Lighting the way

Modern photovoltaic technology does not need bright sunshine, just light, which is why one London borough is seeking to use daylight at night. **Belinda Totton** reports

Solar energy has become a more familiar tool over the last two decades, providing power for items as diverse as domestic hot water, refrigerated lorries and ticketing machines. But what about lighting the streets?

While the area presented by the roof of a house or the top of a lorry allows for the addition of flat photovoltaic cells, the head of a lighting column is not so accommodating. However, solar streetlighting is now here and the residents and workers in the Loudoun Road area of the London Borough of Camden recently indicated their satisfaction with the result in a survey.

This opportunity for the council to gauge public reaction to the columns' unusual appearance was presented by its local agenda 21 group (LA21). It is promoting ideas for energy conservation in the community and the street environment and wanted to investigate energy-saving streetlighting. It also enabled officers to test the claims made about reduced electricity and maintenance costs.

After investigation of a number of sites around the borough, the Loudoun Road pitch was chosen for optimum performance - the panels need to be south facing - and with consideration of local planning rules, the light was installed by SolarTech (UK) in January 2001.

'Solar-powered street lamps can be both cost-effective and environmentally friendly,' says Karen Turton, energy management officer at Camden. 'They generate no atmospheric pollution and, as they require no power cables, they can be put in place with out disrupting or harming the environment.'

The pilot light is installed in the same way as a traditional lamp column with a planted base of 1.5m. This means the galvanised steel column meets the usual European EMC and mechanical stability regulations, with a permissible wind speed of up to 30 metres per second.

However, as there is no need for an external electricity supply, there are no costs for digging cable trenches, no exorbitant costs associated with disconnection or reconnection to the necessary low-voltage electricity distribution network and no metering costs.

Instead, the streetlight shines because it converts daylight into electricity with a photovoltaic generator and then stores it in a solar battery for later use.

Photovoltaic cells are arranged to form a solar module which is fitted to the top of the lighting column. Photo Watt makes the polycrystalline module with two-sided glass encapsulation so that it functions in both high temperatures and moisture. A vandal and theft-proof module also exists for 'high-risk' areas.

The module's galvanised steel support allows it to be tilted to optimise the light available in summer or winter conditions. This light is used by the module to generate electricity that is then transferred by heat-resistant, flexible cable to a battery housed in the base of the lighting column. The cable and highly conductive terminal connections ensure that precious solar energy is not wasted as heat on the way.

The deep-cycle solar battery uses carbon fibre technology to inhibit plate sulphation during its life of 15 years. Independent tests at Loughborough University certified the endurance of these types of batteries as up to three times better than open-flooded or gel types.

Within the naturally cooled base is a lighting control mechanism. The solar battery charges during the day, even in cloudy conditions, so that it is ready to discharge electricity for lighting when the user-programmable controller switch activates at dusk. This same timer will halt the output, and recommence charging of the battery, at dawn.

However, what happens if dawn is a rather sombre affair? Thankfully, the manufacturers have allowed for the British climate and designed the lights to cope with a worst case lighting situation, such as a string of short, cloudy days and winter nights of 15 hours or more. The battery charge will last the course but with the compact, fluorescent lamps emitting a 'dimmed' output.

This independence of supply allows the light to shine even in a power cut and to make real savings - a claimed 140kWh a year on this 100kW solar module. And since conventional energy also has an environmental cost, this saving also equates to 114kg less carbon dioxide being emitted, which fits w ell with the LA21 objectives.

However, the trail of the streetlights has thrown up a number of disadvantages. The inclusion of the battery and operating mechanism in the base means it has to be wider than a conventional unit. This makes it unsuitable for narrow footways.

Other siting problems exist. The addition of the panel on top of the pole makes it unsuitable for conservation areas, and the need for a good source of light rules out the leafiest residential areas.

The issue of constant light may also be a problem. Despite the built in 'dimming' capability, there may be situations where, in order to guarantee satisfactory lighting levels, additional street furniture fitted with photovoltaic cells may be required.

But the main disadvantage is cost. At nearly £3,000 to purchase, install and run this pilot light, the use of solar-powered streetlighting is not a cheap option. And the maintenance costs have also proved to be higher than for a conventional lighting column, although this would reduce considerably if there were a larger number of installations.

While these disadvantages are enough to dissuade the council from installing them throughout the borough, the advantages are such that they have not ruled out their future use altogether.

Although this pilot light was organised and funded from the LA21 budget, it is the council's streetlighting engineer, Eric Blakeman, who would be responsible for future installations. And so far Blakeman is impressed. 'Although the solar powered lamp cost £3,000, which was more expensive to buy that a normal street lamp, it has proven to be extremely cost effective,' he says. 'There were no charges for running power cables to the lamp and there is no electricity bill.'

Further installations will be evaluated on their individual merits, but the most likely candidates for the solar lights are parks and open spaces.

The people who now use the light on dark winter evenings also seem impressed. Although one respondent to a street survey of residents and workers in the area thought the light was a form of security camera, in general the response has been good.

A respectable 91% said they would like to see more solar streetlamps in Camden, and 83% thought that solar streetlamps were a worthwhile investment for the borough. It also prompted a number of respondents to request information on energy saving in the home. The council now plans to continue to monitor this project in terms of cost, reliability, maintenance and public opinion over the next 10 years.

Outdoor solar lighting has already proved to be a dependable means of lighting footways elsewhere, surviving snow storms, hurricanes and earthquakes. But however impressive this fact may be, for Camden council the main benefit of solar outdoor lighting for now will be its visibility.

This single illumination is promoting energy awareness with a positive light and this, in turn, has engendered a very positive public response.

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