PENGARUH ANGIN MUSON TERHADAP POTENSI LAUT DI INDONESIA SEBAGAI SUMBER ENERGI TERBARUKAN BERKELANJUTAN
THE INFLUENCE OF MONSOON IN INDONESIA AS A RENEWABLE ENERGY SOURCE AND SUSTAINABLE DEVELOPMENT

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Abstract-Monsoon is a wind that blows twice a year and passes Indonesia. Monsoon is divided into western monsoon winds that blow in December to April and east monsoon winds that blow in April to October. Differences of solar radiation in the northern hemisphere and southern hemisphere is a factor that led to the change of wind direction and cause the change of seasons in Indonesia. Through the monsoons which will generate waves of the ocean waters that can be used as renewable energy sources, one of which is a sea wave power plant. The potential of ocean waves can be converted into an efficient renewable energy sources and sustainable and eco-environment. Indonesia with a very large water area has a lot of potential as a central point of the area power plants. Sea wave power plant which developed optimally can reduce the dependence to use the non-renewable fossil energy and reduce levels of pollution as a result of its use in every aspect of life.

Keywords: Monsoon, Renewable energy, Sea wave, Sea's potential.

I. INTRODUCTION

A. Background

Ocean waves is a source of energy in the ocean. Research on the utilization of ocean waves have been carried out. The authors clearly explain how the process of ocean waves generate energy and make it as a source of renewable energy. Unfortunately, many of these studies have not realized due to lack of government support, so it has not seen real results based on the research.

The data shows that in Indonesia there is only one wave energy station, the station located in the area of Yogyakarta. Therefore, we emphasize again about the utilization of ocean wave energy to be realized so that it can be one of the sources of renewable energy in Indonesia and become the nation's energy supply. On the other hand, we also analyzed the distribution of monsoon wind direction and the effect on ocean waves so as to map the locations of potential for sea wave energy harvesting.

B. Purpose

The purpose of the analysis of the influence of the monsoon on the ocean waves is to find out more water potential as stations utilization of ocean waves that can be used optimally. As well as to indicate that the ocean waves have great potential to be used as a source of renewable energy that are environmentally friendly and sustainable.

C. Literature Review

The main factor is the driving wind pressure gradient force. The wind moves from areas of high pressure to areas of low pressure and pressure gradient slope is proportional to the wind speed. Types include wind wind land and sea breezes, winds valley and mountain winds, and monsoons.

Onshore wind and sea breezes and mountain winds and wind valley is a small-scale wind by a factor driving the difference acceptance of solar radiation and heat storage between the two places. Unlike the previous two types of wind, the monsoon is a large-scale wind which has a driving factor for admission difference between the position of the sun radiation from the northern hemisphere and southern hemisphere.

Monsoons can be defined as the wind changes direction every season. Among some of the monsoon system known on earth, monsoon system that most influence on the social and economic activities in Indonesia are the Asian-Australian monsoon system (Sakti 2004).

Sakti (2004) stated that in the month of December to February, when the winter in the northern hemisphere and the sun is at position 23.5 LS, high pressure center located in North Asia. The wind was blowing from the northeast and then when the wind passes through the equator is deflected into the wind west to east and toward the low pressure center in Australia. So that the wind is called Wind West Monsoon.

On June to August when the winter in the Southern Hemisphere and the sun is at position 23.5 LU, the center of the high pressure is located in the continent of Autralia. The wind was blowing from the continent of Autralia and when passing the equator is deflected from the southwest into the wind east to west and

towards the low pressure center in North Asia. So that the wind is called Wind East Monsoon (Sakti 2004).
The strength of weak monsoon and erratic direction when entering the season in between. The transition season I took place in March-May and Summer Transition II took place in September-November(Sakti 2004).

Wind is one of the ocean wave generator, in addition to other factors such as seabed seismic activity (earthquakes), volcanic eruptions, the movement of the ship, the attraction of celestial bodies (moon and sun)(Azis 2006). The principle of the generation of waves by wind is the movement of energy from the wind into the water through the water surface (Sugianto 2010).

