Bay Area Air Quality Management District

COUNCIL MEETING

December 3, 2015

BAY AREA AIR QUALITY MANAGEMENT DISTRICT

Welcome

Jack P. Broadbent

Executive Officer / APCO

Brown Act Requirements

Brian Bunger
General Counsel

Public Comment on Agenda Items

Council Members Self-Introductions

Election of Officers

Chair
Vice Chair

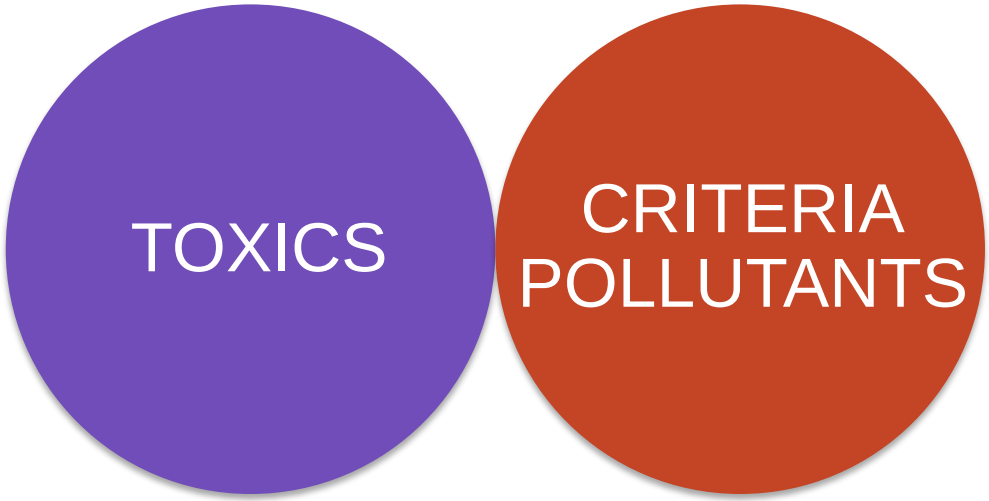
Council Charter

Air District Overview

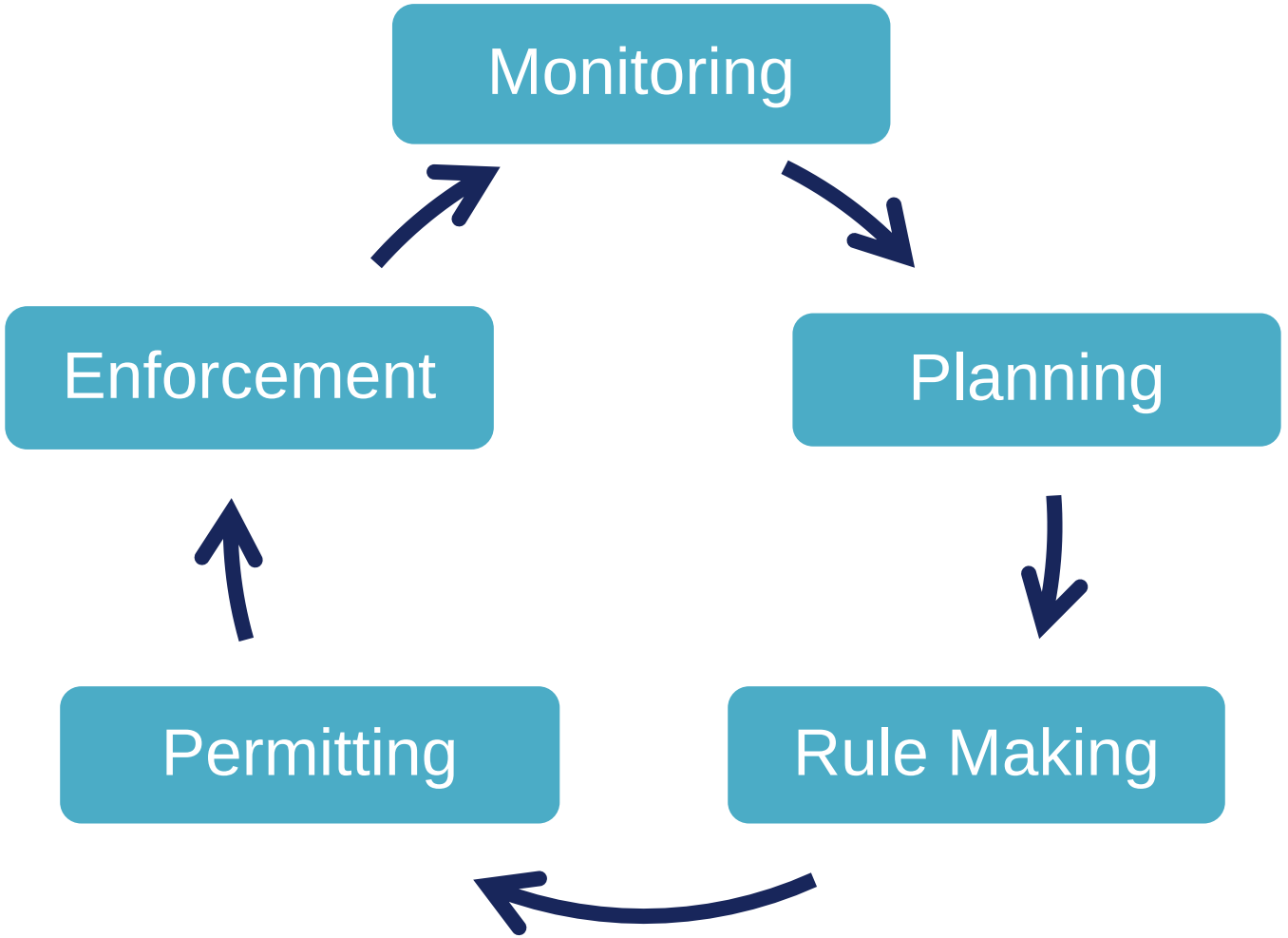
Bay Area Air Quality Management District (BAAQMD)

- Established in 1955
- 100+ cities
- 7 million people
- 5 million vehicles
- Mission: To protect and improve public health, air quality, and the global climate

Two Broad Categories of Pollutants

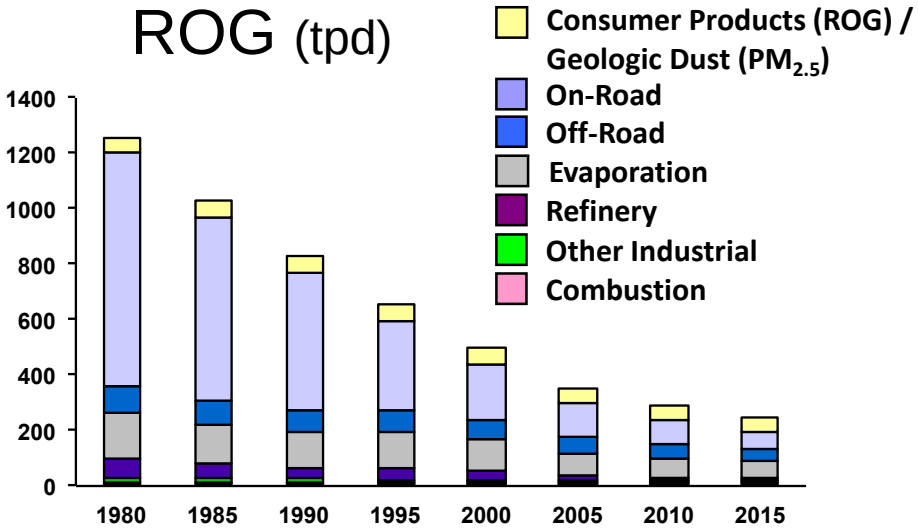


Functional Organization

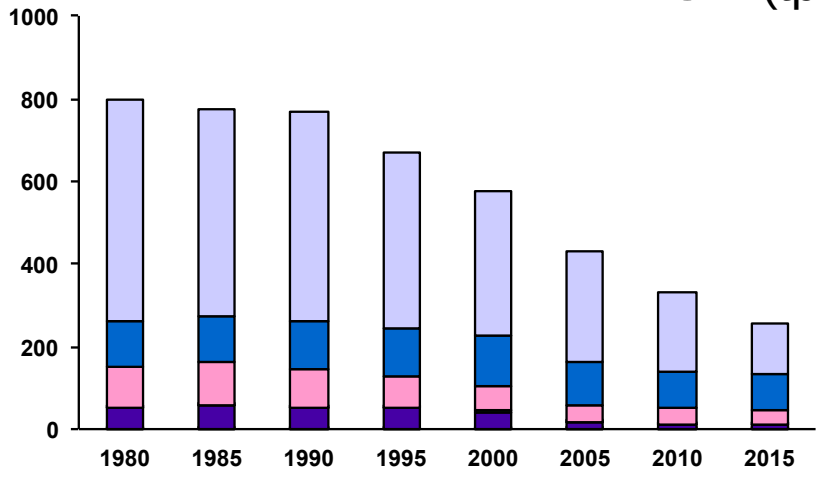


All Source Emission Trends 1980-2015

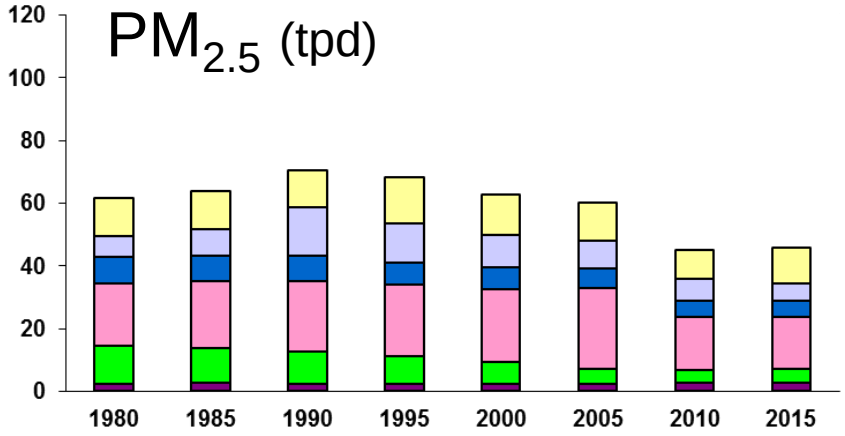
ROG (tpd)



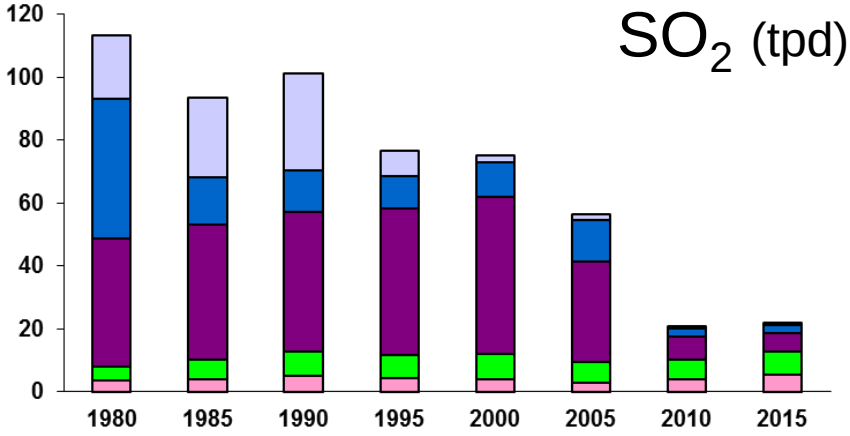
NOx (tpd)



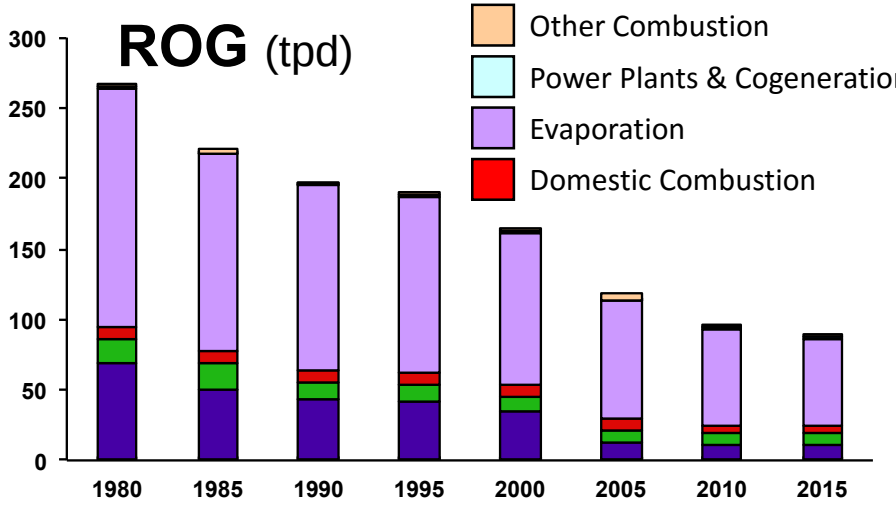
$PM_{2.5}$ (tpd)

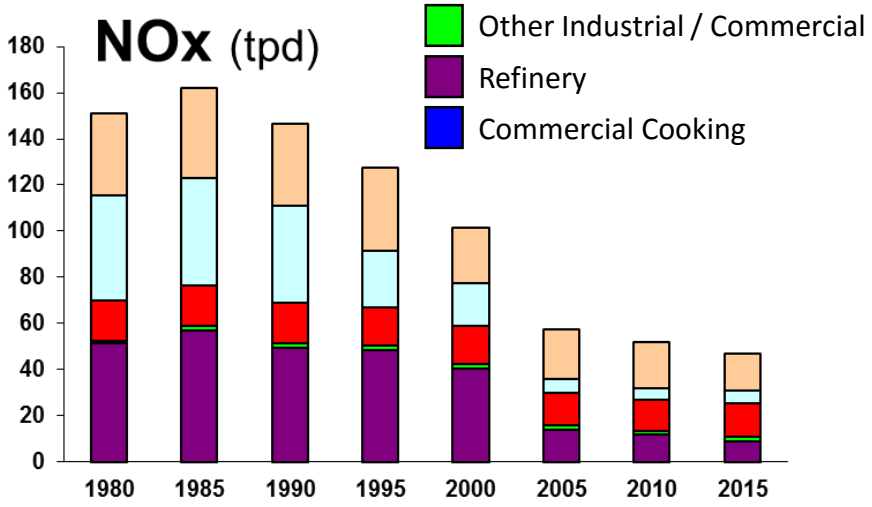


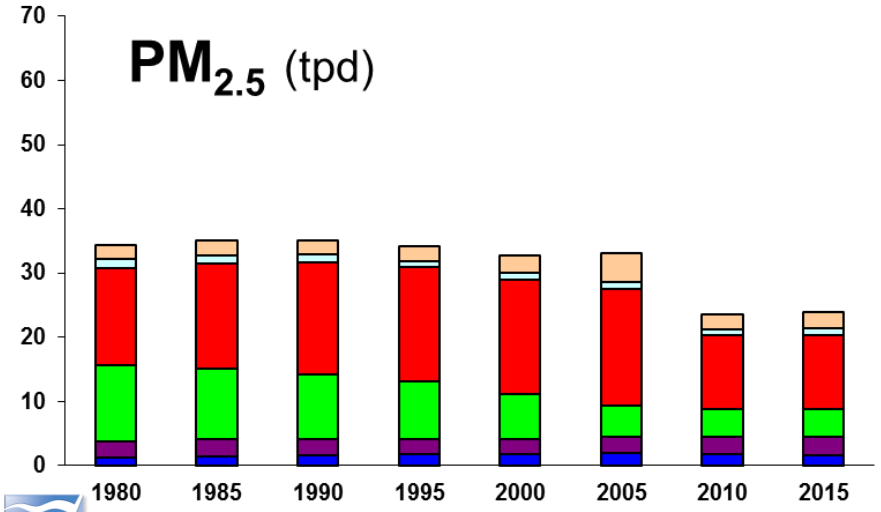
SO_2 (tpd)

