ACF Threshold Analysis Memo

Purpose

Medium- and heavy-duty (MHD) vehicles are responsible for a significant amount of pollution from on-road vehicles in California. Among these MHD trucks and buses, Class 7 and 8 tractor trucks by far contribute the largest about of pollution relative to their numbers. Although just around *1 percent* of vehicles on California roads and highways, tractors trucks contribute roughly 13 percent of greenhouse gas emissions, 25 percent of fine particulate ($PM_{2.5}$) emissions, and 33 percent of nitrogen oxide (NOx) emissions from the state's on-road vehicles.[1]

This document contains the high-level results of an analysis examining the emissions from Class 7 and 8 tractor trucks covered under the proposed Advanced Clean Fleets (ACF) rule language based on the numeric compliance threshold level in the rule.[2] Because of the significant and disproportionate pollution contributions from tractor trucks, these vehicles should be considered differently than other vehicles under the rule.

Tuning the ACF to reduce the greatest amount of pollution from tractor trucks feasible is key to maximizing the effectiveness of this important and groundbreaking regulation.

Key Takeaways

- Tractors are 11 percent of HDVs in CA, but are responsible for around half of GHG, NOx, and PM emissions from the HD fleet.
- Tractors are around 1 percent of vehicles on California's roads and highways, but are responsible for around 13 percent of GHG emissions, 25 percent of fine particulates, and 33 percent of nitrogen oxides from California's transportation sector.[3]
- Lowering the numeric threshold to 10 from 50 vehicles for tractors could result in an estimated 15 percent greater emissions reductions from tractors compared to the proposal, for a total of nearly 90 percent of greenhouse gases, fine particulates, and nitrogen oxide emissions, while only regulating 13 percent of tractor fleets operating in the state.

Methodology

Ideally, an analysis of transportation emissions would be completed using registration data for current in-use vehicles. However, these data are not available, other than in aggregate, because of privacy and confidentiality concerns. Although this information is not available, California maintains a robust registry of drayage trucks and registration is required for fleets to participate in drayage operations. This registry, known as the Air Resources Board Equipment Registration System (ARBER), can be used as a proxy for the statewide fleets of Class 7 and 8 tractors, given that 96 percent of Class 7 and 8 tractors operating in California are also registered in the ARBER.

[1] https://www.ucsusa.org/sites/default/files/2022-08/ca-clean-trucks-report.pdf
[2] https://ww2.arb.ca.gov/rulemaking/2022/acf2022
[3] https://www.ucsusa.org/sites/default/files/2022-08/ca-clean-trucks-report.pdf

Sam Wilson, Senior Vehicles Analyst, Union of Concerned Scientists, Updated September 2022

CARB staff provided the Union of Concerned Scientists with a partially redacted (company names and identifiable information like addresses were removed) dataset of current ARBER registrations including 196,664 individual Class 7 and 8 trucks from 12,059 different fleets. For reference, there are currently 204,000 Class 7 and 8 tractors currently operating in California.[4] The drayage registry is the most appropriate proxy for state's fleet of in-use Class 7 and 8 tractors as most tractor trucks operating in California are registered in the ARBER so fleets can maintain flexibility, whether they commonly complete drayage runs.[5] According to CARB's Initial Statement of Reasons for the ACF, there are an estimated 29,000 tractors performing drayage operations in the state.[6]

Vehicles in the dataset were assigned annual GHG, NOx, and $PM_{2.5}$ emissions values based on vehicles' engine year using weighted average emissions factors Port for LA/Long Beach and Port of Oakland from CARB's EMFAC database, which includes emissions inventories of on-road mobile sources in California. Vehicles with pre-2010 engine years were excluded to reflect the requirements under the California Truck and Bus Regulation. Total fleet emissions were calculated using the sum of emissions from all vehicles associated with each fleet in the ARBER dataset. Relevant CARB staff reviewed both methodology and results.

Results

We found that fleets greater than 10 contribute the overwhelming amount of GHG, NOx, and $PM_{2.5}$ emissions from Class 7 and 8 tractors in California – around 13 percent of fleets in the state are larger than 10 (Figures 1 through 4), but are responsible for about 88 percent of GHG emissions (see Figures 5 and 6), 85 percent of NOx emissions (Figures 7 and 8), and 86 percent of $PM_{2.5}$ emissions (Figures 9 and 10) from the Class 7 and 8 tractor fleet. Fleets of 10 to 24 were shown to have the oldest vehicles on average at 9 years, while fleets over 50 contained vehicles at an average age of 5 years old (Figure 4).

