. Lim Sai Seong, proudly presented the Awards to the seven well-deserving and beaming graduates!

The Awards given to the eligible candidates comprised Certificates of Excellence. They were also fortunate enough to receive generous Cash Prizes for their academic achievements, courtesy of TEEAM. With this Awards Ceremony, TEEAM cemented its reputation as a caring Association for being highly committed to encourage academic excellence and help motivate and nurture the next generation to become future leaders and innovators. We wish to sincerely extend and convey our heartiest congratulations and best wishes to the Awards recipients and their rightfully proud and delighted parents plus family members!

Snapshots of TEEAM Academic Excellence Awards 2023

..... Continue TEEAM 72nd Annual General Meeting 2024

Snapshots of TEEAM 72nd Annual General Meeting 2024

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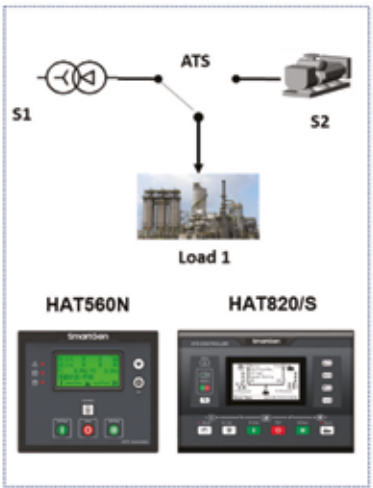

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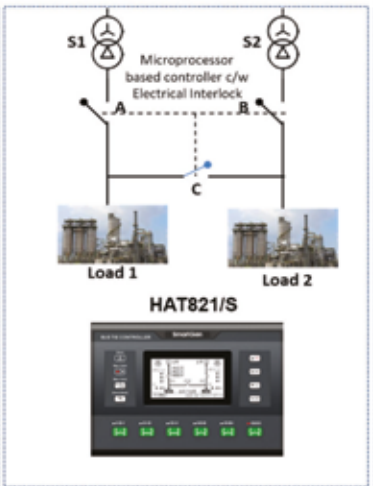
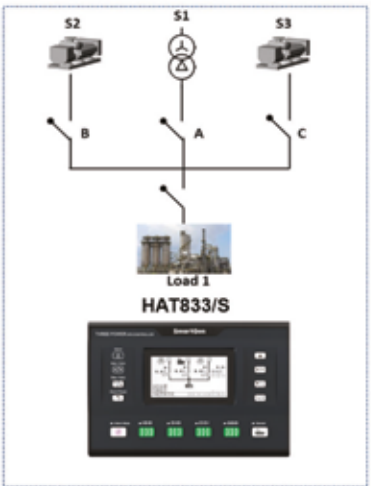
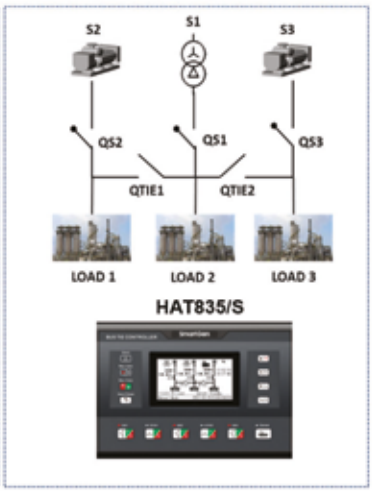


Dual-supply control module with 1 bus tie



Tri-supply control module



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TEEAM Academic Excellence Awards 2023

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Ambition: Electrical Engineer

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Ambition: Electrical Engineer

TEEAM Series of Technical Talks 02/2024

On July 16, 2024, The Electrical and Electronics Association of Malaysia (TEEAM) organised and ran the second instalment of their industry-centric Series of Technical Talks for 2024. The venue at which the event was held was at the TEEAM Seminar Hall located at No. 5-B, Jalan Gelugor, Off Jalan Kenanga, Kuala Lumpur. The total time duration of the 'TEEAM Series of Technical Talks 02/2024' programme was officially listed as 9:00 am to 1:00 pm although the participants were required to come in half an hour earlier to register for the talk.

The Technical Talk started with Welcome Remarks and was followed by the commencement of the first talk of the morning titled 'Fire Prevention for Solar Energy Systems'. Ms. Tan Ai Peng presented the topic as the Speaker and highlighted how crucial it was to implement fire prevention measures in solar energy systems. This urgent concern is justified by recent and increasing occurrences of solar PV fires by way of rooftop fire incidents.

She explained in detail how there was the need for better fire prevention mechanisms to be in place in solar PV systems as paramount since energy supply systems play an important role in our lives. Even though energy is critical to the sustainable development of our society, the unfortunate reality is that we are facing a scarcity of abundant and affordable energy. This shortage is further exacerbated by an ever-increasing world population which results in an even greater energy demand.

Although we derive the bulk of our energy from fossil fuel sources at the moment, we need to consider the longevity of such traditional energy resources in light of their sustainability. There is a very real possibility of these energy sources depleting in the future as supply decreases and demand increases. An immediate transition to renewable energy resource systems is therefore the answer.

Speaker, Ms. Tan Ai Peng sharing a light moment with a participant.

Speaker, Ir. Chew Shee Fuee delivering his presentation.

Ms. Tan pointed out that the most practical renewable energy resource in Malaysia is solar energy. This is because Malaysia is blessed with an abundance of sunlight. Hence it is of vital necessity to protect our solar energy systems from frequent solar PV fires.

Ms. Tan Ai Peng's Background: Ms. Tan Ai Peng has a Master's Degree in Renewable Energy from the University of Malaya and a Bachelor's Degree in Economic Finance from University Putra Malaysia. She has 15 years of experience in Accounting and has over 10 years of experience in the solar energy industry. Ms. Tan is the Executive Director of BSL Eco Energy Sdn Bhd. Her focus is on the viability and challenges of increasing solar PV installations.

Participants and attendees then proceeded to a Coffee Break at 11:30 am. The talk promptly resumed at 11:45 am with the presentation of the topic "What are the Challenges and Opportunities in Solar PV Generation?" by Ir. Chew Shee Fuee. In a similar vein to Ms. Tan Ai Peng's sharing on how viable solar PV installations are in Malaysia due to the country's abundance of sunlight, Ir. Chew mentioned that Malaysia has a whopping potential of 269GW of solar energy.

But while the proliferation of solar PV installations is increasing on both a large as well as a small scale, the sun doesn't stay shining in the sky for 24 hours in a day. Furthermore, there is a substantial reduction of solar PV output on cloudy days. As such, Ir. Chew raised some relevant questions for the participants to ponder:

Can the Grid continue to accept more supply of electricity in unending measure from solar PV generators? There seems to be an almost infinite energy to tap from the sun by deploying Solar PV systems. Is it therefore possible to have all building roofs to be fully embedded with solar PV materials?

These pertinent questions and issues raised by Ir. Chew through his talk, the second and final talk of the day, provided the keen participants with a ripe opportunity to explore the challenges and opportunities regarding solar PV generation.

Ir. Chew Shee Fuee's Background: Ir. Chew Shee Fuee holds a BSc (Hons) in Electrical & Electronics Engineering from the University of Strathclyde, Glasgow, Scotland, United Kingdom. He has over 30 years of experience in the Electrical Engineering industry, particularly in Control and Relay Protection. Ir. Chew has held significant leadership roles in the past, including President of TEEAM from 2001-2005 and 2013-2017. He is currently the Managing Director of G H Liew Engineering (1990) Sdn Bhd.

TEEAM's Series of Technical Talks concluded with a Q&A session at 12:30 pm. Half an hour later, 1:00 pm marked the end of the informative event and its entire programme.

(right) TEEAM Honorary Treasurer, Dato' Andy Tan presenting a Certificate of Appreciation to Speaker, Ir. Chew Shee Fuee.

Participants sharing a light moment.

Thumbs-up for a good Talk.

(left) Speaker, Ms. Tan Ai Peng receiving a Certificate of Appreciation from TEEAM Honorary Treasurer, Dato' Andy Tan.

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2024 Fuyang Investment & Trade Fair and 1st RCEP Entrepreneur Co-operation Conference in China

It was a great honour for The Electrical and Electronics Association of Malaysia (TEEAM) to accept the Industry Co-operation Committee of the Regional Comprehensive Economic Partnership -- RCEP (RICC)'s kind invitation to attend the 2024 Fuyang Investment & Trade Fair alongside the 1st RCEP Entrepreneur Co-operation Conference. Both the Fair and Conference were held concurrently on 17 and 18 May 2024 at Wanda Realm Hotel, Fuyang City, China. The main objectives of this Conference were to publicise and push for new development in the RCEP industrial co-operation, explore investment opportunities, and encourage entrepreneurial collaborations.

The attendees were composed of special invited guests and leaders of the relevant National Chambers of Commerce, Enterprise Leaders, Leaders of Local Government Offices, Local Industries, Industry Associations, and the Media. Participants representing TEEAM were Ir. Chang Yew Cheong (President), Dato' Andy Tan (Honorary Treasurer), Datuk Jacky Chen (Assistant Honorary Secretary), Council Members, Tc. How Chee Seng and Mr. Louis Loo, and Guest, Ir. Dr. Tan Kuang Leong. We at TEEAM would like to express our deep appreciation and sincere gratitude to RICC and the Local Government of Fuyang for their extraordinarily warm hospitality. It was definitely a meaningful two days for all who were present at these impactful Investment and Fair plus Conference!

Snapshots of 2024 Fuyang Investment & Trade Fair and 1st RCEP Entrepreneur Co-operation Conference in China

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From Theory to Practice – Mitigating Real-World Risks in Foundation Earthing System

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ABSTRACT

An Earthing System is important in an Electrical System, to enable automatic disconnection of power supply in the event of electrical fault. Low resistance to ground is desirable for quick and effective disconnection of power supply, and protect lives. Hence, the Foundation Earthing System greatly reduces the resistance to ground as compared to individually-driven earthing rods. However, special care must be given in the application of Foundation Earthing System to terrace houses and shop lots, where common ground slab steel re-inforcing bars are used throughout the entire row of houses or shop lots. If the earth resistance is not sufficiently low, in case of earth leakage in one of the houses or shop lots with faulty Residual Current Device (RCD), the fault current may flow through the foundation steels to other houses or shop lots. The RCDs of other houses or shop lots will not operate as the fault current is from the external, and thus is not detected by the RCDs. The level of touch voltage poses as electrical hazard to the occupants of the house or shop lot with the earth leakage, as well as to the other houses or shop lots. This paper presents the field tests and findings of terrace houses with Foundation Earthing System, the safety considerations, mitigation measures and the importance of such installation to achieve low resistance-to-ground values, to be able to operate the protective devices for supply disconnection during fault conditions.

Keywords: Foundation Earthing System, Equi-potential bonding, Residual Current Device, Earth loop impedance, Earth resistance

List of symbols

ECP is the exposed-conductive-parts
H_1 is the denotation for House 1 of the field tests
H_2 is the denotation for House 2 of the field tests
H_3 is the denotation for House 3 of the field tests
$I_{\Delta n}$ is the rated residual operating current of Residual Current Device
I_{body} is the current flows through human body during fault occurrence
I_f is the fault current
I_n is the rated current of protective device
L is the driven length of earthing rods
R_1 is the resistance to ground for House 1 of the field tests
R_2 is the resistance to ground for House 2 of the field tests
R_3 is the resistance to ground for House 3 of the field tests
R_A is the sum of the resistances of the earth electrode and the protective conductor connecting it to the exposed-conductive-parts
R_a is the resistance of installation earth electrode
R_{body} is the human body resistance
R_e is the effective resistance-to-ground
R_N is the resistance of the supply neutral of overhead poles
R_{Tx} is the resistance of sub-station transformer neutral earthing
S is the separation distance between earthing rods
U_f is the fault voltage
U_0 is the nominal phase-to-earth voltage
U_{pt} is the potential touch voltage
Z_e is the external earth loop impedance
Z_s is the total earth loop impedance

1. INTRODUCTION

Earthing System is essential in an Electrical System to protect people and equipment in the event of electrical fault, by providing a low impedance path for fault current to flow into the ground.

Earth electrodes that can be used are [1]:

a) underground structural metal works embedded in foundation (foundation earthing) plates
b) steel bars in re-inforced concrete embedded in the ground (except pre-stressed concrete)
c) rods or pipes
d) tapes or wires
e) metal sheaths of cables

In Malaysia, water pipes and gas pipes shall not be used as a sole means of earthing, as stated in Regulations 34(2) and 34(3) of the Electricity Regulations 1994 [2], but protective equi-potential bonding to these pipes is permitted.

The common earth electrodes used in electrical installation are:

(a) Earthing rods
Earthing rods are vertically driven into the ground. The earthing rods' material may be copper or more commonly copper-jacketed steel core rods, with screw coupling to reach considerable depth and the desired resistance-to-ground value. Earth electrode using earthing rods is shown in Figure 1.

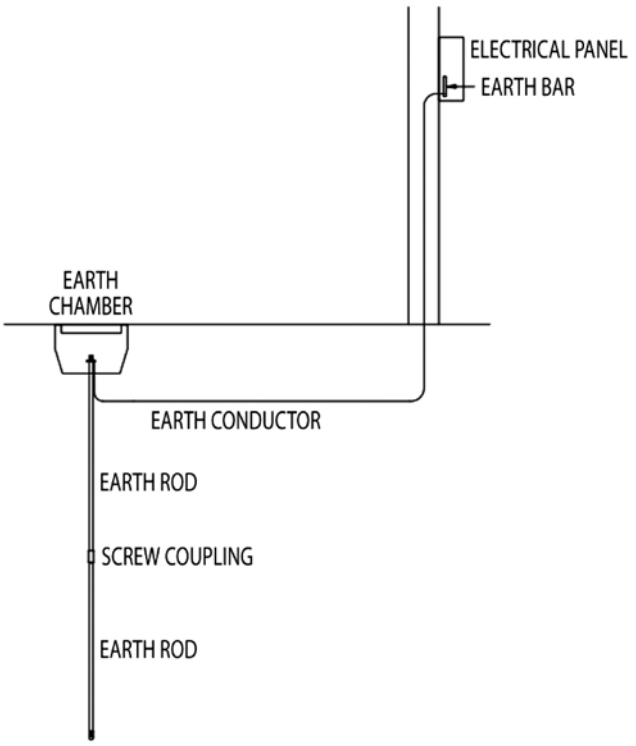


Figure 1. Earth electrode using earthing rods.

(b) Foundation Earthing System

Foundation steel re-inforcing bars in concrete are used as a readily available and effective earth electrode [1], [3], [4] and [5]. The total electrode area formed by the underground steelwork of a structure provides a low resistance-to-ground value. A Foundation Earthing System, whereby the earth foundation re-inforcing bars are used as earth electrode, is shown in Figure 2.

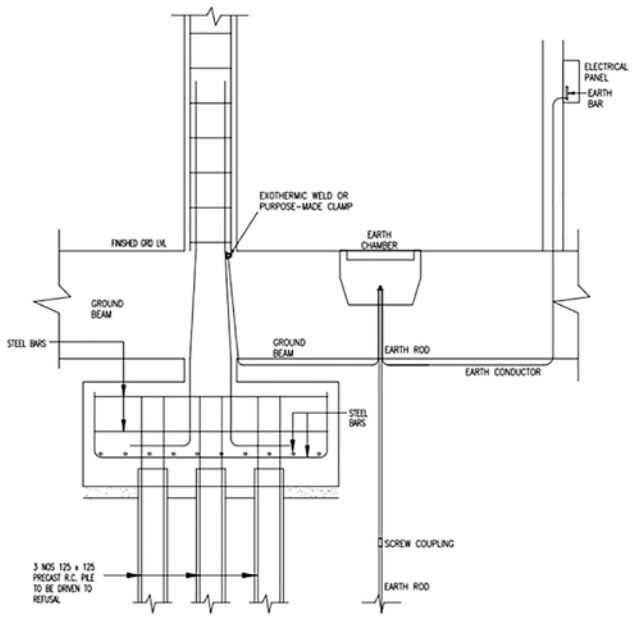


Figure 2. Foundation Earthing System.

2. LOW VOLTAGE (LV) EARTHING SYSTEM

The Low Voltage (LV) Earthing System is applied in various countries around the world and ASEAN countries, and the observations and recommended resistance-to-ground value can be found in Table 1 and Table 2 respectively. The recommended resistance-to-ground value of electrical installations in Malaysia can be found in Table 3.

Table 1: Low Voltage (LV) Earthing System of Countries Around The World

No.	*Country*	*Voltage*	*Frequency*	*LV Earthing System*	*Observations and Recommended Resistance-to-Ground Value*
1	Germany	230/400V	50Hz	TT and TN-C	In Germany, there is an obligation to erect in every new building a foundation earth electrode according to National Standard DIN 18014 [6].
2	Belgium	230/400V	50Hz	TT	< 100 Ohm 30mA Residual Current Device (RCD) for sockets
3	France	230/400V	50Hz	TT	< 50 Ohm (100 Ohm shortly) 30mA (RCD) for sockets
4	United Kingdom	230/400V	50Hz	TT and TN-C	< 10 Ohm
5	Italy	230/400V	50Hz	TT	$R_A \times I_{\Delta n} \leq 50V$
6	Japan	100/200V	East Japan: 50Hz West Japan: 60Hz	TT	< 100 Ohm Frequent use of 30mA RCD
7	Portugal	230/400V	50Hz	TT	< 50 Ohm (100 Ohm as from 1995)
8	USA, Canada	120/240V	60Hz	TN-C	USA: - IEEE Std 80-2000 [7]: 1 to 5 Ohm (With reference to smaller distribution substations) - IEEE Std 80-2013 [8]: Recommended resistance-to-ground value removed. Resistance value to be estimated by calculation formula. - NFPA 70-2023 [9]: ≤ 25 Ohm
9	Australia, New Zealand	230/400V	50Hz	TN-C-S	Refer to Table 8.1 of AS/NZS 3000 [10] (With reference to earth fault-loop impedance relating to operation of protective devices)
10	China	220/380V	50Hz	IT (Hospitals), TT, TN-S	TN-C has gone out of use
11	India	230/400V	50Hz	IT (Hospitals), TT, TN	- NEC of India 2011 [11]: < 5 Ohm - NEC of India 2023 [12]: there shall be adequate co-ordination between the obtainable value of the earth fault loop and setting of the protective devices.

Table 2: Low Voltage (LV) Earthing System of ASEAN Countries

No.	*Country*	*Voltage*	*Frequency*	*LV Earthing System*	*Observations and Recommended Resistance-to-Ground Value*
1	Indonesia	230/400V	50Hz	TT and TN-C-S	PUIL 2000 [13]: < 5 Ohm < 10 Ohm for poor soil resistivity region
2	Philippines	220/380V	60Hz	TT and TN-C-S	Philippine Electrical Code (PEC) [14]: ≤ 25 Ohm
3	Singapore	230/400V	50Hz	TT and TN-S	SS 551 [15]: < 1 Ohm (With reference to transformer star point earth) < 100 Ohm (With reference to operation of RCD)
4	Thailand	230/400V	50Hz	TN-C-S	< 10 Ohm
5	Brunei	240/415V	50Hz	TT, TN-C-S	Electrical Installation Requirements (EIR) [16]: < 1 Ohm
6	Vietnam	220/380V	60Hz	TT, TN, IT	TCVN 4756 [17]: < 10 Ohm
7	Myanmar	230/400V	50Hz	TT, TN	Myanmar National Building Code [18]: Earth resistance to conform with the degree of shock protection desired.
8	Cambodia	230/400V	50Hz	TT, TN	Specific Requirement of Electric Power Technical Standards of the Kingdom of Cambodia [19]: - Class C (LV over 300V) ≤ 10 Ohm - Class D (LV 300V or lower) ≤ 100 Ohm
9	Laos	230/400V	50Hz	TT, TN	Laos Electric Power Technical Standards [20]: - Class C (LV over 300V) ≤ 10 Ohm - Class D (LV 300V or lower) ≤ 100 Ohm
10	Malaysia	230/400V	50Hz	TT and TN-S	TN-C shall not be used [21]

Table 3: Recommended Resistance-To-Ground Value of Electrical Installations In Malaysia

Standards	*Recommended Resistance To Ground Value*	*Remarks*
MS IEC 60364-5-54 [5]	Not stated	
MS 1936 [1]	≤ 10 Ohm	
MS 1979 [4]	≤ 10 Ohm	
Non-Domestic Electrical Installation Safety Code [21]	≤ 1 Ohm	With reference to earth impedance for transformer substation supplying low voltage system
Guidelines for Electrical Wiring in Residential Buildings (Domestic) [22]	≤ 10 Ohm	Earth electrode of installation protected by RCD

For electrical fault protection, Residual Current Devices (RCDs) are used for leakage current protection; and circuit-breakers are used for over-current and short-circuit protection. In Malaysia, RCDs shall be installed in accordance with Regulations 36(2), 36(3) and 36(4) of [2]. The following equation applies where RCD is used for leakage current protection in a TT System, with touch voltage of 50V:

$$R_A \times I_{\Delta n} \leq 50V \quad (1)$$

where:

R_A is the sum of the resistances of the earth electrode and the protective conductor connecting it to the exposed-conductive-parts (in Ohms).

$I_{\Delta n}$ is the rated residual operating current of the RCD.

The resistance R_A is calculated using equation (1) for the different RCD ratings, as shown in Table 4.

Table 4: Maximum Earth Loop Impedance To Operate RCDs

Rated residual operating current of RCD (mA)	*Maximum earth loop impedance Z_s (Ohms)*
10	*5000*
30	*1667*
100	*500*

* Where R_A is not known, it may be replaced by Z_s.

The electrical installation is depicted in Figure 3. It is important to note that the resistance of the installed earth electrode should be as low as practicable. A value exceeding 200 Ohms may not be stable [23].

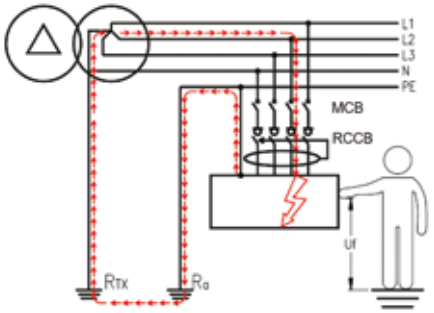


Figure 3. Electrical installation with automatic disconnection of supply for TT System.

3. THE BENEFITS AND POTENTIAL SAFETY HAZARDS OF FOUNDATION EARTHING SYSTEM

To enable automatic disconnection of power supply for safety protection, low resistance-to-ground is essential. In order to achieve a low resistance-to-ground value, for instance in Malaysia, equal to or less than 10 Ohms, the earthing rods are installed in parallel, with mutual separation of L to 2L, where L is the driven depth of the earthing rods, as shown in Figure 4.

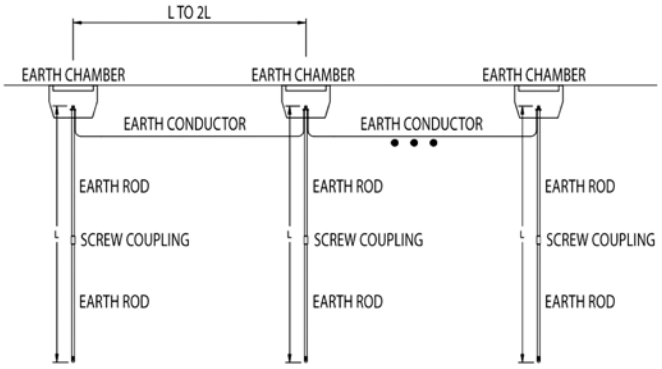


Figure 4. Earthing rods installed in parallel.

