

**BSOMES International Conference:  
New Era of RCx for Building Energy Efficiency  
30 September 2021**

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Good morning President Ir Johnson LAU, distinguished guests, fellow engineers, ladies and gentlemen. Thanks for inviting me to the BSOMES International Conference: New Era of Retro-commissioning for Building Energy Efficiency. It is indeed my great pleasure to join this important annual event of the BSOMES today.

Although it's already some weeks ago, most of us may still recall the glorious moment of Hong Kong athletes receiving the medals in the Tokyo 2020 Olympics and Paralympic. The remarkable breakthroughs achieved by our Hong Kong athletes are for sure inspiring and encouraging. However, behind the scene, many of you may not know that this big world-wide sports event was also successful in making a great sustainable move towards carbon neutrality. For example, 60% of the competition venues were existing venues to reduce environmental load in venue development; 500 nos. of fuel cell electric vehicles were introduced as passenger cars; Electricity used in competition venues and the Olympic and Paralympic Village was 100% renewable electricity; Carbon offset was implemented for the emission of carbon dioxide which were inevitable, etc.

In 2020, a difficult decision on the postponement of Tokyo Olympics by one year to 2021 due to COVID-19 outbreak might be so unpredictable to Japanese citizen from their original expectation. On the other hand, the occurrence of autumn foliage and cherry blossoms each year also becomes more and more unpredictable too and is also drawing more and more attention of Japanese citizen. The cherry blossom season has been starting earlier while the autumn leaves days have been shifted later year by year. According to the meteorological observatory in the country, they believe that global warming and climate change are affecting those seasonal changes.

I believe that such changes might not be a big surprise to all of you. Extreme weather and its associated adverse effect to the normal living have been more often seen in recent years and this is definitely increasing the public's concerns and their awareness of climate changes. The Australia's Black Summer bushfires in 2019 to 2020 were unprecedented and catastrophic in terms of its scale and harm. Nearly 80% of the locals were affected;

1 billion animals were killed. Many of the species are now at risk of extinction and the amount of carbon dioxide released is even more than the annual emission of the country.

A while back in mid-July of this year, Henan experienced a prolonged and record-breaking heavy rainfall which caused severe flooding to the province. Almost 10 million people were affected due to this flood. There was a massive snow storm in Northwest of U.S. with record low temperatures, ice and snow. It led to 47 dead and millions of Americans living without electricity, water and heat. Later in this year summer, some 195 million Americans — out of a population of more than 330 million, faced exceptional heat wave in U.S. with record-high temperature to 43 degree Celsius shattered across different cities. All these disastrous scenes over the world are happening more and more often every year or every few months, causing millions of people's living in very difficult environment or even serious threats to live on.

Albert Einstein once said “In the middle of difficulty, lies opportunity.” When the Hong Kong athletes were facing hurdles set by the pandemic, they could see a clear path that lies in the front. With their strong belief and unflinching effort, some athletes took the opportunity of an extra year of training to get well-prepared for the Olympics games and showed their determination of striving their best to push the limits with remarkable achievement. Similarly, we need everyone's belief, commitment, strong efforts and determination of striving towards the goal of carbon neutrality.

In November last year, the Chief Executive announced a very challenging target of achieving carbon neutrality by 2050 for Hong Kong. In coming November this year, more than 190 world leaders and the elites will assemble for the COP 26 in Scotland to discuss each of their national plans and way forward to combat the climate changes. Hong Kong people are well-renowned for our high flexibility and adaptability to changes. When we see the alarming sign of global warming and climate change at this critical juncture, what opportunities can we see from this difficulty?

In Hong Kong, building energy contributed around 90% of electricity consumption and 60% of carbon emissions. Retro-commissioning (RCx) is a cost-effective systematic process that periodically inspect existing building performance and identify operational improvements. Implementing the concept of “Internet of Things”, various sensors are installed to collect and exchange operational data in real time in a digital format. Operational parameters and settings are reviewed and fine-tuned based on the data logged

by the sensors and the building management systems for enhancing energy efficiency. In the first presentation of the Conference, my colleague Ir Ricky Tam will share with you more of his insight about implementation of retro-commissioning in Hong Kong to strive for Carbon Neutrality.

Retro-commissioning is the one of the starting points in our decarbonisation journey for buildings. It searches for incremental enhancement in building energy efficiency, but we need innovation and technological breakthroughs from time to time to achieve significant stepwise reduction. Achieving carbon neutrality, or just approaching net zero, requires the successive application of incremental and stepwise reductions through retro-commissioning and breakthroughs.

Digitalisation, Big-data and artificial intelligence are promising breakthroughs in our decarbonisation journey. Nowadays, with technique of data mining and utilization of historical data, local weather conditions, operational conditions of the installations, real-time building occupancy profile, etc., energy performance of various E&M systems can be enhanced significantly. EMSD has been applying different operation monitoring and technologies in our projects to strive for energy efficient operation. One of our latest technologies on trial is the “Application of the Concept of Digital Twin in Enhanced Design of Thermal Management in Existing Data Centres”. Digital Twin is used to develop a novel thermal management design by evaluation of optimized solution with holistic consideration of building energy efficiency, predictable indoor environmental condition and cost-benefit analysis. The novel thermal management design can achieve at least 30% of reduction of annual energy consumption as compared to the conventional design using Computer Room Air-conditioning Units. Another example is about the District Cooling System at the Kai Tak Development. With the use of big data analytics and artificial intelligence for chiller optimization using operational data and weather information from Hong Kong Observatory, the system COP of North DCS Plant at Kai Tak Development has been increased significantly by 18% in 2020 comparing with 2016.

