MRPO Regional Air Quality Workshop

Status Report : Candidate Stationary Source Control Measures

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MACTEC Activities July-Nov. 2005

- Updates to Post-2002 Controls
- New White Papers
- Updates to Existing White Papers
- ICI Boiler Database

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Updates to Post-2002 Controls

- EGU Settlements
  - Already accounted for in IPM modeling; not looked at here
- Alcoa Warrick Planned Controls
  - ~100,000 tons/year of SO2 in 2002; estimated 98% reduction by 2010?
- Wisconsin State Actions
  - Quantifying reductions for ~20 facilities
  - NOx reductions from boilers at UW-Milwaukee and Miller Brewing
- Archer Daniels Midland Settlement
  - 59,000 tons/year from corn processing plants mainly in central US
- Cargill, Inc. Settlement
  - 30,000 tons/year from 27 plants, mainly in the central US
- Petroleum Refinery Settlements

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Petroleum Refinery Enforcement Initiative

- http://www.epa.gov/compliance/resources/cases/civil/caa/oil/
- Settlements now cover 85 refineries in 25 states
- Estimated to result in an annual reductions:
  - 80,000 tons of nitrogen oxide and
  - 235,000 tons of sulfur dioxide
  - reductions of particulate matter
  - reductions of VOC and benzene

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Settlement Requirements

- **Boilers, Heaters, FCCUs**
  - Install controls
    - *SCR/SNCR/Ultra-low NOx burners*
    - *Wet Gas Scrubber or SO2 Adsorbing Catalyst*
  - Install Continuous Emissions Monitoring Systems
- **Flaring**
  - Implement program to investigate the cause of flaring incidents.
  - Conduct root cause analyses and take corrective actions
  - Requires NSPS compliance at refinery's flares, sulfur recovery plants, and fuel gas combustion devices.
- **Install new sulfur recovery units and tail gas control devices**
- **Equipment Leaks**
  - LDAR Implement enhanced monitoring program
  - Train all refinery LDAR personnel annually
  - Train all other refinery operations and maintenance personnel on aspects of LDAR relevant to the employee's duties
  - Monitor valves more frequently than regulations require.

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Refinery Settlements in the MRPO

Company	Date	Refinery
Exxon Mobil	10/11/2005	Joliet IL
Sunoco	6/16/2005	Toledo OH
Conoco Phillips	1/27/2005	Wood River IL
CITGO	10/6/2004	Lemont IL
Marathon Ashland	5/11/2001	Robinson IL Detroit MI Canton OH
BP Amoco	1/19/2001	Whiting IN Toledo OH
Premcor Murphy Oil Countrymark Cooperative	n/a	Lima OH Superior WI Mount Vernon, IN

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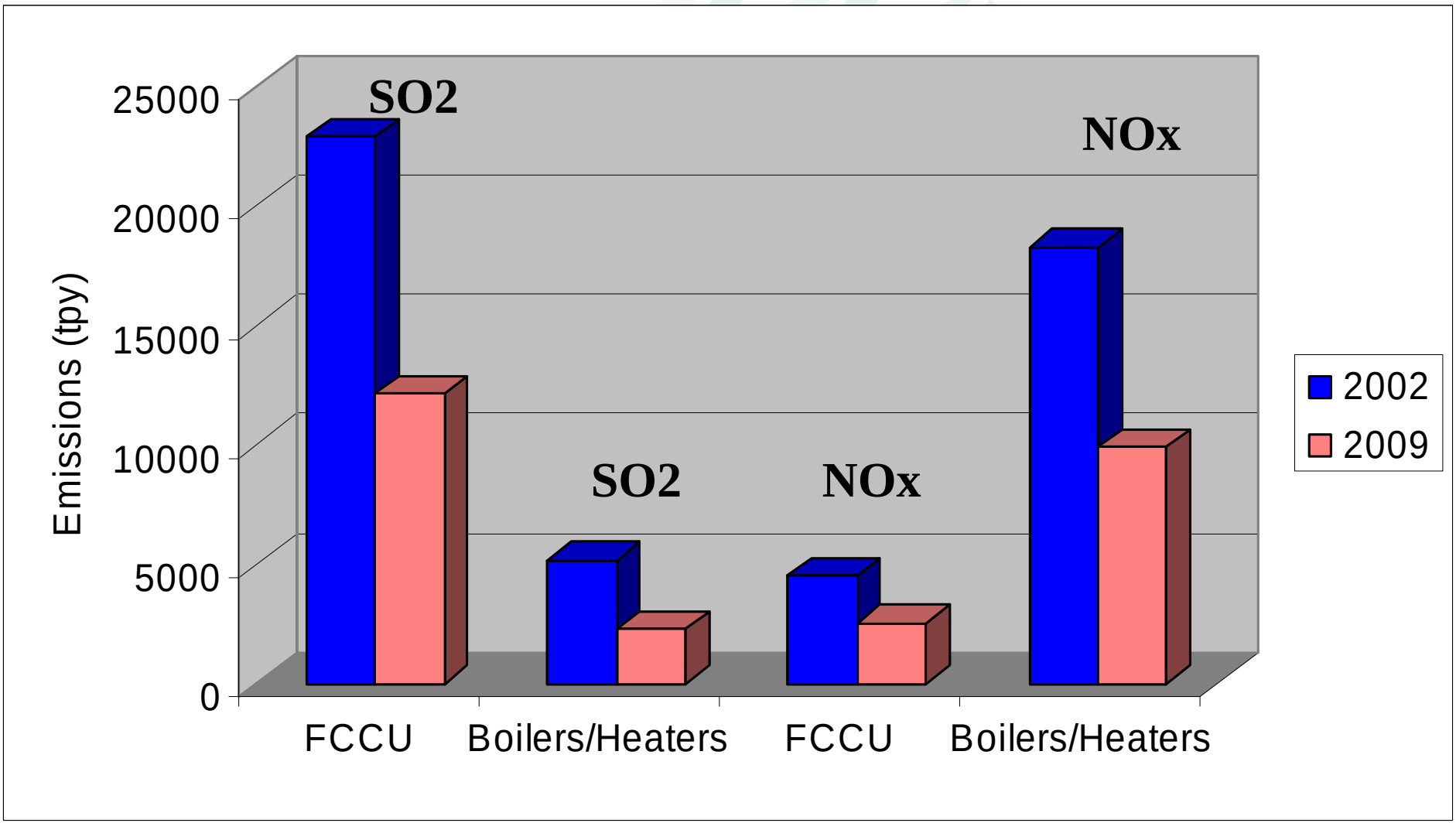
MRPO Refinery Emission Changes



