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Certis and Lendlease break ground for Paya Lebar Green

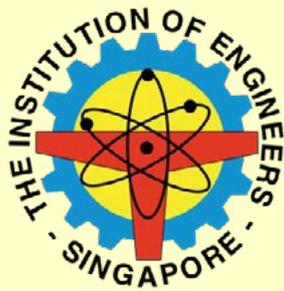


PLUS

ENERGY ENGINEERING: Enhancements for a more secure and resilient power sector

DIGITALISATION: Five automation predictions for 2023

CYBERSECURITY: The convergence of advanced persistent threat methods with cybercrime is predicted



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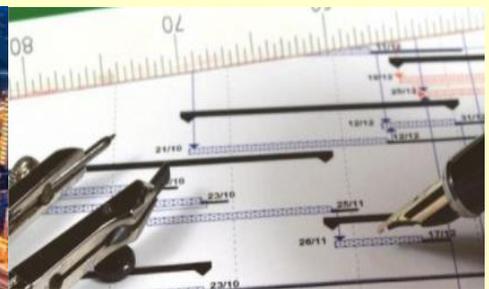


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President
Mr Dalson Chung
Chief Editor
T Bhaskaran
t_b_n8@yahoo.com

Publications Manager
Desmond Teo
desmond@iesnet.org.sg
Snr Publications Executive
Queek Jiayu
jiayu@iesnet.org.sg

Editorial Panel
Dr Chandra Segaran
Dr Ang Keng Been
Mr Syafiq Shahul
Mr Jaime Vega Bautista Jr
Dr Victor Sim
Mr Soon Ren Jun
Dr Alexander Wiegand

Media Representative
Multimedia Communications
(2000) Pte Ltd
sales@multimediacomms.sg

Design & layout by **2EZ Asia Pte Ltd**

Cover designed by **Irin Kuah**

Cover image by **Paya Lebar Green**

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Vertiv supports Singapore's first tropical data centre testbed

Vertiv, a global provider of critical digital infrastructure and continuity solutions, recently announced that it has partnered with National University of Singapore (NUS) and Nanyang Technological University (NTU) Singapore, in the development of an advanced data centre testbed facility. Vertiv has provided racks, rack power distribution units (rPDUs), and high-density cooling solutions, to demonstrate advanced thermal management technologies that support data centres located in tropical locations.

Known as the Sustainable Tropical Data Centre Testbed (STDCT), the testing facility is said to be the first-of-its-kind in the region. It was developed with the goal to enhance Singapore's competitiveness in sustainable and efficient data centre solutions. In this facility, innovative thermal management technologies will be tested, to identify potential operational risks and design de-risking measures suited to the tropical climate.

"In recent years, we have seen a shift of data centre investments in tropical locations across Asia,

largely due to decentralisation and global expansion. With the growth in investments, Singapore has been touted as a key data centre hub in the region", said Hitesh Prajapati, Country Manager for Vertiv.

"However, cooling high-density compute applications, especially in hot and humid tropical climates, can be a challenge. Traditional free-cooling methods that rely on cool, outdoor air to support IT equipment will not be as effective in tropical climates common in Singapore and many countries in Southeast Asia. This facility is an excellent avenue for us to showcase our latest thermal management technologies that support tropical climates", he added.

In support of STDCT's drive towards sustainability, Vertiv provided a row-based coolant distribution unit (CDU) that utilises a liquid-to-liquid heat exchanger for effective heat transfer of the IT heat load. The CDU supplies cold water to proprietary cold plates developed by NUS and CoolestDC, forming an effective

solution for IT equipment cooling. CoolestDC is a Singapore-based deep tech thermal, power, performance and carbon management company.

"Working together with Vertiv has allowed us to develop an advanced chip cooling solution to support high-density servers and computing equipment. The solutions deployed in STDCT will allow customers, researchers, and even the academe to appreciate the latest technologies available to cool data centres in tropical climates", said Associate Professor Lee Poh Seng, Programme Director of STDCT. Assoc Prof Lee is from the Department of Mechanical Engineering under the NUS College of Design and Engineering.

More than a physical facility, STDCT is a technology- and operator-agnostic, co-innovation programme that aims to understand and address the cooling needs of tropical data centres, in order to meet the challenges pertaining to significant power and cooling consumption, carbon footprints, and increasing rack density.

Global Paris Aligned Asset Owners Initiative publishes first Progress Report

The Paris Aligned Asset Owners initiative (PAAO), an international group of asset owners committed to supporting the goal of net zero greenhouse gas emission, by 2050 or sooner, has published its first Progress Report showcasing the steps asset owners are taking to reach their net zero goals.

Alongside the Progress Report, initial target disclosures have also been published for a further 13 asset owners, taking the total to 40, since the initiative was launched in March 2021. The

latest disclosures include targets from asset owners including AP7, Lloyds Banking Group Pensions Trustees Limited and Ilmarinen.

The asset owners are typically pension and superannuation funds, and increasingly occupy a systemically crucial position in the process of aligning financial flows to achieve net zero by 2050.

PAAO is an outcome of the Paris Aligned Investment Initiative which was established as a

collaborative, investor-led forum to support investors in aligning their portfolios and investment activities to the goals of the Paris Agreement. Since 2021, PAAO has been a partner in the UN Climate Champion's Race to Zero campaign and a member of the Glasgow Finance Alliance for Net Zero (GFANZ).

PAAO signatories draw on the Net Zero Investment Framework, the net zero methodology most widely utilised by financial institutions, to set targets and devise a net zero investment strategy.

CCUS market set for growth in key industries

The momentum behind carbon capture, utilisation, and storage (CCUS) deployment is building up. CCUS is recognised as one of the technologies essential to achieving net-zero emissions targets.

The new IDTechEx report, 'Carbon Capture, Utilization, and Storage (CCUS) Markets 2023-2043', highlights what the CCUS industry has been doing to overcome historical challenges and position itself to reach the scale required for net-zero emissions – a bold goal set by more than 70 countries, and recently reinforced at the UN's Climate Change Conference (COP27).

IDTechEx's updated report presents the latest developments across the CCUS industry, that have shaped the current market landscape, including regulatory incentives, business models, project delivery strategy, technological innovation, and more. Based on the drivers and hurdles for CCUS uptake, IDTechEx's latest forecast expects the global CCUS capacity to reach 1.8 gigatonnes per annum, by 2043. Although still a modest capacity, compared to what is needed for countries to achieve their net-zero commitments, attaining the gigatonne level of CCUS deployment will mean unprecedented growth for the industry and large amounts of investments.

Will the CCUS market finally take off?

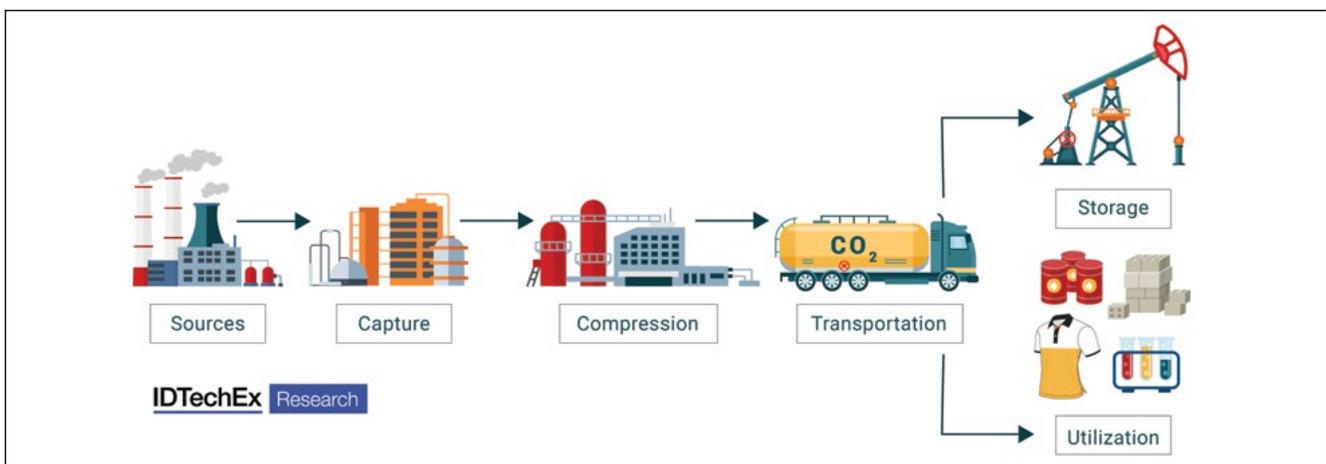
CCUS encompasses a range of technologies designed to capture carbon dioxide (CO₂) emissions and provide long-term sequestration solutions or utilisation routes for the captured CO₂. Though deployment over the past 10 years has been slower than what is needed to limit global warming, CCUS's competitive suitability to decarbonise 'hard-to-abate' industries, such as energy, chemicals, cement, and steel production, has shifted the narrative from whether CCUS is needed, to how quickly it can be deployed at scale.

As decarbonisation commitments, worldwide, grow, the CCUS industry is starting to shift to new business models on dedicated CO₂ storage and emerging use cases for CO₂ such as CO₂-based polymers or building materials. The market has been dominated by enhanced oil recovery (EOR) which involves pumping CO₂ in geological reservoirs to extract additional fossil fuels, due to the difficulty in making an economical business case for the safe disposal of CO₂ alone. However, IDTechEx's new research finds that with rising carbon prices, favourable regulation, and an ever-growing demand for lower-carbon-intensity products, the revenue streams are becoming more diverse, making the market signals stronger for CCUS deployment.

In this new report, IDTechEx also explores how the sector is moving away from full-chain CCUS projects (integrated capture, transport, and storage or use, that serve one large emitter) to developing multi-user, shared infrastructure networks.

Many CCUS project developers are investing in a CCUS 'as-a-service' model, by linking nearby CO₂ emitters through a collection hub, and then transporting the CO₂ to clusters of storage or utilisation sinks, either by ship or backbone pipelines. The concept is akin to waste management and is set to reduce commercial risk and foster economies of scale, although it requires coordination amongst multiple players. Adapting to the new needs of the CCUS market, carbon capture players upstream are offering the next generation of modular, easy-to-retrofit carbon capture units to serve emitters of all sizes across many industries, particularly waste-to-energy, cement, iron & steel, and hydrogen.

IDTechEx's new CCUS report provides a comprehensive overview of the CCUS market, including a 20-year market forecast across 12 sub-categories of CCUS, historical data on CCUS projects, details on future projects announced to-date, nearly 40 company profiles, and technology benchmarking, all to give the reader a clear picture of the CCUS landscape.



The major steps involved in carbon capture, utilisation, and storage (CCUS). Source: IDTechEx – 'Carbon Capture, Utilization, and Storage (CCUS) Markets 2023-2043'.

Grundfos obtains approval of emission reduction targets

Grundfos, a global leader in advanced pump solutions and water technologies, has received full validation of its 2050 net-zero target from Science-Based Targets initiative (SBTi), a climate action organisation that enables companies to set greenhouse gas (GHG) emissions reduction targets grounded in science.

Grundfos became the first organisation in the water solutions sector to receive the approval, as indicated in SBTi's publicly available target dashboard. SBTi also validated the company's near-term 2030 emission reduction targets.

Mr Poul Due Jensen, Group President & CEO of Grundfos, said, "Today, we announce the most significant long-term climate commitment in our sustainability journey at Grundfos, one that highlights our leadership in taking climate action across our footprint and deep into

our value chain. At Grundfos, our services and solutions go beyond water, as do our sustainability ambitions – saving energy, saving water, circular business, and water access. As a leading pump manufacturer and water solutions provider, we take responsibility for the carbon that is emitted not only to produce our products but also to generate the energy consumed when they are in use".

Grundfos aims to accelerate its transformation to a net-zero future, whilst enabling its customers to save energy. The net-zero target will require significant innovation efforts and deep, concerted decarbonisation efforts across the company's operations and value chain.

To achieve this long-term goal, the SBTi also approved Grundfos' near-term CO₂ emission reduction targets. Grundfos has committed

to reduce absolute Scope 1 and Scope 2 GHG emissions 50% and reduce absolute Scope 3 GHG emissions 25% by 2030, from a 2020 baseline year.

Grundfos worked with industry experts to identify the use of Grundfos products by end-users as its biggest source of GHG emissions. These emissions, for which Grundfos is indirectly responsible, across its value chain, account for 99% of the company's total GHG emissions. As such, Grundfos believes it can make the most difference in addressing the growing climate challenges, through reducing Scope 3 emissions, by delivering an energy-efficient and digitally enabled product portfolio.

Grundfos' science-based targets and carbon footprint baseline have been created in partnership with the Carbon Trust, a global climate consultancy.

ManageEngine releases results of study on IT at work

ManageEngine, the enterprise IT management division of Zoho Corporation, recently announced the results of its comprehensive global study 'IT at work: 2022 and beyond'.

The research revealed significant gaps in perceived organisational support between IT and non-IT leaders and control over data, in Singapore companies. As per the report, three-quarters (75%) of IT decision-makers (ITDMs) agreed that their organisations should have supported them more in the last two years. Additionally, more than four in 10 (43%) ITDMs reported that they were inadequately consulted when their organisations adopted flexible working models. With the majority of the workforce indicating a preference towards hybrid work, it is imperative for technology leaders to loop in ITDMs in order to leverage the

flexible work setup and to facilitate virtual delivery models.

The research also indicated that IT holds most of the keys when it comes to controlling access to other departments' data, with the vast majority (77%) of business decision-makers (BDMs) reporting that IT has complete or near-complete control of access to their departments' data. However, this is the lowest compared to other ASEAN regions surveyed, including Malaysia (88%), Indonesia (87%), and the Philippines (86%).

"As democratisation of IT functions gains wider adoption, it is imperative for organisations to pressure test and re-evaluate their IT ecosystems in light of a hybrid workforce, digitisation in the workplace and security and governance concerns", said Mr Arun Kumar, Regional Director for APAC at ManageEngine.

"Because the role of IT has evolved to that of a collaborator and trusted business partner, leadership should make sure that IT departments are empowered and well-equipped to achieve their business imperative", he added.

Conducted by Vanson Bourne, the study surveyed 150 ITDMs and other key business stakeholders from different organisations in Singapore, covering topics such as the role of IT, artificial intelligence, sustainability and cybersecurity. The study identified key dimensions that require immediate attention by decision-makers and highlighted challenges that will arise from the new future of IT. The report will enable key stakeholders to take a conscious and holistic approach towards reimagining an organisation that is geared to thrive in the future of work.

Siemens Mobility and SBS Transit sign MoU to enhance efficiency in train services

Siemens Mobility and SBS Transit recently inked a Memorandum of Understanding (MoU) to collaborate on Controlguide Artificial Intelligence Response Operation (Airo), a data-driven AI-based solution, to facilitate adaptive headway management and resolve planning as well as operational challenges on the Downtown Line.

The signing ceremony was held at Suntec Singapore Convention & Exhibition Centre, alongside Singapore International Transport Congress and Exhibition 2022 (SITCE 2022). The MoU underscores the strong commitment to use data analytics and artificial intelligence to improve train services for Singapore's commuters.

Under the MoU, Siemens Mobility's Controlguide Airo will be launched as a trial to assess the feasibility of new and existing train schedules, based on several Key Performance Indicators (KPIs) such as vehicle occupancy, crowdedness, and average waiting time. SBS Transit will be able to leverage on passenger demand prediction from numerous data collection points for the gener-



Siemens Mobility has signed an MoU with SBS Transit for the application of AI to improve train services.

ation of new train schedules.

When connected to the live Automatic Train Supervision (ATS) system, Controlguide Airo will also have the capability to serve as a decision support system for operations control centres (OCCs), by regulating trains based on actual passenger demand. SBS Transit can benefit from delivering a better service to passengers and operational efficiency, at the same time.

