

Rule 1109.1 – NO_x Emission Reduction for Refinery Equipment

Community Meeting / Working Group Meeting #14
Wilmington, Carson, and West Long Beach
August 27, 2020

Join Zoom Meeting

<https://scaqmd.zoom.us/j/99174749787>

Meeting ID: 991 7474 9787

Passcode: 643530

Call-in number: 1-669-900-6833

Agenda

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- Progress of Rule Development
- 2016 AQMP & AB617
- Rulemaking and Public Process
- Proposed Rule 1109.1
- Proposed BARCT Limits and projected emission reductions
- Implementation Concepts

Progress of Rule Development

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Summary of Working Group # 13 (8/12/20)

- Followed up on the BARCT Assessment for SMR Heaters
- Proposed BARCT limits for Sulfuric Acid Plants which completed the BARCT analysis for all refinery and refinery-related equipment
- Assessed Heaters and Boilers with existing SCRs
- Continued discussion on sulfur clean-up in refinery fuel gas
- Introduced implementation concepts

Since Last Working Group Meeting

- Discussions with third party consultants regarding proposed BARCT limits
- Re-visiting Heaters and Boilers performing close to proposed BARCT limits
- Continued work on draft rule language

Background



REgional CLean Air Incentives Market (RECLAIM) Background

- RECLAIM was adopted on October 15, 1993
- Includes two markets for facilities with NO_x or SO_x emissions \geq 4 tons per year
- Facilities were initially issued an Allocation of RECLAIM Trading Credits (RTCs) that are reduced annually
 - Facilities can either install pollution controls or purchase RTCs from another facility
- RECLAIM was designed to achieve Best Available Retrofit Control Technology (BARCT) in aggregate and allow compliance flexibility
- Although the program has had substantial emission reduction in NO_x, for refineries and refinery-related operations about ~80% of equipment is currently not meeting BARCT

2016 Air Quality Management Plan and Assembly Bill (AB) 617

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- Governing Board approved 2016 Air Quality Management Plan (AQMP) which included CMB-05
 - Achieve further NOx reductions of 5 tons per day by 2025 from NOx RECLAIM sources
 - Transition NOx RECLAIM to a “command-and-control” regulatory framework requiring BARCT level controls

SOUTH COAST AIR QUALITY MANAGEMENT DISTRICT

Appendix IV-A
SCAQMD's Stationary and Mobile Source Control Measures

FINAL 2016 AIR QUALITY MANAGEMENT PLAN

| CMB-05: FURTHER NOx REDUCTIONS FROM RECLAIM ASSESSMENT [NOx] | | | | |
|--|------|-------|-------|------|
| CONTROL MEASURE SUMMARY | | | | |
| VARIOUS RECLAIM NOx SOURCES | | | | |
| VARIOUS CONTROL TECHNOLOGIES AND METHODS | | | | |
| 1012 | 2022 | 2023 | 2025 | |
| 6.51 | 15.6 | 14.51 | 14.51 | 5 |
| | | | | 9.51 |
| 1012 | 2022 | 2023 | 2025 | |
| 6.51 | 15.6 | 14.51 | 14.51 | 5 |
| | | | | 9.51 |

MANAGEMENT PLAN

\$13,500-\$21,000 PER TON NOx REDUCED

SCAQMD

will be used to fund the Regional NSR Holding Account and therefore not

ory

the Regional Clean Air Incentives Market (RECLAIM) program as of the M program includes facilities with NOx or SOx emissions greater than or sequent year. A wide range of equipment such as fluid catalytic cracking ins, coke calciner, internal combustion engines, and turbines are major CLAIM facilities. This control measure identifies a series of approaches m more effective in ensuring equivalency with command and control generate further NOx emission reductions at RECLAIM facilities. This id NOx emission reduction commitment as soon as feasible, and no later and control regulatory structure requiring BARCT level controls as am's original advantages appear to be diminishing, an orderly sunset of y to create more regulatory certainty and reduce compliance burdens } more actual and SIP creditable emissions reductions. A NOx RECLAIM rered in the spring of 2017 to examine the functionality, benefits, and ptions for an orderly transition to command and control.

IV-A-67

March 2017

MARCH 2017

AB 617

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- Health and Safety Code Section 40920.6(c)(1) states:
 - On or before January 1, 2019, each district that is a nonattainment area for one or more air pollutants shall adopt an expedited schedule for the implementation of best available retrofit control technology (BARCT), by the earliest feasible date, but in any event not later than December 31, 2023
- AB 617 requires that the highest priority for implementation will be for those sources that “have not modified emissions-related permit conditions the greatest period of time”
- All RECLAIM landing rules expected to be adopted/amended before December 31, 2023