Class 7+8 Tractor Threshold	Fleets Regulated	% Fleets Regulated	% GHG Covered	% PM Covered	% NOx Covered
50	315	3%	75%	70%	70%
25	634	5%	81%	77%	77%
10	1548	13%	88%	86%	86%

Table 1: Lowering the threshold from 50 to 10 results in significantly larger share of tractor truck emissions being covered under the ACF rule

[4] See page 59 of the ACF ISOR
[5] These assumptions were obtained during conversations with CARB staff and labor and business experts
[6] See page 59 of the ACF ISOR

Discussion

The ACF's numeric compliance threshold should be based on the amount of GHG, NOx, and $PM_{2.5}$ emissions reductions needed to satisfy and exceed state climate and air quality targets and affect equitable access to clean air in overburdened communities. Because they make up the largest share of on-road emissions from the medium- and heavy-duty fleet, electrifying Class 7 and 8 tractors are key to reducing air pollution from transportation. A lower threshold for these vehicles delivers the largest climate and air quality impacts, while avoiding significant burdens to small businesses and agency staff overseeing regulatory compliance.

Significant emissions reductions

The numeric threshold should be set at 10 for Class 7 and 8 tractors. Lowering the threshold from 50 to 10 would affect significantly greater reductions in air pollution, resulting in nearly *90 percent of GHG, NOx, and $PM_{2.5}$ emissions* from Class 7 and 8 tractors covered under the ACF rule. *This is around a 15 percent increase across the board*. This is particularly meaningful as tractor trucks are responsible for a disproportionate amount of air pollution from MHD vehicles operating in California. Tractors are only 11 percent of the state's MHD fleet, but are responsible for around half of total fuel consumption and half of emitted GHGs, NOx, and $PM_{2.5}$.

Impacts to agency workload

Lowering the compliance threshold to 10 from 50 will increase the number of fleets regulated under the ACF rule, resulting in around 13 percent of Class 7 and 8 tractor fleets regulated. This is an excellent return on regulatory investment, given that regulating just over 1 in 10 of the fleets results in a nearly 90 percent coverage of tractor emissions. In general, smaller businesses have fewer administrative resources for regulatory compliance and require greater assistance for agency staff. However, tractor fleets of 10 or more trucks are far less likely to be small businesses compared to fleets consisting of smaller classes of trucks. This implies that a lower threshold for these fleet is not likely to affect a significant increase in compliance assistance required by CARB staff.

