PROPOSED AMENDED RULES 1146, 1146.1, 1146.2 & PROPOSED RULE 1100 PUBLIC WORKSHOP #2

SEPTEMBER 20, 2018

SCAQMD

DIAMOND BAR, CA

Background

- 2016 AQMP Control Measure CMB-05 to:
  - Achieve five tons per day NOx emission reduction in RECLAIM by 2025
  - Transition the RECLAIM program to a command and control regulatory structure requiring BARCT level controls as soon as practicable
- AB 617 BARCT for Market-Based Compliance System
  - BARCT Schedule – January 1, 2019
  - Implementation of BARCT – December 31, 2023
- Rules 1146 & 1146.1 emission limits were previously amended in 2008

Rule 1146 and Rule 1146.1 Universe

- Approximate size of universe: **2,393 units**
  - RECLAIM: **259 Units**
  - Non-RECLAIM: **2134 Units**
- >98% of units utilize natural gas as primary fuel
- <2% of units utilize landfill and digester gas as primary fuel
- Liquid fuels mostly used as secondary
- NOx concentrations are adjusted to 3% O_2

Size Range (MMBtu/hr)	Category	Number of Units	
		Command-and-Control*	RECLAIM
2-5	Rule 1146.1	1,063	40
5-20	Rule 1146 Group III	861	134
20-75	Rule 1146 Group II	179	78
75+	Rule 1146 Group I	8	7
2+	Digester Gas Fired	20	-
2+	Landfill Gas Fired	3	-
	Total	2,393	

**Command and control equipment distribution figures obtained from 2008 rule revision staff report*

Rule Applicability

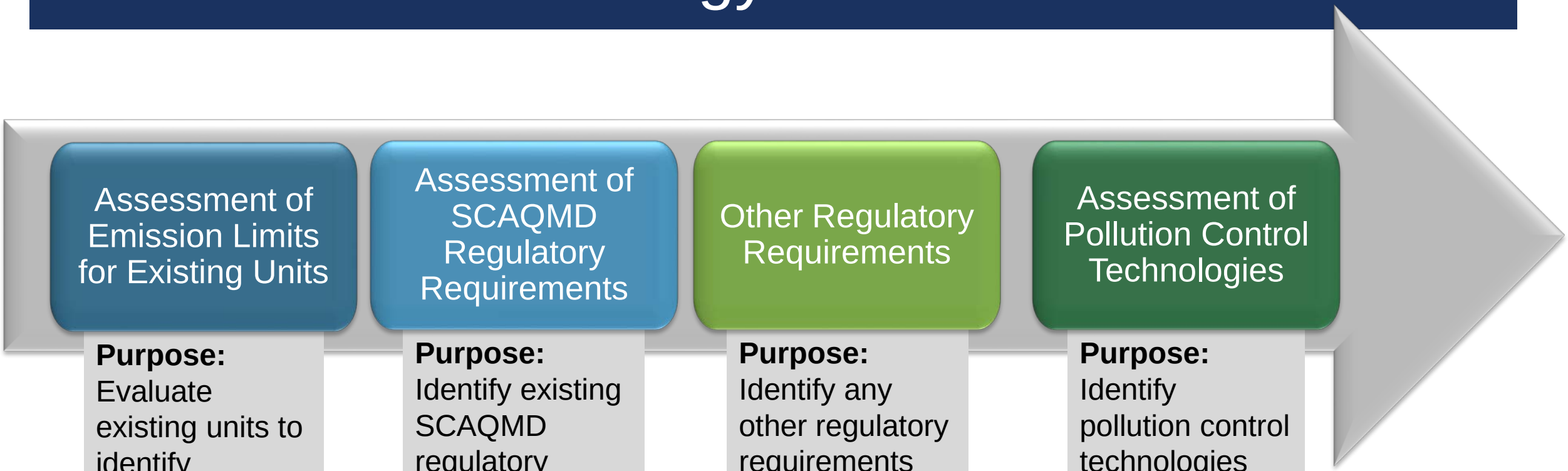
- Proposed Amendments to Rules 1146, 1146.1, and 1146.2 apply to RECLAIM and non-RECLAIM units
- Emission reduction requirements for RECLAIM facilities must be implemented regardless if the facility has exited RECLAIM
- Rule 1146 and 1146.1 equipment at the following facilities will not be included:
  - Electricity Generating Facilities (EGFs) under PAR 1135
    - Except for non-power producing boilers
  - Refineries under PAR 1109.1
  - Other industry categories are included in Rule 1146 and 1146.1

