BAY AREA AIR QUALITY MANAGEMENT DISTRICT

AGENDA: 4

Proposed Amendments to Rules 9-4 and 9-6

Board of Directors Meeting
March 15, 2023

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Presentation Outcome

- Provide information for consideration of the adoption of proposed amendments to Regulation 9, Rule 4 and Rule 6.

Presentation Outline

- Background
- Necessity
- Proposed Amendments
- Findings
- Public Comment
- Resolution and Recommendation

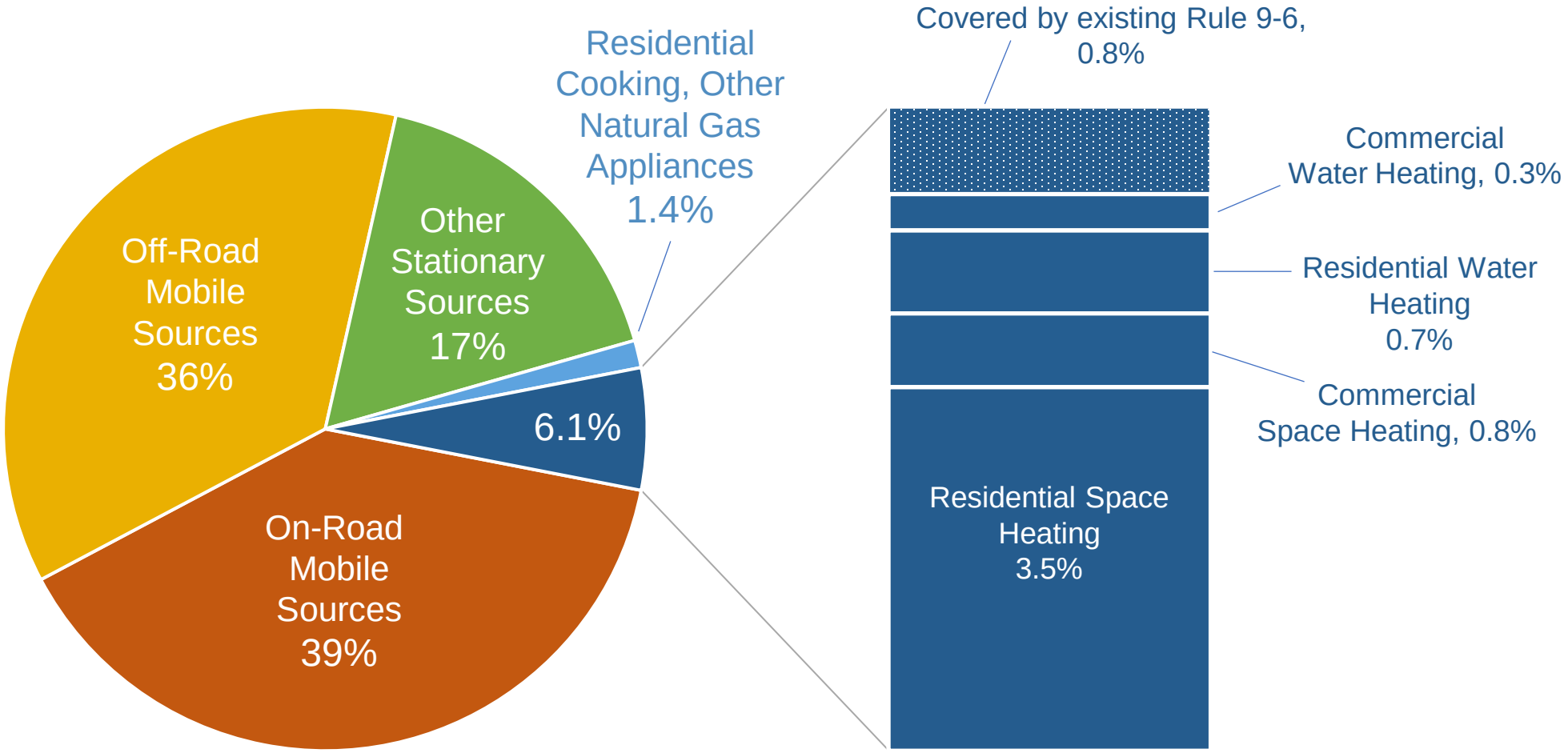
Requested Action

- Consider adoption of proposed amendments to Regulation 9, Rule 4 and Rule 6 as well as certification of final Environmental Impact Report.

Background

- Draft amendments include zero-NOx requirement for residential and commercial space and water heaters
  - Compliance dates 2027-2031 depending on equipment type and size
- Draft amendments released for public comment and workshop in October 2021
- Updated draft amendments and CEQA NOP/IS released for public comment in May 2022 (Scoping Meeting held June 9, 2022)
- Proposed amendments and supporting materials released on December 20, 2022. Public comment period closed on February 6, 2023.

