



# Proposed Rule (PR) 1147.2

## NOx Reductions from Metal Melting and Heating Furnaces

Public Workshop

January 20, 2022

Zoom URL: <https://scaqmd.zoom.us/j/91810732436>

Dial-In: 1 669 900 6833

Meeting ID: 918 1073 2436

# Agenda

- Proposed Rule 1147.2 Background
- Proposed Rule Language Overview
- Emission Reductions and Cost-Effectiveness
- Scope of Socioeconomic Impact and California Environmental Quality Act (CEQA)
- Next Steps



# Proposed Rule 1147.2 Background

# Background

- In March 2017, the South Coast AQMD adopted the 2016 AQMP
  - Control measure CMB-05 requires the RECLAIM program to transition to a command-and-control structure
  - Requires a 5 ton per day NOx emission reduction to be achieved with Best Available Retrofit Control Technology (BARCT) as soon as feasible and no later than 2025
- In July 2017, Assembly Bill 617 was signed by the Governor
  - Requires expedited BARCT implementation for facilities in the state greenhouse gas cap and trade program by December 31, 2023

# Background – Proposed Rule Applicability

- Metal melting, metal heat treating, metal heating, and metal forging furnaces are currently regulated under Rule 1147 – NOx Reductions from Miscellaneous Combustion
- Proposed Rule 1147.2 will separate these furnace categories from Rule 1147 and establish new BARCT emission limits with a compliance schedule
- PR 1147.2 will apply to any metal melting, metal heat treating, metal heating, or metal forging furnace that requires a South Coast AQMD permit located at non-RECLAIM, RECLAIM, and former RECLAIM facilities

# Background – Impacted Equipment

- Proposed Rule 1147.2 will impact 585 pieces of equipment located at 86 facilities
  - 65 non-RECLAIM facilities with 315 units
  - 21 RECLIM facilities with 270 units
- Industries impacted include secondary smelters, manufacturers, foundries, and die-casters
- Staff conducted 17 in-person site visits



# Proposed Rule Language Overview

# Proposed Rule Overview

## Subdivision (a), (b)

### Purpose, Applicability

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- Updated criteria for unit applicability from Rule 1147

## Subdivision (c)

### Definitions

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- Additions and updates to definitions of terms from Rule 1147

## Subdivision (d)

### Requirements

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- Updated BARCT limits for seven equipment categories

## Subdivision (e)

### Implementation Schedules

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- 12-year and 32-year burner age implementation schedule options

# Proposed Rule Overview (cont.)

## Subdivision (f)

### Determination of Burner Age

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- Burner age determination options

## Subdivision (g)

### Demonstration of Less than One Pound of NO<sub>x</sub> per Day

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- Time meter- or fuel meter-based 1 lb/day NO<sub>x</sub> demonstration

## Subdivision (h)

### Monitoring and Source Testing Requirements

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- Source testing and monitoring requirements for source testing and CEMS equipment

## Subdivision (i), (j), (k)

### Labeling, Reporting and Recordkeeping, Exemptions

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- Administrative requirements for unit labelling, recordkeeping, and exemption

# Subdivision (a) – Purpose

# Subdivision (b) – Applicability

## Purpose

Reduce NOx emissions from furnaces that process metal, including metal melting, metal heat treating, metal heating, and metal forging furnaces

## Applicability

PR 1147.2 applies to all furnaces subject to this rule that require a South Coast AQMD permit

# Subdivision (c) – Definitions

## Key Definitions

### Alteration

*“means any physical change or addition to an Existing Unit requiring an application for Permit to Construct pursuant to South Coast AQMD Rule 201 – Permit to Construct.”*

### Decommission

*“means any physical change or addition to an Existing Unit requiring an application for Permit to Construct pursuant to South Coast AQMD Rule 201 – Permit to Construct.”*

### Rated Heat Input

*“means the gross heat input of the Unit specified on a permanent rating plate attached by the manufacturer to the Unit, or as permitted.”*

### Refractory Dry-Out

*“means that period of time during which a Unit is either curing or drying-out refractory lining as a result of a New Unit installation, Existing Unit Alteration, or Existing Unit repair or maintenance.”*

