



BAY AREA  
AIR QUALITY  
MANAGEMENT  
DISTRICT

**AGENDA: 5**

# **Building Appliance Rules: Health and Equity Benefits**

**Stationary Source & Climate Impacts  
Committee Meeting  
October 17, 2022**

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Director**

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# Presentation Outcome



- Brief the Committee on the results of a modeling-based evaluation quantifying the health and equity benefits that could be realized through implementation of proposed amendments to Regulation 9, Rules 4 and 6 for Nitrogen Oxides (NO<sub>x</sub>) emissions from building appliances.

# Presentation Outline



- Goals of the Modeling-Based Evaluation
- Methods
- Findings

# Presentation Requested Action



- None, informational only.

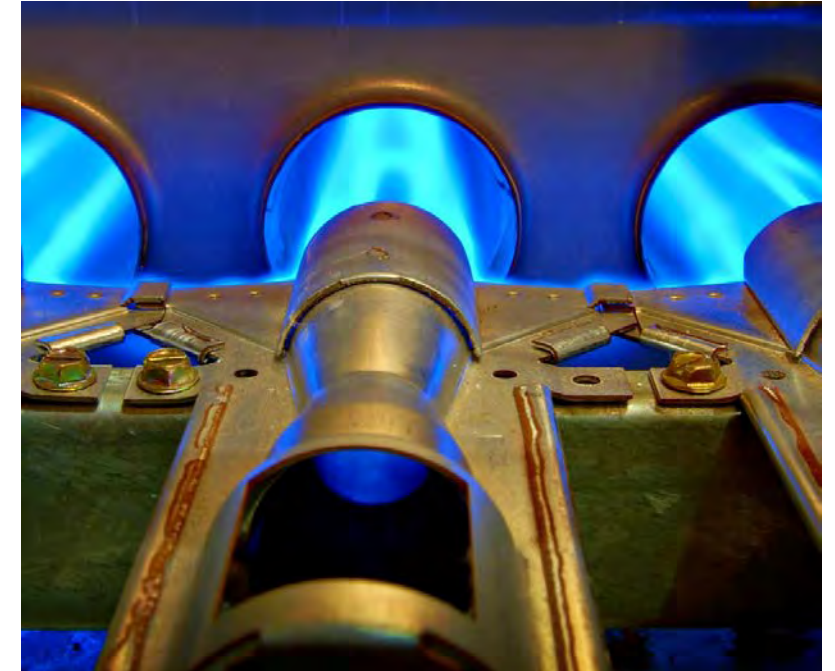
# Goals



- **Provide supplemental information** for proposed amendments to Air District rules to limit emissions of oxides of nitrogen ( $\text{NO}_x$ ) from building appliances:
  - Rule 9-4 for residential and commercial natural gas-fired furnaces\*
  - Rule 9-6 for residential and commercial water heaters and boilers\*\*

\* Rule 9-4: Equipment with max. heat input rating under 175,000 BTU/hr

\*\* Rule 9-6: Equipment with max. heat input rating under 2 million BTU/hr



Rule 9-4 would limit  $\text{NO}_x$  from natural gas-fired furnaces. Image: energy.gov



# Methods

# What's Included



- Outdoor air quality and **health benefits** from emissions reductions
  - Sources covered by proposed amendments to **building appliance rules**
  - Reduced residential exposures to outdoor fine particulate matter (PM<sub>2.5</sub>)
    - With conversion to zero-NOx natural gas appliances (eliminates NOx)
    - With conversion to electric appliances (eliminates NOx and primary PM<sub>2.5</sub>)
- Outdoor air quality and **health impacts** from an unlikely scenario:
  - Added load to Bay Area **fossil power plants**
  - Increased exposures to PM<sub>2.5</sub> from a 12% increase in power plant emissions

# What's Included (cont'd)

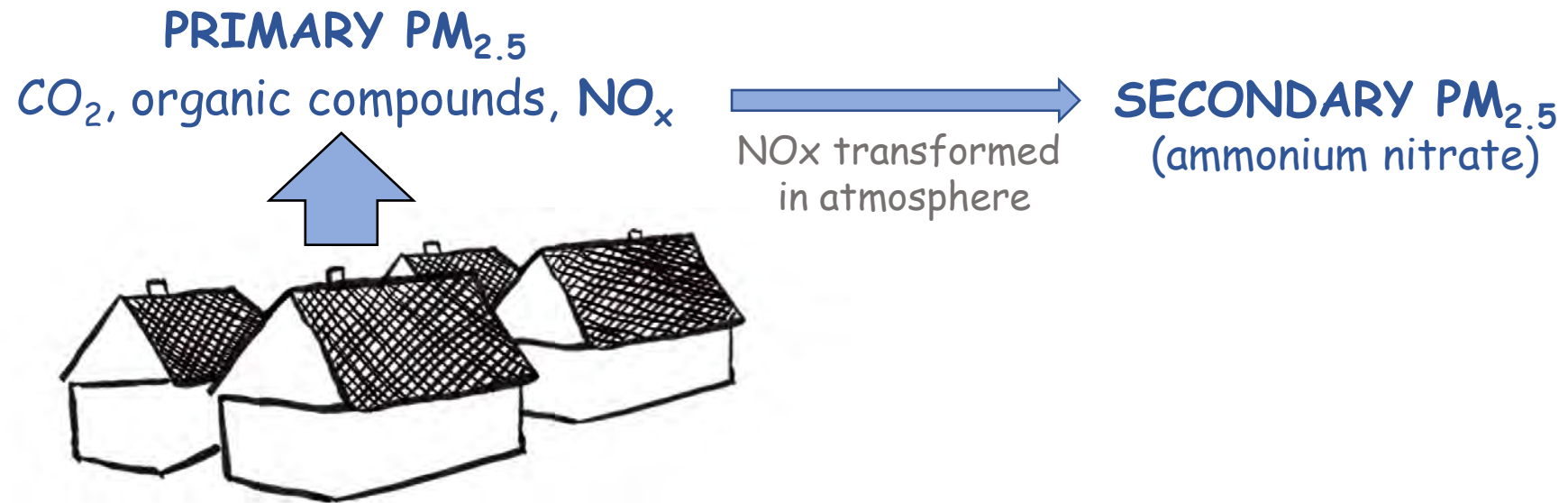


- **Exposures by race and ethnicity** to  $PM_{2.5}$  from existing appliances
- Changes to **peak air pollution** levels

