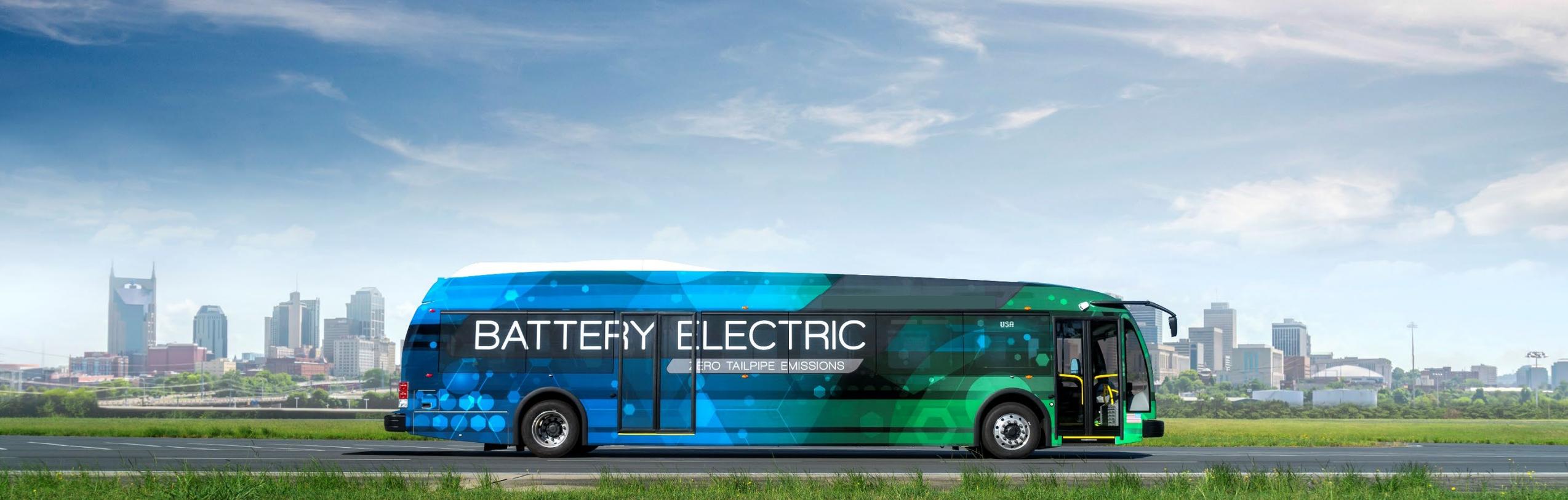


DOCKETED	
Docket Number:	20-IEPR-02
Project Title:	Transportation
TN #:	235612
Document Title:	Presentation - 2020 Mobile Source Strategy- A Vision for Clean Air
Description:	Public Webinar Presentation on March 25, 2020 at California Air Resources Board
Filer:	Raquel Kravitz
Organization:	California Energy Commission
Submitter Role:	Commission Staff
Submission Date:	11/16/2020 10:18:51 AM
Docketed Date:	11/16/2020



2020 Mobile Source Strategy: A Vision for Clean Air



Public Webinar
March 25th, 2020

Today's Webinar

- Background
- 2016 Mobile Source Strategy Progress
- Scenarios
- South Coast & San Joaquin Valley
- Wrap-up

Questions?

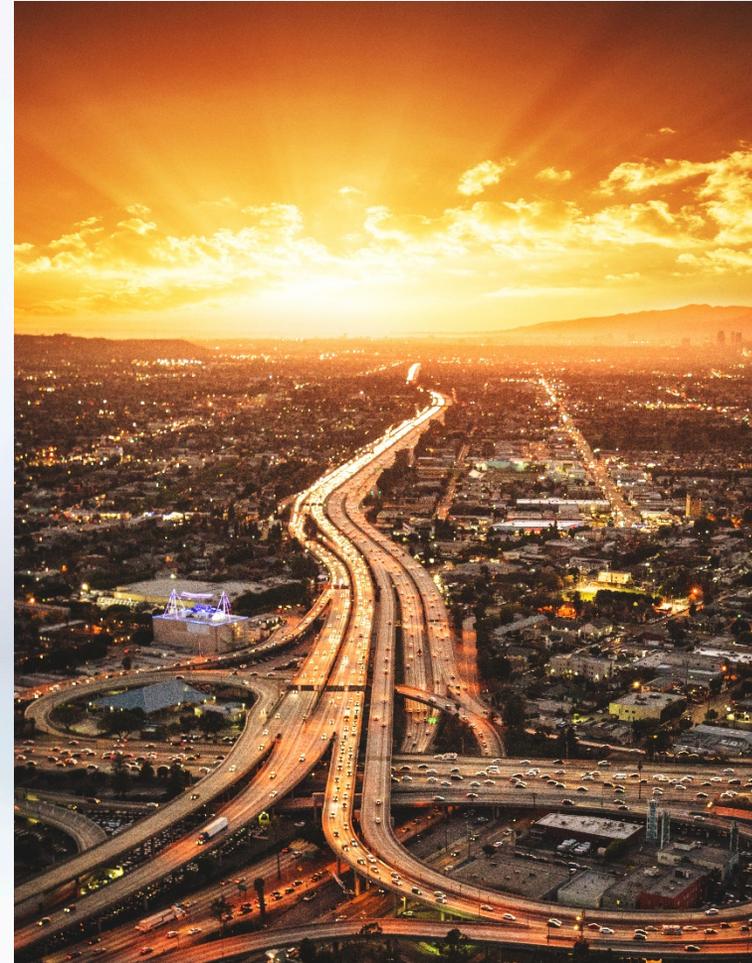
Email us at MSS@arb.ca.gov

Timeline

Scenario Modeling	Ongoing
Informational Update to the Board	Mid 2020
Release Draft Document	Fall 2020
Board Consideration	Late 2020

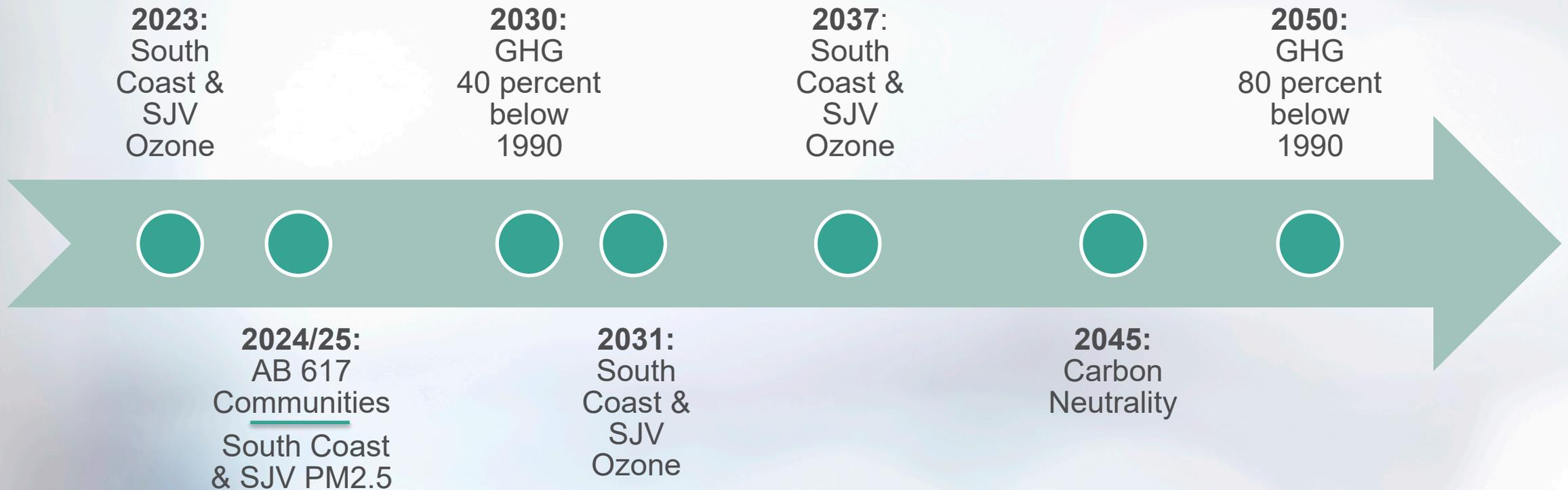
2020 Mobile Source Strategy: A Vision for Clean Air

A conceptual scenario approach to identifying the technology mixes needed to meet California's goals



Background

California's Goals



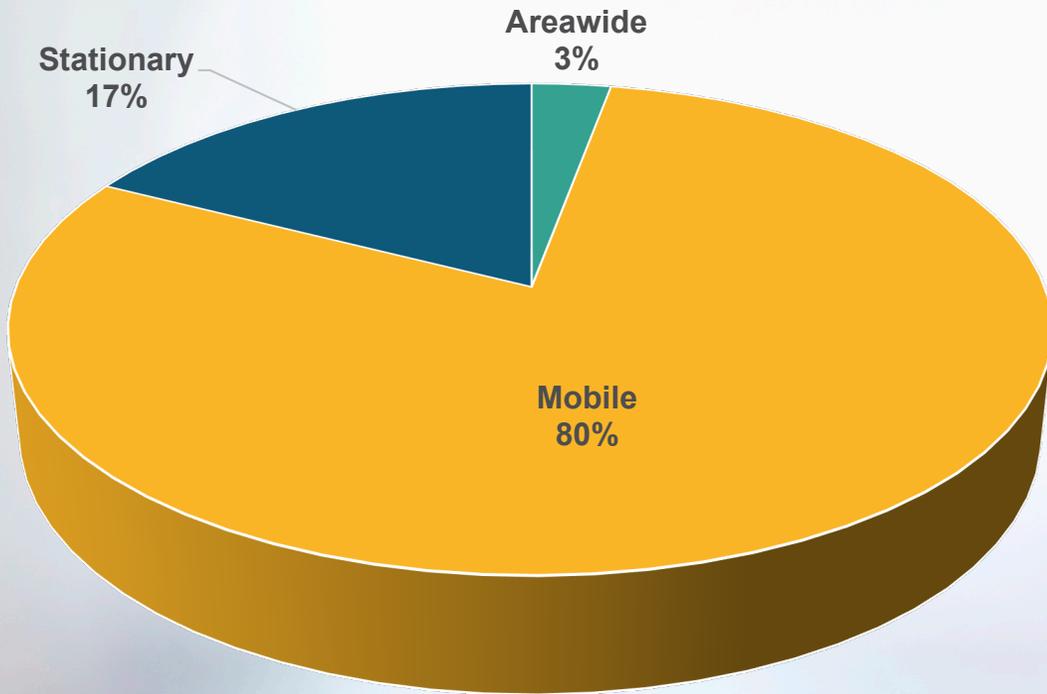
Integrated Planning



2020 Mobile Source Strategy will Support Multiple Planning Efforts

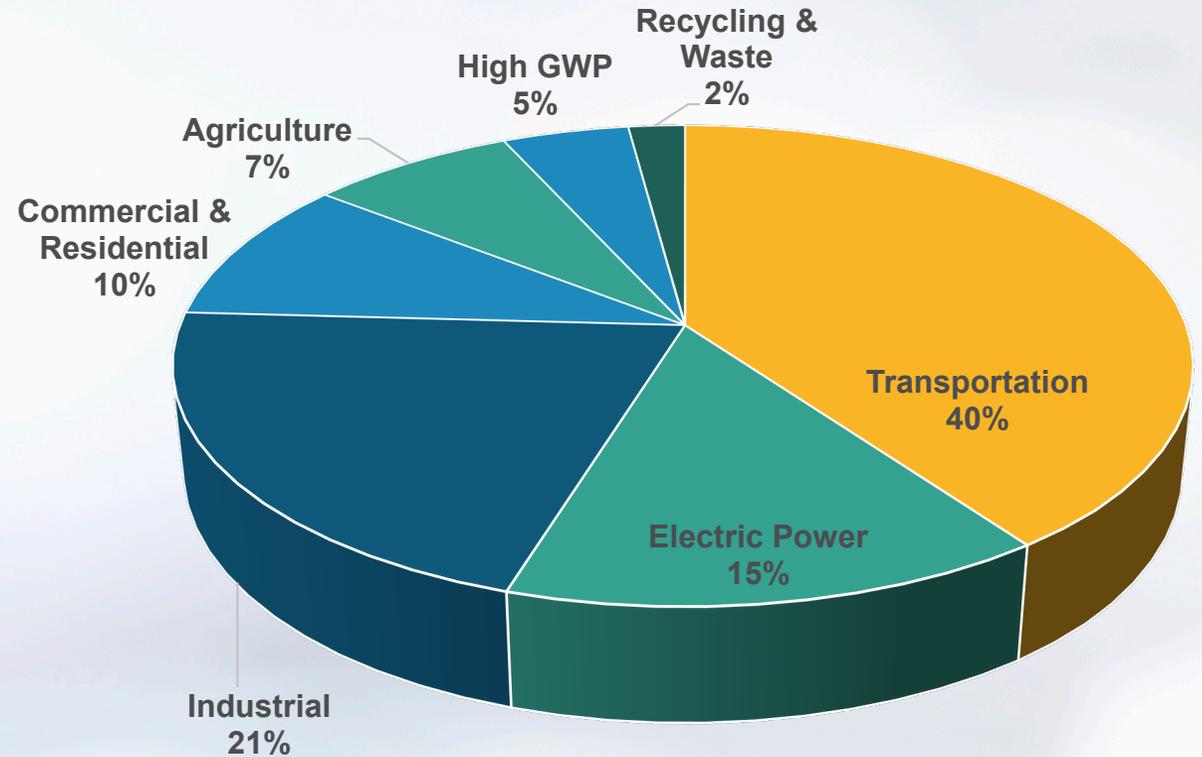
70 ppb Ozone Standard SIPs	2020-2022
Scoping Plan Update	2022
Community Emission Reduction Plans	Ongoing
Sustainable Communities Strategies	Ongoing

