CALIFORNIA
AIR RESOURCES BOARD

Heavy-Duty Vehicle Inspection and Maintenance (HD I/M) Program Development

August 3, 2021
Public Workshop

Today's Agenda

- Purpose of workshop
- Senate Bill 210 (Leyva; Statutes of 2019) pilot program
  - Requirements and stakeholder engagement efforts
  - Pilot program overview
  - Summary and findings of each pilot program activity
- Overview of updated draft HD I/M program proposal
- Implementation phase-in, estimated costs and benefits, next steps

SB 210 Pilot Program Requirements

- Consult with partner state agencies and stakeholders in public process to demonstrate technologies that show potential for bringing vehicles into the HD I/M program – Health and Safety Code (H&SC) §44156(a)
  - Report findings on CARB website before Board hearing
- Adopt and implement the HD I/M program no later than two years after completion of the pilot program – H&SC §44152(a)
- Beyond pilot effort itself, CARB plans to further test components of HD I/M system prior to the roll out of each implementation phase

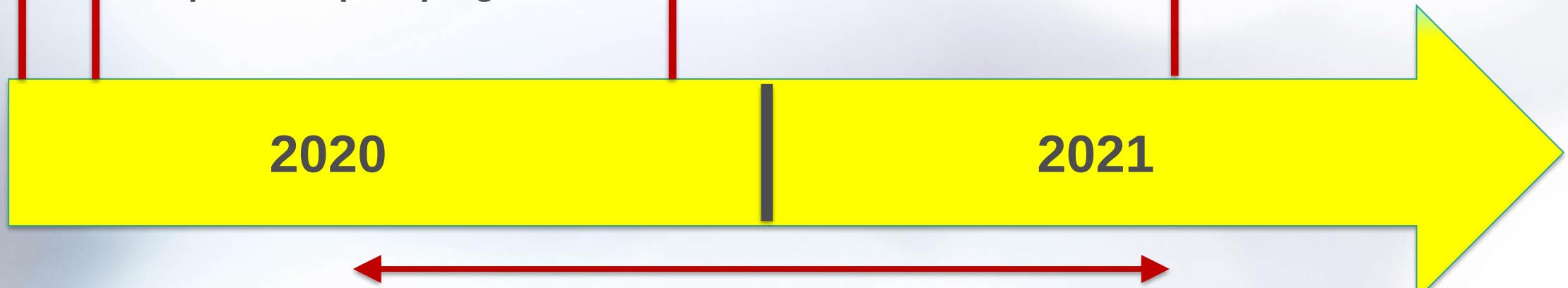
Stakeholder Engagement for Pilot Program Efforts

January: Workshop to discuss SB 210 pilot program concepts/solicit stakeholder ideas

February: Workgroup meeting to continue pilot program discussion

November: Workgroup meeting to provide update on pilot program efforts

Today: Workshop to provide results/key takeaways from pilot program efforts



Meetings with interested parties and coordination on pilot testing efforts

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SB 210 Pilot Program Overview

Overall goal: demonstrate technologies that show potential for bringing heavy-duty vehicles into a HD I/M program

Pre-Pilot Efforts

1) Initial HD I/M Feasibility Study

Primary Pilot Program:

2) On-Board Diagnostic (OBD) Testing Assessments
3) Further Development of Automated License Plate Recognition Cameras (ALPR)
4) Roadside Emissions Monitoring Device (REMD)/OBD Field Testing Efforts

Other efforts:

5) San Joaquin Valley Repair Assistance
6) CARB Repair Durability Study

1) Initial HD I/M Feasibility Study

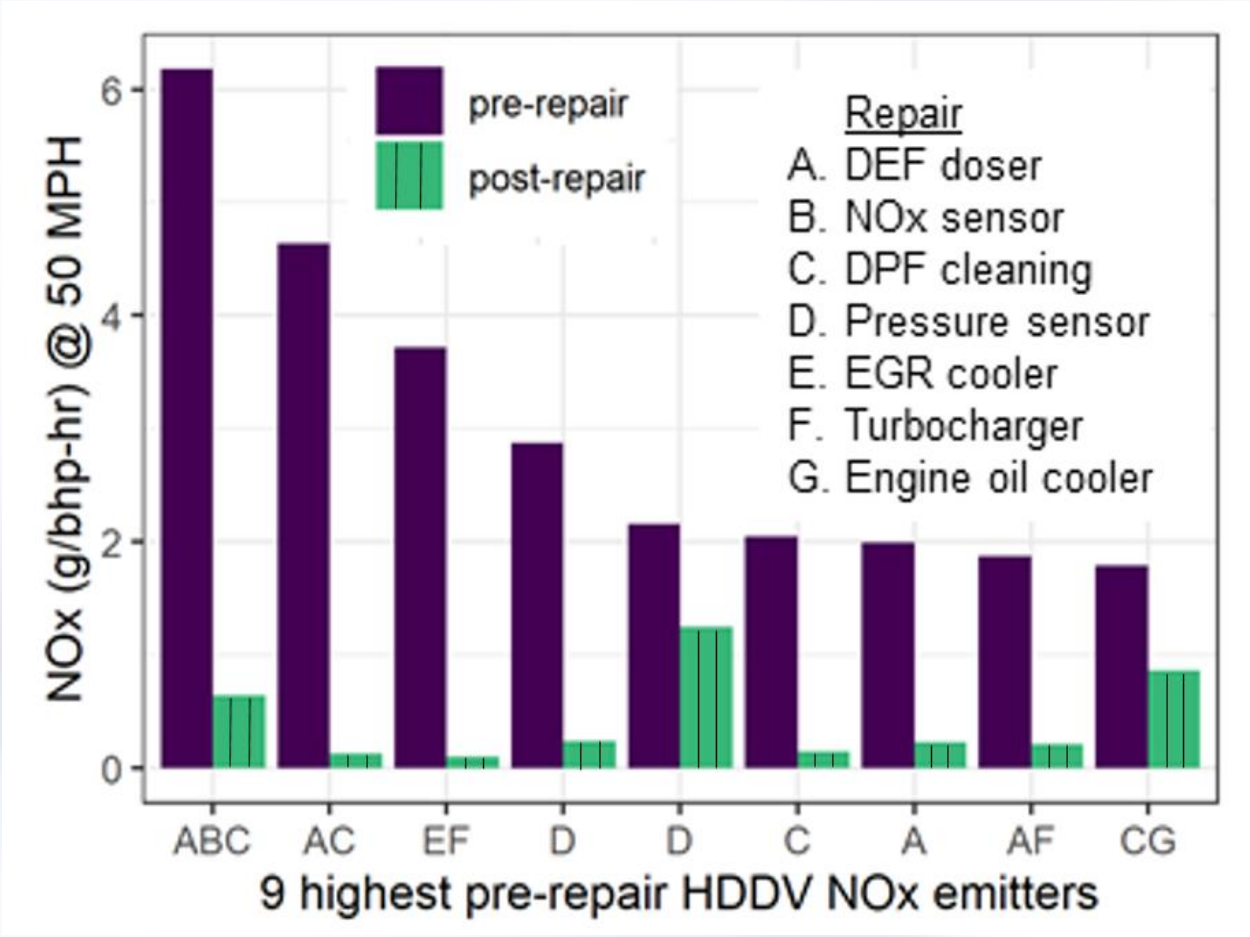
- University of California at Riverside, Center for Environmental Research and Technology – Contract #15R0D22
  - January 2019 final report: https://ww2.arb.ca.gov/sites/default/files/classic//research/apr/past/15rd022.pdf

- Study purpose: Evaluate options for a more comprehensive HD I/M program

- Methodology: Conducted small-scale research prototype
  - Review of existing I/M programs
  - Measured pre- and post-repair emissions of 50 vehicles with common emissions-related malfunctions
  - Tested potential emissions testing instrumentation for use in a future program

1) Main Takeaways from HD I/M Feasibility Study

- Repairs reduced NOx by 50 to over 75 percent
- Repairs cost $250 to $8,660; average cost was $2,037 each
- Recommended Program Design: Periodic OBD data collection w/roadside emissions monitoring
- Chassis dynamometer, portable emissions measurement system (PEMS) not recommended for statewide vehicle compliance testing



2) OBD Testing Assessments

- Study objectives:
  - Demonstrate potential devices that could be used to collect data as part of the HD I/M program
  - Assess whether testing devices will be able to reliably collect OBD data parameters proposed as part of the future HD I/M program
  - Assess potential costs associated with repairing OBD related non-compliance issues
- Methodology:
  - In coordination with participating vendors, collect OBD data from about 350 HD vehicles using their proprietary OBD devices
  - Assess historical OBD fault code data from about 180,000 HD vehicles to determine potential repair issues and work with HD repair industry participants to assess potential costs to repair

2) Current OBD Assessment Findings

- OBD Testing Results
  - OBD data collection testing efforts included vehicles from each OEM
  - All proposed OBD data fields are consistently being collected except for DM30 (PGN 41984)
    - Future updates to vendor devices to incorporate collection of DM30
  - OBD scans completed in about 1.5 to 3.5 minutes.
  - The required data is readily available on HD vehicles for download
- Analysis of fault codes/repairs estimate average repair costs for OBD non-compliance issues at ~$2,000

3) Development and Demonstration of ALPR Cameras

- In 2020, CARB initiated contracts to install ALPR cameras at various Southern CA locations to:
  - Assess data accuracy and efficacy
  - Assess potential challenges for use within the future HD I/M program
  - Identify methods to improve ALPR system performance

