



Proposed Rule 1109.1 – NO_x Emission Reduction for Refinery Equipment and Related Operations

Working Group Meeting #18

February 11, 2021

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Agenda

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- Progress of Rule Development
- Other Related Rulemaking Projects
- Follow-up on Boilers and Heaters
- Stakeholder Comment Letter Responses
- BARCT Assessment and Incremental Cost Effectiveness
- Next Steps

Progress of Rule Development

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Summary of Working Group # 17 (02/04/21)

- Provided response to comments from Working Group Meeting #16
- Updated BARCT Assessment for Boilers <40 <MMBtu/hr
- Discussed Revised PR 1109.1 Rule language

Since Last Working Group Meeting

- Continued Meeting with Stakeholders regarding B-CAP implementation
- Reviewed comment letters received and prepared responses

Other Related Rulemaking Projects

- Staff has initiated rulemaking to amend Rule 1304 to address the co-pollutant issue
 - PAR 1304 will be discussed in the Regulation XIII Working Group Meetings
- Staff has decided to address startup and shutdown provisions in Rule 429
 - PAR 429 will be discussed in the PR 1109.1 Working Group Meetings
- All four rulemakings are scheduled for a June Public Hearing

PR 1109.1 (PR 1109.1 WGM)

- Establishes NOx limits for Refineries and Associated Operations

PAR 1109 (PR 1109.1 WGM)

- Existing rule for refinery operations that will be rescinded

PAR 1304 (Reg XIII WGM)

- NSR exemptions for installation of BARCT controls related to the RECLAIM transition

PAR 429 (PR 1109.1 WGM)

- Establishes startup and shutdown requirements for PR 1109.1 sources

PAR 429 – Start-up and Shutdown Exemption Provisions for Oxides of Nitrogen

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- Rule 429 was adopted in 1989 and amended in 1990
- Rule 429 currently includes provisions for startup and shutdown provisions for Rule 1109 and other sources
- Staff decided to move startup and shutdown provisions in PR 1109.1 in PAR 429
- Staff will discuss comments received related to PAR 429 at the next Working Group Meeting

Follow Up 2 ppm Boilers and Heaters

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BARCT Analysis for Boilers and Heaters ≥ 40 MM Btu/hr

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- Staff has presented BARCT analysis and determination for large boiler and heater at 2 ppm based on units installing ULNB/SCR combo, just SCR, or SCR upgrade
- Recently, stakeholders raised concerns regarding the ability to retrofit ULNB in older units and potential safety issues
- After consultation with consultants and vendors, staff presented an alternative pathway of multiple reactors and ammonia injection grids in SCR to meet 2 ppm without ULNB
 - Stakeholders commented that multiple reactors creates new concerns particularly with space constraints, additional needs, and additional costs
- Staff is exploring a slightly higher NO_x limit of possibly 5 ppm that will likely address these concerns and another approach

Initial Analysis of a 5 ppm NO_x limit for Boilers and Heaters ≥ 40 MMBtu/hr

- For most units, a 5 ppm NO_x limit will require installation of SCR and in some cases Ultra Low NO_x Burners and SCR will still be needed
 - Potential safety concerns regarding replacing burners is eliminated for most units
- 5 ppm NO_x limit has been demonstrated
- 2 ppm NO_x limit is achievable, but is more challenging as many units will require either:
 - Ultra Low NO_x Burners and SCR or
 - Multi-stage ammonia grids
- A NO_x limit of 5 ppm would achieve 90 percent of the estimated NO_x reductions of a NO_x limit of 2 ppm
- Staff is continuing to analyze 2 and 5 ppm for boilers and heaters ≥ 40 MM Btu/hr

Stakeholders Comment Letters

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Comment Letters on PR 1109.1

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- Staff received six comment letters after release of the initial draft of PR 1109.1 on October 23, 2020
 - Torrance Refining Company (TORC) comment letters regarding:
 - Preliminary rule language – November 20, 2020
 - Preliminary B-CAP – December 14, 2020
 - Tesoro Refining and Marketing Company comment letters regarding:
 - Preliminary rule language – December 22, 2020
 - Revised rule language – February 1, 2021
 - Letter not posted yet; will be addressed in future presentation
 - Environmental Representatives letter – January 25, 2021
 - Western States Petroleum Association (WSPA) letter – February 2, 2021
- Comment letters are on South Coast AQMD webpage (Letters or portions of letters marked business confidential not posted)

