CALIFORNIA
AIR RESOURCES BOARD

Gavin Newsom, Governor
Jared Blumenfeld, CalEPA Secretary
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November 6, 2019

Mr. Christopher Lieske
U.S. Environmental Protection Agency
EPA Docket Center (EPA/DC)
EPA West Room B102
1301 Constitution Avenue NW
Washington, D.C. 20460

Mr. James Tamm
National Highway Traffic Safety Administration
U.S. Department of Transportation
West Building, Ground Floor, Room W12-140
1200 New Jersey Avenue SE
Washington, D.C. 20590

Re: Safer Affordable Fuel-Efficient (SAFE) Vehicle Rule for Model Years 2021-2026 Passenger Cars and Light Trucks

Via: http://www.regulations.gov and overnight delivery

Attention: Docket Nos. NHTSA-2018-0067, NHTSA-2017-0069, and EPA-HQ-OAR-2018-0283

Dear Mr. Lieske and Mr. Tamm,

The California Air Resources Board (CARB) submits this supplemental comment concerning its initial analysis of the proposed Safer Affordable Fuel-Efficient (SAFE) Vehicles Rule for Model Years 2021-2026 Passenger Cars and Light Trucks (Proposal).[1] These comments originated in response to a letter to CARB from Mr. Michael Hartrick, Director of Fuel Economy and Climate with the Alliance of Automobile Manufacturers, dated September 11, 2019. Mr. Hartrick sought additional information regarding CARB's analysis of oxides of nitrogen (NOx) emission regional impacts in 2025 and 2035, provided in CARB's October 26, 2018 "Analysis in Support of Comments of the California Air Resources Board on the Safer Affordable Fuel-

[1] 83 Fed. Reg. 42,986 (Aug. 24, 2018.)

Efficient (SAFE) Vehicles Rule for Model Years 2021 – 2026 Passenger Cars and Light Trucks," submitted to your agencies.[2]

In responding to Mr. Hartrick, CARB staff identified a need to make three clarifications to its prior comments, due to the inadequate comment period initially provided on the Proposal. Because this information is "of central relevance to the rulemaking," CARB is submitting this letter and the accompanying spreadsheets to all three Proposal dockets.[3]

The Alliance requested:

> information on how the 280 tpy [tons per year of oxides of nitrogen (NOx)] in 2025 and 921 tpy in 2035 values break down into [the following] components ... (and any others), and the methods CARB used to estimate the [following] individual components.
>
> - The estimated change in refinery emissions due to the production of additional gasoline;
> - The change in fuel transportation and distribution emissions;
> - The change in electric vehicle recharging emissions; and
> - The change in tailpipe emissions of the fleet.

The Alliance also asked:

> whether the change in any of these emissions impacts (or the underlying emissions for either the SAFE rulemaking scenario or the current federal greenhouse gas standards) are adjusted for "fleet turnover" or "vehicle miles traveled rebound effects," and if so, what those assumptions are as well.

While staff made every effort to be clear in its comments, in responding to the Alliance's questions, we noted three clarifications that we should make about our analysis of the proposed SAFE Vehicles Rule within the abbreviated time allowed. These clarifications confirm the proposal would have a significant adverse impact on NOx emissions and highlight that staff's original estimates were understated. Staff will be continuing to refine the analysis to better quantify the impacts of any final rule, including the SAFE Vehicles Rule Part One.[4] We discuss our three clarifications below, then the Alliance's specific questions.

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[2] Docket Nos. EPA-HQ-OAR-2018-0283-5054; NHTSA-2018-0067-11873.
[3] 42 U.S.C. § 7607(d)(4)(B)(i); *see also id.* § 7607(d)(7)(A) (providing that such material forms part of the administrative record for judicial review); SAFE Vehicles Rule, 83 Fed. Reg. 42,986, 43,471 (Aug. 24, 2018), Docket Nos. EPA-HQ-OAR-2018-0283; NHTSA-2018-0067; NHTSA-2017-0069.
[4] The Safer Affordable Fuel Efficient (SAFE) Vehicles Rule Part One: One National Program, 84 Fed. Reg. 51,310 (Sept. 27, 2019).

