ENVIRONMENTAL SUSTAINABILITY OF TWO CPV SYSTEMS: RESULTS FROM THE APOLLON PROJECT

M.J. de Wild-Scholten[1], M. Sturm[2], P. Zurru[3], M. Noack[4], K. Heasman[5], G. Timò[6]

[1] ECN Solar Energy, P.O. Box 1, 1755 ZG Petten, the Netherlands, +31 224 56 4736, m.dewild@ecn.nl

[2]SolarTec International AG, [3]CPower, [4]ENE, [5]NaREC, [6]ERSE

1. Introduction

Economic, social and environmental sustainability are the key factors needed for the growth of photovoltaics. In this work the environmental sustainability of two concentrator PV (CPV) systems is investigated.

These CPV systems are the starting technologies of the Apollon Collaborative Project [1]:

1) A point focus system developed by SolarTec International (Germany) and partners based on a Fresnel lens which concentrates the light on III-V solar cells.

2) A dense array system developed by CPower (Italy) and partners based on mirrors which concentrate the light on monocrystalline silicon and III-V solar cells (mirror based spectrum splitting system).

2. Methodology

Life cycle assessment according to ISO14040 is used to determine the environmental impacts and the energy payback time. An example of environmental impact is the global warming effect expressed as life-cycle carbon dioxide-equivalents emissions (carbon footprint).

3. Results

Energy payback time and carbon footprint will be presented on a map of Europe with direct normal irradiation (DNI) [2]. Preliminary results show that the largest contribution to the life-cycle environmental impacts is from the tracking system, followed by the module.

The long-term “availability” (resource depletion) of materials such as, e.g., germanium will be discussed.

A comparison with other commercial photovoltaic technologies and other electricity generation options will be made.

References

[1] Apollon project: Multi-aPprOach for high efficiency integrated and inteLLigent cONcentrating PV modules (Systems): http://www.apollon-eu.org/

[2] M. Šúri et al. (2009) Comparison of Direct Normal Irradiation Spatial Products for Europe http://www.unige.ch/cuepe/html/biblio/pdf/suri-ineichen%202009%20Comparison%20of%20Direct%20Normal%20Irradiation.pdf