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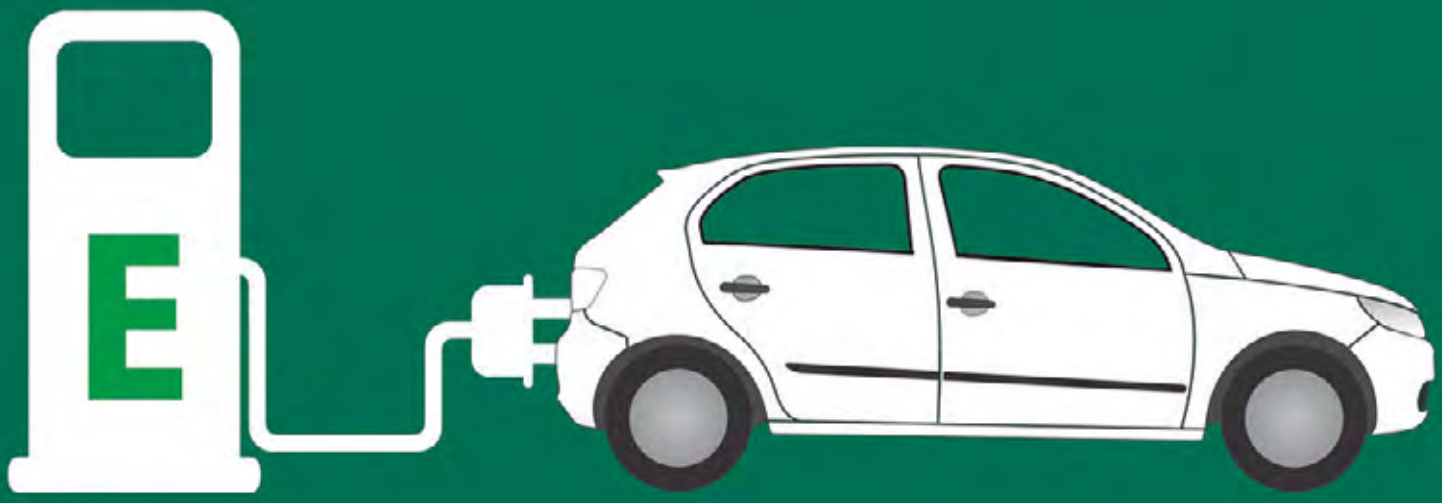

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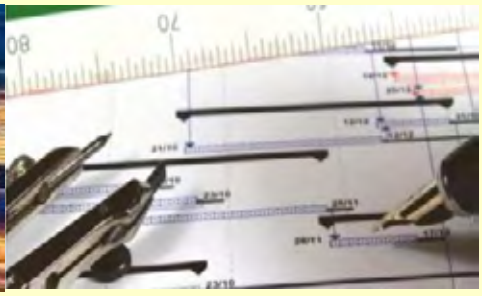

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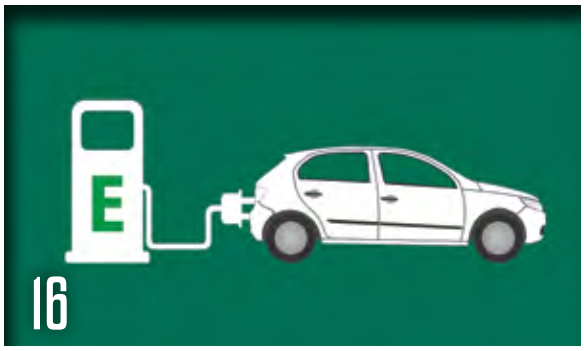
CONTENTS

FEATURES



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SUSTAINABILITY

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NUS PROFESSOR RECEIVES INTERNATIONAL AWARD FOR RESEARCH IN NANOSCIENCE AND NANOMEDICINE

Professor Liu Bin, Vice President (Research and Technology), National University of Singapore (NUS), was awarded the Kabiller Young Investigator's Award in Nanoscience and Nanomedicine, said the university in an announcement made recently.

Professor Liu Bin

She was recognised for the development of nanoparticle probes for enhancing biomedical imaging capabilities and tracking disease.

These include the development of water-dispersible polyfluorenes for DNA sensing, the development of molecular and nanoparticle probes for monitoring cancer metastasis and tissue regeneration, and the development of strategies to track the delivery of nanomedicine at the cellular level.

"I am deeply honoured to receive this award. I would like to take this opportunity to thank my research team and collaborators and all those who have supported and inspired me through my career so far. I am also very grateful to the National University of Singapore for nurturing me and supporting my research career", said Prof Liu.

Prof Liu's research focuses on multidisciplinary collaborative projects that find practical solutions for disease diagnosis and treatment, such as the development of brain-tumour-specific imaging agents for tumour identification and image-guided surgery.

Her team also develops organic molecules for one-photon or multi-photon imaging and photodynamic therapy, and designs reactivity-based probes to differentiate between various chemical species in biological systems. Prof Liu co-founded Luminicell, an NUS spin-off company that offers the next generation of imaging reagents for the biomedical community.

Prof Liu, who is also NUS Provost's Chair Professor and Head of the NUS Department of Chemical and Biomolecular Engineering, has published more than 450 articles with over 41,000 citations.

Previously, in June, Prof Liu also received the Royal Society of Chemistry's Centenary Prize and Medal. She was honoured for her work in the innovative design and synthesis of organic molecules and nanomaterials to advance biomedical research and applications, as well as for excellence in communication.

She has also received the ACS Nano Lectureship by the American Chemical Society (2019), and the Materials in Society Lectureship (2015) by Elsevier.

Established in 2015, the Kabiller Prize and Awards are given out by Northwestern University and the International Institute for Nanotechnology, USA.

Every two years, an independent committee of renowned scientists picks three top scholars – one pioneer, one young investigator and one rising star – in the field of nanoscience and nanomedicine.

Evonik invests in Singapore organ-on-a-chip start-up

German specialty chemicals company Evonik has invested in local start-up, Revivo BioSystems, to support the development and commercialisation of a technology that uses a realistic 4D model of human skin for the testing of chemical, cosmetic and pharmaceutical compounds. The start-up's technology provides an alternative to animal testing that is also quicker, more reliable and cost-efficient.

Revivo's organ-on-a-chip system simulates the interaction of human skin with the substance being tested. Skin tissues, which have been grown in a laboratory or a human skin sample, are placed on biochips which are supplied with nutrients and reagents.

In this way, the technology creates a micro-environment for the tissue models which reproduce the architecture and functions of skin.

In contrast to other model systems, it mimics the function of blood flow, allowing for analysis of both the localised and the systemic impact of compounds on the skin tissue. The platform thus creates a more realistic measurement of the interaction of, for example, skin care products with the skin.

In addition to testing under realistic conditions, the company's system automates testing and sampling procedures. This provides a cost-effective way of carrying out screenings that are required in the regulatory approval procedures for new substances.

Revivo is a spin-off of A*STAR (Agency for Science, Technology and Research). A co-investor is SGInnovate, a Deep Tech ecosystem builder and investor, backed by the Singapore Government.

COP26 SIGNALS ACCELERATED

ZERO CARBON INVESTMENT DRIVE

Commitments confirmed in advance and during COP26 in Glasgow have accelerated investment towards net zero emissions. Stronger policies and 2030 targets are still required to unlock the trillions of dollars required to avoid the worst impact of climate change.

"Global warming of above 1.5° C presents irreversible, foreseeable and large-scale risks to investors and financial markets. The commitments that have come out ahead and as part of Glasgow have been significant but global action is still falling short", said Ms Rebecca Mikula-Wright, Chief Executive Officer of the Investor Group on Climate Change (IGCC).

"The net zero emissions transition is inevitable and already underway, and investors want to seize the enormous investment opportunities, worth trillions of dollars, that will be created. There is a huge opportunity to create new jobs and boost economic growth, but only for those countries that get ahead of the curve. Across Asia, Australia and New Zealand, we call on governments to commit to clear and strong 2030 climate policies that will unlock the capital needed to transition to a net zero economy", she added.

At COP 26, commitments were also made to reduce methane emissions, phase down coal, reduce deforestation and support global carbon markets.

"Global capital is ready to deploy trillions to the zero emissions transition, but more governments need to provide clarity and back up their 2050 commitments with stronger 2030 targets", Ms Mikula-Wright said.

GE CELEBRATES 40 YEARS OF CONTRIBUTION TO SINGAPORE'S AEROSPACE INDUSTRY

GE Aviation celebrated its 40 years of operations in Singapore, recently. To commemorate this milestone, GE Aviation Engine Services Singapore (GE AESS) announced that it is the first Maintenance, Repair and Overhaul (MRO) facility in the world to implement new additive manufacturing technology for the repair of commercial jet engine airfoil components.

The new technology was co-developed by local GE AESS engineers, together with GE Aviation Additive Manufacturing Technology Centers. By using this technology, repair work can be done significantly faster than with conventional repair techniques, with twice as many jet engine parts repaired daily, enabling customers' aircraft to take to the skies again in a shorter period of time.

"GE AESS has played an instrumental role in GE Aviation's Component Repair strategy for the past four decades and continues this tradition with the use of additive technologies in component repair. The use of additive technologies enables improved turnaround time, which will be a game-changer for this site and our customers. I look forward to many more years of new innovations from our GE AESS team", said Mr Russell Stokes, President and Chief Executive Officer of GE Aviation Services.

"GE Aviation Services Singapore has been a leading facility for engine maintenance, repair and overhaul for the past 40 years and will continue to be a critical support centre for the aviation industry's multi-year recovery", said Mr Iain Rodger, Managing Director, GE Aviation, Singapore.

"We anticipate that the growth opportunities in additive manufacturing, digitalisation, automation & robotics, advanced technology research, and sustainability for aviation, will drive the creation of more than 300 new jobs in 2022. We are also committed to investing in our people to develop their skills and expanding next-generation capabilities essential to a transformed travel landscape that demands improved efficiency and sustainability", he added.

Mr Gan Kim Yong, Minister for Trade and Industry, Singapore, graced the 40th anniversary celebration at the GE AESS facility in Loyang.

GE AESS was established in 1981 and is a leading aircraft engine component repair facility serving customers around the world. In addition, it now has a manufacturing facility producing aircraft components for the GE90 and GE9X commercial jet engines. Employing more than 1,700 skilled engineers, technicians and professionals, GE AESS supports more than 100 key global customers, including Singapore Airlines Group, ST Engineering Aerospace and BOC Aviation.

Mr Gan Kim Yong, Minister for Trade and Industry, Singapore (centre), being briefed on the application of additive repair technology for aircraft components, at the GE Aviation Engine Services Singapore facility in Loyang.

With support from various government agencies, GE Aviation continues to train and develop local engineering talent in current and future automation technologies including automation, robotics and additive manufacturing, that will empower new levels of productivity and efficiency.

Mr Lim Tse Yong, Vice President and Head of Conglomerates for the Singapore Economic Development Board (EDB), said, "Congratulations to GE Aviation on its 40th anniversary in Singapore. This partnership is testimony to Singapore's position as a leading aerospace hub for high value-added manufacturing and MRO activities. We will continue to work with our industry partners to develop and harness technologies to ensure their Singapore facilities are best-in-class, as well as invest in our people to equip them with the relevant skills. We thank GE Aviation for its continued confidence in Singapore and look forward to deepening our partnership in the many years to come".

Dr Ho Chaw Sing, Co-Founder and Managing Director of NAMIC (National Additive Manufacturing Innovation Cluster), said, "I want to congratulate GE Aviation for achieving this significant milestone. Manufacturing innovation is key to a thriving aviation sector, especially with increased global supply chain disruptions caused by black swan events. Singapore has continued to invest in deep capabilities and talents to drive competitive advantages and cement its position as Asia's leading MRO hub. Beyond GE's leading role in the aviation industry, this breakthrough is a testament to the continued strong relations between businesses and public agencies, resulting in accelerating and implementing innovation, with the adoption of additive manufacturing technologies".

CDL RECEIVES PRESTIGIOUS TERRA CARTA SEAL

Leading Singapore real estate developer, City Developments Limited (CDL), was awarded the inaugural 2021 Terra Carta Seal on 3 November 2021 by His Royal Highness (HRH) The Prince of Wales through his Sustainable Markets Initiative. CDL is the only Singapore company out of 45 global companies to be awarded the seal. This recognition is given to companies whose ambitions are aligned with those of the Terra Carta – a charter that provides a recovery plan for Nature, People and the Planet. It also recognises companies who hold leadership positions within their industries and who have credible transition roadmaps underpinned by globally recognised, scientific metrics for achieving net zero by 2050 or earlier.

HRH The Prince of Wales said, "The Terra Carta Seal recognises those organisations which have made a serious commitment to a future that is much more sustainable, and puts Nature, People and the Planet at the heart of the economy. We all need to make changes if we are to preserve the planet for our children and grandchildren and these businesses have pledged to make it easier for us all to do so".

Mr Sherman Kwek, CDL Group Chief Executive Officer, said, "CDL is deeply honoured to receive the Terra Carta Seal from HRH The Prince of Wales. We share the same commitment to connect People and the Planet through recognising and promoting the intrinsic value of Nature. In this decade of urgent action, we will continue to push forward with our ESG integration efforts to enhance the value and resilience of our business".

INFINEON ANNOUNCES COLLABORATION

WITH TWO ASIAN INDUSTRY TITANS

Infineon Technologies, a world leader in semiconductor solutions, recently announced separate collaborations with Asian industry leaders, CapitaLand Investment and Hyundai Motor Group, to empower startups in Asia to develop innovations in sustainability, future mobility, smart cities and smart factory.

"This is the first time that Infineon is collaborating with the two titans of the industry to empower our communities of startups to deliver innovations that can make life easier, safer and greener. We welcome CapitaLand Investment and Hyundai Motor Group into our Asia Pacific innovation ecosystem. Together, we aim to inspire new electrification and digitalisation solutions that address real-world challenges and make the world a better place for all", said Mr Chua Chee Seong, President and Managing Director, Infineon Technologies Asia Pacific.

CapitaLand Investment's Smart Urban Co-Innovation Lab will spearhead the collaboration with Infineon. The lab is Southeast Asia's first industry-led platform, focused on smart cities solutions, that brings together leaders across various industries, to catalyse co-innovation communities and seed new market opportunities, leveraging Singapore Science Park as a living lab. Infineon will work with startups on innovations for sustainability such as in energy management and urban farming. Additionally, Infineon and the lab are keen to bring communities of startups together to inspire innovations for a better world. These will involve sustainability-themed engagements such as workshops, technology demos or networking sessions.

The Smart Urban Co-Innovation Lab is led by CapitaLand Investment and supported by Ascendas Real Estate Investment Trust, Infocomm Media Development Authority and Enterprise Singapore.