Responses to Comment Letters on PR 1109.1

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- Comments were grouped together by topic
 - General Comments:
 - Rule Development Schedule
 - BARCT Assessment
 - BARCT Cost-Effectiveness Assessment
 - Alternative Compliance Approaches
 - Emissions Monitoring
 - CEQA
 - NSR and Permitting
 - Implementation
 - B-CAP Comments
 - Specific Comments on Rule Language

General Comments on PR 1109.1

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Rule Development Schedule Comments

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Rulemaking going too fast

- Rulemaking for Proposed Rule 1109.1 began February 2018 (first Working Group Meeting)
- Working Group Meetings discussed all details of the BARCT analysis, included presentations from vendors, two third party reviews of the BARCT analysis, and discussions of proposed provisions
- Governing Board voted to delay Public Hearing from March to June 2021

Proposed Rule 1109.1 needs to be adopted - “long overdue life-saving pollution controls” must be expedited

- Staff understands the need for the emission reductions as soon as practicable
- Implementation schedule needs to take into account the number and complexity of the projects
- Shorter timeframes for the large SCR projects to achieve lower NOx limits may not be feasible and would result in lower NOx emission reductions
- Longer timelines required for emerging technologies

BARCT Assessment Comments

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BARCT levels have not been proven to be technologically feasible, cost-effective, and safe

- Detailed BARCT assessments were conducted for each class and category
 - Presented at the Working Group meetings
 - Consistent with the Health and Safety Code Section 40406
- BARCT levels are achievable based on the timeframe allowed under PR 1109.1
- As previously discussed, staff is re-assessing the NOx limit for boilers and heaters ≥ 40 MM Btu/hr

Incremental cost-effectiveness must be conducted prior to establishing BARCT

- Incremental cost-effectiveness is conducted after establishing BARCT
- Staff is currently conducting the required incremental cost-effectiveness
- Additional discussion of incremental cost-effectiveness will be discussed later in presentation

BARCT Assessment Comments (cont.)

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BARCT assessment should be based on a minimum five years of NO_x emissions data to account for emission fluctuations due to turnarounds and other operational anomalies

- Staff considered a similar approach and evaluated emissions data over 5 years
- Staff used 2017 as a base year as that was the most recent annual data available when the BARCT analysis was initiated in 2018
- In instances where 2017 did not reflect normal operations (e.g. turnarounds or other anomalies), a more representative year was used for that unit

BARCT Cost-Effectiveness Assessment Comments

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25-year useful life is too long for cost-effectiveness assessment

- Useful life of equipment should reflect how long that equipment is typically in-use
- SCRs have been operated in petroleum refineries since the 1980s
 - Not aware of any SCRs that have been replaced due to the end of their useful life
 - A 25-year useful life is a conservative assumption

Alternative Compliance Approach Comment

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Alternative emission reduction approaches, such as mass-based facility caps, should be considered

- Mass-based facility caps does not ensure all of the equipment meets the BARCT limit
- Staff is exploring an option for boilers and heaters ≥ 40 MMBtu/hr that may provide flexibility while achieving specific NOx concentration limits
 - Staff will discuss concept U.S. EPA for consistency with their guidance for Economic Incentive Programs
 - In general Economic Incentive Programs will require a 10 percent environmental benefit
- Staff will continue to work with stakeholders to consider potential implementation options

Emissions Monitoring Comments

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Source tests should be required more often than every 12 or 36 months, unless the equipment is classified as low-use

- Under RECLAIM, boilers and heaters < 40 MMBtu/hr are required to conduct source tests every three or five years, depending on the annual heat input
- PR 1109.1 includes annual source testing for boilers and heaters <40 MMBtu/hr, which is more stringent than what is currently required under RECLAIM
 - In addition, diagnostic tests are required quarterly as an additional periodic compliance check
- Staff maintained a 3-year schedule for vapor incinerators as they are a much smaller source of emissions than boilers and heaters

Emissions Monitoring Comments (*Continued*)

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Petroleum refineries must install CEMS on all equipment to ensure compliance with emission limits

