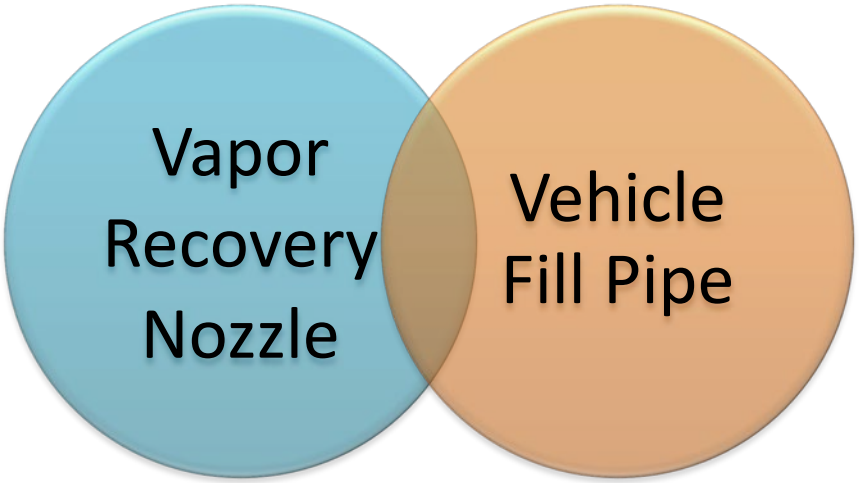
CALIFORNIA
AIR RESOURCES BOARD

PUBLIC WORKSHOP TO DISCUSS:

Proposed Amendments to Vapor Recovery Nozzle and Vehicle Fill Pipe Regulations to Help Address Storage Tank Overpressure



May 23, 2018: Diamond Bar, CA

Housekeeping

- Participant Sign-In, Restrooms, Emergency Exits
- For those joining remotely (via “listen only” conference line and webinar), email your comments and questions to vapor@arb.ca.gov
- Presentation, draft regulatory text, webinar access, and conference call information at: https://ww2.arb.ca.gov/our-work/programs/vapor-recovery
- Please hold questions/comments until the end of each discussion topic

Discussion Topics

1. Refresher on Overpressure
2. Importance of Nozzle and Vehicle Fill Pipe Interface
3. Regulatory Proposal
   a) Amendments to vehicle fill pipe dimensions
   b) Amendments to nozzle dimensions
4. Rulemaking Process/Next Steps

Prior Workshops on Overpressure

- November 2012- Early regulatory proposal
- September 2013- Planning for statewide data collection project
- March 2014- Results of statewide data collection project, preliminary emission impact
- November 2015- Results of nozzle related field studies, plan for second statewide data collection project
- December 2017- Results of second statewide data collection project, proposed menu of options

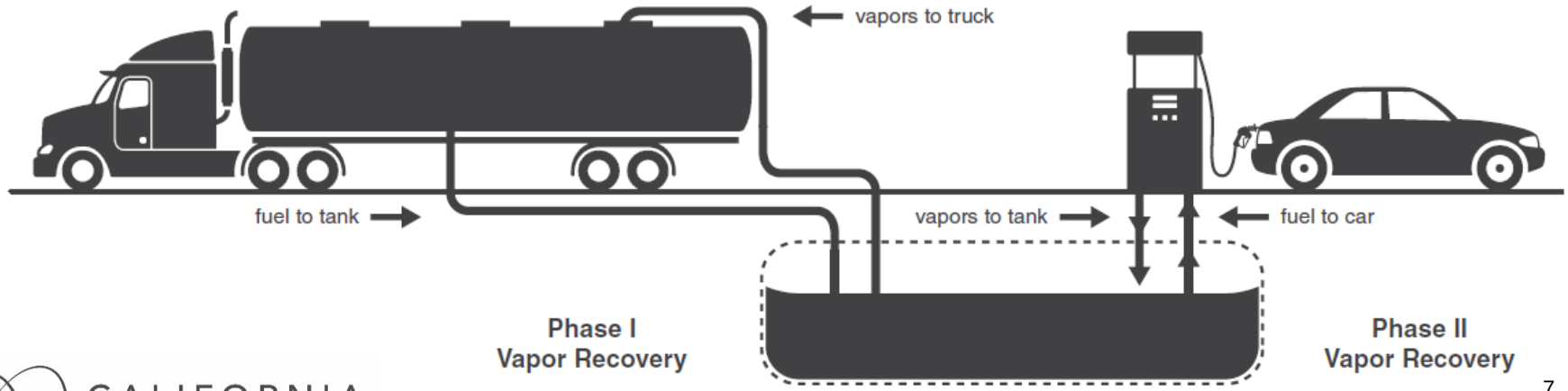
Purpose of Today's Workshop

1. Describe regulatory strategy to address overpressure:
   - Immediate- focus on nozzle and vehicle fill pipe dimensions, October 25, 2018 Board Hearing
   - Future- amendment to ISD alarm thresholds, early 2020 Board Hearing
2. Provide draft regulatory text pertaining to nozzle and vehicle fill pipe dimensions
3. Solicit stakeholder feedback on proposal and alternatives

Discussion Topic #1: Refresher on Overpressure

California's Vapor Recovery Program

- ~15 billion gallons of gasoline consumed/year
- ~10,000 gasoline dispensing facilities (GDFs) with Phase I & II Enhanced Vapor Recovery
- ~7,400 GDF equipped with In-Station Diagnostic (ISD) systems
- ~240 tons of Volatile Organic Compounds (VOC) controlled per day



