



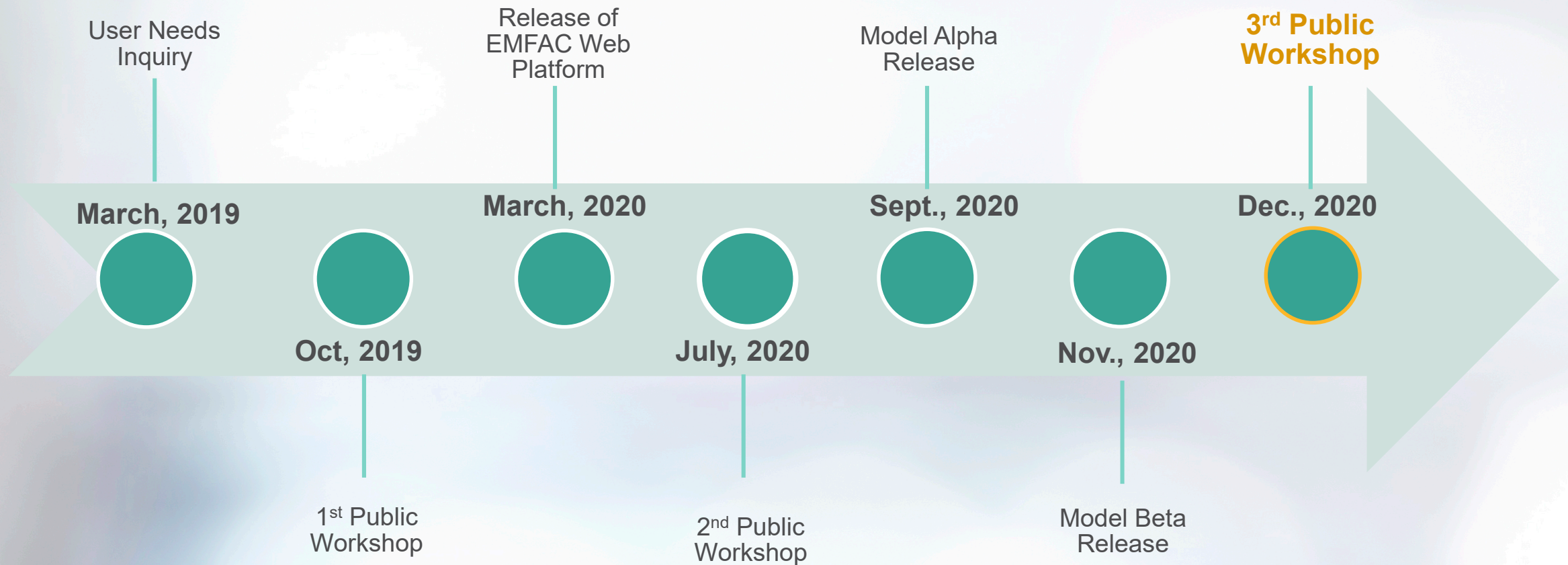
EMFAC202x Updates

December 2020 Workshop

Mobile Source Analysis Branch
Air Quality Planning and Science Division
California Air Resources Board

December 15, 2020

Public Process So Far



Agenda for Today's Workshop

- ❑ Background
- ❑ Comparison with EMFAC2017
 - i. Overall trend
 - ii. Detailed overview of impacts
- ❑ Q&A and Next Steps

Overview

Background

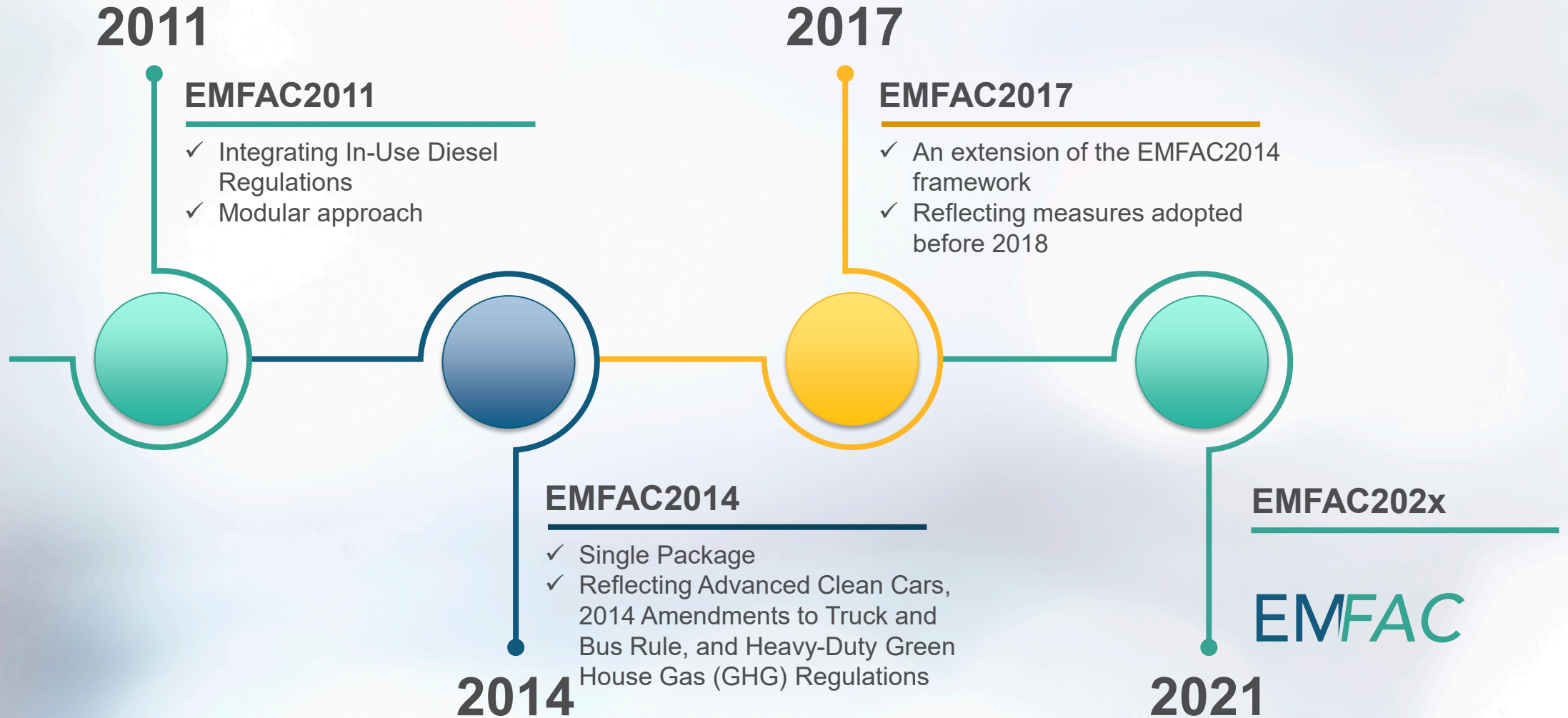
Background of EMFAC

- California specific with USEPA approval
- More than three decades of data collection and methodology refinement
- Advanced Data Mining and Analysis
- Real World Emission Testing
- Use of Big Data (e.g., Telematics)
- Integrated modeling

EMFAC



A Decade of EMFAC Updates



EMFAC202x Updates

New web interface

- Full functionality
- Modern and friendly
- Fast and easy

Data Updates

- Vehicle population
- Vehicle activity
- Emission rates

New model features

- PHEV
- Energy module
- Evaporative module
- Ammonia
- Vocational trucks

New forecasting framework

- Consumer choice model
- Travel demand model



Latest Regulatory Measures



HD Vehicle Inspection Program (HDVIP)/
Periodic Smoke Inspection Program (PSIP)



Innovative Clean Transit (ICT)



SAFE Part One & Final Rule



HD Omnibus



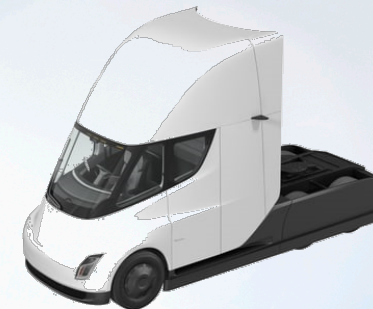
HD Warranty



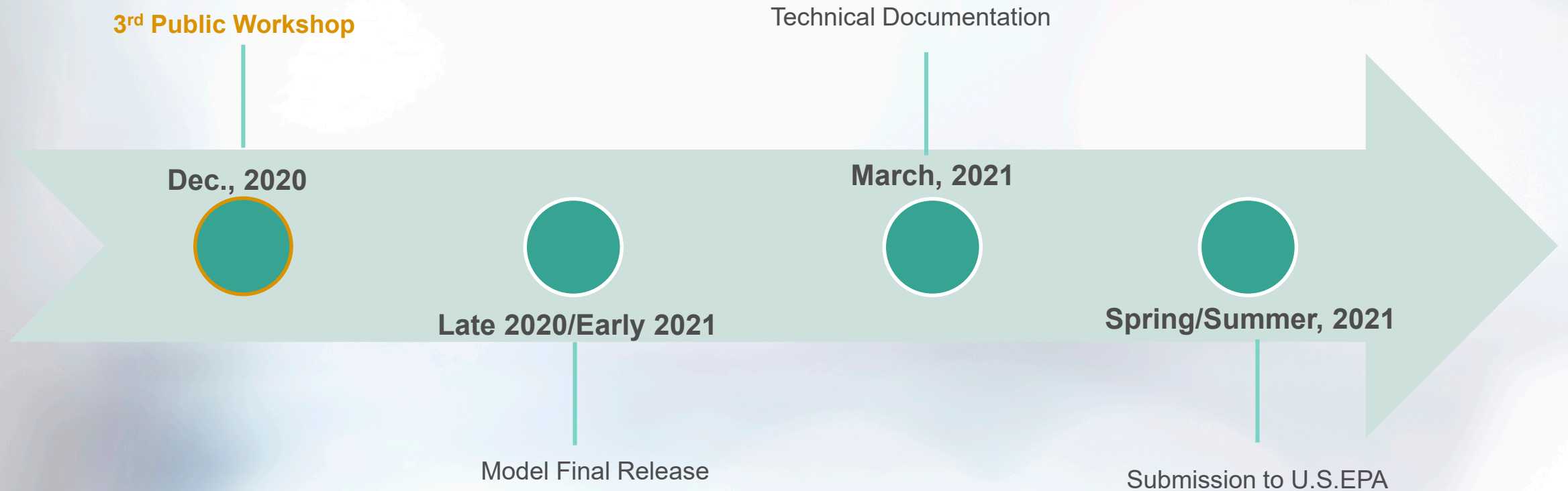
Zero Emission (ZE)
Airport Shuttle Bus



Advanced Clean Trucks (ACT)



EMFAC202x Next Steps



EMFAC202x vs. EMFAC2017

Major Updates and Impacts

□ Overall Trends

Comparisons of EMFAC202x vs. EMFAC2017

- EMFAC202x model will be released with “default” VMT
 - CARB estimated VMT
 - Historical VMT is bounded by fuel sales from CDTFA*
 - Future forecasting is based on socio-econometric modeling for LD and CSFFM** for HD
- Emissions comparisons provided in this workshop are based on “default” VMT
- For State Implementation Plan (SIP) and transportation conformity demonstration, MPO*** VMT will be used

* CDTFA: California Department of Tax and Fee Administration

** CSFFM: California Statewide Freight Forecasting Model

*** Metropolitan Planning Organizations

Overall Trends Relative to EMFAC 2017 (1)

Light Duty (LD)

- All vehicles with Gross Vehicle Weight Rating (GVWR) of 8,500 lbs. or less
- Passenger Cars, Light-Duty Trucks, and Motorcycles

- LD VMT – VMT decrease
- LD Exhaust Emission Rates Updates: **NO_x and ROG increase**
- LD PM Brake Wear Emission Rates Updates: **PM decrease**
- LD Evaporative Emission Module: **ROG increase**
- The Final Safer Affordable Fuel Efficient (SAFE) Rule¹: **CO₂ increase**
- Motorcycle Activity and Emission Rates Updates – Activity decrease: **NO_x, ROG, CO and CO₂ decrease**

Passenger Vehicles



Motorcycles



1. <https://www.epa.gov/regulations-emissions-vehicles-and-engines/safer-affordable-fuel-efficient-safe-vehicles-final-rule>

Overall Trends Relative to EMFAC 2017 (2)

Heavy Duty (HD)

- All vehicles with GVWR of 8,501 lbs. or higher
- Light-, Medium-, and Heavy-Heavy Duty Trucks and Buses

- HD VMT – higher VMT growth rates
- HHD Exhaust Emission Rates Updates:
 - Running: **PM increase**, **NO_x decrease**, **CO₂ decrease**
 - Start: **NO_x increase**
- New HD Deterioration Model: **NO_x decrease** for older fleets
- HD Activity Profile Updates:
 - VMT distribution by speed: **NO_x decrease**, **PM increase**
 - Number of starts by soak time: **NO_x decrease**
 - Extended idling hours: **NO_x and PM increase**
- HD Regulations (e.g., ACT, HD Omnibus): **Criteria and GHG reduction**

Pickups / Vans



Medium Heavy Duty Trucks



Heavy-Heavy Duty Trucks

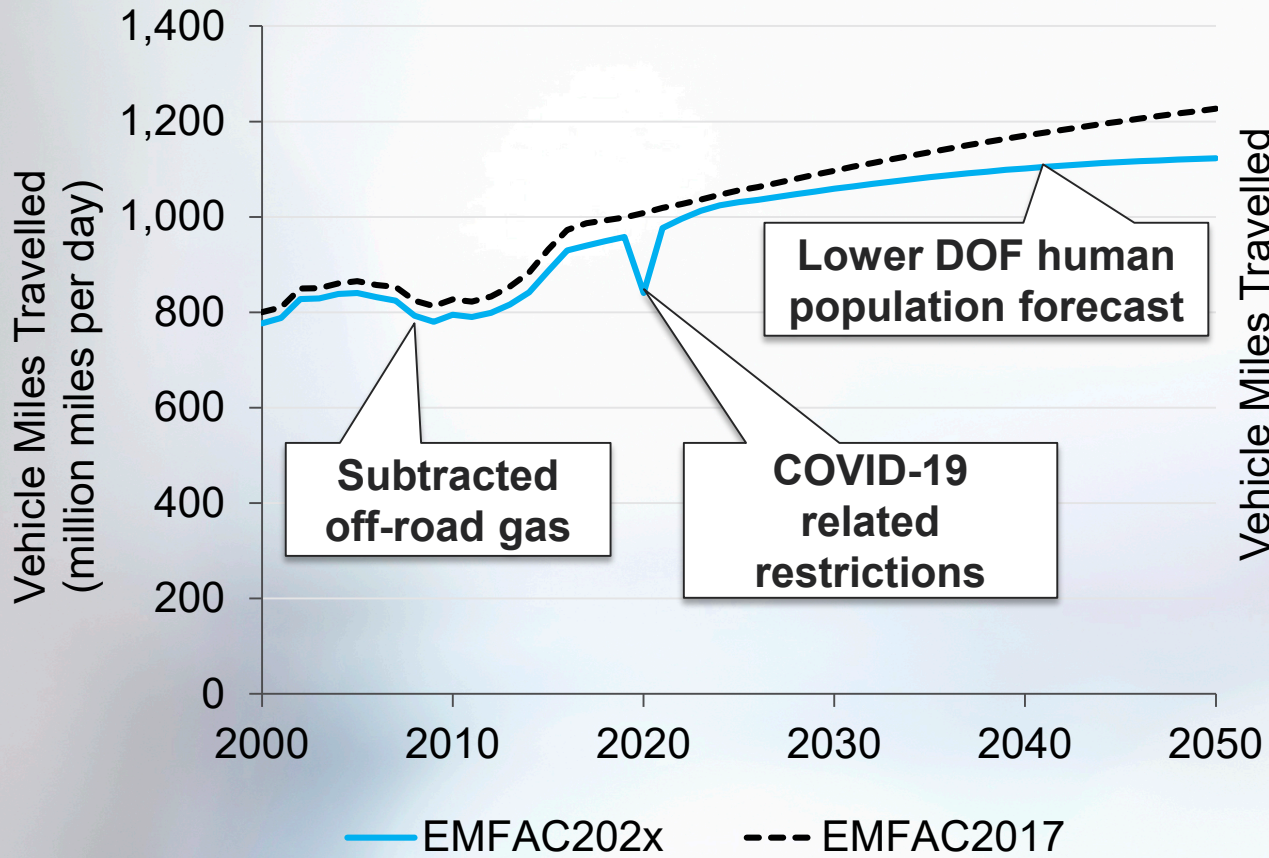


Statewide and Regional Comparison

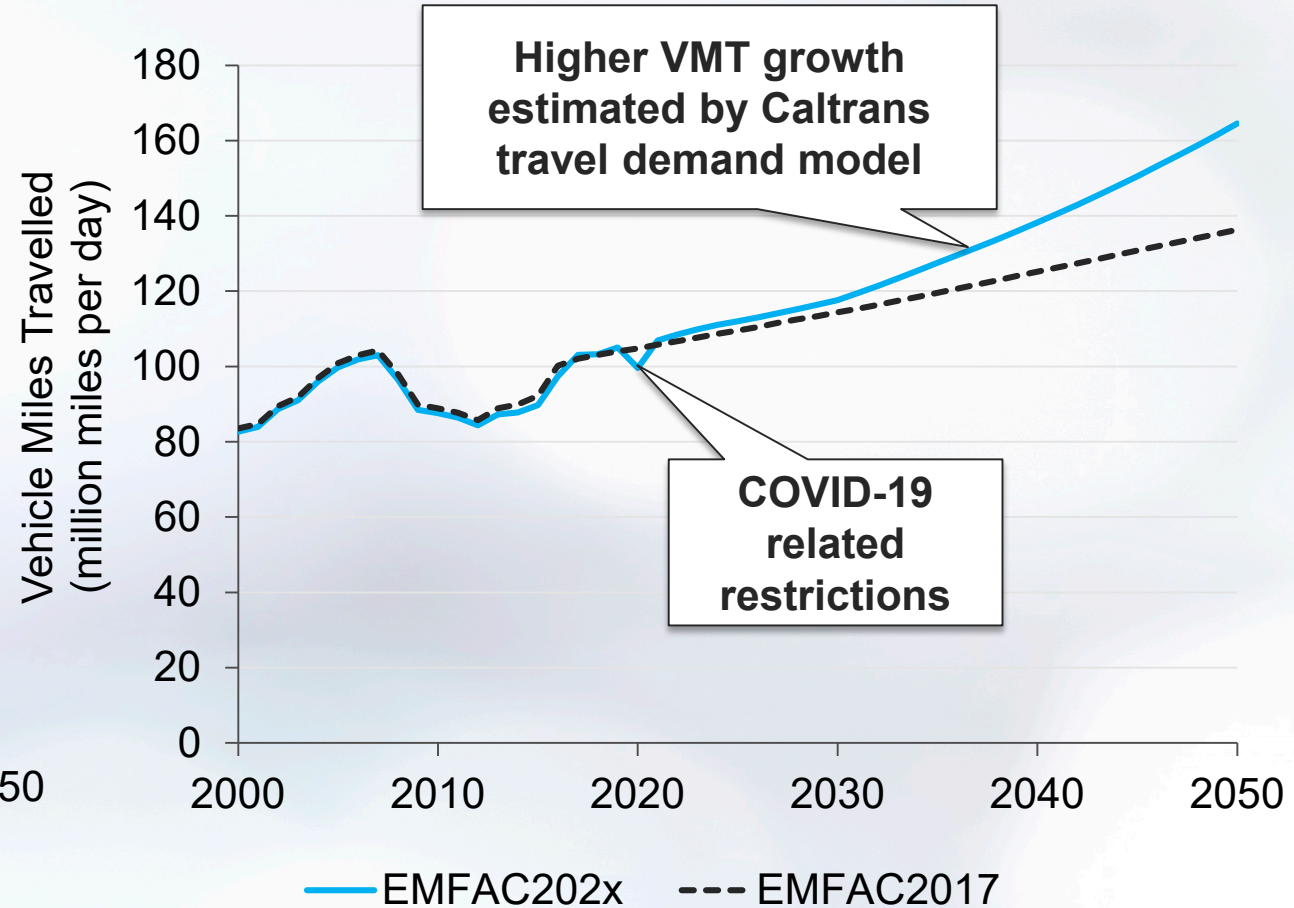
(The followings are preliminary results - subject to change)

VMT - Statewide

Light-Duty (GVWR ≤ 8,500 lbs)

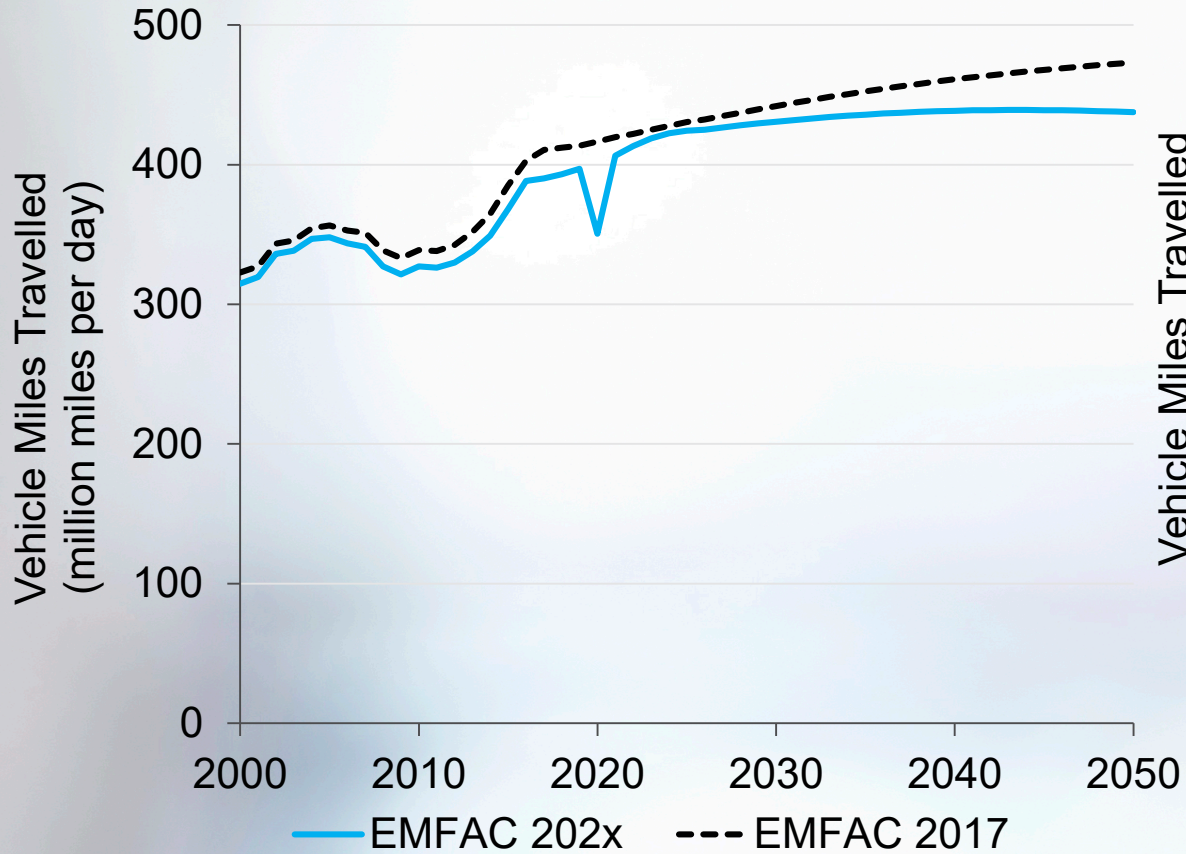


Medium and Heavy-Duty (GVWR > 8,500 lbs)