Rule Applicability (con't)

- Rule 1146.2 applies to all RECLAIM units not covered in industry specific rules
  - If an industry specific rule contains an emission limit of R1146.2 units, R1146.2 requirements are exempt OR
  - If an industry specific rule contains no emission limit of R1146.2 units, R1146.2 requirements apply

BARCT Analysis

Overview of Technology Assessment



Purpose: Evaluate existing units to identify emission levels achieved based on permitted and actual levels

Purpose: Identify existing SCAQMD regulatory requirements for that particular source category

Purpose: Identify any other regulatory requirements with lower emission limits

Purpose: Identify pollution control technologies and potential emission reductions

Staff Recommendations

Unit Description	Recommended NOx Emission Limits and Compliance Dates			
Rule 1146	**Units >5 ppm**	**Units ≤5 ppm**	**Compliance Date >5 ppm**	**Compliance Date ≤5 ppm**
≥75 MMBtu/hour (Rule 1146 Group I)	5 ppm via SCR (same as existing limit)	In compliance with rule limit	75% of 1146 & 1146.1 units by Jan 2021 100% of 1146 & 1146.1 units by Jan 2022 Replacement by Jan 2023	No Action Needed
Rule 1146 and 1146.1	**Units >12 ppm**	**Units ≤12 ppm**	**Compliance Date >12 ppm**	**Compliance Date ≤12 ppm**
≥20 to <75 MMBtu/Hour (Rule 1146 Group II)	5 ppm via SCR	Fire-tube: 7 ppm via ULNB Water-tube: 9 ppm via ULNB	Same as above	Burner replacement or 15 yrs after amendment (for both RECLAIM and non-RECLAIM)
≥5 to <20 MMBtu/Hour (Rule 1146 Group III) >2 to <5 MMBtu/Hour (Rule 1146.1)	Fire-tube: 7 ppm via ULNB Water-tube: 9 ppm via ULNB	Fire-tube: 7 ppm via ULNB Water-tube: 9 ppm via ULNB		
Atmospheric Units ≤10 MMBtu/Hour	12 ppm via ULNB (same as existing limit)	In compliance with rule limit		No Action Needed
Thermal Fluid Heaters	**Units >20 ppm**	**Units ≤20 ppm**	**Compliance Date >20 ppm**	**Compliance Date ≤20 ppm**
All Sizes	12 ppm via ULNB	12 ppm via ULNB	Same as above for RECLAIM facilities Jan 2022 for non-RECLAIM facilities	Burner replacement or 15 yrs after amendment (for both RECLAIM and non-RECLAIM)
Digester Gas Fired Units	**Units >15 ppm**	**Units ≤15 ppm**	**Compliance Date >15 ppm**	**Compliance Date ≤15 ppm**
All Sizes	15 ppm via ULNB (same as existing limit)	In compliance with rule limit	Not applicable	No Action Needed
Landfill Gas Fired Units	**Units >20 ppm**	**Units ≤20 ppm**	**Compliance Date >20 ppm**	**Compliance Date ≤20 ppm**
All Sizes	12 - 20 ppm via ULNB, seeking comment		Jan 2022	Burner replacement or 15 yrs after amendment

Proposed Rule Language
Proposed Amended Rules 1146

EMISSIONS OF OXIDES OF NITROGEN FROM INDUSTRIAL, INSTITUTIONAL, AND COMMERCIAL BOILERS, STEAM GENERATORS AND PROCESS HEATERS

