



BAY AREA
AIR QUALITY
MANAGEMENT
DISTRICT

AGENDA: 14A

Regulations to Track and Reduce Emissions from Petroleum Refineries

Board of Directors Meeting
October 15, 2014

Eric Stevenson
Director of Technical Services



Enhanced Approach

- Proceed with latest version of Regulation 12, Rule 15 (12-15), Petroleum Refining Emissions Tracking Rule
- Develop a companion rule concurrently to 12-15 to mitigate refinery emissions increases
 - Both rules to the Board for consideration by March of 2015
- Develop a Board of Directors Resolution to guide further rule development efforts to reduce emissions
- Expedite rule development



Current 12-15 Elements

- ***Annual emissions inventories*** of all regulated air pollutants based on upgraded methods, including emissions from cargo carriers
- ***Petroleum Refinery Emissions Profile (PREP)***; require that on-going inventories include comparisons with PREP
- ***Crude oil composition characteristics*** with annual emissions inventories (e.g. sulfur, nitrogen content, API gravity, Total Acid Number)
- ***Health Risk Assessments (HRA)*** with enhanced emissions inventories and revised OEHHA HRA guidelines
- ***Enhance fence line monitoring systems and establish community air quality monitoring systems***

A background image of a lush forest with tall trees and green ferns in the foreground, partially obscured by a blue horizontal bar.

Companion Rule to 12-15

- Mitigate emissions increases of criteria pollutants, Toxic Air Contaminants (TAC) and greenhouse gases (GHG) based on PREP
 - Require causal analysis of any increase
 - Require mitigation plan to be submitted
 - Require public review of mitigation plan
- This will help ensure that crude oil composition changes do not increase emissions
- This will help identify processes that contribute to emissions increases



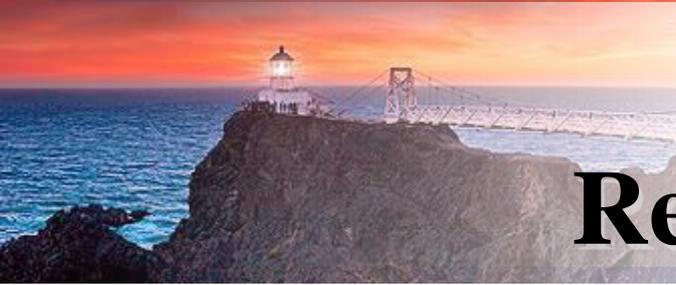
Approaches for Decreasing Emissions

- Investigate emission reduction opportunities
 - VOC's at tanks, and other fugitive sources
 - PM at Fluidized Catalytic Cracking Units (FCCUs) and other combustion sources
 - Reductions to NO_x sources will be limited due to recent regulatory action
 - SO₂ in fuel gas and coke calcining
 - Potentially reduce risk by amending Regulation 2, Rule 5
- Develop resolution directing staff to evaluate emissions reduction approaches and recommend a strategy
 - Consider reduction approaches, including those by advocates and industry
 - Provide a strategy to reduce refinery emissions with an expedited timeline
 - Resolution for Board consideration by December of 2014



2015 Clean Air Plan Preliminary Draft Control Measures & Further Study Measures for Refineries

Project	Expected Benefits	Status
Tracking and monitoring refinery emissions	Improved protection of public health, identification of control opportunities	Rulemaking underway
Mitigating emissions increases at refineries	Ensure refinery emissions continue to decrease	Rulemaking underway
Reduce SO ₂ from coke calcining	Reduce SO ₂ emissions	Rulemaking underway
Reduce PM from Fluid Catalytic Cracking Units	Reduce condensable PM and precursor emissions	Rulemaking underway
Further reduce equipment leaks (tanks, valves, other)	Reduce ROG and toxic emissions	Draft control measure for 2015 Clean Air Plan (CAP)
Limit sulfur content of refinery fuel gas	Reduce SO ₂ emissions at some refineries	Draft control measure for 2015 CAP
Further reduce flaring	Reductions in all pollutants	Further study measure for 2015 CAP
Review of SO ₂ emissions from refineries	Determine if substantial SO ₂ reductions are available	Further study measure for 2015 CAP
Further reduce NO _x	Determine if substantial NO _x reductions are available	Further study measure for 2015 CAP



Strategy for Tracking and Reducing Refinery Emission

- Present 12-15 for Board consideration
 - Air monitoring, HRA and emissions inventory provide a means to track impacts within the immediate communities and throughout the Bay Area
- Development of companion rule and present to Board for consideration
 - Mitigate increases in refinery emissions
- Develop resolution for Board consideration
 - Guide further rule development to reduce refinery emissions

AGENDA: 14B

Bay Area Emissions and Air Quality: Trends & Refinery Overview

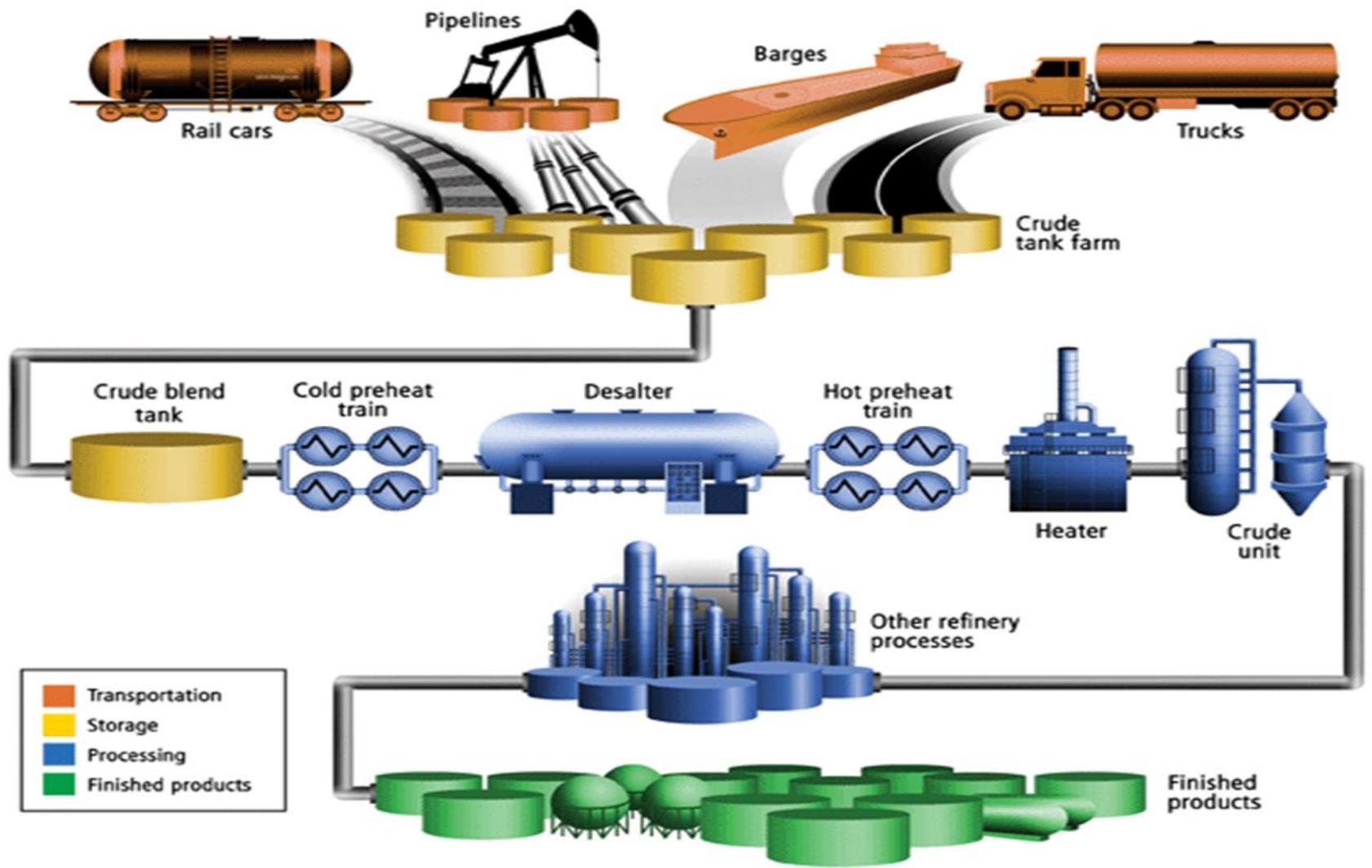
**Board of Directors
October 15, 2014**

**Henry Hilken
Director of Planning, Rules and Research
Wayne Kino
Director of Compliance and Enforcement**





Refinery Overview





Air District Refinery Regulations

REGULATION 1 - GENERAL PROVISIONS

REGULATION 2 - PERMITS

REGULATION 6 - PARTICULATE MATTER AND VISIBLE EMISSIONS

REGULATION 7 - ODOROUS SUBSTANCES

REGULATION 8 - ORGANIC COMPOUNDS:

