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Ava Community Energy: Zero-Emission Medium- and Heavy-Duty Goods Movement Blueprint

Ava

Final Blueprint

Prepared for

California Energy Commission

Prepared by

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Ava
Community
Energy

List of Abbreviations

Parties

ACTC	Alameda County Transportation Commission
ARCHES	Alliance for Renewable Clean Hydrogen Energy Systems
BAAQMD	Bay Area Air Quality Air District ("Air District")
BACC	Bay Area Community Colleges
CARB	California Air Resources Board
CEC	California Energy Commission
CPCFA	California Pollution Control Financing Authority
CTC	California Transportation Commission
CTWI-BTCA	Construction Trades Workforce Initiative - Building and Construction Trades Council of Alameda County
DMV	Department of Motor Vehicles
EBEDA	East Bay Economic Development Alliance
EDF	Environmental Defense Fund
GNA	Gladstein, Neandross & Associates
GO-Biz	California Governor's Office of Business and Economic Development
HTA	Harbor Trucking Association
IBank	California Infrastructure and Economic Development Bank
IBEW	International Brotherhood of Electrical Workers
JATC	Joint Apprenticeship Training Committee

LACI	Los Angeles Cleantech Incubator
NACFE	North American Council for Freight Efficiency
NECA	National Electric Contractors Association
PG&E	Pacific Gas & Electric
SBVC	San Bernardino Valley College
SCAQMD	South Coast Air Quality Management District
SCRTTC	Southern California Regional Transit Training Consortium
SGC	Stakeholder Guidance Committee
SMUD	Sacramento Municipal Utility District
USEPA	United States Environmental Protection Agency
WOEIP	West Oakland Environmental Indicators Project

Terms

ACF	Advanced Clean Fleets (CARB)
ACT	Advanced Clean Trucks (CARB)
CAPP	Community Air Protection Program (AB 617)
CBO	Community-Based Organization
CCA	Community Choice Aggregator
CES	CalEnviroScreen
CTE	Career Technical Education

DCFC	direct current fast charger
EnergIIZE	Energy Infrastructure Incentives for Zero-Emission Commercial Vehicles
EVITP	Electric Vehicle Infrastructure Training Program
EVSE	electric vehicle supply equipment
FIP	Freight Infrastructure Planning (FIP)
HD	heavy-duty
HVIP	Hybrid and Zero-Emission Truck and Bus Voucher Incentive Project
IOU	Investor-Owned Utility
JPA	Joint Powers Authority
LLR	loan loss reserve
LMC	Licensed Motor Carrier
LSE	Load Serving Entity
MD	medium-duty
MDHD	medium- and heavy-duty
NAICS	North American Industry Classification System
OEM	Original Equipment Manufacturer
OUSD	Oakland Unified School District
PM	particulate matter
RFO	Request for Offers
ROP	Regional Occupational Program

RTB	return-to-base
TRU	Transport Refrigeration Units
VMT	vehicle miles traveled
WOCAP	West Oakland Community Action Plan
ZE	zero-emission
ZEB	zero-emission bus
ZE-MDHD	zero-emission medium- and heavy-duty
ZE-MDHDV	zero-emission medium- and heavy-duty vehicle
ZETI	Zero-Emission Technology Inventory (CALSTART tool)
ZEV	zero-emission vehicle

Executive Summary

Executive Summary

Ava Community Energy, formerly East Bay Community Energy, is a not-for-profit Community Choice Aggregator structured as a Joint Powers Authority and created by the cities, counties, and towns it serves. As the default public power agency in Alameda County and parts of San Joaquin County in the Central Valley, Ava Community Energy reinvests electricity sales revenue into local projects and programs that help its Joint Powers Authority member communities achieve their climate goals faster. To that end, AVA is investing heavily to reduce transportation-related greenhouse gas and criteria air pollutant emissions to improve human health outcomes and achieve state policy objectives.

Ava Community Energy's service area is one of the most strategic trade locations in the U.S., with the 5th busiest container seaport in the nation and a vast network of freight corridors. It is also home to warehousing and logistics facilities used by thousands of medium- and heavy-duty fleets and independent vehicle operators. As a result, various stakeholders have been independently working to address the impacts of this ecosystem. In response to the need for a comprehensive and coordinated regional approach that outlines how to transition the goods movement economy to zero-emission technologies, Ava Community Energy spearheaded the Zero Emission Medium – and Heavy-Duty Goods Movement Blueprint planning project on behalf of its Joint Powers Authority member communities.

The project aimed to identify fiscally responsible and sustainable strategies and actions across five key areas at a regional scale: **Vehicles, Infrastructure, Financing, Workforce Development, and Community Benefits**. Ava Community Energy's goal with the Zero Emission Medium- and Heavy-Duty Goods Movement Blueprint (Blueprint) was to create a regional framework, driven by data analysis and stakeholder engagement/collaboration, that when fully implemented establishes Ava Community Energy's service area as a first-mover market for zero-emission Class 3-6 (by 2030) and Class 7-8 (by 2040) goods movement vehicles.

The project entailed three Year 1 tasks across the five key areas of opportunity: **Establish a Baseline; Forecast Future Plans and Needs; and Assess Product Readiness**. After these baselining tasks, Ava Community Energy and its diverse Stakeholder Guidance Committee then identified targeted near- and mid-term priority actions for rapidly scaling the zero-emission medium- and heavy-duty vehicle market and delivering community benefits where needed most. This replicable approach to planning is critical to other Community Choice Aggregators and public power agencies throughout California and beyond as they work to understand the goods movement economy in their service territories and how to transition transportation electrification.

Establishing a Baseline

The project team set out to understand the medium- and heavy-duty vehicle ecosystem in Alameda County and the City of Tracy in San Joaquin County (Project Area). This analysis included the number and types of medium- and heavy-duty vehicles, the vocations each was engaged in, their movement, and current fueling infrastructure.

The project team surveyed and interviewed industry stakeholders and analyzed Department of Motor Vehicles registration, IHS Markit, and other data resources were leveraged. The project team counted over 40,000 MDHD vehicles and was able to narrow that to **~16,000 specifically engaged in the movement of consumer goods**.

This was done first by removing vehicle types that were not engaged in goods movement (i.e., buses, RVs, off-road equipment, utility vehicles, etc.) and then matching Department of Motor Vehicles registration data to North American Industry Classification System codes aligned with Ava Community Energy's commercial customer electricity accounts to categorize vehicles' vocations. With this information, the project team was then able to assess product readiness to identify zero-emission truck and van models available today and in the near future that could meet the vocational needs of goods movement stakeholders.

It also informed identification of where strategic deployment of charging infrastructure solutions could be accelerated to support the needs of medium- and heavy-duty vehicle operators in Ava Community Energy's service area. Establishing baselines for vehicle and infrastructure financing tools, as well as workforce development gaps and needs, was also completed. Ultimately, establishing these baselines enabled further segmentation of the goods movement ecosystem so that Blueprint strategies and actions could be targeted to near- and mid-term timeframes and appropriate stakeholder groups.

Forecast Future Plans and Needs

To develop an informed forecast of future goods movement stakeholder needs across each project key area by 2025, 2030, and 2040, the team engaged fleets, fleet users, workforce development stakeholders, and more in interviews, surveys, and sub-workgroups. The information collected through these efforts confirmed the results of the baseline data analysis and identified additional gaps and needs.

For example, fleet and vehicle operators shared with the project team that it would be highly valuable if Ava Community Energy provided no-cost technical assistance, since vehicle and charging infrastructure assessments are among the services currently in greatest need. Additionally, assistance with applying for incentives/rebates and affordable leasing/financing solutions would help move adoption barriers. With this feedback, Ava Community Energy developed an early Blueprint action that spans multiple key project areas (vehicles, infrastructure, financing):

- *Action: Offer technical assistance ("evFleet Consulting") to Tier 1 stakeholders to assess market availability of zero-emission vehicles relative to fleets' vocations and daily operations.*

That program was approved by Ava Community Energy's Board of Directors in Q1 of 2023 with an initial budget of $750,000, which will enable up to 50 fleets to benefit from no-cost evFleet Consulting services. Ava Community Energy launched this program in June 2023 prior to completion of the Blueprint.

In 2022, medium- and heavy-duty fleet interviewees and survey respondents identified priority areas for public fast charging depots. This input helped Ava Community Energy develop an additional early Blueprint action focused on infrastructure financing.

- *Action: Develop a project loan product for third-party developers and offer it to the market through a public competitive Request for Offers.*

In 2023, Ava Community Energy's Board of Directors approved $4.5 million in financing for a trucking-as-a-service provider to develop California's largest charging depot for drayage trucks in Ava Community Energy's service area. In parallel, a smaller depot is in development on Port of Oakland property to meet vehicle operator needs identified through the Blueprint. This "barbell approach" ensures sufficient charging infrastructure will be available both near the Port and along I-580, which is the critical freight corridor connecting the Bay Area and Central Valley.

This project, born out of innovative financing and strategic infrastructure approaches developed through the Blueprint, exemplifies Ava Community Energy's tenacity and commitment to local investment.

Assess Product Readiness

The transition to a zero-emission goods movement economy will happen in stages, which is the intent behind the implementation of Ava Community Energy's iterative Blueprint. To understand vehicle technology readiness across vocations and applications, and the suitability of charging infrastructure technologies and types, the project team conducted an extensive review of CALSTART's Zero-Emission Technology Inventory (ZETI), statewide medium- and heavy-duty pilot and demonstration projects, existing plans and tools related to zero-emission fleet electrification, and financing options.

CALSTART also conducted a workforce listening tour. Additionally, in collaboration with regional stakeholders, including community-based organizations, labor, nonprofit training organizations, and educational institutions, Ava Community Energy identified near- and mid-term workforce development needs. This included the importance of training new workers and upskilling the existing workforce, ensuring job development and community benefits are equally measured in the Blueprint.

Identify Blueprint Priorities, Stakeholder and Community Benefits

In Year 1 of the Blueprint, the project team analyzed data, engaged relevant stakeholders, and drafted Blueprint strategies and actions across each of its five key areas. In Year 2, the project team organized a robust Stakeholder Guidance Committee that reviewed these in detail over a six-month period, ultimately approving inclusion of the strategies and actions in the Blueprint.

Ava Community Energy Medium- and Heavy-Duty Zero-Emission Goods Movement Blueprint

This Blueprint includes a total of 101 near-term Actions (2023-27) across the five key areas, many of which will lend themselves to future mid-term Actions (2028-32). The Final Report details approaches and findings the project team relied on to create a comprehensive Blueprint with diverse stakeholder buy-in, while this Blueprint itself outlines when and how all strategies and actions will be deployed over time.

Acknowledgements

Acknowledgements

Ava Community Energy (Ava) would like to thank the California Energy Commission for the support to do this important Blueprint work. Our Commission Agreement Managers Alex Wan and Jim McKinney provided valuable support and input throughout this process.

Ava also acknowledges and appreciates the time and energy put forward in participation in this process by the two groups most directly affected in the conversation around the transition to zero-emission goods movement solutions: fenceline and Equity Priority Communities and the trucking fleets and small operators. Fenceline communities in West and East Oakland and along major freight corridors have been facing the environmental injustice of pollution for decades, so at its core this is who this transition aims to serve first. Additionally, the fleets and industry associations who have shared their time and insights have enabled this Blueprint to also be grounded in the real constraints and needs of the network of people and businesses that ensure goods are flowing in our economy. It is the goal of the project team to ensure that both critical communities are supported in this transition to ensure it is just and sustainable in every sense of the word.

Last, but certainly not least, Ava would like to thank the deep bench of technical support from CALSTART in Valerie Thorsen, Lauren Thie, Chase LeCroy, Baha Al-Alawi, and Jessie Lund, the ever-insightful support of Patrick Couch at GNA, and the inspiring cohort of members on the Blueprint's Stakeholder Guidance Committee. This transition is complex and requires coordinated collaboration and it is our sincere hope that this Blueprint reflects that and highlights the impactful work of colleagues across our region.

Introduction

Background

To date, much of the focus on zero-emission (ZE) goods movement in California has been centered on Port activities. However, on-road drayage trucks are a minor source of local emissions in the context of the broader medium- and heavy-duty (MDHD) goods movement ecosystem in Ava Community Energy's (Ava) service area. There are more than 40,000 MDHD vehicles registered in Alameda County and the City of Tracy and most of this ecosystem does not have a footprint at the Port of Oakland (Port). Therefore, Ava's Blueprint applied a geographic lens to planning and coordination that spanned the entirety of its service area, and all MDHD vehicles engaged in the movement of consumer goods movement (including but not limited to drayage trucks). Additionally, electricity load at the Port of Oakland is served by the Port Authority and not Ava. In turn, while the Port was engaged in the Blueprint's Stakeholder Guidance Committee to ensure comprehensive collaboration, the geographic focus of the Blueprint is everything outside of the Port's boundaries.

To understand this ecosystem, the total MDHD vehicle portfolio was analyzed to determine which were moving consumer goods specifically (16,000 of the 40,000). Ava also identified and mapped where these vehicles were registered, the vocation each was engaged in, and whether a market-ready ZE alternative was available. While many of these vehicles will recharge at facilities where they are domiciled or at third-party facilities where they do business, there are a significant number of fleets and vehicle operators for whom behind-the-fence charging will remain a key barrier. In turn, these fleets will need access to convenient public fast charging depots that operate much like a cardlock fuel station today.

For example, approximately 84 percent of MDHD fleets and vehicle operators in Ava's service area have three or fewer trucks or vans. Although some of these stakeholders have return-to-base (RTB) duty cycles, they lack access to overnight charging due to lease constraints, landlord restrictions, electrical capacity issues on the investor-owned utility's transmission and distribution system, and physical space limitations. Planning for this infrastructure and its associated load, which will be served by Ava, must begin today.

Therefore, the strategies and actions developed through the Blueprint establish a path for beginning to coordinate those investments. Ava views its Blueprint as a dynamic and iterative process rather than a static plan of action. As Ava and its partners learn by doing, we will work with stakeholders to refine the Blueprint, which serves as an active framework to guide decision making as the market matures.

Project Scope: Ava's Service Area

In 2018, the County of Alameda and 11 of its cities launched Ava to serve as the default Load Serving Entity (LSE), or public power provider.[1] Today, Ava is the second largest CCA in California serving 15 cities, towns, and unincorporated areas of the county (see Figure 1).[2]

1. East Bay Community Energy Authority Joint Powers Agreement
2. California Community Choice Association

Ava also serves the City of Tracy in neighboring San Joaquin County and will continue to grow, with the cities of Stockton and Lathrop recently joining the Joint Powers Authority (JPA), with service anticipated to begin 2025.[3] In total, Ava meets the electricity needs of over 60,000 commercial and industrial accounts and serves all residential accounts, serving over 1.7 million people.

Ava buys power primarily from clean sources like wind, solar, and hydropower, and delivers that electricity to customers using the distribution infrastructure from the local investor-owned utility (IOU), Pacific Gas and Electric Company (PG&E).

Figure 1. Ava Community Energy's Service Area, 2023

The ability for local government agencies who have formed CCAs to leverage IOU distribution infrastructure was enabled by state legislation passed in 2002.[4]

The JPA is governed by a 15-member Board of Directors consisting of elected officials from each of its member communities.[5] Ava's Board of Directors has established the goal of purchasing 100 percent clean power for all customers by 2030, 15 years before California's target clean energy deadline.[6] As a not-for-profit agency, Ava is mandated to reinvest the revenue earned from the sale of electricity back into the communities it serves. This is done through lower electricity rates to customers, and development and management of energy-related climate programs, including transportation electrification initiatives, which help JPA member cities and counties achieve their climate goals faster. Ava's service territory is the Project Area.

Project Goals

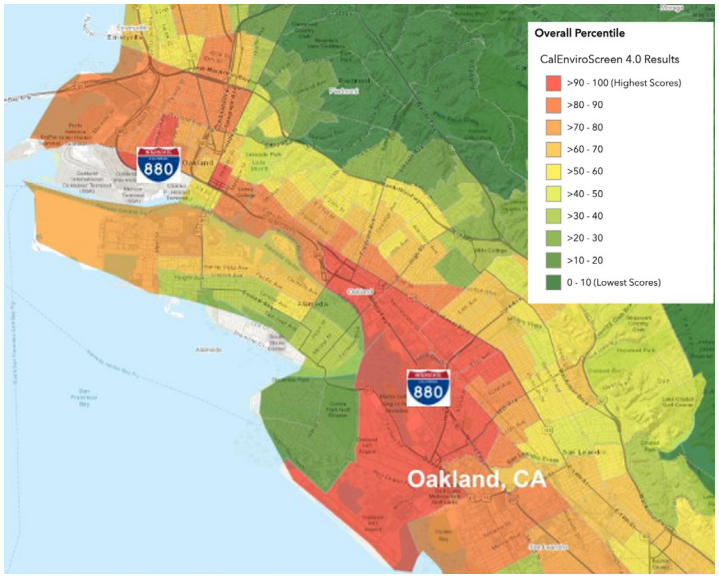
California's air quality crisis, particularly throughout Ava's service area, poses significant human health risks. These regions rank among the most polluted in the United States, with high levels of year-round particulate matter (PM) and ozone.[7] This is especially concerning due to the extensive freight corridors that connect Ava's Alameda and San Joaquin County service areas, which hold a highly strategic position for trade in California.

Alameda County serves as the primary hub for goods movement in Northern California, hosting critical infrastructure such as the Port of Oakland, which handles over 99 percent of containerized goods in the region and ranks among the busiest container ports in the United States. Additionally, Oakland International Airport moves 1.5 million tons of air freight annually.

3. Ava Community Energy Expansion Press Release. September 2022
4. U.S. Environmental Protection Agency: Community Choice Aggregation – Enabling Legislation
5. Ava Community Energy Board of Directors
6. Ava Community Energy 2030 Commitment. December 2020
7. American Lung Association, State of the Air 2023

Although these hubs utilize multimodal infrastructure, trucking remains the dominant mode for goods movement, accounting for 80 percent of tonnage and 60 percent of value transported between 2020 and 2045. This ecosystem plays a crucial role in the local economy with 30 percent of employment stemming from goods movement-dependent industries. Alameda County's significance extends beyond its local economy, as it serves as a vital link in the nine-county San Francisco Bay Area's goods movement.

Figure 2. Oakland's Frontline Communities Along the I-880 Corridor



Approximately 32 percent of all goods movement by weight (and 36 percent by value) within the Bay Area either originates from or has an endpoint in Alameda County or utilizes its international gateway infrastructure. The County's supply chain encompasses a wide range of activities, including regional and local deliveries, as well as the transportation of Central Valley produce using the Port as an agricultural export hub.

This highlights the integral role Ava's service area has in the broader regional freight ecosystem. The County's roadway network includes 204 miles of interstate and other state highways. San Joaquin County is integrally linked to this ecosystem as it is home to the Central Valley's agricultural economy and critical connections to Northern and Southern California markets Collectively, Ava's service territory has the highest volumes of truck traffic in the Bay Area with I-580 and I-880 having the highest overall traffic volumes in Alameda County.

Table 1. Key Freight Corridors in Ava's Service Area

County	Interstate and State Routes	Highest Truck Traffic Volumes
Alameda	I-80, I-238, I-580, I-680, I-880, I-980 SR 84, SR 93	I-580, I-880
San Joaquin	I-205, I-5	I-5

I-580 specifically is the primary interregional corridor with an average of 20,000 trucks traveling this highway daily, more than any other roadway in the Bay Area.

The vision of the Blueprint is to establish Ava's service area as a first-mover market for ZE goods movement through fiscally responsible and sustainable efforts in the five key areas of opportunity. The purpose of the Blueprint is to provide a common framework and guidance for stakeholders to create a healthier community for all residents in Ava's service area. **The core goals of the Blueprint include:**

- Reduce human health impacts to improve quality of life for those most impacted
- Ensure that the transition to a zero-emission goods movement economy is fiscally responsible and sustainable for fleets, independent vehicle operators, fleet users, and other key stakeholders
- Provide opportunities for engagement, build partnerships, and expand awareness with public, private, and community stakeholders
- Ensure that the Blueprint serves as a catalyst for jobs and investment from the private sector
- Create a replicable process for other public power agencies

Perhaps the most urgent air quality and public health issues in Ava's service area relate to impacts on communities adjacent to freight facilities and corridors. Legacy regional planning efforts have documented the impacts of the goods movement economy on State of California-defined disadvantaged communities (DAC). Today, a significant number of Ava's customers live within a CalEnviroScreen 4.0 DAC (CES 4.0),[8] low-income census tract (LIC),[9] Justice40[10] community, and/or California Air Resources Board (CARB) Community Air Protection Program community (collectively, Equity Priority Communities[11] herein). CES 4.0 census tracts with scores of 75-100 are in the cities of Oakland, San Leandro, and Tracy, and unincorporated areas of Alameda County. This will increase in 2025 when Ava begins to serve the cities of Stockton and Lathrop, which both have census tracts in the top 25th percentile of CES 4.0.

