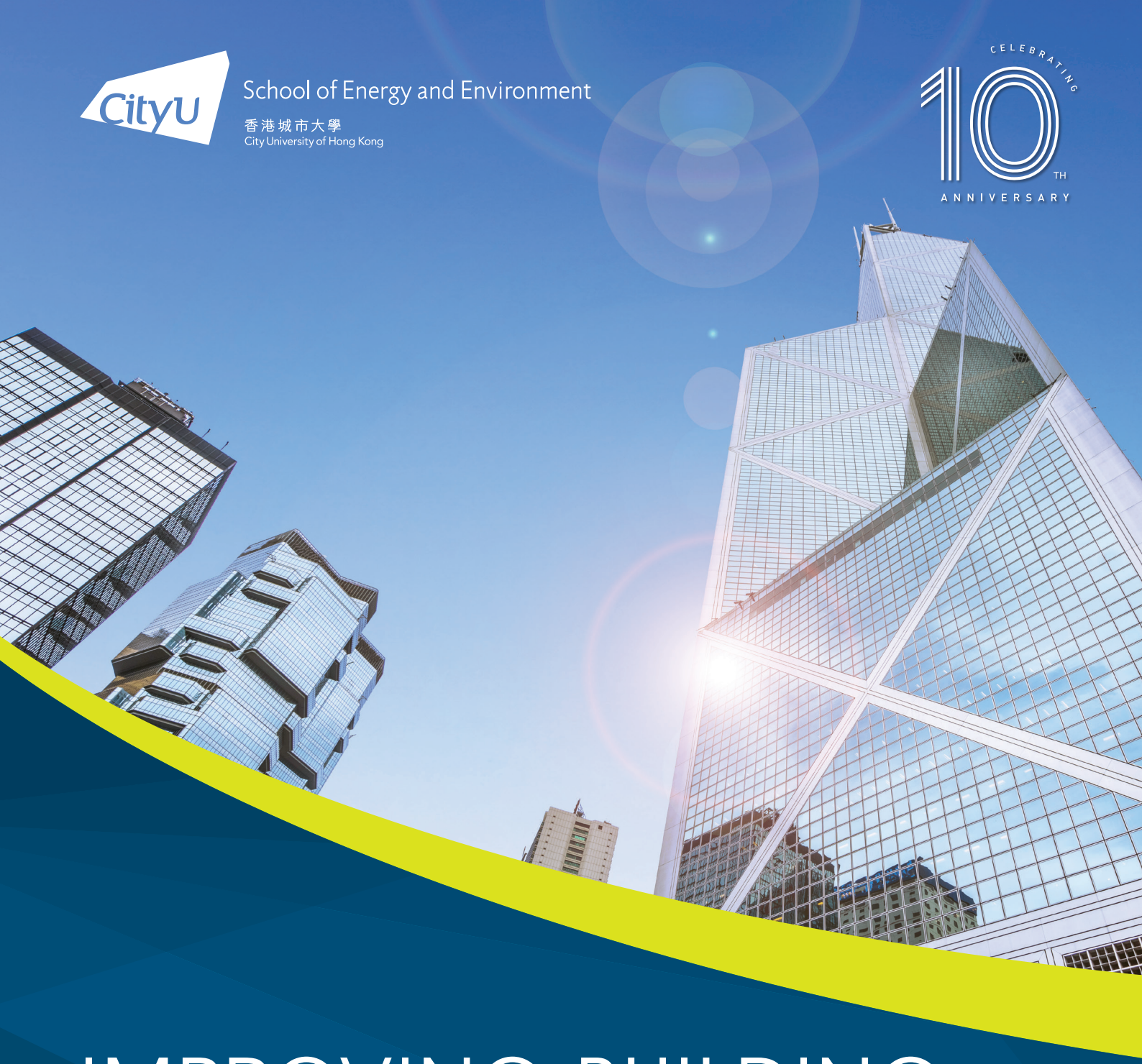
School of Energy and Environment
香港城市大學
City University of Hong Kong