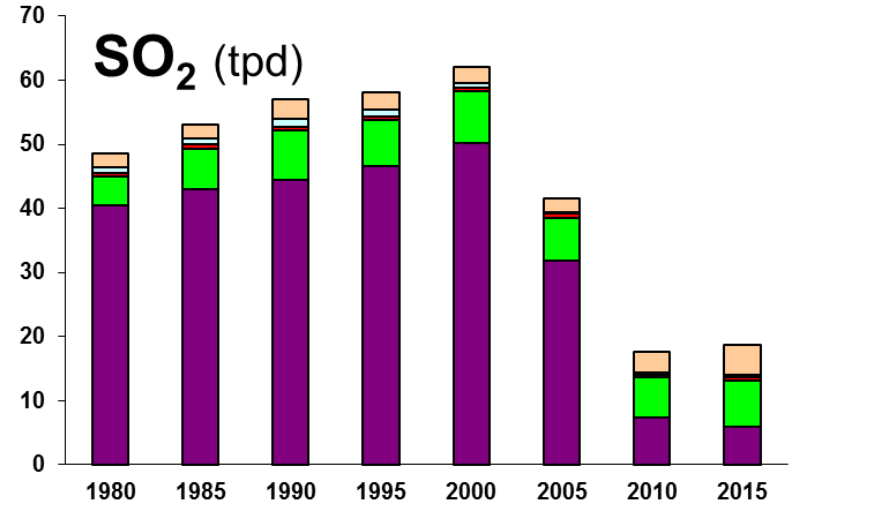


Stationary Source Emission Trends 1980-2015





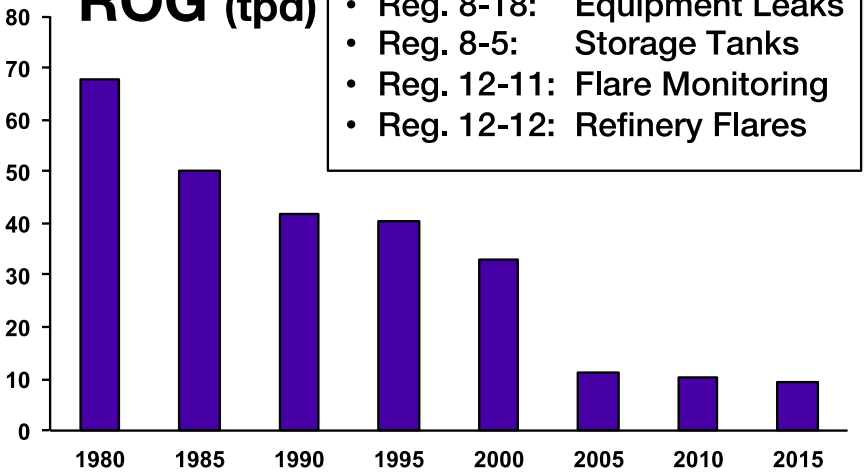




Refinery Emission Trends 1980-2015 and Main Causes of Reductions

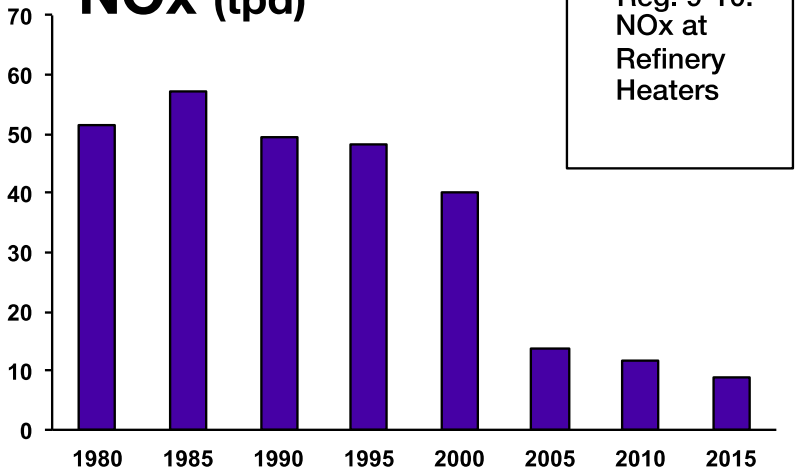
ROG (tpd)

- Reg. 8-18: Equipment Leaks
- Reg. 8-5: Storage Tanks
- Reg. 12-11: Flare Monitoring
- Reg. 12-12: Refinery Flares

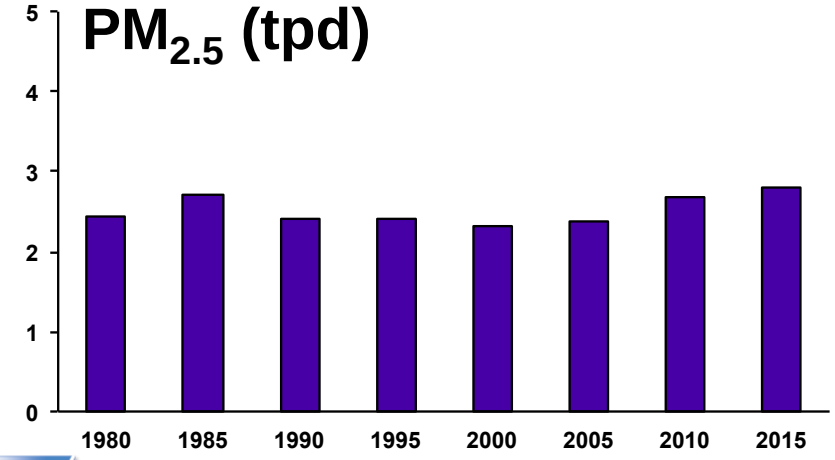


NOx (tpd)

- Reg. 9-10: NOx at Refinery Heaters

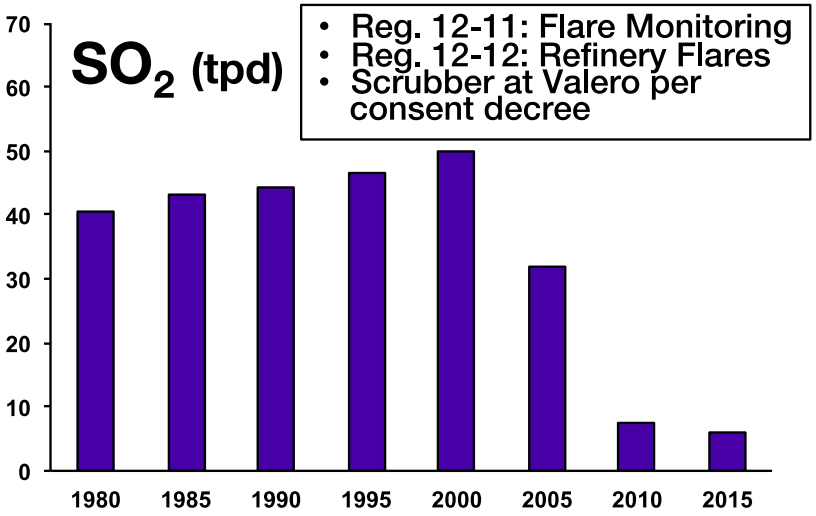


$PM_{2.5}$ (tpd)

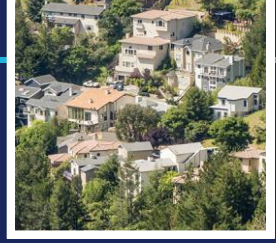


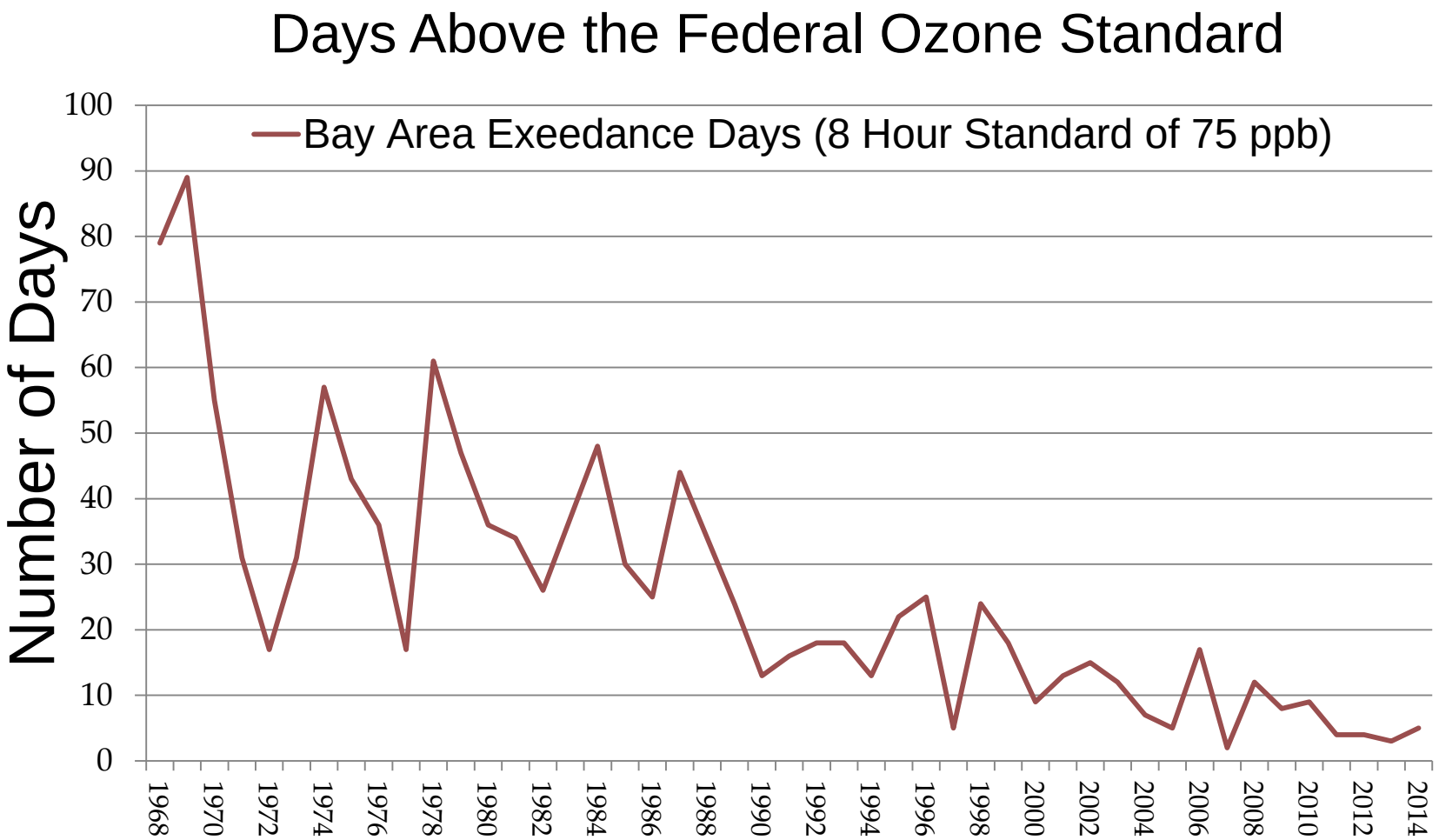
SO_2 (tpd)

- Reg. 12-11: Flare Monitoring
- Reg. 12-12: Refinery Flares
- Scrubber at Valero per consent decree



Bay Area Ozone Trends





National and State Standards

Pollutant	National Standard	National Secondary Standard	State Standard	Averaging Time
Carbon Monoxide Modified in 2011	9 ppm	None	9.0 ppm	8-hour
	35 ppm	None	20 ppm	1-hour
Lead Modified in 2010			1.5 $\mu g/m^3$	30 Day Average
	0.15 $\mu g/m^3$	Same as Primary		Rolling 3-Month Average
Nitrogen Dioxide Modified in 2011	53 ppb	Same as Primary	0.030 ppm	Annual (Arithmetic Average)
	100 ppb	None	0.18 ppm	1-hour
Sulfur Dioxide Modified in 2010	0.03 ppm	None		Annual (Arithmetic Average)
	0.14 ppm	None	0.04 ppm	24-hour
		0.5 ppm		3-hour
	75 ppb	None	0.25 ppm	1-hour
Particulate Matter (PM_{10})	150 $\mu g/m^3$	Same as Primary	50 $\mu g/m^3$	24-hour
			20 $\mu g/m^3$	Annual (Arithmetic Average)
Particulate Matter ($PM_{2.5}$)	15.0 $\mu g/m^3$	Same as Primary	12 $\mu g/m^3$	Annual (Arithmetic Average)
	35 $\mu g/m^3$	Same as Primary		24-hour
Ozone Modified in 2008	0.075 ppm	Same as Primary	0.070 ppm	8-hour
			0.09 ppm	1-hour

There are additional State Standards for visibility, sulfates, hydrogen sulfide and vinyl chloride

