Advanced Clean Trucks

Regulatory Workshop

May 31, 2018

Sacramento, California

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Today's Overview

- Rulemaking strategy update
- Zero emission truck market update
- Fleet requirements
- Updated manufacturer rule concepts
- Alternative and environmental analysis preparation
- Next steps

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California Long-Term Goals

- California needs significant NOx and GHG reductions
  - Federal health-based ambient air quality standards (key milestones in 2023 and 2031)
  - 40 percent reduction in GHG emissions from 1990 levels by 2030
  - 80 percent reduction in GHG emissions from 1990 levels by 2050
  - 50 percent petroleum reduction target by 2030
  - Continued reductions in criteria pollutants and toxic air contaminants to protect public health
- Sustainable Freight Action Plan – a more efficient, competitive, and lower emission freight system
- Meeting these goals requires major emission and energy use reductions from all sectors including industrial, residential, electricity, and transportation

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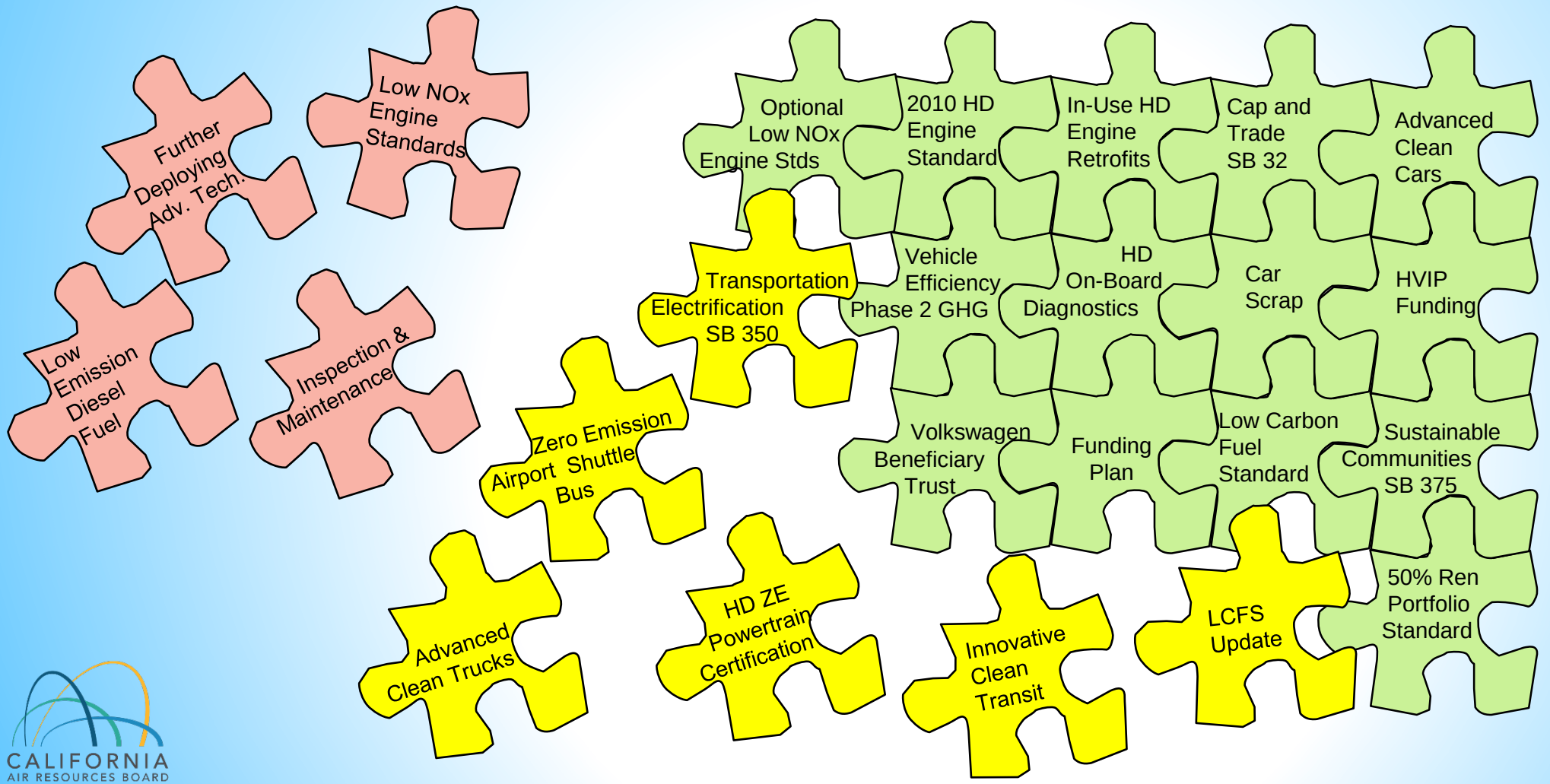
Mobile Source Strategies



