香 港 特 別 行 政 區 政 府
The Government of the Hong Kong Special Administrative Region

政府總部
環境運輸及工務局
香港花園道美利大廈

Environment, Transport
and Works Bureau
Government Secretariat
Murray Building, Garden Road,
Hong Kong

Ref : ETWB(W) 815/70/02
Group : 12

30 November 2005

Environment, Transport and Works Bureau
Technical Circular (Works) No. 16/2005

Adoption of Energy Efficient Features and Renewable Energy Technologies in Government Projects and Installations

Scope

This Circular sets out the guidelines and procedures on the adoption of energy efficient features and renewable energy technologies in government projects and installations.

Effective Date

2. This Circular takes immediate effect.

Effect on Existing Circulars

3. This Circular shall have no effect on existing circulars.

Background

4. The rapid depletion of fossil fuels and the emission of greenhouse gases from conventional power generation plants have drawn world-wide attention to the compelling need to conserve energy and to look for alternative energy sources. The

adoption of energy efficient devices and inclusion of renewable energy technologies is becoming a global trend in striving for a sustainable future.

5. To promote energy efficiency in Hong Kong, the Electrical & Mechanical Services Department (EMSD) has published a set of energy efficiency codes, namely:

(a) Code of Practice (CoP) for Energy Efficiency of Lighting Installations;

(b) CoP for Energy Efficiency of Air-conditioning Installations;

(c) CoP for Energy Efficiency of Lift & Escalator Installations;

(d) CoP for Energy Efficiency of Electrical Installations; and

(e) Performance-based Building Energy Code (Note: following the requirements in this Code will be equivalent to compliance with the previous four Codes mentioned in (a) to (d) above).

In addition, Buildings Department (BD) has issued a CoP for Overall Thermal Transfer Value in Buildings under the Building (Energy Efficiency) Regulation.

6. To encourage adoption of the energy efficient features in buildings, EMSD launched in 1998 the "Hong Kong Energy Efficiency Registration Scheme for Buildings". Any building designed in compliance with one or more of the CoP mentioned in paragraph 5 above can apply for registration under the Scheme. Upon acceptance, a registration certificate will be issued. In addition, EMSD promotes the adoption of water-cooled air-conditioning systems to reduce electricity consumption.

7. To promote renewable energy, EMSD commissioned a consultancy study in 2000 on its applications in Hong Kong, and undertook a number of in-house studies on the related technologies including a demonstration of building-integrated photovoltaic (BIPV) system at the Wanchai Tower.

8. The Architectural Services Department (ArchSD) has revised its specifications to strengthen the technical requirements on energy efficiency, issued departmental instructions requiring compliance with the above-mentioned energy efficiency codes, and adopted renewable energy technologies in projects where feasible. Other Works Departments have also tried out energy efficient features and renewable energy technologies in specific installations.

9. To advocate the adoption of more energy efficient features and renewable energy technologies in government projects and installations, a unified policy is to be established for all Works departments.

Policy

10. All capital works projects and minor works projects, including retrofit and renovation projects funded by block votes, irrespective of being designed by in-house staff or by consultants, or by contractors in case of Design and Build contracts, shall incorporate energy efficient features and renewable energy technologies into their design according to the following guidelines where appropriate:

(a) For projects with building structures, compliance with the energy efficiency codes as mentioned in paragraph 5 shall be the baseline for the building design.

(b) Besides sub-paragraph (a) above, the energy efficient features listed in **Appendix A** shall be incorporated into the building design as far as practicable.

(c) Seawater cooling or cooling towers shall be adopted wherever a project has a central air-conditioning system and has a reliable source of seawater nearby, or is within a zone suitable for using fresh water to operate cooling towers as determined by the Working Group of the Pilot Scheme on Wider Use of Fresh Water in Evaporative Cooling Tower for Energy Efficient Air-conditioning Systems (hereinafter to be referred as the "Working Group").[1]

(d) Energy consumption monitoring systems shall be installed for all projects for:

(i) each piece of equipment consuming 50kW or more; and

(ii) each floor or major area with sub-main distribution exceeding 200A (3-phase 380V) current capacity.

