

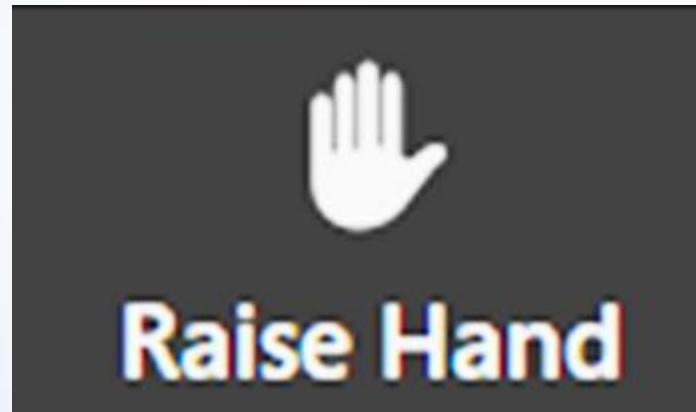


**CALIFORNIA**  
AIR RESOURCES BOARD

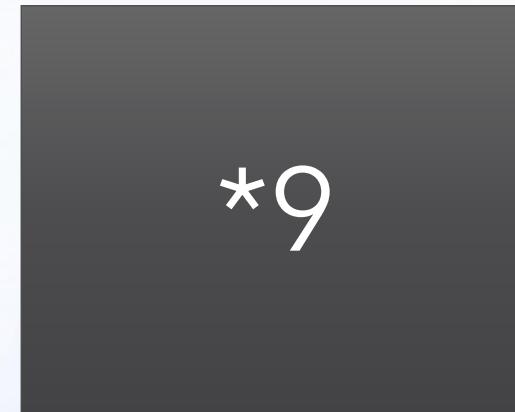
# **Drive Forward: Heavy-Duty Standards and Strategies Workshop**

December 3, 2025

# How to Participate on Zoom

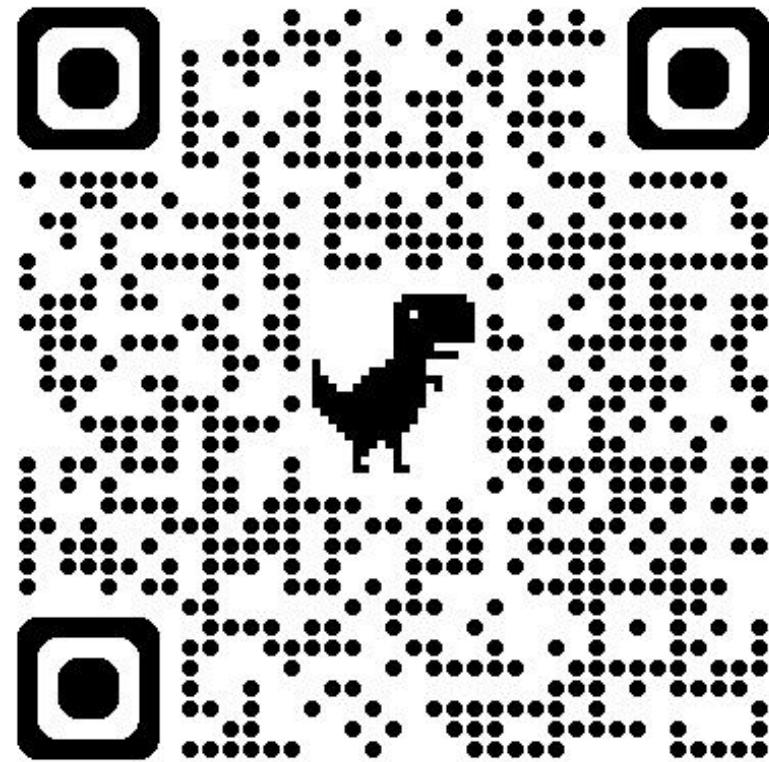


To be added to the speaking queue, use the **Raise Hand** feature



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](mailto: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"

