Accelerating progress towards low carbon vehicles and fuels

Cultivation, processing and distribution of biofuels leads to greenhouse gas emissions. Through effective use of by-products and efficient processes, savings approaching 80% can be achieved in some circumstances – but performance varies widely

Photo: LowCVP

Greg Archer, *Director, Low Carbon Vehicle Partnership (LowCVP), outlines the Partnership's work to accelerate the uptake of low carbon vehicle and fuel technologies in the UK.*

The need for urgent progress to address climate change was reaffirmed in the recent G8 Gleneagles Conference at which the UK government highlighted the issue as one of two key concerns. In the final communiqué participants agreed to 'act with resolve and urgency now to meet our shared and multiple objectives of reducing greenhouse gas emissions, improving the global environment, enhancing energy security and cutting air pollution ….'

Since 1990, the UK has made significant progress towards reducing its greenhouse gas emissions[1] and is on target to achieve its Kyoto target of a 12.5% reduction in greenhouse gas levels on 1990 by 2012. However, the more ambitious domestic 20% reduction in carbon dioxide (CO_2) levels by 2010 will not be met without further policy measures (see **Figure 1**). A revised climate change programme is expected to be announced in November, around the time of the pre-Budget report.

Despite improvements in many sectors, overall UK carbon dioxide emissions have been rising in recent years. In road transport, improvements in average CO_2 emissions from new vehicles have been taken up by the growth in traffic. Road transport now contributes nearly a quarter of total UK emissions by end-user and is projected to rise to approaching one third by 2020. Significant reductions in total UK greenhouse gas emissions are therefore unlikely to be achieved without progress in reducing emissions from road transport.

The Low Carbon Vehicle Partnership (LowCVP) was established in 2003 to accelerate the uptake of low carbon vehicle and fuel technologies. The Partnership's remit also includes the objective of providing new opportunities for UK businesses. LowCVP provides an interface between industry, government, environment and consumer groups, with the aim of achieving consensus on the policies likely to have the greatest impact on the market for low carbon vehicles and fuels. Reducing road transport emissions will require a combination of measures, including:

- Reduced vehicle emissions – through stimulating sales of more efficient vehicles.
- Increased use of low carbon/alternative fuels.
- Improved driving behaviour – to improve fuel economy.
- Reduced vehicle use – through more responsible use of vehicles and increased use of public transport, walking and cycling.
- Better freight distribution.

The Partnership's current work programme is focused around the first two areas, addressed through sectoral working groups for passenger cars, fuels, buses, commercial vehicles and innovation. The LowCVP's membership has grown rapidly and now includes over 165 organisations. Membership is drawn from a wide range of sectors, backgrounds and perspectives, including automotive companies – vehicle manufacturers, distributors, suppliers and research and development organisations – academics, environment groups and other road user groups. There is also significant representation from the energy/fuels industry, including leading oil and energy companies, and new biofuels suppliers.

Challenges ahead

In accelerating progress to a low carbon road transport future the Partnership faces three key challenges:

- The limited market and incentives offered to encourage purchase of environmentally friendly vehicles.
- The relatively high cost and limited

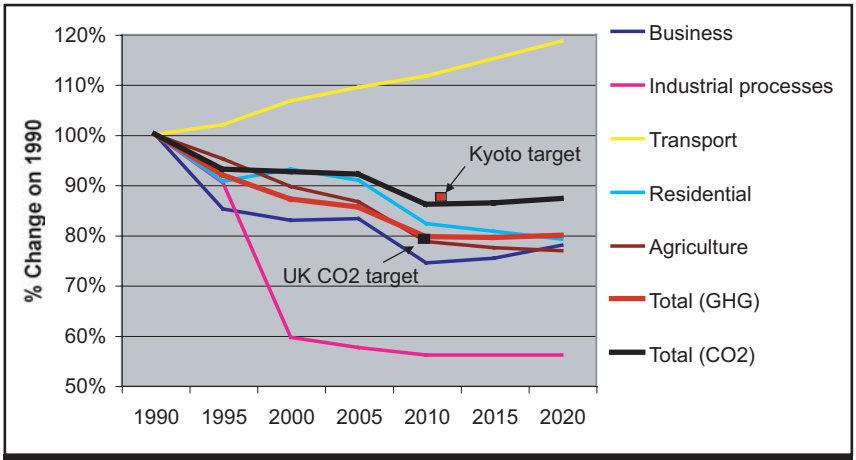

Figure 1: Changes since 1990 in UK greenhouse gas emissions by principal end user segments

availability of renewable transport fuels.

- The relatively small amounts of global research, development and demonstration of low carbon cars being undertaken in the UK. This makes it difficult for the UK to influence a global market.

In addition, the low level of global motor industry profitability is creating additional resistance to further environmental regulation that may increase costs or affect competitiveness.