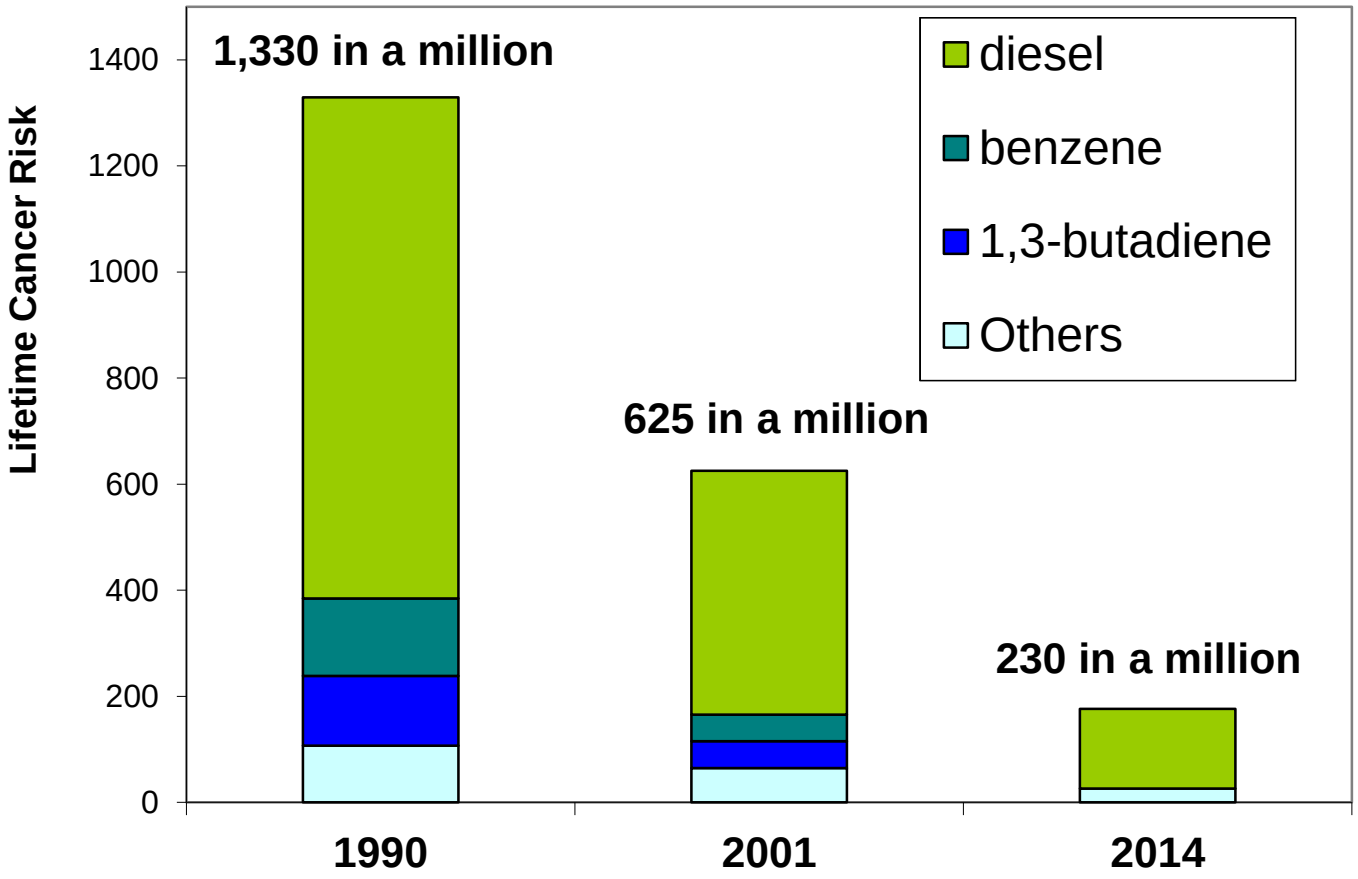
Attainment Status

	State Standard	Federal Standard
Ozone	Non Attainment	Non Attainment
PM_{10}	Non Attainment	Unclassified
$PM_{2.5}$	Non Attainment (Annual Average)	Non Attainment (24-hour Average)

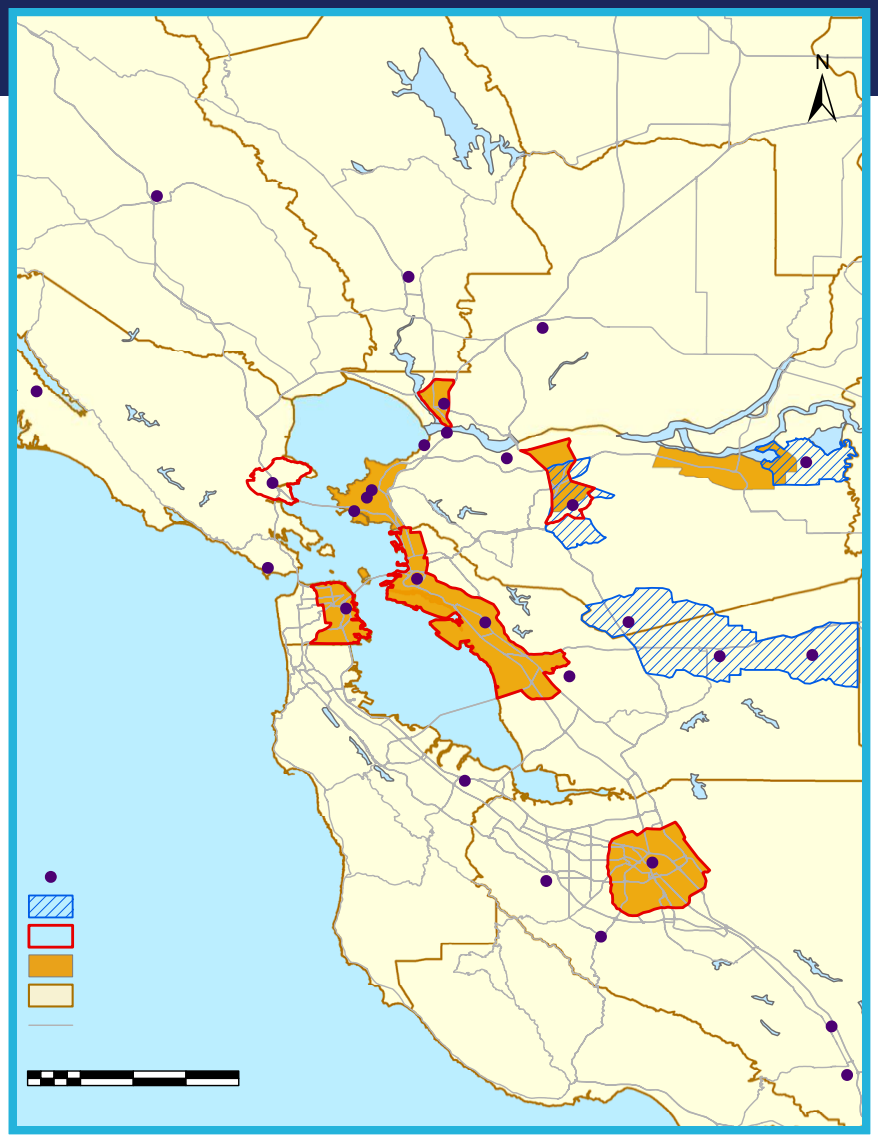
Attainment for National $PM_{2.5}$ (Annual), CO (Hourly and Annual), NO_2 (Annual)

Risk from Toxic Air Contaminants Declining in the Bay Area

Measurement-based Trends

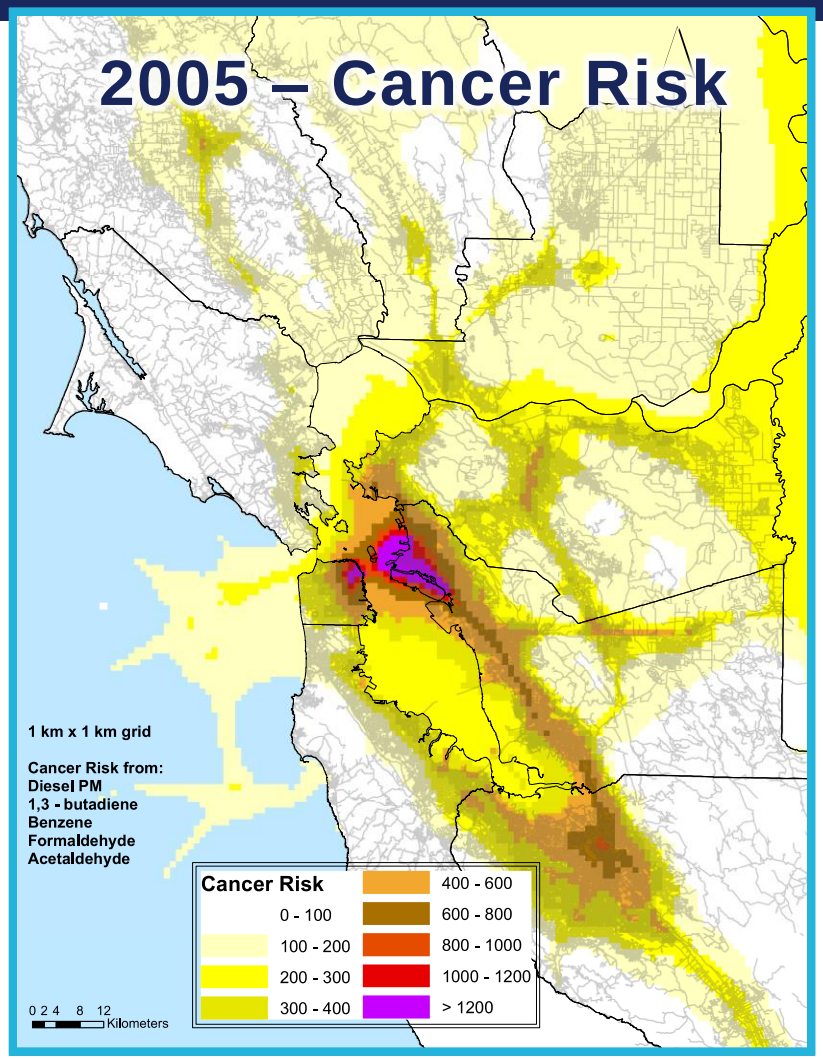


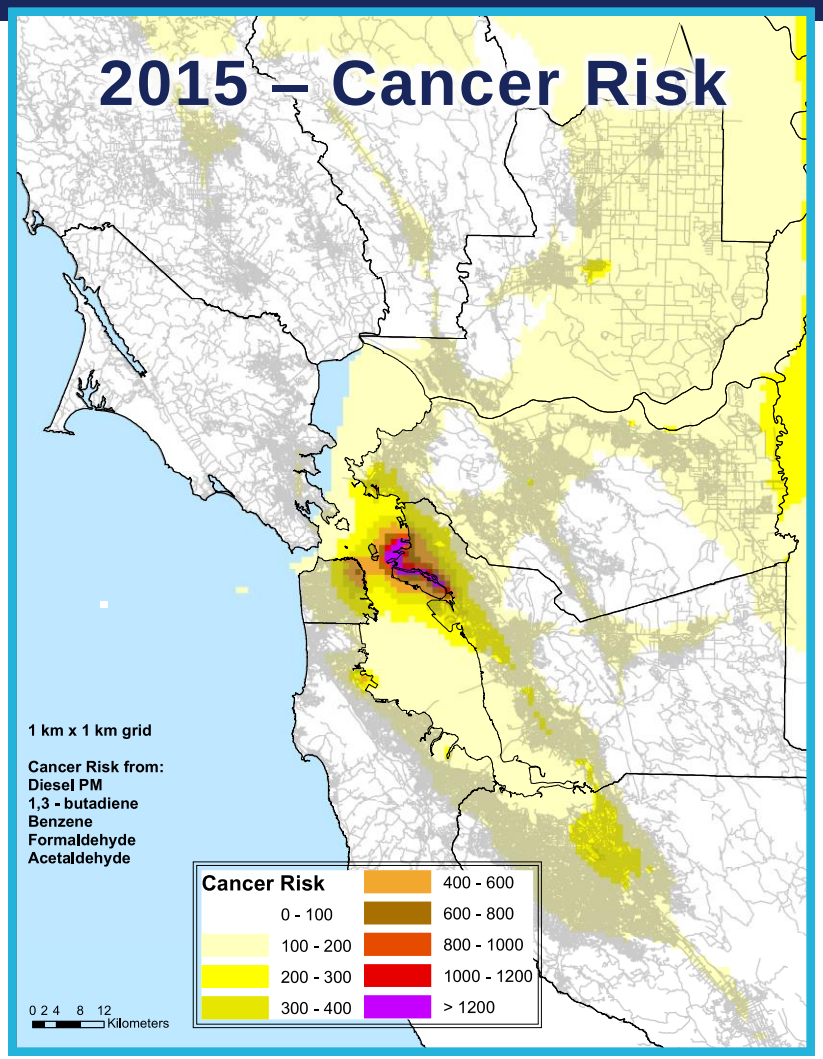
Impacted Communities



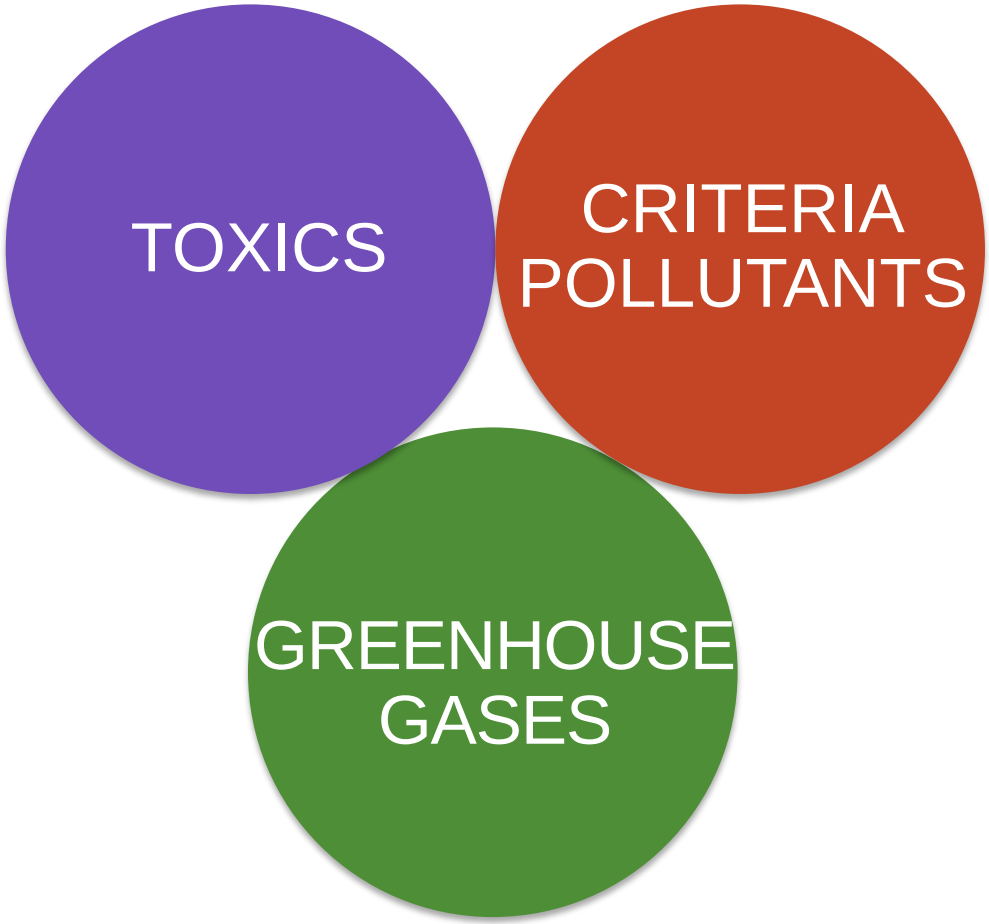
- Community Air Risk Evaluation (CARE) program maps impacted communities
- Cumulative impact areas support and focus localized mitigation activities
- Exceedance areas support and focus regional mitigation activities