The effective resistance-to-ground can be calculated using the following equation:

$$\frac{1}{R_e} = \frac{1}{R_1} + \frac{1}{R_2} + \cdots + \frac{1}{R_n} \quad (2)$$

where:

R_e is the effective resistance-to-ground (in Ohms).
n is the number of earthing rods installed.

In practical, installing earthing rods in parallel, fulfilling the L to 2L mutual separation requirement can be a challenge, particularly in cases where space is limited, such as in terrace houses and shop lots. To overcome this constraint, the implementation of Foundation Earthing System offers a viable solution from both the technical and economic standpoints. By utilising the foundation steel re-inforcing bars, the resistance-to-ground value can be significantly reduced. However, it is crucial to exercise caution when applying Foundation Earthing System in terrace houses and shop lots, where a common ground slab steel re-inforcing bars are employed across the entire row of houses or shop lots. In case of a faulty RCD in one of the houses or shop lots, if the fault current is low and not sufficient to trigger an automatic disconnection of power supply by the circuit-breaker or the cut-out fuse, the fault current may flow through the foundation steel re-inforcing bars, affecting other houses or shop lots! This flow of current could lead to the generation of touch voltage, which poses as safety hazard to the occupants of the house or shop lot with electrical fault, as well as to the other houses or shop lots [24]. The equivalent circuits under fault condition are shown in Figure 5 [25]. The potential touch voltage can be calculated using the following equation:

$$U_{pt} = U_0 \left(\frac{R_e}{Z_e + R_e} \right) \quad (3)$$

where:

U_{pt} is the potential touch voltage
U_0 is the nominal phase to earth voltage
Z_e is the external earth loop impedance
R_e is the effective resistance-to-ground of the installation

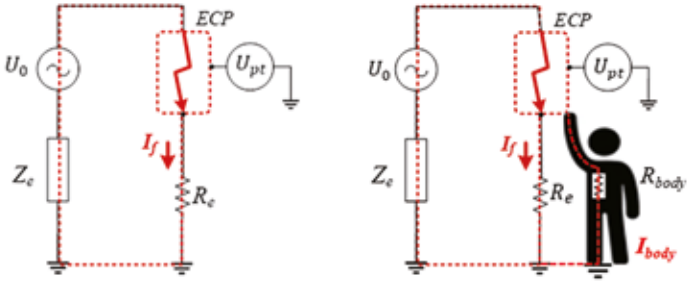
If a human touches the exposed-conductive-parts such as electric kettle or washing machine during fault occurrence, this person may be exposed to electrocution. The current flow through the human body during fault occurrence can be calculated using the following equation:

$$I_{body} = \frac{U_{pt}}{R_{body}} \quad (4)$$

where:

U_{pt} is the potential touch voltage
I_{body} is the current flow through human body during fault occurrence
R_{body} is the human body resistance

The current-duration a person can safely withstand, can be calculated using Dalziel's equation [8]. Some comparison analysis of touch voltage and the allowable current passing through the human body are given in [26], [27], [28].



(a) Equivalent fault circuit

(b) Equivalent fault circuit with a human touching the ECP during fault occurrence

Figure 5. Equivalent circuits under fault condition.

4. FIELD TESTS

In order to demonstrate the benefits and the potential safety hazards of the Foundation Earthing System, field tests were carried out at a project site of terrace houses, where the Foundation Earthing System was implemented. The earthing scheme is of TT Earthing System. The field tests were conducted with the intention of examining the hypothesis of fault current flowing to the neighboring houses through the foundation steel re-inforcing bars, in the event of a faulty RCD in one of the houses. By carrying out these field tests, valuable data and insights were gathered in real-world conditions.

The following field tests were carried out:

(a) Continuity test on the earth electrode from house to house

i. Earthing rods without connection to foundation steel re-inforcing bars (individual unit)
ii. Earthing rods with connection to foundation steel re-inforcing bars (foundation earthing)

The continuity tests were carried out using the Kyoritsu KEW2117R hand-held multimeter, as illustrated in Figure 6.

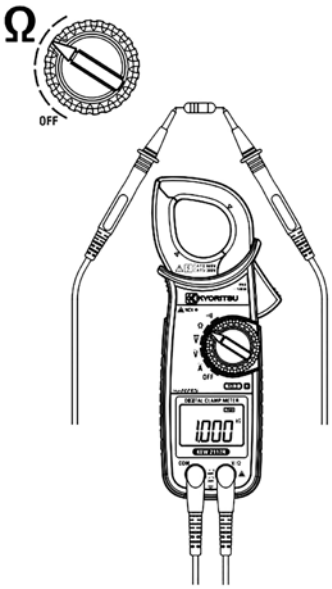


Figure 6. Continuity test using Kyoritsu KEW2117R hand-held multimeter [29].

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(b) Earth resistance test using 3-point fall-of-potential earth-tester

i. Earthing rods without connection to foundation steel re-inforcing bars (individual unit)
ii. Earthing rods with connection to foundation steel re-inforcing bars (foundation earthing)

The earth resistance tests were carried out using the Kyoritsu KEW4105A digital earth resistance tester, as illustrated in Figure 7.

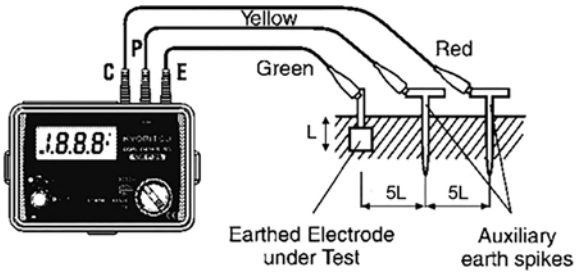

Figure 7. Earth resistance test using Kyoritsu KEW4105A digital earth resistance tester [30].

(c) Earth loop impedance test using earth loop tester

i. Earthing rods without connection to foundation steel re-inforcing bars (individual unit)
ii. Earthing rods with connection to foundation steel re-inforcing bars (foundation earthing)

The earth loop impedance tests were carried out using the Kyoritsu KEW4140 digital loop/PFC/PSC tester, as illustrated in Figure 8.

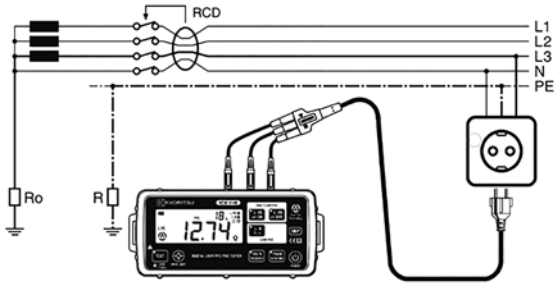

Figure 8. Earth loop impedance test using Kyoritsu KEW4140 digital loop/PFC/PSC tester [31].

(d) Simulation of fault condition

Simulate a faulty RCD in one of the houses, check and measure the fault current, the presence of potential touch voltage at the house with electrical fault and neighbouring houses, and the effectiveness of automatic disconnection of power supply by the 63A incoming circuit-breaker or the 63A cut-out fuse.

i. Earthing rods without connection to foundation steel re-inforcingbars (individual unit)
ii. Earthing rods with connection to foundation steel re-inforcing bars (foundation earthing)

The field test set with functional and faulty RCDs for simulation of fault condition is shown in Figure 9. Some of the field test photographs can be found in Figure 10.

Figure 9. Field test set with functional and faulty RCDs.

(a) Continuity test

(b) Earth resistance test

(c) Earth loop impedance test -- Earthing rods without connection to foundation steel re-inforcing bars

(d) Earth loop impedance test -- Earthing rods with connection to foundation steel re-inforcing bars

Figure 10. Photographs of field tests.

5. TEST RESULTS, FINDINGS AND DISCUSSION

The test results are shown in Table 5.

Table 5: Field test results.

No.	Tests	Results	Remarks
a	**Continuity Test**		
i	Earthing rods without connection to foundation steel re-inforcing bars (individual unit)	H_1 - H_2: 462 Ohm H_1 - H_3: 486 Ohm	
ii	Earthing rods with connection to foundation steel re-inforcing bars (foundation earthing)	H_1 - H_2: 0.2 Ohm H_1 - H_3: 0.1 Ohm	
b	**Earth Resistance Test**		
i	Earthing rods without connection to foundation steel re-inforcing bars (individual unit)	R_1: 13.9 Ohm R_2: 9.79 Ohm R_3: 10.18 Ohm	
ii	Earthing rods with connection to foundation steel re-inforcing bars (foundation earthing)	R_e: 1.24 Ohm	
c	**Earth Loop Impedance Test**		U_0: 241V
i	Earthing rods without connection to foundation steel re-inforcing bars (individual unit)	Z_s: 14.12 Ohm	Prospective Fault Current (PFC): 17A
ii	Earthing rods with connection to foundation steel re-inforcing bars (foundation earthing)	Z_s: 1.54 Ohm	Prospective Fault Current (PFC): 157A
d	**Simulation of Fault Condition**		
i	Earthing rods without connection to foundation steel re-inforcing bars (individual unit)	I_f: 19.53A	- 63A in-coming circuit-breaker: no trip - Potential touch voltage at the house with electrical fault: 231.8V
ii	Earthing rods with connection to foundation steel re-inforcing bars (foundation earthing)	I_f: 170.2A	- 63A in-coming circuit-breaker: trip - Potential touch voltage at the house with electrical fault: 186V - Potential touch voltage at the other house: 185V

The field tests and results are illustrated in Figure 11.

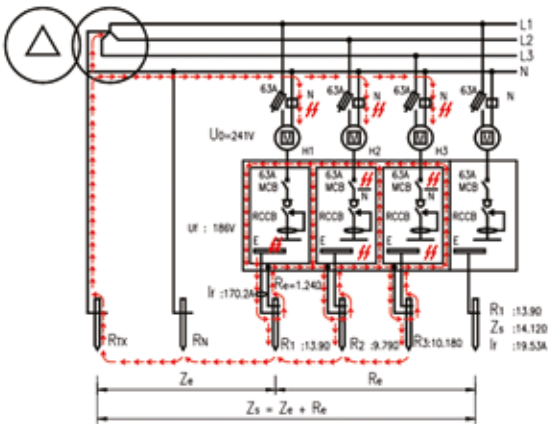

Figure 11. Field tests and results.

From the test results, the earth resistance of earthing rods without connection to foundation steel re-inforcing bars (individual unit) is generally higher (R_1: 13.9 Ohm, R_2: 9.79 Ohm, R_3: 10.18 Ohm). The earth resistance value reduced significantly with connection to foundation steel re-inforcing bars (foundation earthing) (R_e: 1.24 Ohm). Under the simulated fault condition, i.e. phase-to-earth fault, with faulty RCD in one of the houses, the fault current is 19.53A for earthing rods without connection to foundation steel re-inforcing bars (individual unit) (Z_s: 14.12 Ohm). The magnitude of the fault current is not sufficient to trip the 63A in-coming circuit-breaker. Under the similar fault condition, the fault current is 170.2A for earthing rods with connection to foundation steel re-inforcing bars (foundation earthing) (Z_s: 1.54 Ohm). The 63A in-coming circuit-breaker is tripped off.

For discussion purposes, assuming the effective resistance-to-ground value of a row of terrace houses or shop lots is 10 Ohm, and the in-coming circuit-breaker is of 63A. The fault current can be calculated using the following equation:

$$I_f = \frac{U_0}{Z_s} \quad (5)$$

$$I_f = \frac{U_0}{Z_e + R_e} \quad (6)$$

where:
I_f is the fault current
U_0 is the nominal phase-to-earth voltage
Z_s is the total earth loop impedance
Z_e is the external earth loop impedance
R_e is the effective resistance-to-ground of the installation

Assuming the external earth loop impedance is very low and negligible. In the event of phase-to-earth fault, with faulty RCD in one of the houses, the fault current will be:

$$I_f = \frac{U_0}{Z_s}$$

$$I_f = \frac{230\text{v}}{0\Omega + 10\Omega}$$

$$I_f = 23\text{A}$$

The magnitude of the fault current is not sufficient to trip the 63A in-coming circuit-breaker of the house or shop lot with electrical fault. Consequently, the fault current will flow through the foundation steel re-inforcing bars to other houses or shop lots. Under this condition, the fault current being of external source will not be detected by the RCDs of the neighbouring houses or shop lots, thus the RCDs will not operate. As a result, a potential risk emerges in the form of touch voltage generated by the fault current. The touch voltage poses as electrical safety hazard and might cause electrocution to the occupants of the house or shop lot with electrical fault, as well as to the other houses or shop lots!

Based on the above field tests and discussion, it is clear that low resistance-to-ground in electrical installation is important, especially where the Foundation Earthing System is implemented. The minimum required resistance to ground value should be checked against the electrical installation using the following equations [21], [24]:

$$Z_s = \frac{U_0}{FF \times I_n} \quad (7)$$

where:
Z_s is the total earth loop impedance
U_0 is the nominal phase-to-earth voltage
I_n is the rated current of circuit-breaker or fuse
FF is the fusing factor, minimum 1.5 for circuit-breaker, and 2.4 for fuse

$$Z_s = \frac{U_0}{1.5 \times I_n \times EFS} \quad (8)$$

where:
Z_s is the total earth loop impedance
U_0 is the nominal phase-to-earth voltage
I_n is the rated current of circuit-breaker
EFS is the percentage setting of earth fault relay, such as 5% and 10%

Equation (7) is used where the protective device is by means of circuit-breaker or fuse. Equation (8) is used where the protective device is by means of circuit-breaker and protection relay.

Using equation (7), if the in-coming circuit-breaker is 63A, the minimum required resistance-to-ground value is:

$$Zs = \frac{230V}{1.5 \times 63} = 2.43\Omega$$

To blow the 63A cut-out fuse, the minimum required resistance-to-ground value is:

$$Zs = \frac{230V}{2.4 \times 63} = 1.52\Omega$$

6. CONCLUSION AND RECOMMENDATIONS

The earth resistance of an electrical installation plays a crucial role of safety protection to enable automatic disconnection of power supply in the TT System. While the Foundation Earthing System greatly reduces the resistance-to-ground, special care must be given in its application, especially in terrace houses and shop lots, where common ground slab steel re-inforcing bars are used throughout the entire row of houses or shop lots. In the event of faulty RCD in one of the houses or shop lots, the magnitude of the fault current shall be sufficient to operate the in-coming circuit-breaker or cut-out fuse to disconnect the power supply. Otherwise, the fault current may flow through the foundation steels to other houses or shop lots. The level of touch voltage generated by the fault current could be detrimental to the occupants of the house or shop lot with electrical fault, as well as to the other houses or shop lots.

To mitigate the risks, the following recommendations should be observed by the stakeholders, i.e., the Authority, the Developer, the Engineer, the Contractors, as well as the End Users:

i. Do not merely comply with the recommended resistance-to-ground value in the Standards. The required value could be lower. Check the required resistance-to-ground value using equations (7) or (8) and implement accordingly.

ii. Proper bonding of earthing rods to foundation steel re-inforcing bars shall be ensured. This can be achieved by exothermic weld or purpose-made clamp. Continuity test should be carried out. The recommended contact resistance is equal to or less than 0.2 Ohm.

iii. Special care should be given on corrosion and oxidation protection -- foundation steel re-inforcing bars embedded in concrete provides good corrosion and oxidation protection.

iv. Measure earth loop impedance and Prospective Fault Current (PFC) using earth loop tester as verification of the installation.

v. Periodic inspection and testing. RCDs should be tested at least every 6 months to ensure that they are functional.

vi. Design and installation of RCDs in series, with RCD at supply side, and RCDs at load side branch circuits, as per Annex A and Annex B of [4].

7. ACKNOWLEDGEMENT

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PROFILES

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Ir. Toh is the winner of the Tan Sri Ir. Hj. Yusoff Price in 2024 for publishing an outstanding technical paper in the IEM Journal entitled "Foundation Earthing System – Its Application and Electrical Safety Considerations". He is currently a Technical Advisor of Persatuan Kekompetenan Penjaga Jentera & Pendawai Elektrik Perak (PKPPE) [The Perak Electrical Chargemen & Wiremen Competence Association].

Leong Kok Wah *is a registered competent Chargeman and Wireman, with more than 30 years' experience in the electrical industry. He received his secondary education from SMJK Sam Tet, Ipoh, Perak. He attended his Electrical Wireman Course at Politeknik Ungku Omar, Ipoh, Perak.*

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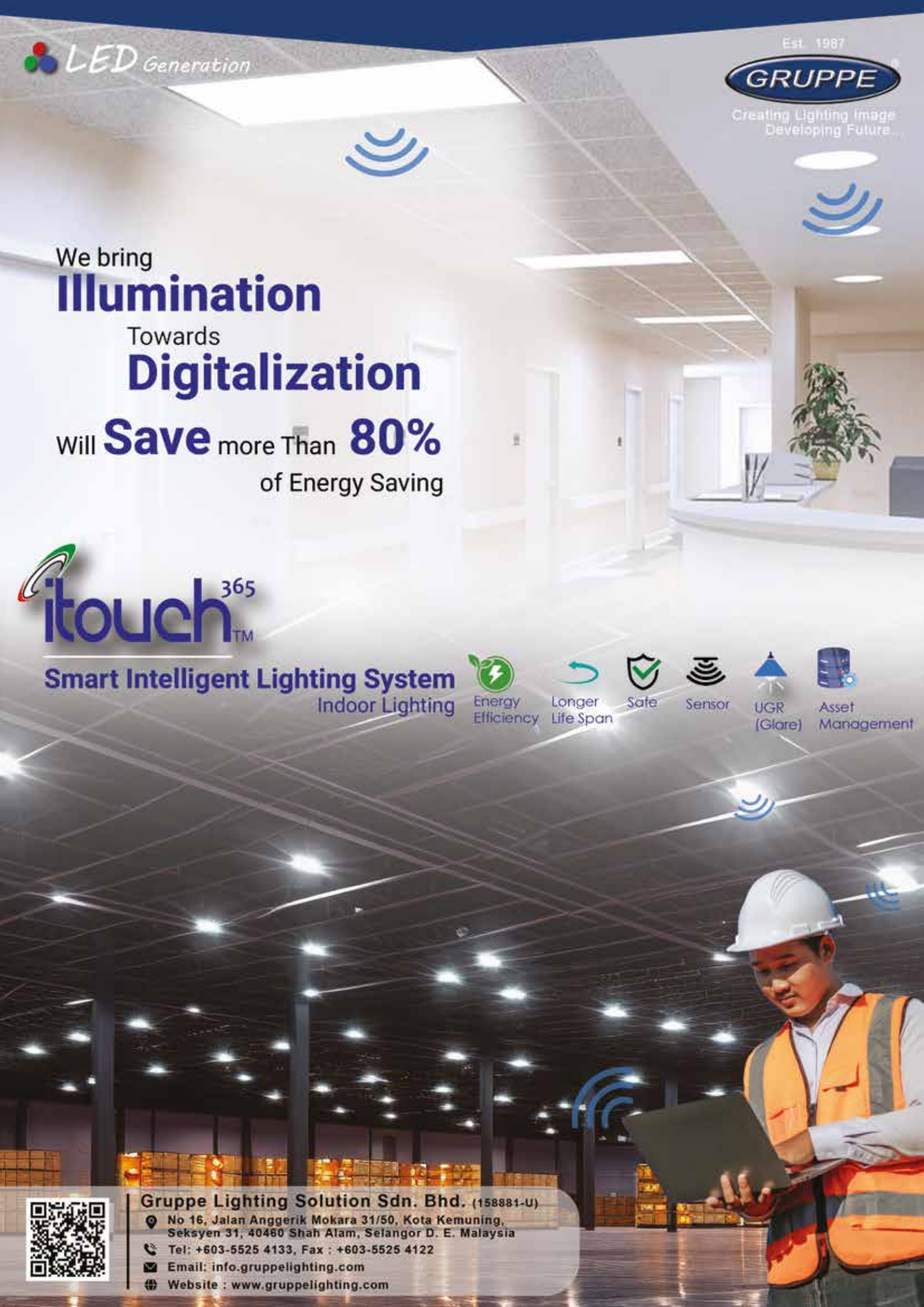
The Metaltech & Automex 2024 Expo, which was held from 15 to 18 May 2024 at MITEC Kuala Lumpur was a smashing success! The tremendous and momentous Expo afforded thousands of local and international exhibitors the much-anticipated exposure and lucrative opportunity to introduce their state-of-the-art innovations encompassing Machine Tools, Sheet Metal Technology, Industrial Hardware, Robotics, Automation and Precision Metrology. Technological advancements in machine and manufacturing processes evolving by leaps and bounds in recent years have enabled manufacturers to complete their processes in the shortest time possible with little human supervision. This efficiency is due to manufacturing plants adopting and investing in the utilisation of smart automation. The Electrical and Electronics Association of Malaysia (TEEAM) was one of the Supporting Organisations.

We must credit the Malaysian manufacturing industry for reacting quickly to such a development. The industry is currently busy trying to achieve their digitalisation objectives by embarking on various facilitation measures. Automex was thereby established to spearhead and support the digital transformation of all businesses which is now a popular and trending buzzword in every industry seeking to be relevant and updated with the changing and latest technological landscape. TEEAM has been a pro-active Organisation instrumental in supporting these such endeavours.

YBhg. Datuk Hanafi Sakri, Deputy Secretary-General of Industrial Development of Malaysia's Ministry of Investment, Trade & Industry (MITI) was invited to officiate the opening of the Expo. Ts. Lim Sai Seong (Deputy President), Mr. Simon Leong (Honorary Secretary) and Mr. Suresh Kumar Gorasia (Past President) attended the event of crucial importance on behalf of TEEAM. They joined the Machinery & Engineering Industries Federation (MEIF) in its VIP tour of the 3 exhibition halls and visited TEEAM's booth and some of the booths manned by MEIF members.

Snapshots of Metaltech & Automex 2024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The Malaysia International Machinery Fair (MIMF) is one of the leading Trade Fairs in the industry in Malaysia and rightly so for good reasons. It has become a major and significant platform to showcase the latest and greatest technological advancements in the machinery sector. MIMF has expanded to feature and host Packaging & Food Processing Exhibition (M'SIA-PACK & FOODPRO); Plastic, Mould & Tools Exhibition (M'SIA-PLAS); and Lighting and LED & SIGN Exhibition (M'SIA-LIGHTING, LED & SIGN).

MIMF provided an extensive and impressive experience for exhibitors and offered a wide range of opportunities to connect and forge business relationships with prominent industry players from both local and international markets due to the ample time allotted for networking. The MIMF 2024 Trade Fair Expo, which was held from 11 to 13 July 2024 at MITEC Kuala Lumpur was a resounding success. The Electrical and Electronics Association of Malaysia (TEEAM) participated as one of the Trade Fair's supporting organisations. TEEAM occupied and shared a pavilion with its members BSL Eco, JT Techtronics and SBC Lighting.

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Snapshots of Technical Visit to Terasaki Electric Malaysia

Technical Visit to Terasaki Electric Malaysia

The Electrical and Electronics Association of Malaysia (TEEAM) recently organised a Technical Visit to Terasaki Electric (M) Sdn Bhd on 16 August 2024. The Technical Visit programme lasted from 9:30 am until 12:00 pm. Twelve members from various companies joined the informative Technical Visit.