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Long-Term Transformation for Mobile Sources

"Transporting freight reliably and efficiently by zero emission equipment everywhere feasible, and near-zero emission equipment powered by clean, low-carbon renewable fuels everywhere else. "

--California Sustainable Freight Action Plan, July 2016

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Benefits of Zero Emission Vehicles

- GHG and criteria pollutant reductions
- Decreases direct exposure to criteria pollutants
- Petroleum use reduction
- Two to six times more efficient than a conventionally fueled vehicle
- Noise reduction
- Potential benefits to electrical grid
- Opportunity to use all forms of renewable energy
- Reduced brake wear/dust
- Less potential for hazardous fluid/gas leaks

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Advanced Clean Trucks Guiding Principles

- Accelerate first wave deployment of zero emission trucks
- Deploy zero emission trucks in best suited applications
- Complement existing and future programs
- Provide environmental benefits, especially in disadvantaged communities
- Ensure requirements are technologically feasible
- Foster a self-sustaining zero emission truck market

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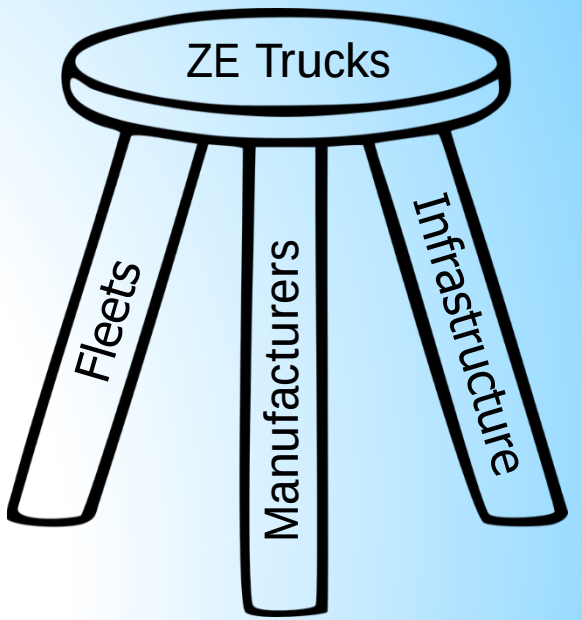
Rulemaking Strategy Update

- Extending time frame to develop proposal
- Balance manufacturer sales requirement with fleet requirements
- Continue to evaluate market potential
- Continue to collect data
  - Zero emission truck and bus demonstrations
  - Survey data
  - Other



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Data Gathering

- Mailed the California Fleet Operation survey to large fleets
  - Purpose is to better understand existing truck use and opportunities for ZEV
  - Have received roughly 25 responses currently – 28,900 vehicles
- California Vehicle Inventory and Use Survey
  - California truck fleet and operational information
  - Still to be released
- DMV and other sources – Population distribution by fleet size

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ACLT Survey – Preliminary Results

- Currently soliciting more responses, early information:
  - 90% of respondents indicated interest in electric vehicles
  - Median desired vehicle payback period – 7 years
  - Statistics on fleets in table below

Industry	Respondent Vehicle Population			Statistics			
	2B to 3	4 to 7	8	Daily Mileage	Annual Mileage	Years in Fleet	Overnight return to base
California State Fleet	15,915	3,960	3,180	-	6,400	-	-
Gov't/Public	1,172	585	325	30	10,000	11	100%
Utility	656	784	214	50	10,000	12	67%
Construction	25	50	1,270	100	18,000	10	90%
Equipment Rental/Dismantler	0	118	85	115	28,500	10	100%
Retail	590	888	117	150	36,000	9	100%
Total Vehicles by Class	18,358	6,385	5,191				

