



Small Off-Road Engines: 2020 Pre-Rulemaking Workshop

June 9, 2020

2020 SORE Rulemaking Timeline

September 2019

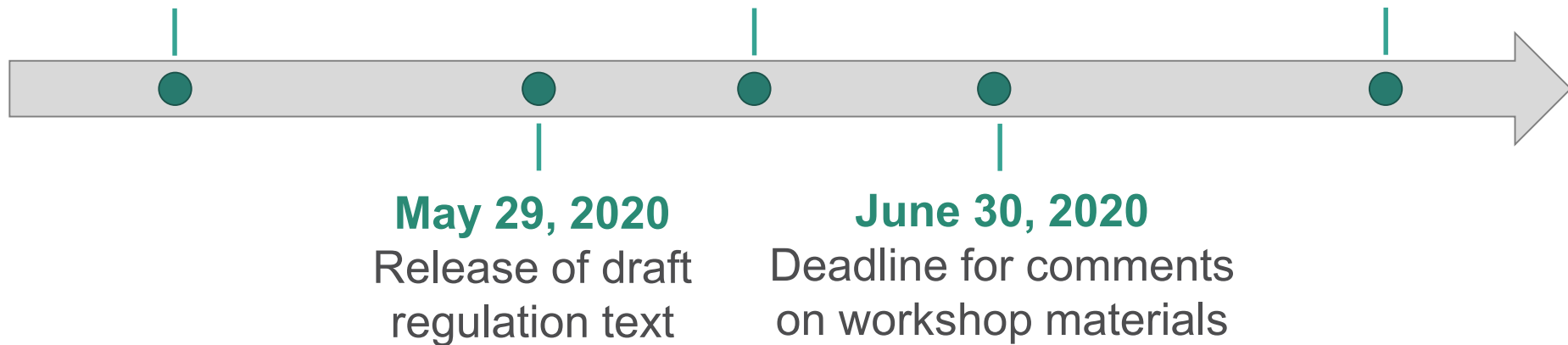
First workshop on 2020 rulemaking

June 9, 2020

Pre-rulemaking workshop

Late 2020

Propose new standards



These changes to SORE regulations have not been considered by the Board. Any proposed changes will be presented to the Board to decide whether to adopt after the required notice and public comment period and any required analyses have been presented to the Board.

Workshop Overview

- Background and regulatory history
- Zero-emission equipment
- Draft updates to SORE regulations
- Certification and test procedure amendments
- Regulatory impact on emissions
- Rulemaking process

Background and Regulatory History

Small Off-Road Engines (SORE)



