

10 Years of Task 9



PHOTOVOLTAIC POWER SYSTEMS PROGRAMME

Report IEA-PVPS T9-10:2009

PVPS

INTRODUCTION

Background to IEA PVPS and T9

The International Energy Agency (IEA), founded in 1974, is an autonomous body within the framework of the Organization for Economic Cooperation and Development (OECD). The IEA carries out a comprehensive programme of energy cooperation among its 26 member countries and with the participation of the European Commission.

The IEA Photovoltaic Power Systems Programme (IEA PVPS) is one of the collaborative research and development agreements within the IEA and was established in 1993. The mission of the programme is to “enhance the international collaboration efforts, which accelerate the development and deployment of photovoltaic solar energy as a significant and sustainable renewable energy option”.

In order to achieve this, the participants in the Programme have undertaken a variety of joint research projects in applications of PV power systems. The overall programme is headed by an Executive Committee, comprising one representative from each country, which designates distinct ‘Tasks’, which may be research projects or activity areas.

Task 9 ‘Photovoltaic Services for Developing Countries’ (PVSDC) has the objective to increase the rate of successful deployment of PV systems - and other renewable energy technologies when appropriate - in developing countries. This is being achieved through enhanced co-operation and flow of information between the IEA PVPS Programme and the other international development stakeholders with a focus on access to electricity in support of the eight United Nations ‘Millennium Development Goals’ (MDG’s).

The remit of “Task 9”: supporting the deployment of PV services in developing countries

Photovoltaics, and other renewable energy technologies, can significantly contribute to economic and social development: still to date, about 2 billion people in the world, many of whom live in isolated areas, do not have access to electricity and to clean water, primary health care, education and other basic services, the impact of which to a large extent depends on access to electricity.

Recognising the issues, the IEA PVPS Executive Committee compiled a ‘Developing Country Strategy’ and in November 1995 formed a ‘Developing Country Team’ (DC-TEAM) with participation of mainly three member countries (Denmark, France and the United Kingdom) and with the aim of addressing the need for developing country specific PV information. This was the very first IEA activity targeting non-OECD countries.



Following three years of DC-Team activities initially focusing on enhanced co-operation with multilateral donor organizations engaged in rural electrification such (e.g. the World Bank and the UNDP) the IEA PVPS Executive Committee in late 1998 decided to form a new Task, Task 9, more effectively to address the increasing amount of work. After a period to formulate a Task work programme and to obtain commitment to participation in Task 9 from interested member countries, the group has been active for over 10 years up to end of 2009.

1. The long-term participating countries are Australia, Austria, Canada, Denmark, France, Germany, Israel, Italy, Japan, Korea, Mexico, the Netherlands, Norway, Portugal, Spain, Sweden, Switzerland, the United Kingdom and the United States of America. The European Commission, the European Photovoltaic Industry Association and the US Solar Electric Power Association are also members. Malaysia and Turkey are recent participants.



The challenge

The focus of the programmes of the world's development assistance agencies, bilateral and multilateral donors, development banks and NGO's are aimed at poverty alleviation in general and at achieving the MDG targets in particular. There is a growing understanding of the enormous potential PV and other renewable energy technologies have in supporting this achievement. For example,

- in the area of primary health care, PV refrigeration has transformed the delivery of vaccination services by agencies such as the World Health Organization and the United Nations Children's Fund. PV vaccine refrigerators are now the standard products of choice in most developing countries;
- in some countries of the Sahel, PV is recognised as a reliable and least cost option for providing drinking water pumping to remote communities, and integrated as such by the relevant government organisations and international agencies such as the WHO.

However, as the introduction and deployment of modern renewable energy technologies in developing countries are often supported by donor assistance, these efforts typically take the form of projects or programmes, i.e. interventions of limited duration. This fact presents one of the most critical challenges for sustainable deployment of PV and other renewable energy technologies, as:

- Critical data and experiences are gained in each individual intervention, but are usually lost at the end of same intervention
- Staff in national governments and in particular in the world's development assistance agencies are normally on a rather short term roster: institutional memory is difficult to secure and often not possible, and invaluable data and experience are lost

The end result is, that PV and renewable energy technology interventions cannot really learn from previous generations of projects and programmes, and it is more the rule than the exception that well known pitfalls and mistakes in project or pro-



gramme implementation are repeated. This situation is compounded with high upfront investment costs of PV and renewable energy technology; the issue of access to capital remains a huge bottleneck, par-

ticularly in an era where priority is given to increase access rates to services, which means maximum number of connections per dollar invested, and not least cost service over the investment's lifetime.

