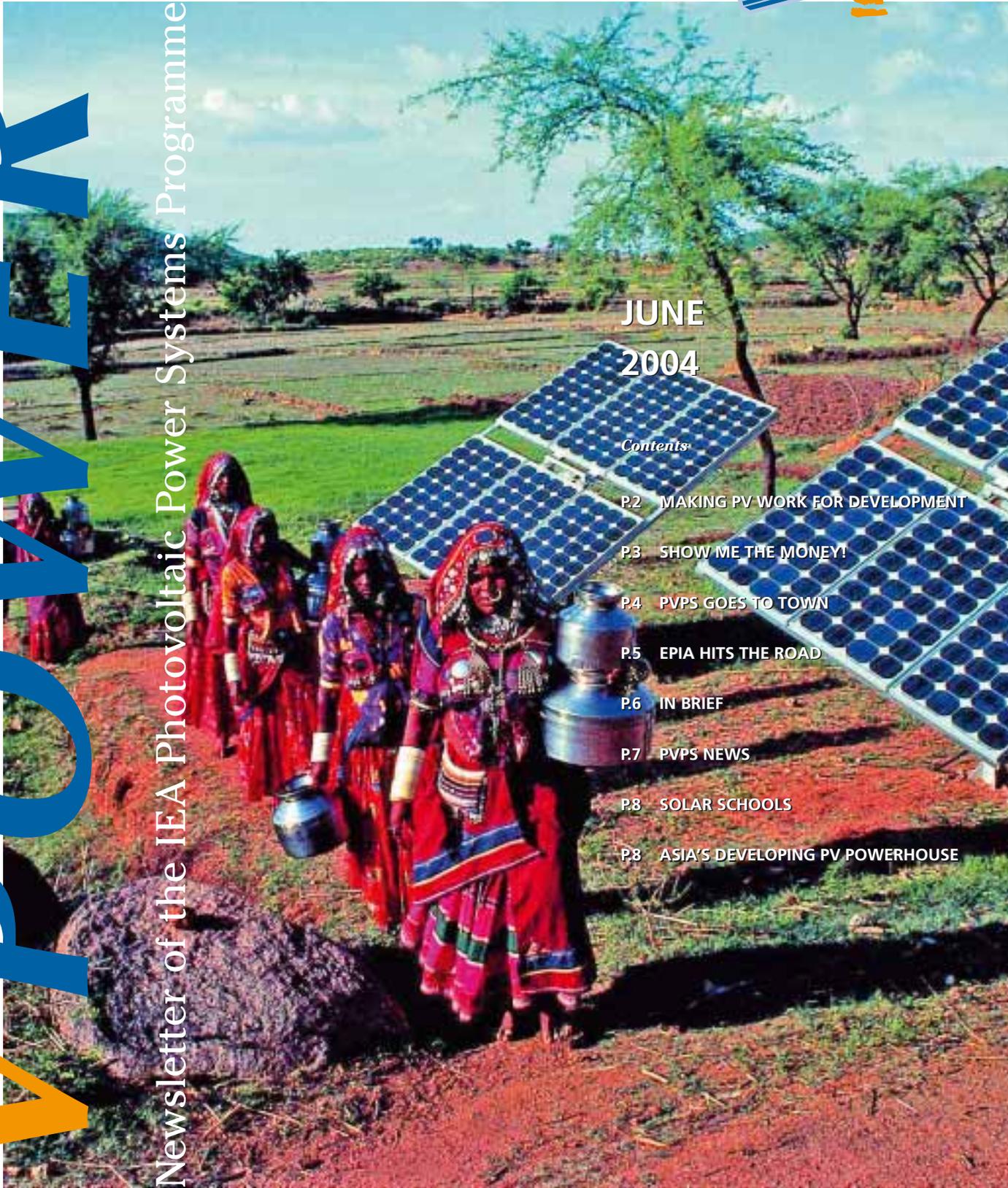




PV POWER

Newsletter of the IEA Photovoltaic Power Systems Programme



JUNE
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Contents

- P.2 MAKING PV WORK FOR DEVELOPMENT
- P.3 SHOW ME THE MONEY!
- P.4 PVPS GOES TO TOWN
- P.5 IEA HITS THE ROAD
- P.6 IN BRIEF
- P.7 PVPS NEWS
- P.8 SOLAR SCHOOLS
- P.8 ASIA'S DEVELOPING PV POWERHOUSE

This safe and reliable energy source makes life easier for the women of Pargula Thanda, a village in the Andhra Pradesh province of India. They can now fetch clean water from the village well at any time of day. [PHOTO SHELL SOLAR]

MAKING PV WORK FOR DEVELOPMENT

IEA-PVPS commits to continued cooperation with developing countries as Task 9 gets the green light for a further five years.

