

Story Proposal: Altfuel Cars

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We propose a 5,000-word feature on the present and future of the alternative-fuel car. The timing is auspicious.

First, the future is now: two hybrid-gasoline cars were introduced in 2000 and for model year 2002 the Big Three will be offering 42 different models that will run on entirely or in part on electricity, natural gas, or ethanol. The entire Tokyo taxi fleet runs on natural gas, as do the buses and city vehicles in many American cities. Tourbuses in Yellowstone Park run on "biodiesel" made of recycled cooking oil and leave behind nothing but the smell of French fries. The list goes on.

Second, the end of the petroleum era is visible. About half the known world reserves have been used up since oil was first pumped out of Titusville, Pennsylvania, in 1859, and at the current world consumption rate of 76 million barrels a day, we could be using up the last of it in half a century or so.

Third, the rubble of the World Trade Center can be laid, in part, at the feet of the internal combustion engine. Fully two-thirds of the oil the United States consumes goes to motor fuels. Were we powering our cars some other way, we would have to import zero oil. Our Middle

East policy could therefore be based on considerations other than oil, which might in turn lead to American behavior that did not incur Islamic wrath. If ever there was a wake-up call to get serious about altfuel cars, September 11 was it.

Six years ago, room-temperature superconductors were the hot call; they promised, among other things, electric cars that could travel a thousand miles between instant recharges. Nowadays nobody talks about them. The technological barriers to a room-temperature superconductor now appear too large. GM feinted in the direction of a plug-in short-range electric that the public liked, but withdrew it because maintaining specialized service stations hither and yon for so few vehicles was too expensive.

So the new vision of the ultimate altfuel car is the hydrogen fuel cell. Engineers say they can see all along the path to the fuel cell Ellysium in a way they never could with room-temperature superconductors. It will take enormous investment and government leadership in the form of taxes, incentives, and penalties. But the path is visible.

It is also very long. Compared to that of the digital world, the rate of progress in the automotive world is positively geologic. We are talking, first of all, of reconfiguring atoms, not bits, and in the heaviest of industries. Beyond that, the auto industry is ambivalent to the point

of schizophrenic about altfuel cars. On the one hand, the Big Three are eager to deliver. They can see the coming end of the oil era as clearly as anyone. They also know that the public is going to like fuel cell cars more than they like their current ones. (They will be silent, odorless, have no transmissions, and will have ample on-board electricity for GPS devices, VCRs, on-board navigation systems, and other consumer electronics that are already leading some automakers to offer 42-volt cars instead of the standard 12.) All three US automakers have impressive altfuel divisions staffed by true believers. Talk to them, and you'd think their whole company was 100-percent behind the altfuel future.

But the automakers have tremendous investment in the internal combustion engine, and are simultaneously determined to squeeze every penny out of those investments that they can. Similarly, the oil companies say they think of themselves as "energy companies" and say they are "looking forward" to providing the energy for altfuel cars. But not before they've made every nickel they can off their gasoline refineries and filling stations. So while both industries can point to slick "hydrogen divisions" and "Th!nk" vehicles, both also lobby Congress against raising fuel efficiency standards (which haven't increased since the mid-Reagan years.) Theirs is a subtle dance, never too overt, and a lobbyist for the Union of Concerned Scientists is feeding me

smoking-gun material on auto- and oil-industry attempts to slow down the altfuel future. Considering that the Internet as we now know it was created in about a decade, it is stunning to hear automotive visionaries say we'll have to wait three times that long to see widespread use of altfuel cars.

Still, they are undeniably coming. The current vision of the "ultimate" is a car that carries tanks of compressed hydrogen, which it doesn't burn, but rather uses in the chemical process of a fuel cell to generate electricity. In the best of all possible worlds, the hydrogen would have been manufactured by cracking it out of water using either solar- or wind-generated energy (the thinking being that, by the time the fuel cells are efficient enough to put in cars, photovoltaics and wind generators will be ready to do this job. If fossil fuels have to be burned to manufacture the hydrogen, there isn't much point.) Ford is taking the compressed-hydrogen route.

Second best would be the development, now underway by Chrysler, of a "direct methanol" fuel cell that injects liquid methanol straight into a fuel cell to generate electricity. One advantage of methanol is that people are used to refueling with a liquid as opposed to a compressed gas. But methanol has its own problems; it would take thousands of acres – with all the attendant land, water, and

pesticide downsides of mass agriculture – to grow the biomass needed to make significant quantities of fuel.

