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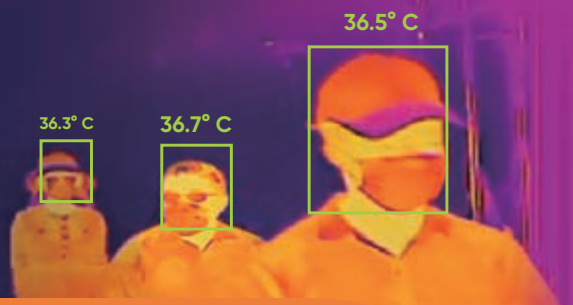

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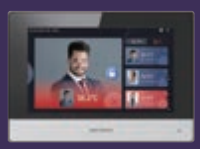

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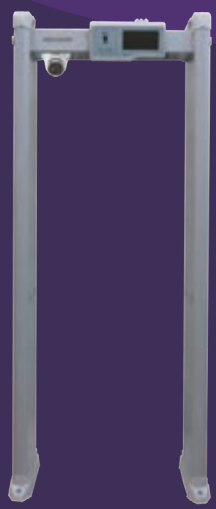

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COVER NOTE

ELECTRICAL SAFETY 2020 & MESI 2.0

by Ir. Francis Xavier Jacob
Chairman, Electrical Engineering Technical Division

It is now 2020 and we are on the brink of becoming a developed nation. Sadly, we continue to be beleaguered by electrical safety issues despite the maturity of our electricity supply industry.

What is the situation of electrical safety in the country? Have there been improvements made that keep up with the development and maturity of the industry? What is being done to improve the situation in this respect?

IEM EETD approached Suruhanjaya Tenaga (ST) recently to gain a better understanding of its latest initiatives to promote electrical safety.

We are also equally excited to learn more about MESI 2.0 and we are sharing our excitement with you in this issue of *JURUTERA*.

IEM EETD is happy to inform readers about the forthcoming biennial ASEAN Symposium & Exhibition 2020, with the theme, Standards Drive Electrical Safety & Innovation. We hope to see you there! ■

EDITOR'S NOTE

by Ir. Dr Bhuvendhraa Rudrusamy
Bulletin Editor

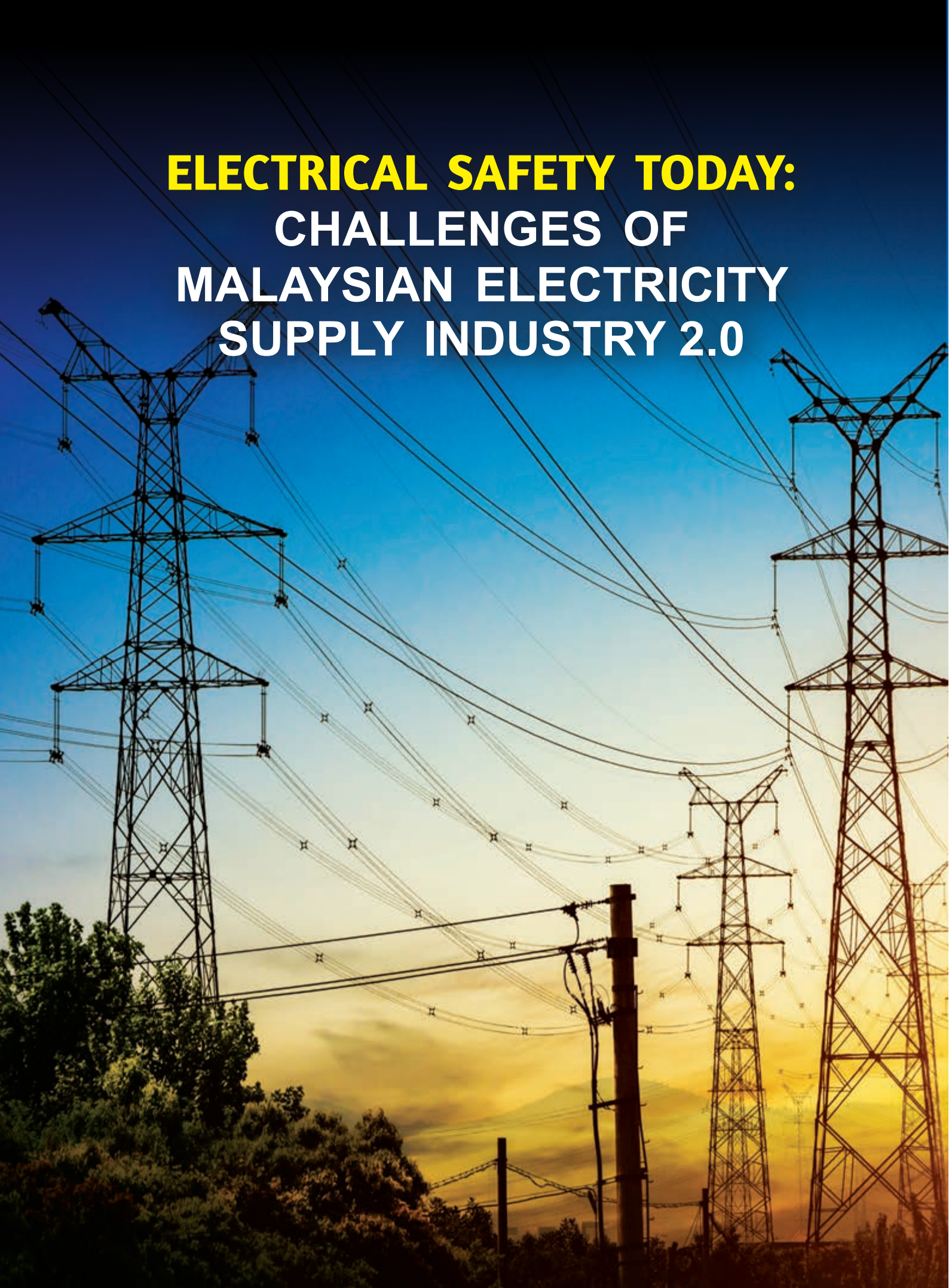
With the recent rapid changes due to the Covid-19 pandemic, we are consistently receiving various new guidelines and/or standard operating procedures (SOP), especially with regards to operational safety in considering social distancing. It makes me wonder if we are doing enough to contain the pandemic as we resume our national economic activities. Let us be part of efforts in improvising the guidelines and/or SOP for advancement.

Although Movement Control Order (MCO) was changed to Conditional MCO (CMCO) on 4 May, 2020, nationwide and some states were showing extra caution by slowly implementing it in stages, this would be the new norm as we could no longer expect to live the lifestyle that we used to before MCO.

But without a doubt, engineers are creative people and I see this as an opportunity for us to innovate to meet the demands of the new world. Change is a sign of improvement!

JURUTERA welcomes you to submit any article about how you'd have done differently. ■

ELECTRICAL SAFETY TODAY: CHALLENGES OF MALAYSIAN ELECTRICITY SUPPLY INDUSTRY 2.0



The Chief Executive Officer of the Energy Commission (EC), Encik Abdul Razib bin Dawood, began his career with Tenaga Nasional. He has more than 20 years' experience, having worked with Malaysian and Australian national power utilities, independent power producers, TNSP and as a consultant for renewable energy too. That's not all; he had also been a construction engineer, project manager, technical advisor, systems planning engineer and a power system study specialist.

En. Abdul Razib bin Dawood, Chief Executive Officer of the Energy Commission (EC), Tenaga Nasional

Encik Abdul Razib graduated in 1991 from the Coventry Technical College with a BTEC National Diploma in Engineering, followed by a degree in Electrical Engineering from the University of Warwick, United Kingdom in 1994. He was then awarded his Master of Science in Power Electronic Engineering from the University of Manitoba in Canada in 1996.

JURUTERA speaks to him about the EC's efforts with regards to electrical safety and plans in the pipeline towards achieving the goals set out under the Malaysian Electricity Supply Industry (MESI) 2.0.

BASIC NECESSITIES

Ask any school-going child in the world what the basic necessities of life are and the most common answers will be food, shelter, running water and electricity (or energy). Energy is a resource very much taken for granted by most of the general population but its importance can never be discounted.

The reliance on energy is global – energy runs our homes, our cars, our phones and computers, stoves, lights, air conditioners and washing machines. It ensures communication, comfort and convenience. The development of a country and the advancement of its technology are directly linked to energy.

When the pandemic crisis hit Malaysia earlier this year and the country went into Movement Control Order (MCO), it was energy that the public and the various sectors including healthcare and security relied on to communicate, to be informed, to protect and to live.

The role of the EC is even more vital than ever. Not only does it have to ensure a strong, smooth and secure energy supply but it also has to safeguard the quality as well as the use of electricity and gas.

ELECTRICAL SAFETY PATTERN

The last two years have been good ones for our country, with regards to electrical safety. In 2018 and 2019, the number of accidents per year was 56 and 52 respectively; this was below the national average of 57, a trend that began in 2002. The EC investigated a total of 1,026 electrical accident cases reported in the last 17 years, of which 505 were fatal and 521 were non-fatal.

"Our analysis also found that, for the past five years, 51% of all cases of electrical accidents involved electrical installations such as electrical substations, low voltage and high voltage overhead lines and that 15% of accidents occured in residential areas," says Encik Abdul Razib.

In 2019, there was a rise in electrical accidents and this was the result of failure to comply with safe working procedures. This was the main cause of all electrical accidents, with a 7% increase as compared to the previous year. The second most common cause was improper installation and/or maintenance and this showed a decrease of 4%.

THE CHALLENGES

While electrical safety is clearly a top priority for the EC, the road to a completely 100% safe industry is still fraught with challenges such as:

1. **Lack of Competent Controllers:** In an effort to ensure that all electrical installations were (and are) always under the purview of clearly competent persons, the EC introduced a "Restricted Certificate of Competent Person" in 2014. This covered a new category of competency and the aim was to tackle industry complaints with regards to the lack of competent persons in

the market. Unfortunately for the industry, this has not been fully utilised.

As of February 2020, only 144,596 such certificates had been issued in Peninsular Malaysia and Sabah or an average of 24,099 certificates a year. Of this, the bulk was issued to wiremen/endorsers (81,433), followed by chargemen/restricted (60,420). The remaining 1.9% who qualified for and received competency certificates were electrical engineers (1,293), cable jointers (830), electrical services engineers (359) and electrical supervisors (261).

2. **Non-Standard Electrical Wiring:** One of the most frequent complaints received by the EC is of that of non-standard wiring. Non-standard wiring not only exposes poor standards but it can also have very severe repercussions, says Encik Abdul Razib.

"For the past few years, the EC had received numerous complaints of non-standard wiring installed on their premises. This is an obvious risk to life. Upon investigation, we found that there were two main causes – improper design of wiring by the consultants and installations by contractors which did not meet standard specifications. Such shoddy work is done because the consultants and contractors lack adequate knowledge and, at the same time, try to cut costs," he adds.

> **"For the past five years, 51% of all cases of electrical accidents have involved electrical installations such as electrical substations, low voltage and high voltage overhead lines."**

3. **Unregulated Online Sales of Electrical Equipment:** Recently, the world faced a global health crisis and many countries would still be in lockdown mode. Physical store sales have dropped drastically while online sales increased massively. While online commercial platforms provide the ease and convenience of purchase, the downside is a lack of quality control.

The selling of electrical equipment to consumers by e-commerce providers has also become more common. This factor, combined with the aforementioned lack of consistency in quality, is obviously worrisome, so the EC has come up with plans to curb that. These include:

- Lodging complaints with the Malaysian Communications and Multimedia Commission (MCMC) regarding sales of non-approved electrical equipment by e-commerce providers.
- Briefing e-commerce providers during regular e-commerce days by the Ministry of International Trade & Industry (MITI) and Malaysia Digital Economy Corporation (MDEC).
- Conducting engagement sessions with local e-commerce platforms such as Lazada, Shopee and Pestamall to ensure these have a full understanding of the EC's regulatory requirements on electrical products by their merchants.

ROADMAP TO ENHANCING ELECTRICAL SAFETY

It is clear that electrical safety nationwide is of the utmost urgency and at the forefront of all of the EC's plans. "It is important to us that all those involved are protected from dangers arising from the electricity and piped gas industries," says Encik

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> **"With growing amounts of distributed energy resources in households, we are increasingly feeding power back into the grid through many small sources – a two-way flow of electricity."**

Abdul Razib. "The number of accidents must be reduced and our targets met."

EC's targets include a 2% annual reduction of electrical accidents, ensuring that there are not more than 2 gas accidents annually and eliminating all preventable gas and electrical incidents. EC is committed to achieving these targets and has developed a five-year safety roadmap (2020-2025) to ensure this. There are five main initiatives.

1. **Continuous Development of Safety Codes & Guidelines:** Guidelines and safety codes will be reviewed regularly and amended where necessary.
2. **Promotion of Self-Regulation within the Industry:** Self-regulation within the industry is integral to electrical safety and, as an added incentive, a safety award will be given to players who best practise this. The safety management plan will also be enhanced through a regular programme audit.
3. **Strengthening Of Enforcement Activities:** Strategic targets such as electrical and gas appliances, construction sites and renovations will be strengthened and compound and prosecution procedures will be enhanced by being benchmarked against other regulators. The EC will work closely with other government agencies and local authorities such as the Prime Minister's Department, SIRIM, Fire & Rescue Department (or BOMBA), Ministry of Housing & Local Government, Public Works Department, MCMC, Department of Wildlife & National Park, the Malaysian Fisheries Development Authority and Malaysia Contractor Portal in collaboration with Construction Industry Development Board.
4. **Increase/Strengthening of Competencies & Capabilities in Handling Safety:** Competency control requirements will be reviewed and updated in accordance with current technology advancements. Registration of contractors will be required and all analysis of root cause accident cases will be enhanced. This will be done via the training and educating of EC workforce in forensic investigations.
5. **Utilisation of Electricity & Piped Gas Infrastructure:** A National Fiberitation & Connectivity Plan (NFCP) will be set up. This pilot project will be used as a guide for similar projects in the future.

