

# California Zero-Emission Vehicle and Infrastructure Webinars

Prologue: Zero-Emission Vehicle and Fuel Programs



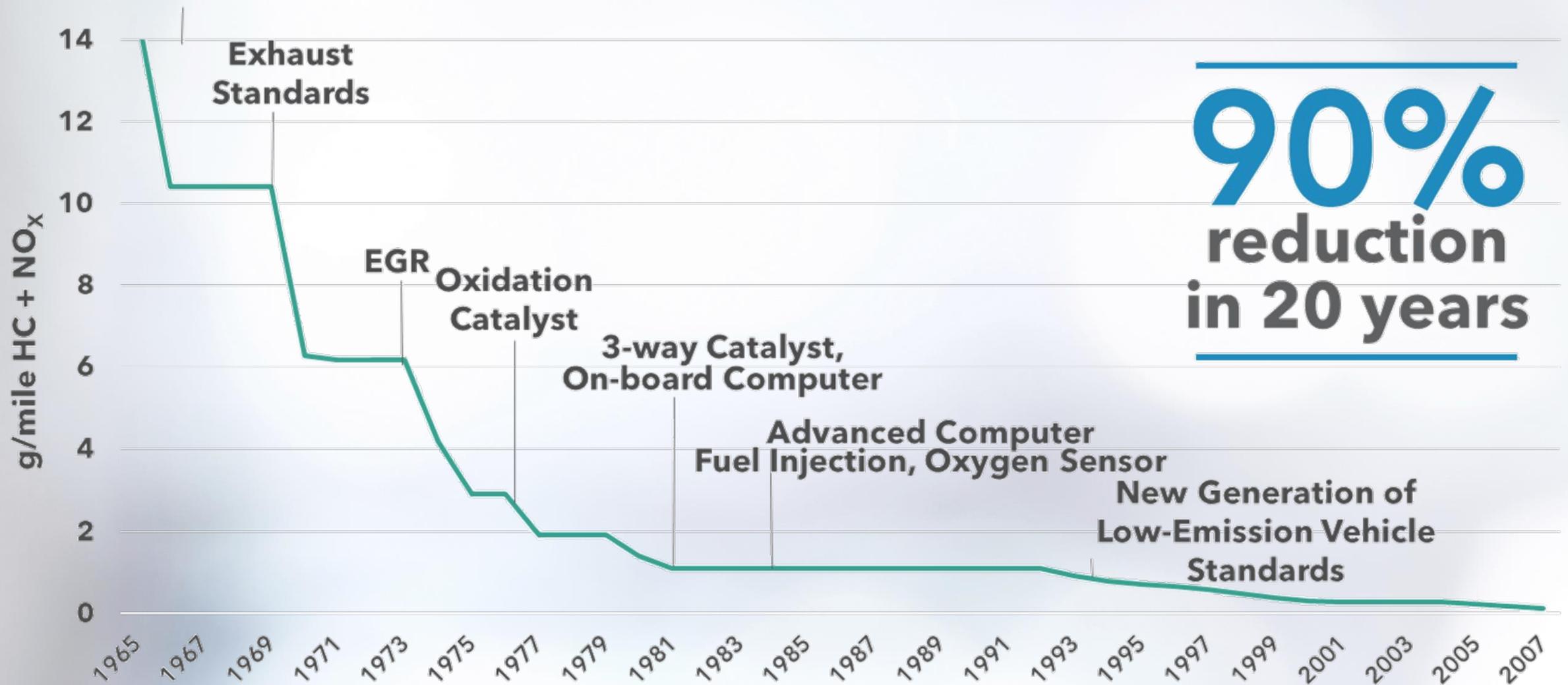
**CALIFORNIA**  
AIR RESOURCES BOARD

CARB leads California's fight against air pollution and climate change, protects public health, and promotes clean, low- and zero-carbon fuels and technology



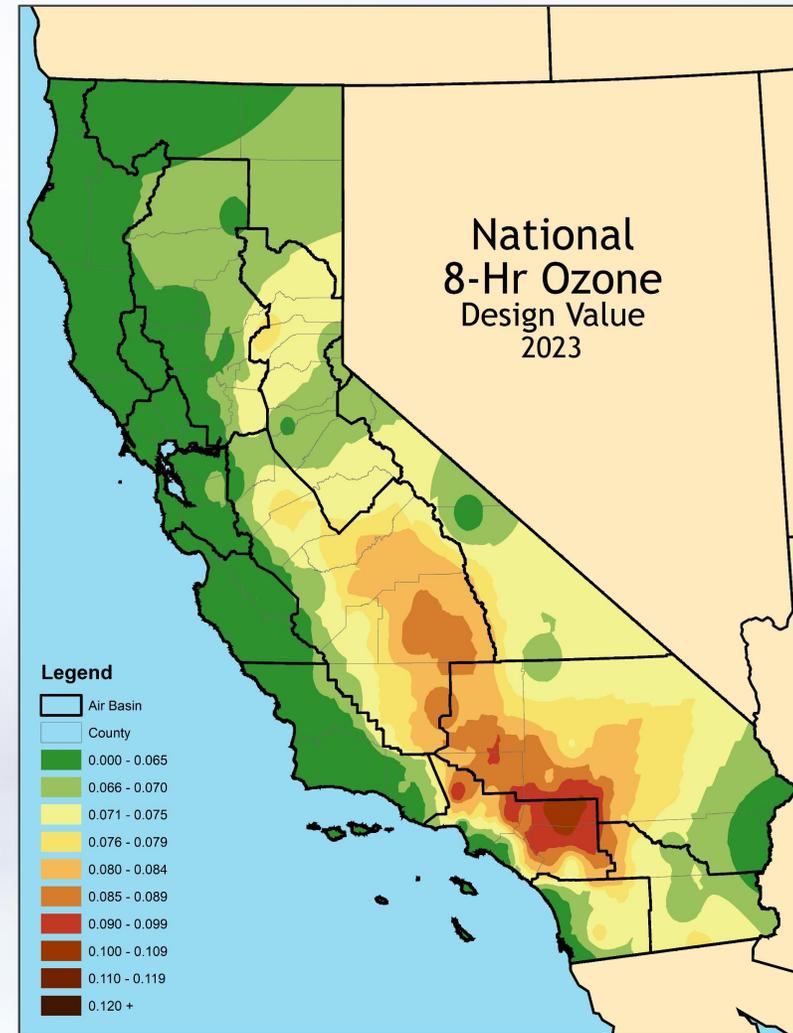
# Significant Emissions Reductions

## Positive Crankcase Ventilation



**90%**  
reduction  
in 20 years

# Air Quality Progress in California



# Most Polluted Cities in U.S.

As of April 2024

■ California city

## BY OZONE POLLUTION

- 1 Los Angeles-Long Beach
- 2 Visalia
- 3 Bakersfield
- 4 Fresno-Madera-Hanford
- 5 Phoenix-Mesa
- 6 Denver-Aurora
- 7 Sacramento-Roseville
- 8 San Diego-Chula Vista-Carlsbad
- 9 Salt Lake City-Provo-Orem
- 10 Houston-The Woodlands

## BY YEAR-ROUND PARTICLE POLLUTION

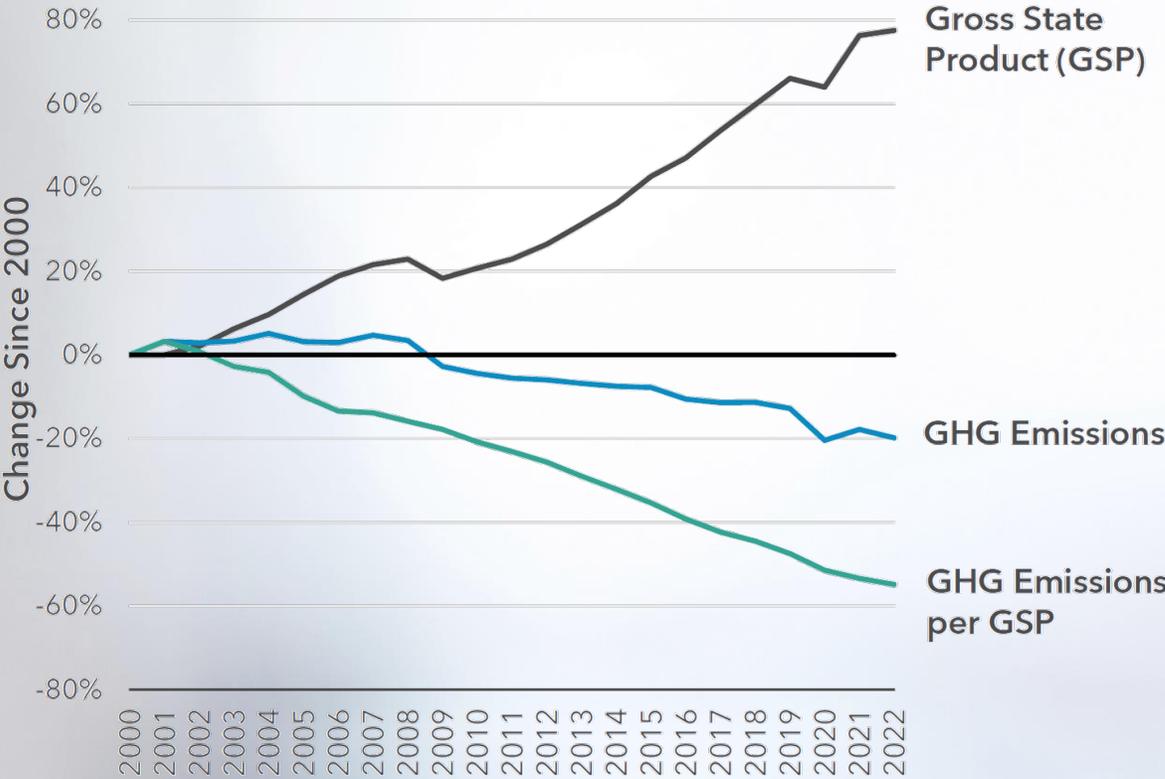
- 1 Bakersfield
- 2 Visalia
- 3 Fresno-Madera-Hanford
- 4 Eugene-Springfield
- 5 San Jose-San Francisco-Oakland
- 6 Los Angeles-Long Beach
- 7 Sacramento-Roseville
- 8 Medford-Grants Pass
- 9 Phoenix-Mesa
- 10 Fairbanks

