



Advanced Clean Fleets Workshop

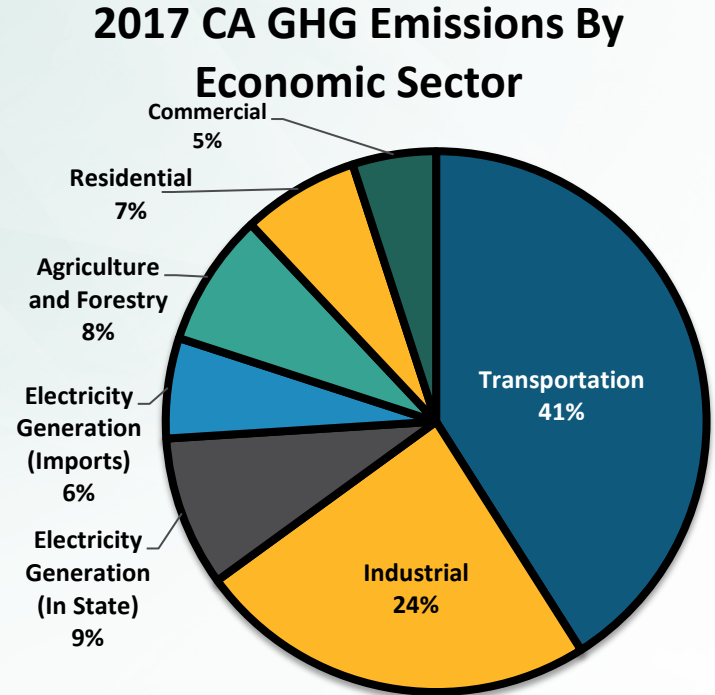
September 18, 2020

Today's Outline

- Background
- Zero-emission (ZE) truck market overview
- Fleet rule principles
- Rule framework concepts
- Market segment discussion
- Timeline and next steps

Transportation Is Largest Source of Greenhouse Gases (GHGs)

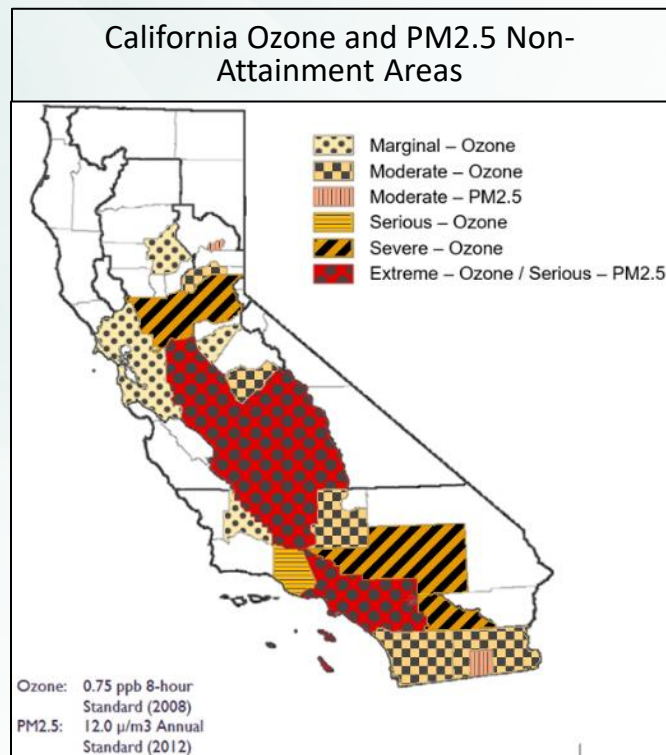
- California's climate change targets
 - 40% below 1990 levels by 2030
 - 80% below 1990 levels by 2050
 - Carbon neutrality by 2045
- Clean electricity
 - 33% renewable by 2020
 - 60% renewable by 2030
 - Zero-carbon by 2045



Note: Mobile sources represent ~50% of GHG inventory when including emissions from fuel production

Major NOx and PM_{2.5} Emission Reductions Needed

- California has the worst air quality in the nation
- Key challenges
 - San Joaquin Valley – PM_{2.5}
 - South Coast - ozone
- Heavy-duty trucks and federal sources remain largest contributors
- Action beyond current programs needed by 2031
 - Nearly all heavy trucks to have 2010 model year engines by 2023



