SOUTH COAST AIR QUALITY MANAGEMENT DISTRICT

Draft 2021 Airports MOU Implementation Progress Report

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Introduction

The Facility-Based Mobile Source Measure (FBMSM) for Commercial Airports implements the 2016 Air Quality Management Plan (AQMP) Control Measure MOB-04, Emission Reductions at Commercial Airports. The FBMSM for Commercial Airports was adopted by South Coast AQMD on December 6, 2019. The measure consists of Memoranda of Understanding (MOUs) between South Coast AQMD and five commercial airports and South Coast AQMD's enforceable commitment to achieve an aggregate 0.52 and 0.37 tpd NOx reductions in 2023 and 2031, respectively. The MOUs were executed with Los Angeles International Airport (LAX), John Wayne Orange County Airport (SNA), Hollywood Burbank Airport (BUR), Ontario International Airport (ONT), and Long Beach Airport (LGB).

The South Coast AQMD's enforceable commitment is based on the airports' implementation of MOU measures. These measures seek to reduce emissions from non-aircraft airport sources namely ground support equipment (GSE), airport shuttle buses, and heavy-duty trucks specified in the MOUs. The MOU measures establish performance targets for 2023 and 2031 for these sources, as presented in Tables 1 to 3. All airport MOUs include a GSE measure, with three airports also including measures for shuttle buses or heavy-duty trucks. Beginning June 1, 2021, and every year thereafter through 2032, airports are required to submit detailed annual reports to document progress toward implementation of these MOU measures.

Table 1. GSE performance targets representing fleet average emissions factors (g/hp-hr)*

Airport	2023 Performance Target	2031 Performance Target
LAX	1.8	1.0
BUR	1.66	0.74
LGB	0.93	0.44
SNA	1.7	0.9
ONT	2.2	1.0

* LAX uses a HC + NOx combined emission factor; other airports use a NOx emission factor

Table 2. Shuttle bus performance targets representing zero-emission percentage of fleet

Airport	2023 Performance Target	2031 Performance Target
LAX	20%	100%
BUR	50%	100%
SNA	50%	80%

Table 3. Heavy-duty vehicles performance targets

Airport	2023 Performance Target
LAX	Distribute up to $500,000 to incentivize adoption of zero or near-zero emission vehicles with a Gross Vehicle Weight Rating (GVWR) greater than 14,000 pounds
SNA	Eliminate routine commercial passenger jet fuel deliveries through the installation of a fuel pipeline

MOU Implementation

Following the adoption of the MOUs in December 2019 and as directed by the South Coast AQMD Governing Board, semi-annual progress reports on MOU implementation were presented to the Mobile Source Committee on June 19, 2020 and January 22, 2021 by staff from South Coast AQMD and representatives from the airports. These semi-annual progress updates by airports mainly provided qualitative assessments on implementation of MOU measures. In addition, despite the impact of COVID on airport operations in 2020, all five airports re-iterated their commitments to implement the MOU measures.

As part of its enforceable commitment, South Coast AQMD is required to submit progress reports to the U.S. EPA by November 1st of each year beginning 2021. These progress reports are based on annual reports submitted by each airport by June 1st, which quantify actual performance levels and associated emissions reductions for the previous calendar year for each of the MOU measures. Based on these annual progress reports, South Coast AQMD staff quantifies the corresponding State Implementation Plan (SIP) creditable NOx emissions reductions based on specified methodology.[1] The progress report for 2020 presented herein addresses the following items:

a. Identify the portion of NOx emission reduction targets achieved and all emissions-related information necessary to independently quantify emission reductions;

b. Document actions by the airports on implementation of the airports SIP creditable Air Quality Improvement Plan/Measures (AQIP/AQIM) measures in the MOUs; and

c. Determine whether the implementation of SIP creditable AQIP/AQIM measures in the MOUs is projected to achieve the full 0.52 tpd of NOx emission reductions in 2023.

2021 Progress Report

This 2021 progress report, covering progress achieved in 2020, is intended to provide an overview of the airports' efforts to implement MOU measures and quantify actual emission reductions. The COVID-19 pandemic's emergence in early 2020 significantly disrupted air travel for most of 2020 with all airports, airlines, and operators experiencing economic hardships. Nevertheless, the five commercial airports reiterated their commitments to the MOUs and remain on track to fulfill their obligations.

The 2020 actual emission reductions achieved for each MOU measure were calculated primarily based on the detailed methodology presented in Appendix B of the FBMSM for Commercial Airports Staff

Report.[1] The methodology for calculating GSE emissions, while largely consistent with that presented in Appendix B of the staff report, was modified to incorporate the latest emission standards for gasoline and liquefied petroleum gas (LPG) equipment based on existing adopted regulations for Large Spark Ignition (LSI) equipment.[2] The methodology in Appendix B of the FBMSM staff report was based on the emission factors included in CARB's OFFROAD model. The 2021 progress reports use the updated gasoline/LPG emission factors, deterioration rates, fuel correction factors, and load factors which were recently provided by CARB and are included on AQMD's website.[3] This modification was necessary because the emission factors in CARB's latest OFFROAD model do not account for the updated LSI emission standards. A comparison of the emission factors for select LSI GSE is shown in Table 4. The updated emission factors are much lower for 2010 and newer GSE. In addition, modified deterioration rate caps, shown in Table 5, were also applied when calculating emissions from individual GSE. The deterioration rate caps represent the maximum cumulative hours beyond which the emission factors do not increase any further. These modifications were only applied to the calculation of GSE emissions, which were used as the basis for assessing progress towards the 2023 SIP creditable emission reduction target.