### Startup Shutdown

*“is as defined in South Coast AQMD Rule 429 – Startup and Shutdown Exemption Provisions for Oxides of Nitrogen.”*

# Subdivision (d) – Requirements

- **Interim Concentration Limits**
  - Required for all units to maintain current emissions until BARCT concentration limits or Alternative Concentration limits are required
  - Limits: non-RECLAIM (60 ppmv); RECLAIM and former RECLAIM facilities (102 ppm)
- Concentration limits are dependent on the type of furnace and the age of a unit's burners
- All units will eventually meet the BARCT concentration limits of Table 1
  - Two implementation schedule options of 12-years or 32-years of burner age

# Subdivision (d) – Requirements

All Units Must Eventually Meet Table 1 Limits

All Units



Table 1 – NOx and CO Concentration Limits for Existing Units

Unit Size	Furnace Type	Temperature	NOx Limit <sup>1,2</sup> (ppmv)	CO Limit <sup>1</sup> (ppmv)
< 40 MMBtu/hr	Metal Melting	All Temperatures	40	1,000
	Metal Heat Treating, Metal Heating, and Metal Forging	≤ 1,200 °F	40	
		> 1,200 °F	50	
	Units with Radiant-Tube Burners	All Temperatures	50	
≥ 40 MMBtu/hr	All Units	All Temperatures	15	

<sup>1</sup> Corrected to 3% oxygen, dry

<sup>2</sup> Averaged over an 8-hour rolling interval for Units equipped with a certified NOx CEMS

Two Implementation Schedules to Meet Table 1 Limits

12-Year Implementation Schedule

Default implementation schedule

32-Year Implementation Schedule

Extended implementation schedule for those units that meet pre-requisite Table 2 Limits

Table 2 – Alternative NOx and CO Concentration Limits for Existing Units

Unit Size	Furnace Type	Temperature	NOx Limit <sup>1,2</sup> (ppmv)	CO Limit <sup>1</sup> (ppmv)
< 40 MMBtu/hr	Metal Melting	All Temperatures	50	1,000
	Metal Heat Treating, Metal Heating, and Metal Forging	≤ 1,200 °F	50	
		> 1,200 °F	60	
	Units with Radiant-Tube Burners	All Temperatures	60	

<sup>1</sup> Corrected to 3% oxygen, dry

<sup>2</sup> Averaged over an 8-hour rolling interval for Units equipped with a certified NOx CEMS

# Subdivision (d) – Requirements (cont.)

**Table 1: BARCT Concentration Limits**

- Final concentration limits of the rule
- Five equipment categories
  - Metal melting units
  - Low-temperature and high-temperature metal heat treating, metal heating, and metal forging units
  - Units with radiant-tube burners
  - Units with a rated heat input  $\geq 40$  MMBtu/hr that are required to install an SCR
- CO limit of 1,000 ppmv to prevent runaway CO emissions while still controlling NOx concentration

**Table 1 – NOx and CO Concentration Limits for Existing Units**

Unit Size	Furnace Type	Temperature	NOx Limit <sup>1,2</sup> (ppmv)	CO Limit <sup>1</sup> (ppmv)
< 40 MMBtu/hr	Metal Melting	All Temperatures	40	1,000
	Metal Heat Treating, Metal Heating, and Metal Forging	$\leq 1,200$ °F	40	
		$> 1,200$ °F	50	
	Units with Radiant-Tube Burners	All Temperatures	50	
$\geq 40$ MMBtu/hr	All Units	All Temperatures	15	

<sup>1</sup> Corrected to 3% oxygen, dry

<sup>2</sup> Averaged over an 8-hour rolling interval for Units equipped with a certified NOx CEMS

# Subdivision (d) – Requirements (cont.)

**Table 2: Alternative Concentration Limits**

- Designed for units that are near the BARCT concentration limits
- Serves as a prerequisite condition to extend the default implementation schedule from 12-years to 32-years
- Units with a rated heat input  $\geq 40$  MMBtu/hr have a fixed-date implementation schedule and do not have an alternative concentration limit

