ENERGY EFFICIENCY AND CONSERVATION IN GOVERNMENT BUILDINGS

Executive Summary

1. In Hong Kong, more than half of the total annual energy use is in the form of electricity consumption, with buildings accounting for about 90% of the city's electricity consumption. Enhancing energy efficiency and conservation in government buildings, being one of the Government's priority tasks, could contribute to the reduction of electricity consumption. The Government has been taking the lead to reduce electricity consumption in government buildings by setting energy saving targets so as to set a good example for the community. The Government has set 4 rounds of electricity saving targets for government buildings for the period from 2003-04 to 2019-20 (with the related targets achieved) and a new green energy target for the 5-year period from 2020-21 to 2024-25. The Environment Bureau (ENB) is responsible for energy efficiency and conservation policy, including setting the Government's energy saving targets, formulating strategies for achieving the targets and monitoring the implementation progress. The Electrical and Mechanical Services Department (EMSD) is mainly responsible for monitoring the progress in achieving the energy saving target, coordinating and overseeing the conduct of energy audits and retro-commissioning (RCx) for selected government buildings, and administering the funding applications of energy savings projects in government buildings under a block vote of the General Revenue Account. The Architectural Services Department (ArchSD) is mainly responsible for administering a block vote for minor building works of the Capital Works Reserve Fund, implementing energy saving projects in government buildings which involve building works and monitoring the implementation progress of such projects. The Audit Commission (Audit) has recently conducted a review to examine the work of ENB, EMSD and ArchSD for energy efficiency and conservation in government buildings.

Achievement of energy saving targets

2. ***Need to explore measures to complete the compilation and submission of annual reports on achievement of energy saving target as early as possible.*** For the latest electricity saving target, the 2015 Policy Address announced a target of

5% saving in the total electricity consumption of government buildings for the 5-year period from 2015-16 to 2019-20 (2015-20 electricity saving target) under comparable operating conditions in 2013-14 as the baseline. EMSD (through its Energy Efficiency Office (EEO)) is responsible for analysing and aggregating electricity consumption data from government bureaux/departments (B/Ds) to determine the government-wide achievement of the 2015-20 electricity saving target and compile an annual report on achievement of the target for reporting to ENB. According to ENB, the 2015-20 electricity saving target had already been achieved in 2018-19 with an overall electricity saving of 5.7% up to 2018-19. According to EMSD, the final results (i.e. up to the final year of 2019-20) would be available in the first quarter of 2021. Audit noted that: (a) long time was taken by EMSD to compile (including collecting returns from B/Ds) and submit the annual reports to ENB for each year from 2015-16 to 2018-19, ranging from 11 to 13 months after the respective financial year end; and (b) B/Ds submitted returns on the total electricity consumption of the government buildings under their management to EMSD in the form of spreadsheets and EMSD had not made use of an information technology system with programming functions for importing and collating the data from B/Ds for generation of management reports. In Audit's view, EMSD needs to explore measures to complete the compilation and submission of the annual reports on achievement of energy saving target to ENB as early as possible, and make better use of information technology in compiling government-wide energy consumption data (paras. 2.2, 2.3, 2.5 and 2.6).

3. ***Need to continue to take follow-up actions on energy saving performance of B/Ds.*** Audit noted that, in September 2018, EEO took a new and one-off measure to assist B/Ds to improve their electricity saving performance by: (a) conducting an analysis on B/Ds' electricity saving performance (up to 2016-17) and identifying 13 B/Ds whose performance was below the government-wide achievement of electricity saving; and (b) requesting the Electrical and Mechanical Services Trading Fund (the maintenance agent of the concerned B/Ds for electrical and mechanical installations) to provide technical assistance to help the 13 B/Ds improve their electricity saving performance. In Audit's view, there is merit for EMSD to continue to take follow-up actions on the energy saving performance of B/Ds (paras. 2.7 and 2.8).

4. ***Scope for improvement in the normalisation process.*** According to EMSD, for the purpose of evaluating the achievement of electricity saving target, normalisation is applied to the raw electricity consumptions for discounting the effect of activity changes in the calculation of electricity savings under comparable operating conditions in the base year. EMSD selects samples of normalisation calculations of

government venues submitted by B/Ds for checking. Audit examined the 2018-19 normalisation calculations of 15 government venues checked by EMSD and with comments on the calculations provided to the concerned B/Ds. While all the concerned B/Ds had responded to EMSD's comments, Audit noted that, for 4 of the 15 government venues, there might be scope for EMSD to seek further clarifications on the effect of activity changes on normalisation calculations from the concerned B/Ds responsible for managing them. Audit also noted that: (a) there were no detailed guidelines on the procedures for checking normalisation calculations submitted by B/Ds; and (b) regular management information for the checking results of normalisation calculations had not been compiled (paras. 2.14, 2.16 and 2.17).

