Public Workshop for Rules 4306 and 4320 (Boilers, Steam Generators, and Process Heaters Greater than 5.0 MMBtu/hr) and Rule 4311 (Flares)

October 8, 2020

webcast@valleyair.org

Rule 4306 (Boilers, Steam Generators, and Process Heaters – Phase 3) and Rule 4320 (Advanced Emission Reduction Options for Boilers, Steam Generators, and Process Heaters Greater than 5.0 MMBtu/hr)

Valley's Air Quality Challenges

- Valley's challenges in meeting federal air quality standards unmatched due to unique geography, meteorology, and topography
- Valley designated as "Extreme" non-attainment of the 8-hour Ozone NAAQS; "Serious" non-attainment of federal standards for fine particulate matter (PM2.5)
  - Substantial emission reductions needed to achieve federal standards – need to go beyond already strict control limits
- Combustion is a significant source of NOx emissions, primary precursor to ozone and PM2.5 formation
  - *2018 PM2.5 Plan* includes commitment to evaluate opportunities to further reduce emissions from boilers, steam generators, & process heaters

Rule 4306 and Rule 4320 Overview

- Rules 4306 and 4320 apply to any gaseous fuel- or liquid fuel- fired boiler, steam generator, or process heater with a total rated heat input greater than 5 MMBtu per hour
- Boilers are external combustion equipment used to produce hot water or steam
- Steam generators are external combustion equipment that convert water to steam; most commonly used in thermally enhanced crude oil production
- Process heaters are combustion equipment that transfer heat from combustion gases to liquid or gas process streams

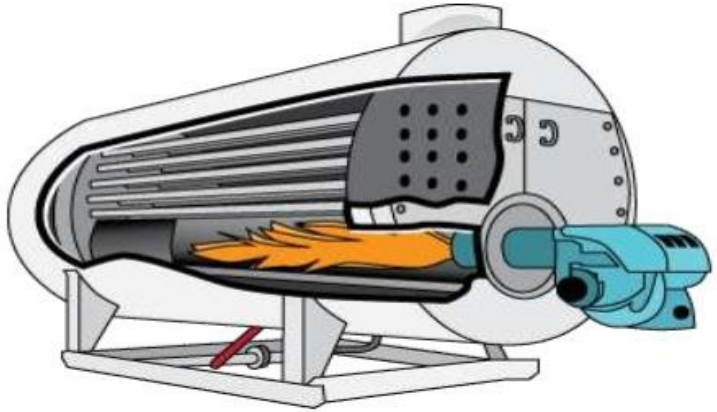


Image credit: US EPA, 2013

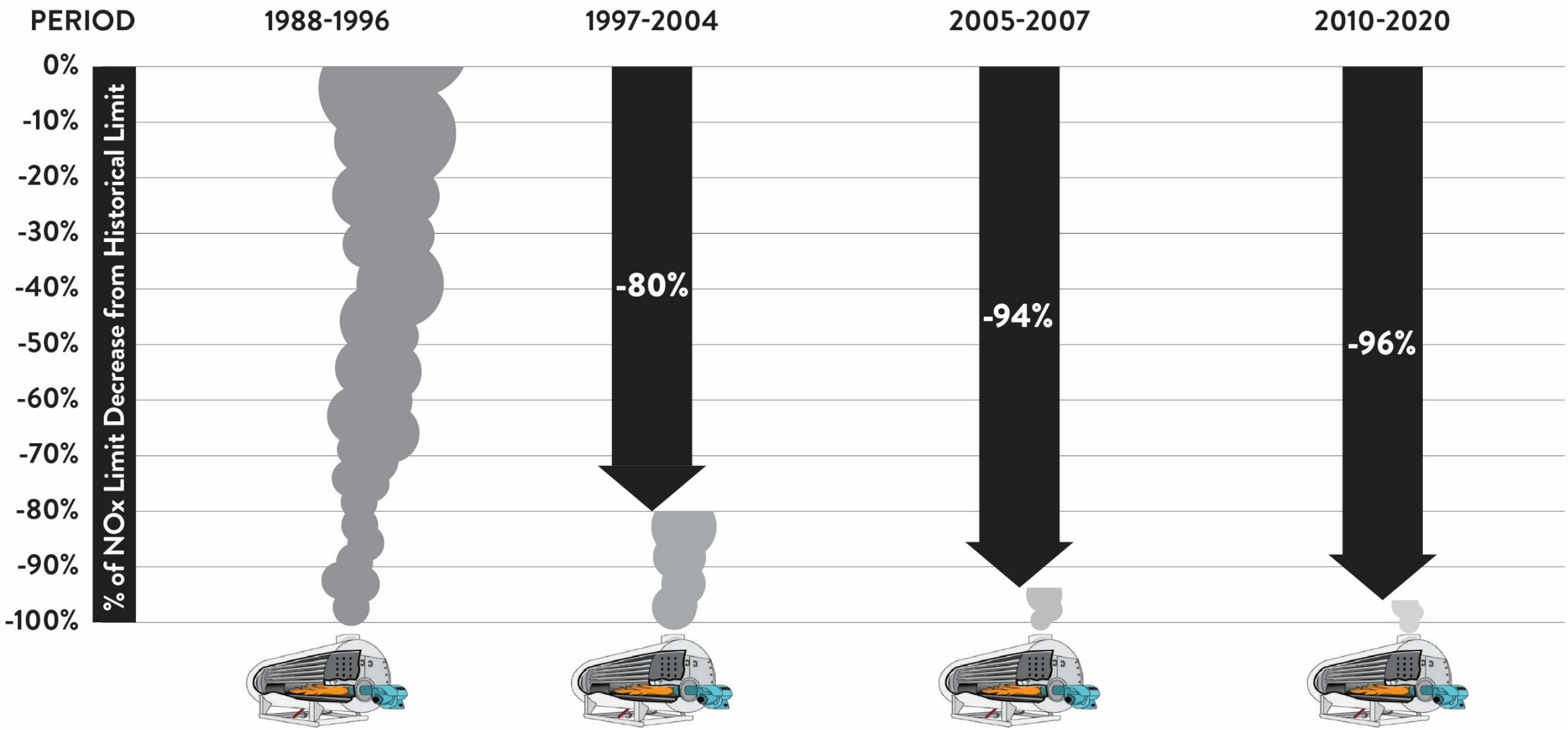
Where do Boilers, Steam Generators, and Process Heaters Operate?

