



Photoenergy Center

Final Report

Workshop on

"Solar Cells and Water Pumping Systems"

Organized by

*Photoenergy Center, Faculty of Science, Ain Shams University,
20-22 December 2001, Cairo, Egypt*

In collaboration with

International Center for Science and High Technology

UNITED NATIONS INDUSTRIAL DEVELOPMENT
ORGANIZATION

Sponsored by: ICS-UNIDO

Hosted and co-organized by: Photoenergy Center, Cairo, Egypt

The Workshop has been held in Cairo taking into account the advantage of its geographic location between Middle East and North African countries, which have good experience and strong interest in PV applications.

The meeting has been hosted by the Photoenergy Centre, Ain Shams University, Cairo, Egypt from 20-22 December 2001. Scientific sessions were conducted at

the conference facilities of Sonesta hotel Heliopolis. The program included a visit to the Photoenergy Center's facilities and Ain Shams University Campus. Detailed program is described in the book of abstracts that has been distributed among the participants upon arrival. A copy of the program is enclosed.

All participants were received at the Cairo international airport by a representative of Ain Shams University and accommodated at Sonesta Hotel Heliopolis.

Complete list of active participants (33 persons) is also given at the end of this report. Participants are from different Arabic as well as African countries and from Egypt together with experts from France, Germany and Italy.

In the opening session Professor *M. A. Tag El-Din (The President of Ain Shams University)*, Professor Saleh Hashem (*vice President of Ain Shams University*), Professor *S. S. M. Hassan (the Dean of the Faculty of Science)*, *Dr. Kinichi Ushiki (ICS-UNIDO, Eng. Umberto Moschella (Consultant, ICS-UNIDO)* and Professor *Sabry Abdel-Mottaleb (Director of the Photoenergy Center)* extended a warm welcome to over 90 audience. The attendees were representing the invited participants and different VIPs from many Egyptian Authorities and Institutions. Most importantly, the initiative of the ICS of holding and organizing this meeting in collaboration with the Photoenergy Center is highly appreciated from the distinguished Egyptian and International participants and all are encouraging the ICS to keep the topic of PV on the top of its activities.

The program offered 19 lectures and presentations that were delivered by a group of international experts. Moreover, several sessions were organized and chaired by top experts in the field for discussions and conclusions. The participants represented a good mix of senior scientists, engineers, industry personnel and economists with some of them on the important decision-making level.

All presentations showed and emphasized the enormous importance of the PV energy for the enhancement of economic and social developments in developing

countries in addition of being an infinite source of clean energy with emphasis on Water Pumping for irrigation and water desalination.

All presentations were accompanied by lively discussions indicating the enthusiasm and competence of the participants in the issues under consideration. Actually, these discussions went on over coffee and meals breaks and often well into the night, which was certainly facilitated by the good infrastructure provided in an excellent hotel.

In summary, it has been emphasized that the worldwide demand for solar electric power systems has increasingly gained momentum in the last decade. Energy from PV solar cells is one of the most judicious choices, particularly in the non-grid remote areas owing to its reliability, competitive cost and easy maintenance.

The participants have been pointed out that typical existing successful applications of PV include stand-alone power systems for cottages and remote residences, navigational aides for the Coast Guard, telecommunication sites, military sites, water pumping for farmers and emergency call boxes for highways.

Through lots of field tests all over the world, PV systems have been devised so as to adapt to the various kinds of applications and also substantive know-how has been established on the institutional aspects, pilot project characteristics, implementation process, operational and technological issues.

The cost of PV systems, which had been a long-standing question for PV applications, has decreased to a realistic level due to the improvement of energy conversion efficiency and the development of thin-film cell technology. In fact, recently the cost has remarkably dropped and it is expected to be competitive with the conventional energy sources before 2010 and share an important role of electricity generation in the near future.

As a consequence, PV applications in developing countries will become essential for our every day life not only in rural areas but also inside the newly established towns using building integrated PV.

With the new phase of PV technology - from the R&D stage to industrialization – a practical approach for technology transfer and sharing is strongly recommended.

One of the most important part of the workshop was the session in which successful stories have been presented by several participants from Germany, Jordan, Ethiopia and Egypt about the experiences gained from applying PV water pumping systems for irrigation. Limitations and conditions for successful applications were also discussed.

