COMMENTS ON:

Proposed Advanced Clean Trucks (ACT) Regulation

California Air Resources Board

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by the

Natural Resources Defense Council (NRDC)

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EXECUTIVE SUMMARY

The Natural Resources Defense Council (NRDC) appreciates the opportunity to comment on the proposed Advanced Clean Trucks (ACT) regulation. We applaud the California Air Resources Board (ARB) staff for their efforts over a multi-year period to develop this proposed regulation. We support ARB adopting a significantly strengthened rule that enables a robust zero-emission medium- and heavy-duty truck (ZET) market through 2030.

NRDC is a national, nonprofit organization of scientists, lawyers and environmental specialists dedicated to protecting public health and the environment. Founded in 1970, NRDC has over 3 million members and online activists. Roughly 400,000 of these members live and work in California. Our members from across the state are impacted daily by the various air quality and climate threats present in California, including the pollution from commercial trucks this rule seeks to address.

The imperative to mitigate harmful air pollution from trucks, such as oxides of nitrogen (NOx) and particulate matter (PM), and curtail the greenhouse gases (GHGs) causing climate change is acute.

A robust ZET market is integral to shifting the trucking industry away from fossil-fuel burning vehicles towards cleaner alternatives. To support the formation of this market, a diverse and reliable supply of zero-emission trucks for all use cases is critical.

The proposed ACT rule intends to ameliorate supply uncertainty by requiring truck manufacturers provide for sale zero-emission electric trucks as an increasing percentage of their California sales from 2024 to 2030 and beyond. The rule will also collect information from large fleets and facilities about truck operations to inform a future "fleet rule" that will ensure electric truck supplies are met with the appropriate demand.

The current proposal would only convert roughly 4 percent of California's commercial trucks on the road to electric by 2030, or 22 percent of new sales on average in 2030. This would ultimately follow rather than lead industry for a number of reasons we discuss in the below sections. We urge ARB to strengthen the ACT rule by:

1. Increasing annual sales requirements across all truck classes to ensure no less than 15 percent of trucks on the road are zero-emission by 2030;
2. Including sales targets for class 2b-3 pickup trucks in the rule beginning in 2024;
3. Clearly articulate ARB's goal for achieving 100 percent ZETs; and
4. Committing to adopt a corresponding fleet requirement in 2021.

I. INTRODUCTION

Curtailing air pollution and greenhouse gas emissions from trucks is vital for California to meet its state and federal requirements, as well as regional air quality objectives. Presently, significant portions of the state are in non-attainment with federal Clean Air Act (CAA) ozone and particulate matter standards.

The vast majority of California's trucks burn diesel fuel. Truck emissions are the largest source of NOx in the state,[1] a pollutant that can lead to ozone and PM formation. Moreover, transportation is the largest source of GHG emissions in the state.[2]

The proposed ACT rule would require truck manufacturers[3] provide for sale ZETs[4] as an increasing percentage of their California truck sales from 2024 to 2030. Through the sales requirement, ARB seeks to begin shifting California's truck fleet away from diesel fuel by guaranteeing growing investments and supply of ZET models from manufacturers. The current requirements would result in about 75,000 ZETs on the road by 2030, which is a small (4 percent) fraction of California's entire truck fleet. The rule also requires large entities[5] provide information about fleet and facility operations to inform a future "fleet rule" to ensure ZETs are purchased where appropriate.

The ACT rule is the first of its kind in the world and again demonstrates California's leadership when it comes to protecting its citizens' health and the environment. According to ARB's calculations, the proposed rule will provide significant improvements to air quality and GHG reductions as well as quantifiable public health benefits of $5.7 billion statewide through 2040 and economic benefits to California's trucking industry of $4.9 billion through 2040.

The leading ZET technologies are battery electric and hydrogen fuel cell medium- and heavy-duty vehicles. However, the most prevalent of these two technologies today is battery electric (BE) medium- and heavy-duty trucks. In addition, BE trucks afford the largest emission reductions and cost savings relative to other technology options.[6] Therefore, our comments will focus largely on BE trucks unless otherwise noted.

Given the imperative to act aggressively to curtail air pollution from trucks, rapid improvements in BE technology, substantial BE investments and commitments from truck manufacturers and fleets, available support for medium- and heavy-duty charging infrastructure, health and economic benefits of more robust sales targets, and state and regional commitments, ARB should strengthen its current proposal.

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[1] https://ww3.arb.ca.gov/regact/2019/act2019/isor.pdf
[2] https://ww2.arb.ca.gov/ghg-inventory-data
[3] Manufacturers with 500 or more annual sales in California.
[4] ZEVs include both battery-electric and fuel cell medium- and heavy-duty vehicles.
[5] Large entities have annual revenue greater than $50 million in the U.S. and do business in California or own more than 100 vehicles with a GVWR greater than 8,500 lbs. and operated at least one in California in 2019 or dispatched more than 100 vehicles with a GVWR greater than 8,500 lbs. in California in 2019 or any California government, including all state and local municipalities, or any Federal government agency operating in California.
[6] http://www.caletc.com/wp-content/uploads/2019/01/Literature-Review_Final_December_2018.pdf

II. IMPERATIVE TO ACT

a. AIR POLLUTION

Air quality is getting worse and greenhouse gas emissions from transportation are on the rise. Over 90 percent of Californians now live in areas that experience unhealthy air at some point during the year.[7] Diesel truck emissions are a devastating local air pollutant, containing high levels of ultrafine particles and over 40 known carcinogens, making it responsible for about 70 percent of cancer risk related to air toxins in California.[8] Internal combustion vehicles create highly localized health hazards near busy roadways, including high levels of particulate matter and toxic air contaminant exposures. Exposure to particulate matter, even for a short period, can elevate the risk of death.[9]

In California, communities of color and low-income communities bear a disproportionate burden of the state's diesel trucking emissions.[10] Diesel exhaust contributes to disproportionately higher risks of cancer in residents who live near rail yards, ports, freeways with diesel trucks, and warehouses.[11] Diesel exhaust also results in higher risks to workers, including railroad workers, truck drivers, dock workers, among other workers who are exposed to diesel exhaust. Short term health impacts of diesel exhaust can include irritation to the eyes, nose, throat and lungs, while long term effects can include lung cancer, bladder cancer, worse allergies, asthma attacks, lung illnesses, and heart disease.

