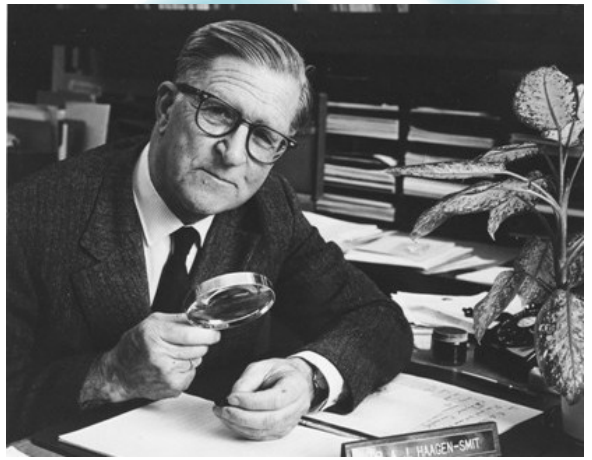
# ONROAD MOTORCYCLE (ONMC) RULEMAKING OVERVIEW

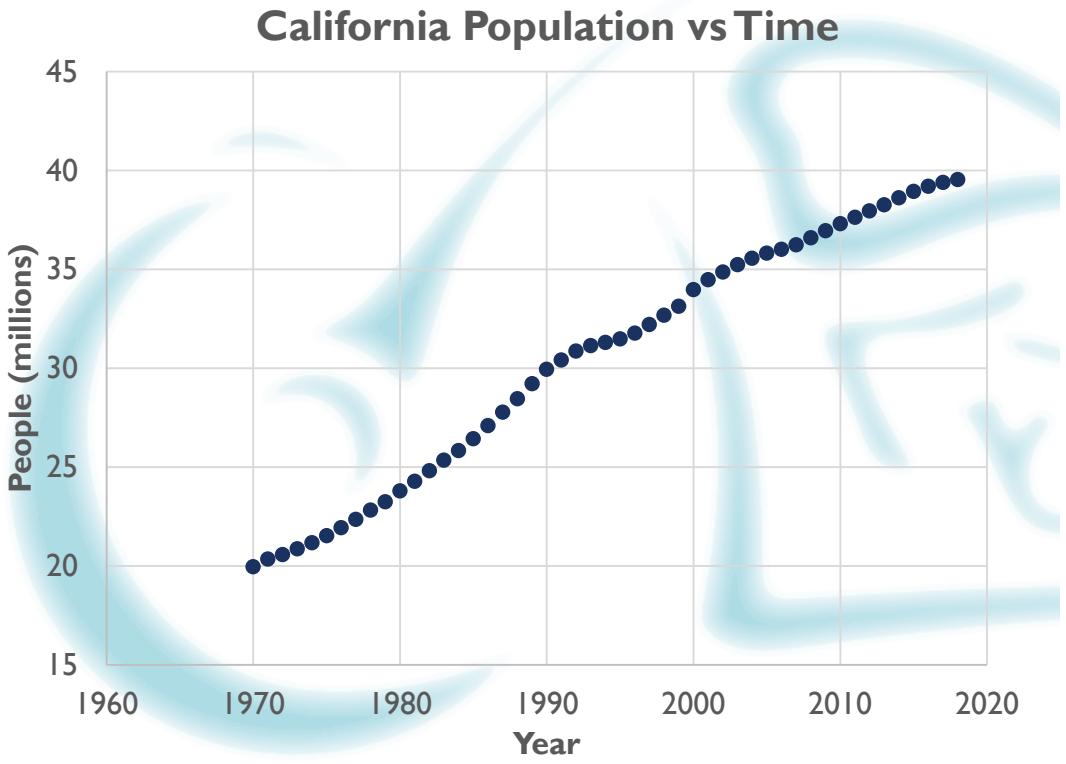
# CARB BACKGROUND

- Californians Identified Smog as a Health Threat in the 1940s
  - Local governments and the state legislature began taking measures to address air pollution
- Dr. Arie Jan Haagen-Smit was a Pioneer in Air Pollution Control
  - His groundbreaking research on smog and work with state and local governments led to the first automotive emissions standards
- The California Air Resources Board (CARB) was Formed in 1967
  - Haagen-Smit was appointed by Ronald Reagan as the first Chair of CARB

