CALIFORNIA
AIR RESOURCES BOARD

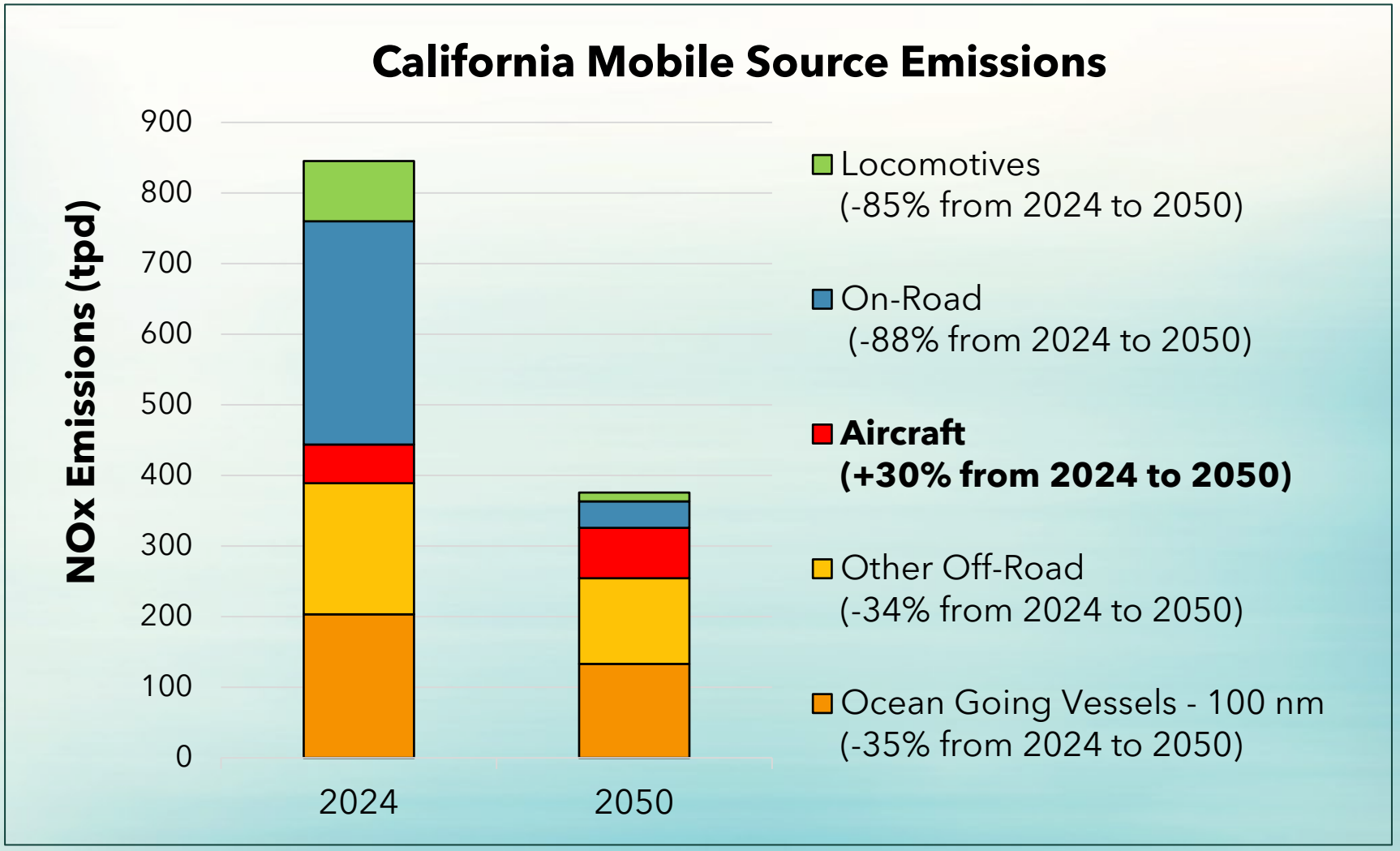
California's Current Strategies for Reducing Emissions from the Aviation Sector

Michael Benjamin, CARB

Conference on Airport Electrification West

October 15, 2024

Emissions From Aircraft Operations in California Are Projected To Increase, As Well As Their Contribution Relative To Other Mobile Sources



State Airport-Related Measures and Targets

Large Spark Ignition Engine Regulation (2009-2013)

In-Use Off-Road Diesel Regulation (2014-2036)

Zero-Emission Forklift Regulation (2026-2038)

Airport Shuttle Bus Regulation (2023-2035)

Advanced Clean Cars II, Advanced Clean Trucks, Advanced Clean Fleet (2024-2035)

