A National Analysis of Toxic Releases from Electric Power Plants

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The Toxics Release Inventory

- Established by section 313 of Emergency Planning and Community Right-to-Know Act (EPCRA) of 1986
- Strengthened by Pollution Prevention Act of 1990
- Lists approximately 650 chemicals and chemical categories
- Public database for community access to toxic release information
- No consideration of risks or effects

Application to Power Plants

- Covers all coal-fired and oil-fired plants with more than ten employees (approximately 1000 facilities)
- First reports due by July 1, 1999 for releases in calendar year 1998
- Information reported to EPA on Form R (one form per reportable substance)

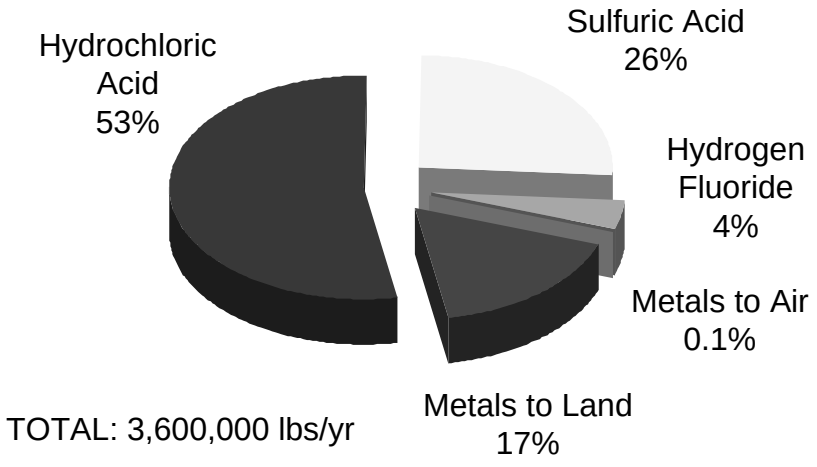
What Gets Reported?

- “Coincidentally manufactured” chemicals, if more than 25,000 lbs/yr
- “Processed” chemicals, if more than 25,000 lbs/yr
- “Otherwise used” chemicals, if more than 10,000 lbs/yr
- *De minimus* exemption for byproducts distributed in commerce

TRI Chemicals Potentially Relevant to the Electric Utility Industry

Metals	Organics	Other
Antimony	Benzene	Ammonia
Arsenic	Dichloromethane	Asbestos (friable)
Barium	Ethylbenzene	Bromine
Beryllium	Ethylene Glycol	Chlorine
Cadmium	Formaldehyde	Chlorine Dioxide
Chromium	Formic Acid	Hydrazine
Cobalt	Methanol	Hydrogen Fluoride
Copper	Naphthalene	Hydrochloric Acid
Lead	PCBs	Nitric Acid
Manganese	Polycylic aromatics	Ozone
Mercury	Propylene	Sulfuric Acid
Molybdenum	Toluene	Thiourea
Nickel	Xylene	
Selenium		
Silver		
Thallium		
Zinc		

Reportable TRI Releases (650 MW Case Study Plant)

