Memorandum

To: CHAIR AND COMMISSIONERS **CTC Meeting**: December 6-7, 2023

From: TANISHA TAYLOR, Executive Director

Reference Number: 4.4, Action

Prepared By: Kayla Giese
Staff Services Manager I

Published Date: November 22, 2023

Subject: Clean Freight Corridor Efficiency Assessment (SB 671)

Recommendation:

California Transportation Commission (Commission) staff recommend the Commission approve the Senate Bill (SB) 671 Clean Freight Corridor Efficiency Assessment (Assessment), included as Attachment A, and direct staff to transmit the Assessment to relevant policy and fiscal committees of the California Legislature.

Issue:

The Assessment provides high-level policy direction for the development of zero-emission freight infrastructure needed to support requirements established in the California Air Resources Board's Advanced Clean Trucks and Advanced Clean Fleets regulations. The Assessment's goal, as defined in statute, is to identify freight corridors, identify zero-emission infrastructure needs, and identify barriers and solutions associated with the transition to zero-emission freight. The Assessment is not an implementation plan, and ongoing work and coordination with all stakeholders – including impacted communities - is needed to identify more specific station locations, to identify where electric infrastructure is needed, and to develop successful business models.

The Assessment was developed with the input of the SB 671 Working Group. The SB 671 Working Group included 300 stakeholders representing trucking associations, warehouse owners, beneficial cargo owners, carriers, truck stop owners, ports, equity and climate advocates, utilities, energy companies, oil companies, local governments, state agencies, and transportation planning agencies. Commission staff also met bi-weekly with state agencies, including the California Air Resources Board, the California Energy Commission, the Governor's Office of Business and Economic Development, the Caltrans, the California State Transportation Agency, and the California Public Utilities Commission, and held fourteen SB 671 Working Group meetings. Updates from these working group meetings were presented in segments to Commissioners at five separate Commission meetings over the past 18 months.

At a high level, the Assessment identifies potential barriers and solutions to challenges the freight industry may face during the transition to zero-emissions. The Assessment's policy recommendations are related to time, economic impacts, and coordination between stakeholders.

The Assessment covers the following parts:

1. Identifies and defines clean freight corridors for the State of California.
2. Estimates clean freight infrastructure needs.
3. Presents a funding outlook.
4. Outlines potential barriers and solutions in clean freight infrastructure development.
5. Other considerations and implications of zero-emission vehicle adoption.
6. An overview of engagement efforts.
7. A summary of key recommendations.

The full draft Assessment underwent a 30-day public comment period from September 26, 2023 to October 26, 2023 and was presented to Commissioners at the October 18-19, 2023 Commission meeting. Commission staff reviewed each comment received during the public comment period and incorporated feedback into the final Assessment. Comment letters received during the public comment period are included as Attachment B.

The Commission received several comments requesting additional information and clarification, the following changes were made:

- An example of the community engagement process used for Interstate 710 was added to the Assessment to demonstrate positive community engagement, and revisions were made to the Central Delivery Team recommendation to make it clear a process needs to be developed to collaborate with community-based organizations, advocates, and public health representatives.
- Additional detail was added to the Appendix to explain the methodology and assumptions used to estimate infrastructure needs.
- Language was added to clarify that battery electric vehicles may be used for all truck use cases, and language was also added highlighting the importance of shared depot stations to add context to the capability of battery electric vehicles.

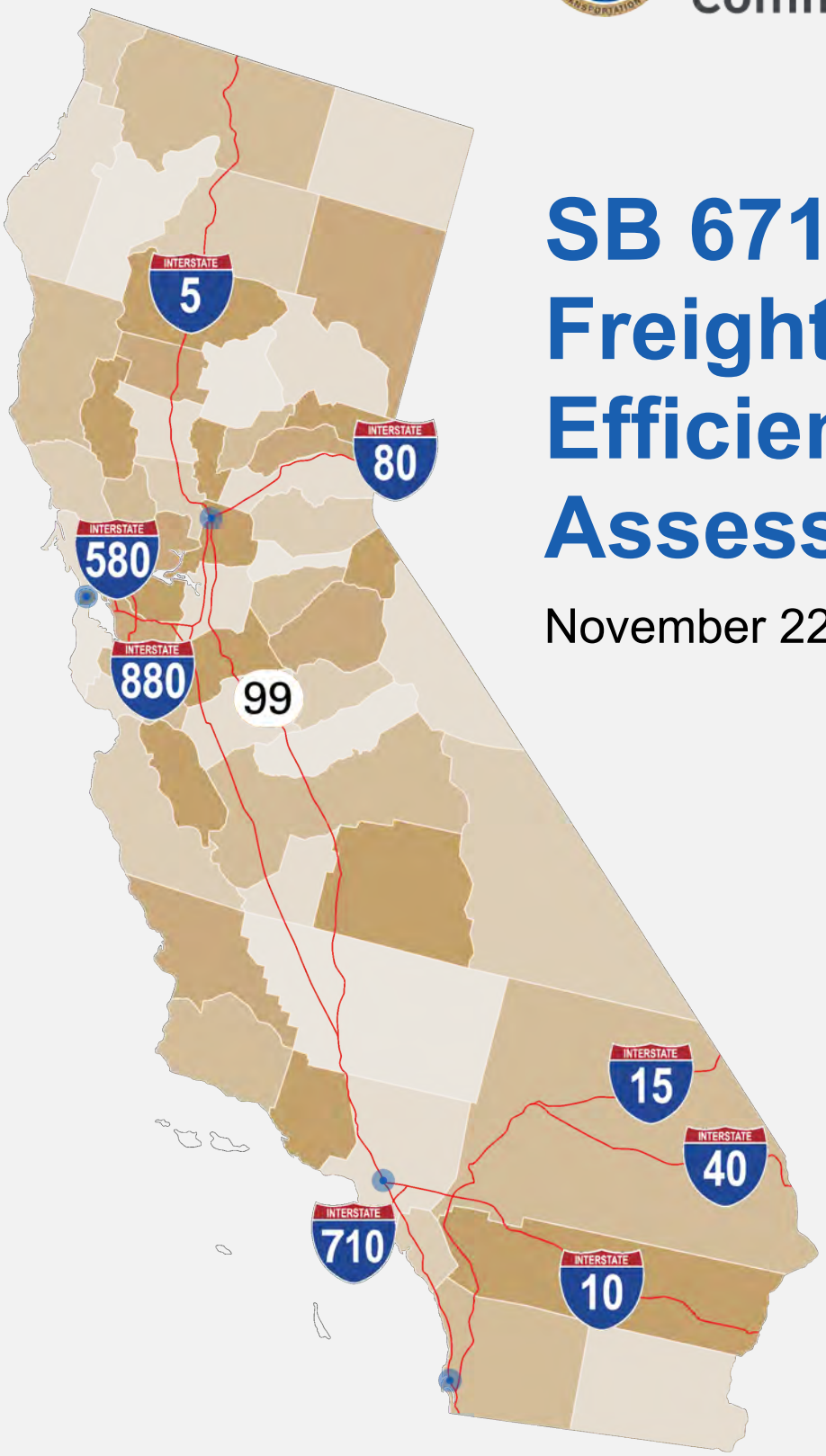
Background:

SB 671 (Gonzalez, Chapter 769, Statutes of 2021) requires the Commission, in coordination with the California Air Resources Board, California Public Utilities Commission, California Energy Commission, and the Governor's Office of Business and Economic Development, to develop a Clean Freight Corridor Efficiency Assessment to identify corridors, or segments of corridors, and infrastructure needed to support the deployment of zero-emission medium-duty and heavy-duty vehicles and to submit the Clean Freight Corridor Efficiency Assessment to the relevant policy and fiscal committees of the Legislature by December 1, 2023.

Attachments:

- Attachment A: Senate Bill 671 Clean Freight Corridor Efficiency Assessment (to reference a version of the Assessment that highlights new language added since the September 26, 2023 version, please visit the SB 671 webpage at https://catc.ca.gov/programs/sb671.)
- Attachment B: Comment Letters (alphabetized by commenting agency)

California Transportation Commission



SB 671 Clean Freight Corridor Efficiency Assessment

November 22, 2023

Table of Contents

Letter from the Chair

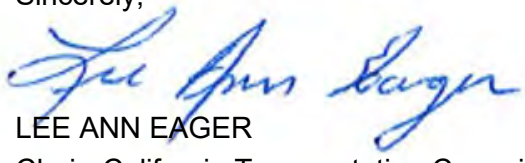
Dear Members of the Legislature:

We are pleased to submit the Senate Bill 671 Clean Freight Corridor Efficiency Assessment to the Legislature. Senate Bill 671 (Gonzalez, Chapter 769, 2021) requires the California Transportation Commission (Commission) prepare a Clean Freight Corridor Efficiency Assessment (Assessment) to identify specified freight corridors, the infrastructure needed to support the deployment of zero-emission medium and heavy-duty vehicles, and barriers and potential solutions to their deployment. This Assessment fulfills these requirements.

Since December 2021, the Commission has worked in partnership with the California Air Resources Board, the California Energy Commission, the California Public Utilities Commission, the California Department of Transportation, and the Governor's Office of Business and Economic Development to develop the Assessment. Fourteen public workgroup meetings have been held to collaborate with state, regional, and local governments as well as non-governmental organizations representing the freight industry, trucking associations, climate, equity, and other advocacy groups, warehouse workers, fleet owners, ports, utility companies and energy companies.

The Assessment provides a recommended path forward for the Legislature by identifying an initial viable network of zero-emission charging and hydrogen fueling stations needed to support fleets as they increasingly transition to zero-emission medium-duty and heavy-duty vehicles within the deadlines established by the California Air Resources Board's Advanced Clean Trucks and Advanced Clean Fleets regulations. The Assessment includes recommended next steps necessary to implement the construction of these stations, such as establishing a central delivery team to lead work, and recommendations that address time and cost concerns. The Commission is honored to play a role in California's transition to zero-emission freight and is committed to offering ongoing support for the transition to zero-emissions.

Sincerely,



LEE ANN EAGER
Chair, California Transportation Commission

Overview of

Requirements Senate Bill 671

Clean Freight Corridor Efficiency Assessment

Assessment Goal

"To identify corridors, or segments of corridors, and infrastructure needed to support the deployment of zero-emission medium-duty and heavy-duty vehicles."

There are the seven areas required by the Legislation:

1. Freight Corridors, or segments, that would be priority candidates for the deployment of zero-emission medium-duty and heavy-duty vehicles.
2. The top five freight corridors, or segments, with the heaviest freight volume and near source exposure to diesel exhaust and other contaminants.
3. Projects that would achieve the goals of the Assessment, including potential project sponsors and funding opportunities.
4. Barriers and potential solutions to achieving the goals of the Assessment and the deployment of zero-emission freight vehicles.
5. The impact on roads and bridges due to the increased weight of zero-emission vehicles.
6. Methods to avoid displacement of residents and businesses on the freight corridor when considering projects.
7. Benefits from the deployment of zero-emission vehicles.

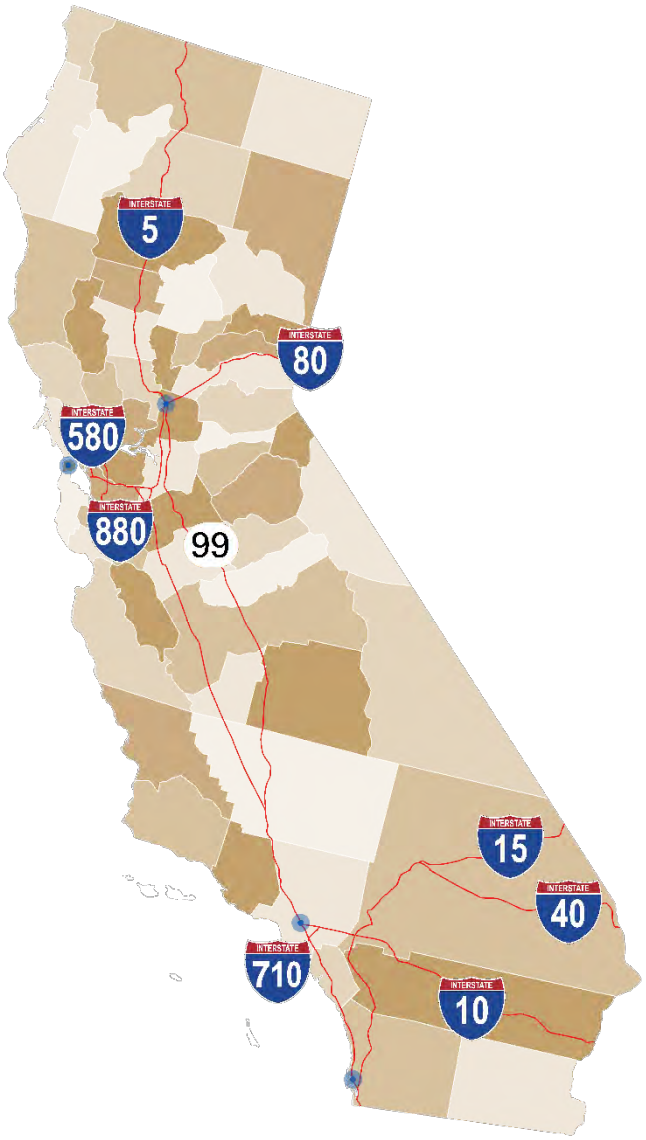
Executive Summary

California's freight network is vital to the State's economy. The State's ports of entry are a preeminent gateway for international supply chains, delivering goods and economic benefits to both the State and national economies. Agricultural goods make up a substantial portion of California's freight, with the Central Valley alone producing one quarter of the nation's food, including 40 percent of its fruits, nuts, and other table foods. While the economic benefits from the State's robust freight sector are significant, emissions generated by diesel fuel consumption cause health and environmental challenges, particularly for communities located near major freight corridors and freight facilities. Although these negative impacts may affect all residents, it is the most vulnerable that are most acutely impacted within communities. Diesel exhaust creates greenhouse gas emissions, contributing to climate change impacts in the form of increased wildfires, flooding, drought, severe storm damage, and other weather events.

Modernizing California's freight transport system in a manner that reduces pollution is essential to improve public health and meet California's environmental imperatives. In September 2020, Governor Gavin Newsom signed Executive Order N-79-20, which set ambitious targets for decarbonization of the transportation sector. As part of that order, Governor Newsom declared a goal for California to reach 100 percent zero-emission medium- and heavy-duty vehicles by 2045 for all operations where feasible, and 100 percent zero-emission drayage trucks by 2035. On April 28, 2023, the California Air Resources Board approved the Advanced Clean Fleets regulation to phase in a transition toward zero-emission medium-and-heavy duty vehicles to meet these goals.

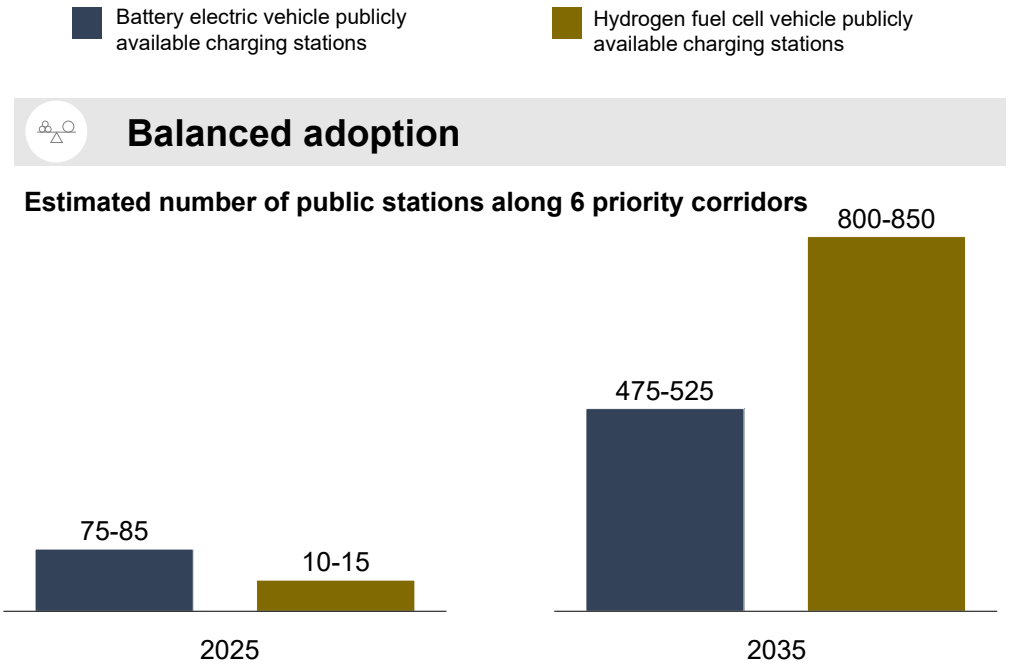
A key challenge in the transition toward zero-emission medium-and-heavy duty vehicles is the need for zero-emission infrastructure to support them, namely battery-electric and/or hydrogen fueling stations. California's network of zero-emission charging infrastructure for medium-and-heavy duty vehicles needs to be significantly expanded in the coming years. This requires coordination across multiple levels of government and the private sector.

To identity the charging infrastructure needed to bring the State's zero-emission goals for medium-and-heavy duty vehicles to fruition, in 2021, the Legislature passed, and Governor Newsom signed into law, Senate Bill 671 (Gonzalez, Chapter 769, Statutes of 2021). This legislation requires the Commission to collaborate with relevant state agencies and stakeholders to develop a Clean Freight Corridor Efficiency Assessment. The goal of the Assessment is to identify the freight corridors, or segments of freight corridors, and infrastructure needed to support the deployment of zero-emission medium- and heavy-duty vehicles.



The Commission's Assessment outlines a path forward for California to plan and implement zero-emission freight infrastructure by identifying the initial infrastructure needed to support zero-emission goods movement and identifying next steps California can take to begin building the necessary infrastructure in a timely manner. The Assessment identifies 34 Priority Freight Corridors for deployment by 2040, developed through an extensive stakeholder engagement process. Among these 34 Priority Freight Corridors, the Assessment recommends an initial focus on the "Top 6" corridors. The corridors were identified using a data driven methodology that considers corridors with the heaviest freight volume and near-source exposure to diesel exhaust and other contaminants. The map to the left shows the locations of the Top 6 corridors identified:

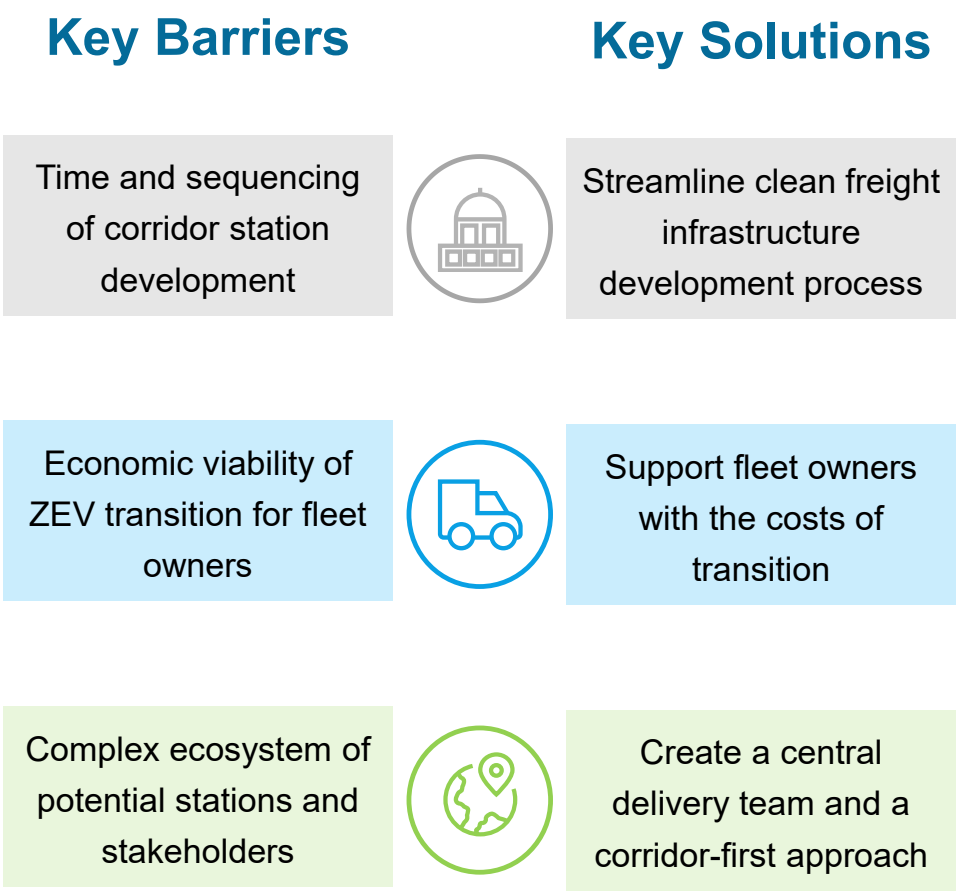
The Assessment identifies the number of zero-emission charging and zero-emission hydrogen fueling stations needed to support medium-duty and heavy-duty vehicles in 2025 and 2035 along the "Top 6" corridors—referred to as the initial viable network. The Assessment considers three potential scenarios for the initial viable network depending on the type of charging station: one for accelerated adoption of battery electric stations, one for balanced adoption of battery electric and hydrogen stations, and one for accelerated adoption of hydrogen stations. The initial viable network findings for public stations are listed below. (Public means the stations are publicly accessible – i.e., open to the public, whether or not they are publicly or privately financed and operated).



The potential costs, excluding grid upgrades, to build the initial viable network infrastructure are estimated to be $505 million to $950 million by 2025 and an additional $10 billion to $15 billion by 2035. Together with private funding, it is possible there are sufficient funds available to build out the public stations required for the initial viable network in 2025, but after that year additional investment is needed. The Assessment recommends allocating available public funds, where feasible, to support the implementation of the 2035 initial viable network cost.

The Assessment identifies three key barriers to building the initial viable network. First, the current station development process may take 6 to 8 years per station, which is too long to meet the needs for the initial viable network in 2025 and make it challenging to build the 2035 initial viable network. Second, the transition to zero-emission medium-and-heavy duty vehicles along the initial viable network may negatively impact fleet owners as they may face large, upfront costs and the need to modify their operations. Third, the transition will require the coordination of many different stakeholder groups across the state such as local permitting agencies, utility companies, Regional Transportation Planning Agencies and Metropolitan Planning Organizations, ports, the California Public Utilities Commission, the California Energy Commission, private entities like start-up companies, community-based organizations and advocates, public communities, impacted communities, and established corporations like beneficial cargo owners and fleets. The Assessment identifies solutions to each of these barriers. To expedite the timeline for building the infrastructure needed along the initial viable network, the Assessment recommends several ways to shorten the station development timeline, including through legislation authorizing a Categorical Exemption from the California Environmental Quality Act for medium-and-heavy duty charging stations as well as a statutory permit approval deadline for them. To support fleet owners during the transition, the Assessment recommends several actions, including the

creation of a new limited-term (five-year) zero-emission truck incentive program to assist fleets with purchasing zero-emission trucks, as well as a new truck buy-back program. To facilitate coordination among the many agencies and stakeholders needed for the transition, the Assessment recommends the Administration create a central delivery team, functioning as a part of, or in coordination with the Governor's recently created Executive Order N-8-23 Strike Team on infrastructure. The key barriers and solutions are summarized below and additional details on each is included in Chapter 4 of this report.



While the implementation of zero-emission medium-duty and heavy-duty vehicles along the initial viable network comes with many costs and challenges, it also results in significant benefits and savings. The Assessment estimates that transitioning the “Top 6” corridors to zero-emissions will reduce diesel emissions of carbon dioxide, total organic gases, oxides of nitrogen, particulate matter 2.5 microns or less in size by approximately 23 percent in 2030, and by 53 percent in 2040, resulting in a potential reduction of 1,720 premature deaths related to emissions through 2040. Moreover, with full implementation of the California Air Resources Board’s Advanced Clean Fleets regulation (meaning beyond the Assessment’s initial viable network), the state will experience a savings of around $18.6 billion in statewide health spending from criteria emission reductions (pollution) through 2040.

The Assessment estimates the impact of zero-emission trucks on roads and bridges to be over $100 million per year in increased road and bridge maintenance costs. It identifies existing and in-development materials created by state agencies that should be leveraged to avoid displacement of residents and businesses during the implementation of the initial viable network. Further, it identifies two capacity and power source considerations that project sponsors should evaluate when determining whether microgrids may be necessary for station development. Finally, as a step toward implementing the initial viable network, the Assessment identifies agencies and entities that may sponsor projects as well as a list of projects which is included in Appendix 3.

Part 1: Identifying and defining clean freight corridors

Chapter Summary

Identifying corridors that are a priority for freight allows California policymakers to prioritize investments in zero-emission station development. It provides a place to start short-term and long-term infrastructure planning. The California Transportation Commission (Commission) took a goods movement-based approach to identifying and defining freight corridors in California. The Commission considered data from a variety of data sources and stakeholder groups, including the Army Corps of Engineers, Engineer Research and Development Center, Lawrence Berkley National Laboratories, the University of California - Davis, the California Department of Transportation (Caltrans), and the Federal Highway Administration, to understand goods movement in California.

To support the transition of medium-duty and heavy-duty trucks to clean energy, the Assessment first identifies 34 “Priority Freight Corridors” necessary to support the efficient movement of goods across the state, as developed by members of the SB 671 workgroup. To identify the “Top 6” corridors needed to support an initial viable network, the Commission reviewed emissions, truck volume, commodity flows, trip types, and the potential powertrain mix of truck traffic on California highways between 2022 and 2050. This approach ensures the outcomes of the Assessment appropriately estimate the infrastructure needs for California’s current and future freight-related industries and economy.

The “Top 6” corridors represent over 50 percent of average daily truck vehicle miles traveled by medium-duty and heavy-duty trucks across California. The implementation of zero-emission infrastructure along these “Top 6” corridors will allow California to reduce tailpipe carbon dioxide, total organic gases, oxides of nitrogen, and particulate matters 10 and 2.5 (by approximately 23 percent in 2030, and by 53 percent in 2040.

“Top 6” Corridors

1. **I-5** from California’s Southern border with Mexico to its Northern border with Oregon
2. **I-15** from San Diego to California’s Southeast border with Nevada
3. **SR-99** from Red Bluff to Bakersfield
4. **I-10/I-710** from the San Pedro Bay Ports to Los Angeles to California’s Southeast border with Arizona
5. **I-40** from its intersection with I-15 to California’s Southeast border with Arizona
6. **I-80/I-580 and I-880** from the Port of Oakland to San Francisco to California’s northeast border with Nevada

1.1 Identifying the 34 “Priority Freight Corridors”

California represents the fourth largest economy in the world. A significant segment of that economy is driven by the movement of goods across the state’s vital freight corridors. To support the transition of medium-duty and heavy-duty trucks to clean energy, the Assessment identifies 34 “Priority Freight Corridors” necessary to support the efficient movement of goods across the state. For the 34 Priority Freight Corridors, the Commission focused on the importance of freight needs as identified by members of the SB 671 workgroup. A major goal of developing the Assessment was to make it useful for stakeholders responsible for implementation of recent air quality regulations, such as fleets, ports, Regional Transportation Planning Agencies, Metropolitan Planning Organizations, and alternative energy companies. Allowing SB 671 workgroup members to contribute to the process of identifying the 34 Priority Freight Corridors helped ensure the Assessment included their perspectives regarding freight need or areas of expertise throughout the state.

The 34 Priority Freight Corridors were identified using the following evaluation criteria:

1. The corridor is a critical freight route.
2. The corridor is located near existing electric infrastructure or hydrogen supply where feasible.
3. The corridor is located near similar efforts to expand electric or hydrogen infrastructure.
4. The corridor is identified as important by the California Energy Commission’s Medium-Duty and Heavy-Duty Electric Vehicle Infrastructure Load, Operations and Deployment Tool (HEVI-LOAD).
5. The corridor is in an area disproportionately burdened by air pollution.
6. The corridor is a route suitable for the short-haul use case (for electric vehicles); for this purpose, the short-haul use case means trips where trucks can complete a shorter route and return to a base to charge at a depot once a day.
7. The corridor is a logical starting point for the build out of a charging network or a logical co-location hub for both light-duty and heavy-duty hydrogen fuel cell electric vehicles.
8. The corridor is a corridor where projects could be built relatively quickly.
9. The corridor is a corridor where land is available to build zero-emission infrastructure.

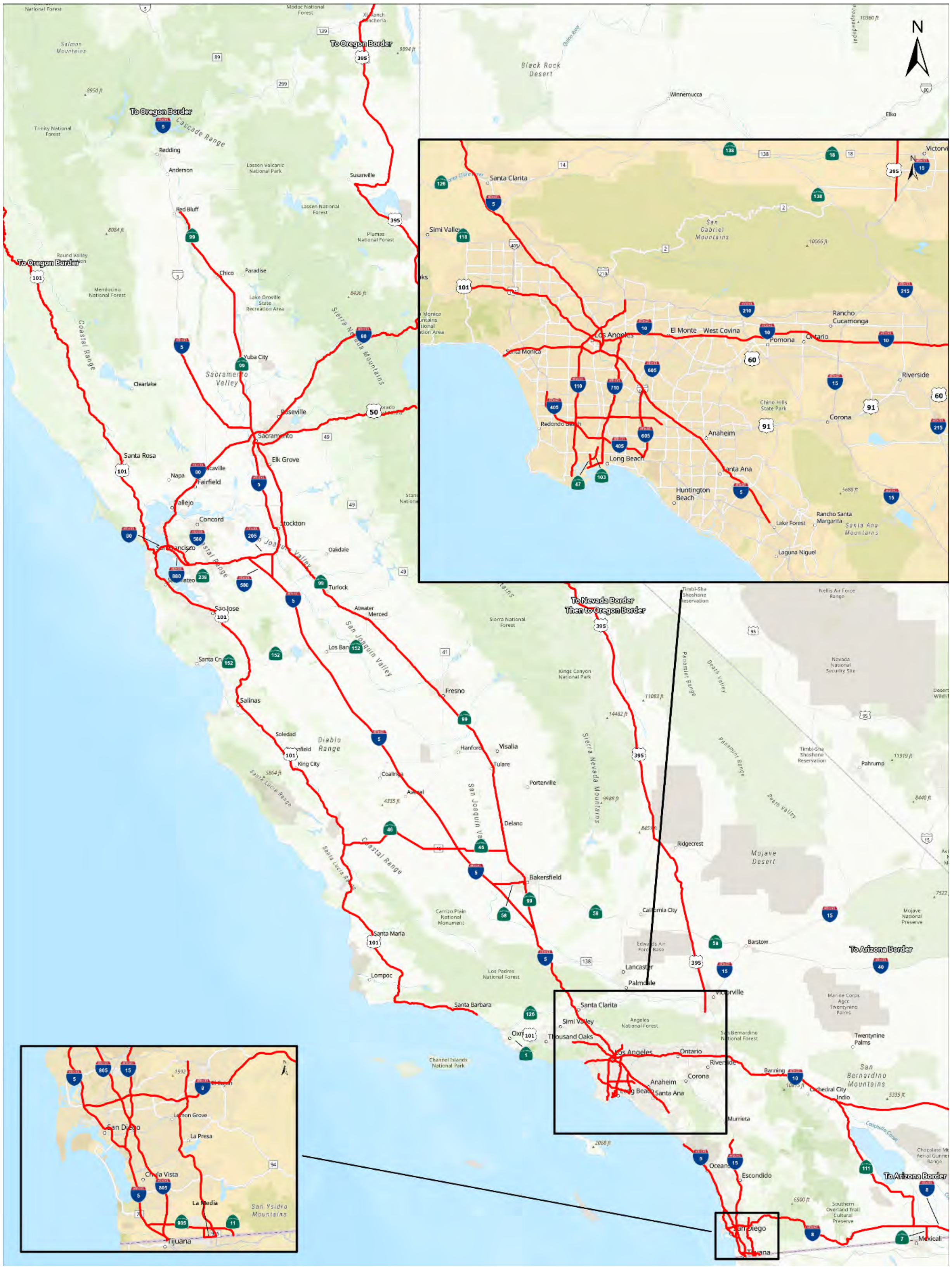
These criteria were expected to be met, where feasible, and the workgroup members who submitted corridors for consideration provided an explanation to justify why the corridor should be considered important for this Assessment.

In addition to considering the criteria, SB 671 workgroup members nominated corridors for consideration based on the following three questions:

1. What Corridor or Corridor Segment do you recommend (please provide your top three priority corridors)?
2. Describe why the Assessment should focus on this corridor?
3. What potential projects could be implemented along this corridor?

The resulting maps were presented to the SB 671 workgroup who confirmed 34 nominated corridors as “Priority Freight Corridors.” These corridors represent important freight routes and align well with the Caltrans Strategic Interregional Corridors and Alternative Fuel Corridors, which mean they have been identified as important freight routes in other studies. They represent the next phase of corridors, after the “Top 6” corridors described in the next section, the state should invest in and support to create a statewide system of zero-emission freight infrastructure. Exhibit 1 shows a map and list of the 34 “Priority Freight Corridors”.

Exhibit 1: Map & List of 34 "Priority Freight Corridors"



The table below lists the 34 Priority Freight Corridors.

Interstates	State Routes	United States Routes
5, 8, 10, 15, 40, 80, 110 205, 210, 215, 405, 580 605, 710, 805, 880	7, 11, 46, 47, 50, 58, 60, 91, 99, 103, 111, 118, 126, 152, 238, 905	101, 395

1.2 Identifying the “Top 6” corridors for the initial viable network

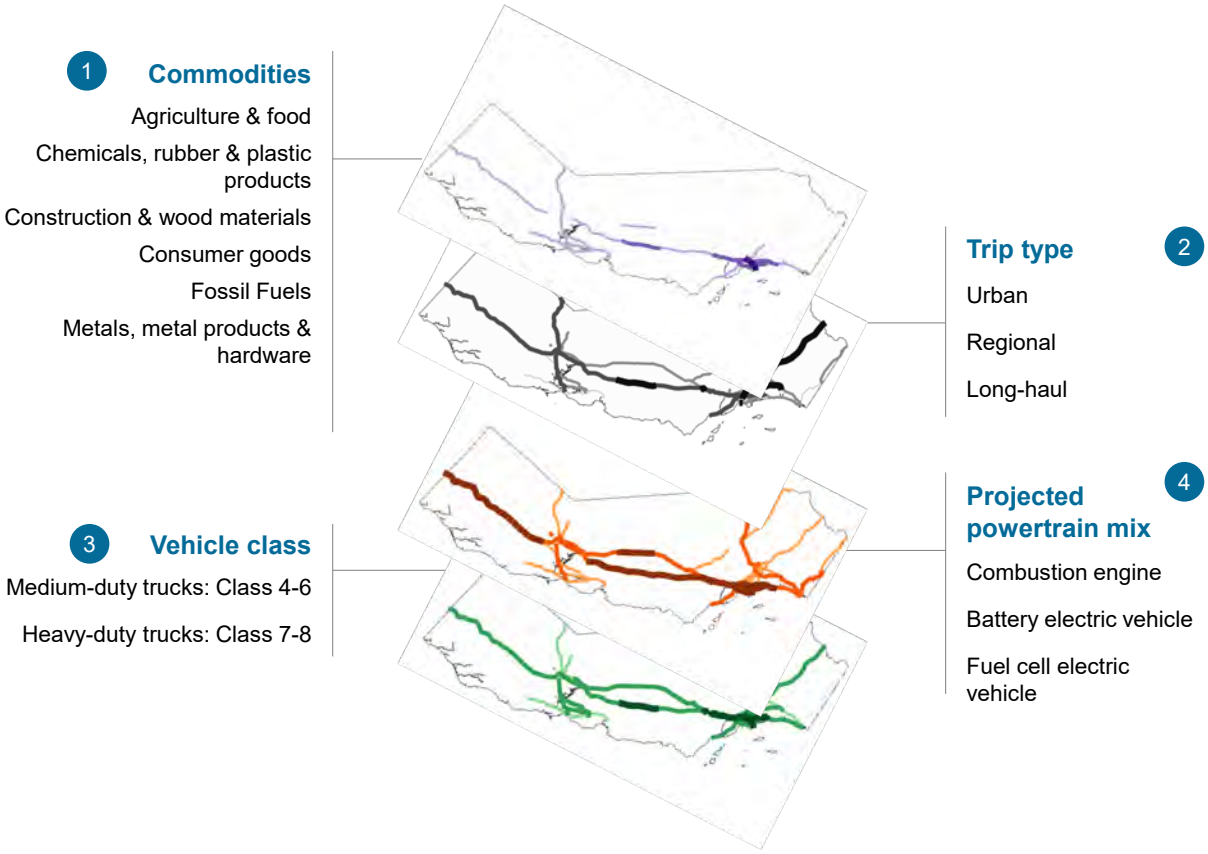
The Assessment employed a four-step approach to further narrow the list of 34 “Priority Freight Corridors” to a final “Top 6” corridors. Focusing on the “Top 6” corridors provides a concrete and achievable first step for the state through the establishment of an initial viable network. The Commission used a data driven methodology to identify the “Top 6” corridors, consistent with the SB 671 requirement to identify “the top five freight corridors, or segments of freight corridors, with the heaviest freight volume and near-source exposure to diesel exhaust and other contaminants.” The Commission identified six top corridors rather than five, because based on the analysis performed, all six of these corridors are of primary importance to California’s freight system and clean air goals and are also needed to establish an initial viable network.

1. Goods movement and commodity flows across commodity type, expected trip type, vehicle class, and projected powertrain adoption were estimated. The term “powertrain” refers to the type of energy used in the truck, such as battery electric or hydrogen fuel cell.
2. The “Top 6” freight corridors were defined as corridors greater than 50 miles in length, with the highest concentration of goods movement and highest average daily truck vehicle miles traveled.
3. Corridors over 50 miles in length were ranked based on vehicle miles travelled determined using Freight Analysis Framework average daily truck vehicle miles travelled and median daily truck trips, and an analysis of additional datasets including truck traffic data from Caltrans and truck Global Positioning System data.
4. “Top 6” corridors were evaluated for emissions and near-source pollution exposure effects.

1.3 Estimating goods movement (Step 1)

The Commission started with goods movement data to preserve the freight-focused intent for the Assessment. The overlap of the highest vehicle miles traveled (VMT) for trucks, and the median of truck trips per day gave an initial perspective on the priority corridors to consider. Truck vehicle miles travelled measures the amount of travel for all trucks on a specific corridor over a specific time period, in this case a year. Exhibit 2 shows four categories of freight information the Commission collected and used to understand goods movement in California and project zero-emission infrastructure needs.

Exhibit 2: Categories Used to Assess Goods Movement in The State of California



The pattern of goods movement was assessed based on the categories in Exhibit 2. These categories are described below.

Commodities: The goods movement analysis found that agriculture and consumer goods in California flow to major population centers, while industrial commodities movement is concentrated around various manufacturing, production areas, and harbors throughout the State.

Trip type: The trip types evaluated were urban, regional, and long-haul. Urban trips are defined as trips in and around cities and urban centers usually for delivery of goods. For this work, cities and urban centers were qualitatively identified based on areas in maps of California that had more people and roads, and the terms “city” and “urban” were used interchangeably. Redding, for example, is a city surrounded by several forest areas with less people and roads. Regional trips are defined as trips in between larger California cities, such as San Francisco and Los Angeles, and neighboring states. Regional also includes short-haul trips such as drayage. Long-haul trips are defined as trips much longer in length, whether cross-country or several states away in proximity. In general, medium-duty trucks are more frequently used for urban or delivery trips and heavy-duty trucks are used for drayage, regional, and long-haul trips. Distances for trip types were largely determined by looking at information about typical truck behavior. In general, urban trips were defined as trips up to 30,000 annual truck miles traveled in length, regional up to 60,000 annual truck miles travelled and long haul up to 90,000 annual truck miles traveled or more. Annual urban trips are concentrated along population centers, while regional and long-haul truck traffic is more equally distributed across major interstates. Medium-duty trucks are concentrated on urban roads between large metropolitan areas, while heavy-duty trucks are mostly found on connecting interstates and some drayage routes.

Vehicle class: California Air Resources Board vehicle classifications were used for modeling purposes because the Assessment also utilized California Air Resources Board zero-emission projected truck estimates and vehicle miles traveled data. Vehicle estimates associated with the Advanced Clean Fleets regulation included some light-duty vehicle classifications, specifically, “LHD-1,” “LHD-2,” and bus vehicle classes. The California Air Resources Board’s Mobile Source Emissions Inventory modeling tool, known as EMFAC, describes these vehicle classifications as “light heavy-duty trucks” with weights between 8,508 and 14,000, which fall within the light-duty vehicle class category. The EMFAC guide lists vehicle class type 4 as the first public medium-duty truck vehicle class. After consulting with state agency partners, the decision was made not to include vehicle class types lower than vehicle class type 4 in the Assessment because SB 671 specifically requires identifying infrastructure for “freight” and “medium-duty and heavy-duty” vehicles. Focusing on medium-duty and heavy-duty vehicles ensures a clear differentiation from passenger vehicles and an assessment focused primarily on commercial vehicles carrying freight. More details on vehicle class types can be found in Appendix 2.

Projected powertrain mix: The projected power train vehicle inventory considered includes combustion engine (including diesel) vehicles, battery electric vehicles, and hydrogen fuel cell electric vehicles. By 2050, annual battery electric truck trips are projected to be concentrated on interstates, while hydrogen fuel cell electric truck trips, coinciding mostly with heavy-duty long haul vehicle trips, are

projected to be concentrated on the highest average daily vehicle miles traveled corridors between major origin and destination points, such as along I-5.[1]

1.4 Defining freight corridors (Step 2)

To identify the "Top 6" corridors, the Assessment had to first delineate a consistent definition for freight corridors.

This Assessment defines freight corridors as routes with the highest concentration of truck volume with a minimum segment length of 50 miles.

A minimum length of 50 miles was chosen as the cutoff point in determining the "Top 6" corridors for this Assessment for several reasons:

- The goal of this Assessment is to take a freight-focused and corridor-based view of goods movement throughout the state and assess the resulting zero-emissions infrastructure needs. Although some of the shorter highways are important links or connectors, the priority for initial funding and development of infrastructure is to develop a connected statewide network that is useable as stations are developed.
- 50-mile spacing is consistent with plans for infrastructure outlined by the National Electric Vehicle Infrastructure Program.[2]
- Shorter length highways and connecting routes often surround key origin and destination points like warehousing facilities in cities, ports, and inland ports, which will need more localized charging infrastructure solutions than can be provided in a statewide study.
- 50 miles is significantly shorter than the range of most zero-emission trucks currently on the market.

Appendix 2 outlines calculations for the recommended 50 mile spacing of the initial viable network for battery electric vehicles in 2025.

I-5 and SR-99, while separate highways, operationally function as one corridor from a national goods movement perspective. Since this is the case, the major east-west roads that connect I-5 and SR-99, for example highway 41 and highway 58 are important to the corridor. Building zero-emission freight infrastructure on these east-west connectors will be necessary to provide for system resiliency.

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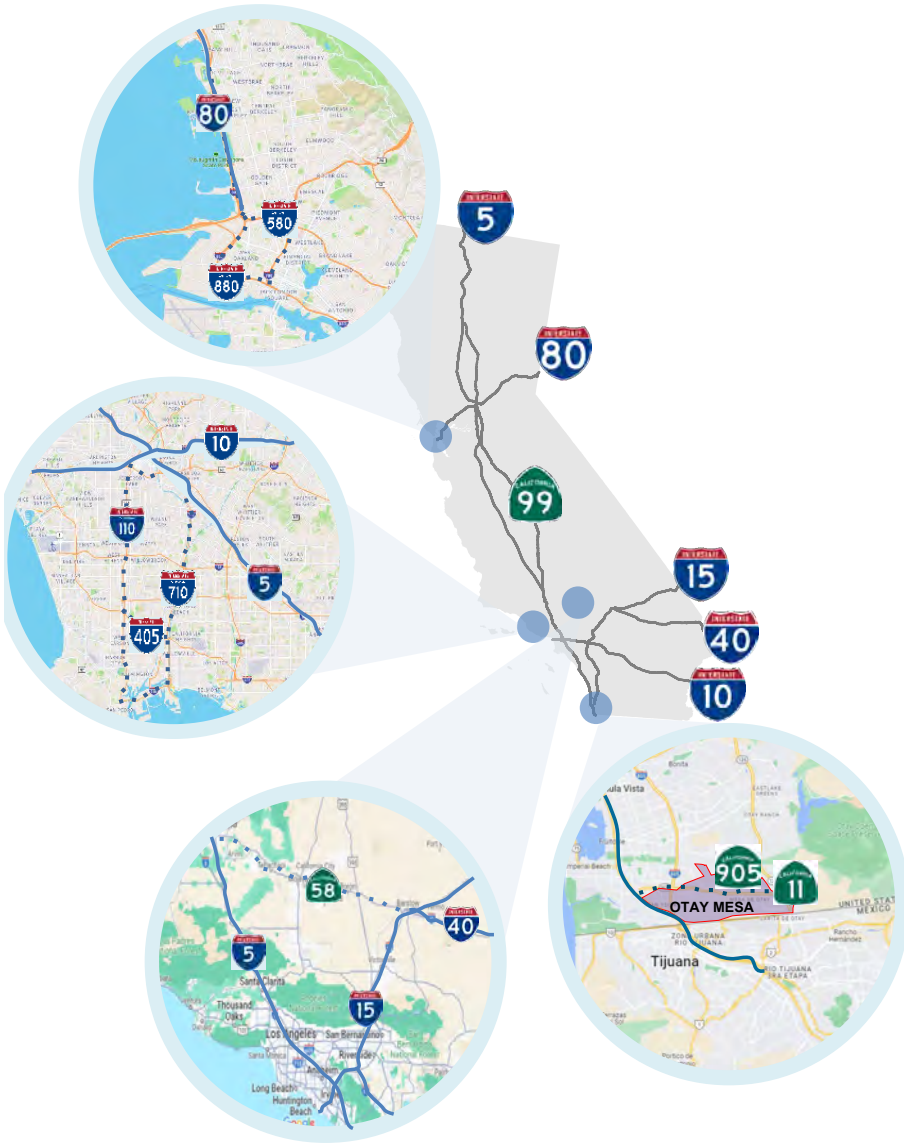
[1] Analysis of data from Highway Performance Monitoring System (Federal Highway Administration), Freight Analysis Framework (Bureau of Transportation Statistics).

[2] The National Electric Vehicle Infrastructure Program was established through the Infrastructure Investment and Jobs Act to create a nationwide network of publicly available, fast-charging battery electric vehicle chargers along state and federal highways with an initial focus on light-duty vehicles

Infrastructure that is placed within a radius of 5 miles of a “Top 6” corridor may support a parallel corridor if it is placed between the corridors. In the case of I-10 and SR 60, for example, infrastructure placed between the routes may support traffic travelling along either corridor.

The “Top 6” corridors also include smaller segments of highways that connect the longer corridors to key ports of entry as part of the corridor due to the segment’s importance to goods movement. For example, a segment of Interstate I-710 is considered part of the I-10 priority corridor, because I-710 connects I-10 to the San Pedro Bay ports. Small segments of I-580 and I-880 are also considered part of the I-80 priority corridor because I-580 and I-880 form a loop which connects I-80 to the Port of Oakland. Exhibit 3 provides a visualization of these links. Additional information about the key connecting segments to ports of entry can be found in Appendix 2.

Exhibit 3: Top 6 Corridors – Key Connecting Routes



PORT OF OAKLAND: The I-80 corridor includes the short segments of I-580 and I-880 that connect I-80 to the Port of Oakland.

SAN PEDRO BAY PORTS: The I-10 corridor includes the short segment of the I-710 that links the I-10 to the San Pedro Bay ports, the SR-47 that connects the Port of Los Angeles to I-710, and the segments of I-405 and Highway 1 that connect I-110 and I-710 near the San Pedro Bay Ports.

OTAY MESA: The I-5 corridor includes the short segments of SR-905 and SR-11 that connect I-5 to Otay Mesa and the US-Mexico border.

SR-58 (SR 99 and I-5 East/West Connectivity): I-40 also includes SR-58 extending to I-5 near Bakersfield.

Key connecting routes

Interstates 580 and 880

Interstate 580 is an east-west state highway which connects with Interstate 880, a north-south state highway, to form a loop which connects Interstate 80 to the Port of Oakland and nearby freight rail intermodal yards at the Oakland waterfront. The Oakland Seaport oversees 1,300 acres of maritime-related facilities serving a local market of over 14.5 million consumers, 34 million consumers within a

seven-hour drive and 50% of the United States' population by rail. Three container terminals and two intermodal rail facilities serve the Oakland waterfront.

The Port of Oakland formalized its commitment to becoming a zero-emissions port in 2019 when it adopted the Seaport Air Quality 2020 and Beyond Plan: The Pathway to Zero Emissions. The Port Infrastructure Development Project will guide the Oakland Seaport in its transition from using fossil-fuels to using clean energy. At the heart of this effort is the use of clean electricity to fuel battery-electric mobile equipment and to provide power to berthed vessels. Port of Oakland tenants have until December 31, 2023, to create a cargo-handling equipment conversion plan. The plan will allow the Port to work collaboratively with its business partners to support an efficient and timely transition to zero emissions.[3]

Interstate 710

I-710 is a major north–south state highway in Los Angeles. I-710 is a heavily congested approximately 25-mile freeway that connects the Ports of Los Angeles and Long Beach to freight rail intermodal yards located near East Los Angeles and to the rest of the national interstate system via I-10. Located in one of the most dense, urban, and economically disadvantaged parts of Los Angeles County, I-710 is essential both to the communities that it traverses, and to the national freight distribution network. In recent years, ever increasing traffic from the ports has combined with local population growth and aging infrastructure to create challenges to meeting the state's safety, equity, environment, and economic prosperity goals on I-710.

The public health and climate challenges facing the equity-focused communities along the I-710 Corridor caused by the tens of thousands of diesel heavy-duty trucks travelling along the corridor has spurred regional agencies to invest significant levels of funding for zero-emission heavy-duty trucks, and their supporting infrastructure, to replace those diesel trucks. The Los Angeles County Metropolitan Transportation Authority has programmed $50 million in seed funding to leverage a $200 million zero-emission truck program for the I-710 corridor, while the Ports of LA and Long Beach have approved a Clean Truck Fund Rate that could generate approximately $90 million per year to subsidize the transition of heavy-duty drayage trucks that call on the ports to zero-emission technology.

The Los Angeles region is planning an extensive zero-emission charging and fueling network to support the deployment of zero-emission trucks. For example, the Los Angeles Cleantech Incubator created an investment blueprint for heavy-duty charging depots adjacent to the busy I-710 freight corridor that can support battery electric trucks serving the San Pedro Bay Ports. Following a selection framework that incorporated grid infrastructure, drayage duty cycles, and community priorities, the Los Angeles Cleantech Incubator identified priority locations for public and private heavy-duty charging infrastructure and associated cost structures. Los Angeles County Metropolitan Transportation Authority is working

[3] More information on the Port of Oakland and its zero emission policy plans is available on the Port's website at: https://www.oaklandseaport.com/

closely with the Los Angeles Cleantech Incubator and is building upon this blueprint and other feasibility studies conducted by the Ports and other partners to advance the deployment of zero emission truck infrastructure in the I-710 Corridor.

Otay Mesa

Otay Mesa is a community located just north of the United States-Mexico border in the City of San Diego and is a key commercial crossing for goods movement between the US and Mexico. The Otay Mesa Port of Entry connects the City of San Diego and incoming and out-going trade across the United States border with Tijuana and western Baja California, Mexico. The Otay Mesa border crossing connects with SR-905, and the Otay Mesa East border crossing connects with SR 11, providing key links to I-805 and I-5.

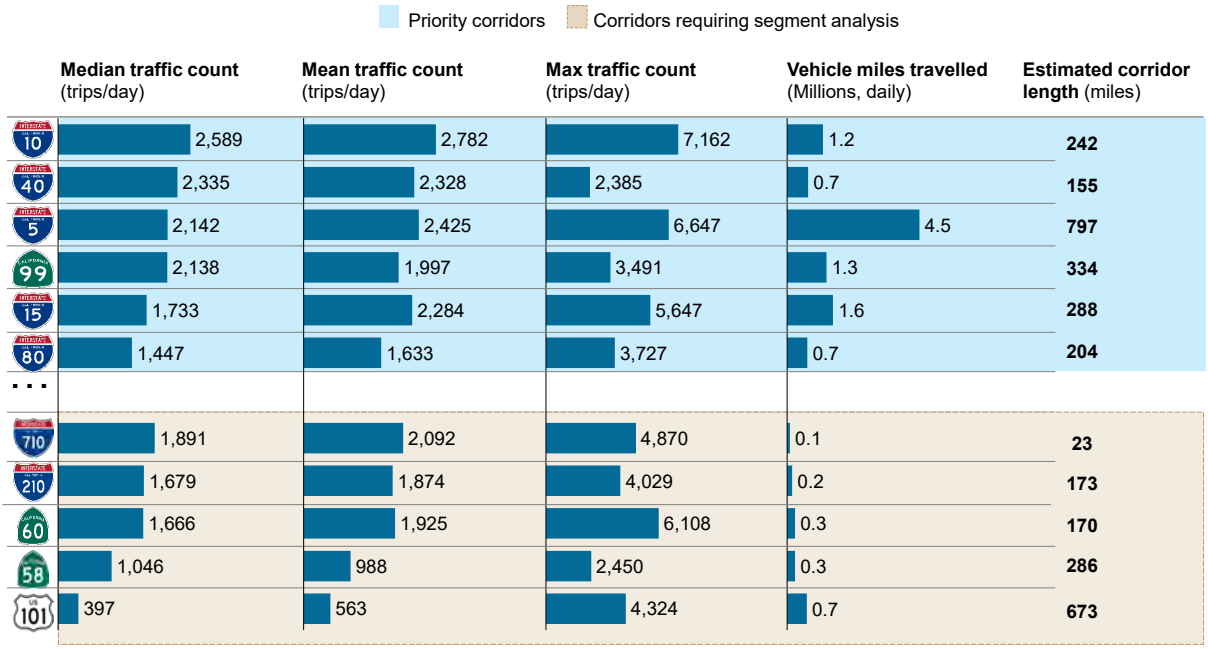
Zero-emission infrastructure is needed along the United States and Mexico border at ports of entry like Otay Mesa East, where many trucks cross the border. The 2023 memo, "Zero Emission Freight Transition at the California and Baja California Border[4] notes over 1.4 million northbound trucks moved through the region's three commercial land ports of entry in 2021, with an assumed equal number of southbound trips. In 2021, the region's land ports of entry handled $71.8 billion in goods, with the Otay Mesa Port of Entry being the second-busiest truck crossing along the United States–Mexico border. Additional information can be found in Appendix 2.

[4] The "Zero Emission Freight Transition at the California and Baja California Border" memo is available online at: https://www.sdapcd.org/content/dam/sdapcd/documents/capp/meetings/int--border/04-19-23/Zero%20Emission%20Freight%20Transition%20at%20the%20California0410.pdf

1.5 Ranking corridors and determining the natural cut-off (Step 3)

In addition to the Freight Analysis Framework version 5 data that was used, the Commission also reviewed truck counts from Caltrans and truck Global Positioning System data. This data, along with the Freight Analysis Framework version 5 data, was used to rank the corridors and then to determine the natural break points of freight corridors. The Freight Analysis Framework version 5 data was given more weight than the other datasets when ranking corridors because it was the primary source for the commodity flow data used in Step 1. The final "Top 6" corridors ranked highly in terms of goods movement and had the highest daily truck volume on segments 50 miles long or more. An excerpt of this analysis is included as Exhibit 4.

Exhibit 4: Truck Traffic Assessment of California Corridors



The vehicle miles travelled was doubled in the graphic above to account for two-way directionality.

1.6 Evaluating “Top 6” corridors for emissions and near-source exposure impact (Step 4)

One of the primary goals of the Assessment is to identify corridors which move freight throughout the state and are also responsible for significant emissions and near-source pollution exposure. For Step 4, the Assessment assumes a direct correlation between truck volume and truck emissions. Thus, after identifying the “Top 6” corridors with the highest truck traffic volume as discussed in the previous section, the next step in the approach was to overlay this data with industrial activity, emissions, and near-source pollution data and research.

The purpose of this step was to estimate the impact of addressing emissions from heavy-duty and medium-duty trucks by investing in zero-emissions infrastructure along these corridors and to confirm that the “Top 6” corridors align with Senate Bill 535 Priority Population data that demonstrates an existing need for improved air quality. See Appendix 2 for the emissions estimation approach. Senate Bill 535 (De Leon, Chapter 830, 2012) authorized the California Environmental Protection Agency and the California Air Resources Board to identify disadvantaged communities based on geographic, socioeconomic, public health, and environmental hazard criteria. The California Environmental Office of Health Hazard Assessment’s mapping tool called “CalEnviroScreen” displays Senate Bill 535 communities. This information was used to show the proximity of the “Top 6” corridors to Disadvantaged Communities. Exhibit 5 highlights that the “Top 6” corridors are near many communities that have been identified as Senate 535 disadvantaged communities.

