

Annual Gathering of HAESCO on Energy Efficiency
Keynote Speech by Ir Alfred Sit JP, Director of Electrical & Mechanical Services

“Making Building Smart – Digitalization & Energy Optimization”

Good afternoon, Mr. Colin Tam, distinguished guests, ladies and gentlemen.

Climate Change

First of all, I would like to express my sincere gratitude to HAESCO for making possible this interactive platform for fellow trade professionals to share the experience of Hong Kong, China on energy efficiency & conservation and the insights of retro-commissioning, digitalization and innovation and technology adoption for making buildings smart.

Climate change is indeed occurring. According to NASA, the present Carbon Dioxide level has increased to 408 parts per million and the global temperature was about 1°C warmer than yr 1880 and the sea level has increased 3.2 millimeters per year. It is time for us to make effort to combat climate change. It is a great challenge for all of us to formulate the Action plans, Policies, Strategies, Initiatives to save our earth.

Paris Agreement

In 2015, the Paris Agreement, the world’s first comprehensive climate agreement, agreed to limit the global average temperature increases to well below 2°C above the pre-industrial levels and make efforts to limit warming to 1.5°C. The agreement aims to increase the ability of countries to deal with the impacts of climate change and mitigate the greenhouse-gas emissions.

In order to response to the Paris Agreement and set targets to combat climate change, the Hong Kong Government published two major plans in recent years. In 2015, the “Energy Saving Plan” was launched which set a new energy intensity reduction target of 40% by 2025, using 2005 as the base. In 2017, the Hong Kong Government also launched the “Climate Action Plan 2030+” which outlined the Government's longer-term actions to combat climate change. The Government has set a target to reduce carbon intensity by 65% to 70% by 2030 using that in 2005 as the base.

To reach this ambitious but necessary target, Hong Kong has developed the “4Ts” as its operational framework. In short, carbon-related reduction “Target” and “Timeline” are established, and the efforts made can be shown with appropriate metrics so that there is “Transparency” and it is everyone’s effort matters so we must work “Together” to achieve the target. It is a common interest in the community to protect the environment by reducing energy consumption and hence the emission of greenhouse gases. Let’s work together to combat climate change and create a more livable and sustainable city.

Journey of Promotion on Energy Efficiency and Conservation

As the collaborator and promotor of energy conservation, we have paid much efforts through the years. Let me share with you our Journey of Promotion on Energy Efficiency and Conservation in Hong Kong. In 1994, the Government set up the Energy Efficiency Office under the Electrical and Mechanical Services Department (EMSD), to promote energy efficiency and conservation as well as renewable energy. In 1995 and 1998, we have firstly launched the Voluntary Energy Efficiency Labelling Scheme for household “Plug-in” appliances and Building Energy Code to promote the building energy efficiency of “Built-in” engineering systems respectively.

Afterwards we took the lead to commit the implementation of District Cooling System Development, the first of its kind in Hong Kong, which is the most energy efficient air-conditioning system in new development. To harvest the full potential of energy saving of the “Plug-in” and “Built-in” systems and equipment, the Mandatory Energy Efficiency Labelling Scheme (MEELS) was launched in phases and Building Energy Efficiency Ordinance and mandatory Building Energy Code also comes into full operation.

In addition, we also launched the “Energy Saving Charter”, “4Ts Charter” as well as “No Incandescent Light Bulbs Charter” (No ILB Charter). As to resonance with the visions of Energy Saving Plan and Climate Action Plan, the whole community has to endeavor to achieve energy conservation. In Government, we have set a target of 5% saving in electricity consumption of government buildings by 2020.

We have also tightened the energy efficiency standards periodically in the MEELS (in 2014) and BEEO (2015) to further enhance energy efficiency performance. Up to this year, the 3rd phase of MEELS commenced from 1 June 2018, it extends the coverage to television, storage type electric water heaters and induction cookers. Under the post-2018

Scheme of Control Agreements (SCAs), Feed-in tariff (FIT) is a new initiative to promote the development of distributed Renewable Energy systems (i.e. solar and wind).

