

DEPLOYMENT OF PHOTOVOLTAIC TECHNOLOGIES: CO-OPERATION WITH DEVELOPING COUNTRIES.
TASK 9 OF THE INTERNATIONAL ENERGY AGENCY'S PHOTOVOLTAIC POWER SYSTEMS PROGRAMME

R. Gunning, J. R. Bates, Z. Li & B. McNelis

IT Power Ltd, The Manor House, Lutyens Close, Chineham Hampshire, United Kingdom, RG24 8AG.
Tel +44 (0) 1256 392700, Fax +44 (0) 1256 392701, e-mail: rebecca.gunning@itpower.co.uk

This paper presents the progress of Task 9 of the International Energy Agency's Photovoltaic Power Systems Programme. The overall mission of the IEA PVPS Programme is to encourage international collaboration efforts through which photovoltaic energy becomes a significant renewable energy option in the near future¹.

An important part of the work of Task 9 is the preparation and dissemination of Recommended Practice Guides (RPGs) for the deployment requirements of PV, and the compilation of case studies on PV implementation programmes. The guides are both technical and non-technical in nature and cover a range of issues. The RPGs are targeted at both the PV programme implementation agencies (multi-lateral agencies, bi-lateral agencies, governments, NGOs and utilities) as well as at financing institutions and capacity builders. The first of the guides: "*Financing Mechanisms for Solar Home Systems in Developing Countries – The Role of Financing in the Dissemination Process*" was published in September 2002.

Following the launch of the RPGs a comprehensive dissemination strategy will be implemented through a series of targeted workshops and seminars. Feedback from these activities will be incorporated into the guides to ensure that they both fully reflect the views of the developing nations and are likely to be utilised and incorporated into manuals of the relevant implementing agencies.

Keywords: 1. Photovoltaics 2. Developing countries 3. Task 9

1. INTRODUCTION

Small amounts of electricity, generated with photovoltaics (PV) can play an important role in helping to meet the Millennium Development Goals. PV is a robust and reliable renewable energy technology which can bring electrical services to support the development needs of many remote and rural communities in developing countries. It is estimated that over 1.6 billion people worldwide are yet to gain access to electricity services and this number is increasing. Conventional electricity services through grid-connection will not in the foreseeable future, if ever, reach the vast majority of these people because of the costs involved: renewable energy technologies are often the only solution. The current market for PV is in the unelectrified areas of the world, particularly in developing countries where PV can already offer the least cost power supply option.

Examples of PV systems which can deliver electricity reliably and at least cost include: lighting and refrigeration for health clinics; pumping and purification of drinking water; power for schools; power for income generating activities (irrigation, motive power etc); telecommunications; home lighting and entertainment; and street lighting. Electricity can improve access to primary healthcare and education. Electricity is fundamental to both economic and social development and its generation and consumption has widespread implications for the local

and global environment. The lack of availability of modern energy services can be detrimental to health, education and transport services, and living standards in general

PV systems have been installed in most corners of the world. There are some outstanding achievements, where PV has changed the lives of its users. But, regrettably, there have also been many failures. Even worse, the same mistakes are often repeated. The International Energy Agency's Photovoltaic Power Systems Programme (PVPS) is trying to make a difference to this cycle. Historically the PVPS programme has addressed issues relating to PV in the IEA countries - the developed countries. Task 9 is the newest initiative of the International Energy Agency's PVPS and is the first time that the programme has looked at those countries which do not participate in the IEA – the developing countries of the world. The PVPS programme aims to encourage international collaboration efforts so that photovoltaic (PV) energy becomes a significant option in the near future.

¹ The following countries are actively participating in the work of Task 9: Australia, Canada, Denmark, Finland, France, Germany, Italy, Japan, Switzerland, the United Kingdom, and the USA

Task 9 brings together renowned PV experts from 12 countries² and developing country specialists with the overall objective of encouraging the appropriate, effective and sustainable deployment of PV systems in development programmes. The project aims to stimulate awareness and interest on the technical and economic potential, social implications, opportunities and best practice of PV systems and to establish a dialogue with multilateral and bilateral agencies and development banks.

The project has 3 key areas of activity:

- deployment infrastructure: the development and dissemination of a series of Recommended Practice Guidelines to promote the necessary infrastructure requirements in developing countries.
- support and co-operation: to raise awareness and interest amongst multilateral and bilateral agencies, NGOs, development banks, on the technical and economic potential, opportunities and recommended practice of PV systems.
- the technical and economic considerations of PV in developing countries.

