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Greener Future by Smarter Buildings

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Greetings and appreciation

Good morning, Ir Walter Au, Chairman of Organizing Committee, distinguished guests, ladies and gentlemen. Welcome to the Build4Asia Conference 2024. I am deeply honoured to be invited for giving the opening remarks and keynote speech for so many trade professionals from the industry in this exhibition. First of all, I would like to thank the Build4Asia team for grouping the demands and supplies into this well-established platform, to share and learn the latest technology development that paves us towards a sustainable future. Given this opportunity, I am going to share some views on the co-creation of a greener future by smarter buildings.

Smart and Smarter Buildings

Buildings are, undeniably, smarter in this era than ever before. The concept of smart building was coined for years. Over the years, buildings have transformed from static structures to dynamic entities that actively respond to occupants' needs, enhance sustainability, and provide a seamless user experience. In the old days, E&M services in buildings only have basic control for automatic operation, such as simple feedback control for equipment start stop. The era of digitalization equip the buildings with smart features and more user interaction, like the IoT, building information modelling and real-time energy management platform. And now, smart building became smarter and greener with the innovative adoption of advanced technologies, starting a new chapter of building with intelligence. There are two additional alphabets between "Smart" and "Smarter", "E" and "R". I would say "E" stands for "Evolution" and "R" stands for "Revitalization". Let's dive into the "E" and "R", and explore how smart buildings can become smarter for a greener future.

Evolution – from digitalization

In the ever-evolving world of technology, no industry remains untouched. With the advancement of communication technology, the connection between systems had been evolved from massive hard wiring to wireless network. These IoT connected applications are particularly valuable in addressing fast and efficient monitoring and control process. The introduction of building information modelling has also empowered the building industry for better visualization and interactive use of data. Digitalisation is the backbone of intelligence. As digital technologies continue to evolve, digital twin emerged by integrating building information model with IoT network and augmented reality technology. These advancements will leading to better performing, sustainable and resilient smart buildings.

Evolution – to the era of AI

Evolution of E&M systems never ends. The rise of Industry 4.0 and the rapid advancement of computing technology have empowered smarter buildings by artificial intelligence. The technology enables continuous, faster and real-time monitoring-based control operation. Unlike the traditional discrete control approach, real-time and monitoring based control or commissioning can play a vital role in leveraging data driven decision marking, automatic fault detection and diagnostics, and continuous energy optimization of E&M systems for greener performance. With more and more innovative adoption of technologies, modern smart building has already witnessed the remarkable shift from traditional control to intelligent operation. This transformation has birthed an era where innovation and technology become the bedrock of smarter buildings.

EMSD drives AI development

To further encourage the growth of AI application for E&M systems, EMSD organized a Global AI Challenge in 2021 with the support from more than forty co-organisers and supporting organisations. This was the largest global artificial intelligence event related to building E&M industry. The Challenge received overwhelming response from more than one hundred and twenty teams around the globe for the competition. Following the competition, EMSD initiated the E&M AI Lab in late 2022 to establish a network of specialists from the Government, industry, academia and research institutes, for the shared goal of applying big data and AI development for E&M facilities. Since its establishment, the E&M AI Lab has already created and incubated over 12 co-research projects, published at least 10 technical papers, organized and participated in more than

6 international collaboration. The AI Lab will continue to play an important role in advancing building E&M AI technology in the years ahead.

Examples of smarter buildings

There are more and more pioneers in adopting artificial intelligence for smarter and greener buildings. The venues of the Asian Games in Hangzhou China are examples. The smart "Digital Supervision Platform" of the venue facilitated the management staff to carry out real time monitoring of more than ten thousand devices, optimizing the energy management and enhance the green performance. Covered by 5G network, the park stadium became smarter and greener by connecting various IoT sensors to cloud platform for centralized monitoring and control. Cutting-edge artificial intelligence technology and virtual reality had been used to improve the operational efficiency of the Games, and provide the athletes, spectators and tourists with top-notch services.

In addition, the Asian Games Village has introduced a cloud-based low-carbon account program to promote green lifestyle for the residents. Residents can participate the village's carbon reduction activities such as food waste reduction, use of green transportation, energy saving and plastic-free shopping. The online platform can facilitate the participants to earn low-carbon points, which can be redeemed for various eco-friendly rewards. The positive feedback of the program had reduced 15 tonnes of carbon emissions during the Asian Games.

Policies supporting AI development

The successful examples of AI implementation demonstrate how smarter buildings have evolved to facilitate greener performance. These intelligent systems seamlessly connect occupants with the building and facilities, enhancing comfort, energy efficiency and sustainability. This growing trend harmoniously aligns with government policies, fostering a sustainable and technologically advanced built environment. China is stepping up the development of AI as one of the country's "New Quality Productive Forces"(新質生產力)". This initiative refers to productivity led by technology innovation that breaks away from the tradition mode of economic growth and development pathway. Taking into account Hong Kong's social and economic situations and its unique strengths, the development of "New Quality Productive Forces" in Hong Kong will support the formation of a new economy with Hong Kong's advantages. The

Hong Kong SAR Government has earmarked $3 billion for supporting researches on frontier technology, and $3 billion for launching the AI Subsidy Scheme to support local universities, R&D organisations and enterprises to make the best use of the supercomputing power of the AI Supercomputing Centre so as to promote local AI and data science development.

