June 29, 2021

Board Members
South Coast Air Quality Management District
21865 Copley Drive
Diamond Bar, CA 91765

Re: Response to SCAQMD Staff Comments on Advanced Clean Fleets Regulatory Concepts

The undersigned coalition of environmental, public health, labor, and frontline freight community organizations, writes to express our deep disappointment in the South Coast Air Quality Management District (SCAQMD) recent requests to the California Air Resources Board (CARB) weaken the Advanced Clean Fleets rule by allowing natural gas trucks to satisfy zero-emission fleet requirements. This position is discrepant with CARB's goals in the Mobile Source Strategy, CARB's resolution approving the Advanced Clean Trucks Rule, the State legislature's goals under SB 350 calling for widespread transportation electrification, and Governor Newsom's Executive Order calling for a full transition to zero-emission trucks ("where feasible") by 2045. More importantly, it is in opposition to the demands of the communities most impacted by the pollution from these trucks, who have repeatedly and vociferously opposed continued policy support for combustion trucks. The District's arguments, which largely mirror those of the oil and gas industry, do not withstand scrutiny, and, at bottom, assume that impacted communities must compromise on their pollution control demands rather than ask the polluting industry to find ways to solve these issues. We urge the District to abandon its attempts to publicly subsidize the gas industry and adopt a problem-solving approach to transitioning to a zero-emission future.

False Narratives and False Solutions

Gas Trucks are Not Necessary to Address Air quality Standards.

Distressingly, the District tries to justify support for gas trucks as necessary for public health and attainment of the national ambient air quality standards for ozone in 2023 and 2031, and suggests the imminent failure to meet the 2023 attainment deadline 2023 attainment is the result if the State's "single-minded pursuit of zero emission technology."[1] Setting aside the disingenuousness of the District's blame throwing in the face of programs such as RECLAIM that have allowed refineries and other stationary sources to avoid basic controls for decades, the District staff offer no explanation as to how converting diesel trucks to gas trucks will provide for attainment, nor could they. District staff know that the issue for ozone attainment is nitrogen oxide emissions and that the retirement of pre-2010 diesel trucks in accordance with SB1 will mean that the trucks remaining on the road after 2022 will be 90 percent cleaner in terms of NOx. Moreover, beginning in model year 2024 all new trucks will be subject to lower NOx standards under the state Heavy-Duty Omnibus Rules. The incremental NOx reductions that trucks meeting the optional 0.02 g/hp-hr are not insignificant, but they are not the solution to the District's ozone nonattainment problem. To the contrary, investing in widespread adoption of new gas trucks means locking in these emissions and protecting these combustion trucks from regulation well beyond both the 2023 and 2031 attainment deadline, well beyond any conservative projection of when zero-emission trucks will be available, and beyond the 2035 deadline for transitioning all drayage trucks to zero-emissions. The District's recommendation to dilute the technology eligibility in the Advanced Clean Fleet Rule is particularly nonsensical as a 2023 attainment concern because the rule will not go into effect until 2023 for drayage trucks and 2024 for all others. The District's recommendation will not solve the region's ozone problem and, in fact, will make long-term attainment even harder.

Knowing they cannot demonstrate necessary NOx reductions for attainment even if trucks are converted to gas, District staff make broad claims about diesel particulate matter emissions and the health imperative. Again, the District makes no attempt to quantify the marginal emission reductions, nor can it support any claim of health benefits. While it is true that gas trucks do not emit "diesel" particles, they do still emit particulate pollution, including ultrafine particle pollution that has been linked to serious health impacts.[2] Indeed, a 2019 study of gas and diesel trucks emissions found that even though the emitted particle mass from certain gas engine technologies may be lower, the emitted particle number is much higher meaning the particle size is much smaller potentially creating new health concerns.[3] More study and health assessments are needed before the District proffers unsubstantiated health benefit claims from industry, and locks communities into decades of these new polluting trucks.

The air quality benefits of this transition are dubious at best, but the climate impacts are unequivocally bad. Even the incremental greenhouse gas benefits of burning gas rather than diesel can be undermined by the significant upstream emissions from extracting and then transporting gas across a leaky pipeline network. In the past five years, a growing number of studies have revised upward the scale of unaccounted-for leaks of methane from the gas delivery system—these new findings increase methane

[1] SCAQMD Letter at 3.
[2] https://www.transportenvironment.org/sites/te/files/publications/2020_06_TE_CNG_particle_report.pdf
[3] https://www.cenex.co.uk/app/uploads/2019/11/324-003-004-Dedicated-to-Gas-Assessing-the-Viability-of-Gas-Vehicles.pdf

gas's GHG emissions by anywhere between 60% to 500% above official estimates.[4] A recent U.N. report warns that the world must immediately slash methane emissions to stall near-term warming and avoid crossing irreversibly damaging climatic tipping points while we pursue rapid decarbonization.[5] Extending reliance on gas and gas infrastructure ignores this message. Unburnt fuel at refueling stations and natural gas vehicle tailpipes all add new sources of methane leakage that can make natural gas vehicles climatically worse than diesel vehicles.[6]

No one wants air that is safe to breathe more than the environmental justice organizations organizing to protect the public health of their communities – communities that live fenceline to truck hubs and corridors. These groups have completely rejected the notion that gas trucks help achieve their vision for public health.[7] They have long recognized, as has the State, that meeting both health-based air quality standards and urgent climate targets requires a wholesale transformation away from combustion altogether. These groups know that the District and gas industry are selling a false narrative to prop up a false solution.

