Strategy to Understand and Address Potential Insurance Gaps for Zero-Emission Medium and Heavy-Duty Truck Technologies

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Contents

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The primary project team for CDI was led by Rabab A. Charafeddine, with contributions from Mike Peterson, Luciano Gobbo, Micah Mumper, and Kara Voss from the Climate and Sustainability Branch. Luciano Gobbo and Micah Mumper led the collection and analysis of CDI's Zero-Emission Truck (ZET) Survey of all admitted insurers in California with non-zero premiums in Commercial Auto Liability and Commercial Auto Physical Damage insurance.

The primary project team at CARB included Brandon Rose and Bruce Tuter. The report authors wish to acknowledge the helpful assistance of Niki Okuk, Brian Rand, and Brittni Karol from CALSTART for collecting and communicating the insurance related responses for interviews with small fleet operators.

Image credits: Left image, Juice on Unsplash; Upper right image, CARB; Lower right image, Rabab A. Charafeddine.

Executive Summary

Drayage trucks, which move freight between ports, rail hubs, and other key logistical points, are a crucial part of California's supply chain. However, they also contribute significantly to air pollution, disproportionately affecting vulnerable communities near freight corridors. In the decade since the Clean Truck, Bus, and Off-Road Vehicle and Equipment Act of 2014 (Chapter 524, Statutes of 2014) became law in California, the state has established regulations to accelerate the deployment of clean heavy-duty vehicle technologies. However, achieving commercial zero-emission drayage truck deployment and emission targets is a cross-sectoral endeavor that involves not only policymakers, but infrastructure planners, investors, truck manufacturers, trucking associations, ports, lenders, and insurers.

This strategy document was developed to understand insurance availability and affordability related to zero-emission medium and heavy-duty trucks, and to respond to Insurance Code Section 938.1, established by Assembly Bill 844 (Gipson) in 2023 (Chapter 347, Statutes of 2023). Initial findings include the need for monitoring insurance data on this emerging market and that as of May 2024, more than 60 commercial insurance companies are offering insurance for zero-emission heavy-duty trucks[1].

New technologies, whether transportation, commercial, or industrial, often encounter uncertainty in insurance availability and pricing during early phases of deployment. Emerging insurance options may be unknown to consumers and lack of observed data on losses can limit the capacity or interest to insure new technologies in the insurance sector. For example, depending on the value of the truck being insured, small commercial fleets that are deploying zero-emission drayage trucks can face challenges finding reasonably priced insurance. Research and education can equip consumers to find the most valuable insurance options available and encourage increased interest and capacity throughout the insurance sector for heavy-duty trucks.

The California Air Resources Board (CARB) and CALSTART have found that insurers commonly lack a general awareness of the deployment or attributes of zero-emission technologies, do not offer commercial insurance products tailored to zero-emission trucks, or track the residual value data of these trucks. Residual value is particularly important in the development of insurance products because it represents the financial risk in the event of a loss claim. At this point in the technology development cycle, the secondary market of used heavy-duty vehicles needed to clearly establish residual values has yet to develop and mature.

Advancement in data availability may help monitor trends and alleviate potential barriers to insurance access. Through its own data collection efforts, the California Department of Insurance (CDI) has found that dozens of insurance companies offer insurance for zero-emission drayage trucks. However, those insurers do not track loss information and do not have standardized coverage amount options and premium rates specific to zero-emission technologies. Data specificity can be key to understanding and

[1] California Department of Insurance. Commercial Insurance for Zero-Emission Drayage Trucks. Accessed December 2024. https://www.insurance.ca.gov/01-consumers/180-climate-change/zero-emission-drayage-trucks.cfm.

addressing affordability needs for consumers and enhancing the insurance sector's understanding of zero-emission technologies, which can also help develop a robust vehicle residual value determination process.

To tackle current insurance accessibility, affordability, and data gaps plus support the state's emission reduction goals, CDI, in collaboration with CARB, has developed the following strategy recommendations:

1. Grow zero-emission technology knowledge in the insurance sector
2. Facilitate cross-sector dialogue on financial tools and insurance gaps
3. Promote data collection and risk assessment
4. Explore innovative solutions that expand insurance options

Background

Commercial Zero-Emission Truck Landscape

Each day, thousands of heavy-duty diesel trucks transport goods along key corridors between ports, rail hubs, and distribution centers, serving residents across the state and representing a large portion of California's economy. However, these trucks are also a major mobile source of air pollution for communities living along these corridors, imposing serious harm to their health. Multiple air pollutants are associated with diesel truck use, including nitrogen oxide (NOx), fine particulate matter (PM2.5), carbon dioxide (CO2e), black carbon, and other toxic air contaminants.

For years, state and federal investments in planning and infrastructure at California's ports and transportation corridors have helped reduce emissions. In 2016, California finalized the Sustainable Freight Strategy, setting 2030 and 2050 goals for safety, efficiency, and emissions reductions in the movements of freight in California. Most recently, in October 2024, the federal government awarded approximately $1 Billion to California's ports as part of efforts to reduce air pollution associated with trucking and infrastructure.