Exhibit 5: Air Quality Impact of Transitioning to Zero-Emission Freight Along "Top 6" Corridors

"Top 6" Corridors

Based on the methodology outlined in this section, the Assessment has identified the following "Top 6" corridors for emissions and truck volume:

Exhibit 6: "Top 6" freight corridors identified

Priority corridors identified
Ordered by truck volume – 2022 projected

- I-5 from California's Southern border with Mexico to its Northern border with Oregon
- I-15 from San Diego to California's Southeast border with Nevada
- Route 99 from Red Bluff to Bakersfield
- I-10/I-710 from the San Pedro Bay Ports to Los Angeles to California's Southeast border with Arizona
- I-40 from its intersection with I-15 to California's Southeast border with Arizona
- I-80/I-580 and I-880 from the Port of Oakland to San Francisco to California's northeast border with Nevada

Freight Analysis Framework version 5 data, 2022 projection

Part 2: Estimating clean freight infrastructure needs

Chapter Summary

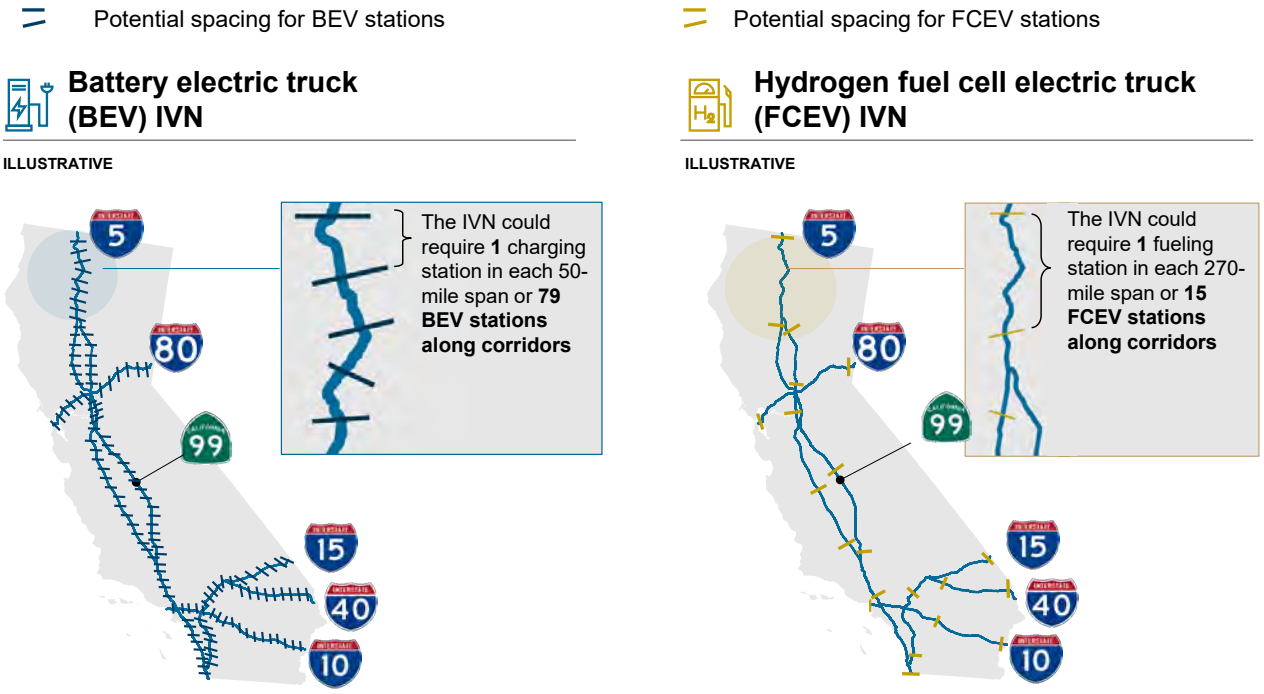
To prioritize zero-emission infrastructure along the most pollution burdened corridors, and to support publicly accessible infrastructure where there is a greater need for charging infrastructure, the Assessment focuses on the need to develop a network of publicly accessible charging and hydrogen fueling infrastructure along the “Top 6” corridors.

Focusing on the “Top 6” corridors as the initial viable network provides a concrete and achievable next step for the state. An initial viable network of zero-emission infrastructure for freight will support the implementation of the California Air Resources Board’s Advanced Clean Trucks and Advanced Clean Fleets regulations. A map of the initial viable network is shown in Exhibit 7.

Infrastructure needs for the initial viable network were estimated using the following approach:

1. Estimated statewide electrical and hydrogen fuel demand across three potential scenarios of zero-emission truck adoption: 1) Accelerated Battery Electric Vehicle Adoption, 2) Balanced Adoption, and 3) Accelerated Hydrogen Fuel Cell Adoption.
2. For the initial viable network, allocated a portion of statewide electrical and hydrogen fuel demand to each of the “Top 6” corridors.
3. Assessed the number of charging and fueling stations required along “Top 6” corridors based on charging and fueling archetypes.
4. Estimated the capital investment required to construct the public and private charging and fueling stations to meet fuel demand along the corridors. More detail is in Appendix 2.

Exhibit 7: Initial Viable Network



Three potential scenarios of infrastructure needs were assessed due to the uncertainty surrounding which type of technologies are likely to be adopted by fleets in the future (more details in the section which follows). This creates a range of potential needs that can help policy makers plan.

The assessment recommends policy makers focus first on the initial viable network of publicly available zero-emission stations needed along the “Top 6” corridors. This prioritizes emissions reductions and public health, while balancing the state’s growing freight sector ensuring the Assessment is a useful tool for policymakers manageable zero emission infrastructure needs.

2.1 Defining potential scenarios for zero-emission truck adoption

The Assessment studied four years that are benchmarks in the Advanced Clean Fleets regulation – 2025, 2030, 2035, and 2040.

For each year, three potential scenarios were created to gauge zero-emission truck demand and estimated infrastructure needs: accelerated battery electric adoption, balanced adoption (given likely fleet owner powertrain choice), and accelerated hydrogen fuel cell adoption.

Input from the workgroup, including private companies and state agencies such as the California Energy Commission and the California Air Resource Board, was used to shape the estimated

powertrain adoption in each scenario. The estimated powertrain adoption is the estimated percentage split between battery electric trucks and hydrogen fuel cell electric trucks used in each scenario.

The Assessment considered the estimated cost of vehicle ownership, and how well different technology choices fit different truck use cases to estimate how many trucks would be battery electric and how many trucks would be hydrogen per scenario. California Air Resources Board vehicle estimates disaggregated by vehicle class type were used to associate different truck vehicle class types with typical use cases and cost. Exhibit 8 summarizes the key scenario assumptions.

Exhibit 8: Key scenario assumptions

Key assumptions behind the three scenarios

	Accelerated battery electric adoption	Balanced adoption	Accelerated hydrogen fuel cell adoption
Cost of ownership	**Battery electric trucks become more cost effective over time** accelerating incorporation into commercial fleets	**Balanced adoption of zero-emissions technologies** over time	**Fuel cell trucks become more cost effective over time** accelerating incorporation into commercial fleets
Technology choice and use case	**BEV trucks and charging become the optimal solution for all or most use cases** including drayage, delivery, and long haul	**No predominantly used technology across use cases**	**FCEV trucks and fueling become the optimal solution for all or most use cases** including drayage, delivery, and long haul

2.2 Assessing clean freight infrastructure needs

Once the three scenarios were developed, the infrastructure needed to support the battery electric and hydrogen medium-duty and heavy-duty truck fleets were estimated for each scenario. Developing scenarios for zero-emission freight infrastructure needs requires estimates of the following factors:

- Total number of zero-emission medium-duty and heavy-duty vehicles on the road (assumptions are held constant across all three scenarios).
- Annual medium-duty and heavy-duty annual average statewide vehicle miles traveled by vehicle class type (assumptions are held constant across all three scenarios).
- Fuel efficiency of battery electric and hydrogen trucks (assumptions are held constant across all three scenarios).
- Mix of power train adoptions. For example, what percent of the total trucks will be battery electric? What percent will be hydrogen? The three scenarios are:
  - Accelerated battery electric adoption: Tests a higher and faster adoption of battery electric trucks.
  - Accelerated hydrogen fuel cell adoption: Tests a higher and faster adoption of hydrogen fuel cell trucks.
    - › Related to hydrogen, there are many safety measures that are either in place in existing standards and codes or that are being developed currently. The United States Department of Energy oversees hydrogen safety work. There is a Hydrogen Safety Panel, with a mission to, “enable the safe and timely transition to hydrogen and fuel cell technologies by sharing the benefit of extensive experience and providing suggestions and recommendations pertaining to handling and use of hydrogen.” The Hydrogen Safety Panel website includes “hydrogen tools” which are related to safety and are funded by the United States Department of Energy and maintained by the Pacific Northwest National Laboratory. The Department of Energy also has a “safety, codes and standards” webpage, which lists all of the existing and in-process standards and codes related to hydrogen safety. Among the standards the list covers are leak detection and response practices, the safe transfer of hydrogen, and the safe distribution of hydrogen. Experts and community members are encouraged to participate in the development of safety standards for hydrogen.
  - Balanced adoption: Tests adoption driven by information about decisions fleets have made in the past about what types of zero-emission trucks to purchase, as well as the likely total cost of ownership parity with combustion engines (based on information about truck sales and a study from the McKinsey Center for Future Mobility, called, “Why the Economics of Electrification

Make This Decarbonization Transition Different),” and the resulting powertrain choice by vehicle class and primary trip type, given expected commodity growth resulting trip types.

- Characteristics of battery electric charging stations, such as the number of public versus private stations, charging efficiency, capacity factors, and utilization (assumptions around these characteristics are held constant across all three scenarios).
- Characteristics of hydrogen fuel stations, such as the split of public versus private ownership, annual fuel capacity per station, and utilization (assumptions are held constant across all three scenarios).
- Maximum distance between charging stations and hydrogen fuel stations to form an initial viable network (assumptions are held constant across all three scenarios but differ based on the rate and mix of zero-emission truck power train adoption included in each scenario).

Exhibits 9 and 10 illustrate the overall approach for modelling energy demand for zero-emission truck charging and fueling and the resulting infrastructure necessary. For detailed information, please see Appendix 2.

Exhibit 9: Approach for Estimating Energy Required

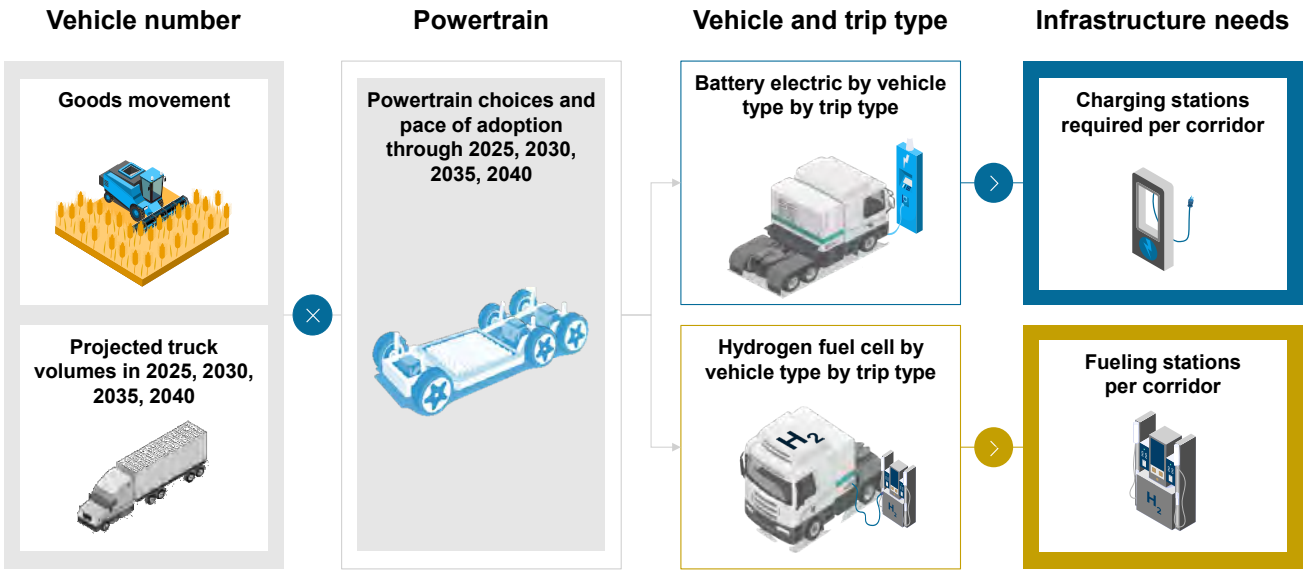
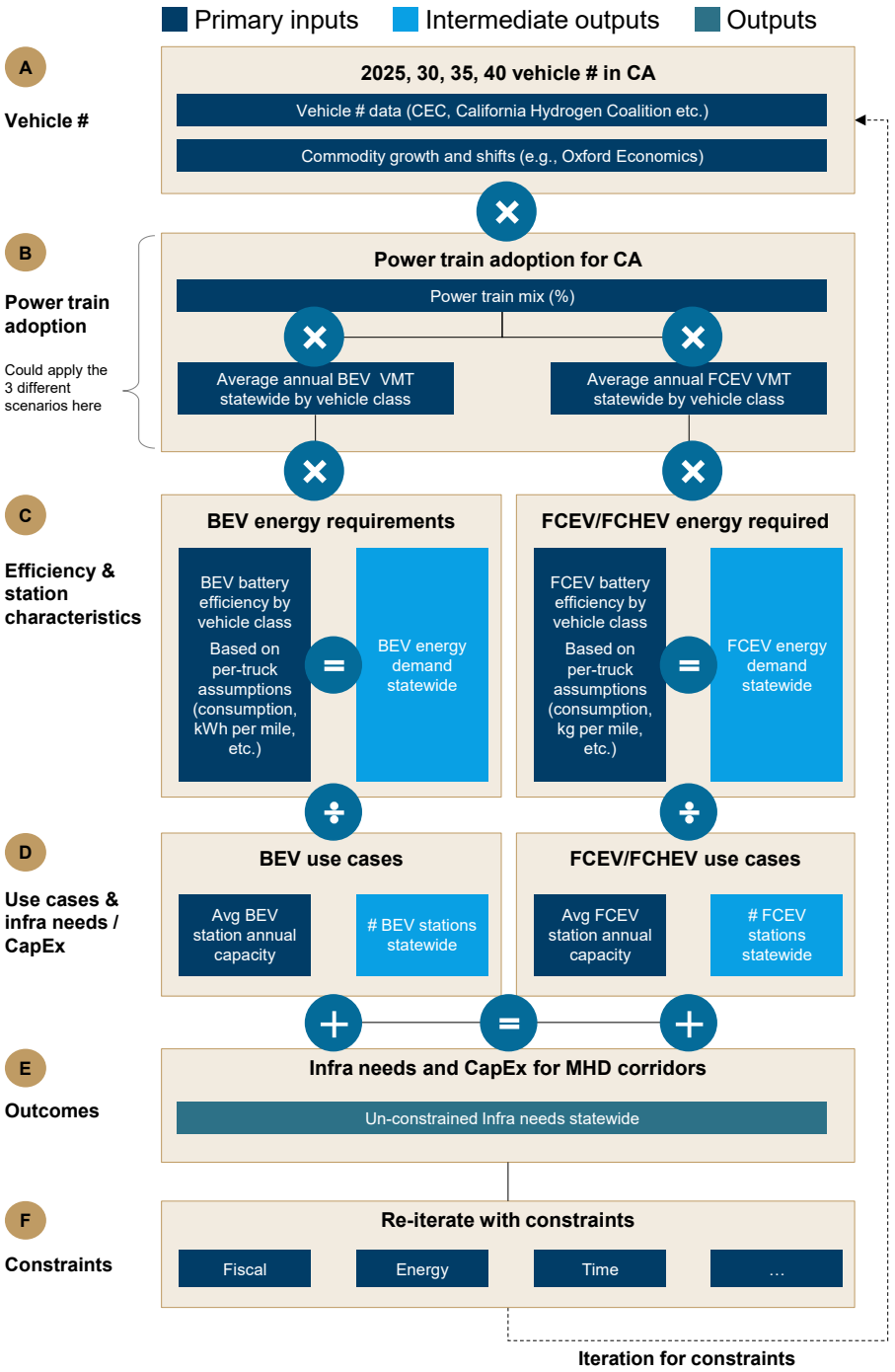


Exhibit 10: Detailed Infrastructure Modelling Logic



2.3 Projects satisfying initial infrastructure needs

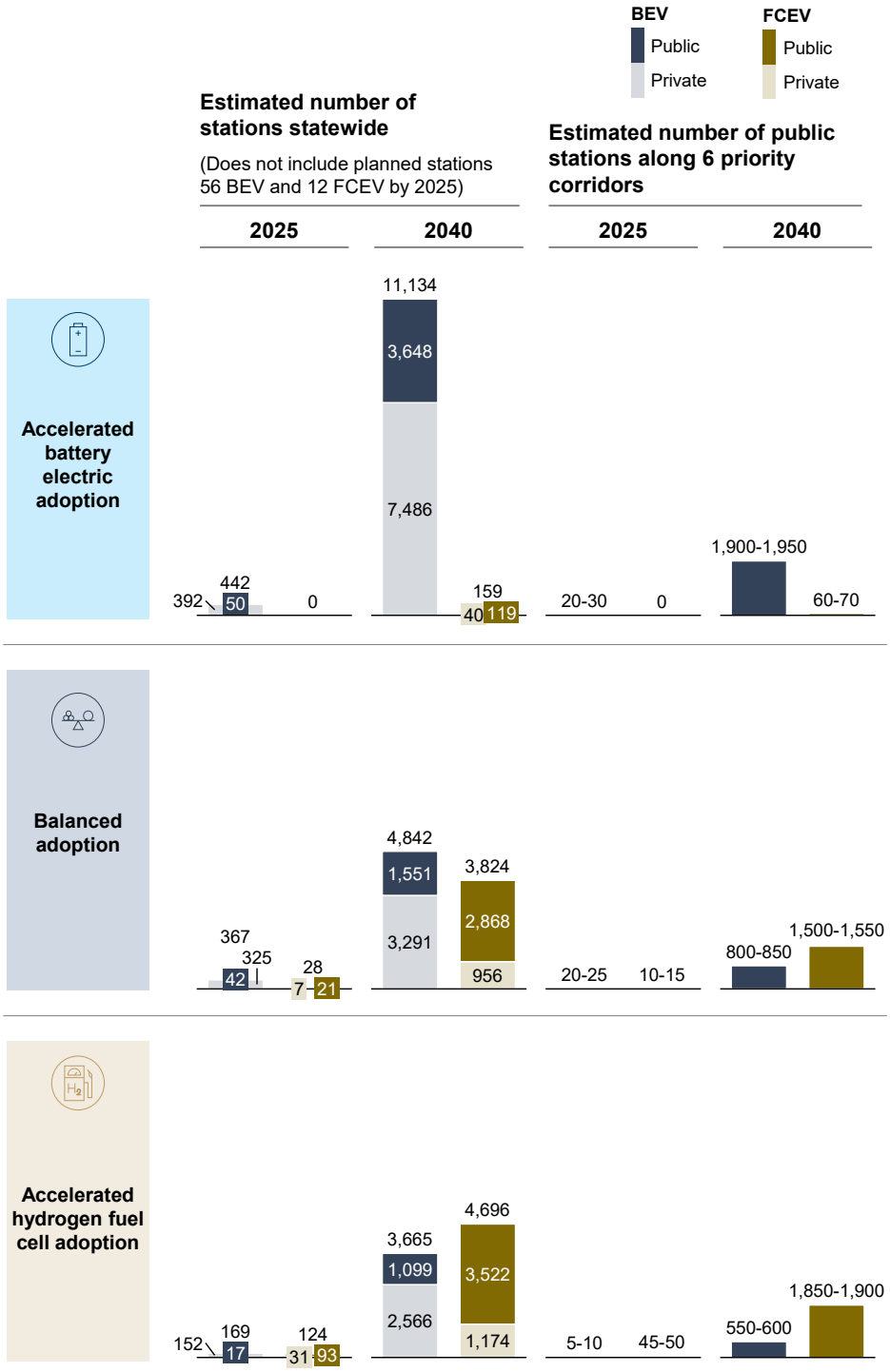
There is value in focusing on the number of electric charging and hydrogen fueling stations required to ensure a network dense enough to encourage early adoption by the 2025 and 2035 benchmark years.

To support zero-emission truck adoption, the state, federal, and local governments can potentially play a greater role in the development of publicly available charging and hydrogen fueling stations to ensure an initial viable network of public infrastructure. For example, in the past, traditional fuel companies like Chevron and Shell built publicly available truck stops and gas stations to realize a return on investment. Today, for zero-emission freight infrastructure, a fleet owner may see a clear need to install a charging or hydrogen fueling station on their property to allow their zero-emission trucks to charge or re-fuel, but a fleet owner may not build a publicly available zero-emission truck station because their primary concern is the financial stability of their fleet. Also, the return on investment for a publicly available station is uncertain. Existing companies interested in building zero-emission infrastructure are truck stops converting some of their existing locations to zero-emissions and companies who are interested in offering an all-inclusive truck and station service model to customers, known as “truck-as-a-service.” However, to date, there are not many companies like this in California. Despite these limitations, publicly available truck stops are essential for independent owner/operators who do not have the ability to charge or re-fuel at a private depot and for long-haul trucks that depend on publicly accessible stations to complete their routes. Until the market is more developed, the state can play a key role in encouraging the development of publicly accessible zero-emission infrastructure.

Please note that the initial viable network is meant to provide a flexible roadmap for zero-emissions truck transition for the state of California and represents the initial infrastructure required to support this transition. It is not intended to suggest that battery electric and fuel cell adoption will necessarily progress in any particular scenario but rather, give the state the ability to plan for a range of options available on the market.

Exhibit 11 shows the estimated stations needed in 2025 and 2040.

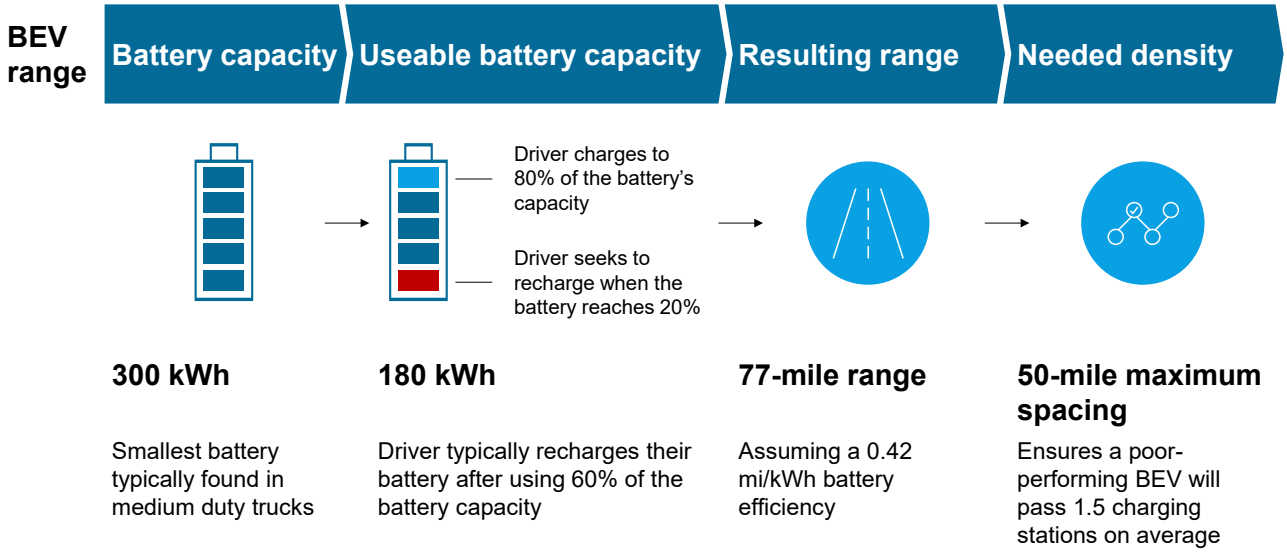
Exhibit 11: Results of the zero-emission infrastructure needs assessment (state-wide and for "Top 6" corridors)



To build the initial viable network, the Assessment recommends zero-emission truck stations be developed first along the "Top 6" freight corridors.

The 50-mile maximum station spacing and the assumed BEV specifications in Exhibit 12 are not intended to characterize the capabilities of the diverse set of BEVs that we anticipate operating along these corridors. The initial viable network needs to be able to support all the vehicles that we might reasonably expect to be operating. Several manufacturers are developing and/or have deployed battery electric Class 8 tractors with the specifications and demonstrated ability to meet long-haul and regional freight duty cycles.[1]

Exhibit 12: Approach to Establish Initial Viable Network for Battery Electric Vehicles

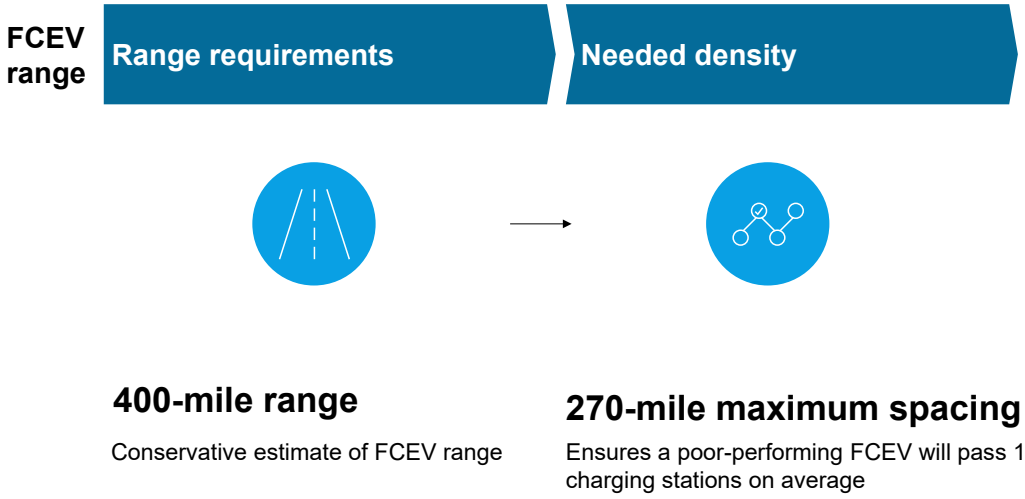


Most Hydrogen Fuel Cell Electric vehicles have a range of 400 miles or more. Hydrogen is similar to diesel in that it allows drivers to cover approximately the same distance and it takes about the same time to re-fuel as it does with diesel. Using 270 miles as the distance between hydrogen stations makes sure that even if trucks do not have a full hydrogen fuel cell, they will likely pass a place where they can re-fuel. Using a 270-mile maximum station spacing, the initial viable network for fuel cell electric vehicles would require 15 hydrogen fueling stations in total along the "Top 6" corridors. Exhibit 13

[1] The North American Council for Freight Efficiency (NACFE) recently completed its Run On Less event which showcases and independently validates the capabilities of various medium and heavy-duty vehicles operating in a variety of commercial settings and applications. The results of this event which include the performance of Class 8 tractors, can be found here: https://results-2023.runonless.com/. It will be important to update zero-emission station estimates as more information becomes available.

summarizes the approach to estimating the spacing needs for Fuel Cell Electric Vehicles; additional information on the methodology is detailed in Appendix 2

Exhibit 13: Approach to Establish the Initial Viable Network for Fuel Cell Electric Vehicles



By investing in an initial viable network, there could be enough stations along these corridors to provide a sufficient network to spur further adoption of zero-emission trucks.

According to the California Energy Commission's EnergIIZE Monitoring Dashboard, which tracks existing and funded zero-emission charging and fueling stations in California, there are 40 battery electric vehicle charging stations and 3 hydrogen fuel cell electric vehicle fueling stations designed for freight within one mile of the 34 Priority Freight Corridors or one of the "Top 6" corridors as of July 6, 2023. Many of the existing or funded stations are clustered in metropolitan areas, so the placement of additional stations should be carefully considered to create the initial viable network. In addition to stations along the "Top 6" freight corridors, stations near the United States/Mexico border, maritime ports, and where the "Top 6" corridors and the 34 Priority Freight Corridors cross into neighboring states are essential.

The stations within the initial viable network could be underutilized in the short-term since zero-emission truck adoption could take some time. However, an initial viable network is required to facilitate

widespread adoption of battery electric trucks and hydrogen fuel cell electric trucks statewide by overcoming fleet-owners' "range anxiety"—the fear of running out of charge or fuel because of travelling on roads that lack sufficient charging or fueling stations.

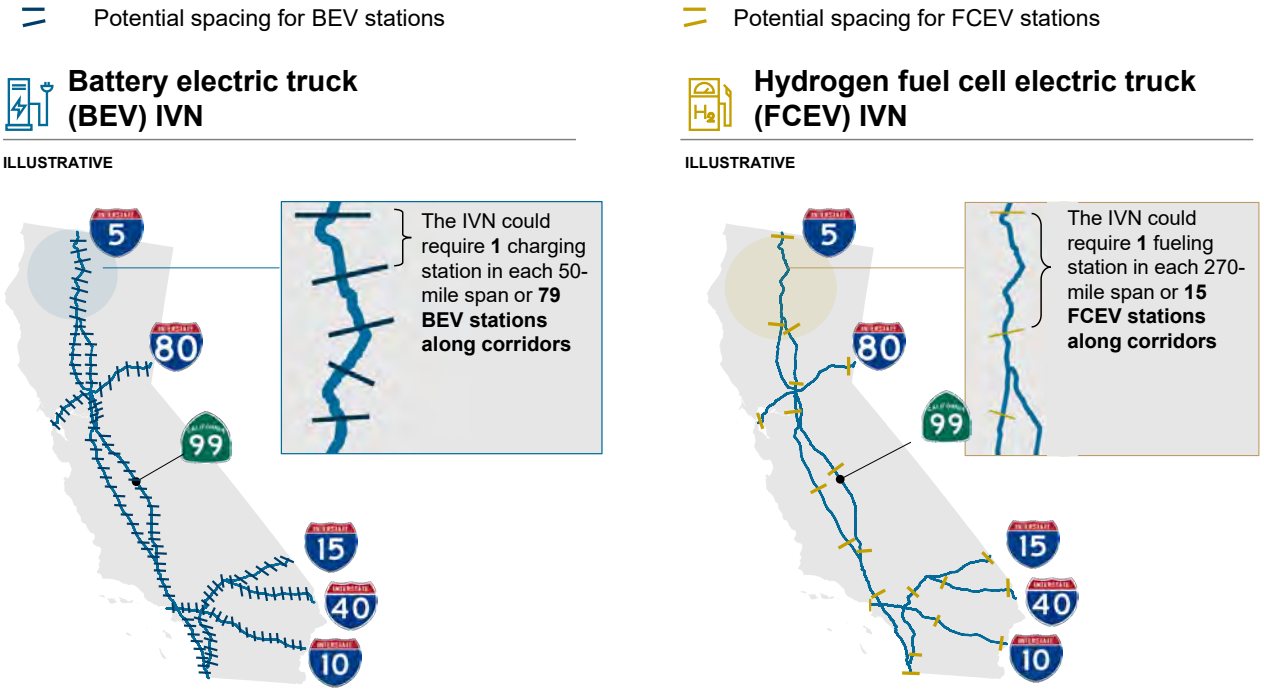
The correct estimation of utilization averages directly affects the number of stations needed to meet demand. This report assumes an average utilization of public stations of around 20 percent. Lower utilization would increase the number of stations needed. Factors that affect this utilization average include the number of stations needed to meet peak demand and drivers' tolerance of queues. Station economics and the value of driver time must be balanced with these factors. As more medium and heavy-duty stations are installed, monitoring utilization over time will provide more insight into this issue.

Shared Depot Facilities

Publicly accessible infrastructure near the Top 6 corridors, and the critical publicly accessible infrastructure needed in the first few years of the transition may not be located within a highway right-of-way. These areas include fleet depots, warehouses, ports, and other logistics hubs. As multiple fleets and independent owner-operators will be able to use a shared depot facility, these sites could be considered publicly accessible. A significant portion of medium-duty and heavy-duty trucks may rely on the shared depot model to serve as a central fueling hub, or hub-and spoke model, and may also rely on opportunity charging infrastructure along their routes. Contracting with a third-party fueling provider can sometimes be more cost effective for fleets than developing their own zero-emission depot. If fleets can save money on infrastructure, it will allow them to invest more in zero-emission trucks.

Exhibit 14 shows the number and spacing of both battery electric and hydrogen fuel cell stations along the initial viable network.

Exhibit 14: Initial Viable Network Along "Top 6" Freight Corridors



2.4 Future project selection and other project types

In the future, additional work can be done by a central delivery team engaging with stakeholders to refine specific station locations throughout the entire state. To this end, the Assessment identifies the location of existing infrastructure, such as electric grid infrastructure, existing funded and planned zero-emission infrastructure projects, truck parking, logistics depots, and warehouses, to see where existing infrastructure can support the development of the initial viable network of zero-emission truck charging and hydrogen fueling infrastructure. An example map is provided in Exhibit 15.

Exhibit 15a: Map of Existing Infrastructure and Truck GPS Data

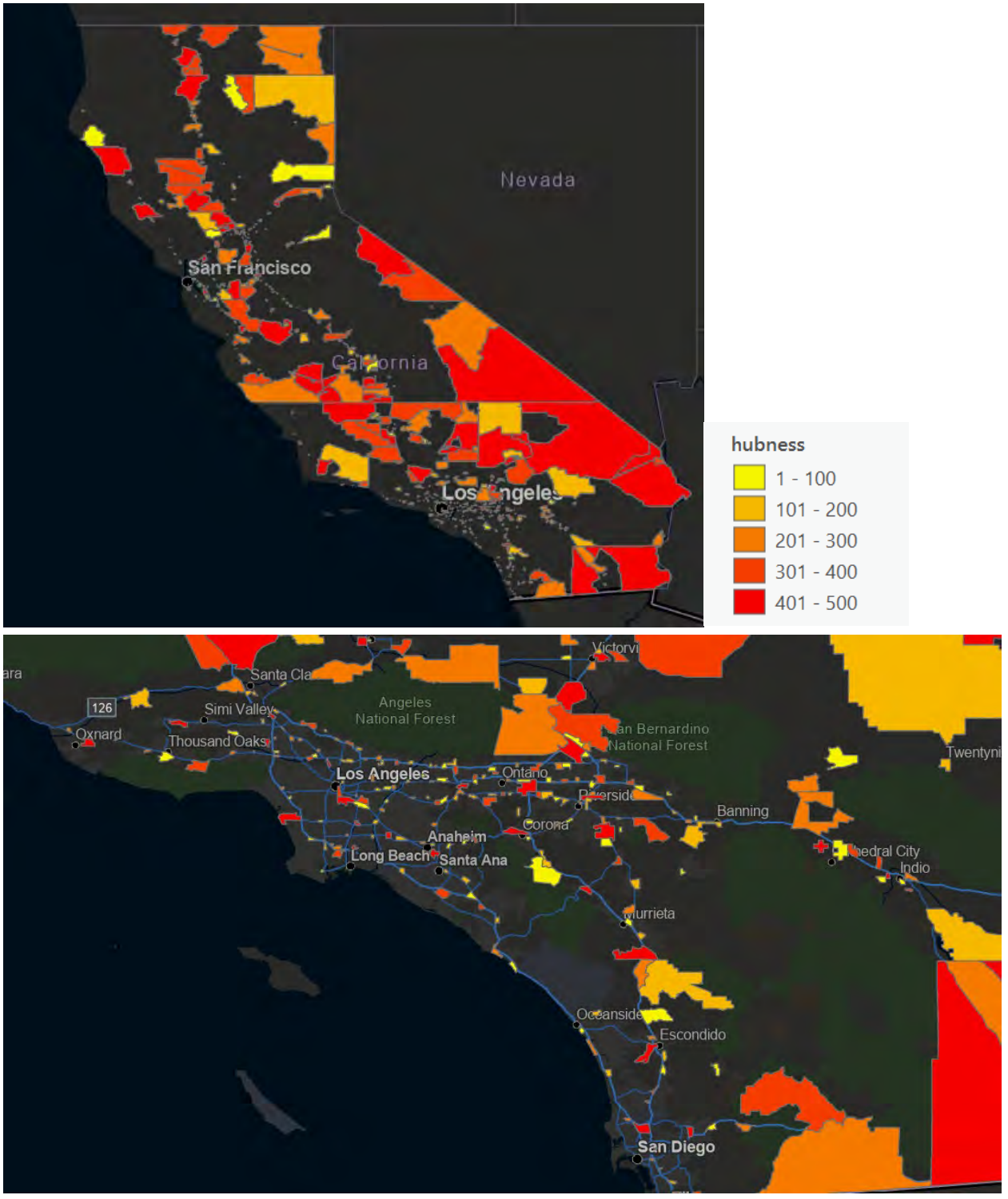
Map Legend:

The Assessment includes an overview of projects that could help achieve the goals of the Assessment and potential project sponsors. This overview can be found in Appendix 2. In general, there are several types of projects that will help achieve the goals of the Assessment. There are a significant number (approximately 50) of projects that have been funded but not yet built. Truck stop companies that plan to add zero-emission infrastructure to existing stations will provide infrastructure to several locations already identified as critical to trucks. Some state funding programs provide a platform for companies ready and interested in building zero-emission infrastructure to apply for funding. For some state grants, private companies must partner with public companies to receive state funds, so public/private partnerships are important.

In addition to building zero-emission charging and hydrogen fueling stations, it is important for the state to incentivize the production of hydrogen and to support more availability of affordable hydrogen in the market. This is especially important in the early years of the transition when customer demand is still developing. Hydrogen is an important option for freight because of its similarity to the characteristics of diesel, such as being light in weight and the ability to distribute hydrogen via trucks.

In addition, the Commission worked with the United States Army Corp of Engineers, Engineer Research and Development Center to develop a map showing optimal census tracts for zero-emission stations based on diesel stations and truck volume. These optimal tracts were given a “hubness” score based on which census tracts include the most truck volume, at least one diesel station, and proximity of highway to the diesel station. Heat maps like Exhibit 15B: Map of Hubness base on Truck GPS data will be important when the central delivery team works on implementing geographically specific station location plans.

Exhibit 15b: Map of Hubness based on Truck GPS data



Similarly, to encourage the availability of charging stations, the California Public Utilities Commission should continue to work with the Commission, the California Energy Commission, and other state agencies as needed to plan the infrastructure needs for the electric grid.

Senate Bill 671 requires the Assessment to consider other project types in addition to zero-emission infrastructure. These include 1) highway improvements needed to accommodate charging and hydrogen fueling infrastructure, including truck parking, 2) highway improvements on the corridor to increase safety and throughput, and 3) improvements to local or connector streets and roads to support the corridor.

Due to limited time, additional study of the topics listed above is necessary. It is recommended that the central delivery team, referenced later in the Assessment, consider these topics more once specific zero-emission station locations are identified. Specific highway improvements to accommodate charging and hydrogen fueling can only be identified once specific locations are identified.

The Assessment discusses these topics as outlined below.

- **Truck parking.** Existing truck parking locations identified by Caltrans were included in the maps used to develop the Assessment and identify potential locations for zero-emission infrastructure.
- **Increased maintenance and operations need resulting from heavier trucks.** A discussion of the need for increased maintenance on all roads due to heavier zero-emission trucks is included in Chapter 5.
- **Safety and throughput improvements on I-710 segment.** The discussion of the I-710 segment in Appendix 2 speaks to safety and throughput improvements along that corridor.
- **“Top 6” corridor connections**. The inclusion of connections within the “Top 6” freight corridors to key freight destinations includes local streets and roads.

One area this Assessment did not have the bandwidth to cover is tires for zero-emission medium-duty and heavy-duty trucks. Tires used on zero-emission trucks may differ from tires used on traditional internal combustion engine trucks. The potential benefits of including tire changing facilities at zero-emission station locations should be considered. Further study of tire dust emissions from tires used on zero-emission trucks may also be beneficial.

2.5 Potential project sponsors

The ideal project sponsor for zero-emission infrastructure projects should be an agency or organization that supports building zero emission charging infrastructure not only through financial co-investing, but also through project and operational leadership. Sponsors for public infrastructure may come from both the public and private sector.

Public sponsors that could lead station development projects locally include Regional Transportation Planning Agencies and/or Metropolitan Planning Organizations throughout the state. These entities could be strong candidates because they plan infrastructure projects at a regional level and could be best positioned to coordinate station sequencing across the top freight corridors which pass through their jurisdictions.

The private sector could bring significant capital to co-invest in development projects, as well as private sector best practices, to deliver the public network. Potential private sponsors for station development projects could include:

- Warehouse owners and operators
- Utilities (for electric grid update portion of projects)
- Truck stops and gas station companies which have already expressed interest in adding zero-emission freight charging to existing locations.
- Private charging station networks, which are developing zero-emission infrastructure independently.
- Zero-emission truck manufacturers, that have expressed intent to invest in zero-emission infrastructure.

In addition, utilities are important project sponsors for electric distribution grid infrastructure. Even though electric utilities may not be the lead development entity on a charging or hydrogen refueling project, coordination with the local electric utility will be fundamental to achieving success. Coordination and early project scoping for electric distribution capacity and service support will be necessary to determine cost feasibility for any site. Electric utilities are integral partners in the infrastructure buildout. It should be noted that utility infrastructure will also be needed for hydrogen stations. Dispensing hydrogen is dependent on hydrogen compression performed by electric compressors, which use significant amounts of electricity at scale.

As demand for zero-emission freight infrastructure increases throughout the state through 2035 and beyond, the private sector may be interested in entering the market and co-developing zero-emission charging stations beyond the public initial viable network.

Part 3: Funding outlook

Chapter Summary

Funding for publicly accessible initial viable network projects should come from public and private sources. Some public funding already exists, but additional state, local, and federal funding is needed to support sustained station development, especially as demand for zero-emission infrastructure is expected to increase over time.

The total capital costs to build the initial viable network in 2025 is estimated to be between $505 million to $950 million (not including electric grid upgrade costs). Estimates identify more than $1 billion available through 2025 for zero-emission freight infrastructure.[1] Most of these funds are limited-term and set to expire in 2025. Together with private funding, it is possible there are sufficient funds available to build the public stations required for the 2025 initial viable network.

The total capital costs for a publicly available initial viable network in 2035 is estimated to be approximately $10 billion to $15 billion. It is recommended this funding need be shared between private and public funding sources to deliver the initial viable network by 2035. Public funds should come from all sources, including federal, state, and local.

Summary of funding needs:

- **2025 initial viable network** – existing public funds available with support from private investment
- **2035 initial viable network** - $10-$15 billion total will be needed from all fund sources.

Individual station cost estimates

The cost for building each hydrogen fuel cell electric vehicle station is estimated to be approximately $9 million to $13 million. The cost for building each battery electric vehicle station is estimated to be approximately $5 million to $9 million. A detailed breakdown of capital expenditure estimates is included in Exhibit 16.

[1] Source: California Transportation Commission internal work completed in collaboration with the California Air Resources Board and the California Energy Commission.

Exhibit 16: Breakdown of Total Estimated Capital Expenditure Costs

	Cost category	BEV cost estimate USD, millions	FCEV cost estimate USD, millions
Permitting and design costs	**PA&ED**	$1.6	$1.6
	Design & engineering	$0.3	$0.3
Construction costs	**Right of way**	$1-3	$1-3
	Hardware & installation	$0.9	$4.7
	Site construction (building, roof, periphery, signage)	$2-3	$2-3
Currently not included in adjustment	**Grid upgrades /capacity**	$2-7	N/A
Updated per station cost estimate		**~$5-9 million**	**~$8.6-12.6 million**
Updated total IVN (2025+) cost range		**~$375-765+million**	**~$130-190+million**

Key considerations

- Sites will vary in need for PA&ED and Right-of-way costs
- Grid upgrades are not currently included in site capex adjustment recommendation; associated costs are often incurred outside of TCEP and related programs
- Not all sites will need design & engineering; some existing sites have in-house capabilities (e.g., gas station companies)
- The private sector will typically contribute 40-50% of total project cost

BEV = battery electric vehicle, FCEV = fuel cell electric vehicle, IVN = initial viable network, USD = United States dollars, PA&ED = Planning and Environmental Documents phase, TCEP = Trade Corridor Enhancement Program

The $2 - $7 million in “grid upgrades/capacity” is based on estimates of zero-emission station costs that were submitted by SB 671 workgroup members. The actual cost of grid upgrades depends on each site and could be more or less than this estimate. Extensive study on the cost of grid upgrades was out of scope for this Assessment. The grid upgrade costs shown on this table were estimated from projects submitted to CTC as part of its SB 671 work. Costs shown here may not be wholly predictive of the cost of future upgrades, as sites with existing available grid capacity will be likely sites for initial electrification efforts.

Number of initial viable network stations needed

The initial viable network of stations needed in 2025 is estimated to be 15-20 publicly available hydrogen fuel cell stations and 75-85 public battery electric stations to support goods movement along the "Top 6" corridors.

The initial viable network of stations needed in 2035 is estimated to be approximately 800-850 public hydrogen fuel cell stations and 475-525 public battery electric stations.[1]

Total cost estimates

Given the per station cost estimates, the total capital costs to build the initial viable network in 2025 is estimated to be $505 million to $950 million.

The total capital costs for the recommended public initial viable network in 2035 is estimated to be approximately $10 billion to $15 billion in 2023 dollars.

These cost estimates include costs for hardware, installation, site readiness and construction, design, and permitting. for public infrastructure. It is also possible, that as technology improves and becomes more readily available, hardware and installation costs may decrease over time.

The costs represented here account for publicly available infrastructure.

These estimates do not include costs necessary to upgrade the electric grid, which were not studied extensively as part of this assessment. To serve new energy load for vehicle charging, utilities may need to make upgrades to components of the distribution system on the utility side of the meter such as transformers, primary and secondary circuits, and substations. These distribution upgrades may in turn trigger the need for additional transmission infrastructure. Estimates for these costs are being developed in other venues, such as through the California Public Utilities Commission's Freight Infrastructure Planning Process.

Timing of needed funding

Current station development timelines may take 6 to 8 years.[2] This timeline is described in further detail in the Barriers and Solutions section of this report.

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[1] The Commission developed 3 scenarios of stations needed, including 1) accelerated battery-electric adoption, 2) accelerated hydrogen fuel cell adoption, and 3) a balanced adoption scenario. The estimate of stations needed for the initial viable network is based on the balanced adoption scenario.

[2] Sites that are dependent on long lead time transmission infrastructure will have a longer development timeline.

California could have enough public and private funds available to fund the 2025 initial viable network, however, given the station development timeline, it is critical funding be awarded and available to use by 2025.

To build the number of stations needed by 2035, public and private investment is necessary through fiscal year (FY) 2031-32. This allows three years after FY 2031-32 to build stations prior to 2035.

Available public funding

Some zero-emission freight infrastructure funding has already been allocated to EnergIIZE[3] projects. The California Energy Commission's EnergIIZE program has provided funding to 111 existing or planned zero-emissions freight stations. Of these, approximately 40 electric vehicle charging stations and 3 hydrogen refueling stations are within 1 mile of the "Top 6" freight corridors[4]. These stations are currently clustered in dense urban areas and do not currently create statewide coverage. Close consideration should be given to the placement of new charging or fueling stations relative to existing stations to ensure they are providing appropriate coverage to create the initial viable network.

An analysis was conducted on existing state funding programs available over the next three years that can support zero-emission freight projects. Based on this analysis, there is more than $1 billion available between 2023 and 2025 that may be used for zero-emission freight infrastructure.[5] When identifying existing funding, the analysis focused on what is available through 2025, because that is the first near-term target year studied in the Assessment. The largest portion of the estimate of existing funds is from the California Energy Commission's Investment Plan, which covers fiscal years 2022-23 through 2025-26. The Investment Plan can be found in the California Energy Commission's 2022-23 Investment Plan Update for the Clean Transportation Program document. The analysis estimated the portion of these funds available for zero-emission infrastructure with input from the California Energy Commission. The Trade Corridor Enhancement Program funds and California Air Resources Board funds are also an estimate of the percent of funds available through 2025 for zero-emission freight infrastructure from existing programs that cover more than just zero-emission infrastructure.

Related to electric infrastructure, the CPUC has authorized just over $1 billion in investor-owned utility (IOU) ratepayer funds to provide behind-the-meter rebates for the medium-duty and heavy-duty vehicle sector. This includes $316.4 million in medium-duty and heavy-duty rebate funding for the CPUC Funding Cycle 1 program which will launch in 2025, as well as funding authorized in prior programs: $356.4 million for Southern California Edison's Charge Ready Transport program, $245.8 million for

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[3] More information about the EnergIIZE program is available at: https://www.energiize.org/.

[4] Source: California Energy Commission Existing and Funded ZE truck stations. As of July 6, 2023

[5] The funding available estimate includes an estimate of funds from the California Energy Commission Investment Plan, the California Air Resource Board Carl Moyer Program and Assembly Bill 617 Program, and the Commission's Trade Corridor Enhancement Program.

Pacific Gas and Electric's Electric Vehicle Fleet program, and $113.4 million for San Diego Gas and Electric's Power Your Drive for Fleets program.

Beyond 2025, it is reasonable to assume some level of funding will continue for zero-emission medium-duty and heavy-duty infrastructure from the California Energy Commission, California Air Resources Board, and Commission programs referenced above, where applicable.

These estimates do not include any estimate of federal Charging and Fueling Infrastructure Discretionary Grant Program funds.[6] This estimate also does not include the California Air Resources Board's Low Carbon Fuel Standard credits program that may be available for zero-emission stations, because this program provides reimbursement at a certain dollar per kilogram or kilowatt hour of station capacity, and it is not feasible to estimate in this study the amounts that will be awarded through it. Additionally, the National Electric Vehicle Infrastructure formula funds may be used for medium-duty and heavy-duty vehicles, and Caltrans will continue to evaluate opportunities to use National Electric Vehicle Infrastructure formula funds for this purpose.

This Assessment does not include a total estimate of electric grid infrastructure costs. The electric infrastructure cost per station is highly dependent on the station location, and since utilities are still determining upgrade needs in each region, it was not possible for this report to include an estimate of total electric infrastructure costs.

Although many programs include zero emissions infrastructure as an eligible project type, after state fiscal year 2025-26, additional public and private funding will be needed to build the statewide infrastructure required to support the transition to zero-emission trucks.

Conclusions

Initial Viable Network – 2025

- California may be able to fund the initial viable network needed in 2025 with existing public and private funds. This is based on the assumption that total costs for the 2025 initial viable network are between $505 million and $950 million, that there is over $1 billion in available public funding through 2025 that may be used, and that the private sector will share a portion of project costs.
- The cost estimate does not include costs associated with electric grid upgrades.

Initial Viable Network – 2035

- The total estimated cost to build the 2035 initial viable network is between $10 billion and $15 billion.
- Public and private investment from all sources will be needed to meet the 2035 infrastructure need.

[6] The Charging and Fueling Infrastructure Discretionary Grant Program provides up to $700 million nationwide for zero-emission infrastructure, although this is not specifically for freight infrastructure. More information on this federal grant can be found here: https://www.fhwa.dot.gov/environment/cfi/

Recommendation for public funding

- Allocate available public funds, where feasible, to support the build out of the 2035 initial viable network cost. The total cost of $10 to $15 billion will need to be shared between private and public funding and come from all available fund sources.

Part 4: Barriers and solutions

Chapter Summary

It may not be possible to build the initial viable network in time to support fleets complying with Advanced Clean Fleets deadlines unless the state and all stakeholders work together to shorten the current station development process.

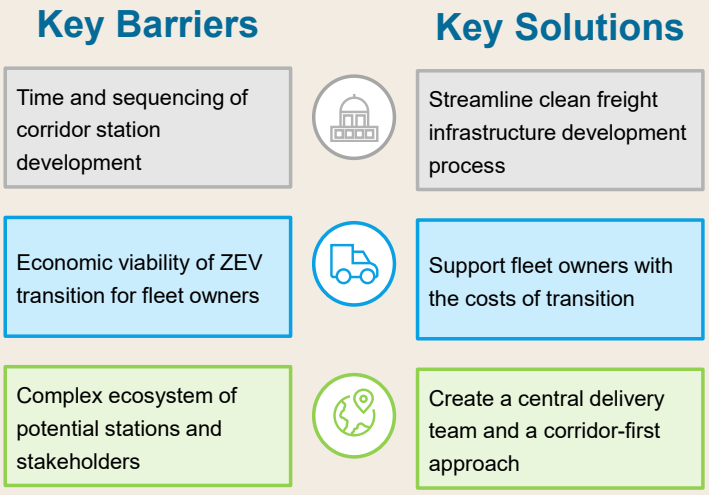
Listening to and understanding the perspective of fleets and individual truck owner/operators is key to understanding how to support them.

Public incentives, federal funds, and private financing strategies such as loans and public-private partnerships are needed to help transition the financing of zero-emission stations to primarily private funds.

A central delivery team could provide a coordinated state vision, and work with stakeholders to hear their needs and work with them through some of the challenges discussed in this chapter.

Three key barriers and corresponding solutions were identified. These three barriers and solutions fall into three main categories: time, cost, and a complex ecosystem of stakeholders.

Exhibit 17: Key Barriers and Solutions to Clean Freight Infrastructure Development:



4.1 Barriers and solutions to achieving the transition to zero-emission freight

The SB 671 workgroup identified several challenges associated with the transition to zero-emission freight; the Assessment groups and consolidates them as shown in Exhibit 17. Each of the challenges associated with the transition will take time and a thoughtful approach to fully implement. The topics not included directly in this report include things like the potential for high vehicle insurance rates, the impact of longer routes on drivers who are paid on commission, the need to standardize station design, and the potential for high demand charges on the use of electricity at peak times.

Below is additional detail related to each main topic area addressed in the Assessment.

4.2 Barrier: Timing and sequencing of corridor station development

Process streamlining and simplification may be necessary to build the 2025 and 2035 initial viable network in a timely fashion. The current station development process ranges from 6 years to more than 8 years on average per station. This represents the aggregated timeline for permitting and pre-construction activities (3 years to more than 5 years), construction (2 years to more than 3 years), and grid upgrades. This station development timeframe presents unique challenges to building the number of stations needed in each of the Assessment's four study years (2025, 2030, 2035, and 2040), particularly in the Assessment's early milestone years.

Challenges identified throughout existing funding and permitting processes include:

- Minimal use and awareness of statutorily created streamlining opportunities by local municipalities.
- Varying local permitting requirements for California Environmental Quality Act approval.
- Limited ability to tier from Programmatic Environmental Impact Reports to expedite permitting processes across multiple site locations.
- Backlog of projects in approval and inspection processes.

According to the California Public Utilities Commission, significant electrical grid infrastructure upgrades could take up to 10 or more years. Additionally, timelines for zero-emission infrastructure are new and still developing. These timeframe assumptions are based on the best available knowledge of current infrastructure development timelines.

4.3 Solution: Streamline the clean freight infrastructure development process

To address the 2025 milestone need for charging infrastructure and ensure the roll-out of an incrementally useable and operational network of stations, the state should take the following steps to streamline the station development process.

Public funding programs and environmental requirements are based on state and federal law. Implementing the recommendations in their totality may require legislative or regulatory change. When implementing these recommendations, absent legislative or regulatory change, state agencies should align with state and federal law and streamline the clean freight infrastructure development process, where feasible.

Recommendations are intended to complement recent efforts to streamline infrastructure development enacted as part of the 2023-24 budget package.

Recommendations for streamlining zero-emission station development

- To shorten the station delivery timeframe, a central delivery team should be created to coordinate state and local stakeholders to implement the recommendations noted in this list. This central delivery team should function as part of or in coordination with the Executive Order N-8-23 Strike Team.
- The central delivery team should work to create a set of standardized station development model(s) (zoning and building permits) that can be replicated for each station across a priority corridor, based on affected local municipality guidelines.
- To complement recent efforts to improve California Environmental Quality Act timeframes, the Legislature should consider enacting a Categorical Exemption from CEQA for zero-emission freight charging and hydrogen fueling stations.
    - It is recommended that, where possible, zero-emission infrastructure encourage the re-routing of trucks away from communities, and that environmental and air quality stakeholders, impacted communities, and community-based organizations are involved in the development process, general planning process, and location planning process. A specific process related to this suggestion is included in the central delivery team recommendations.
    - The community should engage with the CEQA lead to determine the level of environmental document needed. If a project is challenged, a higher-level environmental document, such as an Initial Study or Environmental Impact Report, may be produced to address concerns.
- The Legislature should set a statutory default permit approval deadline for zero-emission freight charging and hydrogen fueling stations similar to AB 970 (McCarty, Chapter 710, Statutes of 2021) that allows a permit for a passenger battery electric vehicle charging station to be deemed complete

if it is not approved or otherwise commented on within a specified time period. In addition, existing law, SB 1291 (Archuleta, Chapter 373, Statutes of 2022), requires cities and counties to administratively approve an application to install electric vehicle charging stations and hydrogen-fueling stations through the issuance of a building permit or similar nondiscretionary permit if the location meets certain criteria. The provision of a default permit approval deadline for zero-emission freight charging and hydrogen fueling stations should be made permanent.

