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Advanced Clean Fleets: Drayage Workgroup

December 9, 2020

Agenda

- Background and Planning
- Drayage Concept Overview
- Drayage Truck Baseline Population and Emissions: EMFAC 202x
- Drayage Operational Characteristics
- Infrastructure Planning
- ZE Drayage Truck Market Overview
- Funding Opportunities
- Next Steps and Timeframe

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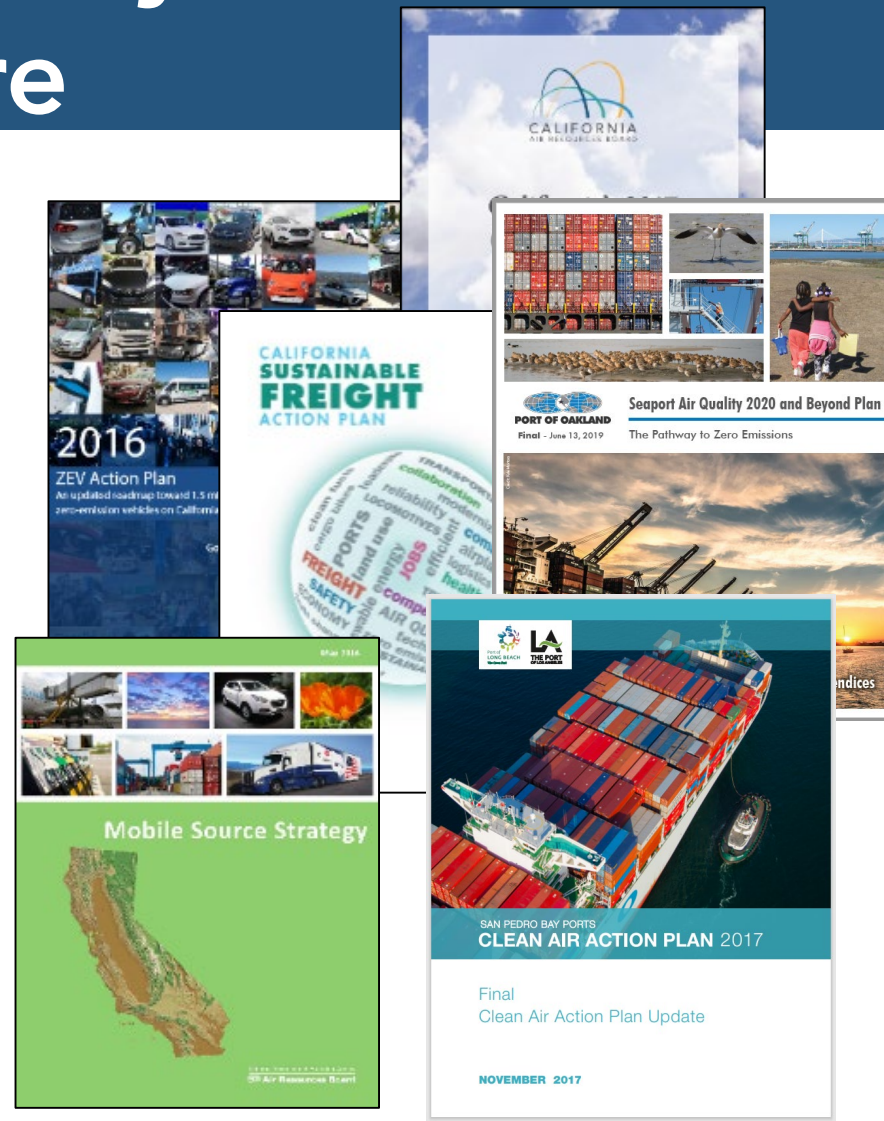
Background and Planning

Zero-Emission Planning: A Key Part of California's Future

- 2016 - ZEV Action Plan
- 2016 - Sustainable Freight Action Plan
- 2017 - San Pedro Ports Clean Air Action Plan
- 2019 - Oakland Seaport Air Quality 2020 and Beyond
- 2020 - Mobile Source Strategy Update



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Zero-Emission Executive Order N-79-20

100% ZEV sales by 2035

Full transition to
ZEV short-haul/drayage trucks
by 2035

Full transition to **ZEV buses** &
heavy-duty long-haul trucks
by 2045*

Full transition to
ZE off-road equipment
by 2035*

*where feasible

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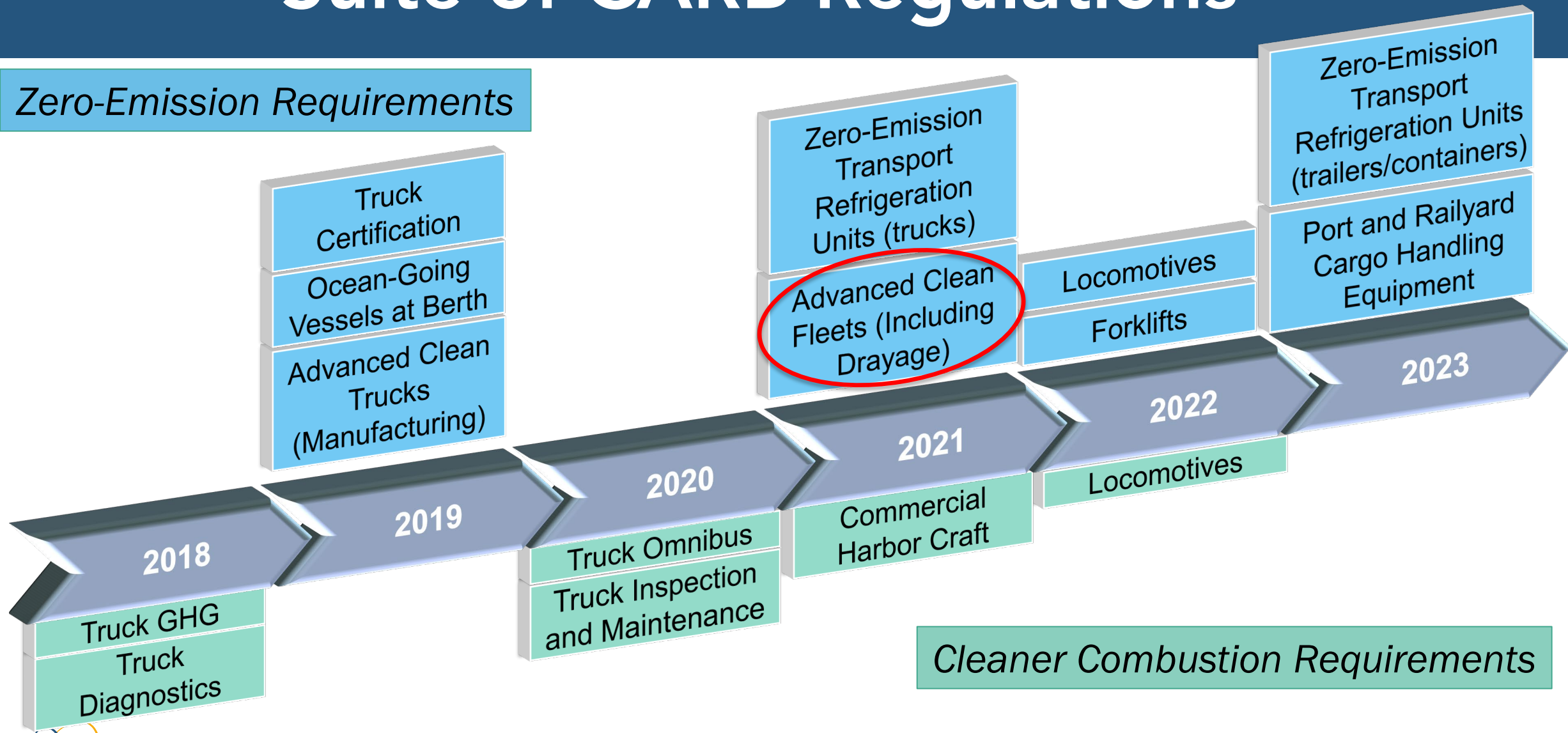
9.23.20-EO-N-79-20-text.pdf (ca.gov) https://www.gov.ca.gov/wp-content/uploads/2020/09/9.23.20-EO-N-79-20-text.pdf

