CHAPTER 1.0 INTRODUCTION

Renewable energy in general can be defined as a source of energy which rapidly replaced by natural processes such as solar, wind, geothermal and biomass. It is filling and naturally derived, directly or indirectly from the environment that are found in abundance around us and are part of everyday life that are used so evident. Another definition of renewable energy is a natural flow of energy that is constantly moving. [1].

People were started use renewable energy for a long time ago whether it is wind, water, solar or bio energy. Time is running parallel to the growth and development of technology, but until the 19^{th} century, the scale on which renewable raw materials are converted to the range usually relatively low for individual use or for small communities in agriculture and industry. In terms of modernity, focus on ways to use renewable energy sources is part of the solution to produce electricity for use in mass production. The devastating oil crisis has led to took place between 1979 till 1980. Since then, the system was heavily dependent on fossil fuels so it is important to found alternatives to reduce dependence on it.

The basic question that motivated towards this research of renewable energy technologies is the sustainability. The current system relies heavily on fossil fuels such as coal, natural gas and crude oil which consumed much more than the amount that they produced. In 2008, global consumption of energy was 474 exajoules (132,000 TWh). This is corresponds to the average consumption of electricity of 15 terawatt hours which 81% came from fossil fuels [2]. According to the statistic of proven coal reserves from the International Energy Agency, there is still about 909 thousand million tons [3], which could sustain for 155 years, but it may increase the speed of these by 5% per

annum, lead to be reduced to only 45 years, or till 2051. However, according to the another published, the world production of liquid fuels will exceed supply in 2013 [4]. For natural gas [21], the decrease in production is expected to occur at around 2020 for the entire source, and in 2030 demand will exceed production by 18%. So the question of sustainable development in fossil fuels is subject to long term. On the other hand, renewable energy has a healthy perspective of sustainable development because they are resources that are almost intact, even if still in use in large quantities.

Another aspect in the context of sustainable development is to protect the environment. Conventional energy production generates carbon dioxide which is emitted into the atmosphere. It contributes to the greenhouse effect and global warming. Other emissions such as sulfur dioxide and nitrogen dioxide can also be produced, depending on the consumption of fossil fuels and burning methods. Renewable energy helps to reduce them and plays a role in making the world healthier to lives by the humans all around.

The situation in Malaysia is no different. The government has also found a particular attention in the needs of using the renewable energy to be added to the supply mix. These are the evident of the country looking for ways to diversify sources of energy today. Although the implementation will be long and difficult, it is worth by performing although for a long-term project.

This document is divided into six chapters. The first chapter provides an introduction to the project objectives and scope of the study. The second chapter presents an overview of the available renewable energy sources around the world and in Malaysia. The third chapter contains a detailed analysis of renewable resources

available in Malaysia, the availability, the degree of implementation and prospects for production of energy. The fourth chapter presents an overview of energy policy in Malaysia, how it reflects the use of renewable energy sources whether it has contributed to the growth of renewable energy in Malaysia. In the fifth chapter, it discussed about the technologies available, the opportunities and benefits in accordance with the development of renewable sources of energy. Finally, the sixth chapter draws the conclusions of this study and also the recommendations that can be made to allow some problems to be solve.

1.1 Objectives

The purposes of this study are summarized as follows:

1. To identify the potential sources of renewable energy in Malaysia.
2. To analyze the current implementation of renewable energy sources in Malaysia.
3. To study the development and commercialization of renewable energy systems, and the conversion technology available.
4. To determine the constraints and market barriers of renewable energy utilization in order to improve its usage in the country.
5. To evaluate the government policies and incentives approved to promote renewable energy sources.

1.2 Problem Statement

Malaysia has a good natural resources in areas such as agriculture, forestry and minerals which dominated by industrial development. Malaysia's population is growing

at a rate of 1.9% per year. In 2010, the population was 28.3 million people and estimated to achieve 31.6 million in 2020 [5].

Economic growth came from large part of population growth, industrialization and urbanization, leading to the increasing demand of energy. In response, the development of the energy sector has created establishment of energy safe, reliable and cost-emphasized. The need now is the efficient use of energy to diversify energy sources and ensure waste minimization.

Besides the energy source that is already used, Malaysia has enormous resources of both non-renewable resources and renewable resources. The largest source of non-renewable energy in Malaysia is petroleum (oil and gas), which is actively used. Although Malaysia has some coal deposits, only a small percentage eliminated. Two abundant sources of renewable energy in Malaysia are biomass and solar energy.

Biomass waste in Malaysia has increased to 70 million tones collected per year. Although there are many biomass generator in Malaysia, most of them are only use to supply small amount of energy to its own place where one biomass plant is build to supply electricity to one specific factory. There still no specific biomass plant is build to supply energy to whole Malaysian as one of important energy supplier in Malaysia.

1.3 Scope of Study

The most important part of this work focuses on the availability of electricity and renewable energy. The territorial scope of this document covers all areas of Malaysia, including the Peninsular Malaysia, Sabah and Sarawak.

Figure 1.1: Map of Malaysia

Malaysia is a country located in south-east Asia, which consists of two different regions divided by the South China Sea, by the name of Peninsular Malaysia (or West Malaysia) and Borneo (or East Malaysia). Peninsular Malaysia is composed of eleven states with the neighboring countries of Thailand to the north, and Singapore in the south, where the two countries are separated by the straits of Johor. While East Malaysia, consisting of two states in the northern part of Borneo, bordering Indonesia, Brunei and the surrounding areas.

Malaysia has a tropical climate with many sunny days due to its location near the equator. Malaysia has the temperature range of 22-33°C and there is a constant season in most of the year. There are two monsoon seasons (April-October), and (from October to February) that will produce rain.

The country has a total area of 329,847 km^2, with an estimated population of 27,356,000 persons [6]. It consists of three important races, Malays, Chinese and Indian and other minorities of races. Malays population of the country is the biggest race of the

country, then Chinese and Indians, respectively. Islam is the state religion and largest in the federation. The official language is Malay and English is the second language.

As for the government, they practice the federal constitutional monarchy, and was headed by Yang diPertuan Agong and politically led by the Prime Minister. Malaysia, Indonesia, Singapore, Philippines and Brunei were the founding as a members of ASEAN, and also an active member of international organizations like the United Nations (UN) and the Organization of Islamic Conference (OIC).