Appendix L

Emissions Inventory Methods and Results for the Proposed Innovative Clean Transit Regulation

I. OVERVIEW

The Innovative Clean Transit (ICT) regulation is proposed as a measure to enhance public health by improving air quality and to mitigate climate change by transforming California transit bus fleets to zero-emissions technologies. The proposed ICT regulation will achieve its electrification goal by gradually increasing the fraction of zero-emission buses (ZEBs) purchased and the number of engines with low oxides of nitrogen (NOx) emissions purchased in early years, if available, to replace the existing conventional internal combustion engine buses. The proposed regulation also includes an option to waive a certain number of ZEB purchases for transit agencies that have made earlier zero emission technology deployment, options to implement innovative zero-emission mobility programs, and requirements to purchase renewable fuels when fuel contracts are renewed for diesel and natural gas. This advanced policy focuses on the transit buses in California would play an important role in demonstrating technical and economic viability of zero-emission technologies in the heavy-duty sector.

This appendix presents the methodology and results of the emissions inventory analysis conducted to examine the effects of the proposed regulation on both criteria and greenhouse gas (GHG) emissions. Staff used the latest available data on population, activity and in-use emissions from transit fleets operating in California to estimate baseline emissions and assess the impact of proposed and alternative scenarios on both criteria (NO_X and $PM_{2.5}$) and GHG emissions. First, staff estimated current transit bus population and their vehicle miles travelled (VMT) in 2016 using latest data from the National Transit Database (NTD), and generated a baseline scenario by projecting the population and activity to future years. In addition to the baseline inventory, staff also assessed the effects of the proposed regulation as well as other alternative scenarios. Finally, staff produced emissions inventories for all scenarios by running the EMFAC2017 model[1] to estimate tank-to-wheel emissions. For GHG, well-to-tank emissions were also estimated using emission rates derived from the Vision model 2.1.[2]

II. EMISSIONS INVENTORY METHODS

An emissions inventory (for any source category) can be calculated at the most basic level, as the product of an emission rate, expressed in grams of a pollutant emitted per some unit of source activity, and a measure of that source's activity. Staff employed

---

[1] California Air Resources Board (CARB) (2018). Mobile Source Emissions Inventory, EMFAC2017. Last updated March 1, 2018. Available: https://www.arb.ca.gov/msei/msei.htm.

[2] California Air Resources Board (CARB) (2017). Vision Scenario Planning, Vision 2.1. Last reviewed February 15, 2017. Available: https://www.arb.ca.gov/planning/vision/downloads.htm.

methods and data incorporated in the EMFAC2017[3] to estimate both baseline (i.e., without the proposed rule) and the regulatory (with the proposed rule) emissions inventories. EMFAC2017 incorporates a detailed transit module that accurately characterizes activity and emissions from transit buses. Transit buses, namely, the "urban buses" category in EMFAC, covers a mix of vehicles that are diverse in body types, fuel types, and weight class. Previous versions of EMFAC model only differentiate transit buses by fuel type. The new module differentiates transit buses by body type and weight class in addition to fuel type, and associates each sub-category with appropriate useful life and emission rates. We also updated transit bus emission rates by incorporating the latest testing data on diesel and compressed natural gas (CNG) buses.

The transit bus module implemented in EMFAC2017 substantially improved the characterization of transit bus population and activity[4] and reflects the latest available test data on in-use emissions from CNG and diesel buses.[5] Previous EMFAC models used California Department of Motor Vehicles (DMV) vehicle registration information to estimate the population of transit buses. Using the DMV vehicle registration database may overestimate the population of these buses, since most of the transit buses have "exempt" plate status which does not require them to register with DMV annually.

Compared to DMV data, NTD also provides more detailed transit fleet activity data such as vehicle make, model year, fuel type, capacity, number of active vehicles, annual miles driven for each transit agency and by mode of service.

While EMFAC2017 provided methods and data for tank-to-wheel emissions, Vision 2.1 model provided well-to-tank emission rates for greenhouse gases. Vision 2.1 is a scenario planning tool that allows CARB to conduct transportation system-wide, multi-pollutant analysis to inform policy development. Vision 2.1 provides well-to-tank fuel production related emissions by aggregating tank-to-wheel energy demand and tailpipe emission outputs. Combining tank-to-wheel emissions based on EMFAC2017 and well-

---

[3] California Air Resources Board (CARB) (2018). EMFAC2017 Volume III – Technical Documentation. March 1, 2018. Available: https://www.arb.ca.gov/msei/downloads/emfac2017-volume-iii-technical-documentation.pdf.