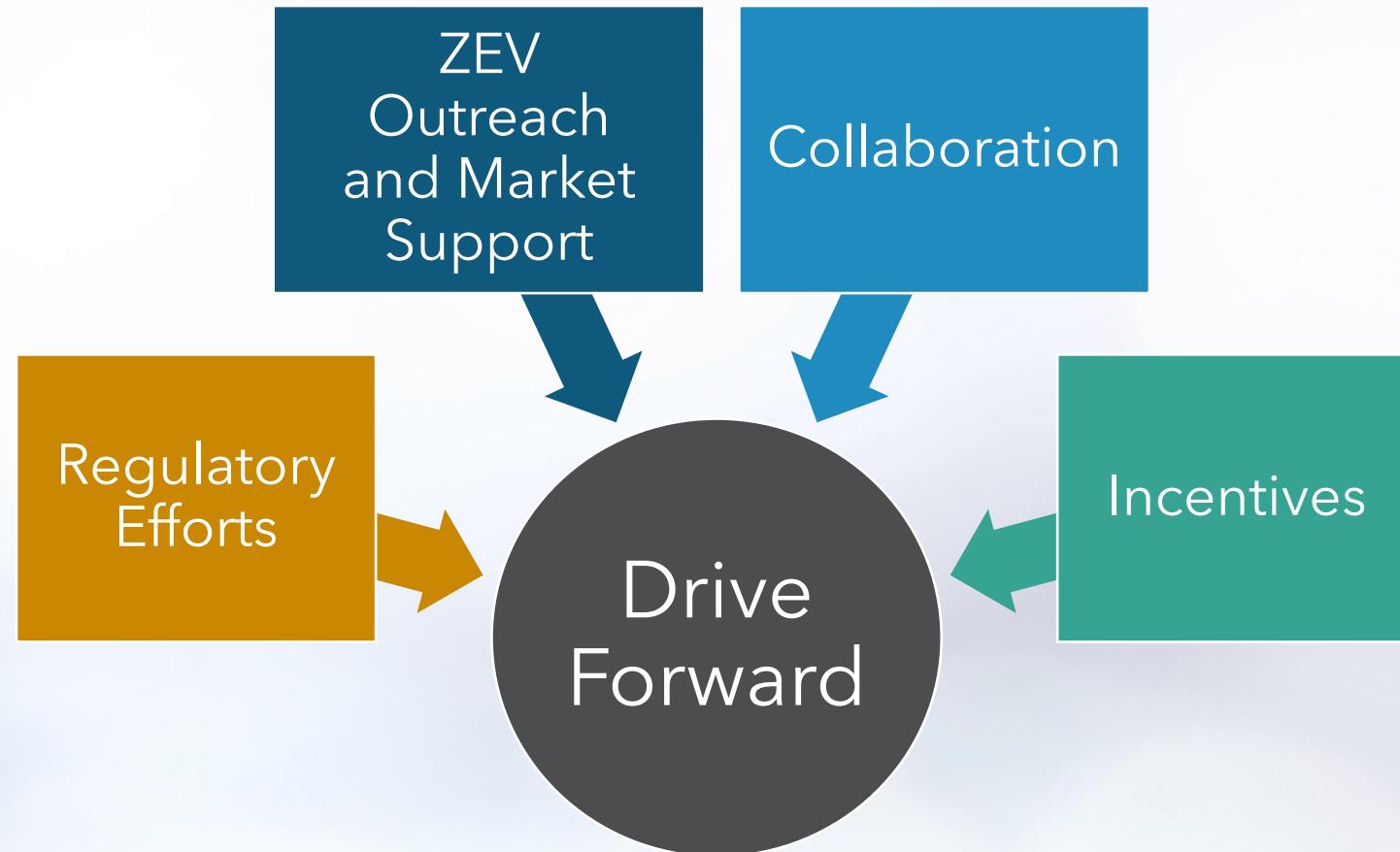


"consider the secondary market"



[support] "the coalition of the willing"