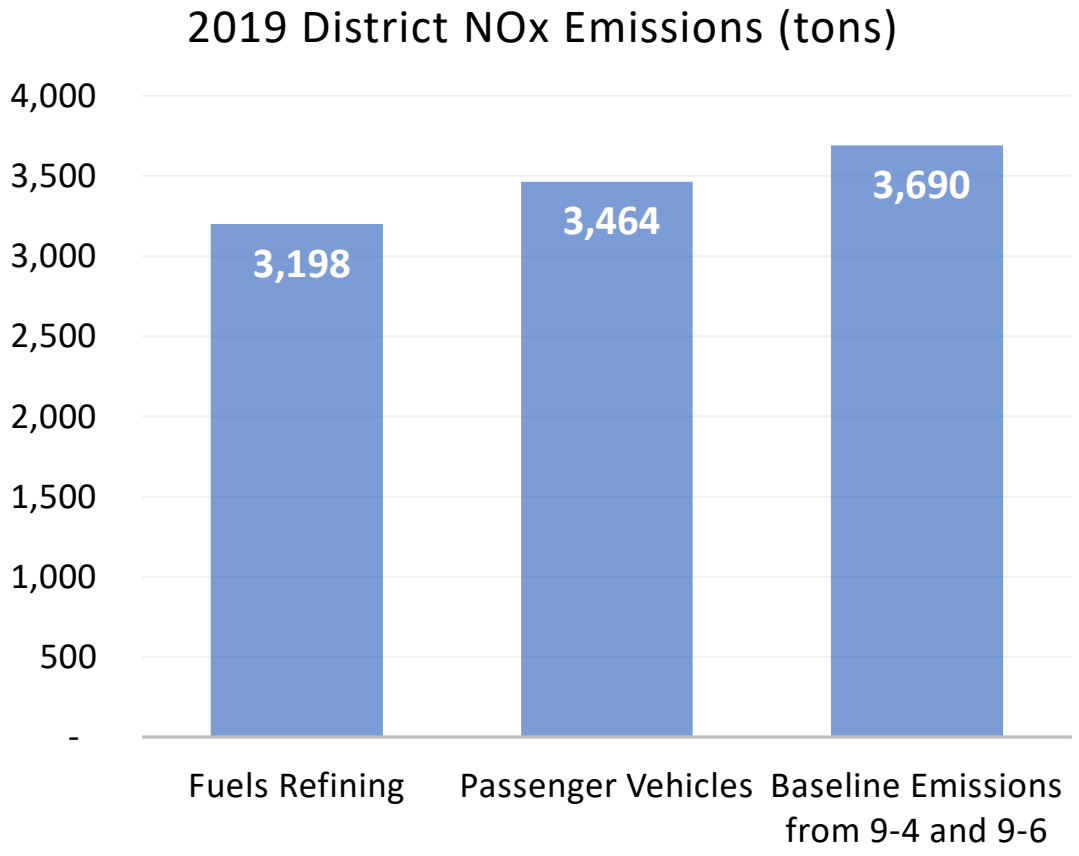
Background: NOx Emissions Comparisons

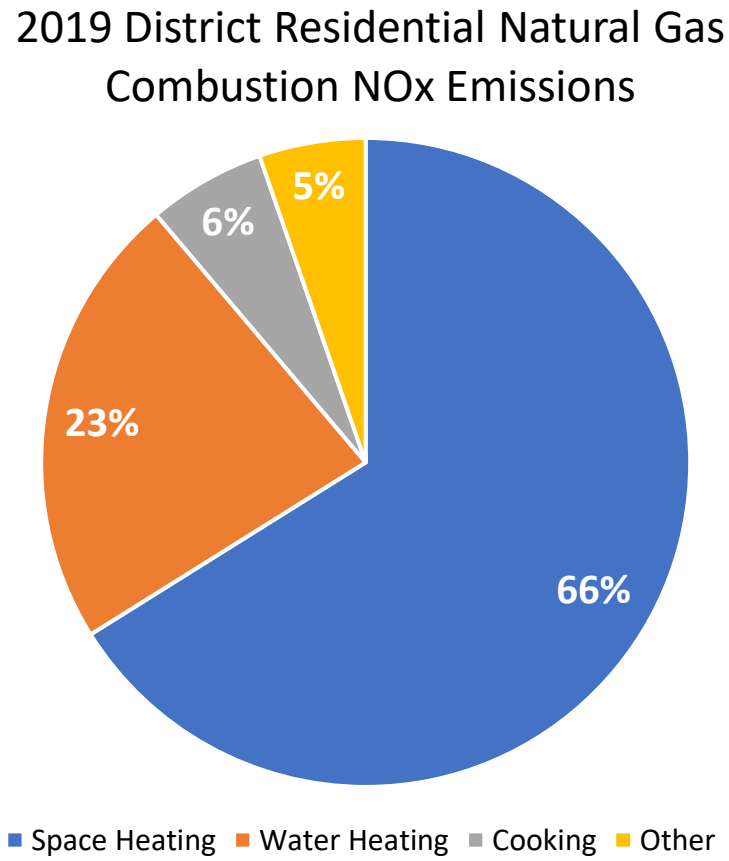


Bay Area (2018) total: 69,740 ton/yr

Emissions from appliances covered by proposed amendments: **3,690 ton/yr**

Background: Residential Appliance Emissions





Necessity

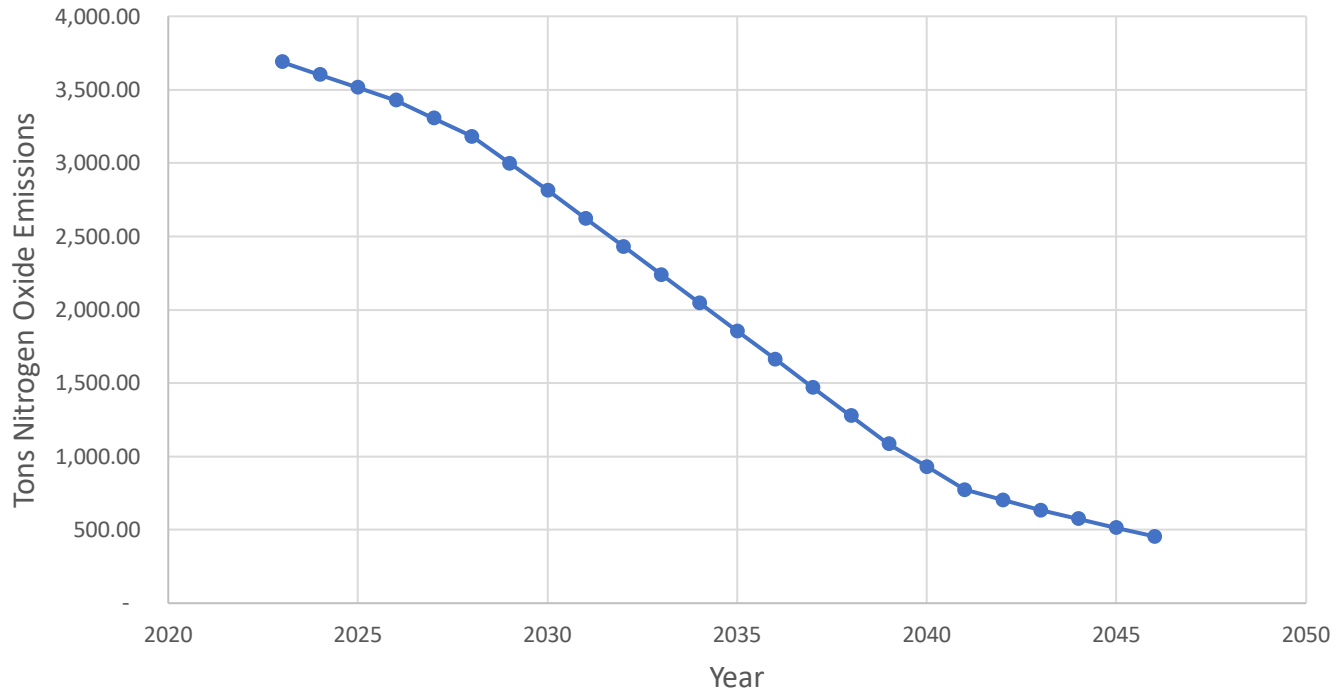
- Buildings account for > 25% of all stationary source NOx emissions in the region
- Significant NOx and secondary PM formation reductions
- Primary PM and GHG co-benefits expected
- Assist in meeting state and federal standards for ozone and PM
- Bay Area can continue to show leadership in health protective rules

