

Major Photovoltaic demonstration programme

Case study: Blackpool Centre for Excellence in the Environment

A derelict seafront solarium in Blackpool has been renovated and refurbished to act as a Regional Centre of Excellence in Environmental Sustainability in the North West. Sustainable energy is a key element of the refurbished building with onsite energy generation from a photovoltaic (PV) installation, two wind turbines and a combined heat and power (CHP) plant.

This innovative project, which cost a total of £1.75 million, provides a focus and platform for delivering and promoting sustainable development across the tourism, manufacturing, commercial, education and community sectors, both locally and regionally.

The wind turbines, CHP and PV system have been sized to provide sufficient energy to power the building totally from renewable resources. The PV array supplies up to 44 per cent of the building's annual electricity requirements.

Team

The Centre for Excellence in the Environment, also known as Solaris, is a sub-regional multi-agency partnership. The project was commissioned by Blackpool Borough Council and is intended to contribute to tackling the major regeneration challenge facing Blackpool. Other partners in the project include Lancaster University, Blackpool and the Fylde College and Blackpool Environmental Action Team.

The PV system was installed by SunDog Energy Ltd, an accredited Energy Saving Trust Installer, and uses double glazed PV units.

Building type

The Solarium is a 1938 art deco style building constructed of stone and brickwork, with a glazed roof of wired glass set in metal glazing bars. It is located in about four acres of open space on the Blackpool Promenade.



Image courtesy of Blackpool Borough Council



energy saving trust®



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The original solarium was a symbol of seaside style housing tropical plants, but it had since become derelict. The project to refurbish the solarium comprised restoration of the façade in keeping with the architectural character, and constructing an extension to the rear of the building. The floor space was almost doubled, from 667m² to about 1200m².

The building accommodates a number of activities split into three different sections. In the central section, there is a lobby and reception area, an exhibition space and a café. The North Wing provides outreach offices for Lancaster University's Environment Centre, training facilities for Blackpool and the Fylde College in addition to housing Blackpool's Environmental Action Team and Local Agenda offices. Flexible spaces that house creative industries and community enterprises are located in the South Wing.

Key photovoltaic data

- Total area of PV: 164.2m²
- Peak output: 18.067 kWp
- Type of module: Saint Gobain glass/glass double glazed bespoke
- Cost of PV including installation: £204,036
- Annual energy production: 12.776MWh

Technical information

- Module power rating: 101.5Wp
- Number of modules: 178
- Type of inverter: SMA (4 types -SMR1700, SMR3000, SMR2500, SMR850)
- Combined nominal inverter power: 14.85kW
- Total number of inverters: 8

PV integration

The PV system is integrated into the 10 degree pitched roof above the building's entrance and exhibition areas and in the glazed roof of the rear corridors. It is a double glazed PV canopy with the 12mm void between the two glass panes filled with argon. There are two sizes of modules, with 36 and 72 polycrystalline cells. The system, which is installed into a conventional double-glazing frame, is the first of its kind in the UK. Due to the translucency of the panels, the systems provide visually-striking day lighting to the building.

General building innovation

Solaris was built as a foundation for the education and promotion of sustainable design and incorporation of renewable energy in the area. The building is of passive design, taking advantage of natural energy flows to maintain thermal comfort and negate the need for mechanical heating and cooling.

The building fabric comprises of recycled and sustainable materials: the building's concrete blocks contain pulverised fuel ash, a by-product from the power industry; and recycled newspapers are used as insulation in the external cavity wall.

In addition to the PV array, a number of other sustainable technologies are incorporated into the building: two 6kW wind turbines, a 5.5kW_e CHP unit, a solar water heating system, rainwater recycling, water conservation devices, passive solar design, energy efficient systems and energy monitoring. The energy usage within the building is monitored and optimised via real time monitoring, which is linked into the building management system.

The building was designed to meet best practice guidelines and has attained an excellent rating from the BREEAM environmental assessment.

Grid connection

The seven sub-arrays on the main roof and north corridor are connected into one distribution board with the eighth sub-array on the south corridor connected into the second distribution board along with the two turbines. If the voltage or frequency strays beyond the prescribed limits, a 'G59 relay' will disconnect the PV generator from the grid. This will also disconnect the inverters from the grid in the event of a loss-of-mains failure, preventing the PV system operating as an 'islanded' generator (where 'islanded' generation is a hazardous situation of the PV system feeding the network or local distribution system during a planned or unscheduled loss of mains).

The Solaris PV and wind system is connected to the distribution network and Blackpool Borough Council has a net metering contract with E.ON Energy.

