

Ocean Wave Energy

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Who ever knew water could help produce electricity or better yet, produce anything that could help change the world? With the energy crisis being at an all-time high and gas prices steady rising, experts are turning to earth's biggest resource, water. Water makes up over half of the earth; it helps produce food, grass, and other things needed to survive, but who knew water could one day help power homes and businesses? Ocean energy is starting to become the newest of many renewable resources used to help power our solar energy. Ocean energy produces two types of energy—thermal and mechanical energy—but the question still remains: how can they use the ocean to power solar energy, or any energy at that? There are three ways: one, the waves of the ocean; two, the tides of the ocean; or three, the sun's heat on the water. Now all this may sound incredible, but it has been done. This could be the best thing the world's thought of in years, and it could save a few pennies in the pocket.

Ocean energy (sometimes referred to as marine energy, marine power, or wave energy), is energy power obtained from the ocean used to power electricity. There are two basic types of ocean energy: thermal and mechanical. Ocean thermal energy is when the sun heats the surface of the ocean's water. There are three different types/ways: closed and open cycles, as well as hybrid. In closed-cycle, "...systems use the ocean's warm surface water to vaporize a working fluid, which has a low-boiling point" ("Ocean Energy," 2013). This idea of ocean energy has been around since the late 1800's and is still being used today; this type of energy is used places where the temperatures are below freezing year round. The second type of ocean thermal energy is open cycle. Open cycle is simply when the water boils. The warm water is propelled into a low-pressure container, which eventually causes it to boil. The third type of ocean thermal energy is hybrid. A hybrid is just a combination of both open and closed cycles;

warm water enters through a vacuum chamber (like in open cycle), and it evaporates (like in closed cycle), which causes this system to produce electricity ("Ocean Thermal Energy Conversion Basics," 2013).

The second general type of ocean energy is mechanical energy. Mechanical energy is the use of waves and tides to convert energy. There are two ways to convert this tidal and wave energy. Tidal energy is an underwater turbine placed in certain places with high tides, used to capture the kinetic motion of the ebbing and rolling of ocean tides in order to produce electricity ("Tidal Power News and Information about Tidal Energy Technology," n.d.). There are two different ways to convert tidal energy; one way is through a barrage and through tidal current systems. According to "Tribal Energy and Environmental Information":

A barrage is a dam placed over an inlet that creates a basin to contain the seawater when the tide comes in and the sluice gates are closed, and then gates are closed until it reaches and the water is held until ebb tide creates a suitable head (i.e., the drop in elevation from the water source to the power generator). Water is then released through turbines and produces electrical energy just like a hydroelectric power. (n.d.)

There are three of these in the world—in France, Nova Scotia, and Russia. A tidal turbine is something like a wind turbine; it uses the water's movement to adapt power. There are two different types of these: the horizontal axis turbine and the vertical axis turbine. The horizontal axis turbine motor can have two or more blades and is in rotation with the seafloor and the movement of the tide flow. A vertical axis turbine flows in the same direction, and its blades are in movement with its axis ("Tidal Power News and Information about Tidal Energy

Technology," n.d.). The next type of mechanical energy is wave energy. This may sound familiar to a lot of people, and it might just make this ocean energy possible! Wave energy, sometimes called ocean energy, has been around since the 1950's. Wave energy by definition is electricity created when generators are placed on the floor of the ocean.

Now that the history, terms, and equipment are defined, the point is that ocean energy is needed. According to an article published by Bob Drogin, a writer at the *Los Angeles Times*, this is the wave of the future. In his article, he interviews experts such as Hoyt Battey, a water power expert at the U.S. Energy Department:

The Federal Energy Regulatory Commission reported that it had issued 140 hydrokinetic preliminary permits for proposals to tap tides, waves, or river currents....In many cases, officials said, applicants are staking claims in case the technology takes off. The Energy Department is...awarding \$37 million in matching grants for the first time to companies with the most promising prototypes or that appeared close to commercial service. (Drogin, 2010)

This plan isn't new to a few Hawaiians who used ocean energy back in the 70's. Students at Oregon State University have been "developing a leading wave energy program to educate students who are motivated to responsibly develop renewable energy resources" (Drogin, 2010). Their goals include, but are not limited to, research on wave generators, developing a plan for a national wave energy research and demonstration center, to be located in Oregon, working with the Oregon Department of Energy to uphold Oregon as the country's first commercial wave park, and examining the biological and ecological effects of wave energy systems (Jouanne & Ted, 2007). The benefit of having wave energy is that the power never

stops. Another benefit is that it's pollution-free, so unlike other energy resources, it won't cloud up the skies or destroy the plants and fish of the sea. The biggest benefit is that, by switching energy to ocean energy, homes and businesses will be operating at low operating costs. Unless the mechanism breaks, there won't be any extra expenses, and it's renewable, without having to use heavy materials to destroy the water's surface. Using ocean energy has minimal if any visual impact; much of the equipment needed to trigger ocean energy is either natural or completely submerged under water. In fact, it even may act as protection for the shoreline ("Wave Power Pros and Cons", 2008).

Like many topics, ocean energy does have its cons. Money is always the key to getting anything to go; if a device breaks down, then it can cost more money to be spent than it is saving, especially if a storm or salt water corrosion develops. Of course, the sea creatures can be affected by this new technology, and if not the creatures themselves, it could possibly destroy their homes. When talking about creating this new technology of ocean energy, the price of how much it would take to pay back is also a factor. The last and probably the least important con of them all is that there are few of these new turbines to be found. This is because there are very few places to place these turbines, unlike solar and wind energies, but this could potentially cause a problem to start creating and planting as soon as the budget is cleared. For all the fishermen of the world, this could affect their fishing in designated areas. Noise is another factor, and nobody likes noise; the sound of the devices running could cause a loud noise, but at least it will not be louder than hearing the sound of the waves ("Wave Power Pros and Cons," 2008).

In conclusion, ocean energy is not new to the world. In fact, it's been around since the 1800's. Ocean energy is needed to help save money and save the energy crisis. With the help of the heat from thermal energy to the waves and tides of mechanical energy, the options could be numerous. The pros include that it's pollution-free, there's minimal if any vision of the equipment used, it's renewable, and it could save money. The only things that could stop/ruin this new technology are damaging our seafood in a few areas and making a loud ocean noises. It is a way to create electricity and will one day help to produce the energy needed to power homes and businesses around the world.

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