Target: 20% Zero-Emission Aviation Sector by 2045

Parentheses indicate year of final regulatory implementation

CARB is Exploring Three Strategies to Reduce Emissions from Airport Ground Operations:

1. Aircraft Operation at Gate
2. Ground Support Equipment
3. Aircraft Taxiing

1. Aircraft Operations at Gate

Concept requires using gate infrastructure rather than Auxiliary Power Units (APU) when aircraft is at the gate

Many airports already provide ground power and preconditioned air at their gates (e.g., 100% electrified gates and PCA at LAX)

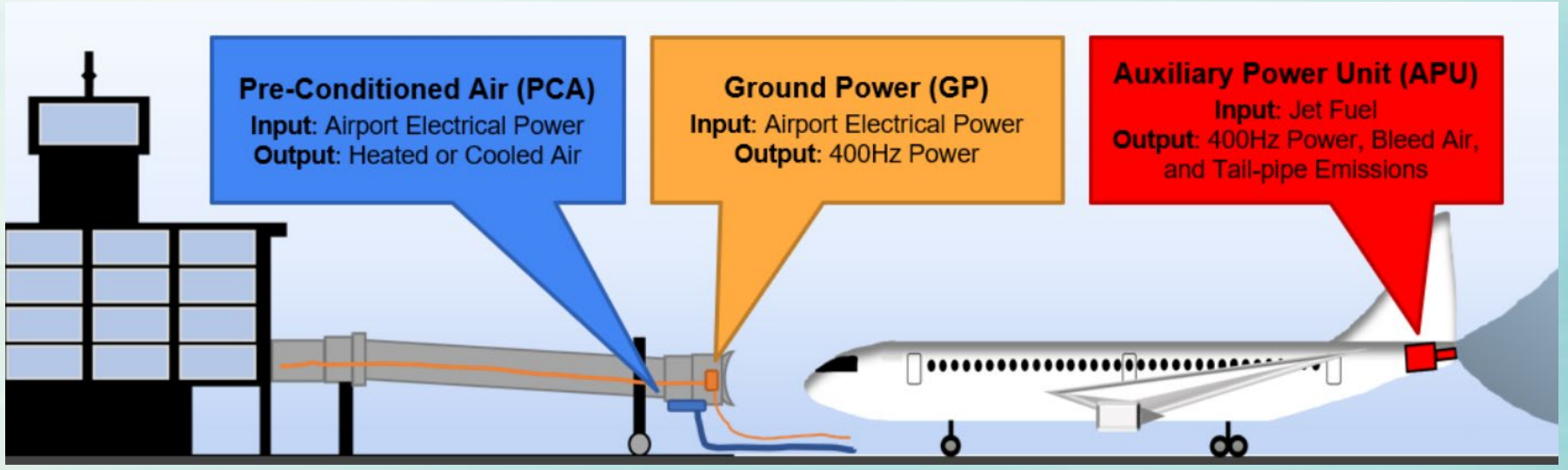


Figure Credit: Rakas et al. (2023)

2. Ground Support Equipment

Many categories of eGSE today are commercially available and operationally feasible

In LAX, 32% of GSE is already electric (1,000+ pieces of equipment are ZE)

As not covered by existing rules yet, new strategies are being evaluated for a potential full transition to zero-emission GSE

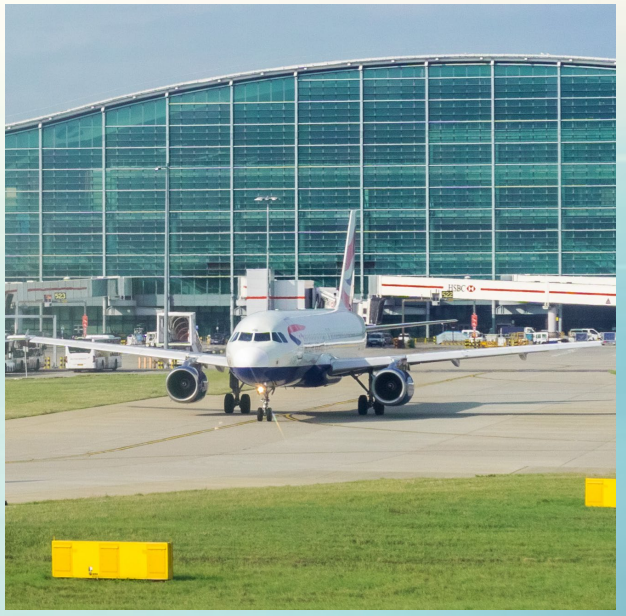
CARB

3. Aircraft Taxiing Operations

Minimize aircraft engine use while taxiing by using zero-emission taxiing technologies or low emission strategies

