

# 智能 EnergyWits



「全民節能減碳2024」運動啓動  
(《節約章》及《4T約章》)  
Launching of "Energy Saving and  
Decarbonisation for All 2024" Campaign  
(for Energy Saving Charter and 4T Charter)

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「綠色校園2.0 - 智能慳電」協助合資格  
小學及中學使用變頻式冷氣機、發光  
二極管燈和實時能源監察系統  
"Green Schools 2.0 – Energy Smart"  
scheme assists eligible primary and  
secondary schools to use variable-speed  
air-conditioners, LED lighting and  
Real-Time Energy Monitoring Systems

《粵港澳大灣區既有建築機電系統再調適技  
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The official launch of association  
standard "Technical Guide on  
Retro-commissioning of Buildings in  
Greater Bay Area"

立法會通過洪水橋/ 厦村新發展區第一期  
區域供冷系統第一階段工程  
The Legislative Council Approved the  
Construction of District Cooling System  
at Hung Shui Kiu/Ha Tsuen New  
Development Area (HSK/HT NDA)  
Phase 1 Stage 1 Works

人工智能在區域供冷系統的應用 --  
優化運作效能  
The Application of Artificial Intelligence in  
District Cooling Systems - Optimizing  
Operational Efficiency



## 「全民節能減碳2024」運動啓動 (《節能約章》及《4T約章》) Launching of "Energy Saving and Decarbonisation for All 2024" Campaign (for Energy Saving Charter and 4T Charter)

環境及生態局(環境局)和機電工程署(機電署)於6月26日正式啓動「全民節能減碳2024」運動(《節能約章》及《4T約章》),推動各界攜手節能減碳,爭取在2050年前實現碳中和。

The Environment and Ecology Bureau (EEB) and the Electrical and Mechanical Services Department (EMSD) launched the Energy Saving and Decarbonisation for All 2024 Campaign (for Energy Saving Charter and 4T Charter) on June 26 to encourage the community to strive for carbon neutrality before 2050 by saving energy and reducing carbon emissions together.



■ 業界及公眾人士踴躍參與「全民節能減碳2024」運動,全力支持節能減碳。

*The trade and public enthusiastically participated in and supported the Energy Saving and Decarbonisation for All 2024 Campaign.*



■ 環境局副秘書長郭慧玲女士(右二)及機電署署長潘國英先生(左二)與「慳神」及機電署吉祥物「機智啤啤」主持「全民節能減碳2024」運動的啓動禮。

*Ms Polly Kwok, Deputy Secretary for Environment and Ecology (second right) and Mr Poon Kwok-ying, Director of Electrical and Mechanical Services (second left) kicked off the Energy Saving and Decarbonisation for All 2024 Campaign together with Hanson and Witty Bear, the mascot of the EMSD.*

# 《節能約章2024》及《4T約章》 Energy Saving Charter 2024 and 4T Charter

業界和機構可通過簽署約章，承諾節約能源。截至2024年6月26日，已分別有超過3 300個場所及超過780個場所簽署《節能約章2024》及《4T約章》。

約章網頁：<https://www.energysaving.gov.hk/esc2024/tc/charter/index.html>

Through signing the Energy Saving Charter, industry practitioners and organisations pledged to practise energy conservation. As at 26 Jun 2024, over 3 300 premises and over 780 premises have signed the Energy Saving Charter 2024 and the 4T Charter respectively.

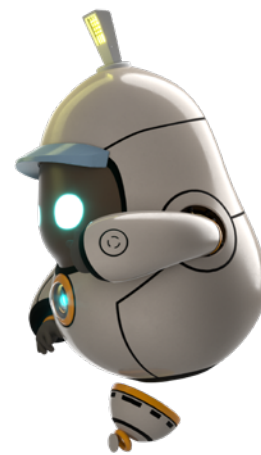
Dedicated website for the Charters: <https://www.energy-saving.gov.hk/esc2024/en/charter/index.html>



■ 環境局副秘書長郭慧玲女士(前排右五)及機電署署長潘國英先生(前排左五)和《節能約章》代表於啟動禮合照留念。

Group photo of Ms Polly Kwok, Deputy Secretary for Environment and Ecology (front fifth right) and Mr Poon Kwok-ying, Director of Electrical and Mechanical Services (front fifth left) with representatives of Energy Saving Charter at the Launching Ceremony.

