Solar panels
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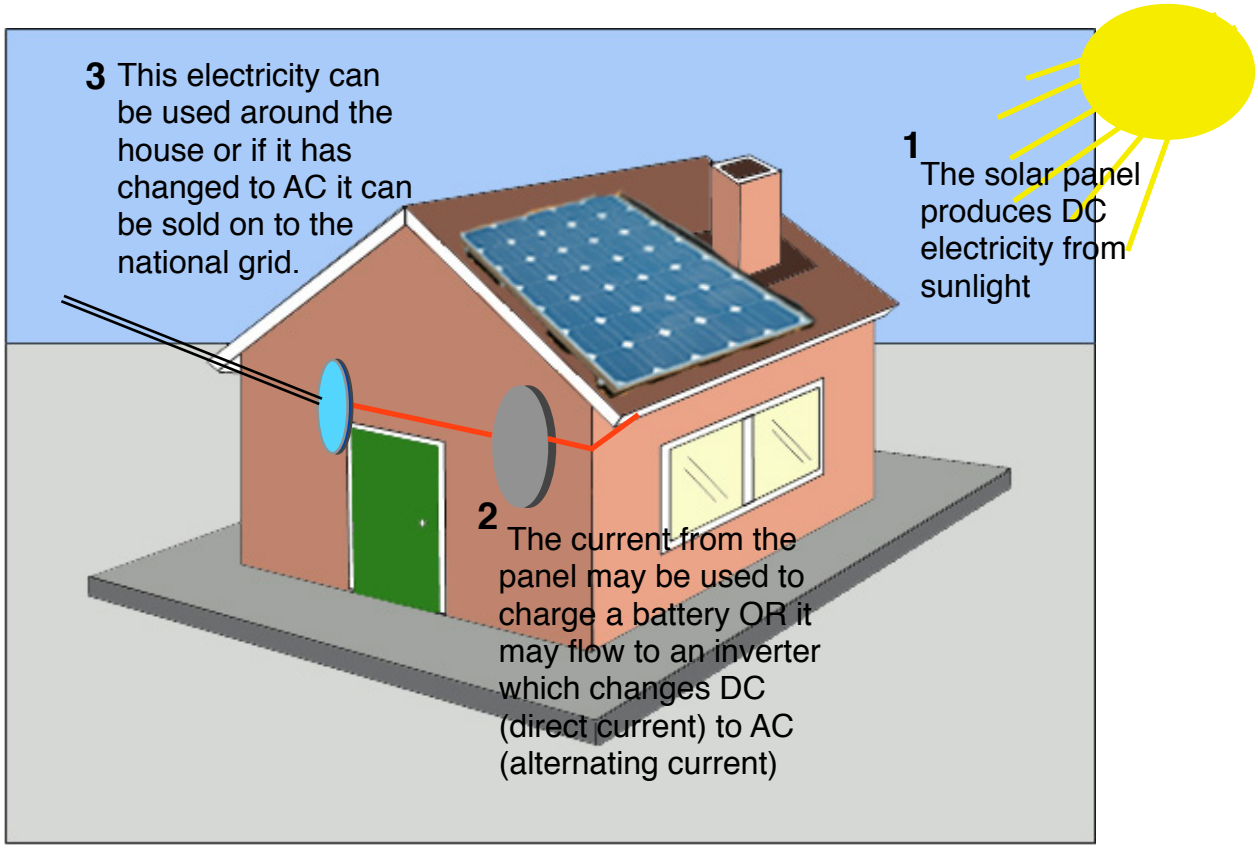
Most solar panels installed on houses in the last few years convert the energy of sunlight directly into electrical energy. These are *photovoltaic* cells.

