

Staff Report

West Mojave Desert VMT Offset Demonstration

Release Date: September 19, 2020

Hearing Date: October 22, 2020



CALIFORNIA
AIR RESOURCES BOARD

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VMT Emissions Offset Demonstration

Introduction

Within two years of adoption of a National Ambient Air Quality Standard (Standard), the Clean Air Act (Act) requires states to submit enforceable transportation control strategies (TCSs) and transportation control measures (TCMs) to offset any growth in emissions from growth in vehicle-miles traveled (VMT) or numbers of vehicle trips for areas designated as Severe or Extreme. The California Air Resource Board (CARB) prepared VMT emissions-offset demonstrations for Western Mojave Desert Severe nonattainment areas for the 70 parts per billion (ppb) 8-hour ozone Standard as required by Section 182(d)(1)(A) of the Act. The following demonstration was developed in accordance with the U.S. Environmental Protection Agency's (U.S. EPA) August 2012 guidance entitled *Implementing Clean Air Act Section 182(d)(1)(A): Transportation Control Measures and Transportation Control Strategies to Offset Growth in Emissions Due to Growth in Vehicle Miles Traveled*.¹

U.S. EPA Guidance on VMT Offset Requirement

In their 2012 guidance, U.S. EPA indicated that technology improvements such as vehicle technology improvements, motor vehicle fuels, and other control strategies that are transportation related could be used to offset emissions increases from VMT. The guidance also set forth a methodology for demonstrating achievement of the VMT offset requirement for volatile organic compound (VOC) emissions. The projected attainment year emissions, assuming no new control measures and no VMT growth, are to be compared with projected actual attainment year emissions that include new control measures and VMT growth. If the latter number is smaller than the former, then no additional TCMs or TCSs are required. The 2012 guidance recommends that the base year used in the VMT offset demonstration be the base year used in the attainment demonstration for the Standard.

Transportation Control Strategies and Transportation Control Measures

By listing them separately, Act §182(d)(1)(A) differentiates between transportation TCSs and TCMs, both of which can be used as options to offset increased emissions from growth in VMT per the provisions of Act §182(d)(1)(A) and the 2012 guidance. Since 1990, when this requirement was established, California has adopted a substantial number of enforceable TCSs—more than enough to meet the requirement to offset increased emissions from VMT growth. Attachment A-1 provides a list of the State's mobile source TCSs CARB has adopted since 1990 that are included in this analysis.

¹ U.S. Environmental Protection Agency [EPA]: Office of Transportation and Air Quality. (2012, August). *Implementing Clean Air Act Section 182(d)(1)(A): Transportation Control Measures and Transportation Control Strategies to Offset Growth in Emissions Due to Growth in Vehicle Miles Traveled* (EPA-420-B-12-053). Retrieved from

<http://www.epa.gov/otaq/stateresources/policy/general/420b12053.pdf>

Under federal law, the Southern California Association of Governments (SCAG) is designated as a Metropolitan Planning Organization (MPO), and under State law as a Regional Transportation Planning Agency and a Council of Governments. The SCAG region encompasses several ozone nonattainment areas including the Western Mojave Desert. On May 7, 2020, SCAG adopted their Regional Transportation Plan (2020 RTP) also known as Connect SoCal for federal transportation conformity purposes only. However, the RTP does not include specific TCMs for the Western Mojave Desert because upwind emissions from the South Coast Air Basin and Ventura County largely influence air quality in Western Mojave Desert.

Methodology

The following calculations are based on U.S. EPA's 2012 guidance. For the 70-ppb 8-hour ozone standard, 2017 and 2032 are the base year and the attainment year for Severe areas, respectively.

This analysis uses California's motor vehicle emissions model, EMission FACtor (EMFAC)². On August 15, 2019, U.S. EPA approved EMFAC2017 for use in State Implementation Plans (SIPs) and to demonstrate transportation conformity³. The EMFAC model estimates the emissions from two combustion processes: running exhaust and start exhaust, and four evaporative processes: hot soak, running losses, diurnal, and resting losses. Emissions from running exhaust, start exhaust, hot soak, and running losses are a function of how much a vehicle is driven. Emissions from these processes are directly related to VMT, trips, and starts. These processes are included in the calculation of the emissions levels used in the VMT offset demonstration. Emissions from resting loss and diurnal loss processes are not related to VMT, trips or vehicle starts and are not included in the analysis because these emissions occur whether or not the vehicle makes a trip (i.e., a start). In addition, The Safer Affordable Fuel-Efficient (SAFE) Vehicles Rule Part One: One National Program impacts some of the underlying assumptions in the EMFAC2017 model. Hence, the emissions output from the EMFAC2017 model were adjusted to account for the impacts of this rule⁴.

