CHAPTER 1

INTRODUCTION

Across the globe, 1.4-1.6 billion people have no access to electricity at all while another one billion are dependent on unreliable electrical grids. Many of those lacking access to modern energy live in rural areas, thus decentralized, off-grid energy projects will play a vital role in achieving. In order to solve this problem, water turbine had built. However, people in rural area prefer things that low cost, easy to operate and long lasting. The turbines produce electricity from the free-flowing water in a river or stream and do not rely upon a water-head to produce electricity.

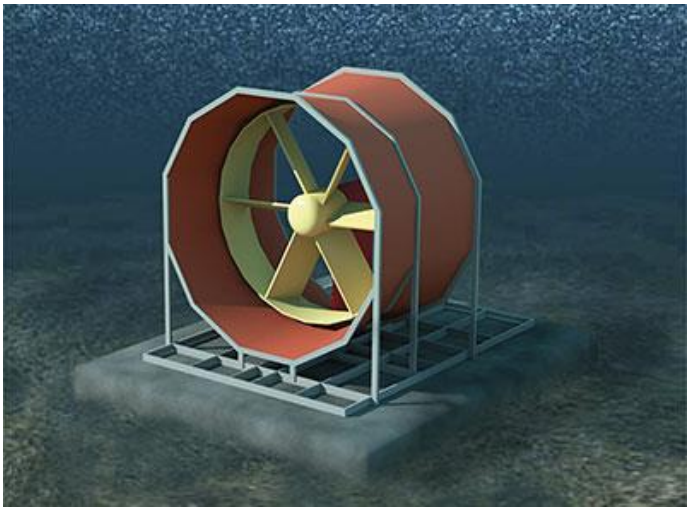

Figure 1.1: Model of a horizontal-axis hydrokinetic turbine

There are many type of turbine that can be found. However, this project is to gain improvement of this mechanism to apply in rural area from improving Hydrokinetic Turbine which place at river stream. The main objective of this project is to generate electricity and supply this green energy in rural area for a better living of remote community in Sungai Pahang. The hydrokinetic turbine could be submerge in the river or could be placed on the surface of the water river using the pontoon. Table 1.1 below show that classification of turbines used for pico-hydro based on hydraulic

head type. The characteristic that suit to Sungai Pahang river is propeller turbine which reaction type and used depth of river below 2 meter.

TURBINE TYPE	LOW (<10m)	MEDIUM (10<50m)	HIGH (>50)
Impulse	Crossflow	Crossflow Turgo Pelton francis	Turgo Pelton
Reaction	Francis Propeller Kaplan	None	None

Table 1.1 : Classification of turbines used for pico-hydro based on hydraulic head and type (Bryan R. Cobb et al, 2011)

The approach here is to apply the hydrokinetic water turbine to the rural area and tested to a house then electricity supply will be connected to a house which is located near to Sungai Pahang. The idea is to provide people on a solution for a rural area which is hard to get electricity supply. The project of hydrokinetic water turbine is proposed because it suit for small communities that required only a small amount of electricity.

Pahang River having the width more than 100 m and the depth could be reached more than 10 meter. The velocity of Pahang River during first sampling ranged from 0.308 to 0.582 m sec−1 and second sampling was from 0.217 to 0.484 m sec−1 (Ahmad, 2013).Usually, turbines able to produce about 1 kW to 2 kW of electrical power from range 0.217 to 0.484 m sec−1 velocity of river suitable for remote homes (Martin Anyi et al, 2009).

1.1 Background of Study

Hydrokinetic energy conversion systems are the electromechanical devices that convert kinetic energy of river streams, tidal currents, man-made water channels or waves into electricity without using a special head and impoundment. This approach of energy conversion and built makes hydrokinetic turbine differ from conventional way that is hydrostatic method. Hydrostatic approach is the conventional way of producing electricity by storing water in reservoirs to create a pressure head and extracting the

potential energy of water. According to Güney and Kaygusuz (2010), hydrokinetic approach, the kinetic energy inside the flowing water is directly converted into electricity by relatively small scale turbines without impoundment and with almost no head.

Hydrokinetic turbines are also known as free flow turbines are designed to be installed in natural streams like rivers, tidal estuaries, ocean currents, waves, man-made waterways and other flowing water facilities with an optimum velocity (Lago et al,2010). Additionally, hydrokinetic systems have minimal environmental impacts compare to dams as its required minimum amount of civil work and no extra cost to construct a dam or a reservoir to accumulate the water (Khan et al, 2010). Large scale hydroelectric power plants have some unfavourable effects on the environment such as; people relocation, inundation of agricultural, historical and habitat areas, sedimentation of fertile lands, methane (CH4) gas emission, altering the river regime, etc. Contrarily, the natural tissue of the energy production site is not seriously affected by hydrokinetic systems.

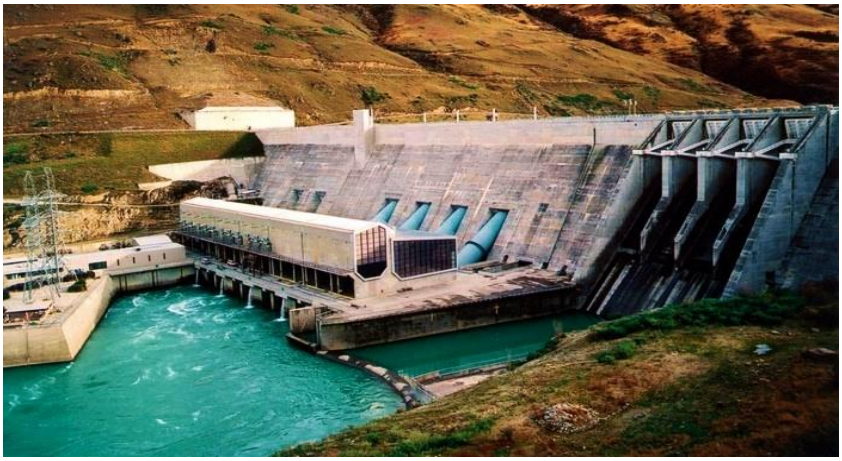

Figure 1.2: Hydropower dam

However, harsh marine environment is one of the disadvantages of hydrokinetic systems. Especially wave energy conversion devices should be strongly designed to withstand high and irregular water loads. On the other hand hydrokinetic systems can have small scale environmental risks. Installation of hydrokinetic systems can block the navigation and fishing. The turbine parts, chemical agents, noise and vibration can badly affect the water habitat (Yuce and Muratoglu,2015).