

Capturing Ocean Energy: Wave Energy Innovation for the Future

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Abstract: Sea waves are one of the energy sources that have the potential to be used as renewable energy. Indonesia as an archipelagic country has a large sea area and quite a lot of sea waves in various regions. Energy from waves can be converted into electrical energy using technology wave energy. This technology is interesting because it utilizes naturally available energy sources and can help reduce the use of fossil fuels. However, its application still has some obstacles, such as fairly high development costs, changing wave conditions, equipment maintenance, and marine environmental conditions. Therefore, the development of wave energy technology needs to be carried out gradually taking into account marine conditions and community needs. With good management, wave energy can be one of the energy sources of choice for the future [1].

Keywords: Wave Energy; Renewable Energy; Marine Technology; Electrical Energy; Marine

1. Introduction

Energy needs continue to increase along with the increasing population and technological developments. So far, most energy needs still depend on energy sources such as oil, gas, and coal. The use of these energy sources in the long term can cause various environmental problems. Therefore, other energy sources are needed that are more environmentally friendly and can be used in the long term [2].

Indonesia has a very large sea area so that the sea can not only be used for transportation and fisheries, but also as a source of energy. One of the energy sources that is starting to be discussed a lot is sea wave energy. The movement of waves that continues to occur can be used using certain tools to generate electrical energy.

In my opinion, wave energy is quite interesting to develop because Indonesia has supportive geographical conditions. However, it does not mean that this technology can be directly applied in all regions. Wave conditions, sea depth, cost, and ability to carry out maintenance must be considered first [3].

2. Discussion of the Main Problem

The main problem in the development of wave energy is how to convert the movement of ocean waves that are not always the same into electrical energy that can be used stably. Sea waves are affected by wind, weather, seasons, and water conditions. This makes the amount of energy produced variable. When waves are large, the energy produced can be higher, whereas when the ocean conditions are calm, the energy produced can also decrease [4].

In addition to these problems, the tools used to capture wave energy must be able to survive in the marine environment. Seawater can cause corrosion of various components, while waves and ocean currents can put considerable pressure on the equipment. If the tool is damaged, the repair process is also not easy because it is located in the sea.

Cost is also one of the issues that need to be considered. The construction of a wave energy system requires tools, installation processes, testing, and maintenance. These costs can be quite large, especially if the installation location is far from the mainland. Therefore, before building a wave energy system, it is necessary to conduct research and calculations so that the technology used is in accordance with the

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conditions of the location [5].

In addition, the community also needs to benefit from this technological development. Do not let the technology have been built but the cost of electricity produced is actually too expensive or difficult for people to use. In my opinion, the development of wave energy must pay attention to the technological side as well as the needs of the community so that the results can really be used.

3. Review and Criticism of Existing Approaches

Various technologies have been developed to harness energy from ocean waves. Basically, these technologies work by utilizing up-and-down movements or wave movements to drive a system that then generates electrical energy. Each technology has a different way of working and shape depending on the sea conditions and the location of its installation [6].

Despite its potential, wave energy technology still has several drawbacks. One of them is the efficiency of the tool which can be affected by changes in wave conditions. The tool must also have enough power so that it is not easily damaged when facing large waves. In addition, maintenance costs are more difficult compared to some energy plants on the mainland [7].

In my opinion, the development of this technology should not only pursue the amount of energy that can be produced. Factors of safety, cost, ease of maintenance, and impact on the marine environment also need to be considered. If you only focus on technology without looking at the actual conditions on the ground, the system built can become less effective.

Therefore, the approach used should be adjusted to the conditions of each region. Not all regions have the same wave characteristics. Direct research and testing are also important before the technology is applied on a larger scale [8].

4. The Author's Perspective or Argument

In my opinion, wave energy has a considerable opportunity to become one of the sources of renewable energy in the future, especially for archipelagic countries like Indonesia. The vast sea is one of the potentials that can be used to produce energy without having to continue to depend on fossil fuels.

However, I also see that this technology still needs a lot of development. It is not enough to use wave energy just to make a tool that can generate electricity, but it must also be able to withstand marine conditions and be easy to maintain. The cost of construction and maintenance also needs to be taken into account so that this technology can be used in the long term.

For me, the success of wave energy technology is not only seen from how much electricity can be produced, but also from how much it benefits society and the environment. If this technology is developed with good planning and adjusted to regional conditions, wave energy can be one of the attractive alternatives to support energy needs in the future [9].

5. Conclusion

Wave energy is one of the marine potentials that can be developed as a source of renewable energy. Indonesia has the opportunity to utilize this technology because it has a large sea area and various areas with usable wave conditions. However, its application still faces several challenges, especially in terms of cost, marine environmental conditions, wave stability, and equipment maintenance.

In my opinion, wave energy technology does not have to be directly applied on a large scale. Research and testing in several regions can be carried out first to find out the most suitable technology. In this way, the development of wave energy can be carried out in a more targeted manner. If it continues to be developed and managed properly, energy from ocean waves can be one of the options to meet future energy needs [10].

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