

Memorandum

To: CHAIR AND COMMISSIONERS

CTC Meeting: June 28-29, 2023

From: TANISHA TAYLOR, Interim Executive Director

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Subject: Clean Freight Corridor Efficiency Assessment (SB 671) Update

Summary:

California Transportation Commission (Commission) staff will present draft Senate Bill (SB) 671 material in the areas listed below.

1. Projects that could achieve the goals of the Assessment
2. Potential sponsors of projects that could achieve the goals of the Assessment.
3. Barriers and potential solutions to achieving the goals of the Assessment and the deployment of zero-emission medium- and heavy-duty vehicles.
4. The impact on roads and bridges due to the increased weight of zero-emission vehicles.
5. Methods to avoid displacement of residents and businesses on the freight corridor when considering projects that achieve the goals of the Assessment.
6. Potential funding opportunities for project types.
7. Benefits from the deployment of zero-emission medium- and heavy-duty vehicles.

Background:

The March 2023, SB 671 Commission meeting update identified six top freight corridors upon which a minimum viable network of public freight charging and hydrogen fueling stations (minimum viable network) could be built. This minimum viable network helps identify key locations for zero-emission medium- and heavy-duty vehicle infrastructure the state should prioritize for its transition to zero-emission medium- and heavy-duty vehicles.

Although public and private zero-emission freight stations needed across the state to support the transition to zero-emission medium- and heavy-duty vehicles was assessed, the Clean Freight Corridor Efficiency Assessment (Assessment) focuses on the minimum viable network needed in 2025 and 2035, along with the associated cost and time needed to build these stations.

1. Projects that could achieve the goals of the assessment

To achieve continuity in freight transport across the assessment's top 6 priority freight corridors presented at the March 2023, Commission meeting, stations will need to be located within 50 miles of each other for battery electric vehicle stations and 270 miles for hydrogen fuel cell electric vehicle stations along the corridors. The resulting public minimum viable network for clean freight infrastructure could consist of 75 to 85 charging stations for battery electric vehicles and 15 to 20 stations for hydrogen fuel cell electric vehicles. Beyond this public "minimum viable network" of zero emission vehicle fueling stations, future stations can branch out from the established early freight routes to ensure a connected network. A summary of the six priority freight corridors and potential minimum viable network can be found in attachment D.

Taking a sequential "corridor development approach" to station development enables a connected, continuous charging and fueling network along the top freight corridors. A well-planned corridor approach enables goods to be moved throughout the state using zero-emission infrastructure even before the minimum viable network is completed in its entirety - for example, from Los Angeles to Oakland along Interstate 5. A corridor development approach could prevent unorganized station development, which may result in station islands or station deserts that could limit freight journeys and the freedom of zero emissions medium- and heavy-duty truck movement. Gaps in station coverage across the state due to poorly planned station rollout would not support the business needs of fleet owners.

SB 671 requires the Commission consider where microgrids could be deployed for zero-emission charging. Microgrids improve resiliency and are helpful additions to charging stations as sources of back-up power when electric grid power is unavailable, or as sources of additional power when paired with things like onsite solar power generation. Microgrids can be expensive, and when paired with alternative power generation, can also take up considerable space. Decisions about where microgrids could be most useful and what type of function the microgrid could serve should be made on a station-by-station basis.

2. Potential project sponsors

A potential sponsor for zero-emission infrastructure projects would ideally be an agency or organization that supports the effort, not only through financial co-investing, but also through project and operational leadership. Sponsors for public infrastructure could come from both the public and private sector.

Public sponsors that could lead station development projects locally include Regional Transportation Planning Agencies (RTPAs), Metropolitan Planning Organizations (MPOs), and/or Air Quality Management Districts (AQMDs) throughout the state. These entities could be strong candidates because they plan infrastructure projects at their local levels 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 build out the public network. Potential private sponsors for station development projects could include:

- Truck stops and gas station companies that have already expressed interest in adding zero-emission freight charging to some of their existing locations.
- Private charging station networks that are developing zero-emission infrastructure independently.
- Zero-emission truck manufacturers that have also expressed intent to invest in zero-emission infrastructure.

