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Educational Aspects on Promoting Liquefied Natural Gas (LNG) as a Fuel and Cargo on the Danube: The European LNG Masterplan

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Abstract

This paper should provide insights into actual steps in achieving the challenging goals set up by European Commissions flagship initiative: the "LNG Masterplan for Rhine-Main-Danube" - an initiative supporting the development Liquefied Natural Gas (LNG) as a fuel and cargo. Due to the fact that the application of LNG a is a very new development in the inland navigation sector, education and awareness-rising measures are of high importance in order to generate knowledge. In order to meet the stakeholders' needs, qualitative empiric research is applied. Expert interviews and focus groups are conducted and afterwards, participants' statements are analyzed by qualitative empiric methods. Based on the results, a portfolio of learning offers will be developed.

Keywords: Education and training, Liquefied Natural Gas, LNG, green logistics, inland waterway transport

Introduction

The transport sector is the fastest growing consumer of energy and producer of greenhouse gases in the European Union, despite advances in transport technology and fuel formulation. Under continuing business as usual these emissions are expected to grow by approximately 40% until 2030. Serious action from both the public and private sector is needed to decarbonize transport.

The European Commission with its Europe 2020 (COM (2010) 2020) strategy for a smart, sustainable and inclusive growth, has developed its Flagship Initiative "Resource efficient Europe" to tackle societal challenges like climate change, energy and resource scarcity, and a more efficient use of resources and energy (European Commission, 2010). In line with this strategy, the Commission´s Transport 2050 Strategy calls for breaking the oil dependence of transport and sets a target of 60% greenhouse gas emissions reduction from transport by 2050 (European Commission, 2011a). It also sets goals for the different modes of transport. Energy efficiency in transport and effective transport management can substantially contribute to reducing oil consumption and air emissions. However, the European Commission considers efforts in energy efficiency not an alter-

native to oil substitution but as an important bridge to alternative fuels. Alternative fuels are considered to be the ultimate solution to decarbonize transport. In order to reach these ambitious goals a big share of alternative fuels is required (European Commission, 2011b). Besides, alternative fuels can significantly contribute to improve European air quality and to reduce the existing oil dependency.

The Commission Communication on a European alternative fuels strategy (COM (2013) 17) evaluated the main alternative fuel options available to substitute oil whilst contributing to reduce greenhouse gas (GHG) emissions from transport and suggests a comprehensive list of measures to promote the market development of alternative fuels in Europe, complementing other policies for reducing oil consumption and greenhouse gas emissions from transport (European Commission, 2013a).

As main alternative fuels are considered: Natural gas and bio-methane (in the form of CNG, LNG and GTL), liquefied petroleum gas (LPG), biofuels, electricity and hydrogen.

Initiated pioneer operations of maritime and short-sea LNG propelled vessels in the North Sea and the first steps into the infrastructure built-up in the Baltic Sea have further triggered the interest of the inland navigation sector to tap the potential of LNG as environmentally friendly and cost-effective fuel. While in North-Western Europe, LNG is already available in small-scale logistics, Central and Eastern Europe is still a white area.

Besides the obstacle of missing alternative fuel infrastructure, markets and common technical specifications for the vehicle-infrastructure interface, the lack of general understanding and consciousness concerning LNG hinders a fast consumer acceptance. Therefore the European Commission has proposed a variety of educational measures aiming at ensuring the generation of awareness and knowledge about the alternative fuel LNG (European Commission, 2013b).

Objectives

The LNG Masterplan brings together 33 companies with the relevant authorities from 12 countries creating the critical mass of stakeholders needed for the development and the promotion of the implementation of LNG.

The project is initiated based on market developments. The combination of future emission regulations for inland shipping, the development of fuel prices and sustainable logistics policies will create an attractive case for LNG in the short to medium term. Already the preparation of the LNG Masterplan has raised high attention from the industry side as well as educational institutions.

Nevertheless the introduction of alternative fuels in the industry, however, is still hampered by a number of major bottlenecks. These include among others the lack of a regulatory framework, the lack of infrastructure and the lack of real-life know-how, knowledge and experience. Furthermore, little research has been done in the area of logistics education and even less in the field of transportation education (Ruppenthal, 1998; Wu, 2007).

The aim of this paper is to demonstrate how education and measures to rising awareness may be used to promote LNG and therefore the use of alternative fuels.

The main research question raised in this paper is how to break chicken and egg situation, e.g., by generating LNG by generating knowledge through education or vice versa. Further research questions guiding this study are: Which are requirements of the economy and industry on a management level as potential users of LNG on information concerning LNG as alternative fuel? Which content and which didactics and educational material should be provided to educate students on

LNG issues? How should the information be provided to lead the future decision-makers to decide for LNG as an alternative fuel option?

In order to answer the stated questions qualitative empiric research is applied. Expert interviews are conducted and afterwards, participants' statements are analyzed by qualitative empiric methods of Mayring (2010) (Flick, 2007; Mayring, 2010).

Methodology

The application of LNG as a fuel and as a cargo is a very new development in the inland navigation sector. Due to the characteristics of LNG as gas and cryogenic liquid, requirements for the use of engine fuel, for loading, unloading and transportation are of complex nature. Therefore, operations with LNG in inland navigation require specific knowledge and skills of the crew members as well as of staff working ashore.

