FACT SHEET – TIDAL POWER

Tidal power uses the motion of the ocean's tides to generate electricity. Tidal energy is the result of the interaction of the gravitational pull of the moon and, to a lesser extent the sun, on the seas. Even though the sun is much larger than the moon, it is much further away from Earth, and, therefore, its effect on the tides is much less.

The interaction between the Earth, moon and sun is quite complex. However, in simple terms, the moon's gravitational force pulls the water in the oceans towards it, so that there are bulges in the ocean on both sides of the planet. The bulge on the side of the Earth opposite the moon is caused by the moon 'pulling the Earth away' from the water on that side. This causes the tides to occur twice a day as the Earth rotates.

If you are on the coast and the moon is directly overhead, you should experience a high tide. If the moon is directly overhead on the opposite side of the planet, you should also experience a high tide. When the sun and the moon pull together, the result is the very high 'spring tides'; when they are at 90° to each other, the result is the lower 'neap tides'.

The UK has the best tidal resource in Europe, with some of the highest tidal ranges in the world.

The UK's amazing tidal resources could provide at least 10% of the country's electricity! However, there are currently no commercial tidal energy projects generating electricity in the UK.

History

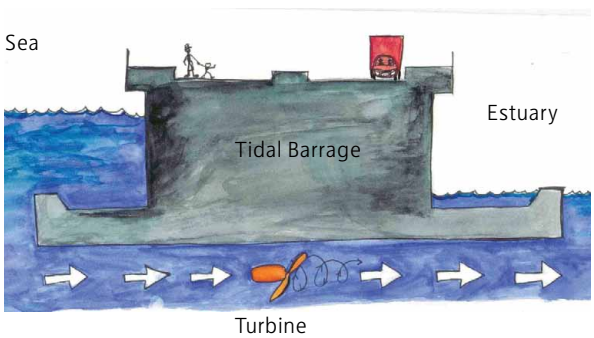
There are examples of the use of tidal power from hundreds of years ago. In the 17th century there were two mills on London Bridge which got half their power from the River Thames' tides running between the arches of the bridge. At one time, there were 200 tidal mills operating in the British Isles!

How Tidal power works

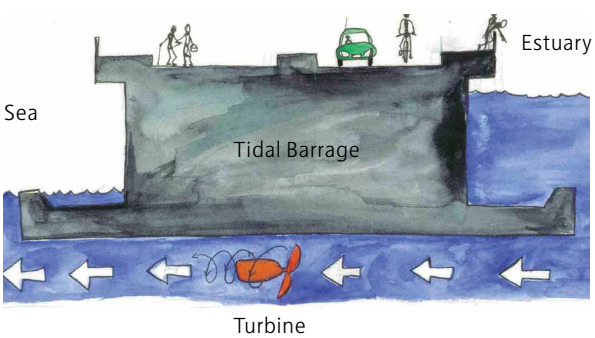
There are two main types of tidal power: tidal range and tidal stream

Tidal range

River estuaries experience large differences in water height between high and low tides. This is known as their tidal range. The tidal range in the Severn Estuary can be as much as 15.4 metres, the second highest in the world! Tidal range technology works in a similar way to hydro power, using the huge volumes of water flowing through a tidal estuary to drive turbines built into a dam (or barrage). Gates built into the barrage are opened to allow the tide to flow in, and turn turbines, which power generators that produce electricity. At high tide the gates are then closed, and the water is held until the tide goes out. The barrage gates are then opened, channelling water through the turbines again.



Tide coming in



Tide going out

TIDAL POWER CONT...

There are a number of proposed tidal range schemes in the UK; the biggest of these is the Severn Barrage. If this project goes ahead it could generate nearly 5% of the UK's electricity.

The first large-scale modern tidal range project began producing electricity in 1969, at the mouth of the River Rance, in northern France. It is the largest tidal power station in the world (and the only one in Europe), and has 24 turbines, producing enough electricity for 330,000 people.

Environmental concerns remain one of the biggest obstacles to the development of tidal barrages, and are probably the reason why they still do not exist in the UK, even though we have an incredible tidal range resource. Estuaries are amongst the world's most sensitive ecosystems, and are home to a great number of unique habitats and species. The disruption caused by tidal range barrages can result in significant local ecological damage.