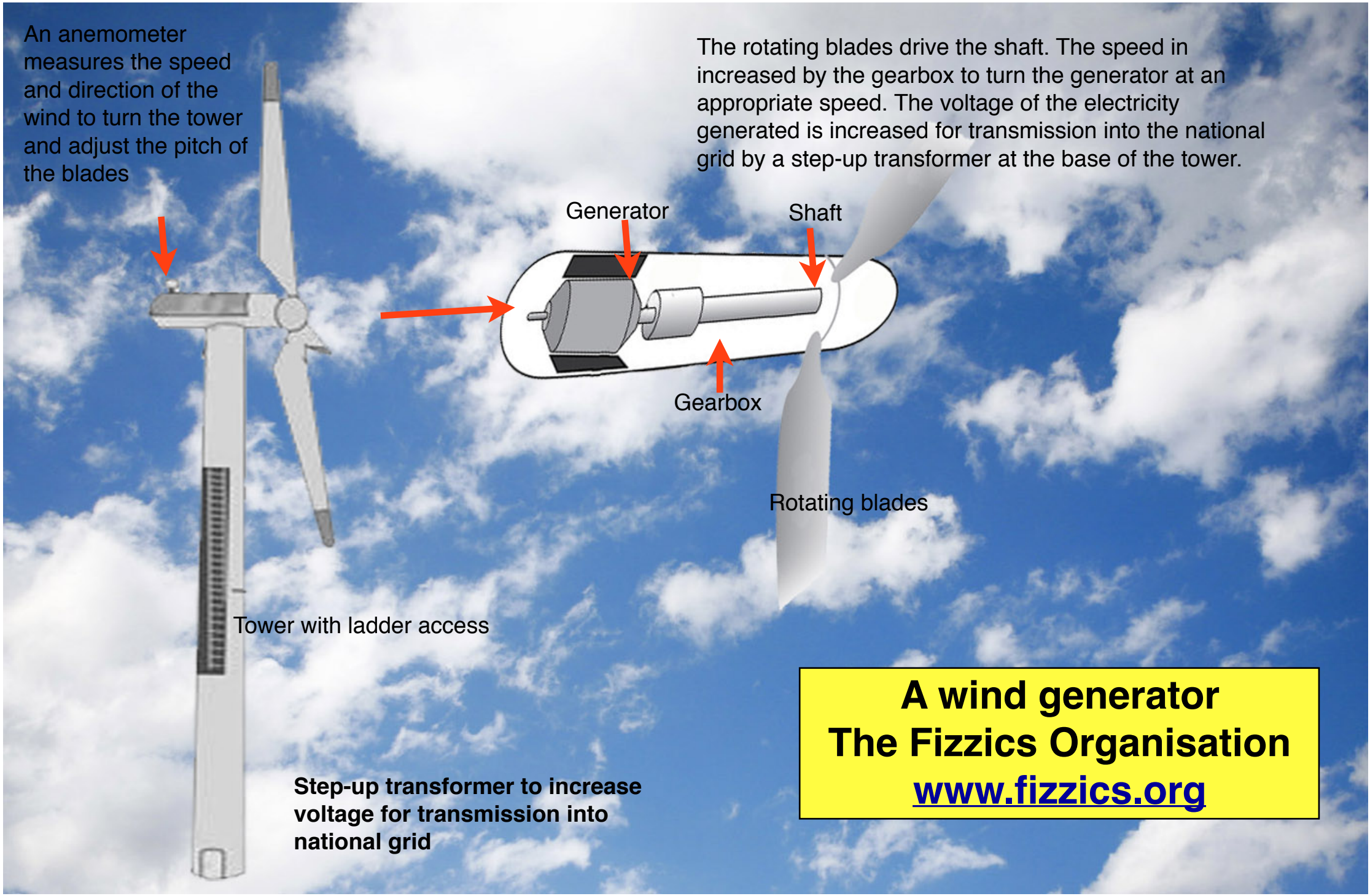


Solar Energy

- Is a totally renewable resource with zero resource costs.
- Remote places or single buildings can have their own supply.

But

- Manufacturing and installing of solar panels is costly and the life of the panels is uncertain.
- The sun does not always shine (especially at night!) and the panels are inefficient in poor light.