The education & training materials will be developed for several categories of staff, in order to ensure a full coverage of a logistics chain involving LNG.

The categorisation of the staff is:

- Inland navigation crew members – use of LNG as a fuel & as a cargo
- Terminal personnel and staff
- Bunkering personnel and staff
- Inspectors from authorities
- Company / management personnel and staff
- Students focusing on logistics

This study focuses on two major target groups: company / management personnel and staff as potential users of LNG and students focusing on logistics.

The paper reports on the authors' work on qualitative research according to the concept of qualitative social-research. The research was done in Austria.

This paper is based on a survey which was conducted in 2013 for the REWWay cooperation on education on inland waterway logistics provides evidence that there is a lack of education on IWT logistics topics in Europe. Moreover, the main part of the interviewed persons had never heard about LNG as eco-friendly fuel or as substitute for pipeline gas. 39 institutions including vocational schools, upper schools, universities and the industry were interviewed (Putz & Schauer, 2013).

First, a study with the aim to identify secondary and tertiary educational institutions o focusing on logistics was conducted.

Second, after educational institutions concentrating on logistics and the logistics industry were identified, representatives as well as partners from the industry (i.e., logistics sector, shippers) were invited to participate in focus group interviews.

Finally, expert interviews and focus groups with the sample groups were conducted and analysed using Mayring (2010) (Putz & Schauer, 2013).

In order to expand the sample group, in the year 2014 further 15 industry partners have been interviewed so far. Since logistics and the industry operations are tightly interconnected, the identification of the industry´s needs and the services offered by logistics service providers are of major importance (van Hoek, 2001).

Results & Discussion

The aim of this paper is to demonstrate how education and measures to rising awareness may be used to promote LNG and therefore the use of alternative fuels.

Since the LNG Masterplan is an on-going project, only interim results can be described yet. Definitive results will be available within the next months.

The results of various interviews and discussions suggest that people outside the gas industry are hardly familiar with LNG. Nevertheless, after they had been given an explanation on LNG and its advantages (e.g. emissions, independence of gas pipelines) their interest in LNG rose.

Companies claim that school and university graduates do hardly know about the opportunity of eco-friendly transport modes or alternative fuels in general. In fact, almost no time is used to train about eco-friendly transport modes such as railway and inland navigation in education facilities. Time used for eco-friendly alternatives represents only a fraction of lectures compared with road transport.

Hardly any offers for (ongoing) logistics personnel on LNG or inland waterway exists. All sample groups consider eco-friendly transport and fuels as essential and claim for interactive training offers which connect theory and practice (i.e. field trips, realistic case studies and external lecturers).

Industry claims that graduates in the field of logistics lack knowledge on inland waterway transport and LNG at all. In addition, industry itself (outside the gas sector) is not familiar with LNG.

There is one university in Austria which offers one Bachelor and two Master degrees which focus on petrol and gas. Results of an interview with one of the (recently) graduates show that issues on LNG are hardly taught. In fact, LNG represents around one third of the world's total gas market but there a lack of education on LNG.

To summarize the actual findings on status quo in the LNG training and education field, the following actual gaps can be identified:

- Teachers' lack of knowledge on IWT and LNG
- Management face a lack of knowledge on IWT and LNG
- In Austria: hardly any information in education or for industry on LNG
- Lack of trainer's material on IWT and LNG

Based on the results of the study and a good practice research, a portfolio of learning offers that meet the needs of the target groups will be developed. There is strong evidence that the educational contents and didactic methods for the analyzed target groups will differ, caused by different demands. A comparison of the different demands and the derived implications on educational material and didactics will be shown.

Further research and activities will therefore concentrate on

- contacting relevant universities, schools, industry to spread information on LNG
- developing teaching materials for logistics students
- developing train-the-trainer offers for teachers, lecturers and industry trainers
- as well as establishing a contact point for Austrian universities, school and the industry for questions on LNG

Judging from the general trend in greening logistics, it seems as though both the economy and educational institutions have a possibility, and perhaps a responsibility, to engage in the environmental challenge that the world is facing.

The use of LNG can be an important step in achieving the goals in greening the supply chain. Therefore a high interest from both sides – from the economy as well from the educational institutions – can be expected.

The LNG Masterplan can be a significant contribution to improve the competitiveness of inland waterway cargo transportation with reduced environmental impact and energy efficiency thus supporting competitive intermodal inland navigation transport chains as an important element in the European strategy to reduce growing transport flows on the congested roads. It will play a pivotal role to reduce GHG emission at the short and medium term through supplying LNG for truck operations into the European core industry regions with the help of waterway transportation. This will contribute to create a "Green Danube-Main-Rhine Corridor" as it follows the supply chain approach and includes connections that build a functional core LNG network.

The gained knowledge and awareness within the industry and the educational institution is an essential catalyst for the sustainable mobility of goods what will therefore result in further improvements of the modal split towards ecofriendly modes of transport.

Although the authors made every possible effort to be comprehensive in data gathering and to reduce bias that may affect results, this study does suffer some limitations. Due to the fact, that our research sample is limited to Austria, some other important aspects may be missing. Moreover, focus groups and personal interviews often stimulate social effects such as group pressure which may bias results.

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Biographies

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