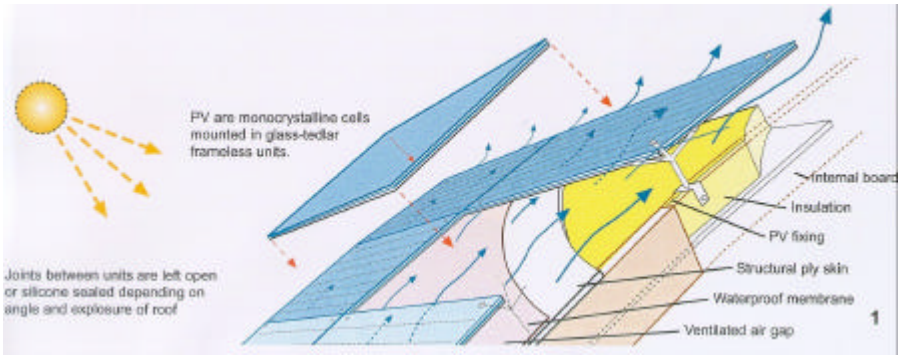
Judges report
Design Competition
Photovoltaic Products for the Built Environment

This international competition to design PV products for use in the built environment has just concluded. The prize giving ceremony was held at the 16th European PV conference held in Glasgow, 1-5 May 2000. The competition demonstrated the wide range of approaches possible for integrating photovoltaics in the built environment. Entries were received from architects, engineers, designers and students from 10 countries demonstrating a variety of cost-effective, practical and elegant designs. The majority of the entries were from working professionals with relatively few entries from students. The largest number of entries came from the UK, followed by Switzerland and the Netherlands.



The **overall winner** was Robert Webb of Robert Webb Associates, UK, for his design for PV panels as a ventilated rainscreen system over a lightweight stressed-skin timber construction. The judges admired the overall concept for the building and its consideration for environmental and passive solar issues in addition to electrical generation. Careful consideration had been given to the manner in which the different energy systems interact. While not being a category winner this entry had a holistic approach spanning a number of categories. As such the judges wished to give it a special award, while acknowledging that the PV element of the design might not be the most innovative.

Peter Schürch, Jörn Jürgens, Hubert Bittner, Taroni Gianpietro, Stephan Kormann and Pizzoferrato Adelmo from Halle 58 Architekten, in Switzerland won the **exhibition prize** for their design of a Solarsail. This was a superbly presented design and technically sound, although the judges had concerns regarding the long-term wind fatigue effects. This prize was awarded on the basis of the number of votes given to the entry by visitors to the exhibition of short-listed designs held at the 16th European PV conference held in Glasgow, 1-5 May 2000. Voting for this prize was very close with the design for a triangular module from Southampton University receiving only one vote less than the final winner.

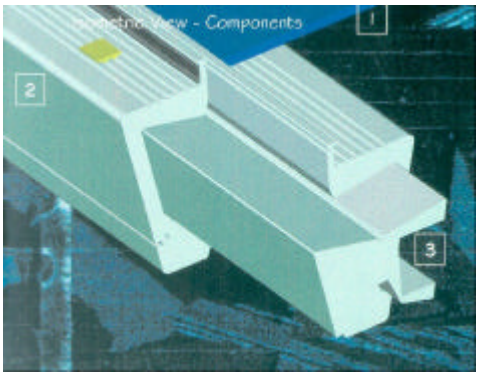
There was a very good standard of **student entries** and the wide range of submissions made it difficult to choose a particular winner although the judges considered that some of the complexity of PV systems had not been fully grasped by some of the entries.

The overall student winner was A Weight of Reading University for his PhotoFIT design, which was also the winner of the roofing product category. The design of a glass-glass triangular PV modules by R Leal Cueva and T Markvart (supervisor) of the University of Southampton, UK was commended both as a student entry and as an entry in the facades category. The water screen system submitted by three students (S Tomatsuri, K Kondo and T Ohashi) from Hosei University, Japan was a shared winner in the facade category.

The results for the individual categories are discussed below.

Roofing Products

The roofing product category was originally sub-divided into sloped roof products and flat roof products however only 1 entry for a flat roof product was short-listed so these two categories were combined for the final judging.



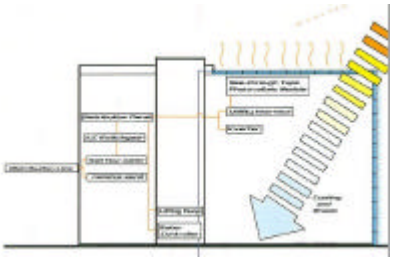
The PhotoFIT design by Andrew Weight from Reading University, UK was the winner of the roofing systems category, as well as being the overall student winner. His design for mounting PV modules to provide a roof or façade covering used an innovative profile system as the module frame. It aimed to minimise costs by simplifying installation requirements in terms of components, complexity and time. The judges considered it to be a well-presented and well thought through entry, giving good consideration to the integration of cabling and avoiding the problem of the frame shadowing the module. Less well demonstrated was how the design dealt with the issues of expansion, weathertightness and the method of fixing the frame to the roof substrata.

