

To: **Liane M. Randolph, Chair**
Honorable Board Members

From: Steven S. Cliff, Ph.D., Executive Officer



Date: February 10, 2023

Subject: **Advanced Clean Fleets Regulation High Priority Fleet Size Analysis**

On October 27, 2022, the California Air Resources Board (CARB or Board) held its first of two Board hearings on the proposed Advanced Clean Fleets (ACF) regulation. The regulation is the next major step in accelerating the transition of medium- and heavy-duty truck market to zero-emissions vehicles (ZEV). During the hearing, the Board agreed with a number of proposed changes and directed staff to provide the Board with additional information. This memo is in response to questions about fleet size and how emissions benefits are distributed throughout the State.

The proposed ACF regulation itself was developed in response to the Board direction from the Advanced Clean Trucks (ACT) regulation in June 2020. At that hearing, the Board approved a zero-emission truck sales requirement, a fleet reporting requirement, and approved a resolution directing staff to begin developing a fleet regulation to complement the manufacturer sales requirements. In late 2022, the Board also approved the State Implementation Plan with a future Zero-Emission Truck Measure. This future measure would require all fleets to transition to ZEVs and would be considered by the Board in 2028. Finally, at various hearings, the Board has also expressed support for making additional changes to the manufacturer ZEV sales requirements to better align manufacturer requirements with fleet requirements to ensure a complete and smooth transition towards a zero-emissions future.

The proposed ACF regulation is a key part of the comprehensive strategy to accelerate the widespread adoption of ZEVs in the medium- and heavy-duty truck sector. It contributes to meeting public health needs, climate targets, and zero-emission vehicle targets established in governor's executive orders. Specifically, the proposed ACF regulation would require certain fleets to deploy ZEVs starting in 2024 and would establish a clear end date of new medium- and heavy-duty internal combustion engine vehicle sales. The proposed ACF regulation would affect all drayage trucks, all public fleet vehicles and commercial fleets that are most suited to electrification representing about two-thirds of California's tractor fleet.

During the October 27, 2022, Board hearing, several Board members requested additional information regarding the potential impacts of changing the fleet size threshold for high priority fleets. Currently, the proposed regulation for high priority fleets impacts any fleet with \$50 million in revenue or fleets with 50 or more vehicles including vehicles under common ownership and control. The high priority fleet size threshold (of 50 or more vehicles) is supported by data collected from fleets in 2020 as was required by the ACT regulation. The proposed ACF regulation ensures that the early ZEV market is being accelerated by

fleets that are most suited to begin a major transition towards electrification, it ensures the maximum feasible reductions are achieved in highly impacted communities, and takes into the account practical timelines to deploy a public infrastructure network while preserving access to incentive funding for fleets that need it the most.

Below is a summary of the different components of the proposed ACF regulation, information about the methodology used to estimate the number of trucks in fleets and potential impacts from reducing the fleet size threshold from 50 or more vehicles to fleets with 10 or more tractors, and a more granular analysis of the geographic distribution of emissions benefits presented in the initial statement of reasons. This memorandum provides the methodology and results of this analysis.

High Priority Fleets

The high priority and federal fleet requirements apply to any fleet owner who owns or operates 50 or more Class 2b-8 vehicles including vehicles under common ownership and control, any fleet with greater than \$50 million in annual revenue, and federal government agencies. High priority fleets must transition to ZEVs by meeting the Model Year Schedule, or opt into the ZEV Milestone Option:

- Model Year Schedule: Beginning January 1, 2024, all additions to the fleet must be ZEVs, and all ICE vehicles must be removed from the California fleet at the end of their minimum useful life. A vehicle’s minimum useful life is defined in Health and Safety Code section 43021(a) and means when the vehicle has exceeded 13 years and 800,000 miles or when it exceeds 18 years.
- ZEV Milestones Option: ZEV phase-in requirement where a portion of the fleet must be zero-emissions based on the schedule in Table 1.