Transforming the market

Since the mid-1990s, average CO_2 emissions from new cars sold in the UK have declined by about 10% – in part due to strong growth in sales of more efficient diesel vehicles. Despite this improvement, just 3% of new vehicle sales are for the most efficient vehicles in vehicle excise duty (VED – annual 'road tax') bands A and B (see **Figure 2**). The UK government's 'Powering Future Vehicles Strategy', which complemented the Energy White Paper of 2002, established narrowly focused but ambitious low carbon vehicle targets – 10% of new cars sold to emit 100 g/km CO_2 or less and 600 low carbon[2] buses per year in operation, both by 2012. The scale of the challenge is illustrated by the fact that less than 300 new cars and about 30 buses met the 2012 targets in 2004.

Research undertaken by the Partnership[3] found that most car buyers are unaware of the cost savings of purchasing more fuel efficient, 'climate-friendlier' cars. The average motorist significantly underestimates the total cost of owning a car and many drivers are unaware that VED rates are less for cars producing lower CO_2 emissions. Furthermore, many car buyers incorrectly assume there is little difference in fuel efficiency (miles per gallon) between cars of the same type. Consequently, motorists are more likely to be influenced by immediate considerations such as the cost of purchase and driving performance rather than by fuel economy and environmental issues.

To address this issue, the Partnership has brokered a voluntary agreement with the UK motor industry to introduce energy efficiency labels for new cars displayed in all UK dealers. The label is familiar to consumers as it mirrors the 'traffic light' energy efficiency coding that currently appears on fridges and washing machines (see **Figure 3**). It gives clear information to enable consumers to compare the environmental and relative running costs of new vehicles. The new label should be present in all new car showrooms in time for the new registrations sales surge this month.

Renewable transport fuels

Despite rising prices, oil generally remains the most cost-effective fuel for vehicles and is likely to remain so for the foreseeable future. Sales of alternative-fuelled vehicles are hampered by limited refuelling infrastructure and choice of models. This is likely to constrain the market principally to depot-based vehicles such as buses, delivery vans, taxis and some fleet operations for which 'return to base' refuelling is possible.

Hydrogen – Hydrogen-powered vehicles offer the potential for zero emissions… but only if the hydrogen can be produced and distributed renewably. Recent government research[4] estimated that to provide hydrogen by electrolysis for a fuel cell vehicle fleet representing 20% of all UK vehicles would require the construction of six or seven 1-GW nuclear reactors – or between 2,000 and 3,000 5-MW wind turbines. This would be in addition to the costs of installing the distribution and refuelling infrastructure. Collaboration will be required between vehicle manufacturers, the energy industry and government in order to develop this infrastructure.

Producing the vehicles at a competitive cost is also a major hurdle. The current cost of a fuel cell vehicle is about £500,000, which needs to be reduced to below 1% of current levels for fuel cell vehicles to be commercially viable in most industry segments. Volume production will aid this process but, at present, the cost of the fuel cell is prohibitive for widespread adoption. To power a small family car the fuel cell contains some 60 grammes of platinum.[5] Whilst this is likely to be reduced, cheaper materials such as enzymatic catalysts may need to be developed to provide more cost-effective solutions. Given the technical and economic challenges, informed opinion generally considers that it is unlikely that a significant proportion of the vehicle fleet will be hydrogen-powered before 2030.

Biofuels – Blends of biofuels within petrol and diesel offer the potential to reduce greenhouse gas emissions from vehicles in use. The CO_2 absorbed from the atmosphere during the growth of a biocrop is released back to the atmosphere when the biofuel is burned. There are emissions of CO_2 (and other greenhouse gases) from the production of crops and the manufacture and distribution of biofuels, so the use of biofuels results in some net emission of greenhouse gases. The net greenhouse gas emissions vary with the biofuel and way in which it is produced but, with the best options, they can be very low. The UK government estimates that adding 5% of bioethanol and FAME (biodiesel) to petrol

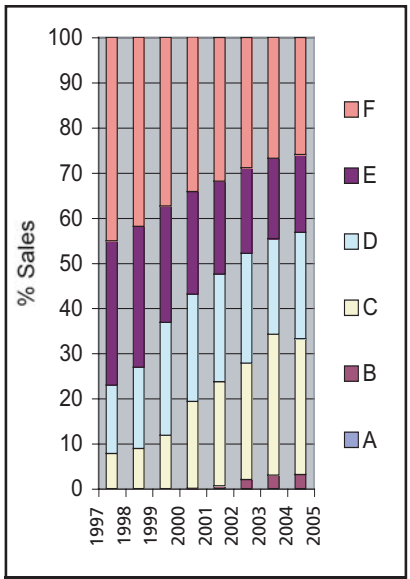

Figure 2: New car sales by VED band

and diesel could save up to one tonne of the current 32mn tonnes of annual carbon emissions from road transport.

