Analysis of Emission Changes to Inform New Emission Projection Analysis

Presented by:

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  - Kathy Pendleton – TCEQ
  - Jim Wilson, Andy Bollman, Viola Glenn, Jackson Schreiber - Pechan

Project Purpose

- Evaluate 1992-2006 Point Source Trends
- Emissions versus Activity
- Identify primary factors affecting emissions
- Use to develop improved forecasts

Priority Source Categories

- Petroleum Refining
- Cement Manufacturing
- Electricity Generating Units
- Natural Gas Production/Processing
- Chemical Manufacturing

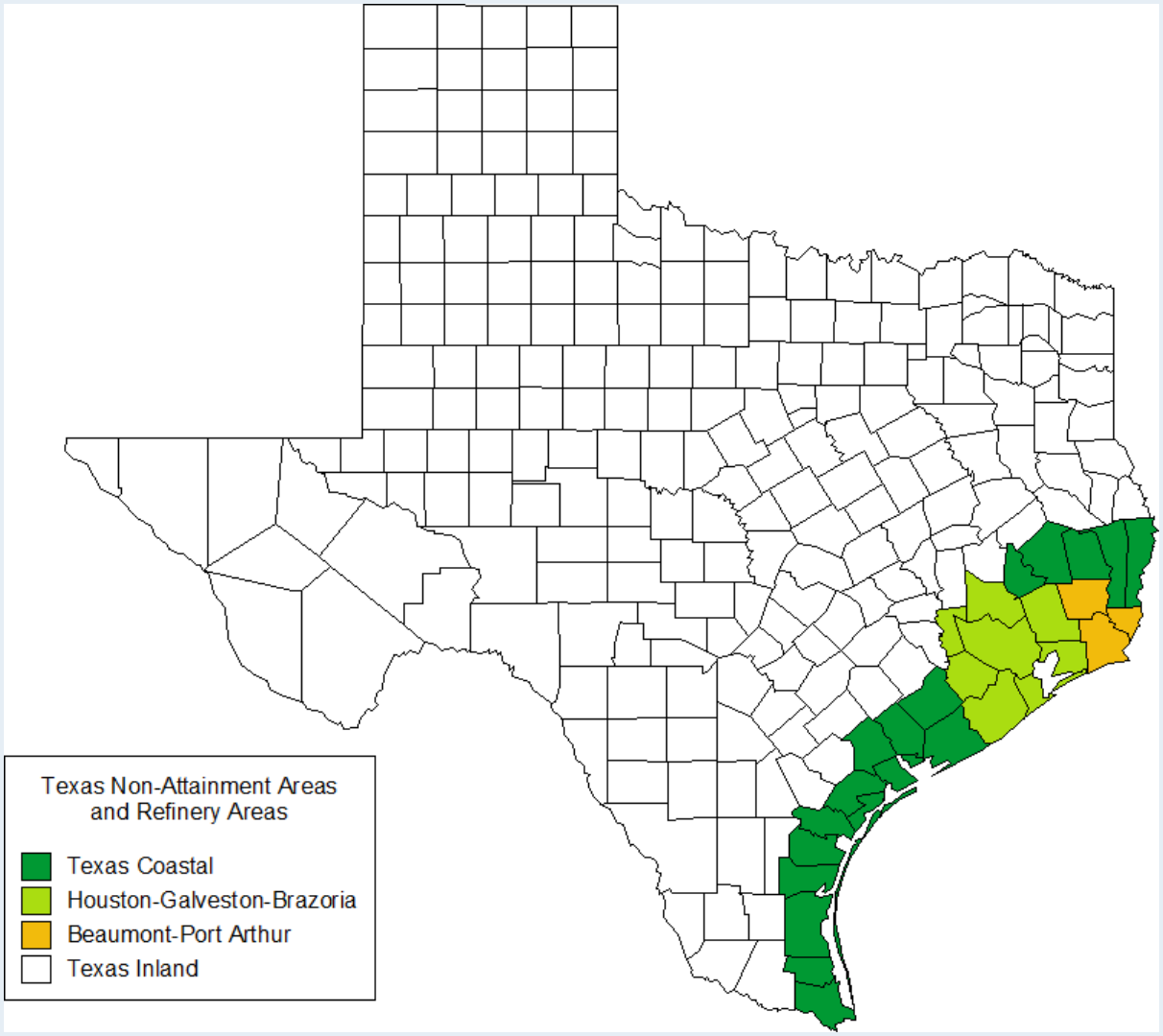
Analysis Period

- Historical 1992-2006
- Base Year 2005
- Forecast Period 2008-2020

Petroleum Refining

- Refining Characteristics in Texas
  - 25 refineries
  - Some increase in production 1992-2006
  - 2 closures
  - Long-term focus on VOC control
  - More recent NO_x control focus

Petroleum Refining



Petroleum Refining (cont'd)

- Petroleum Production Estimates
  - State production totals (Gross Refinery Inputs), from EIA
  - Allocated to individual refineries according to their capacity

Petroleum Refining (cont'd)

- Texas Growth Forecasts
  - *Annual Energy Outlook* reports:
    - National capacity
    - National capacity utilization
    - Regional capacity
  - Regional refinery activity growth
    - 2005-2020 is 9 percent

