

# Cooling of Photovoltaic Systems

## General Outlook

The efficiency of any Photovoltaic (PV) system greatly depends on the temperature of the photovoltaic cells, and so temperature control (usually cooling) is an important issue that becomes critical in medium and high concentration PV systems and in PV plants. The heat that needs to be removed from the cell may be very substantial, and might be used in other applications like water heating and even co-generation.

Such cooling system must cope with the PV system requirements while being economically viable.

The work will be performed in collaboration with the private company WS Energia Lda and it will be an important contribution to a larger R&D project financed by the QREN.

## Objectives

The project will address theoretically and numerically the issues related with heat transfer in PV systems to arrive at a model of a general cooled PV system. This model must be able to determine the requirements of the cooling system depending on the characteristics of the actual PV system and on the ambient conditions.

The acquired know-how should lead to the construction of a prototype of a cooling system for the existing DoubleSun® solar multipliers (winner of the prize BES Inovação). Several cooling systems should also be proposed for different architectures such as heat damping, combined water cooling, PV plants, medium and high concentration PV systems.

It is foreseen that the thesis will lead to both a patent request and to a publication of the results obtained during the field tests.

## Task: general overview

The work will be divided in the following tasks: - theoretical analysis of existing literature on cooling of photovoltaic systems - identification various cooling systems for different architectures – selection of the best option to be used with the existing DoubleSun® solar multipliers – realization of a first prototype – on field tests – patent request – data analysis – publication of the results.