An anemometer measures the speed and direction of the wind to turn the tower and adjust the pitch of the blades
The rotating blades drive the shaft. The speed in increased by the gearbox to turn the generator at an appropriate speed. The voltage of the electricity generated is increased for transmission into the national grid by a step-up transformer at the base of the tower.
Generator
Shaft
Gearbox
Rotating blades
Tower with ladder access
Step-up transformer to increase voltage for transmission into national grid
A wind generator
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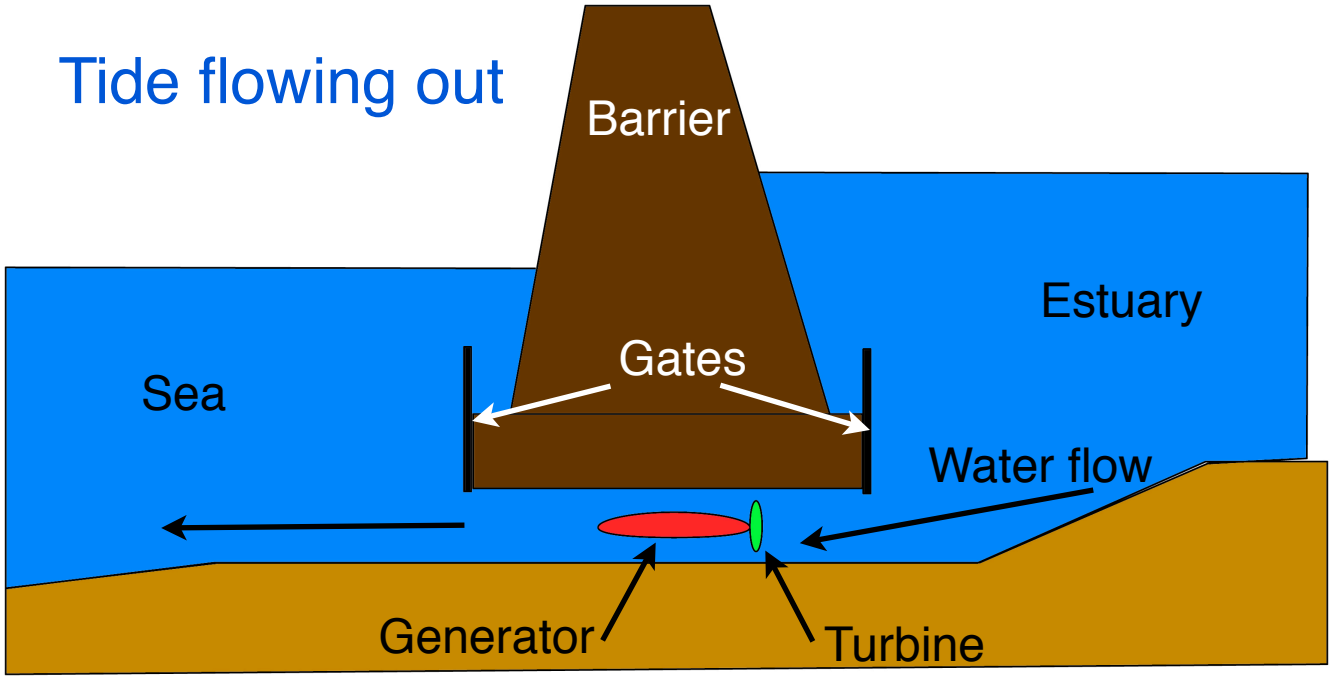