Some of the hardest hit communities include those living near ports, warehouses, and busy roads, that experience high levels of diesel truck traffic and are also known as "diesel death zones" due to the high rates of cancer and asthma in communities. 40 percent of all goods entering the US by water pass through the Ports of Los Angeles and Long Beach, generating massive volumes of diesel truck traffic that impact communities living near the Ports, including along the I-710 corridor and in the Inland Valley where trucks from the ports move goods to warehouses and railyards.

a. KEY AIR QUALITY ATTAINMENT DEADLINES AND EXECUTIVE ORDERS POINT TO A NEED TO HAVE STRENGTHENED REQUIREMENTS

The South Coast Air Basin is in extreme nonattainment with federal Clean Air Act ozone standards. Diesel truck emissions are the single largest source of NOx, a precursor to ozone. For portions of the state in nonattainment with health-based national ambient air quality standards (NAAQS), key federal deadlines are:

- 2021-2025: annual PM2.5 standard[12]
- 2031: 8-hour ozone standard[13]

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[7] https://www.lung.org/local-content/california/our-initiatives/state-of-the-air/2018/state-of-the-air-2018.html
[8] https://ww2.arb.ca.gov/resources/overview-diesel-exhaust-and-health
[9] https://www3.epa.gov/region1/airquality/pm-human-health.html
[10] https://www.ucsusa.org/sites/default/files/attach/2019/02/cv-air-pollution-CA-web.pdf
[11] https://envhealthcenters.usc.edu/infographics/infographic-living-near-diesel-exhaust/references-living-near-diesel-exhaust
[12] https://ww3.arb.ca.gov/planning/sip/2016sip/2016mobsrc.pdf
[13] https://ww3.arb.ca.gov/planning/sip/2016sip/2016mobsrc.pdf

Given the severity of diesel truck emissions on public health and the demonstrable benefits of transitioning to ZEV technology, additional statewide and local targets have been adopted:

- 2025: Executive Order B-48-18 calls for 200 hydrogen fueling station, 250,000 electric vehicle chargers, and 10,000 direct current fast chargers by 2025
- 2030: SB 32 codified GHG target in Executive Order S-3-05 of statewide emissions at least 40 percent below 1990 levels by 2030[14]
- 2030: based on Executive Order B-32-15, the California Sustainable Freight Action Plan established a goal to "deploy over 100,000 freight vehicles and equipment capable of zero-emission operation…by 2030"[15]
- 2030: Executive Order B-48-18 sets a goal of putting 5 million zero-emission vehicles on the road by 2030
- 2035: Executive Directive issued by Mayors of LA and Long Beach calls for San Pedro Bay Ports to achieve 100 percent zero-emission drayage trucks serving the ports by 2035[16]
- 2045: Executive Order B-55-18 sets a goal of statewide carbon neutrality by 2045
- 2050: Executive Order S-3-05 established a target of GHG emission reductions 80 percent below 1990 levels by 2050

b. LEADERSHIP ROLE

As with the Advanced Clean Cars (ACC) rule, California has an opportunity to establish a truck standard whose impact is felt beyond the state's border. Under Section 177 of the CAA, other states may adopt California mobile source emission standards. 13 states have now adopted some portion of California's ACC standard and 3 more have expressed an intent to do so. The Northeast States for Coordinated Air Use Management (NESCAUM)—the regional association of air pollution control agencies representing Connecticut, Maine, Massachusetts, New Hampshire, New Jersey, New York, Rhode Island, and Vermont—recently submitted comments on the proposed ACT rule.[17] Other states are tracking and interested in the rulemaking and it is reasonable to assume that they will consider adopting the ACT once it has been finalized. In their letter, these states also call for a more stringent sales requirement as well.

Other jurisdictions, including China and the European Union, are also monitoring California's climate change policies including those related to zero-emission passenger vehicles and commercial trucks.

[14] https://leginfo.legislature.ca.gov/faces/billNavClient.xhtml?bill_id=201520160SB32
[15] https://ww2.arb.ca.gov/sites/default/files/2019-10/CSFAP_FINAL_07272016.pdf
[16] https://www.documentcloud.org/documents/3864912-Joint-declaration-of-L-A-Long-Beach-mayors-on.html; https://cleanairactionplan.org/documents/final-2017-clean-air-action-plan-update.pdf/
[17] https://www.nescaum.org/documents/nescaum-letter-to-carb-re-act-mhd-zev-20191122.pdf

c. TRUCK MILES DRIVEN

The commercial truck sector is one of the fastest growing sources of emissions. This is due to growing freight activity and the resulting growth in truck miles driven and vehicle population, making a stronger rule even more critical to mitigating future emissions growth. In 2016, trucks made up the largest share of freight movement[18] and by 2045 truck shipping by value is expected to almost double.[19] The truck industry's rise is led by California, where shipments are projected to increase at the fastest rate in the nation.[20] The number of truck miles driven are expected to grow by 50 percent from 2010 to 2050. Much of this growth will come from the already heavily polluted regions of Southern California[21] and the San Joaquin Valley.[22] If more miles are driven by diesel-burning trucks, emissions overall will increase.[23] Switching to ZEV technologies must happen as quickly or faster than the growth of truck miles driven to reduce emissions.

III. ARB SHOULD SIGNIFICANTLY STRENGTHEN THE PROPOSED STRINGENCY

Annual ZEV sales requirements across all truck classes should be increased to ensure no less than 15 percent of trucks on the road are zero-emission by 2030. The increase in stringency is large relative to the proposal. However, it better reflects the evolving BE truck landscape, the extensive supporting programs that comprise California's medium- and heavy-duty truck ecosystem, and the only alternative that achieves federal and state clean air and carbon reduction targets.

