CHAPTER 5

Environment Bureau
Electrical and Mechanical Services Department

Government electricity consumption

Audit Commission
Hong Kong
23 October 2008

This audit review was carried out under a set of guidelines tabled in the Provisional Legislative Council by the Chairman of the Public Accounts Committee on 11 February 1998. The guidelines were agreed between the Public Accounts Committee and the Director of Audit and accepted by the Government of the Hong Kong Special Administrative Region.

Report No. 51 of the Director of Audit contains 12 Chapters which are available on our website at http://www.aud.gov.hk.

Audit Commission
26th floor, Immigration Tower
7 Gloucester Road
Wan Chai
Hong Kong

Tel : (852) 2829 4210
Fax : (852) 2824 2087
E-mail : enquiry@aud.gov.hk

GOVERNMENT ELECTRICITY CONSUMPTION

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PART 1: INTRODUCTION

1.1 This PART describes the background to the audit and outlines its objectives and scope.

Impact of electricity consumption on the environment

1.2 In Hong Kong, electricity is the main source of energy. It is mostly generated by burning coal and natural gas. This electricity-generation process emits air pollutants (e.g. sulphur dioxide, nitrogen oxides, suspended particulates) and carbon dioxide (a greenhouse gas closely linked with global warming). Efforts to reduce electricity consumption will help improve air quality and reduce the emission of carbon dioxide.

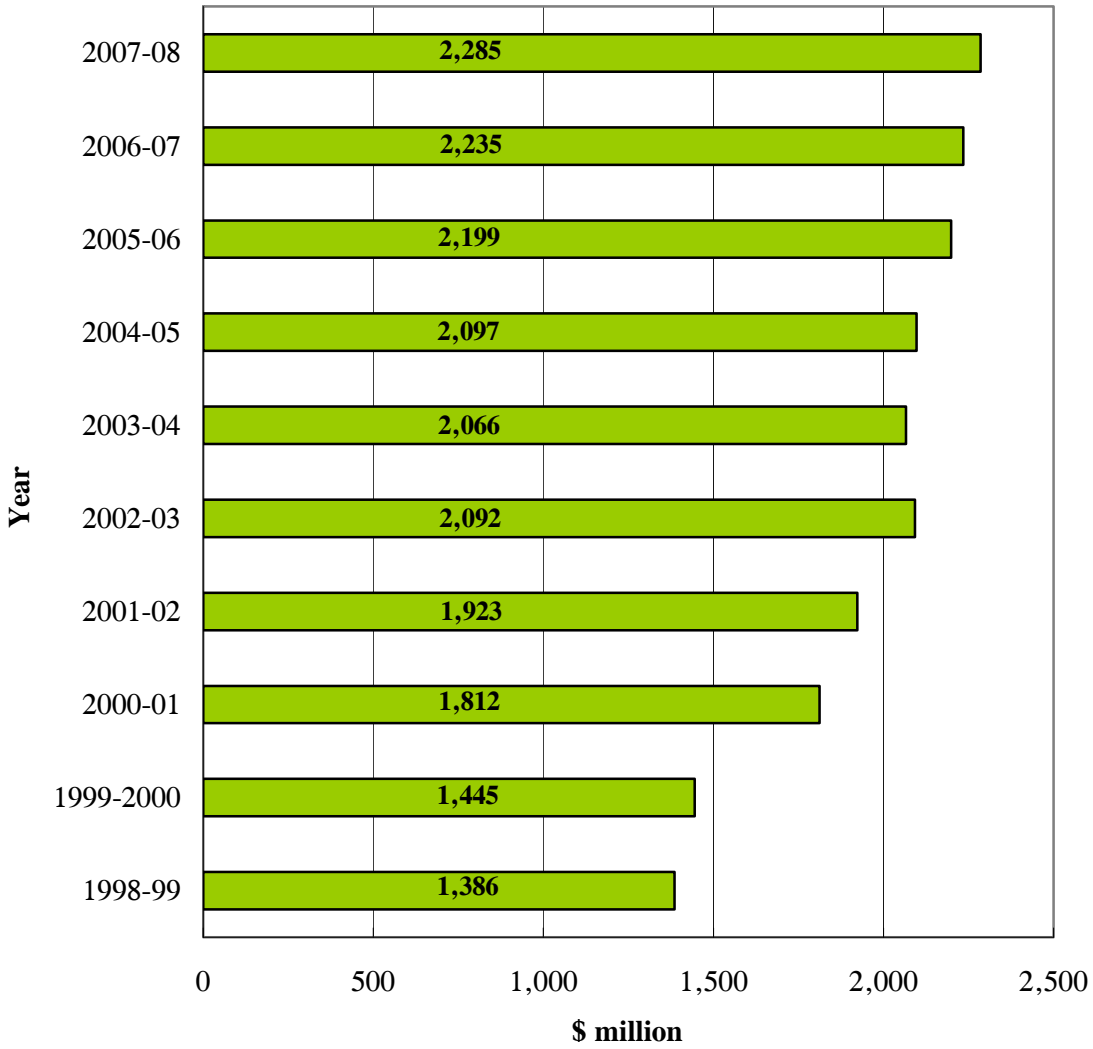
Government expenditure on electricity consumption

1.3 There are two electricity supply companies in Hong Kong, namely Company A and Company B (Note 1). In providing its different services, the Government consumes a large quantity of electricity. During the past ten financial years, from 1998-99 to 2007-08, there had been an increase in government expenditure on electricity consumption (see Figure 1).

Note 1: *Company A supplies electricity to Kowloon and the New Territories, including Lantau, Cheung Chau and most of the outlying islands. Company B supplies electricity to Hong Kong Island, Ap Lei Chau and Lamma Island.*

Figure 1

Government expenditure on electricity consumption (1998-99 to 2007-08)



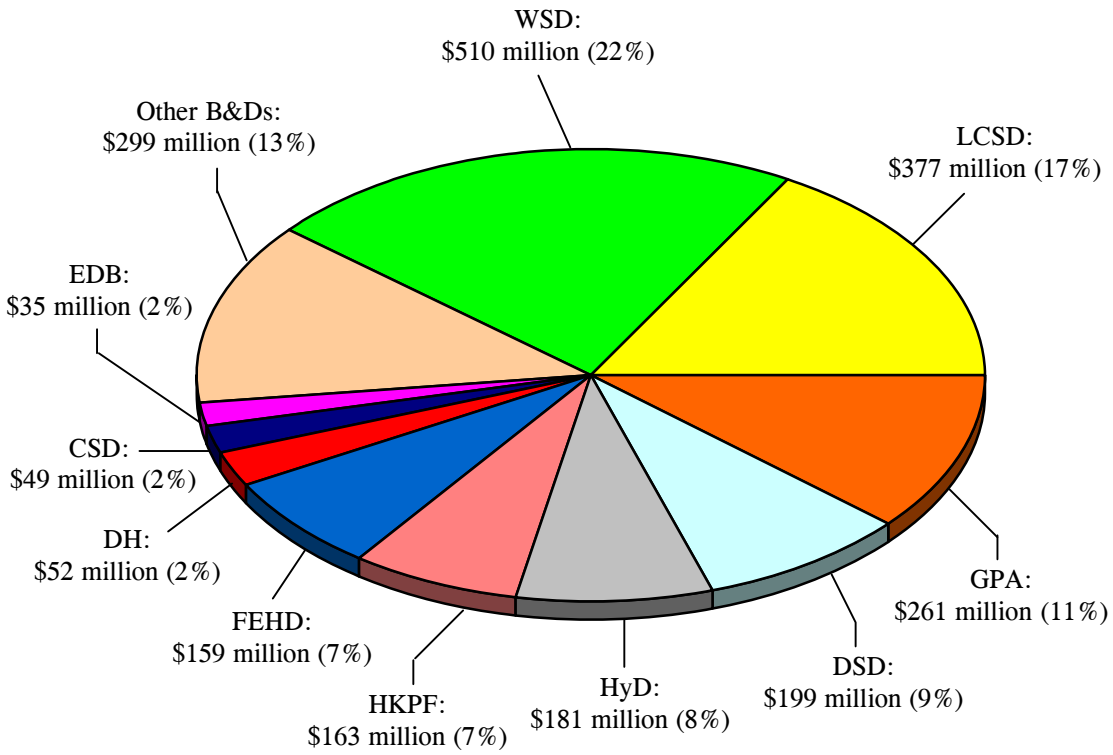
Source: *Treasury records*

Remarks: *The electricity expenditures do not include those of autonomous public bodies, subvented organisations and trading funds.*

1.4 Individual government bureaux and departments (B&Ds) are responsible for the expenditure on electricity consumed in their premises or facilities. For joint-user buildings, the Government Property Agency (GPA) is the management agent responsible for the electricity expenditure. Figure 2 shows the expenditure on electricity consumption of B&Ds in 2007-08.

Figure 2

Expenditure on electricity consumption of B&Ds (2007-08)



Legend:

CSD	—	Correctional Services Department
DH	—	Department of Health
DSD	—	Drainage Services Department
EDB	—	Education Bureau
FEHD	—	Food and Environmental Hygiene Department
GPA	—	Government Property Agency
HKPF	—	Hong Kong Police Force
HyD	—	Highways Department
LCSD	—	Leisure and Cultural Services Department
WSD	—	Water Supplies Department

Source: *Treasury records*

Government energy management

1.5 The Environment Bureau (ENB — Note 2) is responsible for policies on energy efficiency and conservation. In August 1994, the Electrical and Mechanical Services Department (EMSD) set up an Energy Efficiency Office (EEO) to coordinate the Government's efforts in promoting energy efficiency and conservation. The EMSD has promulgated codes of practices and guidelines on energy management, and implemented energy-saving programmes. The Electrical and Mechanical Services Trading Fund (EMSTF) set up under the EMSD provides operation and maintenance services to government departments and autonomous public bodies on electrical, mechanical and building services installations. The Architectural Services Department (ArchSD) is responsible for designing and constructing electrical, mechanical and building services installations of government buildings.

Director of Audit's Report on the management of electricity consumption by the Government

1.6 In Chapter 7 of the Director of Audit's Report No. 31 of October 1998, the Audit Commission (Audit) reported its observations on the implementation of government energy management programmes, and energy management in the Water Supplies Department (WSD) and the Hong Kong Police Force (HKPF). Audit made a number of recommendations for improvement. The ENB, the EMSD, the WSD and the HKPF accepted the audit recommendations and subsequently implemented them.

Audit review

1.7 Audit has recently conducted a review to examine the economy, efficiency and effectiveness in the management of electricity consumption by B&Ds. The review focused on the following areas:

(a) management of electricity accounts (PART 2);

(b) electricity consumption of new government buildings (PART 3);

Note 2: *In July 2007, the Environment Bureau was formed to take up the environmental policy portfolio of the former Environment, Transport and Works Bureau. For simplicity, the Environment, Transport and Works Bureau is also referred to as the Environment Bureau in this Audit Report.*

(c) implementation of energy-saving retrofit programme (PART 4);

(d) procurement of energy-efficient electrical appliances (PART 5); and

(e) achievement of energy-saving targets (PART 6).