- Rule 1 - General Provisions
- Rule 2 - Miscellaneous Operations
- Rule 5 - Storage of Organic Liquids
- Rule 6 - Terminals and Bulk Plants
- Rule 8 - Wastewater (Oil-Water) Separators
- Rule 10 - Process Vessel Depressurization
- Rule 18 - Equipment Leaks
- Rule 28 - Episodic Releases From Pressure Relief Devices
- Rule 37 - Natural Gas and Crude Oil Production Facilities
- Rule 43 - Surface Coating of Marine Vessels
- Rule 44 - Marine Vessel Loading Terminals
- Rule 46 - Marine Tank Vessel to Marine Tank Vessel Loading

REGULATION 9 - INORGANIC GASEOUS POLLUTANTS:

- Rule 1 - Sulfur Dioxide
- Rule 2 - Hydrogen Sulfide
- Rule 3 - Nitrogen Oxides from Heat Transfer Operations
- Rule 7 - Nitrogen Oxides And Carbon Monoxide from Industrial, Institutional, and Commercial

Boilers, Steam Generators, And Process Heaters

Rule 8 - Nitrogen Oxides And Carbon Monoxide from Stationary Internal Combustion Engines

Rule 10 - Nitrogen oxides And Carbon Monoxide From Boilers, Steam Generators And Process Heaters in Petroleum Refineries

REGULATION 10 - STANDARDS OF PERFORMANCE FOR NEW STATIONARY SOURCES:

This Regulation establishes emission and/or performance standards for new plants and other sources by reference to the provisions of Part 60, Chapter 1, Title 40, of the Code of Federal Regulations.

REGULATION 11 - HAZARDOUS POLLUTANTS

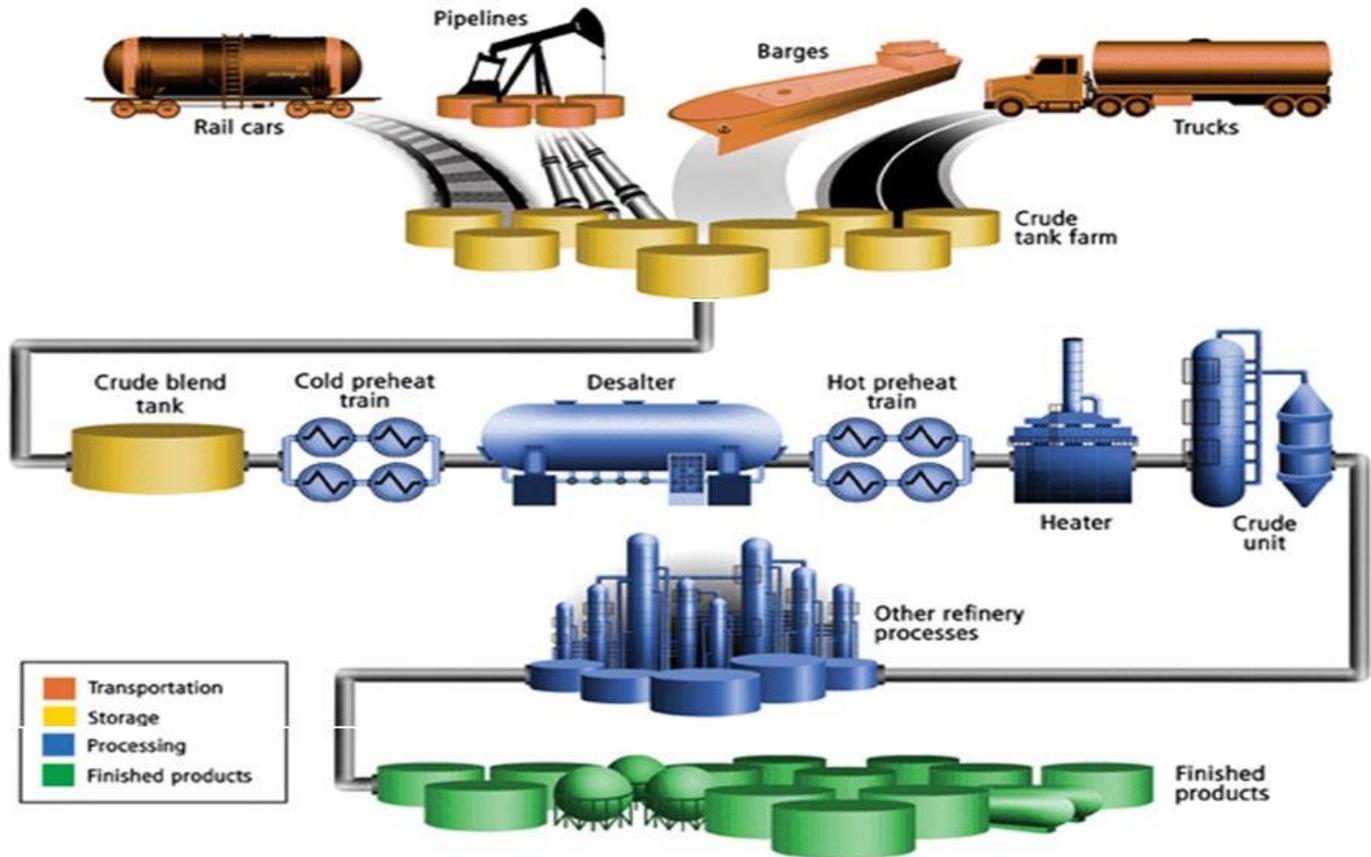
- Rule 1 - Lead
- Rule 2 - Asbestos Demolition, Renovation and Manufacturing
- Rule 7 - Benzene
- Rule 10 - Hexavalent Chromium Emissions From Cooling Towers
- Rule 11 - National Emission Standard For Benzene Emissions From Coke By-Product Recovery Plants and Benzene Storage Vessels
- Rule 12 - National Emission Standard For Benzene Emissions From Benzene Transfer Operations and Benzene Waste Operations

REGULATION 12 - MISCELLANEOUS STANDARDS OF PERFORMANCE:

- Rule 11 – Flare Monitoring
- Rule 12 – Flare Control



Refinery Sources of Emissions



**8 Regulations
18 Rules**

**9 Regulations
12 Rules**

**8 Regulations
18 Rules**



Regulation 8, Rule 18

Fugitive Emissions:

- 100 parts per million leak standard adopted in 1992
- First regulation to control Greenhouse Gases (methane)
- South Coast AQMD and EPA at 500 ppm
- Collaboration between Communities, Environmental Groups and Industry



