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# JUNE 2002

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Silicon feedstock – what's the issue? Is there really a raw material supply problem and if so what is being done to resolve it? Inside we look at one of the PV industry's biggest talking points.

**PV POWER** 



#### Seven years of international collaborative research focusing on grid-interconnection of dispersed PV power systems (PVPS Task 5) culminated in a workshop in Arnhem in January.

Since 1994, PVPS Task 5 has been working to develop and verify technical recommendations for safest, most reliable and lowestcost interconnection and operation of distributed, grid-connected PV systems.

Over the past three years, the priority has been to analyse the impact of high concentrations of PV systems on the electricity distribution network, with the purposes of defining recommendations for network operation and configuration and of optimising PV inverter systems to ensure the distribution network can cope with widespread PV deployment. The conclusions of these activities were presented at the workshop 'Impacts of PV Penetration in Distribution Networks – Network Aspects on High Penetration Level of PV Systems and Islanding Analysis' on January 24-25 in the Netherlands. Over 75 experts from 15 different countries worldwide attended the meeting.

#### **ISLANDING POSES LITTLE RISK**

The main topic of the first day was islanding, a phenomenon whereby distributed generators like PV could potentially continue to feed power into the distribution network after the mains network has failed. A 'live' generator could pose a safety problem for instance for network technicians working to rectify the mains fault. The lively discussions amongst the workshop participants showed the keen interest in this issue.

Part of Task 5's work in this area has been to identify technologies for detecting islanding faults, though at the same time the group has effectively demonstrated that the probability of islanding is practically zero; normally the inverter will force a disconnect from the network if its voltage and frequency trip limits fall outside those of the mains for more than one second. There is a condition when load and generation are closely matched that could allow the inverter to operate outside these limits, but the likelihood of such conditions existing at the same time that the network fails is in the order of 1 in 1 billion, even at comparatively high connection densities. In terms of the likelihood of electric shock PV presents an extremely low risk – better than a 1 in 100 million chance.

#### **PV PENETRATION**

The second day commenced with an overview of the state of the art of grid interconnection guidelines and inverter grid interconnection technology, the main conclusion being that guidelines and technologies are becoming less country specific.

Another topic of particular interest to utilities and electricity delivery companies is the technical impact of high levels of PV penetration on the power network. Task 5 clearly indicated that networks can handle a large amount of PV, up to the daytime minimum load capacity of the distribution line, without significant problems. Slight modification of utility MV/LV transformer taps increases the limit of PV penetration significantly.

A study of the power value of PV systems demonstrated that PV can have a good

power correlation with electrical loads especially in business areas. All presentations showed that there are few technical barriers in power networks for the large-scale integration of PV systems. The focus is now on information dissemination and the removal of some old but persistent barriers – notably how to encourage proper consideration of distributed generators within energy companies' network planning.

The proceedings of the workshop are available electronically. Contact Bas Verhoeven: s.a.m.verhoeven@kema.nl. A set of reports presenting the full findings of the Task 5 studies will be available shortly. Details will be provided on the PVPS website: www.ieapvps.org.

Although the PVPS-specific research into this field has now concluded, the growing importance of distributed generation systems in general – a topic which has gained new significance in the wake of September 11th – is likely to result in a new IEA activity focusing on issues related to implementation of all distributed generation technologies.

Contact: Tadashi Kanbayashi, NEDO Fax: +81 (0)3 35 90 58 03

Network engineers can be quite confident that PV installations conforming to national interconnection standards pose negligible electrical hazard.





## FIVE YEARS OF PVPS IN THE BUILT ENVIRONMENT

#### DESIGNING WITH SOLAR POWER A SOURCE BOOK FOR BUILDING INTEGRATED PHOTOVOLTAICS (BIPV)

This quality reference book encapsulates the five years of Task 7 work, involving over thirty international experts drawn from the fields of BIPV research, development and design. It is aimed at encouraging governments and agencies to support BIPV deployment and to raise confidence among architects, engineers, environmentalists, planners and their clients.

The book addresses the following topics:

- Building design & environmental concepts: Holistic design process, building aesthetics and urban aesthetics, functional and performance needs vs architectural appeal of BIPV and other technologies;
- Technologies & integration concepts: Discussion of PV technologies in the marketplace and a summary of integration concepts in use for all building typologies;
- Building integrated PV application: Case stories from over 20 international examples;
- Non-building Structures: Examples of innovative PV-integrated non-building applications;
- PV Potential & Design tools: International assessment of PV potential against country building stock typology and review of BIPV design plus analysis tools for architects, building practitioners and planners;
- Electrical concepts, reliability & standards: Essential electrical configuration considerations for safely integrating PV technologies to the grid;
- Non technical barriers & markets: A review of national government programmes, mechanisms and market issues to address non-technical barriers to PV deployment.