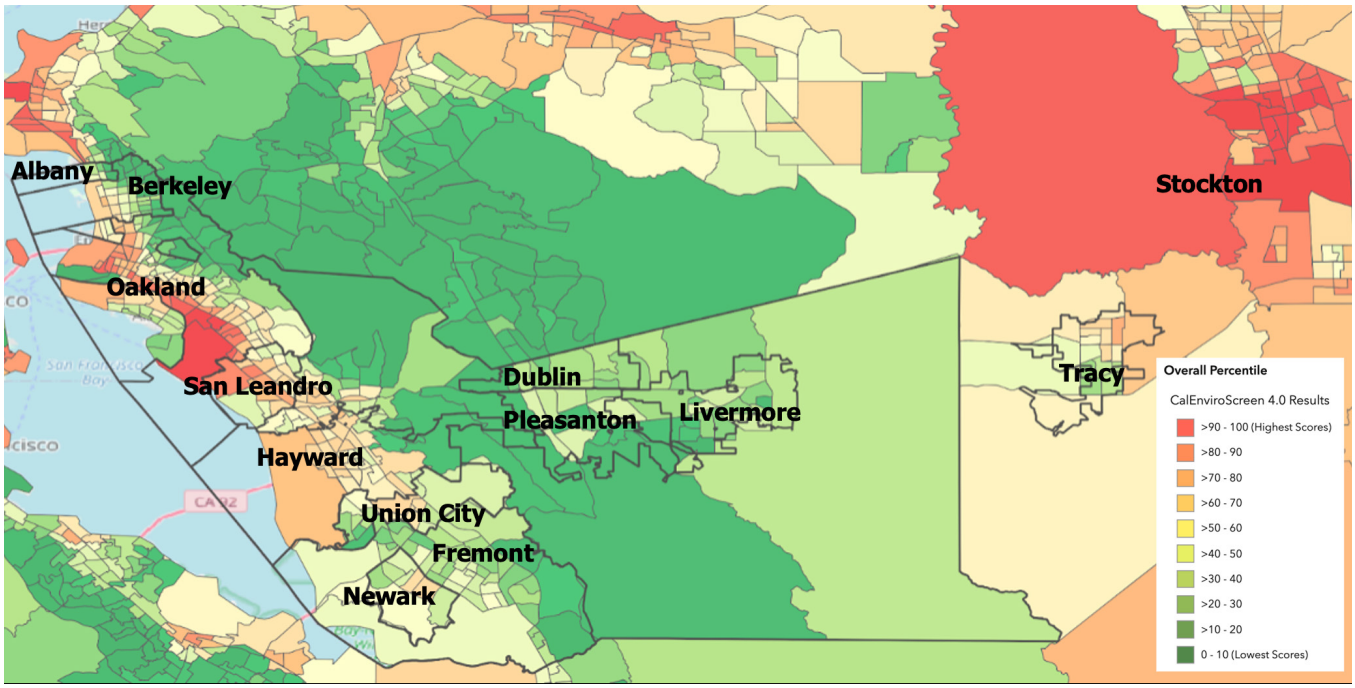
The City of Oakland has among the highest rates of poverty in Ava's service area. Additionally, due to the proximity of I-80, I-580, and I-880, the Port, and other goods movement facilities, residents are exposed to increased levels of MDHD vehicle emissions. As Figure 2 demonstrates, Oakland neighborhoods experience elevated levels of diesel particulate matter, fine particulate matter, and toxic air contaminants contributing to high rates of heart and lung disease, cancer, and asthma. West Oakland specifically has among the highest levels of diesel particulate matter of any community in the nine-county Bay Area. East and West Oakland are also among the 17 communities that CARB has identified as most affected by high cumulative exposure to emissions of toxic air contaminants and criteria air pollutants.[12]

MDHD vehicle trips are regional and not exclusive to one city or census tract. In Ava's service area there are 38 census tracts in the top 25th percentile of CES 4.0. Most of those are in East and West Oakland, with the remaining in San Leandro and Tracy. **Approximately 19 percent of all MDHD vehicles are registered in CES 4.0 census tracts in the top 25th percentile** (36 percent across all Equity Priority Communities).

8. California Office of Environmental Health Hazard Assessment: CalEnviroScreen 4.0
9. Assembly Bill 1550 Low-Income Definition; California Climate Investments Priority Populations 2023 Map
10. Justice40 Initiative
11. Metropolitan Transportation Commission: Equity Priority Communities
12. California Air Resources Board, Fifth Annual Community Air Protection Program Staff Report, 01/2023

Figure 3. CES 4.0 DACs in Ava's Service Area

Source: CalEnviroScreen 4.0



If Ava's Blueprint solely focused on these geofenced areas, it would only address a fraction of the total registered MDHD vehicle population operating in or traveling through communities most impacted by the goods movement economy. The majority of registered MDHD vehicles are domiciled outside these areas.

Along I-80, I-580, and I-880 there are several census tracts with CES 4.0 scores in the 70-75 range, including Berkeley, Hayward, Oakland, San Leandro, and Tracy. The City of Hayward has the greatest number of MDHD vehicles registered to businesses in Alameda County (18.6 percent of total vehicle count). However, just 5 percent of those are in Equity Priority Communities. Hayward is followed by the City of Oakland and then San Leandro, which has 13 percent of the total vehicle count, 8 percent of which are in Equity Priority Communities.

Farther south along I-880 and I-680 is the City of Fremont, which does not have a high concentration of Equity Priority Communities.[13] It does, however, have over 125 freight and logistics companies that originate their trips within the city limits and do business in Equity Priority Communities elsewhere in Ava's service area. Similarly, the Tri-Valley cities of Dublin, Pleasanton, and Livermore do not have many designated Equity Priority Communities.[14]

However, they are located along I-580 which sees more truck trips than any other freight corridor due to its connection to the Port and I-5 in the Central Valley and an important link to Northern and Southern California markets.

13. The City of Fremont has just one low-income census tract and three Justice40 designated census tracts.
14. The Tri-Valley cities collectively only have one low-income census tract and no other Equity Priority Community designated census tracts.

This equates to many warehouses, fulfillment and arrangement facilities, and fleets representing a significant number of MDHD vehicles originating trips in this area but doing business in Equity Priority Communities.

In turn, the project team assessed the entirety of this ecosystem to create a regional strategy for transitioning the goods movement economy to zero-emission vehicles (ZEV) that delivers the biggest benefit possible to residents with a disproportionate burden to on road MDHD vehicle emissions.

During development of Ava's Blueprint, the project team learned that the Port of Stockton was also developing a California Energy Commission (CEC)-funded Blueprint. This supports the iterative nature of Ava's Blueprint in that the Port of Stockton's findings will be integrated later as Ava ramps up delivery of electricity in that city. This is critically important given the number of Equity Priority Communities in Stockton (upper right corner of Figure 3). The CEC also awarded a grant to a project known as the Northern California Megaregion Blueprint, which kicked off in 2023. The scope of this effort includes Ava's Alameda and San Joaquin County service area,[15] and spans Contra Costa and Sacramento counties as well which are served by different public power providers. The Sacramento Municipal Utility District (SMUD) also completed a CEC-funded Blueprint. Ava and SMUD are now proactively collaborating with the Megaregion Blueprint project team to ensure they leverage our Blueprints, fill gaps, and not duplicate efforts.

This is key given the connections to the Ports of Stockton and Oakland, and all the logistics, warehousing, fleets, vehicle operators, and fleet users in between that are connected by freight corridors running through these counties and respective electricity service areas. If Ava, fellow public power providers, and local government agencies are to deliver the biggest community benefit to our most impacted communities, all stakeholders must be coordinated.

Project Team

Ava engaged CALSTART as its Blueprint technical consultant (Project Team). CALSTART is a leading national 501(c)(3) nonprofit organization and clean transportation technology consortium with more than 300 members worldwide including fleets, vehicle manufacturers, fuel and infrastructure providers, and automotive suppliers. CALSTART works to accelerate the commercialization of advanced vehicle technologies and mobility strategies. With a 31-year track record of success, Ava sought CALSTART's expertise and thought leadership for development of its Blueprint. CALSTART has created the organizing framework to drive commercial ZEV adoption worldwide, leads two of the state's most influential MDHD industry groups, administers multiple state MDHD incentive programs, and the Global Commercial Drive to Zero initiative (Drive to Zero)[16] of which Ava is a Pledge Partner.

In addition to the core project team of Ava and CALSTART, the Blueprint relied upon a diverse and engaged Stakeholder Guidance Committee which is further detailed below.

15. Ava Community Energy Service Area Map
16. Global Commercial Vehicle Drive to Zero Program; Pledge Partners

Blueprint Process

Scope of Work

The project aimed to identify fiscally responsible and sustainable strategies and actions in five key areas: **Vehicles, Infrastructure, Financing, Workforce Development, and Community Benefits**. Ava's goal was not to independently develop and implement a Blueprint, but rather to create a regional framework, driven by data analysis and stakeholder engagement/collaboration, that when fully implemented establishes Ava's service area as a first-mover market for ZE Class 3-6 (by 2030) and Class 7-8 (by 2040) goods movement vehicles.

The project entailed three tasks across the five key areas of opportunity: **Establish a Baseline; Forecast Future Plans and Needs; and Assess Product Readiness**. It also informed identification of where strategic deployment of charging infrastructure solutions could be accelerated to support the needs of MDHD vehicle operators in Ava's service area. Establishing baselines for vehicle and infrastructure financing tools, as well as workforce development gaps and needs, was also completed. Ultimately, establishing these baselines enabled further segmentation of the goods movement ecosystem so that Blueprint strategies and actions could be targeted to near- and mid-term time frames and appropriate stakeholder groups.

Ava and its diverse Stakeholder Guidance Committee (SGC) then identified targeted near- and mid-term priority actions for rapidly scaling the zero-emission medium- and heavy-duty vehicle (ZE-MDHDV) market and delivering community benefits where needed most. This replicable approach to planning is critical to other CCAs and public power agencies throughout California and beyond as they work to understand the goods movement economy in their service territories.

Stakeholder Guidance Committee

Stakeholder engagement was a key component of Ava's vision and implementation of the Blueprint. The SGC was an imperative component in the development and refining of the strategies and actions to ensure a transparent and inclusive process. After a year of baseline analysis in each of the key areas, the project team reached out to the diverse organizations that had committed to participate in the SGC at time of grant proposal submission to provide an update and outline next steps, convening the group to review proposed strategies and actions and provide feedback over a six-month period.

SGC Members

The SGC was composed of key representatives from a variety of organizations across the broad ecosystem of stakeholders in the zero-emission medium- and heavy-duty (ZE-MDHD) goods movement transition. Twenty-seven organizations submitted letters of support for Ava's Blueprint proposal in November 2020, with 19 of them able to commit a dedicated SGC representative when the project team reached out to kick off the SGC process in the Fall of 2022. In addition, the project team invited a number of other relevant organizations to participate given their additive perspectives to the cohort. See the Table 2 below for the full list; those marked with an asterisk (*) provided a letter of support to Ava's initial grant proposal. The breadth of perspectives, as well as the depth of knowledge and industry expertise represented amongst the SGC members, enabled robust discussion, shared learning opportunities, and invaluable feedback on Ava's draft strategies and actions.

Table 2. Stakeholder Guidance Committee Members

Government

#	Organization	Type of Representative
1.	Alameda County Transportation Commission*	Deputy Executive Director of Planning and Policy
2.	Bay Area Air Quality Management District (BAAQMD)*	Manager, Strategic Incentives Division
3.	Caltrans	Assistant Deputy Director, Transportation Electrification
4.	City of Albany*	Community Development Assistant
5.	City of Dublin*	Environmental & Sustainability Manager
6.	City of Fremont*	Management Analyst II
7.	City of Hayward*	Environmental Services Manager
8.	City of Livermore*	Sustainability Program Manager
9.	City of Oakland*	Manager, Parking & Mobility Division

#	Organization	Type of Representative
10.	City of Pleasanton*	Operations Superintendent
11.	City of San Leandro*	Sustainability Manager
12.	City of Tracy*	Admin Technician, Economic Development
13.	East Bay Clean Cities Coalition*	Coordinator and Executive Director
14.	California Governor's Office of Business and Economic Development (GO-Biz)	Deputy Director, ZEV Market Development
15.	United States Environmental Protection Agency (USEPA)*	Project Manager, Brownfields

Community

#	Organization	Type of Representative
1.	Bay Area Community Colleges	Regional Director
2.	Earthjustice	Senior Research and Policy Analyst

#	Organization	Type of Representative
3.	East Bay Economic Development Alliance (EBEDA)*	Executive Director
4.	Environmental Defense Fund (EDF)	Director and Lead Senior Economist
5.	GRID Alternatives*	Executive Director, Bay Area
6.	Tri-Valley Career Center*	Director of Apprenticeship Programs
7.	West Oakland Environmental Indicators Project (WOEIP)	Senior Project Manager

Industry

#	Organization	Type of Representative
1.	California Trucking Association	VP of Government Affairs
2.	Gladstein, Neandross & Associates (GNA)	Senior Vice President, Technical Services
3.	Golden Gate Truck Center (Freightliner)	Fleet Account Manager
4.	Harbor Trucking Association*	Chief Executive Officer

#	Organization	Type of Representative
5.	IBEW Local 595	Business Representative Alameda County
6.	Ikea*	Fulfillment Project Implementation Manager, ZE Delivery
7.	Los Angeles Cleantech Incubator (LACI)*	Senior Program Manager, Transportation
8.	Pacific Gas & Electric (PG&E)	Strategic Analyst, Decarbonization Strategies
9.	Port of Oakland	Associate Environmental Planner
10.	Prism Logistics*	VP Transportation and Customer Service
11	TEC Equipment	New Truck Sales Manager
12.	Western States Trucking	Director of Governmental Affairs

SGC Feedback Sessions

Over the course of January-June 2023, the SGC met six times to align on the baseline analysis methodologies and findings, review the draft strategies and actions, and provide feedback. Each session was dedicated to a specific topic (see Table 3 below) and consumed a three-hour virtual Zoom meeting. At least one week before each session, SGC members were sent a pre-reading email including relevant reports for context, as well as the draft strategies and actions for the session so they could come prepared to dive into the discussion.

Table 3. SGC Meeting Schedule and Resources

SGC Meeting Topic	Date Session Held	Recording Link
Overview	January 26, 2023	Recording of session #1
Vehicles	February 23, 2023	Recording of session #2
Workforce Development	March 16, 2023	Recording of session #3
Financing	May 10, 2023	Recording of session #4
Infrastructure	May 25, 2023	Recording of session #5
Community Benefits	June 14, 2023	Recording of session #6

The format of the sessions typically involved approximately one hour of presentation from the project team detailing the baseline analysis efforts, methodologies, and findings during which the SGC members were encouraged to ask clarifying questions and share any additional relevant information or updates with the group. The SGC would then be split into two breakout groups for around 90 minutes, each facilitated by an Ava representative with a CALSTART representative diligently capturing committee member comments on the shared strategies and actions document. The final 30 minutes were spent regrouping and sharing key takeaways from each of the breakout sessions, as well as recapping next steps.

Where relevant, the project team invited guest speakers to share additional context during the presentation portion of an SGC session. While many of the guest presenters were members of the SGC, some of them were subject matter expert colleagues of SGC members. Guest speakers included: Pamela Gutman (College of Alameda), Jason Gumataotao (IBEW Local 595), and Jenny Fothergill (NorCal NECA) in the Workforce Development session; Patrick Couch (GNA), Minda Berbeco (BAAQMD), and Niki Okuk (CALSTART) in the Financing session; Tracy Fidell (Port of Oakland) in the Infrastructure session; and Nicole Merino-Tsui (WOEIP), Alison Kirk (BAAQMD), and Laura Arreola (Port of Oakland) in the Community Benefits session.

Incorporating SGC Feedback

After each SGC session, members then had a two-week period after each session to finalize review of the draft strategies and actions and add any additional comments, discussing with their colleagues as needed. Draft strategies and actions were hosted on a shared platform so all SGC members could see comments made during each feedback session, as well as any others posted directly by fellow committee members.

Once comment periods had closed for all five of the key area draft strategies and actions, Ava made suggested edits to the draft strategies and actions and posted updated versions to the site for SGC final review to confirm feedback had been appropriately incorporated. After the final review period closed, Ava considered the near-term strategies and actions to be final for inclusion in this Blueprint.

Vehicles

Establishing a Baseline

The project team's goal was to understand key vehicle ecosystem statistics including fuel types, vocations, vehicle types, vehicle model year and size, vehicle movement, and likely domicile locations. To establish a baseline, vehicle registration data from IHS Markit and survey data from the California Vehicle Inventory and Use Survey was compiled and analyzed. This data was cross-referenced with North American Industry Classification System (NAICS) codes. The resulting Ava vehicle database identified MDHD vehicles engaged in the goods movement economy categorized by volume, industry type, age, and vocation.

Ava created an internal mapping tool of this data which is connected to its electricity customer database.The map has multiple overlays that enable Ava to see where vehicle registrations, goods movement facilities, and existing fueling infrastructure are in relation to Equity Priority Communities among other key attributes (grid capacity, space limitations, etc.).

Table 4. MDHD Goods Movement Vehicle Ecosystem Overview, Ava Service Area

Class	Total Goods Movement Sector Vehicles
Class 3-6	7,290
Class 7-8	8,594

Figure 4. MDHD Goods Movement Vehicle Ecosystem by Fleet Size, Ava Service Area

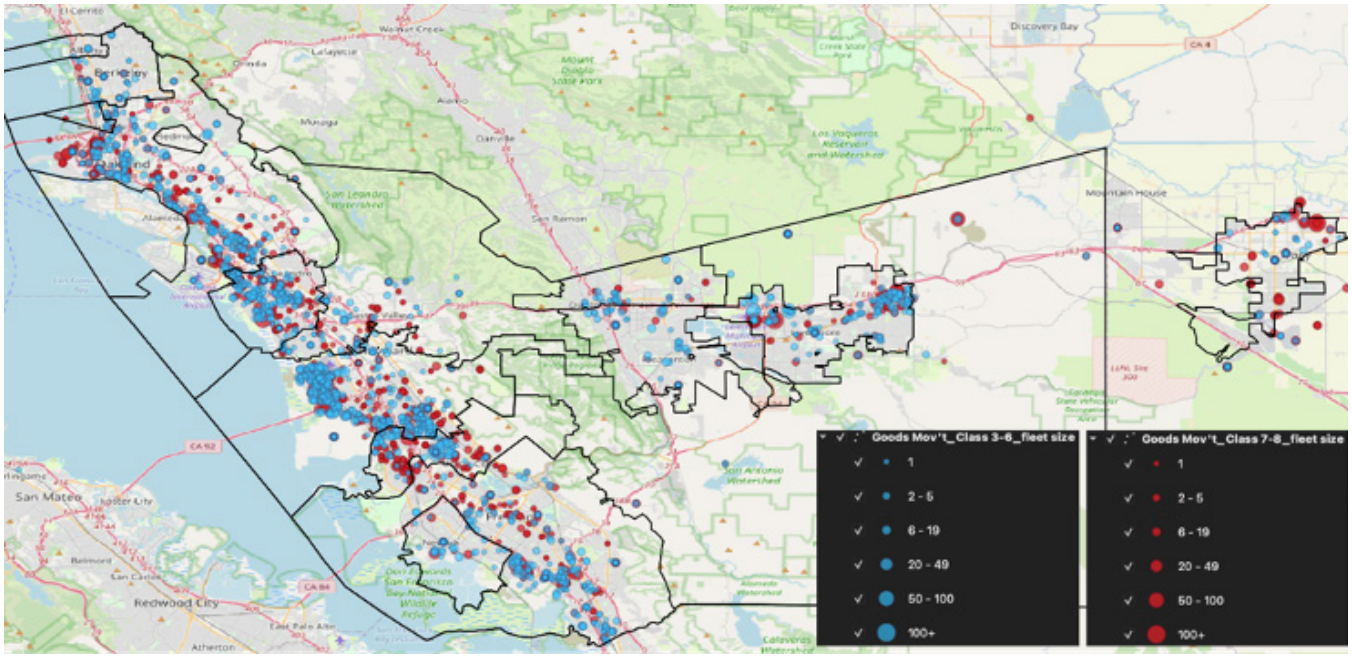


Figure 5. MDHD Goods Movement Fleets and Vehicles Count, Ava Service Area

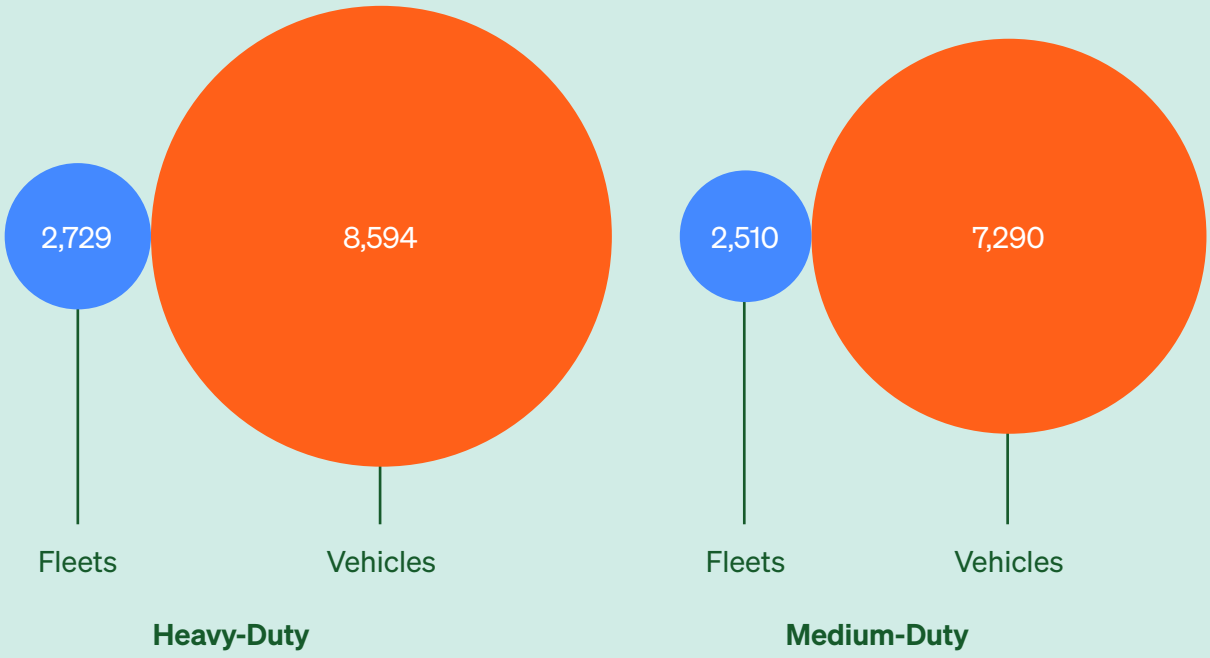


Figure 6. MDHD Goods Movement Vehicle Population by Vehicle Segment, Ava Service Area

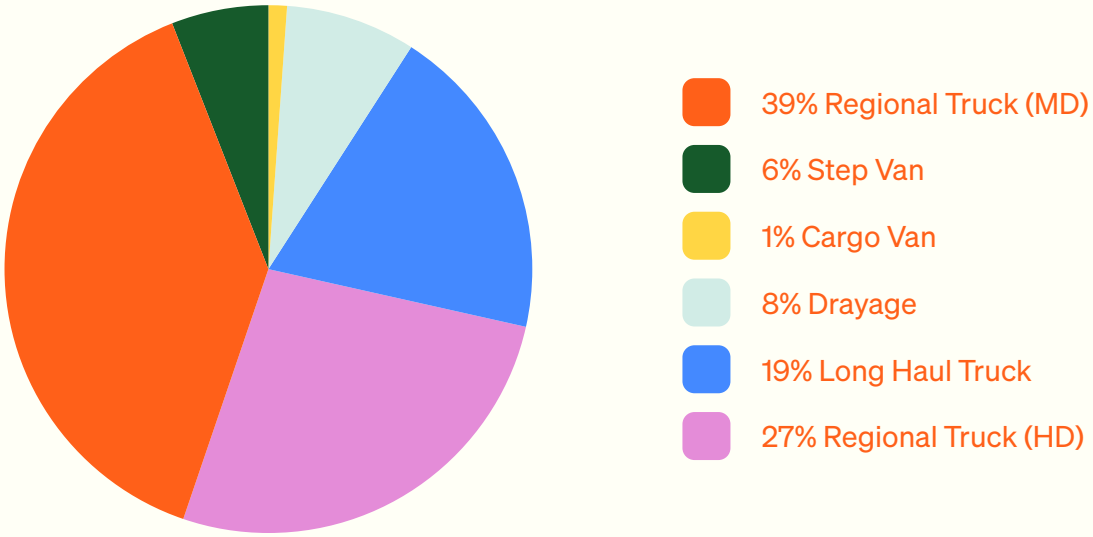


Figure 7. Top 5 Vocations Amongst MDHD Goods Movement Vehicle Population, Ava Service Area

