SOLAR OFFICE DOXFORD INTERNATIONAL UK

Development sector:	Commercial office building
Owner:	Akeler/Sunderland Development Corp.
Location:	Doxford International Sunderland UK
Gross floor area:	4,600m²
Building population:	460
Type of PV components:	Polycrystalline glass/glass modules
PV location:	Inclined facade
Area of array (m²):	950
Peak output (kW_p):	73
Anticipated output (kWh/year):	Electrical 55,100
Anticipated energy demand Electricity:	Electricity: 96kWh/m²/yr Gas: 41kWh/m²/yr PV: 22 kWh/m²/yr
CO_2 emission:	49kg/m²
Surplus PV power:	Exported to grid
Funding assistance:	ERDF and DTI

THE BUILDING

The Solar Office is located an on a business park near Sunderland. It has recently been occupied by Domainnames.com, a company specialising in all aspects of e-commerce. It is the first speculatively constructed office building to incorporate building integrated photovoltaics (BIPV) and the resulting solar façade is the largest so far constructed in Europe.

The 4,600 m² three storey building is 'V' shaped in plan with the extreme ends of the 'V' splayed away from each other. A central core is located at the apex of the 'V'. The building incorporates a 66 metre long south facing, inclined solar façade at the centre of which is the main entrance. Behind it is located a three storey atrium and, between it and the splayed wings, an internal 'street'.

The building is intended to be operated in its low energy 'passive solar' mode, but a tenant with high heat loads may choose, as did Domainnames.com, to augment this strategy by utilising the provision made for a displacement ventilation and cooling system. The building is designed to be robust and versatile. It can, if necessary, be divided into up to six separate tenancies.

ENERGY STRATEGY

The site is exposed and close to the North Sea. The wind, however, has been used to advantage to assist the natural cooling of the building. A wind trough running the length of the facade, with eight baffles mounted at right angles in a line above it, ensures that negative pressure is introduced immediately outside the upper vents regardless of the direction of the wind. The slightly lower pressure in this position encourages air to pass through the vents when open which, in turn, encourages air to be drawn through windows on the opposite side of the building and across the office spaces The air movement keeps the interior cool in summer and ensures hot air accumulating on the inside of the solar façade does not flow into the office space.

The overriding objective in terms of the energy strategy was to find a balance between the low energy measures and those needed for an effective photovoltaic installation. The low energy measures include:

- Limited depth floors (maximum 15m) with generous ceiling heights to encourage cross ventilation and good day lighting;
- Provision for secure night ventilation and the exploitation of building structure to provide thermal mass in order to provide night-time cooling in summer;
- Windows which facilitate good controllable ventilation, glare free daylight and solar control;
- A well insulated, impermeable building envelope to minimise heat loss in winter;
- Responsive controls; and
- Knowledgeable and sensitive building management.

In some instances the optimisation of the photovoltaic power generation runs counter to those for low energy design.