Requiring a turnover first to brand new combustion trucks – even if they are incrementally cleaner – pushes the eventual switch to full zero-emission trucks out by decades. Frontline communities fighting for their public health have made clear that this is not a worthwhile exchange. We agree with them. There is no reason to split our focus and financial resources on vehicles that need to be retired to meet our air and climate goals. Plummeting battery costs, expanding manufacturing heft, and increasing variety and suitability make clear that zero-emission trucks are the future of freight transportation and that future is beginning now.

Gas Trucks Are Not Necessary to Replace Drayage Trucks to be Retired Under SB1.

Part of the District's health argument is that there is an urgency to supporting gas trucks now because a large number of pre-2010 trucks will be forced to retire next year under SB1, and only new gas trucks can fill the void that will be created. Again the narrative and the proposed solution are false and misleading.

While it is true that SB1 will force the retirement (or retrofit) of pre-2010 trucks by the end of next year, there is no analysis to support the claim that a massive investment in gas trucks is necessary to replace those trucks, or that such an effort would even be successful. The District's argument focuses primarily on the replacement of drayage trucks serving the Ports of LA and Long Beach. We have registry data showing the number of trucks in each model year, so we have a rough idea of the trucks that will be forced to retire. What we don't know is how many of these trucks will actually be replaced. We know that these truck owners are waiting until the very last minute to replace the oldest trucks on the road. We also know that the majority of these trucks average fewer than 10 container moves per week. We suspect many of these holdouts are marginal operators, squeezing out the last of their investment, with

[4] See, e.g. Plant et al, Large Fugitive Methane Emissions from Urban Centers Along the U.S. East Coast (July 2019(https://agupubs.onlinelibrary.wiley.com/doi/full/10.1029/2019GL082635, and Zachary Weller et al, A National Estimate of Methane Leakage from Pipeline Mains in Natural Gas Local Distribution Systems (June 2020) https://pubs.acs.org/doi/10.1021/acs.est.0c00437.

[5] https://www.unep.org/resources/report/global-methane-assessment-benefits-and-costs-mitigating-methane-emissions

[6] https://www.nature.com/articles/s41467-020-18141-0

[7] We have appended multiple letters from these organizations that state this clearly.

no plans for continuing after the end of 2022. Those that do plan to continue operating are extremely unlikely to replace their truck with a new gas truck even if subsidized. Incentive programs are difficult for marginal operators to use and will not be sufficient to discourage replacement with the next cheapest diesel. Again, before accepting the industry narrative that a massive investment in new trucks is necessary next year, the District must dig deeper into the data to demonstrate what is truly needed.

The notion that only gas trucks could fill whatever replacements are required next year is also false and misleading. The false premise of this argument is that any truck picking up a container at a port must be able to service any route, which means having a range of up to 600 miles. This is an operational *choice*, not a *requirement* for meeting drayage needs. A 2019 Luskin report found that trucks operating a single shift in a day can "easily" be replaced with battery electric trucks. Because trip distances are often very short, and long wait times at the Ports restrict the number of loads trucks take per day, shifts rarely require a truck to travel 600 miles. In fact, the vast majority of all tours reported in a 2019 GPS study that followed mainly natural gas trucks were less than 130 miles, with a significant peak around 30 miles. The Luskin Study concluded that the range of battery electric trucks is suitable for most daily drayage driving needs, and that to the extent there is variability in the maximum range a truck might need to drive, this concern can be mitigated by selectively tasking trucks to loads that their range can manage.

The presumption in the District's argument over the feasibility of replacing retiring diesel drayage trucks with zero-emission trucks is that such replacements might entail some change in operations at the ports and that requiring operators to figure out how to do this is not an option. **To the extent someone must compromise, it is assumed the public must accept more pollution rather than that industry must accept some cost or modify operations to make a near-term transition to zero-emissions work. We disagree that this is the most reasonable policy choice.** It is not the rational choice if, as the District suggests, it is motivated by air quality and health, nor is it the rational choice if the District is focused on cost.[8]

The Luskin Report specifically warns against meeting any short-term uptick in drayage truck turnover with natural gas trucks. The report explains that if investments focus on gas trucks as the primary replacement, the region will need more natural gas fueling stations. Given goals to transition to zero-emission trucks, these investments will inevitably be stranded. By contrast, an earlier transition to zero-emission trucks would mean fewer short-term investments and more focus on long-term development of charging infrastructure. Two sharp fleet transitions – first to a gas majority fleet and then to a zero-emissions majority fleet – in about 10 years will "cause disruptions and unnecessary costs." Focusing on gas trucks wastes the short-term replacement opportunity created by SB1 by transitioning to gas trucks instead of buying down a significant part of the long-term transition to zero-emissions.