Long-term Policy

From the aspect of long-term policy, let's me share with you the major relevant legislations promote the participation of the public and the trade in energy efficiency and conservation. As just mentioned before, the Buildings Energy Efficiency Ordinance (BEEO) covers 4 major types of building services installations in buildings. The Building Energy Code and Energy Audit Code would be under review every 3 years to enhance the energy efficiency standards in buildings. The reviewing works of current version of BEC and EAC is in progress, the new 2018 version of BEC and EAC would be launched in Q4 of this year.

At domestic side, the Mandatory Energy Efficiency Labelling Scheme (MEELS) implemented since 2009 covers 3 types of “plug-in” appliances. In 2011, the coverage extended to 5 types of appliances. Following, in 2014, the energy efficiency grading standards have been tightened. This year, the scope of 2 appliances extended and 3 more appliances were further introduced. From our estimation, 625 GWh would be saved annually.

District Cooling System

The Government also take an initiative on energy efficient infrastructure. Kai Tak District Cooling System is the first-of-its kind DCS in Hong Kong, with total 284 megawatt of refrigeration (MWr) , when fully commissioned, serving 1.73 million m² AC floor area. In full operation, DCS can bring the return of an annual electricity saving of about 85 million kilowatt-hour, equivalent to the reduction of fifty-nine thousands five hundreds (59,500) tonnes of carbon dioxide emission per annum.

DCS is an energy efficient centralized air-conditioning system and it consumes about 35% less electricity as compared to traditional air-cooled air-conditioning systems. Further to ensure the success of DCS implementation, a specific ordinance, The District Cooling Ordinance (Cap. 624), was enacted to govern the connection standards, technical performances and also the detailed Service Tariff arrangement.

Feed-in-Tariff

The Government also encourages the promotion of renewable energy installations. Under the post-2018 Scheme of Control Agreements (SCAs), Feed-in Tariff (FiT) and Renewable Energy (RE) Certificates are two important new initiatives under two power companies to promote the development of Renewable Energy.

FiT will help encourage the residential and commercial customers to consider investing in RE as the power generated could be sold to the power companies at a rate higher than the normal electricity tariff rate to help recover the costs of investment in the RE systems and generation. At the same time, RE Certificates will be sold by the power companies for units of electricity from RE sources. Through these RE Certificates, the community can show its support for RE.

As to promote the Feed-in Tariff application, a designated website (HK RE Net) has been launched to introduce different types of renewable energy technologies and the details of the FiT scheme. Apart from this, Technical Guidelines on Grid Connection of Renewable Energy Power Systems has been published to assist the public to better understand the technical issues and the application procedures relating to grid connection of small-scale renewable energy installation.

Retro-commissioning

From the aspect of energy saving in buildings, Retro-commissioning (RCx) is a new energy saving initiatives in Hong Kong. RCx is a systematic and cost-effective process to periodically check an existing building's energy performance. The process includes the identification of some operational improvement such as tuning of sensors, optimizing the controls and operational schedule of equipment and fully utilize the data of building management system, etc.

To study how RCx can be applied to existing buildings, EMSD commenced a pilot project on 6 existing government buildings. About 5% saving of the total annual building energy consumption was found (about 2.3 million kWh) from the pilot projects. Those practical experience gained in these RCx pilot projects were used to formulate the Technical Guidelines on Retro-commissioning which was lunched in June 2017. In near future, more government buildings would be planned to conduct RCx.

Energy Saving for All

Since May 2015, the Government launched an “Energy Saving for All” campaign yearly to mobilize stakeholders in all sectors to save energy. The campaigns provide a good platform for collaborative efforts from every sector of the community and the general public to take action to save energy.

Under the “Energy Saving for All” campaign, we will continue the efforts at the annual “Energy Saving Charter” and “4Ts Charter” by inviting offices, office buildings, shops, shopping malls, housing, residential estates and NGO venues to sign up. The “Energy Saving Charter 2018” has attracted 3,600 participants and “4Ts Charter” has been committed by 1,300 venues. In addition, the “No ILB Charters” was launched in 2013. The number of participants in this charter has achieved nearly 700 since launched.

