

THE ELECTRIFICATION ROADMAP SERIES

Electrifying the Future of Freight:

Strategies to Accelerate Medium-
and Heavy-Duty Charging
Infrastructure Deployment



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Electrification
Coalition

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Glossary of Terms

- “**Commercial charging operators**” are third-party providers of charging and other fleet services for commercial vehicles.
- “**Electric truck**” refers to a battery-powered medium- or heavy-duty commercial vehicle.
- “**Energization**” and “**Interconnection**” refer to the process of connecting a location (such as an EV charging hub) to the electric grid.
- A “**heavy-duty**” truck qualifies as a Class 7 to Class 8 vehicle, based on the Federal Highway Administration (FHWA) vehicle classification system.
- A “**medium-duty**” truck qualifies as a Class 3 to Class 6 vehicle, based on the FHWA vehicle classification system.
- A “**plug**” or “**port**” is the physical connector between a charger and a vehicle. Each plug can charge one vehicle at a time.
- A “**public charging**” station (or facility) are stations fully open to the public—allowing any driver of a compatible vehicle to enter and pay for charging with a credit card. “**Semi-public facilities**” are open to all but require a subscription or membership for access.
- “**Residual value**” is the amount of money a vehicle can be sold for after its original owner is done with it.
- A “**shipper**” is the person or company who initiates a shipment, regardless of whether they manufactured the goods.
- “**Utilization**” refers to how often a charger is used. A charger with 50 percent utilization is being used 12 hours/day.

Executive Summary

Medium- and heavy-duty (MHD) trucks, in many ways, are perfect candidates for electrification. They consume more oil and emit more harmful pollutants than passenger cars, leaving significant room to maximize electric vehicles' (EVs') primary benefits: lower fuel cost and reduced emissions. But MHD electrification also faces unique technological, financial, and logistical challenges that have limited the pace of MHD EV and charger deployment. A series of executive orders and the passage of the One Big Beautiful Bill Act have terminated federal EV tax credits—including the Commercial Clean Vehicle Credit—and frozen or rescinded grant funding, contributing to a 2025 slowdown in electric truck sales.¹ The American MHD EV industry is now at an inflection point: will progress stall out, or can a combination of state and local policymakers, businesses, and utilities step up to maintain momentum and lead electrification efforts?



Source: Forum Mobility

This report addresses that question by assessing the current barriers and actionable solutions related to the development of public and semi-public charging stations for MHD vehicles. The barriers and solutions identified are not an exhaustive list but do reflect the primary issues affecting the industry. In this paper, public charging facilities are defined as those accessible to all drivers and that accept standard credit cards as a payment method; semi-public stations are open to fleets and typically require a membership fee or subscription. Semi-public (also known as shared) charging depots have gained popularity in response to demand from fleets without space, capital, or capacity to install their own on-site chargers. Even some fleets with adequate space prefer to outsource the engineering, compliance, and maintenance of charging facilities and infrastructure for ease of operations.

Findings are based on research and a survey of 20 stakeholders representing commercial charging operators, fleets and shippers, utilities, governments, ports, and charging manufacturers. This report uses a Southern California electric freight hub anchored by the co-located ports of Long Beach and Los Angeles, which combined form the third-busiest port in the world by container volume, as a case study.² Five **barriers** and a total of 11 corresponding solutions emerged from the research and interviews:

- 1. High upfront vehicle costs limit charging demand and utilization rates.** Solutions to address this are vehicle purchase incentives, residual value guarantees, competitive fuel standards, and demand aggregation.

¹ Richard, Jacob et al., “Zeroing in on Zero-Emission Trucks, January 2026 Market Update.” (CALSTART) Accessed February 13, 2026. <https://calstart.org/wp-content/uploads/2026/01/ZIO-ZET-January-2026.pdf>

² United Nations Economic and Social Commission for Asia and the Pacific, Improvement of Transport and Logistics Facilities to Expand Port Hinterlands: Policy Guidelines, ISBN: 92-1-120370-8 (2019), https://www.unescap.org/sites/default/files/pub_2299_ch2.pdf

- 2. Overly prescriptive and/or complex program design.** Identified solutions include adopting flexible, performance-based program design, and standardizing reporting and definitions across jurisdictions.
- 3. Grid interconnection delays and capacity uncertainty.** Strategies include flexible service connections, reforms to interconnection rules that enable proactive planning, and the use of on-site energy resources.
- 4. Electricity rate structures are often misaligned with truck charging load profiles.** To resolve this barrier, policymakers should design rate structures that enable MHD electrification while managing peaks.
- 5. Fragmented and opaque local permitting processes.** Overcoming this barrier requires local- and state-level coordination to standardize local permitting processes and ensure EV charging is designated as a permitted use in relevant zones.

This report proposes a replicable strategy based on the solutions described above, drawing on concrete examples of progress from the Southern California hub. Its recommendations demonstrate that the leading barriers to public truck charging deployment are primarily institutional, not technical. Therefore, success in overcoming them will hinge on improved coordination, planning, and policy design. The tools to sustain momentum toward fleet electrification and truck charging exist; whether deployment accelerates nationwide will depend on states' willingness to take a leading role and follow through with effective implementation.

Introduction

Transportation electrification provides significant benefits to those who electrify, the communities through which freight moves, and the nation at large. Because electricity is generally cheaper than diesel and EVs have fewer moving parts, vehicle owners have lower fuel and maintenance costs, often leading to a lower total cost of ownership. For communities with significant freight activity, MHD EVs dramatically reduce harmful air pollution. And for the nation more broadly, it reduces the vulnerabilities posed by oil dependence, creates well-paying jobs, and enhances American economic competitiveness on the global stage, helping to revitalize the nation’s manufacturing base.

Freight electrification is particularly important because the nation’s MHD fleet accounts for a disproportionate share of the transportation sector’s oil demand, greenhouse gas emissions, and particulate matter pollution; each year, the average Class 8 truck travels nearly six times more miles and consumes 24 times the amount of gasoline gallon equivalents than the average light-duty car.³ Compounding the issue, freight activity is expected to triple globally and increase by 50 percent domestically by 2050, amplifying the sector’s outsized contribution to oil consumption.⁴ As a result, electrifying this segment offers a great opportunity to capture the numerous benefits of transportation electrification. To embrace the opportunity MHD electrification presents, this report will examine the barriers slowing the deployment of MHD vehicle charging and outline effective strategies state and local actors can use to overcome them.

Throughout 2025, federal headwinds have caused a scaling back or removal of incentives and regulations aimed at accelerating MHD electrification, such as the Advanced Clean Trucks rule, leading to a year-over-year decline in sales of electric trucks; however, the United States’ electric trucking industry continued to progress in many key areas, with electric yard tractors and medium-duty trucks posting their highest 6-month deployment numbers to date.⁵ The economics of electric trucks have improved so significantly in recent years that early adopters are already finding duty cycles where electric options have a lower total cost of ownership than an equivalent diesel truck, even where a significant upfront price discrepancy remains. PepsiCo, for example, reports, “We’ve seen in certain duty cycles and in certain asset classes that the economics already make sense from the fuel savings, from the maintenance savings, from the driver turnover, and the positive impact on our employees operating the vehicles. We see electric trucks in certain asset classes making sense today, even without grants and initiatives.”⁶

By 2030, or even earlier, the cost to own and operate most battery electric trucks is expected to be lower than that of diesel trucks in most U.S. states.⁷ This promising outlook for electric truck economics

³ “Annual vehicle distance traveled in miles and related data—2021(1) by highway category and vehicle type” | FHWA, <https://www.fhwa.dot.gov/policyinformation/statistics/2021/pdf/vm1.pdf>

⁴ “Freight Activity in the U.S Expected to Grow Fifty Percent by 2050 | Bureau of Transportation Statistics.” Accessed February 10, 2026. <https://www.bts.gov/newsroom/freight-activity-us-expected-grow-fifty-percent-2050>

⁵ Richard, Jacob et al., “Zeroing in on Zero-Emission Trucks, January 2026 Market Update.” (CALSTART) Accessed February 13, 2026. <https://calstart.org/wp-content/uploads/2026/01/ZIO-ZET-January-2026.pdf>

⁶ North American Council for Freight Efficiency, “Overcoming the Cost Challenge,” 2023 ROL – Stories from the Run, accessed December 29, 2025, <https://runonless.com/roled-stories/overcoming-the-cost-challenge/>

⁷ Christopher Busch et al., Delivering Affordability: The Emerging Cost Advantage of Battery Electric Heavy-Duty Trucks and U.S. Policy Strategies to Unlock Their Full Economic Potential (Energy Innovation: Policy and Technology, LLC, & the International Council on Clean Transportation, 2025), <https://energyinnovation.org/wp-content/uploads/Delivering-Affordability-Emerging-Cost-Advantages-of-Battery-Electric-Heavy-Duty-Trucks.pdf>

suggests MHD fleet electrification could accelerate rapidly. **However, the pace and scale at which these vehicles can be deployed and operated to be competitive with diesel trucks will depend heavily on the availability of charging infrastructure.**

Recognizing this challenge, in 2024, the Joint Office of Energy and Transportation published the *National Zero-Emission Freight Corridor Strategy* to inform industry and governments on where to prioritize investments, planning, and deployment of charging and fueling infrastructure to support zero-emission freight (Class 3-8 vans and trucks).⁸ It developed a four-phase development strategy, starting with major freight hubs. Since then, federal support for freight electrification has been largely rescinded. As a result, focus is increasingly shifting to states, local governments, and utilities to sustain deployment momentum.