NOx Emissions Reductions Expected

Projected NOx Emissions from Proposed Rule Amendments

Year	Projected Yearly NOx Emissions (tons/year)	Projected NOx Reduction vs. Baseline (tons/year)
Baseline	3,690	-
2025	3,516	174
2030	2,816	874
2035	1,855	1,835
2040	930	2,761
2045	515	3,176
2046	454	3,236

Commercial and Residential Space and Water Heating
Projected NOx Emissions (tons/year)



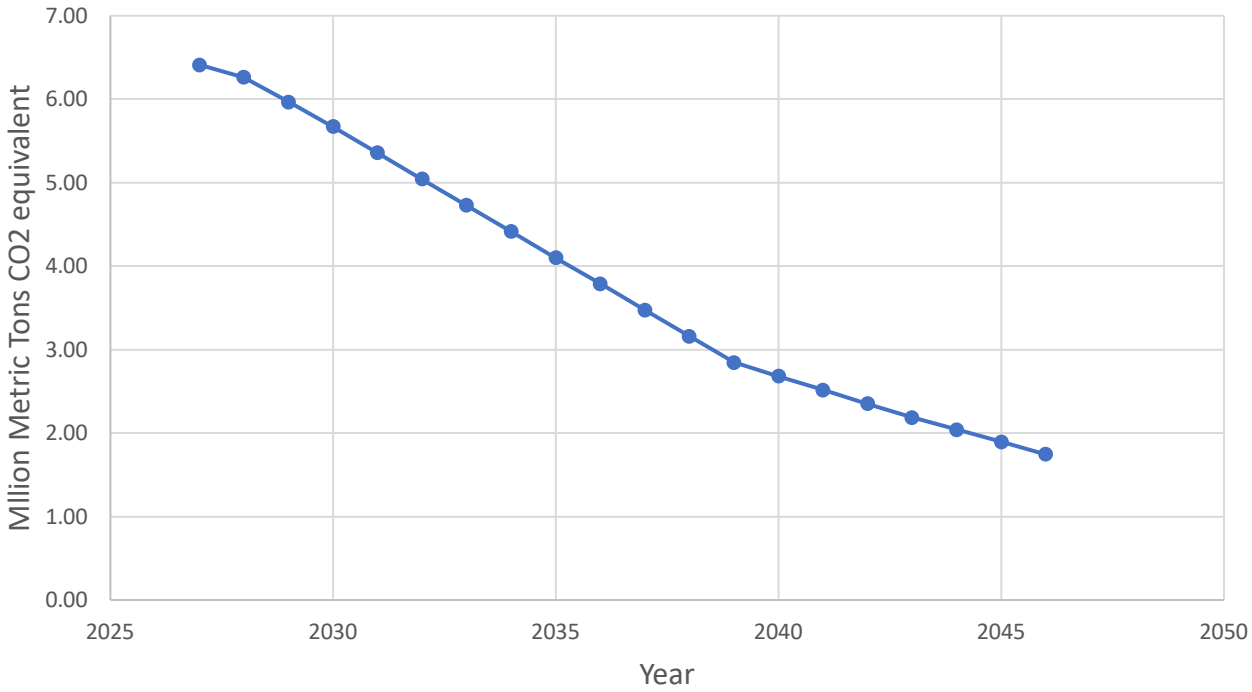
Total Reductions Expected: 40,744 Tons NOx from 2023-2046

GHG Emissions Reductions Expected

Maximum GHG Co-Benefit Reductions

Year	Projected Yearly GHG Emissions ($MMTCO_2e/yr$)	Potential Reduction vs. Baseline ($MMTCO_2e/yr$)
Baseline	6.56	-
2030	5.67	0.89
2035	4.10	2.46
2040	2.68	3.88
2046	1.75	4.81

Commercial and Residential Space and Water Heating
Potential GHG Emission Reductions (MMTCO2e/year)