We also work closely with stakeholders to solicit our visions on our energy saving policy and continuously engage the community in our educational activities including, APEC Energy Working Group (EWG), DCS open day and launching of Energy Saving for All 2018.

Target and Achievement

Over the past years, EMSD has played a key role to showcase energy efficiency and conservation practices to the community. We assisted various government departments to set energy saving targets with timeline, thus achieving an overall electricity consumption reduction by 16% from 2003 to 2014.

A further 5% saving target set from 2015 to 2020 using 2013-14 as the base. Up to 2016/17, 3.4% saving achieved. To achieve this saving target, we are carrying out energy audits and undertaking energy saving projects for government buildings, and at the same time, we continue to promote various good housekeeping measures for departmental green managers to follow.

Hong Kong has attended outstanding performance in the energy saving journey. Among the 21 APEC economies, Hong Kong has the lowest energy intensity, and we have already reduced our energy intensity by more than 26% in the past decades since 2005, that shows the result of what we have achieved with our “Golden Decade of Energy Efficiency”.

Commercial Buildings – High Potential Energy Saving

Having reviewed the current situation, 65% of the electricity being consumed by the commercial sector in existing buildings. It will be the target for energy saving in the coming years.

Under the 4Ts operation framework, we set energy saving target and timeline. By carrying out energy audit and retro-commissioning, we implement the energy saving initiatives and procure green products. The resulting green building will be awarded. In this context, the contribution of building sector in energy saving is extremely significant.

The existing buildings in Hong Kong is about 42,000 and 85% of their age is over 10 years. In order to achieve the energy efficiency for existing buildings, the strategies of energy audit, EUI, retro-commissioning and retrofitting could be applied.

Projects Opportunities from CLP/HEC and Government

The existing buildings bring many project opportunities. CLP Power has launched the new initiatives of Community Energy Saving Fund with around HK\$70 million a year, which will begin operation in 2019. A new Eco Building Fund, which will be increased to HK\$100 million a year, offers subsidies for energy-related improvement works in communal areas of residential, commercial and industrial buildings, achieving greater energy efficiency with lower energy costs.

Similarly, HKE has also launched a “Smart Power Building Fund” to support the carrying out of retrofitting and retro-commissioning, including the implementation of building-based smart/IT technologies to enhance the energy efficiency of a wider coverage of buildings which involves a cost of HK\$25 million a year.

You may also remember that the Government launched Buildings Energy Efficiency Funding Schemes (BEEFS) in 2009. A total of \$450M was granted to subsidize building owners to conducting energy audit and retro-fitting works. Engineering systems of over 6,400 buildings were retro-fitted, over 70,000 man-months of job created, 180M kWh of electricity reduced and 126,000 tonnes of carbon dioxide reduced.

In order to achieve the further 5% saving target from 2015 to 2020. Over HK\$ 600M of energy efficiency projects being implemented in Government Buildings from FY 17/18 to FY18/19.

In resonance with RE initiative, we actively promote the adoption of Renewable Energy on government premises. A funding of \$1 billion is reserved for the RE application. Upon completion of all renewable energy projects, the total annual electricity generated is estimated to be over 6 million kWh.

You may remember I just mentioned before, Kai Tak District Cooling System is just a start. We will make use of the valuable experience learnt from this pilot project to promote DCS in other potential new development areas. Currently, there are 5 potential districts in Hong Kong with total area about 1600 hectares being studied.

From the macroscopic perspective, buildings consume 90% of the city's electricity. It was about 40 Billion kWh electricity consumption per year. From our estimation, it would have about HK\$19 Billion energy saving projects opportunity if the energy saving projects in these buildings can obtain 5% energy saving per year with 8 years payback. This is a great business opportunity in the retrofit market.

What's Next?

Those above project opportunities mentioned are the beginning only. We have to think about – What's next?

Smart City Blueprint

In support of Government initiative of building Hong Kong into a world-class smart city, we enter an era of fast-evolving innovation and technology that a number of enabling technologies have been made for intelligent energy management such as the development of 5G network, big data applications, smart lamp-posts, Retro-commissioning (RCx), LED lighting, green building design technologies, etc. All these technologies shall not only be conducting to maximizing asset values, but also enhance user experiences.