Public sector support in the form of financial assistance, knowledge-sharing, regulation, and targeted deregulation has proven essential in this nascent market—but with the federal government stepping back, states must step up. The research finds that in the absence of federal support, a supportive mix of state, local, and utility policies can provide the stability needed to spur major investments in electric truck charging. This is because, as long as charging infrastructure developers have confidence that sufficient charging demand will materialize, they can raise capital and invest accordingly. For example, Terawatt Infrastructure announced in September 2022 that it secured more than \$1 billion in capital for the build-out of charging sites and operations. In September 2025, following a \$200 million charging hub joint venture with GreenPoint Partners, EV Realty announced it had raised an additional \$75 million to support its planned operations for the next five years—including the construction of its recently opened site in San Bernardino and five to seven others.⁹

This report provides an updated analysis of the leading barriers to—and emerging solutions for—the deployment of MHD truck charging infrastructure, with a focus on public and semi-public charging. Further, it outlines a strategy for subnational leadership, offering recommendations and actions for state and local government policymakers to keep deployment moving forward. The Southern California and greater Los Angeles metropolitan area electric freight hub stretching from the ports of Los Angeles and Long Beach through Anaheim and to the Inland Empire is used to highlight where progress is being made in truck charging infrastructure deployment and how to replicate successes. The research focuses on public and semi-public charging infrastructure because it is essential for intercity long-haul trucking and is increasingly recognized as important for regional and shorter-haul operations run by small fleets, which may lack the time and resources to address the engineering and compliance challenges associated with installing new equipment. Other fleets may not have access to the land or capital to build their own facilities.¹⁰

⁸ Joint Office of Energy and Transportation, *National Zero-Emission Freight Corridor Strategy*, DOE/EE-2816 2024 (2024), <https://driveelectric.gov/files/zef-corridor-strategy.pdf>

⁹ “Terawatt Raises \$1+ Billion to Scale Commercial EV Charging,” Company News, *Press Release*, 2022, <https://www.terawattinfrastructure.com/blog/terawatt-raises-over-1-billion-to-scale-commercial-ev-charging-centers-across-america>; and Jeff St. John, “EV Realty Lands \$75M to Expand Electric Truck Charging in California,” Canary Media, September 18, 2025, <https://www.canarymedia.com/articles/ev-charging/ev-realty-funding-build-truck-depot-california>

¹⁰ California Air Resource Board’s (CARB) Large Entity Fleet Reporting survey found 43 percent of California fleets lease their facilities. On-site space constraints are also evident in the frequency with which trucks park overnight in residential neighborhoods. The 2021 Vehicle Inventory and Use Survey found that nationwide, 16 percent of Class 4-8 trucks and nearly 17 percent of just Class 7-8 trucks typically park at a private residence or does not have a home base.

Background

FEDERAL CONTEXT

Federal policy plays a significant role in transportation electrification, largely by incentivizing the deployment of EVs and charging infrastructure through grant programs and tax credits, and by sending direct market signals to industry through regulations. Over the last five years, the policy landscape for transportation electrification has undergone significant changes, resulting in uncertainty across the sector and about the role the federal government can and will play moving forward.

The Infrastructure Investment and Jobs Act and the Inflation Reduction Act, enacted in 2021 and 2022, respectively, made historic investments in transportation electrification. These laws expanded funding pathways for EVs and charging infrastructure and established programs such as the National Electric Vehicle Infrastructure (NEVI) program, Commercial Clean Vehicle Tax Credit, Clean Ports Program, and the Charging and Fueling Infrastructure (CFI) Grant Program.



Source: Volvo

Beginning in 2025, however, the federal policy landscape for transportation electrification shifted, increasing uncertainty across the industry. The One Big Beautiful Bill Act rolled back many of the Inflation Reduction Act's provisions supporting EV adoption—terminating tax credits for vehicles and charging infrastructure, and rescinding unobligated funding for grant programs. Funding for programs authorized and appropriated under the Infrastructure Investment and Jobs Act—such as NEVI and CFI—was initially frozen but has since resumed. Despite the pause, more than 40 states have continued efforts to build out their charging networks. Congress also passed resolutions repealing Clean Air Act waivers that allowed California and other states to implement the Advanced Clean Truck and Heavy-Duty Omnibus rules.

Additionally, the U.S. Environmental Protection Agency (EPA) published its final rule rescinding the 2009 Greenhouse Gas Endangerment Finding and motor vehicle greenhouse gas emissions standards. While the congressional resolutions and EPA rule are all under judicial review following legal challenges, they still represent a withdrawal of regulatory support for truck electrification with immediate impacts on companies' ability to plan and raise funds.

Against this backdrop, subnational entities such as states, cities, utilities, and utility regulators are increasingly stepping in to fill these policy and leadership gaps. Motivated by the myriad benefits of transportation electrification, these entities are advancing their own policies, incentives, and infrastructure planning efforts; they will continue playing a critical role in freight electrification and charging deployment.

STATUS OF U.S. TRUCK CHARGING INFRASTRUCTURE DEPLOYMENT

According to the most complete public national database focused on truck charging available today—CALSTART’s open-source National Medium- and Heavy-Duty Zero Emission Infrastructure Map, which tracks data on public stations specifically designed to accommodate medium- and heavy-duty trucks—20 stations with at least 368 plugs are currently open as of April 2026. Additional stations under construction or planned bring the total to 149 stations with at least 1,568 plugs.

TABLE 1: U.S. TRUCK CHARGING DEVELOPMENT AS OF APRIL 2026¹¹

Development Status	Number of Facilities	Number of Plugs
Open	20	>368
In Development	17	>285
Pre-Construction	46	>743
Planned	66	>172
Total	149	>1568

Source: CALSTART¹²

Some of these charging stations are dual-use (i.e., accessible to trucks even though they were not designed exclusively for them).¹³ Such stations recently enabled a Windrose Class 8 tractor-trailer to travel 875 miles in a single day and 5,740 miles over 18 days.¹⁴ The Alternative Fuels Data Center and the Electrification Coalition’s Electric Freight Dashboard also track these dual-use facilities, identifying a total of 814 public stations with 2,889 plugs accessible to medium-duty vehicles and 107 stations with 481 plugs accessible to heavy-duty vehicles as of April 2026. However, the actual number of dual-use charging stations and dedicated MHD EV charging stations may be greater. A 2024 report found that 83 percent of charging stations listed on the Alternative Fuels Data Center Station Locator do not report the maximum vehicle class size the site can accommodate; it is likely that some of these sites can serve trucks.¹⁵ Additionally, not all MHD EV charging stations are on the Alternative Fuels Data Center Station Locator.

Most public and semi-public truck charging stations currently offer direct current equipment in the 150–360 kilowatt (kW) range, with higher-powered systems boasting power ratings above 360 kW beginning to emerge.¹⁶ Fleets piloting Tesla’s Class 8 tractor truck, which has a range of up to 500 miles, have installed

¹¹ For development status definitions, see CALSTART’s glossary of terms: <https://bit.ly/CALSTARTglossary>
¹² Chelsea Weber, National Zero-Emission Medium- and Heavy-Duty Infrastructure Map (CALSTART, 2025), <https://calstart.org/mhd-infrastructure-map/>
¹³ Alternative Fuels Data Center, U.S. Department of Energy, “Alternative Fueling Station Locator,” accessed December 26, 2025, <https://calstart.org/mhd-infrastructure-map/>
¹⁴ Heavy Duty Trucking. “Early Insights from NACFE’s ‘Run on Less – Messy Middle’ on Trucking Decarbonization.” October 23, 2025. <https://www.truckinginfo.com/news/early-insights-from-nacfes-run-on-less-messy-middle-on-trucking-decarbonization>.
¹⁵ Powell, Bonnie, Caley Johnson, Arthur Yip, and Amy Snelling. Electric Medium- and Heavy-Duty Vehicle Charging Infrastructure Attributes and Development. NREL/TP--5R00-91571, 2478833, MainId:93349. 2024. <https://doi.org/10.2172/2478833>
¹⁶ “Alternative Fuels Data Center: Alternative Fueling Station Locator.” Accessed April 15, 2026. https://afdc.energy.gov/stations#/analyze?country=US&tab=station&fuel=ELEC&ev_levels=dc_fast&maximum_vehicle_class=HD&show_map=true

750 kW-rated chargers and report recharging to 80 percent in 45 minutes. WattEV’s private Bakersfield depot boasts chargers with a power rating up to 1.2 megawatts (MW).¹⁷ In 2026, WattEV announced funding and specific plans to make Megawatt Charging System (MCS) chargers available at three sites “to reduce vehicle charging times to 30 minutes or less, bringing electric truck refueling in line with diesel standards.”¹⁸



Source: EV Realty

To compare this with what is needed to support freight electrification, the International Council on Clean Transportation (ICCT) estimates that by 2030, to support MHD electrification, the United States will need approximately 134,000–429,000 chargers, depending on levels of zero-emission vehicle (ZEV) adoption.¹⁹ Of these, 6,620–19,280 would need to be fast or ultrafast, representing a good approximation of public charging needs. Expanding the public MHD charging network by roughly three to seven times its current size by the end of the decade necessitates addressing existing bottlenecks—exactly what this report aims to accomplish.

¹⁷ “WattEV Opens US’ First Megawatt Charge Station with 1.2MW Speeds and Solar.” Accessed April 7, 2026.

<https://electrek.co/2024/05/06/wattev-opens-us-first-megawatt-charge-station-with-1-2mw-speeds-and-solar/>.

¹⁸ “Inc, WattEV. “WattEV Accelerates Freight Electrification with Three New Megawatt Charging Depots in Southern California.” GlobeNewswire News Room, July 15, 2025. <https://www.globenewswire.com/news-release/2025/07/15/3115781/0/en/WattEV-Accelerates-Freight-Electrification-with-Three-New-Megawatt-Charging-Depots-in-Southern-California.html>

¹⁹ “Mind the Gap: An Assessment of 2030 and 2035 Charging Infrastructure Needs for Zero-Emission Medium- and Heavy-Duty Vehicles in the United States.” International Council on Clean Transportation, n.d. Accessed April 7, 2026. <https://theicct.org/publication/assessment-of-2030-and-2035-charging-infrastructure-needs-for-ze-mhdv-us-jul25/>

Methodology

Interviews were conducted with 20 organizations across the electric truck and charging industries, including commercial charging operators, fleets and shippers, infrastructure site developers, state governments and port authorities, utilities, and vehicle and charging equipment manufacturers. Participants were recruited from the Electrification Coalition’s Advanced Freight Partners Group²⁰, Electrification Coalition Business Council²¹, and other partner recommendations. Interviews were conducted virtually between October 2025 and January 2026.

The interviews centered on two key topics of discussion:

- What are the top barriers to scaling electric truck charging infrastructure in the short-, medium, and long-term?
- What solutions, best practices, or emerging deployment models present compelling and replicable approaches to successfully overcoming these barriers to scaling electric truck charging infrastructure deployment?

These topics served as a framework for detailed discussions about known areas of concern, including project development, interconnection timelines, utility programs, and policy priorities. While the research team entered the interviews with a base of understanding of the common barriers to MHD charging deployment, questions were designed to allow interviewees to steer the conversation toward the topics they considered most impactful.

