

New applications for Photovoltaic Concentrators: a fast way to improve reliability and technology progress (Project NACIR)



The photovoltaic technology has continuously increased the rate of conversion of solar energy to electricity and decreased its cost. In terms of average overall conversion, conventional CVP injects into the utility grid up to 12 % of the collected light energy.

Currently, very sophisticated solar cells, called multi-junction cells, allow to double that rate of conversion. These expensive high-tech cells require to operate in concentration, this is, casting up to 500 or 1000 times the normal sunlight intensity on small solar cells (about 1 cm²) in systems called Photovoltaic Concentrators (CPV) New modules for improvement of conversion efficiency up to 30% are being developed and current ones are going to be operated in new applications in Morocco and Egypt within NACIR project.

Background

Concentrator systems are more complex than conventional flat panels and are suitable for large plants, of several MW, which are, however hundreds of times smaller than a thermal or nuclear plant, and can be distributed close to consumption centres. One advantage of CPV systems is the big component of local added value and the small capital investment (CAPEX) required in comparison with other photovoltaic solutions, like modules made of silicon cells or thin films.

Objectives

Concentrator technology requires intensive research and development as well as demonstration to assure reliability in the current initial period of implantation.

The project has joined the two leading companies producing CPV's in Europe, Concentrix and Isofotón, and the three most significant research institutes on CPV, like the Universidad Politécnica de Madrid, ISFOC and Fraunhofer-ISE (Germany) for gaining experience and maturity with the present technology and improving both through R&D.



In order to demonstrate new applications of CPV the first stand alone CPV plant is being deployed in Egypt for a significant social and economic project on pumping and irrigation in the desert. The second consists exploring the capabilities of CPV's at the very high irradiance and extreme climate of North Africa with the installation of a grid connected power plant in Morocco

Results

The expected and achieved results of NACIR are:

- Development of normative standards for CPV rating, power plant acceptance and energy production forecast.
- Current CPV modules of both companies have passed the qualification normative which assures their suitability for performing correctly.
- Designing activity for Egypt and Morocco stations is terminated and deployments are underway.
- ISFOC is leading the activity creating directives for the evaluation and fair trade of CPV technology.
- Companies and centres of research are developing better and new optics to improve the CPV performance; this is increasing the efficiency and reducing the sun tracking requirements. Optical and electronic technologies are combined to test indoor CPV modules.

Impacts

Our activity on normative will promote evaluation and fair trade. It will disclose the characteristics of deployment and operation in hard environmental conditions.

To reach module efficiency over 30% combined with tolerant mechanical requirements is a significant impact which should allow reaching a reduction of energy cost beyond other alternative technologies. CPV maximizes local manufacturing development in comparison with other PV technologies. Stand alone applications with CPV is demonstrated.

For more information, please visit the website: <http://www.upm.es/nacir>

Or contact the project coordinator:

Dr. Gabriel Sala, Instituto de Energía Solar – Universidad Politécnica de Madrid
E.T.S.I. Telecomunicación, Ciudad Universitaria, 28040 Madrid, Spain
E-mail: sala@ies-def.upm.es - Tel: +34-915441060 Fax: +34-915446341

EC contribution: 4.397.583 €

Duration: 48 months

Starting date: 01/01/2009

Partners: Fraunhofer-Gesellschaft zue Foerderung der Angewandten Forschung E.V (DE); Instituto de Sistemas Fotovoltaicos de Concentración, S.A. (ES); Concentrix Solar GMBH (DE); Isofotón, S.A. (ES); Office Nacional de l'Electricité (Morocco); Ministry of Water Resources and Irrigation – National Water Research Center (Egypt)