PAR 1146 Subdivision (c) - Rule Emission Limits

Table 1146-1

Rule Reference	Category	Limit (@ 3% O_2)
(c)(1)(A)	All Units Fired on Gaseous Fuels	30 ppm or 0.036 lbs/10^6 Btu (natural gas fired units)
(c)(1)(B)	Any Units Fired on Non-gaseous Fuels	40 ppm
(c)(1)(C)	Any Units Fired on Landfill Gas	**12 – 20** ppm
(c)(1)(D)	Any Units Fired on Digester Gas	15 ppm
(c)(1)(E)	Atmospheric Units	12 ppm or 0.015 lbs/10^6 Btu
(c)(1)(F)	Group I Units	5 ppm or 0.0062 lbs/10^6 Btu
(c)(1)(G)	Group II Units (with an existing NOx limit greater than 12 ppm)	5 ppm or 0.0062 lbs/10^6 Btu
(c)(1)(H)	Group II Units (with an existing NOx limit less than or equal to 12 ppm)	7 ppm or 0.0085 lbs/10^6 Btu for fire-tube boilers only; 9 ppm or 0.011 lbs/10^6 Btu for all others
(c)(1)(I)	Group III Units (Fire-tube Boilers Only)	7 ppm or 0.0085 lbs/10^6 Btu
(c)(1)(J)	Group III Units (Excluding Fire-tube Boilers)	9 ppm or 0.011 lbs/10^6 Btu
(c)(1)(K)	Thermal Fluid Heaters	12 ppm or 0.015 lbs/10^6 Btu

- Limits reflect BARCT analysis
- Staff is proposing to lower the emission limits for units fueled by landfill gas and seeking comment

PAR 1146 Subdivision (c) - Ammonia Slip Requirement

"(c)(2) - The owner or operator of any unit(s) operating with an air pollution control equipment that results in ammonia emissions in the exhaust shall not discharge into the atmosphere ammonia emissions in excess of 5 ppm (referenced at 3 percent volume stack gas oxygen on a dry basis averaged over a period of 15 consecutive minutes)."

- Recently permitted units are already required to meet 5 ppm NH3
- For units installed or modified prior to date of rule amendment with a permit limit >5 ppm NH3, compliance is when air pollution control equipment is replaced or modified

PAR 1146 Subdivision (c) – Compliance for Units Near Final Emission Limit

- For units near final emission limit, not cost-effective to require immediate retrofit
- Existing provisions allow non-RECLAIM Group III units with permit limit of ≤12 ppm to meet emission limit at burner replacement
- Must demonstrate compliance to rule limits during burner replacement or 15 years from date of rule amendment, whichever occurs earlier
  - For units with more than one burner, replacement means when ≥50% of unit's burners are replaced (based on a cumulative percentage for each successive burner replacement)

Equipment Type	Permit Limit (@ 3% O_2)	Compliance Schedule
Rule 1146 Group III (≥5 to <20 MMBtu/hr)	≤12 ppm	Upon burner replacement or 15 years from date of rule amendment
Rule 1146 Group II (≥20 to <75 MMBtu/hr)	≤9 ppm	
Thermal Fluid Heaters	≤20 ppm	
Ammonia Slip	>5 ppm	Modification or replacement of emission control equipment

PAR 1146 Subdivision (c)(5) – Low-Fuel Use

- Existing low-fuel use provision for non-RECLAIM units in operation prior to September 5, 2008 with annual heat input of ≤90,000 therms
  - 30 ppm NOx emission limit upon burner replacement
- Extended the low use exemption specified in paragraph (c)(5) to RECLAIM units
  - Permitted as low fuel use prior to 12 months after date of rule amendment
- Proposed to lower NOx emission limit for both non-RECLAIM and RECLAIM units to 12 ppm
  - Compliance schedule will be until burner replacement or 15 years after rule amendment

PAR 1146 Paragraph (c)(6) - Continuous Emissions Monitoring System (CEMS)

Criteria	Rule 1146	RECLAIM Rule 2012
Size	40 MMBtu/hr	40 MMBtu/hr
Heat Input	200 Billion Btu per year	90 Billion Btu per year

- Current CEMS threshold for Rule 1146 is higher than that of RECLAIM
- Non-Title V RECLAIM facilities that do not exceed criteria in Rule 1146 can choose to remove CEMS
  - Only for equipment size <40 MMBtu/hr
  - Annual heat input <200 Billion Btu per year
  - Permit condition limiting fuel usage required

PAR 1146 Subdivision (d) - Monitoring, Reporting and Recordkeeping (MRR)

- Schedule of RECLAIM MRR transition is addressed in PR 1100
- For units with SCR, annual ammonia slip source test requirement for both RECLAIM and non-RECLAIM units
  - Already required in new or modified equipment permits
  - Must demonstrate compliance within 12 months of unit operation, and annually within 12 months thereafter