²⁰ <https://electrificationcoalition.org/advanced-freight-partners-group/>

²¹ <https://electrificationcoalition.org/work/electrification-coalition-business-council/>

Findings

Based on the team’s research, the interview findings, and subsequent conversations with contributors, the Electrification Coalition has identified the following issues (in no particular order) as the predominant barriers to faster deployment of public and semi-public truck charging infrastructure in the United States:

1. High upfront vehicle costs limit charging demand and utilization rates
2. Overly prescriptive and complex program design
3. Grid interconnection delays and capacity uncertainty
4. Electricity rate structures are often misaligned with truck charging load profiles
5. Fragmented and opaque local permitting processes

The solutions outlined in this report are designed to work together to address freight electrification as a system deployment challenge. While implementing individual solutions helps, a bottleneck at any point in the system can slow progress throughout its entirety. Therefore, ensuring that charging infrastructure does not limit vehicle adoption must involve alignment across multiple stakeholders and interconnected elements, including electric trucks, charging infrastructure, grid and energy systems, and freight operations.

BARRIER 1: HIGH UPFRONT VEHICLE COSTS LIMIT CHARGING DEMAND AND UTILIZATION RATES

Unlike passenger EVs, which have gained significant domestic market share over the past decade, electric trucks still account for a small share of the U.S. fleet, representing less than one percent of total trucks sold in 2024. Despite strong growth in hubs like California, broader U.S. metrics lag behind those of other major markets; four percent of new trucks sold globally in 2025 were electric.²² In China, electric trucks captured 22 percent of new heavy-duty truck sales in the first half of 2025.²³

The limited volume of electric trucks on the road stems from several factors, including higher upfront costs, uncertain residual values, limited range for certain applications, and fewer commercially available models.

The challenge of higher purchase costs for electric trucks is especially pronounced for the largest, heaviest vehicles. In 2025, the average price of a domestic electric-powered Class 7-8 tractor (\$449,000) was more than twice that of the average diesel Class 7-8 tractor (\$188,000).²⁴ This price differential is higher in the United States than in many other countries due to a combination of immature supply chains, higher wage

²² “Clean Trucking Takes Off | BloombergNEF.” Accessed April 7, 2026. <https://about.bnef.com/insights/clean-transport/clean-trucking-takes-off/>

²³ “China’s Shift to Electric Trucks May Reshape Global Fuel Demand | AP News.” Accessed April 7, 2026. <https://apnews.com/article/china-truck-lng-ev-diesel-transport-70f3d612de4b45b6f954a7f557f7f741>

²⁴ Xie, Yihao, and Ray Minjares. Battery Electric Commercial Vehicle Pricing in the United States. n.d. [ID-422---BEV-pricing-commercial-vehicles_working-paper_final.pdf](#); Class 7-8 tractor price estimates given in 2025 dollars. They were originally published in 2022 dollars

standards, the impact of tariffs, low sales volumes, uncertainty around resale value, and more.²⁵ However, as efficiency improves and economies of scale take hold—a development that seems likely to unfold quickly, as reports indicate the mass production of the Tesla Semi will begin this year—Class 8 electric truck costs are expected to decline significantly.

A related issue contributing to vehicle costs is uncertainty around residual value: the amount a vehicle’s buyer expects to recover when it is resold. A recent CALSTART study found that diesel heavy-duty vehicles retain 30 percent of their average purchase price after five years, while electric heavy-duty vehicles retain 15–25 percent.²⁶ For electric trucks, this risk arises from the lack of a well-defined secondary market, which increases the odds that a vehicle’s residual value is lower than expected at the time of purchase. This uncertainty raises financing costs, lowering demand for electric trucks even when their total cost of ownership is already lower than that of internal combustion engine alternatives.²⁷



Source: Zeem Solutions

Having relatively few electric trucks on the road creates uncertainty for commercial charging operators, disincentivizing the multi-million-dollar investments required to construct these sites. This lack of charging infrastructure also discourages the adoption of electric trucks, creating a chicken-or-egg dilemma in which neither side can advance without the other. Current research indicates 10–18 years of market maturation could be necessary before public truck charging stations reach peak utilization, though utilization rates in leading fleet electrification hubs could grow more quickly.²⁸

While upfront vehicle costs remain a key challenge, industry advances continue to improve performance—particularly among newer-generation models—which can strengthen operational economics. In April 2026, Volvo Trucks announced the launch of its newest electric truck model in Europe, with a range of more than 700 kilometers (approximately 430 miles).²⁹ These advancements are coupled with emerging signs of lower-cost electric trucks, such as reports that scaled production of the Tesla Semi this year could bring pricing down from \$449,000 to between \$260,000 and \$290,000 for standard- and long-range models.³⁰ As this market develops, additional strategies can help expand the adoption of electric trucks.

²⁵ Ibid.

²⁶ Nadkarni, Kabir. Financing Fleet Electrification: Battery-Electric Truck Component Resale Highlights Residual Value Upside. n.d. https://theicct.org/wp-content/uploads/2025/09/ID-422---BEV-pricing-commercial-vehicles_working-paper_final.pdf; and Marcacci, Silvio. Delivering Affordability. n.d. <https://energyinnovation.org/wp-content/uploads/Delivering-Affordability-Emerging-Cost-Advantages-of-Battery-Electric-Heavy-Duty-Trucks.pdf>

²⁷ Nadkarni, Kabir. Financing Fleet Electrification: Battery-Electric Truck Component Resale Highlights Residual Value Upside. n.d. https://calstart.org/wp-content/uploads/2024/09/BET-Component-Resale-Explainer_Final.pdf

²⁸ Bennett, Jesse, Partha Mishra, Eric Miller, Brennan Borlaug, Andrew Meintz, and Alicia Birky. Estimating the Breakeven Cost of Delivered Electricity to Charge Class 8 Electric Tractors. NREL/TP-5400-82092, 1894645, MainId:82865. 2022. <https://doi.org/10.2172/1894645>

²⁹ Volvo Launches New Electric Trucks – with Ranges up to 700 Km.” Accessed April 14, 2026. <https://www.volvotrucks.com/en-en/news-stories/press-releases/2026/apr/volvo-launches-new-electric-trucks---with-ranges-up-to-700-km.html>

³⁰ “Tesla Semi Price Revealed: \$290,000 | Electrek.” Accessed April 14, 2026. <https://electrek.co/2026/02/10/tesla-quoting-price-500-miles-electric-semi-truck/>

Solution 1: Offer vehicle purchase incentives to overcome cost barriers

States, which have clear economic interest in attracting investment in emerging technologies and clear public policy interests in improving air quality and reducing emissions, should adopt and implement vehicle incentive programs to offset a portion of the upfront costs of electric trucks. Incentives for clean vehicle purchases, such as vouchers, are the most direct way to do so.

Successful state incentive programs have typically developed dedicated revenue streams to fund them. For example, New Jersey’s incentives are funded by revenue from auctions of carbon-emission permits for compliance with the Regional Greenhouse Gas Initiative. Colorado’s vehicle and infrastructure incentives, the Clean Fleet Vehicle and Technology Program and Fleet-ZERO Grant Program, respectively, are funded by a retail delivery fee, tying the source of revenue closely to its use. Tying incentives to dedicated revenue streams provides companies, such as fleets and commercial charging operators, with the certainty needed to plan long-term.

Notably, many of the commercial charging operators interviewed emphasized vehicle incentives as the most impactful form of support. In their view, lowering the upfront costs of electric trucks and achieving cost parity with diesel trucks through incentives will drive greater adoption, increase demand for charging, and improve the utilization and economics of charging sites more durably than incentives for charging infrastructure alone. Specifically, by securing utilization commitments from fleets, developers can better underwrite the investment costs required for charging infrastructure.

Solution 2: Institute residual value guarantees

Policies to lower the cost of financing offer another approach to counter the challenge of resale (also known as residual) value risk. For example, CALSTART and the Green Finance Institute have published a policy blueprint to address this risk through a government- or financial institution-led resale-value guarantee.³¹ As explained in the blueprint, “for lenders, this ensures they will be able to recoup a larger portion of their investment in case of default, leading to improved access to loans.”³² According to the analysis, such an approach would yield 12 percent savings on UK electric truck leases, indicating similar opportunities here in the U.S., particularly in markets absent vehicle incentives.

Resale value guarantees are notable for their cost-effectiveness. These policies incur costs only in cases of resale value shortfalls and may include fees to cover administrative expenses. As the blueprint lays out, “if a [resale value guarantee] is well-structured and the market conditions are favorable, it could make [electric trucks] more affordable at no cost, or even an upside.”³³ As such, to reduce financing risk and accelerate market adoption, governments and financial institutions such as state and regional green banks should provide residual value backstops that guarantee a minimum resale value for electric trucks.

Solution 3: Design competitive fuel standards to overcome utilization barriers

A competitive fuels standard (CFS) was the solution most cited by commercial charging operators and other stakeholders when asked to name the single policy most capable of solving high upfront vehicle costs. A CFS—also known as a clean fuel standard, low-carbon fuel standard, or clean transportation

³¹ “GFI RVG BLUEPRINT.” Accessed April 7, 2026. <https://www.greenfinanceinstitute.com/wp-content/uploads/2025/10/GFI-RVG-BLUEPRINT-1.pdf>

³² Ibid.

³³ Ibid.

standard—is a technology-neutral, market-based mechanism to accelerate the transition to clean fuel technologies. By creating a carbon-intensity standard for fuels, granting credits to those who generate or use fuels with lower intensity than the standard, and requiring users or producers of fuels with higher intensity to buy credits to offset the gap, it creates a dynamic marketplace for efficient fuels in the transportation sector. The policy also generates funding for the industry without burdening taxpayers.

To keep pace with technological progress, most CFS policies tighten the carbon intensity standard incrementally year after year. Every fuel—from gasoline and diesel to electricity, hydrogen, and biofuels—receives a score based on its full lifecycle (or “well-to-wheels”) emissions, rewarding the most efficient technologies without betting on winners or losers. They offer industry flexibility through a market-based compliance approach, while directly funding electrification and sending long-term investment-inducing signals that the market will increasingly reward cleaner fuels.

California’s Low Carbon Fuel Standard is the longest-standing of the four active statewide programs (the others are Oregon, New Mexico, and Washington); as of 2024, it was estimated to be generating “\$4 billion in annual private sector investment toward a cleaner transportation sector.”³⁴ A study of California’s program by Energy Innovation and ICCT estimated that the credits generated by charging stations are roughly equivalent to 13 cents per kilowatt-hour of charging in a station’s first 10 years of operation.³⁵ At least ten additional states have legislative proposals to adopt some variation of a CFS.³⁶



Source: Forum Mobility

Under a CFS, utilities earn credits for EV-related infrastructure that they can sell, creating a source of revenue for clean vehicle purchases and charging infrastructure. Under California’s program, beginning in 2025, new fast-charging infrastructure credits offer an effective solution to low utilization by functioning as a 20 percent utilization floor for public facilities. As explained by the ICCT, “the crediting formula is designed to reward low-utilization chargers that are necessary to meet EV adoption targets but do not yet service a steady demand of electric MHDVs.”³⁷ Under the program, public chargers generate credits until they exceed a 20 percent utilization rate (≈five hours/day); private charger credits phase out at 10 percent utilization (≈2.5 hours/day).