- CEMS are expensive to install, operate, and maintain and are required for the largest combustion sources (generally units over 40 MMBtu/hr)
- Threshold for requiring CEMS is generally the same for RECLAIM and non-RECLAIM facilities
- Requiring only one industry category to have CEMS on all units would not be equitable
- Smaller sources rely on source tests and periodic diagnostic checks to ensure compliance

The use of emission factors must be removed or restricted as they can underestimate actual emissions

- Rule allows the use of emission factors *only* for a limited number of low-emitting vapor incinerators if there is no source test data
- The default emission factor has to be approved by the Executive Officer

Programmatic CEQA analysis must be performed

- Programmatic EIR was prepared for 2016 AQMP evaluating all landing rules under CMB-05
- Programmatic EA was prepared for 2015 NOx RECLAIM shave evaluating impacts from control technologies to lower NOx
- Supplemental EA being prepared for PR 1109.1 is a comprehensive analysis of all affected facilities and equipment
 - Tiers off previous programmatic documents since shave projects overlap with PR 1109.1 projects

NSR and Permitting Comments

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NSR and permitting issues need to be addressed in PR 1109.1 rulemaking

- NSR issues are being addressed in the Regulation XIII Working Group
- Permitting issues will be addressed in the Regulation XX Working Group as part of the RECLAIM transition

Co-pollutant issues related to the installation of SCR need to be resolved

- Staff has initiated rule development to amend Rule 1304
- Staff is working on comments raised at the January Regulation XIII Working Group
 - Staff will be presenting additional details at the February Regulation XIII Working Group Meeting

Implementation Schedule

22

PR 1109.1 is inconsistent with Greenhouse Gas Programs and AB 617

- CEQA analysis will analyze:
 - Potential GHG emissions impact and make appropriate mitigation recommendations
 - Secondary impacts from ammonia from SCR
- Permitting process will analyze:
 - By-products or precursors, such as ammonium sulfate, ensuring compliance with other regulations such as Regulation XIII
- PR 1109.1 complies with AB617 by determining and implementing BARCT on affected facilities and prioritizing those units with no control for the longest period of time
- Current proposed implementation period is anticipated to achieve AB 617 Community Emissions Reduction Plan goal of 50% NOx reduction

Proposed phase compliance schedule is infeasible; phase should be eliminated

- B-CAP schedule was revised to provide extended timelines to address magnitude of projects
- Phases provides a incremental framework for milestones and corresponding emissions reductions targets to be achieved in a timely manner while allowing flexibility for facilities in selecting projects to be completed within each phase
- Staff has meet and continues meeting with facilities to discuss B-CAP timelines and structure

Six months is insufficient to prepare B-CAP and requires turnaround schedules to be locked-in and broadcast

- Facilities should be evaluating NOx reductions projects and begin deliberations for the B-CAP
- PR 1109.1 allows facility to make changes to this preliminary B-CAP when needed and does not require the disclosure of the turnaround schedule

B-CAP Comments (cont.)

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PR 1109.1 does not specify timeframe for agency to review B-CAP making permit submittal deadlines impossible

- Developing the B-CAP will require considerable planning for the facilities but staff review should be straight forward due to pre-established timelines and unit shares
 - South Coast AQMD is committed to ensuring proper resources are available for review
 - The review of the B-CAP will be a priority

PR 1109.1 fails to establish a deadline for the agency to issue the permit which could delay implementation

- Issuance of permits varies due to application submittal information and complexity of project
- Implementation of PR 1109.1 will be a priority for the South Coast AQMD
- Staff will strive to issue permits as quickly as feasible

B-CAP Comments (cont.)

25

The B-CAP extension should be shortened to 3 months and restricted to circumstances outside of the control of the facility

- The extension allowance is *up to* 6 months so could be less than 6 months
- The extension must be approved and supported by certain reasons for the extension
- Staff will consider rule language that limits the reasons an extension will be approved

B-CAP extensions and modifications are insufficient

- A 6-month extension is sufficient given that this is in addition to the 2 – 3 years implementation period
- PR 1109.1 will allow modifications to B-CAP provided target goals and implementation timelines must be met

Plan fees should not apply to B-CAP

- Plan fees are necessary to support the resources needed to review and approve plans in a timely manner
- Rule 306 plan filing fee is \$202.06 plus an hourly evaluation fee per B-CAP, revisions subject to the \$202.06/hour

