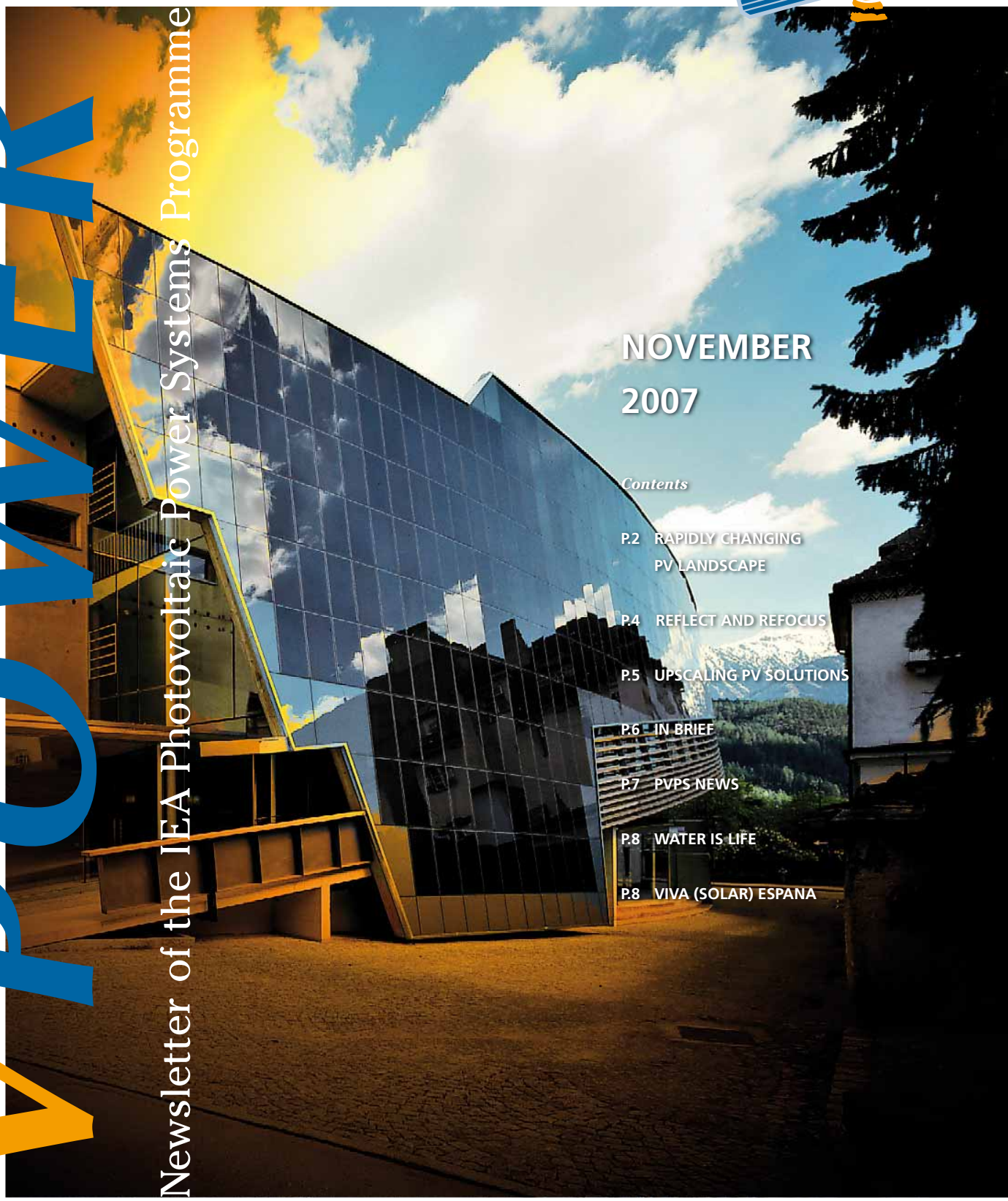
IEA INTERNATIONAL ENERGY AGENCY 27

PV POWER

Newsletter of the IEA Photovoltaic Power Systems Programme



NOVEMBER 2007

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Reflect and Refocus: see page 4 for a review of PVPS achievements over the past five years and a look forward to what the next phase of the programme holds. [VOCATIONAL SCHOOL AT IMST, TYROL, SIBLIK-ELEKTRIK]

RAPIDLY CHANGING PV LANDSCAPE

One year can seem like a long time in PV activities as highlighted by findings presented in the latest international survey report, Trends in photovoltaic applications: survey report of selected IEA countries between 1992 and 2006 (September 2007).

