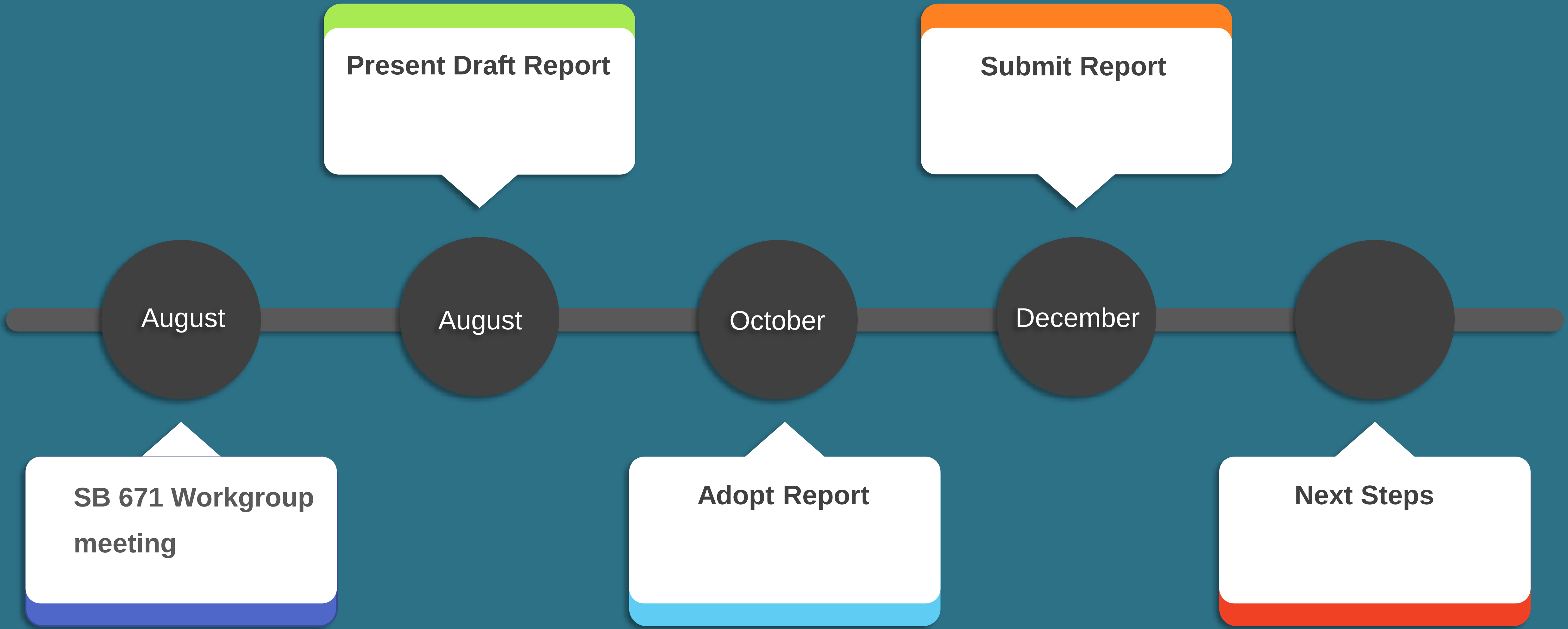
Senate Bill 671 Workgroup

Friday, July 7th, 2023
10:00 am – 11:30 am
Via Zoom

Agenda

- Upcoming Milestones
- Concluding Assessment Work
  - Barriers and Solutions
  - Zero-Emission Truck Weight on Roads
  - Methods to Avoid Displacement
  - Microgrids
  - Benefits