One of the key aspects of the project is to encourage the direct participation of experts from developing countries. Therefore a number of meetings and workshops have taken place in developing countries (Morocco, Indonesia, Mexico) and have allowed active contribution from local experts and direct co-operation with local organisations as well as dissemination activities to the local stakeholders.

2. DEPLOYMENT INFRASTRUCTURE

The overall objective of this activity is to contribute to overcoming the critical barriers to widespread sustainable PV deployment. The central work involves the preparation and dissemination of Recommended Practice Guides (RPGs) for the deployment requirements of PV, and the compilation of case studies on PV implementation programmes. These guides are both technical and non-technical in nature and cover a range of issues. These guides are targeted at both the PV programme implementation agencies (multi-lateral agencies, bi-lateral agencies, governments, NGOs and utilities) as well as at financing institutions and capacity builders.

The first of the RPGs was published in September 2002 and is available on the following website: (www.iea-pvps.org). The remaining RPGs will be published in December 2002. The following guides are being prepared by the Task 9 experts from different countries:

- *Financing Mechanisms for Solar Home Systems in Developing Countries – The Role of Financing in the Dissemination Process.* (Germany) This covers the technical and economic characteristics of solar home systems (SHS) before looking at the financing needs

² Australia, Canada, Denmark, Finland, France, Germany, Italy, Japan, Sweden, Switzerland, the United Kingdom, and the USA

for SHS from the perspective of the energy sector and from the perspective of the financial sector. Credit products and delivery systems are reviewed and the results from a number of case studies are summarised.

- *Summary of Models for the Implementation of Photovoltaic Solar Home Systems in Developing Countries.* (Netherlands, Germany and UK). This guide looks at the considerations in selecting and adapting a PV implementation strategy which will best meet the development and energy needs of a specific region or country.
- *PV for Rural Electrification in Developing Countries – A Guide to Capacity Building Requirements.* (Australia, UK). This guide provides recommendations on the type of capacity building activities that can be implemented to help achieve the dissemination of PV. The following sectors are included: public authorities, including the Departments of Energy, Education, Fair Trading etc.; the utility sector; the financial community; the service delivery chain; and end users.
- *The Role of Quality Management, Hardware Quality and Accredited Training in PV Programmes in Developing Countries: Recommended Practices.* (USA, UK, Australia). The guide covers the quality assurance of both the hardware and the practitioners, as well as the role of government and other relevant sectors in the development of a sustainable PV quality assurance system.
- *A Guide to the Institutional and Infrastructure Framework for PV for Rural Electrification in Developing Countries* (France, Canada). The guide looks at the various functions which need to be satisfied, defines what different kinds of organisations can undertake these functions, and examines the interrelationships between the various functions required to achieve sustainability in rural electrification programmes. A sustainable PV rural electrification scheme requires: a service provider; consumers; a facilitator; a public authority; and a financing package. Each of these sectors is covered.

An overview document is also being prepared which is a 20 page summary and addresses all the issues covered in the individual RPGs: *Issues for Sustainable PV Deployment in Developing Countries.*

Following the launch of the guides, dissemination will take place through workshops and seminars. All feedback from these activities will be incorporated into the guides to ensure that they both fully reflect the views of the developing nations and are likely to be utilised and incorporated into manuals of the implementing agencies.

In addition a number of case studies have also been prepared detailing experiences from previous PV deployment programmes which demonstrate the importance of the issues highlighted in the RPGs. The following list gives details of the studies completed to date.

- PV for Social services in Mozambique

- PV mini-grids in China
- Large scale experiences in rural electrification in Morocco
- PV water pumping in the Sahel
- Financing mechanisms, quality issues and market added value of PV in Namibia
- PV quality issues in Zimbabwe
- PV deployment models in Kiribati
- PV Experience in China
- PV desalination in Syria
- Drinking Water Supply with PV pumps
- Resource conserving irrigation with PV in Chile
- African small system market
- Deployment models and value-added examples in PVMTI (India, Kenya and Morocco)

These will also be available on the T9 website at www.task9.pvps.iea.org.

3. SUPPORT AND COOPERATION

The project is also providing support and co-operation through workshops and seminars to raise awareness of the opportunities and recommended practice of PV systems and interest amongst multilateral and bilateral agencies, NGOs and development banks. The objectives are being met through two main areas of activity: support to multilateral and bilateral donors and development banks; and co-operation with IEA's renewable energy working party (REWP) and IEA/OECD.