## BY SHORT-TERM PARTICLE POLLUTION

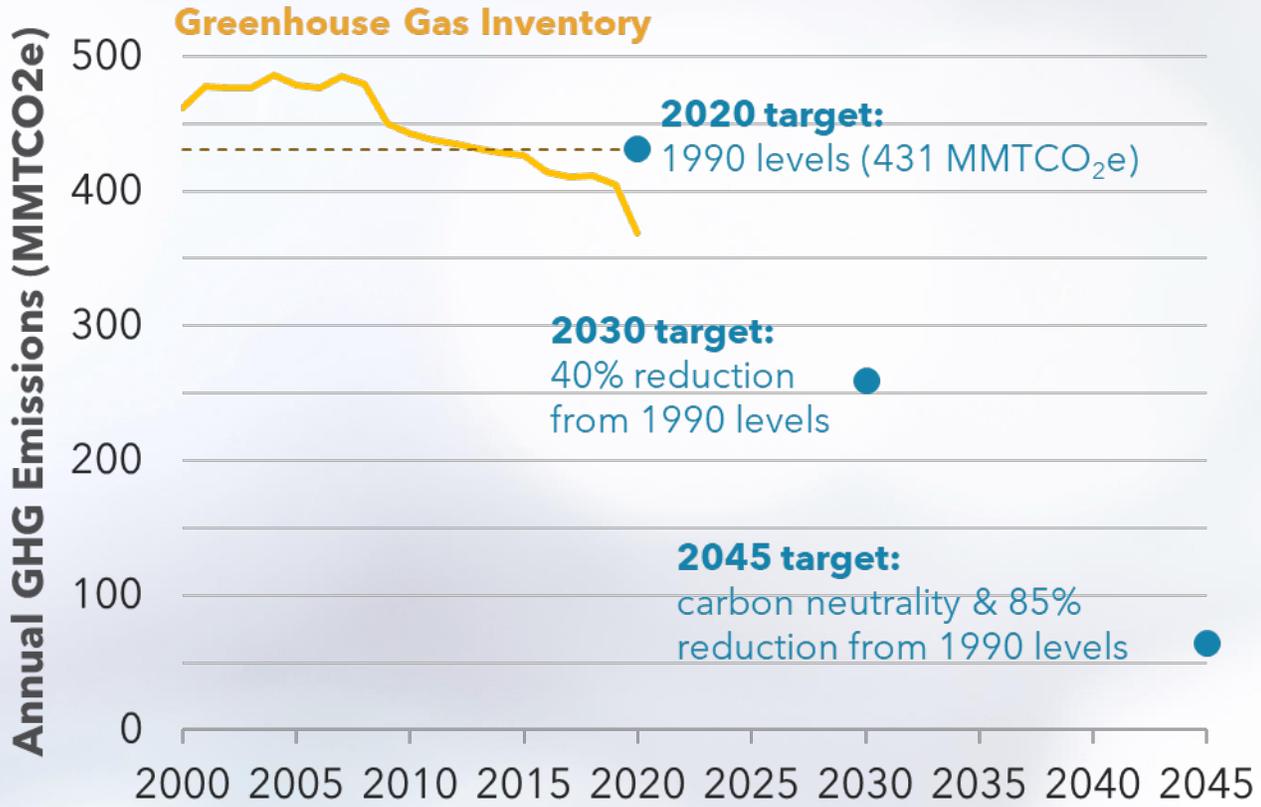
- 1 Bakersfield
- 3 Fresno-Madera-Hanford
- 3 Fairbanks
- 4 Eugene-Springfield
- 5 Visalia
- 6 Reno-Carson City-Fernley
- 7 San Jose-San Francisco-Oakland
- 8 Redding-Red Bluff
- 9 Sacramento-Roseville
- 10 Chico

Source: American Lung Association

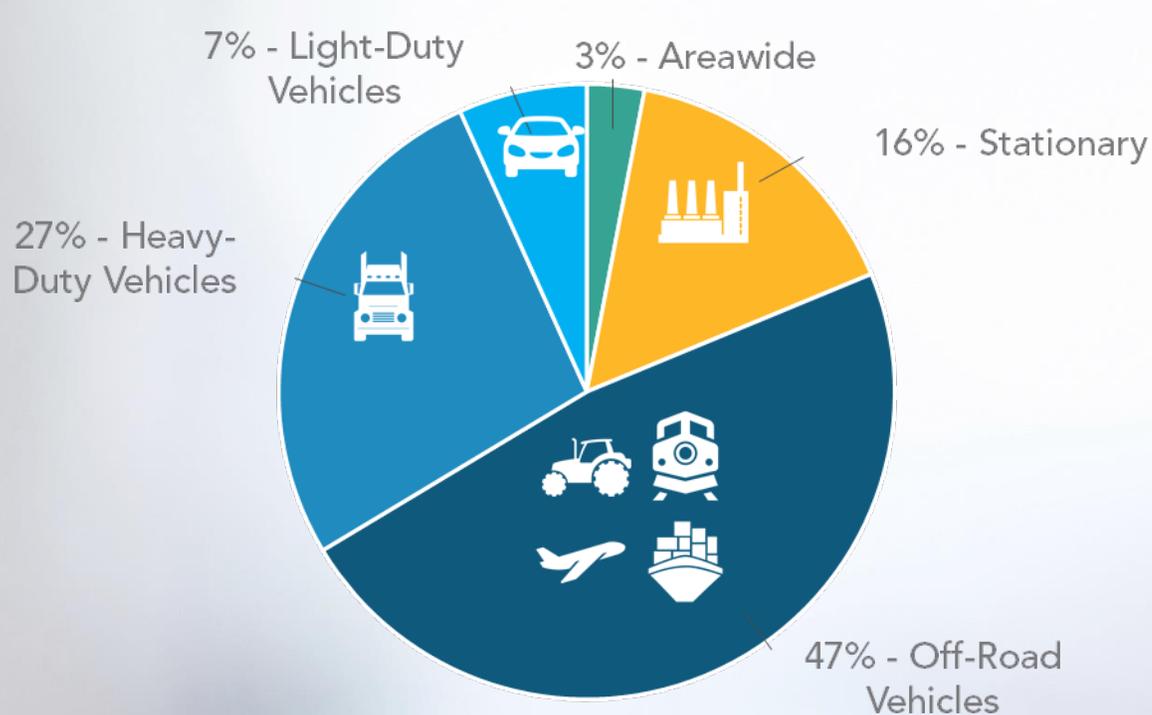
# California's Climate Targets



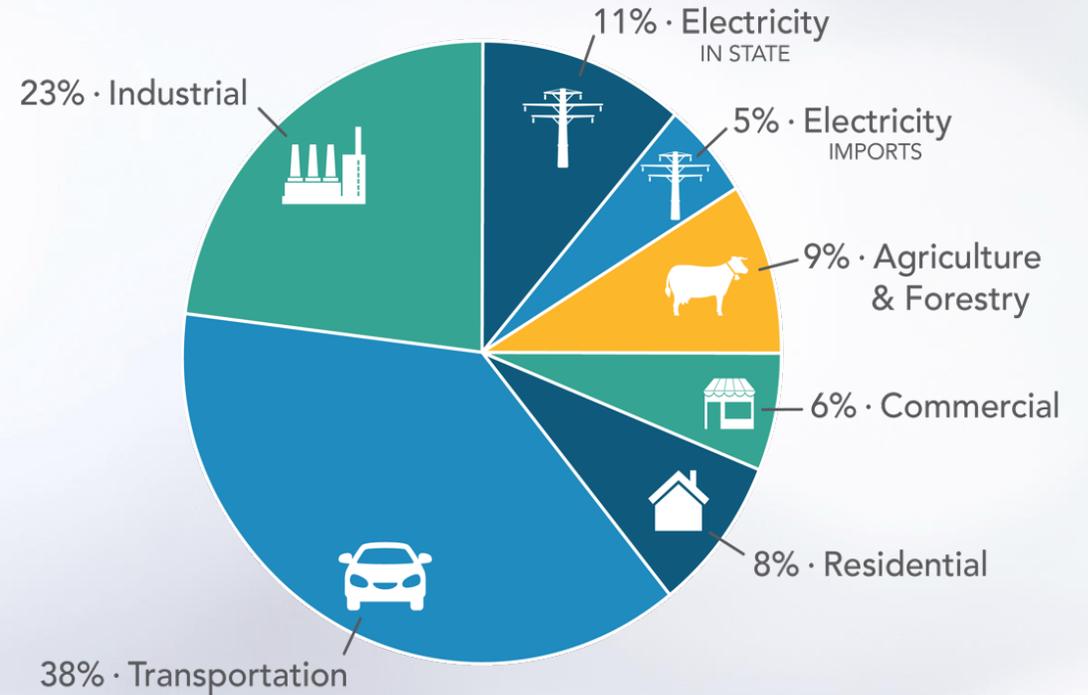
California Greenhouse Gas Emission Inventory, 2024 Edition: 2000-2022