Correcting the Record on Zero-Emission Technologies

Repeatedly, District staff's public technology assessments appear to be at odds with nearly every other technology review, other than those funded by the gas industry. While technology forecasts are inherently uncertain, the track record to date has been to underestimate the rapid developments of zero-emission technologies. We are aware that much of the District's position is informed by private conversations with manufacturers, but these private statements are at odds with their own public

[8] CITE 2035 Report and benefits of aggressive electrification investments.

statements, developments occurring elsewhere around the world, and assessments by independent authorities. In weighing these private statements against the considerable information to the contrary, the District should be mindful of industry incentives to recoup sunk costs in gas investments, and should adopt a problem solving approach rather than taking industry complaints as the final word. We hope that the District's repeated advocacy in favor of including natural gas trucks, which echoes the same talking points as both the natural gas industry and the Western States Petroleum Association, is merely a consequence of under-accounting for the significant progress that zero-emission trucks have made in the past two years alone. In the rest of our letter, we explain how the exponential growth in manufacturer interest, the plummeting cost of battery technology, and the expanding reach of ZEV operational suitability should all assuage the District's concerns about a clear focus on the wholesale transition to zero-emissions.

Model Availability and Manufacturer Capacity

Over the past 5 years, commercial interest in the electrification of heavy-duty vehicles has surged, with both manufacturers and fleets making significant commitments.[9] Cummins, Ford, Freightliner, Mack, Navistar, Nikola, Mitsubishi Fuso, Peterbilt, Tesla, and Volvo all have announced plans for commercial products, with Volvo (the second largest truck maker in North America) and Peterbilt (as part of PACCAR, the third largest truck maker in North America) beginning mass production of ZE tractors this year.[10] A wide range of ZE trucks are already commercially available. BYD has been delivering electric trucks for more than a year and has more than 12,000 on the roads globally.[11] **As of 2021, there are 48 medium-duty, 29 heavy-duty, and 40 bus models that are electrified.**[12] CALSTART's Zero-Emission Technology Inventory tool (ZETI) tracks availability of medium- and heavy-duty (M/HD) EV's by OEM and vehicle type currently and in the near term.[13] Dozens of new models are anticipated in the next two years alone.[14]

Because the rule will not take effect until 2023 for drayage trucks and 2024 for all others, it is important to recognize not just the state of ZE heavy-duty manufacturing today, but the trajectory of advancement. We know already that the pace of change has disrupted regulators' analysis of feasibility. Within the course of the California Air Resources Board's rulemaking for the Advanced Clean Trucks rule, new OEM announcements forced CARB staff to revise upward their ZE targets for manufacturers' sales.[15] In their updated analysis on increasing sales requirements, Staff noted that "the large number of ZEVs launched before the regulation begins [and] the more established ZEV marketplace…support higher ZEV sales requirements in the earlier years and is consistent with Board direction and many public comments seeking to increase the number of ZEVs deployed."[16]

[9] ICCT, Race to Zero, (Oct 2020) https://theicct.org/sites/default/files/publications/Canada-race-to-zero-EN-oct2020.pdf
[10] https://ww2.arb.ca.gov/sites/default/files/2020-09/200918presentation_ADA.pdf
[11] BYD Delivers 100th Battery-Electric Truck in the United States - BYD USA
[12] http://blogs.edf.org/climate411/files/2021/04/EDF_EV_Market_Report_April_2021_Update.pdf
[13] https://globaldrivetozero.org/tools/zero-emission-technology-inventory/
[14] https://www.ucsusa.org/sites/default/files/2019-12/ReadyforWorkFullReport.pdf
[15] ACT 15-Day Notice Attachment B - Justification for Increased Numbers
[16] Id.

That same trend continues now, but faster. In the last year alone, attention and investment from OEMs has intensified. A report by ICCT that summarized the availability or planned production of 125 zero-emission commercial vehicles as of July 2020 already requires updating (the author's suspected it would, given "new zero-emission products being announced on nearly a weekly basis").[17] Since then, Ford announced it would commit $22 billion to electrification (nearly twice what it had previously announced) and said that for its commercial vehicles, they expected two-thirds of sales to be battery electric or plug-in hybrid electric vehicles by 2030.[18] In January, Volvo (which has committed to 50% of its European truck sales being zero-emission) created a new business area dedicated to accelerating medium- and heavy-duty electrification, focused on battery supply chain circularity and providing customer solutions for charging infrastructure.[19] In Europe, where emissions standards for trucks are already in place, OEM announcements have been even bolder. Daimler, Scania, MAN, Volvo, DAF, IVECO and Ford (seven of Europe's largest truck manufacturers) committed to phasing out all diesel trucks by 2040.[20] Daimler (the largest truck maker in North America) set a goal in its 2020 annual report to sell only carbon-neutral vehicles by 2039 across all of their markets, including the United States.[21] It has already begun taking orders for its all electric eM2 box truck and its eCascadia class 8 semi and will begin commercial production in 2022.[22]