Siemens Mobility brings its expertise as a leading provider of rail solutions as well as the automatic

train control and operations control systems supplier for the Downtown Line in Singapore. The collaboration will continue to develop Controlguide Airo for applications such as real-time monitoring and situation assessment which enables the detection of unusual events and provides automatic alerts, in advance, when service levels fall below certain KPIs. SBS Transit will also be able to evaluate the effectiveness of incident response measures for different scenarios, such as adding more trains into service or activating bus replacement services.

Trina Solar's Vertex modules receive Carbon Footprint Certificate

Trina Solar's Vertex modules were recently awarded the Carbon Footprint Certificate by TÜV Rheinland. The products cover a full range of 210 mm P-type solar modules, from Vertex S 410W to Vertex 670W, with carbon emissions that are lower than those of high-efficiency modules in the market.

The assessment follows the requirements of ISO 14067 and Life Cycle Assessment methodology, and estimates the total carbon emissions of the 'cradle to gate' product life cycle, and includes energy management, life cycle analysis, material

application and supply chain management.

Accurate and clear product carbon emission estimates will help end-users to adopt fact-based strategies to reduce and offset such emissions. To ensure the accuracy of carbon emissions values, TÜV Rheinland conducted a number of carbon-emission surveys on the entire PV module supply chain, instead of using carbon emission values from the database, and verified the carbon footprint of Trina Solar's modules, based on the actual production data during the investigation period.

In addition to the Carbon Emission Certificate, Trina Solar's 210 Vertex family modules have received a low carbon emissions assessment, through ISO's Life Cycle Assessment.

Trina Solar is committed to the low-carbon concept and practises it in every aspect of product development, production and use. With products following the LCOE-oriented principle and the principle of low carbon emissions, Trina Solar is providing net-zero solutions to industries, worldwide, especially those that have a high carbon footprint.

Alstom inks services contract with SBS Transit Rail

Alstom and SBS Transit Rail Pte Ltd have signed a long-term services support (LTSS) contract, for the Urbalis signalling system installed on Singapore's North East Line (NEL). Alstom has been a long-term partner to SBS Transit Rail, having implemented the original signalling system for both companies' first Mass Rapid Transit (MRT) line, in 2003. NEL is the world's first fully automated underground driverless heavy metro system.

The LTSS will commence in 2023, with Alstom providing technical

expertise and local repair activities for the NEL fleet.

The agreement was signed by Ms Ling Fang, President, Alstom Asia Pacific and Mr Jeffrey Sim, CEO, SBS Transit Rail, during Singapore International Transport Congress and Exhibition 2022 (SITCE 2022).

"We are very pleased to be entering into this important services project with our long-term partner, SBS Transit Rail. This new agreement is testament to Alstom's growing footprint and ongoing commitment to localising key competencies

within Singapore, while sustaining rail reliability", said Ms Ling Fang, President, Alstom Asia Pacific.

Alstom's communications-based train control (CBTC) solution, Urbalis, first entered service in Singapore on the NEL, in 2003, helping to ease commuter congestion.

Constantly upgraded, the advanced signalling solution aids urban operators in maximising their performance and capacity, while providing standard supervision and control, supporting their operational needs.

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Alstom and SMRT Trains collaborate to enhance rail operations and maintenance

Alstom, a global leader in smart and sustainable mobility, and SMRT Trains, Singapore's pioneer and dominant rail operator, are working together to explore the use of technology such as 3D-printed spare parts, autonomous robots and vision computing for predictive maintenance automation, and recovering braking energy.

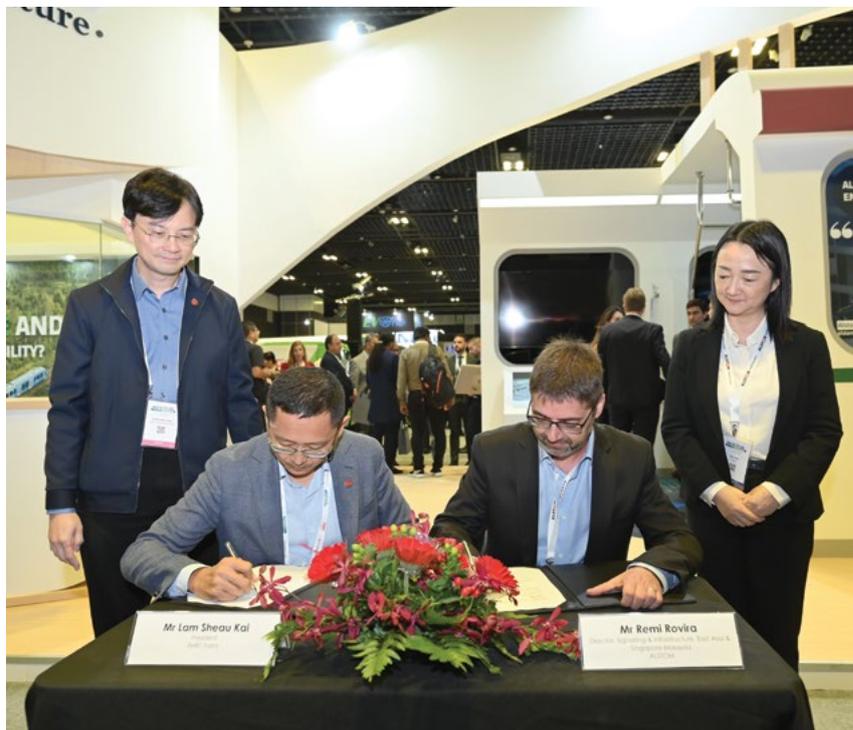
The two companies signed a Memorandum of Understanding (MoU) to establish a framework of cooperation and coordination between the two parties, in the fields of railway operations and maintenance. By signing the MoU, the parties have taken a step towards accelerating railway innovation and transforming Singapore's rail industry.

The MoU was inked by Alstom's Director for Signalling and Infrastructure in East Asia, Singapore and Malaysia, Mr Remi Rovira, and President of SMRT Trains, Mr Lam Sheau Kai, during the Singapore International Transport Congress and Exhibition 2022 (SITCE 2022), in the presence of Alstom's Asia Pacific President, Ms Ling Fang, and Group Chief Executive Officer of SMRT Corporation, Mr Ngien Hoon Ping.

The collaboration will tap on SMRT Trains' extensive local rail network operations and Alstom's global research and development (R&D) resources.

The teams from Alstom's Innovation Station in Singapore and SMRT Trains will leverage the latest technologies, such as additive manufacturing, data analytics, artificial intelligence and cybersecurity, as well as the existing infrastructure, including the communications-based train control (CBTC) simulation facilities, to optimise efficiencies and security in railway operations and maintenance.

Alstom has been present in Singapore for over 20 years and is a major supplier of integrated metro



The MoU was signed by Mr Lam Sheau Kai, President, SMRT Trains (seated, on left) and Mr Remi Rovira, Director, Director, Signalling and Infrastructure, East Asia, Singapore and Malaysia, Alstom (seated, on right), and witnessed by Mr Ngien Hoon Ping, Group Chief Executive Officer, SMRT Corporation (standing, on left) and Ms Ling Fang, President, Asia Pacific, Alstom (standing, on right).

systems, digital train control systems, rolling stock, infrastructure and services. To continuously bring the leading technological advances in rail to customers, Alstom established an Innovation Station in Singapore, in late 2021.

The station focuses on collaborating with local players including customers, research agencies, universities and start-ups, while taking internal innovation projects to the market and beyond the region.

"Alstom offers the most comprehensive range of green and smart solutions to support its customers. We will now expand our innovation capacity and explore products specifically tailored to the geographic, climatic and regulatory realities of the Singapore market. We are therefore excited to be partnering with SMRT Trains on this collaboration journey. Singapore's assets and business environment, combined

with our railway R&D expertise and SMRT Trains' railway operation experience, provide us with a unique opportunity to innovate and grow the local industry", said Ms Ling Fang, President, Alstom Asia Pacific.

SMRT Trains is the first and largest train services provider in Singapore, managing and operating the North-South Line, East-West Line, the Circle Line, the Bukit Panjang Light Rail Transit system and the new Thomson-East Coast Line.

"We are glad to partner with Alstom in exploring innovation and digitalisation, for safe, reliable and sustainable rail operations and maintenance. With SMRT's experience in operating and maintaining train networks and Alstom's R&D expertise, we are confident that this collaboration will enhance productivity, cybersecurity and sustainability", said Mr Lam Sheau Kai, President, SMRT Trains.

Connecting with companies in Finland

The mission of Helsinki Partners, based in Helsinki, Finland, is to promote the city's sustainable growth; attract investments, businesses, talent and visitors; conduct international sales and marketing; as well as build Helsinki's global brand and reputation.

The company was formed when the City of Helsinki combined the operations of two of its subsidiaries – Helsinki Business Hub and Helsinki Marketing.

The services provided by Helsinki Partners are tailored for each customer and are free-of-charge for international companies. They encompass a wide range of fields including artificial intelligence, the circular economy, cybersecurity, data centres, edtech, fintech, health, ICT, smart buildings, smart cities, smart energy and smart mobility.

“The role of Helsinki Partners is that of a matchmaker between international companies and the Helsinki ecosystem. We are already working with organisations in Singapore, sharing information with them, for a number of years now. A concrete example of the collaboration is our Memorandum of Understanding with Smart Urban Co-Innovation Lab”, said Ms Irma Ylikangas, Senior Business Advisor, Helsinki Partners.

“For companies in Singapore who wish to find solutions from Finland, we would be able to connect them with companies, public organisations, research institutions and other key players in Finland. We can arrange the meetings, bring in the knowhow from Finland and see that it reaches the local organisations and projects. At the same time, we can assist those who wish to invest

in Finland, by introducing them to companies in the same sector of activity in Finland”, she added.



Ms Irma Ylikangas

Ms Irma Ylikangas worked as a Business Advisor at Helsinki Partners for several years. Recently, she has taken on the role as Counselor of Innovation and Trade Affairs at Embassy of Finland in Singapore. The cooperation between Helsinki Partners and Embassy of Finland in Singapore is very active.

(More information on business cooperation between Singapore and Helsinki, Finland, may be obtained from Ms Johanna Huurre at Helsinki Partners or Ms Irma Ylikangas at Embassy of Finland in Singapore)

Forging new partnerships in the semiconductor sector

The Embassy of the Kingdom of The Netherlands in Singapore and Singapore Semiconductor Industry Association (SSIA) co-organised an inaugural industry-led event in the semiconductor space, recently.

Titled ‘Singapore and The Netherlands Semiconductor Forum’, the afternoon event was attended by close to 100 participants from the semiconductor industry. The event was graced by Her Excellency, Ms Liesje Schreinemacher, Minister for Foreign Trade and Development Cooperation from The Kingdom of The Netherlands and Mr Soh Leng Huan, Assistant Chief Executive of Enterprise Singapore.

The event started with an overview of Singapore's Electronics Transformation Map (ITM) 2025, specifically in the sphere of microelectronics and its long-

term development goals. Mr Soh also shared about the Singapore Government's support and plans to build and strengthen the semiconductor industry.

A discourse on ‘Singapore and The Netherlands - The Future of Semiconductors’ was also held. The panel discussion, which was moderated by Ms Julie Koh, SSIA's Strategic Programs Director, featured four industry leaders from companies that have an active presence in both the Netherlands and Singapore. The industry leaders shared insights on the semiconductor industry's development and their views on public and private partnerships, and collaboration between the two countries.

Her Excellency, Ms Liesje Schreinemacher, also emphasised the important role both Singapore and the Netherlands play in the global value chain.

“The semiconductor sector is very much a global sector that requires global collaboration. Both Singapore and the Netherlands are key players. By working together our countries can expand our position in the sector”, she said.

“It has always been one of SSIA's key endeavours to collaborate beyond Singapore, to put the SMEs in a better position to be more competitive. Research and Development is also one of the pivotal areas that we would like to focus on, to amplify the technological advancements that drive the industry”, said Mr Ang Wee Seng, Executive Director of SSIA.

“This event hopefully, will be the catalyst to galvanise efforts to kickstart a long-term future partnership between Singapore and Dutch semiconductor companies”, he added.

OnRobot launches D:PLOY in Asia Pacific

OnRobot, a leading international provider of hardware and software solutions for collaborative robotic applications, has launched D:PLOY in the Asia Pacific region. D:PLOY is said to be the industry's first automated platform for deployment of collaborative applications.

D:PLOY is expected to transform and simplify automation for manufacturers in almost every industry. It is said to offer dramatic savings, of up to 90%, on deployment and redeployment time, enabling manufacturers of all sizes to reap the benefits of automation. D:PLOY will work with any leading collaborative or light industrial robot.

The launch is timely as demand for robotic adoption soars in APAC. This is particularly so as manufacturers turn to automation, to cope with rising inflation, labour shortages and supply chain delays. Robotics in APAC is projected to increase from USD 18.7 billion in 2018 to USD 43.7 billion in 2023.

"The launch of D:PLOY marks a huge milestone for OnRobot and offers a foundational market shift that will alter the way automation is deployed across industries", said Mr Enrico Krog Iversen, CEO of OnRobot.

"D:PLOY is set to benefit manufacturers, system integrators, distributors and robot manufacturers. As deployment and redeployment becomes drastically faster, easier and less complex, manufacturers of all sizes can increase productivity and solve their labour shortage challenges. System integrators can complete more projects in less time for greater returns, while distributors can tap into new customer segments. Robot manufacturers can expect higher sales from greater automation adoption. D:PLOY is an automation and market enabler for the entire industry", he added.

"While robot deployments have become easier over the past few years, quite a bit of set up and programming is still required to get



Mr Enrico Krog Iversen, CEO of OnRobot.

them up and running. This is where APAC manufacturers, particularly SMEs, require support, for complexities that could incur additional costs, delaying the ROI on their automation investment. D:PLOY will make those complexities a thing of the past, enabling common robotic applications to be deployed significantly faster and easier", said Mr James Taylor, General Manager, APAC, OnRobot.

The powerful D:PLOY platform allows users to deploy applications directly on the manufacturing floor in a few simple steps. D:PLOY automatically discovers installed hardware while automatically generating a collision-free path for the robot, based on defined obstacles. All of the program logic, signal exchanges, events handling and path planning for the entire application are generated automatically, based on a few user inputs. No programming is needed.

D:PLOY ensures that the application is optimised to be most efficient, ensuring the fastest, collision-free path and solving any possible singularity. It offers insights into performance indicators and other relevant metrics specific to each application, which can be accessed in real time and consulted historically. Lastly, D:PLOY delivers the flexibility and redeployment speed to respond quickly to changes in production requirements, for example, when introducing new parts.

D:PLOY is expected to be available



Mr James Taylor, General Manager, APAC, OnRobot.

in December 2022. The first release will target key applications, such as palletising, CNC machine tending, packaging and material handling, which are typically used in industries such as automotive, electronics, metal and machinery, F&B and life sciences. Future releases will address additional machine tending and material handling applications, as well as process and assembly applications.

According to the International Federation of Robotics, the installation of new industrial robots in factories worldwide hit an all-time high, in 2021, reaching over half a million robots. Singapore, Thailand and India were ranked among the 15 largest markets for industrial robot installations in 2021, alongside robot heavyweights China, Japan and the US.

Eggplant recognised as a leader among continuous test automation providers

Keysight Technologies, a leading technology company that delivers advanced design and validation solutions to a wide range of industries, to help accelerate innovation, announced that its Eggplant test automation platform has been named a Leader in 'The Forrester Wave: Continuous Automation Testing Platforms, Q4 2022'.

Forrester evaluated 15 vendors, assessing them on 26 criteria, grouped into current offering, strategy, and market presence.