B-CAP time extension review should be shortened from 60 days of receipt to 15-days to allow facility maximum amount of time to address issues

- Staff understands the time constraints facing the facilities and will consider a shorter review period for B-CAP extensions

Key Comments on Draft Rule Language

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Applicability and Definition

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PR1109.1 is a sector-based rule and it should include all equipment located at these facilities, including internal combustion engines (ICE)

- There are only 3 ICEs located at PR 1109.1 facilities
 - All used less than 20 hours a year and specifically used as start-up engines for turbines
- Staff considered including a low-use exemption for the ICE in PR 1109.1
 - Would require emission limits and ICE requirements in the event the low-use exemption was exceeded
- Rule 1110.2 (i)(1)(E) already exempts “auxiliary engines used to power other engines or gas turbines during start-ups”
- Staff proposed excluding the ICE from PR 1109.1 in Working Group Meeting #12 instead of duplicating Rule 1110.2 requirements

Applicability and Definition (cont.)

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The definitions for malfunction, start-up, and shutdown should align with EPA definitions

- Staff strives to align definitions with EPA definitions when appropriate
- Staff will amend the definition of malfunction to more closely align with the EPA definition
- EPA definitions for start-up and shutdown are broader definitions that apply to multiple industries and pollutants
 - PR 1109.1 definitions are specific to NOx emissions at petroleum refineries and related operations
 - Staff does not support aligning start up or shutdown definitions with the EPA definitions

Applicability and Definition (cont.)

30

The definition for rolling average should specify how the average emission values should be calculated

- Staff concurs with this comment and will revise the rule language for further clarification

The definition for flare is confusing because it excludes refinery flares subject to Rule 1118

- Staff concurs and proposes the following for further clarification:
 - Flare means a combustion device that oxidizes combustible gases or vapors from tank farms or liquid unloading, where the combustible gases or vapors being destroyed are routed directly into the burner without energy recovery, and the flare is not subject to Rule 1118

Draft rule language includes carbon monoxide (CO) emission limits but the District has not demonstrated such limits are necessary, technically feasible, or cost-effective

- All South Coast AQMD combustion rules contain CO limits
 - CO limits prevent facilities from artificially driving down the NOx by increase CO emissions
 - Staff revised proposed CO limits to be consistent with existing CO permit limits and will not require further action

Exceptions from compliance with Table 1 located within the emission limits section should be moved to Section (I) for exemptions

- Staff concurs and will move those provisions to the exemption section

Emission Limits (cont.)

32

Technical feasibility of emissions limits for boiler <40 MMBtu/hr, SMR heater with gas turbine, or sulfuric acid furnace has not yet demonstrated

- Comment was not clear as to which pollutant being referred
- Based on survey data, all boilers <40 MMBtu/hour currently in use, the SMR heater with gas turbine, and the sulfuric acid furnaces are currently achieving and/or permitted at the NOx and CO limits staff proposed
 - The only potential action needed will be permit limits to reflect the NOx emissions
- Staff will meet with any of the affected facilities to discuss specific concerns

Emission Limits (cont.)

33

The averaging time should be 2-hours or at a minimum return to the originally proposed 8-hour averaging time

- Averaging times were discussed extensively with staff's third party consultants who concluded longer averaging times were the only way the proposed low NOx limits could be achieved
- While longer averaging times allow more time for a facility to address a spike, those spikes have to be averaged out with NOx levels well under 2 ppmv
- Staff is confident a balance was achieved that allowed for the lowest NOx limits feasible

CEMS, Source Testing and Diagnostic Emission Checks

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The requirement that emissions determined to exceed any limits by a certified CEMS shall constitute a violation of the rule is unnecessary and should be removed

- Staff will consider the necessity of maintaining this provision

The phrase “reasonably should have known” should be removed from the requirement for an owner of a unit that exceeds any limits to inform the Executive Officer within 72 hours from the time they knew of the excess emissions, or reasonably should have known

- Reporting the exceedance is critical to ensuring corrective action will take place
- The inclusion of the phrase “reasonably should have known” discourages a facility from citing inattention as justification for not informing the South Coast AQMD of a violation
- Phrase is a commonly used to enhance compliance with rule requirements

CEMS, Source Testing and Diagnostic Emission Checks (cont.)

