Suitable Turbine Selection based on the Parameters of a Potential Site at Sarawak, Malaysia

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***Abstract*—The tidal range is a renewable energy source. In Malaysia, most of the produced renewable energy is generated from the exploitation of the tidal range. The main purpose of this research is to determine a suitable system to produce tidal range energy from a potential site. A turbine selection chart is used. The mean tidal range of Kuching Barrage is 4.2m and the maximum flow rate over a gate is 226.9m^3/s. Therefore, for the extraction of electrical power, a bulb-type turbine with a rated power of 5.2MW is identified as suitable to be deployed at the site.**

Keywords-tidal turbine; power; energy output; flow rate

I. INTRODUCTION

Ocean renewable energy sources are globally established as mainstream sources of energy [1]. It is calculated that the theoretical ocean energy resources are over 30,000TWh/year and the net potential power is larger than the sum of wind and solar power [2]. Malaysia is one of the biggest producers of solar photovoltaic (PV) panels and is ranked as world's third-largest producer of solar PV energy [3]. However, ocean energy resources like tidal range energy can be used at a big scale for sustainable electrical power generation [4]. Tidal range power is produced due to the consistent rise and fall of seawater [5, 6]. Tidal range power can be generated where tidal range flow is available [7]. Energy from tidal range can be used for electrical power generation. A potential site to generate renewable energy from tidal range at the East Coast of Malaysia can be determined [8]. Power could be generated from the existing or a new barrage, in the isolated regions of East Malaysia. This research found that bulb type turbine can be selected as the applicant turbine for Kuching Barrage. The selected turbine is proposed for electricity production in the Sarawak state of Malaysia.

The aim of this research is to determine a suitable turbine for a suitable location at Sarawak. Kuching Barrage is identified as a potential site that could yield 10.23GWh energy per year. The hypothesis of the research is that turbine selection is based on calculated parameters of potential sites, including tidal range and flow rate.

II. LITERATURE REVIEW

A. Selection of the Tidal Range Turbine

Turbine selection is mostly dependent on the accessible tidal range and flow rate. The flow rate is used to conclude the turbine capacity. Tidal barrage turbines usually have a low tidal range turbine. The lowest water range required for the operation of the turbine is between 1 and 1.5m. However, the most of tidal range power plants use low tidal range [8]. Turbine efficiency and price are side factors. There are various turbine types of calculated tidal range, flow rate, and appropriate power [10]. There are four different types of turbines: Pelton, Francis, Kaplan, and bulb type turbines [9]. The calculated ranges are between 50kW and 1,000MW and the flow rate values vary from 1.0 to 1000m^3/s.

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