With Hyundai, a global corporation with a value chain based on automobiles, steel, construction, logistics, finance, IT and service, Infineon aims to empower startups with innovations in future mobility, smart cities and smart factory. Startups selected by Hyundai and Infineon will be offered the opportunity to be located in Infineon's Co-Innovation Space in Singapore. Subsequently, the collaboration will also be expanded globally.

Infineon has a strong track record of successfully empowering startups at its Co-Innovation Space, where its experts provide insights and guidance on systems engineering, chip and system design, business innovation and design thinking. Infineon experts help startups improve the quality, reliability, performance and value of their products for real-world applications.

Startups have 'graduated' from the Co-Innovation Space which was established in 2018, with some showcasing their innovations at Infineon's OktoberTech Asia Pacific in 2021. OktoberTech Asia Pacific is an annual symposium for corporate innovators, startups, academics, investors and policy makers.

After the signing of the Infineon-CapitaLand Investment MoU, from left, Mr Chua Chee Seong, President and Managing Director, Infineon Technologies Asia Pacific; Mr Rohit Girdhar, Vice President, Strategy and M&A, Infineon Technologies Asia Pacific; Mr Gan Kim Yong, Minister for Trade and Industry, Singapore; Mr Alwyn Tan, Chief Customer Solutions Officer, CapitaLand Investment; and Dr Helmut Gassel, Chief Marketing Officer and Member of the Management Board, Infineon Technologies AG.

After the signing of the Infineon-Hyundai Motor Group MoU, from left, Mr Chua Chee Seong, President and Managing Director, Infineon Technologies Asia Pacific; Mr Lee Seung Soo, Vice President and Managing Director, Infineon Korea; Mr Gan Kim Yong, Minister for Trade and Industry, Singapore; Dr Hwang Yun Seong, Vice President, Head of Open Innovation Investment Group, Hyundai Motor Group; and Dr Helmut Gassel, Chief Marketing Officer and Member of the Management Board, Infineon Technologies AG.

Mr Gan Kim Yong, Minister for Trade and Industry, Singapore, was the Guest-of-Honour while Dr Helmut Gassel, Chief Marketing Officer at Infineon, delivered the keynote speech at this year's symposium, a hybrid event with global and regional experts speaking on topics relating to Innovation for Sustainability.

Infineon has made Singapore its Asia Pacific base for more than 50 years, investing SGD 700 million over the past decade. Singapore has become the lead site for the company's smart factory solutions development and the global test hub for automotive microcontroller units. It is also a key node for the global distribution of Infineon's products and one of the major microelectronics R&D centres in Asia.

CUNDALL APPOINTS NEW HEAD OF

LIGHTING DESIGN TEAM IN SINGAPORE

International multi-disciplinary engineering consultancy, Cundall, has expanded its services in Singapore, to include Specialist Lighting Design, with the appointment of Matt Marshall as Head of Cundall Light4 in Singapore to lead the service. Cundall Light4 is now represented in Hong Kong, Sydney and Singapore.

With over 20 years' in the lighting industry, Mr Marshall has built a wealth of experience in lighting design, project management, illumination engineering and creative lighting design. In his new role, he will be developing Cundall's lighting design offering for new and existing clients in Singapore and in the region.

Mr Andrew Bissell, who leads the lighting design team globally, said, "Our global team has delivered many innovative projects and it is great to have Matt to provide the same high-quality architectural lighting design artistry and exceptional service but with a local touch".

Mr Matt Marshall

Mr Marcus Eckersley, Director, Cundall Singapore said, "Having just moved to a larger office in the prestigious 111 Somerset complex, we have set ourselves an ambition growth plan – to increase our headcount by 50%. With Matt leading our Lighting Design, we continue to diversify and expand our offering, adding value to our clients".

GRUNDFOS PARTNERS WITH SINGAPORE POLYTECHNIC

TO DEVELOP SMART SUSTAINABLE SOLUTIONS FOR INDUSTRIES

Grundfos, a global leader in advanced pump solutions and water technology, has signed a Memorandum of Understanding (MoU) with Singapore Polytechnic (SP) to co-develop energy- and water-efficient smart solutions that support industries in Singapore, in their journey towards sustainability, through collaboration, talent development, and sustainability education.

After the signing of the MoU, from left to right, Mr Eric Lai, Regional Managing Director for Industry APAC and Country Director, Singapore, Grundfos; Mr Humphrey Lau, Group Senior Vice President of Global Industry Sales, Grundfos; Ms Georgina Phua, Deputy Principal (Development), Singapore Polytechnic; and Mr Loh Yew Chiong, Senior Director, Computing, Chemical & Life Sciences Cluster, Singapore Polytechnic.

The partnership will see both parties contributing complementary expertise, knowledge and talent, that will advance sustainability efforts for industries. SP will facilitate the various touchpoints between academia and industry, while Grundfos will tap into its extensive network and industry knowledge to provide staff and students with the necessary resources and industry opportunities to successfully co-develop innovative, sustainable solutions. These solutions will be subsequently implemented with industry manufacturers in Singapore through pilot projects.

To achieve this, the three-year partnership will focus on sustainability education and talent development. Grundfos and SP will look to roll out a comprehensive range of solution packages, projects, events, courses and training programmes, as well as webinars, sharing sessions, seminars and conferences, to promote sustainability and smart sustainability to the industry.

To build talent pipelines and foster talent development, Grundfos will also be working closely with SP across various activities, such as mentorship programmes, book prizes, student projects, and internships. One such initiative is Grundfos' sponsorship of the annual book prizes for SP's School of Chemical & Life Sciences (CLS).

Mr Humphrey Lau, Group Senior Vice President, Global Industry Business, Grundfos, said, "With industries being the most energy-intensive sector in Singapore, we believe sustainable manufacturing technologies are key to reducing Singapore's carbon footprint, while also strengthening its position as the regional manufacturing industry hub. By tapping into the Internet of Things (IoT) and moving industries towards digitalisation, the smart sustainable solutions that can be expected from this partnership will ultimately help industries strengthen their business through sustainable operations".

"Institutes of Higher Learning (IHLs) such as Singapore Polytechnic are best placed to take the lead in driving sustainability innovations, as youths have shown a growing passion for sustainability issues", he added.

Mr Eric Lai, Grundfos' Regional Managing Director, Industry – APAC & Country Director for Singapore, said, "Both Asia and Singapore have set ambitious targets towards greater sustainability and, given Grundfos' footprint in the region and Singapore, we see a growing role for us to help drive progress in this sustainability journey. We see partnering with local educational institutes like Singapore Polytechnic as the first step towards uncovering new thinking and innovation while also inspiring the next generation of industry leaders".

SP Principal and CEO, Mr Soh Wai Wah, said, "Our goal for this partnership is to strengthen Singapore's commitments in harnessing energy- and water-efficient smart solutions for small and medium-sized enterprises, so that they can enhance their overall resource-efficiency and capture new business opportunities. By taking these steps early, Singapore companies will be better positioned to maintain their competitiveness globally by embracing sustainable development. This exciting partnership with Grundfos will spur the growth of the sustainability sector, and present our students and staff with the resources and opportunities to co-develop innovative and sustainable solutions".

Both Grundfos and Singapore Polytechnic are kick-starting this initiative with a pilot project at Grundfos' facility in Singapore. This will include feasibility studies followed by implementation of a rainwater harvesting system and utilisation of solar power as alternative power source at the facility, and applying digital solutions in the production building. The final outcome of this pilot project will help the building to further reduce its water and carbon footprint.

ENGIE LAB TO DOUBLE ITS RESEARCH AND INNOVATION PRESENCE IN SINGAPORE

ENGIE Lab Singapore has announced the next phase of growth in its research and innovation activities in Singapore. Supported by the Singapore Economic Development Board (EDB), ENGIE will double its research team in the country over the next three years, and work closely with local universities to build up its competencies.

ENGIE Lab Singapore will focus on developing local capabilities related to low-carbon cooling systems, the greening of data centres and the integration of renewable energy into the local energy mix. The lab will develop a Center of Excellence on Cooling in the tropical climate, and will lead, from Singapore, all the Research and Innovation programmes of ENGIE related to data centres, to realise the group's vision and ambition to be a world leader in carbon-neutral data centres. These strategic areas were identified through a comprehensive, six-month study and engagement of stakeholders.

ENGIE Lab Singapore started in 2016, with the construction of its microgrid testing facility in Pulau Semakau to generate clean power from multiple sources and test energy-efficient industrial solutions in tropical conditions. It was launched under Nanyang Technological University's Renewable Energy Integration Demonstrator - Singapore (REIDS) initiative, an R&D platform that provides a testbed for Singapore's ongoing energy research.

"The long-standing partnership with EDB has helped ENGIE Lab Singapore to grow from strength to strength. This new investment will continue to support the development of research, innovation, and business competencies in Singapore. We are excited to collaborate with the key stakeholders to bridge the gap between R&D and business, accelerate the energy transition and help our clients in their journey towards carbon neutrality", explained Mr Loïc Villocel, Director of ENGIE Lab Singapore.

"Thanks to stronger integration into the local ecosystem, ENGIE Lab Singapore will be able to develop key research capabilities, at the heart of ENGIE's research strategy", said Mr Olivier Sala, Vice President, Research and Innovation, ENGIE.

"ENGIE Lab Singapore's commitment to deepening sustainability-related research capabilities is in line with our efforts to create a conducive environment for businesses to meet their sustainability needs. We look forward to working with ENGIE and other like-minded companies, in the push for sustainable, clean energy solutions that can be developed from Singapore, for the region and beyond", said Ms Dawn Lim, Vice President and Head, Commercial and Professional Services, EDB.

This expansion by ENGIE is the latest milestone in a long-running series of investments that the company has made in Singapore which hosts its regional operating hub for Southeast Asia. Over the last five years, ENGIE has successfully grown and expanded its energy services capabilities in Singapore to include advisory, research and venture building. The milestones include the following:

- 2020 – ENGIE IMPACT, a sustainability transformation advisory firm, expands its presence to Asia Pacific, with the headquarters in Singapore, to provide comprehensive support to corporates, cities and governments, to tackle their complex sustainability challenges, from strategy to execution.
- 2020 – ENGIE Factory Asia-Pacific, the venture arm of ENGIE Asia-Pacific, signs a Memorandum of Understanding (MoU) with EDB New Ventures to launch a portfolio of new zero-carbon startups over the next three years. The first two ventures were launched in the same year. The MoU aims to establish Singapore as a hub for sustainability innovation in Asia, by creating new ventures to help businesses in Singapore and Southeast Asia decarbonise more quickly and profitably.
- 2019 – ENGIE relocates its Asia Pacific headquarters from Bangkok to Singapore.
- 2018 – ENGIE South East Asia establishes its Centre of Expertise (COE) in Singapore to drive digital initiatives and technical competencies in energy efficiency for the region.
- 2016 – ENGIE opens ENGIE Lab in Singapore to focus on industrial energy efficiency, gas technologies, and smart energy systems for islands and cities.

ENGIE's testing facilities on Pulau Semakau features Singapore's tallest wind turbine, a solar farm, a battery storage system, and a green hydrogen full value chain.

SILTRONIC BREAKS GROUND FOR

NEW MANUFACTURING FACILITY IN SINGAPORE

In late October 2021, Siltronic, one of the technology leaders in silicon wafer manufacturing, broke ground for its new manufacturing facility at JTC's Tampines Wafer Fab Park in Singapore.

In partnership with the Singapore Economic Development Board (EDB), Siltronic's investment of around EUR 2 billion (equivalent to nearly SGD 3 billion), until the end of 2024, will play an important role in meeting the growing semiconductor demand.

Singapore's Minister for Trade and Industry, Mr Gan Kim Yong, was the Guest-of-Honour at the ground breaking ceremony. He was accompanied by Siltronic CEO, Dr Christoph von Plotho; EDB Managing Director, Ms Jacqueline Poh; and Siltronic Site President in Singapore, Mr Niew Bock Cheng.

"We support the expansion plans of our valued customers by adding a new 300 mm fab in Singapore. With the decision to invest in this cost-efficient facility, we are setting the course for Siltronic's continued successful future", said Dr von Plotho.

The global demand for semiconductor devices is growing continuously. Silicon wafers are the base material for these devices. Wafer supply is already tight and is expected to become even tighter in the next few years. In order to meet the increasing customer demand, Siltronic will expand its capacity as existing fabs are already fully utilised.

Siltronic started its operations in JTC's Tampines Wafer Fab Park in 1999 with the manufacturing of 200 mm silicon wafers. In 2006, Siltronic added a second fab, under a joint-venture with Samsung Electronics, for the manufacturing of 300 mm silicon ingots and wafers.

The new 300 mm fab, under the joint-venture with Samsung, will be the most advanced wafer facility of the Siltronic Group, producing crystal ingots as well as polished and epitaxial wafers. It will strengthen Siltronic Singapore as a key production hub within the group's production network. About 600 new jobs for professionals, engineers, technicians and skilled workers will be created.

"This is the largest investment in the history of Siltronic. With the new leading-edge production capacities, we will further strengthen our position as one of the technology leaders. This investment also demonstrates our long-term commitment in Singapore", Dr von Plotho added.

"We are committed to support the growth of the semiconductor industry in Singapore with industry leaders like Siltronic. Siltronic's decision to site its largest and most advanced manufacturing facility in Singapore is a testament to our attractiveness as a global node for semiconductors. The new fab will further strengthen our semiconductor industry and create good job opportunities in Singapore", said Ms Poh.

At the ground-breaking ceremony, from left to right, JTC CEO, Mr Tan Boon Khai; Siltronic CEO, Dr Christoph von Plotho; Minister of Trade and Industry, Singapore, Mr Gan Kim Yong; Siltronic Site President, Mr Niew Bock Cheng; and EDB Managing Director, Ms Jacqueline Poh.

Siltronic's production facilities at JTC's Tampines Wafer Fab Park – a rendering of the planned, new production facility is shown on left, while the existing facility is shown on right.

REC GROUP BECOMES PART

OF RELIANCE INDUSTRIES LTD

In early October 2021, REC Group, an international, pioneering solar energy company, headquartered in Norway, announced that Reliance New Energy Solar Limited, a wholly owned subsidiary of India's Reliance Industries Ltd (Reliance), has signed a definitive binding agreement to acquire 100% shareholding of the largest European solar panel brand.

Over its 25-year history, REC has consistently set new standards and introduced numerous innovations in the solar PV industry. This deal is therefore a good fit for the two strong brands with big ambitions to speed up the energy transition for a cleaner future. REC's production capacity is limited, in comparison with the growing demand for its high-quality products in many markets. The new ownership will allow REC to rapidly boost production and better serve its increasing customer base and end-consumers.