Statewide Class 7 and 8 Tractor Demographic Figures

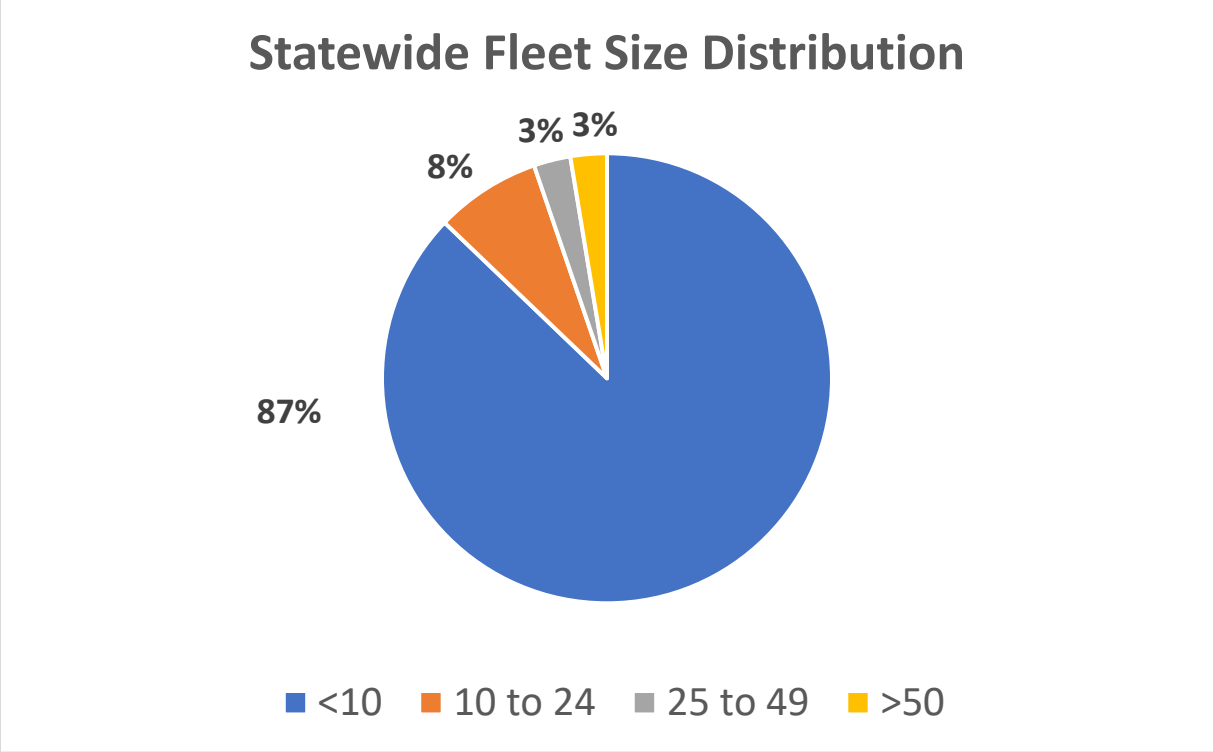

Figure 1: Thirteen percent of Class 7 and 8 tractor fleets in California are larger than 10

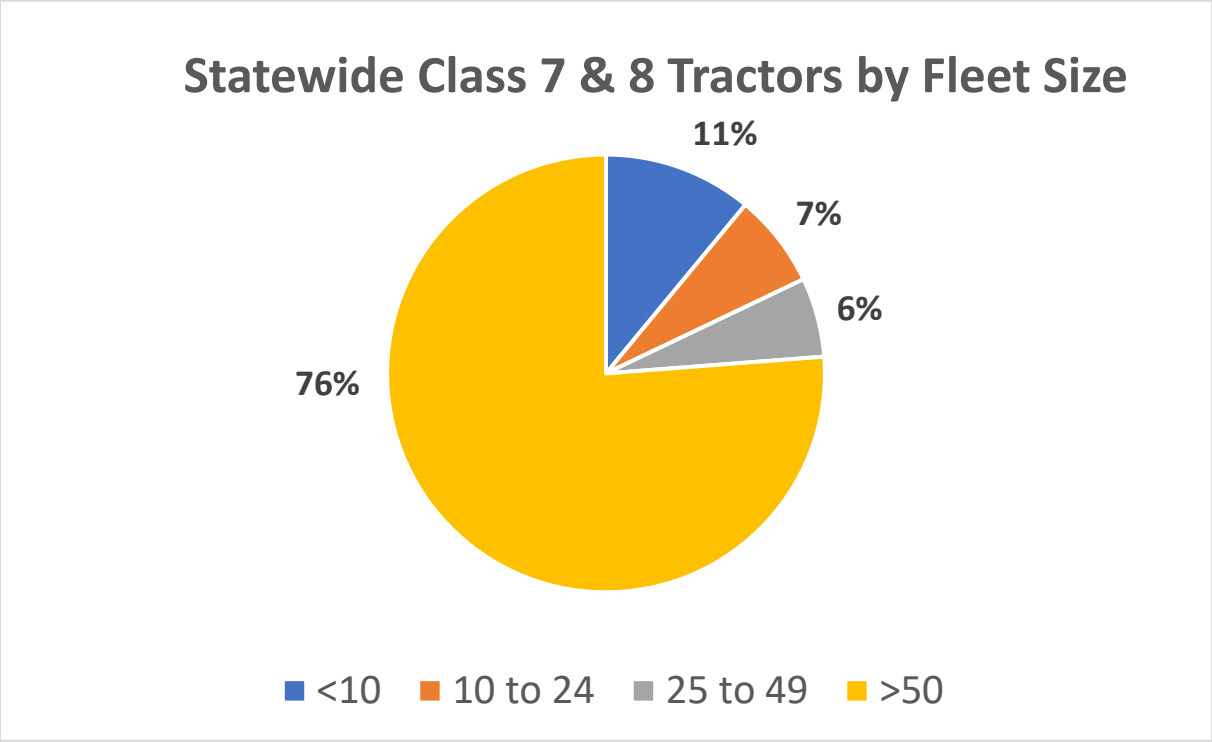

Figure 2: The overwhelming majority of tractor trucks are owned or operated by larger fleets.