The Eggplant platform received the top rating possible in 12 criteria, including automation execution/continuous testing, testing journey, reporting, analytics and quality insights, product vision, execution roadmap and commercial model.

Diego Lo Giudice, author of The Forrester Wave, wrote in the report, "The combination (of Keysight and Eggplant) has huge potential for market penetration in the metaverse, IoT, industrial, automotive and other physical and digital markets. The newly joint vision of

Keysight and Eggplant will become the platform for enterprise-wide automation, test, and assurance of digital systems and products".

Gareth Smith, GM Software Test Automation at Keysight Technologies, said, "The recognition by Forrester reinforces the benefits of our intelligent automation platform that accelerates the pace of delivery and quality of digital experiences. Our end-to-end AI-powered solution enables customers to rapidly automate the entire testing lifecycle across any platform".

WE USE ALL OUR ENERGY SO YOU DON'T HAVE TO.

Sustainable compressed air solutions are our core business. We rack our brains daily in the search for new, highly efficient solutions that will help reduce our customers' energy usage. We've been bringing together our passion for innovation with a clear, uncompromising focus on premium quality for over a century. All the critical components in our compressors are made by us in-house, making our customers – and therefore us – more successful.

Premium compressors – made in Germany.



boge.com



DESIGNED TO TAKE THE LEAD

Compressors are used in different industries and guarantee a continuous supply of compressed air. Many elements can be adjusted if energy consumption, operational costs and environmental footprint are reduced.

This is what BOGE has done with its advanced S-4 series which demonstrates the efficiency, sustainability and reliability of compressed air supply.



*Nalin Amunugama,
General Manager, BOGE
Kompressoren Asia Pacific.*

Whether as a direct work medium, as a pneumatic drive or to control valves and switches – compressed air is an important component of many industrial processes. This energy source is also used for power transmission as well as for transport or cleaning of materials. The applications are numerous, as are the requirements compressor manufacturers face.

“With the S-4 series, BOGE’s developers and engineers have achieved a major breakthrough. The models have significant advantages when it comes to energy consumption, sound insulation, maintenance, longevity and sustainability”, says Nalin Amunugama, General Manager, BOGE Kompressoren Asia Pacific.

Thanks to its robust technology as well as numerous design improvements, the S-4 series quickly pays dividends. It is even suitable for use in sensitive and demanding environments, such as food production. The compressors can also be used in areas with adverse con-

ditions, such as the mining sector and foundries.

What characterises the compressors?

The airend specifically developed by BOGE is powered directly. The drive is hermetically sealed, very robust and therefore requires low maintenance. No dust or dirt can get in and wear is significantly minimised – a huge advantage, compared with belt-driven compressors. As an option, the speed can be controlled with a frequency converter, which makes it perfectly adaptable to any compressed air requirement.

How can efficiency be increased?

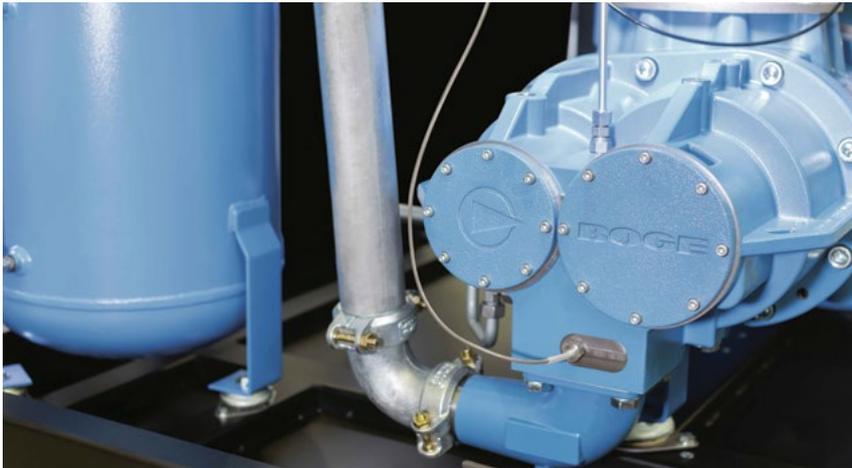
The S-4 series models produce excellent free air delivery at low specific power consumption. These efficiency benefits are based on the revolutionary construction concept – the generously sized components reduce internal pressure losses. BOGE’s airend is capable of achieving high efficiencies. The powerful, energy-saving IE4 motors provide an additional advantage in terms of efficiency.



The S-4 series offers significant advantages that include low energy consumption, sound insulation, low maintenance, longevity and sustainability.

Which components ensure quiet operation?

The use of flexible mounting brackets for the drive motor, airend and oil separation tank results in quiet operation. Oscillations cannot be transmitted, and this is due to the smart fixing on the base frame. The generously sized cooling/ventilation unit, with separate oil and air coolers, additionally ensures sound-optimised cooling air. Furthermore, the sound pressure level is reduced by the radial fan’s low speed. In addition, sound insulation panels have been integrated to limit acoustic emissions to a minimum.



BOGE's highly efficient airend is hermetically sealed to guarantee protection against dust and dirt.

How does BOGE guarantee quick maintenance and long service life?

The compressor guarantees reliable operations with little need for maintenance. Oil separation, for example, takes place via a standing oil separator with a central oil separating element. The innovative separation technology allows service lives of up to 9,000 operating hours. The cartridge can be replaced easily and conveniently. During maintenance, sound insulation panels and components can be removed or replaced with just a few actions. Access is provided from two sides. Oil and air coolers can easily be removed and cleaned via a tray.

S-4 series supplemented with additional power range

The S-4 series models were previously available in the 55 to 160 kW range. BOGE has now extended the series to include the 45 to 75 kW range, so companies and businesses with low compressed air requirements can benefit from the same advantages of the S-4 series.

For the new models, BOGE reduced the footprint to 1.2 x 2 m – creating a compact design with cost benefits. The compressors feature the tried-and-tested airend and are characterised by all

the S-4 series advantages mentioned. The efficient motors are worth mentioning as customers can choose between compressors with a fixed speed and IE4 motor, and frequency-controlled models with a permanent magnet motor. This reduces power consumption, again compared to the previous models, and increases free air delivery. The use of the efficient motors and low energy consumption is accompanied by a reduction in CO₂ emissions. What's more - BOGE has improved its user-friendliness again. For example, the operating element that is attached to the housing is now angled for optimised legibility.

Designed to take the lead - even under tough conditions

With BOGE's innovative technology, construction and design, the S-4 series compressors in the 45 to 75 kW range, as well as models in the higher power range, are suitable even for sensitive applications and demanding environments. They can withstand dust and dirt. The models provide maximum reliability and are designed for a long service life. In combination with the smart control and other options, such as external heat recovery, efficiency values can be increased again and maintained



In addition to the energy-saving IE4 motors, users will enjoy lower future CO₂ emissions, long-lasting operations and low maintenance costs.

at the maximum level – all for a comprehensive optimisation of your compressed air system.

“As an innovation-driven partner, BOGE continually strives for innovative quality (IQ). By this we mean combining tried-and-tested premium quality to offer innovative solutions to fulfil our customers' demands for powerful, efficient, reliable and sustainable air compressors and air compressor systems”, Nalin proudly shares.

About BOGE Kompressoren



Reliable, clean compressed air – BOGE's trademark for more than 100 years. The quality and efficiency of our compressors and compressed air solutions have led us to enjoy the trust of over 100,000 users in 120 different countries. Founded in 1996, BOGE's Southeast Asian branch is one of its longest-established subsidiaries outside of Germany. From its Singapore location, it manages an impressive network of 18 distributors in 10 main markets and over 20 additional re-sellers/OEMs in the market. With an ample stock of compressors, accessories and spare parts, a specialised Singapore-based training facility (for distributors and end customers) and the ability to perform sophisticated energy audits, it effectively continues the BOGE quality chain across the region. ■

EuroBLECH 2022 brings the sheet metal working industry together

EuroBLECH 2022, the 26th International Sheet Metal Working Technology Exhibition, was held from 25 to 28 October 2022, at the Hanover Exhibition Grounds in Germany.

This year's show hosted 1,300 companies from 39 countries, over a net exhibition space of 86,136 m², and attracted a total of 38,076 trade visitors from around the world.

"We are overwhelmed by the fantastic outcome and proud that EuroBLECH continues its critical role in bringing the global sheet metal working industry together. This year's edition was both special and hugely important for the whole sheet metal working industry. Judging by the exhibition space itself, you can tell we came pretty close to the record numbers in 2018", said Ms Evelyn Warwick, Exhibition Director of EuroBLECH, on behalf of the organisers, Mack-Brooks Exhibitions.

About 62% of the exhibitors at this year's show, came from outside Germany. This represents a further increase in international attendance, by 4%.

As the key marketplace for the industry, EuroBLECH 2022 offered its visitors the opportunity to find solutions for the current challenges in the industry and connect them with businesses from all over the world, to help them integrate the latest machinery and software into their manufacturing processes. The hot topics this year were digitalisation, sustainability and Industry 4.0. Many of the products and innovations shown at EuroBLECH 2022 have been developed with a focus on cost and resource efficiency.

Both exhibitors and visitors were satisfied with the show and with their newly established business relations. The visitors praised the comprehensiveness and international range of the products on display, as well as the quality of the exhibition stands and the many live

demonstrations of digital processes. The exhibitors appreciated the highly qualified and international audience with its high percentage of decision-makers (80%).

A great majority of the visitors came from the industry (72%), followed by visitors from trade workshops and services. The most important sectors that visitors belong to include engineering, steel and aluminium construction, sheet metal & products, the automotive industry and its suppliers, iron and steel production, and electrical engineering.

EuroBLECH 2022 Presentation Area

In addition to the innovations and

numerous live demonstrations at the exhibition stands, attendees were also able to appreciate the EuroBLECH 2022 Presentation Area. The new show feature delivered 27 sessions throughout the four exhibition days, offering exciting insight into innovative companies and projects, interesting discussions and valuable networking opportunities.

The next event

Many exhibitors at this year's show have already announced that they will exhibit again at the next EuroBLECH in 2024, which will take place from 22 to 25 October 2024 at the Hanover Exhibition Grounds in Germany.



EuroBLECH 2022 presented the products and solutions from 1,300 companies from 39 countries.

Discussing the way forward for the Built Environment

Architecture & Building Services 2022 (ABS 2022) was held from 16 to 18 November 2022, at the Sands Expo and Convention Centre, Marina Bay Sands, Singapore.

The event included seven co-located international exhibitions and nine conferences.

In the afternoon of the opening day, Guest-of-Honour, Ms Sun Xueling, Minister of State, Ministry of Home Affairs and Ministry of Social and Family Development, officially opened the Temasek Polytechnic-SII Security Conference 2022, organised by the Security Industry Institute (SII) and themed 'Revolutionising the Security Industry: Sustainability & Efficiency'.

Earlier, in the morning, Guest-of-Honour, Mr Neo Choon Keong, Deputy CEO, Building and Construction Authority, Industry Development, officiated the opening of the 8th International Facility & Strata Management Conference (IFSMC) 2022, themed 'Shaping the Future Digital Built Environment'.

The ABS series, organised by Conference & Exhibition Management Services (CEMS), is a one-stop destination for international products, solutions, and service providers who wish to boost their exposure to local and international markets.

The show is dedicated to various sectors within the Built Environment, ranging from Architecture, Facility Management, Lighting, Safety and Security, Fire Disaster Management, Work Safety, and Design.

Themed 'Sustainability in a Digital Built Environment', ABS 2022 provided a real-time interactive and curated experience to connect the industry and also a marketplace connecting exhibitors and trade buyers.

The seven concurrent tradeshow under ABS 2022 were:

- ArchXpo 2022 – The 8th International Exhibition of Architecture & the Built Environment



Guest-of-Honour, Ms Sun Xueling, Minister of State, Ministry of Home Affairs and Ministry of Social and Family Development, touring the exhibition.

- International Facility Management Expo (iFaME) 2022 – The 9th International Facility Management Equipment, Products, Technology & Services Exhibition
- Lighting Asia 2022 – The 8th International LED + Lighting Technology Show
- Safety & Security Asia 2022 – The 20th International Safety & Security, Technology & Equipment Exhibition
- Fire & Disaster Asia 2022 – The 18th International Disaster, Emergency Management & Fire Prevention, Technology & Equipment Exhibition
- Work Safe Asia 2022 – The 8th International Workplace Safety, Technology & Equipment Exhibition
- Design Asia 2022 – The 2nd International Designers Expo for Asia

ABS 2022 also hosted nine conferences, symposiums and forums led by industry experts and leaders.

The conferences were held concurrently with the seven exhibitions. The conferences addressed challenges, solutions, trends and new developments in the Built Environment industry.

The nine conferences under ABS 2022 were the 8th International Facility & Strata Management Conference (IFSMC) 2022; Temasek Polytechnic-SII Security Conference 2022 by Security Industry Institute (SII); 2nd ASEAN Young Architects Forum 2022; ASIS & ISRM Singapore Conference 2022; WSH Forum for Facilities Management Industry 2022; REDAS Integrated Digital Delivery (IDD) Symposium 2022; UAP Singapore Chapter – ArchXpo Conference 2022; 2nd Design Asia Congress 2022; and Hotel Security Roundtable.

Images by Conference & Exhibition Management Services (CEMS)

Certis and Lendlease break ground for Paya Lebar Green

Set to be one of the greenest, healthiest and smartest workplaces in Singapore, the development will enhance the continuing transformation of the Paya Lebar precinct into a lively commercial hub.

Certis and Lendlease recently broke ground on the new Paya Lebar Green – set to be one of Singapore’s most advanced, green, smart-tech and super low-energy, decentralised, Grade-A workplaces. At a groundbreaking ceremony graced by Mr Desmond Lee, Minister for National Development, together with senior leaders from Certis and Lendlease, both organisations unveiled how the redevelopment, which will also house Certis’ global headquarters, heralds the next chapter of Paya Lebar’s transformation into one of Singapore’s most lively commercial hubs.

With the respective capabilities of both parties, the new Paya Lebar Green will feature best-in-class facilities management, green building techniques and technologies, as well as sustainable building design and placemaking, for a future-ready workplace, prioritising the health, well-being and productivity of both tenants and Certis employees. While Paya Lebar Green will continue serving as Certis’ global headquarters, the redevelopment will create about 220,000 ft² of prime, decentralised Grade A office spaces, complete with good end-of-trip facilities and a Green Plot Ratio of 3.0.

Paya Lebar Green comprises two buildings. Building 1 has received the International WELL Building Institute (IWBI) WELL Core Silver pre-certification for prospective tenants’ health and well-being, and was also awarded the WiredScore Platinum certification which is the global accreditor’s highest award for digital connectivity and smart technology. Building 2 has received the WiredScore Gold rating. As an entire development, Paya Lebar Green is on track to receive, from the Building and Construction Au-



Celebrating the joint venture between Certis and Lendlease to develop Paya Lebar Green are, from left to right, Mr Justin Gabbani, Chief Executive Officer, Asia, Lendlease; Mr Tony Lombardo, Global CEO, Lendlease; Mr Desmond Lee, Minister for National Development; Mr Olivier Lim, Chairman, Certis; Mr Paul Chong, President and Group CEO, Certis; Mr Goh Soo Lim, Group Chief Financial Officer, Certis; and Ms Ng Hsueh Ling, Managing Director, Singapore, Lendlease and Chairman, Lendlease Global Commercial Trust Management. Image: Ministry of National Development.

thority (BCA), the Green Mark 2021 Platinum (Super Low Energy), upon its completion in 2024.