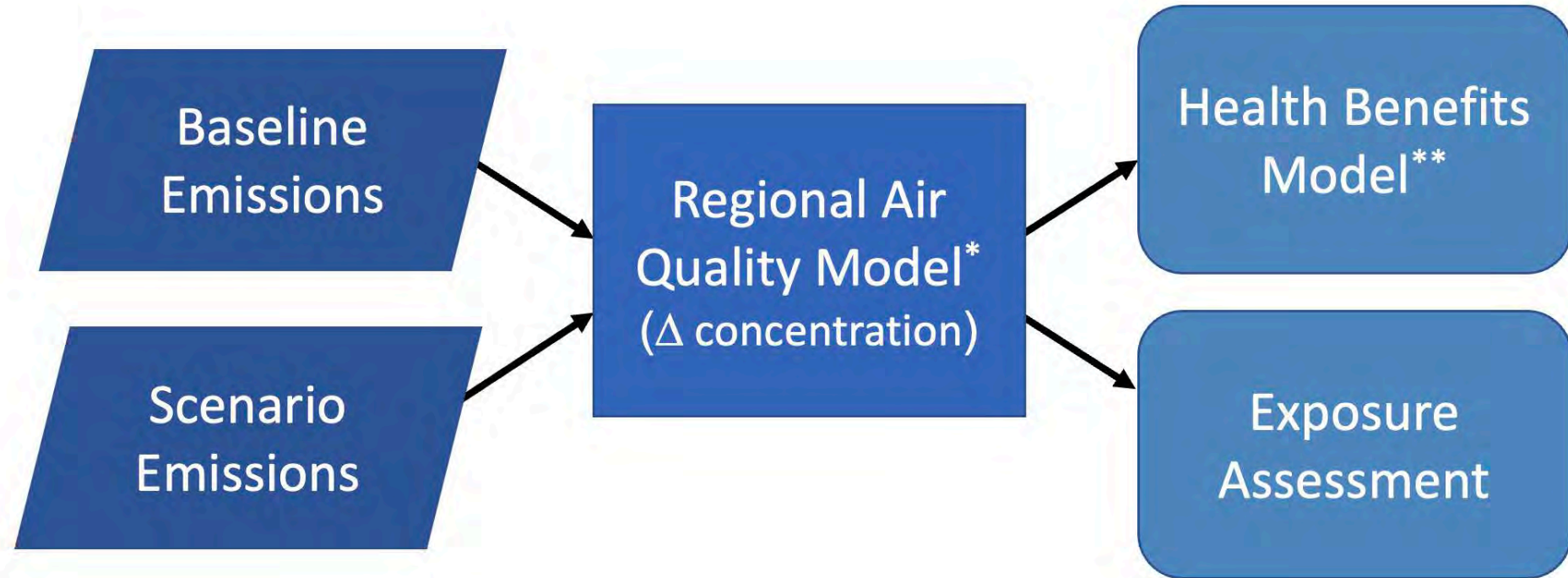


# Tracking Compounds

## Primary Versus Secondary Particles



# Modeling Process

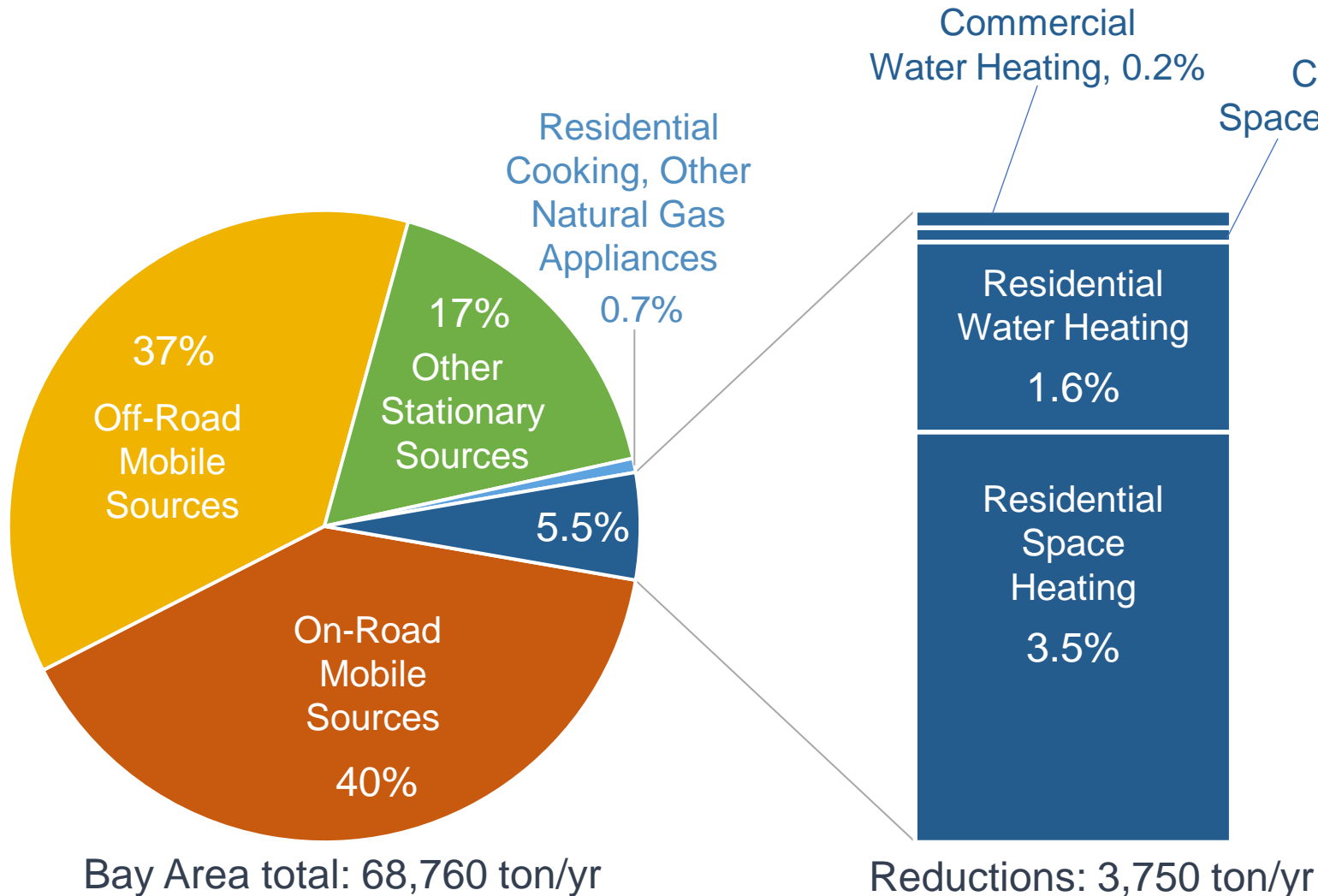


\* The Community Multiscale Air Quality Modeling System ([epa.gov/cmaq](http://epa.gov/cmaq))

\*\* Benefits Mapping and Analysis Program ([epa.gov/benmap](http://epa.gov/benmap))

# Model Inputs

## NOx Emissions



### Baseline (Pie Chart)

- Emissions, 2018
- Of nitrogen oxides (NO<sub>x</sub>)
- From all inventoried sources in Bay Area

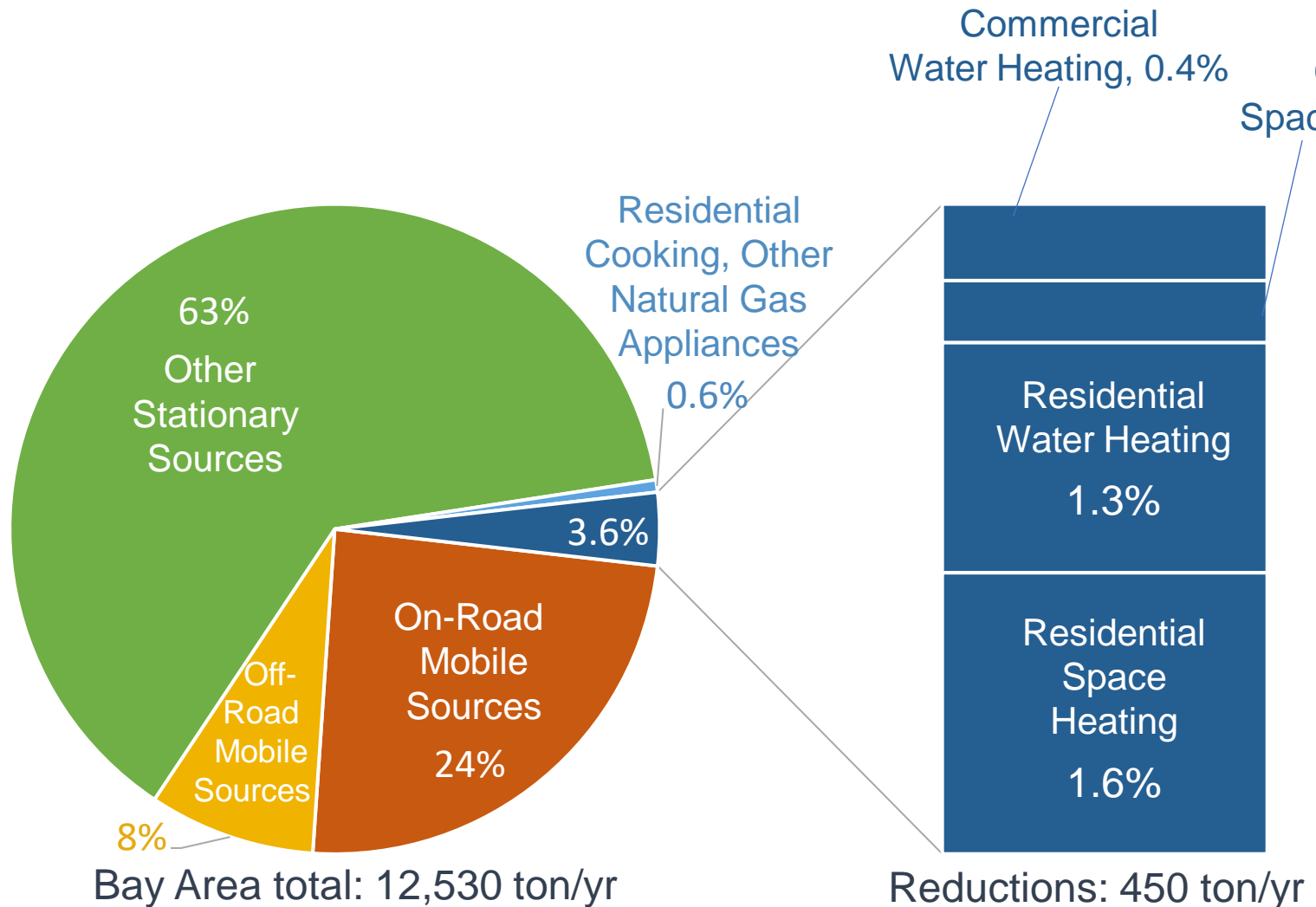
### Reductions (Bar Chart)

- From elimination of NO<sub>x</sub> emissions from Bay Area natural gas-fired commercial & residential space/water heating\*
- ~6% of total NO<sub>x</sub> eliminated

\* Excluding permitted sources.

# Model Inputs (cont'd)

PM<sub>2.5</sub> Emissions



## Baseline (Pie Chart)

- Emissions, 2018
- Of fine particles (PM<sub>2.5</sub>)
- From all inventoried sources in Bay Area

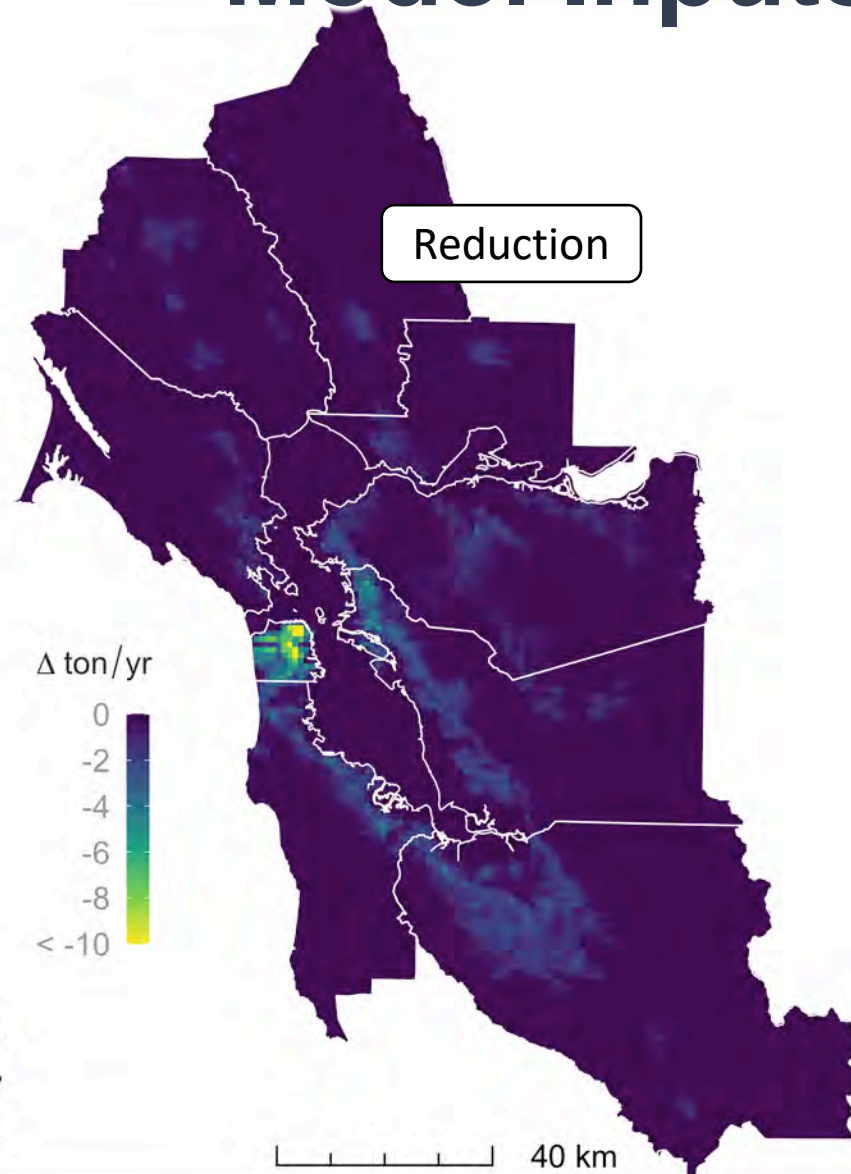
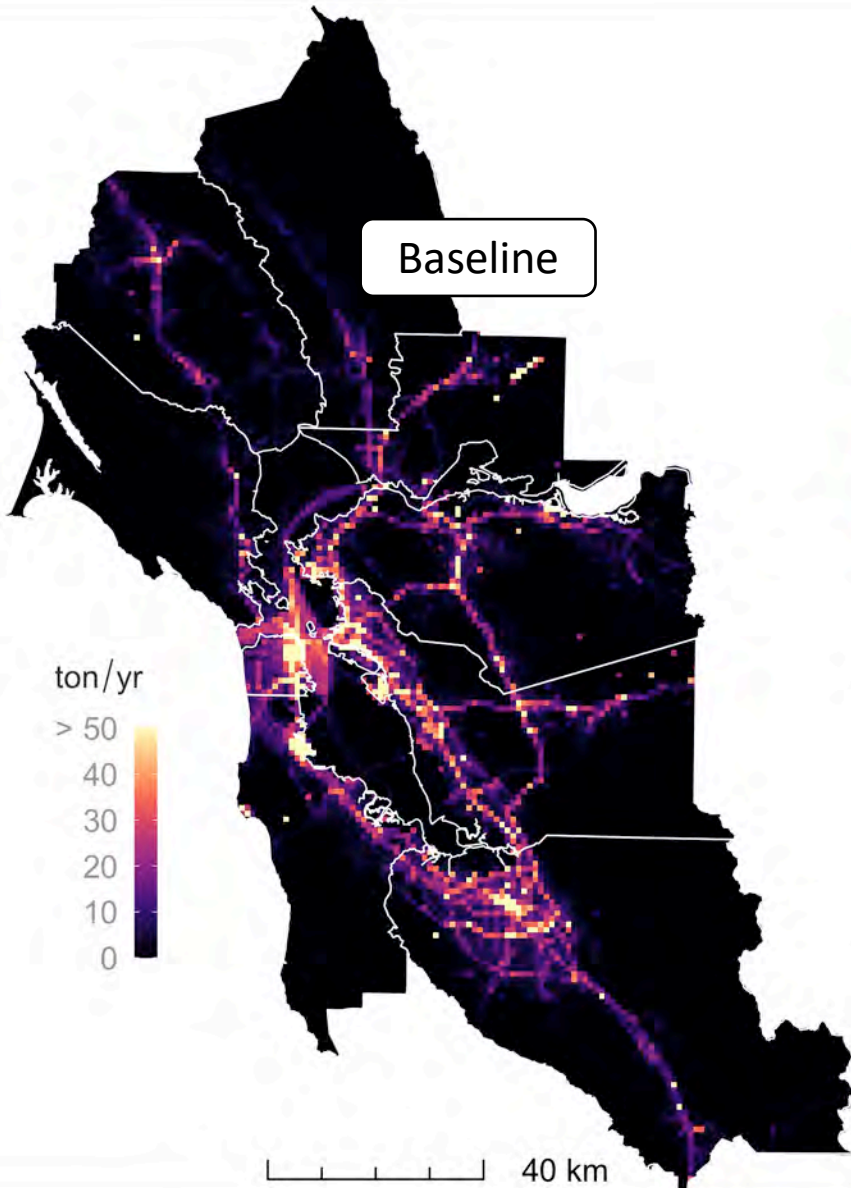
## Reductions (Bar Chart)

