



# 2004 Aging Power Plant Study Third Workshop

California Energy Commission  
June 9, 2004



# Last Workshop

- Three Objectives
  - Role of aging plants in system reliability
  - Environmental and natural gas implications
  - Possible retirements and implications
- Part of the 2004 Update to IEPR
- 66 units – built before 1980, natural gas fired, non-peakers
- What we know about them



# Since Last Workshop

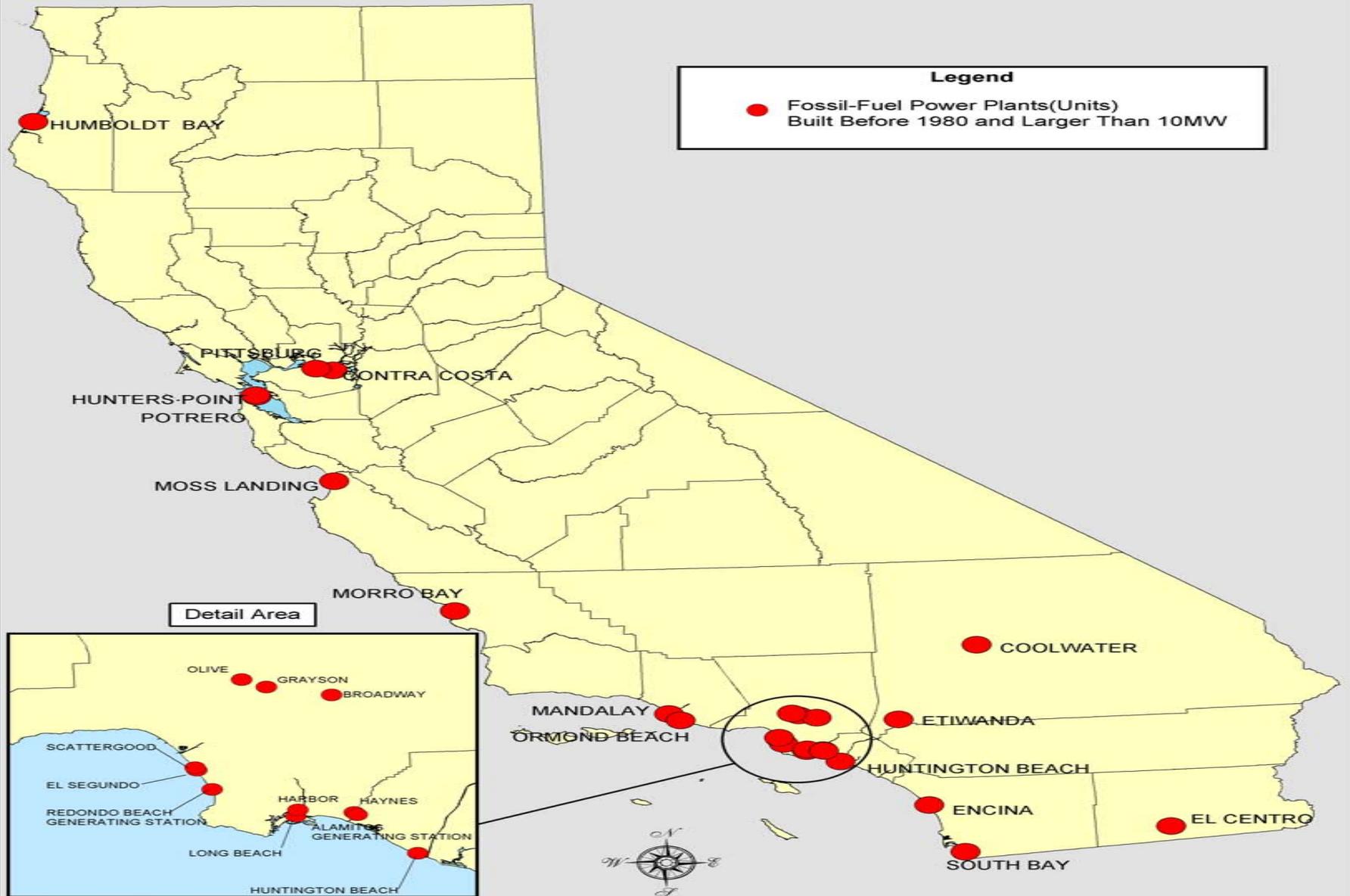
- We have talked to
  - California Independent System Operator
  - Merchant Plant Owners
  - Investor-Owned Utilities
  - Municipal Utilities
- We are gathering information and data from:
  - CAISO
  - Plant Owners
  - FERC
  - CPUC
  - NERC



# Unit Selection Criteria

- Units selected:
  - Grid connected
  - Natural Gas-Fueled
  - Built before 1980
  - Larger than 10 MW
- Units not selected:
  - Peakers
  - Those scheduled to retire before 2005

# Study Group for Aging Power Plant Study





# Summary of Comments

- Generators unified on need for changes to market structures and Must-Offer requirement
- Aging plants require significant maintenance spending to be able to participate in markets
- Retirements highly possible, but should improve economics for those who stay
- Aging plants can still provide valuable service, especially to local reliability
- Impacts of aging plant operation are insignificant



## Summary of Comments (cont'd)

- Aging plants are not operating the way they were designed, causing mechanical stress
- Some aging plants want to compete for peaking capacity needs
- Market uncertainty may cause retirements, but is also preventing new plant construction
- CAISO desires noticing requirements for plant retirements or mothballing
- Efficiency of aging plants closer to new plants when cycled heavily through the day

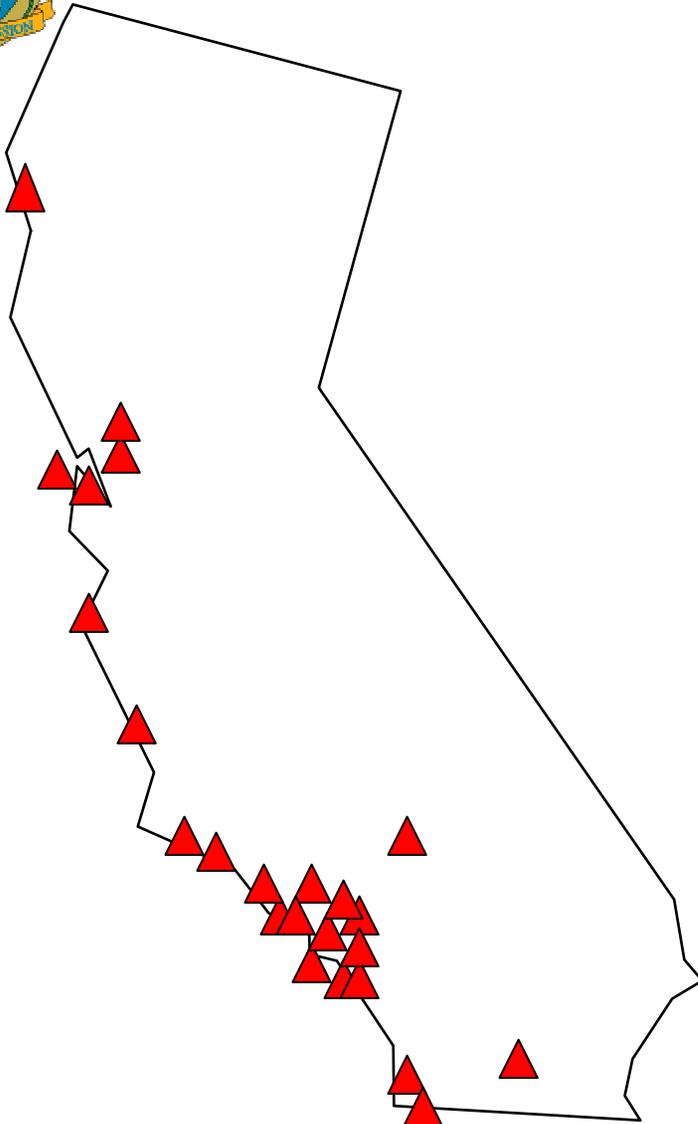


## Role in the System

- Needed Primarily in “Super Peak” Times
- Generation Dependent on Contracts and Participation in Various Markets
  - Day-Ahead and Hour-Ahead Energy Market
  - Ancillary Services Market
  - RMR
  - Bilateral Contracts (DWR)
- Most Have Low Capacity Factors
- Occasionally Used to Alleviate Congestion



