

Tidal Energy



<http://en.dcnsgroup.com/energy/marine-renewable-energy/marine-turbine/>

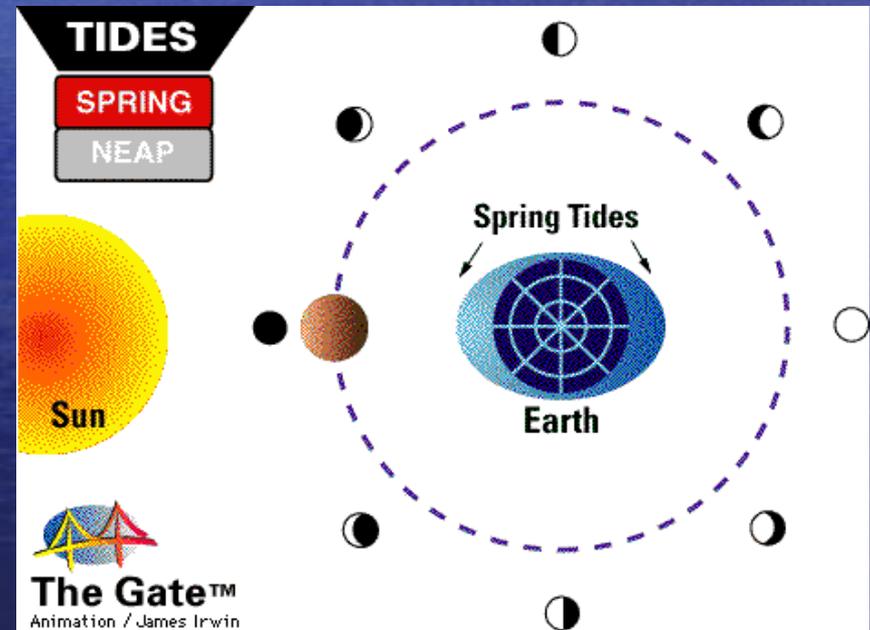
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by Jeremy Black

What is a tide?

To understand tidal energy, we must understand how tides work:

- Ocean tides are the periodic variations in sea level caused by gravitational pull from the sun and moon. 1



<http://www.sfgate.com/getoutside/1996/jun/tides.html>

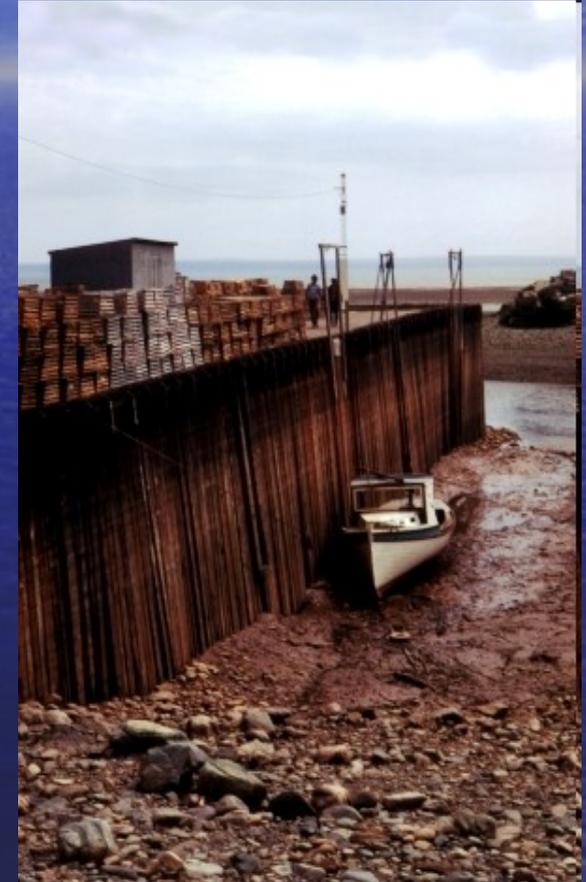
Tidal extremes

- There are approximately two high tides and two low tides daily. ¹
- There is about 12 hours and 25 minutes between high tides. ¹



http://en.wikipedia.org/wiki/File:Bay_of_Fundy_High_Tide.jpg

Bay of Fundy at high tide



http://en.wikipedia.org/wiki/File:Bay_of_Fundy_Low_Tide.jpg

Bay of Fundy at low tide

How can we exploit tidal energy?



http://physics.ucsd.edu/do-the-math/wp-content/uploads/2011/12/Barrage_de_la_Rance.jpg

