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ENVIRONMENTAL SUSTAINABILITY OF CONCENTRATOR PV SYSTEMS: PRELIMINARY RESULTS OF THE APOLLON PROJECT

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Purpose of the work

Economic, social and environmental sustainability are key factors for successful application of photovoltaics. In this work the environmental sustainability of Concentrator PV systems is investigated.
These CPV systems are the technologies to be developed within the Apollon collaborative EU Project:
1) Point focus systems from SolarTec International based on a Fresnel lens which concentrated the light on III-V solar cells.
2) Dense array systems from CPower based on mirrors which concentrate the light on monocrystalline silicon and III-V solar cells (mirror based spectrum splitting system).
At the end of the first phase of the Apollon project prototype systems will be installed and tested at ENEL in Catania (Sicily, Italy).

Scientific innovation and relevance

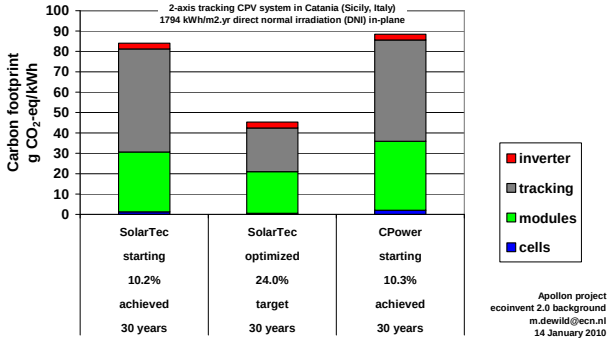
While the number of studies about the environmental impacts of flat plate PV systems is large, investigations about concentrator PV systems are scarce. In this paper results will be presented about the energy payback time and carbon footprint of the first prototype Apollon CPV systems. For the location of Sicily a comparison will be made with flat-plate PV systems and other electricity generation options.

Approach

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

Preliminary results

The figure below shows some preliminary results of the carbon footprint of the first prototype Apollon CPV systems. An operational lifetime of 30 years was assumed.



Conclusions

The largest contribution to the life-cycle environmental impacts is from the tracking system, followed by the module. It also shows that achieving high efficiencies is of high importance to increase the kWh produced by the CPV system.