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Commercial Trucks Are a Key Part of EV Adoption. What's Holding Them Back?

Battery-powered trucks face hurdles that electric cars don't. Among them: They can cost more than three times as much as a similar diesel model

By Bart Ziegler

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Electric trucks have some advantages over their diesel counterparts, but also some disadvantages.
PHOTO ILLUSTRATION: PHOTO ILLUSTRATION BY SIUNG TJIA/WSJ; VOLVO (2)

The effort to reduce carbon emissions by transitioning to electric vehicles isn't going as well as it might seem.

On the bright side, the adoption of electric cars is happening faster than some experts predicted, with sales in the U.S. soaring 65% to 800,000 last year. But the move to electric power for big commercial trucks is stuck in first gear, with only a few thousand on American roads.

Experts say it's vital to replace millions of diesel-engine tractor-trailers and other big rigs with green alternatives to tackle climate change. Medium- and heavy-duty trucks

make up only about 5% of U.S. vehicles but spew about 23% of all greenhouse gases from transportation sources, according to the Environmental Protection Agency.

Now, with a push from billions of dollars in new federal and state subsidies and stricter regulations, some experts are optimistic that the transition to green-energy trucks will accelerate.

But getting there faces speed bumps. Several technologies (batteries, fuel cells or burning hydrogen in a modified internal combustion engine) are competing to replace diesel engines. That's a technological split that the car industry doesn't face, and it could make truck buyers hesitate to commit to any one path. It also could require massive funding to build two "filling station" networks—one with high-power chargers for battery trucks and another to replenish the hydrogen tanks of others.

Another big hurdle: Battery trucks can cost more than three times as much as a similar diesel model—a vastly greater premium than the 15% to 25% extra that consumers pay for many electric cars over nonelectric versions, not counting tax incentives that can reduce this added cost. And there are downsides with the battery trucks' weight, lengthy charging times and limited driving range.

All this means that the truck transformation could take far longer than that of passenger vehicles. "This is a transition that is a minimum of 15 to 20 years," says Bernd Heid, a senior partner at McKinsey & Co. who advises clients on carbon-free transportation.

Here's a look at what might speed up—or slow down—that transition:

Sticks and carrots

In April, the EPA proposed increasingly stringent vehicle-emission rules that it says could require 35% of new short-haul and 25% of new long-haul tractor-trailers to be electric by 2032. Meanwhile, California requires that some trucking companies begin buying electric vehicles starting next January.

There are also positive incentives to make the move. Under the 2022 Inflation Reduction Act, buyers of electric and hydrogen-fuel-cell heavy commercial vehicles can receive a tax break of up to $40,000 per truck. The law also offers tax incentives to install electric charging and hydrogen filling stations. In addition, it provides funds to boost U.S. production of vehicle batteries—the most expensive part of electric trucks—which could reduce their cost.

Customer demand

Pressure from some customers of trucking companies also is fueling the move to electric vehicles.

Gross allowed weight (truck plus cargo) in the U.S.

Volvo VNR 300 diesel
80,000 pounds

Volvo VNR electric
82,000 pounds

Truck weight without cargo

15,000 pounds (weights can vary based on configuration)

6x4 four-battery-pack
22,400 pounds
6x4 six-battery-pack
25,400 pounds

Horsepower for top model

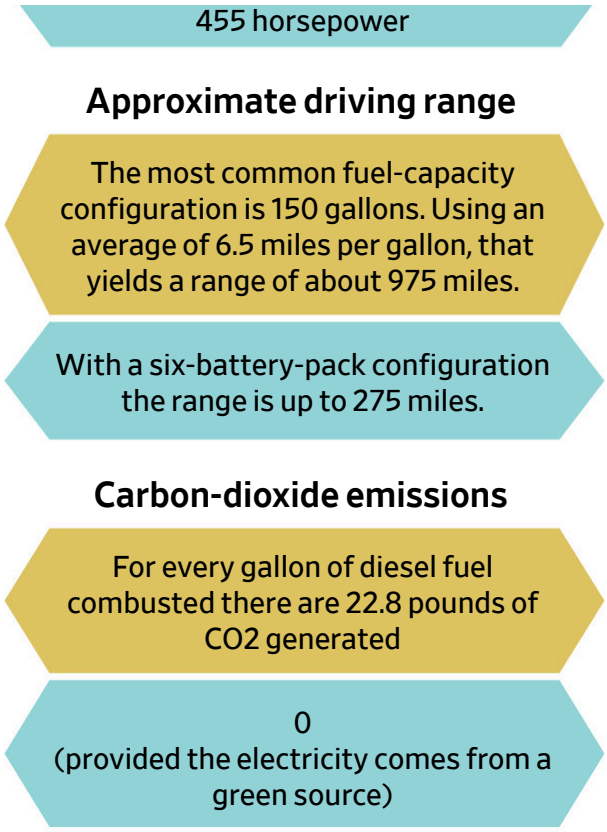
500 horsepower

Katie Griley is president of Griley Air Freight, a family-owned company that moves freight in and out of Los Angeles International Airport. She says a client wanted a no-emissions truck used for its shipping business because one of its own customers specified it. So she bought a Volvo electric truck for about $470,000—compared with about $135,000 for a diesel model.

That's too rich a price for her relatively small company, even after government subsidies, so she says she plans to split the cost with the client. Still, she says of truck electrification: "This is coming. I'm not going to be left to the side."

Sysco, a food products distributor, has about 20 battery trucks from Daimler's Freightliner division and a letter of intent to buy a total of 800. So far, it uses them to deliver shipments to restaurants and other customers in Southern California. The company limits the trucks' daily routes to 130 miles or so to ensure they don't run out of juice. When they return to the depot at day's end they are plugged in and take about three hours to fully recharge.