Accelerating the continued transformation of the wider Paya Lebar Central precinct

Paya Lebar Green is part of the wider Paya Lebar commercial centre, located close to the airport and Singapore’s Central Business District. Employees, tenants and visitors will be able to enjoy the healthier commute options that are supported by good connectivity to major transportation networks including three MRT lines and the Pan Island Expressway (PIE), the Park Connector Network (PCN), the surrounding green, vibrant public spaces and quality fringe amenities. To further encourage an active and healthy lifestyle for its occupants, Paya Lebar Green is equipped with shared mobility solutions and end-of-trip facilities, to enable the seamless use of car, bike and scooter share services.

Featuring Certis’ best-in-class facilities management technologies

As a leading security services provider, Certis has been advancing its Smart Facilities Management (FM) capabilities and will be integrating the full suite of its tech-led capabilities, including Artificial Intelligence (AI), Internet of Things (IoT) and robotics, into Paya Lebar Green.

Mozart, an integrated system that puts security at its forefront, is Certis’ proprietary orchestration platform, that uses AI and data-driven capabilities to achieve sustainability and productivity for smart building outcomes. With Mozart, the new building will be able to successfully orchestrate many complex solutions by integrating IoT sensors and robotics. Paya Lebar Green will be able to harness the technology and data-driven capabilities necessary to achieve sustainability and drive productivity outcomes.

A smart and healthy as well as green building

Led by a people-centric approach, the redevelopment of the Certis global headquarters will be equipped with features that enable digital connectivity, optimal occupant health and wellness as well as climate responsiveness.

Lendlease will bring its expertise in green and sustainable construction with a focus on minimising environmental impact, by reducing direct harmful emissions onsite, recycling building materials, and using low embodied carbon materials and renewable energy sources. Lendlease will apply an innovative modular construction for the Mechanical, Electrical and Plumbing (MEP) system and maximise prefabrication solutions. As a result, the project is slated to attain a more than 80% overall recycling rate for construction and demolition waste.

Visitors to Paya Lebar Green can expect various tech-enhanced health and well-being features, from embedded solutions such as natural ventilation, enhanced filtration systems and bi-polar ionisation, to IoT sensors measuring occupancy, light levels and temperatures, for a comfortable yet sustainable working environment, while providing environmental data analytics for continuous operational efficiency improvements.

Aside from its quality indoor environment, Paya Lebar Green will also feature biodiverse, vertical greenery. The embedded smart and sustainable solutions will help achieve greater energy performance for the buildings. In addition, a high-performance double-glazed façade and Air-Conditioning Mechanical Ventilation (ACMV) system will enable the development to achieve BCA's Green Mark 2021 Platinum (Super Low Energy) rating, with more than 60% energy savings.

Mr Olivier Lim, Chairman, Certis, shared, "Beyond Paya Lebar, we are confident that Certis' transformation as a business will continue to make a material contribution to Singapore's security landscape and smart-city aspirations. Certis has



Mr Desmond Lee, Minister for National Development, flanked by Mr Olivier Lim and Mr Paul Chong, on his right, and Ms Ng Hsueh Ling and Mr Justin Gabbani, on his left, officially breaking ground for Paya Lebar Green.

strong integrated capabilities in tech-enabled Security+ and smart facilities management. We will showcase our broad set of capabilities in this new building".

Mr Tony Lombardo, Global CEO & Managing Director, Lendlease, said, "Paya Lebar Central is fast becoming one of Singapore's best places to live, work and play. We stand ready to work alongside Certis and the Singapore Government, to deliver Paya Lebar Green. Incorporating the very latest sustainability and smart building technologies, the project will be a fitting addition to Paya Lebar's already thriving urban fabric".

Certis

Certis is a leading outsourced services partner that designs, builds and operates multi-disciplinary smart security and integrated services. The organisation's multi-service offerings leverage a strong heritage in security and are augmented by applied AI solutions. These solutions are part of the organisation's comprehensive technology development and systems integration capabilities that are fully cyber-secure by design. Certis is committed to building a safer, smarter, better, and more sustainable business. The organisation is headquartered in Singapore and has an international presence that extends to Australia, Hong



Mr Desmond Lee being introduced to the five key development pillars of Health & Wellness, People-centric, Collaborative and Connected, Green and Smart, and Sustainable and Resilient, guiding the development of Paya Lebar Green.

Kong, Macau, China and Qatar. Certis delivers its services through a 27,000-strong global team which includes 16,000 team members in Singapore.

Lendlease

Lendlease is an international real estate group with core expertise in shaping cities and creating strong and connected communities. Headquartered in Sydney, Australia, and listed on the Australian Securities Exchange, Lendlease has operations in Australia, Asia, Europe and the Americas, with approximately 8,500 employees internationally.

The group's core capabilities are reflected in the operating segments of Investments, Development, and Construction.

PAYA LEBAR GREEN

Paya Lebar Green is a joint development by Certis and Lendlease. It is set to be a sustainable, adaptive, and technology-led workplace of the future, responding to the needs of Singapore's modern workforce.

It will continue to be the global headquarters of Certis as it grows as an innovative, tech-enabled security leader in Asia Pacific, while welcoming other progressive companies to join its premises and be part of the growing ecosystem of leading businesses in the precinct.

The project consists of two buildings with Grade A commercial spaces, integrated with green, smart, and intelligent technologies.

KEY DEVELOPMENT PILLARS

There are five key pillars behind the development of Paya Lebar Green.

Health and Wellness (Enabling healthier and active lifestyles)

- WELL Core Precertified Silver for Building 1 and adoption of similar policies for Building 2.
- Climate-responsive and expansive glass glazing to maximise indoor daylight exposure supporting circadian and psychological health.
- High indoor environment quality through source elimination or reduction, enhanced filtration systems, UV germicidal irradiation and bipolar ionisation for cleaner indoor air.
- Shared mobility solutions and end-of-trip facilities to encourage greener commute.

People-centric (Shaping an inclusive and engaging workplace for the community)

- Communal areas that focus on user experience and allow for a more people-centric and inclusive workplace.
- Optimised lighting, acoustics, thermal and biophilic design, coupled with adequate support for mindful nourishment, and an ergonomic environment, to support productivity and well-being.



Paya Lebar Green is set to be one of the greenest, healthiest and smartest workplaces in Singapore (artist's impressions).



The grand reception, with an expansive double-height lobby filled with natural light at Paya Lebar Green (artist's impressions).

- Connected to the wider Paya Lebar precinct, major transportation networks and Park Connector Network.

Collaborative and Connected (Integrating smart technology for a seamless workplace experience)

- WiredScore Platinum for Building 1 and WiredScore Gold for Building 2.
- Smart building automation technology such as biometric and smartphone-enabled access control for performance optimisation and enhanced security.
- Mobile and wireless connectivity, resiliency and digitally advanced features including IoT smart sensors to optimise space usage and enhance place experience.

Green and Smart (Embedding lush greenery and eco-friendly technologies)

- New lush canal park to connect with the wider Paya Lebar precinct and integrating biodiverse greenery into the building's façade.

- Smart and sustainable IoT solutions to help the building stay climate-responsive and achieve greater energy efficiencies.

Sustainable and Resilient (Maximising energy efficiencies and utilising clean energy)

- Target Green Mark 2021 Platinum (Super Low Energy) Building certification.
- Reduce environmental impact by using low embodied carbon materials and green certified products, as well as by achieving over 80% overall recycling rate for construction and demolition waste.
- Create social value and economic sustainability by working with stakeholders across the Paya Lebar community to transform businesses and help communities thrive.

KEY FACTS AND FEATURES

General

- Located at 1 Eunos Road 8.
- Comprises two buildings.



Paya Lebar Green is well-situated and connected with the wider Paya Lebar Central precinct, three MRT lines and the PIE (artist's impression).

- 220,000 ft² of prime, decentralised Grade A office spaces.
- Green Plot Ratio of 3.0.
- New grand entrance and canal park / green plane featuring lush landscaping that will provide natural shade and a picturesque backdrop for improved pedestrian access and experience.
- Grand reception with an expansive double-height lobby filled with natural light.
- End-of-trip facilities include 111 bicycle lots, shower, and locker facilities in Building 1, connected with the wider Park Connector Network (PCN).
- High quality Mechanical, Electrical and Plumbing (MEP) specifications, MERV14 filters and bi-polar ionisation for enhanced indoor air quality, with high efficiency chiller plant, airside systems and high-speed lifts.

Location and Connectivity

- Highly accessible and conveniently located.
- Located near Paya Lebar Quarter, Lifelong Learning Institute, Paya Lebar Square and SingPost Centre.

Office

- Large, efficient floor plates of approximately 26,000 to 27,000 ft² with Knock Out Panels for inter-floor connectivity catering to the needs of office tenants who are looking for multi-floor tenancy requirements.
- 12 storeys for Building 1 and eight storeys for Building 2.
- About 110 car parking spaces available, with EV charging provision.
- Wi-Fi connection available throughout the two buildings.
- Strong corporate address and branding opportunities.

Sustainability

- Paya Lebar Green features a biodiverse, greenery-infused façade. The embedded smart and sustainable solutions will help achieve greater energy efficiencies for the buildings.

Some features include IoT smart sensors which will help the building to be climate-responsive (controlling indoor environment quality across different scenarios) and inform the occupancy

and utilisation rate of spaces to achieve greater energy and space utilisation efficiencies for the tenants.

- Paya Lebar Green will focus on reducing environmental impact by reducing direct harmful emissions onsite, recycling building materials, and using low embodied carbon materials and renewable energy sources.

As part of the Green Building Innovation Cluster (GBIC) grant award for Building 1, Lendlease is committed to improving the energy savings to meet the Green Mark 2021 Platinum (Super Low Energy) baseline.

Lendlease will apply innovative modular construction of the Mechanical, Electrical and Plumbing (MEP) system and maximising prefabrication solutions.

Lendlease will target more than 80% overall recycling rate for construction and demolition waste.

Images by Paya Lebar Green, unless otherwise stated

Ensuring a resilient and sustainable energy future

Thought leaders from all over the world gathered at Singapore International Energy Week 2022 to address this major challenge.

Singapore International Energy Week 2022 (SIEW 2022), the 15th edition of the event, was held at the Sands Expo and Convention Centre, Marina Bay Sands, Singapore, from 25 to 28 October 2022, once again, as a fully physical event.

On the morning of the opening day, Deputy Prime Minister and Minister for Finance, Singapore, Mr Lawrence Wong, delivered the Singapore Energy Lecture. This was followed by the SIEW Summit Opening Address, delivered by Minister for Trade and Industry, Mr Gan Kim Yong.

This year's SIEW Opening Keynote Address featured two prominent speakers, Dr Fatih Birol, Executive Director, International Energy Agency (IEA) and Dr Ing Christian Bruch, President & Chief Executive Officer, Siemens Energy AG, who shared their insights and perspectives on this year's theme, 'A Resilient and

Sustainable Energy Future'.

Energy ministers and industry leaders convened at the Singapore Energy Summit to discuss and share views on areas surrounding the development of low carbon solutions and innovations as well as sustainable financing.

To celebrate the 15th edition of SIEW, the 'SIEW Energy Showcase' featured an interactive exhibition which explored the frameworks and industry innovations that are supporting Singapore's transition to a low-carbon energy future. A newly introduced SIEW TechTable featured discussions on the emerging energy innovations that will power the energy transitions of tomorrow.

Singapore also partnered IEA and the International Renewable Energy Agency (IRENA) to co-host two high-level discussions on pertinent

issues impacting regional energy transitions. SIEW 2022 also included the Singapore-IEA Ministerial Roundtable and the second edition of the Singapore-IRENA High-Level Forum which was organised in partnership with the Asia Clean Energy Summit.

Making a comeback at SIEW 2022

The pandemic had resulted in the staging of virtual and hybrid events. SIEW 2022, however, marked the return of the fully in-person live event which included the following:

- In-person award ceremonies
- Onsite exhibitions
- Networking events
- Meeting future leaders face-to-face
- In-person roundtables

The next edition of the event, SIEW 2023, will be held from 23 to 27 October 2023.

Sembcorp Solar awarded Singapore Energy Award 2022

Sembcorp Solar Singapore Pte Ltd was conferred this year's Singapore Energy Award, for its impact and contributions in developing Singapore's solar industry. The award was presented by the Minister for Trade and Industry, Mr Gan Kim Yong, at SIEW 2022.

Sembcorp Solar has played a core role in the development of the local solar industry. Over the last six years, the company has contributed significantly to the increase in solar capacity in Singapore. It has deployed and committed to a total capacity of more than 530 megawatt-peak (MWp), as at the third quarter of 2022, which is around 35% of Singapore's solar deployment target of 1.5 gigawatt-peak (GWp) of installed capacity by



Sembcorp Solar Singapore Pte Ltd was presented the Singapore Energy Award 2022, by the Minister for Trade and Industry, Mr Gan Kim Yong, at SIEW 2022.

2025. Sembcorp Solar's flagship project, the Sembcorp Tengah Floating Solar Farm, which was launched in 2021, is one of the world's largest inland floating solar photovoltaic systems.

The company has also demonstrated leadership in capability development for the solar industry. In addition to sending its staff through a mix of e-learning modules and

training at Sembcorp Academy, Sembcorp Solar has been working with Singapore Polytechnic and the Institute of Technical Education to develop certified curriculum focused on solar energy competency.

The Singapore Energy Award recognises organisations and individuals who have made significant contributions to Singapore's energy sector.

Regulatory sandbox to promote energy demand management

The Energy Market Authority (EMA) is inviting commercial and industrial companies to participate in a two-year regulatory sandbox to optimise their energy consumption. Participating companies will have to manage their electricity demand when activated and receive payments as an incentive for reducing their electrical demand on the national power grid. Optimising energy demand underpins the ongoing transition to lower carbon emissions as set out in the Singapore Green Plan 2030.

Demand Side Management programmes

Known as Demand Side Management (DSM), this initiative has two programmes for interested companies to take part in. The first programme is known as

the Demand Response (DR) Programme, where participating companies are activated to reduce their electricity consumption during periods of high wholesale electricity prices. Incentive payments are then made to these companies, based on the total system savings arising from any reduction in wholesale electricity prices, due to their energy demand reduction.

The second programme is known as the Interruptible Load (IL) Programme. Participating companies are paid to be on standby to reduce their committed electrical load when activated during conditions of tight power generation supply. Doing so will help to improve the power system stability by better balancing electricity demand and supply, during times of supply disruptions. In return,

participating companies receive payments, by being on standby to reduce their energy demand even if they are not activated.

Features of the regulatory sandbox

Although both programmes are already open for participation and there are companies actively curtailing their loads, EMA recognises that more can be done to encourage participation. EMA has taken in feedback from the industry to streamline the programmes, to make it easier for potential participants to take part, such as streamlining and reducing penalty thresholds, as well as providing more certainty in activation times to participants. EMA will continue to monitor the activities in both programmes, in the duration of the sandbox.

Student teams contribute ideas for a more sustainable energy future

Over 110 student teams from 36 schools took part in the Singapore Energy Grand Challenge (SEGC) for Youth in 2022. This is the highest number of students the Challenge has engaged, since it was first launched in 2020.

The winning teams received their awards from Ms Low Yen Ling, Minister of State for the Ministry of Trade and Industry (MTI) and Ministry of Culture, Community and Youth, at the Energy Market Authority (EMA)'s flagship Youth@SIEW event.

The third edition of the SEGC (Youth) was held in partnership with Microsoft Singapore, with support from Infocomm Media Development Authority (IMDA), to inspire and encourage youths to co-create ideas using Minecraft: Education Edition.

In 2022, EMA partnered Keppel Infrastructure, Schneider Electric and Sembcorp Industries, and presented a new category for Institutes of Higher Learning (IHL). Students in



The winning teams received their awards from Ms Low Yen Ling, Minister of State for the Ministry of Trade and Industry (MTI) and Ministry of Culture, Community and Youth.

this category were challenged to do a case presentation of sustainable solutions for real-world challenges faced by energy companies.

