

## analysis

# The electric cart before the low-carbon horse

An obsession with the myth that electric cars are energy-efficient threatens to distort UK transport policy and, potentially, to waste a great deal of public money, says **Richard Pike**.

Soon, the term kWh/100km will become prevalent as an indicator of energy consumption in advertisements for electric cars, as the government's planned subsidy of up to £5,000 per car begins to focus prospective buyers' minds on these vehicles.

There is a ring of familiarity to it. The kilowatt-hour has long been the popular unit of electrical energy, and we know it costs us about 10 pence. The 100km is no stranger, either, as petrol consumption is usually expressed in litres per 100 kilometres. But a confusing array of other numbers appears to make the electric car the answer to all our dreams.

What does a kWh/100km figure really mean, when typically for a conventional car we are given petrol consumption figures in terms of urban, extra urban and combined? These refer, loosely, to town driving, motorway driving, and the weighted average. And where do the extraordinarily low carbon emission figures come from?

The myth of the electric car centres on its energy efficiency, reduced carbon emissions and low operating costs. There is no doubt that in a society of low-carbon power generation electric vehicles must be part of a country's transportation strategy, but in the UK right now there is woolly thinking, a lack of scientific scrutiny and, from 2011, a potential waste of £250 million of public money to subsidise the purchase of over 50,000 vehicles.

The Department of Transport cites three principal reports to justify its subsidy-based strategy. The first two, by the WWF and an academic, are written in an almost conversational style, while the somewhat drier third report, from a well-known consulting company, compares the full life-cycle energy requirements of an electric and petrol car using proprietary computer software, but showing no details of the science. Crucially, not one makes clear that, up to its publication, there was no single model of a car that had both an electric and petrol version available for comparison.

There are existing comparisons that show energy consumption of 20kWh/100km for the electric and 80kWh/100km (quoted in the academic report) for the petrol equivalent. In the consultancy report, the equivalent figures are 16kWh/100km and 60kWh/100km, respectively. In all three, the electric car is reportedly

much more energy efficient, by a factor of 3 or 4.

But analysis by what is now the Department of Energy and Climate Change shows that, of the energy available in the fuel in a power station, on average just under 36 per cent is delivered as electricity to the end-user. To account for this, the figures above for smallish electric cars must be multiplied by nearly three to give 60kWh/100km and 48kWh/100km. A typical small four-seater petrol car returns 5.5, 3.6 and 4.3 l/100km for urban, urban extra and combined, or 55, 36 and 43 kWh/100km. The energy advantage has effectively disappeared.

Even if the energy use were identical, the carbon emissions advantage of the electric car in today's UK would be small. The complete replacement of all 30 million passenger cars in the UK, which form 12 per cent of the UK carbon footprint, can be shown to lower this figure to just 10 per cent at best. The £250 million subsidy will thus produce a saving measured as a change to only the *third decimal place* of that percentage. And this at a time when the funding of thousands of university research workers is being constrained—many on projects related to energy, transport and the environment.

For every litre of petrol (10kWh) the internal combustion engine releases approximately 2.3 kilograms of carbon dioxide into the atmosphere. In the UK, 10kWh delivered into an electric car results in average emissions of 5.5kg. In France this is already close to zero, as more than 85 per cent of electricity is generated from nuclear and renewable sources. The electric car consumption of 20kWh/100km readily converts to 110g/km of carbon dioxide in the UK, which is typical of a small petrol car, but is higher than is often claimed in the adverts.

Finally, it is worth asking why the 10kWh in petrol is just as expensive as the 30kWh from fuel burnt in the power station in order to deliver 10kWh of electricity? The answer, of course, is that petrol is taxed, while electricity is not. With a sizeable switch to electric cars, that lost potential revenue stream for the Treasury may mean tax-free electricity is unlikely in the future.

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