Since seats were limited, participants whose acceptance was ultimately subject to the approval of the host, namely Terasaki Electric, were required to register their attendance by 9 August 2024. Registering a week before the actual visit ensured that the participants reserved their seats due to the 'first-come, first-served' basis nature of the Technical Visit.

The day of the visit began with TEEAM's arrival at Terasaki Electric Malaysia's factory at 9:30 am. After Terasaki gave Welcome Remarks, Terasaki Officials proceeded to introduce its factory. Terasaki also delivered a video presentation explaining its long and prolific history of innovation in pioneering Power Solutions. Since its inception more than 90 years ago in 1923 in Japan, Terasaki's vast and comprehensive range of LV Switchgears and Services has redefined power distribution for residential and office buildings, manufacturing plants, energy sectors and infrastructural landscapes.

After the introduction and video presentation, Terasaki presented its product offerings. For the uninitiated, Terasaki is an established power technology company armed with an arsenal of revolutionary products. Terasaki offers everything from Air Circuit Breaker (ACB), Moulded Case Circuit Breaker (MCCB), Miniature Circuit Breaker (MCB) and Residual Current Circuit Breaker (RCCB) to Earth Leakage Breaker (ELB), Surge Protective Device (SPD) and many more.

From the depths of Marine Systems to the intricacies of Industrial Systems and the pulsating heart of the Circuit Breaker Industry, the Terasaki brand stands tall as a testament to forward-thinking solutions. The Mersen SPD product presentation followed Terasaki's presentation of its line of groundbreaking products. Then Terasaki brought the TEEAM members to a production tour followed by opening the floor to receiving and answering further burning questions during the Q&A session. 12:00 pm marked the end of the informative and impactful programme of the Technical Visit.

It was a very fruitful Technical Visit. A big thank you to Terasaki Electric Malaysia and their strong team, Mr. Eng Chee Wei, Mr. Tee Chian Bin, Mr. Eric Tang, Mr. Mohamad Asyqal and Ms. Nurul Asyiqin.

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Challenges and Opportunities in the Electrical Industry – Part 45

Ir Chew Shee Fuee KMN, TEEAM Past President

Battery Energy Storage System (BESS)

Malaysia has a great potential to tap Solar Power as a Renewable Energy (RE) source.

The following is an extract from EMBER (EMBER is an independent energy Think Tank that aims to accelerate the Clean Energy Transition with Data and Policy. It creates targeted data insights to advance policies that urgently shift the world to a clean, electrified energy environment).

"Approximately half of Malaysia's Solar Power potential (138 GW) is in Peninsular Malaysia, while 37% (99 GW) is in Sabah and 12% (32 GW) is in Sarawak. Almost all of this Solar resource is currently untapped.

Peninsular Malaysia, which accounts for 74% of the country's Electricity Demand, had Solar and Hydropower supplying 10% of day-time peak generation in 2023, with Hydro providing 7% of the evening peak. The Report also finds that Peninsular Malaysia's Grid can technically accommodate an additional 2.4 GW of Solar before Storage Systems are needed."

"The 64% reduction in utility-scale Solar Generation costs in Malaysia from 2016 to 2021 presents a significant opportunity to expedite the country's journey towards achieving Net-Zero ambitions in its Power Sector. By adopting holistic system-wide plan targeting Solar and Grid Flexibility, Malaysia can accelerate its transition to Clean Energy, thereby reducing its vulnerability to fuel price volatility and mitigating the risk of becoming a net importer of power generation fuels."

- Shabrina Nadhila Electricity
Policy Analyst - Southeast Asia, EMBER

However, the necessity to further develop Solar for replacing the conventional power stations will require BESS (Battery Energy Storage System). Solar Power is directly impacted by the changing weather and the sun is not available for 24 hours a day.

"Overcoming significant challenges in integrating high levels of Solar Power and implementing effective Solar Firming is crucial for ensuring Grid stability and reliability. Despite the high cost, investing in Energy Storage Solutions such as Battery Energy Storage Systems (BESS) is critical. By strategically planning, embracing technological advancements, and promoting public-private co-operation, Malaysia has the potential to harness its immense Solar resources and pave the way for a secure and resilient energy future."

- Dr. Nora Yusma binti Mohamed Yusoff Director of the Institute of Energy Policy and Researcher at Universiti Tenaga Nasional.

"The utilisation of BESS in Solar Energy Storage brings several significant benefits. Firstly, it enhances Grid stability and reliability. BESS provides a buffer between Solar generation and consumption, ensuring a smooth and consistent power supply. This reduces the risk of black-outs and grid failures. This is important in areas prone to natural disasters or heavily reliant on Solar Energy.

Secondly, BESS enables energy arbitrage. This means buying electricity when prices are low and storing it for use during peak demand when prices are high. This can result in significant cost savings for consumers and utilities. Battery Energy Storage Systems work by converting and storing electrical energy in re-chargeable batteries. When Solar panels generate surplus electricity, it is directed to the BESS for storage instead of being fed directly into the Grid. The stored energy can then be discharged when needed, providing a reliable source of electricity during periods of low solar generation.

The core component of a BESS is the battery pack, which consists of multiple inter-connected batteries. These batteries are typically Lithium-ion based, known for their high energy density and long cycle life. The battery pack is connected to power conversion equipment, such as inverters, which convert the Direct Current (DC) produced by the Solar panels into Alternating Current (AC) for use in homes, businesses, or the grid.

To optimise the performance and lifespan of the battery, sophisticated Battery Management Systems (BMS) are employed. The BMS monitors and controls various parameters such as state of charge, temperature, and voltage, ensuring safe and efficient operation. Additionally, advanced control algorithms are implemented to manage the charging and discharging cycles, maximising the overall efficiency and lifespan of the battery."

Some countries have started to enforce a 30% of BESS for any Solar Power project. It may appear to resolve the stability of supply. However, due to the high cost of BESS, it may deter the smooth development of Solar Power implementation.

There is a possibility to have an independent BESS to be deployed in various locations in order to augment the disturbance of Solar Power embedded in the Grid during a Solar outage.

The proposal to allow utility or private entities to provide BESS with some incentives will certainly enhance the full deployment of Solar Photo-Voltaic (PV) power generation greatly.

Ir. Chew Shee Fuee KMN *B Sc (Hons) (Strathclyde), PEng, CEng, FIEM, MIEE Member, IEEE Member, 1st Grade Electrical Engineer (Competent up to 500 kV).*

Ir. Chew was President of The Electrical and Electronics Association of Malaysia (TEEAM) from 2001-2005 and 2013-2017. He was the President of the ASEAN Federation of Electrical Engineering Contractors (AFEEC) for 2016-2018. He is a Past Chairman of The Institution of Engineering & Technology (IET) Malaysia Local Network. Ir. Chew is currently the Managing Director of G H Liew Engineering (1990) Sdn Bhd and Chris Chew Electrical Consultant. He graduated from the University of Strathclyde, Glasgow with a B Sc (Hons) in Electrical & Electronics Engineering. He is a Professional Engineer and is also licensed by the Energy Commission (Suruhanjaya Tenaga, ST) as a Competent Engineer (without voltage limits), and a Service Engineer to carry out electrical testing up to a voltage of 500 kV.

Ir. Chew has more than 40 years of industry experience in electrical control and relay protection. He is also specialised in electrical site tests on power equipment, electrical fault investigation, plus service and maintenance of electrical switchgears and relays. His work also includes electrical supervision of sub-stations and electrical audit. He also presents lectures on electrical apparatus and the protection system. He can be reached at E-mail: sfchew@ghliew1990.com

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EMAX & PMAX 2024

Held concurrently from 24 to 26 July 2024 at the Setia SPICE Convention Centre in Penang, the Electronics Manufacturing Expo Asia (EMAX) 2024 together with the Penang Manufacturing Expo (PMAX) 2024 extended a warm invitation to Ir. Chang Yew Cheong, President of the Electrical and Electronics Association of Malaysia (TEEAM), to be one of their VIP guests. Dato' Loo Lee Lian, the CEO of Invest Penang Bhd, officiated the Grand Opening while TEAAM was one of the supporting organisations. Hosted by joint organisers NRG Exhibitions & Fireworks, the two Expos presented and featured an extensive range of Conferences, Seminars, Technical Talks and Networking Opportunities aimed at providing attendees with priceless insights into the latest innovative technologies, trends and best practices in the industry.

The timely Expos also showcased Electronics & Industrial Manufacturing as well as Assembly Technology and Equipment by bringing together an international and eclectic mix of Chip Manufacturers, Semiconductor Manufacturers and Equipment Suppliers to promote products and raise awareness of the newest developments in the industry. By doing so, participants could network with major industry leaders and experts while exploring revolutionary solutions shaping the future of Electronics and Manufacturing. EMAX & PMAX 2024 were successful in their focus on encouraging win-win collaboration and driving growth by providing numerous Exhibitors with quality traffic of approximately 8,000 visitors and an engaging platform to represent 200 leading brands!

Snapshots of EMAX & PMAX 2024

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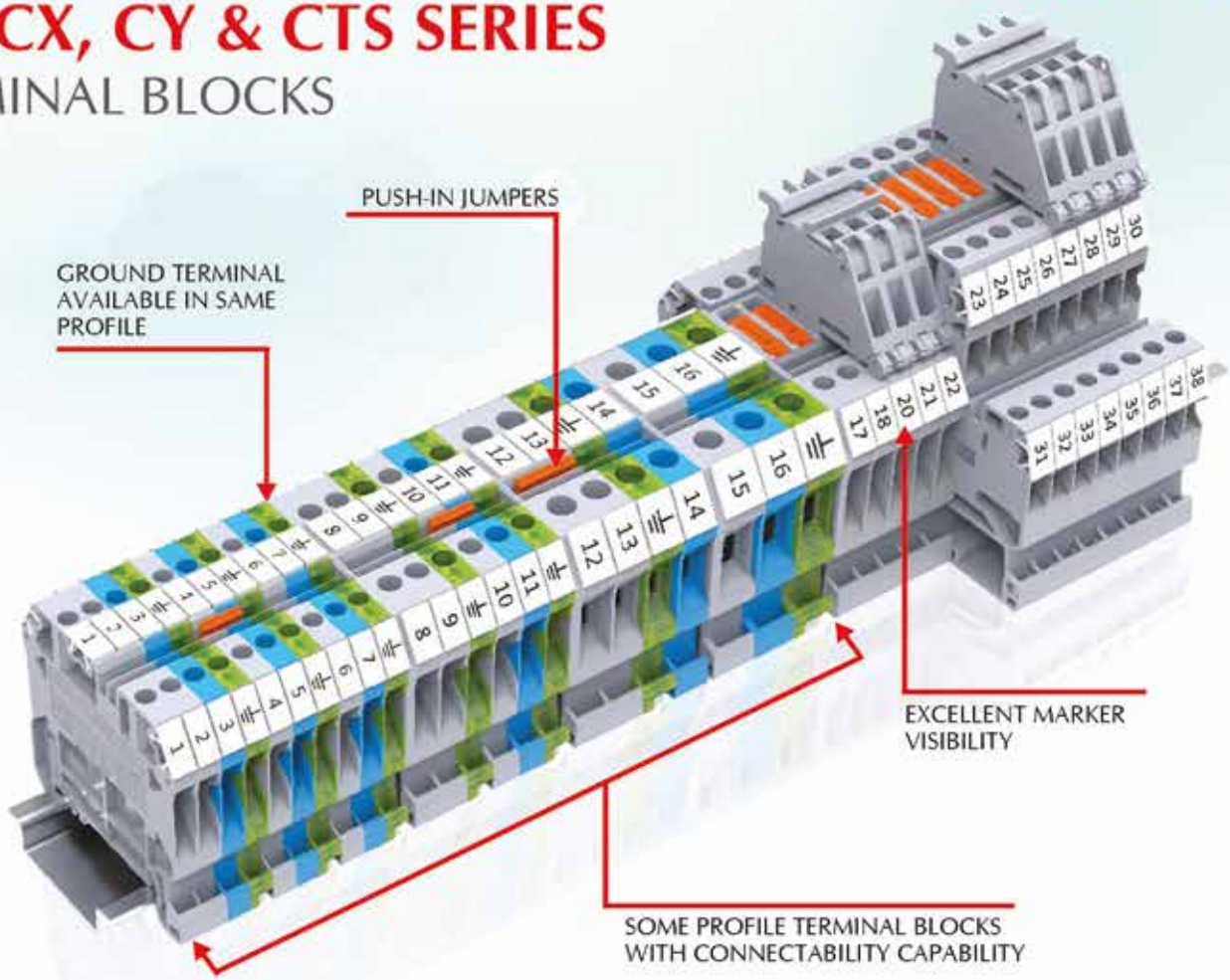

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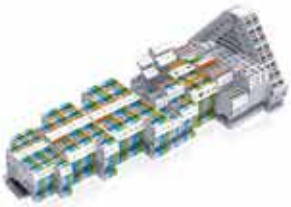

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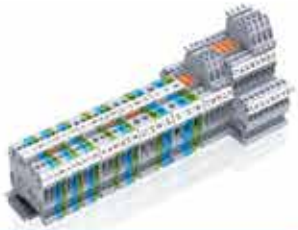

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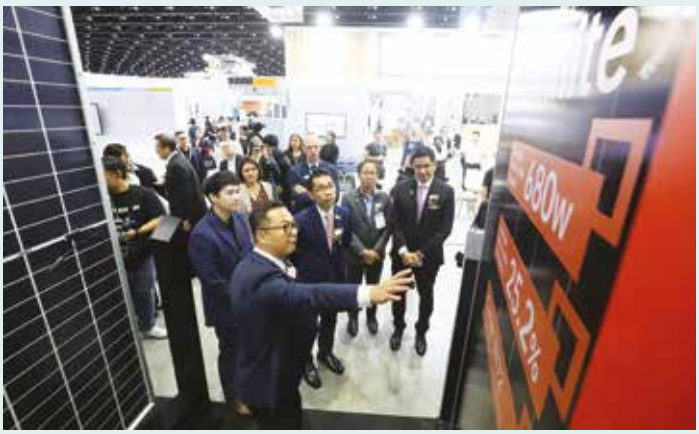
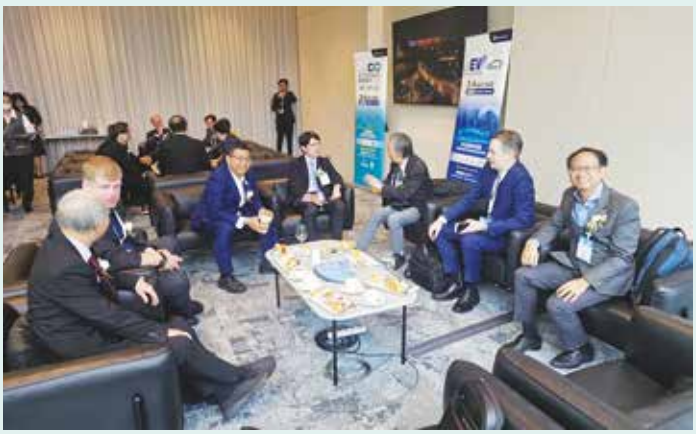
ASEW & EVA 2024, Bangkok

The Electrical and Electronics Association of Malaysia (TEEAM) flew to Bangkok as a group of four representatives to lend and extend support to the ASEAN Sustainable Energy Week (ASEW) & Electric Vehicle Asia (EVA) 2024 in Bangkok with their presence. They were Ir. Chang Yew Cheong (President), Tc. How Chee Seng (Council Member), Ir. Prabakaran Thiagarajah (Committee Member) and Ir. Parameswaran A. Shanmuganathan (Guest).

The Grand Opening Ceremony and Networking Event was held at Thailand's Queen Sirikit National Convention Centre (QSNCC) on 3 July 2024. Dr. Sompop Pattanariyankool, the Deputy Permanent Secretary of Thailand's Ministry of Energy, presided over the Ceremony. ASEW & EVA 2024 ran from 3 to 5 July 2024 at QSNCC, Bangkok. This momentous and memorable industry-centric Event was well-attended by over 33,000 professionals from 65 countries!

Snapshots of ASEW & EVA 2024, Bangkok





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2024 China-ASEAN Electric Power Industry Co-operation Conference in Chongqing, China

The Electrical and Electronics Association of Malaysia (TEEAM) was again honoured to accept the cordial invitation sent by the Industry Co-operation Committee of the Regional Comprehensive Economic Partnership -- RCEP (RICC) of China to attend the 2024 China-ASEAN Electric Power Industry Co-operation Conference in Chongqing, China. This massive undertaking took place from 17 to 19 June 2024 at Fuling Jinke Hotel in Chongqing, China. Apart from enhancing industrial development, the Conference's goal was to promote Trade and Investment in the Power Sector amongst China and ASEAN.

As with the earlier 2024 Fuyang Investment & Trade Fair alongside the 1st RCEP Entrepreneur Co-operation Conference event held in May, attendees consisted of special invited guests and leaders but this time around, it was of ASEAN National Chambers of Commerce, Industry Associations, Local Industry, Enterprise Leaders, Leaders of Local Government and the Media. Ir. Chang Yew Cheong (President), Dato' Andy Tan (Honorary Treasurer), Council Members, Tc. How Chee Seng and Mr. Louis Loo, and Member, Mr. David Liaw, and Guest, Ir. Dr. Tan Kuang Leong attended the event on behalf of TEEAM. TEEAM hereby wishes to convey our deep gratitude and sincere appreciation for the wonderful hospitality of both RICC and the Local Government of Chongqing Municipality. Participants who attended the Conference event felt it was indeed time well-spent and profitable!

Snapshots of 2024 China-ASEAN Electric Power Industry Co-operation Conference in Chongqing, China

A Holistic Approach to Zero-Carbon Emissions

Ir. Dr. F. C. Chan

This Technical Paper was presented by Ir. Dr. F. C. Chan representing the Hong Kong Electrical Contractors' Association (HKECA) at the 2024 ASEAN Federation of Electrical Engineering Contractors (AFEEC) & Federation of Asian-Pacific Electrical Contractors Associations (FAPECA) Conference, which was held on 27 June 2024 at the Kuala Lumpur Convention Centre, Malaysia.

Synopsis

The path to achieving zero-carbon emissions needs a fundamental shift on energy production and utilisation. Such energy transition can be analysed in a number of areas: Use of Renewables to Replace Fossil Fuel, Electrification in Transportation, Product Energy-Efficiency and Usage, Carbon Capture Technology, Innovation and Technology, Resiliency and Adaption in Energy Grid. This Paper also describes the approach and action taken by the Hong Kong SAR Government in response to the Climate Change Perspective. Resources are allocated in this de-colonisation progress. By 2035, the total carbon emissions in Hong Kong will be reduced by 50% in comparing with the 2005 level. Before 2050, the zero-carbon emissions target will be achieved. Of course, it is essential to accelerate and achieve targets for a sustainable, zero-carbon emissions future.

1. Introduction

Under the 2015 Paris Agreement, we need to act to limit the rise in global average temperatures to "well below" 2^0 Celsius above pre-industrial times and strive to keep it to a ceiling of 1.5^0 C. However, our global CO2 emissions continue to rise and our world has already heated up by about 1.1^0 C. This situation would bring ever-worsening extreme weather and potentially catastrophic sea-level rise, making some parts of the planet uninhabitable! The progress to hold temperature rise to 1.5^0 C is slow and the United Nation finds that climate action is still pointing towards a 2.8^0 C temperature rise by the end of the century. Hence, every effort is required to achieve zero emission and remove CO2 emissions from any human-produced carbon dioxide.

The energy sector accounts for some 75% of emissions, hence energy transition to adopt renewable and clean energy is the key for a sustainable future. The path to achieving zero-carbon emissions needs a fundamental shift on energy production and utilisation. Many Governments have committed to reduce such emission to net zero by 2050 as the only way to fight against climate change. Such energy transition can be analysed in a number of areas: Use of Renewable to Replace Fossil Fuel, Electrification in Transportation, Product Energy-Efficiency and Usage and Carbon Capture Technology.

2. Approaches to Reach Zero Carbon Emission

2.1 Use of Renewable to Replace Fossil Fuel

Basically, we need to transform our energy systems replacing fossil fuel by renewable energy as without renewables, there can be no future! Hence it is essential to make renewable energy technology as a global public good – available to all by removing roadblocks to knowledge-sharing and technological transfer. Renewable energy sources can be classified into the following six types: Wind, Solar, Hydro, Bio, Geothermal, and Marine. By far, wind and solar are the most common choices. Investments in technology and corresponding infrastructure are essential. A decentralised approach in using solar energy system at distribution level will likely be a backbone in energy transition. It is anticipated that the electricity sector can achieve net zero globally and all coal and oil power plants will be phased out. By 2050, almost 70% of electricity generation globally will come from solar and wind!

In the replacement of fossil fuel, the carbon-free nuclear energy generation is also required to be considered, particularly it demands in-depth technologies in terms of safety and engineering. Nuclear fission reactor is a mature technology and Small Modular Reactors, based on Generation III Light Water Reactor technologies, with a size ranging from 1 to 300 MW is a viable choice for electricity generation.

2.2 Electrification in Transportation

Reducing transport emissions, in particular from personal vehicles, will play a central role for zero carbon emission. The internal combustion engine vehicles will be phased out (no more selling of such new vehicles by 2035) across the world and application of Battery Electric Vehicle is now the trend (Hydrogen vehicles are also zero emission and currently more costly). Battery life and capacity for electric vehicle are still improving. It is expected that some 60% will be electric vehicles by 2030. Electrification in Transportation is considered as one of the key strategies towards zero-carbon emission.

2.3 Product Energy-Efficiency and Usage

Improving energy efficiency is critical in reducing energy wastage hence the need for better utilisation of available produced energy. This can be achieved through measures like better insulation on heating or air-conditional equipment, energy-efficient appliances, and advanced industrial processes like district cooling system. It is anticipated by 2040, half of the existing buildings will be retro-fitted to zero-carbon ready levels.

2.4 Carbon Capture Technology

For the Carbon Capture, Utilisation, Storage (CCUS) Technology, it is to remove CO2 from the flue gas produced by fossil-fuelled power plant or directly, and from, the atmosphere, followed by recycling the CO2 for utilisation or permanent storage. CCUS is one of the developing technologies to unlock the full potential of decarbonisation to achieve carbon neutrality. Since Waste-to-Energy can also emit CO2, we need also to reduce waste, particularly at the source.

3. Hong Kong Zero Emission Strategies

A Steering Committee on Climate Change and Carbon Neutrality was formed and chaired by the Chief Executive. The following zero emission strategies are adopted by the HKSAR Government. The target is to reduce total carbon emissions before 2035 by 50% and to achieve zero emissions before 2050. There are 4 strategies as described below.

3.1 Net-Zero Electricity Generation

By 2035, Hong Kong will cease using coal for electricity generation (keeping coal-fire plant for back-up purpose). The long term target of net-zero electricity generation is before 2050 through renewable energy development and regional co-operation (importing nuclear energy). Renewable energy in the fuel mix for electricity generation will be increased by 10

to 15% by 2035. Hong Kong also aims to achieve net-zero electricity generation before 2050 with the support of continuous technological advancement in using zero-carbon energy for electricity generation.

In 2020, the fuel mix for electricity generation in Hong Kong is: Nuclear and Renewables 28%, Natural Gas is 48% and Coal is 24%. The use of renewable energy, with the help of public and private sectors, will be increased to 7.5-10% by 2035 and ultimately to reach 15%. Of course, we shall further strengthen the co-operation with neighbouring areas to increase the supply of zero-carbon electricity. Where possible, we shall seek investment and development opportunities for new energy source.