[4] California Air Resources Board (CARB) (2018). EMFAC2017 Volume III – Technical Documentation, Section 3.2. March 1, 2018. Available: https://www.arb.ca.gov/msei/downloads/emfac2017-volume-iii-technical-documentation.pdf.

[5] California Air Resources Board (CARB) (2018). EMFAC2017 Volume III – Technical Documentation, Section 4.3.2.4. March 1, 2018. Available: https://www.arb.ca.gov/msei/downloads/emfac2017-volume-iii-technical-documentation.pdf.

to-tank emissions from Vision 2.1, staff estimated potential impacts of the proposed rule on well-to-wheel greenhouse gas emissions in California.

A. Vehicle Population and Vehicle Miles Travelled

Using population and activity data from NTD, staff constructed an emission inventory for transit buses operating in California. It needs to be noted that the 2016 version of the NTD became available after EMFAC2017 was released, and EMFAC2017 employs the 2015 version of this database. However, for this rulemaking inventory, staff updated the inventory using the 2016 version of the NTD.

Staff extracted vehicle characteristics such as transit agency, service type, vehicle type, and VMT from NTD. The vehicle weight class is determined based on empirical data of vehicle make, model, length, and manufacturer-stated GVWR. As small or rural agencies are not required to provide complete information to NTD, staff filled missing information by assuming they would have similar fleet characteristics as full-reporting urban agencies. Since bus fleets from agencies that do not fully report all the information account for about 7% of the total transit buses, the potential uncertainties in our vehicle characterization from the missing information would be modest. More details on post-processing of NTD can be found in the EMFAC2017 technical documentation.[6]

Future projections of the vehicle population and VMT were forecasted at a regional level using region-specific VMT growth rates. For areas governed by a Metropolitan Planning Organization (MPO) that forecasts transit growth in target years of the Regional Transportation Plan/Sustainable Communities Strategy (RTP/SCS), the growth rate is generated by linear interpolation of the growth between the base year 2016 and target years (e.g., 2020 and 2035). For areas that are not covered by an MPO, or where local MPO does not provide transit growth, the county-level human population growth rate published by the Department of Finance (DOF)[7] were used as a surrogate for forecast the population and VMT of transit fleets. When human population is expected to decrease, we assumed the transit growth to stay flat.

The total new purchase each year is estimated as the difference of current year’s new population and last year population after attrition. The attrition assumes transit buses have a fixed life span and will be removed from the service after their useful life.

---

[6] California Air Resources Board (CARB) (2018). EMFAC2017 Volume III – Technical Documentation, Section 3.2.3.1. March 1, 2018. Available: https://www.arb.ca.gov/msei/downloads/emfac2017-volume-iii-technical-documentation.pdf.

[7] California Department of Finance (DOF) (2017). Demographic Projections. Demographic Research Unit. February 2017.

EMFAC2017 assumes a useful life of 10 years for all cutaway vehicles. All the rest of the transit vehicles are assumed to have a useful life of 14 years. The new purchases are estimated for gasoline vehicles and non-gasoline vehicles separately. For non-gasoline new purchases, the fuel type split between diesel and CNG is determined based on region-specific natural gas penetration trend. It was assumed that 50 percent of all new diesel buses purchased are hybrid diesel buses, which have 25 percent fuel efficiency improvement. Given the absence of regulatory requirement, it is also assumed that there will be no new purchase of zero-emission buses under current conditions.

B. Emissions Rates

EMFAC2017 incorporated new emission rates for diesel and CNG heavy duty buses developed from multiple sources of testing data which are summarized in Table 1 and Table 2. For the rest of fuel types or weight classes, assumptions were made as listed in Table 3.

It is generally believed that transit buses tend to be tamper free, relatively well maintained and properly repaired. Thus, it is assumed that for buses the emissions deterioration due to emission control component failures is negligible, and emission deterioration is mostly attributed with natural degradation of after-treatment systems.

For well-to-wheel emission rates, Vision 2.1 provides emissions on a unit fuel basis (e.g. CO_2e emissions per 1000 diesel gallon equivalent). Combining these emission rates with the EMFAC2017's fuel usage outputs staff calculated well-to-wheel GHG emissions. Since EMFAC2017 does not estimate energy consumptions for electric vehicles, staff used the difference in fuel usage between a given scenario and current condition as the amount of fuel used by ZEBs, assuming that electric vehicles would consume the same amount of energy as the conventional vehicles. This upstream GHG calculation accounted for the differences in fuel efficiencies among different fuel technologies because the well-to-tank emission factors from Vision 2.1 are adjusted for fuel technology by incorporating Energy Economy Ratios (EERs).[8]

[8] California Air Resources Board (CARB) (2015). Low Carbon Fuel Standard Regulation, Table 4. Available: https://www.arb.ca.gov/regact/2015/lcfs2015/lcfsfinalregorder.pdf.

