



## Exploring the market for Compressed Natural Gas light commercial vehicles in the United Kingdom



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### ABSTRACT

This paper examines the potential market for natural gas as a transportation fuel in the light commercial vehicle sector in the United Kingdom. In order to understand this market and identify barriers to growth and possible solutions interviews were conducted with a number of professionals with experience in this market. These interviews were open and exploratory enabling the application of grounded theory techniques in analysis. Clear priorities for potential users were cost and carbon reduction and the main constraint a lack of refuelling infrastructure. Small scale and low cost policy interventions were identified, at national level including maintaining tax differentials; easing payload restrictions; and limited support for refuelling facilities alongside local policy initiatives, for example, restoring the exemption from the London Congestion Charge for gas vehicles, that could help to kick-start the market at least at a niche level.

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### Introduction

Concern over fuel security and the emissions of petrol and diesel vehicles has led to a search for replacement fuels and vehicle technologies. Natural gas has become an attractive option due to its availability, diverse sources (IEA, 2010) lower emissions of local air pollutants, especially nitrogen oxides (NO<sub>x</sub>), Carbon Monoxide (CO) and particulate matter, and its suitability for heavy-duty vehicles (Engerer and Horn, 2010; Park and Tak, 2012). In Armenia, Bangladesh and Pakistan over half the fleet is powered by natural gas (NGVA, 2012b). In Europe growth has been slower but natural gas vehicles now exceed a 1% market share in Bulgaria, Italy and the Ukraine (NGVA, 2013). Some countries have sought to use bio-methane as a more sustainable less carbon intensive direct replacement for fossilised natural gas given that current Compressed Natural Gas (CNG) vehicles have only a slight advantage in terms of CO<sub>2</sub> emissions with respect to their diesel and petrol counterparts. The UK the market is negligible with only 559 mostly heavy duty dual-fuel vehicles on the road in 2011 (NGVA, 2013). This paper aims to shed light on the fledgling UK market in natural gas vehicles to explore barriers to market development and identify ways of overcoming these.

Various attempts have been made to introduce natural gas vehicles to the UK market including small scale infrastructure investments; grants for heavy duty vehicles and publicity campaigns; but these had very little lasting impact (Carslaw and Fricker, 1995; Crowe, 2004; NGVA, 1995). Reasons for this included the need for vehicle conversion in the absence of original manufacturer vehicles in right hand drive versions, and refuelling problems arising from the use of wet gas from the grid (CNG-Services, 2011). Now grid gas no longer causes such problems and original right hand drive vans (3.5 tonnes and

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below) are available from three major manufacturers, namely Iveco, Mercedes Benz and Volkswagen. This is an opportune moment to explore the potential market for such vehicles and the constraints upon it.

The paper explores the questions: what are the barriers to the successful development of a market in natural gas vans in the UK? And how might these barriers be overcome? Thus the focus is on commercial vehicles at and below 3.5 tonnes (hereafter referred to as vans). To address these questions interviews were conducted with a number of professionals with experience in this market. The interviews were open and exploratory enabling the application of grounded theory techniques in analysis. Interviewing commercial van operators as potential early adopters adds a new understanding of the purchaser's position in this wider debate as, to our knowledge, no previous studies have examined the potential barriers and opportunities for natural gas light commercial vehicles in the UK.

The paper is organised as follows. The following section, CNG market evolution, briefly reviews the limited number of studies of the CNG market and draws on evidence from the wider literature on the development of markets for alternative fuels and vehicles. Opportunities and constraints contains discussion and policy implications and is followed by a brief concluding section.

## CNG market evolution

Few studies examine CNG vehicle markets. Yeh (2007) looked at the evolution of relatively mature markets for gas vehicles, including Italy, Argentina, Brazil and Pakistan, where tax rebates and a gas price maintained at around 40–60% of that of diesel/petrol leading to payback periods of less than 3 years were common characteristics in sustaining the CNG vehicle market. A study of Argentina (Collantes and Melaina, 2011), also identified the fuel price differential as key alongside additional government support through regulation with regard to safety and standards together with private investment in infrastructure. However, the authors observe that government-led low prices are likely to create an unsustainable situation of over-consumption, placing strain on reserves. In New Zealand government support in the form of incentives for conversion and refuelling stations and price controls on fuel kick-started the market but the sudden removal of this support led to market collapse (Gwilliam, 2000), a similar pattern was observed in Canada (Struben and Sterman, 2008). In the only study of the UK, Beresford et al. (2003) discuss government initiatives that were in place in the early 2000s to encourage UK freight operators to use alternative fuels. A number of these targeted CNG vehicles, by offering grants for refuelling infrastructure, clearly with no long term success.

Most of the wider literature on markets for alternatively fuelled vehicles focuses on passenger vehicles. Early work by Nesbitt and Sperling (1998) in the freight sector provides lessons still pertinent today. They observed that some of the reasons why fleets were often seen as a potential market for alternative technology vehicles, like the potential for central refuelling, focus on price, and information availability, were not necessarily true, and often the same barriers encountered in the passenger vehicle market also apply. They noted that central refuelling was becoming less popular amongst freight operators in the USA, and that in any case most operators did not have the necessary space to install in-house alternative technology refuelling facilities. Fleet managers did not always compare life-cycle costs but concentrated on the purchase price. Importantly, fleet managers did not appear to be well informed about costs, performance and incentive programmes relating to alternative technology vehicles and often had misconceptions with regards to the reliability and safety of these vehicles.

Barriers to the development of markets for alternative vehicles are normally categorised as financial, regulatory and legal, and physical (Browne et al., 2012). Wiedmann et al. (2011) explored the barriers to the further development of a market for CNG vehicles in Germany, identifying a number of risk factors that seem to affect the purchase of these vehicles and therefore act as barriers to market development. These are financial risks (cost fluctuations and payback periods), performance risks (especially driving range), physical risk (danger) and time risk (time spent learning a new technology).

Lack of refuelling infrastructure (a physical barrier) and the cost of portable or semi-mobile installation (a financial barrier) are certainly among the most important barriers. The provision of public refuelling infrastructure is an expensive investment when demand is not (or not yet) strong enough. Studies have estimated that in order to sustain the development of alternative technology vehicles, suitable fuels need to be available in about 10–30% of refuelling stations in a given country (Melaina and Bremson, 2008; Nicholas et al., 2004; Sperling and Kurani, 1987; Yeh, 2007). Achtnicht et al. (2012) estimated that making Liquid Petroleum Gas (LPG)/CNG available in one out of three service stations in Germany could take such vehicles to 14% of the fleet by 2030. Finally, in terms of break-even distances 40,000 km per vehicle is seen as a critical threshold for acceptability (Hu and Green, 2011).

Some incentives identified for private consumers may also be important for commercial vehicles. Examples include: exemptions from congestion or road user charges and free parking (Ozaki and Sevastyanova, 2011); tax reductions (Gallagher and Muehlegger, 2011), and programmes funding the development of refuelling infrastructure (Wiedmann et al., 2011). Other factors, like peer and network effects (Axsen and Kurani, 2011), could have a role especially in smaller business clusters, where a number of small operators could share experience and potentially spread the costs of infrastructure investment. Better information for potential consumers about available models, performance, environmental impacts and costs is also needed, as even in countries where the market is more mature, like Italy, lack of proper information about prices for example, was seen to be slowing the take up rate (Pascoli et al., 2001).

Most government intervention in the CNG market has, understandably, been at a national level and provided incentives, subsidies and price support for infrastructure, vehicles and fuel. This can be expensive and does not guarantee a sustainable

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