Definition of BARCT

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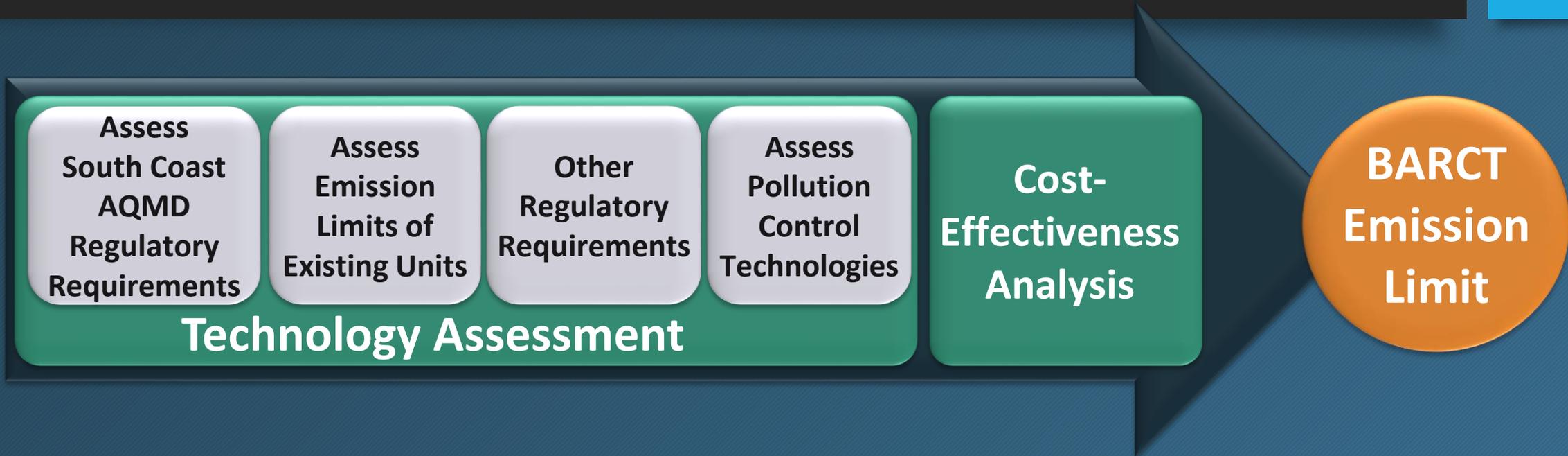
California
H&SC
§40406
defines
BARCT as:

“...an emission limitation that is based on the maximum degree of reduction achievable, taking into account environmental, energy, and economic impacts by each class or category of source.”

- BARCT is an evolving standard that becomes more stringent over time as technology advances that can be achieved through retrofitting or replacing equipment
- Allows for technology forcing limits provided the future compliance date allows for the technology to be developed

BARCT Analysis Process

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- Analysis process is used for establishing BARCT emission limits
- Staff uses the 2016 AQMP \$50,000 per ton of NO_x reduced threshold as a guidance for evaluating the cost-effectiveness

Command-and-Control Regulatory Approach

- Command-and-control regulatory approach establishes an emission limit for each equipment category
- Operators must meet the emission limit for each piece of equipment specified in the command-and-control rule
- Operators CANNOT purchase credits in lieu of installing pollution controls
- Command-and-control rules can have flexibility with the:
 - Implementation schedule
 - Averaging times to meet the emission limits





Rule 1109.1 Rulemaking Process

About Proposed Rule 1109.1

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- Proposed Rule 1109.1 is a command-and-control industry-specific rule that will apply to refinery and refinery-related facilities
- Proposed Rule 1109.1 will establish BARCT NOx emission limits for all combustion equipment at refinery and refinery-related facilities
 - Regulates nearly 300 pieces of combustion equipment
- Staff held the first public Working Group Meeting for Proposed Rule 1109.1 on February 21, 2018
- Proposed NOx emission limits were developed through the rigorous BARCT analysis that estimated the cost-effectiveness for each piece of equipment

Overview of Proposed Rule 1109.1 Development Process

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Information Gathering
and BARCT Analysis

*Working group
and
stakeholder
meetings
continue
throughout
process*



About Proposed Rule 1109.1 Working Group Meetings

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- Working Groups include industry, environmental groups, community members, and public agencies
- 13 Proposed Rule 1109.1 Working Group Meetings held to date

Overview



- Build consensus
- Create a dialogue with all stakeholders
- Encourage early stakeholder input
- Work through key issues with stakeholders

Objectives



- Goal is to develop a proposed rule that addresses the air quality objectives while minimizing and possibly eliminating key issues

