



BAY AREA  
AIR QUALITY  
MANAGEMENT  
DISTRICT

**AGENDA: 6**

A background image showing a view of the Golden Gate Bridge in San Francisco, with the city skyline and hills visible in the distance under a clear sky.

# **Regulation 13, Rule 1: Refinery Carbon Intensity Caps**

**Eric Stevenson, Director  
Meteorology, Measurement,  
and Rules Division**

**Advisory Council Meeting  
February 6, 2017**

- Problem 1: Refinery Pollution has significant impact on nearby communities and on the climate.
- Problem 2: Production of California and Alaska North Slope crude oil is declining. Currently, refineries may retool to process more energy intensive crude oil such as Canadian tar sands.

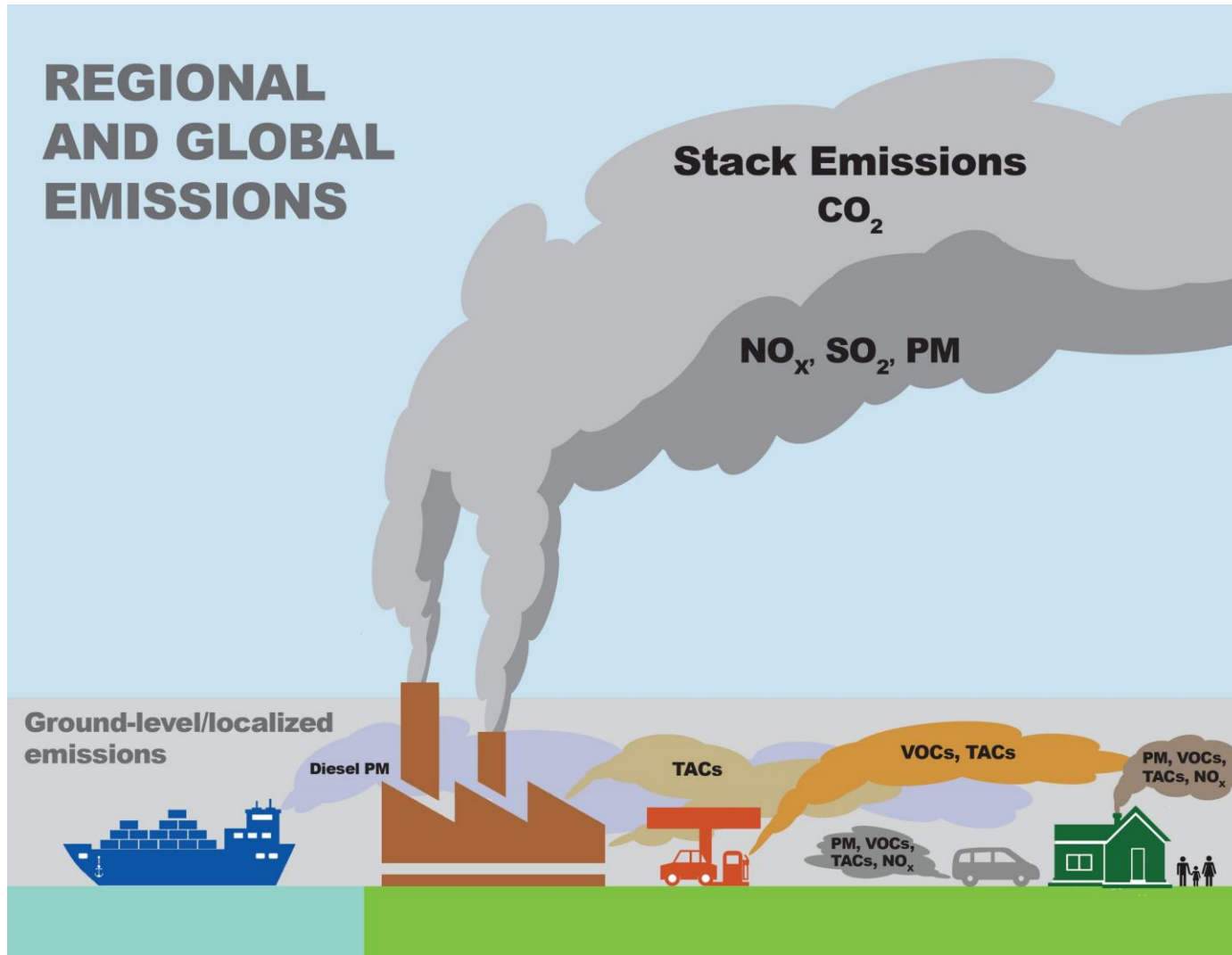
The top left of the slide features a photograph of the Golden Gate Bridge in San Francisco, California. The bridge's iconic orange-red towers and suspension cables are visible against a clear blue sky. In the foreground, there's a glimpse of the water and some greenery on the bridge's approach.

# Proposed Solution

1. Direct regulation of criteria (PM, NO<sub>x</sub>, SO<sub>2</sub>, VOC) emissions.
2. Improved measurement and reporting of refinery emissions and feedstocks.
3. Risk-based rules to reduce health risk from toxic emissions.
4. <New> Cap Refinery Carbon Intensity