Upcoming Milestones



Overview of Work

1. Priority Corridors and 2. Top 5 Corridors
Draft Completed

3. Zero-Emission Freight Projects
Draft Completed

4. Barriers and Solutions
Presenting Today

5. Zero-Emission Truck Weight on Roads
Presenting Today

6. Avoiding Displacement and 7. Benefits
Presenting today

Potential barriers and solutions to clean freight corridor development

Top Six Corridors – Key Connecting Routes

AS OF 02/09/2023 **ILLUSTRATIVE & DRAFT PRELIMINARY – FOR DISCUSSION**

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

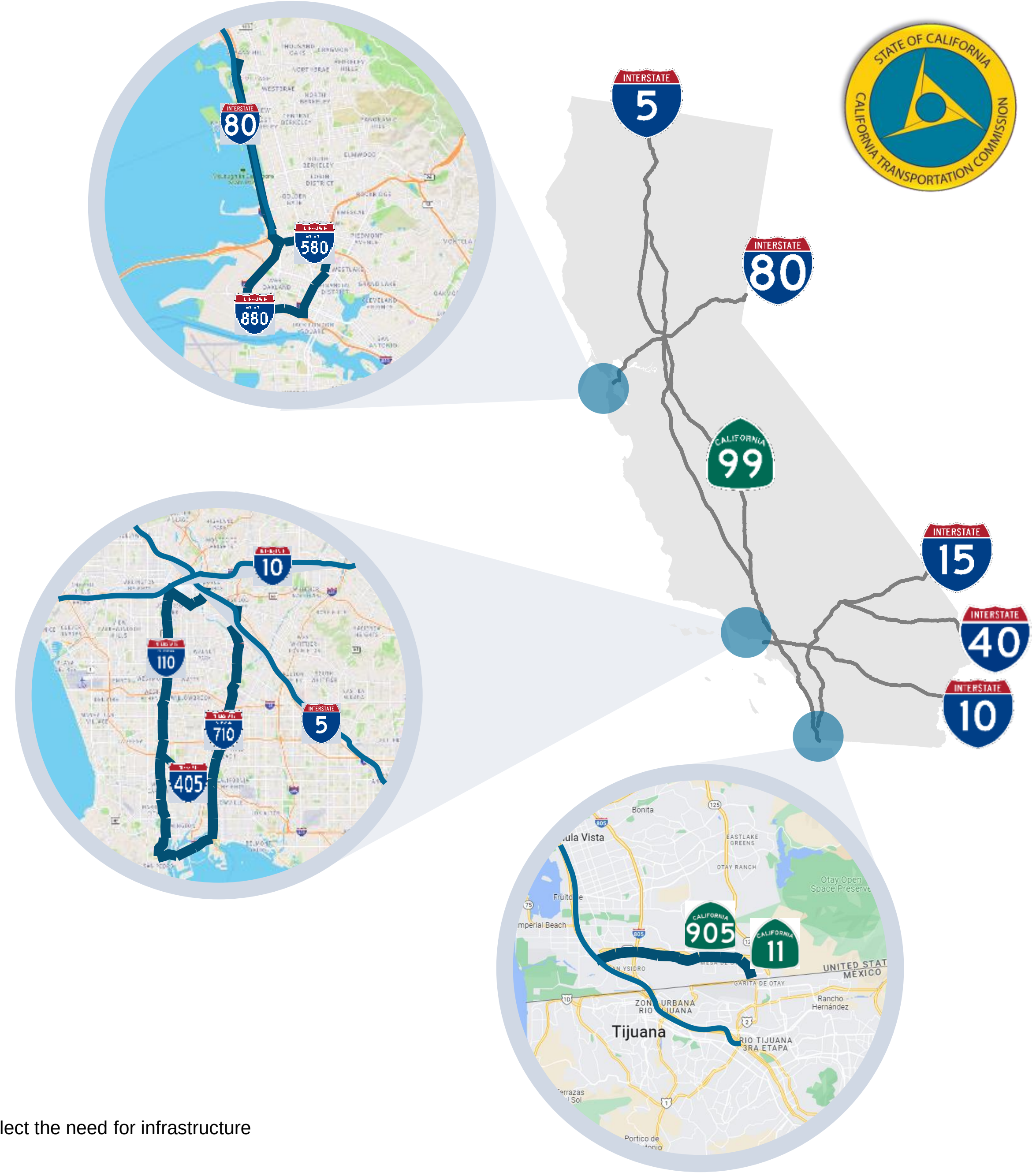
SAN PEDRO BAY PORTS

The I-5 corridor includes the I-710 where it connects I-10 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

The I-10 corridor includes the short segment of SR-47 that connects I-10 to the Port of Los Angeles, and the segments of I-405 and Highway 1 that connect I-10 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



Note: These ports are key freight origin and destination points. Thus, they have been included in the freight corridors to reflect the need for infrastructure in and around them

Source: CTC Working Group, analysis of Freight Analytics Framework (FAF 5)

Top 3 Barriers and Solutions

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

A Timing

Streamline clean freight infrastructure development

Identify opportunities to increase speed of delivery

Develop a streamlined approach to awarding and accessing public funds

Foster standardized approach and timing for permitting and approval processes

B Economic Viability

Support fleet owners with the costs of transition

Where feasible, align funding programs to support the transition

Ensure appropriate access to infrastructure for all freight types and movers across early minimum viable network