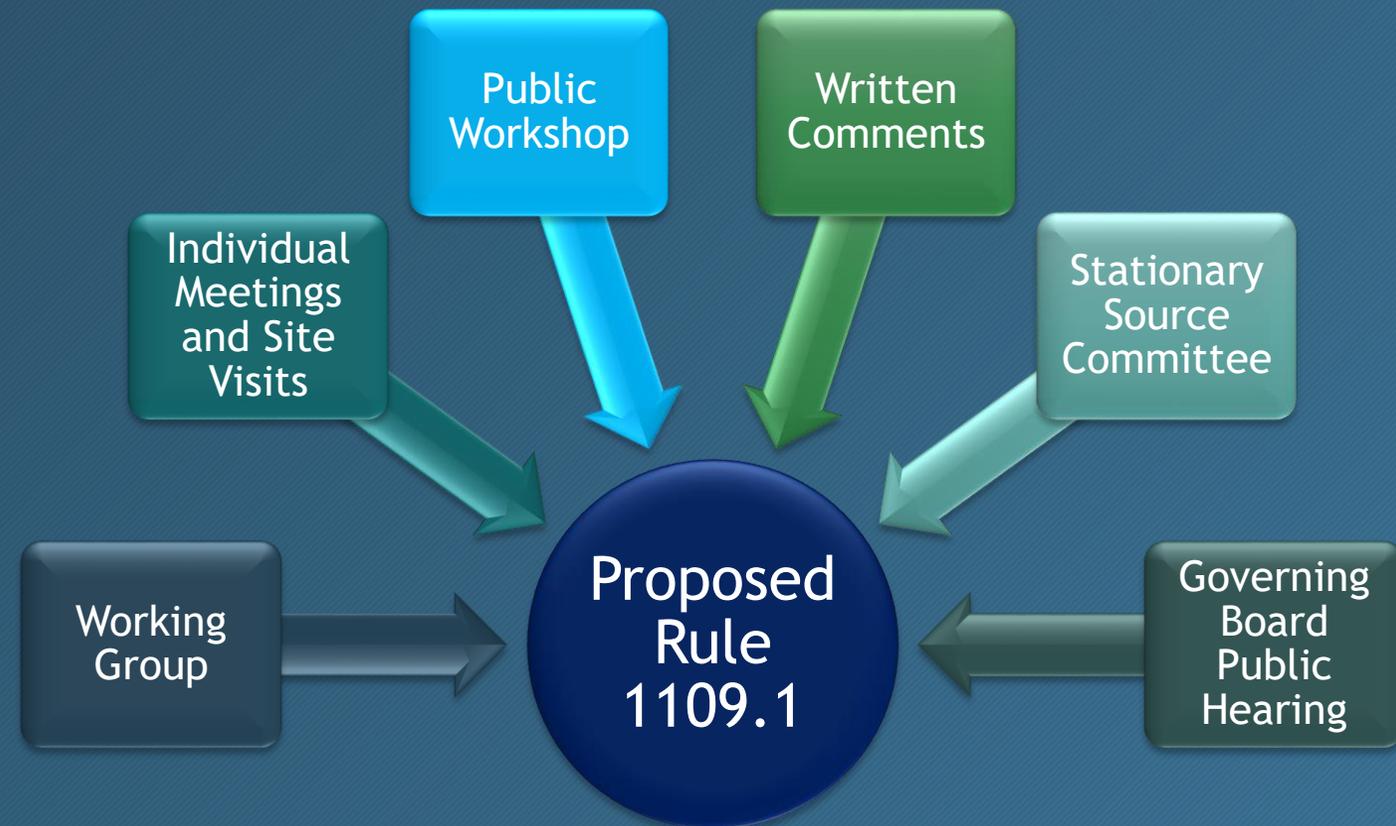
Outcome



Stakeholder Input

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- Stakeholders can provide input during Working Group Meetings and throughout the rulemaking process
- Early input is strongly encouraged to help address issues
- Working Group Meetings, Individual Meetings, and Site Visits allow stakeholders to dialogue directly with staff and discuss individual issues



Site Visits

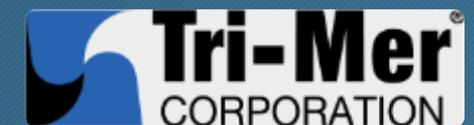
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- Site visits allows staff to understand and assess real-world challenges of installing NOx controls
- 14 facility site visits
 - Visited some facilities several times to gather additional information
- Site visit to San Joaquin Valley Air District for technology demonstration and information gathering
 - Installations have potential to transfer to refinery applications
- Understanding of challenges and limitations of NOx control technology



Control Technology Meetings

- NOx Control Technologies Assessed
 - Combustion modification (e.g., burner technology, water/steam injection)
 - Post-combustion controls (e.g., Selective Catalyst Reduction (SCR), Low temperature oxidation (LoTOx™), multi-component technologies (UltraCat™))
- Met with 13 NOx control technology manufacturers with major presence in the refinery sector



Engineering Consultants

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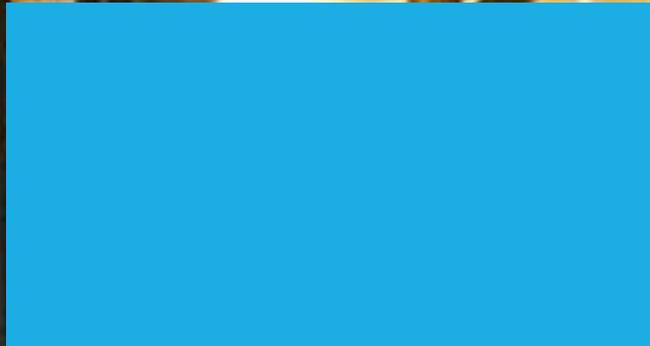
- Conducted site visits to all major facilities
- Compiling assessment and finalizing report
- Space constraints challenges account for the majority SCR costs
- Despite challenges, some facilities have undergone elaborate engineering designs and implementations
- Reviewed cost data



- Engineering assessment of NOx control technologies
- Meeting and discussions with vendors
- Reviewing NOx control cost data and information from refinery projects in other regions such as the Gulf and East Coast
- Reviewing staff's analysis



Proposed Rule 1109.1



Proposed Rule 1109.1 Universe and Applicability

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9 Refinery Facilities

- Crude Oil Processing
- Sulfur Recovery
- Coke Calciner



3 Small Refineries

- Asphalt Plants
- Bio-fuels Plant



4 Related Operation

- Hydrogen Plants
- Sulfuric Acid Plants

Proposed Rule 1109.1 will apply to 16 facilities

Proposed Rule 1109.1 Affected Equipment

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Proposed Rule 1109.1 will establish NOx BARCT emission limits for nearly 300 pieces of combustion equipment

| Equipment Type | Total Number |
|--|--------------|
| Heaters/Boilers | 228 |
| Start-Up Heaters/Boilers | 8 |
| Coke Calciner ⁽¹⁾ | 1 |
| FCCU | 5 |
| Gas Turbines ⁽²⁾ | 13 |
| Sulfur Recovery Units/Tail Gas Incinerators ⁽³⁾ | 16 |
| Flares and Thermal Oxidizers | 14 |
| Total | 285 |

