PV in The Built Environment

UK Activities for Task VII of the IEA Photovoltaic Power Systems Programme

This newsletter has been prepared to inform those interested in Building Integrated Photovoltaics (BiPV) of recent activities associated with the IEA Task VII - PV in the Built Environment. It summarises the latest developments in building integrated photovoltaic systems including activities undertaken in the UK under the DTi PV programme, actions on-going within Task VII and some of the major international projects and programmes such as the solar village planned for the Sydney Olympics. Any comments or questions on the content of the newsletter may be addressed to Donna Munro at the address given below.

UK Activities

The Solar Office, Doxford International Business Park

The Solar Office is a new office building designed for Akeler Developments PLC on the Doxford International Business Park, located on the edge of Sunderland in the north east of England. It was completed in shell and core form in April 1998 to a low energy design incorporating a 73 kWp photovoltaic array.

The building, which was designed by Studio E Architects, is the first speculatively constructed BiPV office building. Negotiations are currently on-going with two major companies on its possible occupancy.

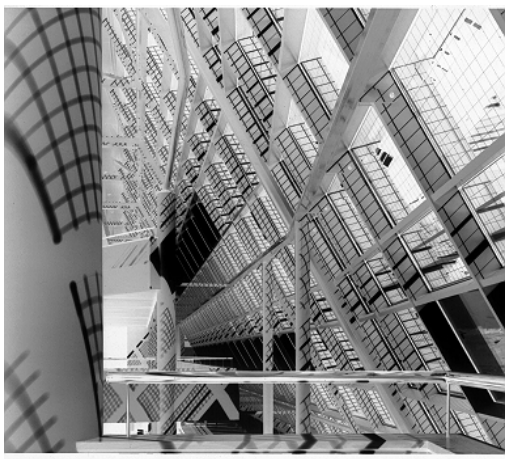
The energy consumption target for the building, occupied by a tenant with conventional power requirements, is 85 $kWh.m^{-2}.year^{-1}$ compared with a conventional air conditioned office of over 400 $kWh.m^{-2}.year^{-1}$. The 73 kWp array provides 55 100 $kWh.year^{-1}$ of electrical power which represents between one third and one quarter of the total electricity consumption within the building. At times when more power is being generated than is required in the building, the surplus will be exported to the National Grid.

The 4600 m^2 three storey building is 'V' shaped in plan with the facade aligned to face due south. The PV system uses Saint Gobain Solaglas modules integrated in a Schüco facade and is sloped at 60°.

The building incorporates the following low energy measures:

- Limited floor widths with generous ceiling heights to encourage cross ventilation and good day lighting.
- Thermal mass to provide night-time cooling in summer is increased by a concrete roof slab.
- A well insulated, impermeable building envelope to minimise heat losses (tested to 3.7 $m^3.h^{-1}.m^{-2}$ at 50 Pa, an exceptional result testifying both to good design and good workmanship).
- Windows which facilitate good controllable ventilation, glare free daylight and solar control.
- The heat from the glass facade is used to assist in heating the building during winter and to pull air through the office space in summer.

When the solar office is run in its passive solar mode, it is estimated that the annual operating costs will be reduced by £55 000 and carbon dioxide emissions by 375 600 kg compared with a 'good practice' air conditioned building.



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Task VII Activities

Task VII of the International Energy Agency PV Power Systems Programme is a collaborative, international, research and development programme involving 14 countries. It is concerned with the enhancement of the architectural and technical quality and the economic viability of PV systems in the built environment. The Task started in January 1997 after a preparatory year and will finish in December 2001. HGa have acted as the UK co-ordinator for the Task since May 1996.

The work plan for the task is divided into a number of activities. The table below lists those activities which are currently active and gives a brief description of what is happening in each activity.

The UK is leading Activity 2.1 on Commercial Building Integration Concepts and Activity 2.4 on Guidelines, Standardisation, Certification and Safety Issues as well as organising a UK architectural design competition under Activity 4.3