Suite of CARB Regulations



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(1st Board hearing dates shown) – Updated December 3, 2020

Advanced Clean Fleets Rulemaking

- Advanced Clean Fleets (ACF) is the follow-up effort to the Advanced Clean Trucks (ACT) Regulation to ensure the transition and market demand for zero-emission medium and heavy-duty vehicles
- Advanced Clean Trucks Board Resolution
  - Return by the end of 2021 with a ZE fleet rule
- Support California's transition to zero-emission where feasible
  - 2035 – Drayage, public fleets, last mile delivery
  - 2040 – Refuse, buses, utility fleets (may include NZEVs)
  - 2045 – For all other trucks and buses where feasible
- Work with sister agencies
  - Workforce development
  - ZEV infrastructure

ACT Resolution: https://ww3.arb.ca.gov/regact/2019/act2019/finalres20-19.pdf

Disadvantaged Community Considerations

- Assembly Bill 617 directs CARB to identify community level strategies
- Communities seek action on transportation and freight emissions
- Seek rapid transition to ZE technology

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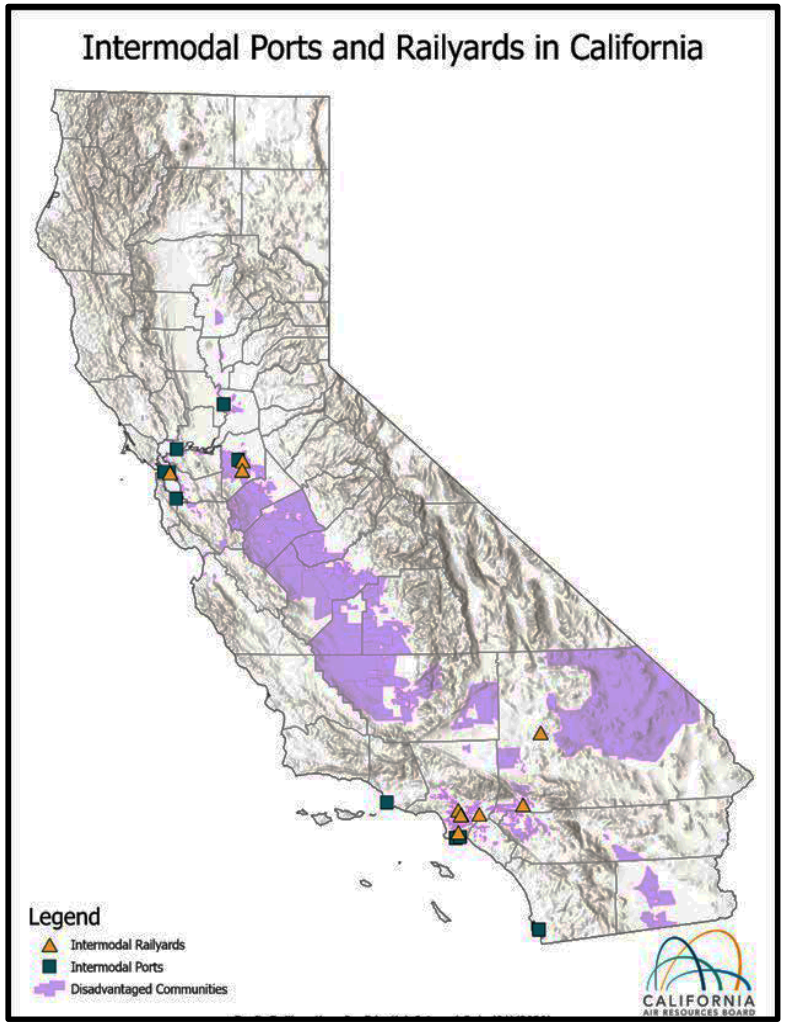
Disadvantaged Community Considerations

- Disadvantaged communities refer to the areas throughout California which suffer the most from a combination of economic, health, and environmental burdens.
- The intermodal seaports and railyards under the current Drayage Truck Regulation are all located in or within ~1 mile of a disadvantaged community.



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Drayage Concept Overview

Drayage: 2035 Zero-Emission Goal

- Transition all Class 7 and 8 drayage trucks operating at intermodal seaports or railyards to full zero-emission by 2035

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Current Drayage Truck Definition

§ 2027. In-Use On-Road Diesel-Fueled Heavy-Duty Drayage Trucks.

Drayage trucks ***are****:*

Any in-use on-road vehicle with a gross vehicle weight rating (GVWR) greater than 26,000 pounds that is used for transporting cargo, such as containerized, bulk, or break-bulk goods, that operates:

- on or transgresses through a port or intermodal railyard property for the purpose of loading, unloading or transporting cargo, including transporting empty containers and chassis or,

- off port or intermodal railyard property transporting cargo or empty containers or chassis that originated from or is destined to a port or intermodal railyard property.

Final Reg language (ca.gov):
https://ww2.arb.ca.gov/sites/default/files/classic//msprog/onroad/porttruck/finalregdrayage.pdf

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Current Drayage Truck Definition Cont.

§ 2027. In-Use On-Road Diesel-Fueled Heavy-Duty Drayage Trucks.

Drayage trucks ***are not***:

- Vehicles operating off of port or intermodal railyard properties that transport cargos that have originated from a port or rail yard property but have been off-loaded from the equipment (e.g., a trailer or container) that transported the cargo from the originating port or rail yard

or

- Vehicles operating off of port or intermodal railyard properties that transport cargos that are destined for a port or rail yard but will be subsequently transferred into or onto different equipment (e.g., a trailer or container) before being delivered to a seaport or intermodal railyard.