3.2 Energy-Saving and Green Buildings

Electricity consumption in Buildings accounts for about 90% and it is essential to commit in energy saving and conservation. We aim to achieve electricity saving in commercial buildings by 15-20% by 2035 and a further saving by 30-40% before 2050. For residential buildings, the saving is targeted around 10-15% and further saving by 20-30% before 2050 -- by strengthening regulation on those buildings with high energy consumption (for example, data centres) and by conducting more frequent energy audits (hence identifying energy improvement opportunities). The HKSAR Government also explores setting a minimum energy-efficiency requirement for specified appliances.

Continuous enhancement of energy performance of buildings is essential. Frequent energy audits are required in order to further identify energy management opportunities and make required improvements. Green buildings certification (e.g. BEAM Plus) aim to advance towards net zero by utilising more new or smart technologies. It is particular important for those major areas of development with energy-efficiency infrastructure and district cooling systems (can save up to 35% of conventional air-conditioning system in individual building). The effort on energy saving measures will continue including those governing by the Buildings Energy-Efficiency Ordinance, the Mandatory Energy-Efficiency Labelling Scheme, etc.

3.3 Green Transport

In green transportation, apart from clean air to be achieved, a clear electric vehicle (EV) roadmap is set to attain zero vehicular emissions before 2050. Transpiration accounts for 18% of the carbon emission in Hong Kong and inside this 18%, private cars account for 4.5% while medium goods vehicles account for 3.2%. In promoting EVs, some financial incentives were adopted for one-for-one replacement of fuel-propelled vehicles. The establishment of public and private EV charging networks (including some subsidy) is essential for EV development. The number of EVs in Hong Kong was around 80,000 at the end of Jan 2024, representing 8.6% of total number of vehicles.

Fuel-propelled and hybrid private cars will be ceased for new car registrations in 2035 or earlier. In the coming few years, tests will be carried out with hydrogen fuel cell adopted for electric buses and heavy vehicles. At the same time, ferries will also be progressively adopted by using new energy. One other important aspect is battery recycling and it is the producer's responsibility in dealing with those retired EV batteries.

3.4 Waste Reduction

A Waste Blueprint 2035 was also prepared with a vision for Waste Reduction, Resources Circulation and Zero Landfill. Currently, it is planned to implement Municipal Solid Waste Charging with an objective to encourage waste reduction and recycling. It is also planned to regulate disposable plastic tableware (reduce plastic at source) by 2025. For those unavoidable wastes (reduce from reliance on landfills), it requires to establish adequate waste-to-energy facilities to handle these wastes. Since the waste-to-energy plant can emit CO2, hence waste reduction and recycling forms an important strategy for reducing CO2 emission.

4. Climate Change Adaptation and Resiliency

Apart from implementing the zero carbon emission as stated in Section 3, HKSAR Government also implemented various measures for climate change with the main purpose of protecting life, health and property of the people from possible extreme weather, including strengthening the resilience of the community.

4.1 Adaptation

Hong Kong is a coastal city, susceptible to weather-related threats such as tropical cyclones, rainstorms and storm surges. Climate change has resulted in a continuous rise of sea-level affecting those low-lying areas in the long run. Hence, it is required to step up coastal protection, to enhance the flood resilience and to stabilise slopes, etc. The following means are adopted:

- Strengthening Infrastructure
- Combatting Sea Level Rise and Marine Protection
- Combatting Extreme Rainstorms and Tropical Cyclones
- Combatting Extreme Droughts and Safeguarding Water Supply
- Combatting Extreme Heat

4.2 Resiliency

Since extreme weather conditions are expected to occur in a more frequent manner, various contingency plans are formulated so that the Government can act in preparedness, response and recovery to guard against natural disasters. Weather is therefore essentially monitored and the appropriate warnings can be issued to alert our community. Local mobile network operators can disseminate time-critical announcements under emergency situations. The transport systems can be well co-ordinated and announced in the event of closure of facilities and suspension of services.

5. Conclusion

Combatting climate change and achieving carbon neutrality both demand long term and persistent efforts. The energy transition by the use of zero-carbon electricity generation is a critical move. It is definitely worthwhile to invest (unlike those business decisions with a good return on investment) in renewable energies so as to obtain zero-emission energy. While aiming towards the acquirement of this clean energy, its application is to replace those industry sectors' energy based on fossil fuels. Green buildings are needed to be geared up in both new and existing buildings (by retro-fitting old buildings). Of course, innovation, technologies and investments are essential for combattting climate change for zero-carbon emission.

Ir. Dr. F.C. Chan *received his education in Hong Kong and United Kingdom. He graduated with First Class Honours from the University of Hong Kong in Electrical Engineering. He carried out research in Power Systems Protection and obtained his Doctor of Philosophy from the Imperial College, University of London. Thereafter, he obtained a Master of Business Administration from the Chinese University of Hong Kong, a Master of Arts in English with Distinction for the Professions from the Hong Kong Polytechnic University and a Master of Laws from the University of London.*

Ir. Dr. Chan has extensive experience in Power Systems Specialising in Power System Protection, Distribution Automation, Substation Design, Plant Construction and Cable Installation Works. As an Electrical Contractor, he Provides Technical Services in Lighting Applications, High Voltage Installation, Traction Supply and Energy Services. Ir. Dr. Chan has served in various HKSAR Government Committees and was awarded the Bronze Bauhinia Star in 2017. He is a Fellow and a Past President of the Hong Kong Institution of Engineers. Currently, he is the Honorary Secretary of the Hong Kong Electrical Contractors' Association (HKECA).

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State Associations News

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E-mail: pema_pg@yahoo.com Website: www.pema.org.my

One-Day Seminar on Sustainable Solution In Electrification & Automation

The Penang Electrical Merchants' Association (PEMA's) Technical Committee, in collaboration with Siemens Malaysia Sdn Bhd, successfully organised a 1-Day Seminar on 'Sustainable Solution In Electrifiation & Automation' on 18 January 2024 at the Eastin Hotel, Queensbay, Penang.

This timely Seminar drew some 58 participants and it was approved with BEM-CPD hours and CIDB-CCD points for Electrical Engineers and Contractors.

PEMA's CNY OPEN HOUSE 2024

PEMA organised a Chinese New Year (CNY) Open House on 24 February 2024. Members, Trustees and Advisors of PEMA and their Family Members were cordially invited to join the auspicious occasion. There was a Lion's Dance Performance and a sumptuous Buffet Lunch was served. Angpows (red packets) were distributed to all the children by PEMA's President, Trustees and Advisors. It was indeed a joyous occasion for all.

PEMA's 76th AGM & Election of Office-Bearers for the year 2024-2025

PEMA's 76th Annual General Meeting (AGM) & Election of Office Bearers were held at the Association's premise on 31 March 2024. The meeting unanimously confirmed and adopted the Minutes of the previous AGM which was held on 25 June 2023. This was followed by the adoption of the Annual Report for the year 2023 and Audited Accounts for the year ended 31 December 2023. The following is the list of the newly-formed PEMA Office-Bearers for the year 2024-2025:

PEMA Office-Bearers for the year 2024-2025

Trustees	Dato` Seri Hong Yeam Wah Khaw Tatt Siew Teoh Yew Yean Cheah See Yeong
Executive Advisor	Dato` Seri Hong Yeam Wah
Association Advisors	Dato Ooi Kok Kee, Lai Chang Hun, Foo Sing Tatt, Ir. Chen Chin Peng, Chiem Boon Kooi
President	Neoh Boon Tong
Deputy President	Lee Kuan Meng
Immediate Past President	Ir. Lee Weng Keen
Honorary Secretary	Ir. Lee Weng Keen
Assistant Honorary Secretary	Steve Koh Cheang Shern
Honorary Treasurer	Yeap Kim Poh
Council Members	Teoh Yew Yean, Choo Kwang Wah, Lim Kim San, Khaw Tatt Siew, Cheah See Yeong, Kelvin Nia Jun Hau, Ir. Ong Beng Siong, Kelvin Loo Poi Ming
Contractors` Committee	Teoh Yew Yean
Manufacturer's Committee	Kevin Nia Jun Hau
Supplier`s Committee	Steve Koh Cheang Shern
Technical Committee	Ir. Ong Beng Siong
Disciplinary Committee	Choo Kwang Wah
Constitution/By-Law Committee	Cheah See Yeong
Welfare Committee	Lim Kim San
Property Committee	Lim Kim San
Membership Recruitment Committee	Ir. Ong Beng Siong
Education Fund Committee	Khaw Tatt Siew
IT & Multimedia Committee	Kelvin Loo Pooi Ming
Technical Advisors	Ir. Beh Hong Pin, Ir. Chen Chin Peng, Ir. Thean Kah Kong, Ir. Tan Yeow Joo, Ir. Tan Tea Hwa
Legal Advisor	Mr. Oh Han Loon
Honorary Auditor	Chu Kerd Yee
Honorary Members	Koh Ah Tee, Foo Sing Tatt Lai Chang Hun

PEMA's 76th Anniversary Dinner Celebration-cum-Education Fund Awards 2024

PEMA celebrated its 76th Anniversary Dinner Celebration-cum-Education Fund Awards 2024 at the Noble Season Chinese Restaurant on 10 August 2024. The event was graced by the Honourable, YB Teh Lai Heng, Penang State Assemblyman of Komtar. More than 550 Members and Guests including PEMA's Trustees and Advisor attended the function!

The sumptuous Dinner started with a Welcome Address by Mr. Lim Kim San (PEMA's Welfare Committee Chairman) which was followed by Mr. Neoh Boon Tong (PEMA's President) & YB Teh Lai Heng (Penang State Assemblyman of Komtar).

PEMA's President, Mr. Neoh Boon Tong in his Opening Address thanked all Members, Organisations and Individuals for their generous support, which have made the Anniversary-cum-Education Fund Awards 2024 a great success. Over the years, the Association has attached great importance to the development of Education. Therefore, similar events are held every year to fully

reflect the purpose of the Association to encourage and recognize the children of PEMA's members and their full-time Employees in rewarding them to study hard and achieve superior results.

Besides the PEMA Anniversary, it was also the time for the PEMA Education Fund Award 2024. It started with an Address by Mr. Khaw Tatt Siew (PEMA's Education Fund Committee Chairman). The PEMA Academic Excellence Awards were presented to the children of PEMA Members and their Employees who had achieved outstanding results in the previous SPM and STPM Government-run Examinations. A total of 12 recipients were presented with the prestigious Awards and the total amount awarded was RM4,600.00.

The joyous excitement of the Celebration Dinner reverberated with Singing, Cake-Cutting Ceremony, Presentation of Certificates, Souvenirs and Lucky Draw. Mr. Neoh Boon Tong (PEMA's President) and Dato Seri Hong Yeam Wah (PEMA's Executive Advisor) presented a memento to the YB Teh Lai Heng to thank him for sparing the time to attend this auspicious Dinner.

The Dinner was joyously rounded-off with entertainment from the Karaoke team who performed some all-time heart-appealing favourite soft numbers and nice songs, which successfully tuned and turned the Dinner into a joyful memorable night for all!

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PEA's AGM and Installation Ceremony 2024

Mr. Richard Wong was elected as the President of the Perak Electrical Association (PEA) during PEA's Annual General Meeting, which was held on 7 April 2024 at PEA's Office. During the 36th Installation Ceremony, which was held on 28 April 2024 at the Exquisite Seafood Restaurant in Ipoh, Mr. Richard Wong, in his speech, called on fellow industry members to face the challenges brought on by new technologies. He emphasised the importance of Continuous Learning (CL) and adaptation to ensure that the industry can keep pace with time, especially in the areas of Renewable Energy (RE) and Environmental, Social, and Governance (ESG) practices. Mr. Richard Wong further added that the Government is pro-actively promoting RE and ESG initiatives, such as Solar Energy, Electric Vehicles and Charging Stations. The RE sector will play a crucial role in the transformation of the power industry.

PEA New Office-Bearers for the year 2024-2025

President	Richard Wong Ngen Wah
Deputy President	Au Wai Yeen
Vice Presidents	Cheah Kong Yew AMP, Chong Kwong Yuen, Lau Sin Leong, Ngoi Sh Tee
Secretary	Low Kam Yoong
Vice Secretary	Chung Chun Heng
Treasurer	Ngeow Khong Seng
Vice Treasurer	Tiew Kah Wei
Correspondence Officer (Chinese)	Wong Kok Mun
Correspondence Officer (English)	Chin Hoo Keat
Correspondence Officer (Bahasa)	Ngo Yew Cho
Social Secretaries	Wong Seng Yin, Low Kam Keen
Welfare Officers	Fook Chee Ming, Hoo Xin Kai
Info & Technology Officers	Lee Yan Kang, Kan Kim Weng, Foo Ken Khuan,
Committee Members	Lee Khar Seng, Wong Chen Fei, Ong Kean Seng, Ng Kah Chuen, Jerry Poon Nik Zen, Chan Wai Choonk, Kan Kok Meng, Law Kah Ching, Kong Kean Wei
Honorary Board Advisor	Wan Kam Weng
Auditors	Lam Yong Kang, Wong Seng Fei

ENERtec Asia 2024 Roadshow in Penang

PEA attended the ENERtec Asia 2024 Roadshow, which was organised by Informa Markets and The Electrical and Electronics Association of Malaysia (TEEAM) on 9 May 2024 at the Amari Spice Penang Hotel to promote the elite Trade Show to the Penang industries and businesses. A Dinner was held on that night for Networking, at the Restaurant Pen Mutiara Batu Maung, Penang. It was attended by PEA President, Mr. Richard Wong (seated on the far left).

ENERtec Asia 2024 Trade Show at KLCC

PEA President, Mr. Richard Wong visited the ENERtec Asia 2024 Trade Show on 27 June 2024 at the Kuala Lumpur Convention Centre. It was a good showcase of products and knowledge on Energy Transition Technology, which is fast shaping-up in Malaysia.

PEA at JBEEA's 46th Anniversary Dinner 2024

PEA President, Mr. Richard Wong (third from the right) and PEA's Secretary, Mr. Low Kam Yoong (first from the right) attended the Johor Bahru Electrical & Electronics Association's (JBEEA's) 46th Anniversary Dinner 2024, which was held on 13 July 2024 at Restaurant Pekin Johor Jaya (Daiman 18) in Johor Bahru.

PCCCI's 61st Central Committee

PEA Deputy President, Mr. Au Wai Yeen was elected as a Central Committee Member of the Perak Chinese Chamber of Commerce & Industry (PCCCI) for the year 2024-2027. The Installation Ceremony of the Office-Bearers of the PCCCI 61st Central Committee, 7th Youth Committee and PCCCI Branches' Committee 2024-2027, was held on 6 August 2024 at Restaurant Sun Lee How Fook, Ipoh. Mr. Au is seen standing in the centre in the dinner photo.

PEA's 37th Academic Awards 2024

PEA offers Academic Awards to children of their members to encourage them in their studies. An Academic Awards Ceremony was held on 11 August 2024 at PEA's Office to present monetary awards to the successful applicants. The Awards were presented by PEA President, Mr. Richard Wong.

Persatuan Kekompetenan Penjaga Jentera & Pendawai Elektrik Perak (PKPPE)
13B, Medan Bendahara 2, Medan Bendahara,
31650 Ipoh, Perak
Email: pkppe.2001@gmail.com
Facebook

PKPPE's AGM & Election 2024

The 2024 Annual General Meeting (AGM) of the Persatuan Kekompetenan Penjaga Jentera & Pendawai Elektrik Perak (PKPPE) [The Perak Electrical Chargemen & Wiremen Competence Association] and Election was successfully held on 11 May 2024 at PKPPE's Clubhouse located at No. 13-B, Medan Bendahara 2, Medan Bendahara, in Ipoh. Mr. Tony Leong was re-elected as the President of PKPPE for another 2-year term. The Installation Ceremony of PKPPE's new Committee Members was held on 21 July 2024 at the Sun Lee How Fook Restaurant in Ipoh.

PKPPE Office-Bearers for the year 2024-2026

President	Tony Leong Kwong How
Deputy President	Tan Soo Choy
Vice Presidents	Steven Kong Kean Wai
	Quah Hoo Kooi
	Leaw Chee Khen
	Sean Lim Kam Yuen
	Kong Chee Yuen
Secretary	Andrew Lee Chan Wah
Vice Secretary	Lam Meng Yang
Treasurer	Stanley Wong Chen Yu
	Gan Si Mia,
Committee Members	Kelvin Khoo SoonSeng,
	Edmund Teoh Choon Kiang,
	Khoo Choo Boon, Tan Fong Lai,
	Ong Kean Seng, Kan Ko Meng
Auditors	George Tan Thow Keen, Ng Yew Cho

Seminar on Foundation Earthing System

On 28 August 2024, the Institution of Engineers Malaysia (IEM) Perak, in collaboration with Suruhanjaya Tenaga (ST -- Energy Commission) Perak Regional Office and PKPPE, successfully held a Seminar and Technical Sharing on 'Foundation Earthing System -- Its Application and Electrical Safety Considerations' in Ipoh, Perak. The Distinguished Speaker was subject matter expert, Ir. Toh Leong Soon.

Foundation Earthing System greatly reduces the resistance-to-ground as compared to driven earthing rods. Low resistance-to-ground is desirable to protect lives – it ensures automatic disconnection of power supply in the event of an electrical fault! However, special attention must be given in the application of the Foundation Earthing System to terrace houses and shop lots, where common ground slab steelwork is used throughout the entire row of houses or shop lots.

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In the enlightening Seminar, field tests and findings of terrace houses with Foundation Earthing System, requirements of design and installation of Foundation Earthing System, and the importance of such an installation to achieve low resistance-to-ground, and to be able to operate the protective devices for supply disconnection during fault conditions were keenly shared. Participants also had the opportunity to visualize them through the demonstration test set during the Technical Sharing Session.

This industry-centric Seminar was well attended by competent Personnel, Electrical Contractors, Consulting Engineers, ST Officers and Members of IEM, PKPPE and TEEAM.

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JBEEA's New Term of Office-Bearers for the year 2024-2026

The Johor Bahru Electrical & Electronics Association's (JBEEA's) newly-elected Office-Bearers for the year 2024-2026 are:

JBEEA Office-Bearers for the year 2024-2026:

Chairman	Datuk Javy Kam Choon Wah
Vice Chairman	Kelvin Yap Tai Sin
Honorary Secretary	Lee Chee Hao
Assistant Honorary Secretary	Victor Chang Chi Ann
Honorary Treasurer	Lee Hai Soon
Assistant Honorary Treasurer	Ngoe Wee Min
Immediate Past Chairman	Steven Lim Kee Teck
Past Chairmen	Lee Chee Boon
	Leong Kam Meng
Committee Members	Chor Chin Min, Chua Kim Kok, Lee Boon Kim, Lim Chen Lian, Lim Kia Seng, Mohd Razali Rohani, Tan Lian Hua, Tiow Yok Seng, Wong Chen Choy
Auditor	Leong Kam Meng

JBEEA's 46th Anniversary Dinner 2024

JBEEA celebrated their 46th Anniversary with a Grand Dinner on 13 July 2024 at the Pekin Johor Jaya (Daiman 18 Golf) Restaurant, Taman Johor Jaya, Johor Bahru.

Electrical Association of Sarawak & Sabah
No. 2A/F, 2nd Floor, Hardin Road, 96000 Sibu, Sarawak.
Tel: +6084-319 949 Fax: +6084-325 112, 346 114
E-mail: sibucci@gmail.com

"Working Safely at Height" Course

A two-day course on "Working Safely at Height" jointly organised by the National Institute of Occupational Safety and Health and the Electrical Association of Sarawak and Sabah (EASS) was successfully held on 22 & 23 June 2024. Some 15 Graduates successfully completed the Course and received their Certificates.

The Working Safely at Height Course aimed to equip industry professionals with essential high-altitude safety knowledge and must-know skills to further enhance their expertise and ensure much safer operations in such dangerous environments. EASS sincerely expressed their gratitude to the Fire and Rescue Department for providing the venue and helping the participants to have actual real-life training exercises. This essential course was an important part of EASS's pro-active initiative to strengthen

New Members

The following new members have been approved and accepted by the TEEAM Council from May 2024 to August 2024. A warm welcome to all the new members and special appreciation is extended to those who introduced these new members. For those who are not yet members, join us and find out how our Association can offer our value-added services to you and your highly esteemed Company!

Cable Mart Sdn Bhd
Lot 4882, Unit 1, No. 5 Jalan SS 13/2,
47500 Subang Jaya, Selangor Darul Ehsan.
Tel: +603-5611 3883
Fax: +603-5612 3399
E-mail: sales@cablemart.net
Website: www.cablemart.com.my
Contact Person : Mr. Bobby Sin
Business: Trading in electrical cables.

Focus Electrical Malaysia Sdn Bhd
Lot 110 & 111, Jalan Industri Semambu 6,
Kawasan Perindustrian Semambu,
25300 Kuantan, Pahang Darul Makmur.
Tel: +609-560 6187
E-mail: general@focuselectrical.com.my
Website: www.focuselectrical.com.my
Contact Person : Mr. Tan Gen Suan
Business: Trading in electrical and electronics goods.

Global Lightning Technologies (M) Sdn Bhd
No. 36, Jalan TS 6/9, Taman Industri Subang,
47600 Subang Jaya, Selangor Darul Ehsan.
Tel : +603-5637 8743 Fax :+603-5637 0816
E-mail: info@gltm.com.my
Website: gltm.com.my
Contact Person: Mr. K P Sasi Dharan
Business: Business: Trading in nVent / Enrico products, lightning protection/earthing system

JMM Lightings Sdn Bhd
No. 2, Jalan BP 4/7, Bandar Bukit Puchong,
47100 Puchong, Selangor Darul Ehsan.
Hp: +6016-262 5516
E-mail: jmotmsb@gmail.com
Website: https://jmmlightings.com.my
Contact Person: Mr. Chan Yunn Horng.
Business: Importers, traders and agents of all types of lighting and related accessories.

Global Technical Solutions Sdn Bhd
A-25-13A, 25th Floor, Menara UOA Bangsar,
No. 5, Jalan Bangsar Utama 1, 59000 Kuala Lumpur.
Tel : +603-9779 2553 Fax: +603-9779 2554
E-mail: enquiry@gtsmalaysia.com.my
Website: www.gtsmalaysia .com.my
Contact Person: Ms. Darwinar Binti Hassan
Business: Business: Electrical testing & commissioning services up to 500KV.

AEG Media Sdn Bhd (Asia Event Group)
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No. 1, Persiaran Bandar Utama, 47800 Petaling Jaya,
Selangor Darul Ehsan.
Tel: +603-2779 5105 Hp: +6019-380 5601
Website: https://exhibitorsvoice.com
E-mail: khairuddin@asiaeventsgroup.com
Contact Person: En. Khairuddin Musa
Business: Event organiser.

Inventronics Malaysia Sdn Bhd
Level 4, Uptown 7, Jalan SS21/39, Damansara Utama,
47400 Petaling Jaya, Selangor Darul Ehsan.
Tel: +603-7660 4909
E-mail: David.Khong@inventronicsglobal.com
Website: www.inventronicsglobal.com
Contact Person: Mr. David Khong Ming Wei
Business: Lighting distributor/supplier

Koenone Co.,Ltd
587-9, Iksan-daero, Iksan-si, Jeollabuk-do
(95-37 Sinyong-dong), Korea.
Tel : +82-10-9200-6600 Hp: +82-10-2849-3017
E-mail: koenspd@gmail.com
Website: www.k-surge.com
Contact Person: Mr. Lee Jin Il
Business: Manufacturer of lightning protection such as surge protectors.