While some annual markets stagnated, others started to take-off during 2006 as support programmes began to take effect, notably in Spain, Korea, Italy, the USA and France. At the same time, the decline of domestic markets continued to be observed in Austria and the Netherlands. PV production saw the relative German market share in 2006 increase at the expense of the Japanese market share. Photovoltaic module production in Europe clearly surpassed that of Japan for the first time during 2006. Interestingly, total 2006 module production only increased by about 9 % over 2005 production in the IEA PVPS countries. Meanwhile, over the last decade, each year's installed market growth expressed as a percentage of total module production has ranged from 65 % in 1998 to a high of 91 % in 2006. Almost overnight it would appear that non-PVPS countries now account for over a quarter of global cell production and over 30 % of global module production, with East Asia as the emerging powerhouse for PV cell and module production internationally.

The Trends report is produced annually by IEA PVPS Task 1 (responsible for information exchange and dissemination) drawing on the information provided in national survey reports from each of the programme's 21 participating countries. The report provides an overview of PV power systems applications, markets and production in the reporting countries and elsewhere at the end of 2006 and analyzes trends in the implementation of PV power systems between 1992 and 2006. The trends report aims to support the development of strategies of businesses and public authorities, the planning processes of electricity utilities and other providers of energy services and also the development of energy policy and national energy plans. A snapshot of the latest report is presented here, touching on the topics of market growth, public budgets and market support, the industry supply chain, prices and economic benefits. More detailed information plus additional topics can be found in the report itself.

INSTALLED CAPACITIES

About 1,5 GW of PV capacity were installed in the IEA PVPS member countries during 2006 (an increase of 15 % over the previous year) which brought the total installed to 5,7 GW. As in recent years, by far the greatest proportion was installed in Germany and Japan alone. Particularly with the recent levels of growth seen in IEA PVPS member countries, this reported installed capacity represents a significant proportion of worldwide PV capacity. Of the total capacity installed in the IEA PVPS countries during 2006 about 4 % (63 MW) were installed in off-grid projects. The annual rate of growth of cumulative installed capacity in the IEA PVPS countries was 36 %, down a little from the highs of 2004 and 2005.

PUBLIC BUDGETS AND MARKET SUPPORT

Over the previous decade, public spending on PV has quadrupled, with spending initially focused on RD&D. 2006 saw a large increase in total budget compared to 2005, to over 2 billion USD. While this was largely due to the increasing amounts being paid under feed-in tariff schemes, such as in Germany, and other market stimulation measures, expenditure on RD&D also increased by about 17 %. Nearly all countries reported increases in total expenditure for 2006 compared to 2005. Besides the obvious increase in Germany, both the USA and Korea reported large funding increases (120 % and 67 % respectively).

The main fiscal instruments being used to publicly support or promote PV continue to be the enhanced feed-in tariffs, with direct capital subsidies also playing an important role. Similar to the direct capital subsidies, tax credits can, to a degree, tackle the upfront cost barrier and various forms of this

The solar harvest continued in 2006 with 1,5 GW of new PV capacity installed.

40 KW PV plant, Narni Italy

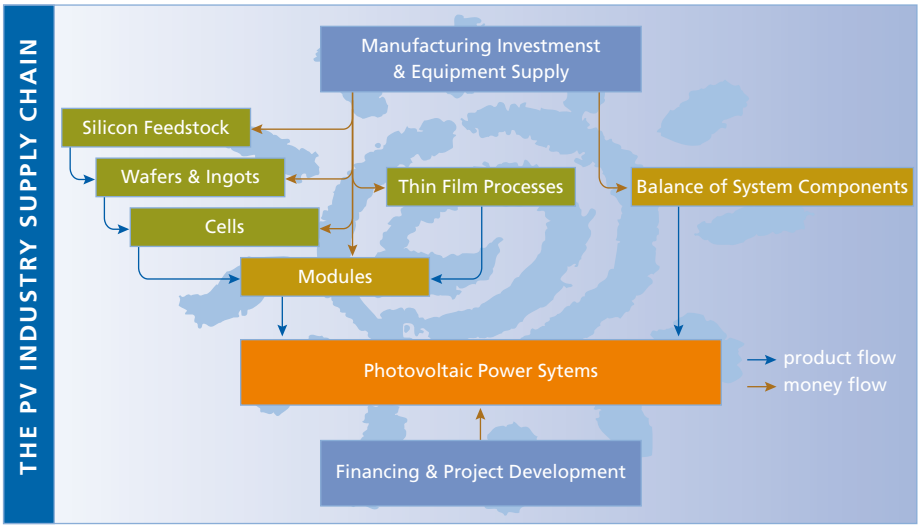
measure have emerged in a number of countries. Also, as the PV market matures and opportunities for business are identified, various commercial initiatives are emerging. These include activities such as preferential home mortgage terms and green loans from commercial banks, and share offerings in private PV investment funds.