PAR 1146 Paragraph (e)(2) – Thermal Fluid Heater Compliance Schedule*

- Deadline: 12 months after date of rule amendment

Submit Complete Permit Applications

Comply with Rule Limit in Table 1146-1

- Current Permit limit: >20 ppm
- Deadline: January 1, 2022

- Current Permit limit: ≤20 ppm
- Deadline: Compliance upon burner replacement OR 15 years from date of rule amendment

Comply with Rule Limit in Table 1146-1

*Except for units at a RECLAIM or former RECLAIM facility subject to the schedule specified in Rule 1100

PAR 1146 Subdivision (f) - Exemptions

- New subdivision added to address exemptions previously mentioned in subdivision (a) - Applicability

"The provisions of this rule shall not apply to:

1. ***boilers used by electric utilities to generate electricity; and***
2. ***boilers and process heaters with a rated heat input capacity greater than 40 million Btu per hour that are used in petroleum refineries; and***
3. ***sulfur plant reaction boilers; and***
4. ***any unit at a RECLAIM or former RECLAIM facility that is subject to a NOx emission limit in a different rule for an industry-specific category defined in Rule 1100 – Implementation Schedule for NOx Facilities."***

Proposed Rule Language
Proposed Amended Rules 1146.1

EMISSIONS OF OXIDES OF NITROGEN FROM INDUSTRIAL, INSTITUTIONAL, AND COMMERCIAL BOILERS, STEAM GENERATORS AND PROCESS HEATERS

PAR 1146.1 Subdivision (c) - Rule Emission Limits

Table 1146.1-1

Rule Reference	Category	Limit (@ 3% O_2)
(c)(1)(A)	All Other Units	30 ppm or 0.036 lbs/10^6 Btu (natural gas fired units)
(c)(1)(B)	Any Units Fired on Landfill Gas	12 – 20 ppm
(c)(1)(C)	Any Units Fired on Digester Gas	15 ppm
(c)(1)(D)	Atmospheric Units	12 ppm or 0.015 lbs/10^6 Btu
(c)(1)(E)	Any Units Fired on Natural Gas, Excluding Fire-tube boilers, Atmospheric Units, and Thermal Fluid Heaters	9 ppm or 0.011 lbs/10^6 Btu
(c)(1)(F)	Any fire-tube Boilers Fired on Natural Gas	7 ppm or 0.0085 lbs/10^6 Btu
(c)(1)(G)	Thermal Fluid Heaters	12 ppm or 0.015 lbs/10^6 Btu

- Limits reflect BARCT analysis
- Staff is proposing to lower the emission limits for units fueled by landfill gas and seeking comment

PAR 1146.1 Subdivision (c) – Compliance for Units Near Final Emission Limit

- For units near final emission limit, not cost-effective to require immediate retrofit
- Existing provisions allow non-RECLAIM units with permit limit of ≤12 ppm to meet emission limit at burner replacement
- Must demonstrate compliance to rule limits during burner replacement or 15 years from date of rule amendment
  - For units with more than one burner, replacement means when ≥50% of unit's burners are replaced (based on a cumulative percentage for each successive burner replacement)

Equipment Type	Permit Limit (@ 3% O_2)	Compliance Schedule
Rule 1146.1 (>2 to <5 MMBtu/hr)	≤12 ppm	Upon burner replacement or 15 years from date of rule amendment
Thermal Fluid Heaters	≤20 ppm	

PAR 1146.1 Subdivision (c)(4) – Low-Fuel Use

- Existing low-fuel use provision for non-RECLAIM units in operation prior to September 5, 2008 with annual heat input of ≤18,000 therms
  - 30 ppm NOx emission limit upon burner replacement
- Extended the low use exemption specified in paragraph (c)(4) to RECLAIM units
  - Permitted as low fuel use prior to 12 months after date of rule amendment
- Proposed to lower NOx emission limit for both non-RECLAIM and RECLAIM to 12 ppm
  - Compliance schedule will be until burner replacement or 15 years after rule amendment

PAR 1146.1 Paragraph (e)(2) – Thermal Fluid Heater Compliance Schedule*

- Deadline: 12 months after date of rule amendment

Submit Complete Permit Applications

Comply with Rule Limit in Table 1146.1-1

- Current Permit limit: >20 ppm
- Deadline: January 1, 2022

- Current Permit limit: ≤20 ppm
- Deadline: Effective at burner replacement OR 15 years from date of rule amendment

Comply with Rule Limit in Table 1146.1-1

**Except for units at a RECLAIM or former RECLAIM facility subject to the schedule specified in Rule 1100*

PAR 1146.1 Subdivision (f) - Exemptions

- New subdivision added for RECLAIM and former RECLAIM facilities subject to PR 1100 previously mentioned in subdivision (a) - Applicability

"The provisions of this rule shall not apply to any unit at a RECLAIM or former RECLAIM facility that is subject to a NOx emission limit in a different rule for an industry-specific category defined in Rule 1100 – Implementation Schedule for NOx Facilities."