Gasoline Dispensing Facility: Sources of Vapor Emissions

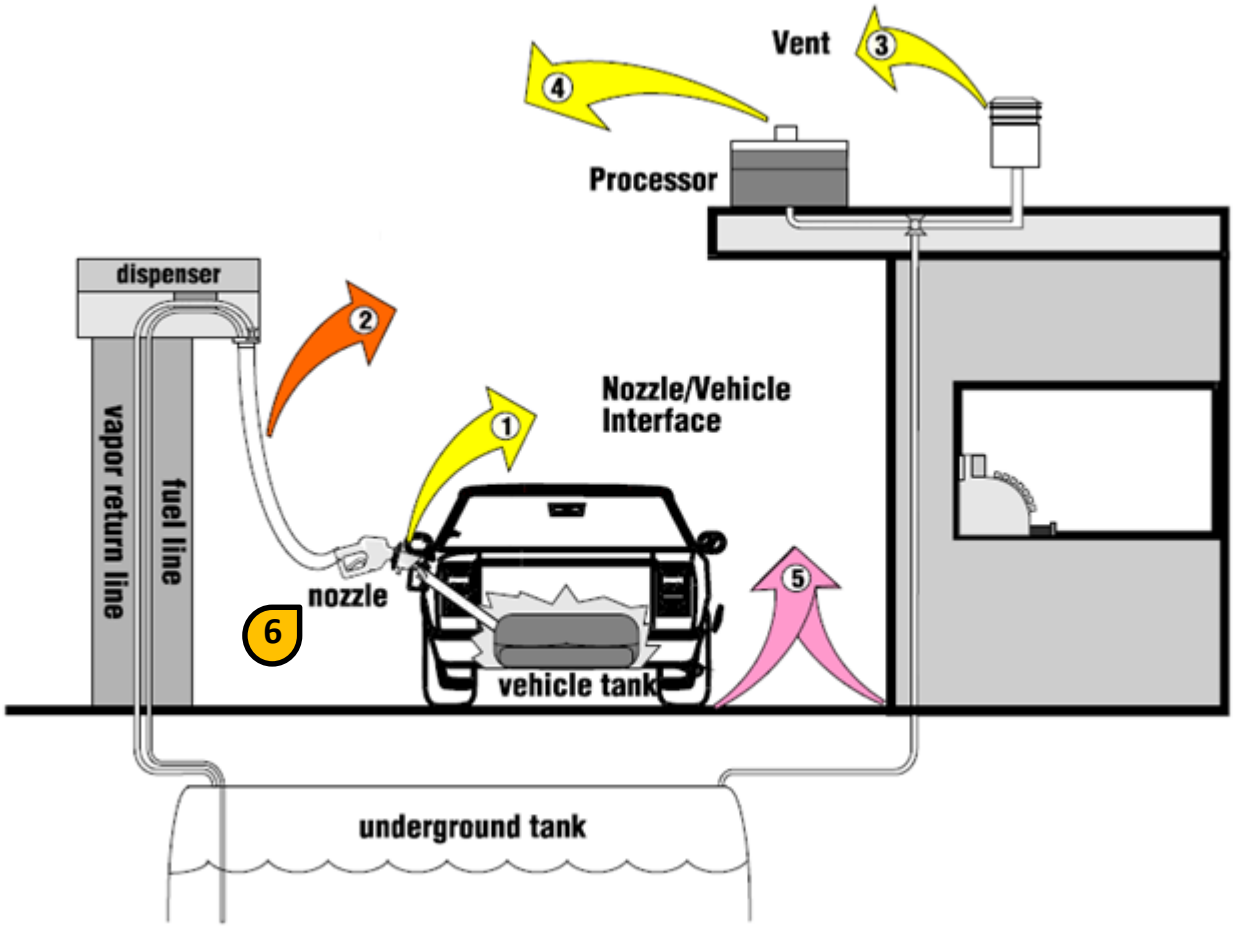


Figure	Emission Point
1	Vehicle Fueling
2	Hose Perm
3	Vent Line
4	Vapor Processor
5	Pressure Driven Fugitive
6	Nozzle Spillage
N.A.	Bulk Fuel Deliveries

In-Station Diagnostics (ISD) and Overpressure Alarms

- Monitors important vapor recovery system parameters: containment leaks, nozzle collection, & pressure in the headspace of storage tanks
- Alerts GDF operators of potential equipment failures, ensures prompt repair
- High frequency of overpressure alarms occur in the winter time with no equipment failure
- Advisory 405 issued to provide temporary relief from the expense of alarm response

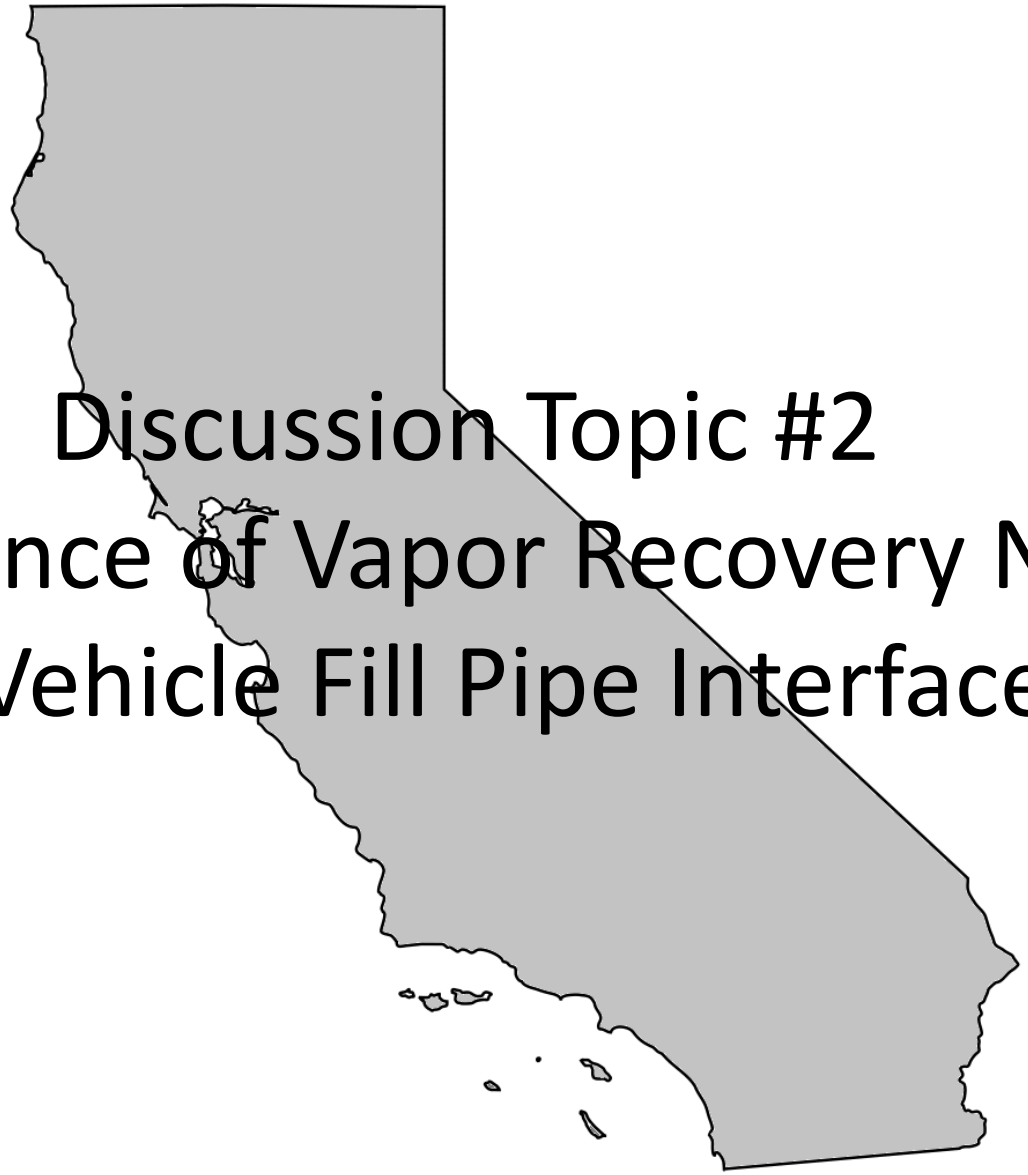
What Causes Overpressure?

- Primary Causes:
  - High Reid Vapor Pressure (RVP) of winter blend gasoline
  - Excess air ingested due to poor seal at vapor recovery nozzle and vehicle fill pipe interface

- Other Contributors:
  - GDF monthly throughput
  - GDF maintenance practices
  - GDF operating hours

Why Are We Concerned?

1. Overpressure ISD Alarms
   - Cost of response when no problem found with vapor recovery equipment (winter time)
   - Disruptive to GDF operations
2. Air Quality Impacts
   - Statewide VOC emission increases of ~4.8 TPD year round (~11.2 TPD winter, ~1.5 TPD summer)
   - Potential near source health risk issues at certain sites due to increased benzene exposure



Discussion Topic #2
Importance of Vapor Recovery Nozzle & Vehicle Fill Pipe Interface

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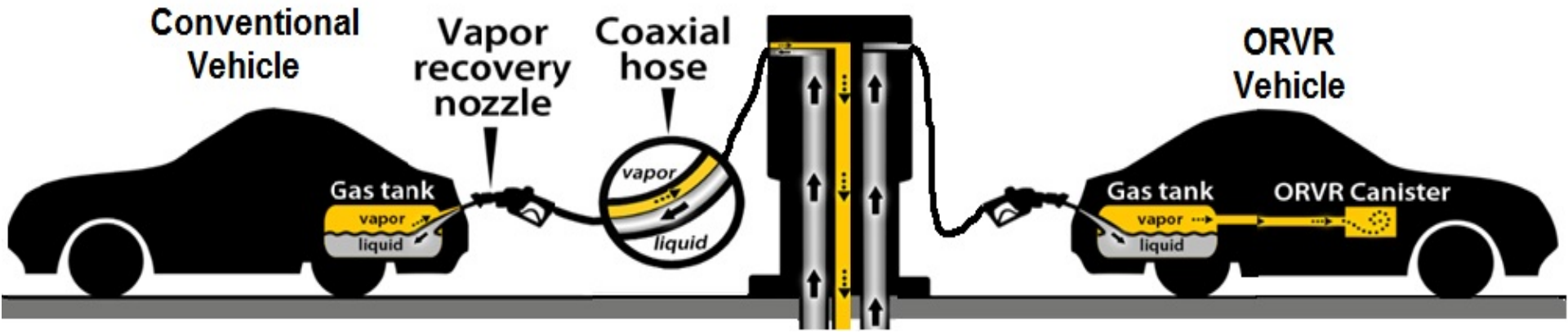
Importance of Vapor Recovery Nozzle and Vehicle Fill Pipe Interface



