A national gas refuelling network for hgvs

A manifesto for achieving breakthrough in the take-up of natural gas-powered heavy goods vehicles

Operators of national heavy goods vehicle fleets are considering wider use of natural gas and biomethane powered vehicles to help achieve operational efficiencies and reduce carbon emissions. In order to provide the necessary confidence in making these investments the Government needs to:

- support the development of national refuelling infrastructure on the main motorway routes
- secure biomethane supplies for the transport sector
- recognise Green Gas Certificates for transport carbon reporting
- allow derogations in vehicle weights and dimensions limits to allow for new tanks and equipment
- work with vehicle operators to understand better the barriers to wider uptake and work collaboratively to remove them

Background

The freight industry is under continued pressure to improve efficiency and reduce carbon emissions. In 2008, the Climate Change Act set two ambitious greenhouse gas (ghg) reduction targets for the UK. The country must reduce ghg emissions by 34 per cent by 2020 based on 1990 levels and by 80 per cent by 2050. Whilst there are no sector specific targets, the logistics sector will be expected to make a contribution to reductions. Hgvs represent about 20 per cent of total domestic transport greenhouse gas emissions. There are a wide range of decarbonisation measures to make moving goods by road more carbon efficient, however it is clear that in order to reduce reliance on conventional fossil fuels such as diesel, the UK must look to alternative fuels that offer an overall carbon saving. One potential fuel is natural gas and ultimately biomethane.

To move from small scale operational trials to use of natural gas as a mainstream fuel requires significant upfront investment in refuelling infrastructure and additional capital costs linked to the vehicle itself. However, taking into account the cost of the fuel, a commercial case for gas powered hgvs exists, where whole life costs are considered over a five to seven year time horizon.

In order for the road freight transport sector to embrace gas as a viable alternative to conventional diesel, a Government policy supporting national public infrastructure and longer rolling fuel duty differential commitment for gas over diesel needs to be in place.

Why business is looking at alternative fuels

Recently, there has been a renewed interest in alternative fuels for commercial vehicles due to:

- **conventional fuel prices rising much faster than general inflation**, meaning changes in fuel type have a greater bearing on whole life vehicle running costs
- **greater awareness of businesses contribution to global warming and air quality issues** through corporate environmental reporting
- **advances in alternative fuel technologies** and their availability as OEM supported options for hgvs
- **traffic management-based restrictions**, such as the London congestion charge and emission-based restrictions, such as the London low emission zone
- **increased availability of alternative fuels and improvements to refuelling technology** which makes the refuelling experience similar to conventional fuels

Types of gas for hgvs

Natural gas can be used as a road fuel either as a liquefied natural gas (LNG) or a compressed natural gas (CNG). It produces less harmful emissions than conventional fuels. It gives around a five per cent carbon dioxide reduction in comparison to diesel and also delivers 80 per cent lower nitrous oxide emissions, as well as zero particulate emissions.

Both dual fuel and dedicated gas vehicles are available; vehicle conversions can cost around £30,000.

Liquefied natural gas

LNG is produced from a mixture of raw components but is predominantly methane and is compatible with diesel technology. Energy density is about 60 per cent compared with diesel. LNG must be stored and transported at a permanently cool temperature in a pressurised double tank system together with a venting system to take away vapour. Although LNG has a higher energy density than CNG and greater volumes can be stored in a smaller space, due to its insulation requirements storage tanks need to be large. It is therefore most suited to large heavy diesel vehicles.

Compressed natural gas

CNG has a much lower energy density than LNG and is stored at very high pressures (approximately 200 bar). Energy density is around 25 per cent compared

to diesel. Storage and vehicle tanks have to be robust and heavy because of the high pressure requirement. The space taken up on the vehicles by the tanks is significantly more than twice that for LNG tanks. Its usage is restricted to areas supplied by pipelines, such as depot-based operations.

Vehicles running on natural gas can be powered by three types of engines.

Dedicated vehicles	Will run on natural gas only
Bi-fuel	Operate on CNG retaining ability to use petrol as a fuel reserve on vehicles, only used on vehicles below 3,500kgs
Dual fuel	Burns diesel and natural gas simultaneously

For a dual fuel gas/diesel hybrid articulated vehicle used on trunking operations, an overall carbon saving of 15 per cent is regularly achieved by carriers in operational trials.