Regional Modeling of Toxic Air Contaminants

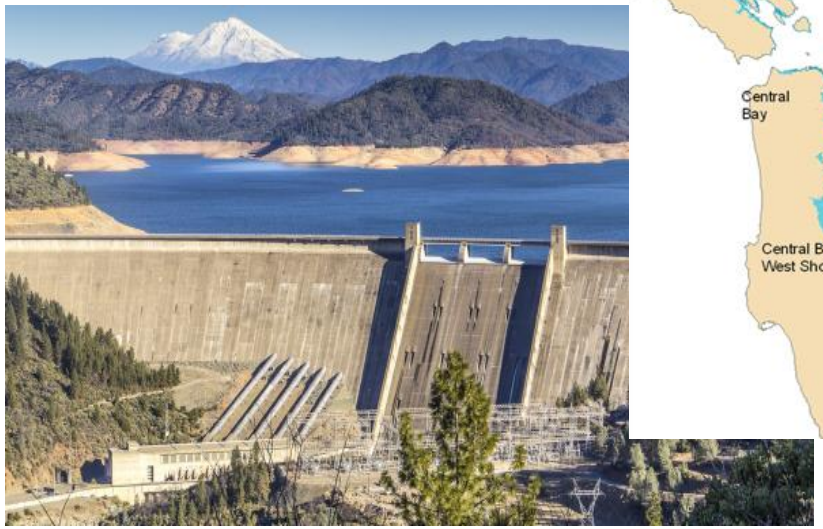


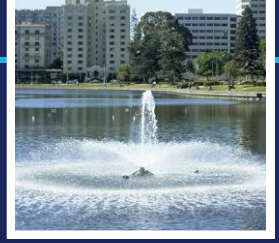


Local Districts' Role in Climate Change



Motivations for Climate Change Action in California





Legal Overview

Brian Bunger
General Counsel

Air Quality Problems

Criteria Pollutants

- Federal and California: ozone, carbon monoxide, nitrogen dioxide, sulfur dioxide, particulate matter, lead
- California only: sulfates, hydrogen sulfide, vinyl chloride

Air Toxics

- Federal: hazardous air pollutants (HAPs)
- California: toxic air contaminants (TACs)

Greenhouse Gases (GHGs)

Regulatory Framework

California Constitution

CA Legislature

California Clean Air Act
Health & Safety Code

U.S Constitution

U.S. Congress

Federal Clean Air Act

CARB

CARB Regulations

U.S. EPA

Code of Federal Regulations

Air Districts

District Regulations

Polluting Activities
(Stationary Sources)

Mobile Sources

District Authority

Primary responsibility: control of air pollution from sources other than motor vehicles

Powers to:

- Adopt and enforce regulations
- Require stationary source permits
- Adopt fees
- Adopt air toxic control measures
- Regulate nuisances
- Prohibit dark smoke
- Adopt state nonattainment plans
- Adopt regulations necessary to execute duties

Criteria Pollutant Control – Planning

Federal – federal attainment plans, e.g., 2001 Ozone Plan

- Must demonstrate attainment by a specified date
- Plan Components
  - Inventory
    - Man-made (“anthropogenic”): stationary sources, area sources, motor vehicles
    - Natural (background/non-anthropogenic)
  - Modeling
  - Control strategy
  - “Commitments” for all source types
- Penalties for failing to have plan
- Joint adoption with MTC

Criteria Pollutant Control – Planning

California – state attainment plans, e.g., 2010 Clean Air Plan

- Must demonstrate 5% reduction in nonattainment pollutant emissions per year averaged over three years OR that District will implement “every feasible measure”
- Plan components: stationary sources, transportation control measures, area/indirect
- To be updated triennially

Differences from federal

- Plan elements limited to those w/in District authority
- Continuous improvement rather than target dates
- Ranking of measures
- No citizen suit provisions

Criteria Pollutant Control – Regulations

Federal New Source Performance Standards

- Detailed industry-specific regulations establishing emissions limits for specific items of equipment
- Federal regulations directly applicable to sources

District-Implemented Regulations Required by Federal and California Clean Air Acts

- New Source Review Permit Program Requirements
- Specific Regulatory Actions Committed to by District in Attainment Plans

Additional District Regulatory Provisions

District Regulations

Substantive requirements

- BARCT
- Feasible measure
- Federal requirements if submitted into California state implementation plan

Procedural requirements

- Noticed hearing
- Analysis of overlapping requirements
- Socioeconomic impact analysis
- Incremental cost analysis
- Board must find that rule meets requirements of necessity, authority, clarity, consistency, nonduplication, and reference

Criteria Pollutant Control – Permits

Pre-Construction Permits

Pre-construction Permits for Major Sources

- New Source Review – for non-attainment pollutants
  - Lowest Achievable Emissions Rate ("LAER")
  - Emission Offsets – "No Net Increase" Requirement
- "Prevention of Significant Deterioration" – for attainment pollutants
  - Best Available Control Technology ("BACT")
  - Analysis of potential to cause violation of air quality standards

Pre-construction Permits for Non-major Sources

- Minor New Source Review
- Incorporates all other applicable regulatory requirements

Criteria Pollutant Control – Permits
Operating Permits & Equipment Registrations

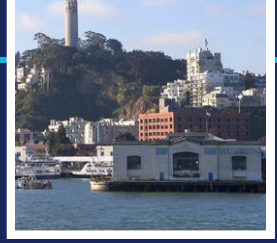
Operating Permit Requirements

- District “Permit to Operate”
  - Incorporates conditions from Authority to Construct
  - Applies to all sources, including existing sources
- “Title V” Operating Permit
  - Consolidates major facility permit requirements in a single document for transparency and ease of review
  - Can also require additional conditions to improve enforceability, e.g. enhanced monitoring

Equipment Registration Requirements for Certain Sources That Do Not Require Permits

- small boilers
- restaurant charbroilers

Air Toxics Control



Regulations

- Federal – source category toxics standards
  - Example – Refinery MACT
  - Example – Aluminum area source (Zzzzzz)
- California –
  - ARB air toxic control measures
  - Air district toxics measures
  - California Toxics Hot Spots Program

Permits

- Federal – Title V incorporates federal toxics requirements
- District – New Source Review of Toxic Air Contaminants

Greenhouse Gases

Federal – Permit requirements for large emitters:

- Requirements “tailored” to facilities over 100,000 MT/yr
- “Prevention of Significant Deterioration” pre-construction permits
- “Title V” Operating Permits

California – Various regulatory initiatives, including:

- ARB’s AB 32 implementation efforts (cap-and-trade, etc.)
- Utilities’ renewable energy portfolio standards (“RPS”)
- Motor vehicle tailpipe standards (“Pavley Bill”)

District – Permit fees based on GHG emissions

BREAK

First Key Question:

What is the efficacy of imposing numeric caps on Greenhouse Gas emissions from Bay Area refineries?

