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This document appeared in

Detlef Stolten, Thomas Grube (Eds.):
18th World Hydrogen Energy Conference 2010 - WHEC 2010
Parallel Sessions Book 5: Strategic Analyses / Safety Issues / Existing and Emerging Markets
Proceedings of the WHEC, May 16.-21. 2010, Essen
Schriften des Forschungszentrums Jülich / Energy & Environment, Vol. 78-5
Institute of Energy Research - Fuel Cells (IEF-3)
Forschungszentrum Jülich GmbH, Zentralbibliothek, Verlag, 2010
ISBN: 978-3-89336-655-2

User Perceptions and Public Attitudes towards Hydrogen Fuel Cell Fleet Vehicles in the EU

Katja Pietzner[*], **Natalia Morgunova**, **Maria Yetano**, **Peter Viebahn**, Wuppertal Institute for Climate, Environment, Energy, Germany

1 Description of Hychain Project

The HYCHAIN MINI-TRANS project is an Integrated Project funded through the 6th Framework Programme of the European Union. It is one of the leading hydrogen demonstration projects of the European Commission's Transportation and Energy Division and is the first project of this nature to be implemented. The project with a network of 24 European partners runs from January 2006 to June 2011 under the co-ordination of Air Liquide.

HYCHAIN MINI-TRANS allows citizens from four European Community regions to test a group of 46 small urban vehicles including small utility vehicles and midi-buses, wheelchairs and cargo-bikes, all powered by hydrogen fuel cells. This project also demonstrates the use of innovative logistics for hydrogen distribution. The four partner regions are: Rhône-Alpes in France (Grenoble Alpes Métropole Agglomeration Community), Castilla y León region in Spain (city of Soria), North Rhine Westphalia in Germany (region of Emscher-Lippe) and the city of Modena in Italy. Public and private fleets are currently operating the vehicles in every-day use: municipal services, public transport, last-mile logistics and personal transport by people with disabilities.

The following four-step approach has already been implemented: (1) the project started from existing prototypes of five low-power fuel cell applications that were optimised in design and functionality, (2) pre-commercial manufacturing lines were set up to reduce costs as well as to improve quality, (3) the required hydrogen distribution logistics and services (transport, distribution, dispensing) were established based based on an innovative refillable storage solution and (4), a network of comparable subprojects using the common demonstration vehicles is being implemented in the four participating regions.

As with the introduction of any new technology, there are a number of social acceptance issues in the field of hydrogen and fuel cell technologies which have to be investigated. The HYCHAIN project is one of the main projects currently underway for the demonstration of hydrogen and fuel cell technologies in Europe. With its focus on low-power urban transport applications, HYCHAIN provides an optimal test-bed for the assessment of the reactions of a wide range of stakeholders to the new technology. A number of these stakeholders will be in touch with the HYCHAIN vehicles relatively directly (regional authorities, fleet managers, drivers, technicians and users/passengers) and can hence provide first-hand signs of the attitudes that are likely to develop in these various groups once greater penetration of the technology takes place. The attitudes of the greater population who have not yet used the

[*] Corresponding author, email: katja.pietzner@wupperinst.org

technology can also be studied within the project and compared to those of the population which is directly in touch with the technologies.

2 Wuppertal Institute's Tasks

Within the international consortium of 24 partners, under the overall coordination of Air Liquide S.A., the Wuppertal Institute for Climate, Environment and Energy acts as the responsible coordinator for work package 8 "Innovation Activities" that comprises the following tasks:

- Dissemination activities distinguished between European and national/regional activities.
- Techno-economic and environmental assessment of technologies.
- Socio-economic studies, providing the necessary insights on how to maintain and to enlarge the use of hydrogen applications in early markets.
- Exploitation of results: the outcome of the socio-economic study package will be used to develop strategies for further exploitation of HYCHAIN-MINITRANS technologies, both on national and international levels.

3 Socio-Economic Studies

The first step of the socio-economic studies is the development of evaluation tools suitable for the study's needs: self-completion questionnaires, face-to-face interviews, online polls and other methods will be used.

The surveys are directed to different target groups due to different aspects of perception concerning the HYCHAIN-project: drivers, passengers, vehicle minders, operators, service-centre-staff and the local public, to mention some of them.