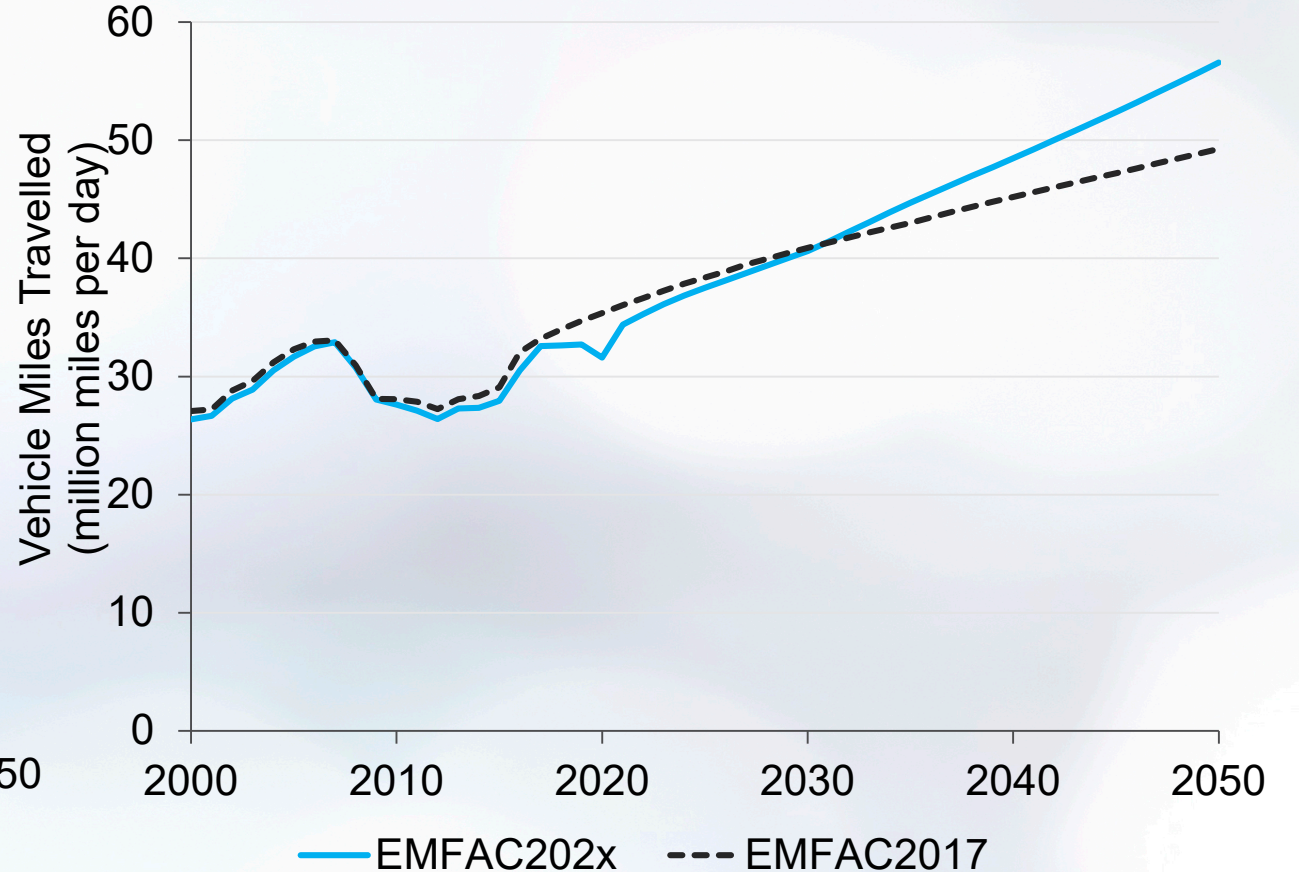


VMT – South Coast (SC)

Light-Duty (GVWR ≤ 8,500 lbs)

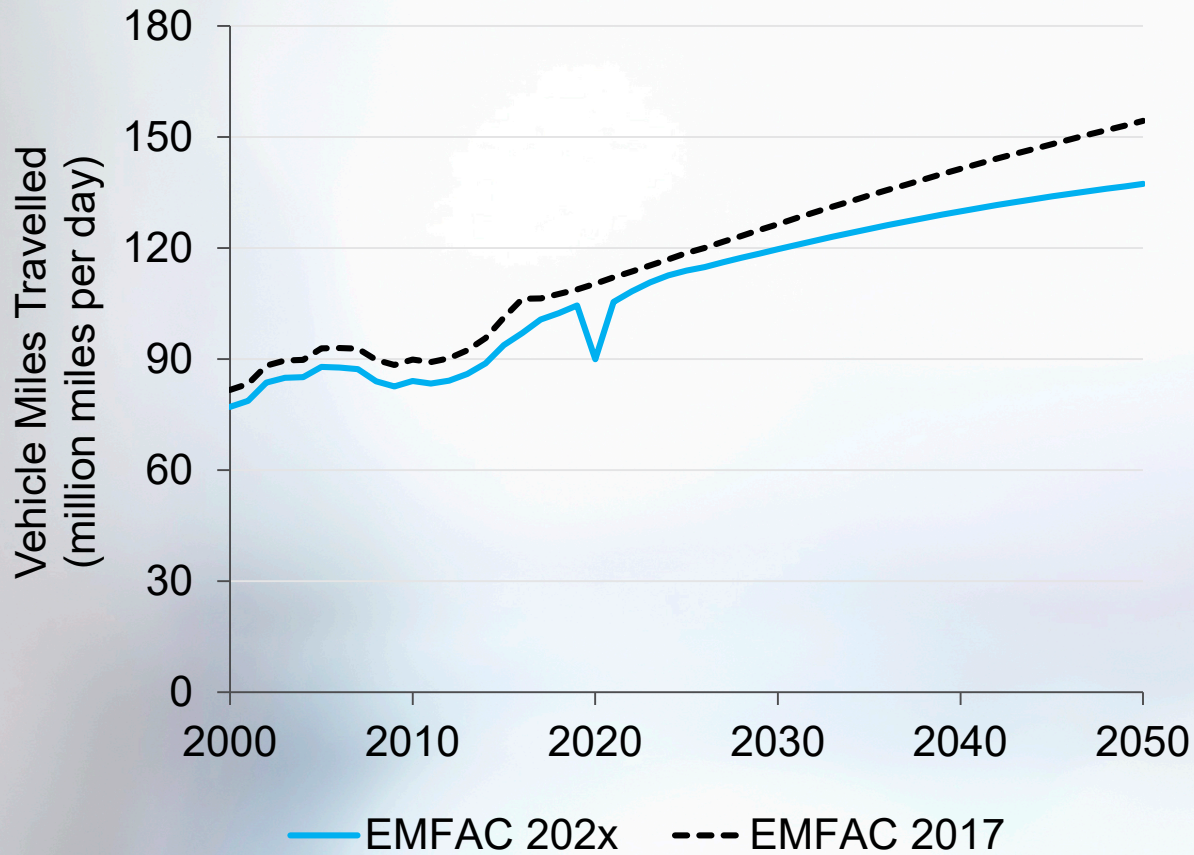


Medium and Heavy-Duty (GVWR > 8,500 lbs)

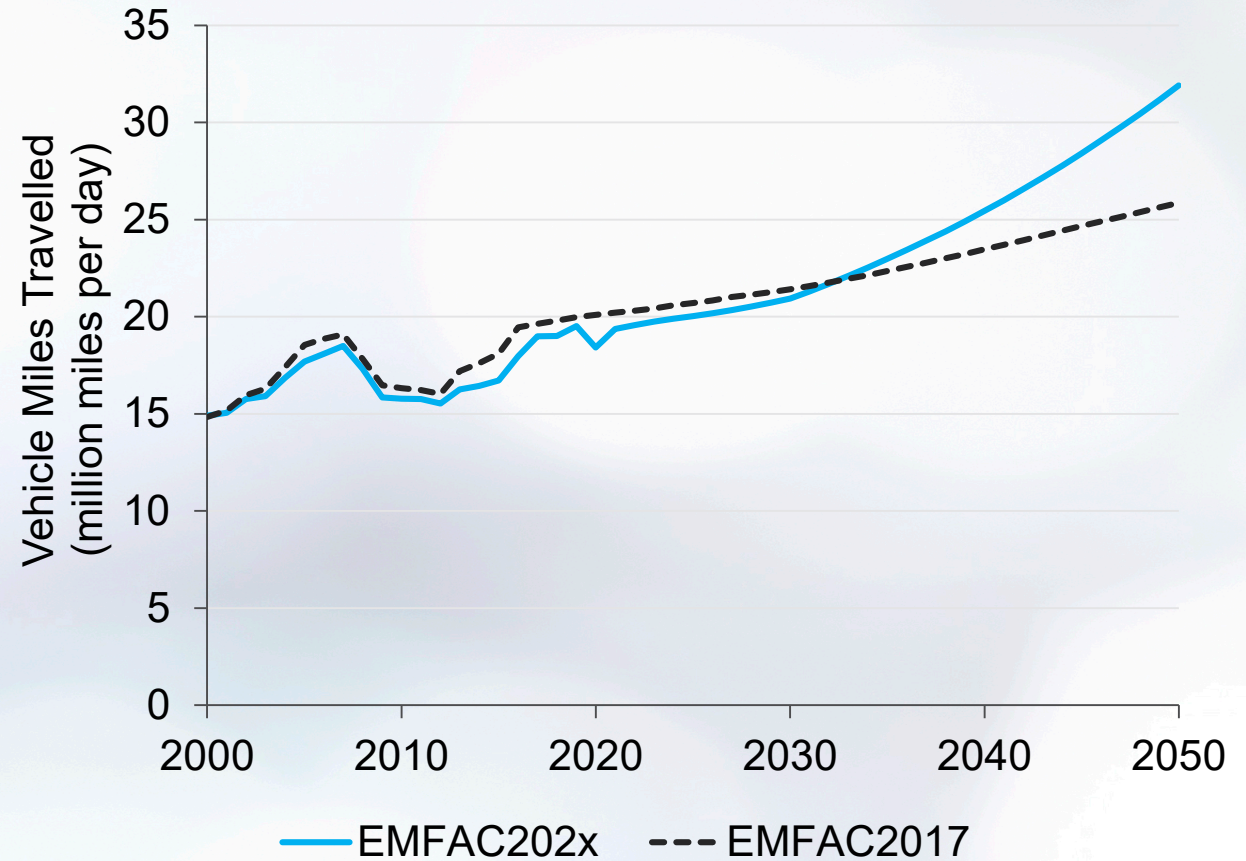


VMT – San Joaquin Valley (SJV)

Light-Duty (GVWR ≤ 8,500 lbs)

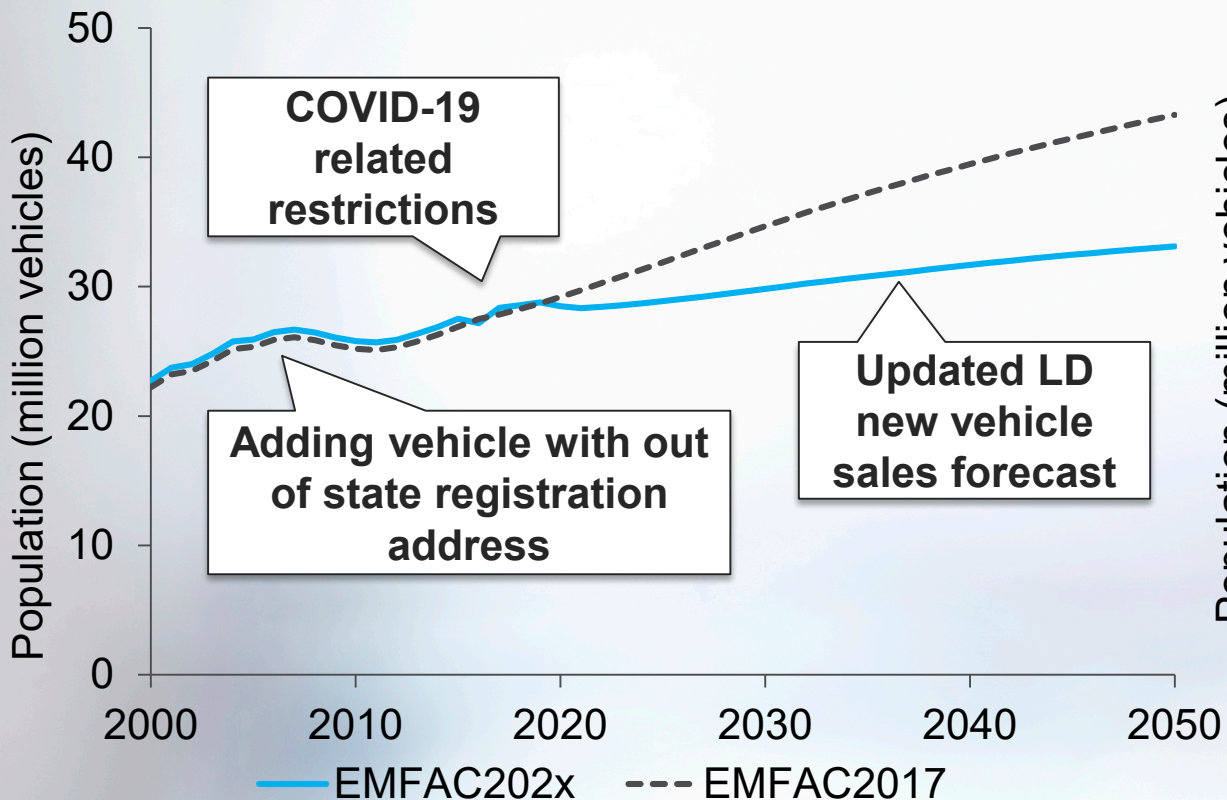


Medium and Heavy-Duty (GVWR > 8,500 lbs)

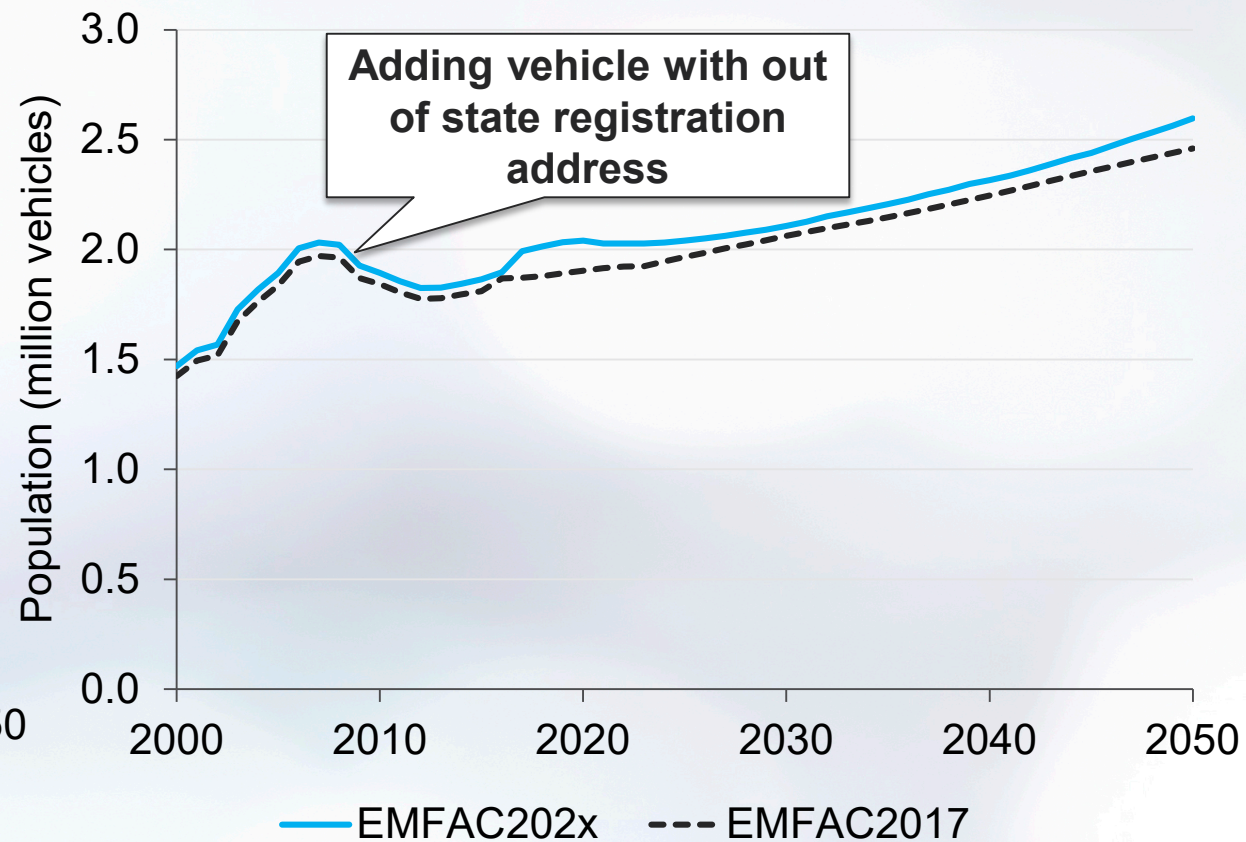


Population - Statewide

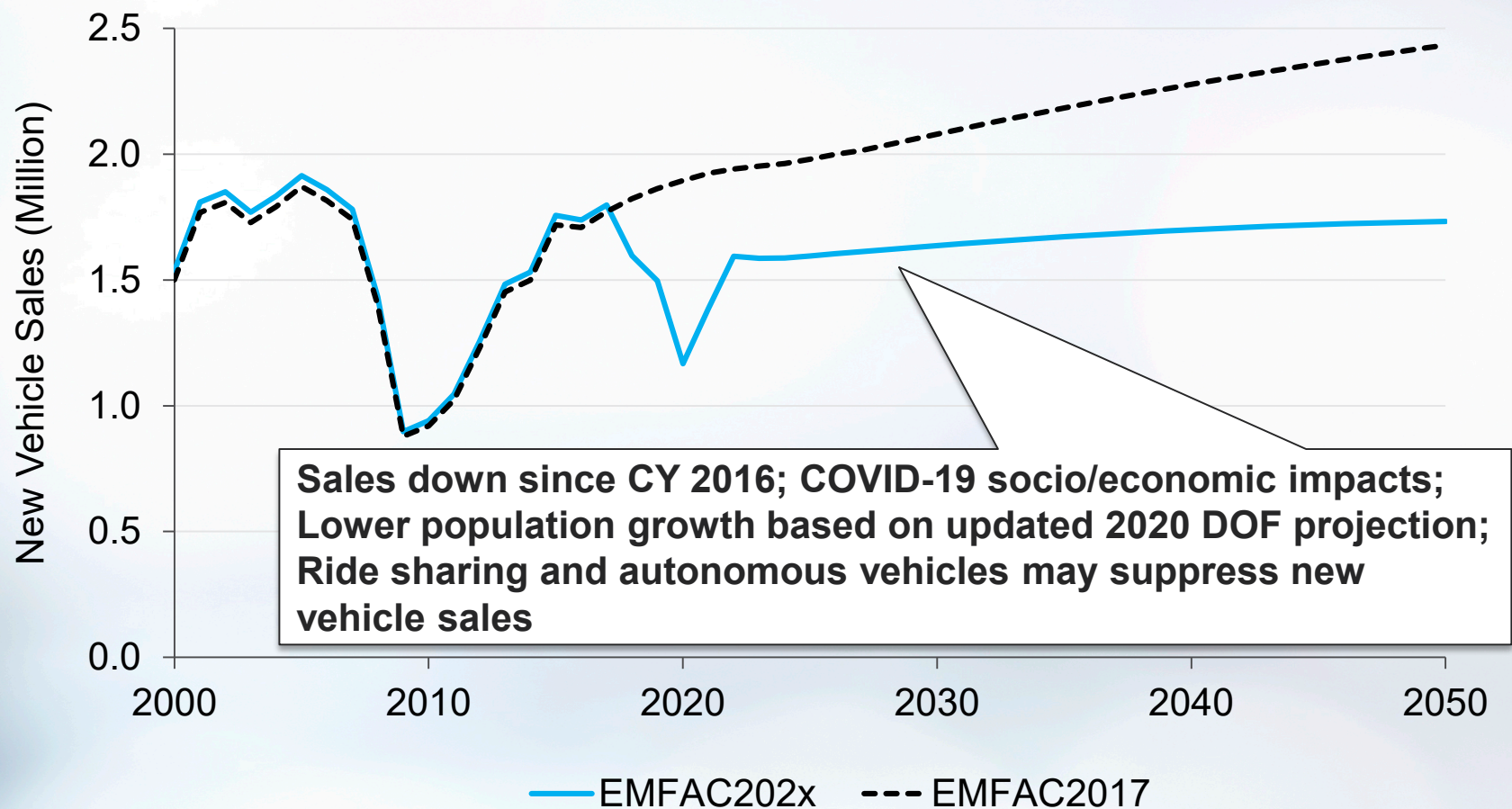
Light-Duty (GVWR ≤ 8,500 lbs)



Medium and Heavy-Duty (GVWR > 8,500 lbs)