CELEBRATING 10TH ANNIVERSARY



IMPROVING BUILDING ENERGY EFFICIENCY

By **Retro-Commissioning**

11 October 2019

Joseph Lee Hall (Lecture Theatre-3505)
3/F, Li Dak Sum Yip Yio Chin Academic Building, City University of Hong Kong
Tat Chee Avenue, Kowloon, Hong Kong

BACKGROUND

Improving energy efficiency has been well recognized as one of the most effective strategies to achieve net-zero carbon emission. In the building sector, retro-commissioning (RCx) is a useful knowledge-based approach to restore a building to its optimal operations, resulting in high energy efficiency. In Hong Kong, the government has set high priority on retro-commissioning in the Climate Action Plan 2030+. The government and professional institutions, such as ASHRAE, BSOMES, HKGBC, HKIE, etc., have taken initiatives to promote RCx by issuing guidelines, organizing training events, conducting pilot projects, launching ACT-Shop Programme, etc. Researchers at universities and research institutes also develop building energy technologies that can facilitate the implementation of RCx. It is important for all stakeholders to disseminate the knowledge and share experience with the industry. As the School of Energy and Environment (SEE) at CityU has identified building energy efficiency as one of the key areas for teaching and research, SEE takes the lead to organize this event to promote RCx.

OBJECTIVE

This half-day event provides a platform to facilitate professional exchange and networking between the industry and academia to promote retro-commissioning of buildings for improving energy efficiency and reducing carbon emissions.

TARGET AUDIENCE

Energy professionals, engineers, consultants, government officials, policy makers, scientists, researchers and academics.

IMPORTANT INFORMATION

Language:	English
CPD:	Attendance certificate will be issued upon request.
Registration deadline:	4 October 2019
Online Registration:	To register, please go to *https://forms.gle/9cYyTZuLkf96Y5i78* A confirmation email will be sent to you by the Organizer once your registration is accepted.
Registration Fee:	Free of charge

ORGANIZER

- City University of Hong Kong (CityU)

CO-ORGANIZERS

- American Society of Heating, Refrigerating and Air-Conditioning Engineers (ASHRAE)
- Building Services Operation and Maintenance Executive Society (BSOMES)
- Energy Institute Hong Kong (EIHK)
- Hong Kong Association of Energy Engineers (HKAEE)
- Hong Kong Green Building Council (HKGBC)
- Hong Kong Institution of Engineers – Building Services Division (HKIE-BSD)
- Hong Kong Productivity Council (HKPC)

CONFERENCE ORGANIZING COMMITTEE

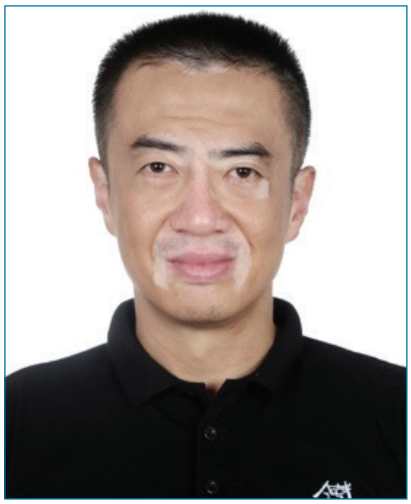
Convenor:

- Ir Prof. Michael K.H. LEUNG, *CityU*

Members:

- Ir Anthony LO, *HKIE-BSD*
- Ir Cary CHAN, *HKGBC*
- Ir Colin CHUNG, *HKAEE*
- Mr Joe CHOW, *ASHRAE*
- Ir K.F. YEE, *EIHK*
- Ir Martin WAN, *BSOMES*
- Ir Raymond FONG, *HKPC*

SPEAKERS AND ABSTRACTS



DR. QINGPENG WEI

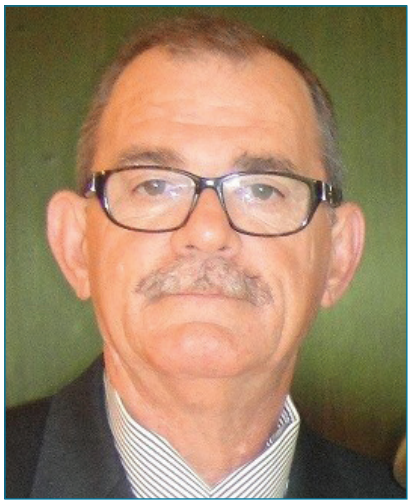
Associate Professor
School of Architecture, Tsinghua University