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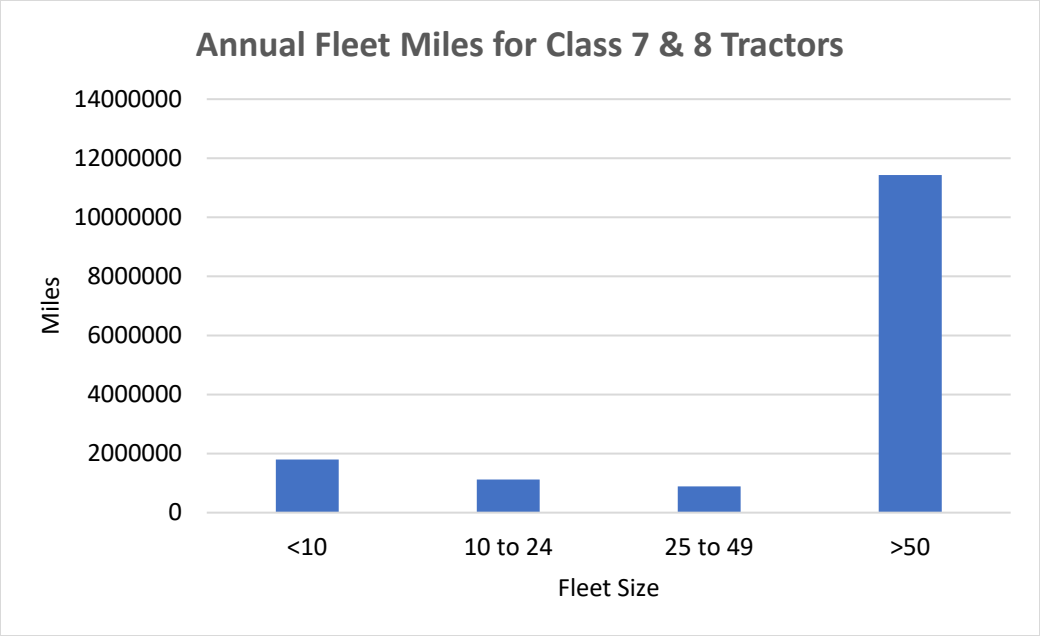

Figure 3: Tractor trucks from the largest fleets travel the most miles annually.

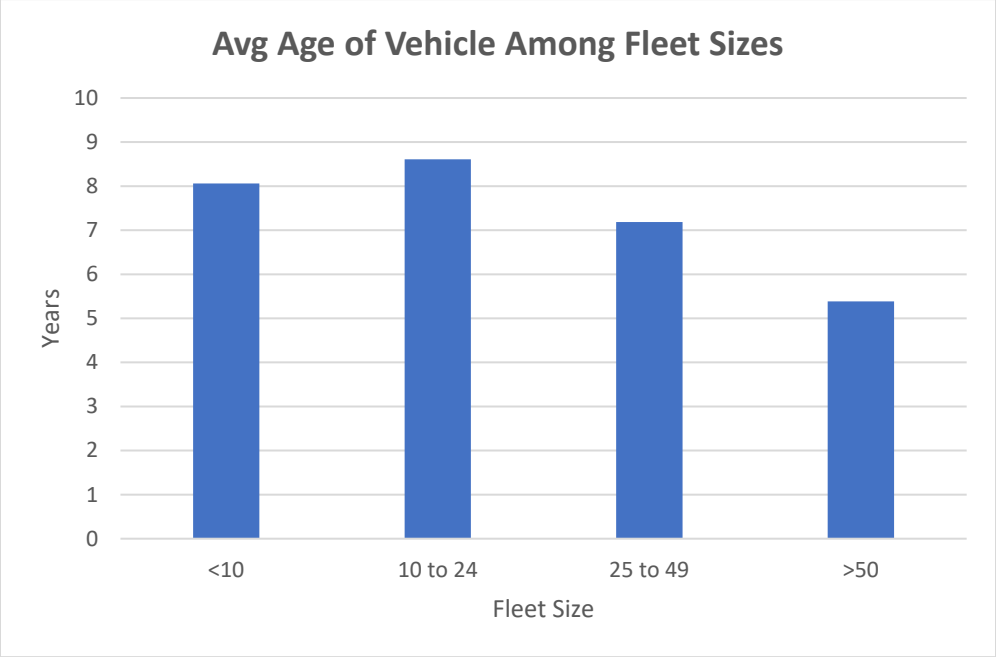

Figure 4: Trucks in larger fleets tend to be newer than those of smaller fleets. Fleets of 10 to 24 vehicles operate vehicles of the oldest average age.