A CD-ROM containing images and training material addressing BIPV products, design options and practice and processes will accompany the book.

Cover price is USD 65.

To order, contact Images Publishing: Fax: +61 (0)3 9561 4860 PVPS Task 7, which for the last five years has drawn together PV industry, architects and other buildings specialists to focus on enhancing the architectural and technical quality and economic viability of PV systems in the built environment, is also coming to a close.

Architectural integration of PV into roofs and façades of buildings and other multifunction structures (e.g. canopies and sound barriers) is seen as one of the key routes by which PV will contribute to the future energy demand of industrialised countries. Indeed, one of the fundamental activities of Task 7 has been to analyse the potential contribution that PV applied to suitable building stock could make towards satisfying current electricity demands. This is an important first step for developing sound market introduction policies, and for establishing realistic targets for PV within national energy portfolios. Between 15 and 60 % of the national electricity demands of the PVPS participating countries could be met from PV in the built environment, excluding building surfaces that either present installation problems, or that are technically inappropriate (e.g that would yield less than 80 % of the output of an optimal system due to poor orientation, inclination or shading).

Task 7 has made an important contribution towards raising awareness not only of the technical potential for urban PV applications through workshops and reports, but has also developed an excellent website (www.pvdatabase.com) to showcase interesting designs and hopefully stimulate new ideas among architects and other key implementation groups.

Another proactive measure to encourage innovative and aesthetically attractive but functional solutions for PV in the built environment was the Task 7 design competition. A compendium of the best ideas, published in the competition results book, is a useful reference tool for PV-novices. Task 7's work has also resulted in a number of products



Percentage of national electricity consumption that can be provided by PV roofs and façades in selected IEA countries. (Assumes solar yield of 80 % and PV system efficiency of 10 %).

aimed at demistifying the technology and simplifying outline PV system design for non-specialists; PVSYST, a software package for architects, engineers, researchers and students, quickly enables relative novices to view and analyse data for a wide variety of system configurations, and also provides a system-sizing functionality. In the longer term, though, a stream of well-informed, appropriately skilled architects, urban planners and building engineers is vital for sustainable implementation of PV in the built environment. Task 7 has developed materials and a proposal for a training course structure as a first step towards satisfying this need.

Information about all of the Task 7 reports and tools mentioned, as well as many others is available on the PVPS website. A book and CD-ROM (see box) encapsulating all of the work undertaken within Task 7 over the past five years will be published later this year, to coincide with Task 7's final workshop which will take place in Rome in October alongside the Conference 'PV in Europe: from PV Technology to Energy Solutions'. Contact: Michiel van Schalkwijk Fax: +31 (0)30 2808301

### SILICON MELTDOWN?

By any stretch of the imagination, the expansion of the global photovoltaics industry in recent years has been impressive. In IEA PVPS countries, market growth rates averaged over the past five years have been approaching 30 %, pushed forward by several major deployment programmes in Japan and Germany. The future, though, is far from certain: module price reductions expected both by the government ministries supporting PV programmes and by the customers have stalled as demand outstrips supply.

The main problem is silicon availability. It's not quantity as such, but quantity at the right price that is the issue. Despite perennial promise of thin film modules requiring less raw materials, 90 % of all PV cells are still made from 'thick' crystalline silicon, using scrap from the electronics (silicon chip) industry. Crystalline silicon is expected to remain the dominant technology throughout this decade, but without a dedicated supply of affordable solar grade silicon, the expected price reductions seem unlikely for the forseeable future.

Nevertheless, from northern Norway at least, there are positive sounds for the future. Glomfjord, a village of only 1400 inhabitants, is home to ScanWafer, a manufacturer of multicrystalline silicon wafers, supplying exclusively to the PV industry. The company, which takes scrap and non-prime 'rocks' of EG-Si and processes them into the wafers used by PV cell manufacturers worldwide, has expanded from 60 employees to 110 in the past year. More significantly, production capacity has been increased by 150 % from 20 MW to 50 MW in the process.