Overview of Petroleum Refining

Jim Karas
Director of Engineering

Agenda

Refinery Overview

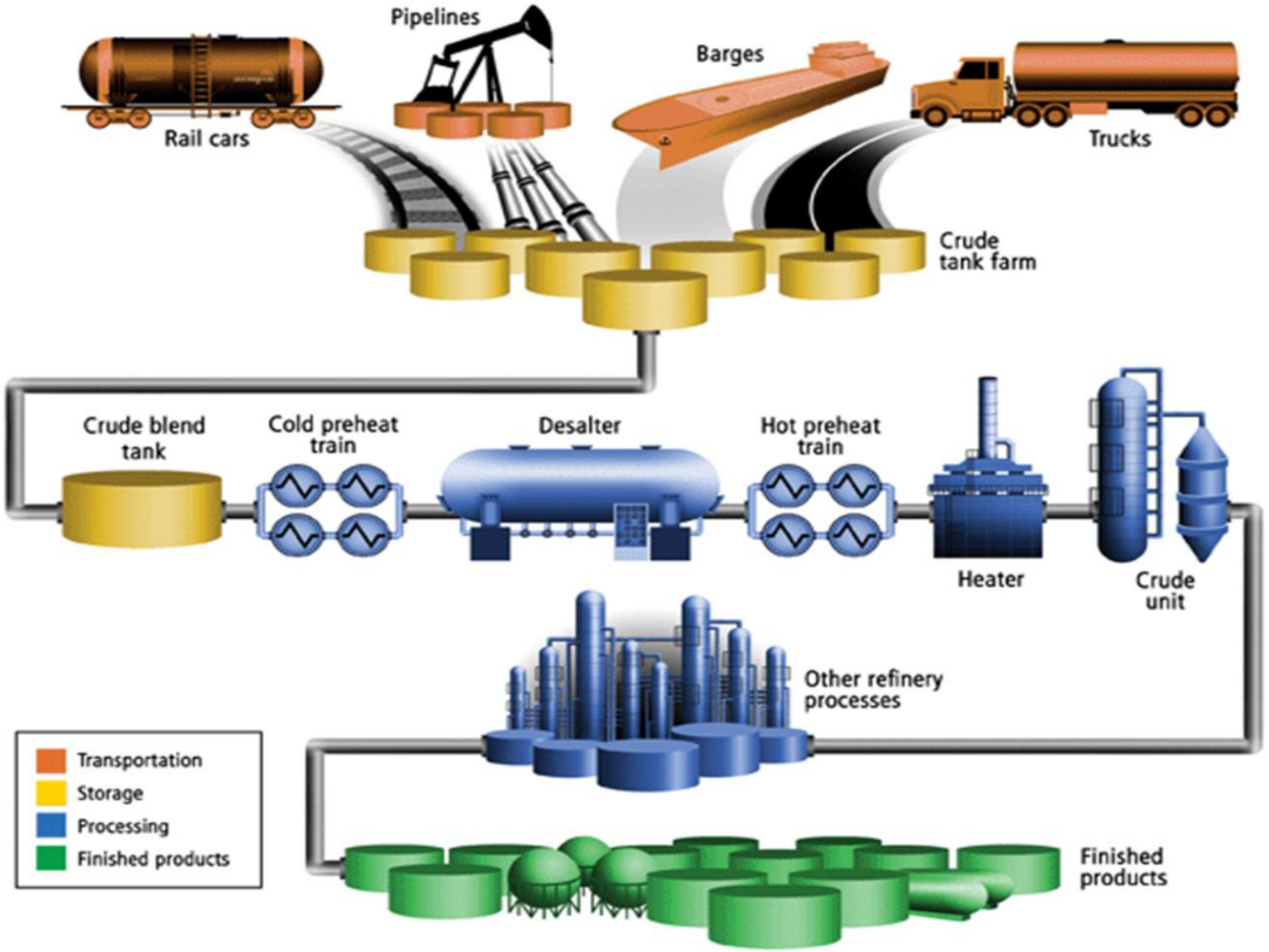
Refinery Crude Oil Overview

Refinery Products

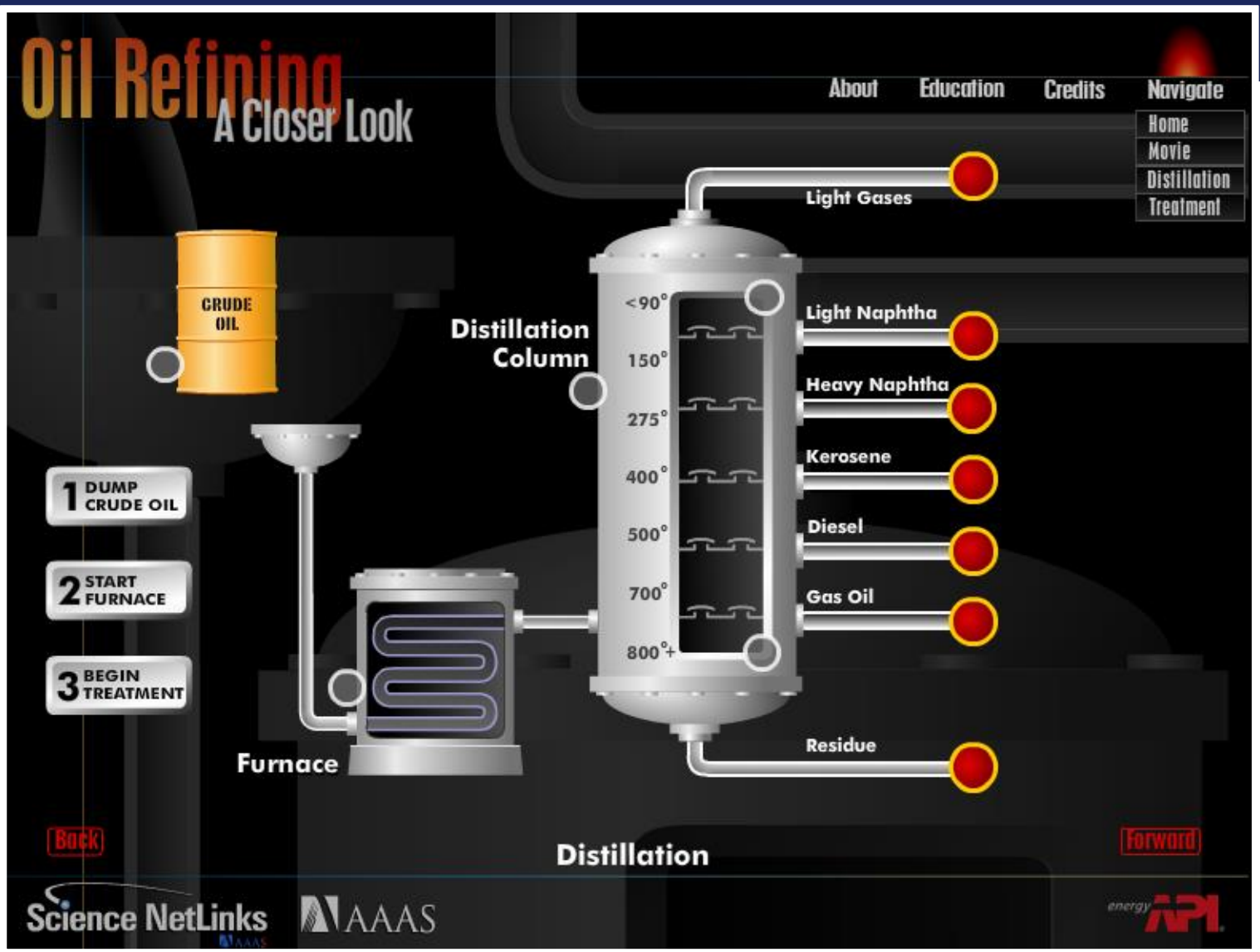
Refinery Emissions

Additional Resources

Refinery Overview



Crude Unit


Oil Refining
A Closer Look
About
Education
Credits
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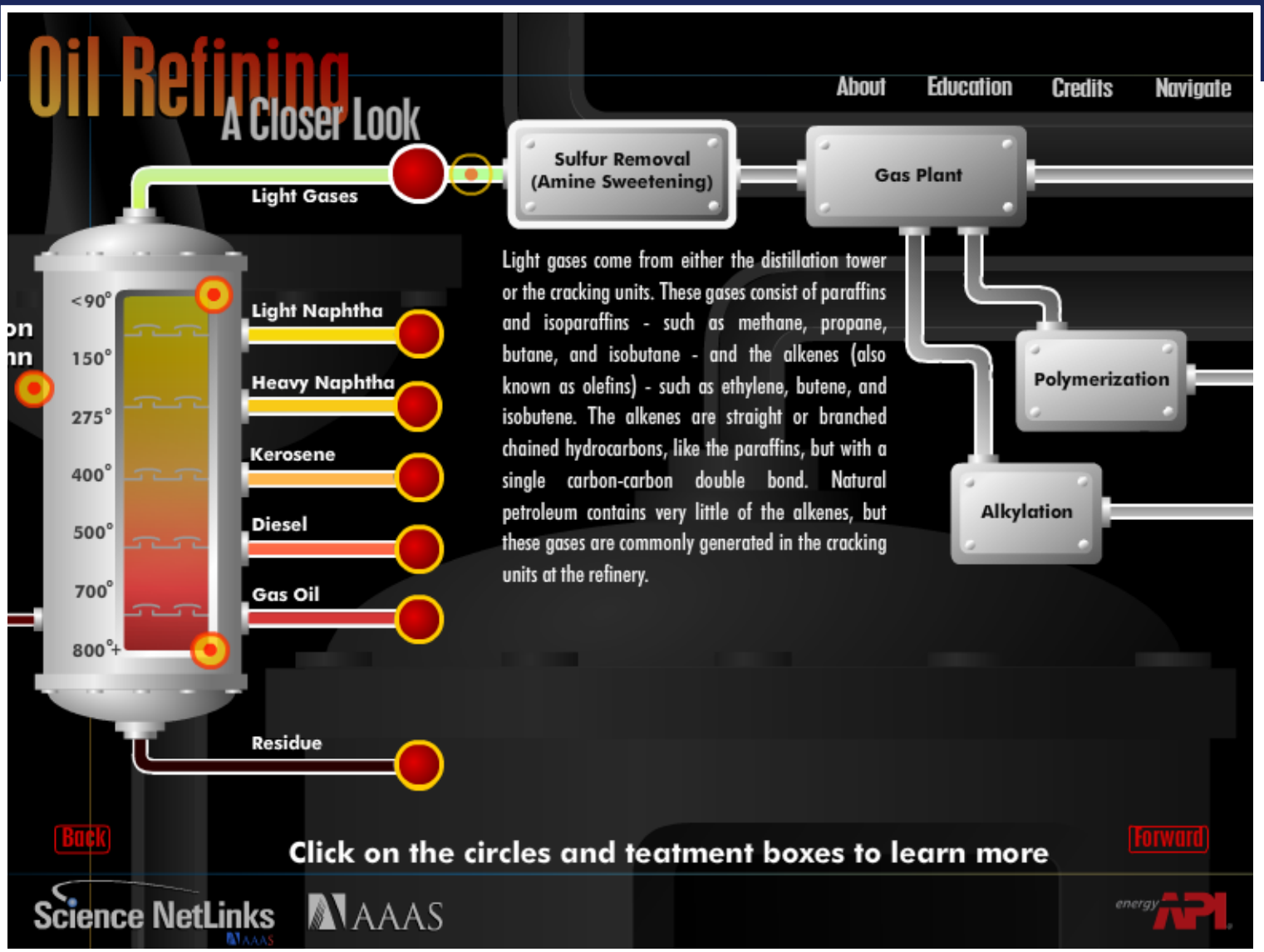
Home
Movie
Distillation
Treatment
Light Gases
CRUDE OIL
Distillation Column
<90°
150°
275°
400°
500°
700°
800°+
Light Naphtha
Heavy Naphtha
Kerosene
Diesel
Gas Oil
Residue
1 DUMP CRUDE OIL
2 START FURNACE
3 BEGIN TREATMENT
Furnace
Back
Forward
Distillation
Science NetLinks
AAAS
energy API

Light Gases


Oil Refining
A Closer Look
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Sulfur Removal (Amine Sweetening)
Gas Plant
Light Gases
Light gases come from either the distillation tower or the cracking units. These gases consist of paraffins and isoparaffins - such as methane, propane, butane, and isobutane - and the alkenes (also known as olefins) - such as ethylene, butene, and isobutene. The alkenes are straight or branched chained hydrocarbons, like the paraffins, but with a single carbon-carbon double bond. Natural petroleum contains very little of the alkenes, but these gases are commonly generated in the cracking units at the refinery.
Polymerization
Alkylation
<90°
150°
275°
400°
500°
700°
800°+
Light Naphtha
Heavy Naphtha
Kerosene
Diesel
Gas Oil
Residue
Back
Click on the circles and teatment boxes to learn more
Forward
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energy
API

Light Naphtha

Heavy Naphtha

Kerosene


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Kerosene comes from the distillation tower. Kerosene, also known as paraffin oil, consists primarily of a mixture of hydrocarbon molecules with 10 to 16 carbon atoms per molecule. Kerosene is composed primarily of paraffin (chains) and isoparaffin (branched chains) molecules, with lesser amounts of naphthene and aromatic molecules.
Light Gases
<90°
150°
275°
400°
500°
700°
800°+
Light Naphtha
Heavy Naphtha
Kerosene
Diesel
Gas Oil
Residue
Hydrotreating
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Click on the circles and teatment boxes to learn more
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API

Diesel


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Diesel comes from the distillation tower. It consists of hydrocarbon molecules with 10 to 20 carbon atoms. Diesel consists primarily of paraffin (straight chains), isoparaffin (branched chains), and cycloparaffin (saturated rings – also known as naphthenes) molecules with lesser amounts of aromatic molecules.
Light Gases
Light Naphtha
Heavy Naphtha
Kerosene
Diesel
Gas Oil
Residue
<90°
150°
275°
400°
500°
700°
800°+
Hydrotreating
Catalytic Cracker
Hydro Cracker
Back
Forward
Click on the circles and teatment boxes to learn more
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energy API

Gas Oil


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Gas Oil comes from the distillation tower. It consists of a complex mix of large hydrocarbon molecules with 20 to 70 carbon atoms. Gas Oil consists of paraffin (straight chains), isoparaffin (branched chains), and cycloparaffin (saturated rings – also known as naphthenes) molecules as well as complex aromatic molecules.
After hydrotreating, gas oil can be used directly as fuel oil in ships, factories, and power generating plants, made into lubricants, or blended into diesel. But today it is usually processed in the cracking units to turn the large molecules in gas oil into smaller, more useful molecules that can be used for gasoline, diesel, and jet fuel.
Light Gases
Light Naphtha
Heavy Naphtha
Kerosene
Diesel
Gas Oil
Residue
<90°
150°
275°
400°
500°
700°
800°+
Hydrotreating
Catalytic Cracker
Hydro Cracker
Back
Forward
Click on the circles and teatment boxes to learn more
Science NetLinks
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energy API

Residue


Oil Refining
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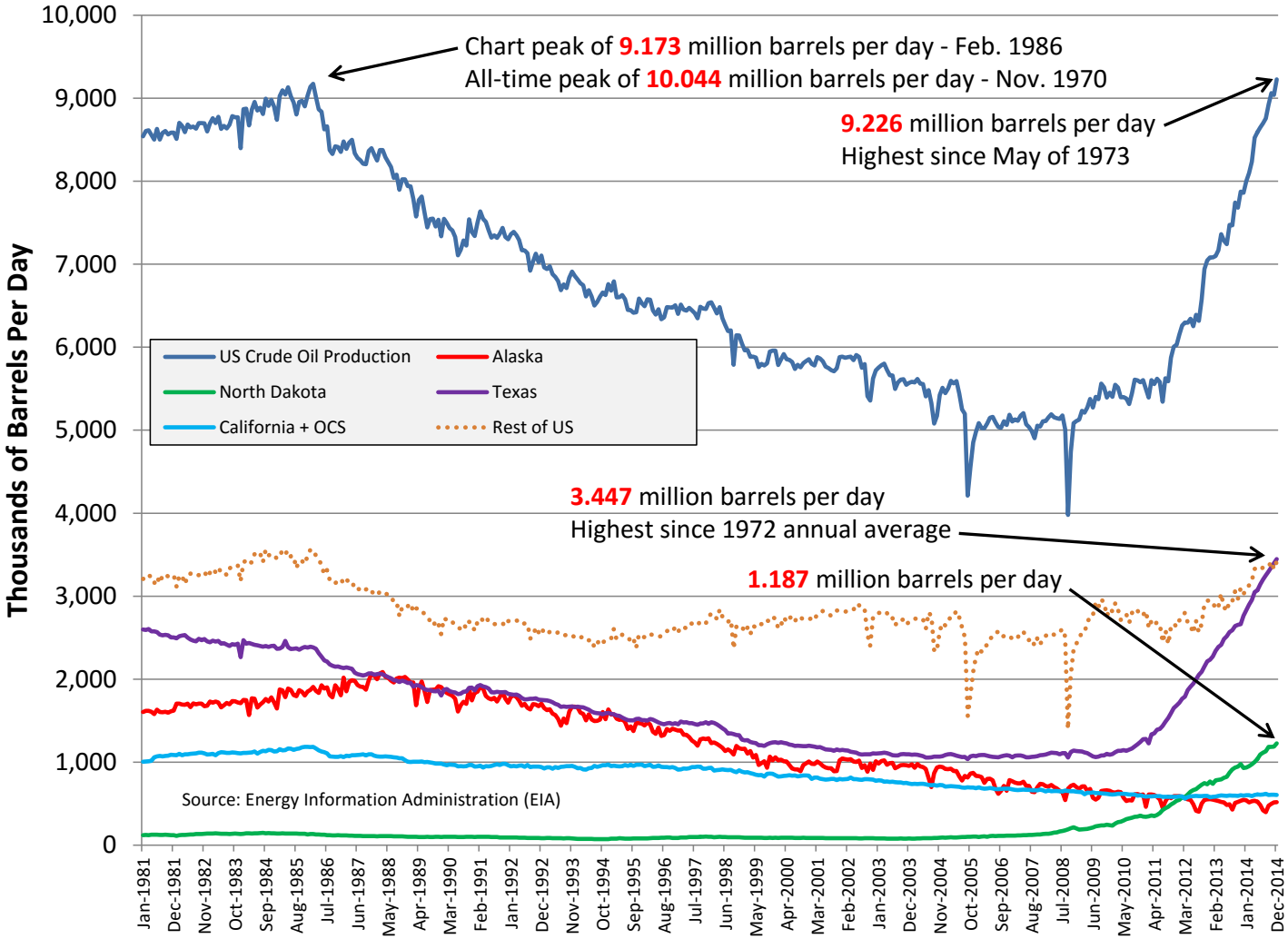
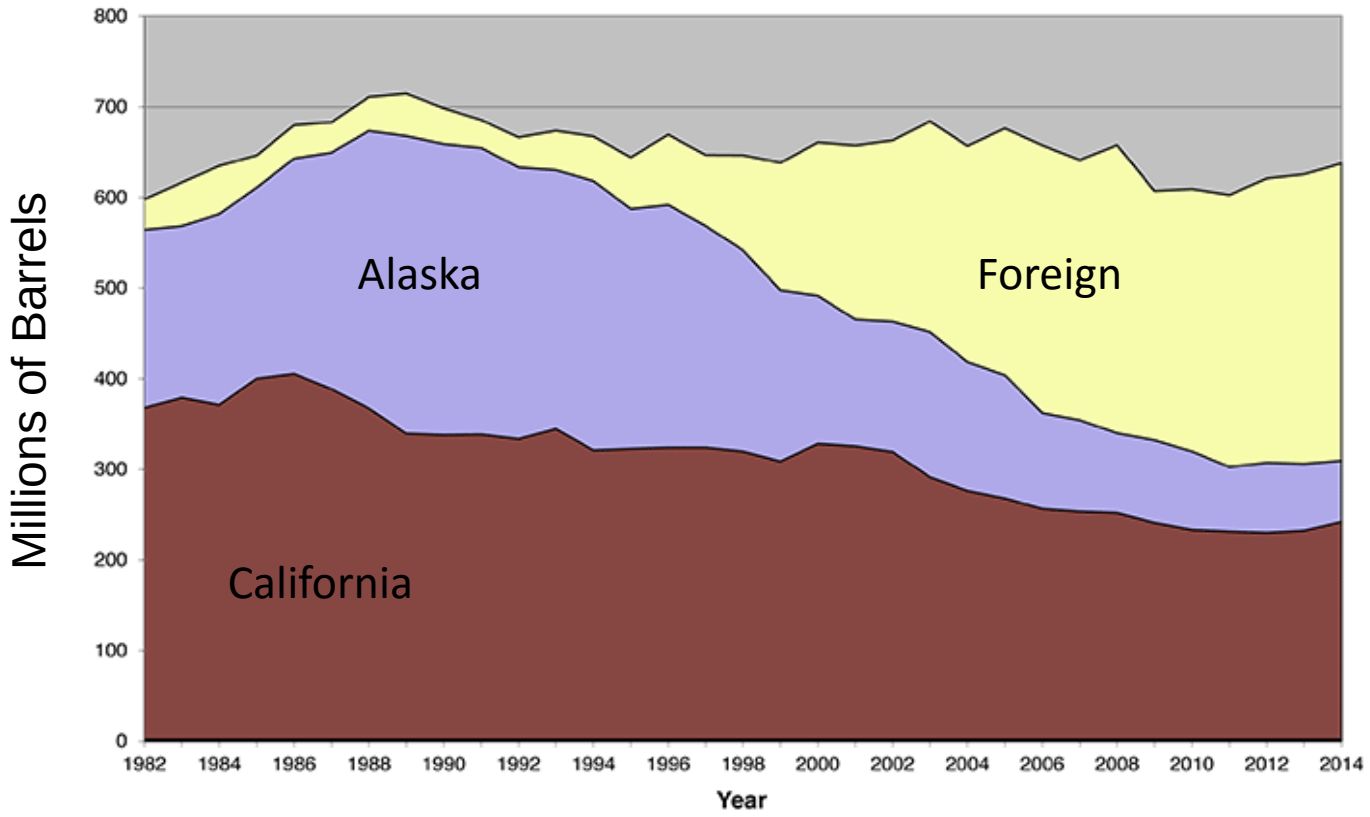
Navigate
Residue comes from the distillation tower. It consists of a complex mix of very large hydrocarbon molecules with more than 30 carbon atoms, and typically more than 60 carbon atoms. Residue generally consists of a large percentage of asphaltenes, which are now believed to be tiny nanofragments of kerogen that were altered during catagenesis and were suspended as tiny particles in crude oil as it moved into the reservoir rocks. Residue also contains large complex paraffin and aromatic molecules as well as resins.
Light Gases
Light Naphtha
Heavy Naphtha
Kerosene
Diesel
Gas Oil
Residue
<90°
150°
275°
400°
500°
700°
800°+
Coker
Deasphalting
Back
Forward
Click on the circles and teatment boxes to learn more
Science NetLinks
AAAS
energy API