C Complex Ecosystem

Create a corridor-first approach

Take an "ecosystem approach" to corridor development to ensure coordination & timeliness

Coordinate funding and project delivery opportunities (e.g., innovative public private partnership opportunities; reduction of public support once demand established)

Source: California Transportation Commission (CTC) working group

Barrier A: Timing - Current development timeframes might not deliver enough stations to meet public zero-emission fleet charging targets

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	Existing timeframe & stations	Target for 2025-2027+ minimum viable network	Target for 2035 minimum viable network
Development process timeline	**7-10+** years to complete each station[1]	**3-7+** years to complete each station	**3-7+** years to complete each station
Number of stations	**~50-60** planned/existing stations	**~90-100+** Public minimum viable network stations in place/operational to support SB 671 objectives	**>1,300** Public charging stations operational for freight and goods movement statewide, based on anticipated demand along priority corridors[3]

1. 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 pounds) 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
2. Minimum Viable Network
3. Based on 817 FCEV and 490 BEV stations in 2035. For comparison, there are currently ~5,000 retail diesel stations (varying numbers of pumps) in California, Statista 2021 accessed on May 5th, 2023.

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 (GO-Biz) Hydrogen Station Permitting Guidebook, September 2020, interview/discussion with GO-Biz (04/24/2023)

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

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

Current timeline	**~1 year**	**1-2 years**	**1-3 years**	**~1 year**	**3-5 years**	**7-10+ years**
Station development phase	**Project development**	**Funding/ financing awarded**	**Permitting***	**Design and engineering**	**Build and inspection**	
Strategic actions to consider	**Explore shortening public state agency application process for funding where feasible** **Refine existing funding programs** to incentivize zero-emission freight infrastructure where possible	**Synchronize state and local funding** with other key processes where possible[1] to facilitate efficient award delivery and optimize public funding sources	**Pursue a Categorical Exemption** (CE) from CEQA[2] and **petition to expedite NEPA[3] permitting** for SB 671 zero-emission station development	**Create model station development process** (zoning and building permits) as appropriate with federal, state, regional, and local partners	**Take a corridor-approach to batch and sequence station buildout** (e.g., ensure top freight journeys within California are developed first, while also working with border states and countries to build out) **Standardize and digitize inspection** and commissioning process	
Potential future timeline	**~1-6 months**	**6 months - 1 year**	**~1 year**	**~6 months**	**1-4 years**	**3-7+ years**

*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)

Breakdown of total estimated capital expenditure cost for station development

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	Cost category	BEV[1] cost estimate (USD, millions)	FCEV[2] 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 MVN (2025+) cost range[3,4]		**~$375-765+million**	**~$130-190+million**

Key considerations

Sites will vary in need for PA&ED[5] and Right-of-way costs

Grid upgrades are not currently included in site capex adjustment recommendation; associated costs are often incurred outside of TCEP[6] 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

1 Battery Electric Vehicle
2 Fuel Cell Electric Vehicle
3 Minimum Viable Network
4 Assumes 75-85 BEV and 15 FCEV stations in MVN and estimated 849 FCEV and 509 BEV stations in 2035.
5 Project Approval & Environmental Document
6 Trade Corridor Enhancement Program

Source: CTC working group; CTC infrastructure assessment model; US Department of Energy National Renewable Energy Laboratory.

Note: estimates for other construction costs and potential grid upgrades were derived based on a scan of existing project costs for charging and refueling stations statewide and nationally, including those provided to CTC in previously awarded and/or existing applications.

*If the project lead owns their own right of way and does not need utility relocation, then the project could have zero right of way costs.

The initial clean freight corridor infrastructure for the minimum viable network could cost up to ~$1B in capital investment

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Existing funding available	Target funding for MVN in 2025-2027+	Target funding for MVN by 2035
	~$505-950+M	~$10-15+B
Approximately $1.4 billion a year over the next 3 years (this is an estimate only)	2025 capex required for MVN	2035 capex required for public station development along 6 priority corridors based on anticipated demand

There is some public funding available for the minimum viable public network through 2027, but **funding needs to be allocated within the next 3 years to build necessary infrastructure by 2035; as demand surpasses the MVN's capacity, additional funding sources may be necessary to support these projects in their early years**

1. Minimum Viable Network

Note: Methodology of how CAPEX requirements were estimated is detailed in the technical memo that accompanies this June 28th Commissioner briefing, please refer to them for further details. Based on estimated 849 FCEV and 509 BEV stations in 2035.