With Reliance's financial strength and commitment to solar, REC will grow to over 5 GW of capacity within the next two to three years, in Singapore, Europe and USA. In India, Reliance plans to use this industry-leading technology in its fully integrated, metallic Silicon to PV Panel manufacturing giga factory at Dhirubhai Ambani Green Energy Giga Complex, Jamnagar, initially starting with 4 GW per annum capacity and eventually growing to 10 GW per annum.

The combination of high-efficiency solar panels and economies of scale will allow consumers in more markets around the globe to access REC's premium solar panels and benefit from the competitive electricity costs per kWh, while actively reducing carbon emissions. REC and Reliance will accelerate their joint mission to empower people around the globe with clean and affordable solar energy.

REC Group

Founded and headquartered in 1996 in Oslo, Norway, REC has grown to become a credible advocate for the global energy transition and green economy, by focusing on innovative solar technology. Among REC's key innovations are the award-winning split cell and junction box technology in a patented twin panel design as well as the lead-free and RoHS-compliant REC Alpha Pure solar panel, based on the advanced heterojunction cell technology. By providing high power density solar panels with a reliable long-term performance and a comprehensive warranty, REC makes it easy for homeowners and businesses to benefit from significant savings on electricity costs and carbon emissions.

Reliance Industries Limited

Headquartered in Mumbai, India, Reliance is India's largest private sector company. Reliance's activities include hydrocarbon exploration and production, petroleum refining and marketing, petrochemicals, retail and digital services.

REC Group's latest innovation is the lead-free and RoHS-compliant REC Alpha Pure Series solar panels which can generate power of up to 405 Watt peak (Wp) in a compact format.

Siemens Gamesa continues on its path to zero emissions by 2040

Siemens Gamesa is deeply committed to sustainability and has set the ambitious target of reaching net-zero emissions by 2040. This includes emissions produced by the company's entire value chain.

The company is taking another step towards a sustainable future. The latest member of Siemens Gamesa's fleet of ships is equipped with environment-friendly propulsion technology. The REM Energy is ready for the addition of a 12-MW battery which would reduce energy consumption during operation.

The REM Energy is also capable to run emissions-free, on green hydrogen or with batteries and offshore charging. Until a green hydrogen economy is established in Germany, the service operation vessel will be conventionally powered by efficient diesel generators.

The REM Energy is almost 90 m long and almost 20 m wide. It will be the workplace and living quarters for up to 75 offshore service technicians and 24 crew members.

PLN SELECTS ABB'S MINIATURE CIRCUIT BREAKERS FOR SAFE

AND RELIABLE ELECTRIFICATION IN INDONESIA

Within Southeast Asia, Indonesia had the highest electricity demand in 2020.

PLN, Indonesia's state-owned power utility, has selected ABB for a new, two-year contract to supply miniature circuit breakers (MCBs). ABB's factory in Cibitung, West Java, will increase production by 100% to cope with the increasing demand.

For the past two decades, ABB has a proven track record as a PLN supplier, with high quality and capacity. The ABB team was in contact with PLN through all stages of the bidding process, understanding the needs and demonstrating ABB's capacity to supply the best quality MCBs at a competitive price.

Southeast Asia is one of the fastest growing regions in the world when it comes to electricity demand, with the average rate growing by about 6% annually, over the past 20 years .

Within the region, Indonesia was the country with the highest electricity demand in 2020, underlining the need for electricity generated to be reliable and consistent. According to the World Economic Forum survey in November of last year, 91.7% of companies in Indonesia applied for the Work from Home (WFH) option during the pandemic, making safe and reliable supply of power to homes a critical requirement.

ABB's MCBs play an important role in protecting homes and devices from voltage fluctuations. They also ensure electrical safety in offices, commercial buildings and industries, by protecting electrical installations against overloads and short circuits. Once a fault is detected, the MCB automatically turns off the electrical circuit to prevent damage to wires and to avoid the risk of fire.

ABB's MCBs protect homes and devices from voltage fluctuations. They also ensure electrical safety in offices, commercial buildings and industries.

"ABB is committed and proud to continue supplying high-performance, locally manufactured MCBs to PLN as they support increased demand from their existing customer base and continue with the electrification of Indonesia", said Mr Jorge Aguinaga, Head of Electrification Business of ABB in Indonesia.

In Indonesia, ABB MCBs are certified by SNI, the Indonesian National Standard. SNI certifies the safety, quality, and performance of electrical equipment. In addition, the MCBs also provide a higher level of local content than the requirement set by the government.

ABB's MCB factory in Cibitung ramped up its yearly capacity to millions of MCB poles last year, to serve PLN and meet export orders from the UK, Belgium, Netherlands and New Zealand.

ADVANCES MADE IN DIRECTED ENERGY DEPOSITION

ADDITIVE MANUFACTURING

Hexagon's Manufacturing Intelligence division has revealed new developments that advance the application of Directed Energy Deposition (DED) technologies to industrial applications, including collaborations with printer manufacturers pro-beam, Sciaky, DM3D, Gefertec and Meltio.

DED incorporates several metal 3D printing technologies used to produce parts by melting and fusing material as it is deposited. Applicable to a broad range of part sizes, it is attractive for the cost-effective production of large parts – from 1 m to 6 m or more – that may be impossible to manufacture using powder bed fusion (PBF) technologies. SmarTech Analysis estimates revenues from large-format metal additive technologies and related areas will reach USD 739 million in 2026.

Sharing core technologies with mature coating and welding processes, DED is rapidly gaining traction for military and aerospace Maintenance, Repair and Operations (MRO) because it can repair or rebuild high-end equipment, such as turbine blades. It also offers innovation potential within hybrid manufacturing processes, where it can add material and features to workpieces finished with wire EDM or milling processes.

Driven by interest from the aerospace and defence industries, parts are often made from high-performance metal alloys such as titanium and high-temperature stainless steels. Hexagon is working with printer OEMs, customers and service providers, to help predict how these materials behave when subjected to the thermal-mechanical stresses of DED processes, which are compounded in large structures.

pro-beam, a global expert in electron beam technology and machines, has combined 45 years of experience in welding to build its new WEBAM (Wire Electron Beam Additive Manufacturing) 3D printers, including the electron beam guns, in-house. Its new PB WEBAM 100, unveiled at Formnext 2021, employs an innovative vacuum chamber design to produce high-quality parts from challenging materials such as pure copper and titanium. Using Hexagon technologies, it validated a 100% virtual design-for-manufacturing workflow for this new wire-based electron beam printer, using a structural aerospace part.

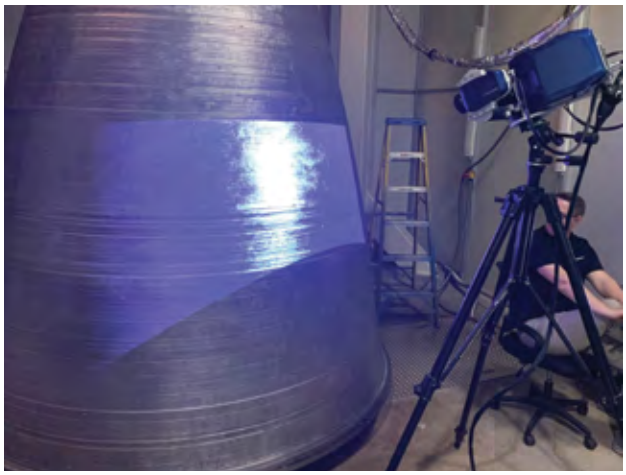
Hexagon's Simufact Welding was used to create a robust DED simulation model that accounts for all pro-beam's proprietary vacuum conditions, clamping locations, and power adjustments to predict stresses, strains, and distortions. The new printer successfully produced the part from 35 layers of titanium wire using an electron beam in the vacuum chamber. The printed part was scanned using Hexagon's state-of-the-art AS1 Absolute scanner and REcreate reverse engineering software, then compared to the final part geometry predicted by the simulation using VGMETROLOGY geometry analysis software from Volume Graphics.

Sciaky Inc, a leading provider of additive manufacturing solutions, has likewise formed a partnership with Hexagon to ensure that its customers can use the company's electron-beam (EBAM) 3D printers to their full potential. Pairing EBAM printers with Hexagon's process simulation software for DED applications ensures that the sophisticated printing technology can be leveraged for optimal productivity.

DED service bureau and machine builder DM3D used Hexagon measurement technologies to prove that it could meet NASA's tolerance requirements in producing a full-scale NASA RS-25 nozzle liner, 111 inches (approximately 2.8 metres) in height and 96 inches (approximately 2.4 metres) in diameter, as part of NASA's Rapid Analysis and Manufacturing Propulsion Technology (RAMPT) project.

Meltio, a disruptive laser metal deposition technology manufacturer, has added Hexagon's ESPRIT CAM computer-aided manufacturing (CAM) software to its technology ecosystem, offering machine shops a single interface for preparing and programming high-quality hybrid direct energy deposition (DED) production and machining.

The collaboration streamlines subtractive and additive manufacturing workflows for users of the Meltio Engine CNC Integration system. Meltio's hybrid manufacturing solution allows for the creation of complex parts with precision machining tolerances, in a single step. Combining this pioneering technology with Hexagon's ESPRIT CAM system CNC programming, optimisation, and simulation for both additive and subtractive processes, results in an advanced but easy-to-use manufacturing workflow, in a single tool.



DM3D used Hexagon measurement technologies to prove that it could meet NASA's tolerance requirements in producing a full-scale NASA RS-25 nozzle liner.

SINGAPORE'S FIRST INTEGRATED

SIMULATION MODEL FOR VEHICLE ELECTRIFICATION CREATED

It provides a comprehensive impact analysis of projected electric vehicle (EV) charging demands.

A*STAR's Institute of High Performance Computing (IHPC) and TUMCREATE Ltd (TUMCREATE) are working together on a research project that supports Singapore's planning for the transition to electric vehicles (EVs) nationwide. The Singapore Integrated Transport Energy Model (SITEM) will be used to conduct a comprehensive analysis of projected electric vehicle (EV) charging patterns and energy demand, which will support policymaking on Singapore's vision for all vehicles to run on cleaner energy by 2040 and contribute towards Singapore's decarbonisation commitments.

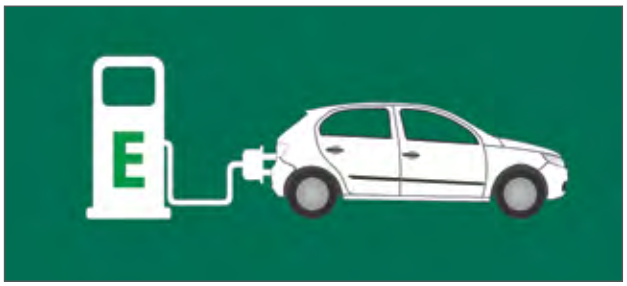
The research project is commissioned by the Science and Technology Policy and Plans Office (S&TPPO), Prime Minister's Office, and aims to advance the nation's capabilities in integrated modelling and simulation of transport and power systems.

Singapore's 2040 vision to phase out internal combustion engine (ICE) vehicles and have all vehicles run on cleaner energy will involve large-scale, multi-agency efforts to provide charging infrastructure, electrify public vehicles and upgrade the electrical grid, to accommodate the new demand. Designed to support this effort, SITEM is the first high-fidelity, island-wide simulation of EV transport in Singapore, that integrates multiple aspects of mobility and energy modelling, including the movements of individual vehicles, drivers' decisions about where and when to charge, and the interaction of EV charging demand with electricity grid capacity.

Through advanced scenario modelling and simulation, the project aims to deliver insights on how Singapore can optimise the placement of EV charging stations, to address the charging needs of drivers and to efficiently allocate energy demand and upgrades across the power grid. Robust modelling and simulation has the potential to reap significant cost avoidance benefits, as projects in the infrastructure and energy space are typically costly and hard to re-work, once in the implementation stage.

To model such a large-scale and multi-layered system at high resolution, IHPC and TUMCREATE are employing advanced capabilities, including large scale complex systems modelling and optimisation, high performance and distributed computing, advanced data analytics, and empirically grounded agent-based modelling of human behaviour. The project team also draws on extensive experience in past and ongoing project collaborations with various local entities in the transport ecosystem, including transit operators, regulatory bodies and urban planners.

The SITEM project builds on two primary simulation technologies developed by TUMCREATE in Singapore, under its NRF-funded Mobility Programme – CityMoS and MESMO.



*Singapore is transitioning to the use of electric vehicles (EVs) nationwide. Image: Institute of High Performance Computing (IHPC), A*STAR.*

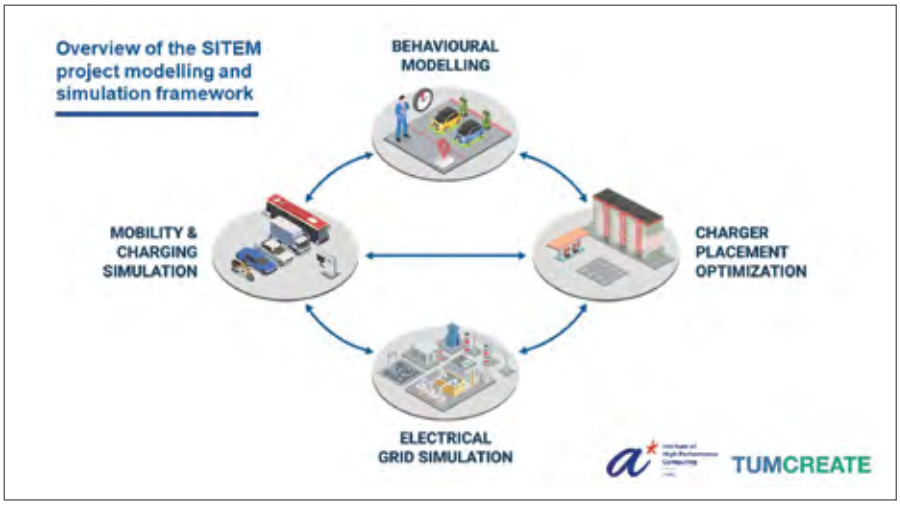
- CityMoS (City Mobility Simulator) utilises high-performance computing techniques to enable high-detail simulation of transport systems in the entire island of Singapore, while maintaining short turnaround times.
- MESMO (Multi Energy System Modelling & Optimisation) is an advanced software framework that combines simulation of electrical grids and optimisation techniques to mitigate the grid impact of distributed energy resources (such as photovoltaics) and new types of loads (such as EV charging).

Network data and modelling considerations were provided by the Energy Market Authority and national grid operator, SP Group.

While further development of SITEM is ongoing, preliminary findings from simulation studies conducted by the IHPC and TUMCREATE research team have enabled collaborating government agencies and industry partners to validate and refine their planning assumptions on the adequacy of electric charger provisioning to meet projected demand and the sufficiency of electrical grid capacity to support vehicle electrification requirements.

