

عنوان مقاله:

Modeling the Performance of Amorphous Silicon in Different Typologies of Curved Building-integrated Photovoltaic Conditions

محل انتشار:

فصلنامه انرژی و محیط زیست ایران، دوره 13، شماره 1 (سال: 1401)

تعداد صفحات اصل مقاله: 11

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خلاصه مقاله:

Photovoltaic cells are a significant renewable energy source due to their cheap cost and renewability. In both warm sunny and colder and cloudier conditions, a-Si modules outperform c-Si modules on a normalized energy basis. This study investigated ۱ m² of amorphous photovoltaic silicon on curved surfaces. The Taguchi and response surface methods were utilized to expand the model in real terms. Results demonstrated the technology gap in the use of silicon crystal photovoltaics is eliminated. The maximum power in the Taguchi method test is ۵۹.۸۷ W, while the minimum power is ۵۷.۸۴ W when the system is deployed on a flat surface, and the maximum power in the RSM Test is ۶۱.۱۴ W when the system is deployed on a hemispherical surface, and the minimum power is ۵۶.۶ W when the system is deployed on a flat surface. The minimal performance was ۷.۱% on a level surface. The flat surface produced ۸۱۰ kWh, the cylindrical surface ۹۶۰ kWh, and the hemisphere ۱۰۰۰ kWh. The NPV at Flat surface is ۶۹۷.۵۲, with a ۳۴.۸۱%, IRR and an ۸.۵۸-year capital return period. Hemisphere and cylindrical surfaces both get ۹۵۵.۱۸. The investment yield was ۳۹.۲۹% for cylindrical constructions and ۴۰.۴۷% for hemispheres. On the flat surface, doubling fixed investment improved IRR by ۲۱.۳%. The cylindrical system increased by ۲۵.۵۹% and the hemisphere by ۲۴.۵۸%. The developed simulation model is empirically evaluated using a MATLAB computer tool; the key findings from the validation procedure are reported in this study.

کلمات کلیدی:

Photovoltaic Cells, Renewable Energy, Amorphous Photovoltaic, Crystal Photovoltaic, MATLAB

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