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

3. Barriers and Potential Solutions to Achieving the Goals of the Assessment

When considering the feasibility of charging and fueling station development to achieve California’s 2035 air quality goals, three key potential barriers and solutions emerge:

Key barriers	Key solutions
A. Timing and sequencing of corridor station development	A. Streamline clean freight infrastructure development and create a central delivery team
B. Economic viability of zero-emission transition for fleet owners	B. Support fleet owners with the cost of transition
C. Complex ecosystem of potential stations and stakeholders	C. Create a corridor-first approach

A. Barrier: Time and sequencing of corridor station development

The existing station development process could need simplification and process streamlining to meet zero-emission transition deadlines established by the California Air Resources Board’s [Advanced Clean Trucks](#) and [Advanced Clean Fleets](#) regulations. The current station development process could take 7-10+ years per station, based on the current time required for permitting and pre-construction activities (3 to 5+ years), construction (3 to 5+ years), and grid upgrades. This station development timeframe makes it challenging to build the number of stations needed in each of the Assessment’s four study years (2025, 2030, 2035, and 2040), particularly in the early years.

A. Solution: Streamline the clean freight infrastructure development process

To address the timing and sequencing barrier and ensure the rollout of an incrementally useable and operational network of stations, the state could take the following steps to streamline the station development process.

An analysis was conducted to identify potential opportunities to streamline the station development process. Two potential solution areas were identified and are summarized below:

i. Streamline the zero-emission station development process

There are some potential actions the state could consider that would address the timing challenge. When implementing these recommendations, state agencies should align with state and federal law and, where feasible, recommend legislative changes to further streamline the process while protecting the environment and ensuring public accountability.

Recommendations for streamlining zero-emission station development

- Shorten/simplify public state agency applications for funding and synchronize award timelines.
- Align state and local funding with other key processes (e.g., permitting, grid upgrades) to facilitate timely funding awards aligned with infrastructure delivery needs.
- 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 applicable local municipality guidelines.
- Consider pursuing a Categorical Exemption from the California Environmental Quality Act for zero-emission freight charging and hydrogen fueling stations.
 - Streamlining and simplifying this process for zero emissions stations could result in significant savings for the state and for project sponsors.
 - Within the framework of a coordinated state-level approach, some stations could also be eligible for Programmatic Environmental Impact Report processes. A Programmatic Environmental Impact Report could reduce the time a project spends in the Planning Approvals and Environmental Documents development phase. The state could bundle the environmental review for similar projects along the minimum viable network to streamline their development.
- Seek to expedite National Environmental Policy Act permitting for zero emissions station development.
- Take a corridor development approach to batch and sequence station development. Project sequencing should be considered as the minimum viable network is developed. This will enable useable segments prior to completion of the entire network.

ii. Equip a central delivery team to lead statewide network development using a corridor development approach

A central delivery team focused on developing freight corridors – rather than just an individual station – could ensure a streamlined and coordinated station delivery process and support a timelier completion of the minimum viable network. The central delivery team could include both a statewide public agency to oversee statewide development, as well as local public agency leads (such as Regional Transportation Planning Agencies or Metropolitan Planning Organizations) to coordinate station funding, permitting, and development at the local level. The site knowledge of a local group, combined with the funding, state permitting, and the corridor focus of a statewide agency, could position the state to achieve the goals identified in SB 671.

Recommendations for a central delivery team

- Create a central delivery team by designating one agency, such as the Governor’s Office of Business and Economic Development, the California Energy Commission, the California State Transportation Agency (CalSTA), the California Department of Transportation (Caltrans), or the Commission to act as a lead in coordinating zero-emission freight infrastructure planning and implementation.
- Require the central delivery team 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 engage with to build stations in a timely manner. Require, to the extent feasible, state, and local public agencies coordinate with the central delivery team to plan and implement projects.

B. Barrier: Economic viability of the transition to Zero Emissions Vehicles (ZEV) for fleet owners

The transition to zero-emission vehicles, and the corresponding infrastructure development required to sustain the transition, could negatively impact fleet owners, both those who operate entirely within California and those who must travel across borders to do business in California.

Large, upfront capital costs to buy zero-emission trucks could deter fleet owners from purchases, even though zero-emission vehicles may have lower long-term operating costs. It may deter fleet owners located outside of California from doing business in the state. For fleet operators located in Mexico, who facilitate a great deal of international commerce across the United States and Mexico border, the cost of transitioning to zero-emission fleets may dissuade international fleets from entering the state.

