H2Accelerate

Whitepaper

Understanding and Meeting Customer Expectations for Hydrogen Trucking

A whitepaper setting out the needs of truck end-users and logistics providers as these organisations look to decarbonise operations, focusing on the opportunities and challenges that hydrogen trucking brings. This paper discusses the role of hydrogen in facilitating truck end user decarbonisation targets, as well as supporting logistics companies to maintain operations amidst increasing regulatory pressure to reduce emissions. The paper outlines the needs and expectations of customers in terms of operational and infrastructure requirements, cost, and policy intervention to enable a transition to zero-emission heavy-duty trucking across Europe.

This paper was published by the H2Accelerate Collaboration in July 2022 as the third in a series of whitepapers in support of the use of hydrogen in long-haul trucking.

The H2Accelerate collaboration

The H2Accelerate collaboration has been formed between Daimler Truck AG, IVECO, Linde, OMV, Shell, TotalEnergies, and Volvo Group with the goal to develop the evidence base and public funding programmes which can help move Europe towards a commercially viable hydrogen trucking system. Each of these major industrial players, from both the fuel supply and trucking sectors, have made their own organisational commitments to achieving net zero carbon in line with Europe's ambitious decarbonisation targets under the Paris climate agreements.

H2Accelerate members share the belief that achieving the decarbonisation of the heavy-duty trucking sector will require the use of hydrogen as a fuel for many of the vehicles used by the continent's vehicle operators. Communication between the H2Accelerate collaboration and different end user groups throughout the project phases will be of critical importance to the successful rollout of hydrogen trucking, not least to ensure the needs and expectations of these vehicle operators are met.

To this end, focus group workshops were held between H2Accelerate members and a range of logistics operators (who operate fleets of trucks across Europe) and logistics end users (who subcontract their logistical needs to logistics operators) in Autumn 2021. The participants in these workshops are listed in the Annex. This paper provides a summary of main conclusions derived from this engagement, covering the following topics:

- Organisational decarbonisation drivers;
- Technological considerations for vehicle operators;
- Cost of technology switching and policy support.

Based on stakeholder engagement, it can be concluded that there is significant interest in hydrogen as a zero-emissions trucking solution, with good awareness of its merits as a technology amongst end users. While there is willingness to invest in the technology at a premium in the early years of rollout, end users were clear in the need for cost premiums to fall. In the long term, end users require cost parity with current incumbent technologies to be met for mass rollout to be achieved. Furthermore, reliability and network coverage of refuelling infrastructure were highlighted as critical to the operations of logistics end users.

These conclusions point not only to key focus areas for industry, but also to the critical need for policy intervention to support the development and rollout of the technology. End-users are united in their wish for uniform and clear policy across Europe to enable the uptake of low-carbon trucking technologies. Decarbonisation of long-haul trucking is unlikely to be met within the timeframes required should this support not be provided by governments.

Members of the H2Accelerate collaboration aim to facilitate the roll-out of a hydrogen trucking system that is able to meet end user need and expectations by leveraging the expertise and commitments of key truck manufacturing and hydrogen infrastructure players.

End-User Decarbonisation Drivers

Each logistics end user organisation involved in the consultation has clear targets for the decarbonisation of their operations, with both long-term and interim targets in place. These targets are public facing, further strengthening the drivers for decarbonisation within these organisations. For example, see Amazon's Climate Pledge and Nestle's Our Road to Net Zero. In addition to external and internal targets, there is expectation from organisations' customers for the decarbonisation of their activities.

These organisations are looking to decarbonise across their value chains. Looking specifically at decarbonisation of trucking operations, several different means to achieve this goal are being considered, including:

- **Modal shift,** i.e., switching some current truck operations to rail or maritime transportation;
- **Improving operational efficiency** (e.g., through avoiding empty or part filled trucks);
- **Innovative technologies** such as hydrogen and battery electric vehicles.

While organisations have set outward-facing decarbonisation targets, these cannot be achieved in isolation. Targets are contingent on others acting, and in particular zero emissions technologies being available at cost parity and with appropriate associated refuelling/recharging infrastructure in place. While focus is currently on the decarbonisation of activities, if technologies are not available at reasonable cost, some organisations confirmed that offsetting (whereby emissions occurring through the organisation's activities will be compensated for by reducing greenhouse gas emissions or increasing carbon storage elsewhere) will be considered to meet targets.

Typically, logistics end users do not own their vehicles - this was the case for the organisations involved in our consultation. Instead, transportation of goods via trucks is subcontracted out to logistics operators.