The improvements in productivity, achieved through industry-leading automation of the ingot to wafer process, together with further process improvements, such as minimising the 'contamination' waste during

#### LIVING ON BORROWED TIME?

The 'scrap' or off-specification supply of electronics grade silicon (EG-Si) is limited to about 15 % of the total annual EG-Si production (currently estimated at some 20 000 tonnes). Such scrap used to cost in the order of USD 20 per tonne. Crystalline silicon modules typically have a specific silicon requirement in the order of 16 - 17 tonnes per MW, so it is clear that the PV industry, with shipments of power modules for 2001 estimated at around 350 MW, is currently exceeding the available off spec supply by some 75 %. The deficit is met from non-prime EG-Si, more expensive than the scrap normally used by the PV industry, and these prices

the silicon block formation, reducing and recycling kerf (sawing) wastage and cutting

## **GREENPEACE TARGETS THE SOLAR GENERATION**

Greenpeace and the European PV Industry Association have published their blueprint aimed at showing how solar power is capable of supplying electricity to more than one billion people worldwide within two decades.

The report, *Solar Generation: Solar Electricity for Over 1 Billion People and 2 Million Jobs by 2020* presents market development projections based on historical growth and current national and/or regional targets for installed PV generation capacity up to the year 2010. The study draws on other market analyses to define a consensus for growth to 2020 and beyond. Encouragingly the importance of solar electricity as a tool for social and economic development in the developing world is not overlooked. The study sees the OECD countries dominating the global market to 2010, but by 2020, it expects that over 60 % of the predicted 207 GW installed capacity to be in non-industrialised regions, especially South Asia and Africa.

However, apart from calling for the extension of policies to stabilise global PV demand at a level above 1 GWp by 2006, the removal of regulatory and fiscal barriers and the introduction of legally enforced mechanisms to accelerate the new market for PV, the practical recommendations for how to achieve the solar generation transformation are rather thin. There is also little mention of industry's ability to meet the demand, or of how the large number of systems (including 200 million Solar Home Systems for the non-industrialised world) can be delivered. Nevertheless, as an 'eye-opener' for PVnovices, particularly in the political arena, it does give a useful overview of how the global market is developing, and - given suitable political and industrial investment – the job creation and environmental impact potential of sustained PV deployment actions. Contact EPIA, Fax: +32 (0)2 468 2430 or Greenpeace, Fax: +31 (0)20 524 6291.

**PV POWER** 

down wafer breakages, give Technical Director, Øivind Gjerstad, confidence that the company can deliver cost reductions of 40 % over the next 3-4 years, even if the feedstock price does not decrease. As the wafer constitutes some 35 % of a multicrystalline PV module cost, this represents an important reduction in module costs, which should mean price reductions for end users.

Even so, there is still a real need for further price reductions, and with the silicon-reliant industry growing so quickly the feedstock price could negate other cost savings if an alternative to electronics grade material is not found quickly. Several major parties from the chemical industry around the world have plans to establish just such a supply. In Japan, Kawasaki Steel has established a small pilot plant investigating the purification of metallurgical grade silicon to solar grade silicon (SOG-Si), but it remains unclear whether this has any potential for upscaling to plants of sufficient size to serve

the PV industry in any meaningful way. Again, Norway may have a key role to play in the search for a dedicated SOG-Si supply. For the past century, abundant cheap hydropower has made Norway an excellent location for energy-intensive chemical and metallurgical processing industries. The country is home to silicon industry giant Elkem, which last year issued a technical cooperation agreement with US cell and module manufacturer Astropower to establish a low-cost, large-volume manufacturing facility for PV silicon feedstock. Still, the impact of this agreement on the PV SOG-Si market before 2005 is likely to be limited. But perhaps the best near term contribution to the PV industry's feedstock problem will come - fittingly - from a Japanese/US/ European joint venture. At the end of March, Renewable Energy Corporation AS (REC) of Norway signed a letter of intent to provide capital and technological development capabilities as its contribution to a

joint venture with Advanced Silicon Materi-



ScanWafer's new silicon processing plant in Glomfjord is running at full speed to help meet global demand for polycrystalline wafers.

als LLC (ASiMI), a United States subsidiary of Japan's Komatsu Ltd. and a manufacturer of polycrystalline silicon. ASiMI has a 3 000 tonne silane gas plant sitting idle as a result of the electronics industry downturn. The objective is to dedicate this to producing polycrystalline silicon for solar applications. And back in Norway, ScanWafer bosses must be smiling; its major shareholder is none other than REC.