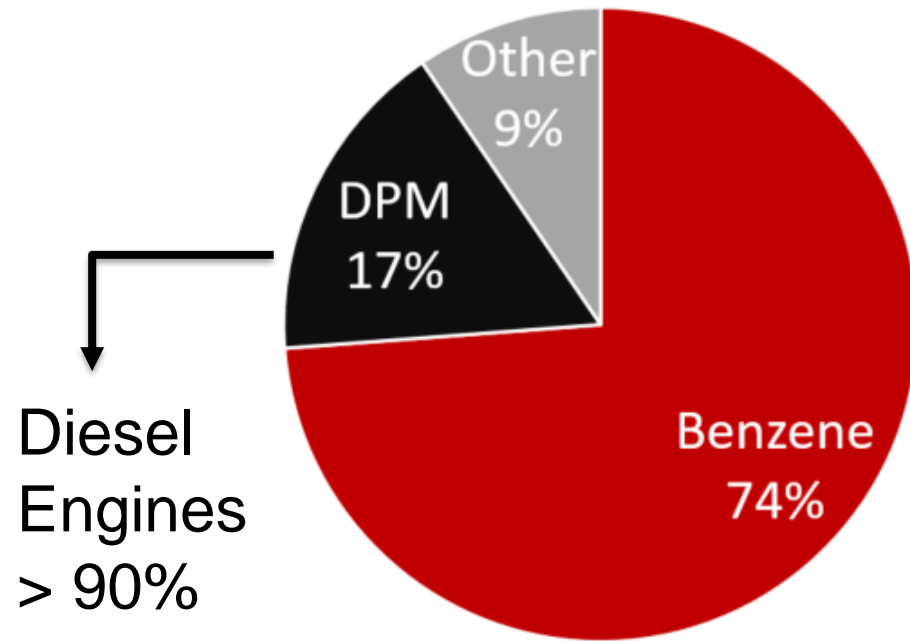


# Impact of Stack Height at Refineries

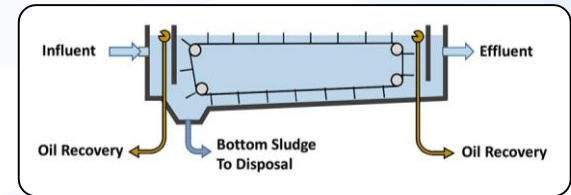




# Cancer Risk Drivers for Typical Large Refinery



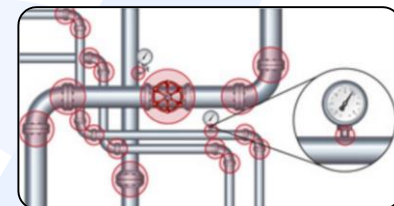
- Wastewater Treatment



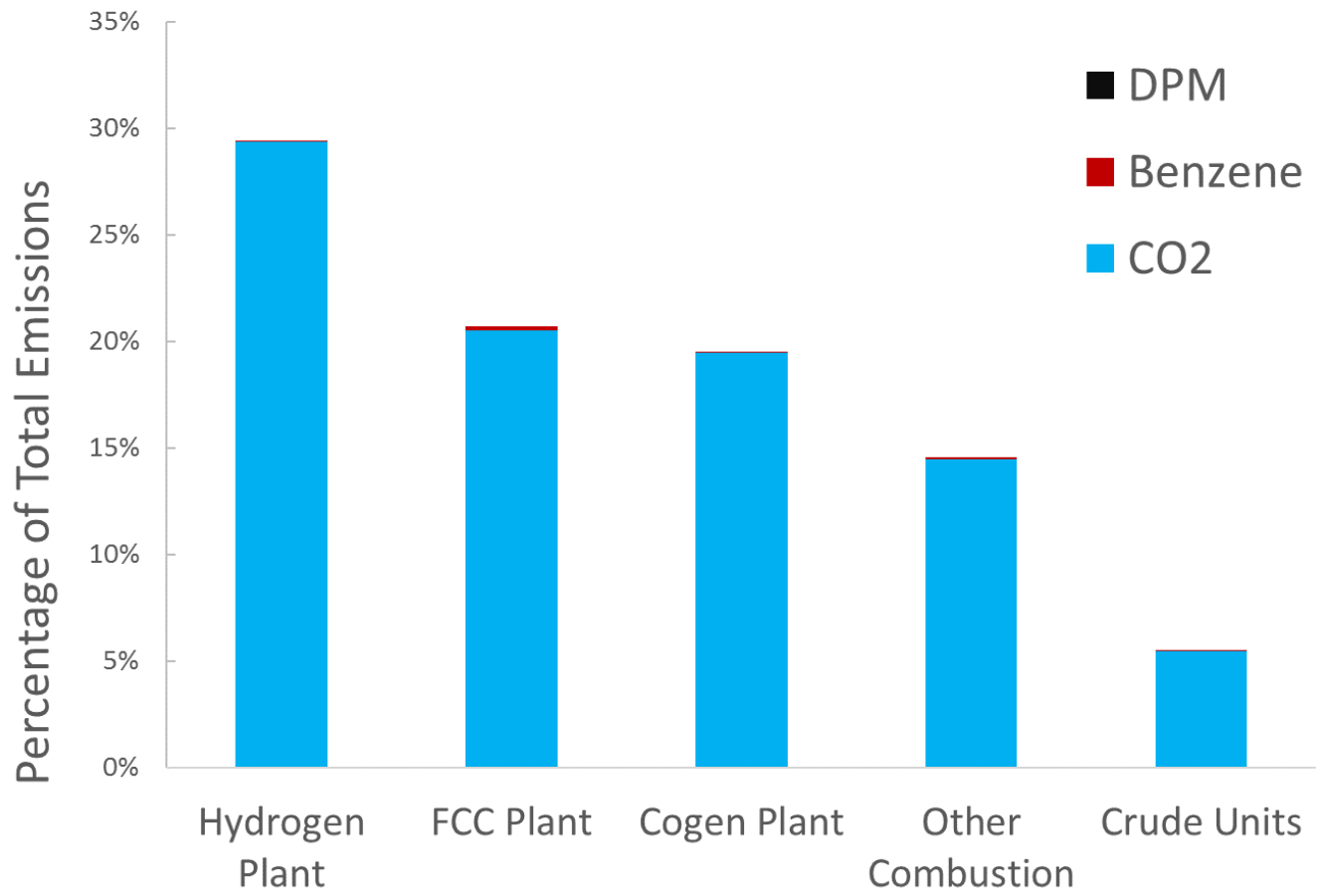
- Storage Tanks



- Valves, Flanges, Connectors & Seals



# Top Sources of GHG Emissions at Typical Large Refinery



- 89% of CO<sub>2</sub> emissions
- 0.45% of Benzene emissions
- 0% of DPM emissions



# Refinery Rulemaking History

## *Progress*

### On track towards *Refinery Strategy* goals

- Six rules adopted in 2015 and 2016
- Criteria pollutant emissions reductions of over 15%