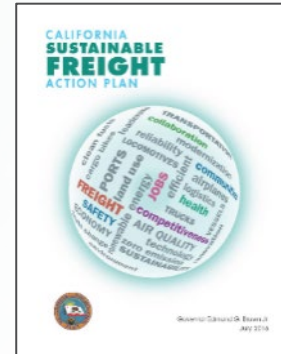
Disadvantaged Community Focus

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



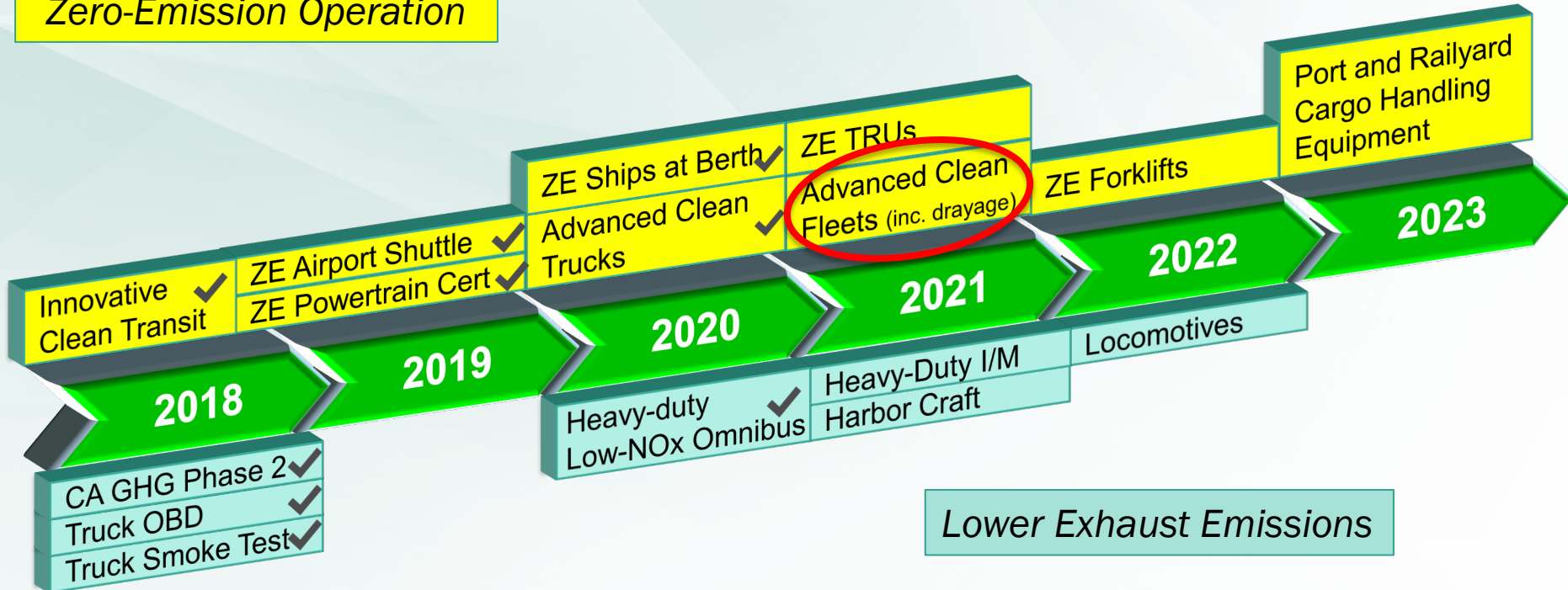
Zero-Emission is Key Part of California's Future

- Multiple NOx and GHG reduction plans
- Core strategies
 - Zero-emissions everywhere feasible
 - Improved efficiency
 - Cleaner fuels and cleaner combustion everywhere else



Suite of Mobile Source Regulations

Zero-Emission Operation



Lower Exhaust Emissions

Innovative Clean Transit

- Approved 2018
- Goal for full ZE fleet transition by 2040
- Percentage of transit agency new bus purchases must be ZE
 - 25% starting 2023
 - 50% starting 2026
 - 100% starting 2029
- Delayed start for small fleets
- Built in exemptions and credit for innovative mobility



ZE Airport Shuttle Buses

- Approved 2019
- Requires full ZE fleet transition by 2035
- Public and private airport shuttle bus fleets
- No backsliding from ZEVs starting 2023
- ZEV milestone requirements
 - 33% of fleet by 2027
 - 66% of fleet by 2031
 - 100% of fleet by 2035



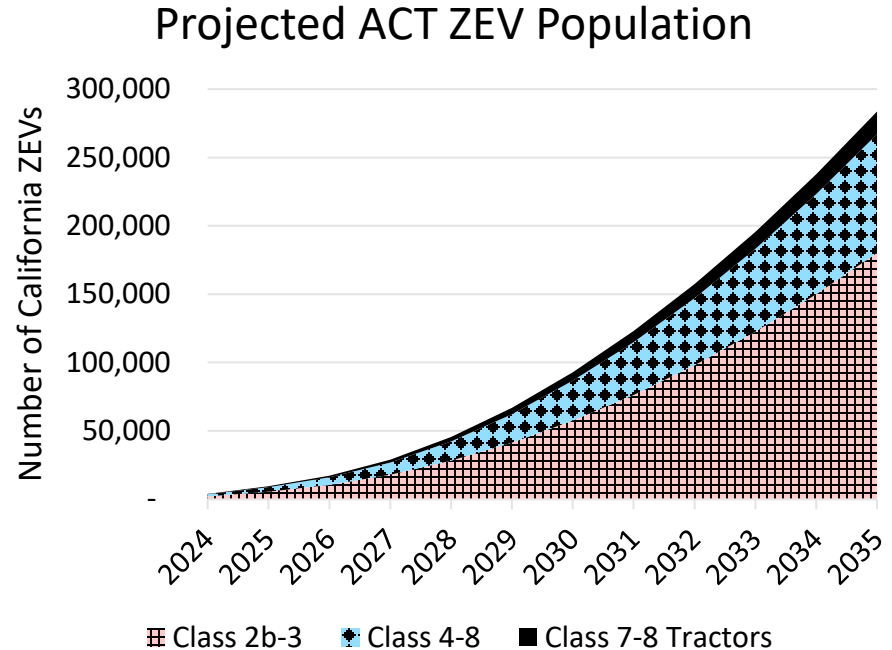
Advanced Clean Trucks

- Approved June 2020
- Percent of manufacturer sales in California must be ZEV
 - Partial credit for plug-in hybrids (NZEV)
- Flexibility to shift sales among categories
 - Requires tractor sales
 - Banking and trading
- Large entity one-time reporting requirement

