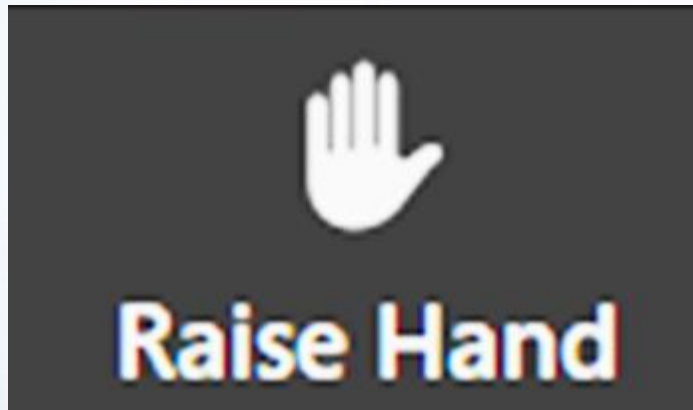




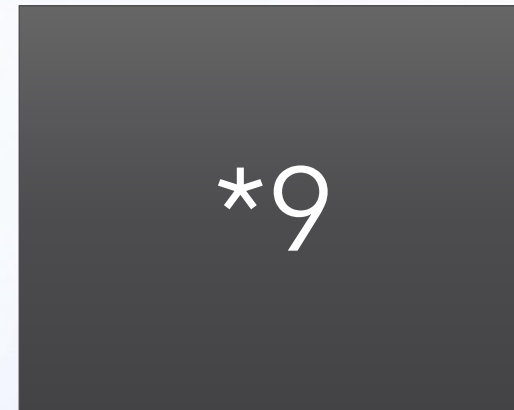
Drive Forward: Heavy-Duty Standards and Strategies Workshop

December 3, 2025

How to Participate on Zoom



To be added to the speaking queue, use the **Raise Hand** feature



Phone: Press ***9** to Raise Hand and *6 to Unmute

Tech Support and Reminders



All meeting materials, the Zoom recording (available soon), and support info are available on the [Meetings & Events page](#) or by scanning the QR code.

For help, contact us at driveforwardfleet@arb.ca.gov.

Workshop Agenda

- Drive Forward Initiative
- Background
 - Emissions and policy
 - Emission reduction technologies
- Regulatory framework
 - Manufacturer concepts
 - Fleet and other concepts
- Discussion
- Next steps
- Outreach plan



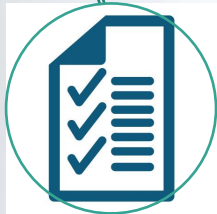
Drive Forward Initiative Overview

This workshop is being recorded

Executive Order N-27-25: California Continues Forward



Reaffirms commitment to deploying ZEVs



Assess additional actions to advance ZEV adoption



Develop new regulations to reduce GHG, criteria, and toxic pollutants



Consider flexibility in new regulations for entities that align with existing regulations



ZEV Forward

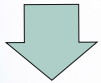
Assess additional actions to advance ZEV adoption



Discussion Pulse Points

Affordability

"solid commitment to incentives"



"work with local [funding] programs"



"maximize [funding] for those who need it most"

Infrastructure

"expand charging infrastructure in frontline communities"



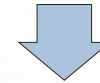
"reliable charging stations along key freight corridors"



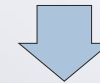
"make permitting easier"

ZEV Market

[ZEVs] "are rapidly picking up pace"