Rule	Addresses	Adopted
6-5	Reduces PM from FCCUs	Dec. 2015
8-18	Reduces VOC from equipment leaks	
11-10	Reduces VOC and toxics from cooling towers	
9-14	Reduces SO <sub>2</sub> from coke calcining operations	Apr. 2016
12-15	Tracks crude slate changes and emissions	
2-5	New Source Review for Toxics	Dec. 2016
9-9	Nitrogen Oxides from Gas Turbines	Q4 2017
TBD	Further SO <sub>2</sub> reductions	Q4 2017



# Draft Rule 11-18

## **Reduces public's exposure to localized health risks**

- Hundreds of facilities will be evaluated, including refineries
- Health Risk Assessments (HRAs) conducted by Air District staff using latest OEHHA guidelines
- Threshold for facilities to develop and execute District-approved Risk Reduction Plans reduced from 100 per million (100/M) to 10/M
- Refineries have among highest priority for HRAs (Phase 1)
- Rule 11-18 ready for Board action in May 2017



# Draft Rule 13-1

## *First Rule of Combustion Strategy*

### Limits refinery GHG & criteria pollutant emissions by focusing on carbon intensity

- Carbon intensity defined on a simple barrel basis

$$\text{Carbon Intensity} = \frac{\text{Annual GHG Emissions (MT CO}_2\text{e)}}{\text{Annual Throughput (barrels of crude oil)}}$$

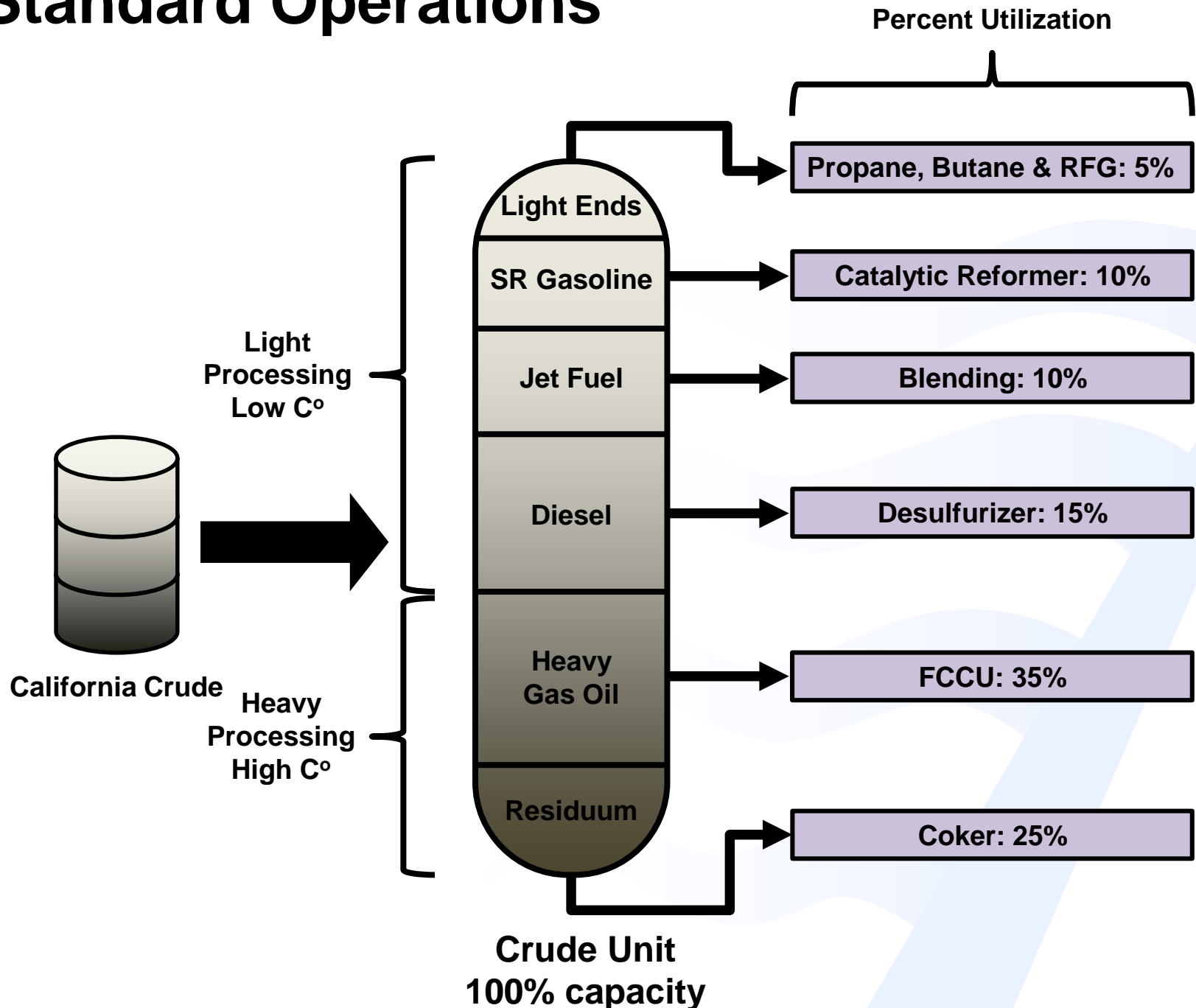
- Caps each refinery's ***carbon intensity*** at a level consistent with current operation
  - Accounts for GHGs from all power and H<sub>2</sub> inputs
  - Requires execution of energy efficiency projects with simple payback of 10 years or less