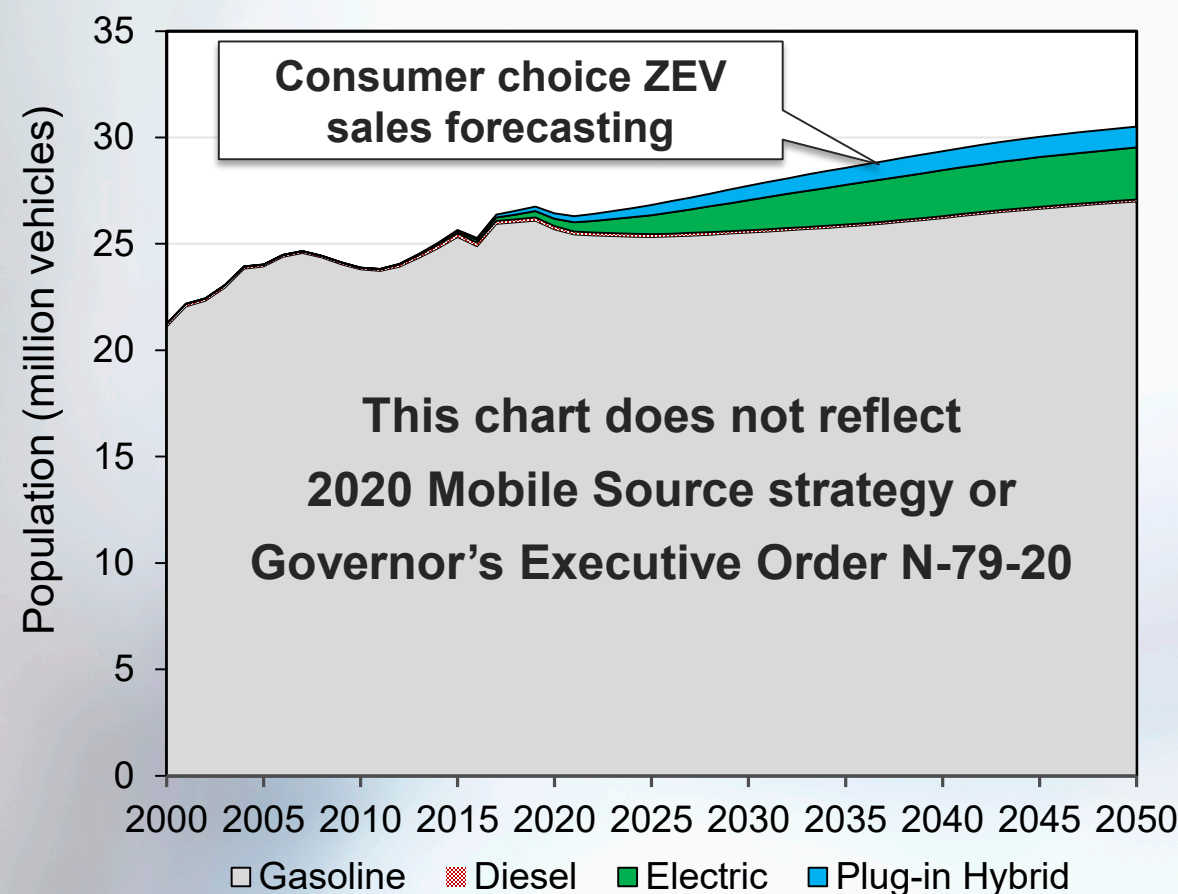
Light-Duty New Vehicle Sales



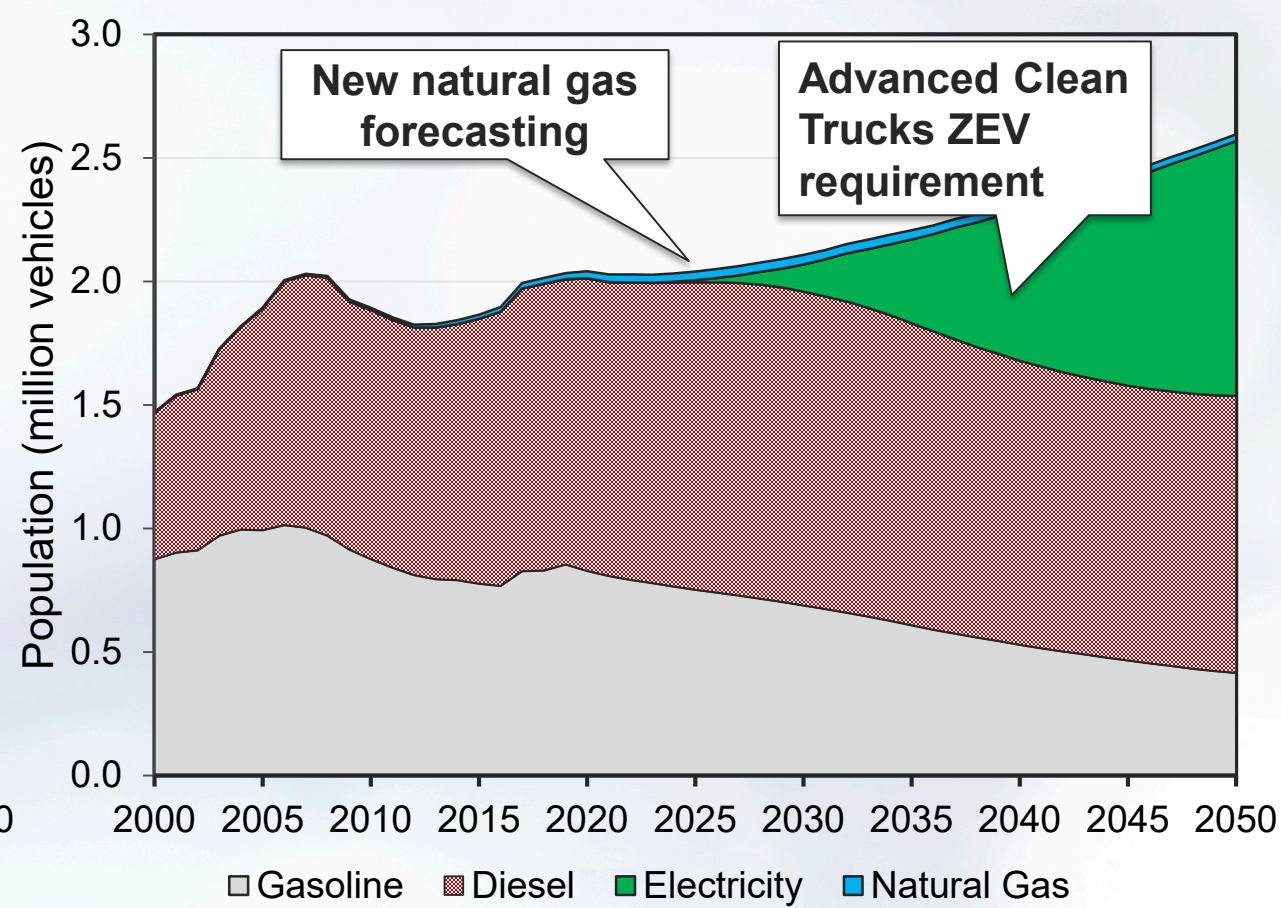
DOF: Department of Finance, California

Population Technology Mix - Statewide

Light-Duty (GVWR ≤ 8,500 lbs)

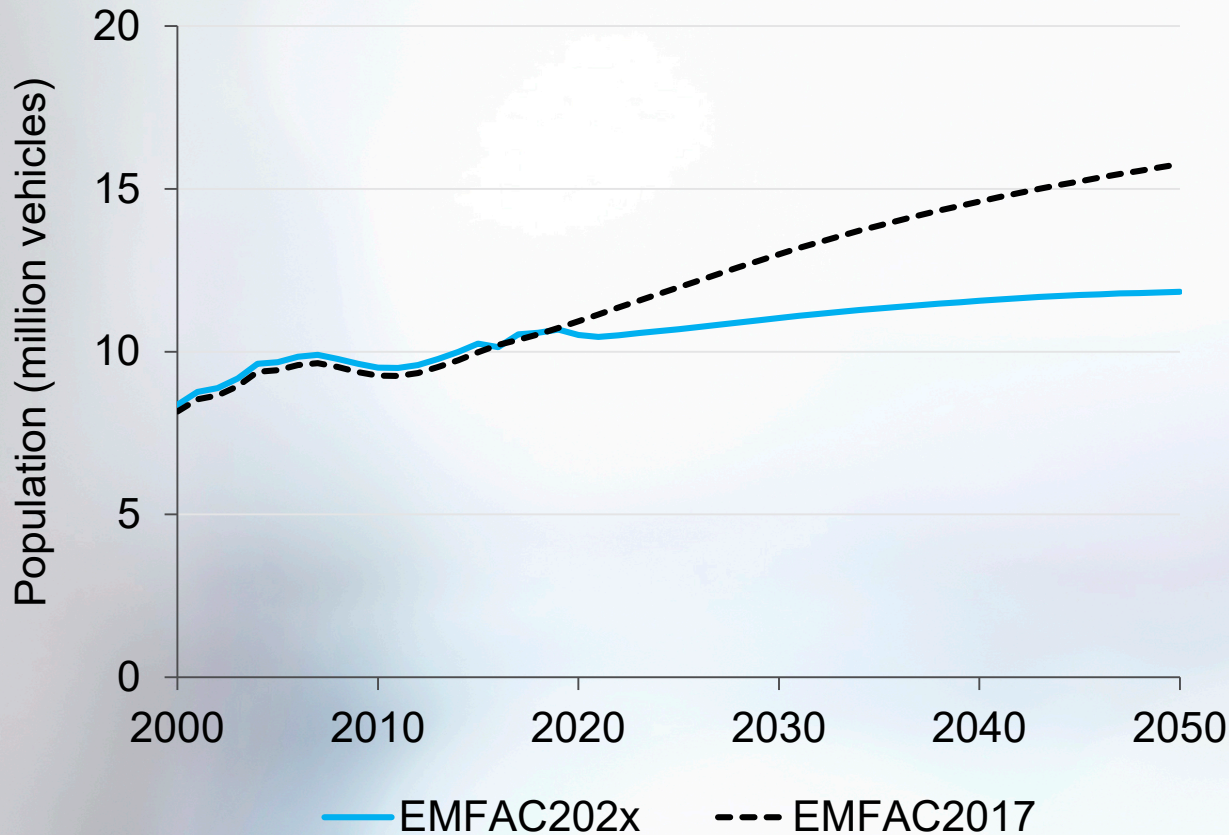


Medium and Heavy-Duty (GVWR > 8,500 lbs)

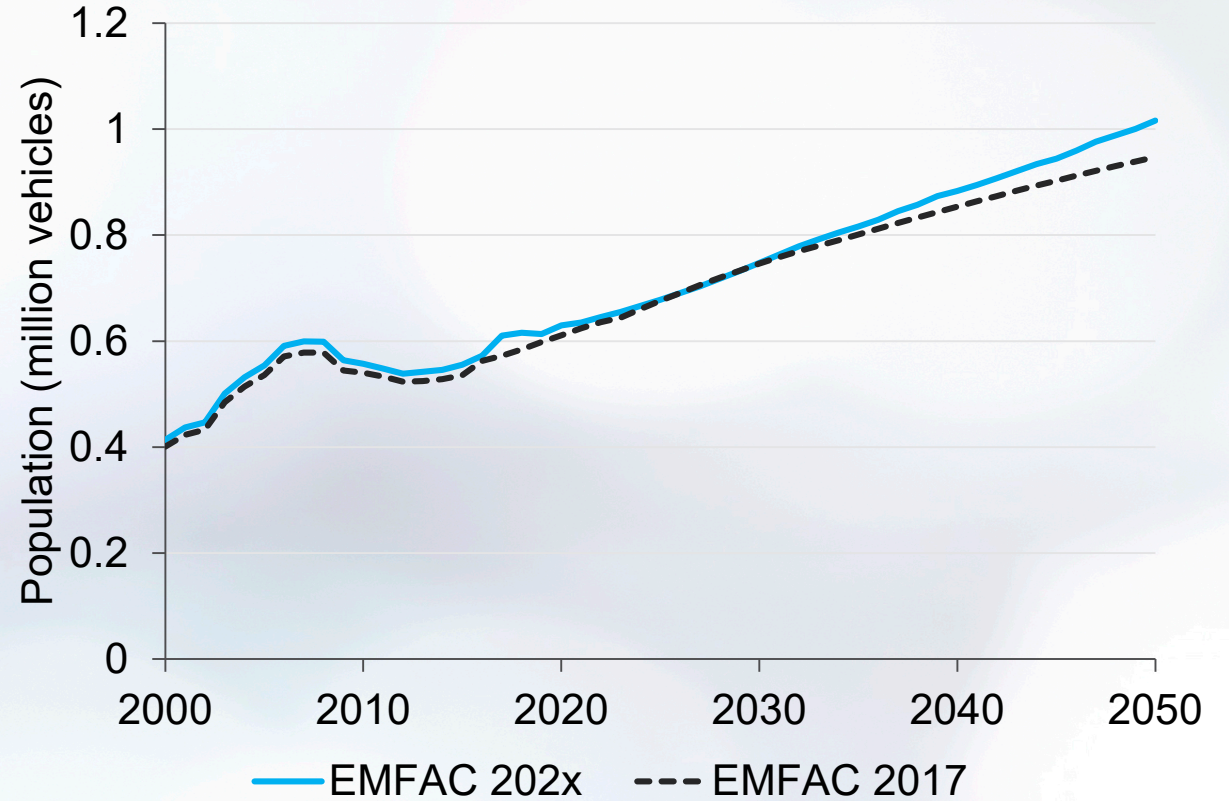


Population – SC

Light-Duty (GVWR ≤ 8,500 lbs)

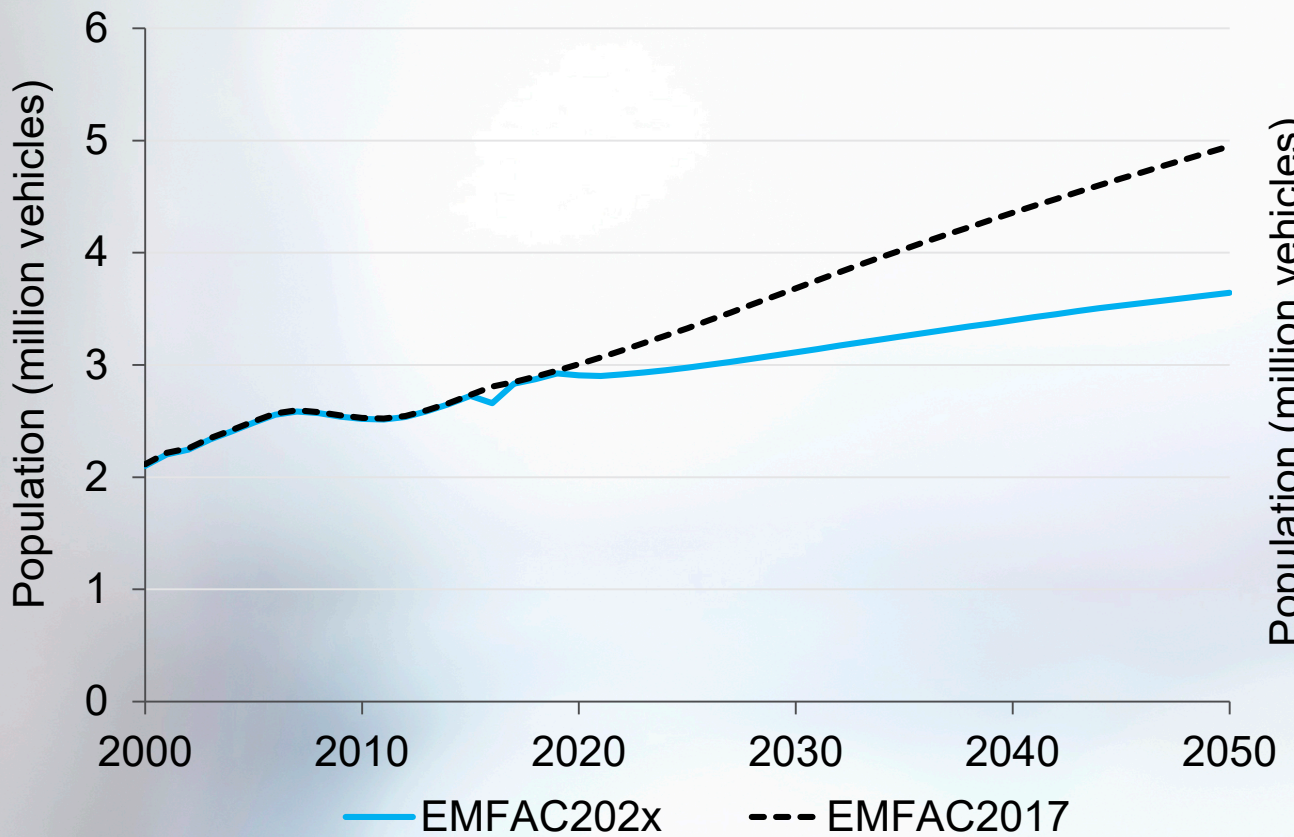


Medium and Heavy-Duty (GVWR > 8,500 lbs)

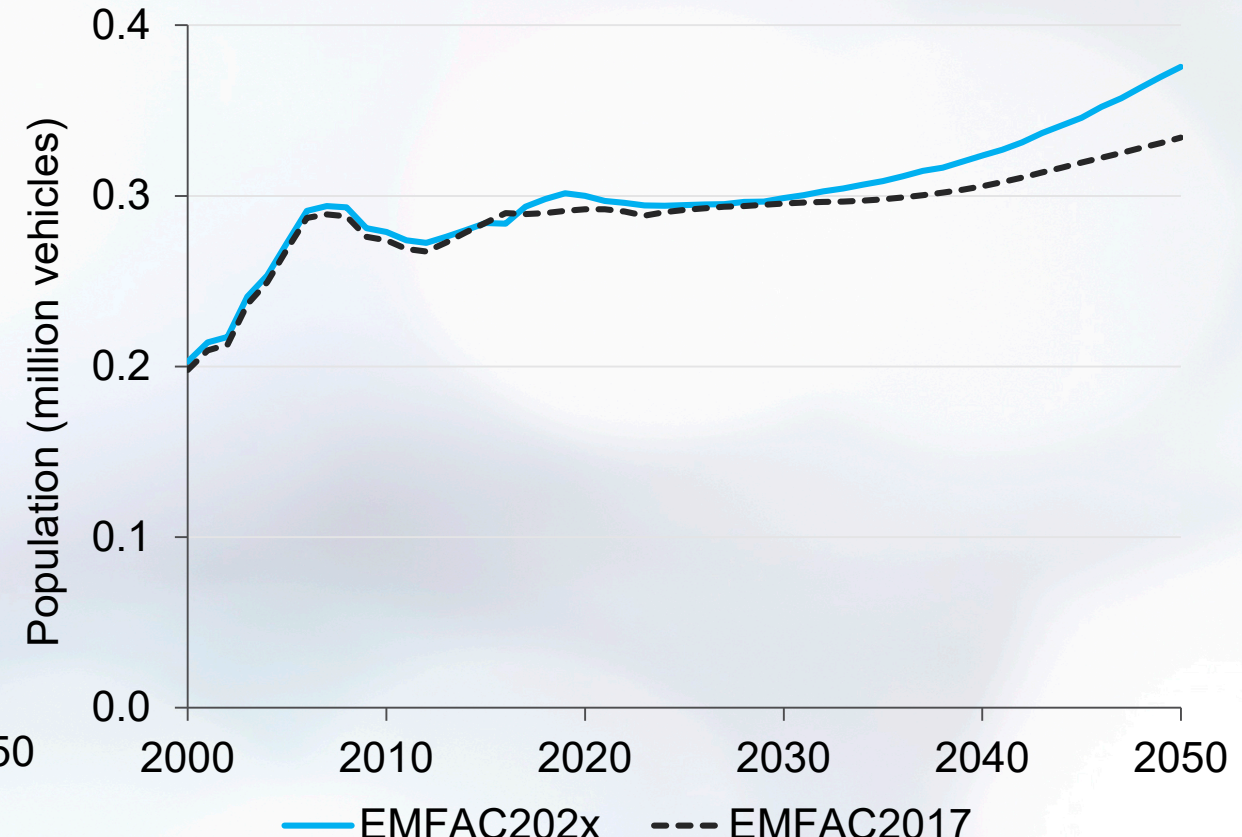


Population – SJV

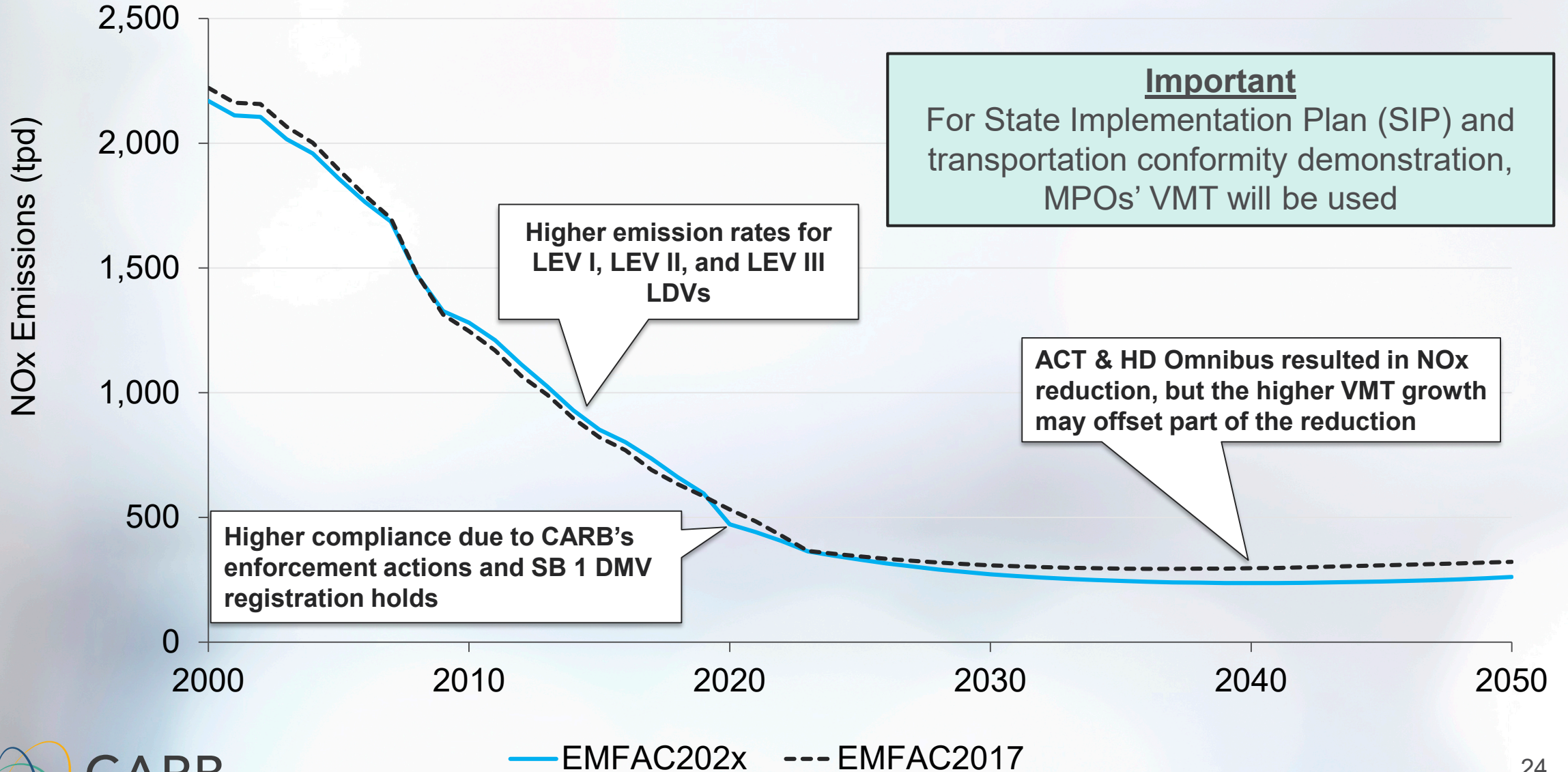
Light-Duty (GVWR ≤ 8,500 lbs)



