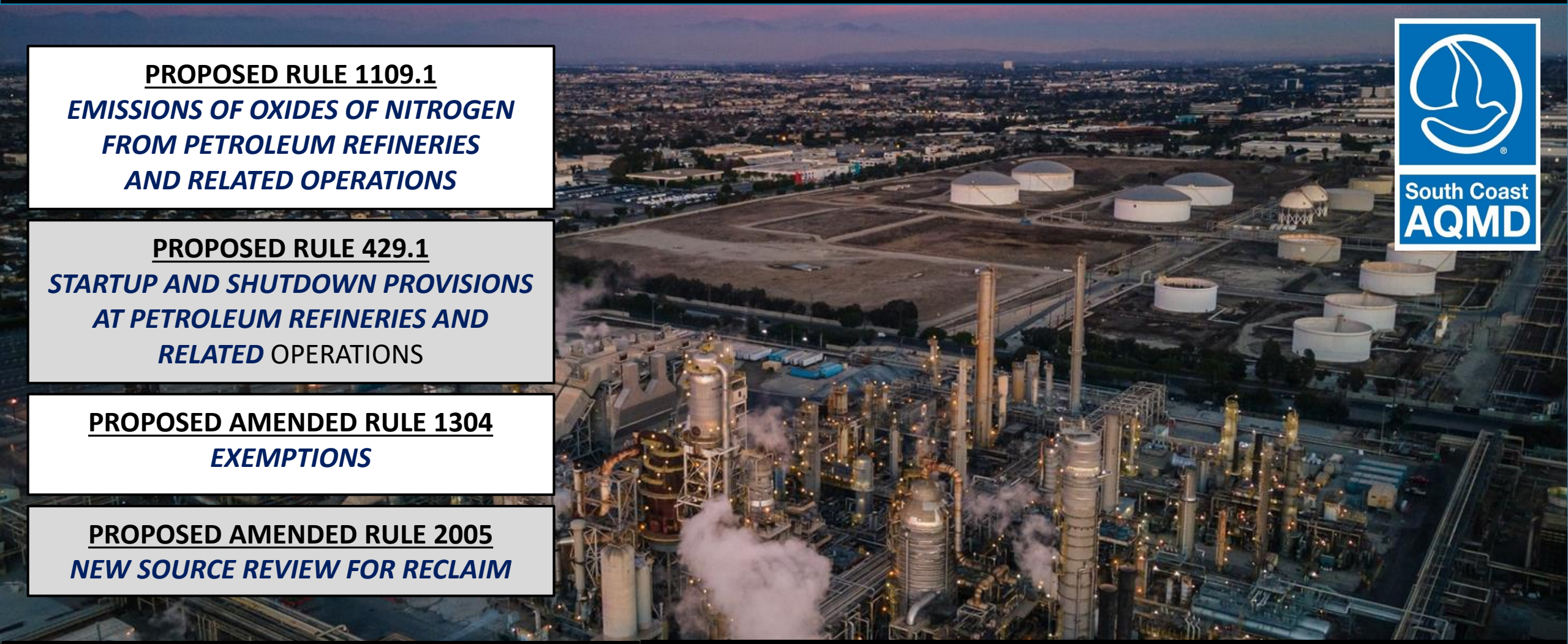


PROPOSED RULE 1109.1
EMISSIONS OF OXIDES OF NITROGEN FROM PETROLEUM REFINERIES AND RELATED OPERATIONS

PROPOSED RULE 429.1
STARTUP AND SHUTDOWN PROVISIONS AT PETROLEUM REFINERIES AND RELATED OPERATIONS

PROPOSED AMENDED RULE 1304
EXEMPTIONS

PROPOSED AMENDED RULE 2005
NEW SOURCE REVIEW FOR RECLAIM

South Coast AQMD

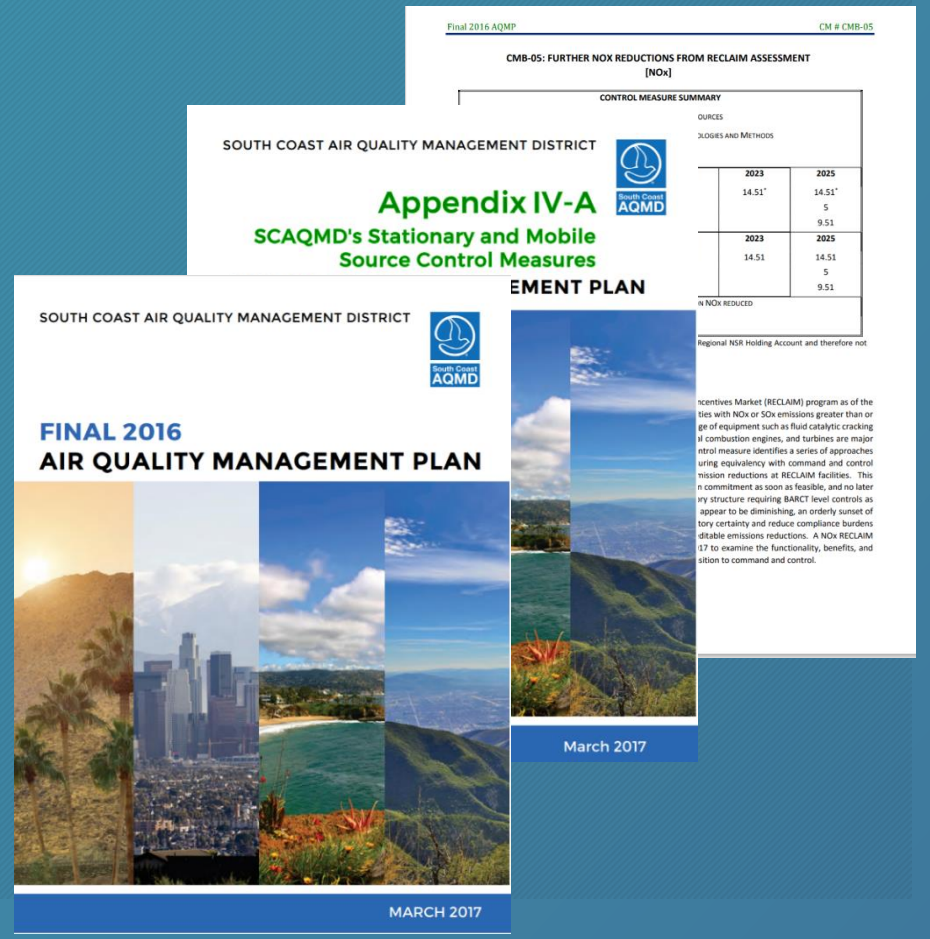
Join Zoom Webinar
https://scaqmd.zoom.us/j/98187027555
Teleconference Dial-In: +1 669 900 6833
Webinar ID: 981 8702 7555

Community Meeting

October 26, 2021

Background

- 2016 Air Quality Management Plan
  - Adopted Resolution called for 5 tons per day NOx reduction from transitioning RECLAIM to a command-and-control regulatory structure
- 2017 – AB 617
  - Applicable to facilities in the state greenhouse gas cap-and-trade program
  - Requires the highest priority for implementation will be for those sources that “have not modified emissions-related permit conditions the greatest period of time”



Overview of Rulemakings Related to PR 1109.1

Proposed Rule 1109.1

- Establishes NOx and CO emission limits for combustion equipment at petroleum refineries and facilities with operations related to petroleum refineries

Other Rulemakings to Support PR 1109.1