³⁴ “CARB Updates the Low Carbon Fuel Standard to Increase Access to Cleaner Fuels and Zero-Emission Transportation Options | California Air Resources Board.” Accessed April 7, 2026. <https://ww2.arb.ca.gov/news/carb-updates-low-carbon-fuel-standard-increase-access-cleaner-fuels-and-zero-emission>

³⁵ Jane O’Malley, Nikita Pavlenko: Impacts of California Low Carbon Fuel Standard Amendments on Support for Medium- and Heavy-Duty Vehicle Electrification, October 2025, <https://theicct.org/wp-content/uploads/2025/10/ID-410-%E2%80%93-LCFS-amendments-Research-Brief-Letter-40045-v11.pdf>

³⁶ “Clean Fuel Standards: The Market-Based Policy for States Looking to Clean Up Transportation - RMI.” Accessed April 7, 2026. <https://rmi.org/clean-fuel-standards-the-market-based-policy-for-states-looking-to-clean-up-transportation/>

³⁷ Jane O’Malley, Nikita Pavlenko: Impacts of California Low Carbon Fuel Standard Amendments on Support for Medium- and Heavy-Duty Vehicle Electrification, October 2025, <https://theicct.org/wp-content/uploads/2025/10/ID-410-%E2%80%93-LCFS-amendments-Research-Brief-Letter-40045-v11.pdf>

In another example of innovative CFS program designs that are opening new pathways for fleets and commercial charging operators to expand, Oregon’s new advanced crediting system allows eligible fleets to generate credits up to six years in advance of when they would normally be generated once the vehicle is put into service.³⁸

Solution 4: Leverage demand aggregation

Automotive manufacturing is a highly capital-intensive industry primarily shaped by economies of scale. Because a large share of each vehicle’s cost is wrapped up in the construction of the factory, automakers are incentivized to produce large quantities of relatively few vehicle models and are unlikely to make a particular vehicle without a significant demand signal. Few freight carriers are large enough to provide that signal on their own, but evidence shows that when demand from multiple parties is aggregated—such as through cooperative purchasing programs like DriveEVfleets.org³⁹—manufacturers respond accordingly.

Demand aggregation also lowers fleets’ procurement costs by leveraging their collective purchasing power, securing for all participants the kind of bulk discounts usually reserved for the biggest business and government fleets. The Center for Green Market Activation, one of the organizations interviewed, pioneered a book-and-claim system that pooled the purchasing power of companies such as Amazon, eBay, Etsy, Green Worldwide Shipping, and Meta to enable the largest known purchase of Class 8 EV trucks in Texas.⁴⁰ Electric trucking carrier Nevoya won the competitive process that the Center for Green Market Activation ran to execute the deployment and meet their members’ demands. Book-and-claim allows shippers to purchase the environmental attributes of the clean trucking service without procuring or operating their own EVs and charging infrastructure, or physically moving their goods on EVs, accelerating investment in electric freight by providing a new and dependable source of cash flow for electric truck carriers.

Other demand aggregation initiatives include the Zero-Emission Truck Shipper-Carrier Alliance Leading Electrification (ZET SCALE)—a collaborative initiative aligning shippers, carriers, vehicle manufacturers, and charging providers to enable large scale procurement of these vehicles—and the coalition led by Terawatt Infrastructure and Smart Freight Centre to better align shippers and carriers looking to deploy electric trucks along the I-10 corridor between California and Texas.⁴¹

BARRIER 2: OVERLY PRESCRIPTIVE AND COMPLEX PROGRAM DESIGN

Incentive programs such as grants and vouchers play a vital role in reducing costs and helping scale the deployment of electric trucks and charging infrastructure. However, the following common forms of overly complex and prescriptive program requirements often increase compliance costs and may discourage participation:

³⁸ Oregon Department of Environmental Quality, “Accelerating the Adoption of Electric Vehicles: Advance Crediting,” accessed January 5, 2026, <https://oregon.gov/deq/ghgp/Documents/cfp-AdvanceCrediting.pdf>

³⁹ <https://driveevfleets.org/>

⁴⁰ Roeswood, Royce. “First Ever GMA Trucking Procurement Brings Together Leading Companies to Enable Largest Known Deployment of Class 8 Battery Electric Trucks in Texas.” Center for Green Market Activation, January 15, 2026. <https://gmacenter.org/news/first-ever-gma-trucking-procurement-brings-together-leading-companies-to-enable-largest-known-deployment-of-class-8-battery-electric-trucks-in-texas/>

⁴¹ “Zero Emission Truck Shipper-Carrier Alliance Leading Electrification” | *Smart Freight Centre*, Accessed April 22, 2026. <https://smartfreightcentre.org/en/our-programs/road-freight/fleet-electrification-coalition-lp/fec-projects-20/zet-scale-zero-emission-truck-shipper-carrier-alliance-leading-electrification/>.

Overly specific technical criteria: Some programs embed technology requirements that may limit innovation or fail to keep pace with market developments. For example, federally funded charging projects, such as those under the NEVI program, must install a certain number of Combined Charging System (CCS) connectors; however, in the light-duty market, the North American Charging Standard (NACS) connector has recently been embraced as the de facto standard. This overly prescriptive requirement initially created problems in the light-duty market and is now impacting the heavy-duty market as well, because several states—such as California and Illinois—have begun making NEVI funding available for MHD vehicles. The now-outdated CCS requirement presents a significant barrier to the heavy-duty sector as the industry transitions to the higher-powered MCS, particularly for corridor charging, which typically serves vehicles in need of a fast charge en route to a destination.

Restrictive eligibility criteria: Some California utility make-ready incentive programs have required fleets to electrify at least two vehicles; however, 16 percent of the market are single-vehicle owner/operators.⁴² In addition to direct eligibility requirements, program design can influence applicants' ability to meet requirements and successfully access funding. For example, while the EnergIZE Commercial Vehicles Project has successfully supported the deployment of electric truck charging in California, certain design elements may limit participation by public commercial charging operators despite their eligibility. The MCS funding lane requires chargers to be dedicated to drayage operations and for applicants to estimate the number of vehicles that will use the site and be associated with vehicle vouchers, such as the Hybrid and Zero-Emission Truck and Bus Voucher Incentive Project (HVIP). These requirements add complexity for public commercial charging operators who do not own or control the vehicles using their sites.



Source: Forum Mobility

Inconsistent reporting requirements and a lack of standardization across jurisdictions: Variations in reporting formats, definitions, eligibility rules, and timelines create administrative burdens and costs, particularly for smaller fleets and emerging charging providers.

Lack of long-term funding certainty: Recently, federal funding programs have been subject to disruptions and significant amendments, increasing soft costs for awardees and often requiring them to cancel or delay projects. At the state level, many programs lack dedicated funding, creating long-term uncertainty that is particularly harmful to infrastructure developers who require long-term planning.

⁴² Patel, Hannah Schuster, Emily Kent, Anjali G. "State Strategies to Advance Medium- and Heavy-Duty Electric Vehicle Charging Infrastructure." David Gardiner and Associates, November 10, 2025. <https://www.dgardiner.com/state-strategies-advance-medium-heavy-duty-electric-vehicle-charging-infrastructure/>

Solution 1: Adopt flexible, performance-based program design

To align with industry needs and maximize impact on MHD EV and charging infrastructure deployment, states should design their incentive programs to be performance-based and flexible. Performance-based programs shift incentives away from prescriptive requirements and focus instead on measurable outcomes, such as the number of electric trucks deployed. As one specific example, multiple commercial charging operators interviewed suggested that infrastructure programs should be designed to award grants per kW dispensed rather than as a percentage of capital expenditure.

Incorporating program flexibility is another way to overcome prescriptive requirements. One example discussed in the interviews was the Illinois Climate and Equitable Jobs Act (CEJA) EV Charging Program, in which the Illinois Environmental Protection Agency, while limited, would evaluate, on a case-by-case basis, whether an awardee could modify its approved site location under the program. In those cases, the awardee would need to provide documentation demonstrating the need to change the site from an electric utility or municipality, and information on the viability of the alternative site.

Further, legacy standards for program design could hamper innovation and the effective deployment of MHD EV charging stations. Programs should maintain sufficient flexibility to update technology and applicant eligibility as the market evolves and new business models emerge, ensuring that these new solutions can be deployed as they become commercially viable. Technology-neutral policy design will be particularly helpful in facilitating a smooth integration of new standards, such as the transition from CCS to MCS charging connectors in the MHD segment.

Solution 2: Standardize reporting and definitions across jurisdictions

Reducing administrative burdens by standardizing and streamlining program language and reporting requirements will significantly reduce compliance costs, accelerate implementation timelines, and improve participation in public and utility programs. The Joint Office of Energy and Transportation Electric Vehicle Charging Analytics and Reporting Tool (EV-ChART), a web-based data submission and analytics platform, was identified as a one example of how states can both streamline and standardize reporting requirements. Standardization within states is a logical starting point, though interstate cooperation is already valuable along major freight corridors and will grow more important over time.

BARRIER 3: GRID INTERCONNECTION DELAYS AND CAPACITY UNCERTAINTY

Lengthy and uncertain grid interconnection and energization timelines increase project risk, delay charging deployment, and raise capital costs, hindering freight electrification even when the upfront cost of electric trucks reaches parity with diesel alternatives.

MHD EV charging sites require substantial electric capacity. Charging operations without behind-the-meter generation require electricity from a viable point of grid interconnection, yet information about available grid capacity is not usually publicly or readily available to developers, and utilities are currently stretched thin as they adapt to sudden, significant increases in demand from sources such as data centers and the electrification of transportation and buildings.

As a result, the timeline to secure power for these sites can be long, uncertain, and opaque, with developers frequently facing multi-year interconnection processes. It is increasingly common for large

interconnection requests, such as MHD charging infrastructure sites, to take several years to be fulfilled.⁴³ As a result, some developers may skip otherwise viable sites or rely on temporary solutions. For example, one fleet was told by its utility that the necessary power would not be available for four years, one year before the company’s current lease on the facility expired. This lack of grid access and/or uncertainty about where on the grid a charging facility can be integrated quickly and efficiently is another major barrier. It should be noted that in 2023, California’s state legislature passed the first law in the country aimed at shortening energization timelines.⁴⁴

Just as uncertainty about grid capacity can slow charging infrastructure deployment, uncertainty about the pace, place, and scale of deployment makes it difficult for utilities to invest wisely. Greater transparency into the grid and better information sharing among fleet operators, utilities, and commercial charging operators would make it easier to determine where a future site should be located or where proactive grid investments can be made to support inevitable demand from truck charging.