Contact: Bruno Ceccaroli, Scatec Fax: +47 3811 9961

#### **EA**

# JAPANESE INDUSTRY CONFIDENCE IS HIGH

Japan's current residential PV programme will expire at the end of the 2002 Fiscal Year. Despite no clear successor at this stage, major industry seems confident of a bouyant future PV market.

The Residential PV System Dissemination programme has been one of the key drivers for global PV market growth, accounting for in the order of 20 % of the additional worldwide generation capacity installed over the past 4 - 5 years.

The initial success of the programme was due largely to the high (50 %) capital subsidies available to the end users, but while the average subsidy has been diminishing – such that the current JPY 120/kW rebate equates to 15 - 20 % of the installed system price – demand for PV among environmentally and technologically aware Japanese homeowners is unabated. It is expected that during FY 2001 some 30 000 new residential systems will have been approved for installation.

At the government level, talks about a new law, possibly involving a renewable power portfolio, are well underway. Japan is well aware of its need to reduce reliance on oil imports, and with the public still cautious about further nuclear development, a future involving a significant renewables component would seem unavoidable.

These factors have not gone unnoticed by two of the world's top three PV manufacturers; Sharp and Kyocera appear very confident that demand for PV will continue to accelerate rapidly. Both have seemingly acknowledged that PV will be an important income stream in the near future and are aiming to retain their positions as market leaders by 'upgrading' their PV departments to independent business divisions. Sharp is reportedly aiming to double its annual production to 200 MW this year. Contact: Osamu Ikki, RTS Co. Ltd. Fax: +81 (3) 3553 8954

#### **BLOOMING MARVELLOUSLY**

Visitors to the Floriade, the world horticultural exhibition, cannot fail to notice the world's largest rooftopintegrated PV system.

A huge glass canopy measuring 100 by 278 metres dominates the valley close to the main entrance of the Floriade 2002 exhibition. Work on the exhibition commenced in 1996, but it was not until 1999 – when the giant steel frame was already built that the Dutch utility Nuon had the idea to incorporate PV. 19 380 semitransparent laminates derived from the standard Shell Solar (Siemens) SP140 module now cover the entire roof area, providing a generation capacity of 2,3 MW. This is sufficient



to meet all the park's energy needs during the Floriade.

The laminates provide a dappledshade area beneath the canopy, which will accommodate a variety of exhibits that require a sheltered and climate-controlled environment, including a display of evergreen conifers 6 - 7 m tall.

The event itself only lasts for six months, but the green power plant will remain well beyond then.

#### **INTERNET RESOURCES**

#### MYSOLAR

This is a very attractive site presenting general information on PV and solar water heating systems, and aimed primarily at potential system purchasers, but will also be of real interest to suppliers worldwide who stand to have their product details posted online. One great feature of MySolar is the '5 step wizard'. This enables the user to input information about their location and system configuration (grid-connected or stand-alone), the proposed orientation of the system, and power reguirement, budget or space restricappropriate system sizes and returns a list of potentially suitable suppliers, from which the user can chose to see a more detailed description of the products on offer. The main downfall of the site at this moment is that, because it is reliant upon suppliers registering their products and services, for customers in many countries the list that is generated is rather limited. Given

time though, this could be a very useful PV sales resource. www.mysolar.com

#### SOLAR DEVELOPMENT GROUP

Solar Development Group (SDG) provides business development support and investment to companies with high growth and profit potential that provide PV and other energy services to off grid rural areas in developing countries.

Business development loans and grants up to 150 000 USD are available from the Solar Development Foundation to assist entrepreneurial companies to prepare for private investment (e.g. market research or essential training activities). Solar Development Capital offers debt or equity capital of 100 000 to 2 000 000 USD to businesses with a viable business plan and good prospects of near-term profitability. The group's website is designed to assist companies seeking such investments to determine whether they may be eligible for assistance and to prepare their applications.

www.solardevelopment.org

Floriade is held once every ten years. The 2002 event runs from 16th April until 20th October 2002 in Haarlemmermeer, the Netherlands. Contact: Nuon Renewable Energy Fax: +31 (26) 844 2186

#### PV-GAP GAINS WORLD BANK ACCEPTANCE

The World Bank Group, one of the main financers of PV projects in less developed countries, has issued advice to its staff that products displaying the PV Global Approval Programme's Quality Mark and/or Seal are of an acceptable standard for World Bank supported contracts.