Table 4. Comparison of NOx emission factors (EFs) derived from OFFROAD model and revised EFs based on engine certification data

GSE Type	Fuel	Engine Model Year	HP	OFFROAD NOx EF (g/hp-hr)	Updated NOx EF (g/hp-hr)
Baggage Tug	Gasoline	2004	85	5.28	0.43
Cargo Tractor	Gasoline	2010	80	6.38	0.78
Ground Power Unit	Gasoline	2018	229	5.04	0.27
Baggage Tug	Gasoline	2019	69	3.29	0.09
Belt Loader	Gasoline	2019	84	3.25	0.16

[1] FBMSM Commercial Airport MOU Staff Report, Appendix B, http://www.aqmd.gov/docs/default-source/clean-air-plans/air-quality-management-plans/facility-based-mobile-source-measures/airports-final-appendix-b.pdf?sfvrsn=6

[2] Off-road Large Spark Ignition Engine Regulation, https://ww2.arb.ca.gov/sites/default/files/2020-03/Amended%20Section%202433%2C%20Title%2013%2C%20California%20Code%20of%20Regulations_2008_R.pdf

[3] Updated LSI Emission Factors, http://www.aqmd.gov/docs/default-source/clean-air-plans/air-quality-management-plans/facility-based-mobile-source-measures/gse-emission-factors-lsi.xlsx?sfvrsn=0

Table 5. Deterioration rate (DR) caps applied to GSE emissions calculations

Diesel		Gasoline/LPG			
HP Range	DR cap (hours)	HP Range	Engine Displacement	Model Year	DR cap (hours)
25-50	5,000	25-50	<1 L	All	2,000
>50	12,000	All	>1 L	>2007	10,000
				<2008	7,000

In contrast with the emissions inventory calculations, the performance targets contained in the MOUs are legally binding agreements between South Coast AQMD and the airports. Therefore, the original methodology used to develop the MOU targets was applied to calculate the fleet average emission factors for GSE measures in the 2021 progress reports. Attachment A of Appendix B of the FBMSM for Commercial Airports Staff Report[4] provides the methodology to calculate emission reductions from MOU measures toward SIP creditable reductions. This ensures consistency when comparing the fleet average emission factors with the MOU performance targets. While each airport used a consistent method for calculating its baseline and future fleet average GSE emission factors, the method differed among airports. As such, the performance levels and targets are not comparable among airports. Key differences are summarized in Table 6.

Table 6. Methods for calculating the GSE fleet average emission factor.

Airport	Source of emission factors*	Calculation method
LAX	Engine standards	Horsepower weighted average
LGB	In-use emission factor, including load factor	Horsepower weighted average
BUR	In-use emission factor, including load factor	Horsepower weighted average
SNA	In-use emission factor, excluding load factor	Horsepower weighted average
ONT	In-use emission factor, excluding load factor, and engine standards	Arithmetic average

* In-use emission factors were derived from OFFROAD2017[5] by dividing total emissions by the total annual horsepower-hours for each equipment type based on model year and horsepower bin. In-use emission factors for on-road vehicles were derived from EMFAC2017[6] by dividing total emissions by annual VMT for each vehicle type based on model year and fuel type.

The following sections present an overview of the 2020 progress in implementing the MOU measures for each airport. The aggregated SIP creditable GSE emission reductions for all airports are presented in Table 15.

[4] Available at https://www.aqmd.gov/docs/default-source/clean-air-plans/air-quality-management-plans/facility-based-mobile-source-measures/airports-final-appendix-b.pdf?sfvrsn=6

[5] OFFROAD2017 Database, https://www.arb.ca.gov/orion/ with 2017 updated emission factors, https://www.arb.ca.gov/msei/ordiesel/ordas_ef_fcf_2017.pdf

[6] EMFAC2017 User's Guide, https://ww3.arb.ca.gov/msei/downloads/emfac2017-volume-i-users-guide.pdf

Los Angeles International Airport

GSE Measure

The airport's GSE policy was originally developed in 2015 to ensure cleaner GSE. This policy was subsequently modified after MOU adoption to incorporate the performance targets shown in Table 1. LAX is expected to continue to work with airlines and third party GSE operators for continued conversion of GSE, and to support any future electrical infrastructure changes that may be necessary. Figure 1 presents the 2017 (baseline) and 2020 performance levels compared to the 2023 and 2031 performance targets. As indicated, the LAX GSE performance level has improved from 2.24 g/hp-hr in 2017 to 1.52 g/hp-hr in 2020, surpassing its 2023 GSE performance target of 1.80 g/hp-hr in 2020 and LAX is making progress towards its 2031 target. The performance levels and targets reflect the original methodology used to develop the MOUs. Although LAX is already achieving its 2023 performance target in 2020 on an airport-wide basis, LAX will work with all tenants to ensure compliance with the 2023 performance target, achieving further reductions in the next two years. Figure 2 presents the 2017 and 2020 GSE emissions compared to 2023 projected emissions in their Air Quality Improvement Measures (AQIM). The emissions reflect the updated emission factors as discussed previously. As shown, GSE emissions have decreased from 182 tpy in 2017 to 150 tpy in 2020, reducing emissions by 32 tpy. As such, LAX is on track to achieving its 2023 projected GSE emission level. Providing further confidence in the emission reductions, Table 7 demonstrates a transition in the GSE fleet from older, higher emitting equipment towards newer, cleaner equipment. Also, as a requirement in the MOU, LAX reported that three pre-Tier 4/pre-2010 GSE were relocated from LAX to LGB and ONT in 2020. LAX's 2021 MOU progress report is provided on South Coast AQMD's website.[7]