Conventional Vehicle

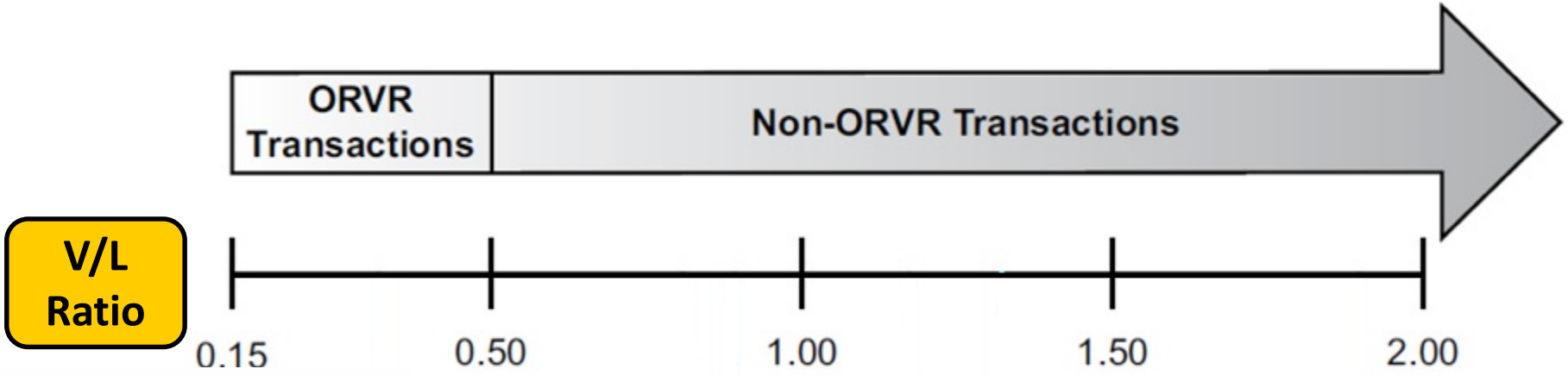
- Vapors exit the vehicle fill pipe during fueling, captured by the vapor recovery nozzle, and returned to GDF storage tank
- Proper seal is needed at nozzle to prevent vapors from entering the atmosphere
- ~18% of CA vehicle population

ORVR Vehicle

- Vapors captured by on-board canister and later burned by the engine
- Proper seal is needed at nozzle to prevent fresh air from entering the gas station storage tank
- ~82% of CA vehicle population

Expected "Vapor to Liquid" Ratio for ORVR Vehicles

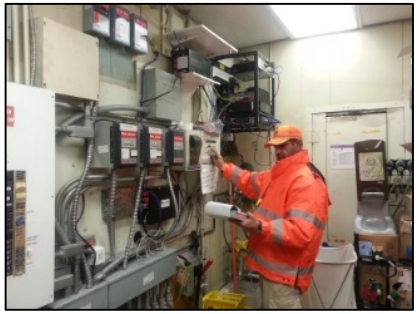
- Phase II vapor recovery systems are designed to reduce the volume of vapor collected relative to volume of liquid dispensed (V/L) when fueling ORVR equipped vehicles
- V/L > 0.5 on ORVR vehicles results in excess air ingestion which leads to vapor growth in the storage tank
- Field studies indicate gas stations with severe overpressure also exhibit an elevated V/L site average



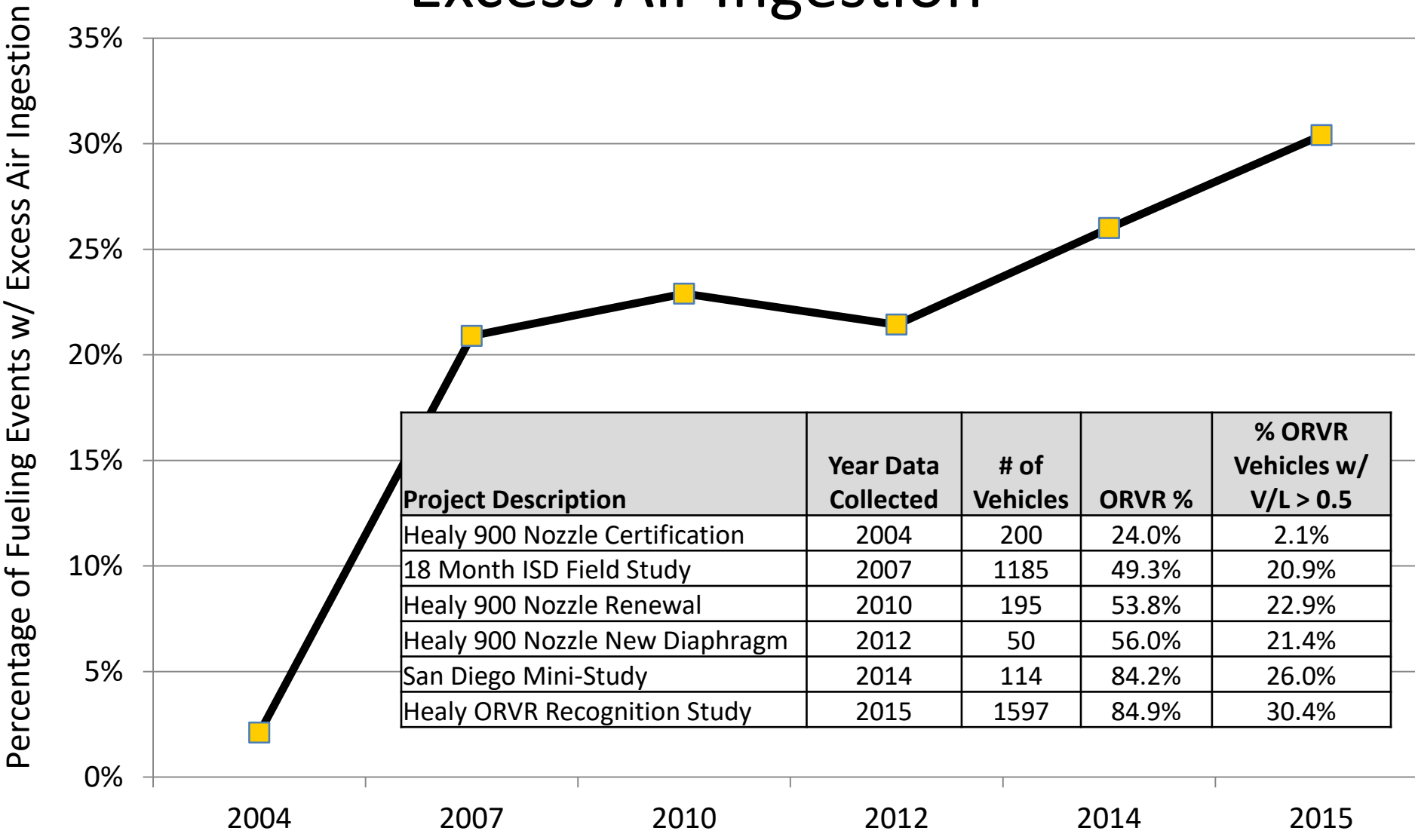
Study to Determine Excess Air Ingestion from Assist Nozzle