THIRD PARTY ACCESS SYSTEM & THE PEER-TO-PEER

The Third Party Access (TPA) system and the Peer-to-Peer (P2P) energy trading are both set to be implemented within the year. The TPA system will allow multiple entities to have access to and be able to utilise gas facilities available in Malaysia on the same terms and conditions.

At present, there are three types of gas facilities falling under the scope of the TPA system – regasification terminals, transmission pipelines and distribution pipelines. Once the TPA is in place, it is hoped that the ensuing competition among the players will be healthy and result in reliable and sustainable gas supply to consumers.

The P2P energy trading will enable a solar photovoltaic producer to sell excess solar electricity on an energy trading platform to another consumer. This turns consumers into prosumers (a person who is both consumer and producer of a product). Traditionally, prosumers sell solar electricity at a rate competitive to the retailer's tariff and participating consumers have the choice of purchasing solar electricity from the P2P or from the retailer. The grid operator will be compensated with a grid fee and the retailer operating the energy trading platform is compensated with a retailer's fee. Everybody wins.

With the upcoming TPA and P2P energy trading, challenges are anticipated in terms of licencing, electrical safety and the trading mechanism.

TPA & P2P CHALLENGES

The most probable challenge under the licence regime will be with regards to the contract between seller and buyer. The contract has to be fair to both parties and ensure a satisfactory deal.

"Both TPA and P2P energy trading are being issued under the Public Generation Licence. This falls under Section 29 of the Electricity Supply Act 1990, which states that all contracts shall be endorsed by the EC," says Encik Abdul Razib.

"Our second challenge will also be a large one, which is taking on the responsibility for the installation and maintenance during the implementation of TPA. Demarcation areas need to be clearly specified in order to ensure the safety of installations and competent persons while operations and maintenance works are carried out."

But it is the third challenge that will be the biggest, he adds. This will be challenges which may arise from implementation of the Malaysian Electricity Supply Industry (MESI) 2.0.

MESI 2.0

To be rolled out over six years, from 2019 to 2025, MESI 2.0 is an ambitious attempt to reimagine the Malaysian Electricity Supply Industry. There are four key reform initiatives under the plan:

1. **Efficiency:** Allowing generators to source for their own fuel to optimise cost, to move from a Power Purchase Agreement (PPA) regime to capacity and energy market and to enhance ring-fencing of Single Buyer and Grid System Operators to maintain level playing field to all players.
2. **Green/Sustainability:** The facilitation of green energy producers and consumers with products such as green tariffs, green gentailers (via a Third Party Contract) and tradable green certificates.
3. **Customer Experience:** The establishment of a Third Party Access (TPA) framework and network charges for grid in order to facilitate participation, to future-proof through digitalisation as a platform to facilitate smart energy network while using digital technologies and to gradually open up the retail market, allowing players to offer new products and services to customers.
4. **Security:** To maintain reliability and system security through continuous investment in the system, to continue to provide support for targeted segments such as B40, e-Kasih and Bantuan Sara Hidup recipients and to establish a supplier of last resort framework to ensure uninterrupted electricity supply to customers.

CHALLENGES ANTICIPATED

Encik Abdul Razib is aware that there will be many challenges, though he firmly believes they can all be dealt with.

"Regulations will need to keep pace as our energy system rapidly evolves. The EC will need to review and amend current legislation or to assist in developing new acts, regulations, guidelines and rules. The outcome from MESI 2.0 must also be attractive enough to attract market participation. In addition, with the implementation of MESI 2.0, tariffs will be based on market prices. Actual fuel market price will therefore have a direct effect on the tariff, resulting in it increasing or decreasing," he says.

Renewables will need to be integrated and energy resources distributed. "With growing amounts of distributed energy resources in households, we are increasingly feeding power back into the grid through many small sources – a two-way flow of electricity. Mitigation actions should be in place to balance the system," he adds.

There will need to be governance processes and procedures as well as a plan to handle possible commercial disputes in the future.

Despite the challenges, Encik Abdul Razib is positive that MESI 2.0 can only result in benefits. "Ultimately, we need to educate and create awareness among the public on the benefits of market reforms, like smart meters," he says.

"Consumers will have more enhanced experiences as they will have choice, options and control as well as improved service levels. Electricity prices will be more reasonable as the industry becomes more competitive regionally and there is transparency across the value chain. Finally, a huge amount of additional economy activity will be generated with increased capital investments, new job opportunities (2020-2030) and new Small Medium Enterprise businesses."

> **"The road to a completely 100% safe industry is still fraught with challenges, and regulations will need to keep pace as our energy system rapidly evolves."**

REGULATION OF ENERGY EFFICIENCY REQUIREMENTS

Another highlight for the EC is The Energy Efficiency & Conservation Act (EECA) which is scheduled to be delivered this year.

"We have developed a comprehensive five-year strategy plan which will guide the EC in implementing the EECA. This includes a plan of execution, the development of guidelines and procedures, the development of resources (human and financial) as well as capacity building," said Encik Abdul Razib.

He is firm in his belief that lots of feedback will be needed and welcomed. "There will be various stakeholder consultations to be conducted and these will include affected and interested parties. The purpose of speaking with stakeholders is to obtain input regarding the guidelines and procedures to regulate the EECA. All the relevant parties have been identified and the invitations will be sent out accordingly," he says.

In addition, the EECA will also include comprehensive building energy codes, building energy labelling, electrical appliance energy performance standards and requirements for capacity building of Registered Electrical Energy Managers.

LARGE SCALE SOLAR 4 PROGRAMME

Encik Abdul Razib talks about the upcoming Large Scale Solar (LSS) 4 Programme. The LSS 3 programme saw tremendous participation from Renewable Energy (RE) industry players, resulting in a total electricity generation capacity of 500MW. "For the next LSS programme, any implementation method or package will be decided only by the Ministry and will be confidential as long as the tender has not yet been floated," he says.

"The impact of the Duck Curve to the overall grid system at the moment is less significant. However, when solar contribution towards the grid becomes higher, effective monitoring of the grid system will need to be done, which will include effective management of hydro for night peak shaving and RE forecasting. New technology such as battery storage needs to be further explored. This technology can be an effective measure to manage the Duck Curve. With the right cost and functionality, this technology can be used in the grid system."

IEM'S ROLE IN SUPPORTING EC TO PROMOTE ELECTRICAL SAFETY

Encik Abdul Razib stresses that IEM and all electrical engineers are integral to the advancement of electrical safety in the country. "We need your support. Please promote EC's publications to the public and to all your members. Help create awareness regarding the importance of compliance to procedures and electrical safety in your internal and external communications such as *JURUTERA* and Facebook. IEM can also consider organising touch point activities (replicating The Electrical & Electronics Association of Malaysia's initiatives to promote Residual Current Devices in electrical installations)," he says.

"From the EC's end, we have stepped up efforts to create awareness among the public by utilising various media such as newspapers, newsletters, radio, television and social media."

Encik Abdul Razib is confident that with all stakeholders working together, electrical safety awareness will eventually be the norm in Malaysia. ■

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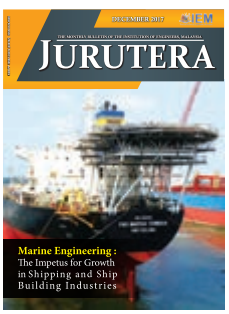

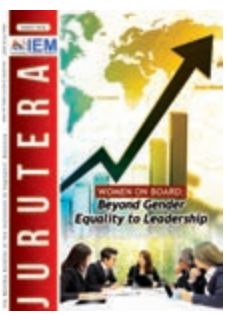

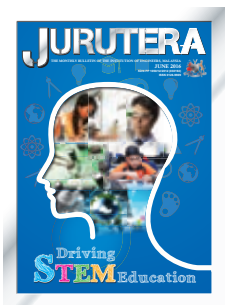

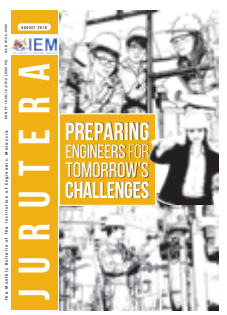

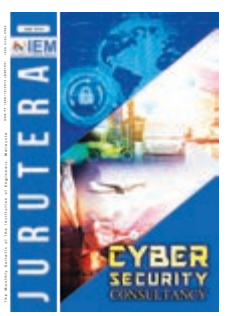

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EVOLUTION OF SURUHANJAYA TENAGA & MALAYSIA ELECTRICITY SUPPLY INDUSTRY 2.0

Ir. Francis Xavier Jacob

Ir. Dr Siow Chun Lim

Suruhanjaya Tenaga (ST) or Energy Commission is a statutory body established under the Energy Commission Act 2001 to regulate the energy sector in Peninsular Malaysia and Sabah. Both electricity and piped gas supply industries are under the direct purview of ST which is responsible for ensuring that electricity and gas supply is made available at reasonable costs nationwide and in a safe manner. Under ST's context, Economic Regulation, Technical Regulation & Safety Regulation must be addressed with equal importance.

Electricity is a necessity for all, whether we are industrial, commercial or residential consumers. Hence, reliable and affordable supply of electricity is no longer a luxury. To understand how ST and several other stakeholders work together to achieve both of the aforementioned goals, let us revisit MESI and how it has been restructured and evolved over the years.

MESI is the acronym for Malaysia Electricity Supply Industry (MESI). The privatisation of MESI from state-owned/public entities to privately-owned commercial entities began with the formulation and enforcement of the Electricity Supply Act 1990. The National Electricity Board (NEB) was privatised as Tenaga Nasional Berhad (TNB) and some limited forms of competition were introduced in the generation sector with the licensing of Independent Power Producers (IPPs). Transmission, distribution and retail activities were still done by TNB. This started the process of restructuring the industry by allowing the private sector to own the industry and to operate it in a commercially viable and efficient manner. It also allowed the private sector to take up the funding of the industry development, thus freeing the public sector of this burden and allowing it to channel its financial resources to other more urgent public projects and requirements.

The restructuring of MESI was further intensified from 2010 to 2014. Known as MESI 1.0, a series of reform took place as shown in Figure 1. The New Enhanced Despatch Agreement (NEDA) was introduced. The Single Buyer (SB) was introduced as an entity to look into the commercial aspects of purchasing electrical power and energy from the generation sector. The Grid System Operator (GSO) with TNB was made more independent. Though still with TNB, both SB and GSO were ring fenced to be answerable to ST. To further enhance the efficiency of fuel purchase by the industry, TNB Fuel and PETRONAS were designated as sole suppliers of coal and gas respectively. To further diversify fuel resources for the industry, IPPs were encouraged to use renewable energy to generate electricity. To do this, special arrangements had to be made to make energy from

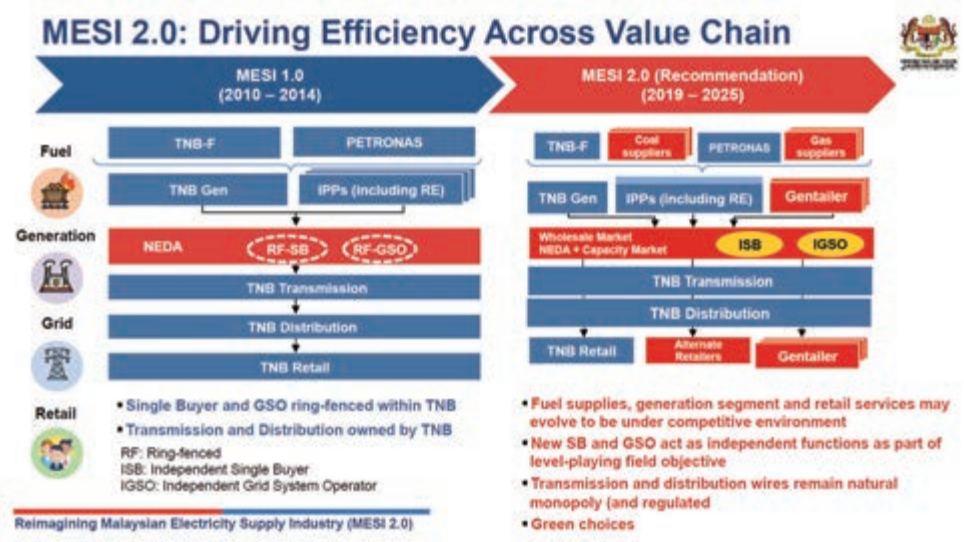

Figure 1: MESI 1.0

Group photo with Encik Razib

renewable energy resources to compete with other forms of electricity generation in the industry.

The implementation of MESI 1.0 resulted in some improvements though there were some shortcomings. Today, MESI is valued at RM50 billion in total sales, with the biggest consumers coming from the industry (40%), commercial (36%) and domestic (23%).

Moving forward, the then Ministry of Energy, Science, Technology, Environment & Climate Change (MESTECC) charted and launched MESI 2.0 in 2018. Naturally, ST was one of the key drivers of MESI 2.0. In this article, EETD will provide an overview of MESI 2.0, based on a recent interview with Encik Razib Dawood, CEO of Suruhanjaya Tenaga.

MESI 2.0 was proposed by the then MESTECC with the aim of enhancing industry efficiency and empowering consumers. Under this reform, the industry projected that the increase in demand must be met early to ensure energy security. Digitalisation shall be fully leveraged on to allow better energy control and connectivity for consumers. Key enabling technologies such as smart meters, smart grid, Internet of Things and Industry Revolution 4.0 are the main supporting pillars of digitalisation of the industry. MESI 2.0 shall also empower consumers to actively participate in the electricity supply industry via a decentralisation approach. This approach shall be catalysed by the advancement in distributed energy storage, batteries, microgrids and other equivalent technologies to encourage even more innovative initiatives such as peer-to-peer energy trading. In a nutshell, the primary motivation of MESI 2.0 is to nurture and strengthen the efficiency, transparency, sustainability and competitiveness of a much greener power industry.