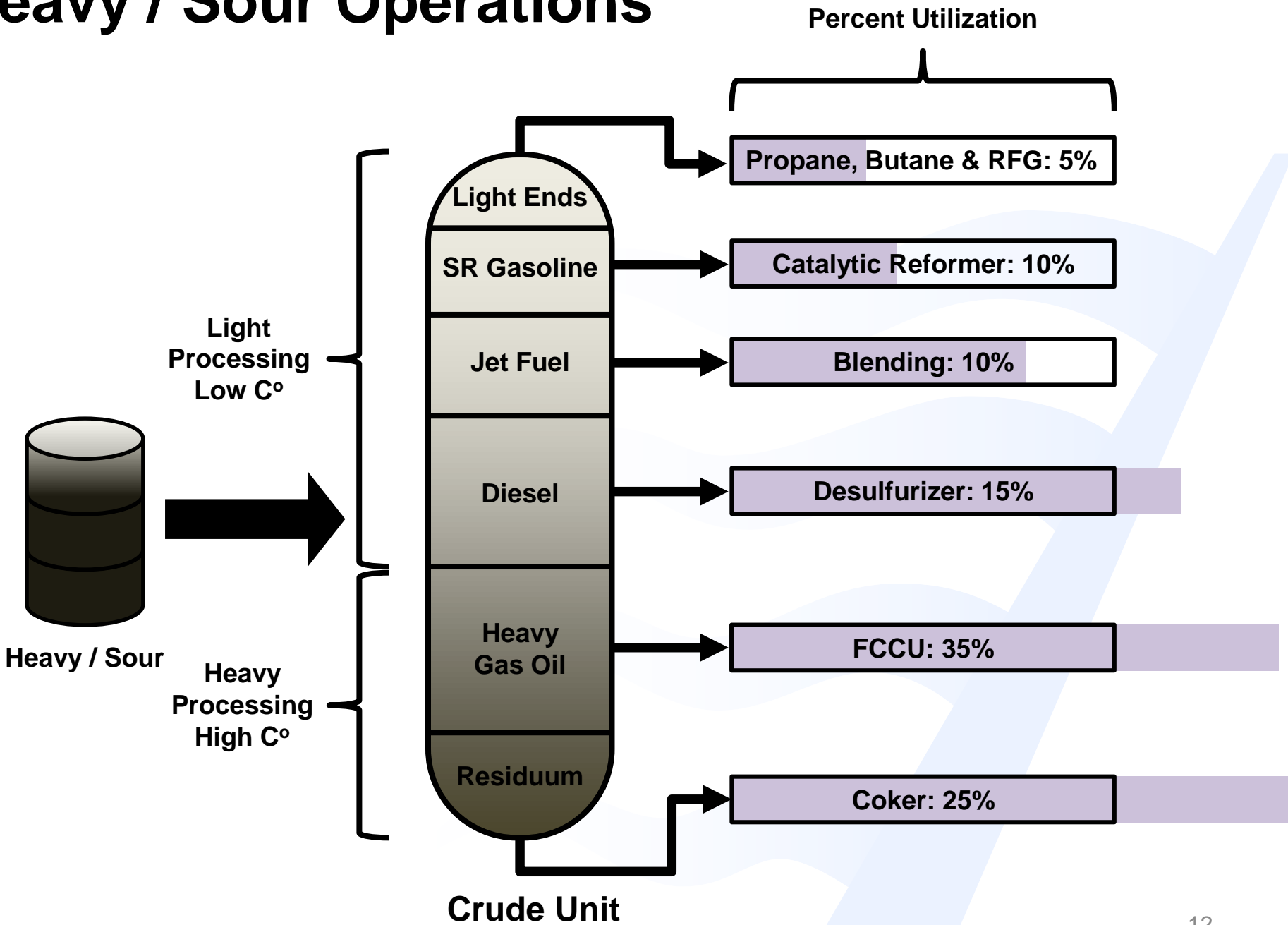
# Key Factors in Refinery Carbon Intensity

- **API Gravity (density)**
  - Heavier crude → more energy to convert to lighter products
  - More energy → higher emissions of GHG, PM, SO<sub>2</sub> and NO<sub>x</sub>
  - GHG and PM from gaseous fuel combustion not amenable to end-of-pipe emissions controls.
- **Sulfur Content**
  - Sulfur must be removed in order to meet product regulatory and technical requirements.
  - Hydrogen is consumed in sulfur removal.
  - Hydrogen generation is a large source of GHG and other combustion emissions.
- **Energy Efficiency**
  - Thermal efficiency, steam management, heat loss, other issues
  - Most cost-effective upgrades are already implemented.