⁽¹⁾ Coke calciner – pyroscrubber and kiln; ⁽²⁾ 10 gas turbines with duct burners, 3 without; ⁽³⁾ 3 units have in-line heaters

Proposed Rule 1109.1 Data Collection and Analysis

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Facility Survey of Equipment

- Analysis of ~400 pieces of equipment and controls
- 5 years of reported emissions
- Equipment age and operating conditions

CEMS Data*

- Analysis of CEMS data for 150 pieces of equipment*
- Analysis of 8,760 data points for each piece of equipment

Cost-Effectiveness

- Facilities provided cost data
- Data from facility survey and CEMS data used to estimate cost-effectiveness

* CEMS is Continuous Emissions Monitoring System. Not all pieces of equipment are required to have CEMS.

Assessment of Existing NOx Levels of Equipment



Used facility survey of equipment and CEMS data to analyze existing NOx emission levels from equipment subject to Proposed Rule 1109.1



Data analyzed for each individual piece of equipment



Summaries of the range of NOx concentrations for each category are provided by permit limits, Continuous Emissions Monitoring System (CEMS) annual average from the survey data, or source test data

Current Range of NOx Levels for Heaters

| Heater Size | No. of Devices in Category | Range of Current NOx Levels (ppmv) ⁽¹⁾ | Percent Oxygen |
|-----------------------------|----------------------------|---|----------------|
| Heaters | | | |
| <20 MMBtu/hr | 22 | 30 to 60 | 3 |
| 20 - 40 MMBtu/hr | 45 | 5 to 100 | 3 |
| >40 - 110 MMBtu/hr | 72 | 5 to 140 | 3 |
| >110 MMBtu/hr | 46 | 5 to 90 | 3 |
| SMR Heaters | 11 | 5 to 50 | 3 |
| SMR Heater/GTG | 2 | 5 | 15 |
| Sulfuric Acid Plant Furnace | 3 | 20 to 60 | 3 |

⁽¹⁾ NOx emissions based permit limit, CEMS annual average, or source test data, dependent on data source available for specific equipment

Current Range of NOx Levels for Boilers

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| Boiler Size (MMBtu/hr) | No. of Devices in Category | Range of Current NOx Levels ⁽¹⁾ (ppmv at 3% O ₂) |
|------------------------|----------------------------|---|
| Boilers | | |
| <40 | 5 | 9 to 40 |
| 40 – 110 | 3 | 70 to 100 |
| >110 | 20 | 9 to 120 |

⁽¹⁾ NOx emissions based permit limit, CEMS annual average, or source test data, dependent on data source available for specific equipment

Current Range of NOx Levels for Calciner, FCCU, Gas Turbines, SRU/TG Incinerators

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| | No. of Devices in Category | Range of Current NOx Levels ⁽¹⁾ (ppmv) | Percent Oxygen |
|-------------------------------------|----------------------------|---|----------------|
| Coke Calciner | | | |
| Kiln/Pyroscrubber | 1 | 70 | 3 |
| FCCU | | | |
| Regenerator/CO Boiler | 5 | 20 to 40 | 0 |
| Gas Turbines | | | |
| Gas Turbines | 13 | 2 to 10 | 15 |
| SRU/TG Incinerators | | | |
| Incinerators | 16 | 4 to 100 | 3 |
| Flares and Thermal Oxidizers | | | |
| Thermal Oxidizers | 13 | 9 to 130 | 3 |
| Ground Flares | 1 | Low Use | 3 |

⁽¹⁾ NOx emissions based permit limit, CEMS annual average, or source test data, dependent on data source available for specific equipment

