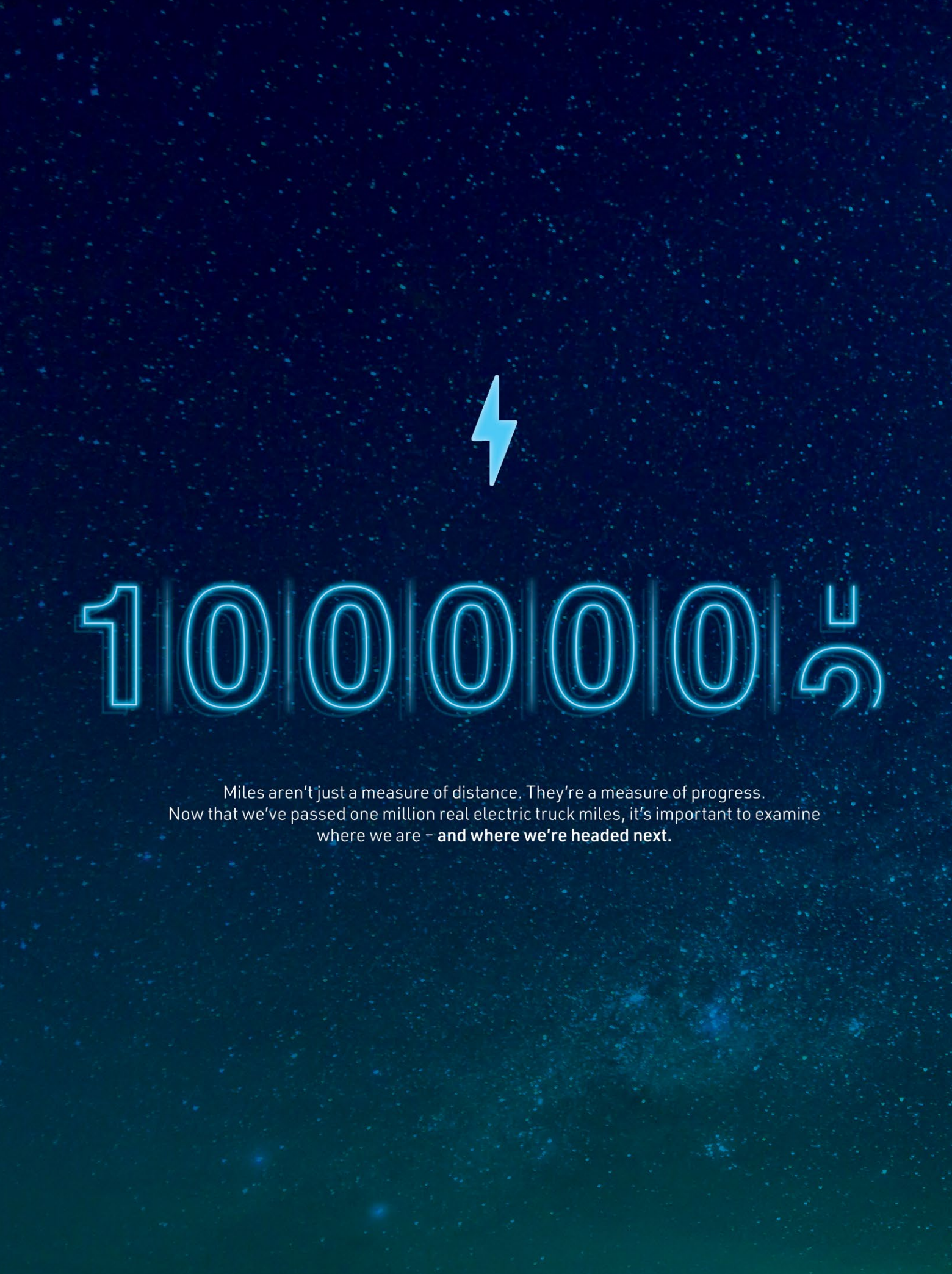
Transport Topics

SPECIAL REPORT:
Trucking's Electrification Journey

"CAN WE GO ELECTRIC?"

Navigating the Barriers To Electric Truck Adoption



Miles aren't just a measure of distance. They're a measure of progress.
Now that we've passed one million real electric truck miles, it's important to examine where we are – **and where we're headed next.**

The journey to one million started in March of 2020 with the launch of our Customer Experience Fleet. To date, we at Daimler Trucks North America have worked with more than 35 customers to take electric trucks from a bold idea to a tangible, efficient reality for real businesses.

As we continue down the highway of innovation, we are strengthening our other core eMobility offerings as well. In May of 2021, we launched Detroit eFill chargers, a fully integrated line of charging solutions designed to deliver smart, efficient charging to customers who are ready to start their eMobility journeys.

Our eConsulting team continues to relentlessly grow its capabilities and expertise in order to guide customers into the zero-emissions world. We are dedicated to answering questions, removing roadblocks and developing customized solutions for our customers, because we know that the best solutions offer more than just EV technology – they make that technology work in the world of transportation.

The journey to the electric future is a marathon. And as we lead the race on the road, we at DTNA will continue forward, steadfast and resolute, focused on the next million.