Regulation 12, Rules 11 & 12

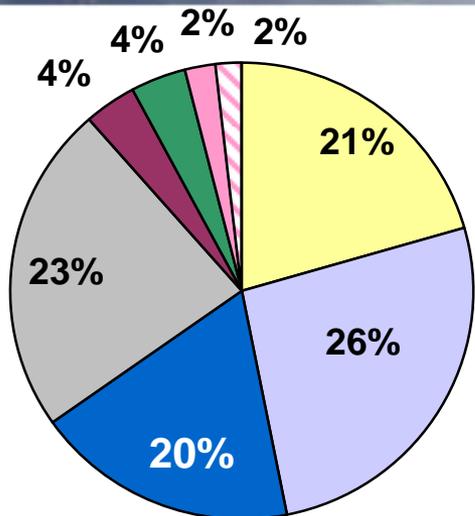
Flare Rules: Goal to limit flaring to emergency events

- Rule 11 required state of the art monitoring in 2003
- Rule 12 required Annual Flare Management Plans in 2006
 - Causal Analysis for Each Flaring Event
 - Identify and Implement Prevention Measures
- Collaboration between Communities, Environmental Groups and Industry

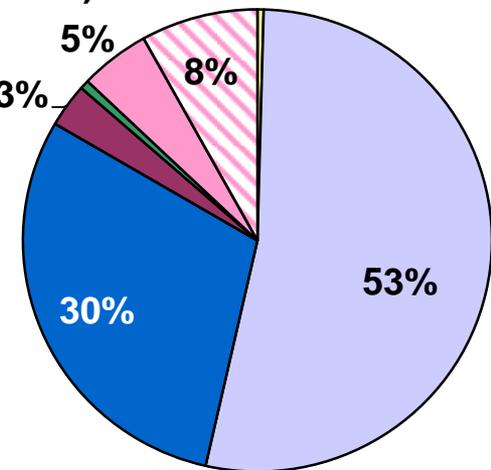
Air District Compliance & Enforcement - 2013

- **Compliance Verification Inspections**
 - 10,130
- **Complaint Investigations**
 - 3,320
- **Violations**
 - 1006
- **Incident Investigations**
 - 442 Episodes, 82 Breakdowns, 2 Major Incidents
- **Compliance Audits & Refinery Program Review**
 - Tank Degas Audit
 - Regulation 8-18 Audit
 - Marine Terminals Audit

Distribution of 2013 Annual Average Emissions

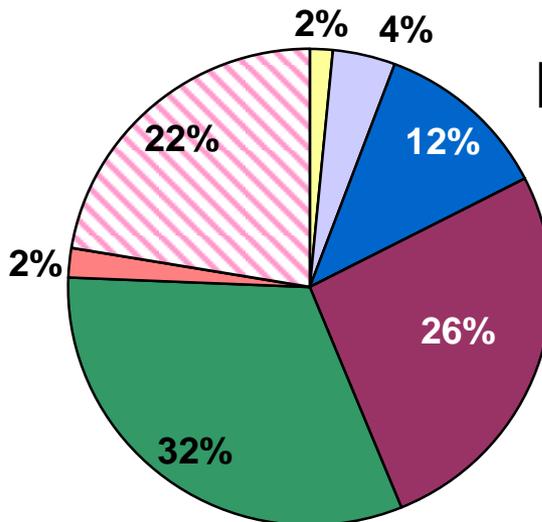
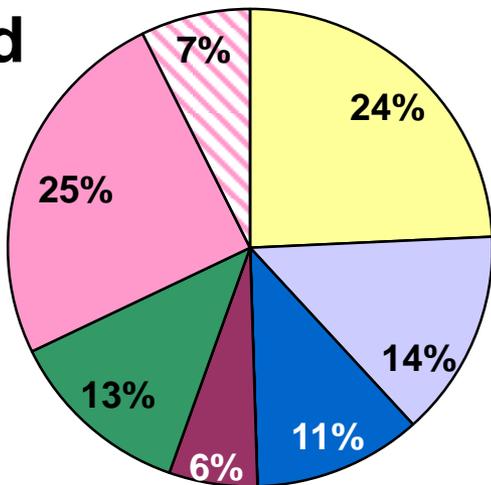


- Consumer Products (ROG) / Geologic Dust (PM2.5)
- On-Road (cars, trucks, etc.)
- Off-Road (construction, ships, trains, etc.)
- Evaporation (paints, fuels, solvents)
- Refinery (processes and combustion)
- Other Industrial / Commercial
- Combustion (residential)
- Combustion (industrial)



ROG: 258 tpd

NOx: 291 tpd

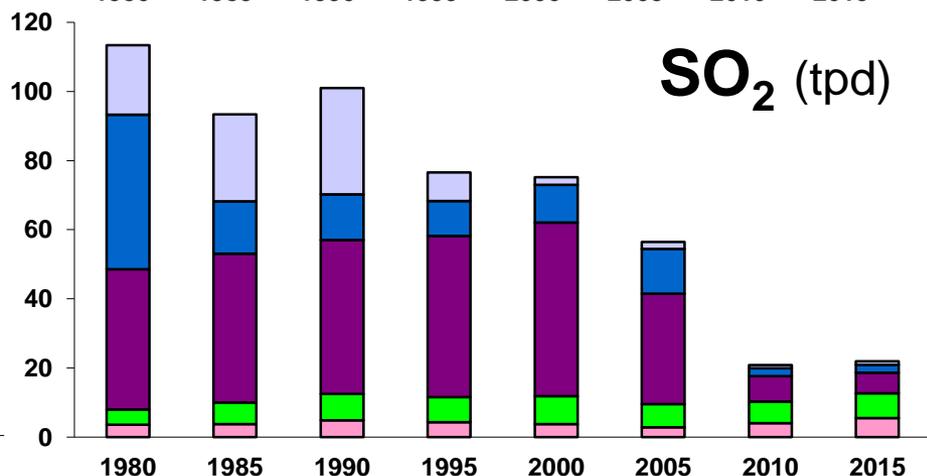
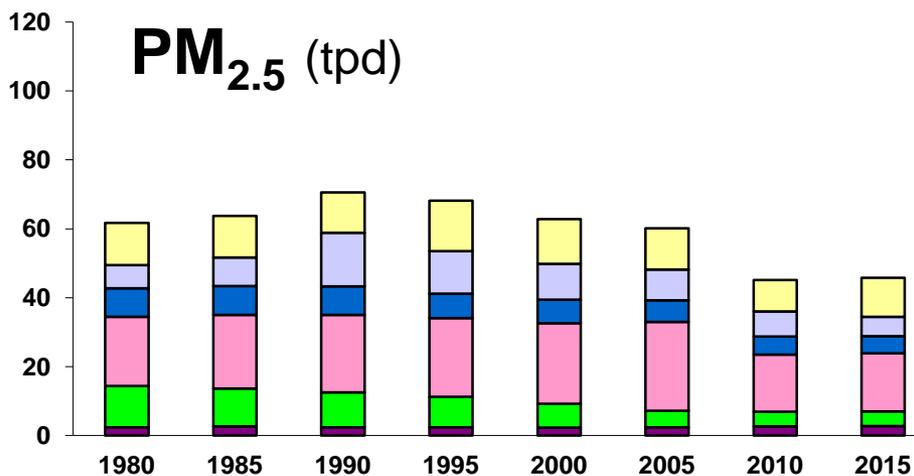
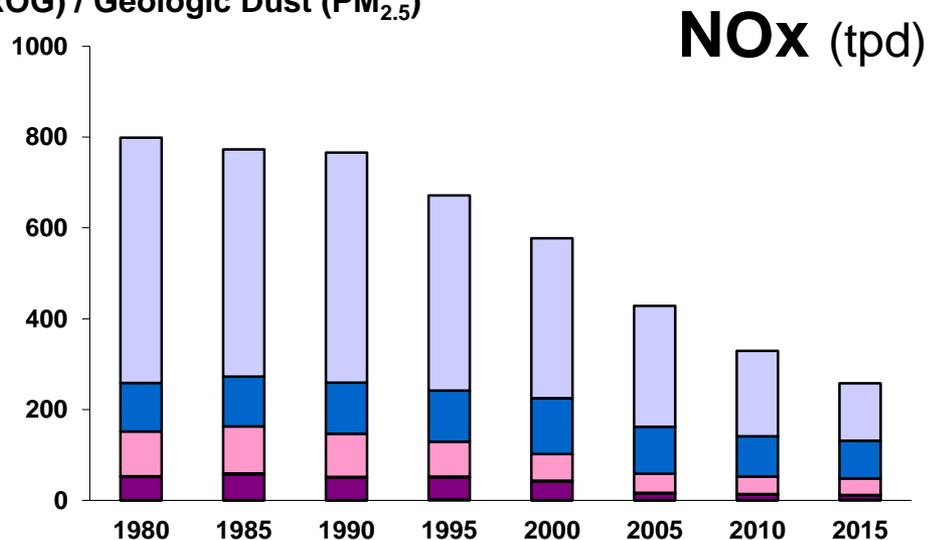
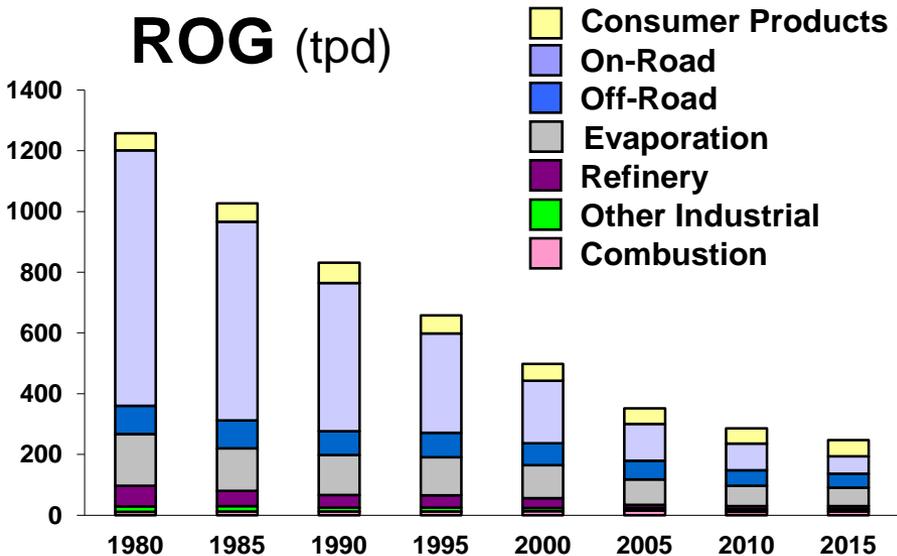