- Conducted in January 2015, at six GDF in San Diego
- 1,729 vehicle refueling observations: 1,356 ORVR

Vehicle Population	Percentage of Fueling Events with Excess Air Ingestion
All ORVR Equipped Vehicles	30%
ORVR With Capless Style Fill Pipes	75%
ORVR With Bayonet Style Fill Pipes	77%



Prior Studies Show Increasing Trend for Excess Air Ingestion



Project Description	Year Data Collected	# of Vehicles	ORVR %	% ORVR Vehicles w/ V/L > 0.5
Healy 900 Nozzle Certification	2004	200	24.0%	2.1%
18 Month ISD Field Study	2007	1185	49.3%	20.9%
Healy 900 Nozzle Renewal	2010	195	53.8%	22.9%
Healy 900 Nozzle New Diaphragm	2012	50	56.0%	21.4%
San Diego Mini-Study	2014	114	84.2%	26.0%
Healy ORVR Recognition Study	2015	1597	84.9%	30.4%

Capless Fill Pipes with Open Drain

Bayonet Style Fill Pipes with Obstructed Face Seal

Outer Ring

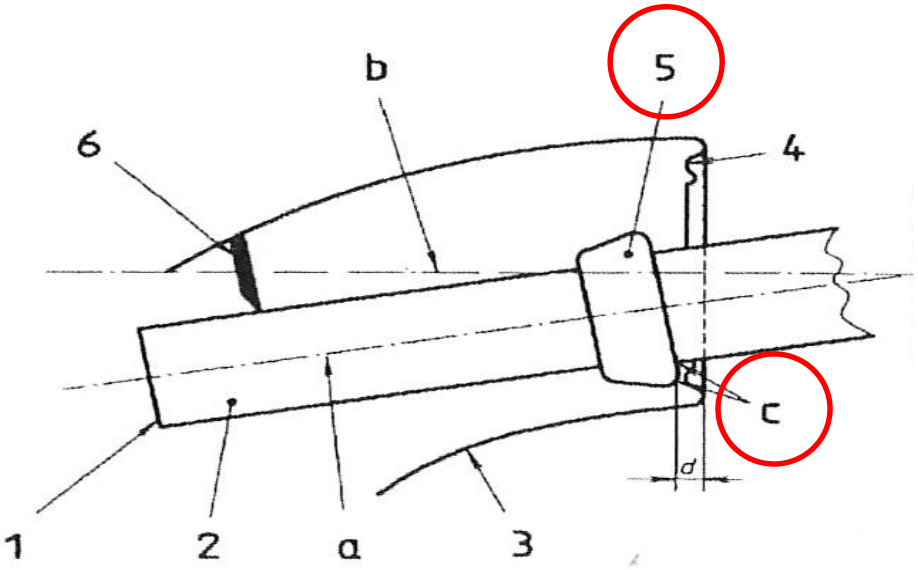
Fill Pipe Sealing Surface

Outer Ring

Fill Pipe Sealing Surface

Loose Latch

- V/L can vary depending on whether nozzle is securely latched within the vehicle fill pipe
- Depth of fill pipe locking lip is a key contributor
- Proposed nozzle dimensions seek to address this issue



Item	Description
5	Nozzle Latch ring
C	Fill pipe locking lip

Secure Latch & Loose Latch

Secure Latch

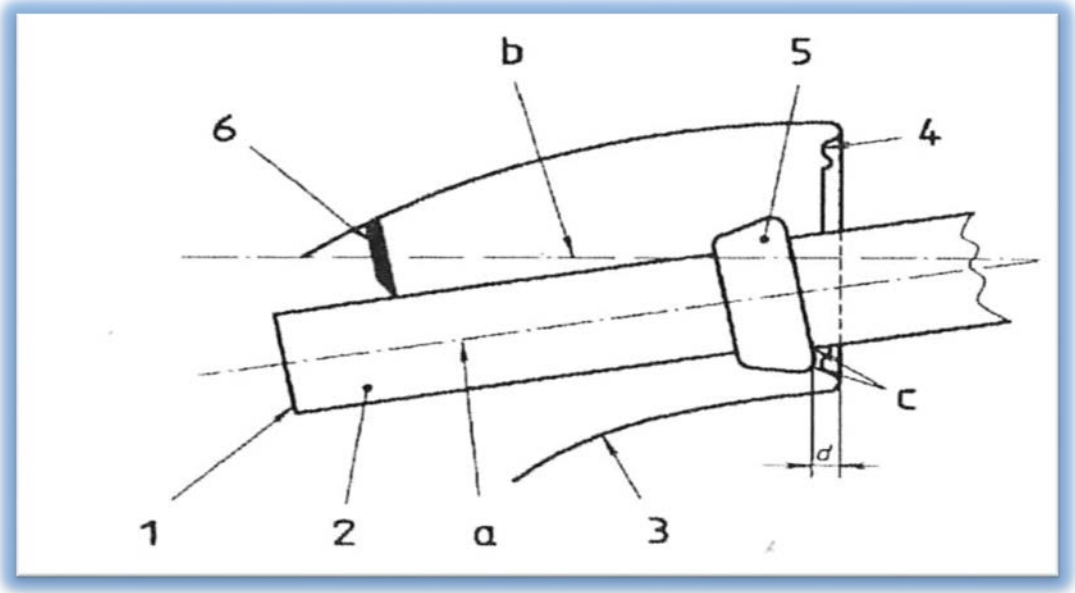
Loose Latch

Summary of Findings

- In addition to winter blend gasoline, excess air ingestion during vehicle refueling is a key contributor to overpressure
- Excess air ingestion is caused by poor seal at the vehicle fill pipe interface due to:
  - Vehicle fill pipe design (openings, obstructed face seal)
  - Vapor recovery nozzle design (latch ring, boot face shape)
- Refinement of existing vapor recovery nozzle and vehicle fill pipe dimensional specifications are needed to improve compatibility

Discussion Topic #3A: Proposed Amendments to Vehicle Fill Pipe Dimensions

Switch to Vehicle Fill Pipe Dimensions Slide Presentation



Discussion Topic #3B: Proposed Amendments to Vapor Recovery and ECO Nozzle Dimensions

Why Amend Nozzle Dimensional Requirements?

- Many ORVR vehicle fill pipes are not compatible with vapor recovery nozzles due to:
  - capless with open drain path, unsealed construction
  - obstructed face seal, secondary outer ring
  - depth of locking lip
- Vehicle manufacturers willing to make changes, but need better defined nozzle dimensions to design compatible fill pipes

SAE Fuels System Task Force

- Comprised of nozzle and vehicle manufacturers, fill pipe suppliers, and CARB staff
- Over 12 meetings since task force formation in May 2016
- Amendment of two existing SAE documents to improve nozzle at vehicle fill pipe compatibility:

  J285: Dispenser Nozzle Spouts for Liquid Fuels Intended for Use with Spark Ignition and Compression Ignition Engines