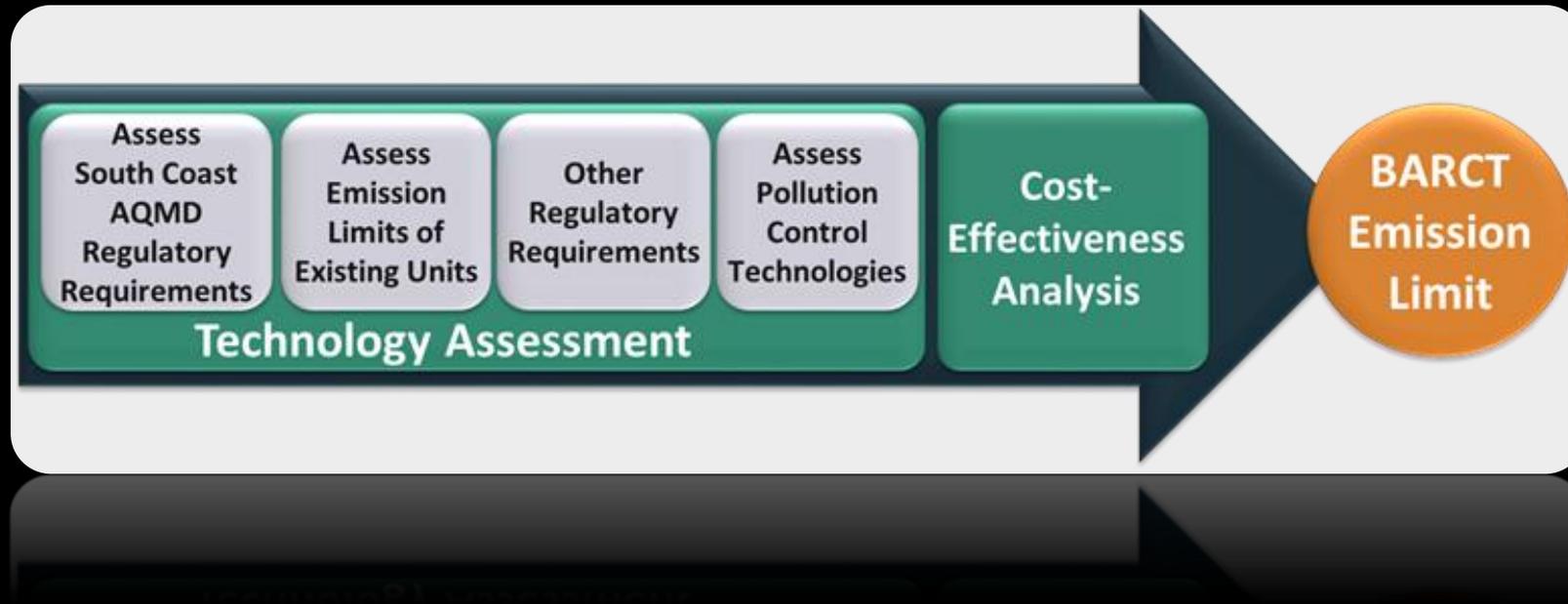
Start-Up/Shutdown Heaters and Boilers (Low –Use)

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| | No. of Devices in Category | Range of Current NOx Levels ⁽¹⁾ (ppmv) | Percent Oxygen |
|-----------------------------|-------------------------------|---|-------------------|
| FCCU | | | |
| Start-Up Air Heaters | 5 | 80 to 100 | 3 |
| Sulfuric Acid Plants | | | |
| Start-Up Heaters | 2 | 100 to 190 | 3 |
| Start-Up Boilers | 1 | 40 | |

⁽¹⁾ NOx emissions based permit limit or source test data , dependent on data source available for specific equipment

Proposed Rule 1109.1 Technology Assessment



- At the heart of the BARCT analysis is the Technology Assessment which included evaluating:
 - SCAQMD NO_x limits for similar equipment and different industries
 - Other Air Districts' NO_x limits for similar equipment
 - Evaluation of units and current pollution controls
 - Assessment of commercially available NO_x control technologies

Commercially Available NOx Control Technologies

| Equipment Categories | Water/Steam Injection | Flue Gas Recirculation (FGR) | NOx Combustion Additive | Ultra Low-NOx Burners (ULNB) | Low-NOx Burners (LNB) | Selective Catalytic Reduction (SCR) | LoTOx™ w/ WGS | UltraCat™ |
|----------------------------|-----------------------|------------------------------|-------------------------|------------------------------|-----------------------|-------------------------------------|---------------|-----------|
| Heaters | X | X | | X | X | X | X | X |
| Boilers | X | X | | X | X | X | X | |
| FCCU | | | X | | | X | X | X |
| Coke Calciner | | | | | | X | X | X |
| Gas Turbines | X | X | | | | X | | |
| SRU/TG Incinerators | | | | X | X | X | X | |
| Flares & Thermal Oxidizers | | | | X | X | X | X | |

Depending on equipment arrangement and operation, combination of two or more technologies achieve the maximum NOx reductions

Control Technologies Analyzed for BARCT Assessment

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| NOx Control Technologies | Application | Achievable Performance |
|-----------------------------------|---|-------------------------------|
| LoTOx™ or UltraCat™ or SCR | Calciner, FCCU | 95% Reduction |
| SCR or ULNB with SCR | Boilers/Heaters, Gas Turbines | Greater than 95% Reduction |
| ULNB | SRU Incinerators, Sulfuric Acid Plants, Small Heater and Boilers, Thermal Oxidizers | 20 – 30 ppm |