Link to Survey https://www.arb.ca.gov/msprog/actruck/docs/acltsurvey18.docx

Most Trucks Average <100 miles/day

2002 VIUS Data https://www.census.gov/svsd/www/vius/2002.html

Zero Emission Truck Market Update

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Multiple Zero Emission Trucks Available

Cargo/Passenger Van
Shuttle and local operations
50-100 miles per charge
30-60 kWh battery

Drayage Truck
Port goods movement
100 miles per charge
188 kWh battery

Delivery Vans
Urban delivery and service
80-120 miles per charge
~145 kWh battery

Yard Tractors
Intermodal operations
~60-80 miles per charge
~209 kWh battery

School Bus
Type A, C, and D operation
50-150 miles per charge
65-200 kWh battery

Cutaway Bus
Airport and transit shuttle
100 miles per charge
105 kWh battery

Refuse Trucks
Urban garbage and refuse
80 miles per charge
~188 kWh battery

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Emerging Zero Emission Truck Market

- Manufacturers offering commercially available electric trucks and vans
  - Bluebird, BYD, Chanje, Lightning Systems, GreenPower, The Lion Company, Motiv, Phoenix Motorcars, OrangeEV, Workhorse
  - Class 3-8
- Nearly all conventional OEMs have EV demonstrations or have announced plans for commercialization
  - Primarily Class 4-8 vehicles
- Announcements by several new entrants to market
  - Nikola, Roush, Tesla, Thor Trucks, Wrightspeed

Suppliers Entering the Market

- Established part suppliers entering ZE truck supply chain
  - Partnering with the existing electric truck/drivetrain manufacturers
  - Announcing plans to develop their own powertrains
  - Bosch, Dana, Cummins, Meritor, Roush
- Synergies with light-duty and bus components
- Opportunities for economies of scale

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NACFE – Electric Truck Report

- North American Council on Fuel Efficiency (NACFE) published report April 2018 on electric trucks
- Analyzed the business case compared to a diesel baseline
- Findings
  - Early adoption will be in the Class 3-6 trucks traveling 50-100 mi. per day, cubing out, running one shift a day, and returning to base daily
  - Class 7-8 electric trucks and heavier trucks are possible in specific operations, but not viable in all roles
  - Long haul will be the most challenging due to payload and infrastructure requirements

SAE Charging Standards

- The Society of Automotive Engineers (SAE) has published a standard for three-phase AC charging, J3068
- Designed for high power AC charging up to 133 kW at 480VAC, 166 kW at 600VAC
- Can be coupled with a DC fast charger in a CCS Type 2 plug
- Charging between J1772 and J3068 is possible with an adaptor
- Charging standards for high power wireless and overhead charging under development

Press Release https://www.sae.org/news/press-room/2018/04/sae-international-releases-new-specification-sae-j3068-for-charging-of-medium-and-heavy-duty-electric-vehicles

CARB ZE HD Funding Portfolio

- $338 million in the fiscal year (FY) 17-18 Funding Plan allocated towards heavy-duty
  - $188 million for Clean Truck and Bus Vouchers (HVIP and Low NOx)
  - $150 for Zero and Near Zero Emission Freight Facilities
- Workshop for FY 18-19 Funding Plan to be held June 15th,
  - $134 million proposed in Governor's budget for heavy-duty
- $220 million over 10 years for the Volkswagen Beneficiary Mitigation Plan for heavy-duty zero emission trucks and buses
  - Board vote was held May 25, 2018

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HVIP

- HVIP* offers a point-of-sale voucher to offset the incremental cost of zero emission, hybrid, and Low NOx technologies
- Funding varies based on technology, vehicle type, location within a disadvantaged community (DAC), number of vehicles
- New – Voucher enhancements available for infrastructure
  - Electric – Up to $30,000 per vehicle
  - Hydrogen – Up to $100,000 per vehicle w/ 5+ vehicles

