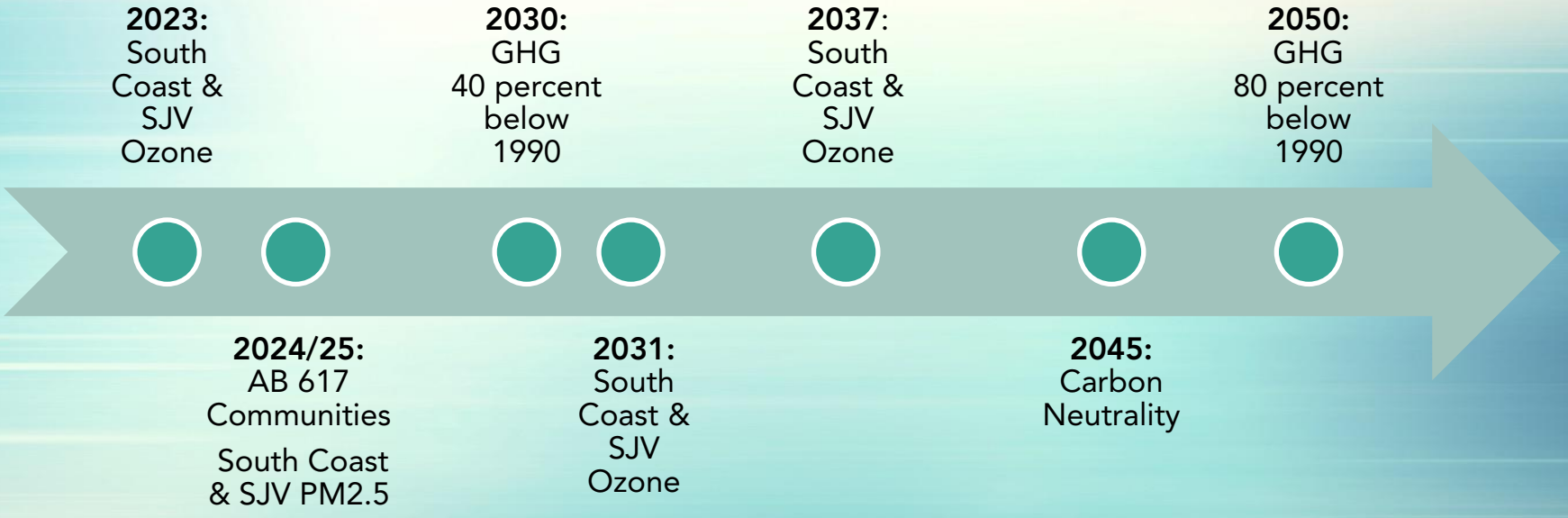
CALIFORNIA
AIR RESOURCES BOARD

Off-Road Diesel Emissions Inventory Modeling and the Need for Reductions

Outline

- California's Air Quality and Greenhouse Gas Goals
- Emission Contributions from Off-road Diesel Engines
- Emission Reductions Needed
- Estimate Benefits of Potential Tier 5 Standards