MRPO Refinery Emission Changes

- Uncertainty as to where reductions will occur
  - Typical condition “use qualifying controls to reduce NOx emissions from boilers/heaters at all refineries by 4,951 tons per year”
  - Reductions may or may not occur in MRPO states
  - For MRPO modeling, assume reductions at MRPO refineries are proportional to required company-wide reduction unless specific compliance plans have been developed
- Compliance dates
  - Many reductions are to occur prior to 2009
  - Other reductions not expected until 2013

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Other Updates to Control Factors

- E.H. Pechan looking at MACT control assumptions for VOC sources
- Are there other nonEGU enforcement settlements or planned reductions that should be included?
- Plan on having revised set of on-the-books and on-the-way control factors available in early December

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New White Papers

- Glass & Fiberglass Furnaces
- Asphalt Manufacturing Plants
- Chemical Plants
- Petroleum Refineries
- Airports

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Category Description: Glass Furnaces

- Types of glass products
  - Flat glass
  - Container glass
  - Pressed and blown glass
  - Fiberglass
- Types of glass furnaces
  - Regenerative end port (container and pressed/blown
  - Regenerative side port (flat and container)
  - Non-regenerative (pressed/blown)
  - Electric melting (fiberglass)
- Furnaces contribute about 0.4% of NOx in 5-state region and less than 0.1% of SO2, VOC, PM

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Regulatory History: Glass Furnaces

- 1979 NSPS – PM limits only
- NSR (BACT/LAER)
- 1994 EPA Alternative Control Techniques
  - controls ranging from 40-85%
  - Cost-effectiveness from $790 to $9,900 per ton
- 1998 NOx SIP Call
  - Glass furnaces not included
  - Exceeded “highly cost effective” threshold of $2,000/ton
- MRPO State NOx regs
  - WI: 4 lbs/ton for furnaces > 50 mmBtu/hr
  - No other MRPO states have NOx rules for glass plants
- Other agencies (NJ, MA, BAAQMD, SCAQMD, SJVUAPCD)
  - Differing limits and applicability thresholds

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Available NOx Controls: Glass Furnaces

Technology	% Reduction	Cost Effectiveness ($/ton)
Combustion Modification		
Low NOx Burners	30-40	323 to 1,920
Oxy-Firing	75-85	1,254 to 4,400
Process Modification		
Cullet Preheat	~25	890 – 5,000
Fuel Reburn	50-65	571 to 1,349
Electric Boost	10-30	2,600 to 9,900
Post-Combustion Modification		
SNCR	20-60	830 to 2,000
SCR	75-90	727 to 3,000

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Candidate Controls: Glass Furnaces

- *Measure GLASS1 – Apply "highly cost effective" NOx controls to all furnaces*
  - Use EPA "highly cost effective" threshold of $2000/ton
  - Average across the MRPO region a *30 percent reduction* in NOx emissions (for example, low NOx burners or SNCR)
- *Measure GLASS2 – Apply "cost effective" NOx controls to all furnaces*
  - Use "cost effective" threshold of $4000/ton?
  - Average across the MRPO region a 75 *percent reduction* in NOx emissions (for example, oxy-firing or SCR)