We initially note that the number of 921 tons per year (tpy) in 2035 the Alliance cited is actually 912 tpy in the spreadsheet submitted to the docket, as shown in cell K2 here:

Figure 1: Copy of Attachment - Emissions Impact Alternative1.xlsx (Cells E1-K3 Screenshot)[5]

	E	F	G	H	I	J	K
1	Impact of NPRM (tpy) (Estimated by NHTSA/EPA)	% Statewide NOx Emissions	Impact of NPRM (tpy) (Estimated by CARB)		CARB Estimated Statewide Impact of NPRM	2025	280.05
2	-2.28	0.2%	1.490249158			2035	912.45
3	-8.09	0.6%	5.825558668				

Clarifications to Prior Emissions Estimates

First, upon closer review, staff has identified a mistake in the original 'summary' tab, cells K1 and K2 that the Alliance referenced in their footnote 4 and is shown above. In the rush to complete comments within the short time period allowed, those summary cells inadvertently only included a portion of the incremental NOx emissions estimated to result from the preferred alternative in the federal proposal. Specifically, the cells only contained values for "well-to-tank" (WTT), or "upstream," emissions and mistakenly omitted the "tank-to-wheel" (TTW), or vehicle, emissions. Thus, CARB's estimate for the total NOx impact was understated.

Second, in verifying the TTW calculations, staff identified an opportunity to more precisely calculate the emission impacts than initially provided in our comments. The emission estimates have been clarified in this letter using analyses and data previously developed or relied upon for CARB's vehicle emission standards, as described below, to provide a more complete picture of the increase in NOx criteria pollutant emissions in California caused by the proposed SAFE Vehicles Rule, in terms comparable to that used in the proposed SAFE Vehicles Rule. The corrected emission estimates show an even greater emissions increase from the proposed SAFE Vehicles Rule than previously stated. The corrected values are 328 tpy for 2025 and 1,047 tpy for 2035 instead of the 280 and 912 tpy values, respectively. These total NOx impact numbers are also the basis for Figures VII-1 and VII-2 that the Alliance cited in their letter and thus, the figures also change to show larger regional impacts in every area for both 2025 and 2035.

These summary cells and figures have been corrected in an updated version (named "Attachment – Emissions Impact Alternative1_revised_2019_10_14.xlsx") attached to this letter. The corrected figures are shown below:

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[5] California Air Resources Board, "Copy of Attachment – Emissions Impact Alternative1.xlsx," Regulations.gov, Docket No. EPA-HQ-OAR-2018-0283-5842

