# EDF's Perspective on How to Rebuild Better

### Dr. James Fine, Lead Senior Economist, Energy Program



Finding the ways that work

# **Rebuild Better**

- Federal
  - ZEV policy beginning to roll
  - "Moving Forward" legislation
- State
  - Social unrest
  - Fiscal impacts
    - CA: AB32 Cap & trade revenue
    - Sales tax
  - Jobs & economy trump environmental goals
  - Health now at odds with sustainability
    - No personal bags
    - No public transit
    - TP of any kind



## Stimulus sign-on letter, May 1, 2020

- "prioritize public health & frontline workers" and...
- accelerate clean transportation manufacturing,
- invest in electric vehicle infrastructure,
- deploy electric transit & school buses
- make electric cars and trucks more affordable
- → Spending taxpayer funds in \$20 billion chunks

# Signees

- 1. 350 Bay Area
- 2. 350 Seattle
- 3. 350 Silicon Valley
- 4. Acadia Center
- 5. Ballard Fuel Cell Systems
- 6. CalETC
- 7. California Business Alliance for a Clean Economy
- 8. CALSTART
- 9. Center for Biological Diversity
- 10. Center for Neighborhood Technology
- 11. Central California Asthma Collaborative
- 12. Ceres
- 13. CHARGE ACROSS TOWN
- 14. Citizens Utility Board Illinois
- 15. Clean Energy Economy for the Region
- 16. Clean Water Action
- 17. Clean Water Action (NJ)
- 18. Climate Solutions
- 19. Coalition for a Safe Environment
- 20. Coalition for Clean Air
- 21. Coltura
- 22. Conservation Law Foundation
- 23. Consumer Federation of America
- 24. Consumer Reports
- 25. Cool the Earth / Drive Clean Bay Area
- 26. CT League of Conservation Voters
- 27. E2 (Environmental Entrepreneurs)
- 28. Earth Day Austin
- 29. Earthjustice
- 30. Earthworks
- 31. East Coast Greenway Alliance
- 32. Easton Energy and Environment Task Force
- 33. Ecology Center (Michigan)
- 34. Elders Climate Action
- 35. Electric Auto Association
- 36. Endangered Species Coalition
- 37. Environmental Defense Fund
- 38. Environmental Health Coalition
- 39. Environmental Law & Policy Center
- 40. Environmental Working Group

- 41. Forth
- 42. Fresh Energy
- 43. Green For All
- 44. GRID Alternatives
- 45. Jobs to Move America
- 46. League of Conservation Voters
- 47. Madison Area Bus Advocates
- 48. Marin School For Environmental Leadership
- 49. Minnesota Center for Environmental Advocacy
- 50. Mothers Out Front
- 51. Move Minnesota
- 52. National Consumer Law Center, on behalf of our low-income clients
- 53. Natural Resources Council of Maine
- 54. Natural Resources Defense Council
- 55. New Jersey Sustainable Business Council
- 56. NW Energy Coalition
- 57. Oregon Environmental Council
- 58. Plug In America
- 59. Protect Our Winters
- 60. Public Citizen
- 61. RE Sources for Sustainable Communities
- 62. RENEW Wisconsin
- 63. Respiratory Health Association
- 64. ReVision Energy
- 65. Safe Climate Campaign
- 66. Sierra Club
- 67. Solar United Neighbors
- 68. Southeast Energy Efficiency Alliance
- 69. Southern Alliance for Clean Energy
- 70. Southwest Energy Efficiency Project
- 71. Sunrise Tacoma
- 72. The Alliance for Business Leadership
- 73. The Climate Group
- 74. The Climate Center
- 75. The Illinois Environmental Council
- 76. Transport Hartford Academy at the Center for Latino Progress
- 77. Union of Concerned Scientists
- 78. Voices for Progress
- 79. West Oakland Environmental Indicators Project
- 80. Windsor Climate Action

## Stimulus letter on Medium & Heavy Duty Vehicles (MHDVs)

- Significance for transportation sector emissions: 5% of vehicles but
  - 45% of NOx
  - 57% PM
  - 25% GHGs
- Recommend point of purchase vouchers, 10% tax credit (HR 5162) and no excise tax

## ZEV Emissions Trucks & Buses: Ready To Deliver Goods & Clean Air

Jason Mathers Pam MacDougall Sarah Ryan Jamie Fine



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### **Current Status**



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# Manufacturers Investing Billions

- Peterbilt parent PACCAR is investing \$650 million in research and development between 2019 and 2020. This includes aerodynamic truck models, integrated powertrains including electric, hybrid, and hydrogen fuel cell technologies
- Daimler: \$3 billion for research and development of commercial electric trucks, including a \$155 million investment in Proterra.
- Cummins: \$500 million for zero-emissions business unit, including acquisition of fuel cell company.
- Navistar launched an entire business unit dedicated to developing electric trucks.
- Volvo Trucks North America: \$400 million investment in New River Valley, Va., factory in part to enable production of electric trucks.



## Battery Costs Drops Enabling EVs

Lithium-ion battery price outlook



Source: BloombergNEF

## **Total Cost of Ownership Trends**

Figure 123: Total cost of ownership for commercial vehicles in the U.S.



Source: BloombergNEF. Note: LCV refers to light-duty commercial vehicles, MCV to medium-duty commercial vehicles and HCV to heavy-duty commercial vehicles.





# Sales of EVs Poised for Growth

EV share of annual vehicle sales by segment



Source: BloombergNEF. Note: Passenger car and bus figures are global. Commercial vehicle segment adoption figures in both charts cover the main markets of China, Europe and the U.S.