LowCVP coordinated research to calculate the greenhouse gas emissions from the production of bioethanol from wheat. The study, which also reconciled methodological differences between previous studies, concluded that how the fuel is made and how its by-products are used, strongly affects the energy and greenhouse gas balance of the final product. The outcomes ranged from showing very little greenhouse gas benefit (7%) based on certain production pathways, to significant benefits (77%) based on others. The report also concluded that the most carbon-efficient models are the most costly and that environmental benefits need to be balanced against economic costs. The Partnership is currently peer reviewing similar research concerned with biodiesel pathways.

The Partnership has recently been providing input to the UK government's deliberations on the proposed renewable transport fuels obligation (RTFO). Under the RTFO, fuel suppliers will be required to source an increasing amount of their energy needs from renewable sources – such as supply of biofuels. The LowCVP has undertaken a feasibility study to examine the options for introducing a sustainability assurance scheme within the RTFO.

Most industry stakeholders support the introduction of biofuels sustainability assurance schemes to ensure that biofuels achieve significant greenhouse gas savings and avoid other adverse environmental effects, such as deforestation, or social detriment, such as use of forced labour. There are a wider range of views as to whether these schemes should be linked to the RTFO or be voluntary, and whether carbon certification should be introduced from the commencement of the RTFO or at a later stage. LowCVP will be publishing the results of its research and final position of these issues in the near future. It is also working on development of a voluntary biofuels sustainability standard.

Opportunities for UK business

The Partnership is also actively engaged in creating new opportunities for UK companies in the transition of low carbon vehicles and fuels. One important development in this area is the new Centre of Excellence for Low Carbon and Fuel Cell Technology (Cenex; **www.cenex.co.uk**).

The Partnership has had an important role in creating Cenex, which will be industry-led and will promote and encourage the development of low carbon technologies applicable to the automotive industry. The Centre aims to be the 'hub' for knowledge in this area, making use of significant resources already existing in universities, institutions and companies around the UK.

Photo: LowCVP

Dr Stephen Ladyman, UK Minister of Transport, announcing the start of the fuel economy label 'roll-out' on 1 July 2005 (see right)

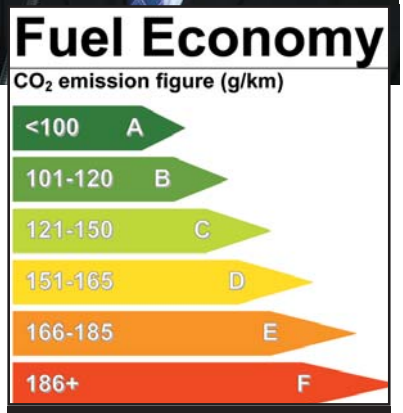

Figure 3: The new fuel economy label is familiar to consumers as it mirrors the 'traffic light' energy efficiency coding that currently appears on fridges and washing machines

Cenex will create stronger links between academia, supply chain companies and OEMs (original equipment manufacturers). It will highlight, demonstrate and develop UK expertise, thereby helping to stimulate inward investment to the UK and new opportunities for UK technology providers. The Centre will also assist in research coordination and provide part of the DTI (Department for Trade and Industry) knowledge transfer network. The Centre is to be based at Loughborough University. The government, via the DTI, has provided funding of £6.5mn over five years, which will be matched by industry. About half the funds are intended for technology validation projects.

Transport 'challenge'

The Low Carbon Vehicle Partnership has recently launched a 'challenge' to the UK's transport policy and academic communities to contribute original or innovative proposals to enable the UK to accelerate the shift to low carbon vehicles and fuels and help meet climate change targets.

The 'Low Carbon Road Transport Challenge' is intended to bring forward policy proposals and other initiatives that will be tested and validated by representatives of the Partnership. The best proposals will be presented at LowCVP's annual conference in spring 2006. Leading representatives from government, motor, fuels and related industries will be present at the conference and LowCVP will invite a government minister to respond to the Challenge submissions.

The Challenge is supported by the Tyndall Centre for Climate Change Research, a leading academic network that focuses on policy advice to mitigate climate change. The Centre will raise awareness of the initiative amongst relevant communities and advise on other aspects of the process.

For more information, please visit **www.lowcvp.org.uk**

Notes

1. UK Climate Change Programme Consultation, **www.defra.gov.uk/corporate/consult/ukccpreview/ccpreview-consult.pdf**
2. Low carbon defined as 30% below current average carbon emissions
3. Car buyer research report – Consumer attitudes to low carbon and fuel efficient passenger cars, **www.lowcvp.org.uk/uploaded/documents/Consumer_research-_final_5.05.pdf**
4. A strategic framework for hydrogen in the UK, **www.dti/gov.uk/ energy/sepn/hydrogen_framework_full.pdf**
5. 'Car makers gear up for the next shortage – platinum', *Financial Times*, 6 July 2005