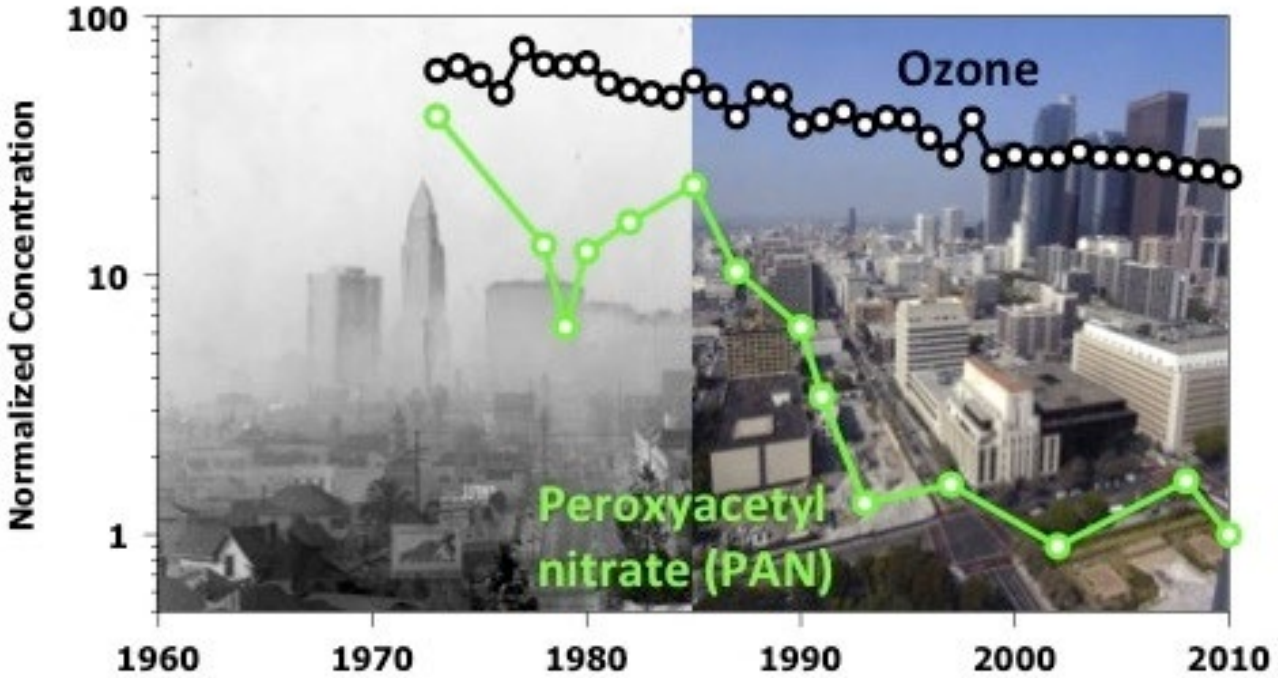


# CARB BACKGROUND (CONTINUED)

## California's Air has Gotten Cleaner as Population has Grown




Los Angeles Air Pollution Over Time



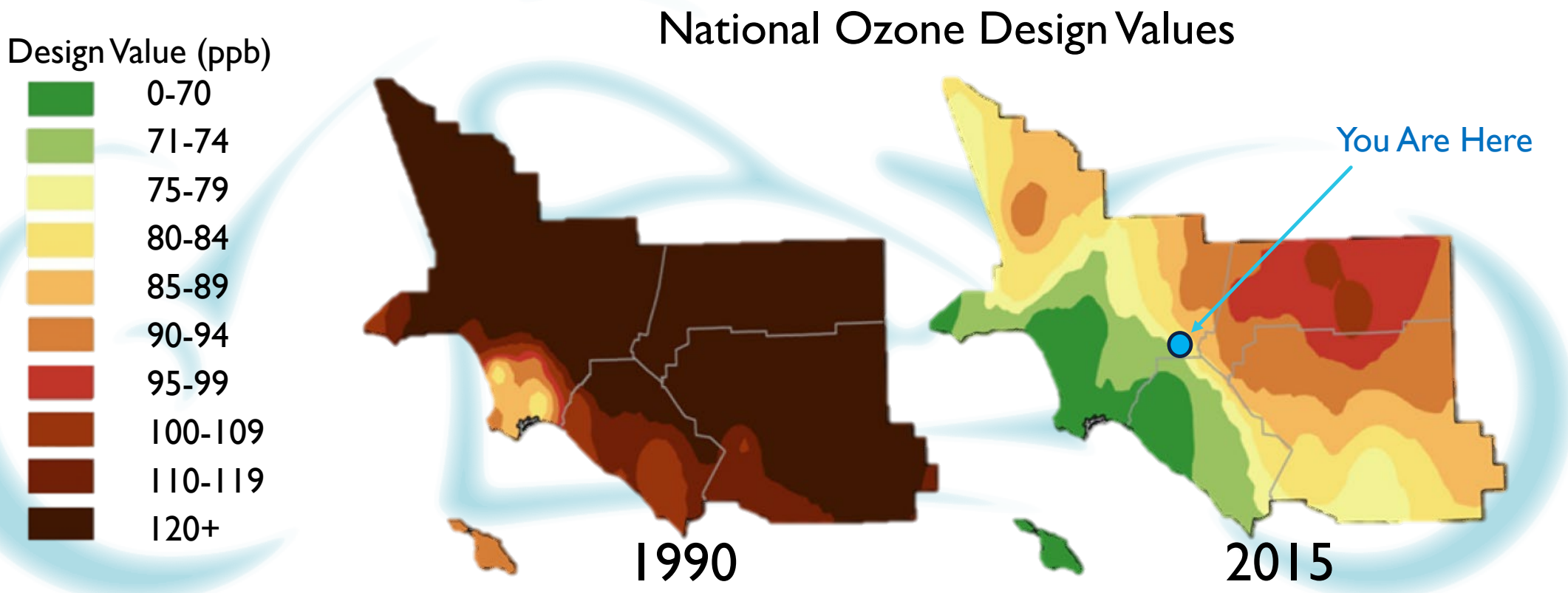

Source: NOAA

# CARB BACKGROUND (CONTINUED)

- U.S. EPA Sets Federal Clean Air Standards
- CARB is Responsible for Developing a State Implementation Plan (SIP) for California to Meet Federal Standards
  - CARB is directly responsible for regulating mobile sources
  - CARB is responsible for developing stationary source emissions standards which air districts may employ
- Local Air Districts Devise Local Strategies to Meet Federal Standards
  - Air districts are directly responsible for regulating stationary sources