Statewide Class 7 and 8 Tractor CO2 Emissions Figures

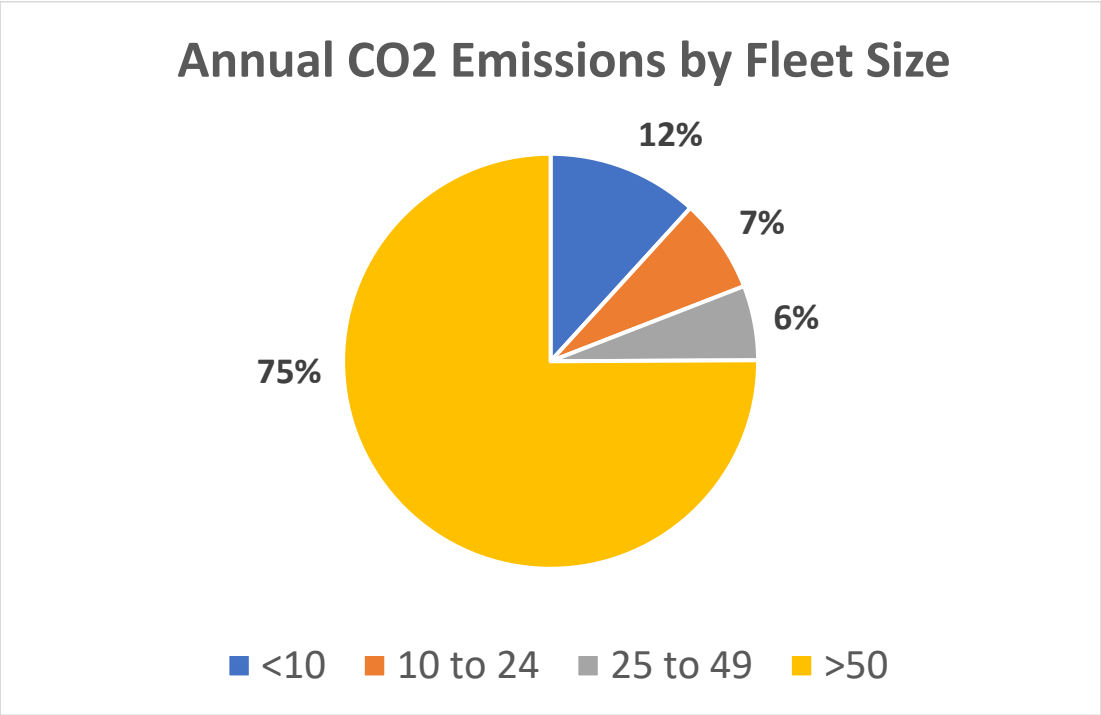

Figure 5: Tractor trucks operating in fleets larger than 10 are responsible for about 88 percent of CO2 emissions from the Class 7 and 8 tractor fleet on California's roads and highways.