Task 9 is highly unusual in that it is the first Task under any of the International Energy Agency's Implementing Agreements to consider a remit beyond IEA member countries. The priority is to further increase the overall rate of successful deployment of PV systems in developing countries through increased cooperation and exchange of information between IEA-PVPS and developing countries, development banks, multilateral and bilateral aid agencies and other target groups. Important progress along this path was made under Phase 1 through the preparation and dissemination of a series of guides summarising best practice approaches for cradle-to-grave development of PV deployment programmes, and also through a number of seminars and workshops for the target groups.

Collaboration will continue with a variety of international partner organisations under Phase 2, including the respective development agencies of the participating IEA countries, the African and InterAmerican Development Banks and regional bodies such as the Latin American Energy Organisation (OLADE), the Economic Community Of West African States (ECOWAS) and Southern African Development Community (SADC). Task 9 will also seek to leverage other appropriate regional networks such



PV can contribute to improving education opportunities for children like these in South Africa/Naroi

as CLER, a regional organisation of utilities from Latin America, The Green Independent Power Producers Network, and SouthSouthNorth, which creates information and technology links among southern countries and northern counterparts to develop the capacity to transact Clean Development Mechanism (CDM) projects.

This reflects an expanded scope for the Task over the next five year phase, to focus on three key additional subtasks: PV energy services for rural electrification and poverty alleviation; Market penetration activities; and PV and the Kyoto Mechanisms.

The first of these areas will serve to quantify the often cited, but relatively poorly supported claim that photovoltaic services con-

tribute to the alleviation of poverty through a variety of social applications in the health, education and water sectors, and increasingly also in the Information and communication technology area.

The market penetration activities will evaluate the techno-economic aspects of small 'PV Power Packs' providing back-up power supply in the event of loss of grid supply, to 'industrial' PV plants for grid-support or peak load shaving. This Subtask will review situations in developing countries where network capacity and/or generation capacity need to be increased and where it is cost-effective to install PV or PV hybrids as an alternative.

The final subtask will consider the relevance of the CDM for PV project finance, in particular modalities and procedures for bundling small projects to overcome the currently prohibitive transaction costs, and also tracking of developments in relation to determination of baselines and monitoring methodologies for such small-scale projects.

The new work programme will result in a number of new case studies and reports, as well as electronic bulletins to keep interested parties abreast of developments.

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SHOW ME THE MONEY!

Identifying and securing finance can be an all-consuming concern for developers of PV deployment programmes. A new report from Task 9 may ease the burden.

Without adequate capital resources, PV programme planning, equipment purchases, transportation and installation, as well as ongoing training and long-term maintenance are largely impossible. In such cases, the only outcome is that the programme – no matter how well-intentioned – cannot get off the ground.

Finance availability in itself is not necessarily the problem. Internationally there are numerous sources of loans and grants, as well as equity investors and other potential financiers or guarantors that might support PV deployment initiatives under the right circumstances. But this is the key; all too often PV programme developers fail to address the investors risk concerns or develop inadequately structured programme concepts



that do not meet the expected return on investment or other such criteria.

To complement its recommended practice guides that have dealt with issues such as the Institutional Framework and Financial Instruments for PV Deployment in Developing Countries and Financing Mechanisms for Solar Home Systems, IEA-PVPS Task 9 has recently released a guide to 'Sources of Financing for PV-Based Rural Electrification in Developing Countries'. The guide is focused at assisting host governments and bilateral institutions, private developers and non-governmental organisations to identify PV finance, to understand the accompanying lending or investment criteria and to pre-

pare to 'sell' their project to the financiers. The guide, Report T9-08:2004, opens with a description of risk analysis and the barriers to financing. A large part of the report is devoted to sources of finance, covering international concessionary financing from multilateral and regional development banks, bilateral development agencies and benevolent foundations, as well as potential national and commercial options. A number of matrices give a simple overview of the typical variables that influence financial appraisal decisions for each of these sources and the type or mix of finance options that might be appropriate for particular types of programmes. An introduction outlining the process for engaging with potential financiers and for developing appropriate business plans to improve the chance of securing finance is also provided. The report, together with the others in the Task 9 Recommended Practice Guide series, is available for download free-of-charge from the IEA-PVPS website.