A recent study found that approximately 44% of GHG emissions at the Ports of Los Angeles and Long Beach were generated by heavy-duty trucks. For the Port of Long Beach heavy-duty vehicles produced 386,990 Metric Tons (MT) CO2e out of 888,712 MT total. For the Port of Los Angles heavy-duty vehicles produced 398,679 MT CO2e out of 903,250 MT total. These values are representative of most ports in California[2].

Addressing the impacts of air pollution is an important priority to address inequity. Low-income communities and communities of concern that tend to be home to people of color are disproportionately impacted by the environmental burdens caused by truck and other freight transportation.

[2] University of California, Irvine. 2023. A Comprehensive and Replicable Infrastructure Blueprint for Zero- Emission Medium- and Heavy-Duty Vehicles Operating at a Port Terminal. https://cleanenergy.uci.edu/PDF_White_Papers/PortTerminalBlueprint2023.pdf

The communities surrounding these areas suffer from elevated risk of premature death, cancer, respiratory and cardiovascular disease, as well as impacts on learning, memory, and behavior. Children in these communities are particularly vulnerable with a higher risk for lung damage, respiratory infections, and asthma[3]. Traffic-related nitrogen dioxide pollution has been linked to 50% of childhood asthma cases in Los Angeles County alone[4].

Sales of new zero-emission medium and heavy-duty trucks in California are growing rapidly and in 2023 have doubled from the prior year, now representing 1 out of every 6 new vehicles sold for services that include last-mile delivery, freight transportation, and school buses[5]. Expanding the deployment of these heavy-duty trucks is a critical component of the state's strategy to meet specific emissions reduction targets for both criteria pollutants and greenhouse gases, including 2030 targets for reducing emissions of the super pollutant black carbon by 50% below 2013 levels[6], which is a pollutant that is commonly released by diesel–powered trucks[7] and has thousands of times more global warming potential than carbon dioxide.

Emissions Reduction Targets and Programs

The successful deployment of zero-emission technologies in the transportation sector is a key pillar to meeting the State's 2045 carbon neutrality goal. In 2022, this sector accounted for 37.7% of GHG emissions in California and On-Road Diesel represents about 19.6% of the sector's GHG emissions or about 28 Million Metric Tons (MMT) of CO2e.

The state continues to develop rules and incentives to expand zero-emission truck fleets. In the past five years, the state has appropriated over $1,000,000,000 in incentives, through programs administered by the California Air Resources Board (CARB), to incentivize the purchase of zero-emission medium and heavy-duty trucks. As of November 2024, the Hybrid and Zero-Emission Truck and Bus Voucher Incentive Project (HVIP) has funded over 4,000 new vehicles, with over 58% located in pollution-burdened communities and 6% specifically for the drayage trucks that are concentrated at California ports. There are approximately 5,000 vehicles with approved vouchers awaiting redemption, of which 900 are for drayage trucks[8].

[3] California Office of Environmental Health Hazard Assessment. February 2022. Impacts of greenhouse gas emission limits within disadvantaged communities: Progress toward reducing inequities. Retrieved from https://oehha.ca.gov/media/downloads/environmental-justice//impactsofghgpoliciesreport020322.pdf
[4] UCLA Luskin Center for Innovation. October 2019. Zero-Emission Drayage Trucks Challenges and Opportunities for the San Pedro Bay Ports. https://innovation.luskin.ucla.edu/wp-content/uploads/2019/08/Zero-Emission_Drayage_Trucks.pdf
[5] Governor Gavin Newsome. June 2024. 1 in 6 new trucks, buses, and vans in California are zero-emission. https://www.gov.ca.gov/2024/06/06/1-in-6-new-trucks-buses-and-vans-in-california-are-zero-emission/
[6] Ricardo Lara. September 2016. SB-1383 Short-lived climate pollutants: methane emissions: dairy and livestock: organic waste: landfills. https://leginfo.legislature.ca.gov/faces/billNavClient.xhtml?bill_id=201520160SB1383
[7] California Air Resources Board. March 2017. Short-Lived Climate Pollutant Reduction. https://ww2.arb.ca.gov/sites/default/files/2020-07/final_SLCP_strategy.pdf
[8] California HVIP. Voucher Map and Data. Accessed December 2024. https://californiahvip.org/impact/#deployed-vehicle-mapping-tool

In 2020, CARB enacted the Advanced Clean Trucks (ACT) regulation[9] to ensure that truck manufacturers produce and sell zero-emission medium and heavy-duty trucks as an increasing portion of their sales from 2024 to 2035. The regulation is anticipated to result in 100,000 zero-emission trucks by 2030 and 300,000 by 2035. Looking at the air quality benefits, CARB projects that the ACT regulation will cumulatively reduce statewide emissions by approximately 57,314 tons of NOx and 1,104 tons of PM2.5 from 2020 to 2040, and reduce CO2 emissions by 21.6 MMT per day by 2045.