Figure 8. Distribution of MDHD Goods Movement Fleet Sizes, Ava Service Area

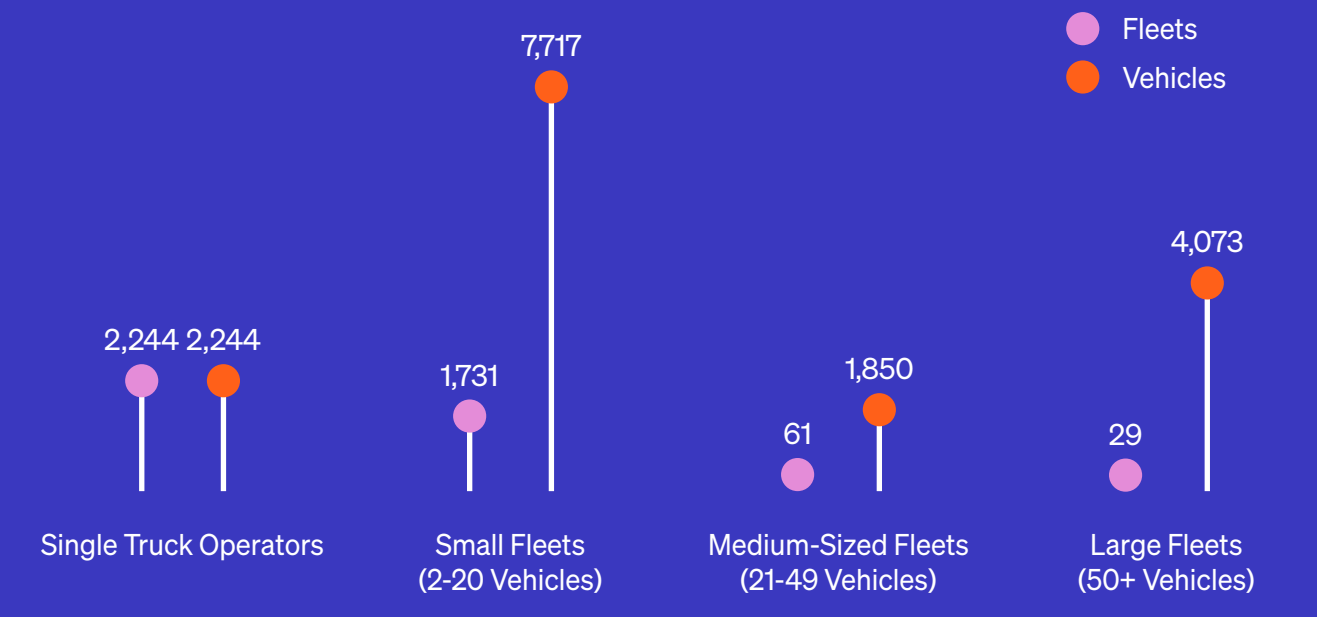


Table 5. MDHD Fleet and Vehicle Count by City, Ava Service Area

City	Medium-Duty		Heavy-Duty		Total		
	Fleets	Vehicles	Fleets	Vehicles	Fleets	Vehicles	% of Total Pop.
Hayward	596	1,474	484	1,485	1,080	2,959	18.63%
Oakland	472	1,163	512	1,698	984	2,861	18.01%
San Leandro	313	1,068	277	1,018	590	2,086	13.13%
Fremont	298	693	303	917	601	1,610	10.14%
Tracy	132	217	486	1,343	618	1,560	9.82%
Livermore	210	599	153	775	363	1,374	8.65%
Unincorporated	49	786	113	407	162	1,193	7.51%
Pleasanton	130	660	75	199	205	859	5.41%
Union City	131	263	216	546	347	809	5.09%
Newark	83	183	75	154	158	337	2.12%
Berkeley	91	177	34	51	125	228	1.44%
Dublin	4	6	1	1	5	7	0.04%
Emeryville	1	1	0	0	1	1	0.01%
Totals	**2,510**	**7,290**	**2,729**	**8,594**	**5,239**	**15,884**	**100.00%**

Table 6. Top 3 Ava JPA Member Cities with MDHD Vehicle Count Located Within Equity Priority Communities

City	Fleets	Vehicles	% of Total Population
Oakland	872	2,437	15.34%
San Leandro	547	1,293	8.14%
Hayward	277	752	4.73%

Assessing Technology Readiness

To establish a baseline, the project team had to understand what percentage of goods movement vehicles had commercially available ZE technology options. CALSTART's Zero-Emission Technology Inventory tool (ZETI) was utilized to identify MDHD models available today and in the near future that could meet the vocational needs of the current ecosystem of registered vehicles. While ZETI is an evolving data source, this analysis found that vehicles are available for fleets and vehicle operators.

These data sources also provided vehicle segmentation to identify fleets' subjection to CARB's Advanced Clean Fleets (ACF) and drayage rules. To complement range estimates collected from the ZETI tool based on manufacturer provided specification, the project team also used the National Renewable Energy Laboratory's (NREL) Fleet DNA clearinghouse of commercial fleet vehicle operating data.

This data represents baseline range requirements for vehicles of similar category and weight class as those in Ava's service area. By combining the baseline NREL average and max expected ranges by vocation, and the ZETI average and max ranges listed in commercially available vehicles, the project team identified the number of ZE-MDHDVs in each vocational category that could meet the needs of the vehicles registered in Ava's service area.

Table 7. Top 3 Vocations by Vehicle Category, Ava Service Area

Vehicle Category	Top 3 Vocations
Regional Truck Class 3-6	• Wholesale/Retail • Services • Manufacturing
Regional Truck Class 7-8	• General Freight • Food Processing and Distribution • Wholesale/Retail
Van Cargo Class 3-6	• Services • Wholesale/Retail

Table 8. Near-term Readiness Vehicle Population by Vocation and Class

Vocation	Vehicle Class	# of Fleets in Service Area	# of Vehicles in Service Area
Beverage Processing and Distribution	3-6	31 (19 of these have 1 vehicle only)	79
	7-8	26 (15 : 1 vehicle only)	117
Food Processing and Distribution	3-6	227 (127 : 1 vehicle only)	810
	7-8	95 (50 : 1 vehicle only)	771
General Freight (includes drayage)	3-6	351 (213 : 1 vehicle only)	831
	7-8	906 (605 : 1 vehicle only)	2,659
Services (includes drayage)	3-6	644 (429 : 1 vehicle only)	2,194
	7-8	226 (141 : 1 vehicle only)	467
Totals		**2,502 Fleets in Service Area (1,595 : 1 vehicle only)**	**7,937 Vehicles**

Based on this analysis, the project team forecasted future needs, assessed solution readiness, and identified vehicle actions by segment near- (2023-27), mid- (2028-32), and long-term (2033 and beyond). For example, out of the total goods movement ecosystem (~16,000 vehicles), there are ~8,000 vehicles engaged in vocations with ZE alternatives available today and near-term.

Fleet Engagement

The Blueprint's vehicle data analysis is fortified by surveys and interviews with fleets, vehicle operators, fleet users, and other applicable stakeholders. This allowed the project team to understand end user opportunities, barriers, and concerns regarding the transition to ZE-MDHDVs and forecast future needs. The project team's survey was disseminated to target Ava customers via email. Additionally, six one-on-one interviews with fleets were conducted that provided input on what opportunities and constraints they faced in transitioning to ZEVs. The City of Oakland requested to participate in some of the stakeholder discussions to understand their concerns about the potential establishment of ZE delivery zones. Fleets represented a variety of vocations including grocers, first- and last-mile delivery, warehousing and distribution, drayage, manufacturing, and parcel delivery. Some key learnings were captured and shared with the CEC in 2022 through Ava's quarterly reports:

- Larger fleets register vehicles at one location but may operate throughout a larger regional footprint. Vehicles vary by class and duty cycle (operational need)
- Some fleets collect telematics data that facilitates ZE transition planning
- Fleets have owned and leased vehicle assets. Some vehicles are operated by third-party service providers
- Charging implementation stood out as a significant barrier/challenge, especially for fleets that do not own the facilities where their fleet vehicles operate or are space constrained. This is amplified by organizational structure as fleet management is largely decoupled from building/facility management and the corporate/regional divide
- Public charging was met with uncertainty due to unknowns associated with driver expense to refuel and whether infrastructure would be available where it is needed most

CALSTART also completed a review of ZE-MDHD pilot projects and highlighted key takeaways in the Pilot Projects Review Report submitted to the CEC July 2022 (Attachment 1). A Market Readiness Analysis Report for Vehicles and Infrastructure (Attachment 2) was submitted by the project team at the same time. And, in October 2022 the project team submitted the results of its Vehicle Segmentation Analysis.

Developments and Progress

The ZE-MDHD marketplace is dynamically evolving, with major activity occurring in California. From pilot and grant projects to market-moving policy, California is on the leading edge of enabling and accelerating ZE-MDHDVs.

Developments in Policy

State regulations are jumpstarting the market near-term. Specifically, CARB's Advanced Clean Trucks (ACT) and Advanced Clean Fleets (ACF) regulations require:[17]

17. CARB: Advanced Clean Trucks Regulation (2021) and Advanced Clean Fleets Regulation (2023) Summaries

ACT

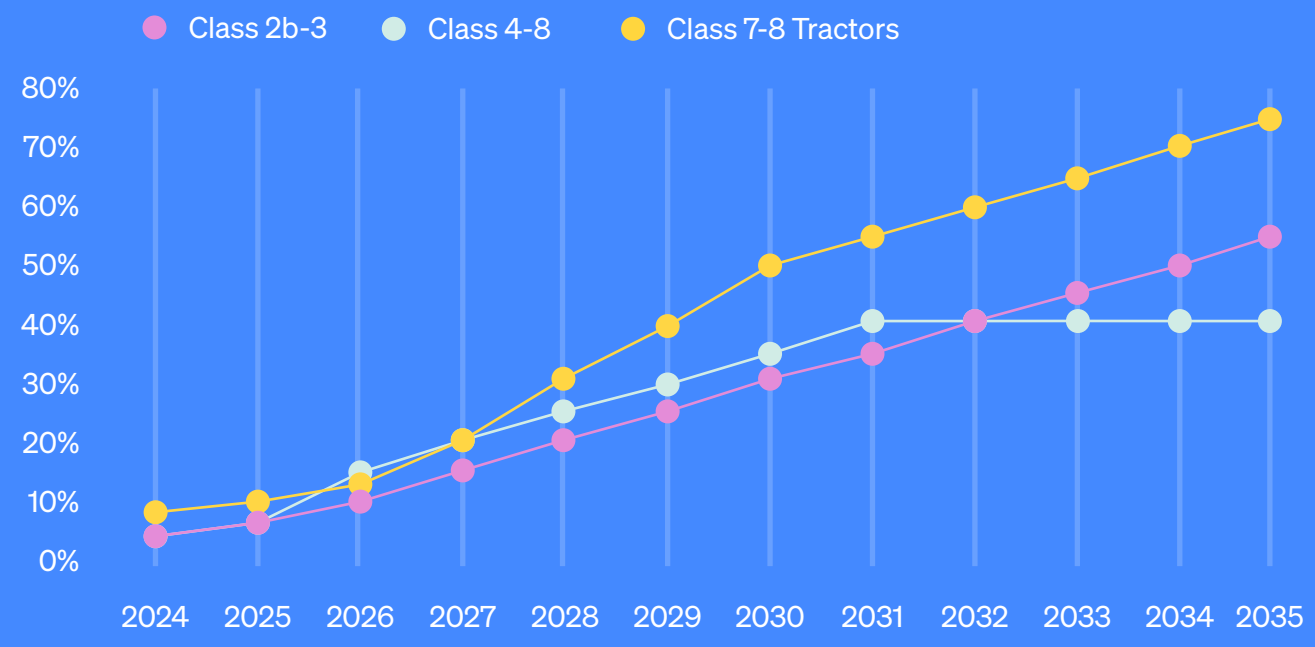
Manufacturers certifying Class 2b-8 chassis or complete vehicles with combustion engines are obligated to sell an increasing percentage of ZEVs as part of their annual sales in California.

ACT is expected to drive adoption of 765,000 ZEVs statewide with medium trucks and vans representing most of that uptake. By 2035, the ACT regulation will require 70% of medium-duty vehicle sales to be ZE. As detailed in Table 4, there are more than 7,000 medium-duty goods movement vehicles registered in Ava's service area today. Nearly 4,000 of these have market-ready ZE alternatives today or near-term.

Table 9. ACT Regulation Requirements by Vehicle Category

Category	ZE California Sales Requirement by 2035
Class 2b-3	55% of annual sales
Class 4-8 Straight Trucks	75% of annual sales
Truck Tractors	40% of annual sales

Figure 9. ACT Annual Sales Targets



ACF

To accelerate a large-scale transition to ZE-MDHDVs, this regulation works in conjunction with the ACT. ACF is a key strategy in meeting the state's air quality and climate goals and is expected to save $26.5 billion in health benefits from air pollution emissions, with a net cost savings of $48 billion to fleets.

Table 10. ACF Requirements

Fleet Type	Requirement
Manufacturer Sales	Starting 2036, manufacturers must only sell ZE-MDHDVs
Drayage Fleets	• From 01/01/24, trucks conducting drayage activities must be registered in the CARB Online System. • Non-ZE "legacy" drayage trucks can register until 12/31/23 and continue to operate through their minimum useful life. • 2035: all drayage trucks entering seaports and intermodal railyards must be ZE.
High Priority and Federal Fleets	• Option 1: Model Year Schedule - Fleets must purchase only ZEVs from 2024 onwards and retire internal combustion engine (ICE) vehicles at the end of their useful life by 01/01/25. • Option 2: ZEV Milestones Option - Fleets can meet ZE targets as a percentage of their total fleet, prioritizing vehicle types suitable for electrification.
State and Local Agencies	• From 2024, state and local government fleets must ensure that 50% of their vehicle purchases are ZE. • By 2027, 100% of vehicle purchases must be ZE. • Small government fleets and designated counties begin their ZEV purchases in 2027. • Alternatively, fleets can choose the ZEV Milestones Option outlined in Table 11

ACF ZEV Milestone Option: Fleets that fall under the High Priority (and Federal Fleets or State/Local Government Fleets) categories may opt to use the ZEV Milestones Option.

Table 11. ACF ZEV Milestones Option to Meet Targets

Percentage of vehicles that must be ZE	10%	25%	50%	75%	100%
Milestone Group 1: Box trucks, vans, buses with two axles, yard tractors, light-duty package delivery vehicles	2025	2028	2031	2033	2035+
Milestone Group 2: Work trucks, day cab tractors, buses with three axles	2027	2030	2033	2036	2039+
Milestone Group 3: Sleeper cab tractors and specialty vehicles	2030	2033	2036	2039	2042+

By establishing a vehicle baseline through the Blueprint, Ava now has stakeholder-approved actions that will provide near-term solutions required to overcome challenges faced by its commercial customers operating MDHD goods movement vehicles. This includes fleets who will need to meet the ACF requirements noted above, as well as those who do not (i.e., small- and medium-sized fleets and single vehicle operators).

Technical Assistance

In response to stakeholder feedback, approval of ACF in 2023, and the availability of significant funding from state and federal agencies, Ava has begun to implement actions from the Vehicle Strategy Area: Technical Assistance. Through extensive stakeholder feedback and industry research conducted via the Blueprint, it became evident that offering technical assistance is a statewide priority for successful fleet electrification projects. In turn, Ava received approval from its Board of Directors to allocate $750,000 to launch a one-year evFleet Consulting program[18] to provide free fleet electrification services to priority vehicle operators.

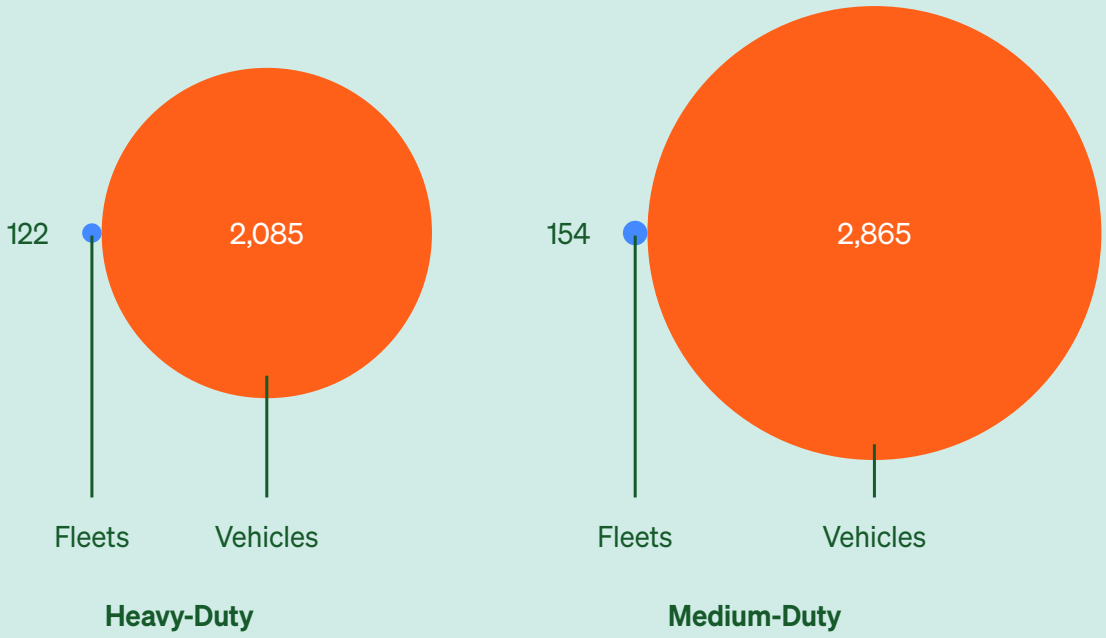
The Blueprint's baseline vehicle segmentation analysis enabled Ava to determine priority commercial customers to offer services through the Program. The analysis reviewed the number of Class 3-8 vehicles registered and engaged in goods movement vocations in Ava's service area. The analysis made assumptions about the daily vehicle miles traveled (VMT) of the vehicle ecosystem and compared that to the technology and market readiness of ZE trucks and vans. This cohort was then organized into priority tiers that would be served by the Program.

18. Ava's evFleet Consulting Program

Eligible fleets must have 5+ Class 2b-8 vehicles and ideally no more than 100. Priority Tier 1 fleets were defined by:

1. Those subject to ACF regulation and have:
   - Class 2b-6 vehicles in vocations with duty cycles that can be served with commercially available ZE trucks or vans today, and/or
   - Class 7-8 vehicles running short-haul drayage
2. And/or located in a DAC, LIC, Justice 40, and/or AB 617[19] Equity Priority Community

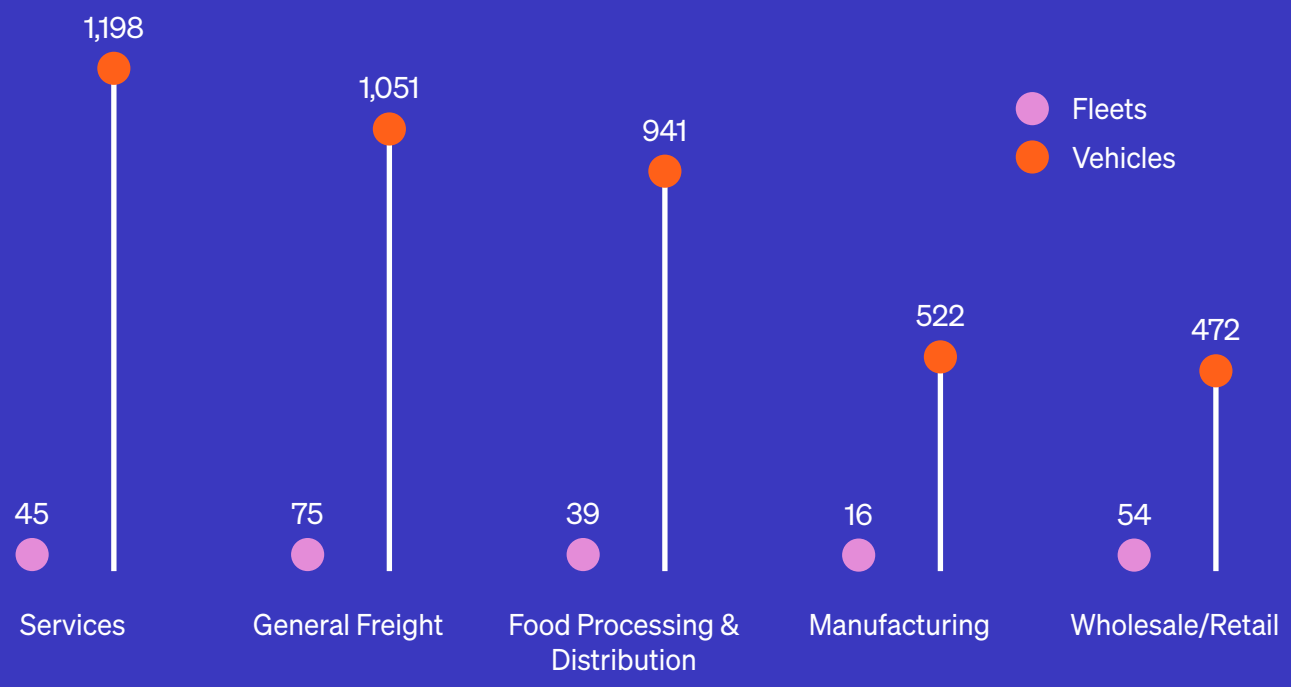
Figure 10. Fleets and Vehicles Count, Ava Tier 1 Stakeholders



Ava contracted with an external consultant team of industry experts (Frontier Energy, GNA, DKS) to support program implementation which launched June 2023 ahead of completion of the Blueprint. Each fleet will participate in a vehicle inventory, facility assessment, and energy use analysis that determines their electrification transition plan. A total cost of ownership analysis will also be completed, and support offered that helps with grant writing, identifying incentives and tax credits, completing applications, and obtaining bids from vendors.