- From elimination of PM<sub>2.5</sub> emissions from Bay Area natural gas-fired commercial & residential space/water heating\*
- ~4% of total PM<sub>2.5</sub> eliminated

\* Excluding permitted sources.

# Model Inputs (cont'd)

NO<sub>x</sub> Emissions



## Baseline (Left Map)

- Gridded 1-km *emissions*, 2018
- Of nitrogen oxides (NO<sub>x</sub>)
- From all inventoried sources in Bay Area\*

## Reductions (Right Map)

- From elimination of NO<sub>x</sub> emissions from Bay Area natural gas-fired commercial & residential space/water heating\*\*

\* Not just natural gas appliances. Includes mobile, stationary, and area sources.

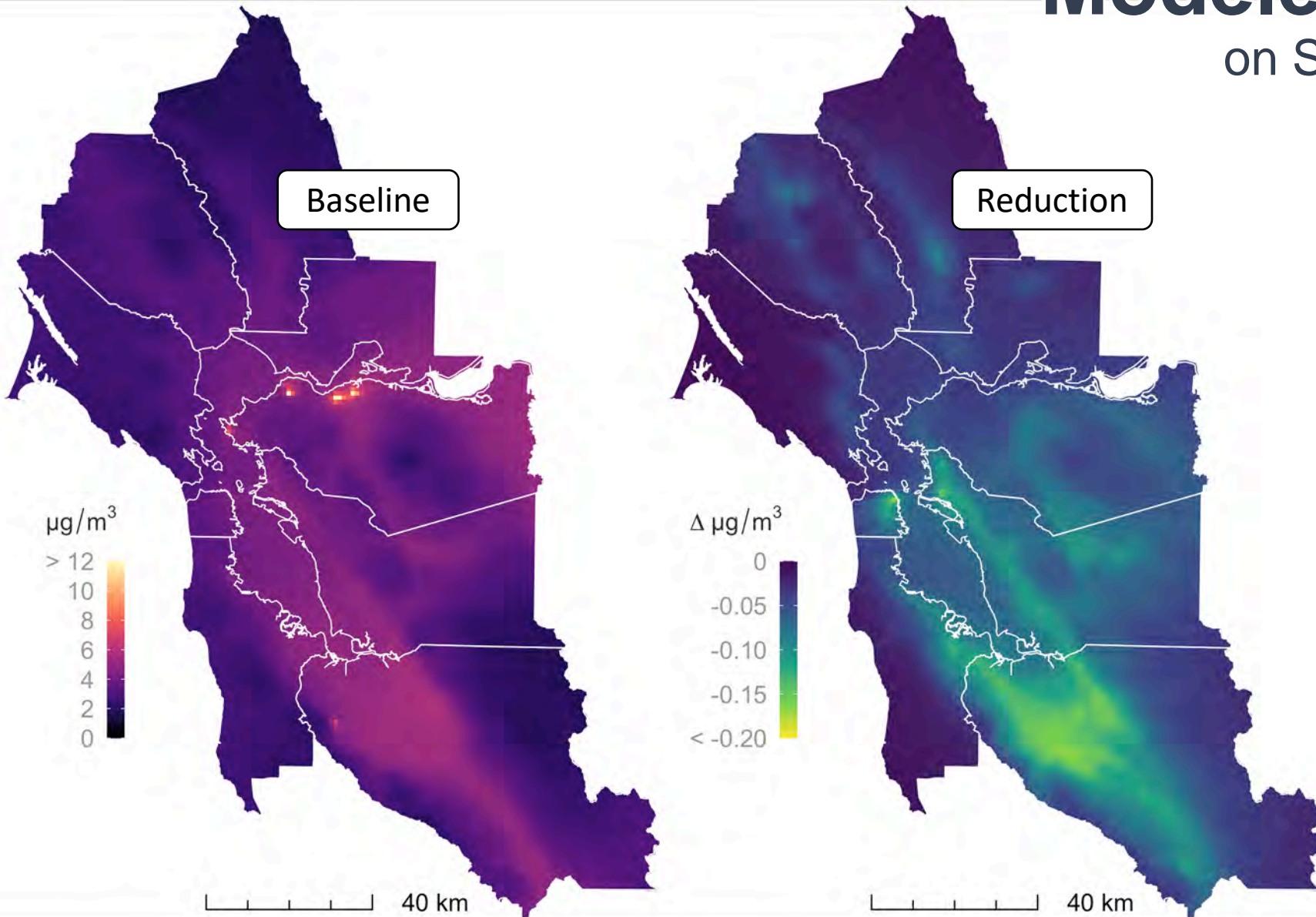
\*\* Excluding permitted sources.



# Findings



# Modeled Impact on Secondary PM<sub>2.5</sub>



## Baseline (Left Map)

- Annual average outdoor concentrations, 2018
- Of secondary PM<sub>2.5</sub>
- Attributed to all sources in modeling domain\*

