Today’s Overview

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

- Low NOx Engine Standards
- Low Emission Diesel Fuel
- Inspection & Maintenance
- Advanced Clean Trucks
- Zero Emission Airport Shuttle Bus
- HD ZE Powertrain Certification
- Innovative Clean Transit
- Transportation Electrification SB 350
- Electrification Phase 2 GHG
- Vehicle Efficiency
- Optional Low NOx Engine Standards
- 2010 HD Engine Standard
- In-Use HD Engine Retrofits
- HD On-Board Diagnostics
- Low Carbon Fuel Standard
- Volkswagen Beneficiary Trust
- Funding Plan
- Sustainable Communities SB 375
- Funding SB 350
- Cap and Trade SB 32
- Car Scrap
- Advanced Clean Cars
- Cap and Trade SB 32
- HVIP Funding
- 50% Ren Portfolio Standard
- LCFS Update
- Phase 2 GHG
- Low NOx Engine Standards
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
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
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
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
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
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

<table>
<thead>
<tr>
<th>Industry</th>
<th>Respondent Vehicle Population</th>
<th>Statistics</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>2B to 3</td>
<td>Daily Mileage</td>
</tr>
<tr>
<td>California State Fleet</td>
<td>15,915, 3,960, 3,180</td>
<td>-</td>
</tr>
<tr>
<td>Gov’t/Public</td>
<td>1,172, 585, 325</td>
<td>30</td>
</tr>
<tr>
<td>Utility</td>
<td>656, 784, 214</td>
<td>50</td>
</tr>
<tr>
<td>Construction</td>
<td>25, 50, 1,270</td>
<td>100</td>
</tr>
<tr>
<td>Equipment Rental/Dismantler</td>
<td>0, 118, 85</td>
<td>115</td>
</tr>
<tr>
<td>Retail</td>
<td>590, 888, 117</td>
<td>150</td>
</tr>
<tr>
<td>Total Vehicles by Class</td>
<td>18,358, 6,385, 5,191</td>
<td></td>
</tr>
</tbody>
</table>

Link to Survey [https://www.arb.ca.gov/msprog/actruck/docs/acitsurvey18.docx](https://www.arb.ca.gov/msprog/actruck/docs/acitsurvey18.docx)
Most Trucks Average <100 miles/day

Annual Mileage

100 miles a day - 25,000 mi./yr.

Zero Emission Truck Market Update
## Multiple Zero Emission Trucks Available

<table>
<thead>
<tr>
<th>Truck Type</th>
<th>Description</th>
<th>Range</th>
<th>Battery Capacity</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cargo/Passenger Van</td>
<td>Shuttle and local operations</td>
<td>50-100 miles</td>
<td>30-60 kWh battery</td>
</tr>
<tr>
<td>Drayage Truck</td>
<td>Port goods movement</td>
<td>100 miles</td>
<td>188 kWh battery</td>
</tr>
<tr>
<td>Delivery Vans</td>
<td>Urban delivery and service</td>
<td>80-120 miles</td>
<td>~145 kWh battery</td>
</tr>
<tr>
<td>Yard Tractors</td>
<td>Intermodal operations</td>
<td>~60-80 miles</td>
<td>~209 kWh battery</td>
</tr>
<tr>
<td>School Bus</td>
<td>Type A, C, and D operation</td>
<td>50-150 miles</td>
<td>65-200 kWh battery</td>
</tr>
<tr>
<td>Cutaway Bus</td>
<td>Airport and transit shuttle</td>
<td>100 miles</td>
<td>105 kWh battery</td>
</tr>
<tr>
<td>Refuse Trucks</td>
<td>Urban garbage and refuse</td>
<td>80 miles</td>
<td>~188 kWh battery</td>
</tr>
</tbody>
</table>
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

Excluding transit buses
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
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
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.

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
HVI P

- HVI P* 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

<table>
<thead>
<tr>
<th>GVWR (lbs)</th>
<th>Base Voucher Incentive</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>1-100 vehicles</td>
</tr>
<tr>
<td></td>
<td>Outside DAC</td>
</tr>
<tr>
<td>5,001-8,500</td>
<td>$20,000</td>
</tr>
<tr>
<td>8,501-10,000</td>
<td>$25,000</td>
</tr>
<tr>
<td>10,001-14,000</td>
<td>$50,000</td>
</tr>
<tr>
<td>14,001-19,500</td>
<td>$80,000</td>
</tr>
<tr>
<td>19,501-26,000</td>
<td>$90,000</td>
</tr>
<tr>
<td>26,001-33,000</td>
<td>$95,000</td>
</tr>
<tr>
<td>&gt;33,001</td>
<td>$150,000</td>
</tr>
<tr>
<td>Hydrogen FC</td>
<td>$300,000</td>
</tr>
</tbody>
</table>

*Hybrid and Zero-Emission Truck and Bus Voucher Incentive Project (HVI P)
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.

Information on the LCFS program and 2018 Amendments: https://arb.ca.gov/fuels/lcfs/lcfs.htm
Fuel Saving Potential in California

Annual Fuel Cost Savings for Electric Trucks

- Electricity vs Diesel Fuel Savings
- LCFS Credit Benefit

- Refuse Truck
  - 25,000 mi./yr.
- Drayage Tractor
  - 25,000 mi./yr.
- School Bus
  - 15,000 mi./yr.
- Delivery Van
  - 25,000 mi./yr.
- Passenger Van*
  - 20,000 mi./yr.

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
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

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

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.

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?
Updated Manufacturer Mandate Concept
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
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
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
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
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?
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.
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.
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.
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
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
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