# Transportation's Role in Climate Change and Air Quality

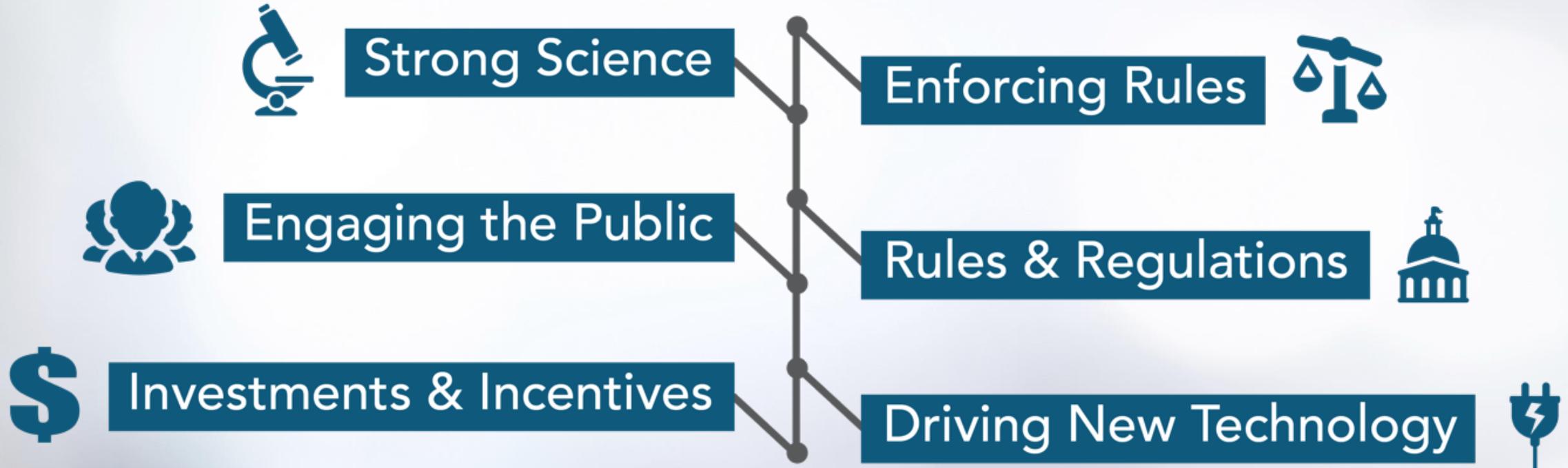


**2020 NOx Emissions**  
1278 tons per day



**2020 GHG Emissions**  
369.2 MMT CO<sub>2</sub>e

# California's Path to Clean Air



# 2022 Scoping Plan Update

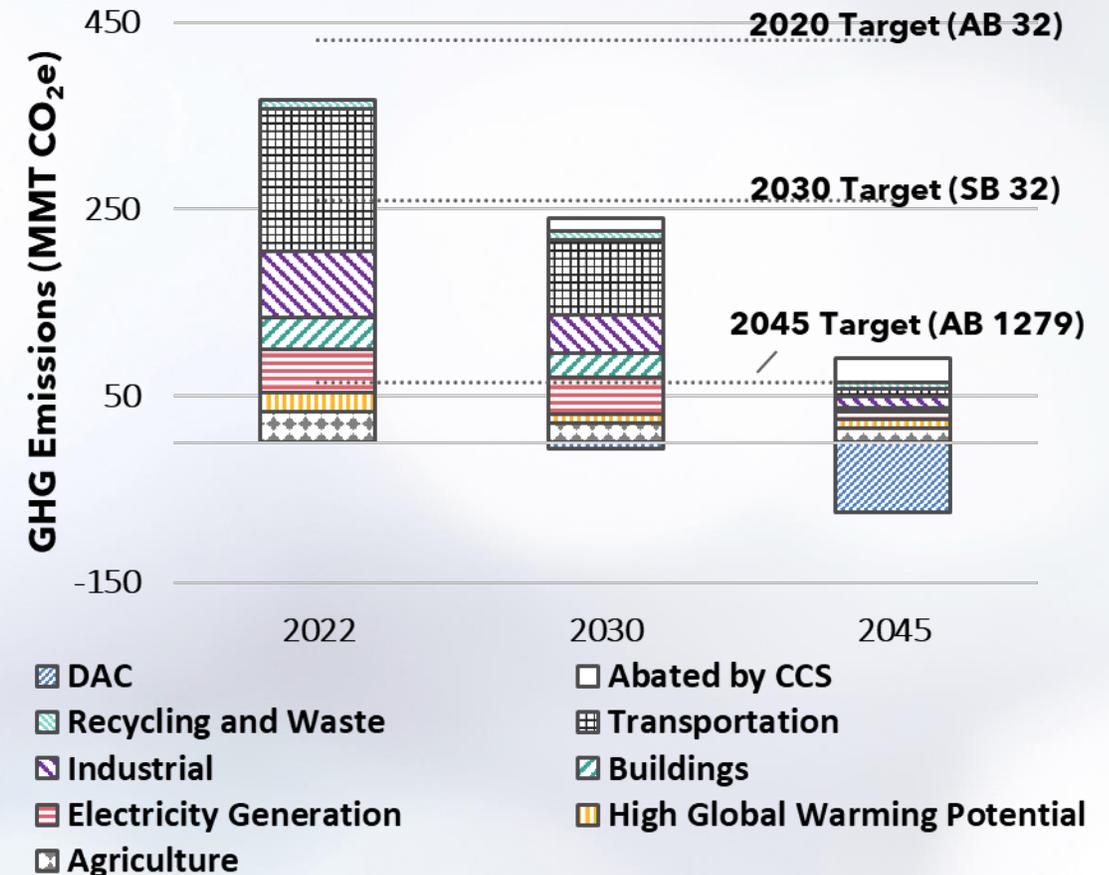
## A Plan for Science-Driven Climate Action

2030: 48% reduction below 1990

- Increased ambition from SB 32 40% target
- Scoping Plan scenario incorporates 20 MMTCO<sub>2</sub>e of mechanical carbon dioxide removal (CCUS/DAC) in 2030

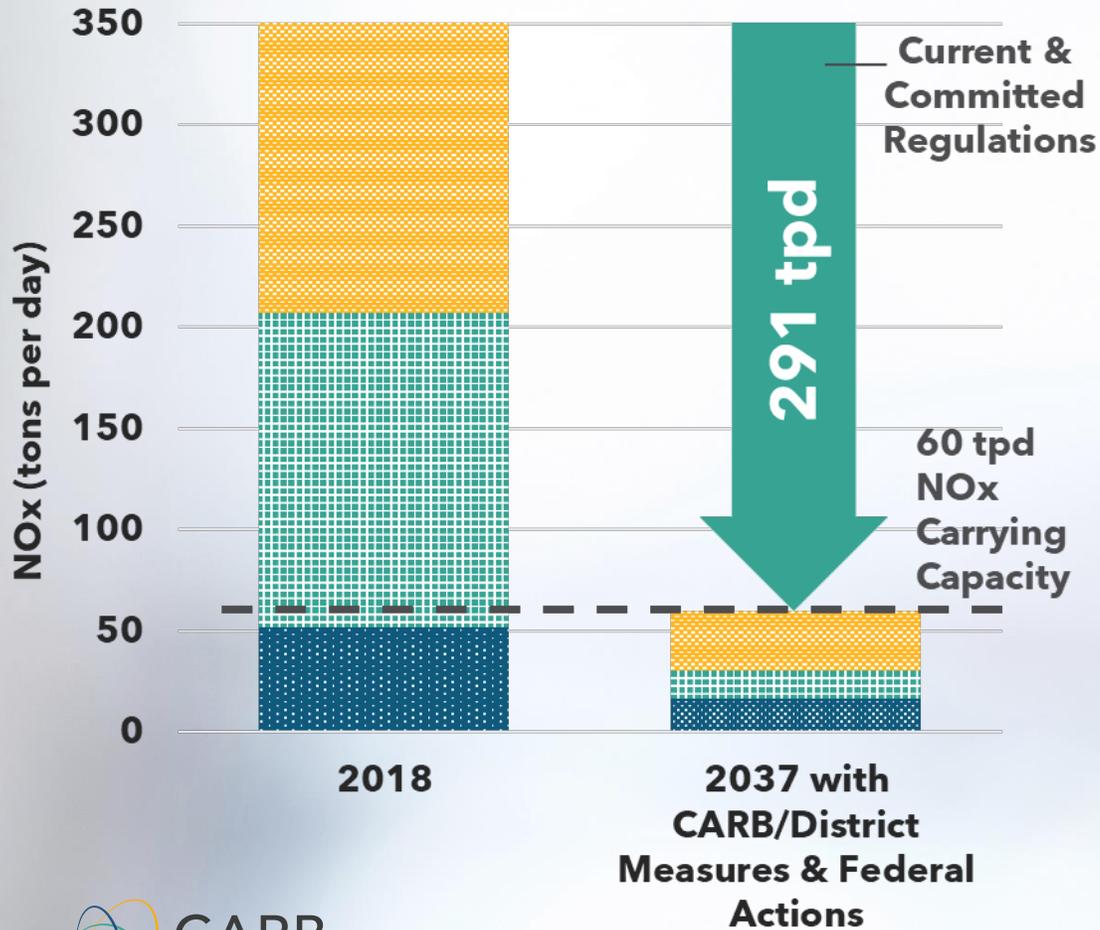
2045: 85% reduction below 1990

- Need CCUS and carbon dioxide removal to compensate for residual emissions to achieve carbon neutrality

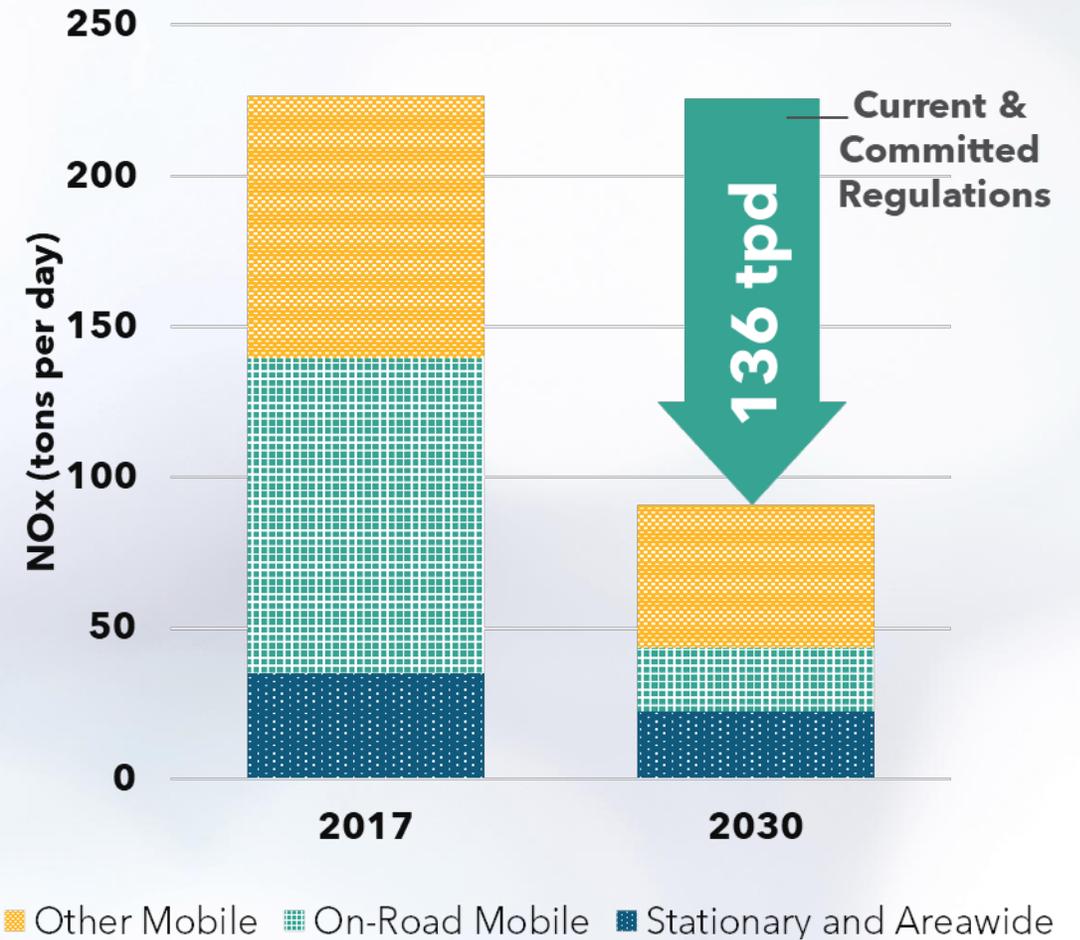


# Achieving Air Quality Targets Requires All Emissions Reductions

South Coast Ozone Attainment



San Joaquin PM 2.5 Attainment



# Tackling Air Pollution

## FEDERAL



### US EPA

Sets & enforces national air quality standards.  
Regulates interstate transportation.