Table 1: Average Emission Rates of Heavy-Duty Diesel Buses by Model Year Group

Model Year Group	NO_X (g/mi)	PM (g/mi)	CO_2 (g/mi)
Pre-2003	27.6	0.319	2,697
2003-2006	12.6	0.0126	2,358
2007-2009	8.13	0.0126	2,432
2010+	1.70	0.0060	2,029

* Emission rates are on the OCBC cycle basis.

Table 2: Average Emission Rates of Heavy-Duty CNG Buses by Model Year Group

Model Year Group	NO_X (g/mi)	PM (g/mi)	CO_2 (g/mi)
Pre-2003	20.3	0.0217	2,325
2003-2007	17.1	0.0151	2,048
2008+	0.61	0.0050	2,237

* Emission rates are on the OCBC cycle basis.

Table 3: Summary of Emission Rates

Weight Class	Fuel Type	Data Source and Assumption
Medium- and Heavy-Heavy Duty Trucks (MHDT & HHDT)	CNG	HHD based on new test; MHD scaled from HHD
	Diesel	HHD based on new test; MHD scaled from HHD, apply 85% PM emission reduction on older buses starting 2010 to account for PM filter retrofit
	BEB and FCEB	Zero tailpipe emissions
	Gasoline	Same as EMFAC2014 gasoline UBUS
	Diesel Hybrids	25% fuel efficiency improvement based on DSL
	Gasoline Hybrids	Same as EMFAC2014 Gasoline
	LNG	Same as CNG
	LPG	Same as CNG
	Low NO_X CNG	90% lower NO_X emission rate based on CNG UBUS
	Low NO_X Diesel	90% lower NO_X emission rate based on diesel UBUS

* Note: Light-heavy-duty trucks are not regulated by the proposed ICT regulation and thus not listed here.

SCENARIOS

The impact of the proposed ICT regulation on criteria and GHG emissions were estimated using five different scenarios: Baseline, Current Conditions, Proposed Rule, Alternative 1, and Alternative 2. Table 4 provides a summary of these scenarios in terms of ZEB purchase requirements within each scenario. These requirements depend on the size of the transit agency, fuel type, and vehicle type. In all the scenarios, it was assumed that 99% of the purchased ZEBs would be battery electric buses (BEBs) and the remaining 1% would be fuel cell electric buses (FCEBs).

(1) **Baseline scenario** represent a situation as if the 2010 Board advisory to withhold the ZEB purchase requirement had not been issued. This baseline scenario reflects a situation where the same number of ZEBs are purchased as originally envisioned with the existing regulation.
(2) **Current Conditions** is a second baseline, which reflects current conditions, including the Board's direction to delay the purchase requirement of zero emission buses. This is the scenario built into the EMFAC2017 model.
(3) **Proposed Rule** represents the proposed ICT regulation. It requires different ZEB purchases depending on the fleet size of the transit agency and the type of the vehicles owned by that agency. Proposed Rule scenario includes ZEB bonus credits. The bonus credits reduce the number of zero emission buses required to be purchased and operated in the fleet until the bonus credit runs out. Based on current status, staff assumed bonus credits listed in **Table 5** and incorporated them in the analysis by tracking bonus credits dedicated to each transit agency.
(4) **Alternative 1** is to have a more aggressive ZEB purchase requirement than the proposed ICT regulation. The goal of reaching 100 percent of ZEB purchases remains the same but would occur earlier than planned.
(5) **Alternative 2** requires transit agencies to purchase buses with low NO_X engine technology if available and would have no requirement to purchase ZEBs. Under this alternative, starting 2020, a CNG fleet is required to purchase low NO_X CNG engines (with 90% lower in-use NOx emissions than existing 0.2 g/bhp-hr engines) when a new bus purchase is made. Because there is no outlook for low NO_X diesel engines available in the near future, a low NO_X diesel engine is not included in this scenario.

