



## The Current State and Future Potential of Hydrogen Trucks in the Automotive Market

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- Hydrogen fuel cell vehicles are the most suitable option for the trucking industry. This is because the driving range and refueling time are nearly comparable to gasoline-powered trucks, thereby lowering the barrier to developing fueling infrastructure.
- In reality, only a small number of fuel cell or battery trucks can be found on roads. Even though the number of battery electric trucks is greater than the number of hydrogen trucks, it is still quite negligible relative to the overall truck stock in countries.

With climate change becoming a more pressing concern, automotive manufacturers are heading away from conventional internal combustion engines (ICE) to electric vehicles (EV). In pure electric vehicles, the industry has two options, battery electric vehicles (BEVs), vehicles that rely only on battery power, and fuel cell/hydrogen vehicles (FCEVs), ones that rely on hydrogen as a fuel source. When it comes to the question of which is the better choice, the market seems divided as some leaders, such as Tesla's CEO, Elon Musk, have made their skepticism about hydrogen vehicles clear on several occasions. However, other market leaders do believe in the technology and consider it the future, including the BMW group. Toyota also views hydrogen as an alternative to conventional integrated engine vehicles in heating, lighting, haulage, mass transit and heavy industry.

Whether BEVs or FCEVs, only a small portion of electrification can be seen in the truck segment. Trucks are mostly responsible for the transportation of freight by weight, resulting in huge amounts of greenhouse gas emissions.

Therefore, electrifying trucks should be a priority. The low present rate of electrification in trucks may be due to a multitude of factors, such as the cost of electric trucks, the heavy weight of battery electric trucks, efficiency of fuel cells, and a lack of effective policymaking.

## Current Market Landscape

Focusing on FCEVs, the Oak Ridge National Laboratory claimed, in 2021, that hydrogen fuel cell vehicles were the most suitable option for the trucking industry. This is because the driving range and refueling time are nearly comparable to gasoline-powered trucks, thereby lowering the barrier to developing fueling infrastructure. Additionally, hydrogen fuel cells have more energy-per-unit mass than a lithium battery. Thus, a truck can have more energy without significantly increasing the weight, an essential consideration for long-haul trucks.

In reality, only a small number of fuel cell or battery trucks can be found on roads. Even though the number of battery electric trucks is greater than the number of hydrogen trucks, it is still quite negligible relative to the overall truck stock in countries. This goes to show how the overall market for pure electric trucks is still in the fledgling stage. As reflected in figure 1, the European market saw more battery electric trucks than hydrogen trucks in 2021. It can be seen that only the Netherlands, Norway, Portugal, and Switzerland have hydrogen trucks in stock. Therefore, comparing the overall European market in 2021, hydrogen trucks only had a 2% share in the pure electric market stock, whereas the other 98% belonged to battery electric trucks.