The following represents one possible scenario that would result in 15 percent of trucks on the road being ZEVs by 2030, representing roughly 60 percent of new truck sales being zero-emissions in 2030. The first column in each class is ARB's proposal while the second with bold numbers and with a light green background is our proposal.

ARB's vs Our Proposal Comparison with Percentages of Sales / Year

Model Year	**Class 2b-3**		**Class 4-8**		**Class 7-8**	
	Excludes pickup trucks until 2027	Includes pickup trucks in 2024	Vocational/Straight Trucks		Tractors	
2024	3%	**15%**	7%	**30%**	3%	**10%**
2025	5%	**23%**	9%	**38%**	5%	**13%**
2026	7%	**30%**	11%	**45%**	7%	**17%**
2027	9%	**38%**	13%	**53%**	9%	**20%**
2028	11%	**45%**	24%	**60%**	11%	**23%**
2029	13%	**53%**	37%	**69%**	13%	**27%**
2030	15%	**60%**	50%	**75%**	15%	**30%**

[18] https://tripnet.org/wp-content/uploads/2019/10/Freight_TRIP_Report_October_2019.pdf
[19] https://tripnet.org/wp-content/uploads/2019/10/Freight_TRIP_Report_October_2019.pdf
[20] https://tripnet.org/reports/california-freight-news-release-10-03-2019/
[21] http://www.freightworks.org/DocumentLibrary/CRGMPIS%20-%20Final%20Report.pdf
[22] https://www.camsys.com/publications/san-joaquin-valley-interregional-goods-movement-plan
[23] https://theicct.org/sites/default/files/publications/Zero-emission-freight-trucks_ICCT-white-paper_26092017_vF.pdf

ARB's vs Our Proposal in Numbers of Trucks

Model Year	Class 2b-3		Class 4-8		Class 7-8		Total for each Year	
	Excludes pickup trucks until 2027	Includes pickup trucks in 2024	Vocational/Straight Trucks		Tractors			
2024	747	**11,235**	1,464	**6,275**	182	**608**	2,393	**18,118**
2025	1,245	**16,852**	1,883	**7,844**	304	**810**	3,432	**25,506**
2026	1,743	**22,469**	2,301	**9,413**	425	**1,013**	4,469	**32,895**
2027	6,741	**28,086**	2,719	**10,982**	547	**1,215**	10,007	**40,283**
2028	8,239	**33,704**	5,020	**12,551**	668	**1,418**	13,927	**47,673**
2029	9,737	**39,321**	7,740	**14,120**	790	**1,620**	18,267	**55,061**
2030	11,235	**44,938**	10,459	**15,689**	911	**1,823**	22,605	**62,450**
Total	39,685	**196,605**	31,586	**76,874**	3,827	**8,505**	75,098	**281,984**
					Percent of total		4%	**15%**
					Total Truck Population 2018		1,863,501	

While the percentage increases we are proposing are significant, the majority of the increase in sales volume is derived from the Class 2b-3 category due to the large overall population of this class relative to Class 4-8 as well as an earlier start-date for the Class 2b pickup trucks (2024 instead of 2027). The rapid cost declines in batteries together with the pace of new products entering the commercial truck sectors just over the course of this rule should give confidence to ARB to be more aggressive.

a. ARB CAN BE AMBITIOUS GIVEN THE RAPID ADVANCEMENTS AND GROWING GLOBAL ELECTRIC TRUCK INDUSTRY

Rising air quality concerns and the global climate emergency are leading global efforts to convert fossil-fuel truck fleets to ZEVs. The political interest, as well as rapid advancements in ZEV technology and the considerable operational and fuel savings, has attracted large investments and commitments from a plethora of companies globally.[24]

China has actively encouraged an electric truck and bus market to help address air pollution. In China, there are now over 400,000 BE buses, tens of thousands of BE trucks, and at least one original equipment manufacturer (OEM) producing BE trucks and buses globally. China's leadership on BE truck and bus adoption has prompted legacy OEMs to focus on BE, plug-in hybrid electric (PHEVs), and fuel cell vehicles. Similarly, the trend by European cities to ban non-electric trucks and buses from city centers has caught the attention of the worlds' legacy truck manufacturers.

[24] https://www.nrdc.org/experts/patricio-portillo/cas-advanced-clean-truck-rule-start-falls-short

Global OEMs are also responding to net-zero carbon laws and pledges by countries, states (including California), and cities.[25] In response to rising demand for ZEVs, there are now over a dozen manufacturers offering more than 50 different electric truck and bus configurations.[26] Model availability will continue to grow as OEMs and fleets continue making investments in BE technology.

Examples of electrification announcements in the last six months from legacy OEMs include Ford, GM, Daimler's Freightliner, VW group, Volvo, Renault, Fiat-Chrysler, Toyota, Kenworth, Mitsubishi-Fuso, Daimler's Mercedes-Benz, Cummins, Nissan, Citroen, Peugeot, Navistar, ABB, Delanchy, Daf Trucks, Mack, and Peterbilt. They are supported by large tier 1 suppliers such as Meritor, Allison, ABB, Dana, and Bosch.

Start-up truck manufacturers, who exert pressure on legacy OEMs, have made similar electrification announcements. Examples include BYD, Tesla, Rivian, Nikola, XOS, Lightning, Workhorse, Lion, Motiv, Fisker, XL Fleet, Proterra, Phoenix, Einride, Bollinger, Emoss, Hytruck, Alkane, ZeroNox, US Hybrid, Transpower, CityFreighter, Odyne, Morgan Olson, DHL Streetscooter, Orange EV, E-force One, Wrightspeed, ZeroTruck, and Zenith.

