

## ITEM FOR FINANCE COMMITTEE

### HEAD 42 - ELECTRICAL AND MECHANICAL SERVICES DEPARTMENT

#### Subhead 700 General other non-recurrent

#### New Item “Study on the Potential Applications of Renewable Energy in Hong Kong”

Members are invited to approve the creation of a new commitment of \$16.5 million for conducting a study on the potential applications of renewable energy in Hong Kong.

### PROBLEM

We need to study the feasibility and potential of making wider use of renewable energy resources<sup>Note 1</sup> in Hong Kong and to formulate a strategy for implementation of those options with potential.

### PROPOSAL

2. The Director of Electrical and Mechanical Services (DEMS), with the support of the Secretary for the Environment and Food, and the Secretary for Economic Services, proposes to engage consultants to undertake a comprehensive study to investigate the viability of using renewable energy technologies in Hong Kong and to make recommendations for formulation of an implementation strategy.

**/JUSTIFICATION .....**

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Note 1

Renewable energy is a general term covering those energy flows that occur naturally and repeatedly in the environment and can be harnessed for human benefit. Examples of renewable energy resources are solar, wind, biomass and geothermal.

**JUSTIFICATION**

3. Hong Kong requires reliable and secure supplies of energy for supporting economic and social development. We have been relying mainly on fossil fuels to meet our energy needs owing to their availability, reliability, cost effectiveness, and the limited availability of alternative renewable energy resources. We do not have any fossil fuel reserves and all our primary energy needs are met by imports from the Mainland and other countries. The average annual growth rates for primary and final energy requirements for the years 1995 to 1999 inclusive were about 7% and 13% respectively. Over the same period, consumption of electricity grew at an average annual rate of about 4%.

4. Greenhouse gas emissions are largely by-products of burning fossil fuels. The most significant greenhouse gas is carbon dioxide. It has been estimated that the carbon dioxide emission from Hong Kong's energy sector for the year 2000 is about 28 million tonnes. If the growth in energy consumption continues on present trends, the projected emissions of carbon dioxide for the year 2010 are about 39 million tonnes, an increase of 39% over the 2000 level.

5. Introducing more renewable energy sources may help contain fossil fuel use, thereby helping to contain external purchase of fuels and to contain greenhouse gas emissions.

6. With growing concern about energy conservation and environmental protection, some local research institutions have started research into renewable energy. A great deal more research has taken place overseas. We consider it opportune to commission a comprehensive study to examine the latest developments in renewable energy technologies and the potential for local applications in the short and long term. The study will help us to formulate a development strategy using renewable energy technologies to reduce pollution arising from energy use and to reduce our reliance on fossil fuels.

7. The proposed study will be carried out in two stages -

(a) Stage 1 will collect and analyse information on renewable energy technologies including the following key tasks -

(i) evaluate the different renewable energy technologies to identify those appropriate for Hong Kong conditions, establish requirements and specifications for suitable renewable energy equipment and provide an estimate of the potential scale of application;

/(ii) .....

- (ii) identify the practical arrangements to support the introduction and maintenance of new renewable energy technologies; and
- (iii) devise a plan to address the priorities and preferences relating to the promotion of cost-effective renewable energy technologies.

A draft report will be made available to the Electrical and Mechanical Services Department (EMSD) for consideration in ten months' time and the Stage 1 report will be made public soon afterwards.

- (b) Stage 2 involves a design and build pilot project to install photovoltaic (PV)<sup>Note 2</sup> panels in existing government building(s) to provide technical data to assess the use of Building Integrated Photovoltaic (BIPV) systems. A draft report will be made available to EMSD for consideration in 24 months.

Encl. 1 A detailed breakdown of the key tasks of the study is at Enclosure 1.