Artificial Intelligence (A.I.) can enable the system to self-learn, adapt, predict and make automatic adjustment on the operational parameters setting. To further promote international exchanges on A.I. application in building E&M installations, EMSD and Guangdong Provincial Association for Science and Technology (廣東省科學技術協會) jointly kicked off the “Global AI Challenge for Building E&M Facilities” in August this year. The associated international conference will be held in October. We are also

calling for enrolment to the global AI challenge. All local, mainland and overseas undergraduate students, trade members, researchers and start-up companies are welcome to join, sharing and showing us your brilliant ideas of paving our road to the future of A.I. for the ultimate goal of contributing to the Carbon Neutrality for buildings.

Innovation and Technology, or I&T in short, is another area that we must look for in our breakthroughs. As the Government's innovation facilitator, EMSD has launched the "E&M InnoPortal" since 2018. It lists the I&T wishes of various government departments, public organizations and the E&M trades, and invites the I&T sector, including start-ups and universities to propose relevant I&T solutions for matching. For successfully-matched I&T wishes and solutions, EMSD will carry out field trials in a bid to promote and drive the research & development and application of innovative green technologies. Up to now, there are over 800 (eight hundreds) I&T solutions. One of the breakthrough solutions is the application of immersion cooling system for data centre. It adopts an innovative new concept by submerging computing hardware into a bath of non-conductive and non-flammable dielectric fluid for evaporative cooling. With this liquid based immersion cooling system in our trial, the energy saving potential on the air-conditioning system is over 70% (actual 78%) when compared with a conventional data centre that cooled by CRAC units.

The World Intellectual Property Organization published its Global Innovation Index 2021 on the 20th of this month. The Global Innovation Index of China is ranked 12th whereas that of Hong Kong is ranked the 14th. China boasts 19 among the top 100 science and technology clusters worldwide - with Shenzhen-Hong Kong-Guangzhou, or what we usually call the Greater Bay Area (GBA), ranked the 2nd in the world and Beijing the 3rd. Capitalizing on such strength of the GBA, and being located in the most open and international city in the GBA, EMSD is extending our collaboration in building energy efficiency and I&T applications with partners in local, mainland, other cities of GBA and across the globe through various Memorandum of Cooperation (MoC) and international cooperation. In fact, being one of the signatory parties of our MoC on retro-commissioning of buildings in GBA, BSOMES continuously works with EMSD to adopt retro-commissioning as a new solution for enhancing building energy efficiency through sharing of knowledge, experience and training. A few months earlier, BSOMES launched a whole series of short videos on social media channel as practical and lively examples of the "RCx Practical Casebook". The learning tool developed and launched by the BSOMES will certainly facilitate all field practitioners to quickly understand the

basics and grasp practical knowhow and hands-on skills in implementing the retro-commissioning.

Tackling carbon neutrality is the challenge to mankind. Collaboration should not only be confined to regional level, but also to worldwide. EMSD represents Hong Kong, China to actively contribute to the Asia-Pacific Economic Cooperation (APEC) Energy Working Group. The Energy Working Group is a voluntary, regionally-based forum operating under the APEC umbrella with participation from all 21 APEC economies, including world leading economies, such as the U.S., China, Japan, Russia, Australia, New Zealand, Singapore, South Korea, etc. Our colleague has been the Chair of the Expert Group on Energy Efficiency and Conservation under the Energy Working Group since 2019. We regularly bid fund from the APEC to host consultancy and workshop on Energy Efficiency and Conservation matters for the benefits of all 21 economies. In early 2022, under the APEC Support Fund, EMSD will organize the APEC Capacity Building Workshop on retro-commissioning. Stay tuned to it and you are certainly welcome to join.

You may be puzzled that with so many to do, and so much funding need to be invested in carbon neutrality, where does the money come from? Here springs up the whole new green economy and its series of products. The Hong Kong Government has been playing a leading and proactive role in the transformation of Hong Kong into a green finance hub, and has been implementing different green financial instruments to facilitate sustainable investment in Hong Kong, including the Green Bonds, Green and Sustainability-linked Loans, Green Tech Fund, etc. In fact, our District Cooling System is one of the 14 projects funded by the Government's Green Bonds launched in 2018. The Government's Green Bond showcases the private sector how green financial instruments could help to sustain the financial development for our carbon neutral city of the future.

In the future, we can imagine that on-site retro-commissioning exercise at regular intervals is no longer necessary while optimization of building energy performance will be carried out automatically by A.I. for all E&M assets. Smart buildings will be set alive and capable of conducting retro-commissioning themselves in a continuous manner without human intervention. It may sound like a dream or a fantasy for now but we, engineers, are always the ones who imaginovate and make dreams come true.

Despite all the joint-efforts paid in the past, the journey to the ultimate goal of Carbon Neutrality has only just begun. Don't wait, hesitate and let the opportunities pass by. May I invite all stakeholders to equip ourselves, and join the fight towards Carbon Neutrality now for achieving the eventual goal before 2050. Thank You.