

## Performance Evaluation of Two PV Technologies (c-Si and CIS) for Building Integrated Photovoltaic Based on Tropical Climate Condition: A Case Study in Malaysia

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### ABSTRACT

This paper presents two grid-connected photovoltaic (PV) systems (monocrystalline silicon, c-Si; copper–indium–diselenide; CIS) situated on the rooftop of the solar lab building in the National University of Malaysia, southwestern Malaysia. Various parameters were used to analyze the system performance; including array yield, final yield, capacity factor, and performance ratio. The recordings were noted down under the actual climatic conditions for an entire year. The variables of energy cost and payback period were also considered to calculate the economic feasibility of the system. Variations in the final yield of CIS were as low as 2.98 h/day in July to the highest value of 4.31 h/day in March. The final yield for c-Si power plant ranged from 2.92 h/day in July to 4.14 h/day in March. The calculated capacity factors for CIS and c-Si power plants were 15.6% and 14.4%, respectively, in July as the worst value, and 21.12% and 20.2%, respectively, in March as the best value. In the case of CIS power plant, the performance ratio ranges from 63.8 in July to 84.12 in March, and for c-Si power plant, it ranges from 59.92 in July to 79.14 in March. The energy cost and the payback period of the suggested system were evaluated as 0.045 USD/kWh and 28.44 years, respectively. Finally, this study provides valuable information for those who are interested in PV system installation in the tropical zones.

**KEYWORDS:** PV performance; Energy efficiency; Final yield; Performance ratio; Capacity factor; Building integrated photovoltaic

**DOI:** [10.1016/j.enbuild.2016.03.052](https://doi.org/10.1016/j.enbuild.2016.03.052)