5. ***Need to keep under review the implementation of green energy target.*** The 2019 Policy Address announced a green energy target of 6% improvement in energy performance for the 5-year period from 2020-21 to 2024-25 under comparable operating conditions in 2018-19 as the baseline. The green energy target, being a new initiative, covers certain new areas including electricity consumptions in government infrastructures and other forms of energy (e.g. town gas and liquefied petroleum gas) consumptions in government buildings and infrastructures. Audit noted that EMSD had issued guidelines on applying normalisation to electricity consumption but not for the consumption in other forms of energy. In Audit's view, ENB and EMSD need to keep under review the implementation of measures by B/Ds to achieve the green energy target (in particular the new areas covered by the target) and provide necessary assistance to help B/Ds achieve the target (paras. 2.20 and 2.21).

6. ***Need to complete renewable energy (RE) projects at existing government buildings as early as possible.*** Since 2017-18 and up to 2019-20, a total of $2 billion has been earmarked for installation of small-scale RE systems at existing government buildings and infrastructures. Regarding the small-scale RE project proposals for government buildings submitted by B/Ds from 2017-18 to 2019-20 and implemented by ArchSD, as of June 2020, 67 projects had been approved for implementation, of which 28 projects had been completed and 39 projects were at planning or construction stages. Audit noted that the progress of 9 of the 39 RE projects (at planning or construction stages) were about 3 to 5 months later than their original completion dates. Audit also noted that, as of June 2020, there were 14 project proposals under feasibility study by ArchSD. These proposals were submitted by B/Ds to ArchSD before August 2018 (i.e. about 2 years ago). As the green energy target recognises the contribution of RE, Audit considers that ArchSD needs to

complete the RE projects at existing government buildings as early as possible (paras. 2.22, 2.24 and 2.25).

Management of energy audits and retro-commissioning for government buildings

7. ***Need to ensure that government buildings meeting the selection criteria are selected for conducting energy audits.*** Energy audit is a systematic review of the energy consuming equipment/systems in a building to identify energy management opportunities (EMOs). A total of 251 government buildings were shortlisted for conducting energy audits between 2020-21 and 2022-23 to identify EMOs for achieving the green energy target. One of the selection criteria is buildings with an annual electricity consumption above 500,000 kilowatt-hours each in 2017-18 and potential for further electricity saving. Audit found that 5 government buildings fulfilling this selection criterion were not shortlisted. After verification by EMSD upon Audit's referral, EMSD advised that it would further review with the B/Ds concerned the need for conducting energy audits for 4 of the 5 government buildings (the other building had been closed for demolition after 2017-18). In Audit's view, EMSD needs to take measures to ensure that government buildings meeting the selection criteria are selected for conducting energy audits and early complete the reviews on the need for conducting energy audits for the government buildings identified by Audit (paras. 3.2, 3.4, 3.6 and 3.7).

8. ***Scope for obtaining information for selected government buildings on implementation of EMOs identified in energy audits.*** According to EMSD, 344 government buildings were selected for conducting energy audits between 2015-16 and 2016-17 under the last energy audit programme for achieving the 2015-20 electricity saving target. Of these 344 government buildings, 136 (40%) buildings were included in the current energy audit programme (between 2020-21 and 2022-23) again for achieving the green energy target. The need to conduct energy audits again for the 136 government buildings within a short period was mainly due to the fact that their electricity saving performance was below average in 2017-18. In fact, Audit noted that the electricity saving performance of 106 (78%) of the 136 government buildings was also below average in 2018-19. In this connection, according to EMSD: (a) an energy audit can achieve energy efficiency and conservation through the implementation of EMOs identified in the audit; and (b) B/Ds are responsible for identifying and prioritising the recommendations for EMOs in the energy audit reports for implementation as far as practicable. However,

Audit noted that there was no requirement for B/Ds to provide information to EMSD on the implementation of EMOs and the related energy savings achieved (paras. 3.4, 3.8 and 3.9).