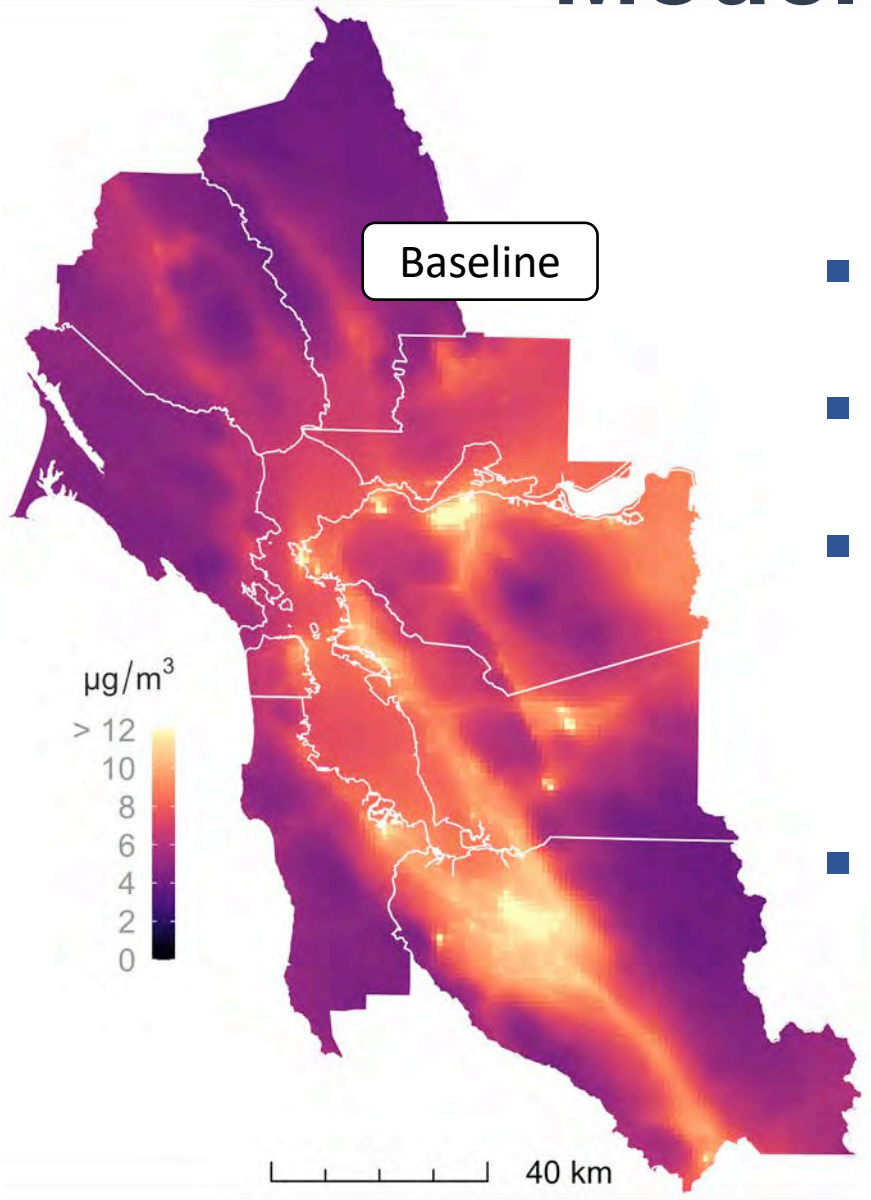


Estimated Maximum GHG Reductions: 54.54 MMT of GHG from 2023-2046

Health Benefits

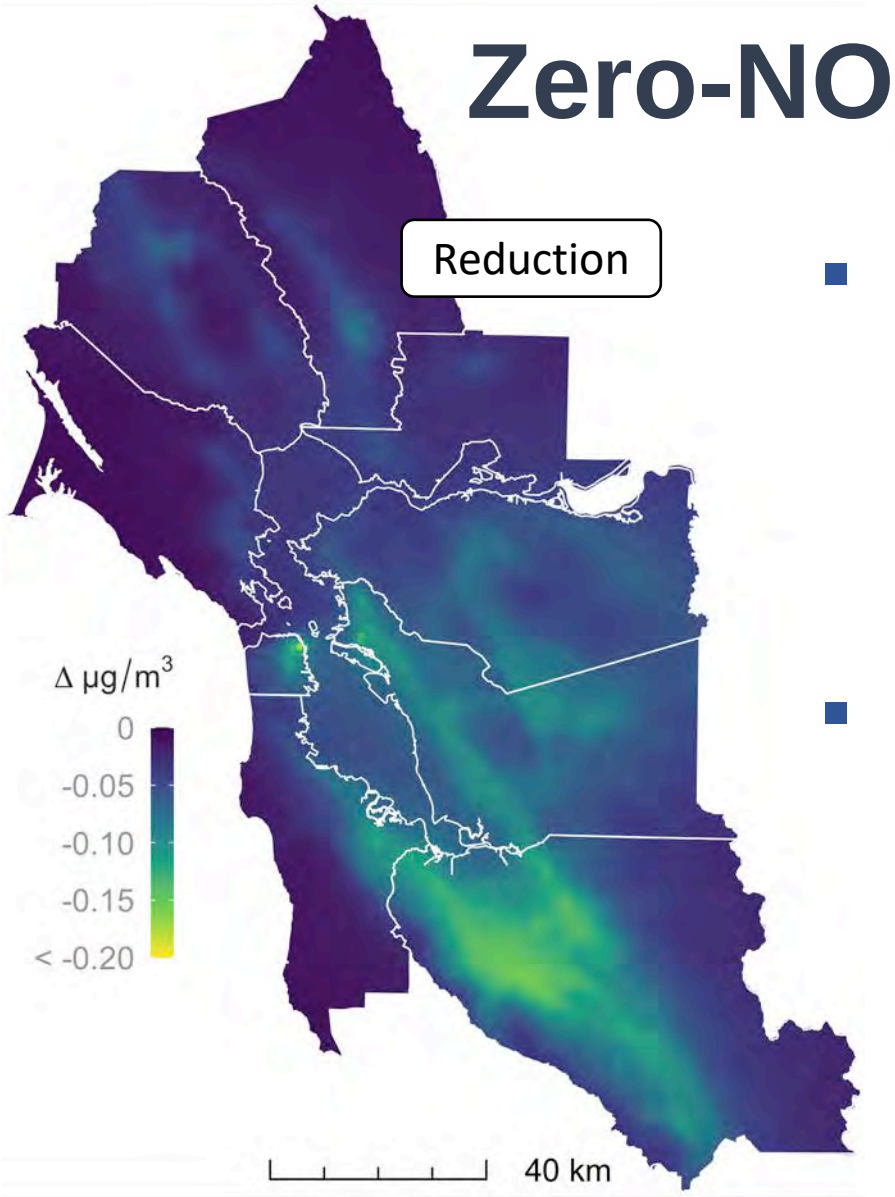
- Benefits quantified:
  - Reduced air pollution levels
  - Reduced health impacts
  - Increased equity
- Used state-of-the-science air quality models
- Focused on benefits of reduced levels of fine particulate matter ($PM_{2.5}$)

Modeled Fine Particulate Matter ($PM_{2.5}$) from All Sources



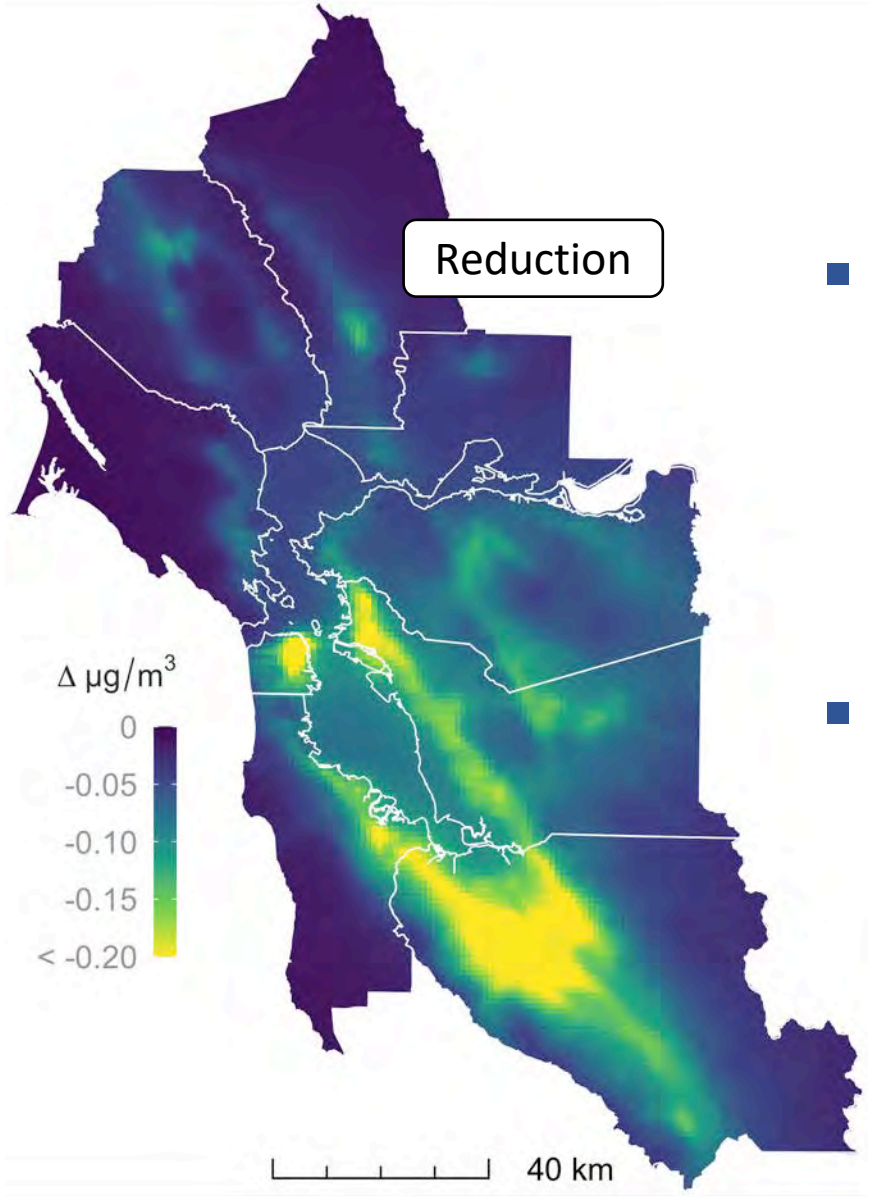
- Annual average outdoor *concentrations*, 2018
- Attributed to all sources of air pollution.
- Includes directly emitted particles (primary $PM_{2.5}$) and particles formed from gaseous pollutants (secondary $PM_{2.5}$)
- Estimated using computer modeling