In addition, SITEM's advanced scenario modelling capabilities have enabled regulatory agencies to explore and evaluate varied pathways to vehicle electrification. For example, in light of the fact that private electric cars will generally park longer than the actual duration required for the car to charge fully, smart charge management can help to reduce grid infrastructure upgrade costs without compromising the overall energy provisioned to the electric cars. SITEM makes it possible to estimate the efficiency gains from such systems, and can model their impact alongside or in combination with other mechanisms such as incentive-based demand shifting, smart scheduling and local energy storage.

Dr Lim Keng Hui, Executive Director of A*STAR's IHPC, said, "The beauty of simulation and modelling in urban planning is that we can integrate with multiple real-world datasets to create realistic computational models of our city, and explore different designs to achieve the optimal outcomes, before physical infrastructure upgrade is commissioned. Our aim is for this collaboration to allow local government agencies to tap on A*STAR's advanced systems modelling and simulation capabilities, to better plan and support the electrification effort in Singapore. IHPC has years of experience in land transportation research, and we look forward to this collaboration with TUMCREATE, to undertake this national-level strategic modelling project".



*The Singapore Integrated Transport Energy Model (SITEM) will be used to conduct a comprehensive analysis of projected electric vehicle (EV) charging patterns and energy demand. Image: Institute of High Performance Computing (IHPC), A*STAR – TUMCREATE.*

Prof Ulf Schlichtmann, CEO of TUMCREATE, said, "It is with great pleasure that TUMCREATE is part of this exciting multi-stakeholder project, together with our partner IHPC and the various Singapore government agencies. I am delighted to see that our simulators, CityMoS and MESMO, play an important role in providing recommendations for the electrification of Singapore's transport system. Since its establishment, TUMCREATE has been conducting innovative research in support of Singapore's sustainability goals and this is a great opportunity for us to contribute further and show the relevance of our technologies".

Er. Pang Chung Khiang, Group Chief Systems Officer of S&TPPO, PMO, said, "This collaboration between the research teams and relevant government agencies allows for integration of the best from two research institutes to address national level challenges. The coupled transport and energy simulation model allows for continuous refinement of planning parameters to better understand interdependencies and emergent behaviours with new concepts of operations for decision-making. Modelling and simulation generate insights that bring downstream savings on infrastructure upgrades whilst allowing our agencies to focus efforts to enhance overall commuter satisfaction. These efforts dovetail with developments like our Smart Nation Initiative".

Institute of High Performance Computing

A*STAR's Institute of High Performance Computing (IHPC) was established in August 1998, to provide leadership in computational modelling, simulation and AI to solve major scientific, industrial and societal challenges. It seeks to promote and spearhead scientific advances and technological innovations through multidisciplinary R&D, and to develop impactful applications to further economic growth and improve lives.

IHPC's research focuses are in computing science and AI, large scale complex systems modelling, social and cognitive computing, computational engineering mechanics, fluidic dynamics, electronics and photonics, materials science and chemistry. These core capabilities enable IHPC to tackle real-world challenges in manufacturing, energy, transportation and urban systems, environmental sustainability and healthcare.

Agency for Science, Technology and Research

The Agency for Science, Technology and Research (A*STAR) is Singapore's lead public sector R&D agency. Through open innovation, A*STAR collaborates with partners in both the public and private sectors to benefit the economy and society. As a science and technology organisation, A*STAR bridges the gap between academia and industry. A*STAR's R&D activities span biomedical sciences to physical sciences and engineering.

TUMCREATE

TUMCREATE is supported by the National Research Foundation, Prime Minister's Office, Singapore, under its Campus for Research Excellence and Technological Enterprise (CREATE) programme. Researchers from world-leading universities, Technical University of Munich (TUM) and Nanyang Technological University (NTU), work closely together to perform research that aims to improve Singapore's public transportation, including on the deployment of electric and autonomous mobility.

S&TPPO, Prime Minister's Office

Public Sector Science & Technology Policy & Plans Office (S&TPPO) conducts science, technology and engineering (STE) planning and strengthens public sector STE capabilities. It works with other centre-of-government agencies to identify key public sector STE capabilities to build, and review how these capabilities are resourced and sited. S&TPPO also supports agencies' efforts in building up ops-tech and technology management capabilities. It also supports the development of STE talent and the community. S&TPPO also coordinates the planning for selected cross-agency programmes, such as demand aggregation programmes as well as modelling and simulation.

OPTIMISING ENERGY PERFORMANCE IN INDUSTRIES

AND GUIDING ENGINEERING STUDENTS

A multi-award winning engineer speaks about his career in industry and academia.

The Singapore Engineer (TSE): Could you provide a few highlights of your education and career to-date including the awards and commendations received?

Dr Md Raisul Islam (MRI): I graduated in Mechanical Engineering from Bangladesh University of Engineering and Technology. In 1994 I was awarded a research scholarship by the Asian Institute of Technology, Bangkok, to undertake research leading to the MEng degree. Thereafter, I worked in Federal Electric Corp Ltd (SHARP), Thailand, as a Senior Engineer, and was involved in energy optimisation for different production processes.

I was awarded a research scholarship by the National University of Singapore (NUS) in 1998 to undertake a research project on heat and mass transfer, relating to air conditioning systems, and was awarded a PhD degree in 2003. After obtaining my PhD, I continued doing research and also taught, initially at NUS and later at Curtin University of Technology, Malaysia. In 2008 I joined as a Technical Director of LJ Energy Pte Ltd (LJ Energy). My main role was to lead a team of engineers in energy audit, energy retrofit and Green Building projects.

I am a Chartered Engineer, Energy Efficiency Opportunities Assessor (EEOA), Singapore Certified Energy Manager (SCEM), Key Qualified Person (KQP), Qualified Energy Services Specialist (QuESS) and BCA-accredited Energy Auditor. Presently, as a Senior Lecturer in the Mechanical Engineering Department of NUS, I am teaching and continuing my research on energy systems.

For my research work, I received the IES Prestigious Engineering Achievement Award 2018 and the ASEAN Outstanding Engineering Achievement Award 2018, awarded by the ASEAN Federation of Engineering Organisations (AFEO).

I have also received several teaching awards from NUS and from Curtin University of Technology, Malaysia.

TSE: What is the most meaningful career achievement for you so far, and why?

MRI: I got the opportunity to apply my engineering knowledge and computational skills for solving real-world energy-related engineering challenges, while I was working as a Technical Director at LJ Energy. I am grateful to Dr Lal Jayamaha, the CEO of LJ Energy, who shared his engineering knowledge, guided me in solving engineering challenges at different levels of difficulty and gave me the opportunities to lead and apply my engineering skills in developing smart solutions for major energy consuming systems used in commercial buildings and industries. I learnt how to analyse the performance of actual-scale, major energy consuming systems; identify the energy performance enhancement opportunities; and develop and implement smart solutions after considering the practical constraints.

Dr Md Raisul Islam

In my teaching work at NUS, I have taken on the challenge of guiding students to be professionally ready for a career in industry, by bringing my real-world experiences on engineering challenges to the classroom. My industrial experience allows me to craft assignments and projects by identifying full-scale, real-world problems related to industrial energy challenges. I use the industrial problems as the vehicles to introduce students to real-world demands, expectations and experiences, in the best possible manner, and which are realisable in a classroom environment. The recognition of my educational leadership by NUS and the encouraging feedback from industries on the competency of my students are my key meaningful career achievements.

TSE: Could you briefly describe the scope of your current duties?

MRI: To achieve the energy sustainability goals of Singapore, I believe the building sector and industries need competent energy engineers who are capable of applying their multidisciplinary engineering knowledge to evaluate the energy performance of existing, major energy consuming systems; identify energy performance enhancement opportunities; as well as develop and implement technically and financially feasible smart solutions. Presently, I am involved in teaching several modules, mainly related to energy sustainability, to students at the Department of Mechanical Engineering, Engineering Science Programme, and School of Continuing and Lifelong Education, in NUS.

I have developed new modules and projects on energy sustainability, such as 'Optimization of Energy Systems', 'Standards in Mechanical Engineering', and 'Major Design Project'. My instructional materials for the module 'Optimization of Energy Systems' cover the key topics in the professional course for certification as a Singapore Certified Energy Manager (SCEM), and include performance enhancement of chiller systems, boiler systems,

compressed air systems, and combined heat and power systems; as well as financial analysis of energy projects.

I authored the monograph 'Air-Conditioning and Mechanical Ventilation (ACMV) Systems' and co-authored the monograph 'Energy Measurement and Audit', which are being used as reference materials for the SCEM course. My students frequently refer to these monographs. Students gain confidence and are inspired to become an SCEM in the future and contribute to the energy sustainability goals of Singapore.

I am also the staff advisor of the IES-NUS Student Chapter. I guided the IES-NUS Student Chapter in conducting several educational events to engage the broader NUS community, proactively. The chapter received the IES Best Student Chapter Award in 2019 and 2020. I gave an industrial talk on Energy Engineering at an IES-NUS event on 9 September 2021. I highlighted the career progression and professional development opportunities for Energy Engineers and Chartered Engineers.

After joining NUS, I collaborated with LJ Energy on the 'Energy Efficiency Benchmarking Study of Food Manufacturing Plants in Singapore', initiated by the National Environment Agency (NEA).

To-date, my research contributions include 41 international journal articles, 26 conference / seminar / workshop contributions, two monographs, seven book chapters and three patents, all of which assist my students to appreciate the real-world applications of engineering principles.

I am also serving in several capacities, including as:

- Member of the working group for developing Singapore Standards, under the Standards Division of Enterprise Singapore.
- Member of the technical committee for Energy Savings Methodologies, under Enterprise Singapore.
- Member of the panel for interviewing Energy Efficiency Opportunity Assessor applicants, with IES as the administrator.

TSE: What are some of the projects that you have been involved in?

MRI: At LJ Energy, I was involved in energy audits, identifying energy and cost-saving opportunities, as well as developing and implementing smart solutions, in a number of commercial buildings, hotels, hospitals and industries. After joining NUS, I have been involved in several translational, energy-related research projects, including on the following subjects:

- AI-assisted smart cooling package for air conditioning applications.
- Smart, demand-side management integration with energy-efficient thermal storage system.
- Innovative, hybrid, super absorbent-indirect evaporative water-based cooling system.
- Hybrid cogeneration-based district cooling systems.

TSE: What motivated you to become a Chartered Engineer?

MRI: I believe that the Chartered Engineer status demonstrates the professional competency, social responsibility, ethics and commitment of an engineer, both nationally and internationally. As a Chartered Engineer, I enjoy the privilege of interacting with other experienced Chartered Engineers, understand energy-related future engineering challenges and potential strategic roadmaps to achieve the targeted energy sustainability goals of Singapore, as well as appreciate the opportunities for applying my engineering knowledge in solving real-world engineering challenges. As a Chartered Engineer, I will get the opportunity to attend relevant professional development workshops and seminars, which is crucial for lifelong learning and continual development of my professional skills to handle emerging technologies and challenges.

TSE: How do you think becoming a Chartered Engineer will assist you in the future?

MRI: With the opportunities I have as a Chartered Engineer and Energy Efficiency Opportunities Assessor (EEOA), I hope to continuously improve my professional skills and, at the same time, transfer my knowledge and experiences to my students, in a classroom environment.

TSE: What advice would you give engineers who aspire to obtain the Chartered Engineer certification?

MRI: The building sector and other industrial sectors need a number of qualified and experienced engineers to develop feasible solutions for real-world engineering challenges, enhance the performance of processes, and meet sustainability goals. An engineer should be actively involved in engineering analysis, by applying his/her multidisciplinary engineering knowledge and hands-on experience to acquire professional competencies. Engineers should have adequate breadth and depth of practical experience. They should attend relevant professional development courses to gain new knowledge. They should prepare appropriate documents and produce evidence of their professional contributions.

TSE: If there was one engineer (past or present) you could meet, who would it be and why?

MRI: I wish to mention the names of a few people that I have interacted with and continue to do so. During the period of my education and professional career, I have had the opportunity to meet several great professors and engineers, such as Professor N E Wijeysundera, Professor S K Chou, Dr Lal Jayamaha and Mr Lee Eng Lock. They taught me mathematical modelling and computational techniques, as well as the design, implementation and performance enhancement procedures for actual-scale systems. I always look forward to meeting them, to discuss and learn more from their invaluable experiences.

DELL TECHNOLOGIES JOINS HANDS WITH IHLS TO EQUIP TECH TALENT WITH DIGITAL SKILLS

The collaboration will benefit more than 5,000 students.

Dell Technologies recently announced a joint commitment with four Institutes of Higher Learning (IHLs) to enhance the pre-employment training curriculum for over 5,000 tertiary students in Singapore over the next two years.

The programme seeks to build and attract a robust talent pipeline for the local information and communications technology (ICT) sector by equipping the students with industry-relevant skills.

Together with Singapore Institute of Technology (SIT), Singapore Management University (SMU), Ngee Ann Polytechnic (NP) and Singapore Polytechnic (SP), Dell Technologies will co-develop new content for curriculum modules, specialist diplomas and degree courses focused on critical core skills tied to new and emerging technologies such as cloud computing, data analytics, the Internet of Things (IoT) and digital cities management. These key skills were identified, based on industry needs – through feedback from Dell Technologies and its partners and customers – and align with the Infocomm Media Development Authority's (IMDA) Services 4.0 roadmap which envisions the future of services using emerging technologies in a digital economy.

An MoU signing ceremony was held recently to mark the launch of this new initiative between Dell Technologies and the four IHLs. The event, which was witnessed by Mr Tan Kiat How, Minister of State, Ministry of Communications & Information, was held at Dell Technologies Executive Briefing Solution Centre at One@Changi City. The programme comes under the 'Dell Technologies Digital Future - Made in Singapore' umbrella which aims to fast-track the adoption of future-ready digital solutions and drive innovations in Singapore for partners and customers globally.

"The Government is committed to developing our youths to seize the exciting opportunities in the digital economy which has grown despite the economic contractions elsewhere. Industry partners such as Dell Technologies play a key role in translating this growth into good opportunities for Singaporeans, especially in the area of emerging technologies. We look forward to more of such partnerships that really bring the possibilities of technology to life", said Mr Tan Kiat How, Minister of State, Ministry of Communications & Information.

"Dell Technologies is committed to collaborate with the Singapore government and the tertiary education institutions to help shape the next generation of tech talent. Together, we can help drive human progress with technology, values and purpose", said Mr Amit Midha, President, Asia Pacific & Japan, and Global Digital Cities, Dell Technologies.

Mr Amit Midha, President, Asia Pacific & Japan and Global Digital Cities, Dell Technologies, delivering his opening remarks at the MoU signing ceremony.