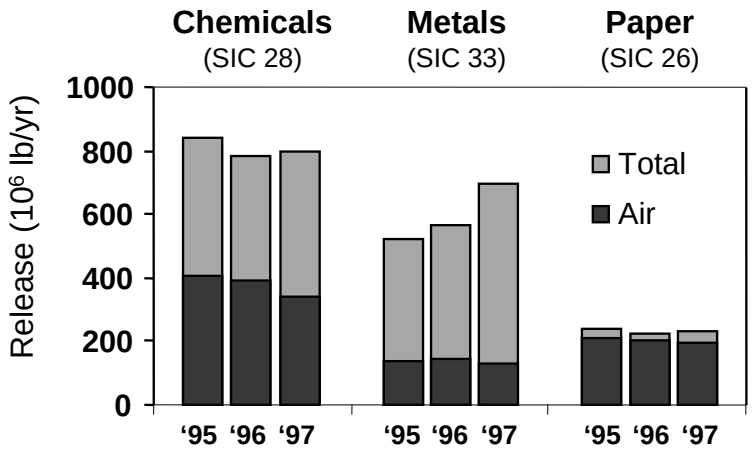


TOTAL: 3,600,000 lbs/yr

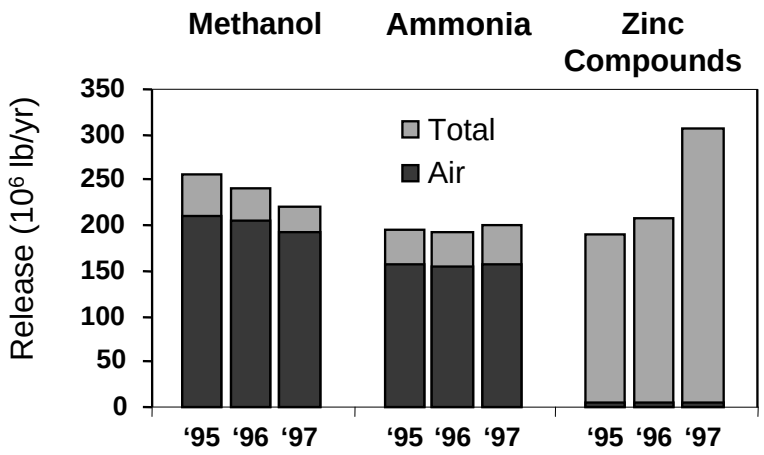
Objectives of This Study

- How do electric utility releases compare to other industries now reporting to the TRI?
- What are the implications for electric utility companies?

Largest Total Releases by Industry



Largest Total Releases by Chemical



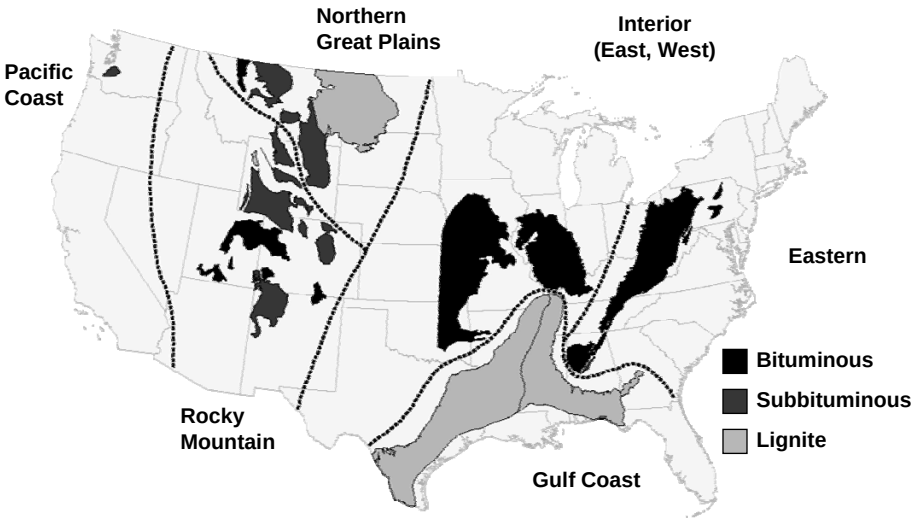
Study Approach

- Use FERC Form 423 data to quantify annual coal consumption at each U.S. power plant
- Use PISCES Model to estimate trace element composition by region, and air/land partitioning by plant type
- Apply TRI thresholds and byproduct exemptions to calculate reportable releases

Summary of Power Plant Coal Consumption (million tons/yr)

	FERC 423 Database	DOE/EIA Utility Data			
Coal Rank	**1995 Totals**	**1995**	**1996**	**1997**	**1998**
Bituminous	419				
Subbituminous	330				
Lignite	75				
Total Coal	**823**	**829**	**875**	**899**	**911**
Power Gen (BkWh)		1653	1738	1789	1807

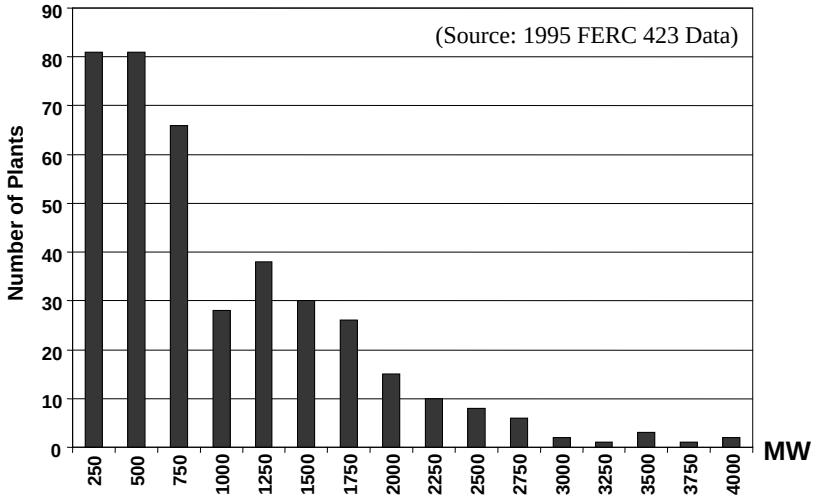
Coal Supply Regions for PISCES Model and Database