- The central delivery team should take a corridor approach to combine and sequence station development where feasible. In other words, synchronize building stations along the selected top freight corridor until the whole corridor is complete prior to moving to the next corridor. The selection process should start first with the “Top 6” corridors and move next to the 34 Priority Freight Corridors. These decisions should be made in collaboration with stakeholders, because while this is an ideal goal, the timing of station development depends on market readiness within each corridor.
  - The initial viable network may be developed to allow smaller segments along the initial viable network to be useable by freight operators as sections of corridors and freight journeys are constructed (for example, given the prevalence of intra-California freight travel along the I-5 corridor, starting construction at the ports and working north or south along the corridor).
- The California Public Utilities Commission, the Commission, and other relevant state agencies should continue to collaborate on the Freight Infrastructure Planning process to proactively update electric infrastructure plans and to coordinate freight modeling efforts. In the short-term, the Freight Infrastructure Planning process will identify process alignment and reforms for infrastructure planning to support freight electrification. In the medium term, the Freight Infrastructure Planning process will identify potential locations for freight electrification to study grid needs. These studies may lead to infrastructure authorization in the long term. The state, and specifically a central delivery team, if one is identified, should continue to work to identify short-term solutions. As part of this effort, it is recommended that state agencies evaluate the procurement process for transformers and identify best practices among utilities that can help reduce bottlenecks. Transformer shortages are impacting projects across the country and can cause project delays up to 24 months. Shortening this process where feasible will help address delays in receiving transformers, switch gear, and other electrical equipment. Stakeholder workshops, and the potential for federal financial aid could be explored.

Exhibit 18 shows the current timeline for zero-emission freight infrastructure development and how the above recommendations could shorten that timeline.

Exhibit 18: Estimated Timing for Zero-Emission Infrastructure Development

4.4 Barrier: Economic viability of the transition for fleet owners

The transition to zero-emission vehicles, and the corresponding infrastructure development required to sustain the transition, could negatively impact fleet owners due to the constraints of time and money.

Members of the SB 671 workgroup who represent fleets and individual truck owner/operators in California, along with fleet owners from Mexico, voice concern regarding the lack of public infrastructure available to power zero-emission trucks: the higher cost of zero-emission trucks; and the resale value of medium-duty and heavy-duty zero-emission trucks.

The Advanced Clean Trucks regulation mandates that manufacturers sell an increasing portion of truck sales in California as zero-emission, starting with the 2024 model year. The Advanced Clean Fleets regulation requires state and local governmental fleets, drayage trucks (diesel-fueled, heavy-duty trucks that transport cargo, such as containerized and bulk goods that primarily operate on and through ports and intermodal railyards), and federal and large commercial fleets to begin acquiring zero-emission medium- and heavy-duty vehicles and light-duty package delivery vehicles beginning in 2024. The Advanced Clean Fleets regulation additionally requires that all new California-certified medium- and heavy-duty vehicles be zero-emission vehicles starting in 2036. However, current demand for these trucks remains low. Large, upfront capital costs to buy zero-emission trucks may deter fleet owners from purchases, even though zero-emission vehicles may have lower overall operating costs in the

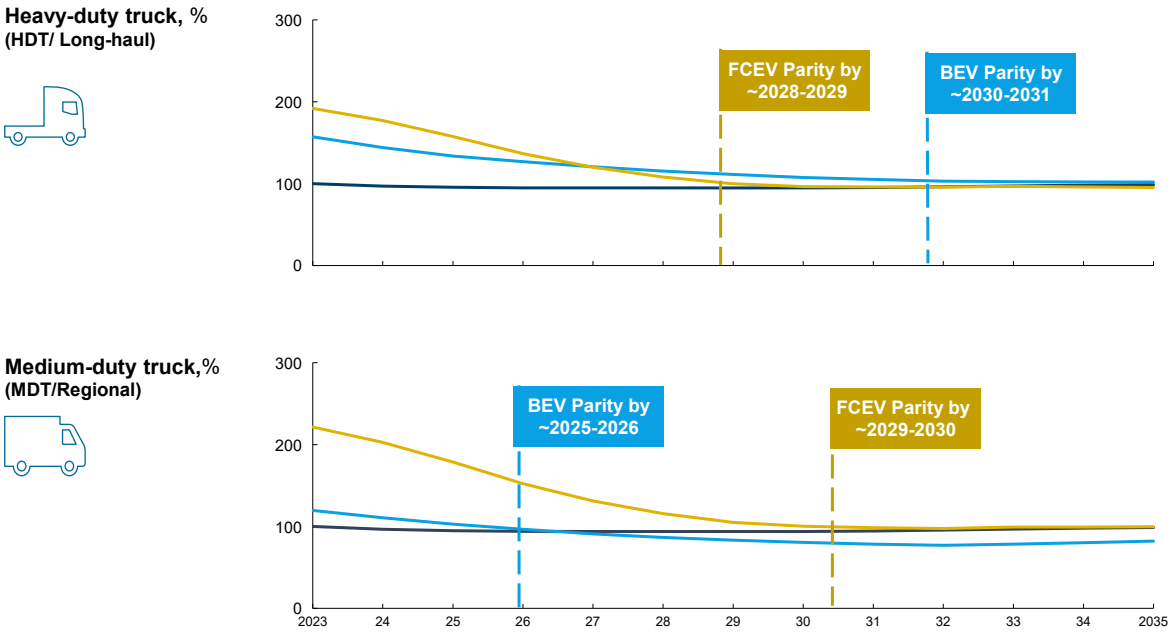
long-term. The McKinsey Center for Future Mobility estimates that battery electric medium-duty trucks will reach cost parity in total cost of ownership by 2026, and battery electric heavy-duty trucks will reach cost parity in total cost of ownership by 2036. The McKinsey Center for Future Mobility also estimates that hydrogen fuel cell electric medium-duty trucks will reach cost parity in total cost of ownership by 2031, and hydrogen fuel cell electric heavy-duty trucks will reach cost parity in total cost of ownership by 2030.[7] Exhibit 19 summarizes these timelines for parity in total cost of ownership. The McKinsey Center for Future Mobility cost parity estimates include the estimated impact of the Inflation Reduction Act on cost parity.

Currently, limited data exists about the life-cycle costs of zero-emission trucks, and it will take a few years to build a body of evidence that can support estimates well. This uncertainty adds risk to the decisions fleets must make about transitioning their trucks to zero-emission. However, decisions regarding fleet conversion should be informed by existing cost parity research that shows that total cost of ownership for zero-emission trucks may be lower in future years than the total cost of ownership for a conventionally fueled truck.

The Advanced Clean Trucks regulation mandates that manufacturers sell an increasing portion of truck sales in California as zero-emission, starting with the 2024 model year. The Advanced Clean Fleets regulation requires state and local governmental fleets, drayage trucks (diesel-fueled, heavy-duty trucks that transport cargo, such as containerized and bulk goods that primarily operate on and through marine ports and intermodal railyards), and federal and large commercial fleets to begin acquiring zero-emitting medium- and heavy-duty vehicles and light-duty package delivery vehicles beginning in 2024. The Advanced Clean Fleets regulation additionally requires that all new California-certified medium- and heavy-duty vehicles be zero-emitting vehicles starting in 2036. However, current demand for these trucks remains low. Large, upfront capital costs to buy zero-emission trucks may deter fleet owners from purchases, even though zero-emission vehicles may have lower overall operating costs.

[7] McKinsey Center for Future Mobility, Commercial Fleet Electrification Model

Exhibit 19: Projected Total Cost Parity for Fleet Owners



In addition, freight fleet workforces will need to adapt to changes precipitated by the widespread adoption of zero-emission hardware and technology. Drivers may require training on fueling, charging, and handling zero-emission vehicles. Logistics workers will need to adjust for alternate driving ranges and charging or fueling schedules. Maintenance workers may require reskilling, upskilling, and in some cases both reskilling and upskilling to support high-tech drivetrain technologies.

4.5 Solution: Support fleet owners through the transition

Listening to and understanding the perspective of fleets and individual truck owner/operators is key to understanding how to support them. Especially in the next five to seven years of the transition to zero-emission freight, public incentives, private funds, and federal funds are needed to ensure a successful transition. At the same time the state plans and implements incentive programs, the state should also plan and implement transitional financing strategies such as loans, and public private partnership opportunities, because this type of support is needed to transition the market to primarily private funds over time.

Fleet owners and some individual truck owner/operators in Mexico are also required to transition to zero-emission vehicles if they do business in California. Incentives and long-term financing strategies

are needed to support the transition to zero emissions medium- and heavy duty-trucks on the Mexico side of the border. This will require innovative financing strategies.

Below are recommended actions to support fleet owners as they transition to zero-emission freight.

Recommendations for supporting fleet and truck owners through the zero-emission vehicle transition

- The Legislature should create a new limited-term (five-year) zero-emission truck incentive program to assist fleets with purchasing zero-emission trucks. Program development should incorporate input from communities, and fleets of all sizes including those who will be impacted by regulations and should be flexible to ensure support in a way that is considerate of their needs. Although a new limited-term funding program is needed, there are existing programs that provide support for zero-emission trucks. Several examples are summarized below.
  - There are clean truck programs that assist fleets with purchasing zero-emission trucks, such as the Port of Los Angeles' Clean Truck Program[8]. These programs are helpful but are typically limited to a specific geographic area like a port where a charge can be levied on users.
  - The California Air Resources Board and the California Energy Commission are working on a new Zero-Emission Truck and Infrastructure Loan Pilot Project designed to combine financing for both heavy-duty zero-emission vehicles and charging or fueling infrastructure. A comprehensive loan package that combines vehicle and infrastructure financing can provide additional access to zero-emission financing and create a streamlined lending process for small businesses, with a focus on those in disadvantaged communities, that are transitioning to zero-emission vehicles. The California Air Resources Board and the California Energy Commission will each partner with the Treasurer's Office to build on successful relationships across agencies and with the California Pollution Control Financing Authority to implement the Truck Loan Assistance Program through their California Capital Access Program.
  - The Short-Haul Zero-Emission Truck Pilot Project is a result of collaboration between the California Air Resources Board, the Portside Steering Committee (the Portside Steering Committee is a group of people representing various interests in an Environmental Justice Community that encompasses parts of Barrio Logan, Logan Heights, Sherman Heights, and National City in San Diego), and the San Diego County Air Pollution Control District to incentivize the purchase or lease of zero-emission heavy-duty trucks that operate in the Portside Environmental Justice community. The program provides up to 90 percent or $250,000 of the eligible purchase cost (or up to 90 percent of the 3-year lease payment) for an eligible truck that

[8] Information about the Clean Truck Program can be found online here: https://www.portoflosangeles.org/environment/air-quality/clean-truck-program#:~:text=Port%20of%20Los%20Angeles%20Clean%20Truck%20Program%20Overview,to%20comply%20with%20State%20law.

has performed at least 52 trips a year in the community of Portside and does not require the participating business to scrap or sell the old vehicle. Currently $4 million in AB 617 (Garcia, Chapter 136, Statutes of 2017) incentive funding has been approved for distribution through this program.

  - Retrofitting traditional internal combustion engine trucks to zero-emission power trains should be explored as an option to reduce costs. This option may be less expensive than purchasing a new zero-emission truck.

- The California Air Resources Board could create a provision within the Low Carbon Fuel Standard program to support buildout and operation of fast charging and hydrogen fueling infrastructure for medium-duty and heavy-duty vehicles, similar to the existing capacity crediting provision in the Low Carbon Fuel Standard regulation.[9]

- State agencies, Regional Transportation Planning Agencies, Metropolitan Planning Organizations, and the Legislature, should consider how the state may support Mexico-based fleets, operating within California, in the transition to zero-emission freight. Mexico-based fleets, operating within California, do not currently have public incentives from the Mexican government to support the transition to zero-emission trucks and the infrastructure to support electricity or hydrogen does not currently exist. The following potential financing strategies and energy support strategies should be considered to support Mexico-based fleets and the zero-emission vehicle transition at the California border:

  - State agencies, Regional Transportation Planning Agencies, and Metropolitan Planning Organizations should apply for federal funding programs designed to support zero-emission trucks and infrastructure in border areas.

  - The Legislature should explore developing a state program that allows public funding to be spent in border regions for zero-emission freight pilot projects that provide benefits to California, where allowable by law.

  - State agencies should build on existing public private partnership programs within public organizations like the San Diego Association of Governments to implement zero emission charging and hydrogen fueling within the border region.

  - State agencies, Regional Transportation Planning Agencies, and Metropolitan Planning Organizations should partner with the North American Development Bank or similar organizations when possible. The North American Development Bank was created with the passage of the North American Free Trade Agreement and focuses on providing funding and technical assistance to border communities in the United States and Mexico.

[9] Low Carbon Fuel Standard program information can be found online here: https://ww2.arb.ca.gov/sites/default/files/classic/fuels/lcfs/guidance/zev_infra_crediting_overview.pdf

  - State agencies should request Congress reinstate the federal Coordinated Border Infrastructure Program that allowed funds to be used for pilot projects that spanned both sides of the United States and Mexico border. Although Mexico is California's number one trading partner, most of these recommendations apply to the U.S. states that border California. These strategies should be employed at all California borders.

- The Legislature should authorize a vehicle buy-back program that would appropriate funds to a state agency that would work with truck sales companies to set aside funds to buy back used zero-emission trucks from fleets once they reach their useful life as a "new" vehicle. This could be added as a new component of existing or new truck incentive programs.
  - A buy-back program could be useful for drayage trucks. Currently, many drayage trucks are used trucks that were bought on the secondary market. Currently, there is no secondary market for zero-emission trucks. Creating a truck buy-back program could help create a secondary market, extend the life of existing zero-emission trucks, and provide more affordable trucks. The Advanced Clean Fleets regulation requires, in pertinent part, that existing drayage trucks cannot be used to conduct drayage operations once they exceed a specified minimum useful life period, defined as the later of either: thirteen (13) years from the model year that the engine and emissions control systems are first certified by the California Air Resources Board or the United States Environmental Protection Agency; or when the vehicle reaches 800,000 vehicle miles traveled or 18 years from the model year that the engine and emissions control systems are first certified by the California Air Resources Board or the United States Environmental Protection Agency, whichever is earlier. This is in Health and Safety Code 43021(a).

Over time, financing strategies that encourage the use of private funds and promote an independent privately funded system should be used. A lease is one example of this type of financing. The California Air Resources Board and California Energy Commission lease pilot programs referenced above are good examples of lease programs for both trucks and infrastructure. Private companies, such as Penske, are also considering lease programs for clients to purchase zero-emission trucks. In addition, North American Development Bank, which is referenced above, is an organization focused on providing leases for zero-emission infrastructure.

4.6 Barrier: Complex stakeholder ecosystem

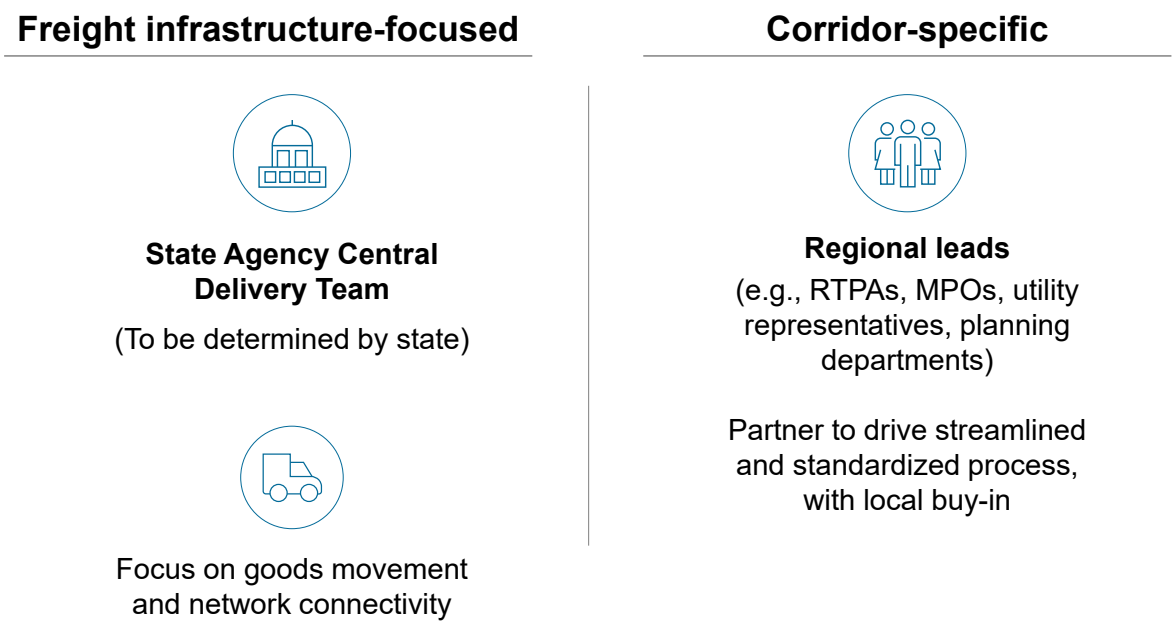
The statewide nature of the transition to zero-emission freight is unprecedented. It will require the coordination of many different stakeholder groups across the state such as local permitting agencies, utility companies, Regional Transportation Planning Agencies and Metropolitan Planning Organizations, ports, the California Public Utilities Commission, the California Energy Commission, private entities like start-up companies, and established corporations like beneficial cargo owners and fleets. In addition, communities impacted by poor air quality should be involved in the planning process for zero-emission freight infrastructure. It is important to include local transportation equity leaders, environmental justice organizations, community-based organizations, impacted communities, and tribal leaders early in the planning process. It will be important to ensure alignment among these various groups to facilitate the timely development of zero-emission freight infrastructure.

As the publicly accessible initial viable network is developed, the state also needs to have a consistent focus on equity and accessibility (for example, to ensure that station locations in underserved communities are included and prioritized in station development).

4.7 Solution: Create a Central Delivery Team

The central delivery team could include both a statewide public agency to oversee statewide development, as well as Regional Transportation Planning Agencies and Metropolitan Planning Organizations to coordinate station funding, permitting, and development at the local level. The site knowledge of a regional or local agency, combined with the funding, state permitting, and the corridor focus of a statewide agency, could position the state to achieve the goals identified in the Assessment. Exhibit 20 provides a visualization of the central delivery team recommendation.

Exhibit 20: Visualization of the idea of a central delivery team



A central delivery team should complete the following actions:

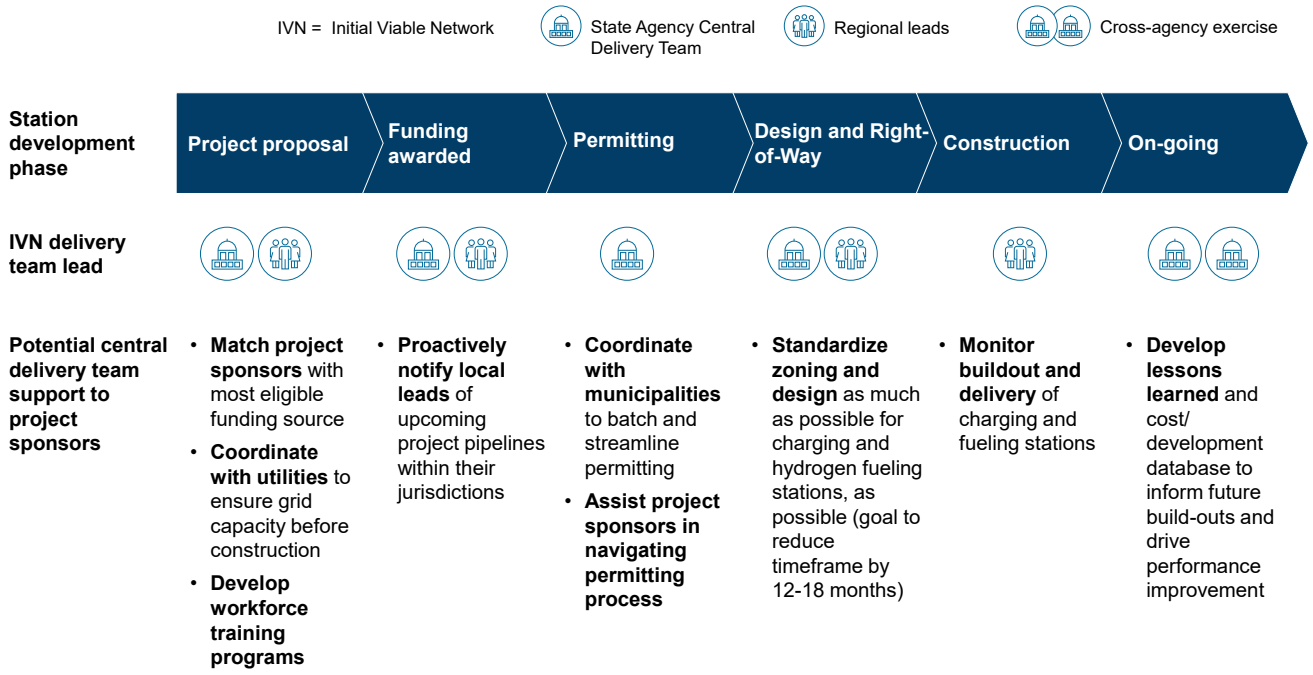
- Carry out the *Recommendations for a central delivery team* identified below.
- Participate in the Freight Infrastructure Planning workgroup that is led by the California Public Utilities Commission, if appropriate. This effort establishes an interagency process including agencies such as the California Energy Commission, Caltrans, the California Air Resources Board, and the Commission to develop common data inputs and assumptions to support planning for the long lead time utility-side electric infrastructure.
- Work with stakeholders to strategically select specific project locations or target small areas for collaboration with state agencies to deliver project sequencing goals. Project sequencing is the idea of finishing segments of a corridor one after another to systematically build a support system one segment at a time.
- Ensure stakeholders are aware of available funding sources and existing public private partnership models.
- At the funding stage, a central delivery team could inform local municipality leads of pipeline projects to reduce the time it takes to have local permits approved, where feasible. As zoning,

permitting, and construction occur for each charging station, the central delivery team could collaborate very closely to minimize delays in the process.

- Regularly communicate with utility companies, the California Energy Commission, the California Public Utilities Commission, the Governor's Office of Business and Economic Development, and other stakeholders to facilitate grid optimization for battery electric stations and procurement and delivery for hydrogen stations.
- Help ensure timely and equitable implementation solutions throughout California.

On May 19, 2023, Governor Newsom issued Executive Order N-8-23, which convened an Infrastructure Strike Team to coordinate across State agencies to facilitate the delivery of infrastructure projects, including zero-emission vehicle infrastructure. The central delivery team could be led by an agency or agencies that are part of the strike team. Exhibit 21 shows examples of central delivery team actions.

Exhibit 21: Example central delivery team actions



Recommendations for a central delivery team

- The Administration should consider designating one lead group or agency to carry out the functions of the central delivery team outlined in this Assessment. This could be an agency that is currently

part of the Executive Order N-8-23 strike team or the Administration could direct the Executive Order N-8-23 strike team to identify and designate such a group. The intent of the central delivery team would be to act as a lead in coordinating zero-emission freight infrastructure planning and implementation, including carrying out the actions included in this Assessment where feasible. The central delivery team should function as a cross-agency team including the California Energy Commission, Caltrans, the California State Transportation Agency, the Governor's Office of Business and Economic Development, California Air Resource Board, California Public Utilities Commission, the Commission, and any other state agencies or entities determined necessary.

- The central delivery team should identify leads from Regional Transportation Planning Agencies, Metropolitan Planning Organizations, ports, utilities, fleets, state-agencies, and other stakeholders (similar to the SB 671 workgroup) that are necessary to build stations quickly.
- The central delivery team should, in coordination with impacted communities, community-based organizations, equity advocates, public health advocates, tribal nations, and environmental advocates, develop a process for impacted communities, community-based organizations, equity advocates, public health advocates, tribal nations, environmental advocates, and any other groups identified to be included in zero-emission station location planning and implementation. Assuming locations around the Top 6 corridors are prioritized, then communities along these corridors should also be prioritized. Outreach efforts should be culturally competent and community specific. In-person meetings and meetings in other languages should be offered when needed. Efforts like the Los Angeles Cleantech Incubator and Coalition for Environmental Health and Justice effort on the I-710 should be used as an example of the type of process needed. In developing the process, the central delivery team should coordinate with the CalSTA Anti-Displacement sub-committee and the interagency Equity Advisory Committee to utilize their expertise and to facilitate the use of existing and any new needed project specific anti-displacement strategies. Existing processes already required under law should also be considered to avoid "re-inventing the wheel." The central delivery team should work with community colleges and ports that provide training programs to support training, reskilling, and upskilling freight industry workers, as necessary. Additional information related to existing training programs can be found in Chapter 5. In addition, the central delivery team should work with state agencies, local agencies, colleges, and other stakeholders as appropriate to develop and provide training to local municipal staff to inform them of critical changes and to publicize more broadly what the changes are.

Zero-Emission Needs in the Baja California and Baja Sur Region

One key consideration for the state is the importance and complexity of goods movement across its border with Mexico. Some truck companies based in Mexico that operate in California may be subject to California's Advanced Clean Fleets regulation, but likely do not currently have the zero-emission trucks, electric grid capacity, or regulatory policy to support the underlying zero-emission freight

movement[1]. The transition to zero-emission vehicles is particularly complex for this region. In 2021, the corridors connecting California to Mexico handled freight goods valued at $71.8 billion[2]. The region is significant for the trade relationship between the United States and Mexico, and a smooth transition that maintains freight movement will be critical for both economies.

Addressing this challenge could involve a high level of involvement from the central delivery team to ensure an appropriate collaboration with Mexico to facilitate goods movement across affected corridors, and to help identify strategies in this region.

Example of a community-centered zero-emission station site planning process

- The Los Angeles Cleantech Incubator collaboration with the Coalition for Environmental Health & Justice on the California Energy Commission funded I-710 Blueprint project is an example of a planning process that leverages community knowledge and expertise to produce more robust and grounded recommendations. The Coalition for Environmental Health & Justice (which includes the environmental justice, base-building organizations of East Yard Communities for Environmental Justice, Communities for a Better Environment, Long Beach Alliance for Children with Asthma, and Long Beach Residents Empowered, among other groups) worked with community members along the I-710 freeway corridor to gather and share input on the priority depot site selection process. This work provided the project team with a richer understanding of high-traffic and high pollution areas near industrial areas. The Coalition for Environmental Health & Justice's priority considerations included: Focus on improving community health through lessening emissions from medium-duty and heavy-duty vehicles
- Avoiding inducing traffic in disproportionately impacted areas, such as near residential areas or sensitive receptors such as schools, senior centers, hospitals, supportive housing, etc.
- Improving air quality in areas with significant air pollution from goods movement.
- Avoiding safety risks to surrounding communities.
- Prioritizing opportunities for small trucking businesses with fewer resources to invest in zero-emission infrastructure.

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[1] Source: San Diego Association of Governments, Caltrans, and Imperial County Transportation Commission Memorandum re: Zero-emission freight transition at Baja Border, May 5, 2022.

[2] Source: San Diego Association of Governments, Caltrans, and Imperial County Transportation Commission Memorandum re: Zero-emission freight transition at Baja Border, May 5, 2022.

The Coalition for Environmental Health & Justice ultimately selected 16 initial sites to prioritize for truck charging infrastructure deployments based on technical information compiled by the Los Angeles Cleantech Incubator, such as a Geographic Information System map that displayed “hotspots” for fast- and slow-charging opportunities based on truck traffic and grid capacity. The Coalition for Environmental Health & Justice held inter-regional, intergenerational convenings to explain and discuss the map with community members from across the I-710 corridor.

The Coalition for Environmental Health & Justice worked to create accessible discussion spaces using visual tools where community members could break down technical concepts and jargon such as slow and fast charging and grid capacity. This was not a result of a single conversation, but rather continued collaboration over several months. Through continued discussions, community members steadily wielded their expanded technical knowledge alongside their existing expertise and lived experiences about their neighborhoods to identify local areas that could be a good fit for battery-electric truck charging depots.

Once the Coalition for Environmental Health & Justice generated the list of 16 sites, the Los Angeles Cleantech Incubator conducted outreach to property owners and managers to share information and gauge interest. Following this outreach, the Los Angeles Cleantech Incubator deemed 4 sites as priorities and set up site visits. The Coalition for Environmental Health & Justice also participated in site visits and community members were able to learn more about the process for developing these sites into battery-electric truck charging depots.

The success of this collaboration was a result of the Los Angeles Cleantech Incubator bringing environmental justice partners in early, not just to share information or to inform them of the project but to substantively engage with their expertise to create better outcomes. This is an example of how to work toward the transition to zero-emission freight in an equitable and community-centered way.

Part 5: Additional implications

Chapter Summary

As California transitions to zero-emission freight, there are several impacts California must consider and plan for. These include impacts associated with heavier zero-emission trucks, potential impacts to residents and businesses, and workforce support needs. This chapter explores these challenges and what the state can do to plan for them. This chapter also covers several potential benefits of the transition to zero-emission freight.

Potential benefits from the deployment of zero-emission medium- and heavy-duty vehicles: The transition to zero-emission freight infrastructure could have both economic and health benefits for California's citizens, including, an estimated $18.6 billion in savings in statewide health spending from criteria emission reductions through 2040 as a result of the Advanced Clean Fleets and Advanced Clean Truck regulations, and an estimated 1,720 lives saved.

Impact on roads and bridges: Zero-emission trucks will introduce heavier axle loads and may increase damage to the pavements they use. Heavier trucks may also impact fleets, requiring them to move the same amount of cargo with more trucks. It is recommended Caltrans evaluate what policies are necessary to address this challenge.

Avoiding resident and business displacement: The Commission reviewed several resources related to effective ways of avoiding displacement, such as the SB 1 Competitive Programs Transportation Equity Supplement, the California State Transportation Agency's Anti-Displacement Subcommittee Workplan, the Caltrans Project Development Procedures Manual, and the online California Estimated Displacement Risk Model provided by the Urban Displacement Project. The guidance and direction from these resources, as well as the California Transportation Agency's forthcoming memo on Policy Recommendations to Promote Anti-Displacement Activities within State Transportation Funding Programs, should be used when implementing next steps such as identifying project locations. In addition, a central delivery team could engage with local transportation equity leaders, environmental justice organizations, impacted communities, community-based organizations, and tribal leaders to obtain their perspective during the planning process.

Potential workforce challenges: The transition to zero-emission trucks will impact workforces such as vehicle manufacturers, fleet owners, individual truck owners, logistics providers, automobile maintenance workers, and others. The Assessment identifies existing training programs and recommends the central delivery team help educate impacted stakeholders about existing resources.

5.1 Benefits of the transition to zero-emission freight

The transition to zero-emission freight infrastructure could have both economic and health benefits for California's citizens, economy, and freight industry.

The Gross Regional Product in California could increase 10 percent by 2040 because of the zero-emissions infrastructure transition[3] This was determined by an analysis of the value chain for zero-emission infrastructure development (for example, looking at electric power, vehicle manufacturing, fueling station development, and ancillary industry impacts) to determine a return on investment (including direct, indirect, and induced) within the zero-emission vehicle value chain.

For this calculation, industries were identified using the North American Industry Classification System database. Figures for 2022 were then identified for each industry. Economic multipliers were applied to the Gross Regional Products of each industry based on their relative value added versus other investments in other industries. These multipliers were used to calculate a return on investment in the zero-emissions infrastructure value chain using a bottom-up approach.

The state could experience a savings of around $18.6 billion in statewide health spending from criteria emission reductions (pollution) and that 1,720 lives will be saved from criteria emission reductions through 2040 from implementation of the Advanced Clean Fleets regulation. California citizens could also benefit from the transition to zero-emissions infrastructure from a public health perspective. It is expected that carbon dioxide, total organic gases, oxides of nitrogen, and particulate matters 10 and 2.5 by approximately 23 percent in 2030, and by 53 percent in 2040.

5.2 Potential weight impacts on roads and bridges

Currently, the Federal Highway Administration limits Gross Vehicle Weight to 80,000 pounds. A recent amendment to the weight limit suggests that a vehicle, if operated by an engine fueled primarily by natural gas or powered primarily by means of electric battery power, may exceed the weight limit on the power unit by up to 2,000 pounds (up to a maximum gross vehicle weight of 82,000 pounds). Fuel cell electric vehicles are not covered under the amendment currently. As of April 2022, approximately 2 to 12 percent of trucks are overweight in California; this could increase as zero-emission trucks are adopted. Zero-emission battery electric trucks and hydrogen fuel cell trucks may introduce heavier axle loads than existing internal combustion engine trucks on roadways, since their battery or tank and drive train can contribute to a heavier vehicle weight than internal combustion engine trucks.

In a preliminary estimate determined through collaboration between the Commission and Caltrans using the "PaveM" model, road maintenance costs in California could increase by more than $100 million per year under the 2,000-pound weight increase currently allowed by state and federal laws. Maintenance costs are expected to increase with further increases to allowable weights. Caltrans is

[3] Source: Lightcast economic multipliers, North American Industry Classification System (NAICS) database.

performing additional analysis on projected road maintenance costs from heavy-duty zero-emission trucks and will provide this information as it becomes available.

Without changes to Federal Highway limits on gross vehicle weights, heavier trucks may pose a challenge for fleets because businesses may be unable to afford the additional overweight fees required to operate the truck. Some SB 671 workgroup stakeholders have indicated the delivery of goods may require the use of more trucks to avoid being assessed additional overweight truck fees. This may increase the cost of goods for consumers and result in negative impacts to pavement quality, air quality, and truck drivers (if compensation is based on how much they deliver or by time-of-day delivery). To mitigate these impacts, fleets may consider using trucks with a smaller battery, investing in fast charging, and participating in truck-as-a-service, which provides one price to fleets for both trucks and infrastructure.

Due to technological advancements within the battery technology field, the weight differences between internal combustion engine trucks and zero-emissions trucks are anticipated to decrease over time. The estimated additional weights of zero-emission trucks from the 2020 University of California, Davis study, "Effects of Increased Weights of Alternative Fuel Trucks on Pavement and Bridges," showing the decrease over time are tabulated below. The exhibit below is from table 2.3 "Summary of Battery Electric Truck Weights," and table 2.5 "Summary of Fuel Cell Truck Weights" in the University of California, Davis study:

Exhibit 22: Battery Electric and Hydrogen Fuel Cell Electric Truck Weights

Additional truck weights of BEVs and FCEVs (in pounds)			
Powertrain	**Segment**	**2030**	**2050**
BEV	Heavy Duty Traffic Long haul	5,328	4,267
BEV	Heavy Duty Traffic Short haul	1,408	237
BEV	Medium Duty Traffic	1,444	606
FCEV	Heavy Duty Traffic Long haul	2,267	466
FCEV	Heavy Duty Traffic Short haul	601	-768
FCEV	Medium Duty Traffic	1,136	506

Recommendation related to the increased weight of zero-emission trucks on roads and bridges

Caltrans should evaluate the impacts of heavier zero-emission trucks on the state highway system and develop solutions to address the impacts. That evaluation should include potential roadway impacts,

impacts to other roadway users, and impacts to fleets. As a part of the solution process, climate adaptation strategies, such as resilient concrete, could be considered.

5.3 Methods to avoid resident and business displacement

There are several existing and in-development materials that speak to effective ways of avoiding displacement. Some tools from state agencies include the Commission's Senate Bill 1 Competitive Programs Transportation Equity Supplement[4], and the Caltrans Project Development Procedures Manual. The University of California, Los Angeles developed a white paper called, "White Paper on Anti-Displacement Strategy Effectiveness." This paper found that, "State agencies may best prevent displacement by prioritizing housing preservation and tenant protection policies where possible, whether in incentive programs or planning documents. However, the state's direct power to curb displacement lies primarily in the long-term, in how it channels its investments and disposes of its assets, i.e., public land, to foster housing production, preservation, and stability." The paper recommends an interagency working group on anti-displacement policies. A workgroup like this has been created and is being led by the California State Transportation Agency. The California State Transportation Agency has a draft Anti-Displacement Subcommittee Workplan that lays out next steps for interagency collaboration on this topic. This document is still in draft form and therefore is not publicly available currently. The California Transportation Agency has a forthcoming memo on Policy Recommendations to Promote Anti-Displacement Activities within State Transportation Funding Programs that will be a helpful resource. Another helpful tool is the state of Texas' Framework for Evaluating Anti-Displacement Policies. The framework considers the strengths and weaknesses of various policy tools and how they can be used to address the needs of vulnerable groups impacted by displacement. Finally, there is an online tool called the "California Estimated Displacement Risk Model" that identifies varying levels of displacement risk for low-income renter households in all census tracts in the state. This tool is provided by the Urban Displacement Project. The outcomes and recommendations of these resources should be referenced and integrated into station development procedures and practices in the coming years.

A central delivery team could engage with local transportation equity leaders, environmental justice organizations, impacted communities, community-based organizations, and tribal leaders to obtain their perspective and could use the development of zero-emission freight infrastructure as an opportunity to re-route trucks away from communities where possible.

For residents and businesses who are displaced, federal and state laws (the Uniform Relocation Assistance and Real Property Acquisition Policies Act of 1970, as amended, also known as the Uniform Relocation Act or just Uniform Act, and California Government Code, Chapter 16, Section 7260, et

[4] An example of the Equity Supplement can be found on page 51 of the 2022 Trade Corridor Enhancement Program Guidelines

seq.) require that relocation assistance be provided to any person, business, farm, or nonprofit operation displaced because of the acquisition of real property by a public entity for public use.

5.4 Potential workforce impacts

In general, demand for jobs within the internal combustion engine vehicle value chain may decrease, while demand for jobs within the zero-emission vehicle value chain may increase. As jobs may change from the internal combustion engine vehicle value chain to the zero-emission vehicle value chain, workers may require training, reskilling, and upskilling to adequately supply the labor pool. It will be important to also ensure that in the transition from an internal combustion engine workforce to a zero-emission workforce, the pay scale and benefits carry over to the new workforce.

The state, through the central delivery team, should consider providing guidance or trainings to facilitate this transition for acutely impacted workforces. There are a variety of organizations the central delivery team could work with to support the development of training programs. The California Community Colleges Association provides a resource for working with community colleges on existing and new training programs. Senate Bill 589 (Secretary of State, Chapter 732, Statutes of 2021) required the California Energy Commission to identify workforce development and training resources needed to meet electric vehicle adoption goals. The central delivery team could work with California Energy Commission staff to coordinate on ways to best support training programs. and policies that measurably and significantly increase priority populations' employment, earnings, and participation in employer-paid fringe benefits.

There are many kinds of training programs needed. For example, training should be developed for local municipalities to help staff understand the changes being made to permitting processes and any resources available to them.

There is a need for additional electrical power engineers as well as electric utility distribution design staff. The timelines to get experienced power engineers in place takes a minimum of 6 years and distribution designers approximately 2 to 3 years. Therefore, it is important to accelerate workforce training wherever possible.

There are also some existing training programs already in place. As part of their SB 589 effort, the California Energy Commission Clean Transportation Program has recently included new and expanded workforce development partners such as the California Conservation Corps through a $1 million agreement for the Transportation Electrification Training Project focused on classroom and on-the-job training for EV charger construction, installation, and maintenance. In 2022, the California Energy Commission provided project funding through a new partnership with the California Mobility Center focused on zero-emission vehicle manufacturing and service. Responsible State Agencies should continue to work to ensure that funding is identified and/or appropriated for the necessary training programs as identified in SB 589.

The California Workforce Development Board's High Road Construction Careers and Training Partnership[5] which develops partnership strategies for the State to engage with evolving sectors, including transportation. The Employment Training Panel[6] is another State-sponsored program that funds worker retraining programs that address evolving business and industry needs. In addition, the San Pedro Bay ports have also started a training center to train truck owners about maintenance of zero-emission trucks.[7]

The State should condition support for training programs on a demonstrated track record of significant and growing participation of members of low-income households, low-income communities, and disadvantaged communities as well as a demonstrated track record of having significantly boosted employment and compensation outcomes for such priority populations.

5.5 Potential uses for microgrids

Zero-emission truck adoption could increase the electricity demand for California's existing electricity grid. Microgrids could be necessary to supplement existing grid capacity and to improve resiliency under certain considerations. Microgrids are grid systems consisting of small-scale generation and distribution networks that can operate in isolation from national, state, or regional grid infrastructure or be connected to them. Microgrids provide two primary functions:

- Backup power / resiliency: In the event of major storms, disasters, or public safety power shutoff events, microgrids can continue to provide power to customers
- Supplementing capacity: In urban areas where the demand exceeds existing grid capacity, microgrids can provide necessary supplementary power

Microgrids are an important resiliency feature. Installing a microgrid, where feasible, can provide back-up power in an emergency and can help ensure customers receive power.

Project sponsors should evaluate whether microgrids will be necessary for the station development, based on the following considerations:

- Capacity: Microgrids can be a cost-effective option for small scale demand (up to 2 megawatts).

[5] More information on the High Road Training Partnership is available here: https://cwdb.ca.gov/initiatives/high-road-training-partnerships/

[6] More information on the Employment Training Panel is available here: https://etp.ca.gov/

[7] More information on this training center is available here: https://www.supplychaindive.com/news/Port-Long-Beach-Los-Angeles-110-million-goods-movement-training-campus/646061/ and here: https://www.portoflosangeles.org/references/2023-news-releases/news_032423_gmtc_pledge

- Energy source: Microgrids can be powered by solar panels; propane, and natural gas; hydrogen; or wind turbines. Specific site features and other factors, such as the companies involved in building the station, may determine which power source may be best suited for each station.

Recommendation related to microgrids

- As zero-emission stations are being built along the “Top 6” freight corridors, the state or central delivery team should assess where additional microgrids may be installed as a transportation system resiliency feature.

Part 6: Engagement

Chapter Summary

The Commission developed the Assessment in collaboration with the SB 671 workgroup and with several other state agencies, including the California Air Resources Board, the California Energy Commission, the Governor's Office of Business and Economic Development, the Caltrans, the California State Transportation Agency, and the California Public Utilities Commission.

Beginning in December of 2021, the Commission led 14 workgroup meetings (a meeting was held approximately every 5 weeks) to discuss the development of the Assessment. The Commission held bi-weekly meetings with the state agencies mentioned above to coordinate Assessment work. The workgroup was public, and anyone interested in participating was encouraged to join. The list of participating organizations can be found in Appendix 4 of this report.

The Assessment was developed in collaboration with the SB 671 workgroup and several other state agencies, including the California Air Resources Board, the California Energy Commission, the Governor's Office of Business and Economic Development, the Caltrans, the California State Transportation Agency, and the California Public Utilities Commission.

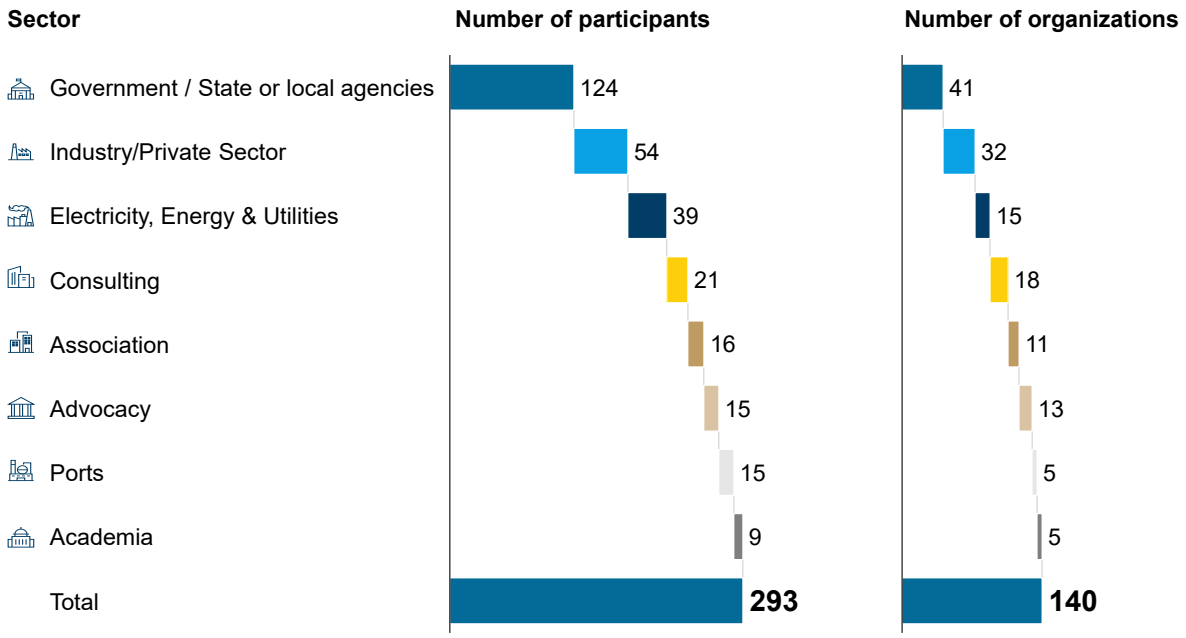
The workgroup was public, and anyone interested in participating was encouraged to join. The Commission reached out to advocates and experts from the freight industry when establishing the workgroup. The workgroup includes stakeholders such as trucking associations, warehouse owners, beneficial cargo owners, carriers, truck stop owners, ports, equity and climate advocates, utilities, energy companies, oil companies, local governments, state agencies, and transportation planning agencies. The list of participating organizations can be found in Appendix 4 of this report.

Beginning in December of 2021, the Commission led 14 workgroup meetings (a meeting was held approximately every 5 weeks) to discuss the development of the Assessment. The Commission held bi-weekly meetings with the state agencies mentioned above to coordinate Assessment work. In addition to scheduled workgroup meetings, the Commission occasionally held individual meetings with experts to solicit their expertise in a specific area. The Commission sent the SB 671 workgroup several requests for information to gather expertise in developing fields, such as expected zero-emission station capacity, costs, fuel efficiency, and other similar topics. Information from workgroup members, along with research, is the basis from which the Assessment was built. Detailed information on the meetings including agendas and presentation slides used for the meetings can be found on the Commission website here.

The Commission engaged a consulting firm though a Request for Proposals process to support the state in developing the Assessment by reviewing existing literature, conducting detailed analyses, and compiling the final outputs, including visuals, executive summaries, and other materials aimed at informing the Legislature. The Assessment was delivered as 14 well-defined tasks. The consultants established a regular cadence of working sessions and interim updates to the Commission. Understanding the Assessment required input from, and coordination with, many public and private sector organizations. A stakeholder engagement plan was co-created with the consultant.

300 individuals and 140 organizations requested to be on the SB 671 workgroup list. 85 to 100 people regularly participated in workgroup meetings. Exhibit 23 shows the participants and organizations by sector.

Exhibit 23: SB 671 Workgroup Participation



~300 individuals and 140 organizations participated in the Assessment process

Part 7: Summary of key recommendations

Recommendation for public funding

- Allocate available public funds, where feasible, to support the build out of the 2035 initial viable network cost. The total cost of $10 to $15 billion will need to be shared between private and public funding and come from all available fund sources.

Recommendations for streamlining zero-emission station development

- To shorten the station delivery timeframe, a central delivery team should be created to coordinate state and local stakeholders to implement the recommendations noted in this list. This central delivery team should function as part of or in coordination with the Executive Order N-8-23 Strike Team.
- The central delivery team should work to create a set of standardized station development model(s) (zoning and building permits) that can be replicated for each station across a priority corridor, based on affected local municipality guidelines.
- To complement recent efforts to improve California Environmental Quality Act timeframes, the Legislature should consider enacting a Categorical Exemption from CEQA for zero-emission freight charging and hydrogen fueling stations.
    - It is recommended that, where possible, zero-emission infrastructure encourage the re-routing of trucks away from communities, and that environmental and air quality stakeholders, impacted communities, and community-based organizations are involved in the development process, general planning process, and location planning process. A specific process related to this suggestion is included in the central delivery team recommendations.
- The Legislature should set a statutory default permit approval deadline for zero-emission freight charging and hydrogen fueling stations similar to AB 970 (McCarty, Chapter 710, Statutes of 2021) that allows a permit for a passenger battery electric vehicle charging station to be deemed complete if it is not approved or otherwise commented on within a specified time period. In addition, existing law, SB 1291 (Archuleta, Chapter 373, Statutes of 2022), requires cities and counties to administratively approve an application to install electric vehicle charging stations and hydrogen-fueling stations through the issuance of a building permit or similar nondiscretionary permit if the location meets certain criteria. The provision of a default permit approval deadline for zero-emission freight charging and hydrogen fueling stations should be made permanent.
- The central delivery team should take a corridor approach to combine and sequence station development where feasible. In other words, synchronize building stations along the selected top freight corridor until the whole corridor is complete prior to moving to the next corridor. The selection process should start first with the “Top 6” corridors and move next to the 34 Priority Freight

Corridors. These decisions should be made in collaboration with stakeholders, because while this is an ideal goal, the timing of station development depends on market readiness in each corridor.

  - The initial viable network may be developed to allow smaller segments along the initial viable network to be useable by freight operators as sections of corridors and freight journeys are constructed (for example, given the prevalence of intra-California freight journeys on the I-5 corridor, starting construction at the ports and working north or south along the corridor).

The California Public Utilities Commission, the Commission, and other relevant state agencies should continue to collaborate on the Freight Infrastructure Planning process to proactively update electric infrastructure plans and to coordinate freight modeling efforts. It should be noted that this process is a long-term solution and results will begin to be realized after the next five years. The state, and specifically a central delivery team, if one is identified, should continue to work to identify short-term solutions.

Recommendations for supporting fleet and truck owners through the zero-emission vehicle transition

- The Legislature should create a new limited-term (five-year) zero-emission truck incentive program to assist fleets with purchasing zero-emission trucks. Program development should take place with input from communities, and fleets of all sizes including those who will be impacted by regulations and should be flexible to ensure support in a way that is considerate of their needs.
  - Retrofitting traditional internal combustion engine trucks to zero-emission power trains should be explored as an option to reduce costs. This option may be less expensive than purchasing a new zero-emission truck.
- The California Air Resources Board could create a provision within the Low Carbon Fuel Standard program to support buildout and operation of fast charging and hydrogen fueling infrastructure for medium-duty and heavy-duty vehicles, similar to the existing capacity crediting provision in the Low Carbon Fuel Standard regulation.[1]
- State agencies, Regional Transportation Planning Agencies, Metropolitan Planning Organizations, and the Legislature, should consider how the state may support Mexico-based fleets, operating within California, in the transition to zero-emission freight. Mexico-based fleets, operating within California, do not currently have public incentives from the Mexican government to support the transition to zero-emission trucks and the infrastructure to support electricity or hydrogen does not exist. The following potential financing strategies and energy support strategies should be

[1] Low Carbon Fuel Standard program information can be found online here: https://ww2.arb.ca.gov/sites/default/files/classic/fuels/lcfs/guidance/zev_infra_crediting_overview.pdf

considered to support Mexico-based fleets and should be considered to support the transition at the California border:

- State agencies, Regional Transportation Planning Agencies, and Metropolitan Planning Organizations should apply for federal funding programs designed to support zero-emission trucks and infrastructure in border areas.
- The Legislature should explore developing a state program that allows public funding to be spent in border regions for zero-emission freight pilot projects that provide benefits to California, where allowable by law.
- State agencies should build on existing public private partnership programs that exist in public organizations such as the San Diego Association of Governments to implement zero emission charging and hydrogen fueling within the border region.
- State agencies, Regional Transportation Planning Agencies, and Metropolitan Planning Organizations should partner with the North American Development Bank (NADBank) or similar organizations where possible. The North American Development Bank NADBank was created with the passage of the North American Free Trade Agreement and focuses on providing funding and technical assistance to border communities in the United States and Mexico.
- State agencies should request Congress reinstate the federal Coordinated Border Infrastructure Program that allowed funds to be used for pilot projects that spanned both sides of the United States and Mexico border. Although Mexico is California's number one trading partner, most of these recommendations apply to the U.S. states that border California. These strategies should be employed at all California borders.

- The Legislature should authorize a vehicle buy-back program that would appropriate funds to a state agency that would work with truck sales companies to set aside funds to buy back used zero-emission trucks from fleets once they reach their useful life as a "new" vehicle. This could be added as a new component of existing or new truck incentive programs.

Recommendations for a central delivery team

- The Administration should consider designating one lead group or agency to carry out the functions of the central delivery team outlined in this Assessment. This could be an agency that is currently part of the Executive Order N-8-23 strike team or the Administration could direct the Executive Order N-8-23 strike team to identify and designate such a group. The intent of the central delivery team would be to act as a lead in coordinating zero-emission freight infrastructure planning and implementation, including carrying out the actions included in this Assessment where feasible. The central delivery team should function as a cross-agency team including the California Energy Commission, Caltrans, the California State Transportation Agency, the Governor's Office of Business and Economic Development, California Air Resource Board, California Public Utilities Commission, the Commission, and any other state agencies or entities determined necessary.

- The central delivery team should identify leads from Regional Transportation Planning Agencies, Metropolitan Planning Organizations, ports, utilities, fleets, state-agencies, and other stakeholders (similar to the SB 671 workgroup) that are necessary to build stations quickly.
- The central delivery team should, in coordination with impacted communities, community-based organizations, equity advocates, public health advocates, tribal nations, and environmental advocates, develop a process for impacted communities, community-based organizations, equity advocates, public health advocates, tribal nations, environmental advocates, and any other groups identified to be included in zero-emission station location planning and implementation. Assuming locations around the Top 6 corridors are prioritized, then communities along these corridors should also be prioritized. Outreach efforts should be culturally competent and community specific. In-person meetings and meetings in other languages should be offered when needed. Efforts like the Los Angeles Cleantech Incubator and Coalition for Environmental Health and Justice effort on the I-710 should be used as an example of the type of process needed. In developing the process, the central delivery team should coordinate with the CalSTA Anti-Displacement sub-committee and the interagency Equity Advisory Committee to utilize their expertise and to facilitate the use of existing and any new needed project specific anti-displacement strategies. Existing processes already required under law should also be considered to avoid "re-inventing the wheel." The central delivery team should work with community colleges and ports that provide training programs to support training, reskilling, and upskilling freight industry workers, as necessary. Additional information related to existing training programs can be found in Chapter 5. In addition, the central delivery team should work with state agencies, local agencies, colleges, and other stakeholders as appropriate to develop and provide training to local municipal staff to inform them of critical changes and to publicize more broadly what the changes are.
- The central delivery team should work with community colleges and ports that provide training programs to support training, reskilling, and upskilling freight industry workers, as necessary. Additional information related to existing training programs can be found in Chapter 5.

Recommendation related to the increased weight of zero-emission trucks on roads and bridges

- Caltrans should evaluate the impacts of heavier zero-emission trucks on the state highway system and develop solutions to address the impacts. That evaluation should include potential roadway impacts, impacts to other roadway users, and impacts to fleets. As a part of the solution process, climate adaptation strategies, such as resilient concrete, could be considered.

Recommendation related to microgrids

- As zero-emission stations are being built along the "Top 6" freight corridors, the state or central delivery team should assess where additional microgrids may be installed as a transportation system resiliency feature.

Part 8: Appendices

Appendix 1: Technical appendix

1.1 Importance of the US-Mexico border

The border region is both essential for trade and impacted by poor air quality. Some of the largest supply chains in the nation are connected through the border region, the core of California's freight economy, generating billions per year in international trade. Mexico became the United States' top trade partner in 2019 and has remained in the top two positions since then. Meanwhile, residents who live near these trade routes have faced some of the worst air quality in the region. The International Border Community, which includes San Ysidro and Otay Mesa, is designated through Assembly Bill 617 and the California Air Resource Board's Community Air Protection Program as an area disproportionately affected by exposure to air pollution from mobile and stationary sources. At the binational land ports of entry, emissions are a concern due to commercial vehicle transport and idling while waiting to cross the border. An important challenge for the region is twofold: recognizing the importance of trucking as the dominant mode of goods movement and backbone of California's freight economy while also recognizing the need to reduce air pollution in impacted communities and reduce greenhouse gas emissions.

In November of 2022, cross border truckers, truck companies, chambers of commerce, and other border stakeholders met with various state agencies in Otay Mesa about the proposed California Air Resource Board Advance Clean Fleets regulation. This meeting was hosted by the California Air Resource Board. The meeting highlighted the state's need to hear comments from stakeholders both in Mexico and the United States about planning implementation of the Advanced Clean Fleets rule. Caltrans and the San Diego Association of Governments conducted interviews over a three-week period with shippers, carriers, truck drivers, truck companies, energy policy experts, customs brokers, a media representative, and manufacturers. For more information, please see the "Zero-Emission Freight Transition at the California and Baja California Border" Commission agenda item from May 2023 about this topic and the formal memorandum between Caltrans, the San Diego Association of Governments, and the Imperial County Transportation Commission, titled, "Zero Emission Freight Transition at the California-Baja California Border."

1.2 Alignment with existing plans

The "Top 6" freight corridors align well with the Caltrans Interregional Transportation Strategic Plan corridors. The Interregional Transportation Strategic Plan identifies eleven Strategic Interregional Corridors that connect California's major regions. Exhibit 23 shows the corridors[2]. In addition, the Commission has worked with Caltrans to align the priority freight corridors and "Top 6" freight corridors

[2] More information on Interregional Transportation Strategic Plan corridors can be found on the Caltrans website: https://dot.ca.gov/-/media/dot-media/programs/transportation-planning/documents/itspaddendum_final-a11y.pdf

with Alternative Fuel Corridors. The federal government designates corridors as Alternative Fuel Corridors in California based on Caltrans' recommendation. Once designated, Alternative Fuel Corridors are eligible for federal funding programs such as the National Electric Vehicle Infrastructure funding program. Currently, all the "Top 6" corridors and most of the priority freight corridors are designated as Alternative Fuel Corridors. Exhibit 24 shows existing and nominated Alternative Fuel Corridors.[3]

Exhibit 24: Interregional Transportation Strategic Plan corridors

Strategic Interregional Corridors

1. United States/Mexico Border Region - Inland Empire Connections Corridor
2. South Coast - Central Coast Corridor
3. Central Coast - San Jose/San Francisco Bay Area Corridor
4. San Jose/San Francisco Bay Area - North Coast Corridor
5. San Jose/San Francisco Bay Area - Central Valley - Los Angeles Corridor
6. Sacramento Valley - Oregon Border Corridor
7. High Desert - Eastern Sierra - Northern Nevada Corridor
8. Southern California - Southern Nevada/Arizona Corridor
9. Central Coast - San Joaquin Valley East-West Connections Corridor
10. San Jose/San Francisco Bay Area - Sacramento - Northern Nevada Corridor
11. North Coast - Northern Nevada Connections Corridor

[3] More information on Alternative Fuel Corridors can be found on the National Electric Vehicle Infrastructure plan website: https://dot.ca.gov/-/media/dot-media/programs/esta/documents/nevi/california-nevi-deployment-plan-ada-rev-20220804.pdf

Exhibit 25: Existing and nominated Alternative Fuel Corridors

In the map above, the term “Rounds 1-5” refers to corridors that were previously designated as Alternative Fuel Corridors by the Federal Highway Administration. The term “Round 6” refers to corridors Caltrans has nominated as Alternative Fuel Corridors that await Federal Highway Administration approval for inclusion as Alternative Fuel Corridors.