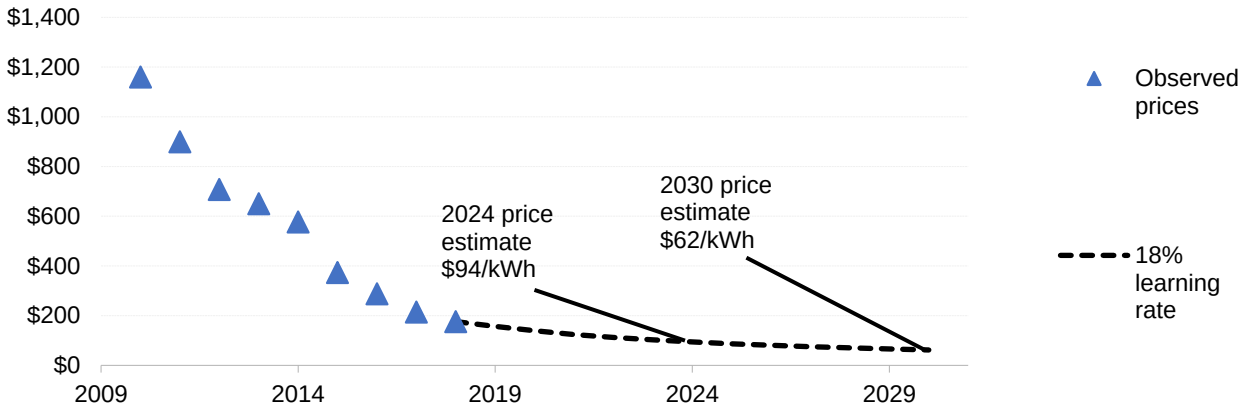
Fleets are also responding to the climate crisis. Eighty-seven major corporations, with a combined market capitalization of over $2.3 trillion, have pledged to reduce emissions and align their businesses with a 1.5°C future.[27] Meanwhile, OEMs such as Daimler and VW Group have announced plans to stop selling internal combustion engine (ICE) only vehicles by 2040 to meet 2050 GHG goals.

These early actions show the desire and opportunity for a larger BE truck market. However, the market needs a push. A stronger rule that guarantees at least 15 percent of California's trucks are ZEVs by 2030 would deliver that push. It would encourage manufacturers to provide more products and send a clear market signal to customers.

a. FALLING MEDIUM- AND HEAVY-DUTY ELECTRIC TRUCK PRICES AND COMPETITIVE TOTAL COST OF OWNERSHIP

BE truck technology is continuing to advance rapidly while costs decline. Due to manufacturing efficiencies from economies of scale and decreasing battery prices, the initial purchase prices of ZEVs are expected to continue falling. Currently, batteries are the single most expensive component of an electric truck. However, prices have dropped by roughly 20 percent per year since 2009[28] and are likely to continue falling through 2030.[29]

[25] http://sdg.iisd.org/news/77-countries-100-cities-commit-to-net-zero-carbon-emissions-by-2050-at-climate-summit/
[26] https://ww3.arb.ca.gov/regact/2019/act2019/isor.pdf
[27] http://sdg.iisd.org/news/77-countries-100-cities-commit-to-net-zero-carbon-emissions-by-2050-at-climate-summit/
[28] https://www.bcg.com/en-us/publications/2018/electric-car-tipping-point.aspx
[29] https://about.bnef.com/electric-vehicle-outlook/



NRDC, together with business groups including California Electric Transportation Coalition and CERES, nonprofit groups including Union of Concerned Scientists, Earthjustice, and NextGen America, and truck manufacturers including BYD, together with advisory support from East Yard Communities for Environmental Justice and U.C. Davis commissioned ICF International to conduct a technical cost, environmental emissions, and economic study of alternative fuel truck technologies.[30] We note the full study and results will be released and submitted into ARB's public record before ARB's hearing on December 12, 2019.

The findings of the ICF study show that the total cost of ownership (TCO) for the first-owners of most ZET classes are already competitive with diesel today in California given the incentives provided under the Heavy-Duty Vehicle Incentive Program (HVIP), value from the Low Carbon Fuel Standard (LCFS) for fleets using electricity as a fuel, and utility programs that have favorable electricity rates. All truck classes considered are projected to be cheaper to own and operate compared to diesel trucks on a TCO-basis without subsidies before 2030. This is largely due to continued decreases in battery costs, reduced maintenance costs, and lower fueling costs.

A recent study by Lawrence Berkeley National Laboratory (LBNL) using the most recent data on battery technology and component-level cost and performance data for trucks found that the TCO of Class 8 electric trucks to be 20 percent less than that of a diesel truck with a payback period within 4 years. The finding is contingent on having appropriate electric rates for ZET charging, which California's three large electric investor-owned utilities (IOUs) are all developing (more below). The TCO improves even further as battery prices decline and if environmental externalities are monetized.

ZET maintenance costs are less expensive relative to their diesel counterparts due to cost savings from fewer fluids and moving parts, infrequent service needs for batteries and motors, and regenerative braking that reduces the wear and tear on brakes.[31] As electrification becomes more prevalent, vehicle service providers will become increasingly familiar with the technology and maintenance costs will likely decline further.

[30] https://caletc.com/wp-content/uploads/2019/01/Literature-Review_Final_December_2018-1.pdf
[31] https://caletc.com/wp-content/uploads/2019/01/Literature-Review_Final_December_2018-1.pdf

BE trucks and buses are more efficient than their diesel or natural gas counterparts. Consequently, an electric bus running on electricity produced by natural gas can go twice as far as a natural gas bus with the same amount of gas in its tank.[32] Importantly for fleets, ZEVs that use electricity to charge are insulated from the vagaries of the global oil market. While electric trucks require less energy to perform the same operations, they also charge using less expensive and more stable electricity prices. Utility rate structures play an important role in determining electric vehicle fuel costs.