Many governments are implementing 'renewable portfolio standards' (RPS) to increase renewable energy deployment in their countries through electricity utility regulations. In the USA in particular, a number of PV-specific regulatory approaches have emerged. Sustainable building regulations are an emerging force in many countries. Worldwide, there are a number of 'green power' schemes offered by electricity businesses through which customers can purchase PV electricity.

THE PV INDUSTRY SUPPLY CHAIN

In 2006 there continued to be four major producers of solar photovoltaic grade silicon together producing about 60 % of the feedstock required by the PV industry. The USA is a large exporter at this level of the PV industry supply chain. It is reported that the selling price of solar photovoltaic grade silicon increased by about 20 % from 2005 to 2006. Ingot producers are in many cases also producers of wafers. European and Japanese companies feature most prominently in this section of the industry supply chain. Some companies are vertically-integrated, controlling the process from ingots to cells and modules.

The total PV cell production volume for 2006 in the IEA PVPS countries was reported to be about 1 900 MW, up from 1 500 MW in 2005, an increase of 27 %. The largest increases in production took place in Germany (additional 170 MW) and Japan (additional 96 MW). Japan was the leading producer of photovoltaic cells (920 MW) and modules (645 MW) during 2006. Production of cells and modules in this country accounted for 48 % and 39 % respectively of the IEA PVPS countries' production, with Germany in second place with 27 % and 21 % of production respectively. In the USA, the third largest producing country, production of cells increased by 29 % from 2005, while module production remained flat.



However, US output of thin-film technologies saw another dramatic production increase of 94 %, on the back of a 109 % increase the previous year. Crystalline silicon technologies maintained their dominance, accounting for 91 % of the market in the IEA PVPS countries.

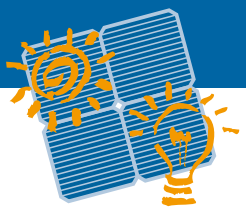
PV PRICES

In 2006 the lowest system prices in the off-grid sector, irrespective of the type of application, ranged from about 9,5 USD to 15,0 USD per watt. The lowest achievable installed price of grid-connected systems in 2006 also varied between countries. The average price of these systems was 6,8 USD per watt (compared with 6,6 USD per watt in 2005). The lower reported prices in 2006 were typically around 6,0 USD to 6,5 USD per watt, also slightly higher than the prices reported for 2005. In 2006 the average price of modules in the reporting countries was around 4,6 USD/W, a marginal increase compared to the corresponding figure for 2005.

ECONOMIC BENEFITS

Significant value of business has been reported by countries with healthy domestic PV market growth and/or large export of production from somewhere along the PV industry supply chain. The total value of business in 2006 amongst the IEA PVPS countries was approximately 10 billion USD. Further, the economic value in the IEA PVPS countries can be characterized by the total direct employment of about 70 000 persons across research, manufacturing, development and installation – an increase of close to 30 % compared to 2005. Many manufacturing companies in Europe have continued to benefit from the strong level of demand within Germany, even when their domestic markets have diminished. In addition, new programmes have emerged in a number of countries – notably in Spain, Korea, Italy, the USA and France.

Further information and a downloadable version of the Trends report can be found on the IEA PVPS website.



REFLECT AND REFOCUS

The IEA Photovoltaic Power Systems Programme is one of the collaborative R&D Agreements established within the IEA. Since its establishment in 1993, the PVPS participants have been conducting a variety of joint projects concerning the application of photovoltaic conversion of solar energy into electricity. At the conclusion of a third term of activity (2002-2007) an end-of-term report is produced for the Renewable Energy Working Party and the Committee on Energy Research and Technology of the IEA.

By mid 2007, twelve individual research projects (tasks) were established within the PVPS programme, of which seven are currently active. With an orientation towards market deployment and acknowledging the wide range of PV applications – small and large, stand-alone and grid-connected, freestanding and building-integrated, in developed and developing countries – the Programme has addressed important technical and non-technical barriers for each of these applications through:

- exchange of information on solutions, experiences, products, markets, industry and policy
- establishment of international databases on products as well as the design and operation of photovoltaic power systems
- formulation of recommended practice in different technical and non-technical areas
- pre-standardisation, e.g. guidelines and security issues of grid-connected systems
- quality assurance of photovoltaic power systems
- studies on economic aspects, added values, marketing, financing, environmental issues
- development of design and education tools
- organisation of workshops and conferences in both IEA and non-IEA member countries.