- These units are used at a wide range of facility types in Valley including:
  - Oil and gas production facilities
  - Petroleum refineries
  - Food and agricultural product processing operations
  - Schools, Universities
  - Ethanol Production
  - Hospitals
  - Livestock husbandry operations (dairies, cattle feedlots, etc.)
  - Manufacture and industrial facilities

Current Rule 4306 and Rule 4320 Requirements

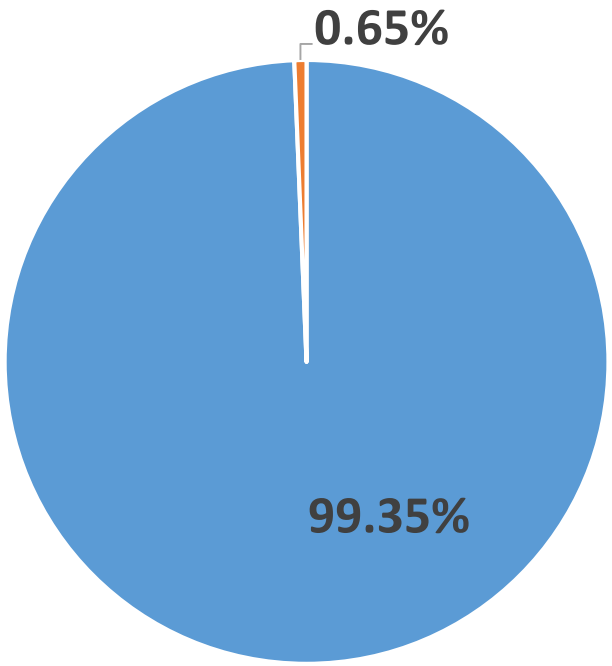
- Rule 4306 establishes specific NOx limits for many categories of boiler/steam generator/process heater units
  - NOx limits must be met in order to legally operate in District
  - Facilities generally control emissions from sources through combustion modification or exhaust gas treatment
- Rule 4320 establishes more strict NOx limits for units in this source category, which are generally technology advancing/forcing. Operators are given three options to comply:
  - Meet specified emission limits, or
  - Pay emissions fee annually to the District, or
  - Comply with low-use provision (fuel limit of ≤ 1.8 billion Btu/yr)
- Through these rules, NOx emissions from these sources already reduced by 96%

Decrease in NOx Emission Limits from Boilers, Steam Generators, and Process Heaters with Heat Input Greater than 5 MMBtu/hr

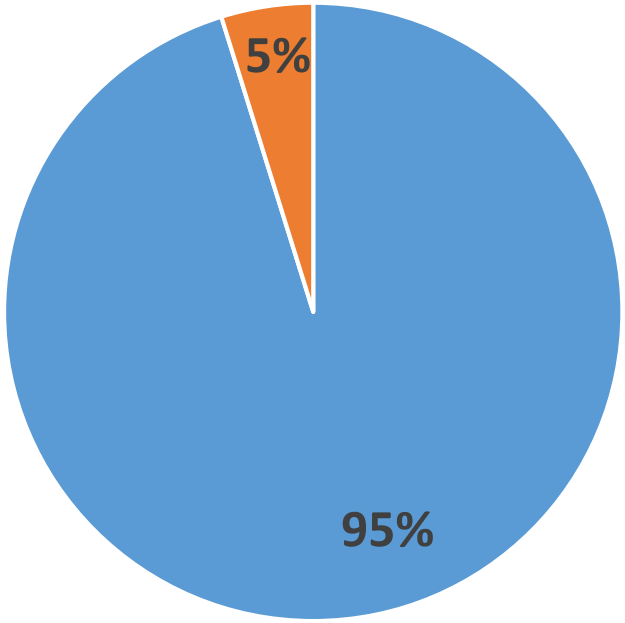


NOx Emissions from Boilers, Steam Generators, and Process Heaters in the Valley

All NOx Emissions in the Valley (Mobile, Stationary, & Area Sources)



NOx Emissions from Stationary Sources



Units in the San Joaquin Valley

Rule 4320 Category	# Units
Group A. Units 5-20 MMBtu/hr except for Categories C-G Units	302
Group B. Units >20 MMBtu/hr except for Categories C-G Units	230
Group C.1 Oilfield Steam Generators 5-20 MMBtu/hr	8
Group C.2 Oilfield Steam Generators >20 MMBtu/hr	410
Group C.3 Oilfield Steam Generators firing on less than 50% PUC quality gas	142
Group D.1 Refinery Boiler 5-40 MMBtu/hr	2
Group D.2 Refinery Boilers ≥40 MMBtu/hr to ≥110 MMBtu/hr	3
Group D.3 Refinery Boilers >110 MMBtu/hr	1
Group D.4 Refinery Process Heaters 5-40 MMBtu/hr	15
Group D.5 Refinery Process Heaters ≥40 MMBtu/hr	6
Group D.6 Refinery Process Heaters >110 MMBtu/hr	0
Group E. Units with an annual heat input 1.8-30 billion Btu/yr	65
Total	**1,184**

Additional Emission Reductions Needed

- Substantial emission reductions needed to achieve PM2.5 standards – need to go beyond already strict limits
- Commitment in *2018 PM2.5 Plan* to evaluate further emissions reduction opportunities from sources including boilers, steam generators, and process heaters
  - Reduce NOx emissions by lowering the NOx emission limits and lowering the more stringent Advanced Emission Reduction Option (AERO) limit for specific classes and categories of units
- District staff have conducted comprehensive review of requirements in other air districts, lowest emission limits being achieved in installations statewide, and costs and feasibility of most effective emission control technologies available

Public Process to Amend Rules 4306 and 4320

- *2018 Plan for the 1997, 2006, and 2012 PM2.5 Standards*
  - Adopted: November 15, 2018
- Public scoping meeting held December 5, 2019
- Public workshops held July 30 and September 24, 2020
- Draft rule posted for public review on October 2, 2020
- Regular updates provided at Citizens Advisory Committee (CAC), Environmental Justice Advisory Group (EJAG), and District Governing Board meetings
- Ongoing opportunities for public input throughout rule development process

Potential NOx Control Technologies Being Evaluated

- Additional oxygen flow controls, flue gas recirculation (FGR), and tuning
  - FGR reduces NOx emissions by recirculating flue gases from the boiler exhaust duct into the main combustion chamber
  - Total Capital Cost: $17,000-$84,000 depending on size of unit
  - More electricity and fuel required: $1,800-$30,000 per year depending on size of unit
    - Larger FGR fan required