Proposed Rule Language
Proposed Amended Rule 1146.2

EMISSIONS OF OXIDES OF NITROGEN FROM LARGE WATER HEATERS AND SMALL BOILERS AND PROCESS HEATERS

Proposed Amended Rule 1146.2

- No changes to NOx concentration limit at this time, will revisit later (post transition)
- Include commitment to conduct a technology assessment by January 1, 2022
  - If BARCT is the same as existing rule requirements (30 ppm), compliance by December 31, 2023
  - If BARCT is less than 30 ppm, a new compliance schedule will be developed
- Any unit at a RECLAIM or former RECLAIM facility that is subject to a NOx emission limit in a different rule for an industry-specific category is exempt from Rule 1146.2

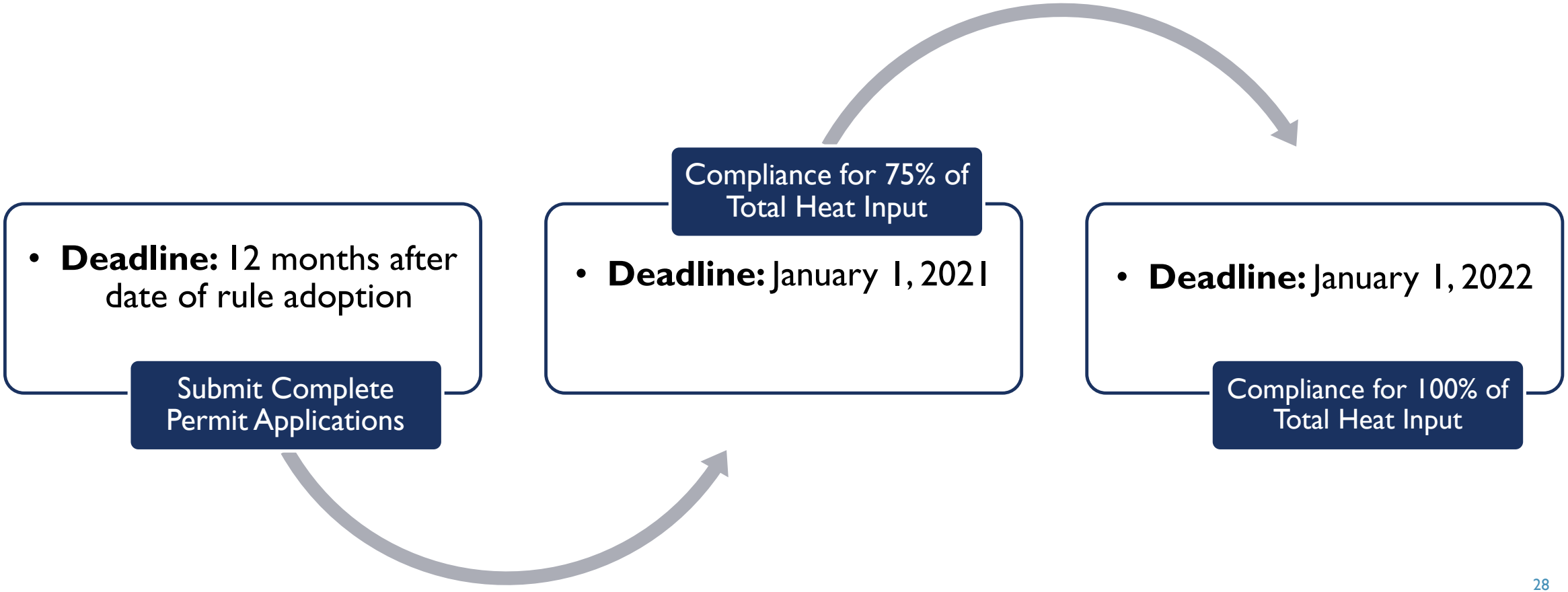
Proposed Rule Language
Proposed Rule 1100