Table 1: High Priority and Federal Fleet ZEV Phase-In Schedule

Group	Percentage of Fleet that Must be ZEVs	10%	25%	50%	75%	100%
1	Box trucks, vans, two-axle buses, yard trucks, light-duty delivery vehicles	2025	2028	2031	2033	2035
2	Work trucks, day cab tractors, three-axle buses	2027	2030	2033	2036	2039
3	Sleeper cab tractors and specialty vehicles	2030	2033	2036	2039	2042

Staff identified businesses with \$50 million or greater in annual revenue using a list of 115,000 businesses from the financial analysis firm Dun & Bradstreet.¹ A unique identification number, the Duns Number, was recorded for each business with a California address on the list and cross-compared with businesses who registered at least one medium- or heavy-duty vehicle registered with the Department of Motor Vehicles (DMV). Staff then used the 2019 DMV and California International Registration Plan (IRP) registration databases to identify

¹ *Dun & Bradstreet*®, acquired from internal communication with CARB’s Mobile Source Control Division (MSCD). For more information please see: <https://www.dnb.com/>

businesses or fleet owners with 50 or more vehicles registered under the same name or address. All the California registered (DMV and IRP with California registrations, or CAIRP) vehicles with unique vehicle identification numbers who satisfy the above criteria were flagged as vehicles owned by high priority fleets. Out-of-state fleets with 50 or more vehicles registered were identified by flagging those operated in California with non-California registrations in the IRP database.

Staff then estimated the number of vehicles operating under common ownership and control on behalf of high priority fleets using the ACT Large Entity Fleet Reporting data. The reporting data suggested the ratio of subhauler population to that of direct ownership is approximately 1 to 5, and thus 20 percent more vehicles were included in the affected population to reflect vehicles under common ownership and control. In summary, staff identified roughly 108,000 tractors directly regulated by the high priority fleet requirements which corresponds to 129,600 tractors when accounting for vehicles under common ownership and control.

Drayage Trucks

The drayage truck requirements apply to Class 7-8 heavy-duty trucks transporting containerized, bulk, or break-bulk goods, empty containers or chassis' to and from California's intermodal seaports and railyards. Under these requirements, beginning January 1, 2024, all drayage trucks newly added to CARB's registry must be ZEVs and all drayage trucks must be ZEVs by 2035. Existing combustion-powered legacy drayage trucks can continue to operate until they exceed their minimum useful life (using the same definition as the high priority fleet Model Year Schedule).

Staff estimates roughly 34,400 drayage trucks will service California's seaports and intermodal railyards in 2024. Information on individual trucks visiting the Port of Los Angeles/Long Beach and Port of Oakland in calendar year 2019 were provided by those ports directly, while the inventory for other seaports was estimated based on past survey data. The drayage inventory for trucks serving intermodal railyards was estimated based on aggregated information provided by Union Pacific Railroad and Burlington Northern and Santa Fe Railway.

Changes to the high priority fleet size threshold does not have an impact on the drayage truck requirements; as a result, the drayage truck requirements remain constant under all fleet size scenarios.

State and Local Government Fleets

State and local government fleets include any California cities, counties, public utilities, special districts, and State government agencies that own a Class 2b-8 vehicle. Affected fleets must purchase ZEVs when adding vehicles to their fleet based on the following schedule:

- 50 percent of purchases must be ZEVs beginning January 1, 2024, except for fleets in designated low-population counties
- 100 percent of purchases must be ZEV beginning January 1, 2027

State and local government fleets do not own a significant number of tractors and are not further analyzed in this paper. The Board approved additional changes for state and local government fleets that are not summarized here.

100 Percent Manufacturer Sales Requirement

The proposed regulation additionally sets an end date for new internal combustion-powered medium- and heavy-duty vehicle sales in California. This piece of the proposal is critical for meeting the state's carbon neutrality target and the goals laid out in the Governor's executive order. The 100 percent requirement also sends key market signals to the trucking market including manufacturers, fleets, infrastructure providers, service technicians, and local governments.

As this is a manufacturer requirement, this component of the regulation does not increase the number of tractors regulated and is not further analyzed in this paper.

Fleet Size Methodology

This analysis is performed using the same emissions inventory methodology used in the ACF Staff Report. Staff developed emissions inventories of the baseline and proposed regulation scenario using the EMFAC2021 model.² EMFAC2021 is the latest emissions inventory model that CARB uses to assess emissions from on-road motor vehicles including cars, trucks, and buses in California, which reflects CARB's current understanding of statewide and regional vehicle activities and emissions. The latest version of EMFAC2021 includes existing regulations approved by the Office of Administrative Law and includes recently adopted regulations such as the ACT regulation and the Heavy-Duty Low NOx Omnibus regulation.

During development of the ACF regulation, the Heavy-Duty Inspection and Maintenance (HD I&M) regulation had not been approved by the Office of Administrative Law and as a result was not included in the baseline emissions calculations. Likewise, the US Environmental Protection Agency has recently published its Clean Truck Plan (CTP) affecting heavy-duty vehicles. For consistency with the ACF Staff Report, the fleet size analysis is presented without the impacts of the HD I&M regulation or federal CTP. This analysis also does not include any other changes suggested by the Board during deliberations such as accelerating the 100 percent manufacturer sales requirement to 2036 or providing additional time to wastewater or waste fleets involved in organic waste diversion.