(e) Renewable energy technologies shall be incorporated so far as reasonably practicable into a project wherever the project satisfies one or more of the criteria set out in **Appendix B.** Where the project can satisfy more than one criteria simultaneously resulting in more than one kind of renewable energy

[1] For buildings equipped with water cooled air-conditioning systems using fresh water cooling towers, the project office shall design, and the building management should operate the plant in accordance with the requirements as detailed in the booklet *Pilot Scheme for Wider Use of Fresh Water Evaporative Cooling Towers for Energy Efficient Air-conditioning Systems* published by EMSD, and should be vigilant about the prevention of Legionnaires' Disease.

technology applicable, the project officer can decide (in consultation with EMSD as necessary) if one or more of them is/ are to be adopted.

11. In addition to paragraph 10, Works Departments shall consult the Director of Electrical and Mechanical Services (DEMS) in the following cases for review on the potential application of energy efficient features and renewable energy technologies, which may include those listed in Appendices A and B, or beyond:

(a) all building projects with central air-conditioning systems, and/or lift or escalator installations;

(b) the generic design for quasi-standardized building projects, e.g. schools, public toilets, fire stations, etc.;

(c) fixed installations, e.g. swimming pools, pumping stations, water treatment works, sewage treatment works, etc., and those with furnaces or incinerators;

(d) projects located within 2 km of the periphery of a landfill site or a waste energy source, e.g. incinerator plant, sewage treatment plant;

(e) prestigious projects which may draw wide media attention; and

(f) projects where no conventional energy source supplied by public utilities is available.

12. Works departments shall endeavour to identify opportunities to upgrade existing government buildings or installations so as to enable energy efficient features and renewable energy technologies be incorporated. For example, the provision of photovoltaic panels or solar water heating system can be carried out simultaneously during the roofing maintenance works of a building. This can be done by treating it as a capital works project or minor works project with work programme to be agreed with the client departments of the buildings or installations, and subject to the relevant funding rules.

Funding Arrangement

Capital Works

13. The costs for the energy efficient features and/or renewable energy technologies for a capital works project shall be allowed for in the estimates during the preparation of the Technical Feasibility Statement (TFS).

14. Where there is NO such allowance in the project, the exclusion shall be mentioned in the covering memo of the TFS to ETWB, with a copy sent to DEMS. The memo should explain the exclusion, with the necessary details.

15. Only if the energy efficient features and/or renewable energy technologies form the core or a substantial part of the project should it be appropriately mentioned in the Public Works Subcommittee (PWSC) submission.

Minor Works

16. Works Departments shall prepare a 5-year works programme to upgrade the **energy efficiency** of existing buildings and installations (e.g. by replacing electrical installations/equipment with energy efficiency models) under their purview. Such programme shall be included in the estimates for block votes.

17. In addition, Works Departments shall prepare a 2-year works programme for the installation of **renewable energy technologies** in existing buildings and installations. The cost for the provision can by funded as minor works projects through block votes.

Reporting

18. The following are to be reported by Works Departments to DEMS for monitoring the progress in the adoption of energy efficient features and renewable energy technologies:

Capital Works

(a) The list of capital works projects entering Category B in the reporting period and their estimated nominal energy savings (in kWh) due to the adoption of energy efficient features.

(b) The list of capital works projects entering Category B in the reporting period with the adoption of renewable energy technologies, including the type of technology adopted and the generation capacity in kW.

Minor Works

(c) The list of minor works projects approved in the reporting period included as

part of their alteration, addition and improvement work for the installation of energy efficient features with the estimated nominal energy savings (in kWh), and/or renewable energy technologies installed and generation capacity in kW respectively.

(d) The rolling 5-year works programme under paragraph 16 above to upgrade existing buildings and installations through block votes to improve their energy efficiency by using energy efficient features.

(e) The rolling 2-year works programme under paragraph 17 above for the installation of renewable energy technologies in existing buildings and installations through block votes.

Renewable Energy in General

(f) The operating condition of renewable energy installations provided through any of the above means, with the minimum scope as given in **Appendix C,** which may be extended from time to time.

19. DEMS will determine the reporting format and issue call memos to Works Departments for the information in paragraph 18, which may be adjusted as necessary. Generally, all of items (a) to (f) in that paragraph are to be reported semi-annually covering the months from April to September, and from October to March. All reports sent to DEMS shall be copied to ETWB (Attn: CAS(W)5) for information.

20. Works departments should ensure that the operating data relating to renewable energy technologies, if installed, are collected regularly and preferably through an automatic recording devices.