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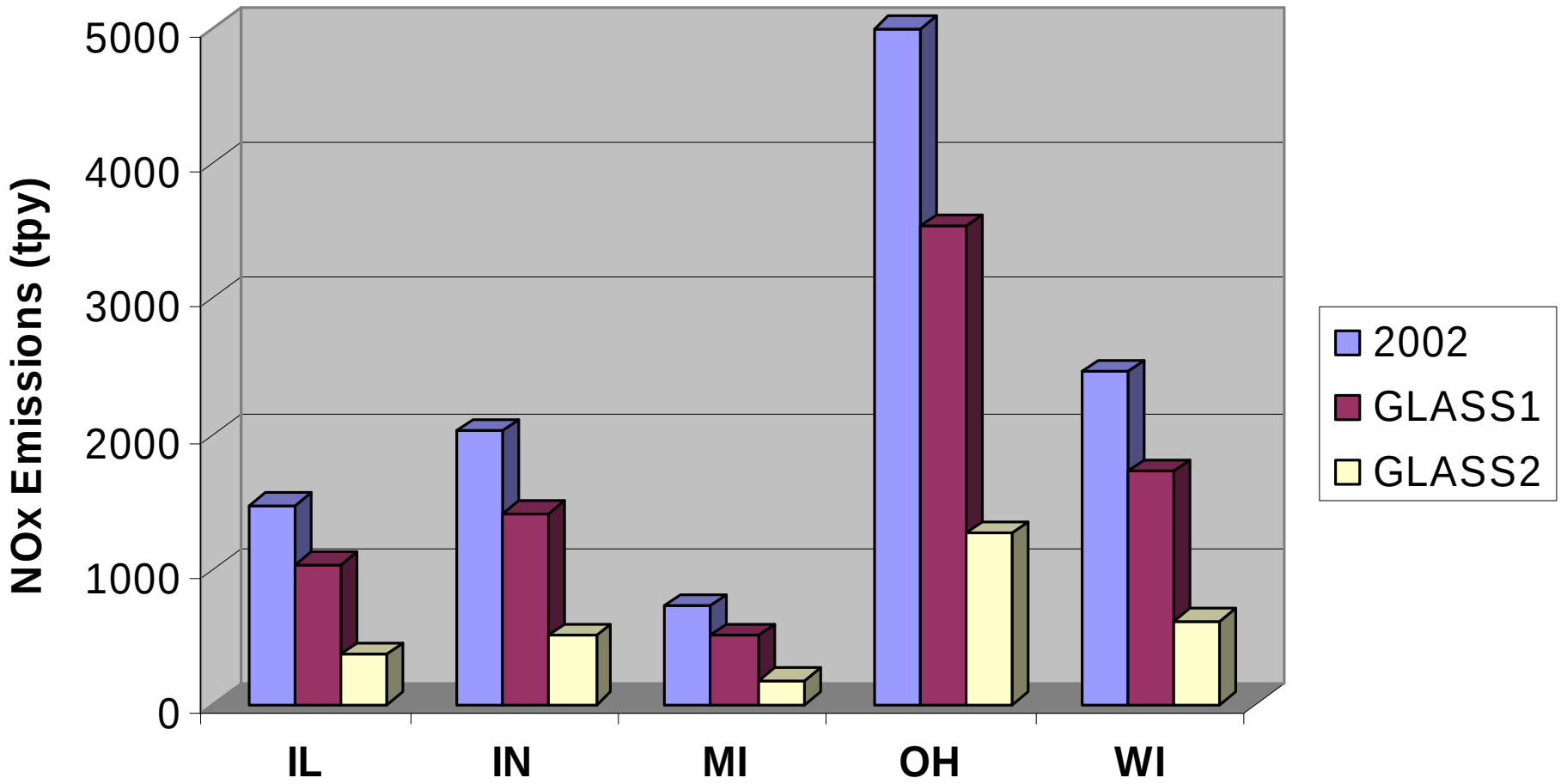
NOx Emissions for Glass Furnaces



Category Description: Asphalt Mfg.

- Hot Mix Asphalt Plants
  - Produce asphalt paving materials
- Asphalt Roofing Plants
  - Produce asphalt-saturated felt rolls, fiberglass and organic (felt-base) shingles, and surfaced and smooth roll roofing materials
- Asphalt heaters/dryers main source of pollution
- Most plants emit < 100 tpy of any pollutant
- ~ 500 hot mix asphalt plants in MRPO
- ~ 15 asphalt roofing plants
- Regionally contribute less than 0.1% of SO2, NOx, VOC, PM on an annual basis
- May have larger contribution during ozone season

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Emissions (tpy) from Hot Mix Asphalt Plants (SIC=2951)

State	# Plants	SO2	NOx	VOC	PM10	CO
Illinois	185	415	574	441	308	1,467
Indiana	53	330	212	159	349	241
Michigan	101	394	671	481	457	584
Ohio	1	25	27	100	3	127
Wisconsin	47	221	233	29	155	383
Total	**387**	**1,385**	**1,717**	**1,210**	**1,272**	**2,802**

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Emissions (tpy) from Asphalt Roofing Plants (SIC=2952)

State	# Plants	SO2	NOx	VOC	PM10	CO
Illinois	9	241	59	224	100	196
Indiana	2	0	1	9	2	0
Michigan	1	33	15	16	8	34
Ohio	1	191	31	74	147	240
Wisconsin	-	-	-	-	-	-
Total	**13**	**465**	**106**	**323**	**257**	**470**

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Regulatory History: Asphalt Mfg.

- NSPS: PM limits only
  - Subpart I Hot Mix Asphalt - 1973
  - Subpart UU Asphalt Roofing - 1980
- NSR (BACT/LAER, minor source BAT)
- MRPO State NOx regs
  - WI: limits for units > 50 mmBtu/hr depending on fuel type
  - No other MRPO states have NOx rules

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Candidate Controls: Asphalt Mfg.

- Low NOx Burners
  - 50% reduction from uncontrolled
  - $2,200 per ton NOx reduced

Category Description: Chemical Mfg.

- Diverse Category
  - SIC 2819 Industrial Inorganic Chemicals, NEC
  - SIC 2821 Plastics Material and Synthetic Resins
  - SIC 2833 Medicinal Chemicals and Botanical Products
  - SIC 2834 Pharmaceutical Preparations
  - SIC 2841 Soaps and Other Detergents
  - SIC 2865 Cyclic Organic Crudes and Intermediates, and Organic Dyes and Pigments
  - SIC 2869 Industrial Organic Chemicals, NEC
  - SIC 2873 Nitrogenous Fertilizers
  - SIC 2899 Chemicals and Chemical Preparations, NEC

