

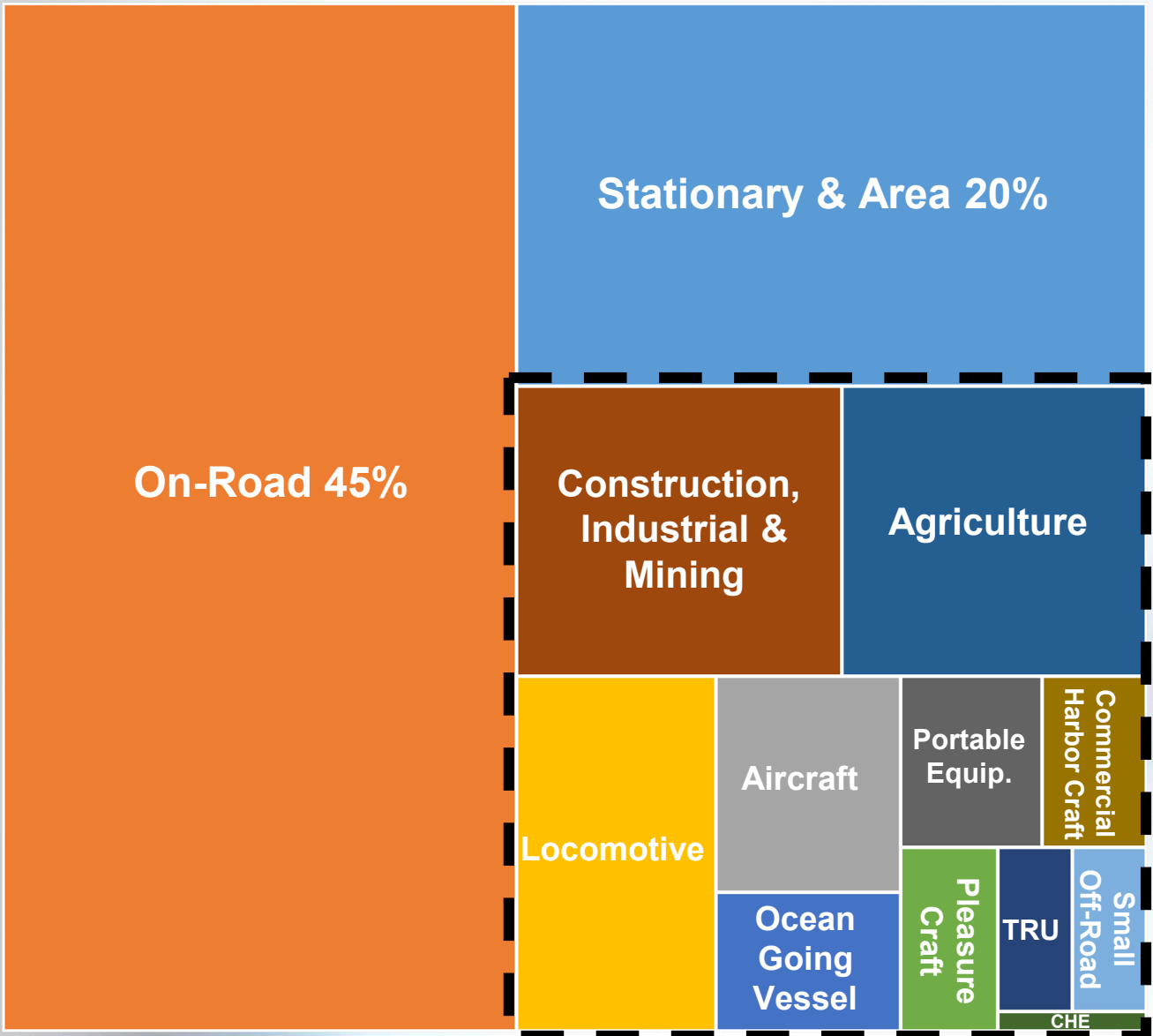
2020 Mobile Source Strategy: A Vision for Clean Air

Transportation DAWG Meeting
August 22nd, 2020



Off-Road Sector

Statewide NOx Emissions



- Off-road mobile sources contributes to 35% of Statewide NOx and 4% of GHG emissions in 2017
- Off-road NOx contribution will grow to 37% (largest) by 2022
- Off-road annual diesel consumption will reach 2.13 billion gallons by 2045