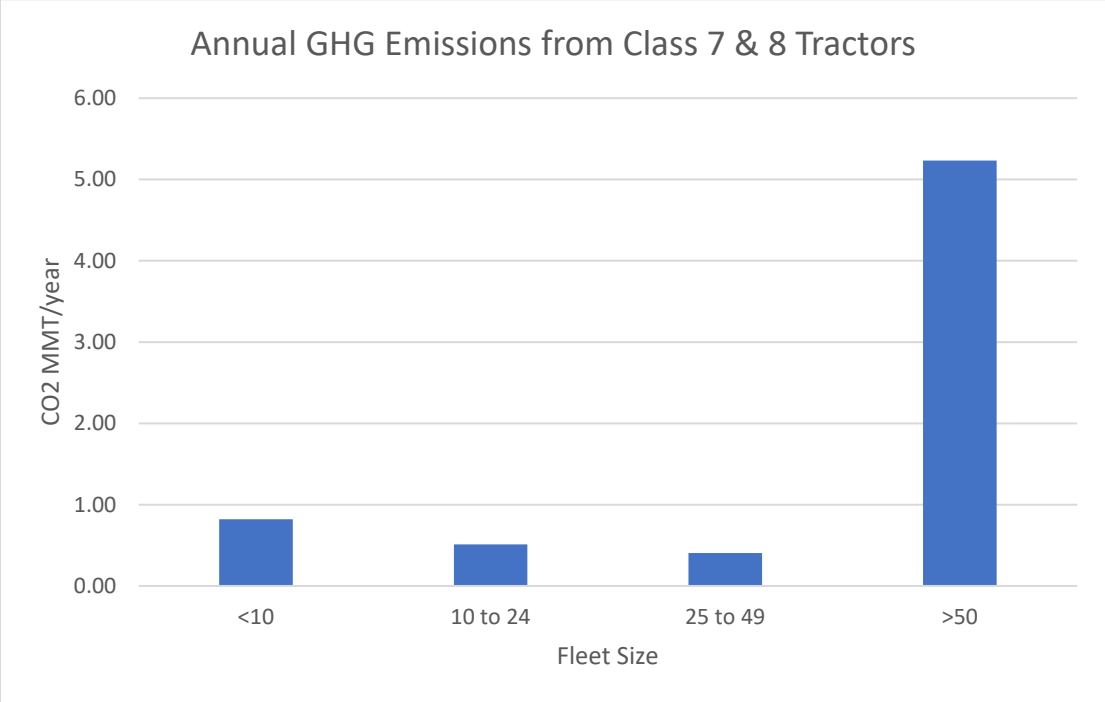

Figure 6: Tractor trucks operating in fleets larger than 10 emit just over 6 MMT CO2 annually.

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Statewide Class 7 and 8 Tractor NOx Emissions Figures

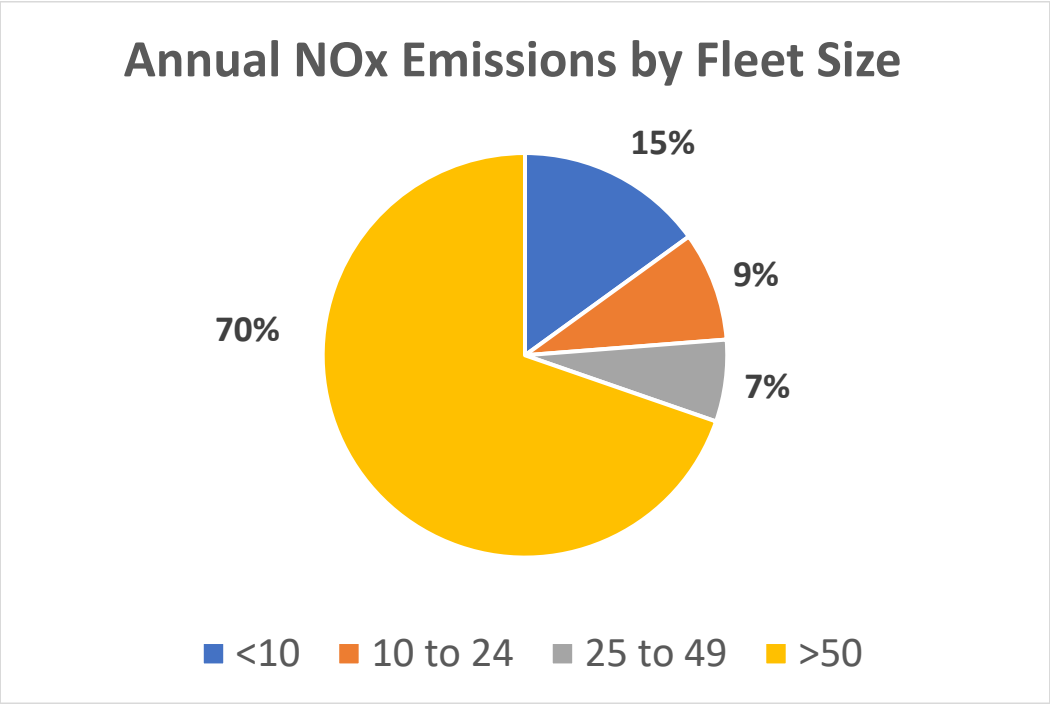

Figure 7: Tractor trucks operating in fleets larger than 10 are responsible for about 85 percent of NOx emissions from the Class 7 and 8 tractor fleet on California's roads and highways.