[7] FBMSM for Commercial Airports, http://www.aqmd.gov/airportsmous

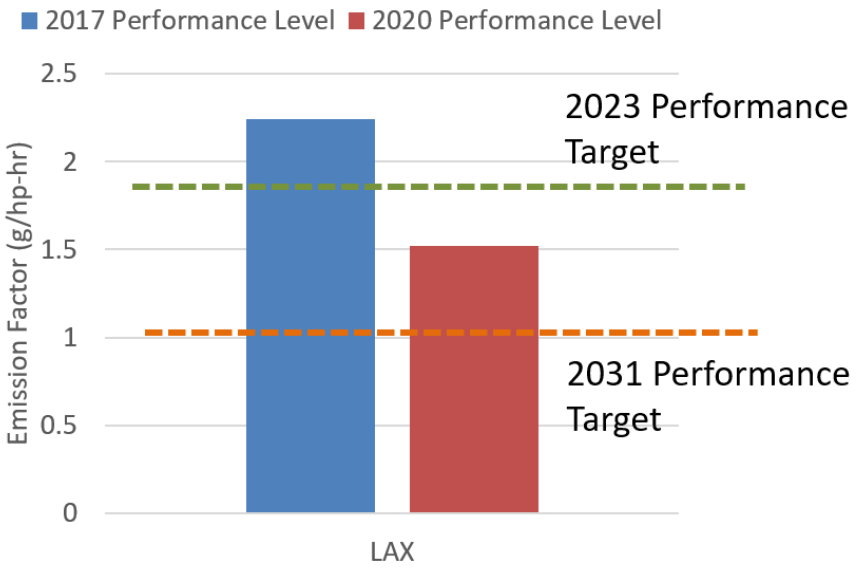

Figure 1. LAX GSE performance levels and targets.

Figure 2. LAX GSE emissions inventories.

Table 7. Comparison of the 2017 and 2020 GSE fleets by fuel and tier/model year for LAX.

Fuel	Sub-type	2017	2020
Diesel	Tier 0	44	25
	Tier 1	160	111
	Tier 2	73	45
	Tier 3	129	83
	Tier 4i	63	63
	Tier 4f	166	325
	On-road	36	132
Electric	All	1052	1053
Gasoline	Pre-2010	323	231
	2010-2020	268	601
LPG/Propane	Pre-2010	217	122
	2010-2020	175	374

Alternative Fuel Vehicle Incentive Measure

The LAX Zero and Near-Zero Heavy Duty Vehicle Incentive Program was designed to distribute up to $500,000 to qualified applicants based on the incremental cost associated with purchasing cleaner vehicles. The program is fully subscribed and has resulted in the acquisition of 14 near-zero heavy duty vehicles in 2020. The replaced vehicles were either scrapped or moved out of state. The emission reductions associated with this program are calculated based on the difference in emissions between the replaced and replacement vehicles. The emission factors for the replaced vehicles are derived from EMFAC2014 for Los Angeles County, while the emission factors for the replacement vehicles are derived from Tables D-1 and D-2 of CARB's Carl Moyer Guidelines.[8] The VMT for both vehicles is assumed

[8] https://ww3.arb.ca.gov/msprog/moyer/guidelines/2017gl/2017_gl_appendix_d.pdf

constant. For detailed methodology, refer to Appendix B of the FBMSM for Commercial Airports Staff Report.[9]

The replaced vehicles had a combined annual VMT of 292,325 miles. Those vehicles were replaced by 2018-2019 model year propane and CNG trucks. Had they been replaced by model year 2020 diesel trucks, the NOx emissions would have been 0.28 tons per year (tpy) in 2020 based on EMFAC2014. The total NOx emission of the new replacement vehicles is estimated to be 0.043 tpy, resulting in a SIP creditable NOx reduction of 0.23 tpy. The program, as implemented in 2020, would result in NOx emission reductions of 0.27 and 0.38 tpy in 2023 and 2031, respectively. The increase in emission reductions compared to 2020 reflects differences in the deteriorated emission factors. Since the LAX program is fully subscribed, 9 additional vehicle replacements (for a total of 23 vehicle replacements) are anticipated by 2023, which will further increase the SIP creditable reductions. Table 8 summarizes the emission reduction calculations.

Table 8. NOx Emissions Benefits for LAX Alternative Fuel Vehicle Incentive Measure

	2020	2023	2031
Number of Vehicles	14	14	14
Total annual VMTs for replaced vehicles (million)	0.23	0.23	0.23
Emissions of existing vehicles (tpy)	0.28	0.33	0.48
Emissions of new near-zero vehicles (tpy)	0.04	0.06	0.10
SIP creditable emission reductions (tpy)	0.23	0.27	0.38

Zero Emission Bus Measure

In 2020, LAX acquired 20 electric (out of 136) LAWA-owned shuttle buses, which represents about 15% of its fleet. This demonstrates significant progress towards the 2023 performance target of 20% electrification, or 27 out of 136 buses. However, due to the pandemic, mileage accrual for the electric buses was lower than the fleet average and overall bus fleet VMT was significantly reduced. In 2020, the LAWA bus fleet accumulated 1,330,928 miles with electric buses accounting for 57,430 miles. Business-as-usual VMT of LAWA's shuttle buses is about 3.25 million miles per year.

In the 2016 AQMP inventory, the urban bus emissions from the Basin portion of Los Angeles County are 6.73 tons per day for 2020 from 556,000 VMTs. The fleet average emission factor is 10.98 g/mile. Applying the average emission factor to LAWA's electric VMT, the resulting SIP creditable emission reduction is 0.70 tpy in 2020. The corresponding NOx emission reductions in 2023 and 2031 are 0.57 and 0.22 tpy, respectively, assuming they only accumulate 57,430 miles each year at the same rate as in

[9] Airport MOU Staff Report, Appendix B, http://www.aqmd.gov/docs/default-source/clean-air-plans/air-quality-management-plans/facility-based-mobile-source-measures/airports-final-appendix-b.pdf?sfvrsn=6

2020. This is a conservative assumption since the 2020 VMTs are affected by the pandemic and are expected to recover from the pandemic and increase in accordance with the region's economic growth. The MOU SIP credit estimates for this measure were 6.40 and 8.25 tpy for 2023 and 2031, respectively, with corresponding electric bus VMTs of 0.65 and 3.25 million. Table 9 summarizes the emission reduction calculations using the reduced mileage accrued in 2020 and business-as-usual (BAU) mileage assumed in the 2016 AQMP. Progress towards emission reductions was impeded by the COVID-19 pandemic.