# Drive Forward Initiative



# Drive Forward: Timeline through Early 2026

**Drive Forward: Light-Duty Vehicle Standards Workshop**  
October 21, 2025

**Drive Forward: Heavy-Duty Vehicle Standards and Strategies Workshop**  
December 3, 2025

**Drive Forward: Incentives Workshop**  
November 13, 2025

**Clean Fleet Connect Public Workgroup Meeting**  
December 9, 2025

**Continued Development on Vehicle Standards and Strategies 2026 and Beyond**  
• Q2 Light-Duty and Heavy-Duty Workshops



# 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

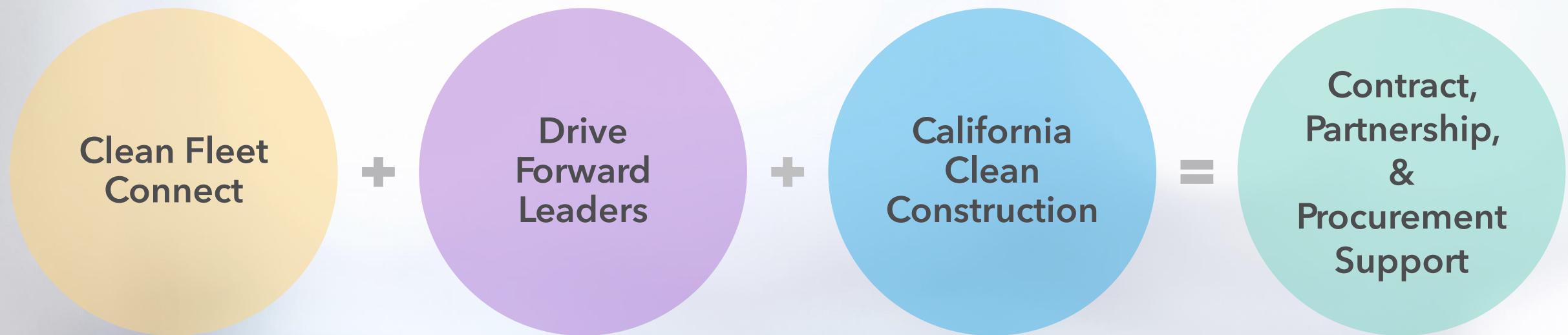
- Planned web tool to highlight fleets that adopt zero-emission vehicles
- Aims to help connect fleets to hiring entities
- Open to on-road fleets with medium- and heavy-duty vehicles
- Fleet participation is **voluntary**
- Expected launch: Early 2026
- Public Workgroup on December 9, 2025: <https://ww2.arb.ca.gov/our-work/programs/clean-fleet-connect>





# 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

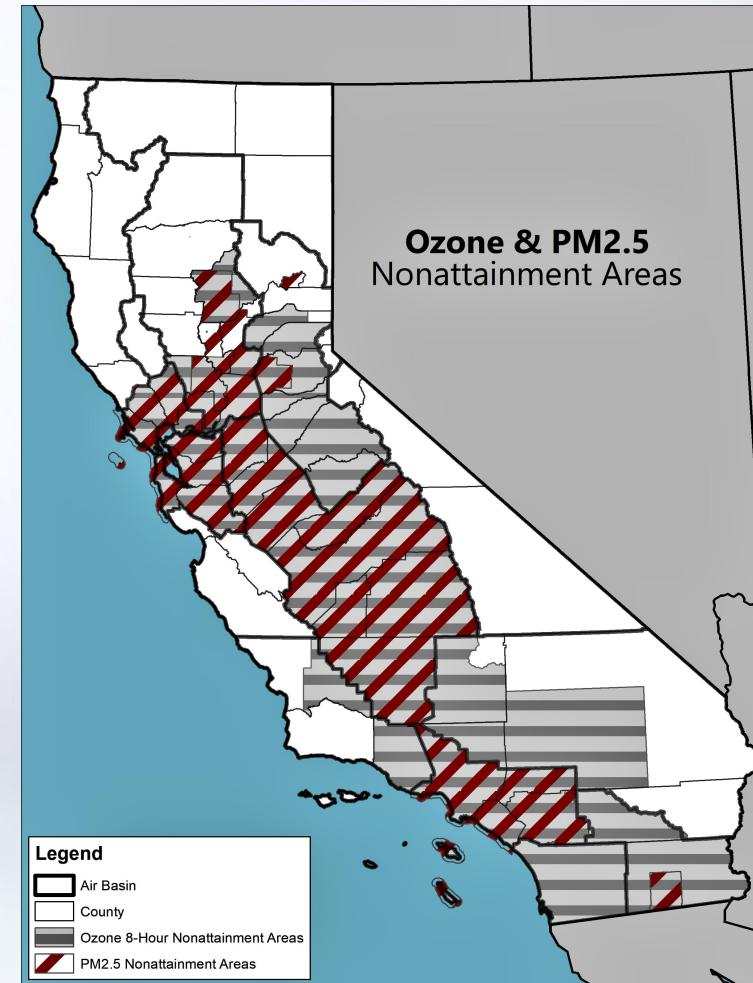
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# Air Pollution and Climate Change Continue to Threaten Public Health in California