Recommended to begin in 2019 till 2025, fuel supplies, generation segment and retail services may evolve to be under a more competitive environment. Open fuel sourcing may be encouraged under MESI 2.0. New SB and GSO shall act as independent functions to level the playing field. Note that the role of the SB entity was further streamlined with the launch of the New Enhanced Dispatch Arrangement (NEDA) rules in October 2015. NEDA was established to elevate competition and cost efficiency of the single buyer market by incentivising the power generators to be more efficient. A hybrid energy management may be put in place as long term power purchasing agreement (PPA) is

Aggregated timeline for MESI initiatives

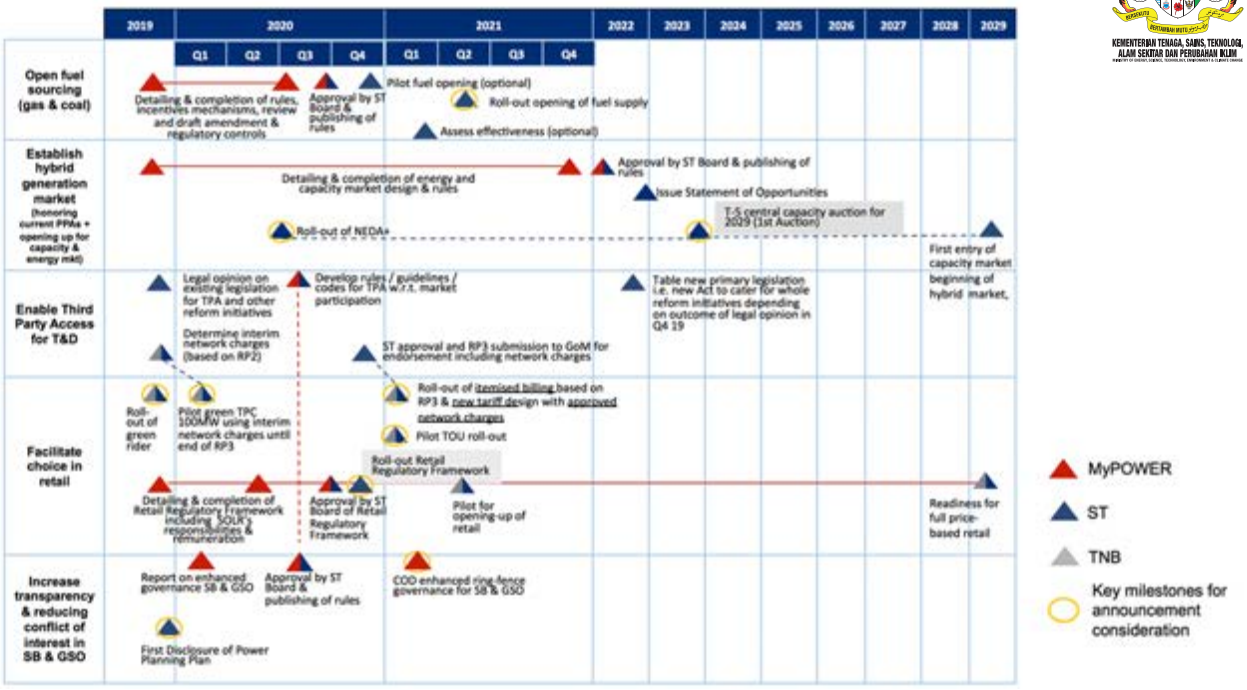

Figure 2: Aggregated timeline for MESI 2.0 initiative

gradually shifted to short term PPA. Figure 2 illustrates the aggregated timeline for MESI initiative.

MyPower (Malaysia Programme Office for Power Electricity Reform) Corp, an agency comprising experts in the energy sector, was to be reactivated to drive MESI 2.0. MyPower is set to execute the reforms laid out under the MESI 2.0 masterplan. ST is heavily involved in all MESI initiatives (see Figure 1) which spans a period of 7 years. Third Party Access (TPA) and Peer-to-Peer (P2P) energy trading will be issued under the Public Generation Licence. TPA allows third parties to access gas facilities despite not being the owner or the operator. By so doing, national gas security shall be enhanced by truly liberalising the sector by permitting third party operators to import, regasify, transport, distribute, ship, retail via licensee pipe and use natural gas.

The main challenge anticipated under the licence regime is in ensuring a fair contract arrangement between the seller and the buyer. All contracts are to be endorsed by ST under the provision of Section 29, Electricity Supply Act 1990.

Achieving MESI 2.0 is expected to be challenging. For a start, regulation needs to keep pace with the rapidly evolving energy system. ST needs to review and amend current legislation or develop new laws (act/regulation/guidelines/rules) in a timely manner. MESI 2.0 can only be successful if there is strong market participation. This, in turn, depends on the attractiveness of the outcomes of MESI 2.0 from the market perspective. With MESI 2.0, tariff will be set based on the market price and it will be directly impacted by the actual fuel market price. Integration of renewables and distributed energy resources into the grid may also be significantly impacting the grid stability. Distributed generation of power in households is expected to increase and mitigations have to be put in place to ensure that any resulting injection of power to the grid does not disturb the balance of the system.

ST also needs to be prepared to handle a growing number of possible commercial disputes in the near future and this can be achieved through better streamlining of the governance process and procedure. Finally, ST acknowledges that the biggest challenge lies in educating the public on the benefits of MESI 2.0, and this is where IEM EETD can play a part.

With all the key reform initiatives in place, potential outcomes such as better consumer experience, reasonable electricity pricing and generation of additional economic activities via increased capital investments, new job opportunities and SME businesses are foreseeable. Consumers are expected to be granted more options and control as well as improved service levels. Electricity prices are expected to be regionally competitive with greater transparency across the value chain. ■

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[2] Aris, Hazleen & Jørgensen, Bo & Hussain, Ida. (2019). Electricity Supply Industry Reform in Malaysia: Current State and Way Forward. 8. 6534-6541. 10.35940/ijrte.D5170.118419.

[3] https://www.st.gov.my/

Authors' Biodata

Ir. Francis Xavier Jacob is Chairman of the Technical Committee on the Standards for Energy Management and sits in various standards working committees. He is a Professional Engineer and a member of IEM.

Secretary/Treasurer of EETD (2019-2020) **Ir. Dr Siow Chun Lim** is Senior Lecturer at Multimedia University, Managing Director of LiRESAS and Secretary of National Working Group of the ASEAN Engineering Inspectorate- Electrical Installation.

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IEC YOUNG PROFESSIONALS PROGRAMME: DRIVING STANDARDISATION

by Ir. Tay Eng Chong

Ir. Dr Siow Chun Lim

IEC Young Professionals Workshop 2019 delegates

The International Electrotechnical Commission (IEC) is one of the world's largest and oldest international standards organisation which produces consensus-based international standards and manages conformity assessment systems for all electrical, electronic and related products, systems and services which are collectively known as "electrotechnology".

The IEC champions the development of electrotechnical standards by engaging closely with national committees across the globe. Powered by close to 20,000 experts from industry, commerce, government, test and research labs, academia and consumer groups, IEC standards are widely used in more than 97% of global population.

A decade ago, the IEC-YP (Young Professionals) Programme was established to engage and nurture young professionals across the world to enhance their involvement in IEC standardisation and conformity assessment activities. Since then, the IEC-YP Workshop had been an annual event, starting in Seattle (2010) and then Melbourne (2011), Oslo (2012), New Delhi (2013), Tokyo (2014), Minsk (2015), Frankfurt (2016), Vladivostok (2017), Busan (2018) and Shanghai (2019). It is scheduled to be held in Geneva this year.

Usually held during the IEC general meeting, the IEC-YP Workshop is a platform which allows the voice of upcoming eletrotechnology experts to be heard on an

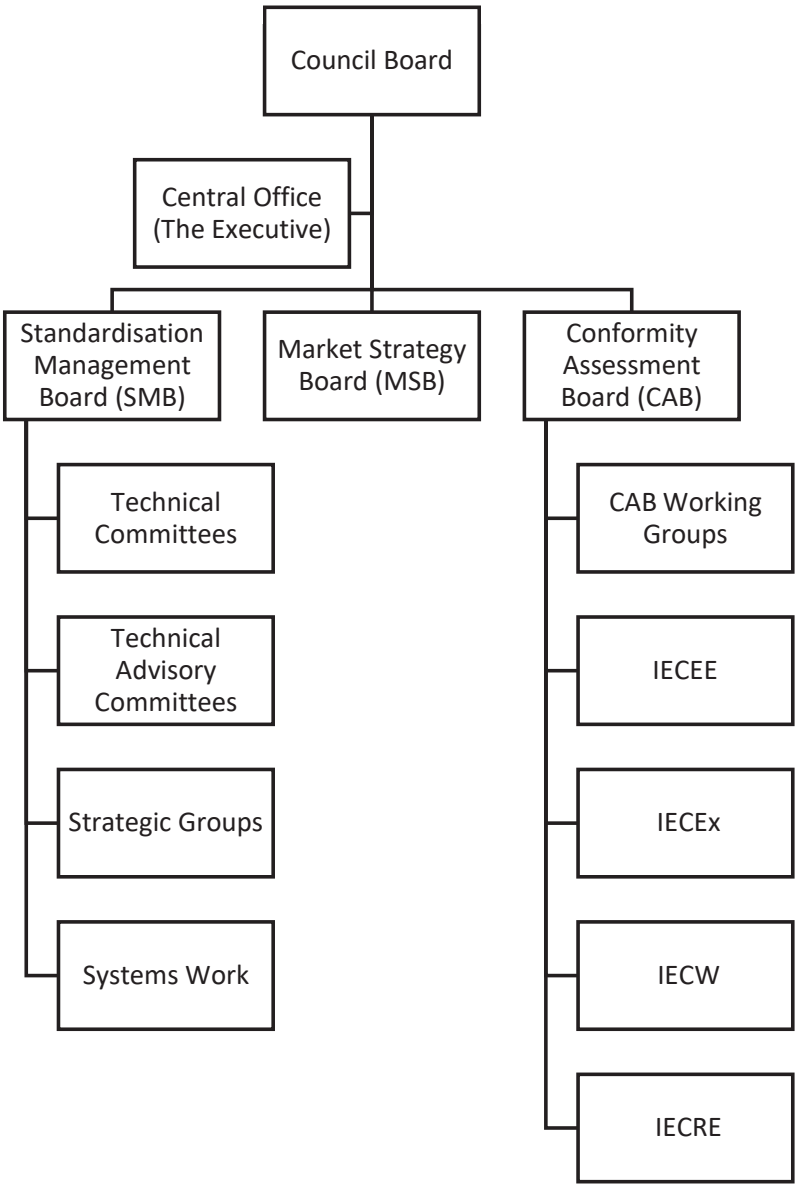

Figure 1: Organisational Structure of IEC

international level and helps to shape the future of global standardisation and conformity assessment. To date, the IEC-YP Workshop has trained more than 500 young professionals from all around the world.

Since 2014, the IEM has been sending delegates to the IEC-YP Workshop through Standards Malaysia and 3 YP leaders are selected each year to lead the planning and organising of the next Workshop. At the 10th edition of the Workshop in Shanghai, Malaysia was represented by 3 young professionals, including one from IEM. The Shanghai event was attended by 88 YPs from 41 countries.

The top leadership of the IEC-YP Programme has always placed strong emphasis on the importance of continuously nurturing more young professionals to be involved in standards-related activities. It is worth noting that IEC is involved in realising 16 out of 17 United Nation Sustainable

Development Goals (UN SDG).

Current technological trends that IEC has a strong interest in are Artificial Intelligence, Smart City and Renewable Energy. Unsurprisingly, these are in full synchronism with what Malaysia is strongly embracing now. As for our information, the supreme governing body of IEC is the council that sets IEC policy and long-term strategic and financial objectives. It delegates the management of IEC work to the Council Board, with specific management responsibilities in the spheres of standards, conformity assessment and market strategy being assumed respectively by Standardisation Management Board (SMB), Conformity Assessment Board (CAB) and Market Strategy Board (MSB). Figure 1 shows the organisational structure of IEC.

It is imperative for IEC to respond to emerging technologies by fast-tracking and streamlining the process of standards development. This strong urge is imparted to the YPs by immersing them in a role-playing activity where they have to visualise themselves as a CEO or CTO of a company and a member of the MSB.

As a member of MSB, they will be the "radar" of IEC and have to foresee or plan activities for the next 5-10 years. This stimulating and immersive environment is an effective way to train YPs to generate and voice out their ideas.

YPs are also exposed to real SMB meetings where standards are deliberated by experts representing their respective national committee. As shown in Figure 1, SMB manages and coordinates the establishment and disbanding of technical committees to develop a particular standard. Timeliness of standards production is always one of the biggest challenges as consensus has to be reached among a majority of national committees. Speediness of standards development ensures that they remain relevant and stay abreast of advancements in technology.

YPs also get to observe how CAB works. CAB drafts the IEC conformity assessment policy and practically supervises conformity assessment activities and systems. IEC's main objective is to have one test and one certification to be accepted globally. Currently, there are four IEC Conformity Assessment Systems in operation which are as follows (See Figure 1):

1. **IECEE:** IEC System of Conformity Assessment Schemes for Electrotechnical Equipment and Components. Some of the developments include the IECEE Global Motor Energy Efficiency and international cyber security certification.
2. **IECRE:** IEC System for Certification to Standards Relating to Equipment for Use in Renewable Energy Application. This system aims to facilitate global trade of the aforementioned equipment while satisfying the safety requirement.
3. **IECEx:** IEC System for Certification to Standards Relating to Equipment for Use in Explosive Atmospheres. This system is important in areas such as petrol stations, oil refineries, chemical processing plants, hospital operating theatres, aircraft refuelling and hangars just to name a few.
4. **IECQ:** IEC Quality Assessment System for Electronic Components. This system covers the design, manufacture, assembly and distribution of electronic component parts such as active components, electromagnetic components, electromechanical components, electro-optic components and passive components just to name a few.