Table 4: ZEB Purchase Requirements under Different Scenarios

Scenario	Baseline		Current Conditions	Proposed Rule				Alternative 1		Alternative 2
Transit Agency	Agencies with more than 200 urban buses		All	Large (>=100)	Small (1-99)	Large (>=100)	Small (1-99)	Large (>=100)	Small (1-99)	All
Fuel Type	Diesel	CNG								
Vehicle Type	Urban Bus	Urban Bus		Standard Bus		Cutaway Bus and Non-Standard Bus				
Year										
2011	15%	0%	0%	0%	0%	0%	0%	0%	0%	0%
2012	15%	15%	0%	0%	0%	0%	0%	0%	0%	0%
2013	15%	15%	0%	0%	0%	0%	0%	0%	0%	0%
2014	15%	15%	0%	0%	0%	0%	0%	0%	0%	0%
2015	15%	15%	0%	0%	0%	0%	0%	0%	0%	0%
2016	15%	15%	0%	0%	0%	0%	0%	0%	0%	0%
2017	15%	15%	0%	0%	0%	0%	0%	0%	0%	0%
2018	15%	15%	0%	0%	0%	0%	0%	0%	0%	0%
2019	15%	15%	0%	0%	0%	0%	0%	0%	0%	0%
2020	15%	15%	0%	0%	0%	0%	0%	100%	0%	0%
2021	15%	15%	0%	0%	0%	0%	0%	100%	0%	0%
2022	15%	15%	0%	0%	0%	0%	0%	100%	0%	0%
2023	15%	15%	0%	25%	0%	0%	0%	100%	100%	0%
2024	15%	15%	0%	25%	0%	0%	0%	100%	100%	0%
2025	15%	15%	0%	25%	0%	0%	0%	100%	100%	0%
2026	15%	15%	0%	50%	25%	50%	25%	100%	100%	0%
2027	0%	0%	0%	50%	25%	50%	25%	100%	100%	0%
2028	0%	0%	0%	50%	25%	50%	25%	100%	100%	0%
2029	0%	0%	0%	100%	100%	100%	100%	100%	100%	0%
2030	0%	0%	0%	100%	100%	100%	100%	100%	100%	0%

Table 5: Transit agencies with Bonus Credits

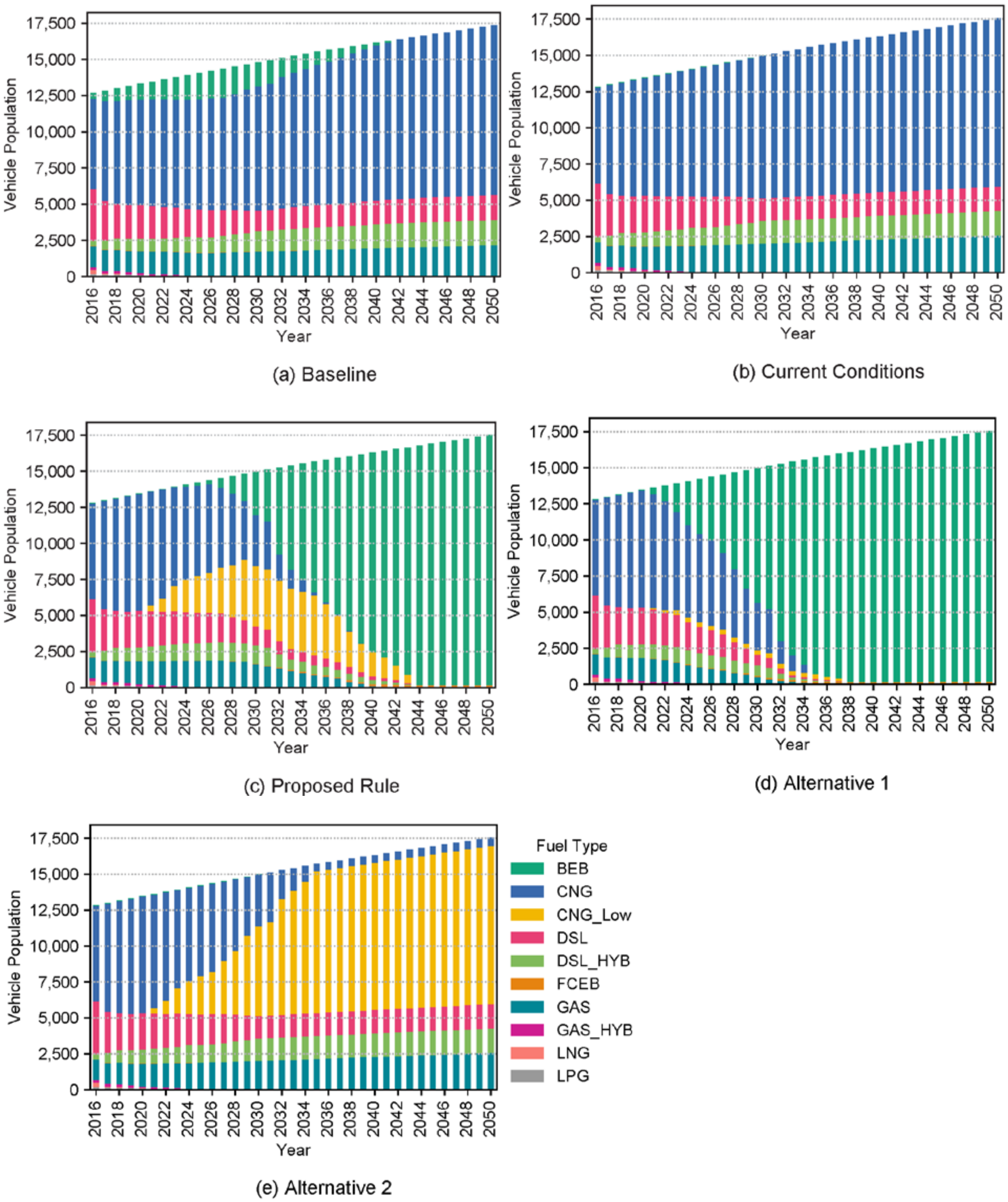
5 Digit NTD ID	NTD Agency Name	Bonus Credits
90121	Antelope Valley Transit Authority	2
9R02-91007	Fresno County Rural Transit Agency	4
90042	City of Gardena Transportation Department	6
90232	Solano County Transit	2
90014	Alameda-Contra Costa Transit District	36
90078	Central Contra Costa Transit Authority	4
90146	Foothill Transit	17
90023	Long Beach Transit	7
90147	City of Los Angeles Department of Transportation	2
90062	Monterey-Salinas Transit	1
90036	Orange County Transportation Authority	12
90012	San Joaquin Regional Transit District	2
90020	Santa Barbara Metropolitan Transit District	14
90079	SunLine Transit Agency	23