Figure 2: Revised Figure VII-1

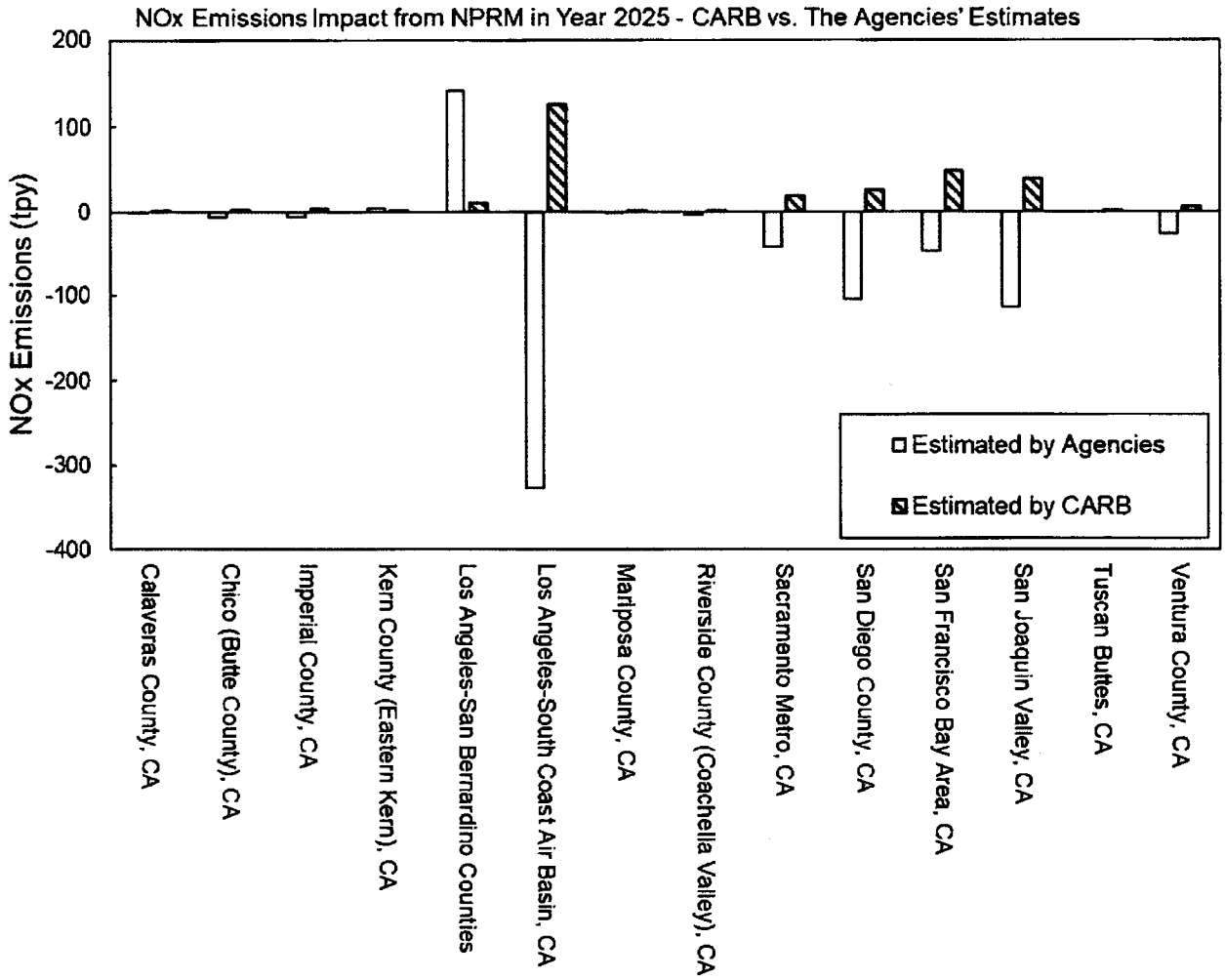
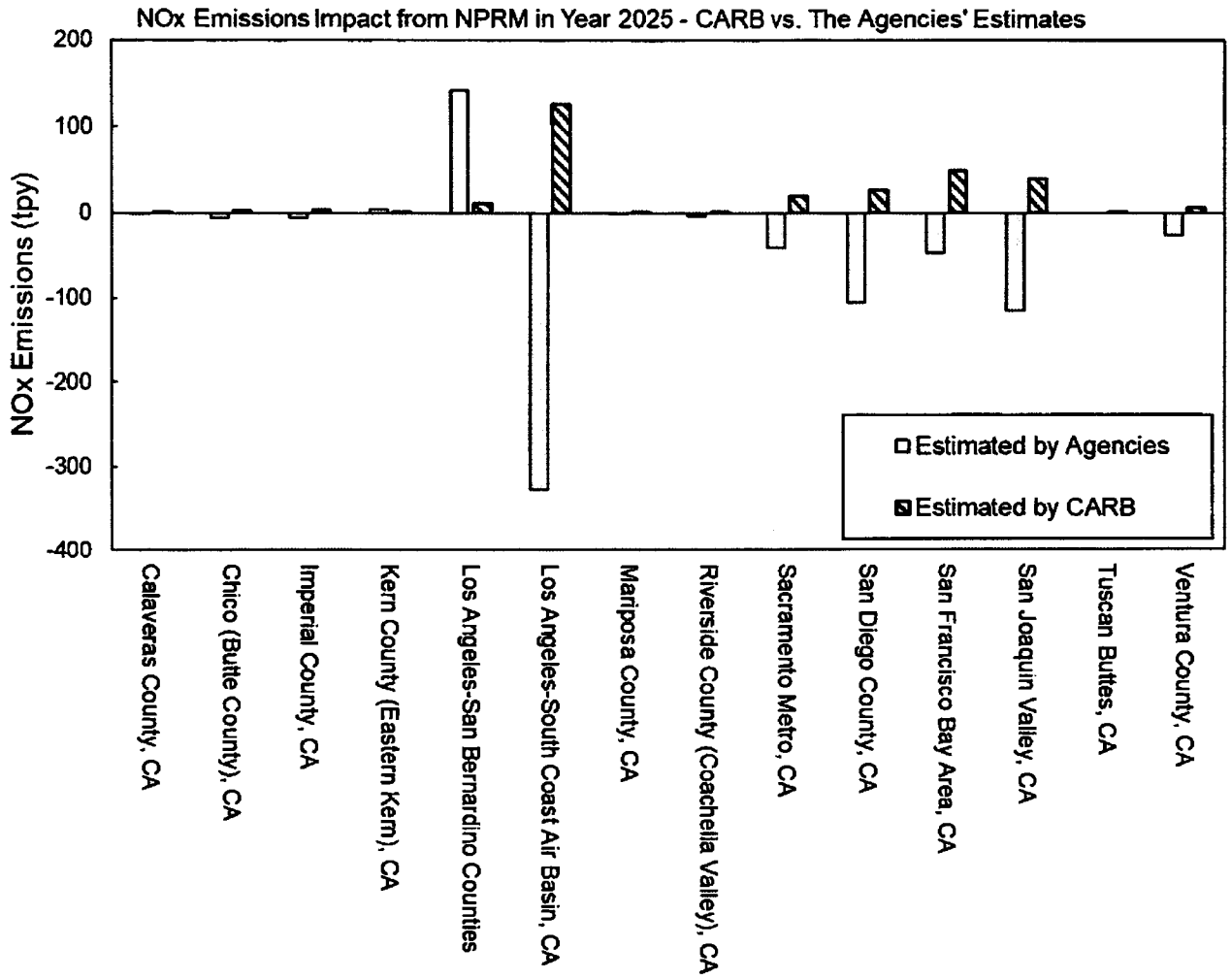