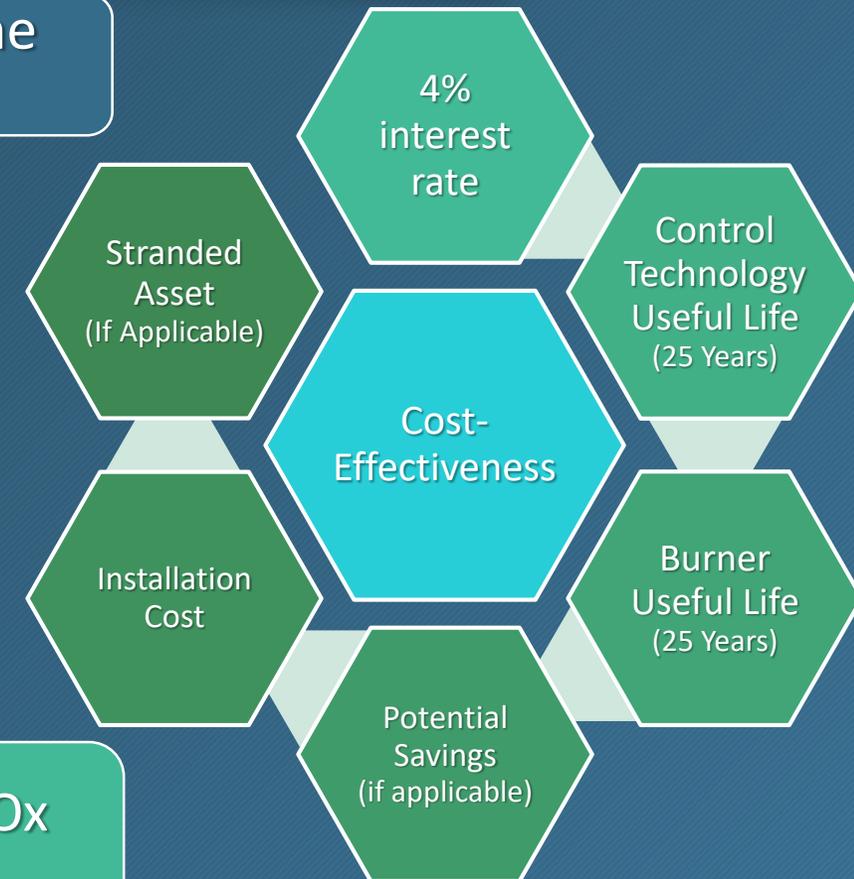
Overview of Cost-Effectiveness

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Cost-Effectiveness is the cost (capital and annual costs) over the emission reductions for the life of the equipment

- Cost-effectiveness is expressed in a dollar per ton of pollutant reduced
- Two major cost elements
 - Capital costs
 - Annual costs
- Emission reductions are based on current emission levels (baseline) compared to the Initial BARCT emission limit

Staff uses the 2016 AQMP cost-effectiveness of \$50,000/ton of NO_x reduced as guidance for establishing the BARCT emission limit



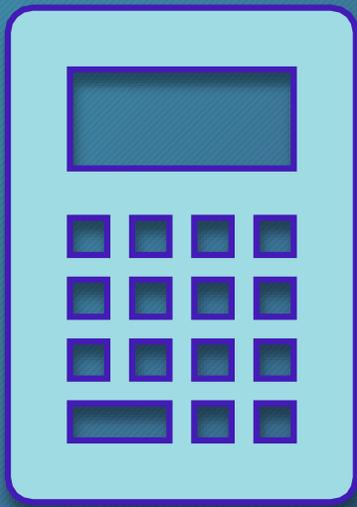
Cost-Effectiveness Analysis

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- Staff relied on several sources for costs:
 - Engineering estimates provided by the facilities
 - Estimates provided by technology vendors
 - U.S. EPA cost spreadsheet for estimating SCR costs revised to reflect California refinery projects and labor costs
- Staff used cost data provided by the facilities when available
 - If data not available, used facility data to generate cost curves to estimate remaining units
- Costs for refineries can be higher than other industries
 - Senate Bill 54 establishes requirements for hiring contractors to conduct certain work which increases costs
 - Refineries have space constraints that can result in challenging and costly SCR installations

Cost-Effectiveness Analysis Update

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- Some of the cost-effectiveness numbers have changed from the initial assessment as the analysis was refined
- Adjustments to the boiler and heater categories
 - Included units with existing SCRs
 - Removed units that are close enough and will not require retrofit
- After adjustments, cost-effectiveness determined by dividing the summed total present worth value by the lifetime emission reductions for each class and category

Proposed BARCT NOx Limit for Heaters

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| Heater Size (MMBtu/hr) | No. of Devices in Category | Range of Current NOx Levels ⁽¹⁾ (ppmv) | Proposed BARCT Limit (ppmv) | Percent Oxygen | Cost-Effectiveness | Averaging Time (Rolling) |
|------------------------|----------------------------|---|-----------------------------|----------------|--------------------------|--------------------------|
| Heaters | | | | | | |
| <20 | 22 | 30 to 60 | 40/9 ⁽²⁾ | 3 | -(³) | 2 hours |
| 20 – 40 | 45 | 5 to 100 | 30/9 ⁽²⁾ | 3 | \$3,900/- ⁽³⁾ | 2 hours |
| >40 – 110 | 72 | 5 to 140 | 2 ⁽⁴⁾ | 3 | \$35,000 | 8 hours |
| >110 | 46 | 5 to 90 | 2 ⁽⁴⁾ | 3 | \$35,000 | 8 hours |

- (1) NOx emissions based permit limit, CEMS annual average, or source test data, dependent on data source available for specific equipment
- (2) 9 ppm limit based on emerging technology with a future effective date
- (3) Requirement at end of useful life - potential additional cost beyond what the facility will already incur
- (4) Units permitted at 5 ppm or less at the time of rule adoption can keep their permit limit until equipment replacement

Proposed BARCT NOx Limit for Heaters (continued)

35

| Heater Type | No. of Devices in Category | Range of Current NOx Levels ⁽¹⁾ (ppmv) | Proposed BARCT Limit (ppmv) | Percent Oxygen | Cost-Effectiveness | Averaging Time (Rolling) |
|-------------------------------|----------------------------|---|-----------------------------|----------------|--------------------|--------------------------|
| Heaters | | | | | | |
| SMR Heaters | 11 | 5 to 50 | 5 | 3 | \$15,000 | 8 hours |
| SMR Heater/GTG ⁽²⁾ | 2 | 5 | 5 | 15 | \$0 | 8 hours |
| Sulfuric Acid Plants | 2 | 20 to 60 | 20 | 3 | \$50,000 | 365 day ⁽³⁾ |