# CARB BACKGROUND (CONTINUED)

## South Coast Ozone Reduction Progress



# CARB BACKGROUND (CONTINUED)

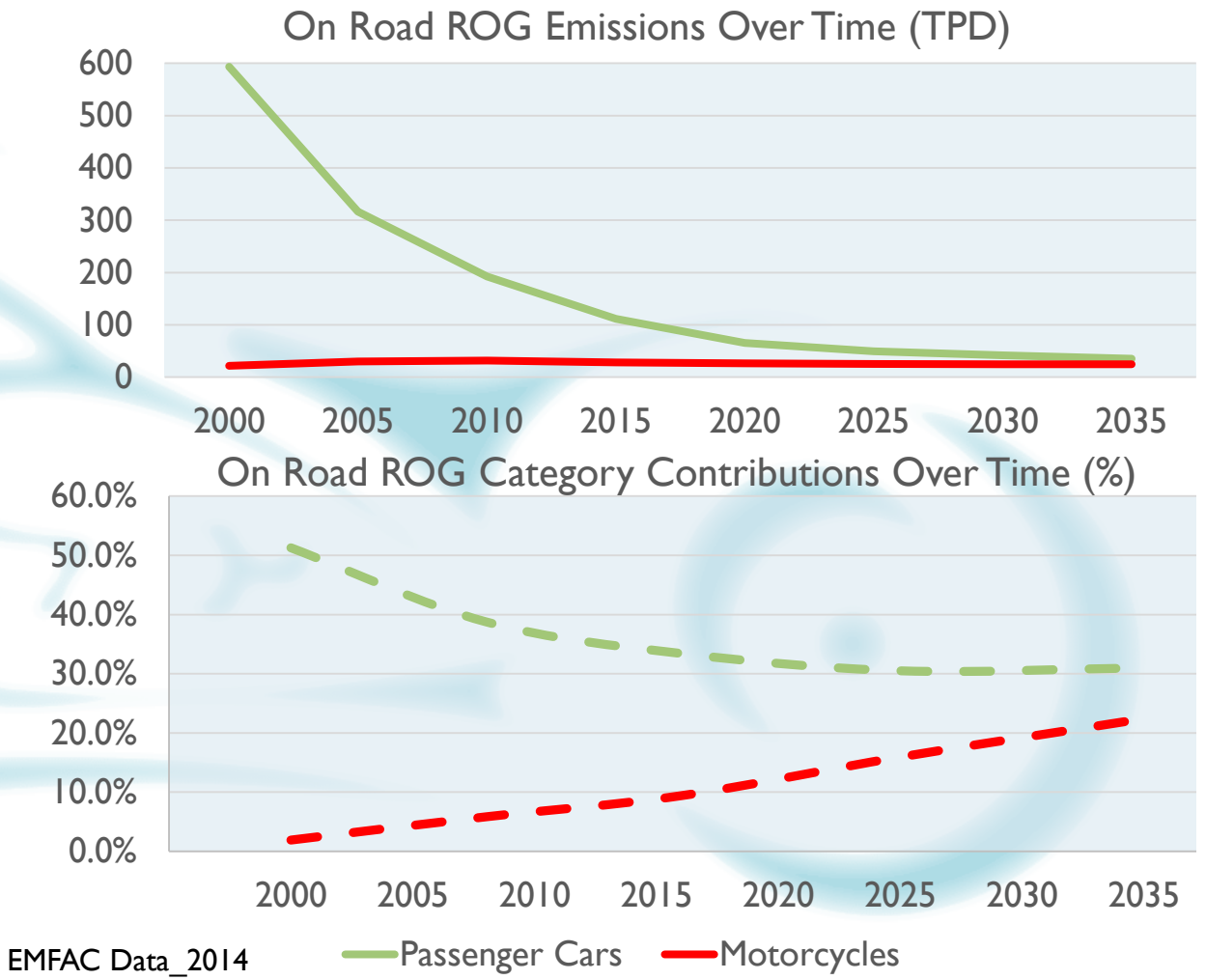
- CARB Continues to Lead in Many Areas
  - Climate Change
  - Low Carbon Fuels
  - Hydrogen Fueling
  - Refrigerant Emissions
  - Small Off-Road Engines
  - Consumer Products
  - Zero Emission Vehicles
  - Zero Emission Motorcycle Incentives
  - Many other programs…

# CARB ONMC REGULATION HISTORY

- CARB First Motorcycle Emissions Standards Adopted in 1975
- Most Recent CARB ONMC Standards Amendments in 1998
  - Evaporative emissions effective in 2007
  - Tail pipe emissions effective in 2008
- Many Other Countries Adopting More Stringent ONMC Emission Standards
  - Many adopting in part/whole European Union (EU) standards

# ONMC EMISSIONS INVENTORY IN CA

- 2016 ONMC Emissions
  - ~ 27 TPD of ROG
  - Population ~ 688,000
- 2035 ONMC ROG Emissions Near Parity with LDV ROG Emissions
- ONMC Emissions are Significant when Considering VMT
  - Passenger car miles ~100x greater than ONMC



