

Analysis of applying building integrated photovoltaic (bipv) to state library sta...

[Business](#), [Industries](#)



Financial Perspective

Comparing the BIPV with conventional method on construction materials and labour, the building envelope, roof or canopy, BIPV economic benefits are more considerable than conventional method. Return on investment could be between 3-7 years depending on technology (Europa studio 2013).

Comparing from the past, the PV modules prices have decreased 10 times from \$30 per watt to \$3 per watt, therefore, applying BIPV on State Library Station will be more effective considering the price is very low but also have a long life span.

Also, as improvements in PV technologies, increase in production efficiencies and volumes will be available and be very beneficial to apply to the station. (Yang & Zou 2016). The PV modules at this stage have a life span up to 25 to 30 years which will bring the market to save large amount of operational cost. Even though there has been reduction on the price of BIPV modules, the capital cost of purchase and installation may feel very expensive, however, in the recent years, cost reductions in materials and technologies, and increasing government support for renewable energy technologies will lead to a better decision making to apply BIPV to the station when considering in long term.

As discussed in the material section, it is recommended to apply the non-crystalline silicon thin-film technology on the station. In the financial perspective, thin-film costs approximately half of the crystalline silicon technology, it uses less material during the production, and can be

manufactured in large-area automated continuous-process equipment (Renewable Energy in the California Desert 2018). On the other hand, conventional method has very limited in terms of design. Depending on the clients' perspective, it may not suit their requirements as it is big, rectangular, and visually unappealing. Also, as State Library Station is a large, considering electricity production, it does not add value on functionality. However, as conventional method is still very common throughout the world, industry standards are more developed and can be easily installed on top of the roof.

Benefits of BIPV

1. Environment

By applying BIPV to State Library Station, there will be benefits on the environment and economic. The main carbon emissions in Australia are due to the burning coal. However, as PV outputs are produced from the sun, which are environmentally 'free', this will reduce the carbon emissions which leads to better health and safety of the public and the environment.

2. Savings on electricity bills

As there will be large amount of use of electricity in State Library Station, by applying BIPV, there will be large amount of savings on the electrical bills. When the capacity of the BIPV system is greater than the requirements of the building, electricity is then fed, or exported, back into the grid system (Ceron et al. 2013). From this results, there will be cost savings equivalent to the rate the electricity retailers charge the end users.

3. Innovative design

From the past, BIPV system have developed extremely that includes higher quality as well as in the design perspective. There are several of colours to choose from, including different types of patterns, shapes, transparency, light control, and also, tailor-made designs that suits the clients' standard therefore, architectural appearance does not fall behind.

Application process

This Chapter will elaborate on who will be involved in the application process and what are the responsibilities and requirements for them when applying BIPV to the State Library Station.

As State Library Station will increase in demand for energy usage, applying BIPV to the station will be far the most abundant form of renewable energy and has the potential to partially replace fossil fuels (Krishnamurthy pg 1). By applying the BIPV to the station, there will be a positive effect on people's health, environment, and climate. There are two types of photovoltaic modules available at this stage which are Crystalline Silicon, and non-crystalline silicon as discussed in the material section. As there are high rise buildings surroundings of the State Library Station, there will be limited direct sunlight going into the building.

Therefore, non-crystalline, thin-film technology will be most efficient way to allow natural daylight to the station. Figure x provides a non-crystalline silicon thin-film technology that will be used in the State Library Station.

As briefly referred on the legal perspectives, in order to correctly integrate PV modules into the façade of the structure, collaboration between architectural, structural, construction, and operation teams are needed. In order to elaborate the teams, Table 1 focusses on the key roles and responsibilities on the involvements in BIPV.

Team Involvement in BIPV

Architect As PV modules are applied into the façade of the State Library Station, architects has an important role to accurately apply the PV modules as desired appearance, and strategies on the adjustment.

Structural

Engineer Structural engineers must consider the weight of the PV modules that are installed into the structure. They must collaborate with the construction, and operational teams to consider the live and wind loads that are applied to the structure. As BIPV modules can be structured in many ways, structural engineers must determine the right fittings that the structure can hold the PV modules.

Construction

The key roles of Construction team is to build what architects and structural engineers have designed and calculated correctly. Their responsibilities are to collaborate with all the teams on whether design and structural engineers proposed designs can be built on the right standard and without any injuries on the employees while proposed designs are being built.

Operation

The main roles for the operational team is the maintenance. As PV modules have life span from 25 to 30 years, they must concentrate on the maintenance of PV modules therefore, it is in a good shape and have longer life span. Manufacturer When the architects and structural engineers have determined the fitting of the PV modules, it is the manufacturer Schott AG to process the steps to transform the product to be ready to be built in the State Library Station.