Apart from CAB and SMB meetings, YPs are also presented with the opportunity to observe more technical meetings organised by Technical Committee (TC) and Standardisation Evaluation Group (SEG). One of the most active SEG is the SEG 10 on Ethics in Autonomous & Artificial Intelligence Application. SEG 10 focuses on identifying ethical issues and the societal concerns of AI application. One of the Working Groups (WG) under SEG 10 is currently developing a rating system for AI application.

In summary, the IEC-YP programme opens the door for young professional to be involved in IEC works and provides a platform for them to share their thoughts with IEC openly. This invaluable experience has motivated the 2019 IEC-YPs of Malaysia to work with Standards Malaysia and former Malaysian IEC-YPs to initiate the National IEC-YP programme at home.

DRIVING STANDARDISATION IN MALAYSIA

The past and present IEC-YPs from IEM have been working closely with Standards Malaysia to drive standardisation in Malaysia since 2016. One of the main initiatives driven

Participants of National IEC Young Professional sharing session at Wisma IEM

is the promotion of awareness of standards among the electrical engineering fraternity in Malaysia. To date, they have organised:

1) IEM-Standards Malaysia Electrotechnical Symposium & Exhibition 2016
2) IEM-Standards Malaysia-Suruhanjaya Tenaga ASEAN Electrotechnical Symposium & Exhibition 2018
3) National IEC-Young Professional Sharing Session 2019

A few IEM YPs are currently involved as IEC experts in SEG 10, TC 64 (Electrical Installations & Protection against Electric Shock) and TC81 (Lightning Protection). They have also initiated an effort to harmonise electrical installation standards in ASEAN countries via the ASEAN Engineering Inspectorate – Electrical Installation (AEI-EI) working group under the ASEAN Federation of Engineering Organisations (AFEO).

The team has also been actively creating awareness of electrical installation standards among electrical engineering undergraduates in Malaysia through standards awareness roadshows and envisions the ultimate goal of including standards education as part of the engineering curriculum in institutions of higher learning nationwide. To date, they have reached out to nearly 20 universities to impart early awareness on technical standards to engineering undergraduates who have been briefly introduced to standards such as IEC 60364, IEC 62305, IEC 61000 and national standards such as MS 1936 and MS 1979.

IEC-YPs will continue to contribute towards standards development and capacity building of more young talents nationally and globally. To be a truly developed nation, upcoming young engineers are strongly encouraged to play an active role in standardisation initiatives and IEM is one of the enabling platforms. ■

REFERENCE

[1] https://www.iec.ch/index.htm

Authors' Biodata

Ir. Tay Eng Chong has 7 years' experience in Electrical and Extra Low Voltage design in building services.

Secretary/Treasurer of EETD (2019-2020) **Ir. Dr Siow Chun Lim** is also Senior Lecturer at Multimedia University, Managing Director of LiRESAS, and Secretary of National Working Group of the ASEAN Engineering Inspectorate- Electrical Installation

UPCOMING ACTIVITIES

WEBINAR - Technical Talk on "Industry4WRD: The Readiness Assessment"

Date	: 2 June 2020 (Tuesday)
Time	: 10.00 a.m. – 11.30 a.m.
Venue	: Online Platform
Approved CPD	: 0
Speaker	: Ir. Dr Tan Chee Fai

WEBINAR - IMPACT OF COVID19 AND MCO/ CMCO ON CONSTRUCTION PROJECTS
What to Expect and What to Do?

Date	: 2 June 2020 (Tuesday)
Time	: 3.00 p.m. – 4.30 p.m.
Venue	: Online Platform
Approved CPD	: 0
Speaker	: Ir. Lai Sze Ching

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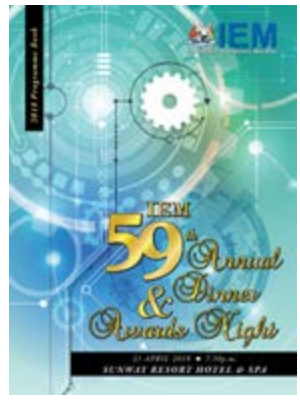
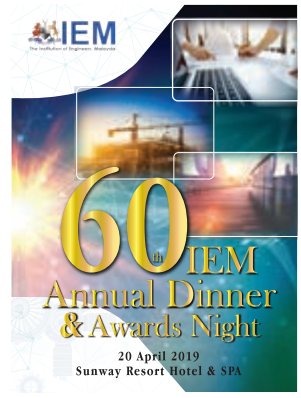
IEM *61st* Annual Dinner and Awards Night 2020 Programme Book





We are pleased to inform that IEM will be holding the 61st Annual Dinner and Awards Night 2020 on **26 September, 2020**. Dimension Publishing has been appointed to put together the Annual Dinner Programme Book which will be circulated to all **1,200 guests** on that night at **KL Convention Centre**.

It is an annual event organised by IEM to present awards to winners of projects and to announce the new committee for year 2020/2021. Special guests of honour will be invited to officiate at the event.

We are now calling for interested advertisers to book their preferred advertising position in this programme book. Below please find the advertising rates for your immediate action and reply. We hope to hear from you soon before the closing date on **28 August 2020**.

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Facing Chairman's Message	2,800	( )	
Facing President's Message	2,800	( )	
Facing Inside Back Cover	2,800	( )	
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OVERVIEW OF BIOGAS SYSTEMS, UTILISATION AND PROSPECTS

Mr. Alex Looi Tink Huey

Ir. Dr Bhuvendhraa Rudrusamy

Biogas is defined as gas produced by the bacterial breakdown of organic matter or feedstock by anaerobic microbes (methanogens) in the absence of oxygen. It is categorised as a clean Renewable Energy (RE) source produced biologically through anaerobic digestion consisting of 50–70% methane (CH_4), 30–50% carbon dioxide (CO_2) and traces of other contaminants such as siloxanes, volatile organic compounds and hydrogen sulphide (H_2S) (depending on the source of the feedstock) [1].

The natural course for biogas includes buried organic matter, wet soils, aquatic sediment, etc. Human activities create additional sources including Municipal Solid Waste (MSW) landfills, wastewater ponding systems, digesters at water resource recovery facilities (wastewater treatment), livestock farms, food production facilities, etc. Important contributions of biogas capturing and utilisation to environmental sustainability are:

- CO_2 neutral [1], as the CO_2 released by combustion of biogas was previously removed from the atmosphere during the generation of biomass through photosynthesis
- Capture of biogas improves climate change and significantly reduces emissions of greenhouse gas, CH_4, which has far more damaging effects (25 times) [2] on the climate than CO_2.

ANAEROBIC DIGESTION PROCESS

Biogas is produced either by mesophilic anaerobic digestion (35-40°C) or thermophilic anaerobic digestion (48-57°C) [3]. Thermophilic process has a faster throughput with faster biogas production per unit feedstock [4]. However, this process requires higher capital expenditure and more energy and control required for heating. Biogas anaerobic digestion involves the complex interaction of various microorganisms and takes place in four (4) separate phases: Hydrolysis, acidogenesis, acetogenesis, and methanogenesis [5] as shown in Figure 1.

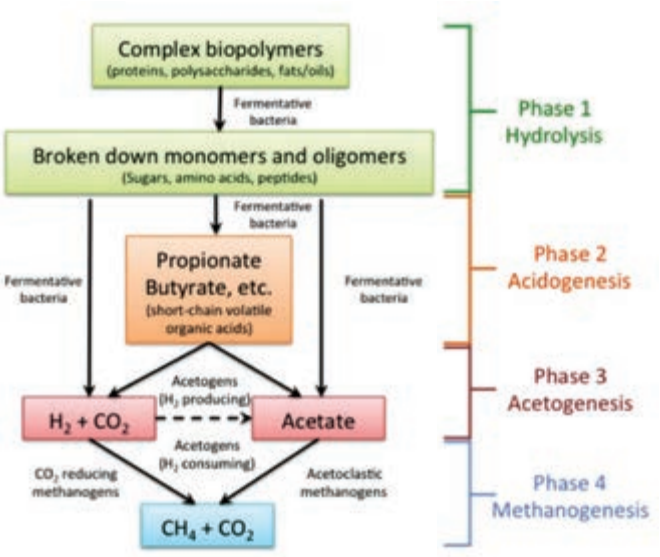

Figure 1: Anaerobic Digestion Process.
Source: MEEMS Module B7 – Anaerobic Digestion

Typically, the anaerobic digestion process starts with the organic matter or feedstock where large contents of carbohydrates, cellulose, proteins and fats are broken down into simple sugars, amino acids and fatty acids [5]. Then, soluble monomers are further converted into volatile fatty acids. The products of acidogenesis subsequently breaks down into acetic acid, releasing hydrogen and CO_2. The last phase which involves methanogens then produce CH_4 by cleaving 2 acetic acid molecules to form CH_4 and CO_2.

BIOGAS PRODUCTION TECHNOLOGIES

Loh *et al.,* [6] indicated that anaerobic digestion can be designed and engineered in a closed-tank anaerobic digester system, or in a covered lagoon digester. Commonly used biogas production technologies are Continuous Stirred-Tank Reactor (CSTR), Up-Flow Anaerobic Sludge Blanket (UASB) and Dry-Fermentation process.

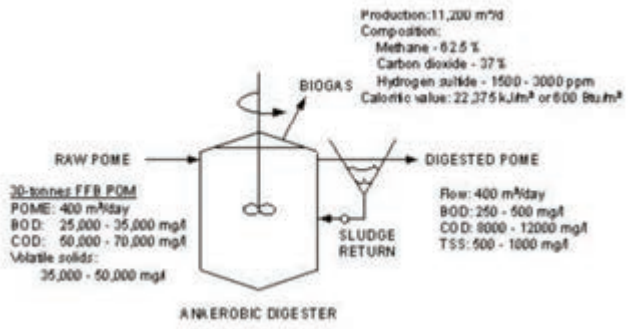

Figure 2: Continuous Stirred-Tank Reactor.
Source: Design Specification of the CSTR Anaerobic Digester of Keck Seng

The CSTR system is typically made of mild steel digester tanks with size and capacity in the range of 3,000 to 4,500m^3. Other alternative materials may include glass-fused-to-steel digester tank with double membrane gas holder installed on the roof. The covered lagoon digester system is equipped with gas-tight covers called geomembranes with internal mixing mechanisms. It has lower capital and operational expenditure compared with the closed-tank digester system.

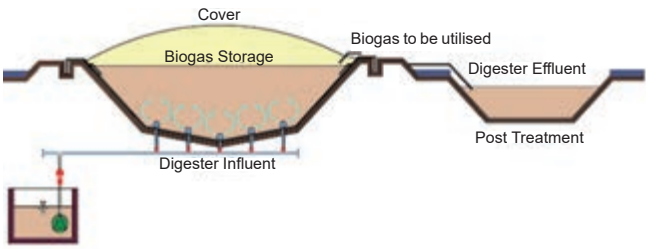

Figure 3: Covered Lagoon Digester. Source: Green Energy Network

The dry-fermentation biogas-based process is also known as the percolation process. The primary focus of this method is to digest dissolvable organics. This process is stackable and has no flowing of solid rich biomass without any pre-processing. It allows simple plant set-up with low capital and operational costs.

BIOGAS DEVELOPMENT IN MALAYSIA, CHALLENGES & OPPORTUNITIES

Malaysia is the second largest palm oil producer in the world, with 446 palm oil mills (as at March 2020) [7], and has huge potential for RE generation from Palm Oil Mill Effluent (POME). We have the potential to generate over 500MW of RE from biogas alone [8]. The biogas development here is driven primarily by biogas capture from POME and landfills. POME is a wastewater generated by the milling process of Crude Palm Oil (CPO) which has a high soluble organic content, and Biochemical Oxygen Demand/Chemical Oxygen Demand (BOD/COD) > 0.45 [6], making it an excellent feedstock for biogas production. Sanitary landfills from MSW can also capture significant amount of biogas due to the enormous amount of MSW being generated daily.