² California Air Resources Board, *EMFAC2021*. Web platform available at <https://arb.ca.gov/emfac/>, May 2022

Fleet Size and Number of Fleets Regulated

Table 2 summarizes the estimated number of tractors regulated by the proposed regulation at the current fleet size threshold of 50 or more vehicles or by lowering the threshold to include fleets of 10 or more tractors. Other vehicle types are excluded from this table. A small subset of these vehicles will be required to turnover to zero-emission technologies in 2024.

Table 2: Estimated Number of Tractors and Fleets Affected in 2024

	Current Proposal 50 or more vehicles	Alternative Proposal 50 or more vehicles and 10 or more tractors	Net Change
High Priority Tractors	129,600	191,100	61,500
Drayage Trucks	34,400	34,400	0
Total California Tractor Population	245,800	245,800	0
Percentage of Tractors Regulated	67%	91%	24%
High Priority Fleets Directly Regulated	1,700	4,000	2,300

Under the proposed regulation presented to the Board at the October 2022 Board Hearing, 67 percent of the State’s tractor fleet would be subject to the regulation. By lowering this threshold to 10 or more tractors, this would increase to 91 percent of tractors.

Staff estimates that in the current proposal, 1,700 fleets would be regulated under the high priority and federal fleet requirements. Lowering the fleet size is expected to increase this number to roughly 4,000 fleets.

Future Zero-Emission Truck Measure

As part of the State Implementation Plan, the Board committed to a new Zero-Emission Truck Measure which would accelerate the transition of the remainder of California’s medium- and heavy-duty truck fleet to ZEVs. The Zero-Emission Truck Measure is scheduled to be presented to the Board in 2028 and begin implementation in 2030. Staff will evaluate a variety of strategies to achieve this goal, such as using market signal tools such as differentiated registration fees, restrictions and fees for combustion trucks entering low and zero-emission zones, and/or indirect source rules which could allow for a smoother and more equitable path to get to a 100 percent zero-emission California fleet. This combination of policies would help ensure that we are moving as quickly as possible to a zero-emission trucking future, everywhere feasible. Staff will also have an opportunity to update the ACT regulation and check-in on implementation of the proposed ACF regulation.

Other Considerations

Lowering the fleet size threshold in the ACF regulation would bring in additional fleets and vehicles. However, staff do not have the same level of detailed information about those fleets as there is for high priority fleets. When the Board approved the ACT regulation, the decision was made to collect information from fleets with 50 or more trucks or with revenues above \$50 million. Staff believe that bringing in more fleets that are more likely to be dependent on retail infrastructure and often buy used vehicles, will present more challenges for them, but we do not have sufficient data at this time to fully inform a recommendation to lower the fleet size in this proposed regulation.

- Fleets with less than \$50 million in revenue and less than 50 vehicles may have more limited access to capital as compared to other fleets. The higher costs for ZEVs and infrastructure create an upfront cost barrier which must be addressed. While ZEVs are expected to have a lower total cost of ownership over the vehicle's useful life versus their combustion-powered counterparts, the upfront incremental costs are expected to come down as technology improves and manufacturers increase production. Fleets that are in the 10 to 49 tractor category are more likely to have limited access to capital and are more likely to purchase used vehicles; however, used ZEVs are not expected to be readily available on the secondary market until the end of the decade.
- Fleets with 10 to 49 tractors are less likely to own their property which could make it more difficult for them to install charging infrastructure where they park. They will likely need to rely on public infrastructure available where they operate. Staff anticipates publicly accessible infrastructure being available along major transportation corridors and near the ports in the initial years of the proposed regulation. Multiple manufacturers have announced investments in charging and hydrogen fueling along major transportation corridors; however, broader availability across the state is expected to take several more years to develop. Fleets that rely on public infrastructure for refueling outside primary transportation corridors are expected to need more time before transitioning their operations to zero-emissions.
- Fleets with 10 to 49 trucks are also expected to have less operational flexibility than other regulated fleets to optimize which routes they place ZEVs. Fleets with limited operational flexibility will need each ZEV to have characteristics to perform in a broader duty cycle which increases costs. These fleet owners are less likely to have any staff available to manage compliance or a ZEV deployment project, therefore creating an additional compliance burden.
- Fleets of 10 to 49 tractors are likely to need exemptions or extensions at higher rates than larger fleets. Exemptions such as the Daily Usage Exemption will be used at higher rates because smaller fleets are less likely to have the operational flexibility. The need for the infrastructure Delay Extension will likely be used at higher rates for fleets without multiple locations that can be electrified. The real-world emission reductions generated by lowering the tractor fleet size threshold is likely to be lower than estimated and the administrative burden of reviewing and approving exemptions is expected to be much higher. These exemption requests will also create regulatory