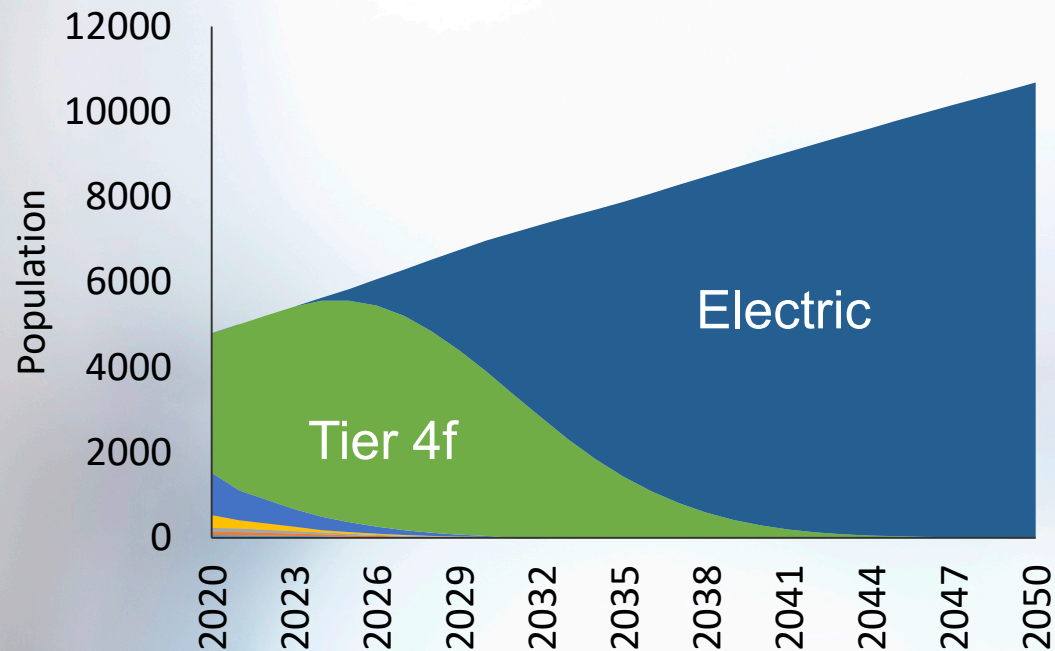
Strategies for Off-Road Sector

- General principles:
 - ✓ Zero-emission technology wherever possible
 - ✓ Remaining combustion engines as low-emitting as technically feasible, throughout entire service lives (Tier 5, OBD and GHG standard)
 - ✓ Use of renewable fuels where electrification is not feasible
 - ✓ Accelerated turnover of older equipment to cleanest available technology, including hybridization
 - ✓ Retrofit with after-treatment technologies

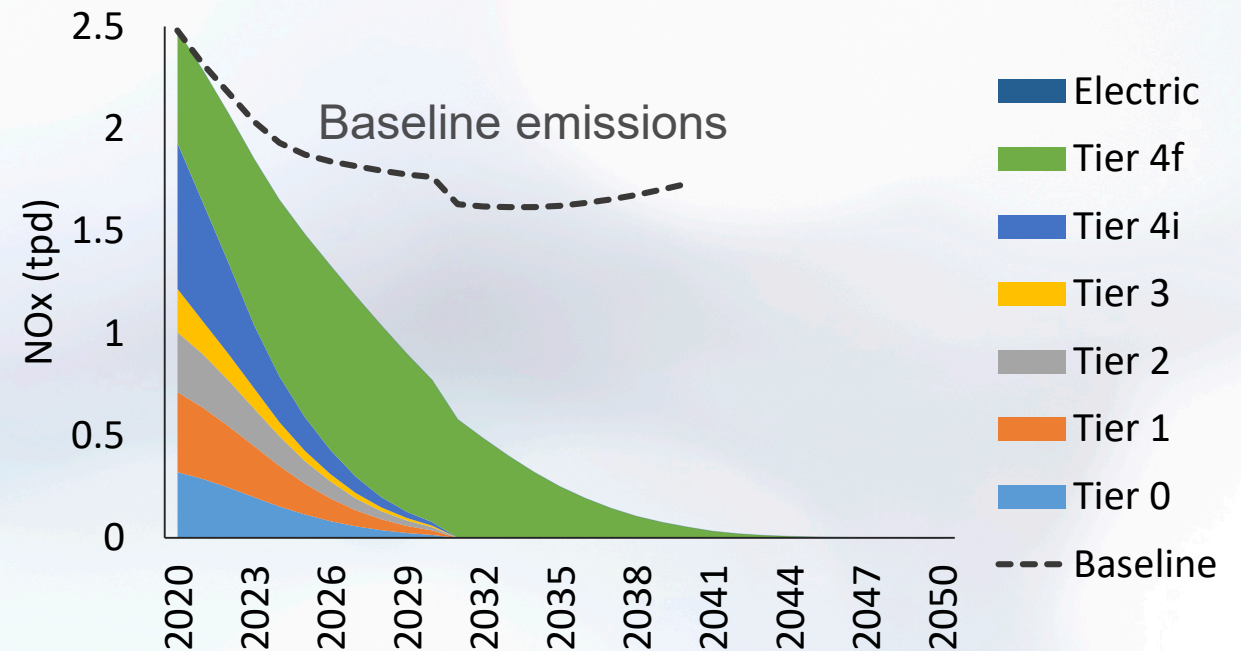
Cargo Handling Equipment

- Important due to proximity of communities and at-risk population centers, primarily significant in SC and Bay Area
- **MSS Scenario:** Begin transition to full electric operation in 2026