1999 to 2009: GETTING PV ON THE AGENDA

The IEA PVPS, through its DC-Team and Task 9, has successfully addressed this challenge:

- by accumulating relevant data and experiences worldwide through exchange of experience within the group of experts and wider technical seminars and workshops;
- by careful analysis of this wealth of knowledge synthesized in a series of Technical Guidelines and Re-commended Practice Guides;
- Through outreach activities, targeting a wide range of key stakeholders.

Practical tools for effective service delivery

The group of experts has crystallised key messages over time, through the following 10 publications, so called "Recommended Practice Guides – RPGs" and flyers, which have been distributed at conferences and workshops, used as supporting documents for courses and lectures; these publications can be downloaded free of charge from the IEA PVPS website: www.iea-pvps.org

1. Institutional frameworks and Financial instruments for PV Deployment in Developing Countries

2. PV for Rural Electrification in Developing Countries: Programme design, planning and implementation

3. Summary of models for the implementation of Solar Home Systems in Developing Countries

4. Financing Mechanisms for SHS in Developing Countries. The role of financing in the dissemination process

5. A guide to Capacity Building requirements

6. The role of Quality Management, hardware Certification and Accredited Training in PV Programmes

7. PV for water services

8. PV injection in isolated diesel grids: feasibility considerations

9. 15 Case studies

10. PV Services in Developing Countries in support of the Millenium Development Goals – MDGs: recommended practice, key lessons

The target group of the RPGs are project planners and appraisers in development agencies, local institutions that wish to facilitate the introduction of

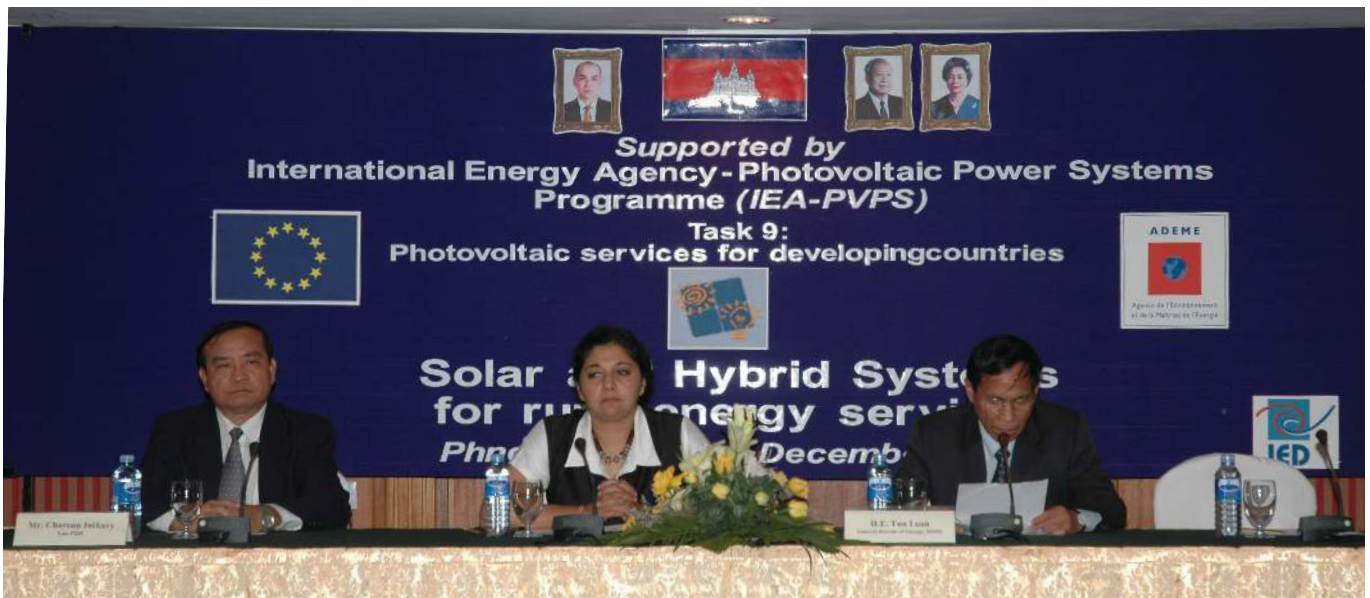
new RE-technologies in to rural markets, rural service utilities (water, electricity) that wish to extend their services.