此份傳單詳細介紹了《節能約章2024》和《4T約章》的內容。它包括了參與的機構類別、具體的承諾目標（如室內溫度控制、關閉待機設備、提高能源數據透明度等）、以及可選的額外承諾（如制定減碳目標和時間表、鼓勵全體參與等）。傳單底部還提供了查詢詳情和聯絡秘書處的資訊。



■ 《節能約章2024》及《4T約章》的宣傳材料  
Leaflet of Energy Saving Charter 2024 and 4T Charter

## 強制性能源效益標籤計劃第四階段的實施 Implementation of the Phase IV of the Mandatory Energy Efficiency Labelling Scheme (MEELS)

節約能源是邁向碳中和重要的一步，使用更多具能源效益的產品可節省能源，並可減少發電廠排放溫室氣體及其他空氣污染物。簡潔易明的強制性能源效益標籤計劃(強制性標籤計劃)，有助市民將節能意識融入消費行為，從而選購高能源效益的產品，從日常生活方面減少碳排放。

強制性標籤計劃第四階段已於2023年9月1日生效，涵蓋範圍擴展至LED燈、氣體煮食爐和即熱式氣體熱水爐，並將於2024年12月1日全面實施。強制性標籤計劃第四階段實施後，整個計劃共涵蓋十一類產品，佔住宅總能源使用量由五成大幅提升至八成，以電力換算，估計每年可節省約十一億度電。

因應強制性標籤計劃第四階段的推展，機電工程署籌劃不同的宣傳及教育工作，提升市民對節約能源的意識，當中包括播放電視及電台宣傳片、到訪零售商舖、以及為不同業界舉辦座談會，讓相關業界及早為第四階段的實施作準備。能源效益事務處於2024年2月舉辦年度業界協作研討會，向業界代表匯報有關強制性標籤計劃的發展。

在產品效能方面，市民亦可利用機電工程署流動應用程式「E&M Connect」的「慳電計」功能，查看和比較不同型號的能源效益及每年燃料費估算。機電工程署會繼續透過不同的宣傳渠道和平台，推廣能源效益、節能和可再生能源；並持續檢討和擴大強制性標籤計劃的範圍。

Energy conservation is an important step towards carbon neutrality. Using more energy efficient products can save energy and reduce greenhouse gases emission and other air pollutants from power plants. The Mandatory Energy Efficiency Labelling Scheme (MEELS), copied with a concise and easy-to-understand energy label, can help consumers make decision in purchasing more energy-efficient products, and reduce carbon emission produced in daily lives.

The phase IV of the MEELS was launched on 1 September 2023, extending the coverage to LED lamps, gas cookers and gas instantaneous water heaters, and will be fully implemented on 1 December 2024. The MEELS covers 11 products in total, by which the total energy consumption in the residential sector covered has substantially increased from 50% to 80%. Converting to electricity consumption, it is estimated that an approximate of 1,100 million units of electricity can be conserved annually.

To cope with the implementation of the phase IV of the MEELS, EMSD organizes various promotion and education works to raise public awareness on energy conservation, including TV and radio announcements, publicity visits to retailers and seminars for different trades to remind them to better prepare for the implementation of the phase IV of the MEELS. Besides, Energy Efficiency Office updated trade associations and trade members on the development roadmap of the MEELS during the annual meeting of Trade Collaboration Committee held in February 2024.

In the aspect of products' energy performance, the public can also use "Energy Saver" function of EMSD mobile application, "E&M Connect" to view and compare the energy efficiency performance and the estimated annual fuel charge of different product models. EMSD will continue to promote energy efficiency, energy saving and renewable energy through various promotion channels and platforms, and continue to review and expand the scope of the MEELS.