Still, direct methanol is better than the third option for fuel cells, which GM is pursuing, which is to build into every car a “reformer” that would crack the hydrogen out of a liquid fuel right on board, and then feed it to the fuel cell. GM is currently experimenting with a special fuel, made from petroleum, that would yield its hydrogen relatively easily. Not only does this route require a second complicated system on board every car, it also keeps the automobile tethered to Saudi Arabia.

To say that one technology is “better” than the other, though, is geekspeak. The best technology doesn’t always win – witness the triumph of VHS over Betamax or the PC over the Mac. So many variables go into a technology’s widespread adoption that nobody knows which of these will triumph.

Much depends on the interim technologies. The gas-electric hybrid reduces gasoline use, but doesn’t replace it. One year into their deployment, it’s already possible to picture them alongside the fax machine and the car phone in a future Museum of Supplanted Interim Technologies. Some people argue that natural gas will be the first widely used altfuel. It emits nought but carbon dioxide, and can burn in an only-slightly-modified internal combustion engine. But most

important, it would introduce the public to gaseous fuels, which is going to be hard. People hear “hydrogen” and they think “Hindenberg.” They see a tank of compressed gas and think of the shark exploding at the end of “Jaws.”

Once you start talking about altfuels, you have to start talking about altfueling stations, which raises a chicken-and-egg problem. People aren't going to buy altfuel cars until they're sure the fuel will be available wherever they go. And natural gas (or hydrogen) stations won't appear everywhere until enough people own the cars that need them. (Millions of Americans are now driving cars that could run on a 70/30 ethanol/gasoline mixture – instead of the standard 10/90 mix – and don't even know it. Many cars sold in the last five years are, essentially, altfuel cars, but because virtually no stations sell the 70/30 mix their capability is irrelevant.)

This is the kind of barrier the marketplace's invisible hand lacks the strength to break. California's state government is taking a crack at it by first mandating a certain percentage of the state's cars be zero emission by 2005 (and giving tax credits of up to \$4,000 to those who buy hybrids), and then by creating the California Fuel Cell Partnership which is planning a “hydrogen” corridor between Sacramento and the Bay Area, dotted with sufficient hydrogen stations to make owning a fuel-cell car in that area practical.

Between the levels of investment needed and the three-headed club of tax policy, regulation, and penalty that only government can wield, the pace of change toward altfuels depends largely on federal leadership. The first federal law defining an altfuel car and providing for incentives passed nine years ago, and a year later the Big Three joined with the feds in the Partnership for a New Generation of Vehicles. Eight years is a lifetime in the electronic world – there was no World Wide Web eight years ago, no Palms, and you still had to ask people if they used email. But in the smokestack world eight years is the blink of an eye. The automakers congratulate themselves on moving with blinding speed toward next year’s altfuel models and say they couldn’t have done it without federal help.

The most important thing government could do to accelerate the altfuels future would be to make gasoline more expensive. Two months ago, altfuelies looked at the oil men in the White House and thought that would never happen. But like almost everybody else, altfuel advocates are using September 11 as a lever to get what they want. Hybrids, fuel cells, natural-gas cars, and electrics look one way at \$1.29 a gallon and another at \$4.00 a gallon. And it’s worth mentioning that after California, the state with the most serious altfuel program is Texas.

Having worked on this only three days, I can't now say which group of engineers I'd focus on. It might be Carl Ovshinsky and his colleagues at Energy Conversion Devices, who are experimenting with a solid bed of metal hydride as a hydrogen storage device that would obviate the onboard compressed hydrogen tanks. It might be the folks designing California's "hydrogen corridor." I might choose a sampling – those with the most gee-whiz technology, those with the smartest political angle, those with the most money behind them, and so on.

The bottom line seems to be that altfuel cars are happening and their future is pretty clearly mapped by those in the industry. Fortunes will be made and lost trying to guess which interim technologies will get us to the bright hydrogen future, and which imperfect technology will ultimately win out. But altfuel cars have moved from the "if" to the "when" column. We can give our readers a thorough and entertaining update on where this technology is now, and where it's headed.

End.