The McKinsey Center for Future Mobility estimates that battery electric vehicle medium-duty trucks will reach parity in total cost of ownership with internal combustion engine medium-duty trucks by 2026, and battery electric vehicle heavy-duty trucks will reach cost parity in total cost of ownership with internal combustion engine heavy-duty trucks by 2036. The McKinsey Center for Future Mobility also estimates that fuel cell electric vehicle medium-duty trucks will reach cost parity in total cost of ownership with internal combustion engine medium-duty trucks by 2032, and fuel cell electric vehicle heavy-duty trucks will

reach cost parity in total cost of ownership with internal combustion engine heavy-duty trucks by 2033. Fleet owners and other stakeholders on the SB 671 workgroup have voiced concern about the lack of public infrastructure currently available to power zero-emission trucks. In addition, SB 671 workgroup stakeholders have also voiced concern about resale values for medium-and heavy-duty zero-emission trucks.

B. Solution: Support fleet owners through the zero-emission vehicle transition

The Advanced Clean Trucks regulation mandates that all new truck sales in California be zero-emission by 2035, but current demand for these trucks remains low. Fleet owners have concerns about the ability to power zero-emission trucks in the short-term without the widespread presence of public infrastructure. Fleet owners have also voiced concern about the financial feasibility of purchasing zero-emission trucks, as the upfront costs are often significantly higher than those for traditional internal combustion engine vehicles.

To address these concerns, the state could commit to supporting the timely construction of public zero-emission freight infrastructure, inclusive of grid capacity upgrades, and to support strategies to generate and deliver hydrogen safely, sustainably, and affordably.

Financially, proactively aligning funding programs to facilitate a transition to zero-emission trucks is important. Existing funding programs at the federal and state level could be coordinated to help relieve the financial burden of zero-emission truck and station development costs for fleet owners. Coordination is beginning to occur; however, it is important that existing funding programs are reviewed and aligned, where feasible.

One example of an existing funding program that provides fleet owners support in the transition to zero emissions vehicles is the Low Carbon Fuel Standard program, which is sponsored by the California Air Resources Board. The Low Carbon Fuel Standard Program offers “capacity credits” to companies based on the amount of clean energy their zero-emission infrastructure is designed to produce. This program helps provide fleet owners with sufficient financial confidence to begin transitioning to zero-emission trucks. The state could consider implementing similar programs to provide reimbursement for things like electric infrastructure development or truck purchases to further support the transition to zero-emission freight, especially in areas of lower demand and income.

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

- Where feasible, align funding programs that facilitate a transition to zero-emission trucks.
- Review existing incentive programs and solicit stakeholder feedback to ensure existing incentive programs provide the best possible support for fleet owners.
- Consider creating a funding program similar to the Low Carbon Fuel Standard program, but with the intent of supporting electric infrastructure buildout.

- Consider how the state may support Mexico-based fleets, who must move freight in and out of California, in the transition to zero-emissions. Specifically, consider the recommendations from the [Zero-Emission Freight Transition at the California and Baja California Border](#) memorandum.

C. 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, including local permitting agencies, utility companies, city, and county governments, RTPAs and MPOs, ports, the California Public Utilities Commission (CPUC), the California Energy Commission (CEC), private entities like start-up companies, and established corporations like beneficial cargo owners and fleets. It is important to ensure coordination amongst these groups to facilitate the timely development of zero-emission freight infrastructure.

As the public network is developed, the state will need to have a consistent focus on equity and accessibility (for example, to ensure that potentially underserved station locations are not overlooked in station build-out).

A central delivery team could participate in the Zero-Emissions Freight Infrastructure Planning workgroup led by the CPUC. This effort establishes a process for developing common data inputs between state agencies like the CPUC, the CEC, Caltrans, and the Commission for zero-emission infrastructure planning, and implements a medium- and heavy-duty Integrated Energy Policy Report (CEC energy needs forecast report) that considers potential energy needs including the impact of recent regulations.

C. Solution: Create a corridor-first approach

Building zero-emission infrastructure involves a complex ecosystem of site development locations and stakeholders throughout the state. The effort requires accountability to ensure all locations in the minimum viable network are developed equitably as part of a public network.