Even without the same depth of policy support as Europe or China, OEMs are shoring up zero-emission manufacturing capacity for their heavy-duty vehicles, with new factories announced in Colorado, Indiana, and North Carolina.[23] Mercedes is investing $60 million in South Carolina to develop its eSprinter vans.[24] Navistar's new San Antonio Plant will now also produce electric trucks. Arrival's President said the South Carolina "microfactories" can produce up to 10,000 vans per year.[25] Volvo is embracing a strategy to be able to ramp production quickly as needed to meet demand and in a cost effective way and said in a recent annual report:

> An important key is our modular vehicle architecture that allows us to put either an internal combustion engine or an electric driveline in the same chassis. In this way, we reduce development time, costs and can enter the market faster with new offers. In addition, we can manufacture different variants on the same assembly line, which again reduces costs and enables us to scale up volumes quickly when conditions are right.[26]

As OEM's manufacturing capacity scales up, so too have their service arrangements and warranties. Rivian recently one-upped Tesla by offering an 8-year warranty (or 175,000 miles) on their pickup and SUV batteries.[27] Tesla is rolling out servicing and maintenance networks for its semi-trucks to match its

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[17] ICCT, Race to Zero, (Oct 2020) https://theicct.org/sites/default/files/publications/Canada-race-to-zero-EN-oct2020.pdf at 2.
[18] http://blogs.edf.org/climate411/files/2021/04/EDF_EV_Market_Report_April_2021_Update.pdf
[19] https://www.volvogroup.com/en/news-and-media/news/2021/jan/news-3876656.html
[20] http://blogs.edf.org/climate411/files/2021/04/EDF_EV_Market_Report_April_2021_Update.pdf sca
[21] https://www.daimler.com/sustainability/climate/ambition-2039-our-path-to-co2-neutrality.html
[22] https://daimler-trucksnorthamerica.com/company/newsroom/
[23] http://blogs.edf.org/climate411/files/2021/04/EDF_EV_Market_Report_April_2021_Update.pdf
[24] Id.
[25] https://www.greenbiz.com/article/keep-your-eyes-these-9-electric-truck-and-van-companies-2021
[26] https://www.volvogroup.com/content/dam/volvo/volvo-group/markets/global/en-en/investors/reports-and-presentations/annual-reports/annual-and-sustainability-report-2020.pdf
[27] https://rivian.com/support/article/what-is-the-warranty-coverage-on-a-new-rivian

customer service for cars, hiring technicians for its new "Semi Service Program."[28] All Volvo VNR Electric trucks are sold in combination with the Volvo Gold Contract, a service contract specifically designed for battery electric vehicles that includes maintenance, towing, unplanned repair and uptime services[29]. Volvo is also opening a new training center in Hayward, California on June 1st in part to support battery-electric vehicle (BEV) training efforts for the Volvo VNR Electric, supplying programs for company employees, technicians, dealer sales staff and aftermarket personnel, as well as drivers and fleet customers. Daimler recently announced products and services to support fleets and customers in the deployment of all-electric trucks. Under the top-tier package, customers receive assistance with planning for charging infrastructure, solar panels, and stationary energy storage projects, along with the support of the "eConsulting" team to interface with local utilities on their behalf.[30] Volvo, Peterbilt, Proterra, Lightning eMotors, BYD and Lion Electric also offer infrastructure planning and implementation, and several of them offer financing services.

Leasing companies are also deploying electric vehicles and developing the maintenance and service capabilities to support them. For example, Penske Truck Leasing's electric vehicle program is supporting Core-Mark International, Inc., with the deployment of a battery-electric Freightliner eCascadia into its fleet. The electric truck fleet is supported by a network of heavy-duty electric vehicle charging stations at six Penske Truck Leasing facilities in Southern California. Penske also performs preventive maintenance at these locations.[31]

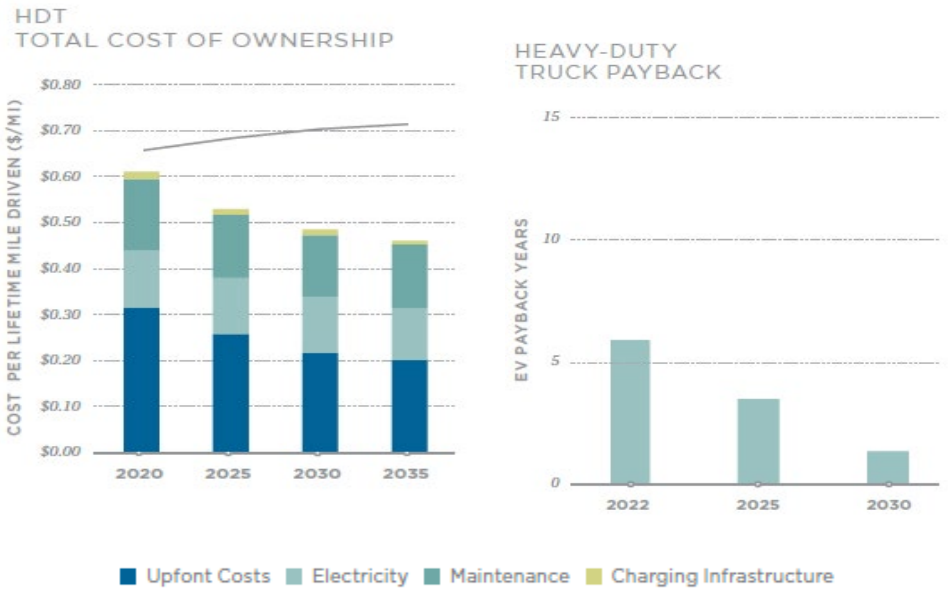
Electric Trucks Have (Increasingly) Positive Total Cost of Ownership