Model Year (MY)	Class 2b-3	Class 4-8	Class 7-8 Tractors
2024	5%	9%	5%
2025	7%	11%	7%
2026	10%	13%	10%
2027	15%	20%	15%
2028	20%	30%	20%
2029	25%	40%	25%
2030	30%	50%	30%
2031	35%	55%	35%
2032	40%	60%	40%
2033	45%	65%	40%
2034	50%	70%	40%
2035+	55%	75%	40%

Projected ACT ZEV Population

- Based on ACT sales percentages
- Some ZEV sales already expected
 - Pre-orders for Class 2b-3 ZEVs
 - Early purchases with funding
 - Other ZEV requirements

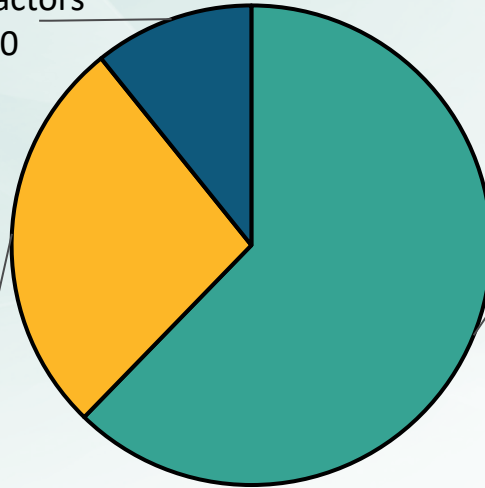


California Vehicle Populations



Class 7-8 Tractors
180,000

Class 2b-3 Trucks and
Vans
1,040,000

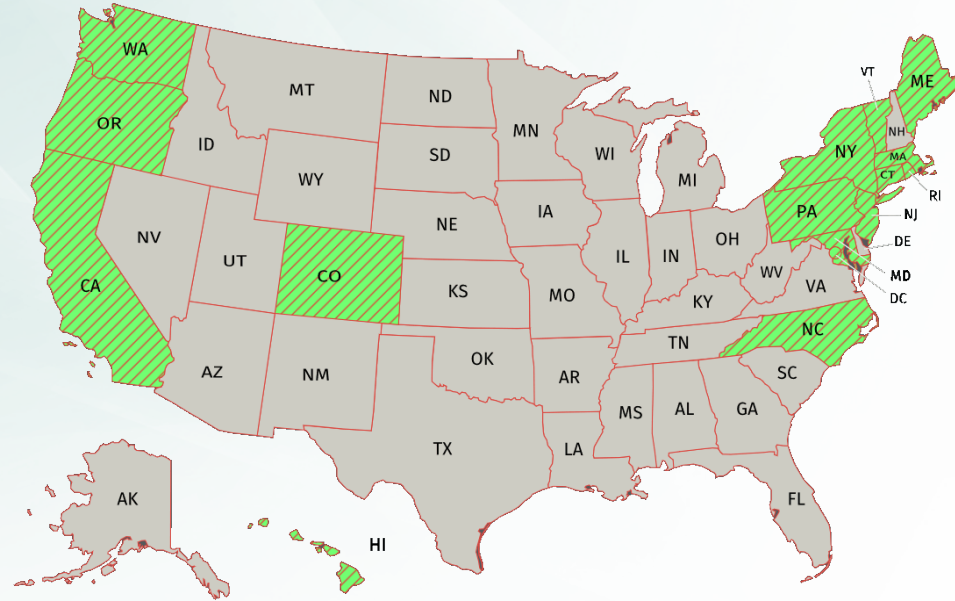


Class 4-8 Straight
Trucks and Buses
450,000



Multistate MD/HD ZEV MOU

- 15 states and the District of Columbia signed MOU to support rapid expansion of ZEV truck market
- Sets ZEV sales targets
 - 30% sales by 2030
 - 100% sales by 2050
- Develop truck ZEV action plan



Advanced Clean Trucks Resolution

- Return by the end of 2021 with a ZE fleet rule
- Support transition California 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

Low Carbon Fuel Standard (LCFS)

- Requires lower carbon intensity of California transportation fuels
 - 20% reduction in statewide fuel pool by 2030
 - Market based mechanism accounts for CI of different fuels
- Low carbon fuel producers earn LCFS credits
 - Credit sales offset cost of low carbon fuel production
- Credits are purchased and retired by regulated parties to comply
- LCFS regulation results in GHG emission benefits of fuel switching (ie. diesel to renewable diesel or from CNG to RNG)
 - Did not include benefits of ZEVs because other regulations or incentives required for transformational change

City, State and Port Policies Enacted

- Law requires Class 6-8 ZEV purchases by state fleets (AB 739)
 - 15% starting in 2025
 - 30% starting in 2030
- San Pedro Bay Port's Clean Air Action Plan goals
 - 100% ZE drayage trucks by 2035
 - 100% ZE cargo-handling equipment by 2030
- Los Angeles's Green New Deal
 - "Zero-emission first" policy for all city vehicle procurement
 - Taxis, drayage, urban delivery, cargo handling equipment & more
- Municipal plans from cities of Sacramento, San Francisco, & others

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



ZE Truck Market Overview

ZE Truck and Bus Market Highlights

- Transit buses and airport shuttles lead the way
 - ZE buses already available in nearly all configurations
- Early ZEV market supported with early funding programs
- Wide range of ZE trucks commercially available today
- All established manufacturers announced ZE truck sales
- Truck market benefiting from technology transfer and experience from ZE passenger cars and buses
- Costs declining rapidly and innovative designs expanding markets

Commercially Available ZEVs

2B-3

(8,501 – 14,000 lbs.)