  J1140: Filler Pipes and Openings of Motor Vehicle Fuel Tanks

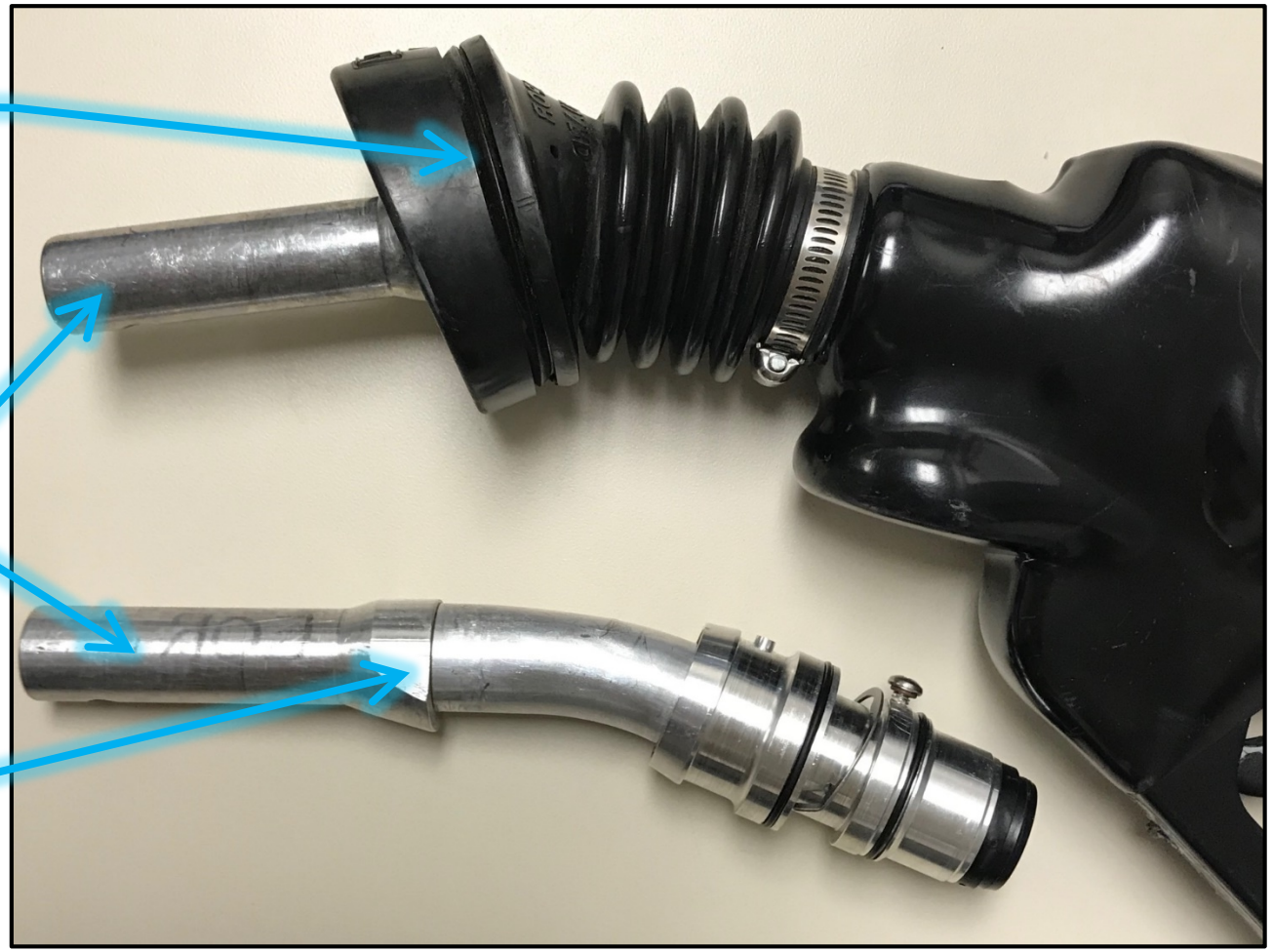
Proposed Spout Dimensions: Key Terminology

Vapor recovery:
Nozzle Bellows
(boot)

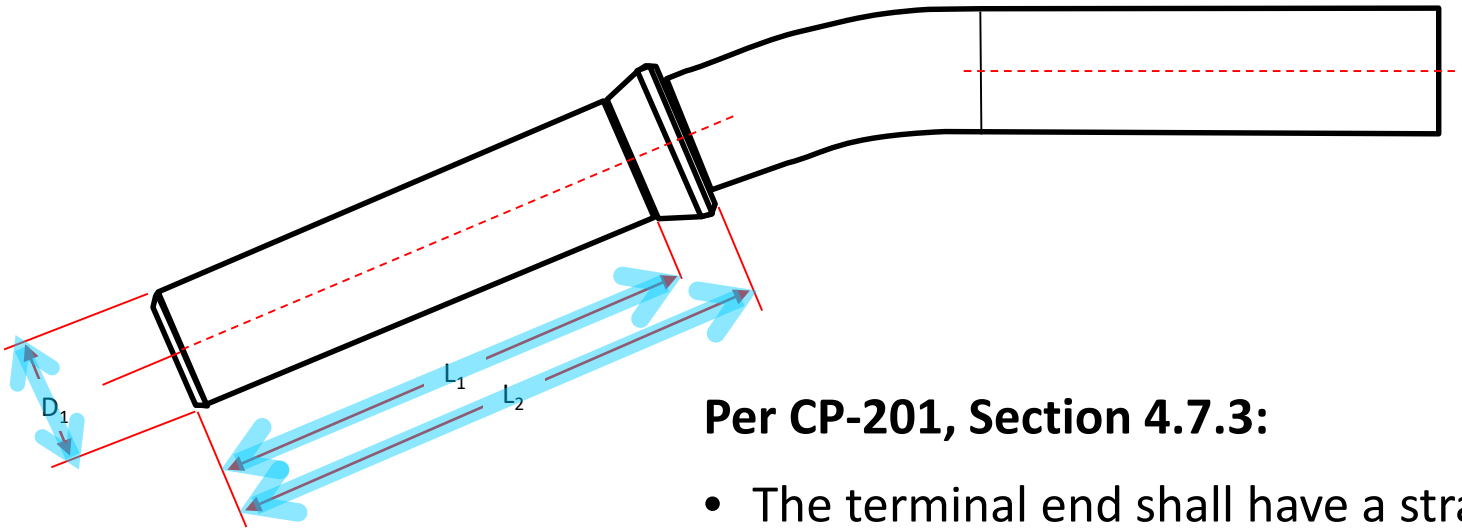
ECO nozzle:
Interlock Device

Nozzle
Spout

Anchor
(latch ring)



Current Spout Dimensions



Per CP-201, Section 4.7.3:

- The terminal end shall have a straight section of at least 2.5 inches (6.34 cm) in length; **(L_1)**
- The outside diameter of the terminal end shall not exceed 0.840 in (2.134 cm) for the length of the straight section; **(D_1)**
- The latch ring shall terminate at least 3.0 in (7.6 cm) from the terminal end; **(L_2)**

Proposed Spout Dimensions

Refinement of 3 existing, plus 16 new dimensions for EVR nozzles. Key items include:

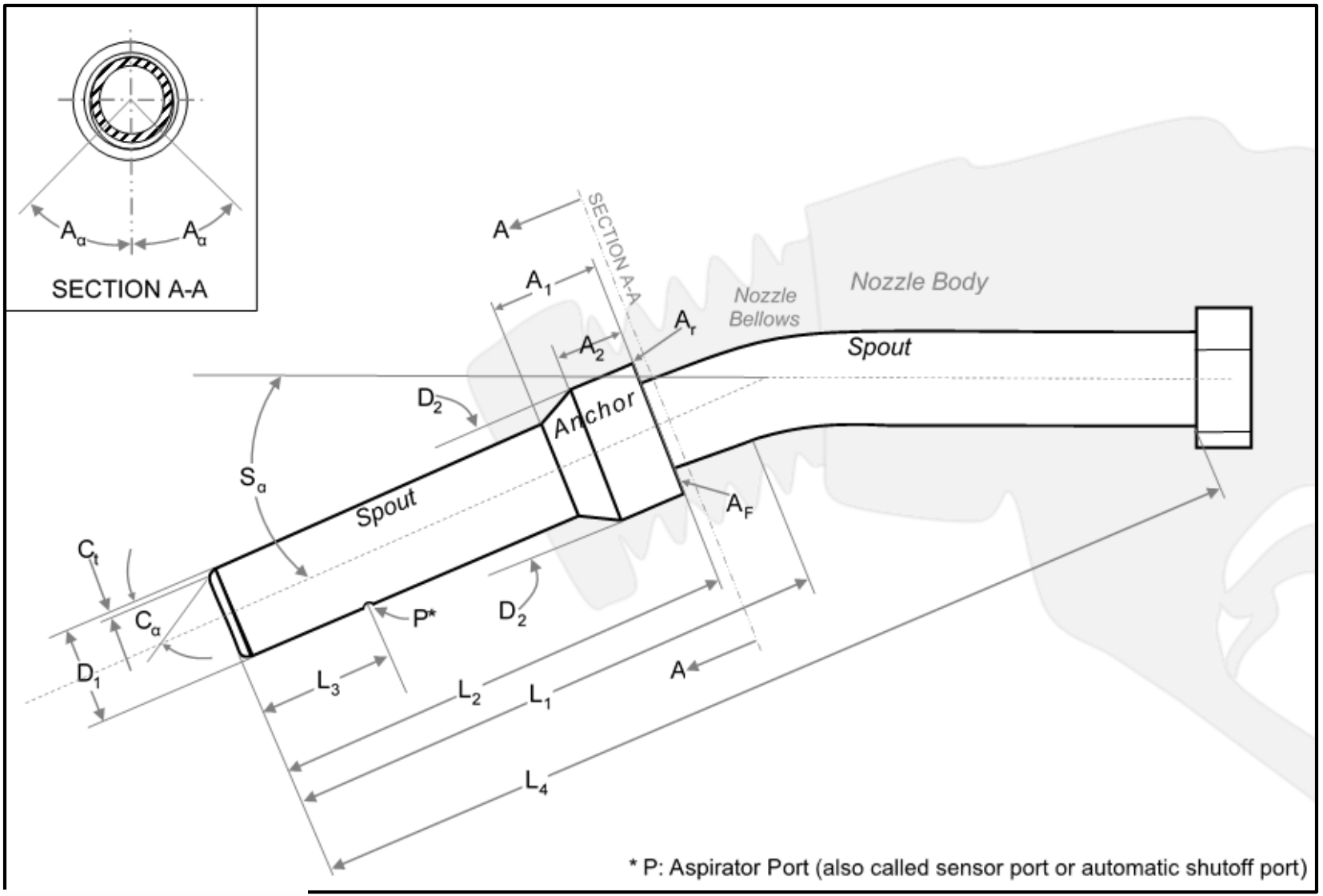
- Spout (10): Distance from spout tip to latch ring position and spout diameter
- Anchor (5): latch zone flatness, outside diameter, radius, overall length
- Bellows (4): outer and inner diameter, face flatness, and contact angle

Similar requirements also proposed for ECO nozzle and its interlock feature (16)

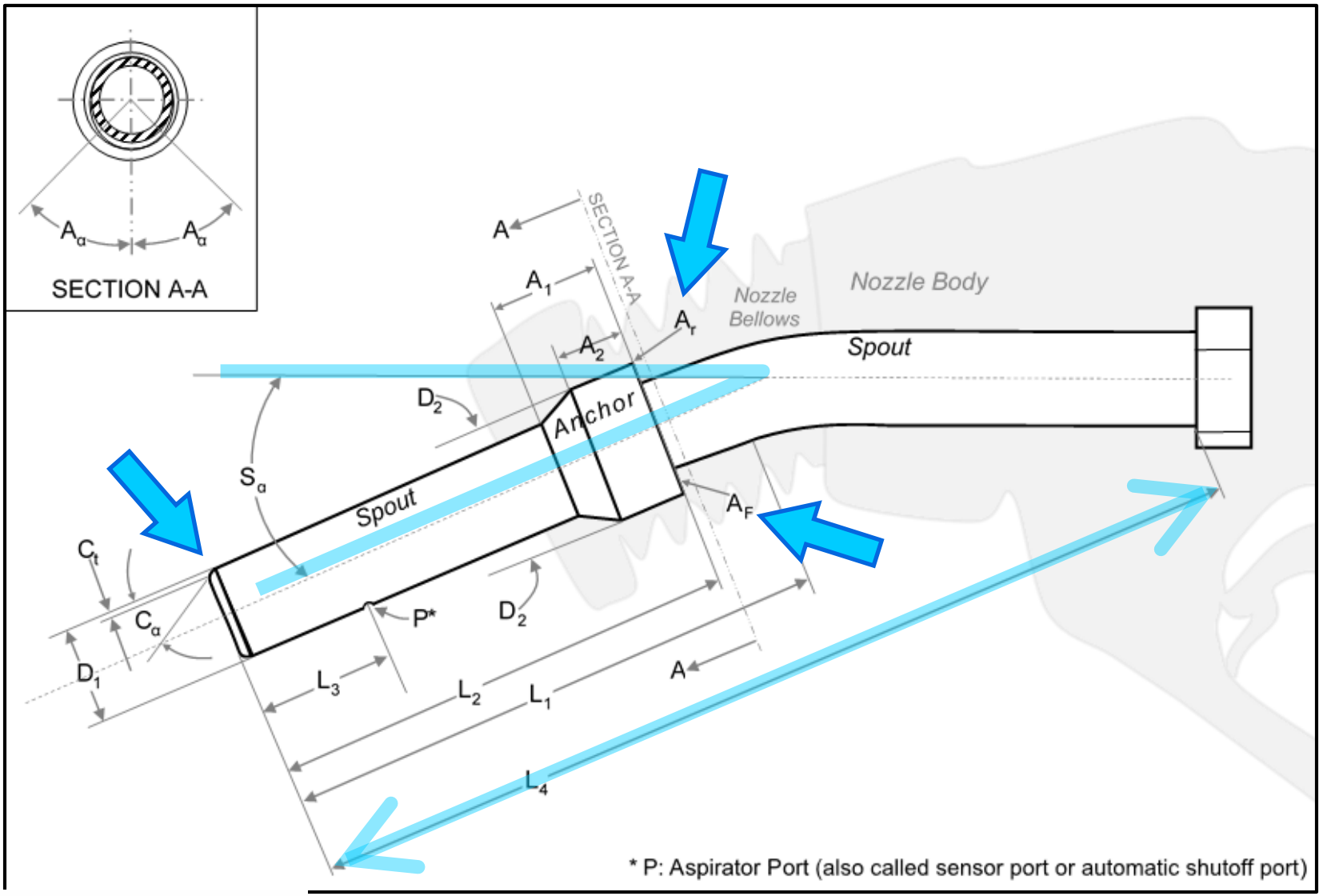
Proposed Spout Dimensions

- Handout and draft regulatory text provide a table of dimensions
- *Key feature:* All dimensions have a proposed **range** of values, rather than a single value