Modeled $PM_{2.5}$ Reductions with Zero-NO_x Natural Gas Appliances



- From elimination of **NO_x emissions** from Bay Area natural gas-fired commercial & residential space/water heating appliances covered by Rules 9-4 and 9-6
- Reductions in secondary $PM_{2.5}$ attributed to these appliances

Modeled $PM_{2.5}$ Reductions with Electric Appliances



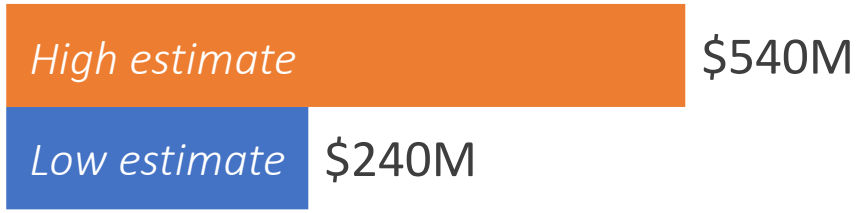
- From elimination of **NO_x <u>and</u> $PM_{2.5}$ emissions** from Bay Area natural gas-fired commercial & residential space/water heating appliances covered by Rules 9-4 and 9-6
- Reductions in total (primary and secondary) $PM_{2.5}$ attributed to these appliances

Modeled Heath Benefits

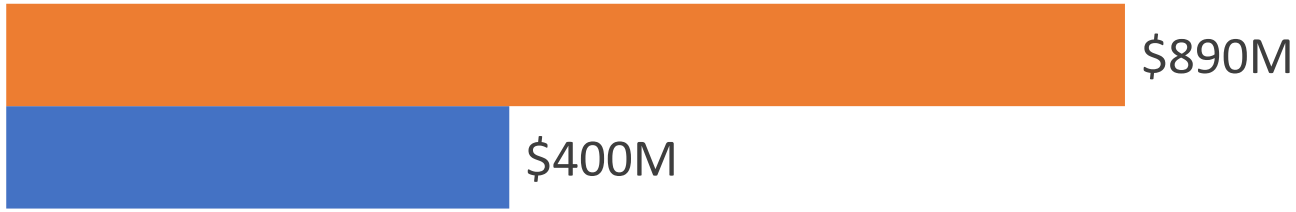
Health Impacts	Annual Health Benefits (Incidence Avoided)	
	Zero-NOx Appliances	**Electric Appliances**
Premature mortality	**23–52**	**37–85**
Non-fatal heart attack	2.6–24	4.2–39
Hospital admission, neurological	7.7	13
Out of hospital cardiac arrest	0.45	0.73
Stroke	1.5	2.4
Lung cancer	1.9	3.1
Hospital admission, respiratory	2.4	3.9
Hospital admission, cardiovascular	3.0	4.9
ER visit, respiratory	13	20
ER visits, cardiovascular	6.2	10
Restricted activity days	24,000	39,000
Work loss days	4,100	6,700
Hay fever/allergic rhinitis	440	710
Asthma symptoms/albuterol use	9,200	15,000
Asthma onset	**71**	**110**

Summary of Health Valuations

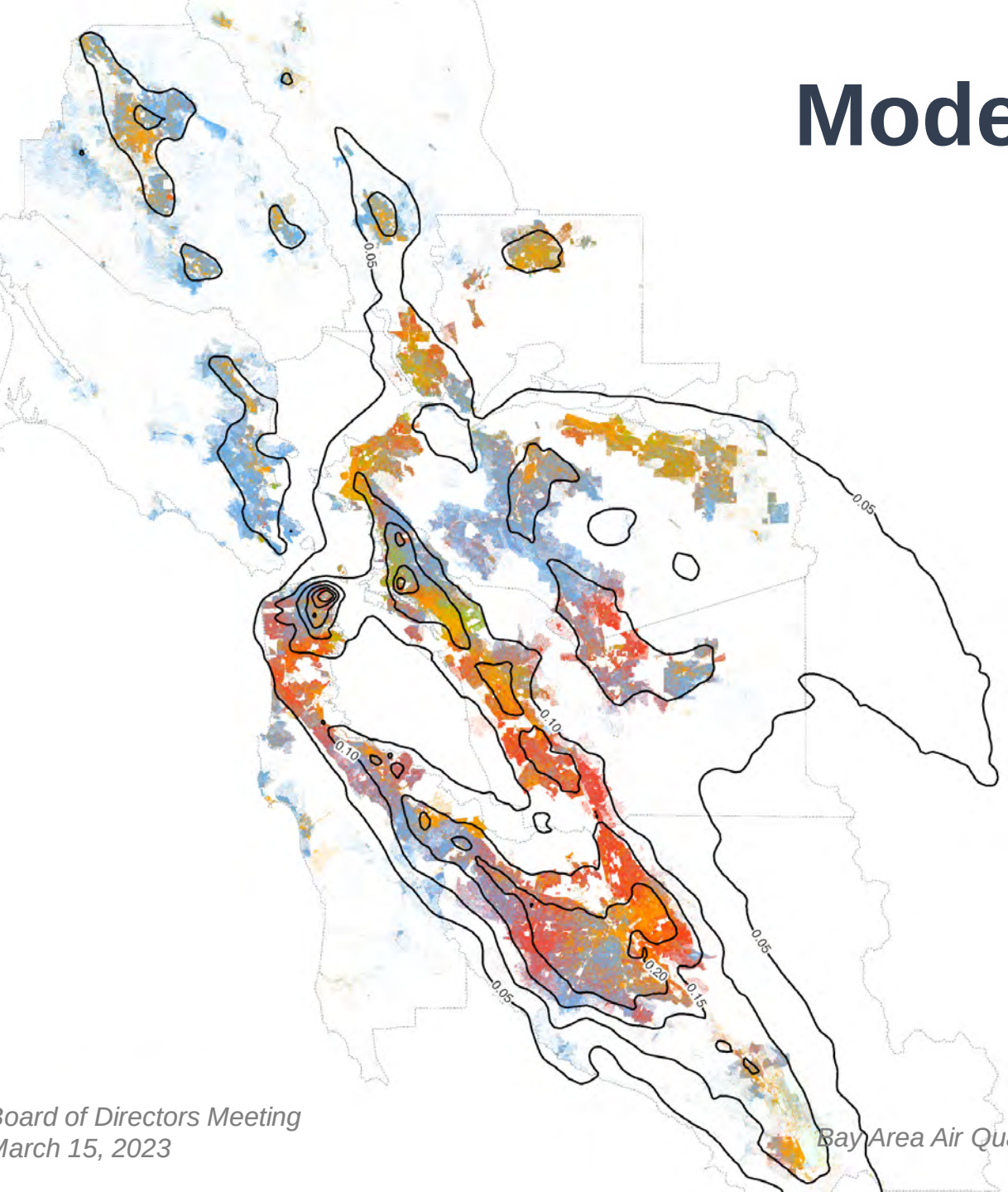
Zero-NO_X natural gas appliances: benefits only from reductions in NO_X emissions