John O'Leary
CEO

David Carson
SVP, sales and marketing

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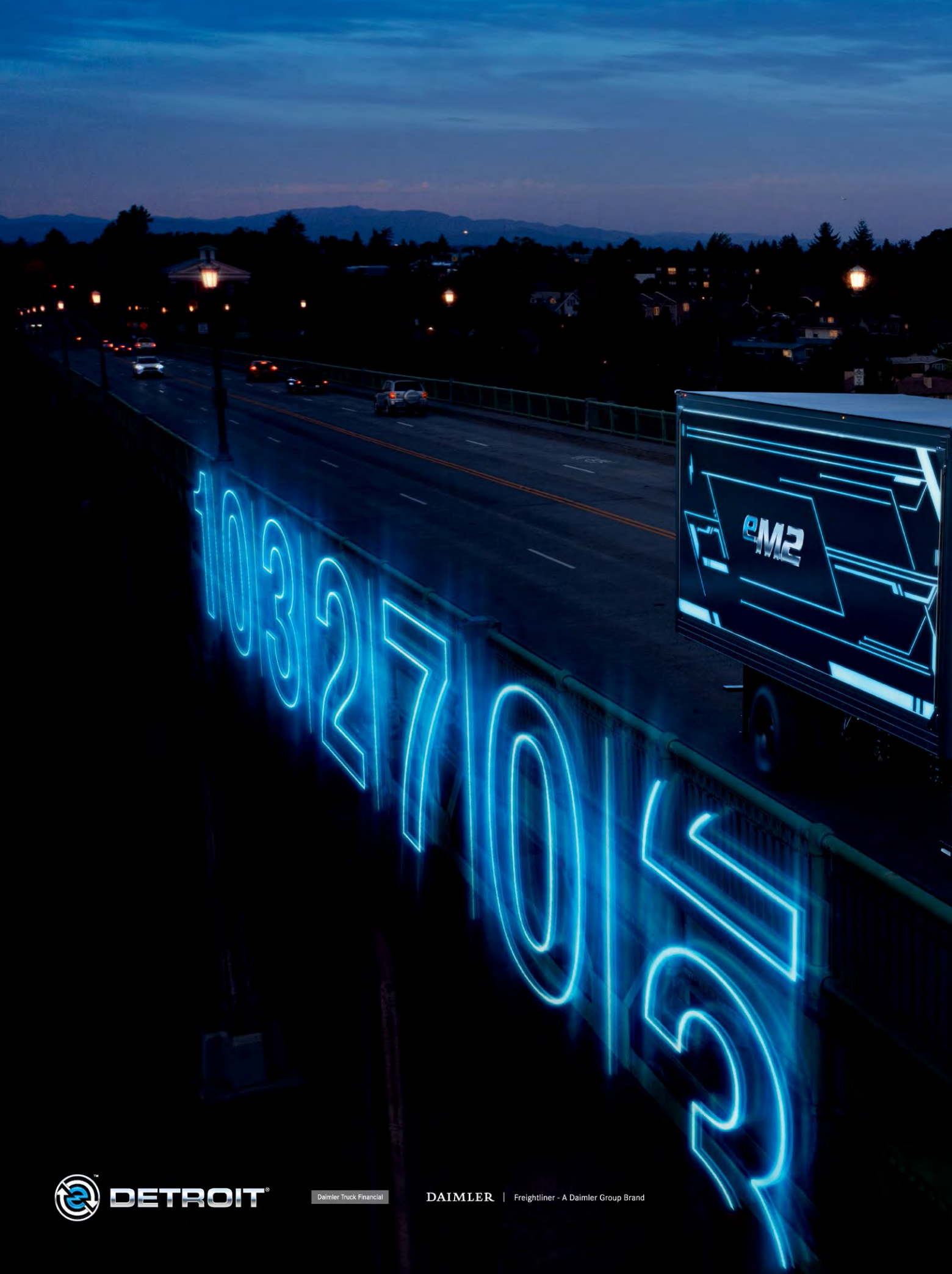

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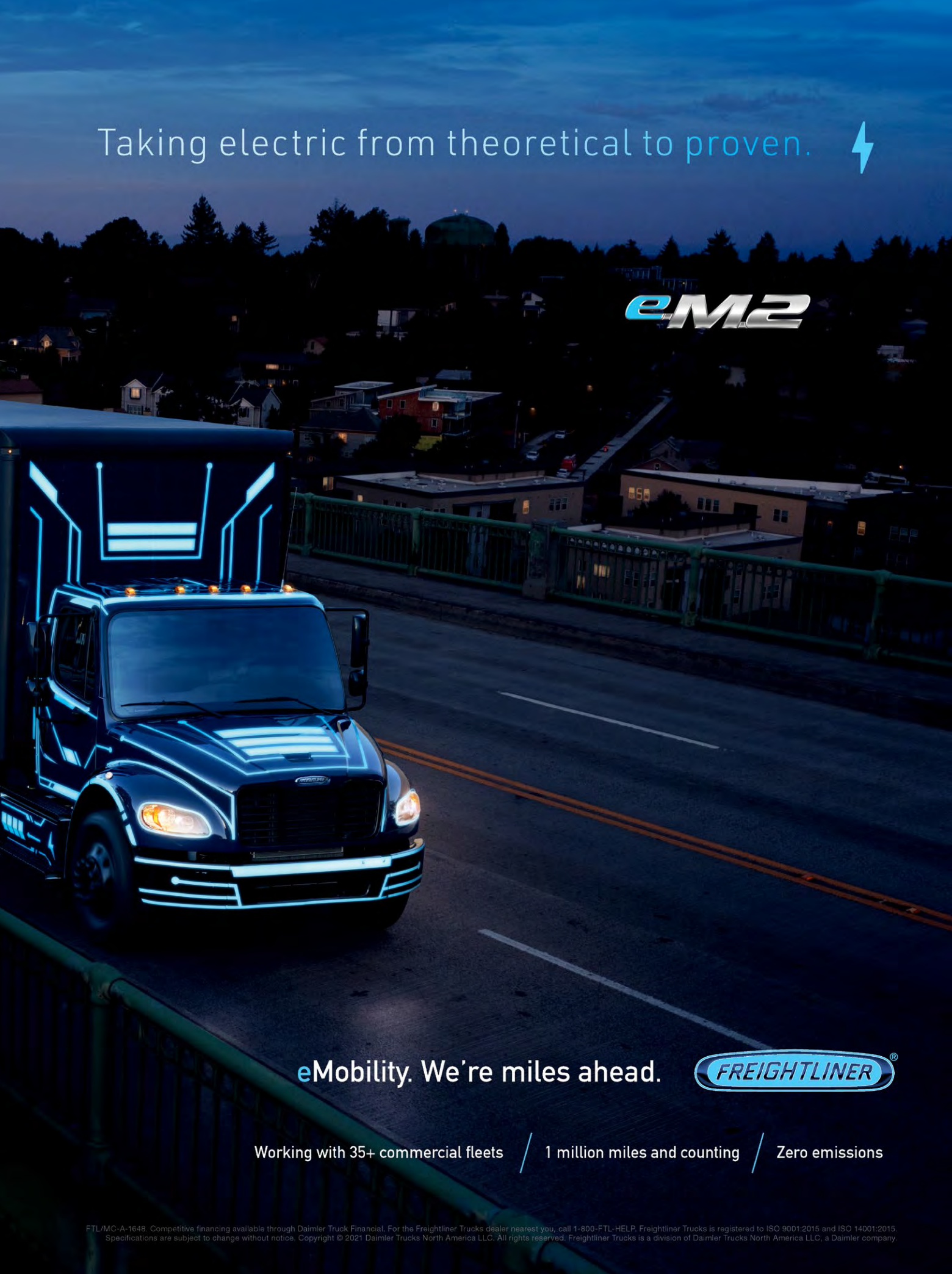


The Electrification Journey

Electric Trucks Offer Many Benefits, But Early Adopters Must Overcome Cost, Range and Charging Obstacles

By Jerry Hirsch
Contributing Writer

Electric trucks promise many potential rewards for the freight transportation industry — zero tailpipe emissions, a quieter, cooler, more comfortable cab, easier driving dynamics, less maintenance and better reliability compared with their diesel counterparts.

But the experiences of fleets that have begun to deploy these vehicles illustrate an elaborate set of challenges and considerations associated with electrification.