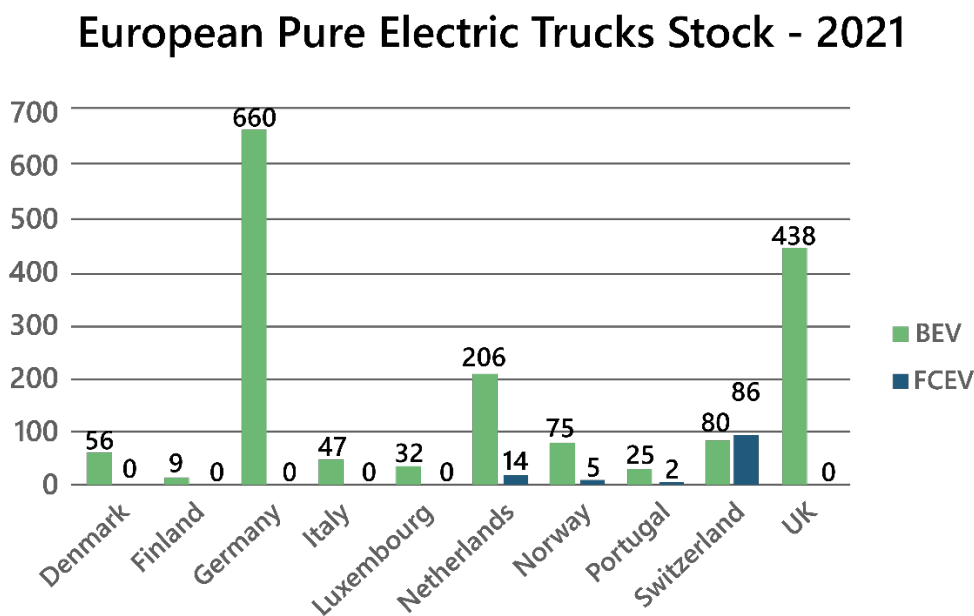


Figure 1: Pure Electric Truck Stocks in Europe

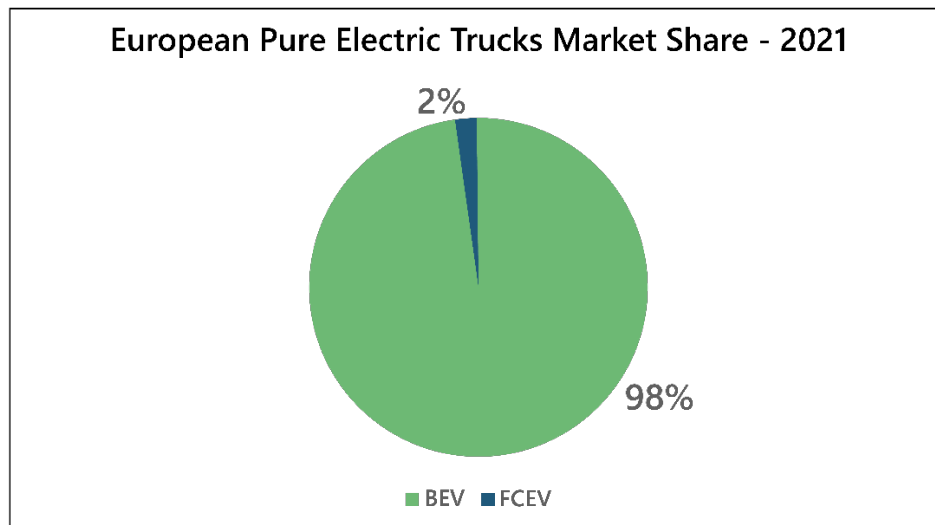


Figure 2: Pure Electric Truck Share in Europe

## Future of the Hydrogen Truck Market

In November 2020, the Volvo Group and Daimler Truck signed a 50:50 joint venture, Cellcentric, that was officially formed in March 2021. Cellcentric is aimed towards building one of Europe's largest planned series productions of fuel-cell systems that will speed up the rollout of hydrogen trucks, harmonized with the EU hydrogen policy framework to allow the fuel cells to become a sustainable commercial solution. In order to ensure the infrastructure essential for supporting these vehicles, both companies, along with public and private stakeholders, are taking steps to set up about 300 high-performance refueling stations for heavy-duty vehicles by 2025, and 1,000 before 2030. Following the venture, Volvo Trucks claimed that it had begun testing hydrogen fuel cell vehicles for some Swedish firms with the range extended to about 1,000 kilometers. Furthermore, the Gothenburg-headquartered Volvo Trucks mentioned that refueling the vehicles will take less than fifteen minutes. However, it will take some years until the vehicles are on road: Volvo has planned to begin customer pilots in the next few years and commercialization in the latter half of this decade.

In a similar vein, Hyundai, the pioneer in fuel cell electric vehicles, is to supply 27 hydrogen fuel cell trucks to Germany, with \$1.63b funding from the Federal Ministry of Germany for Digital and Transport for eco-friendly commercial vehicles. The trucks to be deployed in Germany, XCIENT Fuel Cell trucks, have a fuel cell system of 180-kilowatt while they use seven hydrogen tanks with an extra supply of power from three batteries. The maximum driving range of these trucks will be a little under 400 kilometers, which will make them a suitable choice for a modern battery-electric truck. This is not the first time XCIENT has been exported to Europe: previously, 47 hydrogen trucks had been exported to Switzerland, clocking up over 4 million kilometers on the road, as of July this year. These exports are part of the Hyundai Group's plan to make hydrogen trucks as competitive and reliable as battery electric trucks. In 2021, the Hyundai Motor Group announced its plan for developing various versions of fuel cell technology for its commercial vehicle models by the year 2028, and to introduce a next-generation fuel-cell system in the year 2023. In 2021, it unveiled the prototype of a next-generation fuel cell system for advancing the popularization of hydrogen energy. This next-generation fuel cell system is expected to achieve innovations in various fields such as performance, volume, durability, and price competitiveness.

Apart from these market giants, start-ups are also gearing up to compete. The UK-based startup, Tevva, has recently launched a hydrogen-electric heavy goods vehicle, making it the latest company in the sector. Tevva claims it has raised \$140m in funding and the range of the truck will be 310 miles. Tevva has revealed that the first truck will weigh

7.5 metric tons, followed by 12 and 19 metric tons. The CEO of Tevva clarified that they are not interested in pickup trucks or smaller vans but are more focused on heavy good trucks to go heavier with time, as those are segments that are much harder to electrify.

## Looking Ahead

Such steps toward a greener future indicates a healthy market for hydrogen trucks. But is the rivalry between hydrogen and battery electric trucks really necessary? Rivalry encourages competition, resulting in better efforts and output but many companies, such as Volvo and Daimler, do not choose to be part of any particular group and put their best efforts into both technologies to open ways for a sustainable future. For example, hydrogen trucks should be designated for long distance journeys where one needs to refuel better. However, if the delivery is within city limits and the truck can be charged overnight in a depot, then battery electric is the more economical choice. Thus, the focus should be on attaining a clean and sustainable future. Rather than prioritizing one technology in all cases, steps should be taken for both in different scenarios.

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