Electric appliances: benefits from reductions in both NO_X and $PM_{2.5}$ emissions



Modeled $PM_{2.5}$ Exposure

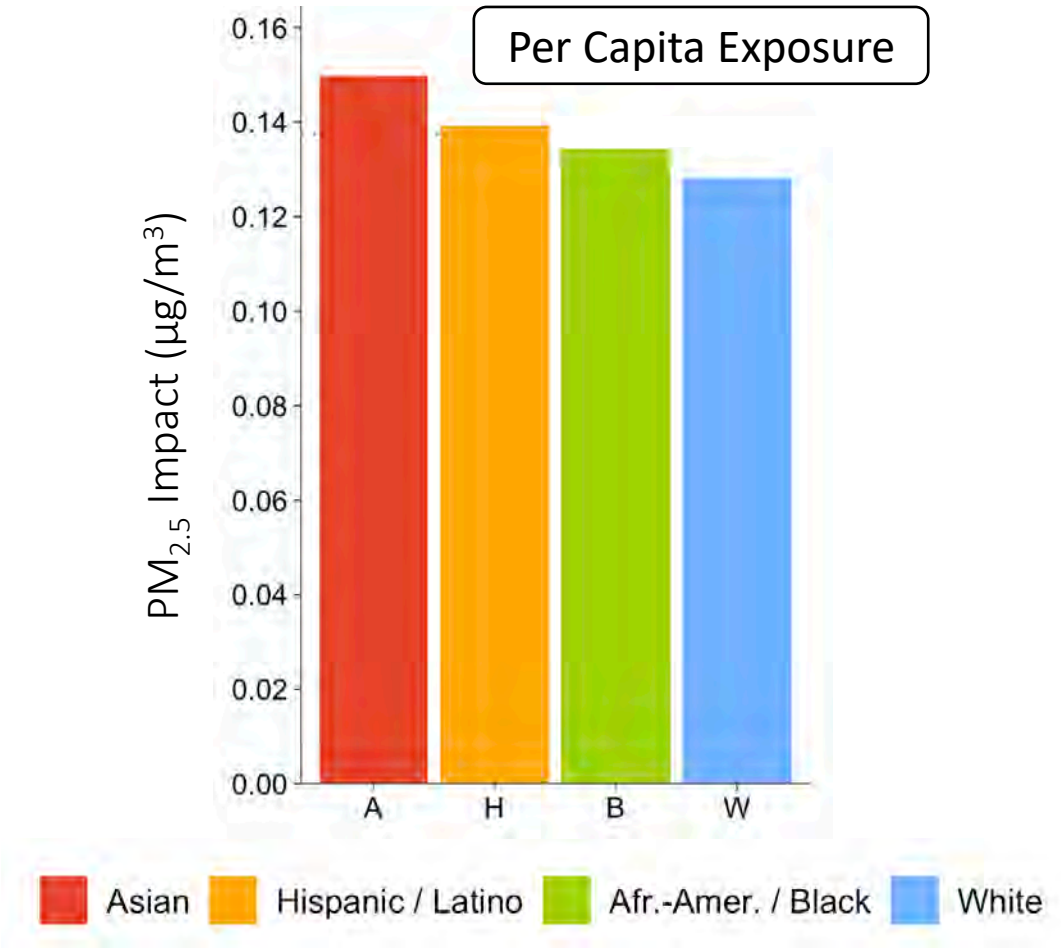


- Exposures highest in high-density areas where $PM_{2.5}$ concentrations are also high (2020 residential population)
- Exposure levels vary by county and by race/ethnicity

Population (2020)
- White
- Hispanic / Latino
- Asian / Pacific Islander
- African American / Black

Equity Assessment

- The counties most affected by these sources, like Santa Clara, tend to be higher % Asian / Pacific Islander. This explains most of the regional pattern (shown at right).
- Within every county, the most-impacted residents tend also to be people of color: primarily Hispanic and African-American/Black.



Changes to Peak Air Pollution Levels

24-hour $PM_{2.5}$ and 8-hour ozone

- Examined modeled changes at monitoring station locations when concentrations were higher
- Relevant to compliance with state and federal standards
- **For 24-hour $PM_{2.5}$:** Mean modeled reduction of about 0.7 µg/m^3 for peak levels (at least 30 µg/m^3 observed)
- **For 8-hour ozone:** Mean modeled reduction < 0.1 ppb for peak levels (at least 65 ppb observed)

Summary of Benefits

- Potential premature deaths avoided: 37–85 deaths per year
- Potential total benefit valuation: $400–890 million per year
- About 60% of benefits accrue from eliminating NOx emissions
- About 40% from eliminating $PM_{2.5}$ emissions (electric appliances)
- People of color most impacted by $PM_{2.5}$ attributed to combustion of natural gas for residential space and water heating
- Reduction to peak air pollution levels, helping us to meet state and federal requirements

Rule Updates and Package Contents

- Proposed amendments package and supporting analyses, including:
  - Health analysis
  - Utility impact analysis
  - CEQA Draft Environmental Impact Report
  - Socioeconomic Analysis