Source: CTC working group, Governor's Office of Business and Economic Development EV-Charging Guidebook

Barrier B – Economic Viability: Upfront vehicle costs could be challenging for fleet owners to transition in the short-term, and availability of infrastructure is also a challenge.

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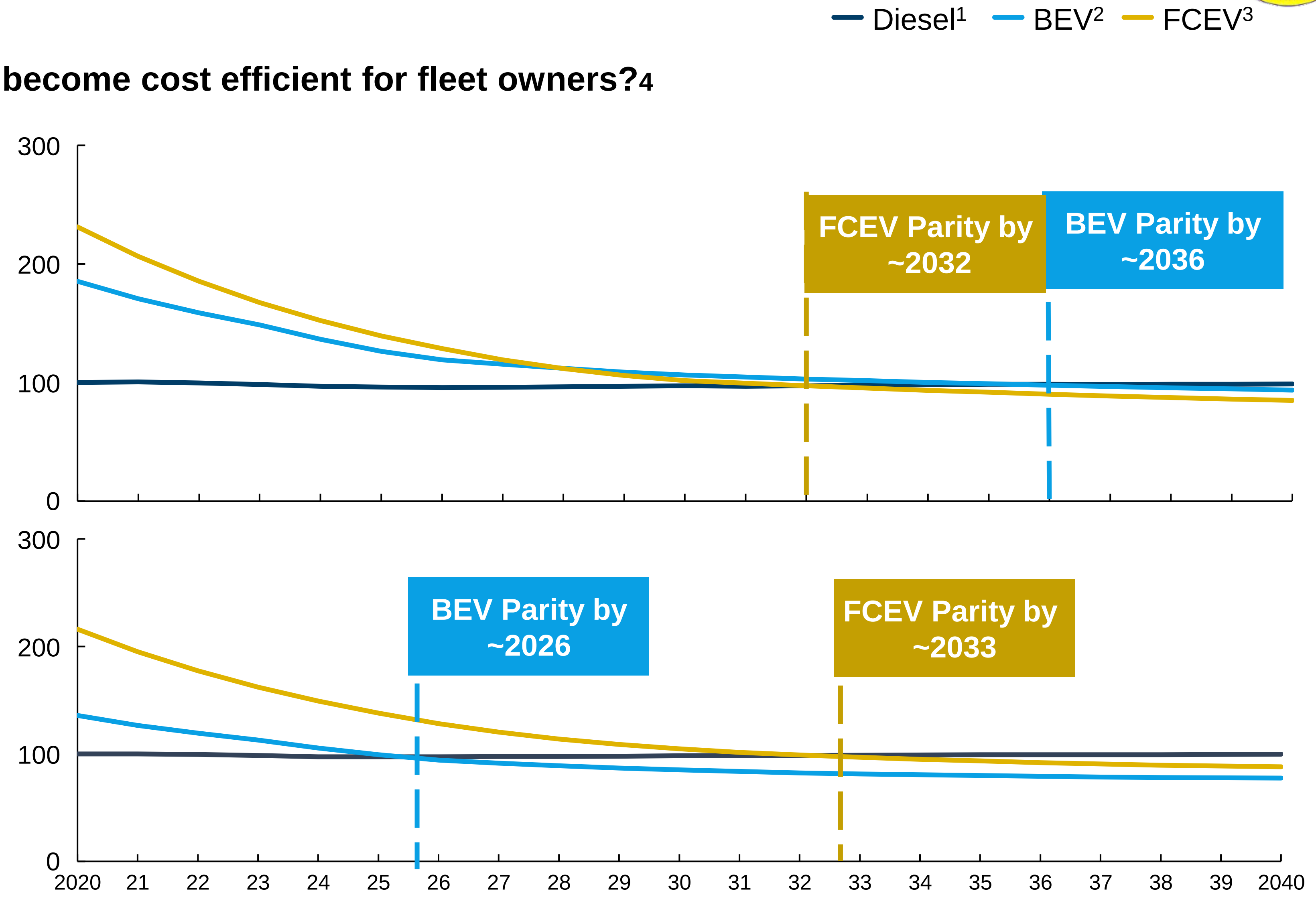
When do zero-emission trucks become cost efficient for fleet owners?[4]