# Power Plants Under Study



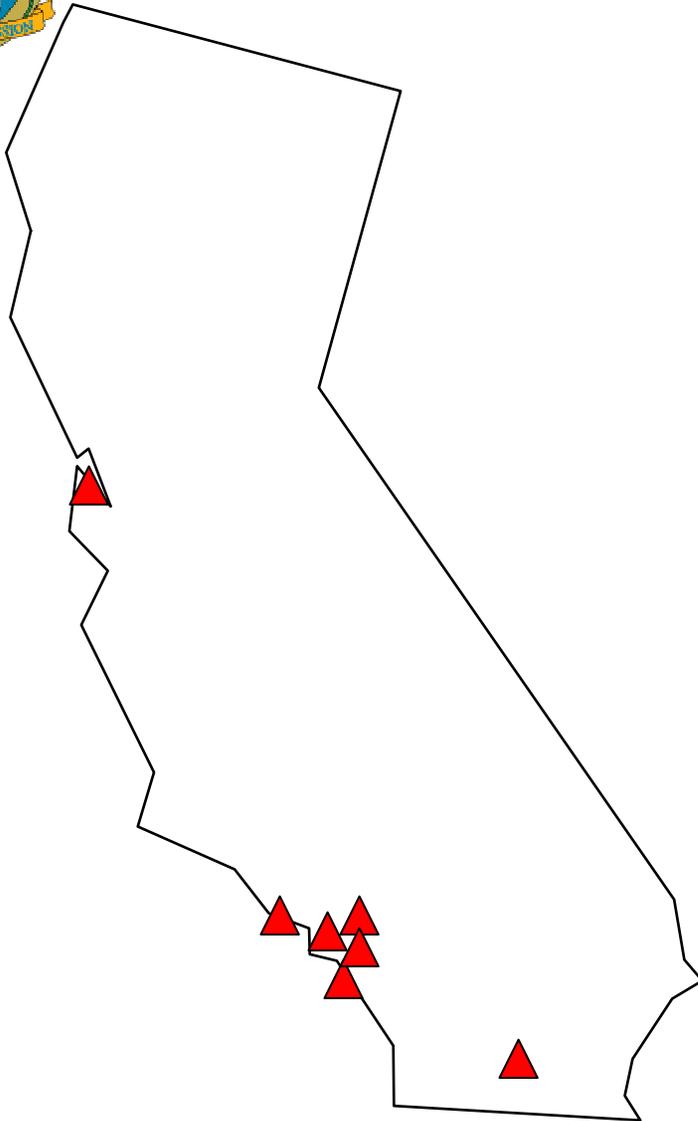
- |                      |                         |
|----------------------|-------------------------|
| <b>Humboldt</b>      | <b>Coolwater</b>        |
| <b>Contra Costa</b>  | <b>El Segundo</b>       |
| <b>Pittsburg</b>     | <b>Etiwanda</b>         |
| <b>Hunters Point</b> | <b>Alamitos</b>         |
| <b>Potrero</b>       | <b>Huntington Beach</b> |
| <b>Moss Landing</b>  | <b>Long Beach</b>       |
| <b>Morro Bay</b>     | <b>Redondo Beach</b>    |
| <b>Mandalay</b>      | <b>Grayson</b>          |
| <b>Ormond Beach</b>  | <b>Haynes</b>           |
| <b>Scattergood</b>   | <b>Broadway</b>         |
| <b>Olive</b>         | <b>El Centro</b>        |
| <b>Encina</b>        | <b>South Bay</b>        |

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# Muni – Owned Plants



**Hunters Point**

**Grayson**

**Haynes**

**Scattergood**

**Broadway**

**Olive**

**El Centro**

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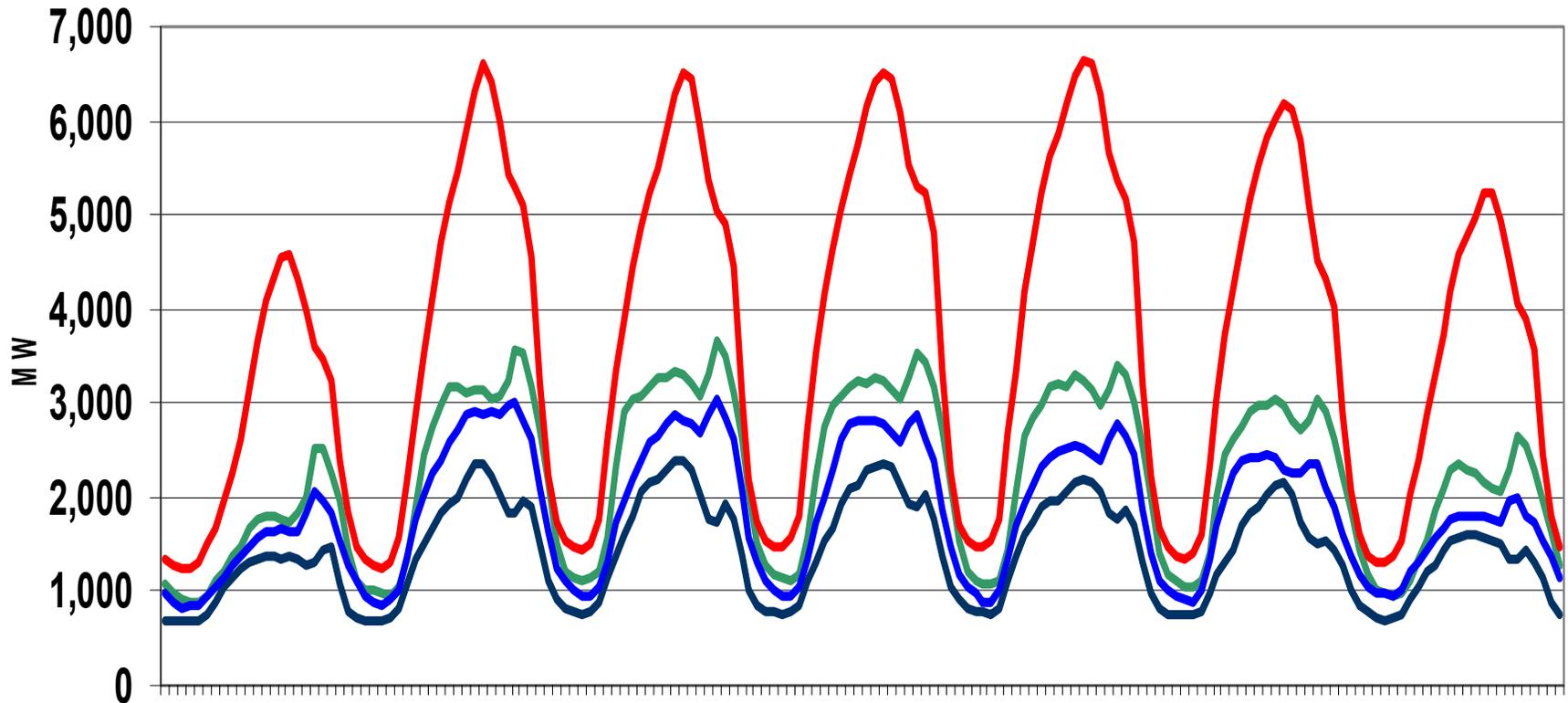
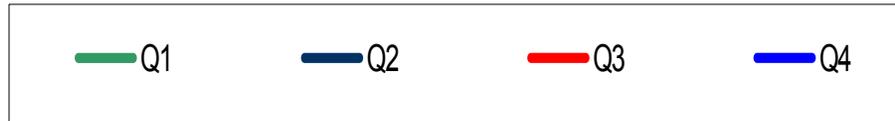


# Aging Muni Units Likely to Remain In Service, Because:

- Have already retrofit/retired units subject to emission control upgrade requirements
- Guaranteed cost recovery
- Potential increases in spot market prices
- Substantial investment in upgrades, recent retirements accompanied by development of new capacity