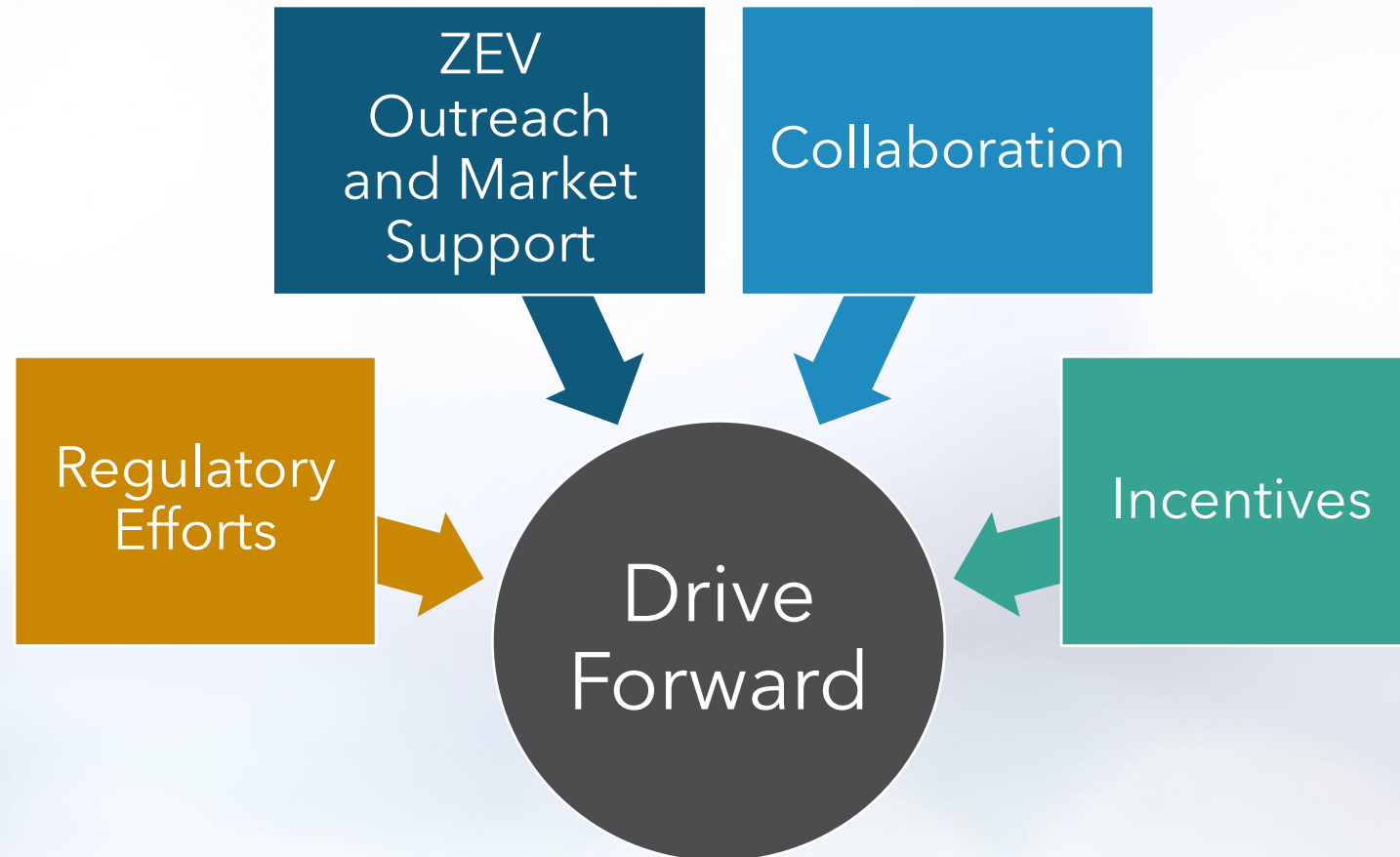


"consider the secondary market"

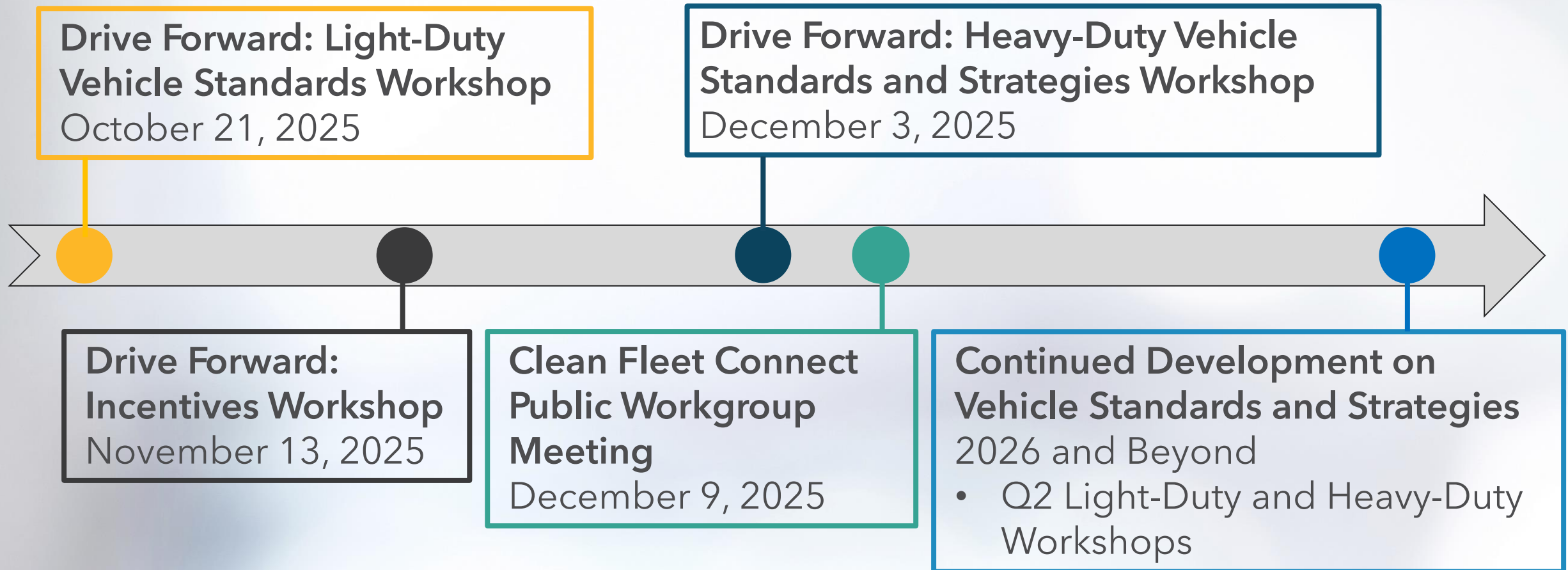


[support] "the coalition of the willing"