PVPS AND THE MILLENNIUM DEVELOPMENT GOALS

Delivering a real contribution towards achieving the Millennium Development Goals (MDGs) is one of the strong driving principles behind Task 9. The eight goals were adopted as a framework for measuring development progress, following the Millennium Assembly of the United Nations in September 2000.

Neither access to modern energy services in general, nor provision of electricity, are recognised as specific goals in themselves. Nevertheless they can play a central role in poverty alleviation, through impacts on education, health and local enterprise, as well as access to telecommunications and information technology resources.

The MDGs and some of the roles for PV are:

- 1 Eradicate extreme poverty and hunger – Lighting allows increased income

generation and reliable electricity encourages enterprise development, energy for water supplies for cooking and drinking and water for irrigation increases food production.

- 2 Achieve universal primary education – Electricity enables access to educational media and communications, energy helps create a more child-friendly environment and reduces school drop-out rates and lighting in schools allows evening classes and helps retain teachers.
- 3 Promote gender equality and empower women – Availability of modern energy means women do not have to carry out survival activities, good quality lighting permits home study and reliable energy services offer scope for women's enterprises to develop.
- 4 Reduce child mortality – Electricity can bring about less indoor air pollution, increased safety, free up more time to be

spent on child care and provide pumped water and purification.

- 5 Improve maternal health – Energy services provide access to better medical facilities (vaccine refrigeration, equipment sterilization, operating theatres). Provision of cooked food and space-heating contribute to better health.
- 6 Combat HIV/AIDS, malaria and other diseases – Energy services provide better medical facilities, and energy can help produce and distribute sex education literature and contraceptives.
- 7 Ensure environmental sustainability – Traditional fuel use contributes to erosion, reduced soil fertility and desertification, energy can be used to pump and purify clean ground water.
- 8 Develop a global partnership for development – Energy supply can contribute to the development of information and communication technologies in remote/rural areas.



PVPS GOES TO TOWN



IEA-PVPS Task 10, the new task addressing urban scale PV applications, kicked off in Vienna in February.

The success of Task 10, which is seeking to take PV from a niche building product to a desirable and commonplace feature of the urban environment within the next ten years, is dependent on generating interest amongst and meeting the needs and aspirations of a wide variety of stakeholders beyond the PV industry – from the building, finance and insurance sectors, to governments, the electricity industry, educators and trainers and of course the end-users. The focus is on expanding the opportunities for wide-scale, solution-oriented applications of PV in the urban environment through approaches that also maximise building energy efficiency and solar thermal usage. To achieve these objectives, the work programme involves a very wide range of activities with emphasis on directly engaging with these groups through regular workshops and a marketing competition, as well as close cooperation with other IEA Implementing Agreements – particularly the Solar Heating and Cooling Programme and the Energy Conservation in Buildings and Community Systems Programme. This approach will help in identifying and developing appropriate products to overcome information gaps, but Task 10 aims to go further to address other market needs and opportunities; the work plan also envisages identification of new system components

and applications for urban-scale PV concepts, as well as development of design assistance tools to help embed PV consideration and integration within urban planning processes.

ECONOMICS AND INSTITUTIONAL FACTORS

The first of the four broad subtasks outlined in the workplan will focus on how to maximise benefits for multiple stakeholder groups. Typically to date, community policy, utility and industry needs have tended to be considered largely as separate, almost unrelated issues. This subtask aims to achieve a more holistic value-based approach that considers economic drivers alongside other broader social, developmental and environmental values. It will also assist the various national and regional PV Roadmaps to move beyond the current concept phase towards actual implementation.

URBAN PLANNING, DESIGN AND DEVELOPMENT

The second key activity area seeks to integrate PV within community building practices emphasising appropriate use of PV to improve both individual building and urban-level energy performance and management. This includes developing guidelines for incorporating PV within whole building design models, building energy and environmental performance rating tools and development codes and practices. Looking beyond the building envelope, the subtask will also seek to move PV and whole com-

munity energy infrastructure considerations into urban planning practices. This will include aspects such as aesthetics, land use, solar access and urban renewal opportunities, but within the context of community-level energy use forecasting, and load control to achieve demand reductions and maximise PV capacity value.