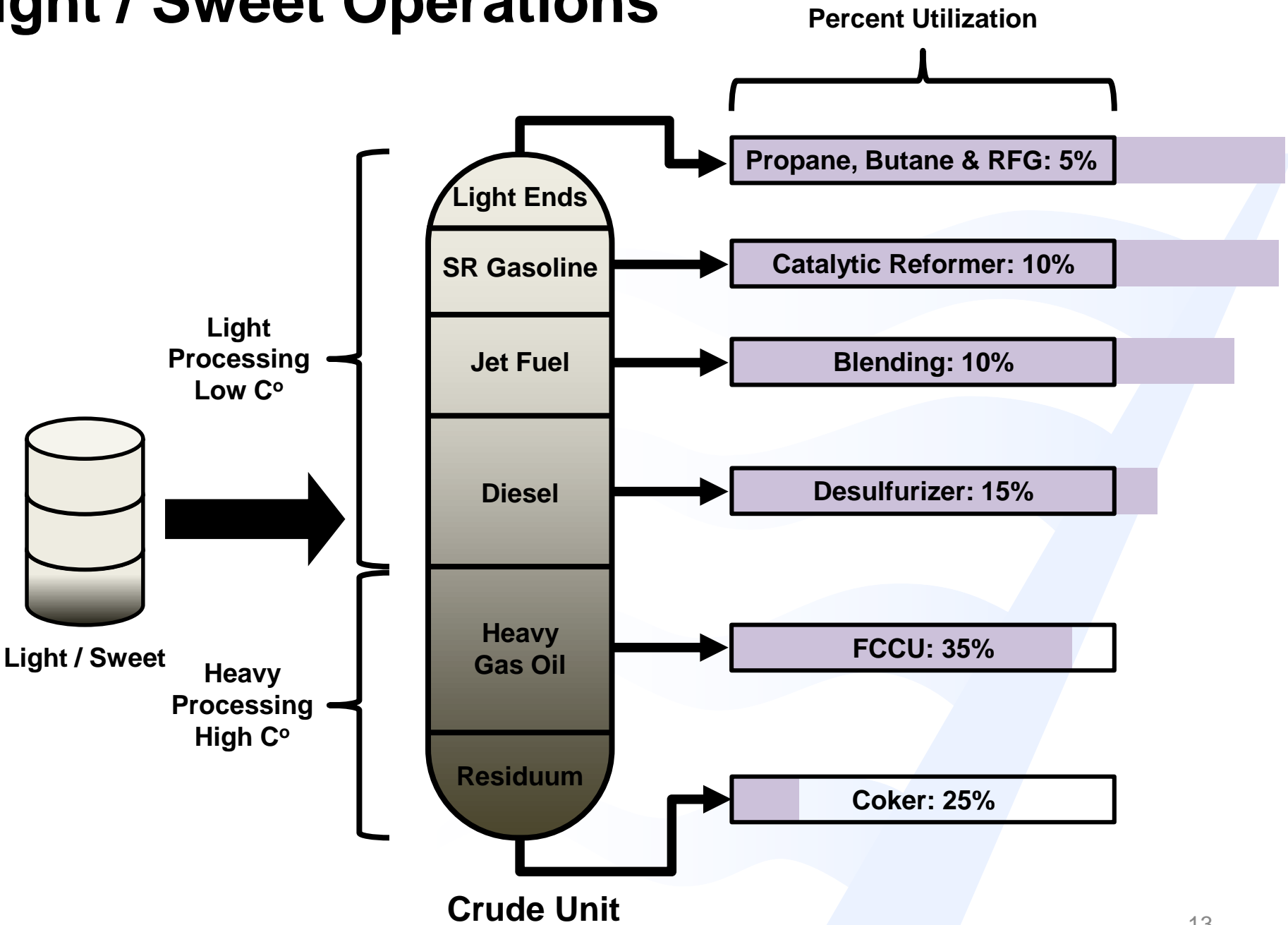
# Standard Operations



# Heavy / Sour Operations



# Light / Sweet Operations



# Crude Oil Comparison

Crude Unit Cut	California (Kern River)	Alaska North Slope	Canadian Tar Sands (Albion Heavy Synthetic)	Fracked Crude (Eagle Ford Shale Oil)
LPG	1%	4%	2%	1%
Straight Run Gasoline	14%	23%	14%	37%
Jet Fuel	8%	19%	5%	12%
Diesel	12%	13%	9%	21%
Heavy Gas Oil	30%	29%	11%	24%
Residuum	34%	12%	59%	4%

The background of the slide features a night-time photograph of the San Francisco skyline, with the city lights reflecting on the water. The Golden Gate Bridge is visible on the left side. The title text is overlaid on the right side of this image.

# Impact of Rule 13-1 Carbon Intensity Limit

- Prevents refineries from re-tooling to process significantly heavier and more sulfurous crude oils like Canadian tar sands.
- Doesn't restrict full-production with current equipment.
- Allows capital projects to increase production as long as carbon intensity does not increase.
- Aligns with draft ARB scoping plan proposal for direct regulation of the refinery sector.



# Draft Rule 12-16

## Proposed by Environmental Advocacy Groups

### Limits refinery GHG & criteria pollutant emissions

- Affects five refineries and three associated facilities
- Caps GHG, PM<sub>10</sub>, PM<sub>2.5</sub>, SO<sub>2</sub> and NO<sub>x</sub> emissions
- Limits set at 7% above each refinery's five-year max

### Has significant issues

- Conflicts with state and federal law on permitting
- Court would likely find it to be arbitrary and capricious
- May cause gasoline shortages if consumption increases





# Comparison of Rule 12-16 & Rule 13-1

	Rule 12-16	Rule 13-1
<b>Goals / Objectives</b>		
• Prevents Significant Increases in PM Emissions	Yes	Yes
• Prevents Significant GHG Emission Increases	Yes	Yes
• Reduces Toxic Emissions	No	No
• Addresses Emissions Leakage	No	Yes
<b>Harmony with...</b>		
• Health and Safety Code	No	Yes
• AB 32 Cap-and-Trade Program	No	Yes
• New Source Review	No	Yes

A photograph of the Golden Gate Bridge in San Francisco, California, spanning across the water. The bridge's iconic orange-red towers and suspension cables are prominent against a clear blue sky. In the foreground, there's a body of water and some greenery on the left side.

# Summary

- Staff believes that draft Rule 13-1 meets the GHG-related goals of draft Rule 12-16, but more analysis and consultation with stakeholders is still required.
- Draft Rule 13-1 will be evaluated as an alternative to draft Rule 12-16 in the EIR for 12-16.
- Analysis of draft Rule 13-1 will not impact the schedule for the analysis of draft Rule 12-16.



# Schedule / Next Steps

## **On track with 12-16/11-18 rulemaking process**

- MAR 2017 – Second round of workshops / hearing package published
- MAY 17, 2017 – Board hearing

## **Proposed schedule for Rule 13-1**

- FEB 2017 – Workshop package published
- MAR 2017 – Outreach in refinery communities
- APR 2017 – Update to Stationary Source Committee
- MAY 2017 – Hearing package published
- AUG 2017 – Board hearing



AGENDA: 7

# ***Advisory Council Deliberation on the Draft Clean Air Plan/Regional Climate Protection Strategy***

## **Advisory Council Meeting**

February 6, 2017

Henry Hilken  
Director of Planning and Climate Protection



# Critical Challenges

## Climate Change

- The greatest common global challenge
- The biggest threat to our environment, economy, health and quality of life

## Health Inequities

- Equal access to healthy air is a fundamental right that still eludes many Bay Area residents