To help ensure a timely and successful implementation of the public minimum viable network, the state could identify a central delivery team that works with all stakeholders to develop an implementation plan. This central delivery team could help ensure that stations are sequenced in a manner that provides full coverage along the top 6 freight corridors first. The central delivery team could maintain a neutral, network-wide focus to mitigate any conflicts and ensure the effort remains on schedule.

One key consideration for the state is the importance and complexity of goods movement across its border with Mexico. Truck companies based in Mexico, that operate in California, are subject to California's Advanced Clean Fleets regulation. Those companies do not currently have zero-emission trucks, electric grid capacity, or regulatory policy to support the underlying zero-emission freight movement at the border. The transition to zero-emission vehicles is particularly complex for this region. In 2021, the corridors connecting California to Mexico handled \$71.8 billion worth of freight goods. A smooth transition that maintains freight movement will be critical for both economies due to the region's significance to the trade relationship between the United States and Mexico.

A solution to this barrier could mean collaboration between the central delivery team and Mexico to facilitate goods movement across affected corridors, and to help identify strategies for how to implement zero-emission freight in this region. The recommendations related to this proposed solution are covered above under “Recommendations for a central delivery team.”

4. The impact on roads and bridges due to the increased weight of zero-emission vehicles

Zero-emission battery electric trucks may introduce heavier axle loads than current internal combustion engine trucks onto roadways, since their battery and drive train typically contribute to a heavier vehicle weight than internal combustion engine trucks. These heavier loads could increase roadway wear and damage and increase maintenance costs. This is especially true in the case of the larger heavy-duty battery electric trucks. Anticipated increases to road maintenance costs are estimated to range between \$4.7 billion and \$6.2 billion cumulatively from 2024 to 2040.

Stakeholders indicate heavier trucks also pose a challenge for fleets because businesses do not want to run the risk of having a truck that is over the weight limit. Some stakeholders indicate their plan is to deliver the same amount of goods using more trucks to avoid having an overweight truck. This practice may increase the cost of goods for consumers.

Due to technological advancements around battery technology, the weight differences are expected to decrease over time. Most vehicle classes and powertrains are estimated to be comparable in weight to diesel by 2050. More details will be presented in the final Assessment.

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

As the Commission considers the implications of zero-emission trucks' increased weights in the near- to medium-term, the following potential actions were developed for consideration:

- Caltrans and the Commission could work with the Federal Highway Administration to consider increasing the gross vehicle weight limits of zero-emission trucks on highways in the near- and medium-term
- Caltrans and the Commission could budget for increased maintenance and repair costs and consider new ways to reduce repair cost through lean construction, design-to-value approaches, etc.

5. Methods to avoid resident and business displacement while achieving SB 671 goals

There are several existing and in-development materials created by state agencies that speak to effective ways of avoiding displacement, including the Commission's Senate Bill 1 Programs Transportation Equity Supplement, the pending Anti-Displacement Subcommittee Report co-created by the California State Transportation Agency and other state agency partners, which contains potential actions to address direct and indirect displacement, and the Caltrans Project Development Procedures Manual. The outcomes and recommendations of these reports should be referenced and embedded into station development procedures and practices in the coming years.

The Commission also recognizes Assembly Bill 617 communities may experience different impacts from the development of zero-emission infrastructure. To avoid disproportionate negative impacts or exacerbation of existing impacts on communities of concern, project leads are encouraged to consult with local entities such as environmental justice organizations and community groups to collaboratively determine strategies in the development of zero-emission freight infrastructure. Community and environmental justice leaders can provide important expertise in the process of determining where trucks can be most appropriately re-routed outside of impacted communities.

6. Potential funding opportunities for project types

Funding for public minimum viable network projects could come from existing or new public and/or private sources.

The total capital costs to build the minimum viable network in 2025 is estimated to be between \$505 million to \$950 million (not including electric grid upgrade costs). Funding sources that include zero emissions vehicle infrastructure as an eligible project type total \$1.4 billion through 2025. Together with private funding, it is possible there are sufficient funds available to build out the public stations required for the minimum viable network in the years 2025 through 2027.

