E.H. Pechan & Associates, Inc.

2018 SO_2 Emissions Evaluation for Non-Utility Sources

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Presentation to
WRAP Stationary Sources Joint Forum Meeting
August 2006

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Presentation Outline

- Study Purpose
- Methods Summary
- Sector-by-Sector Analysis
- Overall Results
- Findings

Study Purpose

- Update the SO_2 emission milestones for the 309 States
- Non-utility source focus
- Milestone sources >100 tpy SO_2 in 2004 at the facility-level

Methods Summary

- Starting point – 2018 SSJF-sponsored emission projections
- MS Excel files posted on SSJF/ projections site
  - 2002 emissions
  - Growth and control factors
  - Equation to estimate 2018 emissions
- Revised base year emissions to 2004 values where needed

Methods Summary (Part 2)

- Revised SO_2 emissions and algorithms
- Consulted with States/sources
- Evaluated economic basis for growth factors
- Industry consultations
- Revisions made

Sectors Versus States

	States				
Sectors	**Arizona**	**New Mexico**	**Oregon**	**Utah**	**Wyoming**
Copper smelters	x	x		x	
Lime Manufacturing	x			x	
Pulp/paper	x		x		
Oil/gas		x		x	x
Chemicals					x
Refining		x		x	x
Cement	x	x		x	x

Copper Smelter SO_2 Emission Projections

State	Facility Name	2002	2018 ERG	2018 Pechan
Arizona	ASARCO-Hayden	18,438	34,490	21,000
	Phelps Dodge-Miami	6,804	9,848	10,000
Utah	Kennecott Utah	939	1,690	1,000
Total		26,181	46,028	32,000

Petroleum Refining

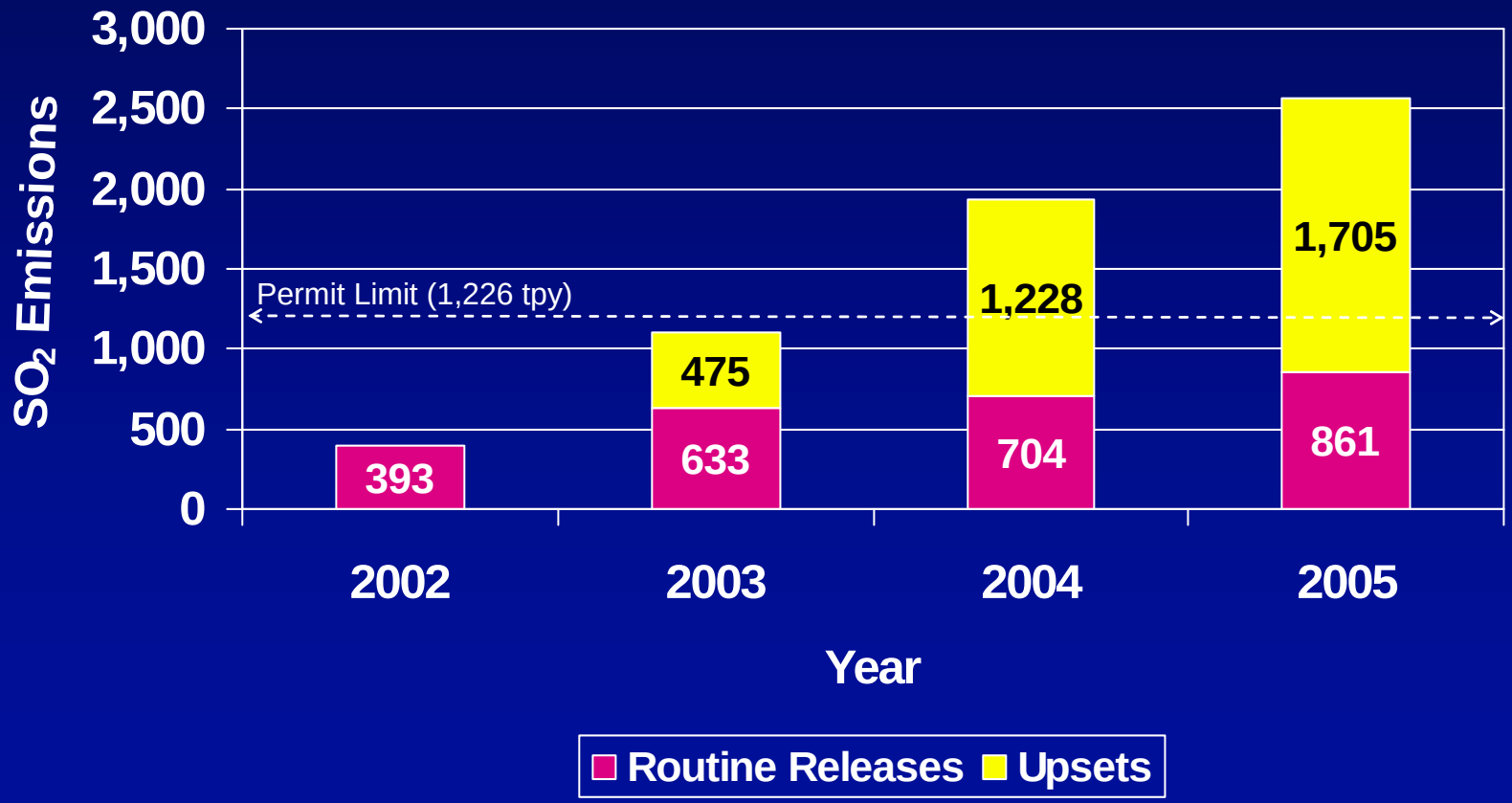
- Retirement/replacement algorithm for SO_2 only affects FCCU and industrial boiler emissions
- FCCU emissions not represented for 7 of 11 refineries
- Pechan allocated SO_2 emissions to FCCUs and revised projections