9. ***Need to keep under review the RCx implementation timetable for government buildings.*** RCx is a systematic and cost-effective process to periodically check an existing building's energy and other performances to identify energy saving opportunities. In 2018, EMSD identified 280 government buildings and invited the pertinent B/Ds to conduct RCx for the government buildings under their management through a 7-year RCx programme from 2019-20 to 2025-26. In the event, RCx would be conducted for 230 (82%) government buildings. According to EMSD, as of September 2020: (a) the RCx study for 44 of the 230 government buildings had commenced; and (b) a tentative RCx implementation timetable for the remaining 186 government buildings had been prepared. In Audit's view, EMSD needs to keep under review the RCx implementation timetable for government buildings included in the RCx programme and confirm the implementation schedule with the concerned B/Ds as early as possible (paras. 3.12, 3.16, 3.25 and 3.26).

10. ***Need to encourage the pertinent B/Ds to include the government buildings under their management in the RCx programme.*** There were 50 government buildings for which the pertinent B/Ds had not yet decided whether they would be included in the RCx programme. According to EMSD, some of the 50 buildings might be included for implementing RCx at a later stage. In Audit's view, EMSD needs to take measures to encourage the pertinent B/Ds to include the government buildings under their management in the RCx programme (paras. 3.27 and 3.28).

Management of energy saving projects and other management issues

11. ***Scope for improvement in monitoring the progress of energy saving projects.*** Funding of about $700 million has been earmarked under a block vote controlled by EMSD (EMSD Block Vote) for the gradual implementation of energy saving projects in government buildings from 2017-18 to 2021-22. As of March 2020, of the 267 energy saving projects funded under EMSD Block Vote, 174 (65%) projects had been completed and 93 (35%) projects were with works in progress. For the 93 projects with works in progress, 18 (19%) projects (all were

with one-year implementation programme) were behind schedule, ranging from 0.9 to 1.9 years (paras. 4.2, 4.5 and 4.6).

12. ***Scope for improving performance measurements for energy saving projects.*** According to EEO, upon completion of an energy saving project funded under EMSD Block Vote, the B/D concerned and/or its works agent are required to conduct performance measurement (i.e. measurement and verification of actual payback period and electricity saving) for the project within the one-year defects liability period. As of March 2020, of the 174 completed energy saving projects funded under EMSD Block Vote, performance measurements for 136 projects had been completed while those for the remaining 38 projects were in progress. Audit noted that, for 3 (8%) of the 38 projects, while the projects had been completed for more than 1 year as of March 2020, the performance measurements were still in progress (para. 4.9).

13. ***Scope for improving accuracy of project estimates.*** When submitting a funding application for energy saving project under EMSD Block Vote, B/Ds and/or their works agents for building services installations are required to provide a project estimate on the funding application form. Audit examination found that, of the 267 energy saving projects funded under EMSD Block Vote as of March 2020, 121 (45%) projects had changes in approved project estimate (APE), comprising 47 projects with an increase in APE (ranging from 4% to 300% of the original APE of each project, averaging 48%) and 74 projects with a decrease in APE (ranging from 2% to 96% of the original APE of each project, averaging 41%) (para. 4.11).

14. ***Scope for improvement in monitoring the progress and cashflow of energy saving projects.*** Apart from the funding under EMSD Block Vote, funding of about $200 million has also been earmarked under a block vote controlled by ArchSD (the Minor Building Works Block Vote) for the gradual implementation of energy saving projects in government buildings from 2017-18 to 2021-22. As of March 2020, there were 204 energy saving projects funded under the Minor Building Works Block Vote controlled by ArchSD. To avoid funds being tied up by projects which are not yet ready for implementation, ArchSD will only consider B/Ds' proposed energy saving projects with at least 10% to 20% of the estimated cashflow to be incurred in the year of approval. However, Audit examination found that: (a) 58 (28%) of the 204 projects had not incurred any expenditure in the year of approval; and (b) of the 58 projects, 17 (29%) projects (with a total APE of $19 million) had not incurred any

expenditure in subsequent year after the year of approval as of March 2020 (paras. 4.2 and 4.17 to 4.19).

15. ***Need to require the B/Ds concerned or their works agents as appropriate to provide information on estimated payback periods and anticipated electricity savings of proposed energy saving projects when submitting funding applications.*** Audit noted that while EMSD had required B/Ds to provide information regarding estimated payback period and anticipated electricity saving on the funding application form for energy saving projects funded under its block vote, ArchSD had not required the B/Ds concerned or their works agents as appropriate to provide such information when submitting funding applications for proposed energy saving projects funded under the Minor Building Works Block Vote (para. 4.21).