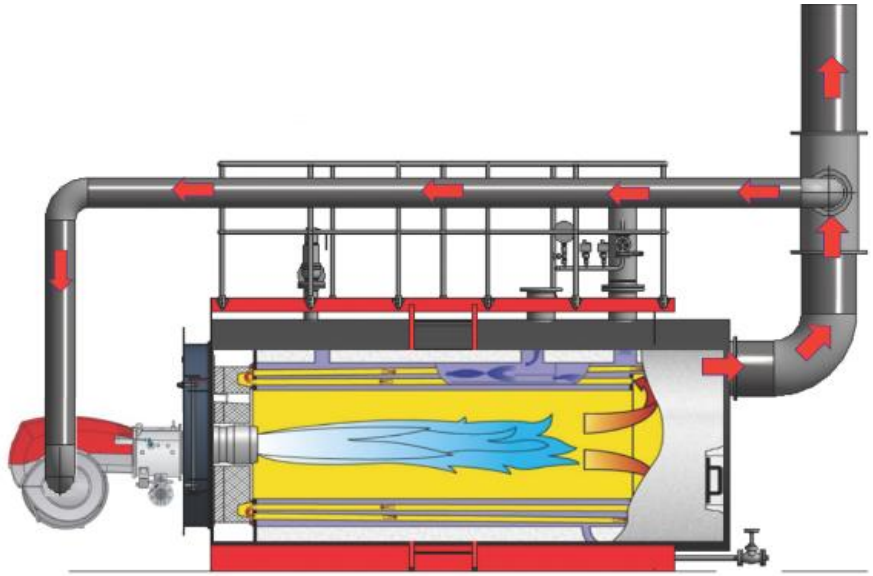


Image credits: Robert Bosch, LLC

Potential NOx Control Technologies Being Evaluated (cont'd)

- Ultra-low NOx burners (ULNBs)
  - ULNBs control fuel and air mixing to improve flame structure resulting in less NOx formation
  - Can be installed on most units
  - Capable of achieving 5 ppm NOx
  - Installed Capital cost: $30,000-$400,000 depending on size of unit
  - More electricity and fuel required: $6,400-$30,000 per year depending on size of unit
    - Larger FGR fan required

Image credit: Webster Combustion Technology

Potential NOx Control Technologies Being Evaluated (cont'd)

- New Ultra Low NOx Boiler or Heater
  - Complete system with high efficiency burner, heat recovery economizer, flue gas recirculation, and advanced control system
  - Capable of achieving 5 ppm NOx
  - Installed Capital cost: $155,000-$1,250,000 depending on size of unit
  - Same incremental electricity cost compared to retrofit unit
  - No increase in fuel costs

Image credit: Cleaver-Brooks

Potential NOx Control Technologies Being Evaluated (cont'd)

- Selective Catalytic Reduction
  - Converts NOx to N_2 and water with catalyst by adding a reactant such as ammonia or urea to exhaust gas
  - Capable of achieving 2 ppm NOx
  - Costs for SCR range depending on size of unit
  - Installed Cost: $230,000-$750,000
  - Additional costs include reagent and catalyst replacement: $4,200 - $48,000 per year
  - Cost Savings due to decreased fuel and electricity use: $16,000 - $148,000 per year

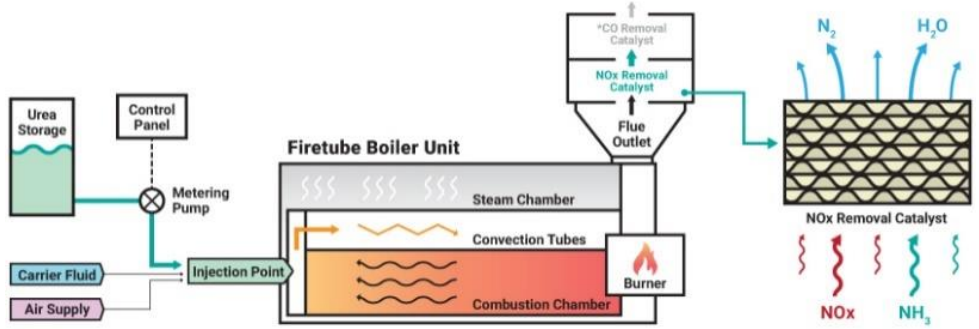


Image credit: RF MacDonald Co.

Potential NOx Control Technologies

- Solar Powered Oil Field Steam Generators
  - In the Valley, two small pilot projects were conducted to demonstrate the feasibility of solar powered steam generation technologies and found that such technologies were not feasible due to:
    - Significant costs
    - Excessively large footprint required
    - Variability of steam generation output

- Electric Powered Units
  - Capital cost of electric units is comparable to natural gas units but cost to operate with electricity is significantly higher than natural gas (typically 3-5 times more expensive)