Numerous policies are accelerating the deployment of zero-emission heavy-duty trucks over the next ten years, including the adoption of the Advanced Clean Fleet (ACF) Rule by CARB in 2023, the emergence of new infrastructure investments, and the alignment of multiple states to the existing ACT regulation adopted by CARB in 2021. The combination of these policies, investments, and incentives is anticipated to result in at least 200,000 trucks by 2030 and at least 500,000 trucks by 2035.

CARB is also exploring non-regulatory strategies to achieve emission reductions from fleets that do not meet the ACF rule thresholds. For example, small fleets have been targeted with increased incentives to help make the conversion to zero-emission vehicles. Other innovative non-regulatory concepts to achieve emission reductions could include differentiated registration fees or indirect source rules.

Emissions related to the heavy-duty truck sector are being addressed through established long-term strategies. Since 2016, California has had emissions reductions targets by 2030 for the super pollutants (short-lived climate pollutants) methane, HFCs, and black carbon, and CARB has been implementing a strategy to achieve those targets with one point of focus on reducing methane leakage from natural gas trucks. The 2022 State Implementation Plan states that through 2037 - 16% of NOx and 7.5% of Reactive Organic Gases emission reductions are targeted to come from the heavy-duty sector[10].

Zero-emission trucks not only offer significant environmental benefits, but recent analyses indicate that they are also more cost-effective to operate. Based on CARB staff analysis, a battery-electric and fuel cell electric Class 7–8 day cab operating in a drayage duty cycle is expected to have a 31 and 33 percent lower Total Cost of Ownership (TCO) versus diesel day cabs, respectively, resulting in savings of $239,000 and $251,000, respectively.

Commercial Auto Insurance for Zero-Emission Trucks

Findings from California and National Surveys

Small fleets (fewer than 20 vehicles) are usually not self-insured by the commercial business itself and most small fleet businesses purchase commercial insurance coverage through the admitted insurance market. In addition, many small fleet operators utilize and likely depend on California incentive programs, such as HVIP, and lenders to purchase zero-emission trucks. While the state and federal government require truck operators to purchase liability coverage, lenders view the vehicle itself as collateral for the loan. To protect their assets, they require fleet owners to purchase not only liability insurance but physical damage insurance as well. Whereas many large fleets of zero-emission trucks are widely self-insured, continuing to expand the insurance policies written for zero-emission trucks in small

[9] California Air Resources Board. Advanced Clean Trucks. https://ww2.arb.ca.gov/our-work/programs/advanced-clean-trucks

[10] California Air Resources Board. September 2022. 2022 State Strategy for the State Implementation Plan. https://ww2.arb.ca.gov/sites/default/files/2022-08/2022_State_SIP_Strategy.pdf

fleets is an important component for emissions reductions and represents a linkage between insurance and emissions reductions in the heavy-duty truck sector. Since 2021, there has been a total of 616 medium and heavy-duty truck vouchers redeemed by small fleets[11], which achieve NOx reductions that are equivalent to removing over 22,000 passenger cars off the road. In addition, small fleets have voucher requests for an additional 1,849 vehicles that are pending redemption.

In Fall 2024, CALSTART, a nonprofit organization partnering with CARB and administrating multiple state zero-emission vehicle incentive programs, interviewed eleven HVIP grantees operating small fleets of medium and heavy-duty trucks in California. Participants consistently said they pay more for insurance due to the high manufacturer's suggested retail price (MSRP) of zero-emission trucks. In general, they did not have difficulty obtaining insurance, but the higher cost was of concern. Fleets reported getting insurance either through their existing provider, through a broker, or through a program sponsored by their beneficial cargo owner. Many fleets had difficulty determining the exact influence of adding zero-emission trucks to their fleet on insurance costs, as they frequently experienced changes in fleet size and driver safety scores simultaneously. Generally, they all indicated an increase in cost, but not one that overwhelmed the savings from reduced fuel and maintenance expenses. They also did not indicate that there was a premium increase simply because of the zero-emission technology, but rather that the higher premium was due to the higher MSRP.

In addition, two national surveys and interviews with small fleet truck stakeholders that include truck-owner operators and independent contractors, revealed that small and minority-owned fleets may face significant challenges in adopting zero-emission trucks[12,13]. These challenges stem from limited access to capital for purchasing zero-emission trucks, insufficient staff capacity to apply for grants, lack of exposure to relevant information, and language barriers—factors that are less prevalent among larger fleets. Although these studies did not specifically address insurance challenges, their findings suggest that these barriers are likely to affect insurance knowledge and accessibility as well. Beyond HVIP grantees, small fleets are the norm in the trucking industry. According to the American Trucking Association, 95.8 percent of fleets operate 10 or fewer truck[14]. These insights highlight that while some fleets may struggle with insurance affordability, for smaller and minority-owned fleets, the barriers could make insurance inaccessible.