■ 電視宣傳片

TV Announcement Video

## 東南亞國家聯盟重新校驗能力建設培訓工作坊在香港舉行 Capacity Building Training on Retro-commissioning of Association of Southeast Asian Nations held in Hong Kong

機電工程署為東南亞國家聯盟（東盟）舉辦的重新校驗能力培訓工作坊（工作坊）於2024年2月26至27日在香港成功舉行，超過二十名來自八個東盟成員國的專家及代表聚首一堂，就重新校驗分享見解、經驗及交流技術應用。是次為機電工程署成功爭取香港與東盟《自由貿易協定》下的經濟和技術合作工作計劃支持，在香港首次舉辦與能源相關的東盟工作坊。我們亦安排與會代表參觀西九文化區的區域供冷系統和機電工程署總部，分享中國香港在能源效益及創科的發展。

環境及生態局局長謝展寰透過錄像致歡迎辭時表示，重新校驗在定期評估建築物能源效益及找出運作改善空間，對實現節能和降低營運成本方面發揮重要作用。透過將重新校驗納入節能策略，能進一步建立更可持續和高能源效益的東盟。

前機電工程署署長彭耀雄亦在工作坊上分享香港特區政府近年為實現碳中和在提高建築物能源效率和節能的工作。他感謝東盟成員國參與工作坊，並鼓勵東盟成員國在重新校驗上推動合作。



Electrical and Mechanical Services Department (EMSD) organized the Capacity Building Training on Retro-commissioning (RCx) of the Association of Southeast Asian Nations (ASEAN) in Hong Kong on 26 and 27 February 2024. More than 20 experts and delegates from eight ASEAN member states gathered to exchange valuable experiences, and technical knowledge and share insights on RCx. EMSD successfully bided support from the Economic and Technical Co-operation (ECOTECH) Work Programme under the ASEAN-Hong Kong Free Trade Agreement to organize this workshop, the first energy-related ASEAN project held in Hong Kong. Site visits to the district cooling system of the West Kowloon Culture District and the headquarters of the EMSD were arranged for the attendees to share the energy efficiency and innovation technology development.

Delivering a welcoming speech by video, the Secretary for Environment and Ecology, Mr Tse Chin-wan, said that RCx plays a vital role in the periodic assessment of the energy performance of a building. It identifies areas for operational improvements, thereby achieving energy savings and a reduction of operating costs. By integrating RCx into energy efficiency strategies, significant progress can be made towards a more sustainable and energy-efficient ASEAN region.

In the workshop, the former Director of Electrical and Mechanical Services, Mr Eric Pang, shared the HKSAR Government's latest efforts in achieving carbon neutrality by enhancing energy efficiency and savings in buildings. He thanked ASEAN member states for joining the training and encouraged co-operation among ASEAN member states on retro-commissioning.



前機電工程署署長彭耀雄與「東南亞國家聯盟重新校驗能力建設培訓工作坊」的出席者合照。

*The former Director of Electrical and Mechanical Services, Mr Eric Pang with other participants.*



實地參觀西九文化區的區域供冷系統。

*Site visit to the district cooling system of the West Kowloon Culture District.*



實地參觀機電工程署總部。

*Site visit to the headquarters of Electrical and Mechanical Services Department.*

## 「採電學社」計劃圓滿結束

### “Solar Harvest” Scheme Successfully Concluded

「採電學社」計劃已於2024年3月圓滿結束。過去五年，計劃已為500所學校和非政府福利機構處所安裝了超過700套10千瓦的太陽能發電系統，估計每年可產生約640萬度電，即大約1,950個3人家庭一年用電量。

機電工程署與環境及生態局和教育局合作，編制了中小學教材套，以豐富中小學的教學資源和配合STEAM(科學、科技、工程、藝術和數學)教育。我們相信教材套配合校內安裝的太陽能發電系統，可協助提升學生對科學學習的興趣，增進他們對可再生能源的認識和應對氣候變化的意識。

小學教材套旨在透過互動學習，幫助學生認識可再生能源，並激發他們對潔淨能源與低碳生活的興趣。小學教材套分兩部分，分別供初小和高小使用。兩者均有教師專用材料、學生專用材料、工作紙、學校需要購置用於STEAM活動的材料清單、常見問題及教學影片。教材套內容深入淺出，充滿互動元素。課程每個階段均設有「動手動腦活動」，讓學生在學習相關理論後，製作以太陽能發電的小手作。學生亦會在機電署吉祥物的帶領下，透過虛擬實境參觀太陽能發電設施。