Drive Forward Initiative



Drive Forward: Timeline through Early 2026





Drive Forward: Light-Duty Vehicle Program

- **Goals:**

- Reduce emissions from light-duty vehicles to protect the health of our most vulnerable populations
- Design stringent but flexible programs that achieve cost-effective emission reductions
- Incentivize early action
- Ensure real-world emission reductions

- **Workshops:**

- [October 21, 2025](#) - recording available
- Next workshop - Winter/Spring 2026
- Community meetings - Spring/Summer 2026

- **More Information:**

- <https://ww2.arb.ca.gov/our-work/programs/drive-forward-light-duty-vehicle-program>





Drive Forward: Incentives Workshop

November 13, 2025

Goal: Facilitated discussion on the next phase of incentives policies and funding needs

Topics included:

- Status of current incentive programs
- Successes, challenges, and lessons learned
- Funding needs and strengthening collaboration

More information can be found online

- <https://ww2.arb.ca.gov/events/workshop-drive-forward-incentives>





Clean Fleet Connect

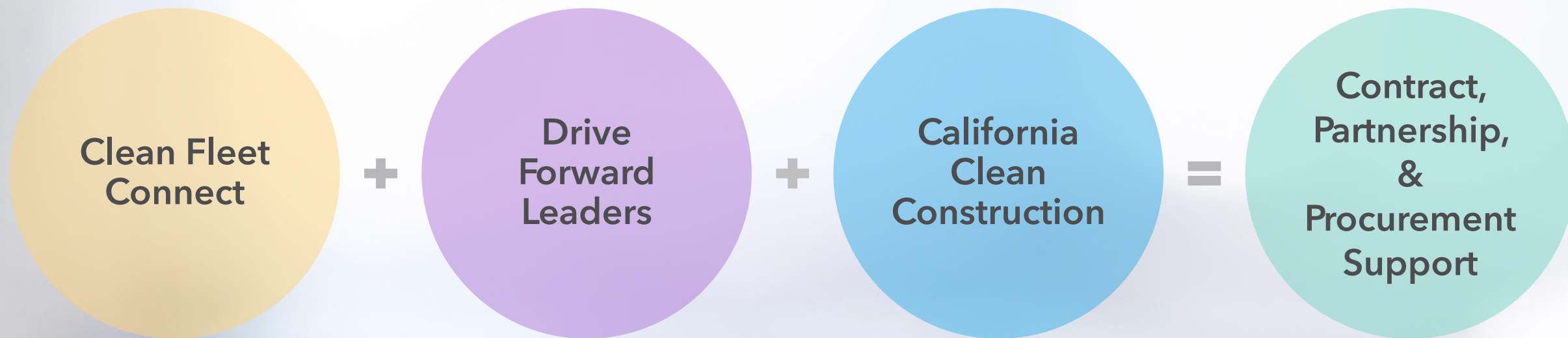
- Planned web tool to highlight fleets that adopt zero-emission vehicles
- Aims to help connect fleets to hiring entities
- Open to on-road fleets with medium- and heavy-duty vehicles
- Fleet participation is **voluntary**
- Expected launch: Early 2026
- Public Workgroup on December 9, 2025: <https://ww2.arb.ca.gov/our-work/programs/clean-fleet-connect>





Encouraging Zero-Emission Technologies

Explore opportunities to connect voluntary programs to State and local government procurement and contract practices





Drive Forward: Outreach and Community Engagement

- Expanding dialogue sessions that are used to shape programs
- Provide guidance to navigate regulatory efforts
- Support for rural and tribal communities
- Engaging communities on their terms
- Building trust and lasting partnerships