Initial Findings from the California Department of Insurance Data Gathering

The California Department of Insurance (CDI) aims to gain a deeper understanding of the current state of the insurance market, including any gaps in coverage or affordability that could hinder the adoption of zero-emission technologies. Because the interest in and use of zero-emission technologies in heavy-duty trucks continue to grow rapidly, CDI is taking an iterative approach to monitoring insurance metrics associated with the trucking and transportation sectors.

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[11] California HVIP. Voucher Map and Data. Accessed December 2024. https://californiahvip.org/impact/#deployed-vehicle-mapping-tool

[12] DREAM.ORG Green For All. April 2022. Taking Charge, Supporting Small Fleets in the Transition to Zero Emission Trucks. https://dream.org/wp-content/uploads/2022/08/Dream.Org_SmallFleet_1.pdf

[13] International Council on Clean Transportation. October 2022. No fleet left behind: Barriers and opportunities for small fleet zero-emission trucking. https://theicct.org/wp-content/uploads/2022/10/small-fleet-ze-trucking-oct22.pdf

[14] CALSTART. January 2024. Zeroing in on ZETs. https://calstart.org/zio-zets-jan-2024-update/

As part of this effort, in May 2024, CDI surveyed 249 admitted insurance companies underwriting commercial auto insurance in California and published a list of companies that cover zero-emission drayage trucks[15]. We found that none of 60[16] companies that insure tractor-trailer trucks engaged in drayage operations differentiated between zero-emission and internal combustion engine trucks in their standardized rating factors and other data collection practices. This is likely because the Insurance Services Office (also known in the insurance sector as ISO), which provides rating manuals to 80% of the insurance companies surveyed by CDI, currently does not explicitly differentiate between the engine technologies of zero-emission and internal combustion in its rating information for medium and heavy-duty trucks.

CDI's data and informational survey also showed that reporting companies collect loss data on their insured trucks generally but have not collected specific loss experience data for zero-emission medium and heavy-duty trucks. Appendix B shows claims and incurred losses for liability (bodily injury and property damage) and physical damage (collision and comprehensive) coverages for all their insured medium and heavy-duty trucks (both diesel and zero-emission). Claims were reported on an accident-year basis for 2022, with losses evaluated as of December 31, 2023. The high-level information CDI collected all led to the same conclusion that none of the insurers that we surveyed had the expertise to be able to consistently identify zero-emission trucks from internal combustion engine trucks.

Future data collection would complement the recently collected data and could clarify understanding of zero-emission heavy-duty truck risk mitigation. Excluding rating factors specific to zero-emission trucks in insurance pricing may overlook key risk mitigation attributes these vehicles possess compared to internal combustion engine trucks. Zero-emission trucks tend to require less maintenance due to fewer moving parts and simpler drivetrain systems. Brake systems also generally last longer than those on internal combustion engine vehicles because of regenerative braking.[17] These characteristics might lower the risks of accidents caused by poor vehicle upkeep. Not tracking these variables in insurance underwriting could lead to pricing programs that fail to reflect the actual risk profile of zero-emission trucks.

The higher financial value of the vehicle being insured may be a major driver of the premiums for zero-emission trucks. CDI's survey found that the annual premium for physical damage insurance is calculated using multiple rating factors, such as driver record and the value of the truck (Appendix A). Because they are assessed on the financial value of the truck being insured, the relatively more expensive zero-emission trucks will have higher insurance costs than internal combustion engine alternatives. Typical physical damage insurance rates are approximately 3% of the market value of the truck each year[18]. Therefore, based on value alone, a $400,000 zero-emission drayage truck, will cost around $12,000 annually to insure, 68% more than the premium of a $168,000 comparable diesel truck. Available grant and subsidy programs can reduce the cost of that zero-emission drayage truck to around $100,000 to

[15] California Department of Insurance. Commercial Insurance for Zero-Emission Drayage Trucks. Accessed December 2024. https://www.insurance.ca.gov/01-consumers/180-climate-change/zero-emission-drayage-trucks.cfm

[16] As of September 2024, there are 55 admitted commercial insurance companies operating in the drayage space.

[17] U.S. Department of Energy. Alternative Fuels Data Center. Accessed November 2024. https://afdc.energy.gov/vehicles/electric-maintenance

[18] Tetra Tech and Gladstein, Neandross & Associates. April 2019. 2018 Feasibility Assessment for Drayage Trucks. https://www.trccompanies.com/insights/2018-feasibility-assessment-for-drayage-trucks/

$150,000. However, lenders treat the truck's full market price as collateral for the loan, requiring physical damage insurance based on the vehicle's total value. Insurers also do not consider grants and subsidies when determining premiums because such grants do not impact the replacement costs of the vehicle. It is important to note that this type of grant funding does not need to be repaid in the event of an accident as CARB will not claw back funding from a purchaser if the vehicle becomes non-operational due to damage that was not intentionally, negligently, or fraudulently caused by the purchaser[19].