To calculate on-road emission inventories in the Western Mojave Desert ozone nonattainment area, EMFAC combines VMT and speed distributions from SCAG's

² More information on data sources can be found in the EMFAC technical support documentation at: <https://ww2.arb.ca.gov/our-work/programs/mobile-source-emissions-inventory/msei-road-documentation>

³ 84 FR 41717 <https://www.federalregister.gov/d/2019-17476>

⁴ EMFAC Off-Model Adjustment Factors to Account for the SAFE Vehicle Rule Part One, https://ww3.arb.ca.gov/msei/emfac_off_model_adjustment_factors_final_draft.pdf

2020 RTP. The number of starts per day are based on household travel surveys, and vehicle population data from the California Department of Motor Vehicles with corresponding emission rates to calculate emissions.

Analysis for the Western Mojave Desert

Step 1. Provide the emissions levels for the 2017 base year.

Table 1 shows the Western Mojave Desert VOC emissions for calendar year 2017 from the EMFAC2017 model.

Table 1: Western Mojave Desert Base Year (2017) VMT and Emissions

Description	VMT (miles/day)	VOC (tons/day)
2017 Vehicle-Miles Traveled and On-Road Emissions	31,687,212	7.7

Step 2. Calculate three emissions levels in the 2032 attainment year.

- (1) Calculate emissions levels with the motor vehicle control program frozen at 2017 levels and with projected VMT in the attainment year. This represents what the emissions in the attainment year would have been if TCSs and TCMs had not been implemented after 2017.
- (2) Calculate emissions levels with the motor vehicle control program frozen at 2017 levels and assuming VMT do not increase from 2017 levels.
- (3) Calculate an emissions level that represents emissions with full implementation of all TCSs and TCMs since 2017.

Calculation 1. Calculate the emissions in the attainment year assuming no new measures since the base year with growth in VMT.

To perform this calculation, CARB staff identified the on-road motor vehicle control programs adopted since 2017 and adjusted the EMFAC2017 output to reflect the VOC emissions levels in 2032 without the benefits of the post-2017 control programs. The projected VOC emissions are 4.4 tons per day.

Calculation 2. Calculate the emissions with no growth in VMT.

EMFAC2017 allows the user to input different VMT values. CARB ran EMFAC2017 for calendar year 2032 with the 2017 VMT level of 31,687,212 miles per day without the benefits of the post-2017 control programs. The VOC emissions associated with the 2017 VMT level are 4.0 tons per day.

Calculation 3. Calculate emissions reductions with full implementation of TCSs and TCMs.

CARB calculated the VOC emission levels for 2032 assuming the benefits of the post-2017 motor vehicle control program and the projected VMT levels in 2032 are calculated using EMFAC2017. The projected VOC emissions levels are 3.8 tons per

day.

VOC emissions for the three sets of calculations described above are provided in Table 2.

Table 2: Western Mojave Desert VOC Emissions Calculations for Attainment Year (2032)

Calculation Number	Description	VMT (miles/day)	VOC (tons/day)
1	Emissions with motor vehicle control program frozen at 2017 levels (VMT at 2032 projected levels)	38,740,483	4.4
2	Emissions with motor vehicle control program frozen at 2017 levels (VMT at 2017 levels)	31,687,212	4.0
3	Emissions with full motor vehicle control program in place (VMT at 2032 projected levels)	38,740,483	3.8

As provided in the 2012 guidance, to determine compliance with Act §182(d)(1)(A), Calculation 3 emissions levels should be less than or equal to the Calculation 2 emissions levels:

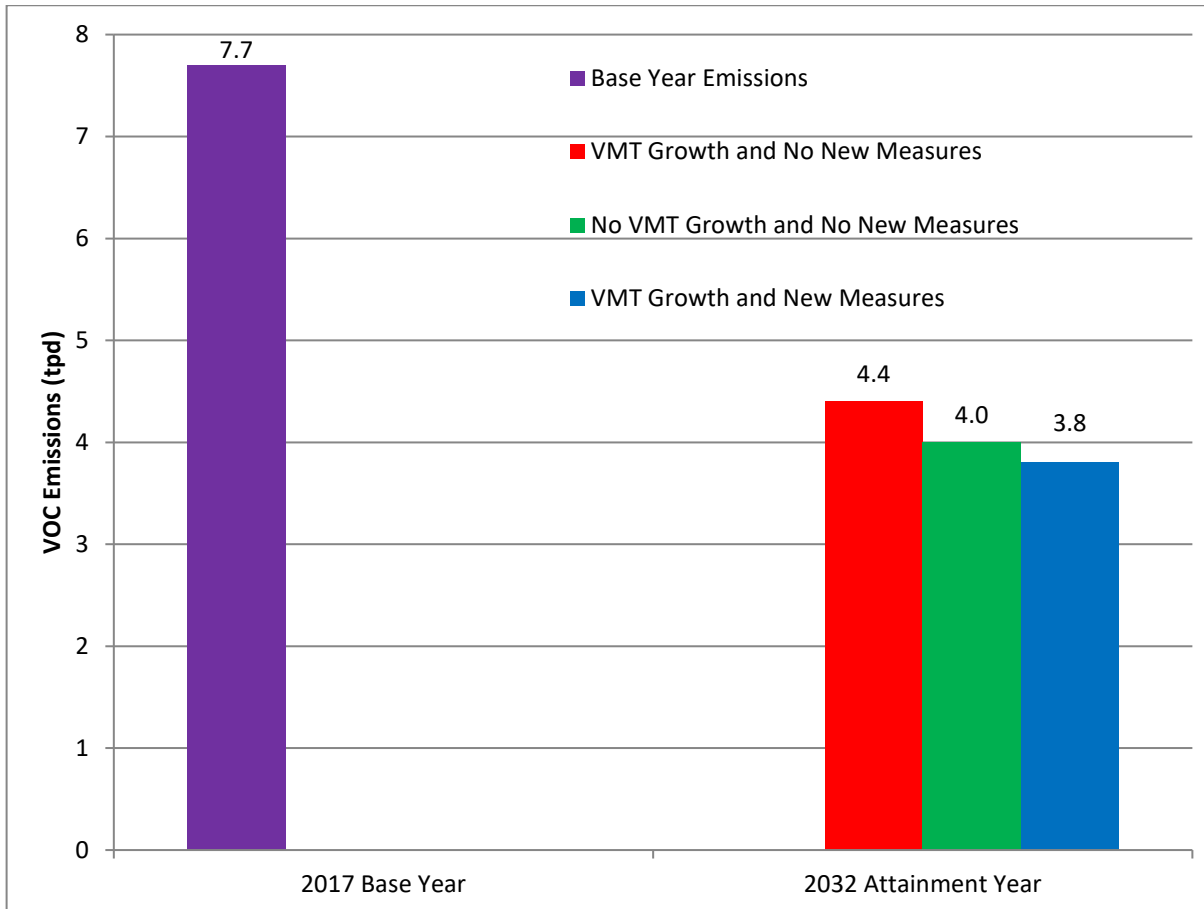
$$\text{VOC: } 3.8 < 4.0 \text{ tons per day}$$

Since the estimated attainment year emissions are less than the VMT Offset ceiling (calculation 2), additional TCMs and TCSs will not be needed.

Summary

The previous sections provide an analysis to demonstrate compliance with Act §182(d)(1)(A). To further illustrate the demonstration, Figure 1 graphically displays the emissions benefits of the motor vehicle control programs in offsetting VOC emissions resulting from VMT increases in the Western Mojave Desert for the 2015 70 ppb 8-hour ozone standard. The left-most bar (in purple) shows the emissions in the base year, 2017 for the 70 ppb 8-hour standard. The set of three bars on the right show the emission levels in the attainment year, 2032. The bars on the right represent the emissions if no further motor vehicle controls after the base year and with projected VMT increases (red bar), the emissions if VMT does not increase from base-year levels and there are no TCSs or TCMs after the base year (green bar), and the emission levels with all the existing motor vehicle control programs in place with projected VMT increases (blue bar). Based on the 2012 guidance, since the blue bar is lower than the green bar, no additional TCSs and TCMs will be needed to offset the growth in emissions.