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

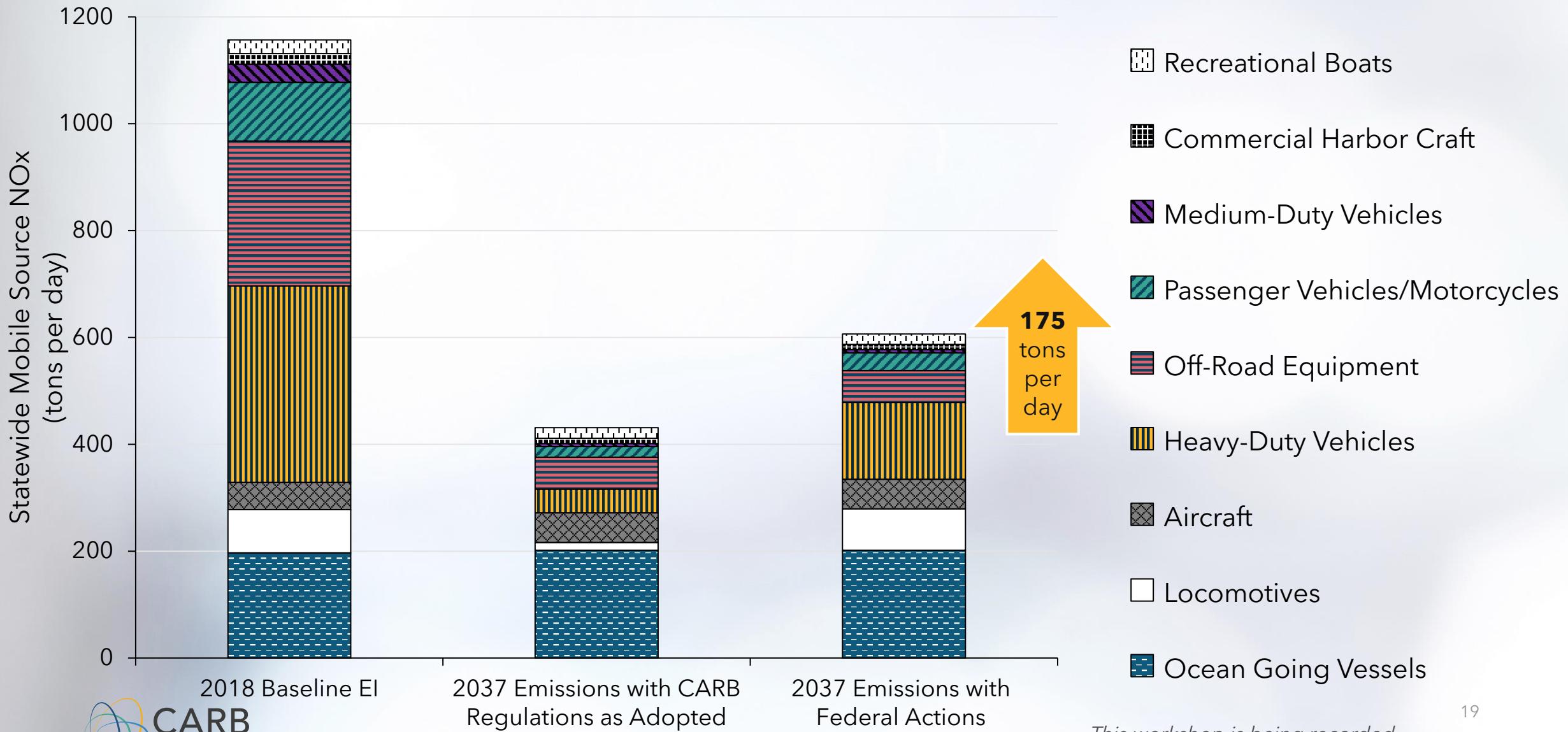
- California has the worst air quality in the nation
- Key challenges
  - San Joaquin Valley – PM2.5
  - South Coast – Ozone
- NOx and other reductions critically needed
- State Implementation Plan (SIP) commitments at risk