## Reductions (Right Map)

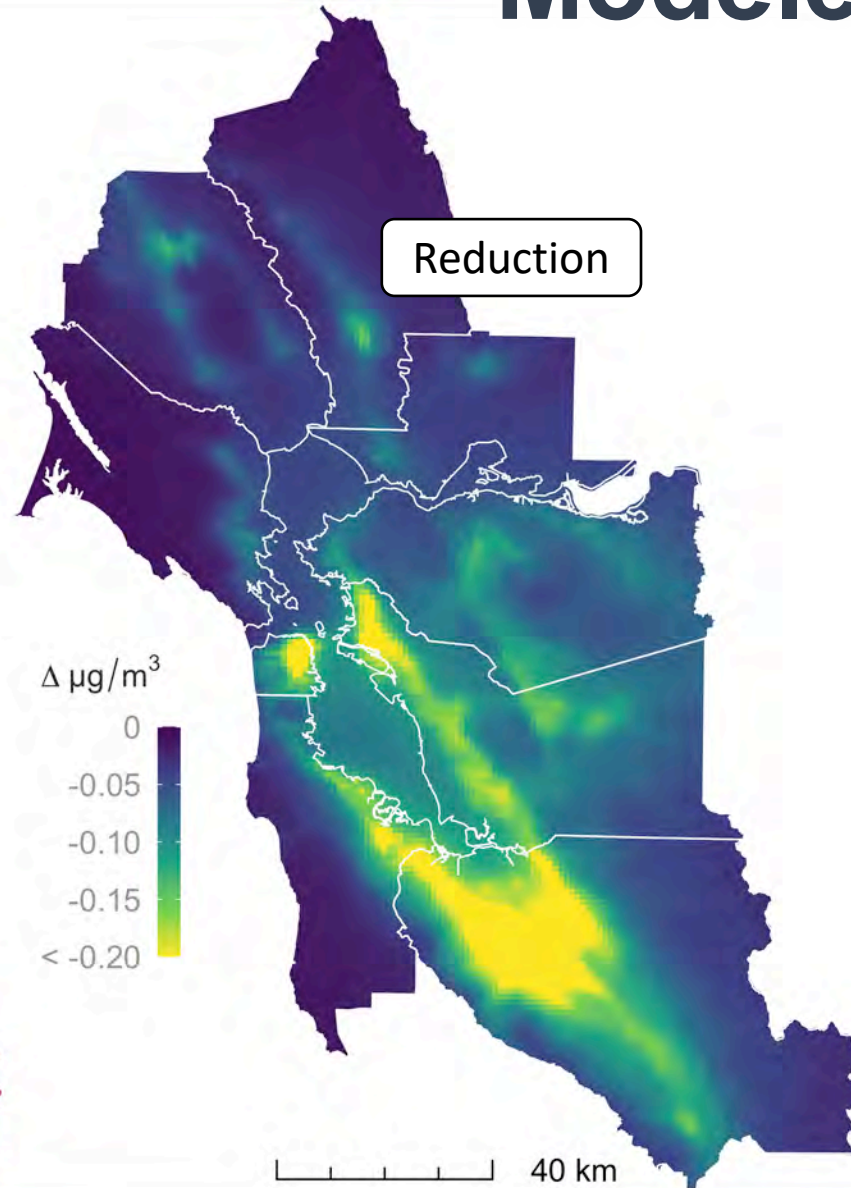
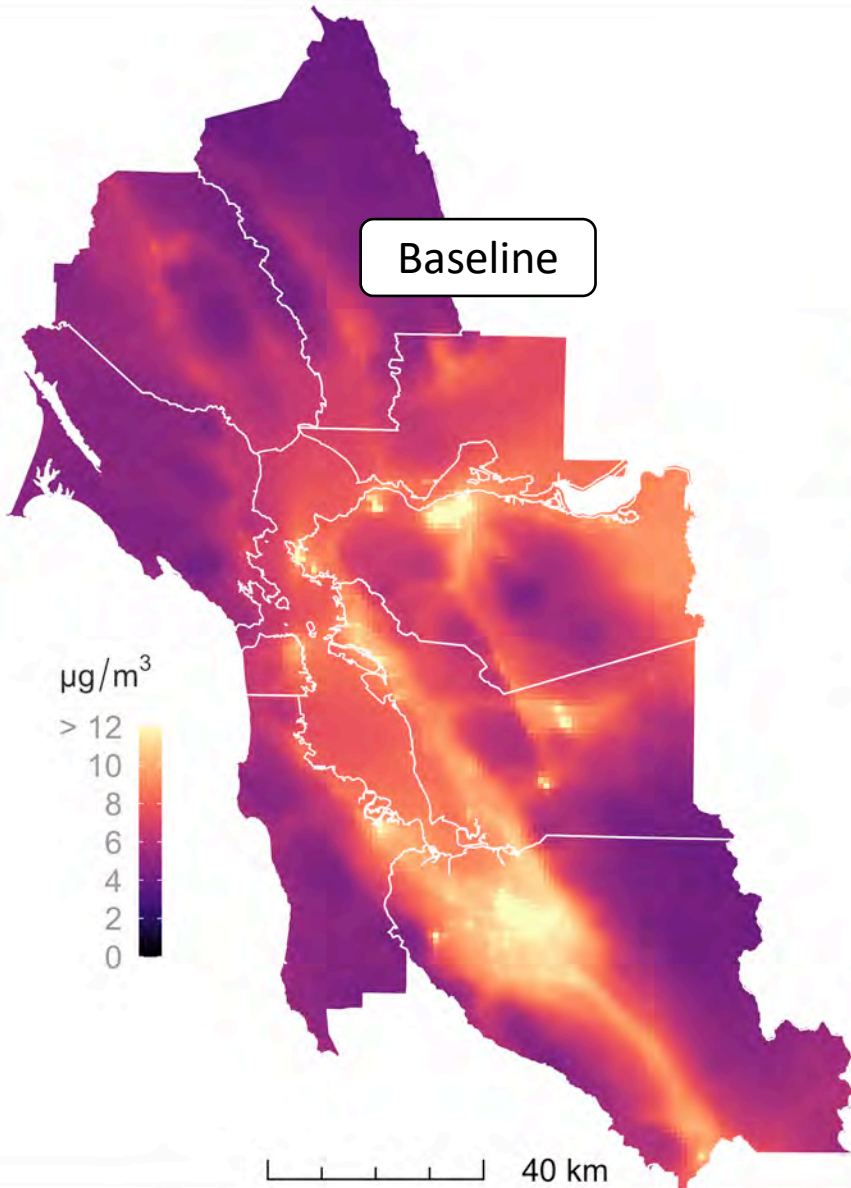
- From elimination of NO<sub>x</sub> emissions from Bay Area natural gas-fired commercial & residential space/water heating\*\*

\* Not just natural gas appliances. Includes some sources outside SF air basin.

\*\* Excluding permitted sources.

# Modeled Impact

on Total PM<sub>2.5</sub>



## Baseline (Left Map)

- Annual average outdoor concentrations, 2018
- Of total (secondary and primary) PM<sub>2.5</sub>
- Attributed to all sources in modeling domain\*

## Reductions (Right Map)

- From elimination of NO<sub>x</sub> and primary PM<sub>2.5</sub> emissions from Bay Area natural gas commercial & residential space/water heating\*\*

\* Not just natural gas appliances. Includes some sources outside SF air basin.

\*\* Excluding permitted sources.



# Health Benefits and Valuations



Health Impacts	Annual Health Benefits (Incidence Avoided)		Annual Valuations (Million US\$, 2020)	
	Secondary PM <sub>2.5</sub>	Total PM <sub>2.5</sub>	Secondary PM <sub>2.5</sub>	Total PM <sub>2.5</sub>
Premature mortality	<b>25–56</b>	<b>39–89</b>	260–570	400–910
Non-fatal heart attack	2.8–26	4.4–41	0.25–2.3	0.39–3.6
Hospital admission, neurological	8.3	13	0.12	0.19
Out of hospital cardiac arrest	0.48	0.76	0.020	0.032
Stroke	1.6	2.5	0.063	0.1
Lung cancer	2.1	3.2	0.060	0.096
Hospital admission, respiratory	2.6	4.1	0.030	0.047
Hospital admission, cardiovascular	3.2	5.2	0.059	0.095
ER visit, respiratory	13	21	0.014	0.022
ER visits, cardiovascular	6.7	11	0.009	0.014
Restricted activity days	26,000	41,000	1.9	3.3
Work loss days	4,400	7,000	1.2	1.9
Hay fever/allergic rhinitis	480	750	0.33	0.52
Asthma symptoms/albuterol use	9,900	15,000	0.004	0.0062
Asthma onset	77	<b>120</b>	3.9	6.1
			<b>270–580</b>	<b>410–930</b>

# Increased Fossil Power Health Impacts and Valuations (Unlikely Scenario)

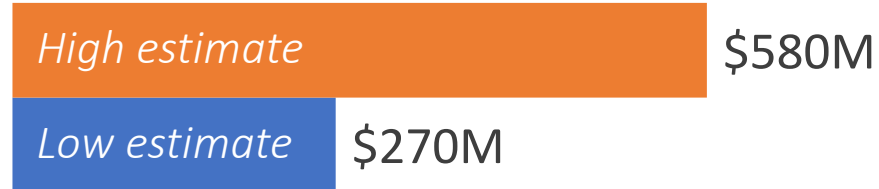


Health Impacts	Annual Health Impacts (Incidence Added)	Annual Valuations (Million US\$, 2020)
	Total PM <sub>2.5</sub>	Total PM <sub>2.5</sub>
Premature mortality	<b>0.96–2.2</b>	9.8–23
Non-fatal heart attack	0.11–1.0	0.0097–0.09
Hospital admission, neurological	0.33	0.0049
Out of hospital cardiac arrest	0.019	0.0008
Stroke	0.063	0.0025
Lung cancer	0.081	0.0024
Hospital admission, respiratory	0.1	0.0012
Hospital admission, cardiovascular	0.12	0.0023
ER visit, respiratory	0.57	0.00058
ER visits, cardiovascular	0.27	0.00036
Restricted activity days	1,100	0.086
Work loss days	180	0.048
Hay fever/allergic rhinitis	20	0.014
Asthma symptoms/albuterol use	420	0.00017
Asthma onset	<b>3.2</b>	0.17
		<b>10–23</b>

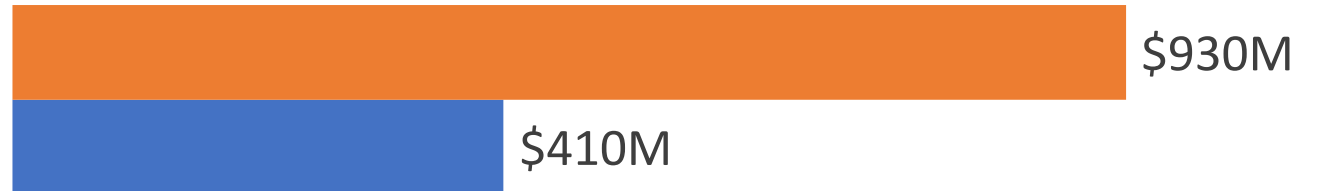
# Summary of Valuations



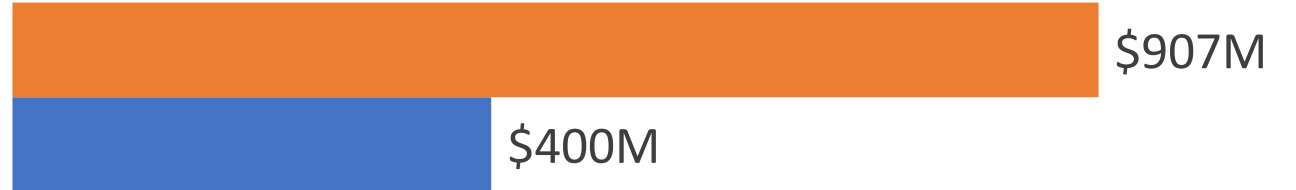
**Zero-NOx natural gas appliances:** benefits only from reductions in NOx emissions