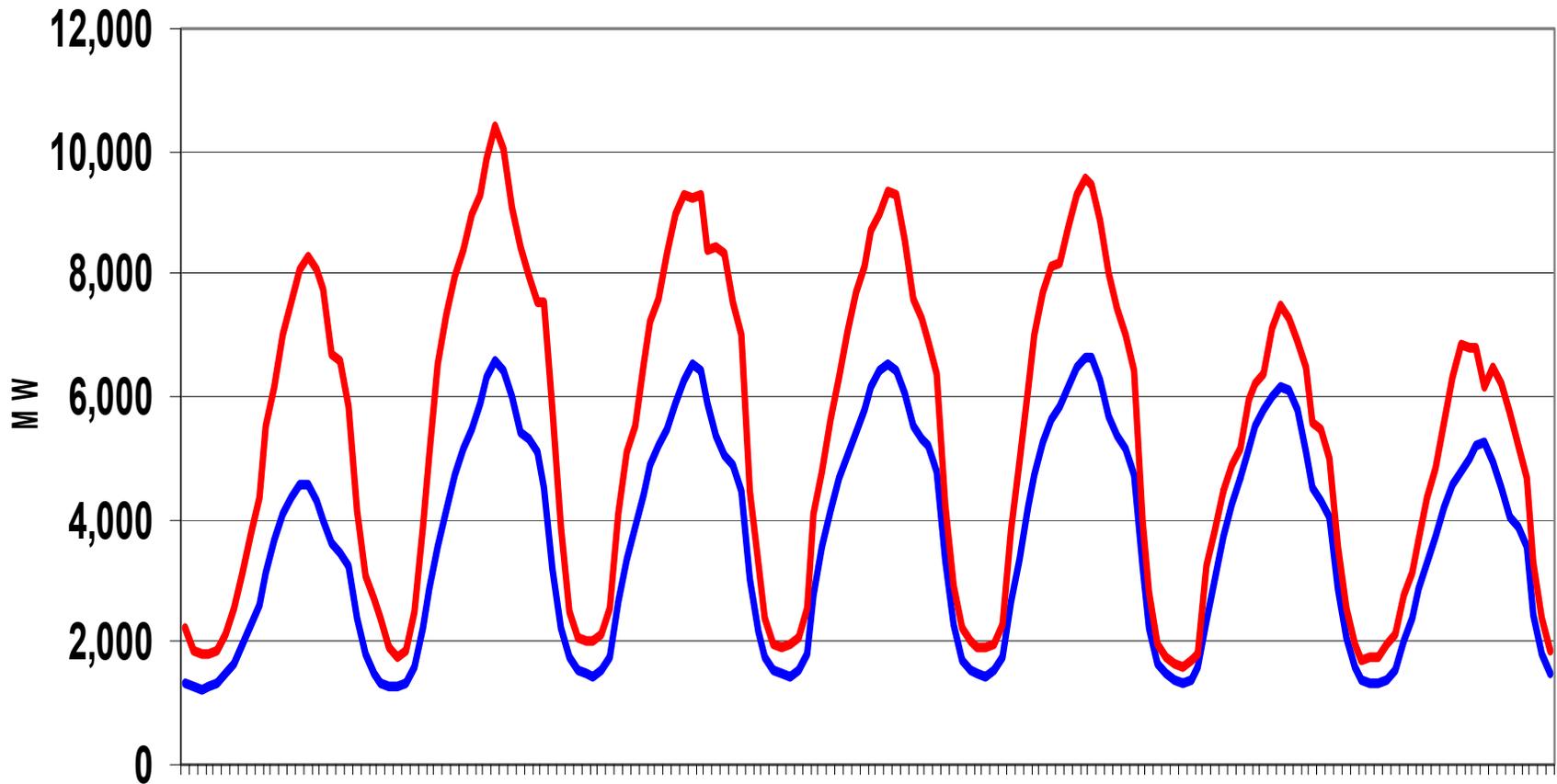


# Typical Weeks for Each Quarter of 2003





# Need for Aging Plants During 2003 Peak

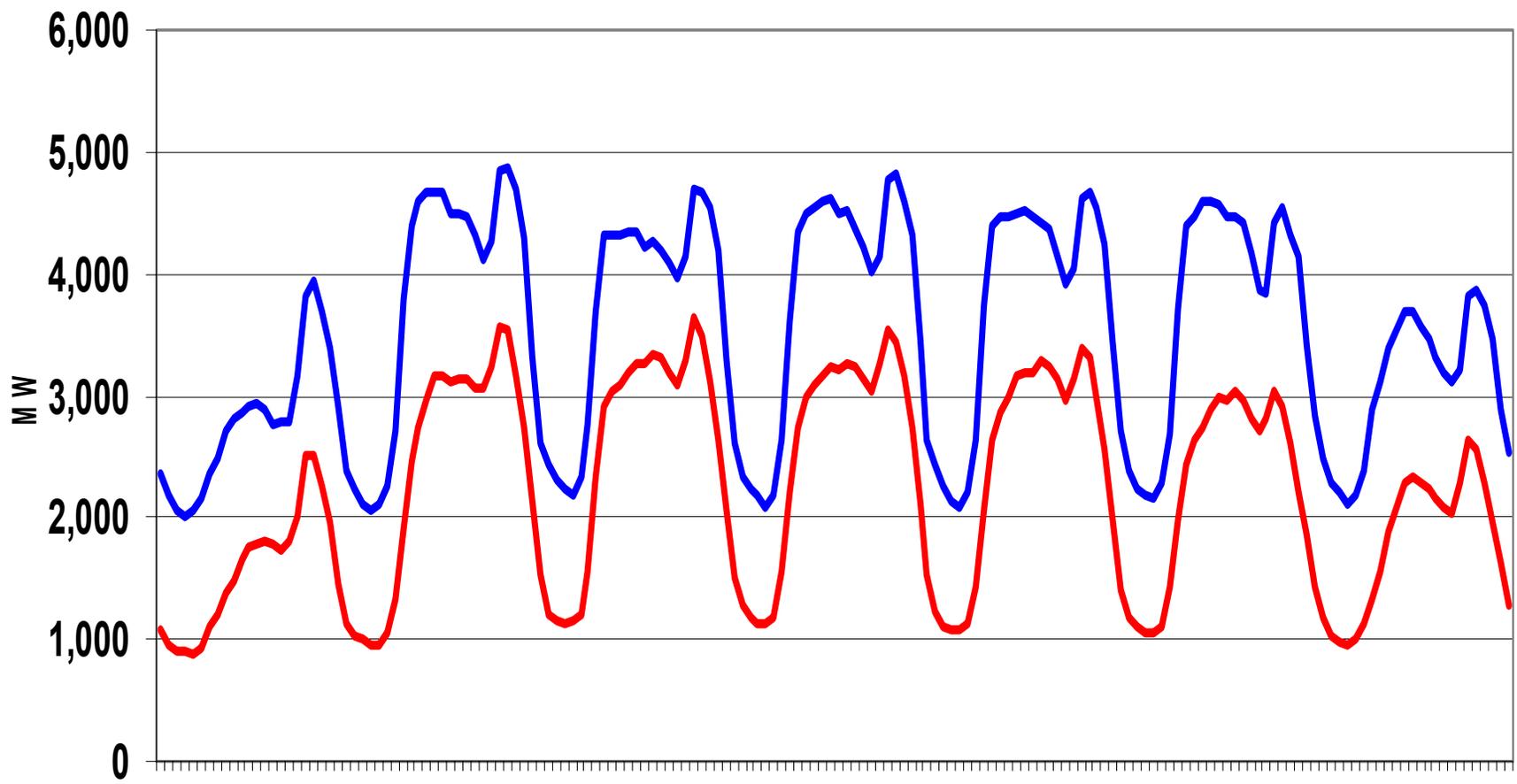


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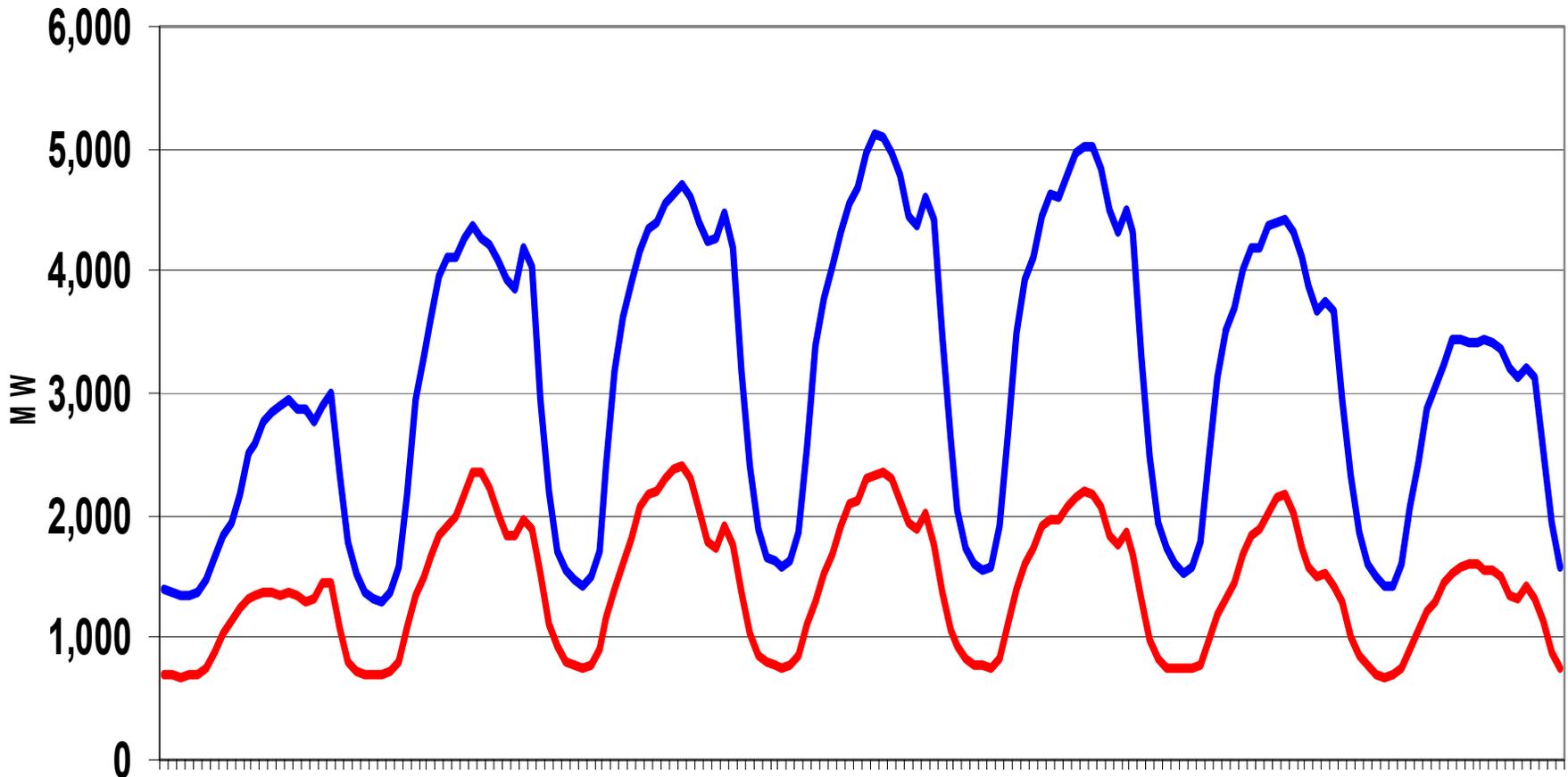