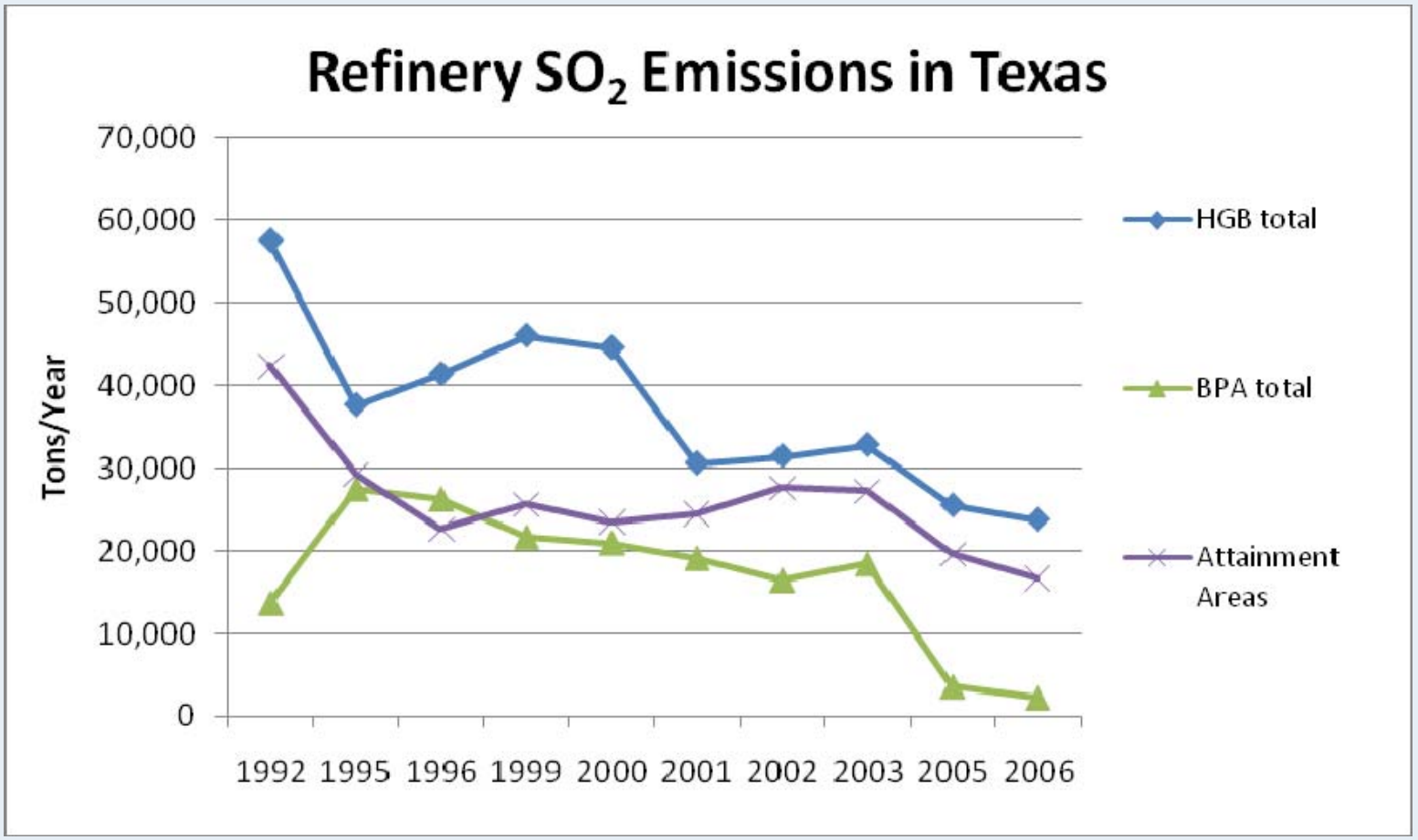
Petroleum Refining (cont'd)

- Refinery Growth Timing
  - Expected capacity additions – next 3 years
  - All production growth by 2014
  - No activity growth after 2014

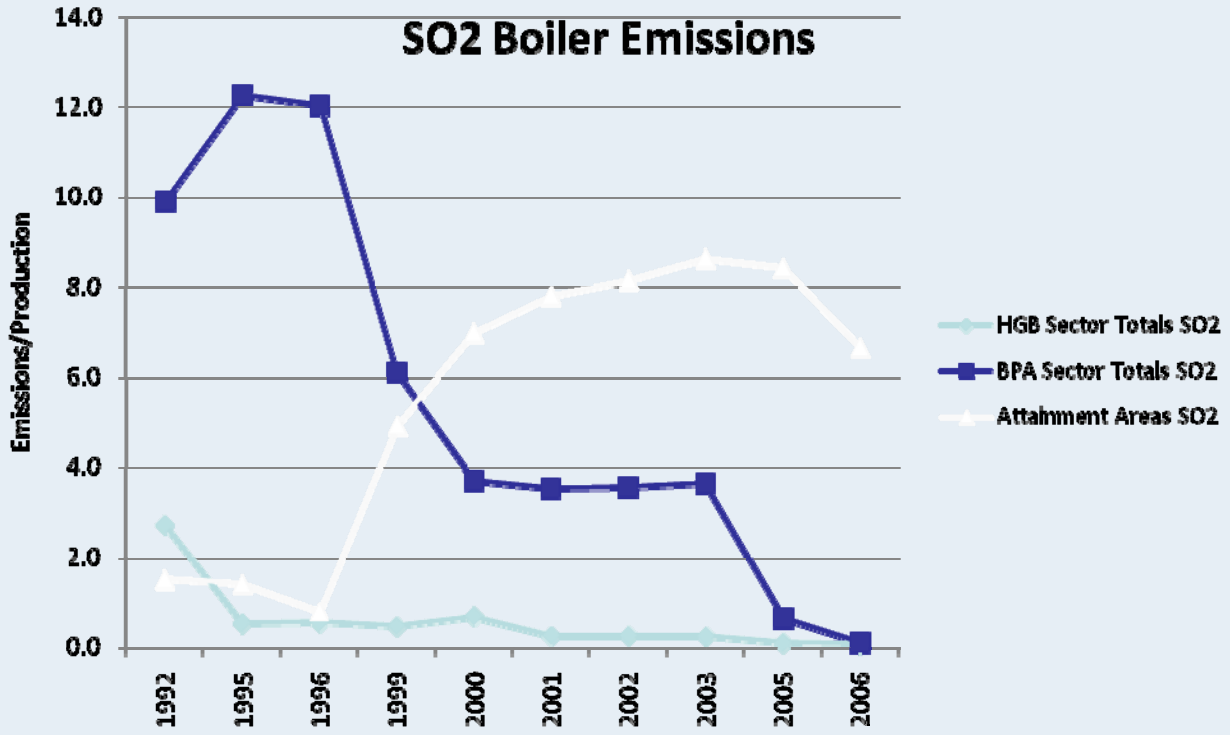
Refinery SO_2 Control Analysis

- Source Categories for Analysis
  - Boilers
  - Blowdown/Flares
  - Catalytic Crackers
  - Process Heaters
  - Sulfur Plants
  - Turbines
  - Other, N.E.C.

Refinery SO_2 Control Analysis (cont'd)