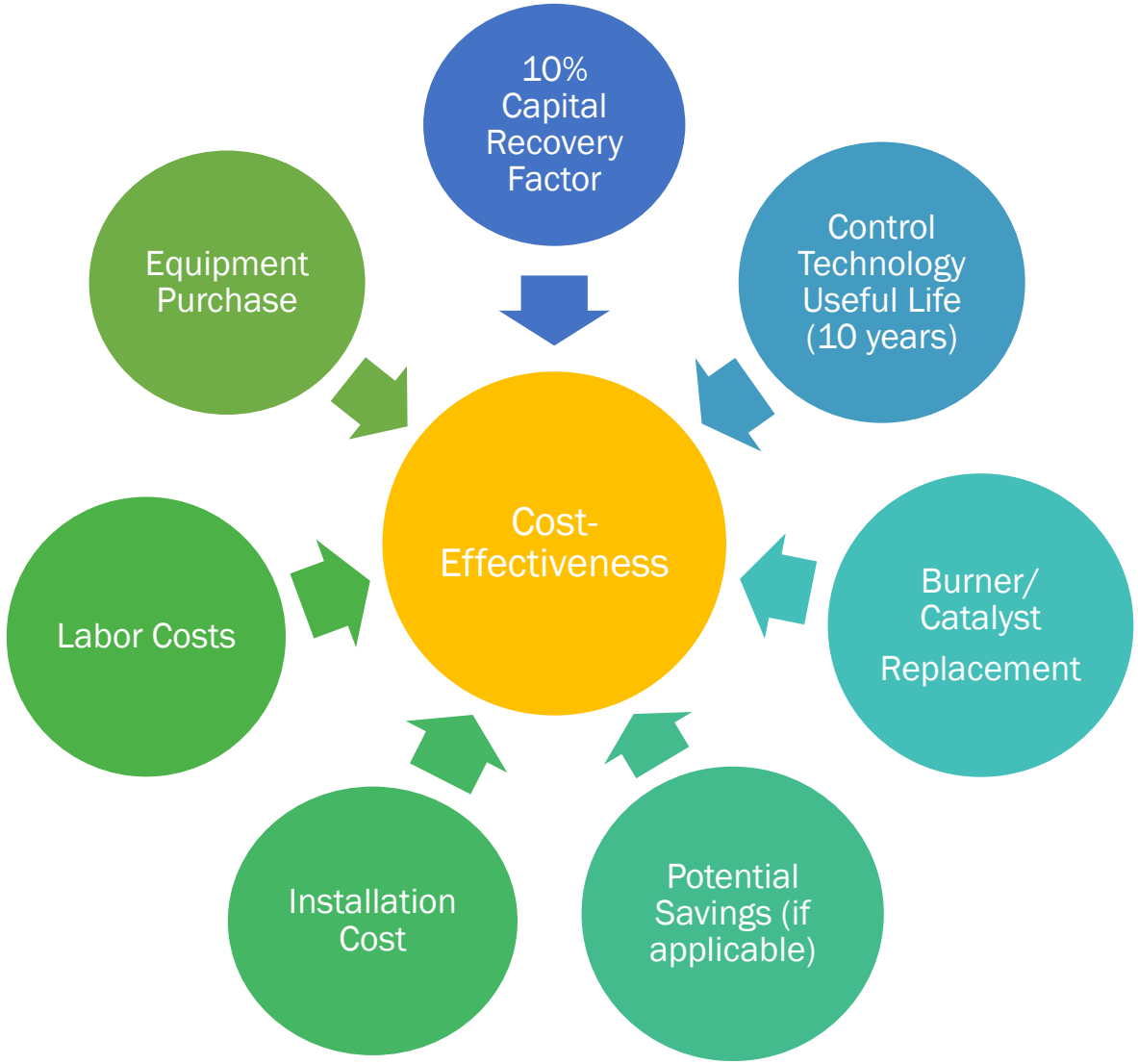
Image credit: BrightSource Energy

Cost Assessment of NOx Control Technology

- Sources for costs
  - Actual costs provided by facilities, engineering estimates, and control technology vendors & manufacturers
  - Various sources for the cost of electricity, fuel, and replacement parts
  - Cost factors from EPA's Office of Air Quality Planning and Standards
- Staff held numerous in person and virtual meetings with facilities, vendors, manufacturers, and other stakeholders

Cost-Effectiveness (CE) Analysis

- Cost-Effectiveness is cost (capital and annual) over emission reductions for the life of the equipment ($/ton)
- Two major cost elements
  - Capital Costs (Equipment, Infrastructure, Engineering, Installation, Tax, Freight)
  - Annual Costs (Operation & Maintenance)
- Emission reductions based on current emission levels (baseline) to proposed emission limit



New Proposed NOx Emissions Requirements

- District proposing to further reduce NOx emissions from various categories through new proposed Rule 4306 and 4320 limits
- All units must meet Rule 4306 and 4320 limits by December 31, 2023 except:
  - Fire Tube Boilers 5-20 MMBtu/hr, Fire Tube Boilers 20-75 MMBtu/hr, and Any Other Units 20-75 MMBtu/hr permitted at 9 ppm or less have until December 31, 2029 to meet 7 ppm
  - Any Other Units 5-20 MMBtu/hr permitted at 12 ppm or less have until December 31, 2029 to meet 9 ppm
  - Category B Units greater than 75 MMBtu/hr permitted at 7 ppm or less have until December 31, 2029 to meet 5 ppm
- Emission Compliance Plan and Authority to Construct due 12/31/21

Proposed Rule 4306 NOx Limits and Cost Effectiveness (CE)

Category A 5-20 MMBtu/hr	Total # of Units	Current Rule 4306 NOx Limit	Proposed Rule 4306 NOx Limit	CE per ton NOx in 2023	CE per ton NOx in 2029
Fire Tube Boilers	178	15 ppm	7 ppm	$54,670	$72,712
Units at Schools and Colleges	9	15 ppm	9 ppm	-	-
Digester Gas Fired Units	2	15 ppm	9 ppm	-	-
Thermal Fluid Heaters	3	15 ppm	9 ppm	-	-
Any Other Units	110	15 ppm	9 ppm	$72,644	$65,558

Proposed Rule 4306 NOx Limits and Cost Effectiveness

Category B ≥ 20 MMBtu/hr	Total # of Units	Current Rule 4306 NOx Limit	Proposed Rule 4306 NOx Limit	CE per ton NOx in 2023	CE per ton NOx in 2029
Fire Tube Boilers >20 to ≤75	88	9 ppm	7 ppm[1]	-	$87,299
Any Other Units >20 to ≤75	56	9 ppm	7 ppm[1]	-	$82,489
Units >75	86	9 ppm	5 ppm[2]	$11,721	$38,842[3]

Proposed Rule 4306 NOx Limits and Cost Effectiveness (cont'd)

Category C – Oilfield Steam Generators	Total # of Units	Current Rule 4306 NOx Limit	Proposed Rule 4306 NOx Limit	CE per ton NOx in 2023
>5 and ≤20 MMBtu/hr	8	15 ppm	9 ppm	$96,302
>20 and ≤75 MMBtu/hr	276	15 ppm	9 ppm	$43,107-$100,841*
>75 MMBtu/hr	134	15 ppm	7 ppm	-
Units fired on less than 50% PUC Quality Gas	142	15 ppm	15 ppm	-

*Depending on whether convection box upgrade is required

Proposed Rule 4306 NOx Limits and Cost Effectiveness (cont'd)

Category D – Refinery Units	Number of Units	Current Rule 4306 NOx Limit	Proposed Rule 4306 NOx Limit	CE per ton NOx in 2023
Boilers >5 and ≤40 MMBtu/hr	2	30 ppm	30 ppm/5 ppm*	$26,781
Boilers >40 MMBtu/hr to ≤110 MMBtu/hr	4	30 ppm	9 ppm	$21,007
Boilers >110 MMBtu/hr	1	5 ppm	5 ppm	-
Process Heaters >5 and ≤40 MMBtu/hr	15	30 ppm	30 ppm/9 ppm*	$12,962
Process Heaters >40 MMBtu/hr to ≤110 MMBtu/hr	6	30 ppm	15 ppm	$13,045
Process heaters >110 MMBtu/hr	1	5 ppm	5 ppm	-

