Welcome!

California’s Advanced Clean Trucks (ACT) rule Digital Dialogue
July 30, 2020
Webinar Logistics

• Please use the Questions Pane on your GoToWebinar Control Panel to submit your questions
  – We will not be using the “raise your hand” feature

• Slides and a recording of today’s webinar will be distributed

• Participation is encouraged
Speakers

Cristiano Façanha, PhD
Global Director, CALSTART

Sydney Vergis, PhD
Assistant Division Chief, California Air Resources Board (CARB)

Meredith Alexander, JD
Policy Director, CALSTART
Drive to Zero aims to accelerate the growth of zero-emission commercial vehicles

2025
Near- and zero-emission commercial vehicles are cost-competitive and commercially viable in beachhead applications and first-mover regions by 2025.

2040
Zero-emission commercial vehicles achieve 80% of new vehicle sales by 2040.
ACT follows the “beachhead” strategy recognizing that zero-emission vehicles will come in waves.

**Wave 1: Transit**
- ZE transit buses: Available now
- ZE industrial lifts: Available now

**Wave 2: Delivery**
- Chanje Class 5 Delivery Van: Available now
- Orange EV yard tractor: Available now
- Fuso ECANter: Available now

**Wave 3: Medium Freight**
- E-Fuso Vision One: Announced 2021
- Freightliner eM2: Demo now
- Announced 2021

**Wave 4: Heavy Regional Freight**
- Freightliner e-Cascadia: Demo now; Announced 2021
- Volvo VNR: Demo now; 2019 Europe; 2021 NA?
- Mack e-Refuse: Demo 2020; Coming 2022?
- Nikola FC tractor: Coming 2022?

**Wave 5: Corridor Longhaul**
- Tesla demo: Coming 2022?

- Similar drivetrain and component sizing can scale to early near applications
- Expanded supply chain capabilities and price reductions enable additional applications
- Steadily increasing volumes and infrastructure strengthen business case and performance confidence

**Timeline:**
- 2019
- 2020
- 2021
- 2022
- 2023
Model availability is increasing rapidly

Source: https://globaldrivetozero.org/tools/zero-emission-technology-inventory/
Advanced Clean Trucks Regulation
California’s Zero-Emission Truck Program
Today’s Overview

• Background: California’s trucks
• Regulation Summary: Advanced Clean Trucks
• Next steps
California Vehicle Populations

Class 7-8 Tractors
180,000

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

Class 4-8 Straight Trucks and...

*Trucks are the largest single source of air pollution from vehicles, responsible for **50% of greenhouse gas emissions**, and **more than 95% of toxic diesel particulate matter** emissions; even though there are only about 2 million trucks among the 30 million registered vehicles in the state.
Examples of Zero- Emission Trucks Commercially Available Today

<table>
<thead>
<tr>
<th></th>
<th>2B-3</th>
<th>4-5</th>
<th>6-7</th>
<th>8</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>(8,501 – 14,000 lbs.)</td>
<td>(14,001 – 19,500 lbs.)</td>
<td>(19,501 – 33,000 lbs.)</td>
<td>(33,000 lbs. and over)</td>
</tr>
</tbody>
</table>

* Over 100 models of Zero Emission Trucks are available or announced.*
Advanced Clean Trucks
Regulation Summary
Regulation Overview

- Approved by the CARB Board in June 2020
- Requires zero emission truck and bus sales in California
  - Class 2b and above (gross vehicle weight rating > 8500 pounds)
  - Starts with 2024 model year
- Applies to large truck manufacturers who sell trucks into California
- Credit and deficit system for compliance
- Partial credit for plug-in electric hybrids ("near-zero emissions" vehicles or NZEVs)
Diverse Universe of Class 2b-8 Vehicles

<table>
<thead>
<tr>
<th>Class 2b-3</th>
<th>Class 4-8</th>
<th>Class 7-8 Tractors</th>
</tr>
</thead>
<tbody>
<tr>
<td><img src="image1" alt="Image" /></td>
<td><img src="image2" alt="Image" /></td>
<td><img src="image3" alt="Image" /></td>
</tr>
<tr>
<td><img src="image4" alt="Image" /></td>
<td><img src="image5" alt="Image" /></td>
<td><img src="image6" alt="Image" /></td>
</tr>
<tr>
<td><img src="image7" alt="Image" /></td>
<td><img src="image8" alt="Image" /></td>
<td><img src="image9" alt="Image" /></td>
</tr>
<tr>
<td><img src="image10" alt="Image" /></td>
<td><img src="image11" alt="Image" /></td>
<td><img src="image12" alt="Image" /></td>
</tr>
</tbody>
</table>

Class 2b has a gross vehicle weight rating above 8,500 lbs
ZEV Sales Requirements

- Applies to manufacturers with >500 annual California sales
- Percent of California sales must be zero-emission starting in 2024
  - ~100,000 ZEVs by 2030
  - ~300,000 ZEVs by 2035
- Near-Zero Emissions Vehicle credits based on all electric miles and model year
  - Up to 50% of compliance obligation

### Model Year (MY) Requirements

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

Note: Class 2B-3 (GVWR: 8,501-14,000 lb.), Class 4-8 (GVWR: 14,001 lb. or greater), Class 7-8 tractor (GVWR: 26,001 lb. or greater)
Deficit/Credits System Developed for Manufacturer Flexibility

- Combustion trucks sold into California generate deficits
- ZEV truck sales generate credits
- Manufacturers may bank and trade their credits
- Credits expire after 5 years