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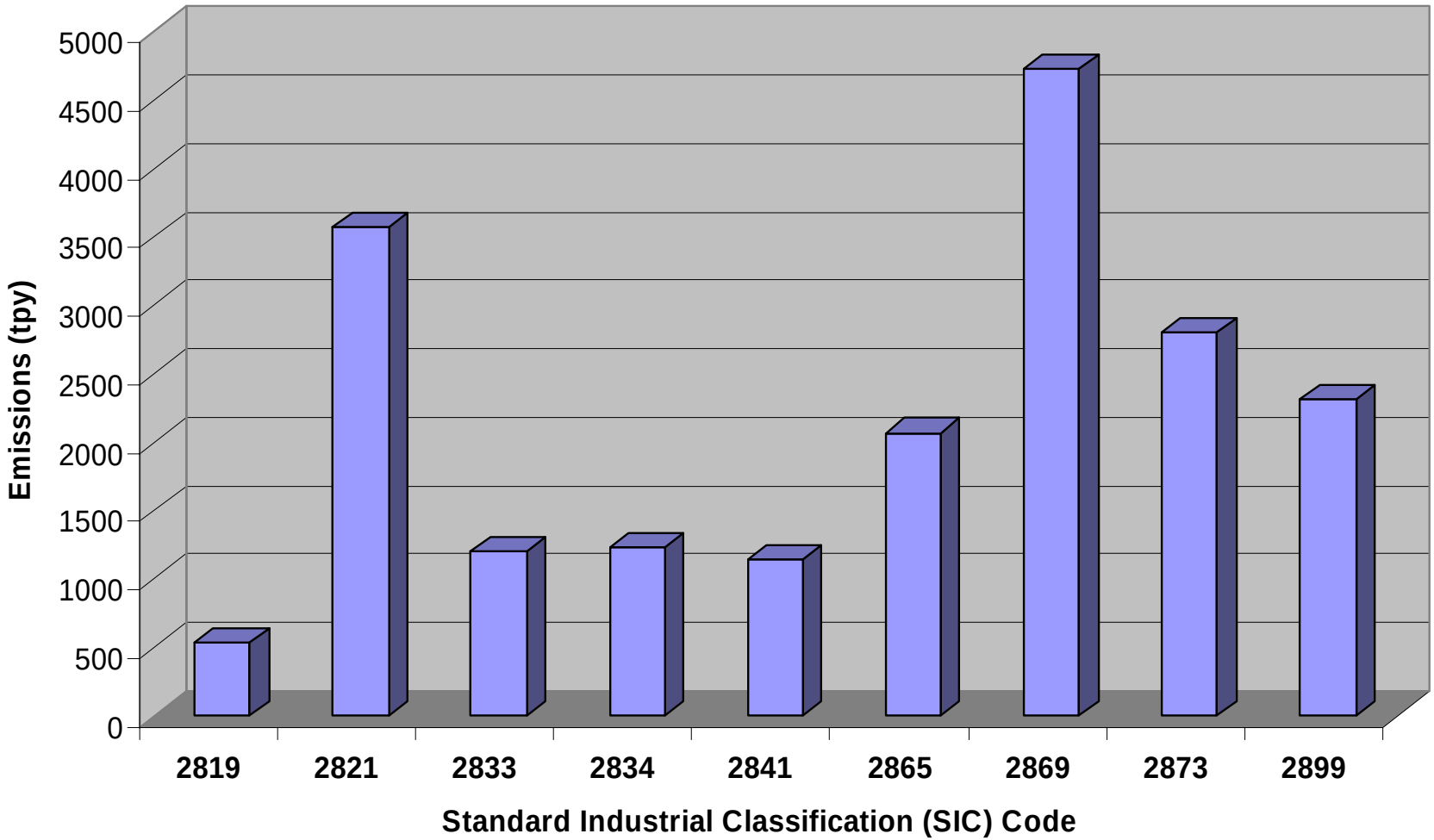