In preparation for large-scale deployment of ZETs, California's three large investor-owned utilities (IOUs) now have either approved or proposed rates designed specifically for commercial EV charging, which will provide significant fuel cost savings for medium- and heavy-duty fleets. Southern California Edison[33] and Pacific Gas and Electric[34] recently received authorization for their reformed commercial EV rates, while San Diego Gas & Electric's proposal is currently pending before the CPUC.[35] Customers charging vehicles on these rates would pay roughly half the price they would have if they used gas or diesel and will save roughly 30 to 50 percent on their monthly bills compared to previous commercial rates. Greater fuel costs savings realized from these rates will further lower the TCO of medium- and heavy-duty vehicles, which is a primary motivator for fleet operators considering electric options

Falling purchase prices, compelling TCOs, and reduced fuel costs of BE trucks have attracted the attention of large fleet operators. Companies committed to purchasing BE trucks include Amazon, Ryder, Penske, FedEx, UPS, Walmart, NFI, PepsiCo-Frito Lay, Anheuser Busch.

b. SUITABILITY FOR ELECTRIFICATION

The tasks ZEVs can perform and the distances they can travel on a single battery charge are impacted by their battery's energy density. Although this is constantly improving, and battery sizes are shrinking, some range constraints exist. However, current ZEV technology is well suited for short local trips as well as regional-haul trips with a centralized charging depot. The following table shows the annual sales volume of trucks by class in California. By applying ARB's electrification suitability analysis for each truck class today, we find that about 37 percent of new truck sales across classes are good candidates for BE trucks. That finding, based on 2019 technology, is roughly 10 percent higher than the final average sales targets across truck classes the proposed ACT rule would achieve.

	Class 2b-3	Class 4-7	Class 8
Annual Sales	75,000	19,000	7,600
Percent with Suitability Score of 1 or 2	30%	70%	30%
Trucks suited for Electrification in 2019	22,500	13,300	2,280

[32] https://www.ucsusa.org/sites/default/files/attach/2016/10/UCS-Electric-Buses-Report.pdf
[33] http://docs.cpuc.ca.gov/PublishedDocs/Published/G000/M215/K783/215783846.PDF
[34] http://docs.cpuc.ca.gov/PublishedDocs/Published/G000/M318/K552/318552527.PDF
[35] http://docs.cpuc.ca.gov/PublishedDocs/Efile/G000/M309/K592/309592529.PDF

Classes in which electrification is a perfect fit today are delivery and drayage trucks, shuttle and transit buses, garbage trucks, terminal tractors, and school buses. Due to increases in transloading, driver shortages, and domestic and international shifts in long-distance logistics, the trucking industry is seeing growth in regional-haul trucking, more warehousing, and a decline in long-haul. This trend towards shorter routes opens up more opportunities for BE trucks.[36] It is important to note that the technology is rapidly progressing and over the next ten years batteries will continue to decrease in size, with improved performance in terms of cycle-life and energy density.

i. THE CLASS 2B-3 SALES REQUIREMENT IS PARTICULARLY WEAK AND SHOULD BE STRENGTHENED

Notably, the proposed ACT rule concludes that many types of Class 2b-3 trucks are unsuitable for electrification. However, many of these are on the borderline of ARB's suitability score. Consequently, small variations in the future of battery prices or design improvements could result in these truck types being suitable for ZETs. In other words, ARB's conservative assessment is highly susceptible to change. In addition, the class 2-3 truck market has grown substantially attracting interest from manufacturers.

For example, Amazon's recently announced a contract to procure 100,000 Class 3 delivery vans from Rivian. These delivery vans are scheduled to begin operation across North America in 2021. Due to California's off-peak rates, LCFS credits, purchase incentives, and favorable programs to reduce infrastructure costs, it's reasonable that California could attract 30,000 to 50,000 of the Rivian delivery vans by 2030. This would be consistent with roughly 46 percent of all light-duty EVs in the US going to California over the 8-years since the adoption of the ACC rule and supported by complementary California policies. That single announcement dwarfs the proposal for the Class 2b-3 sales requirement, threatening to swamp the entire ACT rule and create a ZEV credit glut.

Other examples of existing or announced electric Class 3 vehicles include products from Mercedes e-Sprinter, Renault Master ZE, Lightning Systems, Phoenix, and Atlis. Other traditional OEMs could easily make Class 3 product including GM, Ford, Motiv, BYD, Cummins, Mitsubishi-Fuso (owned by Daimler) and VW Group, particularly since several already manufacture electric Class 4-5 trucks.

By expanding the Class 2b-3 sales requirement to 15 percent in 2024 and 60 percent in 2030, the rule could accommodate the likely influx of electric Class 2b-3 trucks without weakening the value of ZEV credits from a glut. New entrants such as Rivian, BYD, and Tesla can have a big impact in pushing the legacy OEMs, but they need financial support from ZEV credits.