TECHNICAL FACTORS

Subtask 3 will focus on the challenges of developing and expanding the synergies between PV as an electricity supply source and as an effective building material, and on further analysing network impacts, particularly related to extensive penetration of intermittent embedded generators. Again, emphasis will focus on energy efficiency and management aspects to assure demand reduction and capacity value, including how PV control can be successfully integrated within building energy management systems and system optimisation to match lighting and HVAC loads.

Part of the work will include reviews of existing codes and standards, and development of appropriate certification practices for electrical and structural performance of new market-oriented products.

TARGETED INFORMATION DEVELOPMENT AND DISSEMINATION

Critical to the whole process will be the information activities. The participating countries will host technical development and education workshops, and it is anticipated that documents and mass/multi-market

Pal Town Josai-no-Mori residential estate in Ota City, Japan, is a demonstration site for research being undertaken by the New Energy and Industrial Technology Development Organization (NEDO) into clustered PV systems. 100 houses – many of which are built to order – have already been equipped with PV systems and a further 500 will be added before the end of Fiscal Year 2004. The project, which runs until 2007, will assess multiple aspects of high-penetration PV environments such as technologies to avoid restriction of PV system output, analysis of higher harmonics, anti-islanding operation and applied simulation technologies to assess impacts on the grid. Understanding of these issues is also one of the areas being considered under the new Task 10 and will be critical for more widespread introduction of PV.

[< PHOTO PROF. KUROKAWA AND MR OZEKI, TUAT]

[PHOTO RTS CORPORATION >]



promotional material arising from the Task will be translated into multiple languages. An innovative marketing competition will also be organised, with the winner to be

announced at a PV forum for the venture capital sector. One of the first public activities within the new task will be an Architects and Builders workshop for French

stakeholders linked to the European PV Conference in Paris on 10 June. Contact: Christy Herig, Fax: +1 727 392 9470

IEA

EPIA HITS THE ROAD

The European Photovoltaic Industry Association, EPIA, is preparing to release its roadmap; a plan that aims to make PV competitive with conventional energy within the next two decades and put Europe at the forefront of clean power generation.

Not surprisingly, principal among EPIA's roadmap priorities is to reduce [end-user] investment costs of PV systems. There are several parallel routes outlined to achieve this, including technology improvements such as increased efficiency and better use of materials, development of new technology options, mass fabrication techniques and improved tooling, as well as investment in significantly larger scale production units. Amongst the numerous detailed technology goals and milestones, EPIA is calling for industry and research centres to collaborate to cut silicon material consumption by 37,5 to 40 % by 2010. This will be achieved through wire-sawing innovations and use

of larger ingots or ribbon sheets. Crystalline silicon cell efficiency increases of over 20 % and 35 year module life expectancy are sought within the same time frame, while unit area costs for building integrated PV are expected to be cut by 50 % through thin film process and efficiency improvements. On the systems side, EPIA acknowledges that the PV industry must focus on international programmes for developing countries to deliver appropriate off-grid services, while concentrating on developing linkages with the building community to capitalise on opportunities for building integrated PV. A general objective of continual 5 % per year reductions in system component costs is also expressed. At the same time, EPIA recognises that PV has numerous applications with different cost structures and that continuous cost reduction will gradually broaden the competitive market opportunities. A second target is to develop these opportunities and the Association proposes that European

home markets will benefit from the introduction of funding schemes for investments, new financial instruments, improved standards and training for installers and stronger awareness campaigns. Export markets especially in remote areas of developing countries present other opportunities that will require a different development approach, including a focus on energy services (as opposed to energy delivery per se) targeted development finance and continued evolution of appropriate financing schemes. Central to EPIA's technological and market development programme are three branches of policy support which provide the long-term stable platform for industry to base its investments upon: a European rate-based incentive scheme; continuing Focused Research and Technological Development (RTD) Programme with improved funding arrangements; and strengthened assistance for export promotions. Contact: Michel Viaud, EPIA, Fax: +32 (0)2 468 24 30

IN BRIEF

**AUSTRALIA**

The findings of the initial review of the Mandatory Renewable Energy Target (MRET) were released in January. The review recommended that MRET continue, and that the scheme be extended beyond 2010 towards a target of 20 000 GWh by 2020 to provide ongoing certainty for industry and project developers.