Speaker: Dr. Qingpeng Wei received his B.Sc., M.Sc., and Ph.D. degrees in building services engineering from Tsinghua University. As the team leader on energy efficiency in commercial buildings research, Dr. Wei established an on-line energy monitoring and benchmarking system of commercial buildings through detailed metering data. By this monitoring and benchmarking system, current situation, characteristics and saving potentials of energy consumption for HVAC, lighting, office appliances in commercial buildings are clearly disclosed with real time energy consumption data. Therefore, Dr. Wei develops data-driven model and data mining methodology for retro-commissioning in commercial buildings and HVAC systems.

Title: Data-Driven and Intelligence-Aided Retro-Commissioning in Commercial Buildings and HVAC Systems for Energy Efficiency

Abstract: There are tremendous challenges on energy and environmental issue in building sector in China since 24% of energy is consumed in buildings for HVAC, lighting, appliances, etc. Retro-Commissioning during operation, recognized as a key energy efficiency approach to existing buildings, has been well accepted. Data-driven modeling during Retro-Cx can evaluate actual energy performance and disclose energy saving potentials. Intelligence-aided Retro-Cx will offer action plan and realize estimated savings, therefore, leading to another round of Retro-Cx. Case study of HVAC systems with modeling and algorithm will be illustrated in the presentation.

SPEAKERS AND ABSTRACTS



MR. ROSS D. MONTGOMERY

Distinguished Lecturer
ASHRAE

Speaker: Mr. Ross D. Montgomery is an ASHRAE past Society Vice-President, DRC and DAL, RVC, and chapter/section president. He has worked in ASHRAE activities for 37+ years. He has authored several Journal articles on Building EQ (ASHRAE Building Rating program), HVAC controls, Thermal Storage, Building Commissioning, and co-authored the ASHRAE book "Fundamentals of HVAC Control Systems". Professionally, he works as a building commissioning provider (CxP), and a certified testing-adjusting-balancing engineer (TBE). He graduated from the University of South Florida with a BSME, and has his Professional Engineers and Mechanical/Electrical Contractors licenses, as well as certifications for Commissioning with AABC/ACG & ASHRAE, Energy Manager (CEM), Energy Assessor (BEAP), High Performance Building Design (HBDP), Commissioning Process Manager (CPMP), and Green Building Engineer (GBE).

Title: Commissioning in the Built Environment using ASHRAE Standards

Abstract: This talk is about HVAC&R commissioning basics and highlights our ASHRAE Building Commissioning Standard 202 (300 families of commissioning documents), sample commissioning project applications, and photos.

It explains the importance of commissioning (new and existing buildings) and what it is, why we use it, how it works, how it helps the Industry, and how much it should be used extensively. It is important to note that 202 is a process document and can be adapted to be used in many commissioning disciplines. The committee is working on another standard that deals with existing building commissioning, named 202.2P. As a CxA (now called a CxP "commissioning provider") and CPMP, it outlines best practices in commissioning activities in order to establish high-level strategic directions for "Commissioning", and its use and proliferation throughout our Industry, in collaboration with our Industry partners.

SPEAKERS AND ABSTRACTS

IR DR. WAN KOK WING, KEVIN

Engineer
Electrical and Mechanical Services Department

Speaker: Ir Dr. Kevin Wan is currently an Engineer of the Energy Efficiency Office of the Electrical and Mechanical Services Department (EMSD). He enforces the Building Energy Efficiency Ordinance and promotes energy efficiency and conversation in buildings. He is a Chartered Engineer in building services and mechanical disciplines in the Engineering Council and a LEED Accredited Professional in Building Design and Construction (BD+C). He has participated in wide variety of projects with experience in sustainable building designs, energy efficient building assessment and existing building retrofitting. Prior to joining EMSD, he worked as a building sustainability engineer with sustainability and building energy efficiency project experience in the North Americas and East Asia. He received a PhD from the City University of Hong Kong for his research contribution on the investigation of the impact of climate change on energy use in buildings in different climates in China.

