



LOS ANGELES INTERNATIONAL AIRPORT 2021 YEAR REPORT ON MOU IMPLEMENTATION

Summary and Data Report

Los Angeles International Airport (LAX or Airport) has prepared the annual report as requested by the South Coast Air Quality Management District (SCAQMD). On December 13, 2019, a Memorandum of Understanding (MOU) was entered into by the SCAQMD and the Airport. The purpose of this annual report is to quantify the estimated emission reduction benefits in the Basin through implementation of the three (3) voluntary measures from LAWA's LAX's Air Quality Improvement Measures (AQIM). This MOU does not create State Implementation Plan (SIP) creditable reductions, but it identifies specific voluntary measures and provides the means for the SCAQMD to quantify the emission reductions from the MOU Measures to obtain SIP credits.

There are three measures in the LAX MOU, as related to non-aircraft commercial passenger airport mobile sources. LAX monitors the implementation of the MOU Measures and provides data and annual emissions inventory reports to SCAQMD as specified in MOU Attachment A for Measures 1 to 3. The report does not apply to any source or operation of any source that is not specifically identified in the MOU Measures.

The 2021 data is the second reporting year and a continual monitoring of program's progress. The 2020 data was intended to establish a program baseline; however, in February 2020, the novel coronavirus (COVID-19) emerged and significantly disrupted airport operations. As air travel has begun to return to pre-pandemic levels, the outlook for recovery remains somewhat uncertain for the airport. The airport, airlines, ground support equipment (GSE) operators, and many related third parties continue to re-evaluate capital plans and allocation of resources. Although the 2021 data better represents the pre-pandemic operations, it is still considered an anomaly instead of a baseline year.

MEASURE NO. 1 - GROUND SUPPORT EQUIPMENT EMISSIONS REDUCTION POLICY

MOU Measure No. 1 is a measure for ground support equipment. This measure requires that all ground support equipment operators at LAX achieve fleet average NO_x + Hydrocarbon emission factors of 1.8 and 1.0 grams per brake horsepower-hour (g/bhp-hr) by January 1, 2023 and January 1, 2031, respectively. To achieve this measure, the LAWA has been working with Airport tenants to achieve the performance targets by specified dates through accelerated turnover to cleaner equipment.

The 2021 report shows the fleet averaged NO_x emission factor for commercial GSE at LAX is 1.52 g/bhp-hr, which is lower than the 2017 AQIM baseline fleet averaged NO_x emission factor of 2.24 g/bhp-hr and exceeded (i.e., is better than) the 2023 target.

A summary table comparing the number of equipment by fuel type shows the electric count has decreased from 2017 to 2021; however, there are fewer pre-2010 electric and more 2010 and newer in the fleet. The fleet mix also reflects a higher inventory of newer (2016 to present) gasoline and cleaner diesel ground support equipment.

2021 Fleet (difference as compared to 2019 reporting year [based on 2017 fleet])

Fuel Type					
Model Year	Gasoline	LPG/Propane	Electric	Diesel	Total
≤ 2007	193 (-66)	81 (-73)	340 (-237)	211 (-101)	825 (-477)
2008 - 2009	52 (-18)	19 (-22)	74 (-44)	54 (-9)	199 (-93)
2010 - 2015	197 (+70)	184 (+57)	277 (+58)	190 (+18)	848 (+203)
2016 - 2020	447 (+293)	196 (+117)	257 (+123)	291 (+178)	1191 (+711)
≥ 2021	9 (+9)	23 (+23)	52 (+52)	9 (+9)	93 (+93)
					3156 (+437)

A summary table comparing diesel equipment Tier levels from 2017 to 2021 shows an increase in cleaner Tier 4 engines.

2021 Fleet (difference as compared to 2019 reporting year [based on 2017 fleet])

		Horsepower Bin								
Tier	Model Year	25 - 49	50 - 74	75 - 99	100 - 174	175 - 299	300 - 599	600 - 749	≥ 750	Total
≤ Tier 1	≤ 1999	1 (-)	4 (+3)	1 (-10)	0 (-11)	5 (-6)	0 (-)	0 (-)	0 (-)	11 (-24)
Tier 1	1996 - 2005	3 (+1)	56 (+49)	12 (-69)	15 (-23)	11 (-14)	2 (+1)	0 (-)	0 (-)	99 (-55)
Tier 2	2001 - 2010	3 (-2)	10 (-2)	6 (-5)	14 (-12)	6 (-10)	3 (-1)	1 (+1)	0 (-)	43 (-31)
Tier 3	2006 - 2011	0 (-)	0 (-)	5 (-2)	49 (-29)	24 (-15)	6 (-2)	1 (-2)	0 (-)	85 (-50)
Tier 4i	2008 - 2014	2 (-1)	6 (+2)	2 (-6)	36 (+2)	12 (-4)	9 (+3)	0 (-)	0 (-)	67 (-4)
Tier 4	≥ 2013	17 (+12)	87 (+53)	23 (+9)	90 (+42)	38 (+9)	79 (+40)	5 (+1)	0 (-)	339 (+166)

The 2017 fleet performance factor and existing 2023/2031 GSE performance targets identified in the 2017 AQIP/AQIM and the MOU were developed using a methodology that uses NOx engine standards. The 2021 fleet performance factor was calculated in the same manner.