Ozone: 0.70 ppb 8-hr Standard (2015) PM2.5: Annual Standard (2012)

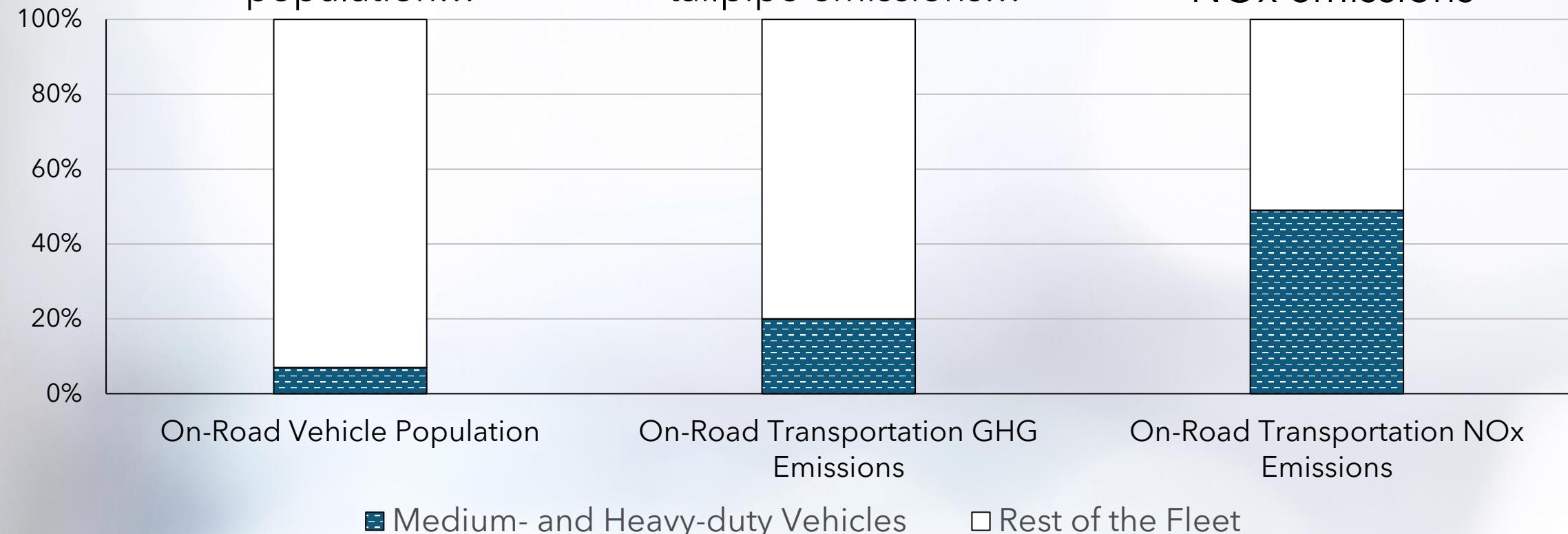
*This workshop is being recorded*

# Federal Attacks Will Significantly Increase NOx Emissions in California



# The Importance of Addressing Truck Emissions

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



■ Medium- and Heavy-duty Vehicles      □ Rest of the Fleet

\*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



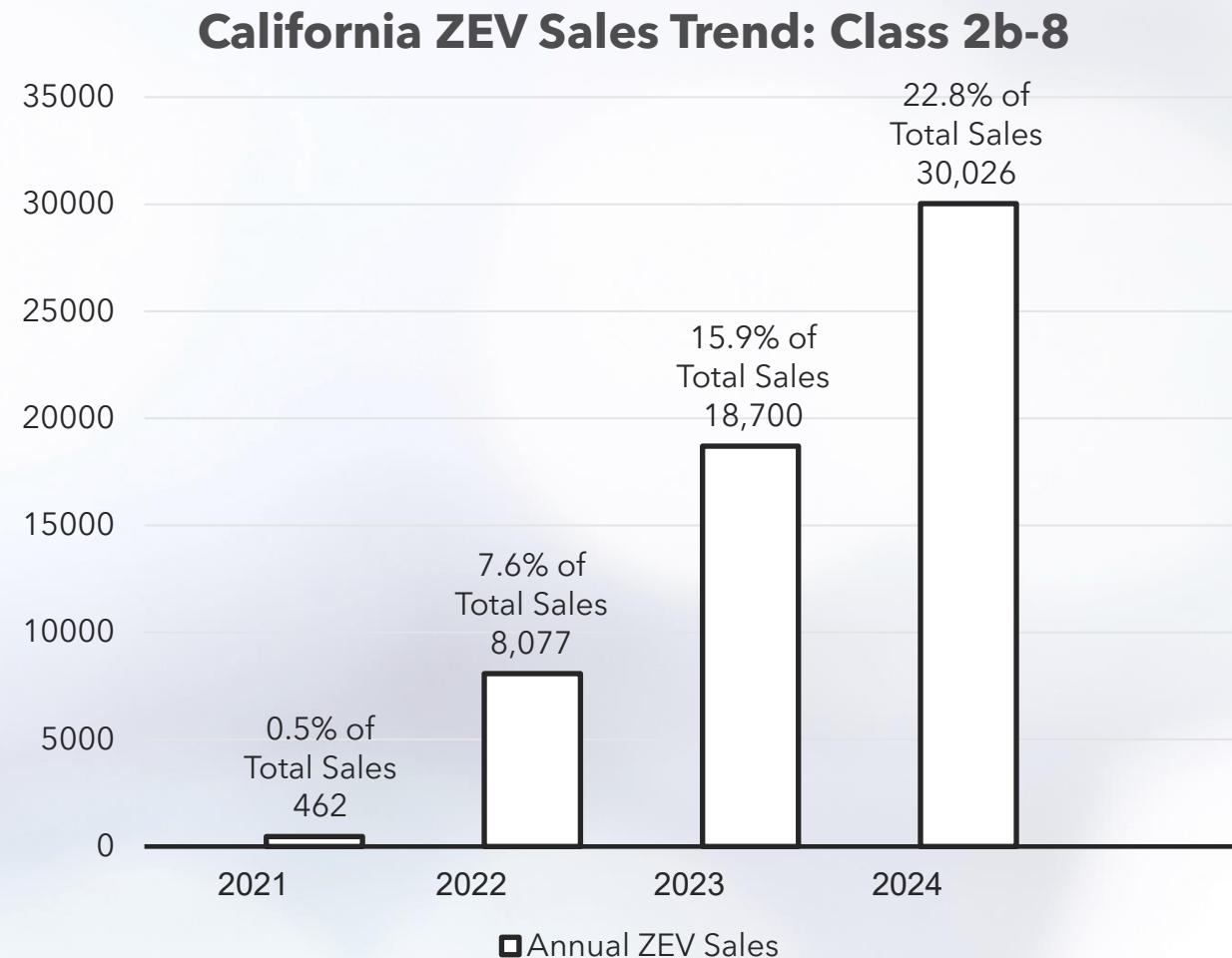
## GHG Reduction

- 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





# 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-NOx 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 (NOx) averaging?
- Encourage early production of ultralow NOx engines and ZEVs

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



CO2 and/or NOx  
Averaging, Banking  
and Trading Credits

# 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:** Manufacturers 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:

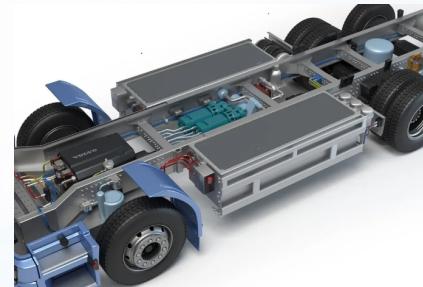
-Reduction options that can be considered for regulatory or alternative measures