Heavy-duty truck, % **(HDT/ Long-haul)**

Medium-duty truck,% **(MDT/Regional)**



1. Internal Combustion Engine vehicle or diesel truck
2. Battery Electric Vehicle
3. Fuel Cell Electric Vehicle
4. Weight classes and selected use cases in USA. Total cost of ownership (TCO) per mi indexed to Diesel = 100 in 2020

Source: Cost parity estimates based in industry insights and analysis of the following data: McKinsey Center for Future Mobility, Commercial Fleet Electrification Mode

Barrier C – Complex Ecosystem: The transition to zero emissions could require alignment from a large ecosystem of public and private stakeholder groups

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C

Complex ecosystem of potential stations and stakeholders

Goods movement and the interrelated nature of the infrastructure build out (e.g., land acquisition, grid update timing and capacity, project permitting and construction) **requires clear coordination and potential for State-wide development plan and corridor management**

For example, developing along I-5 could involve (non-exhaustive):

SDGE
PORT OF OAKLAND
OTAY MESA CHAMBER OF COMMERCE
CALIFORNIA AIR RESOURCES BOARD
SoCalGas
CalSTA
Caltrans
California Public Utilities Commission
SANDAG

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 (GO-Biz) Hydrogen Station Permitting Guidebook, September 2020, interview/discussion with GO-Biz (04/24/2023)

A freight infrastructure-focused and corridor-specific rollout for the MVN[1] 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

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Freight infrastructure-focused

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

Focus on goods movement and network connectivity

Map of potential minimum viable public network of infrastructure

Corridor-specific

Regional leads
(e.g., RTPAs[2], MPOs[3], utility representatives, planning departments)

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

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

The central MVN[1] 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

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State Agency Central Delivery Team | Regional leads | Cross-agency exercise

Station development phase	Project proposal	Funding awarded	Permitting[2]	Design and engineering	Build and inspection	On-going
MVN delivery team lead	State Agency Central Delivery Team; Regional leads	State Agency Central Delivery Team; Regional leads	State Agency Central Delivery Team	State Agency Central Delivery Team; Regional leads	Regional leads	Cross-agency exercise
Potential central delivery team support to project sponsors	• **Match project sponsors** with most eligible funding source • **Coordinate with utilities** to ensure grid capacity before construction • **Develop workforce training programs**	• **Proactively notify local leads** of upcoming project pipelines within their jurisdictions	• **Coordinate with municipalities** to batch and streamline permitting • **Assist project sponsors in navigating permitting process**	• **Standardize zoning and design** for charging and hydrogen fueling stations, as possible (goal to reduce timeframe by 12-18 months)	• **Monitor buildout and delivery** of charging and fueling stations	• **Develop lessons learned** and cost / development database to inform future build-outs and drive performance improvement

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)

Impacts of loaded vehicle weight, methods to avoid displacement, microgrids, and benefits

Additional weight of zero-emission trucks could have two key implications …

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Weight limits could impact business performance: Zero-emission trucks (particularly BEV[1]s) are likely to be up to 15% heavier than combustion engine trucks, which may require a statutory change to allow for the same product load

Potential for more road wear and tear: Given additional expected vehicle weight, there could be more road and bridge "wear and tear"[2], potentially requiring additional investment to remain in a state of good repair

1. Battery Electric Vehicle
2. Large-scale evaluation of the impacts of increasing gross vehicle weight on pavement deterioration and associated repair cost of the California interstate highway system, a report by Caltrans

Source: UC Davis report - Effects of Increased Weights of Alternative Fuel Trucks on Pavement and Bridges (Nov '20) , CTC working group

… and potential actions for key stakeholders to consider

California could **work with Federal Highway Administration (FHWA) to consider increasing the gross vehicle weight (GVW) limits** of zero-emission trucks on highways in the short-term until battery density improves

The state through the budgetary process could **budget for increased maintenance** and repair costs and **consider new ways to reduce repair cost** through lean construction, predictive analytics, new technology deployment, etc.