Proposed Rule 429.1	Provides exemptions from PR 1109.1 NOx concentration limits when units are starting up, shutting down, and certain maintenance activities
Proposed Amended Rules 1304 and 2005	Provides a narrow NSR exemption for installation of BARCT controls related to the RECLAIM transition
Proposed Rescinded Rule 1109	Existing rule for large refinery boilers and heaters that will be rescinded

Background of PR 1109.1

- Applies to 16 facilities
- Establishes NOx limits for nearly 300 pieces of combustion equipment

9 Petroleum Refineries

- Chevron
- Marathon (Carson)
- Marathon (Wilmington)
- Marathon – Calciner
- Marathon – Sulfur Recovery Plant
- Phillips 66 (Carson)
- Phillips 66 (Wilmington)
- Torrance Refining Company
- Ultramar (Valero)

3 Small Refineries

Asphalt Refineries

- Lunday-Thagard DBA World Oil Refining
- Valero Wilmington Asphalt Plant

Biodiesel Refinery

- Alt Air Paramount

4 Related Operations

Hydrogen Plants

- Air Liquide Large Industries
- Air Products and Chemicals (Carson & Wilmington)

Sulfuric Acid Plant

- Eco Services Operations

PR 1109.1 Rulemaking Public Process

25 Working Group Meetings – Starting February 2018

50+ Individual Stakeholder Meetings; ~20 Meetings w/Environmental and Community Groups

Two Community Meetings including AB 617 Carson, Wilmington, and West Long Beach Community