Oil and Gas Production

- Issue 1: Volatility in 2002-2004 SO2 emissions
  - Solution: Data review – industry consultation – information exchanges
- Issue 2: Regional – State – Sub-state allocation of expected activity growth

Oil and Gas Production Emissions Volatility

Example: Dynegy Eunice Gas Plant (NM)



Emission Activity Projections

- Emission Process Specific
  - Fuel Combustion – improve upon Annual Energy Outlook (AEO) sector specificity
  - Non-Fuel Combustion – replace industry sector $ sales forecasts with forecast of emission activity

Non-Fuel Combustion

- Petroleum Refineries
  - Previous – Total Petroleum Products Supply (national)
  - New – no change (stakeholder dialogue on validity of AEO regional refining capacity forecasts)

Non-Fuel Combustion (cont'd)

- Oil and Gas Production
  - Previous – when available, local new well forecast from Resource Management Plans (RMPs) combined with historic well closure rate; otherwise, regional AEO projections
  - New – RMP-based projections replaced with AEO growth (milestone sources only)

Non-Fuel Combustion (cont'd)

- Pulp and Paper
  - Previous – forecast state-level $ sales in Pulp, Paper, and Paperboard Mills sector
  - New – U.S. Forest Service forecast of pulpwood receipts at West region Pulp mills

Non-Fuel Combustion (cont'd)

- Chemicals (Phosphate Fertilizer)
  - Previous – SCC specific (e.g., $ sales in Concrete, Gypsum, and Plaster Products sector)
  - New – no growth assumption reflecting phosphate rock production info

Non-Fuel Combustion (cont'd)

- Cement Manufacturing
  - Previous – equation relating total $ sales to national cement production
  - New – national cement production forecast (Portland Cement Assoc) and Pechan regional prodn. share forecast

Fuel Combustion

- Previous Approach
  - SCC-specific growth indicators from EGAS (AEO energy forecasts). Major limitation is inventory SCC is often generic Industrial, Commercial, or Electric Utility fuel combustion

Fuel Combustion (cont'd)

- New Approach
  - Composite of non-fuel combustion growth and AEO projected change in fuel consumption per $ of facility sector output

State-Level Emission Comparisons

State	Base Year Emissions	2018 Emissions (ERG)	2018 Emissions (Pechan)
Arizona	27,970	47,170	33,814
New Mexico	17,837	21,119	21,965
Oregon	5,301	5,979	4,503
Utah	9,597	10,176	9,314
Wyoming	37,847	45,685	42,868
5 State Total	98,551	130,129	112,464

Sector-Level Emission Comparisons

Sector	Base Year Emissions	2018 Emissions (ERG)	2018 Emissions (Pechan)
Combined Heat & Power	3,801	2,620	2,620
Copper	26,181	46,028	32,000
Wood/Paper/Pulp	5,897	6,247	4,708
Cement	642	909	937
Chemicals/Plastics	2,015	3,129	2,015
Oil and Gas	32,900	45,529	46,574
Refining	13,222	14,308	12,099
Food	813	595	595
Glass	109	180	180
Metals/Mining/Minerals	11,780	9,289	9,442
Miscellaneous	1,189	1,294	1,294
Subtotal	98,551	130,129	112,464

Findings

- Base year data issues
- New vs. existing source SO_2 rates for non-boilers or FCCUs
- Refinery capacity expansion uncertainty
- Oil and gas
  - Upset emissions importance
  - Calibration of activity growth to regional forecasts