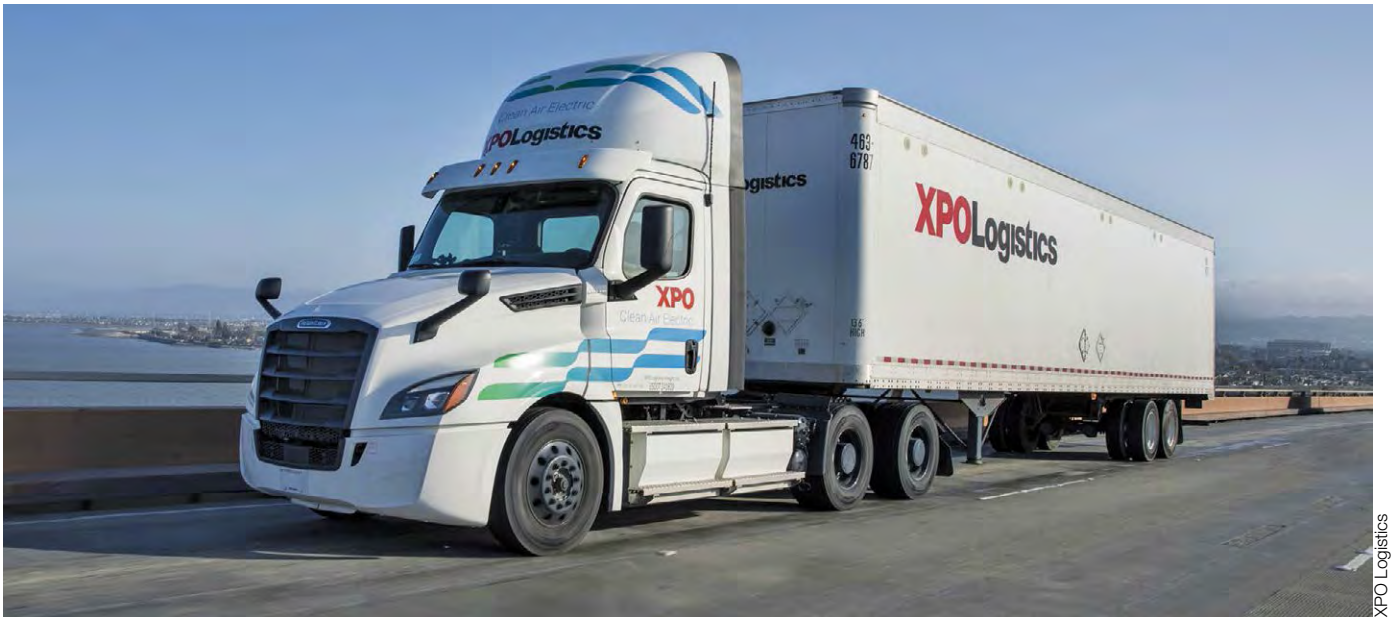
While many of the benefits are proving out, there are several significant barriers to widespread adoption, including high acquisition costs, complex infrastructure requirements and basic financial questions such as the resale value of a first-generation electric tractor.

The number of electric trucks in operation in the United States stands at about 1,000, with another 1,000 on order, according to Calstart, a nonprofit industry consortium pushing zero-emission commercial vehicle adoption.

Those figures are about to grow significantly as automakers launch a series of electric pickup trucks and vans next year that are expected to be popular with utility fleets and delivery services.

The heavy-duty electric truck segment, however, faces additional challenges because it has the most expensive vehicles, the most challenging duty cycles and most expensive charging infrastructure.

With 87 Classes 3-8 electric trucks in its fleet, Penske Truck



XPO Logistics

More trucking companies are introducing electric trucks into their operations, but the industry will need to address issues such as vehicle cost, range and charging infrastructure to pave the way for broader adoption.

Leasing is among the largest users of this new type of commercial vehicle.

"We've learned that the vehicles will perform under different duty cycles, under different mileage bands within their range, and under the different topographies with different rates and payloads," said Paul Rosa, senior vice president of procurement and fleet planning at Penske Truck Leasing.

But challenges abound, starting with how quickly the vehicles and the technology are changing, Rosa said.

For example, it's hard to figure out the resale value of a current generation electric truck three years from now, an essential consideration for those purchasing or leasing the vehicles, he said. They are too new to have a reliability track record. It's difficult to assign a residual value when near-term technology improvements are likely to improve the range, payload and other characteristics of new electric trucks that a current model will compete against in the resale market, Rosa said.

And despite Penske's positive early experiences with electric trucks, it still sees limitations compared with internal combustion vehicles.

"It's been a challenge with the restrictions of which customers can operate them because of range, payload and other specification limitations," he said.

For-hire carrier NFI also is pushing quickly into electric trucking.

The fleet has 10 prototype Freightliner eCascadias with a combined 500,000 miles of operation and is adding four Volvo VNR Electrics to its fleet this year. NFI also has an additional 30 eCascadias and 30 VNR Electrics on order.

Contents

NFI is electrifying its fleet of 60 drayage trucks used for 120- to 170-mile round trips from the Southern California ports to inland distribution centers, said Bill Bliem, NFI's senior vice president of fleet services.

The motor carrier and its drivers like the way the trucks operate, but NFI, much like Penske, has encountered several hurdles that need to be solved to accelerate electric truck adoption, starting with greater flexibility.

"Every fleet is different and no one seems to understand this," Bliem said. "And every truck within a fleet is different depending on weight and how many miles it must go."

NFI, for one, would prefer more battery capacity to extend the range of its electric trucks, even though it would increase the vehicle's weight and cut into cargo capacity.

"We've been telling the manufacturers that we could use a little more battery because we can handle a little less payload," Bliem said. "With containers, we are generally weighing out between 60,000 and 70,000 pounds."

Increasing the vehicle's range could enable NFI to get two port trips out of its trucks between charges.

"I would gladly pay for more battery," Bliem said.

Charging infrastructure is another major challenge. It's expensive and there's not enough of it.

With its own distribution centers and shorter, regional hauls, NFI installs charging stations at its hubs. But not every potential electric truck user has that advantage, Bliem said.

California, for example, wants to electrify the tens of thousands of trucks that work the massive Los Angeles and Long Beach port complex.

"About 90% of those trucks are owner-operators operating as independent contractors. Will they be able to invest even $200,000 into an electric truck?" Bliem asked.

Today, many operate heavily used tractors that are among the least expensive trucks. And even if they could obtain an electric truck, there's almost nowhere they could charge it, especially at a rate that doesn't result in profit-cutting delays.

Charging stations can be built, but they will have to be the so-called Megawatt Charging System, rated at 1,250 volts and 3,000 amps, under development by the CharIN industry task force.

"Every fleet is different and no one seems to understand this. And every truck within a fleet is different depending on weight and how many miles it must go."

Bill Bliem, NFI

"While not as fast as diesel, somebody can fill up in about 20 minutes and hit the road," Bliem said. "Anything less is an illusion. Nobody is going to park at a public charging site for two hours with a driver sitting there doing nothing."

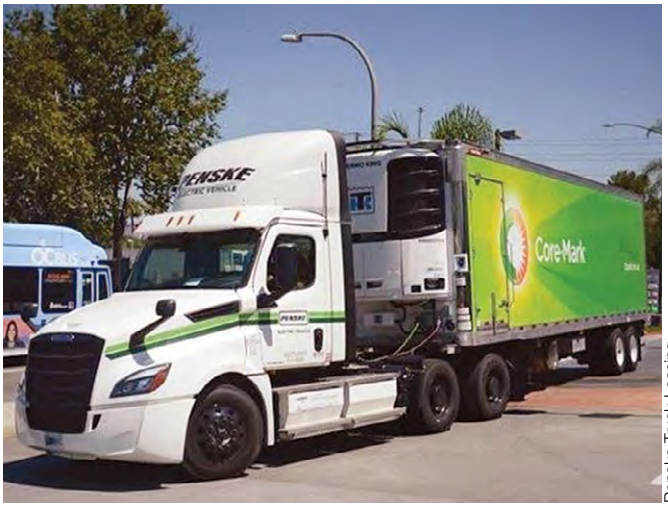
People often have misconceptions about charging infrastructure because of their familiarity with electric passenger car charging, Penske's Rosa said.