*Upon replacement

Proposed Rule 4320 NOx Limits

Category A 5-20 MMBtu/hr	Total # of Units	Current Rule 4320 NOx Limit	Proposed Rule 4320 NOx Limit
Fire Tube Boilers	178	9 ppm & 6 ppm	5 ppm
Units at Schools and Colleges	9	9 ppm & 6 ppm	9 ppm
Digester Gas Fired Units	2	9 ppm & 6 ppm	9 ppm
Thermal Fluid Heaters	3	9 ppm & 6 ppm	9 ppm
Any Other Units	110	9 ppm & 6 ppm	5 ppm
Category B ≥ 20 MMBtu/hr	**Total # of Units**	**Current Rule 4320 NOx Limit**	**Proposed Rule 4320 NOx Limit**
Fire Tube Boilers >20 to ≤75	88	7 ppm & 5 ppm	2.5 ppm
Any Other Units >20 to ≤75	56	7 ppm & 5 ppm	2.5 ppm
Units >75	86	7 ppm & 5 ppm	2.5 ppm

Proposed Rule 4320 NOx Limits (cont'd)

Category C – Oilfield Steam Generators	Total # of Units	Current Rule 4320 NOx Limit	Proposed Rule 4320 NOx Limit
>5 and ≤20 MMBtu/hr	8	9 ppm & 6 ppm	6 ppm
>20 and ≤75 MMBtu/hr	276	7 ppm & 5 ppm	5 ppm
>75 MMBtu/hr	134	7 ppm & 5 ppm	5 ppm
Units fired on less than 50% PUC Quality Gas	142	12 ppm & 9 ppm	5 ppm

Proposed Rule 4320 NOx Limits (cont'd)

Category D – Refinery Units	Total # of Units	Current Rule 4320 NOx Limit	Proposed Rule 4320 NOx Limit
Boilers >5 and ≤40 MMBtu/hr	2	9 ppm & 5 ppm	5 ppm
Boilers >40 MMBtu/hr to ≤110 MMBtu/hr	4	6 ppm & 5 ppm	2 ppm
Boilers >110 MMBtu/hr	1	5 ppm	2 ppm
Process Heaters >5 and ≤40 MMBtu/hr	15	9 ppm & 5 ppm	5 ppm
Process Heaters >40 MMBtu/hr to ≤110 MMBtu/hr	6	6 ppm & 5 ppm	2 ppm
Process heaters >110 MMBtu/hr	1	5 ppm	2 ppm

*Upon replacement

Summary of Cost Effectiveness

- Cost-effectiveness of Rule 4306 ranges depending on current permitted limit of unit, size of unit, and emission reductions achieved
- Technology-forcing limits in Rule 4320 require more costly control equipment
  - Capital costs for facilities much higher to install required control technology (SCR) to meet stringent limits
  - Emissions fee option in Rule 4320 offers operators option to achieve cost-effective emission reductions in lieu of installing costly controls

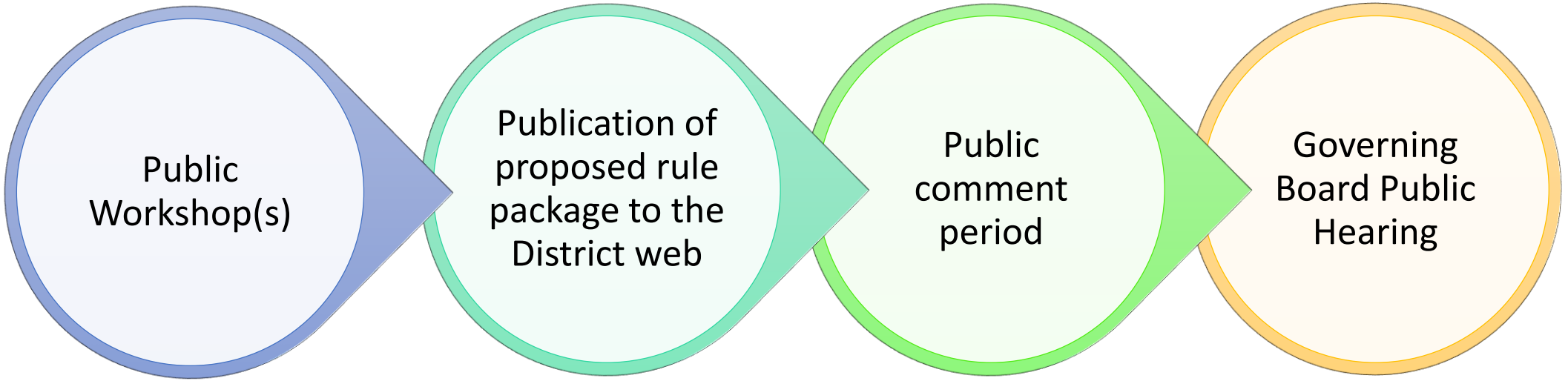
Estimated NOx Emission Reductions

- NOx Emission Reductions from Rule 4306 in 2023
  - 0.25 tons per day
- NOx Emission Reductions from Rule 4306 in 2029
  - 0.03 tons per day
- Total Estimated NOx Emission Reductions
  - 0.28 tons per day

Next Steps

- District staff inviting comment on draft rule
- Socioeconomic Impact Analysis underway to support feasibility analysis
  - Characterization of the Valley's economic climate
  - Evaluation of economic impacts
  - Socioeconomic Impact Analysis report
  - Presentation to Governing Board
- Results of analysis will be included with proposed rule packages

Next Steps: Public Engagement Process for Rule 4306 & 4320 Rule Amendment Development



Public Participation and Comment Invited throughout Process

Rule 4306 and 4320 Contact

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Fax: (559) 230-6064
Email: ross.badertscher@valleyair.org
Listserv: http://lists.valleyair.org/mailman/listinfo/boilers_and_heaters

Questions/Comments

webcast@valleyair.org

Public Workshop for Rule 4311 (Flares)

October 8, 2020

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Valley's Air Quality Challenges

- Valley's challenges in meeting federal air quality standards unmatched due to unique geography, meteorology, and topography
- Valley designated as "Extreme" non-attainment of the 8-hour Ozone NAAQS; "Serious" non-attainment of federal standards for fine particulate matter (PM2.5)
  - Substantial emission reductions needed to achieve federal standards – need to go beyond already strict control limits
- Combustion is a significant source of NOx emissions, primary precursor to ozone and PM2.5 formation
  - *2018 PM2.5 Plan* includes commitment to evaluate opportunities to further reduce emissions from flares

What is Flaring?