Medium and Heavy-Duty (GVWR > 8,500 lbs)

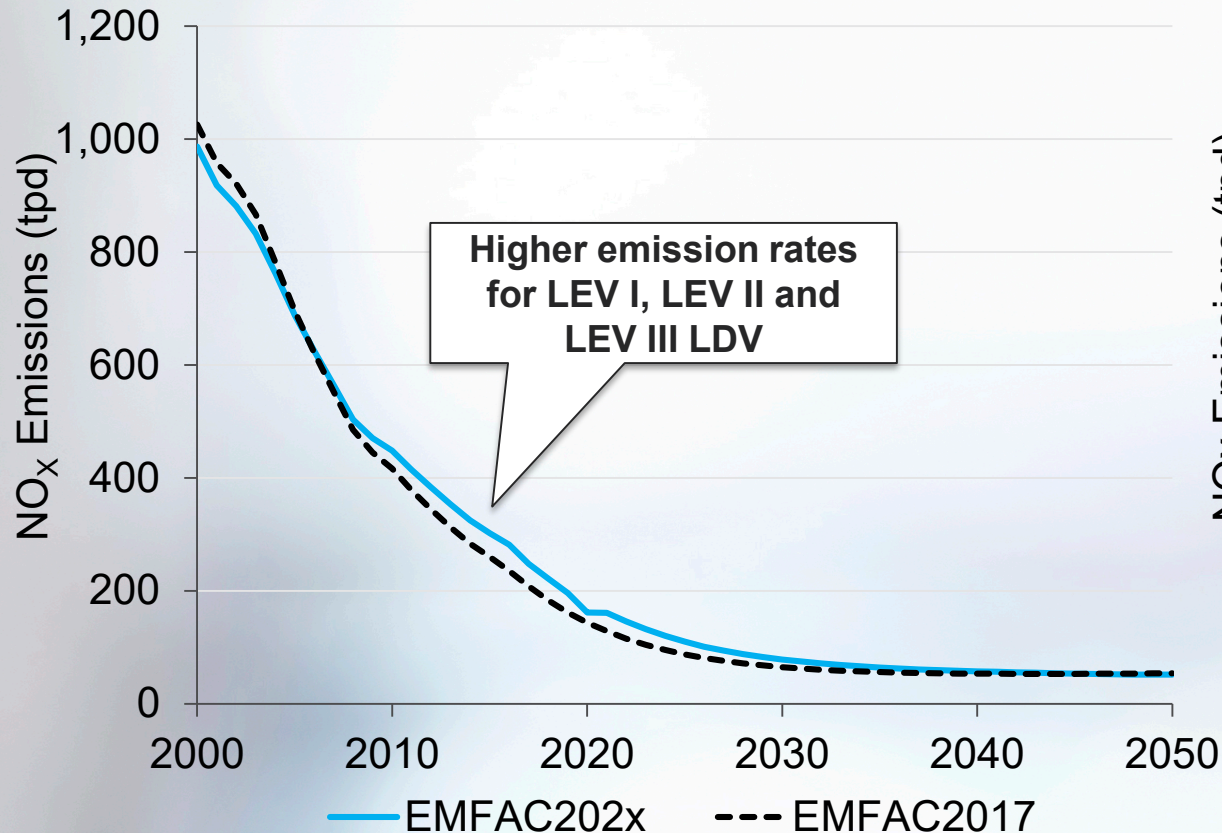


NOx Emissions – Statewide

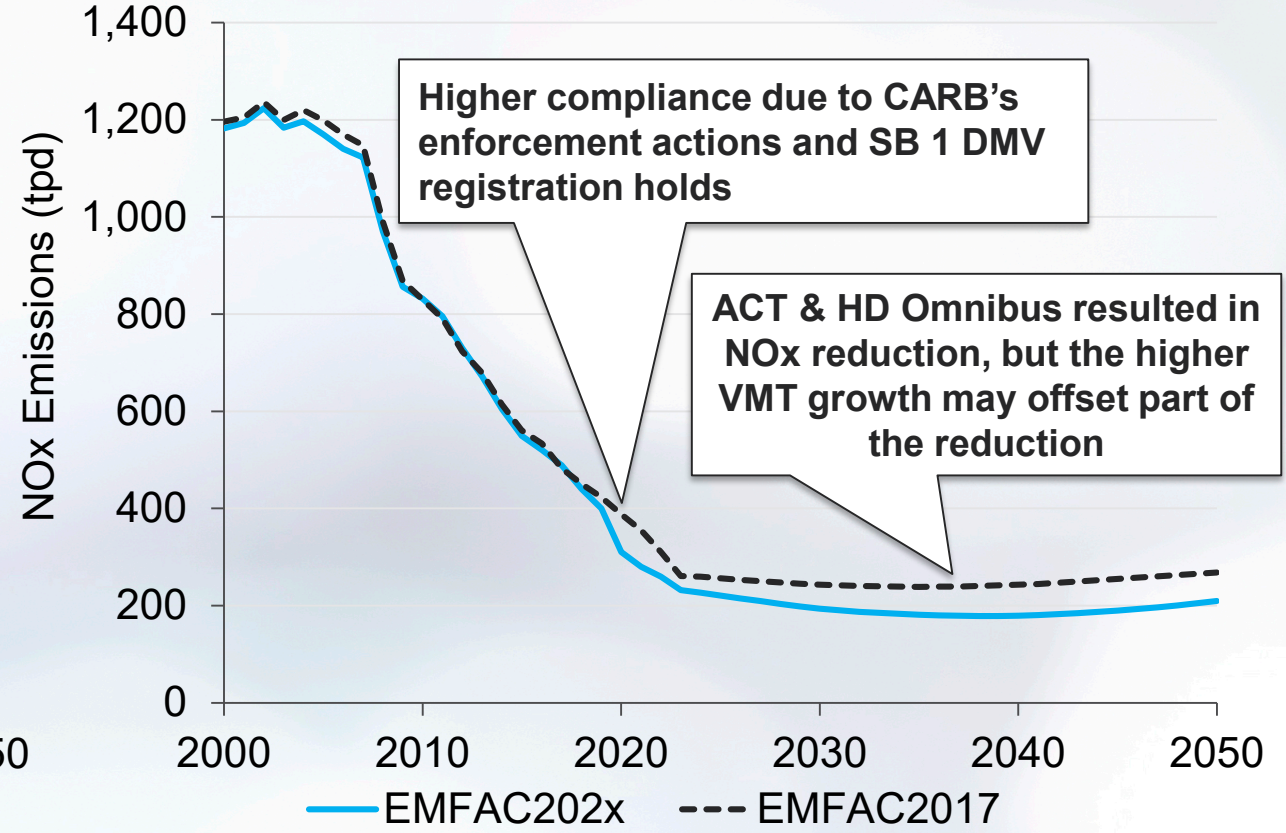


NOx Emissions – Statewide

Light-Duty (GVWR ≤ 8,500 lbs)

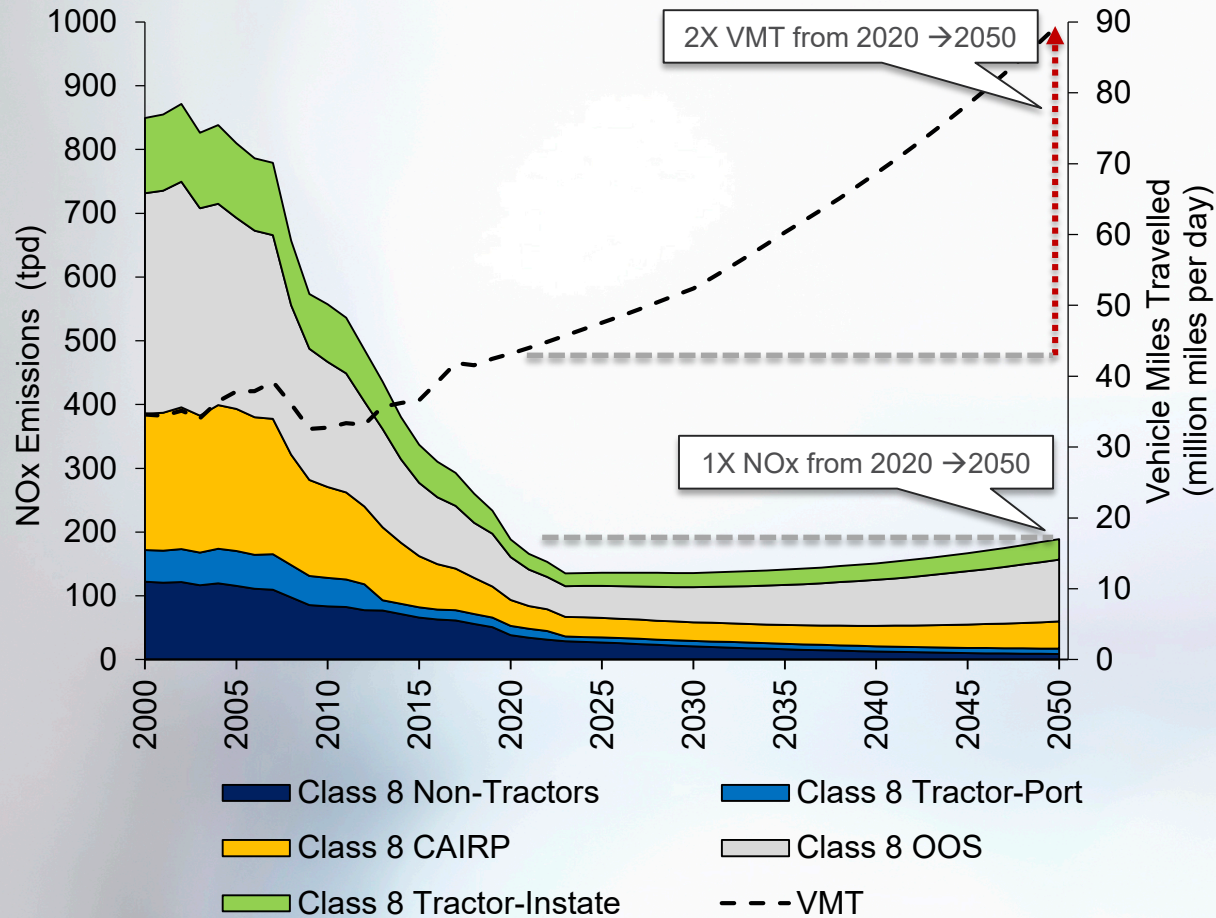


Medium and Heavy-Duty (GVWR > 8,500 lbs)

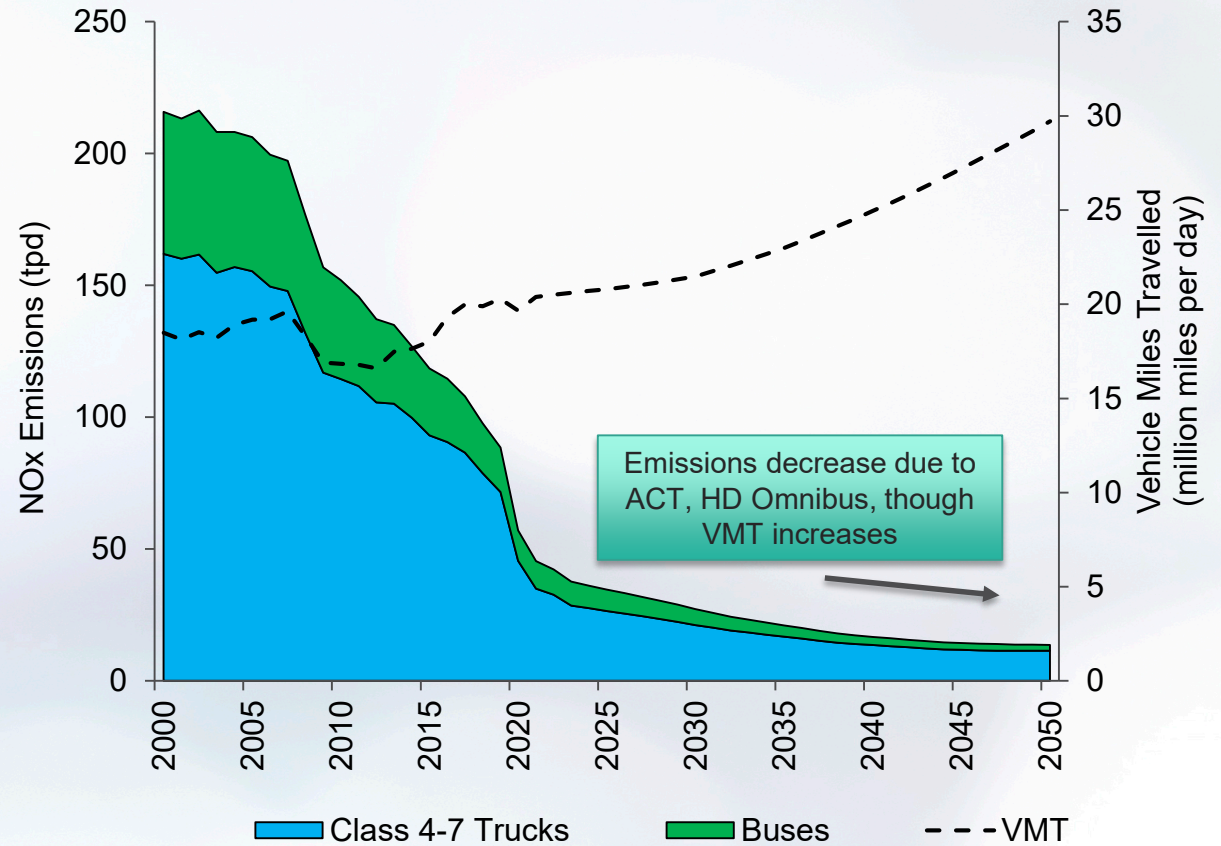


HD Statewide NOx Emissions

Class 8 Trucks

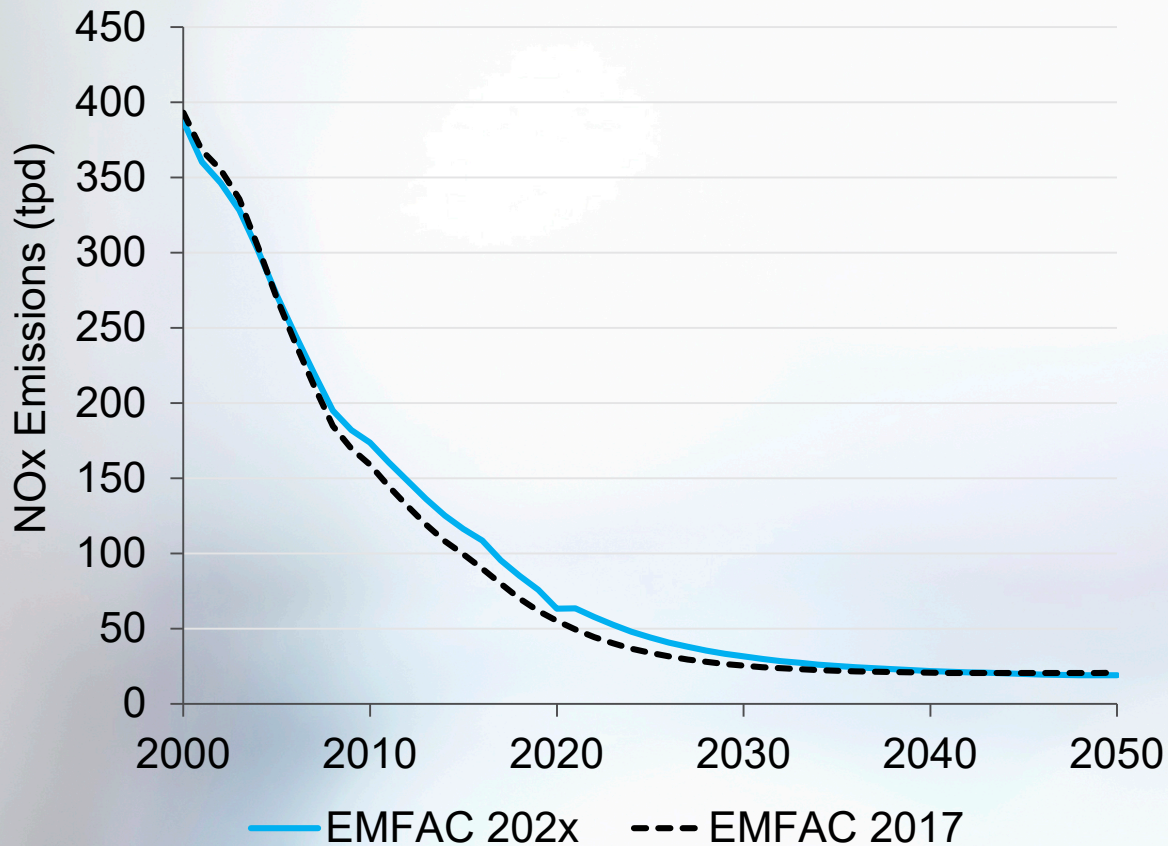


Class 4-7 Trucks and Buses

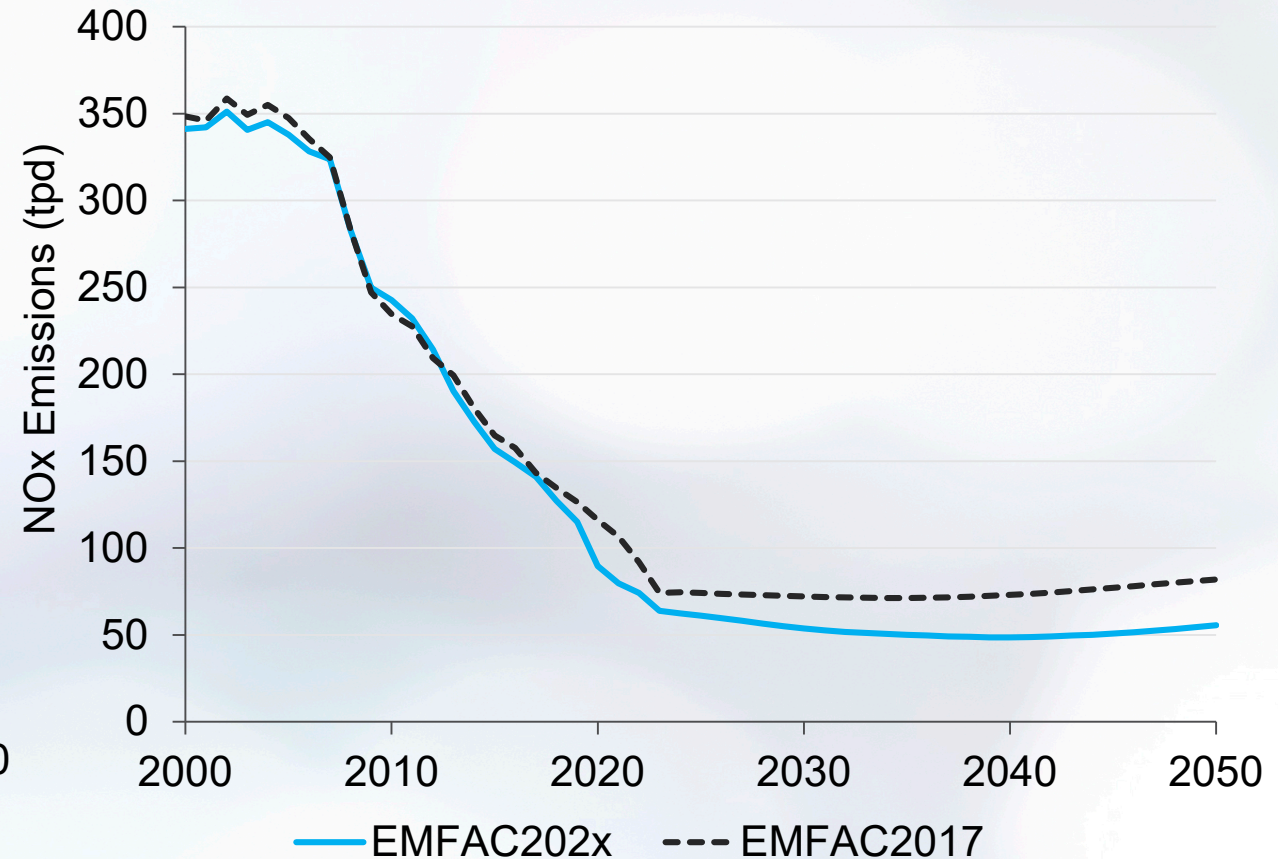


NOx Emissions – SC

Light-Duty (GVWR ≤ 8,500 lbs)

