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Energy's future is trapped in the fossil fuel past

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In his State of the Union address, President George W. Bush proposed a \$1.5bn government research and development programme to replace the internal combustion engine with hydrogen-powered fuel cell cars. While some applauded his call to create a clean, non-polluting energy source for the 21st century, many environmentalists were less enthusiastic. That is because there is both more and less to his announcement than meets the eye.

To be sure, the shift to fuel cells and a hydrogen economy will be as significant and far-reaching in its impact on the global economy and society as the steam engine and coal in the 19th century and the switch to the internal combustion engine and oil in the 20th century. Hydrogen is the lightest, most plentiful element in the universe. When it is used to generate power, heat and light, the only by-products are water and heat. But what Mr Bush did not mention was that hydrogen has to be extracted from either fossil fuels or water. Most commercial hydrogen today is extracted from natural gas but it can also be extracted from coal and oil. Even the nuclear industry has weighed in, arguing that nuclear power can be used to extract hydrogen. The White House's enthusiasm for hydrogen suddenly becomes understandable. If fossil fuels and even nuclear power can be harnessed to produce hydrogen, the Bush administration can have its cake and eat it too.

There is, however, another way to get hydrogen. Renewable sources of energy - wind, photovoltaic, hydrogen, geothermal and biomass - can be harnessed to produce electricity and that electricity, in turn, can be used to electrolyse water, separating the hydrogen from the oxygen for storage and later use in a fuel cell. While this second approach frees us from fossil fuel dependency and is the solution environmentalists have dreamt of for years, it currently costs more to extract hydrogen with renewable energy. That is because electricity has to be generated twice, first to create the electricity to electrolyse the water and grab and store the hydrogen and then to use the hydrogen to power the fuel cell. Why twice? Because electricity generated from renewable sources of energy cannot be effectively stored. If the sun is not shining, the wind stops blowing, or water stops flowing because of drought, electricity stops being produced and the economy stops. By using some of the electricity generated by renewables to electrolyse water and extract hydrogen, society obtains stored energy to use at a future date.

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But in the years ahead, the price of oil and gas will edge up as we reach the peak in global production. Geologists believe oil could peak as early as 2010 or as late as 2037. After that point, oil and gas prices will rise steeply and never fall again. Meanwhile, the cost of producing electricity using renewable sources to extract hydrogen from water continues to plummet with new technologies and wider use. As the rising price of oil and gas approach the diminishing costs of renewable energy and hydrogen extraction, the shift to a truly new energy era can be expected to accelerate dramatically.

But government support for this shift is less than it seems. While government subsidies for the fossil fuel and nuclear industries exceeded \$6bn in fiscal year 2002, the Bush plan proposes only \$300m a year for hydrogen technology and even less for developing renewable sources. So it appears Mr Bush wants to bring us into a hydrogen future without ever leaving the fossil fuel past. It is no wonder environmentalists are leery and accuse the White House of using hydrogen as a ruse to protect the interests of the fossil fuel and nuclear industries.

Make no mistake. Hydrogen is our hope for the future and using renewable sources of energy to extract it is the way we ought to be heading. This does not mean we give up on tough fuel efficiency standards for cars and better energy conservation. The US ought to follow twin tracks, enacting tight regulations on use of fossil fuels while pushing aggressively for a hydrogen economy using renewables.

A hydrogen energy regime based on renewable sources of electricity will reduce global warming, narrow the divide between rich and poor nations and defuse the increasing geopolitical tensions in the Gulf. It is the only way to ensure both energy independence and homeland security. What is needed now is enlightened political leadership that can sever the tenuous link between hydrogen and an old-fashioned fossil fuels agenda.

*The writer is author of *The Hydrogen Economy*, Tarcher Putnam, 2002*