Funding Table for Zero Emission Trucks

GVWR (lbs)	Base Voucher Incentive	
	1-100 vehicles	
	Outside DAC	Inside DAC
5,001-8,500	$20,000	$25,000
8,501-10,000	$25,000	$30,000
10,001-14,000	$50,000	$55,000
14,001-19,500	$80,000	$90,000
19,501-26,000	$90,000	$100,000
26,001-33,000	$95,000	$110,000
>33,001	$150,000	$165,000
Hydrogen FC	$300,000	$315,000

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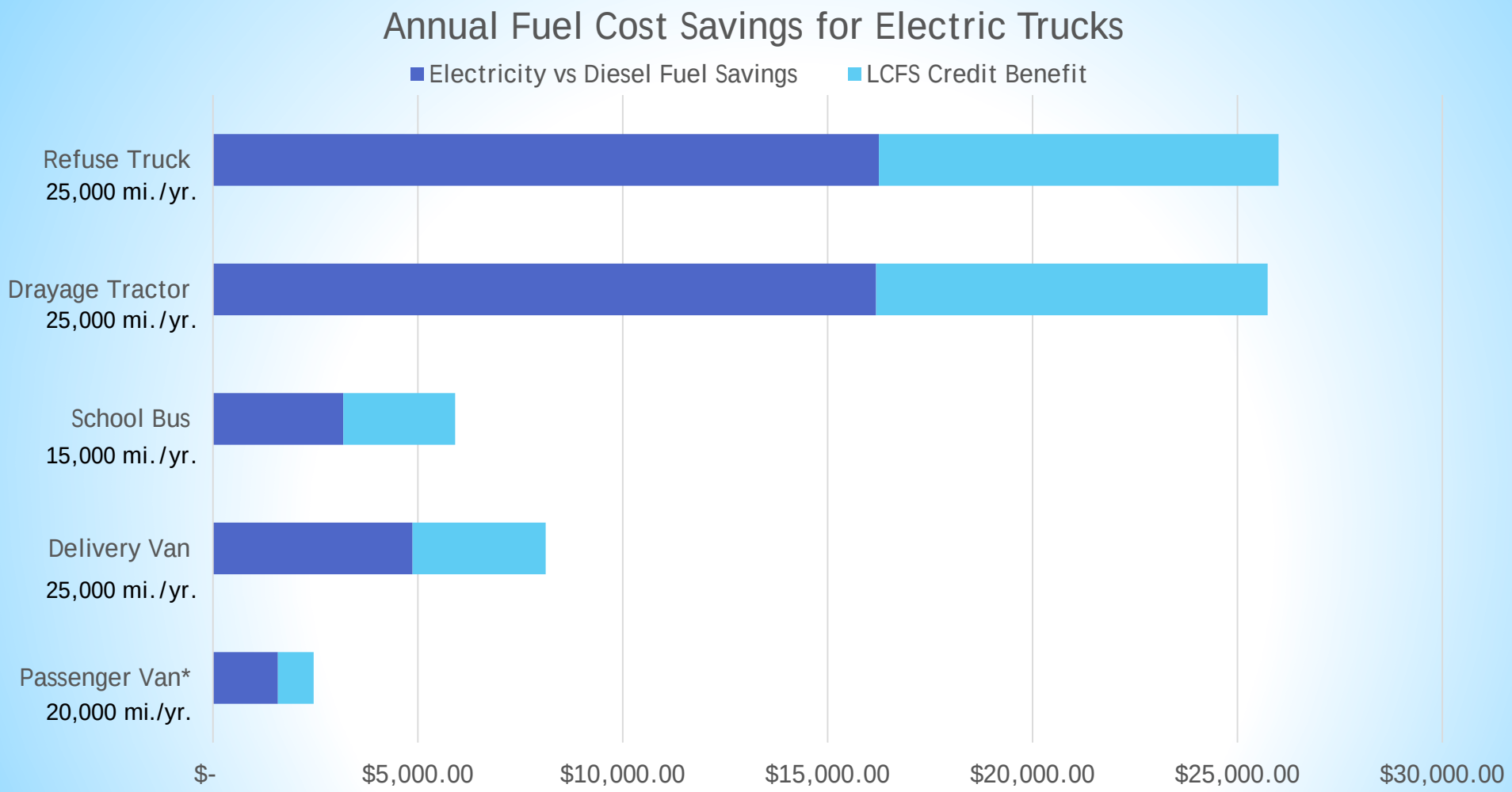
*Hybrid and Zero-Emission Truck and Bus Voucher Incentive Project (HVIP)
2018 HVIP Implementation Manual – Vehicle Voucher Amounts pg. 21-25 https://www.californiahvip.org/wp-content/uploads/2018/01/Final-IM-01172018.pdf