Revitalization for smarter buildings

While evolution of technologies empowered the transformation of smarter and greener building, revitalization can bring new life and vitality to the substantial stock of existing buildings, especially old buildings. In Hong Kong, there are over 40,000 buildings and over 60% of them are aged over 30 years. Revitalizing these buildings with smart technologies for greener performance is a great deal. Nowadays, transforming old building with smart and green features is more convenient than ever. The use of wireless IoT technologies can equip the old buildings with network of sensors for smart monitoring and control without substantive hard wiring. Digitalization, is the key step in revitalizing existing buildings into smart building, and pave way for the further transformation to smarter and greener building with intelligence.

EMSD drives E&M digitalization to facilitate revitalization

EMSD is eager to drive E&M digitalization to facilitate the revitalization for smarter and greener buildings. We gather data using BACnet protocol and connect more than four hundred major government buildings to our Regional Digital Control Centre for remote monitoring and energy management. The availability and integration of real time data laid a solid foundation in applying artificial intelligence for big data analytics and implementation of cloud based algorithms for energy optimization for E&M systems. Thus in turns enhance the green performance of buildings.

Example of Revitalization – Cloud based AI chiller plant optimization (ChillStream)

With massive streams of real-time data, we can harness artificial intelligence to predict demand and auto commission the set points of E&M systems for continuous energy optimization. Chiller plant consumes majority of energy in building. Implementing real-time commissioning for chiller plant will be exceptionally effective in reducing building energy consumption. EMSD recently developed a homemade AI chiller optimization platform called ChillStream. With the real-time collection of operating

parameters, ChillStream is able to predict the cooling load demand in high accuracy, and determine the most energy efficient operating sequences and chilled water supply temperature set point at a 5 minutes interval. The optimal operating sequence of the chiller plant and control set points are then send back to the building for automatic implementation. The cloud-based analytics-as-a-service platform can also pave way for large scale deployment to more buildings in the future.

Revitalizing buildings with smarter features will become a new normal

Through round-the-clock trial in an existing laboratory building in Hong Kong, ChillStream was proven to be capable to achieve an overall energy saving up to 5% at this stage. Moreover, since this platform was developed in-house and the data quality was satisfactory, no new hardware was required, which kept the project cost very minimal. In the upcoming presentation session this morning, my colleagues will share more details about this project. I imagine ChillStream as a virtual energy saving companion which never gets tired, and helps to unlock opportunities of real-time energy management to make existing buildings smarter and greener. With the continuous advancements and evolution of technologies, revitalizing buildings with smarter and greener features such as AI-based energy optimization, cloud computing data analytics services, intelligent fault detection and diagnosis, and digital twins will become the new normal.

Data interoperability

As we explore the evolution of technologies and revitalization of existing buildings, it is undoubtful that there are many technologies and products in the market nowadays. When we embark on this transformative journey, we encounter a critical challenge: the implementation efficiency. It makes us question how we can ensure that these cutting-edge technologies communicate seamlessly with each other.

Data interoperability examples

In fact, we can make reference to some of the digital services in our daily life to get the answer. People can enjoy fast and efficient payment services through the Faster Payment System; passengers can check the estimated arrival time of public transport of various companies in one go using mobile App; and the eHealth system enables communication of personal health records among the public and private healthcare services providers. These digital services all share one similarity that makes them

successful: well-defined data communication protocol, a common language to connect among applications for integrated operation. Common data protocol lays an important foundation for innovation and collaboration in the development of intelligent systems. Riding on the success from these smart digital services, it is a prime time for stakeholders to work together in leveraging open-source systems and data interoperability to develop smarter and greener buildings.

EMSD to drive AI data standard

Data interoperability is a crucial aspect of smarter buildings. It enables seamless communication and integration of different systems and devices within the building ecosystem, supports scalability and ensures compatibility with future technologies. Last year, EMSD signed a Memorandum of Co-operation with two mainland China institutes in Guangdong Province to further deepen collaboration on the development of standards and guidelines for artificial intelligence application for E&M systems. The standard will play a crucial role in ensuring data communication and integration of AI applications between systems and equipment. By fostering open systems and common data language, building E&M systems can become smarter and greener by unlocking the full potential of cross system communication, data analytics and energy optimization.

Collaboration for smarter buildings

Apart from EMSD, the rest of stakeholders also play a crucial part in the implementation of technologies for smarter and greener buildings. Stakeholders could include building owners, facility managers, R&D centers, suppliers, consultants and contractors. They all have different levels of involvement like R&D centers providing platforms for coordinating applied research and facilitating technology transfer to the industry while suppliers, consultants, contractors and facility manager proactively applying technologies to enhance the services provided. However, the most vital element leading to success is collaboration. Smart toilet and "kNOw Touch" contactless panel using in the elevators are the successful examples of collaboration and realisation of I&T outcomes between the stakeholders. We, as the team players of smarter buildings for greener future, can work together in developing products, systems and designs to facilitate holistic integration and collaboration among systems and even buildings.

Closing

The evolution of E&M systems for smarter and greener buildings never ends. Smart buildings will continue to evolve in parallel to the technology advancements and innovations, just like the transformation from simple control in the past, to artificial intelligence-based optimization nowadays. Revitalization of existing buildings also gains synergy with technologies. The “E” and “R” make buildings smarter, and empower better sustainability and higher energy performance for a greener future. With the advanced and diverse development of smart E&M systems, data interoperability ensures that smart buildings are scalable and adaptable to future technologies. This resiliency enables buildings to evolve smarter and greener over time. Our collaboration is the key to making this happen and successful, and I am looking forward to working with you to co-create smarter building for our greener future. Last but not least, may I wish today's conference a great success, and the participants to have a fruitful, enjoyable and inspiring experience at the event. Thank you.

(approx. 2,100 words, 20 mins)