Trains



Planes



Ships

## STATE



Regulates mobile sources of air pollution,  
greenhouse gases & consumer products.



Cars



Trucks



Buses

## LOCAL



### Local Air Districts

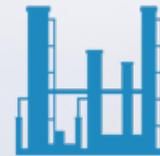
Regulates stationary & local  
sources of air pollution.



Fireplaces



Factories



Refineries



Power plants

# Zero Emission Vehicle Targets: Executive Order N-79-20



**100% ZEV sales** by 2035

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



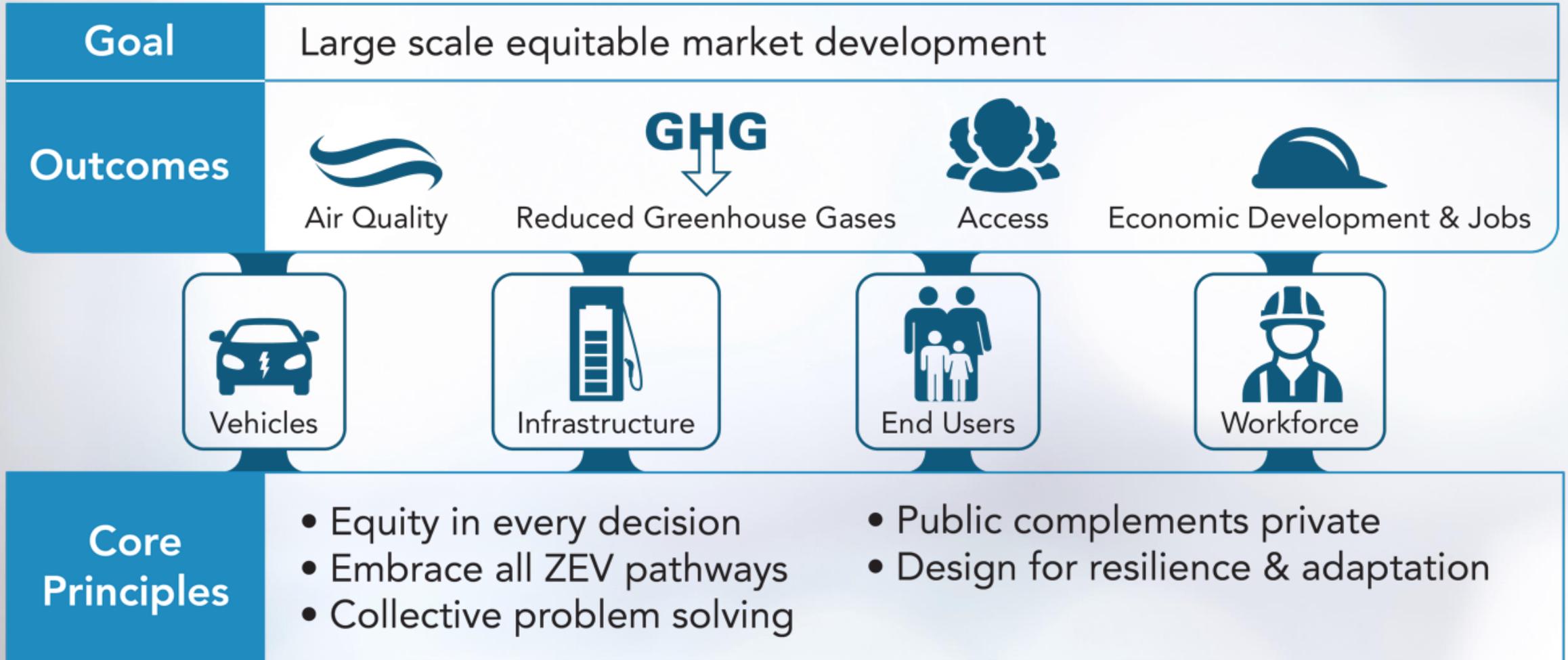
Full transition to **ZEV buses &  
heavy-duty long-haul trucks**  
by 2045\*



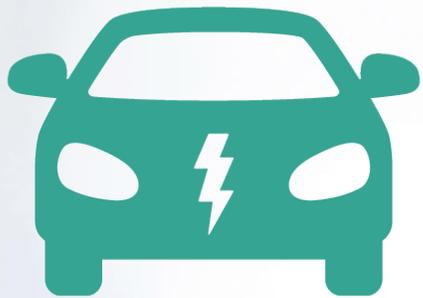
Full transition to  
**ZE off-road equipment**  
by 2035\*

\*where feasible

# ZEV Market Development Strategy



# Zero Emission Vehicle Technologies



## Battery Electric (BEV)

- Energy stored on-board in battery packs
- Electricity from batteries power electric motors
- Charged from various electric power sources, including the grid and home power systems



## Fuel Cell Electric (FCEV)

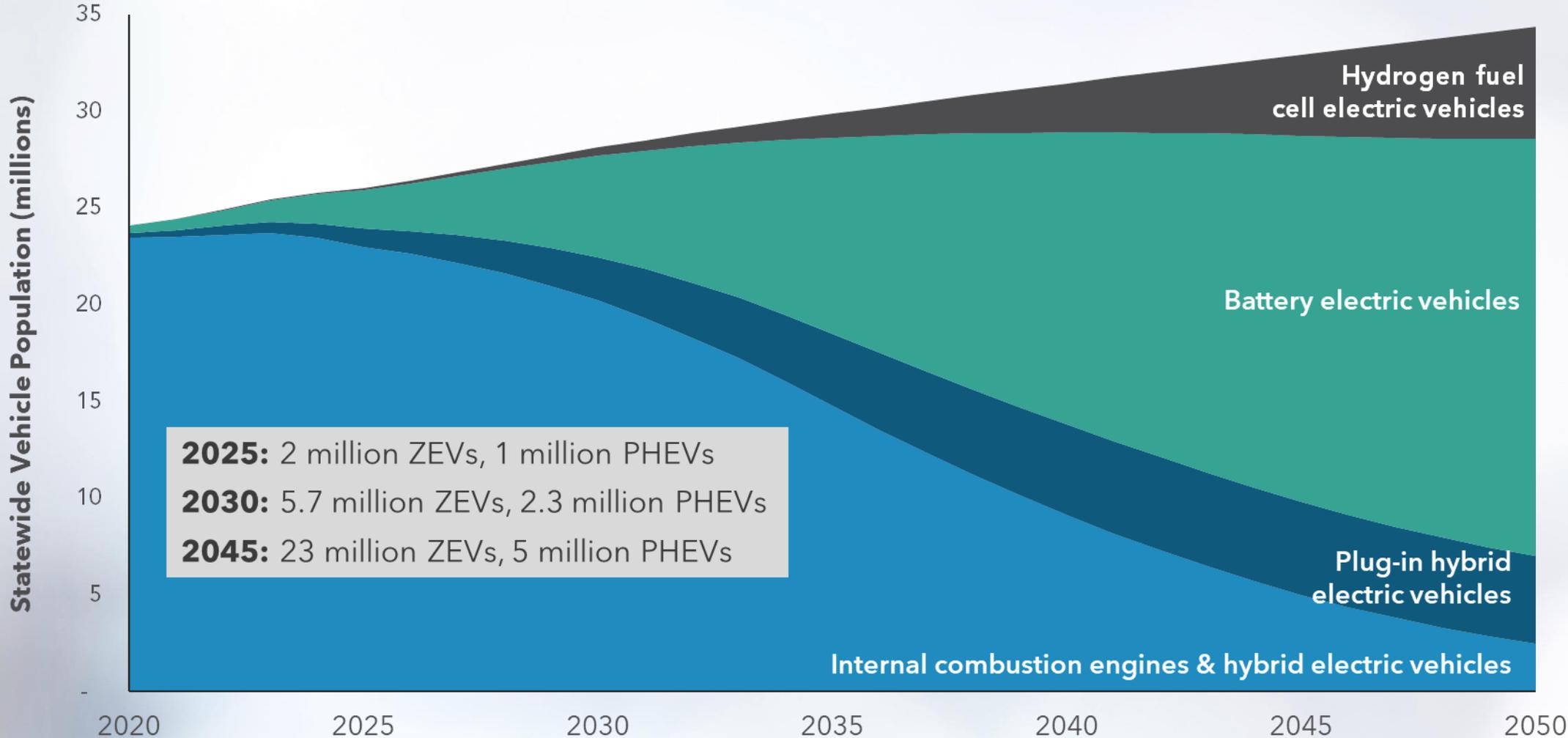
- Energy stored on-board as high-pressure hydrogen gas and often include small battery pack
- Electrochemical reactions in fuel cell convert hydrogen to electricity
- Hydrogen refueled at specially designed stations



## Plug-In Hybrid Electric (PHEV)

- Stores energy on board as both conventional fuel and electricity
- Includes both an engine and a motor to provide power
- Operates for limited range in all-electric mode then operates like a conventional hybrid