**Table 2 – Alternative NOx and CO Concentration Limits for Existing Units**

Unit Size	Furnace Type	Temperature	NOx Limit <sup>1,2</sup> (ppmv)	CO Limit <sup>1</sup> (ppmv)
< 40 MMBtu/hr	Metal Melting	All Temperatures	50	1,000
	Metal Heat Treating, Metal Heating, and Metal Forging	$\leq 1,200$ °F	50	
		$> 1,200$ °F	60	
	Units with Radiant-Tube Burners	All Temperatures	60	

<sup>1</sup> Corrected to 3% oxygen, dry

<sup>2</sup> Averaged over an 8-hour rolling interval for Units equipped with a certified NOx CEMS

# Subdivision (d) – Requirements (cont.)

**New units (installed after date of adoption) shall meet the concentration limits in Table 3 prior to the issuance of a Permit to Operate**

**Table 3 – NO<sub>x</sub> and CO Concentration Limits for New Units**

Unit Size	Furnace Type	Temperature	NO <sub>x</sub> Limit <sup>1,2</sup> (ppmv)	CO Limit <sup>1</sup> (ppmv)
< 40 MMBtu/hr	Metal Melting	All Temperatures	40	1,000
	Metal Heat Treating, Metal Heating, and Metal Forging	≤ 1,200 °F	30	
		> 1,200 °F	40	
	Units with Radiant-Tube Burners	All Temperatures	40	
≥ 40 MMBtu/hr	All Units	All Temperatures	15	

<sup>1</sup> Corrected to 3% oxygen, dry

<sup>2</sup> Averaged over an 8-hour rolling interval for Units equipped with a certified NO<sub>x</sub> CEMS

# Subdivision (e) – Implementation Schedules

## Units < 40 MMBtu/hr

- **Permit Application Submittal:**  
By 12-years or 32-years of burner age
- **Demonstrate Compliance:**  
within 12 months of permit issuance

## Units $\geq$ 40 MMBtu/hr

- **Permit Application Submittal:**  
By July 1, 2023
- **Demonstrate Compliance:**  
within 18 months of permit issuance

If a permit application submittal deadline is not met, compliance deadline is 30 months after original permit application submittal deadline

Units may be decommissioned in lieu of submitting a permit application

# Subdivision (e) – Implementation Schedules

## Multiple Unit Implementation Schedule

- **Applicability**

Apply phased-in implementation schedule for facilities with multiple units that are subject to permit application submittal by July 1, 2023

- **Compliance Determination**

Require submittal of permit applications based on total quantity and total rated heat input of impacted units per schedule

- **Unit Decommissions**

Permit applications to retrofit or form submittals to decommission will both qualify for meeting compliance with Table 4

Table 4 – Multiple Unit Implementation Schedule to Meet Concentration Limits in Table 1

Permit Application or Inactivation of Permit Submittal Date	2 – 9 Units (Minimum % of total Rated Heat Input)	10 – 19 Units (Minimum % of total Rated Heat Input)	20 or More Units (Minimum % of total Rated Heat Input)
January 1, 2023	50%	-	-
January 1, 2024	100%	50%	33%
January 1, 2025	Not Applicable	-	-
January 1, 2026		100%	67%
January 1, 2027		Not Applicable	-
January 1, 2028			100%

# Subdivision (f) – Burner Age Determination

Rule 1147's burner age determination options are preserved while providing flexibility for the operator in how burner age is determined

## Five Burner Age Determination Options

Invoice of burner purchase

Prior permit application information

Unit's original identification or rating plate

Other method approved by South Coast AQMD, CARB, and U.S. EPA

Default assignment of 32 years as of January 1, 2023

# Subdivision (g) – Demonstration of Less than One Pound NO<sub>x</sub> per Day

- Demonstration of less than one lb/day NO<sub>x</sub> requires use of a time meter or fuel meter and provides exemption from the concentration limits of the rule
- Units equipped with a time meter must demonstrate emissions via Equation 1 or Table 5
  - Table 5 values assume 90% operating capacity, default emission factor of 102 ppmv, and natural gas as a fuel
- Units equipped with a fuel meter must demonstrate emissions via Equation 2
- Equations are provided for the use of unit-specific emission factors and fuel sources