4-5

(14,001 – 19,500 lbs.)

6-7

(19,501 – 33,000 lbs.)

8

(33,000 lbs. and over)

Commercial Vehicles
Today



Major Manufacturers Entering Market

- Most major manufacturers have plans to enter the ZEV market prior to 2024
 - Cummins, Ford, Freightliner, Mack, Navistar, Nikola, Mitsubishi Fuso, Peterbilt, Tesla, Volvo have announced plans for commercial products
- ZE tractors starting mass production in 2021/2022
 - Freightliner, Volvo, Tesla, Peterbilt
- ZE pickups starting production in 2021/2022
 - Cybertruck, GMC Hummer, Nikola Badger, Rivian R1T



Major Suppliers and Service Providers Entering Market

- Established suppliers entering ZE truck supply chain
 - Partnering with existing ZE vehicle/drivetrain manufacturers
 - Numerous demonstrations underway
- Established companies servicing, distributing, training, leasing ZE trucks

Electric Powertrain Providers



BOSCH



MERITOR



PROTERRA



ROUSH

Service, Support, Training



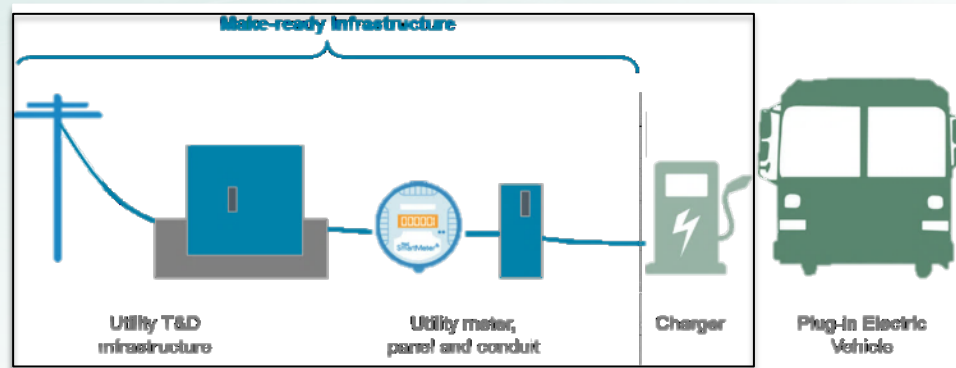
Technology Outlook for the Future

- ZE truck demonstrations for types previously assessed as challenging
- Battery density and cost reductions expected to continue
 - Decreases weight or enables greater range
- Innovative designs create other advantages
 - Skate board platforms, composite bodies, e-axles
 - Some with better payload and lower weight than diesel today
- Fueling/charging network development to expand market potential



SB350 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



LCFS Can Reduce Fleet ZEV Fuel Costs

- Market mechanism from established 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



Battery Electric Fuel Cost Saving with LCFS



EV: 0.6 kWh/mi.
Diesel: 22 mpg



EV: 1.0 kWh/mi.
Diesel: 10 mpg

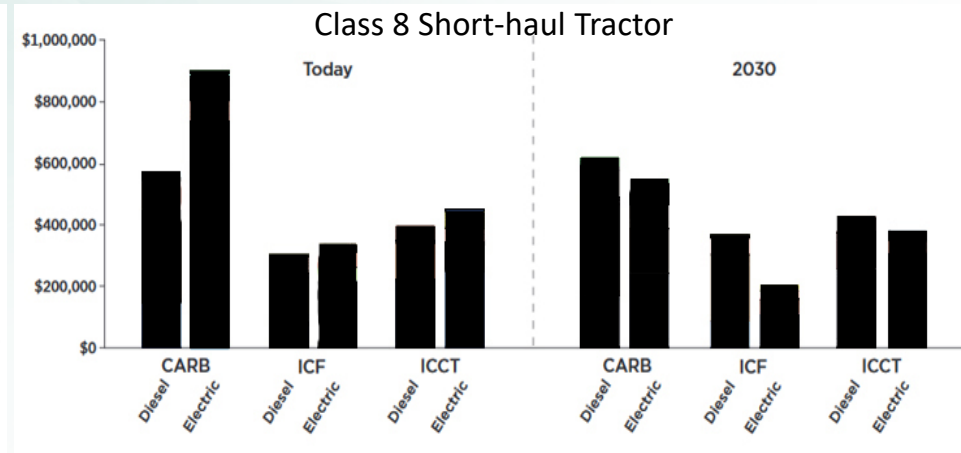
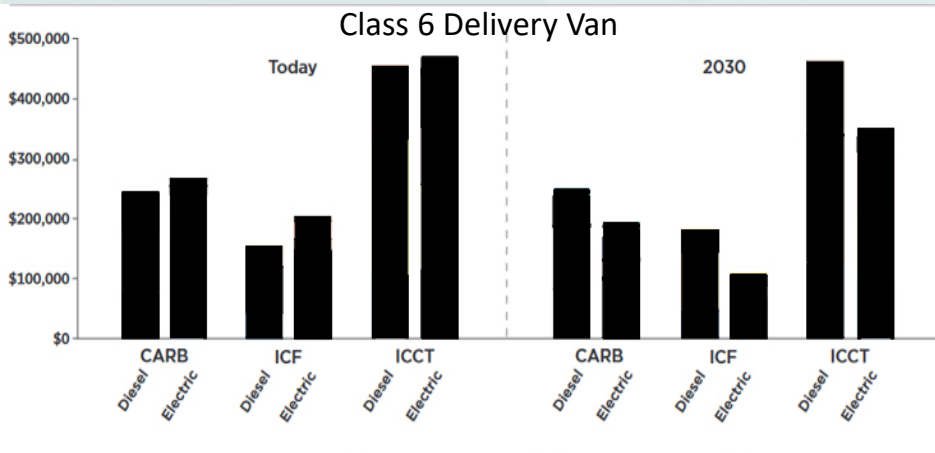