中學教材套旨在透過虛擬實驗包，引導學生發現當地太陽能設施的科學原理，並激發他們實現碳中和和應對氣候變化的持續目標。中學教材套包含32套初中至高中程度有關太陽能的教材，包括中英文短片、教學簡報及學生工作紙。主持在短片中介紹科學原理，進行實驗，並提供從實驗和實時監察系統得到的數據，讓學生在工作紙作分析及討論，參考答案及教學簡報則供教師直接或修改後使用，令學生獲取更多STEAM學科的實作技能，掌握高效太陽能應用背後的原理。

中小學教材套由教育局分別於2023及2022年推出，如要參閱教材套詳情，請瀏覽機電署的採電學社網頁。[https://re.emsd.gov.hk/tc\\_chi/gen/4S/4S\\_Education\\_Kits.html](https://re.emsd.gov.hk/tc_chi/gen/4S/4S_Education_Kits.html)



Solar Harvest scheme has been successfully concluded in March 2024. In the past 5 years, Solar Harvest has installed more than 700 10-kilowatt solar energy generation systems in 500 schools and welfare non-Governmental organisations. It is expected to generate approximately 6.4 million kilowatt-hours of electricity per year, equivalent to the annual electricity consumption of approximately 1,950 three-person households.

Electrical and Mechanical Services Department (EMSD), in collaboration with the Environment and Ecology Bureau and the Education Bureau, developed several sets of educational kits to support Science, Technology, Engineering, Arts and Mathematics (STEAM) education in primary and secondary schools. We believed that with the aid of the educational kits and solar energy generation system installed in schools, it will help enhance students' interest in science learning, as well as their knowledge on renewable energy and awareness of combating climate change.

The kits for primary schools aim to help students better understand renewable energy through interactive learning and inspire their interest in clean energy and a low-carbon lifestyle. The educational kits for primary schools come in two sets separately for junior and senior primary school levels. Each set comprises materials designed for teachers and students respectively, worksheets, a list of materials to be procured by schools for STEAM activities, frequently asked questions and educational videos. The content is written in simple language and full of interactive elements. At every stage of the curriculum, there are hands-on activities for students to make solar-powered handicrafts after learning the relevant theories. Guided by the EMSD mascots, students will also be taken on virtual reality tours of solar energy generation facilities.

The kits for secondary schools use virtual experiment packages guiding students to discover the science of local solar energy facilities and inspire them with the sustainable goals of achieving carbon neutrality and combating climate change. The educational kits for secondary schools comprise 32 sets of learning and teaching materials related to solar energy at junior and senior secondary levels. Each kit contains short videos, teaching slides and student worksheets in English and Chinese. In the videos, professional host introduces the science principles, performs experiments, and analyzes the results. The real data obtained from the experiments and the real time monitoring system are also presented to students for data analysis and discussions in the worksheets. Suggested



solutions to worksheets and teaching slides are available for teachers' direct use or modifications. Students can gain more extensive exposure to practical skills in STEAM subjects, and a comprehensive understanding of the working principles behind the efficient use of solar energy.

The educational kits for primary and secondary were launched by Education Bureau in 2022 and 2023 respectively. For more details of educational kits, please visit Solar Harvest webpage of the EMSD. [https://re.emsd.gov.hk/tc\\_chi/gen/4S/4S\\_Education\\_Kits.html](https://re.emsd.gov.hk/tc_chi/gen/4S/4S_Education_Kits.html)



■ 「採電學社」計劃已於2024年3月圓滿結束，左圖為機電署團隊與安老院管理團隊在完成安裝最後一套的太陽能發電系統後合照

*Solar Harvest scheme has been successfully concluded in March 2024, the photo on the left shows EMSD team and management team of elderly home with the last completed solar power generation system under Solar Harvest*



■ 小學生按照教材套的其中一個「動手動腦活動」，成功砌成太陽能小車，並於學校操場進行測試

*With aids of the one of the hands-on activities from the educational kits, primary students can assemble the Solar Cars and test them in the school playground.*



## 「綠色校園2.0 - 智能慳電」協助合資格小學及中學使用變頻式冷氣機、發光二極管燈和實時能源監察系統

### “Green Schools 2.0 – Energy Smart” scheme assists eligible primary and secondary schools to use variable-speed air-conditioners, LED lighting and Real-Time Energy Monitoring Systems