Audit has found that there are areas where improvements can be made and has made a number of recommendations to address the issues.

Acknowledgement

1.8 Audit would like to acknowledge with gratitude the full cooperation of the staff of the EMSD, the ArchSD, the ENB, the Development Bureau, the Correctional Services Department (CSD), the Department of Health (DH), the Fire Services Department (FSD), the Government Logistics Department (GLD), the GPA, the HKPF, the Highways Department, the Independent Commission Against Corruption (ICAC), the Judiciary and the Leisure and Cultural Services Department (LCSD) during the audit.

PART 2: MANAGEMENT OF ELECTRICITY ACCOUNTS

2.1 This PART examines the management of electricity accounts by B&Ds.

Types of tariffs for electricity accounts

2.2 Non-domestic customers of the two electricity supply companies in Hong Kong, namely Company A and Company B (see para. 1.3), may choose between the following two main types of tariffs for their electricity accounts:

(a) tariff for general electricity accounts (**General Tariff**); and

(b) tariff for high-consumption electricity accounts (**Bulk Tariff**).

2.3 Electricity charges under the General Tariff are based solely on the quantities of electricity consumed, i.e. the energy charge, measured in kilowatt-hours (kWh). The unit rate of energy charge under the General Tariff is higher than that under the Bulk Tariff. For electricity charges under the Bulk Tariff, in addition to the energy charge, there is a maximum demand charge (Note 3), measured in kilovolt-amperes.

2.4 According to Company A and Company B, in most cases, it would be cost-effective for customers to select the Bulk Tariff for electricity accounts with monthly electricity consumption of over 20,000 kWh and 26,000 kWh respectively. Selecting a cost-effective tariff for an electricity account requires an analysis of the pattern of electricity consumption. In general, it would be cost-effective to select the Bulk Tariff for an account if the electricity consumption is high and steady. B&Ds are responsible for selecting the appropriate tariffs for their electricity accounts after seeking technical advice from the ArchSD and the EMSD, if necessary. During the first year of completion of **new** government buildings, the **ArchSD** provides technical advice to B&Ds on tariff selection upon request. For **existing** buildings, the **EMSD** provides technical advice to B&Ds upon request.

Note 3: *The maximum demand on electricity supply is the highest rate of electricity consumption during a billing period.*

Findings of Audit Review in 1998

2.5 In the review conducted in 1998 (see para. 1.6), Audit found that some B&Ds adopted the General Tariff for high-consumption electricity accounts. The B&Ds concerned accepted the audit recommendation on conducting reviews on the issue.

Audit observations and recommendations

Audit examination

2.6 In this review, Audit selected seven government departments (Note 4) with high electricity consumption to ascertain whether they had adopted cost-effective tariffs for their electricity accounts. The findings are shown in paragraphs 2.7 to 2.14.

High-consumption electricity accounts charged under General Tariff

2.7 Audit found that, in 2007, the seven departments adopted the General Tariff for 216 electricity accounts, each with an average monthly electricity consumption exceeding the threshold of 20,000 kWh or 26,000 kWh (see para. 2.4). Details are shown in Table 1.

Note 4: *These seven departments were among the 20 departments with the highest electricity consumption. They were selected for audit examination by a risk-based selection process.*

Table 1

General Tariff used for high-consumption electricity accounts (2007)

Department	Number of high-consumption accounts	Range of average monthly consumption per account		Electricity consumption in 2007	Electricity expenditure in 2007
		From (kWh)	To (kWh)	(thousand kWh)	($'000)
CSD	16	20,674	113,961	8,185	8,862
DH	34	20,122	105,203	18,070	18,739
FSD	22	22,765	106,488	11,477	11,240
GLD	5	87,099	336,480	10,220	13,224
GPA	49	20,367	387,256	62,162	74,049
Judiciary	7	40,580	147,160	6,683	6,415
LCSD	83	20,208	186,112	48,723	49,728
Total	**216**	—	—	**165,520**	**182,257**

Source: Departmental records and Audit analysis

2.8 In the light of the findings mentioned in paragraph 2.7, Audit requested the seven departments concerned to review the 216 high-consumption electricity accounts. Up to September 2008, 108 accounts had been reviewed. The results indicated that it would be cost-effective to select the Bulk Tariff for 42 accounts. The departments concerned had taken action to switch to the Bulk Tariff. Of these 42 accounts, Audit estimated that 16 accounts would achieve an annual saving of $2.3 million (up to September 2008, information for estimating the savings of the other 26 accounts was not available from the B&Ds). Details are shown in Table 2.

Table 2

Review of 216 high-consumption electricity accounts (as at September 2008)

Department	Number of high-consumption accounts (see Table 1) (a)	Number of accounts		Estimated annual savings from switching to Bulk Tariff ($)	Number of accounts being assessed (d) = (a)−(b)−(c)
		Remained under General Tariff (Note 1) (b)	Switched to Bulk Tariff (c)		
CSD	16	1	0	0	15
DH	34	29	5	273,854	0
FSD	22	3	6	505,231	13
GLD	5	1	4	813,566	0
GPA	49	21	1	666,347	27
Judiciary	7	0	0	0	7
LCSD	83	11	26	(Note 2)	46
Total	**216**	**66**	**42**	**2,258,998**	**108**

Source: *Departmental records and Audit analysis*

Note 1: *The General Tariff was found to be more economical for these 66 electricity accounts after review.*

Note 2: *Information for estimating annual savings was not available as at September 2008.*

2.9 **Audit considers that the departments concerned need to complete the review of the remaining 108 electricity accounts early so that the appropriate tariff can be selected.**

Electricity accounts using Bulk Tariff resulting in higher charges

2.10 The seven departments reviewed by Audit had selected the Bulk Tariff for some of their electricity accounts. However, for 29 electricity accounts in four departments, the Bulk Tariff selected led to higher charges, owing to low electricity consumption or high maximum demand charges. Audit estimated that, if the four departments had selected the General Tariff for these 29 accounts, a saving of about $1.6 million could have been achieved in 2007. Details are shown in Table 3.

Table 3

Electricity accounts using Bulk Tariff resulting in higher charges (January to December 2007)

Department	Number of accounts	Total consumption (thousand kWh)	Total charge under Bulk Tariff (a) ($'000)	Estimated charge under General Tariff (b) ($'000)	Estimated savings under General Tariff (c) = (a)−(b) ($'000)
CSD	2	1,592	1,595	1,529	66
DH	4	3,100	3,060	2,976	84
GPA	5	5,960	5,984	5,722	262
LCSD	18	13,282	17,095	15,879	1,216
Total	**29**	**23,934**	**27,734**	**26,106**	**1,628**

Source: Departmental records and Audit analysis

2.11 **Audit considers that the CSD, the DH, the GPA and the LCSD need to review the 29 electricity accounts identified by Audit to ascertain whether it is cost-effective to select the General Tariff.**

Need to issue guidelines for monitoring tariffs of electricity accounts

2.12 As indicated in the audit observations mentioned in paragraphs 2.7 to 2.11, the selection of appropriate tariffs for electricity accounts may bring about savings in expenditure. **Audit considers that the Financial Services and the Treasury Bureau (FSTB) needs to, in consultation with the EMSD and the ArchSD, issue a circular to remind B&Ds of the need to reduce expenditure by selecting appropriate tariffs for their electricity accounts and conducting regular reviews, and seek technical advice from the EMSD and the ArchSD, as necessary, in their reviews.**

Need to identify opportunities for summation metering

2.13 Summation metering is the aggregation of individual electricity accounts in the same premises into one account which may reduce electricity expenditure under the Bulk Tariff. Both Company A and Company B offer summation metering to customers.

2.14 In 2005, the HKPF grouped 14 of its electricity accounts at the Police Headquarters into 4 accounts and selected the Bulk Tariff. As a result, in 2005-06, the HKPF achieved a saving of $160,000 in electricity expenditure. In the same year, the EMSD also achieved savings from summation metering (see para. 3.25). **In Audit's view, there is a need to conduct reviews of multiple electricity accounts in government premises to ascertain whether it is cost-effective to adopt summation metering.**

Audit recommendations

2.15 **Audit has *recommended* that the Commissioner of Correctional Services, the Director of Fire Services, the Government Property Administrator, the Judiciary Administrator and the Director of Leisure and Cultural Services should, in collaboration with the Director of Electrical and Mechanical Services, continue their review of the electricity accounts identified by Audit to ascertain whether it would be cost-effective to select the Bulk Tariff, and take necessary follow-up action (see para. 2.9).**

2.16 **Audit has *recommended* that the Commissioner of Correctional Services, the Director of Health, the Government Property Administrator and the Director of Leisure and Cultural Services should, in collaboration with the Director of Electrical**

and Mechanical Services, conduct a review of the electricity accounts identified by Audit to ascertain whether it would be cost-effective to select the General Tariff for these accounts, and take necessary follow-up action (see para. 2.11).

2.17 **Audit has *recommended* that the Secretary for Financial Services and the Treasury should, in consultation with the Director of Electrical and Mechanical Services and the Director of Architectural Services, issue a circular to remind B&Ds of the need to conduct regular reviews of their electricity accounts to:**

(a) **select the most cost-effective tariffs (see para. 2.12); and**

(b) **adopt summation metering for electricity accounts in the same premises where it is cost-effective to do so (see para. 2.14).**

2.18 **Audit has *recommended* that the Director of Electrical and Mechanical Services and the Director of Architectural Services should, upon request, provide necessary technical assistance and advice to B&Ds in their reviews of electricity accounts for the purposes of**:

(a) **selecting the most cost-effective tariffs (see para. 2.12); and**

(b) **identifying opportunities for adopting summation metering for electricity accounts in the same premises (see para. 2.14).**

Response from the Administration

2.19 The **Commissioner of Correctional Services** agrees with the audit recommendations in paragraphs 2.15 and 2.16. He has said that the CSD will conduct regular review of electricity accounts in order to select the most appropriate tariff for cost-saving purposes. Reviews have been completed on the two electricity accounts mentioned in Table 3 of paragraph 2.10. One account will be switched to the General Tariff and the other will continue to be charged under the Bulk Tariff.

2.20 The **Director of Health** agrees with the audit recommendation in paragraph 2.16. He has said that it has been the practice of the DH to review the electricity consumption of individual accounts on an annual basis, in order to ascertain whether switching to the General Tariff/Bulk Tariff would be more cost-effective. The DH will continue to carry out the review of electricity consumption of individual accounts and to arrange switching between tariffs where appropriate.