Malaysia currently has 69.45MW installed biogas capacity of commissioned RE installations under the FiT mechanism, with an additional 96.94MW approved and awaiting FiT commencement [9]. Introduced in 2011, FiT is one of the key drivers for biogas development where electricity generated from biogas fed into the utility grid gets a guaranteed tariff from the government and is funded via a 1.6% levy on electricity bills. In 2018, e-bidding mechanism for biogas was introduced to optimise the utilisation rate of the RE fund and, at the same time, made the market

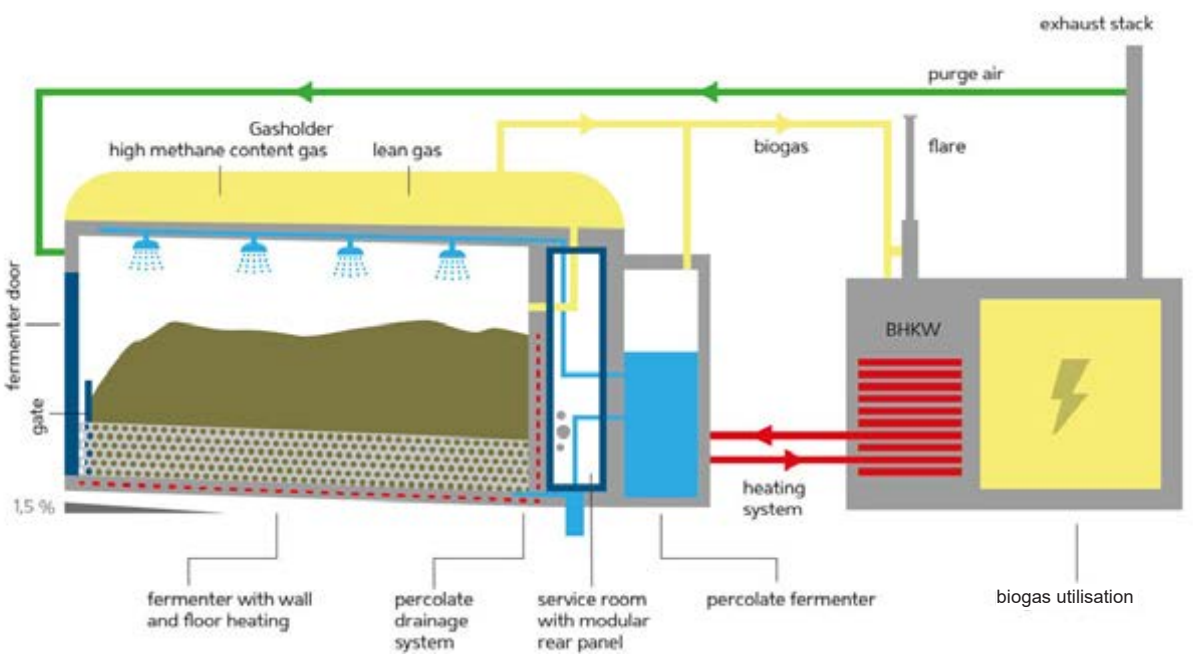

Figure 4: Dry-Fermentation Technology. Source: Bekon Technology

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more competitive. Project owners and developers of RE would also receive tax benefits such as exemption from income tax, Investment Tax Allowance, import and sales tax exemptions. Green Technology Financing Scheme and technology acquisition grants provide the necessary financial support to fund RE projects.

On the other hand, although the resources for biogas and biomass are abundant, the right mechanisms for production and incentives need to be put in place to drive the growth in this sector. Grid connectivity is one of the barriers of biogas development. Most palm oil mills are situated in remote areas and are not always connected to the grid or have low electricity demand in its surrounding rural areas. This means an inability to tap into the FiT scheme or have high investment costs to build the grid infrastructure.

The application of biogas has many advantages aside from combustion in biogas engines for electrical power generation to meet localised uses such as rural electrification or connecting to the utility power grid. Other applications include co-combustion in a biomass boiler to generate steam, combined heat and power (CHP) system, absorption chilling and many more.

Biogas can be further upgraded into natural gas quality known as Bio-Compressed Natural Gas (Bio-CNG). The raw biogas captured is treated using a combined biological and chemical process to reduce H_2S and CO_2 levels, further enriching the CH_4 content to more than 94% [10]. The Bio-CNG is then compressed and stored for dispensing to compressed natural gas trailers for distribution and utilisation (virtual pipeline) or injecting into the gas grid. However, lack of regulatory support and financial incentives for non-electricity utilisation of biogas hamper development work.

Challenges such as risks perceived by the private sector, utility power grid infrastructure (introducing smart microgrids and centralised networks), capacity building (training of competent personnel), diversifying feedstocks to include manure, food waste, sewage, and other agricultural residues such as rubber, rice, sugarcane, etc., financial institutions, national guidelines and standards can be further developed to support this. Regulations and policies can also be further strengthened to accelerate renewable energy advancement and development. Malaysia's focus on renewable energy requires a coordinated and concerted action from all relevant stakeholders and government agencies to tackle long-term environmental impacts of coal-fired power generation, increasing greenhouse gases (GHGs) emissions and detrimental effects of climate change. ■

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Authors' Biodata

Actively involved in the renewable energy sector, **Mr. Alex Looi Tink Huey** is the elected Committee Member of IEM Electrical Engineering Technical Division (EETD) and Chairman of Activities Organising Committee.

Ir. Dr Bhuvendhraa Rudrusamy is IEM Council Member, Bulletin Editor and Advisor of eETD. He lectures at the School of Engineering & Physical Sciences, Heriot-Watt University Malaysia.

AESTHETICALLY PLEASING YANWU BRIDGE

Ir. Ong Guan Hock

Ir. Ong Guan Hock *is a committee member of Standing Committee on Information & Publications.*

Yanwu Bridge is one of 58 road bridges found in Xiamen in China's Fujian Province. It is actually an elevated highway that forms part of Xiamen's ring road system and is located along the south-western corner of Xiamen island.

Construction of the 2.2km elevated highway began in late 2001 and it was opened to traffic in September 2003. The main deck of the bridge was deliberately designed at a low elevation relative to the water surface beneath it to minimise its impact on the surrounding coastal landscape. During high tide, the bridge is said to look like it's floating on the sea, with waves occasionally splashing against its sides.

For aesthetic considerations, there are also no lamp posts; street lighting is achieved by mounting lanterns directly on the bridge railing. ■

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ASEAN ELECTROTECHNICAL SYMPOSIUM & EXHIBITION 2019

by Ir. Tay Eng Chong

Building up on the success of the ASEAN Electrotechnical Symposium & Exhibition 2016 and 2018 in Kuala Lumpur, The Institution of Engineers, Malaysia (IEM), in collaboration with Standards Malaysia and Suruhanjaya Tenaga, organised the symposium in Georgetown, Penang, on 5 December 2019. This was the first time it was organised outside the Klang Valley.

The aim was to propagate and disseminate the latest information on electrical installation standards and regulations in buildings among ASEAN countries to the northern part of Peninsular Malaysia. A total of 139 participants registered for the symposium.

It started with a welcome speech by IEM Penang Branch Chairman Ir. Yau Ann Nian, followed by a speech by IEM President Ir. David Lai Kong Phooi. The symposium was then launched by Encik Hussalmizzar bin Hussain, Director of Accreditation, Standards Malaysia, who emphasised the importance of standards usage in Malaysia and globally. This was followed by a keynote speech by Mr. Dennis Chew, Director of IEC Asia-Pacific Regional Centre, who introduced the participants to the International Electrotechnical Commission (IEC). He encouraged technical experts in the audience to join the IEC working group and enhance their involvement in standardisation works.

After a short break, Ir. Yau Chau Fong, Chairperson of ASEAN Engineering Inspectorate – Electrical Installation (AEI-EI) presented a brief overview of ASEAN Federation of Engineering Organisations (AFEO) and ASEAN Engineering Inspectorate (AEI). The AEI-EI's long term objective is to work in line with the ASEAN initiatives of ASEAN Connectivity Blueprint 2025 and to initiate a Mutual Recognition Agreement for electrical installation works among ASEAN countries. This will ultimately lead towards harmonisation of ASEAN electrical installation standards and regulations. The current level of awareness on electrical installation standards among ASEAN Member States (AMS) is still relatively low and the majority are unaware of the AMS regulatory requirements.

In December 2018, AEI-EI published a feasibility study titled "White Paper on Electrical Installation Standards in Buildings among ASEAN Countries" to bring about greater awareness of AMS regulatory requirements. One key finding of the study was that 90% of AMS had adopted IEC standards as base standards.

At present, AEI-EI has established several technical subcommittees to review several key areas under IEC 60364 which include special location installation (IEC 60364-7), terms and definitions (IEC 60364-1), verification of electrical installations (IEC 60364-6), energy efficiency and prosumer (IEC 60364-8).

Then a forum was held to discuss the differences in the design requirements of electrical installations in special locations, especially in the bathroom and shower areas. For this, most Asean countries use IEC 60364-7-701 as the baseline standard. However, the Indonesian national standard has more stringent requirements than IEC 60364-7-701.

IEM President Ir. David Lai Kong Phooi making his speech

Group picture of participants and speakers at the symposium

In the afternoon, Ir. Simon Leong from Brunei talked about recommendations or guidelines for the definition of design, erection and verification of electrical installation among Asean countries and said there were still minor gaps and differences to be recognised. Then, Dr Florigo C. Varona spoke on the latest updates and developments of energy efficiency in The Philippines.

Last but not least, Ir. Francis Xavier Jacob and Ir. Lee Cheng Pay made presentations on the latest updates in energy efficiency and electrical installation code in Malaysia respectively. ■

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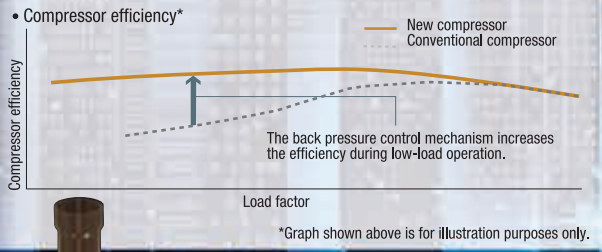
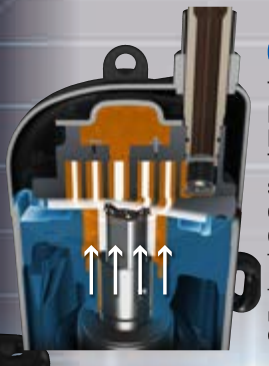


*Graph shown above is for illustration purposes only.

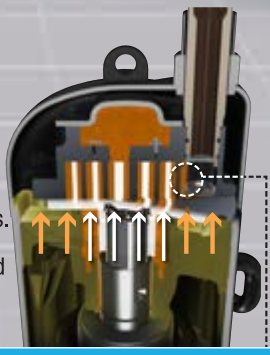
Back pressure control mechanism



Conventional mechanism

The movable scroll is pressed by the pressure difference between high and low pressures. The force pressing the movable scroll decreases during low-load operation, resulting in compression leakage from movable parts.

The force pressing the movable scroll decreases during low-load operation.



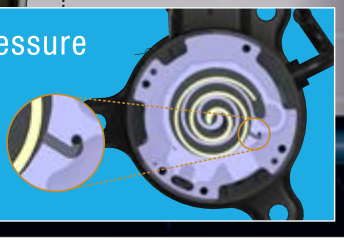
New intermediate pressure mechanism

The force pressing the movable scroll is optimised according to operating conditions. The behavior of the movable scroll has been stabilised to increase efficiency during low-load operation.

The intermediate pressure keeps pressing the movable scroll during low-load operation.

Intermediate pressure adjustment port

The intermediate pressure (back pressure) optimises the force pressing the movable scroll depending on the operating condition.



JOINT SEMINAR ON CONTROL & AUTOMATION (MALAYSIA AUTOMATION & CONTROL ALLIANCE)

by Ir. Dr Siow Chun Lim

The fourth wave of the Industrial Revolution has brought about an accelerated rate of automation sweeping across multiple sectors. With productivity and efficiency as the primary goals, industrial processes and activities have been increasingly automated, albeit at varying degrees.

Nonetheless, another equally important, if not more, expected benefit of automation is safety enhancement. With this in mind, IEM EETD organised a seminar on Control & Automation on 12 March 2020 at Wisma IEM, in collaboration with the International Society of Automation (ISA), the Institute of Measurement & Control (InstMC), IET and IEEE Control Systems Society (CSS).

Industrial experts who shared their knowledge and experiences at the seminar included Ir. V.R. Harindran, Ir. Johnson Tan, Encik Sharul Rashid, Mr. Darren Tay, Dr Chua Wen-Shyan and Assoc. Professor Dr Mohd Hezri Fazalul. The topics ranged from process safety, digitalisation in automation and controls, cyber security in industrial network, smart factory automation and the latest research trends in process control.

Ir. V.R. Harindran, the first speaker

The group of panelists

According to the World Economic Forum (Global Risks Report 2018), cyber-attacks would be among the top 5 risks to global stability over the next five years. The other 4 are natural disasters, extreme weather, data fraud and failure to address climate change.

So it is not surprising that cyber-security is an alarming issue in Industrial Control System (ICS). Cyber-security is defined as a group of measures to safeguard a computer system against unauthorised access which can also be in the form of hacking and attack through malicious software which includes viruses, ransomware, Trojan horses, worms and bots. To combat or prevent these cyber-threats, it is imperative that the management of ICS inculcates the culture of cyber-hygiene among the stakeholders. Cyber-hygiene covers best practices that users can undertake to improve their cyber-security while engaging in common online activities. These include firewalls, antivirus, pathing, strong

Group photo of all participants

passwords, safe browsing habits, safe email habits, strong encryption, back-up of data, management of portable media and disposal of cyber assets. Both Information Technology (IT) and Operation Technology (OT) should converge in terms of people, technology and process to ensure that cyber-security risks are optimally managed. Both security and availability of service should be of equal importance in an ICS environment.

There was a technical forum at the end of the seminar, moderated by Encik Sharul, with panelists Ir. V.R. Harindran, Ir. Dr Norhaliza Abdul Wahab, Ir. Amir Farid and Ir. Chong Chew Fan who represented industry and academia.

Control, instrumentation & measurement and automation systems are the key enablers of an unmanned, autonomous, seamless, remote and fully-integrated industry. The forum concluded by reinstating the importance of engineering professionals in fully realising the potential of automation of industry while keeping industrial safety in check at all times. ■

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MAGNETIC RESONANCE IMAGING SAFETY

by Ir. Shamila Ariaratnam

At 9 a.m. on 14 December 2019, 47 engineers from the various disciplines filled Auditorium Tan Sri Chin Fung Kee at Wisma IEM to listen to a talk on Magnetic Resonance Imaging (MRI) Safety.

The speakers were Mr. Steven Rajah Ponnampalam and Ir. Shamila Ariaratnam. Mr. Steven, Inspector of Works with the Board of Engineers Malaysia and a Qualified Technician with the Malaysia Board of Technologists, spoke first, followed by Ir. Shamila, a freelance Healthcare & Biomedical Engineering Consultant, Trainer & Auditor.

The talk started with the definition of MRI and participants were shown a schematic diagram of the principal components, equipment block diagram and inner workings of a MRI, magnetic fields and principle of physics of the MRI. An electromagnetic field is produced when the MRI coil spins. This electromagnetic field extends beyond the MRI scanner and attracts ferromagnetic metal objects. Nonetheless, the magnetic field exposure is reduced by constructing the MRI scanner within a Faraday cage.