Biomethane

Currently, supplies of natural gas come from non-renewable sources, however the development of methane, or biogas, is a step towards a sustainable natural gas which could significantly reduce carbon dioxide emissions. Biogas is produced from the process of anaerobic digestion of wet organic waste, such as animal slurries, plant and food waste. Anaerobic digestion produces carbon dioxide, methane, hydrogen sulphide, ammonia and water. This combination can be used for heat and electricity, however it is the methane which is effective as a vehicle fuel. It is removed from the other gases using a variety of methods which produces a methane content of about 95–98 per cent. This upgraded gas is generally referred to as biomethane. The entire process can offer several benefits as using organic waste as fuel reduces bio-digestible waste incinerated or sent to landfill. Left untreated waste, such as liquid manure, emits methane which has a higher global warming potential than carbon dioxide, therefore using it as a fuel removes a source of methane emissions.

Experience with biogas use in vehicles in the UK is extremely limited. Whilst biogas is used as a transport fuel in a number of other countries, such as Sweden and France, it is used generally for heat and electricity in this country. There is significant experience of using anaerobic digestion for treating sewerage and landfill waste in the UK, but in the treatment of farm and food waste to generate biogas the country lags behind other EC members.

Using biogas in transport would result in a significant reduction in greenhouse gases compared with diesel. Recent commercial vehicle trials have suggested a carbon dioxide saving in excess of 60 per cent compared with an equivalent diesel vehicle. Additionally, nitrous oxide emissions are lower and there are zero particulate emissions.

Types of gas refuelling infrastructure

Back to base

Currently, many large hgv operators will have a back to base refuelling arrangements whereby diesel is stored at depots, for the company's private use. A back to base arrangement gives the company greater visibility of fuel drawings and greater control over the drivers' refuelling activity. However, refuelling infrastructure can cost up to £1 million to install.

Public

There are a very limited number of commercially operated public gas refuelling sites in the UK that are close to the motorway network. These sites are potentially attractive to tramping hauliers and for top-up drawings by operators with back to base refuelling solutions.

Shared refuelling arrangements

Some operators already have long-standing arrangement for refuelling trucks with diesel at each others' depots. A similar arrangement is beginning to be developed for gas refuelling infrastructure. Refuelling is 'by arrangement' with known operators.

The commercial case for gas

Hgv operators with average vehicle mileages and access to large capacity infrastructure can make cost savings. In the case of a back to base refuelling solution, the costs of operating dedicated or dual fuel trucks is most attractive where operators can access the economies of scale arising from a 5,000-10,000kg/day refuelling station (sufficient for 50-100 trucks). Whilst reducing the refuelling station size to 2,000kg/day or below, quickly makes the economics less attractive. For smaller operators (which make up the majority of the hgv industry), a shared refuelling arrangement or public refuelling infrastructure offer a more attractive solution.

Government policy

Encouraging large scale uptake of low carbon hgvs

In July 2009, the Government published a white paper on the UK's Low Carbon Strategy. Alongside this, a supporting strategy was published: A Carbon Reduction Strategy for Transport. By 2050, the Department for Transport considers that road transport will be largely 'decarbonised.'

The case for gas was supported in November 2012 by a study undertaken by Ricardo-AEA on opportunities to overcome the barriers to uptake of low emission technologies for commercial vehicles on behalf of the Department for Transport's (DfT) Low Emission Hgv Task Force (of which FTA is a member). The study covering hgvs over 3.5 tonne gross vehicle weight (GVW) identified a switch to gas as an area of greatest potential of carbon reduction in commercial vehicles.

This report led to the publication of key recommendations from DfT's Task Force to increase the uptake of gas/biomethane hgvs. Recommendations included:

- reviewing the range of fiscal incentives for gas and biomethane
- supporting the establishment of a strategic network of gas refuelling infrastructure
- ensuring biomethane supplies are secured for the transport sector
- considering the use of incentives that could improve the business case for gas hgvs
- recognition of biomethane as a transport fuel in carbon reporting

National gas refuelling infrastructure

During 2012 FTA assembled a group of large national goods vehicle operators interested in pursuing a significant and enduring switch to natural gas as a substitute for diesel fuel in their long distance trunking vehicle fleets. There were two critical dependencies to this happening.

- The provision of a national gas refuelling network, as most of the vehicles involved will not return to base overnight and

would require intermediate refuelling facilities away from home base
- Assurances from the Government that as the volumes of gas increase the duty rates for road gas fuel will not be increased opportunistically by HM Treasury and so destroy the business cases on which the investment decisions were made

The operators working with FTA have access to significant properties that would be capable of hosting gas storage and refuelling facilities. The cost and land requirement for these sites could be further reduced by locating them close to the national gas grid and utilising high transmission pressures to avoid the need for on-site compression and storage. Working with FTA, the group identified 20 potential sites across the country together with an estimate for annual patronage by hgvs. The work was to form the basis of a submission to the funding competition operated by the Technology Strategy Board on behalf of the Department for Transport, but was withdrawn due to the incompatibility of the proposal with TSB's bidding rules.