The PVPS implementing agreement covers all major IEA countries dealing with PV and addresses the important issues of the large community of non-IEA countries where PV will eventually play an increasing role in the energy supply. In total, about 100 experts are involved in the work of the PVPS programme and the total effort of in-kind contributions is estimated to be about 3,5 million EUR per year. The programme has a unique position as a global, independent network of expertise providing information and recommended practice on latest developments of technology, products, system design, markets and policy.

This combination of addressing all critical factors for the deployment of PV in one comprehensive and global programme is the outstanding feature of this implementing agreement which is not available elsewhere. The documented case studies of implementation strategies and installations provide valuable resources for policy makers, ensuring lessons learned are shared and successful strategies built upon.

The performance assessments and technology reviews assist the PV industry to improve their products and to keep up to date with international developments. PVPS publications provide some of the best promotional material for PV worldwide.

In spite of the impressive global expansion of PV applications, the implementation of this young renewable energy technology is still at an early stage. For a large scale implementation in the different application areas, such as building integrated systems on an urban scale, medium and large size grid-connected systems, support of weak grids and the delivery of energy services in developing countries, many technical and non-technical aspects still need to be addressed. During the next decade PV, like other renewable energy technologies, is seen to have a 'window of opportunity' during which it can establish itself as a well-recognized and widely accepted energy technology. With the anticipated future cost reductions, achievement of price parity with retail electricity rates will lead to an important market transformation and increased opportunities for self-sustaining markets.

Considering this framework for the future a strategy for a further term of the PVPS has been developed. The new strategy will be characterized by:

- providing targeted and objective information on PV energy services for successful implementation
- providing a recognized, high-quality reference network for the global development of PV and related matters
- working with a broader set of stakeholders, especially from industry
- supporting the transition towards self-sustained markets by carrying out activities of multi-national interest
- attraction of new participants from non-IEA countries with growing energy demand.

THIRD-TERM ACHIEVEMENTS

Over the third term of IEA PVPS the main achievements have been:

Three new Tasks established covering urban-scale PV, PV hybrids in mini-grids and environmental safety and health issues

Two country memberships reactivated (Spain and Turkey)

One sponsor member joined (EPIA)

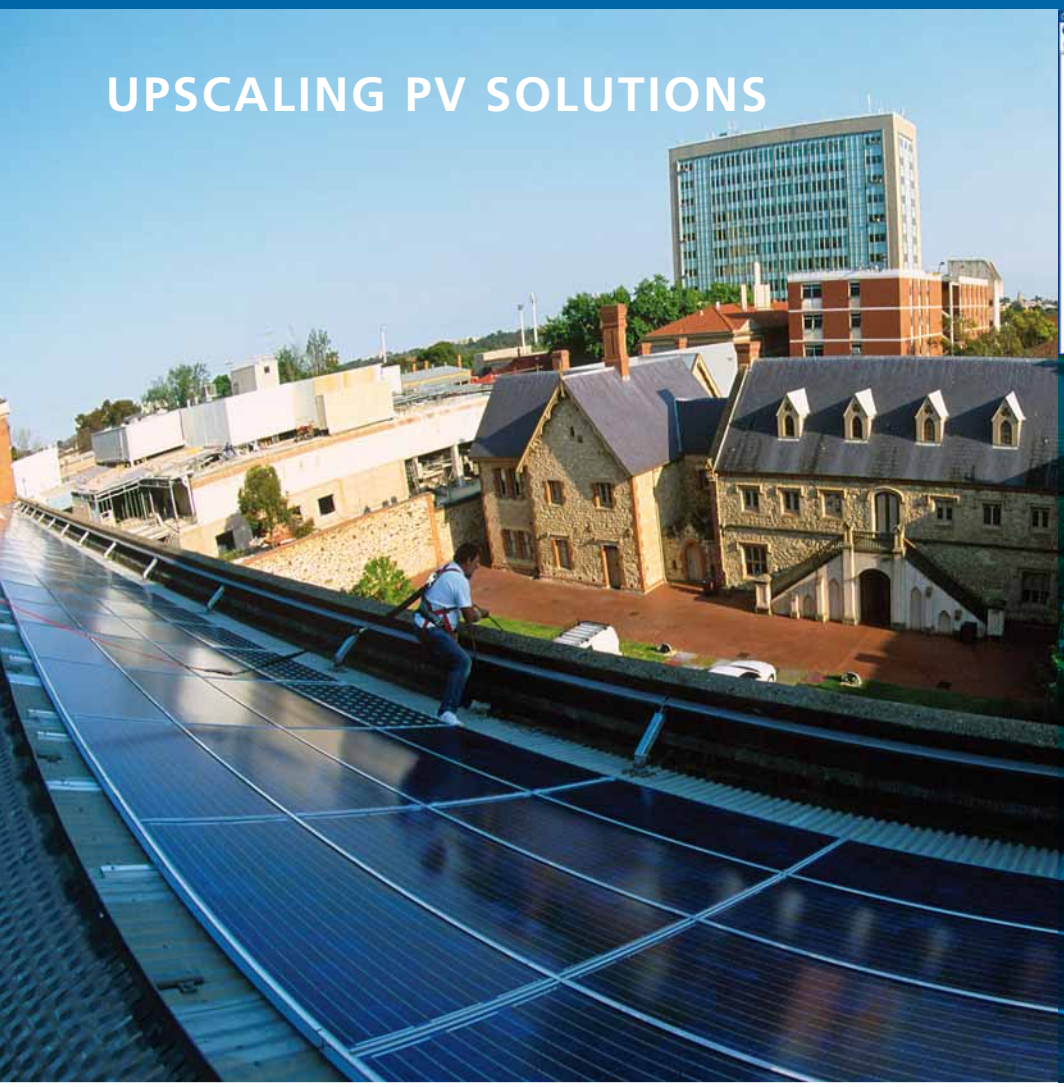
Concrete steps towards membership by at least two countries (Malaysia and Greece)

