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

2017 CA GHG Emissions By Economic Sector

- Transportation 41%
- Industrial 24%
- Residential 7%
- Agriculture and Forestry 8%
- Electricity Generation (In State) 9%
- Electricity Generation (Imports) 6%
- Commercial 5%

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

California GHG Inventory: https://ww2.arb.ca.gov/ghg-inventory-data
Major NOx and PM$_{2.5}$ Emission Reductions Needed

- California has the worst air quality in the nation
- Key challenges
  - San Joaquin Valley – PM2.5
  - 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

Innovative Clean Transit
ZE Airport Shuttle
ZE Powertrain Cert

ZE Ships at Berth
Advanced Clean Trucks

ZE TRUs
Advanced Clean Fleets (inc. drayage)
ZE Forklifts

2018
CA GHG Phase 2
Truck OBD
Truck Smoke Test

2019

2020
Heavy-duty Low-NOx Omnibus

2021
Heavy-Duty I/M
Harbor Craft

2022
Locomotives

2023
Port and Railyard Cargo Handling Equipment

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

<table>
<thead>
<tr>
<th>Model Year (MY)</th>
<th>Class 2b-3</th>
<th>Class 4-8</th>
<th>Class 7-8 Tractors</th>
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<tr>
<td>2024</td>
<td>5%</td>
<td>9%</td>
<td>5%</td>
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<td>2025</td>
<td>7%</td>
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<tr>
<td>2035+</td>
<td>55%</td>
<td>75%</td>
<td>40%</td>
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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 2b-3 Trucks and Vans: 1,040,000
Class 4-8 Straight Trucks and Buses: 450,000
Class 7-8 Tractors: 180,000

Source: EMFAC2017, 2020 Calendar Year
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 (i.e. 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

<table>
<thead>
<tr>
<th>Class</th>
<th>Weight Range</th>
<th>Examples</th>
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</thead>
<tbody>
<tr>
<td>2B-3</td>
<td>(8,501 – 14,000 lbs.)</td>
<td><img src="image1.jpg" alt="Images" /></td>
</tr>
<tr>
<td>4-5</td>
<td>(14,001 – 19,500 lbs.)</td>
<td><img src="image2.jpg" alt="Images" /></td>
</tr>
<tr>
<td>6-7</td>
<td>(19,501 – 33,000 lbs.)</td>
<td><img src="image3.jpg" alt="Images" /></td>
</tr>
<tr>
<td>8</td>
<td>(33,000 lbs. and over)</td>
<td><img src="image4.jpg" alt="Images" /></td>
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Note: Excludes transit buses and all models not shown. Updated Sept. 2020.
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

Image source: Ford, Cummins, Mack, Trucks.com
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
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

Image Source: Workhorse Group, Rivian
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

More information on LCFS: https://ww3.arb.ca.gov/fuels/lcfs/lcfs.htm
Battery Electric Fuel Cost Saving with LCFS

Electric vs Diesel

<table>
<thead>
<tr>
<th>Electric vs Diesel</th>
<th>Airport Shuttle</th>
<th>Package Delivery</th>
<th>Local Drayage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fuel Savings</td>
<td>40%</td>
<td>50%</td>
<td>40%</td>
</tr>
<tr>
<td>Fuel Savings with LCFS</td>
<td>75%</td>
<td>100%</td>
<td>100%</td>
</tr>
</tbody>
</table>

Note: Example assumes average fuel prices of $3.70/gal., $0.18/kWh (includes transmission, energy, fixed fees, and demand charges), and LCFS credit value at $125 per credit.
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

29% under 100 mi/day
63% under 200 mi/day

Source: 2018 California VIUS, including DMV and California IRP tractors, excludes out-of-state IRP 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 (i.e., 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
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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- Green Contracting
  - Bruce Tuter, Manager bruce.tuter@arb.ca.gov

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