California's Air Quality and Greenhouse Gas Goals



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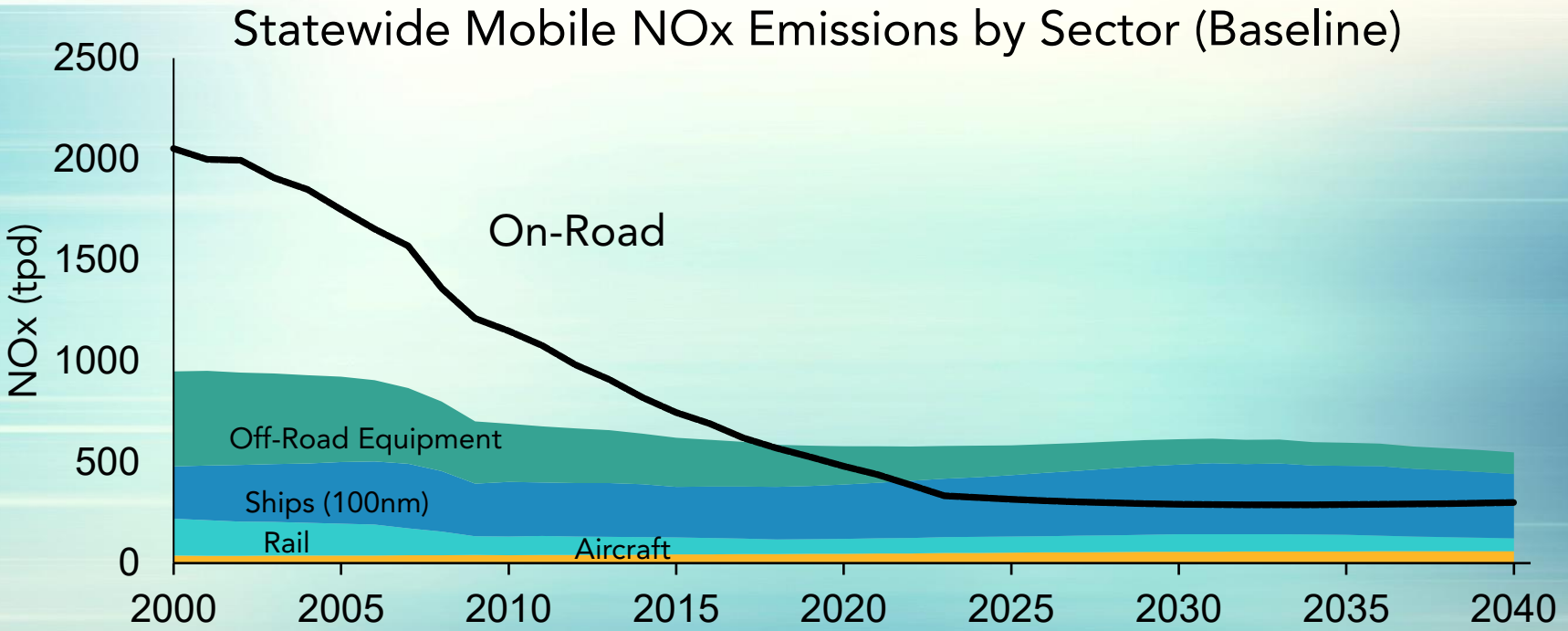
Growing Importance of Off-Road: Reductions are Key



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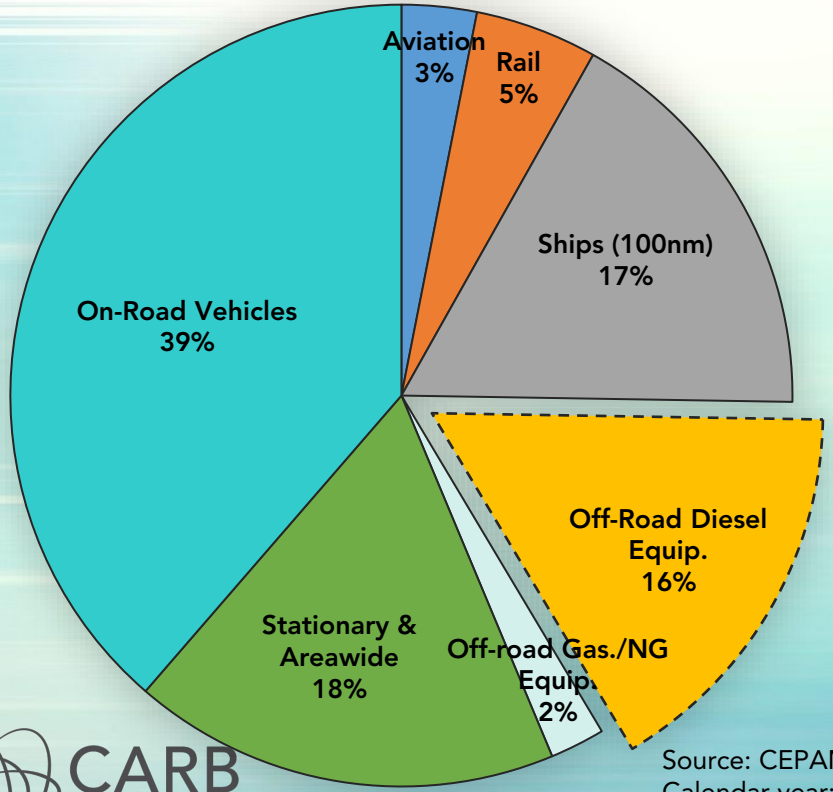
Source: CEPAM 2019 Summer emissions; Vessels includes emissions up to 100 nautical miles

