ประชุมบรรยายพิเศษ
เรื่อง แนวทางการจัดสรรการระบายมลพิษทางอากาศ โดยวิธีการแลกเปลี่ยนการระบายสารมลพิษ

(Emission Trading)

โดย **Mrs. Chailaiwan Mueller**

อดีตเจ้าหน้าที่จาก **South Coast Air Quality Management District :SCAQMD ; CALIFORNIA, USA.**

SOUTH COAST AQMD

- 17 Million Residents
- 12 Million Motor Vehicles
- 30,000 Permitted Companies
- 12,000 Square Miles
- World Largest Gasoline & Diesel User
- World 8th Largest Economy

หลักการและแนวทางการจัดสรรการระบายมลพิษทางอากาศ โดยวิธีการแลกเปลี่ยนการระบายสารมลพิษ (Emission Trading)

The Challenge for Regulators

- Reduce Pollution
- Lower Costs
- Ensure Compliance

Air Pollution Control Tools

- Command & Control

  (When Prescription is Easier)

- Market Incentive
  - Fees
  - Taxes

  (When Movement is enough)
  - Emission Trading

    (When Trading = Savings)

Market Incentive Programs

- Emission Fees
- Alternative Compliance Options
- Bubble and Averaging Periods
- Buying Offset Credits
- Emission Fees in Lieu of Compliance
- Mobile and Area Source Offset

Emission Trading Programs

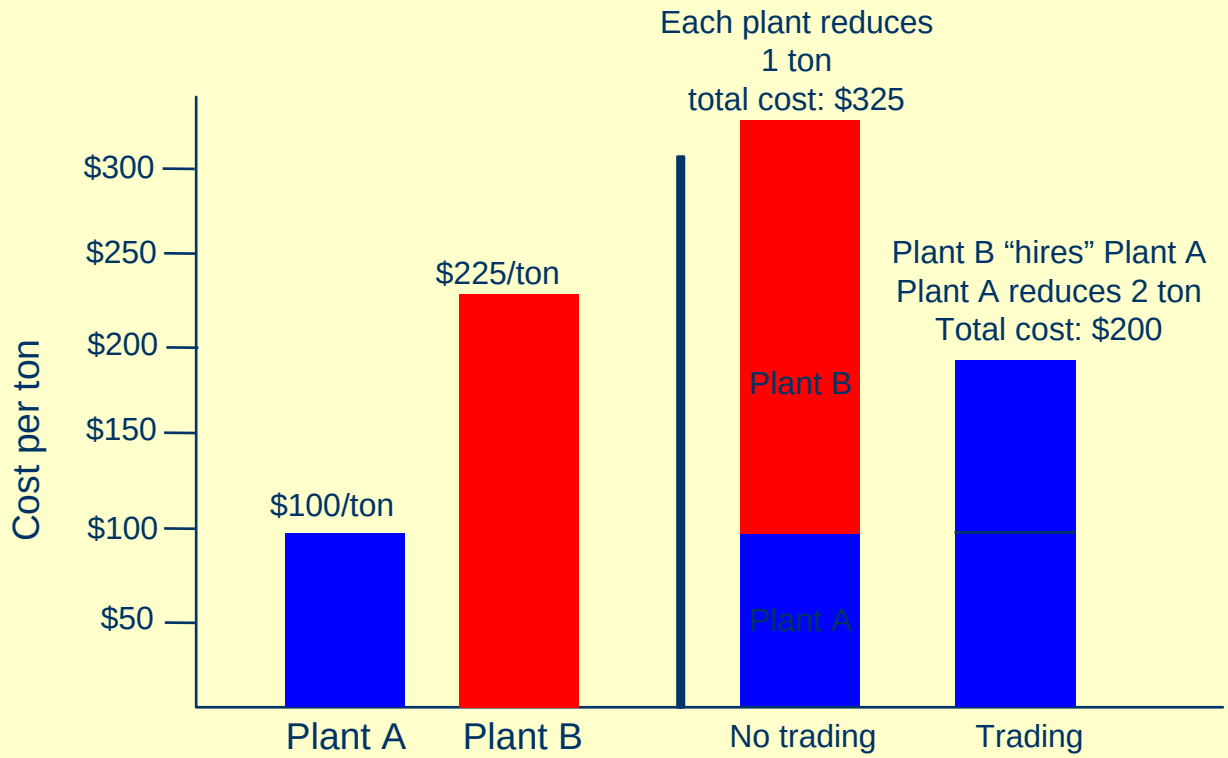
- Emission trading basics
- Types of emission trading
- Key elements of a trading system
- Emission Reduction Targets
- The role of offsets

Emission Trading:

- An alternative to traditional command and control regulation in many environmental and resource areas:
  - air emissions, fishing quota, lead in gasoline
- Combines a regulatory approach with the flexibility and innovation of private markets
- Provides a common price signal to emitters – the market then determines where emissions occur, where abatement occurs

How Emission Trading Cuts Costs

Objective: Reducing emissions by 2 ton



Advantages of Emission Trading

- Emitters are given flexibility and control
  - Firms choose to emit/abate, not bureaucrats
- Rewards innovation and investment in new technology
  - an incentive to go beyond minimum requirements
- Common price signal ensures that reductions take place where they are least costly
  - achieves environmental goals at least cost
- The overall cap on emissions ensures environmental objective is achieved

Disadvantages of Emission Trading

- Still requires monitoring, reporting, verification and compliance infrastructure - like traditional regulation
- May result in increased local concentrations of emissions
- Price is uncertain – determined by market
- Relies on a price signal – some markets may be less efficient
- Allocation of target/allowances is highly contentious

Types of Emission Trading

- Trading within a capped or regulated sector
  - "Closed market" trading of allowances or permits
    "Cap and trade"
- Trading outside a capped or regulated sector
  - "Open market" trading of offsets or credits for project-based reductions or removals
  - Credits are used for compliance by capped entities
  - Trading is one-way – into the capped sector

Cap and Trade Programs

- Acid Rain (NO_X, SO_2)
- RECLAIM Program (NO_X, SO_X)
- Chicago VOC Program (VOC)
- NO_X Budget Trading (NO_X)
- European Union Trading Scheme (CO_2)
- Ozone Transport Region (NO_X, SO_X)
- Chile Emission Trading Program (SO_X, PM_{10})

Approaches to Allowance Allocation
Key Policy Design Issues

- Auction or Free?
- Historic or Updating?
- Fossil units only, or all units?
- Input-based, output-based or emissions reduction based?
- Hybrid?

Allocation has been the most controversial issue in the design of all major trading programs including US acid rain, EU ETS, UK CO2 system, and RGGI etc.

Key Elements Required

- A limit on emissions
- Participants must have different costs for emission reduction
- Monitoring and reporting requirements
- Trading rules – banking, offsets
- Consequences for non-compliance

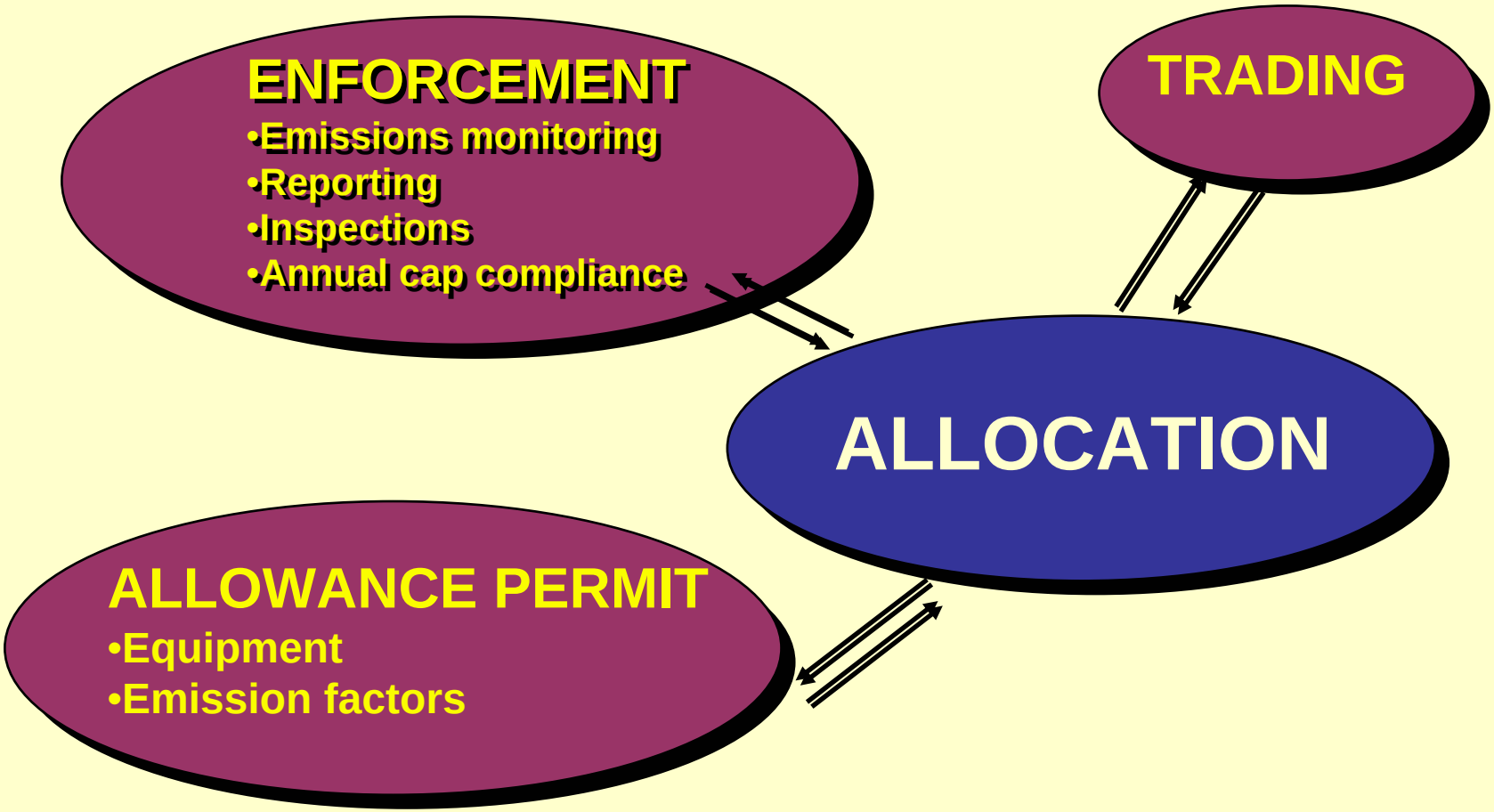
Emission Limits or Targets

- **Absolute limits**
  - **X tons/year**
- **Intensity limits**
  - **X tons/GW.h**

Intensity Targets

- Advantages:
  - Preserves incentive for efficiency while not penalizing growth – addresses some competitiveness concerns
  - Addresses problems related to new entrants, shutdowns
  - Does not penalize firms who take early action
- Challenges:
  - Measuring output
  - Basis for defining target – technology/cost analyses? Across the board cuts?
  - Limited incentive for structural change
  - No overall limit on emissions – unless targets adjusted

The Cap and Trade Structure



Offsets

Allowing credits or offsets for project-based emission reductions/removals would:

- Expand participation in the trading system
- Promote investment in emission reductions outside the capped sector
- Increase the number of compliance options, and potentially reduce costs
- Could provide environmental and other co-benefits

Possible Offset System

- Credits would be earned for voluntary reductions below an emissions baseline
- Possible criteria for eligible reductions:
  - real (beyond business as usual), measurable, verifiable, surplus (beyond what is required), additional/incremental
- Credits would be certified by an accredited body
- Credits could be used for compliance with targets

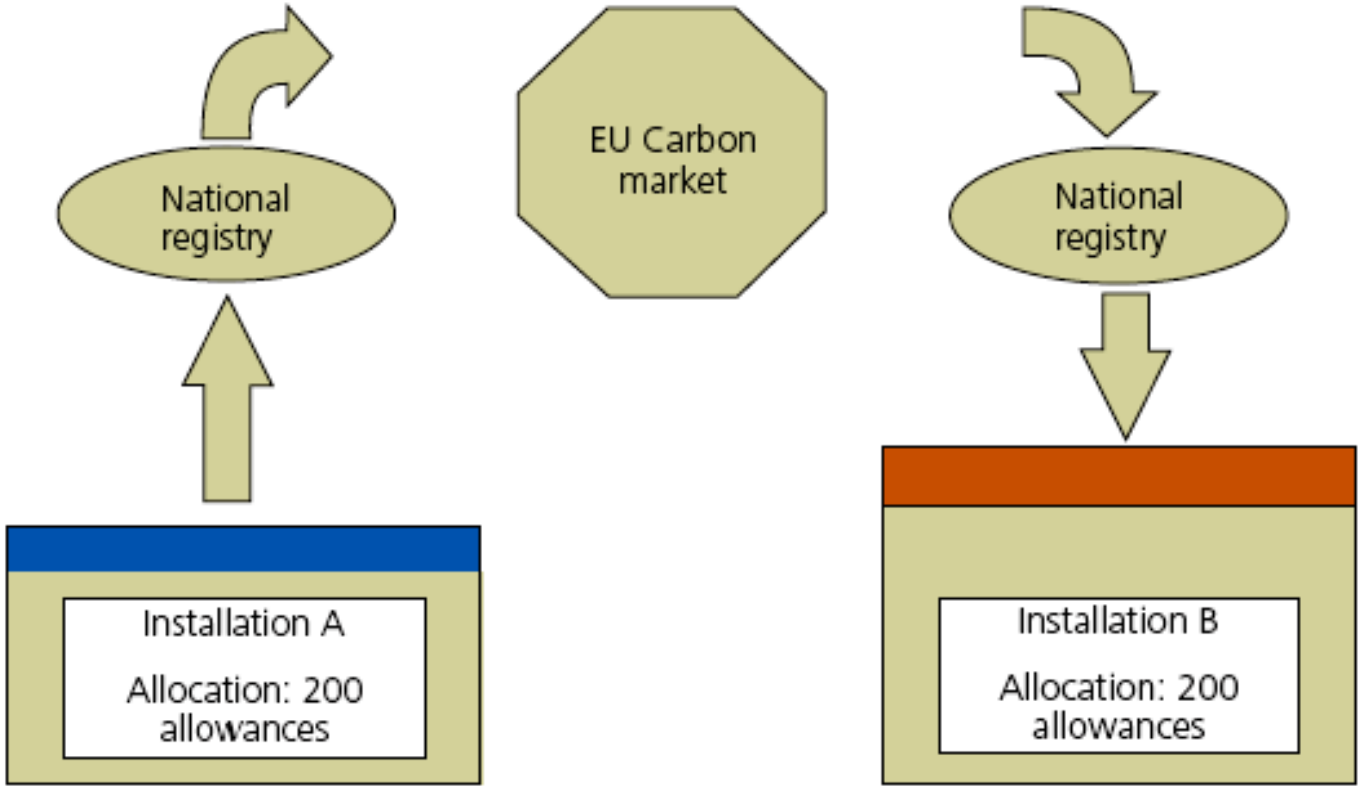
ตัวอย่างการจัดสรรการระบายมลพิษทางอากาศ โดยวิธีการแลกเปลี่ยนการระบายสารมลพิษ (Emission Trading) ในต่างประเทศ