He found that potential leasing clients don't understand the significant increase in complexity and cost required to charge Classes 4-8 commercial vehicles. It's not like wiring a passenger car charger into a garage.

Working with the local utility to make sure there is enough available power takes far longer than people expect. The cost of the equipment and construction can be substantial, he added.

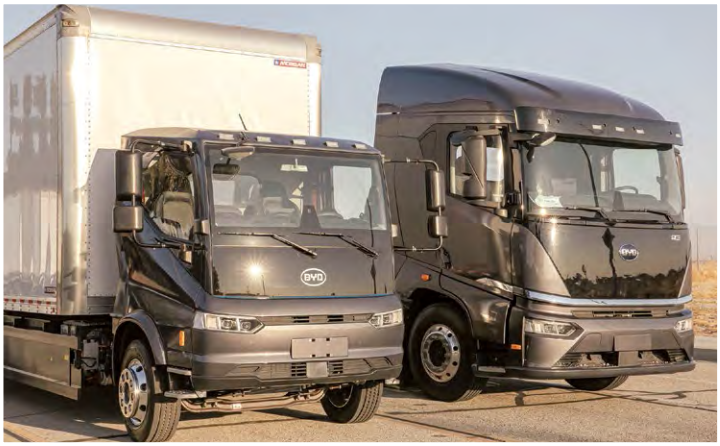
"It takes a year to a year and a half, depending upon what

Volvo Trucks North America

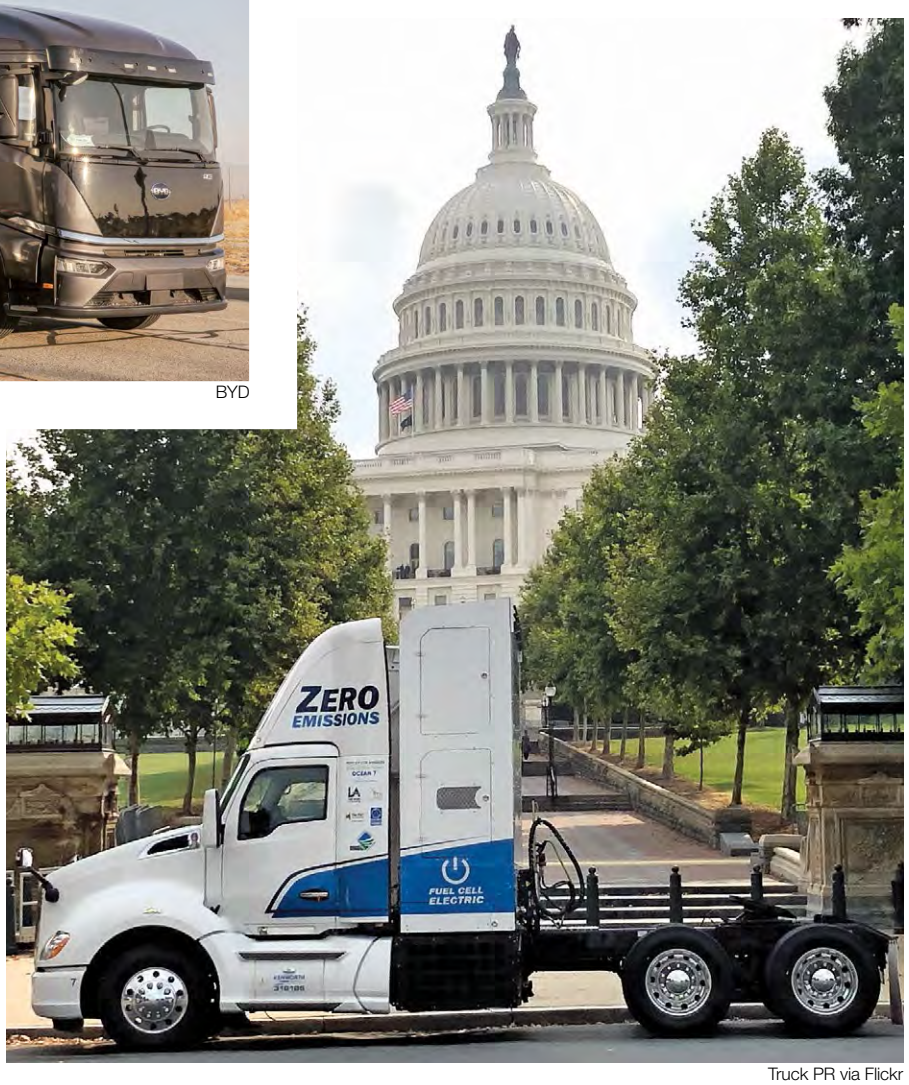


Penske Truck Leasing

Early adopters of battery-electric trucks, such as NFI (left) and Penske Truck Leasing (right), have been gaining experience operating these vehicles in real-world freight applications.



BYD



Truck PR via Flickr

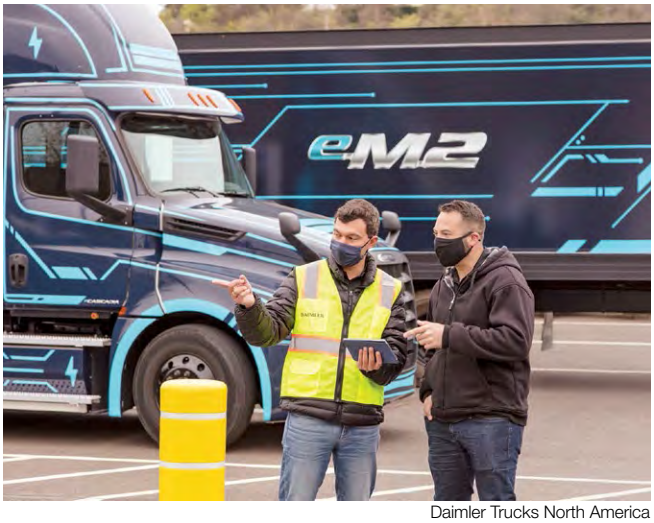
Clockwise from above:

Manufacturers such as BYD have been ramping up production of battery-electric truck models.