Emissions and Policy Background

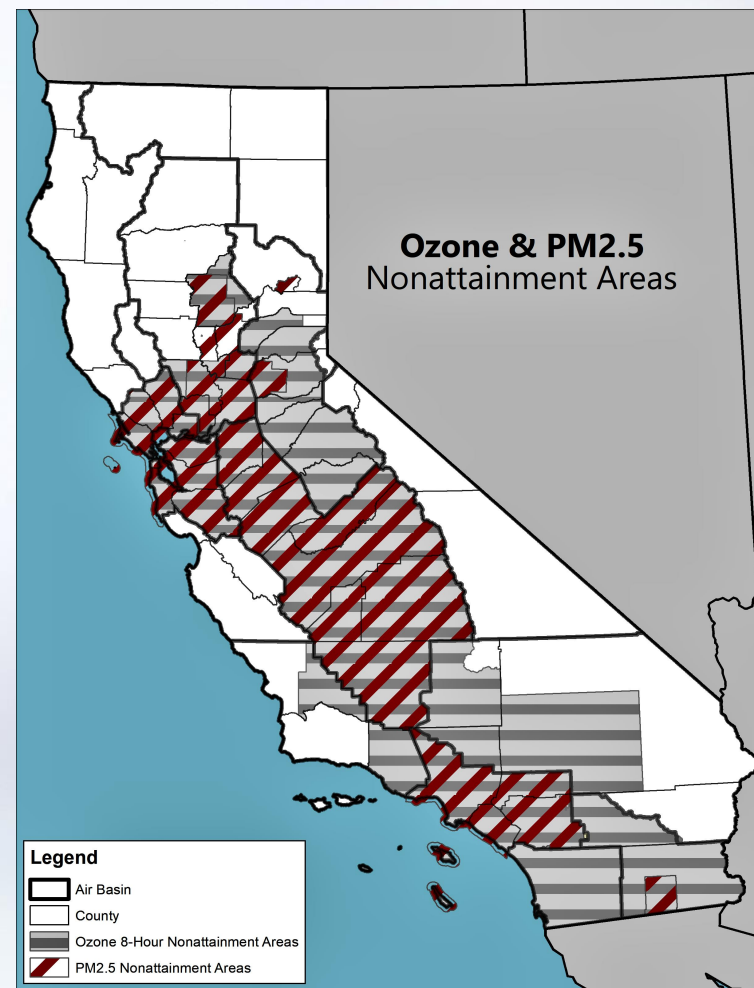
This workshop is being recorded

Air Pollution and Climate Change Continue to Threaten Public Health in California



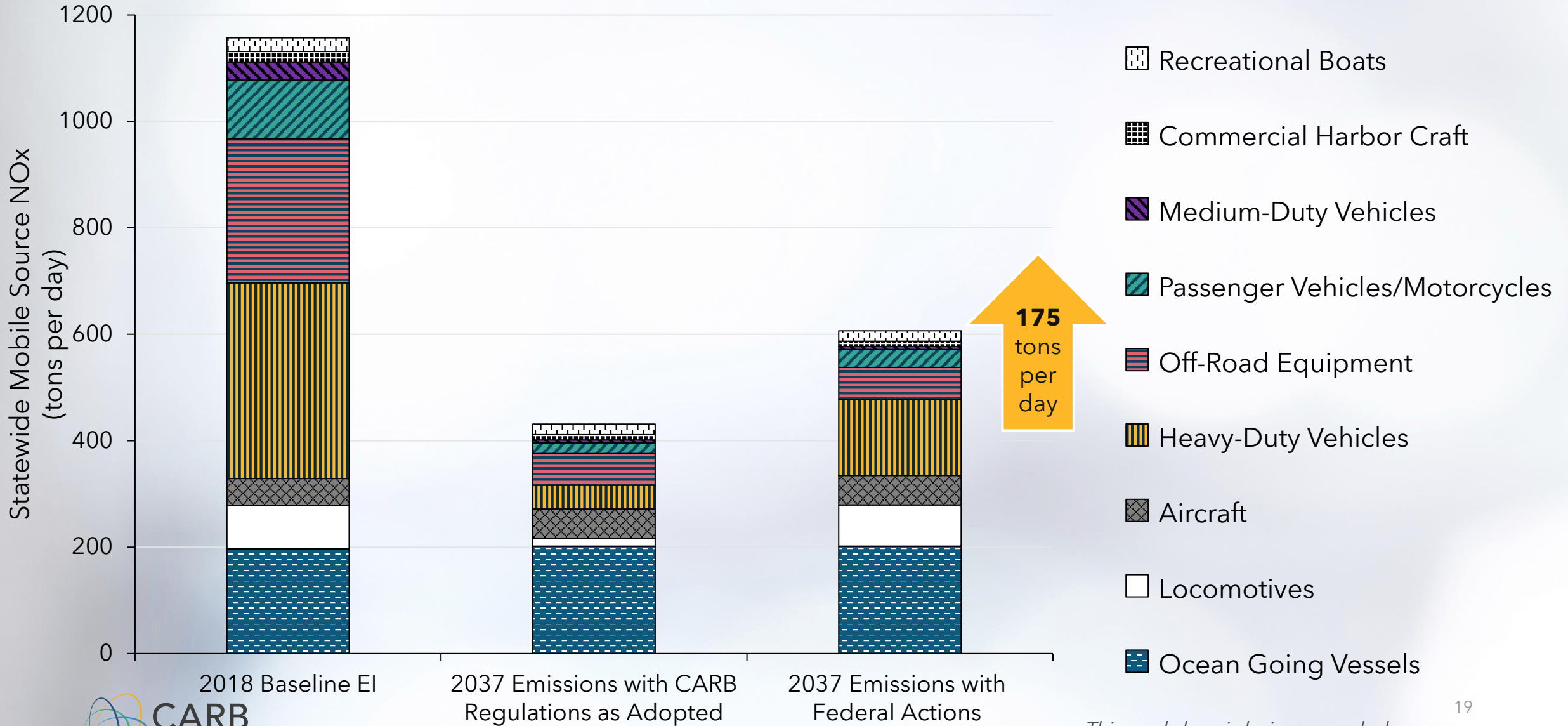
Major Oxides of Nitrogen (NO_x) and Particulate Matter (PM) Emission Reductions Needed

- California has the worst air quality in the nation
- Key challenges
 - San Joaquin Valley – PM_{2.5}
 - South Coast – Ozone
- NO_x and other reductions critically needed
- State Implementation Plan (SIP) commitments at risk

