Ocean Wave Energy as an Energy Alternative

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ABSTRACT

With the energy costs increasing and the available resources depleting many people are looking towards other renewable, easily derived energy resources. With this searching many people have looked toward ocean energy. Ocean energy is an ideal resource meeting the requirements people set when looking for new sources. Although the technology is still being developed and evolved, with the technology known ocean energy has already shown to be more prospective than other energy sources already in use.

Figure 1: Ocean Waves (Smith, 2006)

INTRODUCTION

The resources used currently to supply power to the people of the earth are highly restricted and have constant problems. There are many alternatives available for supplying energy, that are renewable and more nature conscious. One alternative to an energy resource is the use of the energy from the ocean waves, and converting it into usable energy. Ocean waves are one of the world's most abundant sources of renewable energy. The power available from the ocean waves averages around two-three million watts. In more favorable conditions, the area can have an energy production can average 65 megawatts of power per device installed. Along with its power being easily extracted, it does not produce harmful emissions or by-products making it less polluting. If we use the ocean's energy then we can effectively produce a cheap and renewable energy source (Ocean Wave Energy Company, 2006)

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Some of the first research done on the energy of waves dates back as far as 1799, On July 12, 1799 the fist patent for wave energy was filled in Paris for Mr. Girard. The basic concepts of the past are not too unrelated to those being used more currently. The concepts come from the knowledge that the majority of the solar energy is absorbed by ocean, causing a thermal conversion and the creation of winds leading to the developments of waves. Since the heat of the atmosphere creates the winds leading to the creation of waves, wave energy can be seen as a by-product of solar energy. The energy from the waves is transported long distances easily and little energy is lost. Although the energy is transported, the water is not moved. The amount of energy extracted depends on the height of the wave and the speed of the waves; the areas that have the highest energy potential are within the latitude of 40 degrees and 60 degrees, in both the southern and northern half of the hemisphere (Carless, 1993, Gallachóir 2006, Ocean Wave Energy, 2006).

There are many applications to deriving the energy from waves, but the three most known are: Floats or Pitching Devices, Oscillating Water Columns, and Water Surge or Focusing Devices. The Floats are devices that stay close to the surface of the ocean and are usually attached to a raft or the ocean floor. The buoys can convert many waves, coming from multiple directions.

Figure 2: Floating Device (Smith, 2006)

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The Oscillating Water Columns (OWC) is a pressure-activated device that is shaped as a cylindrical rod. There devices use the rising and falling of the water causes the air to be forced into and out of the top chamber. The top chamber contains a turbine, which is driven by the pressure of the air. As the waves rise they push the air and cause the turbine to be turned and as the waves fall the air is sucked out. The turbine always spins in the same direction so it can work both as the water rises and falls.

Figure 3: OWC 1 (Smith, 2006)

Figure 4: OWC 2 (Smith, 2006)

The Wave Surges are devices on the shore that channel and concentrate the waves, forcing the water into a higher platform and as the water flows out of the reservoir it generated the electricity (Carless, 1993, Wave Energy, 2005).

Because of the vast ocean resources, and the amount of energy available it is ideal to use these renewable resources. The ocean covers over 70 percent of the Earth's surface, and is able to collect the largest amount of solar energy. In a day, the average amount of energy absorbed in the tropics is equivalent to 250 billion barrels of oil. Even using the minimal amount of 1/10 of this energy would be enough to supply 20 times as much of electricity used in a given day. Unlike the coal burning process that contributes to the depletion of the ozone layer, ocean energy is clean and does not give off any harmful by-products. There are a few environmental concerns

with tidal energy conversion. With the placement of the tidal converters, the water levels will be changed, affecting the ecosystem. These may affect the ecosystem by changing the wave patterns, and may slightly change the migration of certain species of fish. Along with this, the devices may become loose, and create a hazard because of being so small. Some of these problems can be resolved by adding some sort of signaling device on top, so that it can be easily detected (Carless, 1993, Gallachóir, 2006, Ocean Wave Energy, 2006).

As that the technology is not very commercially available, the economics are not as cost effective as possible. The average cost to build and run a tidal power plant is about 1.2 billion dollars, but that does not include the cost of maintenance and up keep. However, the benefits of the tidal energy are due to the fact of the fossil fuels saved. It can save 3 million barrels of oil, 330,000 tons of coal, 90.8 tons of uranium, and reduce oil needs by one-half. The efficiency of tidal energy is higher than oil efficiency which is 30%, while tidal power efficiency is 80% (*Tidal Energy*, 2004).

With the information available and the information being developed, ocean energy seems to serve as an extremely usable resource. Its high efficiency leads to the assumption that with time it will continuously proceed to increase in efficiency over oil. Its additional advantages are that it is a nonpolluting renewable resource. Ocean tidal energy is a probable energy resource sometime in the near future. With more resources for research and more study, the ocean energy resource will supersede the majority of other nonrenewable resources.

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