"Under our 'Digital Future – Made in Singapore' initiative, our strategic partnerships with Singapore Institute of Technology, Singapore Management University, Ngee Ann Polytechnic and Singapore Polytechnic will enhance the overall tech learning curriculum for students, uplift the ICT and cloud-native ecosystem in Singapore and advance the skills and employability of our future workforce. We will continue to build on these partnerships and are open to forge new ones to expand on the growing tech ecosystem", he added.

Access to curated courses on cloud and dedicated mentorship

Dell Technologies will work closely with the IHL professors and lecturers, offering customised tech expertise and consultation to aid in curriculum planning and curate cloud-native content to be included in students' learning curriculum. Beyond curriculum design, students can benefit from Dell Technologies industry experts' insights, and mentorship will also be offered to students as they navigate final year projects and industry attachments.

Students can look forward to immersing in the latest emerging technologies and industry-relevant content such as DevOps, microservices, cloud-native security, containers and Kubernetes. They will also get opportunities for hands-on experience via lab tutorial projects that

Dell Technologies MoU signing ceremony: From left to right, Professor Chua Kee Chaing, President-designate, Singapore Institute of Technology; Mr Tan Kiat How, Minister of State, Ministry of Communications & Information; Mr Ng Tian Beng, Senior Vice President and General Manager, Channel, Asia Pacific & Japan, Dell Technologies; Mr Amit Midha, President, Asia Pacific & Japan and Global Digital Cities, Dell Technologies; and Professor Timothy Clark, Provost, Singapore Management University.

Dell Technologies MoU signing ceremony: From left to right, Mr Lim Kok Kiang, Principal & CEO, Ngee Ann Polytechnic; Mr Tan Kiat How, Minister of State, Ministry of Communications & Information; Mr Ng Tian Beng, Senior Vice President and General Manager, Channel, Asia Pacific & Japan, Dell Technologies; Mr Amit Midha, President, Asia Pacific & Japan and Global Digital Cities, Dell Technologies; and Mr Soh Wai Wah, Principal & CEO, Singapore Polytechnic.

highlight the importance and complexity of managing applications in an enterprise environment.

With the current hybrid education model, students from the four IHLs will be granted access to a suite of self-guided e-learning courses via Dell Technologies' digital learning platform. These courses are designed to provide students with practical tech knowledge and skills that are in demand by the ICT sector, enhancing their employability and providing a head start to their future technology careers.

An ongoing effort to nurture the tech talent pool

The latest collaboration with the four IHLs is an extension of Dell Technologies' tech skills accelerator initiative announced in February 2021, which aims to equip fresh graduates, mid-career professionals and students in Singapore, with practical knowledge and skills in cloud computing, data protection and management, data science and big data analytics, by 2023.

Beyond students, Dell Technologies continues to work with its network of partners and customers to support mid-career professionals with skills training and enhancement for the data era, through its Dell Technologies Skills Up programme.

"Being part of the Dell Technologies Skills Up programme gave our employees the chance to be trained in core critical skills such as Cloud Infrastructure and Data Analytics. ST Engineering believes in continual learning and upskilling of our employees. In 2021, employees from Mission Software & Services have accumulated over 800 hours of training under this program. This is especially critical in the fast changing and dynamic digital landscape. We seek to work with strong, like-minded partners like Dell Technologies, and invest in the growth of our digital talent", said Mr Raja Gopal, Senior Vice President / General Manager, Mission Software & Services, ST Engineering.

"SIT is happy to co-develop content with Dell to jointly train future ICT talents. As Singapore's University of Applied Learning, we provide avenues for students to work on real-world projects that deepen their knowledge and skills. This uniquely designed programme will allow students to acquire industry-relevant knowledge on emerging technologies and gain rich insights through hands-on projects and close industry mentorship", said Professor Chua Kee Chaing, President-designate, Singapore Institute of Technology.

"As the digital transformation of industries, economies and societies accelerates, there is strong demand in the public and private sectors for graduates with sound knowledge and training in new and emerging technologies such as cloud-native skills and digital cities management. Collaborations with industry and technology providers, such as Dell Technologies, are part of our overall efforts to nurture future-ready graduates who are able to create value to business and society with industry-relevant skills. We are confident that the knowledge and skills gained from our growing collaboration with Dell Technologies can boost the employability of our students and enable them to be even better prepared for evolving technological trends", said Professor Timothy Clark, Provost of Singapore Management University.

"Ngee Ann Polytechnic is pleased to partner Dell Technologies to nurture our future infocomm talents, especially in emerging areas such as Virtualisation and Cloud Native App Development. With industry currency being a key focus area, this collaboration is another strategic partnership for learners at NP to gain proficiency in the latest industry software and exposure to real-world applications. This is very much aligned with our com-

mitment to equip learners with relevant knowledge and skills to better prepare them for careers in the cloud era", said Mr Lim Kok Kiang, Principal & CEO, Ngee Ann Polytechnic.

"As industries and businesses fast-track their digital adoption, it is vital to shift and transform our workforce to be more resilient and ready to meet the demands of an expanding digital economy. Our partnership to innovate with Dell will enable SP to nurture a future talent pool of engineers and software developers with the capabilities to build cloud-native solutions that allow enterprises to deploy highly scalable systems in an agile manner. This co-innovation ecosystem will create even greater learning value to our students when they gain access to work on industry projects and develop solutions that integrate Dell's technologies", said Mr Soh Wai Wah, Principal and CEO, Singapore Polytechnic.

Siemens expands advance manufacturing eco-system and training in Singapore

This will help to upskill local and regional talents in Industry 4.0 capabilities.

Siemens recently unveiled its expanded Advance Manufacturing Transformation Center (AMTC) to include a comprehensive Digital Enterprise portfolio of showcase, consulting, co-creation and test-bedding, for customers and partners in Southeast Asia. It has also added six training classrooms and expanded the curriculum to help upskill the local and regional digital workforce. The unveiling ceremony was graced by the Minister for Trade and Industry, Mr Gan Kim Yong.

The centre has broadened its Digital Enterprise offering beyond manufacturing design consulting to include Industrial Edge, Industrial Artificial Intelligence and Process Analytics, and enable companies to create digital twins of their envisioned advance manufacturing plants.

"Our ambition with AMTC is to help Small and Medium Enterprises (SMEs) in Southeast Asia to explore, innovate and pilot new solutions, and upgrade their capabilities. Many SMEs do not have the resources or facilities for R&D, thus AMTC provides a sandbox for them. It also provides a co-creation platform where partners and Siemens can combine their solutions to enhance a product", said Mr Sascha Maennl, Acting Head of Siemens Digital Industries in ASEAN.

SESTO Robotics, a Singaporean company that builds Autonomous Mobile Robots (AMRs) and solutions for material handling processes, is the first AMTC partner that has co-created an AMR with the Siemens team in Singapore. This AMR is built with an off-the-shelf Siemens solution for AMR called SIMOVE. The SIMOVE software library contains a range of pre-configured and tested functional modules for machine builders. It is also based on the TIA Portal which facilitates efficient engineering. The AMR that SESTO and Siemens co-created includes a PC-based application that allows the AMR to travel with free navigation.

The new AMTC has also expanded its training classrooms and curriculum to include Edge Computing, Cloud Platform, Industrial Internet-of-Things, Artificial Intelligence, Robotics, 3D Design, Virtual Reality / Augmented Reality and the Smart Industry Readiness Index. These additional courses will help to upskill local and regional talents in Industry 4.0 capabilities. AMTC will engage in-house experts and trainers from the Siemens Digital Industries business, as well as expert trainers from its 11 Technology members, for these courses.

In addition, AMTC will be the first non-academic facility in Singapore to be certified under the Safety of Additive Manufacturing Facilities Technical Reference (TR87). AMTC plans to partner TUV SUD to roll out the TR87 safety training in an operational setting to Qualified Professionals (QPs) and Professional Engineers (PEs). The training will certify professionals, to enable more companies to adopt additive manufacturing in the region.

AMTC will also continue to partner with SkillsFuture Singapore to provide a myriad of advanced manufacturing training courses to upskill Singaporeans and to establish Singapore as the region's leading advanced manufacturing hub.

The additive manufacturing training that AMTC and SkillsFuture rolled out under the SGUnited Mid-Career Pathways Programme, in September 2020, has since trained close to 70 people. Among these trainees, about 20 have found re-employment with their new-found skills. Due to its success, AMTC will be offering another 50 slots for this training.

AMTC was first launched in September 2020 as a three-in-one competence centre that combines the Digital Enterprise Experience Center (DEX), the Additive Manufacturing Experience Center (AMEC) and Rental Labs – creating a one-stop advance manufacturing ecosystem that addresses operational transition. AMTC remains committed to this mission and will now provide further support to the manufacturing industry in Southeast Asia.

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ADOPTING BEST PRACTICES AND COMMUNITY ENGAGEMENT

TO ACHIEVE SUCCESS

Ms Joelle Chen, Sustainability Director, Singapore, at Lendlease, speaks to 'The Singapore Engineer' on some of the strategies and actions that the international real estate group is pursuing in Singapore to address the important issue of climate change and sustainability.

Ms Joelle Chen

The Singapore Engineer (TSE): Could you comment on Lendlease's Mission Zero Roadmap for Asia and its significance for the company's projects in Singapore?

Joelle Chen (JC): We have launched the Mission Zero Roadmap for Asia as part of our commitment to becoming a 1.5° C-aligned company and achieving Absolute Zero Carbon by 2040.

Across the countries that we operate in (Singapore, China, Japan and Malaysia), our roadmap spells out how we can achieve this target by reviewing our Scope 1, 2 and 3 emissions, namely, through the fuels burnt, power consumed, materials and services purchased, and emissions by tenants in our properties and our assets, and across our operations.

This is significant for our projects and stakeholders in Singapore – from our clients, partners and tenants to our supply chain – as we explore new pathways to transform our operations and the industry.

For example, we are reducing our direct emissions from fuels we use on site. We are currently trialling the use of biodiesel in our construction plant and equipment, and electrifying a number of onsite equipment such as cranes as well as introducing battery storage to replace diesel generators.

We will reduce our indirect emissions including from purchased energy from a utility provider. This involves increasing the renewable component of electricity purchased, incrementally, to reach 100% by 2030; increasing onsite solar generation on our assets; and installing renewable energy infrastructure in all new developments. In addition, all our workplaces in Asia will occupy only high-performance green buildings and in Singapore, 100% of our assets have achieved the Green Mark Platinum rating.

We also seek to reduce carbon emissions that occur upstream and downstream of our value chain, such as from the materials we procure and from emissions by our tenants' operations. With regard to materials, as a founding member of the Singapore Green Building Council's Embodied Carbon Taskforce and a signatory to the Embodied Carbon Pledge, we are working with industry peers and partners to reduce upstream emissions from the manufacture of building materials. Specifically, we are targeting high impact categories such as concrete, steel, aluminium and glass, and requesting for environmental product declarations (EPDs) or similar sustainable product certifications, to demonstrate how building material suppliers are declaring their carbon emissions and subsequently reducing them.

For downstream emissions, we work closely with our tenants and have achieved 100% Green Leases across our malls in Singapore. We will be reviewing our green leases to ensure that they are aligned not only to the latest BCA Green Mark requirements, but also to how we can partner like-minded and similarly ambitious tenants to transit to a low-carbon future.

TSE: Could you elaborate on why support for community organisations and social enterprises is an important aspect of sustainability?

JC: At Lendlease, we consider environmental, social and economic sustainability as part of our focus on the triple bottom line. Through our Sustainability Framework which underpins our strategy, we focus our efforts on creating vibrant and resilient communities across the places we operate. We believe that in order to be truly sustainable, the community must be engaged with the place. It is no good to have the most environmentally sustainable building if it is not well-used and well-loved by people. That defeats the purpose of sustainable development as it has to deliver people-centric outcomes.

We do this by ensuring our properties are built for inclusivity – for people with diverse needs and interests – as well as by exploring ways in which we can support the local communities. This is why in addition to our carbon targets, we have also set ourselves an outcome-based social target – creating SGD 245.5 (AUD 250) million of social value by 2025.

Community organisations and social enterprises are essential in providing support to vulnerable groups which tend to be disproportionately affected by events like the COVID-19 pandemic as well as inequity caused by the climate crisis. Such organisations may face obstacles in remaining financially viable while providing community outreach services, and there is an opportunity for SMEs and MNCs to build shared value partnerships with them

and incorporate them into their sustainability efforts in the long run.

We are working with organisations such as The Social Kitchen, Project Dignity and Children Society, as part of our long-term strategy to support vulnerable groups. We also recently launched the Lendlease Foundation Asia Community Grant.

TSE: What are the main objectives underpinning the launch of the first Lendlease Foundation Asia Community Grant?

JC: The Lendlease Foundation Asia Community Grant aims to support local social enterprises with their community development and climate change programmes.

Six organisations each from Singapore and Malaysia – ranging from social enterprises to not-for-profit organisations, charities and community-based groups – will be selected and awarded SGD 10,000 / MYR 10,000 each, to support their mission and create positive social impact for the community.

Ever since its founding in 1983, the Lendlease Foundation has aimed to nurture the well-being of employees and their families, as well as our communities. We focus where the impact of our work is greatest – sustainable economic growth, vibrant and resilient communities and cities, and the health of people and our planet.

TSE: With reference to Lendlease Foundation's social impact areas, what are your thoughts, specifically, on Skilling, Training, Jobs & Employment, and Climate Change & Action?

JC: These impact areas have been identified as key pathways in meeting our social and carbon targets. We are cognisant of and encourage the co-benefits of community action and other impact areas. Take for instance an eco-tourism initiative that could provide jobs for communities, as well as catalyse climate action at a local level. This is, in fact, what we have done through the Great Barrier Reef Foundation partnership, in Australia, which Lendlease has been a part of, since 2018.

We support the upskilling, training, and transition of underprivileged communities into stable employment. In particular, we are focused on improving the socio-economic conditions of people with disabilities and low-income groups, through initiatives such as micro-entrepreneurship and work-based training programmes. This could be through the form of raising language proficiency, literacy and financial standards, or empowering women by building their confidence and imparting skills and knowledge.

In terms of climate action, it is important to promote innovative solutions to tackle climate change impact in communities. This includes encouraging the adoption of circular economy principles through the use of sustainable materials, waste reduction and upcycling, while supporting biodiversity recovery in urban areas and integration with nature.

TSE: Any other information that you would like to provide?

JC: I would like to highlight two programmes that Lendlease has undertaken recently.

The first is a two-year, shared value partnership programme with Project Dignity, that Lendlease has committed to, through the Lendlease Foundation. Under the programme, training will be provided for 40 differently-abled individuals in Singapore (four cohorts of 10 trainees each), focusing on culinary and kitchen skills that will enable the trainees to be placed in F&B establishments. Project Dignity will support the trainees in their efforts to secure employment. The first cohort of trainees has just completed the training and seven out of the 10 beneficiaries are already employed.