EV: 2.1 kWh/mi.
Diesel: 6 mpg

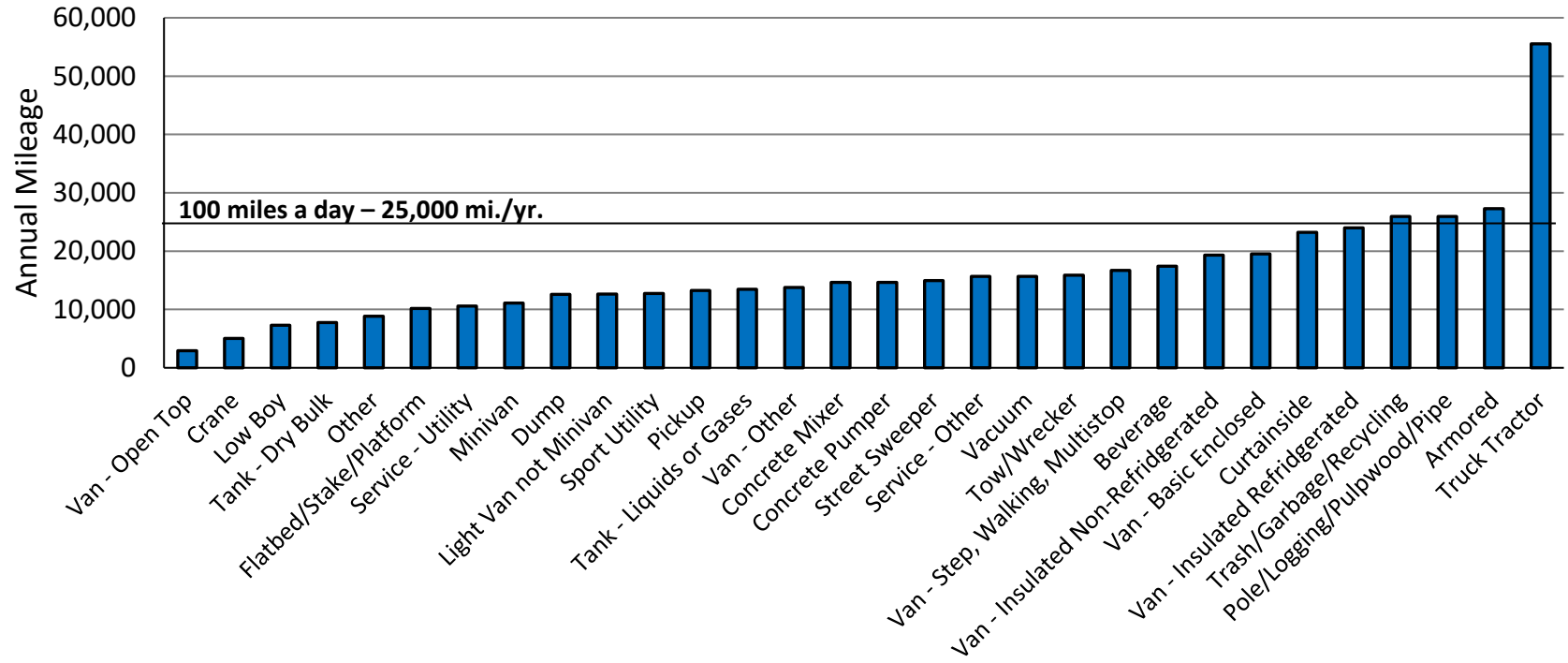
Electric vs Diesel	Airport Shuttle	Package Delivery	Local Drayage
Fuel Savings	40%	50%	40%
Fuel Savings with LCFS	75%	100%	100%