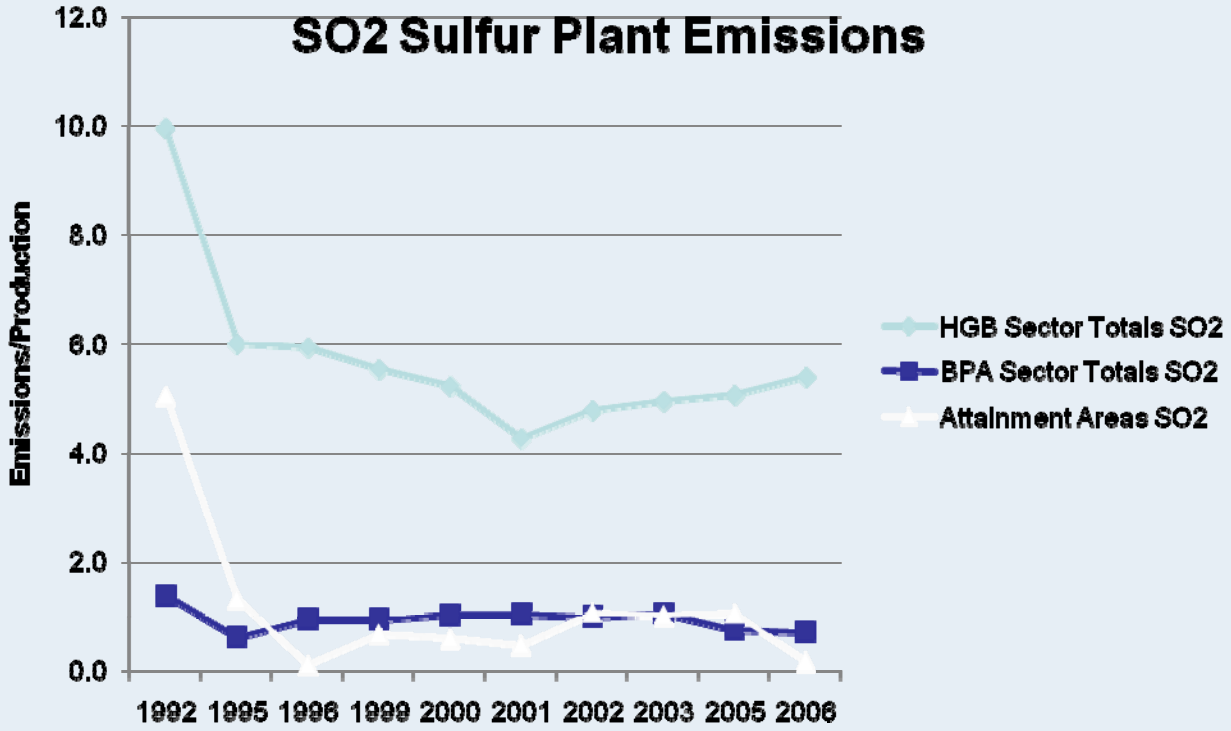
Refinery SO_2 Control Analysis (cont'd)



Refinery SO_2 Control Analysis (cont'd)

- Boilers – low emission rates from natural gas and refinery gas
- Continue at same rates post-2005

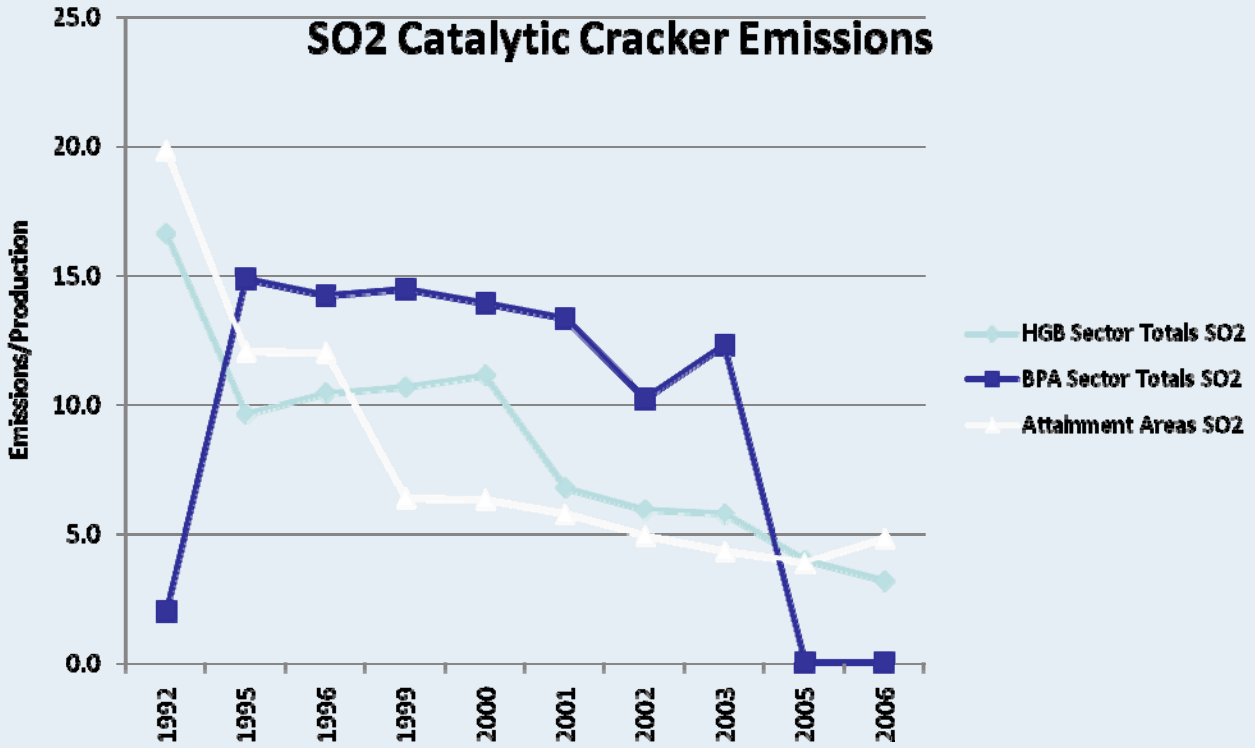
Refinery SO_2 Control Analysis (cont'd)



Refinery SO_2 Control Analysis (cont'd)

- Sulfur plants – limited change in SO_2 emission rate expected as rates approach NSPS levels
- NSPS emission rate times capacity at 100% utilization yields a higher SO_2 estimate than recent actuals

Refinery SO_2 Control Analysis (cont'd)



Refinery SO_2 Control Analysis (cont'd)

- Catalytic Crackers – where not already controlled by WGS
  - Most important factor:
    - Settlement agreements
  - Recommend: Determine where post-2005 settlements require further SO_2 controls and incorporate in CFs

Cement Manufacturing

Cement Manufacturing (cont'd)

Data Source	Information Provided
TCEQ Point Source Emissions Files	Emissions Estimates
Portland Cement Association, *U.S. and Canadian Portland Cement Industry*	Kiln Capacity
United States Geological Survey, *Minerals Yearbook*	Cement Production by Year

Cement Manufacturing (cont'd)

Number of Operational Kilns/Facilities in Texas

	Facilities	Kilns
1992	11	20
2000	11	21
2006	11	22

Primary Pollutants:

- NO_x
- SO_2

Cement Manufacturing (cont'd)