IMPLEMENTATION SCHEDULE FOR NOX FACILITIES

PR 1100 Subdivision (b) – Applicability

- RECLAIM or former RECLAIM facilities that own or operate equipment that meets the applicability provisions specified in:
  1) Rule 1146 – Emissions of Oxides of Nitrogen from Industrial, Institutional, and Commercial Boilers, Steam Generators, and Process Heaters; or
  2) Rule 1146.1 – Emissions of Oxides of Nitrogen from Small Industrial, Institutional, and Commercial Boilers, Steam Generators, and Process Heaters.
- Rule applicability will be updated in the future to reflect amendments to other command-and-control landing rules

PR 1100 Subdivision (d)* - Rule 1146 and Rule 1146.1 Implementation Schedule



*Any unit at a RECLAIM or former RECLAIM facility that is subject to a NOx emission limit in a different rule for an industry-specific category is not subject to the requirements contained in this subdivision.

PR 1100 Subdivision (d)* - Rule 1146 and Rule 1146.1 Implementation Schedule (con't)

- Facility that elects to replace existing applicable equipment (instead of burner replacement or retrofitting) can use the replacement unit to meet total heat input percentage requirement if:
  - A complete permit application is submitted for any new Rule 1146 and Rule 1146.1 Units on or before 12 months from rule adoption date
  - The facility accepts a permit condition that identifies which unit(s) will be replaced and no longer operated once the new units are installed
- Existing unit(s) must be replaced on or before January 1, 2023

*Any unit at a RECLAIM or former RECLAIM facility that is subject to a NOx emission limit in a different rule for an industry-specific category is not subject to the requirements contained in this subdivision.

PR 1100 Subdivision (d)* - Rule 1146 and Rule 1146.1 Compliance for Units Near Final Emission Limit

- A future compliance date for equipment at a RECLAIM facility that was installed or modified prior to date of rule adoption with the following NOx emission limits:
  - Permit limit of ≤ 7 ppm for Rule 1146 Group I units (>75 MMBtu/hr)
  - Permit limit of ≤12 ppm for Rule 1146 Group II & III units (≥5 to <75 MMBtu/hr) and natural gas fired Rule 1146.1 units (>2 to <5 MMBtu/hr; excluding thermal fluid heaters)
  - Permit limit of ≤ 20 ppm for thermal fluid heaters
- Compliance with applicable NOx limits will be 15 years after the date of rule adoption or when 50% or more of the unit's burners are replaced (based on a cumulative percentage for each successive burner replacement)

*Any unit at a RECLAIM or former RECLAIM facility that is subject to a NOx emission limit in a different rule for an industry-specific category is not subject to the requirements contained in this subdivision.

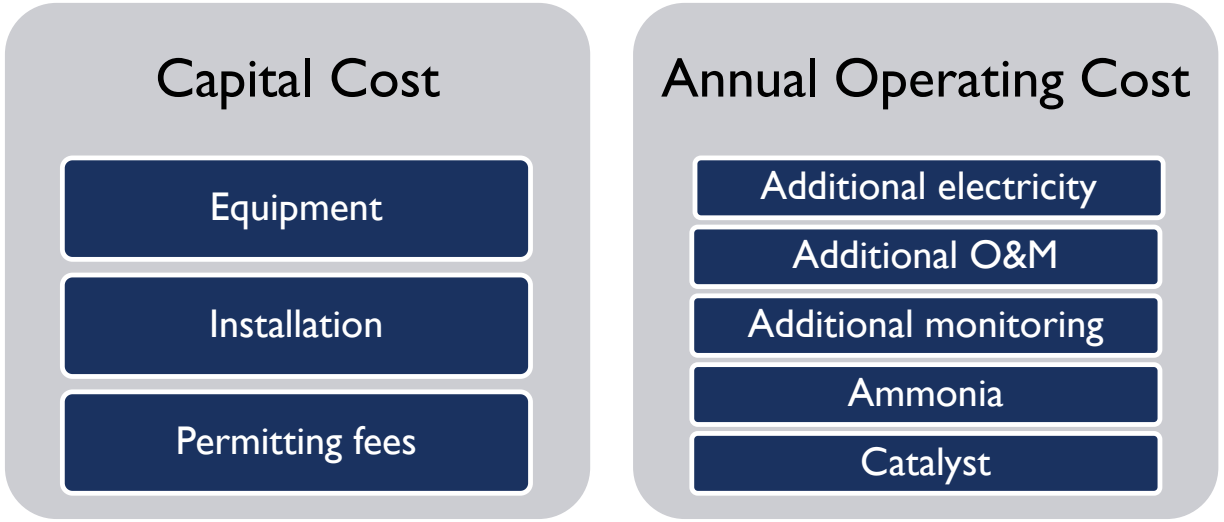
Monitoring, Reporting and Recordkeeping – PR 1100 Subdivision (e)