The programme of work for each Activity takes the form of:

- Educational seminars and workshops for donor agency, bank and client country staff;
- Information and dissemination services including publications;
- Review of publications;

Co-operation with the IEA / REWP, IEA / non-member country committee and OECD Secretariats.

3.1 Workshops

Five international workshops, seminars and presentations have already been held. These include seminars in Washington at the Village Power Conference in December 2000, in Jakarta in March 2001, in Ottawa in September 2001 and in Switzerland in 2002. The seminars have been targeted at bi-lateral and multi-lateral agencies and at developing country representatives with an interest in energy, environment and rural development and who are involved in the design and management of projects for rural areas, including those projects addressing poverty reduction, education, environment and health. Organisation and support for these workshops has been given by the Swiss Economic Co-operation Agency (SECO), the Fraunhofer Institute (FhG-ISE) and ISES as part of the German input to the project, the Swiss Agency for Development and Co-operation (SDC) and the Canadian International Development Agency (CIDA).

Further workshops are under preparation. One is planned in Hanoi, Vietnam in March 2003 targeted at the Asian Development Bank and the Mekong countries. The workshop will be supported by ADEME (Agence de l'environnement et de la maîtrise de l'énergie) and GTZ (Deutsche Gesellschaft für Technische Zusammenarbeit). A workshop is also being planned for West Africa in Autumn 2003 to be targeted at infrastructure personnel in the Economic Community Of West African States (ECOWAS) countries and to be supported by ADEME. A Rural Energy Conference is being organised in China in March 2004.

Further seminars and workshops are planned. The following agencies have been identified as potential host institutions:

- World Bank Group, Washington;
- United Nations Development Programme (UNDP), New York;
- Interamerican Development Bank (IDB)
- African Development Bank (AFDB), Abidjan;
- European Commission (EC), Brussels.
- Department for International Development, UK (DFID)

3.2 Co-operation

One of the activities of Task 9 to date has been co-operation with the G8 Renewable Energy Task Force. Task 9 prepared a paper which was submitted by PVPS to the G8 Renewable Energy Task Force in October 2000. The PVPS submission to the G8 Task Force was well received and clearly influenced the first Draft Final Report, which was completed in December 2000. This proposed the target of serving 1 billion people with renewable energy within ten years. This goal would be targeted at 500 million rural people in developing countries previously unserved by utility power (as recommended by Task 9, and expected to be largely PV), together with 300 million people in grid-based markets in developing and transition countries, and 200 million people in developed countries. However, this draft has been substantially altered at the Task Force meeting in Japan in March 2001. The full text is available on the Task 9 website.

Task 9 has also co-operated with GEF, the United Nations Development Programme (UNDP) and the United Nations Environment Programme (UNEP) all of which are committed to attending Task 9 Expert Meetings. Discussions are also ongoing with staff within the European Commission's Europe Aid regarding co-operation between the European Commission and Task 9.

4. TECHNICAL AND ECONOMIC CONSIDERATIONS

The objectives of this activity are to address the technical and economic considerations of PV deployment in developing countries. Two Recommended Practice Guides are being prepared, currently in draft form, for publication in March 2003:

- Preparation, Design and Implementation for PV Programmes in Developing Countries.
- Funding Sources for PV projects in Developing Countries.

The first RPG considers the issues relating to the preparation, design and implementation of PV deployment programmes. The work considers the various technical supply options - stand-alone systems, diesel hybrid village/mini grid systems and grid-connected systems and the availability and use of new analysis tools. This will provide guidance for programme planners on the various rural electrification approaches and the technical supply options available.

The second RPG aims to provide guidance on the potential sources of finance for PV deployment programmes and the processes involved in accessing this finance. The processes by which finance can be obtained from the World Bank Group, bi-lateral donors, utilities etc will be identified and summarised. The guides are being authored by the USA with input from Australia, Germany and the UK.

5. CONCLUSION

Task 9 is progressing to schedule and is encouraging the use of PV, as a renewable energy option, in developing countries where PV is often the only viable option for remote electrification for meeting development needs. It is anticipated that through Task 9 there will be a further increase in the overall rate of successful deployment of PV systems in developing countries through increased co-operation between international financing institutions and developing countries, and through a greater understanding and awareness of the issues pertinent to sustainable PV programmes.