Digitalization

A more intelligent approach of energy management is now made possible by the ready enormous amount of data generated from the enabling technologies. With digitization process, the measured parameters from real-time monitoring system are transmitted to data repository for data analysis via analytic engines and adopting BIM to gain actionable insights for tuning optimization and data visualization for better monitoring of building performance under the Retro-commissioning (RCx) framework.

This year, EMSD have formulated a five-year strategic plan to provide digitized E&M engineering solutions to move towards a new era of E&M 2.0. One of the major strategies is to achieve E&M Digitization for the analysis of operational data to achieve predictive maintenance and optimized control on the E&M installations. Regional digital monitoring and control centre will be established for real-time remote monitoring on E&M assets to enhance the operational efficiency and environmental performance.

It is planned that by 2020/21, the installation of iBMS (Integrated Building Management System), incorporated with fault and alarm for all 400+ major government buildings maintained by EMSTF with annual electricity consumption exceeding 500,000 kWh will have been completed for interfacing with the data from CCMS (Central Control and Monitoring System), PQEMS (Power Quality and Energy Management System) and smart energy meters. The total estimated cost required would be HK\$ 1M per building.

Microsoft energy-smart building

Let me to share with you an example on how to transform the existing buildings to be smart buildings. One of the biggest technology companies in the world, Microsoft, conducted a pilot project to transform its headquarters buildings of aged 27 to be smarter. She adopted big data process and analysis for the collected mixed types of building management system for over 35,000 assets.

Microsoft adopted the strategies of (1) Fault detection and diagnosis, (2) Alarm management and (3) Energy management analytics. By identifying building faults and inefficiencies in real-time data analysis from the building systems for improving efficiency, reducing maintenance costs, optimizing the building performance. The project

achieved energy savings of 10% per year with 18 months payback only. Let me share a short video on this Energy-smart buildings.

HAESCO participation on energy efficiency

In the coming years, Government will keep putting efforts into the digitalization of buildings. As smart buildings will contribute to a smart city. And you will be my partner to make the building to be smart and make Hong Kong to be a better living city.

Today here, I would like to say thank you to HAESCO for their past years' efforts to facilitate the Hong Kong-based businesses to carry out energy efficiency projects and take much resources to promote the importance of energy efficiency such as seminars arrangement, active participation of international events and connection with oversea counterparts. Your active support could drive Hong Kong's buildings to be more energy efficient and could further reduce the energy consumption.

Innovation and Technology

The possibilities that can be brought by innovation and technology may be endless. The key to making a difference lies with matching our service demand with suitable innovative technologies. To this end, we have been in close liaison with start-ups from HKSTP Incu-Tech Programme for collaboration opportunities. Together, we explored the feasibility of applying the start-ups' fruits of research to aid the operation of our client departments. We launch a web-based "E&M InnoPotal".

Through this platform, we can share the technological challenges and wish-lists of bureau/departments and public bodies, where the start-ups could also propose matching innovation and technology solutions to resolve the problems.

Let's me to share one of the successful cases. A team of CityU research staff and students in Jacky Instruments Limited obtained funding support from Technology Start-up Support Scheme for Universities on developing smart thermostat solution for fan coil units.

Their solution applied new algorithm to reduce energy consumption by fan coil unit, enable step-less control and ultra-low speed. On top of this, this is easy to install so that it has the potential to be widely used in new and existing buildings. This is an example

that the technology is now under trial in EMSD headquarters. EMSD provides the venue and engineering support for the project and also the M&V (Measurement & Validation) process. The testing grounds for various projects are not limited to EMSD headquarters, but we will also liaise other government departments for suitable venues to assist your solution to be tested.

The importance of Building Sector contribute for Energy Saving

At last, let's share a short video from International Energy Agency on how the building sector play a major role to take action to improve the buildings to be more energy efficient and smart.

We all today coming together is a beginning, we are working together is a Success.

Thank you.

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