Table 9. NOx Emissions Benefits for LAX Zero Emission Bus Program

	2020*	2023	2031
Urban bus emissions for LA County in 2016 AQMP (tons per day)	6.73	5.12	1.68
Daily urban bus VMTs in LA County in 2016 AQMP (miles/day)	556,000	514,000	431,000
LA County urban bus emission factor in 2016 AQMP (g/mile)	10.98	8.95	3.49
Airport's bus fleet total annual VMT (million miles/year)	1.33	3.25	3.25
Airport's bus fleet total emissions (tpy)	16.10	32.06	12.50
2020 VMT affected by AQIM measure (million miles/year)	0.057	0.057	0.057
SIP creditable emission reductions (tpy)	0.70	0.57	0.22

* 2020 bus fleet VMT and emissions reflect COVID impact

John Wayne Orange County Airport

GSE Measure

SNA has been working with their tenants to achieve the GSE performance targets.

Figure 3 presents the 2017 (baseline) and 2020 performance levels compared to the 2023 and 2031 performance targets. As indicated, the SNA GSE performance level has improved from 4.0 g/hp-hr in 2017 to 3.2 g/hp-hr in 2020 showing SNA's progress towards its 2023 target. The performance levels and targets reflect the original methodology used to develop the MOUs.

Figure 4 presents the 2017 and 2020 GSE emissions compared to 2023 projected emissions in their Air Quality Improvement Plan (AQIP). The emissions reflect the updated emission factors as discussed previously. As shown, GSE emissions have decreased from 20.4 tpy in 2017 to 18.8 tpy in 2020, reducing emissions by 1.6 tpy, making progress toward its 2023 projected GSE emissions. Providing further confidence in the emission reductions, Table 10 demonstrates a transition in the GSE fleet from older, higher emitting equipment towards newer, cleaner equipment. While the GSE performance level remains short of the 2023 target, SNA is committed to continuing to work with airlines and GSE operators to make progress toward that target. Based on current assessments, SNA infrastructure is currently able to support existing GSE electrical demands for the airlines and third parties. The airport will remain in communication 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. There were no reported GSE relocations in 2020. SNA's 2021 MOU progress report is provided on South Coast AQMD's website.[10]

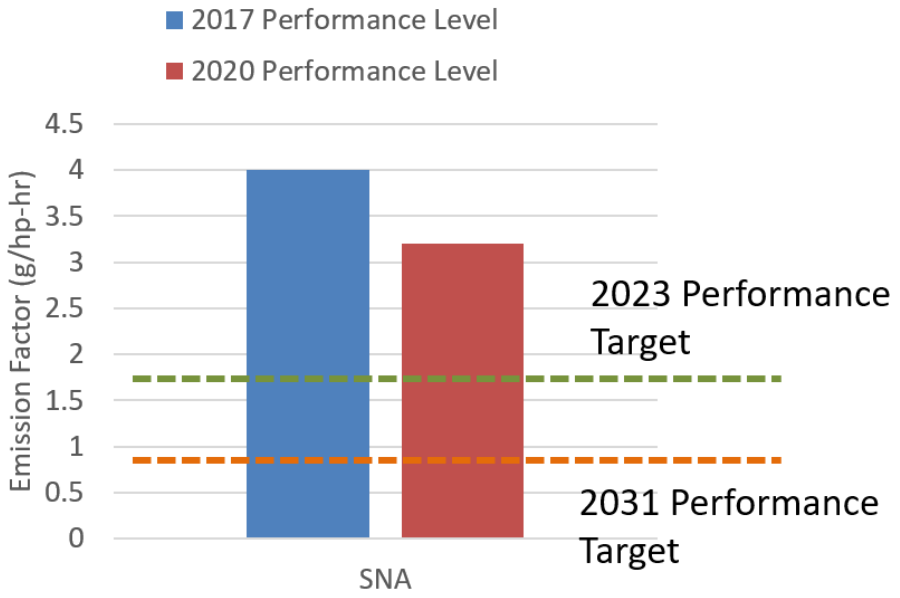

Figure 3. SNA GSE performance levels and targets.

Figure 4. SNA GSE emissions inventories.

[10] FBMSM for Commercial Airports, http://www.aqmd.gov/airportsmous

Table 10. Comparison of the 2017 and 2020 GSE fleets by fuel and tier/model year for SNA.

Fuel	Sub-type	2017	2020
Diesel	Tier 0	11	3
	Tier 1	21	20
	Tier 2	4	5
	Tier 3	7	6
	Tier 4i	3	5
	Tier 4f	11	19
Electric	All	96	99
Gasoline	Pre-2010	15	13
	2010-2020	16	27

Parking Shuttle Bus Electrification Measure

SNA continues to pursue the acquisition of electric shuttle buses, including at least three electric buses scheduled for delivery in 2021. However, there were no electric buses added in 2020 due to a suspension of shuttle operations as a response to reduced demand during the COVID-19 pandemic. As such, there were no emission reductions from this measure in 2020.

Jet Fuel Delivery Truck Measure

SNA's jet fuel pipeline became operational in October 2019 and the airport has coordinated with tenants to facilitate the transition from fuel truck deliveries to the pipeline. During 2020, over 95% of the fuel (30,938,418 gallons) was delivered via pipeline. Due to contractual obligations, there were 1,270,484 gallons of jet fuel delivered by heavy heavy-duty trucks (HHDT). It was estimated that HHDT VMTs from the fuel trucks delivering this amount of fuel were 13,578 miles annually. Therefore, fuel truck VMTs eliminated by the jet fuel pipeline in 2020 were 330,657 miles. Due to reduced flights in 2020, the VMT savings were much lower than the 633,632 miles initially estimated for 2023 in the AQIP.

In the 2016 AQMP inventory, the Orange County HHDT NOx emissions were 5.34 tons per day for 2020 with corresponding VMTs of 1,004,000, affording a NOx emission factor of 4.82 g/mile. The NOx emission reduction from using the jet fuel pipeline was 1.76 tpy. Assuming the pipeline delivers the same amount of jet fuel in 2023 and 2031, the NOx emission reduction would be 0.80 and 0.59 tpy, respectively, while the MOU SIP credit estimates were 1.52 and 1.13 tpy. Table 11 summarizes the emission reduction calculations.