Statewide CHE Population Under MSS



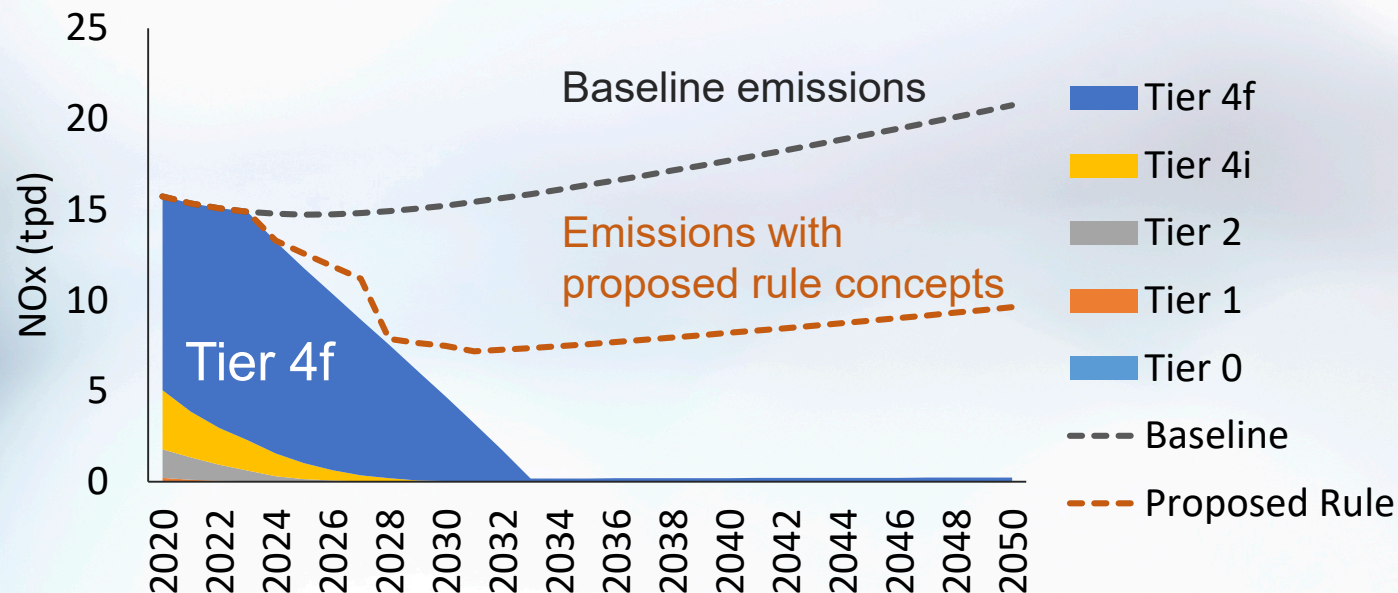
Statewide NOx Emissions From CHE



Transport Refrigeration Units (TRU)

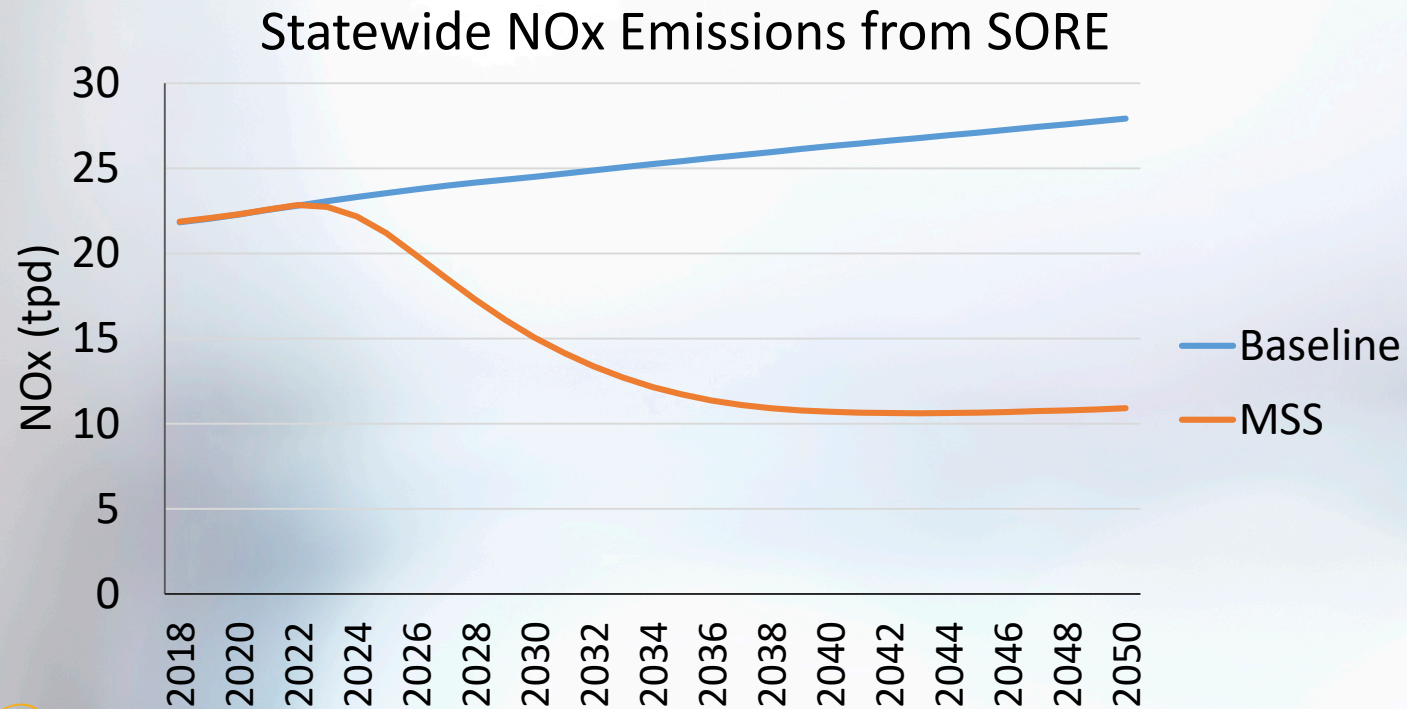
- Significant to all local communities
- **Rule Concepts:**
 - Zero-emission requirements for truck TRU
 - Zero-emission operation requirements while *stationary* for trailer TRU
 - Less than 25 hp TRU and TRU gensets meet standard for 25 to 50 hp
- **MSS Scenario:** Rapid electrification: zero-emission share from 10% in 2024 to 100% in 2034