Europe GHG Trading

- EU trading program includes electricity, pulp & paper, steel, cement, petroleum refining (boilers only), and lime production

- GHG trading in member states began in January, 2005
  - National reduction targets based on Kyoto burden sharing agreement – collectively 8% below 1990 by 2012
  - Covers more than 12,000 installations in 25 countries
  - 70 million tons of CO2 allowances have been traded in 2005 at an average price of 15 Euros/ton – more than $1 billion value has traded in 2006 – price increase to 30 Euros/ton
  - Prices are higher than expected and driven by 25 major companies who are buyers – when Eastern European players enter the market, prices should fall

EU Emission Trading Scheme



Source: www.defra.gov.uk

EU Timing

- Three-year mandatory “warm-up” phase from 2005 to 2007
  - More than 45% of EU emissions covered by trading system
  - Learning-by-doing
- Five-year mandatory Kyoto phase from 2008 to 2012
  - Allocations likely to be reduced in KP phase

Allocation Method

- Harmonized method in the “warm-up” phase
  – Allocation at least 95% free of charge
- Method for 2008 to 2012
  – Free of charge allocation of at least 90%,
  - member states may auction up to 10%
- EC review in mid-2006 to look at further harmonization, expansion to new sectors

Penalties for Noncompliance

- Financial penalties of €40 / ton in the first period and €100 / ton thereafter
- Plus the obligation to offset emission reduction in the subsequent year
- Publication of names of operators who are in breach of requirement to surrender sufficient allowances

Monitoring System in EU

- Mandatory reporting of fuel use by companies to national governments
- Third party verification of company data reports is required
- CEMs are optional, calculation of emissions based on fuel use is std approach, process emissions also must be reported and verified

Source: www.defra.gov.uk

Current EU State of Play

- Biggest issues ahead are tighter allocation levels for KP period, % limits on sinks & nuke CER purchases
- Industry concerns about competitiveness, leakage, cost of compliance – many companies not in market yet
- EU has strong interest in linking to other trading systems (e.g. NZ, Norway, maybe Can., U.S.)

  – Current system permits allowances from countries that have ratified the KP so long as system design is compatible

  – Modification requires agreement by Council but growing interest in linking to various countries & possibly states

  – EU now thinking linkage to US states, even if purchases don't count for KP compliance, is likely worthwhile
- Market now $5 billion, $14 Billion/yr by 2012
- EU has committed to continuation of ETS after 2012

RECLAIM OVERVIEW

RECLAIM PROGRAM HISTORY

- Economic Recession in Late 1980's
- High Abatement Cost for Command and Control Rules
- Time & Resources for Adopting each Command and Control Rule

RECLAIM OBJECTIVE

TO ACHIEVE THE SAME EMISSION REDUCTIONS AS IN COMMAND-AND-CONTROL AT LOWER ABATEMENT COST.

RECLAIM	Command-and-Control
$80.8 Million/Year	$138.7 Million/Year

RECLAIM Development Process

1990 Public Input

1991 Concept Paper

1991-92 Feasibility Study

1992-93 Rule Development

RECLAIM WORKING GROUPS

Trading Market

Energy Impacts

Socio Economic Impacts

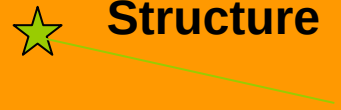
Enforcement and Penalties

Steering Committee

Advisory Committee

EPA/ARB Technical Committee

Administrative Structure



NOx and Sox Enforcement Protocols

Calc 1	Limits 2		Accounts 4

ROG Enforcement Protocols

Calc 1	Limits 2		Accounts 4

Mobile Source Advisory

RECLAIM

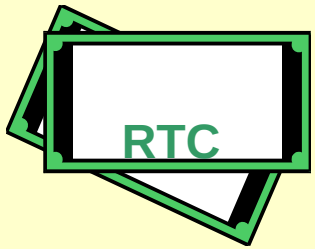
The Original Participants

- 390 NOx Facilities
  - (65% of Stationary Emissions)
- 41 SOx Facilities
  - (80% of Stationary Emissions)

PROGRAM DESIGN

Key Features

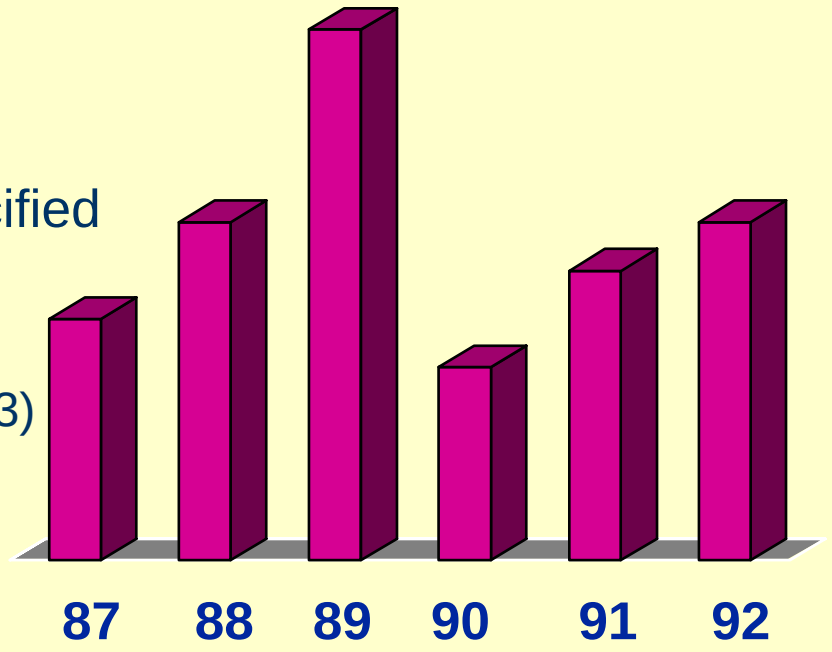
- Establish Declining Facility Emission Caps
- Rate of Reduction Parallels Command & Control
- Buy and Sell Credits to Meet Emission Caps
- Open for Area and Mobile Source Credits to Enter



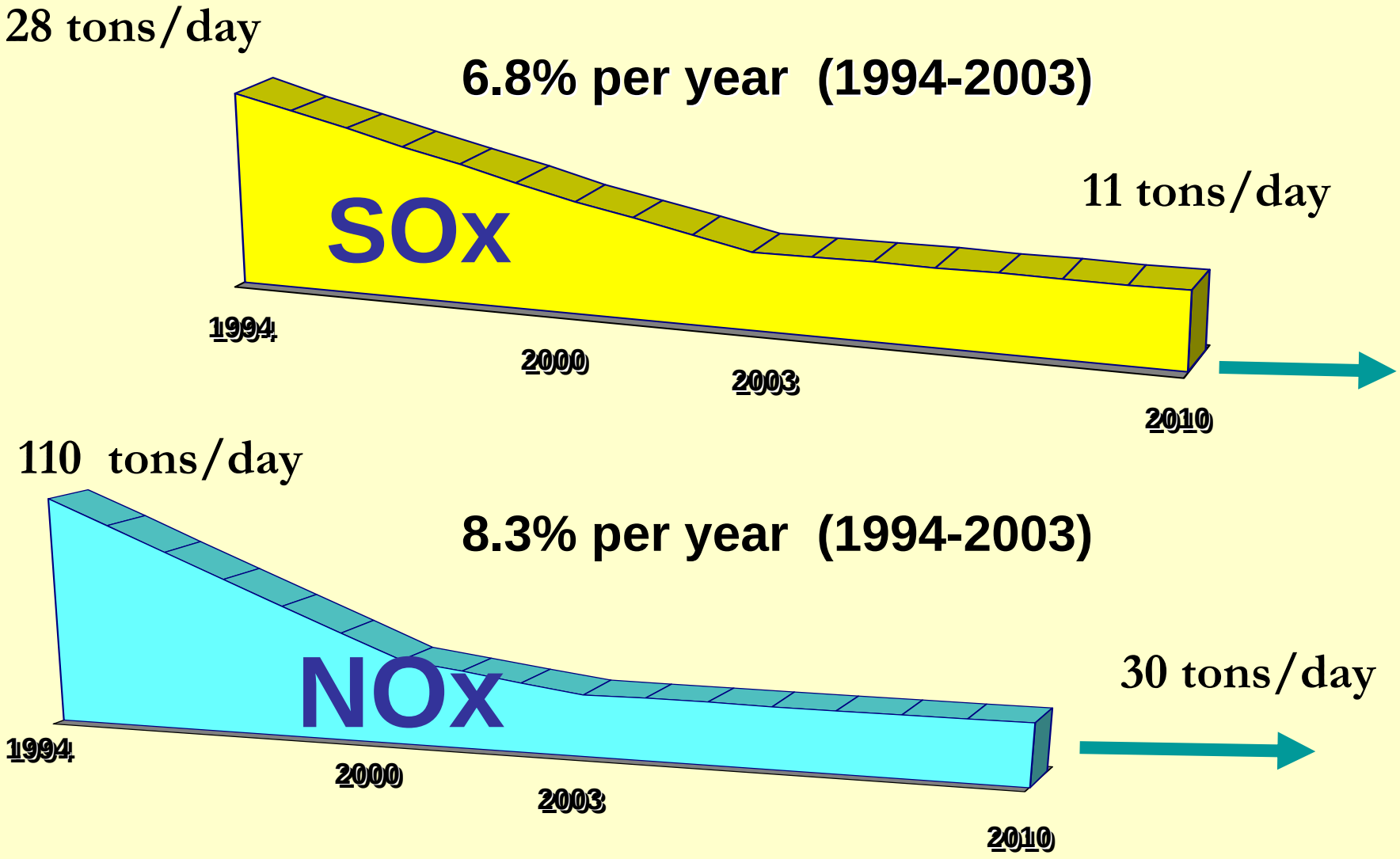
Allocations

Allocations Determined By:

- Historical Activity Levels
  - Peak Production (1989 - 1992)
- Relative Emissions Control Specified by AQMP
  - Current and Projected Rule Requirements (1994, 2000, 2003)



RECLAIM ALLOCATIONS



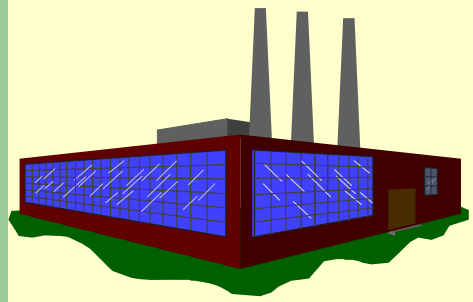
MARKET DESIGN

- **HANDS-OFF** Policy
- Self-Development
- Entrepreneurship
  - Auctions
  - Brokers
  - Wholesalers
  - Souvenirs

Major SOx RTC Traders

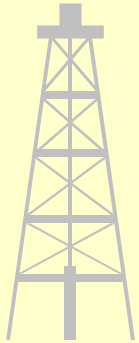
Buyers:

- Large Refineries
- Glass Manufacturing



Sellers:

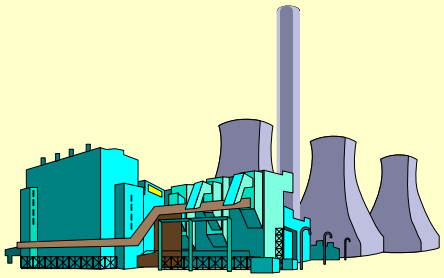
- Small Refineries
- Container-Glass Manufacturing
- Malt Manufacturing



Major NOx RTC Traders

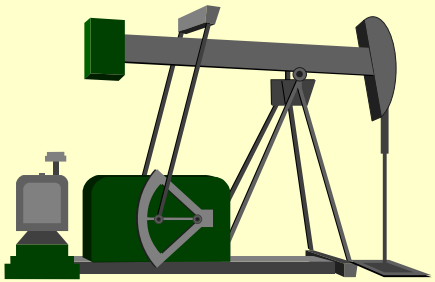
Buyers:

- Utilities
- Large Refineries
- Asphalt Batch Plants
- Metal Processing

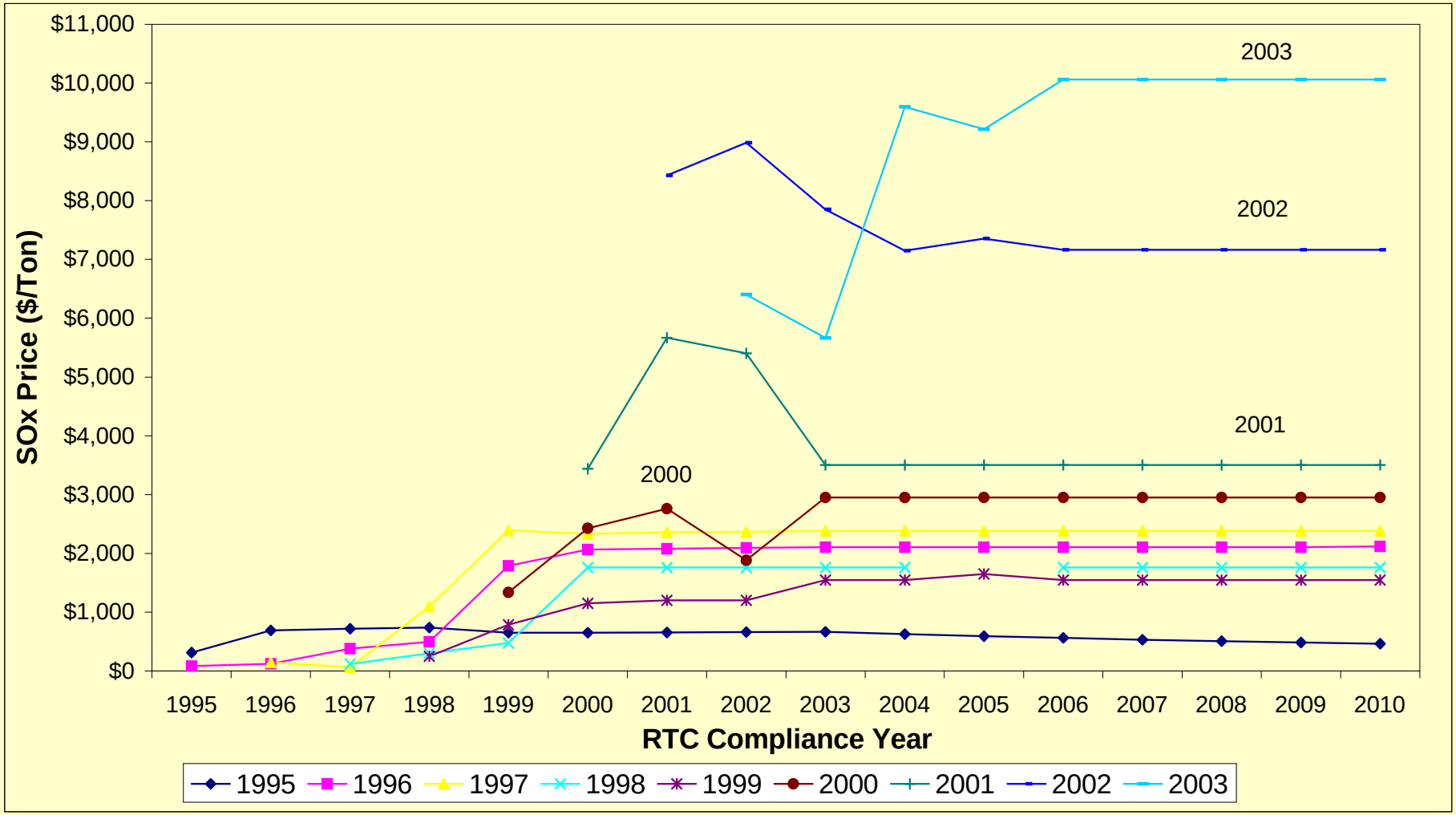


Sellers:

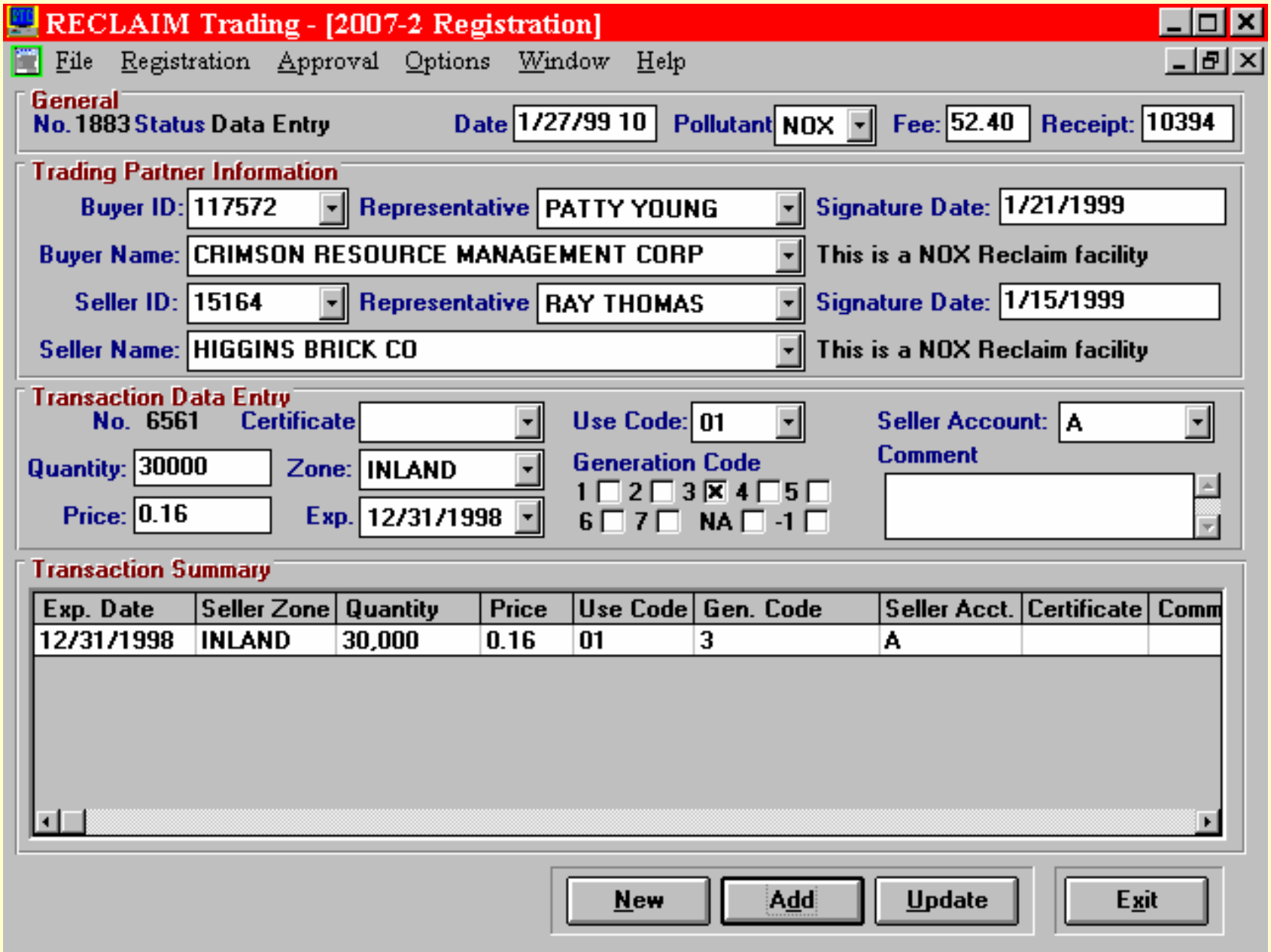
- Small Refineries
- Glass Manufacturing
- Shut Down Facilities