The total capital costs for a public minimum viable network in 2035 is estimated to be approximately \$10 billion to \$15 billion. If approximately \$1 billion of the existing available public funds are awarded to projects that support a 2035 minimum viable network, and if private industry will provide some of the total funding needed, that leaves a funding gap of approximately \$5 billion to \$8 billion (will be further outlined in final Assessment) needed to build a minimum viable network for 2035. These funds should be awarded by 2027 to allow time to build the stations needed by 2035.

A detailed description of potential funding opportunities and potential infrastructure investment costs will be outlined in the final Assessment.

7. Benefits from zero emission medium- and heavy-duty vehicle adoption

The transition to zero-emission freight could have both economic and health benefits for California. On a macroeconomic level, the transition could result in a stimulus to the economy, increasing the state's Gross Regional Product by approximately 10 percent.

Other notable benefits to the transition include a potential reduction in tailpipe emissions of over 50 percent along priority corridors, and approximately \$26.5 billion in expected savings in statewide health spending due to emissions-related health issues by 2040.

Senate Bill 671 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, complete, and submit an Assessment to the relevant policy and fiscal committees of the Legislature by December 1, 2023.

Attachments:

- **Attachment A:** Process flow describing potential actions to streamline the station development process
- **Attachment B:** Description of potential delivery team model for the minimum viable network
- **Attachment C:** Process map outlining the potential interaction between key stakeholders in the minimum viable network delivery team
- **Attachment D:** Priority Freight Corridors and Minimum Viable Network

Attachment A: Process flow describing potential actions to streamline the station development process

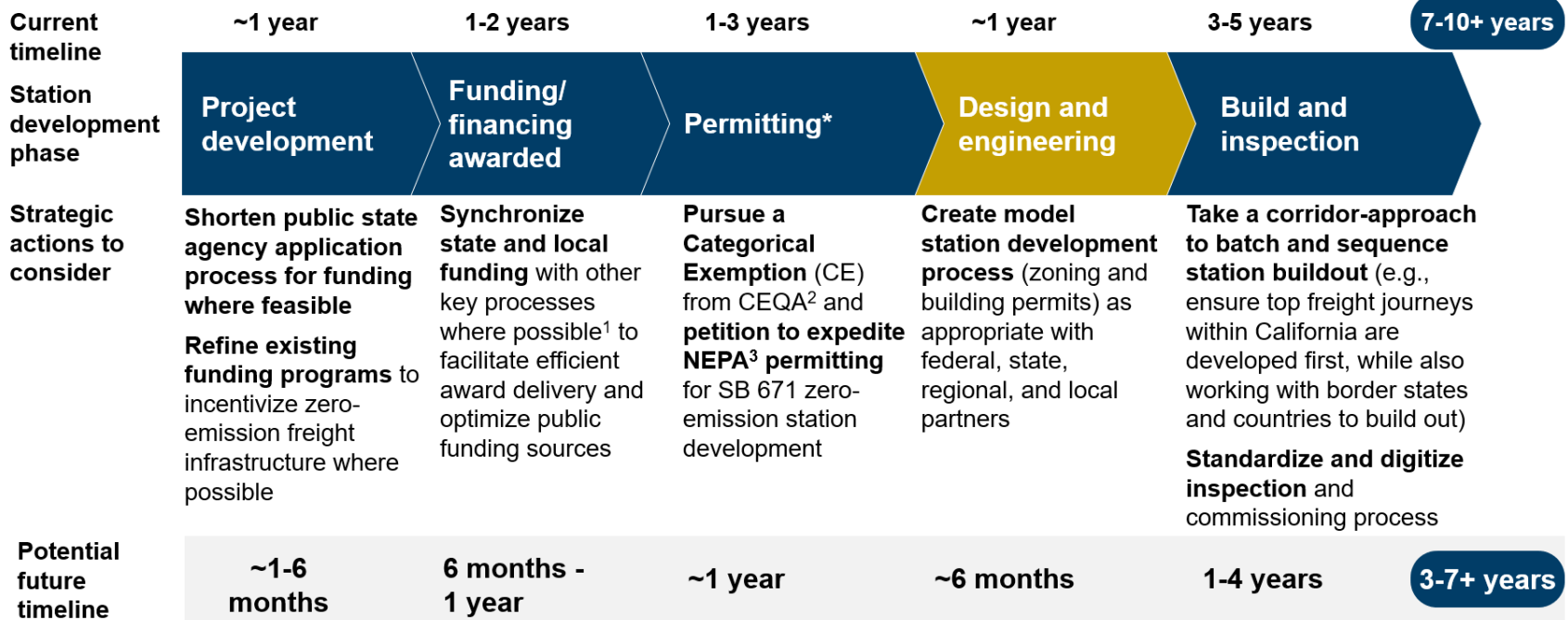
CA could take actions to accelerate the zero-emission truck (ZEV) station development process by 30+%