Site	# License Plate Records	Capture Rate	Data Collection Period
Site #1	12,233	77%	5/19 - 6/24/2021
Site #2	38,133	74%	5/26 - 6/15/2021

3) ALPR Camera Findings

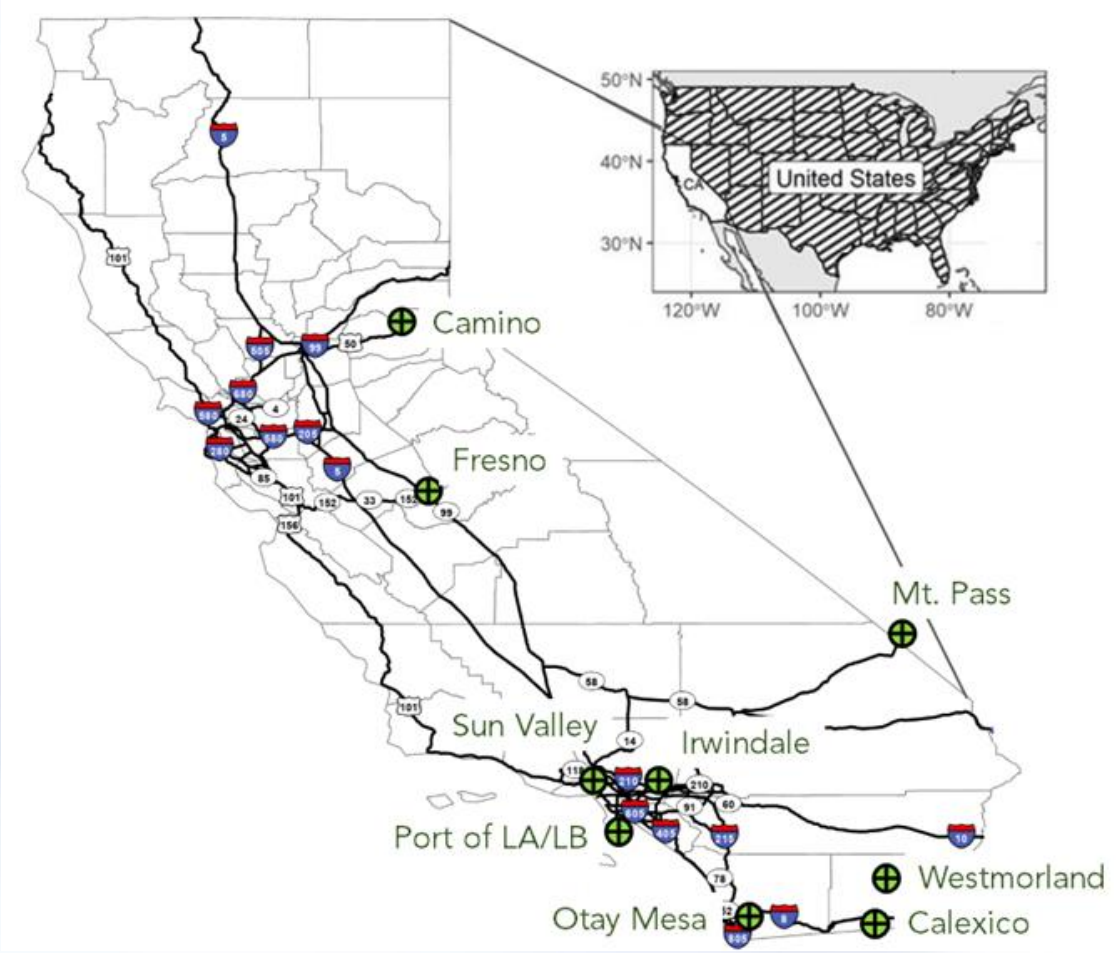
- Lessons learned:
  - ✓ Camera positioning and software calibration is key to increase capture rate
  - ✓ Certain types of plates are more difficult to recognize than others due to differences in their reflectivity (reflectivity of plates changes from one state to another)
  - ✓ Roadside power can be inconsistent
  - ✓ Certain times of day present challenges (e.g., lighting)

Accuracy by Time of Day:

Light Conditions	Accuracy
Dusk	84%
Night	77%
Dawn	70%

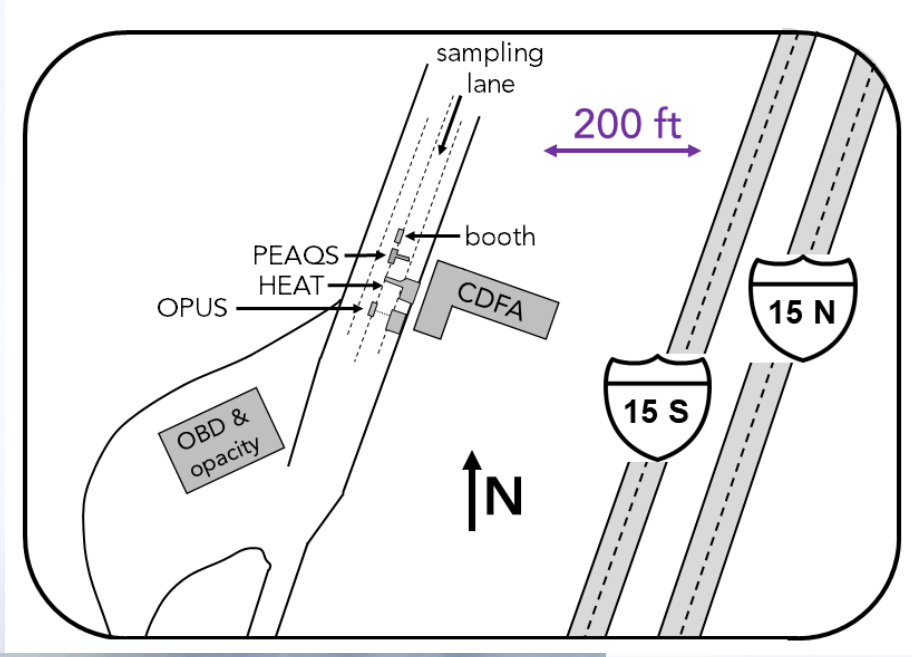
4) REMD – PEAQS Activities

- Deployed mobile PEAQS at multiple locations in 2020 and 2021
  - 16,252 vehicles screened
  - 47 citations issued
- Unattended PEAQs
  - San Bernadino and Riverside
  - 238,000 vehicles screened
  - 53% out-of-state



4) REMD - Concurrence Testing

- Two-week field campaign in Nov 2020 at the CDFA station in Mt. Pass (I-15 CA-NV border)
- Over 10,000 heavy duty vehicles sampled by Roadside Emissions Monitoring Devices (PEAQS, HEAT, Opus)
- OBD scans/opacity testing on over 100 vehicles



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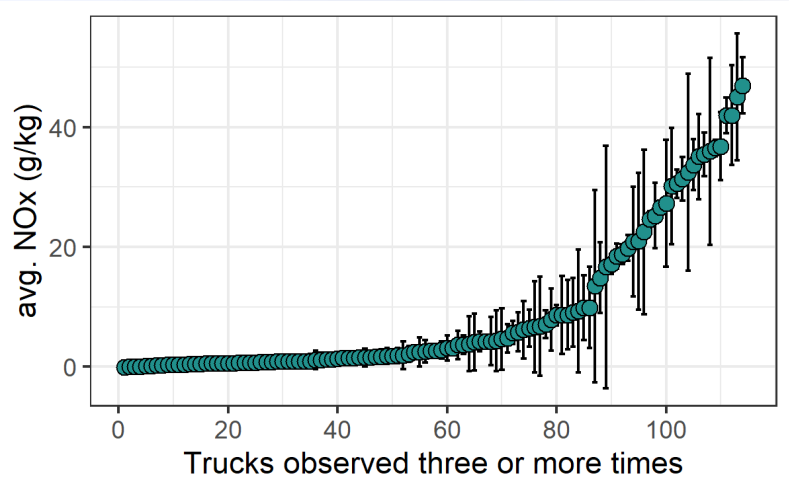
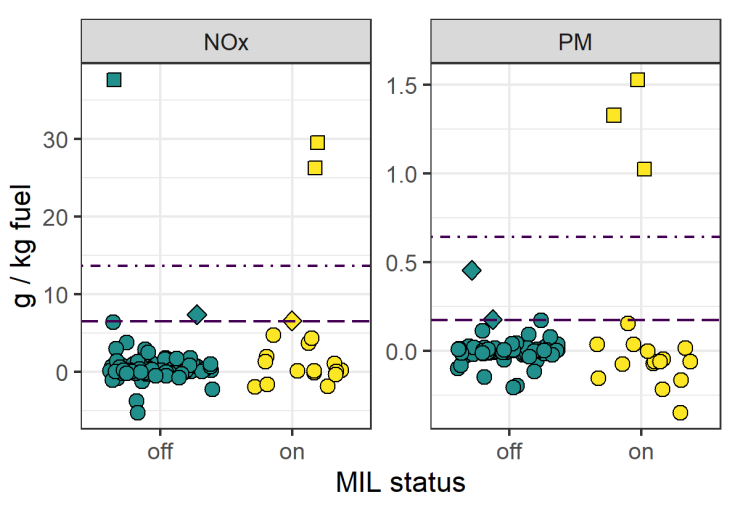
4) Concurrence Testing Analysis

