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# Potential of Building Integrated Photovoltaic Application on Roof Top of Residential Development in Shah Alam

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**Abstract**

Building Integrated Photovoltaic (BIPV) is an application where solar Photovoltaic panels are integrated into the building structures to produce electrical energy. It is silent, clean in operation, highly reliable and low maintenance. The research is to study the potential of BIPV application on the roof top of the houses in Shah Alam. Few samples were selected, important parameters were measured, and analysed to determine which roof form, orientations and PV types that influence the power generations. The average daily power generations range from 11.18kWh/kWp to 29.18kWh/kWp was recorded depending on the number of modules, PV type, slope inclination and location.


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*Keywords:* Photovoltaic; Building Integrated Photovoltaic; power generation; orientation

## 1. Introduction

Photovoltaic is array of cells containing a solar photovoltaic material that converts solar radiation into direct current electricity. Building integrated photovoltaic (BIPV) is the PV system that being applied within building component. Typically, an array is incorporated onto the roof or walls of a building. Arrays can also be retrofitted into existing buildings; in this case they are usually fitted on top of the existing roof structure. Solar energy is the most abundant permanent source of energy in the world and has become an important environmental compatible source of renewable energy. The increase of

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electricity demand, the rigorous growth of the building industry, and the highly potential of solar energy has made the application of BIPV technology in Malaysia as an important and wise approach. The BIPV technology not only create a sustainable impact to the buildings industry but also able to substitute part of the conventional electricity generators. In Europe and other developed countries, BIPV applications are proven reliable and in some cases are already cost-effective. However, in Malaysia BIPV technology has not really being explored and practice as a viable RE application. Many reasons lead to this phenomenon, among others are the lack of understanding on BIPV applications and the limited knowledge on how to utilize the BIPV technology among the users and developers. Another aspect that hinders BIPV application in Malaysia is the high investment costs and a longer payback period.

The first installation of grid-connected PV systems in Malaysia is dated back in 1998 with a total of 450kWp of grid-connected PV installed capacity. However, the current grid-connected PV application has not being explored the full potential of BIPV in the residential and commercial sectors. Sopian, et.al. (2005) in his study, found that the estimated technical potential of BIPV in Malaysia based on available building surfaces is about 11,000 MWp. This technical potential capacity could generate about 12,000 GWh of electricity annually that could cover 20% of the current electricity energy demand.

Based on the assessments of the local manufacturing and industry capabilities, indication clearly shows that Malaysia has a good potential to manufacture BIPV related products and components, such as the BIPV mounting mechanism, cables, connectors and inverters. Malaysia should take advantage of existing high technical skills, good education and well-established industries to move forward and enhance this BIPV related industries. The overall prospect for business opportunities in the field of PV is very encouraging and need to be explored and practiced, especially in the residential sector. In the urban area where the residential development is dense, there are such a big amount of roof surfaces that can be capitalized through BIPV application.

### *1.1. Statement of problem*

In Malaysia, the PV technology is well far behind compared to western countries even though the latter receive less annual solar exposure hours. Its application is limited in a certain area such as expensive housing development and selected office buildings. Few issues arise when discussing PV system like lack of awareness of conserving nature by the public and government. Many developers still not convince that BIPV can offer a fair payback period, and still thought that BIPV is very expensive, and the application require highly skilled workers.

### *1.2. Objectives*

The purpose of this study is to investigate the level of BIPV application in Shah Alam and to determine which type of BIPV system is popular or commonly used in Malaysia. The main objectives of the study are:

- To determine the potential of BIPV application in Malaysia
- To measure how much the existing sample produce
- To highlight the positive and negative influential aspects so that the future application can be enhanced

### *1.3. Significance*

It is hoped that this study will provide an answer to the long debated issue on PV application and the effect of using it to the public and the environment. The importance of this study is not only specific to