Mobile Source Contribution



2017 Statewide NOx Emissions

Total = 1294 tons per day



2017 Statewide GHG Emissions

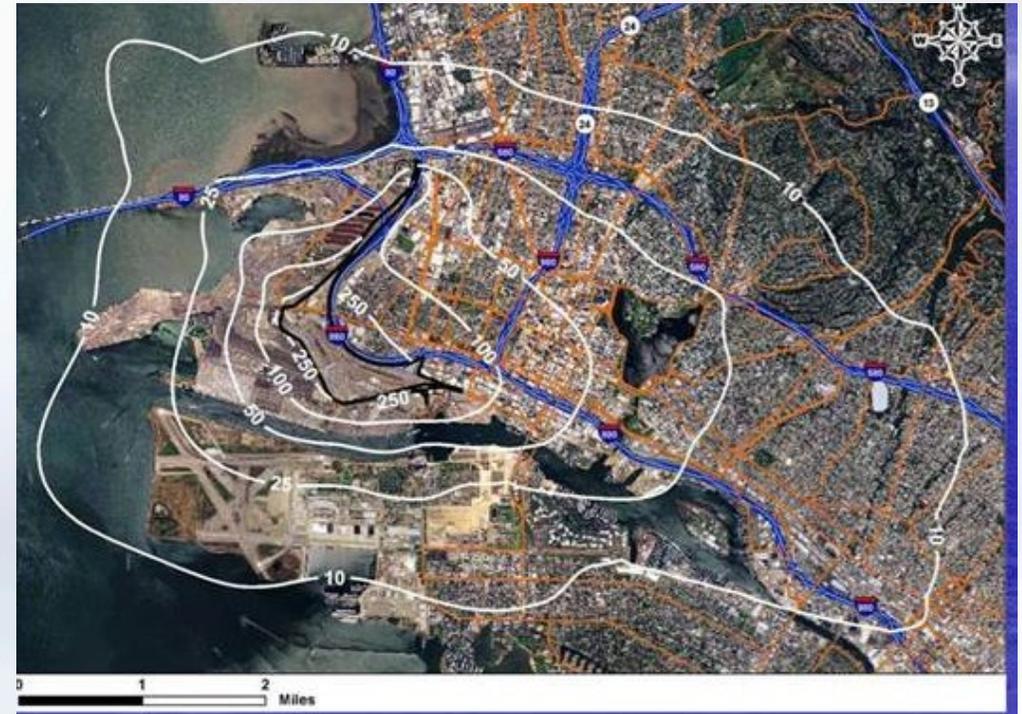
Total = 424 MMTCO₂e

Health Cost of Pollution

Annually, PM_{2.5} exposure results in:

- 5,400 premature deaths due to cardiopulmonary causes*
- 2,800 hospitalizations for cardiovascular and respiratory diseases*
- 6,700 emergency room visits for asthma*

Oakland Railyard Cancer Risk

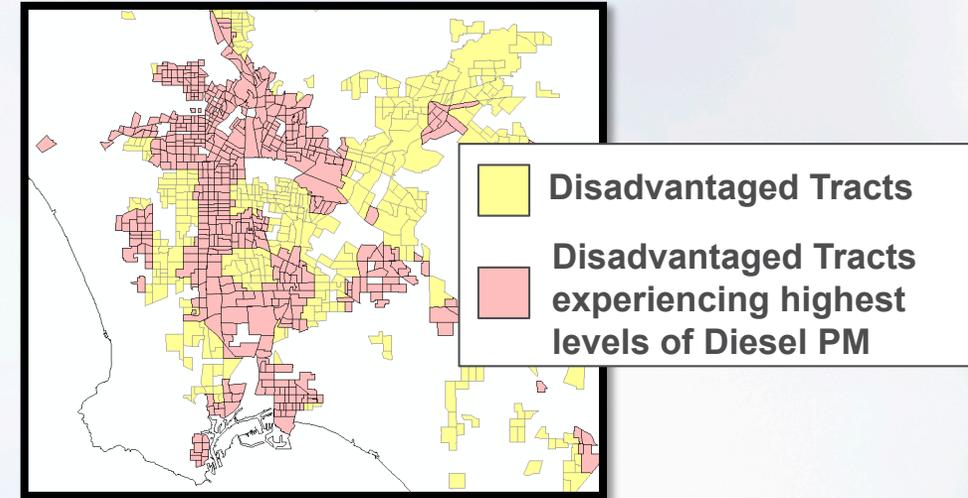


Diesel PM also increases cancer risk

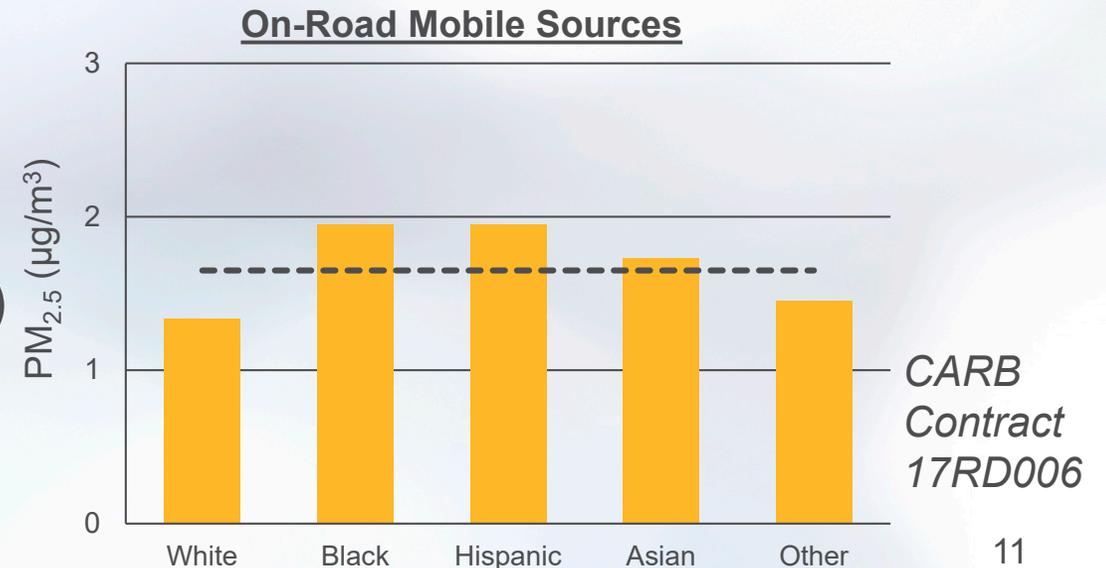
CARB, 2008

Health Cost of Pollution

Disadvantaged communities and people of color are highly affected by mobile pollution



- 46% of disadvantaged census tracts in 75th percentile for Diesel PM
- Black and Hispanic communities exposed to $PM_{2.5}$ at concentrations 18% above average (on-road sources)



2016 Mobile Source Strategy - Progress

2016 Mobile Source Strategy

- Released May 16, 2016
- Elements incorporated into:
 - 2016 State SIP Strategy
 - 2017 Scoping Plan
 - CA Sustainable Freight Action Plan
 - Short-Lived Climate Pollutant Reduction Strategy

Regulatory Items Adopted

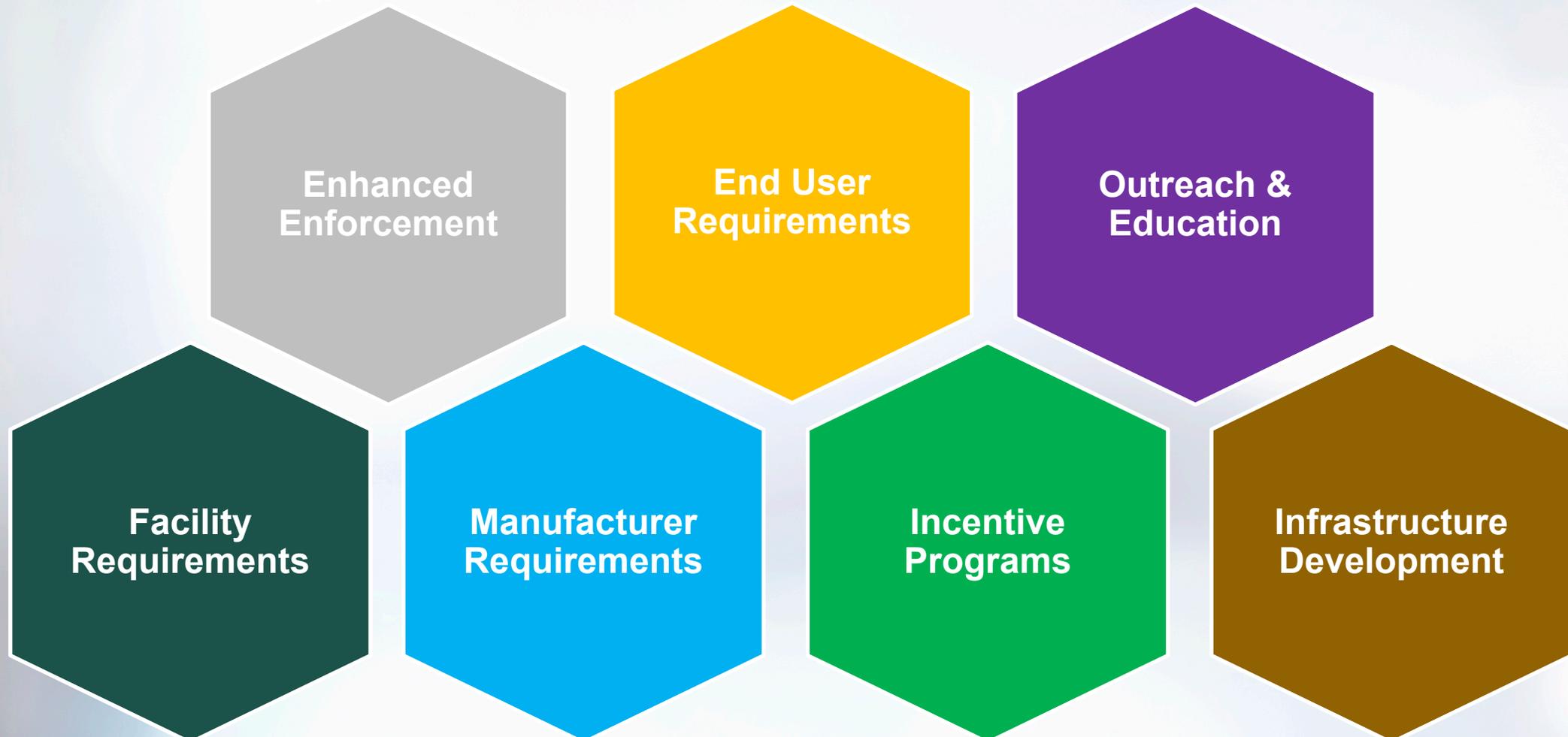
Regulation	Adopted
Medium- and Heavy-Duty GHG Phase 2	February 2018
Lower Opacity Limits for HD Vehicles	May 2018
Amended Warranty Requirements for HD Vehicles	June 2018
Innovative Clean Transit	December 2018
Zero-Emission Airport Shuttle Buses	June 2019

Regulations In Development

Regulation	Progress	Anticipated Consideration
Ocean Going Vessels – At Berth	1 st hearing Dec 2019	Spring 2020
Advanced Clean Trucks	1 st hearing Dec 2019	Spring 2020
Heavy-Duty Low-NOx Omnibus	Workshops since 2016	Mid 2020
Transport Refrigeration Units	Workshops since 2016	Late 2020
Small Off-Road Engines	Workshops since 2016 Evap Reg amended 11/2016	Late 2020
Heavy-Duty I/M	Workshops since 2019	2021
Advanced Clean Cars 2.0	In Development	2021
Low-Emission Diesel Requirement	Workshops since 2019	2021

Scenarios

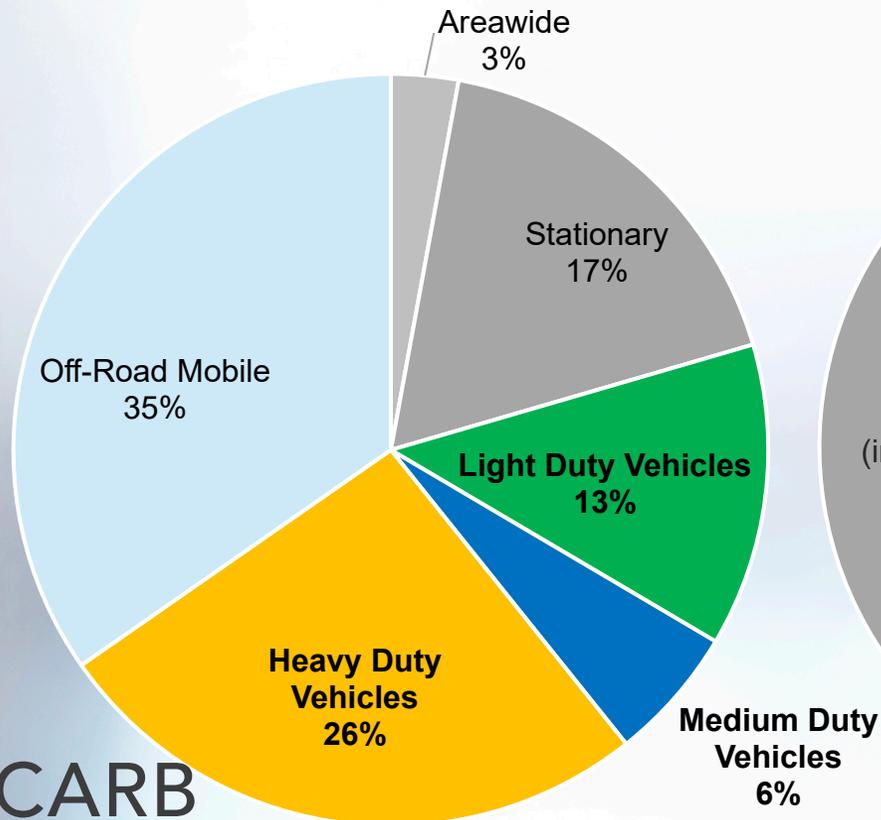
Achieving Air Quality and Climate Goals Requires Multiple Tools



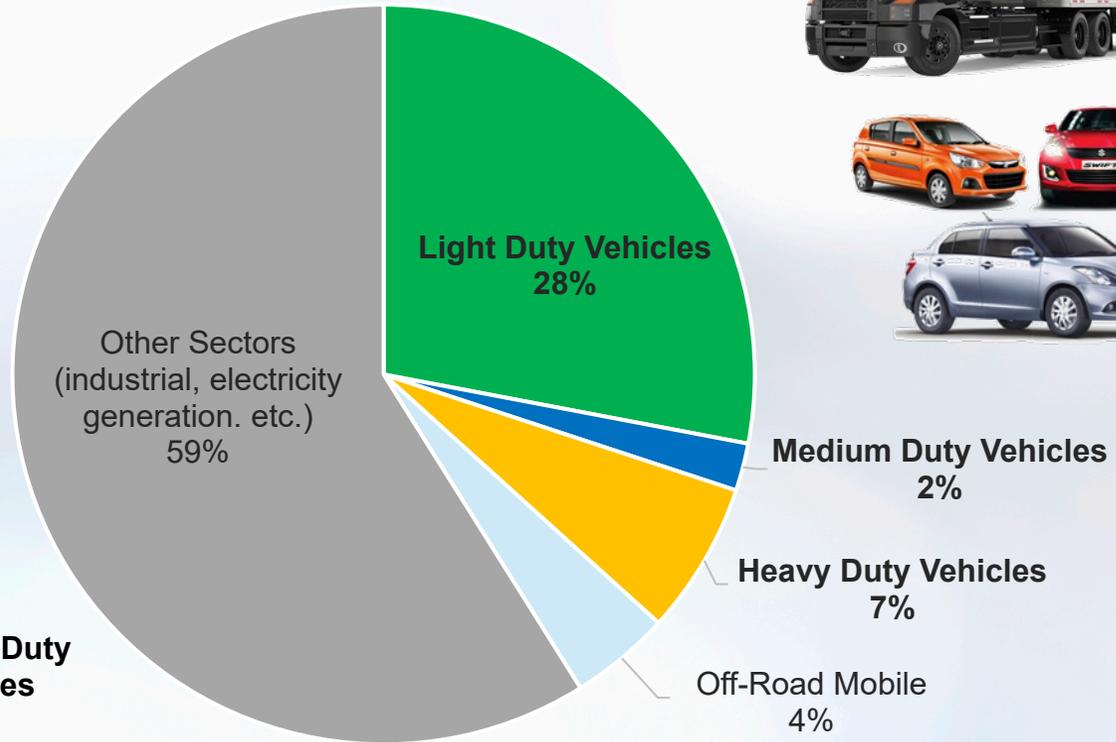
On-Road Sector

- In 2017, on-road mobile sources contributed to 45% of statewide NOx emissions and 37% of statewide GHG emissions