# California's Clean Car Future



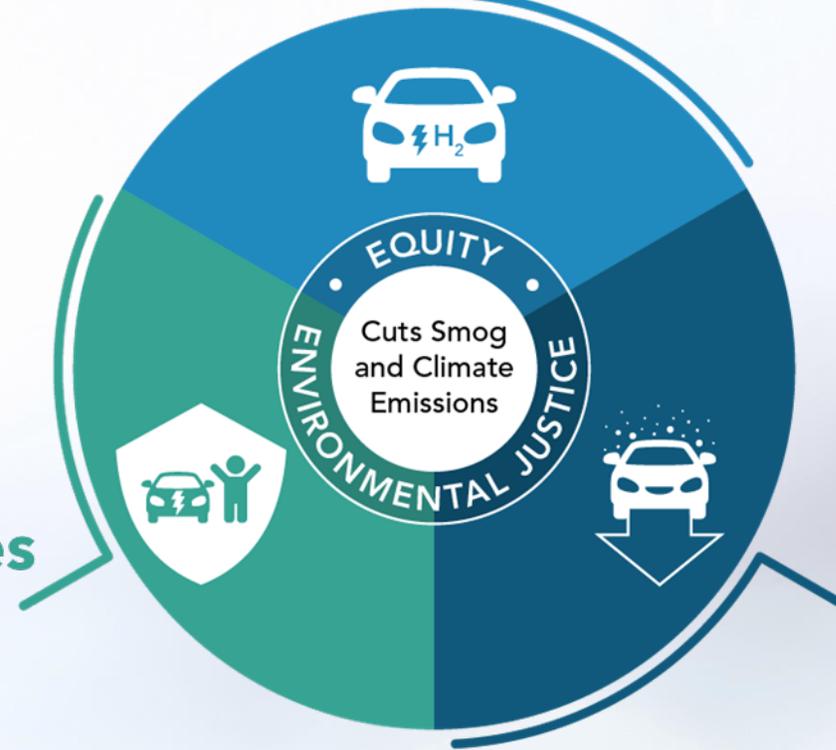
**2025:** 2 million ZEVs, 1 million PHEVs  
**2030:** 5.7 million ZEVs, 2.3 million PHEVs  
**2045:** 23 million ZEVs, 5 million PHEVs

100% ZEV & PHEV Sales

# Advanced Clean Cars II

## Maximize Zero-emission Vehicle Sales

Zero-emission Vehicle Regulation



## High-quality Zero-emission Vehicles

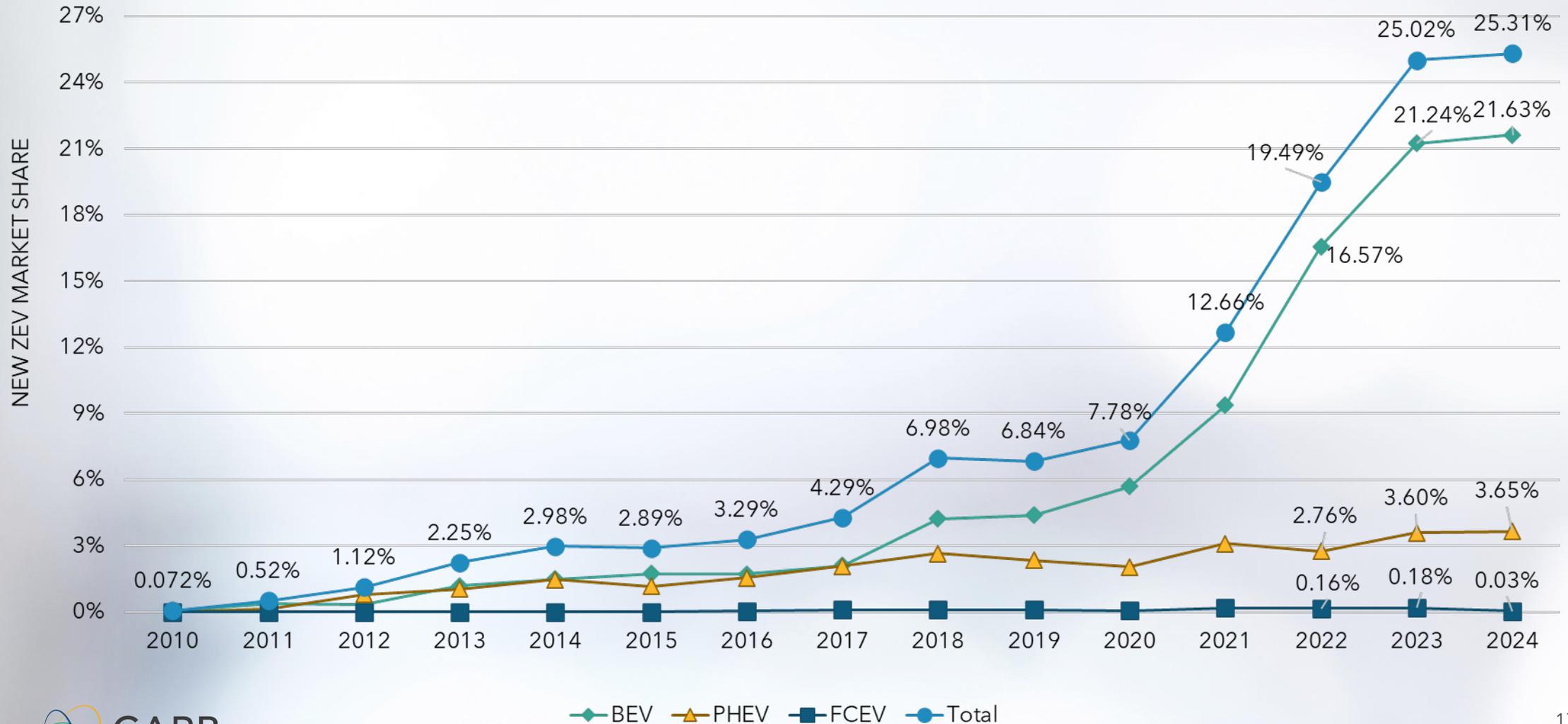
Zero-emission Vehicle Assurance Measures