For many uses today, it can cost truck owners operating electric M/HD vehicles less to operate than diesel or gasoline fueled vehicles on a total cost of ownership (TCO) basis. And the economic trends forecast that the amount of savings will continue to grow over the next several years as battery costs continue to decline and cost effective manufacturing innovations increase with economies of scale and competition.

The reduced costs of electricity as a fuel compared to diesel, reduced maintenance costs and Low Carbon Fuel Standard credits (LCFS) in many cases are more than enough to cover the currently higher up-front cost of the electric truck over the life of the vehicle. Since most M/HD vehicles are financed, even when including the finance costs, a truck owner acquiring a new electric truck can begin receiving positive savings and cash flow from day one compared with a similar internal combustion engine (ICE) vehicle.

The recent 2035 Report 2.0: Plummeting Costs and Dramatic Improvements In Batteries Can Accelerate Our Clean Transportation Future[32] from UC Berkeley's Goldman School of Public Policy explains how a 100% zero-emission transportation system can be achieved while lowering costs. The report shows the favorable TCO for various truck classes. The heavy-duty truck TCO is summarized in the charts below.

[28] https://electrek.co/2021/04/12/tesla-semi-launch-semi-service-program-surprising-location/
[29] https://www.volvotrucks.us/trucks/vnr-electric/
[30] https://daimler-trucksnorthamerica.com/PressDetail/daimler-trucks-north-america-launches-detroit-2021-05-03
[31] https://www.prnewswire.com/news-releases/penske-deploys-battery-electric-truck-with-core-mark-301103050.html
[32] https://2035report.com/transportation/



The left chart shows the TCO for an EV truck while the TCO for the comparable diesel vehicle is shown in the gray line above. The TCO for the electric vehicle starts out as positive compared to the diesel and gets substantially better through 2035. The right chart shows the EV payback in years. In 2022, the payback is a little less than 6 years, and decreases rapidly to less than two years by 2030.

Similar results for other M/HD truck classes including for Class 2b/3, 4-5, and 6-7 medium-duty vehicles show lower TCOs for EV trucks in 2020 compared to combustion vehicles and the TCO's improving significantly through 2035.[33]

Another recent study released by Lawrence Berkeley National Laboratory concludes that "at the current global average battery pack price of $135 per kilowatt-hour (kWh) (realizable when procured at scale), a Class 8 electric truck with 375-mile range and operated 300 miles per day when compared to a diesel truck offers about **13% lower total cost of ownership per mile, equating to a roughly 3-year payback and net present savings of about $200,000 over a 15-year lifetime.**"[34]

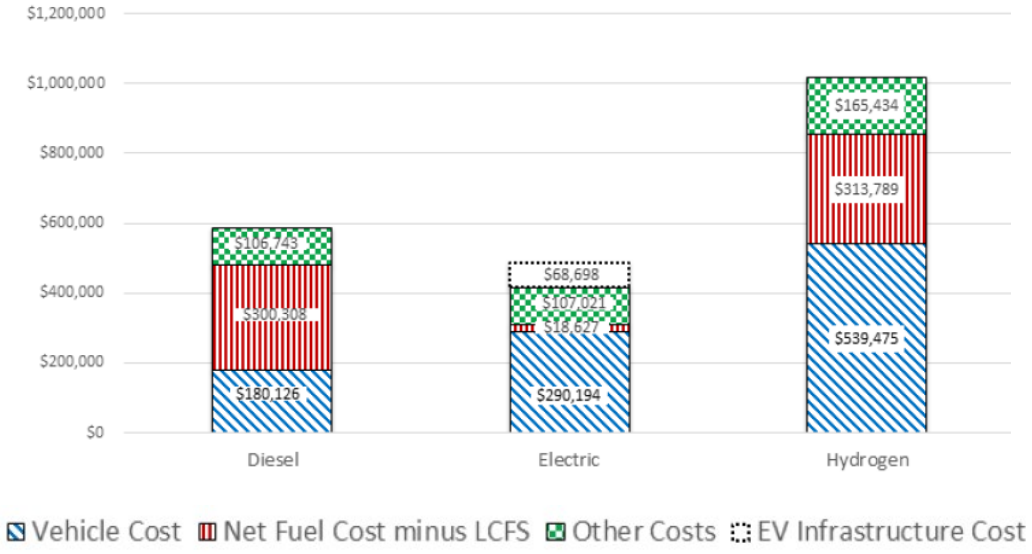
Two years ago, CARB's total cost of ownership study for the Advance Clean Truck (ACT) rule published in February 2019[35] showed a positive TCO for a day cab tractor in 2024 compared to a diesel as depicted below.