Low Carbon Fuel Standard

- The Low Carbon Fuel Standard (LCFS) requires fuel producers to lower the carbon intensity of their fuel
  - Allows low-carbon fuels such as electricity and hydrogen to generate credits for sale
- Low Carbon Fuel Standard (LCFS) currently being amended
  - Energy Economy Ratio (EER) for heavy-duty electric vehicles proposed to increase from 2.7 to 5.0
  - Carbon intensity proposed to drop 20% by 2030
  - First Board hearing April 2018
  - Final vote by Board later this year
- At $100/credit using grid electricity, electric trucks would generate more than $0.12/kWh between 2018 and 2030

Fuel Saving Potential in California



Diesel @ $3/gal, Electricity @ $0.20/kWh, LCFS Credit Value @ $100/Credit, $0.13/kWh
***Medium Duty Vehicles have a lower EER of 3.4, which equates to an LCFS value of $.08/kWh @ $100/credit**

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SB 350 – Transportation Electrification

- The CPUC has approved 15 of the 16 priority review projects with a combined budget of $42 million
- The Proposed Decisions for Southern California Edison and Pacific Gas and Electric would authorize $343 million and $236 million, respectively, for MD and HD infrastructure projects over the next 5 years
  - Proposed decision to be voted on today
- In January, San Diego Gas and Electric proposed to invest $151 million in MD/HD infrastructure projects over the next 5 years
  - Decision from CPUC projected Q1 2019

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Revised Proposed Decision for MD/HD Infrastructure Programs
http://docs.cpuc.ca.gov/PublishedDocs/Published/G000/M214/K985/214985772.PDF

Fleet Requirements

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Potential Fleet Requirements

- The zero emission market will depend on both manufacturers producing electric vehicles and fleets purchasing them
- Regulations by CARB
- State fleet law – AB 739
- Other potential requirements to drive fleet purchases
  - AB 617 – targeting emissions at a local level
  - Port of Los Angeles and Long Beach Clean Air Action Plan
  - SCAQMD Indirect Source Rules development and other actions from air districts

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Planned ZEV Fleet Rules

- Innovative Clean Transit to board 2018
  - Class 4-8
- Zero Emission Airport Shuttle Bus to board 2018
  - Class 2B-8
- Potential zero emission drayage truck regulation to board 2022
- Other/future rules

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Zero Emission Drayage Truck Rule

- In the March 2018 Board meeting, CARB staff identified additional actions to reduce emissions and community exposure from freight pollution
- CARB action: Rule to transition drayage trucks to zero emission operation
- Tentative schedule
  - Board consideration: 2022
  - Implementation: 2026-2028+

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AB 617 and 739

- Assembly Bill 617 requires CARB to begin targeting emissions at a local level in addition to regional and statewide emission reductions
  - Target local emission hotspots
- Assembly Bill 739 requires that a portion of newly purchased vehicles by state agencies to be zero emission - 15% by 2025, 30% by 2030
  - Class 6-8
  - Fleet of 4,300 trucks

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South Coast Air Quality Management District – Indirect Source Rule

- South Coast Air Quality Management District's (SCAQMD) Governing Board directed its staff to continue working on an indirect source rule
- An indirect source rule (ISR) reduces emissions from vehicles associated with a facility rather than the facility itself
- SCAQMD currently developing indirect source rules and voluntary actions for warehouses, railyards, seaports, airports, and new developments

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SCAQMD ISR http://www.aqmd.gov/docs/default-source/news-archive/2018/indirect-source-measures.pdf

San Pedro Bay Ports Clean Air Action Plan 2017

- The San Pedro Bay Ports – the Port of Los Angeles and the Port of Long Beach - approved their Clean Air Action Plan update in November 2017
- Beginning in the early 2020s, all trucks entering the port must meet the near-zero emission heavy-duty engine standard or pay a fee
- Beginning in 2035, all trucks entering the port must be zero emission or pay a fee

San Pedro Bay Ports Clean Air Action Plan 2017 Final http://www.cleanairactionplan.org/documents/final-2017-clean-air-action-plan-update.pdf

Questions on Fleet Rules

- How should manufacturer and fleet requirements be timed/paired?
- What should potential fleet requirements be based on?
  - Focus on the largest fleets in California?
  - The vocations we believe are the best-suited for electrification?
  - The need for local emission reductions?
- How to identify best fits for electrification?