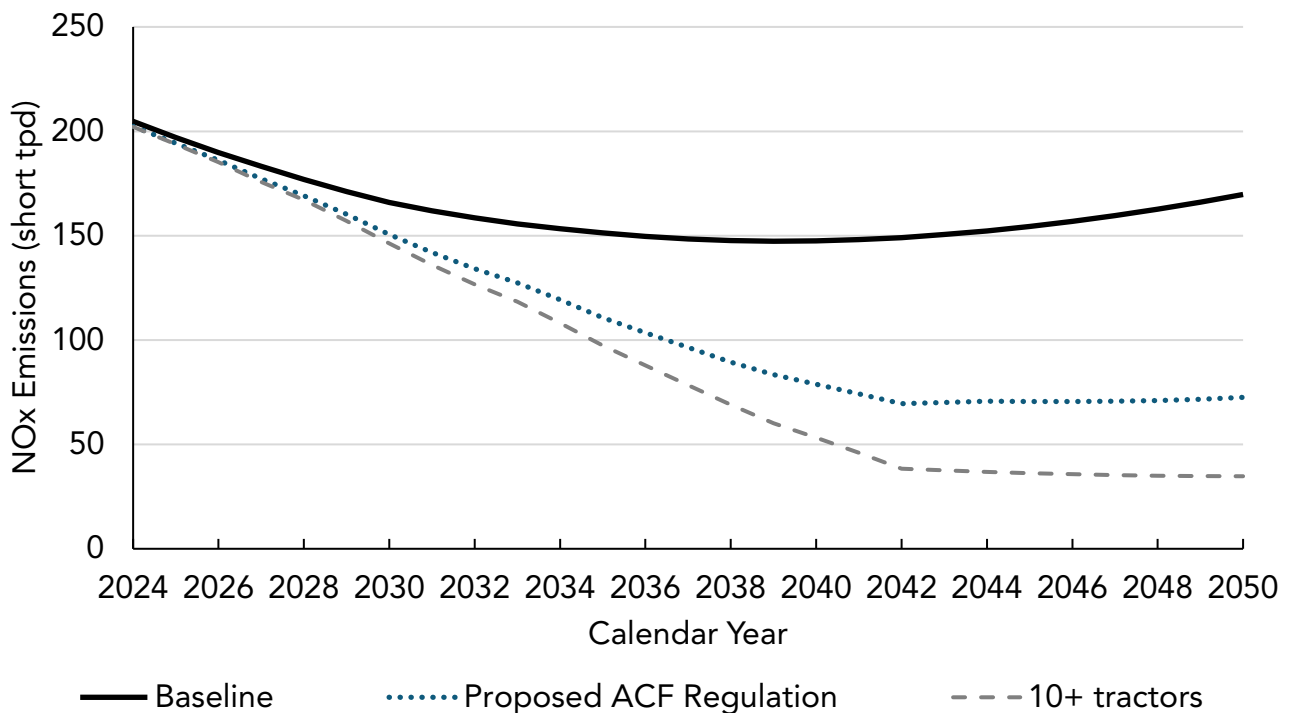
burden on these newly affected fleets. Many of these fleets will have minimal or no regulatory compliance staff to properly prepare and submit these requests.

- Lowering the fleet size threshold would further increase the number of ZEVs required to be purchased but would not change manufacturer ZEV sales requirements prior to 2040. This imbalance between production and purchases could reduce the likelihood that manufacturers will partner with fleets to bring infrastructure solutions and ZEVs at a price point fleets can afford. A more aggressive purchase requirement is likely to result in limited product supply or higher prices without a corresponding increase in manufacturer sales requirements.
- Regulating more fleets in the proposed regulation would potentially reduce their access to funding for certain programs, which would contradict recent Board actions for funding programs that have prioritized funding to smaller fleets. Funding is typically only available for actions that are early or above what is required in CARB regulations. This is a statutory requirement for some programs. As a result, including more fleets in the proposed ACF regulation may reduce their access to existing funding programs.
- A robust used ZEV market may take longer to initially develop due to the differing but improved characteristics of ZEVs. ZEVs are expected to have higher reliability and reduced operating costs which may result in fleet owners holding onto their ZEVs longer than today's combustion-powered trucks. These longer ownership cycles may result in a delayed start to the used ZEV market as new ZEVs stay in their original fleet longer. These challenges can be met during the transition by increasing new ZEV procurement to bolster a used truck market, phased ZEV requirements to match used ZEV market development, or a combination of both.