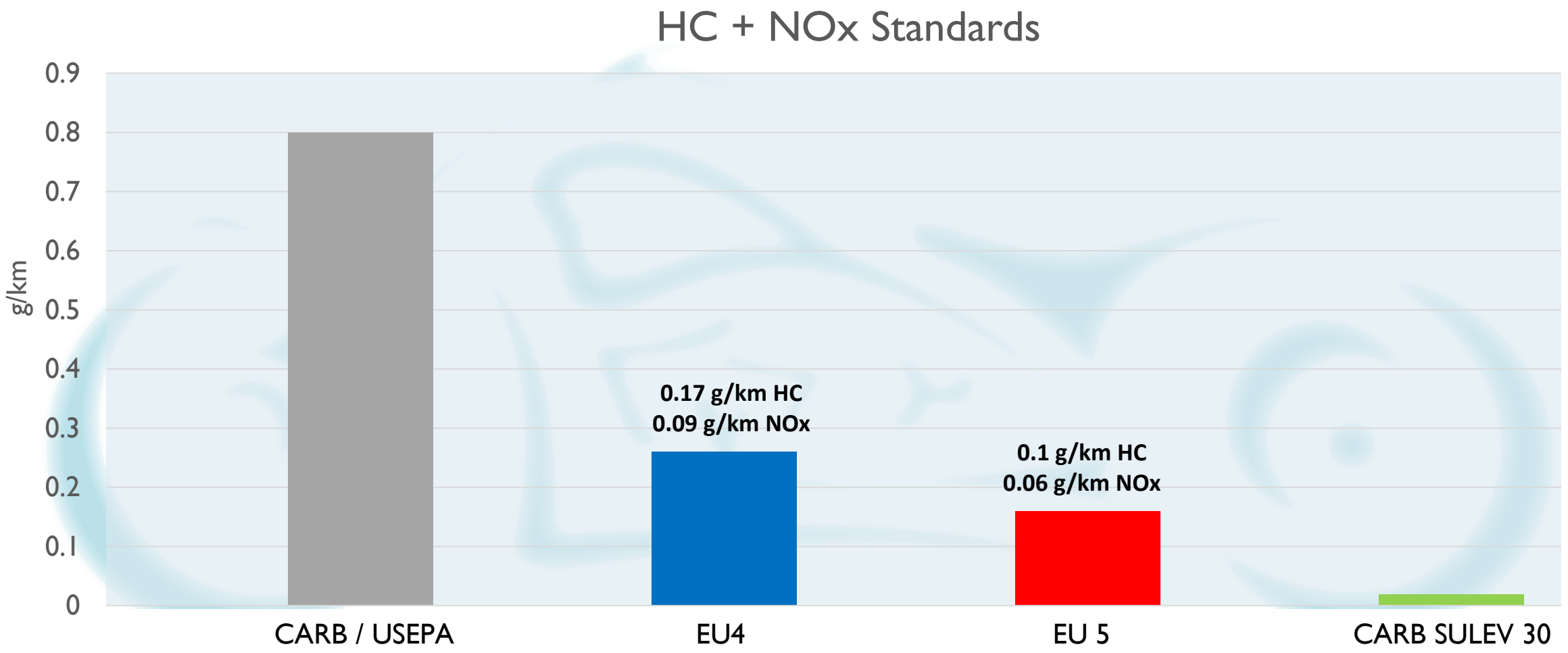

EMFAC Data_2014

# COLLABORATION WITH OTHER JURISDICTIONS

- Some Harmonization Already Exists
  - EU 5 and UN GTRs have many procedures which are harmonized
  - Environment and Climate Change Canada and US EPA are harmonized


- Staff is Actively Engaged with These Regulatory Bodies
  - Efforts to coordinate and share research
  - Staff is participating in UN Global Technical Regulation (GTR) discussions


# ONMC EXHAUST EMISSION STANDARDS



# HARMONIZATION CONSIDERATIONS

- EU 5 Effective on MY 2020 ONMCs

- Key Differences in EU and CARB Standards to be Considered

| | EU 5 | CARB |
|---|---|---|
| Test Fuel | E5, RVP ~ 8.4 | E0, RVP ~ 9.0* |
| Drive Cycle | WMTC | FTP |
| Evaporative Tests | 1 hour test | 1 hour test** |
| OBD | Stage II | No OBD |
| Reg and Category Definitions | L cat: power, speed and displacement | ONMC class I, II , and III by displacement |
| Certification | Certification documentation differences across jurisdictions | |