The PV-GAP mark for components and seal for systems are effectively underwritten by the International Electrotechnical Commission, the international standards and conformity assessment body responsible for all fields of electrotechnology. PV-GAP licences approved manufacturers to use the visual indicators on their components, which simplifies the quality recognition procedure for bank staff and their clients.

Contact: PV-GAP Fax: +41 (0)22 919 0300

#### **REVENUE BOND SIGNALS 10 -**12 MW FOR SAN FRANCISCO

In November, San Franciscans gave their backing to the city governors' proposal to create bonds worth USD 100 million to finance 10 - 12 MW of PV, 30 MW of wind and energy efficiency measures in public properties over the next four years.

73 % of voters said 'yes' to the creation of the revenue bonds, partly in

order that the city can protect itself from the energy price shocks that have rocked California over the past two years. In fiscal year 1998/99, the City of San Francisco spent USD 7 million on electricity purchases. In 2000/01, this had rocketed to 39 million. The bond is expected to pay for itself from the savings in electricity purchases.

The fact sheet outlining the proposition for the bond also advised voters that the measure is likely to attract a PV manufacturer to San Francisco, bringing jobs and creating a new economic base for the city. www.californiasolarcenter.org/ sfbond2001.html

#### UK'S LARGE-SCALE PV PROGRAMME UNDERWAY

In March UK Energy Minister, Brian Wilson, announced GBP 4 million (USD 5,8 million) funding for 18 projects on public buildings across the UK under the Department for Trade & Industry's Large-Scale PV programme.

This represents an additional GBP 1 million over the budget pledged in November's call for tender. The extra funding was made available due to the large number of quality schemes proposed. All the designs are for true building integrated systems and modules and inverters will be required to conform to appropriate certification standards.

The projects include a 280 kWp collonade using semi-transparent cadmium telluride modules, linking the buildings of the new Science Campus at Cambridge University, and a 107 kWp, thin film PV array integrated into the roof of a new sports facility in Birmingham. The latter complex is due to host the world indoor athletics championships soon after completion.

Contact: James Marsh, DTI Fax: +44 (0)20 7222 4382

### **PVPS NEWS**

#### HOW WILL PVPS BUILD ON TASK 7'S ACHIEVEMENTS?

PV seems to be entering a new market phase. PVPS is considering how it can best assist the emerging markets.

The focus of follow-on activities to Task 7, the PVPS activity on PV in the built environment, which is shortly to conclude its work, is currently under discussion.

With Japan's main rooftop deployment programme due for completion in the next year (and Germany's the year after), it is unclear precisely how PV deployment is likely to be driven in future: by individual project developers, through community initiatives or via continued large-scale (national) programmes. What is clear is that project sizes are increasing and use is becoming more mainstream, moving from the 'technology innovators' to 'early-adopters'. Furthermore, all of the deployment approaches will involve the participation of those involved in the building industry, though the precise functions required vary: at the individual project level, innovative products suitable for sustainable buildings are required whereas on the (national) market level low-cost solutions with well-understood warrantees are required. The project level will require participation of fore-running architects, whereas the community level will require more emphasis on urban design and plannina

Over the next year, the structure of a proposed 'Task 10' focusing on the needs of the newly emerging largescale built-environment markets will be defined. PV Power will keep its readers informed of developments.



#### **PV IN NON-BUILDING STRUCTURES**

PVPS Task 7 has published a report highlighting opportunities and pitfalls and presenting design guidelines for PV integration into nonbuilding structures

The potential for using PV in Non-Building Structures in the built environment is large, even in a modern society where the electricity network is well developed. Photovoltaic modules can be incorporated in structures such as bus shelters, information signs, street lights and sound barriers. For applications with a low power requirement PV can be suitable as a commercial alternative to grid connection, avoiding the need to dig up roads or pavements to lay cables.

Such niche applications can provide economic as well as aesthetic benefits. PV also has a unique versatility, as it lends itself equally well to highly visible applications, yet can just as readily be adapted to discrete applications for instance in visually sensitive environments.

Designers of PV systems integrated into non-building structures need to consider a range of criteria such as irradiation, shading, orientation, visual impact, available surface and other technical requirements. Past experience has also shown that theft and vandalism can be a problem for these systems. This report summarises essential considerations and highlights typical problems faced by system designers. It also presents some design strategies to facilitate the successful use of PV in Non-Building Structures. A number of case studies are included. These illustrate the versatility of PV in the urban environment.