Final Reg language (ca.gov)
https://ww2.arb.ca.gov/sites/default/files/classic//msprog/onroad/porttruck/finalregdrayage.pdf?_ga=2.215666647.1107543387.1606146193-354412339.1596474861

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Zero-Emission Drayage Truck Concept Considerations

- Current drayage fleet will have to meet or exceed 2010 MY engine standards beginning in 2023
- Drayage fleets and operations are diverse
- Goal to transition all Class 7 and 8 drayage trucks operating at intermodal seaports or railyards to full zero-emission by 2035

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Zero-Emission Drayage Truck Concept Stakeholder Input

- Availability and state of ZE technology
- Cost of ZE technology
- Incentives and funding support for fleets
- Challenges to infrastructure development
- Prioritization of ZEV deployments in disadvantaged communities

Zero-Emission Drayage Truck Concept

- Beginning in 2023, any truck added to the CARB Drayage Truck Registry must be zero-emissions

Zero Emission Drayage Trucks by 2035

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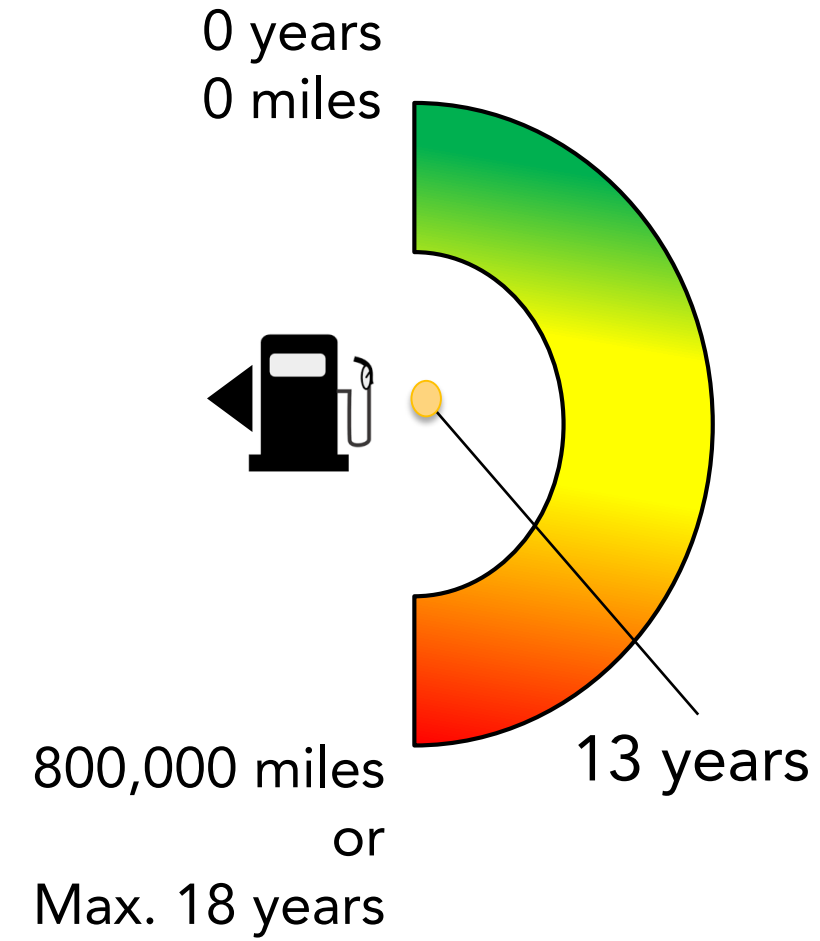
Zero-Emission Drayage Truck Concept
Drayage Legacy Fleet Transition

- Set limits for the legacy drayage fleet
  - All drayage trucks would be required to be zero-emission by 2035
  - Model year engines older than 13 years must report mileage annually
  - Drayage trucks with mileage over 800,000 miles, or a maximum of 18 years from certification, will no longer be compliant in the CARB Drayage Truck Registry



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Drayage Truck Baseline Population and Emissions: EMFAC 202x

Air Quality Planning & Science Division
Mobile Source Analysis Branch

Drayage Trucks

- **Drayage Trucks in EMFAC**:
  - EMFAC includes Class 8 port trucks with diesel, electric or natural gas motive power
  - Drayage trucks visiting railyards are not identified in EMFAC due to lack of data, but they are included within other Class 8 Truck categories

Data Sources (1)

- **Vehicle Population Data**
  - DMV Vehicle Registration Database
  - List of VINs from Major Ports (Ports of LA/LB and Oakland)
  - VIN lists provided by ports are used to identify drayage vehicles in DMV
  - Other Port Trucks are estimated (based on past survey data)

THE PORT OF LOS ANGELES LA

Port of LONG BEACH The Green Port

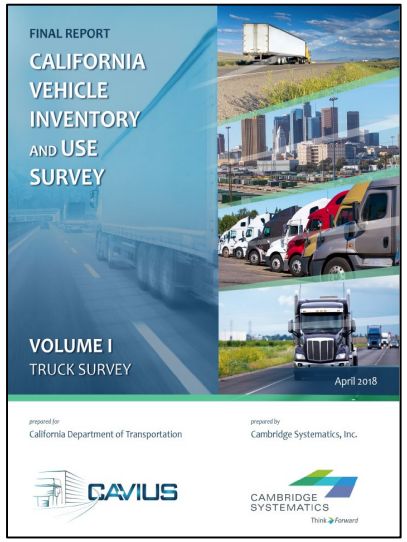
PORT OF OAKLAND

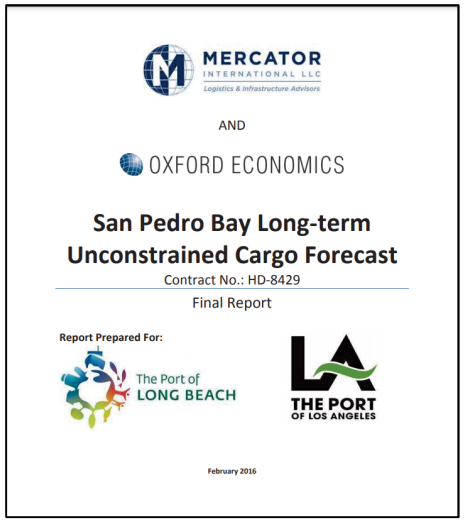
State of California Department of Motor Vehicles

Data Sources (2)

- **Vehicle Miles Traveled (VMT)**
  - Telematics data from Geotab
  - **Cal**ifornia **V**ehicle **I**nventory and **U**se **S**urvey (CalVIUS) in 2018

- **Future forecasting:**
  - Mercator Report for Ports of LA/LB
  - Tioga Report for Port of Oakland





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CY2019 Drayage Truck Inventory

Vehicle Category	Port of Oakland (POAK)	Port of LA/LB (POLA)	Other Ports*	Railyards **
Instate Class 8† *Active Trucks****	**4,224‡**	**13,951‡**	**1,453‡**	TBD
Instate Class 8 † *Inactive Trucks****	n/a***	2,770		
Instate POAK Class 8 already in POLA†	136			
Class 4-7†	22	180		
Out of State†	823	854		
Class 2b-3 or Gasoline	329	3,177		
Total	**5,534**	**20,932**	**1,453**	**TBD**

† *Non-gasoline*

‡ *T7 POLA Class 8, T7 POAK Class 8, and T7 Other Ports Class 8 in EMFAC202x*

* *Estimate based on past Surveys; Requesting updated information from other Sea Ports*