IV. RESULTS

A. Vehicle Population

Figure 1 shows the historical and forecasted transit bus population estimated using method described in the previous section. The vehicle population is expected to grow from over 12,000 buses in 2016 to over 17,000 in 2050. Different scenarios have a different set of vehicle compositions as expected. As explained in the ISOR, a one-year delay between vehicle purchase and delivery is considered to more accurately reflect expenditures and emissions. Requiring all new purchases with ZEBs by 2029, which will be in service by 2030, Proposed Rule shows that all transit fleets have ZEBs in service by 2044.

Figure 1: Projected Vehicle Population by Fuel Type



B. Emissions

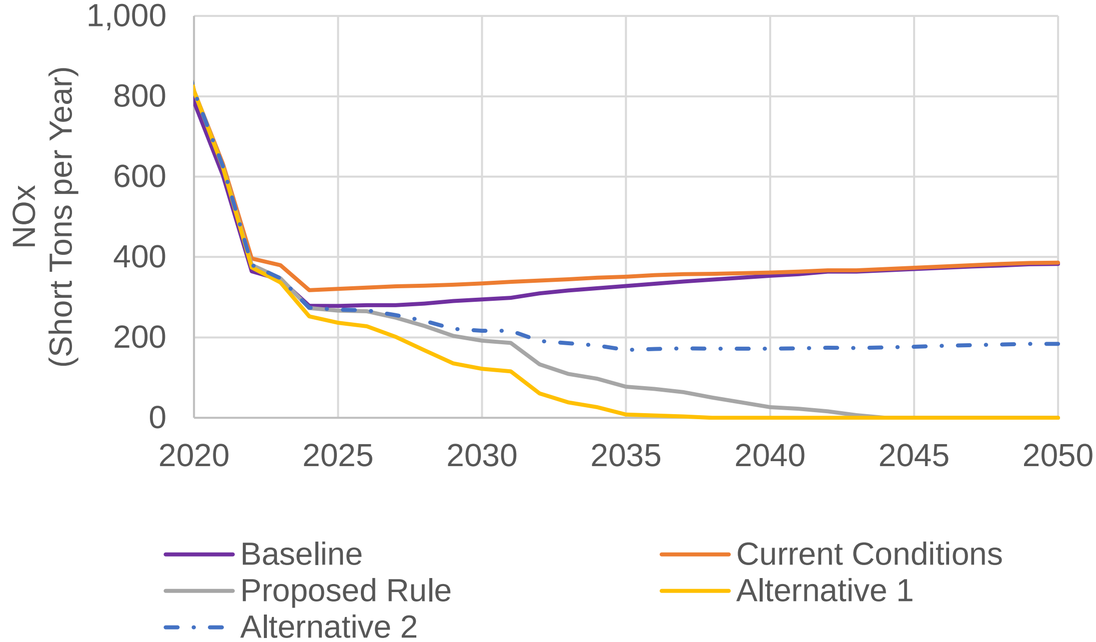
Tank-to-Wheel emissions of NO_X and $PM_{2.5}$ are summarized in Figure 2, Table 6 and Table 7. NO_X and $PM_{2.5}$ emissions from transit buses as of 2020 are 813 tons[9] per year and 2.37 tons per year, respectively, and they gradually become zero by 2044 in the Proposed Rule scenario.