This Plan focuses on strategies that will help us meet both of these challenges



# What Is This Plan?

## Multi-pollutant plan to update 2010 Clean Air Plan

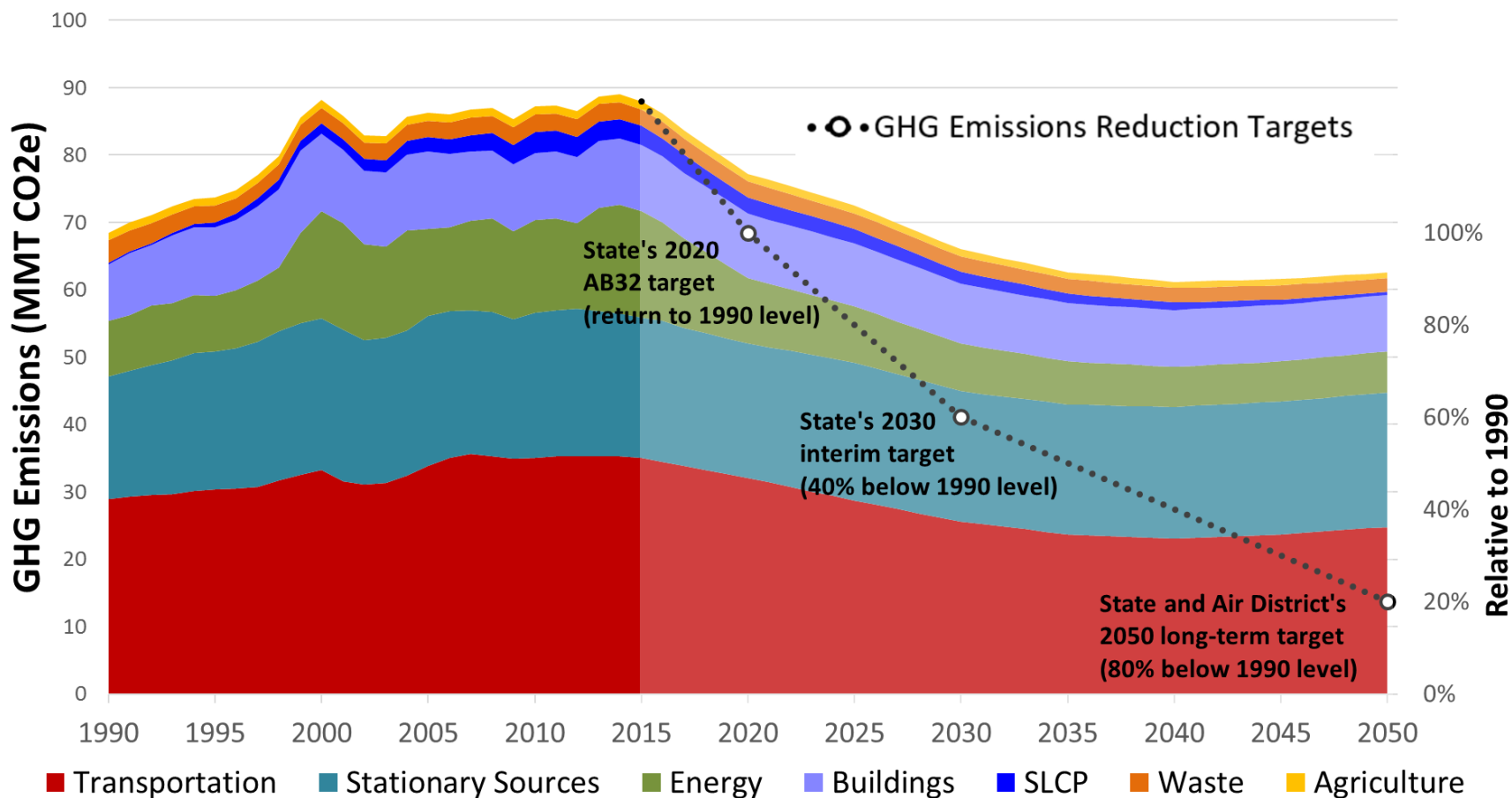
A comprehensive strategy of 85 measures to:

- reduce ozone and PM throughout the region
- reduce toxics in impacted communities
- reduce GHGs toward long-range targets
  - 40% below 1990 levels by 2030
  - 80% below 1990 levels by 2050

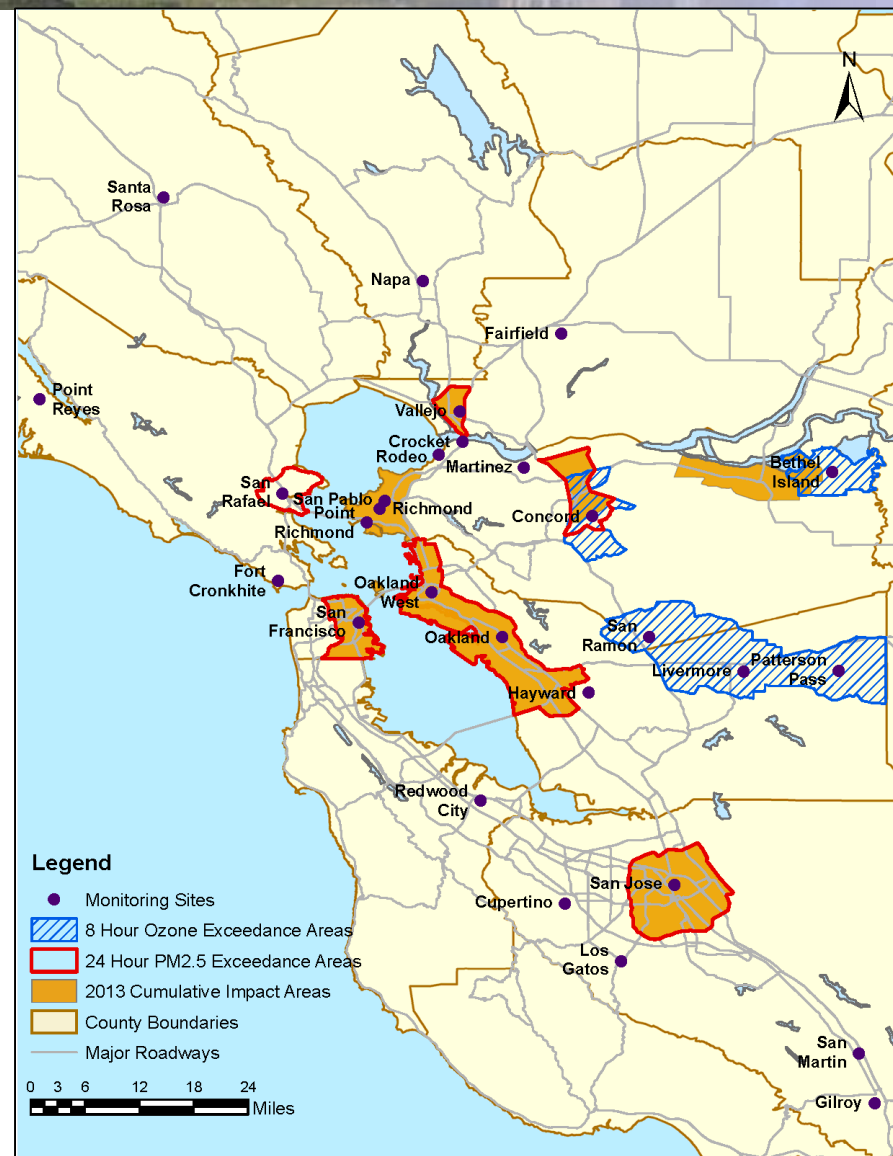
This Plan lays out a Bold Vision for a future Bay Area with a thriving economy, truly equitable access to healthy air, and a healthy, secure environment