Overview of Existing Rules

- Rule 9-4: Natural Gas Fired Furnaces
  - Residential central fan type furnaces
  - NOx emissions standard of 40 ng/J
- Rule 9-6: Natural Gas Fired Boilers and Water Heaters
  - Natural gas-fired boilers and water heaters under 2 million BTU/hr
  - NOx emissions standard from 10-14 ng/J dependent on size and usage
  - Higher emissions standard for mobile homes (40 ng/J)
- Requirements apply to newly installed/sold equipment

Applicability

- Proposed amendments apply to natural gas fired furnaces and water heaters
- Do not apply to:
  - Stoves, dryers, water heaters/boilers larger than 2 million BTU/hr, or other appliances
  - Appliances that use propane or other non-natural gas fuels
  - Mobile home furnaces

Rule 9-4 Updates (Furnaces)

- Introduce 14 ng/J standard for residential fan type central furnaces applicable on January 1, 2024

- Introduce zero NOx standard for all residential and commercial natural gas fired furnaces applicable on January 1, 2029 (does not apply to mobile homes)

Rule 9-4 Updates (Furnaces) (cont.)

- Remove specification of fan type residential central furnaces
- Addition of definitions, test methods and clarifications throughout rule
- Introduction of Interim Report for APCO to report on accessibility factors two years prior to implementation of zero NOx standard to ensure equitable outcomes

Rule 9-6 Updates (Water Heaters)

- Introduction of zero NOx standard for boilers
  - Heat input capacity less than 75,000 BTU/hr, applicable on January 1, 2027
  - Heat input capacity of between 75,000 BTU/hr and 2 million BTU/hr, applicable on January 1, 2031
- Clarification of certification and applicability requirements and use of SCAQMD for demonstration of compliance
- Introduction of Interim Report for APCO to report on accessibility factors two years prior to implementation of zero NOx standard to ensure equitable outcomes

Interim Report

- Introduction of requirement for both rules for interim report to come back to the Board of Directors no later than two years prior to the compliance date
  - Technology options currently (and projected to be) available
  - Market availability of such technology
  - Projected costs of purchase and installation
  - Incentive programs available to reduce costs

Implementation Working Group

- **Purpose**: Inform periodic reporting back to the Board on rule implementation for technical readiness and equitable transition
- **Potential topics of discussion:**
  - Market availability of zero NOx technology
  - Costs of purchase, installation and operation for zero NOx technologies
  - Incentives and other funding and financing available in the Bay Area, especially to low-income residents
  - Potential challenges and opportunities for facilitating an equitable transition

Implementation Working Group (cont.)

- Led by staff with facilitation from professional facilitator
- Invited stakeholders represent:
  - environmental justice groups
  - community-based organizations
  - tenant and landlord groups
  - affordable housing developers
  - building management firms
  - labor and trade organizations
  - technology manufacturers
  - subject matter experts/ building energy advocates
  - technology entrepreneurs focused on home electrification at scale
  - local governments
  - state agencies
  - utility and energy service providers

Costs to Property Owners

Bay Area Average Per Unit Compliance Cost

	Equipment Cost ($)	Net Equipment Compliance Cost ($)[a]	Panel Upgrade Cost ($)
Rule 9-4 Amendments for Space Heating			
Ultra-low NOx Standard	$5,650	$550	$0
Zero NOx Standard	$8,030	$2,900	$2,630
Rule 9-6 Amendments for Water Heating			
Zero NOx Standard	$2,820	$850	$960

Notes:
[a] **Net equipment compliance cost is estimated by calculating the difference in capital cost between equipment meeting the current standard and equipment meeting the applicable proposed standard.**

Cost Effectiveness Range

Average Per Unit Compliance Cost and Cost Effectiveness for Proposed Amendments

	Annualized Equipment Compliance Cost ($/year)[a]	Annual Rate Savings ($/year)	Annualized Panel Upgrade Cost ($/year)	Annual NOx Reductions (lb/year)	Cost Effectiveness ($/ton)[b]
Rule 9-4 Amendments for Space Heating					
Ultra-low NOx Standard	$45	$0	$0	1.66	$54,100
Zero NOx Standard	$241	($150)	$161	2.52	$72,100 - $199,800
Rule 9-6 Amendments for Water Heating					
Zero NOx Standard	$88	($45)	$59	0.34	$250,400 - $594,000

Notes:
[a] Annualized equipment compliance cost is estimated by calculating the difference in capital cost between equipment meeting the current standard and equipment meeting the applicable proposed standard, and amortizing the difference over the lifetime of the equipment.
[b] Ranges of cost effectiveness shown for the space heating and water heating zero-NOx standards represent the cost effectiveness for an equipment installation that does not require a panel upgrade (low end of range) and an equipment installation that does require a panel upgrade (high end of range).

Socioeconomic Impacts Analysis

- Anticipated annual compliance costs for appliances being converted in a given year during the implementation period:

	Net Annual Costs for Water Heaters 2027-2028 ($Million)	Combined Net Annual Costs 2029 - 2039 ($Million)	Net Annual Costs for HVAC 2040-2046 ($Million)
Bay Area Region	**$8.81**	**$30.04**	**$21.23**

- Cost impacts fluctuate throughout implementation phase-in
- Potential job losses from shifts in consumer spending
- Potential for additional costs associated with utility infrastructure expansions
  - May range from $243 million to $1 billion
  - Impact on future electricity rates is unknown at this time

Statutory Findings

Before adopting, amending, or repealing a rule, the Board of Directors must make the following findings:

- **Necessity** - H&SC Section 40727(b)(1)
- **Authority** - H&SC Section 40727(b)(2)
- **Clarity** - H&SC Section 40727(b)(3)
- **Consistency** - H&SC Section 40727(b)(4)
- **Non-Duplication** - H&SC Section 40727(b)(5)
- **Reference** - H&SC Section 40727(b)(6)

Air District Impacts

- Compliance and Enforcement:
  - 1.5 additional FTE
    - 0.5 FTE to support the proposed rule amendments from January 1, 2024, through January 1, 2027
    - 1 FTE starting on January 1, 2027 to support compliance with the requirements of Sections 9-6-301.3, 9-6-301.5 and 9-6-303.5.

- Implementation Working Group (Rules and Planning/Climate):
  - 1 additional FTE
    - Combined workload between these two divisions to support implementation working group and interim reporting process between January 1, 2023, to January 1, 2029.