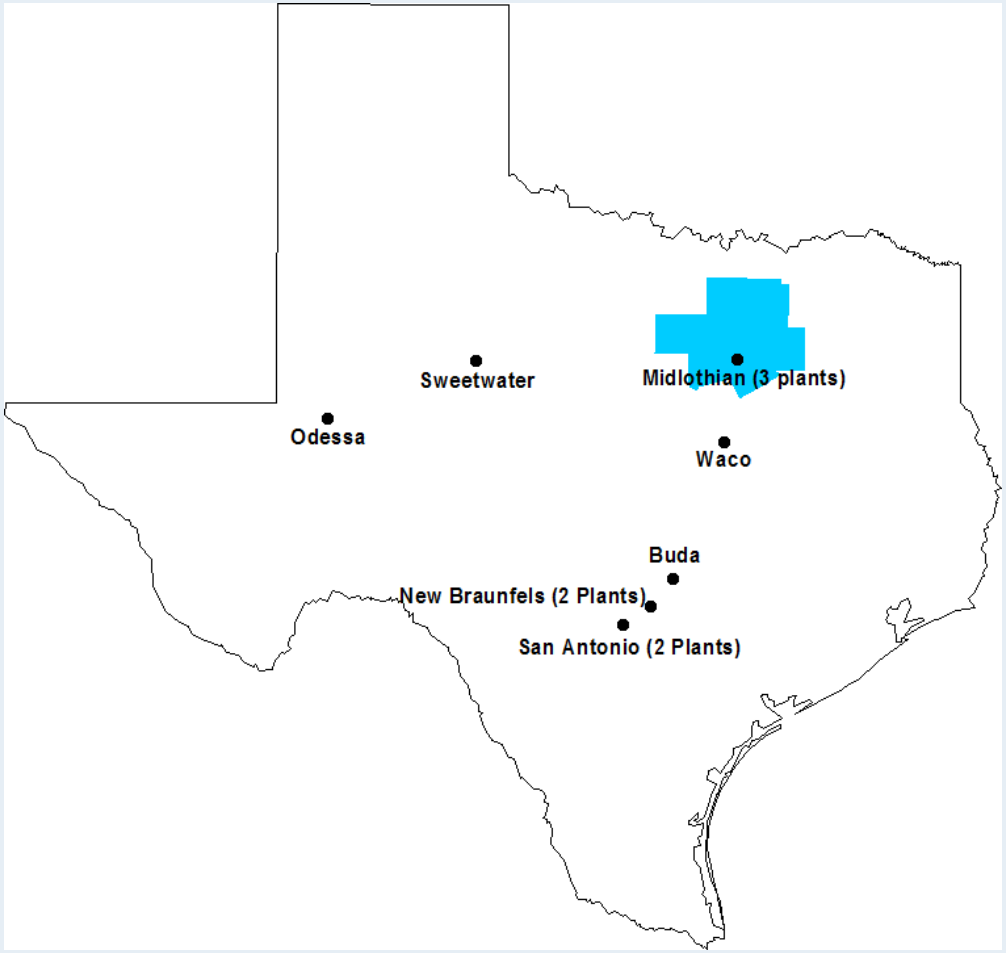
2006 Cement Production ('000 Tons/Year)

Plant	Production	Non-Attainment
Holcim	1,716	DFW
Buzzi Unicem	394	
Ash Grove	743	DFW
Cemex-Odessa	463	
Texas Industries - Midlothian	2,603	DFW
Capital Aggregates	716	
Cemex-Balcones	756	
Texas Industries - Hunter	651	
Texas-Lehigh	946	
Alamo Cement	711	
Lehigh Cement	102	
Total (All Texas)	**11,451**	

Cement Manufacturing (cont'd)

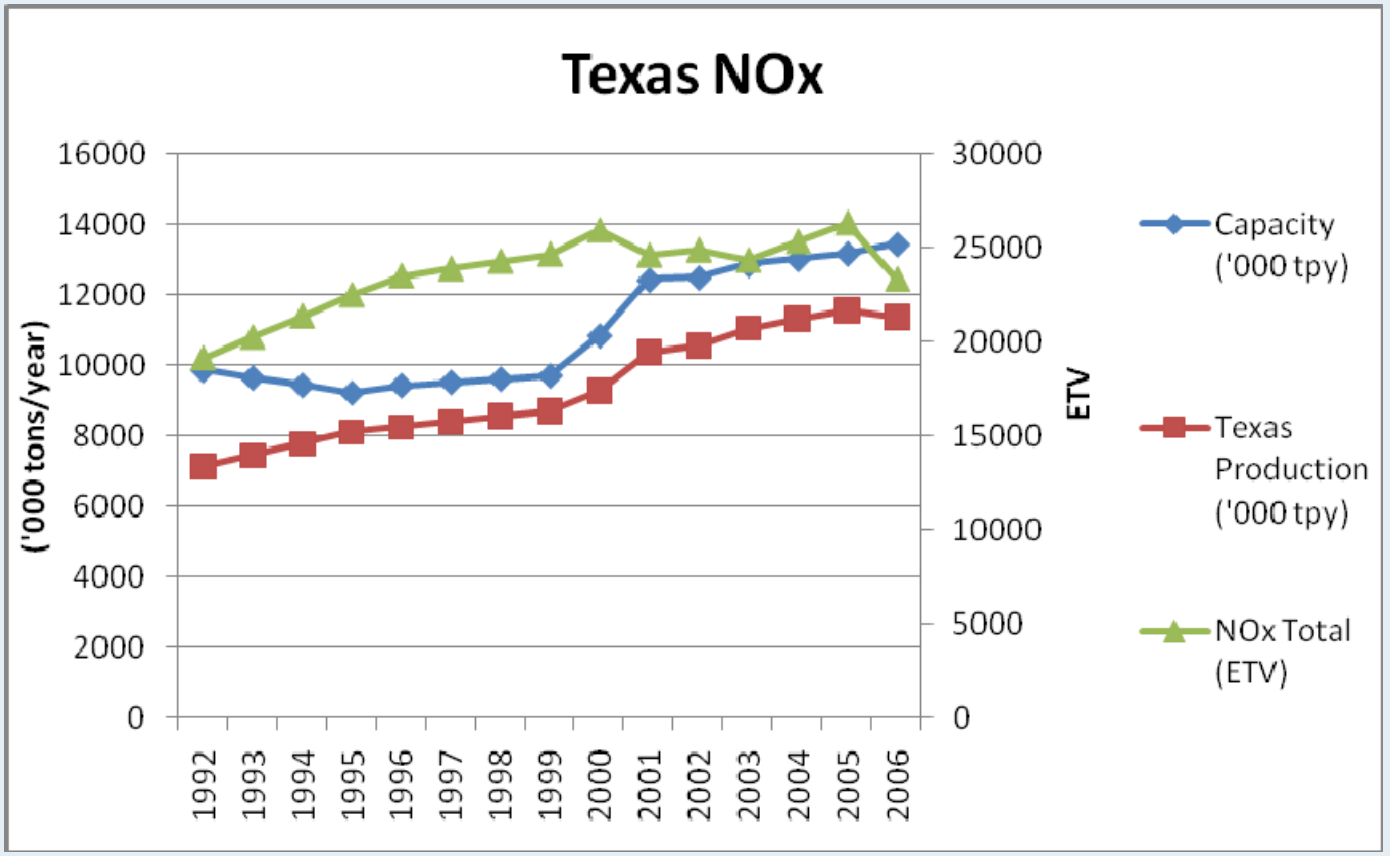
Texas Cement Plants

DFW outlined in Blue



Cement Manufacturing (cont'd)