- All three REMDs displayed strong potential to identify vehicles with high emissions.
- Proposed OBD parameters continued to be reliably collected on vehicles sampled during campaign
  - 17% of vehicles tested had MIL-on issues during campaign
- CARB will continue internal testing and validation to refine mechanism to flag non-compliant vehicles prior to HD I/M full implementation

Repeat Vehicle Measurements sampled from REMD during campaign



Comparison of REMD measured emissions to OBD tests from same vehicle

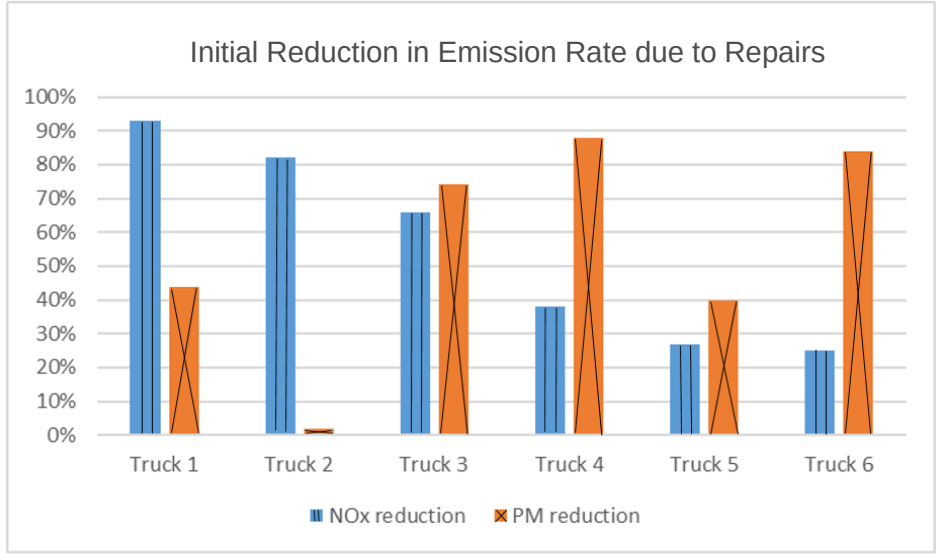


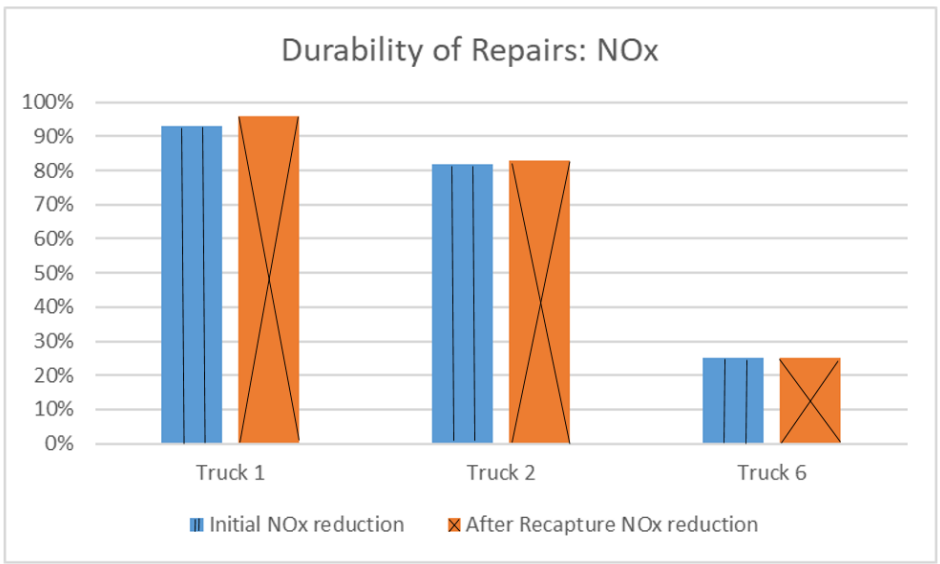
5) San Joaquin Valley Repair Assistance Program

- CARB $1 million grant to the San Joaquin Valley Air Pollution Control District to implement pilot
- Modeled on light-duty repair assistance program
- Could assist small owner-operators bring vehicles into compliance
- Vouchers issued for 156 total repairs at three repair shops
- Challenges:
  - Funding
  - Setting eligibility qualifications
  - Determining eligible repairs
  - Lack of standardized repair estimate requirements in HD industry

6) HD Repair Durability Study

- Study to evaluate ability to repair seriously malfunctioning vehicles and evaluate durability of repairs
- Measure pre-repair and post-repair emissions of vehicles
- Vehicles recaptured for follow-up emissions retesting when feasible to access lasting effectiveness of repairs
- Repairs were found to be feasible, effective, and durable in reducing excess emissions





