PROMOTING SOLAR ENERGY

Kirklees Council – Sackville Street Solar Electricity (PV) demonstration – a Case Study

Introduction

The Sackville Street Solar Electricity (or Photovoltaic (PV)) project focuses on a group of social houses which were recently built by Kirklees Community Association in Ravensthorpe, West Yorkshire. The scheme consists of a series of PV installations on 31 tenanted properties. The project is part of an European consortium scheme, SunCities, and was one of the first 'field trial' PV projects prior to the establishment of the UK's Major (PV) Demonstration Programme.

The Sackville Street project was the first installation in the SunCities project. This European-funded inititaive, with partners from Holland and Germany, aimed to install almost 3 MW (megawatts) of solar electricity onto housing across the partner countries. In Kirklees this includes a total of 350 kWp solar photovoltaic (PV) systems and 63 solar thermal systems. Around 518 households have been involved across Kirklees, including elderly tenants and families with young children. They will benefit from free solar electricity and can expect to save up to £50 a year on their electricity bill. The SunCities project was recognised by the prestigious Ashden Awards for excellent local sustainable energy projects in 2006.

How a solar PV system works.

The heart of a solar PV system is the **solar cell**. There are many different types of technology used for solar cells but they all generate electricity through the *photovoltaic effect.* An electrical field is created near the top surface of the solar cell when sunlight strikes the surface of a PV cell; this electrical field provides momentum and direction to light-stimulated electrons, resulting in a flow of current when the solar cell is connected to an electrical load. A number of cells are hard-wired together usually in the format of a **"module"** or a **"solar tile"**. The tiles or modules are then connected together to form the complete solar system to provide the required power. With power conversion equipment, the electricity produced by the PV systems (DC – direct current) can be converted into alternating current (AC), compatible with conventional appliances. This also allows solar PV systems to be connected to the *electricity grid,* so that power can be exported (to the local power network), rather than having to be stored.

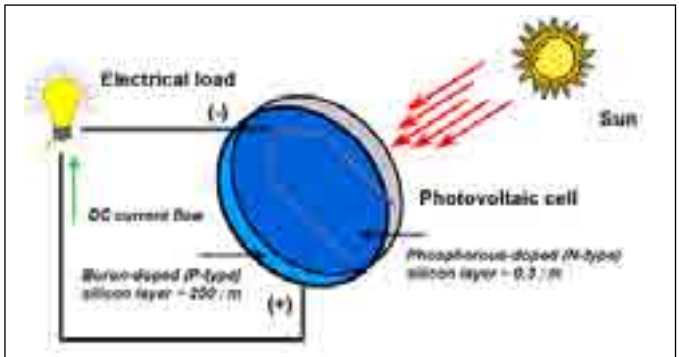

Figure 1. Diagram of silicon type photovoltaic cell.

Figure 2. Completed installations

Project Development

Initial design development was carried out by the technical consultants, ESD, the tenants at that time were consulted about the scheme and unanimous support was given, which gave the green light to go ahead. The project installations were tendered to a number of PV system suppliers in the UK and construction work started in the autumn of 2002. Final commissioning of the project was completed at the beginning of 2003.

Project Profile

Scheme managed by:	Kirklees Council, Environment Unit
Housing developer and management company :	Kirklees Community Association
Technical support:	Energy for Sustainable Development
Installation contractor:	Solar Century
System size:	40 kWp
Number of properties:	31 (tenant lets)
Average size per residence:	1.3 kWp
Module type:	Framed poly-crysalline silicone module
Structural integration:	Aluminium frame attached to roof trusses, with clip-on module systems
Installation completion :	January 2003
Total Costs (equipment and installation only):	£187,000 (£4.8/Wp)
Monitoring:	2 years detailed technical monitroing commenced February 2004. Social monitoring conducted summer 2005

Figure 3. Plan of site and PV orientation

In addition to the functional aspects of a PV systems, i.e. power production, the Sackville Street project was been designed to meet a number of key objectives: value, ease of installation, ease of maintenance and architectural coherenece. The final design solution is a straightword 'bolt-on' system that achieves these objectives. As Figure 4 shows, it utilises a simple sub-frame (Aluminum) which is fixed to the roof timbers through a 'roof hook' device. This fits between tiles and is bolted to the existing timber frame of the roof. The solar panels are then clipped on directly to the sub-frame. Electical connections are passed through the roof to a inverter device, and in some cases also a series of monitoring devices, within the roof space. The AC cabling from the inverter devices then runs directly into the consumer unit (fuse box) from where power can either supply the household or be exported into the local electricity network. The design enables easy access to both the panels and control equipment, allowing for replacement and maintenance o be easily carried out.