Activity		What's happening	Activity Leader
1.1	Documentation of high quality projects	Information has been collected on 203 BiPV projects and will be published as a database on the Task VII website. A short list of high quality projects will be evaluated and the resulting document(s) published.	Netherlands
1.2	Case studies	Ten case studies have been selected and progress on these will be followed over the next few years.	Italy
1.3	Book of examples	Planned for publication in 2001.	Australia
1.4	Design tools	The UK design tools study (see pg. 3) has been published. Work to update the tool PVSyst is on-going in Switzerland.	Finland
2.1 & 2.2	Commercial building integration concepts / Residential building integration concepts	Information on existing products for integrating PV into buildings has been collected and is currently being evaluated. A workshop is planned for February 1999 in Lausanne which aims to bring together manufacturers and architects along with Task VII experts to discuss possible improvements to BiPV products.	United Kingdom/ Netherlands
2.3	Integration of PV in non-building structures	Information is being collected on successful products and systems and the strategies they use to avoid problems such as vandalism.	Sweden
2.4	Guidelines, standardisation, certification and safety issues	Information is being collected on existing guidelines and systems of certification. An evaluation is being carried out of the need for international guidelines and standards and which areas they should cover.	United Kingdom
3.1 & 3.4	Barriers assessment and marketing strategies	A study is being undertaken on non-technical barriers for the introduction of BiPV systems. This will lead into the identification of strategies to overcome the various barriers.	Netherlands/ Austria
3.2	Potential	The potential of PV in the built environment in terms of total resource, technical potential and market potential is being evaluated.	Switzerland
3.3	Economics	Standardised economic assessment methods for BiPV are being developed. A booklet summarising the results will be published.	United States
4.1	Demosite	The demosite at Lausanne provides a showcase for various BiPV systems. Manufacturers interested in demonstrating further products are being sought.	Switzerland
4.2	International solar electric buildings conference	Two conferences are planned to publicise the results of Task VII. The first will be held in Australia in 2000, see back page. The other will be held in Europe at the end of Task VII.	Netherlands/ Australia
4.3	International ideas competition	A number of architectural design competitions are planned in various countries, including the UK.	Netherlands
4.4	Dissemination strategies	A Task VII web site has been developed. It is currently only open to Task VII experts but it is hoped that it will eventually be open to the public.	Denmark
4.5	Training and education	Information has been collected on existing training courses which will lead to the development of Task VII training programmes.	Netherlands

DTI PV Programme Activities

The Department of Trade and Industry's Photovoltaic programme has been running since the early 1990s with the twin aims of assessing the prospects of PV generation for the UK and encouraging UK competitiveness. The strategy involves a collaborative effort with the PV industry, the DTI and other government departments and takes account of opportunities to benefit from international efforts. The emphasis of the programme is to understand the technical and commercial opportunities and technical and non technical barriers to the technology so as to inform industry and government. Several priority areas have been identified including building integrated applications, electrical integration, product development and exports support.

Copies of ETSU research project publications are available on loan from the New and Renewable Energy Enquiries Bureau, Tel: 01235 432450/433601, Fax: 01235 433066. Please quote report number. Report lists are also available on request.

PV System Design Tools

HGa, in collaboration with Studio E Architects, recently completed a review of PV design tools. The project looked at a variety of software packages and evaluated their suitability for PV in buildings.

Ideally a PV design tool should assist building designers who are considering PV integration in developing both an outline design and detailed specification of the installation. The ideal PV design tool could provide an informed estimate of the likely power produced from PV and a more reliable forecast of PV output using locally obtained weather data and site shading. A comprehensive PV component library would be included with a detailed technical design programme to optimise the PV array configuration, wiring and system connections.

The review found that there are very few PV design tools suited to building-integrated PV installations. Two tools were identified as the most promising. The PVS tool has a very user friendly interface and is best suited to preliminary design. It is available from Econzept Energieplanung GmbH, Germany, fax +49 761 4016627. The PVSYST tool offers the ability to model the PV system and its components in greater detail, but is considerably more difficult to operate. An updated version, PVSYST3.0, with improvements in ease of use, is currently being developed at EPFL in Switzerland. The present version is available from GAP, University of Geneva, fax +41 22 3478649.

ETSU Report No. S/P2/00289/REP "Photovoltaics in Buildings - A survey of design tools".

Testing, Commissioning and Monitoring

Guidelines for the testing, commissioning and monitoring of building integrated PV systems have recently been completed by HGa on behalf of the DTI. They are intended for use by building and system designers, contractors, commissioning engineers, system suppliers, building users and owners, maintenance personnel and specialist monitoring companies.

The guidelines provide a methodology for ensuring PV systems are properly tested and commissioned, and recommendations for monitoring PV systems to enable system performance to be evaluated and compared to others projects and faults to be detected.

The Guidelines (ETSU report no. S/P2/00290/REP) will be available from ETSU or BSRIA Publications, BSRIA, Old Bracknell Lane West, Bracknell, Berkshire, RG12 7AH. Tel: +44 1344 426511, fax +44 1344 487575, e-mail bsria@bsria.co.uk

Ecotec Study

Ecotec Research and Consulting Ltd in association with ECD and the Newcastle PV Application Centre have recently completed an assessment of the future market potential for building integrated photovoltaic products. This examines current product availability, product development needs, the nature and size of the potential market and the opportunities for government and the PV supply industry to work together to develop the market.