Estimated increase in road maintenance spending in CA due to ZE[1] trucks varies based on powertrain adoption scenarios

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Scenario	Heavy BEV[2] adoption	Heavy FCEV[3] adoption	Balanced adoption
Estimated additional maintenance spend[4]	**~$365million** Estimated annual additional total repair cost (2023-2040)	**~$276million** Estimated annual additional total repair cost (2023-2040)	**~$288million** Estimated annual additional total repair cost (2023-2040)

Implications

- **BEVs are expected to be 12 to 15% heavier than diesel trucks** and might need the weight limits to be increased to up to 92,500 pounds. to allow for additional vehicle weight
- **FCEVs are expected to be 6 to 7% heavier than diesel trucks** and might need the weight limits to be increased to up to 85,000 pounds. to allow for additional vehicle weight

1. Zero-emission
2. Battery Electric Vehicle
3. Fuel Cell Electric Vehicle
4. Estimated by a 3-step methodology as explained in the technical memo accompanying the June commissioner briefing of this assessment

Source: CTC Working group, interpolation and extrapolation of expected weight of BEVs & FCEVs with respect to CE trucks from UC Davis report (Nov ’20) - Effects of Increased Weights of Alternative Fuel Trucks on Pavement and Bridges, Caltrans inputs received on 04/07/2023 based on interpolation and extrapolation of estimates from Large-scale evaluation of the impacts of increasing gross vehicle weight on pavement deterioration and associated repair cost of the California interstate highway system, a report by Caltrans (Jan ’20)

Existing and on-going CA public agency efforts on methods to avoid displacement

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Initiative	Objectives	Owner(s)	Timeline
SB 1 Competitive Programs **Transportation Equity Supplement**	Provides information on key statistics, benefits, and communicate strategies for project development to yield more equitable outcomes	California Transportation Commission	Adopted in August 2022
Anti-displacement Subcommittee Memo	To create a memo of recommendations that identify a suite of anti-displacement strategies that could be promoted via scoring and evaluation criteria in state funding program guidelines as agencies see fit	Subcommittee of state agency partners such as Caltrans, CARB, CalSTA, etc.	Final memo expected to be circulated by Dec 2023
Project Development Procedures Manual (PDPM)	Provides the framework of policies and procedures for developing State highway improvement projects	Caltrans	Last update on February 28, 2023

Source: CTC (California Transportation Commission), CARB (California Air Resources Board), Caltrans, SANDAG, AB 617 communities' representatives

Actions to consider

- Take a customized approach - AB 617 communities may have varying perspectives and experience different impacts from the build-out of zero-emission infrastructure
- Include methods from these existing agency efforts during the implementation of SB 671

Microgrids could be most applicable for supplementing existing grid capacity and to improve resiliency

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Two key services offered by microgrids:

Backup Power/Resiliency: Microgrids can continue to provide power during emergencies or power shutoff

Supplementing capacity: When energy demand exceeds existing grid capacity, microgrids can provide supplementary power (e.g., at ports, manufacturing facilities, to be up to building code and not overload a transformer etc.)

Primary considerations while selecting microgrids:

Capacity: Can be a cost-effective option for small scale demand (up to 2 MW)

Cost: Can have high upfront installation costs and operational costs depend on energy source

Energy source: Can be powered by solar panels, diesel, hydro, or wind

Source: Lawrence Berkeley National Laboratory, CTC working group

- **Microgrids are grid systems consisting of small-scale generation and distribution networks**, which can operate in isolation from national/state electricity grid or be connected to them
- **Utilities and station developers will need to evaluate microgrid applicability,** given capacity, cost, and time considerations

The transition to zero-emissions trucks could have both economic and health benefits

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For California's citizens

>50%

Potential reduction in annual tailpipe truck emissions along priority corridors through 2040[1]

~1,000

Expected reduction in premature deaths related to emissions through 2040[4]

For California's economy

10%

Estimated return on investment of zero-emissions infrastructure projects statewide[2]

$26.5 billion

Expected savings in statewide health spend from criteria emission reductions through 2040[3]

For California's freight industry

$48 billion

Estimated savings to fleets as a result of state funding programs[3]

>$100 million

Available funding through statewide programs with the goal of reducing total cost of ownership (TCO) for fleet owners[3]

1. Estimation of direct (tailpipe) emissions followed the following steps: (1) Forecast of VMT in 6 priority corridors (Source: Freight Analysis Framework / Federal Highway Administration); (2) Allocation of VMT 2024 and forecast by powertrain and truck type (Source: CARB – ACF Population); (3) Multiply average emissions per powertrain and truck type by VMT
2. Lightcast economic multipliers, North American Industry Classification System (NAICS) database
3. California Air Resources Board Advanced Clean Fleets Regulation Summary, as of April 13, 2023
4. Advanced Clean Trucks 15-Day Notice Attachment C – Updated Costs and Benefits

Questions?

Next Meeting: August 11th

Thank you!