Statewide NOx Emissions from TRU



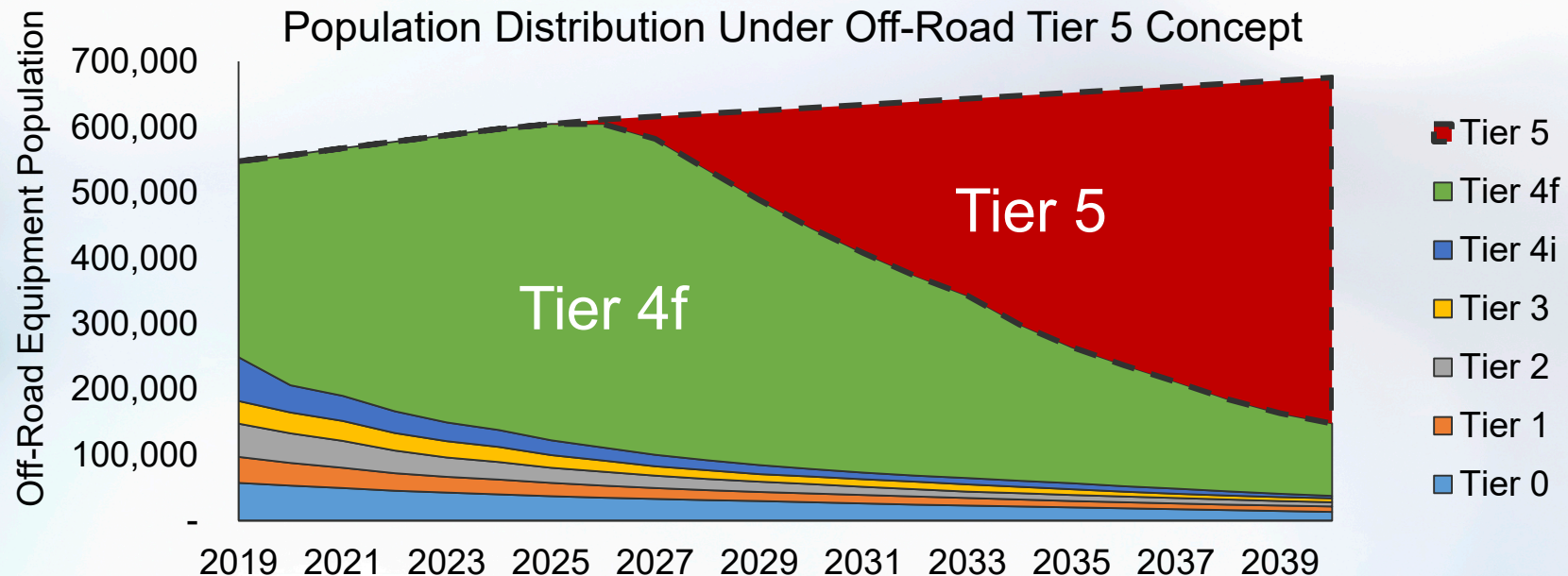
Small Off-Road Engines

- Significant source of statewide ROG emissions
- Types: Lawn & Garden equipment, light commercial equipment
- **Rule Concept:** All new sales will be zero-emission starting in 2025 (except for federally preempted equipment)



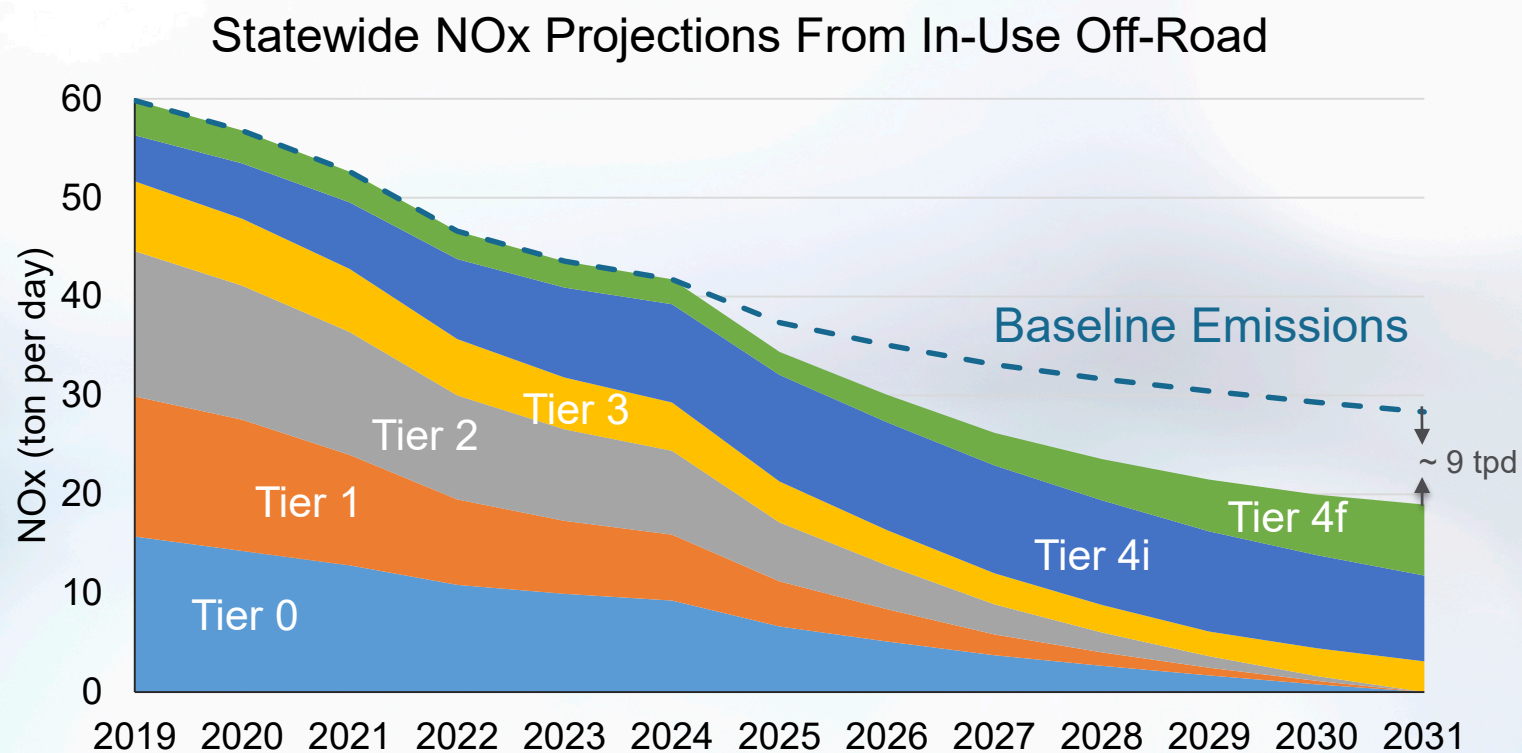
Off-Road Engine Standards: Tier 5

- Would achieve additional NOx and PM reductions for all off-road engines (excluding marine and locomotives) when introduced in mid 2020s
- Explore zero-emission and hybridization wherever feasible
- **Additional concepts:**
 - Off-Road on-board diagnostic (OBD) standards: ensure emissions reduction equipment is working
 - More stringent exhaust standards for spark-ignition recreational marine engines
 - Potential for off-road diesel GHG standards



