ALTERNATIVE

Arguably the most impenetrable barrier preventing wider adoption of LNG/CNG (liquefied/compressed natural gas) as a replacement fuel for heavy-duty diesels is one significant step closer to being dismantled. As predicted, National Grid has confirmed that a new road tanker loading facility will be built at its huge LNG terminal on the Isle of Grain, Kent, with the initial two-bay site opening within nine months and transforming security of supply.

In parallel, the GATE (Gas Access to Europe) terminal at the port of Rotterdam is to build a new 'break bulk' terminal for distributing LNG around north-west Europe. That announcement follows a commitment by Shell to buy the new capacity for freight fuelling, and the terminal should be operational by the close of 2016.

Clearly, reliable availability of LNG/CNG, which is critical to maximising payback on trucks converted for dual-fuel, is ramping up – with global energy businesses behind it. And there is nothing quite like good supply and big names to signal a moving market and, in turn, to stimulate distribution and consumption. So, on the one hand, we can expect serious growth of the public LNG/CNG refuelling infrastructure across the UK (look at Howard Tenens' Swindon CNG station, which opened in July, for example), and, on the other, a sea-change in conclusions from operators' feasibility studies, which have hitherto labelled dual-fuel as 'niche'.

So much for the drama on the supply side. What about the technologies underpinning dual-fuel and gas trucks, particularly in the ongoing absence of Euro 6 engine conversions? Well, there's no doubt that the industry is seeing something of a hiatus where new trucks are concerned, while the main players – conversion specialists but also increasingly truck OEMs – catch up with the emissions legislation. Best estimates for most Euro 6-ready equipment are the end of this year, or early next.

However, a wealth of anecdotal evidence suggests that Euro 5 conversions are in growth mode, partly on derogated new vehicles, but mostly existing fleets, including second-hand trucks. And it's not only larger operators, such as DHL and Muller Wiseman, taking the plunge. Smaller independents, such as KBC Logistics, are also getting in on the act – in its case, with a fast-growing fleet of Mercedes-Benz Axors de-fleeted from Dawson Rentals and converted to dual-fuel LNG and diesel by Hardstaff.

Evidence-based decisions

Should you get on board? To answer that question, you need to look at data coming out of the Technology Strategy Board's two-year, £23 million Low Carbon Truck trials. To recap, these involve

£4,300 to £30,000
conversion costs

FUELS

Despite the lack of proven Euro 6 dual-fuel engine conversions to date, the alternative fuels industry continues to accelerate. Brian Tinham reports

operators including Argos, Brit European, DHL, Eddie Stobart, Howard Tenens, JB Wheaton, John Lewis, Lenham Storage, Muller Wiseman, Tesco, United Biscuits, Waitrose and Wincanton, running trucks from DAF, MAN, Mercedes-Benz, Scania and Volvo. Although the final reports from all 13 trial consortia are not due until December next year, interim information is being made available biannually – with the next release scheduled for the Cenex Low Carbon Vehicle Event this month at the Millbrook Proving Ground.

Last January's review, which covered the first six months' findings (*Transport Engineer*, March 2014, page 23), was encouraging. Notable figures included: conversion costs ranging from £4,300–£30,000, depending on type; and substitution of 40–80% (mean 46%) trending upwards for dual-fuel gas, but 87% for used cooking oil. And confidence in the numbers was good, with trial trucks (175 of the 354 committed operational) by then covering a total of 1,000,000km per month, and having consumed 900,000 litres of diesel, 527 tonnes of methane, 41 tonnes of bio-methane and 48 tonnes of cooking oil.

According to CENEX technical specialist Steve Carroll, the growing numbers of commissioned trial trucks are showing rising gas substitution performance, mostly in line with the improving refuelling infrastructure. "The fleets maximising substitution are those on journeys that allow regular refuelling," he explains. "Some running long-haul on more random journey patterns find they can't always get to the gas infrastructure, so they can't take full advantage... Although there are differences in performance between the [conversion] technologies, it's not really about that: it's about the journeys."

46%
substitution rates for dual-fuel gas

87%
substitution rates for cooking oil

Nevertheless, Carroll believes the freight industry is now on its way to 'critical mass', with the likes of Gasrec, Chive and CNG Services building up their gas plants and refuelling networks, and reliability of supply underpinned by big LNG importers, such as Shell and National Grid. For him, the Low Carbon Truck trials have already made a difference – not only by focusing attention on the LNG/CNG infrastructure, but also by building awareness and confidence in the truck technologies and very real payback.

Mainstream biofuel

"The infrastructure is being installed, and fleets are purchasing and using dual-fuel trucks, without government funding," observes Carroll. "Yes, we're building the body of evidence through the trials, but the industry is already moving ahead, putting these trucks into the mainstream and now looking at increasing their adoption." And while the numbers of trucks are still small, that will soon change, he insists.