16. ***Scope for enhancing the participation in green building certification.*** The Building Environmental Assessment Method (BEAM) Plus is a comprehensive assessment tool to certify green buildings in Hong Kong. All new government buildings of construction floor area above 5,000 square metres (m^2) with central air conditioning or above 10,000 m^2 should aim to obtain the second highest grade or above under BEAM Plus. From January 2015 to July 2020, ArchSD had completed 34 government building projects for which the green building certification requirement was applicable. Audit noted that, as of July 2020, 15 (44%) of the 34 projects had not yet obtained final green building certification. In addition, regarding existing government buildings, in June 2017, ENB informed the Legislative Council that it would encourage B/Ds to apply for BEAM Plus certification for such buildings to showcase the Government's commitment to green buildings. Audit noted that, as of July 2020, only 5 existing government buildings had obtained final BEAM Plus certification (paras. 4.28 to 4.30 and 4.32).

Audit recommendations

17. **Audit recommendations are made in the respective sections of this Audit Report. Only the key ones are highlighted in this Executive Summary. Audit has *recommended* that the Director of Electrical and Mechanical Services should:**

Achievement of energy saving targets

(a) **explore measures to complete the compilation and submission of the annual reports on achievement of energy saving target to ENB as early as possible and make better use of information technology in compiling government-wide energy consumption data (para. 2.10(a) and (b));**

(b) **continue to take follow-up actions on the energy saving performance of B/Ds (para. 2.10(c));**

(c) **take measures to improve the normalisation process (para. 2.18);**

Management of energy audits and RCx for government buildings

(d) **take measures to ensure that government buildings meeting the selection criteria are selected for conducting energy audits and early complete the reviews on the need for conducting energy audits for the government buildings identified by Audit (para. 3.10(a) and (b));**

(e) **consider taking measures to collect information on the implementation of EMOs and the related energy savings achieved for selected government buildings as far as practicable (para. 3.10(c));**

(f) **keep under review the RCx implementation timetable for government buildings included in the RCx programme and confirm the implementation schedule with the concerned B/Ds as early as possible (para. 3.29(c));**

(g) **take measures to encourage the pertinent B/Ds to include the government buildings under their management in the RCx programme (para. 3.29(d)); and**

Management of energy saving projects and other management issues

(h) **in administering energy saving projects in government buildings and funded under EMSD Block Vote:**

(i) **closely liaise with the B/Ds concerned or their works agents as appropriate to request them to monitor the progress of energy saving projects (para. 4.14(a)); and**

(ii) **remind the B/Ds concerned or their works agents as appropriate to closely monitor the progress of performance measurements for completed energy saving projects and make more accurate project estimates for energy saving projects as far as practicable (para. 4.14(b)).**

18. **Audit has *recommended* that:**

Achievement of energy saving targets

(a) **the Secretary for the Environment and the Director of Electrical and Mechanical Services should keep under review the implementation of measures by B/Ds to achieve the green energy target and provide necessary assistance to help B/Ds achieve the target (para. 2.26(b)); and**

Management of energy saving projects and other management issues

(b) **the Secretary for the Environment should take measures to encourage B/Ds to apply for green building certification for the existing government buildings under their management (para. 4.34(b)).**

19. **Audit has *recommended* that the Director of Architectural Services should:**

Achievement of energy saving targets

(a) **complete the RE projects at existing government buildings as early as possible (para. 2.27);**

Management of energy saving projects and other management issues

(b) **in administering energy saving projects in government buildings and funded under the Minor Building Works Block Vote:**

(i) **remind the B/Ds concerned or their works agents as appropriate to make more accurate cashflow forecasts for energy saving projects, and inform ArchSD of the project status and cashflow regularly (para. 4.22(a)); and**

(ii) **require the B/Ds concerned or their works agents as appropriate to provide information on the estimated payback periods and anticipated electricity savings of proposed energy saving projects when submitting funding applications (para. 4.22(b)); and**

(c) **closely monitor the progress in making assessment submissions for green building certification for new government buildings (para. 4.36).**

Response from the Government

20. The Secretary for the Environment, the Director of Electrical and Mechanical Services and the Director of Architectural Services agree with the audit recommendations.