Figure 1 Western Mojave Desert VMT Offset Demonstration*



* Does not include resting or diurnal loss emissions

Attachment A-1 State of California Motor Vehicle Control Program (1990-Present)

Measure	Hearing Date	Category
California Reformulated Gasoline (CalRFG), Phase I. T 13, CCR, 2251.5	9/27/1990	Fuels
California Reformulated Gasoline, Phase II. T 13, CCR, 2250, 2255.1, 2252, 2260 - 2272, 2295	11/21/1991	Fuels
Wintertime Gasoline Program. T 13, CCR, 2258, 2298, 2251.5, 2296	11/21/1991	Fuels
Wintertime Oxygenate Program. T 13, CCR, 2258, 2251.5, 2263(b), 2267, 2298, 2259, 2283, 2293.5	9/9/1993	Fuels
Diesel Fuel Certification Test Methods. T 13, CCR, 1956.8(b), 1960.1(k), 2281(c), 2282(b), (c) and (g)	10/24/1996	Fuels
Diesel Fuel Test Methods. T 13, CCR, 1956.8(b), 1960.1(k), 2281(c), 2282(b), (c) and (g)	10/24/1996	Fuels
1997 Amendments to Onboard Diagnostics, Phase II, Technical Status. T 13, CCR, 1968.1, 2030, 2031	12/12/1996	On-Road
Low Emission Vehicles Standards (LEV 2) and Compliance Assurance Program (CAP 2000). T 13, CCR, 1961 & 1962 (both new); 1900, 1960.1, 1965, 1968.1, 1976, 1978, 2037, 2038, 2062, 2101, 2106, 2107, 2110, 2112, 2114, 2119, 2130, 2137-2140, 2143-2148	11/5/1998	On-Road
Exhaust Standards for (On-Road) Motorcycles. T 13, CCR, 1900, 1958, 1965	12/10/1998	On-Road
Light-and Medium Duty Low Emission Vehicle Alignment with Federal Standards. Exhaust Emission Standards for Heavy Duty Gas Engines. T 13, CCR, 1956.8 & 1961	12/7/2000	On-Road
Heavy Duty Diesel Engine Standards for 2007 and Later. T 13, CCR, 1956.8 and incorporated test procedures	10/25/2001	On-Road
Low Emission Vehicle Regulations. T 13, CCR, 1960.1, 1960.5, 1961, 1962 and incorporate test procedures and guidelines	11/15/2001	On-Road
2003 Amendments to On-Board Diagnostic II Review Amendments. T 13, CCR, 1968.1, 1968.2, 1968.5	4/25/2002	On-Road
CaRFG Phase 3 Amendments. T 13,	7/25/2002	Fuels

Measure	Hearing Date	Category
CCR, 2261, 2262, 2262.4, 2262.5, 2262.6, 2262.9, 2266.5, 2269, 2271, 2272, 2265, and 2296		
Adoption of Minor Amendments to the Low-Emission Vehicle Regulations. T 13, CCR, 1961, 1965, 1978, and the incorporate test procedures	12/12/2002	On-Road
Incorporation of Federal Exhaust Emission Standards for 2008 and Later Model-Year Heavy Duty Gasoline Engines and the Adoption of Minor Amendments to the Low-Emission Vehicle Regulations. T 13, CCR, 1956.8 and documents incorporated by reference	12/12/2002	On-Road
CaRFG Phase 3 Amendments (specifications for De Minimis Levels of Oxygenates and MTBE Phase Out Issues). T 13, CCR, 2261, 2262.6, 2263, 2266.5, 2272, 2273, 2260, 2273.5	12/12/2002	Fuels
Specifications for Motor Vehicle Diesel Fuel. T 13 & T17, CCR, 1961, 2281, 2282, 2701, 2284, 2285, 93114, and incorporated test procedures	7/24/2003	Fuel
California Reformulated Gasoline, Phase 3. T 13, CCR, 2260, 2262, 2262.4, 2262.5, 2262.6, 2262.9, 2263, 2265 (and the incorporated "California Procedures"), and 2266.5	11/18/2004	Fuels
On-Board Diagnostic System Requirements for 2010 and Subsequent Model-Year Heavy-Duty Engines (HD OBD). T 13, CCR, 1971.1	7/21/2005	On-Road
Requirements to Reduce Idling Emissions from New and In-Use Trucks, Beginning in 2008. T 13, CCR, 1956.8, 2404, 2424, 2425, and 2485 and the incorporated document	10/20/2005	On-Road
Mobile Cargo Handling Equipment at Ports and Intermodal Rail Yard. T 13, CCR, 2479	12/8/2005	On-road and Off-road
Evaporative and Exhaust Emission Test Procedures. T 13, CCR, 1961, 1976, 1978	6/22/2006	On-road
Heavy-Duty In-Use Compliance Regulation. T 13, CCR, 1956.1, 1956.8, and documents incorporated by reference	9/28/2006	On-Road