8. The proposed timetable for carrying out the study is as follows -

- |     |   |               |
|-----|---|---------------|
| (a) | Commencement of Stage 1 study   | November 2000 |
| (b) | Completion of the Stage 1 Report  | August 2001   |
| (c) | Commencement of the selection and tendering process for the Stage 2 study                                   | July 2001     |
| (d) | Commencement of the installation phase of the Stage 2 study   | October 2001  |
| (e) | Completion of the installation phase of the Stage 2 study and commencement of monitoring period (12 months) | June 2002     |
| (f) | Completion of the Stage 2 Report  | July 2003     |

9. We expect the study's findings and recommendations to identify practical opportunities for government, professionals, building developers and owners to make wider use of renewable energy resources to meet their needs.

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Note 2

Photovoltaic panel is a panel completed with built-in specially prepared semi-conductors that allow the direct conversion of light energy from the sun into electricity.

10. DEMS has carefully assessed the capability of his department to undertake the study in-house. Though his in-house staff has the theoretical knowledge needed to deal with many different areas of technology, expertise with practical experiences in executing large-scale renewable energy projects is not available in the department because most of the work in developing and using the relevant technologies has been carried out overseas. DEMS has concluded that the wide range of issues covered by the study falls beyond the capacity and expertise of his department. If the study is deferred, we will be unable to give satisfactory support to the development of policies and programmes for more sustainable generation of energy. Increasing reliance on renewable energy sources is an indicator of more sustainable development practices.

### FINANCIAL IMPLICATIONS

11. We estimate the total cost of the study to be \$16.5 million, made up as follows -

	<b>\$ million</b>
(a) Consultant's staff cost	
(i) Collation of information	0.46
(ii) Information analysis	3.04
(iii) Specification and tender documents for the pilot project	1.20
(iv) Pilot project monitoring and data analysis	1.02
(b) Implementation of a design and build BIPV pilot project	
(i) Installation of photovoltaic panels and associated control equipment	8.20
(ii) Engineering works	2.05
(c) Contingencies	0.50
<b>Total</b>	<b>16.47</b>
	<b>Say \$16.5 million</b>

Encl. 2 A detailed breakdown of the cost is at Enclosure 2. We will commission the study and award the pilot project on a lump-sum basis.

12. Subject to Members' approval, we plan to phase expenditure as follows -

	<b>\$ million</b>
2000-01	2.50
2001-02	8.30
2002-03	3.80
2003-04	1.90
	16.50

13. The proposal has no significant recurrent financial implications. The BIPV system will incur minimal maintenance cost and this can be offset by potential savings resulting from the reduction in electricity consumption.

14. Subject to Members' approval, we shall offset any supplementary provision required in 2000-01 by deleting an equivalent amount from Head 106 Miscellaneous Services Subhead 789 Additional commitments.

## **BACKGROUND INFORMATION**

15. The 1999 Policy Address promulgated a number of major policy objectives including the following -

- (a) to improve Hong Kong's urban, rural and marine environment, and to optimise the use of resources so as to reduce pollution and waste; and
- (b) to ensure the provision of sufficient, reliable and reasonably priced supplies of energy for Hong Kong.

In pursuing these policy objectives, the Secretary for the Environment and Food considers that to encourage the use of renewable energy in buildings should be one of the key result areas to reduce pollution arising from energy generation from fossil fuels. At the same time, the Secretary for Economic Services also proposes to study the feasibility and potential for further application and use of alternative forms of power generation and the means to promote and implement those with potential.

16. Based on existing local and overseas research findings, it is envisaged that PV applications are most suitable for Hong Kong. Overseas research indicates that the cost of installing PV system will drop from US\$3 to 7 per watt in 2000 to US\$1 to 1.5 per watt in 2010 under the most favourable scenario. This predicted costing level is likely to be comparable with the cost of electricity generation using fossil fuels.

17. We briefed the Legislative Council Environmental Affairs Panel on the proposed study on 10 February 2000 and 2 March 2000. Members supported the proposal.

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Environment and Food Bureau  
June 2000

**Detailed Breakdown of the Key Tasks**

(A) Evaluation of Technologies

1. Documenting the status of renewable energy technologies and the extent to which these technologies have already been deployed.
2. Researching into the potential advancement of renewable energy technologies that are in the process of being deployed or are likely to be available for deployment in the future.
3. Evaluation of different renewable energy technologies appropriate for use in Hong Kong conditions, establishing requirements and specification for suitable renewable energy equipment.
4. Evaluation of the potential cost benefits of adopting different renewable energy technologies in Hong Kong in terms of delivery capacity, energy efficiency, scale of application and greenhouse gas emissions reduction, etc.