為幫助學校節能和促進學生建立環境保護意識，機電工程署正協助環境及生態局進行「綠色校園2.0 - 智能慳電」計劃。計劃會協助合資格的小學及中學使用變頻式冷氣機、發光二極管燈和實時能源監察系統。

本署為參與計劃的學校提供一站式服務，包括到學校進行實地考察和技術評估、將現有的冷氣機替換為變頻式冷氣機、將現有照明轉換為發光二極管燈以及安裝實時能源監察系統。有關的開支全部會由「綠色校園2.0 - 智能慳電」計劃支付。

「綠色校園2.0 - 智能慳電」計劃為期5年，目標覆蓋300間學校。計劃於2020年推出至今，已為超過200間學校完成節能改造工程。計劃完成後，估計每年可以節省約4千萬度電，即大約12,000個三人家庭一年的用電量。

學校安裝實時能源監察系統後，老師和學生可以隨時隨地上網了解每間課室的用電情況和分析整間學校的用電量，而且可以把收集到的數據製作成教材，教導學生如何計算電費，讓他們知道平日的用電習慣，從而幫助制定不同節能策略。

有關計劃的宣傳短片，請瀏覽下列網址：

Please visit the following websites to watch the promotional videos of this scheme:

1. <https://youtu.be/2LtqVoPtYaA?si=31bEdAfDTzJUoMf2>
2. <https://youtu.be/V5l0Wbl2ulw?si=cetzPOE6tJolKY3N>
3. <https://youtu.be/hthBBo1ZA38?si=My0sKcLO3czvwYu>



■ 已完成節能改造工程的課室

*Classroom with energy saving retrofit works completed*

To help schools to save energy and facilitate students to build capacity on environmental awareness, Electrical and Mechanical Services Department is supporting the Environment and Ecology Bureau to implement “Green Schools 2.0 – Energy Smart” scheme. The scheme assists eligible primary and secondary schools to use variable-speed air-conditioners, LED lighting and Real-time Energy Monitoring Systems.

EMSD provides one-stop services to participating schools, including site surveys and technical assessments, replace existing air-conditioners with variable-speed air conditioners, convert existing florescent lighting to LED lighting and install Real-time Energy Monitoring Systems. All the expenses would be fully covered by the “Green Schools 2.0 – Energy Smart” scheme.

The “Green Schools 2.0 – Energy Smart” scheme is last for five years and aim to cover 300 schools. Since the launch of the scheme in 2020, energy saving retrofit works for more than 200 schools were completed. Upon completion of the scheme, it is estimated that an annual electricity consumption of about 40 million kilo-watt hours could be saved, which is equivalent to the annual electricity consumption of about 12,000 3-person households.

With the Real-time Energy Monitoring Systems installed, teachers can monitor the electricity consumption status of each classroom and analyze the electricity consumption of the entire school. Moreover, the collected data can be used to produce materials for education purpose. Students can learn how to calculate electricity tariff and to understand their energy consumption pattern so as to facilitate the formulation of energy saving measures.



## 《粵港澳大灣區既有建築機電系統再調適技術導則》 團體標準正式發佈

### The official launch of association standard "Technical Guide on Retro-commissioning of Buildings in Greater Bay Area"

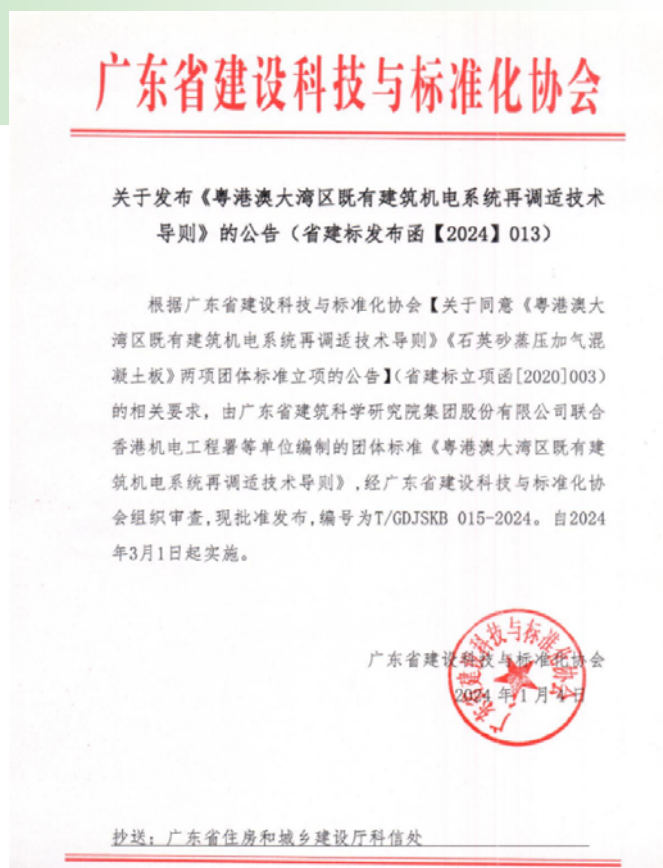
重新校驗(再調適)是一項有系統及成本效益的檢測方法，藉着定期檢查既有建築物的能效表現，制定一套以科學為本的可行優化方案，達致持續改善屋宇裝備裝置的能效表現。