Figure 3: Revised Figure VII-2



To provide the most direct comparison for Figures VII-1 and VII-2 in CARB's October 26, 2018, comment letter to the regional data analysis developed by the federal agencies in the proposed SAFE Vehicles Rule, CARB staff distributed the calculated statewide total (WTT and TTW) NOx emissions to matching individual non-attainment and maintenance areas in the state in proportion to the number of registered vehicles in each region. For example, approximately 39 percent of vehicles in the state in 2025 are projected to be registered in the Los Angeles South Coast Basin, so 39 percent of the 1.0 tpd of statewide 2025 NOx emissions, or approximately 0.4 tpd of NOx, were assumed for that region in 2025.[6]

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[6] Regarding one other area of possible confusion, CARB's comment letter on the SAFE Vehicles Rule often cites a projected NOx increase from the proposed rule of 1.24 tpd for the Los Angeles South Coast Basin area.

Third, in undertaking this exercise, we discovered that the version of the "Attachment_A" spreadsheet submitted by CARB to the federal docket[7] was not the final version actually used for the analysis. We discuss below the differences and necessary corrections and have attached a corrected version to this letter (titled "Attachment A_revised_2019_10_14.xlsx").

Responses to the Alliance's Questions

The Alliance also asked for several specific details regarding our analysis.

As to the Alliance's questions regarding the individual elements of the analysis and assumptions used for this analysis, CARB assumed the preferred alternative in the proposed SAFE Vehicles Rule would become final and: (a) freeze the federal light-duty vehicle greenhouse gas (GHG) standards at projected model year 2020 vehicle tailpipe GHG levels[8] for the foreseeable future; and (b) that zero-emission vehicle (ZEV) sales in California would freeze at model year 2020 levels required under California's ZEV regulation in effect at the time of the analysis.

As CARB has previously stated, both the GHG emission standards and the ZEV sales standards reduce criteria pollutants. As a result of the proposed GHG standard relaxation, and in the absence of California's GHG emission standards, additional gasoline will be needed to meet the travel demands of the fleet. This will increase production and delivery of gasoline throughout the state and increase the emissions associated with such activity. As a result of the loss of the ZEV sales requirements, there may be fewer ZEVs sold and thus additional gasoline-fueled vehicles sold in future years. This would increase criteria pollutant emissions in multiple ways.