# 37% Drop in Generation in 2003 - Quarter 1





# 54% Drop in Generation in 2003 - Quarter 2

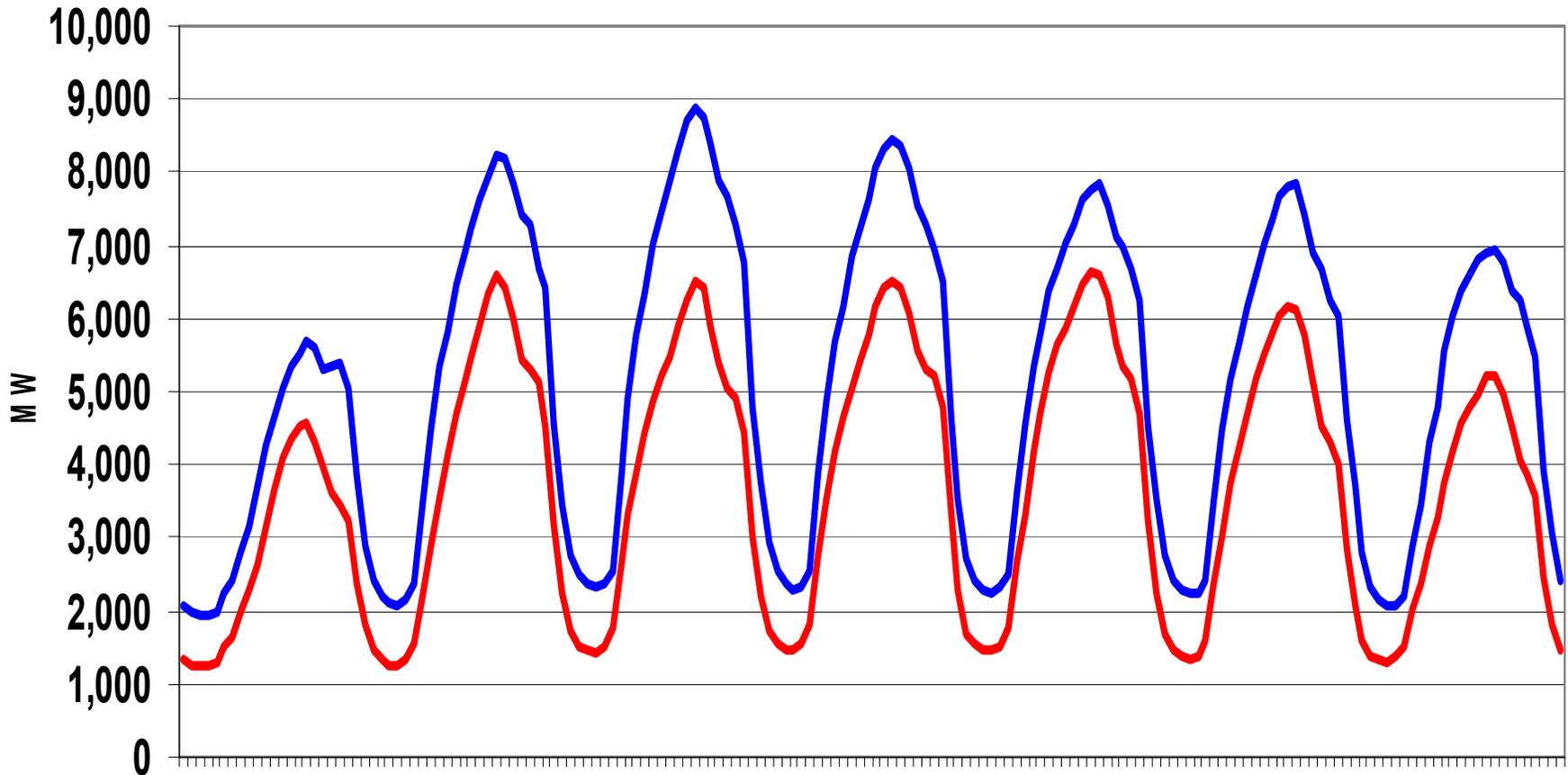


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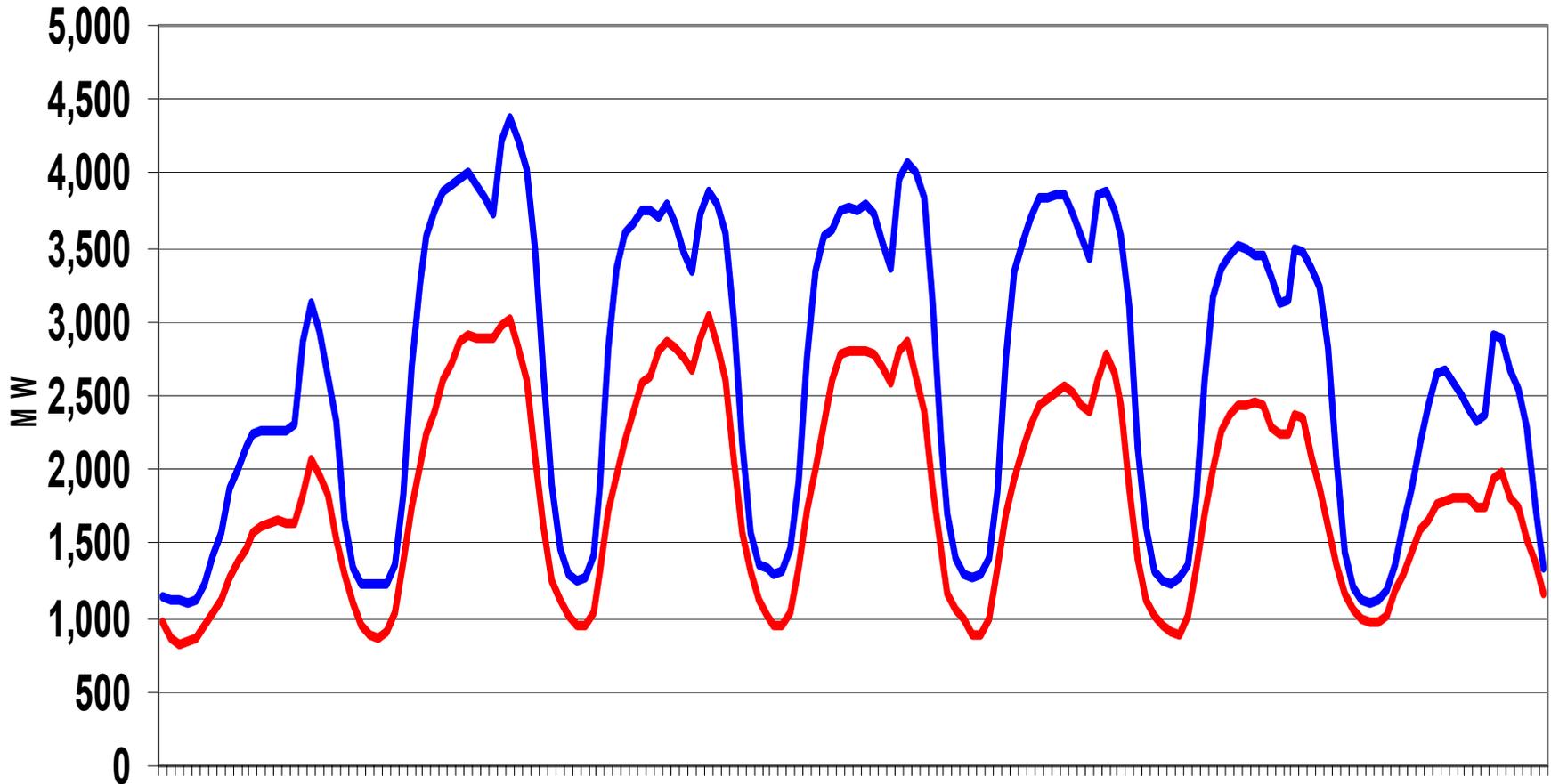


# 28% Drop in Generation in 2003 - Quarter 3





# 30% Drop in Generation in 2003 - Quarter 4





# Dependence on Aging Plants Apt to Increase

- No major additions since summer 2003, more than 1100 MW of capacity mothballed.
- Limited access to new capacity added in Southwest
- Reduction of transfer capability on DC Intertie in summer 2004
- Higher than expected load growth beginning 4<sup>th</sup> quarter of 2003 due to economic recovery
- Above average temperatures expected this summer
- Below average hydro conditions in both CA and the Northwest



## Limited Alternatives in Short Run

Several plant additions anticipated in 2005 – 2006, but

- Mohave, Hunters Point to be taken off line
- Few if any transmission upgrades to reduce reliance on aging plants in load pockets
- No upgrades to increase access to newer plants out of state
- DSM, EE targets will be reached only gradually



# Revenue Sources for Aging Plants

- One DWR contract ensures revenue stream for a set of AES units.
- Several older units in local reliability areas have RMR contracts, but 1-year term does not encourage major capital upgrades.
- Prices in real time energy market in non-summer months are below operating cost of most aging plants.
- Must-Offer requirement pays variable cost but provides disincentives for participating in A/S markets.