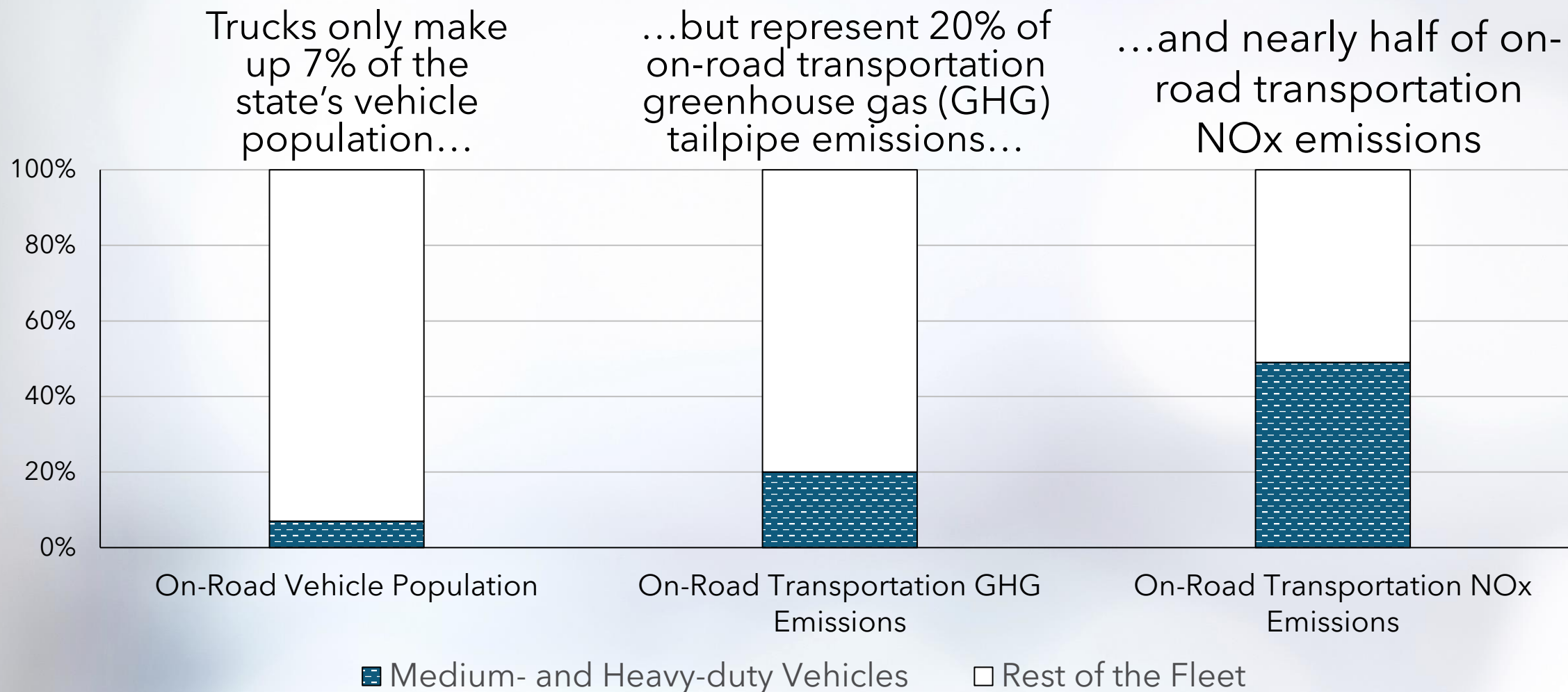


Ozone: 0.70 ppb 8-hr Standard (2015) PM_{2.5}: Annual Standard (2012)

Federal Attacks Will Significantly Increase NOx Emissions in California



The Importance of Addressing Truck Emissions



*Data from EMFAC2025v2.0.0 for 2025 calendar year



Emissions Reduction Technologies

This workshop is being recorded

Emission Reduction Strategies



2009

Low Carbon Fuel
Standard



2018

Innovative Clean Transit
& Phase 2 GHG



2020

Advanced Clean
Trucks (ACT)



2021

Clean Truck
Check

2013

Phase 1
GHG



2019

Zero-emission
Airport Shuttle &
Zero Emission Powertrain
Certification



2021

Heavy-Duty
Omnibus



2023

Advanced Clean Fleets (ACF): State
and Local Government Fleets



Background on Emission Reduction Technologies

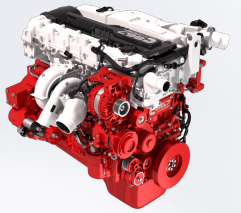
Criteria Pollutant Reduction

- Engines meeting lower NOx standards
- Engine cylinder deactivation
- Improved catalyst formulation
- Dual selective catalytic reduction (SCR) catalysts
- Particulate matter filters
- Cooled exhaust gas recirculation
- Weight reduction
- Cleaner burning fuels
- Hybrids
- Zero-emission vehicles