A ZEV inherently has zero evaporative emissions of hydrocarbons in the form of gasoline vapors, which escape from the tank and fuel lines during operation and while parked. A gasoline-fueled vehicle with evaporative emissions is assumed to take the place of each ZEV that will not be sold. This leads to an overall increase in hydrocarbon emissions.

Unlike the 2025 and 2035 estimates described in this letter, the 1.24 tpd value is an estimate for the 2031 calendar year because that is the year designated in California's State Implementation Plan for required compliance with the 2008 National Ambient Air Quality Standard of 75 parts per billion for ozone. Further, given the availability of more detailed information in that specific region regarding location and capacity of fuel refineries and production, the 1.24 tpd value reflects a 39 percent apportionment of statewide vehicle (TTW) emissions and a 53 percent apportionment of statewide upstream (WTT) emissions.

[7] "Attachment_A.xlsx" previously submitted to the EPA docket is located at EPA-HQ-OAR-2018-0283-7586.

[8] The preferred alternative also included discontinuation of GHG credits for the use of lower global warming potential refrigerants used in vehicle air conditioning systems which are currently used to partially offset vehicle tailpipe emitted GHGs. Accordingly, the preferred alternative and CARB's analysis flatlined the GHG standards at the expected model year 2020 *vehicle tailpipe* GHG emission levels and not at the actual model year 2020 GHG *emission standard* level.

Tailpipe emissions of NOx, hydrocarbons, carbon monoxide, and particulate matter also increase as a result of each additional gasoline-fueled vehicle. This increase occurs for several reasons despite the presence of a criteria pollutant "fleet average" standard[9] that CARB has in place for hydrocarbons and NOx. First, the fleet average does not apply to particulate matter and carbon monoxide, meaning each incremental gasoline-fueled vehicle generates additional tailpipe emissions of both pollutants. Second, because the fleet average is based on a single test cycle and does not fully capture all operating conditions, additional tailpipe emissions of all criteria pollutants occur for every incremental gasoline-fueled vehicle. Third and most significantly, both tailpipe and evaporative criteria pollutant emissions substantially increase over time due to deterioration of the emission controls on gasoline-fueled vehicles. ZEVs have no such deterioration. Thus, even with the fleet-average standard offsetting a portion of the tailpipe emissions by starting some gasoline-fueled vehicles at lower emission levels early in their life, this slight difference is overwhelmed by the increase in emissions from deterioration over the life of the vehicle.

Given the time provided to comment on the proposed SAFE Vehicles Rule, CARB estimated the change in vehicle tailpipe NOx emissions of the California light-duty vehicle fleet using its EMission FACtor 2017 (EMFAC2017) model.[10] EMFAC2017 is the most recent emission inventory model approved for use in California reflecting the latest planning assumptions under federal law.[11]
The EMFAC2017 default model, with an "annual average" setting, was run to estimate statewide vehicle NOx emissions by calendar year, vehicle category, fuel type, and model year projected to occur under the existing Federal and CARB GHG standards and CARB ZEV requirements that were in place at the time of the analysis. These default results were then adjusted in a post-processing step[12] to reflect the proposed SAFE Vehicles Rule. As a result

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[9] The Low Emission Vehicle III program requires manufacturers to average emissions from all vehicles in their fleet to meet the standard. In theory, the elimination of some ZEVs (which are counted in such an average as zero emissions) would cause some of the remaining or increased number of gasoline-fueled vehicles to need to be certified to lower (cleaner) levels in order to still meet the same fleet average. However, as described in the letter, the fleet average standard does not actually result in equivalent fleet emissions.
[10] We discuss NOx here because that was the subject of the Alliance inquiry.
[11] EMFAC is California's federally-approved on-road mobile source emission inventory model that reflects California-specific driving and environmental conditions, fleet mix, and most importantly the impact of California's unique mobile source regulations such as the Low-Emission Vehicle (LEV) program including the LEV II and LEV III standards, California inspection and maintenance programs, and its in-use diesel fleet rules. It accounts for vehicle deterioration and evaporative emissions. The EMFAC model supports CARB's regulatory and air quality planning efforts and fulfills the federal Clean Air Act and the Federal Highway Administration's transportation planning requirements. The U.S. EPA has approved EMFAC2017 for use in state implementation plan and transportation conformity analyses. 84 Fed. Reg. 41,717 (Aug. 15, 2019). For more information on EMFAC, please visit: https://ww2.arb.ca.gov/our-work/programs/mobile-source-emissions-inventory/msei-modeling-tools.
[12] The spreadsheet files submitted to the docket and described in this letter were developed to adjust the results from EMFAC2017 to estimate the emission impacts of the proposed federal action rather than a more