The second programme is with WWF Singapore (World Wide Fund For Nature). Lendlease is the first property management company to commit to WWF's PACT (Plastic ACTion) initiative which aims to eliminate plastics pollution in nature and move towards a circular economy with regard to plastics. As part of their commitment to PACT, Lendlease and WWF embarked on a joint research project to establish best practices in waste management and recycling, culminating in a research report titled 'Circularity in Retail', which was launched in August 2021. The report shared Lendlease's successes in recycling (Lendlease recycled nearly three times more than the average for the retail sector in Singapore) and also best practices to support retail industry players.

An exterior view of PLQ Mall, a part of Paya Lebar Quarter, developed by Lendlease. Image: Lendlease.

SUSTAINABLE ENGINEERING

THROUGH THE APPLICATION OF AGRIVOLTAICS

'The Singapore Engineer' learns more about an initiative taken by a team from SIT, that aims to harness renewable energy and, at the same time, develop rooftop hydroponic farms. The project team members are Mr Jerome Teng Wei Chiang, Assoc Prof Chew Beng Soh, Assoc Prof Steve Kardinal Jusuf and Assoc Prof Ryan Tay Hong Soon. A former student of SIT, Mr Jerome Teng participated in the study, as part of his capstone project. He has since joined Beca as a mechanical engineer.

Question: How would you define the concept of 'Agrivoltaics'?

Answer: Agrivoltaics refers to the integration of solar photovoltaic (PV) systems to generate electricity with agricultural activities to grow food. In other words, it utilises the same land footprint to harness energy and grow crops.

Q: What are its advantages, in general, and in particular for Singapore?

A: The advantages include 'Space Intensification and Optimisation', 'Electrical Power Supplementation' and 'Sustainability'.

Space Intensification and Optimisation is essential in the context of land-scarce Singapore. Agrivoltaics allows us to utilise a single piece of land for growing crops and integrate solar PV systems to harness sustainable energy vital for crop growth. Additionally, it allows us to expand on the types of areas suitable for growing crops and include locations such as the rooftops of urban buildings.

With regard to Electrical Power Supplementation, since urban farming requires electrical energy to run the water pumps and chiller systems, by adopting agrivoltaics, power is generated from the solar PV installation and this will contribute to meeting the total energy requirement.

In terms of Sustainability, although solar PV panels produce sustainable energy, they are under direct solar irradiance and the surface temperature of the panels may rise to above 60° C, and even higher, due to global warming. This can reduce the life-span of the panels. However, with agrivoltaics, transpiration of the crops results in evaporative cooling which will help to reduce the surface temperature of the solar panels and extend their longevity. In turn, the panels offer some shading for the crops during periods of intense sunlight.

Q: Could you provide more details on the collaborative project undertaken by SIT and Archisen in the field of agrivoltaics?

A: Archisen is a Singapore-based agritech company that designs, builds, and operates facilities to grow ultra-fresh, ultra-local produce in cities. Currently, its focus is on indoor urban farming. While the company has considered opportunities in rooftop farming, there is competition with other rooftop solar farms as they are becoming more prevalent. This project resolves the tension of using the rooftop for either photovoltaics or agriculture, by combining the two. This will provide an avenue for the company to widen its business in outdoor farming, in the near future.

Q: What are the objectives of the project and how far has it progressed?

A: The main objectives of the project are:

- To understand how shading of the solar PV system affects crop growth.
- To derive optimised system design solutions beneficial for both solar PV and crop growth, on the same plot of land.
- To investigate how probiotics can enhance the growth of various crop species, under low-light conditions.

The project is in its first year of application and stands as the culmination of a three-year period of project development.

The team has just completed the agrivoltaics setup which is primed for urban deployment. Currently, it is testing suitable crop varieties to grow under the solar PV system.

An agrivoltaic system, with the solar PV panels installed on the roofs of the sheds, and the setup for the growth of hydroponic plants installed within the sheds.

Growth of leafy vegetables in the agrivoltaic farming plot in SIT@Dover.

ILLUMINATING THE PATH FORWARD:

THE FUTURE OF CONNECTIVITY

by Kailash Narayanan, President for Commercial Communications, Keysight Technologies

Mr Kailash Narayanan

By embracing change, the challenges ahead can be overcome.

At a minimum, the last 18 months have made one thing clear: fast, dependable connectivity has become our collective lifeblood. It has proven to be essential for consumers, enterprises and governments.

Customer expectations have also become crystal clear: calls for "I want what I want when I want it" have greater urgency than ever before.

In a bit of serendipity, the ongoing rollout of 5G is enabling game-changing connectivity. The power of 5G will also accelerate the digital transformation of multiple industries.

Establishing the major themes

The present and future of communications are dominated by three major themes: network modernisation, new use cases and business models, and the evolution to 6G.

Looking at modernisation, the new networks are software-based, and some have joked that "everything but the antenna is software". This is getting closer and closer to the truth. To meet the demands of consumers for connectivity, bandwidth, and latency, the network needs to offer unprecedented scale at a lower cost. Solutions include virtualisation and autonomous management.

Next, new use cases and business models are the paths to new revenues. For mobile network operators, consumer wireless still accounts for more than 70% of annual revenues. New possibilities in vertical markets and industrial applications will provide new growth.

Third, as the global rollout of 5G continues, research into 6G is picking up. The goal is to deliver the evolutionary and revolutionary changes needed to enable a vision of pervasive connectivity.

With this baseline, let us look at the path ahead and a pair of time horizons that will be here before we know it: 2026 and 2031.

Envisioning the future: 2026

The longstanding notion of "everyone and everything, connected" has the potential to deliver a powerful set of benefits to consumers, businesses and governments. Expectations continue to evolve as more users, devices, and use-cases demand the best quality of service (QoS).

These expectations are all about dependable, pervasive, and seamless connectivity – and 5G will enable this, with availability to 60% of the global population likely by 2026. Ericsson expects 5G subscriptions to grow to more than 3 billion, and some forecasts predict that by that time, 5G networks will carry more than 50% of total mobile data traffic. This is based, in part, on an expanding array of possibilities:

- Mobile cloud-gaming, expected to grow at a compound annual growth rate (CAGR) of 41%.
- New industrial use cases which could be a USD 1 trillion business by 2028.
- Connected transportation which is crucial to autonomous vehicles.
- Non Terrestrial Networks (NTN), based in part on constellations of Low-Earth Orbit (LEO) satellites.
- As many as six billion cellular IoT connections, with half being 'mission-critical IoT'.

While growth may come from the next 'killer app', significant opportunities are likely to come from areas such as new services for retail and industrial applications, including private networks. There could also be opportunities to create lucrative new marketplaces no one has yet imagined.

Envisioning the future: 2031

By 2031, early networks for 6G will be ramping up – the convergence of the physical, digital, and human worlds through applications, computing, and communications. Some have called this new level of interaction the 'Internet of Everything'.

One key characteristic will be the co-existence and seamless integration of heterogenous radio-access technologies, far beyond what is possible today. 6G use cases will also drive the need for higher data rates. This entails using spectrum above 100 GHz, with multi-gigahertz bandwidths, while also making even more use of bands below 100 GHz. Spectral efficiency, energy efficiency, and waveform design will play crucial roles.

AI-driven network management will enable flexibility, and time-engineering will be necessary to facilitate new use cases. 5G's low-latency benchmarks will be augmented by time-predictability, in which the absolute time of arrival of data (neither too soon, nor too late) will be precise. This requires exceptional capabilities in time synchronisation and routing control.

With such dramatic changes in the interactions of humans, machines, and the connected world, trust and security must be designed in from the beginning. The consequences of hacks and breaches are already severe – so 6G will need to achieve high levels of sophistication in detecting and neutralising threats while enhancing threat prevention and organisational resiliency.

Leading the way with openness

Coming back to the present, the path to 2026 and 2031 starts with a fundamental change that is currently underway – the advent of open radio-access networks or open RAN. This approach standardises interfaces in a disaggregated RAN architecture to enable flexible network deployment, and it also drives a common approach to virtualising the RAN. Open RAN has evolved into the concept of the RAN intelligent controller or RIC, which is an initial step towards the inevitability of merging the RAN and the core network.

While this has the advantage of reducing infrastructure costs and enabling flexible expansion for mobile operators, it adds interoperability challenges amongst network elements from different vendors, both software and hardware. Another challenge is that open interfaces also increase the security attack surface, demanding more and better security measures. Industry leaders are working together to address these challenges through an organisation called the O-RAN Alliance (Keysight is a member ot the alliance).

Facilitating change

We can reframe all of this as an opportunity to facilitate change within organisations and across the industry. It can be useful to split this into parallel trains of thought – accelerating new use cases and managing crucial risks.

First, a clear mindset can help accelerate new use cases. Moving from 'vision' to 'action' to 'success' starts, as always, with speed of execution. This is even more important for those seeking differentiation through new business models that will focus the technology on areas that will ensure the most impact.

Second, business is always about managing risks, and new technologies must be developed and validated quickly and confidently. So, whether you are making semiconductors, network systems, or user equipment (or other new devices), or whether you are a service provider, hyper-scaler, or an automotive OEM, the creation of new alliances, based on shared goals, has proven to be another key to success.

Ultimately, the ability to drive changes that anticipate and meet future expectations requires research, design, and validation alongside processes that effectively and continuously assess user experience within critical use cases. From semiconductor device physics to advanced radio systems to autonomous and virtualised network systems, making it all work will require expertise and tools that assess everything from physical and functional behaviour to QoS.

Making our way forward

Looking across the technologies shaping the future of connectivity, the path ahead is filled with challenges. For companies such as Keysight, our role is to help the industry accelerate innovation and thereby accelerate progress towards dependable connectivity, new possibilities, and exceptional user experience. We look forward to working with the industry and exploring this path together.

New parallel parametric test system

Keysight's new P9002A parallel parametric test system provides high throughput and cost-effective wafer testing to accelerate time-to-market in R&D and lower cost-of-test in manufacturing.

Ongoing technology innovation in semiconductors is progressing rapidly, and the industry is facing a variety of technical challenges to adapt new materials, as well as miniaturisation and 3D packaging processes.

In addition, the complicated device designs, for commercial applications like 5G, data centres, artificial intelligence (AI) and automotive engineering, are increasing test parameters.

To address this challenge and enable manufacturers to quickly ramp capacity, Keysight has delivered the new P9002A parallel parametric test system which offers cost-effective wafer test with high throughput, as well as a flexible option structure for up to 100 channels parallel test resources, including test capabilities required for parametric tests at each test resource.

Keysight's P9000 series provides software compatibility with SPECS software on 4080 series parametric testers, enabling customers to utilise their existing test programs and test plans with data correlations.

The P9002A parallel parametric test system delivers the following key customer benefits:

- The ability to add options based on test requirements, with licence structure for cost-effective budgeting.
- Unique parametric test technologies and fast capacitance measurement generates improved throughput over the 4080 series parametric testers.
- System compatibility and data correlation with the Keysight 4080 series parametric tester, enable customers to utilise their existing tester programs, test plans and probe cards with 4080-compatible probe card adapter to minimise the cost of building with a new P9002A test environment.

COLLABORATIVE ROBOTS SPARK RADICAL

SHIFT TOWARDS MAKING WORK MORE HUMAN

Mr Kim Povlsen

by Kim Povlsen, President, Universal Robots

A leading company in this field provides an overview.

When I joined Universal Robots (UR) as President earlier this year, I knew I was coming in to lead a fast-growing company in a ground-breaking sector. The more I see of collaborative automation, the more I am convinced that the technology can solve many of the problems faced by the manufacturing sector today. People are becoming more aware of this potential and that is driving strong demand for cobots. As the need for cobots grows, our technology is becoming more versatile than ever before and we are able to offer more across a wider range of industries.

The world has gone through an extraordinary couple of years as it has adapted to the pandemic. I think COVID-19 has highlighted the need for resilience in the manufacturing sector - supply chain problems especially have forced companies to look more closely at their production processes. Meanwhile, we are seeing workforce challenges in manufacturing across all the regions we work in, caused by an ageing workforce and young people making different career choices. Automation has an important role in solving these challenges. Collaborative robots can work alongside staff, increase productivity and make manufacturing jobs more attractive to workers.

When employers introduce cobots, we see them upskill their existing employees and the nature of the work changes. Staff take on more responsibilities with creative, problem-solving and communication elements, that only humans can handle, while operating the cobots to complete repetitive tasks. These changes result in increased work satisfaction and better career advancement opportunities amongst the employees.

In the post-pandemic world, people are starting to rethink the kind of work that should be done by humans. The jobs in manufacturing, assembly and operations are often dull, dirty and dangerous. Now, collaborative automation is paving the way for the workforce to take on more interesting jobs. With cobots working alongside them, employees are becoming adept cobot operators, assigning cobots to work on repetitive tasks while they spend more time devising innovative strategies. This trend of changing job scope can help to retain the workforce for companies, while relieving employees of

UR5 cobots, from Universal Robots, address labour shortages and increase packaging production by 30%, at Japan-based manufacturer, Nippon Zettoc.

work which is unfulfilling or physically demanding. I am so excited to be leading a company that empowers this change in the way that work is done.

I often get asked about the challenges we face as a company. We have sold well over 50,000 cobots since the first cobot in 2008. You can now find UR offices in over 20 countries and our cobots can be found in almost every part of the world. But in many ways, we are only just getting started. We look at the challenges facing manufacturing and we know from our market analysis that there are tens of millions of people working in jobs including tasks that are automatable with cobots. The key challenge is therefore in spreading awareness of cobots and developing confidence in using the technology.

In recent years, we have started working with schools and colleges to help develop the robotics skills needed by the next generation of engineers and production workers. UR has also created educational online training accessible to anyone interested in learning about the use of cobots. Our training for cobot operators builds confidence in everything from basic tasks to much more complex processes. This is really the starting point in our company's commitment to every customer's success.

You might think that our technology has now reached a stage of development where the emphasis is on production rather than research and development but, in fact, our research and development work has never been stronger. We are working every day to refine our technology and to continue to innovate. Our colleagues, across innovation, research and development, and product design, work to continuously redefine automation. I am really committed to hiring the best engineering talent from across the world and then empowering those engineers to solve the problems facing the manufacturing sector. We set out to ensure that everyone using our cobots has a positive and frictionless experience and this means putting customer experience at the heart of everything we do. Our teams have constant contact with end-users to understand their needs and desires.

Customers turn to cobot technology for different reasons, and we see different drivers across the world, depending on local economies and industries. In Asia, companies often choose UR to increase quality in production, to build resilience and maintain a competitive edge. We work with many companies in Asia, that are making expensive products, where the cost of mistakes is very high. Our cobots give companies the ability to increase consistency and reduce waste. People have been less mobile since the pandemic started and we know some companies also value the certainty that comes with increasing automation.