2.21 The **Director of Fire Services** agrees with the audit recommendation in paragraph 2.15. He has said that the FSD will continue to monitor the tariffs of electricity accounts to observe any irregularities due to seasonal demand or changes in load profile affected by operation. The FSD will also liaise closely with the electricity supply companies to make prompt evaluation for selecting the appropriate tariff.

2.22 The **Government Property Administrator** agrees with the audit recommendations in paragraphs 2.15 and 2.16. He has said that the GPA will, in collaboration with the EMSD, continue to review the identified accounts with a view to selecting the most cost-effective tariff.

2.23 The **Judiciary Administrator** agrees with the audit recommendation in paragraph 2.15. She has said that the Judiciary has sought advice from the EMSD on whether it would be cost-effective to select the Bulk Tariff for the seven high-consumption electricity accounts (see Table 1 in para. 2.7). Formal applications to switch the accounts to the Bulk Tariff will be submitted to the electricity supply company.

2.24 The **Director of Leisure and Cultural Services** agrees with the audit recommendations in paragraphs 2.15 and 2.16. He has said that the LCSD has regularly reminded the venue management to seek advice from the EMSD on tariff selection and apply for the Bulk Tariff, where appropriate, to economise on electricity charges. Besides, whenever there is any change which may affect the energy consumption, the venue management would review the type of tariff immediately.

2.25 The **Secretary for Financial Services and the Treasury** agrees in principle with the audit recommendation in paragraph 2.17 on issuing a reminder to B&Ds. He has said that, in view of the fact that adopting cost-effective tariffs also forms part of the efforts made by B&Ds in saving energy, and that the ENB has already issued a circular memorandum setting out different energy-saving measures, the ENB will work with the FSTB and relevant departments (including the EMSD and the ArchSD) to include such reminder in the relevant circular to B&Ds when it is issued in future.

2.26 The **Director of Electrical and Mechanical Services** has said that:

(a) the EMSD is always pleased to provide advice to B&Ds upon request in promoting energy efficiency and conservation, and on the selection of appropriate tariff for electricity accounts;

(b) B&Ds are welcome to seek the EMSD's advice or they may approach the two electricity supply companies or their own engineering service providers direct to carry out reviews of the tariff of electricity accounts and take necessary action; and

(c) the EMSD is pleased to provide technical advice on the drafting of the circular mentioned in paragraph 2.17.

2.27 The **Director of Architectural Services** has said that:

(a) the ArchSD will provide necessary technical assistance to the FSTB in drafting the necessary circular;

(b) B&Ds should take initiative to review their electricity accounts and to seek technical advice from the ArchSD for the timely selection of favourable tariffs within the 12-month maintenance period of a new government building; and

(c) the electricity supply companies have different policies and service charges for summation metering applications. The adoption of summation account therefore may not immediately provide financial savings and be cost-effective.

PART 3: ELECTRICITY CONSUMPTION OF NEW GOVERNMENT BUILDINGS

3.1 This PART examines the electricity consumption in two new government buildings, namely the EMSD Headquarters Building and the ICAC Building, with a view to identifying room for improvement in estimating electricity consumption and managing electricity accounts.

Estimating electricity expenditure of new government buildings

3.2 The ArchSD is responsible for designing and constructing government buildings and related facilities. The ArchSD's Building Services Branch is responsible for designing and constructing electrical, mechanical and building services installations (including lighting, lifts, escalators, and air-conditioning systems) of government buildings.

3.3 According to Financial Circular No. 2/2005 "Recurrent Consequences of Capital Projects" of June 2005 (Note 5), the proponent of a capital project should assess the additional annual recurrent expenditure arising from the project, and provide the information in the submission to the FSTB, and the Public Works Subcommittee (PWSC) of the Finance Committee (FC) of the Legislative Council (LegCo). The objectives are to facilitate the provision of:

(a) proper allowance in the Government's financial forecast and plans; and

(b) a fair and equitable basis for the FSTB, the PWSC and the FC to consider funding requests for capital projects.

3.4 According to the above circular, "light and power" is one of the expenditure items in the assessment of recurrent expenditure.

Note 5: *Financial Circular No. 2/89 of January 1989 and Financial Circular No. 5/86 of April 1986 contained similar provisions regarding the assessment of recurrent consequences of capital projects. These two circulars were superseded by Financial Circular No. 2/2005.*

Reprovisioning the EMSD Headquarters Building

3.5 In June 2001, the Administration made a submission to the PWSC to seek funding support for reprovisioning some of the EMSD facilities to the former Hong Kong Air Cargo Terminal 2 Building in Kowloon Bay. The PWSC paper dated June 2001 said that:

(a) the proposal would not give rise to any additional annual recurrent expenditure;

(b) the reprovisioning was provided to the EMSD on a cost-neutral basis; and

(c) there would be no adverse cost implications for the EMSTF.

In June 2001, the FC approved funding of $878.9 million for the reprovisioning works.

3.6 In April 2005, upon completion of the reprovisioning works, the building was renamed the **EMSD Headquarters Building**. The building comprises eight floors, six for workshops and two for offices (see Photograph 1).

Photograph 1

The EMSD Headquarters Building in Kowloon Bay

Source: EMSD records

3.7 Subsequent to the completion of the works in April 2005, the EMSD relocated its offices and workshops in the following locations to the new EMSD Headquarters Building:

(a) the old EMSD headquarters and workshops at Caroline Hill Road in Causeway Bay;

(b) the depot at Sung Wong Toi in To Kwa Wan;

(c) the vehicle servicing station in Kowloon Bay; and

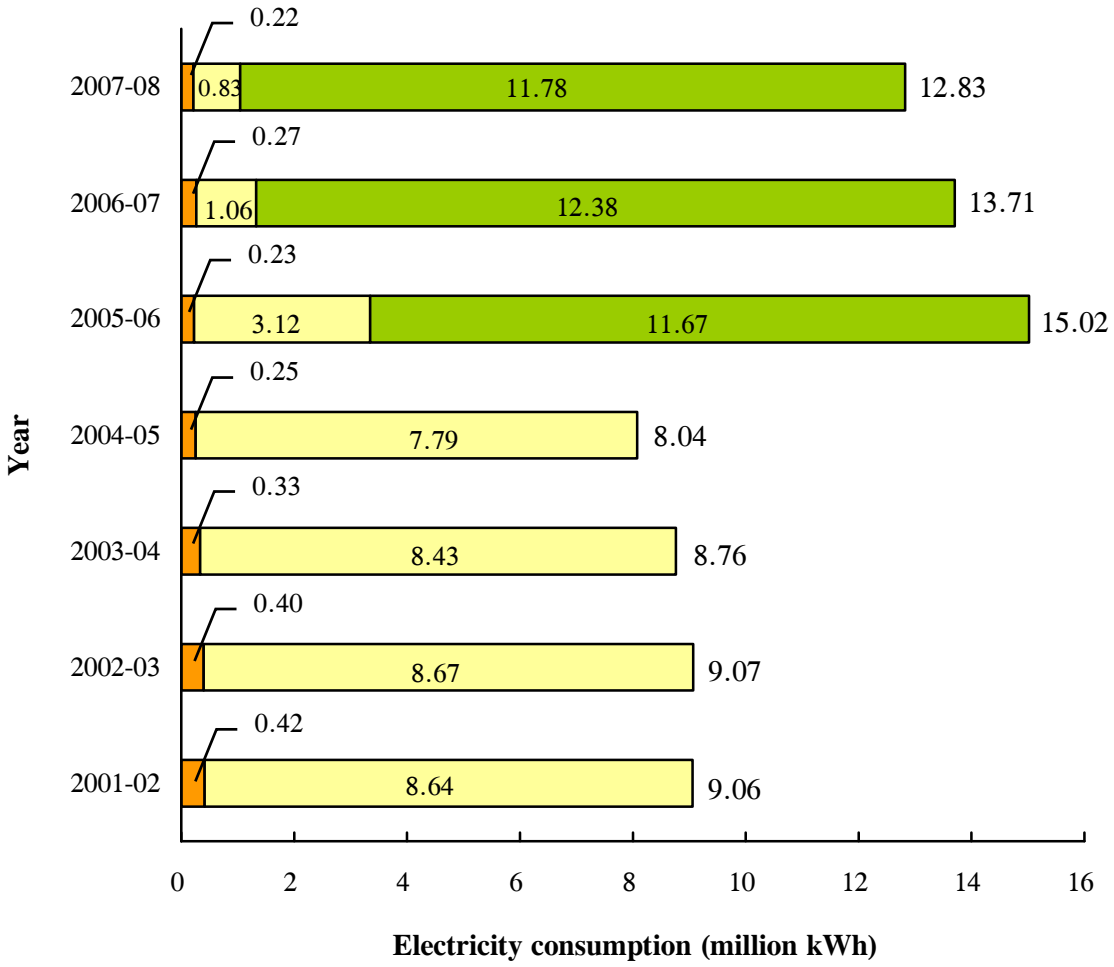
(d) three EMSD sub-offices accommodated in government or leased premises.

Electricity consumption of the EMSD

3.8 Figure 3 shows the electricity consumption of the EMSD from 2001-02 to 2007-08.

Figure 3

Electricity consumption of the EMSD (2001-02 to 2007-08)



Legend:

- Electricity consumption in the new EMSD Headquarters Building
- Electricity consumption in premises to be relocated to the new EMSD Headquarters Building
- Electricity consumption in other EMSD venues

Source: *EMSD records*

Remarks: *The EMSD facilities were relocated to the new EMSD Headquarters Building in phases commencing April 2005.*

Construction of ICAC Building

3.9 In May 2003, the Administration made a submission to the PWSC to seek funding support for constructing a purpose-built headquarters building for the ICAC in North Point. The PWSC paper dated May 2003 said that:

(a) the recurrent expenditure for the ICAC headquarters offices was $16.3 million at that time; and

(b) the estimated annual recurrent expenditure after the occupation of the new headquarters building would be $24.1 million.

In June 2003, the FC approved funding of $731.1 million for constructing the new headquarters building.

3.10 In August 2007, upon completion of the works, the 25-storey building was named the **ICAC Building** (see Photograph 2).

Photograph 2

The ICAC Building in North Point

Source: ICAC records

3.11 Between August and November 2007, the ICAC relocated its headquarters offices from the following locations to the ICAC Building:

(a) seven floors at Murray Road Carpark Building in Central;

(b) five floors at Fairmont House in Central; and

(c) one floor at Murray Building in Central.