PM2.5: 47 tpd

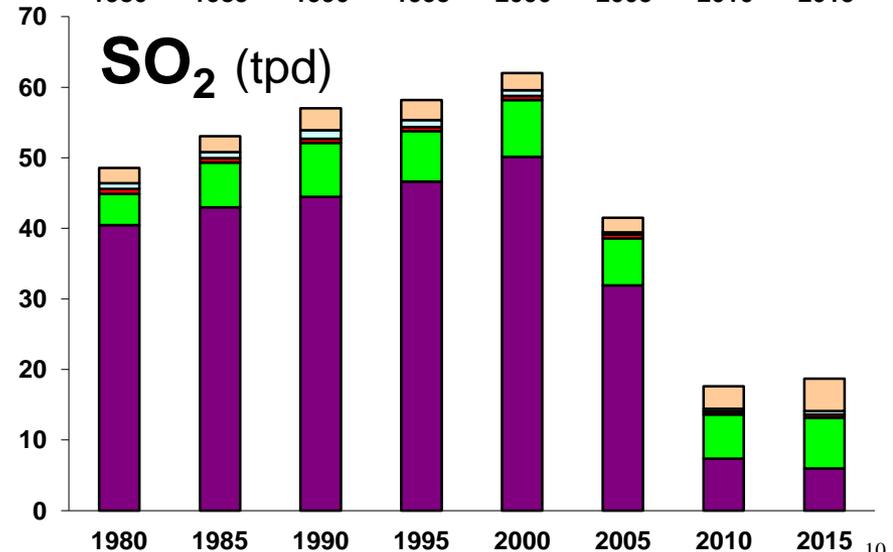
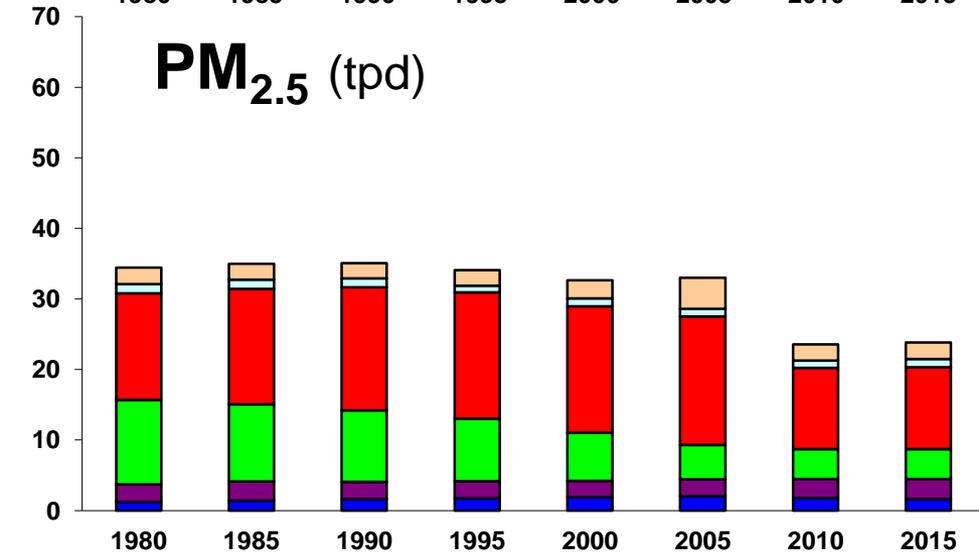
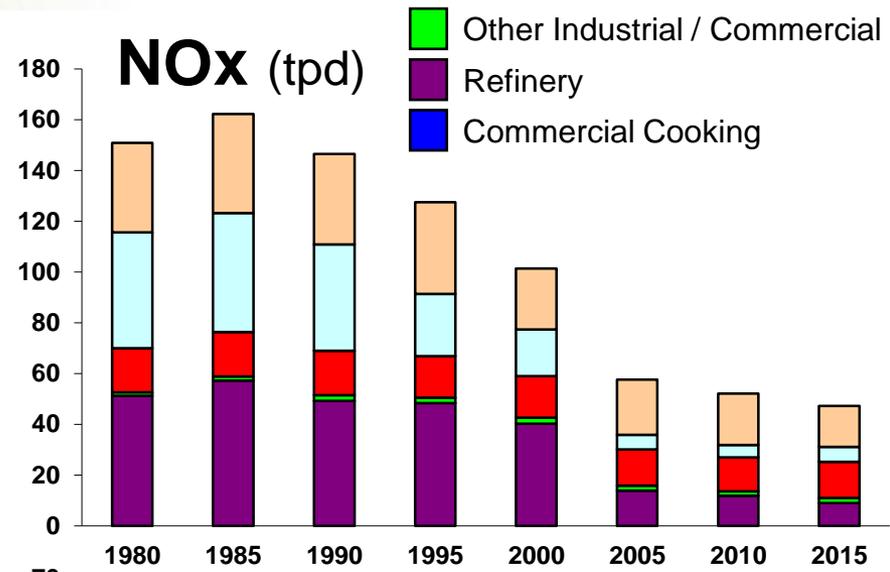
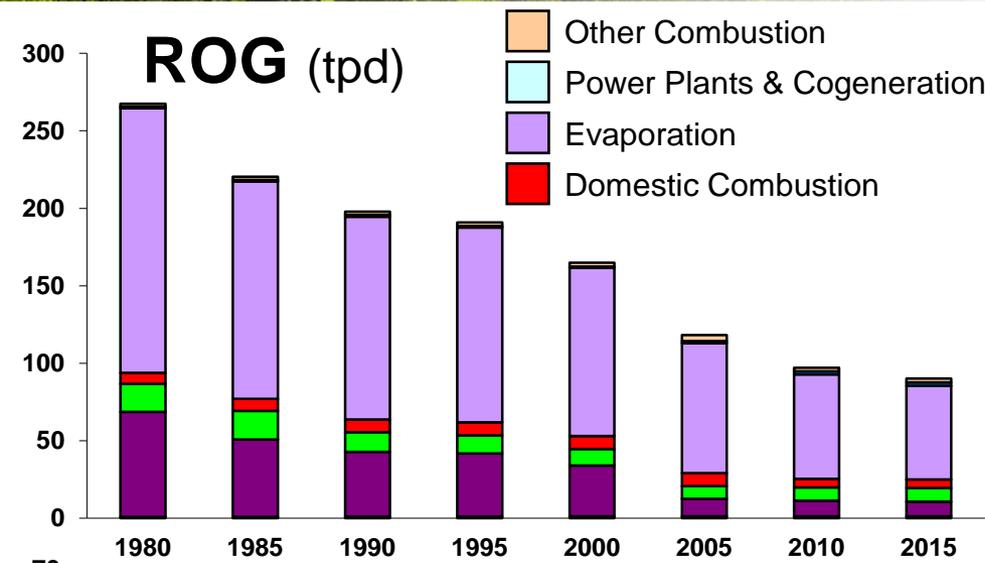
SO2: 22 tpd