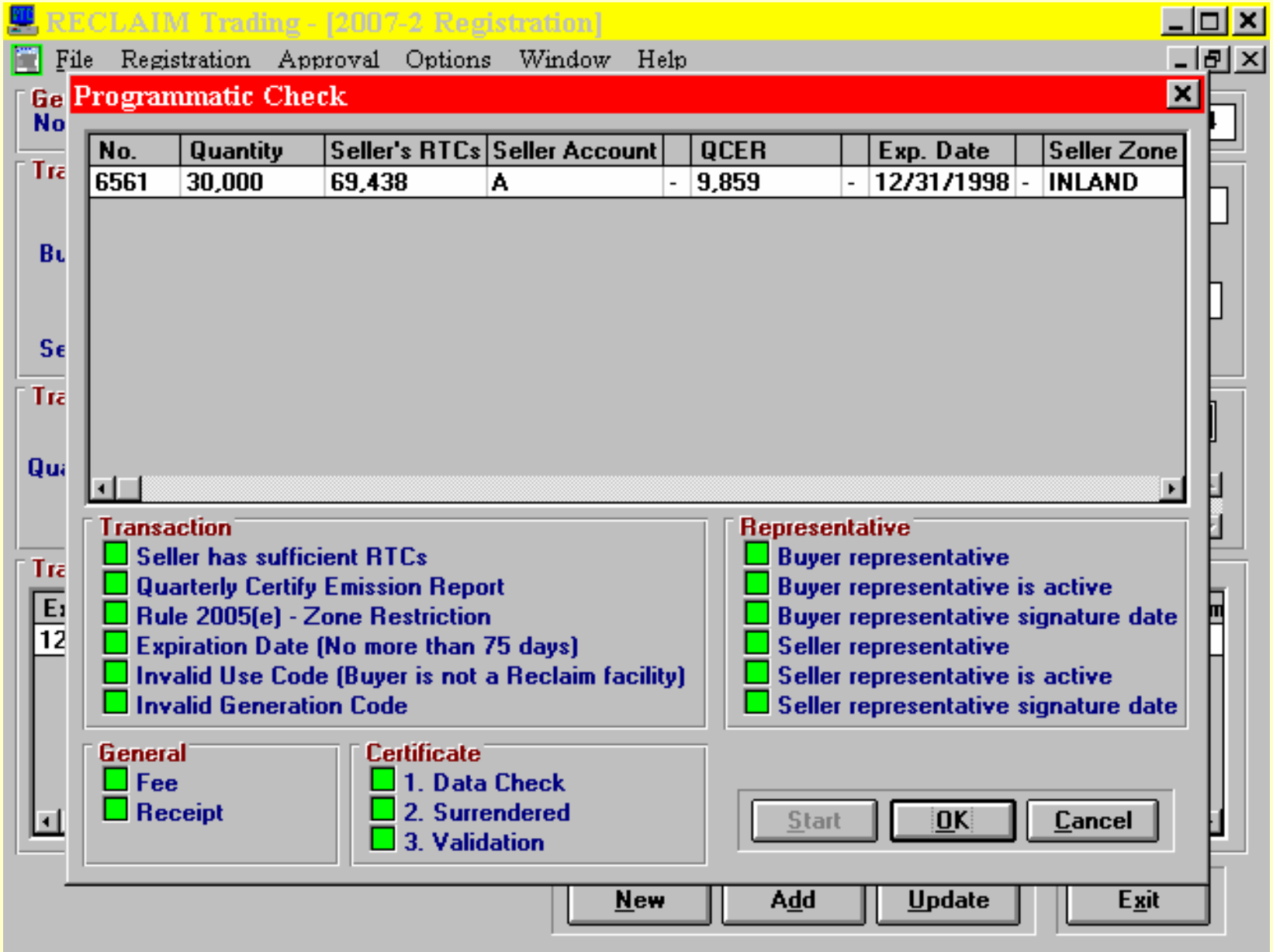
SOx RTC Price Trends



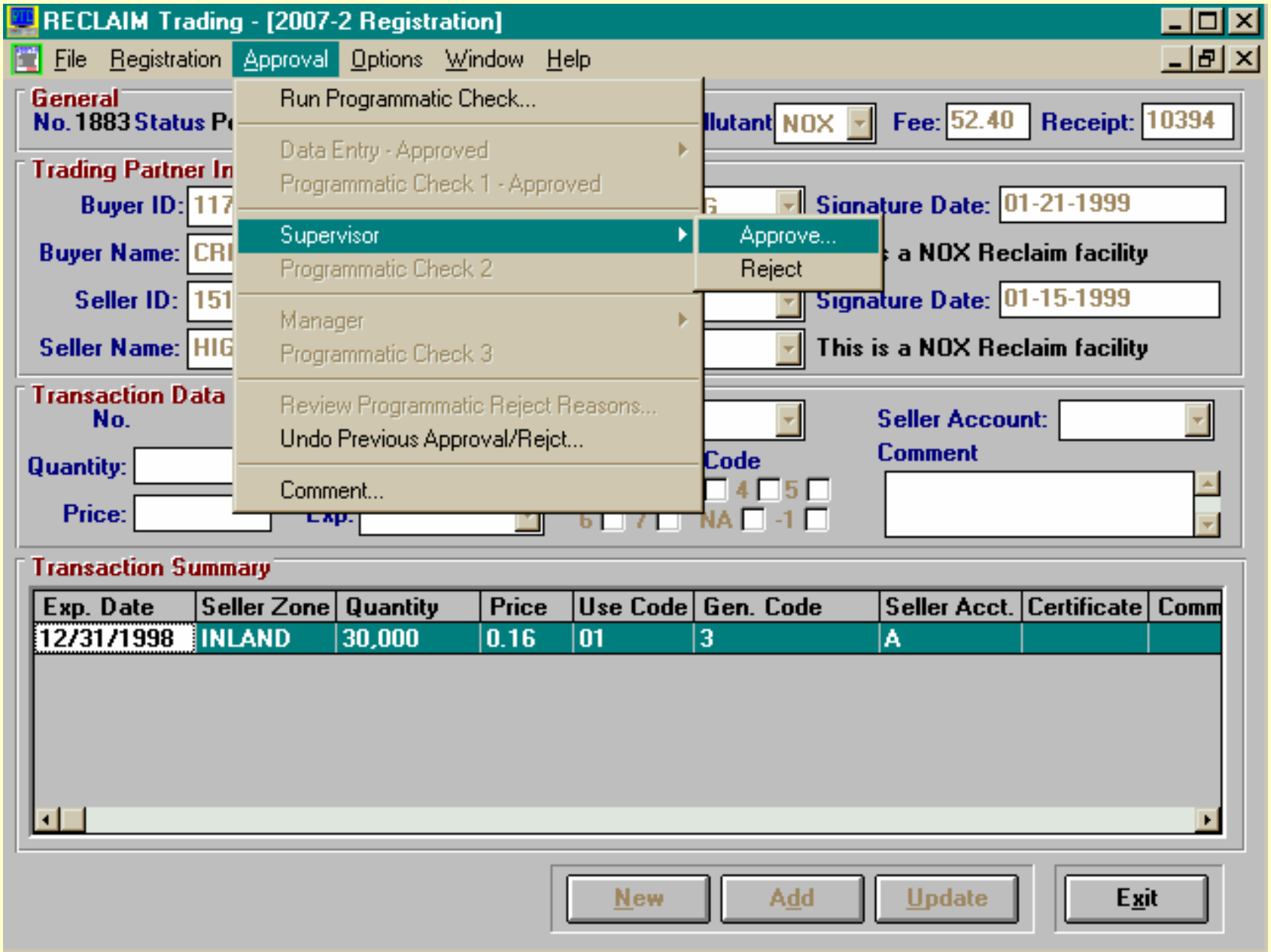
Electronic Trade



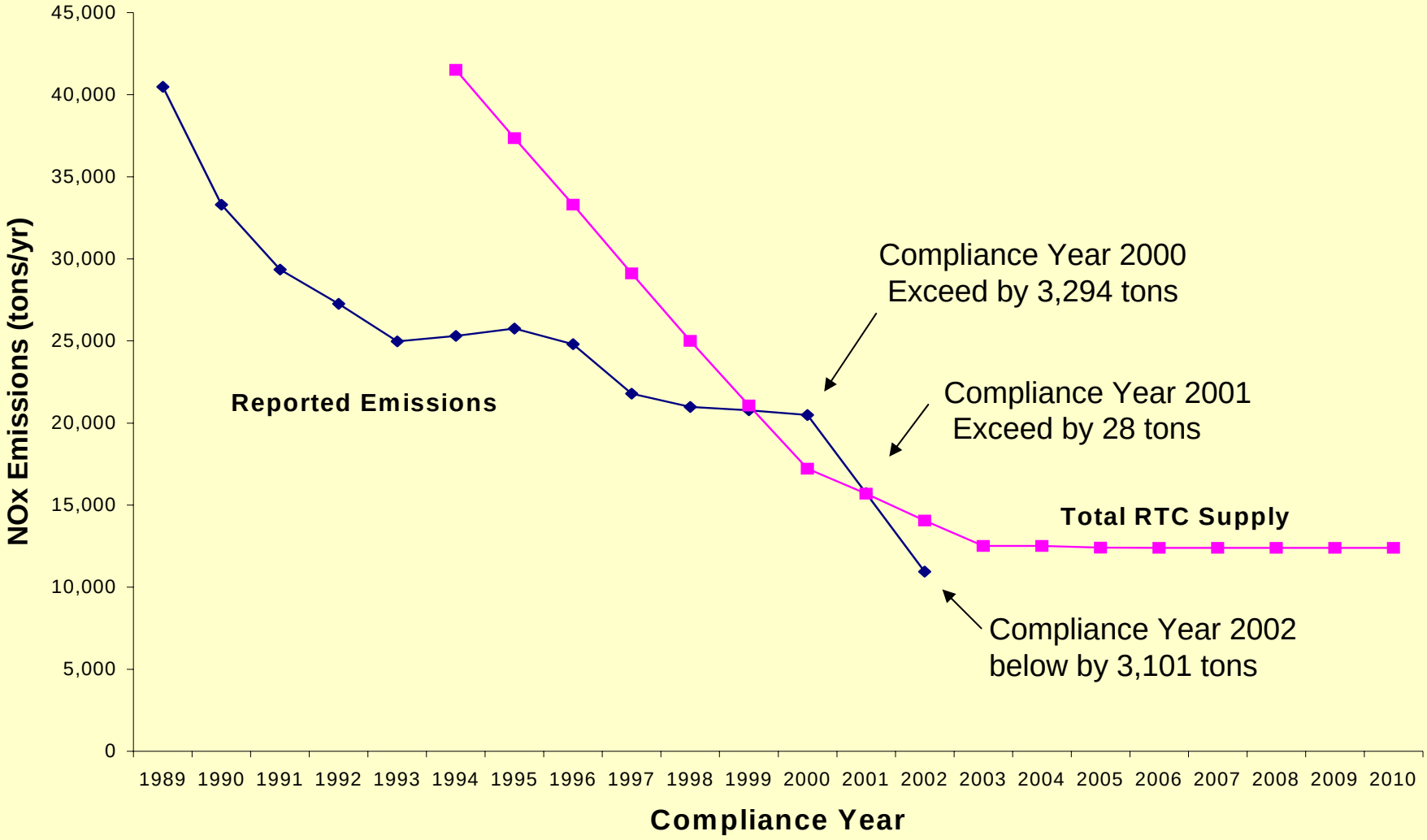
Electronic Trade



Electronic Trade



NOx RECLAIM Allocation and Emissions Profile



Projected Control Equipment Installation at RECLAIM Facilities

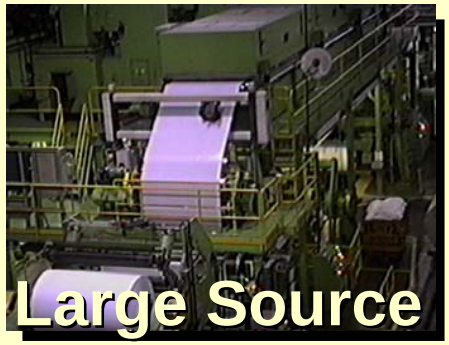
Year	RECLAIM	Observed
1994	No New Technology	SCR, Low NOx Burner,SCONOx,Electrifiction Dry Scrubber (9,444 tons NOx, 169 tons Sox)
1995	No New Technology	Low NOx & Ultra Low NOx Burner (1,657NOx) Dry Scrubber & ESP (237 tons Sox)
1996	SCR, Low NOx Burner Urea Injection, SNCR	Oxygen Enrichment, Oxy Fuel Burner (296 tons NOx)
1997	SCR, Low NOx Burner Wet Scrubber, Urea	SNCR, Low NOx Burner , FGR, Oxy-Fuel 3-way Catalyst (172 tons NOx)
1998	SCR, Low NOx Burner	SCR, Low NOx Burner (81 tons NOx)
1999	SCR, Low NOx Burner	Low NOx/Ultra Low NOx Burners (216 tons NOx)

*

Projected Control Equipment Installation at RECLAIM Facilities

Year	RECLAIM	Observed
2000	SCR, Low NOx Burner	SCR, Low NOx / Ultra Low NOx Burner Stage Combustion (1,057 tons NOx)
2001	N/A	Low NOx & Ultra Low NOx Burner, SCR, FGR, EGR, DENOx, Electrification, Steam Injection, Low NOx Burner w/ steam/ water, Polypropylene Plant(1,342 tons NOx, 435 tons SOx)
2002	N/A	Low NOx Burner, Oxy Fuel Burner , SCR, Steam Injection (478 tons NOx)
*	Total 1994-02	NOx= 14,743 tons SOx =841 tons