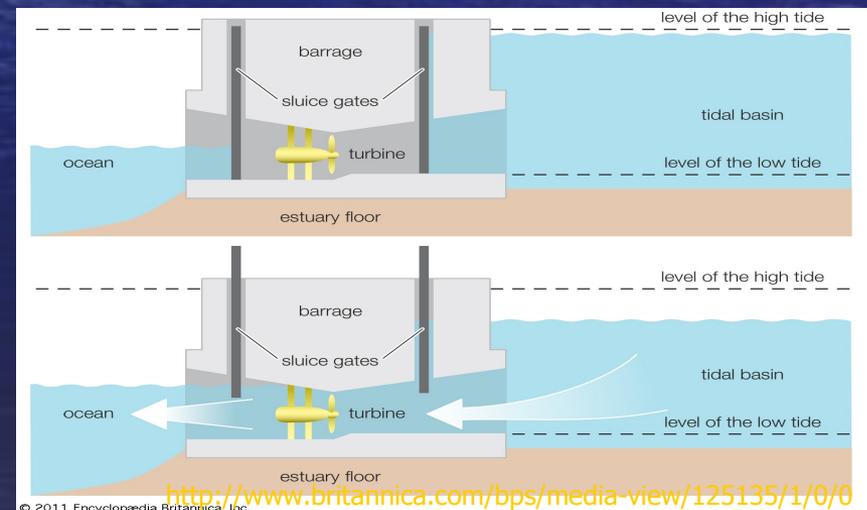
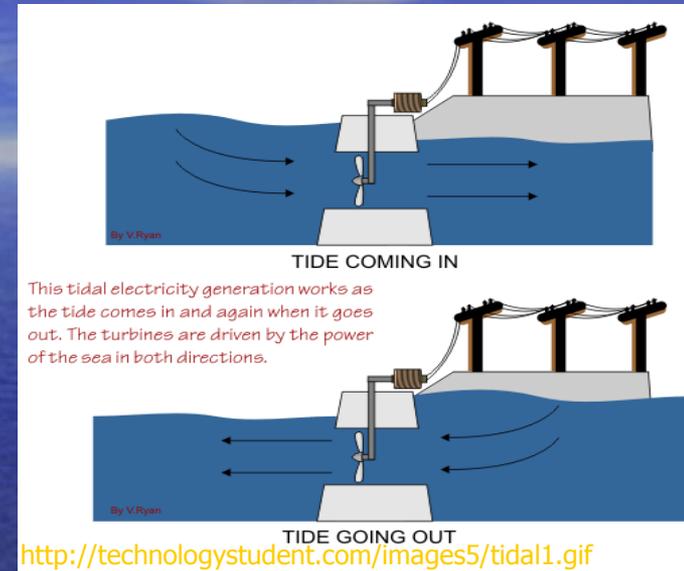


<http://energyinformative.org/tidal-energy/>

- One way we harness tidal energy is by using a barrage.
- A barrage is a dam that blocks receding waters at low tide in an estuary.
- Tidal barrage power systems are a type of hydroelectric power (water turns turbines to create electricity) much like the Hoover dam.
- The examples shown on this page is the Rance power station in France.
- Rance power station has been in operation since 1966. 2

How does a barrage work?

- As the tide comes in, the incoming water spins the turbines which produces electricity.
- The water is stored in the estuary behind the dam using sluice gates.
- Once the ocean is at low tide, the sluice gates are opened and water spins the turbines as the water exits the estuary.



Why don't we use this more often?

Unfortunately tidal energy has its drawbacks:

- Tidal barrages require a minimum 16 foot tidal difference between low tide and high tide to work. There is only a handful of locations in the world that this tidal difference occurs. 2
- Tidal barrages can disrupt estuarine ecosystems. 3
- Tidal barrages only generate energy when the tide is flowing in or out (10 hours a day). 4

Does tidal energy help?



<http://uem.unl.edu/energy-management/portal.shtml>

- Rance tidal power plant generates about 240 Megawatts (240,000,000 Watts). 5
- Sihwa tidal power plant (currently the largest tidal plant) in South Korea generates about 254 Megawatts (254,000,000 Watts). 6
- Proposed future tidal sites would bump the total tidal energy output to 115 Gigawatts (115,000,000,000). 7
- The world operates on a diet of about 13 Terawatts (13,000,000,000,000 watts). 7
- The potential 115 GW total of tidal energy would account for 0.26% of the global demand. 7

Summary

Tidal energy is an abundant renewable resource. Unlike wind power, tidal energy is completely predictable. Tidal barrages harness a decent amount of energy. However, tidal barrages require a substantial difference in tide height that only occurs in a few places in the world. Tidal barrages also impact estuarine ecosystems. Unfortunately tidal energy will not solve our energy dilemma.

References

- 1 <http://www.britannica.com/EBchecked/topic/595148/tide>
- 2 http://inventors.about.com/od/tstartinventions/a/tidal_power.htm
- 3 <http://www.britannica.com/EBchecked/topic/595132/tidal-power>
- 4 <http://www.darvill.clara.net/altenerg/tidal.htm>
- 5 http://en.wikipedia.org/wiki/Rance_Tidal_Power_Station
- 6 http://en.wikipedia.org/wiki/Sihwa_Lake_Tidal_Power_Plant
- 7 <http://physics.ucsd.edu/do-the-math/2011/12/can-tides-turn-the-tide/>

Images

- 1 <http://en.dcnsgroup.com/energy/marine-renewable-energy/marine-turbine/>
- 2 <http://www.sfgate.com/getoutside/1996/jun/tides.html>
- 3 http://en.wikipedia.org/wiki/File:Bay_of_Fundy_High_Tide.jpg
- 4 http://en.wikipedia.org/wiki/File:Bay_of_Fundy_Low_Tide.jpg
- 5 http://physics.ucsd.edu/do-the-math/wp-content/uploads/2011/12/Barrage_de_la_Rance.jpg
- 6 <http://energyinformative.org/tidal-energy/>
- 7 <http://technologystudent.com/images5/tidal1.gif>
- 8 <http://www.britannica.com/bps/media-view/125135/1/0/0>