Texas Capacity and Production of Cement, and Resulting NO_x Emissions

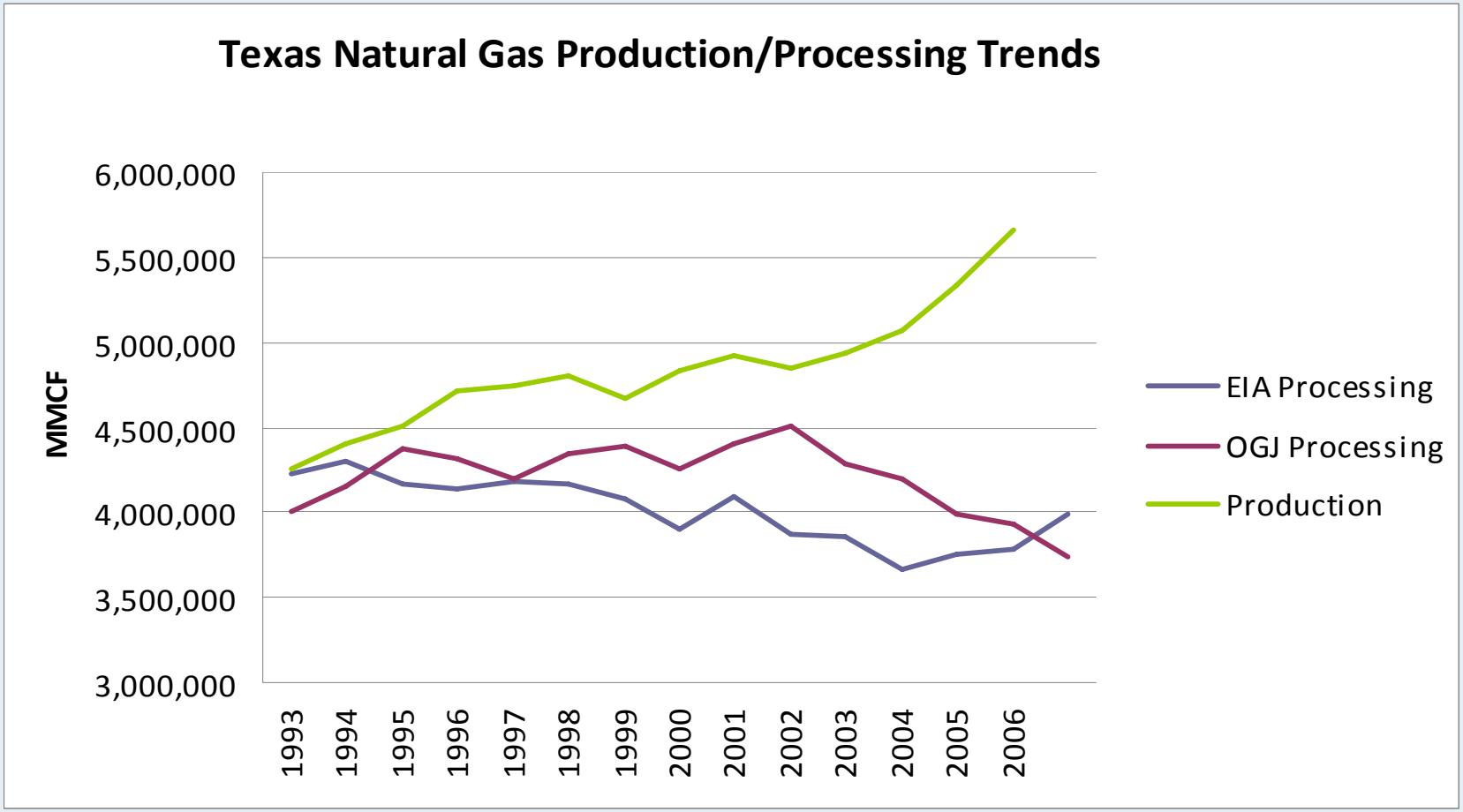


Cement Manufacturing (cont'd)

Control Factors - NO_x

- DFW area-rates constant at 2005 (or post-control) levels
- Other areas – Long-term NO_x rates approach PC/PH rate
  - 30-45% lower than existing
  - Could apply by kiln type or average across TX kilns.

