

MEMBRANE COLOUR AND PHOTOVOLTAIC PERFORMANCE

A study in partnership with 3E*



Background

Independent technical advisor 3E assessed the impact of different roofing membranes on the performance of photovoltaic installations on flat roofs. The assessment was conducted on two operational flat solar roofs in Belgium, each waterproofed with roofing membranes of two extreme colors (black and bright white).

The selected roofs had tilted solar panels, and were therefore able to receive reflected radiation from the rooftop. For each roof, four different albedo values were considered, corresponding to two different membranes and two different weathering exposure conditions (initial reflectivity and reflectivity after three years, which is supposed to be the heaviest impacted period).

Objective

The focus was to assess the influence of the reflected radiation on the overall energy production and performance of the photovoltaic system, in a projection of the full lifetime of the photovoltaic installation. The study tried to answer photovoltaic installation performance on black and white roofs, considering the initial and aged reflectivity of the roofing membrane.

Outcome

The influence of different albedos in the photovoltaic performance for the simulated solar roofs is negligible for both installations. Other factors such as cabling losses, soiling and availability may have a higher impact on the performance over time.

Over the typical lifetime of a PV project (which is usually at least 20 years) one can expect the difference between solar reflectance in both roofing membrane types to be decreasing, making photovoltaic roof yield in the black and white scenarios even closer to that shown in year 3.

Similar results have been observed in other geographies, even if the ratio between direct and global radiation is different from the climate conditions in Belgium. Several layout parameters affect the influence of albedo surface in photovoltaic performance. Higher inter-row distances and module-surface tilts will imply higher influence of albedo in photovoltaic performance.

With the decrease of solar module prices and the changes in regulations to allow more flexible self-consumption schemes, installation types are moving to higher module density than observed in this study, where almost all the rooftop is covered by solar panels. In these configurations, inter-row free distances highly decrease, and in some cases they even disappear. Thus, the influence of the roofing membrane in the performance of solar roofs is in these cases insignificant.



**This study refers to photovoltaic roofs in Belgium. Similar results have been observed in studies for other geographies, even if the ratio between direct and global radiation is different from the climate conditions in Belgium.*



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