GHG Reduction

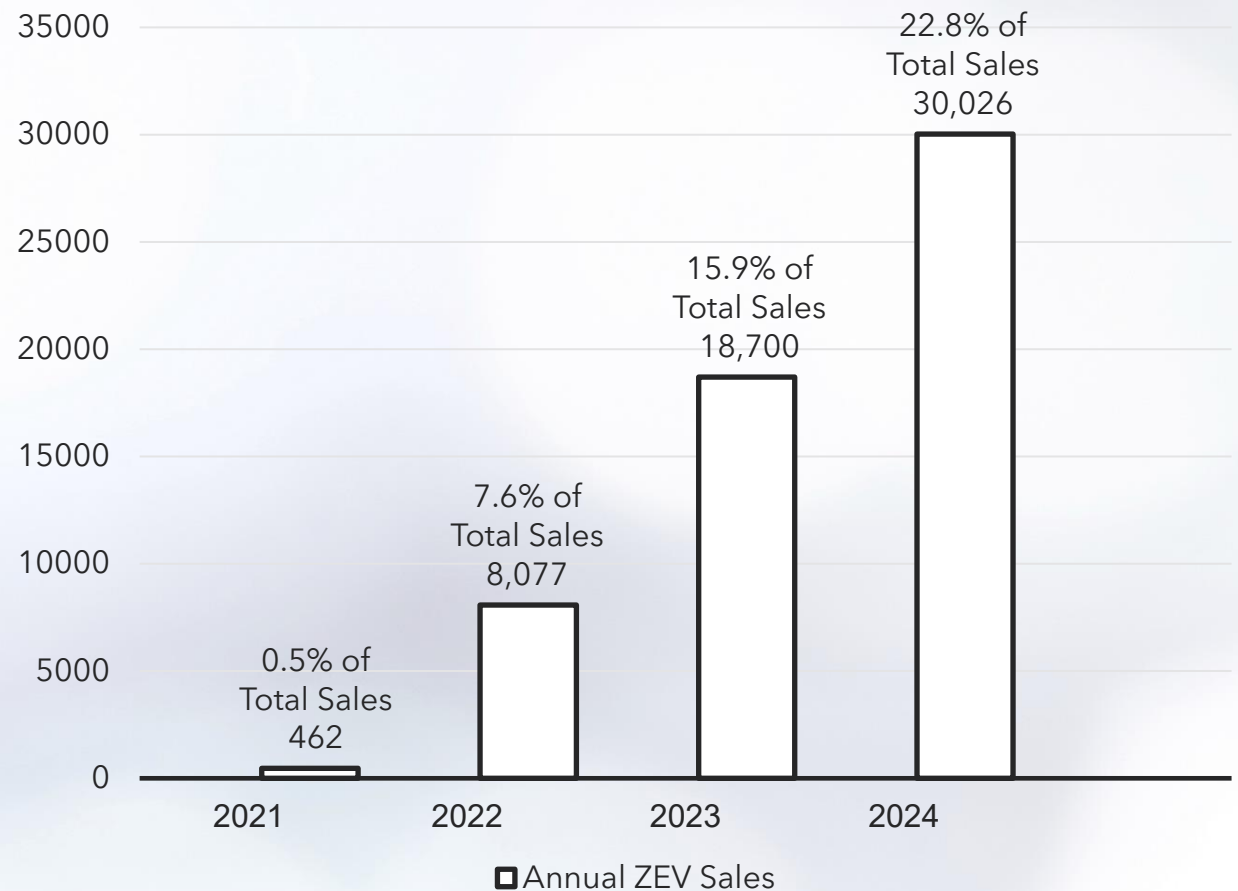
- Advanced internal combustion engines
 - Reduce engine friction, enhance air handling, & waste heat recovery
- Aerodynamic improvements
 - Trailer skirts, cab extenders, and roof fairings
- Low rolling resistance tires & tire pressure management
- Idle reduction such as engine start/stop
- Platooning
- Mobile carbon capture
- Weight reduction
- Low carbon fuels
- Hybrid
- Zero-emission vehicles



ZEV Benefits

- Zero tailpipe emissions
- Reduced brake wear related particulate matter
- Decreases maintenance needs
- Operational savings
- Energy security

California ZEV Sales Trend: Class 2b-8





Regulatory Principles and Scope

This workshop is being recorded

Principles for New Rules

- Protect public health with a focus on overburdened communities
- Achieve cost-effective and technologically feasible emission reductions
- Simple and streamlined compliance and enforcement
- Maintain a level playing field
- Incentivize early action
- Avoid unintended consequences for businesses and consumers



Overburdened Community Focus

- Assembly Bill 617 directs CARB to identify local community-level strategies
- Community Air Protection Program
- Blueprint 2.0, Statewide Strategy
- Community emissions reduction programs (CERPs)
- Criteria Pollutant and Toxics Emissions Reporting (CTR)
- Community Air Grants (CAGs)
- Communities seek rapid action on transportation and freight emissions
- Evaluate emission benefits and business impacts through a racial equity lens



Scope of Rulemaking Discussion

- General focus on medium- and heavy-duty vehicles
 - Gross vehicle weight rating (GVWR) >8500 lbs.
- Suggestions from the public apply to:
 - Manufacturers
 - Vehicle owners and operators, and
 - Other entities that hire truck services