Emissions Impact

Staff performed an emissions analysis of the proposed regulation and a scenario with the tractor fleet size threshold lowered to 10 or more tractors displayed in Figure 1. The baseline represents the emissions without the proposed regulation.

Figure 1: NOx Emissions of Legal Baseline, the Proposed ACF Regulation, and Lowering the Fleet Size to 10 or more Tractors



The proposed regulation is expected to result in significant emission benefits and including more tractors under the proposal increases the emission benefits of the proposal. However, some of the emission benefits forecasted by reducing the tractor fleet size threshold may not be fully realized due to issues discussed in the previous section.

Geographic Distribution of Emission Benefits

The Board also asked staff to breakdown the emissions reductions from the proposed regulation to a more granular level and provide an overview of the estimated reductions by region. Staff estimated the emissions reductions of the proposed regulation on a statewide and air basin level shown in Table 3.

Table 3: Estimated Statewide Emissions Reductions in 2037 by Air Basin and Statewide

Air Basin	NOx Reductions (tpd)	NOx Reductions	PM2.5 Reductions (tpd)	PM2.5 Reductions
Great Basin Valleys	0.19	0.4%	0.005	0.4%
Lake County	0.07	0.1%	0.002	0.1%

Air Basin	NOx Reductions (tpd)	NOx Reductions	PM2.5 Reductions (tpd)	PM2.5 Reductions
Lake Tahoe	0.04	0.1%	0.001	0.1%
Mojave Desert	5.00	9.6%	0.142	10.0%
Mountain Counties	0.98	1.9%	0.026	1.9%
North Central Coast	0.87	1.7%	0.021	1.6%
North Coast	0.71	1.4%	0.018	1.3%
Northeast Plateau	0.51	1.0%	0.013	1.0%
Sacramento Valley	4.69	9.0%	0.113	8.8%
Salton Sea	2.59	5.0%	0.074	5.3%
San Diego County	2.61	5.0%	0.068	5.7%
San Francisco Bay	5.49	10.6%	0.127	10.9%
San Joaquin Valley	12.74	24.5%	0.299	22.2%
South Central Coast	1.10	2.1%	0.025	2.2%
South Coast	14.40	27.7%	0.318	28.5%
Statewide*	51.99	100%	1.252	100%

Generally, the regulation will generate emission reductions statewide with the greatest benefits in the air basins with the highest trucking emissions. These benefits will be most acutely felt in the South Coast and San Joaquin Valley Air Basins. Note that the emission benefit calculations assume that fleets will comply uniformly statewide and will meet their requirements without using flexibilities. Some fleets may choose to electrify some locations first instead of electrifying all sites simultaneously. Some fleets may elect to comply with their requirements by focusing on specific portions of their fleet rather than electrifying all on the same schedule. These individual fleet choices are expected to largely balance out to reach the same emission reduction numbers.

Next Steps

Following the October Board hearing and the past several months, former Vice Chair Berg and Board Member Krakov have led a series of workgroup meetings focused on waste and wastewater fleets, the infrastructure delay exemption, and the ZEV availability exemption. The February 13 workshop meeting previews upcoming changes to the regulation to solicit feedback on the specific regulatory text. Staff will be incorporating feedback received at

these public events and will be releasing changes to the regulation in March which will carry out the direction given by the Board. These changes would provide staff with more tools to address infrastructure delays, more time for trucks using biomethane, additional consideration for transit fleets, earlier access to mutual aid provisions, streamline criteria for other flexibilities, and moving up the end date for sales of combustion trucks. The proposed changes will be available for public comment for a period of 15 days prior to the April 27, 2023, Board hearing for a final decision.

Summary

While lowering the fleet size threshold would reduce emissions compared to the current staff proposal, the comparison should be to the emissions reductions the Board already committed to achieving in the Zero-Emission Truck Measure specified in the State Implementation Plan. The Zero-Emission Truck Measure would transition all remaining medium- and heavy-duty vehicles to ZEVs starting in 2030 and would be developed over several years with additional information and full public participation. Reducing the fleet size threshold now would pull forward a subset of tractors by 3 years with limited information.

This analysis is a paper exercise that does not take into account other considerations, including market dynamics. The proposed ACF regulation already requires more ZEVs to be purchased than manufacturers are required to sell. If this is a concern, the Board could also direct staff to begin the process to update the ACT manufacturer sales requirements as part of the effort to develop the Zero-Emission Truck Measure.