Residual Value Insurance

The residual value (also known as second life or resale value) of a vehicle is a key component in finance and insurance because it represents the replacement value or potential financial payout in the event of a claim, loan default, or other loss. Residual value data for commercial zero-emission vehicles is currently limited, causing residual assumptions to potentially be disproportionally low, which inflates insurance cost and limits or obscures the market for zero-emission trucks as they age over time.

CARB's suite of clean air regulations requires a competitive, well-functioning market, to ensure success. To that end, supporting residual value is a key strategy and CARB has had discussions with leaders in the field such as ZETI, J.D. Power, and the RVI Group, looking to understand operations and collect data. In addition, CARB is investigating direct strategies to support residual values such as a used vehicle voucher program and other creative solutions.

Strategies to Address Insurance Gaps

CDI took a cross-sector approach in collaborating with CARB to collect the preceding research information and data. Based on the initial, cross-sector findings described in previous sections, including surveys of heavy-duty fleet operators, truck operators, and insurance companies, CDI, in further collaboration with CARB, has developed the following strategy recommendations. A key focus of these recommendations is understanding and addressing the current insurance needs and gaps for new and used Medium and Heavy-Duty Zero-Emission Vehicles (MHD ZEVs). Since current indications from our research suggest that physical damage insurance and residual value insurance may be the limiting type of coverages in terms of affordability and availability, the strategies below focus on improving accessibility by monitoring trends over time, identifying potential barriers, and working on collaborative solutions to broaden consumer understanding and options for insurance.

Action 1: Grow zero-emission technology knowledge in the insurance sector

Pillar 1. Expand CARB and CALSTART's ongoing efforts to build capacity and cross-sector education. The widespread adoption of zero-emission vehicles represents a major transformation of the heavy-duty transportation industry in the coming decade. Currently, there are 197 models of MHD ZEVs from over 70 original equipment manufacturers (OEMs) available[20]. A fully informed insurance sector is necessary

[19] CARB and CalSTART, Implementation Manual for The Hybrid and Zero-Emission Truck and Bus Voucher Incentive Project (HVIP). October 2024, https://californiahvip.org/wp-content/uploads/2024/10/FY23-24-HVIP-Implementation-Manual-103124.pdf

[20] Zero-Emission Technology Inventory. Accessed December 2024. https://globaldrivetozero.org/tools/zeti

to ensure critical products and solutions are available to guarantee a healthy and vibrant commercial market.

CALSTART and CARB have developed an early industry engagement plan focused on education to inform key companies about the opportunities presented by the new technology and the need for their products. Work has continued to target outreach strategies and material development over the proceeding months, with an emphasis on identifying and contacting key industry stakeholders and presenting at various meetings and events. The strategy also focuses on publishing MHD ZEVs' status updates and data reports, such as CALSTART's *Zeroing in on Zero-Emission Trucks* report series [21], and publicizing them through media exposure.

Pillar 2. Publish accessible insurance data resources and information on MHD ZEVs. CDI will create accessible fact sheets and resources for consumer facing webpages, such as CARB's ZEV TruckStop. CDI already has a Climate Smart Insurance Products database with over 400 insurance products that encourage emissions reductions and enhanced resilience[22]. The development of multiple integrated resources on the specific topic of MHD ZEVs will equip consumers to be more educated insurance buyers as more ZEV options become available.

Pillar 3. Collaborate on research to build the knowledge base on residual values of zero-emission technologies. CARB oversees the Medium- and Heavy-Duty Zero-Emission Vehicle Fleet Purchasing Assistance Program to make financial and non-financial tools and support available to the operators of MHD fleets to enable a transition to zero-emission vehicles[23]. CARB staff are currently investigating the design of a potential used vehicle project that would support residual values, gather valuable data and accelerate the development of an affordable secondary vehicle market. Many drayage and small fleet owners traditionally purchase used rather than new vehicles and with accelerating market growth, the supply of zero-emission vehicles into the secondary market will expand over the next several years, creating an opportunity for small fleets to adopt zero-emission vehicles.