# **Fleet Perspective on Barriers**

#### BARRIERS TO FLEET ELECTRIFICATION 55% Initial purchase price prohibitive 44% Inadequate charging infrastructure - our facilities 35% Inadequate product availability 32% Inadequate charging infrastructure - public 24% Difficult to get buy-in from top leadership 23% We outsource our fleet operations 14% Difficult to calculate total cost of ownership 11% Uncertain regulatory environment 11% Maintenance costs/needs unknown

7%

Technology changes too quickly



## **CLEAN AIR ACTION PLAN GOALS:**

ZE marine terminal equipment by 2030 ZE on-road trucks by 2035



# Roadmap for Fleet Clean Vehicle Leadership



## Roadmap for Fleet Clean Vehicle Leadership: Theory of Change

- Supply: make clean trucks
- Demand: buy clean trucks
- Finance: solve capital cost premiums using operating cost savings
- Charging infrastructure: educate site hosts, upgrade grid & offer smart pricing
- Power: provide 100% clean, cost-competitive, reliable electricity
- →Advance environmental equity & justice
  - → Co-Create Solutions with Disadvantaged Communities (DACs)
  - $\rightarrow$  Focus on areas where MHDVs operations impact DACs
  - → Policy solutions for diversity of fleets (size, location, age, duty cycles)
  - $\rightarrow$  Workforce development

## California leadership...

## Inside Energy & Environment

Developments in law and policy of energy, commodities and environment FROM COVINGTON & BURLING LLP

HOME > CARB > CARB ADOPTS ADVANCED CLEAN TRUCKS RULE TO SPEED ZERO EMISSION VEHICLE DEPLOYMENT

### CARB Adopts Advanced Clean Trucks Rule to Speed Zero Emission Vehicle Deployment

By Kevin Poloncarz and John Mizerak on July 1, 2020 POSTED IN AIR POLLUTION, CARB, VEHICLE EMISSIONS

The California Air Resources Board unanimously adopted the **Advanced Clean Trucks** rule, which is designed to accelerate the adoption of zero-emission medium and heavy duty vehicles ("ZEV"). By 2045, 100% of new trucks sold in the state will be ZEVs, consistent with the state's broader goal of becoming carbon neutral by that year.

The rule's main component is a ZEV sales quota. Manufacturers who certify Class 2b through 8 charges or complete unbicles with combustion engines will be required to

### Clean Trucks, Big Bucks

Chris Busch, Energy Innovation James Fine, Environmental Defense Fund Amanda Myers, Energy Innovation

June 22, 2020



#### **CLEAN TRUCKS, BIG BUCKS**

California Energy Policy Simulator evaluation of the proposed Advanced Clean Trucks Rule

JUNE 2020

BY CHRIS BUSCH, ENERGY INNOVATION JAMES FINE, ENVIRONMENTAL DEFENSE FUND AMANDA MYERS, ENERGY INNOVATION





### MODELING REQUIREMENTS OF THE PROPOSED RULE ABOUT 60% ZERO EMISSION VEHICLES (ZEVs) IN 2035



	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%	45%
2034	50%	70%	50%
2035	55%	75%	55%

### **TOPLINE RESULTS – EMISSIONS REDUCTIONS**

### Avoided emissions due to proposed rule through 2040



### TOTAL SAVINGS \$7.3 BILLION HIGHER BATTERY COSTS



### TOTAL SAVINGS \$12 BILLION LOWER BATTERY COSTS



### METHODOLOGY IN BRIEF CALIFORNIA ENERGY POLICY SIMULATOR



EPS adaptation cover 55% of global GHG emissions Web access @ https://california.energypolicy.solutions/

### COMPARATIVE RESULTS

### Savings due to the proposed rule through 2040

	CARB evaluation	California EPS with CARB Battery Costs	California EPS with Lower Battery Costs
Total Savings through 2040 (2018 \$s)	\$5.9 Billion	\$7.3 Billion	\$12 Billion



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## Model Availability by Market Segment



# **Transit Buses**



Gillig: Battery Size 444 kWh Length: 40'



Proterra: Catalyst Battery Size 94-660 kWh Length: 35', 40'



New Flyer: Xcelsior CHARGE Battery Size: 260 – 545 kWh Length: 35', 40' 60'



BYD: Battery Size: 180 – 578 kWh Length: 30', 35', 40', 60'

# **School Buses**



Thomas: Class C Battery Size: 155 kWh Range: Up to 120 miles



Lion: Class A & C Battery Size: Up to 250 kWh Range: Up to 155 miles



Blue Bird: Class A, C & D Battery Size: up to 160 kWh Range: Up to 120 miles



IC: chargE Range: Up to 120 miles

# **Yard Trucks**



Lone Star EV



Orange EV



Kalmar Ottawa

# **Cargo Van Options**







Workhorse: nGen Range: 100 miles Deployment: 100 DHL

Rivian: 100,000 truck order by Amazon 1<sup>st</sup> Delivery: 2021

Chanje: V8100 Range: 150 miles Deployment: 1000 FedEx



Ford: E-Transit Range: 100 miles Production: 2022



Freightliner: MT50e Production: 2020

## **Work Trucks**



Peterbilt: E220 Range: Up to 200 miles Availability: 2020

> Fuso: eCanter Range: 80 miles Deployment: 4 in Penske fleet



Navistar: eMV Range 250 miles Availability: 2021



# **Regional EV Tractors**



Volvo: eVNR Range: TBA Available: 2020



Daimler: eCascadia Range: 250 miles Available: 2021



Peterbilt: 579EV Range: 200 miles Available: 2020

# **Fuel Cell Tractors**



Nikola Pilot: Anheuser-Busch



Kenworth Pilot: Ports of LA & Long Beach

# **Refuse Trucks**



BYD: BYD 8R Range: 56 miles Deployment: Seattle pilot

> Mack Deployment: New York City



Peterbilt: EV520 Range: 80 miles