GHG emissions are summarized in Figure 3 and Table 8. In the Proposed Rule scenario, as conventional transit buses are replaced by ZEBs, well-to-wheel CO_2e emissions decrease substantially from 1.2 million metric tons per year in 2020 to 0.2 million metric tons per year in 2050. Although well-to-tank CO_2e emissions increase with more ZEBs, the reductions made in tank-to-wheel CO_2e emissions offset the increase in well-to-tank emissions, resulting in the substantial net decrease in CO_2e emissions.

Alternative 2 requires transit agencies to purchase buses with low NO_X engine technology if available and would have no requirement to purchase ZEBs. Therefore, there are no additional NOx or GHG emission reductions relative to current conditions. In Figure 2 and Figure 3, the lines for current conditions and alternative 2 overlay to show the same emissions for NOx and GHG.

[9] 1 short ton = 907,185 grams

Figure 2: Tank-to-Wheel Emissions of NOx and $PM_{2.5}$ (Break and Tier Wear Not Included)



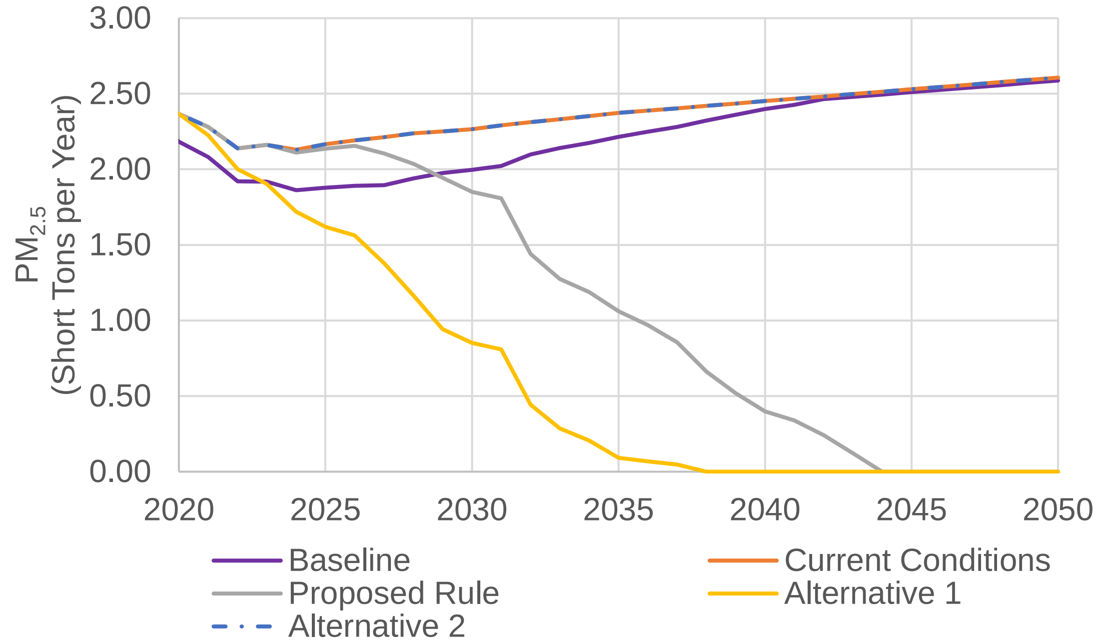


Figure 3: Well-to-Wheel CO_2e Emissions

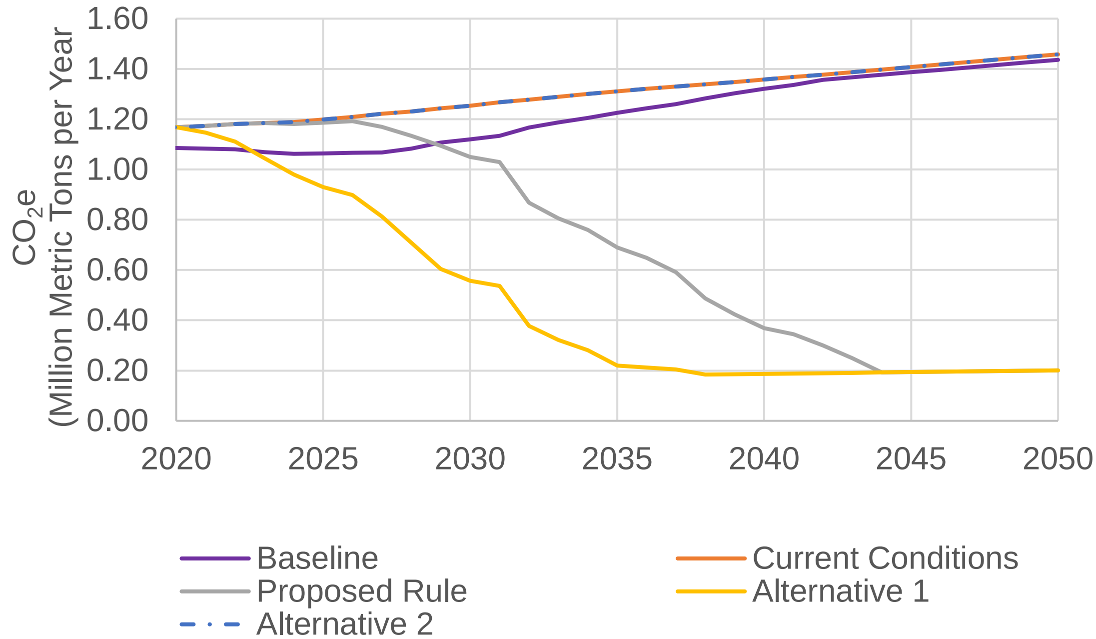


Table 6: Tank-to-Wheel NOx Emissions (Short Tons per Year)

Year	Baseline	Current Conditions	Proposed Rule	Alternative 1	Alternative 2
2020	786	813	813	813	813
2021	603	632	625	623	625
2022	365	397	380	374	380
2023	344	380	347	337	347
2024	278	318	273	253	274
2025	278	321	267	237	269
2026	280	324	265	228	267
2027	280	327	249	201	256
2028	284	328	228	168	241
2029	290	331	204	135	222