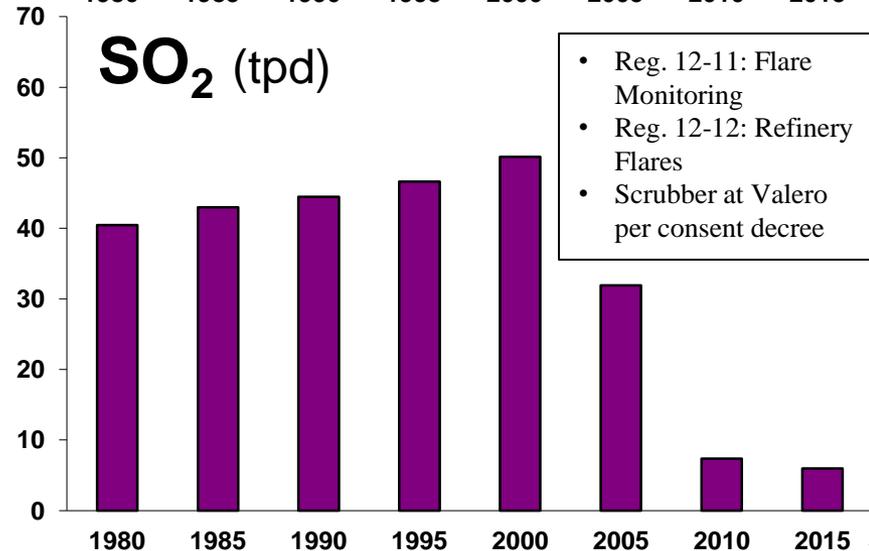
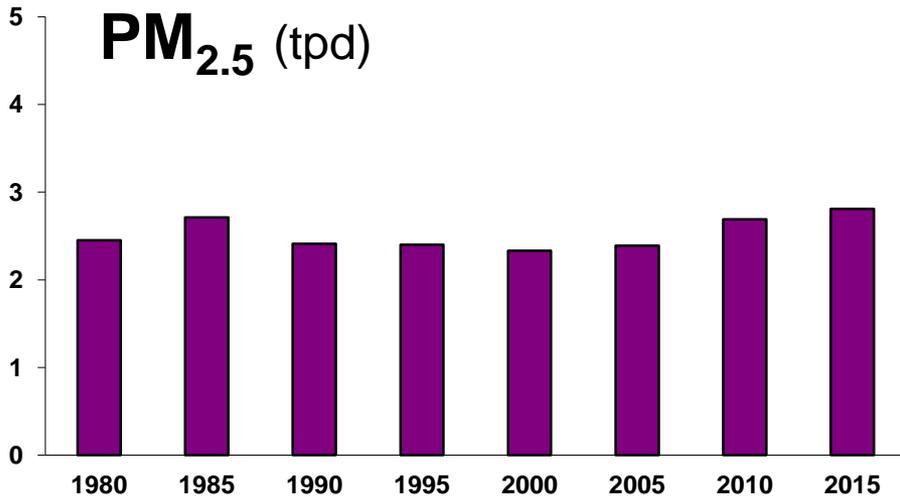
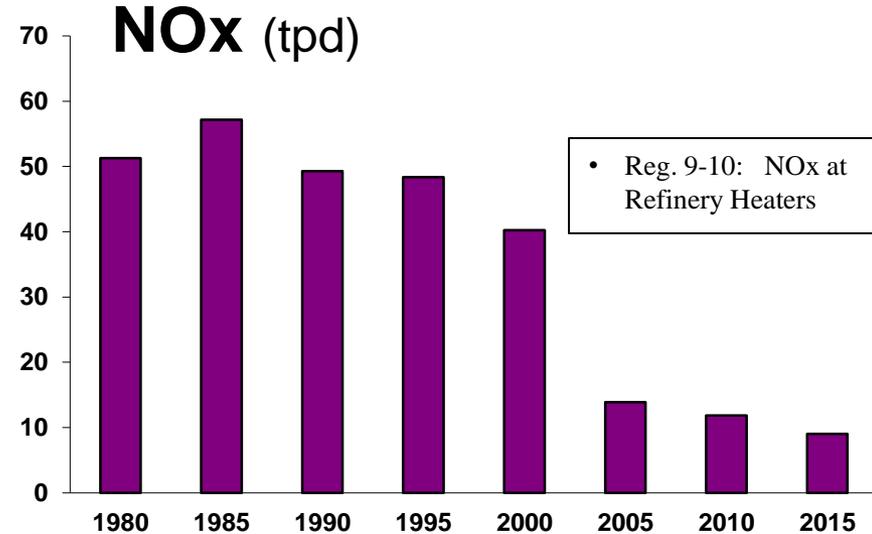
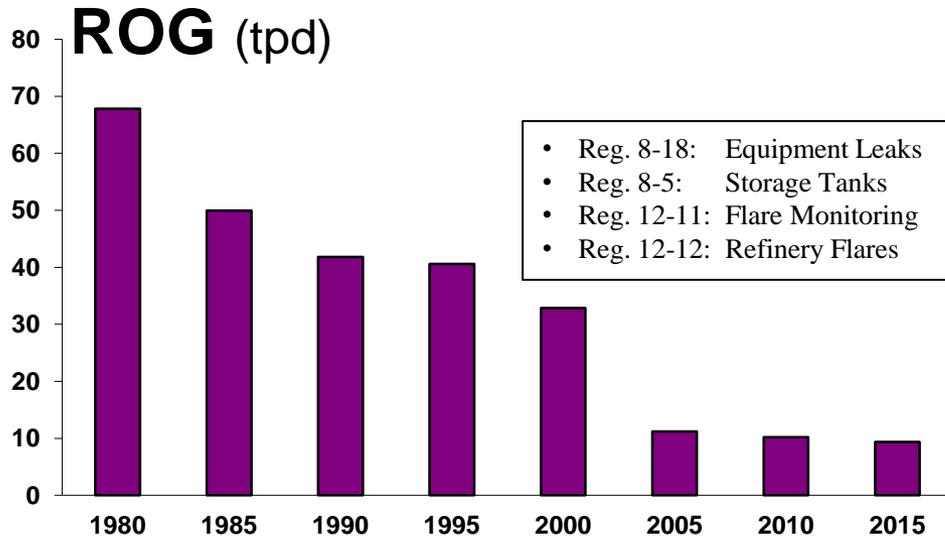
All Source Emission Trends 1980-2015