Solution 1: Enable flexible service connections

Flexible service connections, though not a complete solution to the problems with our nation’s interconnection timelines, can serve as a bridge solution that enables large loads to connect more quickly while incurring fewer costs. As such, public utility commissions and utilities should adopt flexible service connection programs to enable faster energization of new loads while managing grid constraints.



Flexible service connections are mechanisms that allow utilities to provide electricity to customer sites incrementally. Instead of waiting for a site to be energized at full capacity, fleets are guaranteed a quick and affordable connection in exchange for agreeing to certain terms of use. In such arrangements, generally, “the utility provides a certain level of power all the time, and a higher capacity only during times when there is less load elsewhere. This could be during specific scheduled times during a day, different days of the week, or seasonally, with the customer agreeing to adjust their energy use according to the utility’s schedule.”⁴⁵

The first generation of flexible service connections, developed by California’s Public Utilities Commission, allowed utilities to tap into unused grid capacity by selling more electricity during periods of the day or year when demand was far from its peak. The state’s largest utility, Pacific Gas & Electric (PG&E), was managing 11 MW of flexible capacity by the end of 2025, and expects to add 38 MW in 2026.⁴⁶ One fleet used PG&E’s

⁴³ “Queued Up: 2024 Edition, Characteristics of Power Plants Seeking Transmission Interconnection As of the End of 2023 | Energy Markets & Planning.” Accessed March 19, 2026. <https://emp.lbl.gov/publications/queued-2024-edition-characteristics>

⁴⁴ “Bill Status - AB-50 Public Utilities: Timely Service: Customer Energization.” Accessed March 19, 2026. https://leginfo.legislature.ca.gov/faces/billStatusClient.xhtml?bill_id=202320240AB50

⁴⁵ Westhoff, Gerard et al. “Electrification 101: Enabling Truck Charging with Flexible Service Connections.” RMI, November 18, 2025. <https://rmi.org/electrification-101-enabling-truck-charging-with-flexible-service-connections/>

⁴⁶ Cohn, Lisa. “Flexible Interconnection Programs from Utilities on the Rise, Saving Time and Money for Microgrid and DER Developers.” Microgrid Knowledge, June 23, 2025. <https://www.microgridknowledge.com/distributed-energy/article/55298646/flexible-interconnection-programs-from-utilities-on-the-rise-saving-time-and-money-for-microgrid-and-der-developers>

Flexible Connect option to enable charging for 50 electric Class 8 tractor trucks at its Fresno facility—20 more than would have been possible otherwise.⁴⁷ Emerging approaches to flexible interconnection can go further by actively managing on-site energy resources to modulate power output throughout the day in response to overall grid demand.⁴⁸

Other states are also developing their own programs. The Colorado Public Utilities Commission has ordered the Public Service Company of Colorado (an Xcel Energy subsidiary) to develop a flexible service connection option promptly.⁴⁹ In Illinois (ComEd and Amren) and New York (National Grid and Avangrid), utilities are piloting flexible connection projects in preparation for full-scale offerings.⁵⁰

Solution 2: Reform interconnection rules and enable proactive planning and investments

Interconnection rules should be reformed to enable utilities to proactively plan for and invest in locations where significant load growth from freight electrification is expected. A spatial analysis of truck charging investment to date reveals an initial focus and clustering of activity in predominantly urban and metropolitan regions. These stations tend to offer more overnight charging options than highway-adjacent facilities mainly serving intercity traffic. This type of hub-first development is consistent with the national freight corridor strategy and with other research aimed at developing “no regrets” strategies.

Proactive planning can include interagency coordination, fleet-centered forecasting feedback, and forecasting processes that incorporate a wider range of scenarios, while proactive investments can include building new or upgrading substations and other distribution-level upgrades. When done properly, proactive planning and investments do more than shorten timelines to energize MHD charging sites; they also save ratepayers money by fostering economies of scale and reducing the need for less-efficient ad hoc construction. A cost-benefit analysis of proactive upgrades for Con Edison and CenterPoint Energy found savings of \$20 million and \$10–13 million, respectively, compared to the status quo.⁵¹

Historically, utility commissions have been hesitant to allow utilities to proactively plan and invest in these projects, due to the risk of stranded assets and higher electricity rates for ratepayers. However, as one utility interviewee noted, their role is to “thread the needle” between the risks of stranded assets and

⁴⁷ Gerke, Paul. “California Utility Using DERMS to Speed up Grid Interconnection of EV Charger and Battery Sites.” Factor ThisTM, April 29, 2025. <https://www.renewableenergyworld.com/electric-vehicle/ev-charging/california-utility-using-derms-to-speed-up-grid-interconnection-of-ev-charger-and-battery-sites/>

⁴⁸ Brown, Gwen. “California Policy Goes Into Effect Allowing DERs to Avoid Interconnection Upgrades and Unlock Flexibility Through Export Scheduling.” Interstate Renewable Energy Council (IREC), August 30, 2025. <https://irecusa.org/blog/regulatory-engagement/california-regulators-open-the-door-for-ders-to-avoid-interconnection-upgrades/>

⁴⁹ Brown, Gwen. “Colorado Regulators Hold Xcel Energy Accountable for Failures in Grid Data Transparency, Create Path to Flexible Interconnection.” Interstate Renewable Energy Council (IREC), November 15, 2025. <https://irecusa.org/blog/irec-news/colorado-regulators-hold-xcel-energy-accountable-for-failures-in-grid-data-transparency-create-path-to-flexible-interconnection/>

⁵⁰ “What Utility Leaders Are Saying About Flexible Interconnection | Camus Energy.” Accessed April 7, 2026. <https://www.camus.energy/blog/what-utility-leaders-are-saying-about-flexible-interconnection>

⁵³ Shenstone-Harris, Sarah, Paul Rhodes, Jason Frost, Ellen Carlson, Courtney Lane, and Melissa Whited. Electric Vehicles Are Driving Rates Down for All Customers. n.d. <https://www.synapse-energy.com/sites/default/files/Electric%20Vehicles%20Are%20Driving%20Rates%20Down%20for%20All%20Customer%20Update%20Jan%202024%2021-032.pdf>

⁵¹ Environmental Defense Fund, “Proactive Grid Investment Assessment Medium and Heavy-Duty Vehicle Transportation Electrification.” November 11, 2024, https://library.edf.org/AssetLink/atal4338qv8ucl8226qok35dmm170r4e.pdf?_gl=1*16eietk*_gcl_au*NzkwNDI3NDM4LjE3NzAyMjM3Njc.*_ga*MTg1Nzg2MTA4OS4xNjcwMzQyMTEw*_ga_2B3856Y9QW*_czE3NzAyMjM3NjcjbzM1JGcwJHQxNzcwMjZlZnZyY5JGo1OCRsMCRoMA

stranded loads. As the cost-benefit analysis study cited above suggests, underinvestment and reactive grid upgrades can lead to increased costs for ratepayers due to interconnection delays, reduced competitiveness with other utilities and behind-the-meter solutions, and the risk of noncompliance with any federal, state, and local regulations.

California and New York have begun to allow proactive planning. California’s High Distributed Energy Resource Future Grid Proceeding enables the state’s utilities to incorporate pending customer loads, such as MHD EV charging sites, into their distribution planning. PG&E incorporated this approach in its 2027 rate case, seeking funding for capital investments in electric distribution through its Emergency Distribution Capacity proposal, which updates its forecast using projections based on existing work, available public information, and surveys of EV fast charging developers and fleets. In September 2025, the New York State Public Service Commission approved the long-term proactive planning framework submitted by the state’s investor-owned utilities through Case Number 24-E-0364, enabling utilities to “proactively identify grid infrastructure needs to ensure the utilities expand the system in the most cost-effective and timely manner,” accounting for new load from vehicle and building electrification.⁵²

Drawing on California and New York as models, state legislators should direct their public utility commissions (unless the commission acts on its own) to initiate proceedings to enable utilities to proactively invest in anticipation of expected load growth, integrate fleet-informed load forecasting, and undertake corridor-level planning.

In addition to proactive planning, utilities should consider publishing publicly accessible load capacity maps to enable fleets and commercial charging operators to identify available grid capacity and planned upgrades. Greater transparency into grid readiness can help these companies make more informed siting decisions and better align infrastructure investments with system capabilities to reduce both the cost and time it takes to identify suitable locations for charging infrastructure.

Solution 3: Develop on-site energy resources



As electrification technology has matured and spread, a flexible set of energy solutions has emerged to help fleets energize more quickly. These solutions include energy management systems, a variety of methods to increase energy efficiency, and the procurement of on-site electricity supply (increasingly from a combination of battery storage and solar power). These solutions all help reduce a site’s peak power demand, easing grid access—especially when leveraged in combination with flexible interconnection. As indicated by multiple commercial charging operators interviewed, these solutions can improve the site’s economics and help vehicle operators avoid demand charges: the higher electricity rates utilities typically impose based on the maximum amount of power a customer draws over a given time period to avoid demand peaks.

⁵² Department of Public Service. “Commission Advances New Proactive Grid Planning Proceeding to Prepare New York’s Electric Grid for Building and Vehicle Electrification.” Accessed April 7, 2026. <https://dps.ny.gov/news/commission-advances-new-proactive-grid-planning-proceeding-prepare-new-yorks-electric-grid>

BARRIER 4: ELECTRICITY RATE STRUCTURES ARE OFTEN MISALIGNED WITH ELECTRIC TRUCK CHARGING LOAD PROFILES

Legacy electricity rate designs can disproportionately increase charging costs and distort project economics. Though it generally costs less to power a vehicle with electricity than gas, demand charges can dramatically raise rates when a customer's energy demand spikes—as tends to happen when, for example, fleet vehicles return to charge at the end of a shift. Fleets can reduce demand charge costs by distributing charging more evenly throughout the day, but only so long as doing so does not interfere with operations. Because MHD EVs require significant energy, it is not possible to avoid them entirely. In some cases, existing rate structures even charge customers for the worst-case scenario of what they could use; David Gardner and Associates documents the case of one facility that faced demand charges based on maximum potential demand, even though actual use was much lower.⁵³

Solution 1: Design rate structures that enable MHD electrification while managing peaks

The potential to optimize the grid through effective rate design is immense, because fixed costs—primarily grid-related costs such as transmission and distribution—are already the largest component of electricity system costs, and their share is growing. By increasing electricity sales, electrification allows those fixed costs to be more widely shared. If the downward pressure on prices from this effect outweighs new costs required by new electric loads, then the result is net savings for all ratepayers.