Table 11. NOx Emissions Benefits for SNA Jet Fuel Delivery Truck Measure

	2020	2023	2031
HHDT NOx in Orange County in 2016 AQMP (tons per day)	5.34	2.72	2.64
HHDT daily VMT in Orange County in 2016 AQMP (miles/day)	1,004,000	1,138,000	1,477,000
Orange County HHDT emission factor (g/mile)	4.82	2.18	1.62
Airport's fuel trucks total annual VMT (million miles/year)	0.34	0.63	0.63
Airport's fuel trucks total emissions (tpy)	1.81	1.51	1.13
Annual VMT affected by AQIP measure (million miles/year)	0.33	0.33	0.33
SIP creditable emission reductions (tpy)	1.76	0.80	0.59

Long Beach Airport

GSE Measure

LGB has been developing electric vehicle infrastructure at the airport and working with tenants to achieve the performance target through accelerated turnover to cleaner equipment. Figure 5 presents the 2017 (baseline) and 2020 performance levels compared to the 2023 and 2031 performance targets. As indicated, the LGB GSE performance level has improved from 1.50 g/hp-hr in 2017 to 1.23 g/hp-hr in 2020 showing LGB's progress towards its 2023 target. The performance levels and targets reflect the original methodology used to develop the MOUs. Figure 6 presents the 2017 and 2020 GSE emissions compared to 2023 projected emissions in their AQIP. The emissions reflect the updated emission factors as discussed previously. As shown, GSE emissions have decreased from 23.7 tpy in 2017 to 16.2 tpy in 2020, reducing emissions by 7.5 tpy, making progress in achieving its 2023 projected GSE emissions. Providing further confidence in the emission reductions, Table 12 demonstrates a transition in the GSE fleet from older, higher emitting equipment towards newer, cleaner equipment.

In 2020, a total of 18 pre-Tier 4/pre-2010 GSE at LGB were relocated to LAX and ONT primarily due to FedEx's suspension of operations on April 10, 2020 and JetBlue's departure on October 7, 2020. The annual usage hours for these GSE were prorated for the time spent at LGB which were verified by South

Coast AQMD staff (including prorated use of these equipment at the receiving airports). LGB's 2021 MOU progress report is provided on South Coast AQMD's website.[11]

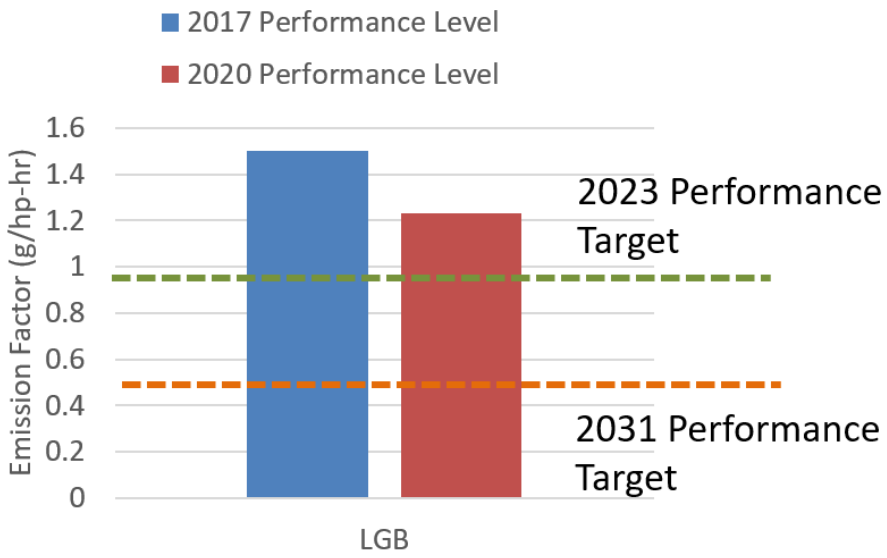

Figure 5. LGB GSE performance levels and targets.

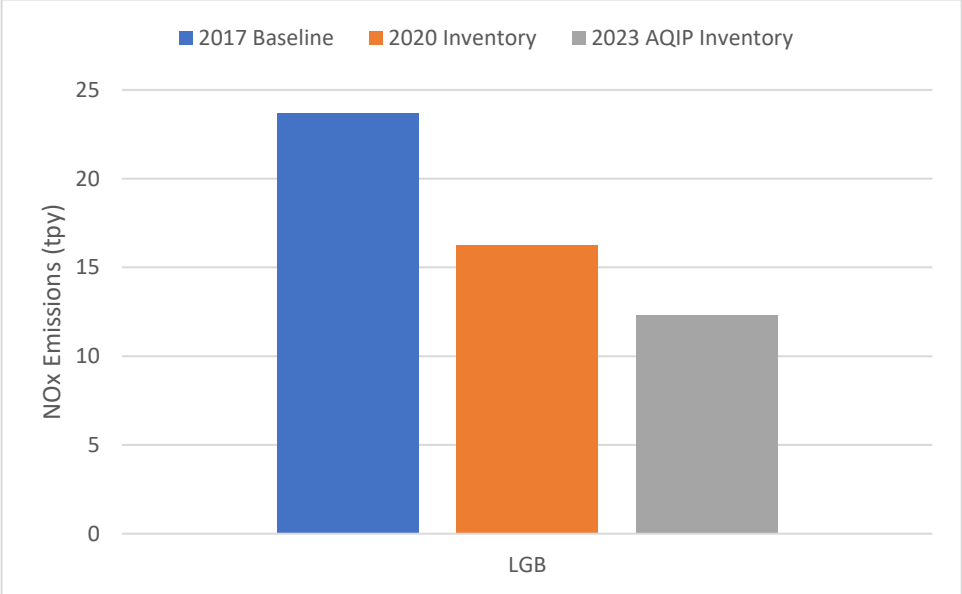

Figure 6. LGB GSE emissions inventories.

[11] FBMSM for Commercial Airports, http://www.aqmd.gov/airportsmous

Table 12. Comparison of the 2017 and 2020 GSE fleets by fuel and tier/model year for LGB.