為推廣在大灣區應用重新校驗(再調適)去持續改善建築物的能效表現，機電工程署自2019年聯同廣東省建築科學研究院集團股份有限公司等單位開始編製《粵港澳大灣區既有建築機電系統再調適技術導則》。於2024年1月4日，《粵港澳大灣區既有建築機電系統再調適技術導則》的團體標準經廣東省建設科技與標準化協會組織審查後，自2024年3月1日起實施。

Retro-commissioning (RCx) is a systematic and cost-effective process to periodically check the energy and other performances of an existing building. The process identifies operational improvements that can optimize energy efficiency performance of the buildings.

In order to promote the application of retro-commissioning in the Guangdong-Hong Kong-Macao Greater Bay Area (GBA) to continuously improve the energy performance of buildings, the Electrical and Mechanical Services Department and the Guangdong Provincial Academy of Building Science Group Co., Ltd., etc. jointly commenced to prepare "Technical Guide on Retro-commissioning of Buildings in Greater Bay Area" in 2019.

On 4 January 2024, association standard of the "Technical Guide on Retro-commissioning of Buildings in Greater Bay Area" was reviewed and approved by the Guangdong Provincial Construction technology and Standardization Association to be implemented with effective date from 1 March 2024.



■ <https://gdsjkb.com/ueditor/php/upload/file/20240105/1704443515135095.pdf>



## 立法會通過洪水橋/廈村新發展區第一期區域供冷系統 第一階段工程

### The Legislative Council Approved the Construction of District Cooling System at Hung Shui Kiu/Ha Tsuen New Development Area (HSK/HT NDA) Phase 1 Stage 1 Works

行政長官在《2022年施政報告》中表示，政府會加快在新發展區(包括「北部都會區」)建設區域供冷系統，節約能源。有見及此，環境及生態局與機電署牽頭推動在洪水橋/廈村新發展區興建區域供冷系統，以助推動能源效益及應對氣候變化。

洪水橋/廈村新發展區第一期區域供冷系統分兩階段進行，以配合洪水橋/廈村新發展區發展，預計於2030年開始提供供冷服務。區域供冷系統的估計製冷量約為470兆瓦，可服務的總空調樓面面積約270萬平方米，以滿足將來新發展區內建築物對供冷量的需求。

立法會財務委員會已於2024年5月批准有關在洪水橋/廈村新發展區提供第一期區域供冷系統第一階段工程計劃，以鋪設冷凍水水管道網絡的撥款建議，估計費用為32億1,630萬元。餘下工程包括興建兩個區域供冷系統供冷站及相關設施、用戶建築物的接駁設施將於稍後時間申請撥款，而相關設計工作亦已於2024年7月開始，並由賓尼斯工程顧問有限公司取得顧問合約。該合約已採用「新工程合約4」專業服務合約，以夥伴協作原則，共同解決困難，以減低工程超支延誤機會。

As mentioned by the Chief Executive in the 2022 Policy Address, the Government will accelerate the incorporation of district cooling systems (DCS) in New Development Areas (NDAs) (including the Northern Metropolis) to reduce energy consumption. Thus, the Environment and Ecology Bureau and EMSD have been spearheading the implementation of the DCS in Hung Shui Kiu/Ha Tsuen NDA (HSK/HT NDA), to promote energy efficiency and combat climate change.