1.3 Vehicle class types mentioned in this report

The SB 671 Assessment defines heavy and medium duty truck zero-emission infrastructure needs. As such the Assessment uses the following cross walk of vehicle types to define focus areas for the study. The report studies Vehicles Classes 4 through 6 for medium duty and Vehicle Classes 7 through 8 and above for heavy-duty as defined by the Federal Highway Administration and the California Air

Resources Board. Classes 1 through 3 are largely non-commercial and therefore not included. Exhibit 25 compares truck vehicle classes defined by each agency.

Exhibit 26: Truck vehicle class type comparison

GVWR categories for this assessment	FHWA GVWR class / weight	FHWA MCFM class / weight	CARB 202x vehicle class	CEC GVWR class / weight	HPMS Vehicle class	HPMS classification
Light-Duty (LDT) <14k lbs.	Class 1: 0 to 6K lbs	Class 1: 0 to 6K lbs	LDT1/2: < 6K lbs	Class 1: 0 to 6K lbs	**Class 1** Motorcycle	Non-commercial: Class 1-3
	Class 2: >6k to 10K lbs	Class 2: >6k to 10K lbs	MDV: 5751 – 8500 lbs LHD1: 8501-10K lbs	Class 2: >6k to 10K lbs	**Class 2** Passenger cars	
	Class 3: >10K to 14K lbs	Class 3: >10K to 14K lbs	LHD2: >10K-14K lbs	Class 3: >10K to 14K lbs	**Class 3** 4 tire, single unit	
Medium-Duty (MDT) 14k-26k lbs.	Class 4: >14k to 16K lbs	Class 4: >14k to 16K lbs	Class 4: >14k to 16K lbs	Class 4: >14k to 16K lbs	**Class 4** Buses	Single-unit commercial: Class 4-7
	Class 5: >16K to 19.5K lbs	Class 5: >16K to 19.5K lbs	Class 5: >16K to 19.5K lbs	Class 5: >16K to 19.5K lbs	**Class 5** 2 axle, 6 tire, single unit	Vehicles with power units and chassis permanently attached. SUs are popular for retail delivery, construction, utilities, and services
	Class 6: >19.5K to 26K lbs	Class 6: >19.5K to 26K lbs	Class 6: >19.5K to 26K lbs	Class 6: >19.5K to 26K lbs	**Class 6** 3 axle, single unit	
Heavy-Duty (HDT) >26k lbs.	Class 7: >26K to 33K lbs	Class 7: >26K to 33K lbs	Class 7: >26K to 33K lbs	Class 7: >26K to 33K lbs	**Class 7** ≥ 4 axle, single unit	
	Class 8: >33K lbs	Class 8: >33K lbs	Class 8: >33K lbs	Class 8: >33K lbs	**Class 8** ≤ 4 axle, single trailer	Combination commercial: Class 8-13
					Class 9 6-Axle tractor semitrailer	Vehicles made up of two or more units, most commonly a tractor and a semitrailer
					Class 10 ≥ 6 axle, single trailer	
					Class 11 ≤ 5 axle, multi trailer	
					Class 12 6 axle, multi trailer	
					Class 13 ≥ 7 axle, multi-tailer	

Please note: EMFAC vehicle classes from Class 4 - 8 also include use-case designations such as Public, Utility, Instate Delivery, Single Dump, etc. CEC categorizes class 2b and 3 vehicles as medium duty

1.4 Infrastructure assessment detailed methodology

The calculation of infrastructure needs began with estimates of total zero-emission trucks that would be on the roads in California in the four study years. The Commission used vehicle estimates from the California Air Resources Board. Using California Air Resources Board zero-emission vehicle counts brings the infrastructure needs assessment into alignment with the California Air Resources Board's Advanced Clean Trucks and Advanced Clean Fleets regulations. Below are the total zero-emission vehicle counts from the California Air Resources Board in each of the 4 study years.

	# ZEVs			
Vehicle class	2025	2030	2035	2040
Class 4-7 (T6TS)	4,483	9,491	17,824	20,282
Class 4	1,283	5,884	15,229	25,405
Class 5	2,441	14,971	36,972	49,117

Class 6	3,360	18,311	45,434	59,212
Class 7	1,325	11,482	26,999	39,035
Class 8	3,103	20,400	48,336	73,805
Class 7 Tractor Day Cab	268	4,215	9,816	14,552
Class 8 Tractor Day Cab	2,498	17,777	26,488	26,747
Class 8 Tractor Sleeper Cab + Day Cab	2,662	32,301	98,651	178,878
Total	21,422	134,831	325,749	487,033

Percent Splits of Technology Type

Next, the total zero-emission vehicles were multiplied by a percent split of battery electric trucks and hydrogen fuel cell electric trucks. The percentage used depended on the scenario. Each percent split is explained in more detail below.

Accelerated Battery Electric Adoption Scenario

The Commission worked with the California Energy Commission on the percentage used in the accelerated battery electric adoption scenario. The California Energy Commission prepares the Integrated Energy Policy Report (IEPR). The IEPR provides a cohesive approach to identifying and solving the state's pressing energy needs and issues. The report, which is crafted in collaboration with a range of stakeholders, develops and implements energy plans and policies. The percent of battery electric trucks and hydrogen fuel cell electric trucks used was from the 2022 IEPR's Additional Achievable Transportation Electrification (AATE) 3 scenario. This is one of the several scenarios in the IEPR.

It should be noted that the 2023 Integrated Energy Policy Report does not have the exact same energy needs estimates as the Assessment. With many entities working in this developing area, it is best to consider estimated outputs as a range of potential outcomes. It should also be noted that IEPR is a separate assumption from the Assembly Bill 2127 report that the California Energy Commission Develops. The Assembly Bill 2127 report estimates of chargers needed is higher than what was estimated in the Assessment.

Below are the percentages used for the accelerated battery electric adoption scenario.

	2025		2030		2035		2040	
Vehicle class	% BEV	% FCEV	% BEV	% FCEV	% BEV	% FCEV	% BEV	% FCEV
Class 4-7 (T6TS)	100.00%	0.00%	100.00%	0.00%	99.62%	0.38%	97.80%	2.20%
Class 4	100.00%	0.00%	100.00%	0.00%	100.00%	0.00%	100.00%	0.00%
Class 5	100.00%	0.00%	100.00%	0.00%	100.00%	0.00%	100.00%	0.00%
Class 6	100.00%	0.00%	99.69%	0.31%	98.25%	1.75%	92.22%	7.78%
Class 7	100.00%	0.00%	100.00%	0.00%	100.00%	0.00%	100.00%	0.00%
Class 8	100.00%	0.00%	100.00%	0.00%	100.00%	0.00%	100.00%	0.00%
Class 7 Tractor Day Cab	100.00%	0.00%	100.00%	0.00%	100.00%	0.00%	100.00%	0.00%
Class 8 Tractor Day Cab	100.00%	0.00%	100.00%	0.00%	100.00%	0.00%	72.90%	27.10%
Class 8 Tractor Sleeper Cab + Day Cab	100.00%	0.00%	100.00%	0.00%	100.00%	0.00%	100.00%	0.00%

Accelerated Hydrogen Fuel Cell Electric Vehicle Adoption Scenario

The Commission worked with the California Hydrogen Coalition on the accelerated hydrogen fuel cell electric vehicle adoption scenario. The percentages used in this scenario are based on a general understanding of the potential impacts of the future cost of hydrogen per kilogram, hydrogen vehicle fuel efficiency, and the type of hydrogen fuel cell electric trucks that may be available in the study years. It is important to note that the Governor's Office of Business and Economic Development is working with stakeholders to accelerate the use of clean hydrogen in California, and to lower the cost of hydrogen. California was recently awarded $1.2 billion in federal funds in support of a hydrogen hub to produce and utilize renewable, clean hydrogen across California. These funds will help support a lower cost of hydrogen and more accessible hydrogen in California. Below are the percentages used in this scenario. In this case the same percent split was assumed across all four study years.

Vehicle class	% BEV	% FCEV
Class 4-7 (T6TS)	67%	33%
Class 4	67%	33%
Class 5	67%	33%
Class 6	67%	33%
Class 7	50%	50%
Class 8	50%	50%
Class 7 Tractor Day Cab	25%	75%
Class 8 Tractor Day Cab	25%	75%
Class 8 Tractor Sleeper Cab + Day Cab	25%	75%

Balanced Adoption Scenario

The Commission used data from a McKinsey Center for Future Mobility (MCFM) national study for the balanced adoption scenario. The MCFM scenarios are based on the speed of electrification of fleets from slow to faster based the transition required to meet international decarbonization commitments. Of the four scenarios (Fading Momentum, Current Trajectory, Further Acceleration, and Achieved Commitments), the Commission used the percentages from the Further Acceleration scenario for the balanced adoption scenario. The Fleet Decarbonization model is modelled based on a variety of commercial medium duty and heavy-duty vehicles and trucks currently available in the market as well as a variety of use cases (urban, regional, long-haul, drayage). The percentage of battery electric and hydrogen fuel cell electric trucks in 2025, 2030, 2035, and 2040 are consistent (within 1-3%) with CARB's projected percentages for each technology. The only difference was the MCFM Further Acceleration had a more conservation ramp up in adoption of FCEVs in the earlier years than the CARB projections.

For this Assessment, the California Air Resources Board vehicle classes 4 through 6 are classified as medium-duty, and vehicle classes 7 through 8 are classified as heavy-duty.

	2025		2030		2035		2040	
Vehicle class	% BEV	% FCEV	% BEV	% FCEV	% BEV	% FCEV	% BEV	% FCEV
MDT	98%	2%	90%	10%	82%	18%	75%	25%
HDT	83%	17%	61%	39%	45%	55%	41%	59%

Annual Average Vehicle Miles Travelled

Once the amount of battery electric trucks and hydrogen fuel cell electric trucks had been identified, the total trucks, both battery electric and hydrogen fuel cell electric, were multiplied by the average annual vehicle miles travelled in each vehicle class to arrive at total battery electric truck vehicle miles and total hydrogen fuel cell electric truck vehicle miles.

- # Of battery electric trucks x average annual vehicle miles travelled = total battery electric truck vehicle miles
- # Of hydrogen fuel cell electric trucks x average annual vehicle miles travelled = total fuel cell electric truck miles

The vehicle miles travelled data was from a 2019 Eastern Research Group Heavy-Duty Vehicle Accrual Rates study prepared for the California Air Resources Board.[4] This information was used at the recommendation of the California Air Resources Board, as it provides some more current information that what was available at the time in the California Air Resources Board's Emission Factor (known as EMFAC) tool for medium-duty and heavy-duty vehicles.

The Eastern Research Group report used vehicle miles travelled accrual rates by vehicle class type. The term "accrual rate" refers to the annual miles accumulated per vehicle. Accrual rates vary by age and generally decrease for older vehicles. The Commission averaged vehicle miles travelled data from 10 years of vehicle age within each vehicle class to arrive at a more accurate estimate. Below are the average annual vehicle miles traveled inputs for each vehicle class.

[4] The California Air Resources Board report that is the source of the vehicle miles travelled data is available here: https://ww2.arb.ca.gov/sites/default/files/2021-02/erg_finalreport_hdv_accruals_20190614_plus_addendum.pdf

Vehicle class	Avg Annual VMT (mi)
Class 4-7 (T6TS)	13,856
Class 4	19,924
Class 5	19,672
Class 6	20,340
Class 7	20,455
Class 8	24,130
Class 7 Tractor Day Cab	22,369
Class 8 Tractor Day Cab	49,050
Class 8 Tractor Sleeper Cab + Day Cab	67,799

Fuel Efficiency

At this point in the methodology, the total battery electric truck vehicle miles and the total hydrogen fuel cell electric truck vehicle miles have been identified. These miles were then multiplied by fuel efficiency estimates to get an estimate of average annual electricity needed and hydrogen needed in each of the four study years.

- Total battery electric truck vehicle miles travelled x fuel efficiency = total electricity needed (annual)
- Total hydrogen fuel cell electric truck vehicle miles travelled x fuel efficiency = total hydrogen needed (annual)

The battery electric truck fuel efficiency was measured in kilowatt hours per mile. The fuel efficiency estimates used were from the University of California, Davis. Below are the battery electric truck fuel efficiency inputs.

The estimates UCD provided were provided in Gasoline Gallon Equivalent, or miles per gallon. The Commission converted the miles per gallon estimates into kilowatt hours per mile using the conversion rates below.

1 mile per gallon equivalent (MPGe) =	0.03	Mile per kilowatt hour (mi/kWh)	=	33.71	Kilowatt hours per mile (kWh/mi)

	BEV Efficiency (kWh/mi)			
Vehicle Class	2025	2030	2035	2040
Class 4-7 (T6TS) (delivery)	0.83	0.79	0.77	0.73
Class 4 (delivery)	0.83	0.79	0.77	0.73
Class 5 (delivery)	0.83	0.79	0.77	0.73
Class 6 (delivery)	0.83	0.79	0.77	0.73
Class 7 (regional)	2.35	2.2	2.09	1.88
Class 8 (regional)	2.35	2.2	2.09	1.88
Class 7 Tractor Day Cab (regional)	2.35	2.2	2.09	1.88
Class 8 Tractor Day Cab (long-haul)	2.14	1.99	1.88	1.83
Class 8 Tractor Sleeper Cab + Day Cab (long-haul)	2.14	1.99	1.88	1.83

The hydrogen fuel cell electric truck fuel efficiency was measured in kilograms per mile. The fuel efficiency estimates used were based on expert interviews and input. Below are the hydrogen fuel cell electric truck fuel efficiency inputs. As can be seen from the table below, there was one efficiency estimate used in all four study years. Miles per gallon equivalents were converted to kilograms per mile.

1 mile per gallon equivalent (MPGe) =	1.019	Mile per kilogram of hydrogen (mi/kg H2)	=	0.981354	Kilograms of hydrogen per mile (kg H2/mi)

	FCEV Efficiency
Vehicle Class	kg/mi
Class 4-7 (T6TS) (delivery)	0.06
Class 4 (delivery)	0.06
Class 5 (delivery)	0.06
Class 6 (delivery)	0.06
Class 7 (regional)	0.11
Class 8 (regional)	0.11
Class 7 Tractor Day Cab (regional)	0.11

	FCEV Efficiency
Class 8 Tractor Day Cab (long-haul)	0.11
Class 8 Tractor Sleeper Cab + Day Cab (long-haul)	0.11

Utilization

The Commission assumed a 20 percent utilization rate for both battery electric charging stations and hydrogen fueling stations. This percent was informed by McKinsey Center for Future Mobility as well as feedback from the SB 671 Working group and is within the bounds of what is normal today for diesel stations. It is possible that over time, utilization may increase, but since 20 percent is on the high end of utilization assumptions, this percent was kept static for the each of the four study years. See the article linked below from McKinsey that discusses the utilization of charging stations.

https://www.mckinsey.com/features/mckinsey-center-for-future-mobility/our-insights/can-public-ev-fast-charging-stations-be-profitable-in-the-united-states

Charger Archetypes and Use Cases

For battery electric vehicles, the Commission completed an additional step to inform the total electricity needed each year – this additional information is called charger archetypes. The charger archetype scenarios were created using data from the McKinsey Center for Future Mobility, Fleet Electrification Model. The back-up information is not published, but for reference, see two reports below where this data was also used:

- Preparing the world for zero-emission trucks
- Can public EV-fast charging stations be profitable in the US?

To create the charging archetypes, the previously identified average annual kilowatt hours of electricity were further divided into long-haul, mid-haul (or regional), and short haul (or delivery) based on vehicle class. See below for the break-out of vehicle class by these general use cases.

Vehicle Class	General use case
Class 4-7 (T6TS) (delivery)	Short-haul or delivery
Class 4 (delivery)	Short-haul or delivery
Class 5 (delivery)	Short-haul or delivery
Class 6 (delivery)	Short-haul or delivery
Class 7 (regional)	Mid-haul or regional

Class 8 (regional)	Mid-haul or regional
Class 7 Tractor Day Cab (regional)	Mid-haul or regional
Class 8 Tractor Day Cab (long-haul)	Long-haul
Class 8 Tractor Sleeper Cab + Day Cab (long-haul)	Long-haul

Within each of these categories, the kilowatt hours were further divided into depot (also known as private location) charging and publicly accessible charging. The percent of assumed public versus depot charging varied based on the general use case category. Within each of these sub-categories, a specific type of charging behavior was assumed based on a range of potential charging options. The potential charging options included are listed below. The composition of assumed charging behavior was different based on the vehicle class, whether it was charging at a depot or public station, and the study year. The charging archetypes were informed by the McKinsey Center for Future Mobility Commercial Fleet Decarbonization tool (based on economical and widely available charging infrastructure currently in the market).

AC fast L2: 15- 22 kw
AC slow L1: <4kw kw
AC slow L2: 4 - 15 kw
DC 100 kw
DC 150 kw
DC 25 kw
DC 350 kw
DC 50 kw
DC 500 kw

Different charging levels each have a different energy output, so completing this step was necessary to identify the total electricity needed in each of the four study years. Different charger types and levels are necessary for overnight versus depot versus fast charging at public and private stations.

Assumptions about Battery Electric Truck Stations

To get to the number of charging stations needed, the average annual electricity needs to be divided by the average annual capacity of a charging station to dispense electricity. Therefore, several assumptions had to be made about charging stations. The Commission made assumptions about peak output, charger efficiency, average output discount, and utilization. These assumptions are outlined below.

Charger	Peak output (kW)	Charger efficiency	Average output discount	Utilization
L2	19	0.9	0.9	0.2
DC 50	50	0.9	0.9	0.2
DC 100	100	0.9	0.9	0.2
DC 150	150	0.9	0.9	0.2
DC 350	350	0.9	0.8	0.2
DC 500	500	0.9	0.8	0.2

The Commission also made assumptions about the number of chargers in depot (or private) stations and public stations based on input from truck stop owners and SB 671 workgroup input. These assumptions are below.

Station type	# Chargers per station
Depot	20
Public	10

Dividing the average annual electricity by the average annual station capacity to generate electricity equals the total number of battery electric stations needed.

Assumptions about Hydrogen Fuel Cell Stations

Similarly, for hydrogen fuel cell stations, several assumptions were made. The Commission assumed an average annual station capacity of 292,000 kilograms of hydrogen a year. This estimate is on the higher side of station capacity and the estimate remains static throughout the four study years. In actual practice, the capacity of a station depends on how many fueling positions the station has and capacity may vary. However, the estimate used represents a reasonable average.

The Commission assumed a 25 percent private and 75 percent private distribution between stations based on feedback from SB 671 workgroup members and the fueling use cases and archetypes (depot vs. public; fast vs. overnight charging).

Dividing the average annual kilograms of hydrogen needed by the average annual station capacity to dispense hydrogen equals the total number of hydrogen fueling stations needed.

1.5 Existing clean infrastructure plans and projects

There are several potential areas where entities have expressed an interest in building zero-emission freight stations in the same place where the Assessment identifies need. These areas are covered below.

1. EnergIIZE Projects

The first area of overlap is the California Energy Commission's EnergIIZE program. This program has funded several zero-emission freight infrastructure projects. There are several different funding opportunities called, "Funding Lanes" available in this program:

- "EV Fast Track" provides incentives of up to $500,000 per project for electric vehicle charger purchases.
- "EV Jump Start (Equity)" provides incentives of up to $750,000 per project for electric vehicle charger purchases.
- "EV Public Charging" provides incentives of up to $500,000 per project to public charging station developers. Level 2 chargers are not eligible.
- "Hydrogen Lane" provides incentives of up to $3 million per project for deployment of hydrogen fueling infrastructure equipment for medium- and heavy-duty vehicles.

As of July 2023, there are 111 electric charging and hydrogen fueling locations funded through this program. As of October 2023, EnergIIZE has awarded 151 projects for 1,435 EV chargers and 31 hydrogen dispensers. Some of these projects are located along key corridors or in dense urban areas. The timeframe for these projects is two to three years to develop these stations once funding is allocated for construction.

Specifically, the stations in Sacramento and Stockton along Interstate 5 and State Route 99, the stations in the Bay Area, the station on Interstate 80 at the edge of the California and Nevada border, the stations along State Route 99 in Visalia and Bakersfield, and the stations in the Los Angeles area are all near the "Top 6" freight corridors or in dense urban areas where stations will be needed for an early milestone year. The California Energy Commission has an interactive online map dashboard which is updated in real time. It can be accessed online at: https://calstartorg.maps.arcgis.com/apps/dashboards/93ba3501edad4f51beb4d8d4dda46647. The timeline of when these stations will be built is around two to three years from the time the funds have been allocated. These stations are locations where entities have applied for and received incentive funding for zero-emission freight infrastructure.

2. Truck Stops

There are several large truck stop companies that have plans to add electric truck charging, hydrogen fueling, or both at their existing locations. Since truck stops are public and since many of these locations exist along key freight corridors already, these locations represent an important piece of planned zero-emission freight infrastructure.

The Pilot Company plans to add zero-emission freight charging and/or re-fueling to all their California locations. Exhibits 27 and 28 show the locations.

Exhibit 27: Pilot Truck Stop Locations – Northern California

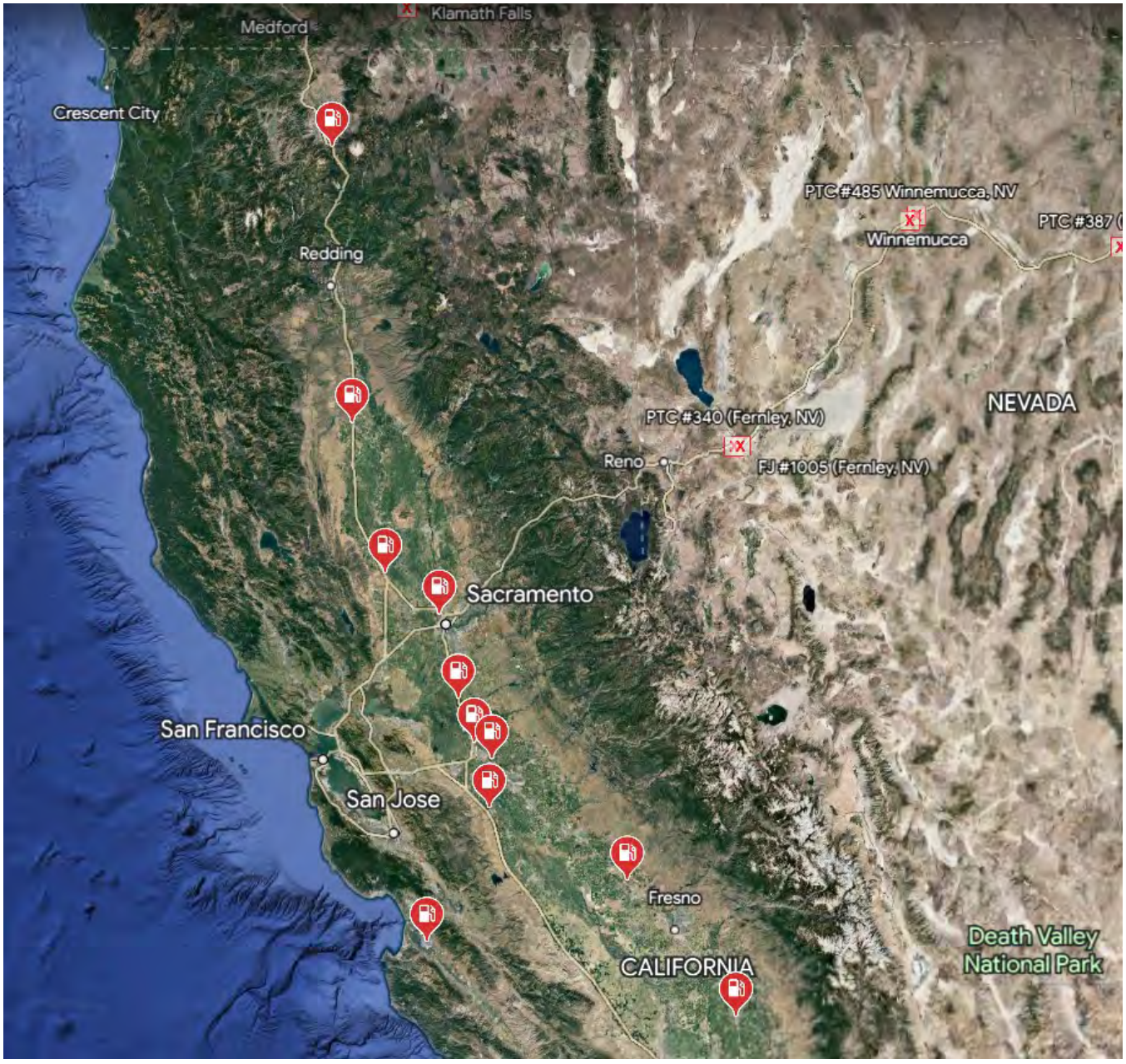
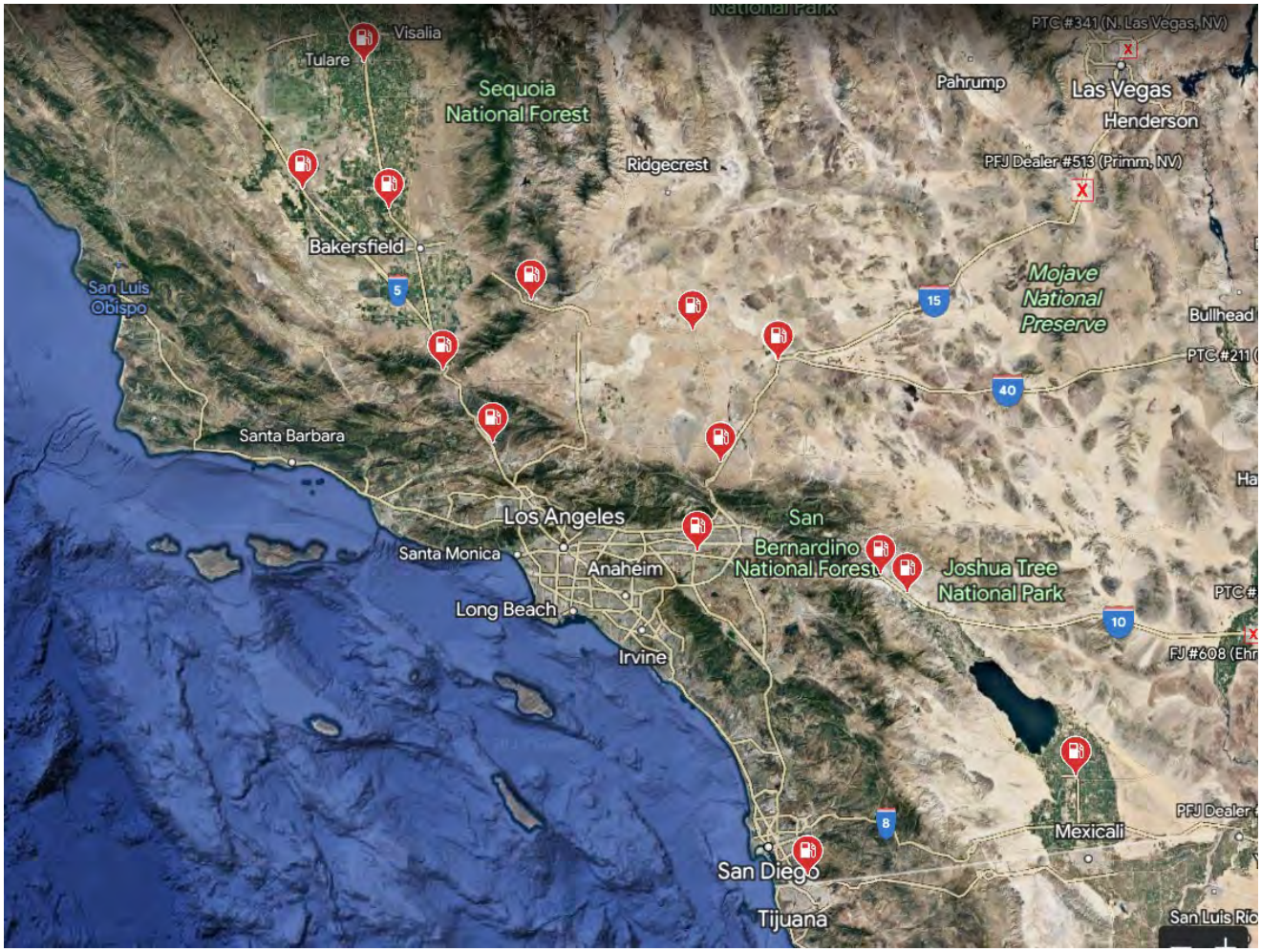


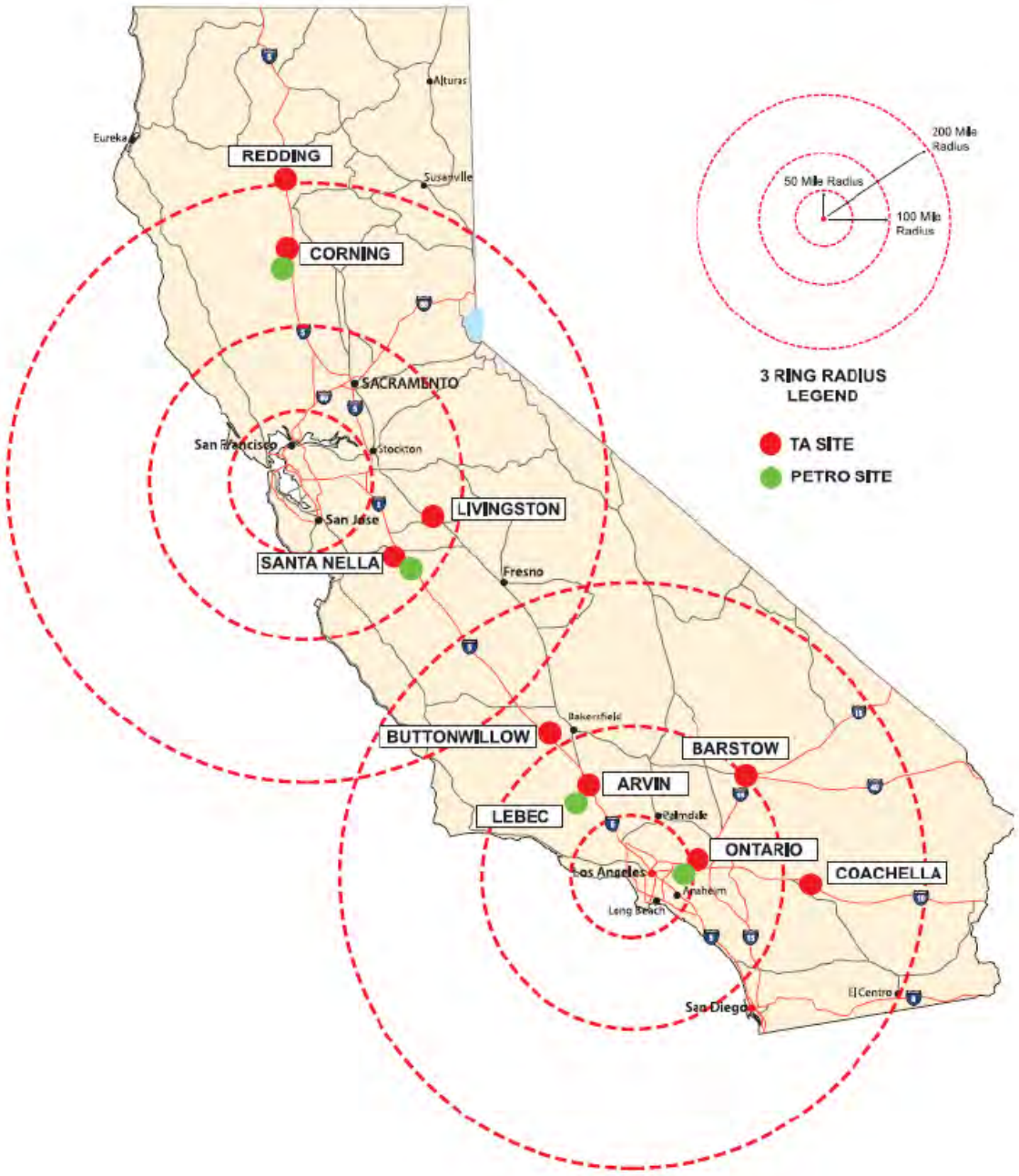
Exhibit 28. Pilot Truck Stop Locations – Southern California



Many of the Pilot truck stops are located along Interstate 5. There are several locations along State Route 99, on Interstate 15, Interstate 10, and near Otay Mesa East.

Similarly, Travel Centers of America is also planning to add electric truck high power charging stations to many of their existing locations. As shown in Exhibit 29, most of the locations are on Interstate 5; there are also locations on State Route 99, Interstate 40, and Interstate 10.

Exhibit 29: TravelCenters of America (shown as "TA" in the image) – Map of California Electric Truck High Power Charging Planned Locations



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1.6 Estimating tailpipe emissions and near-source impact reduction along “Top 6” corridors – Detailed methodology

Calculations for the reduction of tailpipe emissions assume vehicles miles travelled are generated solely by combustion engine powertrains. The calculation considers only tailpipe emissions and does not include vehicle manufacturing, tire and brake wear emissions, or energy production emissions.

Estimation of direct (tailpipe) emissions followed the following steps:

1. Identify the forecast of estimated vehicle miles traveled in the “Top 6” corridors (Sources: Freight Analysis Framework 5 with a base year of 2017 and forecast years 2023 through 2050 / Federal Highway Administration, and Freight Booster)
2. Identify the estimated average annual vehicles miles travelled in each year from 2024 through 2040 by powertrain and truck vehicle class projections using California Air Resources Board Advanced Clean Trucks and Advanced Clean Fleets data for vehicle class type and a California Air Resources Board 2019 report called, “Eastern Research Group Heavy-Duty Vehicle Accrual Rates” for vehicle miles travelled data.
3. Identify the tons of carbon dioxide, total organic gases, oxides of nitrogen, and particulate matters 10 and 2.5 for each year from 2024 through 2040 using EMFAC 2021 data.
4. For each emission type, multiply the average tons of emissions per vehicle per year by the number of internal combustion trucks that are estimated to operate in California each year.

Appendix 2: Projects identified by the SB 671 working group

#	Project name	(Freight) project type	Project sponsor(s)	Public or private
1	Otay Mesa East Point of Entry	Electric Charging	San Diego Association of Governments	Public
2	Harbor Drive and Vesta Street Bridge	Electric Charging	Multiple Entities including the San Diego Association of Governments	Public and Private
3	Madera Hydrogen Refueling Station	Hydrogen Fueling	Air Products	Public
4	Altasea - Port of Los Angeles	Hydrogen Fueling	Air Products	Public
5	Corona Hydrogen Refueling Station	Hydrogen Fueling	Air Products	Public
6	Fallbrook Hydrogen Refueling Station	Hydrogen Fueling	Air Products	Public
7	Galt Hydrogen Refueling Station	Hydrogen Fueling	Air Products	Public
8	Paramount Hydrogen Refueling Station	Hydrogen Fueling	Air Products	Public
9	Santa Clara Hydrogen Refueling Station	Hydrogen Fueling	Air Products	Public
10	Santa Fe Springs Hydrogen Refueling Station	Hydrogen Fueling	Air Products	Private
11	Visalia Hydrogen Refueling Station	Hydrogen Fueling	Air Products	Public
12	Westly Hydrogen Refueling Station	Hydrogen Fueling	Air Products	Public
13	Wilmington Hydrogen Refueling Station	Hydrogen Fueling	Air Products	Public
14	Ontario Hydrogen Refueling Station	Hydrogen Fueling	Nikola	Public
15	Stockton Hydrogen Refueling Station	Hydrogen Fueling	Nikola	Public
16	Colton (South) Hydrogen Refueling Station	Hydrogen Fueling	Nikola	Public
17	West Sacramento Hydrogen Refueling Station	Hydrogen Fueling	Nikola	Public

#	Project name	(Freight) project type	Project sponsor(s)	Public or private
18	Carson Hydrogen Refueling Station	Hydrogen Fueling	Nikola	Public
19	Goshen Hydrogen Refueling Station	Hydrogen Fueling	Nikola	Public
20	Coachella Hydrogen Refueling Station	Hydrogen Fueling	Nikola	Public
21	Oakland Hydrogen Refueling Station	Hydrogen Fueling	Nikola	Public
22	Dixon Hydrogen Refueling Station	Hydrogen Fueling	Nikola	Public
23	Port of San Diego Hydrogen Refueling Station	Hydrogen Fueling	Nikola	Public
24	San Diego (Otay Mesa) Hydrogen Refueling Station	Hydrogen Fueling	Nikola	Public
25	Fontana Hydrogen Refueling Station	Hydrogen Fueling	Nikola	Public
26	Colton (North) Hydrogen Refueling Station	Hydrogen Fueling	Nikola	Public
27	Santa Fe Springs Hydrogen Refueling Station	Hydrogen Fueling	Nikola	Public
28	Bakersfield Hydrogen Refueling Station	Hydrogen Fueling	Nikola	Public
29	Lathrop Hydrogen Refueling Station	Hydrogen Fueling	Nikola	Public
30	Rialto Hydrogen Refueling Station	Hydrogen Fueling	Nikola	Public
31	Vernon Hydrogen Refueling Station	Hydrogen Fueling	Nikola	Public
32	Fresno Hydrogen Refueling Station	Hydrogen Fueling	Nikola	Public
33	Tracy Hydrogen Refueling Station	Hydrogen Fueling	Nikola	Public
34	Madera Hydrogen Refueling Station	Hydrogen Fueling	Nikola	Public
35	Riverside Hydrogen Refueling Station	Hydrogen Fueling	Nikola	Public
36	Corona Hydrogen Refueling Station	Hydrogen Fueling	Nikola	Public
37	Santa Ana Hydrogen Refueling Station	Hydrogen Fueling	Nikola	Public
38	Barstow Hydrogen Refueling Station	Hydrogen Fueling	Nikola	Public
39	Escondido Hydrogen Refueling Station	Hydrogen Fueling	Nikola	Public
40	Modesto Hydrogen Refueling Station	Hydrogen Fueling	Nikola	Public

#	Project name	(Freight) project type	Project sponsor(s)	Public or private
41	Jurupa Valley Hydrogen Refueling Station	Hydrogen Fueling	Nikola	Public
42	Van Nuys Hydrogen Refueling Station	Hydrogen Fueling	Nikola	Public
43	Hesperia Hydrogen Refueling Station	Hydrogen Fueling	Nikola	Public
44	San Jose Hydrogen Refueling Station	Hydrogen Fueling	Nikola	Public
45	Richmond Hydrogen Refueling Station	Hydrogen Fueling	Nikola	Public
46	Moreno Valley Hydrogen Refueling Station	Hydrogen Fueling	Nikola	Public
47	Fairfield Hydrogen Refueling Station	Hydrogen Fueling	Nikola	Public
48	Sacramento Airport Hydrogen Refueling Station	Hydrogen Fueling	Nikola	Public
49	Castaic Hydrogen Refueling Station	Hydrogen Fueling	Nikola	Public
50	Fremont Hydrogen Refueling Station	Hydrogen Fueling	Nikola	Public
51	Lancaster Hydrogen Refueling Station	Hydrogen Fueling	Nikola	Public
52	Lodi Hydrogen Refueling Station	Hydrogen Fueling	Nikola	Public
53	Santa Rosa Hydrogen Refueling Station	Hydrogen Fueling	Nikola	Public
54	Redding Hydrogen Refueling Station	Hydrogen Fueling	Nikola	Public
55	Blythe Hydrogen Refueling Station	Hydrogen Fueling	Nikola	Public
56	San Luis Obispo (5) Hydrogen Refueling Station	Hydrogen Fueling	Nikola	Public
57	Patterson Hydrogen Refueling Station	Hydrogen Fueling	Nikola	Public
58	Kettleman City Hydrogen Refueling Station	Hydrogen Fueling	Nikola	Public
59	El Centro Hydrogen Refueling Station	Hydrogen Fueling	Nikola	Public
60	Industry Hydrogen Refueling Station	Hydrogen Fueling	Nikola	Public
61	Truckee Hydrogen Refueling Station	Hydrogen Fueling	Nikola	Public
62	Mojave Hydrogen Refueling Station	Hydrogen Fueling	Nikola	Public
63	Santa Maria Hydrogen Refueling Station	Hydrogen Fueling	Nikola	Public

#	Project name	(Freight) project type	Project sponsor(s)	Public or private
64	Travel Centers of America Ontario (A)	Electric Charging	Travel Centers of America	Public
65	Travel Centers of America Coachella	Electric Charging	Travel Centers of America	Public
66	Travel Centers of America Redding	Electric Charging	Travel Centers of America	Public
67	Travel Centers of America Corning (A)	Electric Charging	Travel Centers of America	Public
68	Travel Centers of America Buttonwillow	Electric Charging	Travel Centers of America	Public
69	Travel Centers of America Ontario (B)	Electric Charging	Travel Centers of America	Public
70	Travel Centers of America Santa Nella (A)	Electric Charging	Travel Centers of America	Public
71	Travel Centers of America Livingston	Electric Charging	Travel Centers of America	Public
72	Travel Centers of America Barstow	Electric Charging	Travel Centers of America	Public
73	Travel Centers of America Arvin	Electric Charging	Travel Centers of America	Public
74	Travel Centers of America Corning (B)	Electric Charging	Travel Centers of America	Public
75	Travel Centers of America Wheeler Ridge	Electric Charging	Travel Centers of America	Public

#	Project name	(Freight) project type	Project sponsor(s)	Public or private
66	Travel Centers of America Redding	Electric Charging	Travel Centers of America	Public
67	Travel Centers of America Corning (A)	Electric Charging	Travel Centers of America	Public
68	Travel Centers of America Buttonwillow	Electric Charging	Travel Centers of America	Public
69	Travel Centers of America Ontario (B)	Electric Charging	Travel Centers of America	Public
70	Travel Centers of America Santa Nella (A)	Electric Charging	Travel Centers of America	Public
71	Travel Centers of America Livingston	Electric Charging	Travel Centers of America	Public
72	Travel Centers of America Barstow	Electric Charging	Travel Centers of America	Public
73	Travel Centers of America Arvin	Electric Charging	Travel Centers of America	Public
74	Travel Centers of America Corning (B)	Electric Charging	Travel Centers of America	Public
75	Travel Centers of America Wheeler Ridge	Electric Charging	Travel Centers of America	Public
76	TA Santa Nella (B)	Electric Charging	Travel Centers of America	Public
77	Oxnard Harbor District - Port of Hueneme	Electric Charging and Hydrogen Fueling	Port of Hueneme	Public and Private

#	Project name	(Freight) project type	Project sponsor(s)	Public or private
78	Wireless Advanced Vehicle Electrification (various locations)	Electric Charging	WAVE	Public and Private
79	San Pedro Bay Ports Electric Charging	Electric Charging	Clean Energy California	Public

Appendix 3: SB 671 Workgroup Participants

Complete List of SB 671 Workgroup Participants

Academia
California State University, Long Beach
Rio Hondo College
Riverside University Health System
University of California, Davis
University of Southern California
Utah State University, ASPIRE

Advocacy
Coalition for Reimagined Mobility
Electrification Coalition
BizFed
CALSTART
California Council for Environmental and Economic Balance
California Hydrogen Business Council
California Electric Transportation Coalition
Coalition for Clean Air
Coalition for a Safe Environment
Columbia-Willamette Clean Cities Coalition
Communities for a Better Environment
California Hydrogen Coalition
The People's Collective for Environmental Justice
Placer County Tomorrow
Sierra Club California
West Coast Clean Transit Corridor Initiative

Association
American Trucking Associations
California Fuel Cell Partnership
California Trucking Association
Harbor Trucking Association
Hydrogen Fuel Cell Partnership
Los Angeles Cleantech Incubator
Northern California Power Agency
Otay Mesa Chamber of Commerce
Pacific Merchant Shipping Association
Truck and Engine Manufacturers Association
Western States Petroleum Association

Consulting
Actum (consultant to H2 Clipper)
Anrab Associates, Inc.
ArkSpring Consulting
Build Momentum
CEA Consulting
E Source
Emerson and Associates
Englander Knabe & Allen
Gladstein, Neandross & Associates
GLDPartners
HDR
Jacobs
Jove Hydrogen, KAMP Solutions
Peacock Piper Tong + Voss, LLP
Platinum Advisors
Policy in Motion
Ramboll Environ
Rebel Group
Smith, Watts & Hartmann
Starcrest Consulting Group, LLC
Tradesman Advisors

Electricity, Energy & Utilities
Blue Dot Energies
East Bay Community Energy
Forum Mobility
FreeWire Technologies
Northern California Power Agency
Pacific Gas and Electric Company
Sacramento Municipal Utility District
San Diego Gas and Electric
Southern California Gas Company
Southern California Edison
TeraWatt Infrastructure
Turlock Irrigation District
WattEV
WAVE Charging

Government / State or local agencies
Association of Monterey Bay Area Governments
California Air Resources Board
California Energy Commission

California Governor's Office of Business and Economic Development
California Highway Patrol
California Labor and Workforce Development Agency
California Public Utilities Commission
California State Senate Staff
California State Transportation Agency
Caltrans
City of San Diego
City of West Sacramento
County of San Diego (1st District) Staff
Fresno Council of Governments
Gateway Cities Council of Governments
Imperial County Transportation Commission
Kern Council of Governments
Lake Area Planning Council
Los Angeles County Metropolitan Transportation Authority
Metrolink
Metropolitan Transportation Commission
Orange County Transportation Authority
Placer County Transportation Planning Agency
Riverside County Transportation Commission
Sacramento Regional Transit District
San Diego Association of Governments
San Joaquin Council of Governments
Santa Barbara County Association of Governments
Santa Clara Valley Transportation Authority
Solano Transportation Authority
South Coast Air Quality Management District
Southern California Association of Governments
Tri-Valley - SJ Valley Regional Rail Authority US Army Corps of Engineers

Industry/Private sector

Air Products
Amazon
Apex Logistics, LLC
BNSF Railway
BP Pulse Fleet
Chicago Law Partners
Electric Power Research Institute
FedEx Corporation
FirstElement Fuel, Inc
FuturePorts
GTI Energy
International Warehouse Logistics Association
Maersk
Navistar, Inc.
Nikola Motor Company
Pacific Harbor Line
Penske Truck Leasing
Pilot Company
Prologis
The Home Depot
Tesla
Transfer Flow
TravelCenters of America
Trillium
Union Pacific Railroad
Volvo Group North America
Walmart
Watson Land Company
Weideman Group, Inc.

Ports

Port of Hueneme
Port of Oakland
Port of Long Beach
Port of Los Angeles
Port of Stockton

Appendix 4: Factsheets

Electricity:

How Electricity is Generated in California

California Transportation Commission

What is electricity?

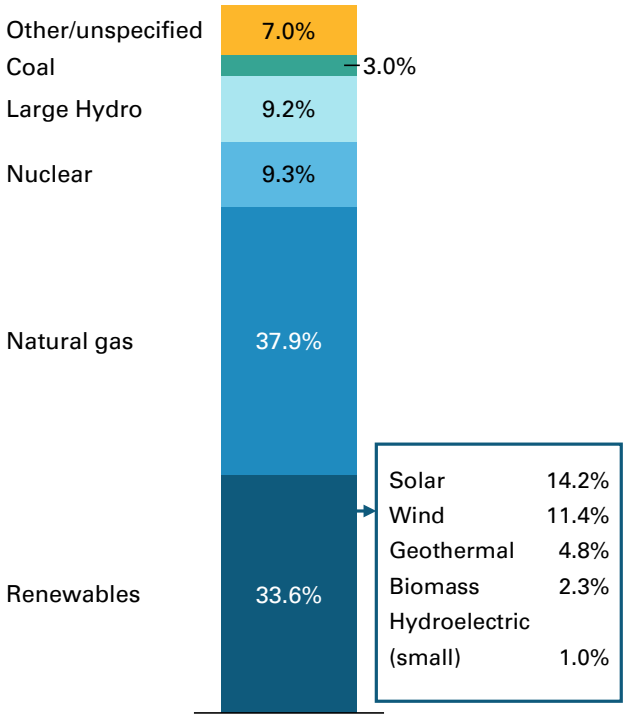
Electricity is one of the most widely used forms of energy; existing both as a basic part of nature and more formally as the flow of electrical power or charge.

The electricity that we use is a secondary energy source. Electricity is produced by converting primary sources of renewable and nonrenewable energy such as coal, natural gas, nuclear energy, solar energy, and wind energy, into electrical power. Electricity is also an energy carrier, meaning it can be converted to other forms of energy such as mechanical energy or heat.

In 2021, California's total electric system generation was 277,764 gigawatt-hours (GWh), making California the fourth-largest electricity producer in the nation and the nation's top producer of electricity from solar, geothermal, and biomass energy.

Sources of California electricity generation (total power mix), 2021

Total = 277,764 gigawatt-hours



Source: 2021 Total System Electric Generation, California Energy Commission – Total California Power Mix

How is electricity used in California?

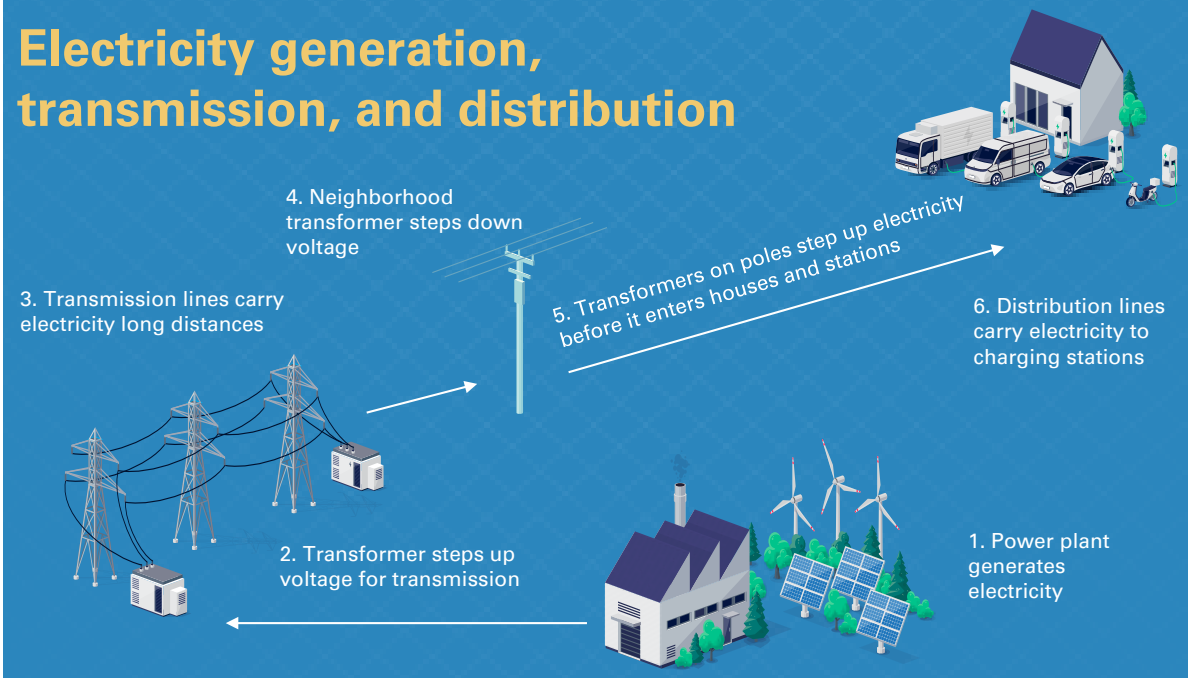
Electricity usage has become common in our modern, everyday lives for lighting, heating, cooling, and refrigeration and for operating appliances, computers, electronics, machinery, and public transportation systems. Below is a breakout of where electricity is used the most:

- 46% *114,697 GWh* Commercial (2022)
- 36% *90,415 GWh* Residential (2022)
- 18% *46,148 GWh* Industrial (2022)
- 0.3% *684 GWh* Transportation (2022)

Source: U.S. Energy Information Administration, Region: California

How is electricity generated, transmitted, and distributed?

Electricity is generated at power plants and moves through a complex system, sometimes called "the grid". The electricity grid consists of hundreds of thousands of miles of high-voltage power lines and millions of miles of low-voltage power lines with distribution transformers. Transformers either condense electricity to be carried through long distance power lines or spread it out to be carried along local power lines. Power lines and transformers connect power plants to all customers across the state.



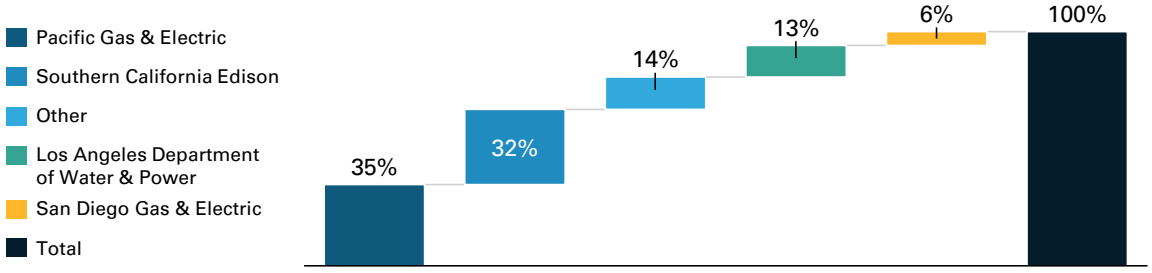
What is the landscape of electricity generation and transmission in CA?

The origin of the electricity that consumers purchase varies. Some electric utilities generate all the electricity they sell using just the power plants they own. Other utilities purchase electricity directly from other utilities, power marketers, and independent power producers or from a wholesale market organized by a regional transmission reliability organization.

Utility companies may be a not-for-profit municipal electric utility; an electric cooperative owned by its members; a private, for-profit electric utility owned by stockholders (often called an investor-owned utility); or a power marketer. **Local electric utilities operate the distribution system that connects consumers with the grid, regardless of the source of the electricity.** The major players in California are Pacific Gas & Electric, Southern California Edison and the Los Angeles Department of Water and Power.

Source: California Energy Commission, U.S. Energy Information Administration, California Energy Commission

Estimate of the electricity main utility companies provide for transportation, 2025 forecast

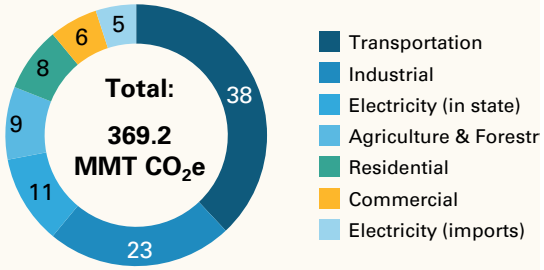


What are the current GHG emissions from CA transportation? What is the goal for reducing this?

Transportation is the largest contributor to green house gas (GHG) emissions in California, responsible for ~38% of emissions; heavy- and medium-duty trucks account for ~10% of total emissions themselves.

A goal in the California Air Resources Board's latest proposal is to reduce fossil fuel consumption to less than one-tenth of what we use today. The proposal could lead to a 71% reduction in smog-forming air pollution and save Californians $200 billion in health costs due to pollution by 2045.

Total CA Emissions (%)



Source: Release number 22-44, AB 32 Climate Change Scoping Plan, California Air Resources Board

How much electricity is needed on average at a truck charging station?

1 electric truck charging station = **~200-400 CA households**

For comparison, CA currently has approximately
13.1 M households[2]

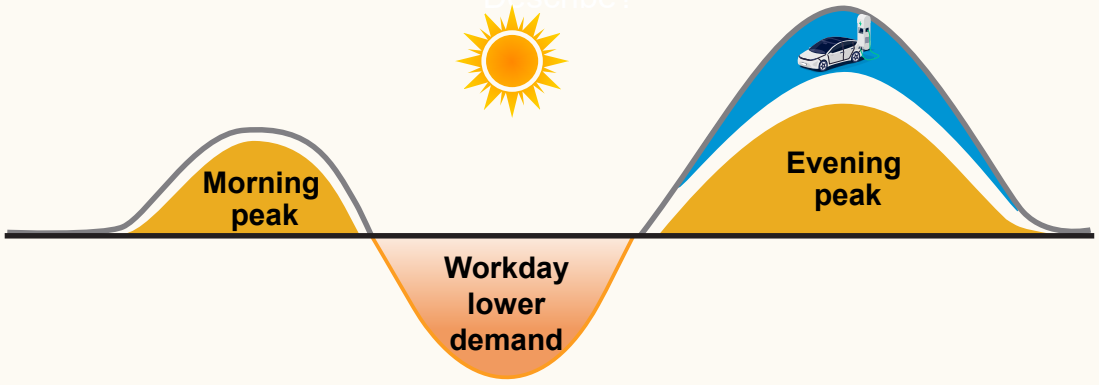
Approximately 200 to 400 households could be powered with same amount of electricity as an electric truck charging station in California. The electricity requirement per station is ~2 to 4.5 Million kilowatt-hours. Electricity consumption depends on the amount of time the chargers are in use (also called utilization). This was assumed to be between 10% and 20% - which gives us the range of electricity requirement. In 2021, the average annual electricity consumption for a U.S. residential utility customer was 10,632 kilowatt-hours (kWh)[1].