Our success at UR is the product of our collaborative business model. The best way of understanding this model is to look at a smart phone – great technology, but the real leap forward in the way we live has come from the technical platform that has allowed independent companies to develop compatible applications to cover every conceivable human need. Our cobot technology creates similar opportunity. We now work with over 290 independent partners who design and develop components and applications for our cobot. This is the only way to create the range of technology at the pace of development demanded by the market. This collaboration is the only reason we see cobots now working on tasks such as sanding and welding that were previously believed to be impossible to perform with collaborative automation. The number of independent developers involved also creates real choice for our customers, which they can match to their unique business needs.

Moving forward, we foresee an exciting year ahead as UR continues to grow in Asia Pacific. The technological capabilities of UR cobots along with the applications and components developed by our partners are constantly evolving. One of my primary goals as the President of UR is to ensure that we continue to innovate and further lower the automation barrier for companies of all sizes. Cobots have proven to provide a promising future for many companies. As cobots permeate the mainstream, we believe that companies will continue to reap the rewards which include increased revenues, improved production quality, and a safe working environment.

UR10 cobots offer the solution for an ageing workforce and reduce relief worker costs for a global car manufacturer, Nissan Motor Corporation.

PT JVC Electronics Indonesia improved productivity and performance quality while reducing yearly operational costs by USD 80,000, with UR3 cobots.

UNDERSTANDING AND ADDRESSING

CYBERSECURITY CHALLENGES FOR INDUSTRIES

Ms Jess Ng, Country Head, Singapore and Brunei, Fortinet, tells 'The Singapore Engineer' that the convergence of IT (Information Technology) and OT (Operational Technology) systems has increased the risks.

Ms Jess Ng

The Singapore Engineer (TSE): Why are industrial organisations vulnerable to cyber attacks?

Jess Ng (JN): Industrial companies belong to the critical infrastructure sector providing vital services and resources to the population. They include oil & gas, electrical generation and distribution, aviation, maritime, rail and utilities companies. Attacks against critical infrastructure differ from regular ransomware exploits because of the direct impact they can have on the everyday lives of people. By holding critical infrastructure providers hostage, for their operations and data, threat actors can capitalise on the fear of causing massive public disruption, thereby reaping huge financial gains through ransomware methods.

Moreover, with the accelerated adoption of digital technologies, which is driving the momentum for convergence with IT processes, especially during the pandemic, businesses within the sector need to revisit their existing security strategies. Industrial companies must adopt new operational processes as physical assets and production become increasingly digitised. The increased connectivity of the devices, systems and networks within Industrial Control Systems (ICS) with the digital space has inevitably expanded the attack surface. This leads to a crucial need for meaningful automated awareness to address the scale of potential threats associated with the rise in connected cloud security environments within Operational Technology (OT).

TSE: What are the common security challenges for Industrial Control Systems?

JN: In recent years, critical infrastructures and manufacturing industries have come under increasingly frequent and sophisticated cyber attacks. Threat actors will target IT insiders through phishing attacks and malicious attachments, steal access credentials and then gain control of the company's network using malware. Most production control platforms such as Supervisory Control and Data Acquisition (SCADA) and Distributed Control Systems (DCSs) are not encrypted. Comprised of several components including IT and OT devices, programmable logic controllers, built-in human-machine interfaces, remote terminal units and actuators, an ICS may also not require authentication when executing commands. Previously air-gapped to the outside world, OT devices connected to the internet via an IT network immediately expose the OT network and all connected OT devices to the entire threat landscape.

Endpoint devices and human interaction interfaces that are used to access the OT network remotely, have inadvertently become security risks because they could potentially be exploited and become a gateway into the company network. As a central control system that can send, transmit and process commands, and interpret signals from sensors, control valves, breakers, switches and motors, a compromised ICS can wipe out files and firmware or trigger an emergency shutdown that can damage industrial equipment.

Cybercriminals are leveraging the speed of OT-IT convergence by exploiting the security gaps in legacy OT systems while developing sophisticated tools and skills in launching more destructive cyber attacks. Cybercriminals have been primarily interested in stealing data, but they are increasingly targeting OT environments, recognising the potential for widespread disruption.

With a spate of high-profile cyber attacks in the US, such as the Colonial Pipeline, JBS and the Kaseya software supply chain cases, the threats of cyber attacks on companies that deliver critical resources and services have become more palpable. Cyber attacks can completely disable business processes for a long duration and inflict tremendous damage, not just on enterprises, but on society as well. These cyber attacks can also threaten the safety of citizens and – in the case of critical infrastructure – national security.

TSE: How can these challenges be addressed through a robust cloud security plan?

JN: Moving OT to the cloud offers numerous benefits that enable businesses to realise business objectives. Organisations are looking for more automated and integrated solutions to ease cost and operational burdens. However, like any infrastructure expansion, moving workloads to the cloud requires careful planning and execution, and as companies' cloud infrastructure becomes more complex, cybersecurity risks also increase.

Gartner predicts that in-cloud breaches occurring through 2025, 99% of incidents will be traced back to preventable misconfigurations or mistakes by end-users. Thus, for companies within the industrial sector, the ulti-

mate goal is to develop a cloud security strategy that can unify security solutions deployed across cloud infrastructures, applications and connections, so that visibility and control can be managed centrally on a single platform.

Organisations can take a three-pillar approach to develop a robust cloud security strategy:

- Zero Trust: Visibility on the devices and users that are connected to the network, and granting profile-based network access per application, can help to enforce security policies regardless of device type, location or method of access.
- Security-driven networking: Tightly integrating network infrastructure and security architecture enables the network to scale and change without compromising on security operations.
- Artificial Intelligence-driven security operations: Deploying technologies like artificial intelligence (AI) and machine learning (ML) coupled with automated processes can help detect and neutralise threats at the speed of lightning.

TSE: What are the main features of converged IT/OT (Information Technology / Operational Technology) environments?

JN: As technologies and digital innovations enable the integration of IT and OT systems, manufacturers and companies providing critical services to other sectors are reaping the benefits of getting insights and controls into a single uniform environment. Leveraging a single, cohesive system where applications and technologies integrate and interoperate seamlessly can help businesses improve process efficiency, minimise errors, reduce costs and gain competitive advantages.

Traditionally, OT cyber security was not necessary because OT systems were not connected to the internet, limiting exposure to outside threats. As digital innovation (DI) initiatives expanded and IT/OT networks converged, organisations have relied on point solutions to address specific security issues. This approach to OT security resulted in a complex network of segmented solutions, resulting in a lack of visibility across the IT environment. Without a comprehensive and integrated security fabric covering every possible attack vector, IT/OT networks become sitting targets for cyber criminals.

TSE: How can we mitigate cyber threats in the OT environment?

JN: Insights from Fortinet's 2021 State of Operational Technology and Cybersecurity Report reveals that significant intrusions affecting organisations' productivity and revenue, as well as threats to physical safety, are rising. Moreover, insider threats and phishing attacks are also becoming rampant.

To attain the necessary visibility, control, and behavioural analytics to secure converged OT/IT networks, companies can leverage the comprehensive, continuous as well as real-time protection that security fabrics can offer. Fortinet provides a proactive and transformative approach to OT security with the Fortinet Security Fabric. Instead of disparate point products operating in silos, the Security Fabric enables multiple OT security technologies to work together across IT and OT environments. With full integration and shared threat intelligence, OT organisations gain fast, automated responses to attacks in any vector. One solution covers the entire converged IT-OT network, to close OT security gaps, deliver full visibility, and provide simplified management.

To address the growing digital skills gap, reskilling and upskilling is also key. With this in mind, the Government of Singapore has recently announced the Cybersecurity Competency Framework, jointly developed by Cyber Security Agency of Singapore (CSA) and Mercer, and supported by SkillsFuture Singapore and Infocomm Media Development Authority. The framework outlines and charts the different cybersecurity skillsets that OT professionals must have across different sectors such as energy, water, manufacturing, and transport.

With this initiative, OT and cybersecurity experts can identify gaps within their technical skills or domain knowledge, and take the required training and certifications to ensure that they are adequately equipped in mitigating cyber risks. Recognising the importance of developing the cybersecurity workforce in mitigating the impact of cyber threats on enterprises and on society, Fortinet is offering a certification program for cybersecurity employees and mid-career professionals.

TSE: Any other information that you would like to provide?

JN: In addition to what we have shared in response to the previous questions, with the increasing number of cyber attacks, enterprises should include a comprehensive Incident Response Plan in their cybersecurity strategy to minimise the damage and mitigate risks, should a compromise occur within the company's network. Organisations must view IT/OT integration as a system within systems and understand the complexity of the infrastructure that this connection supports. Vigilance across the OT architecture must extend from the plant floor all the way up through to the cloud. Having an integrated cybersecurity platform enables consistent security across the network, and provides seamless interoperability and complete visibility as well as granular control for hybrid deployments.

(Fortinet secures the largest enterprises, service providers and government organisations around the world. The company empowers its customers with intelligent, seamless protection across the expanding attack surface and the power to take on the increasing performance requirements of the borderless network – today and into the future. The company's Fortinet Security Fabric architecture can deliver security without compromise to address critical security challenges, whether in networked, application, cloud, or mobile environments).

BUILDING OPERATING SYSTEM PLATFORM

FOR SMART BUILDING APPLICATIONS

Schneider Electric, a leader in the digital transformation of energy management and automation, recently announced the release of EcoStruxure Building Graph, a new building operating system and linked data platform.

The operating system will provide the digital twin of buildings, for seamless access to building systems' data and control. EcoStruxure Building Graph delivers value for building owners, operators and tenants by linking the complex network of interactions between humans and the building, connecting data across various systems and IoT devices, and enabling secure data accessibility and application development.

The future of smart buildings

A truly smart building uses technology to deliver space and energy efficiencies, easily accommodates change, fosters resiliency, and links occupants to a better, more connected experience. But to drive more efficient workflows across the entire building lifecycle, buildings of the future need to be digitised, to allow IT and OT systems to integrate in a more seamless and connected way.

The challenge, however, is most buildings today have disparate systems which inhibit integration. EcoStruxure Building Graph removes the complexities of integrating building systems and accessing building data in siloed environments. By introducing technology and system integration as a core component of the design phase of the building value chain, buildings will be future-proof and enable sustainable, resilient, efficient, and people-centric use cases.

According to Schneider Electric, buildings are becoming smarter and more connected, resulting in an exponential growth of data. Making the most of the data generated by buildings and people within them is key to delivering the full value of digitisation and buildings of the future.

The company believes that EcoStruxure Building Graph removes the complexities that come with integrating building systems and provides application developers with the real-time data access they need to solve customer pain points, increase operational efficiency and deliver a better occupant experience.

Key features of EcoStruxure Building Graph

EcoStruxure Building Graph alleviates integration complexities to deliver smart applications such as:

- Connected solutions: EcoStruxure Building Graph's technology integrates with Schneider Electric's on-premise connected room solutions and BMS, through EcoStruxure Building Operation. It is also complemented by Schneider Electric's native cloud applications, Engage Enterprise and Building Advisor, as well as by industry partner, Planon.
- A focus on occupant well-being: By aggregating and contextualising these data types in EcoStruxure Building Graph, the values can be easily accessed for comfort score ranking and analysed to pinpoint opportunities to improve work environments.
- Advanced BMS Technology: A cloud-based digital twin and linked data platform providing APIs and telemetry connect to extensive data sources.

EcoStruxure Building Graph creates value by unlocking opportunities through advanced automation, connected and integrated solutions, and building environment monitoring in real-time.

Application of EcoStruxure Building Graph

Today, the Dar Group, a leading, privately-owned professional services group, is putting EcoStruxure Building Graph to use at its new 19,000 ft² European headquarters in London, to create a people-centric working environment focused on employee well-being enhanced by data. Using real-time data monitoring, the collaboration has resulted in reducing carbon emissions by 18.5% and in being shortlisted for the prestigious global BREEAM 2021 Awards.

Through the use of building operating systems like EcoStruxure Building Graph, Schneider Electric is able to collaborate with building ecosystem players and open up building data to innovate and create new applications for customers.

Schneider Electric's EcoStruxure Building Graph is a new building operating system that will provide the digital twin of buildings, for seamless access to building systems' data and control.

HYPERTHERM ANNOUNCES RELEASE OF

PRODUCTION MANAGER FOR PRONEST CAD/CAM NESTING SOFTWARE

Hypertherm, a US-based manufacturer of industrial cutting systems and software, has announced the release of Production Manager, an optional module for its ProNest advanced CAD/CAM nesting software. This web-based module is expected to improve productivity, maximise machine up-time, boost on-time delivery and increase material utilisation.

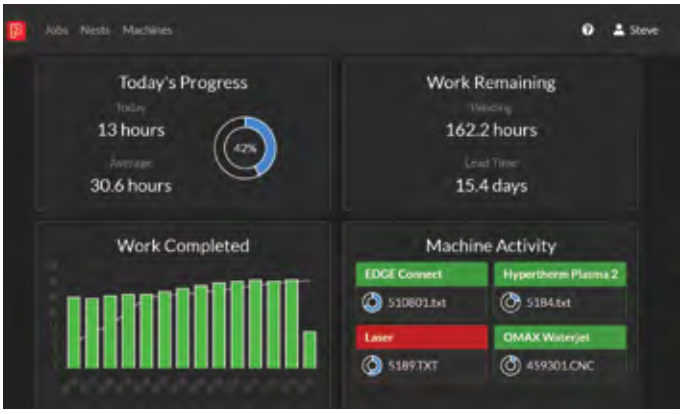
Production Manager is said to seamlessly integrate with Hypertherm's EDGE Connect CNC, to automatically capture machine data without the need for operator intervention. In addition, it displays real-time production data, so team members across an organisation can track the status of job orders, the production schedule and pending inventory requirements. Additional features include:

- Dashboard view: The intuitive dashboard view provides production stats and trends in one view. Colour-coded status alerts help users quickly understand the on-screen information while an interactive display allows users to drill down for additional insight.
- Real-time information: Real-time machine data from the CNC machines is transferred to Production Manager. This enables users to track job progress, from pending to in-production, to actual completion time, making it easier to respond to customer enquiries and forecast the production schedule.
- Flexible intervention: Parts can be added or cancelled, based on last-minute changes to orders. Users can view machine backlogs and ensure loads are evenly distributed across cutting machines in a way that optimises the production schedule.
- Remote access: Users can easily access Production Manager, via a computer, mobile phone, or tablet, anytime and anywhere, if they have a secure network or VPN connection.

According to Hypertherm, Production Manager takes the guess work out of an organisation's daily operation, by connecting everyone to the same information, in real-time, to drive business cohesion and continuity.