U.S. Crude Oil Production 1981–2014



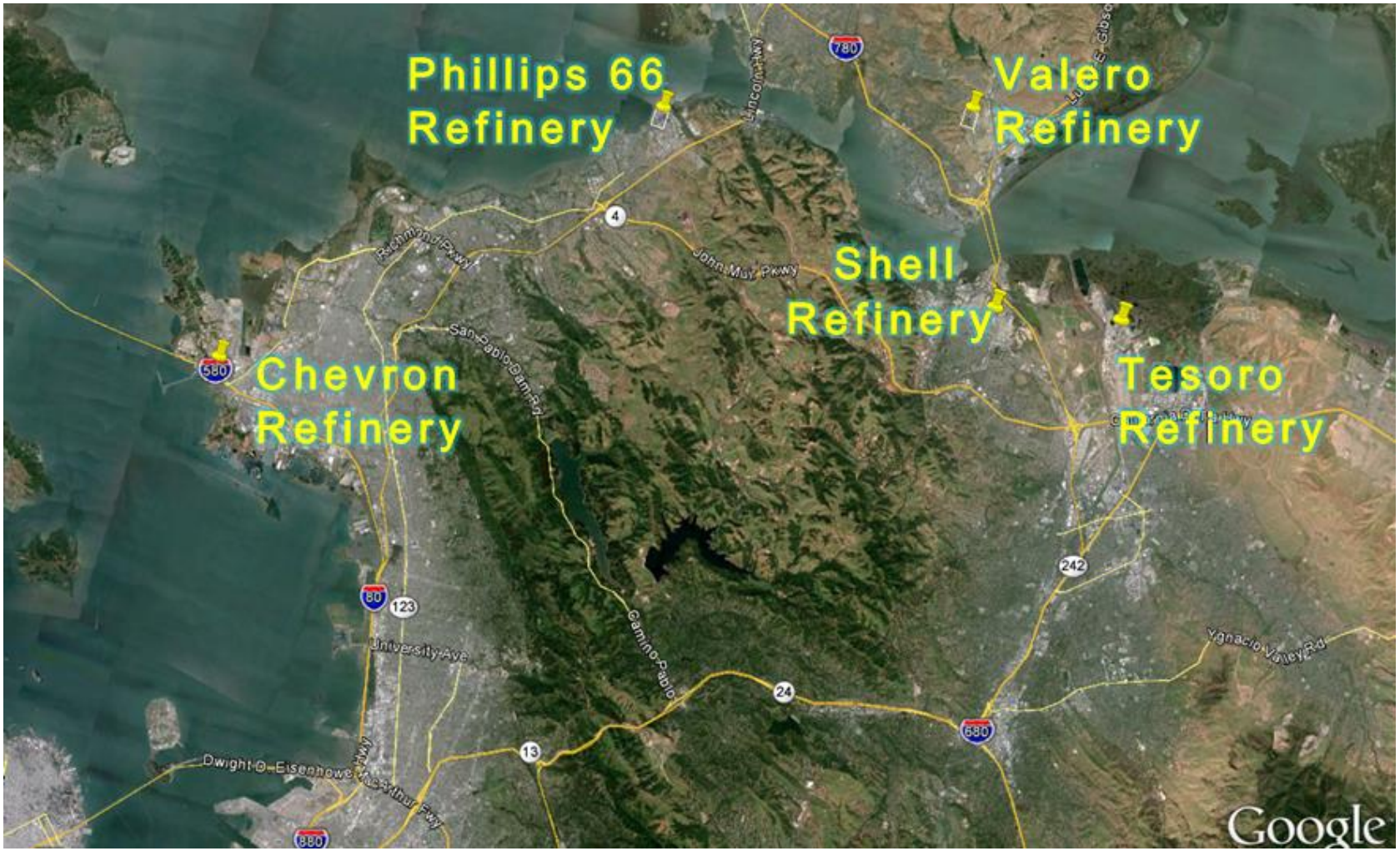
California Crude Oil Supply Sources

Crude Oil Supply Sources to California Refineries



Source: California Energy Commission

Bay Area Refinery Locations



Crude Oil Processing Capacity

Refinery	Crude Oil Capacity (barrels per day)
Chevron	245,000
Phillips 66	120,000
Shell	157,000
Tesoro	166,000
Valero	132,000
Total	820,000
Source: California Energy Commission	

Major Bay Area Refinery Products

Product	Amount (barrels per day)	Exports (barrels per day)	Exports Percentage
Gasoline	420,000	22,000	5%
Diesel	177,000	53,000	30%
Jet Fuel	90,000	2,300	3%
Total	687,000	74,000	11%

Source: California Energy Commission

Refinery Emissions Sources

Refinery Emissions by Source Category

Emission Source Category	NO_X	VOC	SO_2	CO	PM	Toxics	GHGs
Stationary Combustion (furnaces, boilers, gas turbines, flares, engines, thermal oxidizers)	●	●	●	●	●	●	●
Storage Tanks		●				●	●
Process Vents (FCCU, SRUs, Cokers, Hydrogen Plant)	●	●	●	●	●	●	●
Fugitive Equipment Leaks		●				●	●
Cooling Towers		●			●	●	●
Wastewater Treatment		●				●	●
Loading Operations		●				●	●
Marine	●	●	●	●	●	●	●
Rail	●	●	●	●	●	●	●
Fugitive Dust (coke piles, catalyst silos)					●	●	●

Current Refinery Projects

Chevron Modernization Project

- Heavier, Sour Crude

Shell Greenhouse Gas Project

- Lighter Crude

Phillips 66 Propane and Butane Recovery

Tesoro Wharf Replacement

Valero Crude By Rail

Refinery Information Resources

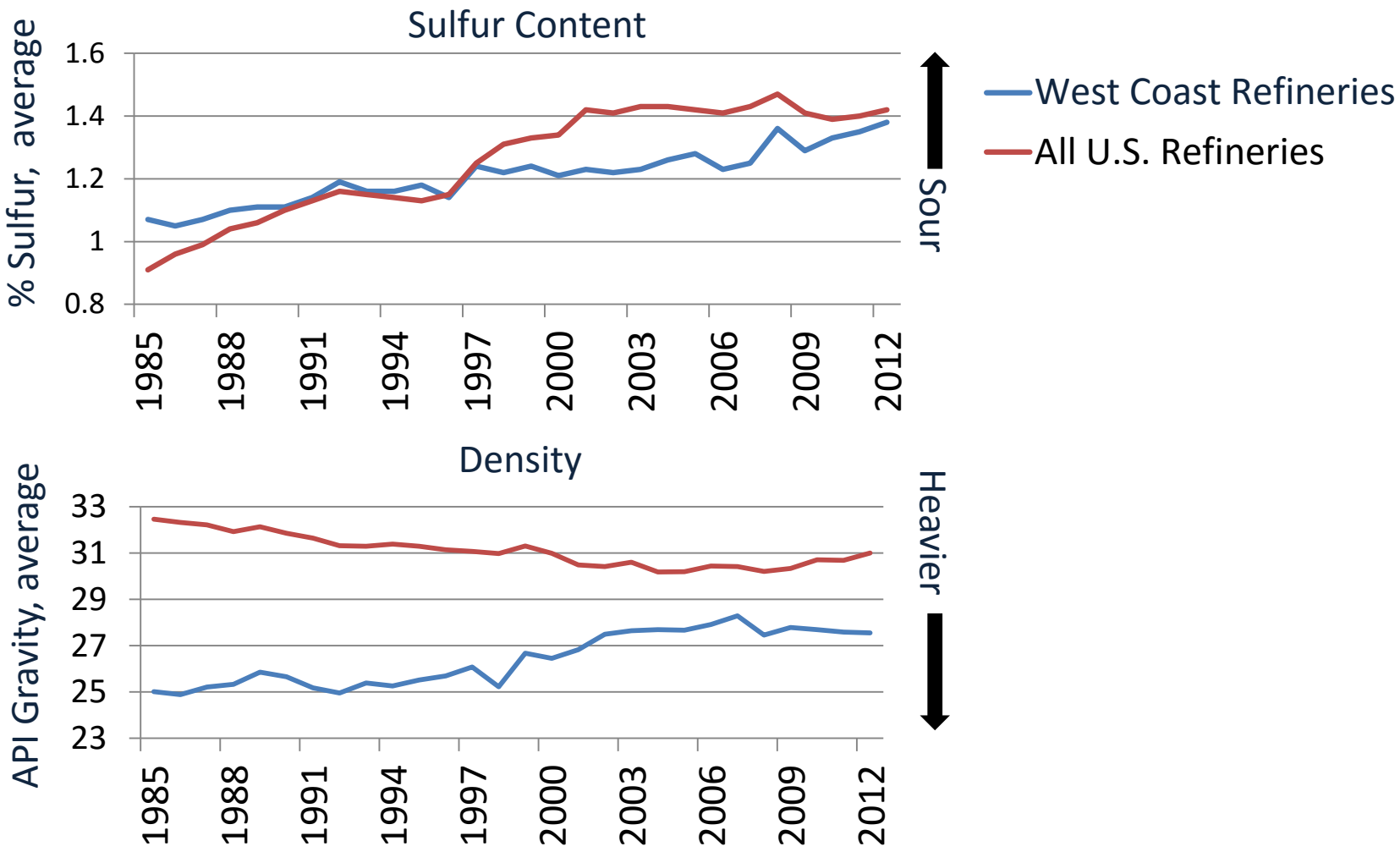
Science NetLinks' Oil Refining Animation (Flash):
sciencenetlinks.com/interactives/energy/interactive

EPA "Addressing Air Emissions from the Petroleum Refinery Sector":
http://www3.epa.gov/apti/video/10182011Webinar/101811webinar.pdf

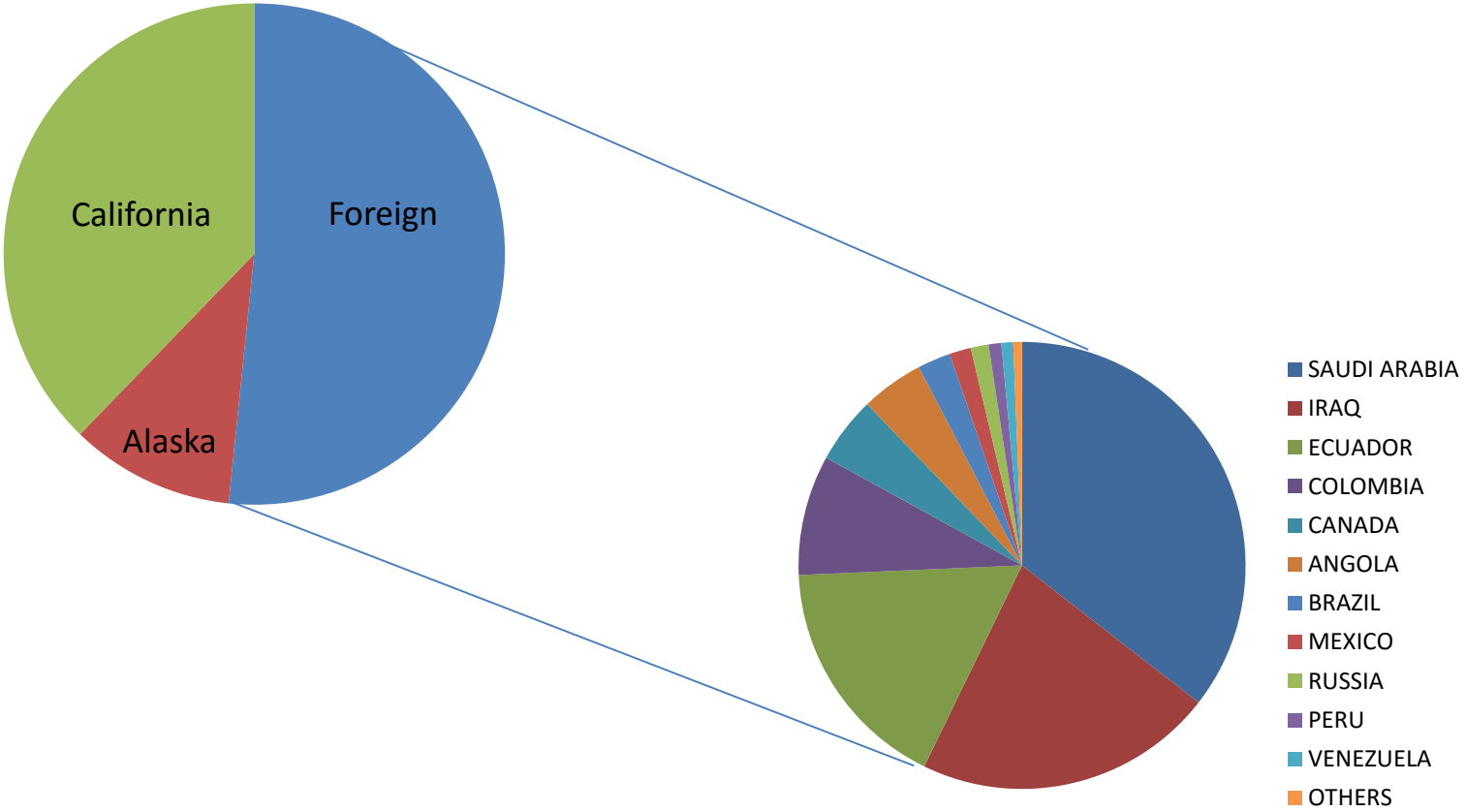
CARB Oil & Natural Gas Production, Processing, and Storage: http://www.arb.ca.gov/cc/oil-gas/oil-gas.htm