The importance of electricity affordability to fleet electrification is clear, even though vehicle cost was a more frequently mentioned barrier to truck CaaS service demand than electricity cost in our interviews. The cost of electricity, including energy and demand charges, is the largest component of the levelized cost of charging. Moreover, for high-mileage vehicles, such as long-haul trucks, fuel costs are the largest contributor to total cost of ownership.

A major national study found that managed charging, which shifts charging to more favorable times, can lower investment needs by 30 percent.⁵⁴ Electricity rates should encourage customers to operate in ways that reduce system-wide costs, rewarding good actors for efficient energy use and imposing extra costs on those who incur expensive upgrades; they should not penalize for theoretical actions or incentivize behavior that leads to demand spikes.

Smart rate design can play a critical role in enabling cost-effective fleet electrification and ensuring that electricity pricing aligns more closely with the operational realities of MHD charging than preexisting commercial and industrial rate structures. In the immediate future, utilities and utility regulators should prioritize transitional rate structures that reflect early market conditions and the ramp-up phase of fleet electrification. Time-of-use rates, which adjust electricity prices to correspond with system demand (low prices during periods of low demand, high prices during peak hours), reward fleets that shift charging behavior accordingly while incurring minimal implementation costs. Subscription-type or capacity-based

⁵³ Patel, Hannah Schuster, Emily Kent, Anjali G. "State Strategies to Advance Medium- and Heavy-Duty Electric Vehicle Charging Infrastructure." *David Gardiner and Associates*, November 10, 2025. <https://www.dgardiner.com/state-strategies-advance-medium-heavy-duty-electric-vehicle-charging-infrastructure/>.

⁵⁴ Wood, Eric, Brennan Borlaug, Killian McKenna, et al. *Multi-State Transportation Electrification Impact Study: Preparing the Grid for Light-, Medium-, and Heavy-Duty Electric Vehicles*. NREL/TP--5400-88795, 2329422, MainId:89574. 2024. <https://doi.org/10.2172/2329422>.

plans that offer predictable monthly costs can also be effective when cost certainty is a priority for both utilities and fleet operators. PG&E’s business EV rate, for example, incorporates both a monthly subscription charge based on maximum monthly EV charging kW consumption and a time-of-use rate.⁵⁵

While demand charges themselves are an important mechanism for utilities to recover the costs of building and maintaining grid infrastructure and managing peak demand across a wide range of customer classes, targeted demand charge holidays for commercial EV charging can serve as an interim solution to help fleet operators navigate early deployment challenges while utilization levels remain low. Over time, by modifying or offering alternatives to traditional demand charge structures (as opposed to eliminating them), utilities can create more viable pathways for fleets. For example, extending the time window utilities use to calculate demand charges from one minute to thirty minutes, or changing basic demand charges to coincident peak demand charges (calculated from a facility’s maximum demand during the utility’s peak demand), would reduce fleets’ costs with minimal effects on the grid.

BARRIER 5: FRAGMENTED AND OPAQUE LOCAL PERMITTING PROCESSES

Inconsistent and unclear local permitting requirements increase development timelines, compliance costs, and regulatory uncertainty—particularly for fleets and charging infrastructure site developers operating in multiple jurisdictions.

Even when sufficient electric grid capacity exists to accommodate interconnection requests, navigating local permitting requirements and securing approvals from multiple government agencies can pose considerable challenges to efficient energization. Where truck charging depots are the first of their kind in a jurisdiction, a local government may lack clear pre-existing requirements, protocols, or approval to deploy electric truck charging infrastructure, which can further slow the process. These barriers are exacerbated by differences in requirements across jurisdictions, creating inconsistent standards within states and even more confusion for projects that cross state lines.

Solution 1: Harmonize local permitting processes

Standardizing permitting for EV chargers across jurisdictions—particularly when combined with robust enforcement mechanisms to ensure compliance—can reduce complexity and compliance costs for site developers.

Florida has taken the most aggressive path to reducing local barriers by centralizing authority for charger permit approval within a single state agency. Other states, such as New Jersey, Colorado, and California, have taken more incremental approaches, including model local ordinances and recommendations to simplify and accelerate approvals.⁵⁶ These appear to work best when local officials take a leading role, designing simple programs with clear enforcement mechanisms. Elsewhere, the effectiveness of more incremental approaches can be limited by the lack of clear enforceability mechanisms.

Model local ordinances provide an anchor for expectations and a template that localities can adopt directly or modify as needed. New Jersey first adopted model ordinances in 2021, and in Colorado, 2024

⁵⁵ “Electric Vehicles (EV) Rate Plans | PG&E.” Accessed April 13, 2026. <https://www.pge.com/en/account/rate-plans/electric-vehicles.html>.

⁵⁶ NESCAUM, *Improving Permitting and Zoning for EV Fast Charging Stations (2023)*, <https://www.nescaum.org/documents/ev-charger-permit-and-zoning-streamlining-fs-12-05-23.pdf>

legislation has established requirements for cities and counties with populations of more than 10,000 or 20,000, respectively.⁵⁷ Colorado’s legislation requires each jurisdiction to develop a checklist outlining the requirements for approving charging equipment installation proposals for public charging projects. It mandates that they must implement one of the following compliance paths: adopt the state’s model code, adopt the processes and standards prescribed by the legislation, or adopt a resolution to opt out, affirming their previous codes and rules.⁵⁸



Source: Mack Trucks

Two pieces of legislation—Assembly Bill 1236 (2015) and Assembly Bill 970 (2021)—provide the basis for California’s efforts, which explicitly communicate expectations for faster local decision-making.⁵⁹ Depending on the size of the project, if local authorities have not issued a decision on a charging project application within 20–40 days of completion, state law may deem it approved. Additionally, charging project proposals are to benefit from “ministerial” review, meaning they should only be declined if there is “substantial evidence of a specific adverse impact upon public health or safety.”⁶⁰

As of the writing of this paper, the California Senate is actively considering Senate Bill 1283, legislation that would tighten and clarify the state’s existing EV charging permitting framework.⁶¹ New Jersey lawmakers, meanwhile, are considering Assembly Bill 4530 and Senate Bill 3739, which, like existing California law, would streamline the permitting approval process by redirecting administrative approvals to non-discretionary permits, or “ministerial” review.⁶²

Solution 2: Ensure EV charging is designated as a permitted use in relevant zones

In addition to harmonizing permitting processes, as jurisdictions review and modernize their zoning and permitting frameworks, EV charging equipment, along with the associated electrical infrastructure and site modifications, should be explicitly identified and designated as permitted uses, particularly in business and industrial zones. Establishing charging infrastructure as an allowable project can reduce administrative burdens for site developers and local jurisdictions, improve permitting predictability, and enable more timely deployment of charging infrastructure. Colton, California, recently implemented this solution by updating its zoning and permitting regulations to accommodate MHD charging infrastructure, as will be discussed further in the project highlight section below.

⁵⁷ New Jersey Department of Community Affairs, “DCA Model Statewide Municipal EV Ordinance,” 2021, <https://www.nj.gov/dca/dlps/home/modelEVordinance.shtml>

⁵⁸ “HB24-1173 Electric Vehicle Charging System Permits | Colorado General Assembly.” Accessed April 7, 2026. <https://leg.colorado.gov/bills/hb24-1173>

⁵⁹ “Attorney General Bonta Issues Legal Alert Reminding Local Jurisdictions to Streamline Permitting for Electric Vehicle Charging Stations | State of California - Department of Justice - Office of the Attorney General.” Accessed April 1, 2026. <https://oag.ca.gov/news/press-releases/attorney-general-bonta-issues-legal-alert-reminding-local-jurisdictions>

⁶⁰ Ibid.

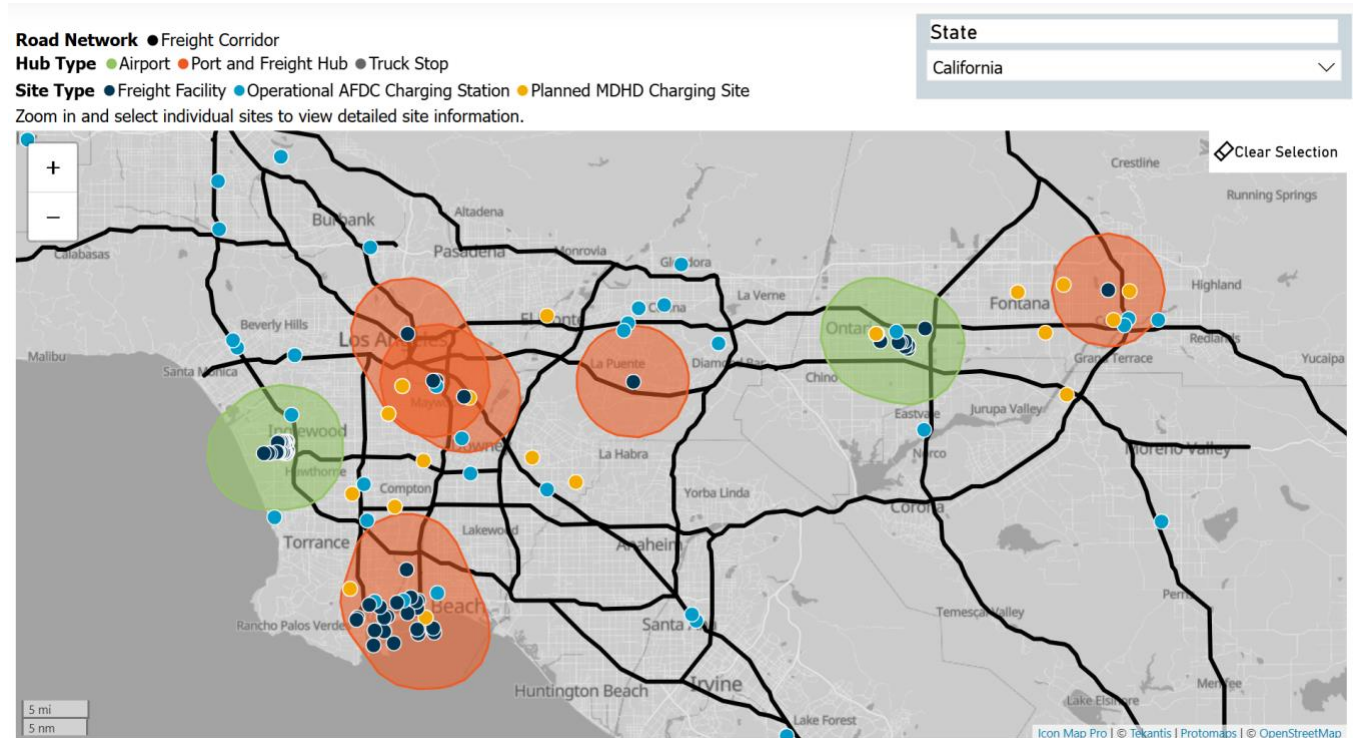
⁶¹ LegiScan. “California SB1283 | 2025-2026 | Regular Session.” Accessed April 13, 2026. <https://legiscan.com/CA/text/SB1283/id/3402602>