** *To be determined (TBD); Requesting information from Railroads*

*** *For POLA, trucks with more than 112 visits/year are considered as "active trucks". 112 visit/year was determined based on POLA monthly active truck counts. POAK did not provide monthly visit data and therefore all of their class 8 in-state trucks were considered active.*

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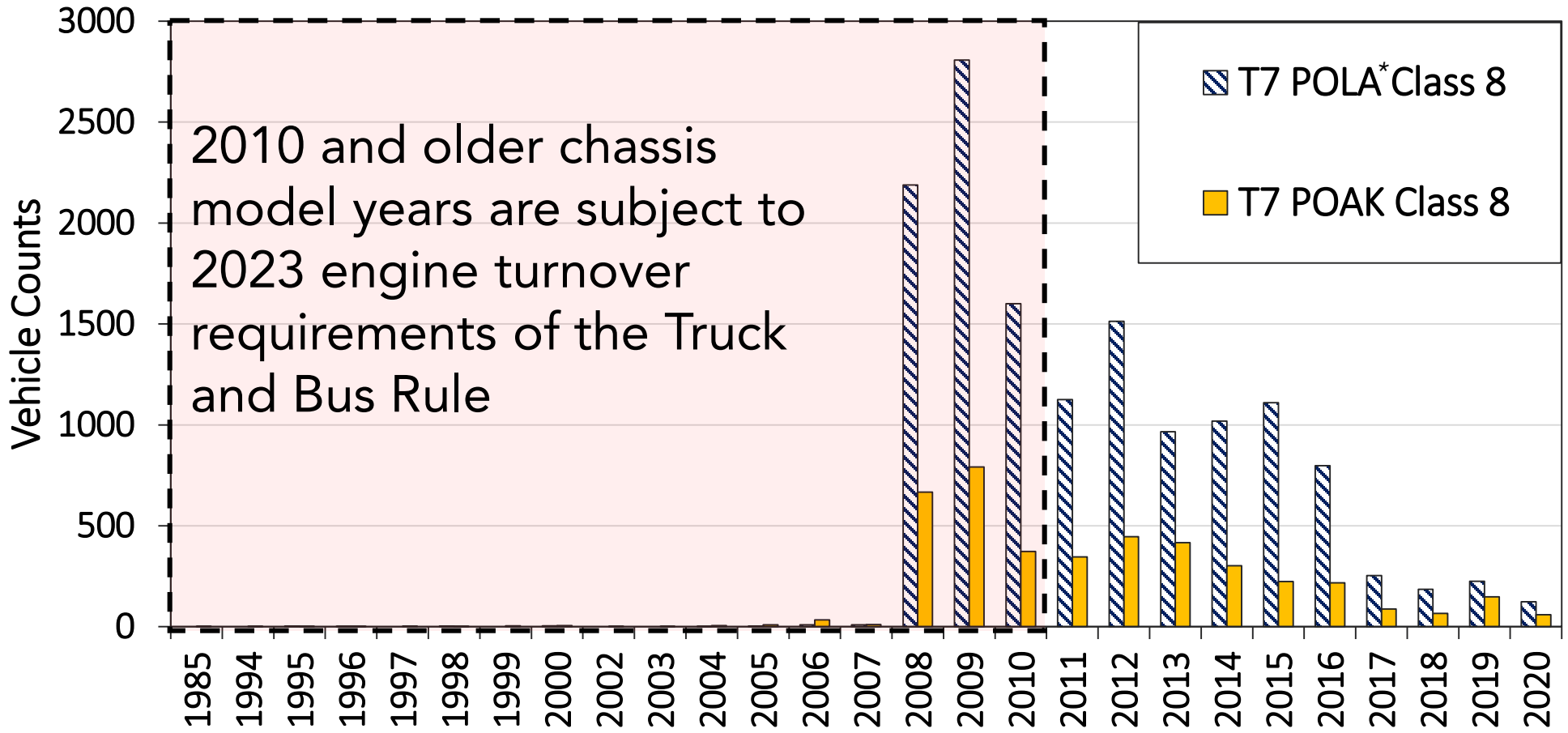
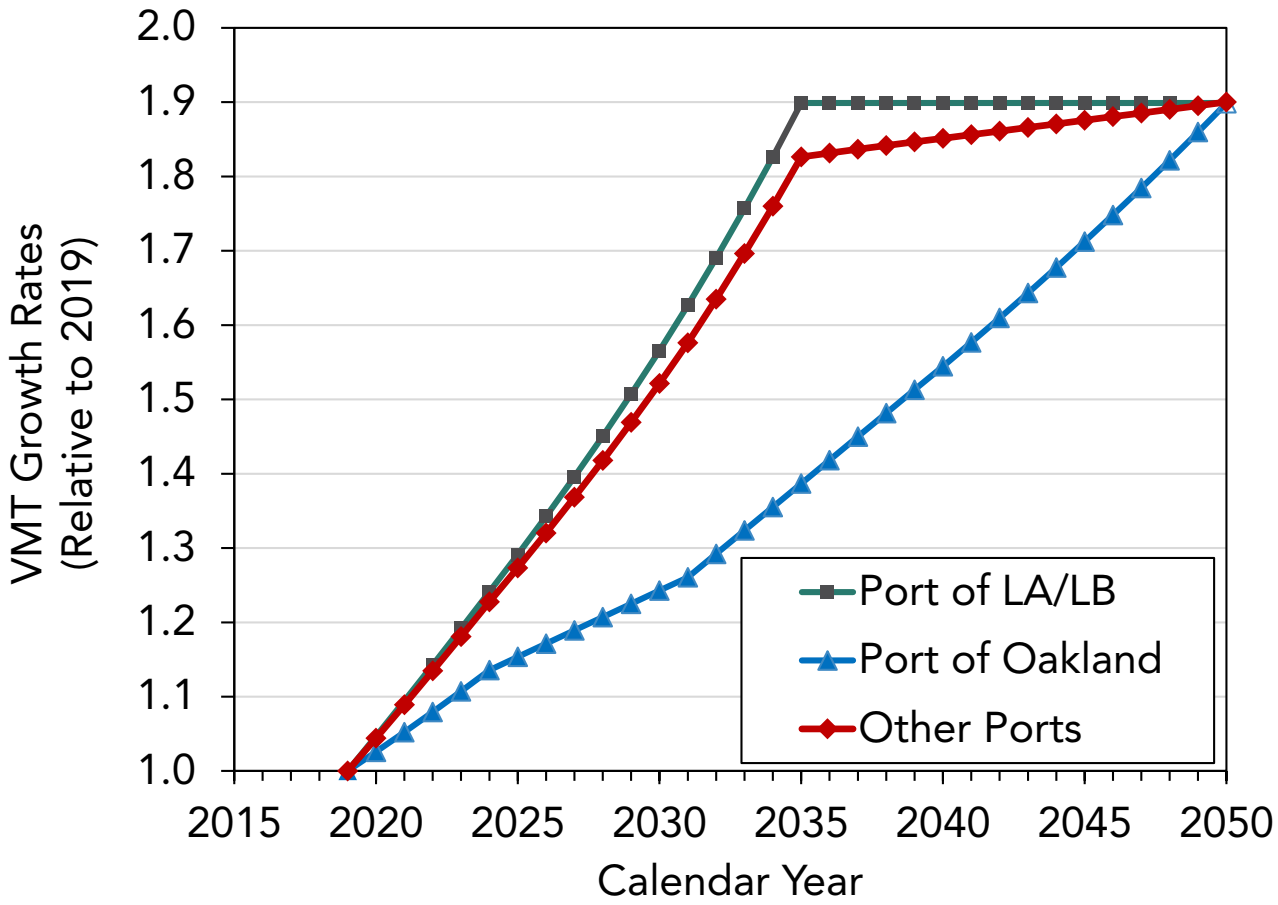
2019 Port Truck Model Year Distribution