Database and Feedback

21. The experience from the use of energy efficient devices and renewable energy technologies in public works projects, particularly the efficiency of the latter, shall be gathered and input to a database to be maintained by DEMS, who will make available summaries of such data on the government intranet (the Central Cyber Government Office) (CCGO) for reference by all government departments.

22. A dedicated web folder titled "Adoption of Energy Efficient Features and Renewable Energy Technologies in Government Projects" will be created and maintained by EMSD under the topic "Green Management" on the CCGO web page

(http://portal.ccgo.hksarg). The content of this web folder will include, but is not limited to, the following:

(a) Energy Efficiency Codes and Building Energy Codes published by EMSD and BD;

(b) Designated zones for the use of fresh water operated cooling towers for water-cooled air-conditioning system as determined by the Working Group;

(c) Information on the "Pilot Scheme for Wider Use of Fresh Water in Evaporative Cooling Towers for Air-conditioning Systems";

(d) Map of mean wind power density over Hong Kong;

(e) Relevant technical documents published by ArchSD;

(f) Information on energy efficient technologies;

(g) Information on renewable energy technologies;

(h) List of energy efficient features in government projects (including information about progress of adoption of such in government projects); and

(i) List of renewable energy installations in government projects.

23. Any query about energy efficient features and renewable energy technologies should be directed to the Chief Engineer/Energy Efficiency A of EMSD.

24. This circular shall be reviewed two years after promulgation.

(C S Wai)
Deputy Secretary for the Environment,
Transport and Works (Works) 2

Appendix A

Energy Efficient Design Features for New Buildings and Retrofits

Item	Feature
1	**General Building Configuration**
1.1	Building orientation to be carefully chosen, e.g. longer fronts to face north/south and shorter fronts to face east/west
1.2	Building fabric materials to be carefully chosen
1.3	Low thermal conductivity materials for building envelope insulation
2	**Building Energy Management System**
2.1	Programmable on/off control for lighting
2.2	Programmable on/off control for air-conditioning system
2.3	Optimum control and scheduling of air-conditioning plants
2.4	Recording of energy consumption trends for energy audit
3	**Lighting Installation**
3.1	Electronic ballasts for fluorescent lamps
3.2	T5 (or better) fluorescent lamps for general lighting
3.3	T5 (or better) fluorescent tubes with parabolic diffusers for tall headroom locations
3.4	Lamps with high-efficacy, e.g. compact fluorescent, induction lamp
3.5	Low energy consumption signs - exit signs, direction signs, occupancy signs, e.g. LED technology
3.6	Task lights for work areas in offices, with reduced illumination level of general lighting
3.7	Photo-sensors for independent control of lighting at perimeter zones close to windows
3.8	Timer-operated lighting
3.9	Occupancy sensors for lighting control, e.g. for office rooms or office cells

Item	Feature
3.10	Digital control of lighting for flexible assignment of luminaries to different control groups, e.g. DALI technology
4	**Air-conditioning Installation**
4.1	Connection to District Cooling System
4.2	Chillers with high coefficient-of-performance (COP)
4.3	Heat recovery chillers for reclaiming waste heat
4.4	Seawater cooled condensers
4.5	Evaporative cooling towers using fresh water as cooling media
4.6	Total energy heat pumps
4.7	Heat pumps
4.8	Thermal wheels/Heat wheels, e.g. total heat wheel to reclaim energy from exhaust air
4.9	Variable speed drives
4.10	Heat pipes
4.11	Multi-zone variable air volume (VAV) system
4.12	Free cooling using outdoor air
4.13	Demand control of fresh air supply
4.14	Variable secondary chilled water flow
4.15	Low piping losses
4.16	Centralized control of room temperature settings
4.17	Room temperature sensing devices (such as thermostats) to be properly located to more accurately reflect room conditions
4.18	Occupancy sensor control, e.g. for office rooms
4.19	Computerized / programmable control for the system
4.20	Separate distribution systems for areas with very different operation characteristics
4.21	Control of air leakage level (positive building pressure)