(1) NOx emissions based permit limit, CEMS annual average, or source test data, dependent on data source available for specific equipment

(2) Unit currently meeting proposed BARCT limit for source category

(3) Proposed 365 day averaging time due to feed and process variations throughout the entire year

Proposed BARCT NOx Limit for Boilers

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| Boiler Size (MMBtu/hr) | No. of Units | Range of Current NOx Levels ⁽¹⁾ (ppmv at 3% O ₂) | Proposed BARCT Limit (ppmv at 3% O ₂) | Cost-Effectiveness | Averaging Time (Rolling) |
|------------------------|--------------|---|---|----------------------|--------------------------|
| Boilers | | | | | |
| <40 | 5 | 9 to 40 | 40/5 ⁽²⁾ | \$0/- ⁽²⁾ | 2 hours |
| 40 – 110 | 3 | 70 to 100 | 2 | \$49,000 | 8 hours |
| >110 | 20 | 9 to 120 | 2 | \$12,000 | 8 hours |

⁽¹⁾ NOx emissions based permit limit, CEMS annual average, or source test data, dependent on data source available for specific equipment

⁽²⁾ 40 ppm achieved – no associated cost; 5 ppm limit at end of useful life - potential additional cost beyond what the facility will already incur

Proposed BARCT NOx Limit for Calciner, FCCU, and Gas Turbines

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| | No. of Units | Range of Current NOx Levels ⁽¹⁾ (ppmv) | Proposed BARCT Limit (ppmv) | Percent Oxygen | Cost-Effectiveness | Averaging Times (Rolling) |
|-----------------------|--------------|---|-----------------------------|----------------|-------------------------------------|---|
| Coke Calciner | | | | | | |
| Kiln/Pyroscrubber | 1 | 70 | 5 10 | 3 | \$10,000 to \$22,000 ⁽²⁾ | 365-day ⁽³⁾ 7-day average |
| FCCU | | | | | | |
| Regenerator/CO Boiler | 5 | 2 to 40 | 2 5 | 0 | \$31,000 | 365-day average ⁽³⁾ 7-day average |
| Gas Turbines | | | | | | |
| Gas Turbines | 13 | 2 to 10 | 2 | 15 | \$40,000 | 8 hours |

- (1) NOx emissions based permit limit, CEMS annual average, or source test data, dependent on data source available for specific equipment
- (2) Cost depends on control device installed
- (3) Proposed 365 day averaging time due to feed and process variations throughout the year - processing unit, not a single unit

Proposed BARCT NOx Limit for SRU/TG Incinerators and Flares/Thermal Oxidizers

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| | No. of Units | Range of Current NOx Levels ⁽¹⁾ (ppmv) | Proposed BARCT Limit (ppmv) | Percent Oxygen | Cost-Effectiveness | Averaging Times (rolling) |
|-------------------------------------|--------------|---|-----------------------------|----------------|--------------------|---------------------------|
| SRU/TG Incinerators | | | | | | |
| Incinerators | 16 | 4 to 100 | 30 | 3 | \$39,000 | 8 hours |
| Flares and Thermal Oxidizers | | | | | | |
| Thermal Oxidizers | 13 | 9 to 130 | 20 | 3 | \$3,400 | 3 hours |
| Ground Flares | 1 | | Low-Use | | | |

⁽¹⁾ NOx emissions based permit limit, CEMS annual average, or source test data, dependent on data source available for specific equipment

Start-Up/Shutdown Heaters and Boilers (Low –Use)

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| | No. of Units | Range of Current NOx Levels ⁽¹⁾ (ppmv) | Proposed Rule Requirement |
|-----------------------------|--------------|---|---------------------------|
| FCCU | | | |
| Start-Up Air Heaters | 5 | 80 to 100 | Low-Use Exemption |
| Sulfuric Acid Plants | | | |
| Start-Up Heaters | 2 | 100 to 190 | Low-Use Exemption |
| Start-Up Boilers | 1 | 40 | |

⁽¹⁾ NOx emissions based permit limit or source test data , dependent on data source available for specific equipment

Projected Emission Reductions

| Equipment Category | Size (MMBtu/hr) | 2017 Baseline Emissions (tons per day) | Projected NOx Reductions ⁽¹⁾ (tons per day) |
|----------------------------|-----------------|--|--|
| | Heaters | <40 | 0.5 |
| 40 – 110 | | 1.6 | |
| >110 | | 2.9 | |
| Boilers | <40 | 0.01 | |
| | 40 – 110 | 0.05 | |
| | >110 | 2.5 | |
| SMR Heaters | | 1.1 | |
| Sulfuric Acid Heater | | 0.1 | |
| FCCU | | 0.8 | ~2 |
| Coke Calciner | | 0.7 | |
| Gas Turbines | | 1.3 | |
| SRU/TG Incinerators | | 0.4 | |
| Flares & Thermal Oxidizers | | 0.05 | |

⁽¹⁾ Includes projects required by the 2015 RECLAIM amendments

Potential Equipment Controls and Costs

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- Approximately 220 pieces of equipment will require pollution control installations, upgrades or modifications to achieve proposed BARCT limits
- Estimated Number of units requiring controls in each category:
 - Heaters and Boilers – 187 units
 - FCCU – 4 units
 - Gas Turbines with duct burner – 9 turbines
 - Gas turbine without duct burner – 1 unit
 - Coke Calciner – 1 units
 - SRU/TG Incinerators – 9 units
 - Thermal Oxidizers and Flares – 8 units
- Estimated cost for each projects range anywhere \$3MM to \$120 MM
- Facilities will have multiple projects
- Estimated emission reductions 7 to 9 tons per day