Electricity consumption of ICAC Building

3.12 Table 4 shows the electricity consumption of the ICAC Building between September 2007 and May 2008.

Table 4

Electricity consumption of ICAC Building (September 2007 to May 2008)

Year	Month	Electricity consumption (million kWh)	Electricity expenditure ($ million)
2007	September	1.24	1.61
	October	1.52	1.97
	November	1.36	1.76
	December	1.27	1.64
2008	January	1.29	1.69
	February	1.28	1.77
	March	1.40	1.88
	April	1.57	1.99
	May	1.29	1.66
Total for 9 months		**12.22**	**15.97**
Annualised total (Note)		**16.29**	**21.29**

Source: *ICAC records*

Note: *This is calculated by dividing the total electricity consumption for nine months by 9, then multiplying by 12.*

Audit observations and recommendations

Increase in electricity consumption

3.13 ***EMSD Headquarters Building.*** As stated in the PWSC paper of June 2001, the proposal to reprovision some of the EMSD facilities to the new EMSD Headquarters Building would not give rise to any additional annual recurrent expenditure (see para. 3.5(a)). **However, Audit examination revealed that there was a substantial increase in electricity consumption after the relocation of the facilities to the new EMSD Headquarters Building. As shown in Table 5 below, the facilities consumed 11.67 million kWh to 12.38 million kWh of electricity a year (i.e. a 35% to 43% increase compared with the electricity consumption of 8.64 million kWh in 2001-02).**

Table 5

Electricity consumption before and after relocation to the new Headquarters Building (2001-02 to 2007-08)

Year	Electricity consumption (million kWh)	Electricity expenditure ($ million)
2001-02	**8.64**	8.16
2002-03	8.67	8.40
2003-04	8.43	8.18
2004-05	7.79	7.58
2005-06 (Note)	**11.67**	9.79
2006-07	**12.38**	10.26
2007-08	11.78	9.96

Source: *EMSD records*

Note: *The EMSD facilities were relocated to the new EMSD Headquarters Building in phases commencing April 2005.*

3.14 According to the submission to the PWSC of June 2001 (see para. 3.5), before relocation, the EMSD facilities occupied 83,042 square metres of floor area. After completion, the new EMSD Headquarters Building provides a total floor area of 81,800 square metres (a 1.5% reduction). Notwithstanding the reduction in the floor area provided, the facilities consumed more electricity after the relocation.

3.15 In response to Audit's enquiry, in October 2008, the EMSD said that:

(a) the EMSD was providing many new facilities in the new Headquarters Building after relocation which had led to substantial increase in electricity consumption. Such facilities included:

(i) the Corporate Data Centre which was a new business element of the EMSTF for housing the information technology servers, network storage devices, etc.; and

(ii) those for providing new services to the trade and the public (e.g. the Education Path on Energy Efficiency and Safety and the training centre for electrical workers);

(b) the new Headquarters Building was housed in the concrete structure of the former Hong Kong Air Cargo Terminal 2 Building. Most of the structural features of the old building, such as the high ceiling and wide circulation area, had been retained which led to more electricity consumption; and

(c) after discounting the additional electricity consumption arising from the above two factors, the estimated electricity expenditure of the new building would have been reduced to $7.39 million, $7.28 million and $6.49 million in 2005-06, 2006-07 and 2007-08 respectively. The adjusted electricity expenditure was lower than the electricity expenditure of $7.58 million in 2004-05 before relocation to the new building.

Audit considers that the EMSD needs to take measures to further reduce the electricity consumption of the EMSD Headquarters Building as far as possible.

3.16 ***ICAC Building.*** As stated in the PWSC paper of May 2003, the recurrent expenditure of the ICAC headquarters offices would increase from $16.3 million to $24.1 million (a 48% increase) after the relocation (see para. 3.9). **In particular, as shown in the supporting documents of the submission to the PWSC of May 2003, the electricity expenditure of the ICAC headquarters offices would increase from $7.6 million to $9.9 million (a 30% increase) a year.** In comparison, the floor area occupied by the ICAC headquarters offices would increase from 17,664 square metres to 23,511 square metres (a 33% increase). As shown in Table 4 in paragraph 3.12, the annualised electricity expenditure of the ICAC Building was $21.3 million a year. This was 115% more than the estimated annual electricity expenditure of $9.9 million.

3.17 In response to Audit's enquiry, in September 2008, the ICAC said that the reasons for the much higher electricity expenditure than the original estimate made in early 2003 included:

(a) the significant increase in electricity tariff rate between 2003 and 2008;

(b) increased electricity consumption due to testing and commissioning of major building systems during the initial months of occupation. With the operation becoming more stabilised, the electricity consumption would gradually ease off;

(c) long operating hours of many floors of the ICAC Building for a prolonged period. Unlike a typical government office building, the electricity consumption of the ICAC Building was largely operation driven. The building also housed a lot of operational facilities which run round the clock; and

(d) the absence of a detailed building design when the estimate for annual electricity expenditure was made in early 2003.

Audit considers that the ArchSD and the ICAC need to ascertain the causes for the increase in electricity consumption during the post-occupation evaluation exercise conducted for the ICAC Building. The ICAC also needs to take measures to reduce electricity consumption of the ICAC Building as far as possible.

Need to more accurately estimate recurrent expenditure in funding submissions

3.18 Electricity expenditure accounted for a significant proportion of recurrent expenditure of the EMSD Headquarters Building and the ICAC Building. However, for both buildings, the actual electricity expenditures significantly exceeded the estimates made in the submissions to the PWSC. **Audit considers that there is room for improvement in providing more accurate estimate on electricity consumption.**

Need to review electricity consumption of new government buildings

3.19 According to the ArchSD's internal instructions, on completion of a major government building, a post-occupation evaluation should be conducted to examine the performance of the electrical, mechanical and building services installations to ensure that they function satisfactorily, meet the client's operational requirements, and achieve optimum energy efficiency. As far as Audit could ascertain, in conducting such an evaluation, the ArchSD staff were not required to review the actual electricity consumption of a new building vis-à-vis the estimated electricity consumption. **Audit considers that there is room for improvement in this regard.**

Need for timely selection of Bulk Tariff

3.20 As shown in PART 2, in most cases, it is cost-effective to select the Bulk Tariff (instead of the General Tariff) for electricity accounts with high consumption. After the completion of a new building, the ArchSD is responsible for maintaining the electrical, mechanical and building services installations during the first year, and for providing advice on the selection of appropriate tariffs upon request.

3.21 ***EMSD Headquarters Building.*** The new Headquarters Building was handed over to the EMSD on 2 April 2005. Thereafter, the EMSD facilities were relocated into the building. In the first two months of occupation of the building (i.e. April and May 2005), the electricity accounts were charged under the General Tariff. With effect from 28 May 2005, the EMSD selected the Bulk Tariff and achieved savings in electricity expenditure.

3.22 ***ICAC Building.*** During the first seven months of occupation (i.e. August 2007 to February 2008), the electricity accounts were charged under the General Tariff. With effect from 29 February 2008, the ICAC selected the Bulk Tariff and achieved savings in electricity expenditure.

3.23 **Audit considers that there is a need to ensure that favourable electricity tariffs are selected for electricity accounts of a new government building in a timely manner in future.**

Need for timely selection of summation metering

3.24 During the first year of occupation of a new government building, the ArchSD is responsible, upon request from B&Ds, for providing advice on whether summation metering (see para. 2.13) for the building should be adopted.

3.25 ***EMSD Headquarters Building.*** During the reprovisioning of EMSD offices and workshops to the new Building, action was taken to combine the six individual electricity accounts to form a summation account. As a result, the EMSD achieved additional saving in electricity expenditure from summation metering after selecting the Bulk Tariff in June 2005.

3.26 ***ICAC Building.*** For the ICAC Building, it had been provided with seven electricity accounts since its occupation in August 2007. In February 2008, the ICAC commissioned the electricity supply company to study the feasibility of adopting summation metering for the seven electricity accounts. Up to September 2008, summation metering had not yet been adopted.

3.27 **Audit considers that there is a need to take early action to assess the feasibility and desirability of adopting summation metering for electricity accounts of a new government building in future.**

Audit recommendations

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

(a) **in collaboration with the Commissioner, Independent Commission Against Corruption, conduct a review to ascertain the causes for the increase in electricity consumption of the ICAC headquarters offices after their relocation to the new ICAC Building (see para. 3.17);**

(b) **in collaboration with heads of B&Ds, take measures to improve the accuracy of the information on estimated electricity consumption of government building projects in future (see para. 3.18);**

(c) **after the occupation of a new government building, conduct a review of the actual electricity consumption vis-à-vis the estimated consumption information, and take necessary follow-up actions (see para. 3.19); and**

(d) **provide advice to B&Ds upon their request on:**

(i) **the selection of favourable tariffs for electricity accounts of a new government building in a timely manner (see para. 3.23); and**

(ii) **the feasibility and desirability of adopting summation metering for electricity accounts of a new government building (see para. 3.27).**

3.29 **Audit has *recommended* that the Director of Electrical and Mechanical Services should take measures to reduce the electricity consumption of the EMSD Headquarters Building as far as possible (see para. 3.15).**

3.30 **Audit has *recommended* that the Commissioner, Independent Commission Against Corruption should, in collaboration with the Director of Architectural Services, take measures to reduce the electricity consumption of the ICAC Building as far as possible (see para. 3.17).**

Response from the Administration

3.31 The **Director of Architectural Services** has said that:

(a) the ArchSD will continue to work with the ICAC to ascertain the causes for the increase in electricity consumption of the ICAC Building;

(b) the ArchSD would, in collaboration with B&Ds, take measures to improve the accuracy of the information on estimated electricity consumption of government building projects;

(c) current post-occupation evaluation exercises have already included the review of the actual electricity consumption of a new building vis-à-vis the estimated electricity consumption; and

(d) B&Ds should take initiative to review their electricity accounts and to seek technical advice from the ArchSD for the timely selection of favourable tariffs and summation metering within the 12-month maintenance period of a new government building. The ArchSD will provide technical advice to B&Ds upon request.

3.32 The **Director of Electrical and Mechanical Services** has said that:

(a) the electricity consumption of the new Headquarters Building started to drop after moving in and the completion of associated renovation works. The reducing trend of the electricity consumption continues in 2008-09; and

(b) the EMSD will continue to take measures to promote energy saving and conservation in its Headquarters Building. He is confident that the Building will continue to operate as one of the most energy-efficient buildings in Hong Kong.

3.33 The **Commissioner, Independent Commission Against Corruption** agrees with the audit recommendation in paragraph 3.30. He has said that:

(a) the ICAC took early steps well before taking over the building to monitor the electricity consumption pattern of the ICAC Building, examine possible causes of high energy consumption and devise measures to reduce electricity requirement;

(b) after relocation, the ICAC continues with the efforts by working closely with the ArchSD and the EMSD to devise and implement measures such as fine-tuning various building systems and plants to minimise energy consumption. The ICAC is still continuing with its endeavour to explore new energy-saving measures; and

(c) to reduce the electricity expenditure, the ICAC has adopted the Bulk Tariff for its electricity accounts as from end February 2008. The ICAC has also taken a further step by preparing to adopt summation metering which provides the most favourable electricity charging terms. An order was placed in August 2008 with the electricity supply company for the necessary network equipment installation works which are anticipated to be completed before November 2008.