Colorado School of Mines Petroleum Refining Course Materials:
http://inside.mines.edu/~jjechura/Refining/

Trends in Crude Oil Quality

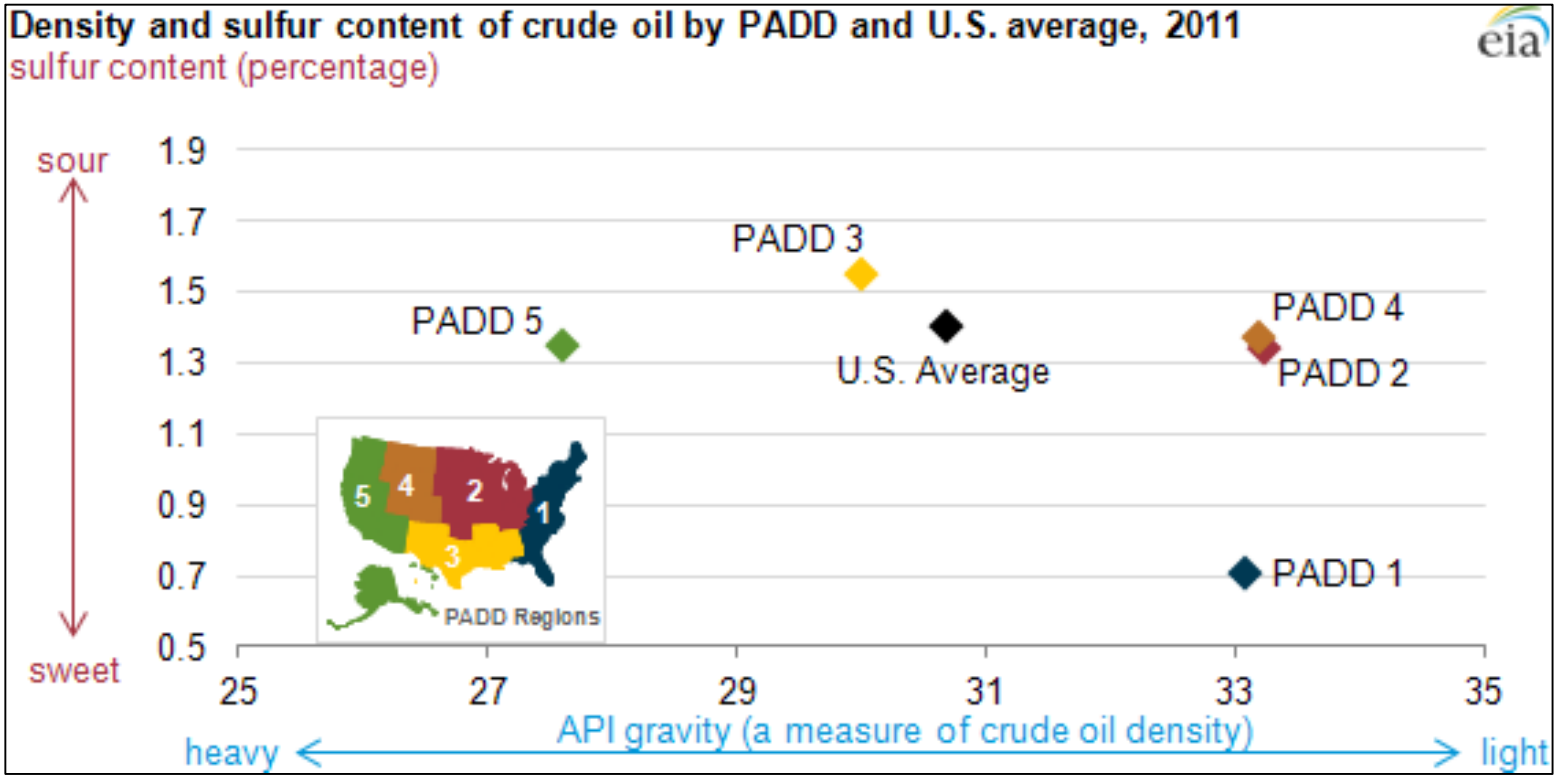


Crude Oil Supply Sources (2014)



Source: California Energy Commission

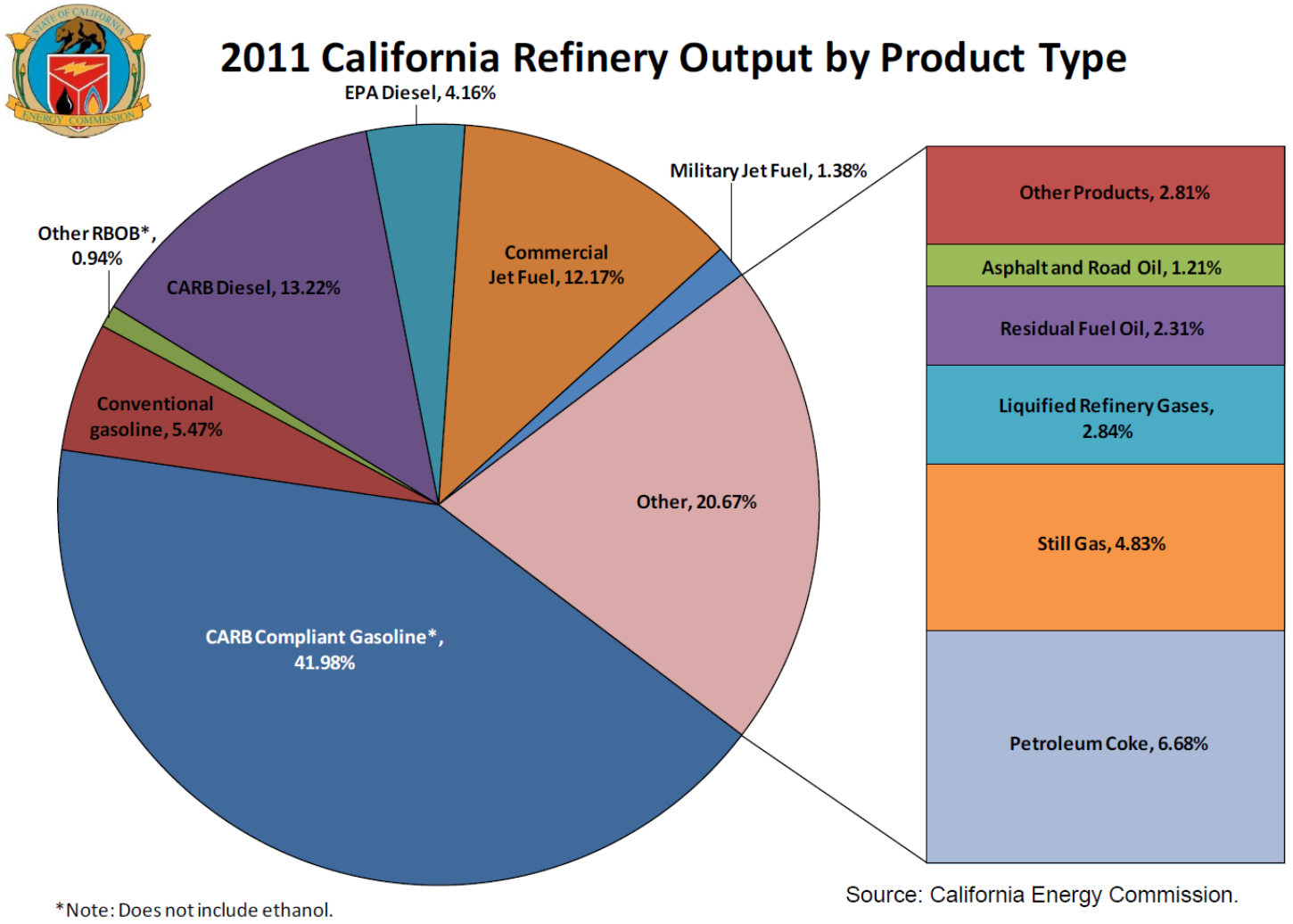
West Coast Refinery Crude Oil Compared to Rest of Nation



PAD District 5 (West Coast): Alaska, Arizona, California, Hawaii, Nevada, Oregon, Washington.

- California currently has 64% of PAD District 5's refining capacity

California Refinery Output by Product Type



*Note: Does not include ethanol.

Source: California Energy Commission.

Air District Climate Protection Program

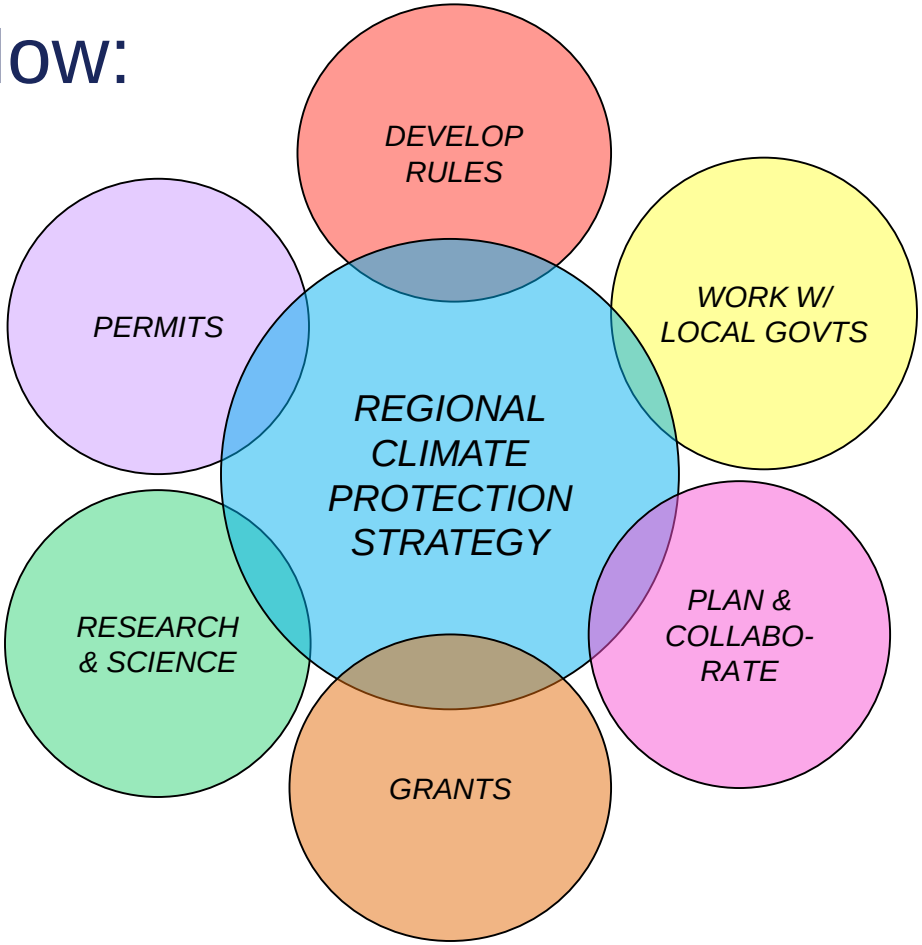
Henry Hilken
Director, Planning & Climate Protection

Goals and Focus

What:

- *Efficiency*
- *Electrification*
- *Decarbonize energy*
- *Reduce non-energy GHGs*

How:



Highlights of Climate Protection Initiatives

Climate Protection Program established 2005

First Air District to:

- develop regional GHG inventory
- adopt GHG fee on stationary sources
- adopt GHG thresholds of significance for CEQA
- conduct regional multi-pollutant planning

Over $300 million invested in grant programs to reduce GHGs and air pollutants

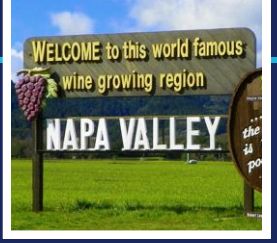
Extensive technical and financial support for local government climate protection work

Regional Summits and conferences

Support of Local Governments

- Grants for local climate action plan development and implementation
- Train local staff on conducting GHG inventories
- Guidance on developing climate action plans
- Provide data and best practices
- Consultation, review and feedback on climate action plan development
- Outreach on Cap & Trade funding for local projects

Highlights of Outcomes & Results



Bay Area leadership in local climate planning;
58 local climate action plans adopted;
80% of Bay Area population

Grants & Incentives

- Climate Protection Grant Program (2008)
  - $3 million, 53 grants to local gov’ts & non-profits
  - Launched game-changing initiatives, e.g., community choice aggregation and property assessed clean energy
- Conoco Phillips GHG Mitigation Program (2009)
  - $4 million, municipal energy efficiency & renewables

GHG co-benefits of air pollution regulations

- E.g., methane reductions via VOC rules

GHG in Air District permits/New Source Review

Collaboration With ARB and Other Air Districts

Technical and policy issues related to strategic planning

- ARB Scoping Plan update
- BAAQMD Regional Climate Protection Strategy
- Short Lived Climate Pollutant Strategy
- Technical work groups, e.g., Adaptive Management

Collaborate on statewide rule development

- Natural gas distribution
- Oil & gas wells

Enforce ARB GHG rules, e.g., landfills, refrigerants

California Air Pollution Control Officers Assn. (CAPCOA)

- Air districts coordinate regional climate programs, e.g., CAPCOA GHG Reduction Exchange

ARB's Cap & Trade Program

Market-based regulation to drive long-term investment in cleaner fuels & more efficient energy use