Statewide NOx Emissions



Statewide GHG Emissions

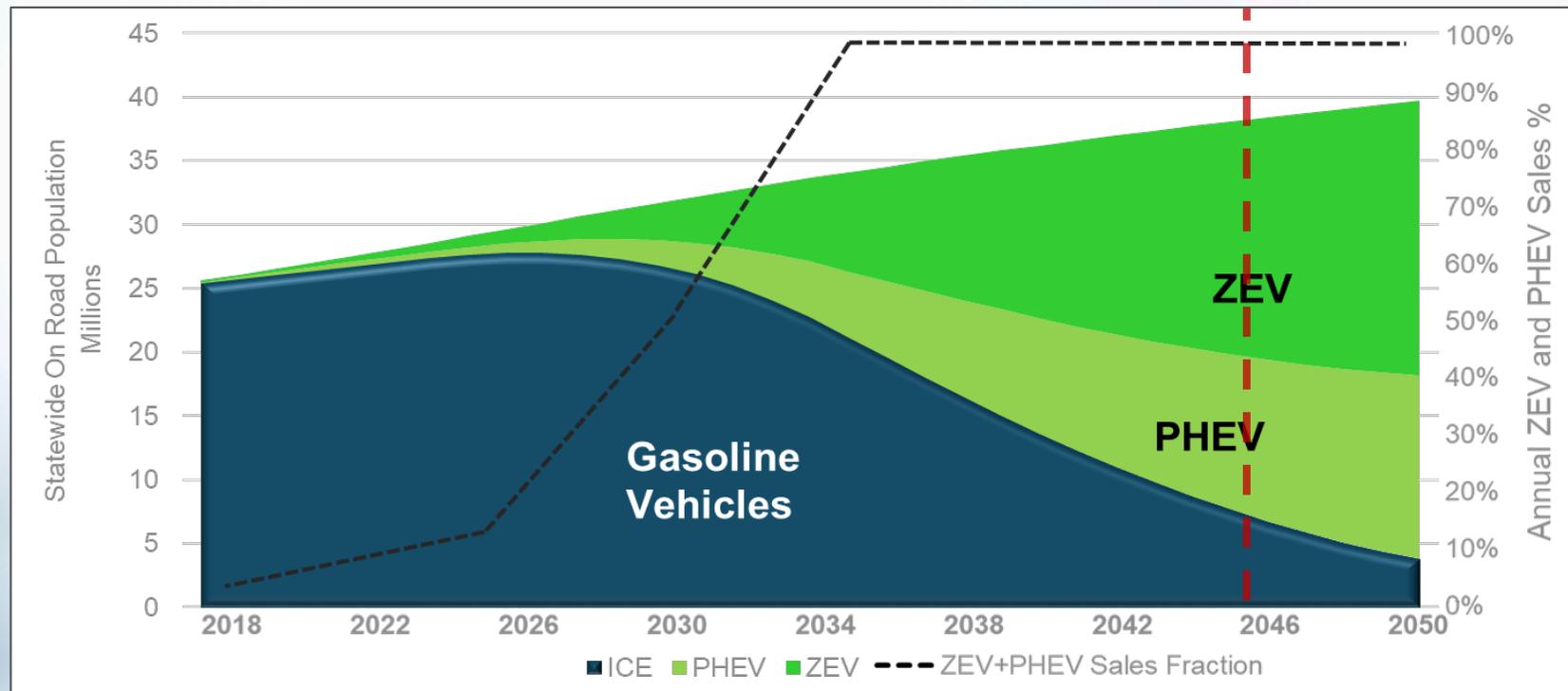


On-Road Light-Duty Sector

- Advanced Clean Cars 2 – Post 2025 automaker rules
 - Enhanced ZEV Regs – Moving beyond early adopters
 - Enhanced LEV Regs – Reducing real world emissions
 - Board to consider in 2021
- Clean Miles Standard (SB 1014) requires CARB to develop a GHG reduction program for ride hailing companies
 - Two targets: gCO₂/passenger-mile; Minimum electric miles
 - Compliance strategies: Electrification; Pooling; Reduce deadhead miles; Connections to transit/active transportation
 - Emissions inventory complete; Board to consider in late 2020

2020 Mobile Source Scenario for LDV

- 100% sales ZEVs & PHEVs by 2035; Does not go far enough
- Half of fleet in 2045 still has combustion engine

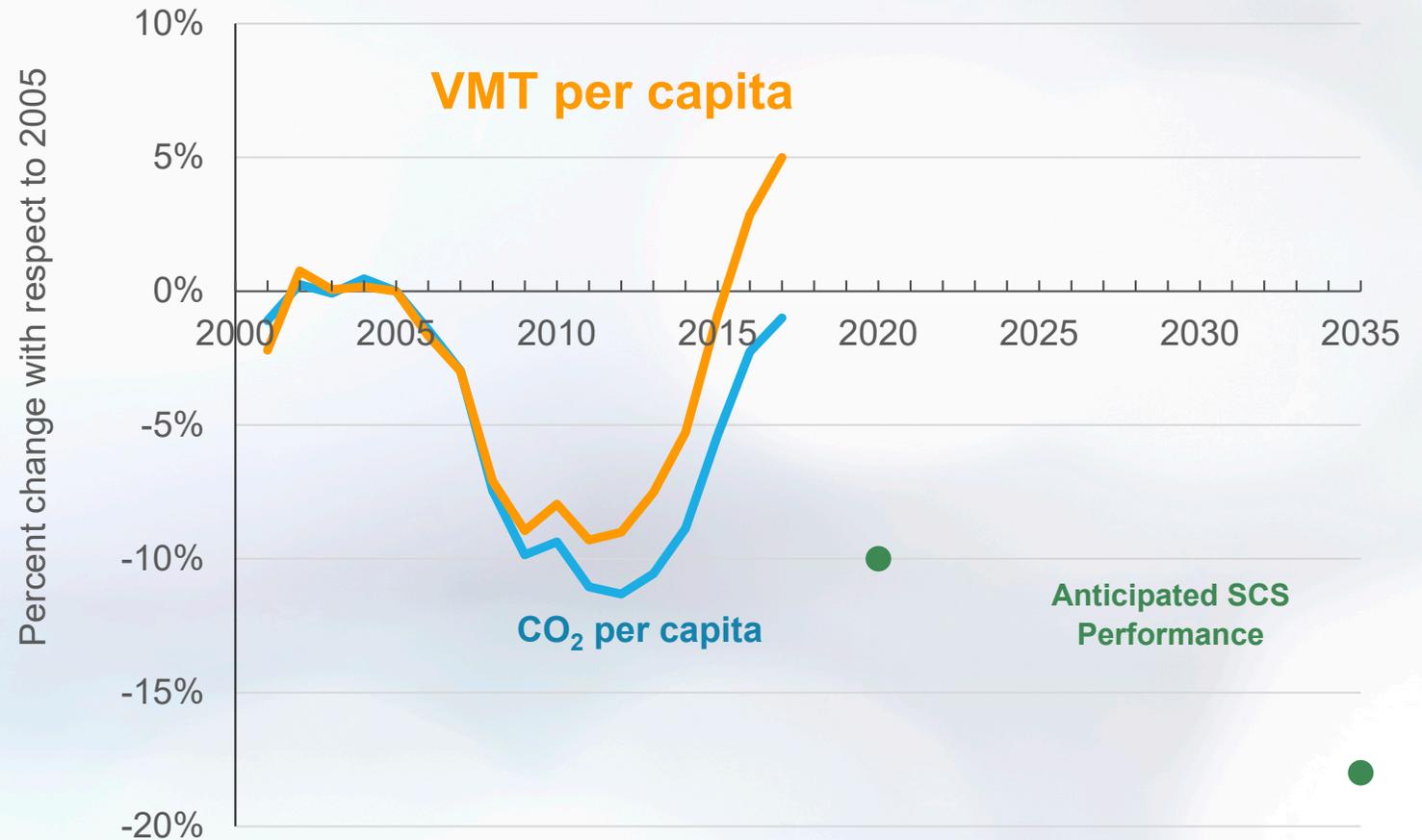


Fuel Demand in 2045
 (bil. gal. per year)
 gasoline – 2.22

Staff continue to evaluate more ambitious ZEV sales scenarios and the impact of high mileage vehicles

Transportation Sector VMT/GHG are Not on Track to Meet Targets

- Californians continue to drive alone as their primary mode of travel
- Transit ridership is falling
- RTP/SCSs include over \$1.1 trillion in spending, but there has been remarkably little shift in spending by mode
- Housing cost burden continues to increase



Opportunity Areas



State Funding for Transp. and Dev. Projects



Growth & the Housing Crisis



New Mobility



Transportation Pricing



Traveler Incentives



Under-Served Communities



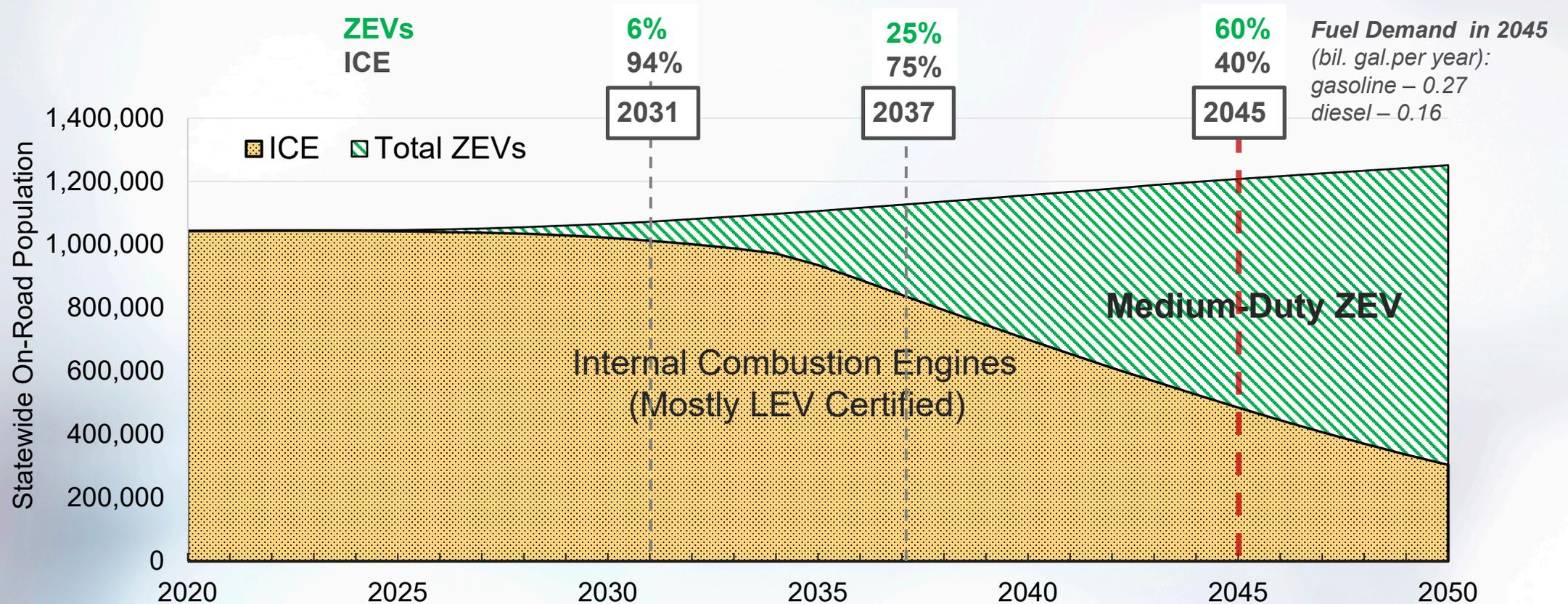
Update & Strengthen SB 375

On-Road Medium-Duty Sector

- Medium-duty vehicles (8,501 – 14,000 lbs. GVWR) are responsible for 7% of statewide mobile source NOx and 5% of statewide mobile source GHG emissions
- **Strategies** for on-road medium-duty vehicles (MDVs) include:
 - ✓ Zero-emission technology transformation starting in 2024
 - ✓ Enhanced LEV regulations through Advanced Clean Cars 2.0
 - ✓ Continued energy efficiency improvements
 - Phase 3 Greenhouse Gas Standards for Medium/Heavy-Duty Vehicles

2020 Mobile Source Scenario for MDV

- Considered a scenario to achieve long-term climate goals
- Strategy: Ambitious ZEV penetration for newer vehicles