AS OF 05/04/2023

PRELIMINARY – FOR DISCUSSION

■ Grid readiness could take 2-7+ years in parallel to this process



*Note: Local permitting often happens after the design phase and NEPA (National Environmental Policy Act) can make permitting last up to 5+ years

1. Other key processes could include permitting, right-of-way etc. which can be interdependent with funding timelines and eligibility requirements

2. California Environmental Quality Act

3. National Environmental Policy Act

Source: California Transportation Commission (CTC) working group, City of Sacramento Community Development, Environmental Impact Reports/Studies, accessed April 2023, Los Angeles City Planning, California Environmental Quality Act flow chart, accessed April 2023, California Governor’s Office of Business and Economic Development Hydrogen Station Permitting Guidebook, September 2020, interview/discussion with GO-Biz (04/24/2023)

Attachment B: Description of potential delivery team model for the Minimum Viable Network



A freight infrastructure-focused and corridor-specific rollout for the MVN¹ could be managed by a central delivery team

A centralized delivery team could have a statewide lead agency / leader accountable for taking a freight journey lens to development, working closely with a task force of relevant regional and local government officials

AS OF 05/04/2023 PRELIMINARY – FOR DISCUSSION

Freight infrastructure-focused



State Agency Central Delivery Team
(To be determined by state)



Focus on goods movement and network connectivity

- 1. Minimum Viable Network
- 2. Regional Transportation Planning Agency
- 3. Metropolitan Planning Organization
- 4. Battery Electric Vehicle
- 5. Fuel Cell Electric Vehicle

Source: CTC (California Transportation Commission) working group

Map of potential minimum viable public network of infrastructure



Corridor-specific



Regional leads
(e.g., RTPAs², MPOs³, utility representatives, planning departments)



Partner to drive streamlined and standardized process, with local buy-in

Attachment C: Process map outlining the potential interaction between key stakeholders in the Minimum Viable Network delivery team



The central MVN¹ delivery team could act as a station development accelerator through coordination with local leaders

The team could proactively remove roadblocks while assisting regional and local leaders and project sponsors