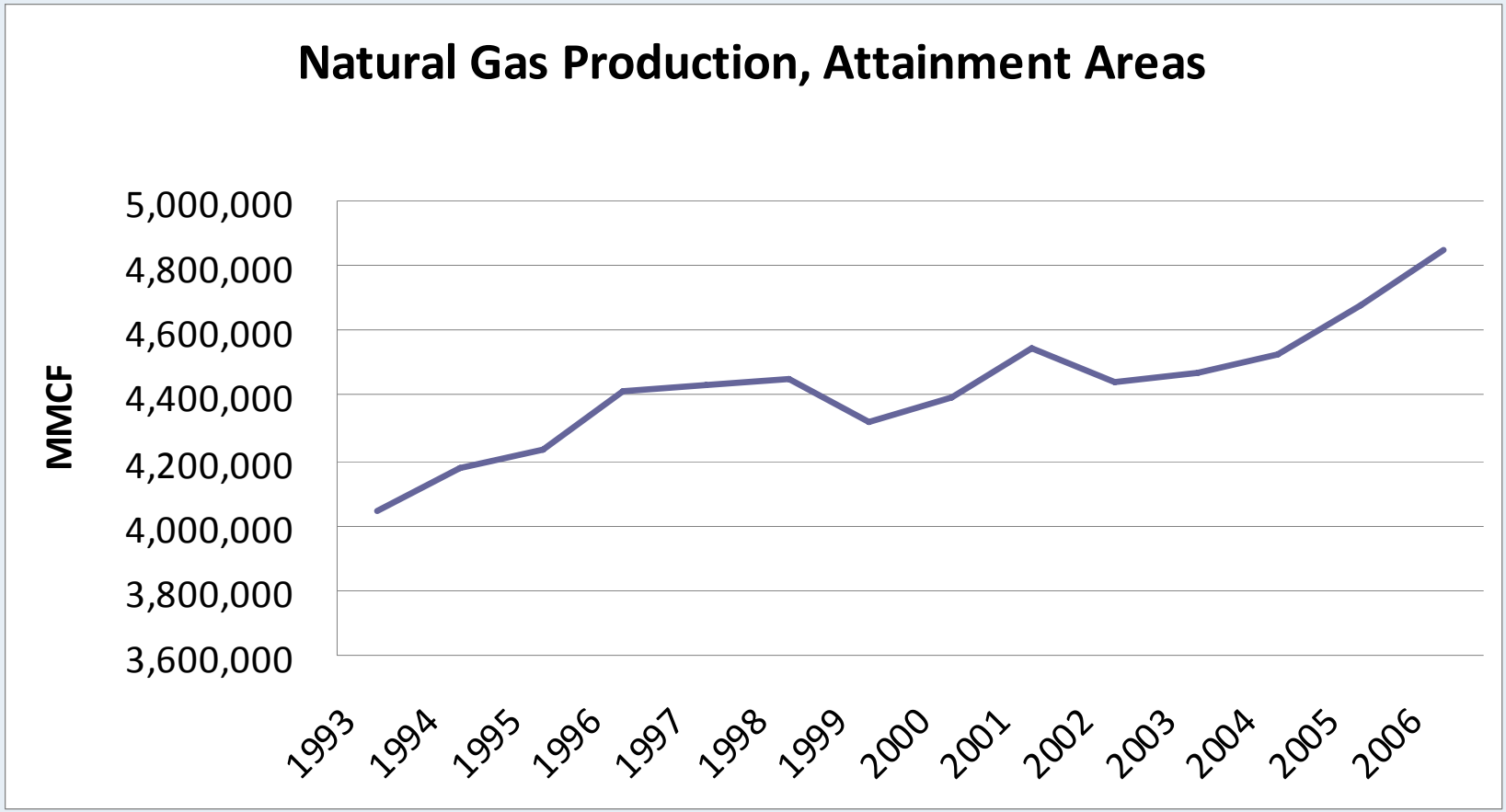
Natural Gas Production/Processing



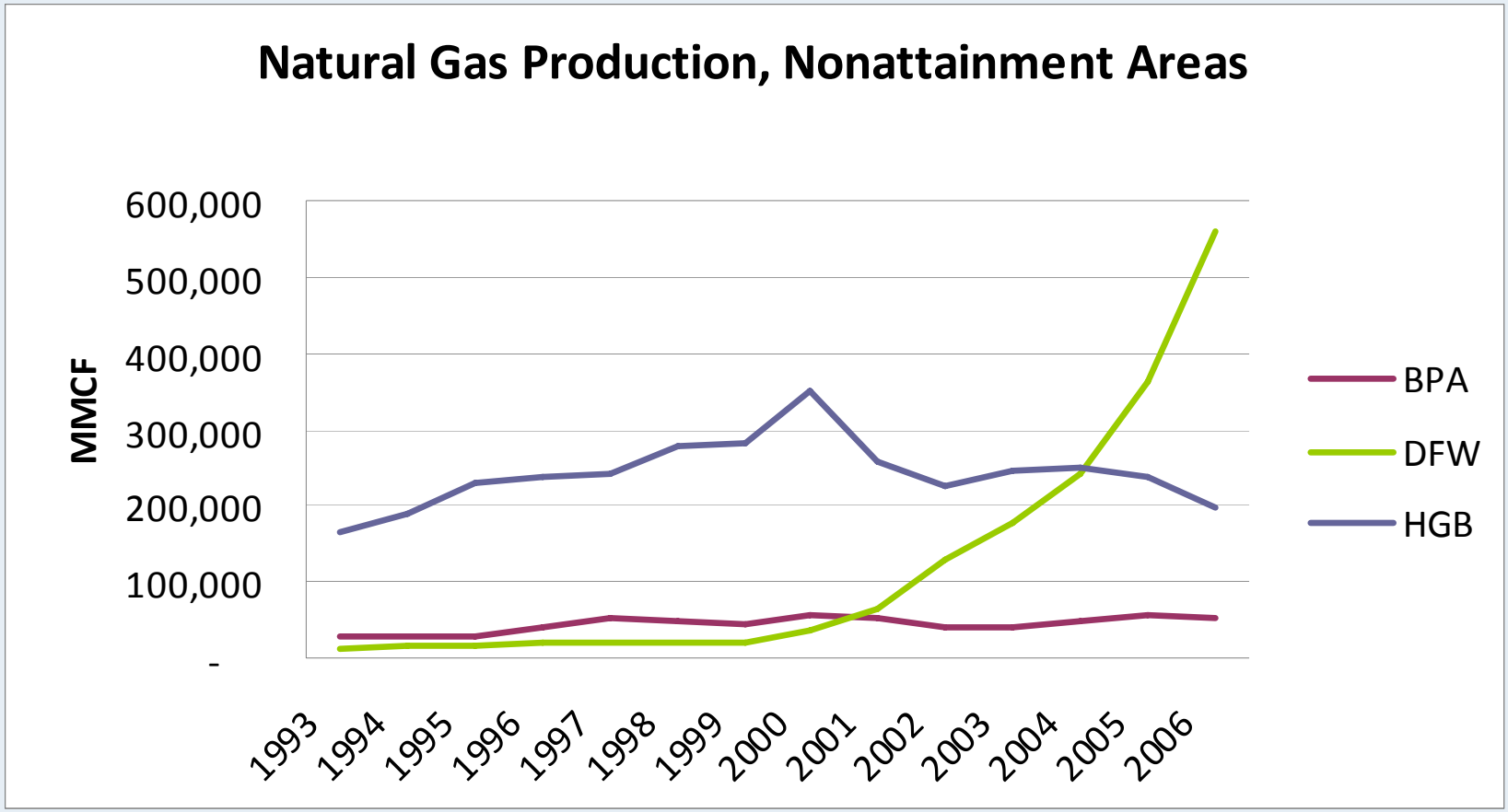
Natural Gas Production/Processing (cont'd)

- Gas Production Characteristics in Texas
  - Production source: Railroad Commission (county-level production)
  - Steady increase in production thru 2004, but accelerated increase in 2005/2006
  - Large majority in attainment areas, but % contribution from NAs increased from 5% in 1993 to 14% in 2006 (DFW)
  - Major pollutants (2006 emissions in tpy):
    - SO_2 (18,561); VOC (6,368); NO_x (3,476)
  - Large emission reductions for each pollutant in historical period

Natural Gas Production/Processing (cont'd)