PART 4: IMPLEMENTATION OF ENERGY-SAVING RETROFIT PROGRAMME

4.1 This PART examines the EMSD's implementation of the energy-saving retrofit programme.

Energy-saving retrofit programme

4.2 In early 2003, in the light of the Government's target to achieve 6% energy saving over four years (see para. 6.3), the EMSD identified and proposed energy-saving projects (hereinafter referred to as the **energy-saving retrofit programme**) which would help B&Ds achieve the target.

4.3 In September 2004, the EMSD proposed to the FSTB that:

(a) it would contribute $50 million from the retained earnings of the EMSTF in the form of a special dividend paid to the Government;

(b) it would use this sum for implementing energy-saving projects in government premises; and

(c) the cost of each project would not exceed $10 million.

4.4 In November 2004, in response to the EMSD's proposal, the FSTB said that:

(a) in accordance with the Trading Funds Ordinance (Cap. 430), dividends from trading funds had to be credited to the general revenue. Therefore, the proposed special dividend from the EMSTF had to be paid into the general revenue and could not be directly used for implementing the energy-saving projects; and

(b) having considered the proposed special dividend and the justifications for the proposed projects, the FSTB agreed to fund the projects up to $50 million in 2005-06 under the expenditure head of the EMSD.

In the 2005-06 Estimates, $50 million was provided for the EMSD to implement the energy-saving retrofit programme.

4.5 In November 2005, the EMSD proposed to the FSTB that:

(a) it would contribute an additional $350 million from the retained earnings of the EMSTF in the form of a special dividend paid to the Government for implementing the energy-saving retrofit programme over five years from 2006-07 to 2010-11, i.e. a $70 million special dividend a year would be paid to the Government for five years; and

(b) in addition to energy-saving retrofit projects, the scope of the programme would be expanded to include renewable energy and indoor air quality improvement projects. The cost of each project would not exceed $10 million.

In January 2006, the FSTB approved the EMSD's proposal.

Implementing the energy-saving retrofit programme

4.6 Under the energy-saving retrofit programme, the operating units of the EMSTF put up proposals for implementing projects in the premises of the clients to which they provided maintenance services. The EMSD's EEO was responsible for prioritising the projects and drawing up a programme for implementation.

4.7 As at May 2008, there were 375 projects in the energy-saving retrofit programme (see Table 6). Projects for 2009-10 and 2010-11 were under planning.

Table 6

Projects included in the energy-saving retrofit programme
(2005-06 to 2008-09)

Year	Types of projects					
	Energy-saving retrofit		Renewable energy		Indoor air quality	
	(No.)	($ million)	(No.)	($ million)	(No.)	($ million)
2005-06	58	50.0	0	0.0	0	0.0
2006-07	109	87.6	9	10.2	6	2.3
2007-08	52	42.5	8	10.5	35	20.1
2008-09	61	53.8	5	3.0	32	19.1
Total	**280**	**233.9**	**22**	**23.7**	**73**	**41.5**

Source: EMSD records

Audit observations and recommendations

Need to cover all B&Ds' facilities in energy-saving retrofit programme

4.8 Audit examination revealed that the 375 projects implemented between 2005-06 and 2008-09 were proposed by the EMSTF. Most of these projects were related to the B&Ds or non-government organisations to which the EMSTF provided maintenance services. **Audit considers that the energy-saving retrofit programme should cover all B&Ds' facilities. There is a need for the EMSD to invite all B&Ds to put up proposals for inclusion in the programme.**

Need for proper funding arrangements for retrofit projects

4.9 The EMSTF clients include B&Ds, subvented organisations and trading funds. Of the 375 retrofit projects implemented between 2005-06 and 2008-09, 76 projects (20%) costing $69.8 million were implemented for two subvented organisations and a trading fund (see Table 7).

Table 7

Retrofit projects for subvented organisations and a trading fund (2005-06 to 2008-09)

Year	Retrofit projects							
	Hospital Authority		Prince Philip Dental Hospital		Post Office Trading Fund		Total	
	(No.)	($ million)	(No.)	($ million)	(No.)	($ million)	(No.)	($ million)
2005-06	8	10.0	2	2.7	3	1.7	13	14.4
2006-07	29	26.3	1	0.2	3	1.0	33	27.5
2007-08	20	16.7	2	0.7	1	0.5	23	17.9
2008-09	6	9.0	0	0.0	1	1.0	7	10.0
Total	**63**	**62.0**	**5**	**3.6**	**8**	**4.2**	**76**	**69.8**

Source: EMSD records

4.10 The Government has established funding arrangements for subvented organisations and trading funds. According to Financial Circular No. 9/2004 of September 2004, capital subventions to subvented organisations are non-recurrent funding for construction, repairs, maintenance, refurbishment and other works projects or the acquisition/construction of systems and equipment. According to Financial Circular No. 5/2006 of May 2006, trading funds are required to pay for the services provided to them by government departments.

4.11 As far as Audit could ascertain, in implementing the 76 projects, the EMSD did not recover the costs of the projects from the two subvented organisations and the trading fund. The EMSD also did not treat the project costs as capital subventions to the two subvented organisations. **Audit considers that the EMSD needs to seek the FSTB's advice on the funding arrangements for implementing such retrofit projects for subvented organisations and trading funds.**

Need to set a ceiling on estimated payback period

4.12 Estimated payback periods (Note 6) are commonly used for evaluating energy-saving retrofit projects. In its website "Energyland", the EMSD said that, for energy-saving measures that required substantial capital investment, the payback periods would range from three to six years. Furthermore, in the EMSD pamphlet "Green Tips on Energy Saving" of March 2003, the EMSD said that the reasonable payback period of energy saving measures with substantial capital investment would be less than seven years.

4.13 In considering energy-saving retrofit projects for inclusion in the retrofit programme, the EMSD accorded priority to project proposals with shorter estimated payback periods, as follows:

(a) Priority 1: Projects with payback periods of less than five years;

(b) Priority 2: Projects with payback periods from five to seven years; and

(c) Priority 3: Projects with payback periods of over seven years.

4.14 Audit examination revealed that, of the 280 energy-saving retrofit projects included in the programme from 2005-06 to 2008-09 (see Table 6 in para. 4.7), the estimated payback periods of 66 projects (24%), costing $59.1 million, were 10 years or more (see Table 8).

Note 6: *The estimated payback period of an energy-saving retrofit project is determined by dividing the cost of the capital investment by the estimated annual energy saving generated. It represents the estimated time (in years) required to recover the capital investment through energy saving.*

Table 8

Estimated payback periods of energy-saving retrofit projects (2005-06 to 2008-09)

Estimated payback period (years)	Number of projects		Estimated cost ($ million)	
1.0 – 4.9	58		42.7	
5.0 – 6.9	69		69.2	
7.0 – 9.9	87		62.9	
10.0 – 14.9	53		48.3	
15.0 – 19.9	6	66	5.4	59.1
20 or more	7		5.4	
Total	**280**		**233.9**	

Source: EMSD records

4.15 Projects with long payback periods would have a higher risk of not being able to recover the capital cost invested. According to the EMSD, a reasonable payback period for an energy-saving retrofit project is less than seven years (see para. 4.12). **Audit considers that the EMSD needs to consider setting a ceiling on the estimated payback period for selecting energy-saving retrofit projects. For projects having estimated payback periods exceeding the ceiling, the justifications for selection should be critically examined and documented.**

Need to examine payback periods of completed projects

4.16 After completing an energy-saving retrofit project, the EMSD would carry out a post-implementation review to ascertain the actual amount of energy saving achieved. Up to May 2008, the EMSD had completed the reviews of the 58 retrofit projects implemented in 2005-06 (see Table 6). The post-implementation reviews indicated that:

(a) comparing with the estimated energy saving of 9.6 million kWh a year, the implementation of the 58 projects resulted in energy saving of 8.75 million kWh (91% of 9.6 million kWh). The average payback period was 6.3 years;

(b) among the 58 projects, 36 projects showed appreciable variances (both increases and decreases) between the estimated and actual energy saving; and

(c) the variances in energy saving achieved were mainly due to changes in the operating hours and cooling demands of the facilities involved.

4.17 Audit analysed the payback periods based on the updated information on project cost and energy saving from the post-implementation reviews. Audit found that the actual payback periods of 43 projects were longer than the estimated ones. There were eight projects with significant variances. For example, for Project A, the actual payback period was 56.3 years, which was 50.6 years longer than the original estimate of 5.7 years. Details are shown in Table 9.

Table 9

Energy-saving retrofit projects with significant variances in payback period (2005-06)

Project	Cost	Payback period		
		Estimated	Actual (Note)	Increase
		(a)	(b)	(c) = (b)−(a)
	($)	(Years)	(Years)	(Years)
A	309,315	5.7	56.3	50.6
B	768,169	5.7	42.5	36.8
C	403,680	4.0	22.4	18.4
D	406,000	6.9	23.7	16.8
E	1,090,400	6.9	23.3	16.4
F	1,090,400	6.9	23.3	16.4
G	379,759	6.9	17.4	10.5
H	1,158,608	7.7	17.9	10.2

Source: Audit analysis of EMSD records

Note: The actual payback periods were based on the EMSD's post-implementation review results.

4.18 **Audit considers that the EMSD needs to continue ascertaining the reasons for the significant variances between the estimated and actual payback periods and take into account the findings of the review in selecting projects in future.**

Audit recommendations

4.19 **Audit has *recommended* that the Director of Electrical and Mechanical Services should:**

(a) **consider inviting all B&Ds to put up project proposals for inclusion in the energy-saving retrofit programme (see para. 4.8);**

(b) **continue to seek the advice of the Secretary for Financial Services and the Treasury on the proper funding arrangements for implementing energy-saving retrofit projects for subvented organisations and trading funds (see para. 4.11);**

(c) **consider setting a ceiling on estimated payback periods for selecting energy-saving retrofit projects (see para. 4.15); and**

(d) **continue to conduct reviews of the actual payback periods of completed energy-saving retrofit projects and take into account the review findings in selecting projects in future (see para. 4.18).**

Response from the Administration

4.20 The **Director of Electrical and Mechanical Services** agrees with the audit recommendations in paragraph 4.19. He has said that the EMSD:

(a) would invite B&Ds to put up project proposals for inclusion in the future energy-saving retrofit programme;

(b) has been working closely with the FSTB on the funding arrangements for implementing energy-saving retrofit projects and will continue to do so;

(c) would set a ceiling on estimated payback periods for selecting energy-saving retrofit projects as appropriate. However, special consideration should be given to allow sufficient flexibility such that B&Ds would not be refrained from employing new technology, or from the wider adoption of energy-saving retrofit projects; and

(d) has conducted post-implementation reviews on completed projects and will continue to do so.