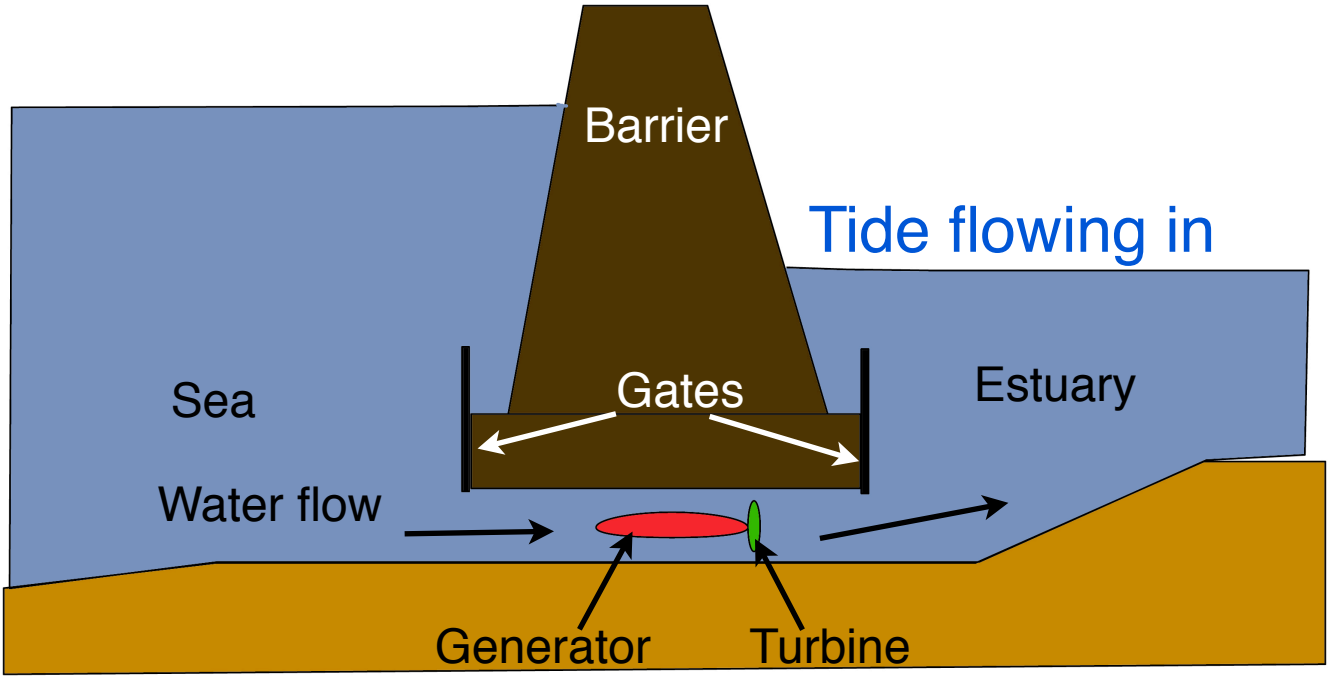

Tidal power
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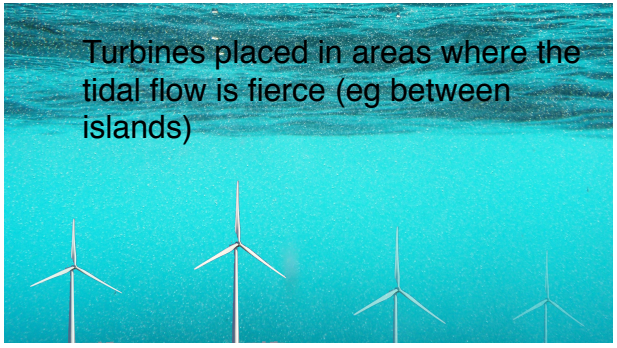
www.fizzics.org

Tidal

- Great potential for an island such as the UK.
- Totally renewable
- Cheap to run.
- Predictable and reliable
- Could generate a lot of energy.
- A tidal barrage can also be used as a bridge and may help prevent flooding.

But

- Construction of a barrage is very costly (running to many billions of pounds).
- Placing turbines in strong tidal currents is difficult and expensive.
- Very few estuaries are suitable.
- May damage the wildlife on the estuary.