NOx Contribution from Off-Road Diesel Equipment



Off-Road Diesel Equipment

- Construction and mining, industrial, agriculture, cargo handling, transport refrigeration units, portable, ground support, etc.
- 16% of NOx emissions and 1% of GHG emissions
- Will be impacted by Tier 5

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Source: CEPAM 2019 Summer
Calendar year: 2017

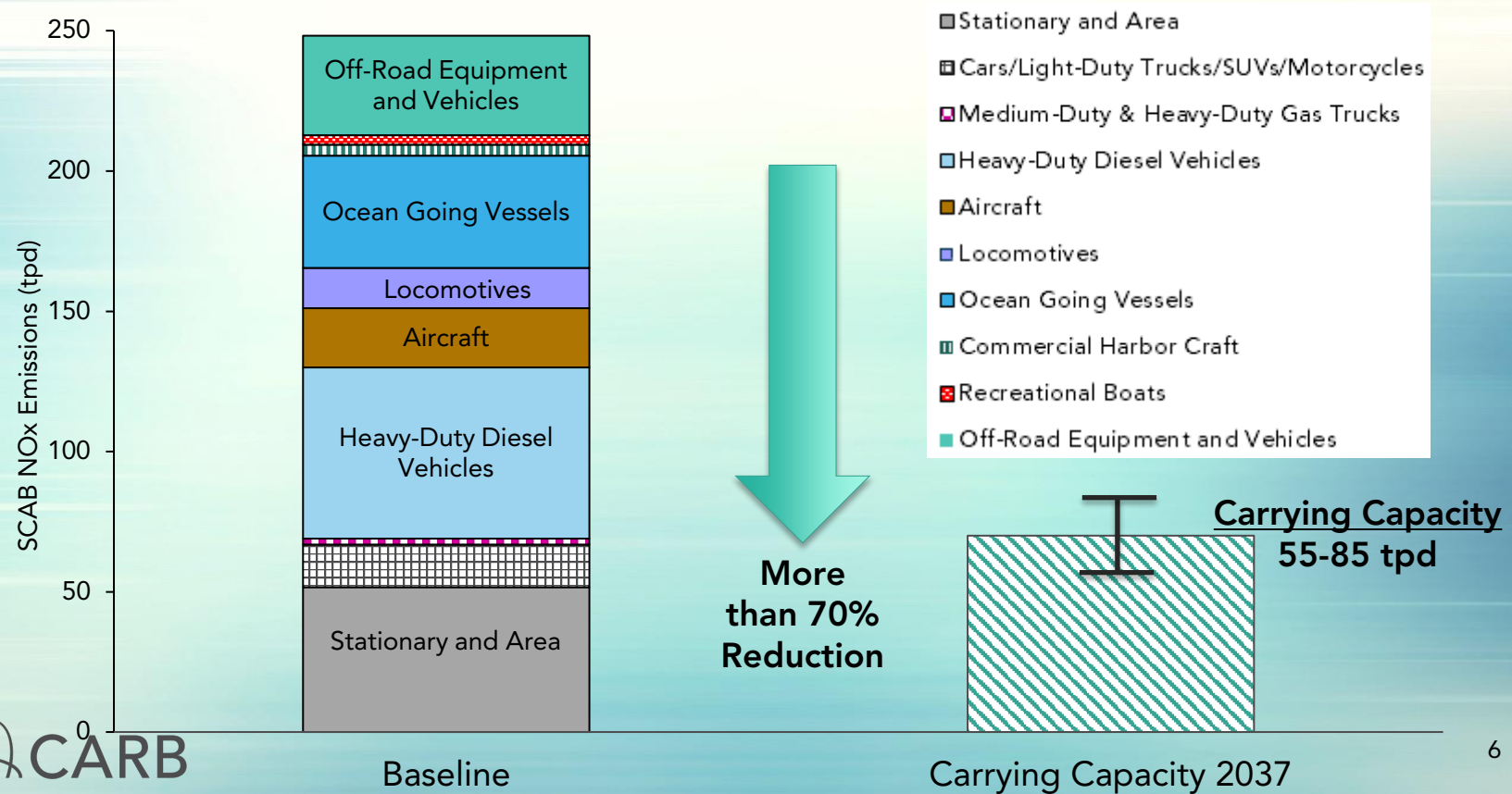
Additional Progress is Needed to Meet Ozone Standard

