Cost-benefit analysis of a Building Integrated Photovoltaic Roofing system for a school located in Blacksburg, Virginia

by

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(Abstract)

In the past few years, there has been a growing concern for the impact of non-renewable resource depletion and environmental degradation as a result of energy consumption in buildings. Buildings account for approximately one-half of the total energy consumption in developed countries. As architects and engineers involved with the fast growing building industry, we have the responsibility of exploring and integrating various renewable energy sources into our buildings to help us move towards what we might call "Positive Energy Architecture", where the role of the building shifts from net energy consumer to net energy producer.

The object of this study is to analyze how different parameters namely solar radiation, temperature, solar altitude and solar azimuth affect the power produced by a new thin film photovoltaic panel. Through the application of multiple linear regression, the model developed is then used to evaluate the cost-effectiveness of the building integrated photovoltaic roofing system when connected to the utility grid when compared to a conventional roofing system. The analysis is applied to a school building located in Blacksburg, Virginia. Using the current utility rates and the energy consumption data, the payback period of the system is evaluated for full roof, half roof and quarter roof coverage.

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