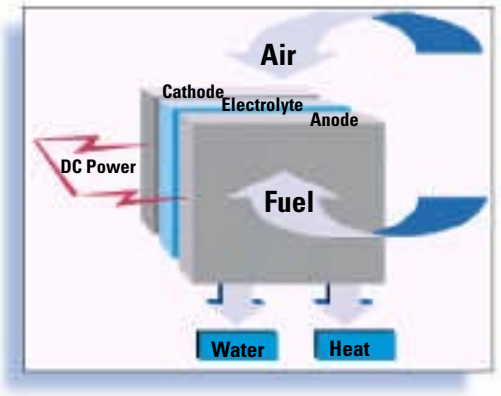
What is a Fuel Cell and How Does it Work?

What is a fuel cell?

A fuel cell is an energy generation device that converts pure hydrogen and oxygen into usable electric power by way of a simple chemical reaction. A fuel cell will generate electricity as long as hydrogen fuel is supplied; meaning that it never needs electrical recharging. As a simple electrochemical device, a fuel cell does not actually burn fuel, allowing it to operate pollution-free. The only emissions produced by a fuel cell are pure water and heat. This also makes a fuel cell quiet, dependable, and very fuel-efficient." [1]



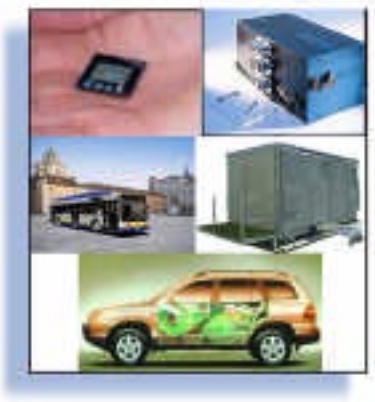
http://www.navc.org/Future_wheels.pdf

How does a fuel cell work?

A fuel cell consists of two oppositely charged metal plates (an anode and cathode) that sandwich an electrolyte. Hydrogen is directed toward a catalyst that splits the atom into protons and electrons. Protons continue through the anode and electrons are directed through a circuit to generate electric power. The protons and electrons then meet on the other side where they combine with oxygen that has been passed through the cathode, and combine to form H2O. Both the heat and water byproducts of this reaction can be captured and used for other purposes.

What are the potential uses of fuel cells?

Fuel cells are scalable and can be used in both mobile and stationary applications. Fuel cells come in many shapes and sizes (clockwise from top left): a fuel cell for handheld devices [2], a residential fuel cell [3], a 1.6 megawatt commercial unit [4], a fuel cell powered Hyundai Santa Fe [5], and a fuel cell bus [6].



What are the benefits of hydrogen fuel cells?

Benefits include:

- Zero greenhouse gas or toxic emissions from fuel cells
- Hydrogen is an abundant, ubiquitous source of energy
- Hydrogen is a non-toxic fuel
- Light molecular weight of hydrogen means it dissipates quickly reducing risk of concentrated and long-lasting fire
- Scalable size of fuel cells allows them to be used in thousands of applications
- Can be used for stationary and mobile uses
- Reduced dependence on fuel from politically volatile regions

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1 Rocky Mountain Institute, http://www.rmi.org/sitepages/pid315.php

2 http://www.trnmag.com/Thin%20Film%20Fuel%20Cell%20Full.jpg

3 http://socrates.berkeley.edu/~rael/fuelcell.html

4 http://www.pnme-izupdate.com/issues/1/2002_03/_print.htm

5 http://www.clean-vehicles.com/templ/cleanv/pics/Hyundai-Santa-Fe-fuel-Cell.gif

6 http://www.clean-vehicles.com/cleanv/art/fuel-cell-bus.jpg

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