Winning teams across the three categories of IHL, Senior and Junior students were awarded a total of SGD 50,000 in cash prizes.

Teams from National University of Singapore (NUS), Singapore Institute of Technology (SIT) and ITE College East emerged as champions of the IHL category, for their holistic presentations on solutions to reduce energy demand, enhance power grid reliability, and maximise solar deployment, respectively.

For the Senior category, a team from Hwa Chong Institution clinched the championship, with its engaging presentation which demonstrated a comprehensive approach towards managing energy demand and supply. Its ideas included the use of Internet-of-Things (IoT) technology to analyse energy usage trends and help to manage energy demand.

For the Junior category, a team from Nanyang Girls' High School was crowned the champion, for its innovative ideas such as the use of hydrogen and electrified transportation, to further lower Singapore's carbon emissions.

Largest energy storage system in Southeast Asia installed across two sites on Jurong Island

This will enhance Singapore’s grid resilience.

The Energy Storage System (ESS) is an essential technology to enhance grid reliability in Singapore. By the end of 2022, Singapore is expected to have an ESS that can store and deliver up to 200 MW of power for one hour, which could meet the daily electricity needs of over 16,700 four-room HDB households in a single discharge (based on the average household electricity consumption of a 4-room flat in 2019).

In June 2022, the Energy Market Authority (EMA) appointed Sembcorp Industries to build, own and operate the ESS, to enhance the resilience of the energy supply and power grid. The ESS is installed across two sites on Jurong Island and spans two hectares of land. Scheduled to be operational in November 2022, it will be the largest ESS deployment in Southeast Asia, and one of the fastest in its size to be deployed.

The ESS functions as a large-scale battery system to store energy and dispense it when needed, to maintain grid reliability. The fast-response nature of the ESS also allows it to actively manage mis-

matches in electricity supply and demand, and perform regulation services to address second-to-second fluctuations in the power grid, which can mitigate the impact of solar intermittency. In view of the



Location of the two ESS installations on Jurong Island. Image: Sembcorp Industries.



The ESS can store sufficient energy to power the daily electricity needs of over 16,700 four-room HDB households in a single discharge. Image: Sembcorp Industries.

ongoing volatility in the global energy market, it can be used to store energy, to provide reserves to the power grid when needed, freeing up power generation plants to generate more electricity to meet demand.

The ESS will use lithium iron phosphate (LFP) batteries. This technol-

ogy is a proven, safe and high-performing method of renewable energy storage, that is widely used worldwide. Its fast-response time, high energy density and high round trip efficiency which measures the amount of energy stored that can be retrieved later, make it suitable for the purpose of maintaining grid stability.

Along with its partners and other government agencies, EMA is also developing policies, regulations and standards to support and guide the deployment of ESSs in Singapore. This includes developing local standards and guidelines on safety considerations for deploying and maintaining ESSs under local operating conditions.



The ESS being installed on Jurong Island. Image (on top): Sembcorp Industries. Image (below): Energy Market Authority.

Enhancements for a more secure and resilient power sector

The Energy Market Authority (EMA) has conducted a review of Singapore's power sector and is introducing guardrails to strengthen the existing competitive market structure. These enhancements will ensure that Singapore is well-positioned to navigate the energy transition.

CHANGING GLOBAL ENERGY LANDSCAPE

The global energy landscape is changing rapidly. Global energy markets are becoming more volatile amidst geopolitical tensions and the global energy transition. Governments around the world are reviewing their approach towards energy markets, to ensure energy security and stability. With the power sector accounting for almost a quarter of global emissions, decarbonising electricity generation is at the core of the global climate effort. This is especially so for Singapore, where the power sector accounts for ~40% of Singapore's carbon emissions.

However, the global energy transition could result in unanticipated security and reliability risks, and extreme price volatilities, as evidenced in the past year.

At the same time, as sectors turn to electrification to decarbonise their operations, demand for electricity will increase. It is therefore critical that Singapore navigates the energy transition in a safe and secure way. This is existential to the country.

TEMPORARY MEASURES TO ENHANCE SINGAPORE'S ENERGY SECURITY

The ongoing global energy crunch has highlighted the need to strengthen Singapore's energy market to better manage volatile market conditions. Since 4Q2021, EMA has put in place various temporary measures to safeguard energy security and resilience.

Crisis Management Measures

Since 4Q2021, EMA has progressively introduced the following

crisis management measures to safeguard energy security and resilience. These include:

- A Standby LNG Facility (SLF) which generation companies (gencos) can draw upon to generate electricity in the event of gas supply disruptions.
- Directing gencos to procure sufficient fuel to generate electricity, based on their available generation capacity.
- Directing gencos to generate electricity using fuel from the SLF to address projected supply shortfalls in the Singapore Wholesale Electricity Market (SWEM).
- The Temporary Electricity Contracting Support Scheme (TRECS) for consumers facing difficulties securing electricity contracts, to reduce their exposure to volatile Wholesale Electricity Prices.

These measures will be in place till end-March 2023.

While these temporary measures have helped to stabilise Singapore's energy markets, it will be necessary to strengthen the market structure to withstand potentially more turbulent times ahead.

LIMITATIONS OF SINGAPORE'S CURRENT MARKET STRUCTURE

Today, Singapore has a liberalised power sector, where private generation companies procure fuel, generate electricity and retail to consumers. EMA sets the performance standards but does not otherwise intervene in gas contracting, generation capacity planting and electricity pricing. While this competitive market structure has served Singapore well over the past two decades – resulting in in-

creased innovation and efficiencies in operations, and a wider range of retail options for consumers – some gaps have emerged.

Risks of gas supply disruptions and price shocks: Currently, gencos have significant flexibility to decide on the amount of gas to contract and the duration of their contracts. However, it does not provide sufficient assurance that there will be sufficient contracted gas on aggregate to meet system demand. Indeed, when gas prices are high, gencos are less inclined to contract for gas, for fear that they would be left stranded when gas prices moderate.

Without the assurance of back-to-back electricity contracts, gencos are also reluctant to enter into longer-term gas contracts which typically offer greater guarantee of delivery and lower prices. Gencos also tend to exhibit herding behaviour in gas procurement, which can lead to either over- or under-contracting of gas, or gas contracts expiring at the same time. This magnifies the power sector's exposure to global market conditions, which may be unfavourable.

Risks of insufficient generation capacity: Today, investments in new generation capacity are driven by each company's commercial considerations. This can lead to prolonged periods of over- and under-supply (since it takes ~4 to 5 years to plant a new generation unit) and could lead to volatile electricity prices. These cyclical mismatches in supply and demand could worsen with the global climate imperative, as rising carbon taxes and the energy transition could discourage investments in thermal generation units which will still be needed to meet

electricity demand in the near and medium-term.

Risks of market failures as industry participants are not sufficiently equipped to deal with volatile market conditions: As part of the liberalisation of the retail market, EMA had allowed Independent Retailers to enter and compete with genco-retailers (gentailers) to sell electricity to consumers. While consumers have benefitted from more competitive electricity prices and a wider range of retail price plans, some electricity retailers were not sufficiently equipped to deal with the extreme market volatilities observed in 4Q2021 and 1Q2022 and either exited the market or prematurely terminated contracts with some of their consumers.

GUARDRAILS TO ENHANCE THE COMPETITIVE MARKET STRUCTURE

EMA will be introducing three key guardrails to address the risks identified above and augment the competitive market structure in place today.

Gas Supply

To ensure the security and adequacy of gas supply, EMA will:

- Institutionalise the current crisis management measure requiring gencos to maintain sufficient fuel for power generation. This will help to safeguard energy security, especially given the uncertainties and volatilities in global energy markets.
- Maintain the Standby LNG Facility (SLF) to address risks of gas supply disruptions. This was also introduced as part of the crisis management measures to guard against risks of gas supply disruptions. As gas supply disruptions are expected to be more prevalent in the future, as the country's Piped Natural Gas (PNG) supplies are depleting and with the energy transition, the SLF will help to safeguard energy security.
- Work with the industry to explore ways to improve gas procurement,

such as by collectively contracting for longer-term gas contracts for greater security of supply, or demand aggregation to provide economies of scale.

Power Generation Capacity

To ensure sufficient generation capacity to meet system demand, EMA will:

- Introduce a structured process to facilitate private investments in new generation. EMA will conduct a competitive tender, about five years in advance of the year in which the generation capacity is projected to be required. The most competitive proposal will be awarded a licence to build, own and operate the new capacity. All new generation plantings will be coordinated within this process to avoid risks of over- and under-capacity.
- If there is insufficient private sector interest to build new generation capacity, EMA will do so as a last resort. The Energy Market Authority Act and Electricity Act were amended in 2021 to provide EMA with the powers to do so.

Retail Market

Last but not least, EMA will strengthen consumer protection by:

- Enhancing regulatory requirements on electricity retailers. These include stricter qualifying criteria for retailers such that only industry participants with sufficient financial strength and sustainable business propositions to withstand some degree of market volatility can enter the market. There are also plans to impose higher capital / hedging requirements on retailers to ensure that they are sufficiently resilient against market volatility, and there are additional protections for consumers if retailers prematurely terminate contracts.
- Tightening the eligibility criteria for consumers on Wholesale Electricity Price (WEP) plans, so that only those who are equipped to deal with the risks of price fluctu-

ations can purchase electricity at wholesale electricity prices.

CONCLUSION

While these guardrails will, to some extent, reduce choice for market participants (e.g. gencos and retailers) and consumers, it will help to improve the stability and security of the power sector in the longer term and ensure that Singapore is well placed to navigate the energy transition.

EMA will be conducting industry and public consultations, and will progressively implement these enhancements from 2023.

The Singapore-Malaysia Electricity Interconnector

Singapore and Malaysia have completed the upgrading of the electricity interconnector between the two countries. This was announced at SIEW 2022.

Since 1983, the interconnector has enabled mutual energy transfer between Singapore and Malaysia, during times of power system disturbances. With the completion of the upgrading works in August 2022, the interconnector can now accommodate bidirectional electricity flows of around 1,000 MW, between Malaysia and Singapore. This is double its earlier capacity and has enhanced regional energy connectivity.

In addition to mutual support, the interconnector is currently used for cross-border power trade, under the Lao PDR-Thailand-Malaysia-Singapore Power Integration Project (LTMS-PIP). The LTMS-PIP imports up to 100 MW of renewable hydropower from Lao PDR to Singapore via Thailand and Malaysia, using existing interconnections.

Fully electric bus makes its Singapore debut

The electric bus has been designed, engineered and manufactured in Singapore.



Volvo Buses Singapore, part of the Volvo Group (Volvo), one of the world's leading providers of sustainable people transport solutions, and SC Auto Industries (SC Auto), a home-grown bus manufacturer, recently launched the Volvo BZL-SC Neustar City electric bus, delivering the first fully electric, three-door, stepless bus that is designed, engineered, and manufactured in Singapore.

Mr Alvin Tan, Minister of State for Trade and Industry and Culture, Community and Youth graced the launch event held at SC Auto's Singapore factory.

This next-generation electric bus, which was designed specifically to meet local bus requirements, utilises advanced electric charging technology and chassis design to deliver superior efficiency and emission-free bus journeys. The bus is also compliant with UN ECE (United Nations Economic Commission for Europe) standards.

Aligned with Singapore's electrification plan for public buses to have a 100% cleaner energy bus fleet by 2040, the newly launched electric bus provides a greener way for people to travel. The Volvo BZL-SC Neustar City electric bus is expected to reduce carbon emissions by up to 60% or approximately 329 kg per passenger per year of carbon dioxide for every 15,000 km, when compared to a diesel-powered bus undertaking a similar journey.



The Volvo BZL-SC Neustar City electric bus was recently launched in Singapore.

Commenting on the partnership, Mr Law Chung Ming, Executive Director (Transport & Logistics), Enterprise Singapore said, "We are heartened to see SC Auto reaching this new milestone in its innovation journey, with the launch of the Volvo BZL-SC Neustar City Electric Bus. Its successful partnership with Volvo demonstrates that Singapore companies have the right capabilities and make good partners for global corporates to co-innovate solutions to address the growing demand for sustainable transport. EnterpriseSG will continue to work with local companies such as SC Auto to build new capabilities and explore partnerships to capture new opportunities emerging from the green economy".

Ms Rachel Lee, Managing Director of SC Auto Industries said, "Today's launch is an important step for SC Auto, as we roll out viable electric buses as part of sustainable land transport solutions for Singapore. We believe this to be an important contribution to the nation's agenda of transitioning to a climate-friendly, net zero emissions mobility sector by 2040".

Mr Mats Nilsson, Director of Volvo Buses Asia Pacific Central said, "We are incredibly proud to showcase the first Volvo BZL-SC Neustar City in Singapore. With a local track record of over 40 years, today's launch represents a key milestone for the manufacturing industry here, and officially kicks off Volvo's complete electromobility offering in Singapore".

ENGINEERING DETAILS

Jointly engineered by Volvo and SC Auto in Singapore, the electric bus has been designed in compliance with global and Singapore regulatory and safety standards, and also with a focus on sustainability and reliability.

The electric bus seats up to 89 passengers and is the first bus model in Singapore that has an emergency exit located at the rear of the bus, for evacuation. The bus body structure is built using Ferritic stainless steel which is a lightweight, high-tensile strength steel that is highly resistant to corrosion. It also features a high-capacity, energy-efficient air-conditioning system, coupled with double-glazed, low emissivity, coated glass panels that help reduce noise and radiant heat transfer.

In addition, the bus is designed to have a lower Total Cost of Ownership (TCO). More than 90% of the bus is recyclable and the battery technology is suited for second life applications and recyclability, thereby promoting a circular economy. Further, the bus's modular design allows for damaged parts to be replaced individually and quickly, with locally available spare parts, thereby reducing repair and maintenance downtime, and enabling the buses to get back on the roads sooner.

Creating jobs and upskilling workforce

The new electric bus will be produced in SC Auto's 200,000 ft² factory at 51 Senoko Road. In line with Singapore's 10-year plan to grow its manufacturing sector by 50%, by 2030, SC Auto and Volvo are expected to create up to 100 new job opportunities in the workforce and/or upgrade the skills of 50% of its existing workforce, as production for the new bus ramps up at the factory.

Additionally, both Volvo and SC Auto are already collaborating with ITEs, through the ITE Work-Study Diploma program, as well as polytechnics and universities, to help nurture the next generation of engineers.

Electric bus specifications

Length – 12 m

Capacity – 89 passengers (depending on configuration)

Driveline gearbox – Either a 200-kW single electric motor or 400 kW dual electric motors, coupled to a two-stage automated gearbox, which increases wheel torque at low speed and evens out current peaks, thus reducing energy consumption and sustaining motor and battery health.

Structure – Built using best-in-class materials, such as double-glazed glass, to reduce heat transfer, and insulation on the bus's roof and motor area to improve energy efficiency. It incorporates high capacity airconditioning with an Electrostatic Air Cleaner (EAC) system, to maintain a clean and cool environment inside the passenger compartment.

Charging – Minimum 310 km on a single charge which requires just over three hours.

Energy storage size and capacity – Three to five lithium-ion battery packs, located on the bus's roof, provide battery options of 282 kWh, 376 kWh and 470 kWh. They are designed for charging flexibility for both high-power charging on route, as well as charging at the depot.

Expected lifespan – Minimum 17 years.

Recycling percentage – At least 90% of the whole bus is recyclable including, but not limited to, the chassis, bus structure and batteries.

Further to this, Volvo has arrangements, in place, with sustainable technology lifecycle services firm, TES, to explore options and opportunities for battery recycling / repurposing / 2nd life applications.