## Limit Pollution from Gas Vehicles

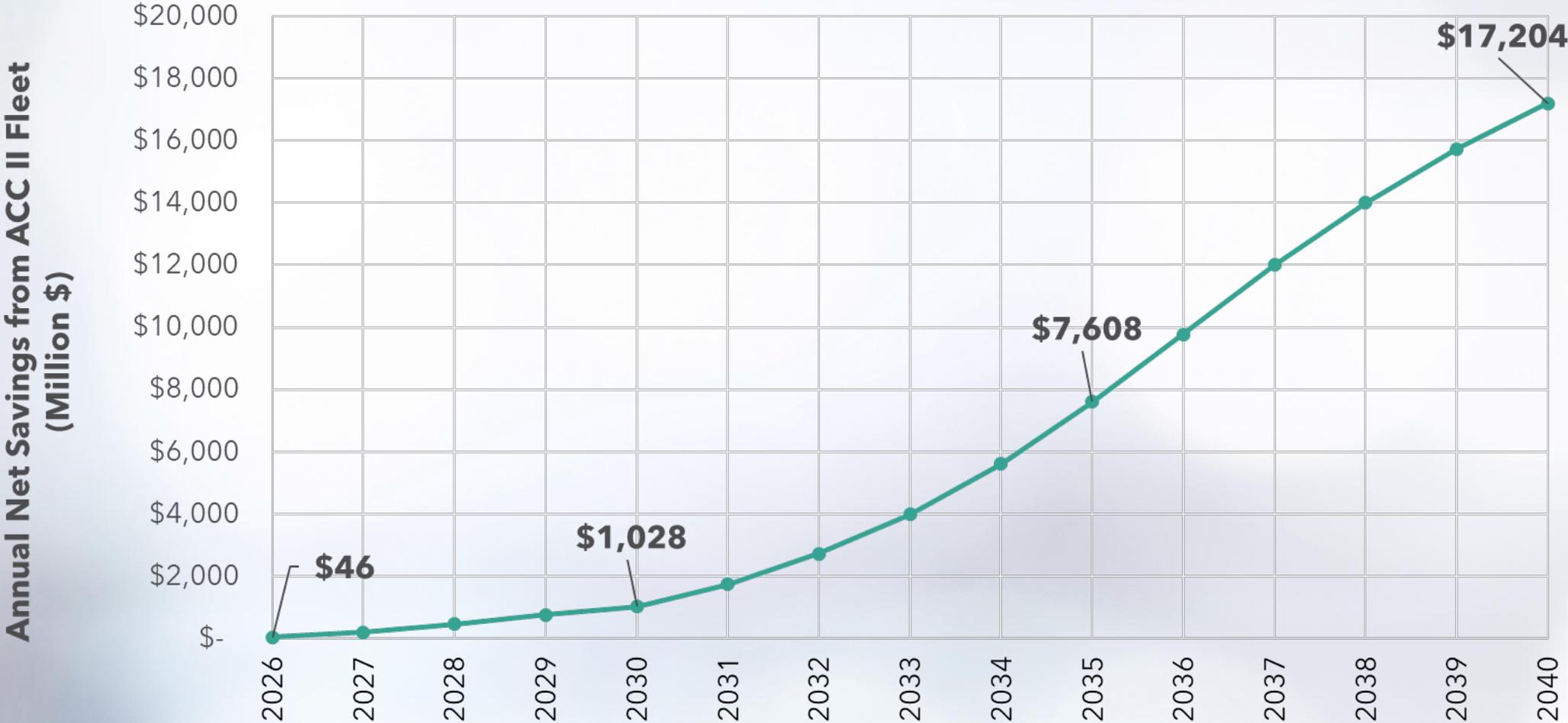
Low-emission Vehicle Regulation

# California ZEV Market Share is Growing

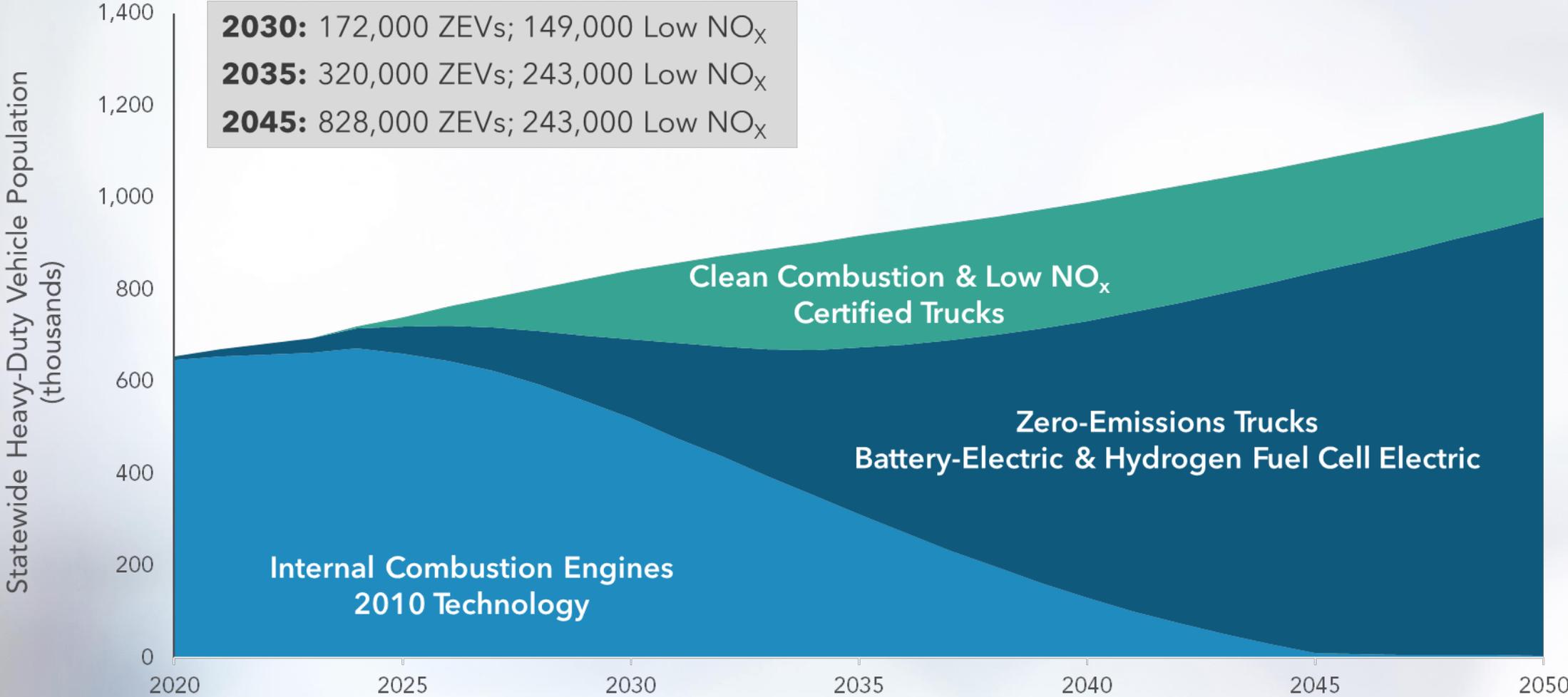
## CA Market Shares of ZEVs by Tech Type (2010 - 2024)



# Savings in Total Cost of Ownership



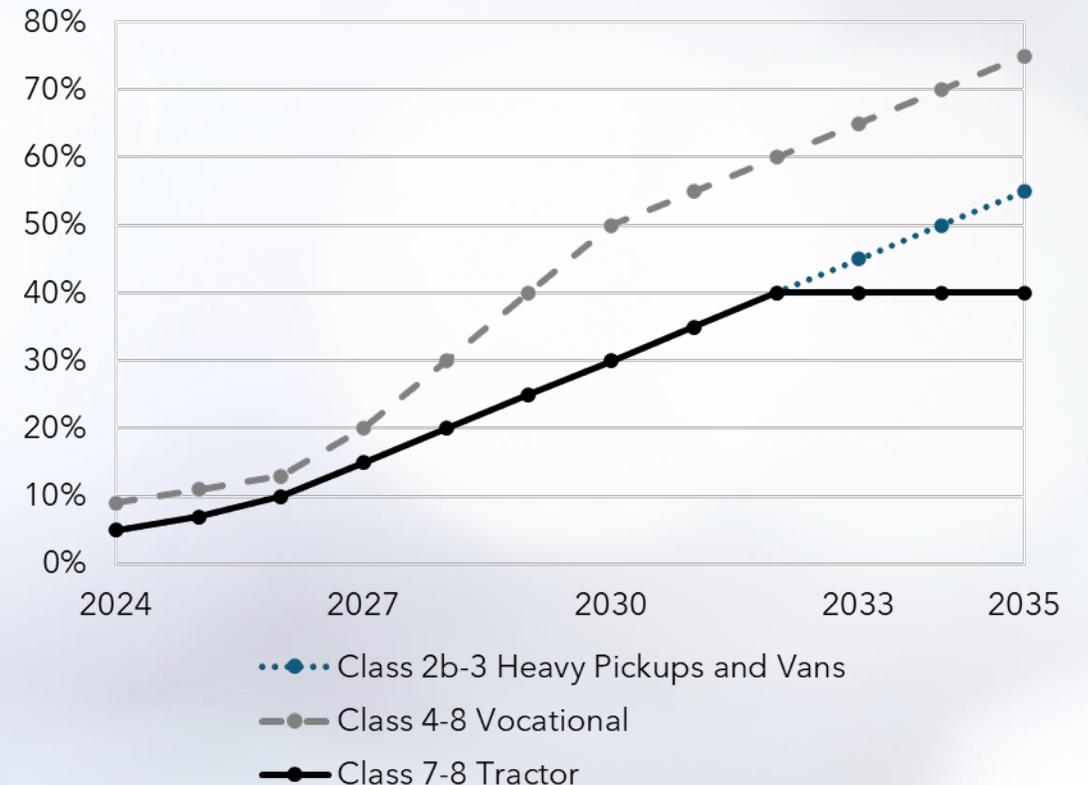
# Future of California's Heavy-Duty Trucks



# Advanced Clean Trucks Regulation

- Manufacturers to sell zero-emission vehicles (ZEV) in all vehicle classes as a percentage of total sales
- Flexibility
  - Credit for early sales
  - 3-year make-up deficits
  - Credit banking and trading
- 320,000 ZEVs to California by 2035
- US EPA Waiver issued in 2022

ZEV Sales Percentage



# Advanced Clean Fleets Components



## Affected Vehicles

Class 2b-8 vehicles

Off-road yard tractors

Light-duty delivery vehicles

## Zero-Emission Requirements

As soon as 2024, depending on fleet and operator characteristics

# ACF Waiver & Enforcement Notice

- California has withdrawn its request for waiver and authorization for the addition of the Advanced Clean Fleets regulation to its emissions program. At this time, CARB is re-evaluating next steps.
- CARB is not enforcing the portions of the regulation that require federal authorization, such as the portions of ACF that apply to high priority and drayage fleets. However, not all elements of the regulation require federal approval.
- The state and local government fleets portion of the rule remains unaffected.
- Because CARB is committed to reducing air pollution to protect public health, we encourage affected industries to continue reducing their emissions and we look forward to continued partnership in these efforts.
- View the ACF Enforcement Notice: [arb.ca.gov/sites/default/files/2024-10/241025acfnotice\\_ADA.pdf](https://arb.ca.gov/sites/default/files/2024-10/241025acfnotice_ADA.pdf)



# California & National Success

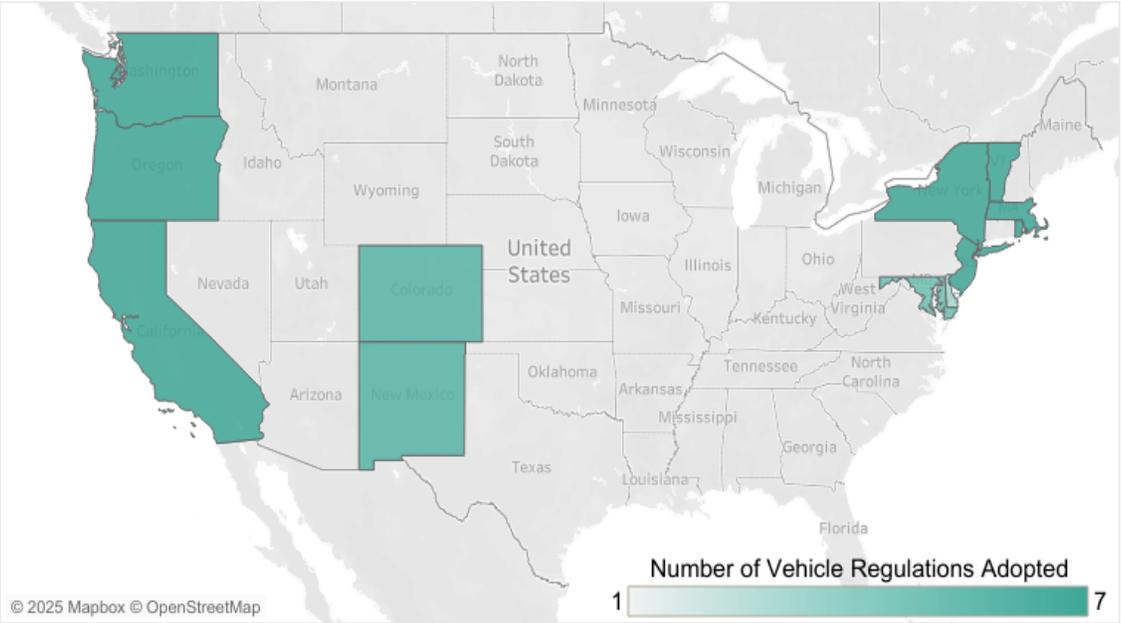


**1 in 6** new trucks in CA was zero emission in 2023

California truck sales in **2023 met 2025 zero-emission targets**

Zero-emission truck sales more than **doubled** between 2022 and 2023

**11 states** have adopted Advanced Clean Trucks



**1 in 4** new cars in CA was zero emission in 2023

**All auto manufacturers** met their Advanced Clean Cars compliance for 2023 model year

Zero-emission passenger vehicle deliveries **grew by 40 percent** between 2022 and 2023 model year