# Climate Challenge in the Bay Area

## Bay Area GHG Projections to 2050 with Key State Programs



# Healthy Air for All Bay Area Residents



Regionally: *reduce ozone and PM emissions* to assure long-term compliance with air quality standards

Locally: *eliminate disparities* in local exposure to air pollution



# Where Do We Want To Be In 2050?

## Laying out a Bold Vision for a future Bay Area

- GHG emissions have been reduced by over 80%
- Disparities in health risk from air pollution have been eliminated
- Eliminate fossil fuel combustion/keep fossil fuels in the ground
- Buildings are fossil-fuel free
- Power supply is nearly 100% renewable
- Transportation based on EVs and renewable diesel
- Half of all trips are via transit, biking or walking
- Oil companies/refineries become clean energy companies
- Organics are cut from waste stream and put to productive use





# How Does This Plan Get Us There?

It sets us on a path to 2050 by laying out specific actions the Air District will take over the next 3-5 years

## Key Priorities in the Plan:

- Reduce emissions of criteria pollutants and toxic air contaminants from all sources
- Reduce emissions of “super-GHGs” such as methane
- Reduce fossil fuel combustion
- Improve efficiency/reduce demand for fossil fuels
- Decarbonize the energy system



# Priority Actions

- Develop region-wide rule-making approach to reduce risk and emissions from many sources comprehensively
  - Health risk from toxic air contaminants
  - Methane and fossil fuel combustion
- Limit GHG and criteria pollutant emissions from refineries and other large stationary sources
- Provide guidance, model ordinances, best practices and other tools to local governments for low carbon buildings, waste reduction, etc.
- Work with MTC/local governments to reduce VMT
- Implement a comprehensive approach to transition energy use in buildings from natural gas to efficiency and renewable energy
- Continue to incentivize EVs & EV infrastructure



# Input Into This Plan

## Outreach

- Convened stakeholder meetings in each county
- Met with subject matter experts
- Convened external working groups
- Convened open houses and workshops
- Posted draft control measures for public review and comment
- Incorporated Advisory Council recommendations

## Research

- Researched state, regional and local air quality and climate plans
- Considered Plan Bay Area land-use and transportation strategies
- Considered key State documents and programs



# Bay Area Leadership

We are embarking on an unprecedented journey to lead the Bay Area to a better future

- Every household, business and individual has tremendous power to make a difference
- We can do this together! The Bay Area has:
  - The brightest minds
  - A culture of innovation
  - The most committed populace
  - A blueprint for the first leg of this journey



# Next Steps

- January 11 – March 9: Public comment period on Draft Plan and Draft EIR
- January 30 – February 8: Eight Open Houses
- February – March: Revisions to Draft Plan and Draft EIR per public comments
- April 19: Board Hearing on 2017 Plan and Final EIR

*Implementation on many control measures has already begun and is moving forward concurrently with this plan adoption schedule.*



# Open House Highlights





# Open House Highlights

## Road to 2050

**TRANSIT** *ridesharing*  
*Bicycling teleworking*  
*rail* **WALKING** *FUEL*  
*HYDROGEN*  
 electric vehicles  
 Healthy Infill bike lanes  
 Low-Carbon Freight **Ferries**  
**CAR SHARING**  
 RESTORED Carbon Sequestration  
**WETLANDS** *shade trees* *compost* **Zero Waste**  
*reduce reuse recycle* *farmer's markets* *Low-GHG Diet*  
**DAIRY DIGESTERS**  
**SOLAR Energy** **WIND FARM**  
*STORAGE*  
**COMMUNITY CHOICE RENEWABLE ENERGY**  
*rainwater collection* **Native Plants** *water recycling* **NATURAL REFRIGERANTS**  
*electric appliances*  
**GREEN BUILDINGS solar**  
 Electric Heat Pumps **CLEAN STOVES** *water heaters*  
**Zero Carbon** *Clean Energy* *Electrification*  
*biogas recovery* *healthy communities*

**BAY AREA AIR QUALITY MANAGEMENT DISTRICT**

## Greenhouse Gases



The scientific consensus is clear that human activities are changing the climate and that climate change poses enormous risks on a worldwide basis. Climate change is expected to have profound impacts on both the natural and man-made systems that sustain us.

Greenhouse gases (GHGs) are the primary agents of man-made climate change. Spare the Air—Cool the Climate, 2017 Clean Air Plan, focuses on the “Kyoto 6” GHGs as well as black carbon. Three of these gases—carbon dioxide, methane and nitrous oxide—represent 98 percent of the estimated global warming potential of the GHGs currently emitted in the Bay Area.