Manufacturer Concepts

This workshop is being recorded

Recent Developments in Heavy-Duty (HD) Criteria Pollutant Standards

**AUG
2020**

CALIFORNIA LOW-NO_x OMNIBUS

First Omnibus
Board Hearing

2024+ MY
Engines in HD
vehicles

**DEC
2022**

U.S. EPA CLEAN TRUCKS PLAN

2027+ MY
Engines in HD
vehicles

**JAN
2025**

WAIVER GRANTED

U.S. EPA
grants waiver
to California
for the
Omnibus
regulation

**JUN
2025**

WAIVER DISAPPROVED

Omnibus
regulation waiver
purportedly
disapproved

**SEP
2025**

EMERGENCY RULEMAKING

Clarified previous
regulations, which
have U.S. EPA
waivers, remain
operative

Recent Developments in GHG Standards

2009

U.S. EPA ENDANGERMENT FINDING

GHGs in the atmosphere threaten public health and welfare

2011

U.S. EPA GHG PHASE 1

2014-2020 MYs

Manufacturers of engines, HD trucks and vans

Off the shelf technologies:
Low rolling resistance tires

2016

U.S. EPA GHG PHASE 2

2021-2027 MYs

Advanced technologies: start/stop, transmission, hybridization, and driveline improvements

2024

U.S. EPA GHG PHASE 3

2027+ MYs

Technology neutral and performance-based reductions in GHG emissions

2025

U.S. EPA PROPOSAL TO RESCIND ENDANGERMENT FINDING AND FEDERAL VEHICLE GHG EMISSION STANDARDS

Unfounded and contrary to the law

Manufacturer Concepts

- Consider aligning with federal Clean Trucks Plan NOx rule - Nationwide harmonized standards
- Stringent greenhouse gas standards on new trucks and engines
- Develop engine and/or vehicle standards to encourage ZEV deployment:
 - Include ZEVs in Carbon Dioxide (CO₂) averaging and/or Criteria Pollutant (NO_x) averaging?
- Encourage early production of ultralow NO_x engines and ZEVs



Seeking input on:
-How should CARB structure future
manufacturer standards?

Real World In-Use Emissions

- California Low NOx Omnibus and U.S. EPA Clean Trucks Plan rule include elements to ensure emissions benefits past certification:
 - **Low Load Cycle:** tests engines at lower loaded operation not previously represented in previous certification cycles. Some HD trucks spend a significant time in low load operation.
 - **In-Use Testing Requirements:** Manufactures must test their in-use engines with a Moving Average Window test procedure that covers most of the operating range a HD truck is expected to experience. Holds the engines to be within some margin of the certification emission limit.
- Consider new methods for real world emissions reductions and make sure we maintain the benefits from the recent Low NOx regulations.

Trailer Standards

- U.S. EPA removed trailer standards and other requirements in the Phase 3 rule
- California still implements the Tractor-Trailer Greenhouse Gas rule for in-use trailers in California
- Evaluate the need for more stringent standards for new trailers
- Consider expanding trailer applicability
- May include commercially available advanced technologies to make trailers more fuel-efficient



Seeking input on:
-How can CARB best ensure cleanest possible trailers?



Non-Exhaust Emissions

- Non-Exhaust Emissions (NEE) are pollutants released from vehicle that are not from the tailpipe or evaporative emissions
 - Brake wear, tire wear, resuspension of road dust by tires or wheels
- NEE could be more than 80% of primary PM emission inventory by 2050 based on a model prediction

Seeking input on:

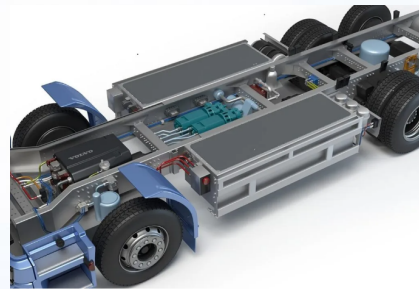
-Reduction options that can be considered for regulatory or alternative measures

Zero-Emission Powertrain Certification

- Include zero emission powertrain certification in any vehicle standards
- Manufacturer reporting for developing and maintaining inventory



Source: Autevtimes.com



Seeking input on:

-Are any changes to ZEP cert needed?

Do manufacturers have any concerns regarding reporting ZE sales to CARB?