of freezing new ZEV sales at model year 2020 levels, the projected fleet for 2021 and beyond was modified to reflect a lower number of future ZEVs and a corresponding greater number of future gasoline internal combustion engine vehicles (and thus, a higher portion of vehicle miles traveled (VMT) by gasoline vehicles).

The increased number of gasoline vehicles were put into appropriate criteria pollutant certification categories under CARB's Low Emission Vehicle (LEV) III criteria pollutant standards to maintain compliance with the required fleet average. However, as noted above, it was discovered that the version of this file previously submitted to the docket by CARB was mistakenly not the final version actually used for the analysis. Notably, the submitted version did not contain the rebalancing of the ZEV and gasoline vehicle fleet in the "Tech Mix NHTSA_EPA" tab that was utilized to calculate the vehicle NOx emission impacts. While verifying the details, it was also found that the original rebalancing of the fleet to maintain compliance with the LEV III standards could be more precise with regard to estimates of compliance at one significant digit past the required compliance standard, consistent with good engineering practice. Specifically, the original rebalancing resulted in a fleet average that was approximately 0.0002 grams per mile (g/mi) lower than the default scenario when compared to the required model year 2025 fleet average standard of 0.030 g/mi.

This issue has been addressed to ensure the identical fleet average is achieved after rebalancing. Details of this rebalancing of the fleet are shown below in columns G, H, I, and J in the "Tech Mix NHTSA_EPA" tab of the updated "Attachment A_revised_2019_10_14" attached to this letter.

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comprehensive approach that would entail making changes within the EMFAC model which was not feasible in the available comment period.

Figure 4: Attachment A_revised_2019_10_14.xlsx: Tech Mix NHTSA_EPA Tab Fleet Rebalancing (Cells A1 through J29 screenshot)

