

*3rd Electric Road Systems Conference 2019
Frankfurt am Main, Germany, 7th to 8th of May 2019*

Social acceptance of catenary hybrid trucks in Germany - first results from the accompanying research of eWayBW

Aline Scherrer¹, Uta Burghard²

¹*Fraunhofer Institute for Systems and Innovation Research ISI, Breslauer Str. 48, 76139 Karlsruhe, aline.scherrer@isi.fraunhofer.de*

²*Fraunhofer Institute for Systems and Innovation Research ISI, Breslauer Str. 48, 76139 Karlsruhe, uta.burghard@isi.fraunhofer.de*

Summary

Catenary hybrid trucks (CHT) are one possible electric road system which has been proposed to reduce GHG emissions in heavy road transport. As an addition to previous studies on technical and economic feasibility, this study focuses on the social acceptance of the technology. Based on a survey, interviews and content analyses of newspaper articles, market acceptance and socio-political acceptance are assessed. First results show that early market acceptance can be found with associated companies but other logistics companies take an observant stance. Overall positive newspaper coverage indicates socio-political acceptance with additional dynamics unfolding in the local field trial context.

1 Research Questions

Catenary hybrid trucks (CHT) powered by renewable electricity are an electric road system which has been proposed to reduce GHG emissions in heavy road transport [1]. The trucks are operated with electricity from overhead lines and combine a conventional engine with an electrical counterpart and additional small batteries to bridge distances without overhead lines and to allow overtaking of other vehicles [2]. The potential of a successful implementation of CHT has so far mainly been approached through assessments of technical feasibility and economic viability. Most studies agree that CHT systems have cost benefits over other zero-emission technologies (see e.g. [3]; [4]; [5]), and will result in overall lower CO₂ emission, even when adjusting for building the infrastructure [2]. The technical feasibility of CHT has been demonstrated in several field tests in Sweden, Germany and the U.S. In Germany, three field trials for testing CHT are currently planned and carried out.

While this feasibility is necessary, a large amount of research surrounding the energy transition in Germany has shown that it is not always sufficient for technology success. Social acceptance of the technology plays an important role as well. For energy-related innovations, three dimensions have proven useful for conceptualizing social acceptance: market acceptance, socio-political acceptance, and community or local acceptance [6]. Market acceptance is concerned with the process in which an innovation gets adopted on the market and focuses on consumers and users. Socio-political acceptance focuses on public support for technologies and policies and the acceptance of policy actors and other central stakeholders. Finally, community or local acceptance is crucial when projects have direct implications for citizens in their vicinity. This dimension captures time-sensitive processes around siting decisions involving local stakeholders.

In this paper, we report first results from the accompanying research of the project eWayBW. The project electrifies parts of the federal highway B462 in the Murgtal valley in Baden-Württemberg. The trial route extends from Gernsbach-Obertsrot to Kuppenheim. After the completion of the current planning phase, three sections totalling 5.7 kilometres of road will be fitted with masts and overhead lines in both directions. One part of the research deals with the social acceptance of the technology and field test along the aforementioned three dimensions of acceptance. The focus of this paper is on market acceptance and socio-political acceptance - results for community acceptance are not available yet. Infrastructure and truck manufacturers as well as logistics firms can be considered the main market actors. Market acceptance studies typically focus on the end user which is also done here, resulting in a focus on logistics companies to assess this dimension. When considering socio-political acceptance, the social climate or social opinion in connection with CHT is considered.

Our research questions are, hence, the following:

- In how far can **market acceptance for alternative propulsion technologies, and for CHT specifically**, be found with logistics companies?
- How can the **socio-political climate around CHT** be described and what are current opinions and argumentation patterns?

2 Methodology

The research is carried out as a two-step process (see Table 1). The first step (1) is a general analysis of social acceptance (market acceptance and socio-political acceptance) of CHT in Germany. On this overarching level, quantitative and statistically descriptive methods are used. For *market acceptance*, a survey with more than 60 representatives from logistics companies in Germany yields the data basis. The survey captures the user demands for road-based heavy-duty transport and puts a specific focus on the usage and perceptions of alternative drive systems. To assess the *socio-political acceptance* of CHT in Germany, a representative sample of 74 German newspaper articles on the topic of CHT for the time frame 2013 to 2018 is assessed with a content analysis. Based on the analysis, articles are rated as either having a positive, neutral, or negative stance towards the technology.