- Flaring is a high temperature oxidation process used to burn primarily hydrocarbons of waste gases from industrial operations
  - Flares typically have a destruction efficiency of 98% or higher

Image credit: Getty Images, 2018

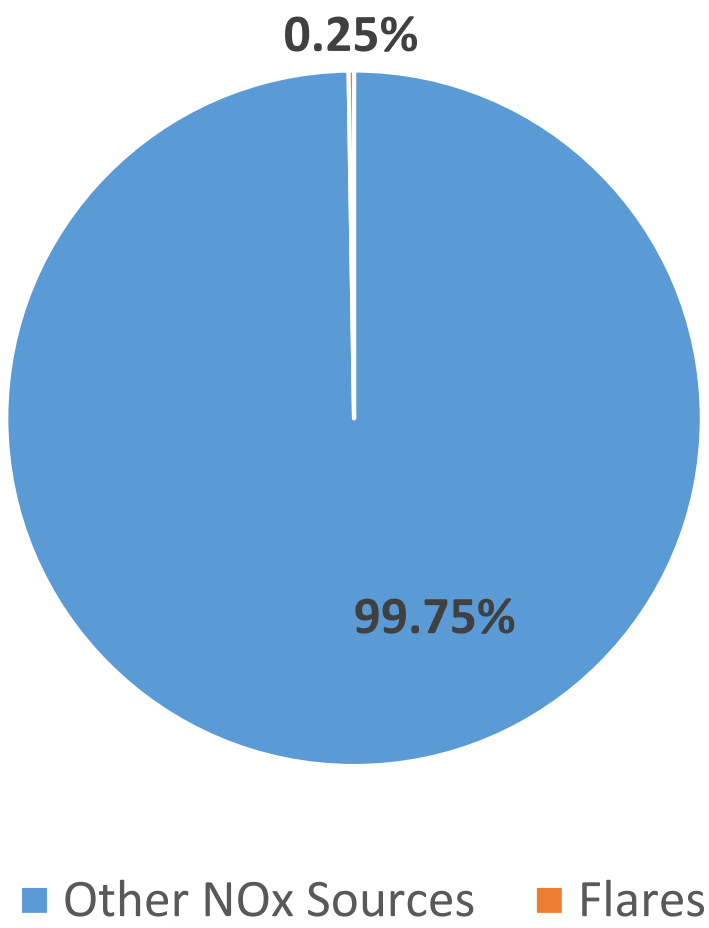
- Flares act as a safety device during unforeseeable and unpreventable situations, and as an emission control device for air toxics and VOCs
- Two general types of flares: elevated and ground flares
- Operators avoid flaring due to high costs, and implement alternatives where feasible

Current District Flare Requirements

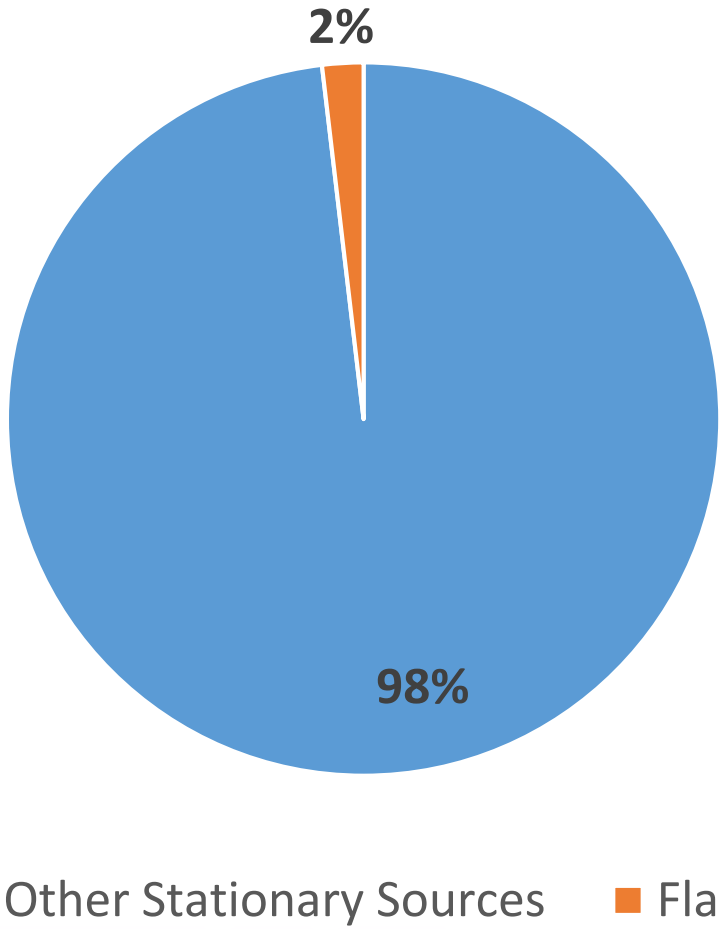
- District Rule 4311 (Flares) adopted June 2002, amended in 2006, again in 2009 to add new requirements, including annual reporting and flare minimization practices
  - Rule limits emissions of NOx, VOCs, and SOx from the operation of flares
- Current requirements for operations with flares include:
  - NOx limits as low as 0.068 lbs-NOx/MMBtu (53 ppmv NOx)
  - Proper operation requirements (i.e., ignition system, heat sensors, etc.)
  - Flare minimization plans
  - Reporting of unplanned flaring event within 24 hours, annual reporting, and reporting of when monitoring system is not operating
  - Vent gas composition monitoring
  - Video monitoring

NOx Emissions from Flares in the Valley

All NOx Emissions in the Valley (Mobile, Stationary, & Area Sources)



NOx Emissions from Stationary Sources



San Joaquin Valley Flare Inventory

Category	# Flares
Chemical Production and/or Distribution	5
Gas Plants	11
Landfills (Open)	17
Landfills (Closed)	11
Oil and Gas Production	161
Other	6
Propane Backup System	6
Refinery	7
Wastewater Treatment	22
Agriculture Related Digester	16
Organic Liquid Handling	4
Total	**266**

Attainment Plan Commitments to Minimize Flaring

- *2018 PM2.5 Plan* commitments
  - Additional low NOx flare emission limitations for existing and new flaring activities at Valley facilities to the extent that such controls are technologically achievable and economically feasible
  - Additional flare minimization requirements to the extent that such controls are technologically achievable and economically feasible
  - Expand applicability of the rule by removing the exemption for non-major sources
  - Plan evaluation estimated 0.05 tpd NOx emission reduction through implementation of low NOx flare installation requirements
- District staff have conducted comprehensive review of requirements in other air districts, lowest emission limits being achieved in installations statewide, and costs and feasibility of most effective emission control technologies available