Summary of Pilot Efforts

- Program piloting potential vehicle compliance and enforcement technologies that could be used in the future HD I/M program
- OBD + REMD testing suggested to be best suited combination of technologies for a future statewide program
- OBD testing technologies demonstrated to be capable of reliably collecting OBD parameters of interest and diagnosing emissions related vehicle issues.
- ALPR technology seen to capture about 80% of license plates
- REMDs
  - Good inter-system correlation and repeatability for NOx
  - Potential to identify MIL-on issues
- Repairs for identified emissions related issues found to be feasible and effective at reducing emissions
- CARB plans to continue further testing to refine components of the future HD I/M system prior to the roll out of each phase of implementation

Overview of Updated Draft Proposed HD I/M Program Components

HD I/M Vehicle Applicability

Draft Proposed

- On-road heavy-duty vehicles (non-gasoline) operating in California with a gross vehicle weight rating (GVWR) > than 14,000 pounds
  - In-state, out-of-state/country
  - Owner-operators
  - On-road vehicles with off-road engines used for motive power
- Does not apply to:
  - Zero-emissions trucks
  - Military tactical vehicles
  - Emergency vehicles
  - New vehicles with engines certified to most stringent optional NOx standard (first 4 years of program)
  - Motorhomes registered outside of California
  - Vehicles operating under an experimental permit
  - Historical vehicles
  - Gasoline vehicles > 14,000 pounds GVWR (covered in BAR's Smog Check program)

Draft Proposed

Vehicle Owner/Driver Responsibilities

Vehicle Owner Responsibilities:

- Perform periodic vehicle compliance tests
- Register with HD I/M database and report owner/company information and vehicle information
- Obtain/maintain vehicle compliance certificate in the vehicle
- Maintain documentation about the hiring entity and keep in the vehicle

Driver Responsibilities:

- Show compliance certificate to the inspector or officer upon request
- Show documentation about the hiring entity upon request
- Allow inspectors to perform requested vehicle compliance inspections

Compliance Certificate Requirements

- All vehicles must have a valid HD I/M compliance certificate to legally operate in California
- Criteria to obtain compliance certificate:
  - Reported owner and vehicle information
  - In good standing with periodic testing requirements
  - No outstanding enforcement actions on the vehicle in question
  - No outstanding emissions related recalls past due
  - Pay annual compliance fee
- DMV registration block would be placed on California vehicles that have not demonstrated compliance with the HD I/M program

Vehicle Compliance Tests

- OBD vehicles:
  - OBD data submission
  - No MIL-related issues
  - Submissions performed via telematics and/or scan tool devices

- Non-OBD vehicles:
  - SAE J1667 opacity test (diesel only)
  - Emissions Control Equipment Inspection

- Testing performed by a HD I/M tester with exception of telematics based OBD submission

Periodic Compliance Testing Requirements

Draft Proposed

NEW

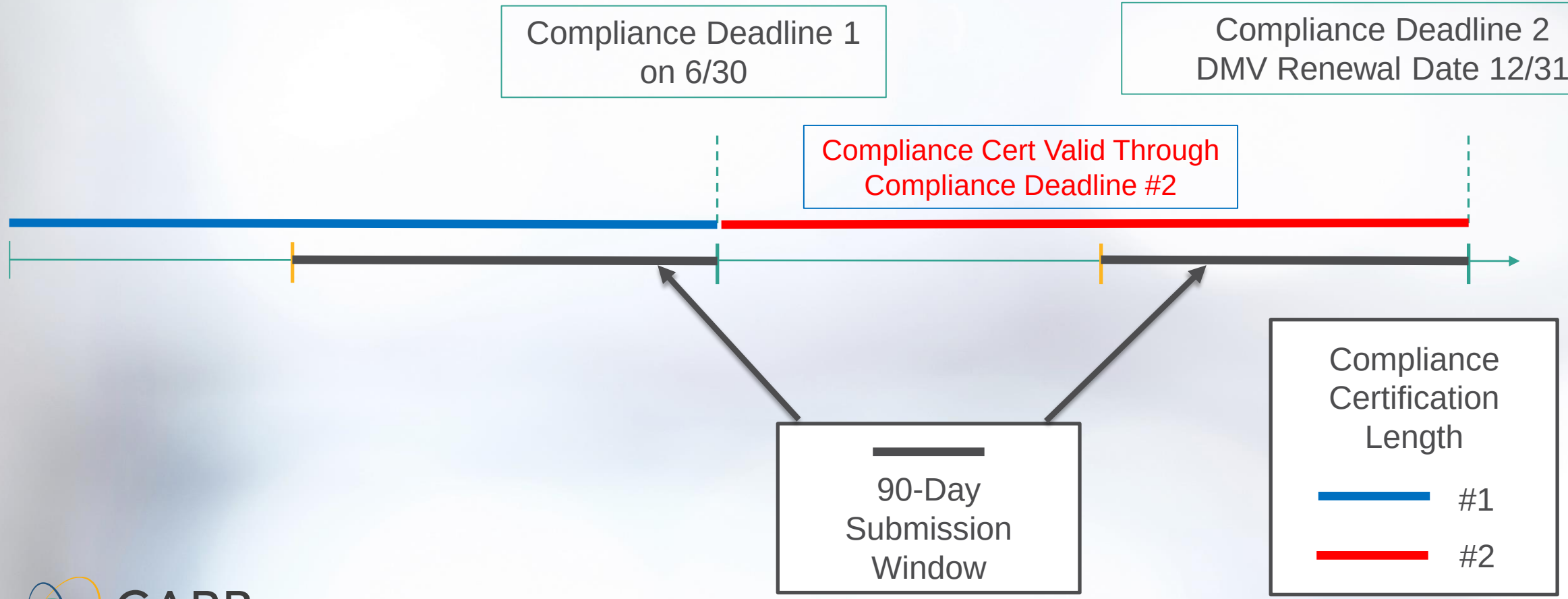
- Frequency of testing
  - 2x per year testing for all vehicles
  - 1x per year for California registered motor homes