Measure	Hearing Date	Category
2007 Amendments to On-Board Diagnostic II. T 13, CCR, 1968.2, 1968.5, 2035, 2037 and 2038	9/28/2006	On-Road
Phase 3 Reformulated Gasoline (Ethanol Permeation) T 13, CCR, 2260, 2261, 2262, 2263, 2264, 2265, 2266, 2270, 2271, and 2273	6/14/2007	Fuel
2007 Amendments to Heavy-Duty In-Use Compliance Regulation. T 13, CCR, 1956.1, 1956.8, and documents incorporated by reference	12/6/2007	On-Road
Port Truck Modernization T 13, CCR, 2027	12/6/2007	On-Road
Cleaner In-Use Heavy-Duty Trucks (Truck and Bus Reg) T 13, CCR, 2025	12/11/2008	On-Road
2010 Amendments to On-Board Diagnostic II. T 13, CCR, 1968.2, 1968.5, 2035, 2037 and 2038	5/28/2009	On-Road
Plug-In Hybrid Electric Vehicle Test Procedure Amendments. T 13, CCR, 2032, 1900, 1962, 1962.1	5/28/2009	On-Road
2010 Amendments to On-Board Diagnostic System Requirements for Heavy-Duty Engines (HD OBD). T 13, CCR, 1971.1 and 1971.5	5/28/2009	On-Road
Truck and Bus Regulation 2010. T13, CCR, 2025	12/16/2010	On-Road
2011 Amendments to Heavy-Duty In-Use Compliance Regulation. T 13, CCR, 1956.1, 1956.8, and documents incorporated by reference	6/23/2011	On-Road
Amendments to Mobile Cargo Handling Equipment at Ports and Intermodal Rail Yard. T 13, CCR, 2479	9/22/2011	On-Road
Advanced Clean Cars T 13, CCR, 1900, 1956, 1960, 1961, 1962, 1965, 1968, 1976, 1978, 2037, 2038, 2062, 2112, 2139, 2140, 2145, 2147, 2235, 2300, 2302, 2303, 2304, 2306, 2307, 2308, 2309, 2310, 2311, 2312, 2313, 2314, 2315, 2316, 2317, and 2318	1/26/2012	On-Road
Zero Emission Vehicle Standards for 2009 through 2017 models. T 13, CCR, 1962.1, 1962.3	1/26/2012	On-Road
2012 Amendments to On-Board Diagnostic II. T 13, CCR, 1968.2, 1968.5, 2035, 2037 and 2038	1/26/2012	On-Road

Measure	Hearing Date	Category
Emergency Regulatory Amendments to the Tractor-Trailer Greenhouse Gas Regulation T 17, CCR, 95307	2/29/2012	On-Road
2013 Amendments to On-Board Diagnostics (OBD I and II) Regulations T 13, CCR, 1968.2, 1971.1	8/23/2012	On-Road
2013 Amendments to Heavy Duty On Board Diagnostic Requirements	8/23/2012	On-Road
Low Emission Vehicle III Greenhouse Gas and Zero Emission Vehicle Regulation Amendments for Federal Compliance Option T 13, CCR, 1900, 1956.8, 1960.1, 1961, 1961.2, 1961.3, 1962.1, 1962.2, 1976	11/15/2012	On-Road
Heavy-Duty Greenhouse Gas Phase 1: On-Road Heavy Duty Greenhouse Gas Emissions Rule, Tractor-Trailer Rule, Commercial Motor Vehicle Idling Rule, Optional Emission Standards, Heavy-Duty Hybrid-Electric Vehicle Certification Procedure T 13, CCR, 1900, 1956.	12/12/2013	On-Road
Heavy-Duty Hybrid-Electric Vehicle Certification Procedure T 13, CCR, 1900, 1956.8, 2036, 2037, 2112, 2139, 2140, 2147, 2485, T 17, CCR, 95300, 95301, 95302, 95303, 95305, 95660, 95661, 95662, 95663, 95664	12/12/2013	On-Road
Amendments to Low Emission Vehicle III Criteria Pollutant Requirements for Light-and Medium-Duty Vehicles the Hybrid Electric Vehicle Test Procedures, and the Heavy-Duty Otto-Cycle and Heavy-Duty Diesel Test Procedures T 13, CCR, 1900, 1956.8, 1961.2, 1962.2, 1965, 1976, 1978	10/23/2014	On-Road
2014 Amendments to Zero Emission Vehicle Regulation T 13, CCR, 1962.1, 1962.2	10/23/2014/5/21/2015	On-Road