In addition to health screening, patients who enter the MRI room are checked for any metal object they might be carrying. Medical devices brought into the MRI room must also be MRI compatible. Only radiologists or authorised radiographers can give permission for technical personnel to enter the MRI room to perform breakdown or maintenance services. These technical personnel will also have to adhere to basic safety measures when carrying out periodical maintenance.

Broadly, MRI safety can be categorised into two sections: That related to patient and/or healthcare providers and that related to image quality for clinical usefulness.

The first section concerns temperature – burn, nerve stimulation, noise, projectile effect, torsion & translation, shrapnel or metallic foreign bodies, presence of tattoos/permanent cosmetics, metallic piercings and jewellery, medical history, claustrophobia and emergency.

The second section concerns the metrics of image quality such as signal-to-noise ratio, geometric distortion, image uniformity, slice thickness, spatial resolution and spectroscopy performance.

For each safety concern, the cause and effect, method used to mitigate and the corresponding standards used to test and measure the compliance were presented in this talk. The general safety requirements, establishing safety zones and signages according to the fringe fields and MRI Procedure Screening Form for Patients are vital in preventing adverse events. The MRI Image quality is also of utmost importance.

Therefore, tests and measurements require physical laboratory studies to ensure good quality images are produced. This leads to the responsibility of the manufacturer and technical personnel. Related MRI standards were also discussed.

To conclude, the MRI environment presents a unique safety hazard that requires well-defined protocols, maintaining constant vigilance, up-to-date MRI guidelines and education to ensure the safest possible environment for patients, research participants, staff members and visitors. ■

Participants at the MRI safety talk

IEMNS PAYS COURTESY CALL ON SEREMBAN MAYOR

by Ir. Dr Oh Seong Por

Group picture (l-r): Ir. Chong Chee Yen, Ir. Hazlin bin Harun, Dato' Zazali bin Solehudin, Ir. Dr Oh Seong Por, Ir. Richard Khoo and Encik Sabarudin bin Sulaiman

On 20 January 2020, the capital of Negeri Sembilan, Seremban, was officially declared as bandaraya (city) by the Yang di-Pertuan Besar of Negeri Sembilan, Tuanku Muhriz ibni Almarhum Tuanku Munawir. Seremban is now administered by the Seremban City Council (Majlis Bandaraya Seremban) which was formed after the merging of Seremban and Nilai municipal councils on 1 January 2020. Seremban's first Mayor is Dato' Zazali bin Solehudin.

Although the Ministry of Housing & Local Government had approved the declaration of city status on 9 September 2009, it was deferred for over a decade due to infrastructure improvement, change of state government (PRU 14) and the relocation of the administration building to Forest Height. The change to city status has enhanced Seremban as the hub of the new growth corridor, Malaysia Vision Valley (MVV), identified as the extension to the Greater Kuala Lumpur conurbation. Seremban City and its capital covers an area of 959 sq. km. and has a population of over 700,000.

On 2 March 2020, Ir. Dr Oh Seong Por, chairman of The Institution of Engineers Malaysia Negeri Sembilan Branch or IEMNS, led a delegate comprising Ir. Hazlin bin Harun (Hon Secretary), Ir. Chong Chee Yen (Hon Treasurer) and Ir. Richard Khoo (Past Hon Treasurer) to pay a courtesy call to the Seremban Mayor's Office. Encik Sabaruddin bin Sulaiman, Director of the Engineering Department was also in attendance. We explained to the Mayor that IEM was a learned society that championed engineering to develop the nation and bring betterment to mankind.

We also briefed him on IEMNS activities such as technical training for young engineers and students, technical talks and visits to upgrade the competencies of practising engineers, conducting professional interviews to elevate candidates to become professional engineers and social activities with the community and agencies. We also talked about our intention to participate in state development plans.

Dato' Zazali was pleased with our activities and said the Seremban City Council will continue to uplift infrastructures which require engineering expertise. He thanked us for the courtesy visit and expressed cooperation with IEMNS in the near future. Ir. Dr Oh then presented a memento to Dato' Zazali at the end of the visit. ■

GRADUATING IN AN UNPRECEDENTED WAY

by Lim Chun Zhe

Julian Goh Hui May

Ir. Dr Bhuvendhraa Rudrusamy (Corresponding Author)

Life during the Movement Controlled Order (MCO) has definitely been exciting. Not too long ago, my peers and I had jokingly discussed the possibility of not having to attend classes physically and even obtaining a passing grade through "pass by catastrophe". Now, this remote possibility has become reality.

Initially, conducting online classes was the talk of the town, with the names of various communication platforms such as Zoom and Teams being frequently mentioned. Access to such platforms allowed students to attend classes in the comfort of their homes, increased flexibility in lecturer hours and reduced travel time. However, some students felt discouraged at having to participate in online classes due to the dissolution of the distinction between university time and private time. Some were also disappointed as they felt that the quality of education they received via online lectures was not be up to their expectations when compared to a real life campus experience.

Studying from home means communication is mostly done online. Phrases like "sorry, can you repeat that again?" have become standard responses at many online meetings or classes due to poor network connections.

Furthermore, the universities had canceled all laboratory sessions that significantly impacted most of the engineering students in completing the prototyping. The research team from various timezone find difficulties when opt to video conferencing to keep everyone accounted for.

Apart from that, work quality may also be affected as there are more distractions at home, such as pets, family members, television and even the bed. Some students find it a challenge to maintain self-discipline in order to retain focus on academics. When the university was open, students could study in the library where it was quiet. Replicating the same environment at home is equally important to improve the learning experience.

The pandemic has upturned traditional methods of examinations. Universities are frantically looking for solutions to evaluate a student's performance fairly. Having traditional examinations that mainly involve memorising engineering facts is no longer suitable as students can easily search for the answers online, while evaluation based on critical thinking and comprehensive solution generation is implementable through online exams. This may push educational reforms to shape the criteria by which students are assessed and which will allow universities to test pioneering evaluation methods.

Another mode of assessment, such as presentation-based assessment, is also conducted online. One of the key disparities between face-to-face and online presentation is the presence of eye contact, allowing the presenter to be more engaging with the examiner. For online presentations, students will have to find other alternatives to engage with the examiners, such as improving vocal delivery, use of informative animations, etc. Therefore, the transition to online presentations will provide students with a new experience in adapting to new methods where video conferencing across different countries will be a norm.

Some universities implemented a safety net by graduating with a similar class that was awarded last year and many welcomed the move. However, there are concerns that such methods of evaluation may impact the graduates' ability to find jobs or academic opportunities. Will employers feel that this batch of graduates does not have sufficient academic quality?

Graduation is a very important milestone for students to celebrate their hard-earned academic completion with loved ones. It concludes their education life and marks the start of their journey as a contributing member of society. The loss of such a pristine event has greatly saddened the heart of many. Some universities provide the option to postpone the graduation ceremony to a later date, but it will never be the same experience.

We are living through a most interesting time. Sir Issac Newton once referred to the time he spent in quarantine during the 1665 Great Plague of London as the "year of wonders". Let us do the same. ■

ROMANTICISM OF THE ANCIENT SILK ROAD

Ir. Chin Mee Poon

***Ir. Chin Mee Poon** is a retired civil engineer who derives a great deal of joy and satisfaction from travelling to different parts of the globe, capturing fascinating insights of the places and people he encounters and sharing his experiences with others through his photographs and writing.*

My first trip on the ancient Silk Road was in August 2001 when I joined a group of friends in retracing the footsteps of yesteryears' trade caravans from Urumqi, the capital of Xinjiang Uyghur Autonomous Region of China, all the way to Islamabad, the capital of Pakistan, cutting right across the great Taklamakan Desert, skirting the mighty Kunlun Mountain Range to reach Kashgar, and then following the Karakoram Highway over Khunjerab Pass into the extremely beautiful Hunza Valley deep in Karakoram Mountain Range in Pakistan-controlled Kashmir.

From the very moment I heard about this ancient trade road, the Silk Road had exerted an irresistible attraction for me. Its very name exuded a strong connotation of romanticism bequeathed by great travellers of the past who had set foot on it.

I have since visited other parts of the Silk Road. In March 2008, my wife and I spent 32 days exploring the Silk Road from Xian to Urumqi. Over 55 days in September to November 2010, we visited many old Silk Road cities in Iran and Turkey. In September 2011, we spent 35 days in Italy to visit Rome and many other cities. In November and December of the same year, we took 49 days to visit more old Silk Road cities in Central Asia and in May and June 2017, we spent 44 days in Bulgaria and Romania visiting yet more old Silk Road cities among other places.

Most people think of the ancient Silk Road as a single road extending westwards from Chang-an (present day Xian) to Rome, over a distance of about 6,500km. But the name Silk Road is really a misnomer in more ways than one. It is actually a network of roads between the East and the West which allowed not only commodities to move one way or the other but, more importantly, it also facilitated the propagation of knowledge, technologies, ideologies, cultures and religions over a very large area.

So when German geographer and explorer Ferdinand von Richtofen first gave this network of roads the moniker "die Silkenstrasse" (The Silk Road) in 1877, he created two misleading connotations: That there was only one road and that silk was the only commodity that mattered.

Silk was undoubtedly very precious to the westerners before they stole the secret of silk making from the Chinese[1], but many other equally valuable goods also moved along the routes, not necessarily between China and the West, but between countries along the way as well.

The roads forming the network not only ran in an east-west direction but north-south as well. This dense network of roads would have certainly taken a very long time to evolve. No single person or country could claim credit for its creation. Many of the roads passed through territories with very hostile climates or peoples, so traders plying the routes often faced tremendous risks of losing their goods and even their lives. Most confined their activities to a small section of the road, so a piece of silk would have gone through many hands before it reached the western market.

The great Tang Dynasty Buddhist monk, Xuan Zang of China, made a very long journey on the Silk Road from Chang-an to India to study Buddhism in early 7th century AD. More than 6 centuries later, Marco Polo of Venice followed his father and uncle to the Yuan Dynasty capital of present-day Beijing, also by way of the Silk Road. These two great travellers are rare examples of the very few people who succeeded in traversing the ancient Silk Road extensively.

The Silk Road began its decline with the start of the industrial revolution in Europe and when many countries became maritime powers which sent fleets of cargo ships out to ply the high seas. Today, the ancient Silk Road remains a symbol of bygone romanticism waiting for intrepid travellers to unearth its past glories. ■

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https://en.wikipedia.org/wiki/Smuggling_of_silkworm_eggs_into_the_Byzantine_Empire

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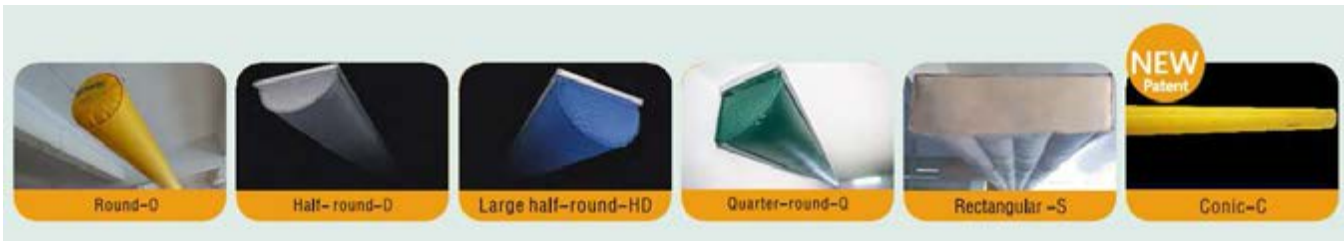

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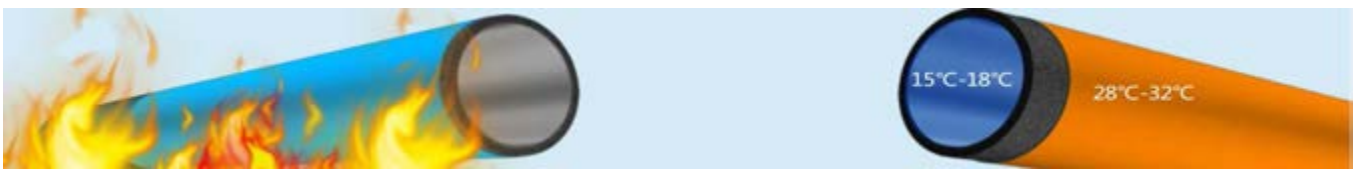

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KEAHLIAN

CONTINUATION FROM MAY ISSUE 2020

PERMOHONAN MENJADI AHLI 'COMPANION'

No. Ahli	Nama	Kelayakan
KEJURUTERAAN MEKANIKAL		
104302	AHMAD ZULHAIRIE BIN MUSTAFA	M.E.HONS.(ICL)(MECHANICAL, 2009)
105506	AMMAR BIN ZULKIFLI	B.E.HONS.(UPM)(MECHANICAL, 2009)
105509	HO HAO HANN	B.E.HONS.(UTM)(MECHANICAL, 2007)
104905	KRISHNA KUMAR	B.E.HONS.(MMU)(MECHANICAL, 2009)
104301	MOHAMAD HAMZAH BIN DAHLAN	B.E.HONS.(UTP)(MECHANICAL, 2007)
104276	SURESH A/L MUNUSAMY	B.E.HONS.(UTP)(MECHANICAL, 2006)
KEJURUTERAAN MEKATRONIK		
105511	SHUKRI B. KORAKKOTTIL KUNHI MOHD	B.E.HONS.(USM) (MECHATRONICS, 2006)