4 Drafts of PR 1109.1
2 Drafts of PR 429.1
2 Drafts of PAR 1304
1 Draft of PAR 2005

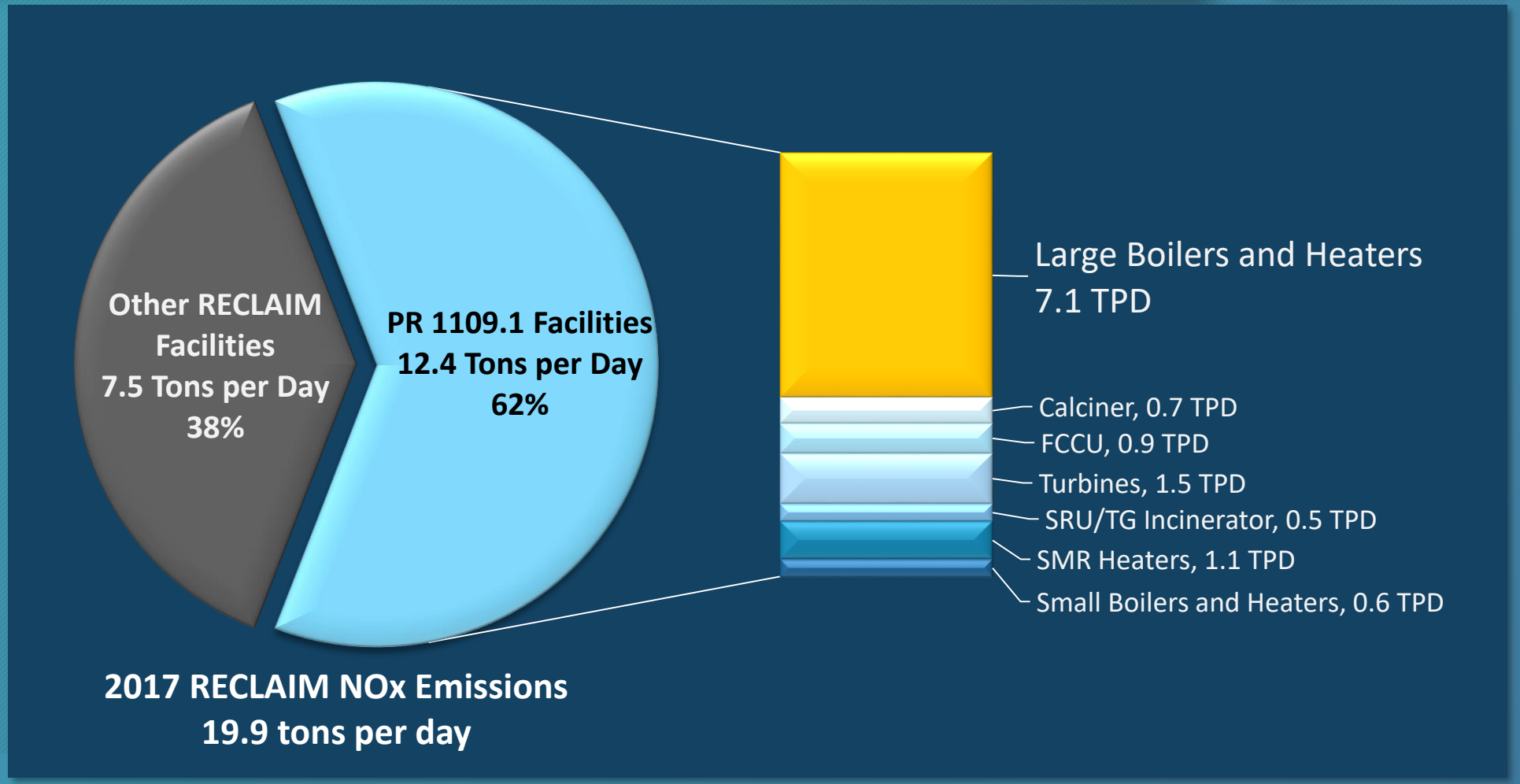
One Public Workshop and One Study Session

About Proposed Rule 1109.1

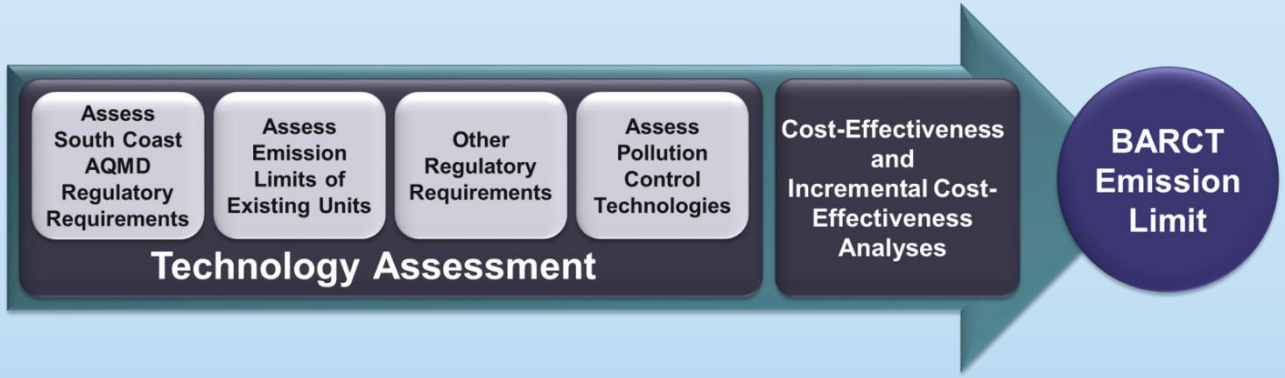
- Proposed Rule 1109.1 is a command-and-control industry-specific rule that establishes BARCT NOx and CO emission limits for all combustion equipment at refinery and refinery-related facilities
- Proposed NOx emission limits were developed through a rigorous BARCT analysis that is consistent with California Health and Safety Code Section 40920.6 (c)(2)
- All implementation options provided in PR 1109.1 are designed to achieve equivalent emission reductions
- Facilities cannot use RECLAIM Trading Credits (RTCs) to meet PR 1109.1 emission reduction obligations – and must be achieved by the affected facilities

