The Development of a Preliminary Design for a Tidal Energy Plant

Kamran Ahmed Samo
Electrical Engineering Department
Quaid-e-Awam University of Engineering, Science and Technology
Larkana, Sindh, Pakistan
kamransamo2@gmail.com

Azhaili Baharun
Mechanical Engineering Department
Universiti Malaysia Sarawak
Kota Samarahan, Sarawak, Malaysia
bazhaili@unimas.my

Andrew Ragai Henry Rigit
Mechanical Engineering Department
Universiti Malaysia Sarawak
Kota Samarahan, Sarawak, Malaysia
arigit@unimas.my

Abstract—Renewable energy sources are considered a part of the future of energy production in Malaysia. The main objectives of this research are to append a new energy extraction technique that harvests energy from tides and to develop a preliminary design for a tidal energy plant at Kuching Barrage. Knowing the diameter of the turbine, the dimensions of the powerhouse are achieved in conjunction with site conditions. The centerline should be at least below the low water tide so that the tide is at all times guaranteed to be submerged. Based on this, the powerhouse has a 24.61m length, is about 100m in distance across, and its elevation is 36.39m. The construction is located downstream and the centerline habitation at -1.15 and below LSD. The calculated tidal energy plant is comprised of four bulb-type turbines installed at each barrage gate. The bulb-type turbine blades would face the sea site with 11.32m length of the draft tube. This study detailed feasibility study can be implemented.

Keywords-tidal range; powerhouse; renewable energy; Malaysia; Kuching Barrage

I. INTRODUCTION

Renewable energy in Malaysia is considered a great source of energy and a factor of the green energy revolution in Malaysia. The Malaysian government is working on various renewable power plants across the country. The most significant renewable energy sources in Malaysia are solar energy from photovoltaic (PV) panels, biogas, biomass, and small hydro. In the upcoming four years, the Malaysian government proposes to generate 2080MW of electricity from renewable energy. On the other hand, the Sustainable Energy Development Authority [1] in Malaysia is skeptical about achieving this target by the year 2020, since from 30th September 2015, the verified renewable energy creation was only about 319.5MW. Malaysia ought to restore its responsibility regarding accomplishing the target of electricity generation from renewable resources. The current research project is expected to raise awareness regarding renewable energy in Malaysia, particularly tidal range technologies, as at present there is no tidal energy plant in Malaysia. Unlike other known renewable energy resources, tidal range energy harvesting is an expectable phenomenon. Energy production from a tidal range power can be assessed appropriately [2]. More than 80% of energy production comes from non-renewable energy resources such as fossil and coal and they are slowly depleting [3].

About 40 sites have been recognized in the world as ideal sites for the harvesting of tidal range technology [4]. However, this site number is relatively low and no Malaysian site is included among these suggested sites. The reason may be the lack of research on this area and the lack of interest of the Malaysian authorities. This lack of research in Malaysian tidal range energy can be overcome with further studies on the Malaysian ocean and with expected technological improvements. The states Sabah and Sarawak have isolated regions near the coastline which have a shortage in the supply of electric power. There are various modes of electricity used to disband electricity to far-flung locales, such as grid-based and diesel-based generators which are well-known modes of electricity disband. One of the common modes of electricity is grid extension, however, it is costly, takes time, is not economically viable in certain remote areas that are not easily accessible, and often requires sophisticated technologies. It is considered that as a not very feasible mode. Hence, renewable energy sources are being patronized as a green, trustworthy, and economical solution, for the far-flung areas. Among various available green energy options, tidal range energy and tidal stream energy have the best potential due to the reason that they are in sheer abundance, have high density, and they are powerful and predictable and void of any weather conditions, in contrast to solar and wind that are highly subject to metrological conditions. Also, their impact on environmental and human activity is less [5, 6].

Corresponding author: Kamran Ahmed Samo