Mass Concentration of Trace Chemicals in Coal (ppmw, dry basis)

Chemical	Bit	Sub	Lig
Antimony	1.0	0.57	0.74
Arsenic	10.0	5.9	8.5
Barium	94.5	196.	220.
Beryllium	1.3	0.5	1.9
Cadmium	0.53	0.83	0.1
Chloride	750.	195.	140.
Chromium	18.6	5.0	9.3
Cobalt	6.4	2.0	3.7
Copper	21.	9.3	10.5
Fluoride	69.	44.	79.
Lead	8.1	7.8	6.2
Manganese	22.4	35.5	74.
Mercury	0.12	0.10	0.22
Molybdenum	2.1	1.7	3.0
Nickel	16.1	9.5	5.9
Selenium	3.2	0.9	1.3
Silver	0.2	0.16	0.1
Thallium	1.6	2.0	0.5
Zinc	22.0	8.7	7.8

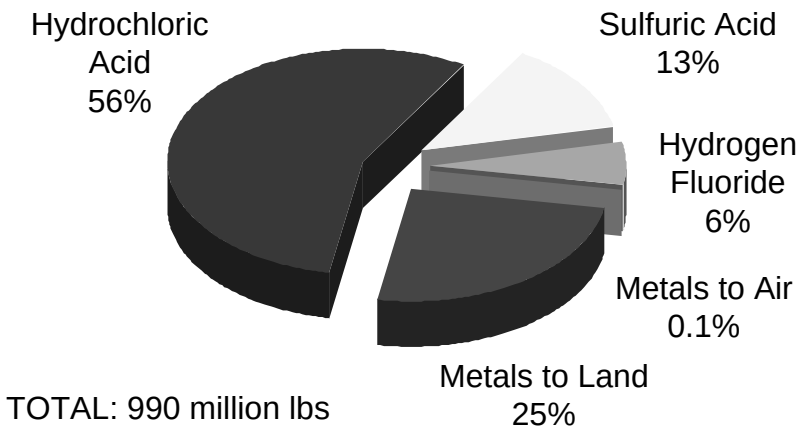
Size Distribution of Coal-Fired Power Plants Modeled in this Study



Base Case Estimates of Total Power Plant Releases for 1995 (millions of pounds)

TRI Chemical	Air	Total
Hydrochloric acid aerosol	553.5	553.5
Barium compounds	< 0.4	142.3
Sulfuric acid aerosol	129.6	129.6
Hydrogen fluoride	55.4	55.4
Manganese compounds	0.2	29.3
Zinc compounds	0.2	19.2
Copper compounds	0.1	12.2
Nickel compounds	0.1	11.7
Chromium compounds	< 0.1	9.9
Lead compounds	< 0.1	6.8
Arsenic compounds	< 0.2	6.0
Molybdenum trioxide	< 0.1	4.7
Cobalt compounds	< 0.1	3.6
Antimony compounds	< 0.1	1.5
Selenium compounds	0.3	0.7
Thallium compounds	< 0.1	0.4
Beryllium compounds	< 0.1	0.3
Total	**740.**	**987.**