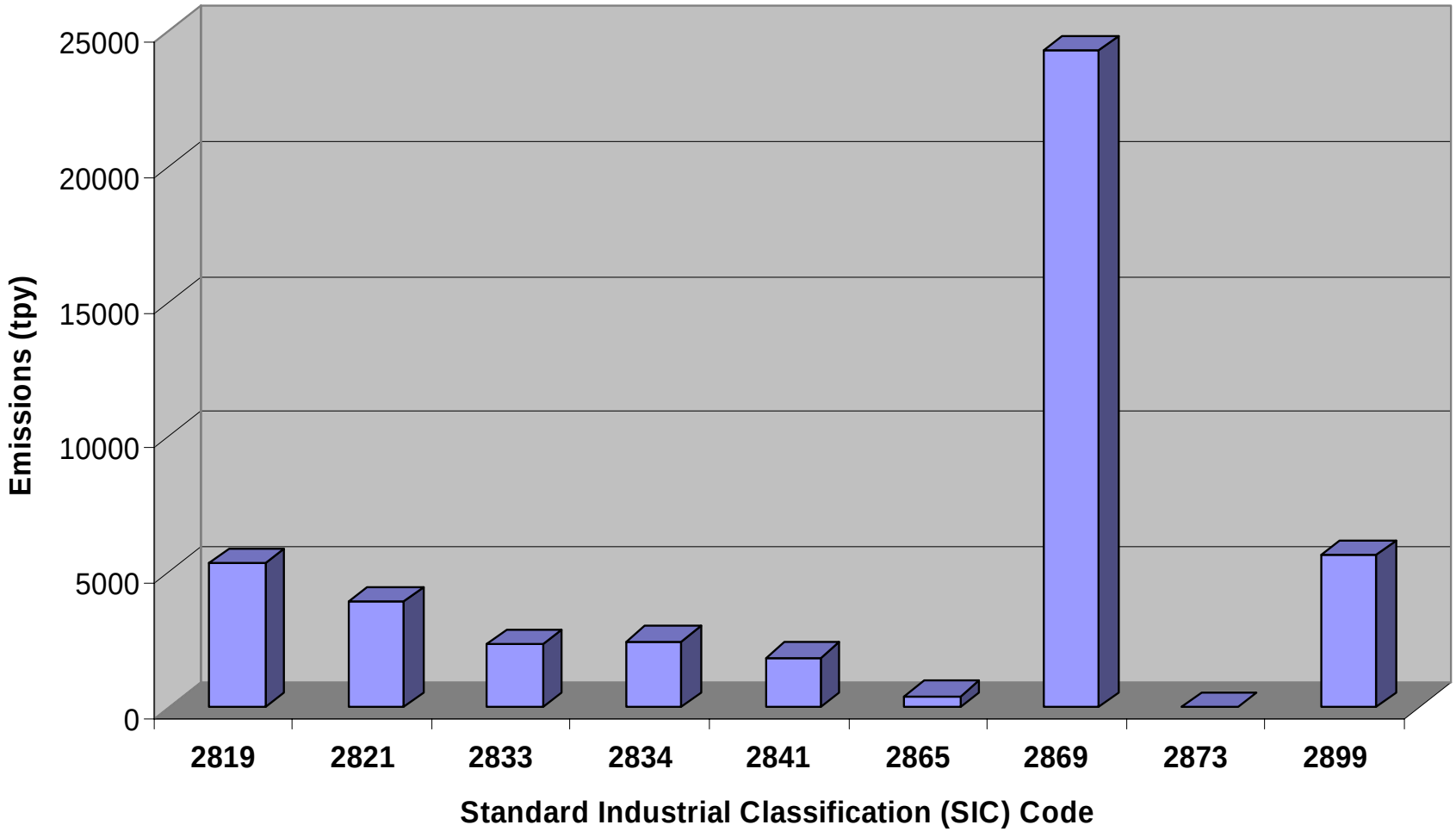
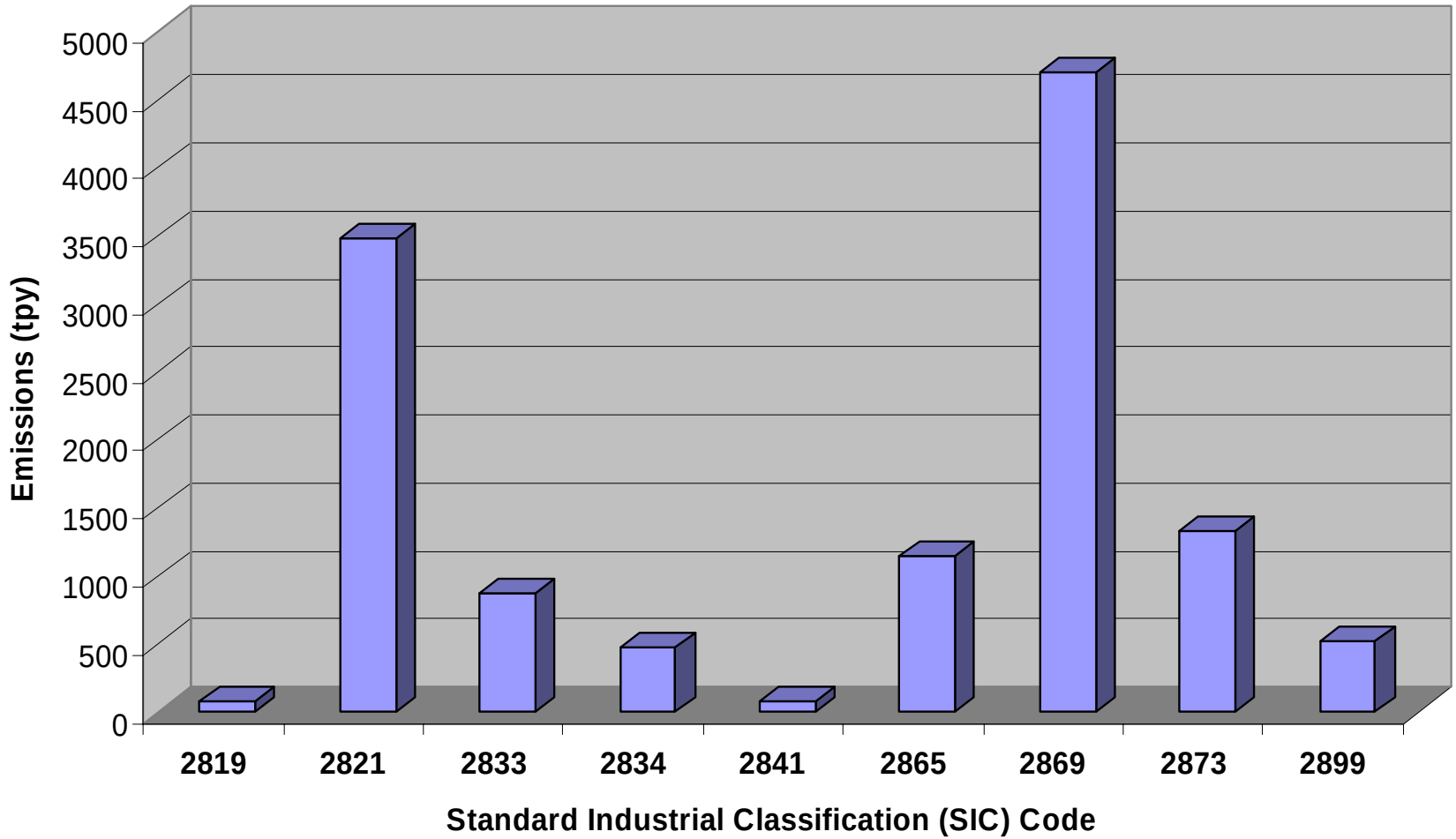
NOx Emissions from Chemical Process Industry