PR 1109.1 2017 Baseline Emissions (Tons per Day or TPD)

- PR 1109.1 facilities represent 62% of the NOx emissions in RECLAIM
- NOx Emissions from large boilers and heaters (≥40 MMBtu/hour) represent 57% of the emissions from PR 1109.1 combustion equipment



PR 1109.1 BARCT Assessment



- Proposed BARCT NOx limit established using a methodical approach that meets state law
- BARCT is defined in the California Health and Safety Code §40406 as
  ;"*…an emission limitation that is based on the maximum degree of reduction achievable by each class or category of source, taking into account environmental, energy, and economic impacts*."

- NOx limits are designed to achieve maximum reductions taking into account economic impacts
- Staff uses a cost-effectiveness threshold of $50,000/ton of NOx reduced
- Incremental cost-effectiveness is the incremental cost over the incremental reductions for the next more stringent NOx limit
  - >>$50,000 indication that next more stringent NOx limit does not achieve substantially more reductions

Core Requirements

- Operators must meet NOx limits in Table 1
- If the conditional requirements can be met, operators can meet Table 2 “conditional NOx limits” in lieu of Table 1 limits
- Conditional NOx limits were developed to acknowledge achieving Table 1 NOx limits for some units have:
  - A high cost-effectiveness due to high capital cost and/or low emission reduction potential
- Incorporating the conditional NOx limits reduced the average cost-effectiveness to near or below $50,000 per ton of NOx reduced for each class and category (BARCT)

TABLE 1: NOx AND CO EMISSION LIMITS

Unit	NOx (ppmv)	CO (ppmv)	O2 Correction (%)	Rolling Averaging Time[1]
Boilers <40 MMBtu/hour	Pursuant to paragraph (d)(3)	400	3	24-hour
Boilers ≥40 MMBtu/hour	5	400	3	24-hour
FCCU	2	500	3	365-day
	5			7-day
Flares	20	400	3	2-hour
Gas Turbines fueled with Natural Gas	2	130	15	24-hour
Gas Turbines fueled with Gaseous Fuel other than Natural Gas	3	130	15	24-hour
Petroleum Coke Calciner	5			365-day
Process Heaters <40 MMBtu/hour	Pursu paragra			
Process Heaters ≥40 MMBtu/hour				
SMR Heaters				
SMR Heaters with Gas Turbine				
SRU/TG Incinerators				
Sulfuric Acid Furnaces				
Vapor Incinerators				

[1] Averaging times apply to units ope pursuant to Attachment A of this r units without CEMS are specified in

TABLE 2: CONDITIONAL NOx AND CO EMISSION LIMITS

Unit	NOx (ppmv)	CO (ppmv)	O_2 Correction (%)	Rolling Averaging Time[1]
Boilers >110 MMBtu/hour	7.5	400	3	24-hour
FCCUs	8	500	3	365-day
	16			7-day
Gas Turbines fueled with Natural Gas	2.5	130	15	24-hour
Process Heaters 40 – 10 MMBtu/hour	18	400	3	24-hour
Process Heaters >110 MMBtu/hour	22	400	3	24-hour
SMR Heaters	7.5	400	3	24-hour
Vapor Incinerators	40	400	3	24-hour

[1] Averaging times apply to units operating a certified CEMS and shall be calculated pursuant to Attachment A of this rule. Requirements, including averaging times, for units without CEMS are specified in subdivision (k).

Requirements for Large Boilers and Heaters (≥ 40 MMBtu/Hour)

Unit	Table 1 NOx Limit (ppmv)	Table 2 Conditional NOx Limit (ppmv)
Boilers 40 – 110 MMBtu/hour	5 ppm	None
Boilers >110 MMBtu/hour		7.5
Process Heaters 40 – 110 MMBtu/hour		18
Process Heaters >110 MMBtu/hour		22

* Emission reductions range based on units identified as possibly meeting Table 2