# Subdivision (g) – Demonstration of Less than One Pound NOx per Day (cont.)

Demonstration of < 1 lb/day must meet either time meter or fuel meter requirements

## Time Meter Requirement

Meet Equation 1 or Table 5

### Equation 1

$$\text{Daily Operating Minutes} = 60 \text{ minutes/hour} \div [R \times (EF \div HHV)]$$

## Fuel Meter Requirement

Meet Equation 2

### Equation 2

$$\text{Daily Therms of Fuel} = (1 \div EF) \times HHV \times 10$$

Table 5 – Less than 1 Pound per Day Daily Operating Limits

Unit Rated Heat Input (Btu/hr)	Daily Operating Limit (minutes)
< 1,000,000	480
≥ 1,000,000 to < 1,500,000	300
≥ 1,500,000 to ≤ 2,000,000	240

## Equation Variables

R = Rated Heat Input (MMBtu/hr)  
 EF = Emission Factor (lbs NOx/MMScf or lbs/1000 gal)  
 HHV = Higher Heating Value of Fuel Source (1,050 Btu/Scf or 90,500 Btu/gal)

# Subdivision (h) – Monitoring and Source Testing Requirements

- Protocol submission and approval
  - Submit protocol at least 90 days prior to source test deadline
- Source test timing and tuning
  - Previous source tests conducted between January 1, 2018 and date of adoption may be used as an initial source test
  - Source tests required every 36 or 60 months depending on unit size, and may be conducted any time within the month that the source test is due
  - Units may be tuned to maintain settings set during the previous compliant source test
- Firing rate during source tests
  - Units must operate within their normal firing range during a source test
- South Coast AQMD-approved contractors and methods

# Subdivision (h) – Monitoring and Source Testing Requirements (cont.)

- Units with a rated heat input  $\geq 40$  MMBtu/hr must operate a NO<sub>x</sub> Continuous Emission Monitor Systems (CEMS) and be certified within 12 months of date of adoption
  - Use of NO<sub>x</sub> CEMS provides exemption from NO<sub>x</sub> source testing
- Units equipped with an exhaust emission control system that utilizes an ammonia-based chemical reagent must source test or install a CEMS for ammonia
  - Quarterly source testing schedule required; annual schedule available if four consecutive source tests are approved
  - Source testing required until any ammonia CEMS is certified
  - Any ammonia source test shall also concurrently measure for NO<sub>x</sub> and CO via a source test or CEMS

# Subdivision (i) – Labeling Requirements

- Existing units
  - A permanent rating plate displaying the unit's model number and rated heat input must be placed in an accessible location
- Altered units
  - A new permanent rating plate displaying the unit's model number and new rated heat input must be placed in an accessible location
  - The date of unit alteration must be determined pursuant to subdivision (f) (*Determination of Burner Age*)



# Subdivision (j) – Reporting and Recordkeeping Requirements

Established recordkeeping requirements for:

- Compliance demonstrations with the concentration limits of the rule
- Daily records for 1 lb/day NO<sub>x</sub> demonstration
- Unit non-operation for demonstration of extended time for source test deadlines
- Alterations to document details regarding any unit alterations

# Subdivision (k) – Exemptions

- Exemption provided during refractory dry-out periods due to atypical operating parameters and to ensure refractory installs or repairs are safe and effective
- Exemption provided during startup and shutdown periods due to atypical operating parameters for Low NOx Burners or Selective Catalytic Reduction (SCR) units
  - Requirements defined in Rule 429 – Start-up and Shutdown Exemption Provisions for Oxides of Nitrogen
- Exemption provided for electrically-powered units
- Units demonstrating NOx emissions of less than one pound per day are exempt from the emissions limits in the rule and only subject to labeling and recordkeeping requirements