Production Manager is also an example of how Hypertherm hardware and software products work together to provide customers with increased levels of automation and efficiency, something that is increasingly important as companies move towards a more digital shop floor.

Production Manager further extends ProNest's reach across organisations, by interfacing with all aspects of the cutting operation, including sales, customer service, procurement, and management.



The intuitive dashboard provides production stats and trends.

Users can easily access Production Manager, via a computer, mobile phone, or tablet, anytime and anywhere.

NEW CONFIGURATION

FOR AUTOMATION HOUSING UNITS

The esmo group (esmo) recently unveiled new configurations of UniCell, the company's cross-industry compact automation housing solution for manufacturers looking to improve productivity levels, production stability, and occupational safety.

The UniCell enclosure is an all-in-one offering that enables manufacturers to streamline and optimise their processes.

Highly standardised, yet customisable, the modular solution can be deployed on stand-alone machines or in a network of complex systems.

Depending on the user's requirements, these automation housing units can be configured to perform specific production or testing tasks (e.g. joining operations, handling, assembly, inspection etc), flexibly catering to a variety of automation needs and tackling challenging demands.

Given its versatility, the UniCell is relevant for all industries and is applicable particularly for small to medium-sized components that require mid- to high-cycle rates. The automation cell boasts an innovative safety and lighting guidance system which enhances occupational safety on the shopfloor while boosting productivity. Furthermore, the UniCell modules are easy to operate, maintain, and transport around the production facility.

Additional features of the UniCell include the following:

- A robust and sturdy welded machine frame made of high rigidity steel.
- Optimum damping/shock absorption of dynamic robot motions, even at high traversing speeds and force/load impacts.
- Plug-and-play option for customer-specific interface preparation.
- Enclosed cell with pressure control systems.
- Optimised accessibility, facilitating maintenance and cleaning operations.
- Integrated and comprehensive safety concept (incorporating EMO features, safety switches, light barriers etc).
- Standard interfaces (OPC UA) - an Industry 4.0 pre-requisite.
- User-friendly HMI touch display for convenient system control.
- A control cabinet that can be integrated into the system substructure plus a storage option for the robotics / vision controller (IPC).

The esmo group

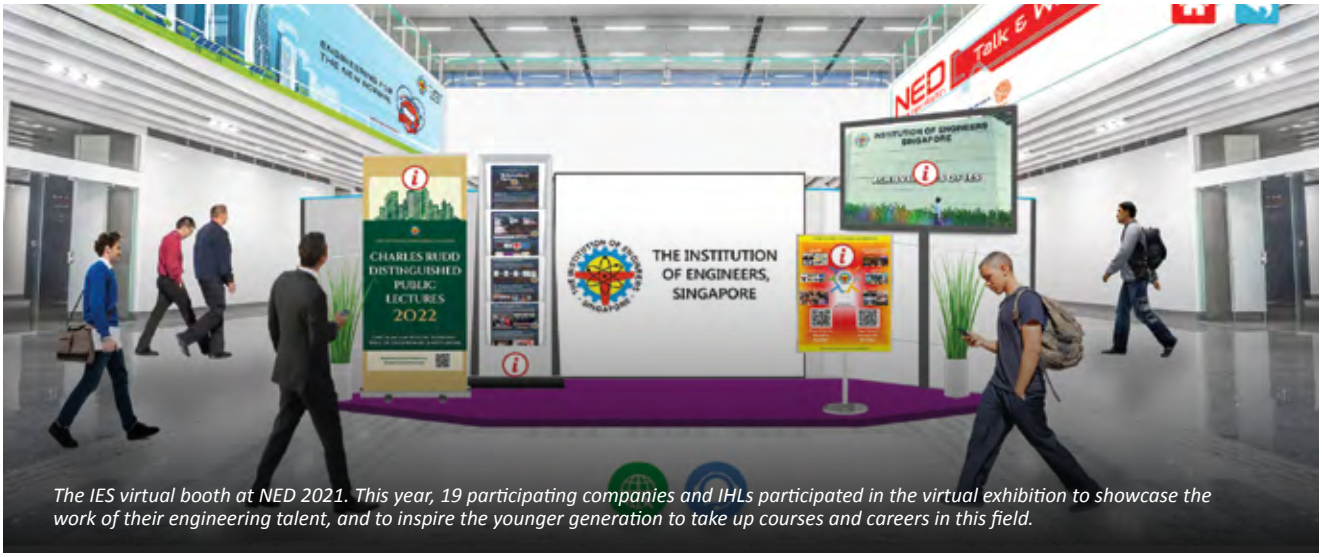
Established in 2001, the esmo group is an international enterprise that provides innovative and advanced engineering services to different sectors across a variety of industries.

esmo automation is a full-service provider that offers a comprehensive range of products and services for plant engineering and automation technology industries.

esmo semicon is a leading supplier of manipulators, docking and interfacing components as well as handling systems for the global semiconductor industry.

The esmo group recently unveiled new configurations of UniCell, the company's cross-industry compact automation housing solution for manufacturers.

YOUTHS APPLAUDED FOR SPIRIT OF INNOVATION AT NED 2021



The IES virtual booth at NED 2021. This year, 19 participating companies and IHLs participated in the virtual exhibition to showcase the work of their engineering talent, and to inspire the younger generation to take up courses and careers in this field.

From 9 to 20 November, the 2021 edition of National Engineers Day (NED) took place as a digital-physical hybrid festival that celebrated engineers and engineering.

An enriching line-up of activities that highlighted the contributions of engineers in the fight against the global COVID-19 pandemic, as well as opportunities for youths to shape the new normal by pursuing a career in engineering, were offered.

This included talks on various topics such as net zero buildings, women in engineering, and the applications of smart technology. There were also online and physical workshops that allowed participants to learn more about areas such as 3D printing and robotics, in addition to virtual guided tours of the Singapore facilities of companies like Huawei and Emerson Automation Solutions.

IES also collaborated with IEEE on a series of engagements themed "Advancing Technology for Humanity", held on the second day of NED 2021. This featured a series of talks and workshops around the topics of sustainability, and the work of engineers in the pandemic response.

The event concluded on 20 November with the Engineering Innovation Challenge (EIC) 2021 Prize Presentation Ceremony that took place at The Ngee Ann Kongsi Auditorium, National Gallery Singapore.

During the ceremony, the top three teams of each EIC category received their awards from Minister for Education Mr Chan Chun Sing, for creating innovative solutions under the theme "Radiation 360".

Despite the challenges posed by COVID-19, fifty-seven shortlisted teams successfully competed at the EIC this year, from a pool of 127 registered student teams. The

Over the course of the 10-day festival, exciting talks and workshops were held to encourage and enthuse students from all backgrounds about the world of engineering.

competition is jointly organised by IES, Science Centre Singapore, and the Singapore Nuclear Research and Safety Initiative (SNRSI), with support from the Ministry of Education.

These students began their EIC journey seven months ago, where they learnt about the applications of radiation in areas such as sustainability, healthcare, food and agriculture, and transportation. They also performed research on background radiation in Singapore, and built up technical skills in prototyping and product development before finally presenting their ideas to a panel of judges.

"At a time where Singapore and the world are striving to recover from the COVID-19 pandemic, NED 2021 has opened the minds of students and the public, enabling them to see the limitless possibilities of using engineering to build a better future.

"The fantastic solutions developed by students for EIC 2021 have emphasised the importance of such a platform to nurture a future generation of engineers who will see us through future crises," said Dr Richard Kwok, IES President.

(Clockwise from top left) Dr Kwok and Mr Chan, together with representatives from the EIC 2021 winning teams in the Secondary School, JC, Polytechnic/ITE, and University categories respectively. Their teammates attended virtually over Zoom.

Engineering Innovation Challenge 2021 Results

Category 1 (Secondary Schools)		
Position	**School (Team Number)**	**Project Title**
Champion	Dunman High School (S-30)	DisinfectantRAY
1st Runner-up	NUS High School of Math and Science (S-24)	Modification of solar panels to expand their range to include gamma rays and other forms of ionising radiation
2nd Runner-up	River Valley High School (S-09)	Pure Speed
Category 2 (Junior Colleges)		
Position	**School (Team Number)**	**Project Title**
Champion	Yuvabharathi International School (J-06)	Automating Agriculture
1st Runner-up	Victoria Junior College (J-10)	XCT: X-ray COVID Terminator
2nd Runner-up	Dunman High School (J-13)	Production of Fertiliser from Unconventional Organic Waste Using Ionising Radiation
Category 3 (Polytechnics & Institutes of Technical Education)		
Position	**School (Team Number)**	**Project Title**
Champion	ITE College West (I-06)	Efficient Method to Detect Lab Grown Diamonds Using UV Phosphorescence
1st Runner-up	Nanyang Polytechnic (P-07)	Application of Ionising Radiation as an Agricultural Wastewater Treatment Method
2nd Runner-up	ITE College East (I-01)	Solar Panel Powered Disinfecting Device
Category 4 (Local & Overseas Universities)		
Position	**School (Team Number)**	**Project Title**
Champion	Taylor's University, Malaysia (U-34)	Fabrication of Bismuth-PETG composite for additive manufacturing of customised radiation shields
1st Runner-up	NTU (U-40)	RadGlow: Utilising Genetically Modified Caulobacter to Detect Uranium in Freshwater
2nd Runner-up	NTU (U-23)	U Take & Go

YOUNG ENGINEERS
CAREER SERIES WEBINAR ROUND-UP

Panel discussion on engineering self-efficacy in challenging environments: 25 October 2021

The fourth webinar in the 10-webinar YEC series was a discussion on engineering self-efficacy in challenging environments. Mr Mervyn Sirisena, IES Vice President for Education, Chairman of SIA Engineering (Philippines) Corporation, and Director of Boeing Asia Pacific Aviation Services, was the featured speaker.

Through a light-hearted presentation, Mr Sirisena shared his life story of his experiences as an engineer, relating it to self-efficacy (as defined by psychologist Albert Bandura) and the Law of Unintended Consequences.

He encouraged participants to recognise that engineers have an important impact and positive influence on the people they work with, and reminded participants to give back to the community, because "you have a living by what you get, but you have a life by what you give".

During the Q&A session, Mr Sirisena spoke about his sacrifices and how he balanced career and family needs as a young engineer.

He doled out slivers of knowledge with his anecdotes, introducing the mantra of "Learn, Unlearn and Relearn" as a means of adapting to changes in the environment. Also, he opined that the word "retire" should be interpreted as "re-tyre", reflecting lifelong learning about new knowledge and technology.

Noting that future problems would require cross-disciplinary knowledge to solve, he encouraged participants to be open-minded in learning from other domains as well.

Mr Sirisena's enthusiasm and candour were welcomed by the participants, many of whom were young engineers. They enjoyed how he took on every question with gusto and felt that the learn-unlearn-relearn concept was a key takeaway from this session.

Pathway to Chartered Engineering: 29 November 2021

In this webinar, Mr Yee Boon Cheow, Group Director of the Rail Assets, Operations & Maintenance and the Rail (Electrical & Mechanical) Groups at LTA, spoke about railway engineering in Singapore and introduced the Chartered Engineer certification programme.

He began by sharing some information on the railway landscape and explained the relationship between the transport operators, contractors, and LTA.

With the planned expansion of Singapore's rail network to 360 km by 2030, Mr Yee foresaw a demand for railway engineers. Having multiple projects going on at the same time was a good opportunity to experience different project phases simultaneously, hastening the learning process.

The skills and experience gained are transferable overseas, especially since Singapore has the greatest number of driverless train systems in the world.

A boost to these would be the Chartered Engineer (Singapore) certification, which is a recognition of one's professional competence. Having attained his CEng certificate in 2016, Mr Yee shared his experiences regarding the journey, pointing out that the certification could help enhance one's employability and career prospects.

Capping off his presentation, he outlined some possible career pathways in the railway industry. To be trained in the full spectrum of project operations – design, installation, testing, and commissioning – one would require about seven years.

After this, further training in specialised areas such as Operations and Maintenance may take another three years or so. A competent railway project manager would therefore need some 10 years of experience.

Mr Yee's informative and grounded sharing earned him praise from many participants.

IES CHARITY GOLF TOURNAMENT RAISES $110K FOR ENGINEERING BURSARIES AND CHILDREN WITH DEVELOPMENTAL CHALLENGES

$60,000 was raised for the IES Bursaries, while $50,000 was raised for the Children's Charity Association of Singapore. Mr Desmond Lee presented the cheques to their respective chairmen, Er. Chong Kee Sen (left) and Mr Mervyn Sirisena, to commemorate the occasion.

On 26 November 2021, IES held the Charity Golf Tournament 2021 at the Singapore Island Country Club. Mr Desmond Lee, Minister for National Development & Minister-in-charge of Social Services Integration, graced the dinner that marked the conclusion of the tournament as the guest-of-honour.

"I thank IES for your generous contributions in the midst of this challenging period … As we continue to transform and better integrate our social services … we will need to work closely with many partners like IES, across the public, private, and people sectors. Together, we can build an even more caring and inclusive Singapore, where no one is left behind," said Mr Lee.

IES raised more than SGD 110,000 from the engineering community through this effort, with 144 players participating in the tournament. The proceeds went to the IES Bursaries for Institutes of Higher Learning, to give engineering students from lower-income families from the ITEs, polytechnics, and universities the education that they deserve.

The other beneficiary is The Children's Charities Association of Singapore, where the funds will support children with developmental disabilities and physical impairments to lead dignified lives, function independently and integrate into society.

"Raising this amount of funds amidst a period of uncertainty holds special significance and bears strong testament to the philanthropy of the engineering community. We would like to thank all sponsors and partners for making this effort a success," said Er. Simon Lee, chairman of the golf tournament's organising committee.

The tournament is part of IES' CSR efforts in leading engineers to give back to the community.

THE HEART & VOICE OF ENGINEERS

IES Membership

1) Professional Development

- Eligible for Chartered Engineers Certification Application (subject to registration criteria and conditions)
- Enjoy preferential rates for IES conferences, seminars and workshops
- Enjoy 10% to 15% discount for IES Academy Courses (T&Cs apply)

2) International Affiliations

- Interaction with overseas engineering institutions in joint programmes

3) Networking

- Exclusive FREE Members' Night (T&Cs apply)
- Enjoy preferential rates for networking activities
- Join our Sports Interest Groups
- Join our Social Events

4) Communication

- Enjoy free subscription of IES weekly e-Newsletter
- Free monthly e-zine – The Singapore Engineer
- Free Annual IES Directory containing the business contacts of all members
- Get the latest updates on government regulations and the activities of allied institutions

5) Others

- Enjoy special rate for IES professional Indemnity Insurance Schemes
- Enjoy exclusive merchant benefits
- Free parking in IES premises
- Get a 5% discount off your membership subscription when you pay by GIRO (T&Cs apply)

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