AS OF 05/04/2023

PRELIMINARY – FOR DISCUSSION



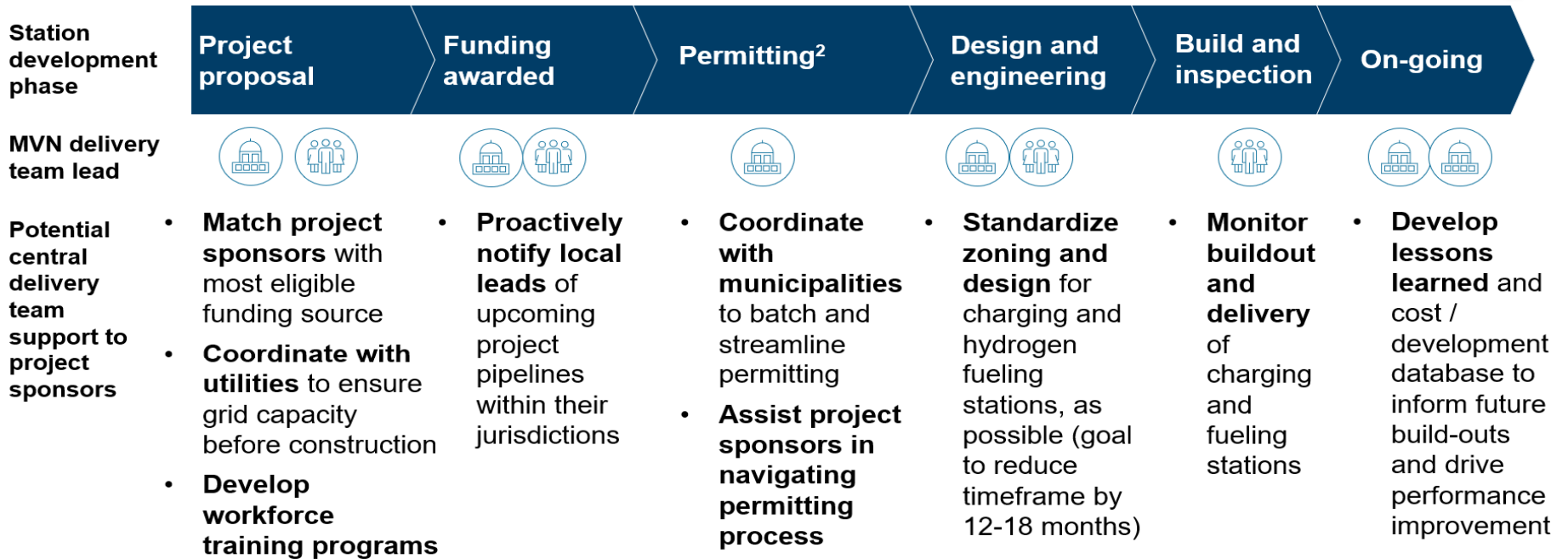
State Agency Central Delivery Team



Regional leads



Cross-agency exercise



1. Minimum Viable Network

2. Note: Local permitting often happens after the design phase and NEPA (National Environmental Policy Act) can make permitting last up to 5+ years

Source: California Transportation Commission (CTC) working group, City of Sacramento Community Development, Environmental Impact Reports/Studies, accessed April 2023, Los Angeles City Planning, California Environmental Quality Act flow chart, accessed April 2023, California Governor's Office of Business and Economic Development Hydrogen Station Permitting Guidebook, September 2020, interview/discussion with GO-Biz (04/24/2023)

Attachment D: Priority Freight Corridors and Minimum Viable Network









Reminder: Recap of last SB 671 assessment update

AS OF 05/04/2023 DRAFT PRELIMINARY – FOR DISCUSSION

Priority corridors identified

Ordered by truck VMT¹ – 2022 projected

-  I-5 from the south border to north border (Oregon)²
-  I-15 from LA to southeast border (Nevada)
-  Route 99 from Red Bluff to Bakersfield
-  I-10 from LA to southeast border (Arizona)³
-  I-40 from intersection with I-15 to southeast border (Arizona)
-  I-80 from San Francisco to northeast border (Nevada)⁴

Map of potential minimum viable network (MVN) of zero-emissions infrastructure



CTC identified:

- **6 priority CA freight corridors**, representing 60% of the statewide, freight-related VMT
- **A public minimum viable network of ~90-100+⁷ charging and hydrogen fueling stations is estimated to be required to serve zero-emission truck traffic by 2025-2027+; demand could require 1,300+ stations⁸ by 2035**

1. Vehicle miles travelled
2. The I-5 corridor includes the I-710, where it connects I-5 to the Ports of Los Angeles and Long Beach, and the segments of I-405 and Highway 1 that connect I-10 and I-710 near the San Pedro Bay Ports. This corridor also includes the local roads that connect the I-5 to the Port of San Diego and to the US/Mexico border
3. The I-10 corridor includes the segment of I-110 and the short segment of State Route 47 that links the I-10 to the Port of Los Angeles
4. The I-80 corridor includes the short segments of I-580 and I-880 that connect the I-80 to the Port of Oakland
5. Battery Electric Vehicle
6. Fuel Cell Electric Vehicle
7. Assumes 75-85 battery electric charging and 15 hydrogen fueling stations in the public minimum viable network by 2025-2027+
8. Infrastructure model assumes a BEV public station has 10 charging ports (BEV private stations have 20) and an extra-large hydrogen fueling station delivers 292,000 kg (643,750 lbs.) of hydrogen per year. Mix of charger type installed depends on type of station whether public fast or overnight charging including AC fast L2, DC 50, DC 100, DC 150, DC 350, and DC 500 kilowatt chargers

Source: Highway Performance Monitoring System (Federal Highway Administration - 2020), Freight Analysis Framework version 5 data published in July 2021 (Bureau of Transportation Statistics)