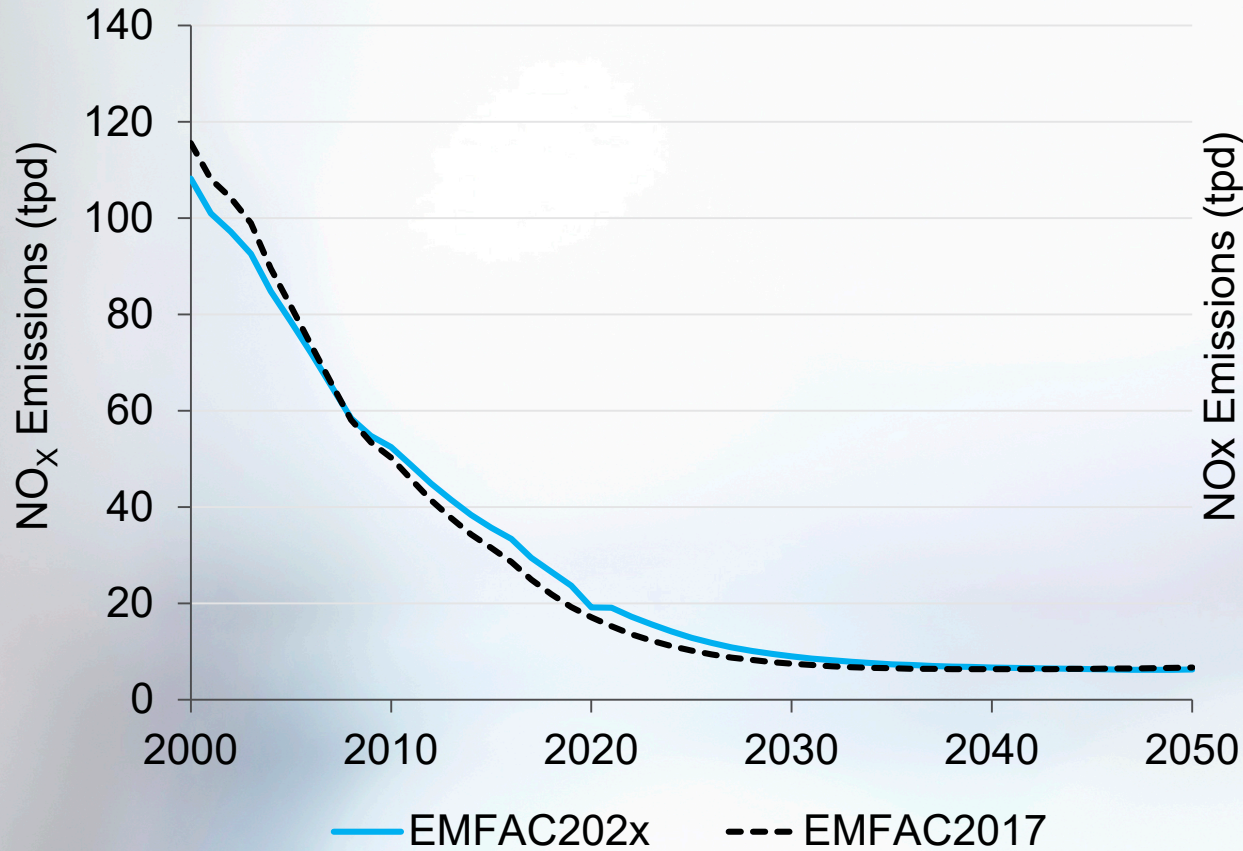


Medium and Heavy-Duty (GVWR > 8,500 lbs)

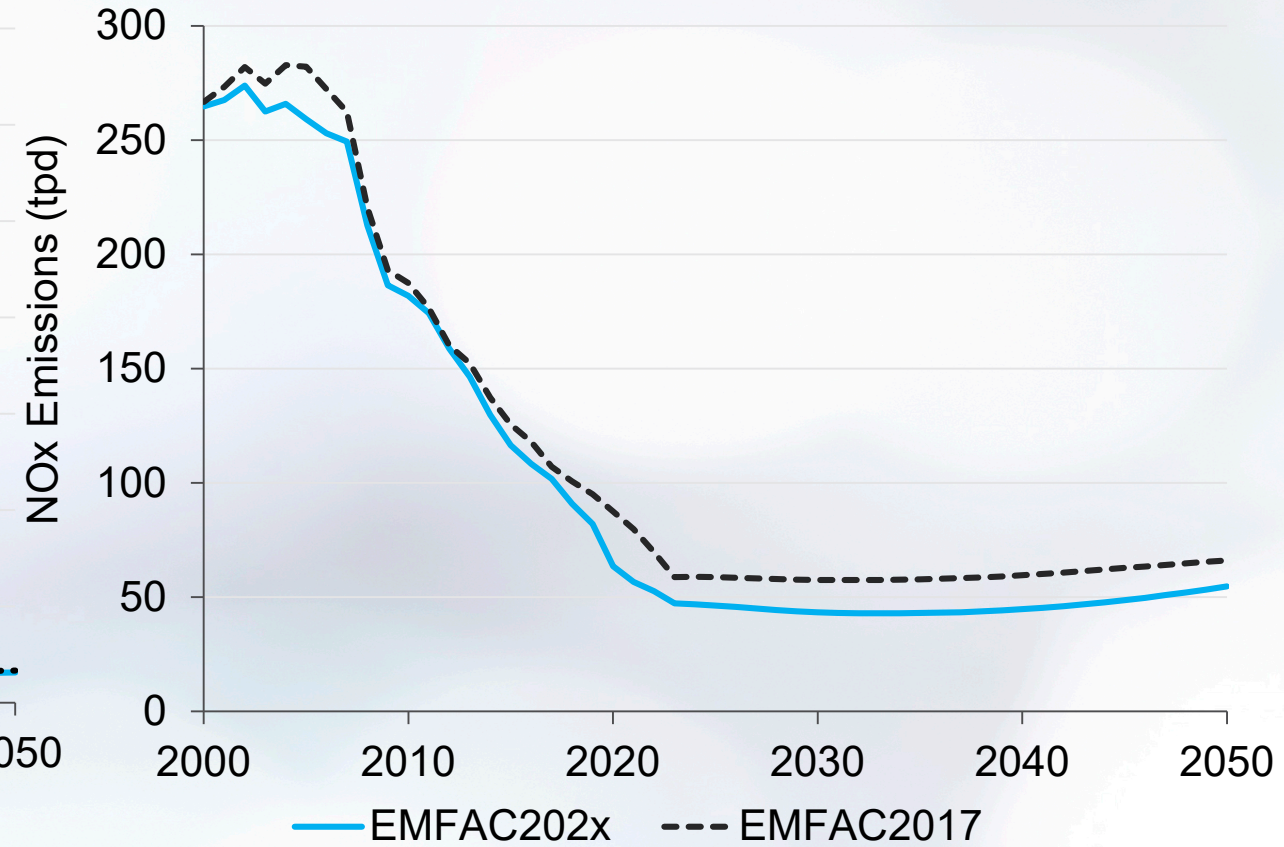


NOx Emissions – SJV

Light-Duty (GVWR ≤ 8,500 lbs)

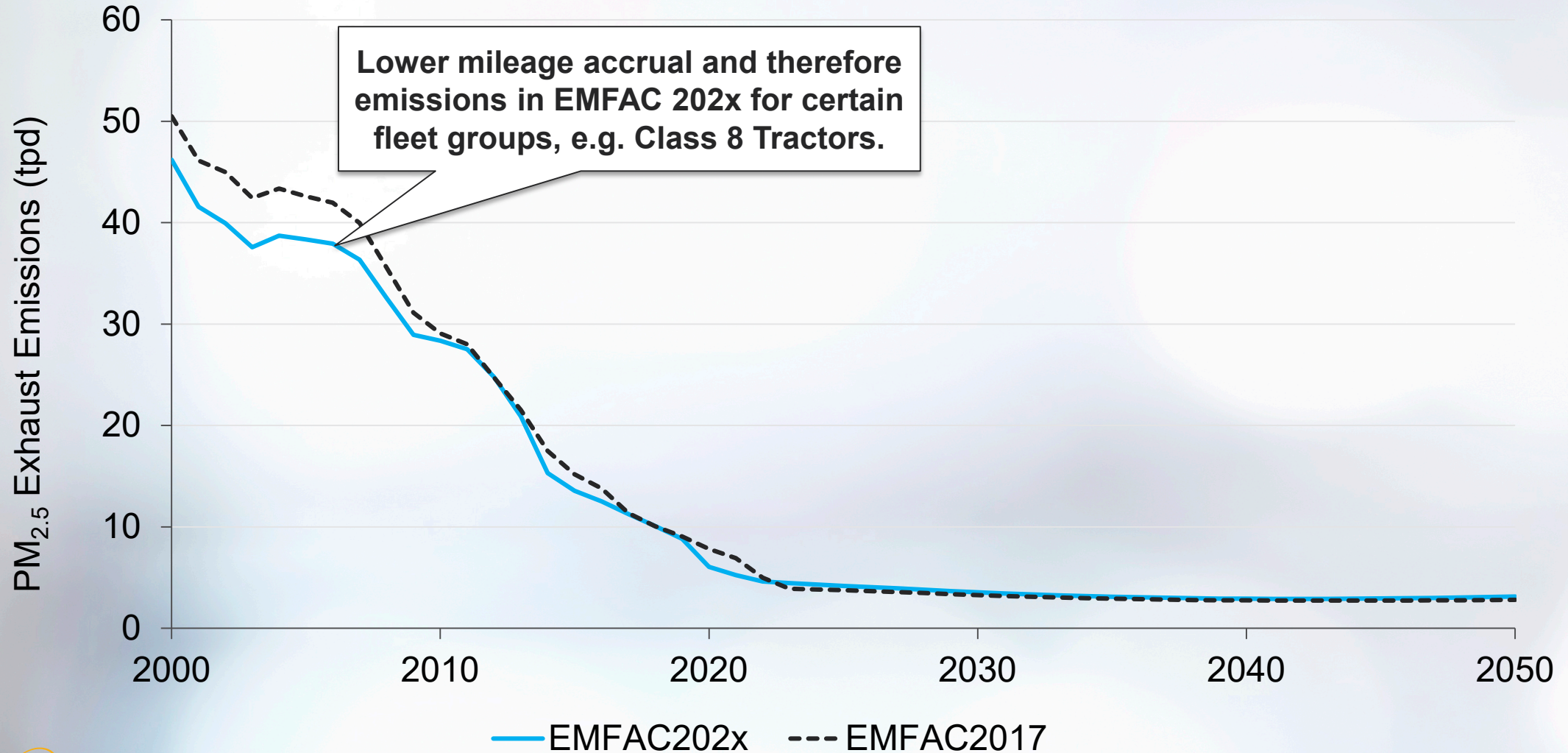


Medium and Heavy-Duty (GVWR > 8,500 lbs)



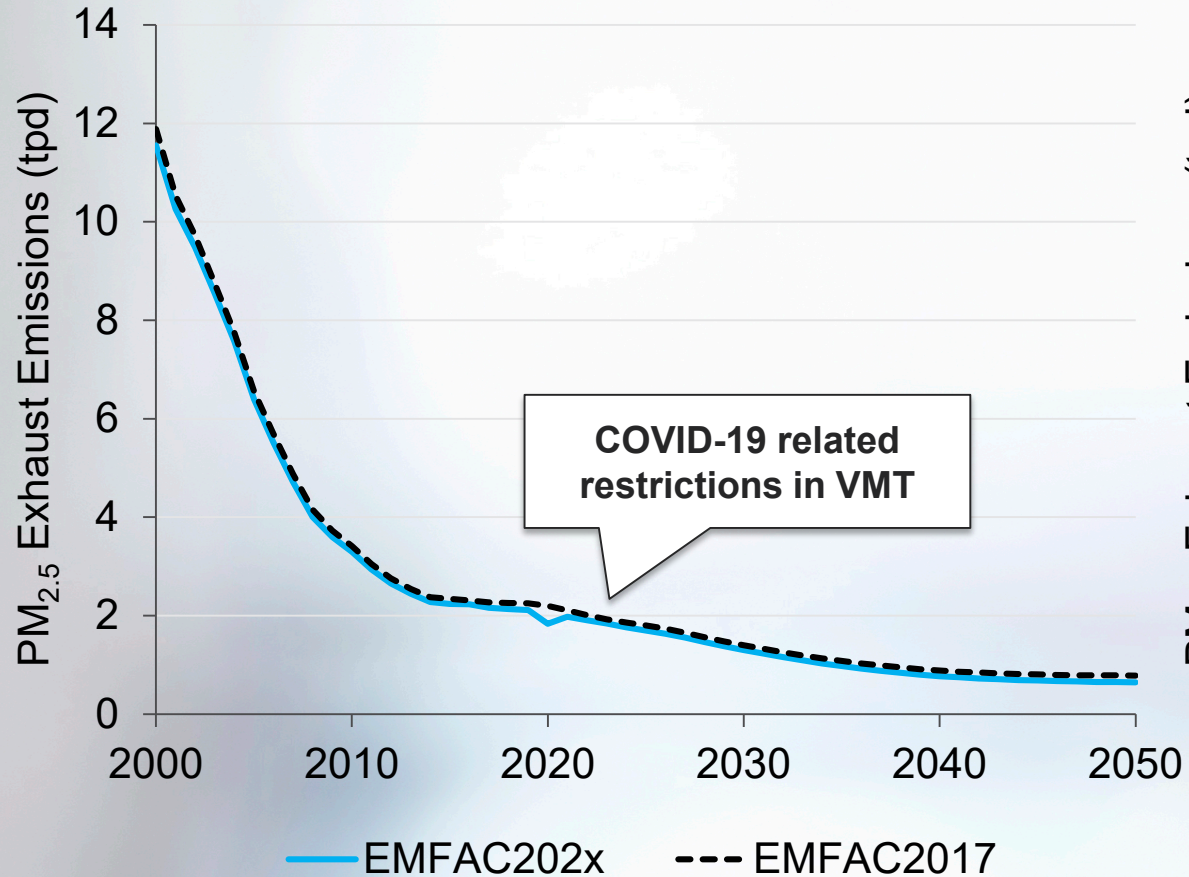
Exhaust PM_{2.5} Emissions – Statewide

Excludes Tire and Brake Wear

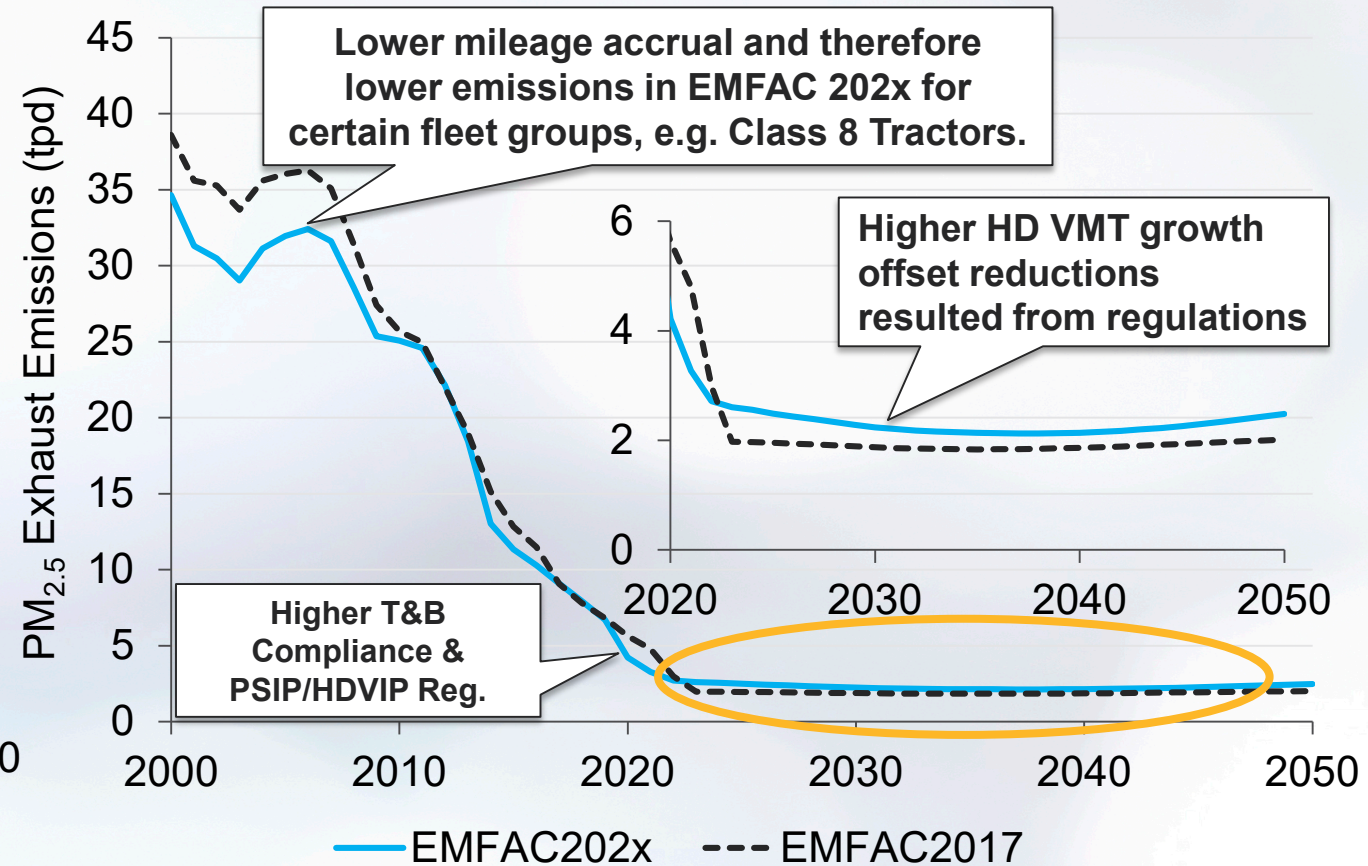


Exhaust PM_{2.5} Emissions – Statewide

Light-Duty (GVWR ≤ 8,500 lbs)

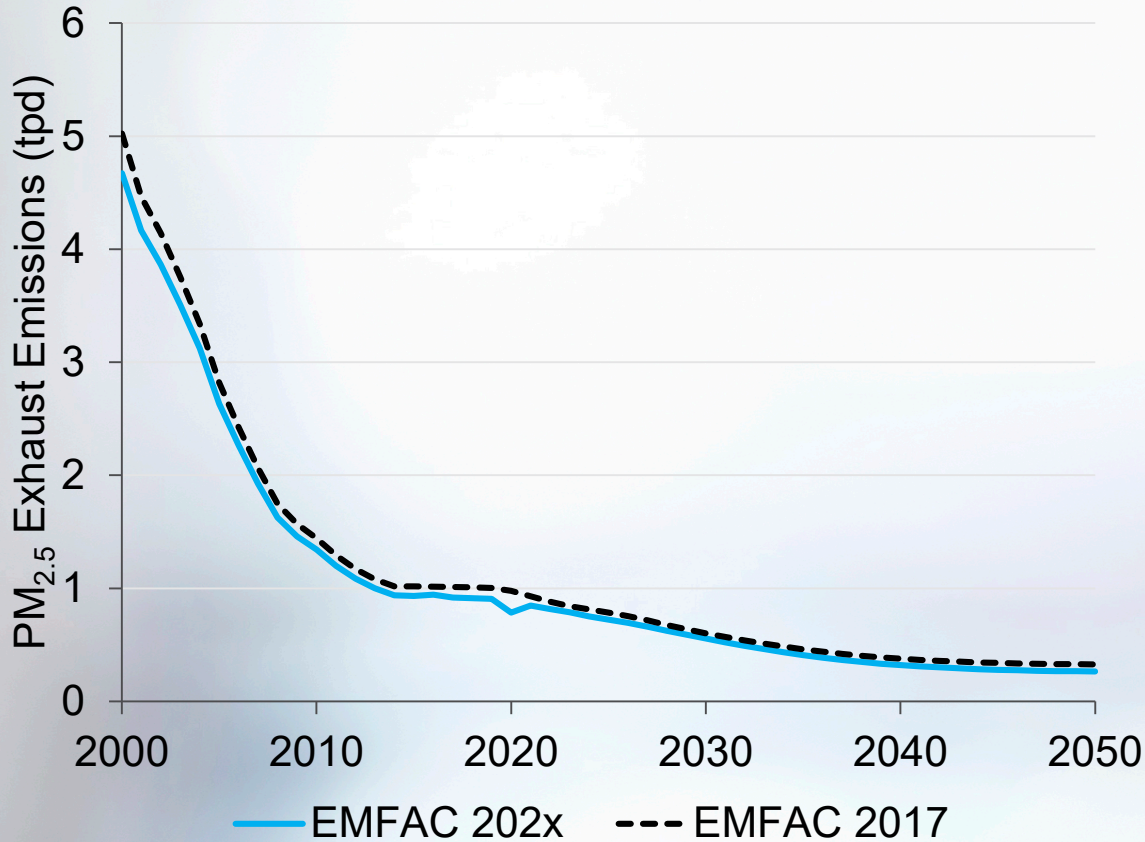


Medium and Heavy-Duty (GVWR > 8,500 lbs)

