

The Hydrogen Economy



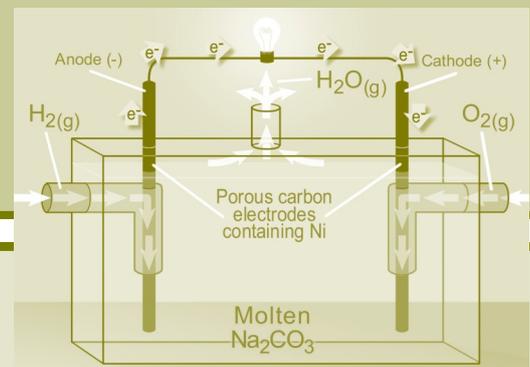
What is the Hydrogen Economy?

First used in 1970, the term 'Hydrogen Economy' refers to an energy system centred around hydrogen as a fuel base for use nationally, if not globally. It is starting to be examined as a possible alternative to the burning of fossil fuels as a means of creating energy.

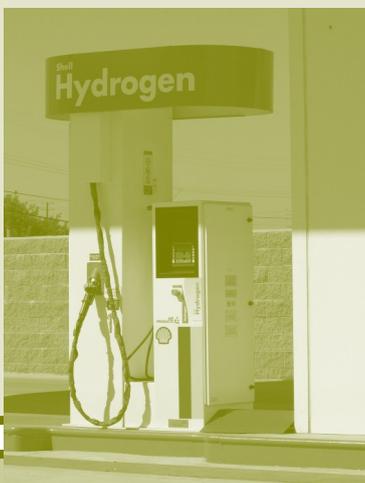
How does it work?

Hydrogen does not naturally occur in large quantities and so has to be generated by the electrolysis and decomposition of water. Though currently this process is energy inefficient, research is looking into other methods of hydrogen sourcing such as algae bioreactors.

A hydrogen fuel cell is a capsule containing two electrodes: an anode (a positively charged device) and a cathode (a negatively charged device). The hydrogen is fed into the cell nearest to the anode and as it passes over it, splits into two H^+ ions. These combine with an O^{2-} ion created by oxygen gas which has separately passed over a cathode in another part of the cell. The combining of these ions creates water as a by-product. Electricity can be produced as electrons flow from the hydrogen ions to the oxygen, creating a current.



Advantages of a Hydrogen Economy



- Hydrogen is a cleaner source of fuel compared to fossil fuels: it releases no harmful pollutants and the water by-product can be reused in the electrolysis of hydrogen.
- Producing no greenhouse gases, hydrogen fuel cells could make a positive impact on the future levels of climate change.
- Hydrogen has a high energy to weight ratio and is therefore relatively efficient compared to a fossil fuel engine.
- If large scale hydrogen fuel cells are used, vehicles can run from the electricity that they would produce in power plants (reducing the need for unsafe transportation of the liquefied gas within vehicles).

Disadvantages of a Hydrogen Economy

- The production of hydrogen requires a large amount of energy, which currently comes from fossil fuel combustion
- Hydrogen fuel cells are relatively expensive for the amount of energy they can produce, so may not be viable for small scale operations.
- Hydrogen is difficult to store: it needs to be one hundred percent pure to be used efficiently and has to be kept under very high pressures or liquefied - this means fuel tanks in vehicles may be very heavy.
- Hydrogen when stored is also highly explosive and has a tendency to try to diffuse through any material that tries to contain it and is difficult to detect when leaking.
- To work at a large, possible national scale, very high amounts of capital investment may be needed to provide safe infrastructure (such as hydrogen gas pipelines and electricity recharging stations for vehicles).