## Incentives to Remain On-Line

- Possible higher prices in near-term due to tightening supply/demand balance.
- Irreversibility of retirement/costs of mothballing
- Possible higher prices for selected units near load centers under LMP.
- Possibility of contracts with LSEs pursuant to adoption and implementation of formal resource adequacy requirements



# Resource Procurement and Adequacy Requirements for IOUs

- Will be increasingly short capacity from summer 2005 forward
- Are currently allowed to enter into
  - 5 year contracts for delivery beginning in 2004
  - 1 year contracts for delivery beginning Q1 – Q3, 2005
- Will be required to meet 15-17% PRM requirements in 2008, with interim requirements to be determined
- Will be required to meet 90% of this requirement one year forward
- Are likely to be required to meet these requirements in each load pocket
- Deliverability issues to be resolved



## IOU/DA Resource Needs

- Need for Q3 peaking capacity in 2004, growing substantially in 2005 and onward.
- Gradual increase in need for capacity in other quarters, energy
- Reluctance to enter into long-term contracts
  - Uncertainty of load obligations
  - 3-year regulatory and construction lag?



## Uncertainties....

- To what extent can aging plants provide products needed by IOUs today?
- Can they competitively provide products that will be needed in 2005-2008?
- Will there be alternative sources for these products? If not, will new products and contractual forms be developed that provide energy and reliability at minimal costs to ratepayers.



# Reliability Investigation

- Conducting Analyses of Effects of Aging Plant Retirements on Transmission System
- Examining Role of Aging Plants in Alleviating Transmission Circuit Congestion (SCIT, etc.)
- Studying Projects that Could Affect RMR Status
- Coordinating with CAISO on Its Study of Reliability Effects of Retirements



# ISO/PTO Annual Grid Assessments

- Starting in 2004 the PTOs (SCE, SDG&E, PG&E) in their annual Grid Assessment Studies will study the impacts of potential power plant retirements on the transmission grid.
- The Grid Assessment studies are usually completed in the fall.



# Annual Grid Assessments

- The annual Grid Assessments are CAISO stakeholder processes with participation from government, public, utilities, generators and interested parties.
- Annual assessments study 5 years out plus the 10<sup>th</sup> year for reliability criteria violations.
- The assessments identify reliability criteria violations and the steps needed to avoid violations.



## Grid Assessments (cont)

- Reliability criteria are specific about both what constitutes a violation and how to test for violations.
- The criteria used in the Grid Assessments include NERC Planning Standards, WECC Reliability Criteria and CAISO Planning Standards.



# Aging Power Plants

- New to the Grid Assessments this year is a study of potential power plant retirements' effects on the ability to meet reliability criteria.
- The specific scenarios for this year's assessments (next page) focus on aging plant retirements.
- The CAISO's Assumptions for Grid Planning Studies can be found at:

<http://www1.caiso.com/docs/2001/06/25/20010625134406100.pdf>



# Plant Retirement Scenarios

- **San Francisco Bay Area Scenario (3711 MW)**
  - Contra Costa Units 6-7, 672 MW
  - Contra Costa Units 4-5, 0 MW (condensers)
  - Pittsburg Units 5-7, 1332 MW
  - Moss Landing 6-7, 1500 MW
  - Potrero 3, 207 MW
- **Morro Bay Scenario (680 MW)**
  - Morro Bay Units 3-4, 680 MW
- **Ventura Scenario (1930 MW)**
  - Ormond Beach Units 1-2, 1500 MW
  - Mandalay Units 1-2, 430 MW



# Plant Retirement Scenarios (cont'd)

- **South Bay Sensitivity (2084 MW)**
  - Redondo Beach Units 5-8, 1279 MW
  - El Segundo Units 3-4, 670 MW
  - Long Beach Units 8-9, 135 MW
- **Orange County Scenario (2786 MW)**
  - Alamitos Units 1- 6, 1926 MW
  - Huntington Beach Units 1- 4, 860 MW
- **San Diego Scenario (948 MW)**
  - Encina Units 1-5, 948 MW



# Units Assumed Unavailable

- 5,325 MW of retired or mothballed plants (current and announced) are unavailable in all studies
- 3,694 MW currently retired or mothballed capacity includes these over 100 MW units:
  - San Bernardino 1&2 (126 MW)
  - Etiwanda 1&2 (264 MW)
  - El Segundo 1&2 (339 MW)
  - Alamitos 7 (134 MW)
  - Pittsburg Units 1-4 (625 MW)
  - Morro Bay 1&2 (342 MW)
  - Etiwanda 3&4 (640 MW)
  - Haynes 4 (222 MW)



## Units Assumed Unavailable (cont'd)

- 1,631 MW are not available because the plant owners have announced these units will retire between 2004 and 2008.
  - Valley 1-4 (513 MW, but will be repowered)
  - Haynes 3 (222 MW, but will be repowered)
  - Magnolia 3&4 (53.5 MW)
  - Hunters Point 1-4 (219 MW)
  - South Bay 1-4 in 2009 (623 MW)
  - Plus Mohave (1,500 MW), which is not in California



# 2004 Aging Power Plant Study: California Environmental Factors

California Energy Commission  
June 9, 2004



# California Generation and Air Emissions

Relatively low emission generation system:

- a predominance of natural gas for fired units
- broad use of emission controls/regulations

Emissions trends should continue to improve:

- robust regulatory infrastructure
- new natural gas-fired resources are cleaner and more efficient than system averages



# Aging Power Plants and Current Air Regulations

NOx emission rates are down 80 to 90%:

- retrofit rules require the installation of SCR on most aging plants; and
- statewide, rules are almost fully implemented.

PM emission rates are low due to exclusive use of natural gas in aging plants.

Global Climate Change gas emission rates are a function of fuel type (e.g., natural gas emits less GCC gases less than coal or oil).



# New or Revised Retrofit Rules?

Air quality progress is slowing in most of California, therefore:

- emissions reductions needed in all sectors;
- all cost effective reductions will be considered; and
- power plants may be required to provide additional emission reductions through new retrofit rules.

South Coast is considering modifying RECLAIM to reduce NO<sub>x</sub> allocations 5 to 15%

The Air Resources Board considered model retrofit rule development for combustion turbines, but did not complete the rule development.



# New/Replacement Power Plants

Aging plant retirements may not result in a net decrease of air emissions in an air basin:

- existing units may operate more;
- offsets from the aging unit now available for new emission sources (e.g., replacement power plants); and
- replacement units may have economic incentives or needs to operate at much higher capacity factors than the APPS units.



# Aging Plants and Public Health

A component of public health is local air quality, which is a function of:

- emissions;
- topography;
- meteorological conditions.

Regulators can only affect air quality by reducing air emissions.

Electricity shortages and price spikes could also have consequences on public health.