Reporting Schemes

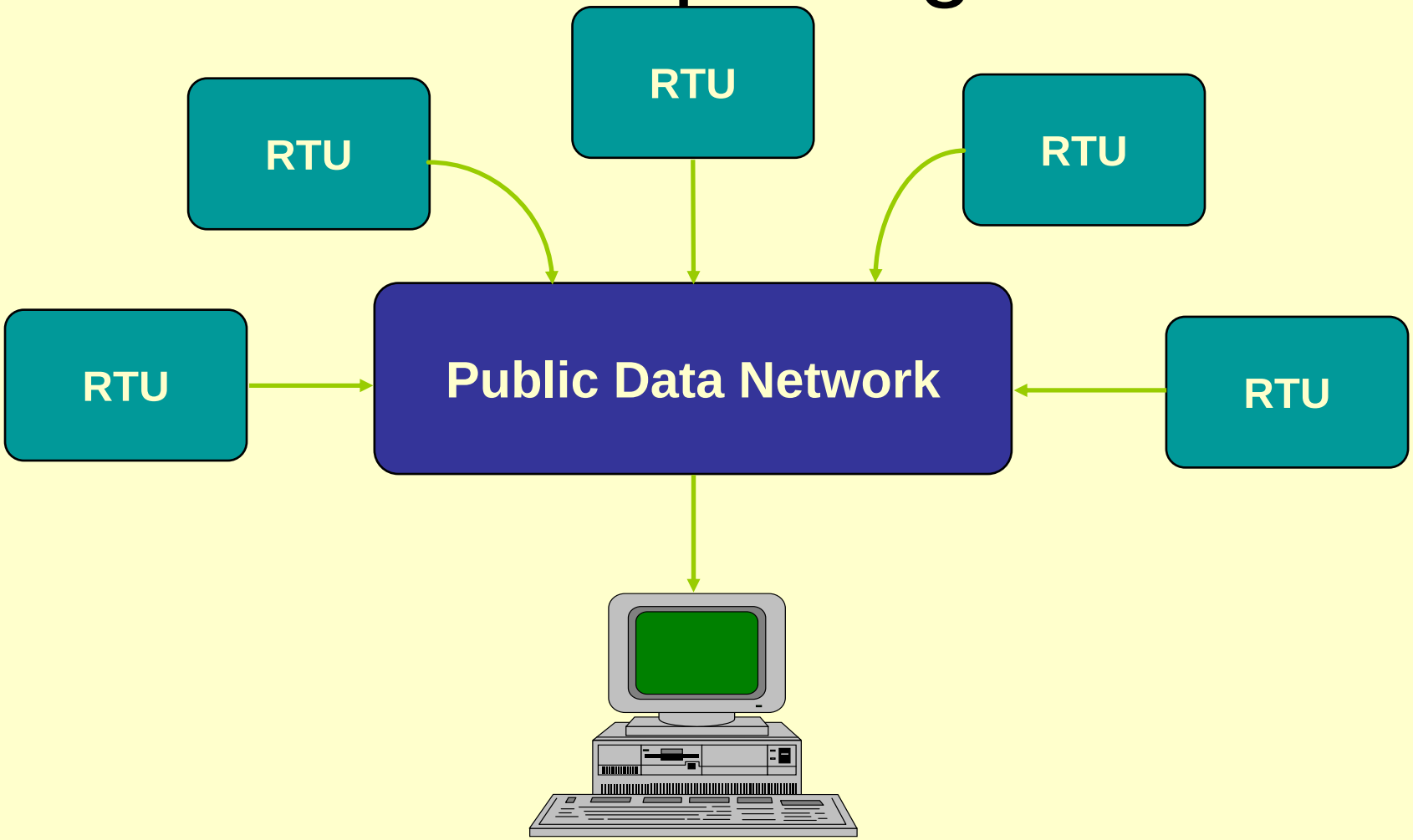


MONTHLY

DAILY

QUARTERLY

RECLAIM Emissions Reporting

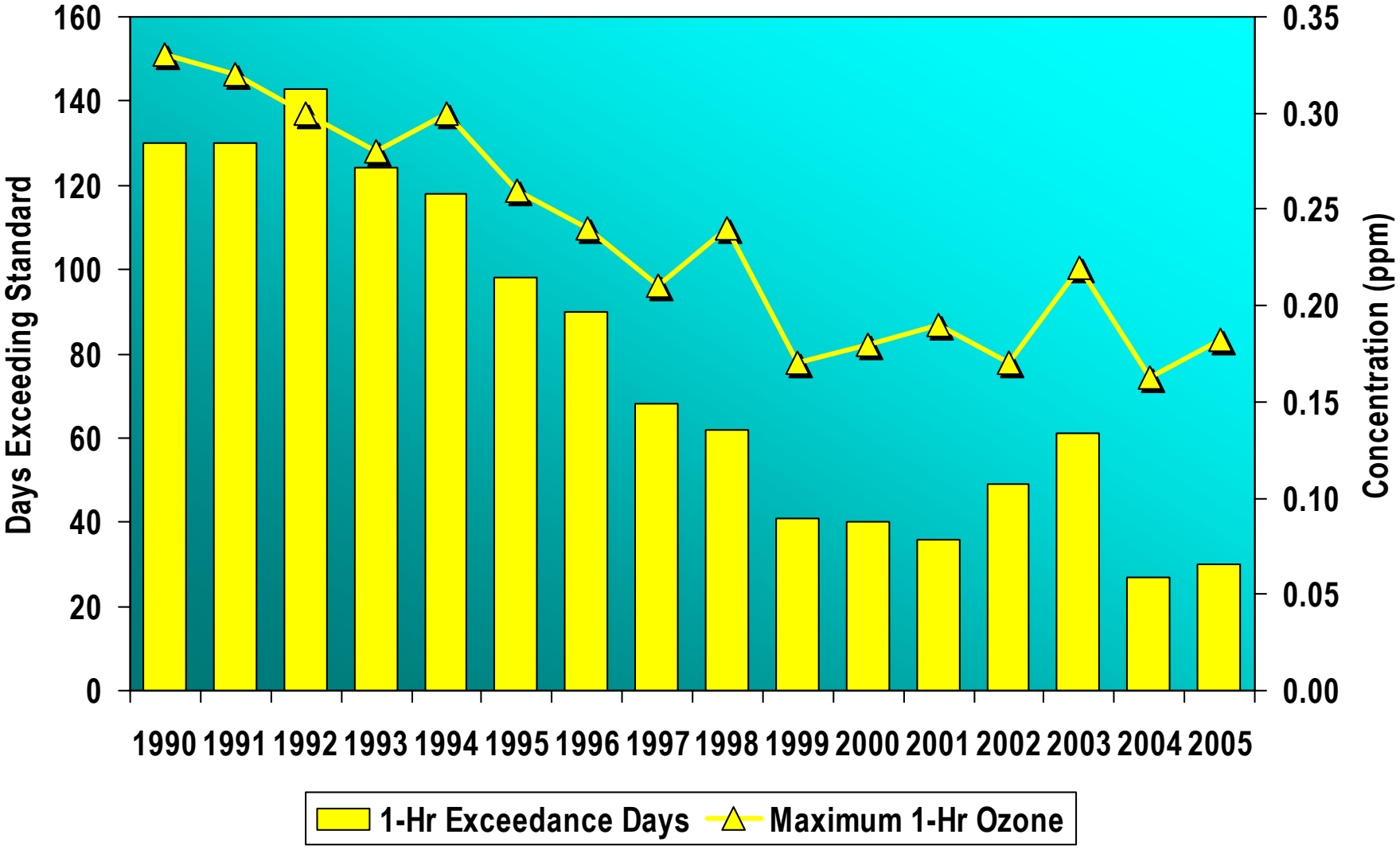


AREA FOR IMPROVEMENT

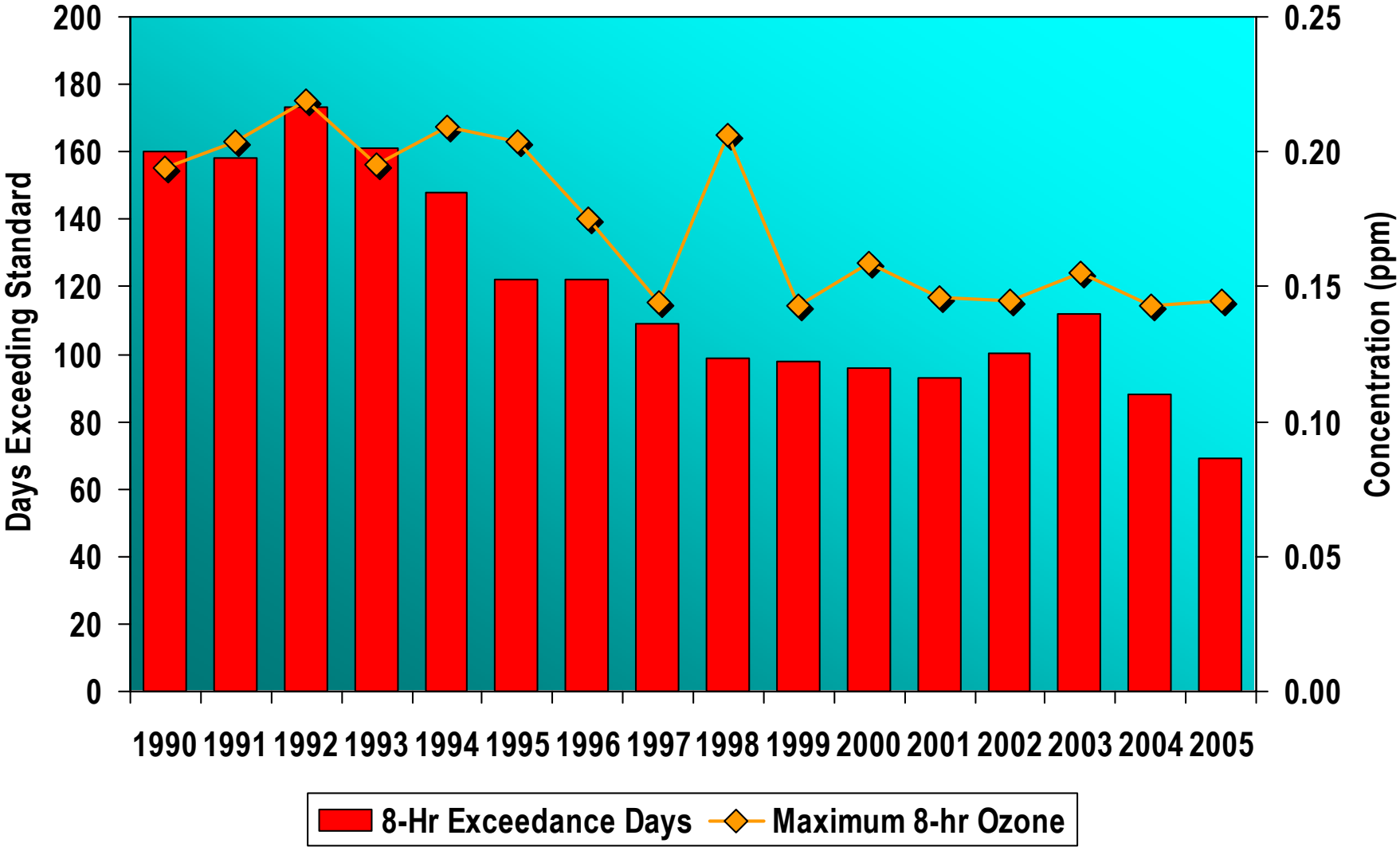
- Set the Right Allocations
  - Maximum Production Rate
  - Impact of Facility Shutdown
- More Trade Information
- Built-in Corrective Action
- Mid-Course Correction
  - Compliance Plan
  - Allocation Adjustment