The HYCHAIN socio-economic studies will aim to answer the following lead questions:

- What is the level of satisfaction and what are the perceptions of users (drivers, maintenance personnel, fleet managers, passengers) in terms of HYCHAIN vehicle performance in daily operation and towards hydrogen as an energy carrier in general?
- What are the perceptions, attitudes and preferences of potential user groups (in the participating regions) with regards to the HYCHAIN vehicle concepts and towards hydrogen as an energy carrier in general?
- How did perceptions and attitudes change under a framework of increased information about the technology (influence of knowledge and experience)?
- What is the value of the non-market benefits (e.g. decreased local pollution) brought about by the vehicles, as elicited from environmental valuation surveys in the public?

4 First Research Insights: Survey on Midibus Drivers in Germany

The first inquiries started in autumn 2009 with the drivers of the two midibuses deployed in the Emscher- Lippe region (Germany).

The questionnaire contained 27 questions regarding personal experiences, satisfaction with the bus, safety and maintenance aspects of the vehicle, the training courses, attitudes and

knowledge and finally sociodemographic data. The sample consisted of 32 male drivers with an average age of 45.3 and a solid experience as a bus driver of more than 10 years for 96.9% of all respondents. At the time the survey was conducted most of the drivers drove the vehicle on a regular basis of several times a week (42%) or several times a month (36%). As an example of the results, Figure 1 shows the drivers' satisfaction with the Midibuses' overall performance. 44% of the drivers are satisfied with the vehicle's overall performance (14 drivers), yet 22% of the interviewees declare themselves to be rather unsatisfied (7 drivers), while one third were undecided (10 drivers). Due to the fact that the buses were operated in regular service from the beginning, these results conform to prior expectations of mixed reactions to the new technology.

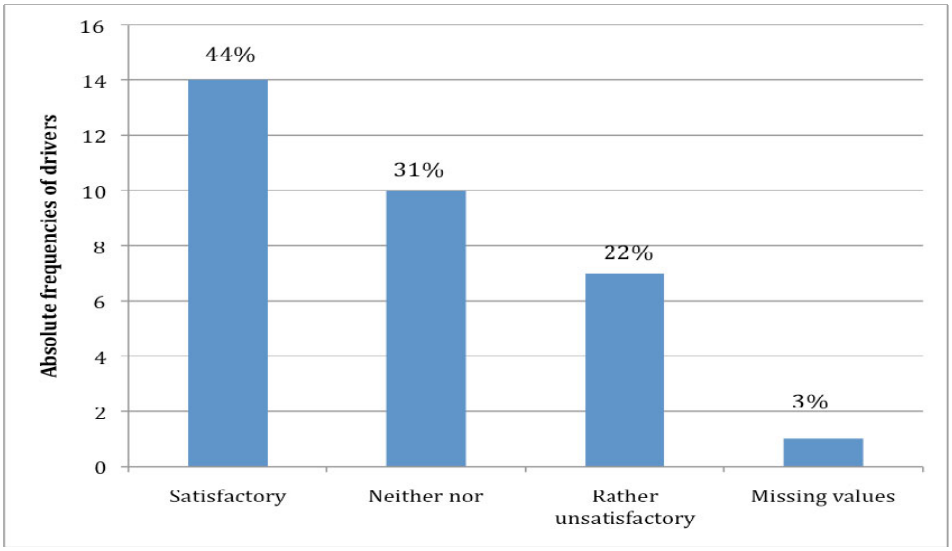

Figure 1: Frequencies of drivers' satisfaction with the Midibus overall performance (n=32).