Key safety features

- Advanced safety systems include fire-retardant materials, from composite flooring to FRP (Fibre Reinforced Plastics), to insulation materials, and to the isolation of high voltage systems and cables. There are multiple layers of fire protection on the roof, with a high

melting point of 1,400° C. Further, shatter-free passenger seats help to reduce the impact in the event of a crash.

- The batteries have nine layers of safety, from the choice of the chemistry to mechanical protection, to ensure overall Energy Storage System (ESS) safety. The bus is also equipped with an automatic fire suppression system for the motors and batteries, that automatically discharges a suppression agent, in the event of a fire, to extinguish it, allowing the driver to lead the passengers to safety. In case of a single cell thermal issue, the battery cell (single cell) and its local environment are designed to prevent further propagation to surrounding cells. This has been repeatedly proven in testing.
- The driver's environment meets ISO 16121 standards which contain requirements for an ergonomic and comfortable seating position to keep drivers in a good state of health for prolonged driving. This includes the mounting positions of the driver's seat and pedals, and carefully chosen steering allowance, to enable drivers to sit comfortably.

Additional bus safety features

- A fatigue warning system, based on deep learning (based on a neural networking model) and facial vision technology to detect abnormal behaviour of the driver, such as distraction or fatigue. It can detect and alert the driver via visual and audio displays, to help enhance safe driving.
- A Driver Assistance System (ADAS) and a Blind Spot Detection System (BSD) which uses AI (Artificial Intelligence) technology to automatically monitor and detect obstacles at the side and front of the vehicle.
 - ADAS includes forward collision warning, lane departure warning, headway monitoring warning and pedestrian collision warning.
 - BSD detects and alerts pedestrians or cyclists on the blind spot, on both sides of the bus, and alerts the driver.

Reliable and sustainable process for cleaning high-tech components

The use of carbon dioxide snow-jet technology can ensure high-purity.

The number of parts which need to be cleaned in a cleanroom, due to stricter cleanliness specifications, is constantly rising – and this is true for many branches of industry. In most cases, these tasks cannot be done using classic cleaning methods. Thanks to the sustainable quattroClean snow jet technology, however, parts can be cleaned, on demand, with consistent results, in a dry process. The cleaning system, which is adapted to the respective cleanroom class, can be designed as a fully automated system for integration into production lines, or as a stand-alone system for partially-automated or manual operation.

In more and more industrial sectors, particulate cleanliness specifications, down to the submicrometre range, and exceptionally high filmic cleanliness requirements, are making it necessary to shift cleaning processes to a clean or pure environment. These include tasks such as cleaning metallic and optical components, for example, before or after coating, for DUV and EUV lithography in the semiconductor supply industry, as well as structural parts for geostationary satellites in space technology. During microchip production, traces of powder or sawing residues, after wafer dicing with lasers or diamond saws, have to be removed.

When it comes to sensor technology and electronics, parts, such as optics and housings for assistance systems in vehicles and smartphone cameras, need to be exceptionally clean to ensure their lasting and reliable function. In addition, contact surfaces need to be cleaned before bonding, as well as electronic parts already fitted with components like imagers. In the medical device sector and pharmaceutical industry, the safe use of products such as implants, instruments and lab-on-chip solutions also depends on the

cleanliness of the parts. Today's cleanliness specifications for these diverse cleaning tasks can no longer be reliably met with conventional processes like compressed air, brush or wet-chemical cleaning.

Snow for outstanding cleanliness

The scalable, quattroClean snow jet technology, from acp systems AG, is a cleanroom-compatible and proven solution for such tasks. The cleaning process is dry and uses liquid, climate-neutral carbon dioxide (CO₂). The key to reliable cleaning results is the design of the wear-free, two-substance, ring nozzle through which the CO₂ is fed. On exiting the nozzle, the CO₂ expands to form fine snow particles which are then bundled by a separate jacket jet of compressed air and accelerated to supersonic speed. The jet is easy to focus on a specific area. On impacting the surface to be cleaned, the four effects (thermal, mechanical, solvent and sublimation) of the quattroClean snow-jet technology ensure that particles down to the sub-micron range and filmic contaminants are removed effectively and consistently.

Since the crystalline CO₂ sublimates completely during cleaning, the surfaces or parts are dry. At the same time, the process is gentle on materials and can therefore be

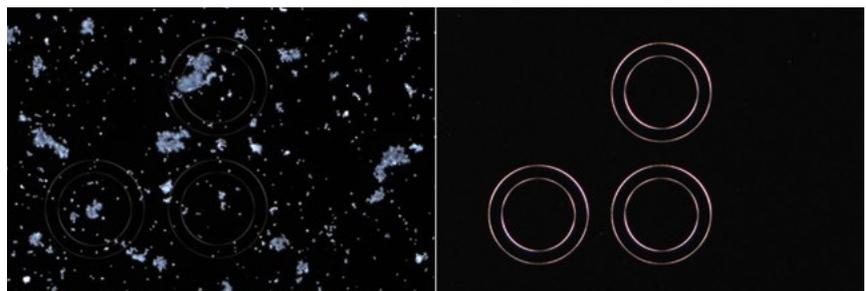
used to clean delicate, sensitive and finely-structured surfaces.

Process design and system design assure good cleaning results

The process for full-surface or partial cleaning is tailored to requirements through tests in acp systems' technical centre. All process parameters, such as the volume flows for compressed air and CO₂, the number of nozzles, the area to be jet-cleaned and the jet time, are precisely tailored to the respective application, by taking into account the material properties, the type of contamina-



Thanks to the interaction of the effects of the quattroClean snow jet technology, particulate contamination down to the submicrometre range, as well as the finest filmic contamination, are removed reliably and consistently.



The residual powder formed during wafer dicing with lasers is removed effectively by the quattroClean snow jet technology. Cleanliness was proven using a digital microscope with marks, that has an external diameter of 0.4 mm.

tion and cleanliness specifications. These parameters can be filed as part-specific cleaning programs in the system control. During cleaning, end-to-end process monitoring and control guarantee that each part is cleaned using the validated process parameters.

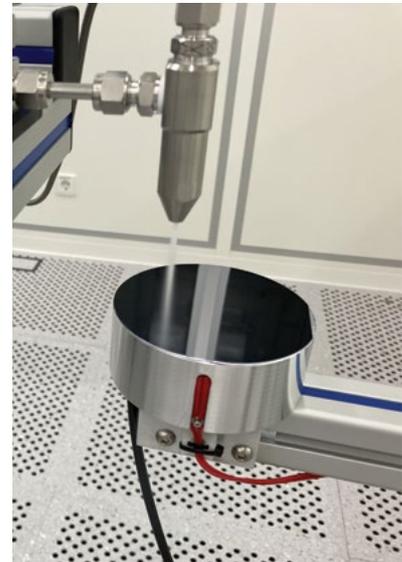
The design and features of the modular cleaning systems are adapted to the respective cleanroom class. Therefore, they are made entirely of stainless steel and have smooth, homogeneous surfaces. The flow-optimised design of the process chamber ensures that the detached impurities and sublimated CO₂ are removed rapidly and effectively by the integrated extraction system. Media preparation equipment, geared to the task at hand, also ensures that cross-contamination and re-contamination are prevented.

A variety of solutions for cleaning

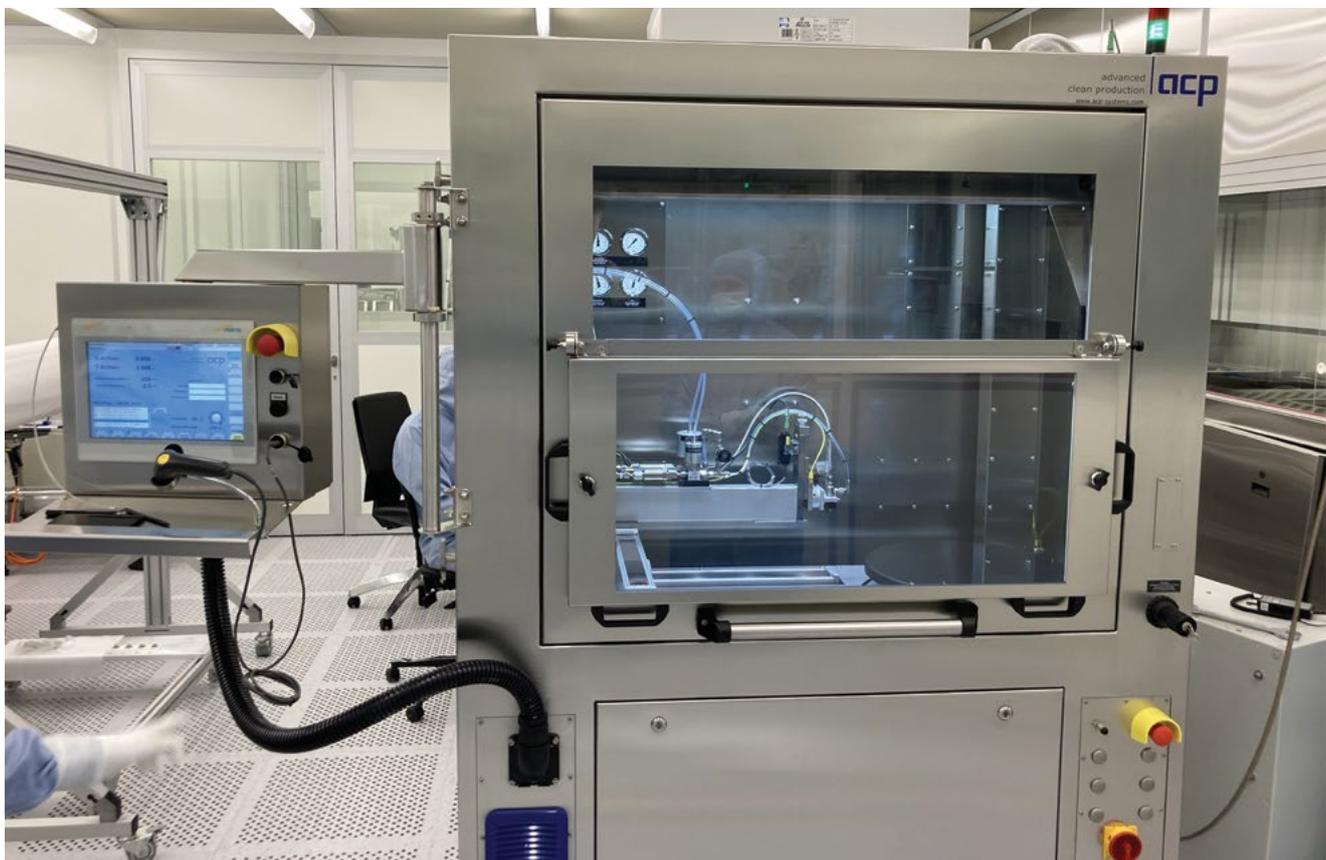
To optimally tailor the cleaning

solution to the respective requirements and production situation, acp systems offers various modular solutions and individually planned systems. The compact JetCell-HP was developed for flexible, automated cleaning tasks. The plug & play cleaning cell can be easily integrated into connected manufacturing environments or operated as a standalone solution. The integrated interfaces make it possible to connect the digitally-controllable cleaning system to higher-level host computers. All data collected during process monitoring and control can be automatically recorded and transferred to the host computer. The JetStation-HP is a closed cleaning cell for partially-automated or manual operation. With these cleanroom-compatible alternatives, all the technology for the snow jet process as well as the media preparation equipment are integrated into the system's slender housing. The system is put into operation simply by hooking it up to the CO₂ and compressed air supply.

All images by acp systems



The process is designed in acp systems' technical centre. All process parameters are precisely adapted to the respective application, material properties, contamination to be removed and cleanliness specifications.



JetStation-HP, designed and equipped for cleanroom use, was developed for flexible cleaning tasks with high cleanliness requirements. It is loaded manually and can be operated in partially or fully automated mode, as a stand-alone solution.

Five automation predictions for 2023

by Anders Beck, Vice President of Strategy and Innovation, Universal Robots



Mr Anders Beck

Turnkey solutions are the future.

The past few years have seen many organisations implement tech-driven changes at a rapid pace. As society becomes more digital, embracing technology and effectively managing new processes is key to the success of almost every business.

With rapid workplace transformation evident across industries, whether that is moving to hybrid working or adopting new technologies, what can we expect from 2023?

Universal Robots discusses five predictions for the coming year.

- **Turnkey solutions will make automation more accessible than ever before**

In recent years, we have witnessed the development of many different types of sophisticated technologies. Advances in robotics, machine learning and other technologies have increased the pace of this

change tenfold. While these promise to change or revolutionise the business world, all technology companies suffer from the same problem – they cannot be good at everything.

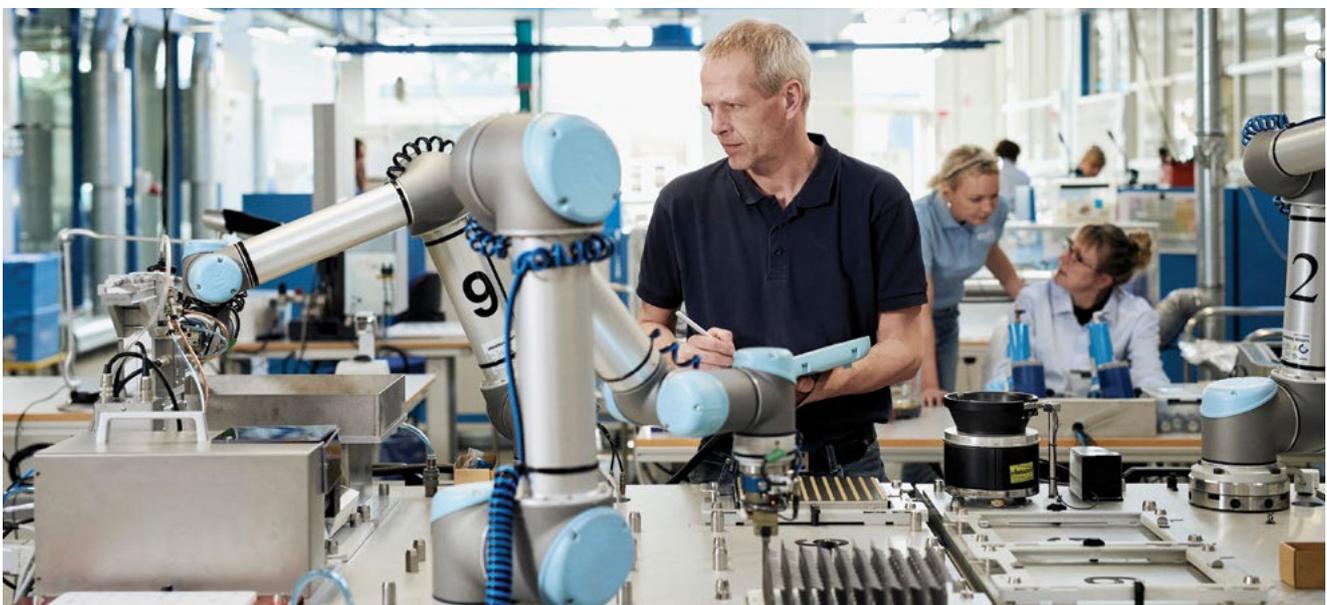
In the world of robotics, this is no different. Creating a robotic system requires hardware development, software development, application development, sensors, and interfaces, to name a few inputs. That is why 2023 will be the year of turnkey solutions. Original Equipment Manufacturers (OEMs) – companies creating new applications and products around existing technologies – will lie at the heart of this. They are able to drive innovation by combining technologies to deliver complete solutions for the most common applications, such as welding and palletising. The result? Automation will become more sophisticated yet more straightforward to use than ever before.