Multidimensional Networking

Under its “International Relations”² task, the group worked towards getting PV on the agenda, initiating dialogue through partnerships, organizing relevant workshops and commenting policy papers and strategies of major donors and lending institutions including the G8. Over the last decade of dialogue, T9 initiated and participated in over 30 events; a few examples hereafter provide an impression on the awareness building activities and process facilitated by Task 9:

1. Task 9 disseminated its findings and observations, and enriched the group’s messages by teaming up with strategically important events and fostering meetings with various cooperation and technical agencies;
2. The group has also been constantly in touch with technology developments and working groups in order to ensure that messages are at the forefront of what the fast evolving PV industry can offer in terms of service delivery;
3. Outreach in “developing countries”, with a special focus on regional events, as exchanges between countries with similar experience is as important as exchanges with an “outside” group such as the IEA T9 technical experts.



2. Sub Task 20, lead by Switzerland

Discussion and exchange workshops

Project planning tools, deficits of a pure log-frame approach, adequate monitoring and impact assessment strategies:

Consultation workshop in Berne with foreign aid policy makers of the Swiss Government for the promotion of Renewable Energies in Developing countries, March 2001: main conclusion was that project goals are generally over ambitious and unrealistic given the reality of weak implementation capacities (too much paper and too little action on the ground);

Is the enforcement of an appropriate institutional framework a prerequisite, or should /can projects come first to foster experience based policy formulation?

After a very dynamic, controversial kind of Hen-Egg discussion, the concluding opinion was that there is sufficient expertise available to first draft a coherent RE policy in which the projects (public or private) have a fair chance to be successful – insisting nonetheless on the immense waste if the frame conditions are not in place (October 2002: Conference in St. Gallen, Switzerland).

From Projects to Markets: PV-Programmes in Developing Countries and Perspectives for Private Sector Participation.

Financing mechanisms for large scale PV Solar Home System programmes of the kind of KfW and GTZ are implementing in China – and scope for replication. The main discussion was related to transaction costs and ways how donor supported Programmes can contribute to a sustainable market development . It was also suggested to keep an eye on market distortion effects by such programs. (March 2004: on invitation by the Deutsche Gesellschaft für Technische Zusammenarbeit (GTZ)

The key success and failure factors for PV programs, a one-day lecture to KfW program officers (November 2004).

Junior bankers showed a lot of interest and it was concluded that such one-day seminars would be real effective “preventive maintenance” for RE programs.

Programme design and financing mechanisms, a one day workshop with various French Government agencies

(Ministry of Finance, Industry, National Renewable Energy Agency, Development bank) (Paris, May 2005) - the programme officers present who were considering starting the design for such programmes welcomed the opportunity of knowledge sharing and support.

The policy and the projects of the International cooperation by the Japanese government in developing countries were presented in the workshop.

(October 2006, Makuhari, Chiba, Japan). The Japanese government as policy maker and the Japanese organizations of international cooperation as donor presented the results and the case studies of International cooperation in the developing countries.

“Energy and the Millennium Development Goals” on the occasion of the WB Energy Week, was an opportunity for interesting discussions and networking (March 2005).



Relevance of PV beyond Solar Home Systems

Large village electrification project in Mongolia, built by Japanese cooperation was visited in 2003 and offered a real opportunity to compare a bigger scheme for a village with high quality equipment from Japan with the Solar Home System approach with Chinese low cost panels. The answer was that Mongolia needs both.

PV pumping systems for lifting water, now a totally commercial market for cattle grazing in certain locations in Australia was observed in September 2004, on the invitation of the Australian PV Association (Alice Springs). Outside the city the population density is so low that many households can not be served by the grid and are PV powered.

When representing the least cost option and exceeding the reliability of diesel gen-sets, why does PV pumping not find its market share in developing countries?

In June 2007, Task 9 organised an expert meeting on invitation limited to thirty people in Bangkok to have a serious dialogue on the question, with the participation of equipment suppliers who have a thriving market in Australia.