4.21 With reference to the audit recommendation in paragraph 4.19(b), the **Secretary for Financial Services and the Treasury** has said that:

(a) the costs of the energy-saving retrofit projects for the subvented bodies can be treated as capital subventions. He would advise the EMSD to create relevant subheads and commitments for the subvented bodies under the Capital Account of the General Revenue Account to account for such expenditure in future; and

(b) the initiative stemmed from a special policy objective of reducing energy consumption, and the subvented organisations and trading funds might not be able to accord priority to the projects or implement them of their own accord. Therefore, the expenditure incurred should not be considered part of the regular subventions or chargeable government services provided to meet the operational need.

PART 5: PROCUREMENT OF ENERGY-EFFICIENT ELECTRICAL APPLIANCES

5.1 This PART examines B&Ds' procurement of energy-efficient electrical appliances and office equipment, and the use of energy-efficient lamps in government premises.

Voluntary Energy Efficiency Labelling Scheme

5.2 In 1995, the EMSD introduced a voluntary Energy Efficiency Labelling Scheme (EELS) for some electrical appliances and office equipment. The objectives of the voluntary EELS are to:

(a) help consumers select energy-efficient products;

(b) promote public awareness of energy conservation and environmental protection;

(c) encourage manufacturers to produce products with higher energy efficiency; and

(d) help users achieve energy saving.

5.3 Under the voluntary EELS, suppliers can apply for one of the following two types of energy labels from the EMSD for designated electrical appliances and office equipment (see para. 5.4):

(a) ***Grading-type energy label.*** Upon a supplier's application and submission of a test report issued by a recognised laboratory, the EMSD verifies the energy efficiency of a product model and issues it with a grading-type energy label (see Figure 4) with a grade ranging from 1 to 5. A product model issued with a Grade 1 energy label denotes that it is among the most energy-efficient product models in the market. According to the EMSD, comparing with the electricity consumed by a room air-conditioner (with a cooling capacity for a bedroom of 10 square metres) issued with a Grade 5 energy label, a room air-conditioner with the same cooling capacity issued with a Grade 1 energy label will consume 480 kWh less electricity (at a cost of $430) a year; and

Figure 4

A sample of a grading-type energy label

Source: EMSD records

(b) ***Recognition-type energy label.*** The EMSD issues a recognition-type energy label (see Figure 5) for a product model if it is satisfied that the model meets the minimum energy efficiency requirements specified under the EELS. This type of label does not have a grading.

Figure 5

A sample of a recognition-type energy label

Source: EMSD records

5.4 Up to April 2008, the EMSD had issued:

(a) ***Grading-type energy labels for five types of electrical appliances*****,** namely room air-conditioners, refrigerators, washing machines, electric storage water heaters and electric clothes dryers; and

(b) ***Recognition-type energy labels for:***

(i) ***five types of electrical appliances*****,** namely compact fluorescent lamps (CFLs), electric rice cookers, dehumidifiers, television sets and electronic ballasts; and

(ii) ***seven types of office equipment*****,** namely photocopiers, multifunction devices (Note 7), laser printers, Liquid Crystal Display (LCD) monitors, computers, fax machines and hot/cold bottled water dispensers.

As at the same month, 3,608 product models involving 194 brands were issued with grading-type or recognition-type energy labels.

B&Ds encouraged to purchase energy-efficient equipment

5.5 In 2000, guidelines were laid down in the Stores and Procurement Regulations requiring B&Ds to take into account the environmental impact in purchasing goods and services, and encouraging B&Ds to purchase products with greater energy efficiency.

5.6 In September 2003, through the issue of a circular memorandum "Enhancing Green Management Practice", the ENB encouraged B&Ds to:

(a) choose from product models which were issued with appropriate energy labels; and

(b) include the "energy label" as a requirement in procurement specifications where appropriate.

Note 7: *Such devices perform multiple functions such as photocopying, printing, faxing and scanning.*

5.7 In November 2006, the EMSD issued an information pamphlet "Guide for Energy Efficient Green Office Equipment" which provided guidelines for choosing energy-efficient office equipment, including multifunction devices, photocopiers, laser printers, television sets, fax machines, computers and LCD monitors.

5.8 In December 2006, in an information paper "Green measures in the Government" submitted to the LegCo Panel on Environmental Affairs, the Administration said that:

(a) the Government had long implemented a green procurement policy;

(b) as early as in 2000, the Stores and Procurement Regulations were amended to require B&Ds to give consideration, as far as possible and where economically rational, to purchase products with greater energy efficiency;

(c) regarding office equipment and electrical appliances, the Government had incorporated the "energy label" under the EELS as a mandatory requirement in the tenders for purchasing room air-conditioners, refrigerators and photocopiers; and

(d) subject to market availability, the Government would further incorporate the "energy label" as a mandatory requirement in purchasing other types of products, with priority given to CFLs, laser printers and dehumidifiers.

5.9 In June 2008, through a memorandum, the ENB encouraged B&Ds to purchase product models issued with Grades 1 or 2 labels (for products issued with grading-type energy labels), or product models issued with recognition-type energy labels. The ENB advised B&Ds to find out more information about the EELS from the EMSD's website.

Mandatory Energy Efficiency Labelling Scheme

5.10 In May 2008, the Energy Efficiency (Labelling of Products) Ordinance (Cap. 598) was enacted. Under the Ordinance, commencing November 2009, it is mandatory for suppliers of prescribed products to apply for grading-type energy labels from the EMSD and display them for the information of consumers. The first phase of the mandatory EELS covers three products, namely room air-conditioners, refrigerators and CFLs.

Audit observations and recommendations

5.11 In 1995, the Government introduced the voluntary EELS. As at April 2008, the voluntary EELS covered 10 types of electrical appliances (5 issued with grading-type energy labels and 5 with recognition-type energy labels) and 7 types of office equipment (all issued with recognition-type energy labels — see para. 5.4). Since 2000, B&Ds have been encouraged to purchase electrical appliances and office equipment issued with appropriate energy labels. However, as at June 2008, B&Ds only incorporated the "energy label" requirement on a voluntary and case-by-case basis in some tenders for purchasing room air-conditioners, refrigerators and photocopiers. As far as Audit could ascertain, there were no guidelines requiring B&Ds to choose from product models with appropriate energy labels in purchasing electrical appliances and office equipment.

5.12 **To demonstrate the Government's lead and commitment in energy conservation, Audit considers that the ENB needs to issue guidelines so that B&Ds will purchase energy-efficient electrical appliances and office equipment with appropriate energy labels as far as practicable.**

Audit recommendations

5.13 **Audit has *recommended* that the Secretary for the Environment should, in consultation with the Secretary for Financial Services and the Treasury:**

(a) **conduct a review to identify suitable electrical appliances and office equipment for purchasing by B&Ds of the related product models issued with appropriate energy labels (see para. 5.12); and**

(b) **issue guidelines requiring B&Ds to purchase electrical appliances and office equipment issued with appropriate energy labels having regard to market availability and choices available (see para. 5.12).**

Response from the Administration

5.14 The **Secretary for the Environment** accepts the audit recommendations in paragraph 5.13. He has said that:

(a) the ENB issued a memorandum in June 2008 to encourage B&Ds to purchase models of electrical appliances with appropriate energy labels; and

(b) the ENB will, in consultation with the FSTB, continue to encourage the purchasing of electrical appliances and office equipment with appropriate energy label as far as practicable.

Use of incandescent lamps in government premises

5.15 There are two types of lamps commonly used, namely incandescent lamps (including tungsten filament lamps and tungsten halogen lamps — see Photograph 3) and fluorescent lamps (including fluorescent tubes and CFLs). In recent years, different types of CFLs are available for purchase (see Photograph 4).

Photograph 3

Examples of incandescent lamps

A tungsten filament lamp

A tungsten halogen lamp

Source: EMSD records

Photograph 4

Examples of compact fluorescent lamps

Source: EMSD records

5.16 Comparing with incandescent lamps, CFLs are more energy-efficient. According to the EMSD, a CFL uses 75% less electricity and has a life span of 6 to 8 times longer than an incandescent lamp of the same brightness. Manufacturers have produced different types of CFLs in terms of size and configuration for replacing traditional incandescent lamps. In the early years of production, CFL prices were much higher than those of the incandescent lamps. In recent years, CFL prices have fallen.

5.17 The EMSD has taken action to promote the energy conservation benefits of CFLs. Since 1998, the EMSD has specified CFLs as a type of electrical appliances which may be issued with recognition-type energy labels under the voluntary EELS (see para. 5.4). Furthermore, in order to achieve energy saving, the EMSD has also encouraged B&Ds to replace incandescent lamps with CFLs in a pamphlet "Green Tips on Energy Saving" issued in March 2003.

5.18 In recent years, some overseas countries have announced proposals to ban the use of incandescent lamps by stages through legislation. In March 2007, a LegCo Member asked the Administration whether there was information on the number of incandescent lamps used by each government department and whether there was any plan to replace all incandescent lamps with CFLs. In reply, the Administration said that:

(a) government departments had already been using CFLs in place of incandescent lamps as far as possible; and

(b) there were no detailed statistics on the number of incandescent lamps used in government departments.

5.19 In May 2007, the EMSD informed the ENB that:

(a) there were about 43,000 units of incandescent lamps being used in government premises;

(b) the incandescent lamps were mostly installed in cultural centres and exhibition halls for general lighting, background lighting and special lighting effects;

(c) about 28,000 units (65%) of these incandescent lamps could be replaced by CFLs to achieve energy saving, and the remaining 15,000 units (35%) were not suitable for replacement owing to the need of special lighting effects for art performances and exhibits; and

(d) replacing the 28,000 units of incandescent lamps would cost about $3 million and would take about 12 months to complete. The resulting savings in electricity consumption would compensate for the replacement cost.

Audit observations and recommendations

5.20 Audit examination of the EMSTF inventory records revealed that, in 2006-07 and 2007-08, the EMSTF issued 13,521 units of incandescent lamps for maintenance of lighting installations in government premises.

5.21 Audit noted that some government premises might need to be provided with incandescent lamps for special lighting effects (see para. 5.19(c)). According to the Policy Agenda of the 2008-09 Policy Address, the Administration will commence a study on phasing out incandescent lamps and replacing them with more energy-efficient lighting products, and on whether to introduce a statutory restriction on the sale of incandescent

lamps. **Audit considers that the ArchSD and the EMSD need to take action to ensure that CFLs are used in government premises as far as practicable.** The replacement of incandescent lamps by CFLs may be a suitable project for consideration for inclusion in the EMSD's energy-saving retrofit projects in government premises (see PART 4).