Ozone Air Quality Trends

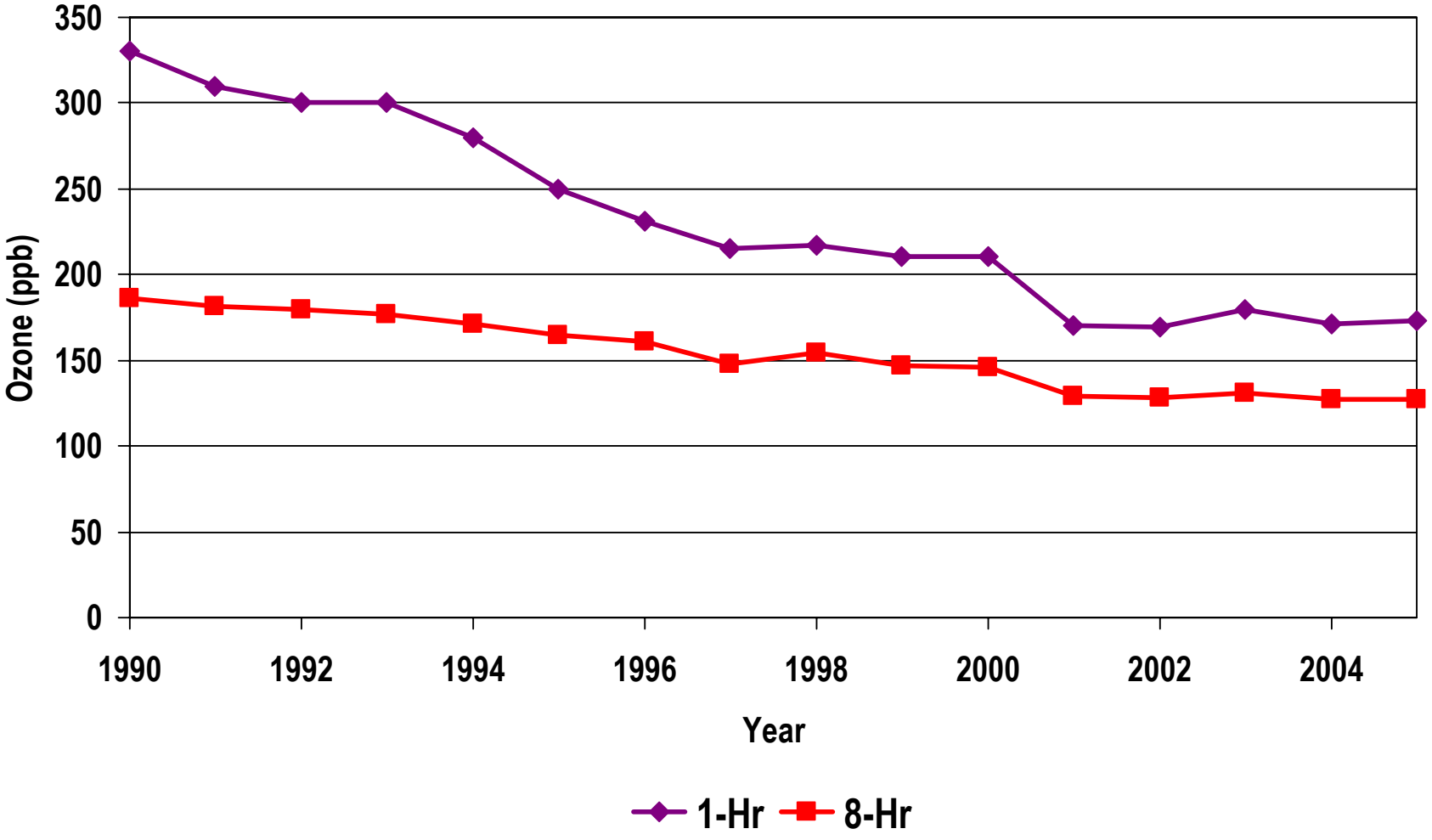
1-Hr Ozone Air Quality Trends

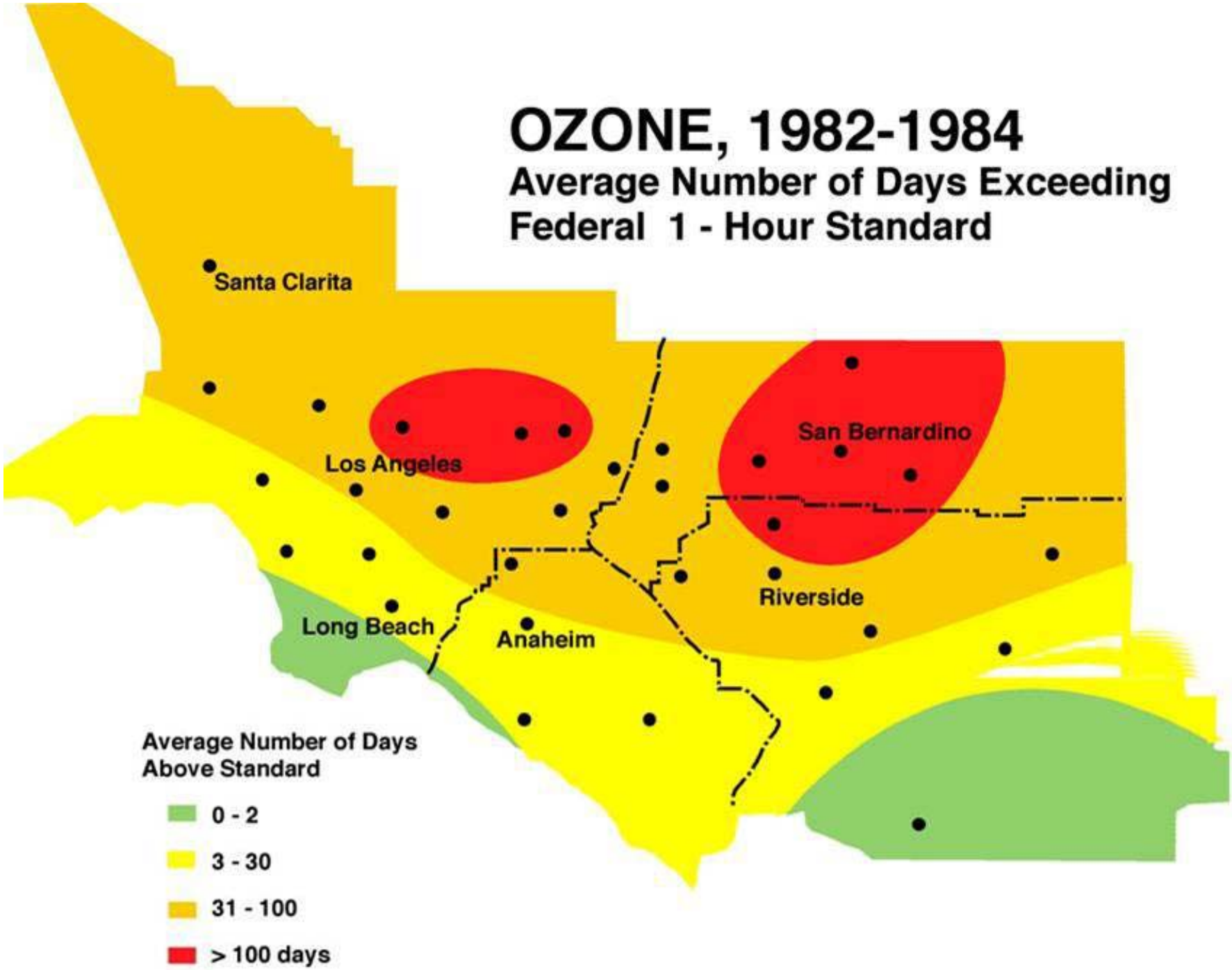


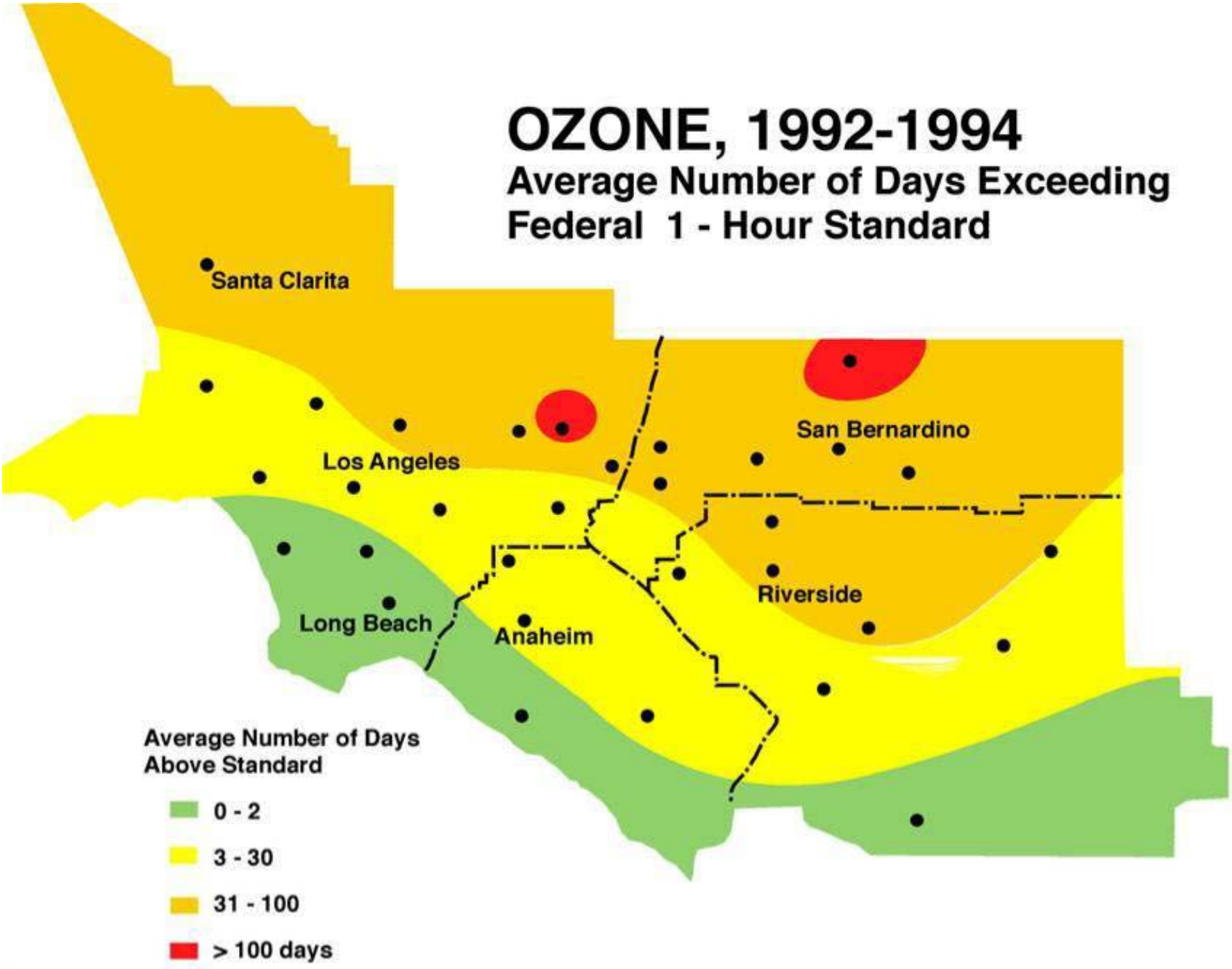
8-hr Ozone Air Quality Trends

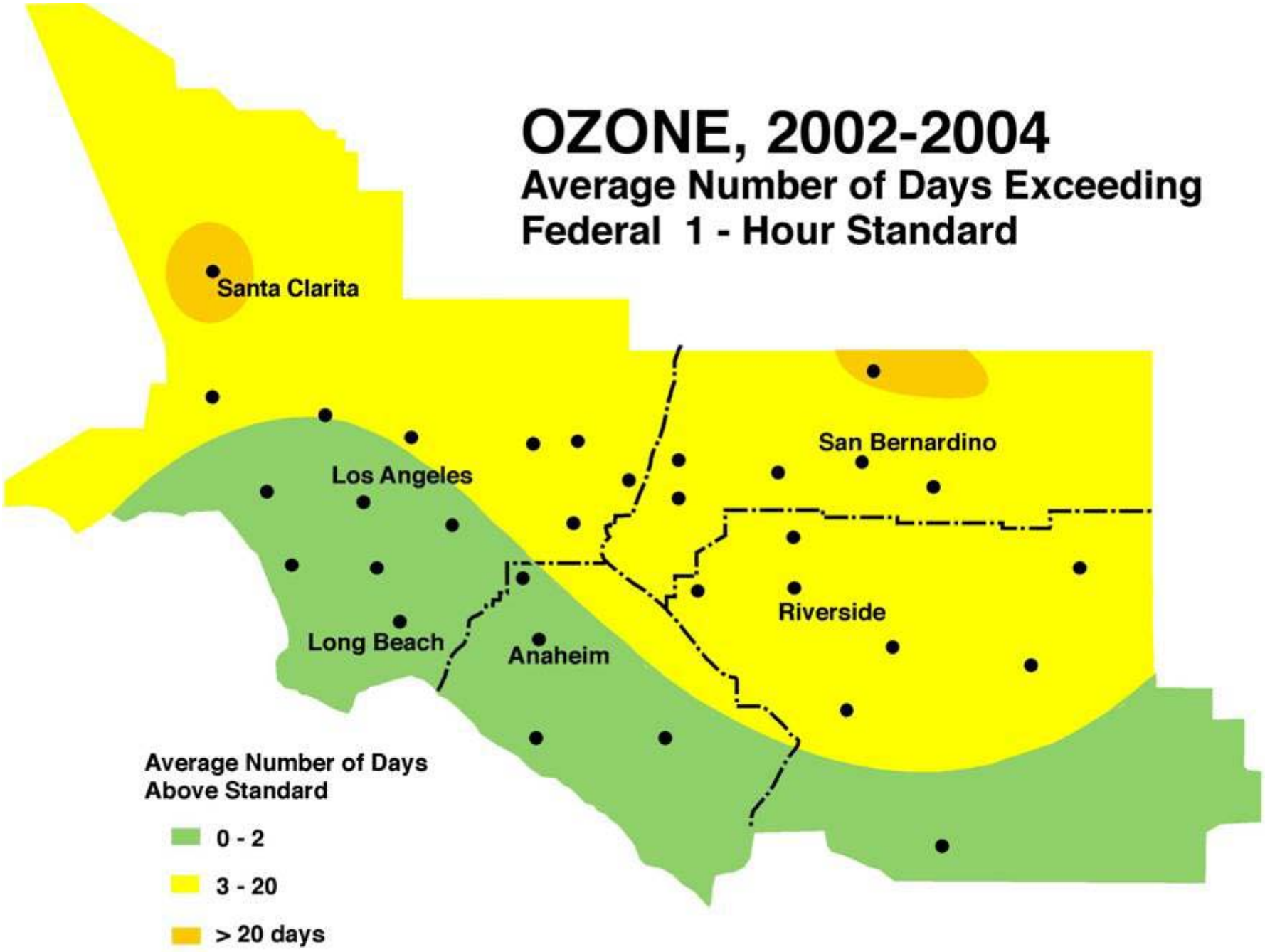


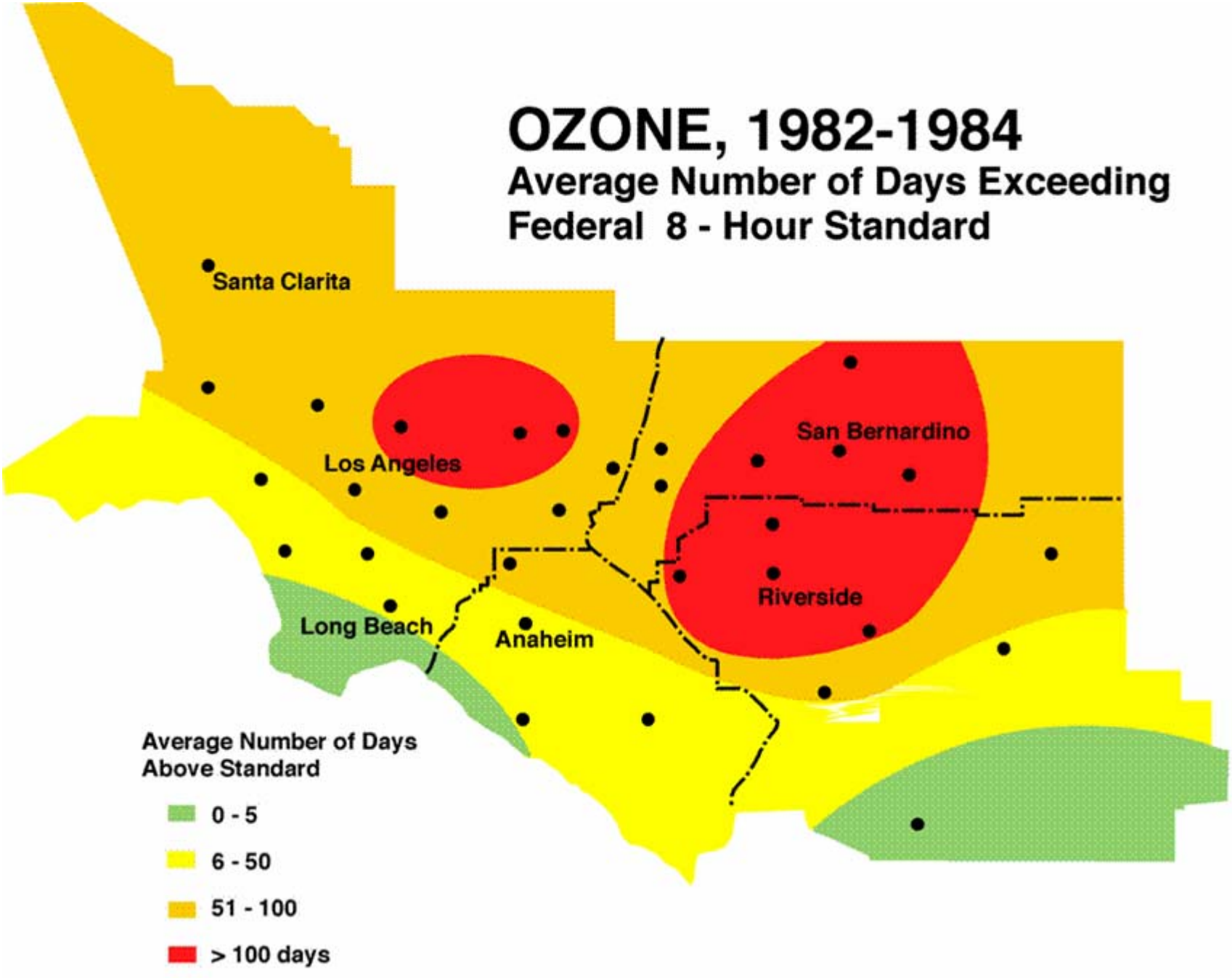
Trend in Ozone Design Values

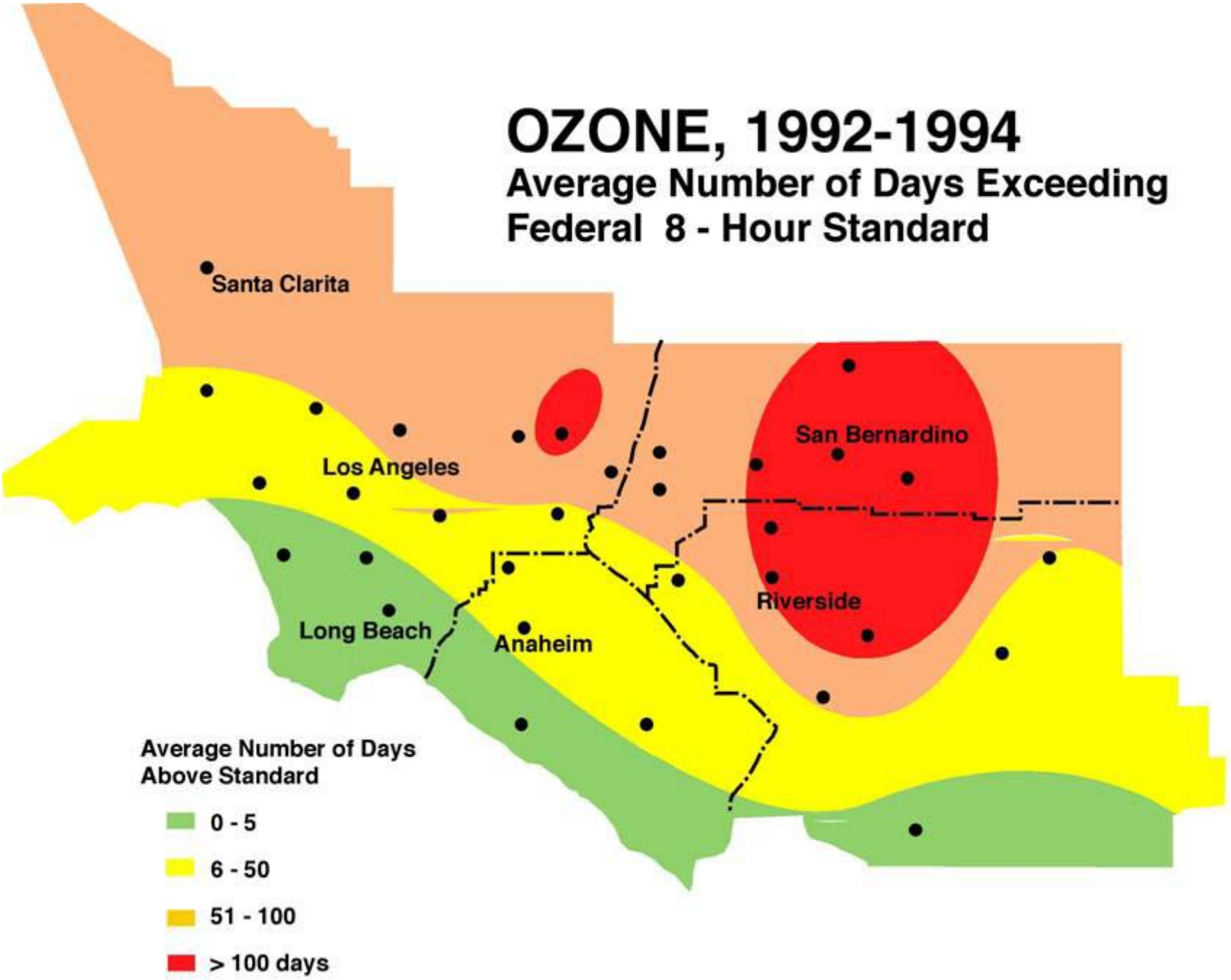


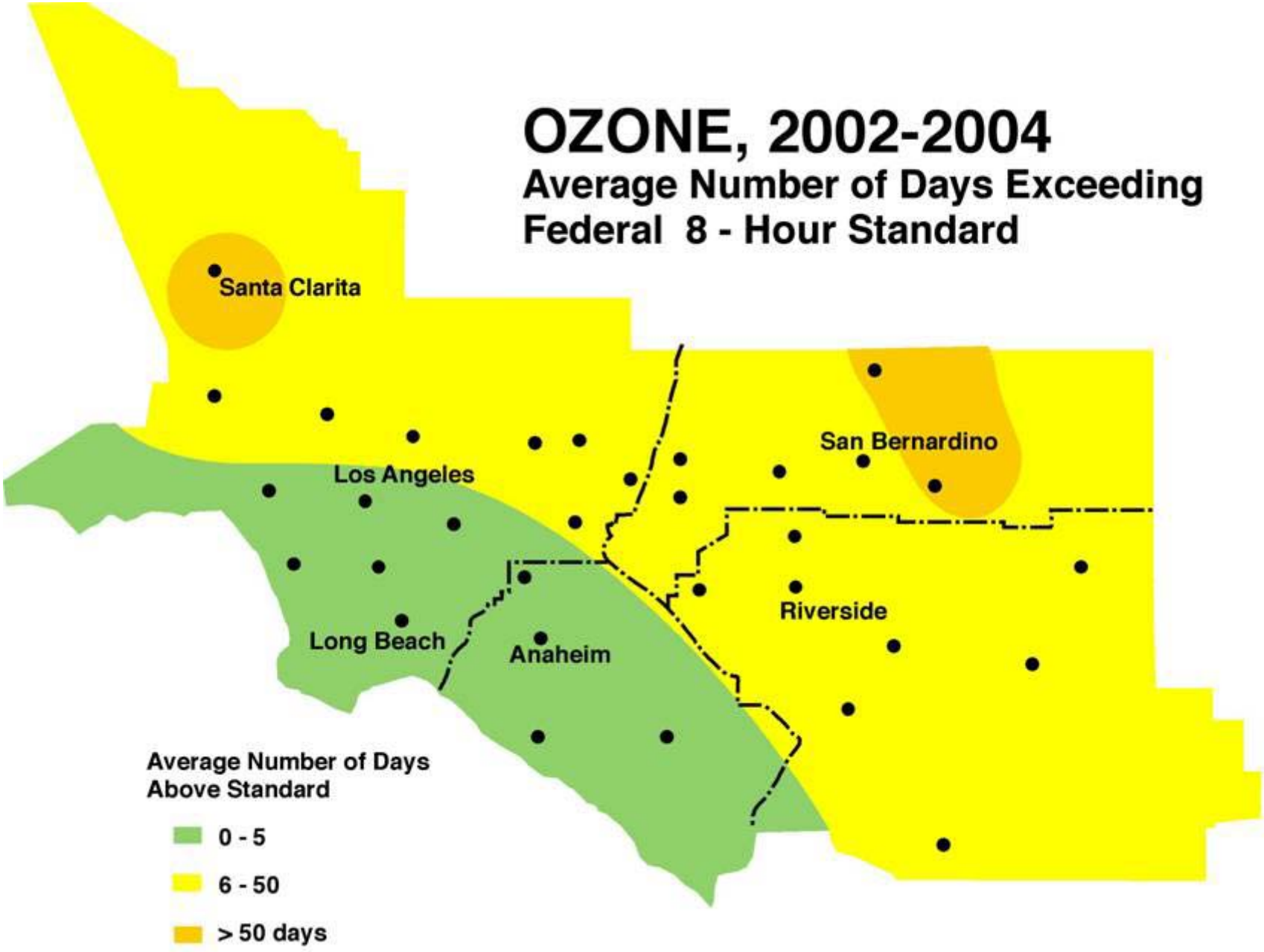

OZONE, 1982-1984
Average Number of Days Exceeding
Federal 1 - Hour Standard
Santa Clarita
Los Angeles
San Bernardino
Riverside
Long Beach
Anaheim
Average Number of Days
Above Standard
0 - 2
3 - 30
31 - 100
> 100 days


OZONE, 1992-1994
Average Number of Days Exceeding
Federal 1 - Hour Standard
Santa Clarita
Los Angeles
San Bernardino
Riverside
Long Beach
Anaheim
Average Number of Days
Above Standard
0 - 2
3 - 30
31 - 100
> 100 days


OZONE, 2002-2004