⁶² “A4530.” State of New Jersey 222nd Legislature, Accessed April 13, 2026. https://pub.njleg.gov/Bills/2026/A5000/4530_I1.HTM

Case Study: Southern California Hub

Due to the convergence of concentrated freight demand, sustained and stackable public incentives, and market mechanisms that create durable revenue streams for charging infrastructure, California leads the nation in truck electrification. The Southern California corridor between the Port of Los Angeles, Port of Long Beach, and the Inland Empire serves as its central hub, featuring 19 public or semi-public, purpose-built truck charging stations. These sites range from just over 1 MW of capacity to more than 10 MW upon full build-out and include a mix of pull-through and pull-in stalls, as well as driver amenities. Some sites have already deployed MW-level chargers, while others are preparing to do so, enabling trucks to connect to chargers capable of delivering more than 1 MW of power and supporting faster turnaround times that expand the feasibility of en-route charging.

The Port of Long Beach and Port of Los Angeles are the United States' first- and third-largest container shipping ports; their combined volume makes San Pedro Bay the third-busiest port in the world.⁶³ The hub's geographic scope approximates the Los Angeles metropolitan area, as shown in the map below.



Source: Electric Freight Dashboard. The *Electric Freight Dashboard* integrates real-world charging infrastructure data, freight hubs, and corridor data into a single view, showing where investment is accelerating and where gaps remain in building out an electric freight network.

This map illustrates the distribution of MHD charging infrastructure and related hubs across Southern California. Both existing and planned infrastructure are beginning to cluster around key freight hubs, including the ports of Los Angeles and Long Beach, Los Angeles International Airport, and regional

⁶³ "Port Performance Freight Statistics: 2026 Annual Report." January 1, 2026. <https://doi.org/10.21949/1403522>; and United Nations Economic and Social Commission for Asia and the Pacific, *Improvement of Transport and Logistics Facilities to Expand Port Hinterlands: Policy Guidelines*, ISBN: 92-1-120370-8 (2019), https://www.unescap.org/sites/default/files/pub_2299_ch2.pdf

railyards, as well as along the I-10 corridor as freight activity moves inland. This clustering of infrastructure and freight activity is beginning to create a self-reinforcing market, improving utilization rates, and strengthening the business case for further investment.

Since the beginning of 2025, seven public and semi-public dedicated MHD charging stations, listed in Table 2, have opened in this region, representing more than 54 MW of additional charging capacity for electric trucks.

TABLE 2: SOUTHERN CALIFORNIA HUB PUBLIC AND SEMI-PUBLIC TRUCK CHARGING FACILITY OPENINGS IN 2025 AND 2026

Company	Location	Chargers	Site Capacity
EV Realty	San Bernardino	72 x 25-400 kW dedicated pull-in stalls, 4 x CCS and MCS pull-through stalls	9 MW
Forum Mobility	Port of Long Beach	19 x 360 kW dual-port chargers, 6 x 360 kW single-port chargers	9 MW
Greenlane Infrastructure	Colton	12 x 400 kW dual-port chargers pull-through chargers, 29 x 240 kW chargers	11.8 MW
Terawatt Infrastructure	Rancho Dominguez	10 x 350 kW dual port pull-through chargers, 10 x 350 kW dual port bobtail chargers	7 MW
Terawatt Infrastructure	Rialto	18 x 350 kW dual-port pull-through chargers	6.3 MW
Tesla ⁶⁴	Ontario	2 x 750 kW chargers	1.5 MW
WattEV	Vernon	24 x 360 kW ports	8.6 MW

Sources: EV Realty ⁶⁵, Forum Mobility ⁶⁶, Greenlane Infrastructure ⁶⁷, Terawatt Infrastructure ⁶⁸, Tesla ⁶⁹, WattEV ⁷⁰

In addition to these sites, several more are in development or opening soon. Zeem Solutions is expected to open its site at the Port of Long Beach in the second quarter of 2026. According to Tesla’s most recent map of open and planned Megachargers, the company has 16 planned sites in California, including stations

⁶⁴ Tesla opened a Semi charging site at TravelCenters of America TA Ontario in March 2026; bp pulse is expected to open 4 x 400 kW pull-through charging bays at the same site later in 2026, increasing the sites’ total capacity to 3.1 MW.

https://www.linkedin.com/posts/bppulse_bppulse-etrucks-evcharging-activity-7415085465999007744-B43m/

⁶⁵ “San Bernardino, CA.” EV Realty, n.d. Accessed April 7, 2026. <https://evrealtyus.com/projects/san-bernardino-ca/>

⁶⁶ Forum Mobility. “Forum Mobility Announces New FM Harbor Charging Depot for Drayage Trucks at Port of Long Beach.” Accessed April 7, 2026. <https://forummobility.com/news/forum-mobility-announces-new-fm-harbor-charging-depot-for-drayage-trucks-at-port-of-long-beach/>

⁶⁷ “Greenlane Electric Truck Charging Station | Colton, CA.” Accessed April 7, 2026.

<https://www.drivegreenlane.com/locations/colton-ca/>

⁶⁸ “Terawatt Infrastructure for Trucking Fleets.” Accessed April 7, 2026.

<https://www.terawattinfrastructure.com/solutions/trucking-fleets>

⁶⁹ bp pulse | LinkedIn.” Accessed April 7, 2026. https://www.linkedin.com/posts/bppulse_bppulse-etrucks-evcharging-activity-7415085465999007744-B43m/

⁷⁰ “Vernon Depot | Electric Truck Charging Vernon, CA.” Accessed April 7, 2026. <https://wattev.com/vernon/>

outside the ports, in Los Angeles, and along I-10 in the Inland Empire. Additionally, companies including EV Realty, Prologis, Terawatt, and WattEV, all have planned sites under development in the region. A review of the California Energy Commission’s Publicly Accessible Medium- and Heavy-Duty Zero Emission Vehicle Charging or Hydrogen Refueling Station dashboard, CALSTART’s National Medium & Heavy Duty Zero-Emission Infrastructure Map, and individual company websites shows that at least 26 public or semi-public, MHD-specific charging sites are opening soon or under development.⁷¹

State and local policy support is another crucial ingredient in the region’s successful recipe. Progress in the region has been driven in large part by the wide range of incentive programs—particularly those that are stackable, allowing them to be combined with other incentives—made available by the state, regional air districts, utilities, and other organizations. While not an exhaustive list, Table 3 in the appendix highlights incentive programs that are, or will be, available to support MHD EV adoption and charging infrastructure development throughout the region.

Advances in the Southern California hub illustrate how state and local policy leadership focused on major fleet hubs can spur progress and create ongoing, revenue-generating opportunities for charging infrastructure. In addition to these financial incentives, California’s Low Carbon Fuel Standard and the adoption of the Fast Charging Infrastructure credit in the recent program amendments, as discussed above, create the conditions for infrastructure developers to invest in MHD EV charging infrastructure. These mechanisms help resolve the chicken-or-egg dilemma by simultaneously incentivizing EV truck adoption and de-risking infrastructure investment.

Further, SCAQMD adopted the Warehouse Actions and Investments to Reduce Emissions (WAIRE) Program, which regulates warehouse facilities to reduce emissions. Specifically, it requires warehouse operators to earn points for actions taken to comply with the regulation. Included in the menu of actions to earn points is the acquisition and use of near-zero- and zero-emission trucks, along with the infrastructure to support them.

However, this case study also illustrates that there is more to do. Project developers expressed challenges with permitting charging stations and sizable backup energy storage installations, and the California Attorney General’s March 18, 2025, *Legal Alert Reminding Local Jurisdictions to Streamline Permitting for Electric Vehicle Charging Stations* illustrates the modest enforcement mechanisms available to support the law’s ambitious goals.⁷² In the Coalition for Clean Air’s estimation, “Approximately 110 cities and counties have taken no action to comply with state laws, including Assembly Bill 1236 (2015) and Assembly Bill 970 (2021), designed to remove bureaucratic hurdles for EV charging station installation. Another 80 local governments have failed to comply fully with these laws.”⁷³

Taken together, these incentives, market drivers, and focus on a limited geographic scope offer a replicable approach to accelerate the deployment of electric freight charging infrastructure: incentives tear down upfront cost barriers, competitive fuel standards create sustainable funding streams for

⁷¹ Commission, California Energy. “MDHD ZEV Station Development in California.” California Energy Commission, current-date. <https://www.energy.ca.gov/data-reports/energy-almanac/zero-emission-vehicle-and-infrastructure-statistics-collection/mdhd-zev>; and “National Zero-Emission Medium- and Heavy-Duty Infrastructure Map - CALSTART.” Accessed April 8, 2026. <https://calstart.org/mhd-infrastructure-map/>

⁷² “Attorney General Bonta Issues Legal Alert Reminding Local Jurisdictions to Streamline Permitting for Electric Vehicle Charging Stations | State of California - Department of Justice - Office of the Attorney General.” Accessed April 7, 2026. <https://oag.ca.gov/news/press-releases/attorney-general-bonta-issues-legal-alert-reminding-local-jurisdictions>

⁷³ Coalition for Clean Air, “CCCA Sues Local Governments to Expand EV Charging Stations in California,” November 19, 2025, <https://www.ccair.org/wp-content/uploads/2025/11/CCA-Press-Release-EV-Charging-Lawsuit-11.19.2025.pdf>

charging infrastructure, and a specific regional focus maximizes the utilization of deployed infrastructure without requiring mass-scale deployment. Aside from California, three states have implemented versions of CFS policies, with another ten state legislatures actively considering one.⁷⁴ And though California has created the most robust set of state-level electrification incentives, other states are beginning to step up, as Colorado did when it created a dedicated funding stream for transportation electrification incentives through a retail delivery fee.⁷⁵ The benefits of doing so are clear. As of April 2, 2026, the California HVIP program has helped deploy 11,600 clean vehicles across more than 2,000 fleets, accumulating more than 181 million miles driven across the state.⁷⁶ These successes are also influencing program design beyond California. For example, Washington State’s Zero-Emission Incentive Program is modeled after California’s HVIP and CORE incentive programs and is beginning to make these point-of-sale vouchers available in 2026 for fleet operators.