- Submit passing test within 90 days of compliance test deadlines:
  - CA registered vehicles: based on DMV registration date
    - Second compliance deadline six months from DMV registration date (i.e., March 15 and September 15)
  - Out-of-state registered vehicles: based on last number of VIN
    - VIN ending in “5” has compliance deadline of March 31
    - Second compliance deadline on September 30

Periodic Testing Submission Timing

Draft Proposed

- Passing compliance test submission within 90 days of compliance deadline



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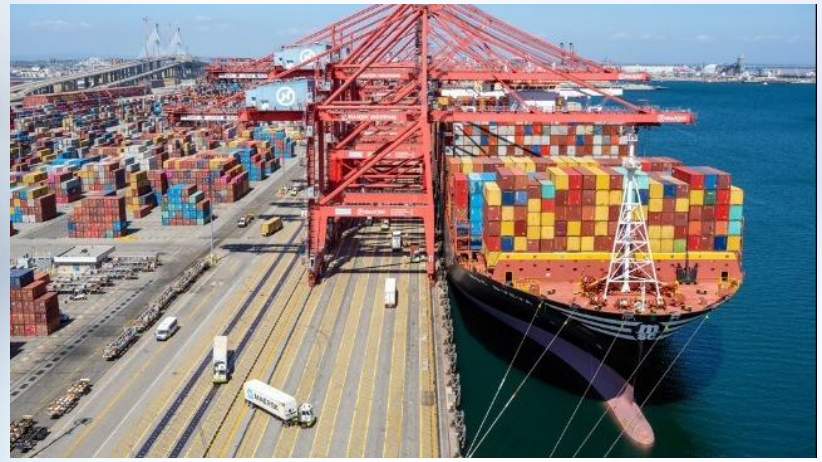
Freight Contractor, Broker, and Applicable Freight Facility Requirements

- Freight Contractors and Brokers must check for compliance documents and retain records
- Applicable Freight Facilities (Seaport Facilities and Intermodal Railyards) must check that only compliant vehicles enter/operate on their properties or maintain records of non-compliant vehicles



Draft Proposed

Freight Contractor, Broker, and Applicable Freight Facility Requirements

- Freight Contractors, which include shippers, receivers, motor carriers and/or any other intermediary are required to:
  - Verify compliance before entering into contracts
  - Maintain records of compliance documentation, transactions, and agreements
- Brokers are required to:
  - Verify compliance before arranging transportation
  - Maintain records of compliance documentation and dispatching motor carrier information
- Applicable Freight Facilities are required to:
  - Attest that only compliant vehicles will enter and operate on their property; or
  - Maintain records of non-compliant vehicle information

Draft Proposed

HD I/M Tester Requirements

NEW

- Individuals approved to perform HD I/M compliance tests on vehicles after completing training
  - Testers not limited to CA, can be based anywhere
- Online training course will consist of training modules:
  - Regulatory requirements
  - Smoke opacity compliance testing
  - OBD compliance testing
  - Vehicle emissions control inspections
- Credential renewal required every two years
- HD I/M testers to submit vehicle compliance tests through tester accounts created in HD I/M database system

Compliance Extension: Unavailability of Repair Parts

Draft Proposed

NEW

- Compliance extension due to parts not being available to complete the needed repairs
  - Option for fleets of 3 or fewer vehicles
  - Owners required to make a good faith effort to bring vehicles into compliance
  - Conditional certificate extends requirement to demonstrate compliance to the next testing cycle

Other Compliance Extension Concepts to Discuss

- Compliance extension to allow for zero-emission vehicle purchase replacement
  - Extend operation of defective truck out to next compliance cycle if owner wants to scrap vehicle for a zero-emission vehicle instead of completing the repair
  - Would such a provision help incentivize small fleets transition to zero-emission vehicles?
  - Would emission impact due to continued operation of defective truck prior to replacement minimize benefit of zero-emission truck purchase?
- Unavailability of repair facilities
  - Would additional time allowed for compliance with proposed move to 2x per year periodic testing minimize need for such an extension?