19. CARB Assembly Bill 617 – Community Air Protection Program Communities

Figure 11. Top 5 Vocations, Ava Tier 1 Stakeholders



By simplifying the fleet electrification process, Ava aims to prepare more businesses for the transition to ZE-MDHDVs and establish lasting relationships with its commercial customers.

In addition to Ava's evFleet Consulting program for its commercial customers, CARB and CALSTART launched a statewide Cal Fleet Advisor effort to similarly provide technical assistance to fleets across the state.[20]

Key Barriers

While there have been significant developments in technology readiness, commercial availability, and policy instrument deployments, there are of course an immense number of barriers to widespread ZE-MDHDV adoption. While key developments have been made, there were only 612 MDHD ZEVs in California by the end of 2022.[21]

20. CARB: Cal Fleet Advisor
21. CEC: Medium- and Heavy-Duty Zero-Emission Vehicles in California dashboard (2022)

Given the inherently interdependent nature of the different key areas in the Blueprint, it is difficult to isolate barriers unique to just the vehicles themselves. This said, focusing on the vehicle technology itself, key barriers identified through the baseline process and shared by stakeholders include:

- Vehicle range relative to duty cycle and payload
- Vehicle compatibility with Transport Refrigeration Units (TRUs), where applicable
- Driver, owner, and fleet manager education and exposure to ZE trucks
- Technical assistance identifying and procuring appropriate and available vehicles

Takeaways

Today the market for ZE-MDHD goods movement vehicles in California is nascent. According to California's Hybrid and Zero-Emission Truck and Bus Voucher Incentive Project (HVIP), the state's point of sale discount program driving commercial technology transformation for MDHD vehicles, since 2015 there have been ~750 vouchers redeemed to date for ZE goods movement vehicles to date (30 in Alameda County; 29 in San Joaquin County).[22] Ava receives monthly voucher updates from CALSTART and as of July 2023, there were ~100 ZE-MDHD goods movement vehicles on the unredeemed HVIP voucher list waiting to be delivered to fleet operators in its service area.

With recent regulations and new evolutions in the commercial market occurring rapidly, the outlook is positive. In other words, the transition to ZE-MDHD goods movement is no longer a matter of "if," but rather "how quickly." Within the Blueprint Actions there are 19 Vehicle Actions across the following Vehicle Strategy Areas:

- Market Research and Data Analysis
- Marketing, Education, and Outreach
- Technical Assistance
- Advocacy

22. California HVIP, Voucher Map and Data

Infrastructure

Establishing a Baseline

Infrastructure is the key area in the Blueprint that receives the most general inquiry and attention. Public agencies, private developers, and the general public are increasingly aware of challenges and constraints that have arisen in the realm of public light-duty charging and are acutely aware of the barriers facing ZE-MDHDV charging infrastructure developments. Before diving into the baseline findings, it is important to level-set on Ava's Blueprint objectives in the key area of infrastructure. The analysis and findings presented in this section are presented at the same level as the other four key areas (i.e., conduct research and data analysis to establish a baseline of the landscape as it stands today, forecast future plans and needs, and assess product readiness). This Blueprint did not set out to identify specific ZE-MDHDV refueling locations, though the project team discusses analytical methodologies utilized to identify strategic areas for further investigation outside of this Blueprint process.

Additionally, while Ava's Blueprint focuses primarily on battery-electric vehicles (BEV) and associated charging infrastructure, the project team also conducted some analysis and took some actions relative to hydrogen and hydrogen fueling. Both will be discussed here.

Charging Infrastructure

A robust and reliable charging infrastructure network is crucial to accelerate the ZE transition California has stipulated in the ACT and ACF regulations. As a public power provider, Ava is uniquely positioned to significantly influence and scale the regional development of charging infrastructure projects.

However, the goal of Ava's Blueprint was not to identify address level sites optimal for charging infrastructure. Nor did the Blueprint aim to estimate the annual fleet charging load across all MDHD goods movement vehicles. There are several statewide efforts led by the CEC and California Transportation Commission (CTC) currently focused on that modeling to support CARB regulations, assess optimal infrastructure deployment locations, and provide grid impact analysis to inform IOU upgrade investments. Throughout development of the Blueprint Ava actively engaged in these efforts and followed the progress of each.

The CTC's Clean Freight Corridor Efficiency Assessment identified key freight corridors and necessary ZE refueling infrastructure in the state.[23]

Figure 12. CTC Maps of Priority Corridors and Connecting Segments

23. California Transportation Commission Clean Freight Corridor Efficiency Assessment

This included six proposed priority freight corridors with the heaviest freight volume and three ZE refueling infrastructure needs scenarios. State Route 99 from Stockton to Bakersfield, I-5 from Mexico to Oregon, and I-80 from San Francisco to the northeast border of Nevada were among the corridors identified in Ava's service area.

Figure 13. Alternative Fuel Corridors in Ava Service Area

Although CTC staff prioritized the corridors, there were shorter highway segments flagged for further consideration when building necessary infrastructure to create a complete and viable ZE refueling network statewide. For example, the I-80 corridor includes key connecting routes or the short segments of I-580 and I-880 in East and West Oakland that connect I-80 to the Port The CTC's assessment also found that medium-duty vehicle trips specifically are concentrated in the Los Angeles Basin and Eastern Bay Area (i.e., Ava's service area). These findings align with the project team's medium-duty vehicle assessment and highlight the need for additional analysis through a local lens.

While state-led initiatives are providing insight into the estimated quantity and types of chargers that will be needed to meet varying MDHD use cases generally, and the optimal geospatial location of that infrastructure, several variables at a more granular level needed to be understood for the project team to develop Blueprint actions associated with ZE refueling infrastructure. For example, the Blueprint's MDHD vehicle analysis found that of the total MDHD goods movement population (15,884 vehicles), **20 percent are affiliated with single truck operators** (3,286 vehicles). Additionally, **50 percent** of the total MDHD population **is operated by small fleets** with 2-20 vehicles (7,927).

The common assumption among state policymakers is that a significant amount of charging will occur behind a fence overnight. However, the specific breakdown is very difficult to assess. The Blueprint project team's local analysis found that the roughly 70 percent of MDHD vehicle operators (i.e., single truck operators and small fleets) are much less likely to be able to do that due to tenant/landlord lease issues, spatial barriers, and/or utility grid constraints.

As previously noted in the Vehicle Baseline section, Ava created an internal mapping tool that identifies the location of each vehicle registration datapoint. The tool also includes warehouse, other logistic facility, and current refueling location data leveraging NAICS codes integrated into Ava's electricity customer account database. It also overlays Equity Priority Communities and PG&E's Integrated Capacity Analysis map which shows available capacity on circuits. Ava's mapping tool was developed in-house by staff and was not a Blueprint grant expense.

With this information the project team aimed to establish a baseline methodology for understanding Ava's commercial customers' charging infrastructure needs, opportunities, and constraints at a local level. With the available data the project team could identify several "hotspot" areas where public fast charging depots are likely necessary to meet the needs of small MDHD fleets and single vehicle operators unable to charge behind a fence due to previously noted barriers. It also enabled Ava to pursue a "barbell" approach to siting public fast charging depots that meet fleet charging opportunity needs on both ends of key routes (see Financing section below), and new collaborative infrastructure funding opportunities among Ava, the Port, and other partners.

Use Case: Drayage

There are hundreds of Licensed Motor Carriers (LMC) conducting business at the Port's maritime facilities. An LMC is an entity that hires, contracts with, and dispatches drayage truck drivers to pick up or deliver freight at the Port. Each LMC must file a Secure Truck Enrollment Program Agreement with the Port, which has over 3,000 trucks in its registry.[24] To understand the charging needs of this stakeholder group, Ava engaged the Port, the City of Fremont's Economic Development Office, Prism Logistics, GSC Logistics, Oakland Maritime Support Services, truck dealerships and Original Equipment Manufacturers (OEM). Ava also engaged the Harbor Trucking Association and Oakland Trucker Work Group (vehicle owner operators and LMCs).

Additionally, Ava procured telematics data from GeoStamp which provided information on the movement of ~800 drayage trucks including commonly traveled routes, stopping points, and origin and destination data. Approximately 300 Class 7-8 trucks (across eight anonymized fleets) had a primary operational footprint within Ava's service area during a six-month timeframe. Like development of Ava's mapping tool, acquiring GeoStamp data was an Ava investment and not a grant expense. This analysis painted a clearer picture of where drayage trucks frequently travel, how long they dwell at various locations (logistic warehouses, fulfillment and arrangement centers, petroleum fueling) along all designated Alternative Fuel Corridors in Ava's service area.

The GeoStamp analysis identified "hotspots" where the cohort of drayage trucks were doing business. These included locations in the cities of Oakland, Hayward, San Leandro, and Tracy. The analysis also informed development of early Blueprint actions that spanned the key areas of infrastructure and financing. Each of these are described in detail below in the Financing section. In 2022 Ava also shared information about these early actions with the CEC through its quarterly reports.

Hydrogen

The primary focus of Ava's Blueprint with regards to infrastructure was aimed at eliminating barriers associated with the deployment of charging infrastructure for battery-electric Class 2b-8 vehicles. Ava recognizes that California's 2022 Scoping Plan[25] includes rapidly scaling up clean energy resources, including production, conveyance, storage, and strategic consumption of green hydrogen. To that end, the Blueprint includes a key action aligned with this goal within the Strategy Area "Deployment of Charging Infrastructure and Electricity Rates." Infrastructure Action #20 centers the assessment of electricity rate and subsidy requirements associated with production of affordable green hydrogen to enable market acceleration of all ZEV technologies.

Low-cost clean hydrogen via electrolysis will depend on ample availability of low-cost clean electricity which will need to scale in parallel with market demand for clean hydrogen in the transportation sector. These cost declines translate to a reduction in hydrogen production costs.

24. Port of Oakland Comprehensive Truck Management Plan, STEP Registry
25. CARB 2022 Scoping Plan Documents – Final 2022 Scoping Plan. December 2022

As the LSE, Ava is well positioned to influence electricity rate design that attracts green hydrogen manufacturers to its service area mid- to long-term which aligns with widespread market availability and cost declines of fuel cell vehicle technologies, and accounts for green hydrogen manufacturing facility project development timelines.

The Inflation Reduction Act has multiple tax credits, including the hydrogen Production Tax Credit, that will be critical in providing supply-side incentives that can make green hydrogen cost-competitive with incumbent technologies. For electrolysis, availability of clean electricity is one of several factors that will play a role in the pace of growth. If electrolysis projects fail to scale during the IRA credit period, electrolysis may not achieve the necessary learning curves to remain competitive in the absence of tax credits.[26] Recognizing the urgency of the issue, Ava has taking the first step in implementing the Blueprint Action noted above.

In 2023, Ava became an Alliance for Renewable Clean Hydrogen Energy Systems (ARCHES) partner[27] which is an unprecedented collaboration of public, private, and nonprofit entities, led by the Governor's Office of Economic and Business Development, with the goal of accelerating this market at scale. Participation in the ARCHES network will allow Ava to meet with green hydrogen manufacturers to understand their rate design needs and communicate to state agencies the levels of subsidies required to achieve those goals. It will also enable Ava to partner with other ARCHES network stakeholders on grant and other funding opportunities.

Developments and Progress

There have been and are numerous other Blueprint projects across the state similarly focused on answering the questions of what barriers need to be addressed and what opportunities can be seized to enable and sustain the transition to ZE-MDHD goods movement. Ava's Blueprint will be a part of this cohort of plans and actions, adding to the momentum of planning, stakeholder engagement, and new initiatives.

Regionally, there are various stakeholders with parallel and complementary efforts to Ava's Blueprint. The Port of Oakland is completing a Public Truck Charging and Fueling Study. The study includes a needs assessment and gap analysis of infrastructure, and the study area is focused on the Port's real estate assets and sites adjacent to Port property. Identification of sites within the study area include those suitable for overnight public truck charging, opportunity public truck charging, and hydrogen fueling stations. Site identification criteria encompassed parcels already serving drayage trucks or currently vacant. These needed to be >500 feet from homes, schools, or parks to ensure minimal impact on residents in East and West Oakland. Additionally, prospective sites could not be on high-value land and could not impede traffic flow at the Port or in and around Oakland International Airport. In total, 30 prospective sites were identified, and of these six sites met all the evaluation criteria. Ava will continue to engage with the Port and its Technical Working Group as the study progresses in-depth site assessments, grid impact analysis, and infrastructure cost assessments. SMUD completed a CEC-funded Blueprint which identifies charging needs for MDHD vehicles within their utility service territory.

26. US Department of Energy: Pathways to Commercial Liftoff – Clean Hydrogen. March 2023
27. ARCHES Network

SMUD's Blueprint specified charger locations to serve those needs and like Ava's Blueprint, found that a significant number of fleets and vehicle operators may not be able to charge a fence. SMUD is also interested in Ava's Tolling Agreement (see Financing section below) and together these public power providers are evaluating the feasibility of deploying public fast charging depots to meet the needs of medium-duty "No Depot" stakeholders through this financing solution.

Similarly, the Northern California Megaregion Blueprint involves a multi-agency planning approach to select locations for infrastructure depots. This effort is particularly relevant as the study area covers 15 counties, including Ava's Alameda and San Joaquin County service area. Ava recognizes that isolated charging infrastructure planning will not maximize benefits to fleets or communities most impacted by the goods movement economy and is committed to ongoing engagement in this Blueprint as it evolves as a member of its Steering Committee.

Key Barriers

Acknowledging the evolving discourse around technology suitability of battery-electric versus hydrogen fuel cell for different vocations, as well as the business decisions behind which technology a fleet chooses to pursue, these barriers focus on the pain points identified specific to charging infrastructure to support battery-electric goods movement vehicles. This said, the evolving discourse itself creates a challenging dynamic in the market with "wait and see" behaviors making clear projections of infrastructure needs quite difficult.

Similar to pain points felt in the light-duty EV charging space, there are numerous barriers to address to deploy appropriate, effective, and reliable charging infrastructure for MDHD goods movement vehicles. If anything, these barriers are amplified for the MDHD segment because time flexibility is minimal for businesses that are paid to move goods, not to sit idle. Among numerous hurdles relative to infrastructure, the three key areas identified as the primary barriers are grid capacity, siting, and development timelines.

Given the power demand for MDHD BEVs, fleets with dozens of vehicles needing to charge at the same depot overnight, as well as those relying upon fast charging, call for significant distribution grid capacity to single service points. While the state is aware of this challenge and has various efforts underway to both understand the scale of the challenge and build processes to address existing pain points—eg., HEVI-Load,[28] the Freight Infrastructure Planning (FIP) effort,[29] among others—the size of this barrier and its real and perceived impacts to this transition cannot be overstated.

Alongside the constraints and concerns around grid capacity are barriers relative to project siting for public charging hubs, as well as general development timelines. While grid upgrades are long lead time items in and of themselves, so too is the process of service planning and large load studies, as well as the procurement of equipment including chargers, switchgear, and transformers. Lead times for these items are currently close to, if not exceeding, one year. This is on top of the service planning timelines and engineering studies to approve a project before developer confidence is satisfied to procure equipment, putting project timelines from concept to commercial operation in the multi-year timeframe in many cases.

28. CEC: Medium and Heavy-Duty Vehicle Load Shapes. September 2021
29. CPUC: Freight Infrastructure Planning. 2023

Regarding siting, the assessment of need between public charging hubs for “No Depot” fleets and private behind-the-fence charging for RTB fleets is still somewhat opaque. Where fleets and single truck operators can and prefer to charge is still being discovered. On top of the balance between public and private charging options is the question of where to site public hubs that are the least disruptive to various goods movement fleet operations, have appropriate ingress, egress, and parking stalls for these larger vehicles, are or can be zoned appropriately and within allowable range from established truck routes, have or can have space for a driver waiting area, and have or can have appropriate physical property security measures implemented. These siting challenges are not insurmountable, but in the face of land-constrained areas like much of Ava’s service area, the competition for “highest and best use” makes identifying viable sites increasingly difficult.

Ultimately the long and uncertain timelines for infrastructure deployments and availability create a “chicken and egg” dynamic relative to vehicle deployments. Fleets are generally not willing nor able to commit to procuring BEVs without a known charging solution, and certain charging infrastructure developers do not have the appetite to build projects without known anchor tenants.

Takeaways

There is so much to better understand, model, plan for, and accelerate in the realm of infrastructure for ZE-MDHDV refueling infrastructure. As such, the Blueprint's Infrastructure Strategy Area: Market Research and Data Analysis, includes several actions that ensures Ava continues to track and leverage statewide and regional efforts actively modeling service area ZE refueling infrastructure needs.

Of the Blueprint Actions, there are 25 specific to addressing challenges with siting and deploying appropriate and effective charging infrastructure to support Class 2b-8 ZEVs, across the following additional Infrastructure Strategy Areas:

- Marketing, Education, and Outreach
- Technical Assistance
- Deployment of Charging and Charging Rates
- Advocacy

Financing

Establishing a Baseline

Ava's Blueprint goal was to identify what financing solutions would have the biggest positive impact for its commercial and industrial customers near term. To understand potential vehicle and charging infrastructure financing solutions that would deliver the greatest benefit, the project team conducted a review of finance research initiatives to establish a baseline. These included a series of CALSTART's financing roundtables, the Drive to Zero program's white paper *Taking Commercial Fleet Electrification to Scale*, and Environmental Defense Fund's (EDF) *Financing the Transition: Unlocking Capital to Electrify Truck and Bus Fleets* report. The project team also leveraged feedback from the statewide Transportation Electrification Partnership's network of financing and industry experts, and insights from the Port of Long Beach's 2019 Innovations in Private Finance Report. The project team identified numerous mechanisms to finance vehicles and reduce risk in this evolving asset class which were included in the Summary of Financing Options Report (Attachment 3) submitted to the CEC in August 2022. Below is a sampling of key mechanisms evaluated across the categories of 1) capital instruments, 2) cost smoothing instruments, and 3) risk reduction instruments:

Credit Enhancement

A credit enhancement is any type of capital instrument that improves the chances that financing will be repaid. Credit enhancements are useful as they encourage lenders and investors to put money into unfamiliar markets or products such as ZE-MDHDV lending. A credit enhancement can absorb the risk of loss and, as a result, be used as a negotiating tool to convince lenders to reduce interest rates or provide longer loan terms. Credit enhancements can also be used as negotiating leverage to convince lenders to relax their underwriting criteria to lend to businesses or individuals with lower than typical credit profiles. A credit enhancement can take one of several forms: loan loss reserve, loan guarantee, loan loss insurance, debt service reserve, or subordinated/senior capital structure.

Conduit Financing

Conduit financing is another capital instrument, allowing private companies, nonprofit organizations, and public entities to raise capital for large-scale projects benefiting the public with tax-exempt bonds. The difference between a revenue bond and conduit financing is that revenue bonds are typically backed by revenues pledged by a public agency, whereas conduit borrowing would be backed only by a specific project's pledged revenue streams. The California Infrastructure and Economic Development Bank (IBank) is the State's only general-purpose financing authority and one of the primary issuers of tax-exempt and taxable conduit financing; however, many other conduit issuers target specific borrower or project types. Other state and local issuers have overlapping mandates and programs but are able to issue tax-exempt private activity bonds on behalf of public agencies, special districts, nonprofits, and other projects that promote economic development or provide critical community services.

"Wet" or "Wraparound" Leasing

A wet lease is a cost-smoothing model where the lessor provides the vehicle, battery, maintenance, and, in some cases, the insurance and operational staff, to the fleet operator. This reduces upfront purchase costs, risk from uncertain residual values of assets, and the need to invest in maintenance or the training of staff. This is similar to "as-a-Service" options, where a third-party provider includes ZE-MDHDVs and charging infrastructure for a base rate to a customer. These structures can mitigate operator adoption risks by blending the operational cost savings of vehicles that have regular and predictable routes and operations with their higher upfront costs (vehicle and/or infrastructure) to create an attractive business case at a reasonable payment rate.

Performance Guarantee

As a mechanism to reduce investment risk, a performance guarantee protects a fleet or operator from the potential underperformance of a vehicle or its batteries. These are typically provided as government-backed guarantees.