Average Number of Days Exceeding
Federal 1 - Hour Standard
Santa Clarita
Los Angeles
San Bernardino
Riverside
Long Beach
Anaheim
Average Number of Days
Above Standard
0 - 2
3 - 20
> 20 days

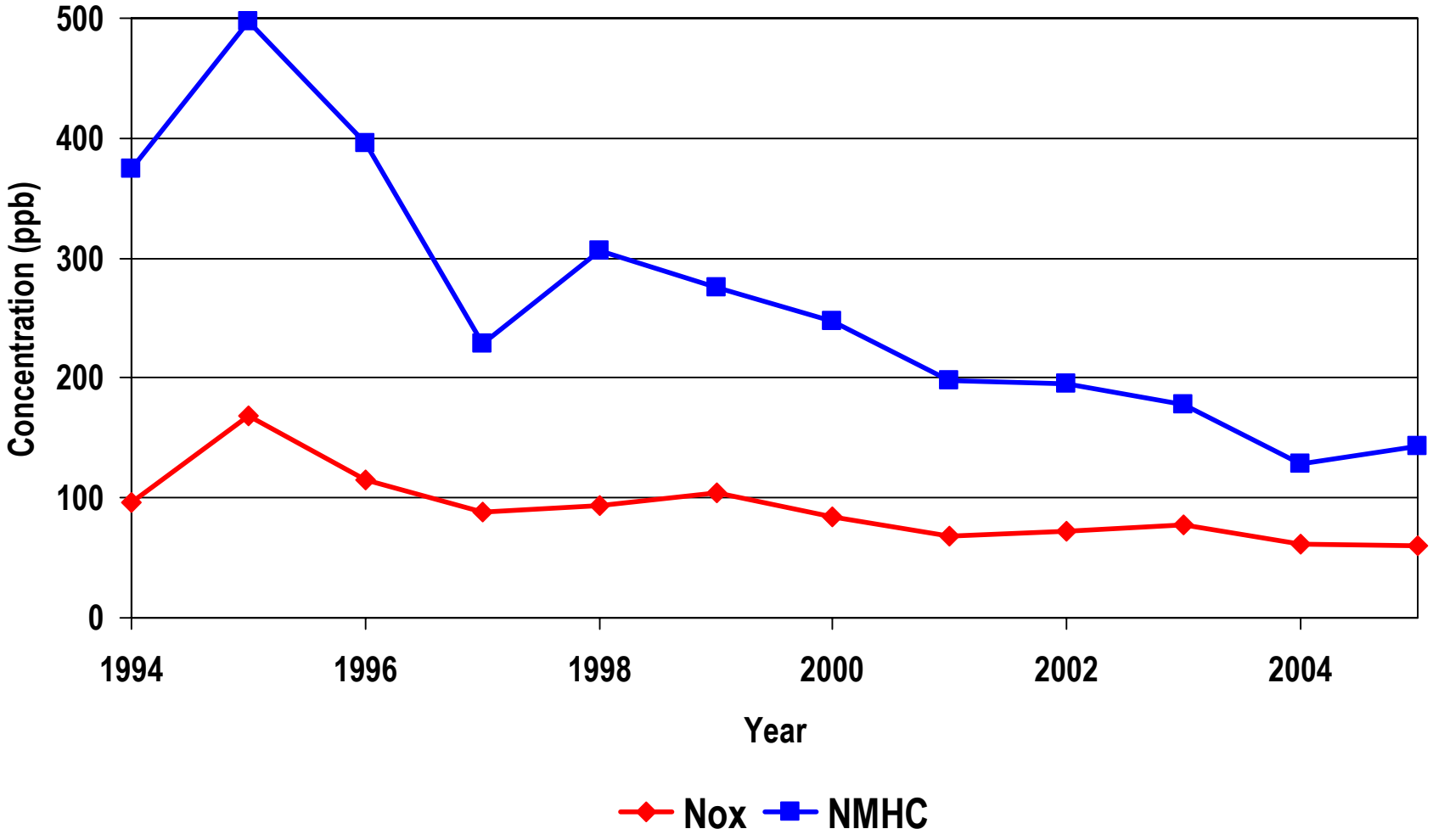

OZONE, 1982-1984
Average Number of Days Exceeding
Federal 8 - Hour Standard
Santa Clarita
Los Angeles
San Bernardino
Riverside
Long Beach
Anaheim
Average Number of Days
Above Standard
0 - 5
6 - 50
51 - 100
> 100 days


OZONE, 1992-1994
Average Number of Days Exceeding
Federal 8 - Hour Standard
Santa Clarita
Los Angeles
San Bernardino
Riverside
Long Beach
Anaheim
Average Number of Days
Above Standard
0 - 5
6 - 50
51 - 100
> 100 days


OZONE, 2002-2004
Average Number of Days Exceeding
Federal 8 - Hour Standard
Santa Clarita
Los Angeles
San Bernardino
Riverside
Long Beach
Anaheim
Average Number of Days
Above Standard
0 - 5
6 - 50
> 50 days