Fuel	Sub-type	2017	2020
Diesel	Tier 0	64	12
	Tier 1	7	15
	Tier 2	13	8
	Tier 3	3	16
	Tier 4i	2	10
	Tier 4f	9	24
	On-road	0	20
Electric	All	155	109
Gasoline	Pre-2010	38	44
	2010-2020	13	32
LPG/Propane	Pre-2010	15	12
	2010-2020	3	3

Ontario International Airport

GSE Measure

In conjunction with GSE operators, ONT has been evaluating the availability of cleaner GSE, planning for capital expenditures, and assessing infrastructure needs. ONT will install additional charging infrastructure for electric GSE in areas that will result in maximum benefit while remaining in communication with airlines and third party GSE operators to encourage the continued conversion of GSE. Figure 7 presents the 2017 (baseline) and 2020 performance levels compared to the 2023 and 2031 performance targets. As indicated, the ONT GSE performance level has improved from 5.84 g/hp-hr in 2017 to 5.14 g/hp-hr in 2020 and ONT is making progress towards its 2023 target. The performance levels and targets reflect the original methodology used to develop the MOUs. Figure 8 presents the 2017 and 2020 GSE emissions compared to 2023 projected emissions in their AQIP. The emissions reflect the updated emission factors as discussed previously. As shown, GSE emissions have decreased from 156 tpy in 2017 to 118 tpy in 2020, reducing emissions by 38 tpy. As such, ONT is on track to achieving its 2023 projected GSE emission level. Providing further confidence in the emission reductions, Table 13 demonstrates a transition in the GSE fleet from older, higher emitting equipment towards newer,

cleaner equipment. However, further reductions at ONT will be critical to achieving the aggregate 2023 reduction target. There were no reported GSE relocations in 2020. ONT's 2021 MOU progress report is provided on South Coast AQMD's website.[12]

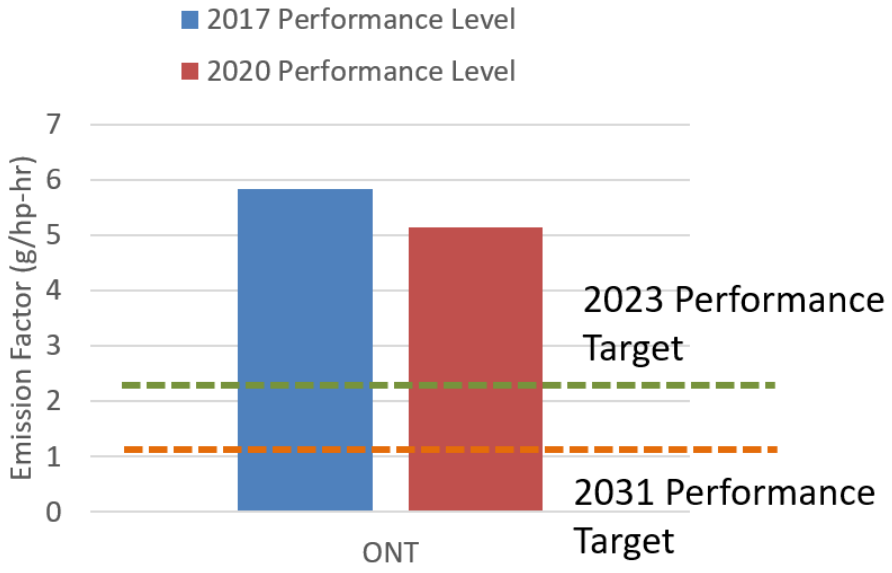

Figure 7. ONT GSE performance levels and targets.

Figure 8. ONT GSE emissions inventories.

[12] FBMSM for Commercial Airports, http://www.aqmd.gov/airportsmous

Table 13. Comparison of the 2017 and 2020 GSE fleets by fuel and tier/model year for ONT.

Fuel	Sub-type	2017	2020
Diesel	Tier 0	25	15
	Tier 1	23	9
	Tier 2	26	16
	Tier 3	52	28
	Tier 4i	13	8
	Tier 4f	63	102
Electric	All	157	110
Gasoline	Pre-2010	254	164
	2010-2020	185	275
LPG/Propane	Pre-2010	2	2
	2010-2020	2	2

Burbank Airport

GSE Measure

BUR has worked with tenants to achieve the performance target through accelerated turnover to cleaner equipment. Figure 9 presents the 2017 (baseline) and 2020 performance levels compared to the 2023 and 2031 performance targets. As indicated, the BUR GSE performance level has improved from 1.74 g/hp-hr in 2017 to 1.09 g/hp-hr in 2020, surpassing its 2023 GSE performance target of 1.66 g/hp-hr in 2020. The performance levels and targets reflect the original methodology used to develop the MOUs. Although BUR is already achieving its 2023 performance target in 2020 on an airport-wide basis, BUR will work with all tenants to ensure compliance with the 2023 performance target, achieving further reductions in the next two years.

Figure 10 presents the 2017 and 2020 GSE emissions compared to 2023 projected emissions in their AQIP. The emissions reflect the updated emission factors as discussed previously. As shown, GSE emissions have decreased from 19.1 tpy in 2017 to 11.2 tpy in 2020, reducing emissions by 7.9 tpy. Providing further confidence in the emission reductions, Table 14 demonstrates a transition in the GSE fleet from older, higher emitting equipment towards newer, cleaner equipment. There were no

reported GSE relocations in 2020. BUR's 2021 MOU progress report is provided on South Coast AQMD's website.[13]