Stationary Source Emission Trends 1980-2015

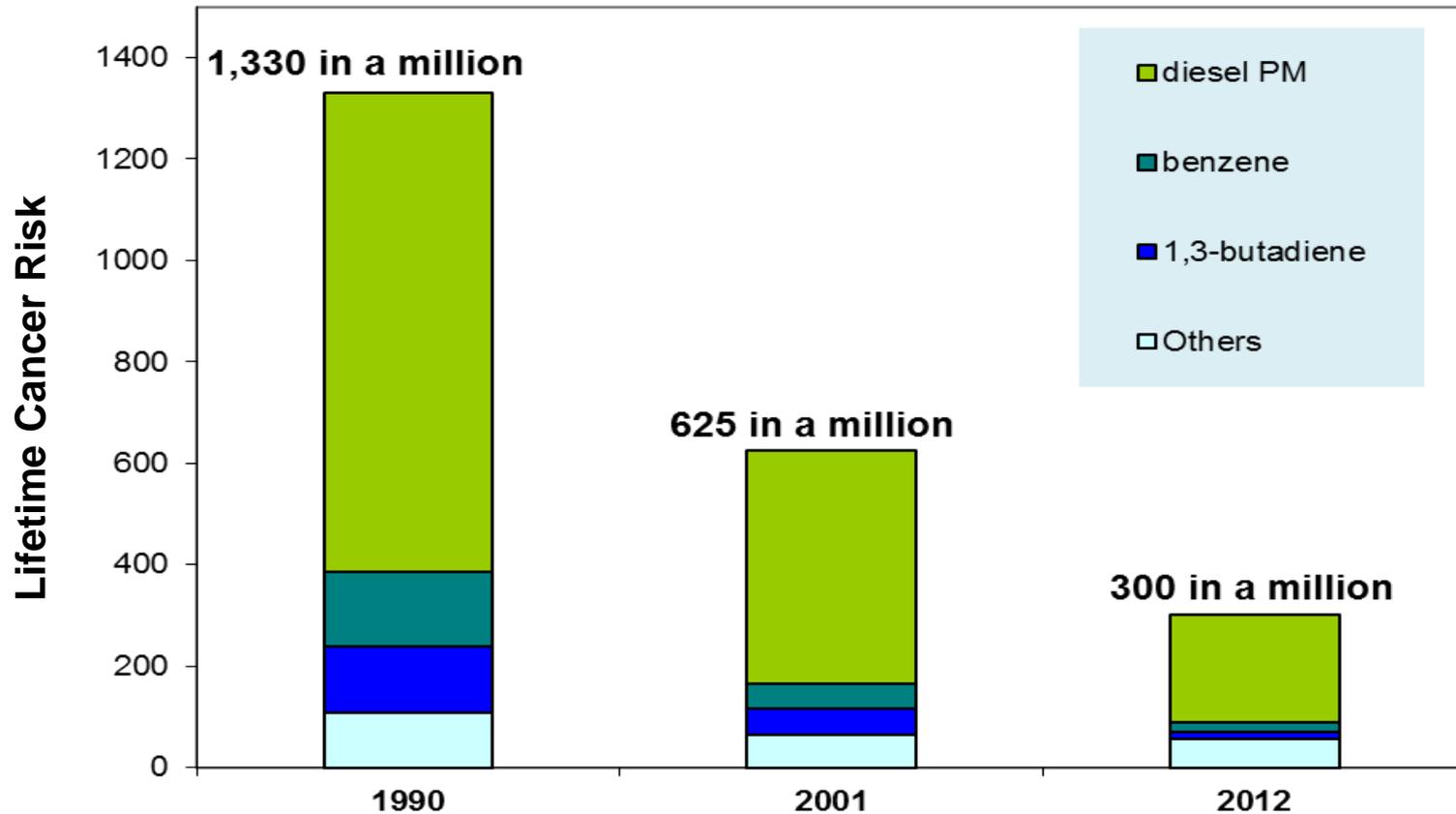


Refinery Emission Trends 1980-2015 and Main Causes of Reductions

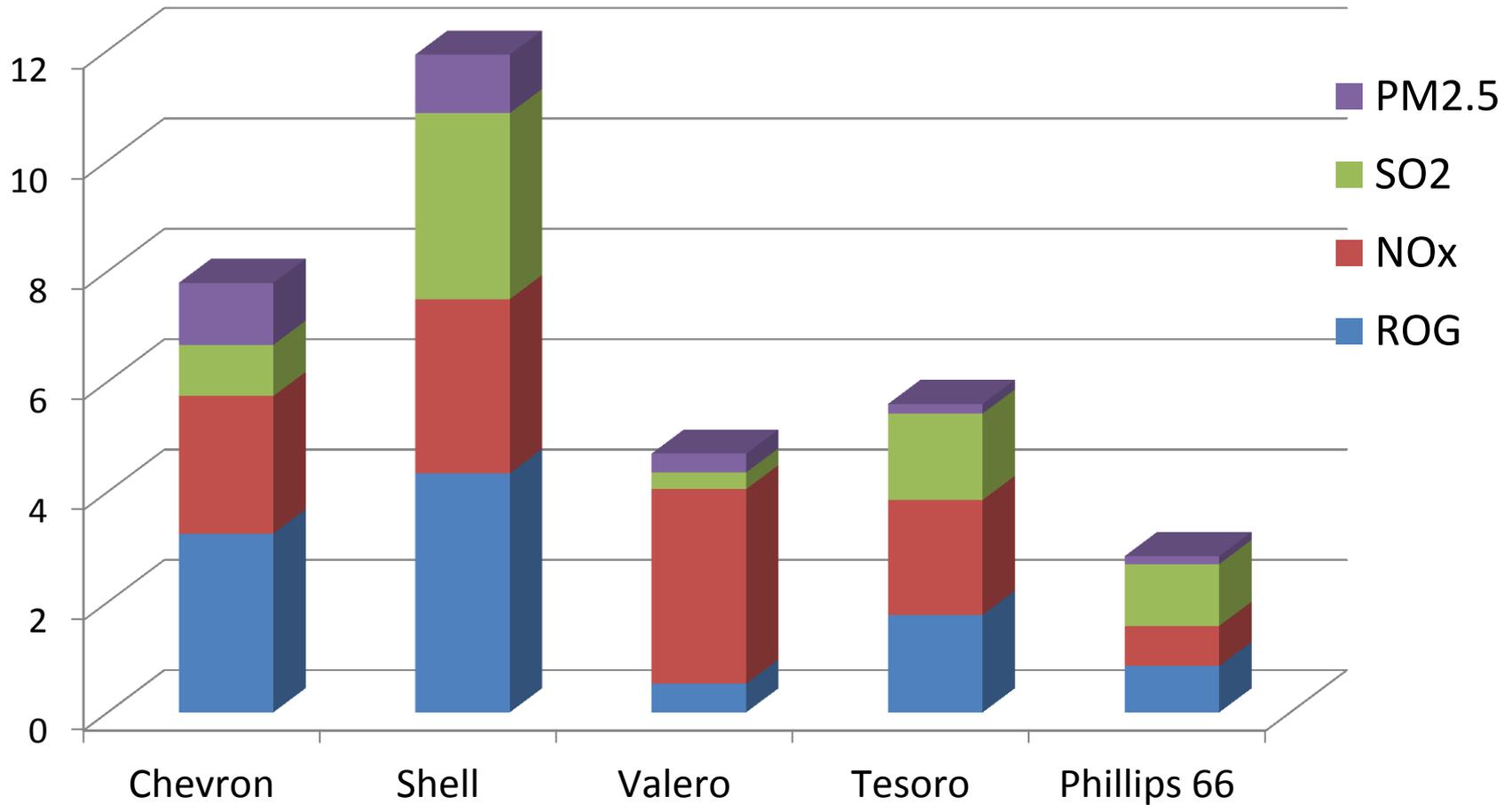