For logistics operators, in addition to customer demand (from logistics end users), low emission policy mandates are significant drivers for the adoption of zero emissions trucking solutions. Strong zero emission policy mandates have been announced in several European cities and countries such as Paris, Rome, Madrid and the Netherlands. For example, at least thirty cities across the Netherlands will have implemented zero emission zones for logistics vans and trucks by 2025 (at the time of writing)[1]. Continued announcements of similar mandates across Europe are expected.

[1] Rijksoverheid (2021), 'Nieuwe afspraken om steden te bevoorraden zonder CO2-uitstoot'

Technological Considerations - End User Perspectives

There is a substantial awareness of hydrogen as a zero-emissions transport solution for truck operators and end users, and the use case for hydrogen trucking featured in the decarbonisation plans of each of the stakeholders consulted.

The use case for hydrogen trucking

From a logistics operator perspective, the main advantage of hydrogen over pure battery electric vehicles is the operational flexibility gained from fast refuelling times (comparable to petrol/diesel vehicles). For logistics operators, the biggest cost in their business is personnel costs. Therefore, quicker and less frequent refuelling (relative to pure battery electric vehicles) is required if the cost of logistics is to be maintained at current levels. These companies expected that for the majority of applications, battery electric vehicles could have sufficient range, but recharging times may limit them to only certain use cases.

While hydrogen's importance for decarbonisation of longer and heavier duty routes is typically recognised, logistics operators have identified other use cases where hydrogen could offer advantages in the decarbonisation of trucking. Logistics operators stressed the importance of hydrogen vehicles in areas where deployment of battery electric vehicles to replace existing fleets would lead to significant grid constraints and would therefore require grid upgrade works. For example, in the Netherlands where zero emission vehicles will be required in certain urban areas from 2025, it is expected that the current electricity grid will not be able to support demand from battery vehicles. Hydrogen vehicles will therefore be required even in short-range applications for logistics operators to be able to reliably serve these areas.

Equally, in certain applications vehicles are often double shifted, whereby the vehicles are driven for two consecutive shifts by two separate drivers. For these applications, waiting for battery vehicles to recharge is not operationally viable, even for relatively short-haul applications. This presents another potential use case where hydrogen trucks can offer an advantage.

Though it can be more cost effective for fleets to switch to a single technology type, logistics operators expect that most future fleets will be mixed, comprising both battery electric and hydrogen vehicles. Although this will, of course, vary by operator, organisations consulted during the workshops suggested that battery electric trucks could fulfil the requirements of ~80% of routes **based only on range requirement**. Note, this figure does not take into account that some fleets may opt to have a higher proportion of hydrogen vehicles for greater operational flexibility.

Network Design and Rollout

Truck end users understand that early station network coverage will be limited, however any detour off-route for drivers, however short, will not be acceptable. Careful planning of early station locations will therefore be needed. Although back-to-base refuelling for suitable fleets could help ensure early station rollout meets vehicle demand, this approach will not be

appropriate for all fleet routes. Where back-to-base refuelling will not be possible, coverage should be targeted to specific routes with stations 100-150km apart. The European Commission-proposed Alternative Fuels Infrastructure Regulation (AFIR) will play a crucial role in ensuring adequate coverage as it stipulates that by 2030, EU member states are to ensure that publicly accessible hydrogen refuelling stations with a minimum capacity of 2 tonne/day and at least one 700 bar dispenser are installed at a distance of no more than 150 km from each other on the TEN-T core network and the TEN-T comprehensive network[2].

It will be of paramount importance that vehicle and infrastructure providers work with end users to identify specific locations for the deployment of stations which align with operations for this initial roll out of stations. In the longer term, station coverage needs will be very similar to station networks for existing diesel vehicles.

Interoperability of stations is crucial for truck end users, particularly if station coverage is low relative to the incumbent diesel refuelling network. As such, following the first phase of deployment at scale, vehicle suppliers and HRS providers sector will need to respond to customer preferences by converging towards a preferred refuelling technology/technologies (350 bar, 700 bar, or liquid hydrogen). This will ensure all stations can be used by all trucks.

Challenges with refuelling/recharging infrastructure availability have been experienced with other new technologies e.g., LNG, BEVs. Logistics operators therefore understand that initially, comparable availability with petrol/diesel stations is unlikely to be met. Longer term, however, the operators will require near 100% availability of stations. Timely, transparent, and coordinated communication of station availability (e.g., via live availability apps which drivers can check, and advance notice of planned downtime) vastly improves the ability of truck operators to manage downtime. This will be of vital importance during the early stages where station availability is reduced, in order to maintain a positive interaction between logistics operators and hydrogen trucking.

