With rising oil prices and the established negative environmental impacts of burning fossil fuels, humanity is looking toward a new means of obtaining energy. One promising alternative to fossil fuels is hydrogen. Hydrogen, which can be burned for heat energy or used in a fuel cell to provide electricity, is thought to be the next viable and plentiful source of energy.

Hydrogen is the most abundant element in the universe and a promising solution to the world's oil dependence. However, the availability of hydrogen is limited in Earth's atmosphere and must be produced from other elements or compounds. Reforming natural gas is one method of producing hydrogen. The simplest way to obtain hydrogen is through a process called electrolysis. This involves exposing water to DC voltage which separates it into hydrogen and oxygen.

One environmentally attractive method to generate that DC voltage is to use such renewable energy technologies such as wind, solar, hydro, and biomass. This removes harmful fossil fuels from the equation completely and allows for an energy infrastructure that is sustainable.
Hydrogen has many applications in the energy market. First, because of hydrogen's combustive nature, it can be used directly in an internal combustion engine, replacing the need for automotive gasoline. Second, it can be stored in fuel cells to create electricity, providing another power source for a vehicle. They are also used to power and heat buildings. Third, it can replace natural gas in its application to heating and cooling homes. In addition, it could also be used to turn the turbines that bring electricity to homes.

With applications in distributed generation and electric vehicles, the hydrogen economy is a revolutionary new field that has the potential to change how we live.

In a hydrogen economy, hydrogen is the primary source of stored energy (as opposed to fossil fuel) and is also used for transportation. It may be transported as gaseous, cryogenic liquid, or bound to other materials as hydrides. This is contrasted to the current world fossil fuel economy, which exploits geologic stores of coal, petroleum (crude oil), or methane (natural gas). These hydrocarbons can be readily transported and stored any place they are needed. Hydrogen is viewed as a replacement due to its abundance in nature, high energy density as well as its ability to be transported and stored. The drawback is the large energy source required to produce the hydrogen gas most likely by the hydrolysis of water. When the hydrogen gas is oxidized by oxygen it returns to water completing the hydrogen cycle.

Hydrogen is of particular interest for several reasons:

- When combusted with oxygen the primary product is water vapor. If combusted with air there may be small amounts of various oxides of nitrogen, called Nox, which may be destroyed with a catalytic converter. Also if methyl mercaptan or ethyl mercaptan is used for detection as in natural gas, sulfur compound contamination will occur. In addition the small size of the hydrogen molecule allows it to interact with metals causing an effect known as hydrogen embitterment.
- When consumed in a fuel cell, electricity is produced at a high efficiency and no pollution is generated - only water.
- Using electricity, hydrogen may be produced by electrolysis (electrolytic decomposition) of water, forming an energy store for electricity produced by photovoltaic solar, geothermal and wind turbine energy sources.

As an energy source, its high energy per unit mass and low energy per unit volume creates optimism and skepticism when considering a Hydrogen Economy. The safety of storing hydrogen is something that has been misunderstood in our society. The reality of a Hydrogen Economy depends on the time frame of solving problems in hydrogen production, storage and transportation. These are some of the biggest challenges we face in pursuing a pollution free, renewable energy source in the 21st century. In the future, methods of producing hydrogen will come from alternate energy sources such as, wind, solar, biomass, or geothermal.
The Future of Hydrogen Economy: There is growing interest in the use of hydrogen as the main fuel for stationary, mobile, and transportation applications, especially using fuel cells. At the same time, there have been news stories for decades about the problems associated with fossil fuels. These two forces are leading the world toward what is broadly known as the hydrogen economy. If the predictions are true, over the next several decades we will all begin to see an amazing shift away from the fossil fuel economy we have today toward a much cleaner hydrogen future.

Depending on how the fuel is produced and distributed, hydrogen fuel and fuel cells could help significantly reduce pollution and greenhouse gas emissions. Further, if hydrogen were produced using domestic energy supplies, it could help reduce dependence on imported petroleum. Also, fuel cells could be used to improve the efficiency and reliability of electricity generation.

Can society actually make this shift, or will the technological, economic and political barriers keep us bound to petroleum and other fossil fuels for the next century and beyond?

World wide impact of developing this Technology: There are several environmental, economical, and social implications of a hydrogen economy. The burning of hydrogen as a fuel would result in a reduction of pollutants and an elimination of carbon emissions, such as carbon monoxide and carbon dioxide, thus making hydrogen a fuel that does not contribute to global warming. The worldwide market for hydrogen is also one that could be highly competitive, as hydrogen can be produced just about anywhere from many different sources. Because of this, electricity would be available in places where it was not, thus creating new jobs and providing higher income to areas of the world that have very small or low incomes.

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