The Phase 1 DCS for HSK/HT NDA will be developed in two stages to tie in with the development of HSK/HT NDA and is expected to start providing cooling services in 2030. The estimated refrigeration cooling capacity of Phase 1 DCS for HSK/HT NDA is about 470 megawatt, which can serve a total of about 2.7million square meters of air-conditioned gross floor area, with a view to meeting the future cooling demand of buildings in the NDA.

The Finance Committee (FC) of the Legislative Council (LegCo) approved the funding proposal for the DCS for HSK/HT NDA - Phase 1 Stage 1 works in May 2024 which involves chilled water pipe laying works, with an estimated cost of 3,216.3 million. The remaining works including the construction of two DCS plants and associated facilities as well as connection facilities at user buildings will be submitted for funding approval in the near future. The Consultancy Agreement in relation to the remaining works was awarded to Binnies Hong Kong Limited and the design commenced recently in July 2024. The Consultancy Agreement adopts New Engineering Contract 4 (NEC4) Professional Service Contract (PSC) which embraces a collaborative culture and foster partnering relationship to resolve difficulties together, thereby minimising the risk of cost overrun and delay.



■ 機電工程署助理署長/電力及能源效益姚德泰先生(右二)·機電工程署合約顧問楊航愉先生(右一)·賓尼斯工程顧問有限公司董事總經理郝炎先生(左二)·賓尼斯工程顧問有限公司董事仇尹樂先生(左一)出席顧問合約簽署儀式。

Mr. Yiu Tak-tai, Boris (second right, Assistant Director/Electricity and Energy Efficiency), Mr. Yeung Hong-yu (first right, Contract Advisor1), Mr. Andy Kwok (second left, Managing Director/Binnies Hong Kong Limited), Mr. Stephanus Shou (first left, Director/Binnies Hong Kong Limited) attended the Agreement Signing Ceremony.

## 人工智能在區域供冷系統的應用 -- 優化運作效能

### The Application of Artificial Intelligence in District Cooling Systems - Optimizing Operational Efficiency

今天人工智能在日常生活中的應用正逐漸普及，借助其強大的數據分析能力，在各個領域中協助人類提高工作效率。近年來人工智能已開始應用於建築物的空調製冷系統的控制領域，協助調節製冷機組的運行模式，從而提升系統的運作效能以達致更好的節能效果。啟德區域供冷系統作為香港現時最大型的製冷系統，亦已應用這項技術來優化系統運作效能。然而在此大規模的系統應用人工智能，需考慮到一些特別因素，以確保系統運行的準確性、穩定性及高效性。以下我們將分享在區域功能系統推行人工智能相關項目的經驗。

#### 多種類型客戶建築物

啟德區域供冷系統連接了各種不同種類的客戶建築物，包括政府辦公大樓、學校、商場、醫院、康體設施、郵輪碼頭和地鐵站等。每類建築物都有其獨特的運作模式，因此為確保系統運行的準確性，需要先預測每個建築物未來的冷負荷需求。要達到這一目標，必需先對過往建築物在不同時段的冷負荷需求進行大數據分析，以獲得相關的參數。部分建築物的冷負荷會因應場地租用情況而改變，所以系統的設計亦需要考慮每日已排程的節目。最後結合各種參數和天氣預測，才可合理地預測到建築物未來的冷負荷需求，確保系統運行的準確性。

#### 具備大型製冷機組的龐大供冷系統

啟德區域供冷系統的設計旨在為整個區內用戶建築物提供恆定供應的攝氏6度冷凍水，以滿足商業和公共建築的空調需求，而建築物一般分佈於距離供冷站約2公里的範圍。因此，供冷系統需要建立大規模的水管網絡，並具備大型的製冷機組。冷凍水通過水管網絡從供冷站流動到用戶建築物的往返時間會因位置和當時的冷負荷需求而改變，最短為數十分鐘，最長可達數小時。這樣，冷凍水水溫的反應時間不斷變化，因而增加了人工智能控制的複雜性。此外，與傳統大廈內的製冷機組不同，啟德區域供冷系統配備了從400到5000冷噸的各種大型製冷機組。不同的製冷機組都具有其獨特的運行特性和要求，在不同條件下表現出不同的效能。人工智能控制系統能全面考慮製冷機組的各種參數，並同時根據準確的未來冷負荷需求預測，選擇最合適的運行模式，達致提升系統的效率和穩定性。