To gain further insights into crucial discussion points and justifications for certain acceptance positions, (2) a case study analysing the social acceptance of CHT is added. The case study revolves around the field trial of the eWayBW project and adds in-depth knowledge, reflecting the exploratory nature of early practical research in a dynamic process such as a field trial. For the market acceptance dimension, two interviews with associated logistics companies and representatives of an associated logistics association are carried out. The interviews provide an initial overview of the opinions and expectations towards CHT held by logistics companies. For the dimension of socio-political acceptance, 40 articles on the field trial by two local newspapers are analysed with a content analysis. The analysis covers article frequencies, the main discussed themes, and the stances towards CHT in the public discourse so far.

Acceptance dimension		Market acceptance	Socio-political acceptance
Level of analysis			
(1) Social acceptance of CHT in Germany	Target group/data source:	Representatives of logistics companies	Newspaper articles
	Method:	Survey	Keyword search
	Analysis:	Descriptive statistics	Content analysis

(2) Social acceptance of CHT in the case study (field trial project eWayBW)	Target group/data source:	Representatives of associated logistics companies and logistics association	Newspaper articles
	Method:	Interviews	Keyword search
	Analysis:	Content analysis	Content analysis

Table 1: Overview of methodology.

3 Results

(1) Social acceptance of CHT in Germany

The first survey results on the *market acceptance* of CHT in Germany show that around 90% of those surveyed are aware of catenary trucks. More than half of this group say they already know something about the technology. However, the intention to use the technology is still limited, with less than 10% approval. For other technologies (electric trucks, fuel cell trucks, power-to-gas trucks, trucks with gas engines) the level of awareness is similar, but knowledge of the CNG/LNG-technology is highest, as is the intention to use this technology.

The content analysis of articles on CHT in a representative sample of German newspapers shows an overall positive *socio-political acceptance* of CHT. Out of a total of 74 articles, 10 articles are rated as negative, 38 articles are rated as neutral, and 26 articles are rated as positive. Negative articles were generally more upfront about criticizing the technology while positive accounts were subtler by using positive language and less counter-arguments rather than openly voicing their support for the technology. Overall, the depiction of the technology of CHT in the media is positive in the analyzed time frame with 26 positive articles outweighing 10 negative articles.

(2) Social acceptance of CHT in the case study eWayBW

To gather impressions of the *market acceptance* of CHT and background information on factors influencing this acceptance, a group interview with representatives of two associated logistics companies in the eWayBW field trial in Baden-Württemberg was conducted. The companies showed great acceptance towards CHT and openness to proactively contribute to the field trial. As one crucial factor to sustain this positive disposition, the companies pointed to the ability to satisfy the needs of their clients. Special requirements, caused for example by non-existent storage possibilities, restrict the room to manoeuvre and have to be tested in the field trial. The logistics companies, therefore, plan to make additional diesel-powered vehicles available for the field trial period.

To additionally capture the opinions of non-associated logistics companies, an interview with representatives of an associated logistics association was conducted. Their main impression is that logistics companies are open to try new options but costs are decisive. The most used alternative drive system is gas, followed by only a hand full of members experimenting with electric trucks. In the discussion around using alternative drive systems, they see CHT considered in fourth or fifth place, even behind synthetic fuels. Larger fleet operators between 50 and 200 units are more interested than smaller operators. The members have a mixed view of CHT - estimated by the representatives as one third with a positive regard and two thirds critical. They find that many companies are waiting for the trial results and that the critical parties do not seek further information on advantages and disadvantages. Some interested parties have not sustained their active involvement in the public discussion after alternative corridors in their vicinity were no longer considered for the trial. Related to these observations, the interviewees find a lack of arguments pro and contra CHT and consider this a result of its early development stage. The representatives also stress the important role of the clients - if a client is not interested in using CHT, for example because of their own role as an automobile producer, the service provider, in this case the logistics company, is likely to follow this credo.

Regarding the *socio-political acceptance* of CHT in the case study, 40 articles on the CHT field trial in Baden-Württemberg were found in the chosen local newspapers since the project started (between September 2017 and October 2018). Article frequencies show some media interest in the beginning of the project in September 2017 following an official press release covering the project start. Subsequently, media interest lowered to

around one article per month and significantly picked up again starting from July 2018 to around 9 or 12 articles per month. This time frame corresponds with the end-phase of the project approval procedure. Two overarching themes dominate the contributions. On the one hand, general facts about the project planning and project activities are presented. On the other hand, the articles inform about the current political situation around the field trial and the corresponding opinions of different actors. Environmental protection is invoked from both proponents and opponents of the technology. The second main recurring theme are restrictions for car drivers and road security aspects. Overall, eight negative, 17 neutral, and 15 positive articles could be categorised resulting in a mixed to positive media coverage of CHT in the case study so far.