5.22 In response to Audit's enquiry, in October 2008, the EMSD said that:

(a) the ENB issued a circular memorandum in June 2008 which stated that B&Ds should replace incandescent lamps in their premises when they were due for replacement with CFLs where practicable;

(b) the EMSD would continue to promulgate the benefits of replacement with CFLs to B&Ds through workshops and experience sharing sessions; and

(c) as B&Ds were the owners of the incandescent lamps and were responsible for lamp replacement, the EMSD would continue to provide technical assistance and advice to B&Ds upon their request on the replacement of incandescent lamps with CFLs to ensure that CFLs were used in government premises as far as practicable.

Audit recommendations

5.23 **Audit has *recommended* that the Director of Electrical and Mechanical Services should continue to provide technical assistance and advice to B&Ds on replacing incandescent lamps with CFLs in government premises upon their request (see para. 5.21).**

5.24 **Audit has *recommended* that the Director of Architectural Services should, in designing lighting installations in government premises in future, adopt CFLs instead of incandescent lamps as far as practicable (see para. 5.21).**

Response from the Administration

5.25 The **Director of Electrical and Mechanical Services** agrees with the audit recommendation in paragraph 5.23.

5.26 The **Director of Architectural Services** has said that, other than the requirements to use incandescent lamps for special lighting effects, the ArchSD has been incorporating all types of energy-efficient lighting equipment into all new building projects as well as retrofit projects.

PART 6: ACHIEVEMENT OF ENERGY-SAVING TARGETS

6.1 This PART examines B&Ds' achievement of energy-saving targets set by the Government.

Energy-saving targets set in 2003

6.2 In February 2003, the ENB proposed the setting of targets for reduction in electricity consumption by B&Ds. The objectives of the proposal were to:

(a) help cut down government expenses on electricity consumption;

(b) enhance green management practices in the Government; and

(c) demonstrate the Government's commitment to environmental protection.

6.3 **Subsequently, the Administration decided that B&Ds should aim to cut down in financial years 2003-04, 2004-05, 2005-06 and 2006-07 their electricity consumption (in kWh) by 1.5%, 3%, 4.5% and 6% respectively, taking financial year 2002-03 as the base year.** According to the ENB, achievement of the targets for reduction in electricity consumption would lead to a saving of $27 million in 2003-04. The saving would increase to $107 million in 2006-07.

6.4 In March 2003, the ENB issued a circular memorandum "Enhancing Green Management Practice" to B&Ds promulgating the energy-saving targets and guidelines for achieving the targets. In 2003, the EMSD set up an Energy Saving Steering Committee (ESSC — Note 8) to oversee the implementation of this energy-saving programme. The EMSD provided B&Ds with technical support and expert advice by:

(a) publishing energy saving tips and guidelines, setting up an energy saving website "EnergyLand", uploading energy saving guidelines on the Green Management Corner of the Central Cyber Government Office, and organising experience sharing workshops and energy-saving competitions; and

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Note 8: *The ESSC was chaired by the Director of Electrical and Mechanical Services with representatives from the EEO and the operating units of the EMSTF.*

(b) performing energy audits and implementing the energy-saving retrofit programme (see PART 4).

6.5 The EMSD monitored the progress of implementing the energy-saving programme by:

(a) collecting electricity account information from B&Ds and, based on such information, obtaining electricity consumption data from electricity supply companies;

(b) analysing factors affecting electricity consumption and changes in B&Ds' levels of activities and operations; and

(c) evaluating the attainment of the energy-saving targets.

Progress of implementing the energy-saving programme

Reporting 2003-04 energy saving

6.6 ***Reports to ESSC and ENB.*** In mid-2004, in reports submitted to the ESSC and the ENB concerning electricity consumption of B&Ds in 2002-03 and 2003-04, the EMSD said that:

(a) electricity consumption of the whole Government showed an increase of 2.5% from 2002-03 to 2003-04. 26 B&Ds achieved the energy-saving target of 1.5%, and 8 B&Ds achieved saving of below 1.5%. However, 23 B&Ds consumed more electricity in 2003-04 than in 2002-03; and

(b) the possible reasons for the increase in electricity consumption in 2003-04 over 2002-03 were related to the opening of new venues and increases in activities.

6.7 ***Progress report on energy saving.*** In June 2004, in a progress report, the ENB said that:

(a) the Government as a whole consumed 2,160 million kWh of electricity in 2003-04, which was 2.5% above the level in the base year of 2002-03, or about $45 million more in dollar term;

(b) quite a number of new government buildings and facilities came into full operation during 2003-04. They consumed a huge amount of electricity. Excluding the consumption attributable to these new buildings and facilities, the overall electricity consumption of the Government in 2003-04 was 1.4% lower than that in the base year; and

(c) **admittedly, the reduction targets for 2003-04 had not been met on the face of the information.** A closer examination of the underlying reasons revealed that this was in part due to the special circumstances faced by a few major B&Ds. Hopefully, the same situation would not arise again.

6.8 ***EMSD letter to B&Ds.*** In July 2004, the EMSD examined the B&Ds which consumed more electricity in 2003-04 than in 2002-03. In a letter to ten such B&Ds with the highest electricity consumption, the EMSD said that:

(a) while B&Ds had enhanced their housekeeping measures for achieving energy saving in 2003-04, the energy consumption by the Government as a whole registered an increase of 2.5%, which fell short of the saving target of 1.5% in annual electricity consumption; and

(b) the EMSD could render assistance in achieving the energy-saving targets.

6.9 ***Circular Memorandum to B&Ds.*** In October 2004, in a Circular Memorandum "Energy saving measures in government premises" issued to B&Ds, the ENB said that:

(a) notwithstanding the saving targets set in February 2003, the overall electricity consumption of the Government had grown by 2.5% in 2003-04; and

(b) noting this increase in electricity consumption, all B&Ds were urged to step up their effort in saving energy so that the targets could be met in the coming years.

Reporting 2004-05 energy saving

6.10 ***Progress reports to ESSC.*** In examining the electricity consumption of 2004-05, the EMSD considered that a "normalisation" process was needed to adjust the electricity consumption to the same activity level as that in the base year of 2002-03 for meaningful like-with-like comparison. In October 2005, in a progress report on implementation of the energy-saving programme in 2004-05 submitted to the ESSC, the EMSD said that:

(a) according to preliminary analysis, the electricity consumption before normalisation showed an increase of 3.1% over that of 2002-03; and

(b) if the effects of new venues and activity increases were discounted for the major energy consuming departments, there would be an energy saving of 2.3%.

6.11 The ESSC agreed that the methodology of "normalising" the electricity consumption for activity changes should be used as a reference for future analysis of government electricity consumption.

6.12 In February 2006, the EMSD submitted a paper "Methodology of Normalising Electricity Consumption for Activity Changes" to the ESSC. The paper presented revised electricity consumption data of individual B&Ds in 2002-03, 2003-04 and 2004-05. The electricity consumption of the top 20 B&Ds and the B&Ds having big increases was adjusted, taking into account activity changes in 2004-05 vis-à-vis those in the base year of 2002-03. As stated in the paper, the normalisation process took into account the following factors:

(a) new venues occupied after 2002-03;

(b) changes in the total gross floor areas of building premises used by B&Ds;

(c) changes in the utilisation rates of premises or facilities (e.g. facilities of the LCSD and the Highways Department);

(d) changes in the volume of water handled by the WSD and sewage treated by the Drainage Services Department; and

(e) specific explanations or information provided by individual B&Ds if there were changes causing a significant impact on electricity consumption.

6.13 In June 2006, in a paper "Progress of Energy Saving in Government" submitted to the ESSC, the EMSD said that:

(a) the Government first put forward the directive that B&Ds should save 6% of electricity consumption in four years, with reference to the 2002-03 consumption. **It did not mention about any allowance for activity changes or increases/decreases in floor areas;** and

(b) progress reports stated that, compared with the electricity consumption in 2002-03, the Government on the whole had achieved a reduction in electricity consumption of 1.4% in 2003-04 and a reduction of 3.6% in 2004-05. These figures had been normalised to the same activity level and gross floor area as in 2002-03 for the major energy-consuming departments.

6.14 ***Progress report on energy saving.*** In March 2006, in a progress report, the ENB said that:

(a) comparing the electricity consumption in 2004-05 with that in the base year of 2002-03, the Government consumed 5.4% more electricity but the energy efficiency was improved by 3.6%;

(b) the 5.4% consumption growth was largely caused by the provision of new facilities and an increase in public demand for government services; and

(c) **without such factors, the energy consumption would have been reduced by 3.6%.**

6.15 ***Report to LegCo Panel.*** In December 2006, the Administration submitted a paper "Green measures in the Government" to the LegCo Panel on Environmental Affairs. As stated in the paper:

(a) the Government had pledged to reduce its electricity consumption by 6% in four years from 2003-04 to 2006-07, taking 2002-03 as the base year, equivalent to an annual saving of 1.5% of electricity;

(b) **with the concerted efforts of B&Ds, the Government had achieved a 3.6% or 76 million kWh reduction in electricity consumption during the first two years of implementation;** and

(c) the Government was well on the way to meet the 6% target.

Reporting 2005-06 energy saving

6.16 ***Report to ESSC.*** In January 2007, in a report on the progress of the energy-saving programme submitted to the ESSC, the EMSD said that the government electricity consumption for 2005-06 increased by 7.1% compared with that in the base year of 2002-03. After discounting for activity changes, the consumption was reduced by 5.6%.

6.17 ***Report to LegCo Panel.*** In April 2007, in a paper "Conservation of Energy" submitted to the LegCo Panel on Environmental Affairs, the Administration said that:

(a) with the concerted efforts of B&Ds, **the electricity consumption had been reduced by 5.6% between 2002-03 and 2005-06,** which was equivalent to an electricity saving of 120 million kWh and a reduction in carbon dioxide emissions of 84,000 tonnes annually; and

(b) the Government was well on the way to meet the 6% target in 2006-07.

Reporting 2006-07 energy saving

6.18 ***Report to ESSC.*** In October 2007, the EMSD reported to the ESSC that the "normalised" electricity consumption of B&Ds in 2006-07 was reduced by **6.9%** when compared with that in the base year of 2002-03, and that the **6%** energy-saving target over four years had been achieved.

6.19 ***Response to LegCo questions.*** In October 2007, in response to a question from a LegCo Member, the Administration said that, compared with that in the base year of 2002-03, the electricity consumption of B&Ds had been reduced by 6.9% from 2003-04 to 2006-07.

6.20 In April 2008, in response to a question from a LegCo Member, the Administration said that:

(a) to enable an objective comparison on electricity conservation, it was necessary to adopt the same operational parameters as the basis; and

(b) using the operational conditions of 2002-03 as the comparison basis, the Government had reduced the total normalised electricity consumption in 2006-07 by around 7% when compared with that of 2002-03.