More than 75 reports, books, publications and presentations

More than 50 events with PVPS organisation and/or participation and over 4 000 participants (large conferences not included)

Over 4 000 users of the Task 2 database from over 90 countries.

UPSCALING PV SOLUTIONS



PV UPSCALE

Complementing and supporting the IEA PVPS work under Task 10, a number of European countries are collaborating on the project PV in Urban Policies: a Strategic and Comprehensive Approach for Long-term Expansion. 'PV UP-SCALE', as it is more widely known, is supported by the European Commission under the framework of the Intelligent Energy-Europe (IEE) program. Several Task 10 participants, notably the Austrian and French experts, are also contributing to PV UP-SCALE, which should ensure a well-coordinated approach to the common efforts (www.pvupscale.org). The World PV Database is one of the joint outputs and a fine example of the effectiveness of the cooperative effort.

Increasingly around the world the focus of PV projects in the urban environment is moving away from projects on individual buildings towards concepts and approaches that look to embed PV and other complementary energy efficiency and generation measures within a broader sustainable urban-development context.

A central challenge of scaling-up from 'simple' building integrated PV towards a well-designed solar suburb and eventually a solar city is to engage the various groups that influence the implementation of such developments – particularly urban planners, the construction sector and the electricity industry – in the process. This is the ongoing objective for IEA PVPS Task 10, which has a strong outreach and information dissemination component.

In addition to organising two successful design competitions under the banner 'the Lisbon Ideas Challenge' (more on Page 7),

9,8 kW Rooftop PV array on the South Australian Museum. This is the first installation of Adelaide's North Terrace Solar Precinct. PV has also been installed on the roofs of the city's Art Gallery, Parliament House and State Library. Adelaide will host the 3rd International Solar Cities Congress in February 2008 [PHOTO CAPITAL CITY COMMITTEE]

Task 10 has already developed a number of practical resources to share knowledge on building integrated and urban-scale PV applications, to support parties that are considering PV for towns and cities.

Developed cooperatively by Task 10 and Task 2 (Operational Performance and Analysis of PV Systems), the BIPVTool (www.bipvtool.com) is a handy educational resource that presents an insight to the entire project process from the initial tentative ideas of those considering PV in the built environment through decision factors to practical aspects of design, tendering, installation and operational performance and evaluation. The tool uses feedback from various international case-study projects, looking at facets such as economic considerations, electro-mechanical design, grid-interconnection and installation issues, monitoring and lessons learned.