# **Emission Reductions and Cost-Effectiveness**

# Emission Reductions

- Emission reductions were calculated on a per unit basis using a variety of data sources
  - Permit limits or emission factors
  - Annual fuel usage from submitted Annual Emission Reports
  - Source test results (if available)
  - CEMS data (if available)
  - Staff proposal for concentration limits
- Staff's proposal for concentration limits included a review of all available information for technological and economic feasibility for both Low NOx Burner retrofits and SCR installations
- Baseline emissions for emission reduction totals are based on permit limits or emission factors
- Emission reductions
  - January 1, 2025: 0.39 tpd
  - Full implementation: 0.50 tpd

# Cost-Effectiveness Overview

- Cost-effectiveness is the cost (capital and annual costs) over the emission reductions for the life of the equipment
- Staff uses the 2016 AQMP cost-effectiveness of \$50,000/ton of NO<sub>x</sub> reduced as guidance for establishing the BARCT emission limit

## Costs

Costs obtained from vendor and facility discussions and facility-provided burner retrofit quotations

## Emission Reductions

Calculated by difference between baseline emissions and emissions based on staff's proposal for each equipment category

Baseline emissions for calculating cost-effectiveness use source test results and CEMS data, if available

# Cost-Effectiveness Results

- Each equipment category had at least one cost-effective pollution control technology
- The  $\geq 40$  MMBtu/hr category had two cost-effective control technologies and an incremental cost-effectiveness was calculated

Equipment Category	Control Technology	Total Costs (\$)	Total Emission Reductions (tpd)	Cost-Effectiveness (\$/ton)
Metal Melting	Low NOx Burner	\$10,909,500	0.033	\$26,000
Metal Heat Treating: Low Temp	Low NOx Burner	\$1,525,100	0.006	\$20,900
Metal Heat Treating: High Temp	Low NOx Burner	\$2,643,000	0.010	\$19,800
Metal Heating/Forging: Low Temp	Low NOx Burner	\$942,900	0.003	\$22,500
Metal Heating/Forging: High Temp	Low NOx Burner	\$4,350,000	0.043	\$7,900
Units with Radiant-Tube Burners	Low NOx Burner	\$721,300	0.002	\$25,600
Units $\geq 40$ MMBtu/hr	SCR	\$13,955,100	0.186	\$8,200

# Incremental Cost-Effectiveness

- An incremental cost-effectiveness analysis was conducted on the Units  $\geq$  40 MMBtu/hr category due to the identification of more than one cost-effective pollution control technology
- This analysis is defined by, and conducted pursuant to, California Health and Safety Code – HSC § 40920.6:

*“To determine the incremental cost-effectiveness under this paragraph, the district shall calculate the difference in the dollar costs divided by the difference in the emission reduction potentials between each progressively more stringent potential control option as compared to the next less expensive control option.”*

# Incremental Cost-Effectiveness (cont.)

- An incremental cost-effectiveness analysis was conducted on the  $\geq 40$  MMBtu/hr category due to the identification of more than one cost-effective pollution control technology

Equipment Category	Control Technology	Total Costs (\$)	Total Emission Reductions (tpd)	Equipment Lifetime Emission Reductions (tons)	Cost-Effectiveness (\$/ton)
Units $\geq 40$ MMBtu/hr	SCR	\$13,955,100	0.186	1,695	\$8,200
Units $\geq 40$ MMBtu/hr	SCR and Low NOx Burner	\$58,561,900	0.199	2,171	\$27,000

- Incremental cost-effectiveness calculated as:

$$\text{Incremental Cost-Effectiveness (\$/ton)} = \frac{\$58,561,900 - \$13,955,100}{2,171 \text{ tons} - 1,695 \text{ tons}} = \$93,700/\text{ton}$$

- Combination of SCR and Low NOx Burner is not pursued due to incremental cost-effectiveness at substantially higher than \$50,000 per ton of NOx reduced



# **Socioeconomic Impact Assessment and California Environmental Quality Act (CEQA)**

# Scope of Socioeconomic Impact

## **Pursuant to California Health and Safety Code § 40440.8, a Socioeconomic Impact Assessment will be conducted**

- Socioeconomic Impact Assessment is required for any proposed rule or rule amendment which “will significantly affect air quality or emissions limitations”
- Socioeconomic Impact Assessment will include:
  - Type of affected industries, including small businesses
  - Range of probable costs, including costs to industry or business
  - Impact on employment and regional economy