1. Source: U.S. Energy Information Administration
2. Source: U.S. Census Bureau

Note: A public truck charging station in this calculation comprises of 6 DC 350kW, 2 DC 500kW & 2 DC 100kW chargers and a private truck charging station / depot comprises of 4 DC 350kW, 2 DC 500kW, 8 DC 100kW and 6 DC 50kW chargers.

How could zero-emission vehicle (ZEV) adoption impact the grid?

The electrification of the transportation sector poses several challenges for the electricity sector in California. From an energy perspective, reaching the 2030 goal of 5 million electric vehicles could add an estimated 20-terawatt hours of annual electricity demand, an increase of about 10% of total electricity load in California. This increase comes amidst an overhaul of the state's electricity system as it strives to meet climate goals through regulation such as the Renewable Portfolio Standard (RPS), which requires a higher proportion of electricity generation from renewable energy sources (such as solar or wind). More energy demand requires more power generation, which may stress the capacity of the state's existing infrastructure, especially during high-use times (referred to as "peaks"). This additional demand may require significant upgrades throughout the energy system, though local distribution grids will likely require the most intervention (e.g., upgrading the capacity of local grids to handle longer and bigger peaks). However, new technologies could also help smooth demand over time, such as the strategic deployment of battery storage, the use of vehicle to grid supply, etc.



Source: Jenn A, Highleyman J. Distribution grid impacts of electric vehicles: A California case study. iScience. 2021 Dec 28;25(1):103686. doi: 10.1016/j.isci.2021.103686. PMID: 35036872; PMCID: PMC8749456, California ISO, Adapted from Duck curve published by Office of Energy Efficiency & Renewable Energy

What are microgrids and why are they important for ZEVs adoption?

Microgrids are grid systems consisting of small-scale generation and distribution networks, providing electricity to a limited number of customers. They can be powered by solar panels, diesel, hydro-electricity, or wind and battery storage. They can operate in isolation from national/state/regional electricity grids or connected to them. Microgrids can be used to supplement the existing grid capacity and to improve grid resiliency. When considering additional grid capacity to support ZEV infrastructure performance, total capacity needed, as well as cost and power generation source, should be evaluated. Microgrids can have the following examples of site-specific applications (non-exhaustive):


Supplementing capacity


Remote access


Extreme terrain


Renewable energy source

Source: Adapted from National Energy Education Development Project (public domain)

Key services offered by microgri

Backup Power/Resiliency

In the event of major storms, disasters, or public safety power shutoff (PSPS) events, mini-grids can continue to provide power to customers

Energy Optimization

Microgrids can help prevent the cost o electricity from getting too high during peak pricing and provide frequency regulation and other ancillary services

Zero-Emission Vehicles:
Battery Electric Vehicles and Hydrogen Fuel Cell Electric Vehicles

A zero-emission vehicle (ZEV) is a vehicle that produces no criteria pollutant, toxic air contaminant, or greenhouse gas emissions when stationary or operating. ZEVs include battery-electric vehicles and hydrogen fuel-cell electric vehicles. This fact sheet and the Clean Freight Corridor Infrastructure assessment it accompanies focus on battery-electric vehicles and fuel-cell electric vehicles for freight hauling (movement of goods rather than people).

Battery electric vehicles (BEVs)

Battery electric vehicles (BEVs) have an electric motor instead of an internal combustion engine. A BEV does not contain the typical liquid fuel components, such as a fuel pump, fuel line, or fuel tank because it runs on electricity. BEVs use a large traction battery pack to power the electric motor and are charged by plugging into a wall outlet or charging equipment, sometimes called electric vehicle supply equipment (EVSE).

Fuel cell electric vehicles (FCEVs)

Fuel cell electric vehicles (FCEVs) use a fuel cell powered by hydrogen to produce electricity, rather than drawing electricity from a battery. The amount of energy stored onboard is determined by the size of the hydrogen fuel tank. Like battery-electric vehicles, fuel cell electric vehicles (FCEVs) use electricity to power an electric motor.

Overview of strengths of each type of ZEV with today's technology

Parameter	Battery electric vehicles (BEVs)	Fuel cell electric vehicles (FCEVs)
Emissions	Zero-emission	Zero-emission
Drive	Electric drive	Electric drive
Efficiency	Higher powertrain efficiency	More efficient than internal combustion engine vehicle
Range	Mileage Range is limited by battery size	Has a mileage range similar to diesel
Time to fuel	Charging times are longer (depending on charger type)	Fuels at the same rate as internal combustion engine vehicle
Infrastructure costs	Low initial infrastructure costs	High initial, low long-term infrastructure costs
Applicability	Best suited for shorter deliveries	Best suited for longer travel with heavier loads

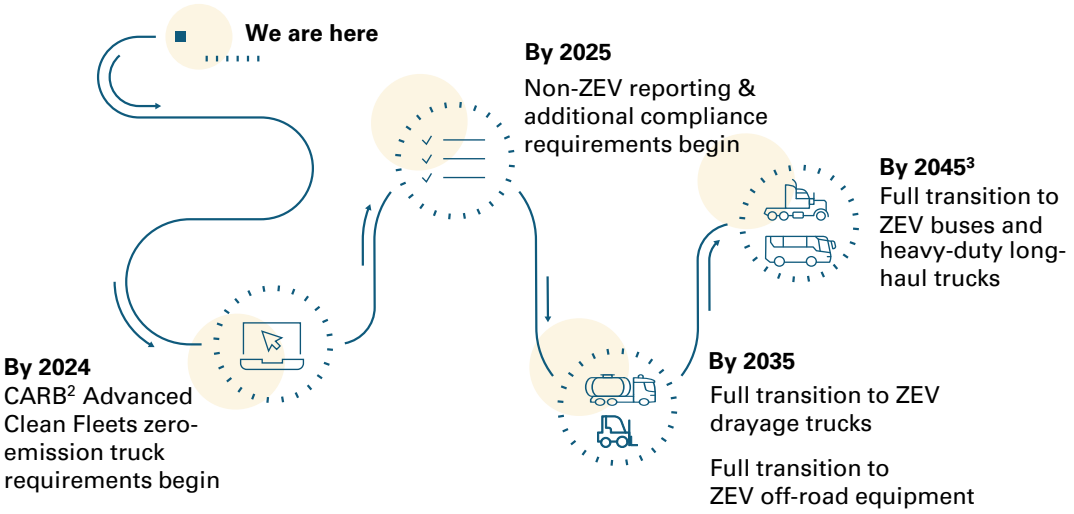
Source: Alternative Fuels Data Center, U.S Department of Energy, California Fuel Cell Partnership cafcp.org

Why do we need BEVs and FCEVs?

Transportation is the largest contributor of greenhouse gas (GHG) emissions in California. One of the goals in the latest California Air Resources Board (CARB) proposal is to achieve carbon neutrality by 2045 by reducing fossil fuel consumption (e.g., liquid petroleum) to less than one-tenth of what we use today – a 94% reduction in demand. This would require moving all types of vehicles, including public transit, passenger vehicles, and goods delivery/freight vehicles, to non-gas energy sources.

Zero-emission vehicles (ZEVs) could be a viable alternative to internal combustion engine trucks, as the technology has matured and total cost of ownership (TCO) parity could be achieved in the short–term. Supporting new ZEV[1] trucks, however, requires having viable charging and refueling infrastructure in place along California's people and goods movement corridors.

CARB Journey to full ZEV transition by 2045



What are the impacts/implications of moving from combustion engine trucks to BEV and FCEV trucks?

As fleets move increasingly to adopt zero-emission vehicles, the following impacts may be expected:

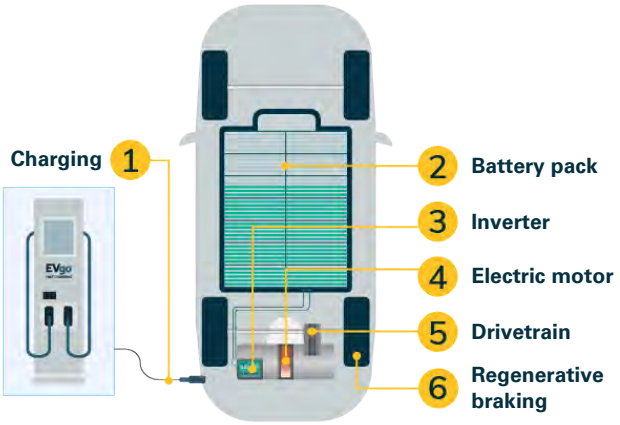
- **Infrastructure:** To support BEV and FCEV adoption, charging infrastructure, such as a network of refueling and recharging stations, can be further developed. A viable network could help to mitigate range constraints and enable faster ZEV adoption.
- **Grid:** Grid capacity expansion and/ or establishing microgrids could be needed to meet the rising electricity demand for electric vehicle charging and hydrogen production activities.
- **Road maintenance:** Zero-emission trucks are heavier and could lead to an increase in road and bridge wear and tear. Potential increases to vehicle weights could necessitate changes in the frequency and protocol of inspections and maintenance.

1. ZEV: Zero-emission vehicles, BEV: Battery electric vehicles, FCEV: Fuel-cell electric vehicle
2. CARB: California Air Resources Board
3. Where feasible

Source: California Air Resources Board, CTC working group

Battery electric vehicles (BEVs) charging

BEVs need to be recharged regularly, much like conventional vehicles need to be refueled. EV[1] charging is the process of using equipment to deliver electricity to the vehicle's battery, where electricity is stored (like a car's gas tank), to power its electric motor. The amount of time needed to charge depends primarily on the size of the charge, the size of the battery, and the state of the battery before charging (see an illustration of main components to the right). The higher the station's output or voltage rating, the faster the charging. Electric vehicle chargers are typically classified into four categories with varying voltage ratings: a Level 1 Charger uses 110/120 volts, a Level 2 charger uses 208/240 volts, a Level 3 charger uses 480 volts, and a DC fast charger uses between 200 and 600 volts.



Commercial BEVs can be charged at a privately owned power source, such as a facility's parking lot (commonly referred to as depot charging). They can also be charged at a public charging station. This usually involves charging a BEV in the middle of a vehicle's route using a DC fast charger, similar to refueling a diesel truck at a gas station located near a highway. The driver may also end the charging process before the battery is full. There are products available today that offer mobile charging options to fleets, such as wireless charging, grid-free charging using portable DC fast chargers, etc.

This chart shows common power ratings and average charge times for public EV infrastructure solutions. The difference in power ratings and charge times can be due to vehicle charging protocol (how the vehicle is designed to charge), the battery management system (BMS), environmental conditions, battery capacity (state of charge, overall kWh capacity), and charging hardware power rating. Level 1 charging is not included in this chart as its use is limited for most fleet, public and/or fee-based charging applications.

Public infrastructure needed for medium- and heavy-duty trucks in California

Public and fleet EV charging

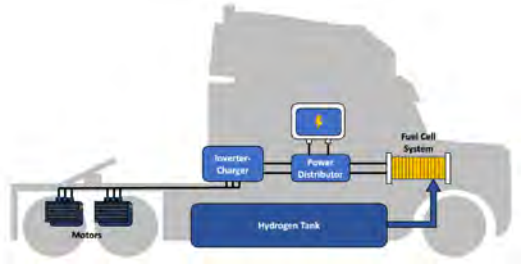
AC Level 2	Destination DC	DC Fast	DC High Power
6 to 19 kW	**20 to 100 kW**	**100 to 150 kW**	**150 to 600 kW+**
4 to 24 hours	**1 to 4 hours**	**15 to 60 mins**	**5 to 20 mins**
• Office, workplace • Multi-family residential • Hotel and hospitality • Overnight fleet • Supplement fast charging sites for PHEV[2] use	• Office, workplace • Retail and public commercial parking • Dealerships • Urban or overnight fleets • Sensitive power supply locations	• Retail, grocery and dining • Convenience fueling stations • Highway truck stops and travel plazas • Fleet depots	• Highway corridor travel • Metro 'charge and go' • Large commercial and private fleets • Bus, medium-, and heavy-duty vehicles

1. Electric vehicle
2. Plug-in Hybrid Electric Vehicles

Source: ZEV Truckstop, California Air Resources Board, EVgo, ABB e-mobility

Fuel cell electric vehicles (FCEVs) refueling

FCEVs are fueled with compressed hydrogen gas stored in a tank on the vehicle. The fuel cell doesn't burn the gas, but instead draws the hydrogen from the onboard tank and fuses it chemically with oxygen to make water. This process releases electricity that will continue to power the car's electric motor, with pure water as the only waste produced. Like conventional internal combustion engine vehicles, FCEVs can fuel in about 20 minutes and have expected ranges of up to 750 miles on a single "tank." Most hydrogen fueling stations are located at existing gas stations, using dispensers that look very similar to traditional gas pumps, but have a different nozzle and hose. Filling with hydrogen is fast, easy, and safe.



Medium- and heavy-duty FCEVs can be fueled by finding a public station that is accessible for larger vehicle types. Most hydrogen stations have two different refueling nozzles, one for 35 megapascal (MPa) fuel and another for 70 MPa fuel. While higher-pressure fuel provides greater vehicle range, there are fewer costs to deliver lower-pressure fuel.

How is hydrogen produced?

Since hydrogen is always bonded to other elements, it must be separated and purified through a process in order to be used in a fuel cell. There are many options for this, as well as a wide variety of sources for hydrogen – many of which can be renewable and low- to zero-carbon.

In today's early market, hydrogen is supplied primarily by industrial gas companies that produce hydrogen from natural gas. Since fuel cells are more efficient than gasoline-powered engines, the overall greenhouse gas emissions from production are much lower (at least half) than using a conventional vehicle, despite the production source.

California is working to have a reliable hydrogen supply: California Senate Bill 1505 requires 33% of hydrogen used for vehicle fuel in California, in the aggregate, to be produced from renewable energy sources. Two common methods exist to produce hydrogen from renewable sources: (1) electrolyzing (splitting) water with renewable electricity and using renewable biogas as the primary feedstock for steam methane reformation or (2) stationary fuel cell hydrogen generation.

Higher carbon		Lower carbon	Zero-carbon
Brown hydrogen	**Grey hydrogen**	**Blue hydrogen**	**Green hydrogen**
Hydrogen produced as a by-product of industrial processes	Hydrogen produced using fossil fuels	Hydrogen produced using fossil fuels where CO_2 is captured	Hydrogen can be produced using electrolysis powered by renewable electricity (e.g., nuclear)

An interactive map of all ZEV refueling locations in the United States and Canada can be found here: https://afdc.energy.gov/fuels/electricity_locations.html#/find/nearest?fuel=ELEC

Source: Hydrogen Station Permitting Guidebook (Sep '20), California Governor's office of business and economic development, DriveClean ca.gov, California Clean vehicle rebate project

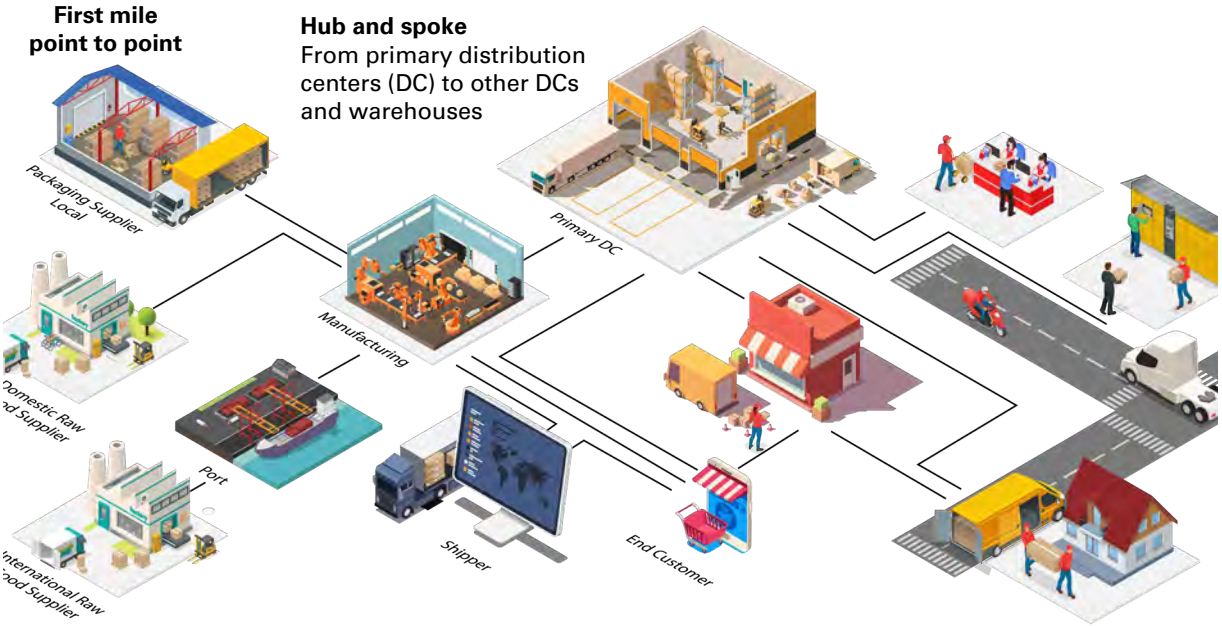
How does freight work:
California and its role in freight

California Transportation Commission

What is freight?

Freight is the transportation of goods, commodities, and cargo by ship, aircraft, truck, or intermodal means (where more than one transportation mode - often via train and truck – is used). Freight can be transported domestically or internationally by land, air, or sea. Any shipment over 150 pounds is considered freight . Manufacturers buy raw materials and intermediate goods, process them in the production operation, and ship their products to customers. Domestic production and international trade are major drivers of freight transport and logistics demand. This fact sheet is focused on the transport of goods, commodities, and cargo via road (i.e., ground freight movement) and how truck fleets are involved in this process. Below is a graphic to illustrate how freight can reach consumers, using a manufacturing supply chain as an example.

Illustration of the freight value chain



First mile

Transportation of goods across the first leg of the supply chain could have different meanings for supply chains and industries (e.g., raw product to manufacturing site vs. product to retailer)

Hub and spoke model

Used to disperse inventory to multiple fulfillment centers from a large distribution center

Distribution loop / last mile

Transportation of goods from the nearest distribution hub to their final destination

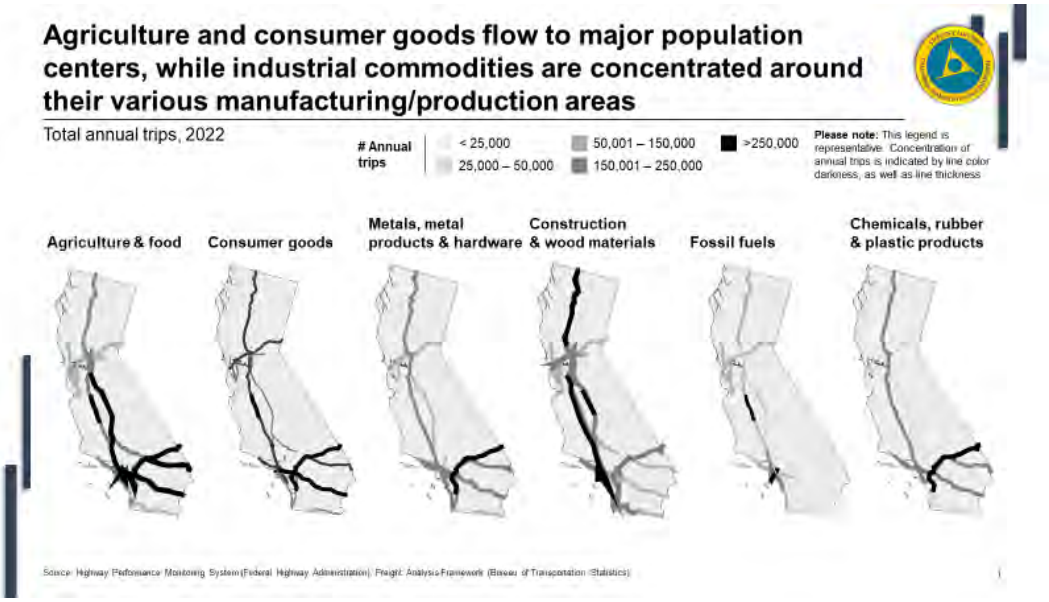
Source: Transportation Statistics Annual Report (TSAR), 2022, FedEx, CTC working group

What are California's key freight flows and how do they impact California's economy?

California is the nation's largest gateway for international trade and domestic commerce, with an estimated $2.8 trillion in freight flow value annually. CA has an extensive multi-modal freight system – spanning ports, roads, rail, and airports – that move millions of tons of cargo every day. While this cargo transportation system supports a vibrant economy, it is also is a source of pollution, generating poor air quality across the state.

Freight businesses may provide transportation services for cargo between retailers, wholesalers, factories, and more. Trucking plays a critical role to the California economy as the predominant mode of transportation for freight and goods. By weight, trucks transport the largest amount of goods into, within, and out of the state.

There are six broad categories of goods movement across California. Agricultural and consumer goods in California flow to major population centers, while industrial commodities are concentrated around various manufacturing hubs, production sites, and ports throughout the state.



Trip length classification

Urban

Trips in and around cities and urban centers, usually for last mile delivery

Regional

Trips in between major cities and neighboring states, includes short-haul trips such as drayage

Long-haul

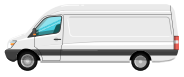
Trips much longer in length whether cross-country or several states away

Source: California Supply Chain Success Initiative Summary, California Air Resources Board, California Governor's Office of Business

What are the different types of trips? What are the types of vehicles currently used for moving freight?

Truck types are determined using the Federal Highway Administration (FHWA) 13-bin vehicle classification system. generally, freight vehicles can be categorized into three major types: light-duty, medium-duty, and heavy-duty. The focus of this fact sheet and the broader SB 671 report is on medium-duty and heavy-duty trucks.

Truck type classification



Light-duty truck

Light-duty trucks are vehicles of Classes 1 – 3 (according to FHWA & CARB definitions), weighing <6-13k lbs.

Medium-duty truck

Medium-duty trucks are vehicles of Classes 4 – 6 (according to FHWA & CARB definitions), weighing 14 – 32k lbs.

Heavy-duty truck

Heavy-duty trucks are vehicles of Classes 7 – 8 (according to FHWA & CARB definitions), weighing >33k lbs.

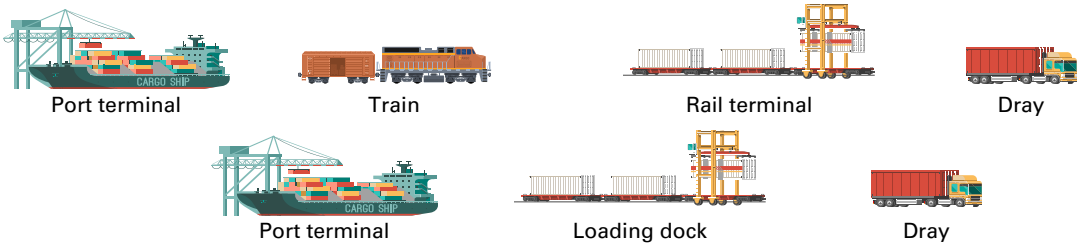
In general, medium-duty trucks are more frequently used for urban or delivery trips and heavy-duty trucks are used for drayage, regional, and long-haul trips.

What is drayage and what are the implications of transitioning to zero-emission trucks specific to the drayage industry?

Drayage is the short haul trucking that connects ports or inland intermodal terminals with a warehouse or distribution point. Generally, a dray (the road freight component) is part of an intermodal move or an import/export container. It is likely that zero-emission transition will happen in drayage first because of the short haul nature of this industry. California has a goal of transitioning to 100 percent zero-emission drayage trucks by 2035. The breakeven point of the zero-emission truck technology for drayage will happen before its long-haul counterpart. Drayage is critical in California, due to the volume of freight moved through the San Pedro Bay and the prevalence of intermodal trips for West Coast goods. Three key considerations for transitioning drayage fleets to zero-emission vehicles are the availability of trucks for purchase, the upfront capex needed by the fleet owners to make the transition, and reliable and available fueling and charging infrastructure with limited impact on freight operations.

Domestic Intermodal

International Intermodal



Source: WEF report - Road Freight Zero: Pathways to faster adoption of zero-emission trucks

Who are fleet owners / operators? What are their current business models? How do freight businesses operate?

There are three key entities involved in freight movement: shippers, carriers/owner/operators and brokerage firms. Shippers are entities from which freight typically originates; they are generally producers or sellers of goods and services. Carriers/owner/operator are companies or individual truck owners who offer transportation services to shippers. Brokerage firms arrange transportation contracts between shippers and carriers/owner/operators. There are three levels of logistics companies relating to the party at which they operate: First-Party Logistics (1PL), Second-Party Logistics (2PL), and Third-Party Logistics (3PL).

1PL
- Shipper's own fleet carries products
- It is seen as a "cost of doing business" – these fleets do not generate revenue from transportation, but are a cost of bringing goods or services to market

2PL
- A shipper contracts a carrier or individual owner/operator to move products, but the shipper keeps logistics in-house
- The carrier or operator generates revenue from the transportation service rendered – they are paid for time and payload (weight) carried

3PL
- A shipper contracts with a 3PL provider to ship products and perform some or all logistics-related tasks
- The 3PL acts as a liaison for the shipper, and books cargo through the carriers/2PLs on the shipper's behalf
- A 3PL generates revenue based on a margin they charge on the underlying transportation cost/mechanics

What are the implications for fleet owners / operators transitioning to zero-emission trucks for the industry?

Infrastructure needs: Zero-emission (ZE) trucks will require new infrastructure in the forms of charging or hydrogen fueling stations. In some cases, charging and fueling operations can take place in depots using infrastructure built specifically for the fleet owner/operator. However, to increase route flexibility and to serve the full set of potential freight use cases, availability of public, on-the-go infrastructure throughout the entirety of key freight journeys is critical.

Large upfront capex cost and residual value: While zero-emission (ZE) trucks will eventually offset higher upfront capital expenses with lower operating expenses, during the transition period, fleets face the issue of expanding upfront capital spending for new vehicles and installing new depot infrastructure, plus the higher everyday operating expenses of running mixed fleets. Leasing and financing models remain uncertain due to the unclear resale values for ZE trucks

Changes in operations: Zero-emission (ZE) trucks are heavier than combustion engine trucks and this could result in potential payload loss, especially for heavy-duty ZEV on long-haul trips. Fueling and recharging time for battery electric trucks are expected to be longer than that of combustion engine trucks and could impact labor costs and speed of delivery.

Source: WEF report - Road Freight Zero: Pathways to faster adoption of zero-emission trucks, CTC working group

The business objective of fleet owners and operators is to maximize their margins by minimizing the cost and maximizing revenue. Fleet costs comprise of two major components – capex (capital expenses) and opex (operating expenses).

Capital expenses

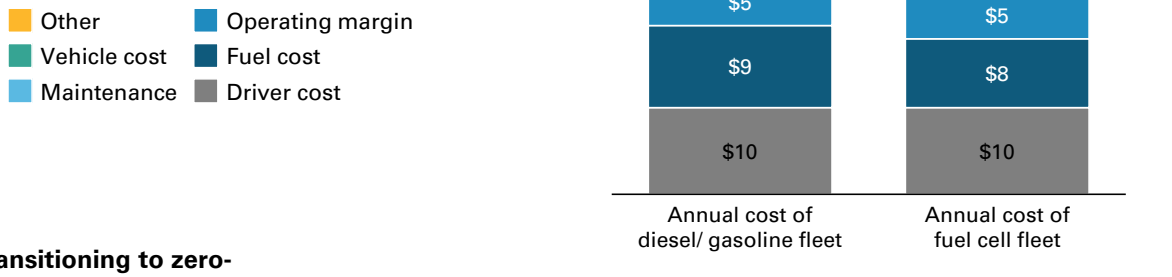
Fixed costs such as vehicle costs, depot infrastructure, etc.

Operating expenses

Variable costs such as fuel, maintenance and repair, driver and other labor costs, etc.

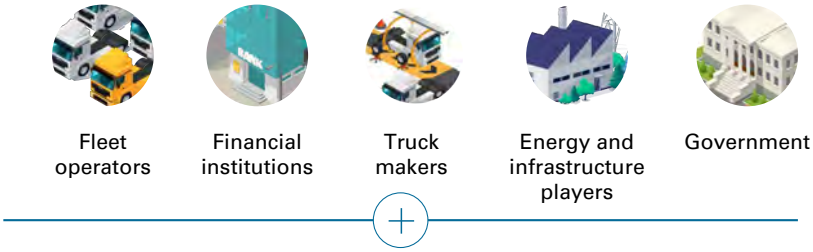
Illustrative annual cost of truck fleets as of 2022
$ Millions

The graph depicts a comparison in overall cost (total cost of ownership) when comparing a traditional internal combustion engine truck with a fuel cell electric truck



Transitioning to zero-emission trucks

Many entities will be involved in transitioning from internal combustion engine vehicles to zero emission fleets. To the right is a description of the main players that could be involved in this work



In addition, several other entities will also have roles to play in the transition, from trailer manufacturers to telematics companies and beyond

What are the implications of intrastate vs. interstate traffic?

The main difference between the intra- and interstate traffic is the involvement of different regulators. The Federal government regulates interstate traffic. Companies that operate commercial vehicles transporting passengers or hauling cargo in interstate commerce must be registered with the Federal Motor Carrier Safety Administration (FMCSA) and must have a United States Department of Transportation (USDOT) number. A commercial vehicle operated only within the state of California must obtain a Motor Carrier Permit, a CA number and, as of September 2016, a U.S. Department of Transportation (DOT) number as well. Some out-of-state carriers must obtain a Motor Carrier Permit and a CA number in addition to the U.S. DOT number to come into California.

Source: WEF report - Road Freight Zero: Pathways to faster adoption of zero-emission trucks, Caltrans, CTC working Group

From: Gagliano,Joseph A.
To: Walter, Hannah@CATC
Cc: Giese, Kayla@CATC; Hawkins,Alison; Bonner,Brian B.; Heller,Miles T.
Subject: RE: [External] Draft SB 671 Assessment posted online for public comment
Date: Thursday, October 12, 2023 12:47:49 PM
Attachments: CTC SB 671 ASSESSMENT DRAFT 9-25-23 - AP Comments.docx

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EXTERNAL EMAIL. Links/attachments may not be safe.

Hannah and Kayla –

Attached are my comments on the draft SB 671 Assessment, mostly focused on references to hydrogen fueling stations, formatting and clarifications on some of the data presented.

Overall, Air Products finds the identification of the Top 6 and 34 Priority Freight corridors as reasonable through its goods movement-based approach. Regarding the estimation of clean freight fuel demand and infrastructure needs, Air Products generally agrees with the Balanced Adoption Scenario where BEVs are used predominantly used in medium-duty short and regional trips, while FCEVs are used predominantly for heavy-duty and long-haul applications. Also, Air Products generally agrees with the Assessment recommendation approach that to build the Initial Viable Network would require ZEV infrastructure buildout along the "Top 6" freight corridors.

Please contact me if you have any questions or need clarification on any of my comments.

Regards,
Joe

Joe Gagliano

Manager – Government Policy | Hydrogen for Mobility
Air Products and Chemicals, Inc.
4000 MacArthur Boulevard
Suite 420, East Tower
Newport Beach, CA 92660
(949) 474-1860 x 17 (office)
(714) 393-2520 (cell)
Email: gaglianoj@airproducts.com

From: Walter, Hannah@CATC <Hannah.Walter@CATC.CA.GOV>
Sent: Tuesday, September 26, 2023 4:01 PM
Cc: Giese, Kayla@CATC <Kayla.Giese@catc.ca.gov>
Subject: [External] Draft SB 671 Assessment posted online for public comment

This email is from an external source. Please exercise caution in opening attachments or links.

Hi all - the draft Senate Bill 671 Clean Freight Corridor Efficiency Assessment is available for your review and comment on the Commission's SB 671 here.

Please send comments to Kayla Giese at kayla.giese@catc.ca.gov by Wednesday,
th

From:	Thomas Riebs
To:	Giese, Kayla@CATC
Cc:	Yosgott, Matthew J@CATC; Gunnlaugur Erlendsson
Subject:	RE: Comments on SB 671 deadline
Date:	Thursday, October 26, 2023 5:38:13 PM

Dear Kayla,

As we represent Enso Tyres, which are one of a select few, if not the only company, which has developed premium tires specifically for Electric Vehicles, I would like to submit my comments here regarding apparently unrecognized, underrecognized, or perhaps overlooked complications related to tire dust emissions from tires used on Electric Vehicles:

- In the United Kingdom, tire dust emissions/pollution is currently far more harmful to the population than tailpipe emissions.
- Electric Vehicles, whether light, medium, or heavy-duty vehicles only exacerbate this problem because of one or more of the following:
    - Additional weight, and in most cases significantly more weight.
    - Additional torque, and in most cases significantly more torque.
    - Inadequate engineering, insufficient materials redesign or reformulation, or other materials related insufficiencies.
    - Significantly shorter lifespan for tires used on EVs.
        - Secondary pollution related to an increase in environmentally unsound dumping of end-of-life EV tires.
        - Lack of adequate end-of-life/lifecycle considerations, including materials recovery possibilities form existing tire manufacturers.

Additionally, existing tire options for light, medium, and heavy-duty trucks have a broad range of energy efficiency, with at least 50% of tires on the market being less or significantly less energy efficient than the OEM installed tires. The continued opportunity to install less energy efficient tires will inevitably lead to secondarily inflicted pollution from unnecessary electricity production, delivery of sub-standard tires, and the environmentally unsound disposal of such sub-standard tires.

It is imperative that the massive implications of the tires installed, by choice or by mandate, on light, medium, and heavy-duty trucks and delivery vehicles be considered carefully when discussing “Zero Emissions Corridors” or “Zero Emissions Transportation” more broadly.

- The failure to include meaningfully the environmental, socioeconomic, health, and equity costs would be costly.
- The CEC is currently considering carefully how to regulate the installation of aftermarket tires from an energy efficiency perspective.
- CARB has engaged UC Riverside to help develop guidelines for how to regulate tire dust emissions.
- It is possible, and even likely, that properly considering and including tire emissions pollution, including micro-dust as well as some of the chemicals in many tires, would put California in an environmental leadership position as well as creates opportunities for world-leading manufacturing with meaningful export opportunities and work-force development opportunities.

Regarding infrastructure considerations, it should be considered that charging and other infrastructure should also include tire changing facilities.

Considering tires and their implications is like to attract meaningful investment, as is already evident from the 2023 Earthshot Prize including tires in the Clean Our Air category.

Please let me know how I can continue to be engaged with this process.

Best regards/Venlig hilsen/Beste Grüße,

Thomas Riebs, JD
Chief Executive Officer

AXEL
Los Angeles | Helsinki | Aalborg | Copenhagen
Actions Speak Louder Than Words

Schedule time for a meeting here:
Meet with Thomas.

Los Angeles, California, USA

Email: tr@axel-us.com
Phone: +1 310 210 7090

From: Thomas Riebs
Sent: Wednesday, October 25, 2023 1:34 PM
To: Giese, Kayla@CATC <Kayla.Giese@catc.ca.gov>
Cc: Yosgott, Matthew J@CATC <Matthew.Yosgott@catc.ca.gov>
Subject: RE: Comments on SB 671 deadline

Thank you Kayla! I need to get at it then!

Best regards/Venlig hilsen/Beste Grüße,

California Electric Transportation Coalition

October 26, 2023

California Transportation Commission
1120 N Street, MS 52
Sacramento, CA 95814

Submitted via email to kayla.giese@catc.ca.gov

Re: SB 671 Clean Freight Corridor Efficiency Assessment

The California Electric Transportation Coalition (CalETC) appreciates the opportunity to provide comments on the draft SB 671 Clean Freight Corridor Efficiency Assessment (Draft Assessment). CalETC would like to thank the California Transportation Commission for all your hard work on developing the Draft Assessment and commitment to meeting California's medium- and heavy-duty (MHD) zero-emission vehicle and infrastructure goals.

CalETC supports and advocates for the transition to a zero-emission transportation future to spur economic growth, fuel diversity and energy independence, contribute to clean air, and combat climate change. CalETC is a non-profit association committed to the successful introduction and large-scale deployment of all forms of electric transportation. Our Board of Directors includes representatives from: Los Angeles Department of Water and Power, Pacific Gas and Electric, Sacramento Municipal Utility District, San Diego Gas and Electric, Southern California Edison, Southern California Public Power Authority, and the Northern California Power Agency. In addition to electric utilities, our membership includes major automakers, manufacturers of zero-emission trucks and buses, electric vehicle charging providers, autonomous electric vehicle fleet operators, and other industry leaders supporting transportation electrification.

CalETC supports the corridor recommendations and prioritization made by the Draft Assessment. CalETC came to similar conclusions during internal analyses we conducted in 2021 and through support of the West Coast Clean Transit Corridor Initiative that has explored these topics since 2019. CalETC members are currently supporting infrastructure deployments that will be the first building blocks of a MHD charging network across the state. In addition, CalETC member utilities also supported the Draft Assessment with case study evaluations that were not mentioned in the assessment. PG&E, SCE, and SDG&E all performed distribution grid capacity assessments for sites along the priority corridors to support the Draft Assessment's analysis of electrical grid feasibility. The exact locations where these assessments cannot be disclosed because of customer privacy protections, but the electrical utilities have actively supported the Draft Assessment and believe the strategies it lays out will help California reach our MHD ZEV goals.

Section 2.5 Potential Project Sponsors

CalETC recommends that electric utilities be added as key project sponsors in Section 2.5. Significant electric distribution grid infrastructure will be required for any of the three scenarios identified in the Assessment: Accelerated Battery Electric, Balanced, and Accelerated Hydrogen

Fuel Cell. It should be noted that dispensing hydrogen is dependent on hydrogen compression performed by electric compressors, which use significant amounts of electricity at scale. Even though electric utilities may not be the lead development entity on a charging or hydrogen refueling project, coordination with the local electric utility will be fundamental to achieving success. Coordination and early project scoping for electric distribution capacity and service support will be necessary to determine cost feasibility for any site. Electric utilities are integral partners in the infrastructure buildout and should be included as project sponsors or key contributors.

Section 3.0 Breakdown of Total Estimated Capital Expenditure Costs for Station Development

CalETC supports the cost estimates included in Exhibit 16 and, for completeness and transparency, we recommend adding references to the cost information and how it was derived. Grid upgrades and capacity costs are cited to be between $2-7 million per station, and it would be useful to have a clearer breakdown of what levels of upgrades were included within that range. Further, although costs attributed to grid upgrades are listed in Exhibit 16, these costs do not appear to be included in the "Updated per station cost estimate" and it is unclear whether grid upgrade costs are in the total capital costs to build the initial viable network in 2025 ($505 million to $950 million) or 2035 ($10 billion to $15 billion). As the costs cited for grid upgrades in Exhibit 16 could potentially double the station development cost, it is important that these costs be considered or that it be made clearer these costs are omitted from the total capital costs provided in the funding outlook. The reference to cost data and development timelines are important given that these ZEV fueling stations will be some of the first constructed in the nation and other states and communities will use data and lessons learned in California for their own planning and deployment of ZEV fueling infrastructure. Including the cost information as references will be a great resource for future project proponents inside and outside California.

CalETC also recommends making available the data and modeling conducted by the Army Corps of Engineers using GPS and telematics data to inform potential charging locations and demand. The Draft Assessment focuses on averages of 10 chargers per public station and 20 chargers per private station, however, it would be useful for other state agencies, the Public Utilities Commission's Freight Infrastructure Plan (FIP), and utilities to see more detail in the analysis to inform potential charging zones or hot spots across the state.

Section 4.3 Solutions: Streamline the Clean Freight Infrastructure Development Process

CalETC supports the actions called for in the solution section and we recommend ensuring that the Draft Assessment is aligned with the Energy Commission's Integrated Energy Policy Report, which is used by the utilities for grid capacity planning and bolstering the need for the FIP to proactively update electric infrastructure plans and coordinate freight modeling. Policy changes are needed to allow early proactive utility investment in grid upgrades to support transportation electrification, which currently are not allowed because of historic concerns over stranded assets. The FIP proceeding is focused on long-term solutions and may take upwards of five years to reach actionable change. The emphasis on long-term solutions is necessary but it does not help California

meet the near-term goals required by the Advanced Clean Fleets and Advanced Clean Trucks regulations. If the FIP were to take five years to implement meaningful policy changes and construction of grid side infrastructure takes six to eight years to complete, meaningful grid side infrastructure will not be available until 2034 at the earliest to support MHD ZEVs at scale. This timeline is not aligned with our state policy goals nor the Governor's executive orders related to ZEV fleet deployment. Faster policy development timelines and utility resource commitments are needed immediately to support meaningful actions towards achieving our MHD ZEV goals.

Section 4.4 Barriers: Economic Viability of the Transition for Fleet Owners

CalETC recommends making available the McKinsey Center for Future Mobility cost parity data between different vehicle technologies by vehicle type. The McKinsey study is noted but there is no link or copy of the study provided that can be reviewed to see how those data points were derived. Other studies such as the recent International Council on Clean Transportation (ICCT) study should be included in the Draft Assessment because it also looked at technology readiness between battery electric and hydrogen fuel cell vehicles and came to different conclusions.[1] It is important that these data sources and their conclusions are made publicly available for transparency, completeness, and exportability to other states deploying ZEV fueling infrastructure.

Section 5.4 Potential Workforce Impacts

CalETC agrees that evaluating workforce impacts and needs will be acutely important in this transition toward ZEV transportation. MHD ZEV fueling infrastructure deployment activities will create significant new jobs[2] and should be coordinated with other activities that are underway at the California Energy Commission, for example electrical contractor training and certification for charging equipment installation. One area of the workforce that should be included is the workforce expansion needed to support the electrical distribution grid expansion. We recommend the Draft Analysis consider recommending the state bolster its secondary education system to address the need for additional electrical power engineers as well as electric utility distribution design staff. Both of these critical job skill sets will be needed to meet the ZEV infrastructure demands at scale. The timelines to get experienced power engineers in place takes a minimum of 6 years and distribution designers approximately 2 to 3 years. Therefore, it is imperative to accelerate workforce training immediately.

Section 5.5 Potential Uses of Microgrids

CalETC supports the deployment of ZEV refueling facilities with microgrid capabilities. Microgrids provide resiliency benefits, for example by enabling emergency responders with the ability to refuel in times of emergencies where power outages occur. Being able to refuel ZEV emergency response vehicles is critical in our transition to ZEV fuels. Additionally, microgrids that combine

[1] ICCT, *Total Cost of Ownership of Alternative Powertrain Technologies For Class 8 Long-Haul Trucks In The United States*, available at https://theicct.org/publication/tco-alt-powertrain-long-haul-trucks-us-apr23/.
[2] See *Workforce Projections to Support Battery Electric Vehicle Charging Infrastructure Installation*, available at https://caletc.com/assets/files/Workforce-ProjectionstoSupportBatteryElectricVehicleChargingInfrastructureInstallation-Final202106082.pdf

onsite electricity generation, primarily from photovoltaic, and energy storage improve the economic performance of the refueling station in early deployment years where vehicle refueling utilization is low. Including distributed energy resources at refueling sites adds revenue potential that may improve the economic viability of the facility in the near term.

Section 7 Recommendations for a Central Delivery Team

CalETC recommends including an electric utility focused liaison within the central delivery team. The utility liaison would work with all development teams and the utilities to improve communication and project execution. In addition, the liaison could support development of common processes, tools, and reporting protocols between utilities to support facility developers that work with different electric utilities and authorities having jurisdiction across the state.

Appendix 1.4: BEV Infrastructure Assessment Detailed Methodology

CalETC recommends using different charger utilization factors for public/shared and depot/private charging stations. The methodology to estimate charger and station needs are dependent on a 20% utilization factor for all chargers, however, this is a more appropriate starting place for public/shared charging infrastructure. Depot/private charging could be better assessed with data on vehicle depots and vehicle registration data, which will likely have higher utilization because there are dedicated vehicles for these charging deployments.

Thank you for your consideration of our comments. Please do not hesitate to contact me at kristian@caletc.com should you have any questions.

Kind regards,

Kristian Corby, Deputy Executive Director
California Electric Transportation Coalition

California Department of Transportation

OFFICE OF THE DIRECTOR
P.O. BOX 942873, MS–49 | SACRAMENTO, CA 94273–0001
(916) 654-6130 | FAX (916) 653-5776 TTY 711
www.dot.ca.gov

October 26, 2023

Ms. Kayla Giese
California Transportation Commission
1120 N Street
Sacramento, CA 95814

Dear Ms. Giese:

Thank you for including the California Department of Transportation (Caltrans) in the review process for the Senate Bill 671 Clean Freight Corridor Efficiency Assessment Report. Caltrans would like to commend the California Transportation Commission (CTC) for collaborating with Caltrans, other state agencies, statewide transportation partners, and the public to develop this report. This report will guide future decision making for innovative freight projects that improve the flow of freight while mitigating environmental and community impacts of the State's goods movement sector.

Caltrans is committed to supporting California's transition to zero-emission freight, and we are proud to have supported CTC in this effort since the project kickoff in December 2021. This report will be critical in helping to prioritize future State investments in zero-emission infrastructure to meet our climate goals.

Caltrans appreciates CTC's leadership on this report and anticipates continued collaboration to implement the report through future projects and strategies to advance the zero-emission transportation system. If you have any question, please contact Kelly McClendon at Kelly.Mcclendon@dot.ca.gov.

Sincerely,

MARLON FLOURNOY
Division Chief, Division of Transportation Planning

c:
Dave More, Interim Deputy Director Planning & Modal Programs
Eric Sundquist, Deputy Director (Acting), Office of Equity, Sustainability, & Tribal Affairs

From California Energy Commission:

Major Comments

It will be useful to have additional information in the assessment on inputs and assumptions, so that the values used in other models (such as the ones used for AB 2127), as well as the results, can be evaluated transparently. Specific areas that will benefit from additional details are listed below:

- Please mention the assumption on trip-start SOC of vehicles, e.g., are they starting trips with X% SOC from depot (private) charging?
- Please mention if assumed battery size(s) and usable SOC range (e.g., 20%-80%) vary by vehicle class.
- Please describe what a private charging station means in this assessment framework. E.g., depot, restricted access stations, or simply trip start and end locations which are assumed to be behind-the-fence.
- Please provide the average battery efficiency values used for different vehicle classes.
- Please provide the quantitative assumption on "partially loaded vehicle" (loaded by X%, X lbs).
- Is the charging energy demand consistent with IEPR and the Energy Assessments Division (EAD) at CEC (Quentin Gee's group)? It appears that UC Davis provided the energy efficiency data, and those are expected to be in-line with IEPR and EAD estimates.
- Please provide some description on the assumed "charging station archetypes".
- Please provide the assumed charging power levels. Please mention if different vehicle classes are assumed to use different charging power levels.
- Please elaborate how private and public stations are estimated for each roadway segment. Are the trips originating/ending at the segments were tracked, and then marked as private charging (depot), while the trips passing through the segments are considered as public charging (en-route)?
- Please provide the energy split between private depot, public depot, en route charging. Please mention if these categories exist in the assessment framework.
- Please provide the reasoning behind assuming the number of chargers to be 10 and 20 for public and private stations, respectively. Is it a possibility that for larger stations with more chargers, combining multiple stations from this assessment will provide a realistic result?
- Please provide charger counts by power levels.
- Please mention the assumed vehicle dwell time at charging stations. Is trip time expected to change to accommodate charging?
- Please mention what the assumptions are on vehicles stopping to charge at the specified stations. Does the assumed dwell time match real world considerations on value of time? For example, battery electric heavy-duty trucks might need to charge up by X kWh within the mandated break duration.
- It seems that the VMT is used as the primary data to determine charging demand, which gives the number of chargers required. A fixed number of chargers per station is then considered to obtain the total number of required charging stations in each roadway segment. This means the spacing between stations for different segments can vary. However, it is also stated that vehicles should get 1.5 stations within their usable range - which indicates that the spacing is a constant tied to vehicle range, and not on charging demand and roadway length. It would be great to have some discussion that clarifies the procedure on calculating the station count and spacing, and removes this confusion.

- It might be useful to include a section listing all the assumptions, their limitations, and suggested improvements.
- Please provide some description of the input data, and how the trips are classified as urban, regional, and long-haul (e.g., by source/destination, length, etc.).
- Would it be possible to provide some discussion on possible increase in trips due to ZEV powertrain weights eating into payload capacity?

Minor Comments

- Page 5, line 1: “zero-emission charging and hydrogen fueling stations” - some sort of rephrasing can be useful as zero-emission include both battery electric and hydrogen fuel cell vehicles.
- Page 5: would be better if the figure is mentioned in the text. Currently it feels a bit unclear which part of the text it relates to, as the text after it discusses cost and timeline, whereas the figure shows the number of stations needed, for one of the three scenarios.
    - It’d also be better if the mention to the figure states that it shows one of the three scenarios considered. Alternatively, figures for all three scenarios can be presented.
- Page 5: possibly make the chart bigger and ensure that it has the title, axis labels and the legend displayed in a different way.
- Page 6: last row of the figure: please correct the broken texts.
- Page 6: particulate matter 2.5 and 10 (particulate matter 2.5 microns or less in size) - the explanation only refers to PM2.5, not PM10.
- Page 7: “The Assessment estimates the impact of heavier zero-emission trucks....”. Are there zero-emission trucks that are lighter or is there any prior discussion that indicates that zero-emission trucks are heavier? I think this statement could be interpreted in different ways.
- Page 11: higher resolution image would be better for “Exhibit 1: Map & List of 34 "Priority Freight Corridors"”. Texts in the current one are not readable.
- Page 11: map needs legend/key and insert maps need some labels
- Page 12: having a transitioning sentence would be better before the numbered list (e.g., ‘The procedure for identifying the “Top 6” corridors is following:’). if this list describes the procedure for identifying the priority corridors, please state as such.
- Page 12, step 3: please provide references (sources) for “Freight Analysis Framework” and “additional datasets including truck traffic data from Caltrans and truck Global Positioning System data”.
- Page 12, step 4: passive voice would make it consistent with the previous points.
- Page 12, line 2: “The overlap of the highest link vehicle miles travelled for trucks and the ...” - probably rephrasing would help to better understand what it means (e.g., ‘The overlap of the link with the highest vehicle miles traveled (VMT) for trucks, and the ...’).
- Exhibit 2: heading style inconsistent with Exhibit 1 (Sentence case vs. Capitalize Each Word).
- Page 15, line 1: “considered includes”, please correct as necessary.
- Page 15, 2nd bullet: please consider putting the NEVI explanation in parentheses as a footnote.
    - Also, just a thought, source to NEVI can be provided as a footnote, rather than the current hyperlink. If the hyperlink format is consistently used throughout the document, that might also do. In short, whatever approach is followed, it must be consistent.
- Page 17, Exhibit 3: some interstate labels are illegible.

- Page 20: “Freight Analysis Framework 5 data” - was the “5” supposed to be used for a footnote? If it’s just what the dataset is called, providing a reference would be useful to avoid any confusion.
    - Exhibit 6 uses a good format: “Freight Analysis Framework version 5”.
- Page 21, Exhibit 4: please enlarge the highway/interstate labels, and the legend font size (“Priority corridors” and “Corridors requiring segment analysis”).
- Page 21: Suggest having Exhibit 4 on a separate page in landscape layout.
- Page 22: please provide reference for CalEnviroScreen.
- Page 23: Enlarge map
- Page 24, Exhibit 6: Caption in sentence case
- Page 26, Exhibit 7: if IVN stands for “Initial Viable Network”, please provide it in parentheses in the Exhibit caption.
- Page 26: Could you enlarge the maps?
- Page 26: Battery electric truck is BET and not BEV, and hydrogen fuel cell electric truck is fuel cell electric truck of FCE not FCEV.
- Page 26: what are the three potential infrastructure scenarios assessed?
- Page 28, Exhibit 8: Caption in sentence case
- Page 29: for reference to the McKinsey material, please use hyperlink or footnote, whichever is chosen to be consistent throughout the document.
- Page 31, Exhibit 10
    - Better image quality needed
    - The superscript for “CEC” seems unnecessary
- Page 33, Exhibit 11
    - Caption in Sentence case
    - “Does not include planned stations 56 BEV and 12 FCEV by 2025” - unclear what it means. Should it be like this: Does not include planned stations **(**56 BEV and 12 FCEV**)** by 2025. ?
    - The bars starting lower, do they indicate a different scale?
- Page 35, hyperlink to EnergIIZE: please use hyperlink or footnote, whichever gets chosen for this assessment.
- Page 36, Exhibit 14: is this the same as Exhibit 7?
- Page 37, Exhibit 15 caption: each word is not capitalized
- Page 41: page number missing.
- Page 42, Exhibit 16: Caption in sentence case
- Page 42, Number of initial viable network stations needed: on which adoption scenario are the presented station numbers based on?
- Page 44: Consider rephrasing the first few sentences.
    - The California Energy Commission (CEC) has allocated some funds to zero-emission freight infrastructure through the Energy Infrastructure Incentives for Zero-Emission Commercial Vehicles (EnergIIZE Commercial Vehicles) incentive project. EnergIIZE has provided incentive funds to ……”
    - Use electric vehicle charging stations instead of battery electric vehicle stations.

    - Use hydrogen refueling station instead of hydrogen fuel station and be consistent throughout the report.
- Page 44, 2022-23 Investment Plan Update for the Clean Transportation Program: please use hyperlink or footnote for all references.
- Page 47, Exhibit 17
    - Caption in sentence case, ":" at the end
    - Broken text
- Page 48: references for stuff such as "California Environmental Quality Act" and "Programmatic Environmental Impact Reports" would be useful.
- Part 4: Barriers and solutions: Would it be better to have each **Solution** contained within their **Barrier** headings, like the following, instead of the current format which makes the solution a heading at the same level as the barrier:

4.2 Barrier: Timing and sequencing of corridor station development

Solution: Streamline the clean freight infrastructure development process

- Page 51, Exhibit 18
    - Caption in sentence case
    - Please enlarge legend font size ("Grid readiness could take 2-7+ years in parallel to this process")
- Page 52: "zero-emitting vehicles" - should it be 'zero-emission'?
- Page 52: reference for "Inflation Reduction Act" might be useful.
- Page 53, Exhibit 19
    - Caption in sentence case
    - Please provide legends to indicate what each colors represent.
- Page 58, Exhibit 20: Caption in sentence case
- Page 60, Exhibit 21
    - Caption in sentence case
    - Please use larger font for legends.
- Page 64: please consider providing reference for "PaveM".
- Page 65, Exhibit 22: please state why weight decreases for FCEV Heavy-Duty Short Haul in 2050.
- Page 80, Exhibit 24: please use a larger font size for text on the right.
- Page 85 -86: Tables 2.2.1, 2.1.2& 2.2.3. It seems there is no text that references the tables and no explanations for the different scenarios.
- What's the source of the data and are these light duty stations?
- Page 88: Tables 2.2.1., 2.2.2, & 2.2.3; What do they mean by "Fuel Cell Electric Vehicle charging stations?
- Page 89: "As of July 2023, there are 111 electric charging and hydrogen fueling locations funded through this program." As of October 2023, EnergIIZE has awarded 151 projects for 1,435 EV chargers and 31 hydrogen dispensers.

COALITION FOR CLEAN AIR

October 24th, 2023

Honorable Lee Ann Eager
Chair, California Transportation Commission
1120 N Street, MS 52
Sacramento, CA 95814

Re: Comments on the Draft SB 671 Clean Freight Corridor Efficiency Assessment

Dear Chair Eager,

Thank you for this opportunity to provide feedback on the Draft SB 671 Clean Freight Corridor Efficiency Assessment. The Coalition for Clean Air is grateful to have been given the opportunity to participate in the SB 671 Workgroup Meetings and provide early feedback on the contents of this report. The robust public engagement process organized by the California Transportation Commission helped to ensure that all voices were heard and incorporated into the Draft Assessment. The detailed work that your staff has done to put this together is very important to the future of our state as the report itself details the benefits the implementation of this report will have on public health and climate.

We appreciate the draft assessment's strong focus on ensuring that progress in building zero-emission infrastructure doesn't come at the cost of harming California's communities. In particular, we are strongly supportive of the language to encourage the re-routing of trucks away from near-freight communities and involve environmental and air quality stakeholders in the planning and development process as much as possible. With 72 million people in the U.S. currently living near truck freight routes, it is important that their voices are represented in important decisions that impact their cardiovascular health[1]. We also appreciate the concern about making sure that implementation does not contribute to resident and business displacement.

