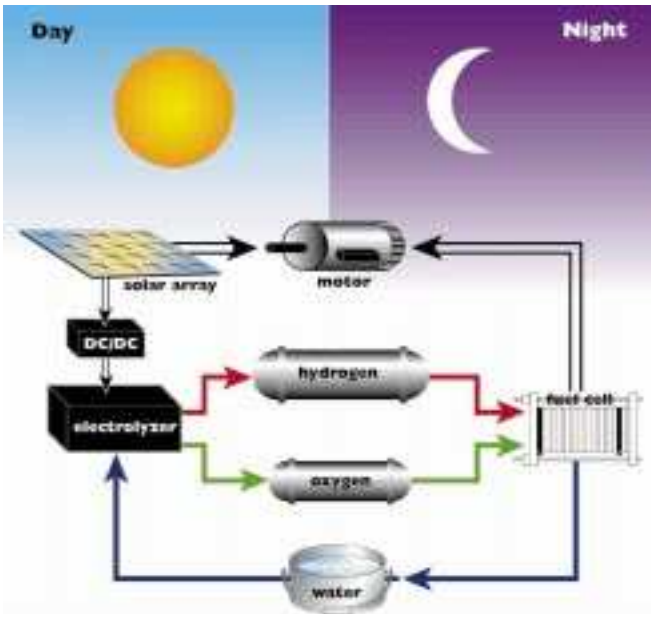
Regenerative Fuel Cell

A regenerative fuel cell, currently being developed for utility applications, uses hydrogen and oxygen or air to produce electricity, water, and waste heat as a conventional fuel cell does. However, the regenerative fuel cell also performs the reverse of the fuel cell reaction, using electricity and water to form hydrogen and oxygen. In the reverse mode of the regenerative fuel cell, known as electrolysis, electricity is applied to the electrodes of the cell to force the dissociation of water into its components.

The "closed" system of a regenerative fuel cell could have a significant advantage because it could enable the operation of a fuel cell power system without requiring a new hydrogen infrastructure. There are two concerns to be addressed in the development of regenerative fuel cells. The first is the extra cost that would be incurred in making the fuel cell reversible.



Renewable regenerative fuel cell utilizing the energy source of the sun to produce power (Courtesy: Aerovironment)

The second drawback to the operation of the regenerative fuel cell is the use of grid electricity to produce the hydrogen. In the United States, most electricity comes from burning fossil fuels. The fossil fuel → electricity → hydrogen energy route generates significantly more greenhouse gases than simply burning gasoline in an internal combustion engine. Although the concept of a regenerative fuel cell is attractive, until renewable electricity, e.g. electricity from solar or wind sources, is readily available, this technology will not reduce greenhouse gas emissions.

Unmanned solar plane powered by a renewable regenerative fuel cell (Courtesy: Aerovironment)

In the near term, fuel availability could be an important reason for operating fuel cell vehicles on gasoline. Today, oil refiners in the U.S. are spending over $10 billion to comply with reformulated gasoline regulations to help lower tailpipe emissions. Fuel cell vehicles operating on alternative fuels will require new and expensive fueling infrastructures. However, alternative fuels will provide superior environmental performance. In the long term, incremental investments in a new domestic fuel infrastructure will be necessary for the 21st century.

RFG : Reformulated Gasoline

M 100 : Methanol

E100 : Ethanol

H_2 : Hydrogen

CNG : Compressed Natural Gas