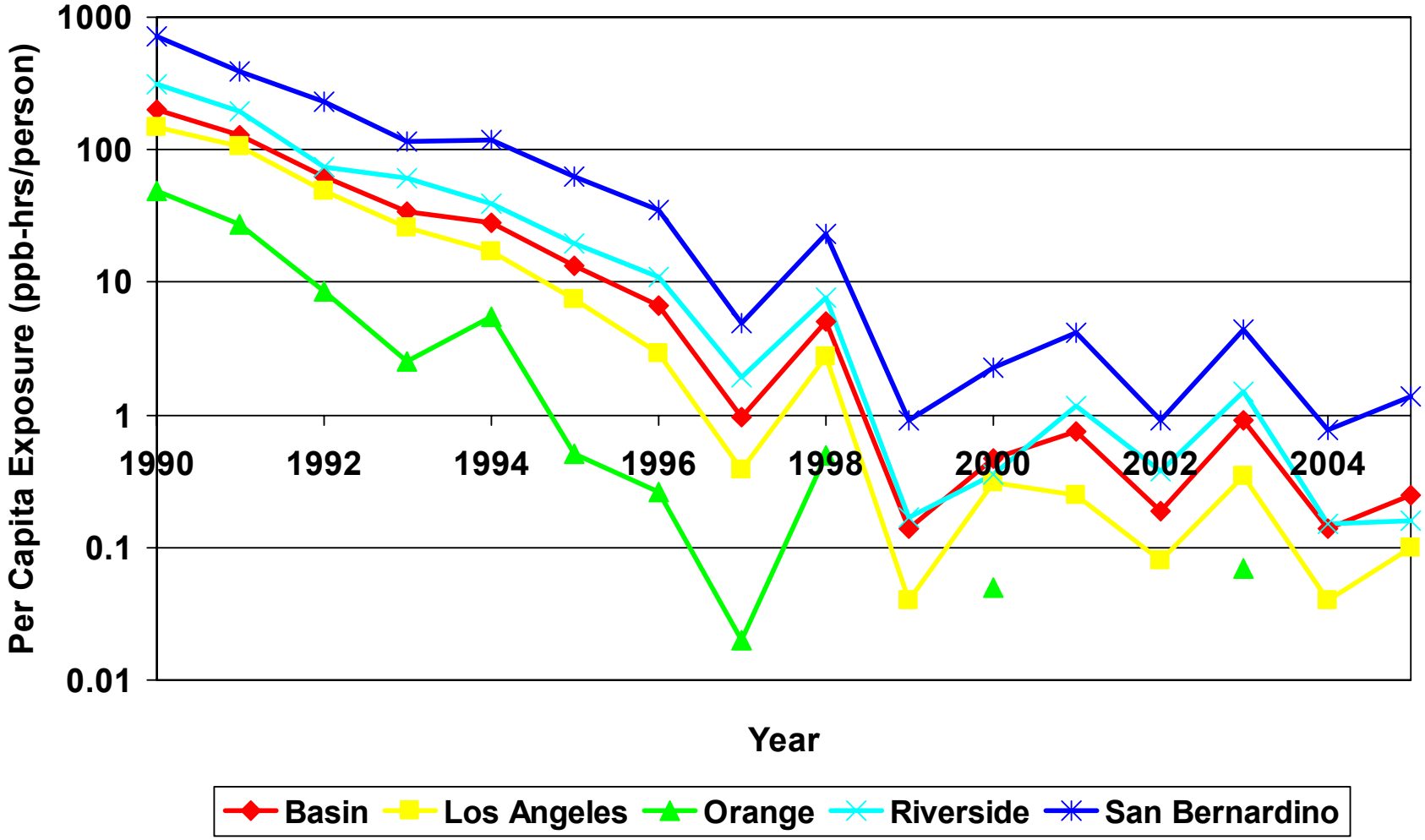
Hydrocarbon/ Oxides of Nitrogen Trends

Average NMHC and NOx Concentrations

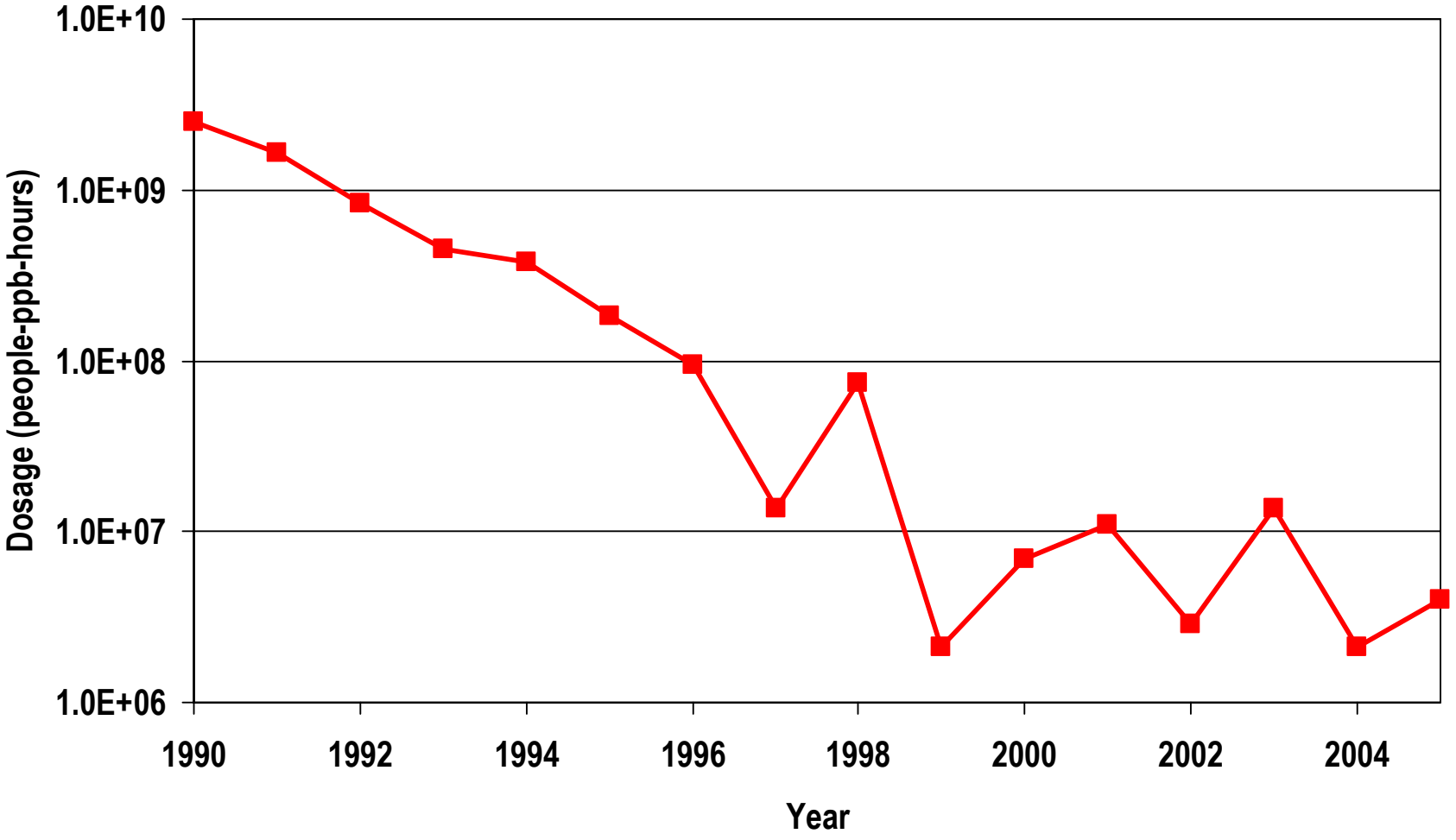


Ozone Exposure/ Dosage Trends

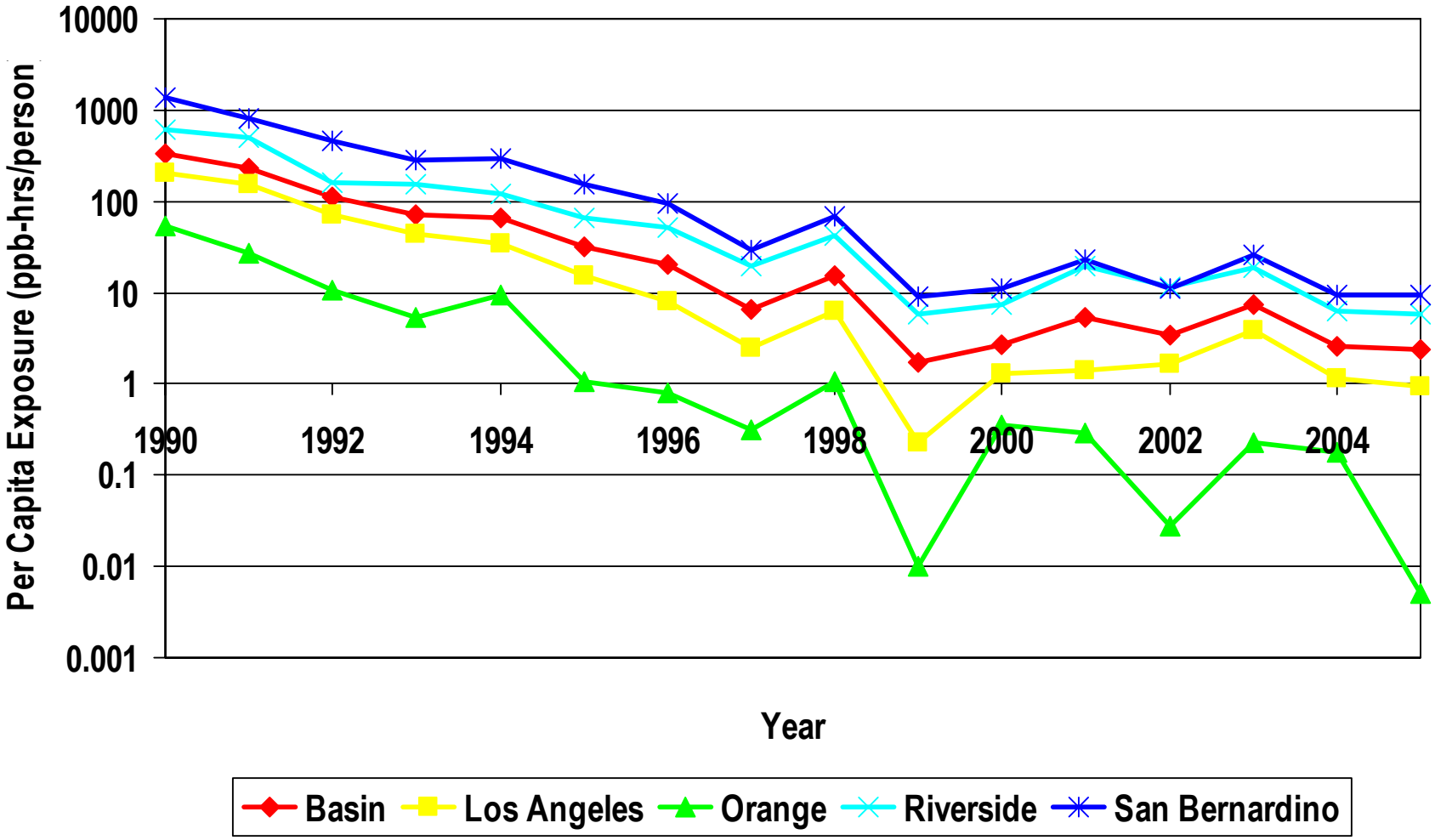
Per Capita Ozone Exposure Above the Federal 1-Hour Standard



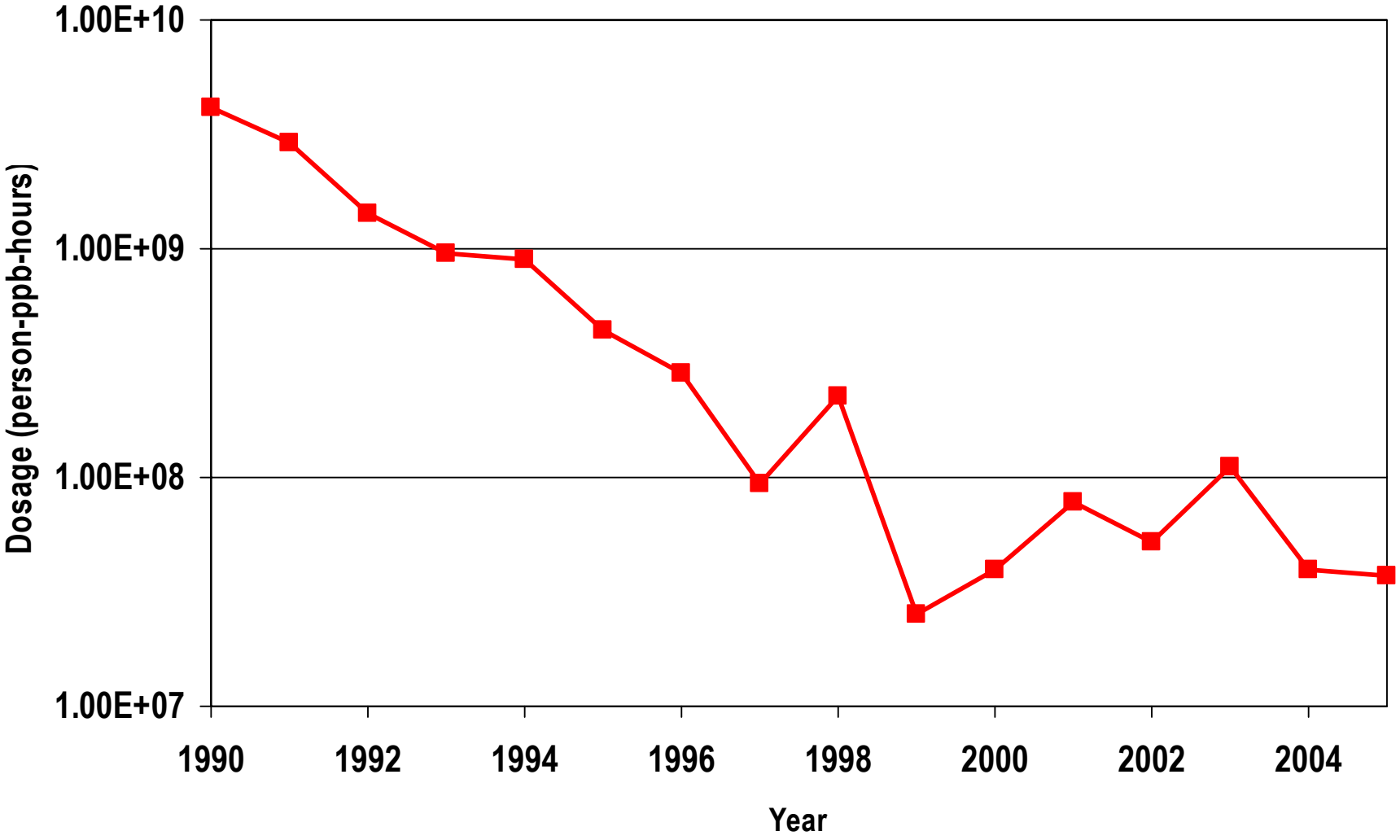
Population Dosage to 1-Hour Ozone



Per Capita Ozone Exposure Above the Federal 8-Hour Standard



Population Dosage to 8-Hour Ozone



Trend in Measured NMHC/NOx Ratios