Public Process to Amend Rule 4311

- Scoping Meeting held August 17, 2017
- *2018 Plan for the 1997, 2006, and 2012 PM2.5 Standards*
  - Adopted: November 15, 2018
  - Included updated commitments
- Flare Operator Workgroup Meetings
  - October 2017, April 2019, July 2019, and August 2020
- Public workshops held November 13, 2019; July 30, 2020; and September 24, 2020
- Regular updates at Citizens Advisory Committee (CAC), Environmental Justice Advisory Group (EJAG), and District Governing Board meetings
- Draft rule published for public review on October 2, 2020
- Ongoing opportunities for public input throughout rule development process

Ultra-low NOx Flare Technology

- District has been conducting extensive evaluation of ultra-low NOx flare technologies for potential use in further reducing emissions under Rule 4311
  - High destruction efficiency of non-methane hydrocarbons (manufacturers guarantee 99%+)
  - ULN flares reduce NOx emissions by 50-75%
  - Emissions controlled through burner system and precise air/gas mixture in enclosed flare
- Costs range depending on size of flare and infrastructure required
  - $400k – $1.3 million capital cost per flare quoted
  - Significant engineering required, additional controls and infrastructure needed for installation
  - Increased costs for operation and maintenance ($30k-$60k)

Image Credit: Lfgtech, 2019

Ultra-low NOx Flare Technology (cont'd)

- Costs obtained from facilities with Ultra-low NOx technology, vendors, & manufacturers
  - Four manufacturers, with a fifth introducing a control system in 2020
- Multiple site visits to understand technology
- Numerous installations in Valley and other regions
- NOx emissions range from 0.018 lb/MMBtu to 0.025 lb/MMBtu depending on gas composition and flow (varies across industry application)

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Proposed Rule 4311 Data Collection and Analysis

- Affected facility analysis
  - Equipment age, type, and operating conditions
  - 5 years of reported flaring data and emissions
- Emissions Inventory data (permitted limits and actual fuel combusted annually) used to analyze existing NOx emission levels and trends from each flare in the Valley
- Cost-Effectiveness
  - Facilities, vendors, manufacturers provided cost data
  - Data from control technology assessment and emissions inventory data used to estimate emission reductions and cost-effectiveness of proposed rule

Proposed Rule Concepts

- Remove non-major source exemption
- Remove landfill exemption
- Add new emissions requirement based on annual throughput threshold that, if exceeded, would require ultra-low NOx technology for existing flares (consistent with SCAQMD Rule 1118.1)
  - Oil and Gas Related Flares: 20,000 MMBtu/yr threshold
    - Controls 65% of gas flared
  - Landfill Flares: 90,000 MMBtu/yr threshold
    - Controls 93% of gas flared
  - Digester/Wastewater Treatment Flares: 100,000 MMBtu/yr threshold
    - Controls 77% of the gas flared
- Annual throughput thresholds based on applicability of ultra-low NOx technology for different flaring processes (industry-specific considerations) and costs

Proposed Rule Concepts (cont'd)

- Operators of flares subject to new requirements must do one of the following:
  - Install an ultra-low NOx flare by December 31, 2023, or
  - Comply with enforceable permit limit below applicable annual throughput threshold by January 1, 2025 based on 1-year
    - Must install ULN flare within one year if exceed annual threshold
    - Under consideration: Change throughput threshold to two-year rolling average, and advance compliance deadline from January 1, 2025 to January 1, 2024 (must still install ULN flare within one year if exceed annual threshold)

Proposed Rule Concepts (cont'd)

- Proposed NOx limits
  - 0.018 lb-NOx/MMBtu limit for flares at oil and gas operations
  - 0.025 lb-NOx/MMBtu limit for flares fired on digester gas at major source facilities, and landfill gas
  - 0.06 lb-NOx/MMBtu limit for digester gas at non-major source facilities
  - 0.068 lb-NOx/MMBtu limit for all other flares
  - 0.034 lb-NOx/1,000 gallons at organic liquid loading operations
- Proposed limits consistent with South Coast Rule 1118.1

Proposed Rule Concepts (cont'd)

- Installation of ultra-low NOx flare technology would be required for flares that combust majority of gas in Valley
  - Proposed concept would require installation of ultra-low NOx flares associated with 65% of total gas flared from all categories
- New ultra-low NOx requirements would be in addition to current requirements, including flare minimization plans
- Rule 4311 exemptions for
  - Units used less then 200 hr/yr as specified on the Permit to Operate, or with an annual throughput limit equivalent to 200 hours or less per year
  - Flares used for well testing, pipeline and tank degassing
  - Flares used to combust regeneration gas
  - Units that burn propane only
  - Flares used at landfills that combust less than 2,000 MMSCF/year and have ceased accepting waste