Hydroelectric power
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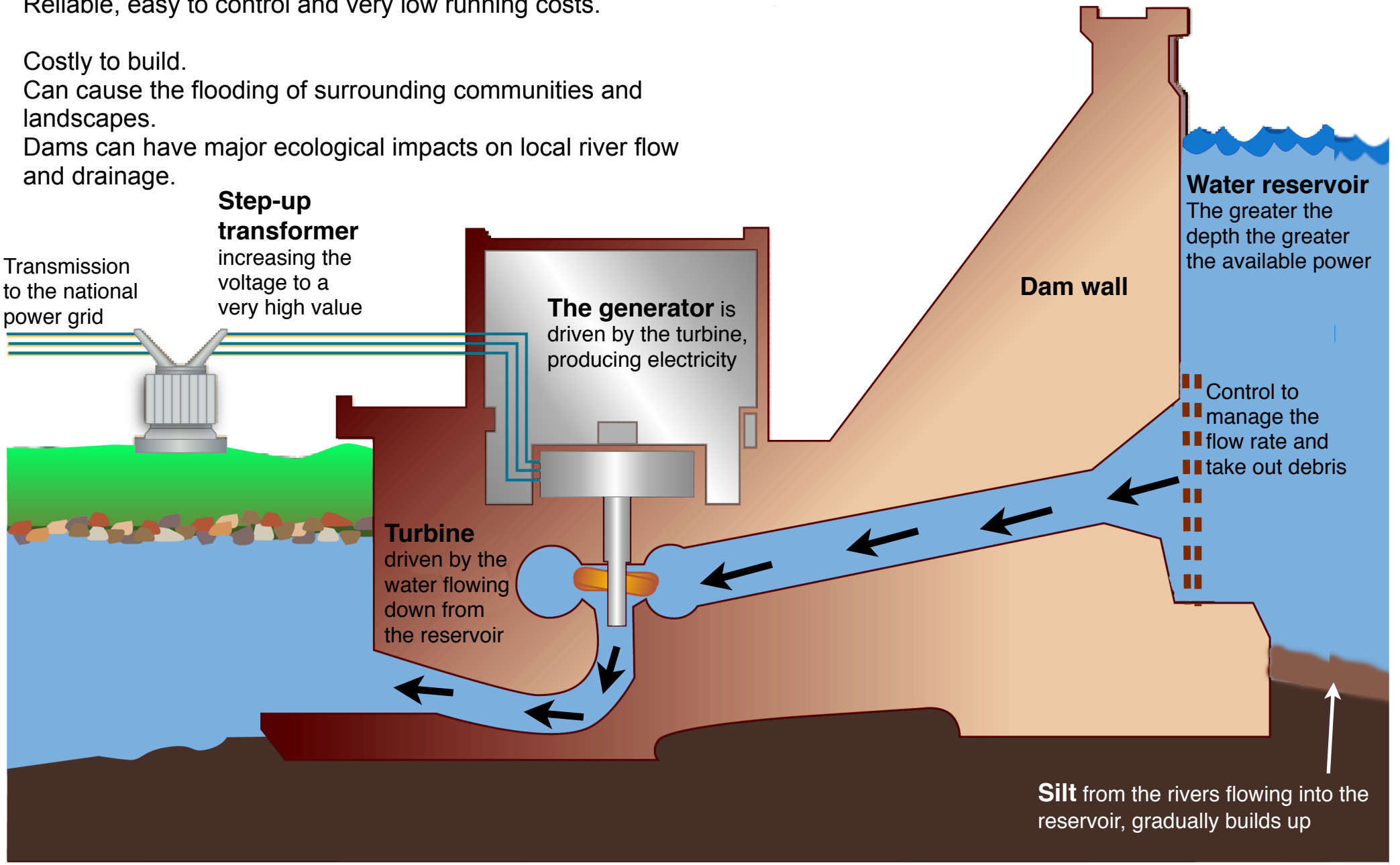
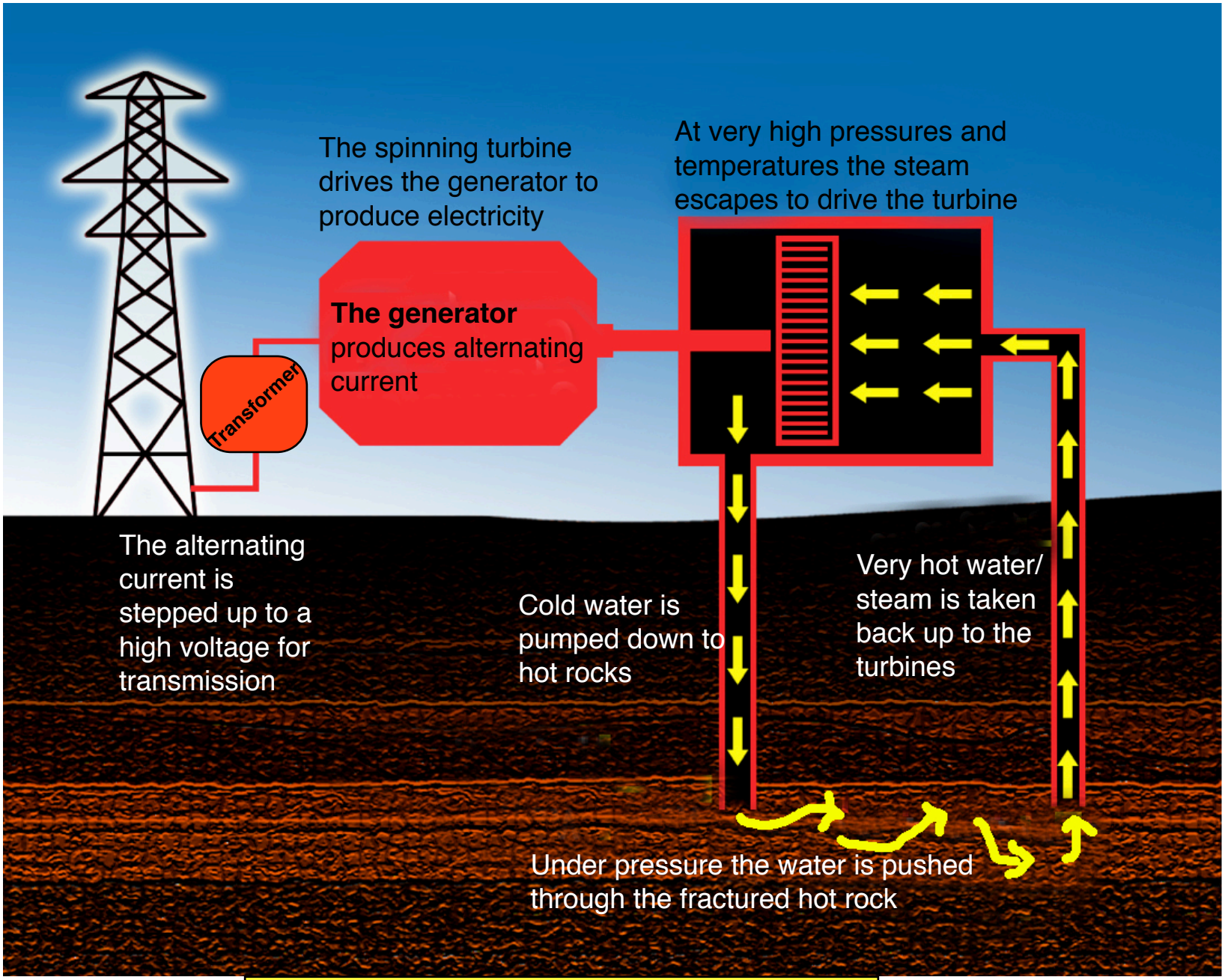
Hydroelectric Power