*POLA: Port of Los Angeles/Port of Long Beach

Port Truck VMT Growth Rates

- Based on port specific forecasts of cargo growth rates
  - LA/LB: Mercator report (Feb. 2016)
  - Oakland: Tioga report (May 2020)
  - Other ports: weighted average of LA/LB (87.5%) and Oakland (12.5%)
- Does not account for mode shifts between truck and rail transport



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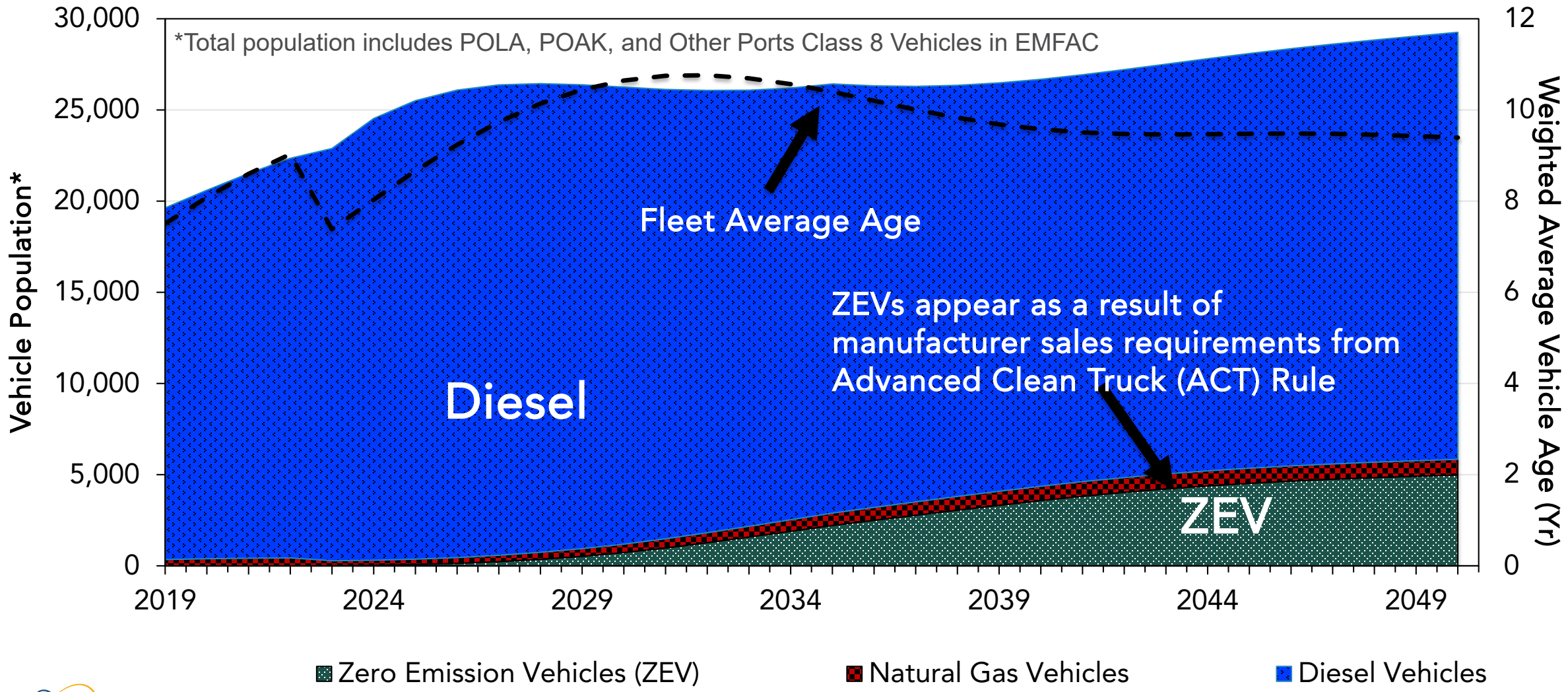
Current EMFAC202x Projections
Technology & Age Distribution

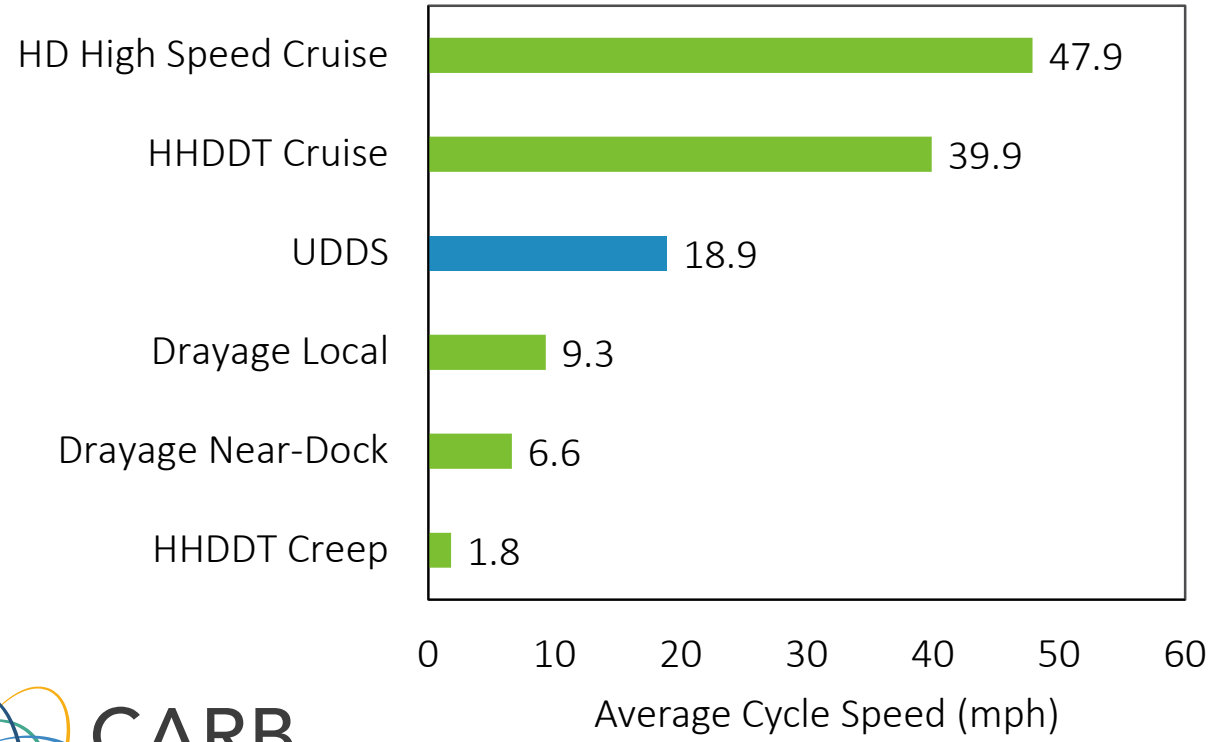


(Preliminary results - subject to change)