Progressture Power Sdn Bhd
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Tel: +603-6413 6568
E-mail: yewweng.ng@progressturesolar.com
Website: www.progressturesolar.com
Contact Person: Mr. Ng Yew Weng
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No. 26, Jalan Puteri 5/8, Bandar Puteri,
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Tel: +6012-211 8292
E-mail: sales@lightsmaestro.com
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TNB Labs Sdn Bhd
No. 1, Lorong Ayer Itam,
Kawasan Institusi Penyelidikan
43000 Kajang, Selangor Darul Ehsan.
Tel: +603-8922 5000 Fax: +603-8926 8828
E-mail: tnbrqats@gmail.com
Website: www.tnblabs.com.my
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Chenzhu Sdn Bhd
No. 2F-12, IOI Business Park, Persiaraan Puchong Jaya Selatan, Bandar Puchong Jaya, 47100 Puchong , Selangor Darul Ehsan.
Tel: +603-8070 4739
E-mail: sales@chenzhu-asean.com
Website: www.chenzhuisolator.com
Contact Person: Mr. Chin KW
Business: Manufacturer of Factory Automation (FA) and Process Automation (PA) instrumentation protection, which include safety barriers, SPDs, isolators, safety relays, and intelligent controllers.

Deng Kai Sdn Bhd
No. 53, Lorong Sungai Puloh 8/KU6,
Aman Perdana, 42200 Klang,
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Tel: +6014-329 4533 Fax: +603-3290 2288
E-mail: enquiry@deng-kai.com
Website: www.deng-kai.com
Contact Person: Mr. Lian Thng Kaih
Business: Electronic breaker and electric management system

Motobatt Sdn Bhd
No. 12, Seventh Avenue,
Jalan Dagang AJ U13/AJ,
Setia Alam, 40710 Shah Alam, Selangor Darul Ehsan.
Tel : +603-3362 3813 Fax: +603-3362 3819
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Website: www.kageroup.com
Contact Person: Mr. Chong Chin Siong
Business: Lithium battery manufacturer & trading.

Safety Regulations in the industry, especially concerning high-risk operations.

EASS is planning to conduct the Second Batch Working Safely at Height Course in response to industry demand. The industry-centric Course was divided into Theory and Practical segments, and was designed to ensure that the Participants gain core practical skills and competent Certification in high-altitude safety operations, which is vital in maintaining safety and compliance in electrical-related tasks in dangerous environments. Graduates of the Course are now officially certified to perform high-altitude work.

This Course represents a significant breakthrough for the EASS in meeting modern industry demands and ensuring that such professionals are highly qualified and specifically equipped to tackle extremely complex challenges in breath-taking high-altitude operations!

Other State Association Members' contacts:

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No. 389-G1, Taman Pringgit Jaya,
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MYS Engineering Sdn Bhd
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Website: www.mys-eng.com
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SBC Lighting Sdn Bhd
No. 15, Jalan SKI 4/KU 7, Kawasan Industri Hi Tech,
Sungai Kapar Indah, 42200 Kapar, Selangor Darul Ehsan.
Tel: +603-3290 4092
E-mail: sbclsb@hotmail.com
Website: www.sbc-lighting.com
Contact Person: Ms. Mok E-Wei
Business: Manufacturer of LED street lights and LED lighting.

Eur Ing Ir. Ts. Fam Deng Fong
No. 60, Jalan Seri Damai 1,
Taman Seri Damai,
43000 Kajang, Selangor.
Hp: +6019-2826137
E-mail: jimmyfam@gmail.com
Business: Specialist - Customer sustainability solution for power utility

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BS 31 CLASS B (SCREWED) HEAVY GAUGE / MANUFACTURER'S STANDARD

NOMINAL SIZE	OUTSIDE DIAMETER				WALL THICKNESS				CALCULATED WEIGHT WITH COUPLER			NUMBERS OF THREADS	LENGTH OF THREADS			
	MINIMUM		MAXIMUM		MINIMUM		MAXIMUM						MINIMUM		MAXIMUM	
in	mm	in	mm	in	mm	in	mm	in	kg/m	kg/ft	lb/ft	PER INCH	mm	in	mm	in
¾	18.76	0.7387	19.05	0.7500	1.52	0.060	1.63	0.064	0.713	0.217	0.479	16	12.70	0.5000	14.29	0.5625
1	25.11	0.9887	25.40	1.0000	1.52	0.060	1.63	0.064	0.972	0.296	0.653	16	15.88	0.6259	17.46	0.6875
1¼	31.46	1.2387	31.75	1.2500	1.52	0.060	1.63	0.064	1.240	0.376	0.830	16	17.46	0.6875	19.05	0.7500
1½	37.80	1.4880	38.10	1.5000	1.73	0.068	1.83	0.072	1.680	0.511	1.130	14	19.05	0.7500	20.64	0.8125
2	50.50	1.9880	50.80	2.0000	1.93	0.076	2.03	0.080	2.510	0.765	1.690	14	22.23	0.8750	23.81	0.9375

MS 275 / BS 4568 CLASS 3 (SCREWED) / MANUFACTURER'S STANDARD

NOMINAL SIZE	OUTSIDE DIAMETER		WALL THICKNESS	CALCULATED WEIGHT WITH COUPLER		PITCH	LENGTH OF THREADS	
	MINIMUM	MAXIMUM		MINIMUM	MAXIMUM		MINIMUM	MAXIMUM
mm	mm	mm	mm	kg/m	kg/m	mm	mm	mm
20	19.7	20.0	1.6 ± 0.15	0.643	0.783	1.5	13	15
25	24.6	25.0	1.6 ± 0.15	0.811	0.995	1.5	16	18
32	31.6	32.0	1.6 ± 0.15	1.069	1.301	1.5	18	20

MS IEC 61386-1 / MS 61386-21 CONDUIT SYSTEM FOR CABLE MANAGEMENT

NOMINAL SIZE	OUTSIDE DIAMETER		INSIDE DIAMETER	EXTERNAL THREAD LENGTHS
	MINIMUM	MAXIMUM	MINIMUM	MINIMUM
mm	mm	mm	mm	mm
20	19.7	20.0	1.6 ± 0.15	13
25	24.6	25.0	1.6 ± 0.15	16
32	31.6	32.0	1.6 ± 0.15	18

BROCHURE

CONTACT SALES

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KYODO PIPE SDN BHD
Plot 322 Jalan PKNK 3/2,
Kaw. Perusahaan Sungai Petani,
08000 Sungai Petani, Kedah.

www.kyodopipe.com.my
sales@kyodopipe.com
604.444.5178 (General Line)
6012.314.9968 (Sales)

Malaysian Economic Statistics Review MESR Volume 8/2024

Key Reviews & Overviews

The Department of Statistics, Malaysia (DOSM) had recently released the Malaysian Economic Statistics Review (MESR) Volume 8/2024 on 30 August 2024. The data and analysis presented in the MESR for August 2024 provide a comprehensive overview of our current economic landscape and guide to our path forward. The MESR will assist users and readers to have the latest information on the economic performance, and in much greater detail.

Key Reviews

- The IMF projects global growth to remain steady at 3.2 per cent in 2024 and 3.3 per cent in 2025, while inflation continues to decline globally. Advanced economies are expected to see inflation drop to target levels by the end of 2025, aided by cooling labour markets and lower energy prices, while inflation in emerging markets and developing economies will decrease more slowly. Global Trade is forecasted to recover at a 3.2 per cent annual growth rate, driven by strong Asian exports and demand for Products tied to Energy Transition and Artificial Intelligence.
- As for Malaysia, the GDP grew by 5.9 per cent in the second quarter of 2024, up from 4.2 per cent in the previous quarter, with seasonally-adjusted growth reaching 2.9 per cent. The strong economic expansion was primarily driven by the Services, Manufacturing, and Construction sectors. For the first half of 2024, the economy grew by 5.1 per cent, an improvement from 4.1 per cent during the same period in 2023.
- Natural Rubber Production increased marginally by 0.2 per cent year-on-year, recording 29,914 tonnes in June 2024 (June 2023: 29,867 tonnes). On a monthly basis, the production rose by 16.8 per cent from 25,608 tonnes in May 2024. Fresh Fruit Bunches Production in July 2024 increased by 14.1 per cent to 9,525,968 tonnes, contrasting with July 2023 (8,350,328 tonnes). Similarly, monthly production also went up by 10.1 per cent as compared to June 2024 (8,650,592 tonnes).
- In June 2024, Malaysia's Industrial Production Index (IPI) climbed by 5.0 per cent, marking its sixth consecutive month of positive growth. The Manufacturing sector led this upward trend with a 5.2 per cent increase, fuelled by a 5.4 per cent rise in export-oriented industries, the highest growth rate since September 2022. The Mining sector also rebounded with a 4.9 per cent gain, while the Electricity sector saw a 3.5 per cent increase. For the second quarter of 2024, the IPI grew by 4.5 per cent, primarily due to a 4.9 per cent boost in the Manufacturing sector, and it improved by 3.9 per cent in the first half of 2024.
- Since January 2024, the Manufacturing sector has experienced steady growth, with sales reaching RM156.1 billion in June, a 5.9 per cent increase from May (5.5%). This growth was primarily driven by a 7.1 per cent rise in the Electrical & Electronics products sub-sector, along with notable increases in the Food, Beverages & Tobacco (8.6%) and Non-metallic Mineral Products (11.1%) sub-sectors. For the second quarter of 2024, Manufacturing sales amounted to RM464.2 billion, reflecting a 5.7 per cent increase -- and over the first half of 2024, the sector's sales reached RM921.5 billion.
- Malaysia's Services sector demonstrated impressive growth in the second quarter of 2024, whereby revenue soared to a record RM607.1 billion, marking a 6.8 per cent increase from the previous year. Furthermore, the Services Volume Index rose by 6.7 per cent, reaching 152.2 points.
- Looking at the prices, Malaysia's Inflation Rate held steady at 2.0 per cent in June 2024, unchanged from May 2024. This stability was attributed to rising costs in several key sectors: Restaurant & Accommodation Services saw an increase to 3.3 per cent (up from 3.2% in May), Food & Beverages rose to 2.0 per cent (from 1.8% in May), Education grew to 1.7 per cent (up from 1.5% in May), and Transport climbed to 1.2 per cent (compared to 0.9% in May). For the second quarter of 2024, inflation edged up to 1.9 per cent, a rise from the 1.7 per cent recorded in the same period the previous year. The July 2024 rate remained at a 2.0 per cent increase.
- The Producer Price Index (PPI) increased by 1.6 per cent in June 2024 from 1.4 per cent in the previous month. All sectors in the PPI Local Production have shown consistent increases since March 2024. The Mining sector grew by 4.6 per cent, Agriculture, Forestry & Fishing jumped to 3.4 per cent, Manufacturing sector saw a 1.1 per cent increase, and the Utility sector experienced mixed changes with Water Supply up by 7.8 per cent and Electricity & Gas Supply up by 1.0 per cent. The PPI continued to rise by 1.3 per cent in July 2024.
- Looking at Malaysia's International Transactions with the rest of the world, the Current Account Balance recorded a lower surplus of RM3.0 billion in the second quarter of 2024 (Q2 2024) compared to RM8.3 billion in the same quarter of the previous year, primarily supported by net exports of the Goods account.
- Foreign Direct Investment (FDI) posted a higher inflow of RM9.1 billion as against RM2.5 billion in Q2 2023. Meanwhile, Direct Investment Abroad (DIA) registered a lower Nett Outflow of RM5.3 billion as compared to RM7.7 billion in the same period of the previous year.
- Malaysia's Total Trade in the second quarter (Q2) of 2024 saw a 10.0 per cent year-on-year increase, recording RM705.6 billion. Exports and Imports both grew as compared to Q2 2023, with Exports rising by 5.8 per cent to RM348.6 billion and Imports by 15.0 per cent to RM336.8 billion. For June 2024, the Trade rose by 8.7 per cent to RM237.8 billion (June 2023: RM218.8 billion), driven by a double-digit increase in Imports (+17.8%) and marginal growth in Exports (+1.7%). Meanwhile, the Trade Surplus decreased by 50.8 per cent from the previous year to RM14.3 billion. Trade Performance in July 2024 remained robust, with an 18.3 per cent year-on-year growth. Imports surged 25.4 per cent faster than Exports, which increased 12.3 per cent, resulting in a smaller Trade Balance Surplus of RM6.4 billion.
- Malaysia's Labour Force grew by 1.1 per cent, reaching 17.15 million in the second quarter of 2024, with the Labour Force Participation Rate increasing to 70.5 per cent. Employment rose by 1.2 per cent, bringing the Total Number of Employed Persons to 16.59 million. At the same time, the Number of Unemployed fell by 0.6 per cent, making the Unemployment Rate stable at 3.3 per cent.
- In June 2024, Malaysia's Leading Index (LI) rose by 3.5 per cent to 113.4 points, primarily driven by a 42.2 per cent surge in the Bursa Malaysia Industrial Index. The LI's sustained long-term trend above 100 points indicates on-going economic resilience. With Malaysia's reliance on consumer spending, domestic demand is expected to receive an additional boost from a Salary Revision initiative.

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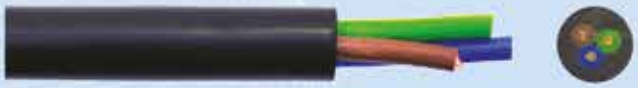

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Tel: +6 03- 9075 7999 (Hunting Line) Fax:+6 03 9075 7488 Website: www.fajarcables.com.my Email: contact@fajarcables.com.my

Overview of World Economy

The International Monetary Fund (IMF) reported in July 2024 that global growth is projected to remain steady at 3.2 per cent in 2024 and 3.3 per cent in 2025, with global inflation continuing to decline. For advanced economies, a gradual cooling of labour markets, along with an anticipated drop in energy prices, is expected to bring headline inflation back to target levels by the end of 2025. In contrast, inflation in Emerging Markets and Developing Economies (EMDE) is expected to remain higher and decrease more slowly than in advanced economies, though it is nearing pre-pandemic levels due to falling energy prices. Global Trade is projected to recover with an Annual Growth Rate of 3.2 per cent, spurred by robust Exports from Asia and rising demand for products linked to Energy Transition and Artificial Intelligence. According to the U.S. Bureau of Economic Analysis' advance estimate, Gross Domestic Product (GDP) increased 3.1 per cent in the second quarter of 2024 year-on-year, following a 2.9 per cent rise in the first quarter. The growth in real GDP was mainly driven by increases in Consumer Spending, Private Inventory Investment, Non-Residential Fixed Investment, and Imports. However, these gains were partially offset by a downturn in Residential Fixed Investment.

The United Kingdom's real GDP is estimated to have year-on-year growth of 0.9 per cent in the second quarter of 2024, following a 0.2 per cent growth in the previous quarter. In terms of output, the Services sector grew by 0.8 per cent quarter-on-quarter, with widespread gains across the sector, offsetting declines of 0.1 per cent in both the Production and Construction sectors. On the Expenditure side, there were increases in Gross Capital Formation, Government Consumption and Household Spending, which were partially offset by declines in Nett Trade.

Meanwhile, China's GDP growth for the first quarter was 5.3 per cent year-on-year, while the second quarter saw a 4.7 per cent increase. In the first half of 2024, China's GDP grew by 5.0 per cent year-on-year at constant prices. The Services sector expanded by 4.6 per cent year-on-year, with notable increases in various industries: Information Transmission, Software and IT Services grew by 11.9 per cent, Leasing and Business Services by 9.8 per cent, Transport, Storage, and Postal Services by 6.9 per cent, Accommodation and Catering by 6.6 per cent, and Wholesale and Retail by 5.7 per cent.

For ASEAN countries, the Philippine's GDP recorded a year-on-year growth of 6.3 per cent (Q1 2024: 5.8%) in the second quarter of 2024. The key contributors to this growth were the Construction sector, which expanded by 16.0 per cent, Wholesale and Retail Trade; the Repair of Motor Vehicles and Motorcycles, which grew by 5.8 per cent, and Financial and Insurance activities, which increased by 8.2 per cent. On the demand side, Household Final Consumption Expenditure was the largest contributor to GDP growth, rising by 4.6 per cent year-on-year in the second quarter of 2024.

Thailand's GDP in the second quarter of 2024 expanded by 2.3 per cent year-on-year accelerating from 1.6 per cent in the first quarter while Singapore grew by 2.9 per cent year-on-year in the second quarter 2024 (Q1 2024: 3.0%), Vietnam 6.9 per cent (Q1 2024: 5.7%) and Indonesia 5.1 per cent (Q1 2024: 5.1%).

Overview of Malaysia's Economy

Malaysia's GDP in the second quarter of 2024 rose 5.9 per cent as compared to 4.2 per cent in the preceding quarter. Correspondingly, Malaysia's GDP grew 2.9 per cent (Q1 2024: 1.5%) in terms of seasonally-adjusted. The expansion in Economy was driven by solid growth mainly in the Services, Manufacturing and Construction sectors, as shown in Table 1. For the first half of 2024, Malaysia's economy increased 5.1 per cent from 4.1 per cent in the same period of 2023.

Table 1: Annual Percentage Change (%) of Malaysia's GDP by Kind of Economic Activity 2022 – 2023 and Q1 2023 – Q2 2024

Kind of Economy Activity	2022	2023	2023				2024		1H 2023	1H 2024
			Q1	Q2	Q3	Q4	Q1	Q2		
Services	11.0	5.1	7.1	4.5	4.9	4.1	4.8	5.9	5.8	5.4
Manufacturing	8.1	0.7	3.2	0.1	-0.1	-0.3	1.9	4.7	1.7	3.3
Construction	5.1	6.1	7.4	6.2	7.2	3.6	11.9	17.3	6.8	14.6
Agriculture	1.3	0.7	1.4	-0.7	0.3	1.9	1.7	7.2	0.3	4.5
Mining & quarrying	3.5	0.5	1.8	-2.1	-1.1	3.5	5.7	2.7	-0.2	4.3
GDP	8.9	3.6	5.0	2.0	3.1	2.9	4.2	5.9	4.1	5.1

Source: Department of Statistics, Malaysia

The Services sector expanded by 5.9 per cent in this quarter as compared to 4.8 per cent in the previous quarter. The improvement was attributed to key sub-sectors such as Wholesale and Retail Trade (4.8%), Finance & Insurance (10.1%) and Transportation and Storage (10.5%). In terms of seasonally-adjusted, the sector grew 3.3 per cent (Q1 2024: 1.3%).

The Manufacturing sector surged to 4.7 per cent from a modest growth of 1.9 per cent in the last quarter! The growth was driven by Petroleum, Chemical, Rubber & Plastic Products (4.1%), Non-metallic Mineral Products, Basic Metal and Fabricated Metal Products (9.4%) and Electrical, Electronic and Optical Products (3.0%). In terms of seasonally-adjusted, this Manufacturing sector grew by 3.1 per cent as compared to 2.4 per cent in the first quarter of 2024.

The Agriculture sector soared to 7.2 per cent in this quarter (Q1 2024: 1.7%), marking its strongest growth in six years! The substantial leap from the previous quarter was attributed to the double-digit growth of 19.0 per cent in the Oil Palm sub-sector. Furthermore, Livestock and Fishing sub-sectors increased much better to 5.4 per cent and 5.3 per cent, respectively. In terms of seasonally-adjusted, this sector rebounded to 1.6 per cent (Q1 2024: -0.7%).

The Mining and Quarrying sector grew at a slower pace of 2.7 per cent as compared to 5.7 per cent in the previous quarter. The performance was influenced by the moderation in Natural Gas at 2.9 per cent, while Crude Oil and Condensate increased 1.6 per cent. Nevertheless, this sector further declined to 4.0 per cent (Q1 2024: -1.4%) in terms of seasonally-adjusted.

The Construction sector further strengthened to 17.3 per cent (Q1 2024: 11.9%). The performance was bolstered by robust growth in Specialised Construction Activities (27.0%), Civil Engineering (23.6%) and Residential Buildings (14.1%). Furthermore, Non-Residential Buildings grew 2.8 per cent in this quarter. In terms of seasonally-adjusted, the sector increased to 8.7 per cent (Q1 2024: 7.9%).

Shifting towards the demand side of the economy, Private Final Consumption Expenditure continued to propel the growth with a 6.0 per cent increase, from 4.7 per cent in the first quarter of 2024. The expansion was supported by the higher consumption of Food & Non-alcoholic Beverages (7.2%), Transport (8.9%) and Restaurant & Hotels (10.5%). In terms of seasonally-adjusted, Private Final Consumption Expenditure increased 4.5 per cent (Q1 2024: 1.8%).

In addition, Gross Fixed Capital Formation (GFCF) rose to 11.5 per cent in this quarter as compared to 9.6 per cent in the first quarter of 2024. The performance of GFCF was contributed by Structure (12.6%), Machinery & Equipment (11.8%) and Other Assets (4.2%). GFCF by sector showed that both the Private and Public sectors posted strong growth of 12.0 per cent and 9.1 per cent, respectively. In terms of seasonally-adjusted, GFCF increased by 5.1 per cent (Q1 2024: 2.8%).

Meanwhile, the External sectors continued with a recovery momentum, with Exports and Imports posting a positive growth of 8.4 per cent (Q1 2024: 5.2%) and 8.7 per cent (Q1 2024: 8.0%). Correspondingly, the Nett Exports rebounded to 3.4 per cent from a 24.5 per cent contraction in the previous quarter.

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Table 2: Annual Percentage Change (%) of Malaysia's GDP by Type of Expenditure, 2022 - 2023 and Q1 2023 - Q2 2024

Type of Expenditure	2022	2023	2023				2024		1H 2023	1H 2024
			Q1	Q2	Q3	Q4	Q1	Q2		
Private final consumption	11.3	4.7	6.1	4.2	4.1	4.2	4.7	6.0	5.2	5.3
Gross fixed capital formation	6.8	5.5	4.9	5.5	5.1	6.4	9.6	11.5	5.2	10.6
Government final consumption	5.1	3.3	-2.0	3.3	5.3	5.8	7.3	3.8	0.6	5.5
Exports	14.5	-8.1	-2.9	-9.0	-12.0	-7.9	5.2	8.4	-6.0	6.8
Imports	18.0	-7.4	-6.7	-8.8	-11.3	-2.6	8.0	8.7	-7.8	8.4
Net Exports	-1.5	-16.2	71.2	-11.9	-19.9	-52.9	-24.5	3.4	26.5	-14.1
GDP	8.9	3.6	3.9	2.9	3.1	2.9	4.2	5.9	4.1	5.1

Source: Department of Statistics, Malaysia

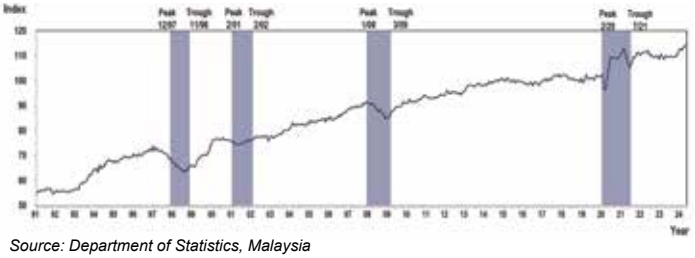
At the same time, Current Account Balance (CAB) in the second quarter of 2024 posted a surplus of RM3.0 billion (Q1 2024: surplus RM16.2 billion), which was mainly supported by Nett Exports of Goods. Meanwhile, the Financial Account recorded a net inflow of RM17.1 billion as against a net outflow of RM18.7 billion in the previous quarter. This was mainly propelled by Nett Inflows in Other Investments and Direct Investments. In the first half of 2024, the CAB reached a surplus of RM19.2 billion while the Financial Account recorded a Nett Outflow of RM1.6 billion.