# 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

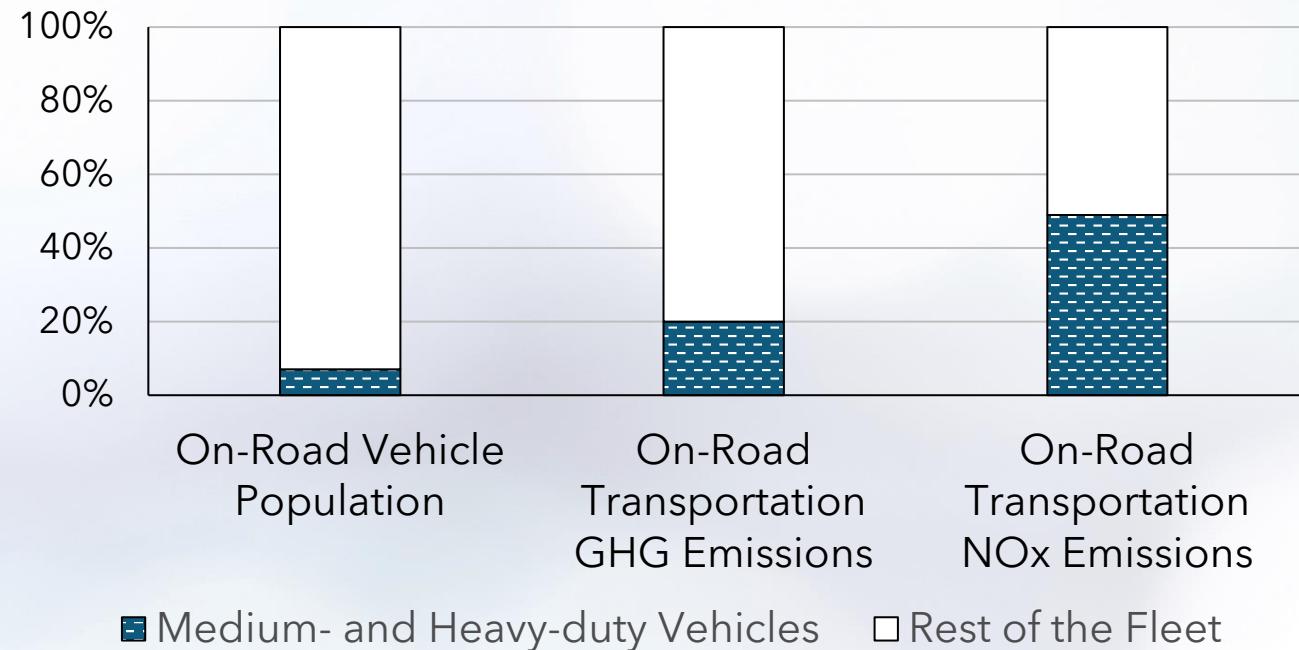
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# Fleets and Other Entities

- 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



\*Data from EMFAC2025v2.0.0 for 2025 calendar year  
*This workshop is being recorded*

# 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 NOx 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

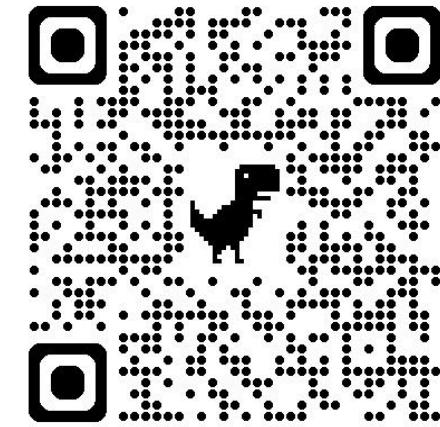
\*Ideas collected from public input at ZEV Forward Dialogue Sessions

# Discussion Topics

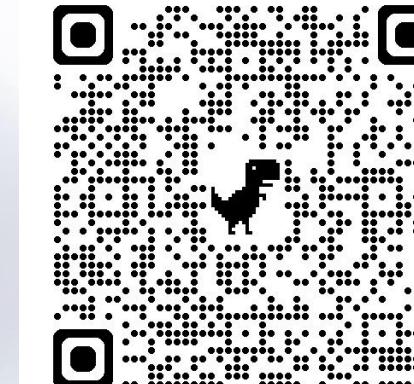
- Are there other frameworks to be considered?
- How should BACT be defined?
- What entities should be included in each concept?
- How to address differences between large and small fleets?
- Should requirements differ by industry/by sector?
  - Last mile urban delivery, regional/long haul shipping with 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](mailto: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