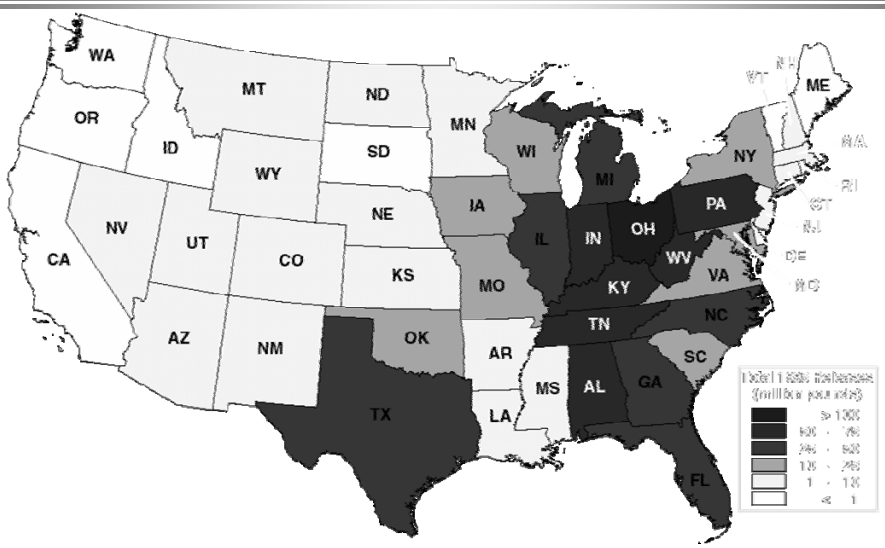
Estimated 1995 Toxic Releases from Electric Power Plants (Base Case)



Uncertainty Estimates for 1995 Releases from Coal-Fired Power Plants (millions of pounds)

Substance	Air Releases		Total Releases	
	Base	**Bound**	**Base**	**Bound**
HCl aerosol	553	1,147	553	1,147
H_2SO_4 aerosol	130	287	130	287
Hydrogen fluoride	55	135	55	135
Metal compounds	< 2	2	249	311
Total	**740**	**1,541**	**987**	**1,880**

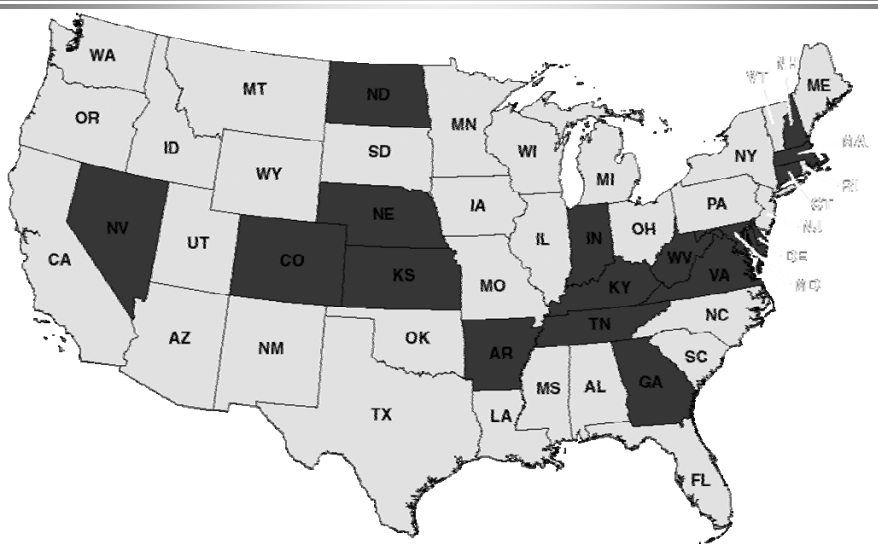
Base Case Estimates of TRI Releases from Coal-Fired Power Plants for 1995



Largest Total Releases by State

Rank	Actual 1995	Actual 1995 + Utilities
1	Texas	Texas
2	Louisiana	Ohio
3	Ohio	Pennsylvania
4	Pennsylvania	Louisiana
5	Illinois	Indiana

States Where a Power Plant is the Largest TRI Source (1995)



Projections for 1998 Electric Utility Releases

Source	Million lbs	
	Coal	Oil
Carnegie Mellon (This study + 10% above 1995)	> 1100	Negl.
Edison Electric Institute (Actual utility data, extrapolated from 65% of coal-fired capacity and 40% of oil-fired capacity)	1100	0.3

Study Implications

- Electric utility industry is likely to dominate the 1998 Toxics Release Inventory based on total mass of releases
- Power plant HCl aerosol releases will substantially exceed current largest chemical releases
- In many states, a power plant will be named as the largest source of toxic releases

Limitation of the TRI

- Total mass emissions do not reflect toxicity or risks from different:
  - Chemicals
  - Sources
  - Environmental media
- Communities must individually assess the significance of reported releases
- Labels and findings are often confusing, conflicting or misleading

Anticipated Utility Response

- Risk Communication Activities

  Brochures, briefings, chemical profiles, toxicity weighting factors, screening studies, site-specific assessments
- Improved Data Acquisition
- Pollution Prevention Programs
- Emission Reduction Programs