

# Power for everyone 9/14 Mans 18/9/02

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**M**ore than a year after the terrorist attacks on the World Trade Centre and the Pentagon, the world is a more dangerous place than ever. And at the heart of the collective fear that continues to grip the human race is the struggle to control oil, the critical resource without which our global economy and modern society would cease to exist.

Experts had been saying that we had another 40 or so years of cheap available crude oil. Now, however, some leading petroleum geologists are suggesting that global oil production could peak and begin a steep decline as early as the end of this decade, sending oil prices through the roof.

While the fossil-fuel era is entering its sunset years, a new energy regime is being born that has the potential to remake civilisation along radical lines. Hydrogen is the most basic and ubiquitous element in the universe. It is the stuff of the stars and of our sun and, when properly harnessed, it is the "forever fuel". It never runs out and produces no harmful carbon dioxide emissions when burned: the only by-products are heat and pure water. We are at the dawn of a new economy, powered by hydrogen, that will fundamentally change the nature of our market and our political and social institutions, just as coal and steam power did at the beginning of the industrial age.

Hydrogen is found in water, fossil fuels and all living things, yet it is rarely free floating and so has to be extracted from natural sources. Nearly half the hydrogen produced in the world is derived from natural gas through a steam reforming process. This has proved the cheapest way to produce commercial hydrogen, but it is not ideal. Natural gas emits carbon

dioxide in the conversion process. Moreover, global production of natural gas is likely to peak between 2020 and 2030, creating a second energy crisis on the heels of the oil crisis.

There is, however, another way to produce hydrogen without using fossil fuels. Renewable sources of energy — wind, photovoltaic, hydro, geothermal and biomass — can be harnessed to produce electricity which is then used, in a process called electrolysis, to split water into hydrogen and oxygen. The hydrogen is stored in a fuel cell and used to generate electricity for power, heat and light. People often ask why electricity must be generated twice, first for the process of electrolysis and then again to produce power, heat and light by way of a fuel cell. The reason is that it doesn't store. If the sun isn't shining, the wind blowing, or the water flowing, electricity cannot be generated and economic activity grinds to a halt. Hydrogen is a way to store renewable sources of energy to ensure a continuous supply of power.

The real question is one of cost. 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, will need to drop considerably to make the process competitive with the natural gas process.

Commercial fuel cells powered by hydrogen are being introduced into the market for home, office and industrial use. Manufacturers have spent more than \$2 billion developing hydrogen cars, buses and trucks, and the first mass-produced vehicles are expected to be on the road in just a few years.

The hydrogen economy makes possible a vast redistribution of power. Today's centralised, top-down flow of energy, controlled by global oil companies and utilities, becomes obsolete. In the new era, everybody could become the producer, as well as

the consumer, of their own energy — so called "distributed generation". When millions of end-users connect their fuel cells into local, regional, and national hydrogen energy webs, using the same design principles and smart technologies that made possible the world wide web, they can begin to share energy, creating a new decentralised form of energy use.

In the hydrogen economy, even the car is a "power station on wheels" with a generating capacity of 20 kilowatts. It can be plugged in, when parked, to the home, office or the main interactive electricity network to provide premium electricity back to the grid.

Millions of local operators, generating electricity from fuel cells on site, can produce more power more cheaply than giant power plants. When the end users also become the producers of their energy, existing power plants will become "virtual power plants" that manufacture and market fuel cells, bundle energy services and coordinate the flow of energy over the existing power grids.

**H**ydrogen has the potential to end the world's reliance on imported oil. It will dramatically cut down on carbon dioxide emissions and mitigate the effects of global warming. And because hydrogen is so plentiful, every human being could be "empowered", making it the first truly democratic energy regime in history.

Sixty-five per cent of the human population has never made a telephone call, and one-third has no access to electricity or any other form of commercial energy. The disparity between the connected and the unconnected threatens to become even more pronounced during the next half-century when the world population is expected to rise from the 6.2 billion to nine billion. Most of the increase will be in the developing

world, where poverty is concentrated.

Lack of access to energy, especially electricity, is a key factor in perpetuating poverty, while access to energy means more economic opportunity. In South Africa, for example, 10 to 20 new businesses are created for every 100 households electrified.

The per capita use of energy throughout the developing world is a 15th of that enjoyed in the US. Making the shift to a hydrogen energy regime is the only way to lift billions of people out of poverty. Narrowing the gap between the haves and have-nots means narrowing the gap between the connected and the unconnected.

As the price of fuel cells and accompanying appliances continues to plummet with new innovations and economies of scale, they will become far more broadly available, just as was the case with transistor radios, computers and cellular phones. National governments and world lending institutions need to be lobbied to help provide financial and logistical support to create a hydrogen energy infrastructure. The goal ought to be to provide stationary fuel cells for every neighbourhood and village in the developing world.

The fossil-fuel era brought with it a highly centralised energy infrastructure, and an accompanying economic infrastructure, that favoured the few over the many. Now, on the cusp of the hydrogen age, it is possible to establish the conditions for a truly equitable sharing of the Earth's bounty. This is the essence of the politics of re-globalisation from the bottom up. The hydrogen economy is within sight. How fast we get there will depend on how committed we are to weaning ourselves off of oil and the other fossil fuels. What are we waiting for?