German states pave the way for truck electrification with new eHighways

Government: **Hesse** and **Schleswig-Holstein,** Germany

Region: Europe

Sector: Clean transportation

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Summary

With transport contributing toward roughly 25% of CO_2 emissions in the European Union, and heavy-duty vehicles accounting for one-fifth of these, electrifying truck transport is a key step to decarbonizing the economy. Electric trucks can also significantly reduce noise, allowing more overnight transport assignments, thus reducing daytime traffic. The benefits on public health due to the drastic reduction of air pollution, which will be particularly noticeable around metropolitan areas, is another obvious benefit.

Two alternative systems are available to electrify truck transport: **on-board storage** (the truck is powered by alternative fuel or electricity stored on board) or **external power supply** (the electricity is provided to the truck through an external system). This includes overhead catenaries (also known as overhead lines), (see box 'The technology side'), which are estimated to be the cheapest and most energy efficient option to electrify transport, according to preliminary data from the Öko-Institut.

In 2016, the federal Ministry of Environment issued a call for proposals for German states to build pilot eHighways using the overhead catenary technology.

The state of the Hesse was the first to start the process for the implementation of a 10.4km-eHighway pilot project coordinated by Hessen Mobil, the road and traffic management agency, together with the Technical University of Darmstadt. The project's budget amounted to €15 million. A few months later, it was followed by the state of Schleswig-Holstein, who collaborated with the regional Transport Ministry and Kiel University of Applied Sciences on a 10.1km eHighway project, which cost €19 million.

The state of Baden-Württemberg is also implementing a similar project on a national road.

Expected results and next steps

Siemens Mobility, the project developer in both states, estimates that a 40-tonne truck driving 100,000 km on an eHighway could offer savings of up to €20,000 in fuel. If 30% of German truck traffic makes the switch to clean electric power, CO_2 emissions could be reduced by six million tonnes. Electric trucks are also twice as efficient than traditional engines, which would significantly reduce local air pollution and operating costs.

There are approximately 12,000 kilometers of highways in Germany, but because 60% of the emissions from heavy duty vehicles occur on 2% of the network, even electrifying only the busiest roads would make a huge contribution to emissions reduction. In addition, the application of overhead catenaries technology could be a lot broader than truck transport and include shuttle and mine transport, as well as long-haul traffic.

The construction phase is set to be completed by Autumn 2018 in Hesse and Spring 2019 in Schleswig-Holstein. The testing phase will then start, with up to five trucks provided by the federal government to each state. The trucks will be used by private transport companies for their daily business, transporting goods ranging from food products to paint. This provides the opportunity to test the logistical challenges of these new types of trucks in real traffic conditions.

After the completion of the test phase, which includes analysis of acceptance as well as investigations into lane and speed behavior, a technological, ecological and economic evaluation of the system will be carried out. This will provide information on the benefits and potential expansion of the eHighways. Respective partner universities will perform this work.

An additional incentive for adoption should be in effect by 2019, when electric trucks will become exempt from truck tolls.

Challenges

- **Building permissions:** approval processes for building such infrastructure are typically quite lengthy (up to 5 years). However, due to the reduced timeline available to use the budget (approx. 2 years), the government of Hesse significantly sped up the process of establishing building rights for electric power lines, while complying with stringent environment laws. Importantly, this was only possible as the eHighways were pilot projects – the approval process for bigger scale projects will inevitably be longer.

- **Knowledge and capacity building:** building eHighways requires a distinct skillset and expertise (for example, on infrastructure and technology). In the case of Hesse, the regional government tapped into both municipality expertise from cities experienced in running trams, and knowledge from the private sector stakeholders involved in the project. Those skills will also be key in maintaining the new infrastructure.

- **Environmental concerns:** building the eHighways involves setting masts and catenaries, which may affect local biodiversity. Including these risks in the long-term planning of the project and establishing a dialogue with all stakeholders, such as local NGOs, was key in making sure the concerns were appropriately assessed and addressed.

- **Supra-national and European integration:** these pilot projects must demonstrate reliability and eventually be rolled out across the European Union so that trucks travelling between member states are adequately equipped to use eHighways.

The technology side: Truck electrification via overhead catenaries

Both eHighways use catenaries, which are overhead electric lines supported by large masts that are constructed beside the road. A pantograph, or sensor, is installed above the driver's carriage and can either automatically or manually attach to the catenaries. This allows trucks to charge while travelling at speeds of up to 90km/h. In addition, the energy produced during braking can either be used by the truck, stored in the battery, or sent back to the grid. When the truck is not connected to the overhead system, it is powered by an alternative propulsion system – this can include a wide range of technologies.

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More information:

News story on the project in Hesse (in German) | Presentation from Siemens on eHighways

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