Energy xxx (2016) 1–10

Contents lists available at ScienceDirect

Energy

journal homepage: www.elsevier.com/locate/energy

Supplying bio-compressed natural gas to the transport industry in Ireland: Is the current regulatory framework facilitating or hindering development?

D. Goulding [a, b, *], D. Fitzpatrick [b], R. O'Connor [b], J.D. Browne [b], N.M. Power [a]

[a] Department of Civil, Structural and Environmental Engineering, Cork Institute of Technology, Cork, Ireland
[b] Gas Networks Ireland, Gasworks Road, Cork, Ireland

ARTICLE INFO

Article history:
Received 30 October 2015
Received in revised form
5 August 2016
Accepted 11 August 2016
Available online xxx

Keywords:
Compressed natural gas
Biomethane
Strategic development
Transport

ABSTRACT

Compressed Natural Gas (CNG) and biomethane when blended as a transport fuel (bio-CNG) have significant potential in Europe. However, this alternative fuel has not been developed in several European countries. One of the barriers to market penetration is the absence of a coherent regulatory framework to eliminate the disparity between European and national legislation. Using Ireland as a test case, this paper examines how conflicting policies can be aligned to ensure effective bio-CNG market development. A key barrier is the regulatory ambiguity placed on transport fuel suppliers and investors who wish to connect to the network to supply bio-CNG. For example, the Irish 2002 Gas (Interim) (Regulation) Act states that all entities supplying natural gas from the network (including bio-CNG) must hold a supplier licence and are bound by the network code of operations. The obligations of the code act as a potential deterrent to bio-CNG suppliers due to the licencing complexity and associated costs. This paper critiques the current regulatory framework in Ireland, highlights areas of ambiguity and puts forward an aligned solution to allow bio-CNG market participants to utilise the network safely, in a regulatory sound and cost-effective manner.

© 2016 Elsevier Ltd. All rights reserved.

1. Introduction

1.1. Utilisation of gaseous transport fuel

In an age where the burning of fossil fuels has led to a significant increase in the production of harmful greenhouse gas emissions, the necessity for sustainable energy and environmental protection has led to investment and development in alternative cleaner forms of energy across the globe [1]. The utilisation of Compressed Natural Gas (CNG), and its renewable form biomethane, as a transport fuel is steadily becoming a viable alternative to traditional gasoline and diesel. CNG has a number of benefits over other fossil fuels including lower fuel costs, reduced greenhouse gas, tail-pipe and particulate emissions and lower noise levels [2]. Furthermore, biogas is typically produced sustainably through the anaerobic digestion process and can significantly reduce greenhouse gas emissions, contributing to European Union (EU) renewable energy targets [3]. Biomethane (upgraded biogas) is typically injected into the natural gas network where it can be used as a substitute for natural gas in any blend proportion to form bio-CNG [4]. *Goulding and Power* found that the potential development of biomethane as a transport fuel is economically viable in Ireland and is a preferable option in comparison to biogas to combine heat and power [5]. Similarly, *Börjesson & Ahlgren* have determined that biomethane as a transport fuel is bettered utilised in a Swedish regional energy system with 31 biogas plants compared to biogas as a heat source from a techno-economic perspective [6].

Technically, bio-CNG technology as a transport fuel is fully developed; the bio-CNG is compressed to 200–300 bar and transferred to the Natural Gas Vehicle (NGV) by a dispenser in a similar manner to gasoline or diesel. In terms of infrastructure, a CNG and bio-CNG dispenser are considered the same, and thus these terms are interchangeable. There are currently over 17.7 million NGVs in operation worldwide with countries such as Brazil, Iran, India and China having the greatest market share [7]. The EU is currently at the middle echelon of bio-CNG global utilisation with 1.1 million NGVs in circulation which are operating on CNG or biomethane across its 28 Member States [8]. In contrast, the United

* Corresponding author. Department of Civil, Structural and Environmental Engineering, Cork Institute of Technology, Cork, Ireland.
E-mail address: daniel.goulding@gasnetworks.ie (D. Goulding).

http://dx.doi.org/10.1016/j.energy.2016.08.037
0360-5442/© 2016 Elsevier Ltd. All rights reserved.

Please cite this article in press as: Goulding D, et al., Supplying bio-compressed natural gas to the transport industry in Ireland: Is the current regulatory framework facilitating or hindering development?, Energy (2016), http://dx.doi.org/10.1016/j.energy.2016.08.037

States had 112,000 NGVs on the road in 2015, with approximately 574 public CNG filling stations [9].

1.2. EU mandatory targets

There has been a strong commitment from the EU to increase its renewable transport energy share through the Renewable Energy Directive 2009/28/EC and the Fuel Quality Directive 2009/30/EC and to diversify fuel type utilisation through the Alternative Fuels Infrastructure Directive 2014/94/EC. The Renewable Energy Directive 2009/28/EC mandates each Member State to achieve 10% renewable energy share in final transport energy demand by 2020 [10]. The Fuel Quality Directive 2009/30/EC requires a reduction of the greenhouse gas intensity of the fuels used in vehicles by 6% by 2020 [11]. The Alternative Fuels Infrastructure Directive 2014/94/EC mandates each Member State to guarantee a sufficient number of publicly accessible CNG/bio-CNG refuelling points in urban/suburban areas and every 150 km along the Core network to allow the circulation of NGVs throughout the Member State by 2020 and 2025, respectively [12].