The wind at low speed will cause a small wave height and wave period occurring low, while strong winds and storms will cause variations in height and wave period and leads to various parts. In good wind conditions, the waves can be observed at random, both for height, period, and direction. Wind provides considerable influence on the ocean waves so that the efficiency of virtually all aircraft ocean wave energy conversion is affected by the frequency of winds that occur throughout the year at a certain sea zone(Wijaya 2010).

Monsoon winds that change direction twice a year and through the waters of Indonesia, has a major role in the generation of ocean waves in the waters of Indonesia. Ocean wave energy transfer from the water to the mainland can be used as a renewable energy source because the ocean wave number is always abundant and not limited by time. Utilization of ocean waves categorized as environmentally friendly energy generation because it does not generate pollution and waste such as power plants that utilize fossil energy, such as coal.

II. RESULTS AND DISCUSSION

Indonesia has a wide territory and population that continues to increase, directly nation's energy needs will increase to meet the needs of every sector of life. Utilization of fossil energy and non-renewable polluting not fully terminated or replaced by other renewable energy utilization, it's just another alternative energy utilization is also environmentally friendly is needed to compensate for the damage caused fossil energy.
Utilization of ocean wave energy for electricity generation is one of the alternative energy potential as an additional source of energy and the nation's energy supply. This is because the resources are always abundant ocean waves and the utilization is also environmentally friendly in that sea wave power plant can be done in a sustainable manner without causing damage.

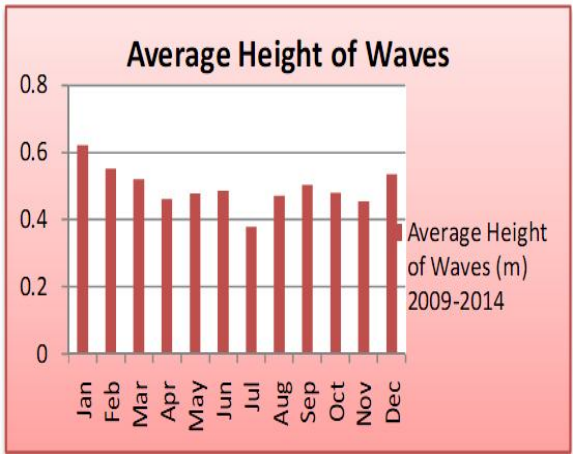
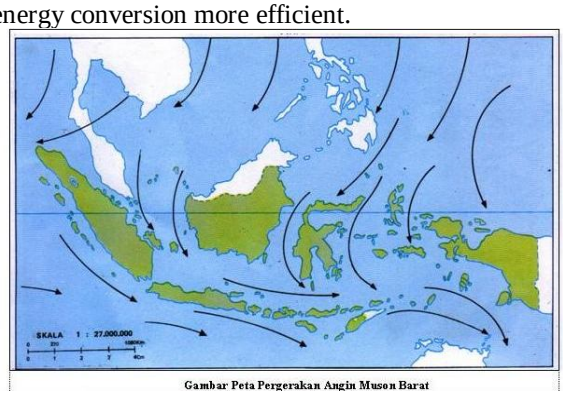


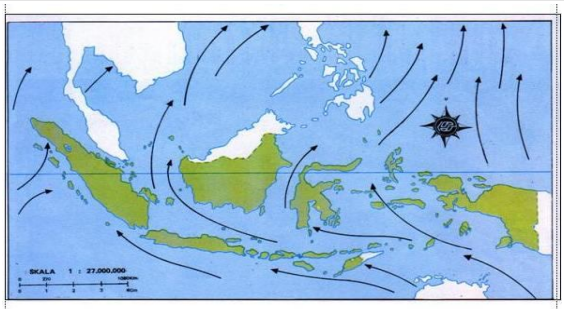
Table 1. Average height of wave In 2009-2014

Average data in 2009-2014 from the ocean wave heights showed fluctuating every month. High waves in January and height wave until April. Wave rose again in May to June and declined again in July. In August, the waves rose again until September and returned reduced height until November and then increased significantly in December.