SO2 Emissions from Chemical Process Industry



VOC Emissions from Chemical Process Industry



Category Description: Chemical Mfg.

- Regionwide Emissions Contribution
  - ~5% of SO2 in 2009
  - ~1% of NOx in 2009
  - ~1% of VOC in 2009
- Emission Processes
  - Industrial Boilers
  - Process Heaters
  - Chemical Processes

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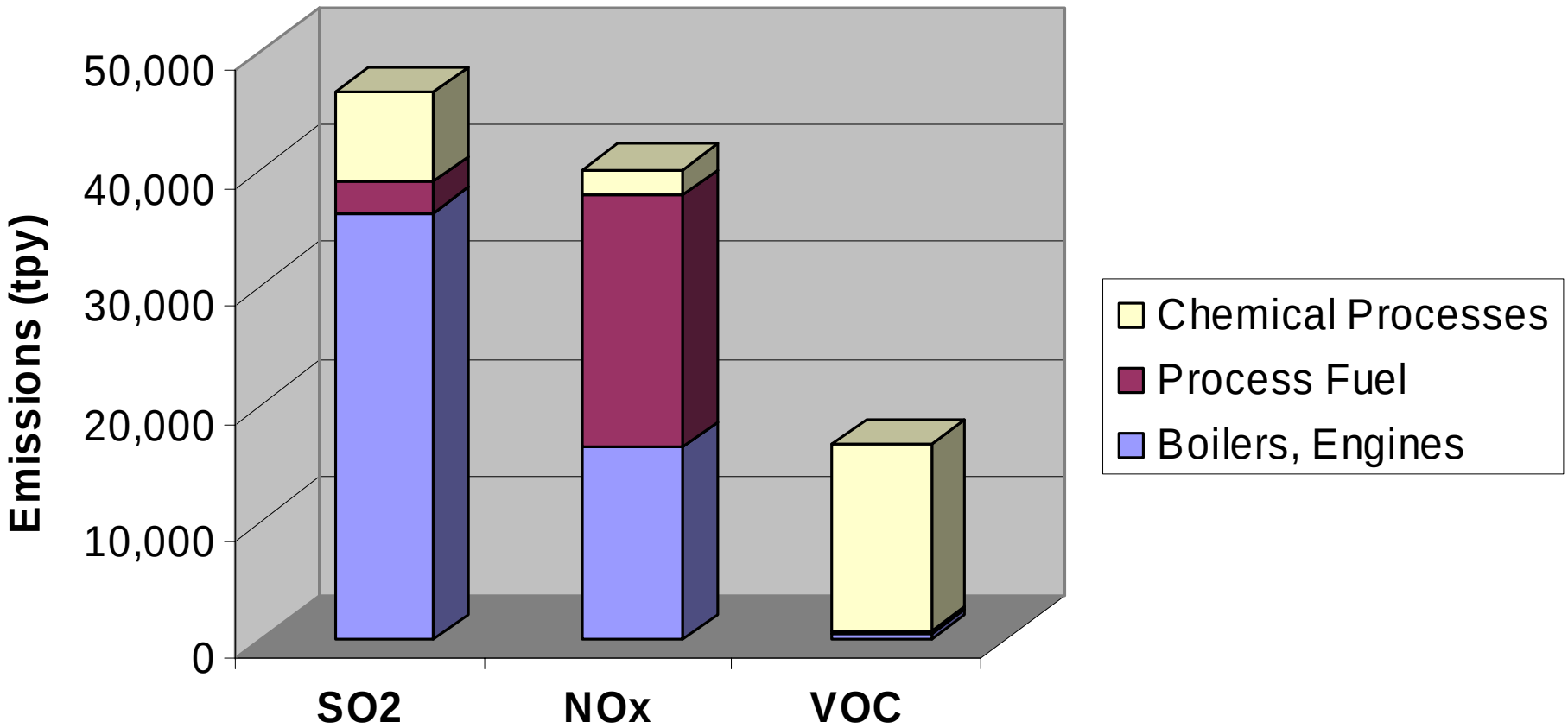
Emissions by Process



Regulatory History: Chemical Industry

- NSPS
  - Numerous applicable standards
- NSR (BACT/LAER)
- MACT
  - Hazardous Organic NESHAP
  - Miscellaneous Organic NESHAP
  - Others
- BART
  - Preliminary analysis showed only boilers would affected

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Candidate Controls: Chemical Mfg.

- SO2/NOx
  - Emissions primarily from combustion sources
  - Candidate controls discussed in ICI Boiler White Paper
  - Process emissions may best be addressed on a case-by-case basis
- VOC
  - Most sources likely to be already controlled based on NSPS, HON, or MON requirements
  - Currently investigating current levels of control and processes where further emission reductions are available

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Updates to Existing White Papers

- **VOC Sources**
  - Gasoline Dispensing Facilities
  - Portable Fuel Containers
  - Industrial Surface Coating
  - Industrial Surface Cleaning
  - Consumer and Commercial Solvents
  - Architectural and Industrial Maintenance (AIM) Coatings
  - Automobile Refinishing
  - Asphalt Paving Applications
- **SO2/NOx Sources**
  - Industrial/Commercial/ Institutional (ICI) Boilers
  - Cement Kilns
  - Electric Generating Units

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Updates to Existing White Papers

- **Gasoline Distribution Facilities**
  - Comment: More recent CARB documentation shows higher costs for enhanced vapor recovery EVR Stage II
  - MACTEC reviewing references to identify most recent CARB cost estimates and will modify White Paper accordingly

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Updates to Existing White Papers

- **Industrial Surface Coating**
  - Comment: many coating operations have converted to low VOC coatings and already have some level of add-on control
  - Comment: 90% overall control is not cost effective, may not be technically feasible, and should not be assumed
  - Comment: Costs are not representative of the difficulty and cost of controlling low to moderate VOC concentration streams
  - MACTEC attempting to identify sources that are already controlled
  - MACTEC reviewing references to determine if cost estimates are appropriate and provide further justification, as necessary

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Updates to Existing White Papers