Construction, Industrial, Mining (In-Use Off-Road)

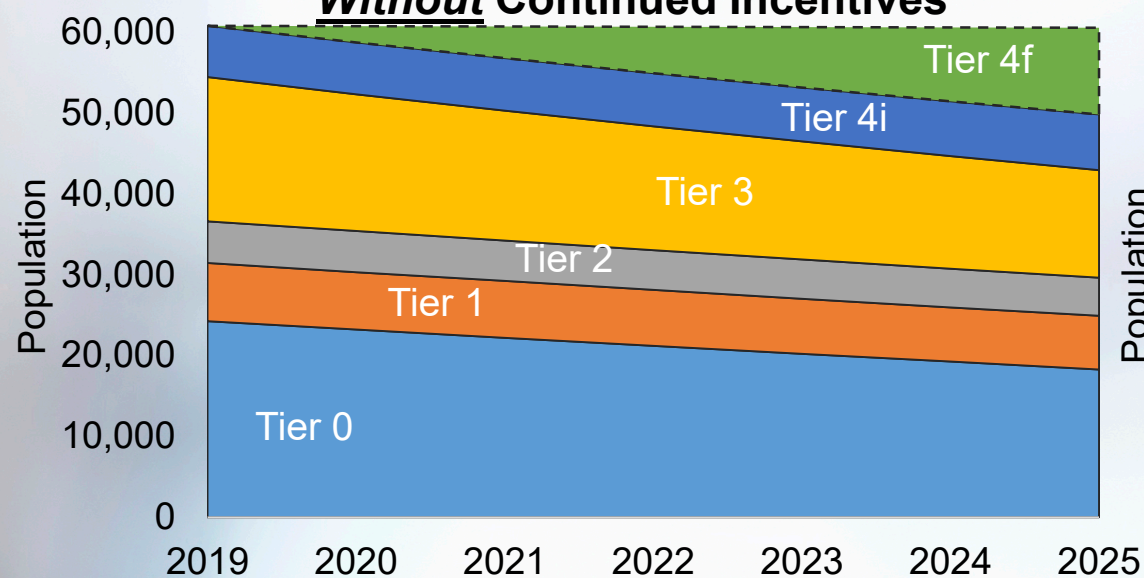
- Significant NOx contributor in SJV and SC
- **Current regulation** allows continued use of Tier 0 to Tier 2 indefinitely if meeting Fleet Average requirements
- **MSS Scenario:** Implement full turnover of Tier 0/1/2 equipment by 2033



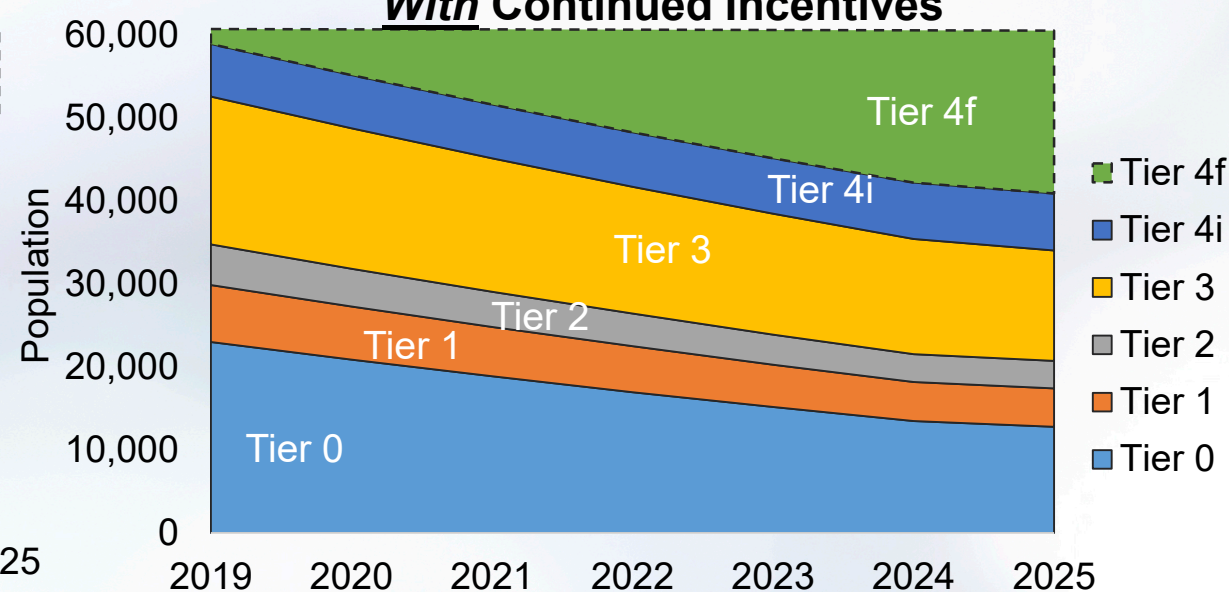
Agriculture

- Important contributor in SJV: 18 percent of NOx emissions in 2019
- **MSS Scenario:** Continue incentive-driven programs (e.g., FARMER)
 - Replacing Tier 0/1/2 tractors with Tier 4-Final tractors; significant acceleration of Tier 0/1/2 has been underway since 2009
 - Replacing diesel all terrain vehicles (ATVs) with electric