Class 7-8 Tractors: 2.5x
Class 8: 2x
Class 6-7: 1.5x
Class 4-5: 1x
Class 2b-3: 0.8x
Anticipated Benefits of the Advanced Clean Truck Regulation

• Significant air quality and greenhouse gas benefits
• $5.9 billion in estimated net economic savings to California
• Additional $8.9 billion in estimated health benefit savings
  ▪ Avoided premature mortality, emergency room visits, hospitalizations, lost workdays
• Net creation of roughly 7,500 jobs
• Reduce energy use and petroleum dependence

*Nearly all trucks to have particulate filters and catalytic systems by 2024
†Includes reduced brake wear
Next Step – Zero Emission Fleet Rule

• Upcoming regulation to require purchase of ZEVs by fleets
• Transition to zero emission vehicles
  ▪ 2035 – Drayage trucks at ports and railyards
  ▪ 2040 – First/last mile delivery, buses, and utilities*
  ▪ 2040 – Refuse trucks and government fleets*
  ▪ 2045 – All others where feasible*

• Will bring a proposal to the CARB Board 2021/2022, requirements start in 2024

* May include NZEVs
More Information

• Advanced Clean Trucks
  ▪ Webpage: https://ww2.arb.ca.gov/our-work/programs/advanced-clean-trucks
  ▪ Rulemaking Documents: https://ww2.arb.ca.gov/rulemaking/2019/advancedcleantrucks

• ZE Fleet Rule
  ▪ Webpage: https://ww2.arb.ca.gov/our-work/programs/advanced-clean-fleets

• Contacts
  ▪ Dr. Sydney Vergis, sydney.vergis@arb.ca.gov
  ▪ Paul Arneja, Lead Staff paul.arneja@arb.ca.gov
CALSTART BEACHHEAD ANALYSIS FOR ACT & FLEET RULES

Meredith Alexander, JD

California’s Advanced Clean Trucks (ACT) rule Digital Dialogue
July 30, 2020
## CALSTART Beachhead Categories for ACT Analysis

<table>
<thead>
<tr>
<th>Vehicle Type</th>
<th>% of Annual Sales- 2024</th>
<th>% of Annual Sales- 2027</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cargo Van (Class 2b-3)</td>
<td>33.3%</td>
<td>75.0%</td>
</tr>
<tr>
<td>Cutaway/Shuttle Bus (Class 3)</td>
<td>33.3%</td>
<td>66.6%</td>
</tr>
<tr>
<td>Coach Bus</td>
<td>33.3%</td>
<td>66.6%</td>
</tr>
<tr>
<td>Cutaway/Shuttle Bus (Class 4)</td>
<td>33.3%</td>
<td>66.6%</td>
</tr>
<tr>
<td>Regional Delivery Truck (Class 4-6)</td>
<td>40.0%</td>
<td>75.0%</td>
</tr>
<tr>
<td>School Bus</td>
<td>50.0%</td>
<td>80.0%</td>
</tr>
<tr>
<td>Step Van (Class 4-5)</td>
<td>40.0%</td>
<td>75.0%</td>
</tr>
<tr>
<td>Terminal Tractor</td>
<td>50.0%</td>
<td>80.0%</td>
</tr>
<tr>
<td>Class 7-8 Regional-Haul Tractor</td>
<td>20.0%</td>
<td>40.0%</td>
</tr>
</tbody>
</table>
## Results – Aggregates of Beachheads in CARB ACT Regulatory Groupings vs. CARB Requirements (% of annual sales)

<table>
<thead>
<tr>
<th>Model Year (MY)</th>
<th>CARB Class 2b-3</th>
<th>CALSTART Class 2b-3</th>
<th>CARB Class 4-8</th>
<th>CALSTART Class 4-8</th>
<th>CARB Tractors</th>
<th>CALSTART Tractors</th>
</tr>
</thead>
<tbody>
<tr>
<td>2024</td>
<td>5%</td>
<td>8.6%</td>
<td>9%</td>
<td>16%</td>
<td>5%</td>
<td>8%</td>
</tr>
<tr>
<td>2025</td>
<td>7%</td>
<td>11%</td>
<td></td>
<td></td>
<td>7%</td>
<td></td>
</tr>
<tr>
<td>2026</td>
<td>10%</td>
<td>13%</td>
<td></td>
<td></td>
<td>10%</td>
<td></td>
</tr>
<tr>
<td>2027</td>
<td>15%</td>
<td>22%</td>
<td>20%</td>
<td>31%</td>
<td>15%</td>
<td>18%</td>
</tr>
</tbody>
</table>
Best Practice Recommendations for OEM & Fleet Rules

• Rule will best achieve its goals as part of a broader and more comprehensive policy and investment structure

• Fleet rules structured around beachheads would provide clear directional signals to vehicle buyers, and guarantees to manufacturers that the market will materialize.

• Regulations will most likely succeed if accompanied by other key policies:
  – Robust purchase incentives that “step down” at key milestones
  – Commitments by other state agencies to accelerate supportive infrastructure policy, including **guaranteed funding & timelines for infrastructure deployment**.
Thank you!

Meredith Alexander
Policy Director
malexander@calstart.org

For more information:
www.calstart.org
www.globaldrivetozero.org
Panel Discussion

Cristiano Façanha, PhD
Global Director, CALSTART

Sydney Vergis, PhD
Assistant Division Chief, California Air Resources Board (CARB)

Meredith Alexander, JD
Policy Director, CALSTART