[33] These results can be seen in the report's "Data Exploer" here: https://www.2035report.com/transportation/data-explorer/

[34] https://eta-publications.lbl.gov/sites/default/files/updated_5_final_ehdv_report_033121.pdf

[35] https://ww2.arb.ca.gov/sites/default/files/2020-06/190225tco_ADA.pdf

Figure 17: Total Cost of Ownership for a 2024 short-haul day cab tractor – 54,000 mi. x 12 years



In 2024, the total TCO savings for the electric truck over 12-year life is $102,639 for a 17% saving. In 2030, this rises to over $150,000 for a 26% saving. This cost includes infrastructure, electricity plus LCFS credits, maintenance, and sales and federal excise taxes. It doesn't include utility support for infrastructure or HVIP funding, which would further improve TCO. CARB is currently working on an updated TCO analysis for the Advanced Clean Fleets (ACF) rule, which should be available within 60 days and is expected to show even more positive results than the 2-year old ACT study did.

The key contributors to positive TCO's for M/HD vehicles are shown below. These values come from CARB's ACT TCO study for a regional or day cab tractor as an example.

Cost of Fuel (before LCFS)	**Type**	**Cost per Mile**	**Annual Cost at 54,000 mi/year**
	Diesel	$0.55/mile	$29,700
	Electric (grid)	$0.27/mile	$14,580
Cost of Fuel (with LCFS)	Diesel	$0.55/mile	$29,700
	Electric (grid)	$0.02/mile	$1,080
Cost of Maintenance[36]	Diesel	$0.19/mile	$10,280
	Electric	$0.14/mile	$7,560
Electric Savings with LCFS	-	**Annual**	**$31,340**
		5-year	**$156,700**

All reasonable analyses forecast continually favorable EV truck TCO relative to diesel, based largely on the following three factors:

- **Plummeting battery costs** – according to BNEF, current battery costs are $137/kWh and by 2030 they will be $56/kWh. Daimler's new eCascadia class 8 semi has a range of 250 miles and a 475 kWh battery. At current prices, this battery would cost $65,000. By 2030 the cost would be

[36] CARB's 2019 estimates, shown here, are 25% lower maintenance costs. In the updated TCO for the ACF rule, CARB includes references to up to 50% lower maintenance costs, so savings would be even greater for the EV.

$27,000 for a savings of $38,000 or a 42% cost reduction and should also lower the cost of the electric truck by that amount.

- **Economies of scale** – As more OEMs invest resources into the EV space, many are innovating manufacturing to simplify designs and support flexible platforms that can accommodate a number of sizes and type of vehicles with a standard set of components. For example, Proterra's modular battery platform **"**enables customizable battery pack dimensions that can easily be configured to megawatt-hour scale systems that fit within a variety of heavy-duty vehicle platforms…Up to four packs can be configured in series, and 16 can be connected in parallel, to provide a wide range of capacity and packaging options for different types of electric vehicles."[37] This flexible design can be used by a wide range of commercial vehicles. GM, New Flyer and others are implementing similar strategies.
- **Competition –** In California, CARB's ACT rule will require all M/HD vehicle makers to start producing and selling at least 5% of their annual sales as EVs beginning no later than 2024. Nearly all major M/HD vehicle makers have made announcements to produce electric vehicles – most in the near future. Competition is expected to be higher in the EV space than currently for conventional combustion vehicles because not only are there all the legacy truck makers, but a host of new electric-only entrants including BYD, Arrival, Xos, SEA Electric, Lordstown Motors, Lightning eMotors, Motiv, Bollinger, Chanje, Rivian, Fluid Trucks, Proterra, Green Power Motor Company and others. Tesla is expected to begin limited production of its semi this year with commercial production in 2022. They have announced that their 300-mile range truck will cost $150,000.

Many M/HD EVs have lower TCOs today compared to combustion vehicles and they will continue to get lower over time as their up-front costs decline. We acknowledge that simply because an investment is rational does not make it easy – upfront capital for new trucks and infrastructure is expensive and requires careful planning and access to financing. But the solution is certainly not to encourage investment in new natural gas infrastructure, which we will inevitably need to move away from. Instead, policies and incentives should provide clear and certain direction to fleets, manufacturers, EVSE companies, utilities, and financing institutions about the industry transitioning to all zero-emission vehicles.