Nevertheless the opportunity for Government to establish a critical network of gas refuelling hubs remains. The availability of such a network appears to be the critical path in determining the speed and uptake of low carbon vehicles in the road freight logistics sector. However, any gas refuelling hubs should eliminate, or at least minimise, leakage/venting of biomethane during the refuelling process, otherwise carbon savings from utilising natural gas are lost.

Members of the FTA consortium were consistent and adamant that Government should devote its resources to the establishment of a refuelling infrastructure. Once this was in place, or had a reliable prospect of emerging, then the necessary investment in gas-powered vehicles would proceed as part of the planned vehicle replacement cycle existing in each of the companies involved. Additional Government funding for vehicles would not hasten their uptake so long as refuelling facilities were not available.

A map showing the selected sites for the location of gas refuelling facilities that would optimise journey length for most operations is shown overleaf.

FTA urges the Government to review the case for a dedicated natural gas refuelling network based on the business case and site locations identified by FTA.

Stability in gas duty rates

The business case for the use of gas powered vehicles rests on the assumed price of fuel over the life of the assets. There is a reasonable risk that over this time the Treasury will seek to increase duty rates on road fuel gas in real terms to secure increases in revenue as duty from other fuels declines. Such uncertainty is sufficient to make many business cases non-viable. FTA therefore welcomed the Chancellor's decision at Autumn Statement 2013 to maintain the duty differential for LNG, CNG and biomethane until 2024 (to be reviewed in 2018). This gives operators confidence to invest in gas powered hgvs.

Biomethane supplies

Currently, Government policies such as the Renewable Heat Incentive provide a much greater incentive for biomethane producers to inject into the grid for electricity and heating, rather than further upgrading the biomethane for use as a transport fuel. The freight sector has limited opportunities to decarbonise, therefore FTA is calling for Government to recognise the value of biomethane and offer producers incentives to ensure that the freight transport sector will have a sufficient supply.

Other supportive measures by Government

In addition there are a series of other actions by Government that would support the wider uptake of gas-powered vehicles.

- A small increase in maximum permitted vehicle weights to compensate for the higher tare weights of gas tanks and equipment and avoid payload erosion that weakens the business case
- Derogation on the maximum permitted length of vehicles, especially new Euro VI models with very limited room on the tractor unit for gas tanks and equipment
- Reductions in other taxes and in the London congestion charges and on bridge and tunnel tolls for gas-powered vehicles achieving agreed CO_2 reduction/air quality targets

- To recognise Green Gas Certificates for transport carbon reporting to enable industry to operate more biomethane fuelled commercial vehicles. By compressing gas direct from the grid and sourcing the equivalent amount of biomethane injected into the grid by anaerobic digestion plants, operators can effectively use biomethane in their commercial vehicles by purchasing Green Gas Certificates which track biomethane usage, avoid double counting and ultimately boost supplies of biomethane

FTA welcomes Government's commitment to increase the uptake of gas/biomethane hgvs. Government needs to continue to consider the views and requirements of the operator, and ultimate purchaser, of low carbon vehicles to understand what barriers still exist to greater uptake and how they might be overcome.

Logistics Carbon Reduction Scheme

The Logistics Carbon Reduction Scheme (LCRS) is an industry-led approach to recording and reporting carbon emissions instigated and developed by members of FTA's Logistics Carbon Working Group. There has already been a great deal of progress in the logistics sector to reduce the industry's impact on the environment and the scheme represents an opportunity to bring these efforts together.

The LCRS is free of charge and requires participants to submit their fuel data to enable FTA to combine all data into one carbon account and give a picture of industry's contribution to reducing its carbon impact. It also gives operators the opportunity to share best practice and review how they can seek to reduce carbon emissions through decarbonisations such as utilisation of alternative fuels. In April 2011 the Department for Transport endorsed the scheme. The scheme is open to both members and non-members of FTA. To sign up or for further information visit www.fta.co.uk/lcrs

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Top 20 locations for a national gas refuelling network

In March 2012, FTA undertook a detailed survey of participants* in its Logistics Carbon Reduction Scheme (LCRS) to establish the optimum locations for gas refuelling infrastructure and the anticipated number of hgvs which would potentially use the site over a three and five-year time horizon.

1 Milton Keynes
2 Birmingham
3 Hatfield
4 DIRFT, Daventry
5 Central London
6 Wellingborough
7 Avonmouth
8 M6/M62 Warrington
9 Swindon
10 M62/M18/M1 near Doncaster
11 Leicester
12 M1/M62 Wakefield
13 Nottingham
14 Coventry
15 M6/M62 Crewe
16 M1/M25 Stevenage
17 Dagenham
18 Knowsley/St Helen's/Haleswood
19 Lichfield
20 Huntingdon A1

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*The results are from 17 participants.

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