For those looking to see more examples of PV in practical applications in the urban environment, the World PV Database (www.pvdatabase.org) builds on IEA-PVPS's tradition – established under the completed Task 7 on BIPV – for presenting high-quality project and product information and stunning photographs in a user-friendly format. The new online database takes the experience to a new level with increased search options and expanded information. A number of projects are highlighted as 'best-practice' examples, each certain to stimulate interest in the potential for PV to meld with the highest standards of architectural design and building innovation. A number of urban-scale projects, achieving large-scale PV deployment via several component sub-projects, are also described in detail. The database will be updated on an ongoing basis as more data becomes available.

IN BRIEF

PV Architecture at the Community Centre in Ludesch/Voralberg, Austria [PHOTO ERTEX SOLAR GMBH]

AUSTRIA

Austria has joined the league of nations that have developed a national PV Roadmap. The strategy, which envisages a 20 % PV contribution to Austria's electricity demand by 2050, was formulated with support of the Ministry for Transport, Innovation & Technology and the Austrian Research Promotion Agency under the 'Energy Systems of Tomorrow' programme.

The plan has a strong R&D emphasis, offering short, medium and long-term recommendations to help the domestic PV industry break into or enhance their position as global players. National PV R&D coordination appears critical, with specific opportunities identified as building integration and PV's impact on building performance, grid-interaction issues, particularly control strategies for networks with high PV penetration, and life-cycle aspects such as recycling.

At the same time short to mid term priorities are identified to assist market dissemination, including a focus on information and educational resources and training in general for a broad range of stakeholders

As far as the enabling framework is concerned, the roadmap identifies a well-structured feed-in-tariff alongside embedding PV requirements into building standards as critical components to achieving the objective.

GERMANY

The German government looks set to accelerate the rate of 'degression' of the feed-in tariff for PV electricity, for systems installed from 2009 onwards. Currently the tariff for building integrated systems declines by 5 % per year; that is to say electricity from a system installed in 2007, for example, would only attract 95 % of the rate awarded to electricity from a system installed in 2006 (the rate is then guaranteed for 20 years for each installation).

However, the German Environment Ministry (BMU) has indicated that it would like to see a modification to the Renewable Energy Law (EEG) which governs the feed-in-tariff arrangements for electricity generated by PV and other renewable energy technologies to increase the rate of decline to 7 % each year in 2009 and 2010. It is anticipated there would be a further change to 8 % from 2011. For ground-based arrays the proposed rate of decline is 8.5 % per annum from 2009 and 9.5 % per annum from 2011. The proposal is expected to pass through parliament this year signalling an amendment to the law next year.

KOREA

With just over 13 MW of PV installed in the whole of Korea at the end of 2005, aiming to increase that 100 times to 1,3 GW in the seven year period to end 2012 might have seemed overly ambitious. But that is exactly the target that was set and 2006 really got the ball rolling, with PV generation capacity increasing by 21,2 MW, four times the amount installed in 2005. This was almost exclusively grid-connected, in line with the principal support measures, notably the 100 000 rooftop programme and the preferential feed-in-tariff. Under the FIT, over 9 MW of commercial plant (systems between 3 kW and 1 MW) were installed in '06, alongside four MW-scale plants – incidentally all owned by energy companies.

As we approach the end of 2007, it's apparent that this will be another bumper PV year with annual installation set to exceed 50 MW. For the future, the building-integrated sector is expected to play an important role, particularly as the Korean government plans to construct a mass of new public buildings throughout the country by 2012 under the 'New Administration-Oriented City' and 'Many Innovation Cities' programmes. By then the Korean PV industry may well have fulfilled the government's near-term expectations: 10 % of the world market, exports amounting to 3 billion USD and 50 000 people employed.

MALAYSIA

Malaysia hosted its first 'PV Industry Days' during August 2007 as part of the ongoing Malaysia Building Integrated PV (MBIPV) Project.

IEA PVPS was pleased to support the event which was conceived to provide a platform for international and local PV industry to network, share lessons learnt and pursue opportunities for business collaboration. The programme combined a seminar (with international and local speakers), sessions for presentations by PV companies, an exhibition, a technical visit to a showcase BIPV site and a Round Table Discussion attended by members of the local press. The seminar also provided a platform for a healthy debate on issues faced by the local PV industry.

A total of 280 participants – notably from the building industry (property developers, architects, engineers) as well as PV industry, universities, financial institutions and government agencies – registered for the seminar. There was healthy representation from outside Malaysia (Japan, China, UK, Germany, Burma Korea, Singapore, Thailand and Australia). Some 550 visitors attended the exhibition of international and local PV companies.