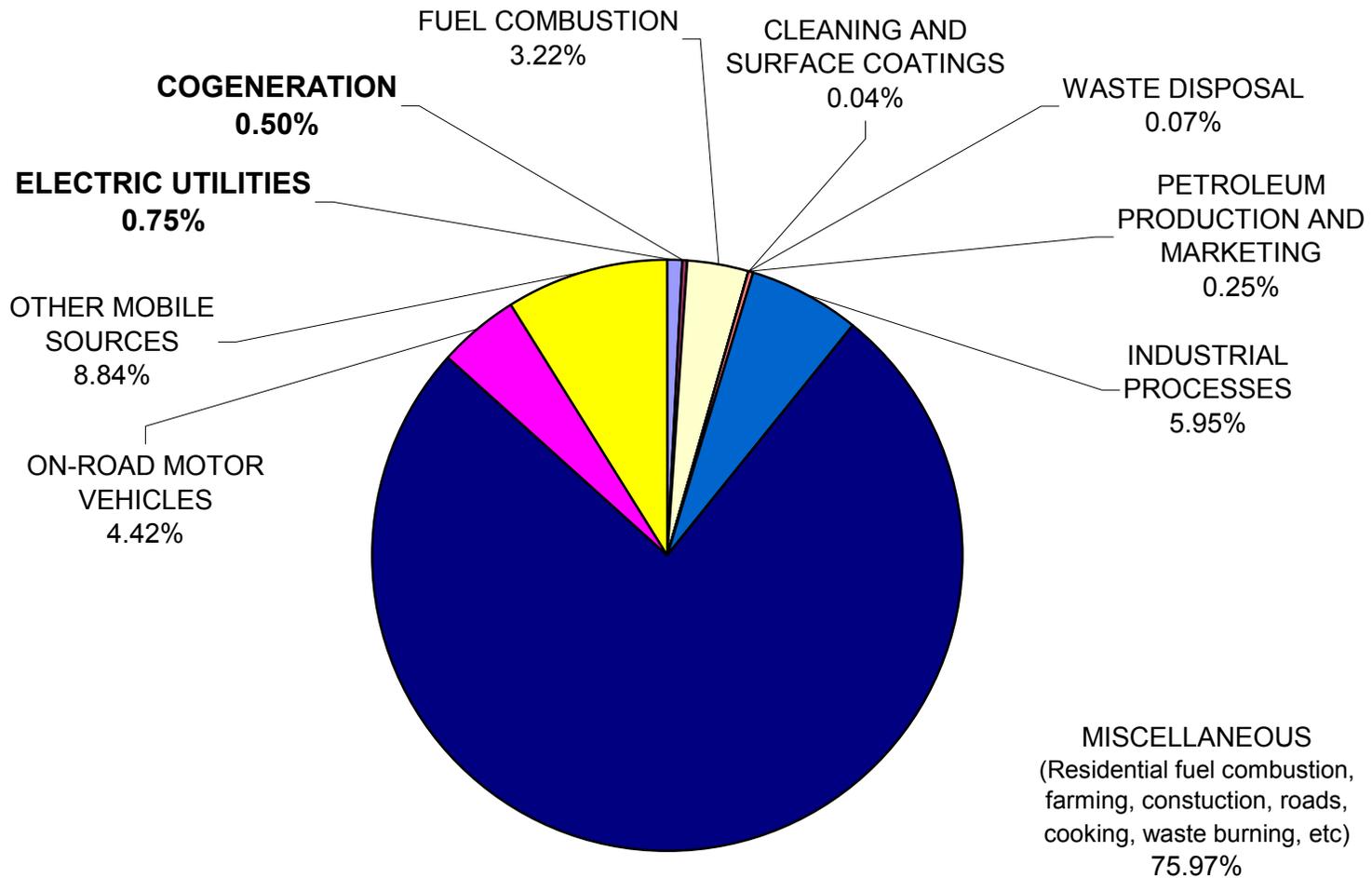
# Aging Plants and Air Quality

Operation or retirements of aging units will have a limited effect on emissions and air quality because:

- All the units use natural gas;
- Most of the units are already well controlled;
- Aging plant air emissions are small compared to other sectors and the total inventory.