Sources of Emissions

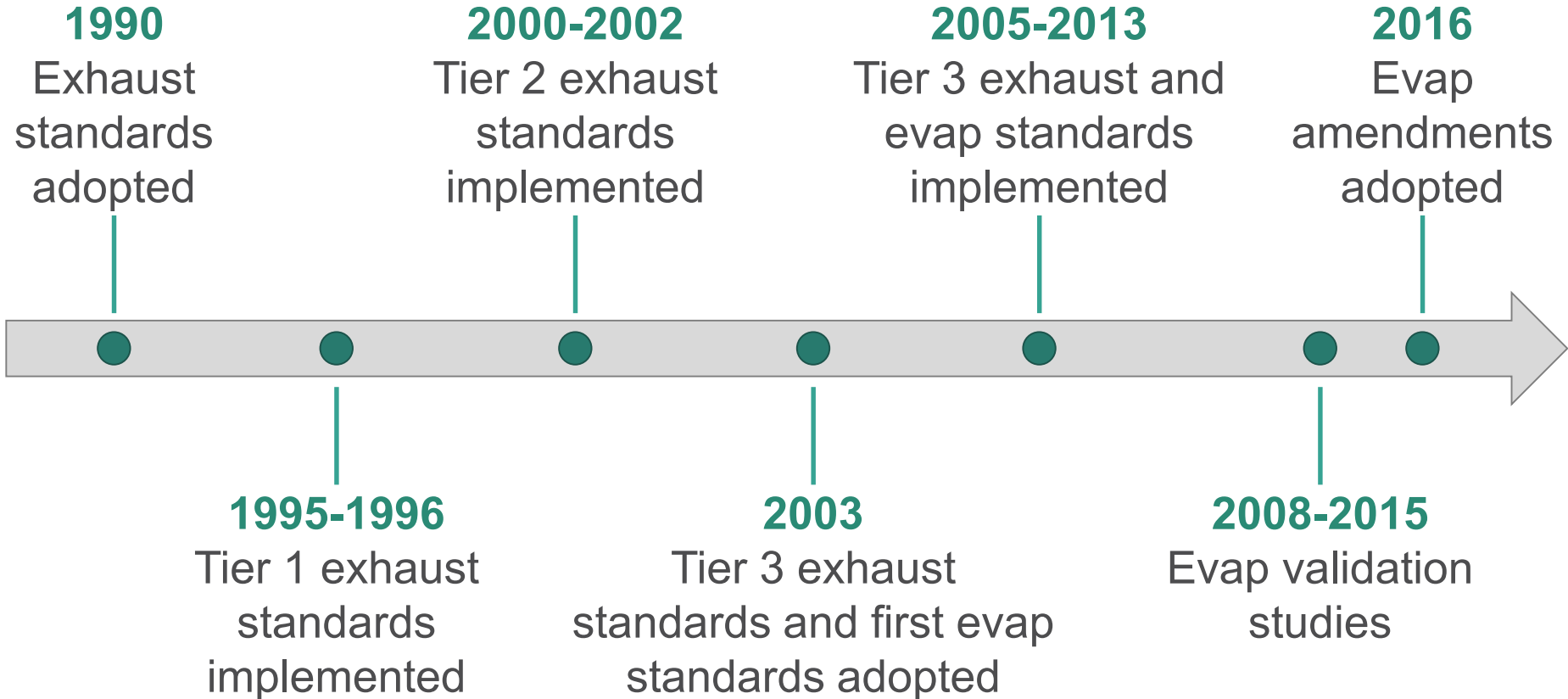


During operation:
Exhaust and evaporative

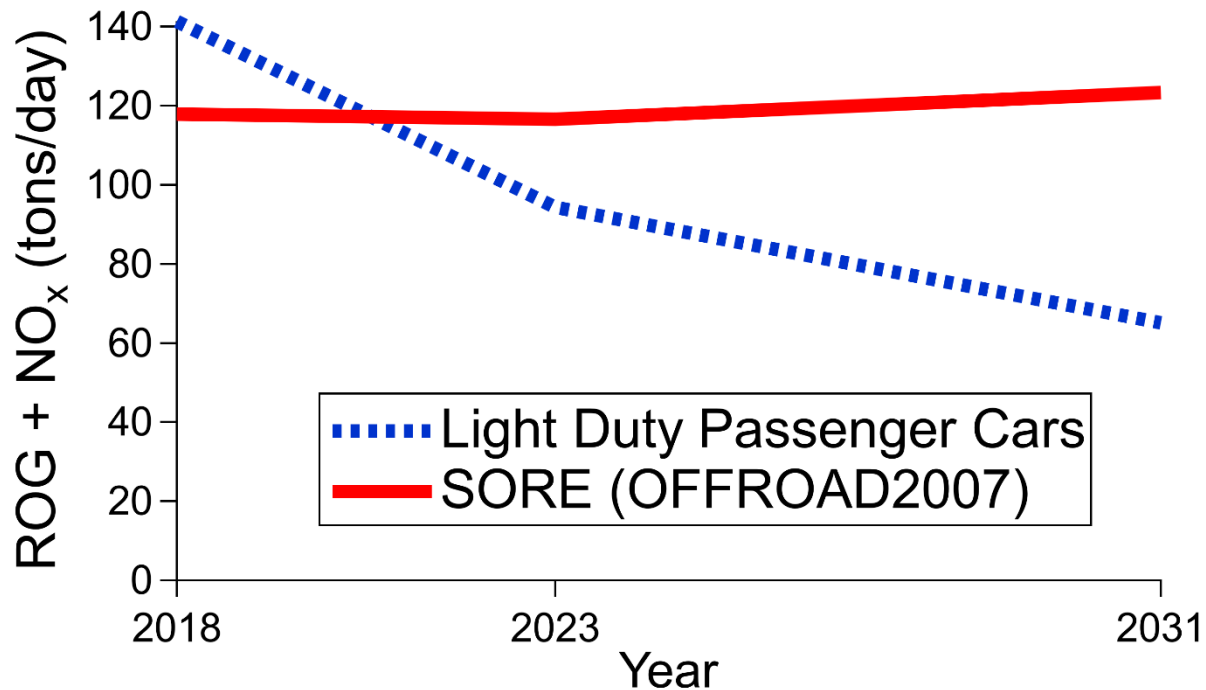


During storage:
Evaporative

SORE Regulatory History



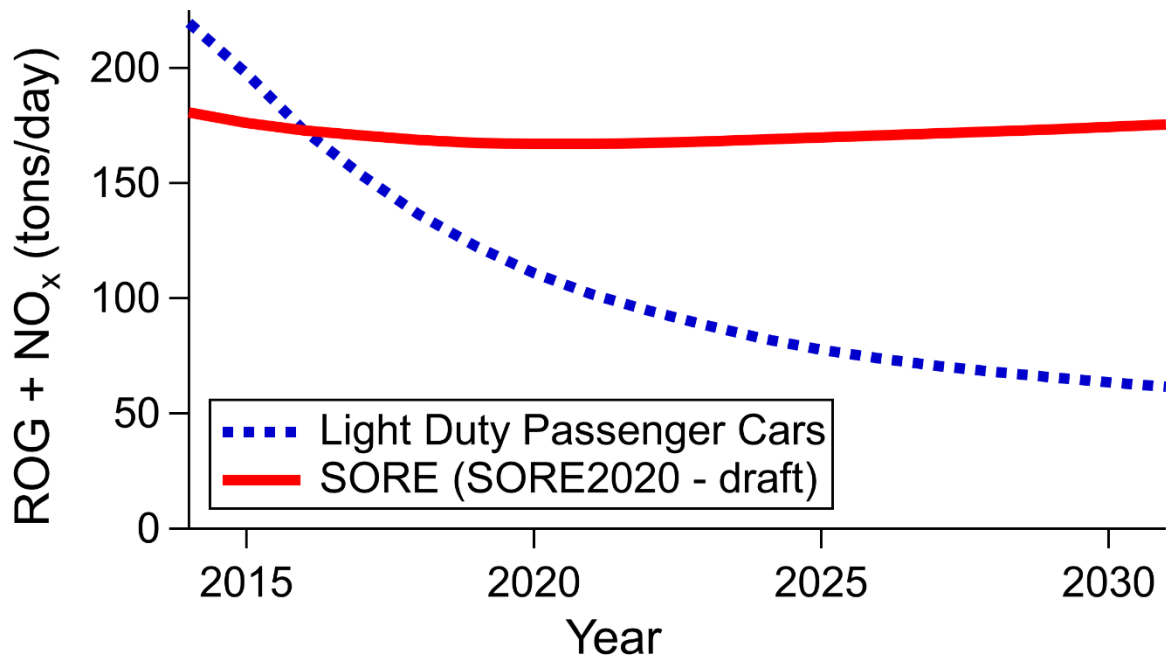
SORE Emissions Versus Cars (Statewide)



- SORE emissions surpass those from light-duty passenger cars in early 2020s
- Auto data from EMFAC2017

SORE Emissions Versus Cars

(Statewide)



- SORE emissions surpassed light-duty passenger cars around 2016
- Note different axis ranges
- Auto data from EMFAC2017