Risk from Toxic Air Contaminants Declining in the Bay Area

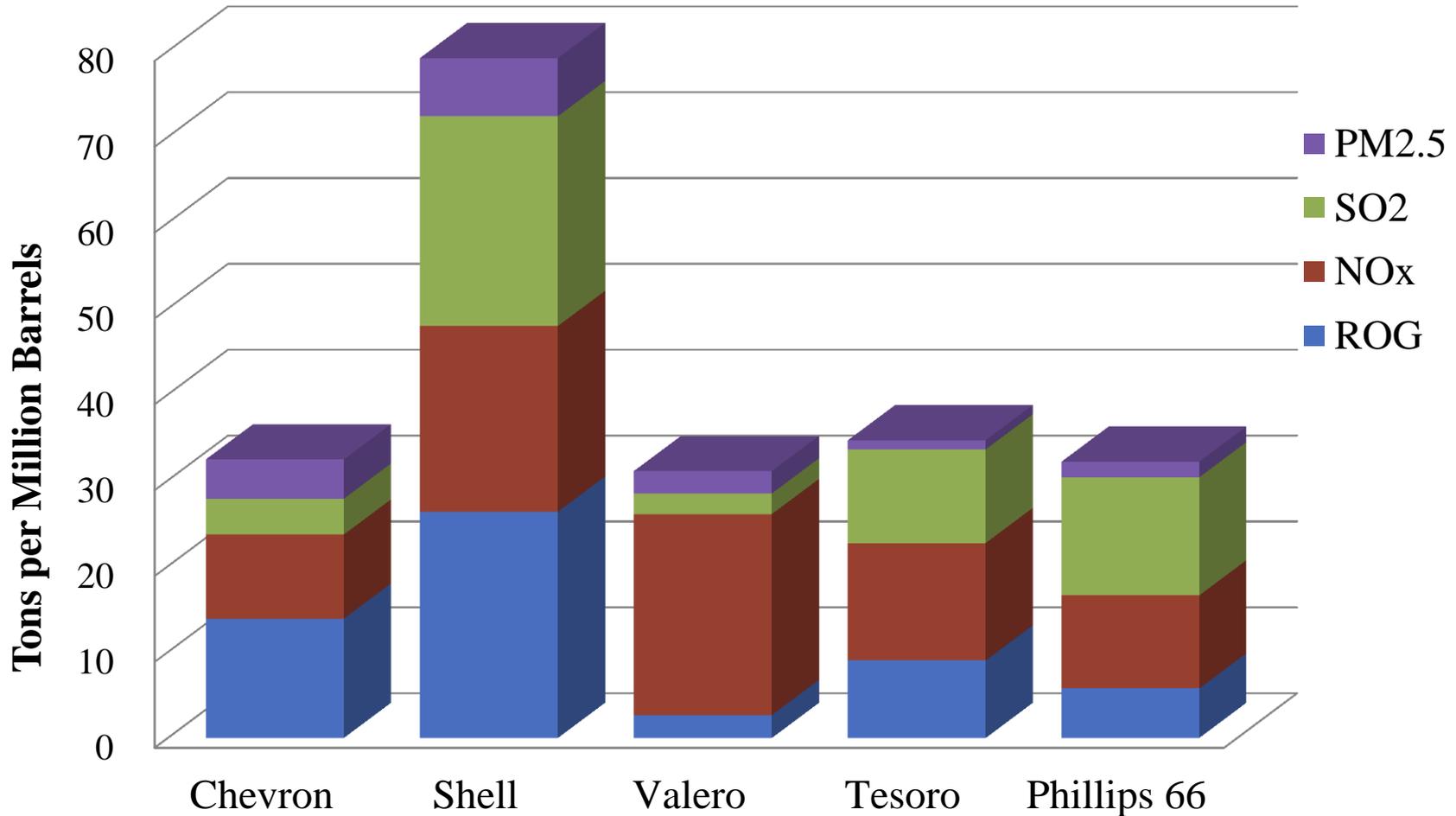
Measurement-based Trends



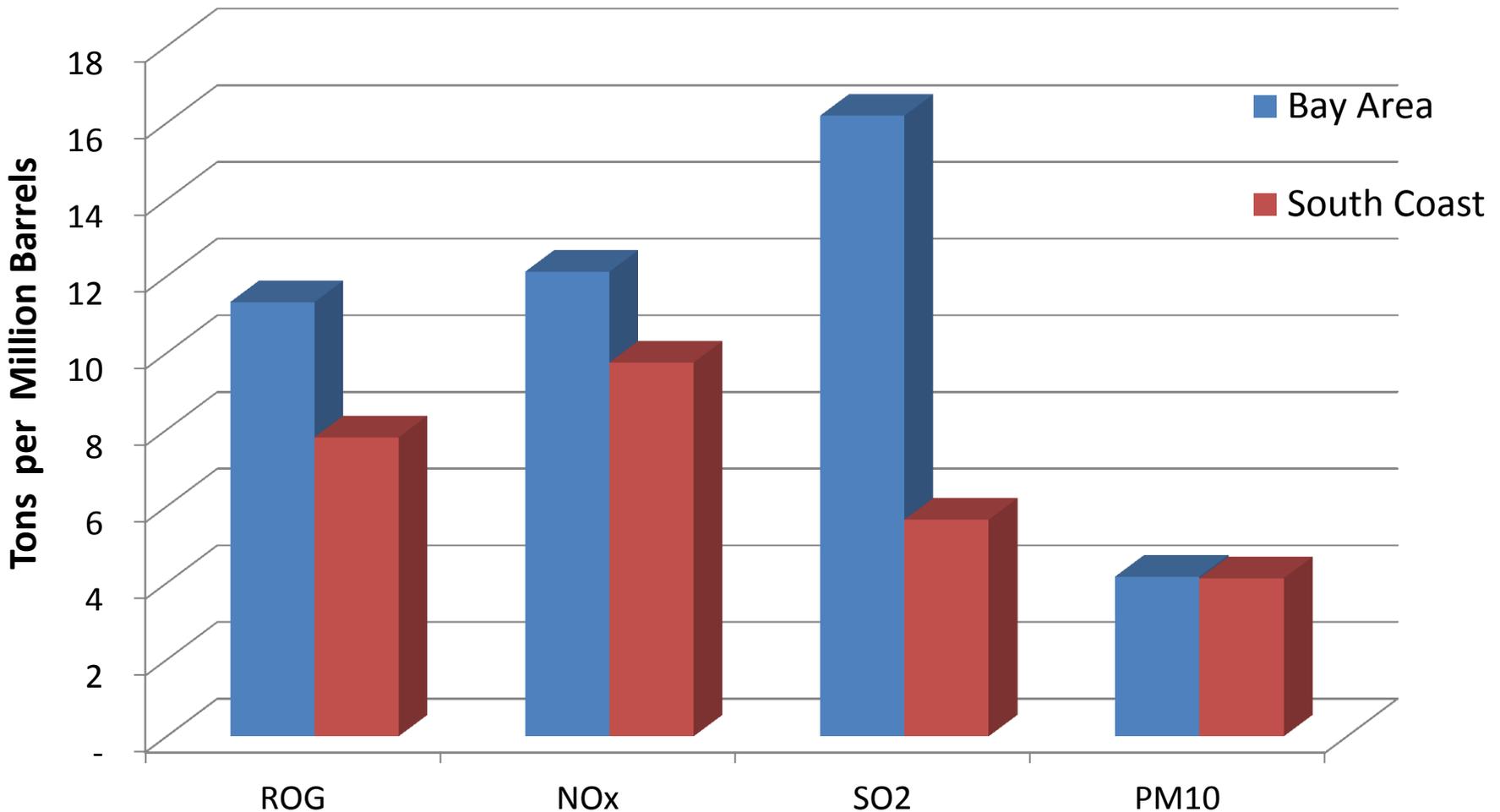
Bay Area Refinery Emissions 2012 (tons/day)