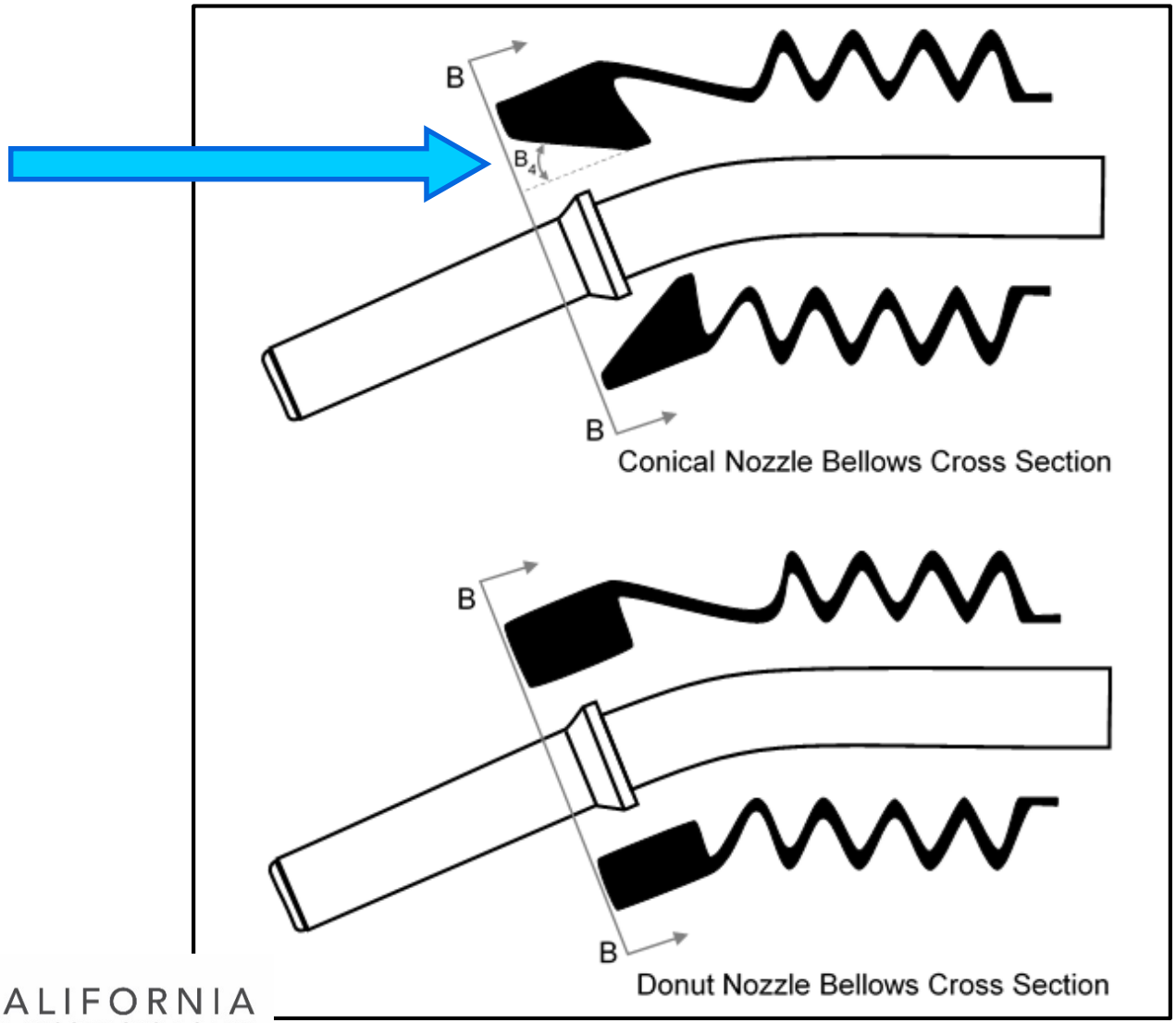
Proposed Spout Dimensions



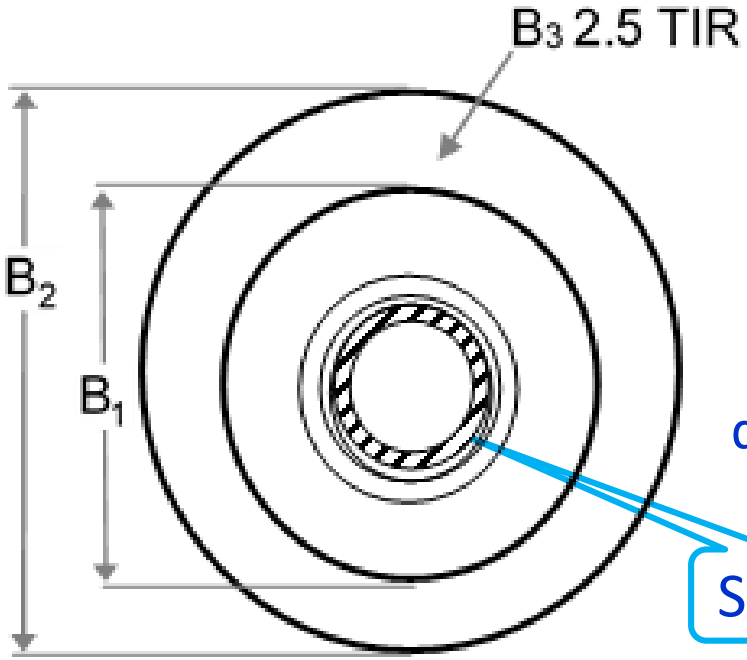
Proposed Spout Dimensions

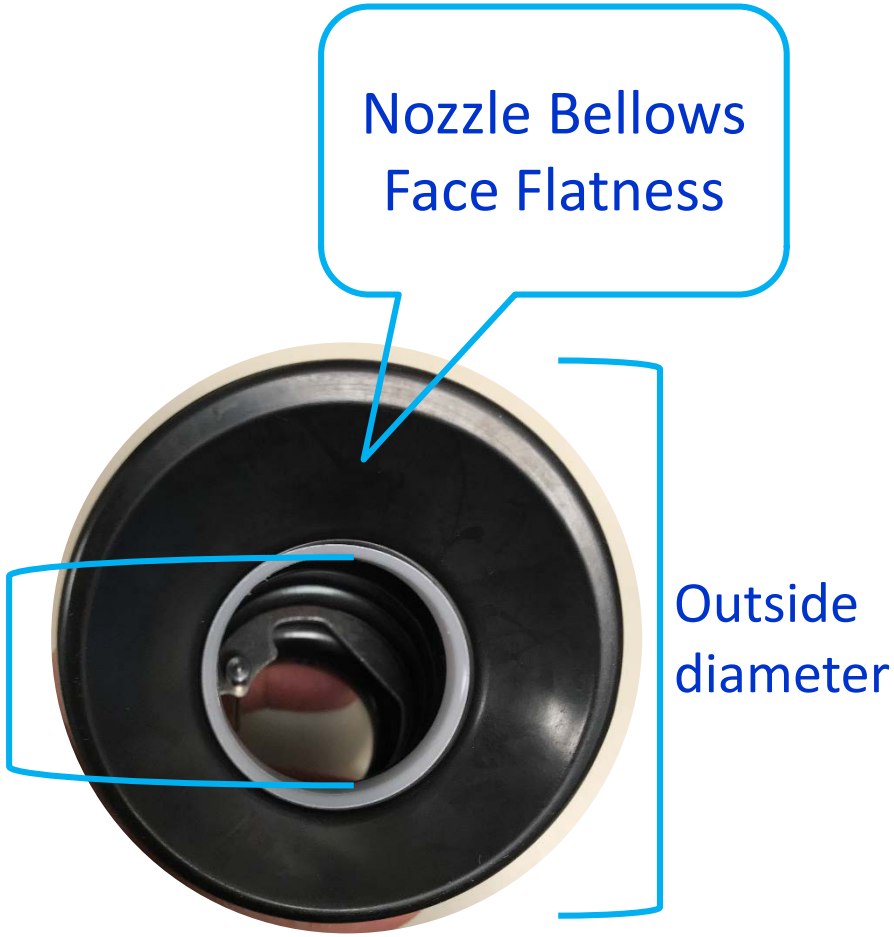


Proposed Spout Dimensions: Inclusion of Phase II EVR Nozzle Bellows

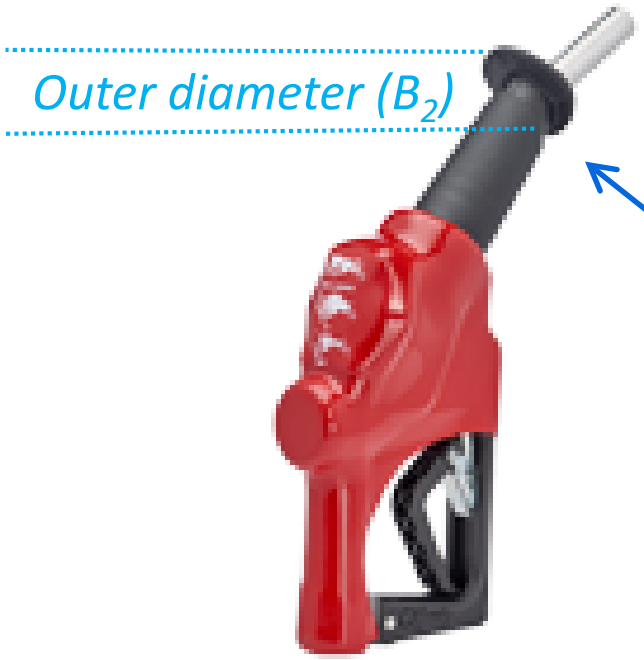


Proposed Spout Dimensions: Inclusion of Phase II EVR Nozzle Bellows





Proposed Spout Dimensions: Inclusion of ECO Nozzle Interlock Device



'Interlock Device'
(vs. 'bellows')

Proposal:
Standardize B_2 but not B_1, B_3 and B_4

CARB Certification Status

- Phase II EVR Spout Assembly:
  - Anticipate currently certified balance and EOR assist spouts and bellows will meet all proposed dimensions
    - *EOR: Enhanced ORVR-Vehicle Recognition nozzle, certified in August 2017*
  - Assist spout assembly certified prior to August 2017 does not meet proposed dimensions, primarily due to latch ring

CARB Certification Status

- Enhanced Conventional (ECO) Nozzles:
  - Two models currently under CARB evaluation
    - Anticipate certification within a year
  - Third model in Research & Development phase
  - CARB, SAE and manufacturers evaluating dimensions

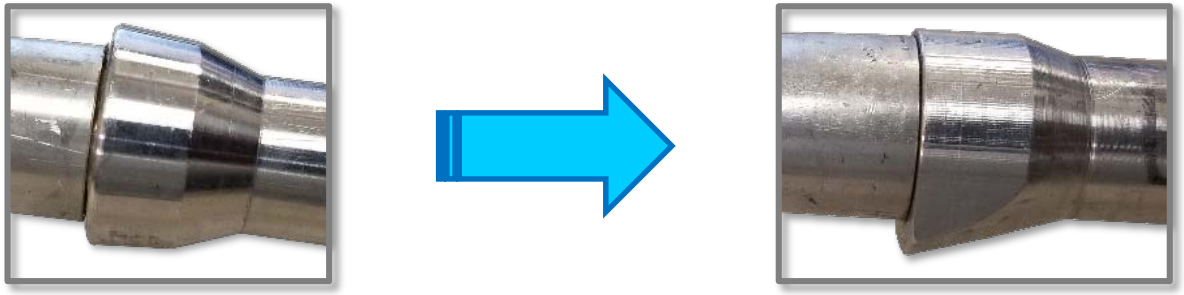
PROPOSED Implementation Timeline*

Phase II System	New Installations	Existing Installations
Assist System per CARB Executive Order VR-201/202	Upon effective date, must install EOR version of nozzle	Upon effective date, existing nozzle may remain until end of useful life ➢ *Average nozzle life:* ***2 years*** *at high traffic site,* ***3.5 years*** *at low* Upon nozzle replacement, must install EOR nozzle
Balance System per CARB Executive Order VR-203/204	No action required	No action required

*Anticipated effective date: Fall 2019

Anticipated Costs

1. Phase II EVR Assist Systems



Staff anticipates low implementation costs:

- EOR nozzle cost is similar to prior model
- EOR nozzle is only version produced since December 2017
- Prior model inventory will be depleted before amendment effective date (~2019)
- Staff proposal: Existing nozzles can remain in use until end of useful life

Anticipated Costs

2. Phase II EVR Balance System

- No new costs anticipated for gas stations
- No anticipated change to manufacturing equipment

3. ECO Nozzles

- None yet certified

4. All nozzles

- Potential small increase in certification process costs to verify more dimensions

Anticipated Benefits

Vehicle fill pipe improvements
+
Nozzle spout/bellows standardization
+
Change to assist EOR spout

- Improve vapor recovery system performance and stop decline due to poor nozzle/fill pipe seal
  - Will reduce winter time pressure driven emissions and ISD alarms associated with overpressure
- ~1.2 tons per day VOC emission reduction anticipated with full implementation of EOR spout *(preliminary estimate)*

Alternatives to Regulatory Proposal

- Focus on fewer dimensions
- Delay amendment until more comprehensive solution (changes to ISD) are proposed