Title: Successful Cases of Retro-commissioning (RCx) in Government Buildings

Abstract: Energy saving in buildings is a key factor of addressing climate change and associated environmental issues of Hong Kong. In January 2017, the Environment Bureau published the "Hong Kong's Climate Action Plan 2030+" which set a target to reduce our carbon intensity by 65–70% by 2030 compared with the 2005 level. With this ambitious vision, the whole community have to further endeavour to achieve energy conservation with concrete supporting measures. The Electrical and Mechanical Services Department (EMSD) is actively pursuing the cost-effective program of "Retro-commissioning (RCx)", a new energy saving initiative, to further encourage energy conservation works in existing buildings. RCx is a cost-effective and systematic process to investigate the energy efficiency performance of existing buildings. The EMSD has carried out a number of pilot projects in both government and private buildings together with the Hong Kong Green Building Council. The newly launched "Technical Guidelines on Retro-Commissioning" gathers the successful experience from different stakeholders and showcases the government-building industry collaboration efforts. This presentation will introduce the framework and technical approach of the Technical Guidelines, lessons learned from the pilot projects and shed the lights on the development direction of RCx implementation in Hong Kong.

SPEAKERS AND ABSTRACTS

IR CARY CHAN, JP

Director
Hong Kong Green Building Council

Speaker: Ir Cary Chan, JP is a professional engineer and is currently the Executive Director of Hong Kong Green Building Council since 2016, responsible for the HKGBC Board of Directors to formulate strategic directions of the Council that drive the green building agenda for Hong Kong. Before joining the HKGBC, Cary had over 30 years in the commercial sector with his last tenure at the Swire Properties Limited as General Manager – Technical Services & Sustainability.

Cary has carried out a lot of researches and initiatives on building energy efficiency with 25 papers have been published up to now. He is well regarded by the industry as an energy expert. Some of his works have won international awards, which includes Client of the Year - Low Carbon Operation Award by the Chartered Institution of Building Services Engineers in 2010.

In terms of green building movement, Cary played a key role in establishing the HK BEAM, the earlier version of the Hong Kong green building rating tool, back in 1995. As for other engagement, Cary was a key person in establishing the Memorandum of Collaboration to promote retro-commissioning in the Greater Bay Area together with the Government of HKSAR and five other major organisations including the Tsinghua University in 2018.

Over the years, Cary was active members to over 10 advisory councils and committees of the Government of HKSAR and he was appointed as Justice of the Peace (JP) by the government in 2017 with his immense contribution to Hong Kong community.

Title: Retro-commissioning – the roadmap in becoming a mainstream practice and what should be it's longer term goal

Abstract: Reliability and cost have been in the past, the main focus of the operation and maintenance industry. With the growing concern on climate change, energy efficiency is becoming a priority for both the government and the industry in meeting their climate change commitments. Towards this end, the SAR government has put Retro-commissioning as one of the initiatives in their Climate Action Plan. In the past three years, the HKGBC has been working together with the government to promote the adoption of retro-commissioning to the industry. The presentation will give a brief on the strategies and means adopted to achieve this aim and the challenges encountered. The presentation will also discuss on whether retro-commissioning should be an end or a means to a more long term goal of transforming the industry in both hardware and software.

SPEAKERS AND ABSTRACTS

IR KENNETH LI
Director
WSP (Asia) Limited

Speaker: Mr. Li is the Director of WSP (Asia) Ltd. and possesses over 30 years' experience in mechanical and electrical engineering systems for various types of projects, including nature with mega size commercial complex, super high-rise buildings, deluxe class hotels, special purpose built universities and institutions, industrial and railway infrastructure.
Mr. Li is also a specialist in energy studies were involved in the development of Performance Based Building Energy Code and Technical Guideline for Retro-commissioning. He is also participating in institutional energy related activities. He is the Technical Task Force Member for Mandatory Building Energy Code and the Chairman for working group for the Performance-based Building Energy section of the BEC. He is also a Faculty member of HKGBC, Expert Panel Member and Assessment sub-committee member of BEAM Society Limited.