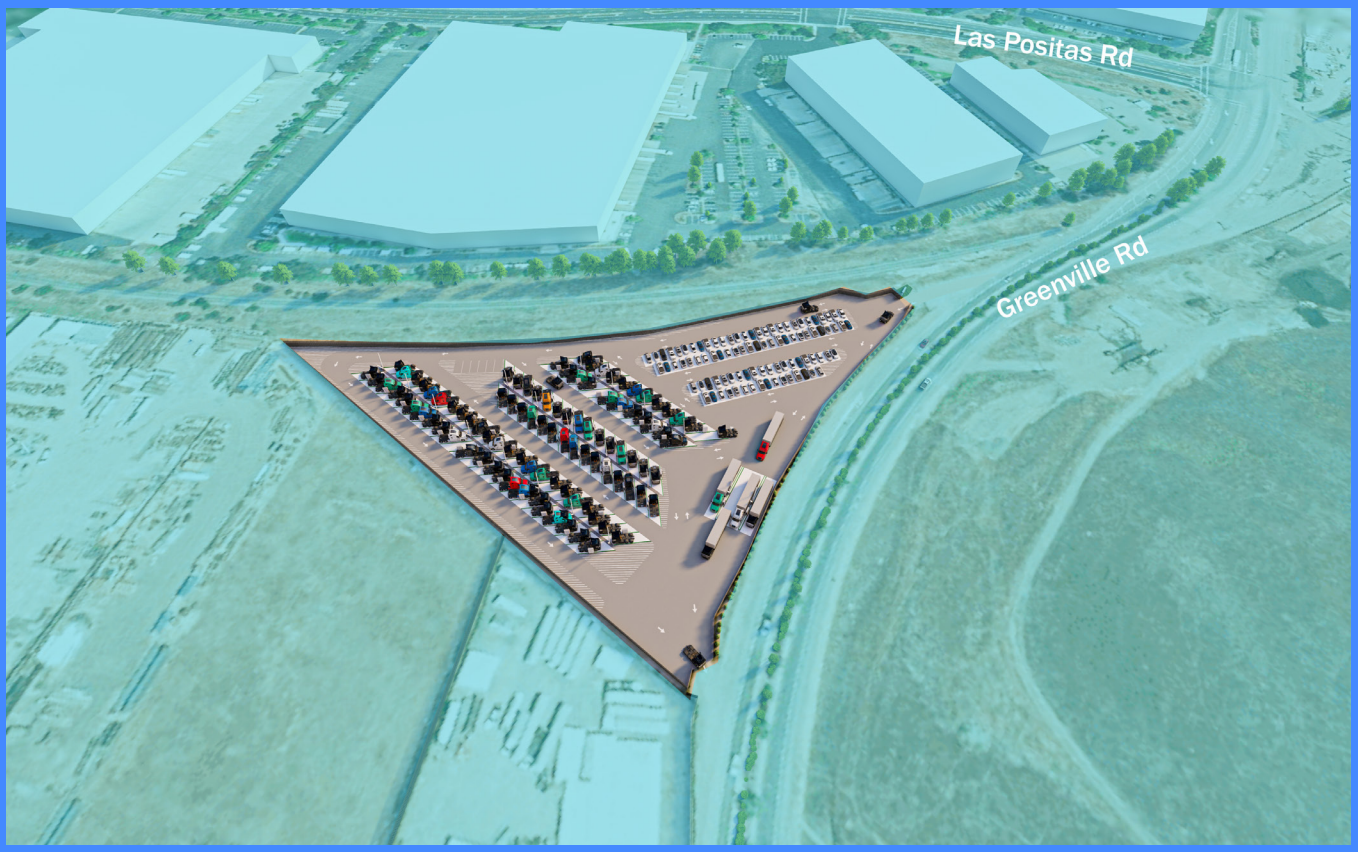
Developments and Progress

Throughout development of the Blueprint, the State of California invested heavily in the transition to ZEVs and associated infrastructure. In 2022 alone, California advanced a $10 billion package to accelerate the market for Class 2b-8 vehicles including those engaged in the movement of goods. There are a number of state-run incentive programs like HVIP[30] and Energy Infrastructure Incentives for Zero-Emission Commercial Vehicles (EnergIIZE)[31] that are helping fleets address some of the upfront cost of new ZE trucks and fueling infrastructure.

Ava holds an advantage as a major procurement agency and the default electric Load Serving Entity, making the agency uniquely poised to drive market acceleration. With strong ties to major financial institutions, as well as other public agencies, Ava can actively leverage public sector investments to attract private sector financing solutions. This strategic approach can help eliminate financing barriers in its service area. Ava took some early actions identified through this Blueprint process —namely Financing Actions #3 and #5—to evaluate (#3) and offer (#5) financing opportunities for both vehicles and charging infrastructure. With regards to new product evaluation, Ava and the California Pollution Control Financing Authority (CPCFA) have met to discuss the pending statewide loan loss reserve (LLR) program for ZE trucks they are developing in collaboration with CARB and the CEC. Ava is also in discussion with Southern California Edison (SCE), which is working with CPCFA to make an investment of $20 million into the pending LLR program for MDHD stakeholders in the IOU's service area. Ava is currently evaluating the feasibility of replicating and/or leveraging this opportunity to make an investment specifically for its commercial customers' ZE-MDHDV financing needs.

30. CARB: HVIP
31. CARB: EnergIIZE

Figure 14. Rendering of Greenville Community Charging Depot



Action Highlight: Ava Powers and Funds Charging Depot

Ava issued a Request for Offers (RFO) in September 2022 offering low-cost debt to help fund eligible projects and costs associated with the development, construction, and operation of fast charging hubs. Eligible activities included capital investments in on-road ZEVs and/or charging infrastructure.

In 2023, Ava's Board of Directors approved providing $4.5 million in financing to the winner of the RFO: Forum Mobility, a private sector Trucking-as-a-Service provider and charging infrastructure developer. Ava's loan to Forum Mobility will support the construction of the Greenville Community Charging Depot in Livermore along I-580.[32] The 4.4 acre site will be capable of charging up to 96 drayage trucks simultaneously, making it the largest charging depot of its kind in California. The project will also be powered by Ava's Renewable 100 electricity product which is certified by CARB as a zero carbon intensity transportation fuel. The project developer has also implemented a barbell approach to siting infrastructure. In addition to the Ava funded project, another depot is planned at the Port of Oakland,[33] ensuring drayage truck drivers traveling along I-580 have charging solutions that enable them to move goods to eastern Alameda County, into the Central Valley, and back to the inner Bay Area.

32. East Bay Community Press Release: Zero-Emission Truck Charging Depot Slated for Livermore. June 2023
33. Port of Oakland: Roundhouse Battery-Electric Truck Charging Station Project. April 2023

Additionally, Ava advanced a financing innovation in the form of a Tolling Agreement for EV charging infrastructure deployments. While this contracting structure is currently being applied to Ava's light-duty DC fast charging hubs, there is potential for the structure to be applied to the MDHD sector, as well.

Action Highlight: Tolling Agreements for Charging Infrastructure

Ava is investing in a publicly accessible network of fast charging "hubs" to accelerate light-duty ZEV adoption, especially among drivers who are renters and cannot charge at home. Rather than put this investment on its own balance sheet, however, in 2022 Ava sought to utilize a common contracting structure in the power generation space—energy tolling agreements—to support the financing of its network.

Under this structure, Ava pays a monthly fixed, capacity-based fee to deploy the white labeled infrastructure. In return it has the right to flow Ava's Renewable 100 electricity product through the fast charging stations to consumers seeking to charge their EVs. The tolling arrangement de-risks capital expense by allowing asset owners (tolling partner) to invest in technology, development, and asset management while the off-taker, Ava, accepts charging utilization risk. By treating the fast charging stations as "tolls" for Ava's electricity, Ava retains the flexibility to set consumer charging rates that align with both grid conditions and public policy goals. Ava also retains the rights to all the revenue generated from customer charging and reinvests that back into the community. Because Ava is the load serving entity procuring wholesale utility scale power, it can resell that resource as a transportation fuel at a lower cost than for-profit fast charging providers. Ava's tolling agreement is the first of its kind globally as no entity has ever developed this contractual arrangement for the use case of charging infrastructure.

Ava's Blueprint calls for the evaluation of expanding the tolling agreement use case to fast charging depots for medium-duty vehicle operators without access to RTB charging and for Ava to pursue funding opportunities to deploy this critical infrastructure.

Key Barriers

The following vehicle and infrastructure cost and financing barriers were considered by the project team. Each one of these barriers creates real world roadblocks for nearly all fleets in the transition to ZE at this point in time, so the collective impact of these numerous barriers is imperative for policymakers and other stakeholders to address as swiftly as possible.

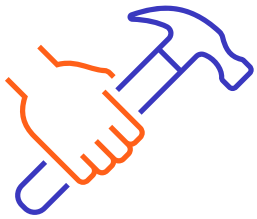
Residual value

Residual value is the unknown quantity of value left in a ZEV at the end of any period, such as the term of financing that vehicle. Because of unknowns within resale prices in secondary markets, which are virtually nonexistent today, larger fleets that adopt ZE-MDHDVs must conservatively assume that residual value is zero. This, of course, is not the case for the financing mechanisms and market established for diesel equivalents. The project team determined this may be an opportunity for Ava to play a role in the guarantee of ZEVs.

High upfront cost

Today ZE-MDHDVs are more expensive than comparable ICE models. On top of the upfront procurement cost is the necessary charging infrastructure cost. However, the total cost of ownership must be considered given the savings associated with the operation and maintenance efficiencies of a ZEV over its lifetime compared to an ICE vehicle. This includes savings associated with using electricity as a transportation fuel instead of being exposed to the volatile diesel market, and state and federal incentives that can help reduce overall project costs. Ava determined that rate design, as well as investments in fleet electrification technical assistance program development that connected stakeholders to state and federal incentives, were areas of opportunity to address this barrier.

Utilization risk



There has historically been a hesitation among infrastructure developers to build assets that do not yet have a known customer base. That is due to the fact that it is yet to be determined when fleets and single vehicle operators will make the transition to ZE-MDHDVs at scale. Charging infrastructure is expensive to build, operate, and maintain. It requires elevated levels of utilization to recoup the investment. Ava may be able to proactively create pipelines of users for private sector charging depots through product solutions it develops. Ava also determined that it may have a role in deploying a network in publicly accessible fast charging depots to specifically meet the needs of medium-duty fleets and vehicle operators that will not be able to charge behind a fence. As a not-for-profit public agency, Ava is not driven by revenue generation and is able to accept greater risk upfront associated with lower utilization.

Rate design

Across the U.S., utility rate structures and demand charges vary. In California the CPUC has approved IOU rate design that aims to benefit ZE-MDHD fleets and vehicle operators while balancing demand on the grid. Fleets are unaccustomed to their fuel expenses being tied to the electricity bill, an arrangement that is not widely understood generally. In turn, this set-up is seen as a risk, as if costs could add up if they charge at times of peak demand. As the default LSE, Ava can develop and set new rates through its Board of Directors, which could be a crucial step in addressing cost barriers for its customers and establishing its service area as a first mover market for ZE-MDHDV adoption.

Insurance

Insurance cost was also identified by the project team as a critical issue for fleets and vehicle operators. CARB is working on addressing this barrier, and in 2023 CALSTART made several recommendations and held public meetings to gather stakeholder input. Among the solutions raised were targeted and proactive educational outreach to commercial vehicle financing and insurance providers, proactive risk reduction for vehicle financing, proactive risk reduction for vehicle insurance, agency-led workshops, and stakeholder surveys. This issue has been included as a Blueprint action for the appropriate agencies to continue work to solve.

Takeaways

Ava has prioritized evaluating financing programs and instruments through the Blueprint and even begun to implement financing actions, demonstrating its procurement expertise, ability to scale, and dedication to making investments in high-impact projects and programs that achieve local climate goals and improve quality of life for its residents. The commitment to balancing achieving policy objectives while supporting and sustaining the goods movement sector and associate fleets and truck operators is key to this transition and questions of financing and incentive supports.

The Blueprint Actions detail 11 Actions across the following Financing Strategy Areas that are unique to addressing the cost and risk barriers to adopting ZE-MDHDVs and deploying associated charging infrastructure:

- Market Research and Data Analysis
- Vehicle Cost and/or Risk Reduction
- Charging Infrastructure Investment
- Outreach and Advocacy

Workforce Development

Establishing a Baseline

Through key stakeholder engagement, Ava aims to better understand workforce needs to develop value-driven strategies and actions that will support goods movement fleet electrification. This involves identification of processes, gaps, needs, and challenges related to workforce development from community colleges, high schools, regional occupational programs, labor unions, Community-Based Organizations (CBOs), and vehicle OEMs.

MDHD Goods Movement Workforce Needs

The future roles within the ZE-MDHD goods movement industry can be divided into two groups: **vehicle maintenance** and **charger installation/maintenance**. This distinction is made to identify workforce representation that does not include upstream sourcing, manufacturing, sales, or other roles. When identifying the difference between electric truck technician training and electric vehicle supply equipment (EVSE) technician training, there are some overlaps including electrical safety skills and electrical safety standards. Additional training and certification necessary for vehicle technicians includes batteries, electronics, management systems, and basic mechanical systems (Tables 11, 12). Charging infrastructure technicians must also be skilled in direct current fast charger (DCFC) installation and servicing.

For new and incumbent MDHD vehicle technicians, there are several pathways to acquiring proper training and certification. Community colleges train technicians in the basics—electrical skills, vehicle systems, safety, and customer service—while truck fleets focus on upskilling recruits by providing hands-on learning experience maintaining the vehicles the fleets operate. OEMs may also provide training to fleets that purchase their ZE-MDHDVs, sending field representatives to fleet facilities to teach mechanics how to maintain vehicles.

New and incumbent charging infrastructure technicians, however, often receive training through labor union apprenticeships with the International Brotherhood of Electrical Workers (IBEW), or with EV charging OEMs directly. Once a certified electrician, they can add to their skill set through the Electric Vehicle Infrastructure Training Program (EVITP). EVITP is the highest standard in training and certification for installation of charging infrastructure in North America and was created by a collaboration of industry stakeholders including automakers, charging infrastructure OEMs, educational institutions, utilities, electrical industry professionals, and other key EV industry stakeholders. In the East Bay, the IBEW Local 595 provides EVITP training to members, though it also offers testing to anyone eligible, regardless of where they pursued the training component.

Table 12. Workforce Skill Set Needs

Infrastructure Installation and Maintenance	Vehicle Maintenance and Upkeep[34]
Electrical safety skills	Electrical safety skills
Electrical safety standards	Electrical safety standards
DCFC installation	Electrical safety standards
DCFC servicing	Basic mechanical systems
Wiring and conduits	High voltage awareness
	Electrical code training
	Computer network training
	Diagnostic tool training
	Electric meter training

Table 13. Existing Certifications

Infrastructure Installation and Maintenance	Vehicle Maintenance and Upkeep[35]
Electric Vehicle Infrastructure Training Program (EVITP)	Advanced transportation degrees and/or certificates (including ZEV content)
	Electrical technology degrees and/or certificates

34. For the purposes of this Blueprint, focus is placed on the ongoing maintenance of vehicles rather than operation and driver experience.
35. For the purposes of this Blueprint, focus is placed on the ongoing maintenance of vehicles rather than operation and driver experience.

Key Stakeholders

Ava partnered with the East Bay Economic Development Alliance (EBEDA) to support in gathering the relevant stakeholders impacting future workforce development and growth in the region. This effort identified three (3) stakeholder subgroups: 1) CBOs and labor unions, 2) high schools and Regional Occupational Programs (ROPs), and 3) community colleges. Table 14 and Figure 15 show the roles identified by Ava as impacting workforce development for ZE-MDHD goods movement in the region.

Table 14. Workforce Stakeholder Session Participant Organizations

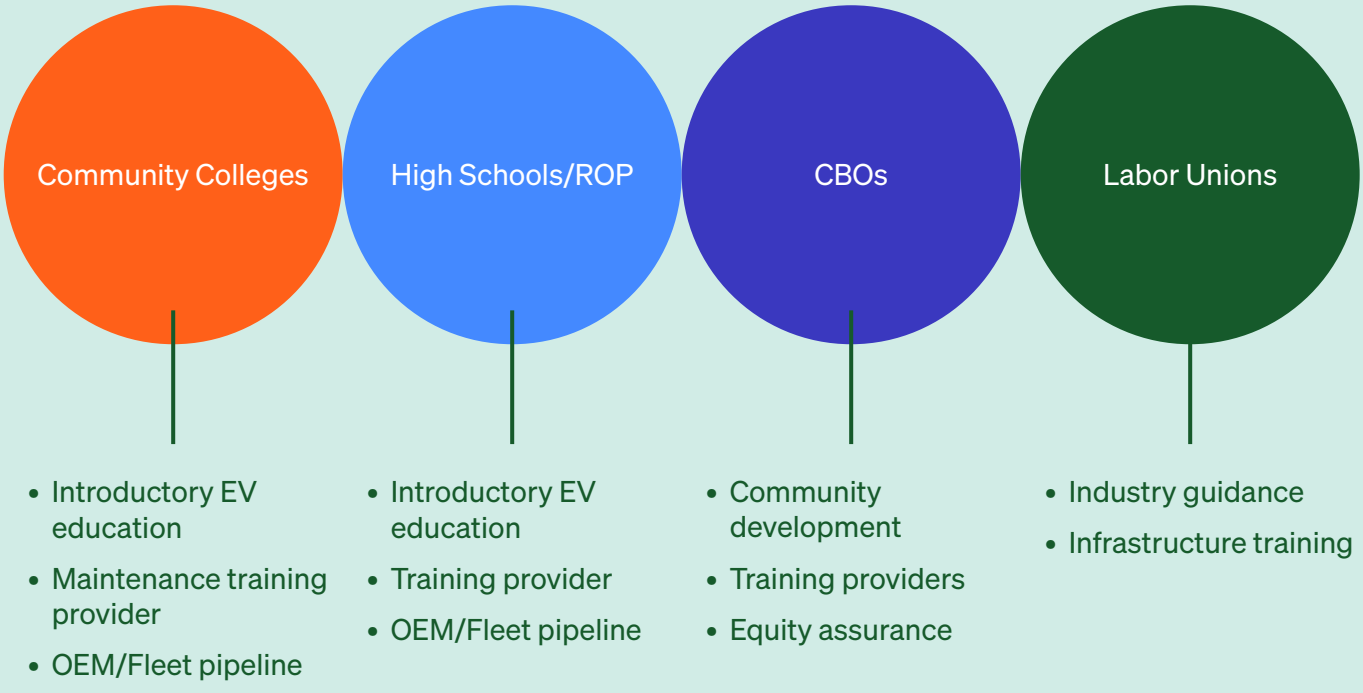
Ava Service Area Stakeholders in Workforce Development Sessions	
Labor	• Construction Trades Workforce Initiative, Building and Construction Trades Council of Alameda County (CTWI-BTCA) • International Brotherhood of Electrical Workers (IBEW) Local 595 • NorCal National Electric Contractors Association (NECA)
CBOs	• Cypress Mandela Training Center • GRID Alternatives • Rising Sun Center for Opportunity
Community Colleges	• Bay Area Community College Consortium • California Community Colleges Advanced Transportation & Logistics • Chabot-Las Positas Community College District • College of Alameda (Peralta Community College District)

Community-Based Organizations and Labor Unions

Labor unions and CBOs intersect two relevant functions within the workforce development space: they provide training and also constantly evaluate the needs of their members. In this case, unions are focused on the laborers and CBOs are focused on uplifting the impacted communities by providing supportive resources along with workforce training. This was the largest stakeholder cohort engaged in the Blueprint's workforce development working group given their wide-ranging interests and concerns.

IBEW is the union representing electrical workers. The local chapter (Local 595) represents electrical workers in Alameda, San Joaquin, and Calaveras Counties. Driven by a national curriculum by the National Joint Apprenticeship Training Committee (NJATC), Local 595 provides continued education and electrician certification programs for journeymen wiremen (journeymen). Electrical apprentices become journeymen by completing in-class and on-the-job training hours. The IBEW-NECA Inside Electrician Apprenticeship is a five-year program requiring 900 hours of classroom instruction and 8,000 on-the-job hours. In partnership with Electrical Contractors, Local 595 formed the Alameda County Joint Apprenticeship Training Committee (JATC), which currently has capacity for 400 apprentices. This committee is also associated with Chabot College in Hayward.

Figure 15. Workforce Development Stakeholder Roles



IBEW 595 is aware of the electrical skills needed to support the ZE vehicle industry, particularly with regard to charging infrastructure. As previously noted, Local 595 is currently offering EVITP training to its members, as well as administering EVITP testing for anyone eligible. EVITP eligibility is dependent on a state licensure, electrician certification, or otherwise demonstrating 8,000 hours of hands-on electrical construction experience. Course instruction and examination is estimated to be 20 hours.

The Alameda JATC receives 300-500 apprenticeship applications on a quarterly basis and have receive about 50-60 new apprentices per year, while 20-25 retire. While Local 595 has the capacity to train 400 participants at a time, the number of apprentices accepted is related to labor demand in the field to ensure apprentices can achieve their 8,000-hour on-the-job training requirement in the targeted five-year period. To maximize—or at least increase—the number of apprentices accepted for training, Local 595 requires evidence of union labor demand in the field. Local 595 and the Construction Trades Workforce Initiative - Building and Construction Trades Council of Alameda County (CTWI-BTCA) stated that the absence of ubiquitous labor standards for EV charging installation and/or service projects requiring union labor is their top barrier. For example, state-certified electricians are only required for C-Specialty Contractors and not by a Class A General Engineering License, so if a project does not have an explicit requirement for Class C specialty contractors, union contracts are much less likely to get the work.

As for CBOs, GRID Alternatives (GRID), Rising Sun Center for Opportunity (Rising Sun), and Cypress Mandela have all been pivotal organizations in providing various construction and clean energy job trainings to the East Bay workforce.

GRID has historically trained people for solar jobs and does not currently offer any training programs for auto or fast charging infrastructure. Given their role and position in the regional workforce training space, GRID was engaged in the stakeholder sessions and will support on the Stakeholder Guidance Committee. Rising Sun similarly does not currently offer any training programs for auto or fast charging infrastructure, focusing more on solar, energy efficiency, and construction training. They are aware of the career opportunities in the growing ZE-MDHD sector and are at present considering if and how they might expand training to support people pursuing those careers. Cypress Mandela, a CBO providing pre-apprentice construction training to community members at no cost, offers a 16-week green construction training pre-apprenticeship which can represent seven college credits at Laney College and University of California campuses. Cypress Mandela also provides an eight-week advanced training in the PG&E PowerPathway™ Program which could eventually lead to workforce opportunities associated with grid upgrades. Cypress Mandela representatives shared that providing training equipment is a challenge and they recommended standardizing training to support local CBOs.

While none of the CBO training programs in Ava's service area have any existing training capabilities directly tied to the ZEV industry specifically, whether for vehicle maintenance or charger installation and maintenance, they have been active in providing training opportunities in the solar industry. This experience gives these CBOs relevant perspective to potentially support the development of the workforce training for the ZE-MDHDV ecosystem.

Various CBOs also shared with Ava that attracting system-impacted people (formerly incarcerated) can be a key strategy to expand the regional workforce and to ensure equitable opportunity to participate in this growing sector. CBOs noted that some industries have historically been more sensitive to system-impacted workers, highlighting that the construction industry has been more accepting, while the solar industry has been more likely to turn away prospective workers based on failed background checks. As stakeholders in the ZE-MDHD sector consider how to expand labor pipelines, it will be important to consider providing some amount of assistance as various CBOs and other training programs have done. This type of assistance includes childcare, transportation assistance, public funding for externships, stipends, etc.

High Schools and Regional Occupational Programs

High schools provide pipeline workforce development programs for industry and skill development. High school programs are embedded within the pathway[36] programs selected by students. According to the Oakland Unified School District (OUSD), "pathways consist of a cohort of students who experience a sequence of industry-themed curricula that integrates career and technical education courses, core academic courses, work-based learning opportunities and student support services." For example, the Skyline Energy, Environment & Utilities Green Academy is currently supporting building construction trade skill sets with hands-on training. Fremont High School has a similar program with a construction boot camp.

High schools can access supporting networks from CBOs, labor unions, and community colleges alike. Fremont High School is looking into working with IBEW, particularly the Local IBEW 595, and the Cypress Mandela Training Center (Cypress Mandela) on the development of electrical infrastructure installation and maintenance training. More information will be provided on CBOs and labor unions in the next section.

36. A career pathway is a career-themed program available at a high school. An academy is another term used at individual schools to describe career pathways.