PERMINDAHAN KEPADA AHLI SISWAZAH

No. Ahli	Nama	Kelayakan
KEJURUTERAAN ALAM SEKITAR		
90226	GAN JIA MIN	B.E.HONS.(UTAR KAMPAR) (ENVIRONMENTAL, 2019)
52712	LEE YAN BIN	B.E.HONS.(UTAR) (ENVIRONMENTAL, 2016)
81044	LIM WOAN YIH	B.E.HONS.(UTAR) (ENVIRONMENTAL, 2016)
85551	NG JIE JIAN	B.E.HONS.(UTAR KAMPAR) (ENVIRONMENTAL, 2019)
72535	NG JIT JANG	B.E.HONS.(UTAR KAMPAR) (ENVIRONMENTAL, 2019)
74729	TAN SHI CHING	B.E.HONS.(UTAR KAMPAR) (ENVIRONMENTAL, 2019)
81880	TAY MING XIAN	B.E.HONS.(UTAR) (ENVIRONMENTAL, 2016)
KEJURUTERAAN AWAM		
56635	AHMAD FADHLI BIN ABDULLAH	B.E.HONS.(UiTM)(CIVIL, 2015)
69730	AIDA FATHIRAH BINTI MOHD FARIDZ	B.E.HONS.(UNIMAS)(CIVIL, 2017)
88575	AWANG AIMAN BIN AWANG AHMAD	B.E.HONS.(UCTS)(CIVIL, 2017)
77904	BERNARDINE BINTI BENEDICT SUNGGOH	B.E.HONS.(UNIMAS)(CIVIL, 2018)
77184	CHAN WAI KIT	B.E.HONS.(USM)(CIVIL, 2018)
84984	CHOW YONG JIN	B.E.HONS.(UTAR SG LONG) (CIVIL, 2019)
76983	CHUAH HOI CHING	B.E.HONS.(USM)(CIVIL, 2018)
54471	CYRILLA BINTANG ISSAC	B.E.HONS.(UiTM)(CIVIL-INSFRASTRUCTURE, 2014)
81145	DELANEY DEFFANNY DASING	B.E.HONS.(UMS)(CIVIL, 2018)
32954	DR NUR IZZATI BINTI AB RANI	B.E.HONS.(UiTM)(CIVIL, 2009) M.Sc.(UiTM)(CIVIL-CONSTRUCTION, 2012) PhD.(UTM)(2018)
47912	DR MAZLINA ZAIRA BINTI MOHAMMAD	B.E.HONS.(UiTM)(CIVIL, 2011) MBA.(UiTM)(2013) PhD.(ASIAN INST. OF TECH.) (2017)
22181	DR NOR AZLINA BINTI ALIAS	B.E.HONS.(UPM)(CIVIL, 2004) M.Sc.(UPM)(WATER RESOURCES, 2006) PhD.(UNITEN)(ENGINEERING, 2017)
43697	DR YIP CHUN CHIEH	B.E.HONS.(SWINBURNE UNI. OF TECH.)(CIVIL, 2012) M.E.(UTM) (CIVIL-STRUCTURE, 2014) PhD.(UTM)(CIVIL, 2018)
52179	EFFA NATRAH BINTI MOHAMAD RIDUAN	B.E.HONS.(UNIMAS)(CIVIL, 2016)
41664	FAUZUHANA BINTI ANAS	B.E.HONS.(UTHM)(CIVIL, 2012) M.E.(UPM)(HIGHWAY & TRANSPORTATION, 2013)
81367	GOH QIU YOU	B.E.HONS.(IUKL)(CIVIL, 2017)
81097	GOH SIEW FANG	B.E.HONS.(UMS)(CIVIL, 2018)
47485	HII CHU MEE, SAMUEL	B.E.HONS.(UKM)(CIVIL & STRUCTURAL, 2012)
88890	HII JUN HAO, KENNY	B.E.HONS.(SWINBURNE UNI. OF TECH.)(CIVIL, 2019)
94743	HONG YIN KIT	B.E.HONS.(UTAR SG LONG) (CIVIL, 2019)
80116	JASREENA KAUR A/P HARJIT SINGH	B.E.HONS.(UNITEN)(CIVIL, 2018)
63931	KEW YOU WEI	B.E.HONS.(UTHM)(CIVIL, 2017)
47498	KHAIRUL DANIAL BIN ABD LATIF	B.E.HONS.(UMP)(CIVIL, 2011)
94054	KHALIESA BINTI RAMLI	B.E.HONS.(UiTM)(CIVIL, 2017)
72317	KOH YI SHENG	B.E.HONS.(UTAR)(CIVIL, 2017)
68521	KUEH ZHEN HUA, DEAN	B.E.HONS.(MONASH)(CIVIL, 2017)
35921	LAI YUAN ZHEN	B.E.HONS.(UTM)(CIVIL, 2010)
81375	LEE DI SHEN	B.E.HONS.(IUKL)(CIVIL, 2017)
69703	LIM ENG CHUAN	B.E.HONS.(UTM)(CIVIL, 2017)
87306	LIM JIA-YOUNG, TIMOTHY	B.E.HONS.(MONASH UNI.) (CIVIL, 2018)
21119	LOH ENG KENG	B.E.HONS.(UTM) (CIVIL-CONSTRUCTION MANAGEMENT, 2001)
84733	LOH YONG CHIAT	B.E.HONS.(UNI. OF MALAYA) (CIVIL, 2016)
54792	LOW VEN SIANG	BE.HONS.(UTHM)(CIVIL, 2015)
87002	LOW WAI SHEN, GARY	B.E.HONS.(UTAR SG LONG) (CIVIL, 2019)
55745	MOHAMAD ZAID BIN MOHAMAD TRUDIN	B.E.HONS.(UNISEL)(CIVIL,2014)
68601	MOHD ASYRAF BIN ISMAIL	B.E.HONS.(UMS)(CIVIL, 2017)
63997	MOHD NOR AFANDI B. RAMANI	B.E.HONS.(UTHM)(CIVIL, 2016)
72787	MUHAMMAD ASYRAF B MOHD SYAZWAN	B.E.HONS.(UTP)(CIVIL, 2017)
84712	MUHAMMAD DANIEL BIN CHE MOHD NOOR	B.E.HONS.(UNI. OF MALAYA) (CIVIL, 2017)
72274	MUHAMMAD HABIB HANIS BIN BADRUL HISHAM	B.E.HONS.(IUKL)(CIVIL, 2016)
50974	MUHAMMAD NAZRIN SHAH BIN MOHD ASRI	B.E.HONS.(USM)(CIVIL, 2015)
56691	MUHAMMAD SYAZWAN BIN BAHARUM NASIR	B.E.HONS.(UiTM)(CIVIL-INFRASTRUCTURE, 2015)
69103	NIZAMUDDIN AZIM B. ZAHARY	B.E.HONS.(UiTM)(CIVIL, 2016)
64068	NOOR HASYIMAH BT. AWANG	B.E.HONS.(UTHM)(CIVIL, 2016)
32974	NOR IKHWAN BIN KHALID	B.E.HONS.(UTM)(CIVIL, 2009) M.E.(UTM)(CIVIL-TRANSPORTATION & HIGHWAY, 2011)
33266	NORDALILY BINTI AB LLAH	B.E.HONS.(UiTM)(CIVIL, 2009)
33171	NUR AIN BINTI ROSDI	B.E.HONS.(UiTM)(CIVIL, 2010)
89962	NUR NADHIRAH BT BASHIR AHAMED	B.E.HONS.(UiTM)(CIVIL, 2018)
40538	NUR SABRINA BINTI TOMIRAN	B.E.HONS.(UTM)(CIVIL, 2011) M.E.(UTM)(CIVIL-GEOTECHNICS, 2013)
69190	NUR SYA'FIQA BINTI JAMALUDDIN	B.E.HONS.(UiTM)(CIVIL, 2016) M.Sc.(UiTM)(ENVIRONMENTAL, 2018)
77113	NURFADHILAH AMIRAH BT CHE KAMARUDDIN	B.E.HONS.(UiTM)(CIVIL-INFRASTRUCTURE, 2016)
76405	OOI SHI YI	B.E.HONS.(UTHM)(CIVIL, 2018)
41960	RONZE BIN ROS AHMAD	B.E.HONS.(UTHM)(CIVIL, 2012)
40322	SITI FATIMAH BINTI MOHD SALEH	B.E.HONS.(UTM)(CIVIL, 2011)
56745	SITI SALBIAH BINTI MOHAMAD	B.E.HONS.(UiTM)(CIVIL-INFRASTRUCTURE, 2015)
67876	SYED MUHAMMAD BAHTHIAR BIN SYED OSMAN	B.E.HONS.(UiTM)(CIVIL, 2016) M.E.(UTM)(GEOTECHNICS, 2018)
69832	TAN CHOON HONG	B.E.HONS.(UNIMAS)(CIVIL, 2017)
33487	WALTER JANTING ANAK NGELAMBAI	B.E.HONS.(UiTM)(CIVIL, 2010)
80967	WONG CHOO ZEN, JOSHUA	B.E.HONS.(MONASH UNI.) (CIVIL, 2018)
KEJURUTERAAN BIO-PERUBATAN		
80396	HENG YEH TAT	B.E.HONS.(UTAR SG LONG) (BIOMEDICAL, 2019)
KEJURUTERAAN ELEKTRIKAL		
74011	AFEEFA ATHIRAH BINTI MUSA	B.E.HONS.(UiTM)(ELECTRICAL, 2018)
84827	AHMAD AZEEM IRHAM BIN AZMAN	B.E.HONS.(UiTM)(ELECTRICAL, 2017)
40676	AZYYATI BINTI OSMAN	B.E.HONS.(UTHM) (ELECTRICAL, 2010)
66513	KUHAN A/L ARUMUGASAMY	B.E.HONS.(MMU)(ELECTRICAL, 2017)
66517	LIM WEI HONG	B.E.HONS.(MMU)(ELECTRICAL, 2015)
62987	LING SUI FENG, LILY	B.E.HONS.(UTeM)(ELECTRICAL-CONTROL, INSTRUMENTATION & AUTOMATION, 2017)
55594	MOHAMMAD NAQIB 'IFWAT BIN ROSLI	B.E.HONS.(UTHM) (ELECTRICAL, 2016)
78229	MOHD NUBLAN HAKIMI BIN MOHD ASRI	B.E.HONS.(UiTM)(ELECTRICAL, 2016)
29307	MOHD RUZAIMI BIN MOHD ARIFFIN	B.E.HONS.(UMP) (ELECTRICAL-CONTROL & INSTRUMENTATIONS, 2008) M.E.M.(UPM)(ENGINEERING, 2016)
95766	ONG YING TEIK	B.E.HONS.(UNITEN) (ELECTRICAL & ELECTRONICS, 2017)
89280	TAN CHONG CHOOR, RAYMOND	B.E.HONS.(UTAR SG LONG) (ELECTRICAL & ELECTRONIC, 2019)
99332	WONG CHANG SHENG	B.E.HONS.(UCTS)(ELECTRICAL, 2018)
KEJURUTERAAN ELEKTRONIK		
76158	AHMAD ZA'IMUL UMAM BIN MUSTAFA KAMAL	B.E.HONS.(UTHM) (ELECTRONIC, 2018)
81101	CHAI MING CHENG	B.E.HONS.(UMS)(ELECTRONIC-COMPUTER, 2018)
25138	DG ZARINAH BINTI ABD RAZAK	B.E.HONS.(UiTM)(ELECTRICAL, 2007)
73312	EFFA ALYIA BINTI SAKDUN	B.E.HONS.(IUiTM) (ELECTRONICS, 2017)
90295	JONATHAN AARON HENDRIKS	B.E.HONS.(MMU) (ELECTRONICS -ROBOTICS & AUTOMATION, 2018)
73969	NOR BALQIS BT MOHD NOOR	B.E.HONS.(UiTM) (ELECTRONICS, 2017)
70192	RICK FALCO POLODIUS	B.E.HONS.(UNIMAS) (ELECTRONIC-TELECOMMUNICATIONS, 2017)
54641	RUSDIE BIN PADU	B.E.HONS.(UTHM) (ELECTRONIC, 2016)
56093	SITI NOR RAFIDAH BINTI MD SAAD	B.E.HONS.(UTHM) (ELECTRONIC, 2016)
30066	TAN EARN TZEH	B.E.HONS.(USM) (MECHATRONICS, 2011) M.Sc.(USM)(ELECTRICAL & ELECTRONIC, 2014)
KEJURUTERAAN KIMIA		
81320	ABDUL SYAKIR BIN ABDUL WAHAB	B.E.HONS.(UTM)(CHEMICAL PROCESS, 2018)
87010	CHAN KAI YIN	B.E.HONS.(UTAR SG LONG) (CHEMICAL, 2019)
85002	CHON WEN-XIAN	B.E.HONS.(UTAR SG LONG) (CHEMICAL, 2019)
74576	CHONG MIN YEE	B.E.HONS.(CURTIN UNI.) (CHEMICAL, 2018)
74631	FOONG KOK CHONG	B.E.HONS.(UTAR)(CHEMICAL, 2015)
78584	JAGATHEES KUMAR A/L SANNA MOORTHY	B.E.HONS.(UMP)(CHEMICAL, 2017)
99218	JEGADISH PADMANABHAN	B.E.HONS.(UTAR KAMPAR) (PETROCHEMICAL, 2019)
70070	KA JEN HAU, BRANDON	B.E.HONS.(UNIMAS) (CHEMICAL, 2017)
71030	KOI ZI KANG	B.E.HONS.(UTP)(CHEMICAL, 2018)
80382	LAW SER CHYEN	B.E.HONS.(UTAR SG LONG) (CHEMICAL, 2019)
72331	LOW KAR KING	B.E.HONS.(UTAR SG LONG) (CHEMICAL, 2019)
78028	LOW SHAO LUN	B.E.HONS.(UTAR SG LONG) (CHEMICAL, 2019)
71019	MOHANA A/P SUPPAYAH	B.E.HONS.(UTP)(CHEMICAL, 2018)
85353	PRAIMON A/L N JANAGARAJAN	B.E.HONS.(MIU UNI.) (CHEMICAL, 2018)
29421	TAN INN SHI	B.E.(UMP)(CHEMICAL, 2010)
74570	TANG KHAI WENG	B.E.HONS.(CURTIN UNI.) (CHEMICAL, 2017)
69463	TEY SU-YI	M.E.HONS.(THE UNI. OF NOTTINGHAM)(CHEMICAL, 2017)
96139	WONG WAN YING	B.E.HONS.(UTAR SG LONG) (CHEMICAL, 2019)
KEJURUTERAAN MEKANIKAL		
77501	'ABDUR RAHMAN BIN HAMID	B.E.HONS.(UTHM) (MECHANICAL,2015)
69847	AHMAD FAIQ WAFI B. AB. PATAH	B.E.HONS.(UTM)(MECHANICAL, 2017)
76973	AIDA FARZANA CHE HUSNI	B.E.HONS.(UiTM)(MECHANICAL-MANUFACTURING, 2017)
63536	AMMELINA DAYANA BT. MOHD FAZIL	B.E.HONS.(UTHM) (MECHANICAL, 2017)
69372	CHEW SHU REN	M.E.HONS.(UNI. OF NOTTINGHAM, MECHANICAL, 2017)
97780	CHUNG SU SAM	B.E.HONS.(QUT)(MECHANICAL, 2018)
65980	JULIANA OMAR BT. ABDULLAH	B.E.HONS.(UNISEL) (MECHANICAL, 2016)
97141	KEONG LE-ONN	B.E.HONS.(TAR UNI.COLL.) (MECHANICAL, 2018)
60707	KOH KELLY	B.E.HONS.(UTP)(MECHANICAL, 2017)
96156	KOON XUAN XIAO	B.E.HONS.(UTAR SG LONG) (MECHANICAL, 2019)
84986	LAI CHUN CHEN	B.E.HONS.(UTAR SG LONG) (MECHANICAL, 2019)
63603	LOW EE SOONG	B.E.HONS.(UTHM) (MECHANICAL, 2017)
63292	MOHAMAD AZIZUDDIN B. MOHD AZMAN	B.E.HONS.(UTeM) (MECHANICAL-DESIGN & INNOVATION, 2017)