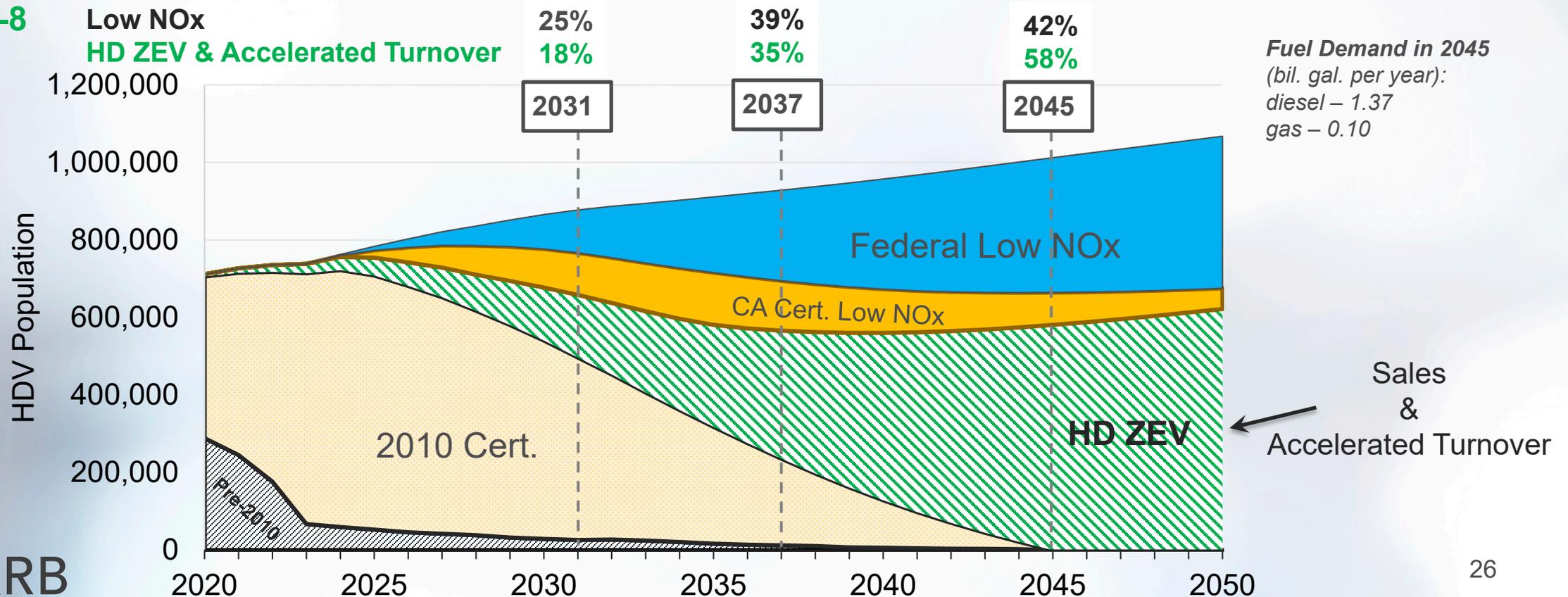
On-Road Heavy-Duty Sector

- Heavy-duty vehicles (above 14,000 lbs. GVWR) are responsible for 33% of statewide mobile source NOx and 16% of statewide mobile source GHG emissions
- **Strategies** for on-road heavy-duty vehicles (HDVs) include:
 - ✓ Zero-emission technology penetration starting in 2024
 - ✓ Cleaner diesel technology (i.e., Low NOx diesel) starting in 2024
 - ✓ Use of renewable fuels where electrification is not feasible
 - ✓ Continued energy efficiency improvements
 - Tractor-Trailer Greenhouse Gas (TTGHG)
 - Phase 3 Greenhouse Gas Standards for Medium/Heavy-Duty Vehicles
 - ✓ In-use performance measures
 - Heavy-duty inspection and maintenance (HD I/M) program starting in 2023
 - More Stringent in-use performance standards
 - Lengthening engine useful life, warranty, and durability requirements

Meeting Midterm Goals

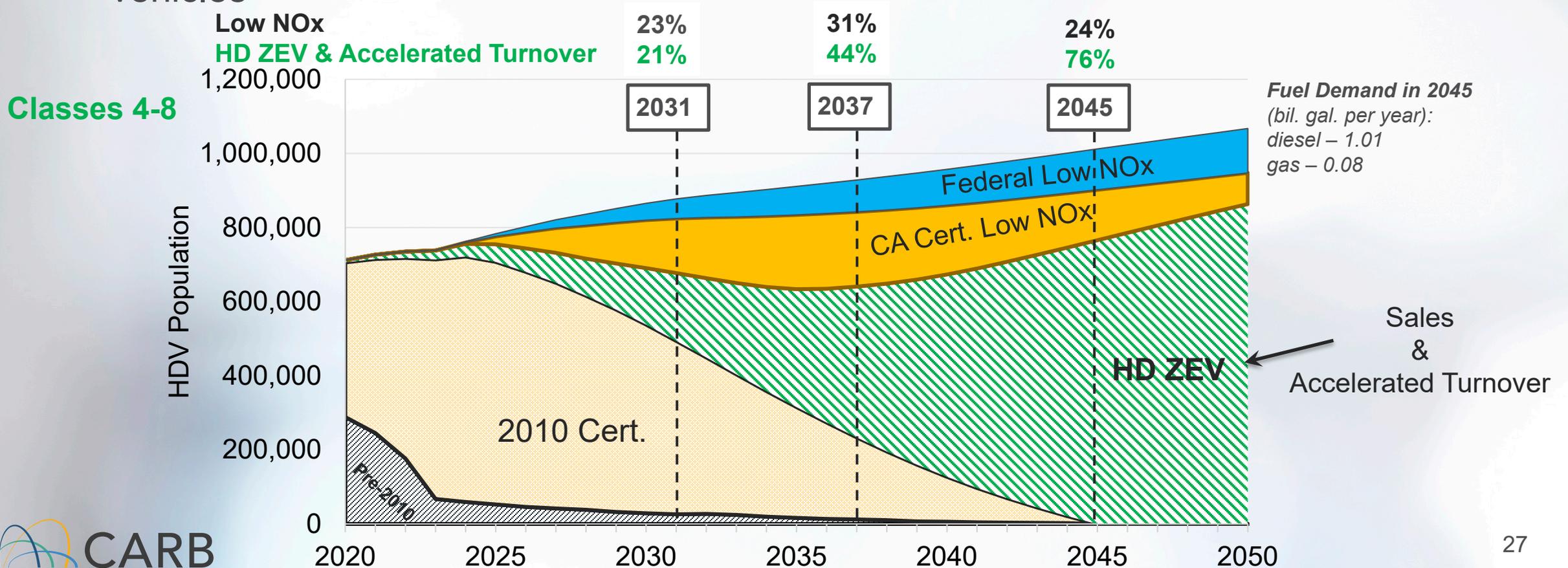
- To achieve NOx reduction needed to meet the air quality goals over the next two decades while also charting a course to achieve longer-term climate change goals
- Ambitious ZEV penetration for newer vehicles combined with accelerated turnover of older vehicles (e.g., 2010-certified)

Classes 4-8



Meeting Long Term Goals

- To achieve NOx reduction needed to meet near term air quality goals, and also maximize the number zero-emission trucks for longer term climate goals
- A hyper ambitious ZEV penetration combined with accelerated turnover of older vehicles



More Information

On-Road Programs

Advanced Clean Cars

<https://ww2.arb.ca.gov/our-work/programs/advanced-clean-cars-program>

Clean Miles Standard

<https://ww2.arb.ca.gov/our-work/programs/clean-miles-standard>

Heavy-Duty Inspection & Maintenance

<https://ww2.arb.ca.gov/our-work/programs/heavy-duty-inspection-and-maintenance-program>

Heavy-Duty Low-NOx

<https://ww2.arb.ca.gov/our-work/programs/heavy-duty-low-nox>

Medium- & Heavy-Duty GHG Regulation

<https://ww2.arb.ca.gov/our-work/programs/ghg-std-md-hd-eng-veh>

Advanced Clean Trucks

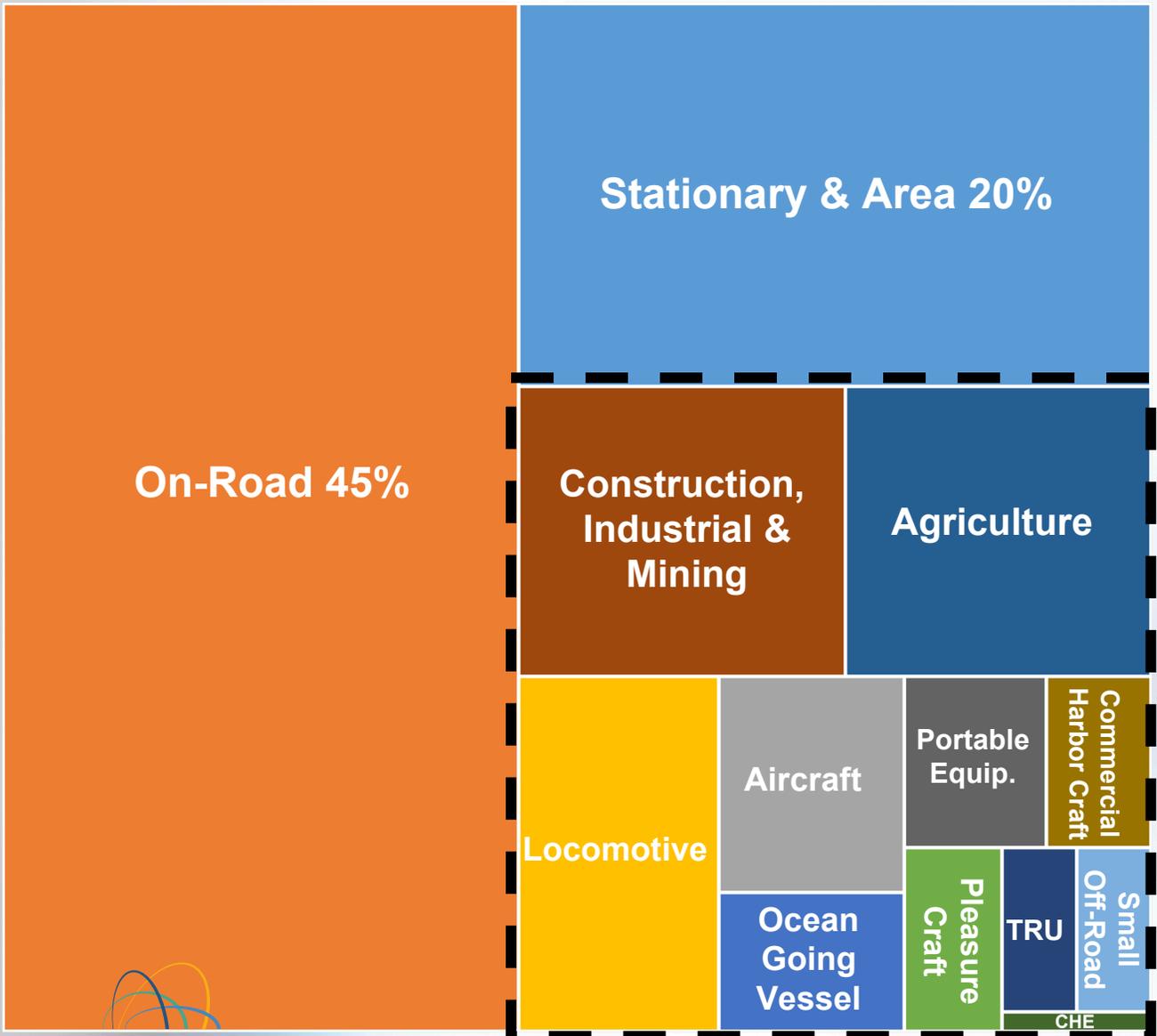
<https://ww2.arb.ca.gov/our-work/programs/advanced-clean-trucks>

Advanced Clean Truck Fleets

<https://ww2.arb.ca.gov/our-work/programs/advanced-clean-fleets>

Off-Road Sector

Statewide NOx Emissions



- Off-road mobile sources contributes to 35% of Statewide NOx and 4% of GHG emissions in 2017
- Off-road NOx contribution will grow to 37% (largest) by 2022
- Off-road annual diesel consumption will reach 2.13 billion gallons by 2045

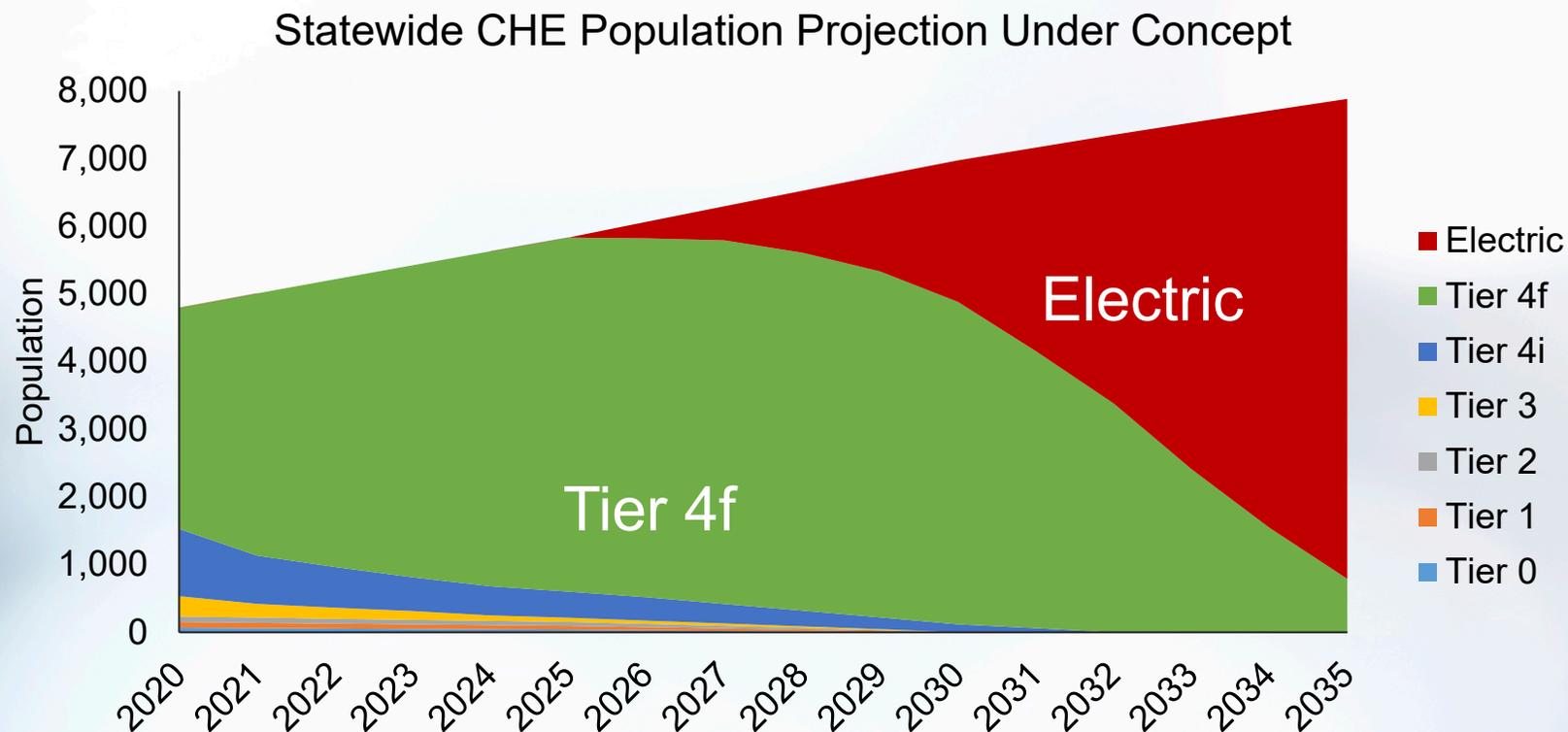


Strategies for Off-Road Sector

- General principles:
 - ✓ Zero-emission technology wherever possible
 - ✓ Remaining combustion engines as low-emitting as technically feasible, throughout entire service lives (Tier 5, OBD and GHG standard)
 - ✓ Use of renewable fuels where electrification is not feasible
 - ✓ Accelerated turnover of older equipment to cleanest available technology, including hybridization
 - ✓ Retrofit with after-treatment technologies

