

Development of Wind Mapping Based on Artificial Neural Network (ANN) for Energy Exploration in Sarawak

S.M.Lawan^{*‡}, W.A.W.Z.Abidin^{*‡}, W.Y.Chai^{**}, A.Baharun^{***}, T.Masri^{*}

^{*}Department of Electrical and Electronics Engineering

^{**}Department of Computer Science and Information Technology

^{***}Department of Civil Engineering

(13010004@siswa.unimas.my, wzaazlan@feng.unimas.my, ycwan@fit.unimas.my, bazhaili@feng.unimas.my, mthelaha@feng.unimas.my)

[‡]Corresponding Author; S.M.Lawan; W.A.W.Z.Abidin, Department of Electrical and Electronics Engineering, Universiti Malaysia, Sarawak, 94300, Kota Samarahan, Sarawak, +60146903182, 13010004@siswa.unimas.my

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Abstract- The exponential rise in global population and rapidly depleting reserves of fossil fuels and pollution that is occurring as a result of burning hydrocarbons have drawn the attention of researchers, engineers and designers in searching for clean and emission free sources of energy. Wind energy is naturally replenished which comes from wind and produce electricity using natural power of wind to drive a generator. The power is clean and inexhaustible that will sustain and maintained the environment. The most important parameter of the wind energy is the wind velocity. A couple number of wind speed prediction models have been published in scientific literatures that are related to estimation of wind speed values. This paper presents Neural Network (NN) techniques for the prediction of wind speed in the areas where wind speeds velocity does not exist. The ANN model has been designed using the NN Toolbox in Matlab environment. A total of ten years data from five locations starting from 2003 to 2012, and five years data from a period of 2008-2012 were used for the network training, testing and validation. Topographical parameters (latitude, longitude and elevation) and meteorological variables that results in wind formation have been considered in this study. Comparison techniques based on statistical measures between the references measured and simulated wind speed indicated that the ANN model correlated well with reference measured data.

Keywords- Renewable energy, Wind energy, Wind mapping, Artificial neural network, Sarawak.

1. Introduction

Malaysia is a developing nation strategically located in the Southeast Asia, between latitude 2^o and 7^o north of the equator. The general weather condition of the country is hot and humid, and the annual mean temperature ranges from 22^oC to 37^oC and relative humidity ranging from 80-90% with the exception of highlands. The country experienced three seasons namely, Northwest monsoon, which begins from about November to April while, the Southwest monsoon occurs from June to September. On the other hand,

the inter-seasonal monsoon occurs in October and May [1, 2].

For a long time hydrocarbon based fuels are the primary sources of energy that satisfy the consumer need in the country. Burning of fossil fuel is associated with many challenges like greenhouse gasses, indeed when these gasses are released into the environment it affects climate and hence increase global warming. Traditionally, Malaysia energy policy is turned around four fuels strategy that is oil, natural gas, coal and hydropower. Nevertheless, the conventional source in Malaysia and other countries of the world is finite. The oil reserve is anticipated to last at least for the next