Favorable TCO For ZEVs Prior to 2030

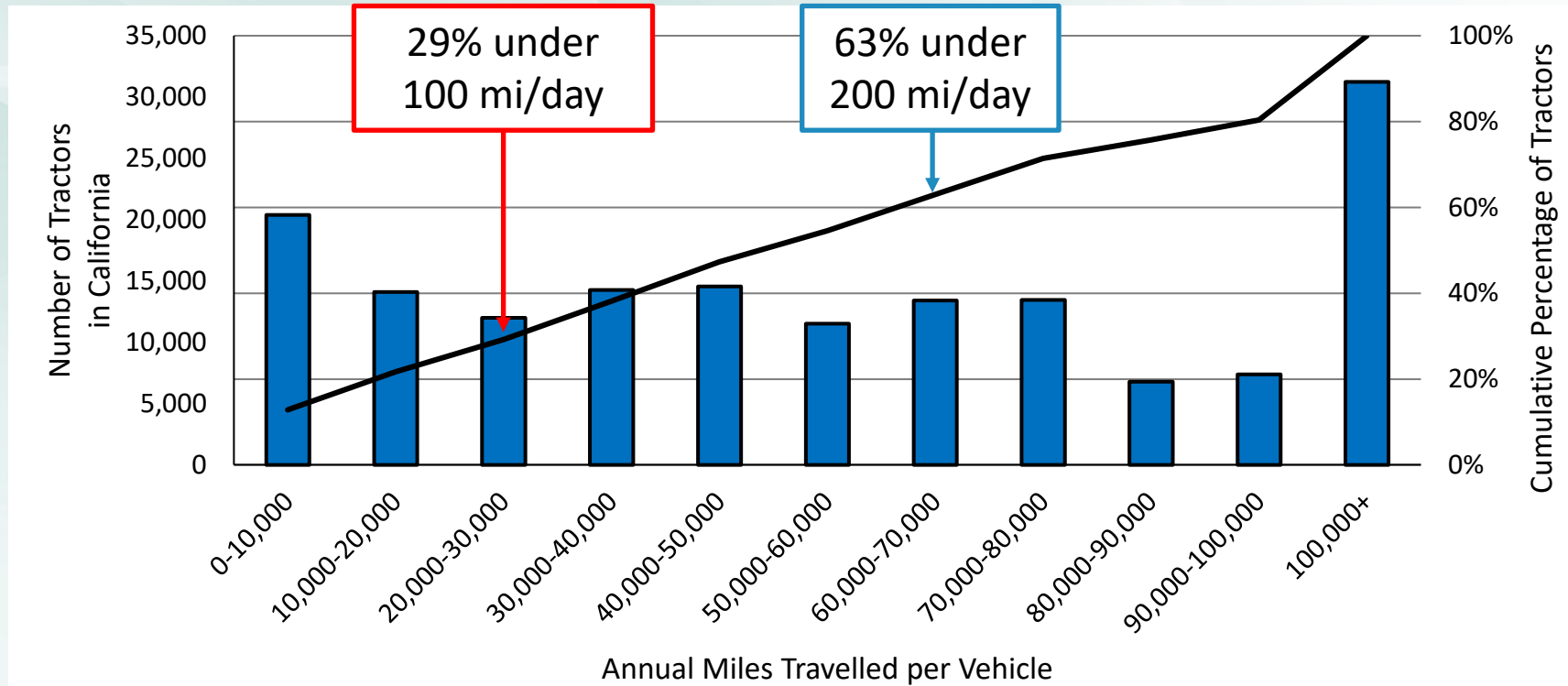
- Numerous studies reach similar conclusions
 - Favorable TCO expected before 2030
 - Dependent on vehicle type and duty cycle



Most Trucks Average Below 100 Miles/day



Annual Mileage for California Tractors



Comments, Questions, Clarifications?



Regulatory Frameworks

Principles for Developing ZE Fleet Rules

- Maximize ZEVs deployed to meet air quality and GHG goals
- Focused action in disadvantaged communities
- Simple and streamlined compliance and enforcement
- Match vehicle capabilities with fleet operational needs
- Expand infrastructure access to enable new markets
- Encourage use of smaller vehicles and innovation
- Support workforce training
- Ensure level playing field
- Avoid unintended consequences



Rulemaking Framework Overview

- Initial focus on truck types and use cases that are most suitable
- Target largest fleets and business for early deployment
 - Own and hired vehicles
- Enable full transition to ZEVs with secondary market
- Align with ACT manufacturer ZEV sales requirements
- Maximize ZE technologies where feasible
- Encourage early action
- One rulemaking phased in 2023 to 2045
 - Use appropriate framework for different fleets or situations

Regulated Fleet Concept

- Vehicles you own or hire to ship your cargo and vehicles you own or hire to directly serve your customers and employees. Examples:
 - Motor carrier: Own vehicles and subhauler vehicles
 - Broker: All the vehicles you dispatch
 - Telecom: All the vehicles you use/hire to serve your customers
 - Retailer: All the vehicles you use/hire to ship your products to warehouses and final point of sale
 - Bus service: All the vehicles you use/hire to transport passengers
 - Manufacturer: All the employee shuttles, and vehicles you use/hire to ship raw materials, parts, and to the final point of sale

Regulated Fleet Questions

- Which entities should be included?
- Which hired vehicles or fleets should be included?
- Motor carriers
 - Is MCP/DOT/CA number adequate to define a fleet?
- What fleet type/services should be included?
 - Package, mail, trash, linen, bus, cash car, beverage, food, etc.
 - How to separate short-haul from long-haul tractors
- How to address temporary/irregular services?
 - One-time construction project, periodic maintenance needs
 - Contract period, spot market, temporary needs

SB 1 – Minimum Useful Life Criteria

- Road Repair and Accountability Act of 2017 (SB 1)
- Limits retirement, replacement, retrofit, or repower of commercial vehicles
 - Applies to new regulations or amendments
- Based on model year of engine or emissions system certification
 - 18 years if vehicle has less than 800,000 miles
 - 13 years if vehicle exceeds 800,000 miles