2030	294	334	192	122	216
2031	299	339	187	116	217
2032	310	342	133	61	191
2033	317	345	109	38	185
2034	322	349	97	26	180
2035	328	351	77	8	169
2036	334	355	72	6	171
2037	339	358	64	4	173
2038	344	358	51	0	172
2039	349	360	38	0	172
2040	353	361	26	0	172
2041	358	364	22	0	173
2042	364	367	16	0	175
2043	364	367	6	0	174
2044	367	370	0	0	175
2045	370	373	0	0	177
2046	373	376	0	0	179
2047	376	380	0	0	181
2048	379	383	0	0	183
2049	382	386	0	0	184
2050	383	386	0	0	184

Table 7: Tank-to-Wheel $PM_{2.5}$ Emissions (Short Tons per Year)

Year	Baseline	Current Conditions	Proposed Rule	Alternative 1	Alternative 2
2020	2.18	2.37	2.37	2.37	2.37
2021	2.08	2.28	2.28	2.23	2.28
2022	1.92	2.14	2.14	2.00	2.14
2023	1.92	2.16	2.16	1.90	2.16
2024	1.86	2.13	2.11	1.72	2.13
2025	1.88	2.17	2.14	1.62	2.17
2026	1.89	2.19	2.15	1.56	2.19
2027	1.89	2.21	2.11	1.38	2.21
2028	1.94	2.24	2.04	1.17	2.24
2029	1.97	2.25	1.94	0.94	2.25
2030	2.00	2.27	1.85	0.85	2.27
2031	2.02	2.29	1.81	0.81	2.29
2032	2.10	2.31	1.44	0.44	2.31
2033	2.14	2.33	1.28	0.29	2.33
2034	2.17	2.35	1.19	0.21	2.35
2035	2.22	2.37	1.06	0.09	2.37
2036	2.25	2.39	0.97	0.07	2.39
2037	2.28	2.40	0.86	0.05	2.40
2038	2.32	2.42	0.66	0.00	2.42
2039	2.36	2.44	0.52	0.00	2.44
2040	2.40	2.45	0.40	0.00	2.45
2041	2.43	2.47	0.34	0.00	2.47
2042	2.46	2.48	0.24	0.00	2.48
2043	2.48	2.50	0.12	0.00	2.50
2044	2.49	2.51	0.00	0.00	2.51
2045	2.51	2.53	0.00	0.00	2.53
2046	2.53	2.54	0.00	0.00	2.54
2047	2.54	2.56	0.00	0.00	2.56
2048	2.56	2.58	0.00	0.00	2.58
2049	2.57	2.59	0.00	0.00	2.59
2050	2.59	2.61	0.00	0.00	2.61