4 Discussion and outlook

In this early phase of CHT field trials, market acceptance differs between logistics companies in general and those associated with the trials. Associated companies are optimistic and pragmatically expect challenges while other companies have an observant or critical stance. This early assessment is, however, explorative in nature and is based on small number of cases. Further developments will yield more differentiated results of underlying argumentations. General socio-political acceptance is high as newspapers paint an overall positive picture of CHT. Further developments of the public discourse will show whether the positive climate prevails especially with regard to local political discussions. Current results characterize the acceptance landscape in the early phase of field trials in Germany and hint at unfolding dynamics between actors which will determine future developments.

Acknowledgments

This paper was prepared as part of the project eWayBW, funded by the German Federal Ministry for the Environment, Nature Conservation and Nuclear Safety, and as part of the project ENavi, funded by the German Federal Ministry of Education and Research.

References

- [1] International Energy Agency. (2017). *The Future of Trucks: Implications for energy and the environment*. Retrieved from <https://www.iea.org/publications/freepublications/publication/TheFutureofTrucksImplicationsforEnergyandtheEnvironment.pdf>
- [2] Wietschel, M., Gnann, T., Kühn, A., Plötz, P., Moll, C., Speth, D., . . . Mader, S. (2017). *Machbarkeitsstudie zur Ermittlung der Potentiale des Hybrid-Oberleitungs-Lkw*. Retrieved from http://www.bmvi.de/SharedDocs/DE/Anlage/MKS/studie-potentiale-hybridoberleitungs-lkw.pdf?__blob=publicationFile
- [3] den Boer, E., Aarnink, S., Kleiner, F., & Pagenkopf, J. (2013). *Zero emissions trucks: An overview of state-of-the-art technologies and their potential*. Delft. Retrieved from CE Delft website: http://elib.dlr.de/83986/1/CE_Delft_DLR_Zero_emissions_trucks_Webversion.pdf
- [4] Gladstein, N. & A. (2012). *Zero-Emission Catenary Hybrid Truck Market Study*. Retrieved from <http://learn.gladstein.org/whitepaper-zeroemissioncatenary>
- [5] Moultak, M., Lutsey, N., & Hall, D. (2017). *Transitioning to Zero-Emission Heavy-Duty Freight Vehicles*. Retrieved from The International Council on Clean Transportation (ICCT) website: https://www.theicct.org/sites/default/files/publications/Zero-emission-freight-trucks_ICCT-white-paper_26092017_vF.pdf
- [6] Wüstenhagen, R., Wolsink, M., & Bürer, M. J. (2007). Social acceptance of renewable energy innovation: An introduction to the concept. *Energy Policy*, 35(5), 2683–2691. <https://doi.org/10.1016/j.enpol.2006.12.001>

Authors



Aline Scherrer studied Liberal Arts and Sciences (BA) with a Major in Governance at the University of Freiburg. In her Master studies of Sustainable Development (MSc) at Utrecht University in the Netherlands, she used a basis of environmental and climate governance topics to focus on theories of socio-technical transitions. In August 2018, she finished her master's thesis at the Fraunhofer Institute for Systems and Innovation Research ISI. Since October 2018, she is a research associate in the Competence Center Energy Technology and Energy Systems. Her work focusses on the acceptance of new energy technologies, social networks, and the interface between acceptance and innovation research.



Dr. Uta Burghard studied Social Sciences with Psychology at the universities of Mannheim, Giessen and Brussels, specializing in Micro-sociology, Consulting and Advisory Services. From March to July 2010, internship at the Fraunhofer Institute for Systems and Innovation Research ISI in the field of consumer acceptance of alternative fuels. From January to December 2011, research associate in the Competence Center Energy Policy and Energy Systems at the Fraunhofer ISI, since January 2012 in the Competence Center Energy Technology and Energy Systems. She finished her PhD at the Leuphana Universität Lüneburg in summer 2016 on norms and guiding principles related to cars and electric mobility in families.