There were relatively few entries short-listed as roofing products, the bulk of the roofing product entries were judged under the category of recently released products. The following entries were short-listed in the roofing product category:

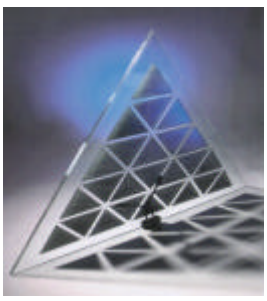
- Roof Shingle SUNPLICITY™, Markus Real, Alpha Real AG, Switzerland
- Waverley Station Roof, Gordon Duffy, Centre for Ecological Technology and Architecture, UK

Façades

The façades category prize was shared between Marcel Ferrier, architect / Marcus Faber of Evergreen Solar Inc., and three students (S Tomatsuri, K Kondo and T Ohashi) from Hosei University, Japan. Ferrier's design was for a PV façade on a circular building that addressed the issue of the sun's movement in an innovative manner, given the specific requirements of the building. The judges expressed reservations as to the replicability of the design on a more general scale.



The Japanese design was for a building with a PV roof and façade with water flowing over the module surfaces. The judges considered that conceptually this was a very attractive proposal and that given careful design it could be realised. There was some concern as to whether or not the PV power provided would be sufficient to move the required quantity of water. The inherent dangers of having electricity and water in close proximity to each other would also need to be carefully considered. However the judges appreciated the combination of PV and water-cooling systems that aimed to keep both the building and PV installation cool.



A design for a glass-glass triangular PV modules by Rogelio Leal Cueva and Tomas Markvart of the University of Southampton, UK was commended as an attractive design, well thought through and well

presented although the final product was likely to be expensive and might have limited applications.

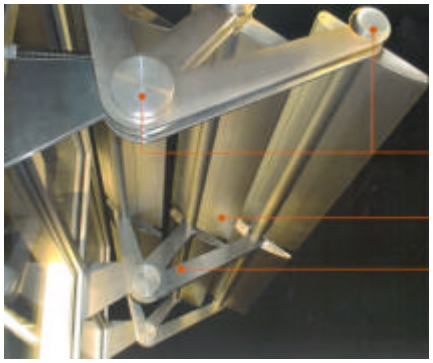
Overall there was a wide range of entries under the façades category although few really tackled the issue of integrating PV into façades.

The following entries were short-listed:

- 2 in 1 Energy Efficient façade / STA Titania Solar wall panels, Dr Igor Skryabin, Sustainable Technologies Australia Ltd, Australia.
- Second skin façade, Peter de Boer, TU-Delft, the Netherlands.
- Solar powered heat recovery ventilation unit, Jochen Kauschmann & Jim Grace, Atelier Ten Ltd, UK.
- Solar cells integrated into movable horizontal glass lamellas in part of façade, Gert Johannesen, Staermose & Isager K/S, Denmark & Morten Verner Thomsen, VITRAL, Denmark.
- Low-cost concentrator for PV façade, Philip Eames, Brian Norton, Tim Bruton and Richard Russell, University of Ulster, UK.
- Cladding panel containing thermally isolated vacuum, Steve Dench, UK.

Other Building Products

A wide range of products was short-listed in the other building product category. The level of development of the products ranged from conceptual to very practical designs.



A PV Sunshade system (left) submitted by D Hewitt and R Braunstein of Kawneer Co. in the USA was the category winner. The judges considered the design to be a practical and sturdy system that both optimised solar gain and avoided self-shading. They did however have some reservations regarding the embodied energy involved in manufacturing the product and its likely cost effectiveness. M Margaroli an architect from the UK was commended for his elegant SHADOPHOTOVOLTAIC design, which is a refinement in PV louver systems, although the judges expressed some concern regarding the system's robustness.

The following entries were short-listed:

- Transparent solar roof window, Franz Baumgartner, FH-Buchs, Switzerland.
- Pneumatic goes solar, Arnold Kahr & Alexander Weiss, Institut fuer Hochbau und Entverfen-TUVienna, Austria.
- PV blinds, Weng-Mui Lee & James Plastow, CREST Loughborough University, UK.
- NanoPV, Ben Smith, Solstis, UK.

Non-Building Structures

No prizes were awarded in this category and only 1 entry was short-listed. This was an entry for a solar streetlight using fresnel lenses and high efficiency LED light source submitted by Robert Webb of Robert Webb Associates, UK. The judges considered it to be a nicely presented, innovative concept but has concerns regarding its technical feasibility. The judges regarded assumptions regarding the underpinning technologies such as fuel cells as questionable.