(B) Institutional Considerations

1. Identifying all the institutional arrangements that are needed to support the introduction and maintenance of new renewable energy technologies.
2. Identifying practical means to encourage or stipulate power utilities to supply a proportion of power from renewable energy sources.
3. Putting forward options for technical and institutional arrangements for feeding electricity from stand-alone electricity power generation systems to the grid of the power companies.

(C) Promotional Considerations

1. Reviewing overseas experiences in the promotion and implementation of the use of renewable energy technologies and identifying the best cases that are likely to be most appropriate for Hong Kong.
2. Identifying appropriate means to encourage local developers to adopt renewable energy technologies in their projects.

3. Devising a strategy addressing priorities and preferences relating to the promotion of renewable energy technologies in Hong Kong after identification and evaluation of local obstacles that may lengthen the deployment process of renewable energy technologies or even prevent it.
4. Outlining policy measures and programmes needed to encourage widespread implementation of cost-effective renewable energy technologies.

(D) Pilot Project

1. Undertaking a pilot project for photovoltaic panel installation in government building(s) to provide technical data for the study on Building Integrated Photovoltaic (BIPV) systems.
2. Preparing technical specification and related contract documents required for the pilot project using BIPV systems to generate electrical power and the subsequent supervision of the pilot project.
3. Collecting technical data from the pilot project and carrying out a desktop study on the effectiveness of a full scale BIPV system on the generation of electricity under Hong Kong conditions.

**Enclosure 2 to FCR(2000-01)28**

**Breakdown of the Study Fees**

<b>Consultant's staff costs</b>		<b>Estimated man months<sup>2</sup></b>	<b>Average MPS salary point<sup>1</sup></b>	<b>Multiplier factor<sup>1</sup></b>	<b>Estimated fee (\$million)</b>
(a) Collection and collation of information	Professional	2	38	2.4	0.28
	Technical	4	14	2.4	0.18
					<hr/> 0.46
(b) Information analysis					
1. Analysis of information	Professional	8	38	2.4	1.12
	Technical	14	14	2.4	0.63
2. Compilation of preliminary report	Professional	6	38	2.4	0.84
	Technical	10	14	2.4	0.45
					<hr/> 3.04
(c) Specification and tender documents for the pilot project	Professional	6	38	2.4	0.84
	Technical	8	14	2.4	0.36
					<hr/> 1.20
(d) Pilot project monitoring and data analysis					
1. Field work	Professional	2	38	2.4	0.28
	Technical	3	14	2.4	0.14
2. Data analysis and compilation of final report	Professional	3	38	2.4	0.42
	Technical	4	14	2.4	0.18
					<hr/> 1.02
<b>Total staff costs</b>					<b>5.72</b>

/Implementation .....

	<b>Estimated fee (\$million)</b>
<b>Implementation of a design and build BIPV pilot project</b>	
(a) Installation of photovoltaic panels and associated control equipment	
1. Photovoltaic panels <sup>3</sup>	6.14
2. Control equipment	1.03
3. Monitoring equipment	1.03
	<hr/> 8.20
(b) Engineering works	2.05
<b>Total costs for implementing a design and build BIPV pilot project</b>	10.25
<b>Contingencies</b>	0.50
	Total      16.47
	Say <u>\$16.5 million</u>

**Notes -**

1. A multiplier factor of 2.4 is applied to the average Master Pay Scale (MPS) point to arrive at the full staff cost including the consultant's overheads and profit. The staff will be employed in the consultant's offices. (At present, MPS Point 38 is \$57,525 per month and MPS Point 14 is \$19,055 per month.)
2. These are only estimates. The actual man months and actual fees required will be known when we have selected the consultant through the usual competitive bidding system on a lump sum fixed price basis.
3. The high material cost for PV panel is due to the need for a substantial amount of PV panels (approximately 1 000 square metres) for the pilot project.