For PV, the review recommended 100 kW be adopted as the maximum size for 'Small Generation Units' (SGUs), a significant increase from the present 10 kW. SGUs can create 'deemed' renewable energy certificates up-front based on assumed annual generation. The panel also recommended the deeming period increase from 5 to 15 years. As deemed RECs can be sold to an agent, this would effectively create a 'buy-down' of around 800 AUD (550 USD) per kW.

AUSTRIA

The Austrian PV market grew by almost 40 % in 2003 thanks to a highly attractive buy-back rate of 60 Eurocents/kWh for systems under 20 kW (see PV Power #18). As anticipated, however, since the cap on the amount of PV that can be supported under the Green Electricity Act 'Ökostromgesetz' was reached in January 2003, comparatively little additional capacity was installed during the rest of the year. On the bright side, despite the market uncertainties, two manufacturers commenced production in Austria in 2003.

**DENMARK**

Following the axing of most of the support to renewables in 2001, a number of recently successful innovative commercialisation projects in the PV sector, in the inverter and silicon production fields, have helped persuade the Danish government to recommence support to PV RD&D. An area of R&D interest is dye-sensitised cells with controllable transparency for building integration products. A new national strategy for PV RD&D has been elaborated by the Energy Authority in collaboration with the electric network operators.

GERMANY

The German PV market continued its strong growth trend in 2003 with around 120 MW of additional capacity installed during the year. This was partially stimulated by a flurry of subscriptions before the 100 000 rooftops programme ended on Dec 31. Even so, the ongoing support for PV under the Renewable Energy Law (20 year contract currently providing around 0,46 EUR/kWh for all power produced) should help maintain a strong market into the future.

In January the Environment Minister indicated that Germany will increase its annual PV R&D budget fourfold to 100 million EUR, though the timeframe for this has not been established.

ISRAEL

The independent Authority for Public Services: Electricity which oversees power issues including tariffs is close to finalising the regulations governing premiums that can be offered to clean energy producers. At the same time, the Israeli Electric Corporation is developing standards for the grid connection of generators. These are expected to be completed by the end of August.

ITALY

The Italian government is defining the details of its PV feed-in tariff. A decision will be made before the end of August, but at this stage the likely tariff rate is not clear. A recent interview with key government figures by the PV journal Photon indicated that a rate somewhere between 0,45 and 0,60 EUR/kWh guaranteed for 15 to 20 years is likely.

In R&D, the current focus seems to be on utility scale PV concentrating systems.

JAPAN

The Ministry of Economy, Trade and Industry (METI) is revising Japan's Long-Term Energy Supply and Demand Outlook with an eye to FY 2030. The outlook for new energy will be plotted out in June.

By February 20, the deadline for applications for FY 2003 Residential PV System Dissemination Program, the total number of applications for the year had reached a record 52 339 – the first time the 50 000 barrier had been exceeded.

KOREA

The Solar Land 2010 (30 000 rooftop) programme commenced in January. In addition to a subsidy equivalent to 70 % of the typical installed system costs, owners can also benefit from a 15 year guaranteed buy-back rate that covers the full difference between the PV electricity price and the marginal electricity price. Currently this provides 670 KRW/kWh (0,57 USD/kWh).

Korea is seeking to repeat the industrial successes it has achieved with semi-conductors and TFT-LCD screens. The aim for 2012 is for 1,3 GW installed and 10 % share of the world market. This would equate to exports of 3 billion USD and employment for 50 000 people.

SWITZERLAND

Budgets for renewables and energy efficiency under the 'SwissEnergy' programme will be reduced by over 20 % to 45 million CHF (35 million USD) within the next three years. Funding will effectively be removed from further pilot and demonstrations projects. The residential market continues to rely on private investment as there is currently no government support in most of the cantons for PV market development, though a nationwide preferential feed-in tariff – albeit at a comparatively low level – is being defined.

UNITED KINGDOM

The UK's Engineering and Physical Sciences Research Council has committed 4,5 million GBP (8 million USD) to a consortium of six universities and seven companies to research 'Photovoltaic Material for the 21st Century'. The project, which will consider electroplating of amorphous silicon onto large area panels, receives the largest single grant the EPSRC has made for solar energy research.