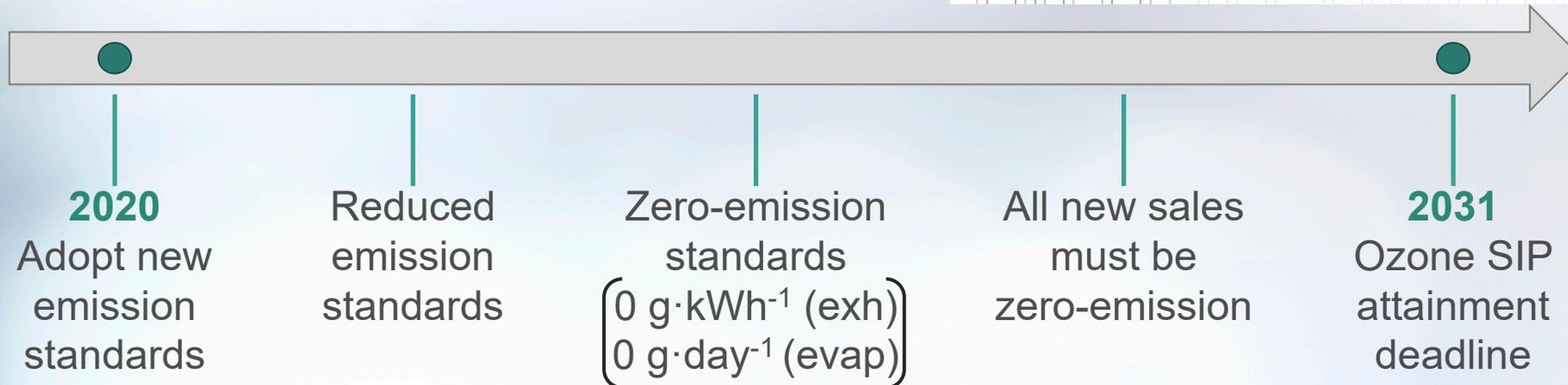
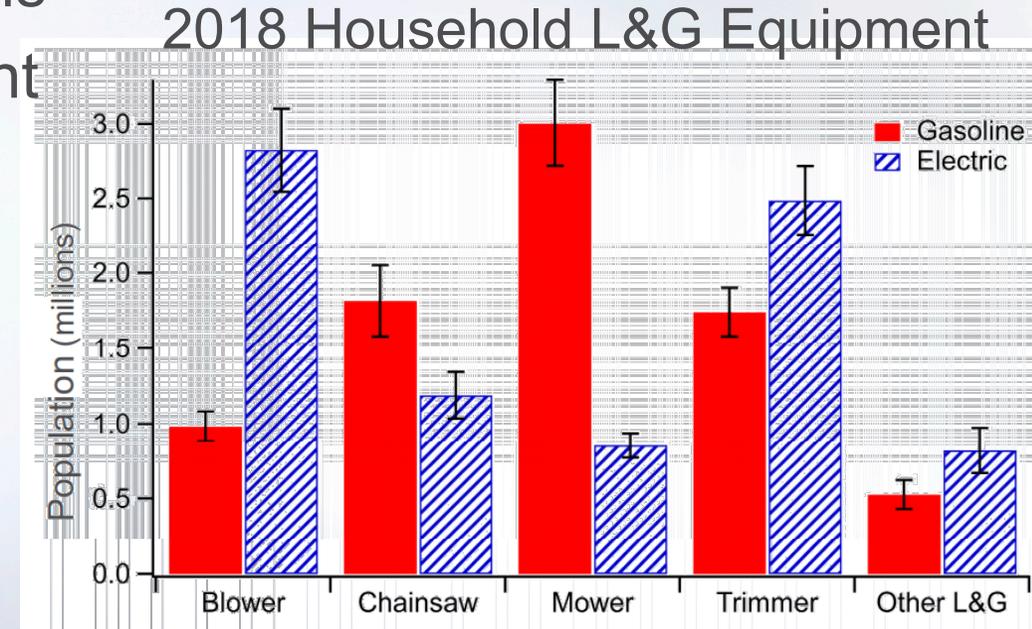
Cargo Handling Equipment

- Important due to proximity of communities and at-risk population centers, primarily significant in SC and Bay Area
- **Concept:** Begin transition to full electric operation beginning in 2026



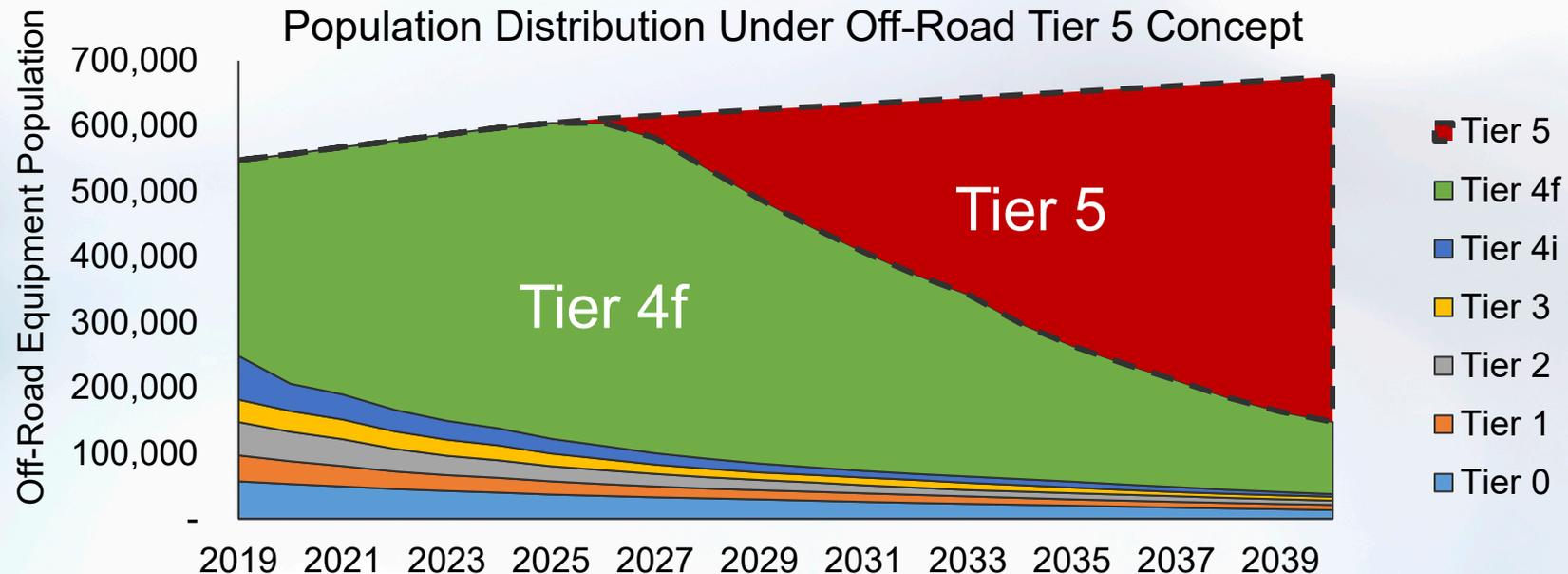
Small Off-Road Engines

- Significant source of statewide ROG emissions
- **Types:** Lawn & Garden (L&G) equipment, light commercial equipment such as generators, compressors, etc.
- **Concepts:**
 - Tighten emission standards
 - Full transition to zero-emission equipment



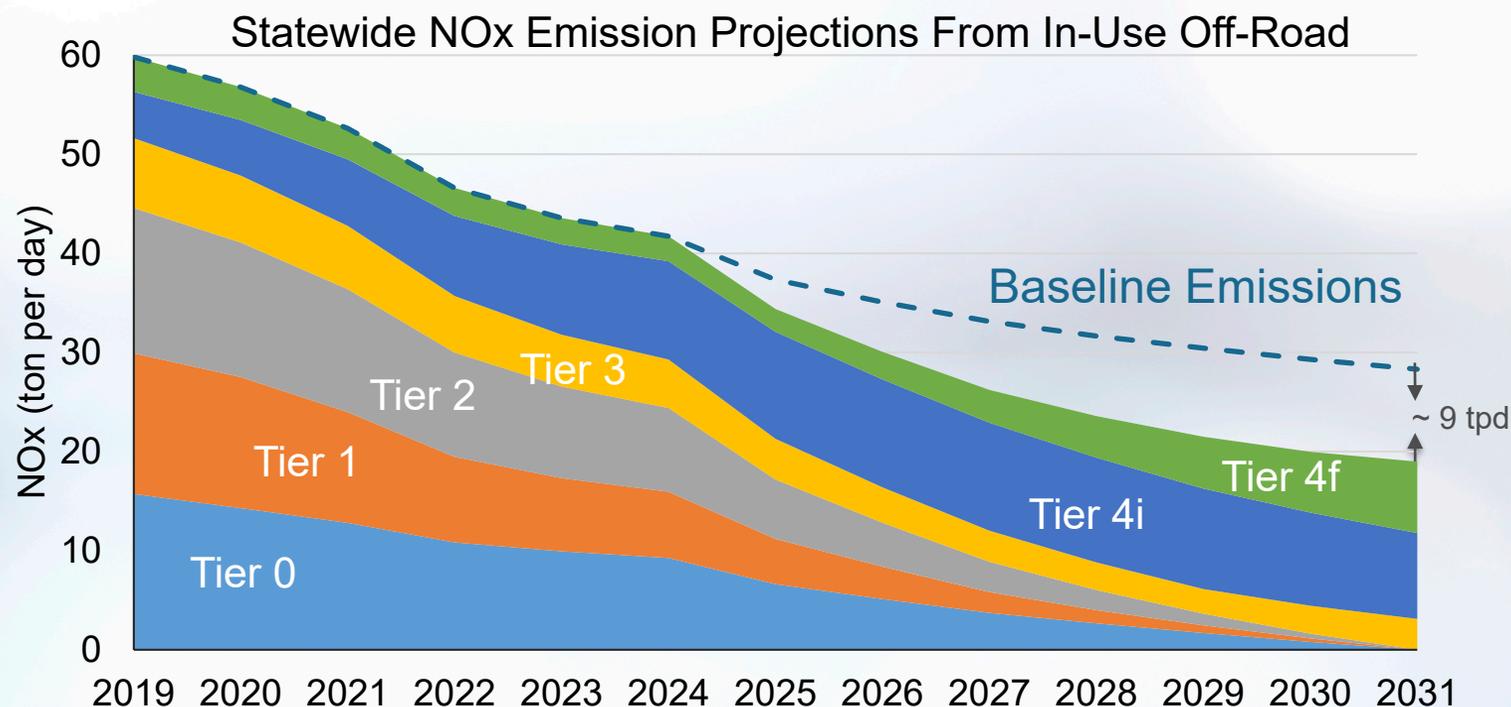
Off-Road Engine Standards: Tier 5

- Would achieve additional NOx and PM reductions for all off-road engines (excluding marine and locomotives) when introduced in mid 2020s
- Explore zero-emission and hybridization wherever feasible
- **Additional concepts:**
 - Off-Road on-board diagnostic (OBD) standards: ensure emissions reduction equipment is working
 - More stringent exhaust standards for spark-ignition recreational marine engines
 - Potential for off-road diesel GHG standards



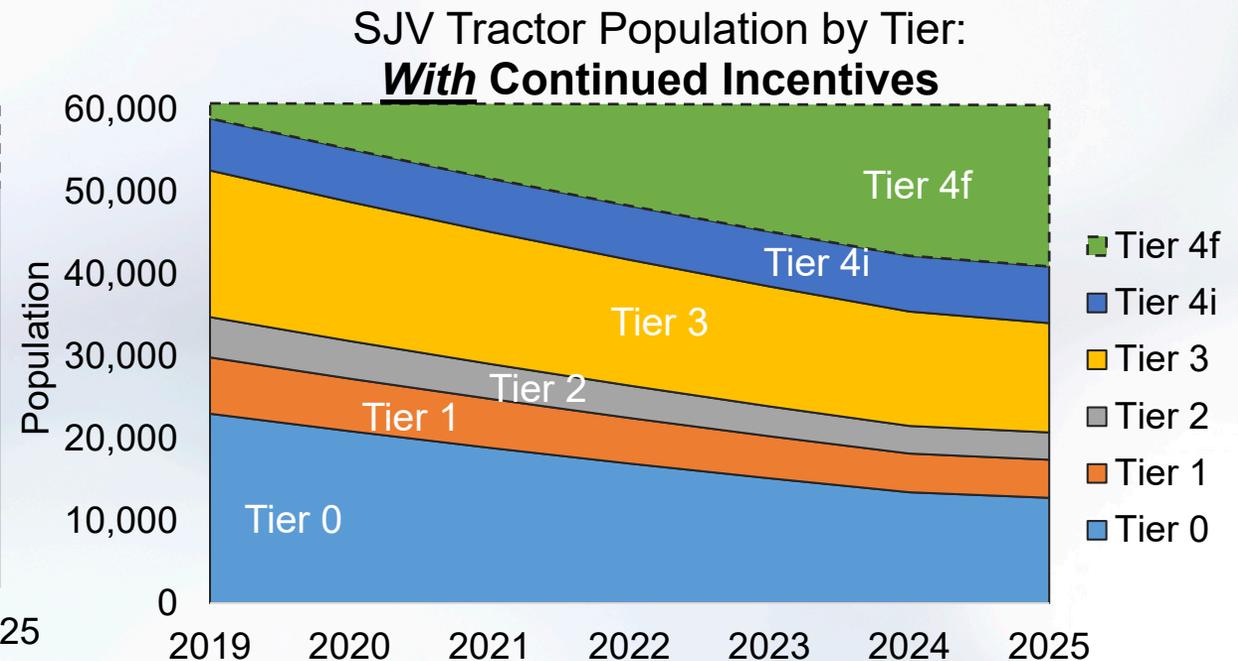
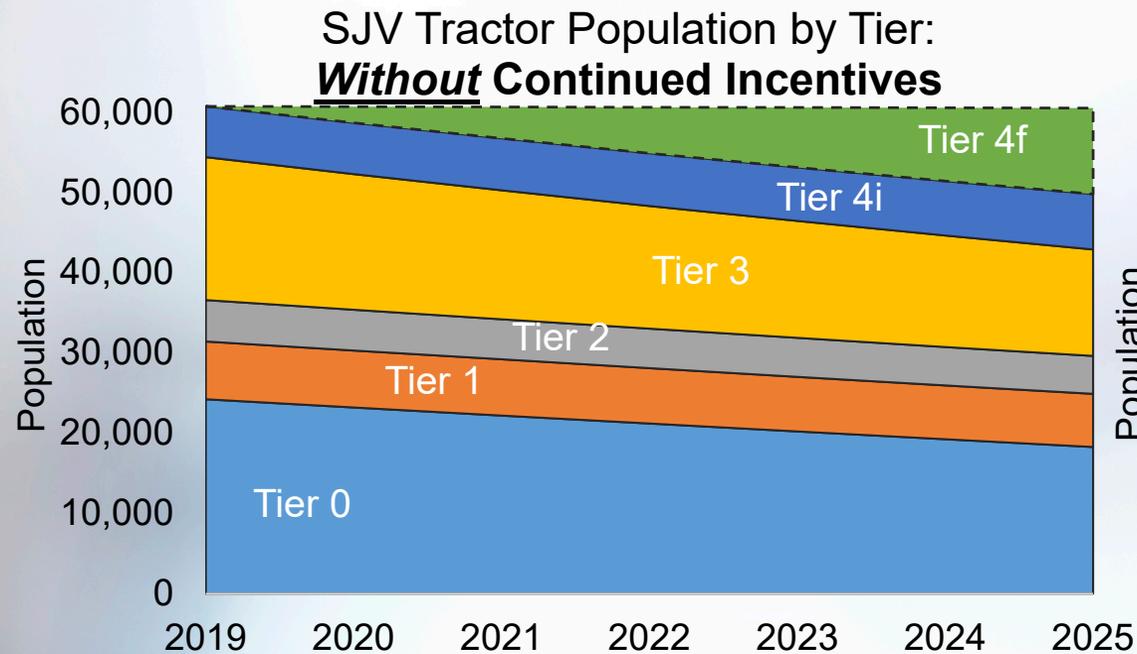
Construction, Industrial, Mining (In-Use Off-Road)