- EPA revised the 8-hour ozone standard to 70 ppb in 2015
- 19 areas in California are designated nonattainment

Nonattainment Area	Classification
South Coast Air Basin	Extreme
San Joaquin Valley	Extreme
Western Mojave Desert	Severe
Coachella Valley	Severe
San Diego County	Severe
Ventura County	Serious
Sacramento Metro	Serious*
Eastern Kern County	Serious*
Western Nevada County	Serious*

*Pending EPA approval

2037 South Coast Attainment Draft



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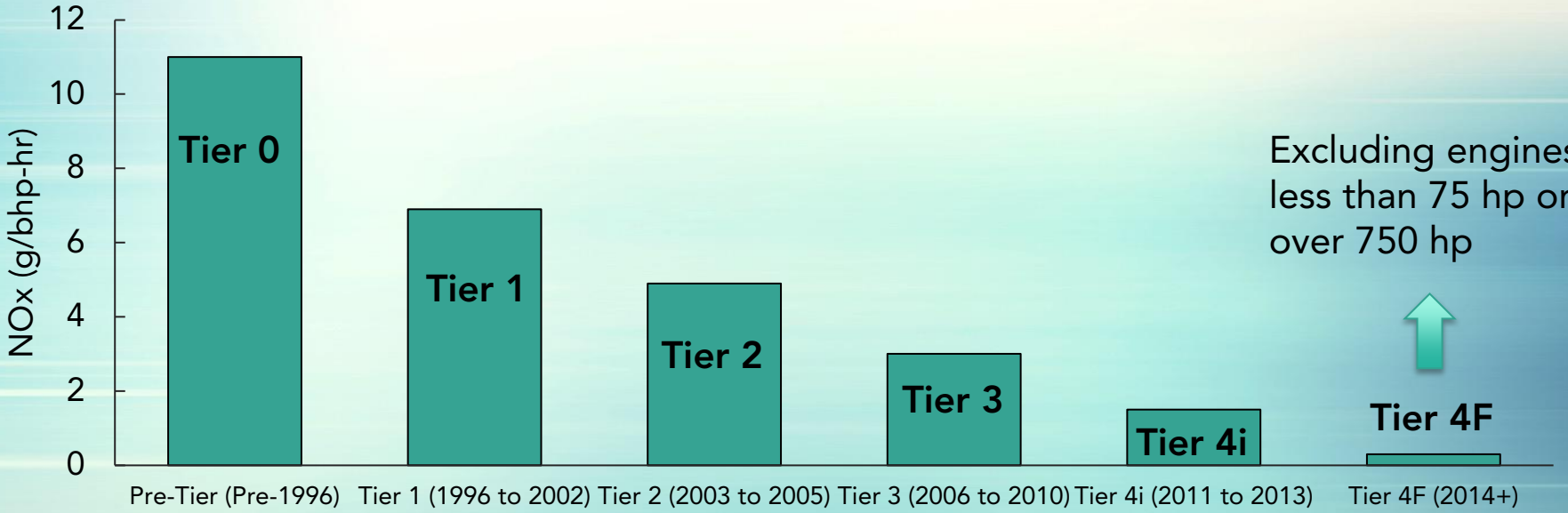
General Emission Inventory Methodology

