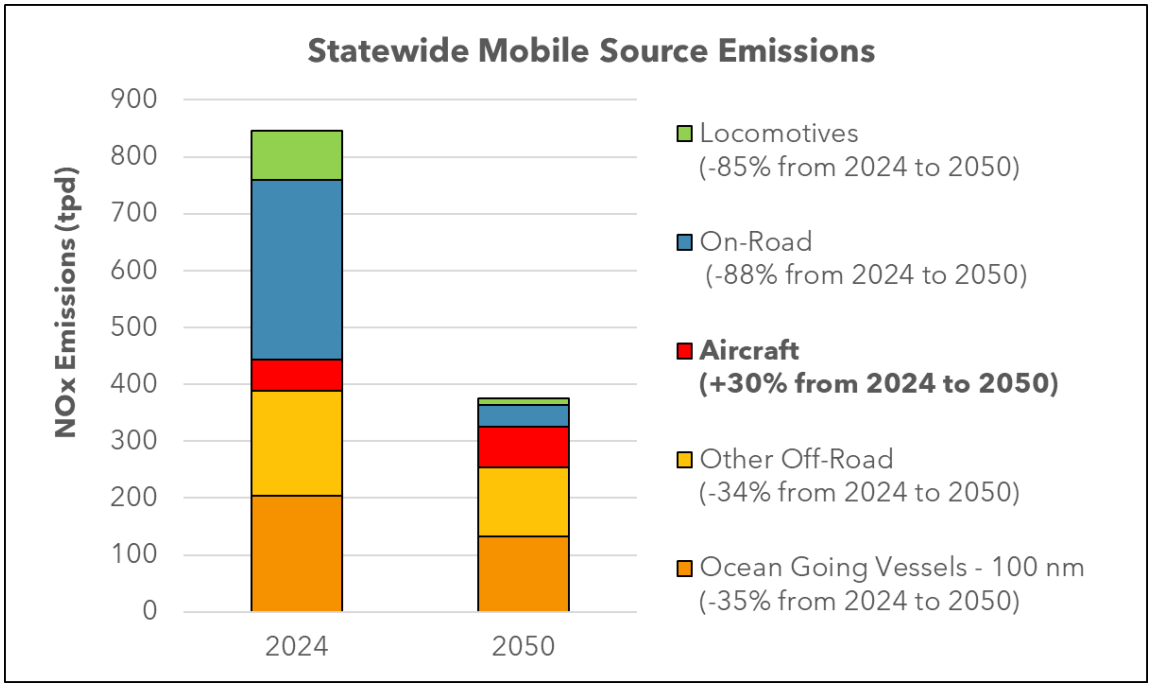
California's Actions in Reducing Emissions from Airports and Aircraft

July 19, 2024

Background

- Airports attract a variety of mobile emissions sources including private and commercial passenger vehicles, shuttle and intercity buses, medium and heavy-duty trucks, private and commercial aircraft, and a wide range of ground support equipment (GSE). Collectively, these mobile sources contribute a significant amount of air pollution, with community, regional, and global impacts. Attainment of federal air quality standards in California will require significant reductions of oxides of nitrogen (NOx), a precursor to the formation of ground-level ozone and fine particulate matter (PM2.5).
- The Federal Aviation Administration (FAA) forecasts California aircraft activity will increase by two-thirds between now and 2050 based on historical aircraft activity and economic predictors, and there are no upcoming plans to tighten current NOx aircraft engine standards. NOx emissions from aircraft operations in California are projected to increase from 55 to 71 tons per day (tpd) between 2024 and 2050, whereas all other mobile source sectors are projected to decrease.



- Aircraft emissions standards are set by the International Civil Aviation Organization's (ICAO) Committee on Aviation Environmental Protection (CAEP). FAA leads the U.S. delegation to CAEP, and the U.S. Environmental Protection Agency (EPA) serves as a technical advisor on the U.S. delegation. California cannot set new aircraft emissions standards.

- General aviation, which includes most privately smaller aircraft that use piston engines, contributes less than 5 percent of aircraft NOx emissions. However, piston aircraft operate on leaded aviation gasoline, which is the source of 83 percent of lead exposure in California.