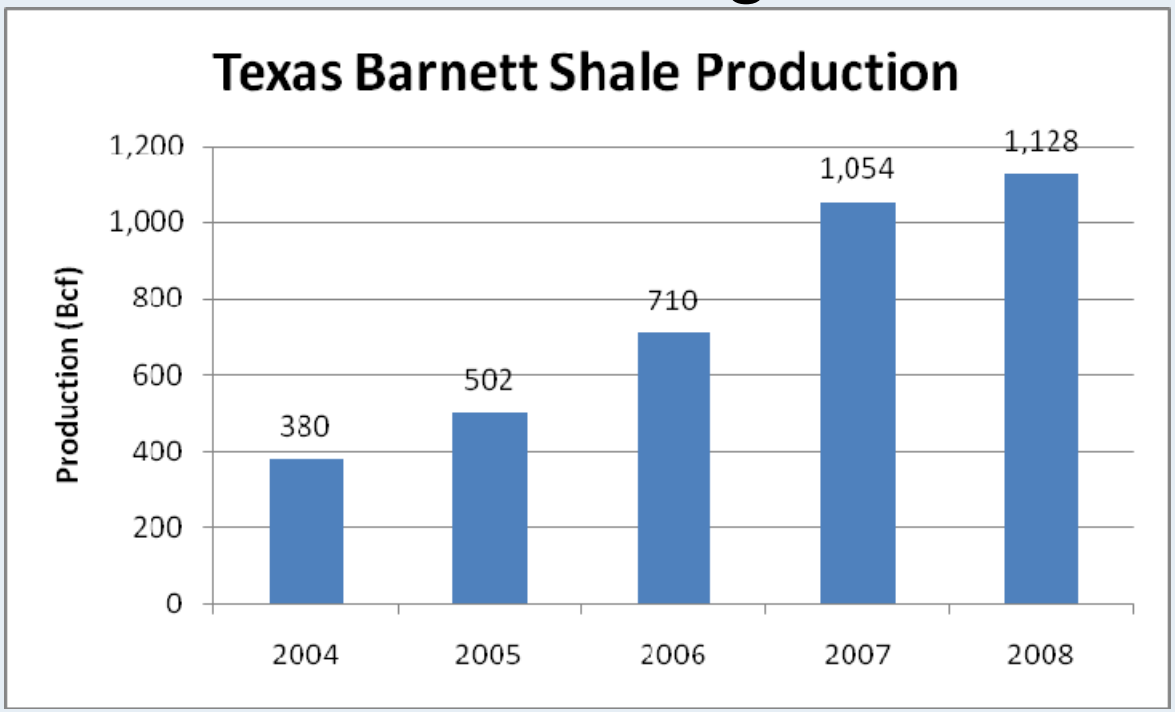


Natural Gas Production/Processing (cont'd)



Natural Gas Production/Processing (cont'd)

- Barnett Gas Shale Region



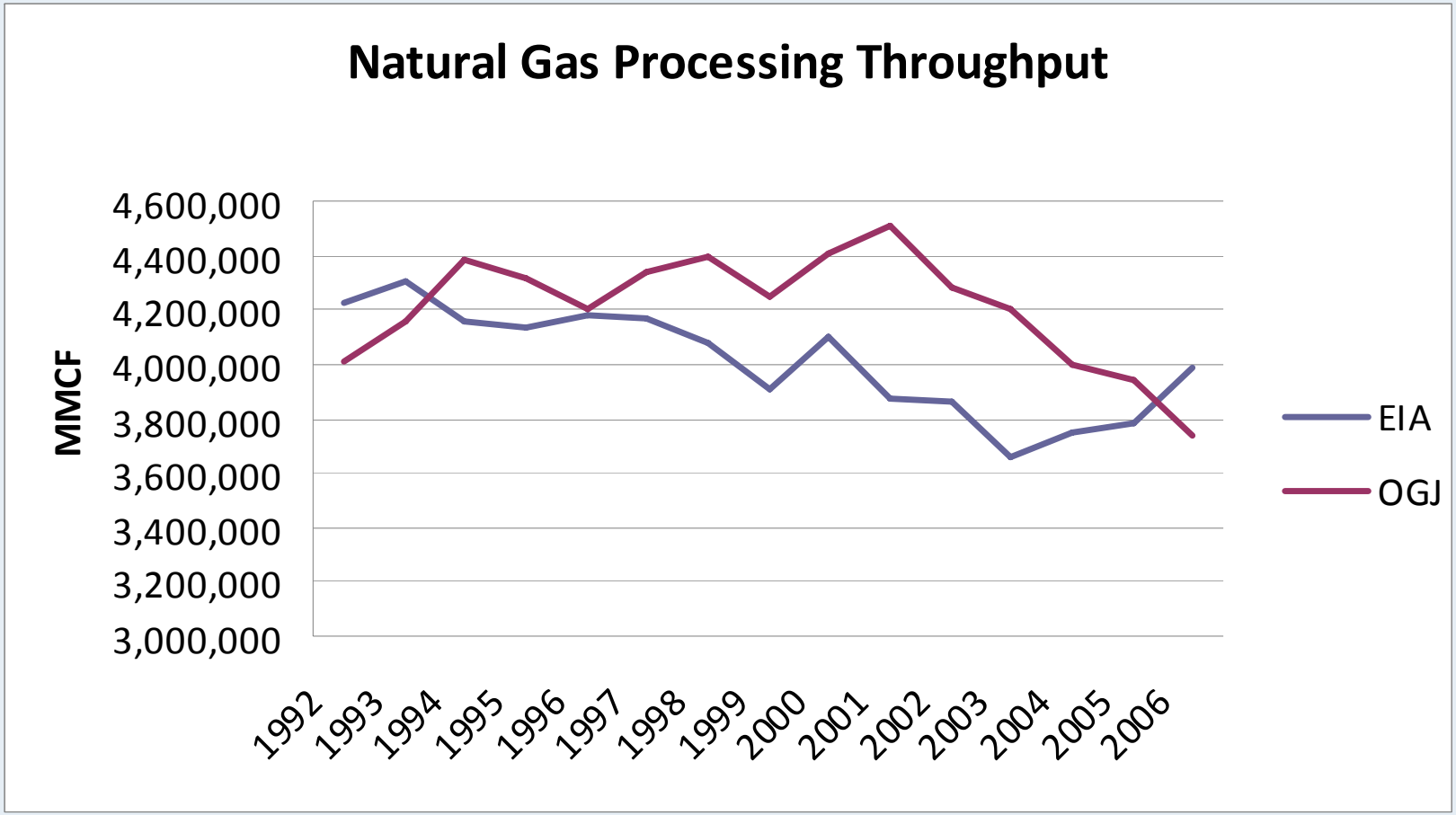
  - Core Counties: Denton, Johnson, Tarrant, and Wise
  - Non-Core Counties: Bosque, Clay, Comanche, Cooke, Dallas, Ellis, Erath, Hamilton, Hill, Hood, Jack, Montague, Palo Pinto, Parker, and Somervell

*2008 includes only January-October

Natural Gas Production/Processing (cont'd)

- Gas Processing Characteristics in Texas
  - Two throughput sources – EIA and OGJ (state-level only)
  - Overall decline in processing between 1993 and 2006
    - EIA reports increase since 2003
  - Major pollutants (2006 emissions in tpy):
    - VOC (2,084); SO_2 (198)

Natural Gas Production/Processing (cont'd)



Natural Gas Production/Processing (cont'd)

- Texas Activity Growth Forecasts
  - AEO regional production forecasts:
    - Gulf Coast - increase through 2008, significant decline through 2020
    - Southwest region - small increase through 2009, fairly steady through 2016, small decrease through 2020

Natural Gas Production/Processing (cont'd)

- Texas Activity Growth Forecasts
  - Gas Production by Basin (billion cubic feet)