PROJECT HIGHLIGHT: GREENLANE INFRASTRUCTURE'S COLTON FLAGSHIP SITE

In April 2025, Greenlane Infrastructure (“Greenlane”) launched its flagship facility in Colton, California, at the intersection of two strategic regional corridors: I-10 and I-215. As a joint venture of Daimler Truck North America, NextEra Energy Resources, and BlackRock, Greenlane is developing a nationwide network of public high-speed battery-electric charging solutions for MHD commercial fleets. Greenlane identified Southern California as a strategic region for investment due to its unique convergence of policy incentives, revenue opportunities, and strong local support.

Colton Site at a Glance

Launched in **April 2025** | Located in **Colton, CA** | **99%+** uptime | **99%** customer satisfaction

Charging:

- 12 x 400kW dual-port CCS pull-through chargers
- 29 x 240kW bobtail chargers

Capacity:

- Currently at **≈4 MW**
- Working towards **≈12 MW**

Amenities:

- Dedicated trailer parking
- Overhead canopies
- 24/7 on-site attendant and security guard
- Security cameras and gated entrance
- Lounge with indoor and outdoor seating, TV, wi-fi, device charging stations, snacks and beverages, restrooms, water refill stations, and lane availability/charging status screens

⁷⁴ “Clean Fuel Standards: The Market-Based Policy for States Looking to Clean Up Transportation - RMI.” Accessed April 7, 2026. <https://rmi.org/clean-fuel-standards-the-market-based-policy-for-states-looking-to-clean-up-transportation/>.

⁷⁵ The Bell Policy Center, “In the Know: Transportation Fees” https://www.bellpolicy.org/wp-content/uploads/ITK_TransportationFees.pdf

⁷⁶ “California’s Clean Truck and Bus Incentive Program Surpasses \$1 Billion Milestone | California Air Resources Board.” Accessed April 7, 2026. <https://ww2.arb.ca.gov/news/californias-clean-truck-and-bus-incentive-program-surpasses-1-billion-milestone>.

Greenlane was awarded \$15 million from the South Coast Air Quality Management District’s Carl Moyer Zero-Emission Infrastructure program (“Carl Moyer”) to support the development of its flagship site, funding the construction of 41 of the charging pedestals and 53 connectors. Beyond the incentive considerations in the region, strong collaboration with and support from local stakeholders have been essential to advancing the project. City leadership, including the mayor, city council, and local municipal utility, recognized the economic opportunities associated with the project—such as increased tax revenue and the creation of local jobs—and worked closely with Greenlane throughout the process, creating a pathway for future truck charging sites to be developed.



Source: Greenlane

A key step was the city council and mayor’s action to update zoning laws to accommodate zero-emission fueling infrastructure, an emerging issue for municipalities as truck charging sites continue to scale. In May 2024, the city council unanimously approved an amendment allowing EV charging and hydrogen fueling infrastructure in areas zoned as industrial parks, expediting the permitting and zoning process. This was critical for Greenlane to meet the timing requirements of the Carl Moyer grant award. Greenlane also worked with the City of Colton Electric Utility to ensure the site can expand as the utility adds additional capacity. This approach enables Greenlane to serve its customers today while preparing the site for future MCS charging as that capacity becomes available.

The coordination between Greenlane and local stakeholders helped mitigate three critical factors beyond Greenlane’s and other developers’ control: permitting and zoning timelines, energization, and grant compliance. “Charging infrastructure doesn’t get built in a vacuum. In Colton, the city council moved decisively to update zoning, the utility planned ahead for future capacity, and those actions kept a complex grant-funded project on track,” said Patrick Macdonald-King, CEO of Greenlane. “That partnership is what turned a strategic vision into our fully developed flagship site in nine months from groundbreaking to grand opening.”

Conclusion

MHD truck electrification is poised to accelerate significantly in the coming years, driven by steady improvements in vehicle performance, declining production costs, demonstrated operational savings, and growing global adoption. However, transportation systems are complex, and early adopters have encountered several bottlenecks that could limit domestic market growth: difficulties overcoming the economies of scale that favor the status quo, complex administrative requirements that raise soft costs, and failures to adapt old systems to incorporate innovative technologies and practices.

Evidence from leading markets shows that durable market growth does not depend on one single policy or technology, but on a set of principles that proactively address these bottlenecks in the adoption process. **Policy stability** enables the long-term investments required to produce electric trucks at scale, supporting **supply chain resilience** and reducing upfront vehicle costs. As they are among the best positioned to take advantage of EVs' benefits today, **fleets should serve as anchor customers for early scale and infrastructure utilization**. Trailblazing fleets, however, continue to encounter high soft costs due to inconsistent administrative requirements across time and geography; therefore, **standards clarity** is needed to lower soft costs for those seeking public support and/or deploying infrastructure. To further support **infrastructure execution capacity** in the MHD market, policy must reduce interconnection delays and create alternative pathways to energization. Finally, **market rules that reward utilization and reliability** will support the creation of a durable network of MHD charging by creating a viable profit model while deterring usage that adversely affects ratepayers.

The Southern California hub case study offers proof that state and local stakeholders can step in and lead charging infrastructure deployment. State leadership on policy and direction is a requisite enabler to support this approach and signal that battery-electric trucks are the future of the market, facilitating the expansion and connection of these early models into regional, then national networks. California is succeeding because it developed an overarching strategy and a detailed technical and policy roadmap, which it implemented ambitiously while building state and local policy coordination.

Given the lack of federal leadership, state and local governments now have an opportunity to play a decisive role in shaping the future of U.S. electric freight. By coordinating public- and private-sector stakeholders to leverage the tools discussed in this paper, states can maintain momentum and scale these early successes into a cohesive national electric freight network.

Appendix

TABLE 3: SOUTHERN CALIFORNIA MHD EV AND TRUCK CHARGING INCENTIVES

Program	Jurisdictional Scope	Administering Agency (or company)	Incentive Type	Eligible Projects
Clean Off-Road Equipment Voucher Incentive Project (CORE)	State	California Air Resources Board (CARB)	Voucher	Purchase or lease of zero-emission off-road equipment
Hybrid and Zero-Emission Truck and Bus Voucher Incentive Project (HVIP)	State	CARB	Voucher	Purchase or lease of zero-emission MHD trucks and buses
Innovative Small e-Fleet Pilot	State	CARB	Voucher	Purchase or lease of zero-emission MHD trucks and buses for small fleets. Fleets can request vouchers for innovative solutions and alternative business models, such as truck-as-a-service.
Truck Loan Assistance Program (TLAP)	State	CARB	Financing Support	Financing assistance for small heavy-duty fleets to purchase vehicles compliant with California's In-Use Truck and Bus Regulation
Carl Moyer Memorial Air Quality Standards Attainment Program	State and Local	CARB and Local Air Districts	Grant	Grant funding for on- and off-road heavy-duty vehicles, equipment, infrastructure, and other projects as made available by the local air quality district
Community Air Protection Incentives Program	State and Local	CARB and Local Air Districts	Grant	Grant funding for projects, including replacement of high-polluting vehicles and equipment with low- and zero-emissions vehicles and charging infrastructure

VW Environmental Mitigation Trust Programs	State and Local	CARB and Local Air Districts	Grant	Grant funding for specific equipment categories, including zero-emission freight and marine projects, and zero-emission Class 8 freight and port drayage trucks
Energy Infrastructure Incentives for Zero-Emission Commercial Vehicles (EnerGIIZE)	State	California Energy Commission (CEC)	Grant	Grant funding for charging or hydrogen fueling infrastructure for MHD vehicles
Trade Corridor Enhancement Program (TCEP)	State	California Transportation Commission (CTC)	Grant	Grant funding for infrastructure improvement projects along corridors with high freight volume, such as the federally designated Trade Corridors of National and Regional Significance and California's portion of the National Highway Freight Network. Eligible projects include MHD zero-emission vehicle infrastructure.
National Electric Vehicle Infrastructure (NEVI) Program	State	CEC and California Department of Transportation (Caltrans)	Grant	Formula funding from the U.S. Federal Highway Administration to states to deploy EV charging infrastructure along designated Alternative Fuel Corridors (California has made funding available for MHD EV charging in recent solicitations).
Battery Electric Cargo Handling Equipment Program (INVEST CLEAN)	Local	South Coast Air Quality Management District (SCAQMD)	Rebate	Replacement of older diesel equipment with electric cargo handling equipment, including electric yard trucks and electric top handlers
Battery Electric Freight Vehicle Deployment Incentive Program (INVEST CLEAN)	Local	SCAQMD	Rebate	Replacement of older Class 8 diesel trucks with electric Class 8 trucks
Charging Infrastructure Incentive Program (INVEST CLEAN)	Local	SCAQMD	Rebate	Purchase and installation of DC fast chargers for Class 4-8 vehicles

Last Mile Freight Program (INVEST CLEAN)	Local	SCAQMD and the Southern California Association of Governments	Rebate	Purchase of conversion of Class 4 and Class 5 electric vehicles
Voucher Incentive Program	Local	SCAQMD	Voucher	Replacement of model year engine 2017 and older diesel trucks with zero-emission vehicles for small fleet owners and operators
Clean Truck Fund (CTF) Rate Program	Port	Port of Los Angeles and Port of Long Beach	Rate-Exemption	Zero-emission trucks are exempted from the Clean Truck Fund Rate of \$10 per 20-foot equivalent unit entering and exiting the ports.
CTF-HVIP Drayage Voucher Enhancement	Port and Local	Port of Los Angeles, Port of Long Beach, CARB	Voucher	Purchase or lease of zero-emission Class 8 drayage trucks that operate at the ports of Los Angeles and Long Beach
Commercial EV Charger Rebate Program	Utility	Los Angeles Department of Water and Power	Rebate	Installation of MHD EV chargers
Charge Ready Transport	Utility	Southern California Edison	Rebate	Electrical system upgrades to support installation of EV charging equipment, including medium- and heavy-duty trucks, port equipment, and off-road equipment
Drayage Truck Rebate	Utility	Southern California Edison	Rebate	Purchase of Class 7 and Class 8 electric drayage trucks
ReCharge Vehicle Rebates	Utility	Southern California Edison	Rebate	Retrofit of existing Class 4-6 commercial vehicles from internal combustion to battery-electric