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IDS 102 Project: Part 1
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Hydroelectric: Oceans

Imagine a resource as vast and as never-ending as the ocean. Imagine that resource producing a cheap, renewable, clean power with little maintenance. Combining existing turbine technology with the infinite kinetic energy of the ocean leads one to question how we use tidal power. Considering the current use of hydroelectric tidal power, how it could be used, its limitations, how long it takes to implement the technology, and its economic value will determine the practicality of using hydroelectric energy from the ocean.

Hydroelectricity is nothing new. Using the power of water to generate energy through a turbine is a legitimate way to fulfill the energy needs of its surrounding community, however, the widespread use of hydroelectric power from the ocean hasn't reached the mainstream. Alvey (2003) reported, "While tidal energy projects are new to the United States, Europe has been pursuing them for decades. In 1966, France commissioned a 240-MW tidal plant in Brittany on the River Rance. Although the plant still operates, its owner, Electricite de France, has not expressed interest in building more tidal projects" (p. 38). These tidal power plants do exist, but are not popular enough to be used by the public on a large scale. The recent construction of the Philippines' Dalupiri Ocean Power Plant attests to the permeation of tidal power plants as a viable power source. Another proponent, Canada's project developer Blue Energy, "project[ed] initial construction costs to be comparable to those of conventional power projects, possibly less as the scale of the project increases" (Alvey, 2003, p. 38).

Geographically, tidal power plants are only viable where there is tidal presence. In essence, the state of Kansas would not be able to construct a tidal power plant as it is clearly landlocked. Pending the location different areas are suited for different types of hydroelectric tidal installations, either stationary turbine, floating turbine, or fenced area. In an area where marine wildlife migration is prominent, stationary turbines would interrupt the ecology a lot less than fenced area. Erhenman (2003) in an interview with Thake from IT Power claims:

> The rotors of the turbines are relatively slow-moving, they pose little threat to fish and other small marine life. "Fish will likely be accelerated by the movement of the rotors, but not cut up by them," Thake said. "It's like moving through a revolving door.

Stationary and floating tidal plants could be located both near and off shore while fence plants are a near shore only option; ultimately, location is a deciding factor on which type of harness a hydroelectric tidal plant will use.

The uses of hydroelectric energy from the ocean is no different than the uses of hydroelectric energy from existing hydroelectric dams. The type of energy produced by a hydroelectric power plant is electric only. For the most part, the energy is fit for heating and lighting homes. To get an idea of the scale output of a hydroelectric tidal plant, an offshore plant near Scotland states that "each Pelamis [turbine] has a rated power output of 750 kW and is expected to generate enough energy to meet the annual electricity needs of more than 500 U.K. households; a 30 MW wave farm of 40 machines could power in excess of 20,000 homes" (National Association of Realtors, 2004, p. 9). One of two conventional ways to heat a house is with either natural gas or electricity. If natural gas resources were scarce, electric power would be a cheaper alternative for many households. With ocean tides being as predictable as they are, one could rely on a constant supply of electric energy from tidal power plants.

With current technology, electric power has definite limitations in a developed nation such as the United States. Anything in terms of combustible engines would not be suited to run of electricity given current technologies. Consider advances in electric conversion technology and the impact of electric cars and infrastructure. Cars could be come obsolete for commuting purposes with an abundance of consistent electrical power (provided by tidal plants). Replacing driven and worn roads with railway projects in cities would provide an excellent means of cheap, and environmentally friendly transportation. Less cars, less pollution, and more importantly, no accidents or 5 o'clock traffic jams. Hydroelectric power would not altogether replace combustible energy, but could provide a cleaner and more efficient alternative with advances in technology.

Development of hydroelectric tidal plants is perhaps the most outstanding question to weigh when analyzing the practicality. Considering "the Earth's vast oceans offer a potentially inexhaustible source of energy," (Cooper, 2004, p. 9) installation of the costly turbines would be economical in the long run. Lortie (2003) in his article illustrates the cost of an experimental tidal power project:

> The navy awarded New Jersey-based Ocean Power Technologies a $9.5 million contract to test if bobbing buoys tethered to the ocean floor can generate cheap and clean power. During the first phase of the project, Ocean Power will tether one of its "PowerBuoys" 9-12 feet below the surface in 100 feet of water. As each swell passes, the buoy will move up and down a rigid pole, which will move hydraulic fluid to a generator on the ocean floor. The power produced by the PowerBuoy is enough to power five to eight homes.

Different projects require different kinds of funding depending on the scale. The Dalupiri Ocean Power Plant in the Philippines (mentioned above) cost an estimated 2.8 billion dollars and anticipates to produce about 100 megawatts of power and a project in San Francisco estimated at

2 million dollar projected about 1 megawatt of power (Alvey, 2003). Scale will also determine how long a project takes to develop. Since the turbine technology has been thoroughly developed, new technology development is not an issue. There are multiple ways to harness the power of the ocean and designs for large scale as well as more efficient technologies are still underway.

The biggest setback of tidal power plant development is the initial cost. If one could imagine harnessing such a vast and renewable resource, long term cost wouldn't be an issue. The most appealing part about tidal power is the environmental impact. Since the power source is a constant flow of kinetic energy that is utilized without being altered, there are little if any environmental impacts as compared to other sources of energy. Many efforts have been made recently to find alternative energy sources due to the fact existing energies from oil and natural gas are non-renewable. "Improvement in technology and rising natural gas costs may change the economics of ocean power during the next decade, though, making ocean energy a viable-not to mention pollution-free-option for some coastal communities" (Alvey, 2003). Alvey reveals tidal energy sources as a costal phenomenon, which means it would be more practical on coasts where tidal flows are faster. The beneficiaries of a small costal region would best be suited with a small scale hydroelectric tidal plant while larger scale projects could power more households outside of a costal community. If a trend appears in hydroelectric tidal power, it would most likely be smaller scale funding for plants that supply a smaller community and not a large scale project simply because people would be hesitant to invest large sums of money on seemingly new technology.

Oceans are a well of kinetic energy just waiting to be tapped. Tidal power plants are surfacing in locations where economic conditions are right. Funding for hydroelectric tidal projects can either be small or large depending on the scale and amount of energy desired for the plant to produce. If one ignores the immediate cost of constructing a hydroelectric tidal power plant, the energy it yields is cheap, clean, ecologically sound, inexhaustible, predictable, and low maintenance.

References

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