Action 2. Facilitate cross-sector information sharing on financing and insurance metrics

Pillar 1. Utilize existing insurance regulator networks to collaborate with other states and countries on sharing insurance information, experiences, and lessons learned. As of December 2024, 19 jurisdictions are participating in the Medium and Heavy-Duty Zero-Emission Vehicle initiative – 17 states[24], the District of Columbia, and the Canadian Province of Quebec. The participating jurisdictions signed a memorandum of understanding (MOU) to accelerate the electrification of medium and heavy-duty vehicles. The MOU sets a goal for 100% of all new medium and heavy-duty vehicle sales to be zero-emission by 2050, with an interim target of 30% zero-emission vehicle sales by 2030. Additionally, states

[21] CALSTART. January 2024. Zeroing in on ZETs. https://calstart.org/zio-zets-jan-2024-update/
[22] California Department of Insurance. Climate Smart Insurance Products Search. Accessed December 2024. https://interactive.web.insurance.ca.gov/apex_extprd/f?p=142:1
[23] California Air Resources Board. Medium- and Heavy-Duty Fleet Zero-Emission Vehicle Purchasing Support (SB 372). Accessed December 2024. https://ww2.arb.ca.gov/our-work/programs/medium-and-heavy-duty-fleet-zero-emission-vehicle-purchasing-support-sb-372/about
[24] The states are California, Colorado, Connecticut, Hawaii, Maine, Maryland, Massachusetts, Nevada, New Jersey, New York, North Carolina, Oregon, Pennsylvania, Rhode Island, Vermont, Virginia, and Washington.

such as Oregon, Washington, New Mexico, New York, Massachusetts New Jersey, Vermont, Colorado, Maryland, and Rhode Island, have adopted California's ACT regulation, which requires manufacturers to increase sales of zero-emission trucks over time[25]. This represents over 25% of all new truck sales in the U.S.

International collaboration can provide an opportunity to learn from established MHD ZEVs insurance best practices. The Sustainable Insurance Forum (SIF) is a global network of 39 insurance supervisors and regulators, overseeing 92% of the global insurance market, all focused on achieving sustainability goals. Because the heavy-duty truck sector is often associated with seaports and high-volume transportation corridors, it will be helpful to build partnerships among jurisdictions that have robust heavy-duty transportation economies. CDI will work with SIF to synchronize data collection and analysis, addressing data gaps and promoting best practices for insuring MHD ZEVs. By engaging this regulator network, CDI aims to foster cross-jurisdictional dialogue, share insights on innovative insurance models, and develop strategies that enhance access to affordable insurance coverage for MHD ZEV fleets.

Pillar 2. Convene different economic sectors in the MHD ZEV space to help the market stay up-to-date and better understand bottlenecks. CDI and CARB will work together to convene and continue ongoing discussions with the economic sectors that directly interact with zero-emission trucks, such as OEMs, fleet operators, and insurers, in regions with more advanced zero-emission truck adoption. By learning from the experiences of global markets, CARB can identify innovative approaches to overcoming challenges like insurance affordability and residual value data availability.

Action 3. Promote data collection and risk assessment

Pillar 1. Refine CDI's data collection efforts by deploying more surveys and conducting interviews to track progress in insurance data, accessibility, and affordability gaps. Specific data will continue to be crucial to educational efforts and feasibility studies for new types of insurance options. CDI initial data collection effort in May 2024, shed some light on insurers' lack of rating factors and loss experience data on MHD ZEVs and their dependance on the ISO for rate setting factors. ISO provides these companies with statistical, actuarial, underwriting, and claims information and analytics, in addition to other services. Importantly, the standard ISO classification plan does not require companies to track and/or rate zero-emission trucks differently from internal combustion engine trucks.

The CDI data collection showed that 48 of the 60 commercial auto insurers reported rating trucks using standardized factors from ISO, which has current data limitations due to the absence of upfront identification of MHD ZEVs in their datasets. While data is available for electric cars, the lack of sufficient electric commercial vehicle adoption hinders broader insights. Furthermore, many early adopters, such as government fleets and large corporate fleets, are self-insured, making their claims and loss data inaccessible.

CDI will continue gathering available long-term data and information from insurers both in the admitted market and in the surplus lines as well as other participants of the insurance value chain, such as brokers

[25] California Air Resources Board. States that have Adopted California's Vehicle Regulations. Accessed December 2024. https://ww2.arb.ca.gov/our-work/programs/advanced-clean-cars-program/states-have-adopted-californias-vehicle-regulations

and agents, to determine if there are other bottlenecks in insurance accessibility. These efforts will also be refined in scope to include specific trucking sectors, such as long-haul trucks and buses.

Pillar 2. Continue alignment of data collection by engaging CalSTART on its market research efforts as part of its HVIP administrator and consumer side. So far, CDI has collaborated with CALSTART by providing insurance-specific questions to include in CALSTART interviews with small fleets and HVIP grantees, ensuring the data collected addresses critical gaps in understanding insurance accessibility and affordability for MHD ZEVs. This partnership has led to the valuable insights above about small fleet-level experiences with securing coverage, helping to identify barriers and informed the strategies for improving insurance products affordability for smaller MHD ZEVs operators. Strengthening this collaboration will be key to developing actionable solutions that support the widespread adoption of MHD ZEVs.