TaxiBot, pilot project at Schiphol Airport

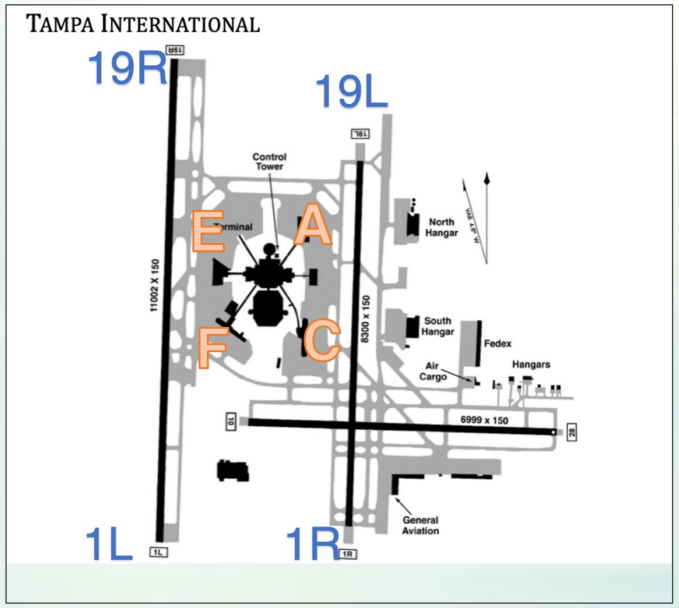
WheelTug, operations planned for 2026



Single Engine Taxiing, required at London Heathrow Airport

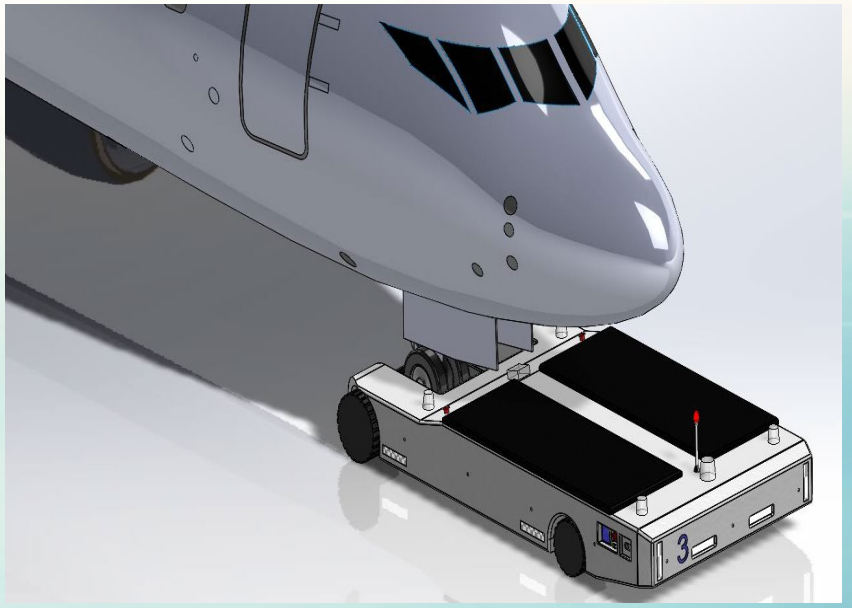
Case Studies on Alternative Aircraft Taxiing

1. Modeling Electric Taxiing Tugs at Tampa International Airport



- ✓ Simulation suggests 10 Electric Taxiing Tugs
- ✓ Reduce engine runtime by 8 mins
- ✓ Save 2.5 million gallons of fuel per year

2. Autonomous Aircraft Tug at Denver International Airport (DEN)



- ✓ Benefit to cost ratio = 6.5
- ✓ Estimated $6.3 million annual savings from all Boeing 737-700 at DEN

Where Collaboration is Needed

- Local utilities to bring additional power to airports, if needed
- Airline and airports to leverage grant funding for zero-emission taxiing demonstration projects
- Continued discussions with airports to share experience from their air quality programs
- Engagement from U.S. EPA and FAA to ensure a smooth and safe transition to zero-emission airport ground operations

Next Steps

- Public workshops to continue discussion of potential regulatory concepts – late 2024/early 2025
- GSE survey of California airports in late 2024/early 2025
- Aviation Technology Forums in collaboration with U.S. EPA and South Coast Air Quality Management District – early/mid 2025
- Develop Request For Proposal (RFP) contract on Zero-Emission Taxiing Feasibility

Contact Information

Michael Benjamin, D.Env.
Chief, Air Quality Planning and Science Division
California Air Resources Board
Michael.Benjamin@arb.ca.gov
(916) 201-8968

For more information:

- https://ww2.arb.ca.gov/our-work/topics/aircraft-airports
- https://ww2.arb.ca.gov/our-work/programs/mobile-source-emissions-inventory