- Significant NOx contributor in SJV and SC
- **Needed:** Implement full turnover of Tier 0/1/2 following existing In-Use Regulation by 2031
 - Current regulation allows continued use of Tier 0 to Tier 2 indefinitely if meeting Fleet Average requirements



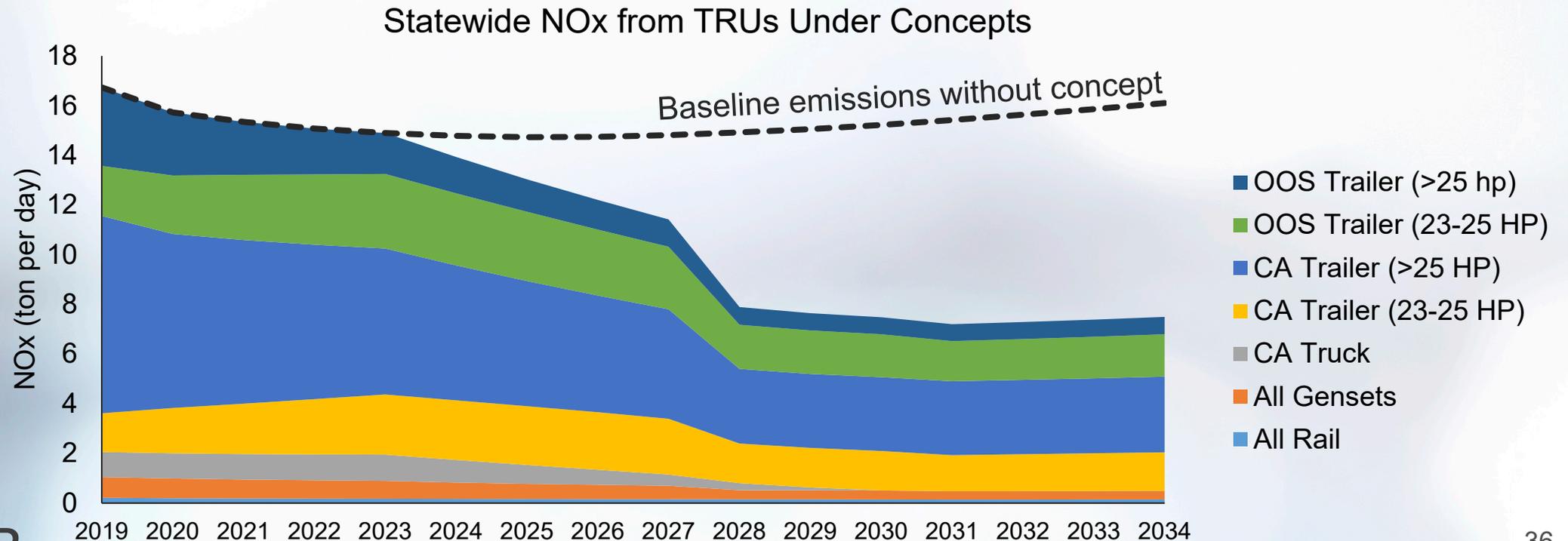
Agriculture

- Important contributor in SJV: 18 percent of NOx emissions in 2019
- **Concepts:** Incentive-driven programs (e.g., FARMER)
 - Replacing Tier 0/1/2 tractors with Tier 4-Final tractors; significant acceleration of Tier 0/1/2 has been underway since 2009
 - Replacing diesel all terrain vehicles (ATVs) with electric



Transport Refrigeration Units

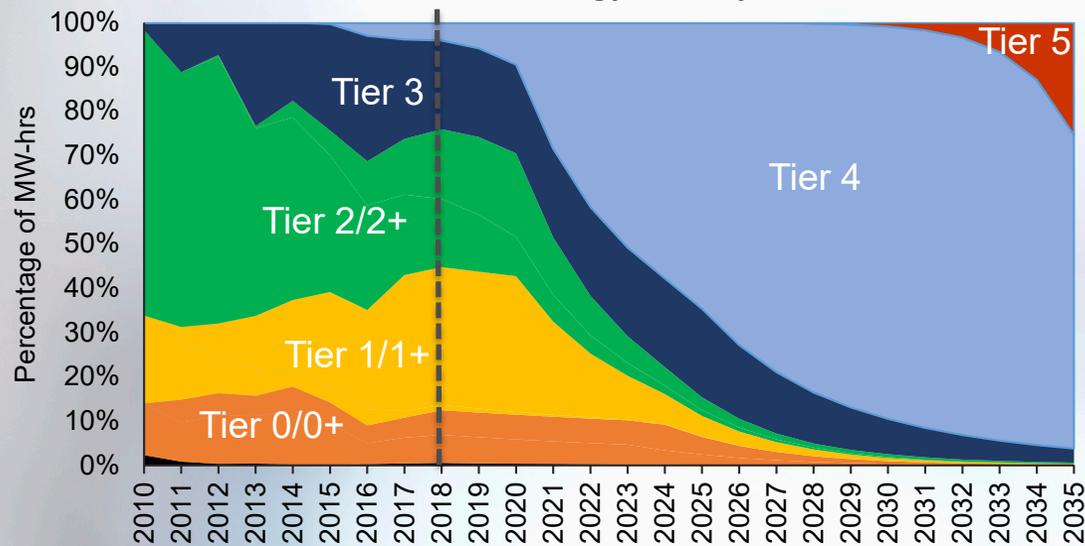
- Significant to all local communities
- **Concepts:**
 - Zero emissions for truck TRUs
 - Zero-emission operation requirements while stationary for trailer TRUs
 - Less than 25 horsepower TRUs and TRU gensets meet standard for 25 to 50 horsepower



Locomotives

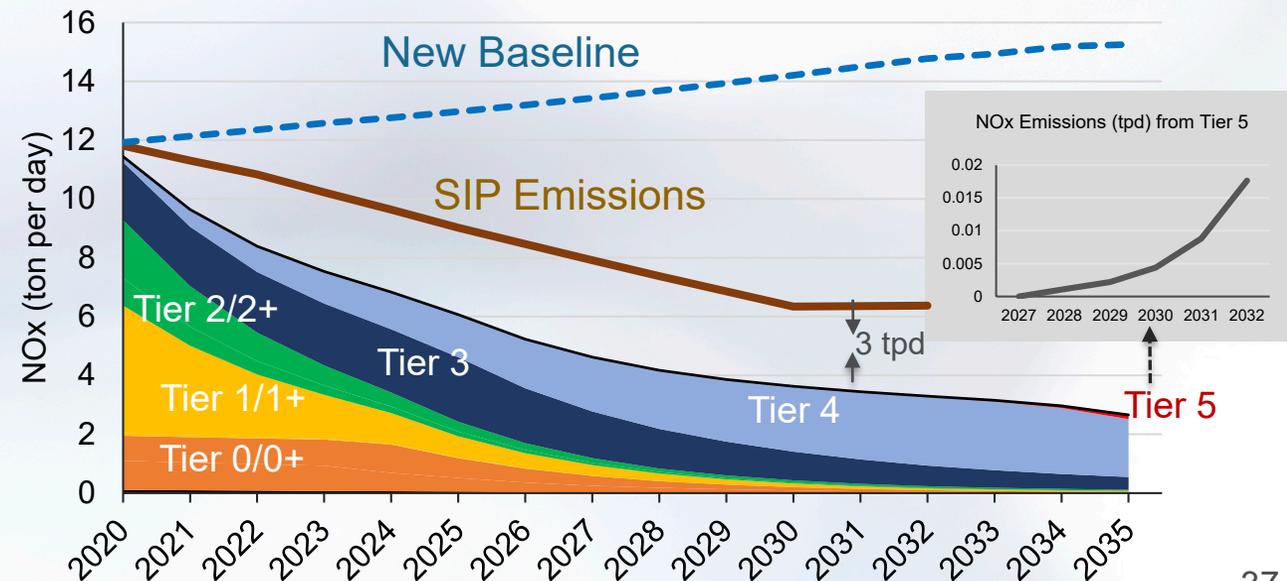
- Significant contributor in SJV and SC, and all communities near railyards
- **Concepts:**
 - Increase purchases of Tier 4 locomotives, reduce use of pre-Tier 3 locomotives by mid-2020s
 - Increase turnover of Tier 0/0+ switchers in railyards
- **Needed:** Tier 5 locomotive standards and significant penetration of Tier 4/5

SC Locomotive Energy Use by Tier Standard



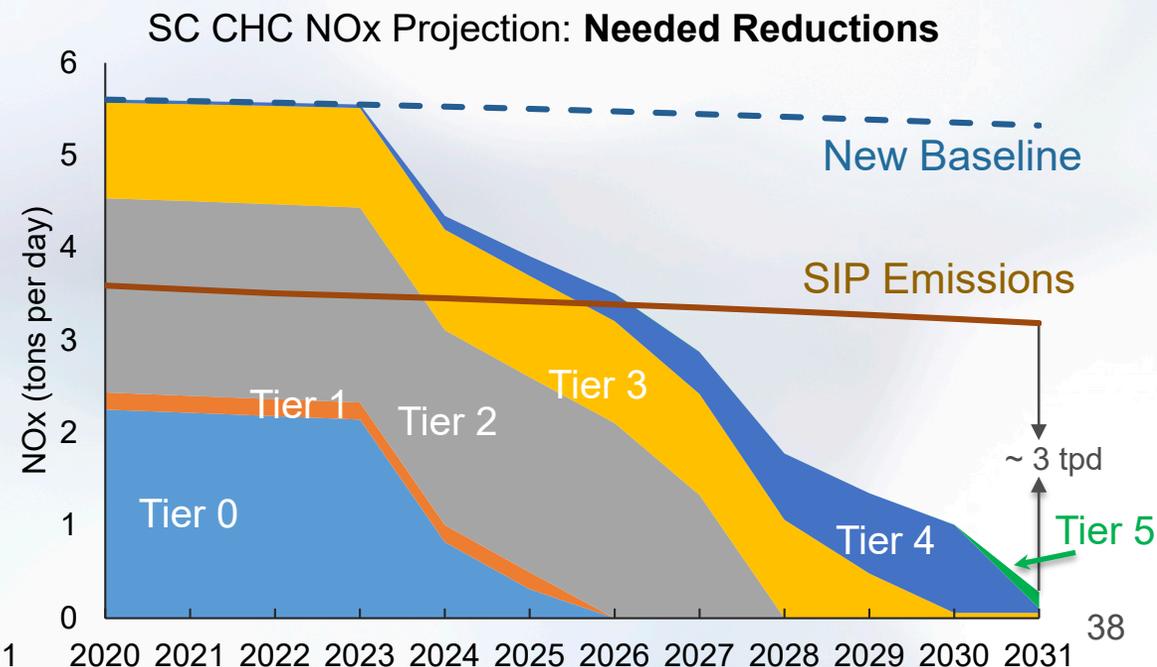
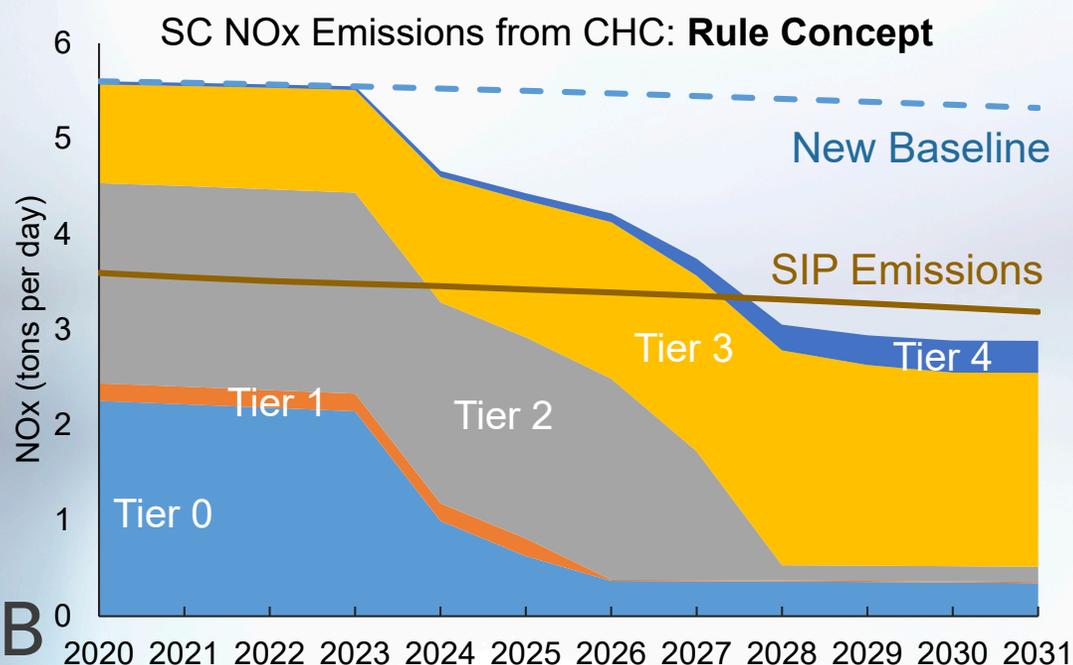
Tier 4 only accounts for 4% of activity in 2018

SC NOx from Locomotives: Needed Reduction



Commercial Harbor Craft

- Important due to proximity of communities and at-risk population centers, primarily significant in South Coast and Bay Area
- **Concepts:**
 - In-use short run ferries become zero-emission by 2028 (9% of ferries)
 - Turn over all vessels except for commercial fishing to cleanest engines and retrofit with DPF
 - Enhanced efficiency for new tugs and zero-emission capabilities for new excursion vessels
- **Needed:**
 - Include commercial fishing; introduce Tier 4 standard to all vessels in 2024 and Tier 5 in 2027
 - Plug-in hybrid for excursions and diesel-electric for tugs by 2030