The latest EU Update Report on its renewables targets states that production of renewable transport energy has been slower than expected, projecting a 5.7% renewable transport share by 2014 and citing lack of policy clarity around 2nd generation biofuels and indirect land use as a major contributor to the slow progress [13]. In 2014, 1st generation biofuels such as biodiesel and bioethanol produced 14.2 Mtoe of alternative fuel in the EU, while 2nd generation biofuels such as biomethane only produced 2.0 Mtoe [13]. The EU have since amended the Renewable Energy Directive 2009/28/EC and Fuel Quality Directive 2009/30/EC in order to create certainty for the deployment of 2nd generation biofuels such as biomethane [14]. Therefore, the pathway is now clear for biomethane to play a more significant role in achieving the Directive targets by 2020. Similarly, a significant improvement is needed in order to achieve the targets of the Alternative Fuels Directive as currently only 50% of Member States have more than 10 bio-CNG filling stations in operation [15]. Bio-CNG has the potential to significantly contribute to meeting the requirements of these three directives, once the correct regulatory framework and policy measures exist that will provide a level playing field between all types of renewable and alternative fuels.

1.3. A gaseous transport fuel market

In order to enable bio-CNG to help achieve the mandatory targets of Renewable Energy Directive 2009/28/EC and the Alternative Fuels Infrastructure Directive 2014/94/EC, the bio-CNG supply chain for transport vehicles must be fully developed from production to transportation to final delivery. The supply of bio-CNG as a transport fuel involves a significant degree of complexity which is often overlooked. The supply of bio-CNG to the customer requires all of the regulatory, commercial, and technical processes to work in unison. From a regulatory perspective, a definitive effective framework is required to allow potential investors to satisfy themselves that bio-CNG is operationally practicable and commercially viable. The reduction of regulatory risk to an acceptable level is critical for bio-CNG investors. Through the author's analysis of the natural gas industry through consultation with the key stakeholders, three key principles have been determined as being fundamental to facilitating the development of bio-CNG in Ireland. The three principles that should underpin the proposed bio-CNG Regulatory Framework are as follows:

- *Safety:* safety is paramount to the operation of the natural gas network in Ireland. The Transporter must operate a safe natural gas network and maintaining such high standards is critical. A strong safety reputation will instil confidence in the product and service of supplying bio-CNG and injecting biomethane.
- *Efficiency:* the operational overheads incurred through any regulatory regime should not outweigh the benefits to be obtained through participation in the market, i.e. players should be encouraged to participate rather than see barriers to entry due to financial requirements.
- *Simplicity:* as many of the players who are anticipated to play a role in the resale of bio-CNG are from outside the gas industry, their regulatory requirements and duties as participants should be clear, consistent and easy to understand and implement. Complex regulatory requirements will act as a barrier to entering into the bio-CNG market.

2. Material and methods

2.1. Focus of paper

The focus of this paper is to develop a strategic regulatory framework which will facilitate the development of a bio-CNG market which can effectively supply bio-CNG both privately and to the public in a safe and cost-effective manner. In order to develop such a regulatory framework, the paper will review the current arrangements in practice globally while playing particular attention to the EU with the intention of identifying the appropriate contractual arrangements to facilitate bio-CNG supply and enable market development. The focus will then switch to Ireland, a new and emerging developer of bio-CNG.

As a test case, the paper examines the current regulatory framework in Ireland in order to develop a bio-CNG market by engaging with the natural gas Transporter in Ireland (Gas Networks Ireland), reviewing the Regulator's (Commission for Energy Regulation) current regulatory approach to supplying bio-CNG in Ireland through their recent public consultation.

and by engaging with potential Bio-CNG Suppliers, Bio-CNG Fleet Operators and Biomethane Injection Suppliers in order to determine the perceived ambiguity for potential bio-CNG market participants. Based on this engagement with the key market participants in the Irish natural gas and potential bio-CNG markets, the paper will provide recommendations in order to develop an aligned bio-CNG regulatory framework in Ireland which can be transposed to other countries with a similar bio-CNG development profile.

2.2. Regulatory requirements

The requirement for a strong regulatory framework is of critical importance in shaping the development and operation of an effective bio-CNG market. As illustrated in Fig. 1, a review of the industry by the authors has identified five key elements required to initiate a strategic regulatory framework to promote, develop and operate an effective bio-CNG market. Using Ireland as the test case, this paper will investigate how the identified elements of the regulatory framework for bio-CNG are being developed and implemented and whether there is potential to further enhance their effectiveness.

2.3. Bio-CNG supply types

When analysing the requirement for a regulatory framework for the supply of bio-CNG, there are two types of supply options available.

Public Supply: bio-CNG supply point is accessible to the public through a typical service station. No contractual arrangements are in place with the NGV customer.

Please cite this article in press as: Goulding D, et al., Supplying bio-compressed natural gas to the transport industry in Ireland: Is the current regulatory framework facilitating or hindering development?, Energy (2016), http://dx.doi.org/10.1016/j.energy.2016.08.037

Download English Version:

https://daneshyari.com/en/article/5475717

Download Persian Version:

https://daneshyari.com/article/5475717

Daneshyari.com