Installation hurdles

During the installation of the PV system, relatively few problems were encountered. Some of the PV modules were damaged during shipping but replacement modules were simply ordered to replace them. Close contact was maintained between the installation partners to ensure a satisfactory design was agreed on, allowing the innovative double glazed PV modules to be ordered. The close liaison allowed the effect of design changes, including shading issues, to be catered for in the choice and positioning of the PV units and also enabled a coordinated effort in the renovation of the solarium and installation of the new technology.

Performance monitoring

The PV system is linked to a real time monitoring system. This provides data on generation from both the wind turbines and PV array, and monitors it against the building's requirements. The monitoring system also incorporates information on fossil fuel usage, rain water harvested and water consumed. A display is located in the main entrance foyer directly beneath the PV roof. It shows information on the instantaneous array output, the total output to date and Carbon Dioxide (CO₂) savings.

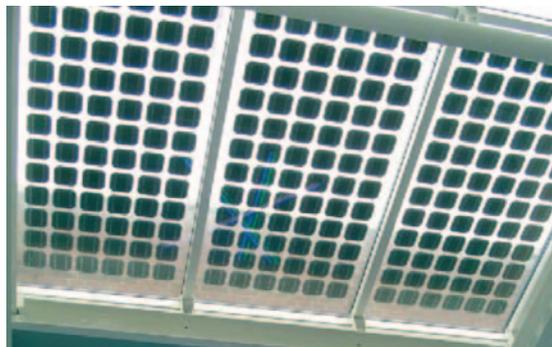


Image courtesy of Halcrow Group Ltd

Non-technical information

Sources of funding

The £1.75 million Solaris project was supported with funding from a number of sources including Blackpool Borough Council (23 per cent), the European Regional Development Fund (27 per cent), Blackpool Challenge Partnership (11 per cent) and Lancashire Tourism Partnership (11 per cent). The grant from the Major PV Demonstration Programme funded 65 per cent of the PV installation (£132,600) with the remainder coming from the overall project budget.

Contractual and management aspects Blackpool Environmental Action Team is responsible for the overall management of the facility. A Management Board is in place with representatives from each of the partners and tenants based in the building, key support agencies including the Tourism Board and Business Link, and the South Shore Area Forum and Holiday Focus Group representing the local community.

Other agencies and organisations involved in the project were Blackpool Challenge Partnership, Lancaster University, Blackpool and Fylde College and the lottery's New Opportunities Fund.

Project uncertainties

Had the Energy Saving Trust not granted support under the Major Photovoltaic Demonstration Programme, a smaller PV system would have been installed. Until the grant had been awarded, this created some uncertainty at the design stage. The main contractor was also unfamiliar with PV systems and how to incorporate them into the design. This was resolved through education of the contractor.

Prior to installation there was some concern over the effect of wind-blown sand and salt build up from the nearby shore, however this problem has not materialised.

Promotion

Blackpool's Centre for Excellence in the Environment is a prominent building on the Blackpool promenade. The centre has an active promotional programme aimed at the 11 million visitors to the town and the 300,000 residents. Promotion is focussed towards schools from Blackpool and the regional catchment area, accommodation providers, community groups and entrepreneurs seeking start up space for new businesses. In addition, scientific and manufacturing sector visitors for environmental and construction research, knowledge and technology transfer, and seminar and professional development audiences are targeted with recent visits by the local IMechE and CIBSE institutions. The centre is advertised in a number of trade publications, newspapers, on the internet and through mail drops to SMEs.



Image courtesy of Blackpool Borough Council

The project has stimulated interest from local residents and businesses wanting to know how they can incorporate similar technologies into their buildings, with over 60,000 visitors to the centre in the first year. In-house consultants provide information about waste, recycling and energy efficiency.

The exhibition in the central building provides a showcase for environmentally sustainable technologies and has interactive computer

displays and visual linkages with the network of regional Discovery Centres and environmental projects. Displays encourage visitors to act responsibly by demonstrating how the combination of individual actions at a community level can significantly impact on issues such as climate change, depletion of natural resources and the threat to biodiversity. There are regular presentations to visitors including scheduled school visits to raise awareness of environmental issues.



Images courtesy of Blackpool Borough Council



Further information

To find out more about the the Blackpool Solarium, please see the following websites:

- Blackpool Borough Council: www.blackpool.gov.uk
- Solaris Centre: www.solariscentre.org
- SunDog Energy Ltd: www.sundog-energy.co.uk
- Blackpool Challenge Partnership: www.bcp-ltd.co.uk
- Lancaster University: www.lancs.ac.uk

The installation of the PV system at the Solaris Centre was supported as part of the Major Demonstration Programme from the Energy Saving Trust. For more information, please visit www.est.org.uk/solar