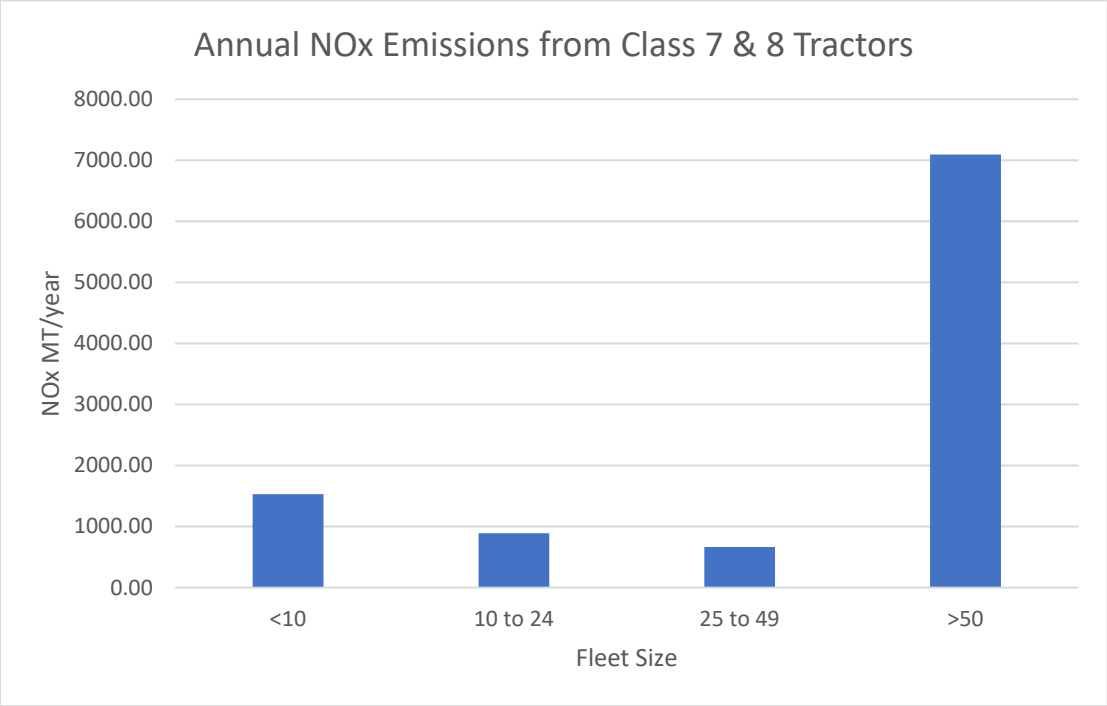

Figure 8: Tractor trucks operating in fleets larger than 10 emit just over 8,650 MT NOx annually.

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Statewide Class 7 and 8 Tractor $PM_{2.5}$ Emissions Figures