### Greenhouse Gases

**Carbon Dioxide (CO<sub>2</sub>)** is released to the atmosphere when fossil fuels (oil, gasoline, diesel, natural gas, and coal), solid waste and wood are burned.

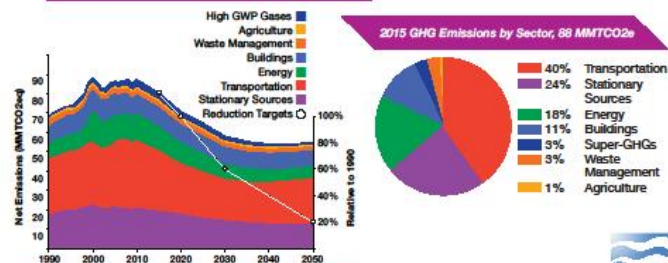
**Methane (CH<sub>4</sub>)** emissions result from the decomposition of organic waste in municipal solid waste landfills and the raising of livestock. Methane is also emitted during the production and transport of natural gas, coal and oil.

**Nitrous oxide (N<sub>2</sub>O)** is emitted by various agricultural and industrial activities, as well as by combustion of solid waste and fossil fuels.

**Hydrofluorocarbons (HFCs), perfluorocarbons (PFCs), and sulfur hexafluoride (SF<sub>6</sub>)** are generated in a variety of industrial processes. These pollutants are extremely potent GHGs, with up to 20,000 times more global warming potential than carbon dioxide.

**Black Carbon (BC)**, commonly referred to as “soot”, is emitted by the burning of fuels, biomass and industrial operations.

### Bay Area GHG Emissions and Projections





# Open House Highlights

## Health Impacts



### Bay Area Communities Most Impacted by Air Pollution

Exposure to air pollution depends on where people live, work, and play. Certain communities (see map) suffer from higher levels of air pollution and accompanying health impacts. The Air District seeks to eliminate these inequities over time.



### How Air Pollution Affects Health

#### Ozone

- Damages the lungs and respiratory tract
- Irritates the nose, throat and respiratory system
- Aggravates respiratory conditions such as asthma, bronchitis and emphysema
- Increases susceptibility to respiratory ailments and permanent damage to lungs
- Contributes to hardening of the arteries and heart attacks

#### Particulate Matter

- Aggravates asthma and bronchitis
- Contributes to heart attacks and deaths
- May increase blood pressure and damage blood vessels
- Can damage cells, tissue and DNA

#### Toxics

- Chronic health effects include neurological damage, hormone disruption, developmental defects, leukemia and other forms of cancer
- Acute health effects include respiratory tract, eye and skin irritation, nausea, dizziness and death at high levels of exposure

#### Greenhouse Gases

- Increase in hotter weather may increase heat-related illness and death from heatstroke
- Hotter weather will increase air pollution, which may exacerbate many of the health effects from air pollutants listed above
- Severe weather may cause injuries, fatalities and mental health impacts

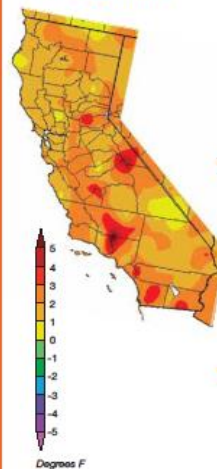


## Climate Impacts



### Climate Change Impacts

Temperature Increase Above Normal 1/12/2016-1/11/2017



#### Rising Temperatures

The number of very hot days and severe heat waves are expected to increase significantly across the region by mid-century. Extreme heat causes heat-related illnesses such as sunstroke and heat stress, and results in higher ozone levels that also impact public health. More frequent extreme heat days threaten to roll back the gains we have made in reducing air pollution. Rising temperatures may also extend the length and severity of droughts.



#### Extreme Weather

Climate change is expected to increase the frequency and severity of extreme weather events like storms, heatwaves, floods, etc. An extreme storm in the Bay Area could result in over \$10 billion in damages to structures and building contents, and in transportation delays and electricity interruption.



#### Rising Sea Level

Rising sea levels impact coastal flooding, erosion, shipping channels and clearance under bridges. Sea level at the Golden Gate Bridge has risen 8 inches over the last 100 years. The frequency of extreme high water events has increased 20 times since 1915. The National Research Council projects an additional 2-12 inches of sea-level rise in the Bay Area by 2030, and 5-24 inches by 2050.



# Open House Highlights

## Transportation



2015 GHG Emissions – Transportation (35 MMTCO<sub>2</sub>e)



*By 2050: The transportation sector will be transformed.*

We will bicycle, walk and take transit for the majority of our trips. When we do drive, we will travel by electric vehicles, both shared and privately-owned.

### Path to 2050:

#### Now:

Funding, regulations, best practices, local government ordinances to support electrification of the vehicle fleet; electric vehicle readiness in buildings; low-carbon freight, public transit, bicycle and pedestrian facilities, ride-, car-, and bike-sharing; infill development, parking and pricing strategies

#### Future:

More development near transit and job centers, walkable and bike-friendly communities throughout the region, nearly 100 percent EV fleet, renewable diesel

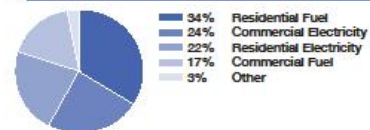
#### Partners:

State, regional, and local governments, commuters, employers, commercial and residential developers, transit agencies

## Buildings



2015 GHG Emissions – Buildings (10 MMTCO<sub>2</sub>e)



*By 2050: Buildings will no longer use fossil fuels.*

The buildings in which we live, work, learn, shop and socialize will be more energy efficient and will be heated, cooled and powered by renewable energy.

### Path to 2050:

#### Now:

Incentives, best practices and local government ordinances to support energy efficiency programs, cool roofs, cool parking, shade trees, rooftop solar, solar water heating, electric heat pumps and onsite renewable energy programs

#### Future:

Maximum energy efficiency, fossil-free buildings, zero-carbon electricity, new energy storage technologies, onsite renewable energy

#### Partners:

State and local governments, residential and commercial building owners