* All other CARB on-road gasoline powered categories moving to LEV III test fuel for all vehicle testing by 2020 (E10, RVP ~ 6.9)

**OHRV TP 933 (a 24 hour diurnal SHED test) was originally intended to be applied to ONMC in addition to OHRV

# RULEMAKING OBJECTIVES

- Quickly Achieve Significant, Real-world and Cost Effective Emissions Reductions to Improve California Air Quality
- Ensure Certification Standards Reflect Real World Emissions Reductions
- Lay Foundation for Potential ONMC I/M Program to Limit Tampering and Ensure Emissions Reductions Over the Life of the Vehicle
- Accelerate Adoption of Zero Emissions Motorcycles (ZEMS)

# DATA NEEDS FOR RULE DEVELOPMENT

- Update ONMC Emissions Inventory Factors
- Quantify Differences in ONMC Emissions Certification Procedures
- PEMS Testing to Assess Real World Driving Emissions
- Assess Tampering Emissions Impacts
- Collect Idle Emissions Data for Potential Use in and ONMC I/M Program

# HIGHLIGHTS COVERED IN LABORATORY TEST PLAN

- Test Fleet Includes:
  - 26 ONMCs
  - MYs 2008-2020
  - Various makes
- Dynamometer Exhaust Testing Includes:
  - WMTC, FTP and UC drive cycles
  - Indolene, LEV III, EU 5, and CARFG3 fuels
  - Tampered vs original configurations
- Evaporative Testing Includes:
  - Multiday diurnal SHED testing up to 7 days
  - CARFG3 and LEV III fuels
  - WMTC and FTP conditioning cycles

# PORTABLE EMISSIONS MEASUREMENT SYSTEM (PEMS)

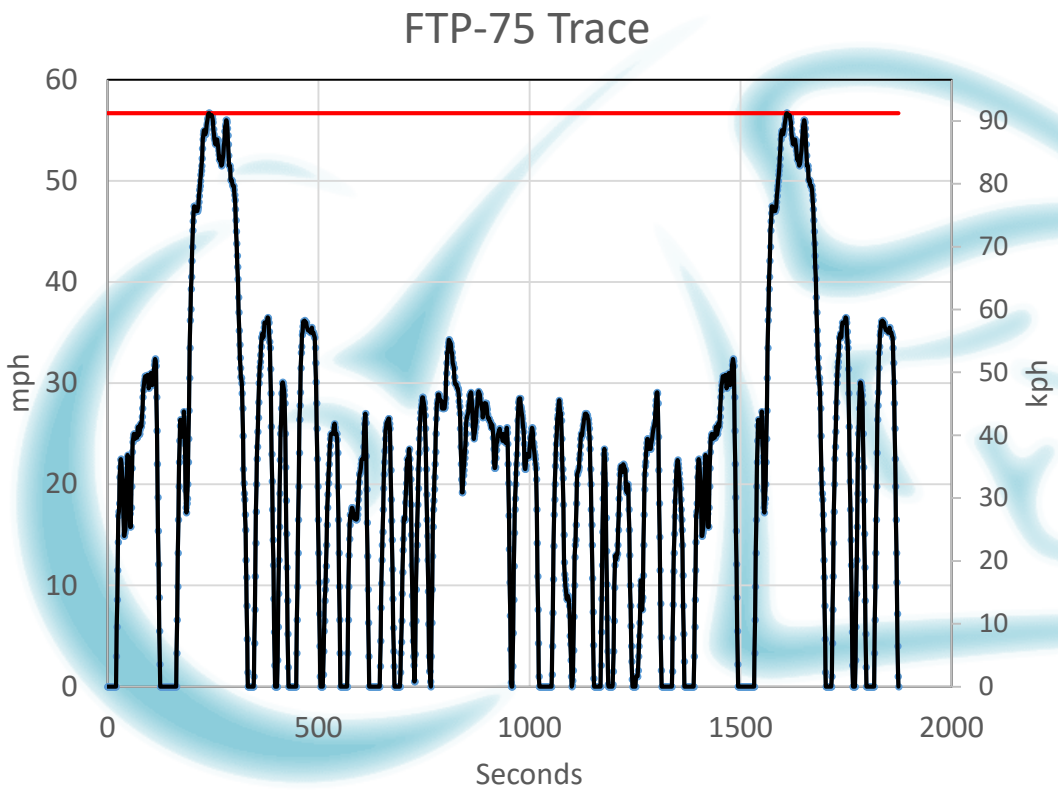
- CARB is Deploying an Axion PEMS Unit
  - Measures CO2, CO, HC, NOx (as NO), O2 concentration
  - Measures engine parameters (RPM, IAT, MAP) to calculate mass flow