CARB Truck & Bus Surveillance Program (TBSP)

- To date, **38** MY2013+ trucks tested on dyno over 6 test cycles
- Most trucks also tested with PEMS

In-Use Tests Using Chassis Dyno



Real World Tests using PEMS

PEMS Route	Driving Type
DP-WSAC-ART	Arterial
DP-WSAC-ART	Arterial / Freeway
DP-WSAC-INDEXT	Low Load / Low Speed
DP-PLAC	Uphill / Downhill

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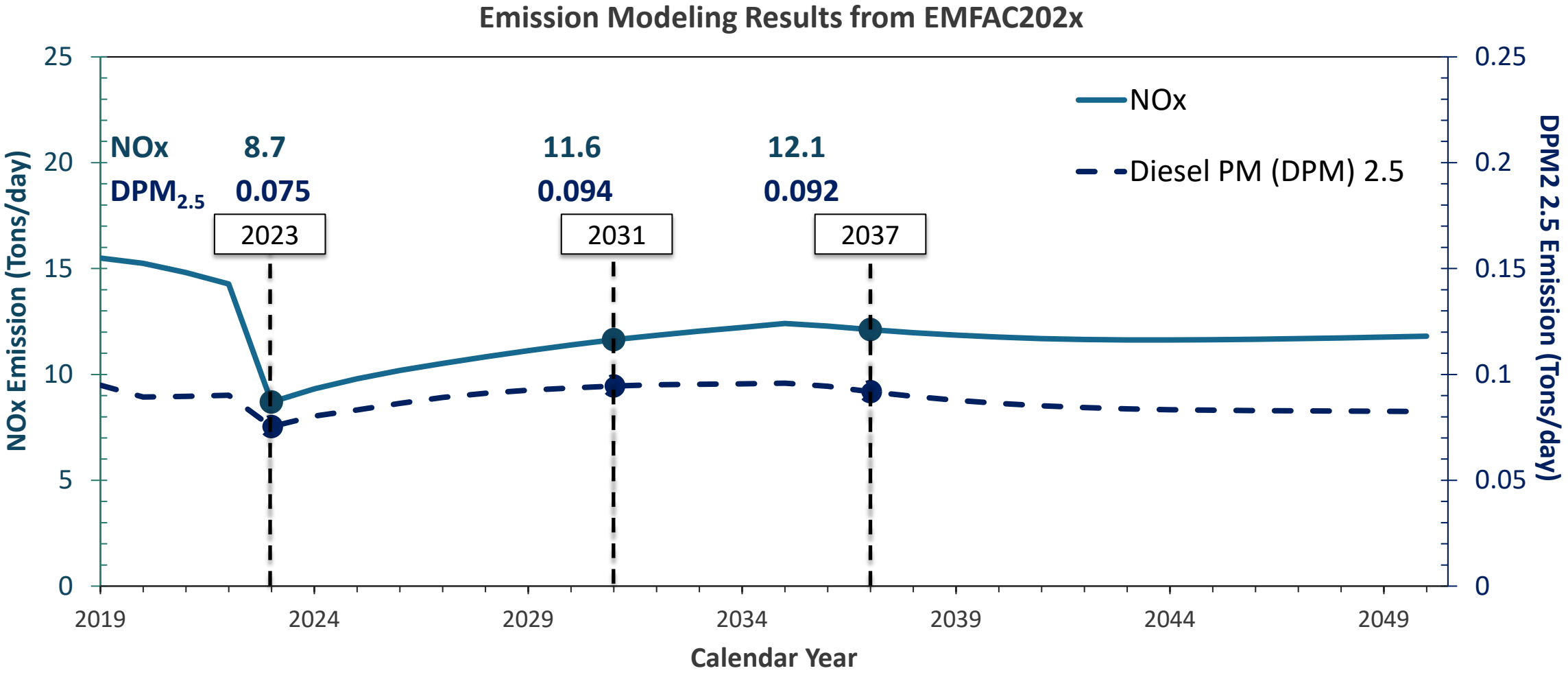
EMFAC202x: Baseline Emissions for NOx and PM2.5



(Preliminary results - subject to change)

Next Steps

- Exploring potential data sources for other drayage categories:
  - ✓ Railyards
  - ✓ Other ports

- Emission benefit analysis based on latest available data and proposed regulatory concepts

EMFAC Drayage Emission and Population Contacts

- EMFAC202x will be released late 2020 or early 2021.
- **EMFAC web database**: https://arb.ca.gov/emfac/
- **Mobile Source Emission Inventory**: https://ww2.arb.ca.gov/our-work/programs/mobile-source-emissions-inventory
- **Contacts:**
  - ❖ General questions about EMFAC: emfac@arb.ca.gov
  - ❖ Emission inventory for Advanced Clean Fleets regulation: Stephanie Kong at stephanie.kong@arb.ca.gov

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Drayage Operational Characteristics

Drayage Operations

CALSTART Drayage Driver Study 2013: *Key Performance Parameters for Drayage Trucks Operating at the Ports of Los Angeles and Long Beach*

- **Trip Lengths:** 81% less than 60 miles
- **Overnight Storage:** 80-90% return to local yards near the ports
- **Truck Trips:** Typically 3 roundtrips per day
- **Shifts Per Day:** 85-90% one shift per day

CALSTART 2013: Drayage Typical Trip Distance		
Trip Distance	% of Trips	% Total
<10 miles	13%	13%
10-20 miles	23%	36%
20-40 miles	23%	59%
40-60 miles	22%	81%
60-100 miles	15%	96%
100+ miles	5%	*100%

*Exception due to rounding.

Key Performance Parameters for Drayage Trucks Operating at the Ports of Los Angeles and Long Beach: https://calstart.org/wp-content/uploads/2018/10/I-710-Project_Key-Performance-Parameters-for-Drayage-Trucks.pdf

Drayage Operations: March 2019 San Pedro Ports CAAP

Operational parameter	Units	Value
Minimum Operational Capabilities Needed		
Maximum Shift Distance	miles	600
Maximum Shifts per Day	#/day	2
Maximum Daily Mileage	miles	800
Maximum Weight (GCWR)	lbs	80,000
Top Speed (0 % grade)	mph	60
Gradeability @ 0 mph	% grade	15% at 80,000 lbs
Gradeability @ 40 mph	% grade	6% at 80,000 lbs (short distance bridge climb)
Gradeability @ 35 mph	% grade	6% at 57,000 lbs (sustained)
# of Shifts between charging/fueling		2 shifts with less than 5 hours for charging/fueling, or 1 shift with diesel-like fueling times

Average Operational Assumption for Economic and Infrastructure Analyses		
Average Shift Distance	miles	160
Average Shift Duration	hours	9.9
Average Shifts per Day	#/day	1.6
Average Daily Operating Time	hours	14.8
Average Daily Mileage	miles	238