Enabled Robotics, an OEM, based in Denmark, is a great example of how this works. Since 2016, the company has been working to combine two types of cutting-edge technology by mounting collaborative robot arms (cobots) onto autonomous mobile robots (AMRs). This hybrid technology is now operating in industry, warehouse management and production, bringing robotics to service applications and hospital intralogistics.

Ultimately, these out-of-the-box solutions make it easier for companies to integrate crucial technologies and there is no limit to the imaginative ways companies will find to bring robots alongside humans in the world of work.

- **Manufacturers will turn towards modular production**

Traditional industrial robots remain important in some parts of manufacturing, but we are seeing a trend



An employee working alongside a UR10 cobot in Elos Medtech in Sweden.

towards deploying more flexible models of production. This is largely down to the fact that traditional industrial robots are typically large and fixed and entail complex deployment.

In contrast, cobots can perform a similar range of activities as traditional industrial robots but are smaller, lighter and much easier to deploy. They are designed to work alongside humans, posing less risk to safety and are better suited to environments that require flexibility and adaptability. On top of this, they are a cost-effective solution for businesses looking to deploy automation – a key consideration as we move into 2023.

The cobot industry is projected to grow to USD 2.2 billion by 2026 (The Collaborative Robot Market 2022 Report, Interact Analysis). As cobots continue to change the way work is done, in applications such as packing, palletising, welding and assembly, in 2023, we will see even larger companies turning to lightweight cobots to increase modularity in their production. Robot weight and versatility will be the key specifications for those exploring new automation solutions and we foresee more reconfigurable robotic work cells deployed than ever before.

- **Higher payload and longer reach cobots will change the landscape for some applications**

As more companies move towards cobot automation, many will still want to handle heavy payloads. The good news is that we have recently seen the introduction of several higher payload and longer-reach cobots. In 2023, these will continue to transform parts of the manufacturing industry, improving the working lives of many employees.

This year, Universal Robots presented a new cobot, UR20, which is built for higher payloads, faster speeds, and superior motion control, all within a lightweight, small footprint system. The 20 kg payload capacity will transform industries such as palletising, while its 1750 mm reach is eagerly anticipated for use in welding. Manufacturers looking for that extra flexibility will find the robot light enough to be unbolted and relocated or attached to a heavy base with wheels. This will create new possibilities for applications and will drive innovation across the board.

- **The long-term increase in industrial robot installation will continue despite global uncertainties**

The recent IFR World Robotics Report showed that industrial robot installation reached an all-time high in 2021, increasing by 31% over the previous year. Overall, worldwide annual robot installations between 2015 and 2021 have more than doubled. Although growth in 2022 seems to be slower across the

sector, this is largely down to global uncertainties triggered by the pandemic and scarcity of electronic components.

We expect the upward trend of cobot automation to resume in 2023. Why? Because businesses across the world are facing labour and skills shortages and, despite the day-to-day challenges faced in the industry right now, we are in the midst of a transition towards industry 5.0 where working alongside robots will create human-centric, sustainable and resilient businesses.

- **Customers will be found at the heart of product development**

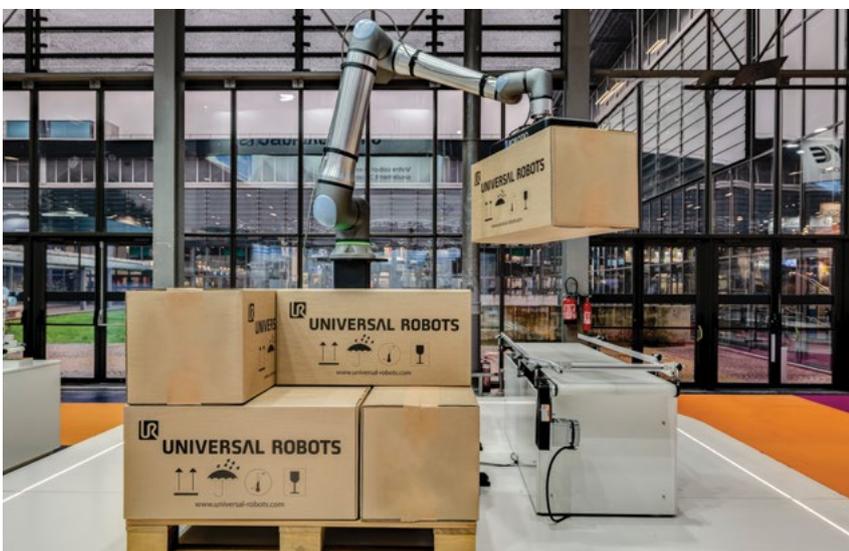
Although we talk extensively about robot collaboration in the workplace, human collaboration is what drives innovation.

Customers understand their own needs better than anyone else and, as the automation market has matured, are better placed than ever before to offer valuable input on their requirements. This means robotics companies will involve end-customers much more in product development. It is why Universal Robots has reorganised its product creation teams and is focusing heavily on understanding the problems customers are facing before designing solutions.

Co-development projects, where robotics companies and customers work together in developing specific solutions, are also bound to increase in 2023 and beyond. Ultimately, these allow customers to directly influence the product they are buying, while at the same time, delivering valuable feedback for the robotic companies – meaning they will be able to launch a product to the benefit of the whole market.

THE FUTURE OF COBOTS

Now more than ever, businesses need to innovate constantly and remain adaptable, in order to survive and expand. As we head into 2023, they will rely ever more on technology and innovation to break new ground, with turnkey solutions at the heart – all of which make the year ahead an exciting time for automation.



Robotiq palletiser displayed at the All4Pack 2022 trade show in Paris.

Automation centre for the logistics industry launched in Singapore

The aim is to improve the industry's long-term competitiveness and sustainability.

OMRON, a global leader in factory automation, including Industry 4.0 solutions, has announced the opening of its first automation centre exclusively catering to the logistics industry in Singapore, Southeast Asia and Oceania.

This is OMRON's second Automation Center in Singapore, the sixth in APAC and 38th worldwide. Named as OMRON AUTOMATION CENTER SINGAPORE for Logistics, it is one of the first solution development centres to support the adoption of Robotics Middleware Framework (RMF) in the logistics sector. It will enable and showcase interoperability between complex and heterogeneous multi-robot systems (MRS). This is an important step towards enabling stronger and seamless human-machine collaboration, where mobile robots using natural or existing infrastructure within the warehouse perform autonomous movement of goods (handling, moving and storing warehouse assets) as they work alongside the human workforce, on the shop floor.

Catalysed by the Singapore National Robotics Programme (NRP) to address interoperability issues among heterogeneous fleets of robots and infrastructure in hospitals, initially, RMF has moved beyond the health-care industry to other sectors, such as facility management, manufacturing and logistics, where different robots are needed for various applications. The ROS-Industrial (ROS-I) Consortium Asia Pacific, managed by Advanced Remanufacturing and Technology Centre (ARTC), under the Agency for Science, Technology and Research (A*STAR), has been actively supporting the growth of RMF adoption in these sectors.

Expressing his enthusiasm while inaugurating the centre, Mr Junta Tsujinaga, Company President,



At the opening of the OMRON AUTOMATION CENTER SINGAPORE are, from left, Mr Junta Tsujinaga, Company President, Industrial Automation Company of OMRON Corporation; Mr Virendra Shelar, President, OMRON Management Centre Asia Pacific; Mr Lionel Lim, Vice President and Head, Technology Hardware & Equipment, EDB, Singapore; Mr Dennis Ling, Executive Director, ARTC, A*STAR; and Mr Don Teng, Managing Director, OMRON Asia Pacific.



OMRON Mobile Manipulator Arm demonstrating the container unloading solution.

Industrial Automation Company of OMRON Corporation said, "The move indicates a big leap for OMRON towards realising our vision of 'Enriching the Future for People, Industries and the Globe by innovative-Automation', through expanding the presence and reach of OMRON AUTOMATION CENTERS in niche but growing industries. Our long-term vision – Shaping the Future 2030 (SF 2030) – takes into account the dynamic, diversified, and

complex world of manufacturing, led by Industry 4.0 and digitisation. With the region's diverse knowledge and maturity levels in automation, we believe that our unique capabilities based on human-machine harmony and collaborations with like-minded organisations will enable the evolution of technologies to realise the transformation of the logistics industry to Logistics 4.0 and more warehouses being automated".



At the signing of the MoU between OMRON and ARTC, A*STAR are Mr Lieu Yew-Fatt, Managing Director, OMRON Electronics Singapore; Dr Wong Chow Cher, Assistant Chief Executive, ARTC, A*STAR; Mr Don Teng, Managing Director, OMRON Asia Pacific; and Mr Dennis Ling (Executive Director, ARTC, A*STAR.



OMRON's pallet picking robot solution.

Mr Lionel Lim, Vice President and Head, Technology Hardware & Equipment, Singapore Economic Development Board, said, "The launch of OMRON's new automation centre focusing on logistics is an addition to Singapore's vibrant and collaborative robotics ecosystem of technology providers, research institutes and sophisticated end-users. We look forward to strengthening our partnership with OMRON, to develop innovative robotics solutions that can drive industry transformation and growth to better serve end-users in Singapore and the region".

The centre aims to work closely with partners in the robotics and automation eco-system, to catalyse the uptake of Logistics 4.0 in Asia Pacific, by addressing some of its biggest issues – such as labour

scarcity, limited space, supply chain disruptions and the pressing urgency to leverage sustainable technologies – to stay resilient while maximising competitiveness. It will help to address the region's growing needs for warehouse automation which, according to the IQ Research Report 2021, is expected to rise with a compounded annual growth rate of over 14%, over the next five years, with a higher increase in both developed and emerging countries in Asia Pacific.

"Today's event marks an important milestone in reinforcing OMRON's commitment to answer social issues and needs of its focus sectors, with its innovative automation solutions. The logistics industry across Singapore and many more countries of Asia Pacific continues to experience unprecedented growth despite many challenges. I believe that a dynamic and resilient supply chain is one of the most important requisites for the region to stay globally competitive and future ready", said Mr Don Teng, Managing Director, OMRON Asia Pacific.

"OMRON AUTOMATION CENTER Singapore for Logistics will enable players in Asia Pacific to test, develop, and deploy innovative automation solutions, to revolutionise workflows and streamline operations, that will act as a big driver to their future growth", he added.

The centre houses many solutions for intralogistics, such as the demonstration of an end-to-end fulfilment centre operation, deployment of collaborative robots and custom mobile robot solutions using natural feature navigation to perform autonomous movement of materials, 3D-vision-guided pick and palletise solutions, interoperability solutions using RMF for mobile robots, logistics training cells, as well as technologies enabling sustainable operations.

OMRON plans to actively work with technology companies, system integrators and startups, offering technologies relevant to the logistics industry, to pioneer warehouse automation solutions catered to the specific needs of 3PL and 4PL fulfilment centres, e-commerce providers and other warehouse management end-users.

In conjunction with the launch, OMRON also initiated a partnership with the ROS-I Consortium Asia Pacific to facilitate the incubation and development of capabilities and applications that leverage the Robotics Middleware Framework (RMF) for the logistics industry. The partnership also aims to develop common standards for robotics and automation, that can be applied globally, leveraging OMRON's custom mobile robot solutions, and use the centre as a test-bedding facility to model the RMF in logistics. This partnership is initiated through the signing of a Memorandum of Understanding (MoU) between OMRON and ARTC, A*STAR which manages the ROS-I Consortium Asia Pacific.

"ARTC's partnership with OMRON, through our ROS-Industrial Consortium Asia Pacific, signifies an industry readiness to adopt the Robotics Middleware Framework currently employed in other industries such as healthcare and facility management. We look forward to working closely with OMRON in leading the adoption of the framework in the logistics industry, while encouraging implementation at scale for the industry and other cross-sectoral applications", said Dr Wong Chow Cher, Assistant Chief Executive, ARTC, A*STAR.

The convergence of advanced persistent threat methods with cybercrime is predicted

An overview of the cyberthreat landscape in 2023 and beyond, is presented.

Fortinet, a global leader in broad, integrated, and automated cybersecurity solutions, recently unveiled predictions from the FortiGuard Labs global threat intelligence and research team about the cyberthreat landscape for the next 12 months and beyond. From quickly evolving Cybercrime-as-a-Service (CaaS)-fuelled attacks to new exploits on nontraditional targets like edge devices or online worlds, the volume, variety, and scale of cyberthreats are expected to keep security teams on high alert in 2023 and beyond.

FortiGuard Labs is the threat intelligence and research organisation at Fortinet. Its mission is to provide Fortinet customers with threat intelligence designed to protect them from malicious activity and sophisticated cyberattacks.

HIGHLIGHTS OF THE PREDICTIONS

Success of RaaS is a preview of what is to come with CaaS

Given cybercriminal success with Ransomware-as-a-Service (RaaS), a growing number of additional attack vectors will be made available, as a service, through the dark web, to fuel a significant expansion of CaaS. Beyond the sale of ransomware and other Malware-as-a-Service offerings, new a la carte services will emerge.

CaaS presents an attractive business model for threat actors. With varying skill levels, they can easily take advantage of turnkey offerings without investing the time and resources up front to craft their own unique attack plan. And for seasoned cybercriminals, creating and selling attack portfolios as-a-service offers a simple, quick, and repeatable payday. Going forward, subscription-based CaaS offerings

could potentially provide additional revenue streams. In addition, threat actors will also begin to leverage emerging attack vectors such as deepfakes, offering these videos and audio recordings and related algorithms more broadly for purchase.

One of the most important methods to defend against these developments is cybersecurity awareness education and training. While many organisations offer basic security training programs for employees, organisations should consider adding new modules that provide education on spotting evolving methods such as AI-enabled threats.

Reconnaissance-as-a-Service models could make attacks more effective

Another aspect of how the organised nature of cybercrime will enable more effective attack strategies involves the future of reconnaissance. As attacks become more targeted, threat actors will likely hire 'detectives' on the dark web to gather intelligence on a particular target before launching an attack.

Like the insights one might gain from hiring a private investigator, Reconnaissance-as-a-Service offerings may serve up attack blueprints to include an organisation's security schema, key cybersecurity personnel, the number of servers they have, known external vulnerabilities, and even compromised credentials for sale, or more, to help a cybercriminal carry out a highly targeted and effective attack. Attacks fuelled by CaaS models mean that stopping adversaries earlier, during reconnaissance, will be important.

Luring cybercriminals with deception technology will be a helpful

way to not only counter RaaS but also CaaS at the reconnaissance phase. Cybersecurity deception coupled with a digital risk protection (DRP) service can help organisations know the enemy and gain advantage.

Money laundering gets a boost from automation to create LaaS

To grow cybercriminal organisations, leaders and affiliate programs employ money mules who are knowingly or unknowingly used, to help launder money. The money shuffling is typically done through anonymous wire transfer services or through crypto exchanges to avoid detection. Setting up money mule recruitment campaigns has historically been a time-consuming process, as cybercrime leaders go to great lengths to create websites for fake organisations and subsequent job listings to make their businesses seem legitimate.

Cybercriminals will soon start using machine learning (ML) for recruitment targeting, helping them to better identify potential mules while reducing the time it takes to find these recruits. Manual mule campaigns will be replaced with automated services that move money through layers of crypto exchanges, making the process faster and more challenging to trace. Money Laundering-as-a-Service (LaaS) could quickly become mainstream as part of the growing CaaS portfolio. And for the organisations or individuals that fall victim to this type of cybercrime, the move to automation means that money laundering will be harder to trace, decreasing the chances of recovering stolen funds.

Looking outside an organisation for clues about future attack methods will be more important than ever,

to help prepare, before attacks take place. DRP services are critical for external threat surface assessments, to find and remediate security issues and to help gain contextual insights on current and imminent threats, before an attack takes place.