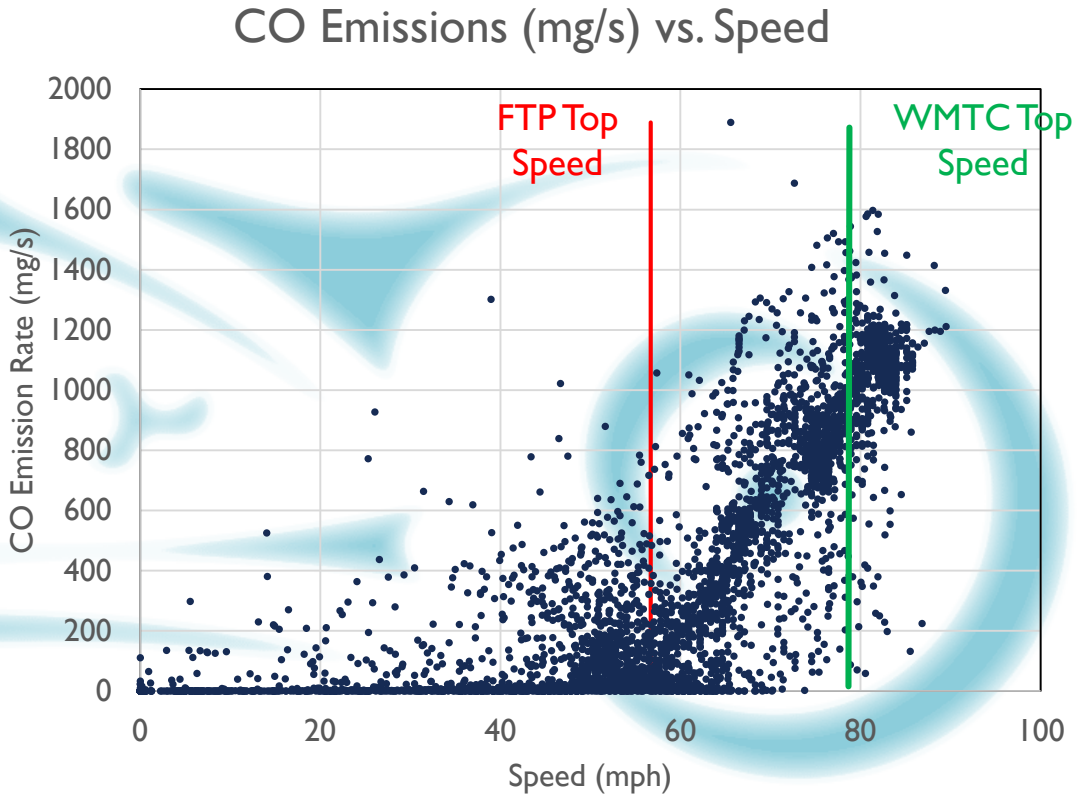
- Current PEMS Work:
  - Urban and rural driving
  - Before-and-after tampering tests

- Potential Future PEMS work:
  - Screening tool to assess real world performance

# EARLY PEMS OBSERVATION

## Off-Cycle Emissions Appear Significant



# POTENTIAL INSPECTION/MAINTENANCE (I/M) PROGRAM

- Need Verification Procedures to Ensure Real World Performance

- Potential In-Use Performance Monitoring Program
  - OBD-based inspection and maintenance requirements
  - Tamper resistant designs and education
  - Two-speed idle test being considered for Pre-OBD ONMCs

- CARB is Seeking Experience of Other Jurisdictions with ONMC I/M Programs
  - Are any UN EPPR Nations currently running, or planning to implement, I/M Programs?