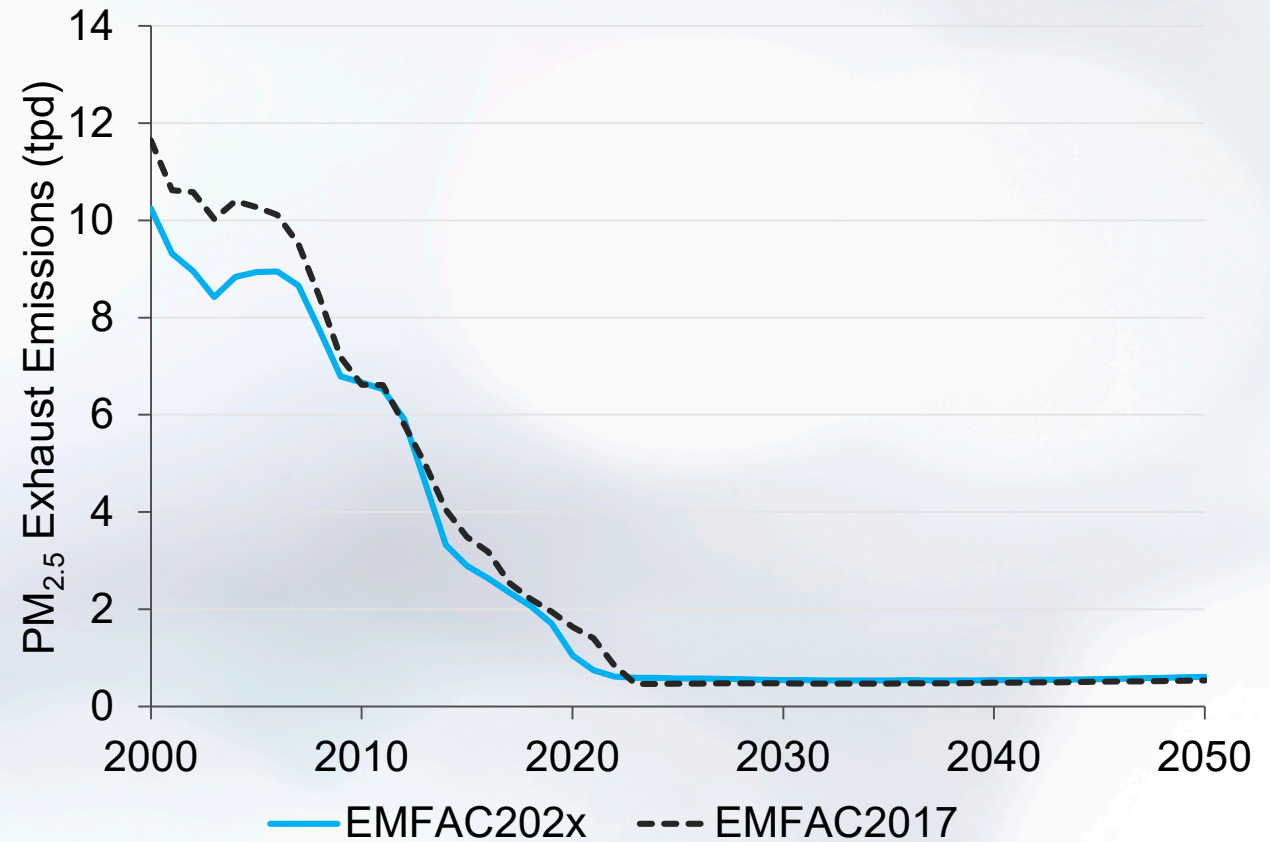


Exhaust PM_{2.5} Emissions – SC

Light-Duty (GVWR ≤ 8,500 lbs)

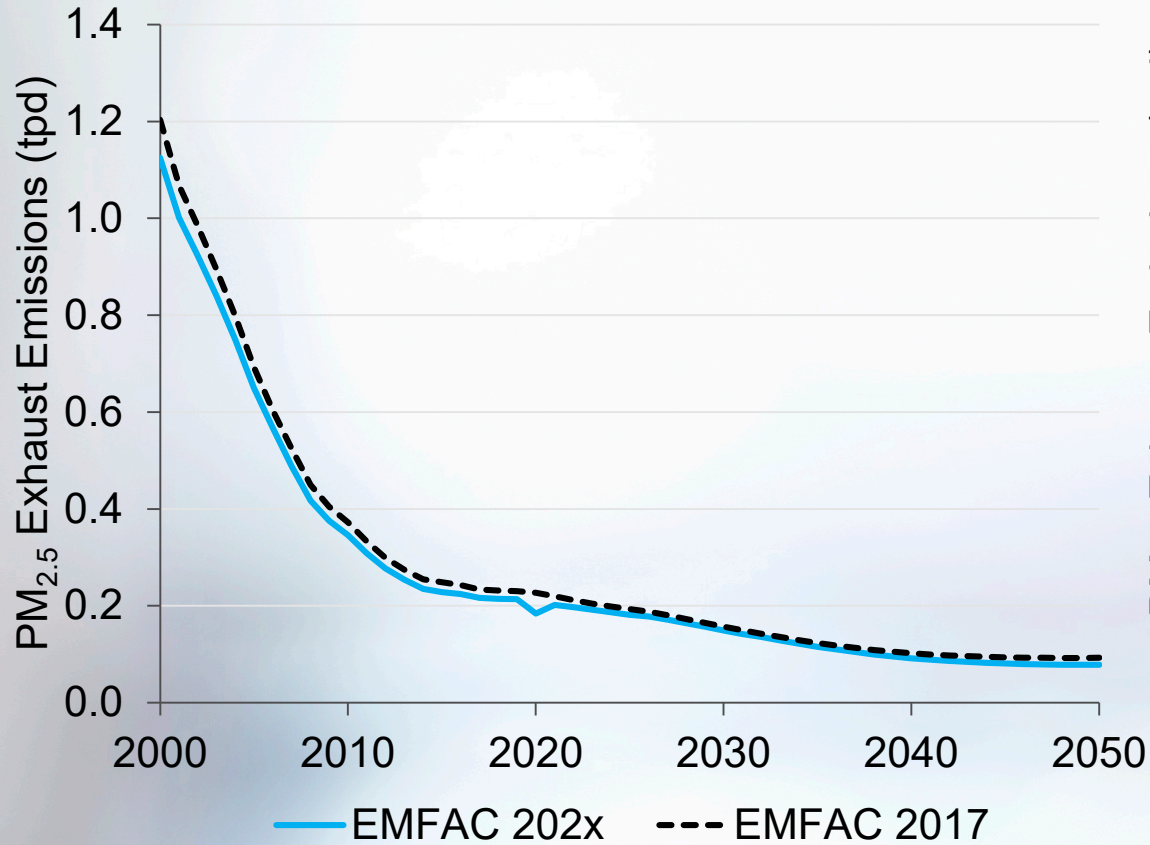


Medium and Heavy-Duty (GVWR > 8,500 lbs)

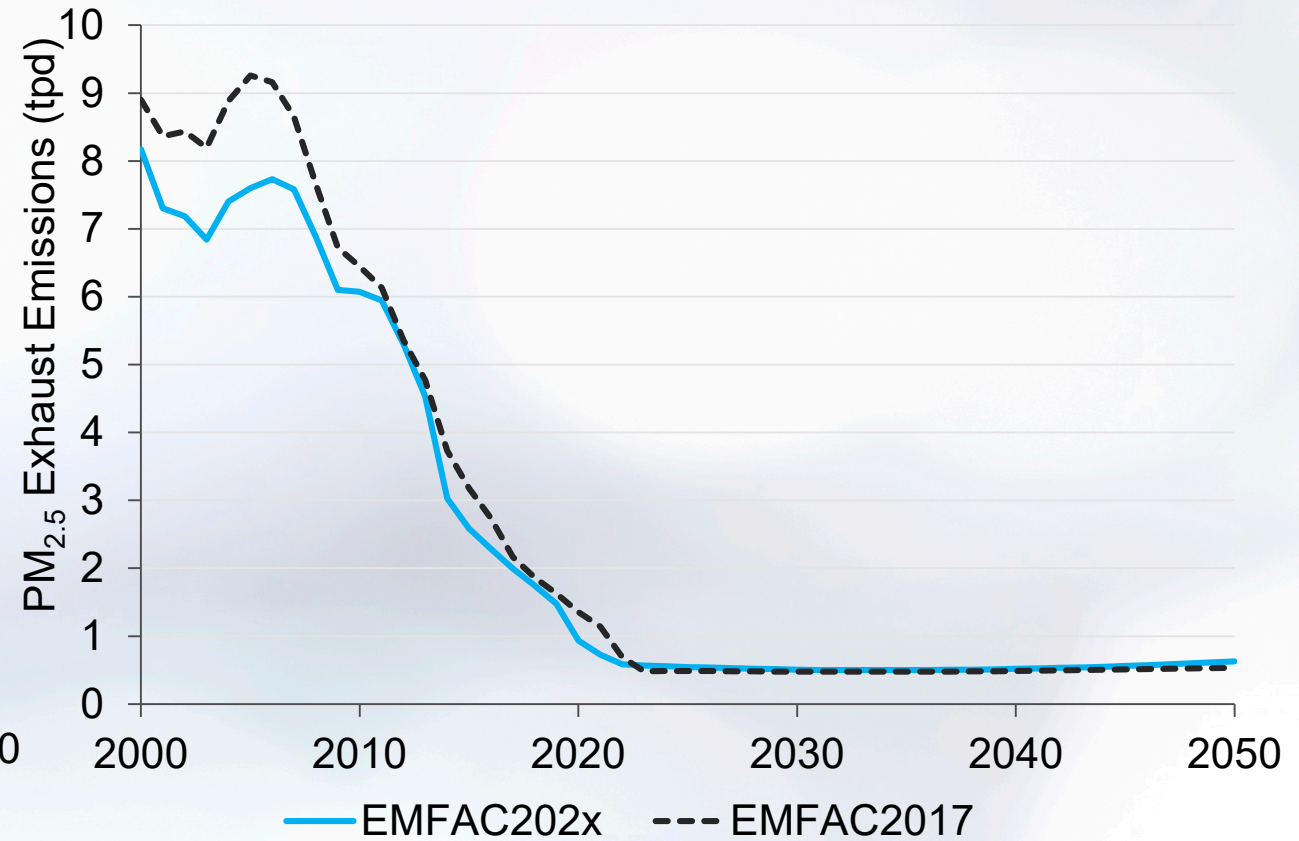


Exhaust PM_{2.5} Emissions – SJV

Light-Duty (GVWR ≤ 8,500 lbs)



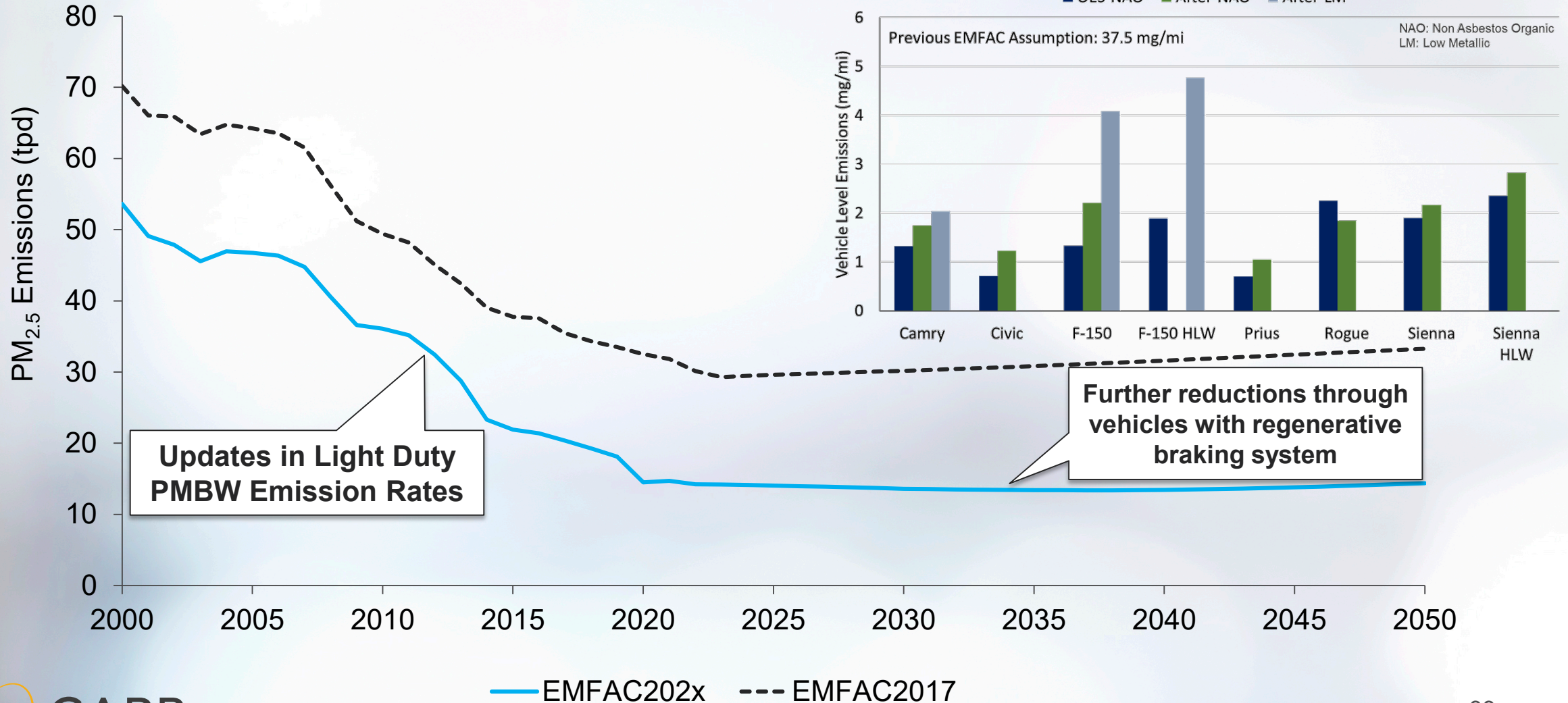
Medium and Heavy-Duty (GVWR > 8,500 lbs)



PM_{2.5} Emissions – Statewide

Includes Tire and Brake Wear

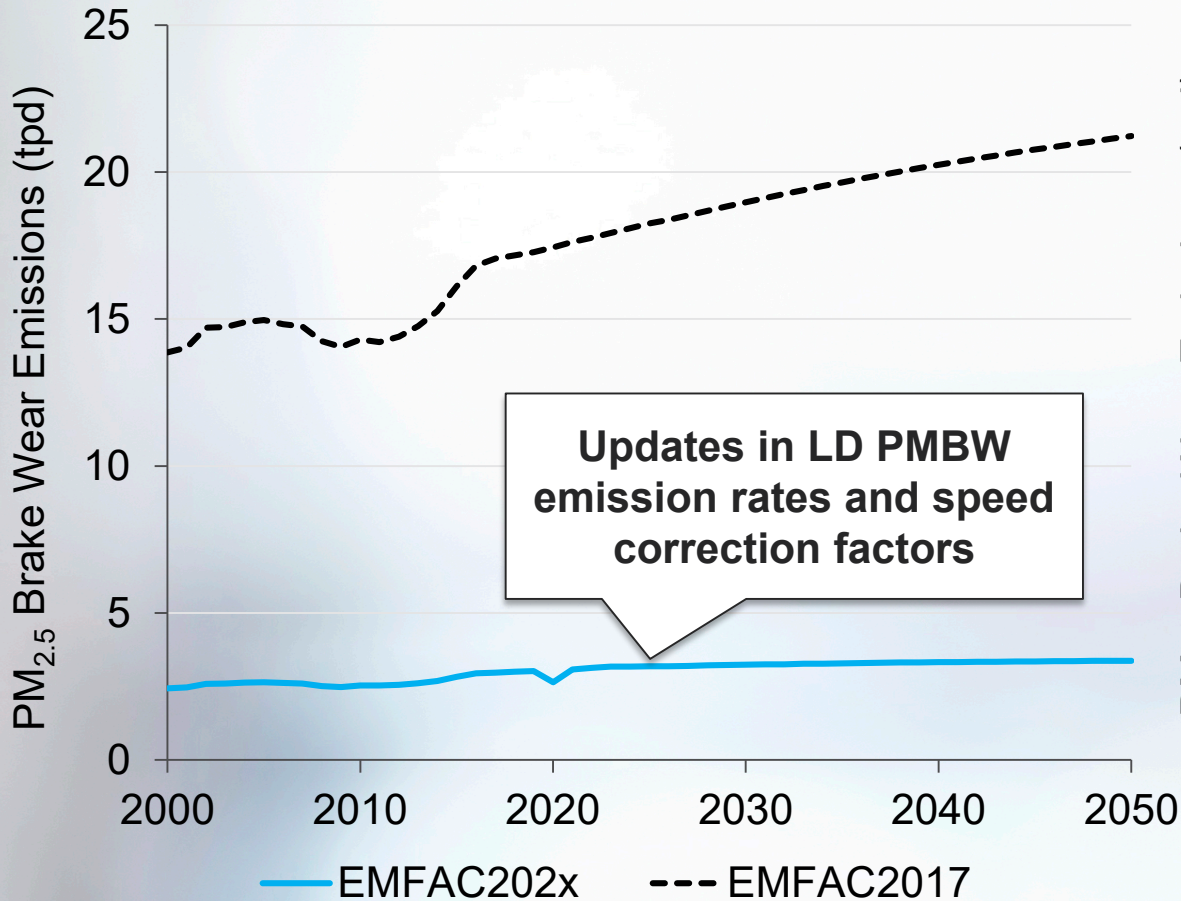
EMFAC202x July Workshop



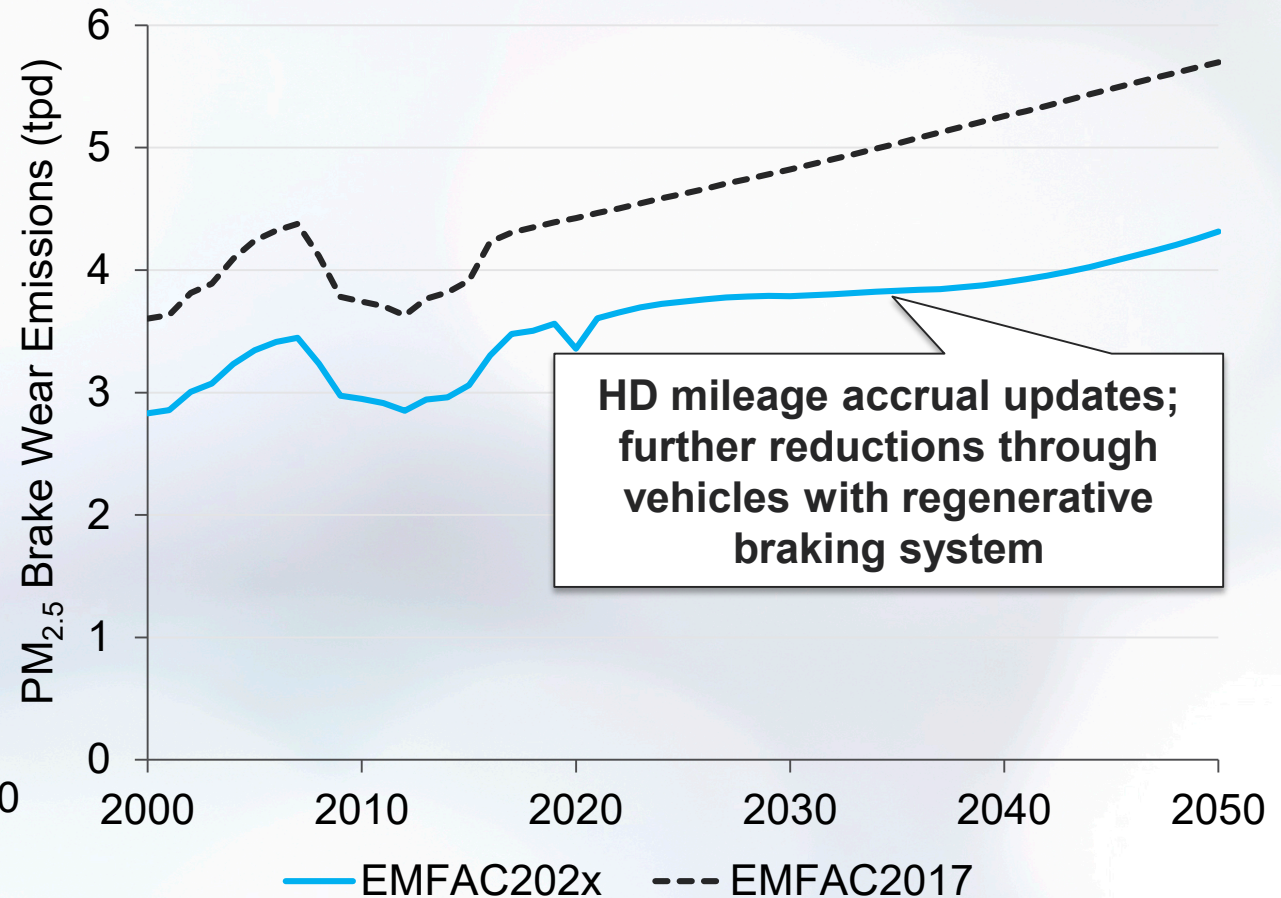
PM_{2.5} Brake Wear Emissions – Statewide

Important
 HD brake wear emission rates may get updated
 (pending available data)

Light-Duty (GVWR ≤ 8,500 lbs)

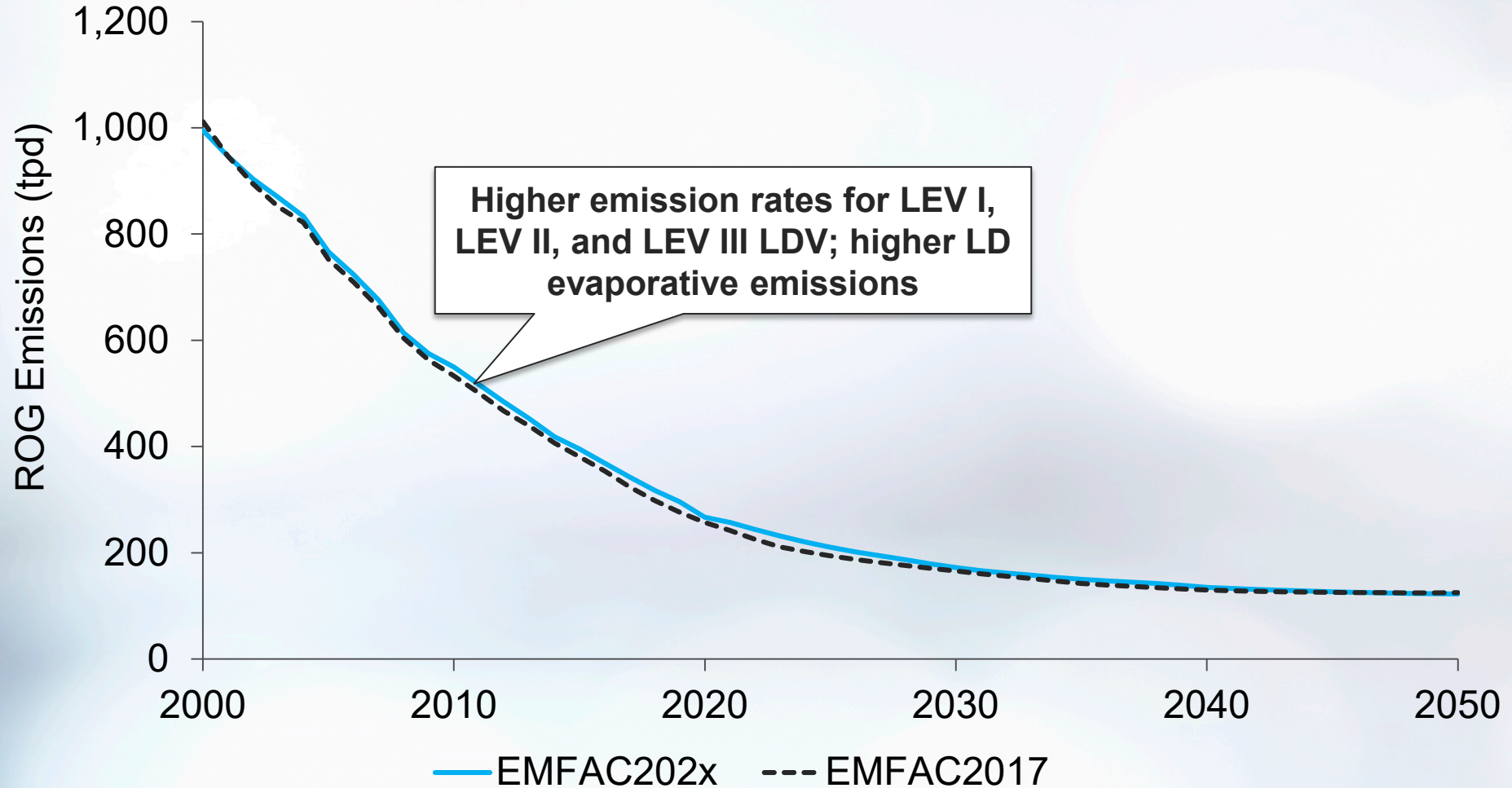


Medium and Heavy-Duty (GVWR > 8,500 lbs)