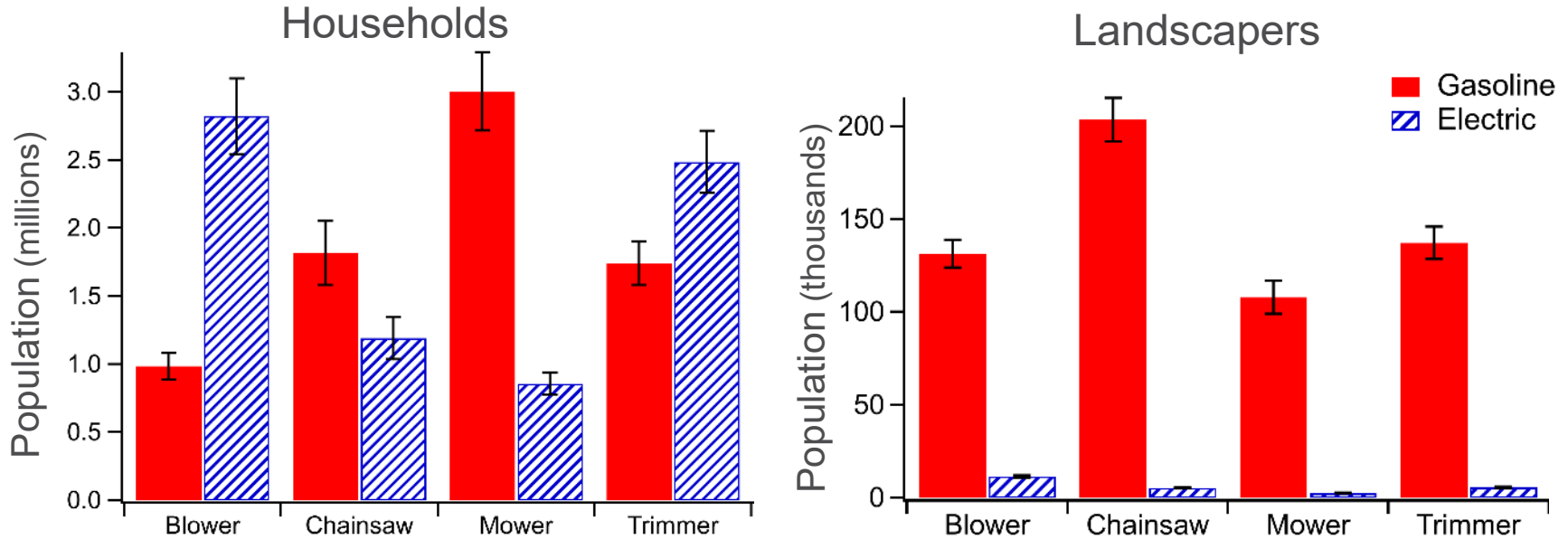
Need for Further Reductions

2016 State Implementation Plan (SIP) Strategy

	Statewide Reductions (tons per day, expected)	
	NO _x	ROG
Total	168	86
SORE	4	36
Additional Off-Road	18	20

SORE Zero-Emission Equipment (ZEE)

SORE and ZEE Populations in CA



- Over half of household lawn and garden equipment is already ZEE
- Landscapers have low ZEE adoption rates

Landscaper ZEE Use

- At least 12 brands of ZEE target landscaper professionals
- Several municipalities have moved to all ZEE for landscaping
- ZEE Roadshow has allowed many landscaping professionals to try commercial ZEE