Valle de las Misiones Grid-connected PV Systems in Mexicali, Mexico

MEXICO

The first subject-specific meeting aimed at fostering the use of PV in Mexico was held in Zacatecas in June attracting more than 200 people. Organized by the Energy Secretariat of Mexico through the Electrical Research Institute (IIE), in cooperation with the State Government of Zacatecas, the two-day event promoted interaction among public and private entities interested in developing and deploying PV for both off-grid and grid-connected applications. In particular it helped foster exchange of ideas and initiated progress towards a common vision for future development of PV in Mexico. Participants included project developers, investors, industry representatives, officials from international agencies and representatives from the Mexican Federal, State and Municipal governments. IEA PVPS Task 1 participated in the meeting, providing insights to what is happening with PV programs around the world. During the event, the Energy Regulatory Commission of Mexico (CRE) announced the forthcoming publication of a Contract Model for Small Grid-Connected PV Systems. This resolution allows the interconnection with the grid for roof top PV system of up to 10 kWp in the domestic sector, and up to 30 kWp in commercial buildings. Subsequently, net metering of electricity from PV under the terms of this resolution has been approved.

For further information contact the relevant national newsletter representative (see list on P7).

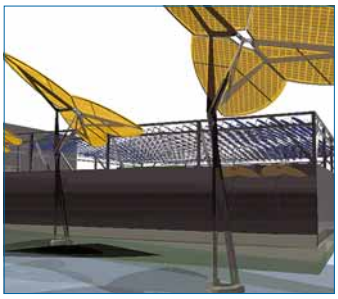
PVPS NEWS

LISBON'S URBAN RENEWAL

At around the same time that this edition of PV Power goes to print, the jury's decisions on the winning design submissions for the 2nd Lisbon Ideas Challenge (LIC II) are due to be announced.

The Prize Award Ceremony takes place in Lisbon on 22nd November during the Conference Energy and Environmental Performance Targets: *Regional and Local Policy and Practice*.

The LIC forms part of the activities of IEA PVPS Task 10 on Urban-scale PV Applications. This year, the design brief considered options for integrating PV into the redevelopment plans for part of Bairro do Padre Cruz, the largest low-income residential neighbourhood in Portugal, located in the north-west of Lisbon. This area of the city has evolved since the late 1950s, but the housing solutions have often been less than optimal and several phases of construction and redevelopment have occurred in the intervening period.



The current redevelopment priority of the Municipality of Lisbon focuses on an area of the Bairro of around 112 000 m^2, approximately 40 % of which is allocated for over 1 600 new homes. An additional 10 % of the area will be used for commercial purposes.

The LIC II organizers had hoped to attract plans that would integrate 1 MW of PV across the broad redevelopment area, but none of the submissions fully complied with the Challenge rules in this regard. Nevertheless, the organizers were able to shortlist thirteen solutions addressing specific sub-projects identified for the south-west block of the redevelopment area. These relate to a multi-storey shopping centre, a public outdoor space known as the 'Kinder Garden', and a six-storey sustainable social housing apartment block.

Although the proposals are optimized for the specific purposes of the Bairro do Padre Cruz redevelopment, a key consideration for the awards jury is the suitability of the solutions for more widespread replication in the urban environment. Three prizes each of 5 000 EUR shall be awarded to the entries that present the best technological integration projects in each of the three categories (Commercial Building, Public Space and Social Housing).

Visit www.lisbonideaschallenge.com.pt to find out about the winners.

NEW ON OUR WEBSITE

The IEA-PVPS website holds numerous PV-related statistics, reports, news and other features to view or download. The site is regularly updated.

Recent additions include:

- The Annual Report for 2006
- The latest in the series *Trends in PV Applications*, covering the period 1992 to 2006
- Many of the National Survey Reports from which the Trends summary is compiled are also available for download.

The site is currently being renovated to improve navigation and searching. We anticipate that the updated site will be online before the end of the year.

Visit www.iea-pvps.org

DIARY DATES...

17th International PV Science and Engineering Conference
Fukuoka, Japan
3-7 December 2007
☛ Yoshio Ohshita
Tel: +81 (0)52 809 1875
www.pvsec17.jp

Photovoltaic Technology Show 2008 Asia
Shenzhen, China
15-18 January 2008
☛ Photon Expo
Tel: +49 (0)241 4003-102
www.photon-expo.com

3rd International Solar Cities Congress
Adelaide, Australia
17-21 February 2008
☛ Plevin & Associates
Tel: +61 (0)8 8379 8222
www.solarcitiescongress.com.au