Water and energy issues within the African Development Bank: why is PV pumping so marginal in the Bank's portfolio? In August 2007, at a T9 – AfDB workshop in Tunis, the following points were raised: the frustrating performance of drinking water schemes, water experts have a limited understanding of energy issues and energy experts vice versa; inability of the provincial / village authorities to ensure operation and maintenance and cover the burden to pay running cost – when investment is paid at the central level. They delegate as much as they can to the district, from there to the village and that's statistically within three years the end of the project.

Joint meeting was held with Task 2 – **Performance, Reliability and Analysis of PV systems**, and Task 10 – **PV hybrid systems within mini grids**, in March 2006, Vancouver, Canada offering an opportunity to exchange

views with colleagues involved in “high tech” developments applied in OECD countries and examine wider relevance.

Joint meeting was held with the Alliance for Rural Electrification's Working group technological solutions where **hybrid systems (Diesel – renewables)** were discussed. As an outcome of this, T9 engaged on an exercise to examine the specific technical and financial feasibility for large scale implementation of PV diesel hybrid systems in remote small villages and published a flyer.



Outreach

The viability status (technical and financial) and perspectives of renewables and PV, with the Renewable Energy Sector Network of **ASEAN, under the aegis of the ASEAN Center for Energy** was an opportunity to exchange experience on rural electrification and renewable energy applications in general and with PV in particular, both among the countries and with T9 experts – which was very much appreciated (March 2003, Hanoi).

Mexico: workshop on the specific and delicate issue of the demarcation line between grid extension and off grid electrification and touching upon effective deployment mechanisms for rural off-grid PV applications. National Renewable Energy Development Center, March 2002.

At a regional meeting in **Ouagadougou, Burkina Faso**, a discussion and exchange workshop was organised **under the aegis of Club of Rural Electrification Organisations and Agencies, where 6 countries** exchanged on institutional frameworks and sustainability of PV programmes in their respective contexts, prompted by presentations of the RPGs on **capacity building and institutional frameworks** (May 2004).

In a context where the **Lao PDR and Cambodia** were in the process of launching large scale PV SHS programmes, T9 offered to share experience on issues of **financing schemes and quality issues**, building on the relevant RPGs, contributing to the design of national programmes (Lao PDR, 2005)

Bringing down the cost of electricity in diesel powered mini grids through PV hybrid systems was the key topic presented by Task 9, who was invited speaker at the general assembly of the **Club of Rural Electrification Agencies**

(www.club-er.org) where more than 10 African countries were present. (Bamako, Mali, 2008)

In December 2008, Task 9 organised a half day workshop in **Cambodia, back to back with a national seminar on rural electrification, offering perspectives on the potential of “pico electrification” using highly efficient appliances (LED bulbs) and of hybrid technologies** in expanding access to services in a country where less than 10% of the total population has a service to date.

May 2009: On the occasion of the Off Grid Electrification Conference in Munich, Germany, Task 9 had the honour to deliver the Keynote speech “Micro Credit – Off Grid Electrification”.



KEY MESSAGES AND PERSPECTIVES, DRAWING ON 10 YEARS' OF ACTIVITY

Lessons...

1. Do not design and run technology driven projects, focus on the final service to be provided and on all the players and activities in the value chain.
2. Raise awareness, build a community: Provide opportunities to express different opinions and strategies for the promotion of renewable energies, getting professionals talking to each other and to define benchmarks, making nations understand the way forward to achieve the intended impact.
3. Develop a strategy and operational implementation plans: The political intention to provide access of modern energies to unserved people is on the agenda of many actors but most of them have no sound strategy to achieve their goal, and need to formulate operational financial mechanisms and to effectively strengthen national capacity.

Rural Energy Services and the Millennium Development Goals

The tremendous socio-economic transformations that have taken place since the industrial revolution have been driven by our recognition that we can apply our inventiveness to harness heat and power to our advantage. In many ways this application of modern energy services is the fundamental defining factor between more developed and developing countries, bringing increased productivity and reducing the time and physical drudgery needed to undertake everyday tasks. This has presented increased opportunities to study, earn a decent living and even to enjoy the greater leisure time.

For those among us fortunate enough to have been born into families in one of the industrialised nations, the thought –if it ever occurs – of life without light or heat at the flick of a switch, without television, computers, refrigerators, microwave ovens, even running water is inconceivable. We can happily imagine getting away from emails, voicemail even TV for a few weeks, but very rarely are we confronted by life without the vast array of labour-saving and life-enhancing services that we take for granted.