In addition to school districts, Ava also invited the Eden Area Regional Occupation Program (Eden Area ROP) to join the working sessions. Eden Area ROP provides "post-secondary career preparedness" specializing in Career Technical Education (as a CTE provider) and partners with Castro Valley, Hayward, San Leandro, and San Lorenzo Unified School Districts to strengthen and broaden the students' educational experience. The organization is governed by a board of Unified School District representatives. Eden ROP provides programming for high school students and adult students as well. While Eden Area ROP representatives shared that there is board support to provide training for emerging and growing market sectors like ZE goods movement, they do not currently provide any training that directly prepares participants for ZE-MDHDVs maintenance or fast charging installation/maintenance.

High school students within the listed school districts are eligible for Eden ROP's high school programs, which currently provide programming for 4,500 students across various disciplines. There are currently no electrical programs available to high school students, though there are two automotive (light-duty) classes offered per year with around 120 students participating annually. As for adult programs, Eden Area ROP offers an electrical program that is geared toward workers new to the trade. The course follows the NCCER Core Curriculum, providing participants with a general introduction to various electrical concepts and settings. Upon completion, participants receive certification of program completion, OSHA 10, CPR, and their Electrical Trainee (ET) card.

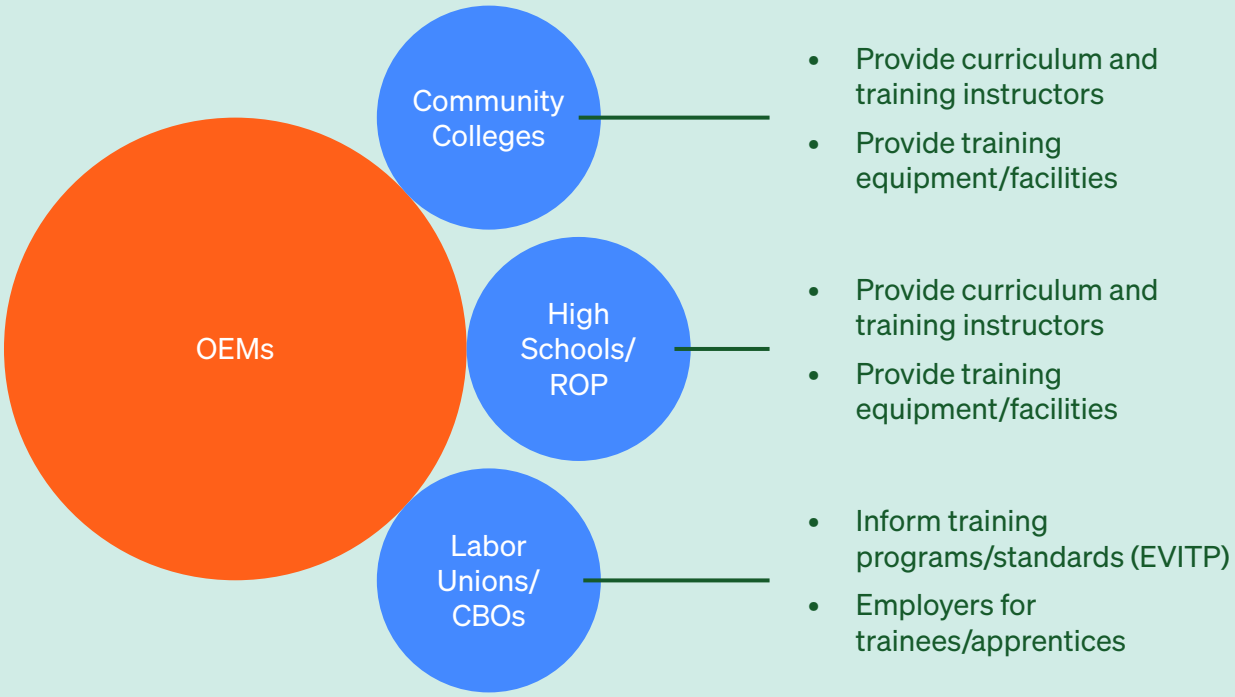
There was a clear distinction observed in comparison between Eden ROP and a traditional community college training program. While the ROP is governed by school district representatives, they are not held to the same requirements for program development as the community colleges. As a smaller organization, the ROP has benefitted from being able to maneuver more quickly when it comes to OEM partnerships, curriculum development, and program approval. For example, the duration for a program to be fully developed at the college level is about two years. Board approval for programs at the Eden ROP can be turned around in a few weeks.

The high school students can benefit from several automotive programs offered both during the day and evening hours, providing students with standard automotive repair and maintenance skills through online industry safety training, instructional content, and hands-on shop work. Within their adult programs, Eden ROP provides the Electrical Program, with topics including: Motor Controls, OSHA 10 Construction Safety, Programmable Logic Controllers, and others. While current programming does not include ZE-MDHDV maintenance or charging infrastructure training, Eden ROP and similar programs may be uniquely positioned to provide a pipeline of students to community colleges or directly to industry. This is the model observed through current programs where students go to Chabot College or to industry.

Community Colleges

Community colleges currently play a crucial role in providing vehicle technician training across the country. Ava and EBEDA held stakeholder sessions to understand how curriculum is developed for automotive programs at Bay Area community colleges and what challenges the institutions face in developing and maintaining training programs, particularly as they look to resource themselves to extend program offerings and curriculum to cover new technologies like battery-electric and hydrogen fuel cell trucks. Representatives from Peralta Community College District and Chabot-Las Positas Community College District were engaged.

Figure 16. Workforce Development Roles of OEMs



Community colleges within both districts have already established automotive repair programs, the majority of which are focused on light-duty vehicles. A subset however have developed MDHD diesel mechanics curriculum. Those with diesel training specifically may represent an opportunity to integrate relevant ZE-MDHDV curriculum near-term. The leading driver for any new curriculum development, however, is faculty engagement. Community college stakeholders identified various pathways to develop a course or training program for ZE-MDHDVs, three of which stood out: 1) a for-credit program, 2) a not-for-credit program, and 3) apprenticeship programs.

The OEM Nexus

OEMs were not engaged in the Blueprint workforce development stakeholder sessions, but they hold a unique position that overlaps or involves all stakeholders. Figure 16 demonstrates their ongoing and potential relationship.

Within the emerging ZE-MDHDV industry, the priority for vehicle manufacturers has focused on training current maintenance technicians employed by the OEM and their dealers to service their vehicles and new vehicle models. For example, Volvo Group has developed a robust online training program available to their technicians.

Additionally, technicians need to be certified as ASCE Master Technicians before taking further training. Then, they provide in-person training at one of four U.S.-based locations. The City of Hayward is where one of these training facilities is to be located, which is in Ava's service area.

Regarding diesel support staff, ZEV technicians are still the minority and can even be considered specialized. While some trained electric vehicle service managers for ZE transit vehicles may be available to provide diagnostics and repair services in the event of an issue with the truck, the industry acknowledges that this is not a long-term solution relative to the growing scale of ZE-MDHDV deployments. Many fleets require their own fleet technicians certified to diagnose and service a vehicle as efficiently as possible, without having to either wait for a dealer-based technician or get the vehicle to the dealer/OEM service center for repair. As more ZE-MDHDVs get on the road, OEMs will quickly learn the most common issues and should integrate that knowledge into their approach to training technicians and better supporting customers' needs to receive efficient service in the field. For example, there is not yet enough data from the small number of vehicles in operation today to confidently identify the top five "fault codes."

In addition to engaging Volvo, Ava and CALSTART spoke with Lion Electric. Like Volvo, Lion trains current and incoming staff on their electric bus and truck models. Lion also provides training to fleets that includes a two-day in-person training that provides a thorough overview of the systems, a foundational training on high voltage including lockout/tagout procedures, and vehicle preventative maintenance. Lion noted they also plan to utilize an online learning management system accompanied with a shadowing/apprenticeship model to train their internal technicians.

Throughout the Blueprint workforce development stakeholder conversations with OEMs, vehicle standardization was also raised as a challenge in training ZE-MDHD technicians. There is little standardization of systems and component placement with ZE-MDHDV manufacturing, so while educational centers can provide introductory training, not all systems may be covered in instruction. That said, OEMs did share that technicians that receive any extensive ZE-MDHD training are much better suited to work on another OEM's vehicle than someone new to the field.

Workforce Projections

In April 2021, the BW Research Partnership[37] prepared a report for Advanced Energy Economy to identify companies, jobs, growth rates, and opportunities for electrification called "Electrifying California: Economic Potential of Growing Electric Transportation." The report acknowledged California's large market share in the deployment of electric vehicles in light-duty segments (5%) and as a primary player in the statewide implementation of charging infrastructure. California is projected to see TE-related[38] employment grow 79% between 2020 and 2024. The report also noted that in 2019, Alameda County had the highest TE-related employment figures in the state, with 16,400 jobs. Los Angeles County was the second highest at 5,600 jobs (about one third of Alameda County's jobs).

The report also identified specific transportation electrification related occupations (Table 14). Additionally, the project team has also begun working with the San Francisco Bay Center of Excellence for Labor Market Research to quantify historic trends and the current relevant workforce in the region, as well as to identify potential channels of opportunity and sources of constraint relative to these occupations.

37. BW Research Partnership is an applied research firm supporting clients with economic and workforce research, customer & community analyses, as well as strategic planning and evaluation services.
38. The report defined "TE-related" as a worker spending any time on electric transportation goods and services.

Community college stakeholders, however, shared that the current state of enrollment in the East Bay has decreased by ~20% regionally since 2019. This enrollment decrease is primarily influenced by population shifts out of the Bay Area, coupled with a national trend in community college enrollments away from trades training. The upside is that curriculum completion is high once students are enrolled. The growing need for TE-related jobs paired with the shrinking community college enrollment trends are cause for concern.

Table 15. Key Occupations in Transportation Electrification

Key Occupations	2019 TE Jobs	Projected 2024 TE Jobs	Median Hourly Wage
Miscellaneous assemblers and fabricators	10,380	19,547	$15.59
Laborers and freight, stock, and material movers, hand	1,475	3,014	$14.98
Automotive service technicians and mechanics	1,467	2,814	$22.60
Sales representatives, wholesale and manufacturing, except technical and scientific products	970	1,856	$29.86
First-line supervisors of production and operating workers	663	1,299	$30.84
Parts salespersons	578	1,117	$16.29
Electricians	466	991	$31.06
Industrial engineers	417	855	$48.52

Developments and Progress

While workforce may be a massive invisible barrier in the transition to ZE-MDHD goods movement, a number of key developments have been made that are critical to highlight, learn from, and replicate at scale.

Partnerships

Given the large and diverse network of stakeholders, partnerships will be key to driving success. Community colleges in partnership with labor unions like IBEW will be fundamental to closing the skill set gaps found in the ZE-MDHDV and charging infrastructure sectors.

Through CALSTART's listening sessions, Long Beach City College (LBCC) identified four colleges[39] in California offering advanced transportation programs and electrical programs that integrate ZE technology into their curriculum and has even begun its own partnership with IBEW to provide apprenticeship credits for students earning an LBCC degree (Associate in Science, Advanced Transportation Technology – Alternative Fuels or Electric Vehicles).[40]

Additionally, employers in the ZE-MDHDV and charging infrastructure sector will also be responsible for helping community colleges provide robust and competent training programs to incumbent workers, i.e. upskill training. Noncredit classes at community colleges are often fee-based and can be offered during the evening and on weekends for increased accessibility to incumbent workers. Employers can also utilize the Employment Training Panel (ETP), funded by California employers through a payroll tax, to subsidize these course fees for their incumbent workers.

ZE-MDHD OEMs that may have partnerships with community colleges could be in a position to potentially provide vehicles as training aids, offering students insight and hands-on experience working with new technologies. Finally, both community colleges and employers must continue to engage K-12 Linked Learning School Districts to immerse students in ZE-MDHD goods movement related careers early in their education.

Messaging the Moment

With a major need for a trained and resilient workforce across the country, paired with a decline in community college enrollments nationwide in a generational trend toward tech-centered jobs away from the trades, there is both a predicament and an opportunity. From California Community College Consortium research, prospective and incoming community college students and their peers are prioritizing computer-based careers, as well as environmental/green jobs. While this has led to a decline in trade-related programs, ZE-MDHD technician careers are both tech-focused and in the environmental/green job space. This leads to a communications, marketing, and storytelling opportunity.

In the Bay Area, the community colleges have run an ad campaign and hosted an associated website—Next Gen Auto—to communicate the opportunities and pathways available to high school students and parents, as well as displaced and returning workers. This type of effort, effectively rebranding and actively promoting the auto technician career path, ought to be amplified across the state.

39 East Los Angeles College, Los Angeles Trade Tech College, Rio Hondo College, and Long Beach City College

40 Port of Long Beach. Zero Emission Port Equipment Workforce Assessment - Final Report.

Learning from ZE Transit

Transit agencies have been playing a fundamental role in training and upskilling technicians that may be engaged in transit today but could be workers in the ZE goods movement economy tomorrow. The Southern California Regional Transit Training Consortium (SCRTTC) consists of multiple transit agencies and community colleges that bring high-standard training resources to transit operation teams. The SCRTTC, who has broadened its scope to other regions in California, offers classes focusing on: Volt Ohm meter usage, general concepts like brakes, doors, bodies, and electrical systems, advanced concepts like HVAC and hybrid vehicle training, safety, and diagnostics, and more specific advanced training in safety courses, zero-emission buses (ZEB), and leadership skills. In their Gap and Needs Assessment report, the SCRTTC identified electrical code training, computer network training, diagnostic tool training, electric meter training, and electric and hydrogen fuel-cell training as fundamental course offerings. SCRTTC also found that technicians require soft skills like communication, leadership, and development of good judgment, while instructors require pedagogical skills such as creating pre/post assessments, lesson plans and objectives, and creating content that incorporates modern instructional practices like videos, PowerPoint presentations, and 3-D modeling. Apprenticeships and mentorships also play a vital role in SCRTTC curricula and successful technician training overall. With certain relevant curriculum overlaps, the Bay Area community colleges with existing Diesel Mechanics degree programs are connected with SCRTTC in open dialogue to enable more efficient program and curriculum development as certain community college programs look to expand their offerings to include ZE-MDHDV training, as well.

Case Study: AC Transit is a Regional Workforce Leader

AC Transit is California's largest public bus-only transit agency and is internationally recognized as a leader in ZEBs. AC Transit has improved its deployment process over 20 years by continuously advancing their practices in procurement, project delivery, operations, and ZEB technology performance. AC Transit's Maintenance Training Plan (Plan) is a robust training program that allows staff and employees to develop higher competencies with the ZE technologies they integrate into their fleet and maintain/operate long term. The Plan invites OEMs and internal stakeholders to instruct staff in basic and advanced bus component and safety courses. AC Transit's current training includes awareness of high-voltage systems, dash controls and indicator lights, specific start-up and shut-down procedures, and defensive driving safety. Additionally, AC Transit immerses their employees in mixed reality training programs, allowing hands-on experience while receiving virtual instruction. Leveraging the build-it-yourself model AC Transit has developed may help ZE-MDHD goods movement workforce development stakeholders leapfrog to where AC Transit is today.

While organizations like SCRTTC provide upskill training to current transit agency workers, transit agencies like Alameda-Contra Costa Transit District (AC Transit), among others, are developing full-fledged programming complete with learning management systems in-house through the support of grant funding. The skills workers gain through either of these pathways are likely transferrable to the ZE-MDHD goods movement economy and were in turn reviewed for Ava's Blueprint.

Case Study: Volvo LIGHTS

Volvo Trucks and other partners, supported by CARB and the South Coast Air Quality Management District (SCAQMD), deployed battery-electric equipment at two warehousing facilities in Southern California operated by Dependable Highway Express and NFI Industries. Equipment deployments, accompanied by charging infrastructure, include forklifts, yard tractors, Class 7 box trucks, and Class 8 tractors at both facilities.

Facilities also benefitted from the installation of solar panels, energy storage systems, and workplace charging services. Volvo's TEC Equipment dealership, the nation's first EV certified dealer-provided electric truck maintenance facility, provided valuable insight on the future of electric truck maintenance. TEC Equipment, with locations in Fontana and La Mirada, are full-service, heavy-duty truck dealerships. TEC Equipment offered fleets the ability to lease the battery electric trucks for real-world trials. There were three (3) educational institutions involved in the project. The University of California, Riverside supported Portable Emissions Measurement Systems testing and data collection. Volvo Group partnered closely with two community colleges—Rio Hondo College and San Bernardino Valley College (SBVC) in the development of electric truck technician training curriculum to support workforce development. According to Rio Hondo's Professor John Frala, Rio Hondo College is designing a technician program specific to Volvo heavy-duty electric truck maintenance, helping to support workforce development in the region and utilizing Volvo's first-of-its-kind augmented reality-based training program.

SBVC is designing an associate degree training program specific to heavy-duty battery-electric truck maintenance. Automotive Technology Department enables students to earn Automotive Technician certificates and take a range of courses, including truck electrical systems, electrical systems diagnosis and repair, and engine repair.

Learning from Southern California

Educational institutions are continuously looking to partner with OEMs for a multitude of support options including curriculum development, training, and providing equipment and/or shared facilities. A key example of a successful OEM and college partnership on ZEV training was implemented through a $45M grant project, Volvo LIGHTS, funded by CARB.

Volvo LIGHTS is an example of what an OEM/college partnership could look like. In addition to curriculum development, Volvo provided vehicle equipment and parts for the students to have hands-on training experience with ZE-MDHD parts and systems. It provided a pathway for access to learning about Volvo MDHD vehicles and overcame hurdles seen by community colleges today. It is unclear if replicating the Volvo LIGHTS model statewide is a viable pathway given supply chain issues and excessive costs. These inhibitors may limit the opportunity for donation of vehicles and equipment. Volvo has also recently announced they plan to build a network of fast chargers (California Electrified Charging Corridor), and there may be training opportunities between dealerships (and not the OEM itself) and community colleges to evaluate.

Key Barriers

Workforce development was frequently cited as a categorical barrier to future growth for ZE-MDHDVs due to the limited availability of vehicle technicians who can repair and maintain this new technology, as well as certified electricians to install and maintain the associated charging infrastructure. Within the umbrella itself, however there are a number of specific barriers to be addressed.

Funding

The most significant challenge for community colleges in developing and sustaining ZE-MDHDV and/or charging infrastructure training programs is funding from state grants, the California State Lottery,[41] and other sources like Perkins funding. Adequate funding is critical to support the workforce necessary to transition to a ZE goods movement economy. We are reinventing the way we move freight in real time. The vehicle and refueling infrastructure needed to ensure business continuity of the goods movement economy depends on a robust workforce that can keep vehicles in operation and chargers online at least 97% of the time. This level of preparedness requires the state to make investments that support all community colleges on faculty professional development and retention, curriculum development, and training equipment purchases (from software and computers to trucks and chargers). The perspective shared by Ava's community college stakeholders was that funding sources were a major gap due to diminishing investments by the state in workforce training. Existing automotive and heavy-duty diesel training programs have not been properly prioritized in terms of state funding which has increasingly focused on healthcare or information technology. This is unfortunate given that the emissions from MDHD trucks contribute to health care issues and ZE-MDHDVs are new on-road technologies driven by software. Additionally, the state regulations mandating the transition to ZE-MDHDVs do not account for the need to prioritize funding for workforce development today to enable this transition to be successful in the coming decade.

Trainer Training and Retention

Community college faculty engagement was also identified as a barrier specifically for ZE-MDHD workforce training for a few reasons. First, there are not enough knowledgeable trainers well-versed in ZE-MDHDVs to train other instructors. Second, those who are considered technology experts are opting for higher wage opportunities with vehicle OEMs. In turn, a key gap in accelerating the market for ZE-MDHDVs is boosting interest and motivation in professionals becoming training program faculty members. All of this is coupled with another key gap that is more of a macroeconomic issue but is affecting trainer availability and the workforce itself and that is the significant nationwide shortage of HD (diesel) technicians, of which there is simply a small talent pool.

Curriculum

CALSTART's listening session also identified bureaucratic processes associated with curriculum development that led community college stakeholders interviewed to determine that notncredit programs have an easier approval process. For-credit curriculum may result in higher cost and extensive time commitments from faculty due to the required approval processes. These steps involve administration or board approval which can take multiple years, even though actual time spent on development of curriculum materials is not a barrier itself if there is faculty willing to work on it. Stakeholders also shared

41. Click here for additional information on how the California State Lottery has funded each school district.

that, should a college pursue a new on-campus program, they would need a new facility to accommodate it. Such construction might last more than a decade due to the requirement for a bond measure to finance the public project. This would add a significant amount of time and cost to the process. This obstacle could be overcome, however, through a partnership with a local OEM training facility or dealer that could serve as a site host for training.

Regarding the ZE-MDHD goods movement industry, perception also drives decision-making and community colleges perceive that industry dealerships and OEMs are not being proactive in providing training support. Additionally, community college stakeholders shared that their institutions lack knowledge on how to mitigate the risk of current technology irrelevance over time in the absence of OEM support for training programs. This could lead to workers who are not marketable because they cannot keep up to date on the latest software or hardware and may also lead to stranded assets on campuses.

Takeaways

Despite the challenges identified by Ava's community college stakeholders, there is still a significant and optimistic willingness to develop meaningful ZE-MDHD curriculum to accelerate vehicle adoption and support regional workforce development. This is currently observed by various ongoing efforts: automotive (light-duty) program partnership pursuits with OEMs, apprenticeship development potential and ability to be creative in program development, exploring municipal partnerships and development of high-level training manuals/materials. There is such a rich dynamic to understand in the space of workforce development, with many more takeaways detailed in the in-depth Summary of Workforce Training and Needs Report (Attachment 4) that Ava submitted to the CEC in August 2022.

Given the robust workforce-specific stakeholder process the project team ran over Summer 2022, there are 31 Workforce Development Actions within the Blueprint Actions. They span the following Strategy Areas and seek to address the need to attract, train, and retain certified workforce to maintain the growing population of zero-emission Class 3-8 vehicles, as well as a certified workforce to install and maintain the associated EV charging infrastructure, all on a timeline that does not bottleneck vehicle deployments or cause goods movement business operations disruptions. The Strategy Areas are:

- Vehicle Maintenance
  - Curriculum Development and Program Approval
  - Trainer Capacity Building and Retention
  - Partnerships for Equipment and Facilities
  - Workforce Analysis and Attraction
- Charging Infrastructure
  - Curriculum Development
  - Trainer Capacity Building and Retention
  - Partnerships for Equipment and Facilities
  - Workforce Analysis and Attraction
  - Labor Standards

Community Benefits

Establishing a Baseline

Community benefits capture the essence of what is at stake in the transition to ZEVs, especially ZE-MDHD goods movement vehicles. The policy and market developments to drive the availability and adoption of ZEVs exist because of the environmental and human health impacts of ICE vehicles. Community benefits center on the reductions in greenhouse gas and criteria air pollutants that result from ZEV adoption, but also include economic development and mobility opportunities, direct investments into Equity Priority Communities, and broader transparency and accountability of public and private stakeholders.