Title: Retro-Commissioning and Sharing of Optimization Approaches

Abstract: Retro-commissioning (RCx) is commissioning for an existing building with the aim of optimizing the building operation. It is a systematic process of identifying improvement and optimization opportunities of the Central Building Services Installations (CBSIs) through searching for indicators of the underlying building operational irregularities which would lead to inefficient energy use and poor indoor environment; and subsequent implementation of those identified opportunities for achieving building optimization. In this presentation, Mr. Li will discuss on the concepts of Retro-commissioning, the scope, its benefits and challenges ahead, together with case sharing to demonstrate some common findings.

SPEAKERS AND ABSTRACTS

DR. EDWIN TSO

Assistant Professor
School of Energy and Environment, CityU

Speaker: Dr. Edwin Tso is currently an Assistant Professor in the School of Energy and Environment at the City University of Hong Kong (CityU). He received his PhD degree in Mechanical Engineering from The Hong Kong University of Science and Technology (HKUST) in 2015. Before joining the CityU, Dr. Tso was a Research Assistant Professor in the Department of Mechanical and Aerospace Engineering at the HKUST. His research interest covers thermofluid, energy conversion in a built environment, particularly, in the fields of heat transfer, adsorption technology, thermal rectification, nanofluids, smart windows and passive radiative cooling using numerical simulations as well as advanced experimental techniques

Title: Retro-commissioning – Energy Efficient Building Technologies for Smart Green Buildings

Abstract: Buildings consume significant amounts of resources and have a great impact, affecting the environment and sustainability of modern society. The demand for space cooling in cities has increased over recent decades, both in commercial and residential areas. As space cooling systems are so prevalent, the energy consumed by space cooling has become one of the largest proportions of worldwide energy usage. There are various approaches to reduce the energy consumption for spacing cooling. Retro-commissioning is one approach in which it is a lucrative and systematic process to regularly examine an existing building's performance, resulting in effectively reducing energy consumption, lowering energy bills as well as improving indoor environment. The other approach is to employ some new and advanced energy efficient building technologies. In this talk, we will firstly discuss those energy efficient building technologies, such as adsorption cooling systems, bio-inspired passive radiative cooling, thermochromic and photovoltaic perovskite smart windows and personal ventilation systems, followed by two case studies in relation to retro-commissioning in buildings (i.e. a retrofitted HVAC system study at the TAL building in Jordan and a study on oil-free chillers in Hospital Authority's venues). Both case studies show that a portion amount of energy can be effectively saved through the retro-commissioning. Overall, utilizing various energy efficient building technologies together with retro-commissioning can create energy-efficient solutions to smart green buildings which can significantly improve the living environment for the occupants and cut down our reliance on fossil fuels.

SPEAKERS AND ABSTRACTS

DR. WEI WU

Assistant Professor
School of Energy and Environment, CityU

Speaker: Dr. Wei Wu is an Assistant Professor in the School of Energy and Environment. His research is focused on sustainable building energy technologies, including: (1) investigation of alternative heat pump working fluids, (2) advanced heat pump cycles for performance improvement, and (3) energy system optimization for net-zero energy buildings. He has obtained 9 patents, and he is now preparing a book titled Absorption Heating Technologies: Efficient Heating, Heat Recovery and Renewable Energy to be published in Springer. He won the IIR Willis H. Carrier Young Researcher Award and the NIST Distinguished Associate Award.

Title: CO_2 Heat Pump Technologies for Sustainable Building

Abstract: Natural refrigerant CO2 has attracted increasing interest due to its low environmental impact compared to the conventional synthesized refrigerants. Although with relatively low COPs for typical space cooling/heating, CO2 heat pumps show great advantages in many application occasions (e.g., water heater, automobile AC, commercial refrigeration, ice rink, simultaneous cooling/heating). In addition, CO2 heat pump is quite compact owing to the very high volumetric cooling/heating capacities, which is important for applications in Hong Kong. Advanced cycles and mixture refrigerants have been investigated to improve the cycle efficiency as well as lower the system pressure.