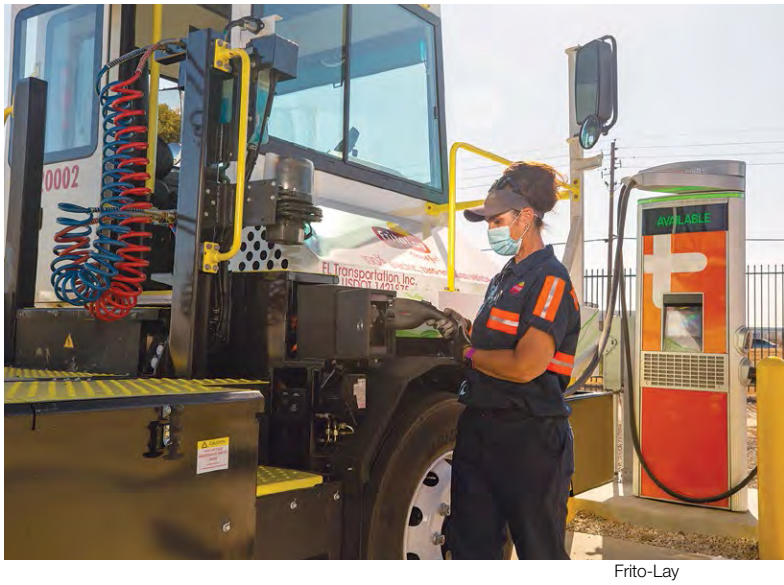
A fuel-cell electric version of Kenworth's T680 tractor on display in front of the U.S. Capitol in Washington earlier this year.

Frito-Lay, a division of PepsiCo, has rolled out electric yard tractors at its Modesto, Calif., facility.

Truck makers such as Daimler are offering consulting services to help customers make the leap to electric vehicles.



Daimler Trucks North America



Frito-Lay

you need. And with today's supply chain challenges and shortages of various things, it could take two years right now to put in your infrastructure," Rosa said.

And then there is the cost factor.

Without incentives and subsidies, Rosa figures the price of an electric Class 8 truck is 2½ to three times that of a comparable diesel vehicle. There's less of a price penalty for smaller electric vehicles, he said.

"We've learned that the vehicles will perform under different duty cycles, under different mileage bands within their range, and under the different topographies with different rates and payloads."

Paul Rosa, Penske Truck Leasing

"Add in the infrastructure challenges, the real estate challenges that go with that, and you're looking at $450,000 without subsidies. That's a really hard total-cost-of-operation case," NFI's Bliem said.

An equivalent new diesel truck sells for $125,000 to $150,000 and requires no infrastructure investment.

That's why most electric trucking is in California, where the state and local agencies offer generous incentives and subsidies. Calstart figures about 70% of the electric trucks in operation are in California.

All told, that's why large fleets are just dipping their toes into electric trucking for now.

XPO Logistics is testing several Freightliner electric trucks at its Hayward, Calif., service center but hasn't launched a large Class 8 project. Working with furniture retailer Ikea, XPO uses Lightning Electric Class 4 commercial box trucks to deliver goods in New York.

It also has several pilot programs operating in Europe.

But for now, XPO says electric trucks still have too many technical and economic obstacles blocking greater deployment.

"Until the charging infrastructure is fully in place, the industry will be limited to charging at a fleet's home base and the vehicles will be best for urban or regional operations," XPO said in a statement.

The less-than-truckload carrier said there still are range issues that make it hard to use electric trucks on varied routes with different elevations, payloads and stops. Finally, it calculates the acquisition cost is three to seven times higher than an equivalent diesel-powered vehicle.

XPO and NFI rank Nos. 3 and 16, respectively, on the Transport Topics Top 100 list of the largest for-hire carriers in North America.

Truck Makers Continue Rolling Out Electric Models

Despite the hurdles, manufacturers producing pickups to Class 8 tractors are confident that electric trucks gradually will replace diesel models and they continue to push forward with development and commercialization.

North America's largest incumbent truck makers as well as electric vehicle companies such as BYD are working to scale up their electric truck businesses.

Daimler Trucks North America has 40 prototype battery-electric Freightliner eCascadias and eM2 box trucks operating under test conditions with about 50 customers. The truck maker plans to launch series production of the Class 8 tractor in 2022, with eM2 production slated to begin the following year, the company said.

Volvo started producing its VNR Electric earlier this year and has about 150 units in operation for various customers, mostly in California. But electric truck deployments are expanding in other regions as well.

"We just delivered five units to our customer Manhattan Beer Distributors in the Bronx, New York, and will deliver two units to our customer Fleetmaster in Texas early in the first quarter," said Brett Pope, director of electric vehicles at Volvo Trucks North America.

Paccar's operating companies, Peterbilt Motors Co. and Kenworth Truck Co., have introduced their own battery-electric truck lineups and are taking orders and delivering vehicles to fleet customers.

Earlier this year, Navistar launched its electric medium-duty International eMV Series trucks.

Meanwhile, a significant market for electric cargo vans and pickups is beginning to take shape. Ford already has 160,000 reservations for the electric version of its flagship F-150 pickup truck, and Rivian has an order for 100,000 delivery vans from online retail giant Amazon.

Regardless of the financial and infrastructure hurdles, motor carriers and shippers need to start planning for an electric future now, said Didem Cataloglu, CEO of Direxyon, an economic modeling consulting firm based in Montreal.

"It's not something that's going to happen overnight. So that's why the transition planning needs to start now."

Didem Cataloglu, Direxyon

"With all of the regulations that are prioritizing clean energy and zero emissions, companies need to have a plan ready to make sure that the transition happens," Cataloglu said. "It's not something that's going to happen overnight. So that's why the transition planning needs to start now."

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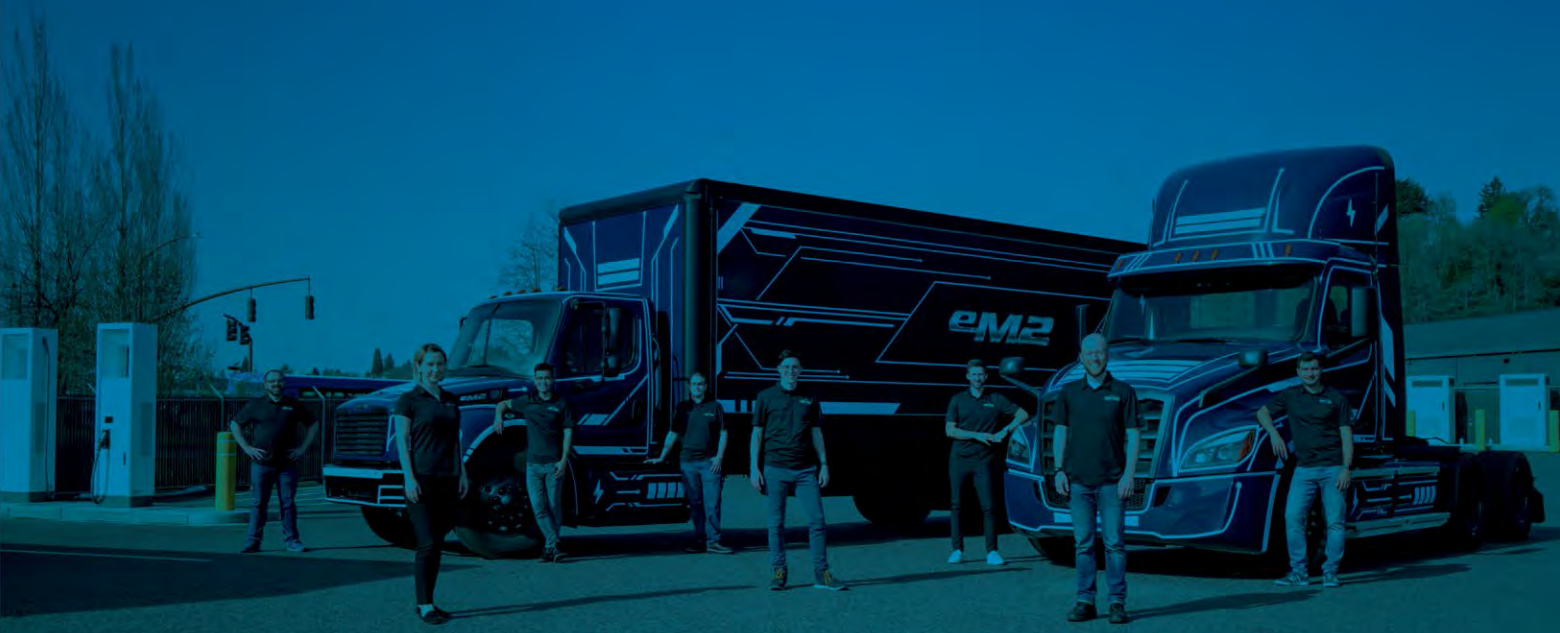