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https://cleanairactionplan.org/documents/final-drayage-truck-feasibility-assessment.pdf/

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Infrastructure Planning

Sister Agency Infrastructure Coordination

- California Energy Commission
  - Biennial statewide charging infrastructure assessment (AB 2127)
  - Light-duty, heavy-duty, off-road
  - Spatially model future infrastructure and energy demand
- California Public Utility Commission
  - Developing Transportation Electrification Framework
  - Support SB 350 and other transportation electrification goals
- Go-BIZ for infrastructure support and deployment

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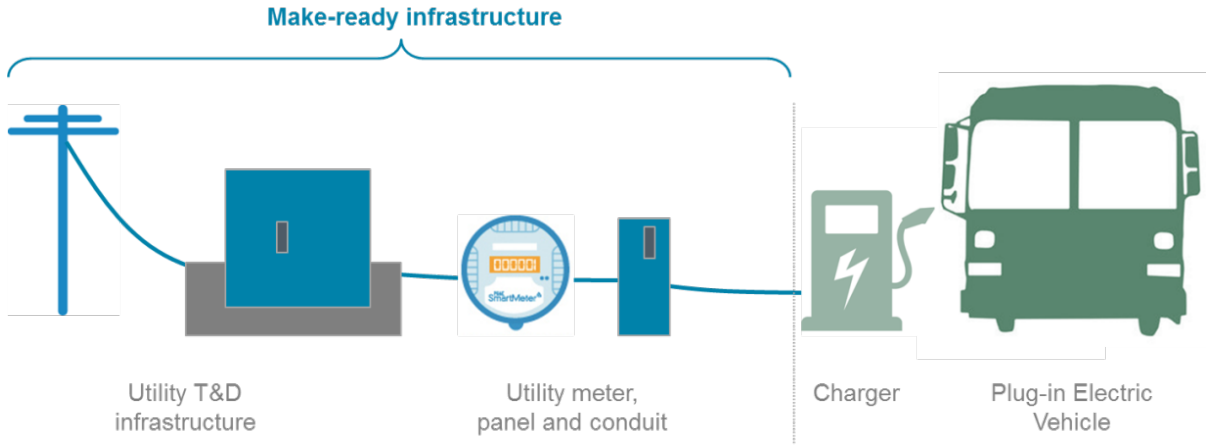
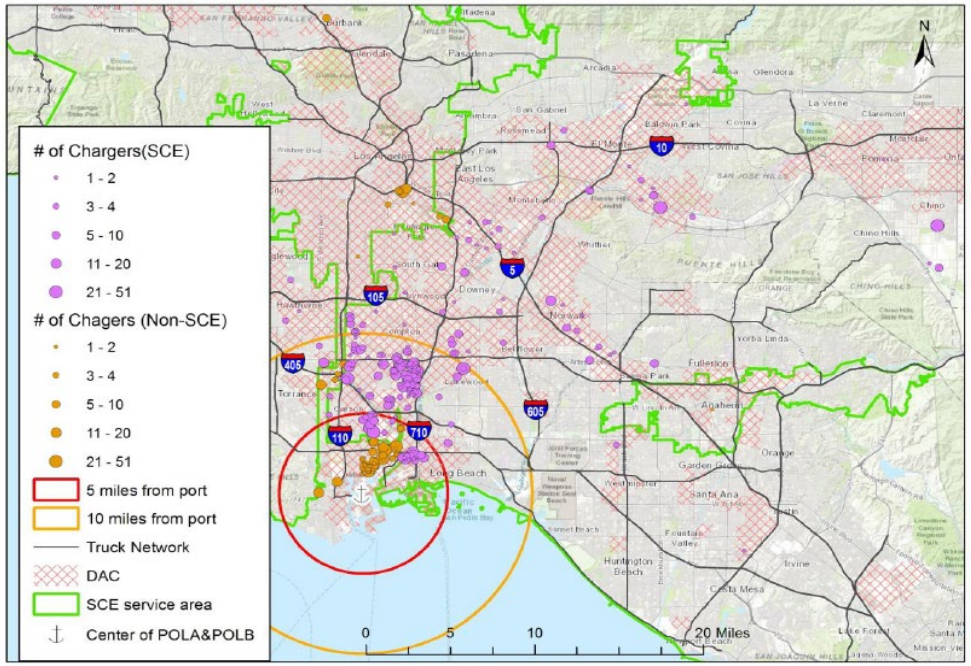
SB 350 Transportation Electrification

- California utilities supporting battery electric truck and bus deployments
- $686 million approved through 2023 for three largest utilities
  - Pay for design and electrical service upgrades on customer property
  - Support charging 18,000 trucks, buses, and off-road vehicles through 2023
  - Rebates for chargers in DACs
- Publicly-owned utilities developing own programs
- New electricity rates to encourage electric vehicles



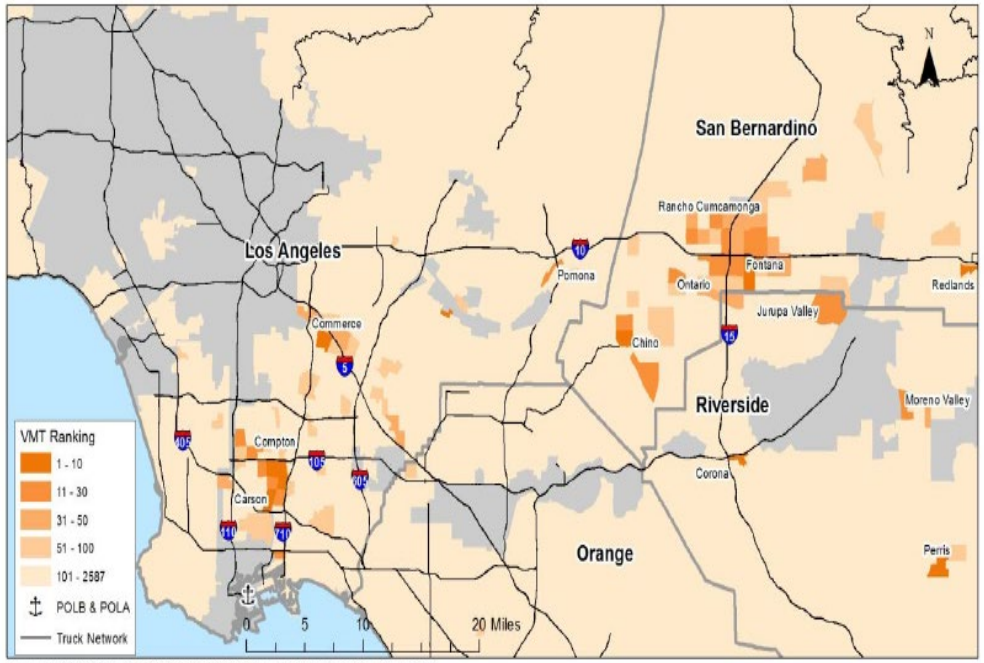
Other Infrastructure Planning

Charging Infrastructure Strategies: Maximizing the Deployment of Electric Drayage Trucks in Southern California UCLA Luskin Center for Innovation 2019



