Cutting carbon from road transport – a ten-year perspective

Electric, electric-hybrid and hydrogen-fuelled vehicles seem to have been emerging gradually for some years now, but how far have they got? Here, Neil Wallis, *from the largely government-funded Low Carbon Vehicle Partnership, takes a long view.*

The Low Carbon Vehicle Partnership (LowCVP) recently celebrated 10 years of working to facilitate the shift to low carbon road transport and the occasion prompted the Partnership to reflect on the progress that has been made in decarbonising the sector over the last decade.

The LowCVP was set up by the government in 2003 to engage stakeholders in the debate, to find better policy solutions and develop other initiatives for cutting carbon from road transport; a particularly hard nut to crack given the long-term trend of growth in vehicle usage. Responsible for around 20% of overall carbon emissions it was clear, though, that the UK would not be able to meet emissions reduction targets (now, of course, enshrined in law under the Climate Change Act) without tackling this problem effectively.

The Partnership – which now has around 200 member organisations – was tasked not only with delivering road transport emissions reductions but also with safeguarding the economic benefits provided to UK plc by the automotive sector and, in particular, to help place local businesses at the forefront of the low carbon shift.

New vehicles 24% cleaner than a decade ago

In 2002, the average new car in the UK emitted 174.2 g of carbon dioxide per kilometre. In 2012, the comparable figure was 133.1 g/km; a reduction of 23.6% – the most rapid efficiency improvement in recent UK automotive history and ahead of the achievements in most other countries. Moreover, 10% of new cars sold in the UK in the last quarter of 2012 emitted less than 100 g CO_2/km.

While there has been a growing disparity between published (test cycle) measures of carbon dioxide (a close proxy for mpg) and 'real world' experience which could account for some of the improvement in vehicle efficiency, there is little doubt that progress has been rapid and this is also validated by verifiable reductions in demand for fuel (particularly clear when compared with total vehicle miles driven, which has generally continued to increase).

By an overwhelming margin, the main contributor to progress made over the last decade has been through improvements in the efficiency of petrol and diesel engines (complemented in terms of overall emissions reductions by a growth in the share of diesel in the vehicle parc).

Manufacturers have adopted a variety of complementary approaches to improving efficiency, including the introduction of 'stop-start' systems, partial electrification (the introduction of 'mild' hybrids such as the original, iconic Toyota Prius), improved aerodynamics and new, lighter body materials. Components suppliers too have contributed through the development of, for example, more energy efficient (lower rolling-resistance) tyres.

There has been a growing focus also on driving style – which can alter mpg by 20% or more – and the provision of dashboard indicators to encourage motorists to 'eco-drive'.

Alternative fuels have begun making some inroads and the UK – along with other governments – has introduced significant incentives for the purchase of vehicles running, wholly or partly, on electricity as well as investing public money in the provision of recharging infrastructure. At the latest count there were around 4,000 publicly accessible recharging points for electric vehicles in the UK; and this does not count the opportunity for vehicles to be recharged at home, overnight.

The current consensus, though – as reflected in the recent RAC Foundation/UKPIA report *Powering Ahead* – is that emissions reductions to 2030 will continue to depend mainly on incremental improvements in petrol and diesel technology, but with a growing contribution from plug-in hybrid vehicles (see also the news story on page 11). A range of plug-in vehicles – such as Vauxhall's Ampera – are expected to make significant inroads in the 2030 timescale and these vehicles will allow the majority of miles to be driven on electric power with petrol – or, sometimes, diesel – providing an extended range facility.

Motivation mainly comes from Brussels

The main motivator of emissions reductions has been European regulation. Despite early reservations and some opposition, the motor industry has generally engaged with, and accepted, the need for an accelerated reduction in emissions to help tackle climate change. Here in the UK, many of the motor manufacturers individually, and collectively via their trade association (SMMT), have played a positive role in the debate, and have been active and constructive members of the LowCVP.