Basin	2005	2010	2015	2020
Fort Worth-Barnett	222	374	434	500

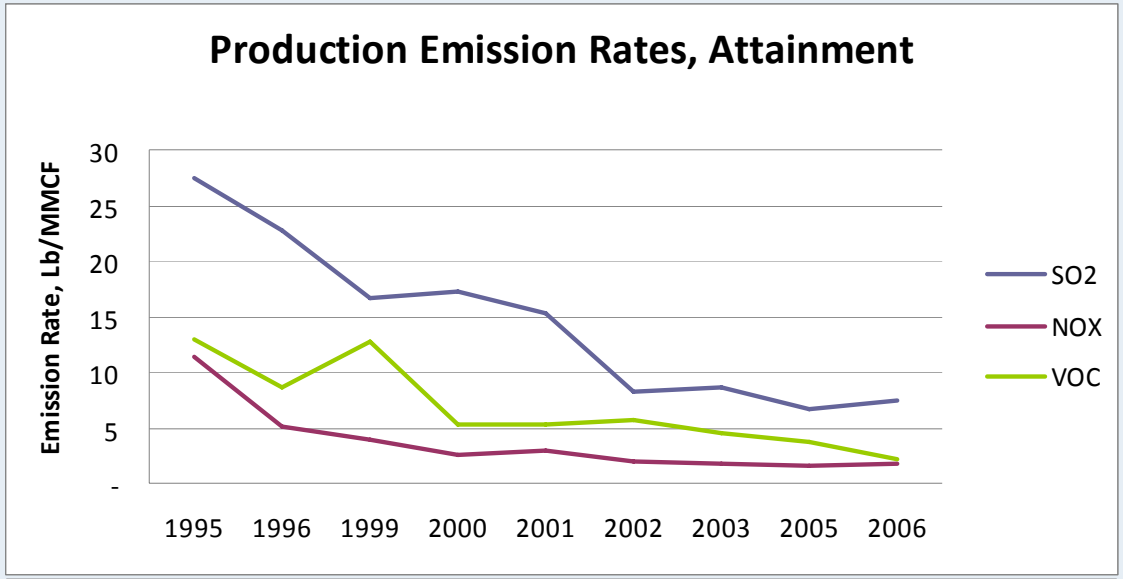
Source: ***Annual Energy Outlook 2005***

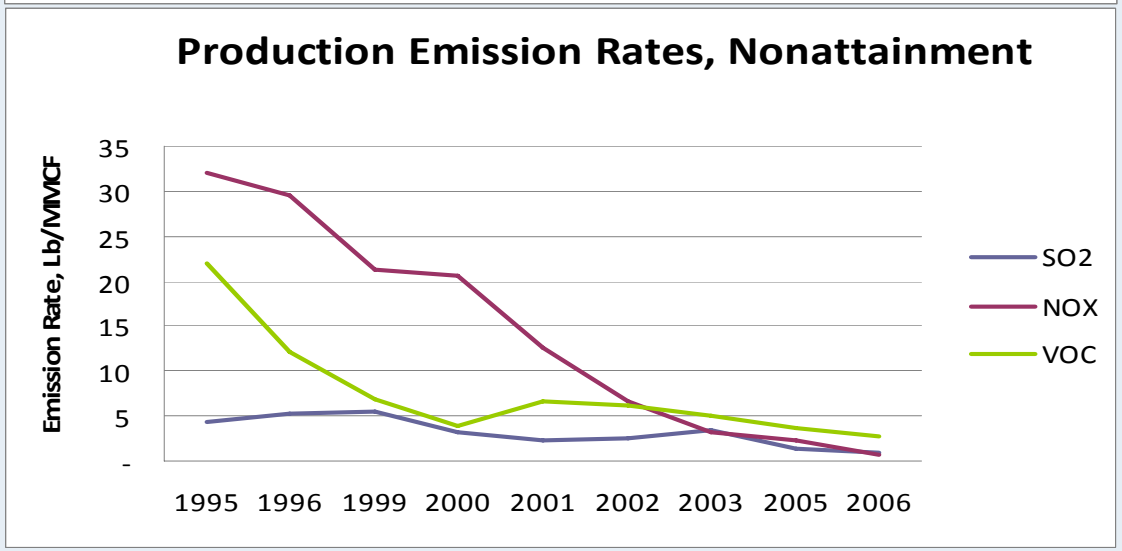
- No Natural Gas Processing Forecast Identified
  - Less gas processed/production (Barnett Shell); ratio of production/processing = 1.0 to 1.10 through 2001, 2005 =1.36, and 2006 = 1.52

Natural Gas Production/Processing (cont'd)

- Texas Activity Growth Forecasts
  - Gas Production
    - Leveling off with low gas prices
    - Develop county-level growth factors through 2008 from Railroad Commission production data
    - Post-2008 forecasts
      - Gulf coast counties using AEO Gulf Coast region forecast
      - Barnett Shell counties using post-2010 3% annual growth assumption from AEO
      - All other counties based on extrapolation of regional trend
  - Gas Processing
    - Compile gas processing throughput through 2008
    - Post-2008 state growth factors
      - Forecast ratio of production/processing
      - Apply ratio to total state production forecast

Gas Production Control Analysis





Gas Production Control Analysis (cont'd)

- Key Source Categories: VOC (tpy)

Category	1992	2000	2005	2006
Glycol Dehydrator Reboiler Still Stack	4,730	3,060	1,174	1,415
Valves: Fugitive Emissions	11,272	1,550	1,233	1,179
All Equipment Leak Fugitives	4,547	1,018	953	1,155
Gas Stripping Operations	2,816	4,038	1,141	903

Gas Production Control Analysis (cont'd)

- Key VOC Control Programs

Program	Source Categories	Geography	Pre-/Post-2005	% Reduction
NESHAP (Major source)	-Glycol Dehydrators -Storage vessels with flash potential -Equipment leaks	State	By 2005	Glycol–65% Storage–70% Leaks-49%
NSPS for Gas Processing	Equipment leaks (valves and compressors)	State	Mostly by 2005 (began in 1984)	70%
TAC, Chapter 115, Subchapter D, Division 3	Equipment leaks (valves and compressors)	HGB, DFW, BPA	By 2005? except March 2009 for Ellis, Johnson, Kaufman, Parker, & Rockwall counties	??
NESHAP (Area source)	Glycol Dehydrators	State	Post-2005 (2009/2010)	17%

Gas Processing Control Analysis (cont'd)

- Key Source Categories: VOC (tpy)

Category	1995	2000	2005	2006
Gas Sweetening: Amine Process[1]	98	281	685	2,038
Glycol Dehydrators: Reboiler Still Vent: Triethylene Glycol	90	103	37	41

[1]Southern Union plant emissions ranged from 130 to 230 tpy; 2005 emissions = 563 tpy and 2006 emissions = 1,897 tpy.

Gas Production Control Analysis (cont'd)

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Gas Production Control Analysis (cont'd)

- Key VOC Controls
  - TCEQ inventory reports nominal equipment leak emissions in processing categories
  - 17% glycol dehydrator reduction by 2010 from area source NESHAP
  - TCEQ permit for Southern Union plant limits VOC to 1,080 tpy in March 2009