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Specialty, Medium-Duty Trucks Could Accelerate EV Growth

By Connor D. Wolf
Staff Reporter

A variety of specialty and medium-duty applications can propel deployment of electric trucks in commercial settings, industry experts said during an Oct. 24 panel discussion at American Trucking Associations' Management Conference & Exhibition in Nashville, Tenn.

"The smaller the truck, the lower the battery, the less charging — that's a simpler and more 'early adopter' truck," said Mike Roeth, executive director of the North American Council for Freight Efficiency. "We believe step vans, box trucks [will] scale probably faster than a lot of us think. Medium-duty and smaller."

Research NACFE has conducted on EV adoption found that some companies see terminal tractors as a good application for electric truck deployment. He noted the power demands are low since they don't travel very fast and remain in the same area.

The Class 8 market, however, presents greater challenges for electrification.

"We need more range, we need less weight, we need a lot of cost savings to get there, but some heavy-duty tractors do the job today," Roeth said. "Anheuser-Busch runs a bunch of electric trucks in beverage. They're making it work right now, really well, in Class 8 tractors."

PepsiCo is one fleet that has been exploring electric trucks as well as renewable energy, and has worked with NACFE on its Run on Less demonstrations for both diesel-powered and electric trucks.

"As we look at the different opportunities, we don't have a one-size-fits-all kind of a solution as we take these products to market, nor will we have a one-size-fits-all solution as we transform the fleet as well," said Ken Marko, senior national fleet engineer for PepsiCo.

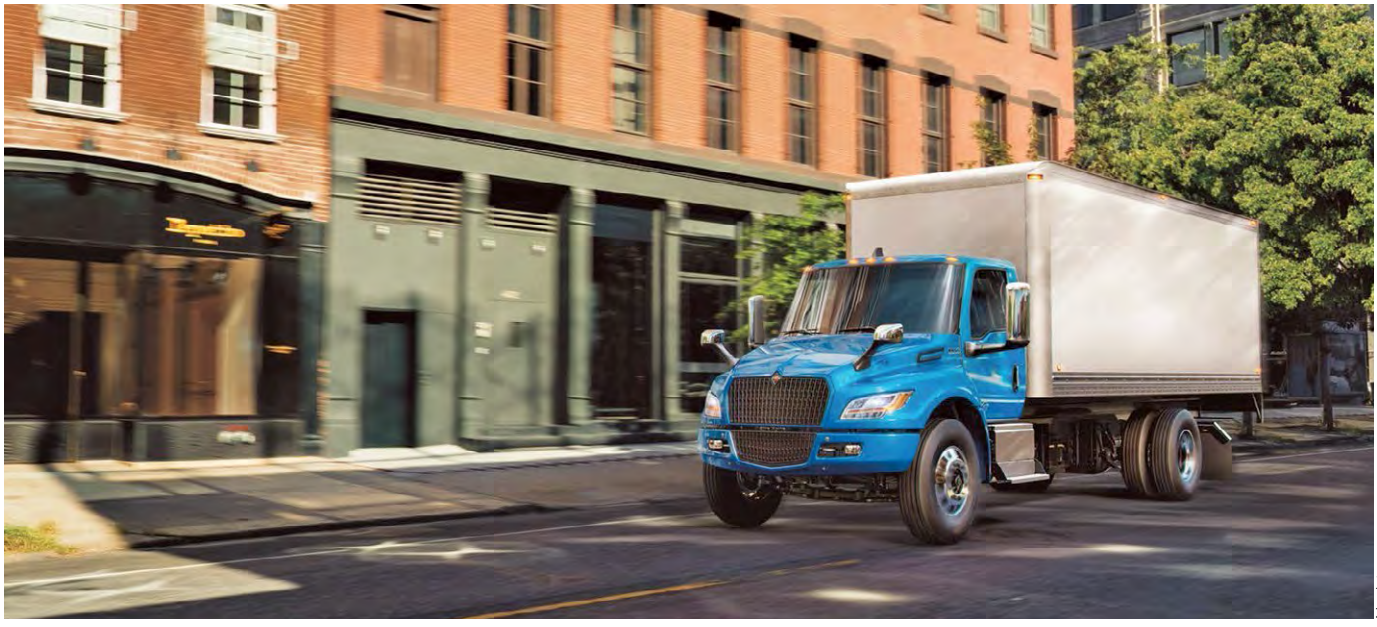
The company has set out to cut its greenhouse gas emissions 75% by 2030.

"We've got to be very aggressive looking at different technologies and focusing on zero-emission technologies," Marko said. "We're investing and we're spending a lot of resources to work with suppliers to develop these technologies and make sure they're suitable for the market."

Steve Mignardi, vice president of on-highway market development at Daimler Trucks North America, said global environmental policy is motivating the push toward electrification.

"We are in a transformation, and there are many reasons," Mignardi said. "One is the environmental factors. We all want to breathe clean air."

Government grants and programs can help ease the costs associated with developing and purchasing the electric trucks, he noted.



Navistar

Truck makers such as Navistar have introduced electric-powered medium-duty models in recent years.

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12 new Detroit eFill charger models are ready to power business.
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Electric Fleet Charging Requires Detailed Planning

By Seth Clevenger
Managing Editor, Features

As trucking fleets test and deploy their first electric-powered commercial trucks, they will need to navigate a learning curve that extends far beyond the vehicle itself.

Several industry experts discussed the many considerations that factor into the design and installation of electric truck-charging infrastructure during an Oct. 24 educational session at American Trucking Associations' 2021 Management Conference & Exhibition in Nashville, Tenn.

"It is not only a vehicle technology problem," said Rakesh Aneja, head of eMobility at Daimler Trucks North America. "On top of that we have to take care of the infrastructure, and also equally, if not more importantly, in the end these trucks have to make money for our end customers."