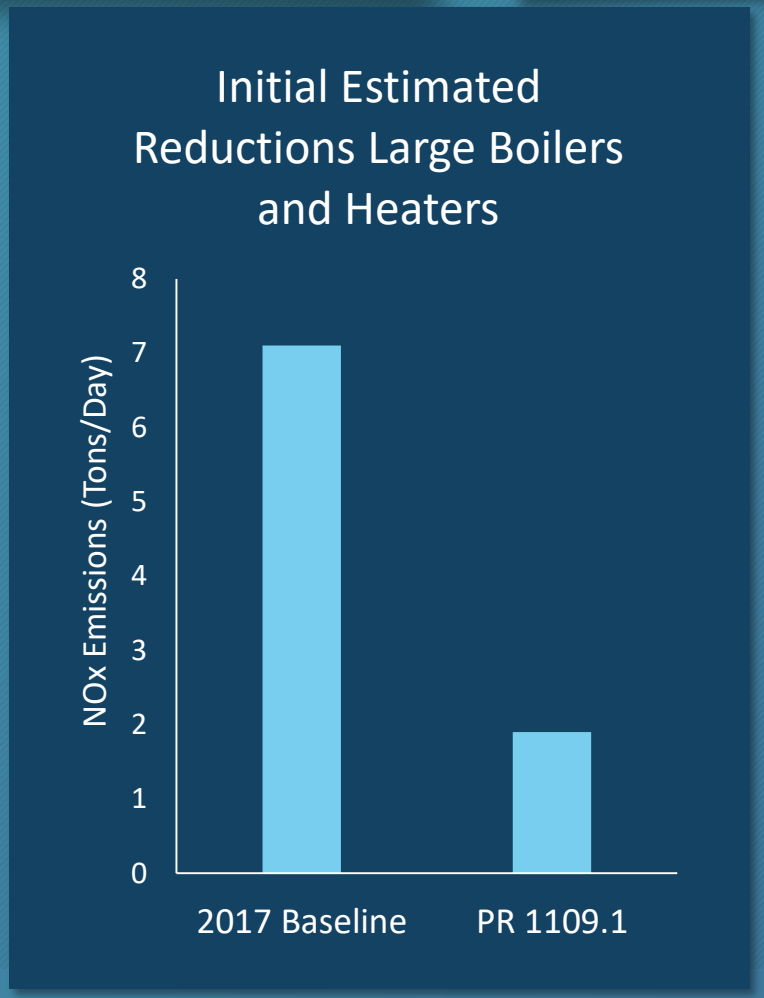


Table 2 Conditional NOx Limits

Unit	NOx (ppmv)	CO (ppmv)	O2 Correction (%)	Rolling Averaging Time[1]
Boilers >110 MMBtu/hour	7.5	400	3	24-hour
FCCU	8	500	3	365-day
	16			7-day
Gas Turbines fueled with Natural Gas	2.5	130	15	24-hour
Process Heaters 40 – 110 MMBtu/hour	18	400	3	24-hour
Process Heaters >110 MMBtu/hour	22	400	3	24-hour
SMR Heaters	7.5	400	3	24-hour
Vapor Incinerators	40	400	3	2-hour

Conditions for Using Table 2 NOx Limits

- Operators cannot use Conditional Limits if:
  - Permit to Construct issued on or after December 4, 2015 for post combustion controls
  - Potential NOx reductions is greater than:
    - 10 tons per year for boilers or process heaters 40 and 110 MMBtu/hour
    - 20 tons per year for boilers and process heaters ≥110 MMBtu/hour
  - Unit currently has permit limit or is currently performing at or below the applicable Table 1 NOx limit
  - Unit will be decommissioned
- Operators must submit a permit application by July 1, 2022 and meet Table 2 limit 18 months after Permit to Construct is issued
- PR 1109.1 includes provisions for "pre-qualified" units – early permit submittal is not required for pre-qualified units

New SCRs should meet Table 1 NOx Limit

Units with large potential reductions should meet Table 1 NOx Limit

Unit already achieving Table 1 NOx Limit

Unit will be shutdown

PR 1109.1 Potential Emission Reductions

- PR 1109.1 will potentially reduce 7.7 – 7.9 tpd of NOx
- Estimated to achieve over 70% reduction in NOx emissions from boiler and process heater categories
  - Percent reductions vary based on emission reduction potential, some units already achieving low emissions
  - SCR can achieve 95% NOx Reductions for uncontrolled units
  - 41 boilers and process heaters currently have SCRs installed
  - Emission reduction estimates account for potential eligibility to meet Table 2 conditional limits

Equipment Type	2017 NOx Baseline Emissions (tpd)	Potential NOx Emission Reductions (tpd)
Boilers & Process Heaters ≥40 MMBtu/hr	7.1	5.0 – 5.2[(1)]
Coke Calciner	0.71	0.68
SMR Heaters	1.1	0.6
Gas Turbine	1.4	0.4
FCCU	0.83	0.4
Boilers & Process Heaters <40 MMBtu/hr	0.64	0.32[(2)]
SRU/TG Incinerator	0.43	0.1
Vapor Incinerators	0.05	0.02
Sulfuric Acid Plants	0.1	0
Total	**12.4**	**7.7 – 7.9**

1 Estimated reductions based on units anticipated to meet conditional limits

2 Includes projected NOx emission reductions from end-of-life burner replacement and emerging technologies

B-Plan and B-CAP Requirements

- The B-Plan and B-Cap would be implemented through an implementation schedule called an I-Plan
- B-Plan and B-Cap provides options to achieve BARCT in the aggregate
- Both alternative compliance options requires each unit to have an enforceable permit limit
  - Some permit limits will be higher than Table 1 limits, however the higher emission limits will have to be offset by lower limits

- B-Plan is a BARCT equivalent *concentration* plan
- Allows operators to select a NOx concentration limits that are equivalent BARCT in aggregate