Source: POLB(2018), Caltrans(2018), CalEPA(2018),SCE(2019),SCAG(2012)
Service Layer Credits: Sources: Esri, HERE, Garmin, Intermap, increment P Corp., GEBCO, USGS, FAO, NPS, NRCAN, GeoBase, IGN, Kadaster NL, Ordnance Survey, Esri Japan, METI, Esri China (Hong Kong), swisstopo, © OpenStreetMap contributors, and the GIS User Community

Figure 32. Charger Placement in the Long-term (including non-SCE Area)



Source: SCAG(2012),Geofabrik (2018),SCE(2019),Caltrans(2018),California Open Data (2016)

Figure 35. TAZs with High VMT of Heavy-duty Drayage Trucks Entering or Departing the Ports

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Charging Infrastructure Strategies https://innovation.luskin.ucla.edu/wp-content/uploads/2019/06/Charging_Infrastructure_Strategies.pdf

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ZE Drayage Truck Market Overview

Market Availability for ZE Drayage Trucks

Hybrid and Zero-Emission Truck and Bus Voucher Incentive Project (HVIP) eligibility vehicle list:

Freightliner

Volvo

Peterbilt

Kenworth

BYD

Lion

Coming soon:

TESLA

TOYOTA & HINO

HYUNDAI

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ZE Drayage Truck Specifications

Make	Model	BEV	Fuel Cell	Estimated Range (miles)
Freightliner	eCascadia	x		250
Volvo	VNR Electric	x		150- 350
Peterbilt	579 EV	x		150
Kenworth	T680E	x		150
BYD	8TT	x		125
Lion	Lion8	x		Up to 250
Tesla	Semi	x		300-500
Hino & Toyota	XL7 Electric		x	n/a
Nikola	Two, Tre	x	x	100-350 500-750
Hyundai	XCIENT		x	240
XOS	ET- One	x		300-360

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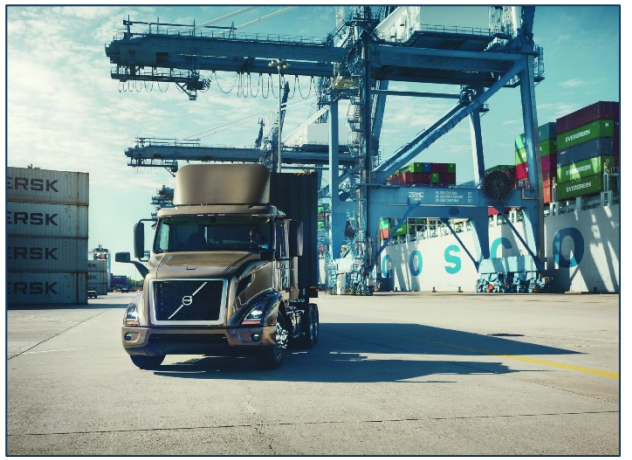
Information in this table is pulled from OEM websites and publically available literature.

CARB Investments in Drayage Technology

- Demonstration projects aim to accelerate the adoption of the next generation of advanced technology.
  - Seven drayage specific demonstration and pilot projects
    - General timeline: 2016 to 2021
  - Deployed at seaports, freight facilities, and intermodal yards
  - **80** electric drayage trucks
    - 15 hydrogen fuel cell, 65 battery electric
  - $228 M spent in total
    - $122 M contributed by CARB
    - Also supports some infrastructure



Heavy-duty Summary Pages: https://ww3.arb.ca.gov/msprog/lct/posters_heavy.htm

Lessons Learned from CARB Demonstrations and Pilots

- ZE trucks have some technology advantages
  - Torque, power, and gradeability
- Drivers appreciate electric trucks
  - Quieter, no diesel smell, less fatigued, lower maintenance costs, and lower cost per mile for fuel
- Improving technology
  - Range, weight, and recharging time

LCFS Can Reduce ZEV Fleet Fuel Costs

- Market mechanism from established LCFS regulation
- Credit goes to station owner/operator
  - Charging station
  - Hydrogen station
- Report amount dispensed to vehicles quarterly to earn credits
- Sell LCFS credits on open market
  - Sales offset fuel costs

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More information on LCFS: https://ww3.arb.ca.gov/fuels/lcfs/lcfs.htm

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Funding Opportunities

Proposed Fiscal Year 2020-21 Funding Plan

- Board will consider proposed funding plan on Dec. 10, 2020:
  - $28.64 M for Air Quality Improvement Program (AQIP)
  - $0 Low Carbon Transportation Incentives
    - $25 M allotted to Clean Truck and Bus Vouchers (HVIP)
- Prioritization given to Drayage Trucks via temporarily increased incentive amounts
- Modifiers can also support the Drayage Industry: DACs and Fuel Cell Tech
- Implementation workgroup in January

Proposed ZEV Incentives

Vehicle Weight Class	Base
Class 2b	TBD
Class 3	$45,000
Class 4-5	$60,000
Class 6-7	$85,000
Class 8	$120,000
Class 8 Drayage Truck Early Adopter*	$150,000

**Drayage tractor voucher amounts revert to Class 8 voucher amounts on 12/31/21*

Voucher Modifiers (plus-ups and discounts)	
Disadvantaged Community	+10%
Class 8 Fuel Cell	+100%
Public Transit Agencies	+15%
School Buses for Public School Districts	+65%
Plug-in Hybrid (>35 mi AER)	-50%
In-Use Converted/Remanufactured	-50%

Plan: https://ww2.arb.ca.gov/sites/default/files/2020-11/proposed_fy2020-21_fundingplan.pdf

Additional Sources of Incentive Funding

- Joint CEC and CARB grant solicitation (GFO- 20-606)
  - $44.1 M available for large scale deployment of on-road, zero-emission Class 8 drayage & regional haul trucks
  - Fueling infrastructure also supported
- Volkswagen Environmental Mitigation Trust
- Community Air Protection Incentives
- Carl Moyer Memorial Air Quality Standards Attainment Program
- Prop 1B- Goods Movement Emission Reduction Program
- Local sources of funding: Air Districts, Ports

Joint Solicitation: https://www.energy.ca.gov/solicitations/2020-11/gfo-20-606-zero-emission-drayage-truck-and-infrastructure-pilot-project
2020-21 Long Term Heavy-Duty Investment Strategy: https://ww2.arb.ca.gov/sites/default/files/2020-11/appd_hd_invest_strat.pdf

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Next Steps and Timeframe

- Next Steps
  - Continue meeting with fleets and stakeholders
  - Continue interagency infrastructure coordination
  - Continue EMFAC 202x inventory updates
  - Collect and analyze fleet turnover rates and mileage

- Timeframe
  - Next Advanced Clean Fleets (ACF) workshop early 2021
  - Rule recommendation to Board anticipated in December 2021
  - Implementation expected to start in 2023

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Comments and Discussion

CARB Contacts

Please send comments and questions to: freight@arb.ca.gov

More information or join email list:

Advanced Clean Fleets Regulation Web Page:
https://ww2.arb.ca.gov/our-work/programs/advanced-clean-fleets
Email List:
https://public.govdelivery.com/accounts/CARB/subscriber/new?topic_id=zevfleet