- **Consumer and Commercial Products**
  - Comment: Need uniform and consistent regulations throughout 5-state region (e.g., OTC Model Rule)
  - Comment: Costs to implement CARB regulation (CONS-1) are underestimated
  - Comment: Sell-through limitation provision unnecessary
  - Comment: Emission reduction credits from existing federal rules are incorrect
  - Comment: States should consider a voluntary program
  - MACTEC reviewing references to determine whether reductions and cost estimates are appropriate; provide further justification, as necessary

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Updates to Existing White Papers

- **Architectural and Industrial Maintenance Coatings**
  - Comment: Accuracy of emission estimates is questionable (e.g., states with the highest population should have the highest AIM VOC emissions)
  - MACTEC reviewing basis for emission calculations and emission reduction estimates; provide further justification, as necessary

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Updates to Existing White Papers

- **Cement Kilns**
  - Comment: do not agree that selective catalytic reduction (SCR) is reasonably available technology for controlling NOX; only one permanent installation exists
  - Comment: provide more supporting data to substantiate cost estimates for each control alternative
  - Comment: provide more supporting data to substantiate differences in SO2 control efficiencies and costs
  - Comment: coordinate with the ICI boiler MACT standard
  - MACTEC gathering supporting data regarding whether SCR is feasible and will provide more information as to how the cost estimates were arrived at

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Updates to Existing White Papers

- **Industrial, Commercial, Institutional (ICI) Boilers**
  - Comment: information is an "interesting first pass at characterizing the population of Midwest ICI boilers", but is "wholly inadequate as a base for regulatory assessment.“
  - Comment: verify that WP reflects reductions from the NOx SIP call and consent decrees
  - Comment: cost effectiveness does not account for complexity of the ICI boiler population. The assumed 80% NOx and 90% SO2 reductions can only be achieved by a few ICI boilers.
  - Comment: coordinate with the ICI boiler MACT standard
  - MACTEC investigating whether data exist to account for existing controls and develop cost-effectiveness estimates based on boiler type/size and fuel type

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ICI Boiler Database

- Building a Boiler Database
  - Starting with State's emission inventory
  - Attempting to fill in gaps:
    - *Boiler capacity (mmBtu/hr)*
    - *Existing controls*
    - *Planned controls due to NOx SIP, Boiler MACT, other requirements*
- Use Database to Better Characterize Emissions, Candidate Reductions, and Costs:
  - By Size
  - By Design Characteristics
  - By Fuel Type