Still, for many millions of people, notably large parts of Africa, Asia and South America, there is little escape from the daily challenges of an existence where such services do not exist and where satisfying the most fundamental human needs – shelter, water, food – demands a huge amount of time and enormous personal effort.

A little under a decade ago, the new Millennium was heralded by the promise from global leaders of much needed action to tackle a series of socio-economic inequities that affect the world's poorest people.

The Millennium Development Goals, underpinned by the commitment of all 191 members of the United Nations, established ambitious but achievable targets for 2015 aimed at eliminating or significantly reducing poverty, hunger and disease, and promoting education and equal opportunities within the context of sustainable global development.



The Main Thrusts of the Millennium Development Goals

1. Eradicating Poverty & Hunger – To be halved by 2015 compared to 1990
2. Achieving Universal Primary Education
3. Promoting Gender Equality – eliminate disparity by 2015
4. Reducing Child Mortality - 2/3 cut by 2015
5. Improving Maternal Health - reduce maternal mortality rate by 75% by 2015 compared to 1990 and achieve universal reproductive health care
6. Combating Disease - by 2015 achieve a reversal in incidence of malaria, TB, HIV/Aids
7. Ensuring Environmental Sustainability – including halving by 2015 the number of people without safe access to water and sanitation
8. Developing a global partnership



Political motivation and institutional capacity alongside appropriate finance mobilisation are clearly fundamental to meeting the MDGs. At the same time, while none of the Goals explicitly point to 'energy' as a prerequisite or even as a key actor in achieving the development objectives, the cross-cutting importance of energy and energy services for socio-economic development has gained substantial recognition, acknowledged by the Expert Task Forces established under the Millennium Development Project and by influential global leaders notably at the G8 summit in Gleneagles in 2005⁴.

Perspectives

By the end of the present Task 9 work programme it can only be concluded, that this crucial work is not completed, and that the accelerating development and deployment of PV and other renewable energy technologies make this work even more important in the years to come.

Unlike ten years ago, today's framework conditions for the deployment of Renewable Energy are conducive, as there is a broad consensus among global policy makers, that renewable energy and energy efficiency is a highway in the right direction. More than 60 countries have a policy to promote Renewable Energy and among them at least 23 are in developing countries, with nearly all international financing institutions promoting these approaches: annual investments have crossed the 100 billion\$ milestone.



Further, until recently, PV was the least cost option for providing a given service only in very specific circumstances where energy requirements were low and households far from the grid – a paradigm which is now favourably evolving with the reducing cost of renewable energy and rising cost of fossil fuels.

With increasing fuel prices, renewable energy is sustainable and PV is uniquely attractive as a source of electric power to provide:

- Basic services, such as lighting, drinking water and PV-power for income generating work becomes attractive, for people without electricity in remote areas, which is a key requirement to meet the ambitious Millennium Development goals which aim at poverty alleviation;
- Reliable and cost effective electricity services to isolated communities which today have no other option than to rely on costly diesel based power generation;
- Increasingly reliable and competitive electricity when integrated in the built and more generally urban environment, particularly when compared to the cost of peak power.

Nonetheless, the challenge of financing today, with the very high capital cost of renewable energy definitely remains, particularly when targets often focus on access rates, and hence on maximizing

the number of connections per dollar investment, to the detriment of long term sustainability.

Over the past 10 years, T9's work concentrated on small PV systems. With the increased reliability of PV systems and grid integration, which is driving the cost of PV services down, the challenge is now to expand activities to encompass village power systems in particular through hybrids, PV in the built and urban environment which offers considerable potential in non OECD countries where cities are expanding explosively, and potential large scale PV.

This will be achieved through building on the work of other technology focused Tasks within PVPS, adapting the messages and implementation frameworks to areas beyond the borders of OECD countries. The technology divide in the world is fast disappearing, and after a period where the PV industry privileged large scale and government support programmes in OECD countries, the market perspectives beyond the OECD and in developing areas look very promising.

Successful deployment will require to pay specific attention to non technical issues, which clearly are a major barrier to the dissemination of renewable energy; major efforts are still needed to work on innovative business models and institutional partnerships, always highlighting the crucial importance of experience sharing and networking.