Cost and policy support

While both logistics end users and logistics operators are willing to invest at a premium to trial new technologies such as hydrogen, cost parity with diesel is needed to justify switching whole fleets to the technology. End users of logistics have suggested that longer term contracts could be used to give preference to logistics companies with a zero-emission offering. Logistics companies however suggest that long term contracts would only encourage the uptake of zero emission vehicles if cost parity with diesel vehicles can be achieved. Organisations are, at present, unwilling to explicitly pass on additional costs of zero emissions technologies to customers e.g., through a 'green premium'.

Hydrogen truck costs as well as the cost of low-carbon hydrogen production are expected to fall significantly over the coming decades. Policy has a critical role to play in enabling and accelerating these cost reductions.

[2] European Commission (2021) *'Proposal for a REGULATION OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL on the deployment of alternative fuels infrastructure, and repealing Directive 2014/94/EU of the European Parliament and of the Council'*

End users highlighted the need for regulatory clarity and uniformity across Europe, otherwise deployments may only target areas with incentives, which does not lend itself to a pan-European approach. Furthermore, regulatory ambiguity slows progress, with investors less willing to commit to the large-scale investments needed to advance the sector.

In terms of specific policy asks, there was strong support for existing German policies for zero emissions trucking to be adopted across Europe. Current German policies include:

- Grant funding of up to 80% of the difference in the cost of a diesel vs. climate-friendly commercial vehicle[3].
- Grant funding for up to 80% of the cost of refuelling / recharging infrastructure for climate-friendly commercial vehicles.
- Exemption from road tolls for trucks with alternative propulsion, expecting to reduce the operating cost between €0.093/km - €0.187/km[4].

Increasing CO2 tax and implementation of zero emission mandates were also recognised as other possible policy mechanisms to support the implementation of a hydrogen trucking system. Logistics end users expressed concerns about the implementation of these policies before a viable alternative system has fully matured, due to the lack of zero emission options currently available on the market. In the near term, support for both vehicle costs and infrastructure is needed to achieve an acceptable cost basis and refuelling network for mass-market rollout of hydrogen trucks.

Conclusions

Consultation with a number of logistics operators and logistics end users has provided useful feedback on the need for, and challenges of hydrogen trucking. Members of H2Accelerate intend to leverage their discussions with these groups to ensure that the hydrogen trucking system is designed to meet end user expectations.

End users of logistics understand the pressure for their organisations to decarbonise and have created outward facing targets with this in mind. These companies acknowledge, however that they are unable to decarbonise logistics unless zero emission trucks and the associated infrastructure becomes available in the coming years. Companies expect to fall-back on carbon offsetting should a mature zero emission truck offering not materialise.

While logistics operators are aligned with the H2Accelerate view that hydrogen trucking will be required for long-haul, heavy-duty applications due to the operational flexibility it offers, further use cases where hydrogen offers operations advantages over BEVs have been identified. These include trucks operating in areas with significant grid constraints which will present challenges for BEV charging, and for use cases where vehicles are double shifted, requiring fast refuelling.

[3] NOW GmbH (2021) '*EU approves new funding guideline for commercial vehicles with alternative drive systems – funding guideline and funding call published*'

[4] Trans.info (2020) '*Germany to extend the exemption for trucks with alternative propulsion*'

Logistics operators understand that early hydrogen refuelling networks will be geographically limited and experience higher maintenance requirements that diesel stations. These limitations are acceptable in the short term provided stations are located very close to transport corridors and downtime at stations is clearly communicated to operators. It is expected that hydrogen refuelling networks will match the operational convenience of current diesel networks in the long term.

Although customers are happy to pay a cost premium to trial small numbers of zero emission vehicles, they will require parity with current diesel prices to switch entire fleets as they are not willing to pass an increased cost of logistics on to end users. It is expected that capital support for trucks and infrastructure, along with road toll exemptions for zero emission trucks will have the greatest impact on the business case hydrogen trucking.

A central objective of the H2Accelerate collaboration is to create an end-user centric hydrogen system, in order to create a mass market for hydrogen trucking in the post-2030 period. H2Accelerate members intend to continually engage with end users to guide the design of early hydrogen refuelling networks, and advocate for policy support that will allow end user needs to be met.

Annex: Acknowledgements

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