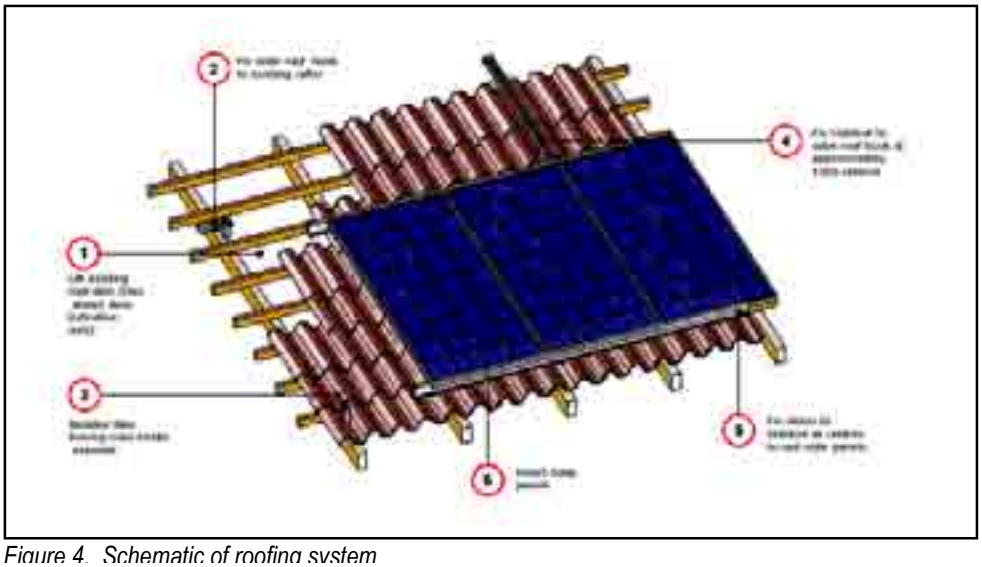

Figure 4. Schematic of roofing system

Benefits to tenants

The Heron Close Solar PV project was initiated under Kirklees Council's on-going commitment to solar PV. As a pilot project it was funded with a signifcant proportion of grant funding, from the DTi and the EU Commisison. Tenants therefore did not contribute to the development of the scheme, nor do they pay for the electricity generated. The tenants receive direct benefit as the electrcity generated either:

a) displaces electricity they would otherwise have to purcahse from their electricity supplier
b) can be sold to their electricity supplier, i.e. exporting power under a "net metering" arrangements"

Figure 5. Typical meter box with import and export meters

The following illustrates the benefits to tenants, assuming that the tenant is using 1/3rd of the electrcity generated and the rest is exported under a net metering arrangement, and that the price of electricity is 7.5p/kWh:

Displaced electricity	344 kWh/yr	£25.83
Export electricity	688 kWh/yr	£51.66

The systems installed are provided with a 20 year power guarantee, and so will provide this level of benefit year on year over that period. In total the entire scheme will also displace approximately 274 Tonnes of Carbon Dioxide (CO_2) over the 20 year period.

Key Issues in developing PV projects

Through the development of this and other PV projects Kirklees Council has developed expertise in this area. The principal issues and conclusions drawn from the development of PV projects are as follows:

Figure 5. One of the blocks of terraced properties

- Achieving good value and low cost is critical in demonstrating the effectiveness of PV as a technology and also assists in securing external support. Value can be achieved in particular through innovation, increasing scale of projects and achieving added value from effective integration, e.g. displacing normal roofing costs, and selling ROCs as well as power.
- Choose applications that can maximise the value of power produced from the systems – matching power demand and supply profiles and/or arranging net metering.
- Ensure that there is an effective plan for operation, maintenance and repair of the system. PV systems need to tast to achieve their potential and elements of the systems, especially inverter devices, will require replacement and/or repair.
- Ensure that the connection of the system to the local electricity grid is considered at an early stage in the design, and discuss it with the power network operator (DNO), as this can introduce a significant time-delay within a project
- Take advice from others users/clients of PV systems as they will give a more objective view of the technology than suppliers.

For further information contact:
Kirklees Council Environment Unit
23 Estate Buildings
Railway Street
Huddersfield
HD1 1JY
Tel: 01484 223568
Email: environment.unit@kirklees.gov.uk