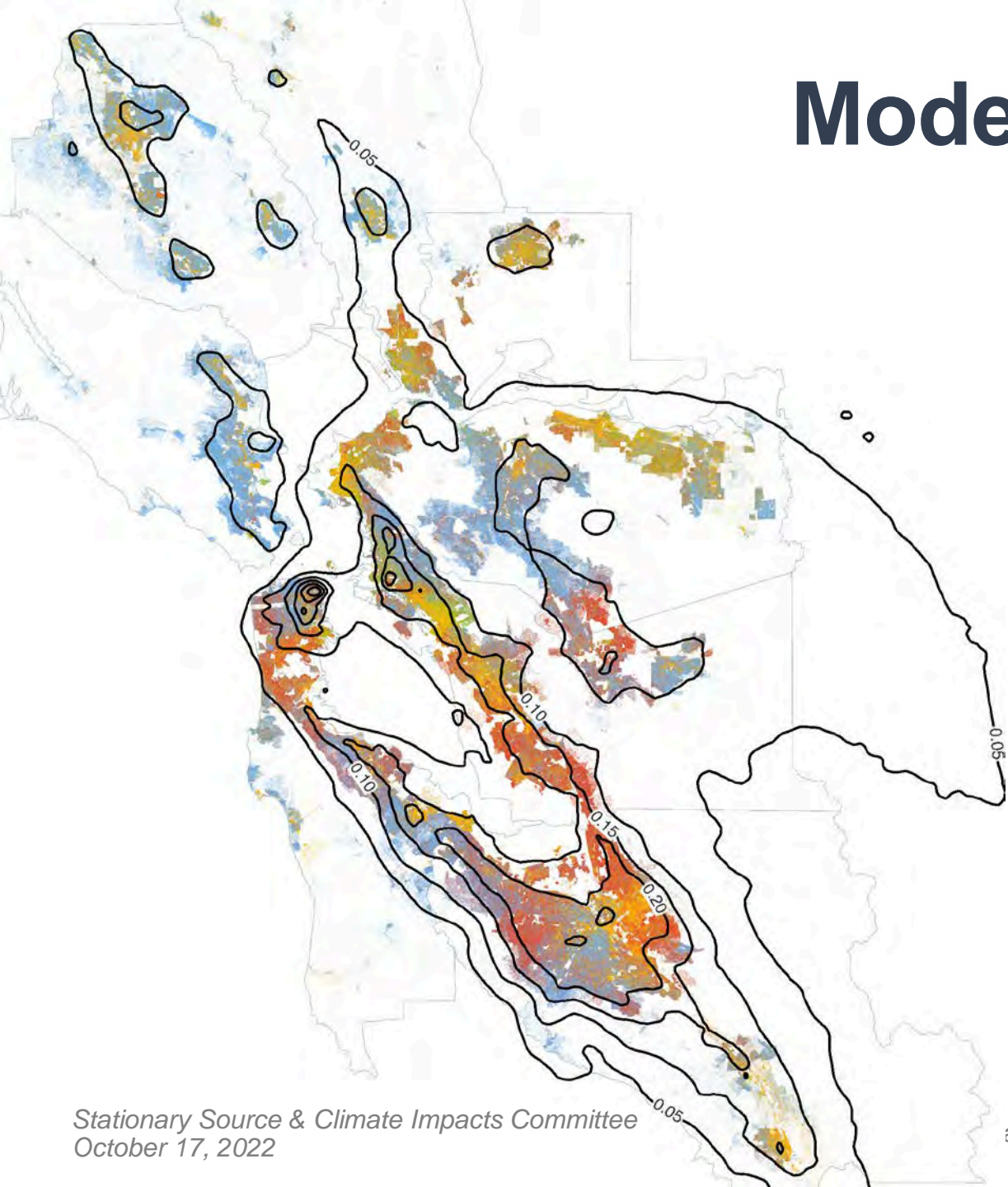
**Electric appliances + non-fossil power:** benefits from reductions in both NOx and PM<sub>2.5</sub> emissions



**Electric appliances + fossil power:** small disbenefits from power plant emissions



# Modeled PM<sub>2.5</sub> Exposure



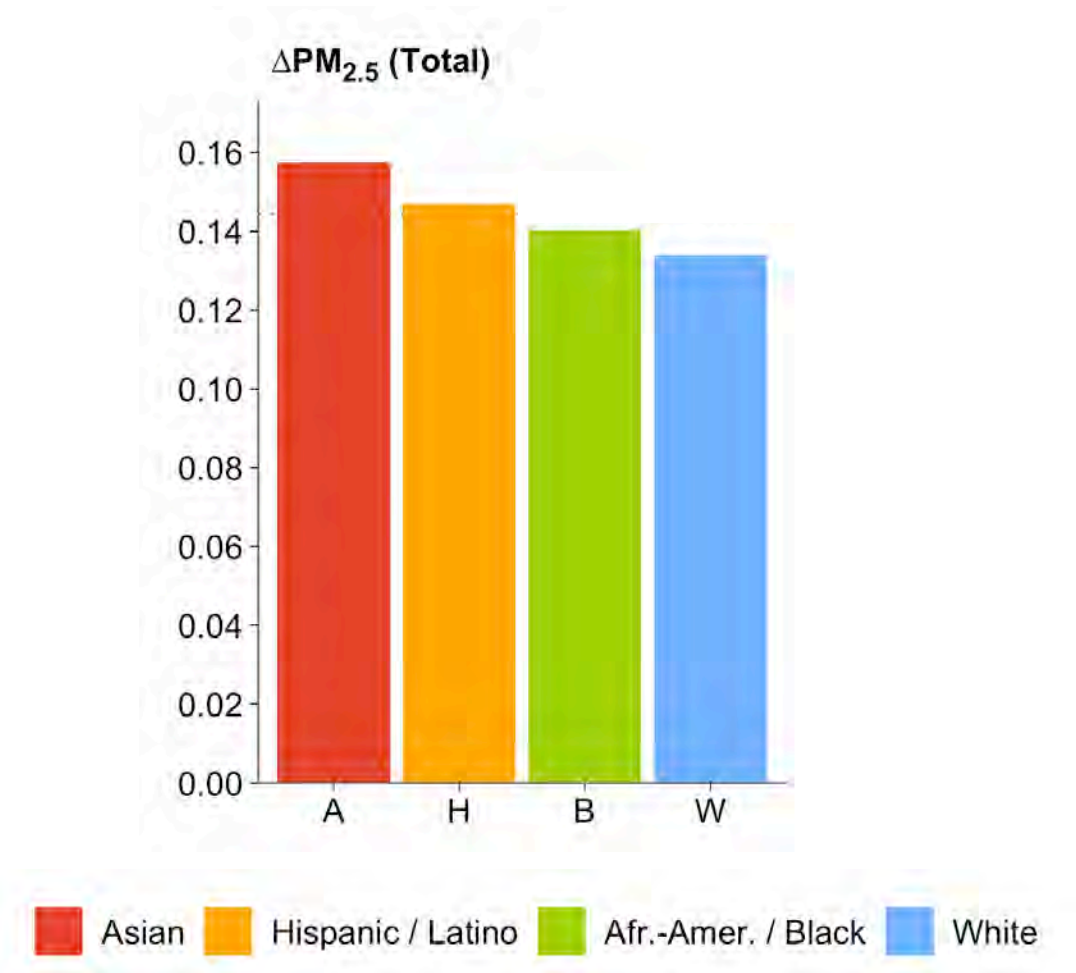
- Exposures highest in high-density areas where PM<sub>2.5</sub> concentrations are also high (2020 residential population)
- Exposure levels vary by county and by race/ethnicity

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

# Equity Assessment



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





# Changes to Peak Air Pollution Levels

24-hour PM<sub>2.5</sub> 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<sub>2.5</sub>:** Mean modeled reduction of about 0.7 µg/m<sup>3</sup> for peak levels (at least 30 µg/m<sup>3</sup> observed)
- **For 8-hour ozone:** Mean modeled reduction < 0.1 ppb for peak levels (at least 65 ppb observed)

# Summary



- Potential premature deaths avoided: 39–89 deaths per year
- Potential total benefit valuation: \$410–930 million per year
- About 60% of benefits accrue from eliminating NO<sub>x</sub> emissions
- About 40% from eliminating PM<sub>2.5</sub> emissions (electric appliances)
- Relatively small disbenefit from scenario of added fossil power load
- People of color most impacted by PM<sub>2.5</sub> attributed to combustion of natural gas for residential space and water heating
- Some reduction to peak air pollution levels, relevant to attainment



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AGENDA: 6

# Building Appliance Rules Update Regulation 9, Rules 4 and 6

Stationary Source and Climate Impacts  
Committee Meeting  
October 17, 2022

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# Presentation Outcome



- Update committee on proposed amendments to Regulation 9, Rules 4 and 6 for Nitrogen Oxides (NO<sub>x</sub>) emissions from building appliances, the implementation working group, and timeline moving forward.

# Presentation Outline



- Background
- Path Forward
- Implementation Working Group
- Timeline Updates

# Presentation Requested Action



- None, informational only.

# 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)
- **Anticipated Timeline:**
  - Proposed amendments and supporting materials to be released in Q4 2022
  - Public Hearing for Board consideration in Q1 2023

# 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
- Bay Area can continue to show leadership in health protective rules

# Rule Updates and Package Contents



- Update to ultra-low NOx requirement in Rule 9-4 – now January 1, 2024 (no impact to zero-NOx requirement timeline)
- Proposed amendments package and supporting analyses, including:
  - Health analysis
  - Utility impact analysis
  - CEQA Draft Environmental Impact Report
  - Socioeconomic Analysis

# 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

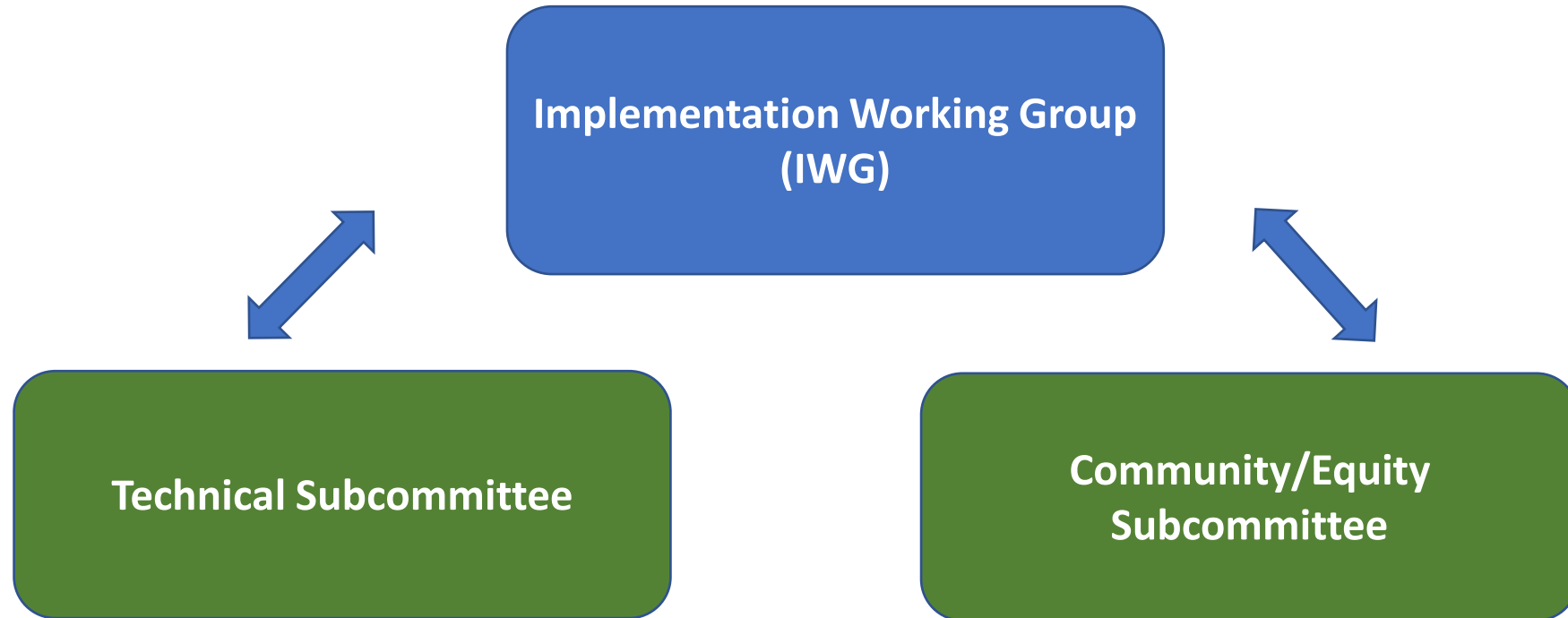
# Implementation Working Group (cont'd)