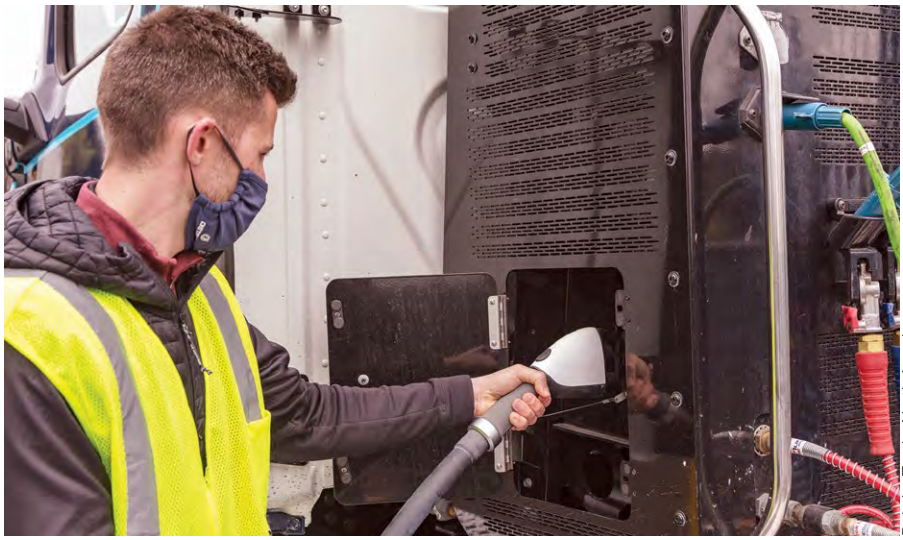
Aneja said the rollout of battery-electric trucks and the infrastructure to support them will require many partnerships.

"Our industry is faced with its biggest transformation ever," he said. "Today, more than ever before, there is a critical need for all stakeholders — policymakers, regulatory bodies, truck OEMs, suppliers, utility and energy providers — to come together for a common cause."

Supporting a fleet of electric trucks involves much more than simply installing charging hardware at a depot, said Mike Rowand, director of engineering and technical services for eTransEnergy, a fleet electrification business owned by power company Duke Energy.

"When you're looking at that charging station, you're really just seeing the tip of the iceberg," he said. "That's the visible part. That's the part that you're going to interact with. But there's a lot below the surface that is involved in infrastructure."

Other components of the charging



Daimler Trucks North America

To power their electric vehicles, companies are installing charging stations at their facilities, but that's only one part of the equation. Fleets also must partner with energy providers and carefully manage when and how they recharge their vehicles.

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Volvo Trucks North America

At this stage, early adopters of electric trucks generally are charging their vehicles at their own facilities. When and how a fleet charges its electric trucks can have a dramatic effect on total electricity costs.

ecosystem include the facility's electrical infrastructure, the utility service infrastructure and other energy resources such as backup generators or solar power, he said.

Plus, as fleets explore deploying electric trucks, they will need to understand their current and future electricity demand, select charging equipment that fits their operations and ensure that their vehicles and charging systems are compatible.

DTNA's Aneja recommended that fleets utilize smart software to optimize the interaction between the vehicle and the charging system and reduce costs.

Over time, as EV batteries reach the end of their useful life in trucking applications, those aging batteries could be repurposed for energy storage at infrastructure sites, he added.

When and how a fleet charges its electric trucks can have a huge effect on total electricity costs, so companies will need to understand electric tariffs.

As an example, eTransEnergy's Rowand said that charging a truck overnight for 10 hours could cost 8 cents per kilowatt hour, but fast charging that same truck in 30 minutes might cost 72 cents per kilowatt hour, nine times more.

Rowand said a fleet of 50 electric Class 8 trucks has a peak electricity demand on par with the Empire State Building.

Infrastructure resiliency is another key consideration, he said. "What happens when there's a power outage? It's not as simple as bringing in a tanker truck with diesel."

Options include on-site or portable backup generators, as well as solar power, he said.

As electric trucks continue to reach the market, the trucking industry is working to develop a better understanding of how to best deploy these vehicles in real-world freight applications.

"The question is, how are we going to get from concept to operation? This is kind of where we are in the industry right now," said Jack Legler, technical director for ATA's Technology & Maintenance Council. "We are seeing the early adopters out there running test fleets very successfully and starting to figure out the equation."

TMC currently has 12 task forces dedicated to developing position papers or recommended practices related to implementing electric trucks, said Kevin Otto, chairman of TMC's Electrified Vehicle Task Force.

Future topics for exploration include charging connector standardization, charging system maintenance, considerations for public charging stations and safety protocols for maintenance shops, Otto said.

> *"It is not only a vehicle technology problem. On top of that we have to take care of the infrastructure, and also equally, if not more importantly, in the end these trucks have to make money for our end customers."*
>
> **Rakesh Aneja,**
> **Daimler Trucks North America**

4 Business Reasons to Start Your EV Fleet

Going electric isn't just about a cleaner world. Sustainability can support efficiency, productivity and better business, too. Here are 4 reasons why building an EV fleet can be good for your bottom line.

1. Lower costs start at the EV charging stations.

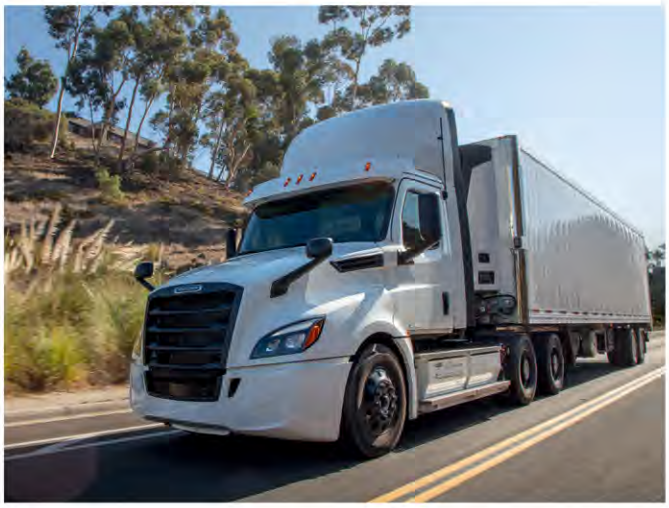
Per mile, electricity is less expensive than diesel and gasoline. But the value of going electric is about more than what powers your trucks. With technologies like telematics and managed charging, everything is connected, from how electric trucks run routes to when they plug in. This increased integration can enable EV fleets to charge when it's most efficient and least costly, leading to big savings over time.

2. Longer electric truck service intervals kick savings into gear.

The differences between electric trucks and their diesel counterparts go far beyond what powers the vehicles. Electric truck components, such as batteries, e-motors and electronics, feature simpler designs and require less maintenance. Ultimately, that translates into longer service intervals, fewer operational disruptions and much less spent on repairs in the long run.