Energy-saving target for office buildings set in 2005

6.21 In the 2005-06 Policy Address promulgated in October 2005, the Administration announced the setting of an energy-saving target for a 1.5% reduction in electricity consumption in all government office buildings in the calendar year 2006 (vis-à-vis 2005). This energy-saving initiative took place in parallel with the 6% energy-saving programme for all B&Ds introduced in 2003. In May 2007, the EMSD reported to the ESSC that the electricity consumption of major government office buildings in 2006 after normalisation had achieved a saving of 2.9% over 2005, while the electricity consumption before normalisation showed a reduction of 1.2%.

Audit observations and recommendations

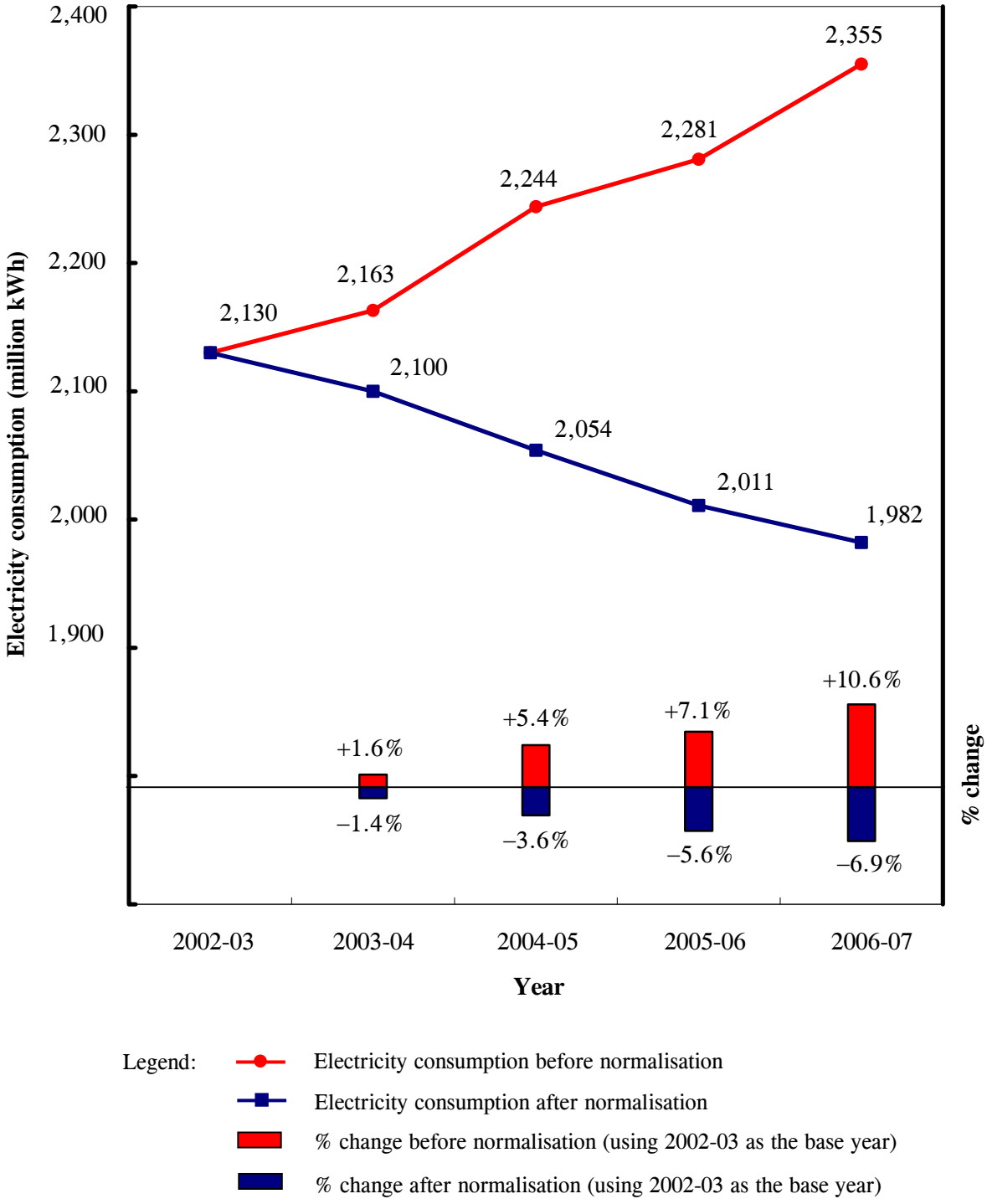
Need to clearly define the energy-saving targets

6.22 In 2003, the Administration set the targets that B&Ds should aim to cut down respectively in financial years 2003-04, 2004-05, 2005-06 and 2006-07 their electricity consumption by 1.5%, 3%, 4.5% and 6%, taking financial year 2002-03 as the base year (see para. 6.3). In June 2004, the ENB reported that, in 2003-04, the Government consumed 2.5% more electricity than that in 2002-03. The ENB also reported that the electricity consumption reduction target for 2003-04 had not been met (see para. 6.7(c)).

6.23 In 2005, the EMSD adopted a normalisation process to discount electricity consumed owing to the addition of new facilities and increases in the provision of government services (see paras. 6.10 and 6.11). The electricity consumption of B&Ds before and after the normalisation process is shown in Figure 6.

Figure 6

Electricity consumption of B&Ds
(2002-03 to 2006-07)



Source: *EMSD records and Audit analysis*

6.24 As stated in the paper submitted to the ESSC in June 2006, the EMSD said that, when the Government put forward the directive that B&Ds should save 6% of electricity consumption in four years, it did not mention about any allowance for activity changes or increases/decreases in floor areas (see para. 6.13(a)). **Audit considers that, in setting energy-saving targets in future, it is necessary to clearly set out the basis for evaluating the achievement of the targets.**

Need to clearly inform LegCo about achievement of energy-saving targets

6.25 In December 2006 and April 2007, the Administration respectively reported to the LegCo Panel on Environmental Affairs that, comparing with the electricity consumption in 2002-03, the Government had achieved a 3.6% reduction in electricity consumption between 2002-03 and 2004-05 and a 5.6% reduction between 2002-03 and 2005-06 (see paras. 6.15(b) and 6.17(a)). In October 2007, the Administration informed LegCo that, compared with that in the base year of 2002-03, the electricity consumption of B&Ds had been reduced by 6.9% from 2003-04 to 2006-07 (see para. 6.19). Audit noted that the above-mentioned savings in electricity consumption were derived after adjusting for activity changes (see para. 6.12). **Audit considers that, in reporting energy savings to LegCo in future, the ENB needs to report the savings before and after adjustments, and the reasons and basis for the adjustments.**

Room for improvement in the adjustment process

6.26 Audit noted that the normalised electricity consumption data were estimated after discounting some factors such as changes in activity levels and floor areas. Audit found that:

(a) a change in the floor area was one of the factors used for discounting the electricity consumption of the EMSD. However, the basis for estimating changes in the floor area was not consistently applied;

(b) the electricity consumption of public recreational venues and cultural centres was adjusted after deducting the full-year effect of new electrical appliances added in 2006-07. However, the electrical appliances were installed during the year and were not fully used for the whole year of 2006-07; and

(c) for the electricity consumption of public lighting installations, the increase in the total number of lighting installations between 2002-03 and 2006-07 was used as a discount factor. However, the types, usage and power rating of different lighting equipment were not taken into account.

Audit considers that the EMSD needs to keep under review the methodology of normalisation for adjusting electricity consumption.

Need for continued efforts to reduce electricity consumption

6.27 Although the electricity consumption after normalisation of all B&Ds showed a reduction of 6.9% from 2002-03 to 2006-07, Audit noted that 23 B&Ds did not achieve the saving target of 6%. As shown in Figure 6, the electricity consumption before normalisation of B&Ds increased from 2,130 million kWh in 2002-03 to 2,355 million kWh in 2006-07 (i.e. a 10.6% increase). **As the energy-saving programme for reducing electricity consumption for B&Ds was completed in 2006-07, Audit considers that there are merits for the ENB to continue implementing energy-saving programmes for B&Ds in future.** These programmes would help achieve energy and cost savings and demonstrate that the Government is taking the lead in energy conservation.

Audit recommendations

6.28 **Audit has *recommended* that the Secretary for the Environment should:**

(a) **in setting energy-saving targets in future, clearly state the basis for evaluating the achievement of the targets at the time of promulgating the targets (see para. 6.24);**

(b) **in reporting energy savings to LegCo in future, report the savings before and after adjustments, and the reasons and basis for the adjustments (see para. 6.25); and**

(c) **continue implementing energy-saving programmes for B&Ds (see para. 6.27).**

6.29 **Audit has *recommended* that the Director of Electrical and Mechanical Services should keep under review the methodology of the normalisation process for adjusting electricity consumption of B&Ds (see para. 6.26).**

Response from the Administration

6.30 The **Secretary for the Environment** accepts the audit recommendations in paragraph 6.28. He has said that the ENB will take account of the audit recommendations in setting energy-saving targets and in reporting relevant progress in future, and will continue with the efforts in implementing energy-saving initiatives.

6.31 The **Director of Electrical and Mechanical Services** agrees with the audit recommendation in paragraph 6.29. He has said that:

(a) the normalisation methodology has been under regular review in the last few years so that the EMSD could make use of the best available data to conduct the necessary normalisation. The methodology will be promulgated to B&Ds through various channels;

(b) in estimating the effect of changes in floor area in the normalisation process, if the changes in floor area were known at the time of calculation, the electricity consumption of the B&Ds would be adjusted proportionately with the changes in floor area. If data on floor area were not available or incomplete at the time of calculation, adjustment of the electricity consumption of the venues could not be made in the calculation;

(c) the EMSD did not have the effective date of the newly added equipment of the client departments. As such, normalisation was performed based on the date of taking over the equipment for maintenance by the EMSD. The calculation can be improved with the availability of more detailed information; and

(d) the data on the electricity consumption of public lighting installations were not available at the time of calculation. As such, normalisation was performed based on the information available at that time. With the availability of more detailed information, the calculation can be further improved.

Acronyms and abbreviations

Audit	Audit Commission
ArchSD	Architectural Services Department
B&Ds	Bureaux and departments
CFLs	Compact fluorescent lamps
CSD	Correctional Services Department
DH	Department of Health
EELS	Energy Efficiency Labelling Scheme
EEO	Energy Efficiency Office
EMSD	Electrical and Mechanical Services Department
EMSTF	Electrical and Mechanical Services Trading Fund
ENB	Environment Bureau
ESSC	Energy Saving Steering Committee
FC	Finance Committee
FSD	Fire Services Department
FSTB	Financial Services and the Treasury Bureau
GLD	Government Logistics Department
GPA	Government Property Agency
HKPF	Hong Kong Police Force
ICAC	Independent Commission Against Corruption
kWh	kilowatt-hours
LCD	Liquid Crystal Display
LCSD	Leisure and Cultural Services Department
LegCo	Legislative Council
PWSC	Public Works Subcommittee
WSD	Water Supplies Department