# HYDROGEN AS THE WONDER FUEL?

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Hydrogen makes up 75% of the known universe but is not an energy source like oil, coal, wind or sun. Like electricity, hydrogen is an energy carrier. However, this ubiquitous element in the universe is being projected by some as the future solution to all energy ills. The 2004 budget of the U.S. government has allocated $ 1.7 billion over the next five years for hydrogen research and development under a programme jingoistically titled as the 'Freedrom Fuel Initiative'. Even though hydrogen is abundant in the universe and does not have the polluting carbon atom, it is not available in free form and needs to be isolated through chemical or electrolytic processes. The clean fuel status of hydrogen depends on how it is produced. Like electricity, it is only as clean as the means of it's production. For example, the Bush administration's FFI proposes to produce hydrogen from industrial fuel sources like coal, gas and nuclear fission. If hydrogen is to be clean, it should be produced using clean energy sources. The kind of hydrogen optimism displayed by authors like Jeremy Rifkin[1] is now being questioned by researchers and analysts.

Over optimism about hydrogen is discounted for several reasons. It takes energy to make energy. Hydrogen production also requires energy. Hydrogen has negative net energy, meaning it takes more energy to produce than it contains[2]. Hydrogen has low calorific value and a very low volumetric energy density. This dictates increased volumes or high pressures in it's storage and transportation, by road or through pipelines. The energy consumed in transportation would render the delivered energy uneconomical. Silvestre Bradley says that the proposition of a sustainable hydrogen economy is no longer simply implausible but ridiculous.

A recent study published in the journal 'Science' by researchers at the California Institute of Technology[3] says that the leaked hydrogen gas resulting from a widespread hydrogen economy, if it accumulates, could indirectly cause as much as ten percent decrease in atmospheric ozone. If hydrogen were to replace all fossil fuels used in transportation and to power buildings, four to eight times more hydrogen would be released into the atmosphere than is currently released by human activity. Then hydrogen would be like chlorofluorocarbons which have damaged the ozone layer.

But other experts like Amory Lovins swear by hydrogen while dispelling what he calls hydrogen myths[4] . He is fascinated by the versatality of hydrogen as a carrier because, unlike electricity, it can be stored in large amounts and can be made from any energy source and used to provide almost any energy service. Lovins stresses the fact that hydrogen is an extremely high quality form of energy which can be readily converted into electricity and back. That is why the fuel cell pioneer Geoffrey Ballard talks about a fungible commodity called '**hydricity**' while arguing for a rapid transition to hydrogen; Lovins admits that a poorly designed hydrogen transition could cause environmental problems.

Dreams of hydrogen emerging as a panacea to our energy ills seem to be misplaced. In the post fossil fuel era, hydrogen will be only one of the energy providers, along with other cleaner and really renewable sources of power like wind, solar energy, wave and tidal energy, small hydro, biomass, etc. However, what seems certain now is that hydrogen would have a number of niche uses that makes sense, like transportation. It is predicted that hydrogen would fuel a fourth of the vehicle fleet in industrialized countries by 2025. The Indian initiatives on hydrogen should keep in mind these realities. What we need is a 'real renewable energy economy'.

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1. *The Hydrogen Economy,* Jeremy Rifkin, Polity Press, 2002.
2. *Is Hydrogen Sustainable?,* Oliver Silvestre Bradley.
3. *Hydrogen Leakage could Harm Earth's Ozone Layer* - www.useu.be/categories/energy/june1203hydrogenstudy.html.
4. *Twenty Hydrogen Myths,* Amory. B. Lovins, dt. 20th June 2003, published at www.rmi.org.