

## Wave and Tidal Hydroelectric Power

The world's waters are in constant motion. Wave power and tidal power attempt to capture some of that energy.

*Wave power* attempts to capture the energy in ocean waves. There are schemes involving buoys that have parts that bob up and down with the waves, generating electricity, which is then transmitted ashore on an undersea cable.<sup>i</sup> There are schemes that funnel waves as they come ashore, causing them to shoot up a tube, compressing air that turns a turbine.<sup>ii</sup> And there are underwater schemes, where the pressure of waves as they pass overhead compresses a diaphragm, squirting water through a hose linked to shore, driving a turbine. One advantage of the last system is that it can also generate enough water pressure to desalinate water, producing fresh water, something of significant interest to many parts of coastal Africa, the Middle East, and Australia.<sup>iii</sup>

Ocean water is highly corrosive, and the ocean is given to fierce storms with high winds and waves that can easily top 50 feet. In addition, wave power schemes can only be sited in locations where the waves have the desired characteristics and reliability, and where they do not interfere with fishing and shipping. Currently, there are test installations but no commercial ones, and it is not known how wave power will work out over time. The U.S. Office of Energy Efficiency and Renewable Energy does not track wave power on its website, and the only estimate of wave energy's potential I found was in Wikipedia: 50 gigawatts worldwide, which is about 2% of world demand.<sup>iv</sup>

*Tidal power* attempts to convert the flow of ocean tides into electricity. There are a few locations in the world—Canada's Bay of Fundy and France's Gulf of St. Malo, for instance—where the rise and fall of ocean tides are large and dramatic. The amount of water that flows with the tides is huge, creating a large potential energy source. However, the challenges of capturing it are large. Barrage schemes place a dam (*barrage* in French) across a narrow point through which the tide flows, perhaps the mouth of an inlet or a river. The dam creates a small head as the tide flows, and power is captured by turbines. The Rance Tidal Power Plant in France, a barrage scheme, has been in operation since 1966, and outputs about 600 mWh per year.<sup>v</sup> Alternatively, open turbine schemes sink much larger turbines in places where the flow of the tide is relatively swift, capturing power much as wind turbines do.<sup>vi</sup>

Not many potential tidal power sites exist, but prototypes have been tested in Australia, Canada, England, Ireland, Italy, Scotland, and the U.S. (in the East River between Manhattan and Long Island).<sup>vi vii</sup>

In a scheme similar to tidal power, a company has proposed installing low velocity turbines in the Mississippi River from St. Louis to New Orleans. Collectively, they would provide 1,600 megawatts of power, more than 100 times the current total hydroelectric production of Missouri.<sup>viii</sup> Many aspects of this scheme need to be studied before it can be known if it truly feasible, or just a fantastic dream. But it illustrates the amount energy flowing by our doorstep if we can figure out how to use it.

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- <sup>i</sup> See the Pelamis Wave Power web site, <http://pelamiswave.com> and the Ocean Power Technologies website, <http://oceanpowertechnologies.com>, for 2 different approaches to the buoy scheme.
- <sup>ii</sup> For an example, see the Ocenlinx website, <http://www.oceanlinx.com/works.asp>.
- <sup>iii</sup> See the CETO Wave Energy web page, <http://www.ceto.com.au/home.php>.
- <sup>iv</sup> See *Wave power*. Wikipedia, retrieved online 12/19/2007. Total world energy consumption is from the *BP statistical review of world energy, 2007*. Available online at <http://www.bp.com/statisticalreview>.
- <sup>v</sup> See the Rance Tidal Power Plant website, <http://www.edf.fr/html/en/decouvertes/voyage/usine/usine.html>, and also the article *Rance tidal power plant*, Wikipedia, retrieved online 12/19/2007 at [http://en.wikipedia.org/wiki/Rance\\_tidal\\_power\\_plant](http://en.wikipedia.org/wiki/Rance_tidal_power_plant).
- <sup>vi</sup> *Tidal power*. Wikipedia. Retrieved online 12/19/2007 at [http://en.wikipedia.org/wiki/Tidal\\_power](http://en.wikipedia.org/wiki/Tidal_power).
- <sup>vii</sup> Verdant Power website, <http://verdantpower.com>.
- <sup>viii</sup> Tomich, Jeffrey. (2008). *New England startup seeks to tap the Mississippi for power*. Retrieved online 5/8/2008 at <http://www.free-flow-power.com/index.php?id=12>.