We support the recommendations in the report to streamline the zero-emission infrastructure permitting process. As the report highlights, implementing this assessment will reduce air pollution by 53 percent by 2040 and potentially avoid 1,720 premature deaths. These strong public health benefits combined with the Governor's order to reach 100 percent zero-emission medium- and heavy-duty vehicles by 2045 show that we cannot afford to wait on

[1] *United States Environmental Protection Agency* (2023) Environmental Justice and Transportation. https://www.epa.gov/mobile-source-pollution/environmental-justice-and-transportation

implementation. For these reasons, we support the recommendation to expedite the charging station permitting process under CEQA and NEPA, though we ask that precautions be taken to ensure that no significant environmental harm is caused by the construction of the charging stations.

We also urge the assessment to ensure there are as few biases as possible in the creation of the initial viable network. The assessment currently estimates that about 800-850 hydrogen fuel cell stations and 475-525 battery electric stations will be needed to ensure that there are enough chargers available to EV owners by 2035. However, according to the California Energy Commission, there are currently over 90,000 electric charging stations and only 115 hydrogen charging stations, with only 13% of those being available for heavy-duty vehicles[2]. While the initial viable network projects there will be a stronger need for hydrogen stations by 2035, the current data shows electric stations significantly outnumbering the number of hydrogen stations. While we understand that the proposed initial viable network projection is meant to be simply an estimate of future demand, we ask that this projection remains unbiased and is often updated to ensure that the viable network projections are as accurate as possible.

Lastly, we understand the limitation of not being able to use the Low Carbon Fuel Standard credits program to fund the construction and operation of zero-emission stations. However, given that the transition to zero-emission is essential to solving our air pollution and climate crises, California needs to make available as many funding opportunities as possible for the construction of heavy-duty zero-emission infrastructure. The Coalition for Clean Air is currently working with the California Air Resources Board to encourage them to create an infrastructure crediting provision for fueling of medium and heavy-duty zero-emission vehicles and we encourage the CTC to continue pushing for it as well.

We would like to extend our thanks once again to the CTC staff for incorporating all stakeholder voices in the development of this assessment. We support the findings made in the SB 671 Clean Freight Corridor Efficiency Assessment and urge for its adoption once the document has been finalized.

Sincerely,

Sofia Rafikova
Policy Advocate

[2] *California Energy Commission* (2023) Electric Vehicle Chargers in California. https://www.energy.ca.gov/data-reports/energy-almanac/zero-emission-vehicle-and-infrastructure-statistics/electric-vehicle

DAIMLER TRUCK
North America

October 26th, 2023

Hannah Walter
Associate Deputy Director
California Transportation Commission

Re: SB 671 Clean Freight Corridor Efficiency Assessment Draft Report

Daimler Truck North America (DTNA) submits the following comments in response to CTC's SB 671 Clean Freight Corridor Efficiency Assessment Draft Report.

DTNA is the largest producer of medium- and heavy-duty (MHD) vehicles in North America. DTNA is fully committed to supporting the emerging zero-emission vehicle (ZEV) market; we expect these technologies to play a significant role in the future of commercial transportation, and know they are a vital contributor to lowering NOx and GHG emissions. DTNA is investing heavily in the development of electric vehicles. We currently offer battery electric school buses, walk-in van chassis (Class 5/6), as well as heavy-duty (Class 8) trucks for sale, and we are preparing for the market introduction of an all-electric medium-duty (Class 6/7) truck. DTNA – in partnership with Portland General Electric (PGE) – is proud to have built the first-of-its-kind public charging island for commercial ZEVs in Portland, Oregon. In addition, DTNA launched a joint venture focused on public charging & refueling (Greenlane) to help in the acceleration of infrastructure that meets the needs of MHD vehicles. Finally, DTNA has an expert eConsulting team dedicated to supporting fleets with all aspects of the ZEV transition, including site design and interfacing with utilities. Therefore, DTNA is uniquely positioned to offer insights into MHD transportation electrification (TE).

DTNA believes the successful transition to ZEV transportation will require a three-part "transformation equation"[1].

Vehicle Technology x Cost Parity x Infrastructure = Successful Transformation

Manufacturers have vehicle technologies available today suitable for a variety of fleet applications. A number of state and federal incentive programs exist to help fleets achieve cost parity. However, the infrastructure factor remains effectively zero, jeopardizing this transformation, the ability of obligated parties to meet CARB regulatory requirements, and the State of California's carbon reduction targets.

DTNA commends CTC staff for preparing this Draft Assessment for the Legislature. However, DTNA is concerned this draft report does not adequately inform the Legislature on several critical topics with enough detail to highlight the urgency and complexity of the issues the Legislature must address to meet the near-term infrastructure milestones set forth in this draft report, and

[1] https://www.youtube.com/watch?v=eY76BzcxeFc

therefore the medium- and heavy-duty vehicle deployments required by CARB's Advanced Clean Truck (ACT) and Advanced Clean Fleets (ACF) regulations. DTNA recommends CTC include additional detail on the following key topic areas in the final report:

- **The current state of California's electric utility distribution grid infrastructure**

  In their recent AB 2127 report[2], the California Energy Commission (CEC) concluded that nearly 13% of Transportation Analysis Zones in California "potentially have EV charging peak loads that exceed the available circuit capacity in 2025", and another 58% have "up to 5MW" of additional load capacity before needing attention. DTNA believes many of the public and private depot sites required on the priority corridors will approach 5MW. For example, the JETSI project at Schneider Transportation alone is a 4.5MW load, indicating a single private depot electrifying a small percentage of its local fleet of trucks will easily consume the existing available grid capacity. The 367 public and private charging stations needed in 2025 per the Balanced Adoption Scenario will vastly exceed the available grid capacity. Even the ~25 stations estimated along priority corridors are likely to exceed the available capacity.

  DTNA includes more detail on forecasted transportation loads on page 7 of these comments.

- **How the needed utility grid infrastructure will be paid for, and built, in a timely manner**

  In Exhibit 16, staff shows an estimated $2-7 million dollars per station for required grid capacity upgrades, currently not included in the total adjustment, totaling up to $175 million by 2025 to support ~25 charging stations along priority corridors, or up to over $2.5 billion statewide to serve the 367 stations in the Balanced Adoption Scenario. Furthermore, CTC acknowledges this assessment does not include a total estimate of the electric grid costs, citing the complexity of forecasting these costs. DTNA is deeply concerned the Agency has not included a detailed cost estimate for these upgrades that must happen within the next year to support this infrastructure deployment. These are significant costs that must be accounted for, and CTC should bring more attention to these costs in this report.

  Furthermore, Staff discusses the timing issues in the Barriers and Solutions section of the report, but does not fully reconcile the stated "current station development timelines range from 6 to 8 or more years" with the just over one year to the 2025 deployment needs, including finding and allocating funding. The mechanism for funding these upgrades is also

[2] https://www.energy.ca.gov/publications/2023/second-assembly-bill-ab-2127-electric-vehicle-charging-infrastructure-assessment

of critical importance and must be determined. Some investor owned utilities in California are not expected to propose their next General Rate Case until 2027 or later, leaving no opportunity along this traditional path for securing the necessary infrastructure upgrades to meet the 2025 milestones.

DTNA Feedback on Part 1: Identifying and defining clean freight corridors

DTNA supports the "Top 6" priority corridors as proposed, and agrees this shortlisting for an initial viable network of charging and refueling stations is prudent. All state, regional, and local agencies should fast track all public and private station builds on these corridors.

CTC should clarify the seemingly conflicting statements in this report, that make the number of necessary stations as part of the initial viable network unclear. Exhibit 11 on page 33 shows 20-25 BEV stations needed on the six priority corridors in 2025 (Balanced Adoption Scenario), but on page 34, staff states "Using a 50-mile maximum station spacing, the initial viable network for battery electric vehicles would require 75-85 charging stations along the "Top 6" freight corridors." This is consistent with the Figure shown on page 5, showing 75-85 BEV charging stations are required in 2025 on the priority corridors. It is unclear how this estimate relates to Exhibit 11.

Based on Exhibit 11, DTNA is concerned that focusing exclusively on these public station estimates along six priority corridors will leave the state's ZEV refueling infrastructure woefully unprepared for the vehicle volumes required by the ACT and ACF regulations, and there is no clear path to achieving the estimated number of stations needed statewide in the early deployment years. DTNA estimates that ACT alone will drive approximately 9,000 ZEVs into operation in California by 2025. Assuming ~25 initial stations, each BEV station would need to recharge over 350 vehicles per day in 2025 if only the priority corridors are served. DTNA urges CTC to publish additional detail around how many vehicles this initial viable network could support for each test year, and make the infrastructure need versus vehicle forecast clear to the Legislature.

DTNA Feedback on Part 2: Defining potential scenarios for zero-emission truck adoption

DTNA is pleased that CTC relied on CARB's projections for the number of zero-emission medium- and heavy-duty trucks. It is critical that all state agencies work from the same vehicle forecast, and DTNA believes CARB is best suited to provide this forecast of ACT and ACF ZEV volumes. However, DTNA encourages CTC to publish far more detail regarding the number of vehicles assumed for each study year, and the percentages that are assumed to be BEV versus FCEV in the three developed scenarios. More transparency around these assumptions will greatly help alignment between all of California's agencies, make clear how the state is progressing toward infrastructure goals to support the regulatory driven truck volumes, and aid in providing feedback on this draft Assessment.

In addition, DTNA recommends CTC publish more detail into the modeling assumptions used to develop the number of BEV charging stations and FCEV stations, including the assumed number

of chargers and their capacities, and the number of FCEV dispensers and their assumed throughput. DTNA believes these figures are critical for understanding the relationship between the infrastructure scenarios developed and the vehicle populations presumed to be served.

DTNA is concerned that the scenarios presented in this Draft Assessment do not appear to align with CEC's recent AB 2127 report, which states "California needs about 157,000 chargers to support 180,000 medium- and heavy-duty ZEVs in 2030". Using the Balanced Adoption scenario shown in this report, and assuming each public charging station has 10 chargers, and each private station has 20 chargers, DTNA calculates CTC's Balanced Adoption Scenario includes only 81,330 chargers in 2040, 10 years later than CEC's much larger forecast. DTNA believes CTC is significantly underestimating the charging needs of California's ZEV fleet, and is deeply concerned CTC and CEC are unaligned on these critical, near-term milestones.

DTNA strongly encourages CTC to rely on the Accelerated BEV scenario, which amounts to 186,200 chargers statewide in 2040, to serve an estimated 519,500 ZEVs driven by the regulatory landscape. Assuming approximately 15% of these vehicles are FCEV, this equates to 2.3 trucks per charger. DTNA believes CTC must publish more detail regarding the assumed charging capacities to be able to determine if these assumptions are reasonable. Furthermore, DTNA recommends CTC rely on the Accelerated BEV scenario as it most closely aligns with CEC's IEPR-AATE3 forecast. It is critical that CTC and CEC are aligned on these vehicle modeling scenarios.

DTNA compares CTC's Accelerated BEV Scenario to DTNA's ACT vehicle forecast below:

CTC Infrastructure Assumptions for Accelerated BEV Scenario (gray in table below):

- 10 chargers per public station
- 20 chargers per depot station
- Proposed charging technologies range 50-500 kW
- **DTNA is referencing previously communicated assumptions but these assumptions are not published in this document*

DTNA Assumptions for Vehicle Projections (blue in table below):

- Projected vehicle volume = Average California new truck registration volume x ACT ZEV %
- 100% ZEV mandate in 2036
- 15% FCEV product mix in population in 2040 (consistent with CARB's BEV/H2 projection)
- ACF volumes that exceed ACT volumes are not included
- Accelerated BEV adoption scenario **must** be used consistent with available product, infrastructure, and market

	2025 Statewide Projections	2040 Statewide Projections
ZEVs in Operation	**9,165**	**519,528**
BEV	9,165	441,559
FCEV	0	77,929
BEV Stations	442	11,134
Chargers	8,340	186,200
H2 Stations	0	159

Based on these values, DTNA believes CTC's Accelerated BEV adoption scenario is adequately forecasting the chargers needed in 2025, but is potentially underestimating the chargers needed by 2040, depending on the EVSE mix assumed in the model.

Based on these figures and the current state of FCEV technologies and market, DTNA believes the Balanced adoption scenario and Accelerated FCEV adoption scenario evaluated by CTC are drastically under-projecting the BEV adoption rates in California and should not be used by the Legislature or other state agencies for any planning exercises.

Furthermore, the EVSE mix in CTC's scenario is maxed out at 500 kW. DTNA believes that most public charging stations will need to be equipped with 10 or more ultra-fast chargers (at over 1000 kW charging speeds), to serve MHD public charging needs. DTNA does not have insight into how CTC scaled the state-wide number of chargers to the 2,000 miles of identified priority corridors, but as DTNA believes the state-wide projections to be too low, we are inclined to believe the charging needs along the priority corridors may be greater than CTC's Accelerated BEV adoption scenario in the later study years.

DTNA Feedback on Part 3: Funding outlook

As discussed on page 2, DTNA is concerned that this funding outlook does not adequately include the grid upgrade costs.

DTNA Feedback on Part 4: Barriers and solutions

Timing and sequencing of corridor station development

DTNA generally concurs with CTC's assessment of the timing challenges and commends the process streamlining and simplification recommended in this report. However, DTNA is concerned that the lack of sufficient utility grid infrastructure is not identified in the Key Barriers discussion,

as any station deployments will heavily rely on grid readiness. As discussed above, DTNA strongly recommends CTC include this issue as a key barrier in this Assessment. Furthermore, DTNA recommends CTC propose specific solutions to the Legislature to encourage utility regulators (PUCs for the IOUs, individual governing boards for the COUs) to approve project budgets for transportation electrification upgrades, such as treating CARB's vehicle forecasts as investment-grade proof of need.

DTNA also agrees with Staff's assessment "There's no way to expedite permitting processes across multiple site locations". There are many authorities having jurisdiction (AHJs) running their own independent processes, making it difficult for fleets to replicate a process in one AHJ for a truck electrification project with another jurisdiction, even in the same county. Local permitting requirements are highly variable, and building and electrical inspectors seem to have broad discretion to determine whether a particular item meets code.

DTNA has also observed that securing Right of Way adds significant time to this process, and recommends CTC add this item to the list of barriers for timing and sequencing of corridor station development on page 48.

Economic viability of ZEV transition for fleet owners

DTNA agrees with CTC's summary of the economic issues concerning fleets, and continues to see very limited demand for ZEV trucks, due to concerns related to infrastructure availability and total cost of ownership parity. In addition to the up front cost of the vehicles and infrastructure and the residual value, fleets are additionally challenged by inflation and the corresponding interest rate increases on purchase costs. The majority of commercial vehicle purchases are financed through equipment loans, lines of credit, and other financing mechanisms. These financing options have become significantly more expensive in recent years due to rising interest rates and will continue to further depress demand for large capital expenditures.

DTNA is concerned the McKinsey Center for Future Mobility cost parity estimates cited by CTC staff may be overly optimistic. ICCT's April 2023 Total Cost of Ownership white paper projects BEV cost parity in California in 2030, but does not predict FCEVs will reach cost parity until after 2040[3]. As projecting cost parity relies on a complex set of future assumptions, DTNA cautions CTC from relying on any one projection. The State may need to be prepared to support fleet owners with the economics of this transition well beyond the 2026-2031 timeframe cited in this draft Assessment.

Furthermore, while DTNA generally agrees with Staff's summary of available programs and recommendations for addressing this barrier, many fleets will be challenged to stay informed of and utilize this smattering of options available through various agencies. Even where fleets are informed and eligible, they may not have the resources to pursue complex funding program

[3] https://theicct.org/wp-content/uploads/2023/04/tco-alt-powertrain-long-haul-trucks-us-apr23.pdf

applications or requirements. CTC should consider adding some recommendations to address navigating these complex options, similar to the permitting streamlining recommendations outlined in this report.

Complex ecosystem of potential stations and stakeholders

DTNA is generally supportive of CTC's assessment of the complexity of this ecosystem, but is skeptical of the "central delivery team" concept if this team isn't provided the authority to push projects through the various state, regional, and local government processes with the highest priority.

DTNA's Transportation Electrification Load Projections

DTNA recommends CTC expand this assessment to include the forecasted transportation load, as CTC's charger capacity assumptions will directly impact the charging loads. In an effort to support CTC in translating vehicle requirements into load projections, DTNA offers the following projections based on our knowledge of zero-emission vehicle products and insights into the commercial vehicle space.

The ACT regulation phases in increasing percentages of Class 2b-8 ZEV sales volumes, beginning January 1, 2024. Based on average annual new truck registrations in California, DTNA believes ZEVs sold under the ACT regulation can be reliably projected, and required capacities calculated. For ACT implementation alone, DTNA estimates California utilities will need to add 8,959 MW of capacity by 2035. Assuming the current distribution grid is at capacity today, the annual capacity increase needed to support ACT ZEV deployment is shown in the table below. Beginning in 2036, all on highway Class 2b-8 vehicles sold in California must be ZEVs. DTNA estimates this will require an additional 2,340 MW of capacity be added per year for 2036 and beyond until the California fleet is fully converted to ZEV. By 2042, this amounts to approximately 25,339 MW.

Annual Capacity Increase Required to Support ACT Required ZEV Deployment in California

Year	New Capacity (MW)
2024	151
2025	198
2026	259
2027	393
2028	552
2029	711
2030	870
2031	987
2032	1,104
2033	1,174
2034	1,244
2035	1,314
2036+	2,340

DTNA has significant concerns regarding the 3,134 MW needed to serve fleet customers in 2024-2030. It is unclear how California's utilities will serve these near-term (1-7 year) demands when capacity increases of this magnitude typically take 10+ years for approvals and construction. For example, the 870 MW capacity increase needed in 2030 requires a construction lead time that would be difficult to fulfill, even if that construction started today.

The Advanced Clean Fleets regulation also takes effect January 1, 2024, affecting large national fleets operating in California, drayage fleets of all sizes, and state and local government fleets. As this regulation offers multiple compliance paths and some phase-in flexibilities, DTNA appreciates that projecting needed capacities year-over-year is more challenging. Simply based on CARB's 2042 final ACF implementation projections of 518,000 vehicles, DTNA applied the same analysis used for ACT and estimates 19,846 MW are required statewide for ACF implementation by 2042. DTNA believes that vehicles sold under ACT will generally be used to satisfy fleet's ACF requirements, and this ACF capacity need is captured within the 25,339 MW required for ACT implementation through 2042.

In addition to DTNA's projections, the International Council on Clean Transportation[4] estimates these demands on a geographic basis:

- 11,196 MWh daily energy consumption statewide from charging in 2030
- Nameplate capacity of chargers on local distribution grid by county in 2030:
    - Los Angeles: 974 MW
    - San Bernardino: 482 MW
    - San Diego: 505 MW
    - Riverside: 379 MW
    - Orange: 348 MW
    - Kern: 229 MW
    - Alameda: 225 MW
    - Santa Clara: 231 MW

DTNA strongly recommends CTC include capacity projections in this report based on the charger mix assumed for both public and private BEV stations.

[4] https://theicct.org/wp-content/uploads/2023/05/infrastructure-deployment-mhdv-may23.pdf

Additional Comments on Miscellaneous Items

- Section 5.5 discusses the potential uses for microgrids. DTNA notes that today, if a depot or public charging hub wants to build a microgrid, they often cannot participate in an IOU's make-ready incentive program. This exclusion runs contrary to the discussion supporting the role of microgrids in MHD charging infrastructure. DTNA is also concerned that Staff lists diesel engines as a possible energy source. Using diesel generators to power BEV trucks is inconsistent with the State's emissions goals, and contrary to the intent of the ACT and ACF regulations.

Summary of Recommendations

DTNA recommends CTC Staff consider the following additions/changes to the Draft Assessment:

- Include the current state of California's electric utility distribution grid infrastructure as a barrier, and outline additional recommendations for reconciling this 6-8 year lead time with the near term study years (2025 and 2030).
- Include a discussion and recommendations for how to pay for and construct this grid infrastructure in a timely manner.
- Clarify the seemingly conflicting statements in this report, that make the number of necessary stations as part of the initial viable network unclear, specifically reconciling Exhibit 11 with the page 34 statement "Using a 50-mile maximum station spacing, the initial viable network for battery electric vehicles would require 75-85 charging stations along the "Top 6" freight corridors", consistent with the Figure shown on page 5.
- Publish a complete list of assumptions related to the number of vehicles assumed for each study year, and the percentages that are assumed to be BEV versus FCEV in the three developed scenarios.
- Publish a complete list of assumptions used to develop the number of BEV charging stations and FCEV stations, including the assumed number of chargers and their capacities, and the number of FCEV dispensers and their assumed throughput.
- Align these projections and recommendations with CEC's recent AB 2127 report and AATE3.
- Include additional references for the cost parity discussion, indicating the State may need to be prepared to support fleet owners with the economics of this transition beyond the 2026-2031 cited in this draft Assessment.
- Consider adding some recommendations to address navigating the complex funding options.
- Further expand on the concept of the "central delivery team" and what kind of authority this team would need to reconcile build projects with these study years.

- Include the total installed charger capacities needed for the scenarios presented.

DTNA thanks CTC for the opportunity to provide feedback on the Draft SB 671 Clean Freight Corridors Assessment and looks forward to continued collaboration to enable widespread transportation electrification.

Sincerely,

Alissa Recker
Engineer, Compliance & Regulatory Affairs

icct

THE INTERNATIONAL COUNCIL ON CLEAN TRANSPORTATION

23 October 2023
California Transportation Commission
1120 N Street MS 52
Sacramento, CA 95814

Dear Kayla Giese,

The International Council on Clean Transportation (ICCT) submits these comments in response to the California Transportation Commission's (CTC) Senate Bill 671 Clean Freight Corridor Efficiency Assessment (the Assessment). This Assessment joins the efforts of other state agencies, including the California Public Utilities Commission's (CPUC) Freight Infrastructure Planning framework, the California Energy Commission's (CEC) Assembly Bill (AB) 2127 Electric Vehicle Charging Infrastructure Assessment, and the CEC 2023 Integrated Energy Policy Report. These timely efforts constitute the planning California agencies need to undertake to support the infrastructure needs of zero-emission medium and heavy-duty vehicles.

As the agency responsible for allocating state and federal funds for eligible refueling and charging infrastructure projects on or along specified transportation corridors, the CTC has an important role to play in fulfilling Governor Newsom's Executive Order (E.O) N-79-20. The E.O established zero-emission sales and operation targets in the state equal to 100 percent zero-emission drayage trucks in 2035 and 100% of all medium- and heavy-duty vehicles by 2045, where feasible. The Assessment offers priority freight corridor candidates, estimates the need for and cost of charging and refueling stations, and recommends policies with the potential to direct investments in new infrastructure.

The Assessment excels in its broad scope but its conclusions with respect to hydrogen are not well supported. ICCT's published projections of hydrogen uptake suggest a far smaller need for hydrogen refueling investment. But since the Assessment does not present detailed support for its assumptions, we do not understand the reasoning behind its projections. With little transparency and high hydrogen uptake projections, we are concerned that hydrogen assumptions in this study lead to unnecessary investments in hydrogen refueling infrastructure that displace more important investments in charging infrastructure. Our comments include references to publicly accessible studies that align with our international research and serve as the basis for improving upon projections of hydrogen uptake.

Our comments are organized into five broad categories: (1) priority freight corridors, (2) technology adoption, (3) charging infrastructure, (4) cost, and (5) barriers and solutions.

Priority Freight Corridors

The Commission's selection criteria for defining priority freight corridors are well justified. This prioritization reflects the geographic heterogeneity of projected charging and refueling needs of zero-emission trucks. The evaluation of diesel truck emissions and near-source exposure impacts can provide the basis for

further prioritizing infrastructure in areas where diesel emissions disproportionately affect low-income communities and communities of color.

The list of Priority Freight Corridors and the further shortlisting of the "Top 6" corridors are consistent with ICCT's own findings from a national near-term medium- and heavy-duty vehicle charging infrastructure assessment.[1] Our view is that infrastructure deployment can achieve early and rapid deployment of zero-emission vehicles by focusing first along 'no regrets' zones along the freight transportation network. Freight corridors are part of this network, which includes ports, warehouses, and industrial areas.

Figure 1 below illustrates priority corridors in the California freight transportation network based on ICCT research. Each road segment is labeled by the quartile of average daily traffic for combination and single-unit trucks based on data from the Federal Highway Administration's Highway Performance Monitoring System. The map shows concentrated truck traffic in the metropolitan areas of the San Francisco Bay, Sacramento, San Diego, and Los Angeles. Five out of the "Top 6" corridors (except for Interstate 40) identified in the Assessment are in the top quartile for annual average daily traffic (shown in red). Most of the 34 Priority Freight Corridors in the Assessment are in the highest two quartiles.

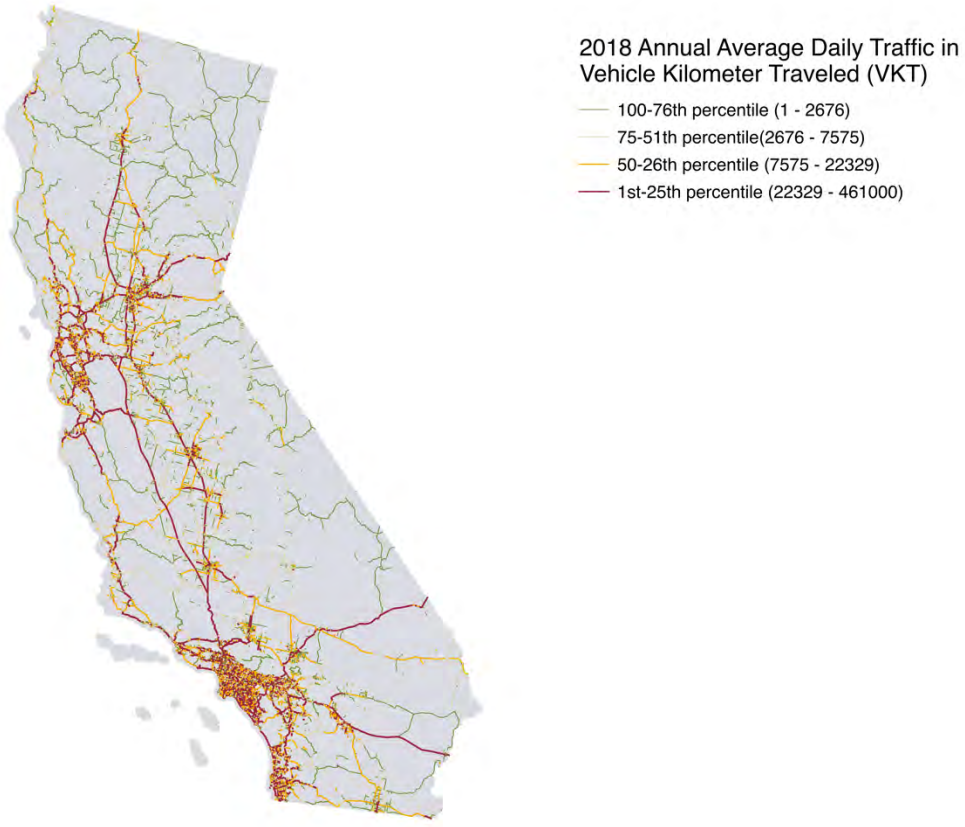

Figure 1 Truck annual average daily traffic distribution in California

The identification of priority freight corridors aligns well with designations and priorities identified by other state agencies. Similar prioritization is reflected in the CEC's Medium-Duty and Heavy-Duty Electric

[1] Ragon, P.-L., Kelly, S., Egerstrom, N., Brito, J., Sharpe, B., Allcock, C., Minjares, R., & Rodríguez, F. (2023). Near-term infrastructure deployment to support zero-emission medium- and heavy-duty vehicles in the United States. International Council on Clean Transportation. https://theicct.org/publication/infrastructure-deployment-mhdv-may23/

Vehicle Infrastructure Load, Operations and Deployment Tool (HEVILOAD) and the designation by CALTRANS of Strategic Interregional Corridors and Alternative Fuel Corridors. Federal, state and local charging and refueling infrastructure planning, construction and energization must occur seamlessly and collaboratively on an ongoing basis to meet CARB regulatory compliance targets. Agreement across state agencies on the locations to prioritize infrastructure investment, construction and energization provides greater market certainty and strengthens the business case for private sector investment.

The Commission may consider taking the additional step of designating first-mover road segments within each key freight corridor. The first waves of zero-emission MHDV adoption will likely originate at ports, then to warehouses near ports, and finally to longer-distance freight transport. Specific designation of priority freight corridor segments provides additional direction to utilities and their customers who must justify investment requests before the public utilities commission.

Technology adoption

The Assessment presents arbitrary scenarios of hydrogen vehicle deployment that weaken the study. In an attempt to identify the range of projected infrastructure needs, the Commission evaluated three scenarios to illustrate uncertainty with respect to adoption of battery-powered vehicles and hydrogen fuel-cell powered vehicles. The scenarios reflect a perspective that accelerated battery-electric vehicle adoption and accelerated fuel cell electric vehicle adoption are equally plausible. While a technology-neutral perspective is justified, the definition of scenarios and the underlying sources to define them reveals an arbitrary bias towards hydrogen. The Commission can strengthen its findings by grounding its technology adoption scenarios on the basis of costs and operational capabilities.

One approach would be to define scenarios based on the relative competitiveness of battery-electric versus hydrogen powered vehicles. This can be done by considering the break-even point of the two technologies given reasonable projections of the levelized cost of charging and of retail hydrogen in California. An illustration of this break-even point for long-haul tractors in 2030 and 2040 at a national level is illustrated in Figure 2 below. A range of scenarios would reflect a degree of uptake of hydrogen-powered vehicles (relative to battery-powered ones) based on their relative affordability.

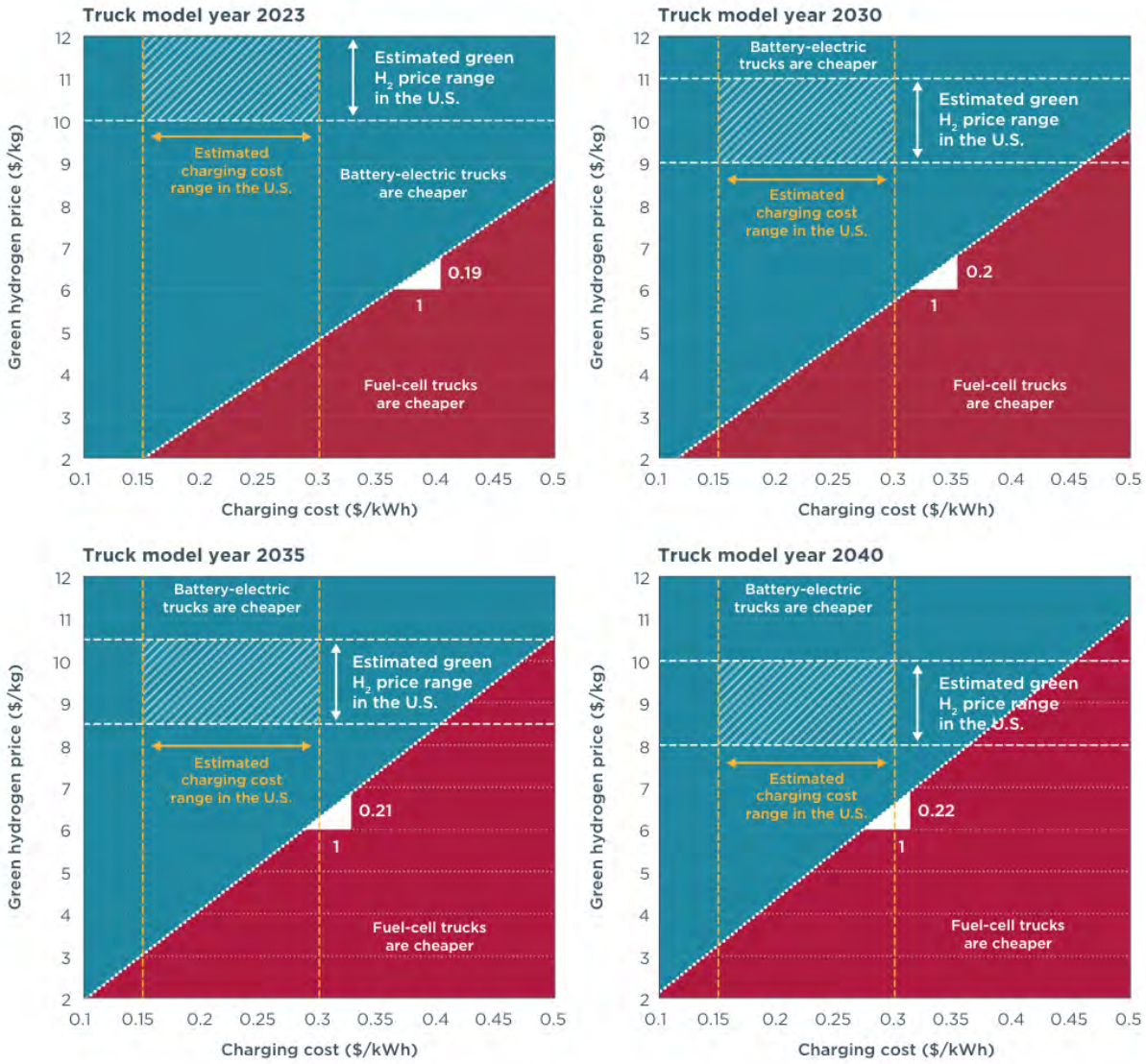

Figure 2. Total cost of ownership parity sensitivity to charging costs and the retail price of green hydrogen across truck model years in the United States. (Basma et al, 2023)

ICCT's March 2023 report includes results of this analysis for long-haul tractors in California.[2] We found no period before 2040 when hydrogen-powered long-haul tractors would reach TCO parity with battery-powered ones. This result can be explained by the doubling of energy efficiency achieved by battery-powered tractors relative to hydrogen tractors, whose operational costs are more sensitive to the price of hydrogen. And it can be explained by a projected retail cost of $9-11 per kg of green hydrogen in 2030, which provides little to no economic case for hydrogen investments when the alternative is lower cost renewable electricity. The Assessment could approach its scenarios differently by assessing the rate of adoption of hydrogen-powered trucks based on a reasonable range in the projected retail price of green hydrogen.

[2] Basma, H., Buysse, C., Zhou, Y., & Rodríguez, F. (2023). *Total cost of ownership of alternative powertrain technologies for Class 8 long-haul trucks in the United States*. The International Council on Clean Transportation. https://theicct.org/publication/tco-alt-powertrain-long-haul-trucks-us-apr23/

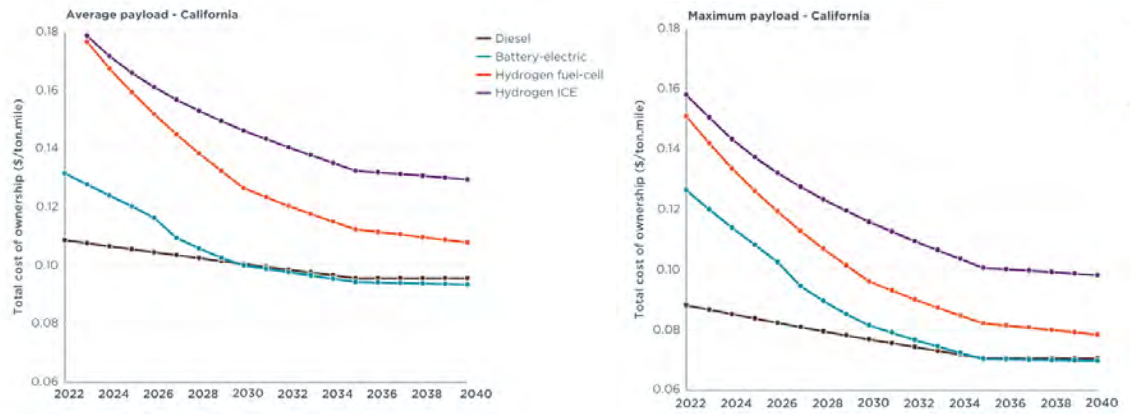

Figure 3. Total cost of ownership of diesel, battery-electric and hydrogen powertrains among long-haul tractors carrying average and maximum payload in California. (Basma et al, 2023)

An ICCT infrastructure needs assessment published in May 2023 evaluated hydrogen infrastructure needs based on its sensitivity to the hydrogen retail fuel price. (See Table 1) The primary infrastructure deployment scenario assumes no hydrogen-powered infrastructure to electrify the national class 4-8 vehicle fleet. However, the study did evaluate how many hydrogen refueling stations would be needed if the retail price of hydrogen were to fall lower than central projections. Results at a national scale are illustrated below.

2040 H_2 price	2040 H_2 long-haul truck sales share	2050 H_2 long-haul truck stock	2050 Nationwide daily hydrogen capacity (metric tons)	2050 Nationwide H_2 stations
$9/kg	0%	0	0	0
$6/kg	9%	85,160	2,826	7,516
$5/kg	30%	246,955	8,195	21,795

Table 1. Hydrogen truck deployment and associated refueling needs under different retail hydrogen price scenarios in the United States. (Ragon et al, 2023)

In addition to economic feasibility, greater consideration of operational feasibility would suggest that a true technology-neutral perspective is likely to include a larger role for battery-powered vehicles. Vehicle logs from the North American Council for Freight Efficiency's (NACFE) Run on Less initiative demonstrate the technical feasibility of battery-powered long-haul tractors such as the Freightliner eCascadia or Tesla Semi traveling 250 miles on a single charge including distances of over 1,000 miles in a day, well in excess of what is typically needed for long-haul freight movement.[3] The fundamental constraint on range is not the weight of the vehicle or its power. The fundamental constraint is access to sufficient charging capacity along the routes these vehicles travel, including chargers capable of 750kW or greater capacity.

The Commission can take additional steps to review and revise its technology adoption scenarios for zero-emission trucks. Specific concerns include the following:

- The Assessment should identify which CEC scenario was used to define the "Accelerated Battery Electric Vehicle" scenario. While this is attributed to the CEC, the CEC has several transportation electrification scenarios and it is not clear which one was used. Their scenarios include a baseline forecast and "additional achievable transportation electrification" (AATE) as a load modifier in the annual Integrated Energy Policy Report. AATE has been adopted by the California ISO and the CPUC for planning purposes.[4] The AATE scenarios have a range of inputs and assumptions which entail different ZET stock numbers and affect subsequent infrastructure modeling. For example, the

[3] https://results-2023.runonless.com/truck/?day=17&depot=pepsico&truck=pepsi_tesla3&units=imperial.
[4] https://efiling.energy.ca.gov/GetDocument.aspx?tn=248735

latest 2022 IEPR AATE 2 projects a battery-electric truck stock of 307,000 in 2035; the AATE 3's projection is 351,000.[5]

- It is not appropriate for the Assessment to treat a CEC scenario as an 'accelerated' battery-electric vehicle scenario. The CEC provides an unbiased and independent outlook that is the basis for utility planning. For the purposes of state agencies like the CPUC and its regulated utilities, the CEC considers AATE3 the scenario that is the most likely to occur. This scenario is not an upper bound forecast. It would be more appropriate for the Assessment to also treat this scenario as the most likely to occur, not an upper bound.
- An 'accelerated' scenario would by definition be one that suggests greater battery-vehicle deployment than AATE3. To develop an accelerated scenario, the Commission may consider a variation on the CEC AATE3 scenario that adopts a pessimistic assumption with regard to the retail price of green hydrogen in 2030 that would lead to a smaller degree of hydrogen vehicle deployment complemented by a larger degree of battery-electric vehicle deployment.
- The use of the McKinsey Center for Future Mobility's Commercial Fleet Electrification Model to define the "Balanced Adoption" scenario is misguided. Neither McKinsey nor the Commission has made available to the public the model inputs, assumptions, or results of the model. The Assessment quotes the McKinsey Center for Future Mobility, who claims battery electric medium-duty trucks will reach total cost of ownership (TCO) parity by 2026 and battery electric heavy-duty trucks will reach TCO parity by 2036; for hydrogen fuel-cell trucks, medium-duty ones reach TCO parity in 2031 and heavy-duty ones in 2030. With insufficient detail publicly available, it is challenging for an independent reviewer to understand how to reproduce these results. Furthermore, the results are inconsistent with results ICCT has published. ICCT projects that the TCO of battery electric long-haul trucks will be lower than diesel equivalents by 2030 in seven U.S. states, including California, while the TCO of hydrogen fuel-cell trucks will not reach parity before 2040.[6] The ICCT study assumes the exclusive use of green hydrogen and availability of megawatt charging by 2027.
- Similarly, the use of projections provided by the Gualco Group to inform the "Accelerated Fuel Cell Electric Vehicle" scenario is inappropriate. This organization publicizes itself as a "California lobbying and consulting firm … [that has] experience with Federal, State, and local policy making and regulatory activities".[7] For this report to earn the public trust and the trust of its partner agencies, the Assessment should avoid using such sources.
- An 'accelerated' fuel cell electric vehicle scenario would by definition be one that suggests greater fuel cell electric-vehicle deployment than AATE3. To develop an accelerated scenario, the Commission may consider a variation on the CEC AATE3 scenario that adopts an optimistic assumption with regard to the retail price of green hydrogen in 2030 that would lead to an even greater degree of hydrogen vehicle deployment.

The Commission can improve its scenarios for zero-emission truck adoption by using publicly accessible data to evaluate a range of technology adoption shaped by sensitivity to the price of hydrogen. More transparency will give the state legislature, members of the public and the trucking industry greater confidence in the Assessment and its recommendations. Due to the lack of visibility of the McKinsey Center for Future Mobility and Gualco Group data sources, we recommend CTC staff remove them from the Assessment. The CEC AATE scenarios are a more appropriate basis to model the effects of optimistic and pessimistic assumptions of the retail price of green hydrogen and their effects on fuel cell electric vehicle adoption.

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[5] https://www.energy.ca.gov/sites/default/files/2022-11/DAWG_Transportation_Energy_Demand_Forecast_2022-11-15_ADA.pdf

[6] Basma et al., (2023)

[7] http://www.gualcogroup.com/about-us/

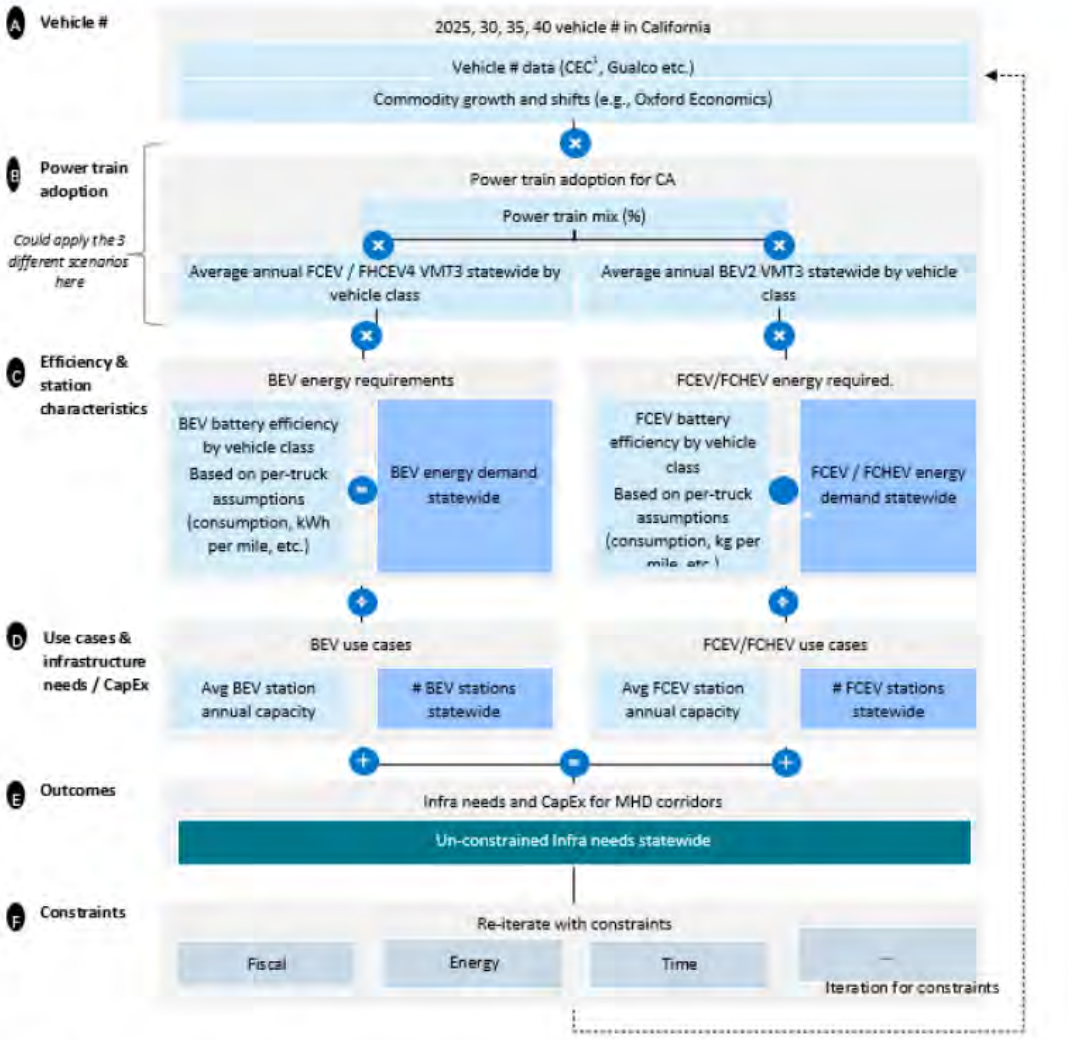
Charging infrastructure assessment

The CTC took a top-down approach to estimate the number of chargers and refueling stations for battery-electric and hydrogen fuel-cell electric trucks, described in Appendices 1.4 and 1.5. While it is a logical approach, we see data gaps and missing links in the execution of this methodology. The Commission has not provided specifications of trucks, charging station or hydrogen refueling station archetypes, such as the energy efficiency of trucks, chargers' rated power, or how charging technologies are assigned to certain vehicle types and use cases. The Commission also did not publish any specific numbers from the McKinsey Center for Future Mobility Commercial Fleet Decarbonization tool it used. Estimating infrastructure needs is highly sensitive to vehicle, charger and refueling station specifications, and related use cases by each vehicle class; it is not clear that the Commission applied that level of detail here.

It is important for the Commission to be transparent about its data and assumptions for the legislature and other readers to understand how its conclusions are drawn. We advise the Commission to publish all data in steps A to C in Figure 2 below (extracted from Exhibit 10 on page 31 of the Assessment) as a technical addendum for further review, comment and possible revision. We also recommend the Commission consider complementary analysis, such as that by ICCT discussed further below, and pursue incorporation of real-world data, including telematics data from vehicle manufacturers and the Electric Power Research Institute's EVs2Scale2030 forthcoming maps on EV charging demand.[8]

[8] https://msites.epri.com/evs2scale2030.

Exhibit 10: Detailed Infrastructure Modelling Logic



Acronyms in the above graphic are spelled out below.
CA = California, BEV = battery electric vehicle, FCEV = fuel cell electric vehicle, CapEx = capital expenditures, Avg = average, VMT = vehicle miles travelled, MHD = medium-duty and heavy-duty, CEC = California Energy Commission, infra = infrastructure

Figure 4 CTC infrastructure modeling flowchart

The Assessment estimates of infrastructure needs are not consistent with ICCT's analysis. In May 2023, ICCT published a study of near-term battery-electric medium- and heavy-duty charging infrastructure needs across the U.S.[9] The ICCT study projects a higher number of chargers compared to the Commission's Accelerated Battery Electric Adoption scenario; the total number of chargers in California in 2025 in the ICCT analysis is 12,500. CTC's Assessment estimates that the number of charging stations under the Accelerated battery electric adoption scenario is 442, which translates to between 4,420 and 8,840 chargers under the Commission's own assumptions. The ICCT study assumes all class 4-8 electric vehicles are battery-powered. But the Assessment does not provide technical information regarding the technology mix of powertrains (discussed in the previous section) or charger specifications that would allow an independent reviewer to understand differences in charger estimates.

[9] Ragon et al., (2023)

The CTC adopted a reasonable initial viable network method to determine the density of charging and refueling infrastructure on the Priority Freight Corridors. The maximum spacing between two charging stations is set at 50 miles, and the maximum spacing between two hydrogen refueling stations is 270 miles. These assumptions closely align with the European Union Alternative Fuel Infrastructure Regulation, which stipulates that a charging station be built every 60km and a hydrogen refueling station be built every 200km along the core corridors of the Trans-European Transport Network by 2030.[10] On the other hand, while some battery-electric trucks may need the 50-mile minimum spacing for charging stations the Commission assumes, the trucks being designed primarily for freight movement today like those identified above from the NACFE Run On Less project have meaningfully larger usable ranges and may require less frequent charging. The Commission can strengthen its case for a 50-mile interval by using data from the EVS2SCALE study to test the sensitivity of fleets to larger distance intervals along key corridors.

Cost

The CTC Assessment quantifies capital costs, including hardware, installation, site readiness, construction, design, and permitting to build publicly available charging stations and hydrogen fueling stations on an initial viable network. The estimates put the scale of investments in perspective and help assess the scale of funding necessary to energize the initial viable network.

CEC found that almost 13% of Transportation Analysis Zones in California may experience peak EV charging loads, which would exceed available circuit capacity as early as 2025.[11] Given this projected grid capacity deficit, we expect upgrades to the electrical grid at and around the key freight corridors to be necessary in the latter half of the decade. This has two implications. First, the Commission may consider highlighting in its report to the state legislature that California utilities need authorization to immediately construct charging infrastructure to fill existing gaps. Second, the Commission may advise the legislature to direct sufficient grants, incentives and loan programs towards grid upgrades that are the most critical to fulfilling the vision laid out in this report and that pose the greatest risk of delay.

Towards this end, the CTC can take steps to evaluate how much grid capacity is available to substations on the initial viable network laid out in the Assessment. CEC's EVSE Deployment and Grid Evaluation (EDGE) tool provides useful information about where grid capacity exists now and where additions are needed due to light and heavy-duty electric vehicle charging loads. It is well-suited to complement the initial viable network analysis.

Barriers and solutions

The CTC's assessment of the main barriers and solutions for zero-emission freight infrastructure are consistent with our understanding of what is needed.

The Commission's concern with the existing timeframe for charging and refueling station development is consistent with our own. The Commission notes that development timelines range from 6 years to more than 8 years on average per station without factoring in possible grid upgrades that can take more than 10 years. This zero-emission freight is also characterized by a complex, multi-stakeholder regulatory structure and market landscape, which the Commission correctly points out as a potential barrier to rapid and equitable deployment of charging and refueling infrastructure. Near-term innovative solutions are available to address these concerns.

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[10] Bernard, M. R. (2023). European Union Alternative Fuel Infrastructure Regulation (AFIR). International Council on Clean Transportation. https://theicct.org/publication/afir-eu-april2023/

[11] https://www.energy.ca.gov/publications/2023/second-assembly-bill-ab-2127-electric-vehicle-charging-infrastructure-assessment

The Commission has proposed several constructive solutions to address the problems. The ICCT echoes these recommendations, especially the call to form a cross-agency central delivery team to lead the coordination of zero-emission freight infrastructure planning and implementation. At the planning phase, this coordination means harmonizing analytical assumptions, methodology and data. Solutions that lead to uniform and coordinating planning will accelerate the delivery of time sensitive infrastructure deployment.

In closing, we thank CTC staff for producing a timely and comprehensive report. We invite staff to contact us with questions about the ICCT analysis referenced in these comments.

Kind regards,

Ray Minjares,
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Managing Director – ICCT San Francisco
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October 24, 2023

Lee Ann Eager, Chair
California Transportation Commission
1120 N Street MS 52
Sacramento, CA 95814

RE: SB 671 Draft Clean Freight Corridor Efficiency Assessment

Dear Chair Eager and Members of the California Transportation Commission:

Los Angeles County Metropolitan Transportation Authority (Metro) applauds the collaborative process led by the California Transportation Commission (CTC) to develop the draft Clean Freight Corridor Efficiency Assessment and Recommended Top Six Priority Freight Corridors.

Since the first working group meeting in February 2022, lead CTC staff members, Hannah Walter and Kayla Giese, demonstrated CTC's commitment to inclusive engagement with stakeholders and conducted a data-backed, defensible process to develop a program that is designed to effectively advance the legislative intent of improving the flow of freight while reducing environmental impacts on communities. Truly, both staff members have been remarkable in terms of mastery of the issues, willingness to listen, and unmatched productivity. They are truly a pleasure to work with.

Metro appreciates CTC's open-minded approach to listening to stakeholders to understand various challenges surrounding the State's goal of advancing alternative fuel corridors, and collaboration to develop solutions that would offer multiple benefits to stakeholders across the board. In particular, Metro appreciates CTC's thoughtfulness and consideration of our request to elevate the I-710 as a freight corridor of national significance. This recognition supports Metro in our efforts to transform I-710 into the zero-emission freight corridor that stakeholders and policymakers at every level are working toward.

It has been a pleasure working with CTC on the SB 671 Assessment and accompanying products. We look forward to continuing our collaborative relationship and furthering the State's zero-emission transportation future.

Sincerely,

James de la Loza

James de la Loza
Chief Planning Officer

cc: Tanisha Taylor, Executive Director, CTC
Matthew Yosgott, Deputy Director, CTC
Hannah Walter, Associate Deputy Director, CTC
Kayla Giese, SB 671 Assessment Coordinator, CTC
Hector De La Torre, Executive Director, Gateway Cities COG
Avital Barnea, Senior Executive Officer, LA Metro
Marissa Hagerman, California Senate Staff
Oscar Cisco, California Senate Staff

METROPOLITAN
TRANSPORTATION
COMMISSION

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415.778.6700
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October 26, 2023

Tanisha Taylor
Executive Director
California Transportation Commission
1120 N Street, MS-52
Sacramento, CA 95814

RE: MTC Comments on the SB671 Clean Freight Corridor Efficiency Assessment

Director Taylor:

Thank you for the opportunity to provide comments on the upcoming SB671 Clean Freight Corridor Efficiency Assessment (Assessment).

The Metropolitan Transportation Commission (MTC) supports the recommendations in the Draft Assessment as they will go a long way toward achieving the state and region's vision for greenhouse gas reduction and air quality improvement. Our region's most recent Regional Transportation Plan/Sustainable Communities Strategy, *Plan Bay Area 2050,* identified the expansion of electric vehicle initiatives as a key strategy in reducing climate emissions. Furthermore, MTC's 2016 *San Francisco Bay Area Goods Movement Plan* emphasized the reduction of environmental and community impacts from goods movement and the promotion of innovative technology strategies to improve the efficiency of the system as two of the region's key goods movement goals. In addition to the planning efforts referenced above, MTC is involved with multiple transportation electrification implementation initiatives including helping our regional transit operators transition to electric vehicle fleets and assisting local agencies to expand their publicly available vehicle charging infrastructure.

We look forward to leveraging this extensive experience when working with the proposed Central Delivery Team on related efforts in the future. If you have any questions, please contact Adam Crenshaw in MTC's Funding Policy and Program Section at (415) 778-6794, or via email at acrenshaw@bayareametro.gov.

Sincerely,

Kenneth Kao
Assistant Director, Funding Policy and Programs

NIKOLA

October 26, 2023

California Transporation Commission
1120 N Street
Sacramento, CA 95814

RE: Draft SB671 Clean Freight Corridor Efficiency Assessment

Nikola Corporation ("Nikola") thanks the California Transportation Commission for the opportunity to provide comment on the draft SB 671 Clean Freight Corridor Efficiency Assessment and looks forward to continuing as part of California's energy transition.

As a leading designer and manufacturer of heavy-duty commercial battery-electric vehicles ("BEV"), hydrogen fuel cell electric vehicles ("FCEV"), and energy infrastructure solutions, Nikola is paving the way as a global leader in zero-emissions transportation. Through a business model that will enable corporate customers to integrate next-generation truck technology and hydrogen fueling infrastructure and maintenance, Nikola and its strategic business partners and suppliers are on a mission to leave the world a better place.

Nikola's mission is to decarbonize the heavy-duty transportation sector. BEVs and FCEVs both have a vital role in the transition to a zero-carbon future. Nikola is among original equipment manufacturers ("OEMs") producing zero-emission vehicles as well as introducing refueling offerings that are available today to help with the market transition to these newer technologies.

Additionally, earlier this year, Nikola formally highlighted its integrated hydrogen solution and introduced "HYLA" its new hydrogen energy brand, which will include an open-access, heavy-duty hydrogen refueling station network to support hydrogen fuel cell trucks from any OEM using industry standard refueling equipment.

Part 1 Identifying and defining clean freight corridors

Nikola supports the 34 identified "Priority Freight Corridors" and the criteria used to evaluate, as well as the identified "Top 6" corridors for initial network development. By targeting key goods movement routes and their connectors, the proposed corridors will address the routes most used by drayage and high priority fleets. It also will address air quality and environmental justice concerns by prioritizing communities most impacted by diesel truck traffic, diesel particulate matter, and other local pollutants.

Part 2 Estimated clean freight infrastructure needs

2.2 Assessing clean freight infrastructure needs

Nikola agrees that the hydrogen fueling network cannot be created by converting current fossil fuel sites or "truck-as-a-service" models alone. Publicly available stations, similar to the existing diesel "cardlock" fueling network, will be critical in supporting fleets without onsite fueling capabilities and the development of over the road goods movement.

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Part 3 Funding Outlook

Nikola believes continuing funding beyond 2025 is essential for continued, rapid expansion of the public fueling and charging networks necessary to fully transition goods movement to zero emission technologies. California has shown the success of state and local climate funding, which will be compounded by federal investments like the Regional Clean Hydrogen Hubs projects.