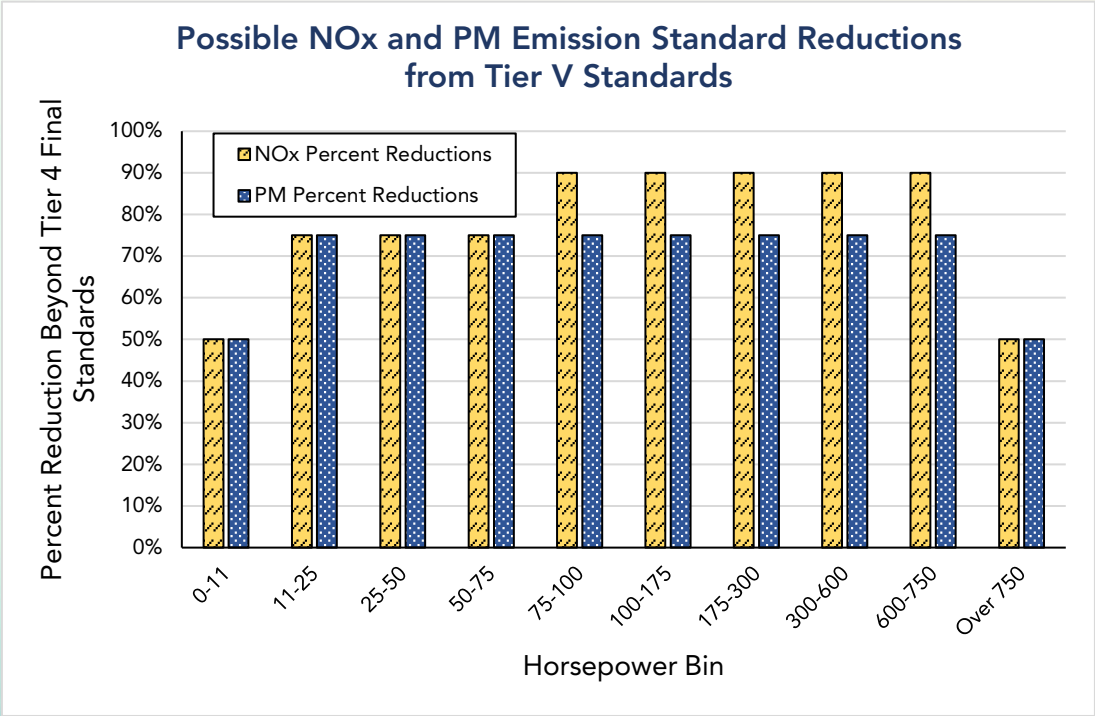
- Emission inventory is the emissions from all combustion engines in the state
- Emission = Activity (hp-hr) × Emission Factor (g/hp-hr)
  - Activity = Population × Annual Hours × HP × Load Factor
    - Data sources: survey, reporting data, etc.
  - Emission Factor (EF)
    - Data Sources: USEPA certification data, PEMS testing
    - Fuel Correction Factors: account for the difference between federal and California diesel
    - Different than the emission standard

Existing Emission Standards by Tier for Off-Road Diesel Engines



Possible Emission Reductions from Potential Tier 5 Standard

- **Off-Road Tier 5** reduces NOx and PM from Tier 4F by 50%-90%



Possible Benefits of Implementing Potential Tier 5 in Mobile Source Strategy

- Proposed implementation starting in 2028 for non-preempted engines, and 2030 for preempted ones