Electrification Can Meet Most Vehicles' Needs

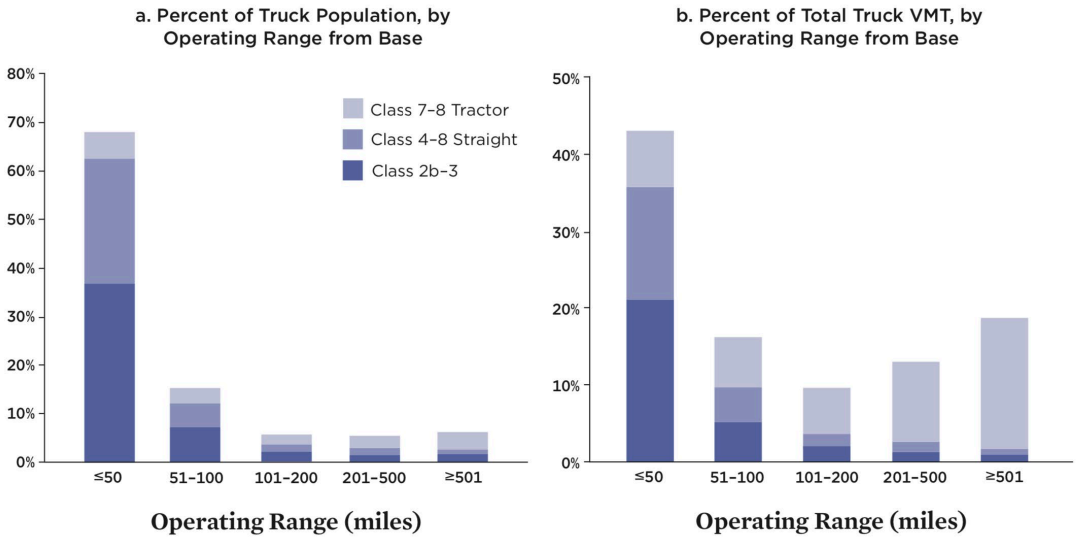
A common question about electric vehicles is whether their range can meet the needs of a given application. The Luskin Report discussed above answered this question specifically for drayage operations at the San Pedro Ports, and the evidence demonstrates that today's battery technology is also suitable for many other uses of trucks and buses.

Analysis of the Vehicle Inventory and Use Survey[38] by the Union of Concerned Scientists indicates that many trucks and buses operate over short urban routes and stop frequently.[39] Nationally, more than 80 percent of all heavy-duty trucks (Class 2b and above) have a primary operating range (the farthest

[37] https://www.proterra.com/proterra-powered/battery-technology/
[38] US Census Bureau (USCB). 2004. Vehicle Inventory and Use Survey. Washington, DC. Online at http://web.archive.org/web/20150405052852/http://www.census.gov/svsd/www/vius/ Revised2002MDF.zip
[39] https://www.ucsusa.org/resources/ready-work

distance from the vehicle's home base) of less than 100 miles; **nearly 70 percent have an operating range of less than 50 miles.**[40]

Operating Range of Heavy-Duty Trucks



Many heavy-duty trucks operate within 100-mile ranges (left), and many vehicle miles traveled (VMT) are attributable to trucks with operating ranges less than 100 miles (right). These trucks are particularly well-suited to early electrification efforts.

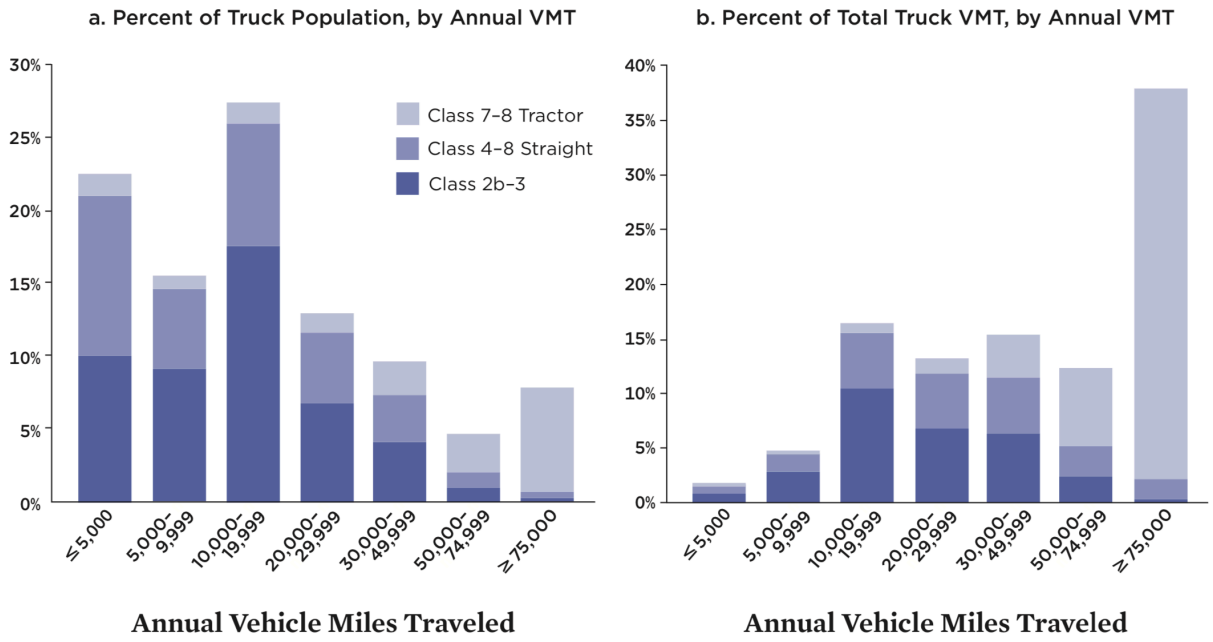
SOURCE: USCB 2004.