ZEV Purchase Framework

- Increasing percent of new purchases must be ZEV
 - 100% ZEV purchases would need to start in 2027 to meet 2045 goals
- Areas to address include
 - Used truck purchases
 - Changes in sub-hauler contracts
- Baseline registry to determine fleet composition
- Requires exemptions process if no ZEV is available

ZEV Purchase Framework Questions

- Is this approach preferred by some fleets?
- How do you treat sub-haulers/hired vehicles?
- Does it maintain a level playing field?
- How to match fleet needs (infrastructure, vehicle availability)?
- How to determine if ZEVs are available/suitable?
- Would fleets change purchase patterns?
- How to encourage early reductions and innovative technologies?

ZE Fleet Standard Framework

- Percent of fleet must be ZEVs by milestone dates
 - Allows for credit for lighter vehicles and innovation
 - Could exclude less suitable ZEVs temporarily
- Must report fleet to CARB annually to enforce
 - ZEV fleets would be listed on CARB website
- Allows for used purchases
- Allows for adding new sub-fleets that meet the standard
- Baseline registry to determine fleet composition

ZE Fleet Standard Questions

- Which fleets does this work for?
- Would it require accelerated purchases?
- Does it maintain a level playing field with sub-fleets?
- How can it work for more challenging vehicle types?
 - Long-haul tractors, motor coaches, specialized trucks
- How to set goals for different vehicle types?
- How to ensure benefits in DACs?
- How to count innovation and lighter vehicles (e.g. cargo bikes)?

Green Fleet Contracting

- Would apply to large entities (truck and non-truck owners)
 - May only apply to certain services
- Regulated entities must hire/contract with ZEV fleets
 - Each hired/owned fleet must meet the ZEV fleet standard, or
 - Pool of hired/owned vehicles must meet the ZEV fleet standard
- CARB would list ZE fleets online
 - Excluded fleets could voluntarily comply to compete
- Reporting and audits required to enforce
 - Vehicle details required if pooling vehicles (i.e. VINs)

Green Fleet Contracting Questions

- How to determine which entities should be included?
- Can it foster voluntary ZEV deployment for excluded fleets?
- Which contracts or services should be included?
- Does it level the playing field between different business models?
- How to phase-in requirements as ZEV market expands?
- How to simplify tracking and audits for reporting and enforcement?
- How to address trucks or uses that are not suitable for ZEVs?

Zero-Emission Zones Framework

- Only ZEVs may enter the zone when fully implemented
- Define geographic boundaries surrounding targeted areas
- Requires a transition strategy to achieve 100% ZEVs
- Simplest with limited points of entry
- Baseline registry to determine fleet composition

ZE Zone Questions

- Do you need to register specific trucks to specific zones?
- How do you address different fleets and truck types?
 - Delivery van vs vocational use van
 - Independent small business vs large fleet
- How to ensure compliance and enforcement during transition?
- Are there synergies with local support ZE zones or policies?

Other Regulatory Frameworks

- ZE Mile Standard
 - Requires tracking and reporting individual truck mileage
 - Presents uncertainty due to external factors (ie. economy, business fluctuations)
- Infrastructure requirements
 - Require stores, warehouse, and other locations with truck traffic to install infrastructure to enable broader electrification
 - Number of questions to be answered

Other Questions to Consider

- How to encourage innovation where ZEVs are not yet suitable
- Where to include plug-in hybrids
- How to encourage cargo bikes and other lighter ZEVs
- How does the Low NOx Omnibus regulation change things
 - Today's low-NOx engines will be a standard engines in 2024
 - What is the effect of early action credits

Comments, Questions, Clarifications?



Market Segment Discussions

Public Fleets 2035 ZEV Goal

- Diverse vehicle and body types
 - About 100,000 in Class 2b-8
 - Mostly variable use, low miles, and operate locally
- Limited sub-contracting services



ZEV Purchases for Public Fleets

- City, county, state owned vehicles
 - Exclude school buses
- Phase-in best available ZEV or NZEV for new purchases
 - 2023 – XX% of purchases (except for small fleet)
 - 2026 – 100% of purchases for all fleets
- Exemption process if suitable ZEV/NZEVs are not available
- Consistent with normal truck purchase cycle
- No significant subcontracting or competitive disadvantage issues

First/Last Mile Delivery 2035 ZEV Goal

- Parcel, food, beverage, linen services, home delivery, mail, and other
 - Initial estimate: 80,000 vehicles
- Return to base, predictable routes
- Contracting and sub-haulers commonly used
- Also own/operate vehicles that may not be suitable for early electrification



First/Last Mile Delivery ZE Standard

- Scope would include large fleets (owned/hired trucks)
- Baseline registry to determine fleet composition in 2023
 - All new and used additions would need to be ZEV, or
- Show the fleet meets the ZE standard
- Would initially apply to straight trucks and would bring in tractors at a later date
- Example ZEV fleet milestones for straight trucks
 - 2025 – X%
 - 2030 – 50%
 - 2035 – 100%
- Must report fleet composition annually to CARB starting 2023