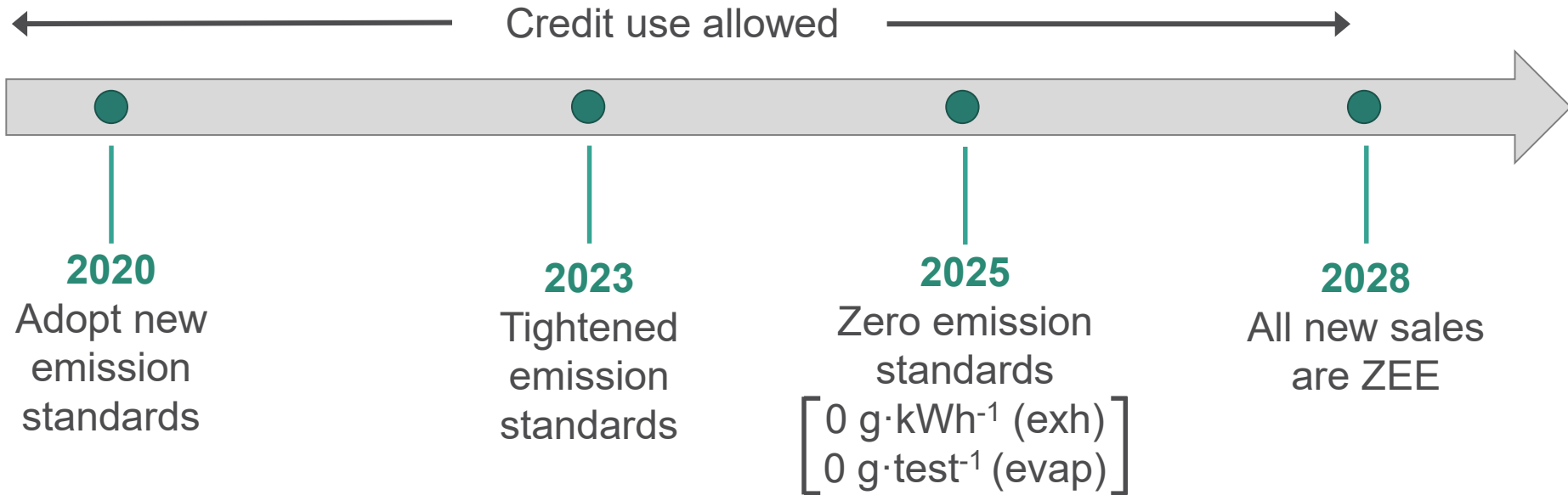


New Emission Standards

- Factors considered
 - Technological feasibility
 - State Implementation Plan
 - Mobile Source Strategy
 - Updated emission inventory

Updates to SORE Regulations

Regulation Implementation Timeline



Changes to Exhaust Emission Standards

- Increase durability periods
- Tighten NO_x and ROG exhaust standards for model year (MY) 2023
- Set NO_x and ROG standards to 0 for MY 2025, with continued use of credits
- Expand ZEE credits and increase flexibility of use
- All new sales must be ZEE for MY 2028

2023 Durability Periods

- Simplified durability periods
- New durability periods are based on the 75th percentile for professional users

Engine Displacement Category	Current Durability Period (hours)	2023 Durability Period (hours)
< 50 cc Handheld	50/125/300	1,000
50-80 cc, inclusive, Handheld	50/125/300	1,000
< 225 cc non-Handheld	125/250/500	2,000
≥ 225 cc - < 825 cc	125/250/500/1,000	5,000
≥ 825 cc	125/250/500/1,000	5,000

2023 HC + NO_x standards

- 2023 standards based on currently certified engines
- Several engines meet the standard in each displacement category
- All common equipment types represented

Engine Displacement Category	HC + NO _x standard (g/kW.h)	2023 HC + NO _x standard (g/kW.h)
< 50 cc, handheld	50	20
50-80 cc, inclusive, handheld	72	13
< 225 cc, non-handheld	10	6
≥ 225 cc - < 825 cc	8	3
≥ 825 cc	8	0.8

Changes to ZEE Credits

- Add stand-on and riding mowers
- Expand credit use to all engines
- Allow full offset with ZEE credits



Changes to Evaporative Emission Standards

- Hot soak + diurnal emissions
 - Standards apply to all engine displacements
- Tighter standards in 2023
- Set standards to 0 in 2025, with continued credit use
- Expand ZEE credits into evaporative averaging, banking, and trading program

Hot Soak Plus Diurnal Standards

- Current standards only cover 24-hour diurnal period (g HC per day)
- New standards include one-hour hot soak (g HC per test)