SJV Tractor Population by Tier:
Without Continued Incentives



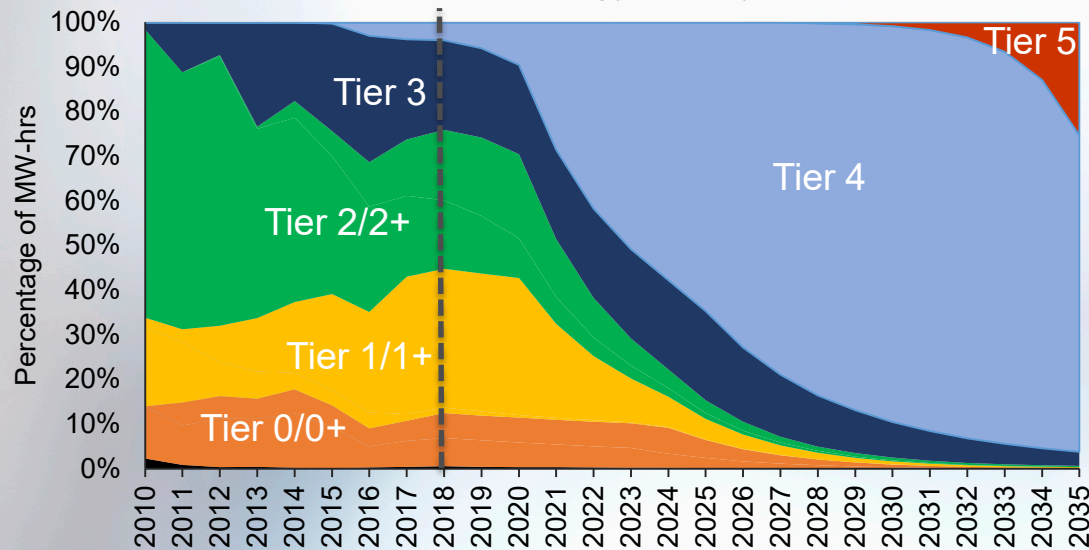
SJV Tractor Population by Tier:
With Continued Incentives



Locomotives

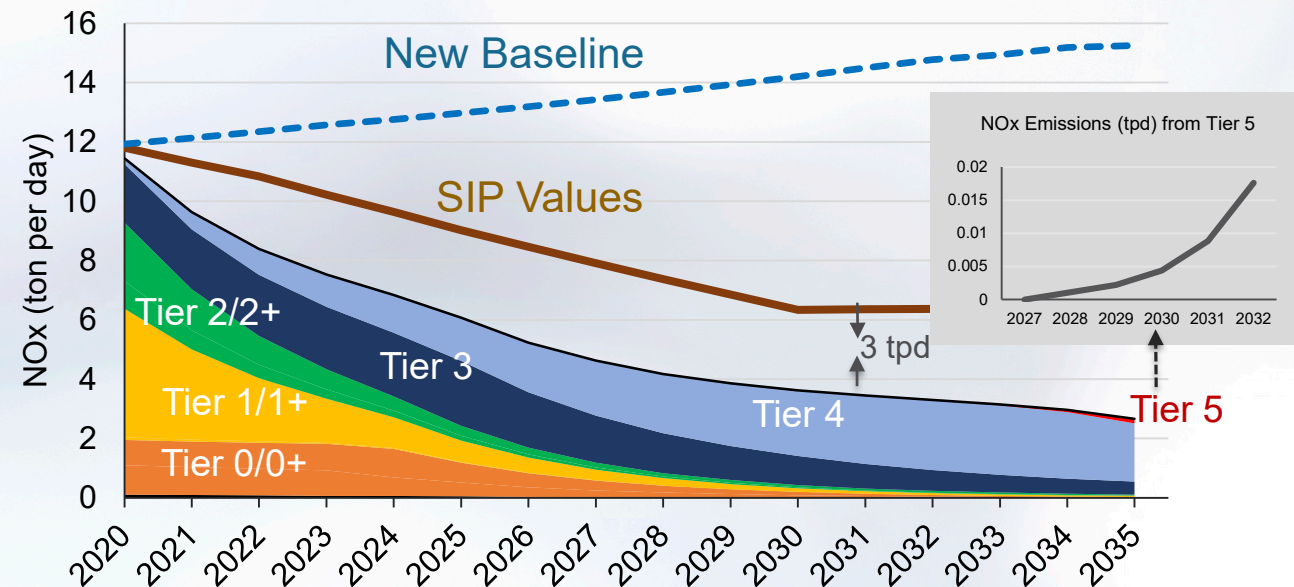
- Significant contributor in SJV and SC, and all communities near railyards
- **Rule Concepts:**
 - Increase purchases of Tier 4, reduce use of pre-Tier 3 locomotives by mid-2020s
 - Increase turnover of Tier 0/0+ switchers in railyards
- **MSS Scenario:** Tier 5 locomotive standards and significant penetration of Tier 4/5