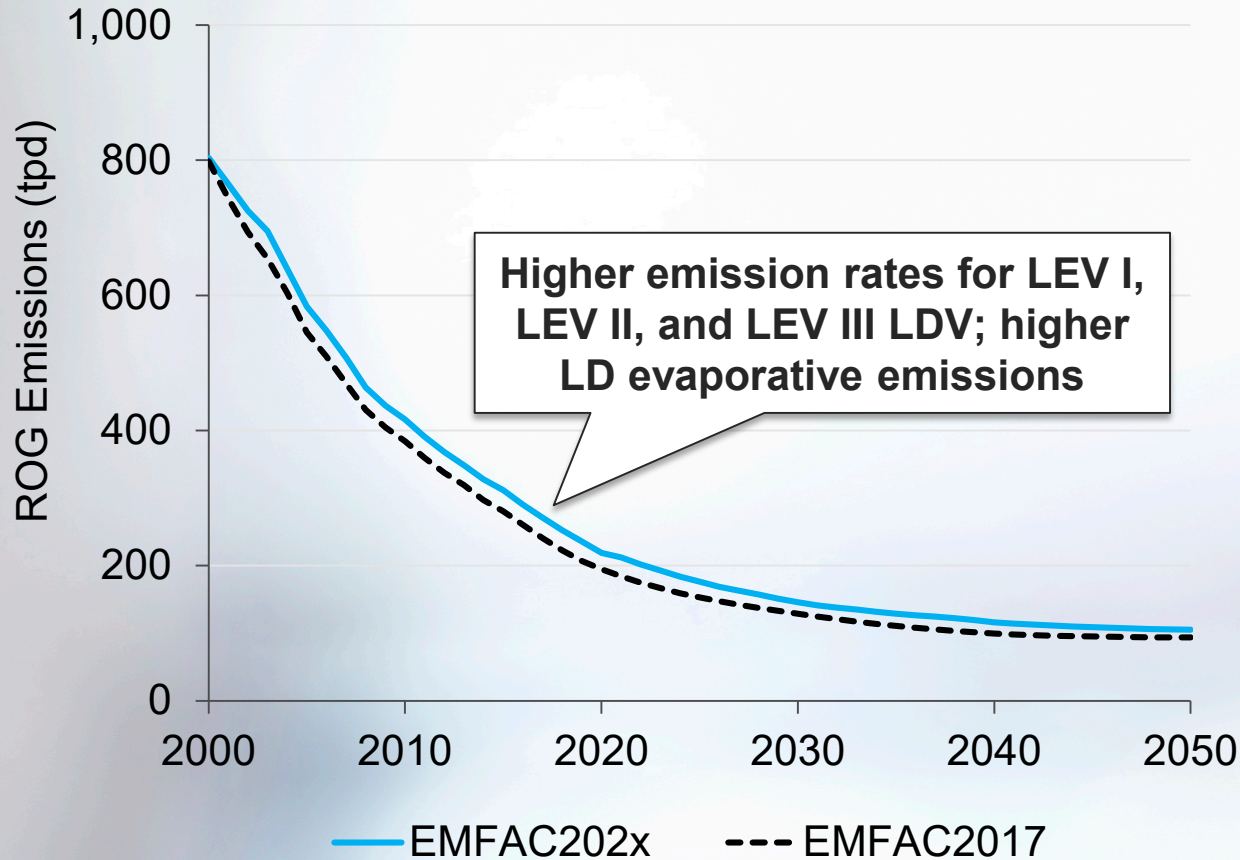
ROG Emissions – Statewide

Includes Evaporative Emissions

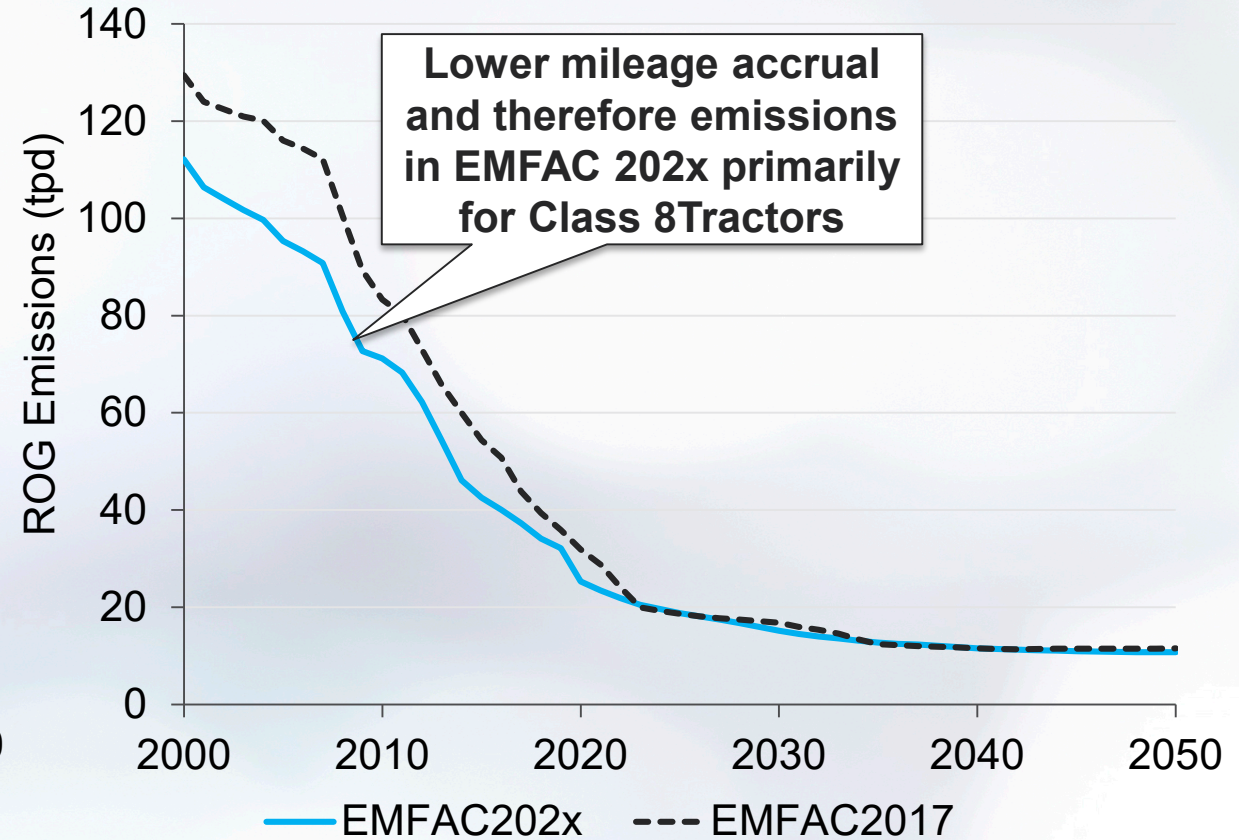


ROG Emissions – Statewide

Light-Duty (GVWR ≤ 8,500 lbs)

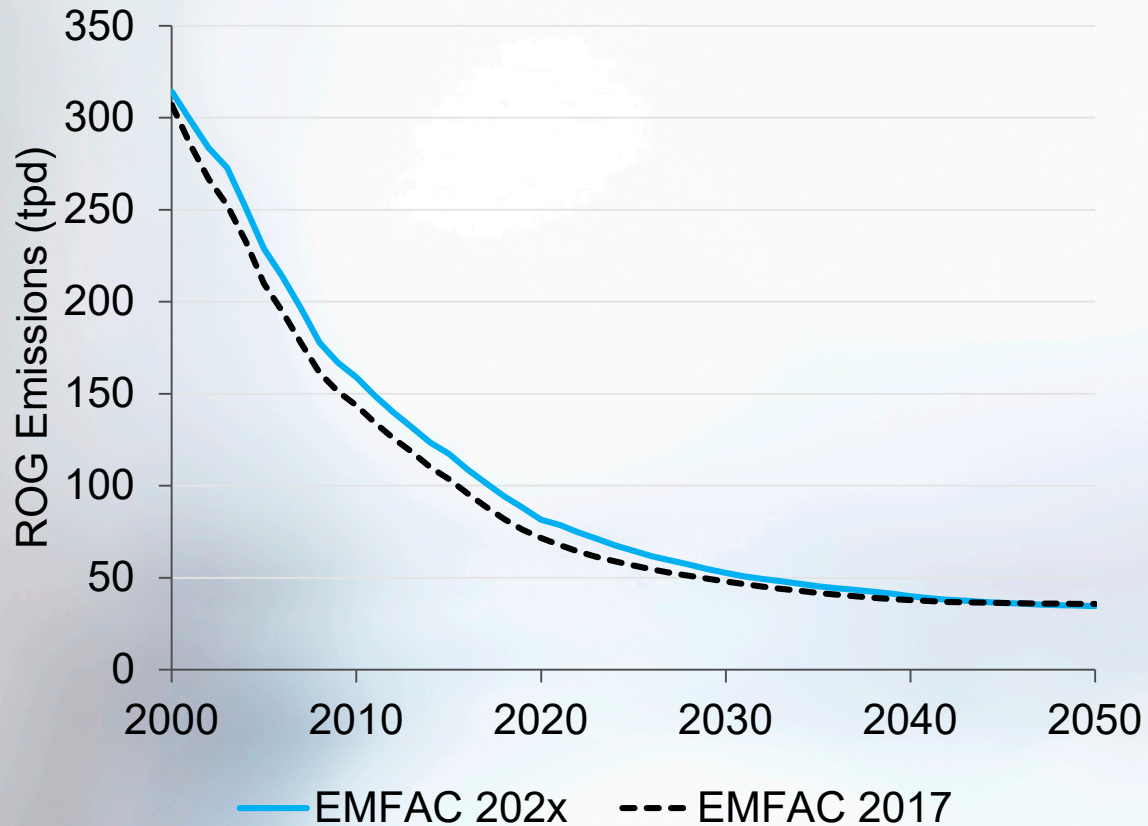


Medium and Heavy-Duty (GVWR > 8,500 lbs)

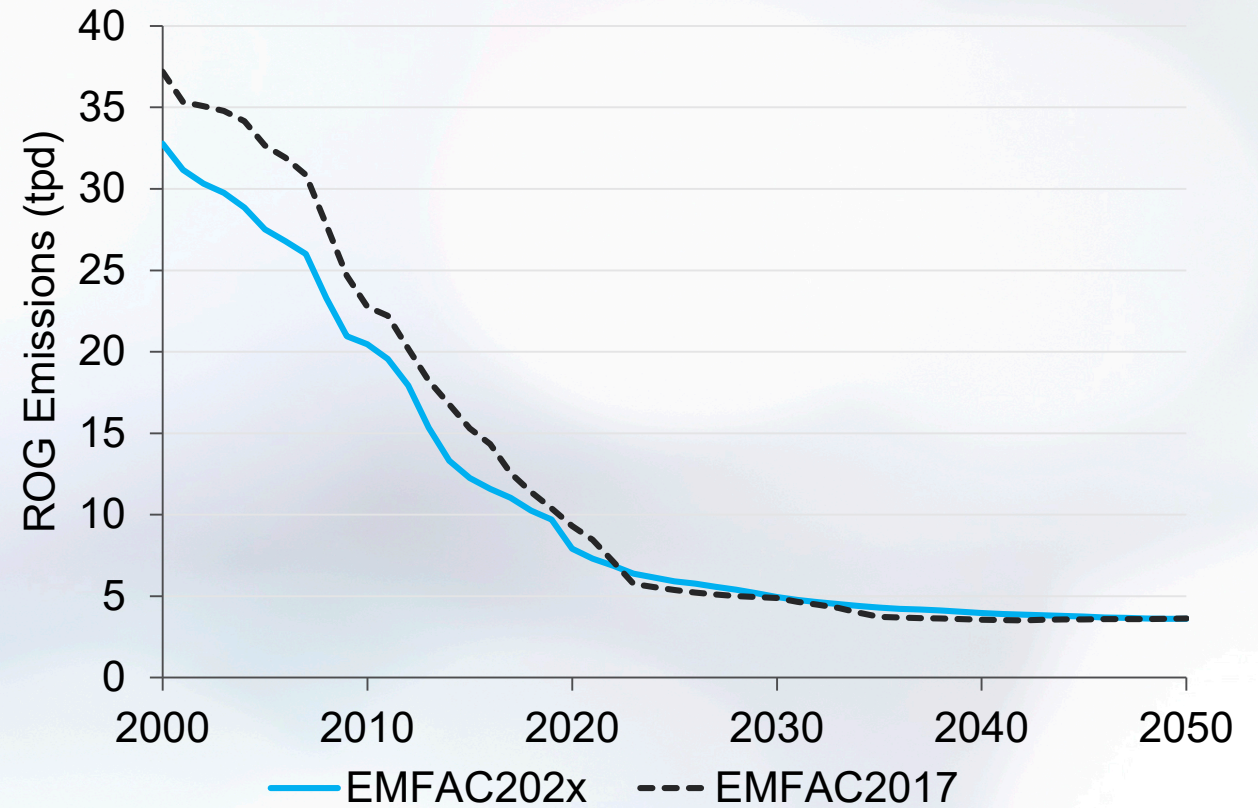


ROG Emissions – SC

Light-Duty (GVWR ≤ 8,500 lbs)

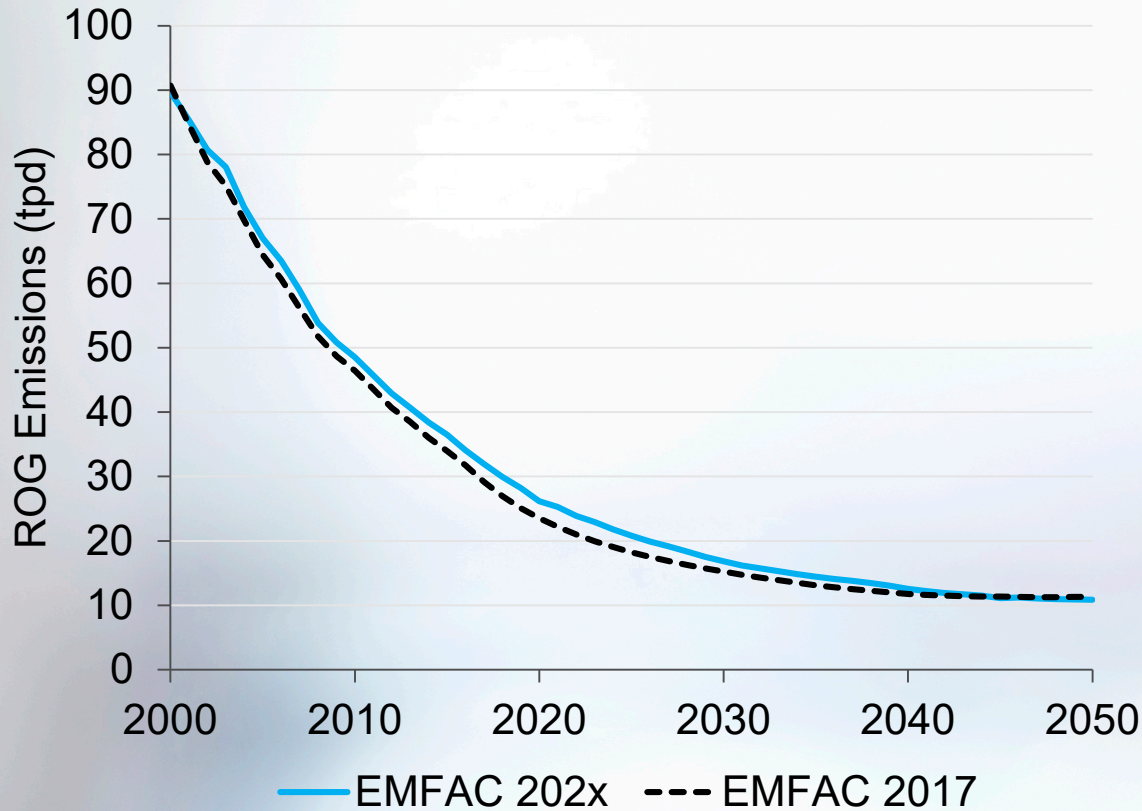


Medium and Heavy-Duty (GVWR > 8,500 lbs)

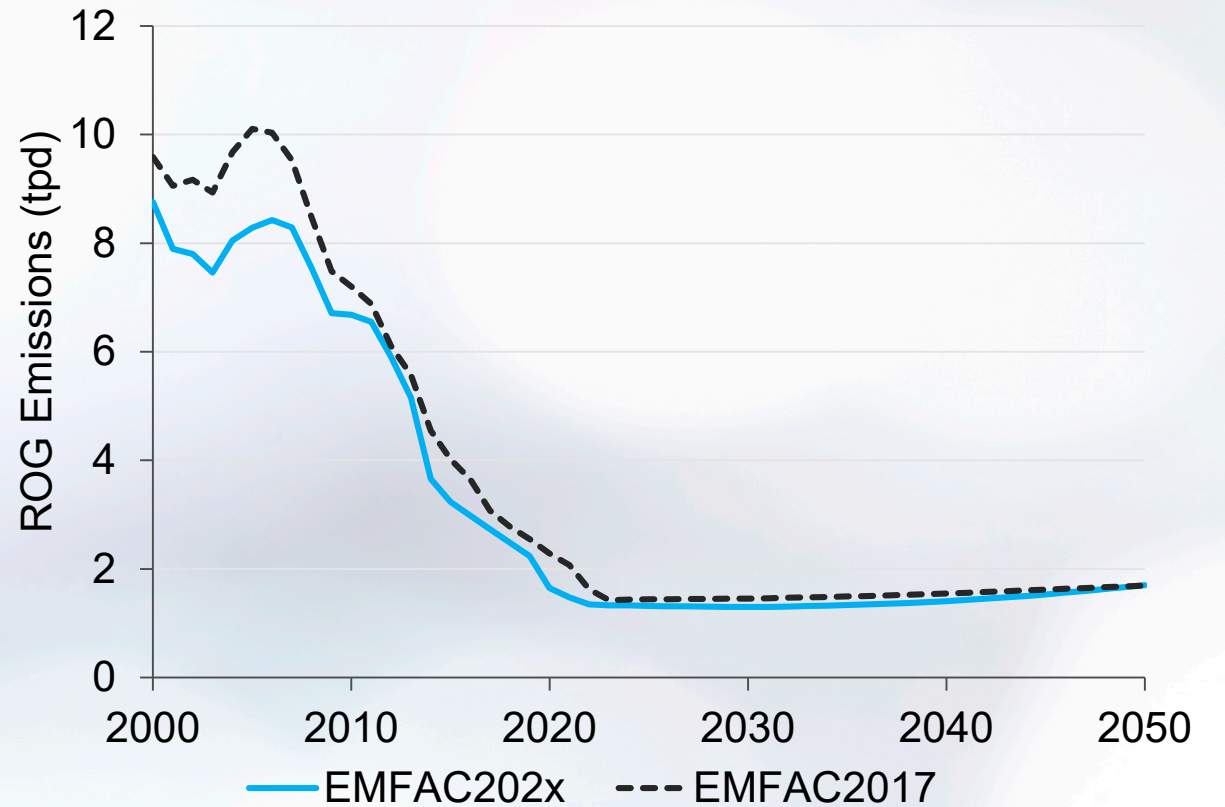


ROG Emissions – SJV

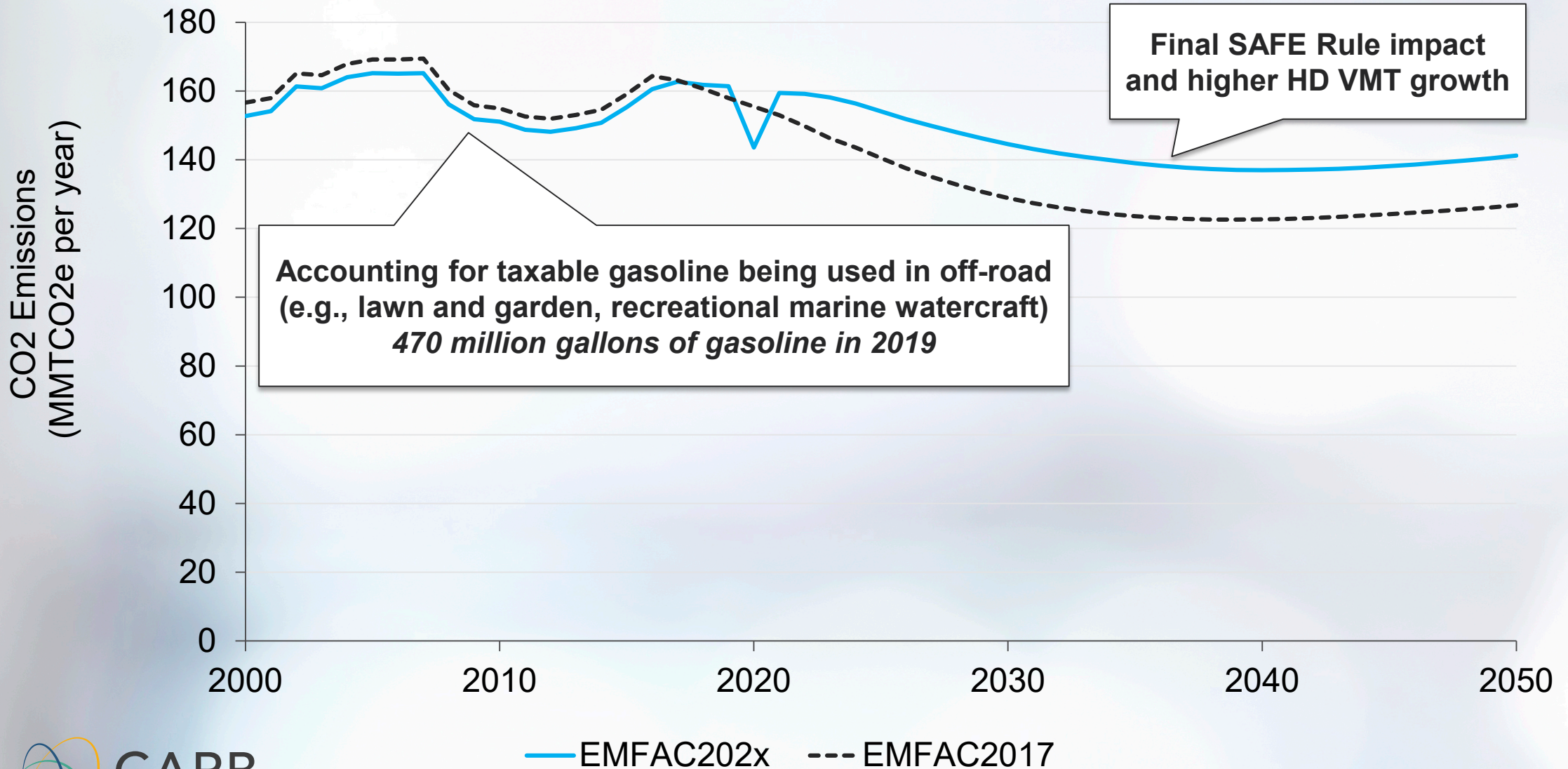
Light-Duty (GVWR ≤ 8,500 lbs)