Malaysia's Trade Performance in June 2024 maintained its upward momentum with an increase of 8.7 per cent driven by Imports that noted a double-digit increase of 17.8 per cent and a marginal increase in exports of 1.7 per cent, contributing to a decrease in the Trade Surplus of 50.8 per cent. Malaysia's Trade Performance in July 2024 remained robust, with an impressive 18.3 per cent growth, fuelled by double-digit increases in both Exports (+12.3%) and Imports (+25.4%). Despite this strong overall performance, Trade Balance, while still in surplus, experienced a decline of 62.9 per cent as compared to the same month last year.

Malaysia's Labour Force expanded by 1.1 per cent or 186.6 thousand persons, to post 17.15 million persons in the second quarter of 2024. Subsequently, the Labour Force Participation Rate (LFPR) rose by 0.3 percentage points to 70.5 per cent (Q1 2024: 70.2%) in this quarter. The number of Employed Persons went up by 1.2 per cent, reaching 16.59 million persons (Q1 2024: 16.40 million persons). Meanwhile, the Number of Unemployed Persons was reduced further by 0.6 per cent to 557.8 thousand persons (Q1 2024: 561.1 thousand persons), recording 3.3 per cent of the Unemployment Rate in the second quarter of 2024 (Q1 2024: 3.3%).

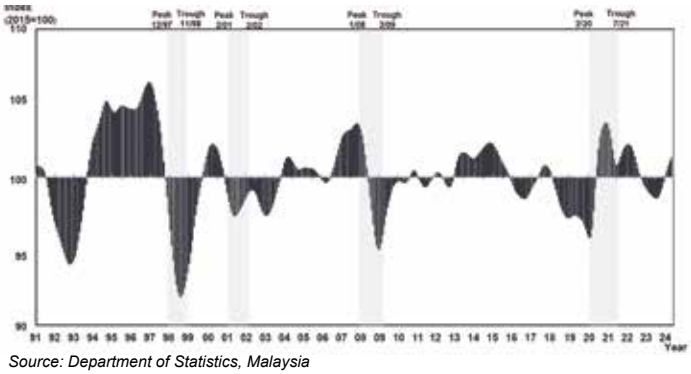
Moving ahead, the Leading Index (LI) recorded positive growth of 3.5 per cent in June 2024 reaching 113.4 points compared to 109.6 points in the same month the previous year. The Bursa Malaysia Industrial Index was the main contributor to this increase, with a strong performance of 42.2 per cent. However, the monthly performance of the LI saw a marginal decline of 0.7 per cent due to declines in five out of seven components, except for the Bursa Malaysia Industrial Index (0.4%) and Real Money Supply, M1 (0.2%). Looking at the smoothed long-term trend in June 2024, the LI remained above 100.0 points. This positive trajectory reflects Malaysia's sustainable and resilient economic growth. As Malaysia is a consumer-driven economy, the implementation of a Salary Revision Initiative is poised to boost Domestic Spending.

Chart 1: Leading Index (2015=100) and Business Cycle (Grey Shaded Areas), January 1991 to June 2024



Source: Department of Statistics, Malaysia

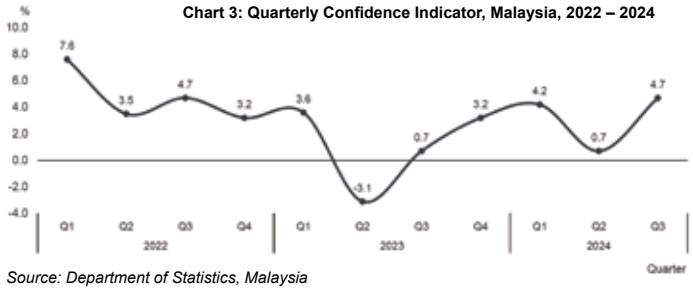
Chart 2: Leading Composite Index (Long Term Trend = 100) and Business Cycle (Grey Shaded Areas), January 1991 to June 2024



Source: Department of Statistics, Malaysia

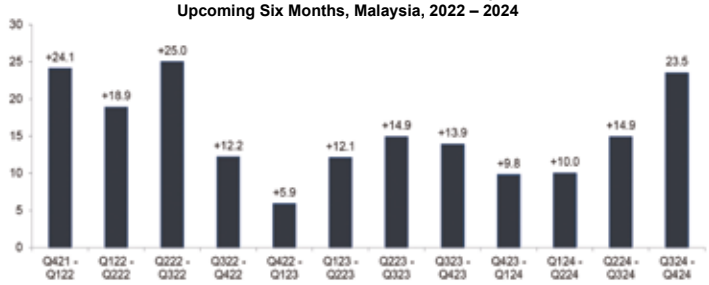
In view of businesses' perspectives, businesses presume an improvement in Malaysia's business environment in the third quarter of 2024, with a positive confidence indicator of +4.7 per cent, up from +0.7 per cent in the second quarter of 2024. Looking ahead, businesses expect a positive business outlook for the second half of 2024, with a Nett Balance of +23.5 per cent, which is higher compared to +14.9 per cent recorded for the April to September 2024 timeline. Sentiment in the Services sector are rising, with a Nett Balance of +30.8 per cent compared to +9.5 per cent earlier. All sub-sectors in the Services sector expect to prosper over the next six months, with the Health, Accommodation, and Education sub-sectors being the most enthusiastic. At the same time, the Industry sector expects a favourable business environment, with a Nett Balance of +23.2 per cent, as against +25.6 per cent earlier. The Construction sector remains positive for the next six months, with a Nett Balance of +21.7%, up from +3.7% earlier. The Wholesale & Retail Trade industry is positive about the business scenario for the next six months, ending December 2024, with a Nett Balance of +13.4 per cent, rebounded from -1.5 per cent earlier!

Chart 3: Quarterly Confidence Indicator, Malaysia, 2022 – 2024



Source: Department of Statistics, Malaysia

Chart 4: Net Balance of Business Performance Expectation for Upcoming Six Months, Malaysia, 2022 – 2024



Source: Department of Statistics, Malaysia

The full publication of the MESR Volume 8/2024 can be downloaded from the DOSM website at www.dosm.gov.my

Acknowledgement

Source: Department of Statistics, Malaysia (DOSM)

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TEEAM's Networking & Appreciation Dinner with the Chinese Media 2024

12 June 2024 was a meaningful date whereby The Electrical and Electronics Association of Malaysia (TEEAM) cordially hosted a Networking and Appreciation Dinner to treat members of the Chinese Media for their tremendous support in covering and publicising TEEAM's activities ever so promptly and thoroughly over the years. Paired with sumptuous and scrumptious varieties of quality Chinese cuisine, the Networking and Appreciation Dinner event provided opportunities for TEEAM to exchange information with the media and update them on current and future TEEAM events. TEEAM unequivocally appreciates the tireless efforts of the Media and desires to continue to maintain a mutually beneficial and close working relationship with them.

The TEEAM-Media gathering witnessed a heartening turnout of a 34-member-strong representation. Those present who were the celebratory function's target audience consisted of Senior Management Officers, Editors and Corporate Communications & Public Relations Representatives from different eminent and established News Media Agencies such as Asia TV, Sin Chew Daily, Nanyang Siang Pau, China Press, Guang Ming Daily, Oriental Daily and Kwong Wah Press.

Ir. Chang Yew Cheong (President), Ts. Lim Sai Seong (Deputy President), Ir. Lee Kok Chong (Vice President), Dato' Andy Tan (Honorary Treasurer), Datuk Jacky Chen (Assistant Honorary Secretary), Mr. Chong Yoon Koon (Council Member) and Secretariat Staff Members, Ms. Winnie Khong and Ms. Sherly Cheong attended the Networking and Appreciation Dinner. They affably mingled and interacted with the Media members who showed up for the Dinner throughout the event until it came to a close and was time to depart and say "Farewell and hope to see you again one day."

Snapshots of TEEAM's Networking & Appreciation Dinner with the Chinese Media 2024

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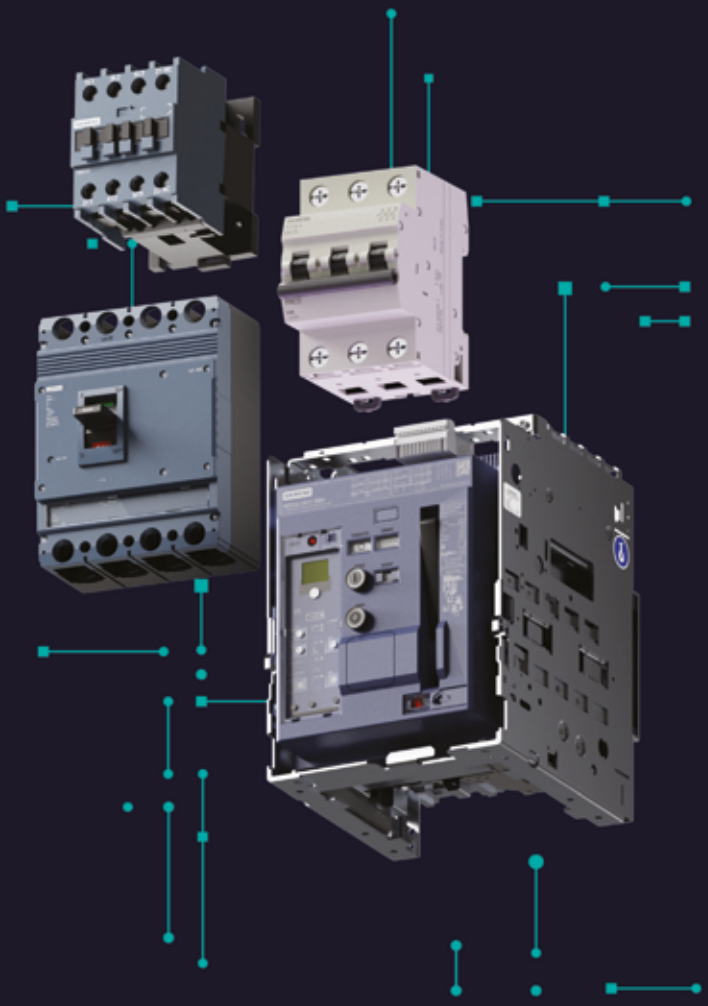

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Micro Modular Reactor, MMR for Future Energy & Carbon Neutrality

Assoc. Prof. Dr. Werachet Khan-ngern

This Technical Paper was presented by Assoc. Prof. Dr. Werachet Khan-ngern representing the Thai Electrical & Mechanical Contractors' Association (TEMCA) at the 2024 ASEAN Federation of Electrical Engineering Contractors (AFEEC) & Federation of Asian-Pacific Electrical Contractors Associations (FAPECA) Conference, which was held on 27 June 2024 at the Kuala Lumpur Convention Centre, Malaysia.

Synopsis

According to Thai Energy Policy, with the goal of lowering carbon dioxide emissions to zero (carbon neutrality), the target is aimed by 2065-2070. This Paper proposes the alternative energy source to move towards carbon neutrality goals and speed up the transition -- away from fossil fuels to renewable, alternative, and nuclear energy. The concept of ultra-safe of micro power under 50 MW per unit, called Micro Modular Reactor (MMR) is introduced to accelerate Action Number 3 of COP 28, to increase and utilise nuclear power source. Safety and environmental issues are presented such as reliable proven technology against radioactivity release and providing protection in the permanent repository after operation. Finally, MMRs are analysed in multi dimensions: technology, safety, cost, carbon-neutrality, sustainability, and public relationship as the ultra-safe solutions for our future energy.

1. Introduction

According to National Energy Plan: NEP -- the plan is to benefit people and to support Thailand to use clean energy and reduce Carbon Dioxide gas. Carbon is reduced to zero or Carbon Neutrality by 2050. This helps investors to invest in countries that have low Carbon, and Thailand will not have to face the serious problem of Greenhouse effect.

According to Conference of the Parties (COP28), they emphasise on reducing fossil and increase nuclear energy. For example, reducing Greenhouse gas in cooling system and air conditioner.

2. Nuclear Technology

The first commercial nuclear power station started operations in the 1950s. Nuclear energy now provides about 10% of the world's electricity from 440 power reactors. Nuclear provides about one-quarter of the world's low-carbon electricity. Nuclear is the world's second largest source of low-carbon power (26% of the total in 2020). Over 50 countries utilise nuclear energy in about 220 research reactors. In addition to research, these reactors are used for the production of medical and industrial isotopes, as well as for training. Fig. 1 shows nuclear electricity production and Fig. 2 shows world electricity production by source 2020.

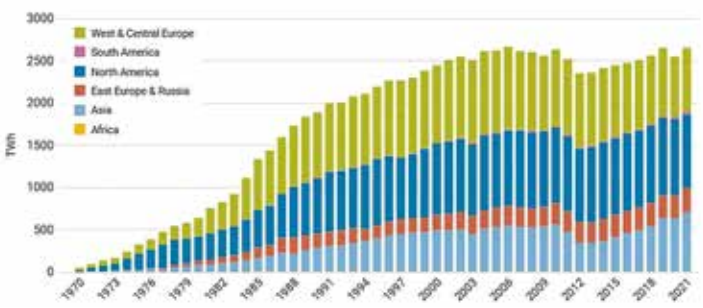

Fig. 1 Nuclear electricity production (source: World Nuclear Association, IAEA PRIS)

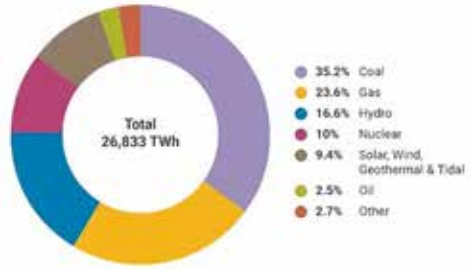

Fig. 2 World electricity production by source 2020 (source: International Energy Agency)

3. Nuclear Technology Selection Criteria

The important thing is that the new nuclear technology should fulfill generating capacity around the world, both to replace old fossil fuel units, especially coal-fired ones, which emit large amounts of carbon dioxide, and to meet increased demand for electricity in many countries. In addition to commercial nuclear power plants, there are about 220 research reactors operating in over 50 countries, with more under construction. As well as being used for research and training, many of these reactors produce medical and industrial isotopes. New Nuclear technology is discovered and researched to support the need from many countries in the world. Fig 3 shows the hierarchical tree for determining nuclear power plants in Indonesia in economic, social and safety aspects.

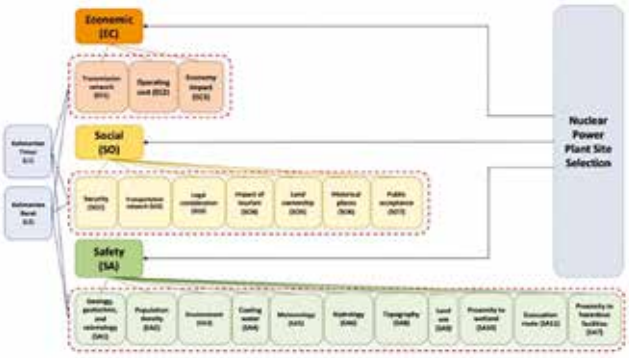

Fig. 3 Hierarchical tree for determining nuclear power plants in Indonesia

Safety issues are the highest priority concern composed of as follows: chemical hazard, heat hazard, terrorist hazard, self-protecting and reactivity hazard.

4. Micro Modular Reactor (MMR)

The Micro Modular Reactor (MMR) Energy System is a 4th Generation nuclear energy system that delivers safe, clean, and cost-effective electricity to users anywhere. MMR is being licensed in Canada and the U.S.A. and is the first "fission battery" in commercialisation. Demonstration units are scheduled for first nuclear power in 2026.

MMR is like a carbon-free natural gas powerplant. It can match changing demand and make up for intermittent renewable power supply. The benefit is no Carbon. Ultra Farms include MMR units, wind and solar assets to minimize electricity costs while meeting 100% of demand.

MMR reactor unit is Micro-modular containerised construction, mass manufactured. It is rapid deployment on site and designed for power and/or process heat. It can produce hydrogen and it is simple, with safe disposal of fuel at end of life.

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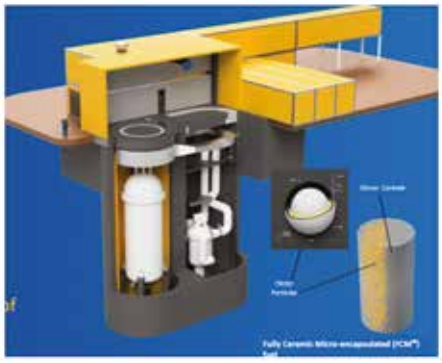

Fig. 4 MMR reactor unit

Fully Ceramic Micro-encapsulated (FCM) fuel provides intensive reactor safety by being an ultimately safe fuel. Industry standard TRISO particles, which contain the radioactive by-products of fission within layered ceramic coatings, are encased within a fully dense silicon carbide matrix. This joining provides an extremely rugged and stable fuel with high temperature stability.

The MMR's technical solution to safety is to limit the power density of the reactor and make greater the surface area so that the reactor can easily dissipate any extra heat without being able to damage itself. The MMR has the lowest power density and highest surface area to power ratio of any reactor ever commercialised -- all while using the best performance fuel in existence.

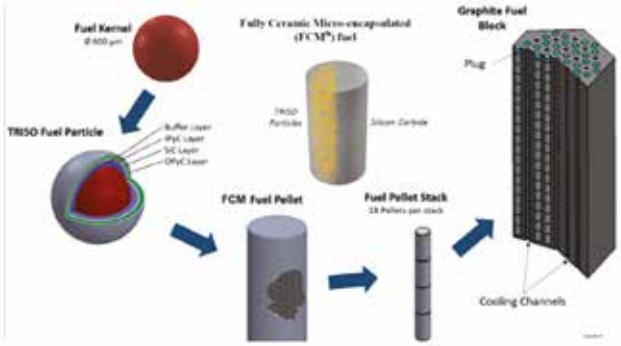

Fig. 5. Key components of Fully Ceramic Micro-encapsulated (FCM)

5. MMR Status

Ultra Safe Nuclear Corp.'s (USNC's) 5-MWe (15 MWth) Micro Modular Reactor (MMR) has entered formal licensing review with the Canadian Nuclear Safety Commission (CNSC) as part of its proposed project spearheaded by Global First Power (GFP). The Small Modular Reactor (SMR) is the first to mark that it is significant.

Seattle-based USNC marked its newest milestone for its high-temperature gas-cooled micro-reactor on 20 May 2023, two days after the CNSC announced that GFP's application for a "License to Prepare Site" for an SMR project at the Chalk River Laboratories had finished preliminary evaluations, giving it the pass to move onto formal license review.

Fig. 6. Canada selects site for first MMR

The MMR Energy System, USNC explained, integrates "one or several standardised micro-reactors (MMRs) with a heat storage unit and the adjacent plant for power conversion and utilisation. Electrical power or process heat (or a mix of both) is produced in the Energy System, depending on configuration. Nuclear heat is transferred from the micro-reactors to a molten salt energy storage unit that decouples the nuclear system from the power utilisation system, greatly simplifying operations and allowing flexible use of the energy generated."

Moreover, the University of Illinois at Urbana-Champaign (UIUC) has formally kicked off a pioneering project to partly re-power its 85-MW Abbott co-generation plant with Ultra Safe Nuclear Corp (USNC).

In Thailand, King Monkut's Institute of Technology Ladkrabang (KMITL) signed an MOU with Ultra Safe Nuclear Corp (USNC) on 8th November 2023 to study how to apply and implement MMR in Thailand.

6. Conclusion

MMR is about future technology aimed at developing the use of clean energy safely. It is a good way to create energy security in Thailand in the future. We must establish co-operation in preparing a study outline for the use of clean energy from nuclear energy with the utmost safety, and focus on developing future technology towards creating stability in alternative energy. Moreover, we should focus on safety as very important, in every process of study, research, development of applications and guidelines for preventing problems that may occur in every dimension.

Fig. 7. MOU signing between KMITL and USNC

7. Reference

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Cultivating Holistic Health and Why It Is Crucial

Caleb Masuda Koh

Nowadays there is a lot of talk on the importance of being and keeping healthy. Other than its obvious benefits of delaying and maybe even eradicating serious and severe illnesses altogether, exercise is one of those areas that can help us maintain our health and boost our energy levels without taking and resorting to dubious herbal supplements. While supplements are good in that they supplement our diet (hence why they're called 'supplements') and supply our bodies with powerful anti-oxidants we may not otherwise derive from our meals, some supplements mass-produced, especially if they originate from questionable countries, may do more harm than good.

You don't need to be a rocket scientist working with NASA to verify such information about the dangers of taking herbal supplements that may be dodgy at best and deadly at worst. There has been documented evidence on news portals, local and global, of certain herbal supplements damaging its consumers' health and in extreme cases, leading to organ failure and subsequently death. However, the main focus of this article is not to centre on supplements although they are helpful if we can't obtain enough nutrients and thereby potent anti-oxidants from our everyday diet.

I would like to approach health from a holistic point of view. Yes, there is no doubting or denying that diet and exercise are critical to maintaining optimal health and sustaining our bodies and their various multiple organs. But, we must also realise that good health encompasses so much more than merely good nutrition and regular exercise.

We must also consider other factors that lead to an abundant life that will ultimately help us to thrive, be it in our workplaces, our familial environments, or other areas we are immersed in on a daily or even weekly or monthly basis. And so, this article is an exploration of holistic health and what it constitutes. I will touch lightly on physical health as it has already been covered in great detail in other places.

Therefore, what I would like to focus on is other less talked about issues that can either help us or harm us. They are: mental health, emotional health, social health and intellectual health. But first, good physical health doesn't mean we just take care of our diet and exercise but it can also entail looking into our hygiene and cultivating optimal hygiene to the best of our conscious ability and capacity.

People always think that hygiene refers to 'cleanliness'. While cleanliness is certainly one aspect of good hygiene and as such, the cliche 'cleanliness is next to godliness' came to be invented, it is not the only sole characteristic of good or optimal hygiene. Apart from personal hygiene such as bathing and washing hands and clothes regularly and dental hygiene, believe it or not there are also mental hygiene and sleep hygiene.

Of course there are also environmental hygiene, domestic hygiene and food hygiene but those facets of hygiene are beyond the scope of this article. In order to cultivate, develop and maintain good and optimal holistic health, we must also practise much-needed self-care in the areas of mental hygiene and sleep hygiene. And that means that we have to be conscious and aware of what we feed our minds on a day-to-day basis, week in week out.

In recent years due to the emergence and rise of social media and the various numerous platforms on which it is hosted, we have experienced an overwhelming amount of information flooding our senses, hence culminating in what is called 'sensory overload'. Not only that, but other terms have also spawned such as 'doom scrolling', which is detrimental to our mental and emotional health and wellbeing. Doom scrolling is a modern phenomenon whereby some of us spend an excessive amount of time reading large quantities of news, especially negative news, both on social media and the greater web.

