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ENERGY GENERATION AND CO_2 EMISSIONS OF PV SYSTEMS

Abstract: *Objective of this paper is to review existing knowledge on energy requirements for manufacturing of photovoltaic (PV) systems and to give some representative calculations for the energy pay-back time and the CO_2 emissions. We will also investigate the effects of future enhancements in PV production technology in order to evaluate the long-term prospects of PV systems for CO_2 mitigation. Both c-Si and thin film module technologies are analized. The CO_2 mitigation potential and the importance of PV systems for sustainable development are also highlighted. In this paper we have reviewed the energy viability of photovoltaic energy technology to answer the question whether PV systems can generate suficient energy output in comparison with the energy input required during production of the system components.*
Keywords: *Photovoltaic systems; Energy pay-back time; CO_2 emissions*

1. INTRODUCTION

Photovoltaic energy conversion is widely considered as one of the more promising renewable energy technologies which has the potential to contribute signifcantly to a sustainable energy supply and which may help to mitigate greenhouse gas emissions [1].

Commercial PV materials commonly used for photovoltaic systems include mono-crystalline silicon, multi-crystalline silicon, amorphous silicon and thin film technologies, such as cadmium-telluride (CdTe) and coper indium diselenide (CIS) [2,3,4]. A typical PV system consists of the PV module and the balance of system (BOS) structures for mounting the PV modules and converting the generated electricity to alternate current (AC) electricity of the proper magnitude for usage in the power grid [2].

In these last decades a number of detailed studies on energy requirements of PV modules or systems have been published [5,6,7]. Most of studies have focused on the environmental aspect of future photovoltaic systems which are assessed through life cycle analysis (LCA), considering different tehnologies, production processes, and evaluation the net energy ratio (NER), the energy payback time (EPBT), greenhouse gas (GHG) emissions, etc [8,9] .

This paper is organized in the following way. In Section 2 life cycle assessment, which is a technique for assessing various aspects associated with development of a product and its potential impact throughout a product's life, is presented. Environmental analysis of PV system is given in Section 3. In Section 4 and Section 5 future PV tehnology and conclusions are discussed and presented.