Operate for 15 minutes
Perform one-hour hot soak at
constant 105°F



Cool enclosure to 65°F
Soak system at 65°F for 2 hours



Perform 24-hour diurnal test using
a 65°F-105°F-65°F variable
temperature profile

Hot Soak Plus Diurnal Standards

- Emission standards based on currently certified engines
- Removed dependence on fuel tank size
- Added complete engine standard for ≤ 80 cc

Engine Displacement Category	Current Diurnal Standard (g HC/day)	2023 Diurnal + Hot Soak Standard (g HC/test)
≤ 80 cc	N/A	0.50
> 80 cc - < 225 cc, walk-behind mowers	1.0	0.60
> 80 cc - < 225 cc, other equipment	$0.95 + 0.056 \times \text{capacity}$	0.60
≥ 225 cc	$1.20 + 0.056 \times \text{capacity}$	0.70

ZEE Evaporative Credits

- ZEE evaporative credits will be available as soon as the updated regulations go into effect
- If equipment qualifies for ZEE exhaust credits, it will also qualify for evaporative
- Prior to 2023 use 8 liter tank for 80- 225 cc equivalents, and 11 liter tank for 225 cc and up



Certification and Test Procedure Amendments

Certification and Test Procedure Amendments

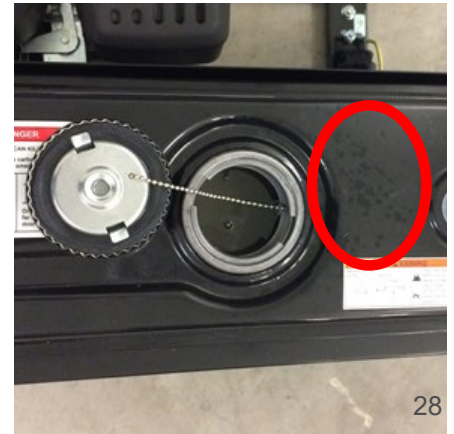
- CP-902: Certification procedure for evaporative emission control systems on SORE with displacement greater than 80 cubic centimeters
- TP-901: Test procedure for determining permeation emissions from SORE fuel tanks
- TP-902: Test procedure for determining diurnal emissions from SORE

CP-902 Amendments

- Expand applicability to all engines
- Test procedure specifications added
- Include a list of equipment brands using engines from the evaporative family

TP-901 Amendments

- Seal fuel tank with fuel cap
- Test fuel tanks in production form
- Fuel cap installation cycles required
- New fuel cap and tether spill test



TP-901 Amendments Continued

- Preconditioning
 - Minimum of 70 days
 - Refill the fuel tank 15 days prior to end
- Reference tank mass specifications
- For FID testing, start test within 15 minutes of sealed

TP-902 Amendments

- One-hour hot soak at 105 °F
- Start hot soak within 180 seconds of engine shutoff
- New fuel cap and tether spill test
- Carbon canister working capacity based on total capacity of the fuel tank

TP-902 Amendments Continued

- Preconditioning
 - Minimum of 70 days
 - Refill the fuel tank 15 days prior to end
- New tilt sequence
- Measure and record pressure limits of the fuel tank