In the near term, identifying funding lanes for mobile hydrogen fueling equipment would prepare California for new market development, increase resiliency, and enable deployment at mixed-use facilities. Permanent infrastructure is under development in some areas but may take longer to reach other where fleets are ready to transition. This bridge can be spanned by deploying mobile hydrogen fueling assets to support developing markets or fleet demonstration projects. As this equipment does not fall under the CORE Program, CEC or CARB should develop a funding lane to support adoption of clean trucks.

Part 4 Barriers and Solutions

4.3 Solution: Streamline the clean freight infrastructure development process

Nikola looks forward to the progress of the EO N-8-23 Strike Team and supports the development of a central delivery team for ZEV infrastructure.

Nikola supports a Categorical Exemption from CEQA for zero-emission freight charging and hydrogen refueling stations, default permit approval deadlines, and any additional streamlining measures. Other streamlining legislation should include mechanisms to create deadlines and a sense of urgency for local jurisdictions to adopt those measures. Past legislation has provided support but has received pushback in implementation prolonging timelines.

4.5 Solution: Support fleet owners through the transition

Nikola supports new near-term incentive programs that will allow fleets to transition faster and more efficiently. Existing large programs are well utilized and some small programs may not be as visible, a central team to assist fleets navigate the various programs could have further impacts.

Development of the used market and buy-back programs is highly important, not only for drayage. Many fleets purchase used trucks from large fleets and will need assistance.

4.7 Solution: Create a Central Delivery Team

The landscape can be difficult to navigate for many and a structured mechanism for information sharing would support the developing clean freight network. We support the development of a Central Delivery Team to assist fleets, OEMs, station developers, and utilities coordinate efforts with local, regional, and state governments.

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Part 5 Additional Implications

Weight
Offsets to account for heavier ZEVs should be provided along identified corridors to allow full utilization of the vehicles. There are various mechanisms to allow this through a ZEV overweight permit, overweight route identification, and collaboration between station developers, fleets, and government agencies.

It is vital that routes unsafe for overweight vehicles are identified and avoided. Routes suitable for the initial deployment of heavier early vehicles should be utilized to allow fleets to meet their needs with new technologies and achieve compliance with the Advanced Clean Fleets regulation.

Investment and research for roads and bridges to accommodate the transitioning vehicle population of California. Collaboration with states that already allow higher weight limits may inform California policymaking. States adopting zero emission fleet rules will need examples to solve the same problem.

Thank you for your time and consideration.

Sincerely,

Sam Bayless
State Government Affairs Manager
Nikola Corporation
samuel.bayless@nikolamotor.com

From:	Ortiz, Guillermo
To:	Giese, Kayla@CATC; Yosgott, Matthew J@CATC; Walter, Hannah@CATC
Cc:	Sam Wilson; Maurissa Brown; Ruben Aronin; Chelsea Lee
Subject:	ACF Coalition Comment Letter: SB 671 Draft Assessment
Date:	Thursday, October 26, 2023 6:07:43 PM
Attachments:	SB 671 - Draft Assessment- ACF Coalition Comment Letter [Final].pdf

EXTERNAL EMAIL. Links/attachments may not be safe.

Hello Kayla, Matthew, and Hannah,

I'm writing to submit the comments (see attached) of members of the ACF Implementation Coalition regarding the SB 671 Clean Freight Corridor Efficiency Assessment. I would like to express my appreciation to staff for the hard work and time that went into producing the assessment.

Please consider our comment letter as a sincere and constructive contribution to the ongoing discussion on infrastructure that will support the zero-emission vehicle transition. We believe that a collaborative approach, where the voices of the public are heard and respected, is essential for successful and inclusive transportation planning.

We would be happy to meet with you to discuss our comments and to prepare for the CTC's December meeting. We eagerly anticipate the opportunity to work together on shaping the future of transportation infrastructure in California.

Sincerely,
Guillermo

GUILLERMO A. ORTIZ
Clean Vehicles Advocate
Climate & Clean Energy

NATURAL RESOURCES DEFENSE COUNCIL
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October 26, 2023

California Transportation Commission
1120 N Street
Sacramento, CA 95814

RE: Senate Bill (SB) 671: Clean Freight Corridor Efficiency Assessment - Comment Letter

Dear Chair Eager and Transportation Commissioners:

The undersigned organizations provide these comments on the SB 671 Draft Assessment. We acknowledge and appreciate the efforts undertaken by the California Transportation Commission (CTC) in addressing the critical issue of modernizing California's freight transportation system, as outlined in the recent SB 671 Clean Freight Corridors Assessment.

The importance of this assessment cannot be understated, particularly when we consider the substantial impact of the freight sector on the environment, public health, and overall quality of life for Californians. We must reduce emissions generated by diesel fuel combustion, especially for communities situated near major freight corridors and facilities. California must rise to the challenge. Governor Gavin Newsom's Executive Order N-79-20, signed in September 2020, set ambitious targets for decarbonizing the transportation sector, with a specific emphasis on transitioning to zero-emission medium- and heavy-duty vehicles. The approval of the Advanced Clean Fleets regulation by the California Air Resources Board in April 2023 illustrates the state's commitment to meeting these goals.

We support the Clean Freight Corridors Assessment, as mandated by Senate Bill 671, which aims to identify the infrastructure needed to support zero-emission medium and heavy-duty vehicles. The identification of 34 priority freight corridors, with a focus on the "Top 6," is a strategic approach that recognizes the importance of data-driven decision-making and targeted investments. Below, we offer comments to strengthen and improve the recommendations and analysis contained in CTC's draft assessment.

1. **Limited Discussion of Environmental Justice, Equity, and Community Engagement**

We are here, prioritizing zero-emission investments across California, as a direct result of decades of community organizing and power-building. Environmental justice and frontline communities have been calling for an achievable zero-emission future for years to address the disparate health impacts felt by frontline communities. Thanks to their work, we are finally in a moment where the policy and the funding have caught up to those calls to action. However, it remains critical to transition to zero-emission technology in a way that continues to build community power and meaningfully engages communities in decision-making. This begins with recognizing the important role communities have played

to date and establishing concrete equitable processes for early and continuous engagement with directly-impacted communities to co-create solutions.

Unfortunately, the draft assessment does not comprehensively discuss equity considerations or describe a meaningful process for community engagement around the deployment of zero-emission infrastructure. This omission results in several significant gaps in the assessment's recommendations.

First, the engagement process of the SB 671 workgroup was not inclusive or transparent to community-based organizations (CBOs). Appendix 4 on page 100 of the draft includes a list of SB 671 Workgroup Participants. Comparatively, the advocacy list includes few CBOs that serve or are accountable to the local residents of the "Top 6" corridors. The CTC's engagement process has not included or made transparent its intentional outreach to these groups or local communities living in or around the priority corridors. More direct and culturally competent outreach should have been carried out along the "Top 6" corridors, which should have included partnership with community-based organizations that are trusted messengers, in-person meetings in those communities, simultaneous interpretation and translation of materials into all relevant languages, and other community-specific methods of outreach and engagement. Going forward, robust and meaningful community engagement and partnership with CBOs must occur.

Second, the assessment must include robust recommendations about how to prioritize community engagement in the deployment of zero-emission infrastructure.[1] One key example of where this is missing is in the sections discussing the coordination necessary to implement its recommendations where it notably leaves out fenceline communities as equally important stakeholders alongside "local permitting agencies, utility companies, Regional Transportation Planning Agencies and Metropolitan Planning Organizations, ports, the California Public Utilities Commission, the California Energy Commission, private entities like start-up companies, and established corporations like beneficial cargo owners and fleets." (pp. 5-6). This transition will have the largest impact on those frontline communities closest to the corridors since they will be enduring truck traffic and most vulnerable to impacts, such as any potential increase in energy rates. As such, their input must be actively sought and incorporated into decision-making. One important way this input could be gathered and incorporated is by requiring that the central delivery team include public health experts and community-based organizations representing the "Top 6" corridors. Community engagement should not be optional or an afterthought after the major decisions have already been made.

Third, engagement can only happen where trust exists. As the CTC acknowledges in its Racial Equity Statement, the policy decisions made by transportation agencies in California have caused deep harm to many communities of color, low-income communities

1 There is growing evidence indicating that improved and earlier public engagement can improve a project's likelihood of success and address points of conflict earlier. See, e.g., Lawrence Susskind, et al., Sources of opposition to renewable energy projects in the United States (2022) 165 Energy Policy 112922, available at https://www.sciencedirect.com/science/article/pii/S0301421522001471.

and other marginalized communities. The CTC in that statement made a commitment to "build and strengthen relationships with community-based organizations, non-profits, advocacy organizations, and other equity experts and practitioners." Those relationships must be non-transactional and built on trust earned by CTC acting in alignment with its statements and other commitments. Without that trust, communities have no reason to believe that their time and expertise will be respected and taken seriously by agencies.

a. Example of co-creation with impacted communities: LACI 710 Blueprint

The site selection of zero-emission infrastructure must be informed by community input, not only because it is the equitable thing to do, but because it results in better projects. The LACI collaboration with the Coalition for Environmental Health & Justice (CEHAJ) on the 710 Blueprint is an example of community knowledge and expertise being leveraged to produce more robust and ground-truthed recommendations. CEHAJ (which includes the environmental justice, base-building organizations of East Yard Communities for Environmental Justice, Communities for a Better Environment, Long Beach Alliance for Children with Asthma, and Long Beach Residents Empowered, among other coalition members) worked with community members along the I-710 freeway corridor to gather and share input on the priority depot site selection process, which provided the project team with a richer understanding of high-traffic and high pollution areas near industrial areas. CEHAJ's priority considerations included:

- Focus on improving community health through lessening emissions from heavy and medium duty vehicles;
- Avoiding inducing traffic in disproportionately impacted areas, such as near residential areas or sensitive receptors such as schools, senior centers, hospitals, supportive housing, etc.;
- Improving air quality in areas with significant air pollution from goods movement;
- Avoiding safety risks to surrounding communities; and
- Prioritizing opportunities for small trucking businesses with fewer resources to invest in zero-emission infrastructure.

CEHAJ ultimately selected 16 initial sites to prioritize for truck charging infrastructure deployments based on technical information compiled by LACI, such as a GIS map that displayed "hotspots" for fast- and slow-charging sites based on grid capacity and truck traffic maps. CEHAJ held inter-regional, intergenerational convenings to explain and discuss the GIS map with community members from across the I-710 corridor. CEHAJ worked to create accessible discussion spaces using visual tools where community members could break down technical concepts and jargon such as slow and fast charging and grid capacity. However, this was not a result of a single conversation, but rather continued back-and-forth over several months. Through continued discussions, community members steadily wielded their expanded technical knowledge alongside their existing expertise and lived experiences about their neighborhoods to identify local areas that could be a good fit for zero-emission truck depots.

CEHAJ's site selection was also informed by over 20 years of community organizing to prevent the expansion of the I-710 South freight corridor. Many CEHAJ community members have been active around transportation issues for a long time and remain engaged in the stakeholder process to develop new investments along the I-710. This highlights the importance of supporting the efforts of environmental justice and frontline organizations to build and shift power, so that there are more opportunities for communities to take part in decisions about what happens in their neighborhoods. The work to build authentic relationships and trust is time-intensive and should be factored into any timelines and not short-changed.

Once CEHAJ and LACI generated the list of 16 sites, LACI and bp pulse conducted outreach to property owners and managers to share information and gauge interest. Following this outreach, they identified 4 site candidates and set up site visits. CEHAJ also participated in site visits and community members were able to learn more about the process for developing these sites into zero-emission truck charging depots.

The success of this collaboration was a result of LACI bringing environmental justice partners in early, not just to share information or inform them of the project but to substantively engage with their expertise to inform better outcomes. This is an example of how to work toward a just transition in an equitable and community-centered way. We would like the CTC to emulate this community-centered approach to zero-emission infrastructure siting and are happy to support the Commission in this endeavor.

b. <u>The omission of specific recommendations around community engagement, equity, and environmental justice falls short of CTC's commitments to equity</u>

The CTC's Racial Equity Statement articulates clearly why agencies such as the CTC must understand the equity implications of their policy recommendations:

> *While infrastructure improvements were being planned, designed, and constructed, Black, Indigenous, and other people of color were disenfranchised, lacked voting protections, and were underrepresented in government decision-making. New highways were frequently constructed through predominately Black, Latino, Asian, and low-income neighborhoods to meet the needs of primarily white suburban commuters, and through tribal lands. Racist policies and decisions also influenced the siting of other types of transportation infrastructure, such as commuter railways, and the delivery of transit services. The results of racial segregation and disinvestment of transportation funds in communities of color are still visible in cities today*.

The evidence of discriminatory and inequitable policy-making is evident in the history of freeway construction, but has also been true in industrial and transportation development. Shortchanging equity and environmental justice risks repeating the mistakes of the past

and continuing to cause harm and disproportionately burden communities of color. As an assessment that will inform how significant amounts of infrastructure investments are spent, these recommendations must be grounded in equity.

The CTC has acknowledged the importance of equity in how it allocates SB 1 funding and has developed questions for project sponsors about how they are considering equity:

- Was outreach conducted with disadvantaged or historically impacted and marginalized groups, including [Latinos/e,] Black, Indigenous, and other people of color, and people with low incomes, within the project study area and how was that input incorporated into the project?
- How has your agency developed the project scope through demonstrated partnership, engagement, and collaboration with the state's most disadvantaged or historically impacted and marginalized communities within the project study area?
- How did the project sponsor assess whether the project would result in any disparate impacts on the basis of race, color, socioeconomic status, gender, sexuality, or national origin? If disparate impacts were identified, were additional strategies that would have a less discriminatory impact considered and included in the project?

These types of questions should also guide the CTC's own work, including this assessment. Just as project sponsors are expected to build in the time to conduct authentic outreach and develop project scopes through a demonstrated partnership with directly impacted communities, so must the Commission.

2. Anti-displacement Recommendations are Too Vague

The development of anti-displacement strategies was part of the earliest form of SB 671, in recognition of the significant role highway and transportation development has played in the direct and indirect displacement of communities, especially communities of color and low-income communities. As a result, the final bill contained a clear requirement for the Commission to "identify … [m]ethods to avoid displacement of residents and businesses on the freight corridor when considering projects that achieve the goals of this assessment." As written, the draft assessment fails to meet this statutory requirement.

The draft lacks detail on the anti-displacement strategies that should be implemented to safeguard community cohesion. Instead, the assessment devotes a single page to a section that describes anti-displacement materials developed by other agencies and academic institutions, and then largely shifts the responsibility for identifying specific strategies regarding the installation of zero-emission infrastructure to a California State Transportation Agency (CalSTA) housing and transportation coordination work group subcommittee. While the ongoing efforts by state transportation agencies to coordinate on housing and transportation issues and develop relevant guidance remains important, this does not negate the Commission's obligation to reflect on what anti-displacement

strategies should be employed in the specific context of zero-emission infrastructure deployment. More robust outreach and engagement with directly-impacted communities along the priority corridors and coordination with community-based housing justice and tenants' rights organizations could have yielded more insights into what specific risks exist along these corridors and how zero-emission infrastructure could exacerbate or contribute to displacement. The CTC must partner with relevant housing justice and tenants' rights CBOs to ensure that anti-displacement recommendations are both concrete and robust.

Considering the draft's cursory review of anti-displacement strategies, the section's closing recommendation is especially disappointing. The section states that the central delivery team "could" engage with local equity leaders, environmental justice organizations, and community advocacy groups to obtain their insights and use zero-emission infrastructure siting to move truck traffic away from communities "where possible."

- First, the assessment should take one step further and recommend that the central delivery team coordinate with the CalSTA Anti-Displacement sub-committee and the interagency Equity Advisory Committee to build from their expertise and identify specific ways to support anti-displacement strategies across the priority corridors.
- Second, the assessment should recommend that the central delivery team direct the Regional Transportation Planning Agencies and Metropolitan Planning Agencies to create an anti-displacement and community benefits plan aligned with the CARB AB 617 Community Emissions Reduction Plans that already exist and the CalSTA Anti-Displacement Subcommittee Workplan when it is finalized.
- Finally, the assessment must contain more specific recommendations for engagement with environmental justice communities along the priority corridor, including on displacement impacts and localized anti-displacement policies. This will require a flexible and customizable approach that can reflect the varying perspectives and impacts of the build-out of zero-emission infrastructure in different communities.

As a reminder, AB 686 (2019), created a state mandate requiring all public agencies and jurisdictions to affirmatively further fair housing, which means "taking meaningful actions, in addition to combating discrimination, that overcome patterns of segregation and foster inclusive communities free from barriers that restrict access to opportunity, replacing segregated living patterns with truly integrated and balanced living patterns" and this includes strong anti-displacement measures. See AFFH Guidelines, pp.14.

3. **Address the real barriers and inefficiencies to zero-emission deployment, rather than weaken a powerful community tool for public input like the California Environmental Quality Act (CEQA) and the National Environmental Policy Act (NEPA)**

CEQA and NEPA are not the primary barriers to the deployment of zero-emission technology, including truck charging stations. There are multiple permitting processes required to plan, design, site, and develop BEV truck charging stations that create delays. In California, electric vehicle charging station permit applications may be administratively reviewed for compliance with building, electric, accessibility, and fire safety regulations. These permit applications may also undergo safety, structural, and engineering review, based on the processes and organizational structure of the local jurisdiction reviewing the proposed project. Proposed projects may also require permits or approvals from state or federal agencies, such as Coastal Development Permits for charging stations located in the coastal zone.

The lack of centralized planning and coordination among regulatory agencies and utilities around issues such as grid capacity, energy distribution, and interconnection of renewable energy projects also contributes to delays in the development of BEV truck charging stations. The draft assessment appropriately recommends addressing some of these other barriers, but the final version should strike a balance between thorough environmental review and community consultation under CEQA with the need to accelerate the deployment of ZEV infrastructure. Community engagement cannot be sidelined, or else we risk replicating historic injustices.

Our organizations have a vision for California's frontline communities to have equitable access to clean energy, healthy jobs, and safe breathable air. We must balance the need to quickly transition from fossil fuels—and toxic diesel fuel in particular—with environmental and community protections that prevent and minimize impacts such as adverse health harms on adjacent communities, increased cumulative impacts, displacement and disruption of community cohesion, habitat preservation, and endangered and sensitive species impacts. It is critical that we center equity and community health in the deployment of zero-emission technology to avoid repeating the mistakes of 20th-century highway and energy planning policies that sacrificed low-income communities and communities of color while polluting our natural environment.

CEQA and NEPA are valuable tools for frontline and environmental justice communities to raise concerns and advocate for health and community mitigation measures. In fact, environmental review can help ensure that BEV stations are utilizing mitigation measures to minimize their environmental impact. Where significant impacts have been identified, those impacts must be properly mitigated to the maximum extent feasible. For example, a required mitigation measure may prohibit the installation of fossil-fueled peaker generators onsite or elsewhere to improve efficiency and reduce harmful emissions, as has been done with other large charging stations in the state.

In addition, CEQA and NEPA review provides a vehicle to analyze the cumulative impacts of a proposed project within the broader context of other existing and planned environmental impacts on a community. Robust environmental review empowers communities to analyze how proposed charging station projects will interact with existing energy infrastructure impacts, and whether the result would worsen local air quality,

increase vehicle miles traveled through already congested corridors, or increase total greenhouse gas emissions.

Early community engagement will avoid project delays, identify and avoid potential harms, and help ensure that charging infrastructure is developed in an equitable manner. CEQA and NEPA facilitate community consultation, which will result in better projects informed by the lived experiences and expertise of residents. Collaborative efforts could even result in faster environmental review, particularly if the process is developed thoughtfully and adequately resourced, because issues that may otherwise be litigated can be resolved through the public participation process.[2]

4. Need to Align Funding Priorities to Support MHDV Charging Infrastructure

The assessment rightly concludes that the number of charging stations and other infrastructure must be a priority to reach the State's 2025 and 2035 benchmarks for zero-emissions truck and fleet deployment. We agree. A network that is dense enough to support widescale fleet deployment is critical to achieving the State's goals. To achieve this, funding priorities across all state agencies must be aligned to ensure that heavy and medium-duty trucks have the support needed to materialize the dense infrastructure along the "Top 6" corridors.

The assessment must reference the State's strategy for investing in charging infrastructure with funding from the National Electric Vehicle Infrastructure (NEVI) Formula Program, established by the Biden Administration's Bipartisan Infrastructure Law. This funding offers the State an opportunity to support the interconnected network of public charging that will increase access and reliability for zero-emissions fleet deployments in the coming years—but only if state agencies are aligned to focus on supporting charging for Class 8 trucks and other heavy-duty vehicles during these early years of transition.

Unfortunately, not all state agencies are aligned. CTC's sister agencies, the California State Transportation Agency (CalSTA) and California Department of Transportation (Caltrans) have determined that the program's focus would be light-duty vehicle infrastructure in the early years, leaving medium and heavy-duty vehicle infrastructure for later years. Though CalSTA and Caltrans appropriately focused on the infrastructure necessary to support medium- and heavy-duty vehicles in their recent application for a Charging and Fueling Infrastructure Grant, they should consider whether some amount of focus on larger vehicles is also appropriate in the near-term for NEVI plans.

Unfortunately, an inconsistent approach will likely miss an opportunity to fully support the ambitious goals proposed in the California Air Resources Board (CARB) Advanced Clean Fleets Regulation. To meet the rule's standards, all new trucks entering the State's

2 See John C. Ruple, et al, Evidence-Based Recommendations for Improving National Environmental Policy Act Implementation, 47 Columbia Journal of Environmental Law 273, 338-340, available at https://journals.library.columbia.edu/index.php/cjel/article/view/9479.

Drayage Truck Registry must be zero-emissions starting as early as January 2024. With a shortage of planned public chargers to support battery-electric truck deployment, the capacity to meet the State's mandate will be challenging.

To meet these challenges, California must prioritize investments in heavy-duty, public charging infrastructure. Other funding opportunities, like the Port Infrastructure Development Program (PIDP), are unlikely to offer the needed capacity for large-scale heavy-duty truck charging infrastructure development. Many of these programs will likely be oversubscribed and include specific requirements that will make large-scale utilization unrealistic. Moreover, unlike NEVI Formula funding, private entities are ineligible for programs like PIDP.

Notably, heavy-duty vehicles contribute a more significant percentage of NOx emissions than light-duty vehicles in the State, especially in non-attainment areas like the South Coast Air Basin and the Central Valley. The areas hardest hit by vehicle emissions and subject to disproportionately worse public health outcomes are disadvantaged communities and communities of color across the State. Thus, prioritizing the heavy-duty infrastructure needed to address these disparities and aligning funding opportunities would help support the State's environmental justice goals.

We recommend that CTC's assessment examine the ways that the intra-departmental funding priorities can realign to support the more rapid deployment of charging infrastructure more adequately for Class 8 battery-electric trucks —with an emphasis on fleets like drayage that will deploy in the busiest and most polluted freight corridors across the State. Furthermore, CTC should leverage its Trade Corridor Enhancement Program (TCEP) to fund electrification infrastructure. TCEP funds about $1 billion in projects every two years, often funding highway capacity expansions along freight corridors. Aligning TCEP with the state's climate and electrification goals can provide support for the infrastructure needed to accelerate the transition to ZEVs.

5. Assessment's Approach to Hydrogen

We appreciate CTC staff's detailed examination of capital expenditures and fueling infrastructure around heavy-duty fuel cell electric vehicles (HD FCEVs). Staff correctly identified that, "limited data exists about the life-cycle costs of zero-emission trucks and it will take a few years to build a body of evidence that can support estimates well." However, given the limitations and variations in the literature, we believe that the results and recommendations in the areas of the Assessment focusing on HD FCEVs could be improved by considering additional sources of information when anticipating the demand for hydrogen fueling stations. This is a critical piece to consider as the climate and air quality benefits of HD FCEV deployment could be negated in part by impacts from hydrogen fuel production on fenceline communities and the development of natural areas and sensitive habitats from upstream energy demand.

Furthermore, we strongly recommend that consideration of hydrogen be limited to hydrogen that is produced from zero-emission technologies and feedstocks. Specifically, hydrogen should only be produced by electrolysis using renewable resources (e.g. wind and solar) to prevent the use of fossil-fuel based alternative production methods.

Additionally, we would appreciate the staff's consideration of the potential for hydrogen leakage in the Assessment. Hydrogen itself is a greenhouse gas with both short- and mid-term warming potential. Given that recent research has shown a leak rate during hydrogen fueling of between 2 and 10 percent, we recommend this be considered in the final Assessment.[3]

In conversations with our organizations, staff indicated that the assumptions around FCEV costs and fueling infrastructure were largely guided by proprietary data from the McKinsey Center for Future Mobility. Despite not having access to this underlying data, the results in the Assessment suggest that the McKinsey data are quite bullish on the adoption of FCEVs for commercial purposes, particularly long-haul tractor trucks. Other state agencies have made similar assumptions about FCEV adoption, including in CARB's supporting documents for the Advanced Clean Fleets Rule.[4] However, the larger body of research varies significantly in assumptions around FCEV costs and adoption – the two factors most likely to influence the demand for hydrogen fueling stations. We recommend that the Assessment better account for the variation in the literature.

The Assessment states in Section 4.4 that CTC staff assume long-haul tractor FCEVs will achieve total-cost parity with diesel models in 2030. This estimation, which is likely heavily influenced by forecasted hydrogen fuel costs, appears to be out of step with other studies.[5] For example, a 2023 study by the International Council on Clean Transportation (ICCT) suggests that long-haul tractor FCEVs will not reach upfront cost parity with diesel models before 2035 and the market price for hydrogen fuel will remain largely flat from today through 2035.[6] This study also suggested that FCEVs would comprise less than one percent of total long-haul tractor sales in 2035.[7]

Although we are unable to verify the hydrogen fuel cost assumptions underlying the Assessment, we recommend that staff compare those in the McKinsey model and current at-the-pump hydrogen prices. While a recent ICCT study suggested that green hydrogen fuel prices should be between $3.00/kg and $6.50/kg by 2030 for FCEVs to compete

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3 Matteo et al. "Hydrogen losses in fueling station operation." Journal of Cleaner Production. March 2020. Available at https://www.sciencedirect.com/science/article/abs/pii/S0959652619341368?via%3Dihub

4 See California Air Resources Board, Appendix G - Total Cost of Ownership Discussion Document, Advanced Clean Fleets Regulation, available at https://ww2.arb.ca.gov/sites/default/files/barcu/regact/2022/acf22/appg.pdf ; California Air Resources Board, Final Statement of Reasons, available at https://ww2.arb.ca.gov/sites/default/files/barcu/regact/2022/acf22/ac/acffsor.pdf

5 See Burnham et al. Comprehensive Total Cost of Ownership Quantification for Vehicles with Different Size Classes and Powertrains. Argonne National Laboratory. April 2021. Available at https://publications.anl.gov/anlpubs/2021/05/167399.pdf

6 See Slowik et al. Analyzing the Impact of the Inflation Reduction Act on Electric Vehicle Uptake in the United States. The International Council on Clean Transportation. January 2023. Available at https://theicct.org/wp-content/uploads/2023/01/ira-impact-evs-us-jan23.pdf

7 See Table A3 of Ibid.

economically even with BEVs, recent media reports have shown that hydrogen fuel prices have recently exceeded $35/kg at the pump.[8]

Conclusion

Given the critical need to accelerate the ZEV transition, the recommendations and findings in the SB 671 Clean Freight Corridors Assessment must receive the necessary attention and funding to become a reality, ensuring a cleaner, healthier, and more sustainable future for all Californians.

Thank you for your time and attention. We look forward to working with the Commission to ensure a successful ZEV transition and the rollout of infrastructure in a manner that is firmly rooted in principles of environmental justice, community engagement, and equity.

Sincerely,

Andrea Marpillero-Colomina
Sustainable Communities Program Director
GreenLatinos

Marven Norman
Policy Coordinator
Center for Community Action and Environmental Justice

Fernando Gaytan
Senior Attorney
Earthjustice

Larissa Koehler
Director, Vehicle Electrification and Senior Attorney
Environmental Defense Fund

Kevin D Hamilton
Executive Director
Central California Asthma Collaborative

8 See Collins, Leah. “It is now almost 14 times more expensive to drive a Toyota hydrogen car in California than a comparable Tesla EV.” Hydrogen Insight. September 2023. Available at https://www.hydrogeninsight.com/transport/analysis-it-is-now-almost-14-times-more-expensive-to-drive-a-toyota-hydrogen-car-in-california-than-a-comparable-tesla-ev/2-1-1519315

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Air Quality Advocate
Environmental Health Coalition

From: Alejandra Mier y Teran
To: Giese, Kayla@CATC
Subject: Re: SB 671 Draft Assessment- Open for Public Comment
Date: Tuesday, October 3, 2023 11:11:37 AM
Attachments: PastedGraphic-1.tiff

Good morning Kayla,
I plan tor read this carefully and maybe provide additional comments but for now, here are my comments...
1) Thank you for the opportunity to comment. I appreciate that Otay is included in the I-5 Corridor. My concern is that all the introductory maps are not clear that Otay is included and for those that just glance at the report, I don't think it will be clear. If there is a way to include Otay in all the maps, I think that would be very beneficial or our community. Marketing is everything.

2) After meeting with a company that does trucks as a service, I do think this could help for the border area, if some of the rules on truck as a service are changed. I am not the one to suggest what those changes are but maybe wording like consider special rules for the border area when approaching trucks as a service so it is a viable program for those communities.

We are trying to figure out that those changes would be but don't know yet.

> Good Morning SB 671 Workgroup,
>
> The draft Senate Bill 671 Clean Freight Corridor Efficiency Assessment is available for your review and comment on the Commission's SB 671 here.
>
> Please send comments to me at kayla.giese@catc.ca.gov ***by Thursday, October 26th***.
>
> Thank you for all of your input into this draft throughout this process!
>
> *Kayla Giese*
> Staff Services Manager
> SB 671 | TCEP | SB 1
> California Transportation Commission
> Cell: 916.281.6109
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October 25, 2023

Ms. Tanisha Taylor
Executive Director
California Transportation Commission
1120 N Street MS-52
Sacramento, CA 95814

RE: Comment on SB 671 Clean Freight Corridor Efficiency Assessment

Dear Ms. Taylor:

We have reviewed the Draft of Senate Bill 671 Clean Freight Corridor Efficiency Assessment and would like to provide comments regarding the Port of Hueneme.

SB 671 directs the Commission to develop an assessment to identify freight corridors and segments and the infrastructure needed to support the transition to zero-emission medium- and heavy-duty vehicles in California. Access to the Port of Hueneme is not included in the "Top 6" corridors (pg. 12), although it is included on the map of all corridors (pg. 11). While we acknowledge truck traffic is heavier in other corridors, Route 101 continues to be an important corridor for truck traffic entering and exiting the Port of Hueneme and for the state.

Route 101 and the associated Port of Hueneme access roads support the fourth largest commercial Port in California, a vital link for international trade. It is the only deep-water port between Los Angeles and San Francisco, and a hub for the import and export of goods grown, built, and imported into Ventura County and distributed to the western United States and southwestern Canada. The Port is a joint-use port with Naval Base Ventura County – Port Hueneme and is the only military deep-water port between San Diego and Seattle. Top imports to the Port are passenger vehicles, commercial vehicles, bananas, avocados and pineapples. Top exports are passenger vehicles, clothing accessories, commercial vehicles, motor vehicle parts and potatoes.

Recently, the State Transportation Agency recognized the critical nature of this port by awarding $94.8 million of Ports Freight Improvement Program funds for improvements to the infrastructure of the Port and the associated access corridors.

For these reasons, we urge the Commission to continue the State's recognition of the importance of the goods movement corridor accessing the Port of Hueneme via Route 101, despite the lower volumes relative to some of the state's interstate highways.

Sincerely,

Kristin Decas
CEO/Port Director
The Port of Hueneme

Martin Erickson
Executive Director
Ventura County Transportation Commission

cc. Kayla Giese

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October 26, 2023

Tanisha Taylor, Executive Director
California Transportation Commission
1120 N Street, MS 52
Sacramento, CA 95814

Dear Ms. Taylor,

RE: Draft Senate Bill 671 Clean Freight Corridor Efficiency Assessment

On behalf of The San Diego Association of Governments (SANDAG), thank you for the opportunity to comment on the Draft Senate Bill 671 Clean Freight Corridor Efficiency Assessment. SANDAG staff have been actively participating in the Senate Bill 671 workgroup since it began meeting in December 2021. Throughout this time, California Transportation Commission staff have been incredibly receptive and responsive to SANDAG feedback. We are pleased to see that the issues and recommendations that we suggested are addressed in the Draft Assessment.

The California-Baja California border region is a nationally significant freight gateway. In 2021, the region's land ports of entry handled 1.4 million northbound truck trips and $71.8 billion worth of goods, with the Otay Mesa Port of Entry being the second-busiest truck crossing along the U.S.–Mexico border. Transitioning these truck fleets to zero emissions technology is a necessary but challenging task because of incongruent state and federal regulations, insufficient coordination with Mexico to deploy consistent zero-emission infrastructure on both sides of the border, limited ability to access incentive funding for vehicles and charging infrastructure, and difficulty ensuring effective outreach and awareness. If barriers are not addressed, companies may seek shipping routes that bypass California. We recognize a need to proactively address these challenges to ensure that our region can remain a competitive market for business investment, provide locally needed goods and services, and contribute to the state and national economy.

The Draft Assessment describes the unique funding and policy challenges for commercial fleets, including those operating on both sides of the border. The extensive list of potential strategies to overcome these obstacles will serve as a valuable resource to the state legislature and public agencies throughout the state. As a planning and implementation agency that works closely with public and private stakeholders, SANDAG is well positioned to assist in facilitating the transition of commercial vehicles to zero-emissions technology. This will provide tremendous benefits for vulnerable communities most impacted by air pollution,

reduce the emission of greenhouse gases, and support the continuity of goods movement within and beyond the San Diego region. The strategies described in the Draft Assessment will require resources to effectively implement. SANDAG urges the state legislature to consider the importance of creating funding opportunities to advance these needs.

In the attached document, we have provided a full list of our comments on the Draft Assessment.

We appreciate your partnership and look forward to continuing this conversation. Please contact me if you have any questions or require additional information.

Sincerely,

Antoinette Meier (Oct 27, 2023 08:32 PDT)

Antoinette Meier
Senior Director of Regional Planning

SANDAG Comments on SB 671 Draft Assessment

Chapter/Appendix Section	Page Number (PDF)	Heading	Staff Name	Comment
Exhibit 16	45	Exhibit 16	MROD	The estimated breakdown does not specify the number of chargers and specs of the station. Please add some description about what is assumed for the example station. Appendix 1 suggests there may be an assumption of 10 chargers per public battery electric vehicle station, but it is not clear in the exhibit.
Section 1.3	18	Projected powertrain mix	TGA	Recommend clarifying the difference between projected routes taken by battery electric and fuel cell electric trucks. The current description doesn't seem to differentiate them. Should it be that battery electric trucks are more suited to intrastate rather than interstate travel?
Section 1.4	20	Exhibit 3	TGA	We appreciate the inclusion of SR 905 and SR 11 as the termini of the I-5 corridor, as these roads connect to the land ports of entry that process commercial vehicles.
Section 1.6	26	Exhibit 5	TGA	Recommend simplifying the map's visualization of the corridors--the yellow highlights and dotted lines may be unnecessary and appear to represent a greater buffer than just 1 mile as currently labeled. In addition, the orange areas illustrating near-road pollution decay radius around disadvantaged communities are not consistent with location of the top 6 corridors. Greenhouse gas is also noted in the legend, but this does not seem to be relevant to displaying air quality impacts.
Part 2	29	Exhibit 7	TGA	The battery electric truck map should be fixed--it seems that the network is not overlaid correctly on the California base map. Consider if it is preferable to show the hydrogen station that seems to be located south of the U.S./Mexico border. We agree that infrastructure should be built on both sides of the border, but it may be beyond the scope of this assessment to recommend this location.
Section 2.2	34	Exhibit 10	TGA	Minor edit: section B of this exhibit seems to have the boxes for FCEV and BEV in the wrong places.
Section 4.4	55	Barrier: Economic Viability	TGA	In describing Advanced Clean Fleets, recommend adding the word "marine" before "ports" since the drayage classification in the regulation does not apply to trucks carrying goods to/from land ports of entry (unless the goods are going to/from marine ports or intermodal railyards), according to the California Air Resources Board.
Section 4.5	59	Recommendations for Supporting	TGA	We appreciate the report's inclusion of the extensive list of potential strategies to support the transition of fleets operating in the U.S./Mexico border area.
Part 7	76	Recommendations for Supporting	PZA	Suggest adding second sentence here: Program development should take place with input from communities, and fleets of all sizes including those who will be impacted by regulations and should be flexible to ensure support in a way that is considerate of their needs. Additional efforts should be made to receive input from minority and small business owned fleets.
Section 2.4	41	Future project selection and other project types	PZA	Regarding this sentence: "Similarly, to encourage the availability of charging stations, the California Public Utilities Commission should continue to work with the Commission, the California Energy Commission, and other state agencies as needed to plan the infrastructure needs for the electric grid." Have considerations been made to work with tribal governments?
Section 2.5	42	Potential project sponsors	PZA	Consider adding a bullet point for tribal nations
Section 4.5	58	Recommendations for Supporting	PZA	Consider adding minority-owned here: "...create a streamlined lending process for small and minority-owned businesses that are transitioning to zero-emission vehicles."
Section 4.6	60	Barrier: Complex stakeholder ecosystem	PZA	Consider adding tribal nations here: "...to include transportation equity leaders, environmental justice organizations, tribal nations, and related community..."

SCAG
INNOVATING FOR A BETTER TOMORROW

SOUTHERN CALIFORNIA
ASSOCIATION OF GOVERNMENTS
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www.scag.ca.gov

October 26, 2023

Tanisha Taylor, Executive Director
California Transportation Commission
1120 N. Street, MS 52
Sacramento, CA 95814

Subject: Draft SB 671 Clean Freight Corridor Efficiency Assessment

Dear Ms. Taylor:

Thank you for providing the Southern California Association of Governments (SCAG) an opportunity to review and comment on the Draft SB 671 Clean Freight Corridor Efficiency Assessment. We are thankful for and appreciate our working relationship with the California Transportation Commission (CTC) staff throughout this effort beginning in December 2021 and commend the CTC's commitment to leading the State's efforts on identifying corridors, or segments of corridors, and infrastructure needed to support the deployment of zero-emission medium-duty and heavy-duty vehicles.

As a metropolitan planning organization, we work with public and private freight stakeholders and local communities from across our region. The SCAG region includes the Port of Los Angeles and the Port of Long Beach, which comprise the largest port complex in the Western Hemisphere and drive substantial trade volumes for both imports and exports supporting local and national consumption. The two largest Class I railroads in North America, BNSF Railway Co. and Union Pacific Railroad Corporation, facilitate the movement of goods for both containerized and non-containerized cargo. Air cargo facilities across the region, including Los Angeles International Airport and Ontario International Airport, provide freight services for international and domestic goods, while key land ports of entry like Calexico East support binational trade supply chains. All these major gateways are part of and supported by an extensive goods movement system including intermodal facilities, freight corridors, and access roads, that connect with the largest industrial warehouse and distribution cluster in the U.S.

<u>High-Level Comments</u>

1) Overall, SCAG is very supportive of the State's Draft SB 671 Assessment. We would like to continue to coordinate and collaborate with the CTC as SCAG works on its Zero Emission Truck Infrastructure (ZETI) Study, Last Mile Freight Program (LMFP), and similar future endeavors, which directly support the transition to a zero-emission transportation system. These efforts involve extensive stakeholder engagement with industry, agencies, utilities, and communities and include a comprehensive zero-emission infrastructure planning roadmap for the entire SCAG region, while also managing direct implementation of these cutting-edge technologies across a diverse set of

private companies from small independent owner operators to major national and global brands.

2) SCAG is supportive of allocating available funds, where feasible to support the build out of an initial viable network of zero-emission infrastructure. However, it is equally important to continue to take a holistic approach to infrastructure needs across the SCAG region and State to support all surface transportation freight mode investments. This will ensure that the State's regions remain competitive and continue to bolster a diverse set of jobs and quality of life. SCAG looks forward to working closely with the State as it studies other project types including highway improvements that address safety, throughput, and truck parking.
3) SCAG is supportive of streamlining zero-emission station development and would like to better understand the State's use of a Central Delivery Team as a key mechanism for this process, among other areas throughout the Draft SB 671 Assessment. SCAG would like to continue to work with the State in identifying the most optimal ways to implement zero-emission infrastructure and to ensure that local and regional perspectives are represented in the decision-making process.

Like the CTC, SCAG is planning for a future to support an innovative and competitive freight system, that incorporates the development and implementation of medium- and heavy-duty zero-emission truck infrastructure. This is reflected in SCAG's Goods Movement Supply Chain Resolution adopted this past March establishing a call-to-action for the region; as well as through SCAG's core studies and programs including the ZETI and LMFP.

We appreciate the CTC's vision of creating an initial viable network as a catalyst towards a robust clean freight system that will continue to lead the nation, with the primary goal of reducing emissions including particulates across vulnerable communities.

Thank you again for allowing SCAG the opportunity to comment on the Draft SB 671 Clean Freight Corridor Efficiency Assessment. Please find a comment matrix attached to this letter (Attachment 1). Should you have any questions, please feel free to contact me at nam@scag.ca.gov or Philip Law, Manager, Mobility Planning and Goods Movement Department, at law@scag.ca.gov.

Sincerely,

Annie Nam

Deputy Director, Transportation Planning & Programming

Attachment 1 – SCAG Comments on the Draft California Freight Mobility Plan 2023

General Comments	
1.	It will likely become clearer as to the ability to achieve the State's 2035 and 2040 targets over the mid-term; was there any thought process about constructing scenarios in the event targets are not met and what implications may be.
2.	How is commercial vehicle clean technology risk viewed as part of the assessment? Many leading OEMs continue to witness setbacks on production and other issues with delivered commercial vehicles, with smaller OEMs facing challenges to raise enough capital to sustain their businesses. Are there detailed resources to track/monitor progress to ensure that the industry side is scaling to the degree required under Legislation? This may become more important over time.
Specific Comments	
4.	Page 13, Commodities Section – Recommend continued coordination with regions and MPOs as further commodity and supply chain analysis continues. A more robust approach towards commodities and industries beyond FAF 5 is necessary to delineate supply chain relationships across industries to inform trip types (including O-D and markets served), vehicle class, and projected powertrain mix.
5.	Page 14 - Trip Type Section – It should be considered that many city areas, especially throughout Southern California, are likely supporting all trip types. This is further justification for placing a stronger emphasis on commodity and industry analysis to optimize supply chain linkages and trip relationships.
6.	Page 14 – Trip Type Section – Were urban, regional, and long-haul definitions and annual truck miles traveled validated across industry standards for each category? Industry sources state local (urban) as within a 100-mile radius so that drivers can be at home at night, while both regional and long-haul involve multi-state with long-haul's distinction being longer distances. Old Dominion Freight Lines as an example defines their business as regional, inter-regional, and national for their primarily less-than-truckload service with an average length of haul being 925 miles. Upon a cursory review of some of the largest trucking companies, most have average lengths of haul of 500-700 miles or lower. Knight-Swift Transportation is the largest trucking company in North America by tractors, and their truckload average length of haul is less than 400 miles.
7.	Page 14 – Vehicle Class Section – Is there information breaking down the number of trucks across the state by vehicle classification? Obtaining the total capacity of trucks is essential in determining truck trips by vehicle class and/or market served. If so, what is the source, and can this information be organized by regional areas across the state?
8.	Page 29 - For the characteristics of battery electric charging stations and hydrogen fueling stations, was there an initial assessment of the total number of gasoline/diesel/natural gas fueling stations across the state? If so, was this considered

	as a starting point to develop newer technology charging/fueling needs based on different range capabilities?
9.	Page 32 - For the drayage industry, it is critical to understand the entire capacity for the State and regions within it, and their domicile locations. Breaking out the proportion that domicile at a multi-family or single-family residential location are key as these are the most at-risk companies to access new technology infrastructure. Most other independent owner operators will pay to domicile their trucks at land-based locations where equipment is stored whether residential-based, commercial, and/or heavy equipment such as chassis and containers.
10.	Page 33 - Exhibit 11 - Why is it that the accelerated battery electric adoption is the only one resulting in a disproportionate amount of hydrogen fuel cell adoption by 2040? If battery electric is accelerated is the assumption that hydrogen fuel cell will not be as necessary, whereas the accelerated hydrogen fuel cell adoption still requires a substantial amount of battery electric charging stations?
11.	Page 34 - Recommend doing an assessment of existing gasoline/diesel/natural gas station density today relative to the "range" of distance that medium- and heavy-duty vehicles can travel based on ICE technology. It appears that this assessment is focusing on a minimum approach to what may be required based on newer technology-based distance capabilities. This may be underrepresenting the true need to equate to density required for the exponentially complex supply chain driven trips across Southern California as an example, regardless of technology mix for station development over time.
12.	Page 38 - As regions and MPOs continue to perform zero-emission infrastructure plans and while projects come on line, recommend coordinating closely with these regions.
13.	Page 43 - Recommend keeping the assessment consistent and detailing a public/private cost estimate like Exhibit 11. Today, most companies rely solely on publicly available facilities to refuel and the cost burden to split this across privately owned facilities and public facilities should be clarified and taken holistically from an infrastructure investment standpoint.
14.	Page 54 - SCAG agrees with supporting fleet owners through the transition to zero-emission, and would also recommend extending this to OEMs, service providers, and all industries involved in the process. Consideration should be placed on areas outside of the control of the State (global supply chain, geopolitics, technology innovation pace, other business risks, etc.) in addition to incentive programs and targets to ensure that objectives can be met. Recommend 3-year updates on number of medium- and heavy-duty zero-emission stations in operation across the State, as well as medium- and heavy-duty zero-emission vehicles being delivered in the State and portion of total trucks operating versus ICE technologies to ensure targets remain on track.
15.	Page 58 - Recommend strongly that the development of a Central Delivery Team occur with substantive stakeholder input at all levels, as all of the implementation

	development will be occurring locally. Would like to better understand the role of this proposed central state agency with respect to authority to develop projects at the local level.

From:	Michael Kuker
To:	Giese, Kayla@CATC
Cc:	External, stiedgen@DOT; Laurent Beauregard; srta
Subject:	SRTA feedback on draft Senate Bill 671 Clean Freight Corridor Efficiency Assessment
Date:	Thursday, October 26, 2023 12:39:00 PM
Attachments:	image001.png

EXTERNAL EMAIL. Links/attachments may not be safe.

Ms. Giese:

Please accept the following comments from the Shasta Regional Transportation Agency (SRTA) on the draft Senate Bill 671 Clean Freight Corridor Efficiency Assessment:

- We noticed that the proposed network (page 26) doesn't show a proposed station in Shasta County. We have concerns about this from a West Coast logistics perspective given that in Shasta County we are averaging a number of events a year causing I-5 traffic to be delayed or stopped (sometimes for multiple days), especially by fires and snow. Logistically, having a station all the way back in Tehama County could create greater traffic concerns if there are multi-day delays, potentially requiring hydrogen fuel trucks to turn around to fuel up again before reaching the next station, adding roughly 72 unnecessary miles.
- Following up with the first point, Redding is also a major North State hub that for several other state highway routes (SR 44, SR 299, and SR 273) that help bring rural goods to urban markets.
- SRTA has partnered with the Alliance for Renewable Clean Hydrogen Energy System (ARCHES), one of seven awardees of the DOE's Regional Clean Hydrogen Hub. The key principles of ARCHES include Statewide (leveraging California's size and diverse geography) and Equity and Justice Centered (prioritized in all decisions with a focus on California's impact, disadvantaged, low-income, and tribal communities), a stronger initial investment in the North State would better exemplify those principles.
- No discussion of how the increased maintenance costs associated with heavier vehicles could be addressed.
- No discussion of ongoing maintenance costs associated with fueling/charging stations.
- Has there been an assessment on the financial ability of fleet owners to transition to BEV/FCEV?
- Has there been any cost-benefit analysis comparing increased investment in freight trucking versus increased use/investment in freight via rail?
- Demonstration that there could be a substantial ROI might get private companies excited to produce public charging/ fueling infrastructure.

Thank you for this opportunity to comment and feel free to follow up with any questions about our feedback.

Sincerely,

Michael Kuker
Associate Transportation Planner | mkuker@srta.ca.gov | ph: 530-262-6204
Shasta Regional Transportation Agency (SRTA) | 1255 East Street, Suite 202, Redding, CA 96001
Help SRTA and Caltrans District 2 re-envision State Route 273—visit envision273.org!

October 20, 2023

Transmitted via e-mail to: Hannah Walter in care of

Kayla Giese
Staff Services Manager
California Transportation Commission
Kayla.Giese@catc.ca.gov

Cc: Hannah.Walter@catc.ca.gov

Subject: Comments on the Draft SB 671 Clean Freight Corridor Efficiency Assessment

Dear Ms. Walter,

Thank you for your leadership in developing this Assessment in such a short period of time and with such an open forum for input. We would like to offer the following recommendations:

The Percentage of FCEVs Should Be Significantly Lowered in the Balanced Scenario

We believe that the recommended percentage split between FCEVs and BEV trucks in the Balanced Scenario should be adjusted to significantly lower the percentage of FCEVs.

The report uses the total MHD vehicle forecasts from the CEC and CARB and then allocates the percentage split according to McKenzie's estimates. Unfortunately, the Assessment does not provide us with any analysis supporting how this major assumption of the BEV/FCEV split was made.

The BEV / FCEV percentages in the Assessment's balanced scenario are:

	2025		2030		2035		2040	
Vehicle class	% BEV	% FCEV	% BEV	% FCEV	% BEV	% FCEV	% BEV	% FCEV
MDT	98%	2%	90%	10%	82%	18%	75%	25%
HDT	83%	17%	61%	39%	45%	55%	41%	59%
Total	90%	10%	78%	22%	65%	35%	59%	41%

The forecast vehicle count assumptions used are:

	2025		2030		2035		2040	
Vehicle class	**BEV**	**FCEV**	**BEV**	**FCEV**	**BEV**	**FCEV**	**BEV**	**FCEV**
MDT	4,930	97	69,059	7,277	164,177	36,856	241,204	78,776
HDT	4,165	863	32,206	20,783	75,177	90,567	125,046	178,526
Total	9,095	960	101,264	28,060	239,354	127,422	366,250	257,302
Total for year	10,055		129,324		366,777		623,552	

It seems that this split may be the result of fundamental assumptions that battery electric heavy-duty trucks are not suitable for long haul vocations and that most heavy-duty trucks are engaged in long haul operations. Neither of these is true. The assessment notes: "Projected powertrain mix: … *By 2050, annual battery electric truck trips are projected to be concentrated on interstates, while hydrogen fuel cell electric truck trips, coinciding mostly with heavy-duty long haul vehicle trips, are projected to be concentrated on the highest average daily vehicle miles traveled corridors between major origin and destination points, such as along I-5."1* (Page 15). (Italics added.)

While we don't have visibility into the data or analysis in the Assessment to learn how this allocation was determined, there are some unfavorable but dated myths about why BEV long haul trucks may not be up to the task. With progress occurring so rapidly, these myths are now largely no longer valid. They have included:

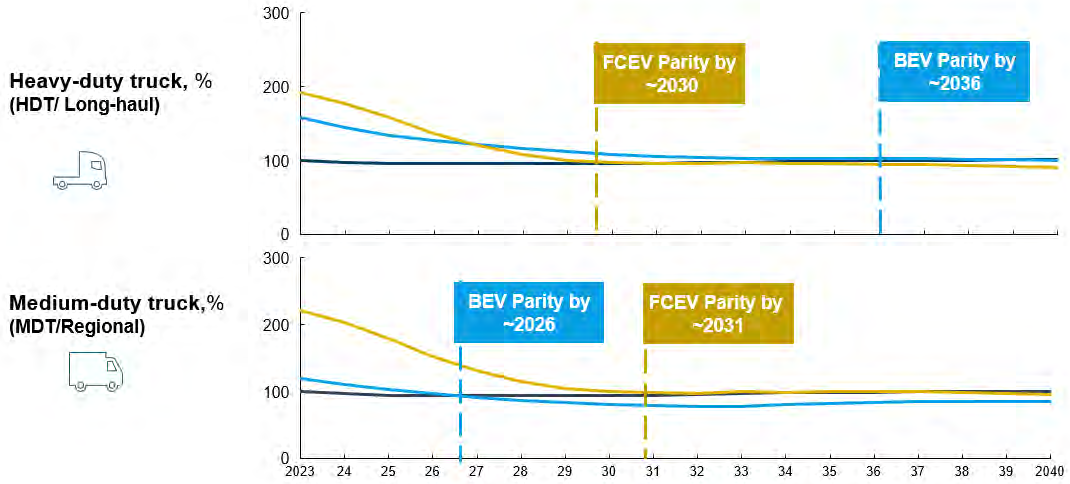
1. Battery electric MHD vehicles largely due to high-cost batteries are too expensive and not economically competitive with diesels.
2. Range for BEVs is not sufficient to support long haul operations.
3. Charging takes too long.

Once these myths have been refuted below, it is clear that many MHD battery electric vehicles and their vocations are economically more favorable than for similar diesel vehicles. While no one can predict what the BEV/FCEV ratio will be in the future, BEVS have significant momentum, are performing well in commercial operation and we believe will continue to dominate in the short and long term especially for MD vehicles. Therefore, the percentage portion of BEVs in the coming years should be increased substantially.

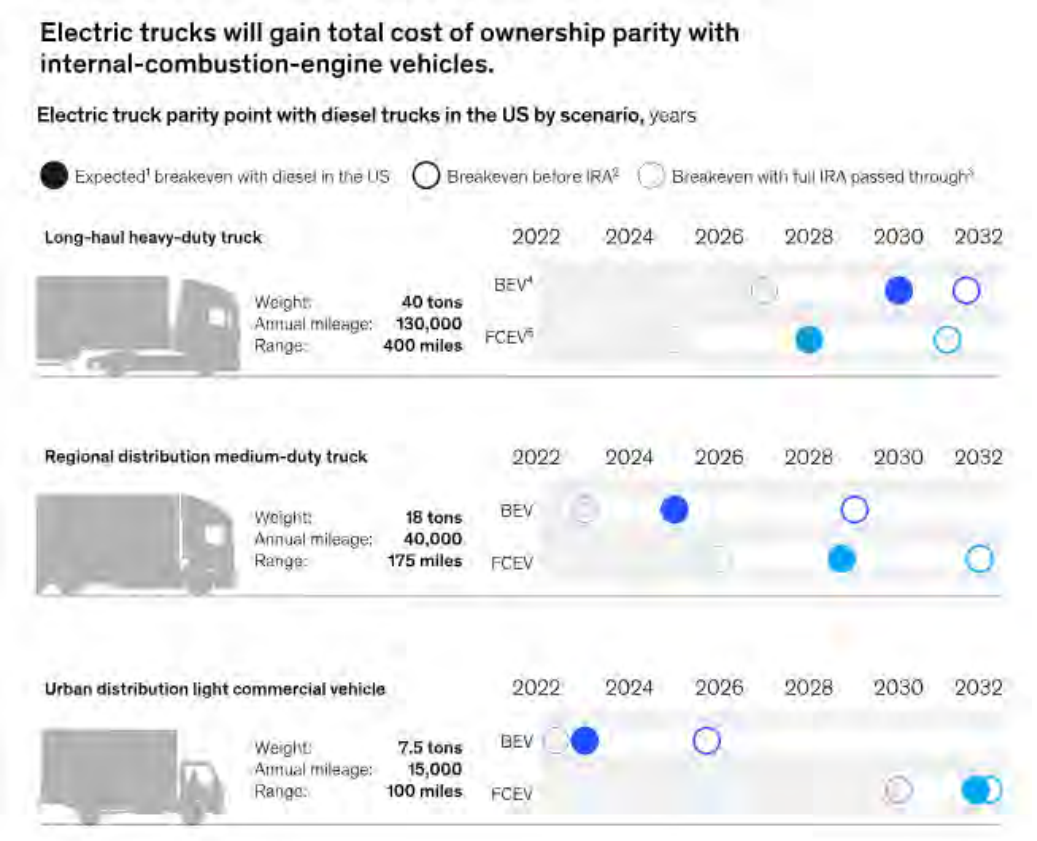
1. Costs of BEVs

Total Cost of Ownership (TCO) Parity with Diesel Trucks - The assessment states, "The McKinsey Center for Future Mobility estimates that battery electric medium-duty trucks will reach cost parity in total cost of ownership by 2026, and battery electric heavy-duty trucks will reach cost parity in total cost of ownership by 2036."(Page 52) and this is shown in the following exhibit. We believe these conclusions are not valid nationally and especially not in California.

“Exhibit 19: Projected total cost parity for fleet owners” (Page 53)



In addition, in the Assessment, it references McKinsey’s January 2023 article “Why the Economics of Electrification Make This Decarbonization Transition Different.”[1] and notes, “U.S. fleet decarbonization would not just be good for the planet; it also makes compelling economic sense. Based on the total cost of ownership (TCO), battery electric vehicles (BEVs) will outperform their internal-combustion-engine (ICE) counterparts across all vehicle classes by as soon as 2025.”[2] This article also has the following TCO exhibit:



[1] The economics of fleet electrification | McKinsey
[2] The economics of fleet electrification | McKinsey

This exhibit shows long haul HD trucks achieving TCO parity with diesels 6 years earlier than in the Assessment in 2030 and the MD truck at parity in 2025 – one year sooner than in the Assessment. We think these numbers are much closer to current reality for a national study and replace the existing exhibit in the Assessment.

