

Tidal Energy Production

Name

Instructor

Institution

Location

Date of Submission

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1 Introduction

With the rising process of globalization, the world is facing different forms of crises including that of depletion of the different sources of energy like crude oil, coal, and natural gas among others. Not only are these forms of energy production facing depletion, they are also unfriendly to the environment. For this reason, therefore, different nations across the globe are encouraging their citizens to make changes and switch to renewable forms of energy as a replacement to the current sources. It is in the light of these changes that energy drawn from tidal power is increasingly gaining popularity especially due to the fact that it is free from pollution. The main purpose of this paper is to provide a report that contains some basic introductions to tidal power and how it works. Having been hired by the government of South Australia, it will be necessary to conduct an assessment of the methods of energy production. One of the factors to consider is the fact that among other things, South Australia is known for using renewable energy hence the focus on tidal energy production. In addition to providing a background on tidal energy production, it will be necessary to also report on the science behind tidal energy production. There is also a need to focus on the negative and the positive aspects of tidal power as a form of energy. Lastly, it will be of great importance to make a recommendation to the government regarding the need to invest in tidal energy production.

2 Definition of Tidal Power

Also referred to as tidal energy, tidal power refers to a form of hydro power that usually converts energy drawn from tides to create power that is usually in the form of electricity. According to Hossain (2009), one of the factors that are causing tidal energy production to gain much popularity is the fact that it is a renewable source of energy that does not emit gases which lead to global warming or the formation of acid rain. Tidal power is usually found in the tides that take

place in the ocean or sea, usually caused by the motion of the water. Tides can be described as the decrease or increase in the water levels, and this takes place following the motion of the water from time to time and from one place to another. Due to the rotational movement of the Earth, Sun, and Moon, the water in the ocean creates large amounts of energy that are responsible for the generation of tidal energy. In this case, therefore, the generation renewable energy from the tides is made possible by the different motions in the water. What makes this possible is the use of a small dam or barrage at the entrance of the bay in the ocean where the tides manage to reach high levels of variation. As indicated in the diagram below in figure 1, the barrage traps tidal water on its behind and the differences in the levels of water creates potential energy. The potential energy is then transformed into kinetic energy usually when the doors in the barrage are opened releasing water to from a high to a low level. The kinetic energy is further converted to form rotational kinetic energy which comes about following the rotation of the turbines (Helston, 2012).

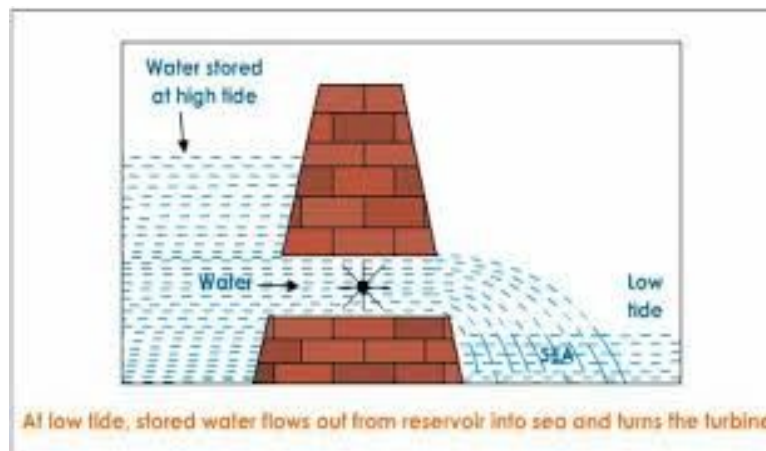


Figure 1: Diagram showing the process of transforming tides into power.

3 Background

It is clearly evident that energy or electricity plays a central role in our lives. The sources of energy used since time immemorial were in the form of crude oil, gas, coal, and nuclear power. However, it became evident over time that extracting these forms of fuel was causing much harm to the environment in form of negative climatic changes, the destruction of the ozone layer, and formation of acid rain among other environmental evils. For this reason, tidal energy emerged as one of the technologies in the renewable sector that was growing rapidly seeking to contribute majorly to a carbon free environment. From a traditional perspective, tidal power generation involves the erection of a dam which cuts across the opening of a tidal basin. In order to be functional, the dam usually has a sluice which is opened in order to make room for the tides to flow into the basin. After the sluice is closed, the sea level drops with the elevated water in the basin being used to generate tidal power or electricity. In order to enhance efficiency and effectiveness in the generation of tidal power, it is necessary to ensure that the technology used is environmentally acceptable, technologically sound, and economically profitable (Tousif and Taslim, 2011).