- Led by staff with facilitation from professional facilitator
- Invited stakeholders will 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



# Implementation Working Group Structure



# Launching Implementation Working Group- Timeline and Next Steps



- **To date:** Contracted with third party facilitator, consulted with building advocates and nonprofit networks regarding structure and membership.
- **October:**
  - Finalize invitational roster
  - Determine method and need for providing stipends for working group members
  - Finalize supportive documents (Working Group charter, stipend policy)
- **November:**
  - Send formal invitations to participate in Working Group
  - Send invitations for Dec meeting
- **December:**
  - Convene first meeting to establish common baseline level of knowledge
- **February 2023:**
  - Working Group will resume meetings upon adoption of rule amendments

# Feedback Requested/Prompt



- Questions and comments?



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**AGENDA: 7**

# **Update on Air District Permitting**

**Stationary Source and Climate Impacts  
Committee Meeting  
October 17, 2022**

**Fred Tanaka  
Manager, Engineering Division  
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# Presentation Outcome



Seeking to provide the Board with Information on:

- Permitting Overview
- Current Permitting Productivity and Backlog
- Reasons for the Backlog
- Comparison with South Coast AQMD
- Possible Solutions to Backlog Issues

# Presentation Outline



- New Source Review Permit Program – Overview
- Permitting Backlog
- Backlog, Staffing and Fee Comparison with South Coast AQMD
- Possible Solutions to Backlog Issues
- Next Steps

# Presentation Requested Action



None, Information Only.



# Permit Programs



## Common permit and approval documents:

- Authority to Construct (A/C) – New Source Review
- Permit to Operate (P/O) – New Source Review
- Certificate of Registration
- Certificate of Exemption
- Certificate for Emission Reduction Credits (ERCs)
- Major Facility Review (Title V) Permit

Note: Asbestos and open burn notifications are handled in Compliance and Enforcement.

# New Source Review - Overview



New Source Review is a two-part process:

- Authority to Construct
  - Obtained prior to the commencement of construction
  - May require meeting start-up conditions
- Permit to Operate
  - Allows for the operation of a source
  - Issued after the requirements of the A/C are met
  - Renewed on an annual basis

# New Source Review – Overview (cont'd)



Ensure compliance with requirements:

- Applicable rules and regulations
- Best Available Control Technology (BACT)
- Offsets
- Air Toxics Health Risk Assessment (HRA)
- California Environmental Quality Act (CEQA)
- Public Noticing requirements
- Fees

# General Statistics for FYE 2022

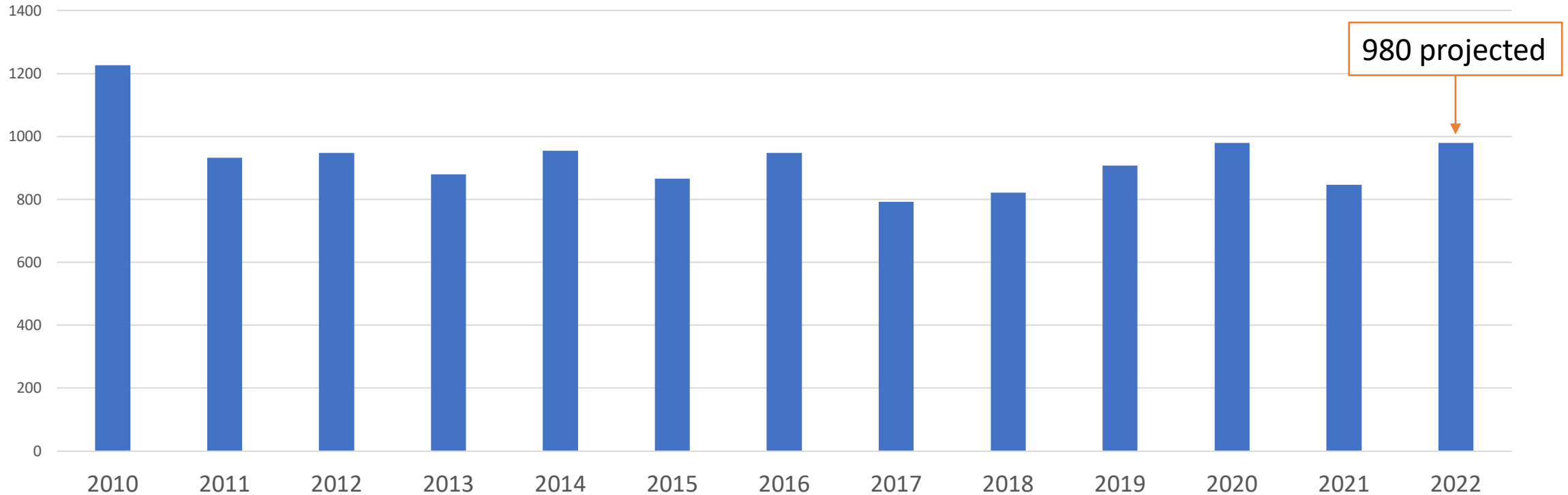


Description	Count
Applications received, All types	1,069
<b>New Source Review</b>	<b>976</b>
Registrations	6
Major Facility Review (Title V)	68
Other	19
Permitted/registered facilities	10,419
Sources at the above facilities	26,271
Renewals processed – Permits to Operate & Registrations	9,738
Data updates processed	3,660

# Application Metrics: Productivity



## Approved New Source Review (NSR) Applications



- Approved means initial permit decision made: A/C issued, A/C waived, Registration Issued, Certificate of Exemption, Canceled, Denied.
- Excludes Title V, Synthetic Minor, Banking, emission reduction credit transfers.

# Application Metrics: Approved Processing times



From 2010 through August 29, 2022

Processing times	# Eval to Approved	% Eval to Approved	# Submit to approved	% Submit to approved
<90 days	9555	82%	5785	49%
90 days to <180 days	1340	11%	3331	28%
180 days to <1 year	501	4%	1760	15%
1 to <2 years	183	2%	612	5%
2 to <3 years	64	1%	159	1%
3 to <4 years	12	0.1%	46	0.4%
4 to <5 years	11	0.1%	30	0.3%
5+ years	16	0.1%	25	0.2%

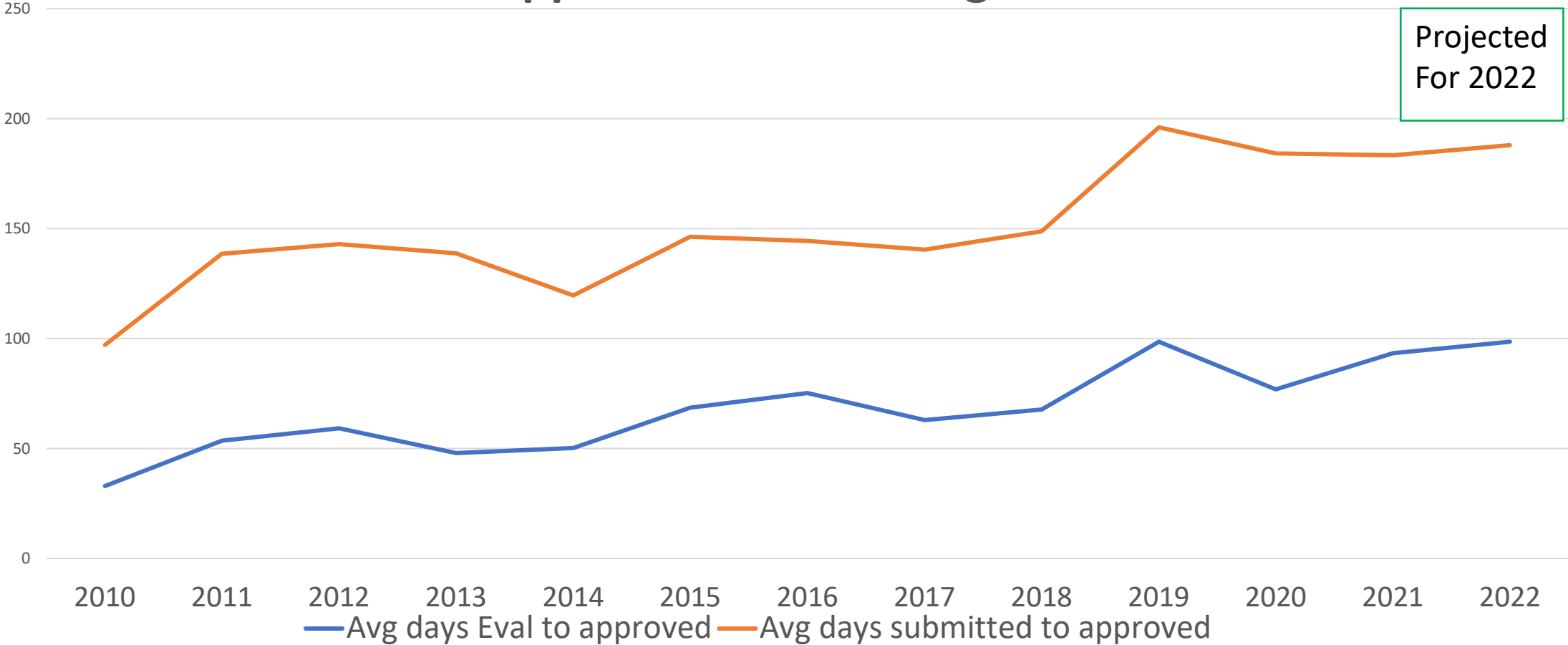
'Eval to Approved' means applications completed from the time we received all information to issuance.