CEQA Impact Analysis

- Environmental Impact Report (EIR) evaluated potential for significant adverse environmental impacts
- Potentially Significant and Unavoidable Impacts
  - Utilities and Service Systems (Energy Resources)
    - Require the relocation or construction of new or expanded electric facilities that would result in an adverse environmental impact
  - Noise
    - Potential to generate long-term operational noise
- Less than Significant Impacts
  - Aesthetics
  - Air Quality
  - Greenhouse Gas Emissions and Climate Change

Public Comments Received

- 565 commenters
  - 404 expressed support for the rule amendments
  - 29 comments from organizations
    - Utilities – PG&E and community choice aggregators
    - State government - CARB
    - Local government – Marin County and Berkeley
    - Labor
    - Manufacturers
    - Building management
    - Advocacy organizations

Public Comments - Cost

- Concerns
  - Concerns about high cost of compliance in individual circumstances
    - Panel upgrades, utility costs, access to funding, upfront capital costs
- Responses
  - Implementation working group to track cost to consumers, facilitate access to funding as appropriate (focusing on low-income households)
    - Appliance costs expected to go down as market grows
    - Minimize need for panel upgrades and other expenses
    - Funding mechanisms that minimize upfront costs
    - Workforce availability and training

Public Comments - Grid

Grid Capacity & Reliability

- Concerns:
  - Insufficient capacity of grid distribution infrastructure to meet the needs of proposed rules
  - Alignment with state-wide planning processes and generation resource build-out
  - Reliability and access to heat and hot water during power outages
  - Emergency replacements
- Responses:
  - E3 report discusses impact to grid and alignment with CEC/CPUC planning processes
  - Modern natural gas appliances require electricity to operate in many cases
  - Emergency replacement plans including loaner programs, workforce training, alignment with building code processes

Common Questions

Q: Is this a natural gas ban?

A: No -

- The proposed rule amendments only address natural gas furnaces and water heaters.
- The zero-NOx emissions standard could be met by natural gas appliances, but there are none currently available.

Q: Will this effect gas stoves?

A: No – The existing regulations and proposed amendments do not include any requirements for gas stoves.

Q: Will property owners be required to replace their gas appliances immediately when the zero-NOx standard takes effect?

A: No, but if an appliance fails and needs to be replaced after the effective date, the replacement must be zero-NOx.

Common Questions

Q: Do the health benefits come from improving indoor air quality?

A: No –

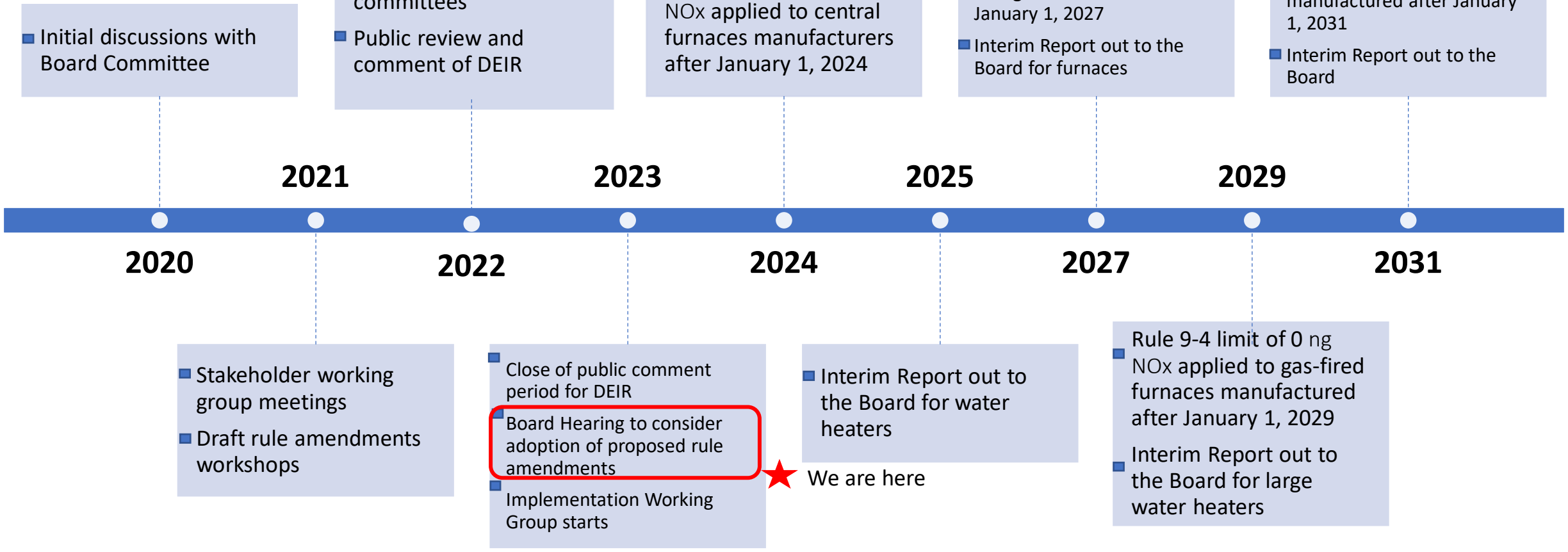
- The proposed amendments only effect water heaters and furnaces whose emissions are vented to the outside.
- NOx and PM2.5 pollution from these 1.8 million appliances harm outdoor air quality and cause health impacts.

Q: Does this effect propane-fired equipment?

A: No –

- These rules have always only applied to natural gas-fired equipment, which are the cause of most of the air pollution from water heaters and furnaces in the Bay Area.
- Propane-fired equipment is not impacted.

Timeline


Initial discussions with Board Committee
Updates to board committees
Public review and comment of DEIR
Rule 9-4 limit of 14 ng NOx applied to central furnaces manufacturers after January 1, 2024
Rule 9-6 limit of 0 ng NOx applied to water heaters < 75,000 BTU/hr heat input rating manufactured after January 1, 2027
Interim Report out to the Board for furnaces
Rule 9-6 limit of 0 ng NOx applied to water heaters 75,000 to 2 million BTU/hr heat input rating manufactured after January 1, 2031
Interim Report out to the Board
2020
2021
2022
2023
2024
2025
2027
2029
2031
Stakeholder working group meetings
Draft rule amendments workshops
Close of public comment period for DEIR
Board Hearing to consider adoption of proposed rule amendments
Implementation Working Group starts
Interim Report out to the Board for water heaters
We are here
Rule 9-4 limit of 0 ng NOx applied to gas-fired furnaces manufactured after January 1, 2029
Interim Report out to the Board for large water heaters

Resolution and Recommendation

- Staff recommends that the Board:
  - Certify the CEQA Environmental Impact Report;
  - Adopt the Proposed Amendments to Regulation 9, Rule 4, and Regulation 9, Rule 6; and
  - Make written CEQA Findings and a Statement of Overriding Considerations as stated in Appendix C of the draft Resolution presented to the Board.