4 The Science of Tidal Energy Production

Having provided background information for the tidal power, it is necessary to establish the science behind tidal energy production. According to Helston (2012), tidal energy works by harnessing the natural flow of tides in order to make the production of power possible. With respect to the science behind the generation of tidal energy production, the tides come about as a result of the gravitational force that pulls the sun and the moon as the earth rotates making it possible for tidal energy to be harnessed either from the sea, estuaries, and tidal rivers. There is a need to understand that the level of water in the shorelines can vary from one ocean to another

with some levels reaching up to 12 meters high. It is the drastic changes that take place in the level of water that makes it possible to generate tidal energy. As the earth, sun, and moon gravitates, the levels of water rise gradually up to the highest point and then falls gradually to the lowest point with the tides fluctuating from time to time. It is through this process that tidal energy is produced from the tides in the ocean (Masoud, Amer, and Samir, 2001).

5 Positive Aspects of Tidal Energy

Concerning the positive aspects of tidal energy, one of the advantages is that tidal energy is a renewable form of energy, one that is sustainable hence cannot impact the environment negatively. Not only does the production of tidal energy reduce on the overall dependence on fossil fuels or energy, it also produces no pollution both solid and liquid. The generation of tidal power can benefit many nations that have access to deep ocean waters, and the time frame between investing in the power generation plants and benefiting from the same is usually short. Unlike the solar and wind systems, tidal currents have proven to be reliable and predictable thus making it an excellent choice for power production. Another positive aspect of tidal energy is the fact that the currents from the ocean tides produce a high density of energy which is approximately four times greater than that from the air. For this reason, therefore, a turbine that is around 15 meters in diameter is capable of generating energy equivalent to a windmill that has a diameter of 60 meters (Masoud, Amer, and Samir, 2001).

6 Negative Aspects of Tidal Energy

Regardless of its increasing rate of popularity, it is necessary to understand that tidal energy also has some negative aspects. One of the negative aspects is the inability of tidal power generation systems to generate electricity at a steady rate. In this case, it can be quite challenging to sustain

peak demands unless there is a way to store the energy generated in an efficient manner. Another negative aspect is that the creation of dams and tidal fences to assist in the generation of tidal power can act as a major obstacle to fish that may be migrating from one part of the ocean to another. Given the fact that they are still trying to gain ground as a main source of energy, tidal energy production is still facing some orientation challenges from an economic angle. For this reason, therefore, the generation of tidal energy is still limited to some few places in the world hence the need to establish ways that would make its generation economically profitable.

7 Recommendation

Following the important role played by energy production across the globe, it is necessary for the government of South Australia to invest in tidal energy production. One of the factors to consider when investing in tidal energy production is the fact that while other sources of energy like coal, crude oil and nuclear energy face the challenges of depletion, tidal energy is less likely to be affected. In this case, investing in tidal energy production is of benefit to the nation given the fact that this form of energy is reliable and can be predicted. However, it is necessary to ensure that the government seeks to come up with some form of technology that would assist in taking care of the marine life, and to also have some equipment that would enhance the safe storage of the generated power.

8 Conclusion

In conclusion, it is clearly evident from the above report that tidal energy production is an excellent source of energy. This is more so because it is a good replacement for the traditional sources of energy like crude oil, coal, and nuclear energy among other dangerous forms of energy. They have been declared as dangerous due to the fact that they affect the climate in a

negative way like leading to global warming following the depletion of the ozone layer. It also leads to the formation of acid rain among other negative environmental effects. However, tidal energy production is an excellent alternative as it is a renewable form of energy and does not affect the environment in a negative aspect. In this case, it is necessary for governments in different countries to come up with policies that favour the generation of tidal energy and should ensure that the forms of technology used are technologically sound, economically profitable, and environmentally acceptable.

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