The report (ETSU No. S/P2/00277/REP) concludes that there is considerable interest among building professionals in employing BiPV in a wide range of buildings and applications. While the available BiPV products meet market needs in many respects, there is clearly scope for additional development primarily to reduce costs and improve visual appeal of the products. It is also necessary for potential users to be given better access to more appropriate technical information and for the supply side to address the issues of standards and product delivery.

Design Guide For Architects

A PV design guide for architects is currently being prepared by Max Fordham and Partners and Feilden Clegg Architects. The guide addresses PV in new buildings and provides an overview to designers and architects. It considers PV as an integral part of a building's overall environment and energy strategy, with an emphasis on high-quality, environmentally friendly, energy efficient design.

The guide is expected to be published in February 1999 and will be launched with a workshop for an invited audience at the BRE.

International Activities

Sydney Olympic Village

The world's largest solar village is planned for the athletes' village next to the site for the year 2000 Olympic Games in Sydney, Australia. The village will include 665 houses, all of which will have a 1 kWp photovoltaic array. Following the games, the village will be used as part of a new housing area for Sydney.

BP Solar have won the contract to supply the first 500 PV systems for the village, which is located in the newly established Sydney suburb of Newington, next to the Olympic site at Homebush. The PV systems, which will be interconnected with the grid, are estimated to supply approximately one million kWh of electricity per year.

The solar houses have been designed to be energy efficient, and combined with the electricity supplied by the PV system, will reduce carbon emissions by more than 2.5 million kg per annum. The village is a case study for the Australian contribution to Task VII. Further information can be found on the web site http://ee.unsw.edu.au/~std_mon/

A Million Solar Roofs for the US

The Million Solar Roofs Initiative aims to install one million solar energy systems on residential, commercial, and public-sector buildings by 2010. In October 1997, President Clinton announced the Federal government's commitment to place 20 000 solar energy systems on Federal Buildings in support of the initiative.

The solar technologies that are included in the programme are PV, solar hot water and solar space heating. For PV, the minimum system sizes counted as a project are 0.5 kW for a residential building and 2 kW for a non-residential building.

The US Department of Energy's Federal Energy Management Programme (FEMP) plays a leading role in achieving the federal commitment. Among their goals is to foster financing mechanisms such as Energy Savings Performance Contracting (ESPC). This involves contracting an energy service company (ESCO) to finance, design, install operate and maintain new renewable energy projects, which are reimbursed with a portion of the energy cost savings during the term of the contract.

Future Events

	Dates	Venue	Description of Programme
PV in the City of the Future	12 and 13 October 1998 (optional tutorial on 14 October: One megawatt PV projects in new housing areas).	Nieuwland 1 MW PV Project, Amersfoort, The Netherlands	The Programme will consider opportunities for PV in European cities of the future. Its major emphasis will be on overcoming the non-technical barriers that impede the application of building integrated PV systems and evaluating the potential for PV in public spaces and public services
	For further details, contact Meggie Schreurs of Ecofys, +31 30 2913449 or send an e-mail to PV.CityoftheFuture@Ecofys.nl		
Solar Power: Local Opportunities for the 21st Century - Practical application of solar power in buildings	27 November 1998	Berrill Theatre, Open University, Milton Keynes	This conference aims to introduce the concepts of solar energy to those working to promote sustainable development or who have responsibility for buildings and their energy consumption. It will include initiatives taken by Local Authorities and LA 21 Groups.
	For further details, contact Christiane Buckle, UK-ISES Secretariat, Tel. 01865 484367, Fax. 01865 484263, E-mail. uk-ises@brookes.ac.uk		
Building with Photovoltaics - Products, Systems and Opportunities	11 & 12 February 1999	EPFL, Lausanne, Switzerland	This workshop will review existing PV building products for building integrated PV systems. It will bring architects and product suppliers together in working groups to evaluate the current 'state of the art' and identify opportunities for the development of existing or new PV products and systems.
	For further details contact Mrs Stephanie Sayer, HGa, Burderop Park, Swindon SN4 0QD Tel. 01793 814756, Fax. 01793 815020, E-mail: dgd@hga.co.uk		
Upcoming Task VII Meetings	8 and 9 October 1998	Madrid, Spain	Fourth Task VII Expert Meeting
	April 1999	Austria	Fifth Task VII Expert Meeting
	March/April 2000	Australia	The Task VII Intermediate Conference is to be held in conjunction with the ISES Pacific Conference