Apart from their high cost, Sysco is pleased with the vehicles. "The biggest surprise is the truck holds its charge better than we assumed," says Marie Robinson, Sysco's chief supply-chain officer, who is overseeing the rollout.



That's allowing the company to test routes longer than 130 miles.

Another upside: In an era when truck drivers are in short supply and frequently jump jobs, Sysco's drivers "love the truck," she says. Electric trucks are quieter and accelerate more smoothly and quickly than diesel ones.

Sysco plans to have one-third of its fleet converted to nondiesel by 2030. But the cost of the vehicles and the chargers makes them economically viable only with government subsidies. As Sysco plans to expand its use of electric trucks elsewhere in the U.S., "we anticipate some form of government assistance in all those places," Robinson says.

Moving to electrics also can require changes in driver habits. Performance Team, a distribution company owned by shipping giant A.P. Moller-Maersk, has told drivers of its Volvo electric trucks to look for "opportunity charges"—hooking up their rigs when they pause for a break at the company's depots, says Michael Gallagher, Performance Team's head of procurement, fleet and services in North America. One incident reinforced that practice—a truck got stuck along a road with a depleted battery and had to be towed.

Getting the juice

Beyond the steep price of battery trucks, fleet operators face high expenses and other challenges in constructing charging stations at their depots. Among the hurdles: delays in government approvals, lead times of up to two years in procuring the electrical gear, and trouble getting the local utility to provide the vast amount of power needed.

"I've had a number of customer sites that I have worked with where we've got longer lead times getting the infrastructure in place than we do for our ability to deliver the trucks," says Keith Brandis, vice president of system solutions partnerships at Volvo Group North America.

Trucking firm Schneider National started work on charging stations at its Southern California sites about three years ago to service the 92 Freighliner electric trucks it ordered. "We thought we'd be done late last year," says Rob Reich, Schneider's executive vice president and chief administrative officer. But it didn't have a ribbon cutting for the installation until June. His advice to other trucking firms: "It's going to take a lot longer than you think."

Truck makers are trying to ease the issue. They are helping customers determine details such as how many chargers they need, where to install them and how much power they will use.

Unlike in the diesel world, where fuel delivery to truck depots is a well-established system, "we have to enter into the infrastructure space," says Rakesh Aneja, head of e-mobility for Daimler Truck North America. "That to me was one of the biggest surprises" about the move to electric.

What about trade-ins?

Commercial-truck purchases are all about the total cost of ownership—what it costs to buy the truck, operate it and maintain it, and what it will be worth when it is traded in for a new model. "It's the only metric that counts," says McKinsey's Heid.

Calculating the trade-in figure—the residual value—is well-established for diesel trucks but a mystery for electric ones because there is no resale market yet to base it on. Plus, there's an added concern: The long-term viability and worth of the batteries aren't known. As with cellphones and laptops, truck batteries will lose their ability to hold a charge as they age.

All that makes it tough for truck buyers and companies that finance them to figure out the economics of purchases.

The long haul

Designing battery trucks that could take nonstop trips of 500 or more miles—common for long-haul diesel routes—faces hurdles. The battery packs already are heavy. Adding more batteries could cut into how much freight a truck can carry, due to government weight limits. That could harm the economics of trucking. And charging bigger battery packs would increase the already-long charging times.

Many experts say fuel-cell trucks are the answer. These trucks carry compressed hydrogen that is fed into a device that converts the gas into electricity that powers the motors.

Experts say a fuel-cell truck could travel 500 or more miles before its tanks need a refill. And that refill would take a fraction of the time it takes to charge an electric truck. But the technology is still at an early stage.

Most major truck makers are exploring fuel-cell models. Paccar has joined with Toyota Motor to develop fuel-cell trucks for its Kenworth and Peterbilt brands. Daimler is working with Volvo. In May, Hyundai announced a commercially available version of a fuel-cell heavy-duty truck.

"I'm excited about the option," says Schneider's Reich. "I don't anticipate [electric trucks] will be able to handle long haul."

But so far there are very few fuel-cell trucks in use—generally just test versions—and very few places to fill their tanks. Also, hydrogen is expensive and making it creates pollution.

Some 95% of hydrogen in the U.S. is produced by using steam to interact with natural gas. The process splits off hydrogen atoms, but emits carbon dioxide into the atmosphere—the very greenhouse gas that nondiesel trucks are supposed to eliminate.

Hydrogen advocates say "green hydrogen" could be created through an alternative method: using electricity from renewable sources to split water into hydrogen and oxygen. So far, production of hydrogen by this costly technology is minimal.

Volkswagen's Traton unit, which makes Navistar, Scania, MAN and other truck brands, is betting that batteries will advance enough to relegate fuel cells to a niche product. "There is so much research and money flowing into battery technology," says Michael G. Grahe, executive vice president of operations at Navistar.

Traton argues that battery trucks are much more energy-efficient when all the energy used to produce and transport green hydrogen and turn it into electricity in a truck's fuel cell is compared with the energy used to produce and transmit electricity to a battery truck.

Splitting their bets

Truck manufacturers also are considering models that burn hydrogen in an internal combustion engine, similar to a diesel engine. But this technology faces the same hydrogen limitations as fuel cells—it's costly, and making it can produce greenhouse gases.

And these vehicles present another pollution concern. The high heat inside the engine creates nitrogen oxides, which can damage the human respiratory tract. So such

trucks aren't considered zero emission.

Many big truck makers plan to split their bets by pursuing battery-electric, fuel-cell and, possibly, hydrogen-combustion options. And they say diesel could be around for many more years.

"We are likely to see a world in commercial vehicles where battery electric, diesel and hydrogen coexist for decades to come," says Brian Collie, Boston Consulting Group's global leader in the automotive and mobility sector.

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