USA

California's state Senate Housing Committee has passed a bill (SB1652) that would require building developers to include PV on a 'minimum percentage' of new homes from 2006 onwards. The bill must pass through the full senate before the mandate becomes law and an earlier draft calling for PV on 25 % of new homes has been relaxed. However, with some 135 000 new homes constructed each year, the Mandate could be a very significant driver for PV in the State.

For further information about any in-brief articles, contact the relevant national newsletter representative (see list on P7).

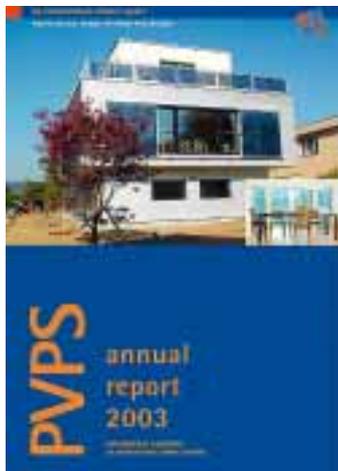
PVPS NEWS

PVPS ANNUAL REPORT

The IEA-PVPS Annual Report for 2003 is now available.

The Annual Report summarises the PVPS programme activities and achievements over the last twelve months. It also includes a detailed overview and plan of deliverables for the new Task 10 on Urban Scale PV Applications, together with Status Reports presenting the national frameworks, programmes and policies for each of the 20 participating countries.

A limited number of hard copies of the report are available on request from the IEA-PVPS Secretariat. Contact Mary Brunisholz
Fax: +41 (0)26 494 00 34
The report can also be downloaded from the PVPS website.



INVERTER SURVEY

A Survey of Inverters and Related Protection Equipment completed under PVPS Task 5 is now publicly available for download from the PVPS website.

Inverters are the key to reliable and safe grid interconnection of PV systems. They are also required to generate high quality power within strict AC utility system boundaries at reasonable cost. This report, IEA-PVPS T5-05: 2002, which is intended to be a reference for people interested in

installing grid-connected PV systems, electricity industry personnel, manufacturers and researchers, presents the findings of manufacturers responses to an in-depth questionnaire. The survey analyses a wide variety of technical characteristics such as input and output voltages and frequencies, power factor, conversion efficiency, isolation between AC and DC and protective functions. Additional data on costs, size and weight are also provided.

The report gives full details of 35 inverters from 17 manufacturers in 6 countries. It also presents a useful guide to the requirements of modern inverter technology for the lay-reader.

STAND-ALONE SYSTEMS

The PVPS task addressing stand-alone systems issues, Task 3, has now ended. It looks likely that a new Task will be developed over the next six to twelve months to address a number of other stand-alone systems issues that were identified by Task 3 for further work.



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 IEA-PVPS Annual Report for 2003; A survey report of inverters and related protection equipment. If you are seeking PV images for use in presentations, check out our online photo-gallery. Visit www.iea-pvps.org

DIARY DATES...

19th European PV Solar Energy Conference and Exhibition
Paris, France

7-11 June 2004

☛ WIP

Fax: +49 (0)89 720 12 791

www.wip-munich.de

World Renewable Energy Congress VIII
Denver, Colorado

28 August ñ 3 September 2004

☛ WREN

Fax: + 44 (0)1189 611365

www.wrenuk.co.uk/wrenviii.html

Intersolar 2004
Freiburg, Germany

24-26 June 2004

☛ Solar promotion GmbH Fax:

+49 (0)72 31 351381

www.intersolar.de

ISES Latin America 2004
Oaxaca, Mexico

4-8 October 2004

☛ ANES

Fax: + 52 1 7773 101650

www.anes.org

15th Int. Conf. on Photochemical Conversion & Solar Energy

Storage Paris, France

4-9 July 2004

☛ IPS-15 Secretariat

Fax: +33 (0)1 4771900 5

www.congres-scientifiques.com/IPS15

6th Renewable Energy Finance Forum

20-21 September 2004

London, UK

☛ Euromoney Energy Events

Fax: +44 (0)20 7779 8946

www.euromoneyenergy.com

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PV POWER

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SOLAR SCHOOLS

CASE STUDY

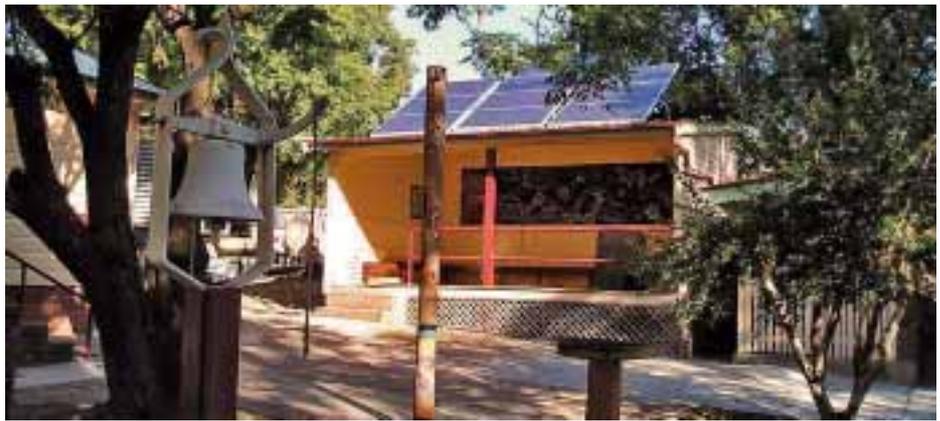
PROGRAMME SUMMARY

- Solar Schools completed to date: NSW 43, QLD 32
- Additional schools in pipeline: NSW 35, SA 50
- Annual energy savings: 2100-2900 kWh per school
- Avoided CO₂ emissions: 55-60 lifetime tonnes per school

Website: www.solarschools.net

Solar Schools is an exciting community based programme that provides PV systems and supporting educational resources to Australian schools.

The solar schools network currently includes SEDA's Solar in Schools programme in New South Wales, and Queensland's Environ-



mental Protection Agency's Solar Schools programme. South Australia has also recently initiated a solar schools programme that is shortly expected to link into the national network.

Each participating school receives a PV system of around 1,5 to 2,0 kW which helps offset part of its electricity purchases and raises awareness of PV and energy issues amongst students, teachers, parents and the local community.

In NSW, the programme is supported by the Department for Education and Training and Energy retailer Integral Energy, with additional financial support from the Australian Greenhouse Office. Each NSW school also

receives a 'Solar Explorer' kit containing a small PV module, meters, lights, buzzers, and experiment booklet which gives students a 'hands-on' opportunity to see PV power at work.

Several of the schools are already connected to the programme website, which provides information about the initiatives, the participating schools and their PV systems. It also provides data feeds from the schools' systems to allow performance monitoring. This gives website visitors an opportunity to see how PV works under different conditions. It also has the potential to alert the schools and regional programme administrators in the event of a system problem.

ASIA'S DEVELOPING PV POWERHOUSE

Thailand has had a steady but largely unremarkable interest in photovoltaics for over twenty years. However, Prime Minister Thaksin Shinawatra's government has turned that upside down with an ambitious programme which by the middle of next year will have seen PV use across the country increase by a factor of six in just thirty months.

The Solar Homes System (SHS) project announced in 2003 is providing 300 000 rural households each with a 120 W PV home electricity system, comprising module, inverter, battery and two fluorescent lights. One of the primary purposes of powering

the nation in this way is to enable rural families to access modern communications, particularly television. The systems should provide sufficient power for light and TV for 4 to 5 hours per day. Cynics might argue that the 7 600 million baht (180 million USD), 36 MW project is a rural vote-buyer, but Thailand's broader energy strategy has a strong environmental focus and a view towards energy security through more effective use of domestic energy resources. Renewables are expected to constitute 8 % of the country's final energy demand – the equivalent of 2400 MW installed capacity – in 2011, compared with just 1 % at the end of 2002. One of the principal measures to achieve this is an obligation on power producers to

source the equivalent of 4 % of their installed capacity from renewables. This is expected to include an additional 214 MW of PV, which will put the nationwide installed capacity at over 250 MW by 2011. The positive policy environment is also seeing benefits in terms of local industry development. Buoyed by a seemingly strong market framework, manufacturers are actively investing in new module production facilities, notably Solartron's 15 MW plant in the country's North East. This article is based on papers presented at PVSEC-14 in Bangkok in January, 2004, notably S. Silasuta of DEDE, fax +66 2 2249 280, and W. Khunchornyakong of Solartron, fax +66 2 3381 0936.