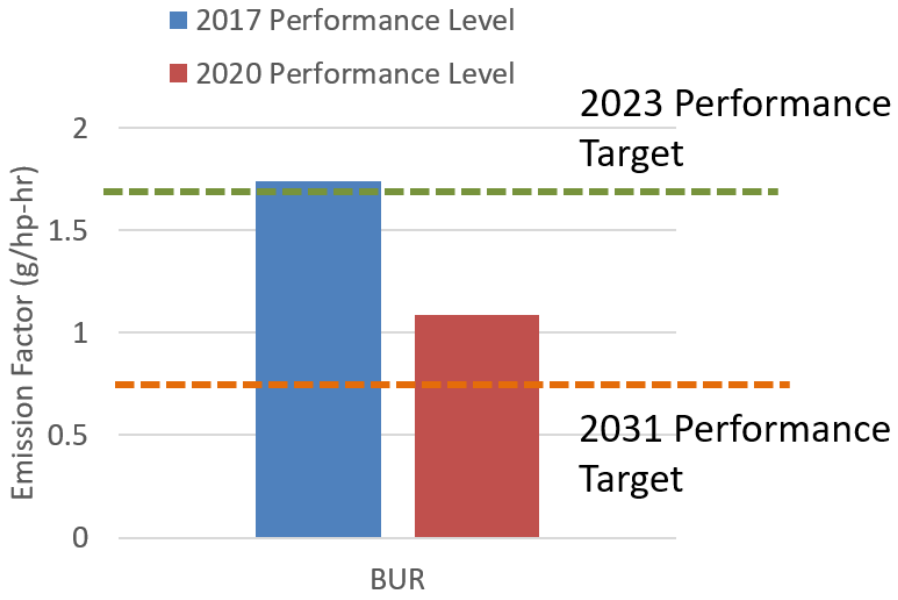

Figure 9. BUR GSE performance levels and targets.

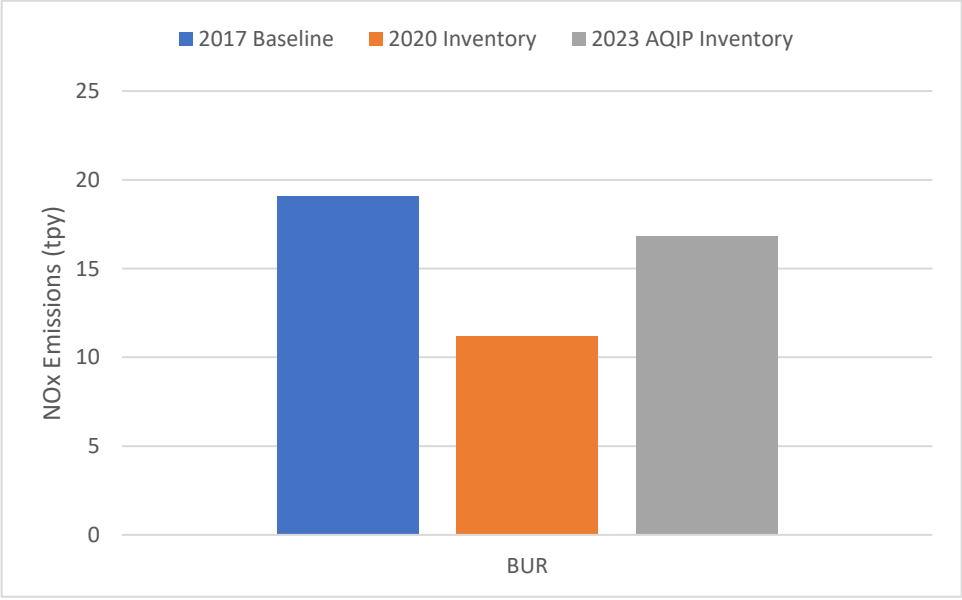

Figure 10. BUR GSE emissions inventories.

[13] FBMSM for Commercial Airports, http://www.aqmd.gov/airportsmous

Table 14. Comparison of the 2017 and 2020 GSE fleets by fuel and tier/model year for BUR.

Fuel	Sub-type	2017	2020
Diesel	Tier 0	12	7
	Tier 1	3	2
	Tier 2	13	13
	Tier 3	16	17
	Tier 4i	2	8
	Tier 4f	17	41
	On-road	0	2
Electric	All	107	120
Gasoline	Pre-2010	41	37
	2010-2020	12	27
LPG/Propane	Pre-2010	10	8
	2010-2020	3	5

Shuttle Bus Electrification Measure

Shuttle services to all parking lots were fully suspended on April 5, 2020 at the airport and have not resumed as of June 1, 2021. lt is unclear when passenger activity will increase to the level required to resume shuttle operations. Nevertheless, BUR is committed to renew the Shuttle Fleet Bid prior to 2023 with MOU requirements for electric buses. As such, no emission reductions occurred in 2020.

Progress toward South Coast AQMD's SIP creditable emission reduction target

Table 15 and Figure 11 summarize progress towards South Coast AQMD's 2023 SIP creditable reduction target for all MOU measures. Attachment A of Appendix B of the FBMSM for Commercial Airports Staff Report[14] provides methodology to calculate emission reductions from MOU measures toward SIP creditable reductions. Approximately 95% of the NOx reductions in 2023 are projected to come from

[14] Available at https://www.aqmd.gov/docs/default-source/clean-air-plans/air-quality-management-plans/facility-based-mobile-source-measures/airports-final-appendix-b.pdf?sfvrsn=6

GSE measures. It is important to note that the 2020 GSE NOx emissions inventories reported by airports were not discounted to reflect the decrease in airport operations due to COVID. As such, the actual 2020 GSE emissions were likely far below the "business-as-usual (BAU)" estimates provided in this report. The 2020 GSE NOx emissions inventories for all airports totaled 314 tpy compared to the 2020 SIP baseline inventory of 470 tpy, representing 156 tpy of reductions or a 33% decrease. This compares to the 2023 SIP creditable reduction target of 180 tpy of NOx reductions beyond the 2023 SIP baseline inventory. While the 2020 GSE NOx emissions reductions cannot be directly compared to the 2023 SIP inventory, these reductions which have occurred due to transition to cleaner GSE will continue in 2023. The 2023 progress report will include the actual reductions achieved in 2023.