Fleet and Other Regulatory Frameworks

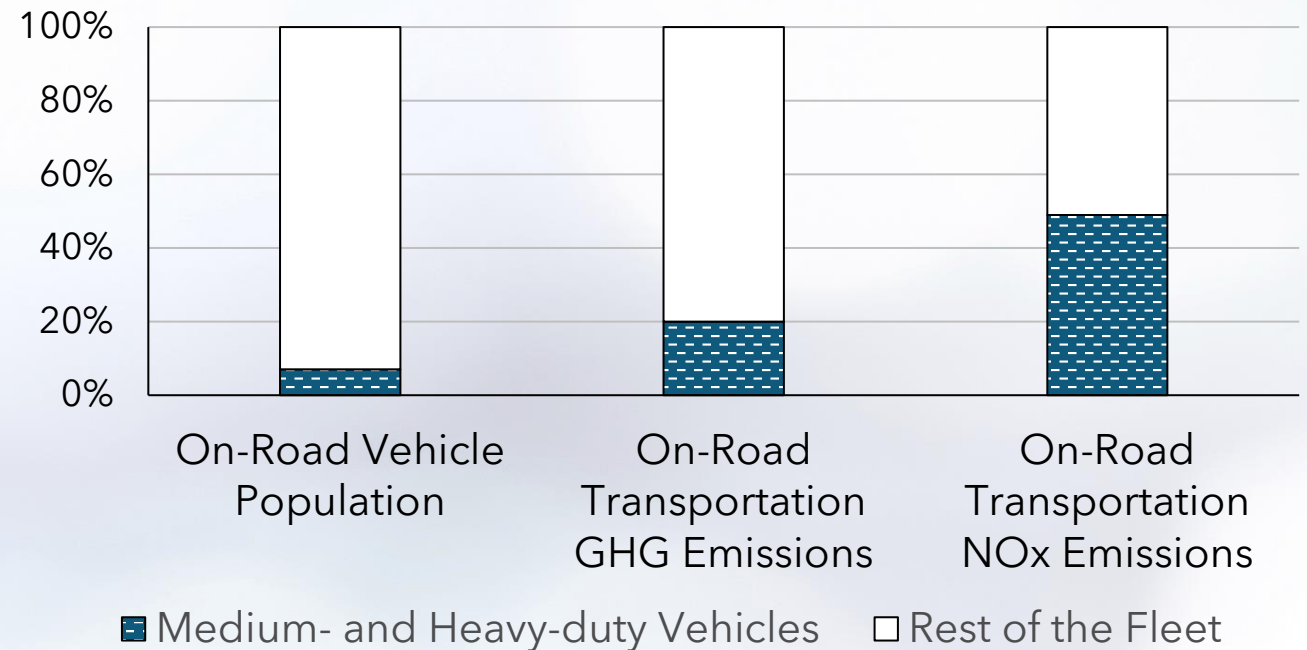
This workshop is being recorded

Fleets and Other Entities

- Background on statutory useful life requirements
- Potential frameworks
 - Truck owner rule concepts
 - Hiring entity concepts
- Discussion

Trucks only make up 7% of the state's vehicle population...

...but represent 20% of on-road transportation GHG tailpipe and nearly half of on-road transportation NOx tailpipe emissions



Useful Life Requirement

- Road Repair and Accountability Act of 2017 (SB 1)
- Applies to new fleet regulations or amendments requiring vehicle retirement, retrofit, replacement, or repower
 - Minimum of 13 years
 - Up to 800,000 miles or 18 years, whichever comes first

Fleet Owner Framework Concepts

- Retire and replace*
 - Retire vehicle at end of useful life
 - Replace with new or used best available control technology (BACT)
- Green zones*
 - Establish zones or regions that only cleaner vehicles can enter
- Clean Mile Standard for heavy-duty*
 - Establish a percentage of miles that must be driven with cleaner vehicles
- Fleet emissions target
 - Meet a NO_x or GHG emission target based on fleet average

*Ideas collected from public input at ZEV Forward Dialogue Sessions

Hiring Entity Concepts

- Hiring requirements*
 - Entities must hire fleets that meet existing fleet rule requirements
- Green contracting*
 - Entities hiring Class 7-8 tractors must hire green fleets (i.e.. fleets that voluntarily exceed the minimum requirements)
- Could apply to shippers, third party logistics, other hiring entities

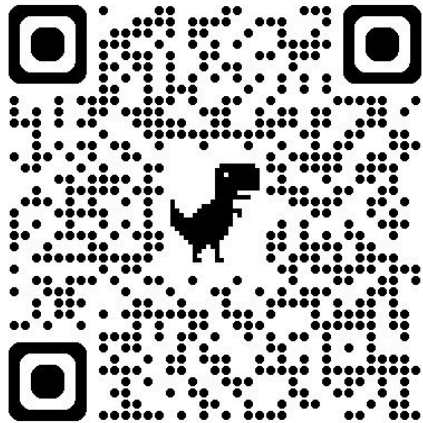
*Ideas collected from public input at ZEV Forward Dialogue Sessions

Discussion Topics

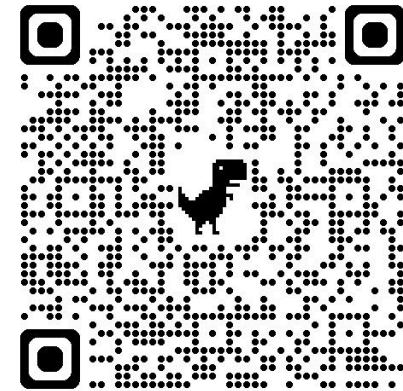
- Are there other frameworks to be considered?
- How should BACT be defined?
- What entities should be included in each concept?
- How to address differences between large and small fleets?
- Should requirements differ by industry/by sector?
 - Last mile urban delivery, regional/long haul shipping with dry or reefer vans, construction, other?
- What trucks are most amenable to ZE in the short term?
- What considerations should be given for fleets that took early action?

Tentative Timeline and Next Steps

- Quarterly workshops in 2026
- Board item in 2027
- Reach out to us at driveforwardfleet@arb.ca.gov



[Drive Forward Fleet
Program Page](#)



[Public Comment Docket](#)

Drive Forward Outreach

- **Inform** interested parties, local communities, business partners, and stakeholders about new rulemakings and seek their input
- **Build partnerships** with organizations, community groups and agencies to expand outreach opportunities
- **Communicate** through direct public engagement, social media, and events
- **Collect feedback** to inform and shape rulemaking
- **Promote inclusion** through language access and outreach