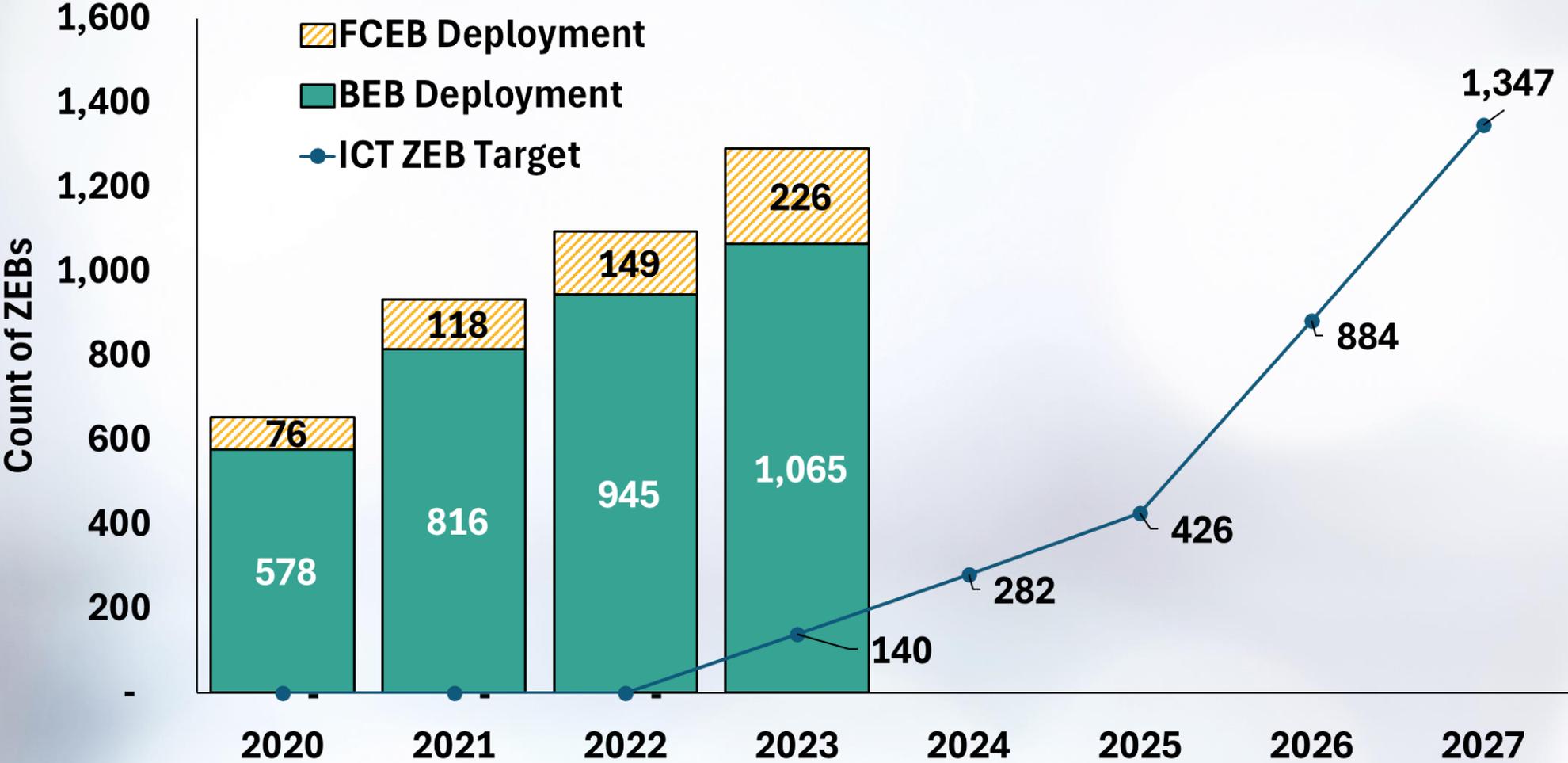
**13 states** have adopted Advanced Clean Cars II

# Innovative Clean Transit (ICT) Regulation

- Adopted in 2018 as the first heavy-duty zero-emission vehicle regulation in the United States
  - Zero-emission bus (ZEB) Rollout Plan to ensure adequate planning
  - Phase-in schedule to allow preparation time
  - Compliance flexibility and safeguards for a smooth transition

Year	ZEB Percentage of Total New Bus Purchases	
	Large Transit	Small Transit
2023-2025	25%	-
2026-2028	50%	25%
2029 & on	100%	100%

# Cumulative ZEB Deployment in California (In service and On order)



# Expanding Zero Emission Options Across Transportation Modes

- Zero-emission technologies growing across transportation and goods movement sectors
  - Zero-Emission Airport Shuttle
  - Zero-Emission Forklift
  - At Berth (Shorepower)



# Zero-Emission Options Meeting Job Site Needs



# Incentive Programs with ZEV Focus

## Air Quality Improvement Program (AQIP)

Criteria pollutant and toxics reductions, including zero-emission vehicles

## Volkswagen (VW) Mitigation Trust

Nitrogen Oxides (NOx) mitigation via zero-emission vehicles



## Low Carbon Transportation

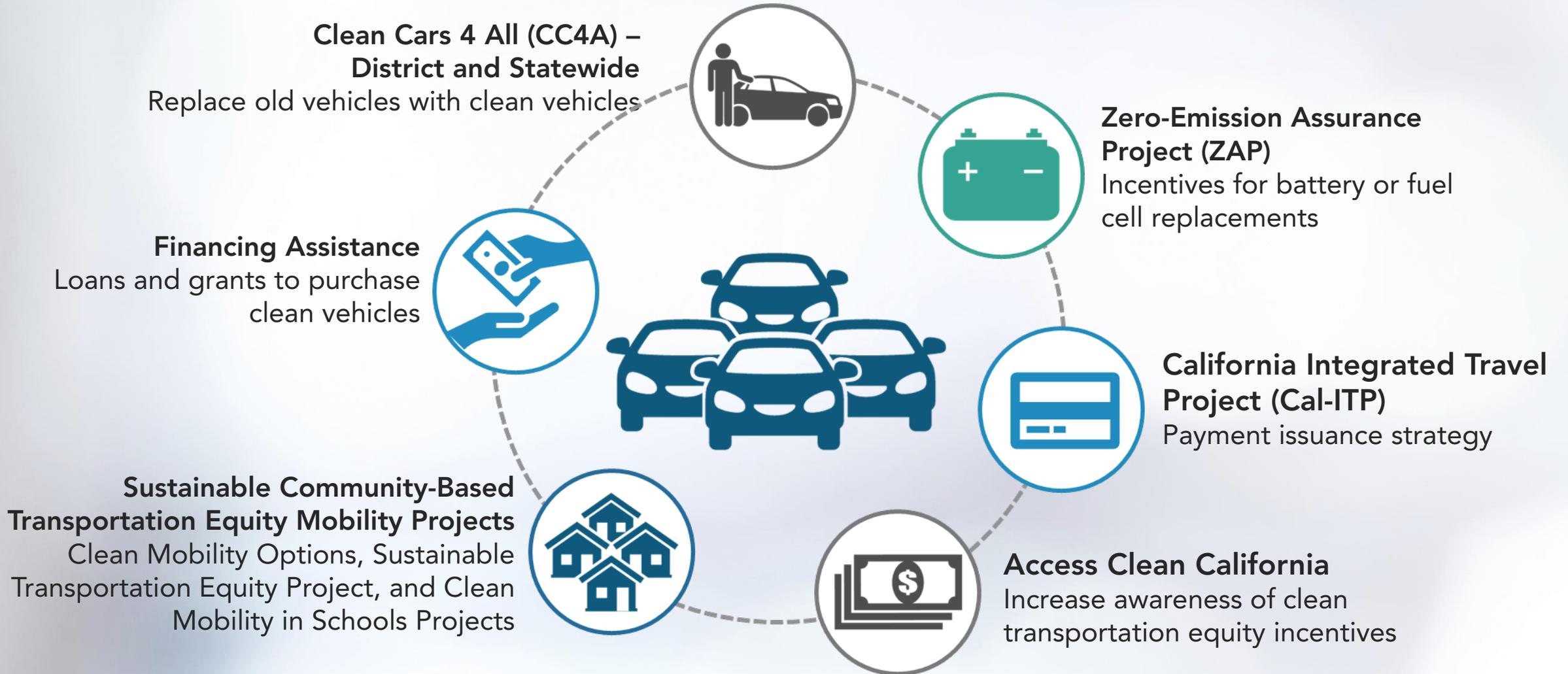
Advance technologies to provide greenhouse gas reductions and Priority Populations benefits

## Additional Programs with ZEV Options or ZEVs Encouraged

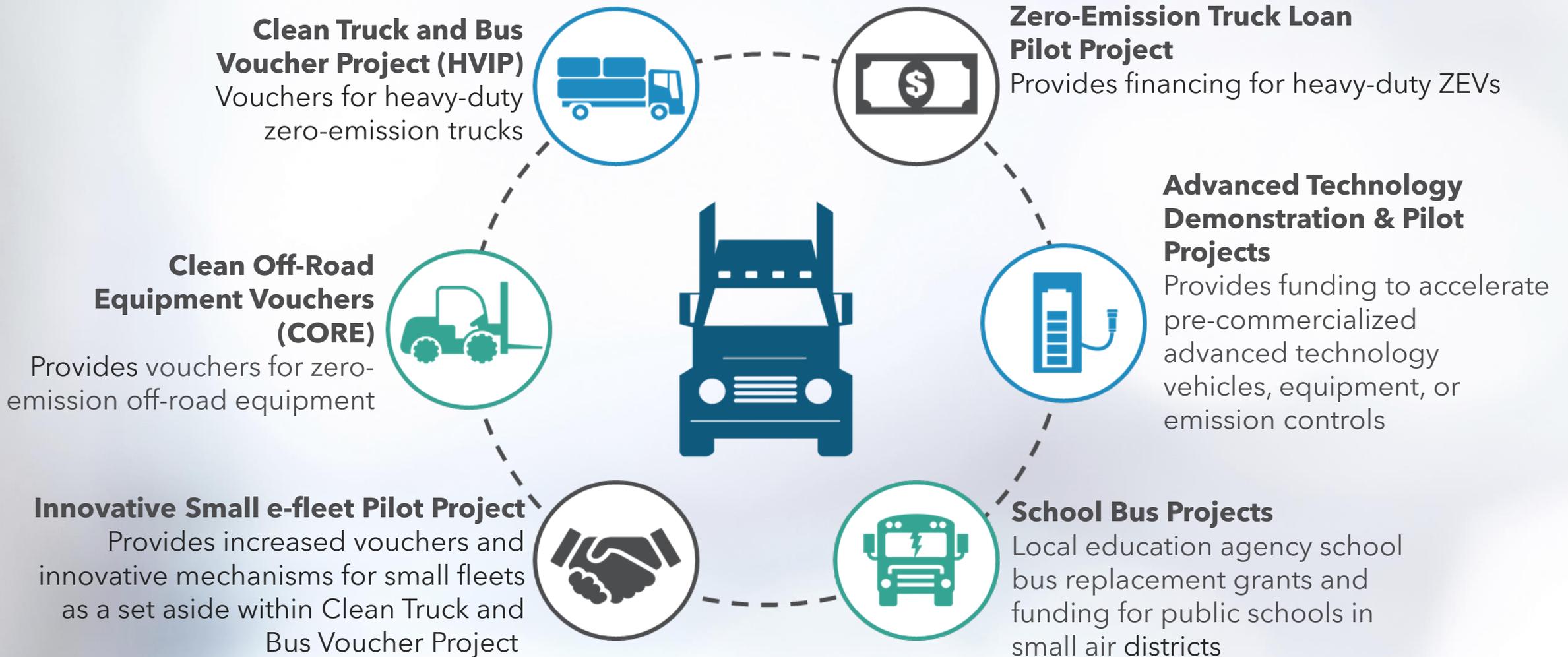


- Carl Moyer Program
- Community Air Protection Program (AB 617)
- Funding Agricultural Replacement Measures for Emissions Reductions (FARMER) Program