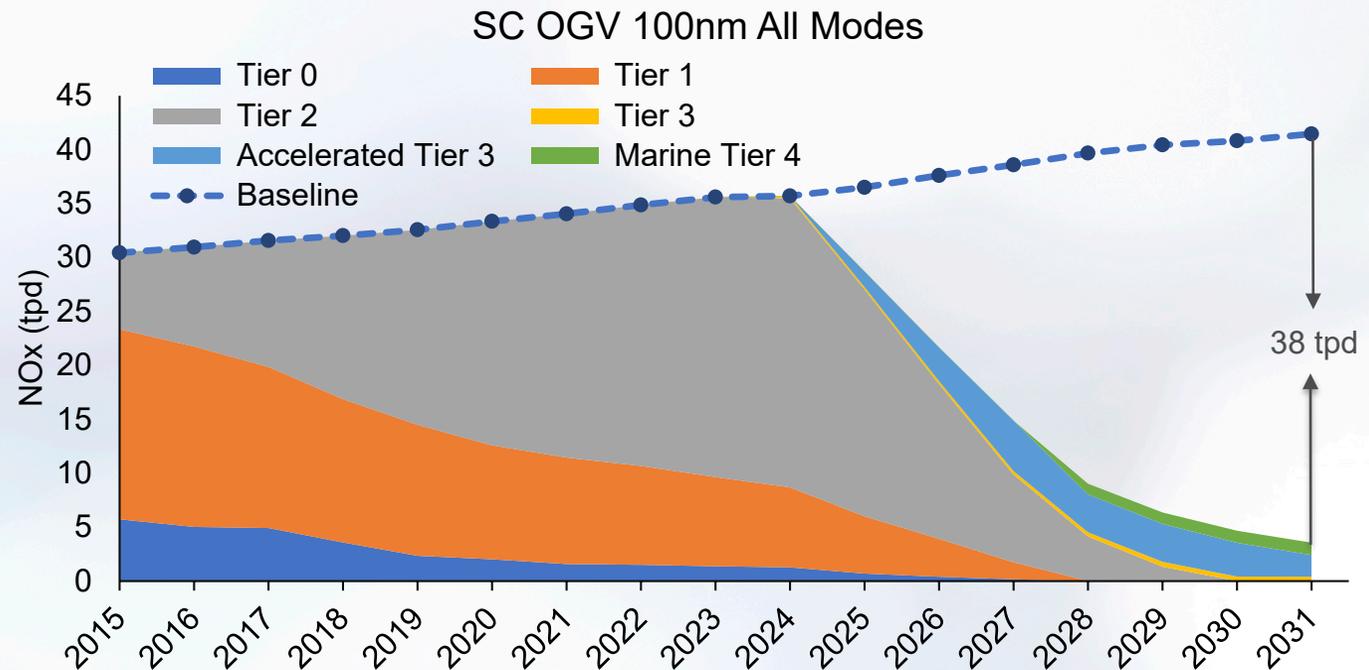
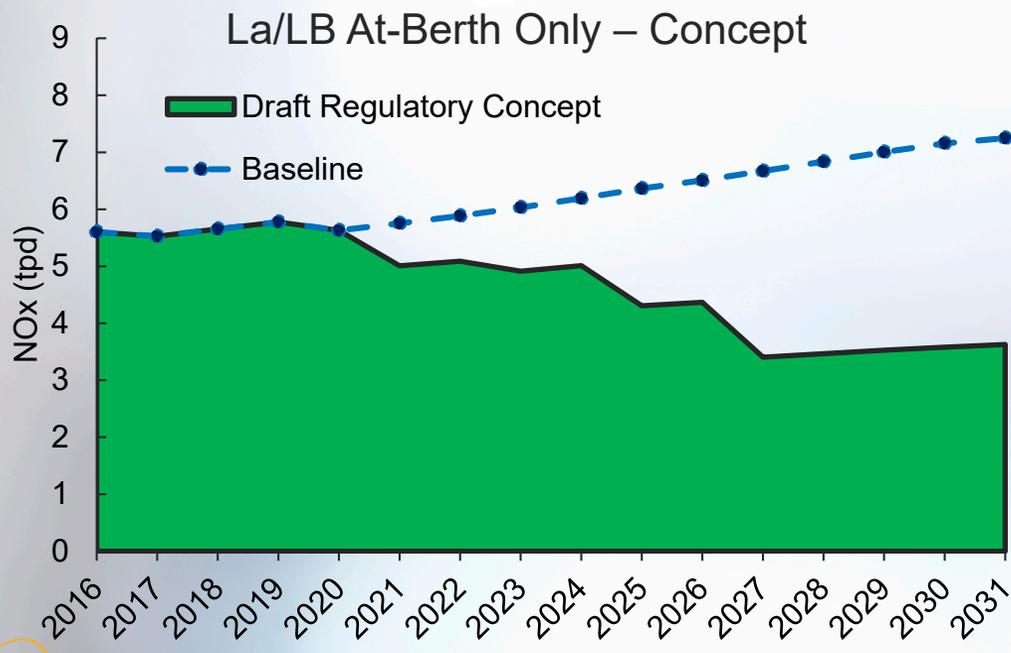
Ocean-Going Vessels At Berth

- Concepts:**

- Focused on diesel PM exposure in local communities, expansion of at-berth regulation to cover more vessel types and locations. Advocate at IMO for Tier 4 vessel standards

- Needed:**

- Address transit, anchorage and maneuvering emissions – Tier 4 marine standards in 2028 and significant penetration of Tier 3/4 beginning 2025. Expanded at-berth coverage for non-covered visits.



More Information

Off-Road Programs

Zero-Emission Cargo Handling Equipment

<https://ww2.arb.ca.gov/our-work/programs/cargo-handling-equipment>

Small Off-Road Engines

<https://ww2.arb.ca.gov/our-work/programs/small-off-road-engines-sore>

Locomotive Emission Reduction Measure

<https://ww2.arb.ca.gov/our-work/programs/reducing-rail-emissions-california>

OGV At-Berth Regulation

<https://ww3.arb.ca.gov/ports/shorepower/shorepower.htm>

Transport Refrigeration Unit Regulation

<https://ww2.arb.ca.gov/our-work/programs/transport-refrigeration-unit/new-transport-refrigeration-unit-regulation>

FARMER Program

<https://ww2.arb.ca.gov/our-work/programs/farmer-program>

Commercial Harbor Craft

<https://ww2.arb.ca.gov/our-work/programs/commercial-harbor-craft>

Energy and Infrastructure

- Zero-emission technology where possible
- Requires streamlined infrastructure build-out
- AB 2127: CEC to prepare infrastructure assessment
 - 5 million ZEVs by 2030
 - Reducing GHG 40% below 1990 by 2030
 - Including all vehicle categories (on-road and off-road)
- Significant investments being made in infrastructure
 - \$100 million annually through CEC's Clean Transportation Program
 - ~\$1 billion in authorized IOU transportation electrification (TE) infrastructure spending through 2023
 - Requesting almost another \$1 billion for future infrastructure programs



South Coast & San Joaquin Valley

SIP & AB 617 Deadlines

Ozone Attainment

80 ppb standard in 2023

75 ppb standard in 2031

70 ppb standard in 2037

PM2.5 Attainment

24-hour 65 $\mu\text{g}/\text{m}^3$ and
Annual 15 $\mu\text{g}/\text{m}^3$ standards in 2020

24-hour 35 $\mu\text{g}/\text{m}^3$ standard in 2024

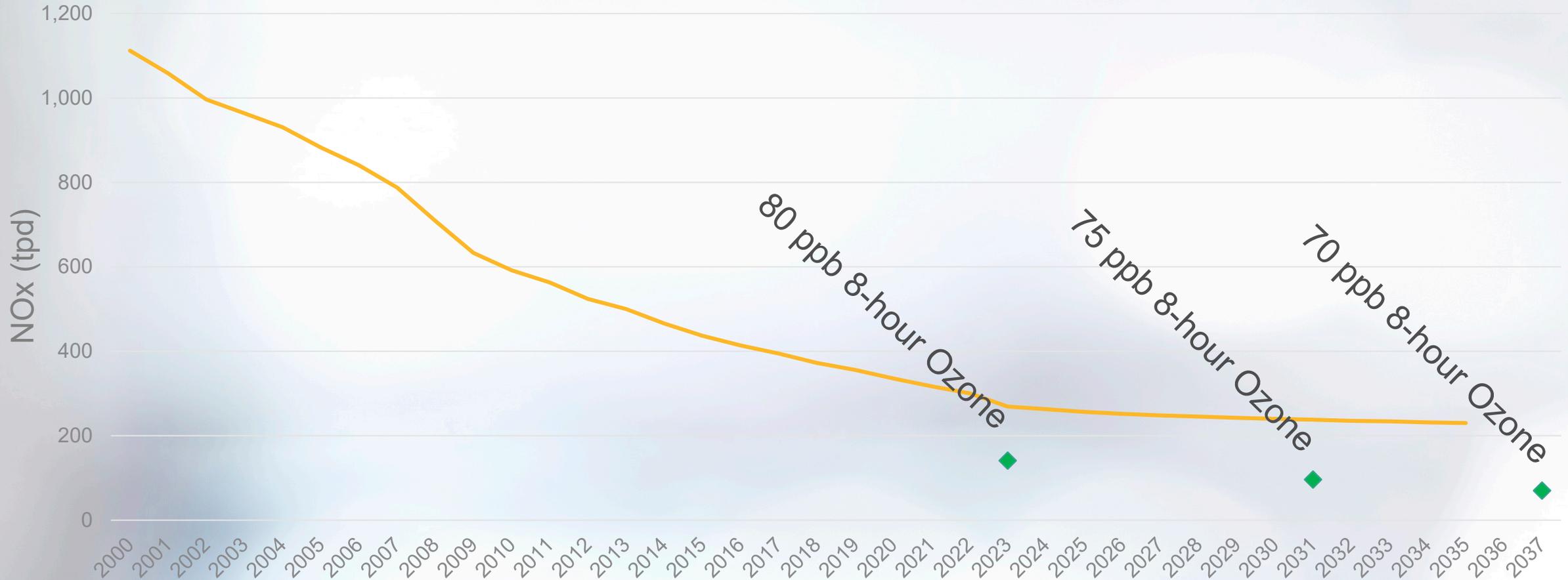
Annual 12 $\mu\text{g}/\text{m}^3$ standard in 2025

AB 617 Targets

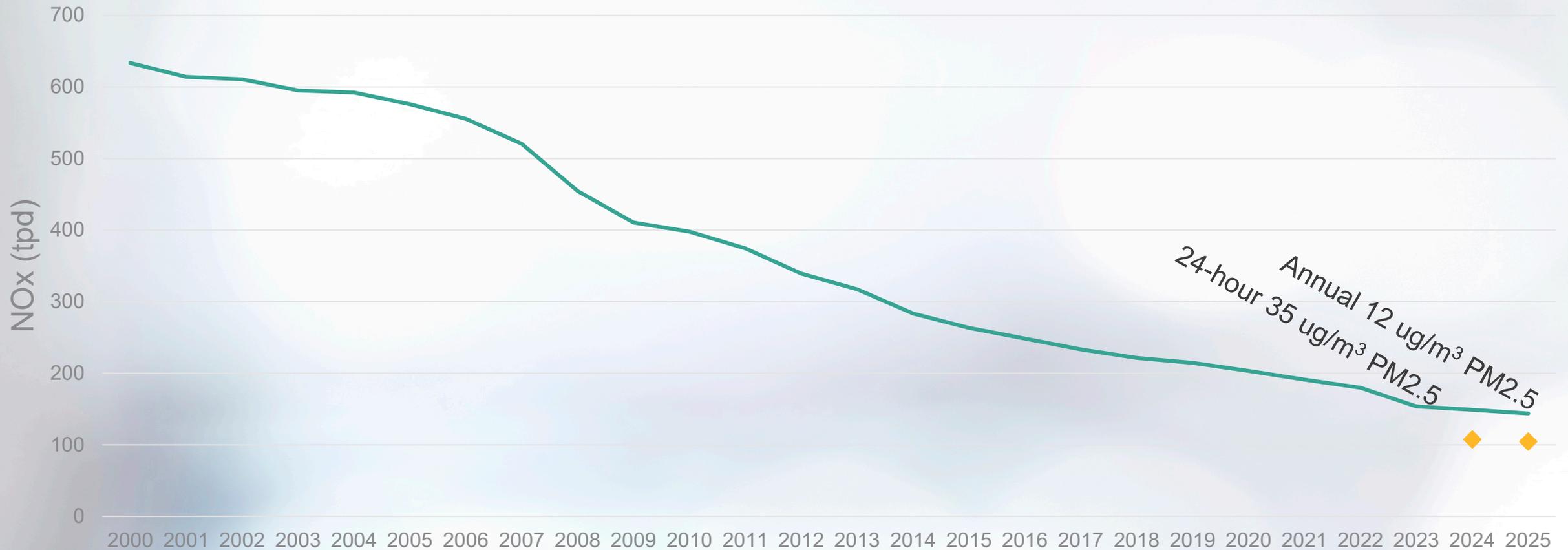
Best Available Retrofit Control Technology (BARCT) on
industrial sources by December 31, 2023

Community emission reduction goals in 2024 & 2025

NOx Reductions Needed in the South Coast Air Basin for Attainment of Ozone Standards