Pillar 3. Consider partnering with university researchers on using models to examine risks and risk mitigation attributes. Research can bridge data gaps and maximize the alignment between our understanding of risks and risk mitigation features. Risk models tailored to MHD ZEVs can provide insurers with data-driven insights into vehicle performance, accident rates, repair costs, and unique operational risks. Grants could be directed toward collaborative research projects involving insurers, OEM, fleet operators, and academic institutions to establish robust, evidence-based public actuarial models. These models would reduce uncertainty for insurers, enable more accurate underwriting, and promote the development of insurance products specifically designed for MHD ZEVs.

In addition to risk modeling, research priorities could include risk mitigation attributes unique to MHD ZEVs, such as their simpler drivetrains and advanced safety technologies. Exploring how these features compare to internal combustion engine trucks in terms of loss frequency and severity could provide a foundation for insurers to lower premiums based on MHD ZEVs-specific characteristics.

Action 4. Explore innovative solutions that expand insurance options

Insurance not only supports recovery from climate disasters but can also provide incentives for climate mitigation to advance clean energy and zero-emission transportation. As highlighted by CDI's survey findings, new technologies generally lack historical loss data, limiting initial insurance options. Innovation in expanding insurance product options can advance the state's MHD ZEVs deployments targets and contribute both to reducing greenhouse gas emissions and making communities more resilient to climate impacts.

Pillar 1. Convene an Innovative Insurance Showcase to highlight insurance products and solutions tailored for MHD ZEVs. This event would bring together insurers, fleet operators, risk assessment service providers, and policymakers to explore emerging opportunities in the insurance market. The showcase could feature innovative insurance products and advanced risk assessment tools.

Pillar 2. CDI will continue to collaborate with CARB to explore the feasibility of risk pool-based commercial automobile insurance models. This collaboration aims to improve the affordability and accessibility of insurance for MHD ZEVs, helping reduce costs for consumers and accelerate progress toward a decarbonized transportation sector. To explore the feasibility and structure of such a risk pool, CDI plans to utilize the following sub-pillars for guidance.

Sub-Pillar 1. Request information from insurance brokers. Request information on the emerging MHD ZEV market from insurance brokers on the needed data points (number of trucks, geographic distribution, jurisdictional boundaries) for comparing insurance models and creating a shared analysis for CARB and CDI to utilize.

Sub-Pillar 2. Plan a comparative study on the feasibility of different insurance models for zero-emission heavy-duty truck technologies. The feasibility study will be based on the information obtained from brokers about public and private insurance pooling options, including the following delivery models (Figure 1)[26]:

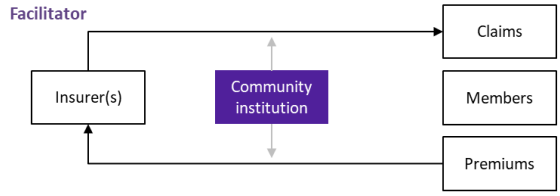
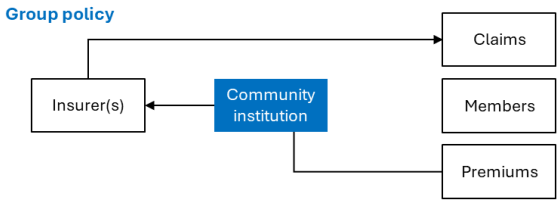
Models	Description	Community Institution Roles
	The community institution helps to establish a beneficial arrangement with an insurer for the risk pool. Risk pool members contract directly with the insurer.	Member education; data provision; engage and educate members; administer means-testing program (if any); adopt regulations to encourage purchase; and negotiate discounts for risk reduction.
	The community institution arranges a group policy on behalf of its risk pool members (e.g., similar to an employee benefit arrangement). Community institution may facilitate premium payment, but the members maintain a relationship with the insurer for claims management.	Same as facilitator model; plus management of enrollment/distribution negotiations of premium; and facilitation of payment.

Figure 1. Two of the broad institutional structures for physical damage risk pool-based automobile insurance that will be explored. Adapted from Marsh McLennan, 2021.

A facilitator model: In this model, the community institution is more of a facilitator and a negotiator of an insurance pool.

A group policy model: In this model the institution takes a more active role in establishing the physical damage insurance product by negotiating policy terms with insurers, collecting fees or taxes, and paying the premium on behalf of its members. This could be a California focused group policy or multistate initiative that involves a bigger risk pool of fleets from states adopting the ACT rule, for example.

Sub-Pillar 3. As the market shows continued growth, CDI will create a complementary analysis of how to monitor insurance pricing changes over time and how to integrate multiple streams of insurance data. This analysis would help inform a review of targeted premium subsidies or standalone programs as the state pursues the goals set by CARB. The technologies for zero-emission engines may diversify to include multiple zero-emission vehicle systems and insurance data that monitors this emerging market will be informative to future policy decisions, especially those that equip consumers with more information.