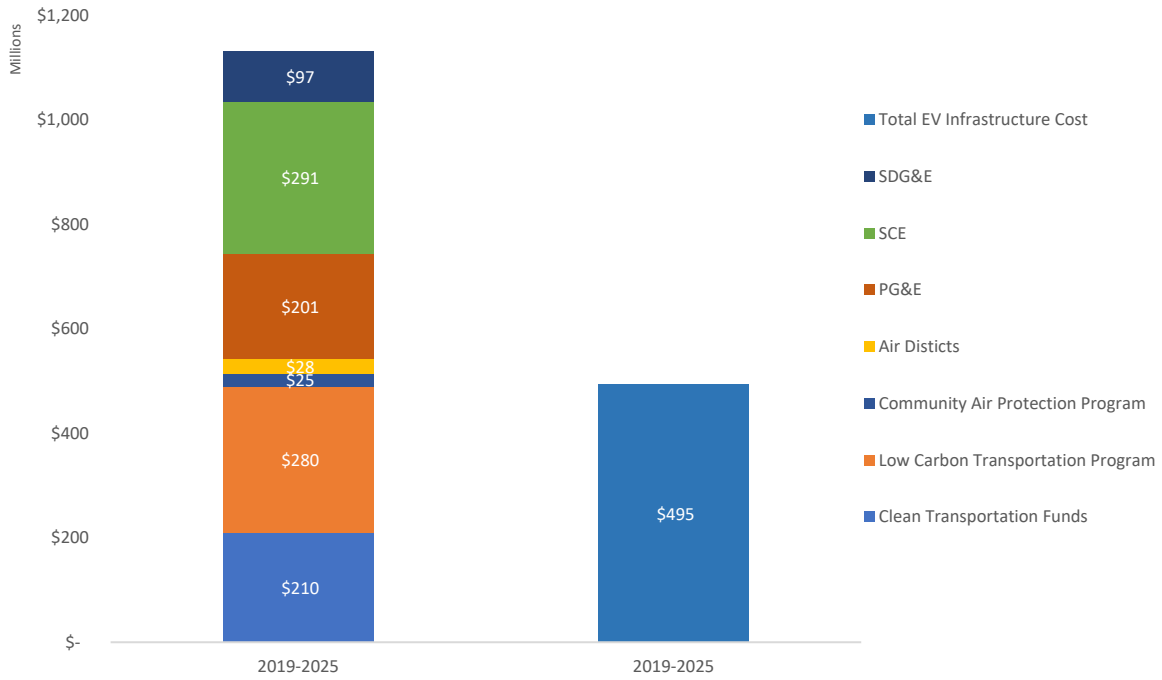
c. SUPPORT FOR CHARGING INFRASTRUCTURE

Substantial support exists for medium- and heavy-duty ZEV charging infrastructure. However, enhanced coordination between agencies and programs is advised. In the short-term (2020-2024) funds for charging infrastructure include approved investments from the three major electric IOUs, state grants, LCFS and cap-and-trade funds to utilities, and LCFS revenue to site hosts. Existing utility and California

[36] Source: Advanced Clean Transportation conference and expo 2019.

Energy Commission (CEC) programs can fund infrastructure for 40,000 Class 2b-8 trucks by 2024 depending on how they are applied. In the long-term (2025-2030), utility and state programs as well as LCFS credits will continue to provide funding.

Infrastructure Funding Sources Compared to Total Cost Est. of Current Proposal (2019-2025)



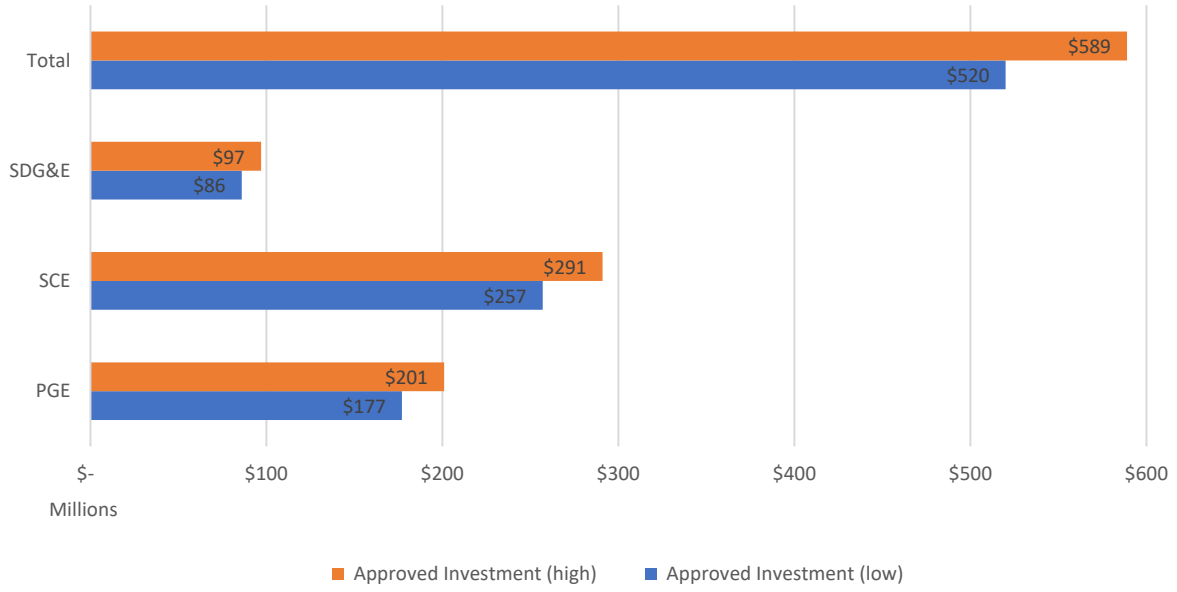
ii. Infrastructure Funding Sources: 2019-2024

IOUs

The three largest electric IOUs in California that serve roughly three-quarters of the state, all have approved programs to invest in medium- and heavy-duty truck ZEV charging infrastructure.

- Pacific Gas & Electric: make-ready infrastructure and charging stations rebates approved at $177-201 million for at least 525-595 sites supporting 4,875-5,525 ZEVs. The approved investment is through 2023.
- Southern California Edison: make-ready infrastructure and charging station rebates approved at $257-291 million for at least 650-740 sites supporting 6,367-7,216 ZEVs. The approved investment is through mid-2023.
- San Diego Gas & Electric: make-ready infrastructure and charging station rebates approved at $86-97 million for at least 240-270 sites supporting 2,400-2,700 ZEVs. The approved investment is through 2024.

IOU Approved Investments in M/HD EVSE (through 2024)



Beginning in 2020 a portion of IOU's LCFS credits must go to equity programs and some drayage truck projects are on the list of approved projects.

POUs

Publicly owned utilities (POUs) supply roughly a quarter of California's population and load. POUs are also able to use LCFS credits to support M/HD charging infrastructure.[37] Large POUs such as LADWP have programs to support charging infrastructure for M/HD.

Other Sources of Funding

- ARB's Low Carbon Transportation program funds several competitive grant programs that may pay for infrastructure. Assuming annual appropriations equals FY 2019-2020, expect $40M/year for the HD advanced technology demonstrations and pilots[38] and another $14M from several smaller programs, as well as a portion of the one-time $135M FARMER program.[39]
- ARB's AB 617 Community Air Protection program was expanded to include zero-emission M/HD charging infrastructure when the Legislature appropriated an additional $245 million in FY 2018-19. This new one-time funding is in addition to the original $250M one-time funds.
- ARB's Zero- and Near-Zero Emission Warehouse program was funded as a one-time program at $50M per year in 2017. Expect some infrastructure to be funded.