Implementation Concepts

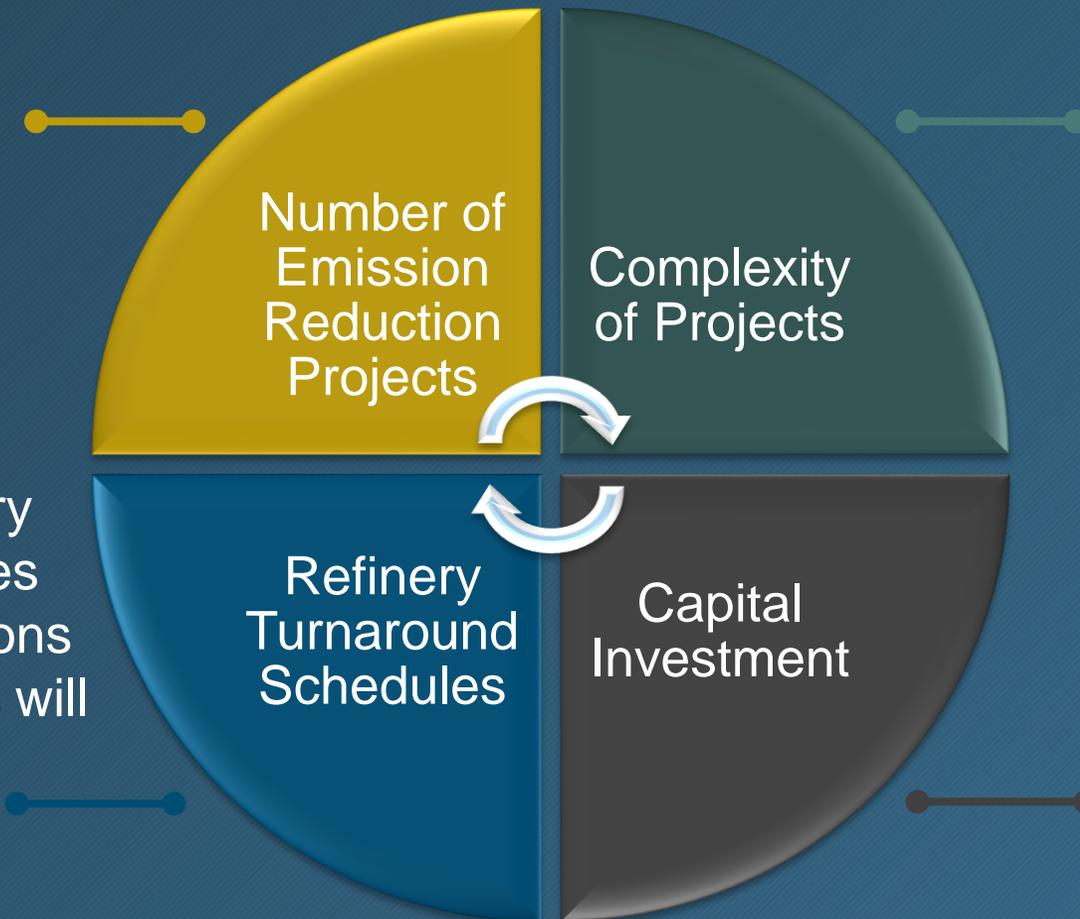
Initial Thoughts for Developing the Implementation Schedule

- Ensure proposed NO_x BARCT emission limits are achieved
- Highest priority for implementation will be for those sources that “have not modified emissions-related permit conditions the greatest period of time,” consistent with AB 617
 - These sources will be further prioritized based on those with the greatest emission reduction potential
- Allow some flexibility in the implementation schedule without compromising the ability for each source to meet the specified emission limits, thus ensuring the overall air quality benefit is achieved
- Important that any implementation approach is as quick as feasible, accounting for considerations that are unique to PR 1109.1

Key PR 1109.1 Considerations

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- ~ 220 pieces of equipment are not meeting proposed NOx emission limits
- Accounting for refinery turnarounds schedules will minimize disruptions
- Staggered schedules will reduce the demand for construction resources



- Projects are complex requiring significant engineering, design, installation, and commissioning
- ~110 SCR/SCR upgrade projects for the boiler/heater category
- ~130 burner replacement projects that can involve 10's to 100's of burner replacements per unit
- Most emission reduction projects will be more than \$10 million
- Each of the petroleum refineries have many projects

Initial Concept for Implementation Schedule

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- Consider a *fixed* implementation schedule for facilities with small number of equipment (some of the refinery related facilities have five or less units)
- Considering facility-specific Refinery Specific Compliance Plan
 - Provide specific requirements on how prioritization of units – units with the greatest emission reductions highest priority
 - Establish interim compliance dates and milestones with a final compliance date
 - Equipment needs to meet the applicable BARCT limit
- Staff is seeking input on concepts and elements of a compliance plan

Next Steps

Further Sulfur Fuel Gas Clean Up Analysis



Continued Meeting with Stakeholders



Final Assessment Report from Consultants



Draft Rule Language



CEQA /Socioeconomic Analysis



Public Workshop/Public Hearing

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