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
California's Air has Gotten Cleaner as Population has Grown

**California Population vs Time**

**Los Angeles Air Pollution Over Time**

Source: NOAA
• U.S. EPA Sets Federal Clean Air Standards

• CARB is Responsible for Developing a State Implementation Plan (SIP) for California to Meet Federal Standards
  o CARB is directly responsible for regulating mobile sources
  o CARB is responsible for developing stationary source emissions standards which air districts may employ

• Local Air Districts Devise Local Strategies to Meet Federal Standards
  o Air districts are directly responsible for regulating stationary sources
South Coast Ozone Reduction Progress

National Ozone Design Values

Design Value (ppb)
- 0-70
- 71-74
- 75-79
- 80-84
- 85-89
- 90-94
- 95-99
- 100-109
- 110-119
- 120+

You Are Here
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 First Motorcycle Emissions Standards Adopted in 1975

• Most Recent CARB ONMC Standards Amendments in 1998
  o Evaporative emissions effective in 2007
  o Tail pipe emissions effective in 2008

• Many Other Countries Adopting More Stringent ONMC Emission Standards
  o 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
COLLABORATION WITH OTHER JURISDICTIONS

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

• Staff is Actively Engaged with These Regulatory Bodies
  o Efforts to coordinate and share research
  o Staff is participating in UN Global Technical Regulation (GTR) discussions
HC + NOx Standards

CARB / USEPA: 0.17 g/km HC, 0.09 g/km NOx
EU4: 0.1 g/km HC, 0.06 g/km NOx
EU 5: 0.1 g/km HC, 0.06 g/km NOx
CARB SULEV 30: 0.1 g/km HC, 0.06 g/km NOx
HARMONIZATION CONSIDERATIONS

- EU 5 Effective on MY 2020 ONMCs

- Key Differences in EU and CARB Standards to be Considered

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

* 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:
  o 26 ONMCs
  o MYs 2008-2020
  o Various makes

• Dynamometer Exhaust Testing Includes:
  o WMTC, FTP and UC drive cycles
  o Indolene, LEV III, EU 5, and CARFG3 fuels
  o Tampered vs original configurations

• Evaporative Testing Includes:
  o Multiday diurnal SHED testing up to 7 days
  o CARFG3 and LEV III fuels
  o WMTC and FTP conditioning cycles
PORTABLE EMISSIONS MEASUREMENT SYSTEM (PEMS)

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

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

• Potential Future PEMS work:
  o Screening tool to assess real world performance
EARLY PEMS OBSERVATION

Off-Cycle Emissions Appear Significant

FTP-75 Trace

CO Emissions (mg/s) vs. Speed

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
  o OBD-based inspection and maintenance requirements
  o Tamper resistant designs and education
  o Two-speed idle test being considered for Pre-OBD ONMCs

• CARB is Seeking Experience of Other Jurisdictions with ONMC I/M Programs
  o 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
  o Operating since 1984 throughout California

• Can an ONMC I/M Program Use Existing LDV I/M Program Infrastructure?
  o This would result in better cost effectiveness

• Current Type II Idle Exhaust Test May Not Be Easy to Perform During a Routine Inspection
  o Adaptors required to accommodate tail pipe probe insertion to 60cm
    - California SMOG requirements for passenger cars requires insertion to 16in (40.6cm)
  o Type II test would require many adaptors for various configurations
  o WMTC or 600 seconds driving under normal traffic conditions would be difficult execute/confirm
TECHNICAL WORKING GROUPS

• Technical Working Group Purpose
  o Engage expertise of stakeholders to address technical areas rule development and potential harmonization

• Participants Include:
  o Motorcycle and parts manufacturers, testing groups, industry groups, and regulators

• Technical Working Groups Include:
  o Testing Protocols - fuels, drive cycles, evap test procedures, etc.
  o Procedural - certification streamlining and jurisdictional definitions, etc.
  o Verification - assess real world performance, OBD, tampering, etc.
  o ZEM Incentives - fleet averaging, rebates, credits, etc.
TENTATIVE TIMELINE

- Potential for Optional Phase-in and/or Early Adoption Provisions in MY2021
• Please Contact Us With Any Questions

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