Medium and Heavy-Duty (GVWR > 8,500 lbs)

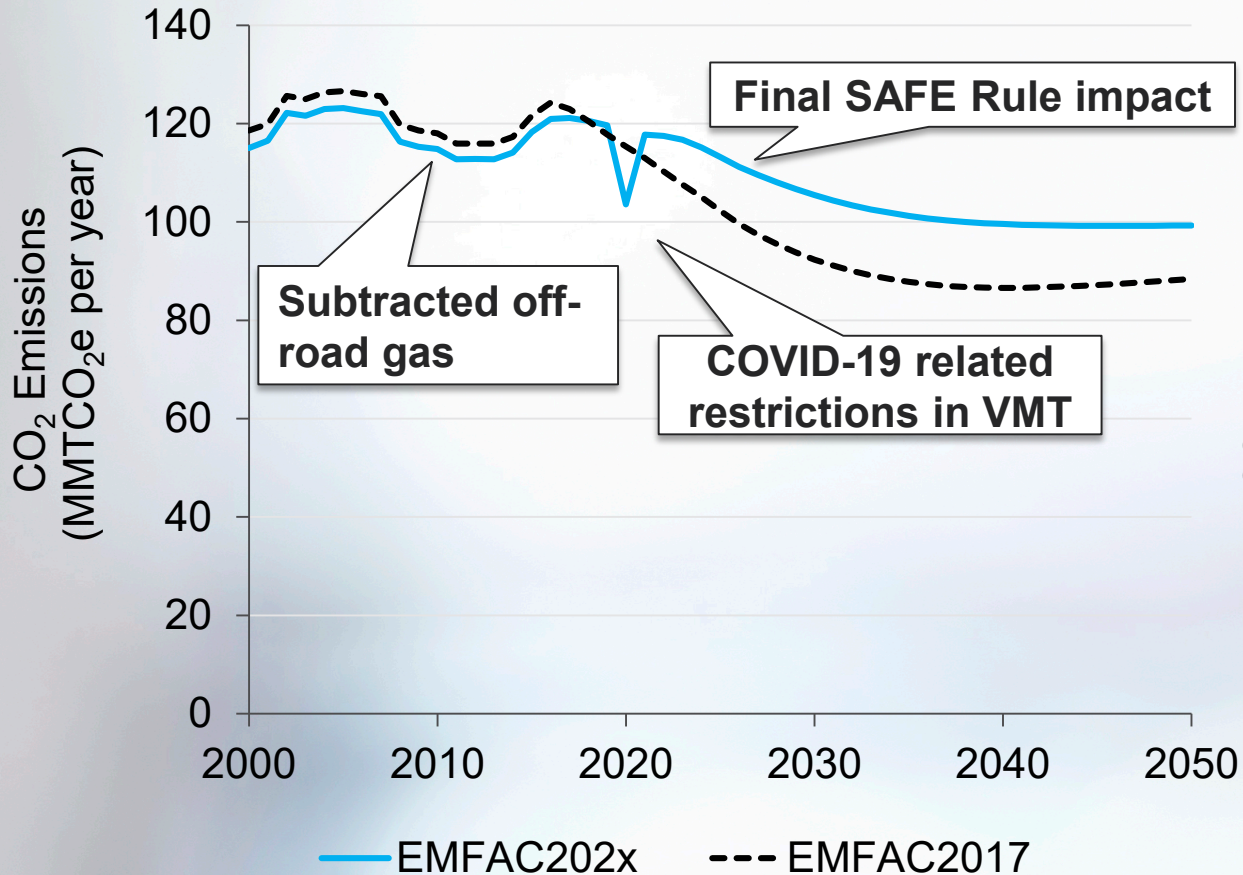


CO₂ Emissions – Statewide

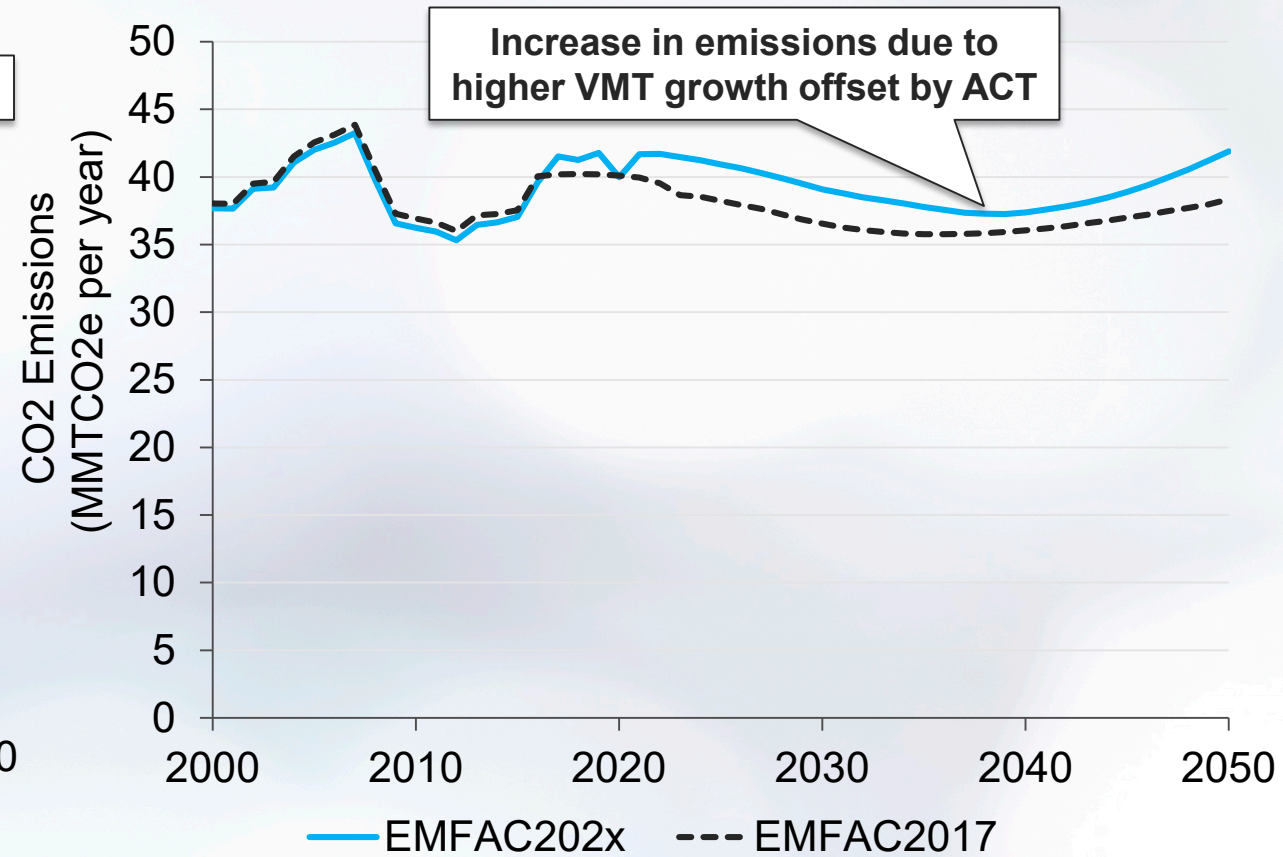


CO₂ Emissions – Statewide

Light-Duty (GVWR ≤ 8,500 lbs)

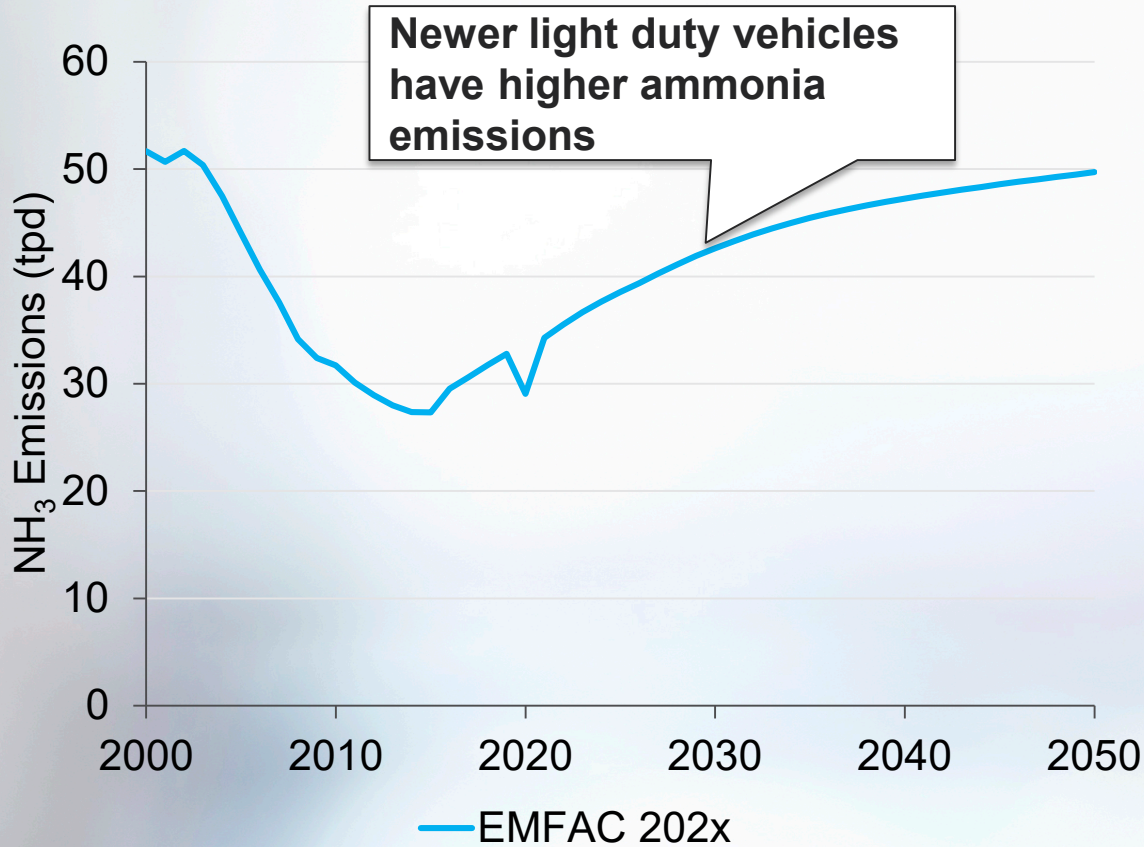


Medium and Heavy-Duty (GVWR > 8,500 lbs)

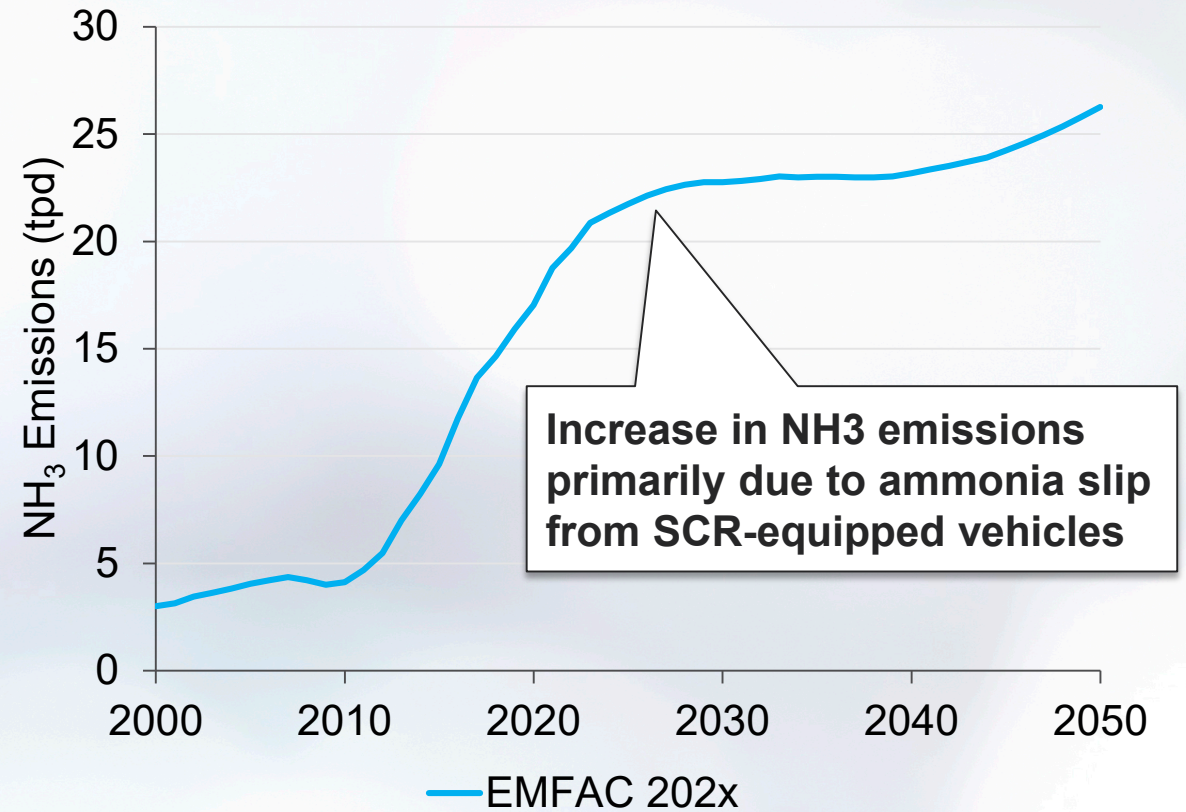


Statewide NH₃ Emissions

Light-Duty (GVWR ≤ 8,500 lbs)

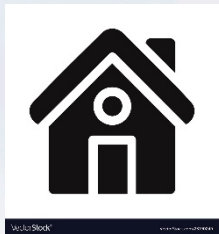
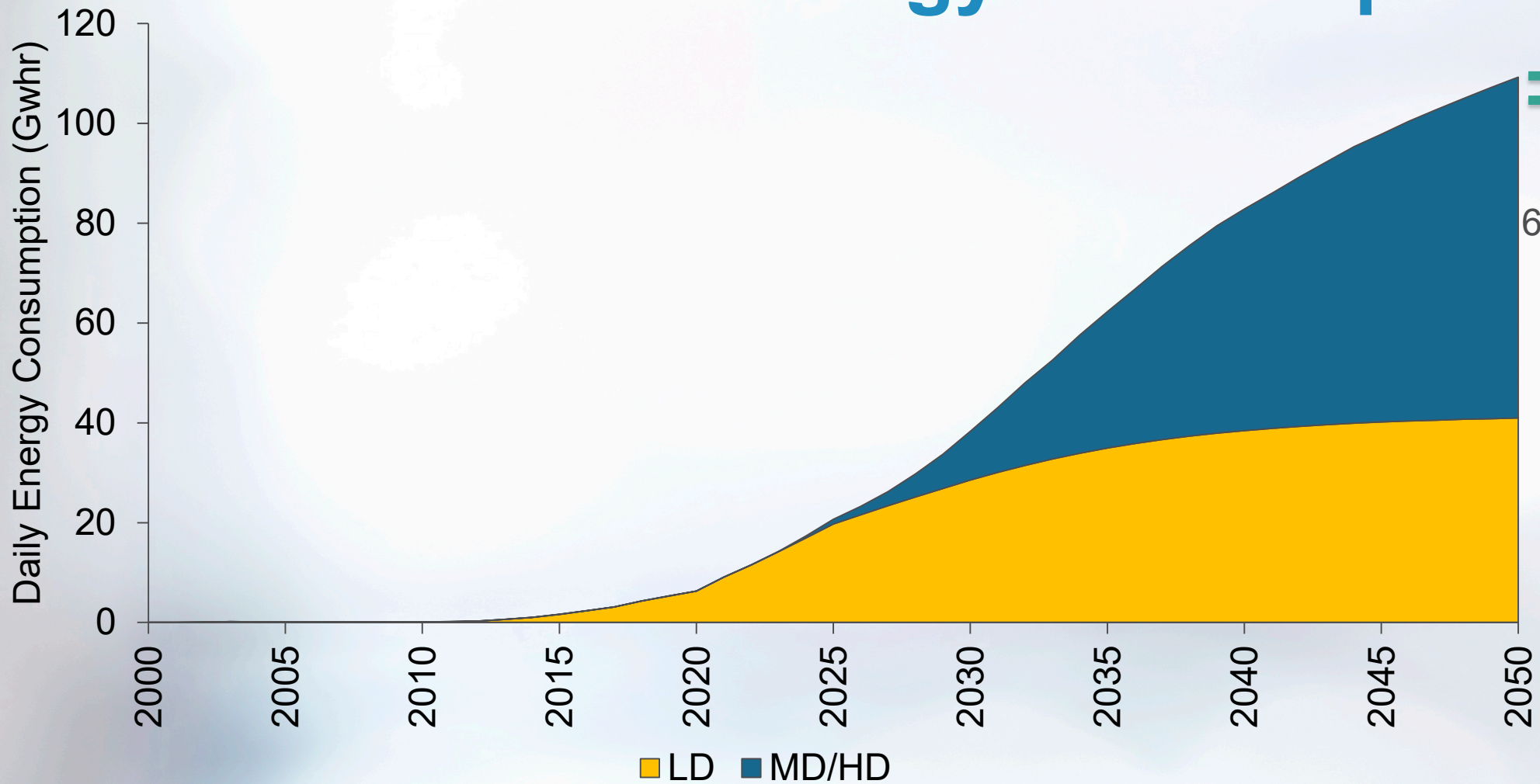


Medium and Heavy-Duty (GVWR > 8,500 lbs)



NEW!

Statewide Energy Consumption

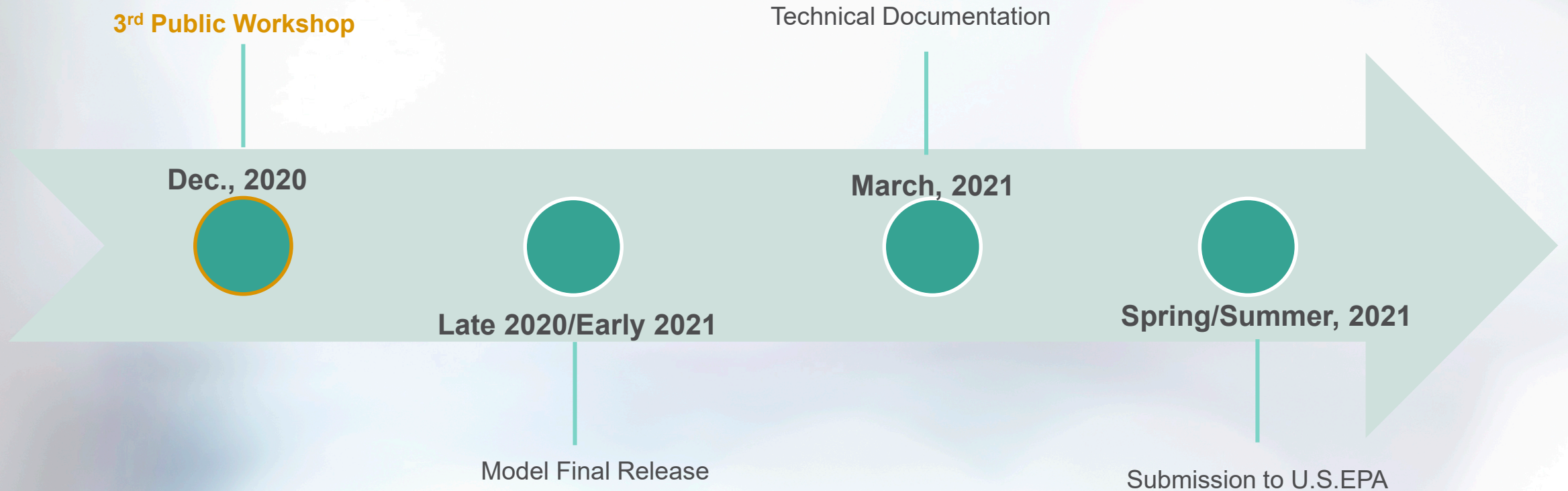


= 6 million households

California electricity usage ~700-800 GWh daily – energy.gov

Q&A and Next Steps

EMFAC202x Next Steps



More updates before the final release

- Adjusting LD technology mix to reflect higher fraction of zero emission vehicles
- HD brake wear emission rates



CARB



- HD CO₂ emission reduction
 - Analysis of Phase 1 HD GHG certification data

Looking Forward to

- **EMFAC202x application:** to inform and support upcoming policies and regulations, e.g.
 - Heavy-duty Inspection and Maintenance (HD I/M)
 - Advanced Clean Fleet rule (ACF)
 - Advanced Clean Car 2.0 (ACC 2.0)
 - On-Road Motorcycle (ONMC)
- **Next version of EMFAC in 2023/2024**
 - Fleet information by industry/vocational type
 - ALPR data to better understand truck traffic
 - Real world emission and performance data – OBD REAL and PEAQS
 - Lab and field testing to update emission rates