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The high potential of plug-in hybrids

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This article was originally written for The Hybrid Debate.

The hybrid car may be a milestone in the history of personal transportation, but it still burns petrol and releases CO2. In this sense, it's no different from the Model-T Ford of 1908. True, the technology provides significant efficiency benefits. But it won't be revolutionary until its next incarnation, the "plug-in hybrid electric vehicle" (PHEV), goes mainstream.

In a PHEV, the internal combustion engine (ICE) is further reduced in size; the electric motor and battery pack are scaled up; and a cable is provided, to connect the car to the national grid via wall sockets. With heavy-duty electrical components taking more of the strain, the ICE runs for shorter periods of time, thus improving the car's efficiency.

The most significant aspect of this development is, arguably, the plug itself, since it has the potential to shift the car's primary energy source from petrol to electricity. Suddenly, propulsion could be powered by anything from coal, gas and nuclear fission to wind, waves and sunlight. In a world of dwindling fossil fuels, this decoupling of the car from oil could be extremely beneficial, especially to countries such as the UK that are (or are about to become) net oil-importers.

Furthermore, a fleet of PHEVs could lower a country's carbon emissions by acting as a "back-up battery" for the national grid.

How would this be possible? Well, PHEVs can operate in a mode called "vehicle to grid", under which surplus energy is discharged back into the wall. A national grid system could use this energy to mitigate a variety of problems, including the intermittent nature of renewable energy sources.

The precise nature of this arrangement would be controlled by signals sent along the power lines and interpreted by the car based on your personal preferences. For example, you might insist that your car had to be fully charged by 7am, so that you could drive to work. However, you might also allow it to be used by the grid for load-balancing while you were asleep, or while you left the car plugged into an alternative wall socket at work. It's conceivable that utility companies would pay you for this service, either as a fixed annual payment or through a significant price differential between electricity taken from the grid and that sold back.

As Professor Andrew Frank (wikipedia) of the University of California, Davis has argued, a nation with significant numbers of hybrid vehicles could increase its "base load" (i.e. its total energy generating capacity) without having to build new power stations. Cars could be charged at night while demand for electricity was low, and discharged during the day while demand for electricity was high. This would reduce the number of peaks and troughs in the energy generation system and thereby lower the cost of electricity for everyone.

At first glance, this idea appears simply to shift the burden of emissions from one source of energy

to another. However, power stations and hybrid drive trains are significantly more efficient than small internal combustion engines, and "well to wheels" research suggest Frank's plan would increase efficiency and reduce pollution.

Ultimately, PHEVs provide a tantalising way to transition away from oil, and ultimately other fossil fuels, towards renewable energy, whilst maintaining all of the benefits that cars provide today.

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The Hybrid Debate encourages people to consider how their choice of car affects the world we live in and imagine how mass acceptance of hybrid technology could influence other aspects of our lives.

The aim is to encourage informed analysis and public debate amongst advocates and sceptics of the new technology.

Writers and experts in areas ranging from urban planning to the economy have been asked to kick start the debate by imagining a hybrid future and the implications in their area of expertise.

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