Covers 85% of CA GHG emissions

- Electricity generators & industrial facilities emitting ≥ 25,000 MTCO2e annually (2013)
- Fuel distributors - transportation, natural gas & other (2015)

Declining cap on 2012 GHG emission levels

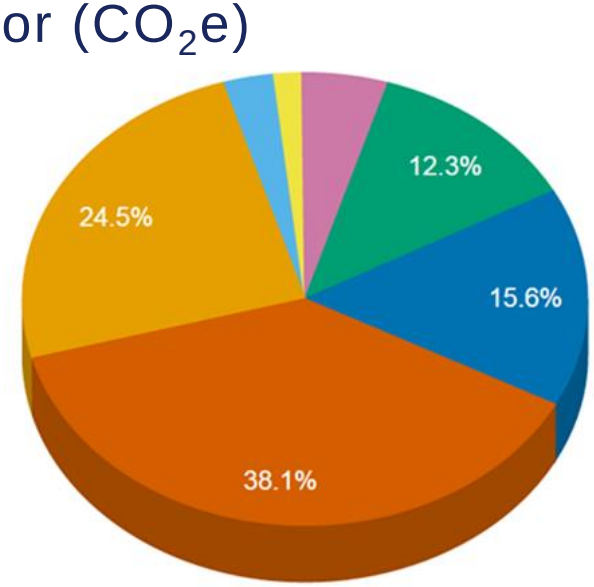
- 2% in 2013 & 2014, 3% annually through 2020

All 5 Bay Area refineries must report

- 16.1 million MTCO2e covered by C&T (2014)

Bay Area GHG Emissions

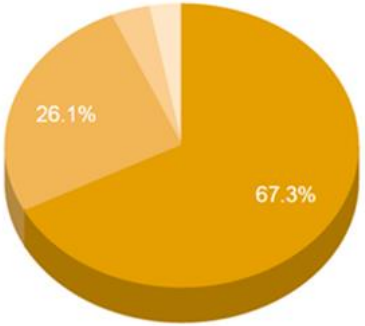
2015 Bay Area GHG Emissions By Sector (CO_2e)



- High GWP Gases
- Agriculture + Farming
- Recycling + Waste
- Commercial + Residential
- Electricity + Cogeneration
- Transportation
- Industrial

Total: 81 $MMTCO_2e$

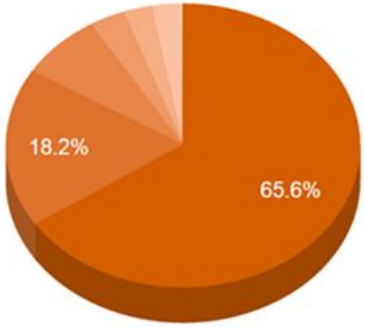
Industrial



- Oil Refineries
- General Fuel Usage*
- Fugitive and Process Emissions (3.5%)
- Cement Plants (3%)

* Boilers, dryers, heaters, etc.

Transportation



- Passenger Cars/Trucks
- Heavy Duty Trucks
- Aviation (7.5%)
- Industrial Equipment (3.2%)
- Ships and Boats (2.6%)
- Buses and Motorhomes and Motorcycles (2.6%)
- Locomotives (0.3%)

Consumption-Based GHG Emissions Inventory

Consumption-based emissions inventory (CBEI) estimates GHG emissions embedded in goods & services consumed by people residing within a given area

Accounts for emissions from goods & services produced outside the Bay Area

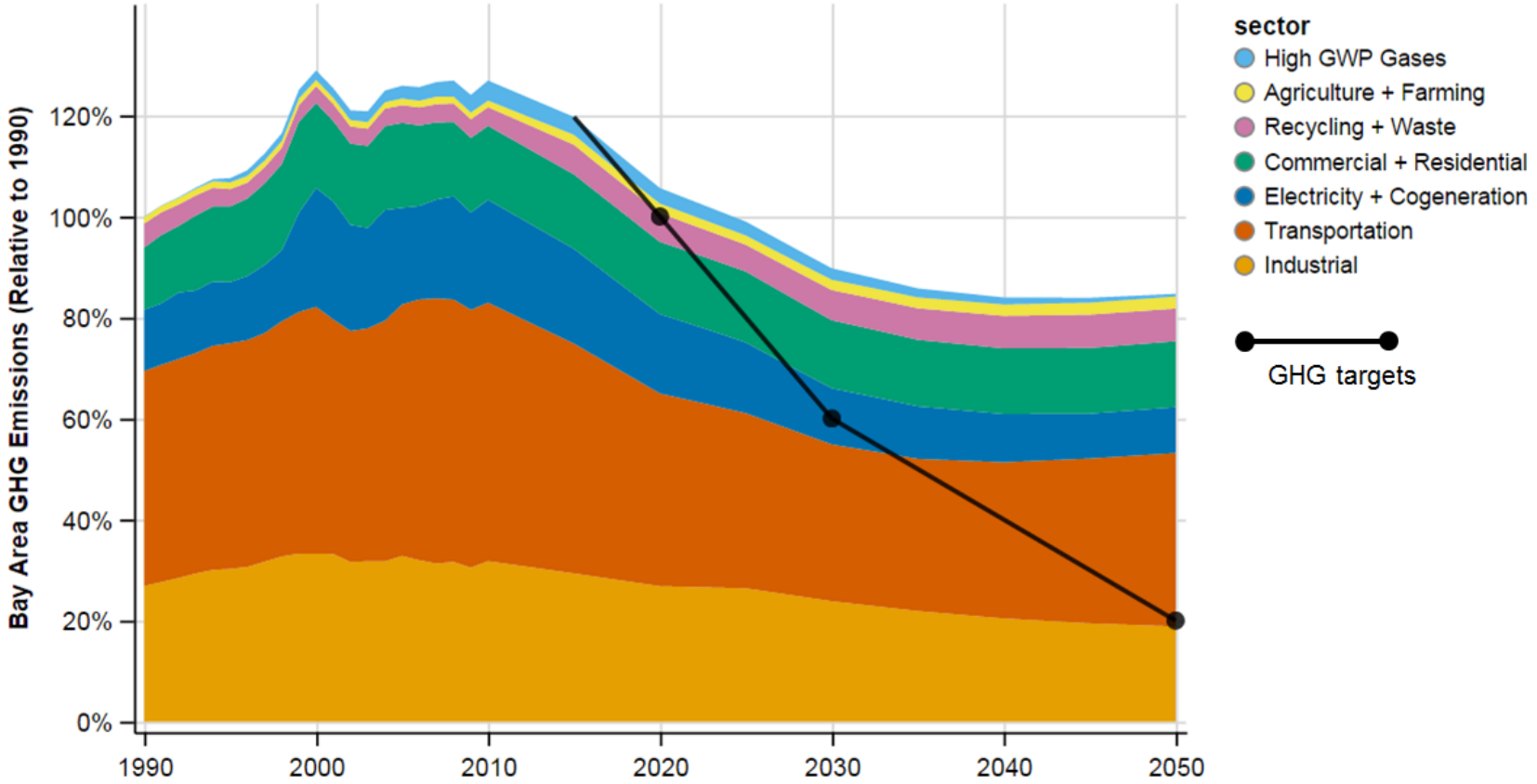
Includes full life-cycle analysis of emissions for each product/service:
- Production / Use / Disposal or recycling

Complements existing production-based GHG emissions inventory

CBEI will inform Regional Climate Protection Strategy, assist local climate planning, support public education campaigns

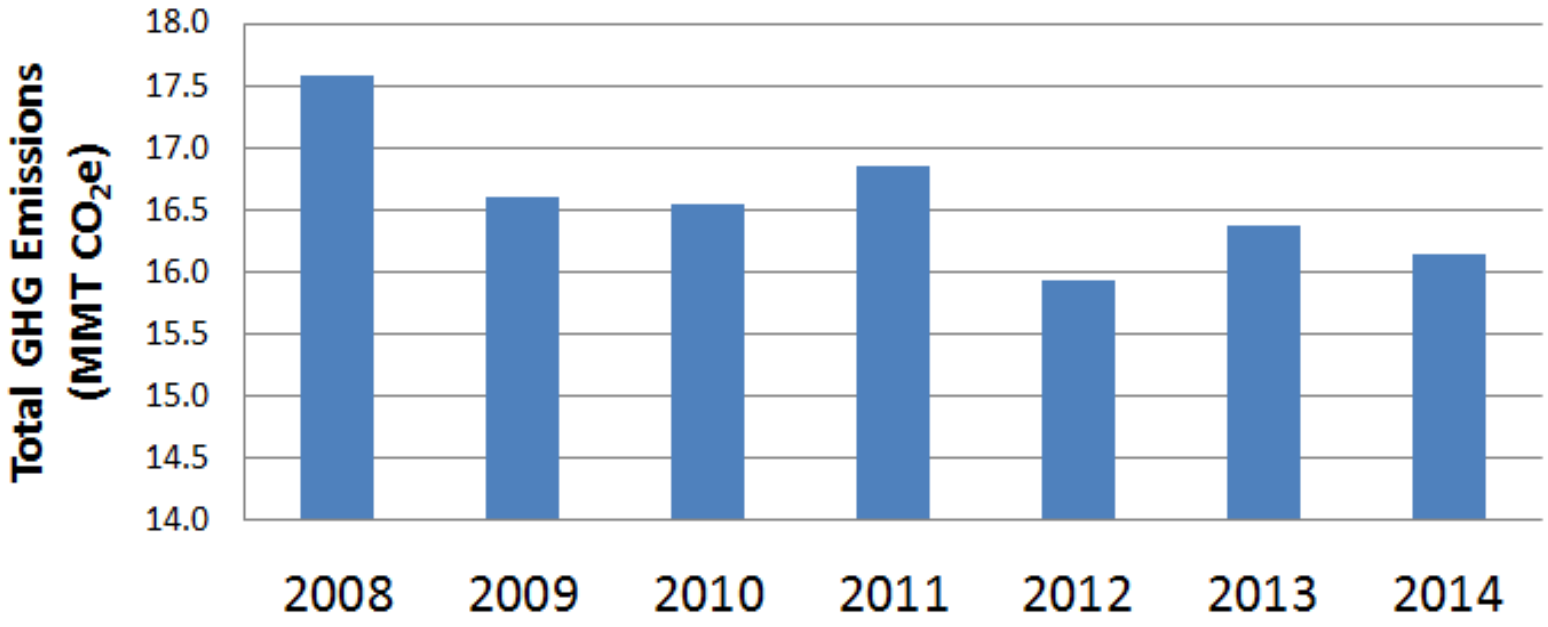
Bay Area GHG Forecasts

GHG Emissions & Projections (Relative to 1990) With Committed & Expected Policies



Bay Area Refinery GHG Emission Trends

Bay Area Refinery GHG Emissions
(Source: ARB)



Climate Protection Resolution

Growing concerns among the public and the Board of Directors regarding climate led to the Air District Board adopting climate protection resolution in November 2013 (Resolution 2013-11):

- Reduce Bay Area GHG emissions 80% below 1990 levels by 2050
- Develop a Regional Climate Protection Strategy to be included in the Clean Air Plan Update
- Develop a work program to guide and document the Air District climate protection work in the near-term
  - 10-point climate work program adopted April 2014

10-Point Climate Action Work Program

Work Program Area	Recent Achievements
Regional Climate Protection Strategy	Conducted "gap analyses," developing control measures, planning for public workshops
GHG Rule Development	GHG rule-development proposed for methane sources, refineries, permitting, generators, wood smoke
Inventory & Forecasting	Refining methane inventory; black carbon and consumption-based inventories coming soon; forecast scenarios being developed
GHG Emissions Monitoring	GHG monitoring equipment installed at four locations
Support for Local Governments	Regular updates on Cap & Trade funding for local CAP implementation; launched VMT data project with MTC; launched solar schools initiative with KyotoUSA
Bay Area's Energy Future	Advisory Council Report delivered to Board April 2015

Climate Staffing & Resources

New Climate Protection Section established March 2015

Climate Protection Manager and 7 staff

- Planners, Engineers, Specialist, Policy Advisor

Climate Protection Program resources in FYE 2016 budget = $1.6 million

Additional Climate Protection staff and resources in other divisions

Regional Climate Protection Strategy

Climate is key element of 2016 multipollutant Clean Air Plan update

Outline a strategy to make progress towards long-term GHG reduction goals, focusing on Air District strengths, resources & authority

Bay Area GHG inventory & forecast

Economic sector-based analysis of GHGs, consistent with ARB 2014 Scoping Plan sectors

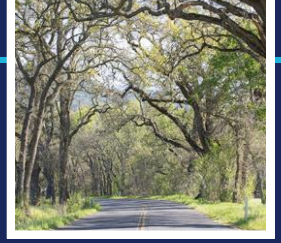
GHG emission reduction measures

Support Plan Bay Area and regional resiliency work

Initial Proposed Climate Rulemaking

Regulations	Timeline
Limit GHGs in Permits (New Source Review)	Q2 2016
Cap & Trade Backstop for Refineries	TBD
Further Reduce Emissions from Back-up Diesel Generators	Q2 2016
Further Reduce Methane from Capped Wells	Q4 2016
Further Reduce Fugitive Methane from Oil & Gas Production (w/ ARB)	TBD
Further Reduce Methane Leaks from Natural Gas Transmission & Distribution (w/CPUC, ARB)	TBD
Further Reduce Black Carbon from Wood Burning	Q4 2015
Further Reduce Methane from Landfills	Q3 2016
Regulations Under Evaluation	**Timeline**
Cap & Trade Backstop for Other Sources	TBD
Reduce Emissions from Composting Operations	Q4 2016
Reduce Emissions from Wastewater Treatment Facilities	TBD
Reduce Energy Use in Residential & Commercial Buildings	TBD
Limit Fossil Fuel Combustion from Furnaces, Water Heaters	TBD

The Pathway to 2050



Grants

- Reduce black carbon

Develop Rules

- Cap & trade backstop
- Limit methane
- Limit black carbon

Permits

- Limit GHG via New Source Review

Research & Science

- Improve methane, BC inventory
- Methane monitoring
- Consumption-based inventory

Work w/ local gov'ts

- Improve building efficiency
- PACE, other financing
- Implement, track local CAPs
- Urban heat island mitigation

Plan & Collaborate

- Support strong Plan Bay Area
- Expand VMT reduction programs
- Support ARB programs

Council Discussion on:

- Key Question
- Resources for Next Meeting

Air District Council
Second Meeting Resources

- California Air Resources Board speaker
- Review of AB32 mechanisms
- Description of possible GHG refinery caps
- Effect of “first movers” on control technology