[37] At least one POU has. ARB is revising the base residential LCFS credit program to make clear that unused credits for the clean fuel rewards program must partially go to equity programs. Equity programs include funding drayage trucks, school buses, transit buses, and other projects.
[38] Includes non-road equipment.
[39] Infrastructure is one of several eligible costs in ARB's FARMER program with most of the money going to the Central Valley.

- CEC's Clean Transportation program has about $30M/year for ZEV trucks and infrastructure and $20M for hydrogen infrastructure (mostly light-duty).
- California air districts provide grants that include funding for M/HD infrastructure, but they vary annually. For example, the SCAQMD funds about $2-4M/year.
- The Carl Moyer program (about $60M/year) funds various on- and off-road projects. Funds may be used for HD charging infrastructure.[40] However, the program historically has not been a significant source of funding for electric or hydrogen projects.
- Prop 1B – while little money remains absent a new influx of revenue – has been provided for port-related projects.[41]

LCFS

LCFS credits go to the owners or tenants of the property where charging occurs, or to a designated aggregator or charging network provider. Currently, the value is about 16.75 cents/kWh for MD[42] and 27.25 cents/kWh for HD at the $200/ton credit price.[43] For a class 2b van, this is about $2,100/year and about $46,000/year for a high-mileage Class 8 regional haul truck.[44] While substantial, credit prices can fluctuate.

iii. INFRASTRUCTURE FUNDING SOURCES: 2025-2030

LCFS

LCFS credits are expected to continue indefinitely. The current credits price is $200-213/ton. The incentives have become substantial revenue streams for fleets and private vehicle owners alike who can retain and monetize 100 percent of the credits generated. Those funds can help offset the costs of truck financing payments or the charging infrastructure.

IOUs

Under SB 350, the California Public Utility Commission and the state's IOUs are required to accelerate transportation electrification. If additional medium- and heavy-duty charging infrastructure is needed, it is reasonable to assume that a second round of IOU programs will be approved.

POUs

It is also reasonable to expect that the POUs will continue to explore opportunities to encourage medium- and heavy-duty truck electrification; particularly considering the LADWP's goal to support the 2028 Olympics and the zero-emission transformation of the San Pedro Ports by 2030.

Other Sources of Funding

[40] https://ww3.arb.ca.gov/msprog/moyer/guidelines/2017gl/2017_gl_chapter_4.pdf
[41] Note, the AB 617 funding provided new one-time funds for Prop 1B.
[42] Based on an Energy Economy Ratio of 3.4.
[43] Based on Energy Economy Ratio of 5.0.
[44] These calculations are based on grid-average electricity and exclude the cost of selling credits or administering compliance reports and exclude additional credits from linking to low-carbon intensity electricity or smart charging.

- CEC's Clean Transportation funds should continue with at least $30M going to M/HD infrastructure.
- ARB's Low Carbon Transportation Program should continue (low case $40M per year) with a small portion going to infrastructure.
- Carl Moyer Program competitive grants should continue at $60M per year with very little for infrastructure.

Existing and potential sources of funding are considerable within California for BE trucks charging infrastructure. However, greater coordination is needed to improve the efficacy of these disparate funding sources and maximize charging network coverage.

d. PROPOSED RULE IS INCONGRUOUS WITH EXISTING COMMITMENTS AND EXPECTATIONS

As proposed, the rule is inadequate compared to California's need to aggressively transition to zero-emission trucks on the road. For example, in Southern California, the Mayors of LA and Long Beach issued an Executive Directive directing the San Pedro Bay Ports to transition all drayage trucks servicing the Ports to zero-emission trucks by 2035, and the Ports' joint 2017 Clean Air Action Plan Update reiterates the Ports' commitment to these goals. The commitment to electrify the Ports' trucking fleet follows decades of advocacy by community members who have long borne the health costs of diesel trucking by the goods movement industry. Reaching full electrification of the Port serving drayage trucks presents a public health imperative, and ARB must take stronger action in support.

There are over 18,000 drayage trucks registered at the Ports,[45] with about 13,000 to 14,000 trucks regularly working out of the Ports.[46] The need to transition all 18,000 registered trucks is roughly double the number of BE trucks that the proposed rule would achieve. Many of the trucks currently servicing the Ports will be retired in the 2020s,[47] making it critical that ARB set an ambitious manufacturing standard to ensure ZETs are widely available in the coming years. A stronger sales mandate is necessary to complement the efforts by the Ports to fully transition to zero emissions in the next 15 years.

A comprehensive economy-wide analysis of GHG reductions performed by Energy + Environmental Economics (E3) for Southern California Edison identified substantially more BE trucks than envisioned in the proposed ACT rule. The analysis used the GHG reduction targets that currently exist in statute or as directives and estimated how many medium- and heavy-duty ZEVs would be needed to meet those targets in 2030, 2045, and 2050. Their findings again dwarf the projections in the proposed ACT rule:

45 https://cleanairactionplan.org/documents/clean-truck-program-rate-workshop-presentation-8-1-19.pdf/ at 4.
46 https://innovation.luskin.ucla.edu/wp-content/uploads/2019/10/Zero_Emission_Drayage_Trucks.pdf at 5.
47 https://innovation.luskin.ucla.edu/wp-content/uploads/2019/10/Zero_Emission_Drayage_Trucks.pdf at 3.