Most companies will meet the EU's 2015 average new car carbon dioxide target of 130 g/km and there is an emerging consensus around a 95 g target for 2020. The early salvos around the 2025 objective have produced an indicative target of 68–75 g, but the decision still has to be confirmed by the full European Parliament, EU member states and the Commission. The indicative target lays down a marker that the average new car should need less than three litres to drive 100 km by 2025, the equivalent of about 100 mpg!

The Commission is also indicating that it favours the introduction of a new test cycle, more representative of real-world driving conditions as well as the tightening of procedures around emissions tests.

While cars are significantly the biggest contributor to road transport carbon emissions, trucks, vans and buses also contribute over a third of emissions and European policy focus has recently shifted more to these types of vehicle. The Commission is working on a comprehensive strategy to reduce carbon dioxide emissions from heavy duty vehicles in both

About the LowCVP

The LowCVP is a public-private, not-for-profit partnership that exists to accelerate a sustainable shift to lower carbon vehicles and fuels and create opportunities for UK businesses. The LowCVP has been – and continues to be – mainly funded by the Department for Transport with increasing contributions through membership fees and sponsorship/other income. Around 200 organisations are members, from diverse backgrounds including automotive and fuel supply chains, vehicle users, academics, environment groups and others.

www.lowcvp.org.uk

The Ashwoods Hybrid Demonstrator

freight and passenger transport. It has recently proposed, for example, changes in the rules to encourage manufacturers to develop more aerodynamic trucks which will reduce fuel consumption, cut emissions and also enhance safety for road users.

In the UK, the government has introduced a Plug-in Van Grant (to complement the Plug-in Car Grant) to stimulate sales and has also – adopting technical guidance from the LowCVP – successfully run four successive rounds of its Green Bus Fund to support the widespread introduction of low carbon buses. The UK is now the largest market in Europe for low carbon and hybrid technology in buses.

In addition to providing support, guidance and technical input to a range of government policies in this area, the LowCVP has devoted considerable attention over the last decade to improving consumer understanding and awareness of low carbon vehicles to encourage their uptake.

Amongst these initiatives was the LowCVP's facilitation of the introduction of a colour-coded fuel economy label, initially present on all new cars and, latterly, on used cars in larger retail outlets. The LowCVP has also recently developed a version of the label for electric and plug-in cars to reflect growing consumer interest in these technologies. In collaboration with industry and advertising partners, the LowCVP introduced a 'Green Claims Guide' which aims to encourage greater consistency in low carbon vehicle marketing and in the ways new and unfamiliar technologies are explained to consumers.

Low carbon car companies invest in the UK

Progress in cutting vehicle emissions over the last decade has been combined with an encouraging economic performance by the UK automotive sector. A consistent and forward-looking policy environment has encouraged car companies and their suppliers to invest in the UK, such that the automotive industry is currently looked upon as one of the UK economy's bright spots in a generally bleak picture.

Significant developments include Nissan's investment in production of the electric Leaf (and its batteries) which recently began in Sunderland, Toyota's in hybrid models in Derby and Ford's of EcoBoost engine models in Wales. Reports have suggested that Ellesmere Port is a favourite location to begin European production of Vauxhall's Ampera.

These high profile investments, and others associated with them, have provided a much needed boost to the UK's economic prospects and to jobs in areas of high unemployment. A recent forecast suggested that more than £150bn is likely to be invested in low carbon vehicle technologies in the UK over the next 20 years.

Biofuels – a pause for re-evaluation

Significant developments in terms of emissions reduction over the last decade have not been restricted to vehicle technologies. Driven by European policy enshrined in the Renewable Energy/Fuel Quality Directives, the UK has introduced a mechanism – the Renewable Transport Fuels Obligation (RTFO) – which obligates fossil fuel suppliers to produce evidence showing that a percentage of fuels for road transport supplied in the UK come from renewable sources and are sustainable. (The LowCVP developed the technical guidelines which now enable the government to review the carbon and sustainability performance of biofuels supplied to the UK market). The Obligation states that 4.75% of all fuel sold in the UK in 2013 should come from renewable sources.

