Technology Offer:
Solar panel with reflection structures

One of the latest trends in the solar industry are bifacial solar panels. These panels not only have a glass cover sheet on the frontside but also on the back side. With new types of solar cells these panels can harvest light from both the front and back side. These so-called 'bifacial' solar panels can produce 10%-20% more kWh's than conventional panels. ECN has developed a relatively simple and cost-efficient improvement that has the potential to increase the yield of bifacial solar panels with an additional 2.0-2.5%.

Keywords: Bifacial solar panel; white bifacial; PV; module; c-Si, light capture

Description

- The invention relates to a bifacial solar panel (fig.1), with a white or highly reflective material in between the solar cells.
- Solar cells are spaced 2.0-2.5 mm apart in a panel.
- Light that hits the solar panel in between the cells is not lost anymore, it will be reflected back to the front air-glass interface.
- 30% of this reflected light leaves the solar panel, while 70% is re-directed to the solar cells leading to a higher energy yield (fig.3).

New and innovative aspects

- The spaces between the solar cells in current state-of-the-art bifacial solar panels are transparent (fig.2). ECN introduces a white scattering, reflective material in non-light harvesting regions in solar panels.

Main advantages of its use

- 2.0-2.5% higher energy production compared to a conventional bifacial solar panel

Specifications

- The solution requires a white reflective material that isotropically reflects light.
- The reflective material can be placed on the inner side of the front glass sheet, or on the inner side of the back (glass) sheet, or can be at the same level of the solar cells.
- The reflective material should endure minimally 15 kWh/m^2 of UV exposure, based on the standards IEC 61215 and IEC 61646, and should be able to withstand 3000 kWh/m^2 in desert regions[1)].

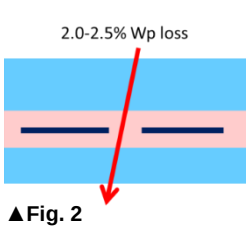
Potential applications

- The main use of the panels will be in (utility scale) solar farms, but it may also be used on flat roofs.

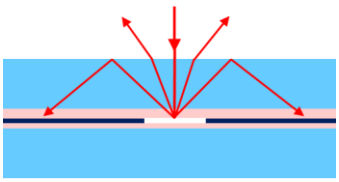
State of development

- At ECN lab-prototype bifacial modules have been made with white intra-cell reflection structures. (Technology Readiness Level 5).
- Next step will be to develop and to test a production method suitable for mass production.
- Reflection geometries on top and/or bottom glass need further detailing to increase module efficiency.

▲Fig. 1



▲Fig. 2



▲Fig. 3

Fig.1. A conventional bifacial panel, with a glass sheet on the front and on the back, with transparent regions between the cells.

Fig.2 Cross section of a state-of-the art bifacial solar panel, with glass sheets (light blue), solar cells (dark blue) and encapsulant (pink). The big arrow represents unharvested light, representing 2%-3% power.

Fig.3. A white reflective structure is placed in between the solar cells. Light incident on the reflective structure is scattered. Part of the light is reflected back towards the solar cells.

Transaction type and partner profile

- Spin-off and/or (exclusive) license
- We are looking for a business partner with extensive knowledge of the solar industry.

Publications and IP

- B. van Aken, EUPVSEC, 2016
- Patent WO2016005607 and auxiliary unpublished patents.

[1] M. Köhl, The challenges of testing the UV-impact on PV-modules

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