

The Dawn of the Hydrogen Economy

By **Jeremy Rifkin** | Friday, January 10, 2003

More than a year after the terrorist attacks of September 11, the world is more dangerous than ever before. At the heart of the collective fear that grips the human race is the struggle to control oil. It is the one critical resource without which our global economy and modern society would cease to exist. Jeremy Rifkin explains the way out of this dilemma.

Remove oil and other fossil-fuels from the present human equation — and modern industrial civilization would simply shut down. We heat our homes and businesses with fossil-fuels. We run our factories — and power our transportation with fossil-fuels.

Muted concern

We light our cities and communicate over distances with electricity derived from fossil-fuels. We grow our food with the help of fossil-fuels — and construct our buildings with materials made from fossil-fuels. We treat sickness with pharmaceuticals made from fossil-fuel derivatives.

We store our surpluses with plastic containers and packaging made from fossil-fuels — and produce our clothes and home appliances with petrochemicals. Virtually every aspect of modern existence is made from, powered with or affected by fossil-fuels.

In recent months, U.S. government concerns over the availability of oil in the Middle East has intensified because of the prospect of war with Iraq, the escalating violence between Israel and the Palestinians and the likelihood of more terrorist attacks by the al Qaeda network.

Now, an even deeper worry is beginning to surface, whose consequences could be enormous and far-reaching for everyone on Earth.

Looming shortages

Experts had been saying that we had another 40 or so years of cheap available crude oil left. Now, however, some of the world's leading petroleum geologists are suggesting that global oil production could peak and begin a steep decline much sooner, as early as 2020. That would send oil prices through the roof.

Worse, non-OPEC oil producing countries are already nearing their peak production, leaving most of the remaining reserves in the politically unstable Middle East. Increasing tensions between Islam and the West are likely to further threaten our access to affordable oil.

In addition, rising oil prices will assuredly plunge developing countries even further into debt — locking much of the third world in the throes of poverty for years to come.

The sunset years

In desperation, the United States and other nations could turn to dirtier fossil-fuels — coal, tar sand and heavy oil. But that would only worsen global warming — and imperil the earth's already beleaguered ecosystems.

Looming oil shortages make industrial life vulnerable to massive disruptions — and possibly even collapse.

Fortunately, though, while the fossil-fuel era may well be entering its sunset years, a new energy regime is being born that has the potential to remake civilization — and do so along radical new lines.

The stuff of the stars

Hydrogen is the most basic and ubiquitous element in the universe. Quite literally, it is the stuff of the stars — and of our sun. When properly harnessed, it is the "forever fuel." It never runs out — and produces no harmful CO₂ emissions when burned. The only byproducts are heat and pure water.

We are at the dawn of a new economy, powered by hydrogen. That change could have implications which go well beyond energy and the environment. It will fundamentally change the nature of our market, as well as of political and social institutions.

The change will be as significant as the one the world witnessed when coal and steam power came online more than 200 years ago, spawning the industrial age.

Where's the problem?

Hydrogen is found everywhere on earth — in water, fossil-fuels and all living things. Yet, it rarely exists free-floating in nature. Instead, it has to be extracted from natural sources.

Today, nearly half the hydrogen produced in the world is derived from natural gas via a steam-reforming process. The natural gas reacts with steam in a catalytic converter. The process strips away the hydrogen atoms, leaving carbon dioxide as the by-product.

Harnessing renewables

Coal can also be reformed through gasification to produce hydrogen, but this is more expensive than using natural gas. Hydrogen can even be processed from oil.

While using steam in order to reform natural gas has proven the cheapest way to produce commercial hydrogen, natural gas still is a hydrocarbon. It thus

emits CO₂ in the conversion process. Moreover, global production of natural gas may peak sometime before 2030, creating a second energy crisis on the heels of the emerging oil crisis.

There is, however, another way to produce hydrogen without using fossil fuels in the process. Renewable sources of energy — photovoltaic, wind, hydro, geothermal and biomass — can be harnessed to produce electricity.

Twice the work?

The electricity, in turn, can be used — in a process called electrolysis — to split water into hydrogen and oxygen. The hydrogen can then be stored and used, when needed, in a fuel cell to generate electricity for power, heat and light.

People often ask: Why generate electricity twice, first to produce electricity for the process of electrolysis and then again to produce power, heat and light by way of a fuel cell? The reason is straightforward: Electricity does not store.

So, if the sun isn't shining or the wind isn't blowing, or the water isn't flowing, electricity can't be generated — and economic activity would grind to a halt. Hydrogen is a way to store renewable sources of energy to ensure an ongoing and continuous supply of power for society.

A question of costs

The real question, then, boils down to one of costs. Wind, hydro and biomass are already cost-competitive in many parts of the world — and can be used to generate electricity for the electrolysis process.

Photovoltaic and geothermal costs, however, are still high and will need to come down considerably to make the process competitive with the natural gas steam-reforming process in the production of hydrogen.

The good news

But there is considerable good news. Commercial fuel-cells powered by hydrogen are just now being introduced into the market for home, office and industrial use.

Portable hydrogen fuel cell cartridges will be on the market by 2005 or 2006. You will be able to power up your cell phone and laptop computer for 40 days with one cartridge.

The major automakers have spent more than two billion dollars developing hydrogen cars, buses and trucks. And the first mass-produced vehicles are expected to be on the road in just a few years.

Gearing up for a hydrogen future

More than 1,000 companies around the world are already racing to the hydrogen future — the speed up in R&D and market introduction is of the early days of the personal computer revolution and the emergence of the world wide web.

A recent study done by Price Waterhouse Coopers forecasted that in less than 18 years hydrogen technologies and related goods and services will exceed 1.7 trillion dollars in worldwide sales. We are truly on the cusp of a new economic era — with far reaching consequences for society.

Jeremy Rifkin is the author of [The Hydrogen Economy: The Creation of the World Wide Energy Web and the Redistribution of Power on Earth](#) (Tarcher/Putnam, 2002).



Copyright © 2003 by The Globalist. Reproduction of content on this site without The Globalist's written permission is strictly prohibited. [Terms of Use](#) | [Privacy Policy](#)

McPherson Square, 927 15th Street, NW, Washington, D.C. 20005