Current Actions and Programs

- The South Coast Air Quality Management District (South Coast) has Memoranda of Understanding (MOU) with the five largest commercial airports in their jurisdiction to reduce emissions from non-aircraft sources (e.g. GSE) by agreed upon targets by 2023 and 2031.
- CARB regulates GSE through the Large Spark Ignition and Off-Road Diesel Fleets Regulations. These rules were last amended in 2016 and 2022, respectively, to meet specific combustion fleet average standards. Zero-emission GSE can be used to meet either diesel or LSI fleet average standards but is not required.
- In 2018, CARB adopted the Airport Shuttle Bus regulation to require buses servicing the State's 13 largest airports to transition to zero-emission starting in 2027 and phasing in through 2035.
- Since 2019, CARB's Low Carbon Fuel Standard (LCFS) has defined jet fuel as a credit-generating fuel. Since then, consumption of sustainable aviation fuel (SAF) for jet aircraft has increased over ten times to 23 million gallons per year by 2023. Federal agencies are striving to make available 3 billion gallons of SAF per year nationally by 2030, with more ambitious longer-term goals to transition to SAF. SAF can be used in blends of up to 50 percent with conventional jet fuel, which provides lifecycle greenhouse gas (GHG) reductions and particulate matter (PM) reductions of 65 percent but may not reduce NOx.
- Between 2018 and 2023, CARB has adopted regulations such as Innovative Clean Transit, Advanced Clean Trucks, the Clean Miles Standard, Advanced Clean Cars II, and Advanced Clean Fleets, which provide greater zero-emissions transportation options to and from airports.
- The next ICAO CAEP meeting (CAEP/13) begins in 2025 and will explore tighter GHG and noise standards. EPA is working with FAA to ensure fleet average NOx emissions do not increase, but there are no plans to consider technology-forcing NOx standards.
- In October 2023, EPA issued an endangerment finding for leaded aviation gasoline. As of today, FAA has approved formulations of unleaded fuel that will work in all piston aircraft. However, FAA has not adopted regulations for phasing out leaded gasoline. A limited number of airports in California are offering unleaded fuel or have banned the use of leaded fuel.

Looking Forward

- Zero-emission technology is either currently required or expected to be available for non-aircraft sources operating at airports on a timeline aligning with Governor Newsom's directive of 100 percent zero-emission off-road equipment by 2035.
- In the 2022 State SIP Strategy, CARB committed to return to the Board in 2027 with an update on an evaluation of opportunities to reduce airport and aircraft emissions to the maximum extent practicable.
- In July 2024, CARB, South Coast, and EPA announced joint intent to act for further emissions reductions from a variety of sources primarily under federal control, including airports and aircraft.
- CARB announced intent to explore developing a Zero Emission Airport Ground Operations Regulation to require zero-emissions taxiing, zero-emissions GSE, and zero-emissions gate operations.
- CARB intends to host three technology forums for aviation on the following:
    - How airport operations are managed, focusing on optimizing zero-emissions GSE, auxiliary unit operation, and airplane operations (e.g., taxiing).
    - Operational practices and economics of aircraft routing within the State, country, and internationally.
    - Strategies for lowering NOx emissions from aircraft, including improved combustor design, selective catalytic reduction, water-in-fuel strategies, or other strategies.
- EPA announced intent to:
    - Continue coordination with FAA and ICAO on tighter engine standards
    - Explore development of measures that use economic incentives at South Coast airports to prioritize use of aircraft with lower NOx emissions
    - Work with CARB on zero-emission ground support equipment and zero-emission taxiing technology assessments.
    - Together with South Coast, assist CARB with the three technology forums listed above.
- South Coast announced intent to:
    - Explore technology demonstration projects for lower and zero-emissions technologies and associated infrastructure.
    - Explore new mechanisms to reduce emissions from airports including potentially revisiting existing airport MOUs or a future airport Indirect Source Rule (ISR).
    - Together with EPA, assist CARB with the three technology forums listed above.