	A	B	C	D	E	F	G	H	I	J
1										
2	**PC + LDT1**									
3	**Emission Bin**	**BIN 325**	**LEV 160**	**ULEV 125**	**BIN 110**	**ULEV 70**	**ULEV 50**	**SULEV 30**	**SULEV 20**	**ZEV**
4	**Standard [g/mile]**	**0.325**	**0.160**	**0.125**	**0.110**	**0.070**	**0.050**	**0.030**	**0.020**	**0.000**
5	**2016**	**0.00%**	**2.34%**	**36.99%**	**8.32%**	**6.39%**	**0.00%**	**43.08%**	**0.00%**	**2.88%**
6	**2017**	**0.00%**	**2.34%**	**36.99%**	**8.32%**	**6.39%**	**0.00%**	**43.08%**	**0.00%**	**2.88%**
7	**2018**	**0.00%**	**2.34%**	**26.93%**	**8.32%**	**18.17%**	**0.00%**	**43.64%**	**0.00%**	**0.59%**
8	**2019**	**0.00%**	**0.00%**	**19.60%**	**8.32%**	**27.02%**	**0.00%**	**43.97%**	**0.00%**	**1.09%**
9	**2020**	**0.00%**	**0.00%**	**19.38%**	**0.00%**	**27.02%**	**7.52%**	**44.57%**	**0.00%**	**1.51%**
10	**2021**	**0.00%**	**0.00%**	**13.38%**	**0.00%**	**27.02%**				1.51%
11	**2022**	**0.00%**	**0.00%**	**8.55%**	**0.00%**	**27.02%**				1.51%
12	**2023**	**0.00%**	**0.00%**	**1.68%**	**0.00%**	**27.02%**				1.51%
13	**2024**	**0.00%**	**0.00%**	**0.00%**	**0.00%**	**18.41%**				1.51%
14	**2025**	**0.00%**	**0.00%**	**0.00%**	**0.00%**	**0.00%**	**0.00%**			1.51%
15										
16										
17	**LDT2**	**new**								
18	**Emission Bin**	**BIN 325**	**LEV 160**	**ULEV 125**	**BIN 110**	**ULEV 70**	**ULEV 50**	**SULEV 30**	**SULEV 20**	**ZEV**
19	**Standard [g/mile]**	**0.325**	**0.160**	**0.125**	**0.110**	**0.070**	**0.050**	**0.030**	**0.020**	**0.000**
20	**2016**	**0.05%**	**2.12%**	**61.11%**	**21.37%**	**8.89%**	**0.02%**	**6.43%**	**0.00%**	**0.00%**
21	**2017**	**0.05%**	**2.12%**	**61.11%**	**21.37%**	**8.89%**	**0.02%**	**6.43%**	**0.00%**	**0.00%**
22	**2018**	**0.00%**	**2.12%**	**52.83%**	**21.37%**	**16.77%**	**0.02%**	**6.77%**	**0.00%**	**0.12%**
23	**2019**	**0.00%**	**2.12%**	**42.29%**	**12.00%**	**35.85%**	**0.02%**	**7.29%**	**0.00%**	**0.42%**
24	**2020**	**0.00%**	**2.12%**	**36.42%**	**0.00%**	**37.85%**	**10.87%**	**11.83%**	**0.00%**	**0.90%**
25	**2021**	**0.00%**	**2.12%**	**24.08%**	**0.00%**				**0.00%**	0.90%
26	**2022**	**0.00%**	**2.12%**	**12.00%**	**0.00%**				**0.00%**	0.90%
27	**2023**	**0.00%**	**2.12%**	**5.00%**	**0.00%**				**0.00%**	0.90%
28	**2024**	**0.00%**	**2.12%**	**0.00%**	**0.00%**				**0.00%**	0.90%
29	**2025**	**0.00%**	**2.00%**	**0.00%**	**0.00%**	**0.00%**			**0.00%**	0.90%

In the calculation of vehicle NOx emissions, VMT accrual rates and fleet turnover rates (comprised of new vehicle sales and older vehicle attrition rates) programmed as default parameters in the federally approved EMFAC 2017 model for estimating on-road mobile source emissions under California-specific conditions were selected. For all of the reasons stated in CARB's comments submitted to the SAFE Vehicles Rule docket, the VMT and fleet turnover effects alleged in U.S EPA's and NHTSA's analysis of the proposed rule are highly flawed, and thus unreliable. CARB's original NOx analysis submitted during the comment

period[13] showed the proposed SAFE Vehicles Rule would increase statewide vehicle tailpipe (or "TTW") NOx emissions by approximately 0.22 tons per day (tpd) in 2025 and 0.57 tpd in 2035.

But as noted above, upon rebalancing the fleet to increase the level of precision for the analysis, the TTW NOx emission impacts were recalculated and found to be slightly lower at approximately 0.14 tpd in 2025 and 0.39 tpd in 2035. Converting these updated average weekday values to tons per year (tpy) yields statewide vehicle NOx emission increases of 48 tpy and 135 tpy for 2025 and 2035, respectively.[14] This updated analysis can be found in the same updated "Attachment A_revised_2019_10_14" file, on the "Summary" tab (see cells V7 and V17), which is attached to this letter.