Drayage 2035 ZEV Goal

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



Zero-Emission Drayage Truck Concept

- **Framework**
 - Build on current regulatory structure, and CARB and seaport registration programs
- **Considerations**
 - Drayage operations have a significant impact on disadvantaged communities
 - Current drayage fleet will have to meet 2010 MY engine standards beginning in 2023
 - Drayage fleets and operations are diverse
 - Opportunity to align with the San Pedro Bay Ports Clean Air Action Plan and other ongoing local air quality planning efforts



Zero-Emission Drayage Truck Concept

- Beginning in 2023, any truck added to the CARB Drayage Truck Registry must be zero-emissions
 - Trucks must register with CARB if they conduct drayage activities at the seaports and railyards
- All drayage trucks would be required to be zero-emission by 2035

Zero Emission Drayage Trucks by 2035



Utilities 2040 ZEV Goal and Concept

- Meet ZE fleet standard and baseline registry to determine fleet composition
 - Softer targets for work trucks
- Private electricity, water, sanitation utilities
 - About 13,500 vehicles
 - Specialized vehicle and emergency use
- Telecoms and broadband
 - About 18,000 vehicles
 - Specialized vehicles



Refuse Services 2040 ZEV Goal

- Compactor, roll-off trucks, transfer trucks and other
- 16,000 vehicles (mostly Class 7-8)
 - 53% diesel and 47% CNG engines
 - 1,400 transfer trucks (tractor)
- Owned by or under contract with municipalities
- Some fleets are making capital investments to meet SB 1383 and AB 827 organic waste diversion requirements
 - Includes investments in RNG production and on-site use



Refuse Service Rule Concept

- Large fleets meet ZE fleet standard with 2040 target
 - 2023 baseline will have 18 year useful life
- Require green fleet contracting by municipalities for waste services
- Details to evaluate
 - Effects of SB 1383 and AB 827 organic waste diversion goals
 - Potential conflicts and synergies to meet policy goals

Buses and Shuttle Buses 2040 ZEV Goal

- Employee shuttles, limousines, motor coaches, and other
- About 25,000 buses not affected by current ZE rules
- Wide range of ZE buses commercially available
- Subject to CPUC oversight and registration
- Long distance motor coach use requires further study



Zero-Emission Buses Concept

- Establish ZEV fleet standard for large bus fleets
 - Delayed requirements for motor coaches
 - ZEV fleets must report to CARB and will be listed online
- Require green contracting for large entities and government
 - Must hire fleets that meet the ZE standard starting 2025
 - Applies to contracts for employee and visitor transportation services (excludes transit buses and airports)
 - Allow exemption if no ZEV fleets bid for contract
 - Reporting required to show compliance or claim exemptions

Green Fleet Contracting Requirements

- Large entities and government must own/hire green fleets for certain services starting in 2025
 - Hire green fleets listed on CARB website or
 - Pool of vehicles used must meet the ZE fleet standard
- Service types include parcel, food, beverage, home delivery, linen services, armored car, buses, refuse, and freight transportation
 - Allow exemption if no ZEV fleets bid for contract
- Reporting required to show compliance and to claim exemptions

Green Contracting Questions

- Which entities should be subject to the green contracting requirement?
- Does setting a ZEV fleet standard facilitate voluntary green fleet contracting
- Which type of services are challenging to define?
- Does this concept have advantages in accelerating ZEV use in markets where they are most suitable?
 - Does this approach work well for ZE tractors?
- Are there barriers to using brokers to manage shipments?

Other Tractors (non-drayage)

- Largest vehicle emissions category
 - Largest contributor to truck pollution in DACs
- Most tractors operate less than 200 miles per day
- Long-haul not suitable for electrification yet
 - Depends on technology improvements and infrastructure deployment
- Vehicle use is challenging to determine and to enforce
- Can green contracting requirements on large entities accelerate the use of ZEV tractors where suitable if it is voluntary for fleets?

All Trucks ZEV by 2045

- How maximize ZEVs by 2045 where feasible
- Which truck types are the most challenging electrify 20 years from now?
 - Specialized work trucks
 - Interstate operation
 - Emergency use
- How do we facilitate a secondary ZEV market
 - More economic for some fleets to buy used
 - Provide more cost certainty for early ZEV fleets
- What is the appropriate role for plug-in hybrids?
- If retail fast fueling becomes widely available, will there still be barriers?
- Is it better to increase the ACT manufacturer ZEV sales requirement in 2036?

Potential Workgroups

- Purpose of workgroups is to focus on technical information and details related to fleet operation and ZEV deployments
 - The focus is not on rule itself
- Potential workgroups
 - Drayage
 - Infrastructure (BEV and FC)
 - Cost assumptions and methodology
 - Other

Timeline and Next Steps

- One-time fleet reporting workshop next week
- Continue individual meetings with fleets and stakeholders
- Continue interagency infrastructure coordination
- Next workshop/workgroup meeting later this year
- Receive fleet reported data April 2021
- Rule recommendation to Board in December 2021
 - Implementation starts 2023

One-time Reporting for Large Entities

- Workshop on September 22, 2020
 - Tools and resources to facilitate reporting
 - Guidelines on how to collect and report fleet information
 - How to meet the April 2021 reporting deadline
- All fleet information will be on the Advanced Clean Fleets page at <https://ww2.arb.ca.gov/our-work/programs/advanced-clean-fleets>

CARB Contacts

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

List Serve: https://public.govdelivery.com/accounts/CARB/subscriber/new?topic_id=zefleet