



# Novel Optical Concentrator for BIPV Systems

**Sector(s):** Energy and Renewables, Construction and Built Environment, Electronics, Sensors and Photonics

## About Opportunity

Building Integrated Photovoltaic (BIPV) solar concentrator systems not only generate electricity, but also allow the transformation of ambient light and the use of cogenerated heat for various functions.

Glasgow Caledonian University (GCU) has developed a novel optical concentrator capable of providing gain on two planes. Such a concentrator can be used in a non-tracking wall mounted BIPV system.

The concentrator provides higher optical gains than alternative optical elements, thereby reducing the amount of PV cell (and silicon) required. Additionally, carefully selected FOVs (Field-of-Views) contribute to capture solar radiation throughout the day and all year round, removing the requirement for electromechanical tracking.

Further, the optical structure has been designed to take into account the fact that the sun's path deviation from summer to winter is far less than the deviation from sunrise to sunset and the entrance aperture and concentrator profile have been optimised to redirect sunlight to the exit aperture and to the PV material.

A concentrator PV-array based on this structure is also capable of providing ambient light to building interiors.

**The concentrator provides higher optical gains than alternative optical elements, thereby reducing the amount of PV cell (and silicon) required.**

The reduction of PV material can be particularly important in applications using Gallium Arsenide PV cells.

The optical element can be used not only for solar energy systems (solar PV and solar thermal), it also could be used to collect visible and infrared radiation in applications such as sensing and optical wireless communications.

## Key Benefits

- Reduction in cost of BIPV systems
- High optical gain
- High electrical power output
- Optimum collection of light at a variety of angles of incidence
- No electrical tracking required
- Provides illumination as well as energy generation
- Reduction in CO2 emissions

## Applications

- BIPV Systems
- Optical sensing
- Optical wireless communications
- Lighting

## IP Status

The technology is protected by an international patent application (Priority date December 2011).

Small prototypes have been built and tested with positive results. Larger scale units are now planned and will be built in the coming months.



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