- B-Cap is a BARCT equivalent *mass* cap
- Requires operators to accept a NOx emission limit for each unit
- Allows facilities to take credit for equipment shutdowns and throughput reductions

NOx Emission Targets for B-Cap and B-Plan

TABLE 1: NOx AND CO EMISSION LIMITS

Unit	NOx (ppmv)	CO (ppmv)	O2 Correction (%)	Rolling Averaging Time[1]
Boilers <40 MMBtu/hour	Pursuant to paragraph (d)(3)	400	3	24-hour
Boilers ≥40 MMBtu/hour	5	400	3	24-hour
FCCU	2	500	3	365-day
	5			7-day
Flares	20	400	3	2-hour
Gas Turbines fueled with Natural Gas	2	130	15	24-hour
Gas Turbines fueled				
Gaseous Fuel other t Natural Gas				
Petroleum Coke Cal				
Process Heaters <40 MMBtu/hou				
Process Heaters ≥40 MMBtu/hou				
SMR Heaters				
SMR Heaters with (Turbine				
SRU/TG Incinerat				
Sulfuric Acid Furna				
Vapor Incinerator				

[1] Averaging times a pursuant to Attachment A of this rule. Requirements, including averaging times, for units without CEMS are specified in subdivision (k).

TABLE 2: CONDITIONAL NOx AND CO EMISSION LIMITS

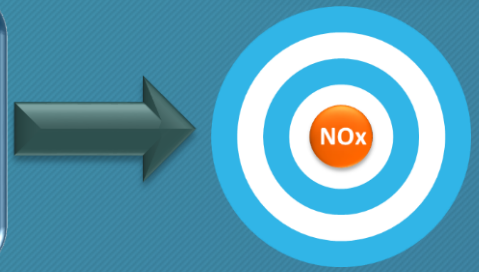
Unit	NOx (ppmv)	CO (ppmv)	O_2 Correction (%)	Rolling Averaging Time[1]
Boilers >110 MMBtu/hour	7.5	400	3	24-hour
FCCUs	8 16	500	3	365-day 7-day
Gas Turbines fueled with Natural Gas	2.5	130	15	24-hour
Process Heaters 40 – 10 MMBtu/hour	18	400	3	24-hour
Process Heaters >110 MMBtu/hour	22	400	3	24-hour
SMR Heaters	7.5	400	3	24-hour
Vapor Incinerators	40	400	3	24-hour

[1] Averaging times apply to units operating a certified CEMS and shall be calculated pursuant to Attachment A of this rule. Requirements, including averaging times, for units without CEMS are specified in subdivision (k).

Emission Targets for all facilities based on NOx limits in Table 1 and Table 2

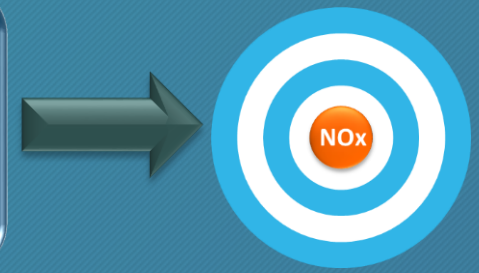
B-Plan

Aggregate NOx concentration limits must meet Emission Target



B-Cap

Facility-wide emissions must meet Emission Target + 10% Environmental Benefit



+ 10%

B-Plan and B-Cap are designed to achieve Facility-Specific Emission Targets that are Based on Table 1 and Table 2 NOx Limits

Alternative Implementation Schedule (I-Plan)

