

Flow study on the Ambatolaona river (Madagascar) for tidal power generation

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Abstract :

Demonstrator of a hybrid production system combining a P66 tidal turbine and a photovoltaic field, the Rural Electrification project by HYdrolienne Guinard Energies (ERHYGE), benefited 50 homes, 5 companies and all public services including the school commune of the locality of Amboarakely in Ambatolaona. The tidal turbine is installed on a river, with a flow velocity of 2 m/s from the management of the hydraulic dam in Mantasoa. During the rainy season and for the water reserve of the dam, the flow of the stream flowing into the canal is reduced then the tidal turbine remains immobile and not operated, thus the photovoltaic panel which supports all the consumption, load shedding frequency, risk of storage battery failure. Our objective is to provide a solution by studying the flow of the river and to suggest a more appropriate installation zone so that the tidal turbine runs all year.

The proposed method is based on numerical modeling of the flow of the river by Basement thus to study the new installation proposal divided into three sub-study zones: sub-zone 1: inclined plane of the angle θ , sub-zone 2 of the hydraulic jump, sub-zone 3 of the downstream flow along the basin. The study shows that the flow of the river is followed, the model of the reliable zone has an inclination slope of $I_{\theta} \approx 45^\circ$ and the installation of the tidal turbine is optimal in sub-zone 3

Keywords: tidal turbine, modelization, flow, energy, river