Solar '08 "Putting Light to Work"
Cairo, Egypt
24-28 February 2008
☛ Egyptian Intl. Conferencing
Tel: +2010 168 6244
www.sabrycorp.com/cms/so/08

4th European PV-Hybrid and Mini-Grid Conference
Athens, Greece
29-30 May 2008
☛ OTTI
Tel: +49 (0)941 29688 29
www.otti.de/uebersichten/ren.html

Intersolar 2008
Munich, Germany
12-14 June 2008
☛ Egyptian Intl. Conferencing
Tel: +49 (0)7231 58598
www.intersolar.de

IEA-PVPS NEWSLETTER

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If you have any comments or require further information about any articles appearing in PV Power, or if you have suggestions for new features, please contact your national representative. Full contact details are provided on the PVPS website.

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PV POWER

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This newsletter is intended to provide information on the activities of IEA PVPS. It does not necessarily reflect the viewpoints or policies of the IEA, IEA PVPS Member Countries or the participating researchers. Articles may be reproduced without prior permission, provided that the correct reference is given.

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WATER IS LIFE

CASE STUDY

PROJECT SUMMARY

- **Location: Nibket El Elk, Timbuktu region, Mali, W. Africa**
- **1,8 kW Solar Pumping System**
- **Water yield: >28 m^3/day**
- **System cost: 33 800 USD**
- **Annual O&M costs: 2 685 USD**
- **Effective water delivery cost: 0,01 USD / person / day (assumes 20 year life cycle)**

Contact: Freddy Wirz
E-mail: wirzsolar@bluewin.ch

Mali in West Africa is one of the world's poorest nations. Each year during the rainy season large tracts of land surrounding the Niger Delta are flooded, but the surface water quickly evaporates, leaving only scarce resources for the country's 12 million people to survive on for the 9 months of dry.

Overall only 4 % of the country's 1,24 million m^2 surface is irrigated.

In 1997, the village of Nibket El Elk near Timbuktu in the north of Mali was a temporary settlement frequented by some 600 people repatriated from a UNHCR camp in Mauritania. At that time the only permanent infrastructure was a simple open well. A borehole was subsequently drilled, but lack of fuel and frequent breakdowns of the diesel generator driving the pump meant there was still no continuous water supply.

At that point the villagers asked Sundance, a Swiss NGO, to support them with a solar pump.

By 2000, the pump was installed, financed 15 % by the villagers themselves, and began to deliver upwards of 28 m^3 per day. Soon more permanent infrastructure became visible, including the first adobe homes and a primary school for the now 800 strong population. It also enabled villagers to start a reforestation programme to provide materials to support the construction work, as well as facilitating crop cultivation, creating jobs and improving nutrition.

The flow of the precious liquid has literally allowed life to bloom in this harsh desert environment

Now the settlement has expanded to 2000, with the school nurturing over 400 pupils. A mosque and shops are also now permanent features and a health post is under construction. The local villagers have also established a local pump fund based on revenue from sale of the water which will support system maintenance and contribute towards a second pump.

VIVA (SOLAR) ESPANA

For years European tourists have flocked to Spain to take advantage of the excellent climate. The famed Spanish sunshine is continuing to attract many to the country, but these days the sun-seekers are almost as likely to be solar project developers as tourists.

The added attraction is the favourable feed-in-tariffs for PV electricity, guaranteed for 25 years and beyond, which coupled to the excellent solar resource (typically 50 % better than Germany), makes Spain the hottest spot for PV investment at present. Revisions earlier this year to Royal Decree 661 which relates to the FIT have effectively eased the passage for very large players via a substantial increase to the tariff for plants above 100 kW (to almost 42 Eurocents/kWh compared to around 26 EURc/kWh previously). This means investors can now get the incentive for single plants up to 10 MW in size, rather than having to go through the cumbersome process of creating multiple 100 kW systems with different owners, as they were doing before.

But the market is not without it's potential problems. Most notably the tariff is currently capped to the first 371 MW installed. That was thought to be large enough to support the market to 2010 or so, but the boom has been such that there is some speculation the target may already be close to saturation – implying some 240 MW may have been installed in 2007 alone and much of that in the second half of the year. A revision of the Decree is not due until 2010, so it remains to be seen whether the market will go through a classic boom to bust next year.

Countering this sobering prospect, a slightly less well publicized Royal Decree (RD 314/2006) provides a Technical Building Code that mandates the installation of PV on new large buildings (offices, government buildings, hospitals, etc.). Based on new construction forecasts, the government agency IDAE estimates that this Decree will result in some 68-93 MWp of additional building integrated PV by 2010.