35

Diagnostic emission checks are inaccurate in determining emissions and should be removed

- Diagnostic checks serve as an interim emission check for units that require annual source tests
- The intent was not to require diagnostic checks to span hours/test and staff will clarify this requirement

Rule language regarding CEMS; reporting and recordkeeping; and references to the Rule 218 series; must be revised to reflect the transition from Reg XX to the Rule 218 series

- Staff will work to clarify the requirements in the staff report to reflect the transition from Regulation XX to Rule 218 series

Exemptions

36

The exemption provisions state units must operate in compliance with the SCAQMD permit condition is unnecessary and should be deleted

- Staff will consider the necessity of maintaining this provision

South Coast AQMD improperly exempts various units from compliance with emission limits without a rational basis or evidentiary support

- Staff provided justification for exemptions during the Working Group Meetings presenting the BARCT assessment for each class and category
 - Justifications and forgone emissions for exemptions will also be included in the staff report
- Staff will re-evaluate the proposed exemptions for potential loopholes, including defining an “unfired boiler” to address potential circumvention

Exemptions (cont.)

37

PR1109.1(l)(5) mischaracterized heaters >40 MMBtu/hr currently meeting 5 ppm NO_x as an exemption from the 2 ppm limit, the 5 ppm is the endpoint for these units and needs to be under Section (d)

- Staff disagrees with this characterization
- The 5 ppmv NO_x limit addresses control equipment recently installed to achieve 5 ppm (e.g., stranded assets)
 - At the end of useful life of the control equipment, those units are required to meet the 2 ppm

Exemptions (cont.)

38

PR 1109.1 cannot require a 2 ppm endpoint for heaters >40 MMBtu which currently achieve 5 ppm because staff did not demonstrate it was cost-effective

- BARCT determination is at 2 ppm but staff recognized those units recently installed SCRs designed to achieve 5 ppm would not be cost-effective to meet a 2 ppm NOx limit
- When equipment requires replacement, there will already be a cost associated with a new SCR
- Proposed rule requirements provides 10 years after rule adoption for those units *already* operating at 25 years, and 25 years for those operating less than 25 years at rule adoption
- In Working Group Meeting #15, staff presentation indicated the 2 ppmv is cost effective at equipment replacement

BARCT Analysis

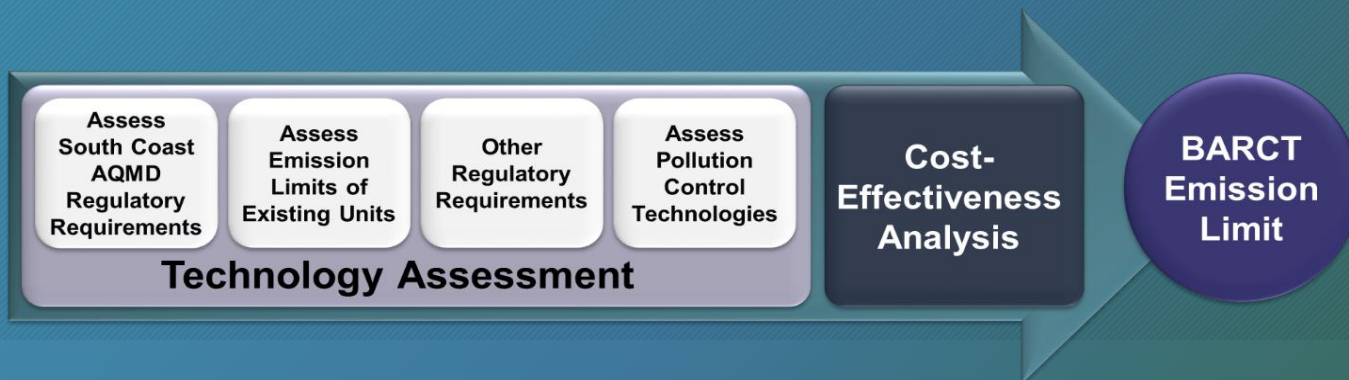
39

Staff received comments on the BARCT assessment
and would like to review the process

BARCT Definition §40406(a)(1)

“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.”