An alternative to tidal barrages is coastally connected tidal lagoons. These work in the same way, but can avoid blocking a whole estuary and perhaps have lower environmental impacts. Lagoon options are also being considered for the Severn Estuary.

Tidal stream

Tidal streams are fast flowing tidal currents, usually found in narrow channels around headlands. The energy in these currents can be harnessed by using underwater turbines, modelled on wind turbine technologies that are fixed on the sea bed or estuary floor. Sea currents are much more powerful than the wind, and water is denser than air, therefore the turbine blades can be smaller and turn more slowly than wind turbines. As the turbine turns, it drives a generator via a gearbox, and the electricity is then brought to the shore via a cable.

The UK has an excellent tidal stream resource and, because the tidal flow does not have to be blocked (as is the case with barrages), these technologies have a minimal environmental impact. However, being underwater does make installation and maintenance more difficult and expensive

RWE npower renewables is working with Marine Current Turbines to develop one of the world's first big tidal stream projects off the coast of Anglesey, in North Wales. It is proposed that the project will have seven 1.5MW tidal turbines and, subject to gaining planning permission, that they will be generating electricity by 2011 or 2012.

Advantages

- Tides are very predictable compared with other types of renewable energy.
- Tides are a renewable resource.
- Tidal power does not contribute to climate change or local air and water pollution.
- The tides come at different times in different places in Britain, so in theory, the electrical output could be well spread out to create a constant supply.

Disadvantages

- Tidal barrages can damage the local ecology. However, this needs to be weighed up against the potentially devastating impacts of climate change on the world's ecological systems.
- Transmission of electricity from offshore is expensive.
- At the moment, because it is a new technology, the development of tidal power is expensive. However, in the long term, it will not be unrealistic to expect similar costs to those of offshore wind.

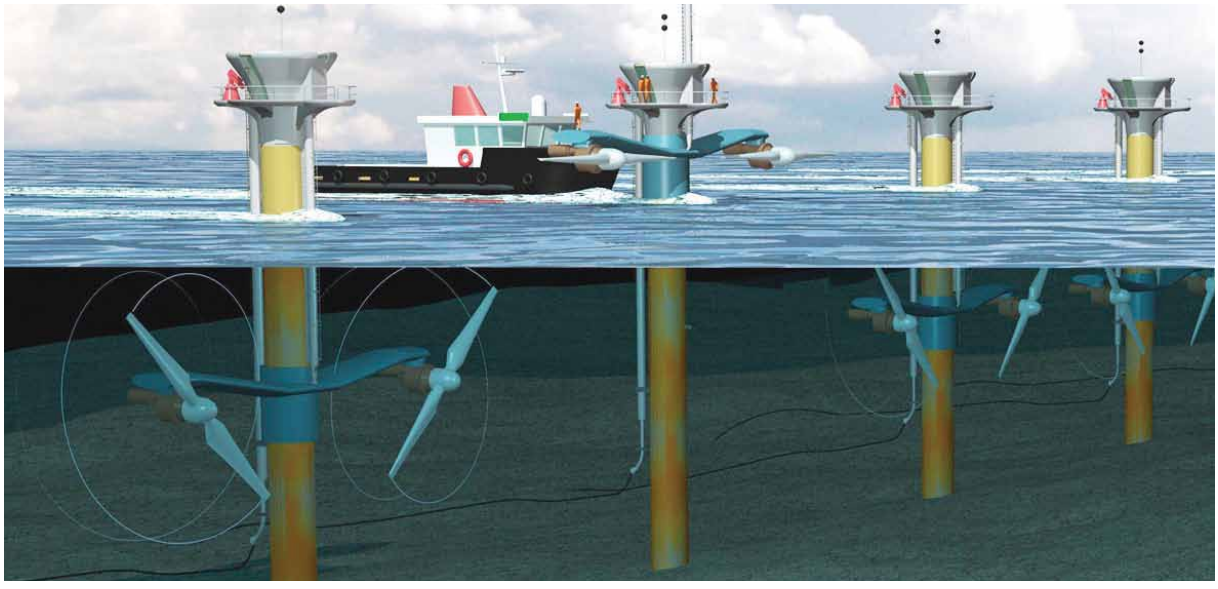


Photo courtesy of Marine Current Turbines