Based on the graph, it can be concluded that in the western waves reaching the highest average, while in the east monsoon waves are not too high. According to Hadi (2004), in the western significant wave height greater than the east season. Significant wave height and peak period in the spring and summer tiumr west respectively ranged from 0.44 to 1.83 m and 2-5 sec and 0.35 to 1.06 m and 2-5 seconds.
Monsoon winds that change direction twice a year cause differences in the strength of the wind in every Indonesian waters. Wind speed into surface waters after crossing the island or the mainland will be reduced. This will cause waves that are formed are relatively smaller. This factor is called the fetch or distance without obstacles where the wind is blowing (Aziz 2006).
The difference in wind speed causes the difference in the size of the waves to be one of the factors determining the need for a potential point of wave energy utilization. It is intended for the use of technology and other inputs in this ocean wave energy conversion more efficient.



Picture 1. The movement of west monsoon



Picture 2. The movement of east monsoon

Based on the movement image of monsoon, there are differences in the potential region of ocean wave energy utilization for the period of the west and east monsoon season. Point potential as an ocean wave energy harvesting is the area through which the waters of the monsoons without prior island or the mainlan, so the wind blowing generate harder and bigger waves.

In the west, the waters of the potential for harvesting wave energy are the Sulawesi Sea, Maluku Sea, and the Natuna Sea. In the east , the water potential is Arafuru Sea, Southern Sea, Java Sea and the western part of Sumatra. These waters are considered to be potential for the coming monsoon is not hampered by the mainland and have not turned on the equator so that the speed has not been much reduced.

As it is known that the study of ocean waves has been done but there is no realization. To that end, we adopted the idea from one of the countries including Australia, have taken advantage of ocean waves into renewable energy sources. Utilization of ocean wave energy project that has been realized is in Australia named Carnegie Perth Wave Energy Project's that can create an energy wave. The workings of this wave energy is a submerged buoy moored to a pump at the bottom of the sea. An oscillating CETO BA technology in harmony with the ocean waves, then transferring energy through a rope that is in the sea. This buoy moves with the movement of the waves coming in and drive the pump. Pressing the pump fluid is then used to drive a water turbine and generator to produce electricity. Then produce a low pressure water is then returned to offshore in the closed-loop system. CETO system differs from other wave energy devices because it operates under the water where it is safe from major storms and visible from the beach. A working system is simple yet complex in its application.

The explanation above is the workings of the ocean waves from the Australian state project described in the website. Of course, in its application requires a very large capital and high technology. Meanwhile, Indonesia can use turbines to generate electricity by a generator conversion results. Application of the turbine would be much cheaper and simpler.

One reason for the lack of realization of the existing research is due to the lack of adequate facilities in the construction of sea wave power plant. Expensive also be one of the obstacles projects done. Though the project from the Australian state stressed that the utilization of this energy is not only realized for the Australian state of energy supply, but also the supply of energy to the world. A favorable terms if the Indonesian state can do the same project. Where, Indonesian state does not need to rely on fossil energy sources are not renewable and will eventually run out and use costs. Ocean wave energy is also an environmentally friendly energy and sustainable for the future. Surely with this renewable energy source can be beneficial to the country and can increase foreign exchange piecemeal indirectly increase the economic development of Indonesia.

CONCLUSION

The analysis showed that the movement of the monsoon west and east monsoons have an influence on the ocean waves in Indonesia. Results of mapping and peregerakan monsoon region are points of potential in the use of wave laut.Pada west monsoon, water potential to harvest the energy of ocean waves are the Sulawesi Sea, Maluku Sea, and the Natuna Sea. In the east, the water potential is Arafuru Sea, Southern Sea, Java Sea, and the western part of Sumatra that can be optimal utilization of the waves in the area. In addition, ocean waves have great benefit by converting a source of renewable energy that are environmentally friendly and sustainable.

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