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71003	MOHAMAD ROSMAN BIN MOHAMAD RAZIF	B.E.HONS.(UTP)(MECHANICAL, 2018)
30431	MOHD NOORHAFIZ BIN SHAHIDIN	B.E.HONS.(UiTM)(MECHANICAL, 2010)
75683	MUHAMMAD HAZMAN BIN ABD AZIZ	B.E.HONS.(UiTM)(MECHANICAL, 2018)
32263	NIK MOHD HANIF BIN NIK ALWI	B.E.HONS.(UTeM)(MECHANICAL-STRUCTURE & MATERIAL, 2009)
69993	PHILLIP MAPANG ANAK ANGKING	B.E.HONS.(UNIMAS)(MECHANICAL & MANUFACTURING, 2017)
86931	PRYA SUTHAN A/L SATHIANANTHAN	B.E.HONS.(UKM)(MECHANICAL, 2016)
77596	SHARON GELINGIE ANAK ELECTS	B.E.HONS.(UNIMAS)(MECHANICAL,2018)
32261	SYED HAMZAH BIN SYED OTHMAN	B.E.HONS.(UTeM)(MECHANICAL-STRUCTURE & MATERIALS, 2008)
66661	TAN SHIM SHEN	BE.HONS.(UNITEN)(MECHANICAL, 2016)
51893	TEO KOK ENG	B.E.HONS.(UNIMAS)(MECHANICAL & MANUFACTURING, 2015)
63848	THARMARAJ A/L SREEDHARAN	B.E.HONS.(UTHM)(MECHANICAL, 2017)
89077	UMASUTHAN A/L JANASEKKER	B.E.HONS.(MONASH UNI.)(MECHANICAL, 2018)
67753	WAN MUHAMAD ANIQ AIMAN BIN W ZAINUDDIN	B.E.HONS.(UiTM)(MECHANICAL,2017)

KEJURUTERAAN MEKATRONIK

50085	LOH YUEN PENG	B.E.HONS.(UCSI)(MECHATRONICS, 2013)
63035	MOHD RIDZWAN SHAH BIN MAROT	B.E.HONS.(UTeM)(MECHATRONICS, 2018)
88907	TAN YEW JIN	B.E.HONS.(UTAR)(MECHATRONICS, 2018)
80301	YAP YUAN PING	B.E.HONS.(UTAR SG LONG)(MECHATRONICS, 2019)

KEJURUTERAAN MIKROELEKTRONIK

53222	MOHD ASRAF BIN HARON	BE.HONS.(UniMAP)(MICROELECTRONICS, 2012)

KEJURUTERAAN PEMBUATAN

96147	FOO TEE WEI	B.E.HONS.(UTAR SG LONG)(MATERIALS & MANUFACTURING, 2019)
64314	LAU SIE CHIEK, JEREMY	B.E.HONS.(UTeM)(MANUFACTURING-ROBOTICS & AUTOMATION, 2017)
48171	MUHAMMAD HARITH BIN ABDUL KADIR	B.E.HONS.(UKM)(MANUFACTURING, 2012)
69632	MUHAMMAD NOOR FAHMY MAULA FAZARNDIR	B.E.HONS.(UKM)(MANUFACTURING, 2018)
62153	NG QI MUN	B.E.HONS.(UTeM)(MANUFACTURING-MANUFACTURING MANAGEMENT, 2016)

KEJURUTERAAN PERTANIAN

41446	LEONG KAH CHYE	B.E.HONS.(UPM) AGRICULTURAL & BIOSYSTEM, 2013)

KEJURUTERAAN PETROLEUM

68536	POON CHEE HIM	B.E.HONS.(UTP)(PETROLEUM, 2018)

PERMOHONAN MENJADI AHLI SISWAZAH

No. Ahli	Nama	Kelayakan

KEJURUTERAAN AEROANGKASA

105597	MUHAMMAD ZAKWAN BIN HISAMMUDDIN	B.E.HONS.(IIUM)(AEROSPACE, 2018)

KEJURUTERAAN ALAM SEKITAR

104325	KHAW EU HAN	B.E.HONS.(UTAR KAMPAR)(ENVIRONMENTAL, 2019)
104870	LAI LI SZE	B.E.HONS.(UniMAP)(ENVIRONMENTAL, 2012)

KEJURUTERAAN AWAM

105608	AHMAD SULAIMAN BIN MOHAMAD	B.E.HONS.(USM)(CIVIL, 2015)
105626	ALYSSA HEERA ASING	B.E.HONS.(UTM)(CIVIL, 2018)
105607	AMIRAH NABIHAH BINTI ISMAIL	B.E.HONS.(UTM)(CIVIL, 2018)
105520	AMIRAH SHAHIRAH BINTI SHAMSUL BAHRIN	B.E.HONS.(UNI. OF MALAYA)(CIVIL, 2016)
105256	ANG WEI XIAN	M.E.HONS.(THE UNI. OF NOTTINGHAM)(CIVIL, 2018)
105665	ARIF BIN MOHD DANI	B.E.HONS.(UiTM)(CIVIL, 2016)
104288	AZRIN HELMI BIN MOHD GHAZALI	B.E.HONS.(UiTM)(CIVIL, 2009)
104306	CHEN CHO' LIN, JOSEPH	B.E.HONS.(SWINBURNE UNI. OF TECH.)(CIVIL, 2014)
105249	CHEW ZHAO YIN	M.E.HONS.(THE UNI. OF NOTTINGHAM)(CIVIL, 2019)
105244	CHIN CHUNG WEI	B.E.HONS.(UTAR)(CIVIL, 2012)
104844	CHIONG SWEE KAK	B.E.HONS.(UTHM)(CIVIL, 2013)
105519	CHONG YEE ZHENG, CLEMENT	B.E.HONS.(CURTIN UNI. OF TECH.)(CIVIL & CONSTRUCTION, 2015)
104908	CHOOI YONG HOW	B.E.HONS.(UTM)(CIVIL, 2016)
105638	DARVINTHAREN A/L GOVINDASAMY	B.E.HONS.(USM)(CIVIL, 2018)
105242	DR FONG WEN JING, DICKSON	M.E.HONS.(THE UNI. OF NOTTINGHAM)(CIVIL, 2013) PhD.(THE UNI. OF NOTTINGHAM)(2018)
105265	DR HUZAIFA BIN HASHIM	B.E.HONS.(UTM)(CIVIL, 2008) M.E.Sc.(UNI. OF MALAYA)(STRUCTURAL, 2011) PhD.(UNI. OF MALAYA)(2017)
105663	DR LEONG KAH HON	B.E.HONS.(UTHM)(CIVIL, 2009) PhD.(UNI. OF MALAYA)(2015)
105266	DR SHIN TO AMIRI	B.E.(ISLAMIC AZAD UNI.)(CIVIL, 2010) M.E.(UTM)(CIVIL-GEOTECHNICS, 2012) PhD.(UTM)(CIVIL, 2018)
105653	FOO DUN YU	B.Sc.(TH EOHIO STATE UNI.)(CIVIL, 2018)
104871	HAMDI BIN MOHAMAD AZIZ	B.E.HONS.(UTM)(CIVIL, 1989)
104290	JAUHAR NAFIS BIN JOHARI	B.E.HONS.(UiTM)(CIVIL, 2012)
105592	KHAIRUL NIZAM BIN BERAHIM @ IBRAHIM	B.E.HONS.(UTM)(CIVIL, 1997)
105525	KHAIRUNNISA BINTI KAMDI	B.E.HONS.(UNI. OF MALAYA)(CIVIL, 2016)
105233	KONG YIT PIN	B.E.HONS.(UNI. OF MALAYA)(CIVIL, 2008)
104607	LACHMI SRI A/P MANOHARAN	B.E.HONS.(UTP)(CIVIL, 2016)
104916	LAM WEN QIAN	M.E.HONS.(THE UNI. OF NOTTINGHAM)(CIVIL, 2018)
104299	LAU ZHEN XIANG	M.E.HONS.(UNI. OF NOTTINGHAM)(CIVIL, 2013)
105603	LEE JIAN HAN	M.E.HONS.(THE UNI. OF NOTTINGHAM)(CIVIL, 2019)
105610	LEE KIM LOONG	B.E.HONS.(IUKL)(CIVIL, 2016)
104309	LEE TZE YEI	B.E.HONS.(UNI. OF NOTTINGHAM)(CIVIL, 2013) M.Sc.(HERIOT WATT UNI.)(CIVIL ENGINEERING & CONSTRUCTION MANAGEMENT, 2017)
104277	LIEW WEI CHERN	B.E.HONS.(UTAR)(CIVIL, 2016)
105667	LIEW ZHEN MIN, EDMUND	B.E.HONS.(UCSI UNI.)(CIVIL, 2018)
105254	LIM FU HWI	B.E.HONS.(UPM)(CIVIL, 2018)
105516	LOH WEI KIEN	B.E.HONS.(UKM)(CIVIL & STRUCTURAL, 2018)
105235	LOH ZHI PIN	B.E.HONS.(UNI. OF MALAYA)(CIVIL, 2017)
105523	MEGAT MUS'AB BIN MEGAT JOHARI	B.E.HONS.(UPM)(CIVIL, 2016)
104602	MOHAMAD AFIZI BIN JAMADIN	B.E.HONS.(UiTM)(CIVIL, 2009)
104614	MOHAMMAD MOKHSEN BIN HAMZAH@MD. JAN	B.E.HONS.(UiTM)(CIVIL, 2012)
105601	MOHAMMAD SYAZWAN BIN MOHD AYOB	B.E.HONS.(UiTM)(CIVIL, 2012)
105238	MOHD FADIL BIN HUSHIN	B.E.HONS.(UTM)(CIVIL-CONSTRUCTION MANAGEMENT, 2006)
105618	MOHD FAIRUZ BIN TAHA	B.E.HONS.(UTM)(CIVIL, 2015)
105633	MOHD HARIS BIN HAMIZAN	B.E.HONS.(KLIUC)(CIVIL, 2010)
105248	MOHD ZAHIR BIN SALLEH	B.E.HONS.(UTHM)(CIVIL, 2008)
105591	MUHAMMAD IZZAT BIN NOOR EZZUDDIN	B.E.HONS.(UNITEN)(CIVIL, 2015)
105590	MUHAMMAD MUSLIM BIN RAMLE	B.E.HONS.(UMP)(CIVIL, 2012)
104304	MUHAMMAD SHAFIQ AIMAN BIN AHMRAN	B.E.HONS.(UniMAP)(CIVIL, 2015)
105522	NABIL FIKRI BIN MOHD. NADZMI	B.E.HONS.(UiTM)(CIVIL, 2014)
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Date : 4 June 2020 (Thursday)
Time : 10.00 a.m. – 11.30 a.m.
Venue : Wisma IEM, 17- GoTo Webinar
Approved CPD : 0
Speaker : Ir. Dr Tan Chee Fai

WEBINAR - Managing Production Operations for Offshore Facilities

Date : 13 June 2020 (Saturday)
Time : 9.00 a.m. – 11.00 a.m.
Venue : Online Platform
Approved CPD : 0
Speaker : Ir. Johan Adam Leong

Pengumuman yang ke-139

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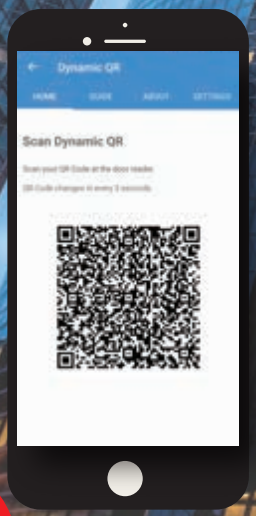

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