For the WTT, or upstream, emission impact, CARB's analysis calculated the increased NOx emissions that would result from the increased production and delivery of gasoline, and the decreased NOx emissions from reduced production of electricity and hydrogen collectively caused by the proposed SAFE Vehicles Rule's assumed effect on light-duty vehicle GHG emissions and ZEV sales. This part of the analysis found the federal proposal would increase statewide upstream NOx emissions by approximately 0.81 tpd in 2025 and 2.63 tpd in 2035. Converting these to annual emissions yields a statewide upstream NOx emission impact of 280 and 912 tpy of NOx emissions in 2025 and 2035, respectively. To calculate these values, staff used the following analyses and data previously developed or relied upon for CARB's vehicle emission standards:

- VMT by ZEVs were divided into miles driven by battery electric vehicles (BEVs) and fuel cell electric vehicles (FCEVs) based on the technology splits projected in the Mid-Range Scenario of CARB's Advanced Clean Cars Midterm Review.[15]
- Vehicle electricity and hydrogen consumption was estimated by applying the average vehicle efficiencies for BEVs and FCEVs developed in CARB's Vision scenario modeling framework.[16] Under the proposed SAFE Vehicles Rule, both the technology split and vehicle efficiencies remained at model year 2020 levels.
- Upstream emissions associated with fuel and energy production pathways for gasoline, electricity, and hydrogen were calculated based on the best available data representative of California fuel and energy production. Data sources for criteria pollutant emission factors included the California Emission Inventory

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[13] The file "Regional WTW summary 09182018.xlsx," available in the dockets at and EPA-HQ-OAR-2018-0283-7586, contains a tab "Statewide EI TTW" that shows the statewide TTW NOx emission increases.

[14] EMFAC2017 uses a factor to convert tpd (tons per [typical week] day) to tpy (tons per year) of 347 times the average weekday VMT to equate to average annual VMT.

[15] https://www.arb.ca.gov/msprog/acc/mtr/appendix_a.pdf

[16] https://ww3.arb.ca.gov/planning/vision/docs/vision2.1_model_documentation_20170202.pdf, Appendix B

- Development and Reporting System[17] from CARB, annual power generation by plant unit reported by the California Energy Commission,[18] facility nameplate capacities[19,20] and utilization rates,[21] Renewable Portfolio Standards,[22] and Argonne National Laboratory's study on refinery products' contributions to facility emissions.[23]

These calculations can be found and the total WTT emissions breakdown into separate categories requested by the Alliance in a third spreadsheet attached to this letter (titled "Statewide WTT Analysis_2019_10_14.xlsx;" see tab "combined EI WTW," cells G10 and G20). Specifically, NOx emission increases are separately identified for the production of gasoline, the transportation and delivery of gasoline, and the generation and delivery of electricity for charging BEVs. For completeness, staff has also provided a separate value for the production and delivery of hydrogen to fuel FCEVs. The table below, created from these estimates, summarizes the values for each of these categories, including the updated TTW emissions.

Figure 5: Updated statewide NOx tons per year emission impact breakdown

		2025	2035
WTT Emissions	Gasoline production emissions	278	888
	Gasoline transportation and distribution emissions	17	53
	BEV electricity generation and delivery emissions	-14	-25
	FCEV hydrogen production and delivery emissions	-1.5	-3.9
	Subtotal WTT	**280**	**912**
TTW Emissions	Vehicle tailpipe emissions	48	135
	Total (WTT + TTW)	**328**	**1,047**

[17] https://ww3.arb.ca.gov/ei/drei/maintain/database.htm
[18] https://ww2.energy.ca.gov/almanac/electricity_data/web_qfer/Annual_Generation-Plant_Unit_cms.php
[19] https://www.eia.gov/petroleum/ethanolcapacity/ethanolcapacity.xlsx
[20] https://h2tools.org/hyarc/hydrogen-data/merchant-hydrogen-plant-capacities-north-america
[21] https://www.eia.gov/dnav/pet/pet_pnp_unc_dcu_nus_a.htm
[22] https://www.cpuc.ca.gov/RPS_Procurement_Rules_50/
[23] https://greet.es.anl.gov/publication-air_pollutants_smr_petroleum

These clarifications broadly confirm CARB's original analysis in its directionality and magnitude; of course, any projection of future emissions is necessarily subject to further analysis – but the core scientific point remains the same: The SAFE Vehicles Rule as proposed would substantially increase criteria pollutant emissions.

Should you need any additional information, further inquiries may be addressed to Dr. Sam Pournazeri, Chief of the Mobile Source Analysis Branch, at sam.pournazeri@arb.ca.gov or (916) 322-2022.

Sincerely,

Steven S. Cliff, Ph.D.
Deputy Executive Officer

Enclosures