Table 8: Well-to-Wheel CO_2e Emissions (Million Metric Tons per Year)

Year	Baseline	Current Conditions	Proposed Rule	Alternative 1	Alternative 2
2020	1.09	1.17	1.17	1.17	1.17
2021	1.08	1.17	1.17	1.15	1.17
2022	1.08	1.18	1.18	1.11	1.18
2023	1.07	1.18	1.18	1.04	1.18
2024	1.06	1.19	1.18	0.98	1.19
2025	1.06	1.20	1.19	0.93	1.20
2026	1.07	1.21	1.19	0.90	1.21
2027	1.07	1.22	1.17	0.81	1.22
2028	1.08	1.23	1.13	0.71	1.23
2029	1.11	1.24	1.09	0.60	1.24
2030	1.12	1.25	1.05	0.56	1.25
2031	1.13	1.27	1.03	0.54	1.27
2032	1.17	1.28	0.87	0.38	1.28
2033	1.19	1.29	0.81	0.32	1.29
2034	1.21	1.30	0.76	0.28	1.30
2035	1.23	1.31	0.69	0.22	1.31
2036	1.24	1.32	0.65	0.21	1.32
2037	1.26	1.33	0.59	0.20	1.33
2038	1.28	1.34	0.49	0.18	1.34
2039	1.30	1.35	0.42	0.19	1.35
2040	1.32	1.36	0.37	0.19	1.36
2041	1.34	1.37	0.34	0.19	1.37
2042	1.36	1.38	0.30	0.19	1.38
2043	1.37	1.39	0.25	0.19	1.39
2044	1.38	1.40	0.19	0.19	1.40
2045	1.39	1.41	0.19	0.19	1.41
2046	1.40	1.42	0.20	0.20	1.42
2047	1.41	1.43	0.20	0.20	1.43
2048	1.42	1.44	0.20	0.20	1.44
2049	1.43	1.45	0.20	0.20	1.45
2050	1.44	1.46	0.20	0.20	1.46

Reference List L

The following documents are the technical, theoretical, or empirical studies, reports, or similar documents relied upon in proposing these regulatory amendments, identified as required by Government Code, section 11346.2, subdivision (b)(3). Additionally, each appendix references the documents upon which it relies, as required by Government Code, section 11346.2, subdivision (b)(3).

Note: Each “Explanatory Footnote” is a footnote containing explanatory discussion rather than referencing specific documents relied upon.

1. California Air Resources Board (CARB) (2018). Mobile Source Emissions Inventory, EMFAC2017. Last updated March 1, 2018. Available: https://www.arb.ca.gov/msei/msei.htm.

2. California Air Resources Board (CARB) (2017). Vision Scenario Planning, Vision 2.1. Last reviewed February 15, 2017. Available: https://www.arb.ca.gov/planning/vision/downloads.htm.

3. California Air Resources Board (CARB) (2018). EMFAC2017 Volume III – Technical Documentation. March 1, 2018. Available: https://www.arb.ca.gov/msei/downloads/emfac2017-volume-iii-technical-documentation.pdf.

4. California Air Resources Board (CARB) (2018). EMFAC2017 Volume III – Technical Documentation, Section 3.2. March 1, 2018. Available: https://www.arb.ca.gov/msei/downloads/emfac2017-volume-iii-technical-documentation.pdf.

5. California Air Resources Board (CARB) (2018). EMFAC2017 Volume III – Technical Documentation, Section 4.3.2.4. March 1, 2018. Available: https://www.arb.ca.gov/msei/downloads/emfac2017-volume-iii-technical-documentation.pdf.

6. California Air Resources Board (CARB) (2018). EMFAC2017 Volume III – Technical Documentation, Section 3.2.3.1. March 1, 2018. Available: https://www.arb.ca.gov/msei/downloads/emfac2017-volume-iii-technical-documentation.pdf.

7. California Department of Finance (DOF) (2017). Demographic Projections. Demographic Research Unit. February 2017.

8. California Air Resources Board (CARB) (2015). Low Carbon Fuel Standard Regulation, Table 4. Available: https://www.arb.ca.gov/regact/2015/lcfs2015/lcfsfinalregorder.pdf.

9. Explanatory footnote