Bay Area Refinery Emissions per Production Capacity, 2012



Bay Area vs. South Coast Refinery Emissions per Production Capacity, 2010



Comparing South Coast and Bay Area Refineries

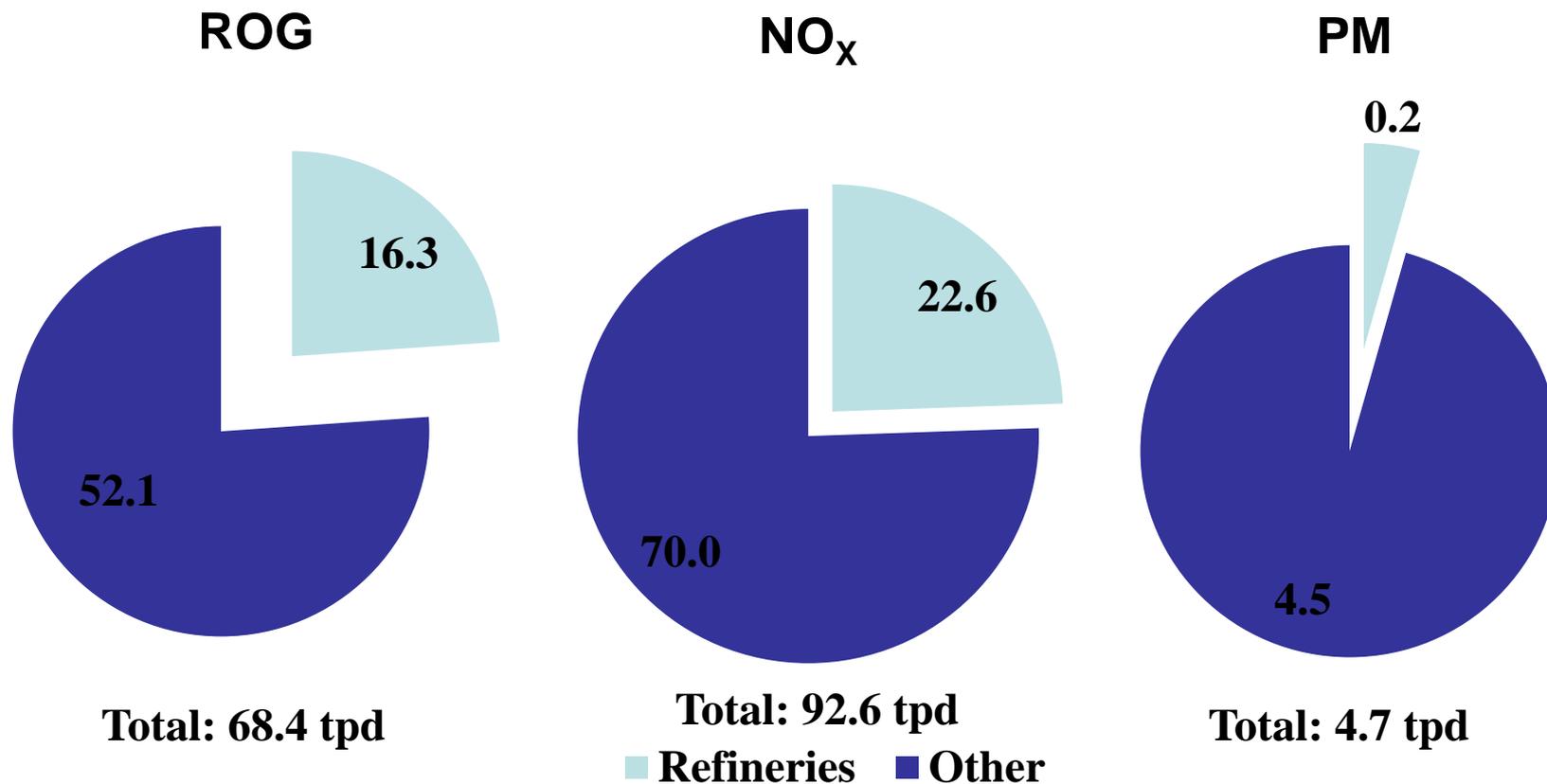
Pollutant	Comparison	Comments
NO _x	Bay Area emissions are <u>generally higher</u> . With some refineries performing better than others.	South Coast is an extreme ozone nonattainment area. As a result, NO _x requirements on all sources are more stringent in South Coast.
SO _x	Bay Area emissions are <u>consistently higher</u> . However, emissions at the Valero Benicia refinery are very low.	South Coast PM-2.5 strategy includes aggressive SO ₂ controls.
ROG	There appears to be <u>no significant, consistent pattern</u> . Some Bay Area refineries are high emitters and some South Coast refineries are high emitters.	Further investigation on this issue is required, due to differences in how ROG emissions are calculated and reported.
PM	Insufficient data.	There are significant differences between how PM is calculated and reported in each district, making it difficult to compare.
Toxics	Insufficient data.	There are significant differences between how toxics are calculated in each district, making it difficult to compare.

Board Actions Requiring Emissions Reductions at Refineries 1992-2013

Date	Reg.-Rule	Description	Pollutant
3/92, 1/98, 11/02, 1/04	8-18	Equipment leaks at refineries	ROG
3/92	8-22, 8-25	Leaks from valves and flanges	ROG
1/93, 12/99, 10/06	8-5	Storage tanks	ROG
1/94, 12/10, 10/13	9-10	Boilers, steam generators, process heaters	NO _x
12/97, 3/98, 12/05	8-28	Leaks from pressure relief valves	ROG
6/03	12-11	Refinery flare monitoring	All
1/04	8-10	Process vessel depressurization	ROG
9/04	8-8	Refinery wastewater separators	ROG
7/05, 4/06	12-12	Refinery flares	All
12/05	8-44	Marine loading operations	ROG
7/07	9-8	Stationary internal combustion engines	NO _x , PM
4/09	8-33, 8-39	Gasoline bulk terminals	ROG
4/10	8-53	Marine loading operations	ROG

Emissions Reductions from Air District Rules 1992-2013

Stationary Source Emissions Reductions from Air District Rules 1992-2013 [tons per day]





2015 Clean Air Plan Preliminary Draft Control Measures & Further Study Measures for Refineries

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Mitigating emissions increases at refineries	Ensure refinery emissions do not increase	Rulemaking underway
Reduce SO ₂ from coke calciners	Reduce SO ₂ emissions	Rulemaking underway
PM from Fluid Catalytic Cracking Units	Reduce condensable PM and precursor emissions	Rulemaking underway
Further reduce equipment leaks (tanks, valves, other)	Reduce ROG and toxic emissions	Draft control measure for 2015 Clean Air Plan (CAP)
Limit sulfur content of refinery fuel gas	Reduce SO ₂ emissions at some refineries	Draft control measure for 2015 CAP
Further reduce flaring	Reductions in all pollutants	Further study measure for 2015 CAP
Review of SO ₂ emissions from refineries	Determine if substantial SO ₂ reductions are available	Further study measure for 2015 CAP
Further reduce NO _x	Determine if substantial NO _x reductions are available	Further study measure for 2015 CAP



Summary and Next Steps

- Significant emissions reductions have been achieved in the Bay Area, Bay Area air quality has improved
- Increased focus on fine particulate
 - Smaller particles (TSP > PM10 > PM2.5 > ultrafine)
 - More complex sources – secondary PM and condensable PM
- Continuing challenges
 - Low hanging fruit is gone
 - State and national AQ standards regularly revised, tightened
 - Local areas with high pollution exposure, poor health outcomes
 - GHGs
- Each refinery is unique
- Refinery emissions will continue to be focus of District rulemaking and analysis

Summary of Ozone Seasons

Year	National 8-Hour	State 1-Hour	State 8-Hour
2011	4	5	10
2012	4	3	8
2013	3	3	3
2014	5	3	10

Spare the Air Alerts: 5/12, 5/13, 5/14, 6/8, 6/9, 7/25, 8/1, 9/11, 9/12, 10/3

Days > 0.075 ppm 8-hour NAAQS: 4/30, 5/1, 5/14, 10/4, 10/5