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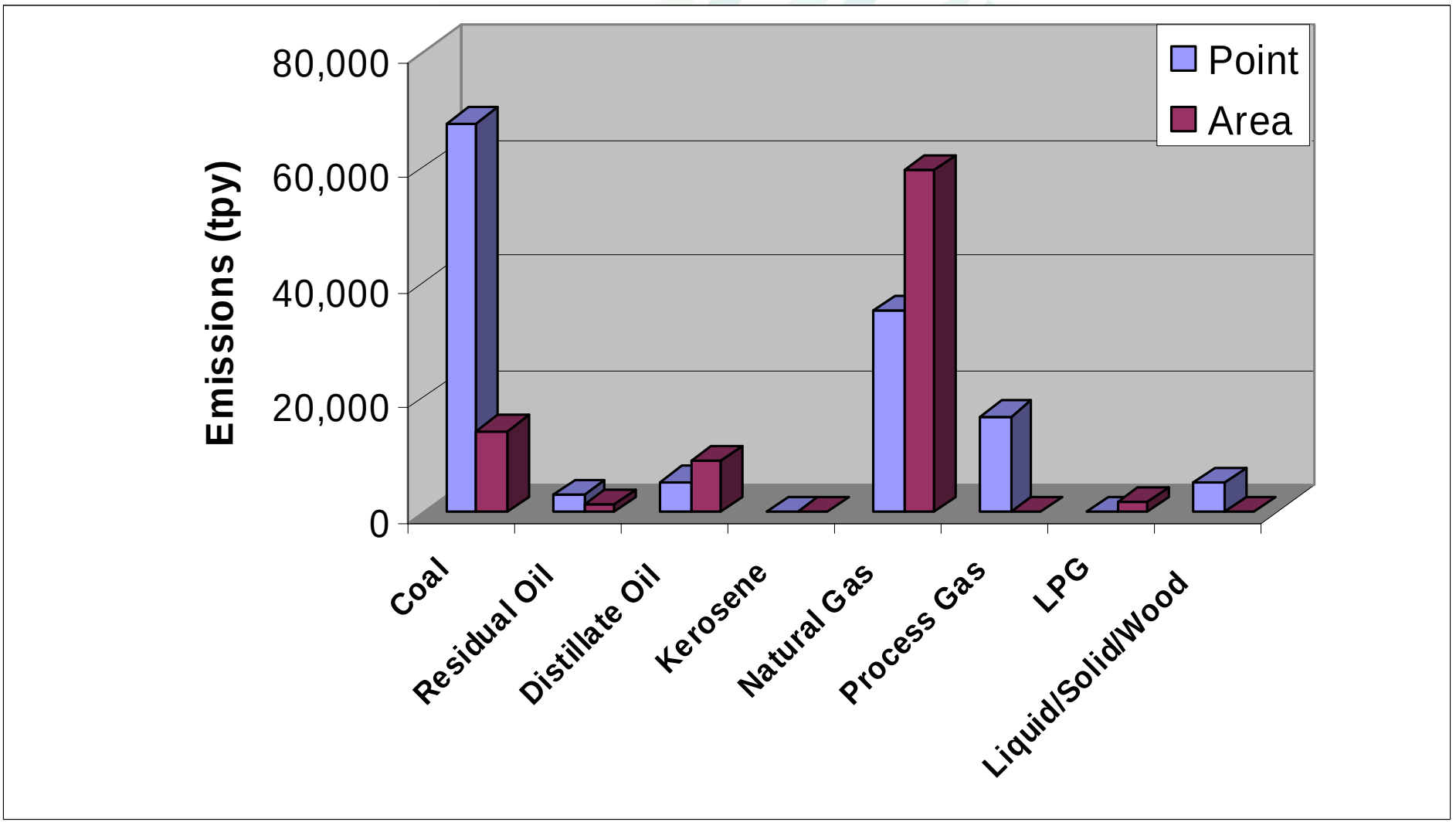
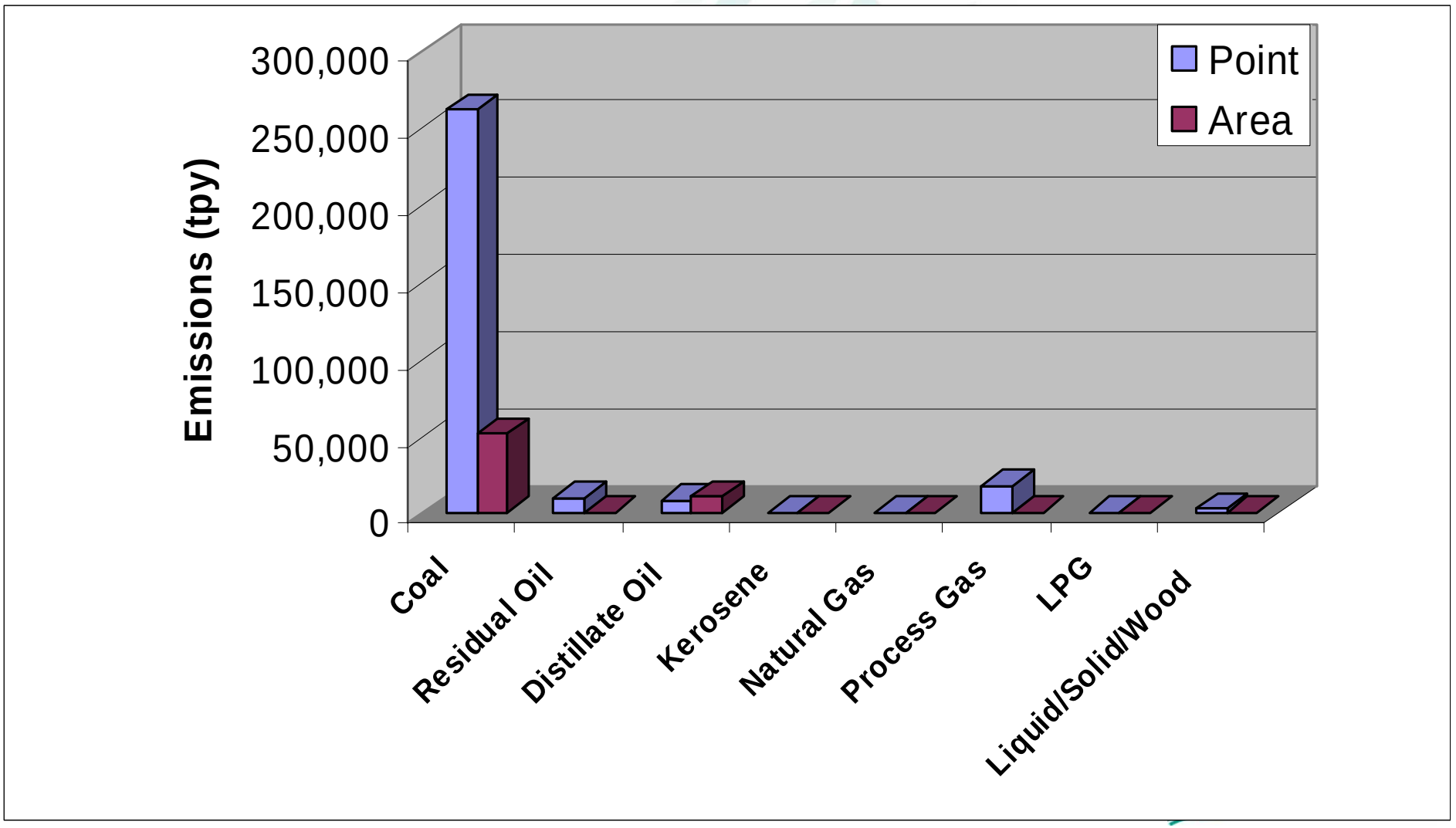
ICI Boiler NOx Emissions By Fuel Type



ICI Boiler SO2 Emissions By Fuel Type



Updates to Existing White Papers

- **Electric Generating Units (EGUs)**
  - Comment: update WP to reflect final CAIR and recent VISTAS/MRPO IPM modeling
  - Comment: WP does not adequately address electric rates, demand for IL,IN,OH coal, economic impacts, and employment in the region
  - Comment: need to clarify whether NOx emission caps are on an annual basis, and address the implications of maintaining the summer ozone season CAIR NOx cap
  - Comment: need to address how state-specific mercury reduction requirements, which are more stringent than CAMR, impact SO2 and NOx reductions.
  - Comment: many others related to stringency and feasibility of proposed EGU1 and EGU2 emission caps

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Next Steps

- OTB/OTW Control Factors – early December
  - Consolidate information from EPA settlements, state identified changes, and Pechan's MACT work
- Revisions to Existing White Papers – Thanksgiving
  - Post revised White Papers for VOC source categories on LADCO web site
- 5 New White Papers – Thanksgiving
  - Post new White Papers for Glass Furnaces, Asphalt Plants, Chemical Plants, Petroleum Refineries, and Airports
- ICI Boilers
- EGUs

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