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Floating Photovoltaic Installation at Off River Storage Facilities to Optimize Infrastructure Utilization

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Extended Abstract

Solar or photovoltaic power has been a source of energy for many years and the number of installations of large-scale solar panel or commonly known as the solar farm worldwide is increasing significantly. It is an indication of global initiative towards replacing the mainstream energy source namely the fossil fuel which is predicted to deplete in 2030. Among the challenges of establishing photovoltaic as a power source is space availability as solar farm can be land-intensive and vacant lands are very limited. The solution to this problem is by installing photovoltaic panels over water by means of buoyancy and this has given the name widely referred to as floating solar panels or floating photovoltaic (FPV).

FPV is most often deployed on massive water bodies such as dams and reservoir but one of the strategic locations for the installation of FPV worth considering is the off-river storage facilities. The establishment of off-river storage facility in Malaysia is becoming a priority to the nation as the country has been facing water shortage issue for the past decades despite receiving an average of 2000 mm to 2500 mm of rainfall annually. The project, which is called *Takungan Air Pinggiran Sungai* (TAPS), or riverside water storage, has entered the implementation phase where the government has invested in its construction in Malaysia especially the areas with high population [1]-[2]. The main concept of TAPS is to divert excessive stormwater from the river during heavy rain and store the water as reserve to support the main water supply for consumers.

There are several disadvantages of FPV installation over the water at dams and reservoirs. Firstly, the water level at dams often fluctuates within a significantly large margin due to factors such as the extraction of water to consumers and the release of water downstream for environmental flow [3]. The level fluctuation could affect the installation angle of the photovoltaic panels which can reduce its efficiency. Moreover, the FPV could also be subjected to position or directional changes caused by the wind flowing across the water body or waves created by the wind movement [4]. The most concerning issue that has been raised regarding FPV deployment at dams and reservoir is its adverse impact to the aquatic ecosystem [5]. It is claimed that the FPV panels block the sunlight from entering the water body and thus disrupt the photosynthetic activities that take place inside the water involving various kinds of aquatic plants and fauna.

Off river storage facilities such as TAPS on the other hand do not exhibit these characteristics. The water level fluctuation at TAPS is normally within a small margin as most of the time they are not used to supply water for domestic use and no environmental flow is required. Wind movement effects are hardly present as the wind speed at small lakes such as TAPS is relatively low. Last but not least TAPS facilities are built environments and existing aquatic ecosystem in such locations is not present and therefore threat to the water body environment is not significant.

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