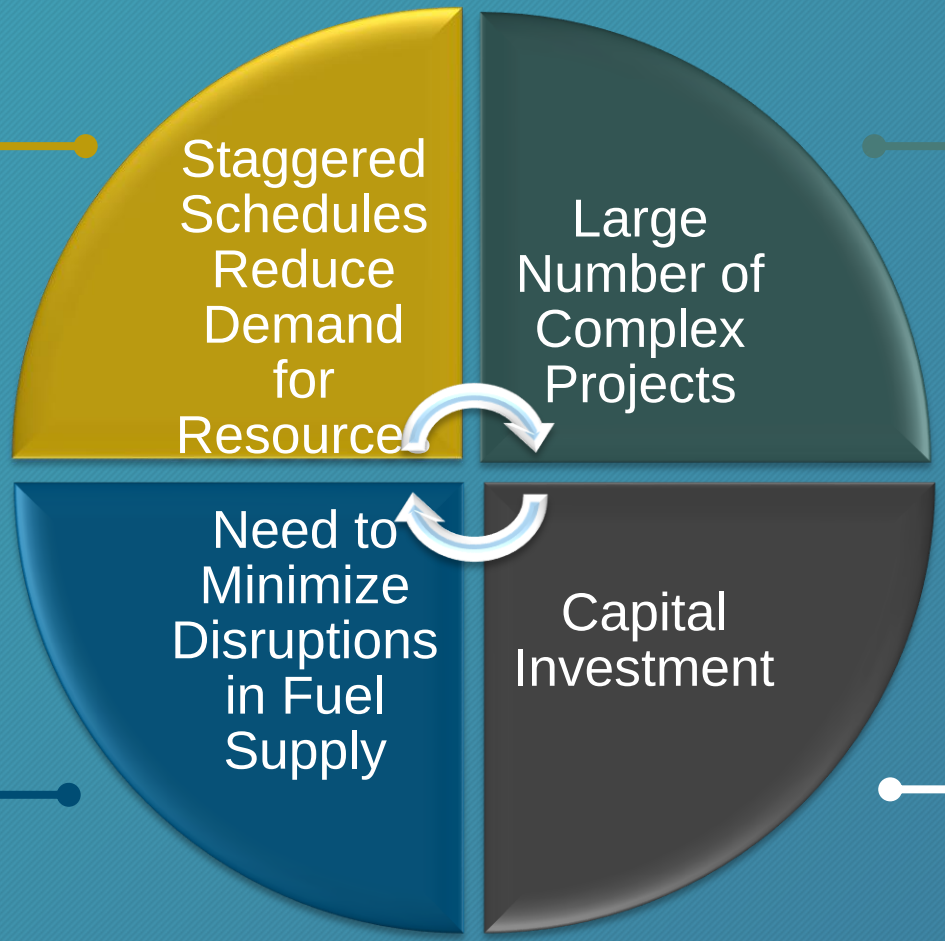
- I-Plan is a phased implementation schedule
- Allows operators to tailor the implementation schedule to meet NOx limits to minimize operational disruptions

- I-Plans are needed due to the complexity and number of projects required to achieve PR 1109.1 limits
- The flexibility in the I-Plans allows the facilities to install the NOx emission reduction projects during schedule maintenance to help minimize downtime and additional cost
- I-Plans are designed to achieve early emission reductions and allow longer implementation periods for the units that have longer maintenance schedules

PR 1109.1 Implementation Considerations

- Refineries competing for same pool of skilled labor, equipment manufacturers, source testing companies, etc.

- Integrating projects in refinery turnaround schedules minimizes fuel supply disruptions
- Most turnaround schedules are 3 to 5 years, a few are 9 to 10 years



- ~75 new selective catalytic reduction (SCR) projects
- ~25 SCR upgrades projects
- SCR projects customized and require complex engineering
- Challenging to integrate within existing facility structure

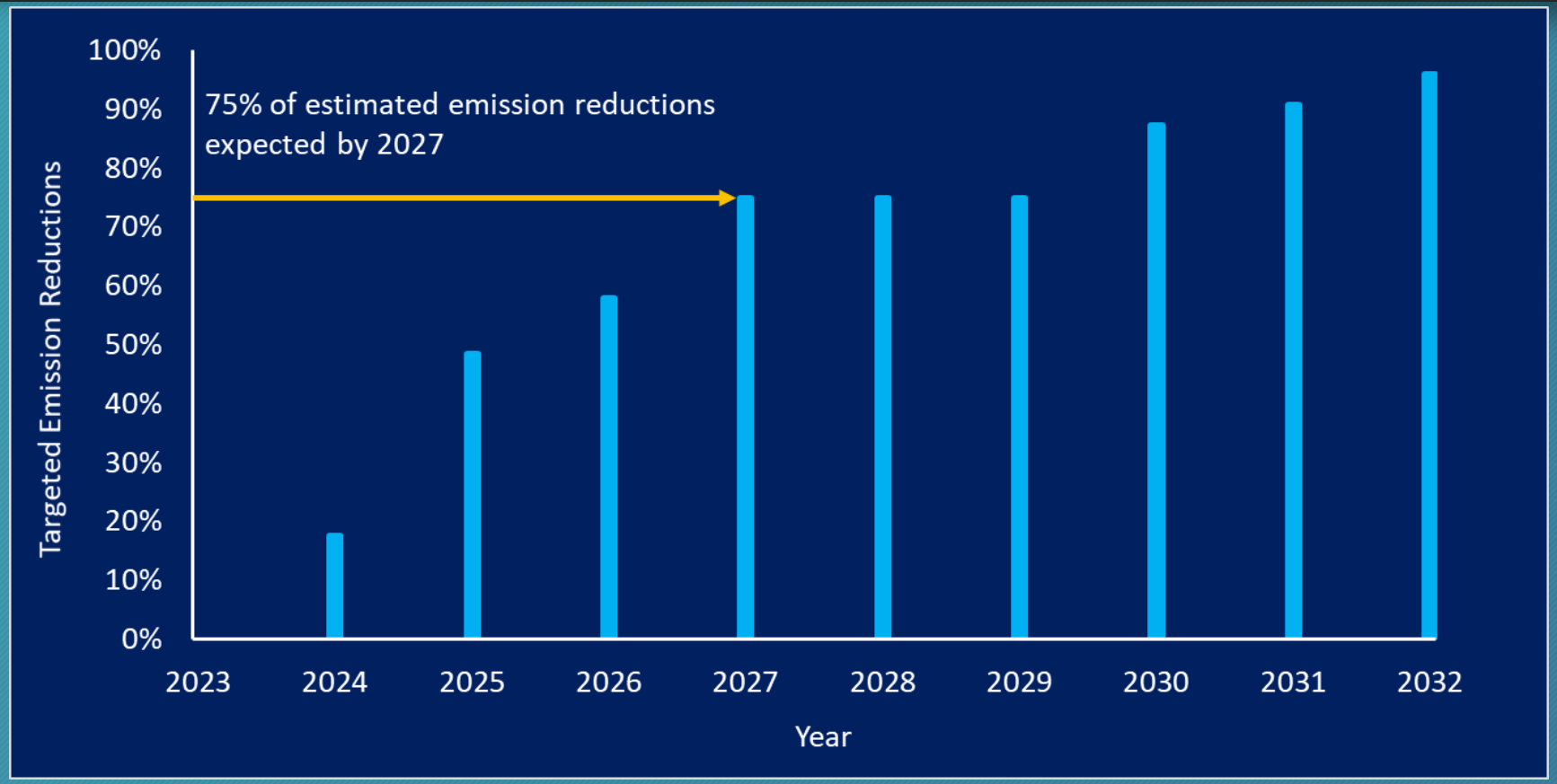
- Capital costs for each project $10 to $70 million
- Cost per petroleum refinery ranges from $179 million to $1 billion