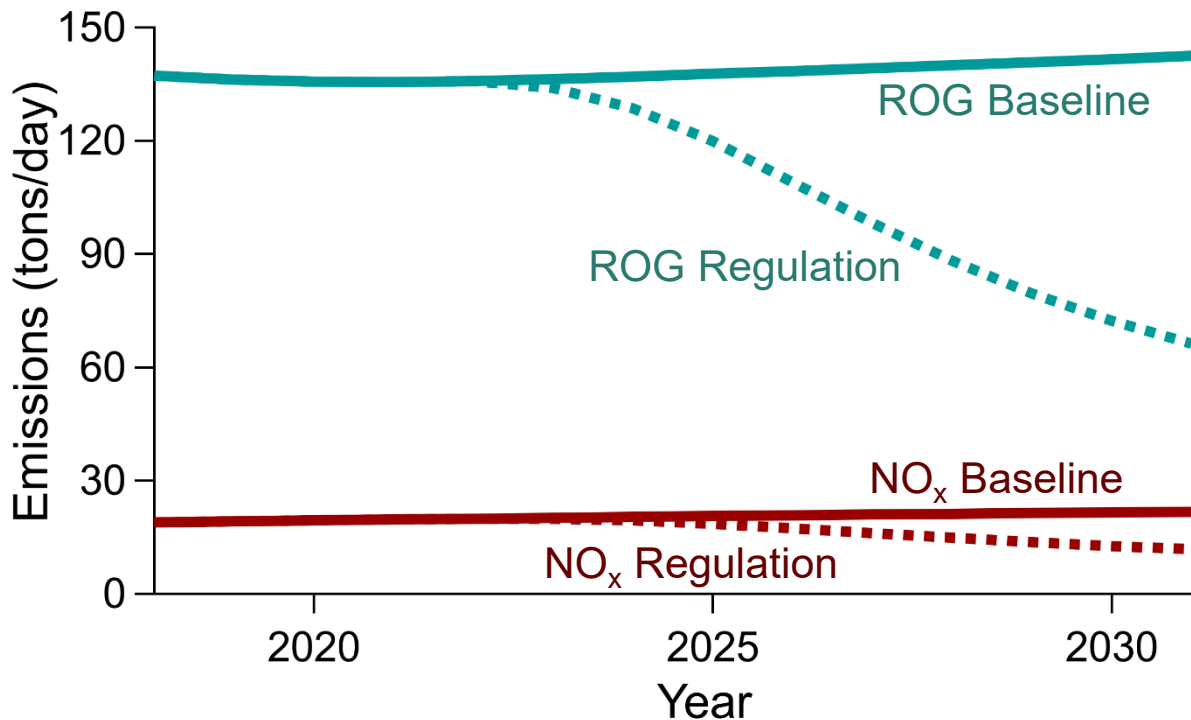


Exhaust Test Procedure Amendments

- 1054.115: An operating parameter is not considered adjustable if you permanently seal it ~~or if it is not normally accessible using ordinary tools.~~ Operating parameters that may be adjusted using tools are considered adjustable.
- 1054.245: Calculated deterioration factors may cover ~~families and~~ model years in addition to the one upon which they were generated...
- 1065.650: Require PM measurement for 2-stroke engines

Regulatory Impact on Emissions

SORE Emissions (Statewide)



- Data from draft SORE2020 model
- Lawn and garden and light commercial (93% of SORE)
- With regulation:
 - 2031 NO_x 9.9 tpd lower
 - 2031 ROG 76 tpd lower

Rulemaking Process

Stakeholder Engagement

- Stakeholders
 - Participate in workshops and meetings
 - Share ideas to reduce emissions
 - Share test data and product information
 - Submit comments on potential changes to regulations
- CARB staff
 - Public process

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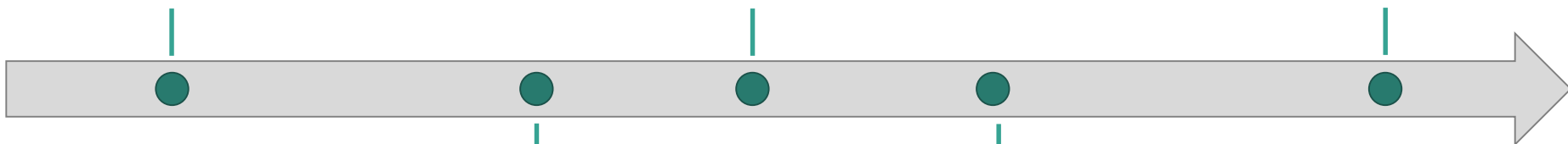
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May 29, 2020

Release of draft regulation text

June 30, 2020

Deadline for comments on workshop materials

Next Steps

- Accept comments on draft language released May 29, 2020 through June 30, 2020
- Release ISOR and proposed regulation updates in fall 2020
 - Will begin 45 day comment period
- Late 2020 Board hearing for proposed updates

CARB Staff Contact Information

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