# Determination of Potential Tidal Power Sites at East Malaysia

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*Abstract*—**Tidal range energy is one of the most predictable and reliable sources of renewable energy. This study's main aim is to determine potential sites for tidal range power in East Malaysia, by analyzing tidal range distributions and resources and the feasibility of constructing barrages. Investigation was conducted in 34 sites, estimating their potential energy outputs and studying their areas for constructing barrages. Only 18 sites were marked as appropriate for constructing a tidal range energy extraction barrage. The highest potential power was found in Tanjung Manis, and its maximum capacity was calculated as 50.7kW. The second highest potential of tidal power extraction was found in Kuching Barrage at Pending, where an energy harvester could produce electric power up to 33.1kW.**

***Keywords-tidal range; renewable energy; potential site; power; East Malaysia***

## I. INTRODUCTION

Oceans possess a huge potential to generate electric power [1]. Generating electricity from ocean power can offer many advantages compared to other renewable energy sources [2]. Ocean power is a vast and comparatively reliable source. Thermal power can be harvested from oceans by the temperature difference of warm shallow and deeper cold waters, and kinetic power can be harvested from tides, waves, and streams. Salinity gradient power is the energy extracted by the difference in the salt concentration between sea and river water. Although Malaysia is located in the equatorial zone surrounded by sea, this ocean power has not attracted much attention by the local government [3]. The country's total coastline is 4,675km, West and East Malaysia have 2,068km and 2,607km of coastline respectively [4]. The long length of Malaysia's coastline is a huge advantage in utilizing tidal range energy as a reliable alternative energy source [5].

## II. LITERATURE REVIEW

A potential site can be determined by the maximum available tidal energy. The East Coast of Malaysia, was studied in [6] where four areas with high exploitable tidal water energy were determined. Data for potential energy production at the East Coast of Peninsular Malaysia, covering Kelantan and Terengganu regions, were obtained from Malaysia Meteorology Department (MMD), Department of Mapping and Survey, and National Hydrographic Centre, while potential regions were determined through GIS. Tidal power derives from the tidal range, as the water is confined in a basin during a high tide, and it runs out through a turbine at low tide [7-9]. The energy extracted from a tidal barrage can be calculated by considering the tidal range of water, as:

$$E = h \times \rho \times g \quad (1)$$

where $E$ is the potential energy (J), $h$ is the tidal range (m), $\rho$ is the water density (1025kg/m$^3$), and $g$ is the gravitational force (9.81m/s$^2$). Generated power can be calculated, concerning the space of barrage and tidal ocean as:

$$W = \frac{(E \times (A \times h) \times 2)}{T} \quad (2)$$

where, $E$ is the potential energy (J), $A$ is the barrage area (m$^2$), $h$ is the tidal range (m), and $T$ is the duration in one day (s). The width of the river site was assumed to be about 200m and the area of the tidal barrage was about 200×200m [6]. The barrage area was considered using data from the Department of Irrigation and the Department of Drainage in Malaysia [6]. A graph of the optimum upper limit of power generated per month, created at Tanjung Berhala, Terengganu, is shown in Figure 1. Data were analyzed by month, and the maximum daily power was considered.

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