'Submit to Approved' means applications completed from receipt of the application to issuance.

# Application Metrics: Processing times by Year



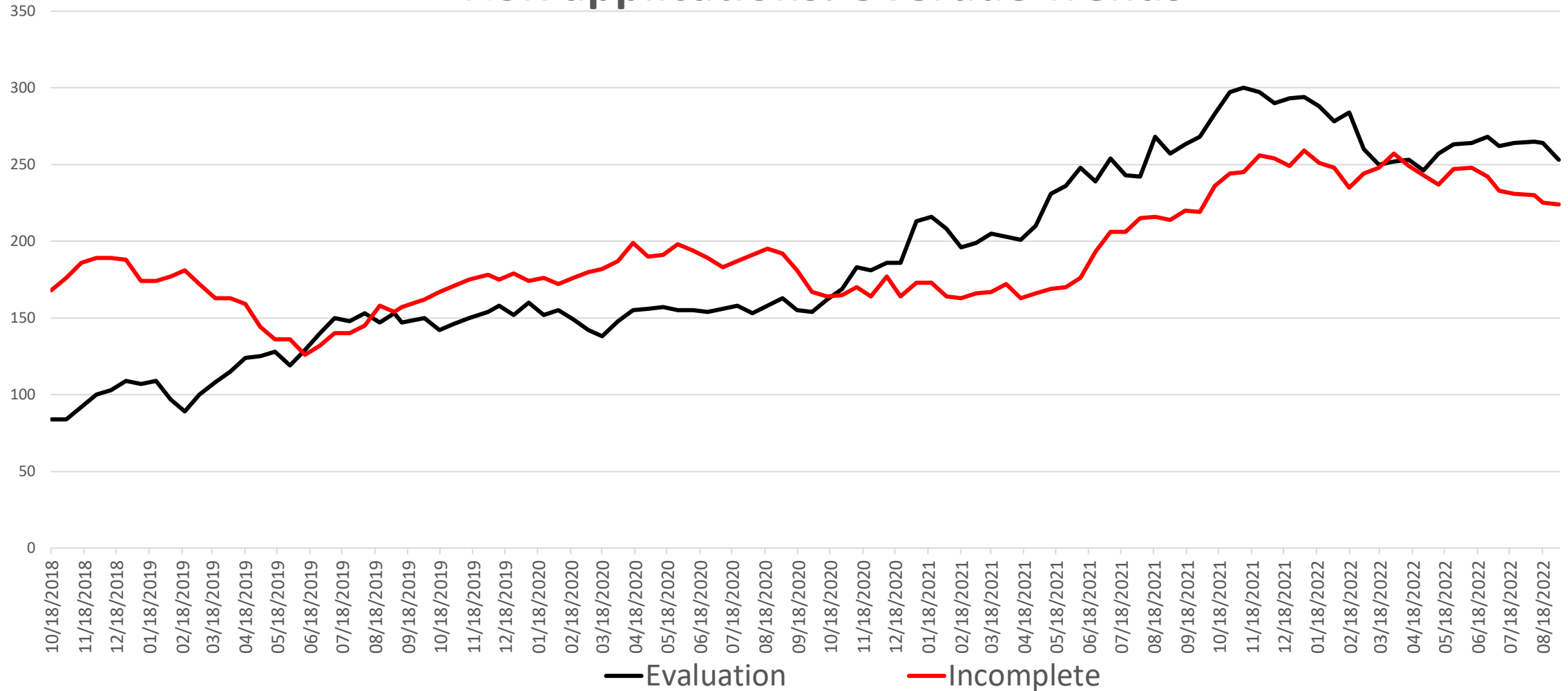
## NSR Application Processing Times



# Overdue NSR Applications

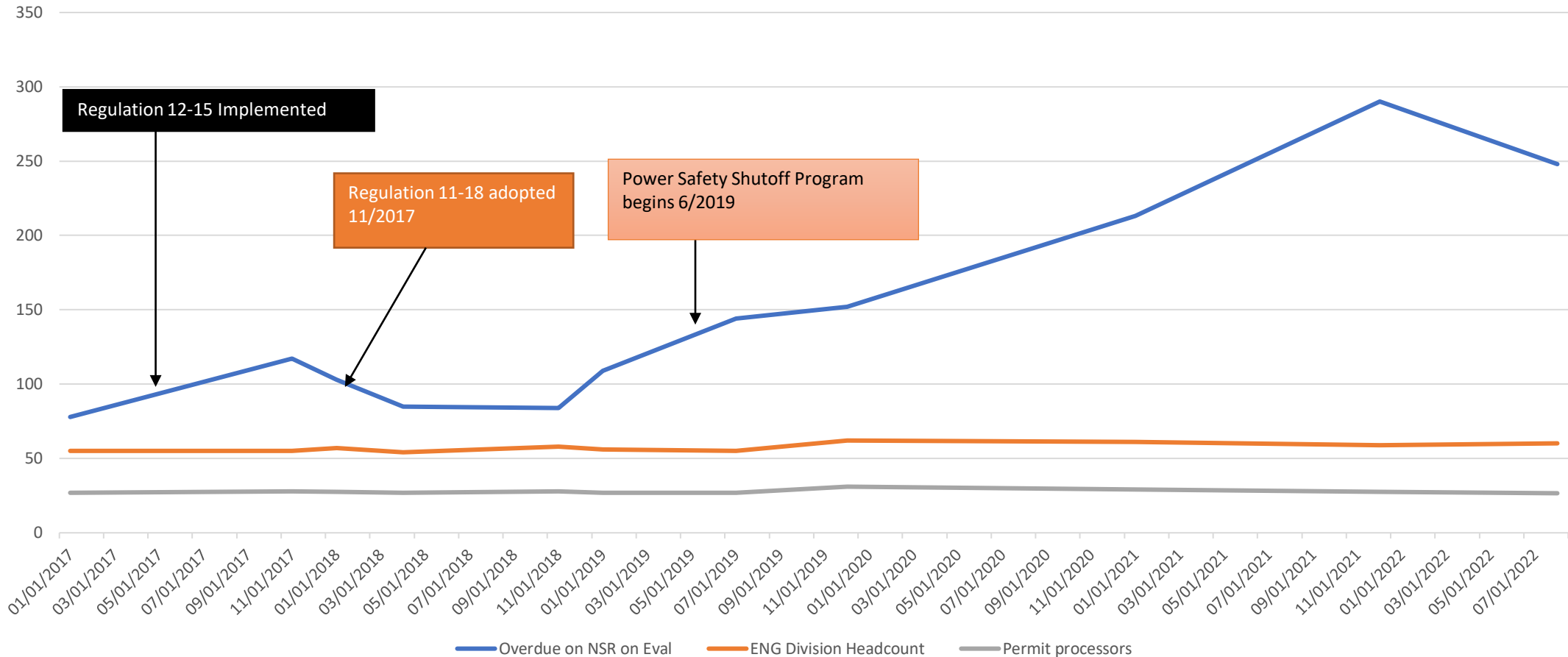


## NSR applications: Overdue Trends





# Overdue Applications and Staffing

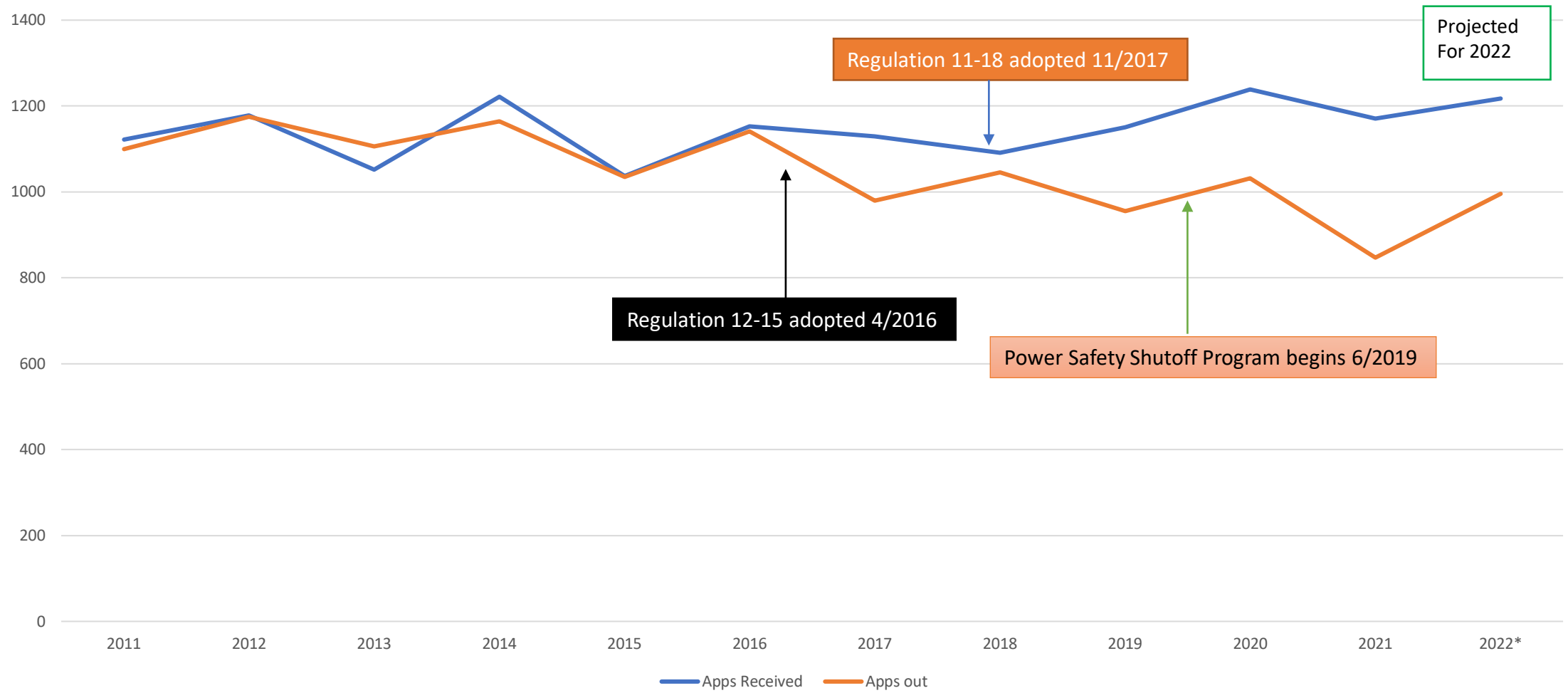


- Data as of August 29, 2022

# Annual Application Metrics



## Comparison of Applications Received and Approved



# Evolution of Permitting



## Increased complication in permitting

- More rules and regulations
- New abatement technology
- Compliance issues
- Additional toxics and lower thresholds
- Additional Public Noticing requirements
- CEQA considerations – Notice of Exemption (NOE) & Notice of Determination (NOD) filings

# Evolution of Permitting (cont'd)



## Other

- New permit mandates
- Permit exemptions require scrutiny and review!
- Recent changes to Regulation 2 for Overburdened Communities are expected to lengthen permit issuance timeframes.