Due to the pandemic, converting airports' shuttle fleets to zero-emission has progressed slower than anticipated, with LAX as the only airport reporting electric shuttle deployments in 2020. VMT accrual for these buses also occurred at a far slower rate than anticipated due to the pandemic and, therefore, only a small portion of the reduction target was achieved. Further reductions can be anticipated from LAX, which plans to increase its current shuttle bus electrification rate of 14.7% to meet its 2023 performance target of 20% electrification. The remaining reductions will depend on electric shuttle bus deployments at SNA and BUR. As previously noted, these airports suspended shuttle operations in 2020 as a response to reduced demand. Nevertheless, all airports anticipate operating electric shuttle buses by 2023 in accordance with their MOU obligations.

The heavy-duty vehicle measures include the jet fuel pipeline at SNA and alternative fuel vehicle incentive measure at LAX. These measures have already achieved more than 50% of the respective reduction targets, despite decreases in activity due to the pandemic. As previously noted, LAX has ensured full subscription to its alternative fuel vehicle incentive measure, which will result in 9 additional vehicle deliveries by 2023 and will add an additional 0.12 tpy of NOx reductions thereby matching the 2023 SIP creditable reduction target.

Table 15. Progress toward SIP creditable reduction target by MOU measure for all airports (NOx, tpy)

MOU Measure	2020 Reductions*	2023 SIP Creditable Reduction Target
GSE	155.8	180.2
Shuttle Bus	0.70	7.85
Heavy-duty Vehicles	1.99	1.91
Total	158.5	189.9

* GSE operating hours were not discounted to reflect the decrease in operations, however shuttle buses and HD vehicles have reduced VMTs due to the COVID-19 pandemic

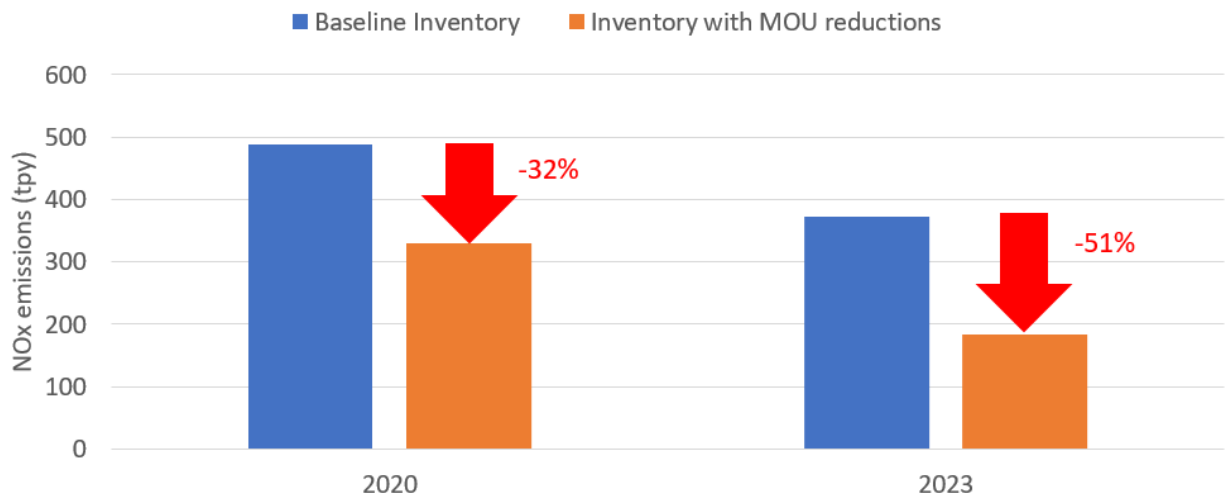

Figure 11. Comparison of total NOx emissions for all MOU measures with the SIP baseline. The orange bar in 2023 reflects the SIP creditable reduction target.

Figure 11 demonstrates positive progress in 2020 toward the 2023 SIP creditable emission reduction target. The total reduction achieved in 2020 is 158.5 tpy or 32% compared to the 2020 SIP baseline. To achieve the 2023 target, the corresponding emissions reductions are 189.9 tpd, or 51% compared to 2023 SIP baseline. While the GSE reductions in 2020 cannot be mapped directly to the 2023 inventory, significant progress has been made toward the reduction target in 2023. This progress was achieved despite reduced air travel activities due to the pandemic. The reductions associated with implementation of the MOU measures satisfy the U.S. EPA's four integrity elements (i.e., surplus, permanent, quantifiable, and enforceable), with thorough supporting analysis presented in Chapter 4 of the FBMSM for Commercial Airports Staff Report.[15] All MOU measures provide surplus reductions because the accelerated pace of achieving the reductions exceeds the requirements under existing regulations. CARB's Zero-Emission Shuttle Bus Regulation is the only adopted regulation that may affect the 2031 surplus reductions from shuttle bus measures due to the phase-in schedule of the regulation. All reductions achieved are quantifiable and permanent due to the stringent MOU reporting

[15] FBMSM for Commercial Airports Staff Report, http://www.aqmd.gov/docs/default-source/clean-air-plans/air-quality-management-plans/facility-based-mobile-source-measures/airports-final-staff-report.pdf?sfvrsn=6

requirements, which require detailed emissions-related data and calculations. The detailed annual emissions inventories provided by the airports represent the remaining emissions for each measure and they provide the basis for tracking progress toward achieving the projected SIP credit in 2023, demonstrating permanency of emission reductions. The airports will also provide data on the sale, retirement, and relocation of existing equipment to other airports within the South Coast Air Basin as specified in the MOUs. Finally, MOU reductions are enforceable due the airports' commitment to implement the measures and due to the public accessibility of the emissions calculations. Furthermore, the enforceable commitment by South Coast AQMD provides a safeguard against a potential shortfall.

Summary and Conclusion

South Coast AQMD's enforceable commitment is based on the airports' implementing their MOU measures and achieving their performance targets. This 2021 progress report demonstrates that, despite the impact of COVID-19, airports have made significant progress in implementing their MOU measures in 2020 and are on track to meet their 2023 performance targets. Concurrently, South Coast AQMD is also making good progress toward its SIP creditable emission reduction target and projects that 0.52 tpd NOx emission reductions will be achieved from full implementation of MOU measures by January 1, 2023.