Virtual cities and online worlds are new attack surfaces to fuel cybercrime

The metaverse is giving rise to new, fully immersive experiences in the online world, and virtual cities are some of the first to foray into this new version of the internet, driven by augmented reality technologies. Retailers are even launching digital goods, available for purchase, in these virtual worlds. While these new online destinations open a world of possibilities, they also open the door to an unprecedented increase in cybercrime in uncharted territory.

For example, an individual's avatar is essentially a gateway to personally identifiable information (PII), making the person a prime target for attackers. Because individuals can purchase goods and services in virtual cities, digital wallets, crypto exchanges, NFTs, and any currencies used to transact, offer threat actors yet another emerging attack surface. Biometric hacking could also become a real possibility because of the AR- and VR-driven components of virtual cities, making it easier for a cybercriminal to steal fingerprint mapping, facial recognition data, or retina scans, and then use them for malicious purposes. In addition, the applications, protocols, and transactions within these environments are all also possible targets for adversaries.

Regardless of work-from-anywhere, learning-from-anywhere, or immersive experiences-from-anywhere, real-time visibility, protection, and mitigation are essential with advanced endpoint detection and response (EDR), to enable real-time analysis, protection, and remediation.

Commoditisation of Wiper malware will enable more destructive attacks

Wiper malware has made a dra-

matic comeback in 2022, with attackers introducing new variants of this decade-old attack method. According to the 1H 2022 FortiGuard Labs Global Threat Landscape report, there was an increase in disk-wiping malware in conjunction with the war in Ukraine, but it was also detected in 24 additional countries and not just in Europe. Its growth and prevalence is alarming because this could be just the start of something more destructive.

Beyond the existing reality of threat actors combining a computer worm with wiper malware, and even ransomware, for maximum impact, the concern going forward is the commoditisation of wiper malware for cybercriminals. Malware that may have been developed and deployed by nation-state actors could be picked up and re-used by criminal groups and used throughout the CaaS model. Given its broader availability, combined with the right exploit, wiper malware could cause massive destruction in a short period of time, given the organised nature of cybercrime today. This makes time to detection and the speed at which security teams can remediate, paramount.

Using AI-powered inline sandboxing is a good starting point to protect against sophisticated ransomware and wiper malware threats. It allows real-time protection against evolving attacks because it can ensure only benign files will be delivered to endpoints, if integrated with a cybersecurity platform.

RESPONDING TO ATTACK TRENDS

The world of cybercrime and the attack methods of cyber adversaries, in general, continue to scale at great speed. The good news is that many of the tactics they are using to execute these attacks are familiar, which better positions security teams to protect against them. Security solutions should be enhanced with machine learning (ML) and artificial intelligence (AI), so they can detect attack patterns

and stop threats in real time. However, a collection of point security solutions is not effective in today's landscape. A broad, integrated, and automated cybersecurity mesh platform is essential for reducing complexity and increasing security resiliency. It can enable tighter integration, improved visibility, and more rapid, coordinated, and effective response to threats across the network.

"In 2023, cybercriminals will continue to use tried-and-true attack tactics, particularly those that are easy to execute and help them achieve a quick payday. In addition, we can also expect several new attack trends leveraging deepfakes, metaverse, Web3, and mixed reality (MR) technologies to increase. To effectively defend against these attacks, organisations need to understand cybercriminals better, what motivates them, their tools and tactics, and how they act. However, given the cyber skills talent shortage, organisations can consider adopting managed services to support the integration of security into the network, and deploying automated response tools in addition to having a cybersecurity mesh platform", said Rashish Pandey, Vice President of Marketing and Communications, Fortinet Asia.

"The acceleration of digital transformation, including the transition to the cloud and the rapid adoption of IoT and applications, is replacing the traditional network. The corporate network must keep up with these remote connectivity demands and maintain consistent security everywhere. To do that, businesses must tightly integrate their network infrastructure and security architecture, enabling the network to scale and change without compromising security. This next-generation approach is essential for effectively defending today's highly dynamic environments, providing consistent enforcement across today's highly flexible perimeters and weaving security deep into the network", said Nirav Shah, Vice President of Products at Fortinet.



2023 Cyber Threat Predictions at a Glance

New Attack Trends We Expect to See in the Coming Year

Our FortiGuard Labs team anticipates several distinct new attack trends will emerge in 2023. Adversaries will continue to rely on tried-and-true attack tactics, and the rise of advanced persistent cybercrime will pave the way for new, more sophisticated threats. Here's what to watch for:

Get Ready for More Advanced Persistent Cybercrime



We saw more targeted, high-profile ransomware attacks because of Ransomware-as-a-Service (RaaS) playbooks.



Pre-attack reconnaissance and weaponization is laying the groundwork for Crime-as-a-Service (CaaS) growth.



In 1H 2022, the number of new ransomware variants increased by nearly 100% versus the previous six months.

Virtual Cities Roll Out the Welcome Mat for Cybercrime

Immersive online experiences will open the door to more cybercrime like:

-  Stolen virtual goods and assets
-  Hacked crypto wallets
-  Hacked biometrics like fingerprint maps

CaaS Offerings Go Mainstream

The success of RaaS will drive new CaaS offerings like:

-  Deepfake video and audio recordings
-  RaaS with targeted attack blueprints

These could potentially be subscription based.

Wild West of Web3 Poses Risks

Web3, a blockchain-based version of the internet, lets users control their data.



Yet humans are typically the weakest link in security.

Expect regulations around Web3 to help address fraud and stolen data.

Wipers Run Rampant



7 new wiper variants in 1H 2022—nearly as many as seen in the last decade.



Expect hackers to combine wipers with other threats.

Cybercriminals ♥ Quantum Computing



Expect to see cybercriminals use quantum computing.



Could use it to weaponize AI to find new zero-day vulnerabilities.

Money Laundering Gets a Boost from Automation

Cybercriminals will start using machine learning (ML) to speed things up:

ML will help with recruiting potential money mules.



Hackers will use automation to move money through crypto exchanges.

Cybercriminals aren't stopping with these. From the rise of advanced persistent cybercrime to more attacks on edge and operational technology (OT) devices, we've got more predictions—plus tips to safeguard your organization against these risks—in our full report.

Read the full 2023 threat predictions report

[Download now](#)

Detecting leakage in pipelines

by Friedhelm Best, Vice-President APAC, HIMA



Mr Friedhelm Best

If ignored, the consequences could be serious.

On 25 January 2022, an underwater pipeline in the Gulf of Thailand leaked an estimated 50,000 litres of oil and spread over 47 km², reaching the Mae Ramphueng Beach in Rayong, Thailand. Around 350 people, including 200 Thai Royal Navy soldiers, three civilian ships and 12 navy ships were sent to contain the leak.

Pipelines are the lifeblood of many nations, carrying important fluids, such as oil and natural gas. Pipelines are generally well-engineered and deemed some of the safest ways to transport fluids. However, in the event of an unscheduled leak, whether due to wear and tear, natural disasters, or human incidents, pipeline leaks can have an impact on the environment, and incur serious financial losses and legal liabilities, and shatter the reputations of businesses.

With the increasing consumption of energy and natural gas, facilities and governments are demanding dependable pipeline safety and leak detection. According to BlueWeave Consulting, it was reported that the global oil and gas pipeline leak detection market is estimated to reach around USD 5.7 billion by the end of 2028, up from USD 3.6 billion in 2021. It was revealed that Asia Pacific has the highest share of the oil and gas pipeline leak detection market. The Asia Pacific region is now the fastest growing economic zone in the world, with correspondingly expanding import and export of oil and gas. This necessitates a more comprehensive adoption of technologies that can prevent leakage and puncture in pipelines, such as a leak detection system.

Reasons behind pipeline failures

Material failure, including corrosion and attrition, is the most common cause of pipeline damage. The resultant leak is often so small that it may be completely overlooked or spot-



Pipelines carry important fluids such as oil and natural gas.

ted late, and through which large quantities of oil or gas may have already leaked. Crime is a growing concern for pipeline operators, too. In certain cases, particularly in remote locations, vandalism and theft of raw materials go unnoticed for some time. Moreover, cross-border pipelines may be targeted by terrorists. All these failures can cause serious damage and threaten the energy supply to a facility and to even a nation. The digital age injects yet another possible reason where pipelines can fail, where threat actors, including nation-state threat actors, can compromise pipelines and systems through cyberattacks.

Smarter pipeline management

There are various international standards and legal regulations in place, for pipeline integrity, especially to minimise damage to the environment. One particularly important stipulation is the use of a leak detection system (LDS). However, legislation remains unclear and companies are required to follow only those regulations that are deemed 'technically feasible', in some nations. According to some current legislation, companies that conform to these may avoid liability for any damage caused. Beyond legal compliance however, companies may still suffer financial losses and reputational damage.

Minimal leaks and faster fixes

Security systems will become a requirement and will have to be integrated with the LDS. Companies need solutions to help operators conform to all relevant regulations and international standards for pipeline integrity management up to SIL 3. For instance, the HIMA FLOWorX solution combines a software leak detection system with a SIL 3 hardware emergency shutdown system. It allows operators to instantly detect leaks, ruptures and other faults in their pipelines, conforming to all major legal regulations. Operators should adjust and control pipelines centrally, automate operations, and reduce downtime. A fault-tolerant system architecture minimises false alarms, which also contributes towards lower operating expenses.

Durable performance

Pipelines set remarkable endurance records. There is virtually no other system that must withstand such high pressures over such long periods of time. For pipelines up to several thousand kilometres in length, detecting every risk and even the tiniest leaks is a huge challenge. Pipeline solutions to help companies overcome that challenge is now a necessity rather than a luxury.

Subsea pipeline repair robot to enhance operational efficiency

AI and Robotics Ventures (ARV), together with Kongsberg Ferrotech, a subsea robotics company, have officially released 'Nautilus', said to be the world's first subsea pipeline inspection and repair robot, after its successful pilot trial in providing subsea Inspection, Repair, and Maintenance (IRM) services for offshore operations, under the PTTEP group.

Nautilus is now ready to serve customers and partners in both the public and private sectors of the oil & gas exploration and production industry.

The recipient of two innovation awards, Nautilus is said to increase IRM operational efficiency, while significantly reducing time and cost of subsea pipeline maintenance.

The technology, developed over a period of four years, is said to increase operational efficiency and reduce the time and costs of subsea IRM operation in the oil & gas industry, which traditionally requires skilled divers to board a pressurised submarine that dives deep under the sea to perform the tasks. There are risks to life and the environment, and high costs, in such operations, and it can take seven to 14 days for each repair operation.

Nautilus is designed and developed with performance and portability in mind. It can confirm the spot with abnormalities by performing a Non-Destructive Testing (NDT) scan and it can also repair the damaged spot immediately. Nautilus has also been approved for application in the repair of non-metallic, subsea pipelines.

The Nautilus IMR robot performs the complete process in a single dive – from removing the existing corrosion coating (e.g. 3LPP), defect sizing, surface preparation, coating, leak sealing and, finally, structural strengthening using carbon fibre – all by robotic means, digitally controlled and fully documented.

The environment in the repair habitat is fully controlled throughout the repair process. All contaminants are collected and brought back to the surface for safe disposal. The operation time can be reduced to less than 48 hours and it is possible to save more than 50% on the preparation cost for subsea pipeline maintenance.

Throughout the four years of development, Nautilus had undergone

software and hardware component testing for more than 1,000 hours, to ensure system integrity and the quality of the product.

Nautilus also gained international recognition by winning the Award for Breakthrough Technological Project of the Year, at the ADIPEC Awards in 2020, and the Spotlight on New Technology Award, at the Offshore Technology Conference Asia (OTC Asia) in April 2022.



Nautilus is said to be the world's first subsea pipeline inspection and repair robot.

New ABB ACS180 machinery drives offer reliable machine operations

ABB has extended its all-compatible family of machinery drives, with the new ACS180 variable speed drive (VSD) for applications up to 22 kW. This easy-to-use and compact VSD brings reliability and performance for machinery builders.

The ACS180 is designed for OEMs and system integrators across several industries and for a wide range of applications. The ACS180 can control, for example, conveyors, pumps, fans, mixers, and compressors, in a wide variety of industry sectors, including food & beverage, textiles, material handling, and commercial applications.

The ACS180 joins ABB's family of All-Compatible drives for machine building. It features a robust and compact design that offers precise control as well as scalability and flexibility. All-Compatible ABB drives share the same architecture and user interface for ease of use.

The ACS180 is designed for controlling both induction and permanent magnet motors, up to 22 kW.

The VSD is housed in an IP20 enclosure, in five frame sizes for cabinet mounting. It features a robust design and optimised airflow for cooling, to ensure a long and reliable service life. To provide the functional safety essentials, when



The ACS180 joins ABB's family of All-Compatible drives for machine building.

designing and building machines, the VSD has embedded Safe Torque Off (STO) functionality that brings motor safely to a no-torque state.

When it comes to performance, the ACS180 is said to offer good motor control without an encoder. It supports both scalar control for effortless, robust and basic speed control and vector control for more demanding regulation of speed and torque, to ensure accuracy throughout the speed range.

The VSD can interface with an overall plant automation system via its built-in Modbus RTU protocol or using digital/analog input and out-

put control connections. Graphical icons make the built-in control panel straightforward to operate and reduce the need for translation, which is important for OEMs selling in global markets.

Adaptability to machine automation needs is provided by the ACS180's new-generation adaptive and sequence programming that allows customisation of the drive's functionality. This uses the embedded small-scale programmable logic controller to offer a common approach to drive programming that enables the drive functionality to be tailored to suit its specific application.

A cloud-based solution for monitoring and optimising all processes

WeASSIST, from WERMA, is a plug & play solution for comprehensive monitoring of all production and logistics processes. It is cloud-based, easy to install, quickly retrofittable and widely scalable. Whether used on machines or systems, in logistics areas or at manual workstations, WeASSIST is said to ensure transparency, digitally and in real time. This helps in the identification of problems before they arise and in the constant optimisation of processes.

The cross-industry cloud solution consists of hardware and software, and turns networking and Industry 4.0 into reality, quickly, easily, and without involving major installation work or programming. This facilitates comprehensive monitoring and constant optimisation of all manufacturing processes.

All relevant data is clearly displayed, regardless of the source (manufacturer, type and age of machines or manual workstations). WeASSIST enables easy identifica-

tion and evaluation of optimisation potential, in real time and from anywhere.

The solution can be retrofitted at any time. The hardware is integrated into workstations or machines and the software access is activated. The hardware, software and individual dashboards are then configured and the roles and users are assigned. All integrated machines and workstations will immediately report their status directly to the software via a gateway.

IES PRESIDENT RECEIVES HONOUR FROM NUS FOR CONTRIBUTIONS TO THE INDUSTRY AND COMMUNITY

On 16 November 2022, IES President Mr Dalson Chung received the Distinguished Alumni Award from the NUS College of Design and Engineering.

He was honoured for his contributions in three areas: Spearheading the National Environment Agency (NEA)'s efforts in developing the environmental industry in Singapore to meet local needs

and help companies globalise, especially in the waste management and cleaning industry sectors; as an active member of the NUS Department of Civil and Environmental Engineering's consultative committee since January 2019; and engaging waste industry members to offer internships and career opportunities to NUS students, together with his team at NEA.

Instituted in 1989, the award is conferred on NUS alumni who have distinguished themselves nationally or internationally through excellent and sustained contributions and achievements in public and community service, entrepreneurship, and in a professional or scholarly field.

The IES Council and Secretariat congratulate Mr Chung for receiving this high honour.



(From left) Prof Aaron Thean, Dean, College of Design and Engineering, poses for a photo with the Distinguished Alumni Award recipients, Mr Dalson Chung and Mr Teo Swee Ann, as well as Assoc Prof Kua Harn Wei, Vice Dean, Alumni Relations. Photo: NUS CDE

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