- Title V RECLAIM facilities shall comply with MRR specified in Rule 2012
- Non-Title V RECLAIM facilities shall comply with the monitoring, reporting, and recordkeeping requirements in the applicable rule(s) when the facility exits RECLAIM

Cost Effectiveness

Cost Information

- Control technology cost consists of two main components:
  - Capital Cost
  - Annual Operating Cost
- Source of information:
  - Vendor discussion
  - U.S. EPA SCR Cost Manual*



*Available at: https://www3.epa.gov/ttn/ecas/docs/SCRCostManualchapter7thEdition_2016.pdf

Cost Effectiveness

Group	Size (MMBtu/hr)	Preliminary Recommended Emission Limit	Cost Effectiveness ($/ton)	
Rule 1146 Group I	≥75	5 ppm via SCR (existing limit)	$17,000*	
Rule 1146 Group II	≥20 to <75	5 ppm via SCR	For units > 12 ppm*	
			$33,000	
Rule 1146 Group II	≥20 to <75	7 ppm via ULNB for fire-tube boilers 9 ppm via ULNB for non fire-tube boilers	For units ≤ 12 ppm	
			$14,000 compliance until burner replacement or 15 yrs after amendment	
Rule 1146 Group III	≥5 to <20	7 ppm via ULNB for fire-tube boilers 9 ppm via ULNB for non fire-tube boilers	For units > 12 ppm*	For units ≤ 12 ppm*
			$27,000	$10,000 compliance until burner replacement or 15 yrs after amendment
Rule 1146.1	≥2 to <5	Same as above	For units > 12 ppm*	For units ≤ 12 ppm*
			$36,000	$10,000 compliance until burner replacement or 15 yrs after amendment
Atmospheric Units	≤10	12 ppm via ULNB (existing limit)	$34,000^	
Thermal Fluid Heaters	NA	12 ppm via ULNB	$39,000^	
Digester Gas Fired	NA	15 ppm via ULNB (existing limit)	Not applicable	
Landfill Gas Fired	NA	12 - 20 ppm via ULNB	$17,000#	

** Estimated using emissions from RECLAIM units*

^ Estimated assuming 20% operating capacity and a baseline of 30 ppm

 # Estimated assuming retrofit to meet 20 ppm

Incremental Cost Effectiveness

Background

- An incremental cost-effectiveness analysis is required under Health and Safety Code Section 40920.6
- Incremental cost effectiveness is defined as the difference in control costs divided by the difference in emission reductions between two potential control options

$$Incremental\ Cost - Effectiveness = \frac{C_{alt} - C_{proposed}}{E_{alt} - E_{proposed}}$$

Where:

$C_{proposed}$ is the cost of the proposed control option;
$E_{proposed}$ are the emission reductions of the proposed control option;
C_{alt} is the cost of the alternative control option; and
E_{alt} are the emission reductions of the alternative control option

Incremental Cost Effectiveness

Group	Size (MMBtu/hr)	Current Proposal	Alternative	Incremental Cost-Effectiveness
Rule 1146 Group II	≥20 to <75	For units > 12 ppm	None	Not Applicable
		5 ppm via SCR		
		For units ≤ 12 ppm	5 ppm via SCR	$290,354
		7 ppm via ULNB for fire-tube boilers 9 ppm via ULNB for non fire-tube boilers		
Rule 1146 Group III	≥5 to <20	7 ppm via ULNB for fire-tube boilers 9 ppm via ULNB for non fire-tube boilers	5 ppm via SCR	$1,094,123

Updated Schedule

Sept 20, 2018	Public Workshop
Oct 4, 2018	End of Comment Period
October 16, 2018 (tentative)	Working Group #7
Oct 19, 2018	Stationary Source Committee
Nov 2, 2018	Set Hearing
Dec 7, 2018	Public Hearing

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