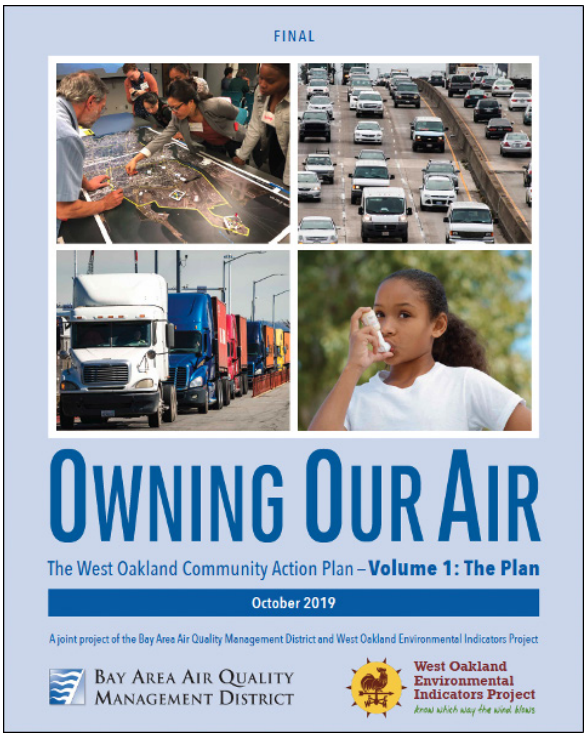
Activity Underway

Within Ava's service area there is a very engaged network of local and regional stakeholders, many of whom have already been involved in the development and implementation of an advanced set of plans related to community benefits. Through the AB 617 Community Air Protection Program (CAPP), the West Oakland Community Action Plan (WOCAP) was developed as the first of its kind in the state.[42] The Steering Committee was formed and kicked off in 2018 as a partnership between the Bay Area Air Quality Management District (BAAQMD) and the West Oakland Environmental Indicators Project (WOEIP), with BAAQMD Board of Directors adopting the plan in October 2019.

The WOCAP focuses on human health impacts to the Port of Oakland fenceline community in West Oakland and puts forward stakeholder-developed actions to measure air quality and work to improve it, calling on numerous related parties to engage and own these actions. In short, the plan is focused on achieving "air parity" and is the guiding resource for emissions and air quality action in Ava's service area. In February 2022, approval was granted for BAAQMD and the AB 617 community of East Oakland to partner on a CAPP working group and action plan. The Steering Committee kicked off in September 2022.

Additionally, the Port of Oakland's Seaport Air Quality 2020 and Beyond Plan is an action plan related to Port activities and efforts toward ZE operations that was released in May 2019.[43]

Figure 17. "Owning Our Air: The West Oakland Community Action Plan - Volume 1"



42. https://woeip.org/wp-content/uploads/2020/11/WOEIP-research-Owning-Our-Air-full.pdf
43. https://www.portofoakland.com/files/PDF/Volume%201.pdf

The plan puts forward a common framework and guidance for equipment, fuels, and infrastructure with five key goals: 1) keep the Port competitive and serving as a catalyst for local jobs and economic development, 2) minimize criteria air pollutants, 3) reduce greenhouse gas emissions, 4) build and strengthen partnerships, and 5) provide opportunities for meaningful stakeholder engagement. Each year the Port produces an annual progress report, making this another foundational action plan and stakeholder-led process that Ava looked to and built upon with regards to community benefits strategies and actions in the Blueprint.

In 2021, the San Joaquin Valley Air Pollution Control District completed a Community Emission Reduction Program Report[44] for the Stockton AB 617 community. In February 2022, approval was granted for BAAQMD and the AB 617 community of East Oakland to partner on a CAPP working group and action plan as well. East Oakland is located along major freight corridors including I-880 and I-580 and is home to significant industrial activities. It is also where many logistic and other warehouses are located, given its proximity to both the Port and Oakland International Airport, which moves 1.5 million tons of air freight annually. The Steering Committee kicked off in September 2022.[45]

Figure 18. "Seaport Air Quality 2020 and Beyond Plan"

Developments and Progress

While there is activity actively underway in Ava's service area through the AB 617 process in both West and East Oakland, on a broader level the state is also working to develop universal community benefits metrics that can be used to track and measure impact of state-funded infrastructure projects, as well as align stakeholders around common objectives. This is primarily being led by the CEC's Community Benefits Metrics Workshops process through the Clean Transportation Program. The exercise of identifying and defining metrics is a challenging task. An impactful set of metrics balances specificity without being prescriptive and running the risk of a metric or methodology being irrelevant in certain circumstances, with universality without being so high-level that the metrics or methodologies are hard to put into practice. Ava is grateful for the CEC's leadership on creating this process and alignment and looks forward to the final set of metrics.

44. Stockton Community Emissions Reduction Program Report. March 2021
45. CARB: CAPP – East Oakland; Stockton

Evolving Community Benefit Paradigms

The project team also spent time discussing evolving practices around community benefits with public agencies and CBO stakeholders. In addition to local air quality improvement and potential job creation from infrastructure projects, Equity Priority Communities are also advocating for direct investment in the form of community-side project funding. For example, as the Justice40 funding approach is rolled out at the federal, state, and local levels there is opportunity for the 40 percent of funds going toward Equity Priority Communities to not just be the installation of chargers in one of these census tracts, but an investment in a community-selected project (transportation electrification or otherwise) that will deliver direct value in a prioritized area to the people most affected. Through collaboration with local CBOs, this new practice, particularly through public grant funding opportunities, opens a new avenue for the clear and more immediate delivery of community benefits along with truck and infrastructure projects that will bring longer-term benefits. This said, a more consistent framework for how this practice can be applied from the grant-making and grant applicant side is needed to ensure opportunities are accessible, transparent, and consistently available.

Key Barriers

Through lessons learned by the local activities already underway, there are a number of continuing challenges—and some new challenges—that continue to need to be addressed. These barriers include the streamlining of metrics and progress tracking, as well as the alignment of stakeholders around emerging and evolving frameworks around community investment and benefits.

First and foremost, alignment is needed among stakeholders at various levels around what is meant by "community" and by "benefits" when discussing objectives, projects, and investments. A shared language and framework for statewide and local contexts that link together and speak to one another will ensure that planning, stakeholders' engagement, implementation, and measurement are done by a shared set of principles and expectations that center those intended to benefit. Relatedly, there are currently no streamlined mechanisms for measuring and evaluating qualitative or qualitative metrics at all scales. Having not only streamlined mechanisms but also central resources for tracking progress is imperative to ensure consistent and equitable outcomes of state and local programs. The ecosystem of impact tracking is currently very fragmented and there is no clear central player yet to facilitate a change.

Within the realm of evolving community benefit paradigms, there is no consistent or agreed upon framework yet for enabling and implementing direct community investments as the project team has started to pilot with local partners. Aligning community expectations with agency practices within this new framework has yet to be achieved, though is a critical step to ensuring successful implementation that centers community benefit.

Takeaways

The project team leveraged each of the plans noted above and their actions to develop the Blueprint's Community Benefits Strategies and Actions. Ava will continue participating in work groups and steering committees associated with these plans, as well as local, state, and federal efforts to track updates that serve as an opportunity to iterate on the Blueprint. Ava will also pursue funding opportunities to implement Blueprint Actions that result in measurable Community Benefits.

The Blueprint Actions are unique to the task of delivering social, economic, and public health benefits to all through the various components of the transition to a ZE-MDHD goods movement economy. They include 15 Actions across the following Community Benefit Strategy Areas:

- Defining Metrics
- Measurement and Verification
- Direct Community Investments
- Transparency and Accountability

Blueprint Actions

Preface

These Blueprint Actions were developed after a year of thorough data analysis and a robust set of stakeholder interviews. They were reviewed and refined collaboratively with the Stakeholder Guidance Committee to find their final form presented in this Blueprint. These actions are specific to the near-term time frame of 2023-27, as Ava and the collective stakeholders appreciate the dynamic nature of the MDHD goods movement ecosystem transition to new technologies. This Blueprint is intended to be iterative, with mid- (2028-32) and long-term (2033+) Actions developed closer to those time frames to retain relevance as the market evolves.

Vehicles

Market Research and Data Analysis

#	Actions	Authority	Implementation				
			2023	2024	2025	2026	2027
1.	Annually assess ZE market readiness for MDHD vehicles registered in Ava's service territory based on best available data via IHS, DMV, and ZETI tool.	Ava, CALSTART					
2.	Annually assess real world vehicle adoption data via DMV registrations, dealers, and leasing providers to quantify and analyze: • The types of fleets and vocations transitioning, • vehicle classes and models being deployed most, • the breakdown between vehicle purchases and leases, and • used vehicle adoption trends. Results will be compared between the Los Angeles region and Ava's service area to identify differences in trends and opportunities for replication and/or apply lessons learned/best practices.	Ava, LACI, CALSTART					
3.	Collect and analyze data from Tier 2 fleets on vocation readiness and needs through evFleet Consulting (detailed in Vehicles Action #12) to understand and project mid- and long-term electrification opportunities for fleets in vocations without commercially available ZEV options yet.	Ava					
4.	Develop a HVIP heatmap to visualize geographic distribution of redeemed and unredeemed vouchers issued per square mile. The heatmap will be updated annually for three years.	Ava, CALSTART					

#	Actions	Authority	Implementation				
			2023	2024	2025	2026	2027
5.	Conduct the same data analysis completed for the MDHD vehicle population in Alameda County and the City of Tracy for the new JPA member, the City of Stockton.	Ava, City of Stockton, Port of Stockton, CARB					

Marketing, Education and Outreach

#	Actions	Authority	Implementation				
			2023	2024	2025	2026	2027
6.	Organize Ava outreach campaign to Tier 1 and Tier 2 stakeholders to fill the Ava evFleet Consulting pipeline. Leverage public agencies and other trusted communication channels to get the word out. This will be in conjunction with Infrastructure Action #9.	Lead: Ava; Support: CARB, BAAQMD, ACTC, Go-Biz, Ava JPA member cities, Port of Oakland, local dealerships					
7.	Implement information sharing campaigns to Tier 3 stakeholders to provide market and regulatory updates and resources, ensuring information is available in relevant languages. This will be in conjunction with Infrastructure Action #11.	Lead: CARB; Support: BAAQMD, ACTC					
8.	Evaluate formal outreach partnership opportunities with vehicle providers and dealerships as channels for disseminating information about vehicle regulations, grant and incentive programs, Ava evFleet Consulting services, and possibly events for EV exposure (e.g., Ride and Drive).	Ava, local dealerships, vehicle lease providers					

#	Actions	Authority	Implementation				
			2023	2024	2025	2026	2027
9.	Organize and host Drayage Ride and Drive event at Port of Oakland that offers hands-on experience and informational sessions for drayage operators.	Lead: CARB, CALSTART, Port of Oakland; Support: BAAQMD, ACTC, local dealerships					
10.	Host Class 3-6 Ride and Drive event that offers hands-on experience and informational sessions for vehicle operators.	Lead: CARB, CALSTART; Support: BAAQMD, ACTC, local dealerships					

Technical Assistance

#	Actions	Authority	Implementation				
			2023	2024	2025	2026	2027
11.	Offer technical assistance ("evFleet Consulting") to Tier 1 stakeholders to assess market availability of ZEVs relative to fleets' vocations and daily operations. evFleet Consulting will be inclusive of the charging assessment detailed in Infrastructure Action #12.	Ava					
12.	Offer evFleet Consulting to Tier 2 stakeholders to assess market availability of ZEVs relative to fleets' vocations and daily operations. evFleet Consulting will be inclusive of the charging assessment detailed in Infrastructure Action #13.	Ava					

#	Actions	Authority	Implementation				
			2023	2024	2025	2026	2027
13.	Coordinate technical assistance programs, putting in place a standard operating procedure that maximizes customer participation.	Ava, PG&E					
14.	Develop grant writing assistance program for evFleet Consulting participants; coordinate with SCE to incorporate best practices from SCE's grant writing technical assistance program. The result of this Action will be leveraged in Financing Action #6.	Ava, SCE					

Advocacy

#	Actions	Authority	Implementation				
			2023	2024	2025	2026	2027
15.	Track and assess ZEV regulatory proceedings and requirements; submit comments where applicable.	Ava					
16.	Assess feasibility of advocating for removal of the Federal Excise Tax for ZE Class 3-8 vehicles.	Ava					

#	Actions	Authority	Implementation				
			2023	2024	2025	2026	2027
17.	Evaluate feasibility of Zero-Emission Delivery Zones and/or updating zoning and parking policies, looking to LACI pilots in Southern California for methodologies and lessons learned. Pursue grant funding opportunities where applicable.	Ava JPA member cities, BAAQMD, LACI					
18.	Evaluate advocating for exemptions (or reductions) from sales tax and registration fees for ZE Class 3-8 vehicles until overall cost parity is achieved.	Ava, Port of Oakland					
19.	Evaluate advocating for an increase in weight limits to above 82,000 pounds for over-the-road Class 8 BETs, where feasible.	Ava, Caltrans, Ava JPA member cities					

Infrastructure

Market Research and Data Analysis

#	Actions	Authority	Implementation				
			2023	2024	2025	2026	2027
1.	Leverage statewide and regional efforts (e.g., CTC SB 671, HEVI-Pro, ACTC, FIP) to assess charging infrastructure needs (i.e., # of EVSE/ports) in Ava's service area, mindful of evolving analytical approaches.	Ava					
2.	Leverage statewide efforts (e.g., CTC SB 671, CEC/ LBNL-HEVI Load, FIP) modeling load and grid capacity associated with charging infrastructure in Ava's service area.	Ava					
3.	Purchase and assess telematics data for a sample population of drayage trucks operating in and through the Ava service area to identify potential destination charging sites based on vehicle travel and stopping patterns.	Ava					
4.	Collaborate with Port of Oakland to: 1. Confirm drayage truck charging needs and siting analysis in and around the Port 2. Confirm via drayage truck operator engagement where charging infrastructure is needed within and beyond the boundaries of Ava's service area (barbell approach) 3. Track infrastructure deployment	Ava, Port of Oakland, SMUD, Harbor Trucking Association, Western States Trucking Association, California Trucking Association					
5.	Ava to include analysis of charging needs in the City of Stockton from the Port of Stockton's Blueprint and the pending Northern CA Megaregion Zero-Emission Medium-/Heavy-Duty Vehicles Blueprint.	Ava					

#	Actions	Authority	Implementation				
			2023	2024	2025	2026	2027
6.	Purchase and assess MDHD vehicle travel data to assess travel behavior in/out/through Ava's service area.	Ava					
7.	Assess customer load profiles associated with charging infrastructure throughout service area.	Ava					

Marketing, Education, and Outreach

#	Actions	Authority	Implementation				
			2023	2024	2025	2026	2027
8.	Collect and share industry best practices to inform Ava's fleet/vehicle operator engagement marketing and outreach strategy, tailoring efforts to market segments and types of operators.	Ava					
9.	Organize Ava outreach campaign to Tier 1 and Tier 2 stakeholders to fill the Ava evFleet Consulting pipeline. Leverage public agencies and other trusted communication channels to get the word out.	Ava					
10.	Develop a pre-qualified vendor list for behind the fence charging infrastructure. Ava to consider leveraging list.	PG&E					

#	Actions	Authority	Implementation				
			2023	2024	2025	2026	2027
11.	Implement information sharing campaigns to Tier 3 stakeholders to provide market and regulatory updates and resources, ensuring information is available in relevant languages. This will be in conjunction with Vehicles Action #7.	Lead: CARB; Support: BAAQMD, ACTC					

Technical Assistance

#	Actions	Authority	Implementation				
			2023	2024	2025	2026	2027
12.	Offer technical assistance ("evFleet Consulting") to Tier 1 stakeholders to assess facilities and charging opportunities/constraints relative to fleets' vocations and daily operations. Data collected from assessment to inform Ava infrastructure investment strategy/priorities. evFleet Consulting will be inclusive of the vehicle assessment detailed in Vehicles Action #11.	Ava					
13.	Offer evFleet Consulting to Tier 2 stakeholders to assess facilities and charging opportunities/ constraints relative to fleets' vocations and daily operations. Data collected from assessment to inform Ava infrastructure investment strategy/ priorities. evFleet Consulting will be inclusive of the vehicle assessment detailed in Vehicles Action #12.	Ava					
14.	Coordinate on technical assistance programs, putting in place a standard operating procedure that maximizes customer participation.	Ava, PG&E					

#	Actions	Authority	Implementation				
			2023	2024	2025	2026	2027
15.	Develop grant writing assistance program for evFleet Consulting participants; coordinate with SCE to incorporate best practices from SCE's grant writing technical assistance program. The result of this Action will be leveraged in Financing Action #6.	Ava, SCE					

Deployment of Charging Infrastructure and Electricity Rates

#	Actions	Authority	Implementation				
			2023	2024	2025	2026	2027
16.	Collect and analyze available data through evFleet Consulting to evaluate the feasibility of developing behind the fence charging solutions and/or public fast charging depots. Share data outcomes, as allowable, with regional and state infrastructure modeling efforts.	Ava					
17.	Leverage fleet relationships established via evFleet Consulting to support a utilization pipeline for fast charging depots (public and/or private sector).	Ava					
18.	Coordinate on drayage infrastructure needs to ensure the network of charging solutions within and outside of the Port boundaries is aligned to best meet the locational requirements of truck operators.	Ava, Port of Oakland, Port of Stockton					

#	Actions	Authority	Implementation				
			2023	2024	2025	2026	2027
19.	Evaluate feasibility of developing a commercial MDHD charging electricity rate that ensures affordable fueling costs for vehicle operators, 100% renewable energy content, and sustainable cost recovery of public funds.	Ava					
20.	Assess electricity rate and subsidy requirements associated with production of affordable green hydrogen to enable market acceleration of all zero-emission vehicle technologies.	Ava, GO-Biz					
21.	Coordinate process efficiency and flow to maximize fleet participation in front-of-the-meter support programs.	Ava, PG&E					
22.	Develop strategic substation upgrade plan to support incoming charging infrastructure requirements.	PG&E					
23.	Assess potential of launching a best-of-the-best demonstration challenge that showcases advancement of ZE-MDHD goods movement in Ava's service area (and beyond).	Ava, SMUD, GNA, NACFE					

Advocacy

#	Actions	Authority	Implementation				
			2023	2024	2025	2026	2027
24.	Advocate to the CPUC and state legislature for streamlined processes with regards to utility distribution network upgrades and service planning.	Ava, Ava JPA member cities, CCAs, ACTC, Ports, other state agencies (CTC, CARB, CEC, Caltrans), NGOs, CBOs, vehicle and charging OEMs, trucking associations					
25.	Assess feasibility of engaging Federal Motor Carrier Safety Association (FMCSA) in discussion around the classification of “Hours of Service” for time spent charging to best support driver needs, considering the anticipated return on investment of advocacy time.	HTA, CTA, WSTA					

Financing

Market Research and Data Analysis

#	Actions	Authority	Implementation				
			2023	2024	2025	2026	2027
1.	Engage in CARB's evaluation of potential LCFS regulation amendment concepts, understanding actual regulatory changes and what gaps may exist.	Ava					
2.	Evaluate the propensity of vehicle operators' interest in leasing vs. owning vehicles to understand market evolution and shifts; Ava to leverage information to pivot investments as market evolves.	Ava, consultant support					

Vehicle Cost and/or Risk Reduction

#	Actions	Authority	Implementation				
			2023	2024	2025	2026	2027
3.	Assess feasibility of developing and offering cost and/or risk reduction instruments in light of emerging CalCAP and/or IBank loan programs. Additionally, assess feasibility of including other public agencies in product offering.	Ava					
4.	Through Ava's evFleet Consulting program, provide concierge support for fleet applications to incentive, rebate, CalCAP loan, and/or grant funding opportunities for ZEVs. This will be in conjunction with Vehicles Action #14 and Infrastructure Action #15.	Ava, Frontier Energy/GNA					

Charging Infrastructure Investment

#	Actions	Authority	Implementation				
			2023	2024	2025	2026	2027
5.	Develop a project loan product for third-party developers or vehicle operators and offer it to the market through a competitive public RFO. The loan product will be designed to attract and accelerate infrastructure and/or vehicle deployment. • Consider multiple rounds of loan opportunities through public agency-led solicitations. • Consider pooling funding from multiple public agencies.	Ava, other public agencies					
6.	Through Ava's evFleet Consulting program, provide concierge support for fleet applications to incentive, rebate, and grant funding opportunities for charging infrastructure. This will be in conjunction with Vehicle Action #14 and Infrastructure Action #15.	Ava, Frontier Energy, GNA					
7.	Collaborate on federal, state, and local funding opportunities for MDHD charging infrastructure, leveraging analysis and partnerships developed through the Blueprint.	Ava, Port of Oakland, CEC, Caltrans					

Outreach and Advocacy

#	Actions	Authority	Implementation				
			2023	2024	2025	2026	2027
8.	Evaluate partnership opportunities with local dealerships to promote State loan products.	Ava, CARB, BAAQMD, TEC Equipment, Golden Gate Truck Center, other dealer network stakeholders					
9.	Promote State incentive and grant programs to eligible fleets and independent operators.	BAAQMD, Port of Oakland					
10.	Conduct outreach and advocacy to the truck financing community to educate them on ZE-MDHDV commercial values and market developments to enable loan and leasing terms comparable to ICE truck financing.	CARB, CALSTART					
11.	Conduct education and advocacy to the truck insurance community to educate them on ZE-MDHDV commercial values and market developments to enable comparable terms to ICE truck insurance policies.	CARB, CALSTART					

