

GAS AND AIR

A government body wants the UK to have an all-electric truck fleet by 2050.

Richard Simpson examines alternatives



The influential National Infrastructure Committee

has advised the government that the UK's transport industry can be 'decarbonised' by ending the sale of new diesel trucks by 2040, and banning their use 10 years later (see links).

It proposes replacing internal combustion engines with two technologies: battery-electric and hydrogen fuel cell. While prototype and trial trucks using both technologies are up and running (see links again, and article p38), serious questions remain over issues including range, durability and payload. While these may be answered in the next 20 years, issues of sufficient production and infrastructure are unlikely to be resolved in time.

There are other problems, too: if the objective is to truly decarbonise transport, then the energy source must be carbon-neutral as well. This means electricity from renewable sources

only, either to charge vehicle batteries directly, or to produce hydrogen from water by electrolysis; most current industrial hydrogen production is by reformation from hydrocarbons, a process which releases carbon. Hydrogen can be produced from water using electrolysis close to the point of use, which conveniently sidesteps many of the issues arising from its transportation and storage, but that process places yet more load on already overstretched electrical production and distribution systems.

Vehicle OEMs are not energy providers, argues Goran Nyberg, MAN's recently appointed director of sales and marketing. He says: "We can adapt our vehicles to any technology, but we need the infrastructure. Current power grids are not able to cope with the demands of full electromobility. Today, it's all about vehicles, but we need to take the broader picture into account."

THE ALTERNATIVE

There is an alternative, of course. And that is a transition from 'fossil' diesel to renewable fuels for conventional engines. There's quite a list of alternative fuels, including methane (available either as fossil 'natural' gas or 'sustainable' biomethane, with each of those delivered in either gaseous or liquefied forms), synthetic diesel and liquid biofuel (see next article, p14). Some of these fuels are derived from 'fossil' sources, so cannot be described as carbon-neutral: nevertheless, their use can reduce pollution at a local level.

Methane is a front-runner here. As natural gas, it is widely distributed via the mains network, and IVECO, Scania and Volvo all offer factory-built gas trucks and buses. IVECO and Scania use engines converted to spark ignition, and with reduced compression ratios, while Volvo offers a novel Westport compression-cycle arrangement (see p20).

Supplying vehicles with compressed gas (CNG) requires the installation of a compressor connected to a gas



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Carbon dioxide reductions vary: even ‘fossil’ methane is an improvement over oil-based fuels, as each molecule contains four atoms of hydrogen to just one of carbon, resulting in ‘well-to-wheel’ CO₂ output being reduced by 10-15%. If the methane is from a renewable source (biomethane) and the feedstock for this is organic waste, then CO₂ is reduced by up to 95%, and natural emissions to atmosphere of methane from rotting material (itself a powerful greenhouse gas) are eliminated.

MORE CONVENIENT?

A more convenient solution is to switch to a ‘pour-in’ non-fossil fuel: synthetic diesel. Hydrotreated vegetable oil (HVO) is currently being promoted as a direct diesel replacement by DAF, Scania and others. It has two potential advantages over diesel: it can be manufactured from food waste and produces reductions in NOx output.

Outside the lab, Scania carried out a field trial of HVO in 14 K410 EB Caetano-bodied coaches operated by Lucketts Group on National Express routes from Portsmouth to London and Brighton late last summer. Seven of the 14 coaches involved were run on HVO, with the only preparation for the switch being a fuel tank check and fuel filter change to remove any possible contaminants. The coaches ran without issue in the trial.

Subsequently, Scania submitted a similar coach for testing on the chassis dyno at Millbrook, with the vehicle put through the Low Carbon Vehicle

Partnership’s coach (UK) cycle, which replicates typical operating conditions. Switching to HVO generated significant improvements over the figures recorded by the Euro VI engine on diesel. Carbon monoxide emissions fell by 29% and total particulate matter by 43% (although the number of particles emitted per km was unchanged). Engine emissions of NOx fell by 12%, allowing a commensurate reduction in AdBlue consumption, and tailpipe emissions of CO₂ were reduced by 6%. However, when the non-fossil nature of the fuel was taken into account, the total CO₂ reduction was calculated as 83%.

Other operators both in the UK and around the world are using biodiesel, rather than synthetic diesel, although a number of ethical and practical questions remain to be resolved. First, where wild land is deforested to grow palm oil, or farmland is switched from food to fuel production. Second, at high concentrations, biodiesel can also impose its own requirements on fleet operations. Most truck manufacturers are shy of allowing the use of biodiesel in high concentrations for these reasons, and those that do will frequently specify shorter service intervals, particularly filter and oil changes. [TE](#)

FURTHER INFORMATION

NIC report – www.is.gd/ojamek

MAN electric truck trials – www.is.gd/ahiwic

ANALYSIS

While no alternative to diesel is completely unproblematic, it seems that the NIC may have missed a trick by dismissing these fuels in favour of unproven battery and fuel cell alternatives, which, even if they do become practical for long-haul, heavy-duty transport, will require substantial investment in an infrastructure that does not as yet exist.

-Richard Simpson

main, while liquefied gas (LNG) can be dispensed from either a permanent or transportable bulk tank. For example, online grocer Ocado has had 29 gas-powered IVECO Stralis 4x2 tractors running since the turn of the year. Fleet services manager Graham Thomas reports that the £20,000 additional capital cost was soon offset by fuel savings worth £13,000 a year, and worries about residual value were taken care of by a manufacturer’s lease. Operationally, a CNG 4x2 tractor had a 363mi range: choosing higher-density LNG could triple this. A 6x2 on LNG could cover 528mi.

Although they produce 30bhp less than the diesels they replaced, “drivers seem to like them,” says Thomas. They are also 10dB quieter than the equivalent diesel, he reports.

In terms of environmental impact, gas trucks typically emit 35% less NOx than Euro VI diesels, and they do so without using SCR and AdBlue, which further reduces running costs. Particle emissions can fall by up to 95%.