- Staff conducted a thorough technology assessment to evaluate the NOx control technologies that will achieve BARCT
 - Staff evaluated regulatory requirements, and available air pollution control technologies
 - Cost effectiveness was calculated using cost provided by facilities and modified EPA cost model
 - BARCT determined based on technical feasibility and cost effectiveness



BARCT Assessment Example from WGM 10

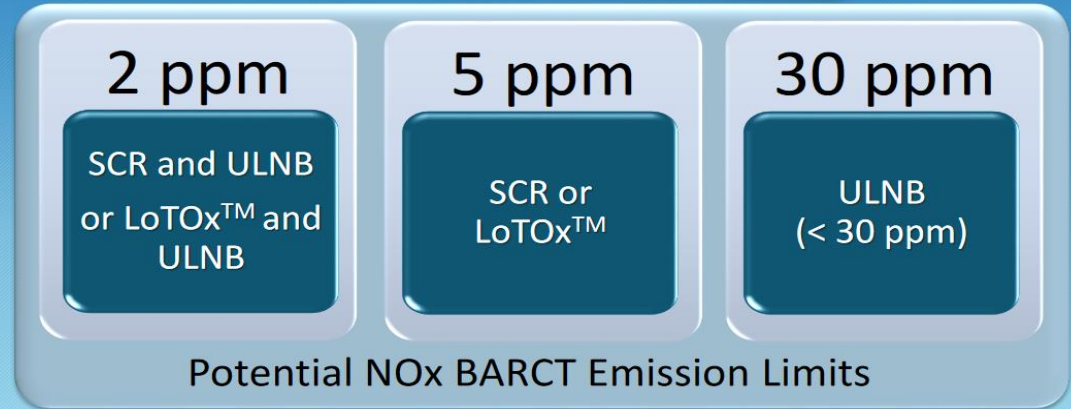
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- Staff 's Assessment considered several technologies and BARCT limits not just the lowest limit
- 2015 BARCT concluded that 2 ppm is achievable for SRU/TG Incinerator category with SCR or LoTOx
- Staff 1109.1 BARCT assessment concluded that 2 ppm and 5 ppm was not cost-effective
- If lowest BARCT was not cost-effective staff looked at the next stringent BARCT limit

Initial BARCT NOx Limits for Cost-Effectiveness Analysis for SRU/TGI

56

- Evaluated three NOx concentration limits
 - 2 ppm using SCR/ ULNBs or LoTOx™
 - 5 ppm using SCR or LoTOx™
 - 30 ppm using ULNB only



2 ppm		5 ppm		30 ppm
ULNB and SCR	ULNB and LoTOx	SCR	LoTOx	ULNB
Cost- Effectiveness				
Greater than \$50,000				Less than \$50,000

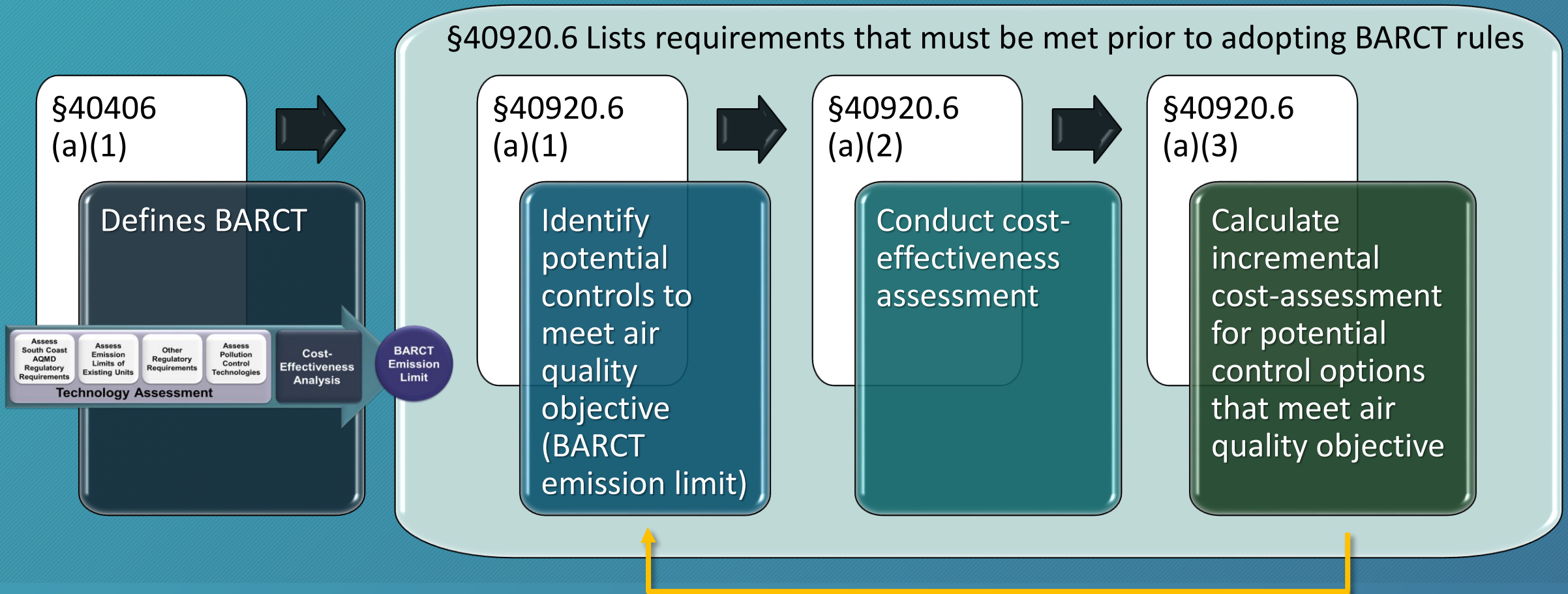
BARCT Assessment and Incremental Cost-Effectiveness (I-CE)