SPEAKERS AND ABSTRACTS

IR PROF. MICHAEL K.H. LEUNG

Professor and Director
Ability R&D Energy Research Centre,
School of Energy and Environment, CityU

Speaker: Ir Prof. Michael Leung is a Professor in the School of Energy and Environment and the Director of Ability R&D Energy Research Centre at CityU. Prof. Leung's main research interests are solar photocatalysis, fuel-cell electrochemistry and advanced refrigeration and air-conditioning. He has published 150+ journal papers, 16 books/book chapters, and 7 patents. He is listed in Highly Cited Researchers 2018 by Clarivate Analytics that recognizes world-class researchers selected for their exceptional research performance. He is also listed in The Most Cited Researchers in Energy Science and Engineering, Developed for ShanghaiRanking's Global Ranking of Academic Subjects by Elsevier. He has received total HK$40M+ research funding. Prof. Leung is also the Chairman in the Education and Examinations Committee of the Hong Kong Institution of Engineers (HKIE), a Past Chairman of the Energy Institute (Hong Kong Branch), a Chartered Engineer, and a Registered Professional Engineer. He is serving as an editor in the editorial boards of Applied Energy and HKIE Transactions.

Title: Recovery of Low-Temperature Waste Heat in Buildings

Abstract: During the operation of air-conditioning systems, low-temperature waste heat is rejected to the ambient environment. As air-conditioning is the largest energy consumer in urban cities in tropical and subtropical regions, the amount of such waste heat is massive. Effective recovery of the thermal energy and converting it into other useful forms of energy represent a promising approach to improve energy efficiency. The speaker will present different effective low-temperature heat recovery technologies that can be integrated into building retro-commissioning for innovative energy management.

PROGRAMME

11 OCTOBER 2019 (FRIDAY)

13:30 – 14:00	**Registration**
Opening	
14:00 – 14:05	**Welcoming Remarks** ***Prof. Way KUO*** *President and University Distinguished Professor, City University of Hong Kong*
14:05 – 14:10	Presentation of Carbon Offset Certificates Group Photo Taking
14:10 – 14:30	**Opening Speech** ***Ir Alfred SIT*** *Director, EMSD, HKSAR Government, Hong Kong*
Keynote Speeches	
14:30 – 15:00	***Dr. Qingpeng WEI*** *Associate Professor, School of Architecture, Tsinghua University* **Data-Driven and Intelligence-Aided Retro-Commissioning in Commercial Buildings and HVAC Systems for Energy Efficiency**
15:00 – 15:30	***Mr. Ross D. MONTGOMERY*** *Distinguished Lecturer, ASHRAE* **Commissioning in the Built Environment using ASHRAE Standards**
15:30 - 16:00	**Tea Break**
Invited Speeches	
16:00 – 16:20	***Ir Dr. WAN Kok Wing, Kevin*** *Engineer, Electrical and Mechanical Services Department* **Successful Cases of Retro-commissioning (RCx) in Government Buildings**
16:20 – 16:40	***Ir Cary CHAN, JP*** *Director, Hong Kong Green Building Council* **Retro-commissioning – the Roadmap in Becoming a Mainstream Practice and what should be it's Longer Term Goal**
16:40 – 17:00	***Ir Kenneth LI*** *Director, WSP (Asia) Limited*
17:00 – 17:15	***Dr. Edwin TSO*** *Assistant Professor, School of Energy and Environment, CityU* **Retro-commissioning – Energy Efficient Building Technologies for Smart Green Buildings**
17:15 – 17:30	***Dr. Wei WU*** *Assistant Professor, School of Energy and Environment, CityU* **CO_2 Heat Pump Technologies for Sustainable Buildings**
17:30 – 17:45	***Ir Prof. Michael K.H. LEUNG*** *Professor and Director, Ability R&D Energy Research Centre, School of Energy and Environment, CityU* **Recovery of Low-Temperature Waste Heat in Buildings**
17:45 – 18:00	**Q&A + Discussion Forum**
18:00	**Closing Remarks**

Enquiries

Ms Mandy DUNG

Email: mandy.dung@cityu.edu.hk Tel: 3442 4022

Subject to changes without prior notice.