- Require all prior-model assist nozzles to be replaced with EOR model within 4 years of amendment effective date
- No action

10 New/Revised D-200 Definitions & Acronyms

- Aspirator port
- Conventional nozzle
- Enhanced conventional (ECO) nozzle
- Enhanced vapor recovery (EVR)
- Nozzle anchor
- Phase II nozzle
- Phase II EVR nozzle
- Society of Automotive Engineers (SAE)
- Total indication reading (TIR)
- Useful life

Proposed Amendments Beyond the Scope of Nozzle Dimensions

- Draft regulatory text released on 05/16/18 contained proposed amendments to a few sections of the certification procedures not related to nozzle dimensions:
  - Conditions of Certification
  - General In-Station Diagnostic System Requirements
- Upon further consideration, CARB staff will remove these items from the immediate regulatory proposal and will re-visit them in the future

Discussion Topic #4: Rulemaking Process/Next Steps

Rulemaking Timeline

Public Workshop
May 2018

45-day Comment Period for Rulemaking
Sept – Oct 2018

Board Hearing
Oct 25-26, 2018

1. Informal Process

Discuss research activities, field studies and findings

Present concepts and draft regulatory language

Solicit stakeholder input on concepts and draft language

2. Formal Process

Staff publishes the proposed regulatory language and provides reasons including costs and impact (original proposal) in "Initial Statement of Reasons" (ISOR or staff report)

Public may submit written or oral comments on staff's proposal to Board

3. Final Stage

Staff presents proposal to Board

After considering all comments, Board may accept proposal and direct staff to address any remaining issues, or reject the proposal

Public has 15 days to submit comments on any changes made to the original proposal

Proposal for How to Include New Nozzle Dimensions in the Regulations

- **Draft** (currently posted to CARB website): Include proposed dimensions in vapor recover certification procedures (CP-201, CP-206, and CP-207) and definitions for CPs (D-200)
- **Draft Final/Final**: * ^
  - Include all dimensions and new definitions in SAE J285 *Dispenser Nozzle Spouts for Liquid Fuels Intended for Use with Spark Ignition & Compression Ignition Engines*
  - Reference SAE J285 in the CPs & include new definitions in D-200

* Pending SAE review and approval process.

^ Similar proposal for fill pipe changes and SAE J1140.

Next Steps

1. Consider stakeholder comments on draft regulatory language

   Please submit comments by ***June 1***

2. 45-day comment period anticipated to begin on **September 7**

3. Board Hearing scheduled during **October 25-26** Board Meeting

More Information

- Fill-pipe Dimension Inquiries:
  Jason Gordon: Jason.Gordon@arb.ca.gov
- Nozzle Dimension Inquiries:
  Michelle Wood: Michelle.Wood@arb.ca.gov
- Vapor Recovery Overpressure Webpage:
  https://www.arb.ca.gov/vapor/op/op.htm
- Advanced Clean Cars Program Webpage:
  https://www.arb.ca.gov/msprog/acc/acc.htm
- General Vapor Recovery Program Inquiries:
  vapor@arb.ca.gov

QUESTIONS?