Draft Proposed

OBD Device Certification Overview

- Device vendors required to certify their remote OBD (ROBD) testing devices
  - Continuously connected
  - Non-continuously connected
- Vendors may choose which OBD protocols (e.g., SAE J1939 or J1979) their devices support
  - Upon adoption of the SAE J1979-2 protocol, ROBD devices supporting SAE J1979 shall also meet the requirements of the SAE J1979-2
- Vendors required to receive an Executive Order (EO) to sell and use their tools for HD I/M compliance determination
  - Recertify on an annual basis
- Following successful certification, each individual OBD device used in HD I/M program must be registered with CARB

Draft Proposed

Device Certification Testing Requirements

Vendor Initial Validation Testing

- Perform internal laboratory testing verifying proper device responses

CARB Device Verification Testing

Vendor Field Testing

- Minimum 100 vehicles for non-continuously connected device per OBD protocol
- Minimum 100 data submissions/30 vehicles for continuously connected device per OBD protocol
- Minimum 50 data submissions/10 vehicles for OEM specific vehicle

NEW

Draft Proposed

HD I/M Implementation Phase-In Schedule

- First Phase – Begins **January 1, 2023**
  - Vehicle screening begins via REMD
  - Vehicle owners establish accounts in HD I/M database by July 1, 2023
- Second Phase – Begins **July 1, 2023**
  - Enforcement of compliance certificate requirements starts
  - DMV registration holds for California registered vehicles start
  - Freight contractor, broker, freight facility requirements start
- Third Phase – Begins in **2024**
  - Periodic testing starts
  - Certified devices required for OBD submissions

Roadside Emissions Monitoring Network

Draft Proposed

Roadside emissions monitoring devices (REMD) to be deployed throughout the state

- **January 1, 2023**: begin screening for potential high emitting vehicles for follow-up testing
- Vehicle owner will be issued a Notice to Submit for Testing (NST)

Criteria for flagging vehicles as potential high emitters:

- OBD vehicles: NOx and/or PM emissions that exceed equivalent OBD trigger threshold
- Non-OBD vehicles: PM emissions that exceed equivalent smoke opacity standard

Roadside Emissions Monitoring with PEAQS

Unattended PEAQS system in operation in San Bernardino

- CARB developed PEAQS for reliable, unattended use
- Recent improvements to ALPR system: plate capture rate > 90%
- Continuous improvements to PEAQS units
  - Upgrade sensors, diagnostic information, and analytics over time
  - Differentiate Transport Refrigeration Unit (TRU) and tailpipe exhaust
  - Identify US DOT number

Sunsetting of Current Inspection Programs

Draft Proposed

NEW

- HDVIP sunsets upon effective date of HD I/M program (start of Phase 1 in 2023)

- PSIP sunsets upon implementation date of periodic testing (start of Phase 3 in 2024)

NEW

Estimated HD I/M Program Costs and Benefits

- OBD testing device costs:
  - Purchase costs for non-continuously connected devices (dongles, hand-held): ~$400 per device
  - Incremental subscription costs for add-on OBD data transmission capability to a current telematics service
- Repair costs: ~$2,000 average repair cost
- Compliance certificate fee: $30 per vehicle
- Projected statewide emission benefits in 2024
  - NOx: 30 tons/day reduced
  - PM: 650 pounds/day reduced
- Projected cost effectiveness
  - $1.84/pound NOx reduced
  - $62.27/pound of PM reduced

Next Steps: HD I/M Development

- Late summer: SB 210 pilot program report will be posted on CARB website
- Summer through December 2021: additional meetings with stakeholders
- October 12, 2021: HD I/M Proposed Regulation and Staff Report publicly available
  - **October 15: 45-day public comment period begins**
- Board hearing: December 9 -10, 2021

For More HD I/M Program Information

- Visit CARB's website at: https://ww2.arb.ca.gov/our-work/programs/heavy-duty-inspection-and-maintenance-program
- Subscribe to receive HD I/M email updates at: https://public.govdelivery.com/accounts/CARB/subscriber/new?topic_id=hdim
- Contacts:
  - Krista Fregoso at Krista.Fregoso@arb.ca.gov
  - James Goldstene at James.Goldstene@arb.ca.gov
  - Bob Nguyen (Compliance time extensions) at Bob.Nguyen@arb.ca.gov

OPEN DISCUSSION

Options to ask questions:

- Use Zoom's "raise hand" button in the webinar window - staff will unmute you
- Type your question in Q&A in the webinar window
- For those who joined via a conference call, press #2 to "raise hand"