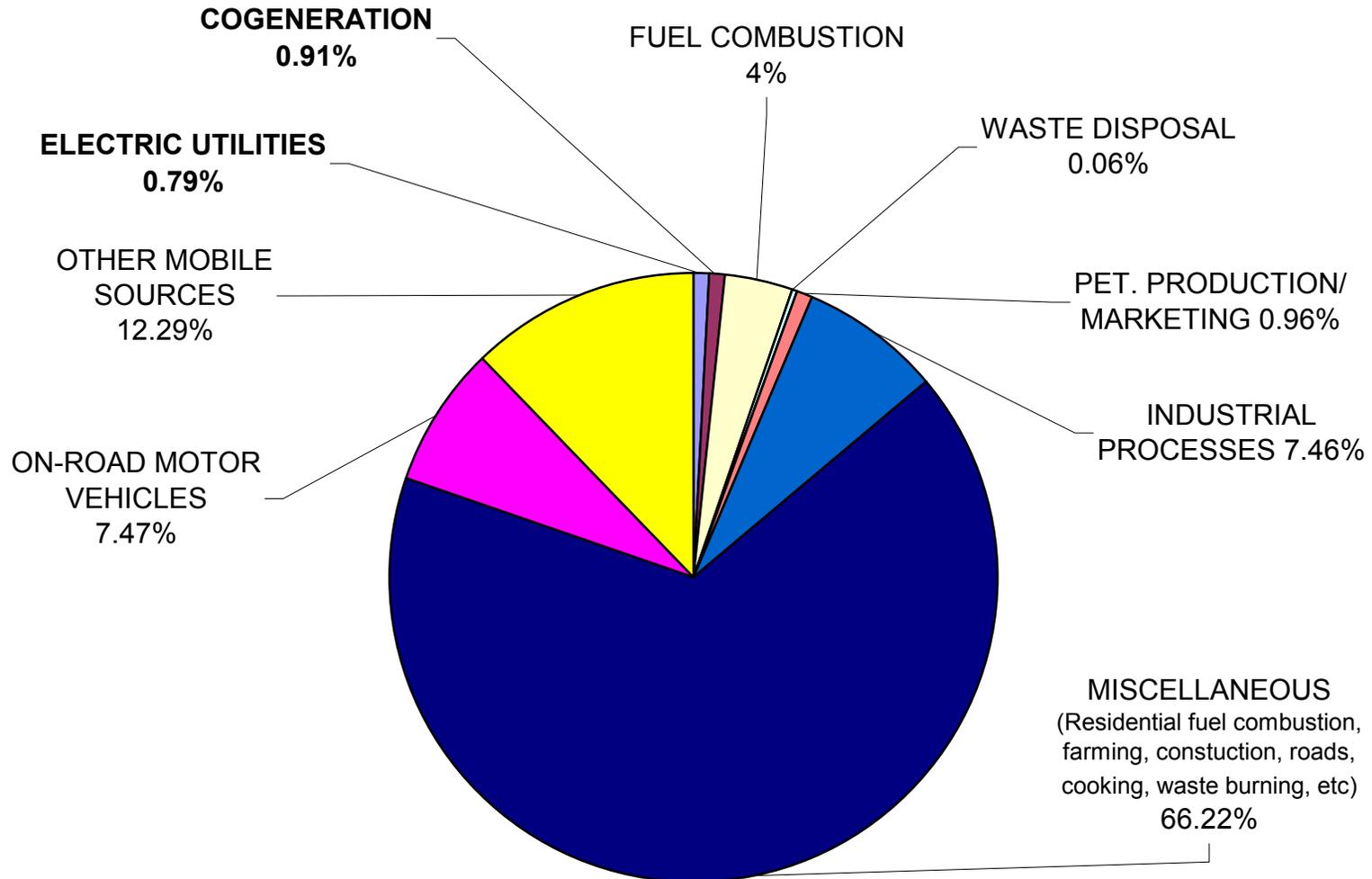


## Statewide PM2.5 Emissions - 2003





## Bay Area Air District PM2.5 Emissions - 2003

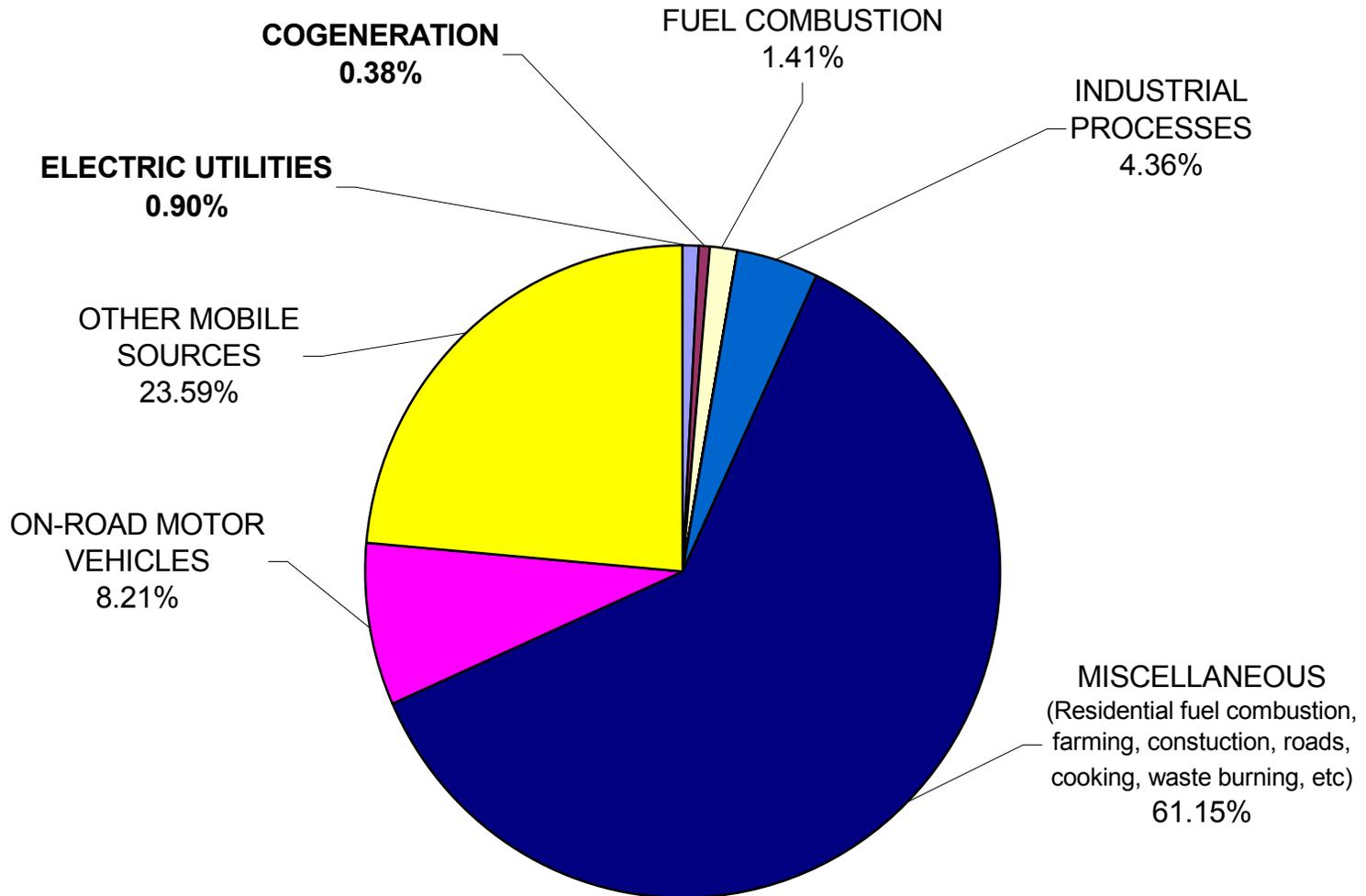


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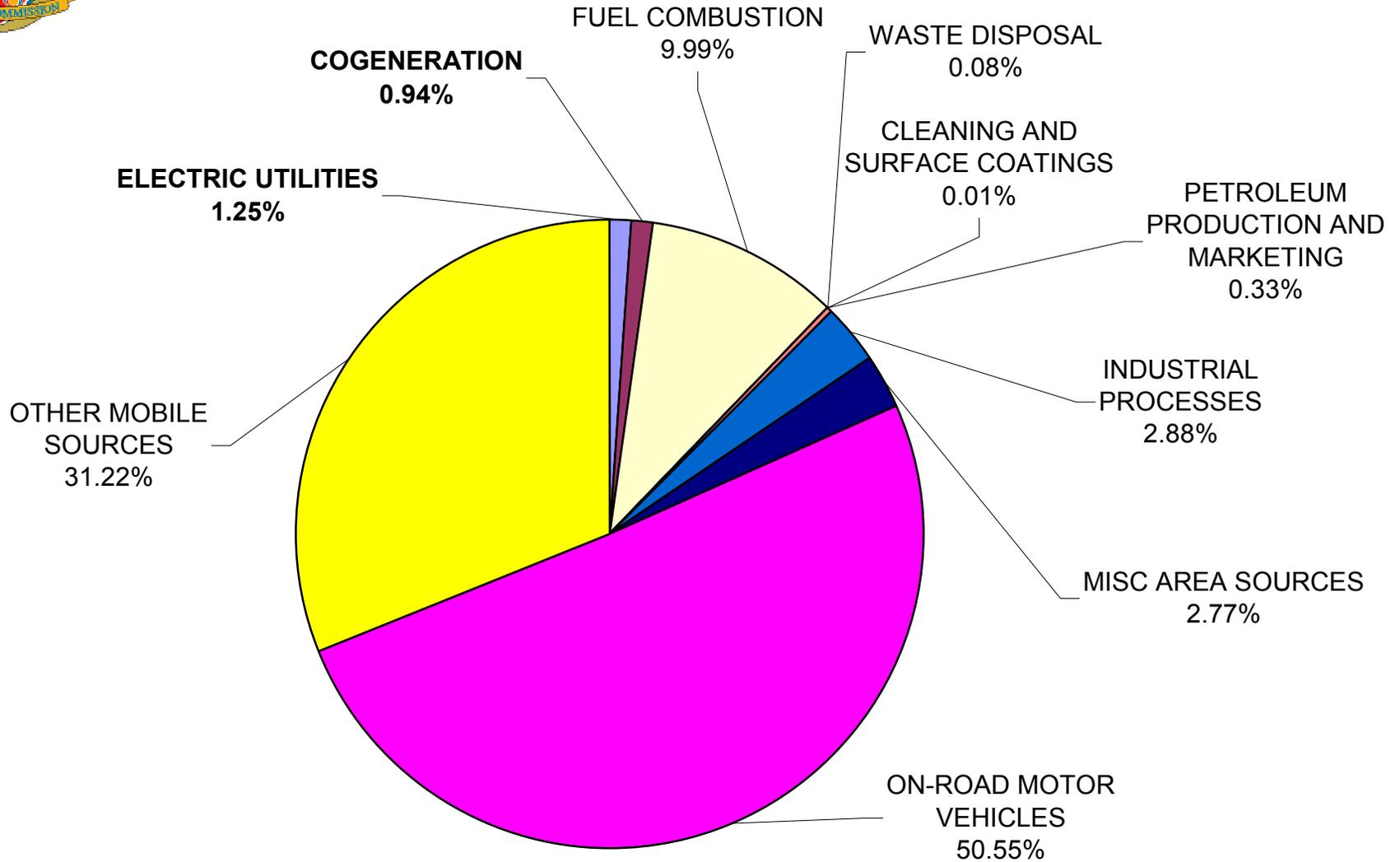