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Updated Manufacturer Mandate Concept

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Advanced Clean Trucks Rulemaking

- Still see need for manufacturer sales requirement
- Need to address how the rule will be paired with fleet requirements
- Need time to evaluate role of fleets in overall strategy
- Will provide update on key issues and questions

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April 2017 Original Proposal Summary

- Manufacturer mandate to produce a portion of sales as zero emission
- Class 2B-7 with Class 8 being optional
  - Two separate credit pools – Class 2B-3 and Class 4-8
- Small manufacturers exempt
- 3 technology categories – ZEV, TZEV, BEVx
- Increasing credit amounts for longer ranged vehicles
- 2.5% in 2023, ramping up to 15% by 2030

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Heavy-duty Pickups

- Recognize variability with pickups as well as towing and payload concerns
- Pickups should not be excluded from rule
  - Excluding pickups above 8,500 lb. may incentivize moving light-duty vehicles into medium-duty
  - Maintain consistency with light-duty policy
- Options
  - Later timeline than other trucks
  - Plug-in hybrid transition
  - Other

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Class 8

- Class 8 should be included prior to 2030
  - Highest fuel saving potential
  - Some markets in Class 8 look promising – short haul, refuse, city delivery
  - Ensure consistency with fleet requirements
- Options
  - Later timeline than other trucks
  - Plug-in hybrid transition
  - Other

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Other Questions

- How should small manufacturers be defined and treated?
- Should Class 2B-3 and Class 4-7 be split?
- Should there be a minimum ZEV requirement?
- Should ZEVs earn more credit for longer all-electric range?
- Overlap with the GHG Phase 2 Advanced Technology Multiplier?

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Alternatives to Rule

- CARB is seeking alternatives to the rule that will result in an equivalent number of zero emission vehicles
- Please submit alternative proposals to Paul Arneja, Air Resources Engineer, at paul.arneja@arb.ca.gov

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Environmental Analysis

- Environmental Analysis (EA) being prepared analyzing potentially significant adverse impacts caused by reasonably foreseeable actions.
- Meets requirements of CARB's certified program under the California Environmental Quality Act (CEQA).
- The CEQA Environmental Checklist (CEQA Guidelines Appendix G) is used to identify and evaluate potential indirect impacts.
- The EA will be an appendix to the Staff Report.

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Environmental Analysis to be Prepared

- The EA will include:
  - Description of reasonably foreseeable actions taken in response to amendments.
  - Programmatic level analysis of potential adverse impacts caused by reasonably foreseeable actions
  - Beneficial impacts
  - Feasible mitigation measures to reduce/avoid significant impacts
  - Alternatives analysis
- Input invited at this early stage on appropriate scope and content of the EA.
- Draft EA will be released for 45 day public comment period.

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Zero Emission Truck Focus Group Meeting

- Held in coordination with Governor's Office of Business Development (Go-Biz)
- Manufacturers, fleets, and utilities providers
- Goal was to identify the key barriers to zero emission truck deployment from differing perspectives
- Second subgroup meeting has been scheduled

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ZE Truck Focus Group Meeting Summary

- All three parties want to get zero emission trucks on the road, but there are barriers and uncertainty
  - Utilities support transportation electrification, but need to know details about vehicles and power requirements before they can start building infrastructure
  - Manufacturers need to know what technology fleets are willing to buy, what specifications to build to, and what quantities they can sell
  - Fleets need assurance that vehicles can meet operational needs, will be supported through the life of the vehicle, and not be tied to proprietary equipment

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Next steps

- Continue discussions with manufacturers
- Expand dialogue with more fleets to better understand opportunities and barriers to electrification
- Next meetings
  - How fleets and manufacturers can foster a zero emission truck market in California
  - Zero Emission Truck Informational Symposium

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