Data on annual mileage further illustrate the nature of trucks' daily operation. More than 75 percent of heavy-duty vehicles travel 30,000 miles or less each year (120 miles per day, assuming they operate five days per week and 50 weeks per year); 65 percent travel less than 20,000 miles each year (80 miles per day, assuming they operate five days per week and 50 weeks per year). These daily distances are well within the range of existing heavy-duty electric vehicles on a single charge or tank of hydrogen—from roughly 90 miles to 500 miles or more, depending on the vehicle's make and model. Especially well-suited for electrification are fleet vehicles operating in defined areas and parked at central depots where they can recharge.

[40] Excluding Class 2b vehicles does not significantly affect the fraction of vehicles with operating ranges less than 50 or 100 miles. Eighty percent of Class 3–8 trucks have a primary operating range of less than 100 miles; 63 percent have an operating range of less than 50 miles. An updated survey of heavy-duty vehicles in California found similar weighted-distributions of vehicle population (by truck class and vehicle age) and vehicle miles traveled (by truck class, but not commodity) from 2002 and 2017, suggesting results from the 2002 vehicle inventory and use survey (VIUS) still roughly reflect present- day trends in the truck industry in the absence of a newer national VIUS
and despite a small sample size for pickup trucks in the 2002 survey. See:
Komanduri, A. 2019. Oral presentation, Southern California Association of Governments (SCAG) Modeling Task Force, Los Angeles, CA. January 23. Online at *www.scag.ca.gov/committees/CommitteeDocLibrary/mtf012319_CAVIUS.pdf* and Birky, A., M. Laughlin, K. Tartaglia, R. Price, B. Lim, and Z. Lin. 2017. Electrification beyond light duty: Class 2b-3 commercial vehicles. Oak Ridge, TN: Oak Ridge National Laboratory. Online at *https://info.ornl.gov/sites/publications/Files/Pub72938.pdf*

Conversely, a small percentage of vehicles, consisting almost exclusively of Class 7 and 8 semi, or tractor, trucks, travel many miles each year and account for a large fraction of the total miles traveled by heavy-duty vehicles. Vehicles with annual mileages greater than 50,000 miles (200 miles per day, assuming they operate five days per week and 50 weeks per year) make up about 10 percent of heavy-duty vehicles yet account for about 50 percent of the total miles traveled within this sector. However, many Class 7 and 8 tractors have lower annual mileages. A similar number of trucks in these categories travel less than 50,000 annual miles (45 percent) as trucks traveling more than 50,000 annual miles (55 percent).

Annual Mileage of Heavy-Duty Trucks



Many trucks have annual mileages that suggest compatibility with today's battery and fuel cell technologies (left), although a small fraction of vehicles account for the bulk of the total miles traveled by trucks (right).

SOURCE: USCB 2004.

While semi-trucks are often considered more challenging to electrify, several manufacturers (e.g., BYD, Daimler, Tesla, Volvo, Xos) have developed and are testing such vehicles in real-world operations. These demonstrations are proving it is entirely possible to electrify a vehicle segment once thought a moonshot. And recent analyses, as discussed in greater detail above, indicate similar if not lower total costs of ownership for vehicles purchased within the next 5 to 10 years, if not earlier, for electric semi-trucks compared with diesel, whether operating in long-haul or regional contexts.[41]

[41] California Air Resources Board (CARB). 2019. Advanced Clean Trucks: Total cost of ownership discussion document. Sacramento, CA. Online at http://ww2.arb.ca.gov/sites/default/ files/2019-02/190225tco_0.pdf

Di Filippo, J., C. Callahan, and N. Golestani. 2019. Zero-emission drayage trucks: Challenges and opportunities for the San Pedro Bay ports. Los Angeles, CA: University of California–Los Angeles. Online at https://innovation.luskin.ucla.edu/wp-content/uploads/2019/ 10/Zero_Emission_Drayage_Trucks.pdf

The figures above showing operating ranges and annual mileages present average values. Some types of vehicles will operate above and others below those averages. For example, drayage trucks, which carry cargo to and from ports, railyards, and distribution centers, travel a wide range of distances depending on whether they operate near the port or travel to warehouses on the far side of the region they serve. But even considering the varied nature of truck and bus operations, the data indicate that today's technology offers opportunities for electrifying every type of heavy-duty vehicle.

Conclusion

Our groups share the District's view that near-term emissions reductions are an urgent priority for both public health and the planet. But we fear that the District's continued advocacy in support of reduction pathways that rely on combustion are at cross-purposes with this goal – splitting resources and investment focus on multiple fuel types and deferring the transition to zero emissions by another full vehicle lifetime. These outcomes are as unwise as they are unnecessary. Instead the District must focus on ensuring that the inevitable transition to zero-emission freight happens at the speed and scale necessary to meet our health and climate goals.

Sincerely,

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