On July 12 2021, it was determined that the publicly available version of CARB's OFFROAD2017 model did not incorporate the engine-standard requirements associated with CARB's 2006 LSI rulemaking and subsequent 2010 amendments. These standards required new LSI equipment certified for sale in the state of California to meet stringent emission standards for NOx and hydrocarbons which far exceeded previous requirements. As a result, LSI engine emissions calculated using the OFFROAD2017 factors resulted in vastly overpredicted emissions, especially for newer equipment. SCAQMD was informed of this discrepancy and discussed the issue with CARB on July 14, 2021. Updated emission factors were developed by CARB based on actual historical engine certifications in the state of California since the 2006 rulemaking came into effect. These updated factors were provided initially on July 16, 2021 and were updated on July 23, 2021 with final load factors and deterioration caps provided on August 13, 2021. These finalized LSI factors were used with CARB's ORDAS factors for diesel (which also incorporated the most recent engine standard requirements) were used to develop the emissions inventory.

Although the emission factors were updated, the fundamental calculation methodology was not changed from the methodology used in the 2017 AQIP/AQIM and MOU. Equipment categories were paired to each reported unit and emission factors were looked up based on the model year, fuel type, horsepower, and equipment category of a given unit. In the calendar year 2017 MOU calculations, base emission factors were back calculated from the OFFROAD2017 model's tons per year per equipment population outputs. The CARB-provided updated base factors were calculated using zero-hour emissions, emission deterioration rates, fuel correction factors, and load factors. Activity factors were derived from the OFFROAD2017 default activity levels for diesel GSE pairings, except where gasoline & natural gas pairings provided a more specific factor (i.e. for air start GSE units, the activity for gasoline & natural gas "air start units" was used in lieu of the diesel "other GSE" activity). For low-use equipment, the activity level was assumed to be 200 hours per year regardless of the equipment type. Per unit emissions were calculated using the following formula and summed across all equipment listed at the airport to determine the fleet-total emissions:

$$\text{Emissions (grams per year)} = \text{Activity (hours per year)} \times \text{Power Rating (horsepower)} \times \text{Load Factor (dimensionless)} \times \{ \text{Zero-hour Emission Factor (grams per brake horsepower-hour)} + [\text{Deterioration Rate (grams per brake horsepower-hour per hour)} \times \text{Equipment Lifetime Cumulative Operational Hours (hours)}] \} \times \text{Fuel Correction Factor (dimensionless)}$$

This report contains all the elements required in the MOU and neither emission factor calculation methodology nor the performance targets were amended. LAWA will continue to work with airlines and third party GSE operators to encourage the continued conversion of GSE, and to support any future electrical infrastructure changes that may be necessary. LAWA is conducting a GSE infrastructure study to evaluate the feasibility of comprehensive GSE pooling and electrical charging infrastructure. The intention is to consolidate GSE facilities and expand electric GSE use at the Airport.

MEASURE NO. 2 - LAX ALTERNATIVE FUEL VEHICLE INCENTIVE PROGRAM

MOU Measure No. 2 is a measure based on LAX's AQIM measure, the LAX Zero and Near-Zero Emission Heavy-Duty Vehicle Incentive Program and is attached to and a part of the MOU between LAX and SCAQMD. LAX will implement an incentive program that will distribute up to \$500,000 dollars in funding to applicants based on the "incremental cost" differential of the zero or near-zero emission vehicles as compared to conventionally-fueled equivalents with a Gross Vehicle Weight Rating (GVWR) of 14,001 pounds or greater by December 31, 2021.

To date, LAX has distributed \$325,000 for 15 vehicles that meet the near-zero emission standard. LAX has contracts to spend the remaining incentive program funds to replace the 8 additional vehicles.

MEASURE NO.3 – ZERO-EMISSION BUS PROGRAM

MOU Measure No. 3 is a measure based on LAX's AQIM measure, the LAX Zero- Emission Bus Program to convert Airport-owned buses at LAX to zero-emission buses and is attached to and a part of the MOU between the Airport and SCAQMD. The Measure requires LAX to replace 20% and 100% of the Airport-owned and operated buses with zero-emission buses by January 1, 2023 and January 1, 2031, respectively.

Since the implementation of the MOU, LAX scrapped a total of 11 diesel and 3 CNG buses with engine model years between 1996 to 2007. In 2021 LAX reported 124 buses in its fleet. Of the 124 buses, 20 are electric (16% of its bus fleet). The electric buses are dedicated airfield buses and have short routes used to transport passengers between the Remote Gates and the Bradley International Terminal. LAX-it program uses CNG buses for passenger transfer in the Central Terminal Area (CTA). Airport operations began to decrease due to COVID in 2020. Although passenger traffic has increased in 2021, LAX continued to have reduced bus services in the CTA. None of the LAX-it buses operated in 2021. Some year-end odometer readings were unavailable, in which case Vehicle Miles Travelled (VMT) were estimated using fuel usage and recorded data from LAX's Automatic Vehicle Identification System (AVI). The annual VMT shows similar anomalous reduction and should not be compared to the 2017 AQIM baseline for meaningful trend analysis.

2021 Measures 1-3 Data Reports