SOLAR PHOTO-VOLTAIC GENERATOR

CLEAN GREEN ELECTRICITY,
PRODUCED BY THE SUN

TECHNICAL DETAILS

Dr Hans Bleijs
Department of Engineering
University Road, Leicester LE1 7RH
Tel. 0116 252 2553, fax. 0116 252 2619
Email: j.bleijs@leicester.ac.uk
UNIVERSITY OF LEICESTER

LIBRARY SOLAR PHOTO-VOLTAIC GENERATOR

MAIN FACTS

Location  David Wilson Library (Main Campus)

Designed & Installed by  Solar Technologies  
(www.solartechnologies.co.uk/home)

University Consultant  Dr Hans Bleijs, Department of Engineering

Commissioned  March 2007

Total Installed Power  38.2 kWp (under STC @ 1000W/m²)

Annual Energy Yield  25,500 kWh (estimated)

Annual CO₂ Savings  11 tonnes

Funding  The John Hobley Charitable Trust

The Energy Savings Trust (via Department of Trade and Industry’s Major Photovoltaic Demonstration Programme)

The University of Leicester

The Library PV Generator consists of 3 sub-systems: plant room roofs, sun-shade louvres and atrium roof, using different silicon PV technologies.
**PV SYSTEM DETAILS**

**Plant room roofs (areas 1A and 1B):**

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Details</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Location</strong></td>
<td>On roof of plant rooms A and B</td>
</tr>
<tr>
<td><strong>Installed power</strong></td>
<td>area 1A: 15.6 kW&lt;sub&gt;p&lt;/sub&gt;; area 1B: 7.3 kW&lt;sub&gt;p&lt;/sub&gt;</td>
</tr>
<tr>
<td><strong>PV modules</strong></td>
<td>176 x Schuco S-130 module, poly-crystalline silicon</td>
</tr>
<tr>
<td><strong>Integration type</strong></td>
<td>Over-roof (Photo 1)</td>
</tr>
<tr>
<td><strong>PV area</strong></td>
<td>area 1A: 120 m&lt;sup&gt;2&lt;/sup&gt;; area 1B: 56 m&lt;sup&gt;2&lt;/sup&gt;</td>
</tr>
<tr>
<td><strong>Orientation</strong></td>
<td>South-East</td>
</tr>
<tr>
<td><strong>Inclination</strong></td>
<td>5° (from horizontal)</td>
</tr>
<tr>
<td><strong>Configuration</strong></td>
<td>See Figure 1</td>
</tr>
<tr>
<td><strong>Inverters</strong></td>
<td>6 x SMA SB2500 (1A); 3 x SMA SB2500 (1B)</td>
</tr>
</tbody>
</table>

**Sun-shade louvres (areas 3A and 3C)**

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Details</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Location</strong></td>
<td>In front of south-west façade</td>
</tr>
<tr>
<td><strong>Installed power</strong></td>
<td>area 3A: 10.5 kW&lt;sub&gt;p&lt;/sub&gt;; area 3C: 3.1 kW&lt;sub&gt;p&lt;/sub&gt;</td>
</tr>
<tr>
<td><strong>PV modules</strong></td>
<td>297 x Romag PowerGlaz&lt;sup&gt;®&lt;/sup&gt; louvre blades with 2 rows of mono-crystalline silicon E-Ton cells per blade</td>
</tr>
<tr>
<td><strong>Integration type</strong></td>
<td>External sun-shade louvres (Photo 2, top)</td>
</tr>
<tr>
<td><strong>PV area</strong></td>
<td>82 m&lt;sup&gt;2&lt;/sup&gt;</td>
</tr>
<tr>
<td><strong>Orientation</strong></td>
<td>South-West</td>
</tr>
<tr>
<td><strong>Inclination</strong></td>
<td>45°</td>
</tr>
<tr>
<td><strong>Configuration</strong></td>
<td>See Figure 2</td>
</tr>
<tr>
<td><strong>Inverters</strong></td>
<td>SMA SB3000, 2 x SB1700, 2 x SB1100 (3A); SB2500, SB700 (3C)</td>
</tr>
</tbody>
</table>

**Atrium roof (area 5)**

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Details</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Location</strong></td>
<td>In roof of West Atrium</td>
</tr>
</tbody>
</table>
Installed power 1.7 kWp

PV modules 23 Schott ASITHRU® 3-L semi-transparent thin-film amorphous silicon modules

Integration type Double-glazed units with PV- glass laminate (Photo 2, bottom)

PV area 42 m²

Orientation South-West

Inclination 6°

Configuration See Figure 3

Inverters SB1700, SB700

Grid connection

Inverter location In plant rooms A & B (Photos 3 and 4, and Figure 4)

Inverter connection Via DC & AC isolator

Inverter protection Via MCB in marshalling enclosures

Electrical schematic See Figure 5

Grid protection 3-phase with G59 protection

Metering Import/export AC kWh meter (3-phase)

Instrumentation and data monitoring, storage & display

Sensors 1 silicon solarimeter, ISET Poly-crystalline silicon
1 silicon solarimeter, ISET Mono-crystalline silicon
1 silicon solarimeter, ISET Amorphous silicon
1 ambient temperature (PT100)
3 module temperatures (PT100)
For sensor location, see Figure 4

Data monitoring and storage SMA Sunny Boy Control+ (Photo 4, bottom) with associated & software, running on PC with UPS and LAN connection in Department of Engineering’s Concrete Laboratory (Garage part), with 19” TFT screen for display of current performance and historical data (Photo 5)
**Data display**

30” PV display panels at Library front and rear entrance with continuous update of instantaneous power, energy generated and amount of CO$_2$ saved (Photo 6)

**Photos and figures**

Photo 1 PV panels on roof of plant rooms A (back) and B (front)

Photo 2 PV sun-shade louvers on south-west elevation and semi-transparent PV panels in roof West Atrium (below louvres)
Photo 3 PV inverters in plant room A

Photo 4 PV inverters in plant room B
Photo 5 Data monitoring and storage (in Engineering Concrete Laboratory)

Photo 6 Display panel at Library entrance
Figure 1 Configuration of PV panels on plant rooms A and B (Solar Technologies)

Figure 2 Configuration of PV sun-shade louvers (Solar Technologies)
Figure 3 Configuration of PV panels in atrium roof (Solar Technologies)

Figure 4 Location of irradiance and temperature sensors (Solar Technologies)
Figure 5 Electrical schematic of Library PV system (Solar Technologies)