# Light-Duty Vehicle Investments



# Medium- and Heavy-Duty Incentive Projects



# Sustainable Community-Based Transportation Equity Projects

## Statewide Clean Mobility Options Voucher Pilot Program (CMO)

Small-scale, shared-mobility projects and community transportation needs assessments



## Regional Clean Mobility Options Pilot Projects

Early pilots to provide shared mobility services



## Sustainable Transportation Equity Project (STEP)

Holistic, equity-focused projects to address community mobility needs and reduce vehicle miles traveled



## Planning and Capacity-Building (Planning)

Community-led planning and capacity building projects



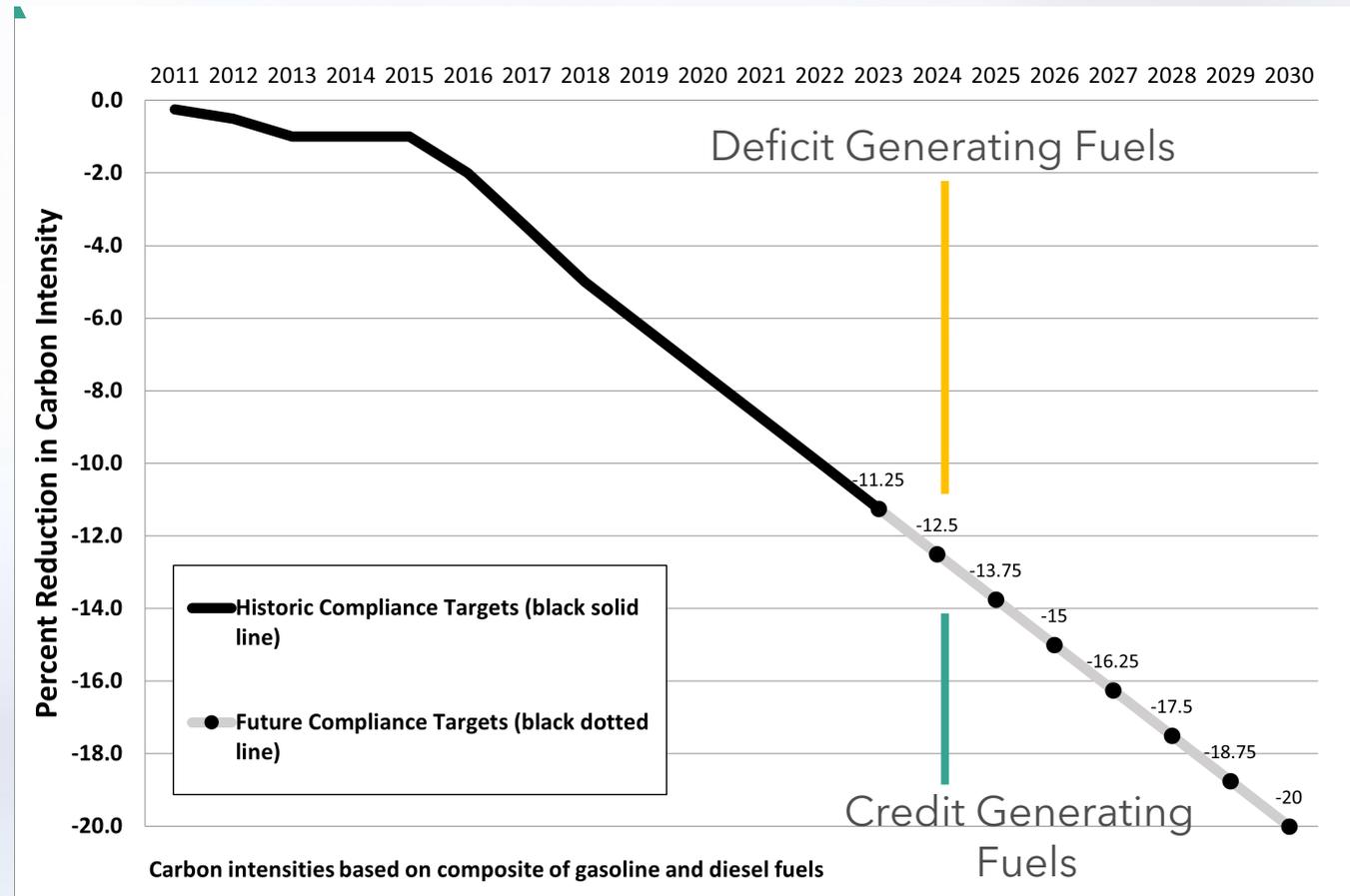
## Clean Mobility in Schools (CMIS)

Clean transportation and education projects at K-12 public schools



# Low Carbon Fuel Standard

- Establishes an annual, declining carbon intensity (CI) target for transportation fuels used in California
- Carbon intensity is the measure of life cycle GHG emissions
- The lower carbon a fuel is, the more credits can be generated



# LCFS Outcomes

15.3% reduction in the carbon intensity of California's transportation fuels

Over 31 billion gallons of petroleum fuels displaced by low-carbon fuels

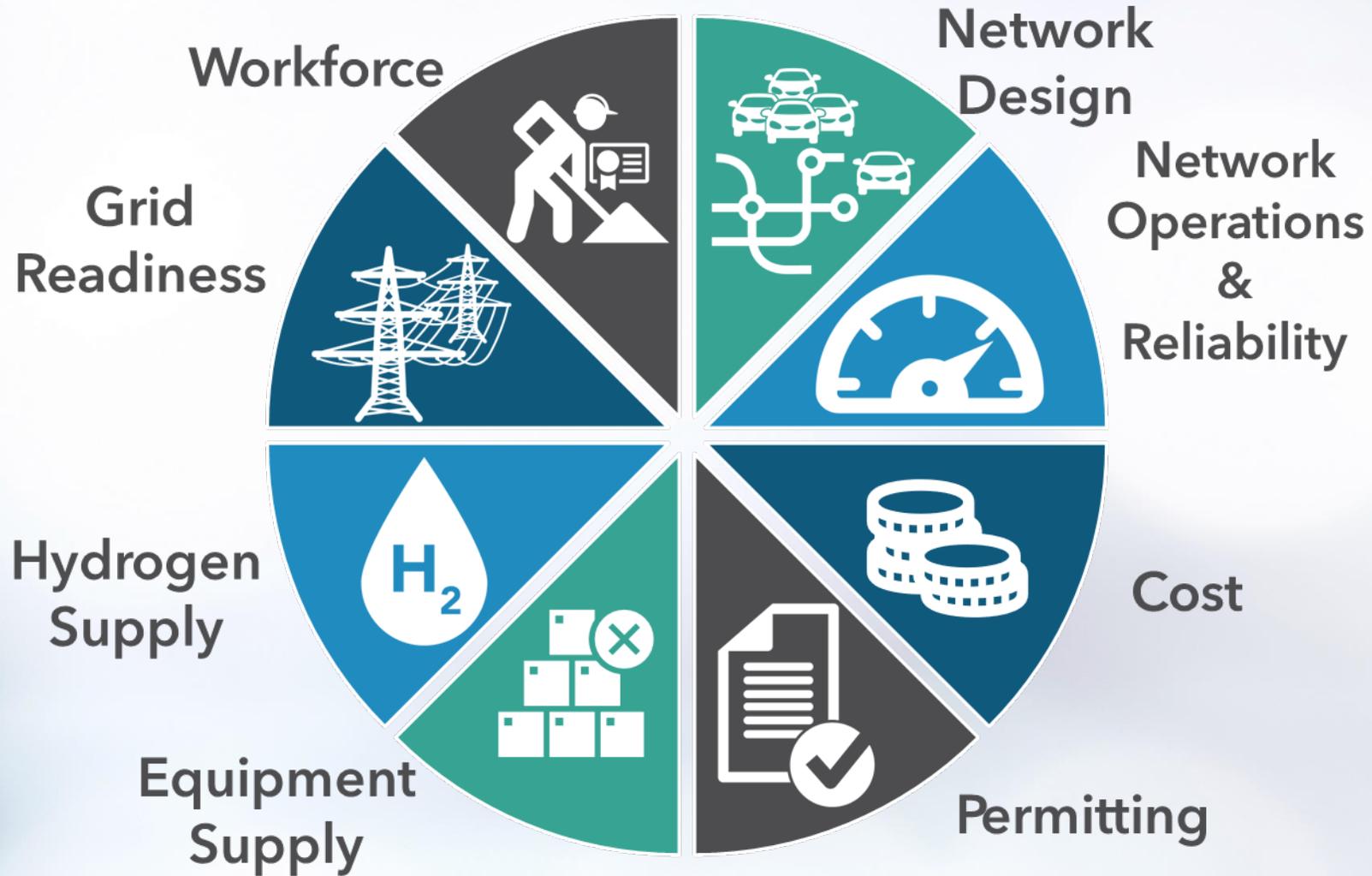
75% of fossil diesel displaced by biomass-based diesel in 2023, resulting in PM and NOx benefits

\$4 billion annually to support low-carbon investments and \$341M cumulative for public transit

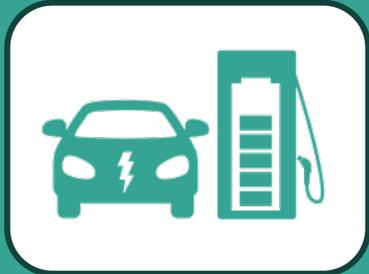
Supports many State programs and goals, including cars and trucks going to zero-emission vehicles

Financial assistance for vehicle purchases at the state and local level

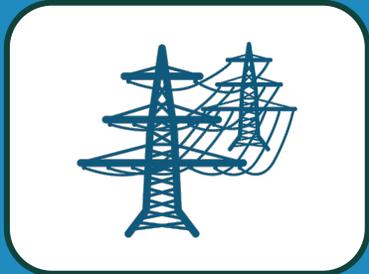
# Enabling ZEV Infrastructure



# Save the Dates



**Chapter 1:**  
Charging  
your ZEV at  
Home and  
On the Go



**Chapter 2:**  
Ensuring  
a Resilient  
Electric Grid



**Chapter 3:**  
Adding  
Hydrogen  
in the Mix



**Chapter 4:**  
Charging and  
Fueling Big  
ZEVs and  
Working ZEVs