Workforce Development

Vehicle Maintenance: Curriculum Development and Program Approval

#	Actions	Authority	Implementation				
			2023	2024	2025	2026	2027
1.	Develop and agree upon a matrix of distinct electric MDHD technician levels, the associated skills required per level, and the party responsible for providing training of each the required skills. This matrix will serve as an industry guide that aligns the community colleges and OEMs on what skills are required and ensures a more streamlined and holistic training pathway.	California Community Colleges, vehicle OEMs					
2.	Register electric automotive programs to the Chancellor's Office Curriculum Inventory System (COCI) and post electric automotive curriculum materials to the Course Identification Numbering System (C-ID) to assist community college programs in curriculum and program development.	California Community Colleges					
3.	Submit ZE-MDHDV maintenance training material to the California Community College Regional Directors to post on the login-protected Advanced Transportation & Logistics webpage for community colleges to draw upon for curriculum and program development.	Vehicle OEMs					
4.	Maintain roster of at least one faculty champion per campus for ZE auto programs (i.e. department chair and/or electric automotive faculty l'ead). Convene at least annually to provide updates and opportunities around ZE auto program success, challenges, and opportunities. Evaluate role of EV Academy developing out of Rio Hondo College relative to this function.	Bay Area Community College Consortium (BACCC) Regional Director					

#	Actions	Authority	Implementation				
			2023	2024	2025	2026	2027
5.	Develop (OEMs) and implement (Eden Area ROP) Introductory Zero-Emission MDHD Auto Coursework for High School Students programming. Program to have ability to expand to serve upskilling and returning workers if/as Eden Area ROP has bandwidth to open auto programming to their adult students.	Vehicle OEMs, Eden Area ROP					

Vehicle Maintenance: Trainer Capacity Building and Retention

#	Actions	Authority	Implementation				
			2023	2024	2025	2026	2027
6.	Negotiate partnership(s) with OEM(s) to enable mechanics employed by the OEM or a dealer in their network to teach ZE mechanics courses within the community college programs. Evaluate engagement with formal coalition of truck OEMs, e.g. Clean Truck Partnership.	Vehicle OEMs, College of Alameda, Santa Rosa Junior College, Hartnell College, Peterbilt, Bay Area High Road Transition Collaborative					
7.	Evaluate possibility of entering a Memorandum of Understanding with a local dealership and/or parent OEM to establish a partnership for workforce training opportunities at the local OEM or dealership facilities and/or with OEM-trained technicians.	Offices of Economic Development in Hayward, Oakland, San Leandro, (Stockton), vehicle OEMs					

#	Actions	Authority	Implementation				
			2023	2024	2025	2026	2027
8.	Provide funding to support community college faculty upskilling to teach ZE-MDHD mechanics programs.	CARB, CEC, BAAQMD					
9.	Provide funding to community colleges with MDHD mechanics programs to cover college memberships to the California Transit Training Consortium (CTTC) for access to training materials as they release heavy-duty freight modules.	CARB					

Vehicle Maintenance: Partnerships for Equipment and/or Facilities

#	Actions	Authority	Implementation				
			2023	2024	2025	2026	2027
10.	Enter a partnership affording community college students internship opportunities, granting them access to training facilities and hands-on vehicle maintenance experience.	College of Alameda, Peterbilt					
11.	Prepare a retrospective report to public agency stakeholders about the Peterbilt partnership detailing components that worked well, opportunities to scale this type of training partnership further, and what is needed to deliver that scale. Coordinate with Peterbilt for review and approval before publication.	College of Alameda					
12.	Enter a Memorandum of Understanding with one or more local MDHD dealers or employers they are currently working with to offer ZE mechanics apprenticeships annually.	East Bay Automotive Machinists Union					

#	Actions	Authority	Implementation				
			2023	2024	2025	2026	2027
13.	Provide funding pool for community college MDHD programs to enable procurement of up-to-date training materials including but not limited to laptops, software, vehicles, and/or components.	CARB					

Vehicle Maintenance: Workforce Analysis and Retention

#	Actions	Authority	Implementation				
			2023	2024	2025	2026	2027
14.	Develop and run a statewide media campaign rebranding the MDHD mechanic career. GO-Biz to sponsor.	Veloz, GO-Biz					
15.	Co-fund California Community Colleges' Next Gen Auto social media campaign to expand the reach and potential for driving enrollments with a focus on equity and messaging that resonates with underrepresented communities. BACCC to present to State agencies, retain control over the regional campaign, and support State in contemplating how to expand the campaign to other regions in California.	CARB, GO-Biz, BACCC					
16.	Amplify social media campaigns detailed in Workforce Actions #14 and #15 to further promote the training program opportunities and resources.	Vehicle OEMs, truck industry influencers					

#	Actions	Authority	Implementation				
			2023	2024	2025	2026	2027
17.	Conduct high school campus recruiting visits, leveraging marketing materials and messaging developed through Actions #14 and #15.	BACCC, Vehicle OEMs					
18.	Assess developing a funding program to enable Bay Area community colleges to hire and retain a regional auto programs-focused Recruiting Coordinator to communicate and coordinate with prospective students and support them through the application process.	MTC, BAAQMD, CARB					
19.	Assess developing a funding program to enable “earn-as-you-learn” programs with/through select community colleges offering ZEV programs to incentivize enrollments and program completions. Funding program to be open to community colleges and OEMs for internships or apprenticeships.	MTC, BAAQMD, CARB					
20.	Conduct market analysis of specific vehicle maintenance issues (scope and frequency) faced by fleets who have piloted and adopted ZE-MDHDVs and produce white paper to inform faculty on priority training module focuses.	CALSTART					

#	Actions	Authority	Implementation				
			2023	2024	2025	2026	2027
21.	Conduct workforce status and demand analysis that assesses: 1. supply evaluation (i.e., the current workforce, including anticipated retirements and separations, as well as current skills and competencies), 2. demand forecast (i.e. the optimal number of workers and competencies needed in mission-critical occupations for the future workforce), and 3. workforce gap analysis (i.e., an evaluation of the gap between supply and demand to identify the current number of workers, the competency surplus and deficiencies, and the gaps in future workforce and future competencies) for ZE-MDHD Technicians. Work conducted by San Francisco Bay Center for Excellence for Labor Market Research and sponsored by EBEDA and BAAQMD.	San Francisco Bay Center for Excellence for Labor Market Research, BAAQMD, EBEDA					
22.	Convene twice yearly to assess regional ZE-MDHD technician training program offerings, progress, and challenges for stakeholder awareness and knowledge sharing.	Ava, EBEDA, College of Alameda, CBO training programs					

Charging Infrastructure: Curriculum Development

#	Actions	Authority	Implementation				
			2023	2024	2025	2026	2027
23.	Develop training curriculum and certification process for DC fast charging infrastructure diagnostics and maintenance. IBEW and other entities currently offering EVITP training to offer this training and testing, as well.	EVITP, IBEW					
24.	Develop (OEMs) and implement (Eden Area ROP) Introductory EV Charging Coursework for Upskilling and Returning Workers programming. Program to have ability to expand to serve high school students if/as electrical offerings are approved by school districts.	EVSE OEMs, Eden Area ROP, College of Alameda					

Charging Infrastructure: Trainer Capacity Building and Retention

#	Actions	Authority	Implementation				
			2023	2024	2025	2026	2027
25.	Sponsor EVITP Train the Trainer events to efficiently expand the number of certified instructors available statewide to provide EVITP training.	CEC					

Charging Infrastructure: Partnerships for Equipment and/or Facilities

#	Actions	Authority	Implementation				
			2023	2024	2025	2026	2027
26.	Assess feasibility of coordinating statewide clearinghouse of chargers specifically available for training entities, requiring EV Service Providers to donate 1 DCFC for every 100 DCFCs installed in California. Training entities can apply for DCFCs for no cost access for use in training.	CEC, EVSPs					
27.	Evaluate feasibility of a Community Workforce Grant to fund/support local workforce training programs. Funds could be raised by Ava via some combination of EV charging revenues, LCFS credit sales, future Ava Board-approved budget, and/or private sector development partner commitment of funds and/or charging equipment.	Ava					

Charging Infrastructure: Labor Standards

#	Actions	Authority	Implementation				
			2023	2024	2025	2026	2027
28.	Require prevailing wage for EV charging projects to support union labor, in turn further supporting the EVITP training pipeline.	Misc. public agencies installing charging infrastructure					
29.	Advocate for statewide requirement of prevailing wage for all EV charging projects installed in the state.	CEC					

Charging Infrastructure: Workforce Analysis and Attraction

#	Actions	Authority	Implementation				
			2023	2024	2025	2026	2027
30.	Conduct workforce status and demand analysis that assesses: 1. supply evaluation (i.e., the current workforce, including anticipated retirements and separations, as well as current skills and competencies), 2. demand forecast (i.e. the optimal number of workers and competencies needed in mission-critical occupations for the future workforce), and 3. workforce gap analysis (i.e., an evaluation of the gap between supply and demand to identify the current number of workers, the competency surplus and deficiencies, and the gaps in future workforce and future competencies) for EV charging technicians. Work conducted by San Francisco Bay Center for Excellence for Labor Market Research and sponsored by EBEDA and BAAQMD.	San Francisco Bay Center for Excellence for Labor Market Research, BAAQMD, EBEDA					
31.	Convene twice yearly to assess regional EV charging technician training program offerings, progress, and challenges for stakeholder awareness and knowledge sharing.	Ava, EBEDA, College of Alameda, IBEW, CBO training programs					

Community Benefits

Defining Metrics

#	Actions	Authority	Implementation				
			2023	2024	2025	2026	2027
1.	Track and utilize evolving statewide program for defining community benefit metrics to implement and measure the impacts of ZEVs and supporting refueling infrastructure. This will be an iterative process.	CEC, CARB, Ava					
2.	Coordinate and align on community benefit metrics with NorCal Megaregion Blueprint.	Ava, Frontier Energy					

Measurement and Verification

#	Actions	Authority	Implementation				
			2023	2024	2025	2026	2027
3.	Track changes in local air quality and criteria air pollutants relative to ZEV deployments, leveraging Air District, municipal, and community-based organization efforts as needed, per WOCAP.	BAAQMD, City of Oakland, WOEIP					
4.	Maintain a publicly accessible dashboard to quantify and visualize current and anticipated adoption of Class 2b-8 ZEVs at county level via DMV registration and HVIP data.	CEC, CARB, CALSTART					

#	Actions	Authority	Implementation				
			2023	2024	2025	2026	2027
5.	Assess community hire and upskilling trends relative to job opportunities spurring from the ZEV transition (i.e., vehicle technicians, EVSE technicians, entrepreneurship, etc.). Assessment via bi-annual convening of stakeholders discussed in Workforce Actions #22 and #31.	EBEDA, Port of Oakland					

Direct Community Investments

#	Actions	Authority	Implementation				
			2023	2024	2025	2026	2027
6.	Establish a new investment fund/structure that ensures when ZEV and/or infrastructure investments are made, projects (ZEV-related or not) that provide co-benefits (social/public/health benefits) are also eligible for funding in AB617 communities of concern.	BAAQMD, CEC, CARB, Caltrans					
7.	Expand awareness of educational and career pathways to ensure residents can take advantage of workforce training and community hire programs. Also see Workforce Actions #16 and #17.	CEC, CARB, EBEDA, Port of Oakland, Community Colleges, CBO training programs					
8.	Evaluate feasibility of providing technical assistance to JPA member cities to support planning, zoning and land use updates. Develop a public zoning map that shows allowable and prohibited activities to enable clearer planning and development by public and private parties.	Ava, Ava JPA member cities/ County					

#	Actions	Authority	Implementation				
			2023	2024	2025	2026	2027
9.	Evaluate the feasibility of developing road improvement plans relative to heavier weights of ZE-MDHVs and identify what resources are needed to complete plans.	Ava JPA member cities					
10.	Coordinate and collaborate on state and federal grant opportunities pertaining to port activity, including grant scope and budget for community-side investment projects where available. See also Financing Action #7.	Port of Oakland, Ava, WOEIP, Earthjustice, EDF, Union of Concerned Scientists					
11.	Provide no-cost evFleet Consulting services to fleets with a minimum of 5 MDHD vehicles in priority communities of concern. See also Vehicles Action #11 and Infrastructure Action #12.	Ava					

Transparency and Accountability

#	Actions	Authority	Implementation				
			2023	2024	2025	2026	2027
12.	Develop a Blueprint website that tracks annual status/progress on actions.	Ava					

#	Actions	Authority	Implementation				
			2023	2024	2025	2026	2027
13.	Evaluate effectiveness of Blueprint actions in terms of community benefits delivered. Share results through an annual progress presentation to the Ava's Board that highlights stakeholder engagement and progress on Blueprint actions.	Ava					
14.	Connect results of Port of Oakland and NorCal Megaregion Blueprint charging infrastructure site identification efforts with CBOs in communities of concern to gain feedback on potential issues/ barriers associated with proposed sites. If funding is necessary for CBO engagement, identify resources.	Port of Oakland, WOEIP, Frontier Energy, Ava					
15.	Continue to enact public engagement activities near-, mid-, and long-term per the Seaport Air Quality 2020 & Beyond Plan (Public Engagement Plan).	Port of Oakland					

Conclusions

Conclusions

Ava's Blueprint was conceptualized, pursued, and completed to convene stakeholders in collaborative planning for the actionable steps that will enable and sustain the transition to ZE-MDHD goods movement in and through Ava's service area. The Blueprint will serve as a dynamic and iterative guide that, when fully implemented, will establish the service area as a "beachhead" market for ZE Class 2b-6 goods movement by 2030 and enable the transition of ZE Class 7-8 goods movement vehicles by 2040.

This Blueprint benefited immensely from a diverse and engaged set of stakeholders. Through regular, open, and meaningful participation, the project team gleaned insights, built trust, and developed and refined a robust list of Strategies and Actions that accounted for various needs and perspectives. Leveraging a systems analysis backed up by rigorous data analysis, this Blueprint puts forward Actions that will enable equitable solutions for the most impacted communities by ensuring the entire ecosystem is built to succeed and sustain. Gathering stakeholder feedback and consent on the methodologies, findings, and Actions provides a degree of gravitas to the work put forward in this Blueprint and also sets a model for engagement.

All in all, the process the project team established has created an economical, demonstrated approach to planning that is replicable by other CCAs, public power providers, and municipalities across the state and the country. Ava's role, as well as its and position as a central convener of public agency, community, and industry stakeholders afforded the impactful opportunity to build this type of regional plan and catalyze action. It is the hope of the project team that this Blueprint is not only useful in its regional specificity, but also in its replicable methodologies.

Glossary

Glossary

CALIFORNIA AIR RESOURCES BOARD (CARB)	The state agency charged with protecting the public from the harmful effects of air pollution and developing programs and actions to fight climate change. CARB oversees all air pollution control efforts to attain and maintain health-based air quality standards. *Source: California Air Resources Board*
CALIFORNIA ENERGY COMMISSION (CEC)	The state agency established by the Warren-Alquist State Energy Resources Conservation and Development Act in 1974 (Public Resources Code, Sections 25000 et seq.) responsible for energy policy. The Energy Commission's five major areas of responsibilities are: 1. Forecasting future statewide energy needs 2. Licensing power plants sufficient to meet those needs 3. Promoting energy conservation and efficiency measures 4. Developing renewable and alternative energy resources, including helping develop clean transportation fuels 5. Planning for and directing state response to energy emergencies. *Source: CEC*
COMMUNITY CHOICE AGGREGATION (CCA)	Through CCA, communities can purchase electricity on behalf of residents and businesses, in place of investor-owned utilities such as Pacific Gas and Electric Company (PG&E), San Diego Gas & Electric, and Southern California Edison. Over the last decade, local governments in more than 200 towns, cities, and counties throughout California have chosen to participate in CCA to meet climate action goals, provide residents and businesses with more energy options, ensure local transparency and accountability, and drive economic development. There are currently 25 operational CCA programs in California serving more than 14 million customers. *Source: Cal-CCA Website*

DUTY CYCLE	The applicability of a vehicle technology platform's abilities for the wide range of duty cycles required by its applications. On-road vehicle technology platforms are measured by their ability to meet range, power, and load capacity requirements. *Source: CALSTART*
ELECTRIC VEHICLE INFRASTRUCTURE TRAINING PROGRAM (EVITP)	Training and certification for electricians installing electric vehicle supply equipment (EVSE) and required for charging stations funded by the State of California. *Source: EVITP Website*
ELECTRIC POWER GRID	A system of synchronized power providers and consumers connected by transmission and distribution lines. In Ava's electricity service area, PG&E is the investor-owned utility that owns and operates the electric power grid which includes but is not limited to high power transmission lines, high voltage primary service for industrial and other applications, medium voltage primary service for commercial and industrial applications, and secondary service for commercial and residential customers. *Source: EIA.gov*
EQUITY PRIORITY COMMUNITIES	Formerly called "Communities of Concern;" Census tracts with any combination of the following impacted classifications: CalEnviroScreen 4.0 Disadvantaged Community, AB 1550-designated Low-Income Community, AB 617-designated Community Air Protection Program community, Justice40 community. Source: Metropolitan Transportation Commission (MTC)
GOODS MOVEMENT	The processes and activities involved in the pickup, movement, and delivery of goods (agricultural, consumer, industrial products, and raw material) from producers/points of origin to consumers/point of use or delivery. The transportation system helps move goods (or freight) from its source of production and distribution to points of consumption. Goods movement facilities include but are not limited to seaports, airports, railyards, marine highways, highways and high truck traffic roads, warehouses, and distribution facilities. *Source: EPA.gov*

GREENHOUSE GASES	Those gases, such as water vapor, carbon dioxide, nitrous oxide, methane, hydrofluorocarbons, perfluorocarbons, and sulfur hexafluoride, that are transparent to solar (short-wave) radiation but opaque to long-wave (infrared) radiation, thus preventing long-wave radiant energy from leaving Earth's atmosphere. The net effect is a trapping of absorbed radiation and a tendency to warm the planet's surface. *Source: EIA.gov*
GROSS VEHICLE WEIGHT RATING (GVWR)	The maximum operating weight of the vehicle set by the manufacturer. This includes the empty vehicle weight, fuel, passengers, and cargo combined. *Source: CEC*
HEAVY-DUTY	Vehicles with a GVWR greater than 26,000 pounds. Includes weight classes 7 and 8. *Source: CEC*
INFRASTRUCTURE	Generally, refers to the recharging and refueling network necessary to successful development, production, commercialization, and operation of alternative fuel vehicles, including fuel supply, public and private recharging and refueling facilities, standard specifications for refueling outlets, customer service, education, and training, and building code regulations. *Source: CEC*
JOINT POWERS AUTHORITY (JPA)	A JPA is a legally created entity that allows two or more public agencies to jointly exercise common powers. The Joint Exercise of Powers Act, as codified in California Government Code section 6500, governs JPAs. Under the Act, JPAs are restricted to use by public agencies only. To enter into a JPA, the public agencies must enter into an agreement and the governing bodies of all the contracting public agencies must approve the agreement.

LOAD (electric)	An end-use device or customer that receives power from the electric system. *Source: EIA.gov*
LOAD SERVING ENTITY	Secures energy and transmission service (and related Interconnect Operations Services) to serve the electrical demand and energy requirements of its end-use customers. *Source: EIA.gov*
MEDIUM-DUTY	Vehicles with a GVWR between 10,001 and 26,000 pounds. Includes weight classes 3, 4, 5, and 6. *Source: CEC*
NORTH AMERICAN INDUSTRY CLASSIFICATION SYSTEM (NAICS)	The standard used by Federal statistical agencies in classifying business establishments for the purpose of collecting, analyzing, and publishing statistical data related to the U.S. business economy. *Source: Census.gov/naics*
ORIGINAL EQUIPMENT MANUFACTURER	Refers to the manufacturers of complete vehicles or heavy-duty engines, as contrasted with remanufacturers, converters, retrofitters, up-fitters, and re-powering or rebuilding contractors who are overhauling engines, adapting or converting vehicles or engines obtained from the OEMs, or exchanging or rebuilding engines in existing vehicles. *Source: CEC*
OZONE	A kind of oxygen that has three atoms per molecule instead of the usual two. Ozone is a poisonous gas, but the ozone layer in the upper atmosphere shields life on earth from deadly ultraviolet radiation from space. *Source: CEC*

PARTICULATE MATTER	Unburned fuel particles that form smoke or soot and stick to lung tissue when inhaled. A chief component of exhaust emissions from heavy-duty diesel engines. *Source: CEC*
PUBLIC POWER PROVIDER	Not-for-profit entities that provide electricity to customers at the lowest rates and are a division of local government, governed by the community and run by boards of local officials accountable to the residents and businesses. *Source: American Public Power Association*
TECHNOLOGY READINESS	A measurement of a vehicle's stage or pathway toward commercialization, though in a broad sense includes ready to order, commercially available vehicles. This matches the ZETI/CALSTART definition of depicting a comprehensive view of clean commercial vehicle and equipment platform performance and readiness for the marketplace. *Source: CALSTART*
TIER 1 STAKEHOLDERS	Medium- and heavy-duty goods movement vehicle operators that are: • Subject to the Advanced Clean Fleets regulation and have: – Class 3-6 vehicles in vocations with duty cycles that can be served with commercially available electric vehicles today, and/or – Class 7-8 vehicles running short-haul or regional drayage • And/or located in a disadvantaged community, low-income census tract, Justice40-designated census tract, and/or AB617 community, with at least five vehicles
TIER 2 STAKEHOLDERS	Medium- and heavy-duty goods movement vehicle operators that are: • Subject to the Advanced Clean Fleets regulation and have: – Class 3-6 vehicles in vocations with duty cycles that cannot yet be served with commercially available electric vehicles today, and/or – Class 7-8 vehicles running regional distribution

TIER 3 STAKEHOLDERS	Medium- and heavy-duty goods movement vehicle operators that are: • Not subject to the Advanced Clean Fleets regulation • Not otherwise included in Tier 1 or Tier 2
TOXIC AIR CONTAMINANT (TAC)	An air pollutant, identified in regulation by CARB, which may cause or contribute to an increase in deaths or in serious illness, or which may pose a present or potential hazard to human health. TACs are considered under a different regulatory process (California Health and Safety Code section 39650 et seq.) than pollutants subject to California Ambient Air Quality Standards. Health effects to TACs may occur at extremely low levels and it is typically difficult to identify levels of exposure which do not produce adverse health effects. *Source: CEC*
ZERO-EMISSION (ZE)	An engine, motor, process, or other energy source that emits no waste products that pollute the environment or disrupt the climate. *Source: CEC*
ZERO-EMISSION VEHICLE (ZEV)	Vehicles which produce no emissions from the onboard source of power (e.g. electric vehicle). *Source: CEC*

List of Attachments

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Attachment 1.

Pilot Project Review

Attachment 2.

Summary Report on Vehicle and Infrastructure Product Readiness

Attachment 3.

Summary of Financing Options

Attachment 4.

Summary of Workforce Training and Needs