The report is available for download via the PVPS Main website:

www.iea-pvps.org

#### DIARY DATES...

Intersolar 2002 Freiburg, Germany 28-30 June 2002 Solar Promotion GmbH Fax: +49(0)7231 351381 www.intersolar.de/index\_e.html

World Renewable Energy Congress VII & Expo, Cologne, Germany 29 June - 5 July 2002 Prof. Ali Sayigh Fax: +44 (0) 118 961 1365 www.wrenuk.co.uk

IEA PVPS programme: Bringing RTD results to target groups Vienna, Austria 13 September 2002 Michael Heidenreich, Arsenal E: michael.heidenreich@arsenal.act.at PV in Europe - From PV Technology to Energy Solutions Rome, Italy 7-11 October 2002 WIP-Munich Fax: +49 (0)89 720 12791 www.wip-munich.de

Storage for Renewable Energies Conference (STIRE) Aix en Provence, France 9-11 October 2002 Patrick Jourde, Genec E: patrick.jourde@cea.fr

3rd World Conference on Photovoltaic Energy Conversion Osaka, Japan 12-16 May 2003 WCPEC-3 E: wcpec3@cc.tuat.ac.jp www.tuat.ac.jp/-wcpec3/

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### **BASEL STADIUM**

### **CASE STUDY**

#### **PROJECT SUMMARY**

- Location: Basel, Switzerland
- Installed: October 2001
- Modules: 1258 x Kyocera K120 Multi-crystalline silicon
- Inverters: 5 x Sputnik SolarMax 30+
- Mounting: Energiebüro Zürich
- Generation capacity: 150 kWp
- Annual electricity production: 130 000 kWh – more than is required to illuminate all matches during the year.
- PV System is visible from the executive boxes

Contact: Eric Nussbaumer, ADEV Fax: +41 (61) 922 08 31

The St. Jakob Stadium Cooperative, owners of Basel's football ground, can justifiably claim to have one of the greenest stadia in the world – and that's not just a reference to the lush new playing surface.



Many sports arenas offer an ideal location for PV installations: their large, otherwise redundant roof areas tend to be wholly, or to a large extent, free from shade and they are generally inaccessible to unauthorised personnel so risk of theft or damage is low. They can also present an excellent marketing opportunity for the technology itself as well as for the system owners and associated groups.

The owner of the PV plant is ADEV Solarstrom AG, a company with 500 shareholders that invests in cost-recoverable PV installations. ADEV rents the roof space from the stadium owners. The installation is the result of an annual request for proposals issued by the local utility, Industrielle Werke Basel (IWB). Under Basel canton law, IWB offers a subsidy of about 40 %, plus a feed-in tariff of CHF 0,70/kWh (0,40 USD/kWh) fixed for 20 years funded through the Solar Stock Exchange (see PV Power #12).

Installed on the inclined south-facing roof covering the north stands, the PV array is visible from the executive boxes in the opposite stands. Even if their team doesn't win, the fans have something to celebrate.



### **PV IN THE CITY**

IE A

No two towns are identical, but in respect of planning development and implementation of PV projects, the considerations for one urban environment are much the same as the next, particularly within any one country.

This is the thinking behind the EU project 'Photovoltaic City Guide' which has drawn on the work of PVPS amongst others to develop a series of concise, simple to use national guides to provide practical advice to those involved in urban PV developments. The guides, which cover issues such as the technology & markets, design & legislation, financing and project implementation & quality assurance, have been tested in ongoing BIPV projects in Belgium, Italy, Spain, Sweden, Switzerland and the UK.

The project culminated in an international workshop 'PV Solar Power in European Cities' in Basel, Switzerland in September 2001. The event focused on three critical aspects of urban PV project planning and implementation – the policy and legislative framework, the design environment and project management. The central question under discussion was how to progress from individual projects to programmes for urban PV. As only about 10 % of ideas for urban PV projects ever come to fruition it is clear there are some key issues to resolve: either the majority of project proposers do not have a full appreciation of what is involved in seeing the project through to completion, or there are obstacles which prevent the majority of projects being realised. Key amongst the workshop conclusions were the need for properly focused promotional and marketing tools for PV solutions, and a greater emphasis on the added values that PV can offer the urban environment. The reports and workshop conclusions are available from the project website: http://pvcityguide.energyprojects.net