Item	Feature
4.22	Automatic condenser tube cleaning equipment
4.23	Due consideration about chiller part-load efficiencies
5	**Lift & Escalator Installation**
5.1	Variable voltage variable frequency motor drives
5.2	Energy-efficient gear drives for escalators
5.3	Lift idling provision
5.4	Shutting off of fan & lighting in lift after no occupancy for certain time
5.5	Occupancy sensors to control escalator on/off
6	**Electrical Installation**
6.1	Equipment with high power factor
6.2	Capacitor banks, where power factor is less than 0.9 lagging
6.3	High-efficiency motors
6.4	Metering provisions for energy consumption check
6.5	Equipment with low harmonic distortion
6.6	Balancing currents among phases
6.7	Low copper losses in distribution circuits

Criteria for Adoption of Renewable Energy Technologies in Government Projects or Installations

A. Adoption of solar water heating technology

Solar water heating should be adopted for premises with centralized hot water supply systems such as hospitals, games halls, barrack blocks, swimming pools, hostels, etc.

B. Adoption of photovoltaic (PV) technology

1. For buildings with footprint area or infrastructure projects involving open spaces or flat surfaces with area greater than 1,000 m^2, PV panels should be installed where practicable with due consideration given to the shading effects caused by nearby buildings/ structures.

2. Building-integrated photovoltaic (BIPV) panels on façades should be adopted provided it is allowed by the structural and architectural design of the building, and will not be shaded by nearby structures.

3. For remote areas with no electricity network practically available for providing electric power, PV alone or PV-wind hybrid power supply installation should be adopted.

[Note: The design of the PV installations can be operated in parallel with the electricity grid where necessary.]

C. Adoption of wind turbine technology

For sites of mean wind power density above 200W/m^2, without nearby obstructions to the flow of wind and having the advantage of height or exposure to the sea, wind turbines (e.g. rooftop turbines) should be installed where practicable with due consideration given to issues relating to noise, visual and safety.

D. Adoption of bio-gas heating/ electricity generation technology

For sites with bio-gas source available, the use of bio-gas as a fuel for heating and electricity generation should be adopted where practicable with due consideration given to the health risk impacts caused by the emission of flue gases.

Appendix C

Information to be supplied to DEMS about Adoption of Renewable Energy Technologies in Government Projects or Installations

(1) Basic Information for All Renewable Energy Installations

(a) Department Name
(b) Project Name
(c) Location
(d) Project Completion Date
(e) In-house Design or Consultant
(f) Renewable Energy Technology Type
(g) Total Installed Capacity/ Quantity (broken down for each technology/type)
(h) Total Installation Cost
(i) Estimated Annual Electrical Energy Output (kWh/year)

(2) Solar Photovoltaic (PV) System

(a) Tilt Angle of PV Panel
(b) Orientation
(c) Total Surface Area of PV Panel (m^2)
(d) Building Integrated or Standalone Installation
(e) Grid Connection Arrangement
(f) Manufacturer/Supplier/Brand of Installation
(g) Nominal DC Output Voltage (V)
(h) Monthly DC Electrical Energy Output (kWh/month)
(i) Monthly AC Electrical Energy Output (kWh/month)
(j) Monthly In-plane Solar Irradiation (kWh/m^2/month)

(3) Solar Water Heating System

(a) Manufacturer/Supplier/Brand of Installation
(b) Tilt Angle of Solar Collector
(c) Orientation
(d) Total Surface Area of Solar Collector (m^2)
(e) Hot Water Storage Capacity (m^3)

(f) Monthly Mean In-plane Solar Irradiation (MJ/m^2/month)
(g) Monthly Mean Solar Energy Absorbed by System (MJ/month)
(h) Monthly Electrical Energy Consumption of Circulating Pump (kWh/month)

(4) Wind Power System

(a) Type (whether rotation axis is vertical or horizontal)
(b) Wind Turbine Tower Height (m)
(c) Monthly Mean Wind Speed (m/s)
(d) Monthly Mean Wind Direction (degrees azimuth)
(e) Manufacturer/Supplier/Brand of Installation
(f) Monthly DC Power Output (kWh/month)
(g) Monthly AC Power Output (kWh/month)
(h) Building Integrated or Standalone Installation

(5) Bio-gas Heating/ Electricity Generation System

(a) Heating or Electricity Generation Installation
(b) Grid Connection Arrangement
(c) Manufacturer/ Supplier/ Brand of Installation
(d) Monthly Bio-gas Consumption (m^3 /month)
(e) Monthly Heating or AC power Output (MJ/month or kWh/month)