There is currently uncertainty, however, about the future of biofuels policy at European and national level following a series of reports and studies by NGOs and government agencies which point to the impact of increased biofuels adoption on land-use. Indirect land-use change – or ILUC – has been suggested to adversely affect food prices and availability, biodiversity and carbon emissions and efforts are under way to better understand its impacts and, if possible, incorporate these into policy mechanisms.

The European Commission is expected to confirm its view on how ILUC should be handled in policy terms this year. The UK government has stated that, given concerns over the sustainability of certain biofuels, it is not proposing to increase targets for biofuel supply under the RTFO beyond 2014 at this time and that addressing ILUC is a prerequisite for ensuring biofuels sustainability.

Decarbonising the heavy duty vehicle fleet is proving particularly challenging, but working from a recent LowCVP report, UK industry and government are actively reviewing the opportunities for gas and biogas (in both compressed and liquid form) in the truck market, and investigating the potential introduction of a range of hybrid technologies and electric plug-in options for urban truck operations.

Hydrogen as a low carbon fuel

Hydrogen has for some time been promoted as a potential low carbon fuel of the future. While the technology is well understood and has been shown to work effectively in real-world operations (such as trials of buses in London) there are still significant challenges in terms of the development of a viable hydrogen refuelling infrastructure and in the generation efficiency, transport and storage of the fuel.

Government recently published the first phase of the UKH2Mobility project which provides a 'roadmap' for the introduction of vehicles and hydrogen refuelling infrastructure in the UK. The report confirms a view published earlier that over one and a half million hydrogen-powered vehicles could be on UK roads by 2030. The next phase of UKH2Mobility will further develop a framework for the actions that need to happen for that potential to be realised.

Actions to develop a hydrogen transport economy have not been restricted to government at a national level, or above. Over the last few years the London Hydrogen Partnership, convened by the Greater London Authority, has initiated over £50mn worth of hydrogen projects; attracting and rolling-out new hydrogen buses, taxis, scooters, refuelling stations, materials handling vehicles and fuel cell combined heat and power units to London.

Looking to the future

In addition to providing an opportunity to review past progress in decarbonising road transport, the LowCVP's tenth anniversary also gave a prompt to con-

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sider future strategy. With the plethora of vehicle developments and an increasing range of energy and fuel sources to consider, identifying the optimal pathway to the UK's 80% carbon reduction target requires careful consideration of the most appropriate solutions for each vehicle segment. Electrically driven vehicles in city centres bring with them huge benefits in urban air quality, while high energy density liquid fuels still appear one of the best available options for long haul operations.

One of the key challenges identified is that the introduction of new transport fuels like electricity and biofuels means that we will no longer be able to rely solely on measures of emissions at the vehicle tailpipe to assess our true progress in tackling climate change. In the longer term we need to establish systems which will allow us to monitor progress on a full life-cycle basis, including emissions derived from the production, distribution and disposal of both fuels and vehicles.

While over the next decade the use phase will remain dominant, information and systems will need to be developed to provide policy makers with better means of understanding these impacts and to build them into policy mechanisms. Incorporating the whole fuel pathway (well-to-wheel) and including other greenhouse gases such as methane in the measurement will allow closer correlation with climate effects. Ensuring the test process reflects real world driving will greatly enhance the relevance of the measures as far as drivers are concerned. These techniques are already in place as they have been developed by the LowCVP for the low carbon emission bus evaluation used for the Green Bus Fund in the UK.

This theme of 'beyond the tailpipe' which was introduced at the LowCVP's celebration event last January will provide the focus for the Partnership's upcoming annual conference, to be held on 11 July in Central London. The conference aims to explore this policy landscape and set out some stepping stones on the road to incorporating emissions from beyond the tailpipe. The event will focus on the technical implications of the move to a more holistic view of emissions analysis, introduce ideas and mechanisms from other sectors and also look at what will need to be done to engage consumers in the process.

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