It is our understanding that the McKinsey report is a national study. The cost assumptions in California are different and in aggregate are better than at the national level especially considering the multitude of significant financial and policy support programs California provides to lower the costs of the vehicles, charging infrastructure and fuel (electricity costs.) Programs that offer significant financial support for the capital costs of infrastructure and its installation include:

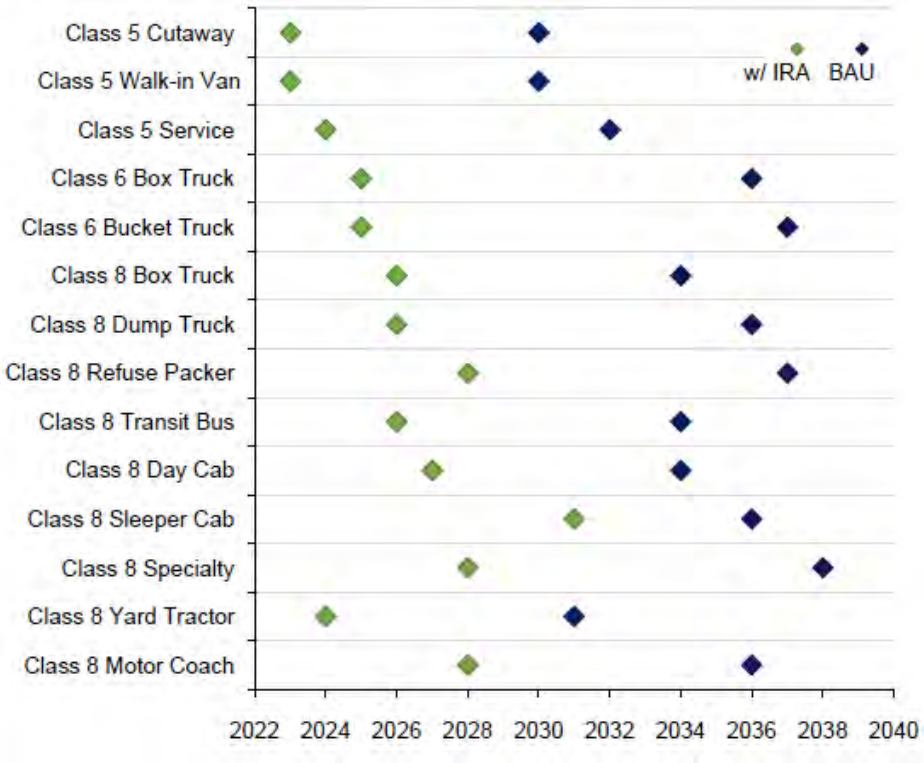
- The CPUC has authorized $740 million from 2021 – 2024 through the state's IOUs to support equipment and installation costs and an additional $700 million for 2025-2030[3];
- The CEC is authorized to spend $2 billion for infrastructure for medium - and heavy-duty vehicles from 2021-2026 (EV and Hydrogen)[4]
- The Federal IRA also provides a tax credit of 30% of the cost of the charger up to $100,000.
- The state has regulations that require IOUs to pay for nearly all of the electric system upgrades on their side of the meter to support charging infrastructure.[5],[6]
    - Note: on Pg. 45 the Assessment says, "This Assessment does not include a total estimate of electric grid infrastructure costs. The electric infrastructure cost per station is highly dependent on the station location, and since utilities are still determining upgrade needs in each region, it was not possible for this report to include an estimate of total electric infrastructure costs." **We recommend that the Assessment language here be modified to recognize the significant benefits of this CPUC Decision in addressing this cost item.**

Fuel (electricity) costs are significantly reduced by the state's Low Carbon Fuel Standard (LCFS) program. In combination with much lower fuel costs for electricity than diesel to begin with, in some cases the LCFS program can pay for nearly all of the electricity costs. For example, in CARB's TCO study for the ACF, it notes that in the 2030 scenario for a Class 8 Semi Day Cab, the electricity costs are 48% lower than the diesel fuel costs. The LCFS revenues produce an additional 41 % cost reduction for a total savings of an 89% cost reduction in fuel compared to diesel. [7]

[3] CPUC Adopts Transportation Electrification Program To Help Accelerate Electric Vehicle Adoption
[4] Zero-Emission Vehicle Infrastructure Plan (ZIP) (ca.gov)
[5] 413061495.PDF (ca.gov)
[6] CA Approves New Rules to Support EV Charging Infrastructure (nrdc.org)
[7] Proposed ACF Regulation - Appendix G: Total Cost of Ownership Discussion (ca.gov) Note: CARB's assumption for its TCO study was $200 / LCFS credit. The actual value of this was about $200 for 2.5 years beginning in 2019 but has since declined and is now at about $75 / credit. CARB is in the midst of a major revision and update to the LCFS program and one of its objectives is to "Provide long-term price signals and increase regulatory clarity for the market to support deeper transportation sector decarbonization needed through mid-century." Many stakeholders are hopeful that this will provide more stability and predictability of LCFS credit prices in the future. At the current LCFS credit price, BEV truck owners would still save a very substantial 15% of the cost of the electricity every year.

On the upfront purchase cost of the vehicles, a study by ERM[8] for EDF notes that, "When the IRA ZEV tax credit is incorporated, **purchase price parity for a wide range of M/HD ZEVs is reached at least 5 years and as much as 12 years earlier than would occur without the credit**." The study shows that purchase cost parity including IRA tax credits is in 2027 for a Class 8 day cab and in 2031 for a class 8 sleeper cab.

Figure 1. Year purchase price parity is achieved for a range of types of ZEVs compared to internal combustion vehicles for business-as-usual and with the IRA



CARB's TCO Studies showed that the Class 8 Day Cab BEV had a substantially lower TCO than diesel trucks in all of its 2025, 2030 and 2035 scenarios. The same is true in both of CARB's 2030 and 2035 scenarios for a Class 8 Sleeper CAB.[9] And these did not include either the IRA incentive of up to $40,000/ truck or the now substantial state and federal financial support programs for charging infrastructure.

Given the TCO parity value from the recent January 2023 McKinsey article of 2030 for Long Haul HD vehicles and 2025 for MD regional trucks, if you add consideration for all the additional support programs from California outlined above, we would expect the TCO to be better still and reach parity with diesel trucks even sooner than those dates.

We recommend that that Assessment be revised to include these new TCO values from the January 2023 McKinsey article and add a note listing that this is a national study and that

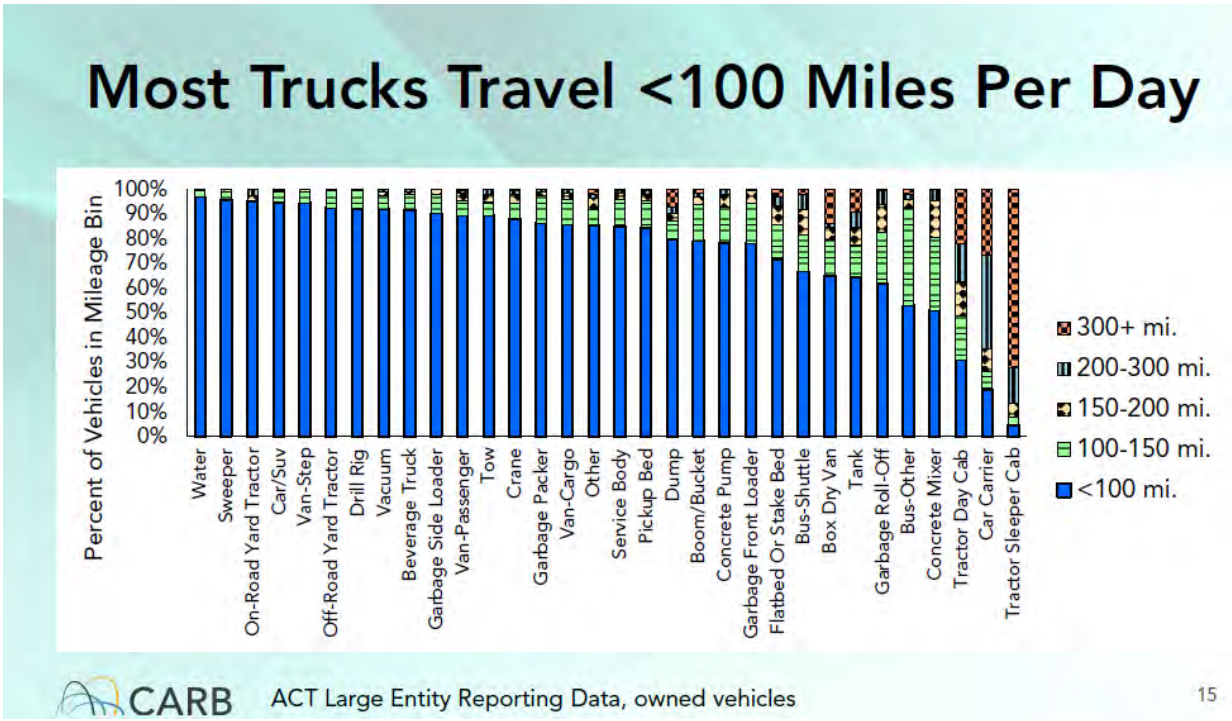
[8] Investment Reduction Act Supplemental Assessment: Analysis of Alternative Medium and Heavy Duty Zero Emission Vehicle Business as usual Scenarios: Prepared by ERM for EDF 8/19/22 (www.erm.com)
[9] Proposed ACF Regulation - Appendix G: Total Cost of Ownership Discussion (ca.gov)

the TCO in California and parity years should even be better due to the significant CEC and CPUC financial support programs for infrastructure and LSFS credits.

2. **Range Sufficiency**

The myth here is that long-haul BEVs don't have sufficient range to meet the needs of long-haul operations and even if they did it would take too long to charge them.

It's important to first understand that there are many vocations for class 8 Semi's that have reasonably short routes. When you add up all the HD trucks on the CARB's Slide below[10] including day cabs, sleeper cabs, beverage trucks. garbage packer, etc. many of these vehicle daily routes' are less than 200 miles. According to CARB for Day Cabs, about 2/3 of trucks travel 200 miles / day or less while 80% travel 300 miles or less. 30% of sleeper cabs travel 300 miles or less. So many trucks can do their daily duty cycle on a single charge from their home-depot, recharge overnight and repeat the next day. Many of these vocational needs for short to medium regional routes are 200 miles or less and being met today with commercially available and in use class 8 BEV trucks from several OEMs including Daimler, Volvo, Nikola and Tesla fully loaded.



Most Sleeper Cabs and one third of day cabs have routes longer than 300 miles. For those vehicles that will be doing long-haul operations of more than 500 miles/day and not returning to their home base charging depot during the day, you need vehicles with a range of about 500

[10] Proposed ACF Regulation Workshop - High-Priority and Federal Fleets (ca.gov) Slide 15.

miles and publicly available enroute fueling infrastructure (for both BEVs and FCEVs). (CARB Assumes that all BEVs will have a home base depot charger where most of the charging for MHD vehicles occurs. - The significant exception is for long-haul sleeper cabs.) And for BEVs the chargers need to be fast enough for enroute charging to be able to complete a charge within the 30 minutes rest break drivers take. We have an example of this in the Tesla Semi with its 500-mile range on a charge fully loaded and with a 70% charge in about 30 minutes using a 750 kW Tesla charger. When MCS chargers start becoming available rated at 1.2-1.5 MW in the next year or two, the semi will be able to get a full charge in 30 minutes.

Tesla is demonstrating its Semi with these capabilities today.

- In December 2022, it drove its fully loaded semi (81,000 pounds) over 500 miles on a single charge. [11],[12]
- PepsiCo, in Sacramento, received 21 Tesla Semi's in early 2023. "Out of our 21 assets of the Tesla Semis that we have here, three of them are dedicated to long haul, over-the-road routes," Dejan Antunovic, PepsiCo's electrification program manager, said in the video. "The routes may change or vary between 250 miles up to 450 miles. We have been aggressive to push the limit and demonstrate that we are able to achieve a very high range with a fully loaded tractor with the Semi fleet."[13]
- The North America Council on Freight Efficiency (NACFE) just completed its "2023 Run on Less"[14] program where it did extensive testing of 22 ZEV MHD vehicles in commercial operation with very detailed data collection. Three of the trucks were Tesla Semis.

  > "The Tesla Semi outperformed its rivals in real-world tests, demonstrating its advantages in range, charging efficiency, and performance by a significant margin. The results of the Tesla Semi placed a definitive period on the issue of whether battery electric trucks are feasible for the transport sector.
  >
  > During the Run on Less event, which was organized by the North American Council for Freight Efficiency, a Tesla Semi operated by PepsiCo Inc. traveled 1,076 miles in a single day with three relatively brief 750-kW fast charging sessions."[15]

Ranges for class 8 electric semi's from other OEM's include Nikola's Tre at 330 miles, Volvo's eVNR at 275 miles and Daimler's Freightliner's eCascadia at 230 miles. As with light duty EVs these battery ranges, costs and battery densities are all expected to continue improving fairly rapidly over the coming years.

3. **Rapid Charging**

Many trucks only need to be charged out of their home depots and can be filled up overnight within a few hours using type 2 chargers. For those needing to charge enroute or re-charge at their depot during the day, faster DC charging will be needed. Currently, there are CCS chargers

[11] Tesla Semi completes first 500-mile trip with a full load | Electrek
[12] Watch: Tesla Semi's 500-Mile Drive On One Charge - CleanTechnica
[13] PepsiCo praises Tesla Semi's performance on long-haul, regional loads - FreightWaves
[14] Home - Run On Less
[15] Tesla Semi dominates real-world tests during Run on Less event (teslarati.com)

up to 350 kW. Daimler's Freightliner semi eCascadia, can complete an 80% charge in 90 minutes.

Tesla has developed and has commercially deployed its 750 kW Tesla Semi Chargers and can achieve a 70% charge for a 500 mile range semi, in 30 minutes.

With the coming Megawatt Charging System (MCS) [16] standard chargers, drivers will be able to fully charge a Semi within their 30 minute rest break. CharIN[17] is an international charging systems standard development organization that is leading the effort to finalize the MCS standard and is expected to complete this by the end of 2024. Here are some anecdotes about the progress being made on finalizing the MCS standard:

- "A few weeks ago, Scania [in Europe] announced it had successfully installed and tested a pilot MCS from ABB E-mobility, noting the technology will cut charging time for heavy-duty vehicles in half.
- Scania plans to provide electric trucks to its first customers with a preliminary version of the MCS standard plug this year. Meanwhile, ABB E-Mobility intends to launch the next version of the MCS technology in late 2024 or early 2025.[18]
- "We are now in the prototype phase, so in principle it is ready," CharIN Chairman Claas Bracklo told EV in Focus. "We have 17 charger manufacturers currently building prototypes. We have 18 truck manufacturers building those prototypes. We have 13 cable connector companies and 10 charge point operators."[19]
- WattEV, a leading Truck-as-a-Service (TaaS) company, is already installing chargers with future conversion to MCS chargers when they come available. "According to Salim Youssefzadeh, CEO of WattEV, a company building out public truck charging sites, the company is preparing sites today with multiple CCS ports, with the plan to aggregate the power modules of the CCS chargers to eventually power the MCS ports. Specifically, the power cabinets will have flexibility in the "building block" power modules to be able to provide power to a CCS charging pedestal and combine multiple modules together to provide higher charging power to an MCS pedestal. Once MCS charging pedestals are available, they can be added to a site, and utilize the power cabinets which already provide power to the CCS chargers. Youssefzadeh stated, "With a focus on heavy duty transport at WattEV, it was imperative for us to find a solution that supports both CCS and MCS so our investment will not become obsolete during the transition. Starting in 2023, all our installations will use modules of 1200kW systems that support 5 CCS at 240kW or one MCS at 1200kW."[20]

[16] Megawatt Charging System (MCS) (charin.global)

[17] Charging Interface Initiative (CharIN) is leading the international effort to finalize this standard. It is the largest global association focused on the electrification of all forms of transportation based on the seamless and interoperable charging experience enabled by the Combined Charging System (CCS) and the Megawatt Charging System (MCS). CCS and MCS are the global standards for charging vehicles of all kinds. An inclusive, industrywide coalition, CharIN represents nearly 300 leading e-mobility stakeholders, from automakers to utilities, grid operators, component suppliers, and charging station developers. Nearly 75 of these members are based in the United States. A complete list of members may be found on our website at www.charin.global.[17]

[18] Scania tests ABB's megawatt charging system for next-gen electric trucks - electrive.com

[19] Charged EVs | Frustration with delays in implementing the Megawatt Charging System standard - Charged EVs

[20] How to prepare for the Megawatt Charging System – CharIN

When we examine the very favorable TCO of long- haul HD BEVs compared to diesels, 500-mile ranges already achieved today, fast charging already in commercial operation and the MCS standard ready to begin by end of 2024 and the commercial availability of many vehicles from multiple OEMS and in operation today, we believe that BEV growth will predominate at least in the short and medium term. The growth of ZEVs will be driven both organically and by the Advanced Clean Trucks and Advanced Clean Fleets rules in California.

The ICCT study "Analyzing The Impact of the Inflation Reduction Act on Electric Vehicle Uptake in the United States" estimates that FCEV market share with IRA incentives will be 0.6% for day cabs and 0.2% for long haul trucks by 2035. They state "For all truck and bus classes, ZEV sales are projected to be dominated by BEVs. Among truck classes, FCEVs make up less than 1% of total sales in all years. [through 2035]" [21]

Uptake of light duty FCEVs has not achieved expectations. The CEC has already been lowering its expectation for FCEVs in the light duty category. In its first AB 2127 report it estimated a 95/5% split between PEVs and FCEVs. In the latest draft report, it is reducing that to 99%/1%.[22] In the first half of 2023, LD PHEVs sales in California represent over 24% market share of all light duty vehicles. FCEVs are less than 0.2% of ZEV sales.[23]

The FCEV industry and supportive ecosystem is lagging that for BEVs. The CEC's dashboard for MHD ZEVS in California shows no FCEV vehicle types in operation in 2022 except for transit buses.[24] The HVIP.org site shows no HVIP certified MD FCEVs among all the approximately 45 class 4, 5 and 6 vehicles it has listed. We are not aware of much OEM activity on developing MD FCEVs that are commercially available today or will be in the near future. This is most likely due to the fact that BEVs do exist today, are being commercially deployed and can meet most duty cycles quite well both from a TCO and functionality perspective. The site does list 4 Class 8 Tractor FCEVs from Hyzon, Hyundai and Nikola and commercial introduction are just getting started in the last few months.

In the above, we have documented how BEV HDTs at a national level will reach cost parity with diesels in 2030 and sooner in California, purchase cost parity for day cabs in 2027, can have ranges of 500 miles / charge today, are successfully commercially operating on many short and medium haul vocations with Semi's from multiple OEMs, that fast chargers are starting to appear that can charge a 500 mile Semi 70% in 30 minutes and with MCS chargers coming soon that can completely charge a semi in 30 minutes. The old myths about what BEV semis can't do are not valid.

BEV MHD vehicles are several years ahead of FCEVs in terms of available vehicles across many vehicle types and from multiple OEMS, proven suitability in a host of vocations, charging infrastructure, many miles in successful commercial operations, funding support programs, massive investments continuing to be made, policy support, consulting services, innovative business model development and ecosystem product and services support. The utilities are all now very experienced at installing infrastructure and have EVSE funding support programs that

[21] ira-impact-evs-us-jan23-2.pdf (theicct.org)
[22] Second Assembly Bill (AB) 2127 Electric Vehicle Charging Infrastructure Assessment: Assessing Charging Needs to Support Zero-Emission Vehicles in 2030 and 2035 | California Energy Commission
[23] New ZEV Sales in California
[24] Medium- and Heavy-Duty Zero-Emission Vehicles in California

also offer planning assistance for fleets. When you consider the billions of dollars manufacturers are investing in manufacturing of LD EVs and batteries, higher power chargers, the impact of the Bilateral Infrastructure Law and Inflation Reduction ACT pouring additional $billions into manufacturing vehicles, infrastructure and in the domestic supply chain for minerals and the enormous economies of scale that will be achieved in light duty and MHD vehicles with rapidly growing volumes, BEVs and its industrial complex has several advantages over FCEVs driving its continuing rapid growth. In addition, MHD trucks can take advantage of products made economically in large volumes for LD EVs. For example, Tesla is using proven and high-volume Model 3 electric motors to power its semi at low cost. GM is using its Ultium battery and drive train products for cars and its delivery vans. And the huge volumes of battery cells being made for LD vehicles can be used in MHD vehicles to keep these costs down. Just two examples of large commercial orders and deliveries of MHD vehicles include Sysco's order of 800 Daimler Freightliner Class 8 eCascadia semis due to all be delivered by 2026[25] and Amazon's order of 100,000 Delivery Vans from Rivian. Amazon just announced that it is now operating 10,000 Rivian electric vans across the country.[26]

RECOMMENDATION #1 - The Percentage of FCEVs Should Be Significantly Lowered in the Balanced Scenario

a. We recommend that the percent of MD ZEVS that are FCEV be substantially reduced in all three scenarios.

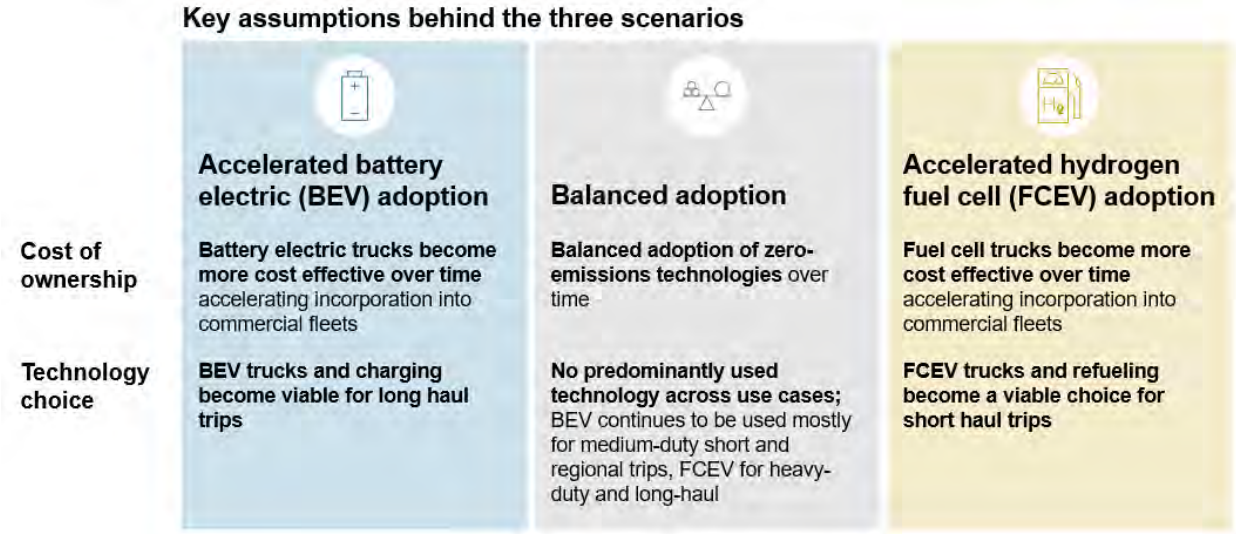
b. The percent of MD BEVs should be reduced to very low levels due in part to little interest so far in OEMS making FCEVs for these types of vehicles. BEVs already can meet most of the vocational needs of these vehicles and TCOs now especially with the IRA incentives are good especially in California.

c. We recommend that an appendix item be added to the report that shows the final assumed number of MD and HD vehicles forecast by fuel type (BEV & FCEV) by year. This is a foundational data set that drives everything else the assessment does in terms of calculating numbers of chargers and fueling stations needed and it is important to include in the Assessment.

[25] Sysco Transforming the Future of Foodservice Delivery: Announces Intent to Purchase Up to 800 battery electric Freightliner eCascadia from Daimler Truck North America to Serve U.S. Customers | Daimler

[26] Everything you need to know about Amazon's electric delivery vans from Rivian

d. We recommend changes to the assumptions below to this exhibit, “The Assessment (split) considered the estimated cost of vehicle ownership.” Page 27



Based on all we have presented above, **we recommend the following changes**:

For the Accelerated BEV Scenario,

- Battery electric trucks become significantly more cost effective over time accelerating adoption as the preferred technology for most use cases into commercial fleets.
- A national network of MCS chargers is installed facilitating national long-haul operations in and out of California.

For the Balanced Case

- The state has successfully built a hydrogen fueling network using 100% renewable H2 and transported when necessary with ZEV trucks, H2 costs have dropped dramatically and so FCEVs and BEVs are competing on an equal TCO basis for long haul operations.
- BEVs continue to dominate MD vehicles and many HD vehicles. FCEVs and BEVs are competing on TCO and features roughly equally.

A New Barrier Should Be Included on the Potential Lack of Electrical Capacity Where and When Its Needed

Perhaps the most significant barrier to the timely installation of needed charger infrastructure is the ability of utilities to provide needed electrical capacity especially for larger projects such as for MHD vehicle hubs along freight corridors. Because it can take years to build new substations or install new distribution lines to support new DCFC charger hubs for MHD vehicles, it is critical that the utilities determine where to build out this capacity in advance of need and start this process many years in advance.

The CEC has created a tool called the "EVSE Development and Grid Evaluation" (EDGE) tool. Its purpose is to forecast gaps in needed electrical capacity to support forecast EV demand vs available utility capacity by Traffic Analysis Zone (TAZ)[27].

This tool is essential to provide the roadmap for the utilities on how, where and when they need to upgrade their distribution grids in advance of forecast need to avoid major charger install delays.

The preliminary results from the EDGE analysis in 2025 show that 13% of TAZs have no additional capacity. Another 58% have at most only 5 MW of headroom. These results are forecasting a pending crisis in shortage of capacity unless bold action is taken quickly to create more capacity.

Given this immediate challenge, the utilities need to take this gap data and preemptively upgrade their substations and distribution grids in advance of coming load and not wait for customer requests. Like the RETI program the CPUC needs to support the IOUs by upgrading their distribution grids in advance. While there is some risk to overbuilding, the risk is very small. This is because we know that CARB's ACC II and Advanced Clean Fleet rules will require significant and growing minimum EV Adoption rates, so the only downside to over building is that it may take an additional year or so before the new charging assets are more fully utilized.

<u>RECOMMENDATION #2</u> - A New Barrier Should Be Included entitled: "Insuring Adequate Electrical Capacity for Large Charging Projects When Needed

We recommend that a new Barrier entitled "4.1 Barrier: Insuring Adequate Electrical Capacity for Large Charging Projects When Needed" be added to the report under Part 4 and that because it is so important, it become the first barrier listed. In addition to the description of what this barrier is, under the solution portion 4.2, the following could be listed:

1. The CEC continue its efforts in earnest to improve the EDGE tool, so that it can produce detailed electrical capacity gap analysis results for all TAZs in the state including for all IOUs and POUs and share its resulting gap analysis with all these utilities and other key stakeholders.
2. Utilities begin immediately to use the EDGE tool results to determine where they currently or in future years will not have sufficient electrical capacity to support anticipated capacity needs and begin to plan for and upgrade their distribution grids expeditiously where needed to fix those shortfalls in time.
3. That the CPUC support this least regrets approach to building out in advance of customer requests to avoid disastrous delays that would otherwise occur and that to do this, it modify its Integrated Resource Plan (IRP) and General Rate Case processes and time frames to be able to respond more quickly to growing demands. The CPUC's proposed draft Freight Infrastructure Planning program[28] can be a big help on achieving these objectives.

[27] Second Assembly Bill (AB) 2127 Electric Vehicle Charging Infrastructure Assessment: Assessing Charging Needs to Support Zero-Emission Vehicles in 2030 and 2035 | California Energy Commission
[28] Freight Infrastructure Planning (ca.gov)

Address Equipment Supply Chain Delays

We recommend a new barrier and solution to Address Equipment Supply Chain Delays.

Significant delays in receiving transformers, switch gear and other electrical equipment are causing major delays in infrastructure install projects. And in light of accelerating demand with the electrification of transportation, buildings, etc,.this problem will only grow unless addressed.

The Joint EV Partners, (ChargePoint, EVgo, Electrify America, and Tesla) in their comments to the CEC[29], noted:

> **Provide more frequent updates to EV forecasts to inform the growing need for transformers and consider other policy tools that California may leverage to bolster production of transformers and other grid equipment**. Transformer shortages are impacting projects across the country and can cause project delays up to 24 months. This issue is a threat to California's broader electrification goals and is only expected to continue to grow in magnitude.[30] Evaluating the procurement process for transformers is important and identifying best practices amongst utilities can help reduce bottlenecks. For instance, it may be useful to procure and allocate transformers based on forecasts versus historical data given that electrification is growing at such a rapid pace. Additionally, California may consider manufacturing incentives to bolster the supply of transformers and other grid-related equipment.[31]

Franchesca Wahl of Tesla says their personal experience is often 18-24 month delays to get transformers.

RECOMMENDATION #3 - We recommend a new barrier and solution to Address Equipment Supply Chain Delays

In the solutions part of this barrier the following could be listed:

1. We recommend that the CEC convene an exploratory public workshop including key agencies and stakeholders (such as Go-Biz, the CPUC, the Department of General Services as well as other stakeholders such as EVSPs and utilities) to define all aspects of the nature of the critical electrical equipment supply chain, the causes of the shortages and actions that could be taken to solve this problem with the goal of significantly reducing delays currently occurring in the timely install of EVSE.
2. One option for financial aid would be to see if federal financial aid from the Inflation Reduction Act could help provide support for e.g. transformer manufacturers to expand capacity. This same approach may apply to other critically short materials.
3. The federal government could leverage the Defense Production Act to bolster manufacturing of transformers and other grid equipment.

[29] California Energy Commission : Docket Log

[30] During a presentation at the National Charging Initiative's Energize! Workshop at Roadmap 2023, a representative from Edison Electric Institute shared that transformer delays may last for 5 years or more without policy intervention.

[31] EVgo has also filed comments requesting that the federal government leverage the Defense Production Act to bolster manufacturing of transformers and other grid equipment.

RECOMMENDATION #4 - We recommend making the following suggested edits and additions.

1. **The statement that it takes an average of 6-8 years to install charging stations is incorrect.**

In the executive summary and elsewhere in the assessment it states. "First, *the current station development process may take an average 6 to 8 years per station*, which is too long to meet the needs for the initial viable network in 2025 and make it challenging to build the 2035 initial viable network." (Page 5, 43 and 48) (italics added)

We believe that this is overstated and recommend it should be revised to say, "it can take 2 to 8 years to build a large station" and remove the word "average". We are not aware that it takes leading charger installation vendors like Electrify America, Tesla and others 6-8 years on average to install a station.

Later in the Assessment where it is reporting on the 111 CEC EnergIIZE funded EVSE projects that were completed, it states: "The timeframe for these projects is two to three years to develop these stations once funding is allocated for construction." Page 89 (If more detailed information is desired, you could go to e.g., the IOU EVSE financial support programs for MHD BEVs for SCE, PG&E, SDG&E, Tesla, Electrify America, Black and Vetsch the CPUC, CEC and CPUC for data on time frames to construct EVSE projects.)

The Assessment's main point is that some of these projects can take a long time, and most take longer than they need to which we agree with. Actually, the single largest contributor to taking years to complete a project is all the effort it takes utilities to make major grid upgrades to support new large capacity requests. We address this in **Recommendation #2**.

2. **Funding Outlook (Pg 43)** "This estimate does not include costs necessary to upgrade the electric grid." We recommend adding this sentence. "**However, the CPUC has implemented a rulemaking that requires IOUs to cover the majority of these costs."**[32]

3. **Add Additional Projects, Plans and Financial Support Projects to Appendix 1.6 Existing Clean Infrastructure Plans and Projects Pg 88.**

   We recommend at least the following be added to this Appendix and could also be listed under the following categories as additional sponsor types:

   - **Private charging station networks**, which are developing zero-emission infrastructure independently.
     - Truck / Charging -as-a-service companies – you could list their specific projects that are operating or planned for
       - WattEV[33]
       - Zeem[34]

[32] 413061495.PDF (ca.gov)
[33] Home | WattEV | Electrifying Heavy Duty Transport
[34] Zeem (zeemsolutions.com)

        - Forum Mobility[35]
        - Terawatt Infrastructure[36]
    - Electrify America, others?
- **Zero-emission truck manufacturers**, that have expressed intent to invest in zero-emission infrastructure.
    - **Daimler Greenlane project** Daimler, NextEra and Blackrock are initially committing $650 million to build a national publicly accessible network of chargers for MHD electric trucks beginning in 2023.[37] The network will initially be along the West (Including California) and East coasts and the Texas Triangle by 2026.
    - **Volvo with Pilot**[38]
- **The CPUC** has authorized the IOUs grant up to a total of $700 million for Electric EVSE from 2025 - 2030[39]
- **Federal Tax credits** of 30% of the purchasing and installation costs of up to $100,000 per charger is available through 2032 from the Inflation Reduction Act (IRA).

One source of references to these and others can be found in the ACF Infrastructure Fact Sheet entitled "Charging Up Electric Trucks" [ACF Infrastructure Fact Sheet (ca.gov)] note that if you move your cursor over a described funding program in the document, a hidden hyperlink reference will become visible.[40]

4. **"Zero-Emission Needs in the Baja California and Baja Sur Region" (page 61)** We recommend adding a reference to CALSTART's White Paper – "Technology and Commercialization Pathways for Zero-Emission Medium- and Heavy-Duty Vehicles in Mexico" **[41]**

5. **Locations of chargers** – While we understand that it would not be appropriate to propose specific locations of recommended chargers to the address level, **we recommend that heat maps showing the most suitable general locations be provided as part of the Assessment.** There has been a tremendous amount of work to generate this data by the Assessment project team and partners and it will be very helpful to many stakeholders to be able to get a sense of generally where the highest priority locations for charger stations are and what might the optimal volume of ports at those locations be.

6. **New Tasks for the Central Delivery Team** (page 59) – The concept of the central delivery team is an important one. **We recommend that an additional responsibility of this team be to manage generally where, when and how many stations should be built including the estimated number of ports per station. Then this planned data should be tracked against actual progress**. Further, **we recommend that this team work with state grant making organizations to provide more funds for high priority**

[35] Home | Forum Mobility
[36] TeraWatt Infrastructure | EV Charging Solutions for Fleets
[37] Drive Greenlane | Press Release
[38] Volvo and Pilot Company partner to Build a National Public Heavy-Duty Charging Network (volvogroup.com)
[39] CPUC Adopts Transportation Electrification Program To Help Accelerate Electric Vehicle Adoption
[40] ACF Infrastructure Fact Sheet (ca.gov)
[41] https://calstart.org/wp-content/uploads/2023/01/CALSTART_Pathways_ZEMHDV_Mexico.pdf

locations and/or to fill important gaps along corridors that have insufficient chargers. A modification of something like the EnergIIZE Monitoring Dashboard map is a good format for tracking this.[42]

7. **Microgrids must utilize 100 % renewable energy or grid power.** We very much support the use of microgrids where they make sense especially in rural areas where grid power may not be available to support capacity needs for charging stations. However, in the Assessment it states, "Energy source: Microgrids can be powered by solar panels; propane, natural gas, and diesel engines; hydrogen; or wind turbines. Specific site features and other factors, such as the companies involved in building the station, may determine which power source may be best suited for each station." (Page 68) **We recommend that the Assessment should not include any mention of the use of any fossil fuels such as propane, natural gas or diesel** since this violates the whole purpose of moving to ZEVS that will also utilize carbon free sources of fuel.

8. **Under representation of benefits of ZEVs** – The Assessment focuses on many potential challenges to transition to ZEVs but to give a balanced perspective, **we recommend that either in section 4.4 Barrier: Economic viability of the transition for fleet owners (Pg. 51) or elsewhere in the report there be articulated some of the many benefits of ZEVs.** Some of these could include for example:
    - The cash savings to be realized by the positive TCOs of many of the BEV MHD vehicles even today.
    - Reduced financial risk from the price volatility of fossil fuels.
    - Easier recruiting and retention of drivers who love driving ZEVs for so many reasons.
    - Less maintenance costs and downtime for routine maintenance and improved reliability of ZEVs reducing unscheduled downtime.
    - Improved driving performance of BEVs in terms of acceleration, ability to operate at normal speeds going up hills and improved turning radius.
    - Potential Enhanced Safety of BEVs due to lower center of gravity and other safety features of electric drive trains.
    - Reduced costs to the economy in goods shipment.

Thank you for considering our thoughts and recommendations. We wish you all the success in a great final report that can make its contribution towards getting charging /re-fueling infrastructure installed where it's needed in time to promote rapid transition to MHD ZEVs.

Sincerely,

Ray Pingle
Lead Volunteer, Transportation Electrification Campaign
Sierra Club California

Jason John
Associate Director
Sierra Club California

[42] EnergIIZE Monitoring Dashboard (arcgis.com)

California Transportation Commission
1120 N Street, MS 52
Sacramento, CA 95814

CC: Hannah Walter, Associate Deputy Director, Kayla Giese, SB 671 Assessment Coordinator

October 26, 2023

The undersigned 4 companies provide these group comments on the California Transportation Commission's (CTC) Clean Freight Corridor Efficiency Assessment. These comments are informed by our collective commercial focus on providing electric vehicle (EV) charging solutions for fleets in California to meet emissions reduction targets.

As a pioneer in all classes of vehicle electrification, California is looked to nationally as a blueprint for the electrification strategies of the federal government and numerous states. Therefore, the importance of this assessment in laying down the framework for regional and national replication should not be understated. We thank the CTC for its work in developing this comprehensive assessment and appreciate the efforts that the CTC and other California state agencies are making to support a coordinated, demand-aligned buildout of California's fleet EV charging infrastructure. Our comments are included below.

Sincerely,

Anthony Harrison, TeraWatt Infrastructure
Adam Browning, Forum Mobility
Henrik Holland, Prologis
Suncheth Bhat, EV Realty

Introduction -
We thank the CTC for its work to develop this comprehensive Assessment which provides a clear path forward for the expansion of California's charging infrastructure for battery electric commercial vehicles (BEVs). Coordinated development of a statewide network of charging infrastructure for these vehicles will provide surety and reliability to fleets in their transition to zero-emission operations. We strongly support the work of the CTC in developing this framework so that industry partners can align their own development plans with those of state level funding programs and Califonia's state and regional policy objectives. As the Assessment is further refined by public comments, we encourage the CTC to consider these key recommendations:

Include all corridor-serving fueling infrastructure in state planning -
Highway infrastructure planning generally takes a corridor oriented approach, often limited by the scope of a project to a corridor's right-of-way (ROW). However, a significant amount of BEV fleet charging infrastructure will be built in areas not located within a highway ROW that still serve a corridor. These areas include fleet depots, warehouses, ports, and other logistics hubs. This infrastructure will enable short- and medium-haul logistics, with many fleets leveraging shared depots in a hub-and-spoke model for regional operations with opportunity charging filling in gaps for long-haul routes. As this will be a significant portion of commercial BEV charging capacity in California, it is important that it be reflected in the CTC's infrastructure planning so that this model can be scaled alongside opportunity charging stations.

The operational changes in fleet business models that are needed to support a BEV conversion will require near-perfect technological reliability and known windows of accessibility to be viable. Therefore, fleets may not see opportunity charging sites similar to modern gas stations located along a route as enough to support their operations. Many of these sites may not have the requisite utility infrastructure to support high-powered fast charging, including megawatt charging when it is commercially available, or the number of chargers required to meet demand, and fleets need to manage their charging operations in order to reduce fueling costs and account for longer dwell times. Due to this, many fleets will rely on shared, purpose-built high powered depot charging sites that serve their operations along their service routes.

This infrastructure will comprise a large portion of California's BEV fleet charging infrastructure, as studies have estimated that 75%-90% of medium- and heavy-duty vehicle charging will occur at a depot location, rather than along a corridor at a "traditional" fueling station[1]. Therefore, we recommend that this infrastructure be included as a priority in state electrification planning, including this Assessment, so that there is a broader view of the current and future capacity of California's BEV fleet infrastructure. This approach will help state leaders as they

[1] Atlas Public Policy, U.S. Medium- and Heavy-Duty Truck Electrification Infrastructure Assessment

determine where to target investment in BEV infrastructure.

Highlight the benefits of the shared depot model for fleets during initial transition years - In the first years of fleets transitioning to BEVs, a significant portion will rely on the shared depot model to serve as a central fueling hub which will be supported by opportunity charging infrastructure along their routes. By contracting with a third party fueling provider, who manages the design, build, financing, operations, and maintenance of the facility, fleets can reduce up-front capital investment needs and access reliable, accessible charging infrastructure at a lower cost and on a shorter timeframe than developing their own zero-emission fueling depot. As multiple fleets and independent owner-operators will be able to use a shared depot facility, these sites should be considered "publicly accessible" and captured in state level electrification planning accordingly.

Leveraging this BEV charging model has several benefits to fleets. Most significantly, it means that fleets can increase their investments in BEVs rather than charging infrastructure, in turn enabling them to reach regulatory requirements on a faster time frame. Many existing fleet depots are also unable to support BEV charging at scale, creating an immediate barrier to decarbonization. Over the lifetime of the facility, a site host will be able to optimize charging operations so that fleets maximize their total cost of ownership savings. Finally, this model allows fleets to trial BEV operations at a larger scale than they would be able to using their own, driving adoption and creating more industry support for fleet transitions at scale. We encourage the CTC to highlight this model in the Assessment, as well as the charging capacity that planned investments in shared charging depots will provide to fleets over the coming years so that fleets are aware of its benefits.

Continue to develop innovative solutions to expedite BEV uptake and charging infrastructure deployment -
We appreciate the CTC's acknowledgement of key barriers to commercial freight decarbonization, as well as the forward looking recommendations for policy changes in Section 4 that can enable expedited BEV uptake and charging infrastructure deployment. We strongly support the CTC's recommendations on expanded vehicle incentives and lowering up-front capital investment needs for fleets to transition to BEVs. The policy recommendations included in the Assessment would significantly reduce this investment need and create more cost parity between BEVs and diesel trucks. We encourage the CTC to continue to advocate for expanded incentives for vehicles and to continue engagement with fleets of all sizes so that their feedback on this Assessment can continue to be reflected in future policy.

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www.tesla.com/contact

October 26, 2023

California Transportation Commission
1120 N St
Sacramento, CA 95814

RE: Comments on the California Transportation Commission's Draft Senate Bill 671 Clean Freight Corridor Efficiency Assessment

Dear Transportation Commission Staff,

Tesla appreciates the opportunity to submit these comments on the California Transportation Commission's (CTC) Draft Senate Bill (SB) 671 Clean Freight Corridor Efficiency Assessment. As an initial matter, Tesla strongly supports efforts by the CTC and other agencies to proactively identify and promote the development of the infrastructure that will be needed to support the transition to Zero Emission Vehicles (ZEVs). Given the extensive lead times required to plan, permit, and deploy this infrastructure at any meaningful scale, efforts like this are essential if the state has any chance of achieving the ambitious ZEV adoption goals it has set for itself. Below we offer some brief thoughts and recommendations that we hope the CTC will consider before adopting the final version of this report.

The Assumed Use Cases and Specifications for Battery Electric Vehicles Should be Revised/Clarified

Despite our overarching support for this effort as well as our general alignment on the various policy recommendations in the report, we do have some concerns regarding the underlying assumptions used by the CTC in its analysis. Specifically, Tesla is concerned that a number of the assumptions with respect to the capabilities and specifications of battery electric vehicles (BEVs) may reflect an overly narrow view of the use cases and applications that battery electric vehicles can address. As currently drafted, the report appears to embrace the notion that BEVs are best-suited to relatively short-haul applications, while hydrogen vehicles will be used to serve longer-haul operations. Tesla strongly disagrees with this perspective.

The fundamental assumption of the respective domains in which BEVs vs fuel cell vehicles (FCVs) play is highly contestable. For example, in sharp contrast to the CTC's apparent assumptions, the International Council on Clean Transportation (ICCT) offers a very different perspective on the anticipated role of fuel cell vehicles in the Medium Duty/Heavy Duty (MD/HD) space. In a recent study from the ICCT that analyzed the infrastructure needs nationally to support MD/HD ZEV adoption through 2030, the ICCT found that "there is no case of positive Total Cost of Ownership for hydrogen trucks relative to battery electric trucks."[1] Tesla is not advocating that FCVs be taken out of this analysis, but we think it is important to highlight that it is by no means a settled issue that FCVs will be the dominant technology used in regional and long-haul applications.

It should come as no surprise that Tesla has concerns with the CTC's assumptions in this regard, given our development and deployment of the Tesla Semi, a battery electric Class 8 tractor trailer designed to support regional and long-haul services. The Tesla Semi comes in two variants, a 300-mile range version and a 500-mile range version. Tesla recently completed its delivery of 36 of these vehicles (500-range variant) to PepsiCo which are now in active operation. We are now moving forward with expanding our production capacity in Nevada in 2024 to support higher volume production in the future. Several of the assumptions used in the CTC study as provided above do not align with the use of HD BEVs for long haul and regional freight. The battery size would be significantly greater than 300 kWh, the range assumed in the CTC study is significantly lower compared to the

[1] "Near-Term Infrastructure Deployment to Support Zero-Emission Medium- and Heavy-Duty Vehicles in the United States"; Pierre-Louis Ragon, Sara Kelly, Nicole Egerstrom, Jerold Brito, Ben Sharpe, Charlie Allcock, Ray Minjares and Felipe Rodríguez; International Council on Clean Transportation; May 2023; https://theicct.org/wp-content/uploads/2023/05/infrastructure-deployment-mhdv-may23.pdf

range of the Tesla Semi, and the assumed efficiency numbers are also significantly worse than what Tesla anticipates from our heavy duty offering.

Notably, the operation of these vehicles and their capabilities have been validated through the enrollment of a number of Tesla Semis deployed by PepsiCo in the North American Council for Freight Efficiency's Run On Less multi-week trucking event, which unambiguously demonstrates the viability of the Tesla Semi in meeting the needs of regional freight operations.[2] Pepsi's press release issued following the event provides a helpful distillation:

> "The Tesla Semis being deployed out of Sacramento run two different types of routes: long-haul routes that transport between 250 and 520 miles per run and with a gross vehicle weight plus load of up to 82,000 lbs.; And 18 different delivery routes where the trucks cover less than 75 miles per day, hauling a diminishing load that leaves nearly full and lightens throughout the day as deliveries are made.
> The three Tesla Semis participating in the Run on Less are driving slip-seated long-haul transport routes. After two weeks (Sept. 11 – Sept. 23), these Semis have accumulated a total of 19,122 miles. Approximately 65 percent of miles driven during the first two weeks of Run on Less were loaded to a gross vehicle weight plus load of over 70,000 pounds. The program has also demonstrated the capability of megawatt charging in transport operations enabling slip-seat, continuous transportation capabilities with an electric vehicle."[3]

Tesla defers to the CTC in terms of whether taking a more expansive view of the role that BEVs can play in longer-haul use cases would alter the selection of the priority corridors (we assume it would not) but it seems likely that these assumptions would impact the type, scale, and spacing of infrastructure that the CTC finds would be needed to support the transition to ZEVs on these corridors. As an initial matter, the view that BEVs have only a limited role in supporting goods movement on longer routes will result in underinvestment and/or misaligned investment in the charging infrastructure needed to support BEVs engaged in long-haul and heavy freight operations on these corridors.

We recognize that the CTC included a number of different technology adoption scenarios, including an accelerated battery electric vehicle adoption scenario. However, it is not apparent in the report if the assumed specifications of the battery electric vehicles modeled in these scenarios remain the same as what is reflected in Exhibit 12, or if instead, the modeling assumes a diverse set of capabilities including recognition of the now proven ability of BEVs to address long-haul and regional use cases. To the degree these assumptions remain unchanged, and the modeling of categorized vehicles with these specifications into regional or long-haul use cases for which they are not appropriate, then we would be concerned that the modeling results will indicate far more stations would need to be deployed, and far more costs incurred, relative to what Tesla would anticipate given the capabilities of the Tesla Semi. Given these concerns, Tesla would encourage the CTC to consider updating its modeling with a more realistic set of assumptions for battery electric vehicles, recognizing the availability of BEVs with capabilities that are aligned with regional and long-haul freight operational needs. Or, if the modeling already appropriately reflects the capabilities of BEVs in the regional and long-haul operations, this needs to be clarified and made more explicit in the body of the report.

Additional Funding Support for Fleets in the Near Term will be Critical to Driving Scale and Promoting Early Adoption

Tesla agrees with the views expressed in the report regarding the important role of state funding and other means of providing financial support to fleet operators to help catalyze the transition to ZEVs. Tesla is bullish on the economic advantages that heavy-duty battery electric vehicles will offer relative to conventional vehicles as measured by total cost of ownership. However, the higher upfront cost that exists today between a BEV and a conventional vehicle coupled with the perceived technology risk of deploying BEVs both stand as significant barriers to near-term adoption. Incentive programs can play a helpful role in overcoming these hurdles.

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[2] See https://results-2023.runonless.com/

[3] See https://www.pepsico.com/our-stories/press-release/pepsico-beverage-s-sacramento-based-electric-fleet-is-driving-progress-toward-pepsico-s-net-zero-emissions-goal-in-nacfe-run-on-less-trucking-event2

Tesla observes that the example incentive programs identified in the report do not mention the Hybrid and Zero Emission Truck and Bus Voucher Program (HVIP) overseen by the California Air Resources Board. This program offers meaningful incentives specifically structured to overcome the cost differential between conventional MD/HD trucks and buses and ZEV alternatives. This program, though relatively well-funded, has also been subject to a number of reforms over the past few years which have dramatically limited the ability of larger fleets to participate.[4] By effectively excluding larger fleets, who are best positioned to incorporate ZEVs into their operations, these reforms have impaired the efficacy of this program in accelerating the adoption of MD/HD ZEVs in advance of obligations under the Advanced Clean Fleets Regulation. We mention this because if not for these reforms, HVIP could serve as the program that the CTC appears to be envisioning in the report where it discusses the idea of a legislatively established, five-year zero emission truck incentive program. Tesla would not oppose the creation of such a program but recognizing the realities of securing additional funding for such a purpose, we believe there is an opportunity for the CTC to work with CARB to amend and more effectively leverage HVIP funding to support ZEV adoption.

Tesla appreciates the opportunity to submit these comments to the CTC and looks forward to working with the Commission on these important issues going forward.

Sincerely,

Andrew Schwartz
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[4]As amended, fleets with more than 500 vehicles are subject to a number of requirements under HVIP that makes it challenging to participate in, including a minimum purchase requirement pursuant to which a fleet must purchase at least 30 ZEVs after which only subsequent vehicles would be eligible for incentives and a requirement that any incentivized vehicles be domiciled in disadvantaged communities.

VOLVO

2023-10-25

California Transportation Commission

Sacramento, CA

Re: Comments on the California Transportation Commission's SB 671 Clean Freight Corridor Efficiency Assessment

Dear Hannah and Kayla

Volvo Group North America (Volvo Group) welcomes the opportunity to provide comments to the California Transportation Commission's SB 671 Clean Freight Corridor Efficiency Assessment. We have been an active participant in this activity and in general support the findings outlined in the draft of the Assessment document. The corridors identified, especially the "Top 6," are where the bulk of California's freight transport takes place now, so logically those are the corridors that should be the first to transition to zero emission technology. The State's goals and regulations make these corridors a high and immediate priority.

The report correctly calls out that the transition to zero-emission (ZE) medium- and heavy-duty (MHD) vehicles depends on the infrastructure to support the vehicles.— Today, a public infrastructure barely exists and faces numerous barriers that were enumerated in the draft report. The Advanced Clean Trucks (ACT) and Advanced Clean Fleets (ACF) regulations commence next year, so we would suggest that the recommendations convey a greater sense of urgency to serve the coming influx of vehiclessince the ACF rule has a clause that allows fleets to delay compliance if infrastructure is not available or cannot be completed in a timely manner.

Timing Out of Sync

The report notes that the first barrier to building out this infrastructure is the time needed to develop, build and energize the critical charging/refueling stations. In the report, an average development time of 6 to 8 years was cited, which clearly does not synch up with the imminent start of the ACT and ACF regulations. The "solution" proposed of streamlining the infrastructure development process is a good step, but the details remain undefined. The suggestion of granting these projects a California Environmental Quality Act (CEQA) exemption is welcome, but it's not clear whether that could be accomplished without legislative direction.

The idea of establishing a "central delivery team," coordinating the disparate activities of various state agencies, also lacks definition o how they will be able to affect the dramatic shift from the 6-8-year timeline. We have evidence of private companies being able to establish MHD public charging stations in less than two years[1], but they appear to be the exception to the norm. There are a variety of hurdles, including those of slow local permitting, CEQA issues and specified timing for energization by the utility (something addressed in the recently passed and signed SB 410[2]).

We believe a group such as the central delivery team needs to be vested with some authority to truly move the needle in the delivery of charging/refueling infrastructure. Having the authority of the Governor's Office would help give weight to its recommendations and help direct funds for a timely transition to zero-emission technology. If this group is to be effective, it needs to have the power to drive changes in the accepted order that the current paradigm will not meet the state's goals. Currently, the state's direction is filtered through multiple agencies and that dilutes the ability of the state's financial support and regulatory direction to have the impact it needs to have.

We were disappointed that the report presented a passive acceptance of the California Public Utility Commission's (CPUC) Freight Infrastructure Planning process and its projection that needed upgrades for near-term infrastructure would not be applicable for less than five years. We would suggest upgrading the engagement "to identify short-term solutions" with the CPUC as a high priority.

The report's recommendation that funding to assist fleets in acquiring zero-emission vehicles, as well as providing financial support for needed infrastructure, is fundamentally sound. Because of the nascent nature of transportation electrification, that support appears to be a critical need throughout the decade in order for the ACT and ACF to be successful.

The other recommendations in the report for improvement in transportation electrification are also worth further consideration.

We look forward to continuing our productive work with the California Transportation Commission, other state agencies and stakeholders to support the transition to the cleanest transportation in the Golden State while ensuring all communities benefit, especially those overburdened by air pollution and other negative effects of freight movement.

[1] WattEV's Port of Long Beach station.
[2] https://www.edf.org/media/governor-newsom-signs-bill-help-californias-power-grid-keep-states-transition-electric

Kind regards,

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About the Volvo Group

Volvo Group drives prosperity through transport and infrastructure solutions, offering trucks, buses, construction equipment, power solutions for marine and industrial applications, financing and services that increase our customers' uptime and productivity. Founded in 1927, the Volvo Group is committed to shaping the future landscape of sustainable transport and infrastructure solutions. The Volvo Group is headquartered in Gothenburg, Sweden, employs some 100,000 people worldwide, and serves customers in more than 190 markets. Volvo Group North America, with headquarters in Greensboro, NC, employs more than 13,000 people in the United States and operates 11 manufacturing and remanufacturing facilities in seven states. In 2022, the Volvo Group's global net sales amounted to about $47 billion.

In California, the Volvo Group and its dealers employ more than 1,000 people with locations in Costa Mesa, Mountain View, Corona, Hayward, Fontana, Stockton, Fresno, La Mirada, and other locations. Volvo Group is in the process of training and certifying dealers to sell and service its electric products. Currently, dealers at four locations in California have been certified as Class 8 electric vehicle dealers, with more expected to be added soon.

Volvo Group's Electromobility Solutions

The Volvo Group has spent years developing complete solutions for electromobility, and today – in North America – we are selling five configurations of the Volvo VNR Electric[3] truck, the Mack LR Electric[4] waste hauler, the Mack MD Electric[5], five

[3] https://www.volvotrucks.us/trucks/vnr-electric/
[4] https://www.macktrucks.com/trucks/lr-series/lr-electric/
[5] https://www.macktrucks.com/trucks/md-electric/

electric Volvo Construction Equipment models[6], and the Nova Bus LFSe+ electric bus[7]. Both Class 8 truck models are assembled exclusively in the U.S. for the North American market. While battery-electric vehicles are a suitable solution for local goods distribution, city buses, regional haulage and similar applications, hydrogen fuel cells (to power the electric driveline) will be a viable option for heavy transport and challenging long-haul applications. For use cases involving heavier loads and/or longer distances, the weight of the batteries themselves becomes a limiting factor, and hydrogen fuel cells are likely to be an interesting alternative.

With this in mind, the Volvo Group has formed cellcentric, a joint venture with Daimler Truck AG to accelerate the development, production, and commercialization of fuel cell technology for Class 8 vehicle applications in the second half of this decade. Volvo Group appreciates the efforts to develop a refueling infrastructure to support the future deployment of fuel cell Class 8 vehicles and sees this as an important investment. Fuel cell Class 8 vehicles will need demonstration projects to further prove their role in the commercial vehicle world.

Within the Volvo LIGHTS[8] project in California, we have successfully demonstrated the viability of battery-electric Class 8 trucks in real-world applications, putting 30 battery-electric Class 8 trucks in commercial operations across 11 different fleets.

The Volvo Group is the first traditional truck manufacturer to sell battery-electric Class 8 trucks to customers and is the current market leader with more than 48 percent of the battery-electric Class 8 truck market. Based on this experience, and our ongoing ZE product development efforts, our biggest concerns about the Class 8 truck market are not related to technology viability, but rather factors beyond our control that are critical to ensure a conducive market environment.

[6] https://www.volvoce.com/global/en/our-offer/emobility/
[7] https://novabus.com/blog/bus/lfse-plus/
[8] https://www.lightsproject.com