## City & County of San Francisco PM2.5 Emissions - 2003



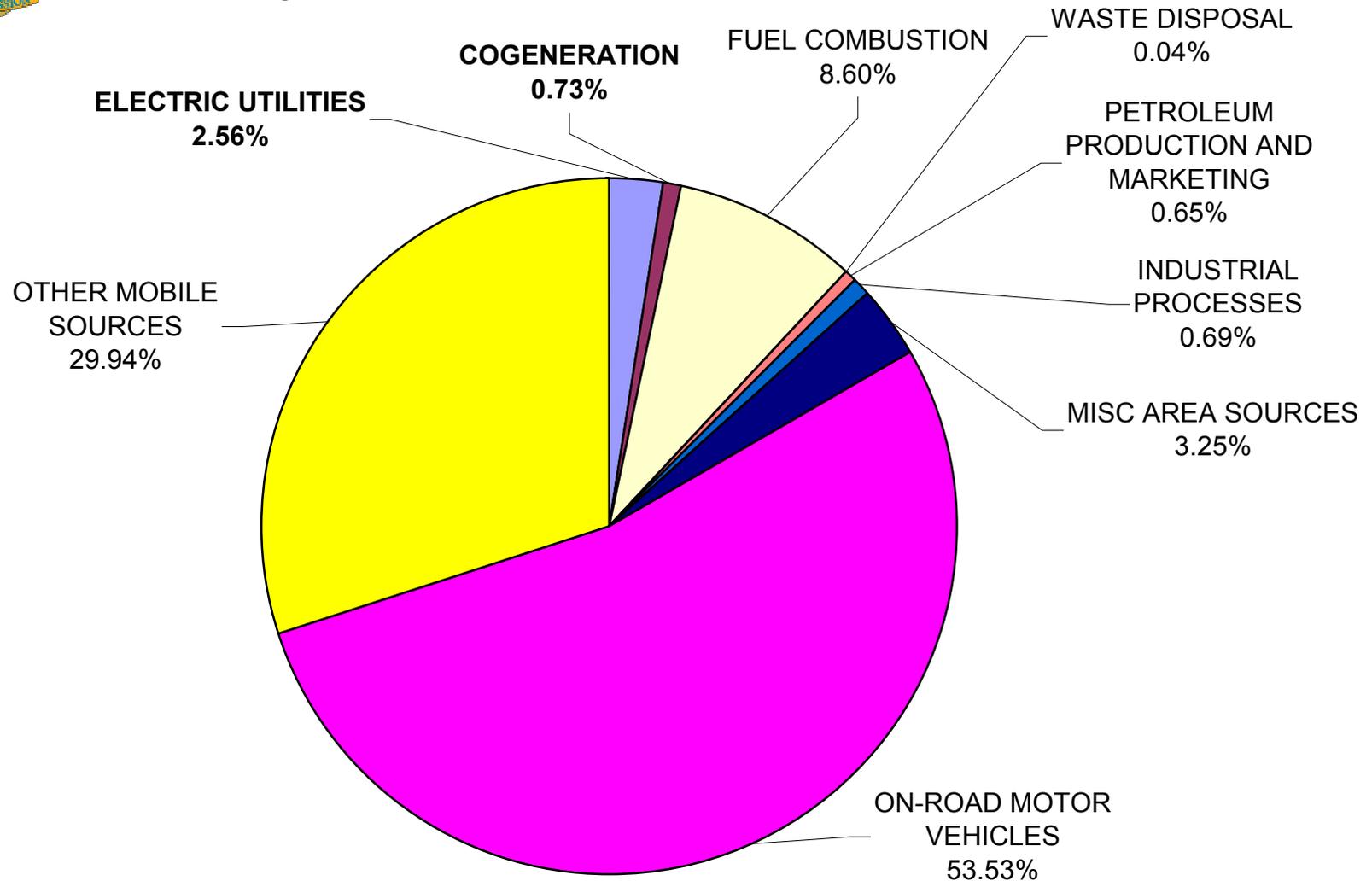


## Statewide NOx Emission - 2003



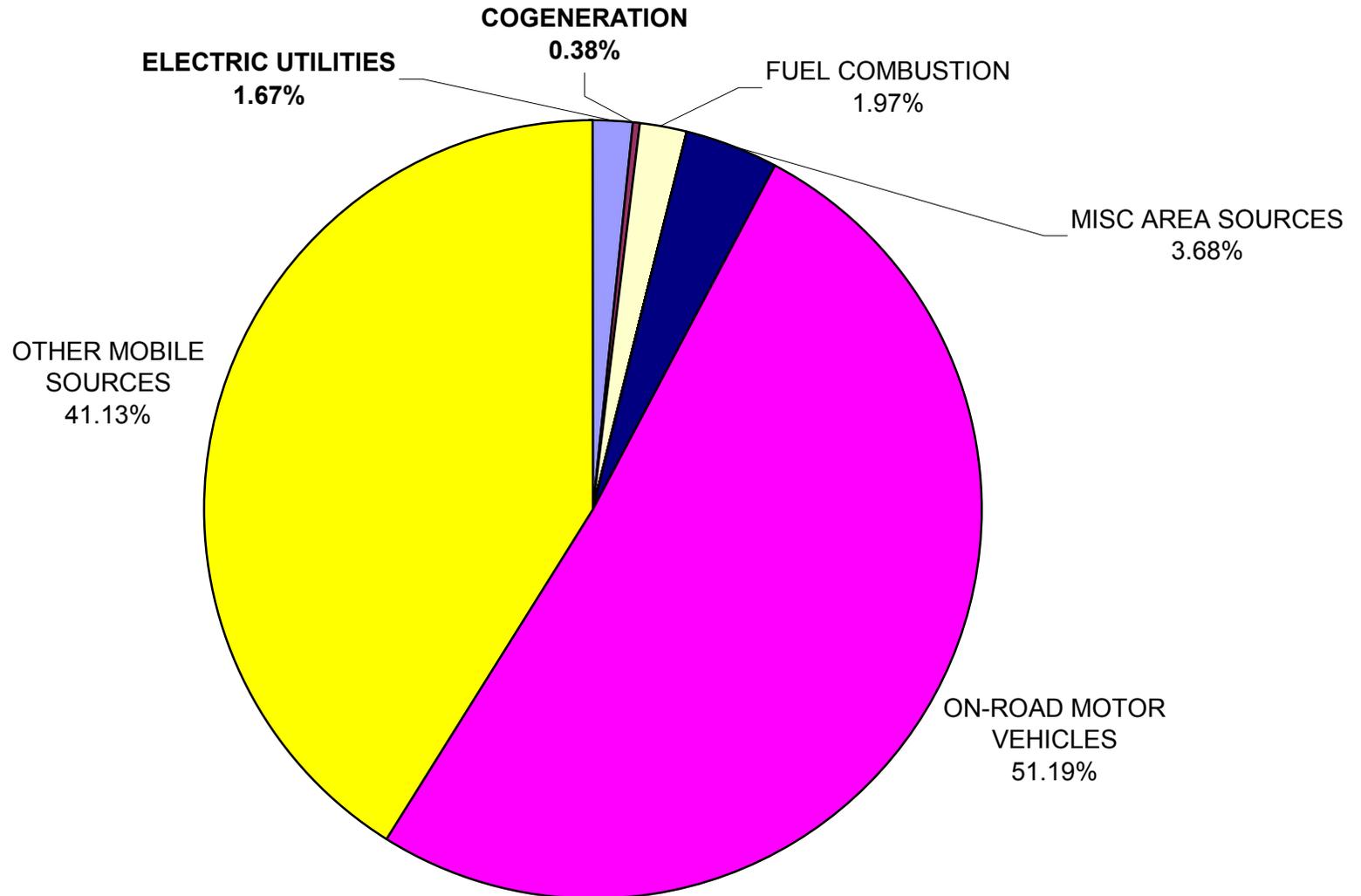


## Bay Area Air District NOx Emissions - 2003





## San Francisco City and County NOx Emissions - 2003



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# Preliminary Land Use Information

- Community Concern – San Francisco
  - City/County of San Francisco Ordinance regarding New Generation
  - City/County of San Francisco agreement with PG&E to shut down Hunters Point plant when no longer needed for system reliability
  - Southeast San Francisco area residents' concerns about continued operation of the Potrero plant
  - City/County of San Francisco's plans for new generation units on Potrero property



# Preliminary Land Use Information

- Community Planning – Redondo Beach and Chula Vista
  - City of Redondo Beach’s 1992 and 2002 Specific Plans addressed the Redondo Beach plant
  - City of Chula Vista and Port of San Diego jointly working on a Chula Vista Bayfront Master Plan with South Bay plant included



# Once-Through Cooled Facilities

- 80% of the power plant units being studied for the Aging Power Plant Study are once-through cooled.
- A once-through cooled power plant withdraws water for power plant cooling from an adjacent water body such as a bay, river, or ocean and often discharges the heated water into the same water body.



# Once-Through Cooled Facilities

- New Federal Clean Water Act – Section 316(b) – Regulations for Cooling Water Intake Structures
  - Released February 2004 to establish best technology available to protect aquatic species
  - Require impingement impacts to be 80-95% lower than uncontrolled levels
  - Require entrainment impacts to be 60-90% lower than uncontrolled levels



# Compliance Alternatives for 316(b) Final Regulations

- Demonstrate facility has reduced cooling water flow commensurate with closed-cycle recirculating system;
- Demonstrate facility has reduced cooling water flow intake velocity to 0.5 feet/second;
- Demonstrate that existing design and construction technologies, operational measures, and/or habitat restoration measures meet the performance standard;



# Compliance Alternatives for 316(b) Final Regulations

- Demonstrate that design and construction technologies, operational measures, and/or habitat restoration measures will meet performance standards;
- Demonstrate that facility has installed and properly operates and maintains an approved technology; or
- Demonstrate that a site-specific determination of Best Technology Available is appropriate.



# Once-Through Cooled Facilities

## Existing Power Plants:

- Cooling water intake velocities are higher than new regulation standard of 0.5 feet per second
- Impingement and entrainment impact analyses are out-of-date or were never done for most older facilities
- No cumulative impacts studies have been completed for once-through cooled power plants on Santa Monica Bay
- Some parties believe commercial fishing opportunities could benefit if the plants were modernized



# Once-Through Cooled Facilities

## Results of New Rules

- No project owner has indicated that new 316(b) regulations will lead to closure of any facility.
- No project owner has indicated that they intend to stop using once-through cooling.
- All project owners intend to do whatever new regulations require.
- There is some uncertainty as to how the Regional Water Quality Control Boards will apply the new regulations.



# Once-Through Cooled Facilities

## Examples of Environmental Enhancements:

- Encina Power Plant (Owner: West Coast Power/NRG/Dynegy)
  - \$2 million spent every two years to dredge Agua Hedionda Lagoon to keep it open, which maintains water quality and benefits endangered California least tern and its habitat
  - Supports sea bass hatchery in Agua Hedionda Lagoon
  - Supports restoration of eelgrass habitat and elimination of invasive species in Agua Hedionda Lagoon



# Once-Through Cooled Facilities

Examples of Environmental Enhancements (cont'd):

- Ormond Beach Power Plant (Owner: Reliant)
  - Attempting to restore Ormond Beach wetlands
  - Supports marine laboratory that is raising abalone
  - Puts up signs to help protect Endangered California least tern and Threatened western snowy plover



# Environmental Justice

- Fair treatment of people of all races, cultures and income
- Demographics of population within two miles identified
- One of many factors considered in Aging Power Plant Study



# What's Next?

## Steps to Complete the APPS

- Collect operations, cost and revenue data (generators, FERC, CAISO)
- Examine potential for any unit to lose RMR status during 2004-2008
  - New plant construction
  - Transmission line projects and upgrades
- Determine relative risk of retirements
  - High risk, medium risk, low risk



# What's Next?

## Steps to Complete the APPS

- Conduct analysis of system-wide and local reliability effects of aging plant retirements
  - Supply/demand balancing
  - Local transmission effects of retirements (PSLF modeling)
  - Congestion relief in LA basin (SCIT, etc.)
- Complete analysis of environmental and resource effects of continued generation



# What's Next?

## Steps to Complete the APPS

- Continue meetings with generators and agencies to hear feedback on study process and results
- Conduct additional workshop(s)
  - One after data collection process complete
  - Possibly another after releasing draft APPS in July
- Revise APPS, publish in final form in 2004 IEPR Update