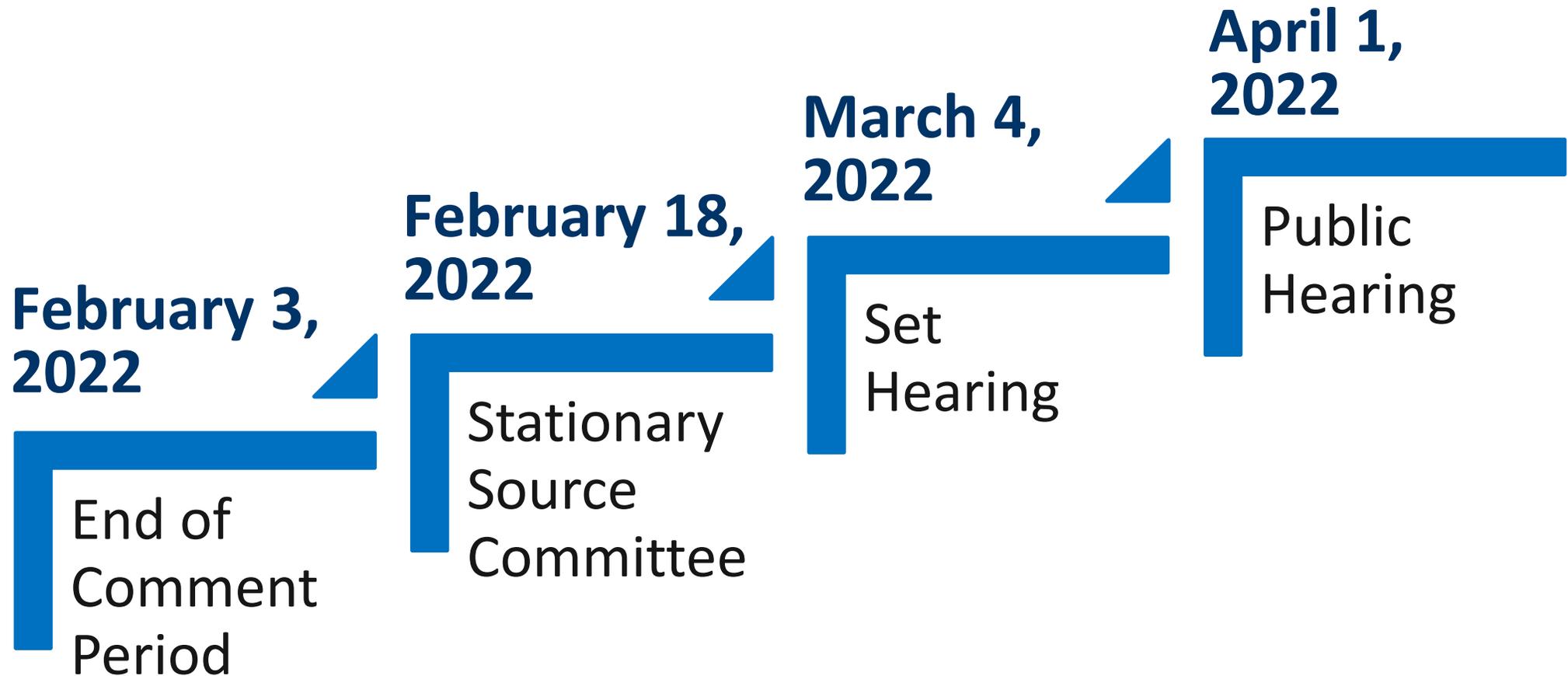
# California Environmental Quality Act (CEQA)

- PR 1147.2 comprises the proposed “project” and is subject to CEQA
- South Coast AQMD is reviewing the proposed project to determine if it will result in any environmental impacts
- Appropriate CEQA documentation will be prepared



**Next Steps**

# Next Steps



# Contacts

PR 1147.2	PAR 1147	RECLAIM Questions	General Questions
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