This is not a good practice because the more time we spend reading negative news, the more it affects us psychologically – that is, mentally and emotionally. Psychologists and mental health professionals alike have discovered that a constant and copious fixation on reading and sharing negative news may effect and exacerbate stress, anxiety and depression. While it is true we can't totally avoid negativity in this life and suffering is a very real component of our earthly existence, we can control what we feed our minds with and thereby mitigate against eventually getting stressed, anxious and depressed when we use our digital devices.

Another thing we must keep in mind is to practise good sleep hygiene. As sleep is a necessary element of repairing our bodies when we rest and rejuvenating us so that we can wake up feeling fresh and refreshed, we must treat the areas where we sleep with great care and responsibility. That means only lying down on our beds when it is time for us to sleep and not using it to play with our various devices that may lull our easily-deceived minds into thinking beds are not only for sleep and love-making. And that may result in us not receiving adequate rest when we lie down to sleep since our minds and bodies have unfortunately become subconsciously conditioned to regard beds as multi-purpose apparatuses.

But beyond ensuring that we maintain good hygiene, personal, mental and sleep or otherwise, it is also paramount that we seriously look into cultivating good social and intellectual health. In one of her widely-televised TED Talks, a popular public speaking platform for experts to share their erudite insights and opinions, a Canadian researcher discovered in her findings that surrounding oneself with affirming and supportive family members and friends contributes immensely to longevity of life, if not more than merely diet and exercise. Not only that, but some of the world's longest-living nonagenarians and centenarians (those who live to 90 and 100 and more years respectively) credit active social lives as things that resulted in meaningful fulfilment outside of their other pastimes and passions.

Last but not least, intellectual health is a crucial facet of optimal holistic health as it allows for our minds to be stimulated and grow. Intellectual health doesn't just extend our intelligence but it can also delay and in some cases, even prevent us from developing cognitive disabilities later on in life when we age. Hence, why lifelong learning has become a popular buzzword and trend in recent years.

Accomplished inventors and influential thought leaders can attest to the fact of how important intellectual health is. The pacifist and respected revolutionary Mahatma Gandhi of India once quipped, "Live as if you were to die tomorrow. Learn as if you were to live forever." Similarly, the prominent and eminent former President of the United States of America, Benjamin Franklin also extolled the virtue of lifelong learning by stating, "If a man empties his purse into his head, no man can take it away from him."

An investment in knowledge, and particularly, applied knowledge, is never wasted, especially for personal and professional development. Such investments include enrolling in educational institutions of higher learning, registering for seminars and workshops and even engaging in self-directed learning in areas of interest. These days one doesn't even need to be physically present in classrooms to gain knowledge as e-learning or electronic learning has become a tangible reality in this day and age.

Stimulating our minds or engaging in cognitive stimulation can also assist in enhancing our ability to adapt to new circumstances that may not always be pleasant, and also do improve our problem-solving skills. We should regularly engage in activities that challenge our minds, such as reading, creative writing, doing puzzles, and playing strategy games whether physical board games or virtual video games. By doing so, we can delay and maybe even prevent the onset of cognitive decline and illnesses such as Dementia and Alzheimer's, which can be debilitating and make us a burden to our loved ones.

In conclusion, we should all try our utmost to be well-rounded in every area of health – physical, mental, emotional, social and intellectual. Taking an active and pro-active interest in such areas of our lives that affect our well-being and longevity will serve us well for the years to come as aging inevitably sets in, which we need to manage responsibly and responsively.

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Artificial Intelligence And Computer Vision – A Match Made In Heaven?

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ABSTRACT

After becoming independent in 1957, Malaysia continued as an agricultural country but quickly grew into a manufacturing nation in a relatively short time. Literally from nowhere, the manufacturing sector now commands more than 38% of the nation's GDP overtaking the agriculture sector which commands just slightly above 7%. In addition to the multinational manufacturers who are mainly in the electrical and electronics sectors, there are also other smaller producers who produce for the rest of the world. Nevertheless in order to compete, they cannot just rely on manual labour whether local or foreign, to produce high volume and high quality goods at a competitive price. With intense competition, even the old way of making many products to satisfy the global appetite for good products from both the brick-and-mortar shops to your huge online shops is no longer adequate. Manual operations in the manufacturing process can come in various forms, ranging from the very simple but monotonous and repetitive to the highly complex or sophisticated. In the quality department many of the local manufacturers have chosen to use human labour to ensure their quality is maintained. For many of these highly repetitive but relatively simple tasks, the human operators need to be properly trained for an appropriate length of time before they can perform effectively.

Other than the intelligence of these operators, their ability to detect deviations from the desired patterns are also utilised. And this is where artificial intelligence and computer vision can help. This paper shows how artificial intelligence combined with computer vision can be used to improve productivity and effectiveness in three different areas within a typical supply chain to make each of this production processes more efficient, namely in the production of edible bird's nest, retail ecommerce and finally the recognition of cancerous cells. Keywords: artificial intelligence, computer vision, image processing, automation, quality control, healthcare, ecommerce

1.0 INTRODUCTION

Malaysia's humid tropical climate and seasonal monsoonal weather have produced conducive conditions for plant growth. Hence for a long time after independence, agriculture forms the backbone of the Malaysian economy where the agriculture sector contributed 37% of Malaysia's GDP [1]. In those early years, the economy was supported by a range of primary products (e.g. tin, rubber, palm oil, timber, oil, liquefied natural gas, etc.) before the Government embarked on an industrialisation programme to transform it into a manufacturing-based economy, with electronics and electronic components as the mainstay [2]. The manufacturing sector's contribution stood at 38.3%, over a third of the country's GDP in 2018 but by now the contribution by the agriculture sector is just slightly over 7.3% [3]. Manufacturing fulfils an important need where handcrafted or manual production cannot handle, i.e. more consistent quality, cost reduction and overall reduction in production time.

Compared with mass production, manual production does not produce goods with consistent quality. This is especially true when we use human operators to do quality checks as both boredom and fatigue can cause lapses in concentration leading to defects escaping detection and inadvertently sent to the customers. While there is demand for hand-crafted products, however if the demand is high this mode of production is not efficient. However depending on the complexity of the product manufactured as well as other factors, the manufacturing process may not be fully mechanicalised. Moreover, there are still many of the repetitive processes in the Malaysian manufacturing sector that are still handled by humans.

Because of today's very short time-to-market deadlines, demanding customers, and a rise in the complexity of products, manufacturers are finding it increasingly harder to maintain high levels of quality. And this is where artificial intelligence and computer vision can help. Prior to 1955 when there was no such term, intelligent systems were either known as thinking machines, cybernetics, automata theory, or complex information processing [4]. The term artificial intelligence was first coined at the Dartmouth Summer Research Project on Artificial Intelligence, a 2-month, 10-man study of artificial intelligence initiated by John McCarthy in 1956. While there are many definitions, Ray Kurzweil, an American inventor and futurist defines it as machines that perform functions that require intelligence when performed by humans [5]. A well known global media company did a survey on the importance of artificial intelligence (AI) in the automotive and manufacturing sectors. They found that while 44% classified AI as "highly important" in improving the manufacturing function in the near term, just lightly less than half of them believed that this is "absolutely critical to success." [6]. Hence this reaffirms that artificial intelligence holds the key to future growth and success, especially for those industries in the manufactur ing sector.

Computer vision (CV) as the name suggests, fundamentally deals with how computers can gain high-level understanding from digital images or videos [7, 8]. It seeks to understand and imitate the capability of the human visual system which includes the acquisition, processing, analyzing and understanding digital images to help make better decisions. This is illustrated in Figure 1.

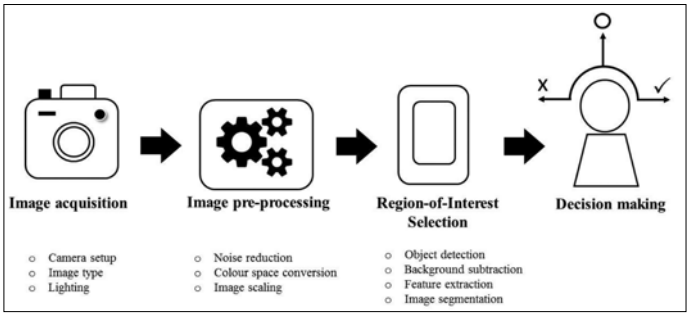

Figure 1: Traditional computer vision pipeline

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This is especially true when it comes to quality control and inspection. Even the most eagle-eyed human inspector would fail at finding defects that are either very small or can only be seen at a certain angle. However a machine equipped with a powerful camera that is many times more sensitive than the naked eye will not fail. It starts with getting the human expert to identify the defects and then train the machine to perform the same task based on the results from the human expert. However, for many of these manual quality inspection, it is neither easy nor simple as it requires a huge amount of resources to properly train the humans before they can handle the task effectively.

A major driver for the industry to adopt these new technologies has been the huge improvements in image acquisition devices making them very affordable and attractive to adopt and the same goes for computing power. In tandem with these two major developments has been the intense work into the development of powerful algorithms.

For a typical product supply chain, it usually starts with the sourcing of the relevant raw materials after which these are then combined to manufacture the product before eventually reaching the consumers or customers through the appropriate distribution channel which can now be via the internet. The supply chain would generally be the same for each industry, whether it is for the production of tee shirts or medical devices. To illustrate both the flexibility as well as the power of AI and CV working together in a particular intelligent system, we have identified three key areas within such a supply chain.

Edible bird's nest (EBN) are nests formed from the saliv of swiftlets commonly found in South-East Asia and is a multibillion dollar industry. Trained operators are currently used to sort these natural products into the correct grade for eventual sales. In the next section we shall look at how AI working together with CV can be used to correctly grade EBN.

Breast cancer is a group of diseases in which cells in breast tissue change and divide uncontrolled, typically resulting in a lump or mass. What makes it deadly is that there are usually no symptoms when the tumour is small and most easily treated. Regular screening is important as it can help in early detection. Breast cancer is the most common cancer affecting women, with about 2.1 million cases reported per year, as communicated by the World Health Organisation (WHO). Moreover, breast cancer is also the main cause of cancer-related deaths in women. For example, it is estimated that in 2018, 627,000 women died of breast cancer, corresponding to about 15% of cancer-related deaths in women [9]. In Malaysia, breast cancer tops amongst the various types of common cancer. When cancer is suspected, a sample of the tissue for microscopic analysis is usually obtained. However, lack of trained experts, time consuming process, difficult in identifying the tumours, etc, are some of the challenges which can slow this process down. In the second part we will show some of the results of the collaboration of AI with CV to detect breast cancer using the concept of artificial teachers to help train such an intelligent system to help the medical experts. And lastly we will illustrate some of our work in using a combination of AI and CV to perform visual fashion understanding which is of huge interest for the industry, motivated primarily by the needs of electronic commerce in clothing retrieval, fashion recommendation, etc. A fundamental driver for this is to identify fashion landmarks which are functional key-points defined on clothes, such as corners of neckline, hemline and cuff.

2.0 IDENTIFYING THE RIGHT EDIBLE BIRD'S NEST

EBN are nests formed from the saliva of swiftlets commonly found in South East Asian countries of Malaysia, Indonesia, Thailand, and Vietnam [10] and is a multi-billion dollar industry. They are especially popular among some Asian communities due to their high-protein nutrients [11] and sialic acid which is believed to improve brain function.

To cater to the various customer preferences, EBNs are sold either in the unprocessed or raw form or they can also be sold after cleaning, further processing and then graded. The price of EBNs solely depends on the grade. Among the various grades, Grade AA nests are the most expensive as it is the highest quality, followed by Grade A, B and C. The grades of EBNs are normally based on their shape, size, colour, and level of contaminants. Conventionally, trained human operators would grade EBNs based on these features. However, the consistencies of the grading results can be unreliable as the manual grading process is prone to the subjectivity of the human operators [12]. Thus, such a tedious grading process leads to production costs, subjectivity in the end results, as well as low efficiency as huge amounts of time are spent on the inspection. Furthermore, hiring and training new operators to inspect the nests are unavoidable for such a conventional approach to grading. Notwithstanding the conventional method, with the technological advancement in recent decades some aspects of identifying EBNs have improved dramatically in terms of speed, accuracy, and reliability [10].

In this section, we will describe a novel and fast multifeatures neural fuzzy approach using a set of unique features to automatically grade EBN and the results compared with several state-of-the-art AI (artificial intelligence) techniques. Unlike other popular approach our contributions are as follows:

1) a novel application of a neural fuzzy approach, based on an intuitive multi-feature set to accurately grade EBNs,
2) unlike other more popular AI techniques, our proposed approach does not need huge amounts of training data - which would require huge amounts of human effort and time to compile,
3) training is fast and it does not need special high performance computing platforms.

Grading of the EBN that is practised by the industry is based on the size, amount of contaminants, and the overall shape. A common method adopted by the industry to assess the size is by comparing it with the three fingers of the human hand where the three fingers are the index finger, middle finger and the ring finger of an average adult [13]. Clearly this can be very subjective when the operators are trained to assign the correct grade to each specimen as the size of their fingers would vary. A more scientific approach would be to measure the width and length of each specimen of the EBN but obviously this would be very time consuming. Moreover, the grade of the EBN also heavily relies on the amount of contaminants in each sample. These contaminants or impurities can range from feathers, sand particles, bird droppings, etc. EBNs with lesser amount of contaminants will fetch a higher price compared to those with more contaminants. Finally, the shape of the harvested nests will have a significant effect on the grade. Deformed EBNs that are significantly different from their accepted shapes will have a lower commercial value [13]. What this means is that specimens when placed evenly on a horizontal surface that exhibit a perfect half cup shape would be a good grade. Lower grades, would also have a similar shape as their better counterparts but these will not be even when placed on a horizontal surface, as shown in Figure 2.

Figure 2 Examples of EBN for Grade AA, Grade A and Grade B. Adapted from [Introduction to Birds Nest 2018]

An important element for any successful autograding system is CV. For example, to identify the correct grade of mangoes is to correlate it to the fruit's maturity level. In such an intelligent system when used to auto grade and sort agricultural produce like mangoes, CV would again play a very important role as a core component. Nandi et al. first obtained sample images of

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unsorted mangoes for five different varieties of mangoes. Human experts were then used to predict the maturity of mangoes from theseimages. In their study, the Gaussian Mixture Model (GMM) was used to predict the maturity level of the mangoes based on the set of relevant features of the mangoes. They showed that the classification accuracies of the Gaussian Mixture Model (GMM) in their system were as good as those of human experts [14].

Diseases of fruits like apples, palm oil fruits, mangoes, dates and strawberries can also be correctly identified with the appropriate classifier working on the extracted features of the fruit. In order to correctly identify the disease, a unique set of features were used for each different fruit. Solanki et al. applied such an approach involving the right classification technique with an effective set of extracted features to identify the diseases [15]. They segmented the images of the fruits in order to identify and segregate the healthy and infected parts on the fruit. With these results, the system was then able to correctly grade the fruits based on the amount of infections found on the fruits. To improve the system's performance various segmentation techniques to identify the region of interest were also investigated and these include histogram matching, region based segmentation, edge detection and fuzzy segmentation.

Automated classification and grading of agricultural products have been extensively implemented using a variety of different classification techniques [16, 17, 18, 19, 20, 21]. Other than agricultural produce, Han Yan et al. developed an Adaptive Neuro-Fuzzy Inference System (ANFIS) to classify water quality status of river based on a total of 9 weeks data (845 observations consisting of 3 water quality parameter) collected from 100 monitoring stations in all major river basins in China [22]. They were able to report good classification accuracies with such an approach. Other than water quality identification, B. Ari Kuncoro and Suharjito investigated ANFIS to classify the texture of crumpled aluminum foil, corduroy, cotton and orange peel from the images using a combination of Discrete Cosine and Gray Level Occurrence Matrix (GLCM) methods on the set of extracted features [23]. Other areas where ANFIS was used includes the work by Alireza et al where ANFIS is now used to detect and diagnose breast cancer based on a set of risk factors [24]. In their work, they chose to use ANFIS to see if it can correctly identify breast cancer patients using nothing more than a set of 22 features from the standard data sets and then on real data. They were able to obtain satisfactory results with the ANFIS they developed.

2.1 Auto Grading of EBN

The EBN images were collected from a centralised EBN processing facility with modern and hygienic facilities. This is a more cost-effective way of processing the EBN. The EBN when harvested is sent for processing by the individual EBN farms which are usually managed on a small scale. They would not be able to provide either the facilities or the human personnel to process the raw EBN and grade the EBN efficiently and consistently.

To test the auto grader, we used the EBN of 3 different grades, AA, A and B which had been carefully graded by the trained operators. A total of 63 samples were collected and photographs were taken with a standard Digital SLR camera fitted with a macro-lens.

Table 1 shows a selection of the 4 extracted features for each class of EBN. Notice the different range of values for each feature. Both the size and the estimate of the impurities are in their thousands whereas curvature and colour are less than one.

Classification of the EBN grades has been investigated with several powerful and popular AI techniques, namely the Adaptive Neuro Fuzzy Inference System (ANFIS), k-Nearest Neighbour (kNN), Naive Bayesian (NB), Support Vector Machines (SVM), as well as Artificial Neural Networks (ANN). Because the values of the extracted features are of different ranges, we need to normalise them to the range [0, 1] to avoid the larger numerical values from any of the features dominating the auto-grading process. Hence we investigated several different data preprocessing methods that converted the raw data into an effective and efficient form before the data were processed. Z-score normalization, decimal scaling, linear normalization, min-max normalization and a non-linear normalization based on the sigmoid function were investigated. The results showed that the classifiers are sensitive to the pre-processing schemes used and they performed better for some of these normalisation schemes. kNN was not able to match the accuracies of the others managing only 61.54%. On the other hand, NB was able to match the accuracy achieved of the more modern SVM classifier. In addition, if we just look at the lowest performance of ANFIS, it still outperforms most of the other classifiers as shown in Table 2.

Table 1: Features extracted for various grades

grade	curvature	size	contiminants	colour
AA	0.3560	5784956	1148060	0.6824
AA	0.7969	2646064	2370178	0.6784
	-	-	-	-
A	0.2403	6333746	133551	0.7608
A	0.4217	5075468	416805	0.7765
	-	-	-	-
B	0.3537	5361693	518880	0.6784
B	0.7216	5084135	4971157	0.6980
	-	-	-	-
	-	-	-	-

Table 2: Maximum and minimum classification accuracies (%)

Classifier	Min	Max
kNN	54.19	61.54
NB	72.09	89.70
ANN	68.32	89.28
SVM	74.97	89.52
ANFIS	81.34	94.09

Finally, the Convolutional Neural Network (CNN) was also tested to auto-grade EBN. The MVGG-19 [25] which is based on the VGG-19 CNN and uses the same number of convolutional layers and max pooling layers was chosen. The MVGG-19 used here has 19 layers, with 32 input filters in the first layer. However, the MVGG-19 has a smaller number of parameters compared to the VGG-19. The MVGG-19 was integrated with Keras library and TensorFlow backend. Moreover as it is computationally intensive, the NVIDIA GeForce GTX 1070 GPU was used to speed up the computation. Since the EBN dataset images have large dimensions, the computation time is much longer. Hence, the dataset images were scaled down before they can be processed by the CNN model. Squashing was adopted to resize the images. Furthermore, as such computation methods thrive on large data sets, data augmentation in the form of random transformations were applied to the existing EBN dataset such as horizontal/ vertical flipping, clockwise and anticlockwise rotation. Table 3 summarises the best classification accuracy extracted from the various pre-processing schemes.

Table 3: Best Classification accuracies obtained

Classifier	Accuracy
kNN	61.54
NB	89.70
ANN	89.28
SVM	89.67
ANFIS	94.09
MVGG-19	88.89

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With 4 features presented to the classifiers, ANFIS performed better than kNN with the kNN able to only achieve 62% whereas ANFIS was able to achieve 94%. Neural nets, SVM and NB were able to achieve about 89%, some 5% less accurate than ANFIS. We have also evaluated a non-feature based approach that does not require any feature extraction as it uses the images. However, as the data set is relatively small, a significant amount of preparatory work needs to be done before the MVGG-19 CNN was able to learn the various grades and then autograde the remaining images not used in the training. The CNN was able to produce an average accuracy of 89% with this non-features approach.

A major advantage of our features-based approach is that it is less time consuming as the system developed here was able to achieve satisfactory results without requiring a huge set of data nor any additional computing hardware. In the future, we would like to extend the work to look at EBNs from a different source where the grading may be different as well as to investigate a better imaging system to further improve the accuracy of the system.

3.0 ARTIFICIAL TEACHERS FOR BREAST CANCER CLASSIFICATION

The field of Artificial Intelligence is particularly compatible with the overall approach adopted by the field of Natural Computation, where researchers aim to solve computational problems by getting inspiration or adapting mechanisms from nature [26]. One of the earliest examples, pioneered by McCulloch and Pitts [27], corresponds to a family of techniques, which form the foundation of the current AI explosion, i.e. deep learning, also known as artificial neural networks, more generally. The process of obtaining inspiration or adapting mechanisms from nature is however, far from complete. In fact, it could be argued that it has barely begun. Other examples of neural network breakthroughs associated with bioinspiration include convolutional neural networks [28], and the usage of attentionbased mechanisms [29], all of which have been particularly prominent in targeting CV problems.

When seeking bioinspiration for Artificial Intelligence, it is natural to focus on the biological organism that exhibits the highest level of general intelligence so far, i.e. humans. When we compare arguably the most common learning paradigm in the field of neural networks (i.e. supervised learning with a single dataset) with how teaching/learning occurs in humans, the constraints and limitations of the former become very evident. For example, humans learn a diversity of different fields and skills, in carefully structured stages, with different kinds of assessments, involving a variety of teachers and teaching methods. In other words, the simplicity of neural network learning paradigms is currently no match for the richness and complexity of the educational approaches and pedagogical techniques practised by humans. Having said this, researchers have gradually been making some progress in this direction. For example, in curriculum learning Bengio et al. [30] divide the learning process into several stages of increasing complexity, which partially addresses the approach of learning in “carefully structured stages” mentioned above. Furthermore, and in direct connection with this section, Hinton et al. [31] have improved the classification accuracy of a “student” model by employing an additional “teacher” model, which partially addresses the “variety of teachers” limitation mentioned above.

The approach introduced by Hinton et al. building upon the work of Rich Caruana and his colleagues [32] is generally referred to as knowledge distillation. The approach hinges on the key insight that crucial knowledge regarding generalization can be transferred (distilled) from a larger teacher model (e.g. an ensemble of many models or a large single model) to a smaller student model, by making the student learn the teacher’s full set of output/label probabilities rather than just the single winning output/label. The full vector of output/label probabilities contains rich information not necessarily obtainable by the small model when trained from scratch on the same training set. For example, in the classic digit classification dataset MNIST, if the input pattern is the digit “8”, then the probabilities of the output nodes corresponding to “8”, “3” and “1”, might be 0.6, 0.2, and 0.05 respectively. These relative probabilities contain useful information about digit similarities (i.e. the similarity between 3 and 8 is higher than the similarity between 1 and 8), which in turn is useful for generalization. The information contained in the full vector of probabilities is often called “dark knowledge” because it represents the hidden/implicit knowledge learnt by an ensemble, or a large regularized model. If we relate back to the human educational domain, an intuitive but loose analogy would be to equate the traditional approach of directly training on the dataset as “learning facts”, and the knowledge distillation approach as additionally learning the attitudes, soft skills, relative emphasis, and indirect implications of the teacher. We can also see that the artificial assistants also need to «go back to school» - using the concept of teacher and student to learn the key details to be effective. In this case, the neural networks have to go back to school!