- Totally renewable
- Creates water reserves as well as energy supplies.
- Reliable, easy to control and very low running costs.

But

- Costly to build.
- Can cause the flooding of surrounding communities and landscapes.
- Dams can have major ecological impacts on local river flow and drainage.





Geothermal energy
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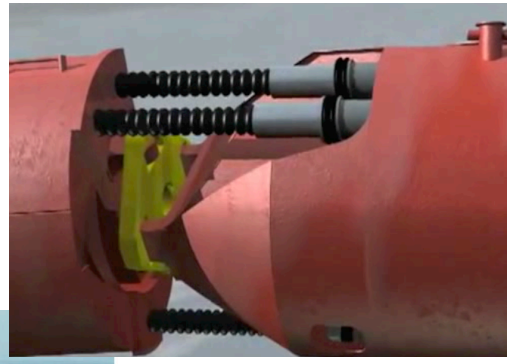
Geothermal

- Totally renewable
- Potentially infinite energy supply.
- Used successfully in some countries, such as New Zealand and Iceland where the earths crust is thin.

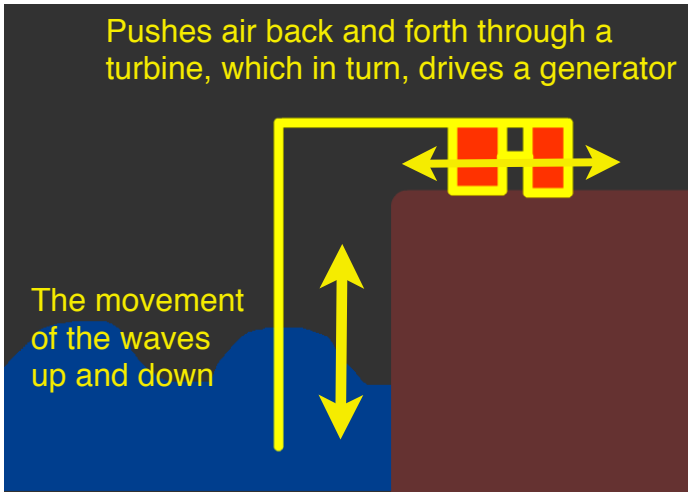
But

- It is likely to be impractical in most areas due to the depth of drilling required.
- Can be expensive to set up.
- Dangerous elements found underground must be disposed of carefully.

The movement between a long snake of individual cylinders is used to pump fluid backwards and forwards between them. The motion of the fluid is used to drive a generator.



There are many models and systems for the capture of wave energy. The illustrations show three of the more developed.



The device is located on a steep shore

Wave

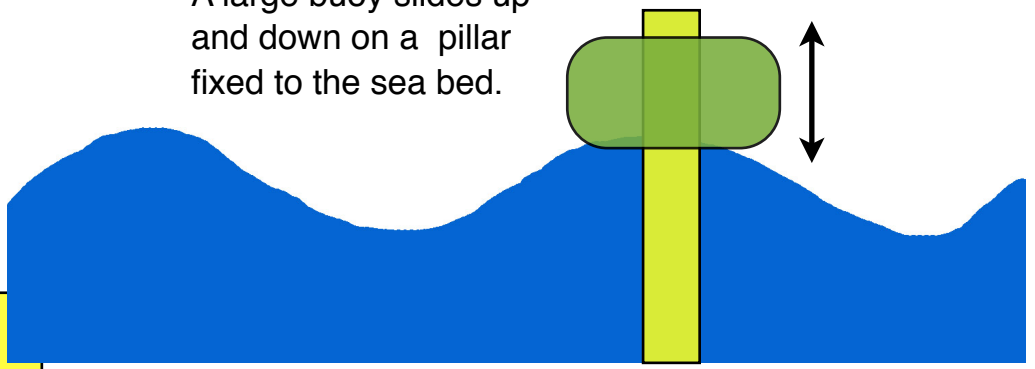
- Great potential for an island such as the UK.
- Totally renewable.
- Low running costs since energy supply is zero cost (although maintenance may be expensive in inhospitable seas)

But

- More likely to be small local operations, rather than done on a national scale.
- Construction can be costly, there is no large scale production so far.
- May obstruct the view in unspoiled coastline or be a problem for shipping.
- Small output on calm days

This movement is used to pump oil through tubes which in turn, drive a generator

A large buoy slides up and down on a pillar fixed to the sea bed.



Wave energy
The Fizzics Organisation
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In the UK crops such as willow are grown (on a fairly small scale) to burn in a power station much in the same way as coal is burnt.

Biomass fuel may be wood grown to burn, seed grown for oil to burn or to manufacture diesel, sugar grown to produce alcohol for use in vehicles of plant which are composted to decay and produce gas.

- It is can be a cheap and readily available source of energy.
- If replaced, biomass can be a long-term, sustainable energy source.
- If grown locally it is reliable and secure and absorbs carbon dioxide from the atmosphere

BUT

- When burned, it gives off atmospheric pollutants, including greenhouse gases.
- Biomass is only a renewable resource if crops are replanted.
- Using the land to grow fuel reduces the amount available to grow food for the world growing population.

The use of biomass is regarded as carbon neutral since the carbon dioxide released when it burns is balanced by the carbon dioxide absorbed as it grows.

Oil from crops such as rape seed (the bright yellow crop seen across the country in late spring) can be used in the production of fuel for diesel cars

Biomass energy
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