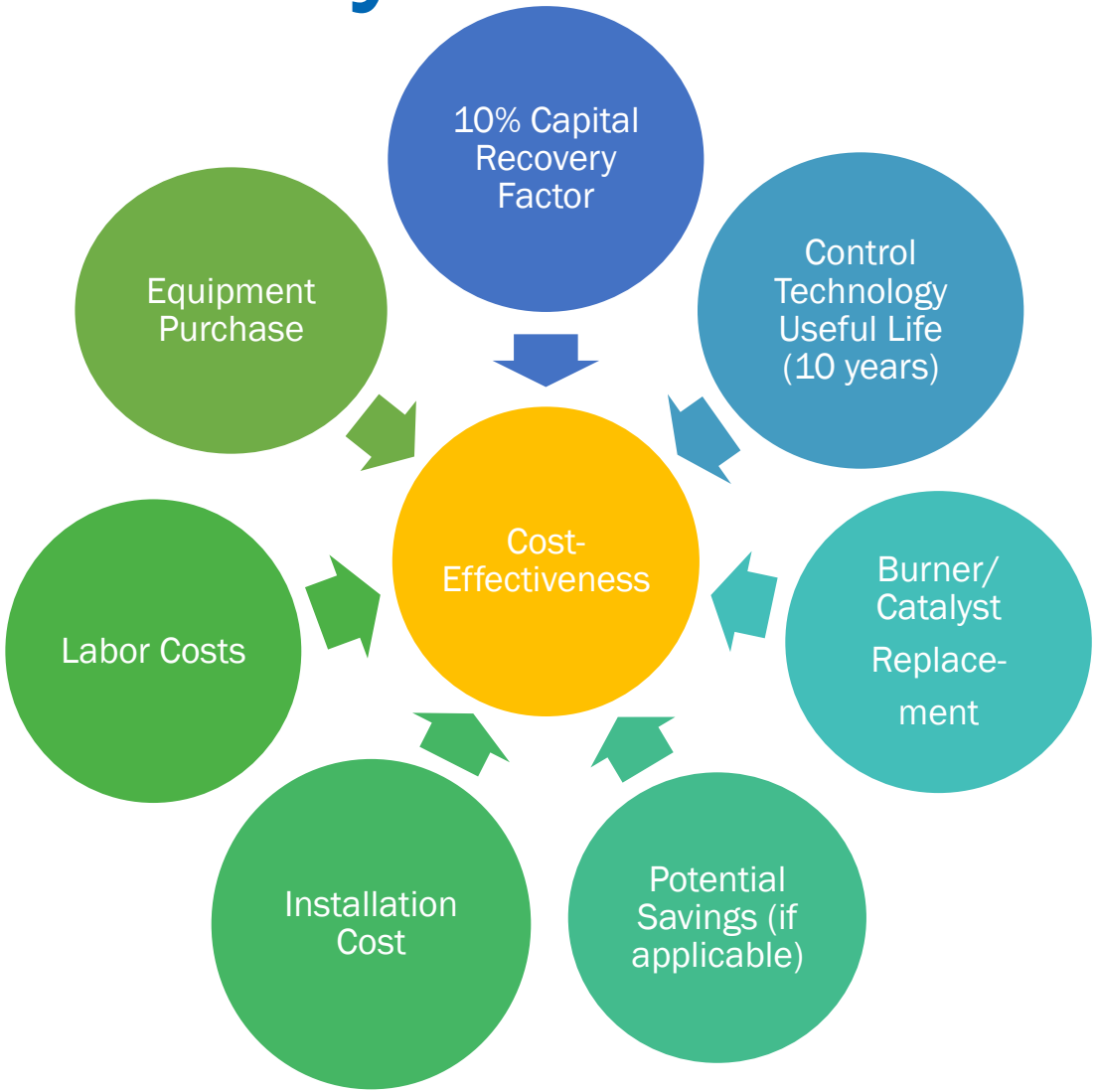
Estimated Additional NOx Emission Reductions from Proposed Regulatory Amendments

Further controls 65.6% of all flared gas through use of ultra-low NOx flaring technology

Achieves 0.19 tons/day NOx reduction (exceeds SIP commitment of 0.05 tons/day NOx reduction)

Cost-Effectiveness Analysis

- Cost-Effectiveness is cost (capital and annual) over emission reductions for the life of the equipment ($/ton)
- Two major cost elements
  - Capital Costs (Equipment, Infrastructure, Engineering, Installation, Tax, Freight)
  - Annual Costs (Operation & Maintenance)
- Sources for cost
  - Engineering estimates, actual costs provided by facilities, control technology vendors & manufacturers
  - Various sources for the cost of electricity, fuel, and replacement parts
  - Cost factors from EPA's Office of Air Quality Planning and Standards
- Emission reductions based on current emission levels (baseline) to proposed emission limit



Estimated Ultra-low NOx Flare Technology Costs

Flaring Operation Category	Flare Size (MMBtu/hr)	Estimated Capital Cost	Annual O&M	Annualized Cost
Oil and Gas Production	4	$616,800	$28,680	$129,065
Oil and Gas Production	15	$598,415	$40,500	$137,890
Oil and Gas Production	40	$1,488,700	$114,260	$356,540
Digester	15	$664,850	$35,540	$143,740
Digester	50	$1,561,000	$126,160	$380,200
Landfill	20	$980,000	$30,000	$189,490
Landfill	60	$927,000	$100,000	$250,865
Landfill	160	$1,386,400	$200,000	$425,630

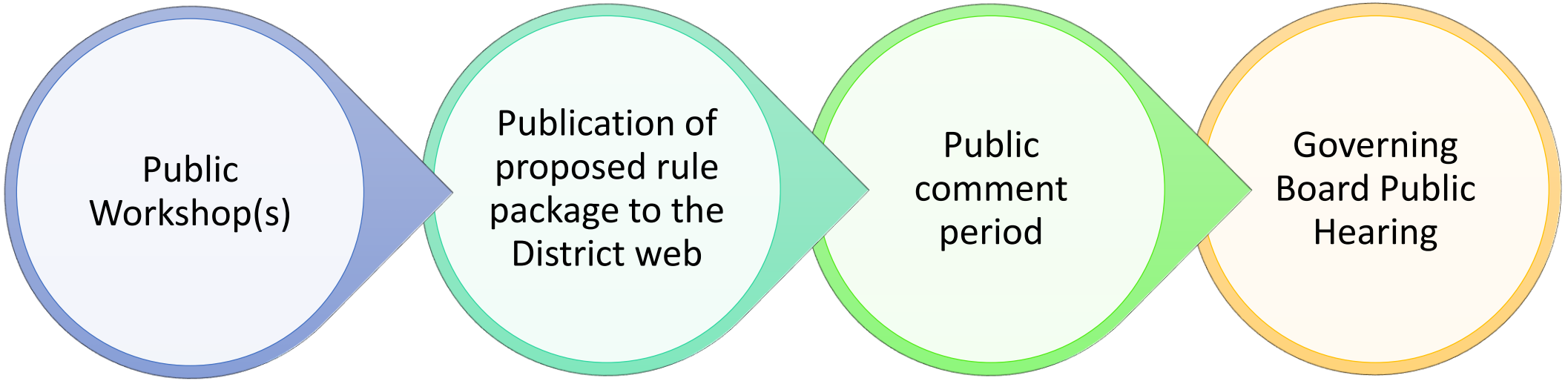
Cost-Effectiveness Estimates

Category	Projected Flare Replacements	Cost-effectiveness Range ($/ton NOx)		
		Low	High	Average
Oil and Gas Production	20	$40,700	$147,330	$75,020
Digester/Wastewater Treatment	2	$40,300	$50,800	$45,650
Landfill	10	$24,290	$86,525	$49,660

Next Steps

- District staff inviting comment on proposed rule concepts
- Socioeconomic Impact Analysis underway to support feasibility analysis
  - Characterization of the Valley's economic climate
  - Evaluation of economic impacts
  - Socioeconomic Impact Analysis report
  - Presentation to Governing Board
- Results of analysis will be included with proposed rule packages

Next Steps: Public Engagement Process for Flare Rule Amendment Development



Public Participation and Comment Invited throughout Process

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