Recently Released Products

Eligible products for this category were products that had been released since 1 September 1998. The products short listed were all roofing products, and included systems to fit onto sloped roofs, PV roof tile systems and systems for mounting PV modules on flat roofs. They were all well developed designs providing cost effective and practical methods of mounting PV on a wide range of roof types.

Peter Scheigrond, Anton Schaap, Klauss Hoekstra from Econergy International in the Netherlands won the category prize for their INTERSOLE design that allows a range of module types and sizes to be integrated into any type of tiled roof in a weatherproof manner. The ability to separate the lining tray from the module to form a watertight roof early in construction was considered a singular benefit of this pitched roof integrated system. The judges commented that this was a practical system likely to be good value for money.

A Sloped Roof Integration Frame System submitted by Andreas Haller of Ernst Schweizer AG, Switzerland was commended. This was another cost effective well-integrated sloped roof system, although it did not appear to allow PV modules to be placed against the roof edge.

The following entries were short-listed:

- Tailor-Made Solar Roofs and Façades with Solarcells, Juergen Hartwig, Ersol Solarstrom GmbH & co KG, Germany.
- Terra Piatta® - Solar, Michael Dolle, Dachziegelwerke Pfleiderer GmbH & co KG, Germany.
- The Unisole Prefab PV Roof, Ton Van Der Wekken, Ecofys, The Netherlands.
- Solmax - Mounting For PV Modules, Jacques Bonvin & Antoine Muller, Solstis, Switzerland

Overall Comments

The designs submitted to the competition demonstrated the wide range of approaches possible for integrating photovoltaics in the built environment. The designs varied in their level of development, from conceptual designs to fully developed designs, and in the level of innovation demonstrated. The quality of the designs was generally high.

The conformity of the entries with the requirements explained in the briefing pack was variable, many entrants had not read the briefing pack carefully. A number of posters were returned to the entrants by the competition organisers for modification as they identified the entrants. Many submissions failed to provide sufficient information to allow their designs to be assessed against the full set of judging criteria. The main exception to this was the student entries, students appear to be markedly better at following instructions and providing answers to all the questions asked.

The quality of presentation was very high, with the vast majority of the posters submitted being very professional in appearance, attractive, well laid out and informative.

Notes on Judging Procedures

Following the competition announcement in October 1999 and the deadline submission date of 29th February 2000, there were two rounds of judging. First a preliminary round by experts drawn from Task VII and then final judging by a panel of well-known designers and architects. Both rounds of judging were anonymous, with only the competition organisers knowing who had submitted each design. This applied to all categories except for recently released products where the identity of the designers and their products was obviously public knowledge.

The preliminary judging decided the short list based on the score each entry received against the list of criteria given below. Two or three judges, who included one engineer and one architect, saw each entry. None of these judges were from the same country as the competitor

to avoid any potential problems with judges being familiar with the products and their designers. Each individual judge carried out this judging on their own without discussion with the other judges. The competition organisers then averaged the results and the highest scoring entries were short-listed.

The final judging panel met during the 16th European PV conference held in Glasgow, May 2000 to decide the winners and commended entries. The comments and marks from the preliminary judging round were available to the final judges. The judging criteria were used as the basis for the selection of winners, but the marking scheme was not used, rather a consensus was reached amongst the judges. Note that the final judges were not aware which entries students had submitted until all the other awards had been decided.

The final judging panel was made up of:

- David Lloyd Jones of Studio E Architects, UK: Chairman
- John Curran of TXU, UK.
- Duncan Jackson of Nicholas Grimshaw & Partners, UK
- Tjerk Reijenga of BEAR Architechten, NL.
- Michael Colijn of Shell Solar Energy, NL.
- Steven Strong of Solar Design Associates Inc., USA.

The judging criteria for assessing the entries were as follows:

MARKS	JUDGING CRITERIA
10	▪ Visually attractive.
10	▪ Integration into the built environment. The product should fit well in the context for which it is intended.
10	▪ Functional – the product should meet whatever function the type of product is expected to provide.
10	▪ There must be an identifiable market for the product (it is not the size of the market that counts).
10	▪ The product should be innovative in some respect. This may involve innovative components, the assembly of the components or the application.
5	▪ The product should be reasonably simple to install, maintain and operate, where applicable.
5	▪ The performance/efficiency of the product is important. Thermal outputs can be considered as well as electrical outputs where appropriate. Demonstrate issues such as ventilation and shading have been considered to maximise output from the chosen PV technology.
5	▪ Practical and cost effective manufacturing method.
5	▪ Environmental issues. Demonstrate that environmental issues have been considered, including minimising: the energy payback of the system and the use of materials harmful to the environment.
5	▪ Flexibility/versatility of the design (able to use in various locations/orientations/markets, etc.)