42

Staff received several comments on the BARCT and incremental cost-effectiveness assessment and would like to provide clarification

Overview of California Health and Safety Code BARCT Requirements

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BARCT Assessment §40920.6 (a)(1)

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§40920.6(a) *Prior to adopting rules or regulations to meet the requirement for best available retrofit control technology... districts shall, in addition to other requirements of this division, do all of the following:*

(1) Identify one or more potential control options which achieves the emission reduction objectives for the regulation

- Rule objective is to establish a NOx BARCT limit that will provide the greatest emission reductions
- Depending on the equipment category, staff may evaluate one or one or more options
- Evaluation of the cost-effectiveness starts with the initial BARCT limit that will produce the greatest reductions

Cost Effectiveness Assessment § 40920.6 (a)(2)

45

(2) Review the information developed to assess the cost-effectiveness of the potential control option. For purposes of this paragraph, “cost-effectiveness” means the cost, in dollars, of the potential control option divided by emission reduction potential, in tons, of the potential control option.

- Staff evaluated cost effectiveness for the most stringent initial BARCT limit
- If most stringent initial BARCT limit was not cost-effective, then next most stringent limit was assessed
- NOx BARCT limit was established at the level of NOx control demonstrated to be cost effective

Incremental Cost-Effectiveness § 40920.6 (a)(3)

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(3) Calculate the incremental cost-effectiveness for the potential control options identified in paragraph (1). 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.

- Once BARCT assessment is complete and NOx limits are established, staff considers incrementally more stringent options
- Serves as a check to demonstrate the NOx limits represents the “*maximum degree of reduction achievable by each class or category*”

Incremental Cost-Effectiveness Example

- Incremental cost-effectiveness (I-CE) is calculated as follows:

$$I-CE \left(\$/\text{tons NO}_x \text{ reduced} \right) = \frac{\text{Incremental Difference in Cost (Present Worth Value)}}{\text{Incremental Difference in Emission Reductions (Lifetime Reductions)}}$$

Two examples:

- Assumes installation of second SCR reactor to achieving additional 80% NO_x reduction

	Proposed BARCT	More stringent limit	Emission Reductions (tons)			Cost (PWV)			I-CE
			BARCT	More Stringent Control	Difference	BARCT	More Stringent Control	Difference	
Boilers 40 – 110 MMBtu/hr	2	0.4	466	474	8	\$21 M	\$25 M	\$4 M	\$500 M
Heaters > 110 MMBtu/hr	2	0.4	21k	22k	1k	\$828 M	\$1 B	\$200 M	\$200 M

Next Steps

Discuss Facility-Specific B-CAP
information with Facilities



Continue Meetings with Stakeholders



Release Preliminary Draft Staff Report and
Rule Language



Public Workshop



Public Hearing

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