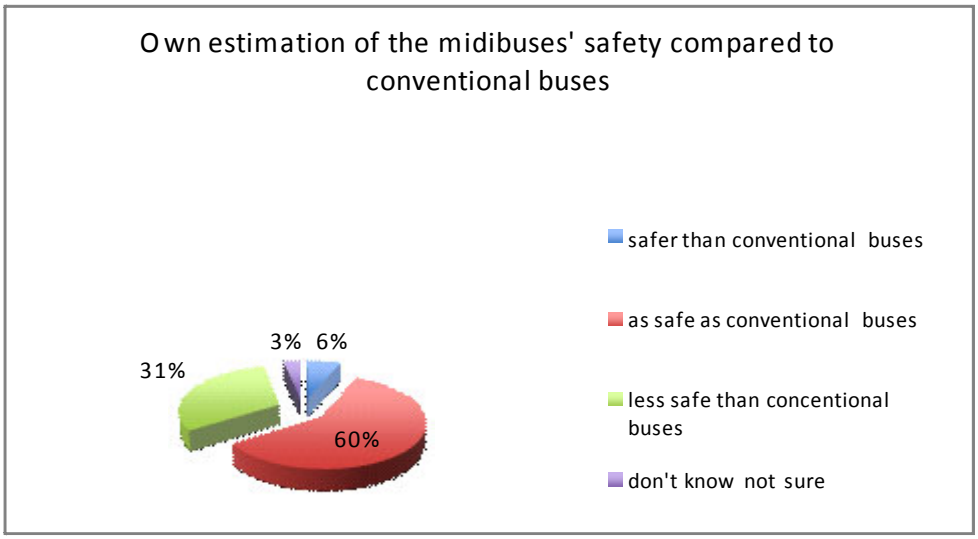

Figure 2: Frequencies of drivers' interest regarding Midibuses' safety (n=32).

The aspects named the most to be unsatisfactory were “speed” and “driving noises”. The drivers mostly describe their own interest in hydrogen as very or rather strong whereas only 6% are indifferent concerning this topic. The bus safety is estimated to be the same compared to conventional buses (60%), whereas 31% state that the midibus is less safe than a conventional bus.

5 Next Research Steps

The evaluation of the HYCHAIN projects consists of several investigative steps, which are on schedule for the year 2010. The next research steps include the follow-up survey on perceptions and attitudes of midibus drivers, as well as the survey of other vehicle drivers and target groups. Each driver group will be interviewed twice in order to gather the evolution in their opinions over time. Drivers will continue to be surveyed through self-completion-questionnaires, whereas face-to-face interviews are planned for other groups of interest e.g. service-centre-staff, infrastructure-operators, decision makers and fleet managers. The surveys regarding the project’s acceptance in the local public will be organized with the help of web applications, which allow a simple and quick programming of a questionnaire and an automatic response collection. The recruitment of a representative sample will be carried out by a professional online polling company. Finally a workshop for multipliers and stakeholders is planned. Representatives of influential groups concerning the project will be asked to participate in a panel discussion in each region. Such representatives would for example be government officials, journalists or regional stakeholder and researcher scientists. The following table presents some insights of the next research steps within the user perceptions and public acceptance surveys.

Table 1: Time schedule for the next research steps to conduct the perceptions and acceptance regarding HYCHAIN vehicles.

HYCHAIN communities in France, Germany, Italy and Spain		HYCHAIN fleet Time schedule for the next research steps			
Evaluation type		Midibus	Cargobike	Utility Vehicle	Weelchair
Questionnaires	Drivers	Two survey waves in April and September 2010			
	Passengers	Survey planned from May to July			
	Local Public	Survey planned from May to July			
	Minders	Survey planned from May to July			
In-depth interviews	Infrastructure Operator	Survey planned from September to December			
	Service Center Stuff	Survey planned from September to December			
	Fleet manager	Survey planned from September to December			
	Decision makers	Survey planned from September to December			
Workshops (optional)	Multipliers & Stakeholders	Survey planned from September to December			

6 Outlook

The first survey results with Midibus drivers in North-Rhine-Westphalia revealed a quite positive perception regarding the hydrogen fuel cell vehicles. The conference presentation will give more detailed insights and show whether these results were confirmed by the data from all four countries.

In summary, the surveys provide a comprehensive knowledge base on the perceptions and acceptance of hydrogen fuel cell vehicles in the four selected European communities. Our results will shed light into the local understanding and knowledge of hydrogen related issues, and possibly reveal existing misconceptions concerning hydrogen and fuel cell vehicles. The embedded in-depth interviews will provide insights in how security aspects affects hydrogen evaluations. These results will be evaluated and discussed with regard to their implications for hydrogen and fuel cell communication and implementation methods.