Today, the application of artificial intelligence (AI) is gradually becoming widespread in society. With its powerful data analysis capabilities, AI can handle massive datasets and assist humans in improving work efficiency across various fields. In recent years, AI has been applied in the control of chiller systems of individual building, helping intelligently regulate the operation of chiller to enhance system performance and achieve better energy-saving results. The Kai Tak District Cooling System (KTDCS), as the largest cooling system in Hong Kong, also has been adopting this technology to optimize its operational efficiency. However, when applying AI to a district cooling system of this scale, additional factors need to be considered to ensure accuracy, stability, and efficiency. Below, we will analyze several important points to explore the potential and challenges in this field.

#### Diverse Consumer Buildings

The KTDCS connects various types of consumer buildings, including office buildings, schools, shopping malls, hospitals, sports facilities, cruise terminals, and metro stations. Each building type has its unique operational mode. Therefore, to ensure the accuracy of the system's operation, it is necessary to predict the cooling demand for each building. To achieve this goal, carrying out big data analysis for historical cooling demand of buildings is required for obtaining relevant operational parameters. Some buildings' cooling loads may change depending on the rental situation of the venues, so the system design also needs to consider the daily scheduled programme. Finally, by combining various operational parameters with weather forecasts, it becomes possible to predict the real-time cooling demand of each building accurately and ensure the accuracy of the system's operation.

#### Huge Cooling System with Large Capacities of Chillers

The design of the KTDCS aims to provide a consistent supply of chilled water at 6 degrees Celsius for air conditioning purposes throughout the entire Kai Tak district, catering to both commercial and public consumer buildings which generally located within a range of about 2 kilometers from the cooling plant. As a result, the system requires a large-scale network of water pipes and large capacity for the chillers. Typically, the round trip travelling time for chilled water from the DCS plant to the consumer buildings vary from minimum tens of minutes to few hours all the times, depends on the building's location and the loading demand. The variability in response time of chilled water temperature adds complexity to the AI control considerations for real-time cooling demand.

在區域供冷系統應用人工智能需要更全面的考慮，必須選擇正確的運算方法，以提高系統的準確性、穩定性和效率。透過深度機器的自我學習能力，人工智能模型可以識別繁複的數據，提取錯綜複雜的特徵，以確立其運作模式。因此，當人工智能控制系統準確地預測未來冷負荷的需求，它就能夠調節出最節能的運行模式。

目前，在啟德區域供冷系統中已經開始試行人工智能模式。我們期望不久的將來通過正式應用人工智能系統，區域供冷系統能夠進一步減少能源使用和碳足跡，促進可持續發展和綠色建築的實現。



■ 啟德區域供冷系統的供水網絡  
Kai Tak district cooling system network



■ 啟德區域供冷系統的客戶  
Consumers of Kai Tak district cooling system

Additionally, unlike conventional chiller plants, the KTDCS plant is equipped with a various large capacity of chillers from 400 tons to 5,000 tonne of refrigeration. Each chiller possesses unique operational characteristics and requirement, leading to different outcomes of energy efficiency under various conditions. The AI control system needs to comprehensively consider various parameters of chillers and choose the most optimal operating mode based on real-time cooling demand in order to enhance system efficiency and also the stability.

District cooling system requires a more comprehensive considerations in the application of AI to correctly select suitable AI algorithms to enhance system accuracy, stability, and efficiency. Leveraging the power of deep machine learning, AI models can recognize the hierarchical representations of data, extract intricate features, and identify complex patterns in KTDCS operations including the response time and chiller performance. Consequently, when combined with accurate real-time cooling demand predictions provided by AI, it is capable to select the most suitable chillers for operation, thereby ensuring optimal system efficiency.

Currently, AI technology is being trial run in KTDCS. We expect that in the near future, through the application of AI systems, KTDCS will further reduce energy consumption and carbon footprint, promoting sustainable development and the realization of green buildings.



■ 5,000冷噸的製冷機組  
The 5,000 tonne of refrigeration chiller



■ 收集運作數據的傳感器  
Sensors that collect operation data