Vehicle Type	2030 Pathway Results	2045 Pathway Results	2050 Pathway Results
Medium-duty vehicles	• 280,000 EVs (23% of stock)	• EVs = 67% of total stock • Hydrogen vehicles = 5% of total stock	• EVs = 75% of total stock • Hydrogen vehicles = 9% of total stock
Heavy-duty vehicles	• 23,000 EVs (6% of stock)	• EVs = 38% of total stock • Hydrogen vehicles = 20% of total stock	• EVs = 48% of total stock • Hydrogen vehicles = 27% of total stock

Source: SCE Pathway 2045, Appendices, https://www.edison.com/content/dam/eix/documents/our-perspective/201911-pathway-to-2045-white-paper-appendices.pdf

A major electric utility in the state is informing their long-term planning and investments assuming a substantially higher number of BE trucks than what ARB is proposing.

e. SUBSTANTIAL ECONOMIC AND HEALTH BENEFITS OF INCREASING STRINGENCY

In the Standardized Regulatory Impact Assessment (SRIA), ARB analyzed an alternative, strengthened ACT rule that would achieve a 10 percent target for ZEVs on the road in 2030. The SRIA identified economy-wide savings of $4.5 billion for California from 2020 to 2040. Moreover, the strengthened alternative would roughly double the NOx and PM2.5 emission reductions in 2031 result in further reductions in 2040. The reduced pollutant would result in $8.7 billion in health benefits, $3 billion more than the proposed ACT rule. It would also produce GHG reduction benefits ranging from $624 million to $2.7 billion through 2040.

ARB only conducted this analysis for a 10 percent on-the-road ZEV target by 2030. However, since our recommended more stringent sales targets and would result in a larger shift towards ZEVs, it is reasonable to assume even greater benefits.

IV. BEGIN COMPLIANCE FOR ALL CLASS IN 2024

As it is currently proposed, the ACT rule excludes Class 2b pickup trucks from the sales requirement until 2027. Class 2b pickups are part of the large and growing Class 2 segment that is not currently subject to mandatory zero-emission vehicle regulations. Given the size and expected growth of this truck class, impending ZEV deployment, and unregulated nature, Class 2b pickup trucks should be included in the ACT rule's sales requirement beginning in 2024.

In addition, for Class 2a trucks that currently fall under the passenger vehicle ZEV program, automakers receive the same credits for building a small passenger electric car as they would a larger Class 2a pick-up electric truck. Together with the large over compliance in the passenger vehicle ZEV program, there is

little regulatory push to electrify the Class 2a either. The result is a regulatory gap to push electrification of the Class 2a and 2b market over the next seven years.

This gap is problematic because over 6 million Class 2a and over 1 million Class 2b trucks are expected to operate in California in 2030 based on 2018 EMFAC 202x data. Compared to the other classes in the ACT rule, the Class 2 market overall is a large and attractive market for manufacturers. From a technology standpoint, electrification of the Class 2b truck market has much overlap with the light-duty and Class 2a pickup trucks. More could be done to push electrification of the Class 2 market more generally between the Advanced Clean Truck and Advanced Clean Cars regulations.

One explanation ARB staff has offered for the low ACT sales requirements is that they are choosing to place greater reliance on the upcoming fleet rule to expand the ZEV truck market. But because Class 2a and 2b pickup trucks, vans, and SUVs (gross vehicle weight of 6,000-10,000 lbs.) are such a large category of vehicles and are in many cases also personal vehicles, the proposed ACT regulation requirements on Class 2b vehicles will be unable to rely as heavily on fleet mandates. As a result, the logic of an ACT manufacturing sales mandate for the Class 2b pickup trucks should mirror that of the ACC regulation in being the primary driver.

Light-duty EVs are expected to grow to 16-17 percent of the on-the-road passenger vehicle fleet by 2030.[48] A feasible upper-end for personal ZEV truck purchases that fall under the ACT rule would be close to this, or about 15 percent on-the-road in 2030.

When ARB initially began developing the ACT rule two years ago the market for ZEVs, and electric medium-duty pickup trucks in particular, was very different than today. Now there are over 30 existing or forthcoming electric trucks targeting the Class 2 or 3 markets in either Europe or North America.

V. ACCELERATE THE FLEET RULE TO BE EFFECTIVE IN 2024

We agree with ARB on the importance of the future fleet rule which will work in tandem with the ACT rule by ensuring there is a strong demand for ZEV purchases. The certainty of demand for ZEV commercial trucks can send a clear signal to manufacturers, helping mitigate risk and enabling strategic manufacturing investments. Accelerating the fleet rule will also make it more feasible for new zero-emission truck start-ups to compete with legacy truck manufacturers. ARB staff has stated that the earliest they will propose the fleet rule is 2022. ARB should accelerate this timeline so that the proposed fleet rule can become effective simultaneously with the ACT sales requirement in 2024.

While we understand ARB's desire to collect more information on fleet and facility operations before finalizing the fleet rule, state and national datasets exist that could inform the initial development of the fleet rule. ARB should begin with existing data and augment as needed, rather than waiting for ACT rule's reporting requirements to be submitted.

[48] https://efiling.energy.ca.gov/getdocument.aspx?tn=223244

VI. ARTICULATE A GOAL FOR 100 PERCENT ZEVS

ARB currently lacks a longer-term goal for transitioning the entire medium- and heavy-duty truck fleet to ZEVs. Nor is there a clear trajectory for reaching 100 percent zero-emission trucks. In order to guide this rule and future, ARB should articulate goals for 100 ZEVs in each truck class. Further, ARB should demonstrate how reaching these goals is consistent with attaining state and federal air quality and GHG requirements.

VII. CONCLUSION

Transitioning California's on-road truck fleet to ZETs is essential to cleaning up air pollution from the transportation sector and meeting federal, state, and local commitments. Given the rapid advancement in electric truck technology, growing demand from fleets and investments from suppliers, and compelling economics underlying ZETs, the current proposal's sales requirements fall short and ARB should strengthen the ACT rule as outlined above.

We thank ARB for their hard work in developing this first-of-a-kind rule and for the opportunity to comment on its development. We look forward to continuing to engage throughout the process as ARB works to develop a robust and sustainable zero-emission medium- and heavy-duty truck market. Please feel free to reach out for any follow-up questions.