3. Reduced truck noise keeps drivers happy for a positive bottom line.

Despite all the noise electric trucks have made in the industry, there's one place they're consistently quiet: on the road. They ride smoothly and don't create any fuel odors, either, which can contribute to a more pleasant working environment throughout the day. And the happier drivers are, the more likely they are to keep working hard for your business.



4. Electric trucks are powerful – and powerfully efficient.

The first time you drive an electric truck like the Freightliner eCascadia® or eM2®, its acceleration might surprise you. That's because an electric truck can provide near-instant, maximum torque at low RPMs – essentially from a standing start. Instant torque enables larger trucks to get up to speed quicker and easier. That's the kind of efficient power that can lead to significant savings on charging costs.

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We're fully charged to help your EV fleet succeed. No matter where you are on the road to electric, our eConsulting experts are ready to move you forward.

eConsulting includes:

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- Route analysis and optimization training
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- Hands-on shadowing and partnering with a coach

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DOE Awards $128 Million For Electric Truck Projects

By Connor D. Wolf
Staff Reporter

The U.S. Department of Energy has awarded five manufacturers a total of $128 million to advance electrified truck technologies.

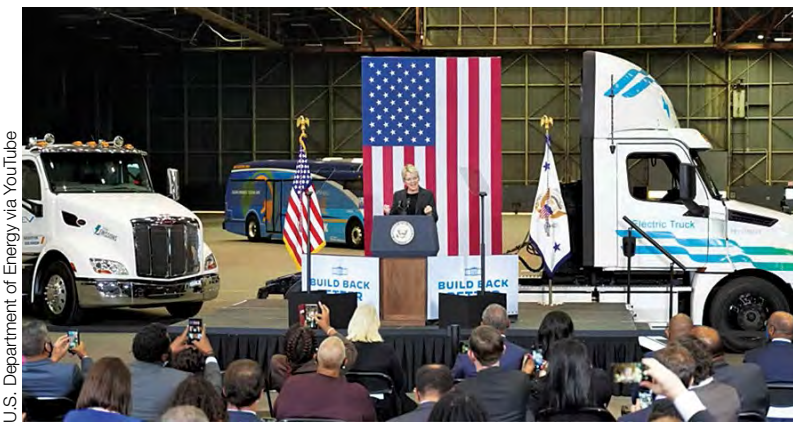
The DOE Office of Energy Efficiency and Renewable Energy is providing the funding as part of its SuperTruck 3 initiative.

Daimler Trucks North America, Ford Motor Co., General Motors, Paccar Inc. and Volvo Group North America are the recipients.

"DOE is working with manufacturers and industry partners to reimagine vehicle transportation across the country to achieve our climate goals," U.S. Energy Secretary Jennifer Granholm said in the Nov. 1 announcement. "This investment and the innovations that come from it will help shape our clean energy future and strengthen domestic manufacturing that support good-paying careers."

Vice President Kamala Harris joined Granholm at John F. Kennedy International Airport in New York on Nov. 1 to announce $199 million in funding to develop cleaner cars and trucks, with the bulk of the funding going to the SuperTruck 3 recipients. The projects will be funded over five years and are subject to appropriations. The recipients also must match the funding.

"We remain laser-focused on our goal to electrify our trucks and to help build the necessary infrastructure," said Rainer Mueller-Finkeldei, DTNA's senior vice president of engineering and technology. "Through DOE's SuperTruck 3 program, we will be able to more quickly investigate high-risk, high-reward technologies."



U.S. Department of Energy via YouTube

Granholm announces the funding for electrified truck development in front of several electric vehicle models.

Daimler was awarded $25.8 million to develop and demonstrate two Class 8 fuel cell trucks with 600-mile range, 25,000-hour durability, and equivalent payload capacity and range to diesel.

Volvo got $18.1 million to develop a 400-mile-range Class 8 battery-electric tractor-trailer with advanced aerodynamics, electric braking, EV-optimized tires, automation and route planning.

> *"DOE is working with manufacturers and industry partners to reimagine vehicle transportation across the country to achieve our climate goals."*
>
> **Jennifer Granholm, U.S. Secretary of Energy**

"We are grateful to be selected once again for DOE funding for SuperTruck 3 as our project scope includes a multitude of green technologies, including battery-electric and hydrogen fuel cell drivetrains, as well as related charging infrastructure for a planned 400-mile logistics corridor across several Mid-Atlantic states," Keith Brandis, vice president of partnerships and strategic solutions at Volvo Group North America, told Transport Topics.

Paccar, the parent of Kenworth Truck Co. and Peterbilt Motors Co., was awarded $33 million to develop 18 Class 8 battery-electric and fuel cell vehicles with advanced batteries and a megawatt charging station.

"Many of the technologies developed in the earlier SuperTruck programs were deployed in production vehicles, benefiting the environment and Paccar's customers," Kevin Baney, Kenworth general manager and Paccar vice president, said in a Nov. 4 statement. "Kenworth, Peterbilt, Paccar Parts, and the Paccar Technical Center are collaborating on the SuperTruck 3 program."

Ford received $25 million to develop and demonstrate five hydrogen fuel cell-electric Class 6 super-duty trucks.

General Motors was awarded $26.1 million to develop and demonstrate four hydrogen fuel cell- and four battery-electric Classes 4-6 trucks.

Planning Your EV Charging Infrastructure

The world of electric trucking is full of opportunities, but getting there is about more than just flipping a switch. You need to build the right foundation first. Here are a few tips to help you get started.

Understand your EV operations

It all starts with a few key questions. What will your average route length be? How long will your trucks have to charge? Will you have just a few vehicles making deliveries once a day, or will you have an entire fleet running around the clock? Understanding how EVs work best within your operations is essential to planning for the right charging infrastructure.

Engage your utility company early

Building your charging infrastructure is also about making the right connections with your utility provider – ideally about a year in advance. Your utility can help you assess your site's existing infrastructure, reduce future electricity costs and learn from any charging solutions they've already deployed for other businesses, which can drastically reduce your deployment time.

Explore your charging options

For commercial enterprises, charging stations boil down to two main choices: AC Level 2 and DC Fast Charge. Level 2 charging stations are suitable for common applications, especially in fleets that can charge trucks overnight. DC Fast Charge stations allow trucks to charge in a shorter amount of time by utilizing DC rather than AC power.

CHARGER TYPE	VOLTAGE	POWER (KW)	TYPICAL USE CASE
AC Level 1	120 V	1.9 kW	Consumer EV
AC Level 2	208 - 240 V	7.2 - 19.2 kW	Commercial vehicles with longer dwell times
DC Fast Charge - DCFC	Usually 480 V AC input	20 kW - 500kW	Commercial vehicles with larger batteries and shorter dwell times

Harness the power of charge management software

Charge management software (CMS) is like the brain of your charging stations. It's designed to automatically help your trucks charge efficiently. By avoiding charging trucks during peak times, your CMS can help you pay less for energy – and save you time by keeping things simple.

Look for EV-related grants

When operating an electric fleet, keeping energy costs low is a major priority. However, you can also find significant savings by taking advantage of local, state and federal grants. ***Be sure to talk with your utility partner and the eConsulting team at Freightliner early in your planning phase.***

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