Another successful part of the Workshop was the visit of the Photoenergy Center facilities and laboratories featuring state-of-the-art PV training and demonstration systems and spectroscopic instrumentation that are used for the characterization of the semiconductors used for producing solar cells. The visitors were impressed to see the great advances achieved due to efforts of the Ain Shams University researchers to establish the Photoenergy Center as an important photophysics, photochemistry and spectroscopy research, development and training institution on an international level. Detailed information about the Photoenergy Center is available at the website: www.photoenergy.org

The social events accompanying the Workshop, which included a short sightseeing tour as well as a social dinner, cruise on the Nile, succeeded in creating a warm social atmosphere and good contacts among the participants.

All participants expressed their thanks to the Photoenergy Center for the outstanding hospitality extended to all and for the friendly atmosphere that created many fruitful contacts that would be last for many years to come.

Directors and Organizers of the Workshop were:

- Eng. Umberto Moschella, Consultant, ICS-UNIDO**

- **Prof. Sabry Abdel-Mottaleb, Director, Photoenergy Center**
- **Dr. Kinichi Ushiki, ICS Programs Manager, High Tech and New Materials area, Trieste, Italy**
- **Local Organizer: Dr. Sabry Abdel-Mottaleb and the staff members of the Photoenergy Center in collaboration with the Public Relation Department of Ain Shams University.**

NOTES AND FINAL CONCLUSIONS:

The Workshop was held in Cairo, Egypt during 20-22 December 2001.

All participants strongly endorsed the initiative of the UNIDO International Centre for Science and High Technology (ICS) in sponsoring this meeting, and its foresight in conducting a program on photovoltaics and applications.

The participants also congratulated the Photoenergy center of Ain Shams University for its excellent job in organizing the meeting in a very short notice, and other Egyptian Authorities for their moral support.

The meeting reached the following conclusions:

- **There is an urgent need for PV water pumping systems to the development process of remote and rural areas in the region.**
- **The potential markets for PV water pumping and desalination in the Arab and some African regions, developing countries and globally is very large.**
- **There is an urgent need for making feasibility studies concerning establishment of a factory for PV in the area (Egypt is willing to establish such a factory to meet with the needs of the region).**
- **The dual benefits of bringing elective power to remote areas through PV are poverty alleviation and reducing climate change.**
- **There is a need for programs on financing PV water pumping and desalination projects as well as awareness building and training in PV systems, their assembly installation, repair and maintenance, design and calls on ICS – UNIDO and other international and regional organizations to address this.**

- **There is universal agreement on the importance of networking among group members. Sharing of experiences and know how of groups working on and promoting PV is invaluable in facilitating future development and cooperation.**
- **Increased focus is needed in the application and commercialization of PV systems. Commercial activity will have the largest impact on increasing the uptake of PV technology.**
- **There is a myth on the high cost of PV. In many cases PV is the only viable solution, particularly if life cycle costs are compared. There is an existing market and this will expand as the cost of PV continues to fall.**
- **Monitoring of PV systems to obtain performance data is very important.**
- **Success stories need to be publicized and replicated elsewhere.**
- **Supportive National Policy and regional initiatives were necessary to achieve optimum growth of PV and renewable energy systems.**

The participants of the Workshop made the following recommendations:

- **Calls upon donor countries to support and contribute to feasibility studies needed for the establishment of a PV factory in the region.**
- **Calls upon different countries and different sectors to make statistical studies about their needs from the PV systems.**
- **Calls upon national and international Banks and financial organizations to offer soft loans for establishing demonstration projects for PV water pumping and desalination.**
- **Encourages sharing and cooperation in national programs on PV, and inviting participants to each other's training programs and participation of experts in various centers of expertise.**
- **Encourage link and integration between researcher/Government and industry. This could involve commercialization and local production of technologies, policy initiatives and determining priority areas of research.**
- **Project development workshop by ICS – UNIDO in different countries to bring together stakeholders on renewable to develop good projects.**

- **Calls upon UNIDO to develop in cooperation with other international and regional organization regional GEF projects for capacity building on PV and renewable energy in developing countries and the region.**
- **Calls upon ICS to continue and expand its programmes on PV and renewable energy in general as it fits both the area of high technology and new materials, and the environment.**
- **Establishment of an electronic information exchange and the development of a website to be managed as a project by ICS/UNIDO.**
- **Initiating the monitoring of PV systems to obtain performance of data as a high priority. The information is to be shared. The collection (and analysis) of data will assist resource assessment and planning, and evaluation of systems.**
- **Developing training in the effective planning and design of PV based, and PV hybrid systems.**
- **Developing strategies to influence National Policy (and Regional Initiatives) and that will assist the uptake of renewable energy technologies.**
- **Establish and maintain international collaborative links.**
- **Call upon UNIDO to work with national focal points for GEF to develop projects on renewable energy.**

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