

Building Integrated Photovoltaic System Pilot Project

Introduction

With the worldwide attention focusing on the topic of sustainable development, in particular after the World Summit held in Johannesburg in September 2002, local interests in the use of renewable energy resources has grown dramatically, largely as a result of concerns over environmental degradation. The burning of fossil fuels for energy generation releases greenhouse gases into the atmosphere causing global warming and acid rain. These climate changes may be potentially harmful to human health, food production and our living environment.

Apart from the environmental problems, fossil fuels will inevitably be exhausted. Renewable energy produced from sustainable natural resources such as solar, wind and biomass is an energy resource that will not run out. Also, most renewable energy are considered as clean energy resources, and they do not release any gaseous or liquid pollutants during their power generation processes.

In November 2000, Electrical and Mechanical Services Department (EMSD) commissioned a 2-stage consultancy study to investigate the viability of using renewable energy technologies in Hong Kong. The consultancy study will be concluded in mid 2004.

Stage I Study

The Stage 1 Study evaluates the potential of various forms of renewable energy for wide-scale local use; and the related legal, institutional and promotional issues. It also makes recommendations for formulating an implementation strategy.

Upon reviewing the current technological trends and applications, and taking into account Hong Kong's local characteristics, renewable energy that are considered potentially feasible for wide-scale application in Hong Kong include: -

- (1) Solar power (solar photovoltaic),

- (2) Wind power, and
- (3) Energy from waste.

Hong Kong is regarded mildly rich in solar energy resource. The overall potential resource of photovoltaic (PV) power is estimated to be around 16% of the 2002 annual electricity consumption in Hong Kong.

According to EMSD's study [1], PV systems are mainly divided into 2 categories: -

- (1) Building integrated photovoltaic (BIPV) system; and
- (2) Non-BIPV system.

The BIPV type is usually mounted on the roof or integrated to facade and external walls of a building, while the non-BIPV type can be built along highway noise barrier, slopes, etc.

Stage II Study

The Stage 2 Study is a pilot project involving the installation of a BIPV system at Wanchai Tower (Figure 1) which is a high rise government office building located in congested urban area. The installation works commenced in late April 2002 and completed in end 2002.



Figure 1: Wanchai Tower

The objectives of this pilot project are to undertake a detailed assessment of the effectiveness of BIPV system in generating electricity under the geographical and climatic conditions of Hong Kong, and to demonstrate to the general public the potential applications of PV technologies in buildings.

The project involves some 500 m² of PV panels with an installed capacity of 55 kW. The annual energy yield is estimated to be around 30,000 kWh and about 18 tonnes of carbon dioxide emission from the power station can be avoided each year. The system helps to reduce greenhouse gas emissions, and hence makes a contribution towards a better environment.

All PV panels have been installed facing south to receive maximum solar irradiation. To demonstrate the applicability of photovoltaic technologies locally, the BIPV system is divided into 3 different sub-systems. They are: -

(1) A rack type sub-system (Figure 2) comprising 165 m² of standard type poly-crystalline PV panels (20 kW). It is installed on titled support frames on the upper roof of the building.



Figure 2: Rack Type Sub-system

(2) A sunshade-screen type sub-system (Figure 3) comprising 232 m² of mono-crystalline PV panels (25 kW) in the form of double-glazed panels completed with integrated PV cells. The panels are externally mounted on the building façade to provide shading for the upper portion of all south-facing windows from 1st to 12th floors inclusive.



Figure 3: Sunshade Type Sub-system (Interior view)

(3) A skylight type sub-system (Figure 4) comprising 96 m² of mono-crystalline PV panels (10 kW) in the form of double-glazed panels completed with integrated PV cells. It is mounted vertically to replace some of the glass-infill of the existing glass atrium at the front entrance hall.

Electrical power generated from the BIPV system will supplement the existing electricity supply system of the building to meet the electrical loads of the building.

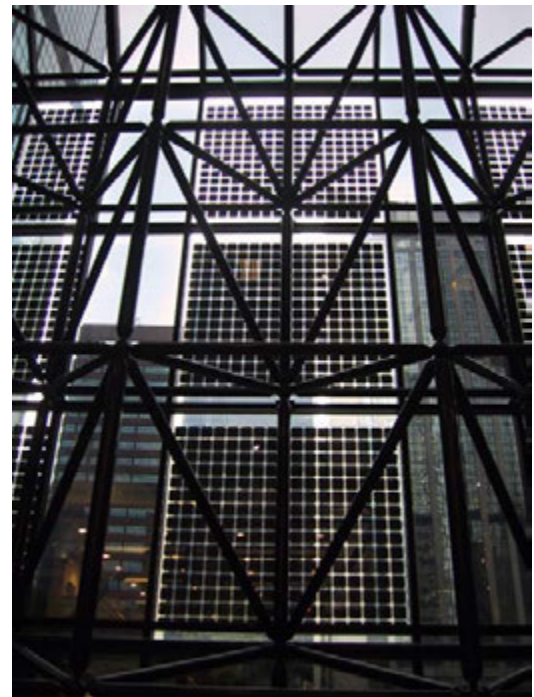


Figure 4: Skylight Type Sub-system – Interior view

Performance

The performance of the BIPV system installed at Wanchai Tower will be closely monitored by EMSD until



early 2004. The technical data collected will be used to assess the effectiveness of the BIPV system on power generation under Hong Kong's climatic conditions.

Publicity

This pilot project attracts a lot of public interest and, in fact, a number of visits have already been arranged.

For example, prior to the LegCo Panel Meeting where the issue on renewable energy development would be discussed, five members of the Environmental Affairs (EA) Panel of Legislative Council visited the BIPV installation at Wanchai Tower on 4 February 2003. Details of the installation were explained to the LegCo members during their visit.



Figure 5: LegCo Members Visited Wanchai Tower

In addition, an information display panel (Figure 6) has been installed at the building's main entrance to disclose real time operational data to the general public. The data include solar irradiance, power output, cumulative energy generated and CO₂ avoided by the BIPV system. The information, which is also accessible through the Internet (Figure 7) at the Internet Protocol address of "202.130.116.90", will help the general public to understand the concept of PV technology.



Figure 6: Information Display Panel for Public



Figure 7: BIPV Website for Public

Reference

- [1] The Executive Summary of the Stage 1 Study on the Potential Applications of Renewable Energy in Hong Kong. EMSD, Nov 2002. "http://www.emsd.gov.hk/emsd/e_download/wnew/stage.pdf"