

Solar Window Technology for BIPV or BAPV Energy Systems

OVERVIEW

A team within the Scottish Institute for Solar Research (SISER) at Heriot-Watt University in Edinburgh, Scotland has patent pending for a high efficiency concentrating photovoltaic system using a minimal area of expensive PV material. The technology is readily suited to Building Integrated or Building Applied Photovoltaic generation systems (BIPV or BAPV). Developed within Dr Tapas Mallik' research group, this BIPV system allows a high degree of light transmission making it suitable for use as a window, a skylight or a roof cladding panel etc.

PROBLEM THIS TECHNOLOGY SOLVES:

Using a novel high efficiency concentrator design, this static "Solar Window" system is such that it allows a high degree of light transmission whilst generating electricity from a reduced area of expensive photovoltaic material.

lens, curved mirror or other method is one way of reducing this cost but these systems often require an "active" solar tracking device to maximise their efficiency. Static concentrating systems often found within building Integrated or building applied PV (BIPV or BAPV) energy generation do not have such tracking systems and the overall efficiency can be limited due to their inability to capture the full power of the sun as they are fixed in one position all day long.

PV cells are typically opaque to visible light therefore limiting the light transmission capability of the panel making them generally unsuitable for use as windows etc. A solution to the above problems is proposed by SISER through the use of a novel static concentrator design concentrating light to an array of PV cells arranged to allow light transmission between each PV cell yet still providing a high power output (figure 1).

TECHNOLOGY

Although mass manufacture & increasing efficiency has reduced the cost of Solar energy considerably, photovoltaic or PV material is still a major \$ cost/unit of energy produced. Concentrating sunlight to a smaller area of PV using for example, a Fresnel



Figure 1: The prototype non-imaging concentrator design has a wide acceptance angle of 120° (-60° to $+60^\circ$) to maximise the sunlight captured between dawn till dusk and a range of concentration factors (1x to $>10x$) is available depending on the performance needs.

High transparency provides light transmission making the design suitable for roofing panels etc.

BENEFITS & APPLICATIONS:

- Wide acceptance angle maximising the collection of diffuse & direct sunlight
- Reduced area of PV material lowering \$ cost / unit
- BIPV or BAPV systems such as windows, doors, canopies, roof cladding panels etc.
- Easily manufactured concentrating element – glass / plastics
- PV generation system allowing light transmission into buildings

STAGE OF DEVELOPMENT

Technology and “Proof of Concept” has been demonstrated using an array of 16 x 100mm² commercially sourced PV solar cells.

Design, Performance Data & the Prototype array are available for inspection under confidentiality agreement only

INTELLECTUAL PROPERTY STATUS

GB patent application filed (Dec 2011, GB1122092.8) establishing a priority date to protect the method, apparatus and designs. CAD Design and all modelling & performance data is available.

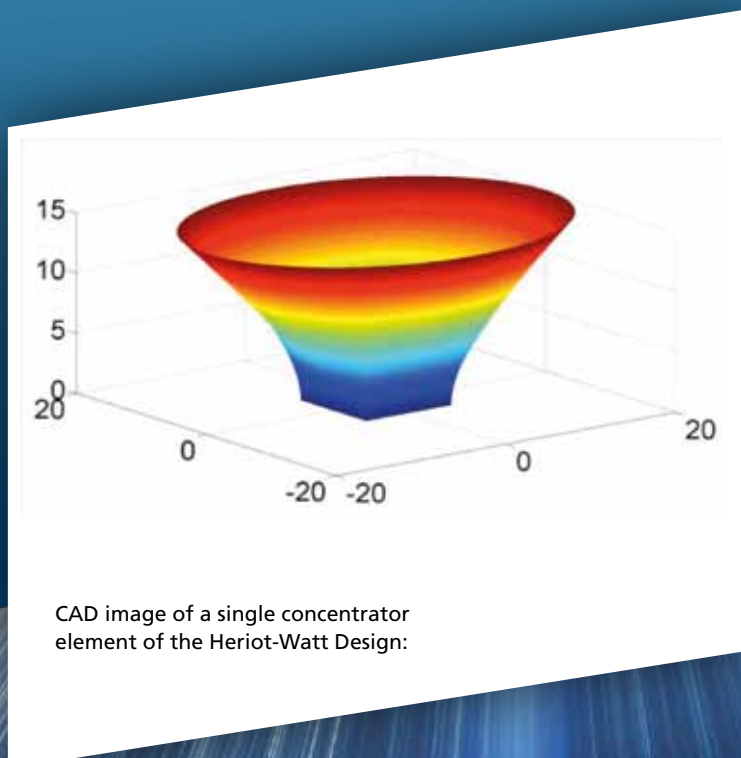
A technical paper outlining the general design principle & performance was presented at IREC2011 “Optical Characterisation of a 3D static Concentrator”.

COMMERCIAL OPPORTUNITY

Heriot-Watt now seeks Photovoltaic system developers, integrators and investors who see utility in the applications of this technology.

Investors or commercial partners should have an interest in either obtaining a licence to develop this technology or to act as sponsors to collaborate and ideally provide financial (or “in-kind”) support for commercial or technological development in specific defined areas.

UK companies (or overseas companies with a UK presence) may be eligible for UK government or Scottish Development Agency financial support to develop this Heriot-Watt technology through an industry/ university knowledge transfer partnership: Knowledge Transfer Partnership Scheme or Scottish Enterprise



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