SC Locomotive Energy Use by Tier Standard



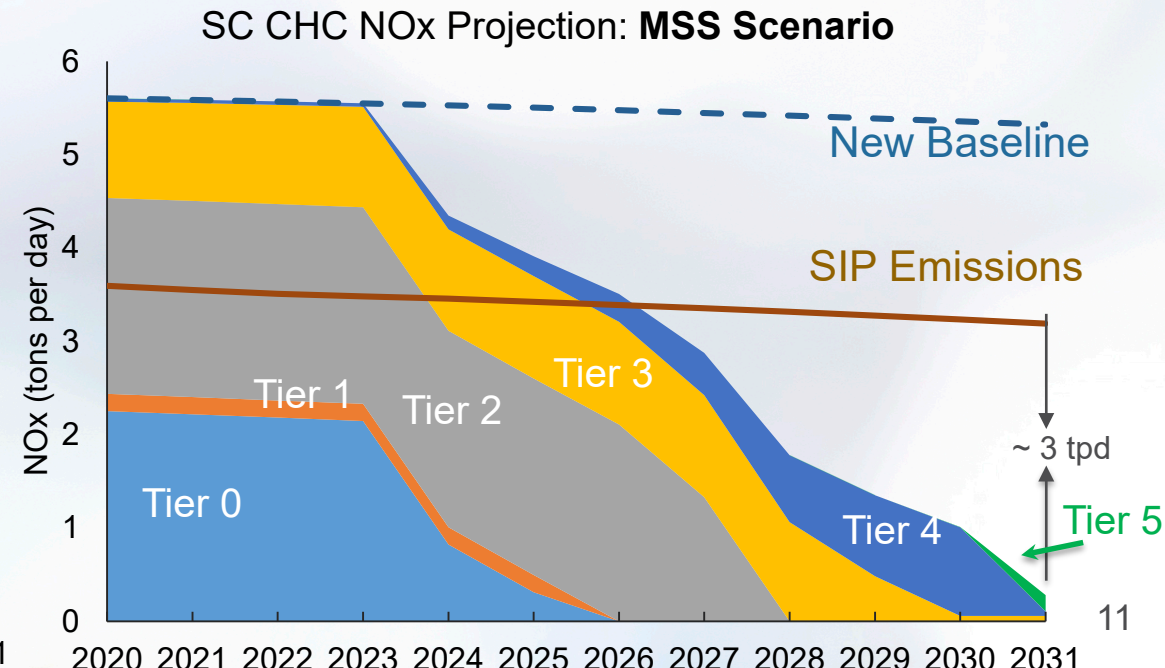
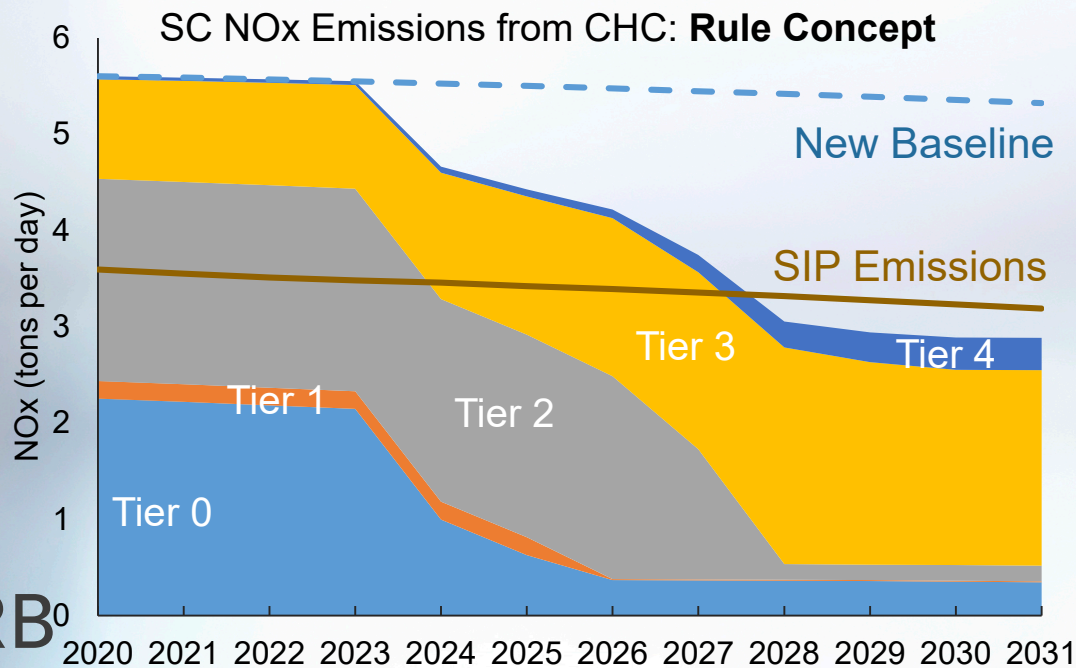
Tier 4 only accounts for 4% of activity in 2018