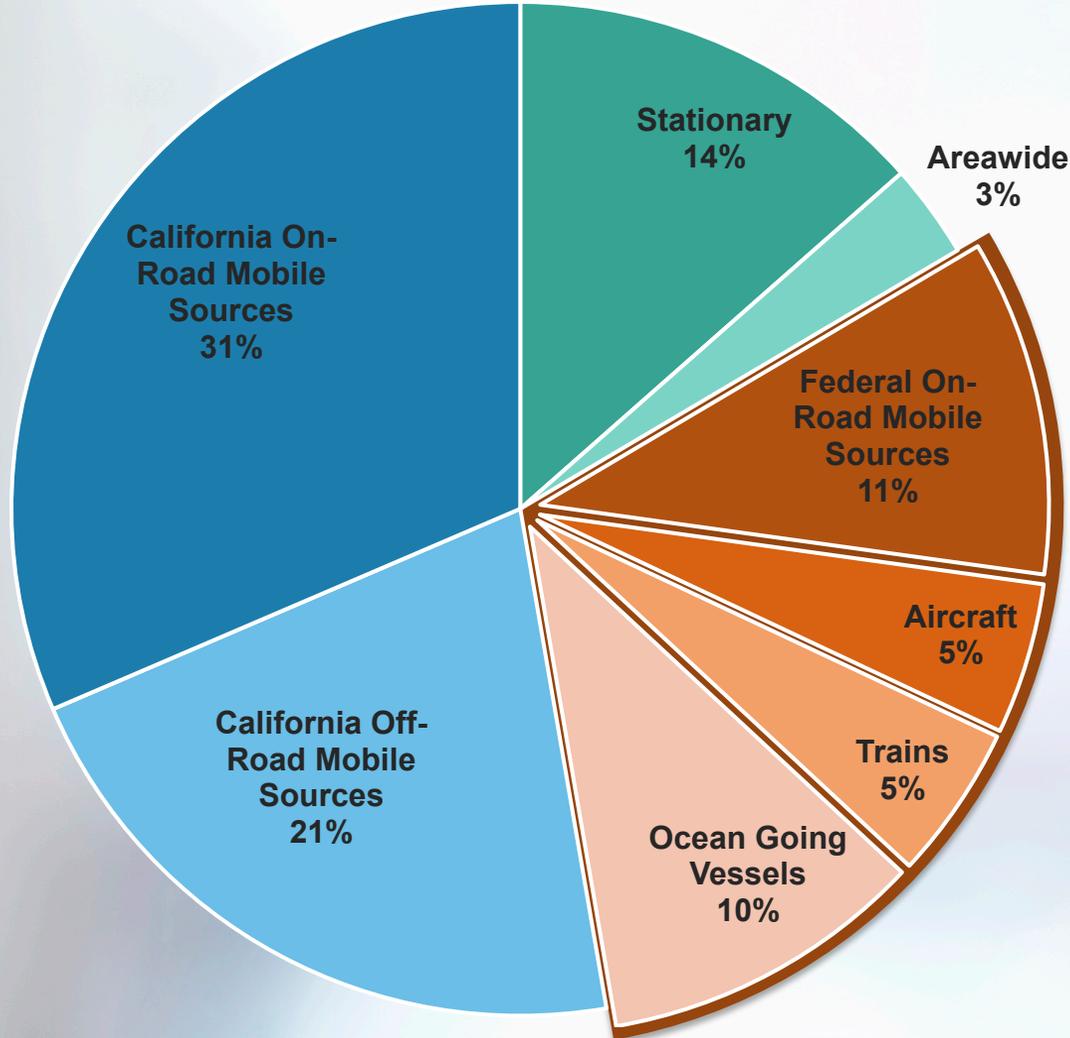


NOx Reductions Needed in the San Joaquin Valley for Attainment of PM2.5 Standards

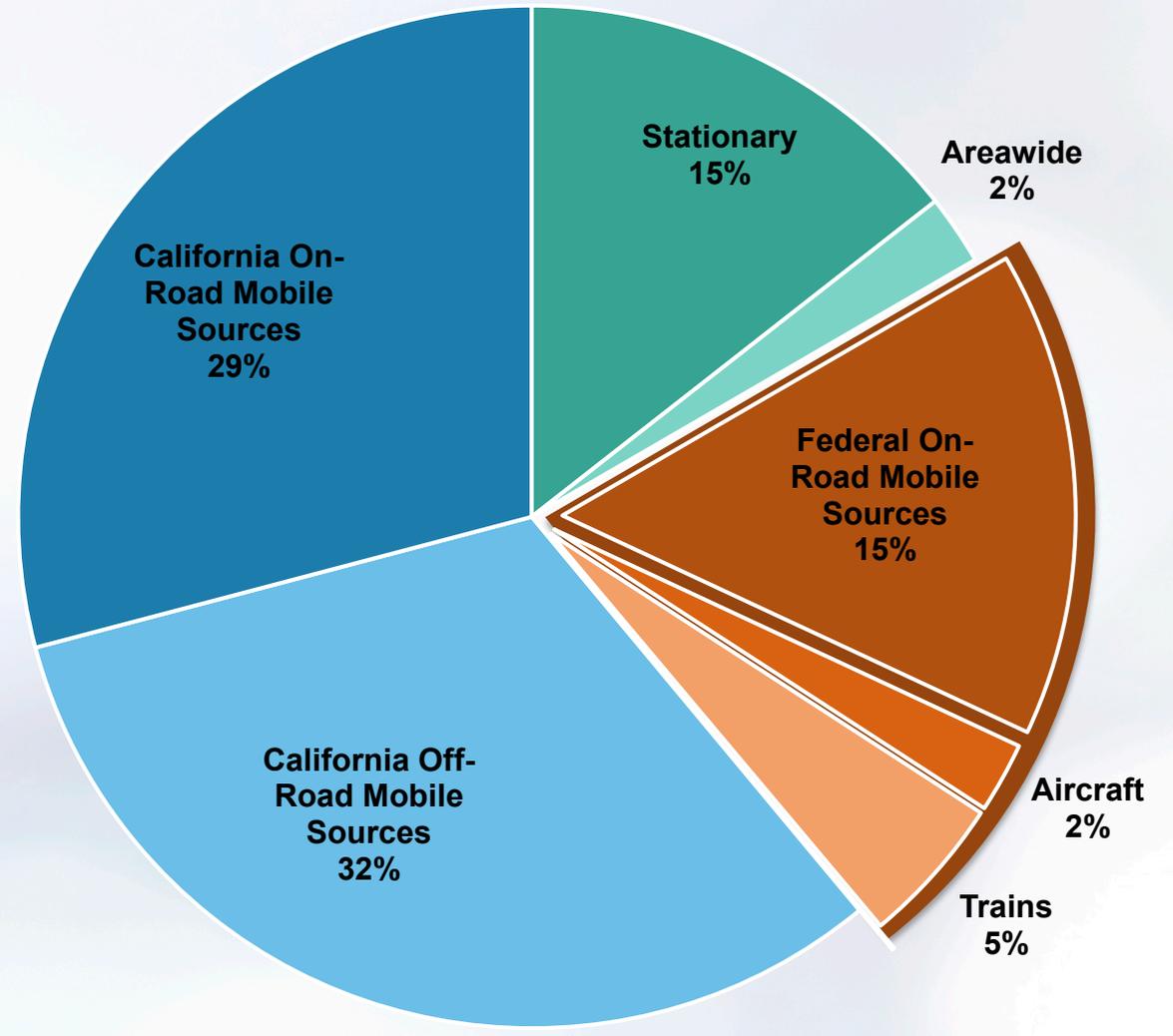


Federal Action is Critical

South Coast 2020 NOx Emissions



SJV 2020 NOx Emissions



Primarily-Federally Regulated Sources

Near-Term Funding is Important

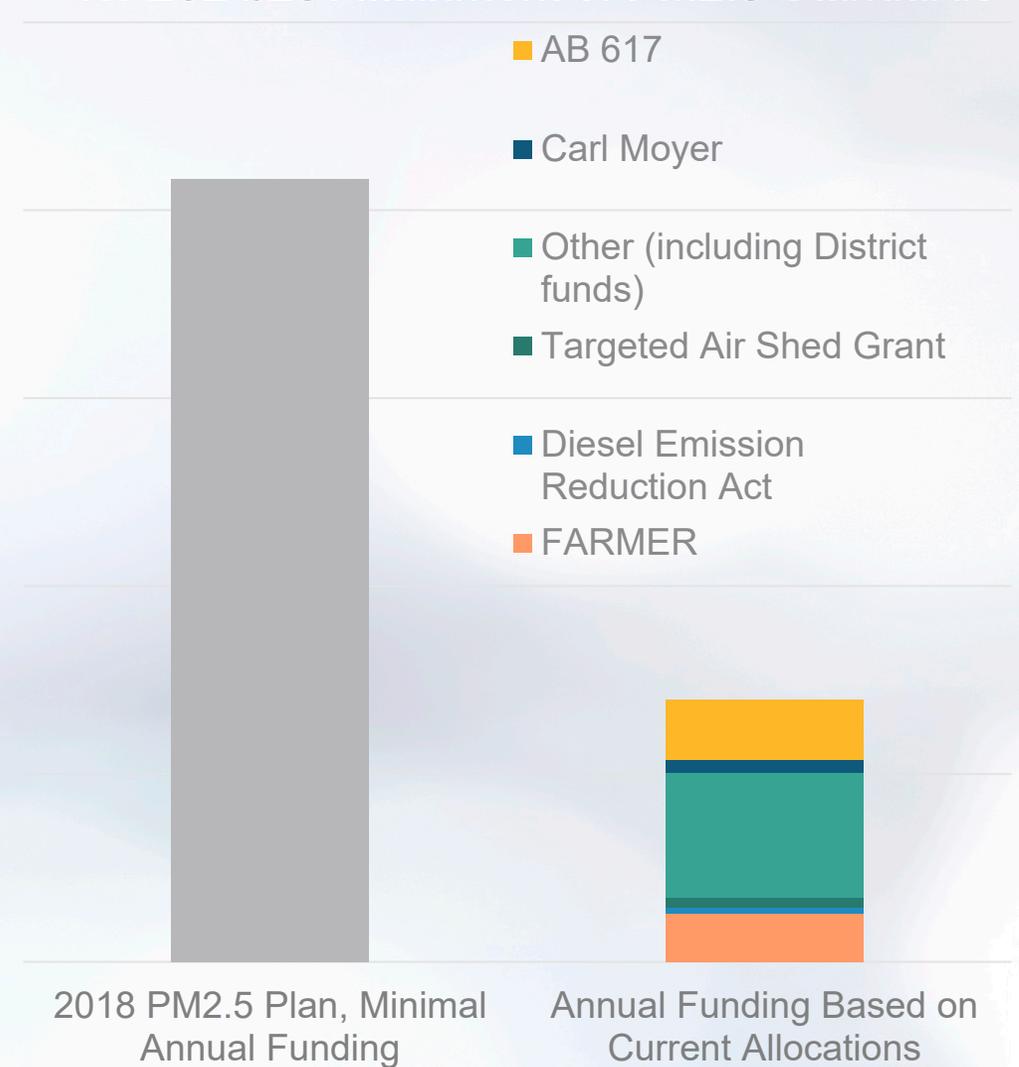
South Coast

for 2023 Attainment of 80 ppb Ozone



San Joaquin Valley

for 2024/25 Attainment of PM2.5 Standards



Meeting 2023-2025 SIP Needs

2016 State SIP Strategy

2023

Innovative Clean Transit

Zero-Emission Airport Shuttle Bus

Heavy-Duty Inspection & Maintenance

Small Off-Road Engines

Ocean Going Vessels – At Berth

Low-Emission Diesel Requirement

2024/25

Heavy-Duty Low-NOx Omnibus

Advanced Clean Truck Rule

Transport Refrigeration Units

New Programs / Concepts

2023

Clean Miles Standard

Advanced Clean Trucks Fleet Rule

Locomotive Emission Reduction Measure

2024/25

In-Use Off-Road Regulation Amendments

Commercial Harbor Craft Amendments

Meeting 2031 SIP Needs

2016 State SIP Strategy

Advanced Clean Cars 2

Zero-Emission Forklifts

Zero-Emission Cargo Handling
Equipment

New Programs / Concepts

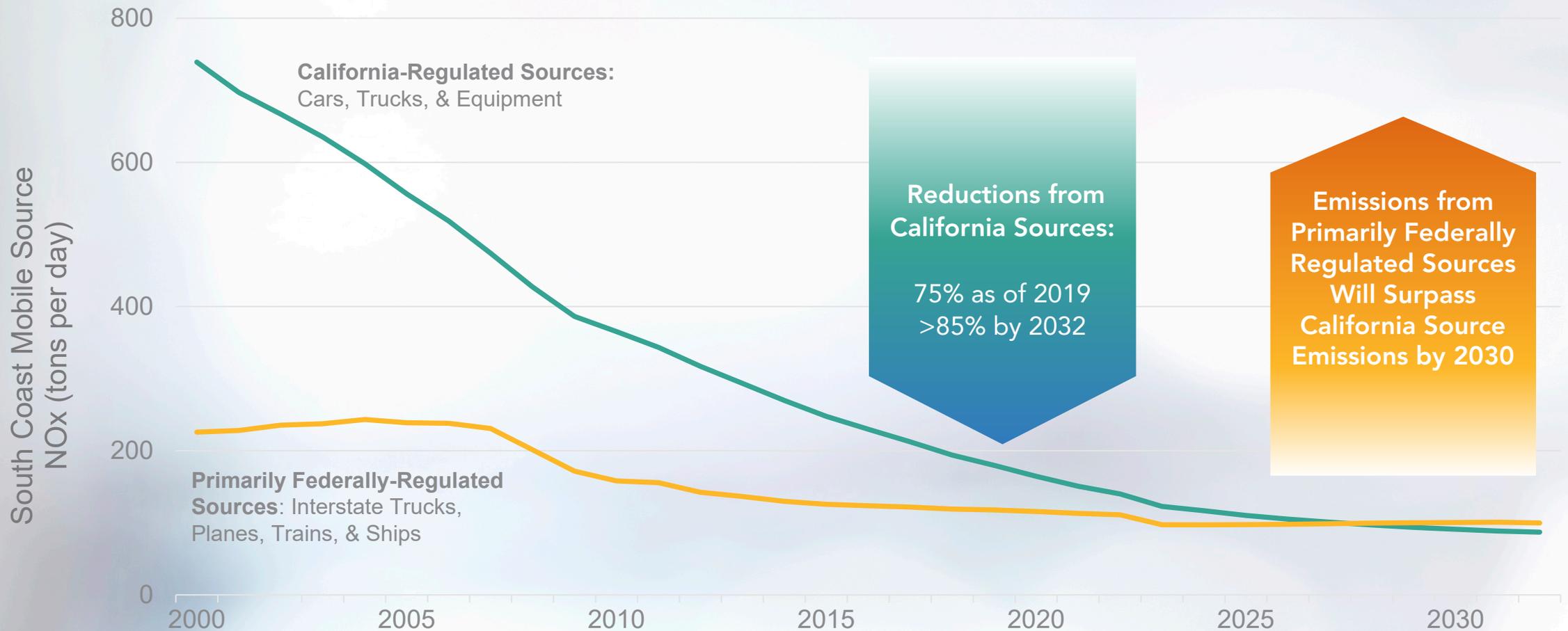
Off-Road Diesel Standards

Off-Road OBD

Recreational Marine Boat Standards

Wrap-Up

Federal Action is Increasingly Critical



Source: CARB, CEPAM 2016 SIP - Standard Emission Tool (v1.05), <https://www.arb.ca.gov/app/emsinv/fcemssumcat/fcemssumcat2016.php>

Increased Funding is Needed

- South Coast and San Joaquin Valley's near-term ozone and PM2.5 attainment requires increases in incentive funding
- AB 617 funding is important to provide critical near-term reductions in impacted communities

CARB Continues to Push Forward

- CARB continues to look for new control strategies in all mobile sectors
- New regulatory concepts have been identified
- Work will continue to develop concepts with ongoing public and stakeholder feedback

Next Steps

Scenario Modeling	Ongoing
Informational Update to the Board	Mid 2020
Release Draft Document	Fall 2020
Board Consideration	Late 2020

Contact us!

- General information: Ariel Fideldy, Ariel.Fideldy@arb.ca.gov
- Scenario modeling
 - On-Road: Sara Forestieri, Sara.Forestieri@arb.ca.gov
 - Off-Road: Liang Liu, Liang.Liu@arb.ca.gov

<https://ww2.arb.ca.gov/resources/documents/2020-mobile-source-strategy>

Questions?

MSS@arb.ca.gov

<https://ww2.arb.ca.gov/resources/documents/2020-mobile-source-strategy>