

DEPLOYMENT OF PHOTOVOLTAIC TECHNOLOGIES: CO-OPERATION WITH DEVELOPING COUNTRIES.

TASK 9 OF THE INTERNATIONAL ENERGY AGENCY'S PHOTOVOLTAIC POWER SYSTEMS PROGRAMME

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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 future.

The objective of Task 9 is to further increase the overall rate of successful deployment of PV systems in developing countries where PV is often the only viable option for remote electrification. With this in mind Task 9 is co-operating with developing countries and international financial institutions. 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 as well as participation from the World Bank, UNEP and UNDP.

The work of the task has been split into three activities: deployment infrastructure; support and co-operation; and the technical and economic aspects of PV in developing countries. This paper describes the progress of Task 9 to date within the three activities. The work has included the compilation and analysis of information from case studies on PV deployment and the preparation of an overview document highlighting the key issues of PV deployment in developing countries. The progress on the preparation of Recommended Practice Guides covering issues such as quality assurance and accreditation, financing mechanisms and institutional frameworks is also detailed.

The paper details the work carried out with developing nations, international bodies and multi-lateral/bilateral agencies. Task 9 has had an important input to the G8 Renewable Energy Task Force. Four workshops have been held to stimulate awareness and interest on the technical and economic potential, opportunities and recommended practice of PV systems. This has enabled the participants to obtain the expertise and knowledge that is required to prepare PV programmes and initiate appropriate PV system deployment.

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

1. INTRODUCTION

Task 9 is the newest initiative of the International Energy Agency's Photovoltaic Power Systems Programme. The PVPS programme aims to encourage international collaboration efforts so that photovoltaic (PV) energy becomes a significant option in the near future. Historically the PVPS programme has addressed issues relating to PV in the IEA countries - the developed countries. This project 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.

This broadening of emphasis is significant as PV is a technology particularly well suited to the electrification needs of many remote and rural communities in developing countries. It is estimated that over 2 billion people in 400 million villages 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. Two billion plus people without electricity and unlikely to

receive grid supplies represents an enormous potential market.

The overall objective of Task 9 is to encourage the appropriate, effective and sustainable deployment of PV systems in development programmes, particularly rural electrification and agricultural applications.

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 Task is to encourage the direct participation of experts from developing countries. Therefore two of Task 9 experts' meetings have been held in Morocco and Indonesia and future meetings are planned in Mexico, the Philippines and Uganda. These meetings allow active contribution from local experts and direct co-operation with local organisations as well as dissemination activities to the local actors.

2. DEPLOYMENT INFRASTRUCTURE

The overall objective of this activity is to contribute to overcoming the critical barriers to widespread 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.

Six detailed guides are currently in draft form and are being prepared by the partners shown below.

Overview document	(UK/France/Switzerland)
Institutional and Infrastructure Frameworks	(France/Canada)
Capacity Building	(Australia/UK)
Deployment Models, Financing and Investment Mechanisms	(Germany/US/ Switzerland/Netherlands)
Financing SHS in Developing Countries	(Germany)
Quality Assurance	(USA/Australia/UK)

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 overview document is a 20 page summary and addresses all the issues covered in the individual RPGs.

The sustainable deployment of renewable sources of energy and PV for rural development in particular will occur at a substantial scale only in an adequate framework. The Institutional and Infrastructure Framework RPG 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 in the RPG.

The RPG on Capacity Building 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 Deployment Models, Financing and Investment Mechanisms RPG looks at the considerations in selecting and adapting a PV dissemination strategy which will best meet the development and energy needs of a specific region or country.

Financing SHS in Developing Countries covers the technical and economic characteristics of solar home systems (SHS) before looking at the financing needs 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.

The RPG on quality assurance 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.

The guides will be published in Autumn 2002 and launched at an international rural energy workshop. 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.

Publishing will be over the internet as this is both cost effective and easier than hard-copy publication. It will also facilitate easy and regular updating of the guides.

A number of case studies have been drafted detailing experiences from previous PV deployment programmes which demonstrate the importance of the issues highlighted in the RPGs. The case studies will also be published in Autumn 2002 on the internet. 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
- African small system market
- Deployment models and value-added examples in PVMTI (India, Kenya and Morocco)

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

3. SUPPORT AND COOPERATION

The objective of this activity is to stimulate awareness and interest amongst the target sectors 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 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

A number of international workshops, seminars and presentations have already been held or are planned to stimulate awareness and interest on the opportunities and recommended practices for PV systems. These are detailed below.

Renewable Energy Promotion Seminar

A Renewable Energy Promotion Seminar was held in Jakarta in March 2001. This was organised jointly by Task 9, the Swiss Economic Co-operation Agency (SECO) and the ASEAN Centre of Energy (ACE). Additional financial support was provided by SECO. The event was very successful, there were 18 speakers including Task 9 Experts and a lively discussion regarding renewable energy deployment and financing in developing countries. The event was attended by approximately 80 participants including people from the ASEAN nations.

Financing Solar Home Systems in Developing Countries

Two workshops have been organised by the Fraunhofer Institute (FhG-ISE) and ISES as part of the German input to Task 9. The first workshop was held in conjunction with the Village Power Conference in Washington DC in December 2000; the second Workshop was held in Jakarta in March 2001. The two workshops gathered information on deployment models for PV in rural power supply in developing countries in order to help bridge remaining knowledge gaps on suitable models for energy supply in rural areas. The final report of this work is available at www.resum.ises.org.

Photovoltaic Power Systems for Developing Countries

A workshop on PV in Rural Electrification was held in Ottawa in September 2001. The workshop was organised jointly by the Canadian International Development Agency (CIDA) and CANMET and was targeted at CIDA staff with an interest in energy, environment and rural development and who are involved in the design and management of projects for rural areas of developing countries, including those projects addressing poverty reduction, education, environment and health. The workshop objectives were to provide information on the theory and design of photovoltaic power systems and an analysis of successful applications in developing countries.

Further workshops are planned over the next three years. The following agencies have been identified as potential host institutions:

- World Bank Group, Washington;
- United Nations Development Programme (UNDP), New York;
- Asian Development Bank (ADB), Manila;
- Interamerican Development Bank (IDB)
- African Development Bank (AFDB), Abidjan;

- European Commission (EC), Brussels.

3.2 Co-operation

One of the activities of Task 9 to date has been co-operation with the G8 Renewable Energy Task Force which has been established since the commencement of Task 9. The G8 countries were asked to nominate members of the Task Force and also experts to form an Advisory Group. Participants in Task 9, the UK and France, were appointed to the Advisory Group. The Task Force was mandated to:

- identify the main barriers to the use of renewable sources of energy particularly in developing countries;
- to recommend practical actions which G8 governments can take to help remove these barriers;
- to summarise these in a report for consideration by G8 Heads of Government at their Summit in July

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 Autumn 2002:

- RPG: Preparation, design and implementation
- RPG: Proposal Preparation

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