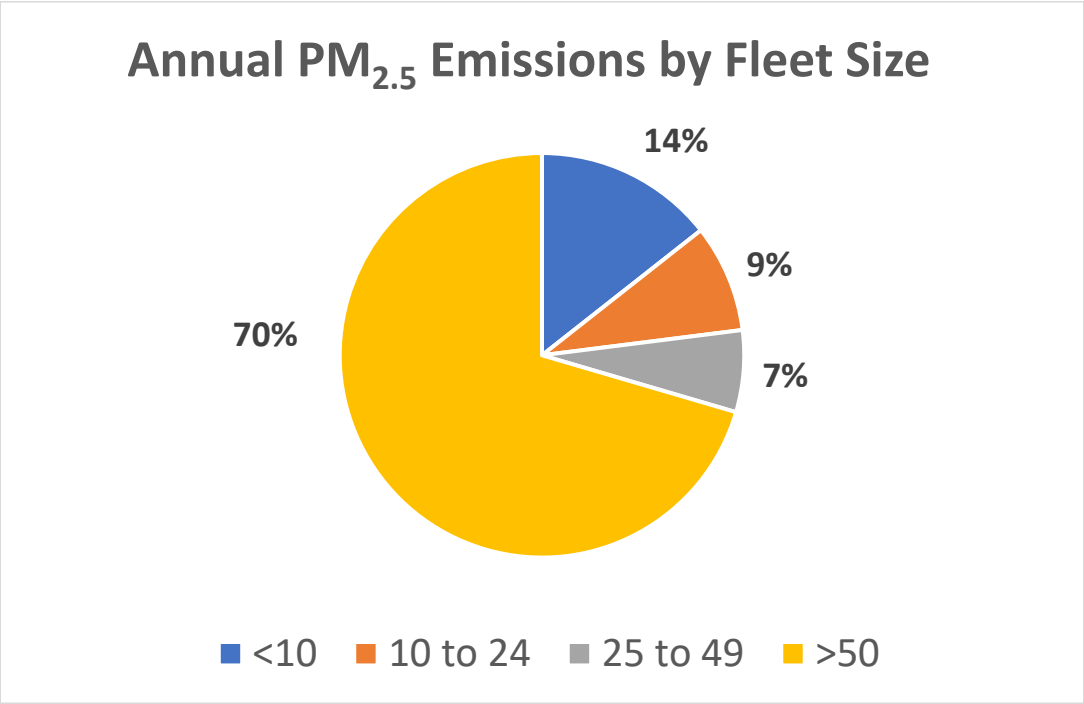

Figure 9: Tractor trucks operating in fleets larger than 10 are responsible for about 86 percent of $PM_{2.5}$ emissions from the Class 7 and 8 tractor fleet on California's roads and highways.

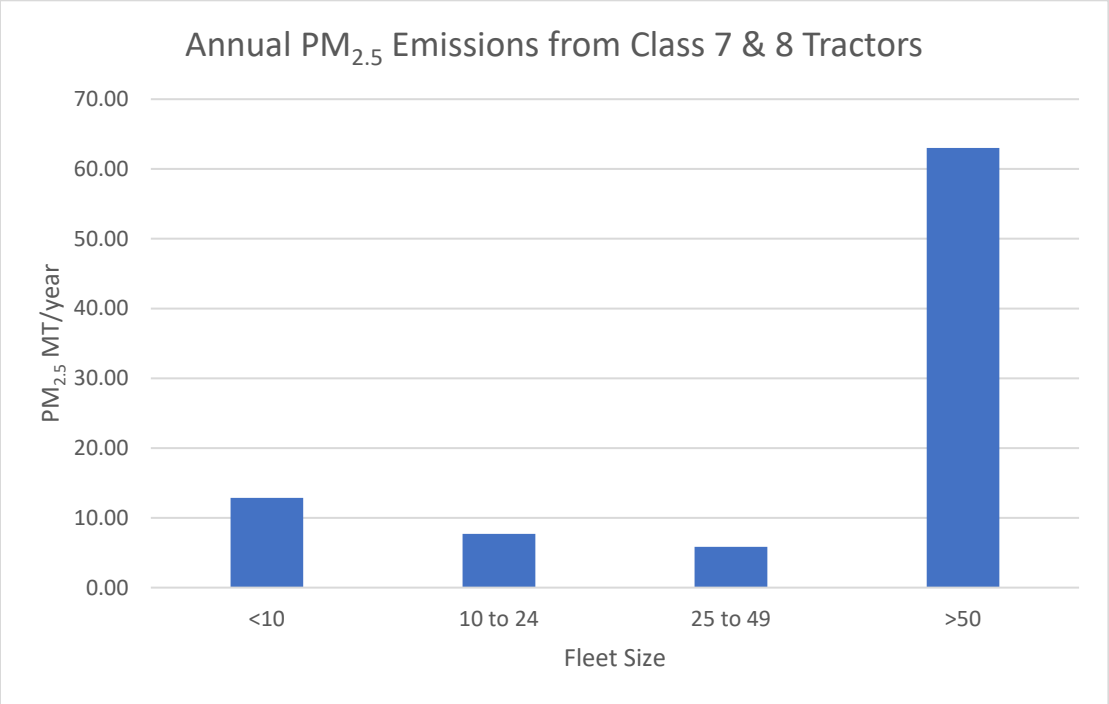

Figure 10: Tractor trucks operating in fleets larger than 10 emit over 76 MT $PM_{2.5}$ annually.