I-Plan Options

- PR 1109.1 includes five I-Plan Options
- Some I-Plans are limited to the type of BARCT Compliance Plan
- I-Plan Option 2 and 3 have an additional condition that the facility must be achieving a NOx emission rate less than 0.02 pound per million BTU of heat input

I-Plan Options	Provision	Phase I	Phase II	Phase III
I-Plan Option 1 B-Plan Only	**Percent Reduction Targets**	**80**	**100**	**N/A**
	Permit Application Submittal Date	January 1, 2023	January 1, 2031	N/A
	Compliance Date	No later than 36 months after a Permit to Construct is issued		NA
I-Plan Option 2 B-Plan Only and as allowed pursuant to paragraph (h)(7)	**Percent Reduction Targets**	**65**	**100**	**N/A**
	Permit Application Submittal Date	July 1, 2024	January 1, 2030	N/A
	Compliance Date	No later than 36 months after a Permit to Construct is issued		N/A
I-Plan Option 3 B-Plan or B-Cap and as allowed pursuant to paragraph (h)(7)	**Percent Reduction Targets**	**40**	**100**	**N/A**
	Permit Application Submittal Date	July 1, 2025	July 1, 2029	N/A
	Compliance Date	No later than 36 months after a Permit to Construct is issued		N/A
I-Plan Option 4 B-Cap Only	**Percent Reduction Targets**	**50**	**80**	**100**
	Permit Application Submittal Date	N/A	January 1, 2025	January 1, 2028
	Compliance Date	January 1, 2024	No later than 36 months after a Permit to Construct is issued	
I-Plan Option 5 B-Plan Only	**Percent Reduction Targets**	**50**	**70**	**100**
	Permit Application Submittal Date	January 1, 2023	January 1, 2025	July 1, 2028
	Compliance Date	No later than 36 months after a Permit to Construct is issued		

Cumulative NOx Reductions from Major Petroleum Refineries Based on I-Plans



- Bars represent the estimated start of the emission reduction projects (18 months from permit submittal deadline)
- Facilities have 36 months from issuance of Permit to Construct to demonstrate compliance

Compliance with the WCWLB CERP

- Final Community Emission Reduction Plan (CERP) approved in September 2019
- CERP for Wilmington, Carson, West Long Beach include goals for emission reductions from refinery equipment, flaring, storage tanks
- One goal targets 50% reduction in NOx emissions with implementation of PR 1109.1
  - Equates to 3-4 tons per day NOx reduction by 2030
- PR 1109.1 anticipates overall 7.7 – 7.9 tons per day reduction from full implementation
- Reductions from WCWLB refineries ~4.5 tons per day NOx reduction so CERP goal will be satisfied

Socioeconomic Impact Analysis

- Socioeconomic Impact Assessment and 3rd Party Reviews released September 7, 2021
  - Total cost estimated to be $2.34 billion (net present value)
  - Estimated average annual costs of $132.5 million per year
  - Documents can be viewed here: http://www.aqmd.gov/home/rules-compliance/rules/scaqmd-rule-book/proposed-rules/rule-1109-1
- Local price of gasoline is projected to increase by less than one cent per gallon
- Average annual regional job impacts are projected increase by 213 jobs per year
  - In general, job gains are in the construction sector
  - Job gains from construction is expected to outweigh any negative impacts on affected industries
- Monetized public health benefits estimated to be $2.63B (net present value)
  - Benefits include approximately 370 premature deaths avoided, 6,200 asthma attacks avoided, and 21,400 work loss days avoided

Next Step

Public Hearing: November 5, 2021

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