# Industries with Complex Permitting



Industries with complex permitting evaluations:

- Petroleum refinery
- Wastewater treatment facilities
- Landfill
- Material handling
- Composting operations

# Issue: Engine Permitting



## BAAQMD Internal Combustion Engine Permit Statistics

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500+ engine applications received per year

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9,700 Permitted Internal Combustion Engines

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442 Prime Engines – 169 Diesel, 177 Natural Gas/LPG, 54 Digester gas, 34 landfill gas

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322 Natural Gas/LPG Emergency Backup Engines

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7928 Diesel Emergency Backup Engines

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2035 Diesel Emergency Backup Engines that are 1000 BHP and larger





# Issue: Regulation 12-15 Program Implementation



## Regulation 12, Rule 15 Review

**43 Spreadsheets in One Workbook!**

Source Name	Volume Flow Rate (gpm)	GPM Fuel Flow Rate (gpm)	NOx Flow Rate (lb/hr)	PM Flow Rate (lb/hr)	CO Flow Rate (lb/hr)	SOx Flow Rate (lb/hr)	Acetylene Flow Rate (lb/hr)	Propene Flow Rate (lb/hr)	Propadiene Flow Rate (lb/hr)	Other
TAC Reactor Furnace, F-1550	...	...	...	...	...	...	...	...	...	...
ABC Reactor Furnace, F-1550	...	...	...	...	...	...	...	...	...	...
TAC Reactor Furnace, F-1550	...	...	...	...	...	...	...	...	...	...
...	...	...	...	...	...	...	...	...	...	...

**Each Spreadsheet has over 8,000 rows and between 20 to 40 columns for review  
Millions of cell entries in one workbook**

- Name
- AEI\_Summary\_RY2020\_P0010\_Chevron\_v1.0
- CBI 2020 Abrasive Blasting Emissions\_v1.0
- CBI 2020 Cooling Water Tower Emissions\_v1.0
- CBI 2020 DEBRU Vent Emissions\_v1.0
- CBI 2020 FCC Catalyst Silo Emissions\_v1.0
- CBI 2020 FCC Emissions\_v1.0
- CBI 2020 FCC Emissions\_v1.0\_NCM
- CBI 2020 Flare Dates and Times\_v1.0
- CBI 2020 Flare Emissions\_v1.0
- CBI 2020 Hydrogen Plant\_v1.0
- CBI 2020 IC Engine Emissions\_v1.0
- CBI 2020 LPG Loading Emissions\_v1.0
- CBI 2020 Lube Oil Loading Emissions\_v1.0
- CBI 2020 Non-Retail GDF Emissions\_v1.0
- CBI 2020 Paint Booths\_v1.0
- CBI 2020 Process Drains and Components\_v1.0
- CBI 2020 Process Piping Fugitives\_v1.0
- CBI 2020 Process Piping Fugitives\_v1.0\_NCM
- CBI 2020 Process Vessel Depressurization\_v1.0
- CBI 2020 Rheniformer Emissions\_v1.0
- CBI 2020 RLP Ink Usage Emissions\_v1.0
- CBI 2020 SRU Emissions\_v1.0
- CBI 2020 Sulfur Scrubber Emissions\_v1.0
- CBI 2020 Tank emissions\_v1.0
- CBI 2020 Therm Ox Emissions\_v1.0
- CBI 2020 V475 RFG Combustion Emissions\_v1.0
- CBI 2020 V701 RFG Combustion Emissions\_v1.0
- CBI 2020 V870 RFG Combustion Emissions\_v1.0
- CBI 2020 Wastewater Emissions\_v1.0
- CBI 2020 Wharf ERD Emissions\_v1.0
- OneDrive\_1\_4-15-2021
- RY2020 12-15 EI cover Plant 10\_Final\_Signed

# Issue: Regulation 11-18 Program Implementation



- Implementation Timelines and Workgroup
- Litigation Settlements and their Constraints
- Limited time and priorities of Air District facility engineers
- Modeling staff time diverted to handle other high priority projects
  - Crematory expansions due to COVID-19
  - Bay View Hunters Point Applications, Public Meetings and CEQA
  - Schnitzer Steel Thermal Oxidizer and settlements
- Permit Reform Rule Amendments and Implementation (Fees)
- Public Workshop for Reg. 11-18 HRA for AB&I Foundry

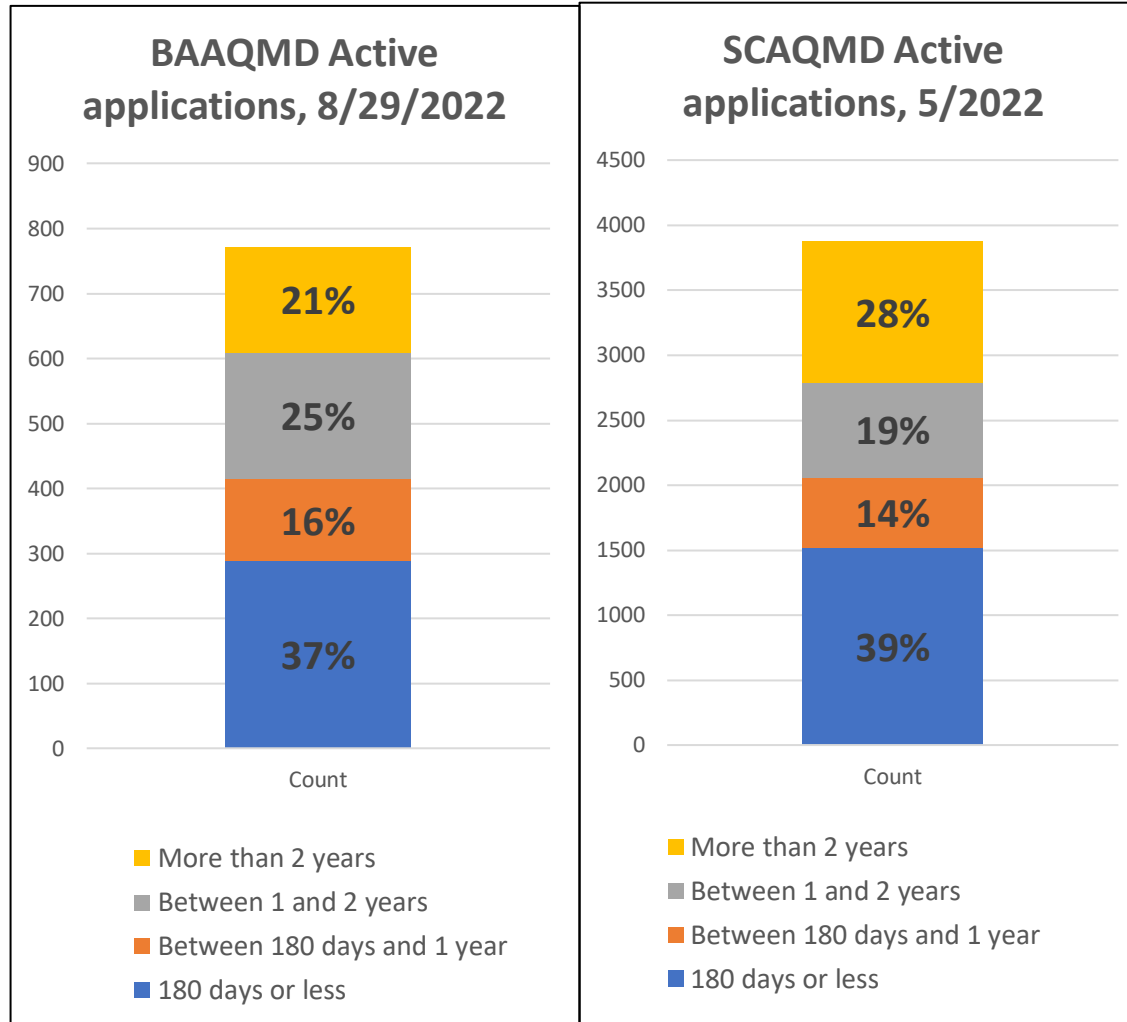


# Air District Comparison



<b>Description</b>	<b>BAAQMD</b>	<b>SCAQMD</b>
Budget – General Fund (2022)	\$117 MM	\$180 MM
Revenue from fees	\$53.6 MM	\$101 MM
Direct costs for fee-based work	66%	74%
Indirect costs for fee-based work	34%	26%
Overall cost recovery	83.70%	100%*
Budgeted positions	415	957
Vacancy rate	12%	13%
Total facilities	10,419	24,889
Total sources	26,271	66,642

# Comparison of Active New Source Review Applications





**Permit Streamlining Policy** New minimum requirements for application acceptance;

- New minimum requirements for applications to be deemed complete;
- Restrictions on the numbers and types of application revisions;
- Timeboxing for requests for project revisions;
- Timeboxing for requests to review permit conditions; and
- Restrictions on revisions to permit conditions after authority to construct issuance.

**Webinar in March 2022**

# Solutions (cont'd)



- **11-18 Program**
  - Dedicate staffing
  - Utilize consultants for inventory and modeling preparation
- **Permitting Program**
  - Look for methods to address “bubbles” for examples: IC Engines, Soil Vapor Extraction
  - Permitting Liaison – prescreen applications, assist companies
  - Have dedicated staff for permit renewal activities

# Solutions (cont'd)



- **Reevaluate 12-15 Inventory Program**
- **Require Implementation plans, staffing and fees for new rules and programs.**

Example Amended Regulations 2, Rules 1 and 5.

- Permit reform rules were adopted in December 2021 identifying 8 FTEs needed for implementation.
- New fees were adopted in June 2022
- Requirement for rule in place now but staffing discussion needs to be completed

# Next Steps



- Allocate Staffing Resources as part of a comprehensive staffing plan
  - Methods to address “bubbles” for examples: IC Engines, Soil Vapor Extraction
- Reevaluate 12-15 Inventory Program
- Continue to Implement Permit Streamlining Policy
- Monitor Backlog
- Adopt Regulation 3 (Fees) changes and approve staffing when new or modified rules are considered for adoption.

# Feedback Requested/Prompt



None. Questions?