[26] Adapted from Marsh McLennan. February 2021. Community-based catastrophe insurance: Enhancing disaster resilience through innovative solutions. https://www.marshmclennan.com/web-assets/insights/publications/2021/february/Community--Based--Catastrophe--Insurance--(Final).pdf

Key Timelines and Specific Checkpoints for Monitoring Insurance Accessibility

MHD ZEVs are growing in number in California, and there are benefits to aligning data collection across sectors. For example, the number of new trucks deployed is anticipated to reach key thresholds in the coming years and insurance data collections can provide valuable context and insights to those zero-emission thresholds. To align with the regulatory timeline for transitioning MHD fleets to zero-emission technologies, CDI will use the projected numbers of MHD ZEV due to ACT rules (Table 1) as a metric to monitor the progress of the proposed strategies. This represents the minimum expected expansion of MHD ZEVs in the California fleet, not including vehicles purchased due to other regulatory programs or incentives. Also, this does not reflect the growing national MHD ZEV fleet due to adoption of California's ACT regulation by other states. CDI created the checkpoints in Table 2 to support the working timeline for these strategies in 2025 and 2026. This will lay a foundation for further growth anticipated in future years. In particular, the greatest growth due to the ACT regulation occurs in the years following this, with over 100,000 total additional ZEVs in 2030.

Table 1

Year	Combustion-Powered Vehicles	ZEVs due to ACT
2024	1,803,916	3,938
2025	1,801,678	10,411
2026	1,795,825	19,321
2027	1,782,674	32,487

Table 1. Number projections of MHD ZEV in California only due to ACT.

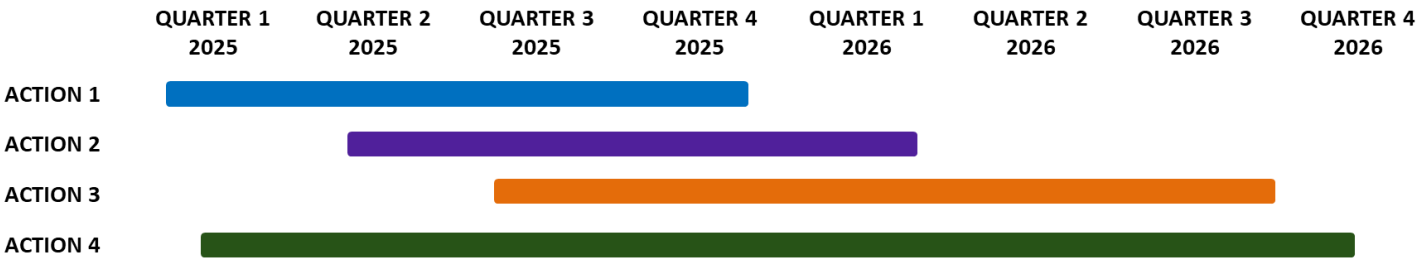


Table 2. Strategy Quarterly Checkpoints for 2025-2026.

Appendix A: List of Common Medium and Heavy-Duty Vehicle Rating Factors

1. Vehicle Weight/Size
2. Vehicle Type (i.e., bus, truck, van, etc.)
3. Vehicle Value (Cost new or MSRP of vehicle)
4. Age/Condition of Vehicle
5. Garaging ZIP code
6. Equipment used
7. Industry/Type of Business (commercial, service, retail, etc.)
8. Driver Characteristics
9. Experience/Years in Business
10. Radius of Operations
11. Nature of operations/Use of vehicle (farming, trucking, etc.)
12. Fleet size
13. Composite Rating (As opposed to an individual rate that generates risk premia that correspond to a vehicles specific profile, composite rates use a population or sample average instead.)
14. Mileage/Miles Driven by state
15. Garage Storage
16. Loss Experience/Rating Territory
17. For-hire vs. not for-hire basis
18. Safety Equipment
19. Any other standard ISO Rating Factors

Appendix B: 2022 Statewide Claims and Losses for Medium and Heavy-Duty Trucks from Carriers that Insure Tractor-Trailer Trucks Engaged in Drayage Operations

Coverage:	Earned Premiums	# Covered MHD Vehicles	# Claims	Incurred Losses
Bodily Injury (CSL-BI/PD*)	$ 791,839,131	268,048	7,030	$ 285,564,844
Property Damage (CSL-BI/PD*)			17,169	$ 100,671,508
Collision	$ 176,805,788	204,859	9,939	$ 102,340,998
Comprehensive	$ 63,172,831	145,054	4,360	$ 36,272,444

*CSL-BI/PD = Combined Single Limit – Bodily Injury & Property Damage Coverage

Coverage:	Average Earned Premium	Claim Severity	Claim Frequency (per 1,000)	Loss Ratio	Loss Cost
Bodily Injury (CSL-BI/PD*)	$ 2,954	$ 40,621	26	36	$ 1,065
Property Damage (CSL-BI/PD*)		$ 5,864	64	12	$ 376
Collision	$ 863	$ 10,297	49	58	$ 500
Comprehensive	$ 436	$ 8,319	30	57	$ 250