As mentioned in the introduction, breast cancer is the most common cancer affecting women, and is also the main cause of cancer-related deaths in women. In Malaysia, breast cancer is the top cancer amongst the various types of common cancer [33] as shown in Figure 3. In the period between 2012 and 2016 the following were the 10 most common cancers diagnosed in Malaysians: ovary, uterus (cervical), liver, prostate gland, leukaemia, nasopharynx, lymphoma, lung, colorectal, and breast cancer.

In recent work, we have experimented with extensions to the above knowledge distillation ideas and have applied these to the domain of cancerous breast tumour classification in mammograms [34] which serves as another example of the fruitful marriage between CV and AI. In particular, images from the Digital Database for Screening Mammography (DDSM) were used. This is a database to facilitate research into AI techniques for breast cancer screening. The database was built from about

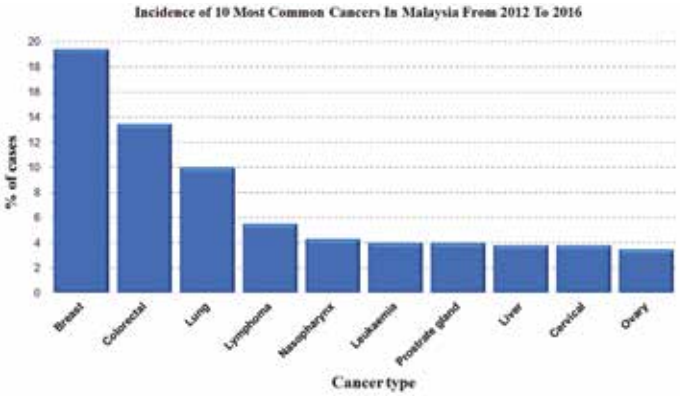

Figure 3: Incidence of 10 Most Common Cancers In Malaysia From 2012 To 2016

2,500 studies, each one consisting of two images of the breast, one from the cranial-caudal (CC) view and the other from the mediolateral-oblique (MLO) view. The images are classified into the following labels: normal, cancerous, benign or benign without callback. The images are also accompanied by corresponding pixel wise segmentations of the lesions [35, 36]. To the best of our knowledge there are currently no other research works that explore knowledge distillation questions in the context of the DDSM dataset.

In particular we have sought to extend the knowledge distillation (KD) approach by looking into two key ideas: (1) the introduction of assistants between the teacher and student, and (2) reversing the direction of distillation. The first idea involves distilling from the teacher to one or more intermediate assistants before distilling from the final assistant to the student. This idea was initially

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proposed by Mirzadeh et al. [37], based on the observation that a student's performance deteriorates as the gap between the teacher and the student increases. Motivated by this observation, the authors recommended to place assistant models in between the teacher and student to more effectively transfer the required information. The authors showed that student model performance is positively correlated with the number of assistant models used. Regarding the second idea, distillation traditionally occurs from the more complex (larger) model to the simpler one, so a reversal here implies distilling knowledge from a smaller model and applying this to a larger model. The idea of KD reversal is somewhat related to the idea of curriculum learning [30], except that instead of implementing gradually increasing complexity at the level of datasets, this is implemented at the level of models, whereby the output probabilities of simpler models are used to help the representation learning of larger models.

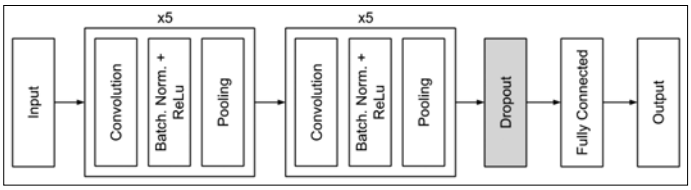

Figure 4: Our baseline model consisted of convolutional, batch normalization, pooling, dropout and fully connected layers

In our main experiment, we set up a series of conditions to test the performance of different numbers of assistants (i.e. 0, 1, or 2), and different distillation directions (i.e. the standard flow from a more complex teacher to a simpler student, or the reverse). Our baseline model, depicted in Figure 4, consisted of ten 2-dimensional convolutional layers, each with batch normalization, ReLU activation functions and max pooling layers, and one final fully-connected layer.

All of the remaining models consisted of standard residual networks [38], adapted from the standard ResNet models provided by PyTorch in their torchvision package, adopting varying numbers of layers (i.e. 18, 34 and 50), applying dropout, and limiting the number of outputs to 3. For the performance metric reported here, we adopt the area under the curve (AUC) metric, computed relative to the malignant class. The AUC performance values for models trained in the traditional manner (without KD) for the baseline, ResNet18, ResNet34, and ResNet50 models, were 0.7684, 0.8792, 0.8810, and 0.8876 respectively, and can be found in the "Base AUC" column.

KD Flow	Teacher	Assistant 1	Assistant 2	Student	Base AUC	KD AUC
D→S	ResNet50			Baseline	0.7684	↑ 0.7706
S→D	Baseline			ResNet50	0.8876	↓ 0.8871
D→I→S	ResNet50			ResNet34	0.8810	↑ 0.8818
D→I→S	ResNet50	ResNet34		Baseline	0.7684	↑ 0.7726
S→I→D	Baseline			ResNet34	0.8810	↑ 0.8850
S→I→D	Baseline	ResNet34		ResNet50	0.8876	↑ 0.8893
S→I1→I2→D	Baseline			ResNet18	0.8792	↑ 0.8810
S→I1→I2→D	Baseline	ResNet18		ResNet34	0.8810	↑ 0.8891
S→I1→I2→D	Baseline	ResNet18	ResNet34	ResNet50	0.8876	↑ 0.8902

Table 4: AUC of class 2 (malignant) against class 0 (normal) and 1 (benign) for models with knowledge distillation

Legend: D = deep network, S = shallow network, I = intermediate-sized network compared to D and S, I1 = smaller network than I2. The knowledge is distilled from the Teacher to Assistant 1, then to Assistant 2 and lastly to the Student. The "Base AUC" column refers to the baseline performance of student models without KD (in the "Student" column) and is portrayed for the sake of easy comparison with corresponding KD variants. Arrows in the rightmost column denote whether the KD conditions improved the AUC of corresponding non-KD (base) conditions. All cases showed an improvement except for the reverse non-assistant condition (i.e. S→D).

Changing the conventional knowledge distillation method of ResNET50 to a shallower network seems to be able to boost the performance of the student based as shown here in Table 4. The reverse knowledge distillation method (i.e. S→D case) however did not improve the performance of the deeper student model. However, when one assistant was added, both KD flows (i.e. D→I→S and S→I→D) showed an increase in AUC relative to their non-KD conditions. The usefulness of assistants and reverse KD was also observed when two assistants were used, as seen in the S→I1→I2→D condition, which exhibited the best performance across all conditions (i.e. 0.8902 AUC), indicated by bold typeface in the table. Overall these results clearly show the positive effect and potential of combining assistants with reverse KD. Both techniques are motivated by the need to decrease the complexity/knowledge gap between models, and presumably both are effective for the same reason, although a detailed and insightful explanation into the effectiveness of the techniques is an open question for future work.

The techniques discussed here clearly highlight that even within the relatively narrow scope of extending learning paradigms with multiple artificial teachers and teaching flows, the bioinspired approach to AI in general, and AI for Computer Vision in particular, still has a lot to offer.

4.0 IMPROVING EFFECTIVENESS OF ECOMMERCE

In getting an overview on how big ecommerce is we turned to a report by a global business data platform which conducted an xtensive study in 2019 focusing on both sales and revenue of ecommerce. They concluded that retail ecommerce sales stands at USD3.53 trillion in 2019 but growth of revenue from e-retail would nearly double that number by 2022[39]. Online shopping would remain as one of the most popular online activities worldwide.

Among those, online clothing shopping has seen immense growth in popularity in recent years. According to Rusell [40], fashion retailers have had a 38% increase in online orders even during the Covid-19 pandemic.

However, the issue with online clothing shopping is the inconsistent sizing across different brands and manufacturers [41]. Various studies have shown that 50% of returns are caused by sizing issues [42, 43]. Furthermore, fit of the garments may vary as body proportions do not conform entirely to standard sizing. A Kurt Salmon Associates study reported that 50% of women have difficulty finding apparel that fits. To make a customfit garment, customers would have to manually provide their measurements, which may not be readily available or accurate. Custom-fit garments are also usually costly and inconvenient to purchase due to the need for multiple fittings to achieve the desired fit. This is where the need for virtual tailoring arises.

Deep learning techniques have been widely applied to industries where a large amount of labelled data can be collected/acquired, e.g., in wireless communication [44], industrial robotics [45], smart manufacturing [46], and quality control in printing industry [47], to name a few. However, data labelling process can be tedious, time-consuming, and prone to human errors. This is particularly so in the case of labelling accurate landmark positions on object/subject of interest for a large number of images [48, 49, 50, 51, 52]. It thus poses us a critical question, i.e., is it still possible to address industrial problems where the labelled data sample size is small?

The literature suggests that such problems may be addressed by appropriately transfer-learning from existing Deep Learning models on similar problems and with data augmentation. A recent study on smart buildings has shown that a deep neural network trained with building source data in Beijing has been successfully adopted and re-trained to predict ventilation control for buildings in Shanghai with just 15 days' of data [53]. On the other hand,

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for data such as images that have much higher dimensionality than that of a smart building, data augmentation has been playing significant role for boosting up small samples [54].

In this section, we report a case study on body landmark detection with an extremely small dataset. Figure 5(a) shows a typical example of the frontal image of a customer and the expected body landmarks, including five landmarks along the shoulders ('Shoulder.A' to 'Shoulder.E'), two landmarks on the right and left side of the chest ('L.Chest' and 'R.Chest), two landmarks on the right upper arm ('Arm.A' and 'Arm.B'), and finally one landmark on the left wrist ('Arm.E'). To the best of our knowledge, there is no public dataset that is similar to the body landmark dataset shown in Figure 5. As there are currently only 99 sample images with their corresponding landmarks, it is far from being adequate to train any deep neural network from scratch.

Figure 5: Examples of augmented training images with ground truth body landmarks (triangles). (a) Labels of body landmarks. (b)-(f) augmentations through rotation, translation, cropping, flipping, etc. of different training images and their corresponding ground-truth body landmarks.

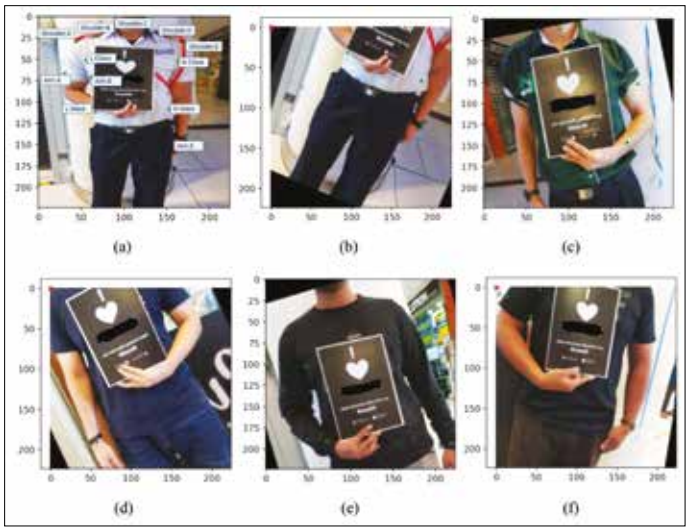

Figure 5: Examples of augmented training images with ground truth body landmarks (triangles). (a) Labels of body landmarks. (b)-(f) augmentations through rotation, translation, cropping, flipping, etc. of different training images and their corresponding ground-truth body landmarks.

However, there do exist public datasets in related domains, e.g., DeepFashion [55], Pose [56, 57], etc. Therefore, by leveraging on the concept of transfer learning, we explore architectural modification to an existing Deep Fashion Net that was trained for fashion landmark detection [58], and re-train the modified deep convolutional neural network for body landmark detection. We divided 99 samples into 79 training samples and 20 validation samples. Due to the extremely small sample size, we applied heavy online augmentation where each sample is augmented 100 times with random rotation, translation, cropping, and left-right, leading to a total sum of 7900 training samples and 2000 validation samples, respectively. Figure 5(b)-(f) show some examples of augmented images and their corresponding landmarks (triangles).

The DeepFashionNet in Figure 6 contains a base network (i.e., VGG16) for extracting image features and classifying clothes to different attributes and categories, a landmark branch for predicting fashion landmarks (see the circles in Figure 8), and an attention unit that focuses the classification on the area of fashion landmarks.

The proposed Fashion-to-Body Attention Network adopts the VGG16 feature extractor, fashion landmark branch, and the attention unit in the DeepFashionNet, but replaces the classification branch with a body landmark branch (see Figure 7). The body landmark branch has identical architecture to the fashion landmark branch, except that the output heatmap has 12 channels corresponding to 12 body landmarks, instead of 8 channels corresponding to 8 fashion landmarks. The loss function is defined as the mean squared error (MSE) between the output heatmap and the ground-truth heatmap.

To train the proposed model, the weights for VGG16 extractor and fashion landmark branch are loaded from the trained DeepFashionNet [59] and are frozen. The weights of the attention unit are initialised with uniform distribution on [0, total number of weights in the network]. The body landmark branch is initialised according to yhe Kaiming He method [60]. The learning rate is set as 0.0001 with decay. The optimisation method is the Adam optimiser [61]. The training would run for 20 epochs in total.

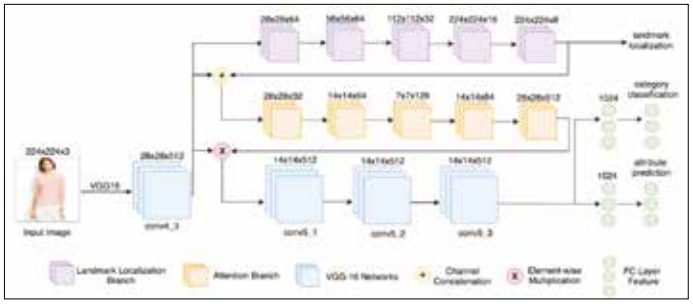

Figure 6: Deep Fashion Analysis [52]. The architecture contains a base network of VGG16, a fashion landmark branch, and an attention unit.

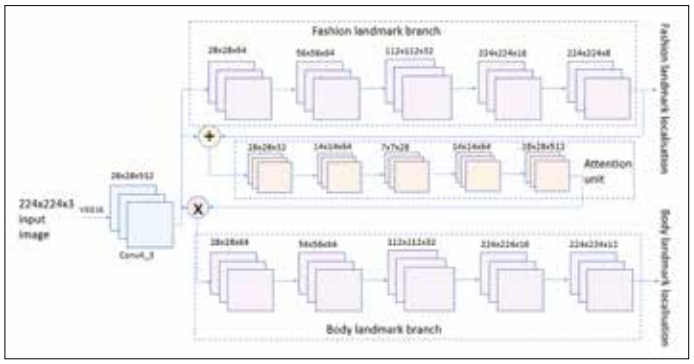

Figure 7: The proposed Fashion-to-Body Attention Network for body landmark detection. It replaces the classification branch in the base network with a body landmark detection branch. The idea is to use fashion landmarks detected by the fashion landmark branch to provide the attention for the body landmarks.

Figure 8 demonstrates the body landmark detection results of several testing images by applying our proposed model. The crosses are the detected landmarks whilst the triangles are the ground truth. In comparison, the fashion landmarks detected by the base network, DeepFashion Net, were also plotted as circles. Notice the semantic difference between the ground-truth body landmarks (i.e., triangles) and the fashion landmarks (i.e., circles). Visually it is clear that the predicted body landmarks (i.e., crosses) are much closer to the groundtruth body landmarks than to the fashion landmarks. Table 5 has shown that the testing error in terms of normalised average landmark distance between the predicted landmarks and the ground-truth, is 0.0284 for the proposed model. It is around 47% lower than that was reported for the Fashion landmarks (0.0534) by [52]. It demonstrates that the proposed model has successfully transferred fashion landmark detection to body landmark detection through the attention mechanism.

Nonetheless, the preliminary experimental results also revealed several drawbacks of the proposed model as well as some intrinsic problems with the dataset. As shown in Table 5, the mean individual body landmark localisation error varies from landmark to landmark. The largest individual landmark localisation error occurs with the landmark 'Arm.E' and L.Waist'. There is a large variation of local image features around the area where the landmark 'L.Waist' would be marked in different images, due to the fact that customers were holding an A4 paper with their right hands, sometimes blocking

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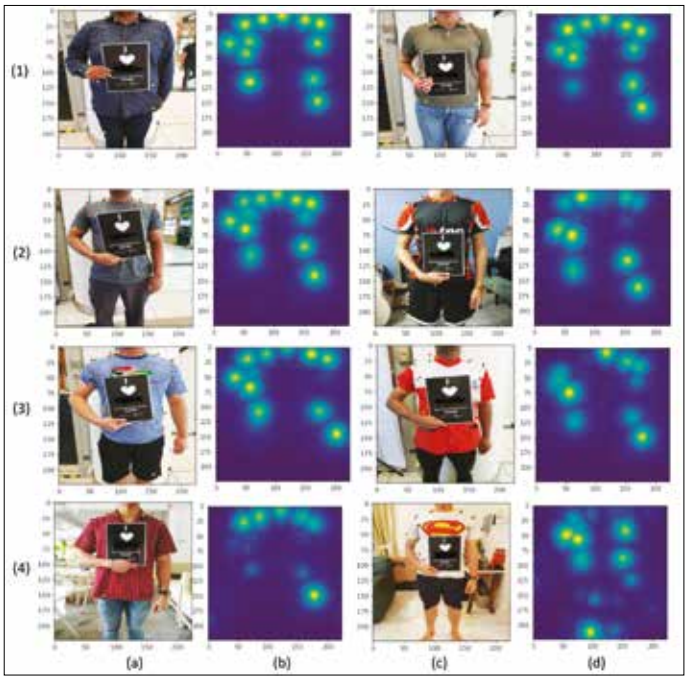

Figure 8: Columns (a) and (c) are frontal images of customers with their respective body landmarks and fashion landmarks. Triangles (Δ): ground-truth body landmarks (i.e., manually labelled); Crosses (X): body landmarks detected by the proposed model; Circles (O): fashion landmarks detected by the base network, DeepFashion net. Columns (b) and (d) are the landmark heatmaps for the images in columns (a) and (c), respectively.

Table 5: Mean body landmark localisation errors of testing images

L.Che	R.Che	Sho.A	Sho.B	Sho.C	Sho.D	Sho.E	Arm.A	Arm.B	Arm.E	L.Wai	R.Wai	Average
0.0188	0.0262	0.0221	0.0226	0.0162	0.0246	0.0135	0.0279	0.0122	0.0632	0.0634	0.0302	0.0284

the waist. On the other hand, even if the waist is not blocked, the variation of labelling a waist landmark is still larger than other landmarks. This is reflected as the landmark localisation error for 'R.Waist' is the second largest (see Table 5).

The large mean localisation error for 'Arm.E' over all the testing images is mainly skewed by the large error of the wrongly detected landmark in image e.g., Figure 8(c). In fact, the landmark 'Arm.E' in Figure 8(c) was not detected but instead a Figure 8: Columns (a) and (c) are frontal images of customers with their respective body landmarks and fashion landmarks. Triangles (Δ): ground-truth body landmarks (i.e., manually labelled); Crosses (X): body landmarks detected by the proposed model; Circles (O): fashion landmarks detected by the base network, DeepFashion net. Columns (b) and (d) are the landmark heatmaps for the images in columns (a) and (c), respectively. point around the right ankle was detected. A close examination of its corresponding heatmap (Figure 8(d)) shows that there are more than 12 landmark responses. This is possible since the convolutional layers' receptive field is small and therefore local features that excite the relevant neurons will be detected and returned as a candidate landmark. The right ankle has similar local features as that of a wrist and thus had very high response. As the current model does not incorporate any structural constraints on the body landmarks, it returned the largest response in each channel of the output heatmap which contains the right ankle.

Observing carefully the heatmaps in Figure 8, we notice some of the detected landmarks have very weak and/or wide responses and resulted in relatively large visual localisation error compared to the rest of the landmarks, e.g., 'Shoulder.A' and 'Shoulder.B' in image (3)(c), 'R.Chest' in image 8(a). These problems may be attributed to the lack of texture variation around the landmarks in concern, i.e., the foreground looks similar to background. In such cases, it is important for the model to pick up the structural/shape constraints among the landmarks to counter the lack of texture information. This is, however, not the case with the proposed model.

We also observe that when the localisation error of individual landmarks is high, it does not necessarily mean the landmark has large semantic deviation from the ground-truth landmark, particularly in the case of 'L.Waist' and 'R.Waist'. It suggests that it is important to have a different evaluation metric that would better capture such characteristics than the current MSE error for individual landmarks. The current dataset is small, lacks variations in poses, clothing styles, clothing texture, background, etc., and suffers from high interpersonal variation of manual landmark labelling. These issues should be addressed during the course of further data collection.

5.0 CONCLUSIONS

In this paper we have illustrated what the marriage of artificial intelligence which Kurzweil has conveniently compared to just a "a bag of tools" with CV can accomplish. The first section introduced how AI working together with CV can revolutionize the multi-billion dollar EBN industry by providing better efficiency and productivity. As the price of EBNs solely depends on the grade it is the current practise in the industry to use trained operators to sort the raw EBNs to the correct grade. While the human visual superior system is much better than the current cameras however, humans even trained ones can become tired easily and even inconsistent occasionally. By combining AI with CV we investigated 6 different AI techniques to autograde EBNs with ANFIS achieving an accuracy of 94.09%. Breast cancer is a major disease around the world and because it does not show any symptoms unless it is too late, early detection through regular screening is necessary for successful treatment. In the second part we showed the results of the use of CV with AI to detect breast cancer using the concept of bioinspired AI help train such an intelligent system in order to help the medical experts. Using two assistants and reverse KD, a maximum performance across all conditions of 0.8902 was obtained. And lastly we illustrated how a combination of AI and CV was used to perform visual fashion understanding which is of huge interest for the industry, motivated primarily by the needs of electronic commerce in clothing retrieval, fashion recommendation, etc. A fundamental driver for this is to identify fashion landmarks which are functional key-points defined on clothes, such as corners of neckline, hemline and cuff. Unlike conventional AI approach on such a technique, our DeepFashionNet was trained only on an extremely small dataset, something which is unconventional and challenging to do. With such an approach we were able to achieve mean body landmark localisation errors of the testing images from a low of just 0.0122 (Arm.B) to 0.0634 (L.Wai).

With AI trending at the moment and the spotlight turned on it, many in the industry want to believe that this is the silver bullet that they have been waiting for to solve all their woes. However, those working in the field will tell you that while many of the success stories published are very encouraging, there are certain limitations to AI's ability. However this is not to say that AI does not work but while progress is being made in pushing the boundaries on those which work and those which do not, new(er) applications are being announced almost on a daily basis. In this paper we have combined the «intelligence» of AI with CV to show how it can work on several different problems, as we believe the brain needs to «work with the eyes» - just like what humans normally do when we try to interpret what our eyes tell us. Many of the current approaches in using AI requires large amounts of data (EBN grading, breast cancer identification for example) where more is preferred. A major challenge will be the collection of these data as it can be challenging, time consuming and costly to assemble a large amount of data. On the bright side, with the cost of both computing power and sensors coming down it will now be more cost effective for industries to adopt such technologies. Finally we hope that the results from using this combination of AI and CV on three different areas have clearly shown that they are a match made in heave-with the potential to help produce a better world.

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