What matters next is twofold. First will be the arrival of Euro 6 retrofit conversions, from the likes of Clean Air Power, G-Volution, Hardstaff and Prins, and, just as important, the OEMs' own production line multi-fuel engines. The most eagerly awaited among the latter is Volvo's direct-injection Euro 6 dual-fuel system, said to offer much higher gas substitution, with unconfirmed rates beyond 90%.

While unwilling to release details – including on whether the technology stems from its partnership with Clean Air Power – Volvo fleet support manager

Power of used cooking oil

There's more to alternative fuels than methane, from whatever source (fossil fuel or renewable bio-methane) and in whichever phase (cryogenic liquid or gas). If your interest is pure biofuel, then there is also reprocessed used cooking oil (UCO), which is the focus of United Biscuits' TSB consortium, working with Biomotive Fuels and Leeds University.

This is nothing like as whacky as it might sound. Jim Ebner, director and founder of Biomotive, explains that his company used to produce 20,000 litres of UCO-based biofuel per week, for local bus companies, at its plant in Hampshire – taking waste oil from the retail market and generating a diesel replacement with near identical calorific value. That all came to an end in 2012, when the government closed its 20p per litre duty derogation, increasing RTFO (Renewable Transport Fuel Obligation) credits but crippling the business case.

"That's when we started working with Convert2Green [C2G], based in Middlewich, Cheshire, helping to augment their biodiesel plant with our UCO technology to process the newly developed C2G Ultra Biofuel," explains Ebner.

However, Biomotive was already working with United Biscuits, having converted several of the firm's trucks to run on UCO biofuel processed from its own waste. With further development required, the UB consortium was formed and won funding under under the TSB Low Carbon Truck trials. It commissioned new biofuel vehicle management systems from German company Bioltec on 10 Mercedes-Benz Euro 5 Axor 2543s, and installed a 30,000-litre heated refuelling station, from UK Bunded Fuel Tanks, at UB's Ashby depot.

How's it going? Data from the trucks' on-board telematics confirms an average 87% C2G Ultra Biofuel substitution rate, with the trucks starting on diesel and the system progressively blending biofuel, reaching close to 100% while trunking. One minute before re-entering the depot, UB's drivers simply switch back to diesel to flush the system through.

According to analysis by the Energy Institute at Leeds University, no detrimental effects have been attributable to the biofuel. Indeed, in some cases, injectors running with Ultra Biofuel are cleaner at scanning electron microscope level than those running diesel. Also, thermo-gravimetric analysis of the biofuel shows the kind of consistency we would all expect from any fuel. And, given that UCO starts with a zero carbon footprint, and that transportation is zero and processing minimal, the 'well to wheel' carbon reduction is unbeatable.

As for fuel consumption, that reflects the calorific value of the biofuel at 1–2% down, compared to UB's reference vehicles – set against which, the fuel is cheaper (particularly given UB's case) and the conversion is cheap at £6,000. Ebner estimates that others taking Ultra Biofuel could expect a payback within two years for trucks on 80,000km per year.

What about the future? "We've been looking at Euro 6 Actros truck conversions for United Biscuits," answers Ebner, "and the first conversion kit is now imminent. In fact, we're preparing for our first UK Euro 6 conversions right now."

Tony Owen says this engine is due for launch late in 2015 or early 2016. "We are taking this very seriously," he states. "We wouldn't be investing in Euro 6 if Euro 5 dual-fuel hadn't already proved itself. As diesel becomes less relevant, we see [methane] as a viable solution for the future of the industry."

Meanwhile, as numbers of Euro 5 conversions continue to grow and paths to Euro 6 become clearer, the market will establish itself, and the chicken and egg conundrum will become irrelevant.

But second, to spread LNG/CNG uptake further and achieve the low-carbon future to which this government has committed, we need high-capacity refuelling stations in urban areas, capable of supplying commercial fleets and the general public. These will open the methane market to lighter vehicles, from urban trucks to panel vans and cars. "That's further down the line," concedes Carroll, "and requires financial support."

Plainly, we're at the start of a journey likely to offer several options. But methane, with its sheer availability and ability to work with existing diesel engines, will certainly show greatest growth for commercial vehicles above 3.5 tonnes.

For information on the Low Carbon Truck trials, the consortia involved, performance data and case studies, as well as an up-to-date map of LNG/CNG refuelling stations, with access requirements, fuel types and contact numbers, go to: www.gasvehiclehub.org.

With support from the Technology Strategy Board and the transport community at the KTN, the Cenex-LCV 2014 show (10–11 September, Millbrook Proving Ground: www.cenex-lcv.co.uk) will, for the first time, feature a heavy-duty vehicle arena, displaying several of the trucks supported though the TSB Low Carbon Truck trial. Visitors will be able to meet the trial fleet operators and consortiums, and discuss progress to date and ways forward.