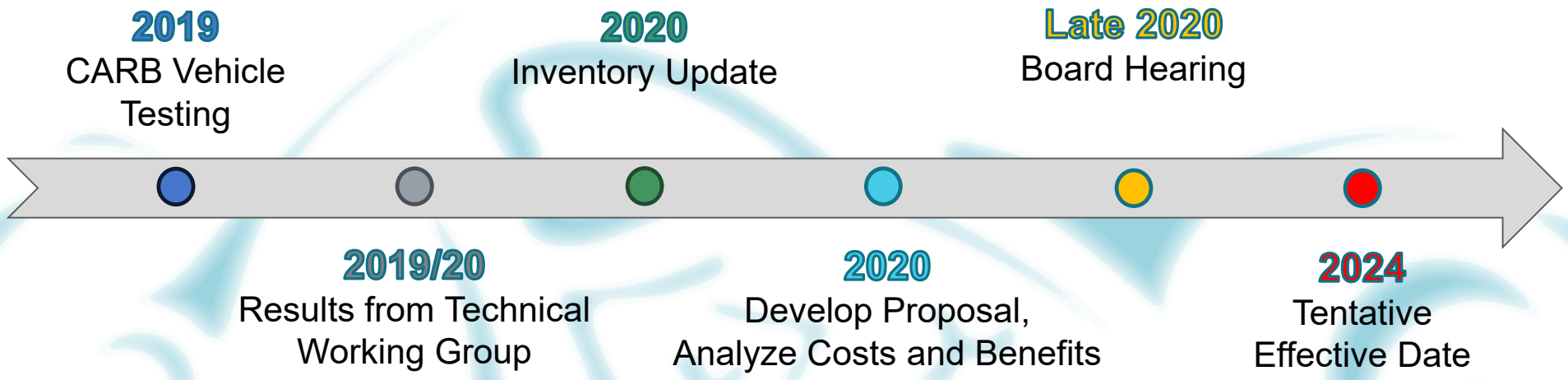
# ONMC INSPECTION/MAINTENANCE (I/M) CHALLENGES

- California has an Extensive Light Duty Vehicle (LDV) I/M Program
  - Operating since 1984 throughout California
- Can an ONMC I/M Program Use Existing LDV I/M Program Infrastructure?
  - This would result in better cost effectiveness
- Current Type II Idle Exhaust Test May Not Be Easy to Perform During a Routine Inspection
  - Adaptors required to accommodate tail pipe probe insertion to 60cm
    - California SMOG requirements for passenger cars requires insertion to16in (40.6cm)
  - Type II test would require many adaptors for various configurations
  - WMTC or 600 seconds driving under normal traffic conditions would be difficult execute/confirm

# TECHNICAL WORKING GROUPS

- Technical Working Group Purpose
  - Engage expertise of stakeholders to address technical areas rule development and potential harmonization
- Participants Include:
  - Motorcycle and parts manufacturers, testing groups, industry groups, and regulators
- Technical Working Groups Include:
  - Testing Protocols - fuels, drive cycles, evap test procedures, etc.
  - Procedural - certification streamlining and jurisdictional definitions, etc.
  - Verification - assess real world performance, OBD,  tampering, etc.
  - ZEM Incentives - fleet averaging, rebates, credits, etc.

# TENTATIVE TIMELINE




- Potential for Optional Phase-in and/or Early Adoption Provisions in MY2021

# CONTACTS

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- For More Information Visit:

  https://ww2.arb.ca.gov/our-work/programs/on-road-motorcycles