SC NOx from Locomotives: Needed Reduction



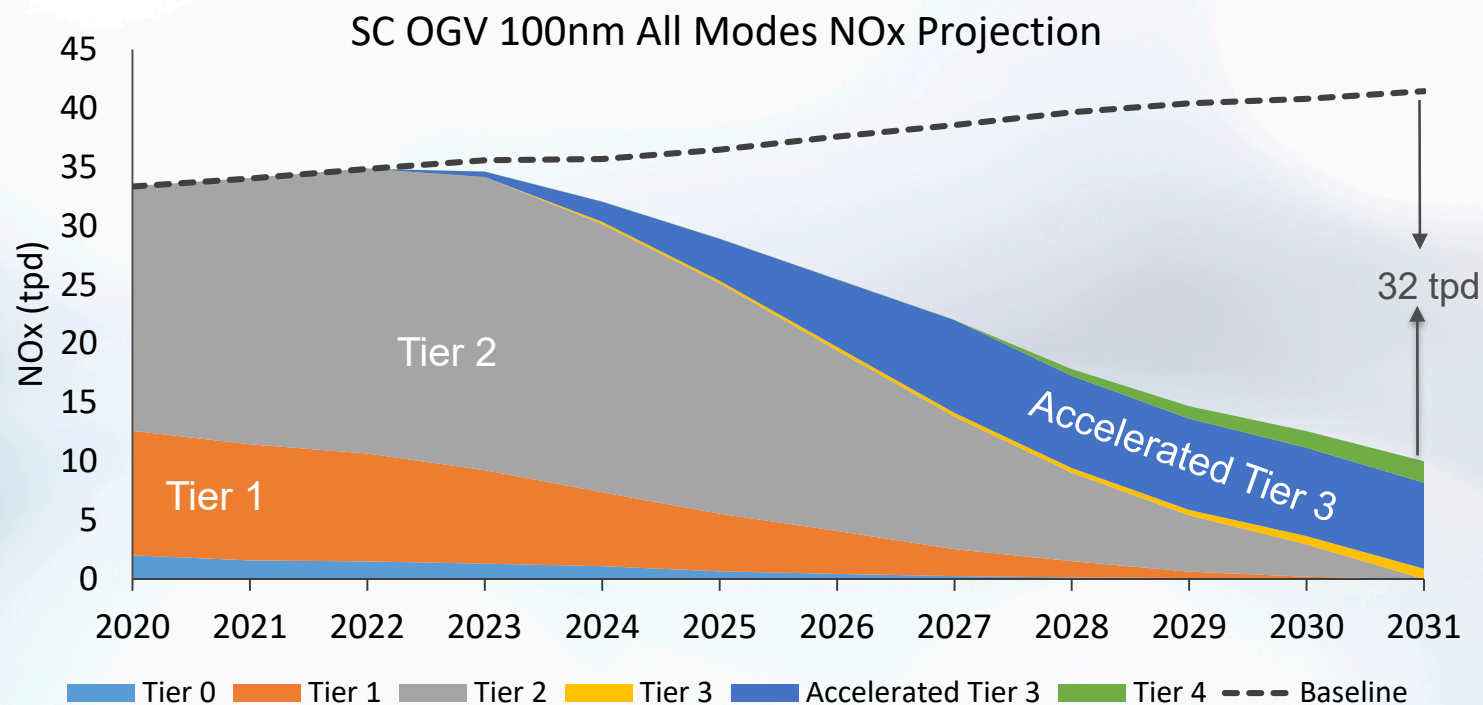
Commercial Harbor Craft

- Important due to proximity of at-risk communities, primarily significant in South Coast & Bay Area
- **Rule Concepts:**
 - In-use short run ferries become zero-emission by 2028 (9% of ferries)
 - Turn over all vessels except for commercial fishing to cleanest engines and retrofit with DPF
 - New excursion boats go to plug-in hybrid, new tugs go to diesel-electric beginning in 2023
- **MSS Scenario:**
 - Include commercial fishing; introduce Tier 4 standard in 2024 and Tier 5 in 2027
 - Plug-in hybrid for excursion boats and diesel-electric for tugs by 2030











Ocean-Going Vessels At Berth

- **Rule Concepts:** Expansion of at-berth rule to cover more vessel types and locations
- **MSS Scenario:** Address transit, anchorage and maneuvering emissions
 - Introduce Tier 4 marine standards in 2028
 - Completely phase out Tier 0/1/2 vessel visits from 2023 to 2031

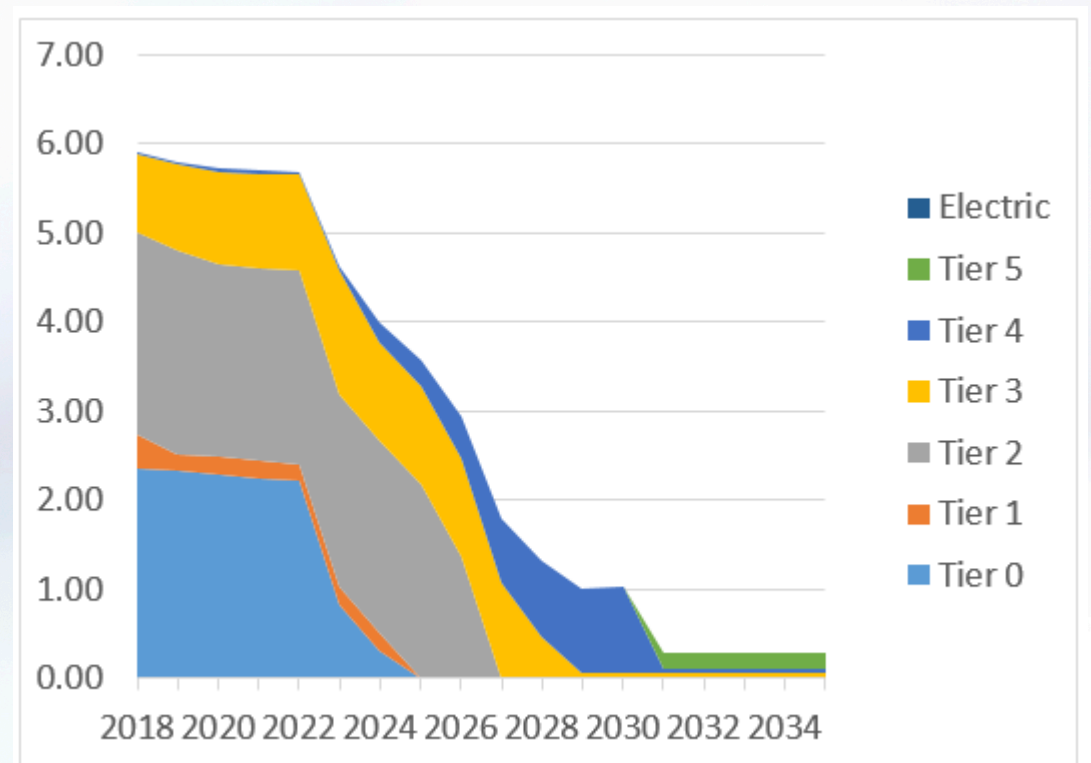


META: Off-Road Equipment

Users may select categories, air basins, scenarios, and pollutants

Inputs		Assumptions	
category	 	fields	 
Agricultural		CO2_tpd	
CHC		Fuel_million_gpy	
CHE		NOx_tpd	
In-Use		PM2.5_tpd	
Locomotive		Population	
OGV			
PERP			
TRU			
airbasin	 	scenario	 
San Joaquin Valley		Baseline	
South Coast		MSS	
Statewide			

Scenario Visualization



Contact us!

- Scenario modeling
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- MSS General information: Ariel Fideldy, Ariel.Fideldy@arb.ca.gov

<https://ww2.arb.ca.gov/resources/documents/2020-mobile-source-strategy>