

Nitinan Pooltananan 2010: Effect of Spectral Irradiance Distribution on the Outdoor Performance of Photovoltaic Modules. Master of Engineering (Electrical Engineering), Major Field: Electrical Engineering, Department of Electrical Engineering. Thesis Advisor: Assistant Professor Patamaporn Sripadungtham, Ph.D. 58 pages.

The outdoor performance of photovoltaic (PV) modules is affected by several environmental conditions. Spectral irradiance is one of the important factors that should be investigated.

This thesis presented the effect of spectral irradiance by using average photon energy (APE) to declare spectral irradiance distribution. Relationship between the performance ratio (PR) and the APE were shown. The results indicated that thin-film amorphous silicon (a-Si) PV module was significantly affected by the APE. The increasing of APE enhanced the outdoor performance of the thin film a-Si PV module until the value of the APE reached 1.94 eV, while the polycrystalline silicon (poly c-Si) PV module was found to be less sensitive to the change in the APE since it showed a small change in the PR of 5%. The PR of the thin film a-Si PV module in winter decreased to the minimum value of 95%, consistent with the lowest APE in this season. The average APE in Thailand was found to be approximately 1.91 eV. This is informative data for selecting the PV module which is suitable for Thailand, and it is also beneficial information for improving thin film a-Si in PV module fabrication. Moreover, the monthly APE obtained from this study is a useful factor for accurate estimation of output power of PV modules.

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Thesis Advisor's signature

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